Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

UNCLASSIFIED/NON CLASSIFIÉ

ORIGINAL/ORIGINAL

CMD: 22-H13

Date signed/Signé le: 15 AUGUST 2022

Reference CMD(s)/CMD(s) de référence: 17-H101, 14-H117, 12-H10

A Licence Renewal

Renouvellement d'un permis

Canadian Nuclear Laboratories

Application to Renew, Port Hope Long-Term Low-Level Radioactive Waste Management Project

Les Laboratoires Nucléaires Canadiens

Demande de renouvellement de permis, le Project de gestion à long terme des déchets radioactifs de faible activité de Port Hope

Commission Public Hearing

Audience publique de la Commission

Scheduled for:

22 November 2022

Prévue pour :

22 novembre 2022

Submitted by:

CNSC Staff

Soumise par :

Le personnel de la CCSN

e-Doc 6724987 (WORD)
e-Doc 6828550 (PDF)

Summary

This Commission Member Document (CMD) presents information about the following matters of regulatory interest with respect to the Port Hope Long-Term Low-Level Radioactive Waste Management Project (Port Hope Project):

- application from Canadian Nuclear Laboratories (CNL) to renew its waste nuclear substance licence WNSL-W1-2310.02/2022 for the Port Hope Project, for a 10-year period.

CNSC staff recommend the Commission take the following actions:

- renew the WNSL licence to authorize CNL to continue its authorized activities at the Port Hope Project from January 1, 2023 to December 31, 2032
- authorize the consolidation of the 4 CNL licences issued for the remediation activities associated with the Port Hope Area Initiative (PHAI)
- approve the proposed licence change to remove the authorization to process, package and transport radioactive material as outlined in section 3.14 and summarized in Part Two of this CMD
- approve the proposed liquid effluent release limits for the Port Hope Project Wastewater Treatment Plant as summarized in section 5.5 of this CMD
- issue the proposed WNSL for the PHAI, WNSL-W1-2310.00/2032

Résumé

Le présent CMD offre de l'information sur un ensemble de questions d'ordre réglementaire concernant le projet de gestion à long terme des déchets radioactifs de faible activité de Port Hope (projet de Port Hope) :

- demande des Laboratoires Nucléaires Canadiens (LNC) concernant le renouvellement de son permis de déchets de substances nucléaires, WNSL-W1-2310.02/2022, pour le projet de Port Hope, pour une période de 10 ans.

Le personnel de la CCSN recommande à la Commission de prendre les mesures suivantes :

- renouveler le permis WNSL pour la période allant du 1er janvier 2023 au 31 décembre 2032, afin d'autoriser les LNC à poursuivre leurs activités autorisées relativement au projet de Port Hope
- autoriser la fusion des quatre permis des LNC délivrés pour les activités d'assainissement associées à l'Initiative dans la région de Port Hope (IRPH)
- approuver la modification de permis proposée visant à retirer l'autorisation de traiter, d'emballer et de transporter des matières radioactives, comme il est indiqué à la section 3.14 et résumé à la Partie 2 du présent CMD
- approuver les limites de rejet d'effluents liquides proposées pour l'usine de traitement des eaux usées du projet de Port Hope, comme il est résumé à la section 5.5 du présent CMD
- délivrer le permis de déchets de substances nucléaires, WNSL-W1-2310.00/2032, proposé pour l'IRPH

- authorize the delegation of authority as set out in subsection 5.7 of this CMD

The following items are attached:

- current licence Port Hope Project WNSL-W1-2310.02/2022
- current licence Port Granby Project WNSL-W1-2311.00/2022
- current licence Pine Street Extension Temporary Storage Site WNSL-W1-182.0/2022
- current licence Port Hope Radioactive Waste Management Facility WNSL-W1-344-1.8/ind.
- proposed licence changes
- proposed licence WNSL-W1-2310.00/2032
- proposed licence conditions handbook

- autoriser la délégation de pouvoirs prévue à la section 5.7 du présent CMD

Les pièces suivantes sont jointes :

- permis actuel du projet de Port Hope, WNSL-W1-2310.02/2022
- permis actuel du projet de Port Granby, WNSL-W1-2311.00/2022
- permis actuel du site d'entreposage temporaire du prolongement de la rue Pine, WNSL-W1-182.0/2022
- permis actuel de l'installation de gestion des déchets radioactifs de Port Hope, WNSL-W1-344-1.8/ind
- modifications proposées au permis
- permis proposé, WNSL-W1-2310.00/2032
- manuel des conditions de permis proposé

Signed/Signé le

15 August 2022

Burton, Patrick

Digitally signed by Burton, Patrick
DN: C=CA, O=GC, OU=CNSC-CCSN, CN="Burton, Patrick"
Reason: I am the author of this document
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Director General (Acting)

Directorate of Nuclear Cycle and Facilities Regulation

Directeur général (intérimaire)

Direction de la réglementation du cycle et des installations nucléaires

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EXECUTIVE SUMMARY

Land acknowledgement

The land on which the proposed licence and activities take place is on the traditional territory of the Wendat, Anishinabek Nation, and the territory covered by the Williams Treaties with the Michi Saagiig and Chippewa Nations.

Summary

The Port Hope Area Initiative (PHAI) is a federal government initiative based on a community proposal, which includes the Port Hope Long-Term Waste Management Project (Port Hope Project) and Port Granby Long-Term Waste Management Project (Port Granby Project). The Government of Canada, through Natural Resources Canada (NRCan), has committed to clean-up low-level radioactive waste in the Port Hope area and to provide long-term safe management of the historic low-level radioactive wastes in the Port Hope area. These wastes arose from the activities of a former federal Crown Corporation (Eldorado Nuclear) and its private sector predecessors.

Through its Historic Waste Program Management Office, Canadian Nuclear Laboratories (CNL) is implementing the PHAI on behalf of Atomic Energy of Canada Limited (AECL), a federal Crown corporation.

CNL currently has 4 licences issued by the CNSC associated with the PHAI. The 4 licences include:

- WNSL-W1-2310.02/2022 Port Hope Project (PHP)
- WNSL-W1-2311.00/2022 Port Granby Project (PGP)
- WNSL-W1-182.0/2022 Pine Street Extension Temporary Storage Site (PSETSS)
- WNSL-W1-344-1.8/ind. Port Hope Radioactive Waste Management Facility (PHRWMF)

On September 10, 2021, CNL submitted an application requesting a 10-year licence renewal for its PHP WNSL. In its licence renewal application for the Port Hope Project (PHP), CNL requested that the PGP and PSETSS licences be consolidated with the PHP licence for a 10-year licence term. The application also proposed to incorporate effluent release limits for the PHP wastewater treatment plant (WWTP) into the licensing basis. In addition, CNL requested to increase the soil clean-up criteria for arsenic and uranium.

Subsequently, on March 4, 2022, CNL submitted an amendment to its application, requesting to also consolidate the PHRWMF licence with the PHP licence, and to remove the requested changes to the soil clean-up criteria from the application. The renewal application was submitted pursuant to section 24(2) of the *Nuclear Safety and Control Act*.

Should the Commission authorize the consolidation of the licences, CNSC staff recommend that the PHP licence number remain the same, but the name of the licence be changed to the Port Hope Area Initiative Waste Management Project, as indicated in the draft proposed licence in Part Two of this CMD.

The PHP involves the construction and operation of a long-term waste management facility (LTWMF), WWTP and supporting infrastructure for the long-term management of approximately 1.2 million cubic metres of historic low-level radioactive waste; the cleanup activities of the waste from various sites in Port Hope; and the transportation of this waste to the LTWMF.

The PGP involves the construction and operation of a LTWMF, WWTP and supporting infrastructure for the long-term management of approximately 1.3 million tonnes of historic low-level radioactive waste removed from a former waste management site on the shoreline of Lake Ontario in Southeast Clarington.

The PSETSS and PHRWMF are small temporary storage sites primarily used for the short-term storage of soils contaminated with low-level radioactive waste. This waste originated from the contaminated sites within the Municipality of Port Hope and that are being remediated as part of the current PHP licence. Contaminated soils are stored at the PSETSS and PHRWMF until it is transferred to the PHP LTWMF, which opened in 2016.

CNSC staff conducted consultation and engagement activities with the identified Indigenous Nations and communities to encourage their participation in the regulatory review process, and to ensure that their concerns are heard and addressed by CNL and the CNSC in a meaningful way. Based on the information reviewed to date, CNSC staff are satisfied that the proposed licence renewal and amendment for the PHP is unlikely to cause any new impacts on Indigenous and/or treaty rights.

CNSC staff have assessed the proposed licence renewal application and conclude that it meets the requirements for a WNSL set out under the *Nuclear Safety and Control Act* and its Regulations.

The CNSC's regulatory oversight will continue throughout all phases of the licensed activities through their compliance oversight. Validation of CNL's performance will be a part of ongoing licensing and compliance activities throughout the lifecycle of the project.

Through their review CNSC staff have determined that CNL has made adequate provision for the protection of the environment and the health and safety of persons.

CNSC staff recommendations

CNSC staff recommend that the Commission issue the proposed licence WNSL-W12310.00/2032, which would remain valid until December 31, 2032. This recommendation is based on CNSC staff's review and assessment of CNL's application and supplemental information and performance during the current licensing term,

Part Two of this CMD provides licensing-related documentation pertaining to this hearing, including the proposed licence and the current licences. A draft licence conditions handbook is also included for information only.

Any referenced documents in this CMD are available to the public upon request, subject to confidentiality considerations.

This CMD is presented in two parts.

PART ONE

Part One includes:

1. An overview of the matter being presented
2. Overall conclusions and overall recommendations
3. General discussion pertaining to the safety and control areas (SCAs) that are relevant to this submission
4. Discussion about other matters of regulatory interest
5. Addenda material that complements items 1 through 4.

PART TWO

Part Two provides all available information pertaining directly to the current and proposed licence:

1. The proposed licence - WNSL-W1-2310.00/2032
2. The draft licence conditions handbook
3. The current licence - Port Hope Project (PHP) WNSL-W1-2310.02/2022
4. The current licence - Port Granby Project (PGP) WNSL-W1-2311.00/2022
5. The current licence - Pine Street Extension Temporary Storage Site (PSETSS) WNSL-W1-182.0/2022
6. The current licence - Port Hope Radioactive Waste Management Facility (PHRWMF) WNSL-W1-344-1.8/ind.

1. OVERVIEW

1.1 Background

The Port Hope Area Initiative (PHAI) is a Canadian Federal Government initiative requested by communities within the Municipalities of Port Hope and Clarington. The land on which the proposed licence and activities take place is the traditional territory of the Wendat, Anishinabek Nation, and the territory covered by the Williams Treaties with the Michi Saagiig and Chippewa Nations. The project is based on community recommended solutions for the cleanup and local long-term management of historic low-level radioactive waste (LLRW). The LLRW is a result of uranium refining activities performed by the former federal Crown Corporation Eldorado Nuclear Ltd and its private sector predecessors from 1930 to 1988. A legal agreement between the Federal Government and the two Municipalities describes the framework and responsibilities for remediation activities in Port Hope and Port Granby. The CNSC is not a signatory of the legal agreement; however, the clean-up and management of the historic LLRW generated up to 1988, are covered under the PHAI licences issued by the CNSC.

CNL is the licensee responsible for the implementation of PHAI. In October 2014, the Commission approved the transfer of the PHAI licences from Atomic Energy of Canada Limited (AECL) to CNL under the Government-owned, Contractor-operated (GoCo) model [1]. While the restructuring of AECL (the GoCo) has seen the oversight of the PHAI transferred to a private-sector contractor, the Canadian National Energy Alliance, AECL retains ownership of the lands, assets and liabilities associated with CNL's licences. CNL is implementing the PHAI, through CNL's Historic Waste Program Management Office, on behalf of AECL, a federal Crown corporation.

1.1.1 CNL Application

On September 10, 2021, CNL submitted an application requesting a 10-year licence renewal for its PHP WNSL [2]. The renewal application was submitted pursuant to section 24(2) of the *Nuclear Safety and Control Act*. As part of the renewal, CNL requested to consolidate the Port Granby Project (PGP) licence associated with the PHAI, incorporate effluent release limits for the PHP WWTP and change the PHP clean-up criteria for uranium and arsenic. In addition, CNL has committed to meeting the applicable requirements of the CNSC's recently published or revised waste management and decommissioning Regulatory Documents (CNSC's REGDOCs) for the PHAI. Further details are provided in section 3.11 of this CMD.

Subsequently, on March 4, 2022, CNL submitted an addendum to the application requesting the consolidation of two additional licences associated with the PHAI and that the requested changes to the clean-up criteria be removed from the application [3]. The removal of the requested changes to the clean-up criteria is further discussed in Section 1.2 of this CMD.

Therefore, this licence renewal is now requesting the following:

1. Renew the PHP WNSL and consolidate the PHP licence with three other WNSLs associated with the PHAI into a single WNSL for a 10-year licence term.
2. Incorporate effluent release limits for the PHP WWTP into the licensing basis.
3. Meeting the applicable requirements of the CNSC's recently published or revised waste management and decommissioning regulatory documents for the PHAI.

1.1.2 Project Overview

CNL currently has the following four licences, authorized by the Commission, that are associated with the PHAI and are proposed to be consolidated into a single WNSL as part of this licence renewal.

- WNSL-W1-2310.02/2022 PHP
- WNSL-W1-2311.00/2022 PGP
- WNSL-W1-182.0/2022 PSETSS
- WNSL-W1-344-1.8/ind. PHRWMF

The current PHP and PGP licences are authorized by the Commission, while the current PSETSS and PHRWMF licences are issued by a CNSC designated officer.

Port Hope Project (WNSL-W1-2310.02/2022)

The PHP is being conducted in three distinct phases and is currently in Phase II, which includes construction and commissioning of the LTWMF, construction and operation of a WWTP, and remediation of legacy LLRW located within the Municipality of Port Hope.

Pursuant to section 24 of the *Nuclear Safety and Control Act*, the Commission authorized the WNSL for a 10-year period, expiring on December 31, 2022. The current WNSL authorizes CNL to possess, package, transport, transfer, manage and store the nuclear substances except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from Phases 2 and 3 of the Port Hope Area Initiative – Port Hope Long-Term Waste Management Facility, as more particularly described in Appendix A to of the current licence.

Port Granby Project (WNSL-W1-2311.00/2022)

The PGP is being conducted in three distinct phases and is currently transitioning to Phase III. Phase II activities included the construction and commissioning of the LTWMF, construction and operation of a WWTP, and remediation of the Port Granby Waste Management Facility. Phase III involves the long-term maintenance and monitoring of the site including the LTWMF and WWTP.

Pursuant to section 24 of the *Nuclear Safety and Control Act*, the Commission renewed the PGP WNSL in December 2021 for a 1-year period expiring on December 31, 2022. The purpose of the PGP short-term renewal was to align the expiry date with the PHP licence as part of this proposal to consolidate the PHAI licences. The current WNSL authorizes CNL to possess, package, transport, transfer, manage, and store nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the Port Hope Area Initiative - Port Granby Long-Term Low-Level Waste Management Facility, located in the Municipality of Clarington, Regional Municipality of Durham, Province of Ontario.

Pine Street Extension Temporary Storage Site (WNSL-W1-182.0/2022)

The PSETSS is a small temporary storage site that is primarily used for the short-term storage of soils contaminated with LLRW originating from contaminated sites within the Municipality of Port Hope. The WNSL authorizes CNL to possess, transfer, use, process, manage and store nuclear substances, except Category I, II and III nuclear material as defined in Section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the operation of the PSETSS located within the Municipality of Port Hope.

The site consists of a storage building, currently used to store contaminated artefacts and radioactive material. The site also has two (2) asphalt pads (known as Pad-1 and Pad-2), which store contaminated soils and other debris. In 2020, CNL transferred the contaminated soils from Pad 1 and 2 to the PHP LTWMF.

The site is now primarily used as a staging area for the remediation of the Pine Street Extension Consolidation site and future remediation activities planned for the Highland Drive Landfill, which is an authorized activity under this licence. The PSETSS site is located in the Municipality of Port Hope, Ward 1, Ontario.

The PSETSS licence was renewed in December 2021 for a 1-year period expiring on December 31, 2022 [5]. The purpose of the short-term renewal was to align the expiry date with the PHP licence for consolidation. Following the remediation of this site, against the clean-up criteria in the PHP licence, it is anticipated that CNL will apply to amend its licence to remove this site from the licence, during the licence term.

Prior to the licence being revoked, CNSC staff will conduct a final inspection to ensure the cleanup criteria has been met and that the property can be transferred to the Municipality of Port Hope.

Port Hope Radioactive Waste Management Facility (WNSL-W1-344-1.8/ind.)

The PHRWMF is comprised of three sites: The Pine Street Extension Consolidation Site, the Strachan Street Consolidation Site, and the Sewage Treatment Plant Temporary Storage Site. All three storage sites are for the short-term storage of soils contaminated with LLRW originating from contaminated sites within the Municipality of Port Hope. The WNSL authorizes CNL to possess, transfer, use, manage and store the nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the operation of the Port Hope Waste Management Facility located within the Municipality of Port Hope, Ward 1, at the sites more precisely described in Appendix "A" of WNSL-W1-344-1.8/ind.

The storage sites have not received contaminated soils for more than 30 years. With the opening of the PHP LTWMF in 2016, CNL has been transferring the contaminated soils from the three licenced sites to the PHP LTWMF. To date, CNL has removed the soils stored at the Sewage Treatment Plant Temporary Storage Site and is currently in the process of verifying that the remaining soils meet the cleanup criteria in the PHP licence. The transfer of the contaminated soil from the Pine Street Extension Consolidation Site and Strachan Street Consolidation Site to the PHP LTWMF is currently underway.

The PHRWMF licence has an indeterminate expiry date. Following the remediation of these sites, against the clean-up criteria in the PHP licence, it is anticipated that CNL will apply to amend its licence to remove these sites from the licence, during the licence term.

Prior to the licence being revoked, CNSC staff will conduct a final inspection of each site to ensure the cleanup criteria has been met and that the properties can be transferred to the Municipality of Port Hope.

1.2 Highlights

In the submitted application and subsequent addendum, CNL is requesting the renewal of the PHP licence for a 10-year period, along with the consolidation of the PHP licence with the PGP, PSETSS and PHRWMF licences. This section outlines key details of CNL's application and addendum, as well key changes captured in the proposed licence and LCH, which can be found in Part Two of this CMD. Key changes include the inclusion of a fitness for service licence condition, integration of the PHP WWTP effluent release limits, inclusion of the waste management and decommissioning regulatory documents, and removal of CNL's request to change the clean-up criteria for arsenic and uranium. More details on these key changes are as follows:

Fitness for Service

During the current licensing period, CNL focused on the design and construction of structures, systems, and components necessary to carry out the activities authorized in the licence. Now that the PHP and PGP LTWMFs and WWTPs are operational, CNL has gained the necessary operational experience to develop and implement a fitness for service program that ensures structures, systems and components are available to perform their intended design function.

The current PHAI licences do not have a specific licence condition for a fitness for service program. However, CNSC staff have proposed a fitness for service licence condition in the proposed licence. CNL has implemented and continues to maintain a corporate-wide maintenance plan that identifies structures, systems and components that require preventive maintenance to ensure equipment reliability. The plan includes a systematic process of identifying, screening, planning scheduling and executing work activities. Based on CNSC staff's review of CNL's maintenance plans for the PHAI, CNSC staff concluded that the plans are acceptable and meet regulatory requirements.

The inclusion of a fitness for service licence condition is further discussed in Section 3.6 of this CMD.

PHP WWTP Effluent Release Limits

As part of the renewal application, CNL has requested the effluent release limits in table 1 of its application be integrated into the proposed PHAI Licence Conditions Handbook (LCH).

The PHP WWTP has been operational and discharging treated liquid effluent to Lake Ontario since January 2017. Interim liquid effluent release limits were established based on the design objectives of the WWTP. The interim limits were accepted by the Commission at the time of the 2012 licence renewal hearing. Interim limits, for a period of 1-year, were required to permit CNL time to optimize the performance of the treatment process prior to establishing final limits.

Subsequently, CNL proposed liquid effluent release limits and action levels which were established following the requirements in draft REGDOC-2.9.2, *Controlling Releases to the Environment*. CNSC staff provided the criteria used for establishing release limits and action levels. A technical assessment of the proposed limits and action levels was conducted by Environment Climate Change Canada and CNSC staff and were found to be acceptable.

The integration of the PHP WWTP effluent release limits into the proposed LCH is further discussed in Section 5.6 of this CMD.

Waste Management and Decommissioning Regulatory Documents

CNL's renewal application commits to meeting the applicable requirements of the CNSC's recently published or revised waste management and decommissioning regulatory documents for the PHAI. These regulatory documents provide information on the governance and regulatory framework for radioactive waste management and decommissioning in Canada. CNL has committed to meet the applicable requirements and guidance of the following CNSC's regulatory documents:

- REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada*, Version 2
- REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*
- REGDOC-2.11.1, *Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste, Version 2*
- REGDOC-2.11.2, *Decommissioning*

Complimentary to the waste management and decommissioning regulatory documents, CNL has committed to meet the applicable requirements and guidance of the following CSA standards:

- N292.0-19, General principles for the management of radioactive waste and irradiated fuel [67]
- N292.3-14, Management of low - and intermediate - level radioactive waste [5]
- N292.5-11, Guideline for the exemption or clearance from regulatory control of materials that contain or potentially contain, nuclear substances [6]
- N292.6-18, Long-term management of radioactive waste and irradiated fuel [7]
- N294-19, Decommissioning of facilities containing nuclear substances [8]

On January 31, 2022, CNL provided CNSC staff with a gap analysis of its current programs and implementation plan for meeting these requirements. CNSC staff will work with CNL on the applicability, implementation of its submissions related to these requirements. CNL's implementation plans are captured in the proposed LCH under the Waste Management SCA. CNL has made the following commitments:

- implement a standalone waste acceptance criteria document for the PHP in alignment with CNSC's REGDOC-2.11.1 Vol I,
- implement a Financial Guarantee in accordance with CNSC's REGDOC-3.3.1 and Preliminary Decommissioning Plan in accordance with CNSC's REGDOC-2.11.2, and
- develop a Financial Guarantee in accordance with CNSC's REGDOC-3.3.1 and Preliminary Decommissioning Plan in accordance with CNSC's REGDOC-2.11.2.

The inclusion of waste management and decommissioning regulatory documents is further discussed in Section 3.11 of this CMD.

PHP Clean-up Criteria Change

CNL's original application requested a change to the clean-up criteria for arsenic and uranium [2]. After multiple reviews and discussions with CNL on its technical document to support a change to the clean-up criteria, CNSC staff and Health Canada determined that there was insufficient evidence to support the selection or use of the proposed arsenic clean-up criteria [9]. Furthermore, reviews conducted by Ontario Ministry of Environment Conservation and Parks (MECP) [10], Ontario Public Health (OPH) [11] and Haliburton Kawartha Pine Ridge District Health Unit [12] concluded that further information was required to validate the assumptions and calculations used in the risk assessment.

Subsequently, CNL submitted an amendment to its application, on March 4, 2022, removing the request for changes to the clean-up criteria [3]. Any future requests by CNL to change the clean-up criteria in the PHP licence will require Commission approval, and this would be considered at a future licence amendment hearing.

CNSC staff Assessment of CNL's Application

CNL's application provides a clause-by-clause statement for relevant excerpts from the *Nuclear Safety and Control Act* and relevant regulations, and describes how CNL continues to meet these requirements as per the compliance verification criteria prescribed by the CNSC in the LCH. CNL provided reference in its application to the most recent revision of programs implemented to meet regulatory requirements.

CNSC staff assessed the completeness of the application submitted by CNL for the PHAI against the requirements in the *Nuclear Safety and Control Act* and relevant regulations and are satisfied that all the relevant information, in order to make an informed recommendation, was included in the application. CNSC staff conducted this review to ensure all applicable SCAs were adequately covered and that the information provided by CNL meets regulatory requirements to support a 10-year licence.

Based on the review of the application, CNSC staff are of the view that the information presented in the application meets regulatory requirements to support a 10-year licence.

Requested licence period

In CNL's application to renew the CNSC-issued licence, a 10-year licence term was requested. CNL's current licences associated with the PHAI were also authorized for a 10-year period. Over the proposed 10-year licence period, the remediation activities for both the PHP and PGP should be completed and both will be in Phase III, which includes maintenance and monitoring. Additionally, during the proposed 10-year licence period, CNSC staff anticipate that CNL will request an amendment to remove both the PSETSS and PHRWMF following the remediation of these sites.

CNSC staff confirm through the conduct of oversight activities over the current licence period that CNL continuously implemented and maintained programs required by their licence in accordance with regulatory requirements.

Over the proposed 10-year period, CNSC staff will continue to verify CNL's compliance through desktop reviews, inspections, and event reviews. In addition, CNSC staff will continue to report on CNL's compliance performance on the PHAI annually to the Commission in public meetings through the regulatory oversight reports.

Based on CNSC staff's review of CNL's application, supporting information, and performance, as well as consideration of the nature of the activities being performed over the proposed 10-year licence period, CNSC staff recommend the Commission authorize CNL's request for a 10-year licence.

1.3 Overall Conclusions

CNSC staff have reviewed CNL's licence renewal application and supporting documents and CNSC staff's assessment determined that the application complies with the regulatory requirements and concluded that CNL's performance during the licensing term was satisfactory and met regulatory requirements.

1.4 Overall Recommendations

CNSC staff recommend that the Commission:

1. Renew the WNSL licence to authorize CNL to continue its authorized activities at the PHP from January 1, 2023 to December 31, 2032.
2. Authorize the consolidation of the 4 CNL licences issued for the remediation activities associated with the PHAI.
3. Approve the proposed licence change to remove the authorization to process, package and transport radioactive material as outlined in section 3.14 and summarized in Part Two of this CMD.
4. Approve the proposed liquid effluent release limits for the PHP WWTP as summarized in section 5.5 of this CMD.
5. Issue the proposed WNSL for the PHAI, WNSL-W1-2310.00/2032.
6. Authorize the delegation of authority as set out in subsection 5.7 of this CMD.

2. MATTERS FOR CONSIDERATION

2.1 Environmental Protection Review

CNSC staff reviewed the licence application to determine what type of environmental review is required to be conducted, if applicable. CNSC staff determined that the *Impact Assessment Act* (IAA) does not apply because the proposed activities are not captured in the IAA's *Physical Activities Regulations*, nor are they considered a project on federal lands.

CNSC staff conduct environmental protection reviews (EPRs) for all licence applications with potential environmental interactions, in accordance with CNSC's mandate under section 9 of the *Nuclear Safety and Control Act* to regulate the production, possession and use of nuclear substances in order to prevent unreasonable risk to the environment. The EPRs inform the Commission's conclusion on whether the proposal provides adequate protection of the environment and the health of people.

An EPR was conducted for all activities requested in the licence application. The EPR report, encompasses the four WNSLs associated with this licence renewal. The report focuses on items that are of Indigenous, public, and regulatory interest, such as potential environmental releases from normal operations, as well as risk of radiological and hazardous substances to the receiving environment. The EPR report, which contains the results of this assessment, including a summary of past environmental reviews for the PHAI, can be found in addendum F of this CMD.

The EPR report findings are that the potential risks from radiological and hazardous releases to the atmospheric, terrestrial, aquatic, and human environments are low to negligible and are similar to the natural background. Further, the PHAI activities do not pose a potential risk to human health and are indistinguishable from health outcomes found in the general public. CNSC staff have also found that CNL continues to implement and maintain effective environmental protection measures to adequately protect the environment and the health of persons.

CNSC staff will continue to verify and ensure that, through ongoing licensing and compliance activities and reviews, the environment and the health of persons are protected and will continue to be protected over the proposed licence period.

2.2 Relevant Safety and Control Areas (SCAs)

The functional areas of any licensed facility or activity consist of a standard set of SCAs. Each SCA is comprised of "specific areas" of regulatory interest; however, the specific areas associated with each SCA vary between facility types. See addendum D, "Safety and Control Framework", for further information about SCAs.

In the following table:

1. The risk ranking column indicates the overall level of risk associated with each SCA at the PHAI (refer to addendum A, "Risk Ranking").
2. The relevance of each SCA to this CMD is indicated.
3. The rating level for each relevant SCA indicates the overall compliance with regulatory requirements for implementation (refer to addendum B, "Rating Levels").

Functional Area	Safety and Control Area	Risk Ranking*	Relevant to this CMD?	Rating Level**
Management	Management System	L	Yes	SA
	Human Performance Management	L	Yes	SA
	Operating Performance	L	Yes	SA
Facility and Equipment	Safety Analysis	N/A	No	N/A
	Physical Design	L	Yes	SA
	Fitness for Service	M	Yes	N/A***
Core Control Processes	Radiation Protection	L	Yes	SA
	Conventional Health and Safety	L	Yes	SA
	Environmental Protection	L	Yes	SA
	Emergency Management and Fire Protection	L	Yes	SA
	Waste Management	L	Yes	N/A***
	Security	L	Yes	SA
	Safeguards and Non-Proliferation	L	Yes	SA
	Packaging and Transport	L	Yes	SA

* H = High; M = Moderate; L = Low; SA = Satisfactory

** Rating level for the current licence period (December 31, 2012 to December 31, 2022).

*** Proposed new licence condition; SCA not previously rated

2.3 Other Matters of Regulatory Interest

The following table identifies other matters that are relevant to this CMD.

Table 1: Other Matters of Regulatory

OTHER MATTERS OF REGULATORY INTEREST	
Area	**Relevant to this CMD?**
Public Engagement	Yes
Cost Recovery	Yes
Financial Guarantees	Yes
Improvement Plans and Significant Future Activities	Yes
Licensee Public Information Program	Yes
Nuclear Liability Insurance	No
Additional "Other Matter" Port Hope Waste Water Treatment Plant Release Limits	Yes
Delegation of Authority	Yes

The relevant "other matters" of regulatory interest are discussed in section 5 and 5 of this CMD.

2.4 Regulatory and Technical Basis

The regulatory and technical bases for the matters discussed in this CMD are provided in addendum C to this document.

The PHP and PGP licences are waste nuclear substance licences. Authority for licensing decisions for this type of licence is generally delegated by the Commission to a CNSC Designated Officer. However, in 2012 the Commission has retained the decision-making authority [13]. For the licences issued under the PHAI, the key requirements come directly from the *Nuclear Safety and Control Act*, and its associated regulations as well as applicable CNSC regulatory documents and Canadian Standards Association (CSA) Group standards.

3. GENERAL ASSESSMENT OF SAFETY AND CONTROL AREAS

CNSC staff's assessments provided in the following sections are based on a comprehensive review of CNL's past performance at the PHAI and a thorough evaluation of the safety and control measures to be implemented for the next licence period. These areas are outlined in CNL's licence application [2, 3] and supporting documentation submitted for this application.

The CNSC implements a risk-informed approach in the regulation of nuclear facilities and activities. The depth of regulatory reviews of each SCA and the baseline frequency of regulatory compliance activities is informed by the risk ranking of that SCA as outlined in section 2.2.

CNSC staff assessed the qualification of CNL over the current licence period and made a determination whether CNL has conducted the authorized activities within the licensing basis requirements and maintained its licensing basis documentation to ensure its programs remain up to date and reflect current regulatory requirements. CNSC staff also evaluated whether the licensing basis for the current licence remains applicable to support a 10-year renewal. CNSC staff assessed the application submitted by CNL and reviewed CNL's past performance in all applicable SCAs. CNSC staff's assessment of CNL's past performance for the PHAI is based on regulatory oversight activities including onsite and remote inspections, reviews of reports submitted by CNL, reviews of events and incidents, and general communication and exchanges of information with CNL. CNSC staff report annually on CNL's performance and licensing activities in regulatory oversight reports (RORs). RORs are presented at Commission meetings and provide an opportunity for Indigenous groups and the public to provide interventions on CNL's performance and licensing activities. A general overview of staff's assessment of the application with respect to all applicable SCAs is provided in this section of the CMD.

The specific areas that comprise the SCAs for the licenced activity are identified in section D.1. If specific areas are listed for an SCA in section 3 of this CMD, then the related details about them are provided in section D.2 to this document. If specific areas are not listed for a given SCA in section 3, then a decision has been made to encompass them in an overall approach to that SCA.

3.1 Management System

Safe and reliable operation of nuclear activities requires a commitment and adherence to a set of management system principles and, consistent with those principles, the implementation of planned and systematic processes that achieve expected results. The management system focuses on safety in all business activities and supports the safe conduct of the licensed activities. The specific areas that comprise this SCA are not addressed individually in this document.

The management system is in place to satisfy the requirements set out in the *Nuclear Safety and Control Act*, regulations made pursuant to the *Nuclear Safety and Control Act*, the licence and the measures necessary to ensure that safety is of paramount consideration in the implementation of the management system. The management system promotes and supports a healthy safety culture by integrating the following characteristics of a healthy safety culture:

- safety is a clearly recognized value;
- accountability for safety is clear;
- safety is integrated into all activities;
- a safety leadership process exists; and
- safety culture is learning driven.

3.1.1 Trends

The following table indicates the overall rating trends for the Management System SCA over the current licensing period:

MANAGEMENT SYSTEM								
Overall Compliance Ratings								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains a Management System program in compliance with regulatory requirements. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The management system program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's management system meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.1.2 Discussion

In order to meet regulatory requirements in this area, CNL must implement and maintain a management system in accordance with the national standard applicable to management system, CSA N286-12, Management System Requirements for Nuclear Facilities [14]. The management system brings together, in a planned and integrated manner, the processes necessary to satisfy the requirements that must be met to safely carry out a licensed activity.

In conformance with these requirements, CNL has implemented and continues to maintain a mature corporate-wide management system in accordance with CSA N286-12.

The Management System Manual is CNL's high level document that explains the integrated corporate-wide management system and sets out the framework of policies and procedures through which CNL is governed and managed from the setting of direction through to day-to-day operations. The framework applies to research and development; design engineering; procurement; manufacturing; qualification testing; construction; commissioning; operations; decommissioning; demolition; waste management; inspection; maintenance and plant life management; and project management; for nuclear power plants, research reactors, nuclear/non-nuclear facilities, and installations. The management system submitted in the application for the management system SCA includes:

- Historic Waste Program Quality Assurance Plan (QAP) [15]

CNL's PHAI Quality Assurance Plan identifies the requirements and processes specific to the PHAI. The Quality Assurance Plan is supplementary to and meets the requirements of the corporate-wide management system. A recent improvement update to the QAP included reference to a newly developed engineering change control procedure specific to PHAI that includes instructions and requirements for the engineering change control process at PHAI for use by employees. Also included in the update was the addition of criteria for when to notify the CNSC of a design change. CNSC staff are satisfied that CNL's Quality Assurance Plan is acceptable and meets requirements for the activities taking place at the PHAI.

3.1.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.1.3.1 Past Performance

As part of ongoing regulatory oversight at the PHAI, CNSC staff evaluated CNL's management system by reviewing and assessing CNL's documentation, annual reports and conducting inspections. The management system applies to all work performed by CNL employees, contractors, and sub-contractors across all CNL sites/business lines, which includes the PHAI. Given this, CNSC inspections performed at any site are assessments of the same management system and corrections made to address non-compliances typically apply PHAI wide.

Since the beginning of the phase II activities, CNSC staff conducted 3 inspections focused on Management Systems.

The majority of the construction and remediation activities performed at the PHAI are executed by contractors. Consequently, CNSC staff compliance activities placed emphasis on CNL's management of contractors, or their contractor management program. CNSC staff inspected CNL's oversight and management of contractors in 2018 and 2021 and found areas for improvement with respect to how it conducted oversite of its contractors and how oversight findings were captured and closed within CNL's corrective action system. CNL took immediate corrective actions to address the inspection findings, including revamping its oversight process in all areas relevant to contractor activities. CNSC staff are satisfied with CNL's corrective actions in response to the inspection.

CNSC staff verification activities conducted throughout the licensing period included areas of maintenance, calibration, problem identification/resolution, change and design control, document and records control, procurement (specifically in the areas of contractor management and change control), the internal audit program, management self-assessments, and annual reviews. CNSC staff found areas for improvement related to CNL's engineering change control procedure and the need for CNL to update applicable procedure level document(s) to specify the criteria for when CNSC is to be notified of a design change. CNL has made revisions to its change control procedure and associated procedural level documents to improve its Management System plan. CNSC staff will continue to monitor CNL's change control process to ensure the changes are effective.

In 2019, CNL performed a CNL-wide safety and security culture assessment at several CNL sites including the PHAI. The scope of CNSC's REGDOC-2.1.2, *Safety Culture*, is intended to apply to Class I nuclear facilities and Uranium Mines and Mills. Even though the PHAI is not a Class I facility, CNL voluntarily chose to assess the PHAI against the requirements of CNSC's REGDOC-2.1.2. CNSC staff observed that CNL made a number of positive changes to the safety culture at the PHAI. Some of these positive changes included, but were not limited to:

- Encouraging CNL staff to report issues and ensuring the resolution of issues.
- Implementing a company-wide Safety Stand Down on May 30, 2019 to raise safety awareness amongst CNL staff with respect to raising/resolving issues and reporting events.
- Encouraging the active involvement of the management team via focused in-field observations of the work being performed by staff.
- The Vice President of Health, Safety, Security, Environment, and Quality routine attendance at Safety and Health Committee meetings.

CNSC staff will continue to monitor the safety culture at the PHAI through routine compliance activities.

For all inspections, CNSC staff have determined that all of the findings have been closed or CNL has an appropriate corrective action plans in place to address the finding. CNSC staff will continue to monitor the progress for the corrective action plans and will continue to execute compliance oversight in this SCA.

3.1.3.2 Regulatory Focus

Since 2016, CNL has been in the process of developing and transitioning to a new and integrated corporate-wide management system structure. This new structure includes the use of corporate level documents which are applicable to multiple CNL sites, including the PHAI. The major update since 2017 is CNL's adoption of the CSA N286-12 standard requirements. This change permits CNL to incorporate changes such as reorganizing the company document structure, document format, and changes in responsibilities.

CNSC staff will continue to monitor CNL's performance in the Management System SCA through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to this SCA.

3.1.3.3 Proposed Improvements

There are no proposed improvements noted for the Management System SCA.

3.1.4 Conclusion

Based on CNSC staff's oversight activities, CNSC staff conclude that CNL continues to implement and maintain an effective management system program in accordance with regulatory requirements. CNSC staff have determined that CNL's Management System program is adequate to support the activities authorized in the licence.

3.1.5 Recommendation

One standardized licence condition is included in the proposed licence for the Management System SCA. Licence condition 1.1 requires CNL to implement and maintain a Management System program. Compliance verification criteria for this licence condition are provided in the draft LCH.

3.2 Human Performance Management

The Human Performance Management SCA covers activities that enable effective human performance through the development and implementation of processes that ensure a sufficient number of licensee personnel are in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to carry out their duties safely. The specific areas that comprise this SCA are not addressed individually in this section.

3.2.1 Trends

The following table indicates the overall rating trends for the Human Performance Management SCA over the current licensing period:

HUMAN PERFORMANCE MANAGEMENT (TRAINING PROGRAM)								
Overall Compliance Ratings								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains a Systematic Approach to Training (SAT) based training system and program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The training program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's training program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.2.2 Discussion

Systematic Approach to Training (SAT) is the framework endorsed by the CNSC for establishing and maintaining training for persons performing activities at the PHAI. The CNSC requires CNL to ensure that workers are trained, qualified and are assessed to confirm that they have acquired and maintain the knowledge, skills, and safety-related attributes to safely perform their work assignments. CNL has implemented a SAT framework to train its workers to safely and competently perform the activities authorized by the licence.

CNSC's REGDOC-2.2.2, *Human Performance Management, Personnel Training*, updated in December 2016, defines the requirements and guidance for the analysis, design, development, implementation, evaluation, documentation and management of training at nuclear facilities within Canada, including the essential principles and elements of an effective training system. CNSC's REGDOC-2.2.2 is included as compliance verification criteria in the draft LCH, provided in Part Two of this CMD. The program submitted in the application for the Human Performance SCA includes:

- Port Hope Area Initiative Training Plan [16]

The training program at the PHAI, as outlined in the PHAI Training Plan, is consistent with the regulatory requirements and the requirements and guidance captured in CNSC's REGDOC-2.2.2. CNSC staff are satisfied that CNL's current training program is acceptable for the activities taking place at the PHAI.

3.2.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.2.3.1 Past Performance

As part of ongoing regulatory oversight at the PHAI, CNSC staff assessed CNL's training program by reviewing and assessing CNL's documentation, annual reports and conducting inspections. CNSC staff inspections conducted at any PHAI site assesses the same training program. As such, corrections made to address non-compliances from these inspections, typically apply to all PHAI sites.

In 2017 and 2019, CNSC staff conducted inspections of the PHAI training program to evaluate and verify compliance. As a result of these inspections, CNSC staff found areas for improvement related to the incorporation of learning objectives in to training, completion of mandatory training, alignment of training with governing documents, completion of task analysis and the carrying out training program oversight. CNSC staff verified that CNL staff implemented suitable corrective actions to address the findings identified. All findings were closed in an effective and timely manner.

CNSC staff continues to monitor personnel training at PHAI through inspections, document reviews, as well as annual compliance reports.

CNL has strengthened its training program over the licensing period, including the alignment of PHAI training programs to CNL training program governing documents, the implementation of a list of positions and roles requiring SAT, as well as the incorporation of effectiveness reviews of the PHAI training programs.

3.2.3.2 Regulatory Focus

CNSC staff will continue to monitor CNL's performance in the Human Performance SCA through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to training.

3.2.3.3 Proposed Improvements

There are no proposed improvements noted for the Human Performance SCA.

3.2.4 Conclusion

Based on the oversight activities conducted, CNSC staff conclude that CNL continues to implement and maintain an effective training program in accordance with regulatory requirements. CNSC staff have determined that CNL's training program is adequate to support the activities authorized in the licence.

3.2.5 Recommendation

One standardized licence condition is included in the proposed licence for the Human Performance SCA. Licence condition 2.1 requires CNL to implement and maintain a training program. Compliance verification criteria for this licence condition are provided in the draft LCH.

3.3 Operating Performance

The operating performance SCA includes an overall review of the conduct of the licensed activities and other activities that enable effective performance. The specific areas that comprise this SCA are not addressed individually in this section.

3.3.1 Trends

The following table indicates the overall rating trends for the Operating Performance SCA over the current licensing period:

TRENDS FOR OPERATING PERFORMANCE								
Overall Compliance Ratings								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains an operating performance program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The operating performance program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's operating performance program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.3.2 Discussion

The operating performance SCA requires that the licensee implement and maintain an operating performance program for the conduct of licensed activities. This SCA focuses on compliance monitoring, operational performance, event reporting, and various types of notifications.

CNSC's REGDOC-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees*, *Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices*, incorporates and clarifies requirements found in the *Nuclear Safety and Control Act* and regulations. This regulatory document also provides guidance for reports and notifications that licensees must submit to the Commission. It also provides details on the events, situations and dangerous occurrences that must be reported. The program submitted in the application for the operational performance SCA includes:

- Management Control Procedure, CNL Reporting to Regulatory Agencies [17]

The operating performance program at the PHAI is consistent with the reporting requirements prescribed in the *Nuclear Safety and Control Act*, regulations and the requirements and guidance captured in CNSC's REGDOC-3.1.3. CNSC staff are satisfied that CNL's reporting procedures are acceptable for the activities taking place at the PHAI.

3.3.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.3.3.1 Past Performance

CNSC staff assess information provided in reports submitted by CNL for the purpose of monitoring any ongoing events, confirming licensing basis, assessing trends and patterns, monitoring performance, and identifying precursors of more significant events. The outcome of these assessments informs CNSC staff's rating of the applicable SCAs.

CNL's corporate-wide management system consists of high-level documentation supported by lower-level procedures. CNL maintains a comprehensive suite of procedures across all programs and sites at the PHAI. Since 2013, CNL continually updated the facility-specific procedures relating to operations, maintenance, and emergency response as needed and supported ongoing process improvements across all PHAI sites.

CNSC staff regularly review procedure level documents as part of ongoing compliance verification activities. Based on these reviews, CNSC staff conclude that there were no significant changes to documentation that affected the activities taking place at the PHAI.

Detailed requirements for reporting unplanned situations or events at the PHAI to the CNSC are included in the applicable licences and LCHs. CNL has complied with the requirements for submission of these reports since 2012.

Total number of events reported to the CNSC by CNL are presented in tables 2, 3, 4 and 5.

Table 2: Reportable Events for PHP WNSL-W1-2310.02/2022 (2012-2021)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total number of events	1	2	0	0	2	5	0	0	2	5

Table 3: Reportable Events for PGP WNSL-W1-2311.00/2022 (2012-2021)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total number of events	2	0	2	3	5	6	5	3	3	0

Table 4: Reportable Events for PSETSS WNSL-W1-182.0/2022 (2012-2021)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total number of events	0	0	0	0	0	1	0	0	0	0

Table 5: Reportable Events for PHRWMF WNSL-W1-344-1.8/ind (2012-2021)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total number of events	0	0	0	2	3	6	0	0	0	0

CNSC staff report annually to the Commission on reportable events through Regulatory Oversight Reports. As such, this CMD only provides details on reportable events from January 2021 to July 1, 2022. Any events reported after July 1, 2022 will be provided in the 2022 Regulatory Oversight Report.

As indicated in table 2, in 2021 there were two (2) reportable events at the PHP. The first reportable event in 2021 at the PHP was related to a release of 15 cubic metres of untreated water to the inner harbour from the Port Hope Harbour Centre Pier. The discharged water contained chromium VI, fluoranthene, pyrene and aluminum in excess of the environmental compliance approval, issued by the Ontario Ministry of the Environment Conservation and Parks. The cause of the event was related to procedural adherence, break down in communication and a gap in a contractor's environmental program. CNL implemented corrective actions to ensure water sample analysis data is approved before releasing water, revised the contractor's program and clarified that water release are not to be compared to the Provincial Water Quality Standards. The second reportable event in 2021 at the PHP was related to truck carrying clean backfill and striking an overhead powerline on Shuter Street in Port Hope. The box of the truck was raised while moving forward causing the powerline catch. No one was injured; however, CNL implemented a project wide stand-down to review safety plans and conduct retraining for truck operators and spotters. CNSC staff found that both reports met reporting requirements and the risk to human health and the environment as a result to these events was negligible. CNSC staff are satisfied with the corrective measures taken by CNL to prevent similar events in the future.

As of July 1, 2022, CNL had 5 reportable events at the PHP. In January CNL reported 2 events related to the packaging and transportation of radioactive material. These events are further described in section 3.14.3.1 of this CMD. In June 2022, CNL reported an effluent action level exceedance for arsenic. The cause of the exceedance was due to an increase of influent water temperature in conjunction with the age of the revers osmosis membrane. CNL will be replacing the revers osmosis membrane to restore the effectiveness of the system. The fourth reportable event was presented to the Commission in June 2022 as an event initial report. Further details on this event are provided in table 6 below. The fifth reportable event is related to CNL's failure to provide written notification of a design change to the PHP LTWMF. During a compliance inspection in March 2022, CNSC staff observed wooden pallets supporting supersacks of Cameco waste being placed into the LTWMF, which is a deviation from the waste placement design. CNL has since submitted documentation on the design change to demonstrate that permitting wooden pallets in the LTWMF will not have in impact on the integrity and long-term performance of the LTWMF. CNL has also taken corrective actions to ensure design changes are reviewed by CNSC staff before implementing the change. CNSC staff found that CNL met reporting requirements for these events and the risk to human health and the environment as a result to these events was negligible. CNSC staff are satisfied with the corrective measures taken by CNL to prevent similar events in the future.

As indicated in table 3, in 2021 there were three (3) reportable events at the PGP. The first reportable event in 2021 at the PGP was a toxicity failure of a final effluent sample. After an investigation and further sampling CNL determined that the original toxicity sample results were an anomaly and invalid. As a result of this event, CNL initiated a practice of collecting additional samples that can be measured by an independent lab when verification is needed. The second reportable event in 2021 at the PGP was an action level exceedance for copper at the Port Granby WWTP. The cause of the elevated copper concentration was attributed to poor reverse osmosis performance coupled with warmer than normal influent (untreated) water. To prevent a similar occurrence in the future, CNL replaced the reverse osmosis membrane and examined the declining performance of the membrane overtime to better understand when membrane replacements are needed. The third reportable event in 2021 at the PGP involved an underground spill of contaminated water. CNL determined that cause was due iron pipes under the water treatment building that had degraded and leaked. CNL remediated the impacted soils and conducted an engineering review to replace or abandon the piping. In addition, CNL will be constructing six new ground water wells around the water treatment building to detect any future leaks. CNSC staff found that the reports met reporting requirements and the risk to human health and the environment as a result to these events was negligible. CNSC staff are satisfied with the corrective measures taken by CNL to prevent similar events in the future.

CNSC staff review all reported events to identify if there are any regulatory concerns and report significant events to the Commission at public meetings/hearings in event initial reports (EIR). There were three EIRs presented to the Commission since during the licencing period related to the PHAI licences. Table 6 provides a summary of the EIRs. The actions associated with these EIRs have all been completed and there are no outstanding issues or concerns.

Table 6: Event Initial Reports at PHAI Since 2012

EIR	Event Summary
17-M38	On June 23, 2017, the Port Hope area experienced heavy rainfall with an accumulation of 50 to 75 mm of rain over a period of 12 hours. As a result, a diversion ditch in combination with a culvert used to capture water from the LTWMF area were overwhelmed by surface water. Consequently, the water flowed in an unintended direction toward the south treatment pond causing it to overflow. CNL and CNSC staff confirmed that this event had no adverse environmental or health effects.
19-M9	On January 9, 2019, a contractor was injured when their leg was pinned by a roll off bin being unloaded from a truck. This event resulted in serious injury to the individual. Consequently, the worker was airlifted to a hospital in Toronto.
22-M38	On June 6, 2022, CNL reported that during routine compliance sampling at the PHP WWTP the composite effluent sample for the week ending June 1, 2022, exceeded the weekly release limit for copper and the action level for zinc. This event had no adverse environmental or health effects.

CNL submits quarterly and annual reports on compliance monitoring and operational performance for the PHAI sites. As part of the compliance oversight activities performed by CNSC staff, these reports are reviewed and reported to the Commission annually via the RORs. The most recent ROR was presented to the Commission in CMD 21-M32 (Canadian Nuclear Laboratories: Regulatory Oversight Report for Canadian Nuclear Laboratories Sites: 2020), where staff rated all SCAs as "satisfactory". CNSC staff continue to oversee the PHAI and will report on any changes or trends in subsequent annual RORs. No significant regulatory issues were identified during the licensing period for the PHAI sites.

3.3.3.2 Regulatory Focus

CNSC staff will continue to monitor the effectiveness of CNL's Operating Performance SCA through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to this SCA.

3.3.3.3 Proposed Improvements

In general, the reporting requirements for the PHAI licences are similar given the reporting requirements in the *Nuclear Safety and Control Act* and regulations apply to all licensees. Historically, specific reporting requirements for the individual PHAI licences were captured in their respective licence and LCH. To accommodate CNL's proposal to consolidate the PHAI licenses and to incorporate a single licence condition for reporting to the Commission, CNSC staff propose to standardize the licence condition for the Operating Performance SCA and incorporate the reporting requirements and guidance from CNSC's REGDOC-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Device*s in the LCH.

3.3.4 Conclusion

Based on CNSC staff's oversight activities, CNSC staff conclude that CNL continues to implement and maintain a program for reporting to the Commission or a person authorized by the Commission in accordance with regulatory requirements. CNSC staff have determined that CNL is meeting its reporting requirements and are adequate to support the activities authorized in the licence.

3.3.5 Recommendation

Following past reporting practices, the licences issued under the PHAI have required quarterly environmental monitoring reports and quarterly project status update reports. With the recent publication of CNSC's REGDOC-3.1.3, which drives a consistent approach to reporting, CNSC staff recommend that the quarterly reporting requirements no longer be a requirement of the licence as they are not consistent with the regulatory reporting requirements. The proposed licence condition 3.1 requires CNL to implement and maintain a program for reporting to the Commission or a person authorized by the Commission. Part Two of this CMD provides further details on the proposed changes to the licence and compliance verification criteria to be incorporated in the LCH.

3.4 Safety Analysis

Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and that considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.

Unlike a Class I facility, the information required in support of an application for the PHAI WNSLs, there is no specific requirement for conducting a safety analysis.

However, CNL provided an analysis of potential accidents and malfunctions at the PHP and PGP sites as part of their respective Environmental Assessment (EA) Screening Reports [18, 19].

The long-term safety of the LTWMF containment system is ensured through the design and monitoring and verification process. A summary of the engineering, radiological and environmental safety indicators is provided in the Addendum to the Detailed Design Description Reports (DDDR) for the PHP and PGP LTWMF's [20, 21]. The monitoring of the engineered LTWMF components performance and associated safety indicators and the implementation of mitigation measures is addressed in the PHP and PGP design documentation [22, 23], PHAI Quality Assurance Plan [15], PHP Environmental and Biophysical Monitoring Plan [24] and the PGP Environmental and Biophysical Monitoring Plan [25].

3.5 Physical Design

Relates to the activities that impact on the ability of systems, components, and structures to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

This CMD covers the following specific areas of Physical Design:

- Design governance
- Facility design
- Structure design

3.5.1 Trends

The following table indicates the overall rating trends for the Physical Design SCA over the current licensing period:

TRENDS FOR PHYSICAL DESIGN								
Overall Compliance Ratings								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains a physical design program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The physical design program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's physical design program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.5.2 Discussion

The Physical Design SCA requires that the licensee implement and maintain a design program in accordance with requirements of the PHP and PGP licences and associated LCHs. The program's objective is to ensure that the design of structures, systems and components are managed using a well-defined approach to ensure design outputs are verified against design inputs and performance expectations. Implementing and maintaining a design program confirms that safety-related structures, systems and components and any modifications to them continue to meet their design bases given new information arising over time and taking changes in the external environment into account. It also confirms that safety-related structures, systems, and components continue to be able to perform their safety functions during all phases of the projects.

Design Governance

CNL's design engineering documents and associated procedures and instructions are intended to ensure:

- design activities are defined, effectively planned, and controlled
- work activities are coordinated, and progress is monitored
- performance of work is verified to meet design, customer, and regulatory requirements in accordance with approved procedures and applicable codes and safety standards.

Since 2012, CNSC staff have reviewed CNL's conduct of design engineering documents, to ensure activities are planned, controlled, and monitored in accordance with regulatory requirements and applicable codes and safety standards.

Facility Design and Structure Design

The PGP and PHP LTWMFs consist of an above-ground engineered containment mound with associated infrastructure and support facilities which include a WWTP at each location.

The engineered containment mounds of the PGP and PHP LTWMFs were designed to isolate the waste from the surrounding environment and safely manage the waste for over 500 years. The engineered containment mounds consist of a multi-component baseliner system comprising a composite barrier system made up of synthetic geomembrane, geosynthetic clay liner, and compacted clay layer, which is the barrier that will limit the release of contaminants to the subsurface and groundwater. A leachate drainage/collection system comprising sand and gravel layers with inclined leachate pumping wells at leachate collection sumps, serves to control the accumulation and mounding of leachate and hydraulic head on the base liner system. The cover consists of a multi-component system engineered to reduce infiltration of surface water coming into contact with the waste, eliminates direct exposure with the waste and provides gamma shielding.

Port Hope Project Long-Term Waste Management Facility

The PHP LTWMF consists of 4 Cells, shown in figure 1, that have been constructed in phases. CNL completed the construction of Cell 1 in 2016 and completed the construction of Cell 3, 2A and 2B as of December 2021. The initial receipt of wastes began in 2017 following the construction of Cell 1. Following the remediation activities in the Port Hope area, CNL will construct the capping system to encapsulate the waste from the environment. Following the capping of the LTWMF, CNL will begin its Phase III activities which involve long-term maintenance and monitoring.

Figure 1: Port Hope Project Long-Term Waste Management Facility

CNL's licence application included the DDDRs for the PHP LTWMF. The DDDRs describe the design of the engineered containment system and the supporting utilities and supporting infrastructure. They also identify the applicable regulations, codes, standards, and guidelines used during the design, construction, and operation of the LTWMF. These include:

- Port Hope Project – Detailed Design Description Report: Long-term Waste Management Facility [22]
- Port Hope Project – Addendum to Detailed Design Description Report: Long-term Waste Management Facility [20]

CNSC staff assessed CNL's DDDR's and found that they adequately capture the design requirements for the LTWMF.

Port Granby Long-Term Waste Management Facility

The PGP LTWMF is an engineered, aboveground mound designed for the safe management of low-level radioactive waste. The mound consists of a baseliner system where the waste is placed and a cover system that isolates the waste from the environment. Construction of the storage mound began in 2016 and involved the installation of multi-layered base liner and cover systems to safely isolate the waste from the environment. Dedicated systems within the mound and around the perimeter of the facility will allow maintenance and monitoring of the facility's safety and performance over time. Figure 2 is an overhead picture of the WWTP (large white building), mound (grass covered rectangle) and supporting infrastructure.

Figure 2: Port Granby Project Long-Term Waste Management Facility

In 2020, CNL completed the transfer of historic LLRW from the Port Granby Waste Management Facility into the engineered containment mound of the LTWMF. In total 1,315,061 metric tonnes of LLRW were safely transported to the LTWMF since the remediation started. CNL completed capping the LTWMF in November 2020 that included final grading, erosion control measures, and the construction of the groundwater collection system at the Port Granby site.

CNL's current project plan estimates that it will progress to Phase III in November 2022. Phase III entails the long-term maintenance and monitoring of the site and operation of the WWTP. CNL has captured the transition from Phase II activities to Phase III in a Turnover Management Control Procedure [26]. The procedure is structured to ensure CNL, its contractors and AECL have a smooth, responsible, accountable, and efficient transition from all Port Granby operations, to CNL's Waste Water Operations. The PGP site will remain in a maintenance and monitoring period for the foreseeable future.

CNL's application included the DDDRs for the PGP LTWMF. The DDDRs describe the design of the engineered containment system and the supporting utilities and supporting infrastructure. It also identifies the applicable regulations, codes, standards, and guidelines used during the design, construction, and operation of the LTWMF. These include:

- Port Granby Project - Detailed Design Description Report [23]
- Port Granby Project - Detailed Design Description Addendum [21]

CNSC staff assessed CNL's DDDRs and found that they adequately capture the design requirements for the LTWMF.

Waste Water Treatment Plants

The WWTPs at the PHP and PGP treat impacted water resulting from the project activities. This includes surface water that is impacted by contaminated soils, groundwater, and contaminated water from within the LTWMF when it is capped. Treated effluent from the WWTPs are aligned with the Federal and Provincial surface water quality guidelines and once treated are released to Lake Ontario.

The liquid effluent release design requirements for the plants are captured in their respective Water Treatment Definition documents [27, 28]. The Water Treatment Definition documents are based on Best Demonstrated Available Technology (BDAT) to optimize environmental protection by minimizing pollution and the loading of contaminants to the environment.

The PHP WWTP has been operational and discharging treated liquid effluent to Lake Ontario since January 2017. Interim liquid effluent release limits were established based on the design objectives of the WWTP and were accepted by the Commission at the time of the 2012 licence hearing. Interim limits were required to allow CNL time to optimize the performance of the treatment process prior to establishing limits.

As part of the renewal application, CNL has requested the liquid effluent release limits in table 1 of its application be integrated into the Port Hope licensing basis. Section 5.8 of this CMD contains CNSC staff's assessment of the proposed liquid effluent release limits and recommendation for the Commissions consideration.

The PGP WWTP has been operating under liquid effluent release limits approved by the Commission on April 5, 2019.

Clean-up of Historic LLRW at Various Sites within Port Hope

The basic remediation strategy for all properties requiring remediation involve the excavation of contaminated material and transfer to the LTWMF. The approach is similar for all properties and include the following three steps:

- Pre-Remediation – Planning and Site Preparation;
- Excavation of Contaminated Material; and
- Backfill and Restoration of Site.

CNSC staff assessed the remediation methods proposed by CNL for the remediation of individual sites. Site-specific conditions require CNL to consider using different remediation techniques and mitigation measures between sites. This approach ensures efficient removal of contaminated soil and protection of the environment and people.

Details on the site-specific remediation activities are captured in DDDRs and process documents. The site specific DDDRs and process documents for each site is specified below:

Small Scale Sites (SSS)

The PHP involves conducting property radiological surveys to confirm which properties have historic LLRW and require clean-up. Property owners are notified of the survey results and are provided a letter stating if the property requires remediation or not. Properties identified with LLRW undergo additional testing to characterize and confirm the boundaries of the LLRW. The property then undergoes a design plan for the clean-up. CNL works with the property owner to develop the remediation plan. Following the remediation process, the property owner is issued a compliance letter stating that the property meets the clean-up criteria. Figure 3 shows residential properties being remediated and the after the remediation has been completed in the Municipality of Port Hope.

Figure 3: Port Hope Project Small Scale Site Remediation

CNL submitted the following design processes, used for SSS, as part of its application:

- Port Hope Project Small-Scale Site Remedial Process [29]
- Arsenic/Coal Ash Decision Matrix for Identification of Historic LLRW in Port Hope Soils [30]

CNSC staff assessed CNL's processes for SSS and found they are adequate for ensuring the cleanup criteria will be met at SSS.

Sites Requiring Remediation

DDDRs provide general principles and design elements for the remediation of sites requiring clean-up. The DDDRs also describe the location of sites requiring remediation including the volume of waste and waste characteristics. CNL submitted the following DDDRs for sites requiring clean-up:

- Port Hope Project – Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Waste Remediation Sites Group 1A [31]
- Port Hope Project – Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites Group 1B [32]

- Port Hope Project – Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Waste Remediation Sites Group 2A [33]
- Port Hope Project LCH reference - Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Waste Remediation Sites Group 2C [34]
- Port Hope Project – Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites Group 2D [35]
- Port Hope Project – Detailed Design Description Report for Low-Level Radioactive Waste Remediation of Port Hope Harbour [36]

The table 7 lists sites that require remediation with reference to the applicable DDDR:

Table 7: Detailed Design Description Reports for the Port Hope Project

Site	DDDR Reference
Pine Street North Extension Temporary Storage Site	31
Highland Drive Roadbed	32
Highland Drive Landfill	35
Pine Street North Extension Roadbed	35
Highland Drive South Ravine	33
Strachan Street Consolidation Site	33
Alexander Street Ravine	33
Waterworks Site	33
Viaducts Area	32
Centre Pier Temporary Storage Site	31
Mill Street South Site	32
Sewage Treatment Plant Temporary Storage Site	31
Lions Recreation Centre Park	34
Former Coal Gasification Plant	34
Centre Pier	34
Chemetron Lagoon	34
Sewage Treatment Plant Storage Cell	34
Port Hope Harbour	36

CNSC staff assessed CNL's DDDRs processes for sites requiring remediation and found they are adequate for ensuring the cleanup criteria will be met at SSS.

3.5.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.5.3.1 Past Performance

PHP LTWMF

Over the period of time the LTWMF was being constructed, CNSC staff conducted seven (7) inspections of the PHP LTWMF to ensure the cells were constructed in accordance with the DDDRs. CNSC staff did not identify any areas of non-compliance for the physical design SCA. CNL continues to implement and follow the design control process as per it's change control process. CNSC staff have also assessed the as-built reports related to the LTWMF containment cell construction and the design changes documented in the as-built reports. The review confirmed that the construction activities reported in the as-built reports were conducted as designed and the design changes made followed the engineering change control processes and procedures. As a result, CNSC staff found that the cells were constructed as designed.

PGP LTWMF

CNSC staff conducted six (6) inspections related the construction of the PGP LTWMF to ensure the baseliner and cover system were constructed in accordance with the DDDRs. CNSC staff did not identify any areas of non-compliance for the physical design SCA. CNL continues to implement and follow the DDDR's. The as-built reports related to the LTWMF construction, and any design changes documented in the as-built reports will be assessed by CNSC staff once all Phase II project activities have been completed. CNSC staff will review the report to ensure the LTWMF and supporting infrastructure were constructed as designed. An update of this review will be included in future RORs.

PHP and PGP WWTP

To ensure the safe operation of the PHP and PGP WWTPs, CNSC staff conducted three (3) inspections during the non-active and active commissioning of the PHP PGP WWTPs against CNL's commissioning plans and procedures. CNSC inspectors also took grab samples of treated effluent from both WWTPs for analysis at the CNSC laboratory to confirm CNL's water results. In addition, CNSC staff assessed CNL's final commissioning reports for the WWTPs to confirm all necessary checks were performed during the commissioning of the WWTPs. CNSC staff found that CNL followed their established plans and procedures, and the liquid effluent was within the established limits.

Clean-up of Historic LLRW at Various Sites within Port Hope

CNSC staff have performed several oversight activities during the remediation of the sites to ensure the general principles and design elements are being met. There were no enforcement actions raised related to the physical design SCA as a result of these inspections. Based on the oversight activities conducted, CNSC staff conclude that CNL's general principles and design elements at remediation sites is being met.

3.5.3.2 Regulatory Focus

CNSC staff will continue to monitor CNL's performance in this SCA through regulatory oversight activities including onsite inspections and desktop reviews of relevant program documentation, review of designs for new or modified structures, systems, and components.

3.5.3.3 Proposed Improvements

There are no proposed improvements for noted this SCA. Improvements to structures, systems and components are identified on an ongoing basis and implemented as part of continuous improvement.

3.5.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain a physical design program in accordance with regulatory requirements. CNSC staff have determined that CNL's physical design program is adequate to support the activities authorized in the licence.

3.5.5 Recommendation

One standardized licence condition is included in the proposed licence for the Physical Design SCA. Licence condition4.1 requires CNL to implement and maintain a physical design program. Compliance verification criteria for this licence condition are provided in the draft LCH.

3.6 Fitness for Service

The fitness for service SCA covers activities that impact the physical condition of structures, systems, and components to ensure that they remain effective over time. This area includes programs that verify equipment is available to perform its intended design function when called upon to do so.

The specific areas that comprise this SCA are not addressed individually in this section.

3.6.1 Trends

CNSC staff did not rate this SCA during the current licence period.

3.6.2 Discussion

During the current licensing period, CNL focused on the design and construction of structures, systems, and components necessary to carry out the activities authorized in the licence. Following the construction of the LTWMFs and WWTPs, CNL required time to gain operational experience to develop and implement programs and procedures to ensure equipment is available to perform its intended design function.

Following the construction of the PHP and PGP LTWMFs, CNL implemented and continues to maintain a corporate-wide maintenance programs that identifies structures, systems and components that require preventive maintenance to ensure equipment reliability. The plan includes a systematic process of identifying, screening, planning scheduling and executing work activities. The programs submitted in the application for the fitness for service SCA includes:

- Maintenance Categorization [37]
- Maintenance Work Planning and Control [38]

Gradually, CNL will develop a more mature fitness for service program as additional operational experience is gained. CNSC staff conclude that CNL has maintenance procedures for the activities authorized in the licence.

3.6.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.6.3.1 Past Performance

CNSC staff did not perform any assessments of CNL's Fitness for Service SCA during the current licensing period. However, aspects of the Fitness for Service SCA were assessed by CNSC staff through other SCAs. For example, environmental protection inspections involve the review of environmental monitoring equipment to ensure they are operational, maintained and calibrated in accordance with the manufacture's requirements.

3.6.3.2 Regulatory Focus

Through continual improvement CNL's fitness for service program will become more robust to ensure the operability of all applicable structures, systems, and components. CNSC staff will monitor CNL's performance in this SCA through regulatory oversight activities including onsite inspections and desktop reviews of relevant program documentation.

3.6.3.3 Proposed Improvements

Previously the PHAI licences did not include a licence condition for the Fitness for Service SCA. Now that the PHP and PGP LTWMFs and WWTPs are operational and CNL has gained sufficient operating experience, CNSC staff propose a licence condition in this area. Through continual improvement CNL will continue to develop a robust maintenance program that ensures the operability of all applicable structures, systems, and components.

3.6.4 Conclusion

Based on CNSC staff's review of CNL's corporate-wide maintenance programs and site-specific maintenance plans for the PHAI, CNSC staff conclude that the plans are acceptable and meet regulatory requirements.

3.6.5 Recommendation

Now that the PHP and PGP LTWMFs and WWTPs are operational and CNL has gained sufficient operating experience, CNSC staff propose including one standardized licence condition for the Fitness for Service SCA. Licence condition 5.1 requires CNL to implement and maintain a fitness for service program. Compliance verification criteria for this licence condition are provided in the draft LCH.

3.7 Radiation Protection

The Radiation Protection SCA covers the implementation of a radiation protection (RP) program in accordance with the *Radiation Protection Regulations*. The program must ensure that contamination levels and radiation doses received by individuals are monitored, controlled, and maintained as low as reasonably achievable (ALARA).

The specific areas that comprise the Radiation Protection SCA are as follows:

- Application of ALARA
- Worker dose control
- Radiation protection program performance
- Radiological hazard control

3.7.1 Trends

The following table indicates the overall rating trends for the Radiation Protection SCA over the current licensing period:

TRENDS FOR RADIATION PROTECTION								
Overall Compliance Ratings								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains an RP program as required by the *Radiation Protection Regulations*. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. No worker received a radiation dose in excess of the CNSC's regulatory limits as a result of the licensed activities conducted at the PHAI. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.7.2 Discussion

The *Radiation Protection Regulations* require licensees to implement an RP program. As part of that program, licensees must keep effective and equivalent doses received by and committed to persons ALARA, considering social and economic factors, through the implementation of management control over work practices, personnel qualification and training, control of occupational and public exposures to radiation, and planning for unusual situations. The *Radiation Protection Regulations* also prescribe dose limits for Nuclear Energy Workers (NEWs) and persons who are not NEWs. The program submitted in the application for the Radiation Protection SCA includes:

- PHAI Radiation Protection Plan [39].

CNL has implemented and continues to maintain the PHAI RP Plan for the activities performed under the PHAI licences. The PHAI RP Plan provides the level of radiation safety that is required to ensure that contamination levels and radiation doses received by individuals are monitored, controlled, and maintained ALARA. CNSC staff conclude that the PHAI RP Plan meets regulatory requirements for the activities authorized in the licence.

3.7.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.7.3.1 Past Performance

CNSC staff conducted five (5) focused Radiation Protection compliance inspections at the PHAI in 2018, 2019 and 2021. The following is a summary of past performance by the specific areas that comprise the Radiation Protection SCA.

Application of ALARA

CNL's commitment to the ALARA principle has been demonstrated through the implementation of the PHAI RP Plan. The PHAI RP Plan aligns with CNL's corporate RP program, to ensure that the work activities at the PHAI comply with the level of radiation safety that is required by the *Radiation Protection Regulations*. The PHAI RP Plan describes the responsibilities of individuals managing and overseeing the project; the processes to be implemented; and the requirements to be met by contractors to provide effective RP coverage for the PHAI. The PHAI RP Plan includes a commitment to apply ALARA techniques for all PHAI activities. The application of ALARA is managed through routine monitoring and regular reviews of dose records to confirm that no adverse trends or exceedances have occurred.

CNSC staff assessed CNL's application of ALARA and are satisfied with their performance during the licensing period.

Worker Dose Control

Radiological dose at the PHAI result from exposures to Radium-226 (and progeny), Thorium-230, Thorium-232 (and progeny) and Uranium. The primary exposure pathway is external gamma radiation, followed by inhalation of radon gas and progeny. Inhalation and ingestion of dust also contributes to total effective dose but at a lower proportion. Radiation exposures of persons are monitored to ensure compliance with the CNSC's regulatory dose limits and to maintain radiation doses ALARA.

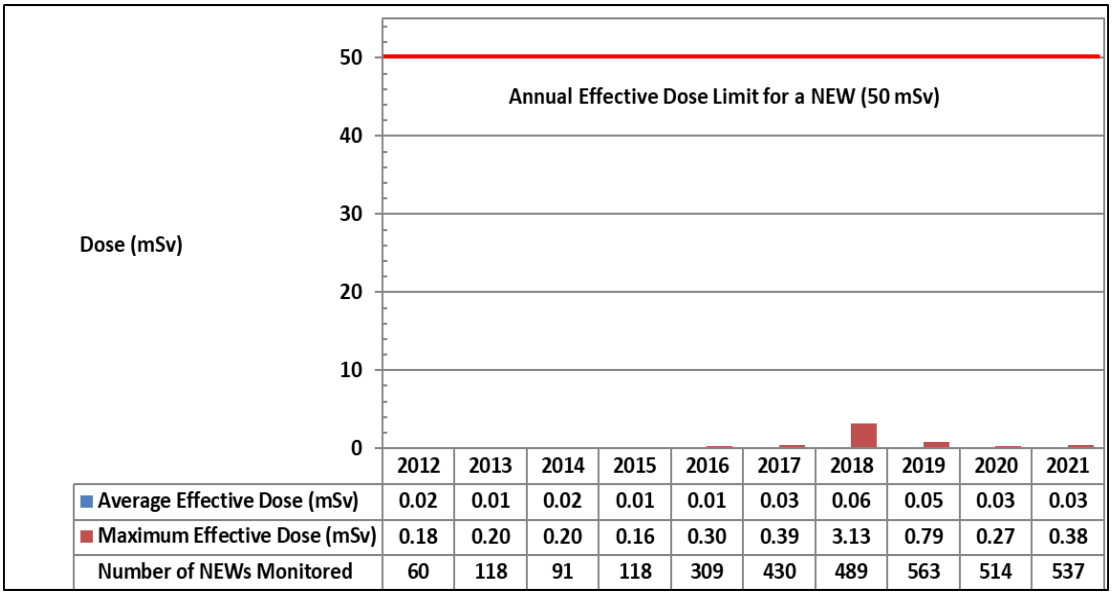
Dosimeters are used for measuring external doses (whole body and skin) for NEWs. Internal doses received by NEWs, resulting from exposure to radon progeny and long-lived alpha (LLA) emitters, are determined either by indirect estimation methods using concentration levels in air and time spent in work areas, or by direct monitoring using Personal Alpha Dosimeters.

For visitors and workers not considered NEWs, radiation doses are estimated using data from the radiological conditions of areas visited, or directly monitored by electronic personal dosimeters. CNL has set a project limit for visitors of 0.2 mSv per year for all project activities, including tours, as well as a project limit for workers that are not considered NEWs of 0.3 mSv per year. During the licensing period, radiation doses to visitors and workers not considered NEWs were kept below CNL's established project limits and the CNSC's regulatory effective dose limit of 1 mSv over one calendar year.

Radiation doses received by NEWs at the PGP, 2012 - 2021

The maximum effective dose received by a NEW at the PGP during the licensing period was 3.13 mSv in 2018, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period. Figure 4 depicts the total effective dose statistics for NEWs at the PGP during the licensing period. The total number of NEWs includes all contractors involved in work activities at the PGP as well as CNL staff.

Figure 4: Effective doses for Port Granby Project Nuclear Energy Workers, 2012-2021



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Average Effective Dose (mSv)	0.02	0.01	0.02	0.01	0.01	0.03	0.06	0.05	0.03	0.03
Maximum Effective Dose (mSv)	0.18	0.20	0.20	0.16	0.30	0.39	3.13	0.79	0.27	0.38
Number of NEWs Monitored	60	118	91	118	309	430	489	563	514	537

In 2018, doses to NEWs at the PGP were higher than previous years, which is attributed to an increase in the scope of work that was performed, including: operation of the WWTP; construction and operation of the LTWMF; and the excavation and emplacement of waste in the LTWMF. Radiation doses began trending down in 2019 due to nearing completion of excavation activities, and the focus of work turning to capping of the LTWMF.

For the five-year dosimetry periods that occurred during the licensing period (January 1, 2011 to December 31, 2015, and January 1, 2016 to December 31, 2020), the maximum cumulative effective doses received by NEWs at the PGP were 0.58 mSv and 5.04 mSv respectively, which are well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Annual average and maximum equivalent doses to the skin for NEWs at the PGP during the licensing period are provided in table 8. The maximum skin dose received by a NEW at the PGP was 2.44 mSv in 2018, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

Table 8: Equivalent doses to the skin for Port Granby Project Nuclear Energy Workers, 2012-2021

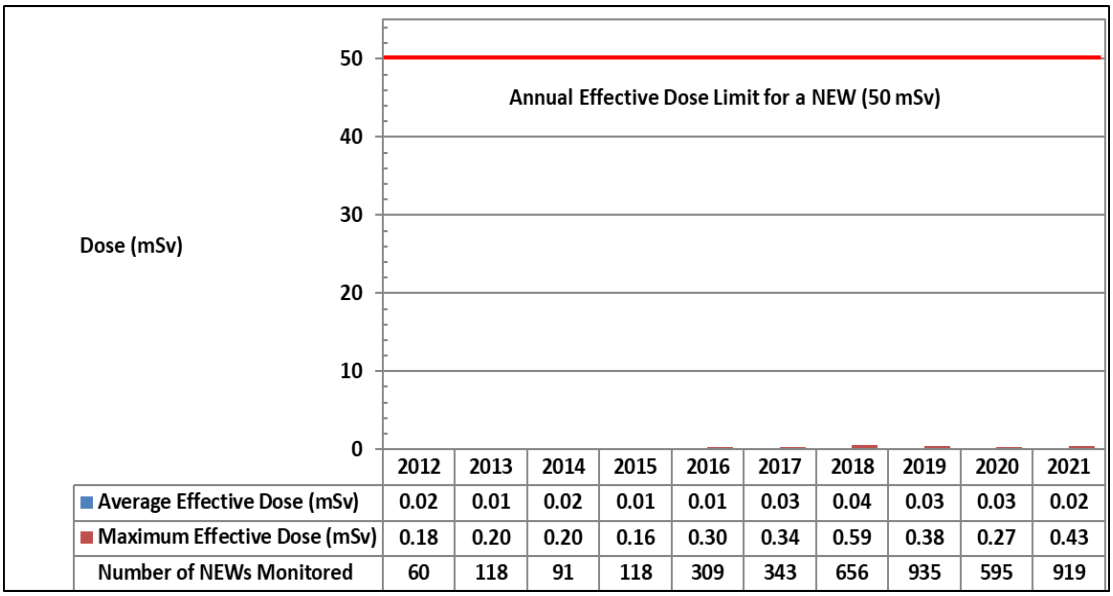
Year	Average skin dose (mSv)	Maximum individual skin dose (mSv)
2012	0.02	0.18
2013	0.01	0.20
2014	0.01	0.16
2015	0.01	0.16
2016	0.01	0.30
2017	0.04	0.34
2018	0.05	2.44
2019	0.05	0.79
2020	0.03	0.27
2021	0.03	0.44
Regulatory dose limit	**-**	**500 mSv/year**

CNSC staff are satisfied that worker doses at the PGP are being monitored and controlled below the CNSC's regulatory limits.

Radiation doses received by NEWs at the PHP, 2013 - 2021

The maximum effective dose received by a NEW at the PHP during the licensing period was 0.59 mSv in 2018, which is well below the CNSC's regulatory effective dose limit for NEWs of 50 mSv in a one-year dosimetry period. Figure 5 depicts the total effective dose statistics for NEWs at the PHP during the licensing period. The total number of NEWs includes all contractors involved in work activities at the PHP as well as CNL staff. CNL staff who work at the PHP, PHRWMF and PSETSS wear the same dosimetry between sites. Consequently, the worker doses reported at the PHP are inclusive of the PHRWMF and PSETSS worker doses.

Figure 5: Effective doses for Port Hope Project Nuclear Energy Workers, 2012-2021



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Average Effective Dose (mSv)	0.02	0.01	0.02	0.01	0.01	0.03	0.04	0.03	0.03	0.02
Maximum Effective Dose (mSv)	0.18	0.20	0.20	0.16	0.30	0.34	0.59	0.38	0.27	0.43
Number of NEWs Monitored	60	118	91	118	309	343	656	935	595	919

Late 2017 marked the beginning of hauling on-site waste into the newly constructed Cell 1 mound at the LTWMF, resulting in a slight increase in effective doses to NEWs in 2018 when compared to previous years.

For the five-year dosimetry periods that occurred during the licensing period (January 1, 2011 to December 31, 2015, and January 1, 2016 to December 31, 2020), the maximum cumulative effective doses received by NEWs at the PHP were 0.58 mSv and 1.16 mSv respectively, which are well below the CNSC's regulatory effective dose limit of 100 mSv in a five-year dosimetry period.

Annual average and maximum equivalent doses to the skin for NEWs at the PHP during the licensing period are provided in table 9. The maximum skin dose received by a NEW at the PHP was 0.60 mSv in 2019, which is well below the CNSC's regulatory equivalent dose limit for NEWs of 500 mSv in a one-year dosimetry period.

Table 9: Equivalent doses to the skin for Port Hope Project Nuclear Energy Workers, 2012-2021

Year	Average skin dose (mSv)	Maximum individual skin dose (mSv)
2012	0.02	0.18
2013	0.01	0.20
2014	0.01	0.16
2015	0.01	0.16
2016	0.01	0.30
2017	0.04	0.34
2018	0.04	0.33
2019	0.04	0.60
2020	0.03	0.27
2021	0.02	0.44
Regulatory dose limit	**-**	**500 mSv/year**

CNSC staff are satisfied that worker doses at the PHP are being monitored and controlled below the CNSC's regulatory limits.

Radiation Protection Program Performance

CNSC Compliance Activities

RP program performance was assessed during the licensing period through various CNSC compliance verification activities, including desktop reviews of annual compliance reports. Aspects of the Radiation Protection SCA have been covered during all CNSC compliance inspection activities as cited in this CMD. In addition, CNSC staff conducted five (5) planned compliance inspections, focused on the Radiation Protection SCA, in the years 2018, 2019 and 2021. CNSC staff's assessment of CNL's performance in the Radiation Protection SCA identified areas of strength and opportunities for improvement, which included: reviewing and posting radiological warning signage, documenting parameters, specifications and requirements associated with radiation monitoring and radiation instrumentation and equipment, and enhancing the details in radiation monitoring records. All enforcement actions associated with these inspections have been closed to CNSC staff's satisfaction. Corrective actions were implemented by CNL, which included updating and documenting practices and procedures supporting the PHAI RP Plan.

Radiological Action Levels

CNL has established action levels for parameters including total effective, skin and committed effective doses for NEWs over a corresponding dosimetry monitoring frequency. When an action level is reached, it may be indicative of a potential loss of control for that specific parameter. CNL's action levels serve as early warnings of conditions that warrant further investigation and reporting to the CNSC if reached.

CNL reviewed the radiological action levels implemented during the years 2013/2014, 2018/2019 and 2020/2021. The reviews were conducted to confirm that the action levels continued to be reflective of the work activities being conducted at the sites, and that they remain adequately sensitive indicators to detect the emergence of a potential loss of control of elements of the PHAI RP Plan. The most recent set of action levels, based on the reviews that occurred over 2020 and into 2021, continue to be acceptable to CNSC staff. These action levels have been incorporated into the draft LCH.

During the licensing period, the following action level exceedances were reported to the CNSC:

- Over 2012-2013 at the PHP, there were eight exceedances of the action level of 50 Bq/m^3 for ambient radon concentration in air. This action level was established for Phase II construction and remediation activities and was applied to the ambient radon concentration in air measured by radon monitoring equipment deployed in five locations across the PHP site. Following the licensee's investigations, it was concluded that the slightly elevated radon concentrations at the locations being monitored resulted in negligible doses to workers since the exceedances occurred at locations where workers were not located for extended periods of time. As part of the corrective actions, a review of the action level was initiated by the licensee in 2013. This resulted in the removal of the radon concentration action level in 2014, with the confirmation that the effective dose action level of 1 mSv over a 4-week monitoring period was the more appropriate action level to apply for occupational radon exposures.
- In 2018, a NEW at the PGP received a committed effective dose from exposure to radon of 0.70 mSv and a whole-body effective dose of 0.46 mSv, for a total of 1.16 mSv effective dose over a 4-week monitoring period, exceeding the action level of 1 mSv over a 4-week monitoring period. Through an investigation, the licensee concluded that the worker's health and safety was not compromised. The licensee concluded that the action level exceedance did not represent a loss of control of their PHAI RP Plan, due to the nature of the work activities being performed by the worker which was in an area of excavation showing elevated gamma dose rates and elevated radon concentrations. Following the action level exceedance, the licensee implemented revised radiation protection action levels in 2019 that were more reflective of the work activities being conducted at the PGP and PHP.

CNSC staff are satisfied with the reporting and investigations into the action level exceedances and the corrective actions taken during the licensing period.

3.7.3.2 Regulatory Focus

During the licensing period, CNL revised the PHAI RP Plan as part of their continual improvement activities, as a result of findings arising from CNSC compliance verification activities, and more recently, to ensure compliance with the amendments to the *Radiation Protection Regulations* that came into force in November 2020. Overall, CNSC staff are satisfied with the radiation protection program performance at the PHAI during the licensing period.

3.7.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the Radiation Protection SCA.

3.7.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain an RP program in accordance with regulatory requirements. CNSC staff have determined that the program is adequate to support the activities authorized in the licence.

3.7.5 Recommendation

One standardized licence condition is included in the proposed licence for the Radiation Protection SCA. Licence condition 6.1 requires CNL to implement and maintain a radiation protection program which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days. Compliance verification criteria for this licence condition are included in the draft LCH.

3.8 Conventional Health and Safety

The conventional health and safety SCA cover the implementation of a program to manage workplace safety hazards and to protect personnel and equipment.

The specific areas that comprise this SCA at the PHAI include:

- Practices
- Awareness
- Performance

3.8.1 Trends

The following table indicates the overall rating trends for the Conventional Health and Safety SCA over the current licensing period:

TRENDS FOR CONVENTIONAL HEALTH AND SAFETY								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA

Comments

CNL has implemented and maintains a conventional health and safety program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The conventional health and safety program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's conventional health and safety program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.

3.8.2 Discussion

The CNSC requires licensees to develop, implement and maintain effective safety programs, to promote a safe and healthy workplace for employees, and to minimize the incidence of occupational injuries and illnesses. The CNSC requires CNL to identify potential safety hazards, assess the associated risks, and implement the necessary materials, equipment, programs, and procedures to effectively manage, control and minimize these risks at the PHAI. The program submitted in the application for the occupational health and safety SCA includes:

- Port Hope Area Initiative Occupational Safety and Health Plan [40]

The occupational health and safety program at the PHAI is comprised of several components designed for employees, visitors, and contractors. CNSC staff are satisfied that CNL's health and safety program meets regulatory and legislated requirements.

3.8.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.8.3.1 Past Performance

Practices

In addition to the *Nuclear Safety and Control Act* and its associated regulations, CNL's activities must comply with Part II: *Occupational Health and Safety* of the *Canada Labour Code*, *Canada Occupational Health and Safety Regulations*, and other applicable federal and provincial health and safety acts and regulations.

CNL's occupational health and safety program applies to all work performed by CNL employees, and to work performed by others on sites and workplaces controlled by CNL. Under this program, CNL is required to conduct internal audits and self-assessments at frequencies identified in the program. Actions resulting from these audits and assessments are managed and tracked to completion through CNL's corrective actions program.

CNSC staff verified CNL safety practices during compliance inspections and site walk downs. CNSC staff are satisfied with CNL's performance at the PHAI in the aspects related to conventional health and safety.

Awareness

CNL actively promotes conventional health and safety through the provision of information, training, instructions, and supervision. Employees are encouraged to participate, and to report concerns (e.g., unsafe conditions, non-compliances, or events) to identify hazards and ensure measures are put in place to prevent injury and illness.

During the licensing period, CNL improved aspects of the conventional health and safety program based on industry best practices and the results of internal focused audits, self-assessments, effectiveness reviews and health and safety inspections.

The findings from these reviews, audits, inspections and self-assessments resulted in internal actions being raised to improve site wide health and safety performance. These internal actions focused on continuing to increase awareness of occupational hazards and the potential for injury to workers, as well as on methodologies to reduce the frequency of occurrence.

CNSC staff monitors CNL employee reports which identify safety concerns through the initiation of ImpActs. CNSC staff are satisfied with CNL's promotion of health and safety awareness at CRL.

Performance

The key performance indicators for conventional health and safety are the number of recordable lost-time injuries (RLTI) that occur per year, and the RLTI severity and frequency. An RLTI is defined as a workplace injury that results in the worker being unable to return to work for a period of time. RLTI severity and frequency provide context to the number of RLTIs. Severity quantifies the number of lost workdays experienced per 100 employees, while frequency quantifies the number of lost-time injuries relative to the number of hours worked. Prior to 2019, CNL only provided data on the number of RLTIs at the PHAI. In addition, RLTIs for the PHP are inclusive of RLTIs at the PHRWMF and PSETSS.

Data on RLTI, RLTI Frequency and RLTI Severity since 2013 for PHP and PGP are included in tables 10 and 11 below.

Table 10: Summary of PHPs RLTIs, frequency, and severity

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Person Hours Worked	-	-	-	-	-	-	298377	391875	389016
RLTI	0	0	0	0	0	0	1	0	1
Working Days Lost	-	-	-	-	-	-	33	0	1
Frequency	-	-	-	-	-	-	0.68	0	0.51
Severity	-	-	-	-	-	-	22.57	0	0.51

The 2019 RLTI at the PHP occurred in March 2019, an employee slipped on a residential house deck dislocating their left shoulder. CNL reported to CNSC staff that the employee required medical attention leading to 33 lost days.

The 2021 RLTI at the PHP was related to a worker who suffered an allergic reaction to an unknown insect bite. The reaction had a delayed manifestation and resulted in the worker visiting the hospital.

Table 11: Summary of PGPs RLTIs, frequency, and severity

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Person Hours Worked	-	-	-	-	-	-	41 622	30 000	19614
RLTI	0	0	0	0	0	0	1	0	1
Working Days Lost	-	-	-	-	-	-	1	0	11
Frequency	-	-	-	-	-	-	4.81	0	10.2
Severity	-	-	-	-	-	-	4.81	0	112.16

The 2019 RLTI at the PGP occurred on January 9, 2019, a subcontractor injured their leg requiring them to be airlifted to hospital. The incident happened at the PGP LTWMF, where a "roll-off bin" being unloaded from a truck, pinned a worker's leg while the bin was being off-loaded. CNL investigated the incident and where safety-related findings were identified and subsequently corrected by CNL in a timely manner. CNSC staff reviewed the resulting reports and corrective measures and are satisfied with CNL's actions. This event was report as an EIR to the Commission and is captured in CMD 19-M9.

The 2021 RLTI at the PGP was identified on December 31, 2021, a worker was identified through routine screening to have COVID. Contact tracing of other PGP site staff was conducted, which included both rapid tests and follow-up polymerase chain reaction tests to prevent workplace transmission.

Data on RLTI, and RLTI frequency and severity at the PHAI is provided in CNL's Annual Compliance Monitoring Reports and reported by CNSC staff in annual RORs. For comparison, CNL's reported RLTI frequency is lower than lost-time injury rates for comparable industries in Ontario like construction and manufacturing, as per Ontario Workplace Safety and Insurance Board data. CNSC staff consider this to be a conservative comparison because Ontario lost-time injury data includes only injuries for which compensation claims were allowed, rather than all reportable injuries, as is included in CNL data. As part of ongoing compliance verification activities, CNSC staff have verified that CNL is meeting regulatory requirements in reporting injuries.

CNL is required to report all hazardous occurrences to Employment and Social Development Canada. CNSC staff receive copies of these notifications as per the requirements of CNSC's REGDOC-3.1.3.

3.8.3.2 Regulatory Focus

CNSC staff will continue to monitor the effectiveness of CNL's conventional health and safety program through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to this SCA.

3.8.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the conventional health and safety SCA.

3.8.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain a conventional health and safety program in accordance with regulatory requirements. CNSC staff have determined that CNL's conventional health and safety program is adequate to support the activities authorized in the licence.

3.8.5 Recommendation

One standardized licence condition is included in the proposed licence for the conventional health and safety SCA. Licence condition 7.1 requires CNL to implement and maintain a conventional health and safety program. Compliance verification criteria for this licence condition are included in the draft LCH.

3.9 Environmental Protection

The Environmental Protection SCA covers the implementation of an environmental protection program in accordance with the *Nuclear Safety and Control Act*. This SCA covers programs that identify, control, and monitor all releases of radioactive and hazardous substances, and the effects on people and the environment from facilities or as a result of licensed activities.

The specific areas that comprise the Environmental Protection SCA are as follows:

- Effluent and Emissions Control
- Protection of People
- Assessment and Monitoring

3.9.1 Trends

The following table indicates the overall rating trends for the Environmental Protection SCA over the current licensing period:

TRENDS FOR ENVIRONMENTAL PROTECTION								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains an environmental protection program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The environmental protection program has been maintained and improved over the licensing period. CNSC staff conclude that CNL's environmental protection meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.9.2 Discussion

Protection of the environment and the public are both assessed in the SCA of environmental protection. This SCA covers programs that identify, control and monitor all releases of radioactive and hazardous substances, and the effects on people and the environment from facilities or as a result of licensed activities. The programs submitted in the application for the environmental protection SCA include:

- Port Granby - Environmental and Biophysical Monitoring Plan [25]
- Port Hope Project Environmental and Biophysical Monitoring Plan [24]
- Port Hope Project Environmental Protection Plan [41]
- Port Hope Area Initiative Dust Management Plan [42]

CNL implemented and continues to maintain an environmental protection program for the activities performed under the PHAI licences. The PHAI environmental protection program identifies, controls, and monitors all releases of radioactive and hazardous substances as a result of the licensed activities. CNSC staff conclude that CNL's environmental monitoring programs meet regulatory requirements and are protective of the public and the environment.

3.9.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.9.3.1 Past Performance

Effluent and Emissions Control

Prior to the commissioning of the PHP and PGP WWTPs in 2016, CNL operated Water Treatment Plants (WTPs) which had limited capabilities for treating COPC's in the liquid effluent. The PHP WTP had licence limits and treated for radium-226, arsenic and pH. The PHP WTP is still operational but at this time is only used in the event of an emergency to augment the treatment capacity of the PHP WWTP. During heavy rainfall events in 2017, 2018, 2019 and 2020, CNL restarted the PHP WTP to treat excess waste water. The operation of the PHP WTP is only permitted following CNL's notification to CNSC staff in accordance with CNL's emergency water contingency plan [44]. The water contingency plan is in place to avoid a release of untreated water to the environment, such as the June 2017 event reported to the Commission in EIR **17-M38**, summarized in section 3.3.3.1 of this CMD.

The PGP WTP had licence limits and treated for radium-226 and pH. The PGP WTP was decommissioned in 2016 following the commissioning of the PGP WWTP. Due to its shutdown, there were no liquid effluent releases from the PGP WTP since 2016.

Treated liquid effluent released to the environment after the final point of control from the PHP and PGP WWTPs must meet the effluent discharge limits stipulated in the PHP and PGP Environmental and Biophysical Monitoring Plans [25, 24]. As part of the renewal application, CNL has proposed effluent release limits that are discussed further in Section 5.6 of this CMD. CNSC staff consulted with Environment and Climate Change Canada (ECCC) and verified that the proposed release limits for the PHP WWTP and established limits for the PGP WWTP follow the principles of ALARA, Best Available Technology Economically Achievable (BATEA), pollution prevention and are protective of the environment.

Action levels have been established for each WWTP and have site-specific parameters that are chosen to be effective and efficient indicators of a potential loss of control and are set near the upper bounds of normal operating performance. As such, reaching an action level is not a regulatory non-compliance or violation. Action levels for the WWTPs are specified in the applicable Environmental and Biophysical Monitoring Plan. CNL periodically reviews and adjusts these action levels to ensure that they remain an effective indicator of the system performance.

Liquid effluent release from the PHP and PGP WTPs are provided in tables 12 and 14 below. Liquid effluent release from the PHP and PGP WWTPs from 2017 to 2021 are provided in tables 13 and 15 below. The data provided in the tables show the monthly mean concentrations and the maximum monthly mean concentration recorded during the year. Liquid effluent releases are compared to the interim liquid effluent levels used during the commissioning of the PHP and PGP WWTPs. Liquid effluent releases from 2018 to 2021 are compared to the proposed licence limits of the PHP WWTP and established licence limits for the PGP WWTP. While establishing licence limits for Boron at the PHP WWTP, and Molybdenum at the PGP WWTP, it was determined that the influent levels are already below any Federal and Provincial surface water guideline. As such, no release limits were required following the interim limits established at the time of the WWTP design.

Table 12: PHP WTP annual treated liquid effluent releases from 2012 – 2016

COPC, Unit	Concentration	2012	2013	2014	2015	2016	Previous Licence Limits (Monthly Mean)
Ra-226 (Bq/L)	Annual Avg	0.075	0.050	0.049	0.034	0.028	**0.37**
	MAX	0.105	0.078	0.066	0.049	0.081	
As (µg/L)	Annual Avg	17.0	12.0	7.6	7.7	13	**500**
	MAX	53.0	38.2	19.5	21.3	52	
pH	Annual Avg	7.51	7.51	7.6	7.71	7.64	**6-9**
	MIN / MAX	>7.07, <7.89	>6.91, <7.82	>7.33, <7.87	>6.97, <8.02	>7.19, <7.90	

Table 13: PHP WWTP annual treated liquid effluent releases from 2017 – 2021

COPC, Unit	Concentration	2017	2018	2019	2020	2021	2017 - 2020 Interim Limits (Monthly Mean) *	2021 to Present Licence Limits (Monthly Mean) **
Ra-226 (Bq/L)	Annual Avg	0.005	0.005	0.005	0.006	0.005	**0.37**	**0.37**
	MAX	0.005	0.005	0.005	0.008	0.005		
As (µg/L)	Annual Avg	1.9	10.6	1.2	1.4	11.7	**41**	**150**
	MAX	6.5	38.0	2.0	6.8	29.9		
pH	Annual Avg	7.39	7.68	7.81	7.58	7.59	**6 - 9**	**6 - 9**
	MIN / MAX	>7.08, <7.58	>7.12, <7.83	>7.56, <7.93	>7.28, <7.90	>7.36, <7.88		
Acute Toxicity	Pass / Fail	PASS	PASS	PASS	PASS	PASS	**Cannot be toxic**	
	MAX	N/A	N/A	N/A	N/A	N/A		
U (µg/L)	Annual Avg	0.7	4.6	1.2	1.4	1.5	**150**	**150**
	MAX	1.5	11.0	2.3	2.8	2.5		
TSS (mg/L)	Annual Avg	1	1	1	1	1	**15**	**15**
	MAX	1	1	1	1	2		
Al (µg/L)	Annual Avg	6.1	5.9	5.3	2.7	1.2	**660**	**110**
	MAX	13.0	8.0	6.0	5.4	2.0		
B (µg/L)	Annual Avg	20	30	34	N/A	N/A	**1820**	**-**
	MAX	26	53	47	N/A	N/A		
Cu (µg/L)	Annual Avg	1.0	1.0	1.1	1.4	1.3	**15**	**15**
	MAX	1.0	1.0	2.5	1.90	2.1		
Pb (µg/L)	Annual Avg	0.5	0.5	0.5	0.4	0.5	**22.8**	**23**
	MAX	0.5	0.5	0.5	0.6	0.7		
Zn (µg/L)	Annual Avg	5.0	5.0	5.0	2.9	1.4	**110**	**210**
	MAX	5.0	5.0	5.0	2.9	2.5		

*Interim Licence limits for PHP new WWTP, used since 2017 to April 2020
**Licence limits PHP new WWTP used since April 2020

Table 14: PGP WTP annual treated liquid effluent releases from 2012 – 2016

COPC, Unit	Concentration	2012	2013	2014	2015	2016	Previous Licence Limits (Monthly Mean)
Ra-226 (Bq/L)	Annual Avg	0.058	0.057	0.072	0.172	0.005	**0.37**
	MAX	0.065	0.084	0.145	0.230	0.190	
pH	Annual Avg	7.68	7.80	7.74	7.87	7.70	**6 - 9**
	MIN / MAX	>7.49, <7.89	>7.22, <7.91	>7.65, <7.86	>7.60, <8.14	>7.56, <8.58	

Table 15: PGP annual treated liquid effluent releases from 2017 – 2021

COPC, Unit	Concentration	2017	2018	2019	2020	2021	2017 Interim Limits (Monthly Mean) *	2018 to Present Licence Limits (Monthly mean) **
Ra-226 (Bq/L)	Annual Avg	0.009	0.005	0.008	0.006	0.005	**0.37**	**0.37**
	MAX	0.051	0.008	0.038	0.008	0.005		
As (µg/L)	Annual Avg	4.1	12.3	9.3	6.8	8.7	**41**	**100**
	MAX	8.5	35.5	39.1	15.6	24		
pH	Annual Avg	7.45	7.46	7.68	7.64	7.49	**6 – 9.5**	**6.0 – 9.5**
	Min / MAX	>7.01, <7.57	>5.91, <7.85	>7.35, <7.94	>7.37, <7.98	>7.3, <7.74		
Acute Toxicity	Pass / Fail	PASS	PASS	PASS	PASS	PASS	**Cannot be toxic**	
	MAX	N/A	N/A	N/A	N/A	N/A		
U (µg/L)	Annual Avg	7.5	7.3	10.4	3.9	1.2	**150**	**100**
	MAX	15.5	17.5	55.8	8.8	2.7		
TSS (mg/L)	Annual Avg	1.0	1.0	1.0	1.5	1.1	**15**	**15**
	MAX	1	1.4	1	1.5	1.3		
Se (µg/L)	Annual Avg	2.0	2.0	2.0	2.0	0.04	**10**	**30**
	MAX	2.0	2.0	2.0	2.0	0.04		
Cu (µg/L)	Annual Avg	1.0	1.0	1.0	0.5	0.7	**24**	**15**
	MAX	1.2	1.2	1.2	1.1	2.1		
Mo (µg/L)	Annual Avg	1.73	N/A	N/A	N/A	N/A	**730**	**-**
	MAX	3.90	N/A	N/A	N/A	N/A		
Tl (µg/L)	Annual Avg	0.05	0.05	0.05	0.05	0.005	**8**	**8**
	MAX	0.07	0.06	0.05	0.01	0.005		
Cd (µg/L)	Annual Avg	0.10	0.10	0.10	0.10	0.01	**0.33**	**1**
	MAX	0.10	0.10	0.10	0.10	0.01		
V (µg/L)	Annual Avg	0.51	0.62	0.64	0.26	0.24	**42**	**40**
	MAX	0.57	1.06	1.55	0.40	0.90		
P (mg/L)	Annual Avg	0.02	0.02	0.02	0.01	0.02	**0.10**	**0.35**
	MAX	0.02	0.02	0.04	0.03	0.05		
Nitrite (mg/L)	Annual Avg	0.02	0.11	0.09	0.07	0.12	**0.6**	**1.5**
	MAX	0.02	0.26	0.25	0.16	0.30		
Nitrate (mg/L)	Annual Avg	3.30	2.94	1.58	0.44	0.10	**127.8**	**75**
	MAX	5.74	8.94	3.35	1.92	0.10		
Ammonia (mg/L)	Annual Avg	0.11	0.10	0.13	0.16	0.18	**2.9**	**5.75**
	MAX	0.60	0.27	0.34	0.73	0.30		

COPC, Unit	Concentration	2017	2018	2019	2020	2021	2017 Interim Limits (Monthly Mean) *	2018 to Present Licence Limits (Monthly mean) **
Co (µg/L)	Annual Avg	0.50	0.50	0.57	0.52	0.52	9	5
	MAX	0.50	0.55	1.24	1.30	2.30		

*Interim Licence limits for PGP NEW WWTP, used in 2017
** Licence limits for PGP NEW WWTP, used since 2018.

Liquid releases of radioactive and hazardous substances at the PHP and PGP remain below their respective licence limits during the current licence period. CNSC staff conclude that the effluent verification monitoring programs in place for PHP and PGP sites protect the environment and the health and safety of the public.

Protection of People

The environmental risk assessment (ERA) that a licensee conduct is a systematic process to identify, quantify and characterize the risk from contaminants and physical stressors in the environment to human and non-human (biological) receptors. As PHAI licenses are not Class I nuclear facilities, CNL does not require an ERA according to the criteria of CSA Standard N288.6-12. However, CNL has implemented an Environmental Assessment (EA) follow-up monitoring programs for the PHP and PGP to confirm that the environmental effects are consistent with the predictions of the PHP and PGP EA.

CNSC staff assessed the results of CNL's environmental follow-up programs and found that there is adequate monitoring and controls in place for the potential release of radiological and hazardous substances to provide adequate protection to the environment.

CNL maintains a comprehensive environmental monitoring program for the PHAI to verify that radiation doses to members of the public as a result of radioactive releases from the project activities remain ALARA, with social and economic factors being taken into account. CNL provides estimated maximum effective radiation dose results in annual reports to CNSC staff to confirm compliance with applicable regulatory requirements.

Estimated maximum effective radiation doses from 2013 to 2021 are compared to the regulatory public dose limit in tables 16 and 17 below for the PHP and PGP LTWMF sites. In 2016, CNL modified its approach for calculating estimated dose to the public. The estimate now includes dose contributions from radon monitoring and dose measurements taken at the perimeter of the PHP and PGP LTWMF sites. CNSC staff found this to be a more conservative method for calculating public dose and support the change.

Table 16: PHP Estimated Maximum Effective Dose to the Public

Dose Statistic	2013	2014	2015	2016	2017	2018	2019	2020	2021	Regulatory limit
Maximum effective dose (mSv)	0.0998	0.0871	0.0935	0.0120	0.0045	0.0275	0.0360	0.0330	0.023	1 mSv/y

Table 17: PGP Estimated Maximum Effective Dose to the Public

Dose Statistic	2013	2014	2015	2016	2017	2018	2019	2020	2021	Regulatory limit
Maximum effective dose (mSv)	0.0084	0.0066	0.0084	0.0054	0.0057	0.0200	0.0396	0.0200	0.041	1 mSv/y

CNSC staff's review of these results since 2013 indicate that the concentration of radionuclides in the environment resulted in very low levels of dose to the public. The estimated maximum effective radiation dose to the public continues to be well below the regulatory dose limit of 1 mSv/year.

Assessment and Monitoring

To complement ongoing compliance activities, the CNSC has implemented its Independent Environmental Monitoring Program (IEMP) in the Municipalities of Port Hope and Port Granby. The IEMP results verify that the public and the environment are protected. The IEMP results for Port Hope and Port Granby are published on the CNSC's website.

3.9.3.2 Regulatory Focus

CNSC staff will continue to monitor the effectiveness of CNL's environmental protection program through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to this SCA.

3.9.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the environmental protection SCA.

3.9.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain an environmental protection program in accordance with regulatory requirements. CNSC staff have determined that CNL's environmental protection program is adequate to support the activities authorized in the licence.

3.9.5 Recommendation

One standardized licence condition is included in the proposed licence for the environmental protection SCA. Licence condition 8.1 requires CNL to implement and maintain an environmental protection program which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days. Compliance verification criteria for this licence condition are included in the draft LCH.

3.10 Emergency Management and Fire Protection

The emergency management and fire protection SCA covers emergency plans and emergency preparedness programs that exist for emergencies and for non-routine conditions.

The specific areas that comprise this SCA at the PHAI include:

- Conventional Emergency Preparedness and Response; and
- Fire Emergency Preparedness and Response.

3.10.1 Trends

The following table indicates the overall rating trends for the Emergency Management and Fire Protection SCA over the current licensing period:

TRENDS FOR EMERGENCY MANAGEMENT AND FIRE PROTECTION								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains an emergency management and fire protection program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The emergency management and fire protection program has been maintained and improved over the licensing period. CNSC staff conclude that the emergency management and fire protection program meet regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.10.2 Discussion

Conventional Emergency Preparedness and Response

The CNSC requires licensees to develop, implement and maintain effective emergency preparedness plans for the protection of the health and safety of workers, the public and the environment. The program submitted in the application for the occupational health and safety SCA includes:

- Port Hope Area Initiative Emergency Plan [44]

CNL's emergency preparedness and emergency plan contains the necessary guidelines and responsibilities for CNL staff to respond to an emergency. The plan identifies the onsite emergency response organization members and their duties and responsibilities for responding to emergencies. The plan also specifies the required equipment to be used in responding to such emergencies, maintenance of equipment and emergency procedures. The emergency response plan addresses both general emergency response and support from outside emergency responders. CNSC staff conclude that CNL's emergency management plan meets the requirements of subsection 24(4) of the *Nuclear Safety and Control Act*.

Fire Emergency Preparedness and Response

The CNSC requires licensees to develop, implement and maintain effective fire protection plans to minimize both the probability of occurrence and the consequences of fire that may occur as a result of the activities authorized in the licence. The program is required to comply with the requirements of the *National Building Code of Canada, 2015* and the *National Fire Code of Canada, 2015*. The program submitted in the application for fire protection includes:

- Port Hope Area Initiative Fire Protection Plan [45]

The PHAI fire protection plan describes the responsibilities and measures healthy work environment. CNSC staff conclude that CNL's fire protection plan meets regulatory requirements for the activities authorized in the licence.

3.10.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.10.3.1 Past Performance

Conventional Emergency Preparedness and Response

Since the construction of the PHP and PGP WWTP and LTWMF, CNSC staff conducted four (4) inspections of CNL's emergency preparedness and response program. Three (3) of these inspections involved observing CNL's emergency exercises and drills. As part of the inspection CNSC staff ensured that the lessons learned from the emergency exercises and drills were implemented to ensure CNL's emergency preparedness and response plan was strengthened. Some of the lessons learned included better communications with emergency responders, improvements to contamination monitoring and having available an escort vehicle available to bring first responders to the location of the incident. CNSC staff conclude that CNL's emergency preparedness and response program meets regulatory requirements for the activities authorized in the licence.

Fire Emergency Preparedness and Response

CNSC conducted a focused inspection of CNL's fire protection program in December 2021. The inspection found opportunities for improvement to strengthen the PHAI fire program including better oversight of contractor sites and buildings. Since the time of the inspection, CNL has developed a dedicated fire protection plan to ensure both the probability of occurrence and the consequence of a fire is minimized. CNSC staff conclude that CNL meets regulatory requirements for the activities authorized in the licence with respect to fire preparedness and response.

3.10.3.2 Regulatory Focus

CNSC staff will continue to monitor the effectiveness of CNL's emergency management and fire protection programs through regulatory oversight activities, including compliance inspections, and desktop reviews of CNL's compliance reporting and revisions to relevant program documentation pertaining to this SCA.

3.10.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the emergency management and fire protection SCA.

3.10.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain an emergency management and fire protection program in accordance with regulatory requirements. CNSC staff have determined that CNL's emergency management and fire protection programs are adequate to support the activities authorized in the licence.

3.10.5 Recommendation

Two licence conditions are proposed for the emergency management and fire protection SCA.

On standardized licence condition is included in the proposed licence for emergency management. Licence condition 9.1 requires CNL to implement and maintain an emergency preparedness program. Compliance verification criteria for this licence condition are provided in the draft LCH.

Previously the PHAI licences did not include a licence condition for a fire protection program as the licence did not follow the standardized format. CNSC staff propose one standardized licence condition for a fire protection program. Licence condition 9.2 requires CNL to implement and maintain a fire protection program. Compliance verification criteria for this licence condition are provided in the draft LCH.

3.11 Waste Management

The waste management SCA covers internal waste-related programs that form part of the operations up to the point where the waste is removed from the site of the authorized activity to a separate waste management facility. This area also covers the planning for decommissioning.

3.11.1 Trends

The licences associated with the PHAI are waste nuclear substance licences. As such, this SCA is encompassed by the licence itself. Consequently, the waste management SCA was not previously assessed as there was no specific licence condition or requirement for waste management.

3.11.2 Discussion

The current PHAI licences do not have a specific licence condition for a waste management program. Wastes generated as a result of the PHP and PGP activities are being safely stored in the PHP and PGP LTWMFs. As the projects transition to Phase III, long-term maintenance, and monitoring, it will not be possible for the LTWMFs to accept waste. Consequently, it is necessary for CNL to develop and implement waste-related programs and decommissioning plans for the PHP and PGP supporting infrastructure.

CNL's licence renewal application commits to meeting the applicable requirements and guidance of the CNSC's recently published or revised waste management and decommissioning regulatory documents for the PHAI. The following CNSC regulatory documents provide information on the governance and regulatory framework for radioactive waste management and decommissioning in Canada. CNL has committed to meet the applicable requirements and guidance of the following CNSC regulatory documents:

- REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada, Version 2*
- *REGDOC-2.11.1, Waste Management, Volume I: Management of Radioactive Waste*
- REGDOC-2.11.1, *Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste, Version 2*
- REGDOC-2.11.2, *Decommissioning*

Complimentary to the waste management and decommissioning regulatory documents, CNL has committed to meet the applicable requirements and guidance of the following CSA standards:

- N292.0-19, *General Principles for the Management of Radioactive Waste and Irradiated Fuel* [67]
- N292.3-14, *Management of Low- and Intermediate-Level Radioactive Waste* [5]
- N292.5-11, *Guideline for the Exemption or Clearance from Regulatory Control of Materials that Contain or Potentially Contain, Nuclear Substances* [6]
- N292.6-18, *Long-Term Management of Radioactive Waste and Irradiated Fuel* [7]
- N294.0-19, *Decommissioning of Facilities Containing Nuclear Substances* [8]

3.11.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.11.3.1 Past Performance

No specific assessments of the waste management SCA were performed during the current licensing period as it was not applicable.

3.11.3.2 Regulatory Focus

As CNL continues to develop a robust waste management program and decommissioning plans, which CNSC staff will assess to ensure the waste management program and decommissioning plans meet regulatory requirements. CNL's performance for this SCA will be monitored through regulatory oversight activities including onsite inspections and desktop reviews of relevant program documentation.

3.11.3.3 Proposed Improvements

On January 31, 2022, CNL provided a gap analysis of its current programs and implementation plan for meeting the CNSC's regulatory documents and CSA standards listed above 46, 47]. CNL's implementation plan for meeting the requirements in the CNSC's regulatory documents committed to the following:

- Consolidation of PHP waste acceptance criteria information aligned to CNSC's REGDOC-2.11.1 Vol I, a technical review is currently underway.
- Development and implementation of a decommissioning plan for the PHP and PGP in accordance with CNSC's REGDOC-2.11.2. The PHP Preliminary Decommissioning Plan is expected to be submitted by June 30, 2024 and a technical review of the PGP Preliminary Decommissioning Plan is currently underway.
- Consolidation of existing post-closure safety case information for the PHP and PGP aligned to CNSC's REGDOC-2.11.1 Vol III. This is expected by December 22, 2023 for the PHP and November 29, 2024 for the PHP [48].

CNSC staff are currently conducting a technical review of the PHP Waste Acceptance Criteria and PGP Preliminary Decommissioning Plan and will work with CNL to ensure these documents meet regulatory requirements. CNSC staff will then incorporate the finalized PHP Waste Acceptance Criteria and PGP Preliminary Decommissioning Plan in the LCH.

Given the PHP will remain in phase II, construction, and development, for several more years, the Preliminary Decommissioning Plan will be submitted in June 2024. However, the PGP is currently transitioning to phase III, long term maintenance and monitoring, as such it is important that CNL develop and implement a decommissioning plan sooner.

3.11.4 Conclusion

CNSC staff are of the opinion that a waste management program and decommissioning plan are required for the PHP and PGP sites as they transition to Phase III, long-term maintenance and monitoring. CNL's implementation plan for meeting the applicable regulatory documents and CSA standards was reviewed by CNSC staff and found to take a reasonable approach for the activities authorized by the licence.

3.11.5 Recommendation

The PHAI licences do not include a licence condition for the waste management SCA. Now that the PHP and PGP approach phase III activities, CNSC staff require CNL submit decommissioning plans that meet regulatory requirements. In addition, CNSC staff propose two standardized licence conditions for the waste management SCA. Licence condition 10.1 requires CNL to implement and maintain a waste management program. Licence condition 10.2 requires CNL to maintain a decommissioning plan. Compliance verification criteria for these licence conditions are provided in the draft LCH.

3.12 Security

The security SCA covers the implementation of a program which provides provisions to prevent the loss, unauthorized removal and sabotage of nuclear substances, nuclear materials, prescribed equipment, or information.

The specific areas that comprise this SCA are not addressed individually in this document.

3.12.1 Trends

The following table indicates the overall rating trends for the Security SCA over the current licensing period:

TRENDS FOR SECURITY								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains a security program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The security program has been maintained and improved over the licensing period. CNSC staff conclude that the security program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.12.2 Discussion

The *General Nuclear Safety and Control Regulations* require that a licence application contain information related to site access control and measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information. The program submitted in the application for security includes:

- Port Hope Area Initiative Security Plan [49]

The PHAI security plan provides details on CNL's security program to minimize risk to the public, employees, the environment and to protect company assets from sabotage, theft, criminal acts by internal or external agents and potential vulnerabilities. CNSC staff conclude that CNL's security plan meets regulatory requirements for the activities authorized in the licence.

3.12.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.12.3.1 Past Performance

During the current licensing period, there were reports of equipment theft and some vandalization of property. There is no history of sabotage or any evidence of intent of actual or planned sabotage threats conveyed to the CNSC.

CNSC staff monitor implementation of this program through compliance verification activities. Two (2) inspections conducted during the licence period included criteria related to the security SCA. No non-compliances were identified during this inspection.

CNSC staff have concluded that the security measures are sufficient and meets regulatory requirements.

3.12.3.2 Regulatory Focus

CNSC staff will continue to monitor CNL's performance in this SCA through regulatory oversight activities, including onsite inspections and desktop reviews of relevant program documentation.

3.12.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the security SCA.

3.12.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain a security program in accordance with regulatory requirements. CNSC staff have determined that CNL's security program is adequate to support the activities authorized in the licence.

3.12.5 Recommendation

One standardized licence condition is included in the proposed licence for the security SCA. Licence condition 11.1 requires CNL to implement and maintain a security program. Compliance verification criteria for this licence condition are included in the draft LCH.

3.13 Safeguards and Non-Proliferation

The Safeguards and Non-Proliferation SCA covers the programs and activities required for the successful implementation of the obligations arising from the Canada/International Atomic Energy Agency (IAEA) safeguards agreements as well as other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons*. This SCA comprises a safeguards program and a non-proliferation program.

The scope of the non-proliferation program for this licensee is limited to the tracking and reporting of foreign obligations and origins of nuclear material. This tracking and reporting assist the CNSC in the implementation of Canada's bilateral Nuclear Cooperation Agreements with other countries. The import and export of controlled nuclear substances, equipment and information identified in the *Nuclear Non-proliferation Import and Export Control Regulations* require separate authorization from the CNSC, consistent with subsection 3(2) of the GNSCR.

The specific areas that comprise this SCA are not addressed individually in this section.

3.13.1 Trends

The following table indicates the overall rating trends for the Safeguards and Non-Proliferation SCA cover the current licensing period:

TRENDS FOR SAFEGUARDS AND NON-PROLIFERATION								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
NA	NA	NA	NA	NA	SA	SA	SA	SA

Comments

CNL has implemented and maintains a safeguards and non-proliferation program. The satisfactory trend for this SCA applies only to the Port Hope Project as there are no requirements for the other licensed sites. Safeguards and non-proliferation only became a requirement in 2018. CNSC staff conclude that the safeguards and non-proliferation program meet regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.

3.13.2 Discussion

The CNSC regulatory mandate includes ensuring conformity with measures required to implement Canada's international obligations on the peaceful uses of nuclear energy. Pursuant to the *Treaty on the Non-Proliferation of Nuclear Weapons*, Canada has entered into a Comprehensive Safeguards Agreement and Additional Protocol with the IAEA (hereafter, the safeguards agreements). The objective of the Canada/IAEA safeguards agreements is for the IAEA to provide annual assurance to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there is no indication of undeclared material.

The CNSC provides the mechanism, through the *Nuclear Safety and Control Act*, regulations and a licence condition, for the IAEA to implement the safeguards agreements at the PHP. Conditions for the application of IAEA safeguards are contained in the licence and criteria in order to meet the conditions contained in the LCH and in CNSC's REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy*. Compliance includes the timely provision of reports on the movement and location of all nuclear materials, operational requirements, and access and assistance to IAEA inspectors for safeguards activities.

The scope of the non-proliferation program for the PHP is limited to the tracking and reporting of foreign obligations and origins of nuclear material. This tracking and reporting assist the CNSC in the implementation of Canada's bilateral Nuclear Cooperation Agreements with other countries. Note that safeguards and non-proliferation requirements only apply to the PHP.

3.13.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.13.3.1 Past Performance

During the licensing period, CNL provided the CNSC and IAEA all the reports and information necessary to comply with the safeguard's regulatory requirements, including those related to nuclear material accounting and reporting. In addition, CNL submitted its annual operational program to the CNSC as required, along with quarterly updates and the annual update to the information pursuant to the IAEA Additional Protocol.

The IAEA performed inspections and verifications, including six (6) inventory verifications, four (4) design information verifications, and three (3) complementary accesses. In addition, the IAEA was also at the facility on three (3) occasions for installation and maintenance of their safeguard's equipment.

In all cases, CNL provided the IAEA with the necessary access and assistance and complied with all regulatory requirements. There were no reportable events or findings issued as a result of these inspections.

Overall, CNL's programs for safeguards and non-proliferation for the PHP continue to meet CNSC requirements and expectations.

3.13.3.2 Regulatory Focus

CNSC staff will continue to monitor CNL's performance through participation in IAEA inspections, evaluations independent of the IAEA, and ongoing assessments of compliance with the various reporting requirements.

3.13.3.3 Proposed Improvements

CNSC's REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy*, is a requirement for safeguards and is referenced in the LCH. This document sets out requirements and guidance for safeguards programs for applicants and licensees who possess nuclear material, operate a uranium and/or thorium mine, carry out specified types of nuclear fuel-cycle related research and development work, and/or carry out specified types of nuclear-related manufacturing activities.

3.13.4 Conclusion

Based on CNSC and IAEA oversight activities, CNSC staff conclude that CNL continues to implement and maintain a safeguards and non-proliferation program in accordance with regulatory requirements. CNSC staff have determined that CNL's safeguards and non-proliferation program is adequate to support the activities authorized in the licence.

3.13.5 Recommendation

One standardized licence condition is included in the proposed licence for the safeguards and non-proliferation SCA. Licence condition 12.1 requires CNL to implement and maintain a safeguards and non-proliferation program. Compliance verification criteria for this licence condition are included in the draft LCH.

3.14 Packaging and Transport

The packaging and transport SCA include programs that cover the safe packaging and transport of nuclear substances for the PHAI. The specific areas that comprise this SCA are not addressed individually in this document.

3.14.1 Trends

The following table indicates the overall rating trends for the Packaging and Transport SCA over the current licensing period:

TRENDS FOR PACKAGING AND TRANSPORT								
OVERALL COMPLIANCE RATINGS								
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
SA	SA	SA	SA	SA	SA	SA	SA	SA
Comments								
CNL has implemented and maintains a packaging and transport program. The satisfactory trend for this SCA applies to the licences issued under the PHAI over their respective licensing periods. The packaging and transport program has been maintained and improved over the licensing period. CNSC staff conclude that the packaging and transport program meets regulatory requirements. CNSC staff will continue to monitor this SCA through the conduct of regular compliance verification activities.								

3.14.2 Discussion

CNL has developed and implemented a packaging and transport program for the activities authorized in the licence to ensure compliance with the *Packaging and Transport of Nuclear Substances Regulations, 2015*, and the *Transportation of Dangerous Goods Regulations*. The program submitted in the application for packaging and transport SCA includes:

- Port Hope Area Initiative Transportation of Dangerous Goods Plan [50]

The *Packaging and Transport of Nuclear Substances Regulation, 2015* apply to the packaging and transport of nuclear substances, including the design, production, use, inspection, maintenance and repair of packages, and the preparation, consigning, handling, loading, carriage and unloading of packages.

CNL has appropriate training for personnel involved in the handling, offering for transport and transport of dangerous goods, and is required to issue a training certificate to those workers in accordance with *Transportation of Dangerous Goods Regulations*.

For the PHP, all contaminated material excavated from the remediation sites will be transported to the LTWMF on prescribed routes as shown in figure 6. These prescribed routes are not a requirement of the regulations. Rather, they were established in consultation with residents of Port Hope, to have the least amount of impact on residential roads due to truck traffic resulting from the project.

Figure 6: Prescribed Transportation Roads

CNSC staff conclude that CNL's PHAI packaging and transport program meets the requirements of the *Packaging and Transport of Nuclear Substance Regulations* and *TDG Regulations, 2015* and *Transportation of Dangerous Goods Regulations*.

3.14.3 Summary

A summary of the licensee's past performance, challenges and proposed improvements are presented in the following subsections.

3.14.3.1 Past Performance

During the review period, CNSC staff conducted compliance inspections that covered various aspects of the PHAI transport and packaging program. In March 2019, CNSC staff conducted a focused transportation and packaging inspection that involved the transportation of soils from remediated sites to the PHP LTWMF. CNSC staff reviewed procedures, workers' training records, transportation logs, package labelling and shipping documents. The inspection resulted in 2 enforcement actions, one related to the information contained on the transport document and the other related to the use of American dangerous goods placards. Both enforcement actions were of low safety significance and were addressed by CNL to CNSC staff's satisfaction. CNSC staff concluded that the transport and packaging program and associated procedures comply with regulatory requirements.

During the licence term there were three (3) minor packaging and transport incidents, one in 2017 and two in 2022, involving incorrect labelling and improperly classified material. These incidents were reported by CNL in accordance with the regulatory requirements. None of the incidents resulted in health or radiological effects or releases to the environment. CNSC staff were satisfied with the corrective actions taken by CNL in all cases.

3.14.3.2 Regulatory Focus

CNSC staff will continue to monitor CNL's performance in this SCA through regulatory oversight activities, including onsite inspections and desktop reviews of relevant program documentation.

3.14.3.3 Proposed Improvements

CNSC staff have not noted any improvements needed for the packaging and transport SCA.

3.14.4 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to implement and maintain a packaging and transport program in accordance with regulatory requirements. CNSC staff have determined that CNL's packaging and transport program is adequate to support the activities authorized in the licence.

3.14.5 Recommendation

In previous PHAI licences, under licensed activities, CNL was authorized to package and transport radioactive material. Based on the materials and activities taking place at the PHAI, there is no need to specifically authorize these activities as this is covered under the *Packaging and Transport of Nuclear Substances Regulations 2015*. Therefore, CNSC staff recommend that the licensed activities of package and transport be removed from the licence.

One standardized licence condition is included in the proposed licence for the packaging and transport SCA. Licence condition 13.1 requires CNL to implement and maintain a packaging and transport program. Compliance verification criteria for this licence condition are included in the draft LCH.

4. INDIGENOUS AND PUBLIC CONSULTATION AND ENGAGEMENT

4.1 Indigenous Consultation and Engagement

The common-law duty to consult with Indigenous Nations and communities applies when the Crown contemplates actions that may adversely affect potential or established Indigenous and/or treaty rights. The CNSC ensures that all of its licence decisions under the *Nuclear Safety and Control Act* uphold the honour of the Crown and consider Indigenous peoples' potential or established Indigenous and/or treaty rights pursuant to section 35 of the *Constitution Act, 1982*.

4.1.1 Discussion

CNSC staff have identified the Indigenous Nations and communities who may have an interest in the renewal of the PHP licence. These Indigenous Nations and communities include:

- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Chippewas of Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation
- Mohawks of the Bay of Quinte
- Métis Nation of Ontario

These Indigenous Nations and communities were identified due to the proximity of their communities, treaty areas and/or traditional territories to the PHP, or due to previously expressed interest in being kept informed of CNSC licensed activities occurring in or proximal to their territories and/or areas of interest.

CNSC Staff Consultation and Engagement Activities

In March 2022, CNSC staff sent letters of notification to the list of Indigenous Nations and communities. The letters provide information regarding the proposed licence renewal and amendment application, the availability of participant funding to facilitate participation in the licence renewal process, and details on how to participate in the Commission's public hearing process proposed for November 2022.

CNSC staff conducted follow-up phone calls and emails with the identified Indigenous Nations and communities in March 2022 and April 2022 to ensure they had received the letters of notification and to answer any questions about the regulatory process, how to get involved in the Commission proceeding, as well as on the availability of participant funding through the CNSC's Participant Funding Program (PFP).

All the identified Indigenous Nations and communities have been encouraged to participate in the regulatory review process and in the public hearing to advise the Commission directly of any concerns they may have in relation to this licence renewal and amendment application. CNSC staff remain open to meeting with Indigenous Nations and communities to discuss this licence renewal and amendment application and to encourage and maintain productive and respectful relationships throughout the licensing term.

In addition, the CNSC has a Terms of Reference with Curve Lake First Nation, the Mississaugas of Scugog Island First Nation and Métis Nation of Ontario for long-term engagement and have and will continue to discuss the PHP licence renewal and amendment as part of our regular scheduled meetings.

During engagement sessions, the CNSC has heard the topics of interest and concern regarding the long-term management of contaminated soils and ecological compensation. CNSC staff are committed to continuing to address any concerns that are raised and to provide information pertaining to the PHP licence renewal and amendment. Follow-up activities will be conducted with Indigenous Nations and communities who express any remaining concerns following the Commission hearing, where necessary.

CNSC staff are committed to ongoing engagement and collaboration with interested Indigenous Nations and communities and will continue to provide opportunities for meaningful long-term engagement over the proposed licensing term.

CNL Engagement Activities

CNSC CNSC's REGDOC-3.2.2, *Indigenous Engagement*, sets out requirements and guidance for licensees whose application may raise the Crown's duty to consult. While the CNSC cannot delegate its obligation, it can delegate procedural aspects of the consultation process to licensees, where appropriate. The information collected and measures proposed by licensees to avoid, mitigate, or offset adverse impacts from the proposed licence renewal, may be used by CNSC staff in helping to meet its consultation obligations.

Based on the information received in the proponent's application, this licence renewal with amendments could be of concern or direct interest to Indigenous Nations and communities. CNSC staff determined that CNSC's REGDOC-3.2.2 would apply to this licence renewal. In accordance with CNSC's REGDOC-3.2.2, CNL prepared an Indigenous Engagement Report [51], which includes a list of Indigenous Nations and communities identified for engagement, a summary of any Indigenous engagement activities conducted to date, and a description of planned Indigenous engagement activities. Progress against this plan was and continues to be monitored by CNSC staff through regularly scheduled meetings and information updates from CNL.

CNL's Indigenous engagement activities included site tours, direct notifications, presentations / meetings, offers of contribution agreements and/or relationship agreements, involvement in the archaeology program, project newsletters and online communications. CNL has committed to continuing to refine the approach to their engagement based on the interests and needs to the Indigenous communities.

Previously, CNL included Indigenous Nations and communities as a target audience in CNLs PHAI Phase 2 Public Information Program. In 2022, CNL will implement a PHAI Indigenous Communications and Engagement Program, that will be guided by CNSC's REGDOC-3.2.2 and REGDOC-3.2.1. CNL is developing the program in consultation with Indigenous Nations and communities, and it will be implemented in tandem with the PHAI Public Information Program.

CNL has committed to maintaining and refining the Indigenous Communications and Engagement Program throughout the life of the PHAI.

CNL has indicated that topics of interest and concerns brought up to date include environmental protection and monitoring, the cleanup criteria amendment, economic opportunity, and heritage resource protection. To date, CNSC staff have not been made aware of any concerns regarding potential new impacts on Indigenous and/or treaty rights specific to the licence renewal and amendment expressed by Indigenous Nations and communities through CNL's engagement activities.

4.1.2 Conclusion

The CNSC ensures that all of its licensing decisions under the *Nuclear Safety and Control Act* uphold the honour of the Crown and reflect the broader interests of Indigenous peoples who exercise Indigenous and/or treaty rights in proximity to CNSC-regulated activities or facilities. Based on the information reviewed to date, CNSC staff conclude that the proposed licence renewal and amendment for the PHP is unlikely to cause any new impacts on Indigenous and/or treaty rights.

CNSC staff conducted engagement activities with the identified Indigenous Nations and communities to encourage their participation in the regulatory process and to ensure their concerns are heard and addressed by CNSC staff and the Commission in a meaningful way. CNSC staff are committed to ongoing consultation and engagement with the identified Indigenous Nations and communities and work to address any concerns they may have with regards to the licence renewal and amendment application and hearing process.

To date, CNL has met the requirements set out in CNSC's REGDOC-3.2.2 pertaining to Indigenous engagement. CNSC staff are satisfied with CNL's approach to Indigenous engagement, which is in accordance with the requirements and guidance of CNSC's REGDOC-3.2.2. CNL has engaged with the identified Indigenous Nations and communities and is working towards addressing questions or concerns as appropriate. CNSC staff are pleased to see that CNL is developing a PHAI Indigenous Communications and Engagement Program and encourage CNL to continue working with the identified Indigenous Nations and communities throughout the proposed licensing term to ensure that they continue to build relationships, provide regular updates on their activities, and address concerns on an ongoing basis.

4.2 Public Consultation and Engagement

The following sections summarize the public engagement activities conducted by CNL and CNSC staff specific to this licence renewal application. Indigenous engagement activities by CNL and CNSC staff are detailed in section 4.1 of this CMD.

4.2.1 Discussion

The main objectives of the CNSC's public engagement activities with respect to the PHAI are to:

- Disseminate objective scientific, technical, and regulatory information to the public, Indigenous Nations and communities and other stakeholders.
- Demonstrate CNSC's commitment to protecting the health, safety, security, and the environment.
- Identify and engage with people and organizations potentially affected by or interested in the PHAI so they understand and have confidence in the regulatory review process and CNSC's role in the licensing renewals.
- Foster two-way lines of communications with the public, Indigenous Nations and communities and other stakeholders to encourage participation in the CNSC regulatory review process and public hearing for the PHAI.

As per its normal public notification process for Commission proceedings, CNSC staff informed the public via the CNSC's website, email subscription list and social media channels of the public Commission hearing and availability of participant funding.

In advance of this licence renewal, CNSC staff did a mail drop containing information related to the licence renewal, attended in-person engagement activities, such as the Port Hope Fall Fair (figure 7) and meetings with the Municipality of Port Hope. Generally, the participants from these in-person engagement activities appreciated having one-on-one time with CNSC staff. Current information on the PHAI is available on the CNSC website.

Figure 7: CNSC attending Port Hope Fall Fair 2019

CNSC staff annually report to the Commission and the public on the regulatory oversight of all CNL licenced facilities and sites, including the PHAI. All RORs are available on the CNSC's website. The public can review, question and comment on the ROR and appear before the Commission. Through CNSC's PFP, financial support was made available for participation in the review of the RORs.

Overall, CNSC staff's public engagement activities have focused on the objectives of providing information on relevant project activities, the licensing process, and the role of the CNSC as Canada's nuclear regulator.

CNL's application included details of its public engagement strategy and plans with stakeholders and the public [52]. The engagement plan was implemented in alignment with the PHAI Public Information Program and CNL's corporate-wide Public Information Program, and follows the guidance provided in CNSC's REGDOC 3.2.1-*Public Information and Disclosure*.

The specific objectives of CNL's public engagement strategy were to:

- Proactively and transparently share information with stakeholders and the public on CNL's application to renew the Port Hope WNSL and consolidate the Port Hope and Port Granby WNSLs, the effect the renewal for a 10-year term will have on the PHAI timeline, schedule, and budget, and on how to participate in the licence renewal process.
- Provide opportunities for stakeholders and the public to discuss with CNL and give feedback on the licence renewal, amendment application and other related topics.

Feedback received from stakeholder and the public engagement was used to further refine project planning and project messaging. An open two-way dialogue loop was maintained throughout the engagement process.

4.2.2 Conclusion

Based on CNSC staff's assessment, CNSC staff conclude that CNL made reasonable efforts to keep targeted audiences, including the public and other stakeholders, informed about the PHAI and address project-specific issues and concerns raised. CNSC staff recommend that CNL engage stakeholders prior to any future licensing amendments related to changes to the clean-up criteria.

4.3 Participant Funding Program

The CNSC made funding available through its Participant Funding Program (PFP) to assist Indigenous Nations and communities, members of the public, and stakeholders in participating in the regulatory process for licence renewal and amendment for the PHP and to provide value-added information to the Commission through informed and topic-specific interventions. This funding was offered to review CNL's licence application and associated documents and to prepare for, and participate in, the Commission's public hearing.

4.3.1 Discussion

The Funding Review Committee (FRC) reviewed the applications received and made recommendations on the allocation of funding to eligible recipients. Based on the recommendations from the FRC, the CNSC awarded a total of $36,320.00, in funding to the following recipients:

- Curve Lake First Nation
- Anna Tilman
- Mississaugas of Scugog Island First Nation

In accordance with rule 17 of the *Canadian Nuclear Safety Commission Rules of Procedure*, a Notice of Public Hearing has been issued and posted on the CNSC website inviting written comments and requests for appearances before the commission. CNSC staff also communicated information about the regulatory process for the licence renewal and amendment of the PHP to the public, stakeholders and Indigenous Nations and communities through various methods including feature articles, mail out flyers, graphics on the CNSC website, meetings, and social media accounts.

4.3.2 Conclusion

CNSC staff encourage the public and Indigenous Nations and communities to participate in the Commission's public hearing. The PFP was offered to assist interested members of the public, Indigenous Nations and communities, and other stakeholders to prepare for and participate in the Commission's public hearing.

5. OTHER MATTERS OF REGULATORY INTEREST

5.1 Cost Recovery

The PHAI project is exempted from the CNSC's *Cost Recovery Fees Regulations* under section 2(e).

5.2 Financial Guarantees

Subsection 24(5) of the *Nuclear Safety and Control Act*, provides that a licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission. Section 3(1)(l) of the *General Nuclear Safety and Control Regulations* stipulates that, "an application for a licence shall contain a description of any proposed financial guarantee related to the activity for which a licence application is submitted." CNSC's REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, covers the provision of financial guarantees for decommissioning activities.

5.2.1 Discussion

AECL is a Schedule III, Part 1 Crown Corporation under the *Financial Administration Act* and an agent of Her Majesty in Right of Canada. As an agent of Her Majesty in Right of Canada, AECL's liabilities are ultimately liabilities of Her Majesty in Right of Canada. While the restructuring of AECL (the GoCo) has seen the oversight of the PHAI transferred to a private-sector contractor, the Canadian National Energy Alliance, AECL retains ownership of the lands, assets and liabilities associated with CNL's licences.

These liabilities have been officially recognized by the Federal Minister of Natural Resources in a letter dated July 31, 2015 [53]. This letter states that AECL will retain ownership of the lands, assets and liabilities associated with CNL's licences, including the CRL site, and states that the liabilities of AECL are the liabilities of Her Majesty in Right of Canada. CNL confirmed that the provisions in the 2015 letter remain valid on August 25, 2020 [54].

CNSC's REGDOC-3.3.1 states that an expressed commitment from a federal or provincial government is an acceptable form of financial guarantee.

5.2.2 Conclusion

CNSC staff conclude that the financial guarantee is sufficient for the decommissioning of the PHAI including the supporting infrastructure, should it be accepted by the Commission.

5.2.3 Recommendation

To align with the standardization of licence conditions, CNSC staff recommended one general licence condition (G.3) requiring CNL to implement and maintain a financial guarantee for decommissioning that is acceptable to the Commission. Compliance verification criteria for this licence condition are included in the draft LCH.

5.3 Licensee Public Information Program

CNL has committed to maintain a Public Information and Disclosure Program (PIDP) for the PHAI in alignment with CNSC's REGDOC-3.2.1, *Public Information and Disclosure*. CNSC's REGDOC-3.2.1 is not applicable to the licence types for the PHAI; however, CNL continues to meet the requirements. The program submitted in the application for PIDP included:

- Port Hope Area Initiative Public Information and Disclosure Program [55]

The primary goal of the PIDP is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities and activities are effectively communicated to the public and Indigenous Nations and communities. The program includes a commitment to, and protocol for, ongoing, timely communication of information related to the licensed facility during the course of the licence period.

5.3.1 Discussion

CNSC staff have assessed and inspected CNL's PIDP program as recently as September 2019. CNSC staff determined that the PIDP:

- identifies clear goals and objectives in terms of dissemination of information to multiple target audiences such as local residents, elected and government representatives, media, business leaders, youth, interest groups, and community organizations;
- recognizes the importance of actively providing updates and briefings to Indigenous Nations and communities;
- is available to the public and posted on CNL's website.

5.3.2 Conclusion

CNSC staff conclude that CNL continues to implement and maintain an effective PIDP for the PHAI that meets the requirements of CNSC's REGDOC-3.2.1.

5.3.3 Recommendation

One standardized licence condition is included in the proposed licence for the PIDP. Licence condition G.4 requires CNL to implement and maintain a PIDP. Compliance verification criteria for this licence condition are included in the draft LCH.

5.4 Nuclear Liability Insurance

The *Nuclear Liability and Compensation Act* (NLCA) establishes a compensation and liability regime in the unlikely event of a nuclear accident resulting in civil injury and damages. This new law entered into force on January 1, 2017 and replaced the *Nuclear Liability Act* (NLA), legislation which dated back to the early 1970s.

The licensed activities associated with the PHAI are not subject to the liability and financial security requirements of the NLCA.

5.5 Additional "Other Matter" Port Hope Project Waste Water Treatment Plant Liquid Effluent Release Limits

As part of the renewal application, CNL has requested the effluent release limits in table 1 of its application be integrated into the PHP licensing basis. Effluent release limits for the PGP WWTP were proposed by CNSC staff in CMD 19-H101 and approved by the Commission on April 5, 2019.

5.5.1 Discussion

The PHP WWTP was built to treat impacted water generated from the remediation activities taking place in Port Hope and for the treatment of ground water and leachate generated from the PHP LTWMF site. The WWTP will continue treating groundwater and leachate at the PHP LTWMF site following the closure of the LTWMF for the foreseeable future. The same CNSC regulatory documents, standards and methodologies used to establish the PGP WWTP effluent release limits were used for the PHP WWTP.

On July 31, 2018, CNL proposed liquid effluent release limits to CNSC staff following the full commissioning of the WWTP. The proposed limits included an assessment of potential exposure-based and technology-based release limits [56] The proposed release limits followed the requirements in draft CNSC's REGDOC-2.9.2, *Controlling Releases to the Environment*. The approach used to establish the proposed release limits encompassed the following steps:

a. identify the final effluent release points where the release limits will apply
b. identify the contaminants and/or physical stressors which will require release limits
c. identify and harmonize the release limits, where appropriate, with existing federal, provincial/territorial, and municipal requirements
d. calculate release limits using:
   - an exposure-based approach to identify maximum releases for the protection of human health and the environment from unreasonable risk
   - a technology-based approach to identify maximum possible releases during normal operation based on the approved facility design
e. justification for final selection of release limits

The proposed release limits apply to the final point of discharge which consists of a diffuser in Lake Ontario with a mixing zone of 1 in 10 dilutions. Imposing release limits at the final point of discharge is consistent with national and international practices.

Contaminants and/or physical stressors requiring release limits were identified during the development of design objectives for the PHP WWTP, whereby the projected maximum effluent concentrations were compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life, in order to protect the nearest receptor from the aquatic exposure pathway. In the absence of a CCME guideline, the Ontario Provincial Water Quality Objectives (PWQO) and *Metal and Diamond Mining Effluent Regulations* was used.

During the development of the design objectives total boron was identified as a contaminate requiring a release limit. Subsequently, influent, and effluent data collected from April 2017 to July 2018 showed significantly lower levels than anticipated from the design criteria and exposure-based limits. As a result, boron was screened out of requiring a release limit as even without treatment, the aquatic environment is protected from boron.

Proposed release limits for radium-226, total suspended solids, and pH are set at limits outlined in the federal Metal and Diamond Mining Effluent Regulations, which have been demonstrated to be achievable in industrial sectors. For uranium, a technology-based release limit has been proposed based on the optimization screening objective as outlined in the Annual Reports on Uranium Management Activities [58, 59, 60].

Limits for contaminants of potential concern were calculated using both an exposure-based and technology-based approach where no established limit existed in Canada. Technology-based release limits are proposed on both the monthly mean concentration and the concentration in a weekly composite sample. In all cases, the technology-based release limit was more conservative than the exposure-based release limit when a mixing zone of 1 in 10 dilution is assumed. The 1 in 10 dilution was determined to be appropriate for use in the calculation of the release limits at the Port Hope site based on the results of a CORMIX® modelling assessment conducted for the Port Granby Diffuser. The model demonstrated that that the release limits would result in a receiving environment concentration below the CCME aquatic life criterion for each of the contaminants within approximately 2 to 6 m of the diffuser located in Lake Ontario.

In line with section 16 of the *Metal and Diamond Mining Effluent Regulations*, CNSC staff concluded that toxicity testing be performed on a quarterly frequency. Should a quarterly sample be found toxic, CNL would no longer meet the criteria for quarterly testing, and thus would be required to increase to a monthly testing frequency. This approach is consistent with the *Metal and Diamond Mining Effluent Regulations.*

The CNSC maintains a collaborative working relationship with ECCC through a formal memorandum of understanding (MOU). CNSC staff consulted with ECCC during the finalization of the Port Hope release limits in order to ensure that the release limits were established based on the principles of ALARA, BATEA, pollution prevention and are protective of the environment. CNSC staff were able to demonstrate to ECCC that the receiving environment quality respected the guidance provided by the CCME on the site-specific application of the water quality guidelines in Canada. table 18 below contains the proposed effluent release limits for the PHP WWTP.

Table 18: Proposed Release Limits at the PHP WWTP

Contaminant	Units	Weekly Concentration in a Composite Sample	Monthly Mean Concentration
Radium-226	Bq/L	0.74	0.37
Total Arsenic (As)	mg/L	0.30	0.15
Total Aluminum (Al)	mg/L	0.22	0.11
Total Copper (Cu)	mg/L	0.03	0.015
Total Lead (Pb)	mg/L	0.046	0.023
Total Uranium (U)	mg/L	0.30	0.15
Total Zinc (Zn)	mg/L	0.42	0.21
pH	pH	6.0 – 9.0	6.0 – 9.0
Total Suspended Solids	mg/L	30	15
Acute Toxicity	-	-	Cannot be toxic[1]

[1] Acute toxicity testing is to be performed at a frequency no less than quarterly.
Previous release limits are compared in tables 12 and 13, section 3.9.3.1.

5.5.2 Conclusion

CNSC staff have reviewed the effluent results submitted quarterly by CNL and conclude that the releases from the PHP WWTP were below design objectives, and thus have not had an adverse effect on the environment or public health. Liquid effluent discharges from the PHP WWTP have remained below the proposed licence limits since it was commissioned in 2017. CNSC staff have analyzed effluent samples independently from the PHP WWTP at the CNSC laboratory and have verified that contaminant concentrations are consistent with CNL's reported values.

5.5.3 Recommendation

CNSC staff recommend the proposed liquid effluent release limits for the PHP WWTP as summarized be authorized by the Commission for inclusion into the licensing basis. These limits will be captured in CNL Port Hope Biophysical Monitoring Plan [24] and require Commission approval if an increase to theses proposed limits are required in the future.

5.6 Clean-up Criteria

The clean-up criteria for the PHP and PGP are specific to soil and were established in consultation with public stakeholders, the Municipalities of Port Hope and Clarington, and provincial and federal authorities. The contaminants of potential concern (COPC) in soil are all natural elements but occur at relatively high concentrations and are associated with the former Eldorado operations. Based on a review of the extensive data available, the EA concluded that the chemical signature of Eldorado waste in soil invariably includes elevated concentrations of arsenic, uranium, radium-226 (^{226}Ra), and thorium-230 (^{230}Th) above the identified background levels.

The clean-up criteria for residential and municipal properties in Port Hope are aligned with the 2011 Ontario provincial standards for clean-up of contaminated soil adopted from the MECP generic standards per O. Reg. 153/04 (as amended in 2011). Applying the MECP generic standards for the clean-up of residential and municipal properties in Port Hope eliminates any potential regulatory restrictions for using the remediated sites in the future and addresses the public concerns for not applying the more restrictive provincial standards.

The clean-up criteria for the Welcome Waste Management Facility and Highland Drive Landfill in Port Hope and the PGP were developed following protocols, guidance and regulatory practice set by the CNSC, the Ontario MECP, and ECCC. The joint regulatory assessment determined that the criteria for these sites are protective of the environment and public.

5.6.1 Discussion

The development of clean-up criteria for the PHP and PGP includes radioactive and non-radioactive COPC's. The COPCs are categorized as primary and secondary COPC's, based on their potential to contribute to ecological and human health effects. The primary COPCs collectively account for the majority of the potential hazard and secondary COPCs contribute minimally to the potential hazard.

The clean-up criteria used for the PHP and PGP are included in their respective Environmental and Biophysical Monitoring Plans [24, 25].

CNL has developed operating procedures that describe the requirements, responsibilities, and processes to plan and perform remediation activities at the various sites in Port Hope and Port Granby. These procedures are used to ensure the clean-up criteria are met. The procedures submitted as part of the licence renewal application for remediation verification included:

- Port Hope Project Small-Scale Site Remedial Process [29]
- Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure – Harbour [36]
- Operating Procedure – Port Hope Project Remediation Verification Standard Operating Procedure - Soil on Remediated Site [60]

- Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure - Contaminated Surfaces and Objects [61]
- Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure – Radon [62]
- Port Hope Project Remediation Verification Standard Operating Procedure - Soil for Sites Without Remediation [63]
- PHAI Port Granby Remediation Verification Procedure [64]
- Arsenic/Coal Ash Decision Matrix for Identification of Historic LLRW in Port Hope Soils [65]

To address unique situations where the Port Hope clean-up criteria cannot be met, CNL developed a protocol to provide an appropriate process for the identification and application of property-specific clean-up approaches, referred to as "Special Circumstances". The protocol was developed in consultation with CNSC staff and the Municipality of Port Hope. The protocol for Special Circumstances submitted as part of the licence renewal application included:

- Operating Procedure - Port Hope Area Initiative Special Circumstances Protocol- Port Hope Project [66]

The processes and procedures used by CNL for ensuring the clean-up criteria for the PHP and PGP were assessed by CNSC staff and found to be acceptable. CNSC staff conclude that CNL's processes and procedures are adequate for ensuring the clean-up criteria are met.

CNSC staff have performed several oversight activities at sites being remediated. As part of those compliance activities, inspectors have taken soil samples from remediated properties to confirm that the clean-up criteria were met. There were no inspection findings resulting from these inspections. Soil sample results from the CNSC laboratory align with CNL's results and indicate that CNL's processes and procedures are effective for ensuring the clean-up criteria is being met.

5.6.2 Conclusion

Based on oversight activities, CNSC staff conclude that CNL continues to meet the established clean-up criteria at the PHP and PGP. CNSC staff have determined that CNL's processes and procedures are adequate for ensuring the clean-up criteria are met.

5.6.3 Recommendation

One standardized licence condition is included in the proposed licence for the remedial clean-up criteria. Licence condition 14.1 requires CNL to conduct remedial work in accordance with the project developed cleanup criteria. Compliance verification criteria for this licence condition are included in the draft LCH.

5.7 Delegation of Authority

The Commission may include in a licence any condition it considers necessary for the purposes of the *Nuclear Safety and Control Act*. The Commission may delegate authority to CNSC staff with respect to the administration of licence conditions, or portions thereof.

Licence condition 3.1 states, "*The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission*". For this licence condition, CNSC staff recommend the Commission delegate its authority to the following staff:

- Director, Canadian Nuclear Laboratories Regulatory Program Division
- Director General, Directorate of Nuclear Cycles and Facilities Regulation
- Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch.

6. OVERALL CONCLUSIONS AND RECOMMENDATIONS

CNSC staff's conclusions and recommendations consider an overall assessment of CNL's compliance with the *Nuclear Safety and Control Act* and its regulations during the current licence period (2012-2021). CNL has programs, resources, and measures in place to ensure the health and safety of persons and the environment and of the measures related to security and Canada's international obligations during the proposed licence period.

CNSC staff have assessed and concluded the following with respect to paragraphs 24(4)(a) and (b) of the *Nuclear Safety and Control Act*, in that CNL:

1. is qualified to carry on the activity authorized by the licence; and
2. will, in carrying out that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Overall Recommendations

1. Renew the WNSL licence to authorize CNL to continue its authorized activities at the PHP from January 1, 2023 to December 31, 2032
2. authorize the consolidation of the 4 CNL licences issued for the remediation activities associated with the PHAI
3. approve the proposed licence change to remove the authorization to process, package and transport radioactive material as outlined in section 3.14 and summarized in Part Two of this CMD
4. approve the proposed liquid effluent release limits for the PHP WWTP as summarized in section 5.5 of this CMD
5. issue the proposed WNSL for the PHAI, WNSL-W1-2310.00/2032
6. authorize the delegation of authority as set out in subsection 5.7 of this CMD

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GLOSSARY

For definitions of terms used in this document, see *REGDOC-3.6, Glossary of CNSC Terminology*, which includes terms and definitions used in the *Nuclear Safety and Control Act* and the Regulations made under it, and in CNSC regulatory documents and other publications.

Additional terms and acronyms used in this CMD are listed below.

ACRONYMS

Acronym	Definition
AECL	Atomic Energy of Canada Limited
ALARA	As Low As Reasonably Achievable
BATEA	Best Available Technology Economically Achievable
BDAT	Best Demonstrated Available Technology
CCME	Canadian Council of Ministers of the Environment
CMD	Commission Member Document
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminate of Potential Concern
CRFR	*Cost Recovery Fees Regulations*
CSA	Canadian Standards Association
DDDR	Detailed Design Description Report
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EIR	Event Initial Report
EMP	Environmental Monitoring Program
EMS	Environmental Management System
EPR	Environmental Protection Review
ERA	Environmental Risk Assessment
FRC	Funding Review Committee
Go-Co	Government Owned – Contractor Operated
IAEA	International Atomic Energy Agency
IEMP	Independent Environmental Monitoring Program
LCH	Licence Conditions Handbook
LLA	Long-lived Alpha
LLRW	Low-level Radioactive Waste
LTWMF	Long-Term Waste Management Facility
MECP	Ministry of Environment Conservation and Parks
NEW	Nuclear Energy Worker
NPT	Treaty of the Non-Proliferation of Nuclear Weapons

Acronym	Definition
NSCA	Nuclear Safety and Control Act
OPH	Ontario Public Health
PFP	Participant Funding Program
PGP	Port Granby Project
PHAI	Port Hope Area Initiative
PHP	Port Hope Project
PHRWMF	Port Hope Radioactive Waste Management Facility
PIDP	Public Information and Disclosure Program
PIP	Periodic Inspection Program
PWQO	Provincial Water Quality Objective
REGDOC	Regulatory Document
RLTI	Recordable Lost-time Injury
ROR	Regulatory Oversite Report
RP	Radiation Protection
PSETSS	Pine Street Extension Temporary Storage Site
SAT	Systematic Approach to Training
SCA	Safety and Control Area
TDG	Transportation of Dangerous Goods
TSS	Total Suspended Solid
WNSL	Waste Nuclear Substance Licence
WTB	Water Treatment Building
WWTP	Waste Water Treatment Plant

A. RISK RANKING

The CNSC uses a risk-informed regulatory approach in the management and control of regulated facilities and activities. CNSC staff have therefore established an approach to identifying appropriate levels of regulatory monitoring and control for specific classes of licensed facilities and types of licensed activities based on risk ranking.

Risk ranking is applied to each SCA and is determined by considering the probability and consequence of adverse incidents associated with each SCA as it relates to the given facility and activity types.

The methodology used to determine risk ranking is based on Canadian Standards Association guideline CAN/CSA-Q850, Risk Management: Guideline for Decision Makers. This guideline provides a description of the major components of the risk management decision process and their relationship to each other, and describes a process for acquiring, analyzing, evaluating, and communicating information that is necessary for making decisions.

In section 2.2 of the CMD, in the Relevant Safety Control Areas table, the "Risk Ranking" column shows a high (H), moderate (M) or low (L) indicator for each SCA that is relevant to the current facility and activities being addressed in this CMD. The risk rankings are not static and will change over time for a given facility and activities (e.g., facilities age, facilities and equipment are upgraded, activities cease or begin, licensees change, technology and programs mature, knowledge and understanding of impacts and probabilities increase, etc.).

The following matrix provides a high-level overview of risk ranking, and the management and monitoring approach associated with the various degrees of risk.

APPROACH TO ASSESSING AND MANAGING POTENTIAL RISK			
CONSEQUENCE	**MANAGEMENT/MONITORING APPROACH**		
Significant Impact	Considerable management of risk is required	Must manage and monitor risk with occasional control	Extensive management is essential. Constant monitoring and control
Moderate Impact	Occasional monitoring	Management effort is recommended	Management effort and control is required
Low Impact	Random monitoring	Regular monitoring	Manage and monitor
Probability of Occurrence	Unlikely to Occur	Might Occur	Expected to Occur

RISK RANKING SCALE					
L	Low Risk	**M**	Moderate Risk	**H**	High Risk

On this basis, a high-risk SCA would be subject to increased regulatory scrutiny and control while a low-risk SCA would generally require minor verification and control.

B. SAFETY PERFORMANCE RATING LEVELS

Satisfactory (SA)

Licensee meets all of the following criteria:

- Performance meets CNSC staff expectations
- Licensee non-compliances or performance issues, if any, are not risk-significant
- Any non-compliances or performance issues have been, or are being, adequately corrected

Below Expectations (BE)

One or more of the following criteria apply:

- Performance does not meet CNSC staff expectations
- Licensee has risk-significant non-compliance(s) or performance issue(s)
- Non-compliances or performance issues are not being adequately corrected

Unacceptable (UA)

One or both of the following criteria apply:

- Risk associated with a non-compliance or performance issue is unreasonable
- At least one significant non-compliance or performance issue exists with no associated corrective action

C. BASIS FOR THE RECOMMENDATION(S)

C.1 Regulatory Basis

The recommendations presented in this CMD are based on compliance objectives and expectations associated with the relevant SCAs and other matters. The regulatory basis for the matters that are relevant to this CMD are as follows.

Management System

The *General Nuclear Safety and Control Regulations* requires that an application for a licence shall contain, under paragraph:

- 3(1)(*k*), the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority.

It is a requirement of the *General Nuclear Safety and Control Regulations* under section 15 that every applicant for a licence and every licensee shall notify the Commission of:

- 15(*a*), the persons who have the authority to act for them (the applicant/licensee) in their dealings with the Commission.
- 15(*b*), the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence.
- 15(c), any change in the information referred to in paragraphs (a) and (b) within 15 days after the change occurs.

Human Performance Management

The regulatory foundation for the recommendation(s) associated with human performance management includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under section 12, that every licensee shall:

- 12(1)(*a*), ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence.
- 12(1)(*b*), train the workers to carry on the licensed activity in accordance with the Act, the regulations made under the Act and the licence.
- 12(1)(*e*), require that every person at the site of the licensed activity to use equipment, devices, clothing and procedures in accordance with the Act, the regulations made under the Act and the licence.

Operating Performance

The regulatory foundation for the recommendation(s) associated with operating performance includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 29(1), that every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:

- 29(1)(a), a situation referred to in paragraph 27(b) of the Act.
- 29(1)(b), the occurrence of an event that is likely to result in the exposure of persons to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations*.
- 29(1)(c) a release, not authorized by the licence, of a quantity of radioactive nuclear substance into the environment.
- 29(1)(d), a situation or event that requires the implementation of a contingency plan in accordance with the licence.
- 29(1)(f), information that reveals the incipient failure, abnormal degradation or weakening of any component or system at the site of the licensed activity, the failure of which could have a serious adverse effect on the environment or constitutes or is likely to constitute or contribute to a serious risk to the health and safety of persons or the maintenance of security.
- 29(1)(h), a serious illness or injury incurred or possibly incurred as a result of the licensed activity.
- 29(1)(i) the death of any person at a nuclear facility

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 29(2), that every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:

- 29(2)(a), the date, time and location of becoming aware of the situation.
- 29(2)(b), a description of the situation and the circumstances.
- 29(2)(c), the probable cause of the situation.
- 29(2)(d), the effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation.
- 29(2)(e), the effective dose and equivalent dose of radiation received by any person as a result of the situation
- 29(2)(f), the actions that the licensee has taken or proposes to take with respect to the situation.

Physical Design

The regulatory foundation for the recommendation(s) associated with physical design includes the following:

Paragraph 3(1)(*d*) of the *General Nuclear Safety and Control Regulations* requires that an application for a licence shall contain a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence.

Radiation Protection

The regulatory foundation for the recommendation(s) associated with radiation protection includes the following:

The *General Nuclear Safety and Control Regulations* require, under subsection 3(1), that a licence application contain the following information under paragraphs:

- 3(1)(*e*), the proposed measures to ensure compliance with the *Radiation Protection Regulations*.
- 3(1)(*f*), any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations*.

The *General Nuclear Safety and Control Regulations* require, under subsection 17(b), that a worker comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment.

Conventional Health and Safety

The regulatory foundation for the recommendation(s) associated with conventional health and safety includes the following:

The *General Nuclear Safety and Control Regulations* require, under paragraph 12(1)(c), that every licensee shall take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances.

The *General Nuclear Safety and Control Regulations* require, under subsection 16(1), that every licensee shall make available to all workers the health and safety information with respect to their workplace that has been collected by the licensee in accordance with the Act, the regulations made under the Act and the licence.

It is a requirement of the *General Nuclear Safety and Control Regulations* under section 17, that every worker shall:

- 17(a), use equipment, devices, facilities and clothing for protecting the environment or the health and safety of persons, or for determining doses of radiation, dose rates or concentrations of radioactive nuclear substances, in a responsible and reasonable manner and in accordance with the Act, the regulations made under the Act and the licence.

- 17(b), comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment.
- 17(c)(i), promptly inform the licensee or the worker's supervisor of any situation in which the worker believes there may be a significant increase in the risk to the environment or the health and safety of persons.
- 17(e), take all reasonable precautions to ensure the worker's own safety, the safety of the other persons at the site of the licensed activity, the protection of the environment, the protection of the public and the maintenance of the security of nuclear facilities and of nuclear substances.

The CNL's activities and operations must comply with the Canada Labour Code, *Part II: Occupational Health and Safety*.

Environmental Protection

The regulatory foundation for the recommendation(s) associated with environmental protection includes the following:

The *General Nuclear Safety and Control Regulations*, under paragraphs 12(1)(c) and (f), require that each licensee take all reasonable precautions to protect the environment and the health and safety of persons, and to control the release of radioactive nuclear substances and hazardous substances within the site of the licensed activity and into the environment.

- The *Radiation Protection Regulations* prescribe dose limits for the general public, which under subsection 1(3) is 1 mSv per calendar year.

It is a requirement of the *General Nuclear Safety and Control Regulations* under section 17, that every worker shall:

- 17(a), use equipment, devices, facilities and clothing for protecting the environment or the health and safety of persons, or for determining doses of radiation, dose rates or concentrations of radioactive nuclear substances, in a responsible and reasonable manner and in accordance with the Act, the regulations made under the Act and the licence.
- 17(b), comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment.
- 17(c)(i), promptly inform the licensee or the worker's supervisor of any situation in which the worker believes there may be a significant increase in the risk to the environment or the health and safety of persons.
- 17(e), take all reasonable precautions to ensure the worker's own safety, the safety of the other persons at the site of the licensed activity, the protection of the environment, the protection of the public and the maintenance of the security of nuclear facilities and of nuclear substances.

Emergency Management and Fire Protection

The regulatory foundation for the recommendation(s) associated with emergency management and response includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 12(1) that every licensee shall:

- 12(1)(c), take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security of nuclear facilities and of nuclear substances.
- 12(1)(f), take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment of the licensed activity.

Waste Management

The regulatory foundation for the recommendation(s) associated with waste management includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under paragraph 3(1)(j) that an application for a licence include the name, quantity, form and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed, or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste.

Security

The regulatory foundation for the recommendation(s) associated with security includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 3(1), that an application for a licence shall contain the following information:

- 3(1)(g), the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information.
- 3(1)(h), the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information.

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 12(1), that every licensee shall:

- 12(1)(g), implement measures for alerting the licensee to the illegal use or removal of a nuclear substance, prescribed equipment or prescribed information, or the illegal use of a nuclear facility.
- 12(1)(h), implement measures for alerting the licensee to acts of sabotage or attempted sabotage anywhere at the site of the licensed activity.

It is a requirement of the *General Nuclear Safety and Control Regulations* under section 17, that every worker shall:

- 17(c), promptly inform the licensee or the worker's supervisor of any situation in which the worker believes there may be:
  - 17(c)(ii), a threat to the maintenance of the security of nuclear facilities and of nuclear substances or an incident with respect to such security.
  - 17(c)(iv), an act of sabotage, theft, loss or illegal use or possession of a nuclear substance, prescribed equipment or prescribed information.

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 29(1), that every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:

- 29(1)(f), information that reveals the incipient failure, abnormal degradation or weakening of any component or system at the site of the licensed activity, the failure of which could have a serious adverse effect on the environment or constitutes or is likely to constitute or contribute to a serious risk to the health and safety of persons or the maintenance of security.
- 29(1)(g), an actual, threatened or planned work disruption by workers.

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 29(2), that every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:

- 29(2)(d), the effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation.

Safeguards and Non-Proliferation

The regulatory foundation for the recommendation(s) associated with safeguards and non-proliferation includes the following:

It is a requirement of the *General Nuclear Safety and Control Regulations* under paragraph 12(1)(i) that each licensee take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement.

Under subsection 21(1) of the *General Nuclear Safety and Control Regulations*, information that concerns any of the following, including a record of that information, is prescribed information for the purposes of the Act:

- 21(1)(a), a nuclear substance that is required for the design, production, use, operation or maintenance of a nuclear weapon or nuclear explosive device, including the properties of the nuclear substance.
- 21(1)(b), the design, production, use, operation or maintenance of a nuclear weapon or nuclear explosive device.

- 21(1)(c), the security arrangements, security equipment, security systems and security procedures established by a licensee in accordance with the Act, the regulations made under the Act or the licence, and any incident relating to security.
- 21(1)(d), the route or schedule for the transport of Category I, II or III nuclear material, as defined in section 1 of the *Nuclear Security Regulations.*

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 30(1), that every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the situation and of any action that the licensee has taken or proposes to take with respect to it:

- 30(1)(a), interference with or an interruption in the operation of safeguards equipment or the alteration, defacement, or breakage of a safeguards seal, other than in accordance with the safeguards agreement, the Act, the regulations made under the Act or the licence.
- 30(1)(b), the theft, loss or sabotage of safeguards equipment or samples collected for the purpose of a safeguards inspection, damage to such equipment or samples, or the illegal use, possession, operation or removal of such equipment or samples.

It is a requirement of the *General Nuclear Safety and Control Regulations* under subsection 30(2), that every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:

- 30(2)(a), the date, time, and location of becoming aware of the situation.
- 30(2)(b), a description of the situation and the circumstances.
- 30(2)(c), the probable cause of the situation.
- 30(2)(d), the adverse effects on the environment, the health and safety of persons and the maintenance of national and international security that have resulted or may result from the situation.

The Agreement between the Government of Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the *Treaty on the Non-Proliferation of Nuclear Weapons*.

The Protocol Additional to the Agreement between Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the *Treaty on the Non-Proliferation of Nuclear Weapons*.

Packaging and Transport

CNL is required to comply with the *Packaging and Transport of Nuclear Substances Regulations 2015* and Transport Canada's *Transportation of Dangerous Goods Regulations*.

Financial Guarantee

The regulatory foundation for the recommendation(s) associated with the PHAI Decommissioning Strategy and Financial Guarantees includes:

The *General Nuclear Safety and Control Regulations* requires under paragraph 3(1)(l) that a licence application contains a description of any proposed financial guarantee relating to the activity to be licensed.

C.2 Technical Basis

The technical basis for recommendations, including several guidance documents, national standards and regulatory documents has been presented in this CMD and is addressed in detail in the LCH.

D. SAFETY AND CONTROL AREA FRAMEWORK

D.1 Safety and Control Areas Defined

The safety and control areas identified in section 2.2 and discussed in summary in sections 3.1 through 3.14 are comprised of specific areas of regulatory interest which vary between facility types.

The following table provides a high-level definition of each SCA. The specific areas within each SCA are to be identified by the CMD preparation team in the respective areas within section 3 of this CMD

SAFETY AND CONTROL AREA FRAMEWORK		
Functional Area	**Safety and Control Area**	**Definition**
Management	Management System	Covers the framework which establishes the processes and programs required to ensure an organization achieves its safety objectives and continuously monitors its performance against these objectives and fostering a healthy safety culture.
	Human Performance Management	Covers activities that enable effective human performance through the development and implementation of processes that ensure a sufficient number of licensee personnel are in relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.
	Operating Performance	This includes an overall review of the conduct of the licensed activities and the activities that enable effective performance.
Facility and Equipment	Safety Analysis	Maintenance of the safety analysis that supports that overall safety case for the facility. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.
	Physical Design	Relates to activities that impact on the ability of systems, components and structures to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

SAFETY AND CONTROL AREA FRAMEWORK		
Functional Area	**Safety and Control Area**	**Definition**
	Fitness for Service	Covers activities that impact on the physical condition of systems, components and structures to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.
Core Control Processes	Radiation Protection	Covers the implementation of a radiation protection program in accordance with the *Radiation Protection Regulations*. This program must ensure that contamination and radiation doses received are monitored and controlled and maintained ALARA.
	Conventional Health and Safety	Covers the implementation of a program to manage workplace safety hazards and to protect workers.
	Environmental Protection	Covers programs that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.
	Emergency Management and Fire Protection	Covers emergency plans and emergency preparedness programs which exist for emergencies and for non-routine conditions. This also includes any results of exercise participation.
	Waste Management	Covers internal waste-related programs which form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. Also covers the planning for decommissioning.
	Security	Covers the programs required to implement and support the security requirements stipulated in the regulations, in their licence, in orders, or in expectations for their facility or activity.

SAFETY AND CONTROL AREA FRAMEWORK		
Functional Area	**Safety and Control Area**	**Definition**
	Safeguards and Non-Proliferation	Covers the programs and activities required for the successful implementation of the obligations arising from the Canada/IAEA safeguards agreements as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons*.
	Packaging and Transport	Programs that cover the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility.

D.2 Specific Areas for this Facility Type

The following table identifies the specific areas that comprise each SCA for the PHAI:

SPECIFIC AREAS FOR THIS FACILITY TYPE		
Functional Area	**Safety and Control Area**	**Specific Areas**
Management	Management System	▪ Management System ▪ Organization ▪ Performance Assessment, Improvement and Management Review ▪ Change Management ▪ Safety Culture ▪ Records Management ▪ Management of Contractors
	Human Performance Management	▪ Personnel Training
	Operating Performance	▪ Not addressed individually
Facility and Equipment	Physical Design	▪ Design Governance ▪ Site Characterization ▪ Structure Design ▪ System Design
	Fitness for Service	▪ Not addressed individually
Core Control Processes	Radiation Protection	▪ Application of ALARA ▪ Worker Dose Control ▪ Radiation Protection Program Performance ▪ Radiological Hazard Control
	Conventional Health and Safety	▪ Performance ▪ Practices ▪ Awareness
	Environmental Protection	▪ Effluent and Emissions Control (releases) ▪ Assessment and Monitoring ▪ Protection of People ▪ Estimated Dose to the Public

SPECIFIC AREAS FOR THIS FACILITY TYPE		
Functional Area	**Safety and Control Area**	**Specific Areas**
	Emergency Management and Fire Protection	▪ Conventional Emergency Preparedness and Response ▪ Fire Emergency Preparedness and Response
	Waste Management	▪ Waste Management Practices ▪ Decommissioning Plans
	Security	▪ Not addressed individually
	Safeguards and Non-Proliferation	▪ Not addressed individually
	Packaging and Transport	▪ Not addressed individually

E. SUPPORTING DETAILS

E.1 PHAI Performance Ratings for Past Years

Safety and Control Area	Rating								
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Management System	SA	SA	SA	SA	SA	SA	SA	SA	SA
Human Performance Management	SA	SA	SA	SA	SA	SA	SA	SA	SA
Operating Performance	SA	SA	SA	SA	SA	SA	SA	SA	SA
Safety Analysis	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Physical Design	SA	SA	SA	SA	SA	SA	SA	SA	SA
Fitness for Service	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Radiation Protection	SA	SA	SA	SA	SA	SA	SA	SA	SA
Conventional Health and Safety	SA	SA	SA	SA	SA	SA	SA	SA	SA
Environmental Protection	SA	SA	SA	SA	SA	SA	SA	SA	SA
Emergency Management and Fire Protection	SA	SA	SA	SA	SA	SA	SA	SA	SA
Waste Management	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Security	SA	SA	SA	SA	SA	SA	SA	SA	SA
Safeguards and Non-Proliferation	N/A	N/A	N/A	N/A	N/A	SA	SA	SA	SA
Packaging and Transport	SA	SA	SA	SA	SA	SA	SA	SA	SA

F. PHAI EPR REPORT

e-Doc 6777684 (PDF)

Canada's Nuclear Regulator

Environmental Protection Review Report:
Port Hope Area Initiative

August 2022

e-Doc: 6670091 (Word)
e-Doc: 6777684(PDF)

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

Canada

Environmental Protection Review Report: Port Hope Area Initiative

Également publié en français sous le titre : Rapport d'examen de la protection de l'environnement : Rapport d'examen de la protection de l'environnement : Initiative dans la région de Port Hope

Document availability
This document can be viewed on the CNSC website, in both English and French. To request a copy of the document in English or French, please contact:

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Revision history

The following table identifies the revision history of this document.

Revision number	Change	Summary of changes	Date
000	Initial release	N/A	August 2022
001			

Executive summary

The Canadian Nuclear Safety Commission (CNSC) conducts environmental protection reviews (EPRs) for all nuclear facilities with potential project–environmental interactions, in accordance with its mandate under the *Nuclear Safety and Control Act* (NSCA) to ensure the protection of the environment and the health of persons. An EPR is a science-based environmental technical assessment conducted by CNSC staff. The fulfillment of other aspects of the CNSC's mandate, such as regulating safety and security, is met through other oversight activities.

This EPR report was written by CNSC staff as a standalone document describing the scientific and evidence-based findings from CNSC staff's review of Canadian Nuclear Laboratories' (CNL's) environmental protection measures for the Port Hope Area Initiative (PHAI) located in the municipalities of Port Hope and Clarington, Ontario. Under its multiple current licences comprising the PHAI, CNL is permitted to perform cleanup activities of historic low-level radioactive waste contamination and place it in long-term waste management facilities located in Clarington and Port Hope. These licences are:

- the waste nuclear substance licence WNSL-W1-2310.02/2022, for the Port Hope Long-Term Low-Level Radioactive Waste Management Project
- the waste nuclear substance licence WNSL-W1-2311.00/2022, for the Port Granby Long-Term Low-Level Radioactive Waste Management Project
- the waste nuclear substance licence WNSL-W1-182.0/2022, for the Pine Street Extension Temporary Storage Site
- the waste nuclear substance licence WNSL-W1-344-1.8/ind., for the Port Hope Radioactive Waste Management Facility

The PHAI also lies within the traditional territory of the Wendat, Anishinabek Nation, and the territory covered by the Williams Treaties with Michi Saagiig and Chippewa Nations. CNSC staff's EPR report focuses on items that are of Indigenous, public and regulatory interest, such as potential environmental releases from normal operations, as well as risk of radiological and hazardous (non-radiological) substances to the receiving environment.

This report includes CNSC staff's assessment of documents submitted by the licensee from 2012 to 2021, such as, but not limited to, the following:

- regulatory oversight activities
- the results of CNL's environmental monitoring, as reported in annual compliance monitoring reports
- Independent Environmental Monitoring Program (IEMP) results
- health studies with relevance to the PHAI sites
- the results from other environmental monitoring programs in proximity to the PHAI sites

Based on their assessment and evaluation of CNL's documentation and data, CNSC staff found that the potential risks from radiological and hazardous releases to the atmospheric, terrestrial, aquatic and human environments are negligible and tend to be similar to natural background. Further, the potential risks to human health are not impacted by the PHAI activities and are

indistinguishable from health outcomes found in the general public. CNSC staff have also found that CNL continues to implement and maintain effective environmental protection measures to adequately protect the environment and the health of persons. CNSC staff will continue to verify CNL's environmental protection programs through ongoing licensing and compliance activities.

The information provided in this EPR report summarizes CNSC staff's findings that may inform and support staff recommendations to the Commission in future licensing and regulatory decisions. CNSC staff's findings do not represent the Commission's conclusions. The Commission's decision making will be informed by submissions from CNSC staff, the licensee, Indigenous Nations and communities, and the public, and through any interventions heard during public hearings on licensing matters.

For more information on CNL's PHAI, visit the CNSC's web page and CNL's web page. References used throughout this document are available upon request and requests can be sent to ea-ee@cnsc-ccsn.gc.ca.

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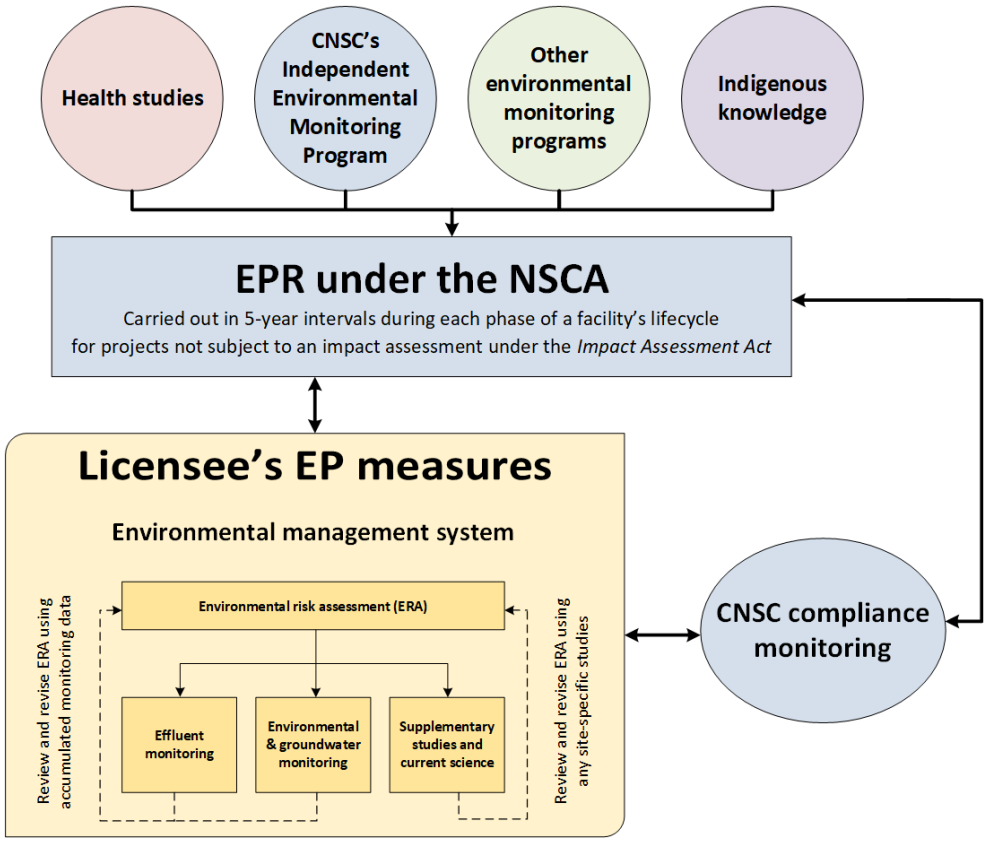
1.0 Introduction

1.1 Purpose

The Canadian Nuclear Safety Commission (CNSC) conducts environmental protection reviews (EPRs) for all nuclear facilities with potential interactions with the environment, in accordance with its mandate under the *Nuclear Safety and Control Act* (NSCA). CNSC staff assess the environmental and health effects of nuclear facilities and/or activities at every phase of a facility's lifecycle. As shown in figure 1.1, an EPR is a science-based environmental technical assessment conducted by CNSC staff to support the CNSC's mandate for the protection of the environment and human health as set out in the NSCA. As per the CNSC's Indigenous Knowledge Policy Framework the CNSC recognizes the importance of considering and including Indigenous knowledge in all aspects of the CNSC's regulatory processes, including in environmental protection assessments. CNSC staff are committed to working directly with Indigenous Nations and communities and knowledge holders on integrating their knowledge, values, land use information and perspectives in the CNSC's EPRs where appropriate and when shared with the licensee and CNSC. The fulfillment of other aspects of the CNSC's mandate, such as safety and security, are met through other regulatory oversight activities and are outside the scope of this report. Each EPR is typically conducted every 5 years and is informed by the outcomes of the licensee's environmental protection (EP) program and documentation submitted by that licensee, as per regulatory reporting requirements.

Figure 1.1: EPR framework



The purpose of this EPR report is to report the outcome of CNSC staff's assessment of Canadian Nuclear Laboratories' (CNL's) EP and environmental compliance activities for the Port Hope Area Initiative (PHAI). This review serves to assess whether CNL's environmental protection measures for the PHAI adequately protect the environment and health of persons.

No decision is made on the EPR itself. CNSC staff's findings may inform and support recommendations to the Commission in future licensing and regulatory decision making, as well as inform CNSC staff's future compliance and verification activities. CNSC staff's findings do not represent the Commission's conclusion. The Commission's conclusions and decisions are informed by information submitted by CNSC staff, the licensee, Indigenous Nations and communities, and the public, and through any interventions heard during public hearings on licensing matters. The information in this EPR report is also intended to inform Indigenous peoples, members of the public and interested stakeholders.

EPR reports are posted online for information and transparency to allow interested Indigenous peoples and members of the public additional time to review EP-related information ahead of any licensing hearings or Commission decisions.

This EPR report is based on information submitted by CNL, compliance and technical assessment activities completed by CNSC staff from 2012 to 2021, and the following:

- regulatory oversight activities (section 2.0)
- the results of CNL's environmental monitoring, as reported in annual compliance monitoring reports for Port Hope [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]and Port Granby [11] [12] [13] [14] [15] [16] [17] [18] [19] [20]
- Independent Environmental Monitoring Program (IEMP) results (section 4.0)
- health studies with relevance to the PHAI (section 5.0)
- other environmental monitoring programs in proximity to the PHAI sites (section 6.0)

This EPR report focuses on topics related to the environmental performance of the facility, including liquid (effluent) releases to the environment, the potential transfer of contaminants of potential concern (COPCs) through key environmental pathways and associated potential exposures and/or effects on valued components (VCs), including human and non-human biota. VCs refer to environmental biophysical or human features that may be impacted by a project. The value of a component relates not only to its role in the ecosystem, but also to the value people place on it (e.g., it may have scientific, social, cultural, economic, historical, archaeological or aesthetic importance). The focus of this EPR report is on radiological and hazardous substances associated with activities undertaken at the PHAI sites, with additional information provided on other topics of Indigenous, public and/or regulatory interest. CNSC staff also present information on relevant regional environmental or health monitoring, including studies conducted by the CNSC (e.g., IEMP) or other governmental organizations. These topics were selected based on those that have historically been of interest to Indigenous peoples, members of the public and the Commission.

1.2 Facility overview

This section of the report provides general information on the CNL's site, including a description of the site location and a basic history of site activities and licensing. This information is intended to provide context for later sections of this report, which discuss completed and ongoing environmental and regulatory oversight activities.

1.2.1 Site description

The PHAI is a remediation project with sites located within the traditional territory of the Wendat, Anishinabek Nation, and the territory covered by the Williams Treaties with Michi Saagiig and Chippewa Nations and on the north shore of Lake Ontario in the municipalities of Port Hope and Clarington, Ontario. As the licensee, CNL responsible for carrying out the day-to-day activities on behalf of the Atomic Energy of Canada Limited (AECL), while AECL retains ownership of the lands, assets and liabilities associated with CNL's licences. Figures 1.2 and 1.3 provide detailed aerial views of the 2 main areas for the project, the Port Hope and Port Granby long-term waste management facility (WMF) sites. The surrounding area consists of predominantly urban residential properties and farmland.

Figure 1.2: Aerial view of the Port Hope long-term waste management facility [21]

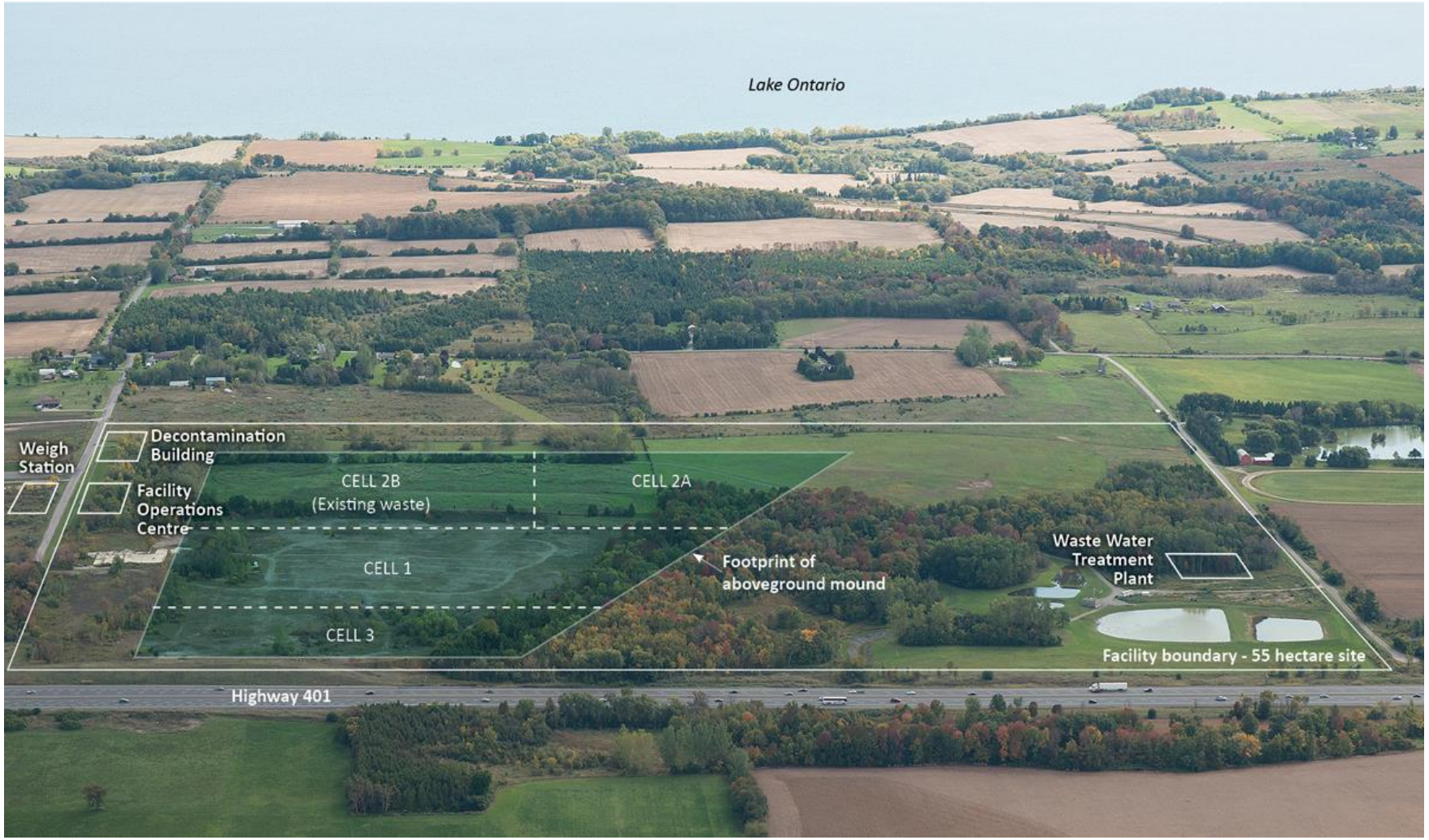


Figure 1.3: Aerial view of the Port Granby long-term waste management facility [22]

1.2.2 Site history and operations

Port Hope hosted a radium refining facility from 1933 to the 1950's. This facility was owned by a former federal crown corporation known as Eldorado Nuclear Limited. In the 1940's the operation shifted to uranium refining – this activity is still in operation today at the CNSC-licensed Port Hope Conversion Facility, operated by Cameco Corporation. Waste from Eldorado's operations were placed in the Welcome Waste Management Facility, which was eventually closed in 1955, and other locations throughout the urban area. Waste management operations then shifted to Port Granby Residue Area in the mid-1950s [23]. Originally, waste placed in the Welcome WMF consisted of iron and carbonate residues with trace amounts of other metals such as uranium, radium, arsenic, cobalt, copper, nickel, and zinc, and low-grade ore that was rejected from processing. Today the wastes are largely soil type materials that contain elevated levels of uranium, arsenic and radium [24].

In 2001, a legal agreement between the now municipalities of Port Hope and Clarington and the Government of Canada set out the framework for the PHAI and the launch of two environmental assessments (EA) for the clean-up and long-term management of historic low-level radioactive waste (LLRW) identified at major, industrial and small-scale sites within Port Hope and the Port Granby Residue Area. Additional information about the EAs for the two projects is provided in section 2.1.

The PHAI is being carried out as two projects – the Port Hope Project (PHP) and the Port Granby Project (PGP). Each project has three phases, and both are currently in the same phase 2:

1. Pre-Construction Phase – Monitoring intended to supplement or confirm the baseline information used to conduct the EA studies.
2. Construction and Development Phase – Monitoring intended for verification of predicted environmental effects and the effectiveness of mitigation measures during project activities.
3. Maintenance and Monitoring Phase – Monitoring intended to verify that the environmental effects are as predicted by the EA and that the long-term waste management facility (LTWMF) is operating as expected. The duration of this phase will be several hundred years.

Port Hope Project

PHP consists of remediating historic low-level radioactive waste at multiple sites in Port Hope and transporting the waste to a new LTWMF, see figure 1.3.

Locations for cleanup range from major sites such as the Highland Drive Landfill and the Port Hope Harbour to smaller scale sites like residential properties. There are also 2 separate licences that are captured under the PHP, the Pine Street Extension, a temporary storage location for contaminated material, and the Port Hope Radioactive WMF. More information on the sites under the PHP can be found here [25].

The PHP LTWMF involves the design and construction of an engineered aboveground mound to isolate the waste by encasing it in multiple layers of natural and specially manufactured materials. These layers are designed to prevent contaminants from entering the environment. The proposed design and location were approved by the CNSC as part of the EA in January 2007. The LTWMF consists of 4 cells that have been constructed in phases. CNL completed the construction of Cell 1 in 2016 and completed the construction of Cell 3, 2A and 2B in December 2021. The initial receipt of wastes began in 2017 following the construction of Cell 1. Following the remediation activities in the Port Hope area, CNL will construct the capping system to encapsulate the waste from the environment. Following the capping of the LTWMF, CNL will begin its Phase 3 activities which involve long term maintenance and monitoring.

The LTWMF also includes a waste water treatment plant (WWTP) to treat surface water and groundwater during waste placement in the engineered mound and groundwater and contaminated water from within the mound after it is capped and closed. The two-stage treatment process consists of chemical precipitation and clarification followed by reverse osmosis. The reverse osmosis system removes salts, heavy metals and contaminants such as radium and arsenic by forcing the water under high pressure through a membrane where the contaminants are filtered out. Excess acid in the treated water is removed through filters and the pH level is adjusted before the final treated effluent is discharged into Lake Ontario [26].

Port Granby Project

Similar to the PHP, the PGP involves relocating historic low-level radioactive waste from the former Port Granby WMF to a new PGP LTWMF which includes a WWTP and an engineered above-ground mound like the PHP, see figure 1.4. The proposed design and location were approved by the CNSC as part of the EA in August 2009. The PGP LTWMF consists of 2 cells which began receiving waste in 2016. By 2020, CNL completed the transfer of historic LLRW from the Port Granby WMF into the engineered above-ground LTWMF. In total 1,315,061 metric tonnes of LLRW were safely transported to the LTWMF since the remediation started.

The PGP WWTP operates a similar process as the PHP WWTP except phase one uses a bioreactor tank to treat ammonia nitrate, which is a contaminate specific to PGP [27]. Progress continues including final grading, erosion control measures, and the construction of the groundwater collection system at the Port Granby site. These activities are expected to be finalized in the fall of 2022 and then PGP will move into Phase 3, which entails long-term maintenance and monitoring of the site and operation of the WWTP.

Additional information on effluent sampling and monitoring for the PHP and PGP WWTPs can be found in section 3.1.2.

2.0 Regulatory oversight

The CNSC regulates nuclear facilities and activities in Canada to protect the environment and the health and safety of persons in a manner that is consistent with applicable legislation and regulations, environmental policies and Canada's international obligations. The CNSC assesses the effects of nuclear facilities and activities on human health and the environment at every phase of a facility's lifecycle. This section of the EPR report discusses the CNSC's regulatory oversight of CNL's EP measures for the PHAI.

To meet the CNSC's regulatory requirements, and according to CNL's licensing basis for the PHAI, CNL is responsible for implementing and maintaining EP measures that identify, control and (where necessary) monitor releases of radiological and hazardous substances, and the effects on human health and the environment. These EP measures must comply with, or have implementation plans in place to comply with, the regulatory requirements found in CNL's licences and associated licence conditions handbooks (LCH). The relevant regulatory requirements for the PHAI are outlined in this section of the report.

2.1 Environmental protection reviews and assessments

When the PHAI was initiated in 2001, no federal EA was carried out, as there were no EA requirements stipulated in the federal legislation at the time. Since that time, 2 EAs were completed, for the Port Hope Long-Term Low-Level Radioactive Waste Management Project in 2007 and the Port Granby Long-Term Low-Level Radioactive Waste Management Project in 2009, as noted in table 2.1 below and described further in subsection 2.1.1. These EAs were conducted under the *Canadian Environmental Assessment Act, 1992* (CEAA 1992) [28], predecessor to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) [29]. In 2019, the *Impact Assessment Act of Canada* (IAA) [30] came into force replacing CEAA 2012. CNL's current activities do not require an impact assessment under the IAA's Physical Activities Regulations. The purpose of any one of these assessments is to identify the possible impacts of a proposed project or activity and to determine whether those effects can be adequately mitigated to protect the environment and the health and safety of persons.

An EPR under the NSCA has not previously been conducted for PHP or PGP, and as such, this report is the first developed for PHAI.

Table 2.1: Federal EAs completed for the PHAI

Project	Applicable EA process and/or legislation	EA start date	EA decision date
Port Hope Long-Term Low-Level Radioactive Waste Management Project	*Canadian Environmental Assessment Act* (1992)	November 21, 2001	January 24, 2007
Port Granby Long-Term Low-Level Radioactive Waste Management Project	*Canadian Environmental Assessment Act* (1992)	November 21, 2001	August 19, 2009

2.1.1 Previous EAs completed under CEAA 1992

The PHAI is a community-based program for the development and implementation of a safe, local long-term management solution for historic low-level radioactive wastes in the Port Hope area, Ontario. The Government of Canada enacted a legal agreement with the municipalities of Port Hope and Clarington in March 29, 2001, to support the PHAI. Natural Resources Canada designated AECL as the proponent of the PHAI. In November 2001, AECL applied to the CNSC to seek approval for 2 long-term low-level radioactive waste management projects (LTWMFs) as part of the PHAI.

Port Hope Long-Term Low-Level Radioactive Waste Management Project in Port Hope, Ontario

The PHP EA consisted of the remediation of sites containing LLRW, marginally contaminated soils (MCS) and specified industrial wastes in the Municipality of Port Hope, and the management of wastes in a local LTWMF.

CNSC staff reviewed the application and determined that pursuant to section 5 and 7 of CEAA 1992 [28], a screening EA of this project was required in order for the project to proceed. In addition, an EA screening report was required pursuant to subsection 18(1) of CEAA 1992. The project was also subject to permits and approvals under the NSCA [31] to possess, manage and store a waste nuclear substance. An EA screening report [32] was prepared in accordance with the requirements of CEAA 1992.

Following the Commission's consideration of the EA screening report in 2006, public concerns expressed about the project, and CNSC staff recommendations, the Commission rendered its decision on the EA [33]. In its decision, the Commission stated that, taking into account implementation of mitigation measures identified in the EA screening report, the project was not likely to cause significant adverse environmental effects and that the Commission would proceed to consider the application for a licence amendment under the provisions of the NSCA [31].

It was determined that a follow-up program to verify the accuracy of the EA, and/or determine the effectiveness of any measures taken to mitigate the adverse environmental effects, was required for this project, and this follow-up program was added as a condition of the licence granted by the CNSC [33].

Port Granby Long-Term Low-Level Radioactive Waste Management Project in Clarington, Ontario

The PGP EA assessed the remediation of sites containing LLRW and MCS in the Municipality of Clarington and associated with the existing licensed Port Granby WMF. The waste from remediation efforts would be transferred to the LTWMF.

CNSC staff reviewed the application and determined that pursuant to section 5 and 7 of CEAA 1992 [28], a screening EA of this project was required in order for the project to proceed. In addition, an EA screening report was required pursuant to subsection 18(1) of CEAA 1992. The project was also subject to permits and approvals under the NSCA [31] to possess, manage and store a waste nuclear substance. An EA screening report was prepared in accordance with the requirements of CEAA 1992 [34].

Following the Commission's consideration of the EA screening report in 2009, public concerns expressed about the project, and CNSC staff recommendations, the Commission rendered its decision on the EA [35]. In its decision, the Commission stated that, taking into account implementation of mitigation measures identified in the EA screening report, the project was not likely to cause significant adverse environmental effects and that the Commission would proceed to consider the application for a licence amendment under the provisions of the NSCA [31].

It was determined that a follow-up program to verify the accuracy of the EA, and/or determine the effectiveness of any measures taken to mitigate the adverse environmental effects, was required for this project, and this follow-up program was added as a condition of the licence granted by the CNSC [36].

2.1.2 Current EA follow-up programs

EA follow-up programs are designed to validate the predicted environmental effects and the effectiveness of mitigation measures. The CNSC ensures that EA follow-up programs that are within the CNSC's mandate are incorporated into licensing and compliance activities.

Port Hope Long-Term Low-Level Radioactive Waste Management Project in Port Hope, Ontario

In 2009, to fulfill the requirements of the EA for the Port Hope LTWMF [33], AECL submitted an EA follow-up program to the CNSC [37]. Appendix A of this EPR report lists all activities included in the EA follow-up program.

CNL, on AECL's behalf, continues to inform the CNSC of the status and results of EA follow-up program activities through annual compliance reports ([1] – [9]). Some activities have met the established EA objectives and are therefore completed, while other activities are still ongoing (see appendix A). Many of the activities have been integrated into the Port Hope Environmental and Bio-physical Monitoring Plan [38] (see section 2.2) to be continued as CNL's routine monitoring. CNSC staff continue to review the detailed monitoring activities pertaining to the EA follow-up program to ensure that objectives are being met.

Port Granby Long-Term Low-Level Radioactive Waste Management Project in Port Hope, Ontario

In 2009, to fulfill the requirements of the EA for the PGP [36], AECL submitted an EA follow-up program to the CNSC [39]. This program integrated any active EA follow-up program activities identified in the 2007 EA. Appendix B of this EPR report lists all activities included in the EA follow-up program.

CNL, on AECL's behalf, continues to inform the CNSC of the status and results of EA follow-up program activities through annual compliance reports ([11] – [20]). Some activities have met the established EA objectives and are therefore completed, while other activities are still ongoing (see appendix B). Many of the activities have been integrated into the Port Granby's Environmental and Bio-physical Monitoring Plan [40] (see section 2.2) to be continued as CNL's routine monitoring. CNSC staff continue to review the detailed monitoring activities pertaining to the EA follow-up program to ensure that objectives are being met.

2.2 Environmental regulatory framework and protection measures

The CNSC has a comprehensive EP regulatory framework which includes both radiological and hazardous substances; physical stressors (such as noise); and the protection of people and of the environment. Public dose is considered under the EP framework, from a radiation protection standpoint. The focus of this section of the EPR report is on the EP regulatory framework and the status of CNL's environmental protection program (EPP) for the PHAI. The results derived from this EPP are detailed in section 3.0 of this report.

The EPP at CNL's PHAI sites was designed and implemented in accordance with the principles of REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (2014) [41], as well as the environmental protection standard of the CSA Group listed below. The EPP includes effluent release limits, action levels (ALs) and public dose modelling. CNL's PHP EPP meets the latest version of REGDOC 2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* (2020) [42] and the latest draft of the REGDOC-2.9.2 *Controlling Releases to the Environment* [43]. The implementation status for these items for the PHP is shown in table 2.2 and for PGP in table 2.2 below.

Table 2.2: Status of EP measures to implement regulatory documents and standards at PHP

Regulatory document or standard	Status
CNSC REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures, version 1.2* (2020) [42]	Implemented/ September 2020
CNSC REGDOC-2.9.2 Controlling Releases to the Environment (Under Development) [43]	Implemented/ March 2021

Table 2.3: Status of EP measures to implement regulatory documents and standards at the PGP

Regulatory document or standard	Status
CNSC REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures*, version 1.2 (2020) [42]	Implemented/ December 2021
CNSC REGDOC-2.9.2, *Controlling Releases to the Environment* (under development) [43]	Implemented/ December 2021
CSA N288.8-17, *Establishing and Implementing Action Levels to Control Releases to the Environment from Nuclear Facilities* [44]	Implemented/ December 2021

CNSC staff confirm that CNL has implemented programs according to the relevant EP regulatory documents or standards.

Licensees are also required to regularly report on the results of their EPPs. Reporting requirements are specified in REGDOC-3.1.3, Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices [45], the *Radiation Protection Regulations* [46] (e.g., for ALs or dose limit exceedances), the licensees' approved programs and manuals, or the LCHs [47] [48].

CNL is required to submit PGP and PHP annual compliance monitoring reports. These reports are reviewed by CNSC staff for compliance and verification, as well as trending. Summaries of CNL's PGP and PHP annual compliance monitoring reports are available via the PHAI's public documents page on its website [49].

CNSC staff regularly report on the licensee's performance to the Commission regarding activities conducted at the PHAI sites, including operational issues that could result in potential releases to the environment. Regulatory oversight reports (RORs) are a standard mechanism for updating Indigenous peoples, the public and the Commission on the operation and regulatory performance of licensed facilities. RORs are available on the CNSC website [50].

2.2.1 Environmental protection measures

To meet the CNSC's regulatory requirements under REGDOC-2.9.1 [42], CNL is responsible for implementing and maintaining EP measures that identify, control and monitor releases of radioactive and hazardous substances, and the effects on human health and the environment from the PHAI sites. EP measures are an important component of the overall requirement of licensees to make adequate provision to protect the environment and the health of persons.

This, and the following subsections, provide a summary of CNL's EPP for the PHP and PGP and the status of each specific EP measure, relative to the requirements or guidance outlined in the latest regulatory document or CSA Group standard. Section 3.0 of this EPR report summarizes the results of these programs or measures against relevant regulatory limits and environmental quality objectives or guidelines and, where applicable, discusses any interesting trends.

CNL is not required to implement an environmental management system that conforms to International Standards Organization Standard 14001:2015, *Environmental Management Systems* [51] for the PHP and PGP, as both sites are not Class I facilities according to the NSCA [31]. However, CNL has developed and implemented an EPP [52], which includes the following components in accordance with licence conditions [47] [48] (with corresponding subsections

discussed in this EPR report), to align with the requirements and guidance as outlined in REGDOC-2.9.1 [42]:

- Effluent and emissions control and monitoring
  - Effluent release limits
  - Liquid effluent monitoring
- Environmental monitoring program (EMP)
  - Ambient air monitoring
  - Soil monitoring
  - Surface water monitoring
  - Groundwater monitoring
  - Gamma monitoring

2.2.2 Environmental risk assessment

The environmental risk assessment (ERA) that a licensee conducts is a systematic process to identify, quantify and characterize the risk from contaminants and physical stressors in the environment to human and non-human (biological) receptors. As the PHP and PGP sites are not Class I nuclear facilities, CNL does not require an ERA according to the criteria of CSA N288.6-12 [53]. However, CNL performs EA follow-up monitoring to confirm that the environmental effects of the projects are consistent with the predictions of the EA, and to perform environmental monitoring as per conditions of the waste nuclear substance licences [54] [55] [56] [57].

2.2.3 Effluent and emissions control and monitoring

Controls on environmental releases are established to provide protection to the environment and to respect the principles of sustainable development and pollution prevention. The effluent and emissions prevention and control measures are established based on industry best practices, the application of optimization (e.g., in design) and as low as reasonably achievable principles, the Canadian Council of Ministers of the Environment (CCME) guidelines, and findings of the past EAs.

CNL's EPP [52] was reviewed and approved by CNSC staff and the EPP was revised in April 2022 [58]. It contains site-specific effluent operating limits and AL to control radiological and hazardous effluents and emissions. The effluent release limits are CNSC-licensed limits in place to ensure that the PHP and PGP continue to operate within their licensing basis. In addition, the PHP and PGP have established ALs to serve as an early warning of potential loss of control to prevent exceedances of the effluent release limits exceedances, in accordance with PHP licence condition 2.10 [47] and PGP licence condition 7.1 [48].

The PGP's effluent monitoring programs have been reviewed and approved by CNSC staff and are in compliance with REGDOC-2.9.1 [42] and the relevant standards. CNL will revise the PHP EPP accordingly during the upcoming licence period to address any changes in the PHP and PGP programs associated with the implementation of the most recent version of REGDOC-2.9.1 (2020) [42].

Based on compliance and technical assessment activities, CNSC staff have concluded that the effluent monitoring programs currently in place for the PGP and PHP continue to protect human health and the environment.

2.2.4 Environmental monitoring program

The CNSC requires licensees to design and implement an EMP that is specific to the monitoring and assessment requirements of the licensed facility and its surrounding environment. The program is required to:

- measure contaminants in the environmental media surrounding the facility or site
- determine the effects, if any, of the facility or site operations on people and the environment
- serve as a secondary support to emission monitoring programs to demonstrate the effectiveness of emission controls

More specifically, the program must gather the necessary environmental data to calculate public dose and demonstrate compliance with the public dose limit (1 millisievert (mSv) per year). The program design must also address the potential environmental interactions identified at the PHP and PGP sites. Radium-226, uranium and arsenic are the main contaminants of interest at the PHP and PGP, although other hazardous substances and radionuclides are included within monitoring activities associated with liquid discharges. CNL's EMP for the PHP and PGP consists of the following components:

- particulates in ambient air monitoring
- soil monitoring
- surface water monitoring
- groundwater monitoring
- gamma monitoring
- sediment monitoring
- noise monitoring

CNL submits the environmental and biophysical monitoring plans for the PHP and PGP sites. These plans provide details on the effluent and environmental monitoring activities for each project during the Pre-Construction, Construction and Development and post-construction (Maintenance and Monitoring) Phases. The most recent submission was in March 2018, which included all of the above monitoring requirements [38] [40] [59]. CNSC staff reviewed and accepted the revisions in 2018 and 2019 for the PHP and PGP, respectively. CNL submits environmental monitoring results to the CNSC through annual compliance reports for CNSC staff to review. If environmental effects from the projects are found to differ significantly from EA predictions, CNL must re-evaluate and adjust mitigation measures to ensure successful completion of the project without significant adverse effects on the environment.

CNL will be required to maintain its EMP to be in compliance with REGDOC-2.9.1 [42] and relevant standards.

Based on compliance activities and technical assessments, CNSC staff have determined that CNL is in compliance with REGDOC-2.9.1 and continues to implement and maintain an effective EMP for the PHP and PGP that adequately protects the environment and the health of persons.

3.0 Status of the environment

This section provides a summary of the status of the environment around the PHP and PGP. It starts with a description of the radiological and hazardous (non-radiological) releases to the environment (section 3.1), followed by a description of the environment surrounding the PHP and PGP and an assessment of any potential effects to the different components of the environment as a result of exposure to these contaminants (section 3.2).

It should be noted that CNSC staff regularly review the environmental components through annual reporting requirements and compliance verification activities, as detailed in other areas of this report. This information is reported to the Commission in the sections on environmental protection in licensing CMDs and annual RORs. The annual compliance reports submitted by CNL for the PHP and PGP ([1] - [20]) are made publicly available via the PHAI's public documents page on its website [49].

3.1 Releases to the environment

Radioactive and hazardous substances that have the potential to cause an adverse effect to ecological or human receptors are identified as COPCs. Once COPCs are emitted from a facility or licensed site, they are considered a release to the environment. The ways they get to the different receptors considered by the EA are called exposure pathways. Figure 3.1 below illustrates a conceptual model of the environment around a generic nuclear waste mangement facility to show the relationship between releases (airborne emissions or waterborne effluent) and human and ecological receptors or exposure pathways. This graphic is meant to provide an overall conceptual model of the releases, exposure pathways and receptors for the PHP and PGP, and thus should not be interpreted as a complete depiction of the PHP and PGP sites and their surrounding environments. The specific releases and COPCs associated with the PHP and PGP sites are explained in detail in the following subsections.

Figure 3.1. Conceptual model of the PHAI sites

3.1.1 Licensed release limits

The PHP and PGP have licensed release limits, to control effluent releases to the environment. CNSC staff requested that CNL establish exposure-based release limits (EBRLs) at identified release points for the PHP and PGP [60]. EBRLs result in a release limit that is based on the objective of ensuring that releases to the receiving environment stay below certain levels, or within endpoint parameters, to meet desired human health or environmental quality criteria in the areas of radiotoxicity, chemical toxicity, and protection of aquatic life. In general, liquid and air EBRLs are established for contaminants that require control as part of a screening level assessment. The lowest and limiting endpoint parameter is selected when calculating the EBRLs. The principle applied is the protection of human health and the most sensitive fresh-water aquatic receptors. When calculating the EBRLs, existing federal or provincial guidelines are also identified and used.

Under the NSCA, the operating licences for PHP and PGP include licence limits for radium-226, pH and total suspended solids (TSS), which CNSC staff have adopted from the *Metal and Diamond Mining Effluent Regulations* (MDMER) [61].

CNL submitted its proposed EBRLs in 2018 and 2020 for the PGP [62] and PHP [63] WWTPs, respectively. CNSC staff reviewed and approved the proposed EBRLs, which were submitted by CNL for PGP and PHP in 2018 [62] and 2020 [63], respectively. These EBRLs were harmonized with the MDMER [61] (where applicable, i.e. radium-226, pH and TSS) and with technology-based release limits that are protective of the environment.

3.1.2 Waterborne effluent

CNL controls and monitors liquid (waterborne) effluent from the PHP and PGP to the environment under its implementation of the EPP/EMP and includes monitoring of radiological and hazardous releases.

CNL monitors primary COPCs of uranium, radium-226 and pH, and secondary COPCs in effluent released from the PHP and PGP WWTPs. The effluent discharge is typically sampled on a flow-proportional basis with the use of automated samplers. Sample types and techniques are specified in accordance with methods and protocols approved by the Ontario Ministry of the Environment, Conservation and Parks (MECP). The PHP and PGP each have 1 discharge location in Lake Ontario. Treated effluent at each location is released using an outfall pipe and diffuser. The diffusers are designed to ensure a minimum 100-fold dilution at the point of entry into the lake under normal conditions.

Tables 3.1 to 3.4 summarize the concentrations of liquid effluent discharged to Lake Ontario for PHP and PGP, respectively, before dilution occurs at the end of the pipe, over a ten-year period from 2012 to 2021. In addition to licence limits, the PHP and PGP have established liquid effluent ALs, which are used to prevent exceedances of licence limits. Exceedances of these limits and ALs are reported to the CNSC, documented and investigated, and appropriate corrective action are taken where warranted.

Before 2017, there were limited release limits for both the PHP and PGP's water treatment plants (WTP). The design objectives and AL were developed by CNL for the new PHP WWTP in December 2017 [64], which were put in place for after CNSC staff reviewed and approved them in March 2018 [65], until the design objectives were turned into release limits in April 2020 [63].

The AL and release limits were put into place for the new PGP WWTP in August 2017 [66] and April 2018 [67], respectively. During heavy rainfall events in 2017, 2018, and 2019, CNL restarted the water treatment buildings to treat excess contaminated water, in accordance with CNL's water contingency plan, to avoid a release of untreated water to the environment. The water treatment buildings has not been used since 2020.

Table 3.1: PHP WTP annual treated liquid effluent releases from 2012 – 2016 [1]–[5]

COPC, Unit	Concentration	2012	2013	2014	2015	2016	Licence Limits (Monthly Mean)
Ra-226 (Bq/L)	**Annual Avg**	0.075	0.050	0.049	0.034	0.028	**0.37**
	MAX	0.105	0.078	0.066	0.049	0.081	
As (µg/L)	**Annual Avg**	17.0	12.0	7.6	7.7	13	**500**
	MAX	53.0	38.2	19.5	21.3	52	
pH	**Annual Avg**	7.51	7.51	7.6	7.71	7.64	**6-9**
	MIN / MAX	>7.07, <7.89	>6.91, <7.82	>7.33, <7.87	>6.97, <8.02	>7.19, <7.90	

Table 3.2: PHP WWTP annual treated liquid effluent releases from 2017–2021 [6]–[10]

COPC, Unit	Concentration	2017	2018	2019	2020	2021	2017 - 2020 Interim Limits (Monthly Mean)[1]	2021 to Present Licence Limits (Monthly Mean)[2]
Ra-226 (Bq/L)	**Annual Avg**	0.005	0.005	0.005	0.006	0.005	**0.37**	**0.37**
	MAX	0.005	0.005	0.005	0.008	0.005		
As (µg/L)	**Annual Avg**	1.9	10.6	1.2	1.4	11.7	**41**	**150**
	MAX	6.5	38.0	2.0	6.8	29.9		
pH	**Annual Avg**	7.39	7.68	7.81	7.58	7.59	**6 - 9**	**6 - 9**
	MIN / MAX	>7.08, <7.58	>7.12, <7.83	>7.56, <7.93	>7.28, <7.90	>7.36, <7.88		
Acute Toxicity	**Pass / Fail**	PASS	PASS	PASS	PASS	PASS	**Cannot be toxic**	
	MAX	N/A	N/A	N/A	N/A	N/A		
U (µg/L)	**Annual Avg**	0.7	4.6	1.2	1.4	1.5	**150**	**150**
	MAX	1.5	11.0	2.3	2.8	2.5		
TSS (mg/L)	**Annual Avg**	1	1	1	1	1	**15**	**15**
	MAX	1	1	1	1	2		
Al (µg/L)	**Annual Avg**	6.1	5.9	5.3	2.7	1.2	**660**	**110**
	MAX	13.0	8.0	6.0	5.4	2.0		
B (µg/L)	**Annual Avg**	20	30	34	N/A	N/A	**1820**	**-**
	MAX	26	53	47	N/A	N/A		
Cu (µg/L)	**Annual Avg**	1.0	1.0	1.1	1.4	1.3	**15**	**15**
	MAX	1.0	1.0	2.5	1.90	2.1		
Pb (µg/L)	**Annual Avg**	0.5	0.5	0.5	0.4	0.5	**22.8**	**23**
	MAX	0.5	0.5	0.5	0.6	0.7		
Zn (µg/L)	**Annual Avg**	5.0	5.0	5.0	2.9	1.4	**110**	**210**
	MAX	5.0	5.0	5.0	2.9	2.5		

[1] Interim Licence limits for PHP new WWTP, used since 2017 to April 2020
[2] Licence limits PHP new WWTP used since April 2020

Table 3.3: PGP WTP annual treated liquid effluent releases from 2012 – 2016 [11]–[15]

COPC, Unit	Concentration	2012	2013	2014	2015	2016	Licence Limits (Monthly Mean)
Ra-226 (Bq/L)	Annual Avg	0.058	0.057	0.072	0.172	0.005	0.37
	MAX	0.065	0.084	0.145	0.230	0.190	
pH	Annual Avg	7.68	7.80	7.74	7.87	7.70	6 - 9
	MIN / MAX	>7.49, <7.89	>7.22, <7.91	>7.65, <7.86	>7.60, <8.14	>7.56, <8.58	

Table 3.4: PGP WWTP annual treated liquid effluent releases from 2017 – 2021 [16]–[20]

COPC, Unit	Concentration	2017	2018	2019	2020	2021	2017 Interim Limits (Monthly Mean)[1]	2018 to Present Licence Limits (Monthly mean)[2]
Ra-226 (Bq/L)	Annual Avg	0.009	0.005	0.008	0.006	0.005	0.37	0.37
	MAX	0.051	0.008	0.038	0.008	0.005		
As (µg/L)	Annual Avg	4.1	12.3	9.3	6.8	8.7	41	100
	MAX	8.5	35.5	39.1	15.6	24		
pH	Annual Avg	7.45	7.46	7.68	7.64	7.49	6 – 9.5	6.0 – 9.5
	Min / MAX	>7.01, <7.57	>5.91, <7.85	>7.35, <7.94	>7.37, <7.98	>7.3, <7.74		
Acute Toxicity	Pass / Fail	PASS	PASS	PASS	PASS	PASS	Cannot be toxic	
	MAX	N/A	N/A	N/A	N/A	N/A		
U (µg/L)	Annual Avg	7.5	7.3	10.4	3.9	1.2	150	100
	MAX	15.5	17.5	55.8	8.8	2.7		
TSS (mg/L)	Annual Avg	1.0	1.0	1.0	1.5	1.1	15	15
	MAX	1	1.4	1	1.5	1.3		
Se (µg/L)	Annual Avg	2.0	2.0	2.0	2.0	0.04	10	30
	MAX	2.0	2.0	2.0	2.0	0.04		

Cu (µg/L)	**Annual Avg**	1.0	1.0	1.0	0.5	0.7	**24**	**15**
	MAX	1.2	1.2	1.2	1.1	2.1		
Mo (µg/L)	**Annual Avg**	1.73	N/A	N/A	N/A	N/A	**730**	**-**
	MAX	3.90	N/A	N/A	N/A	N/A		
Tl (µg/L)	**Annual Avg**	0.05	0.05	0.05	0.05	0.005	**8**	**8**
	MAX	0.07	0.06	0.05	0.01	0.005		
Cd (µg/L)	**Annual Avg**	0.10	0.10	0.10	0.10	0.01	**0.33**	**1**
	MAX	0.10	0.10	0.10	0.10	0.01		
V (µg/L)	**Annual Avg**	0.51	0.62	0.64	0.26	0.24	**42**	**40**
	MAX	0.57	1.06	1.55	0.40	0.90		
P (mg/L)	**Annual Avg**	0.02	0.02	0.02	0.01	0.02	**0.10**	**0.35**
	MAX	0.02	0.02	0.04	0.03	0.05		
Nitrite (mg/L)	**Annual Avg**	0.02	0.11	0.09	0.07	0.12	**0.6**	**1.5**
	MAX	0.02	0.26	0.25	0.16	0.30		
Nitrate (mg/L)	**Annual Avg**	3.30	2.94	1.58	0.44	0.10	**127.8**	**75**
	MAX	5.74	8.94	3.35	1.92	0.10		
Ammonia (mg/L)	**Annual Avg**	0.11	0.10	0.13	0.16	0.18	**2.9**	**5.75**
	MAX	0.60	0.27	0.34	0.73	0.30		
Co (µg/L)	**Annual Avg**	0.50	0.50	0.57	0.52	0.52	**9**	**5**
	MAX	0.50	0.55	1.24	1.30	2.30		

[1] Interim Licence limits for PGP NEW WWTP, used in 2017

[2] Licence limits for PGP NEW WWTP, used since 2018.

3.1.2.1 Findings

CNSC staff have found that CNL's reported liquid effluent discharged to Lake Ontario from the PHP and PGP remained below the CNSC's approved licence limits throughout the reported period (2012 to 2021).

CNSC staff are satisfied that CNL continues to provide adequate protection to the people and the environment from effluent it discharges to Lake Ontario from the PHP and PGP.

3.2 Environmental effects assessment

This section presents an overview of the assessment of predicted effects from licensed activities on the environment and the health of persons. CNL performs environmental effects monitoring to ensure that all reasonable precautions have been taken to protect the environment. This monitoring also determines if the effects on environmental aspects of the project are as predicted in the EA, confirms whether the mitigation measures implemented are effective, and determines if new mitigation strategies are required. In addition to environmental effects monitoring, CNL also performs performance/operational monitoring, to ensure integrity of the LTWMF, and compliance monitoring, to ensure compliance with licence requirements and regulations (e.g., effluent monitoring from the WWTP as described in section 3.1.2). This section of the report focuses on environmental effects monitoring between 2015 and 2020, inclusively. To inform this section of the report, CNSC staff reviewed CNL's EA predictions [68] [69] and environmental monitoring plans [38] [40] [59], along with CNL's monitoring results presented in its annual reports [1]–[18].

While CNSC staff conducted a review for all environmental components, only a selection of components is presented in detail in the following subsections. The environmental components were selected based on licensing requirements; some were also included because they have historically been of interest to the Commission, Indigenous peoples and the public.

The Port Hope Environmental and Biophysical Monitoring Plan [38], the Port Granby Project Environmental and Biophysical Monitoring Plan [40], and the Port Hope Licensed Sites Environmental Programs Specifications [59] provide the details of the environmental monitoring activities required throughout the projects. These plans include the EA follow-up monitoring undertaken in the biophysical environment during the implementation of the projects. CNL submitted these plans for the PHP and PGP sites in March 2018, revisions to which were reviewed and accepted by CNSC staff in 2018 and 2019, respectively. These plans will continue to apply as the sites move into their respective Maintenance and Monitoring Phases. It is important to distinguish that the monitoring requirements for the environmental effects may be different in each of the 3 project phases for the Port Hope and Port Granby projects:

1. Pre-Construction Phase – Monitoring intended to supplement or confirm the baseline information used to conduct the EA studies.

2. Construction and Development Phase – Monitoring intended for verification of predicted environmental effects and the effectiveness of mitigation measures during project activities.

3. Maintenance and Monitoring Phase – Monitoring intended to verify that the environmental effects are as predicted by the EA and that the LTWMF is operating as expected. The duration of this phase will be several hundred years.

The PHP LTWMF project is currently in phase 2 (the Construction and Development Phase). Therefore, only monitoring relevant to this phase is discussed in the following sections. Many offsite locations for the PHP have not started remediation work; therefore, they are not the focus of this report. The PGP is nearing completion of phase 2; therefore, discussion around the monitoring requirements moving into phase 3 (the Maintenance and Monitoring Phase) is discussed in the following sections.

3.2.1 Port Hope Project

3.2.1.1 Port Hope offsite locations

A number of offsite activities require remediation as part of the PHP (including sites under the Waste Nuclear Substance Licence – Pine Street Extension Temporary Storage Site (WNSL-W1-182.1/2021) [56] and the Waste Nuclear Substance Licence – Port Hope Radioactive WMF (WNSL-W1-344-1.8/ind) [57]). These offsite locations vary from small consolidation sites, small-scale sites (e.g., Port Hope residential properties), to large-scale sites with greater volumes of LLRW (e.g., Port Hope Harbour and Highland Drive Landfill Area).

Some of the environmental subcomponents monitored at offsite locations during the remediation projects include:

- the atmospheric environment (e.g., non radiological air quality, radiological air quality, noise, odour)
- the aquatic environment (e.g., both radiological and non-radiological surface water and sediment quality)
- the terrestrial environment (e.g., soil quality)
- the hydrogeological environment (e.g., both radiological and non-radiological groundwater and drainage water quality, groundwater flow)

The measured concentrations are compared to predictions made during the EA and applicable federal and provincial guidelines.

Many of the Port Hope offsite locations have not been remediated yet. Each site requiring remediation undergoes detailed planning prior to any construction activities. Due to the nature of these offsite locations and the fact that many have not undergone remediation at the time of this report, monitoring results are not discussed in detail.

Findings

Based on the review of CNL's results of the monitoring program for the PHP's offsite locations, CNSC staff have found that the environment surrounding the sites remains within EA predictions and that offsite locations will continue to be remediated to improve conditions in the future.

3.2.1.2 Port Hope Harbour

CNL began mechanical dredging of the Port Hope Harbour in 2019 and is required to execute the EA follow-up monitoring for the harbour as outlined in its monitoring plan [38]. Prior to any dredging activities, CNL performed a fish-out, by electrode fishing, of the inner harbour area. Fish-out activities are reported to the DFO, Environment Climate Change Canada, and the CNSC. The follow-up monitoring program for the Port Hope Harbour includes quarterly surface water sampling at three locations to track water quality in the Ganaraska River and in the harbour

confluence (see figure 3.2). Sampling is conducted for a suite of parameters before, during and after (only if required) the dredging of the Port Hope Harbour. The surface water monitoring is designed to verify that there is no effect on downstream water quality during dredging activities. The results are compared to the Canadian Water Quality Guidelines for Protection of Aquatic Life (CCME) [70] and Provincial Water Quality Objectives (PWQO) [71]. CNL's monitoring plan also requires weekly monitoring at two other locations (PHH-1 and PHH-2) during dredging activities to verify that there are no unexpected water quality effects on the confluence area [38].

EA predictions [68] state that concentrations of radium-226 and uranium may increase in the area between the harbour and the Ganaraska River during dredging of the harbour but should remain below PWQO. There were no exceedances of water quality guidelines for uranium at the 3 harbour monitoring locations in the 2015–2020 reporting period prior to the commencement of dredging activities (see table 3.5). CNL began mechanical dredging of the Port Hope Harbour in 2019 and shortly after observed uranium and other metals at concentrations above PWQO guidelines in the harbour near the dredging site. CNL's environmental plan [38] has a requirement that concentrations of waste-related parameters above PWQO [71] in the confluence area be investigated and mitigated if appropriate. As these elevated concentrations were not predicted in the EA and are above water quality guidelines, CNL has increased the number of monitoring sampling points and frequency of monitoring, initiated routine toxicity testing, performed additional modelling, and is examining potential mitigation measures to ensure the protection of the environment. CNL plans to dredge the harbour sediment down to bedrock or hard till. Once contaminated sediment is removed from the harbour, water quality is predicted to significantly improve over time.

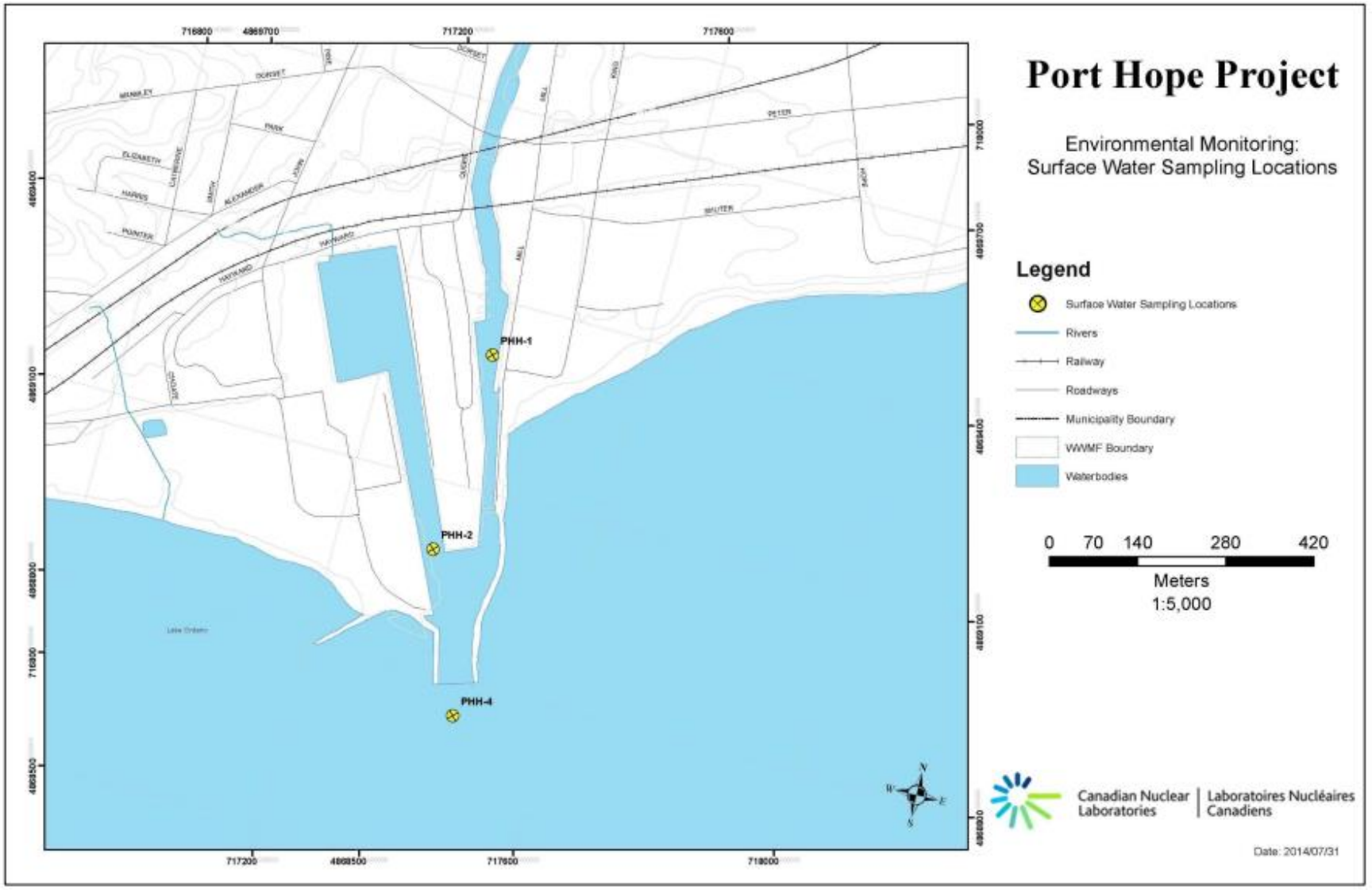
Table 3.5: Annual average concentrations of uranium in Port Hope Harbour for EA follow up surface water monitoring locations

Location	2015	2016	2017	2018	2019	2020	Limits
PHH-1	0.8	0.8	0.75	0.84	0.74	0.78	**PWQO: 5 µg/L** [71]
PHH-2	2.1	1.8	3.8	2.7	2.3	1.67	
PHH-4	1.0	0.7	0.35	0.62	0.45	0.40	

Findings

Based on the review of CNL's EA and the results of the surface water monitoring program for the Port Hope Harbour, CNSC are satisfied that surface water quality remains at levels protective of human health and that the environment. Although there have been some exceedances of guidelines for contaminates due to the Port Hope Harbour dredging activities, they have been followed up on appropriately and water quality will continue to improve once the dredging activities are completed.

Figure 3.2: Surface water sampling locations for the Construction and Development Phase of the Port Hope Project [38]



3.2.1.3 Port Hope LTWMF

Environmental monitoring is carried out by CNL to ensure the waste remains isolated from the environment, and that there are no impacts on the environment during placement of the waste. The main environmental monitoring measures are taken for air, surface water, soil and groundwater.

The assessment below focuses on the monitoring results for the PHP LTWMF during the Construction and Development Phase (phase 2).

Atmospheric environment

CNL is required to characterize the ambient air quality around the PHP LTWMF during the Construction and Development Phase to ensure the project is not impacting the environment. The EA follow-up monitoring activities include monitoring of air quality (radiological and non-radiological parameters) and noise. There will be very limited potential for airborne non-radiological contaminants caused by project activities when the project moves to the Maintenance and Monitoring Phase. Therefore, only radon monitoring will continue to occur at the LTWMF area past phase 2. Discussion below focuses only on the current phase of the PHP, phase 2.

Ambient Air Quality

Air quality monitoring addresses concentrations of suspended particulate that could be caused by PHP LTWMF project activities. Management of air quality uses a hierarchical approach starting with observation of visible dust. Personnel trained in the evaluation of visible dust are onsite during construction activities to evaluate the need for improved dust control. During periods of visible dust and to assist trained observers, portable real-time dust monitors are used to take readings at downwind locations along the property line. A PHAI dust administrative control level of 100 $\mu g/m^3$ total suspended particulate (TSP) and PHAI dust AL of 120 $\mu g/m^3$ TSP averaged over 15 minutes at the site perimeter is outlined for the real-time dust monitoring at the work sites, as per CNL's Dust Management and Requirements Plan [72]. These are internal levels and not required to be reported to external regulators. However, exceeding these levels does trigger actions. These levels are set to ensure that, over the long term, levels of airborne metals remain below Ontario's Ambient Air Quality Criteria (AAQC) [73], which are desirable concentrations of a contaminant in air, based on protection against adverse effects on health or the environment. An independent dust monitoring program (IDMP) is also carried out in addition to that conducted by the prime contractor and CNL. The IDMP is designed to monitor dust at the perimeter of PHAI work sites and is not controlled by the prime contractor or CNL. Continuous monitoring occurs during the work hours, and results are reported on a 15-minute interval. An exceedance of the 15-minute interval dust AL triggers an immediate response by CNL and the prime contractor to initiative corrective action to reduce dust levels.

In addition, both TSP and $PM_{2.5}$ (fine particulate matter) are measured using high-volume (Hi-Vol) air samplers operating at 4 locations (figure 3.3), which must be analyzed in an accredited laboratory. The locations monitored include Welcome South, Welcome Northwest, Welcome Weather Station and 192 Toronto Road. Monitoring occurs daily (24-hour sample) on days when dust-generating construction activities are taking place. As per CNL's Dust Management and Requirements Plan [72], the TSP filter results are assessed against an overriding limit of 120 $\mu g/m^3$ averaged over 24 hours which is adopted from Ontario's Ambient Air Quality

Criteria. An exceedance of this overriding limit triggers internal actions. Any TSP filter exceeding 100 $\mu g/m^3$, or the highest TSP sample measured during the week (if none are above 100 $\mu g/m^3$), is also analyzed for metals from each monitoring location. For $PM_{2.5}$, in 2012, the CCME adopted the Air Quality Management System as a new comprehensive approach to managing air issues [74]. Prior to that, the monitoring results for $PM_{2.5}$ 98th percentile were compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 $\mu g/m^3$. In 2020, a value of 27 $\mu g/m^3$ was published by CCME for $PM_{2.5}$.

Radiological air quality measurements include TSP, long-lived alpha activity (LLA) and radon. Levels of radionuclides are measured on the same TSP filters selected for metals analysis. Radionuclide analysis is carried out for natural uranium, natural thorium, thorium-230, thorium-232, radium-226 and lead-210. LLA is also measured daily at the perimeter locations generally downwind of remedial activities. The LLA results are reviewed daily to provide early indication of any unexpected or unusual levels of airborne radioactivity. Radon monitors are located along the perimeter fenceline of the LTWMF. Comparison of the baseline levels with the levels measured during the Construction and Development Phase and Maintenance and Monitoring Phase determines the levels associated with project activities.

As per the PHAI Radiation Protection Plan [75], a value of 0.5 Bq/m^3 averaged over the time period the sample was acquired has been adopted as the investigative threshold for LLA in air measurements taken at work sites. The PHAI Radiation Protection Plan also established a limit of incremental average radon levels of 150 Bq/m^3 for the PHP LTWMF during phase 2 activities. An exceedance at any of the monitoring locations triggers a dose assessment to a member of the public for a comparison to the 1mSv/y regulatory dose limit.

Comparison to EA predictions

Using air dispersion modelling, the EA studies predicted occasional, albeit infrequent, exceedances of the applicable criterion for TSP of 120 $\mu g/m^3$ [54] immediately adjacent to the LTWMF. $PM_{2.5}$ was predicted to infrequently exceed the 24-hour Canada-Wide Standard [74] adjacent to the LTWMF. The PHP Screening Report [76] identified that predicted levels of radionuclides would be below Health Canada reference levels [77]. Radon concentrations during the Construction and Development Phase are expected to be no higher than an annual average concentration of 25.3 Bq/m^3 at the fenceline of the proposed LTWMF. Since the EA, CNL indicated that the predicted levels had been set to an unachievable level and should be re-evaluated. CNL also noted that during the EA baseline study, different radon monitoring equipment was used for radon measurements, and it is not recommended for comparison to the current monitoring scheme that uses RSSI alpha-track detectors. In a memorandum to the CNSC, CNL defined the radon gas concentration of 150 Bq/m^3 as the base concentration and received approval in July 2014. Exceeding this concentration triggers follow-up actions such as ascertaining dose to the public.

Atmospheric monitoring data for TSP from 2015 to 2020 is summarized below (see table 3.6). Between 74 and 259 samples at each location have been collected per year from each high-volume air sampler (TSP and $PM_{2.5}$) for the PHP LTWMF site. The trigger level of 120 µg/m^3 for TSP has been exceeded occasionally over the years, as predicted in the EA, and appropriate follow-up actions have been performed. The AAQC for $PM_{2.5}$ of 30 µg/m^3 (98th percentile averaged over 3 years) was not exceeded over the monitoring period. There were no exceedances of the AAQC for metals in TSP samples sent for analysis. Radium-226 and thorium-232 occasionally exceeded the EA predicted values for some of the filters over the monitoring period. However, all remained well below the Health Canada reference values [77]. The EA-predicted values were based on modelling PM_{10} concentrations, which was considered a conservative approach.

Table 3.6: Annual concentrations of TSP in ambient air as measured around the PHP LTWMF

Hi-Vol station		2015	2016	2017	2018	2019	2020	Overriding limit
PHP LTWMF weather station	**Average* (µg/m^3)**	14	21	22	23	16	18	**120 µg/m^3 TSP** [47]
	Maximum (µg/m^3)	56	95	116	104	**158**	85	
PHP LTWMF Northwest	**Average* (µg/m^3)**	14	22	18	26	21	21	
	Maximum (µg/m^3)	51	79	73	**150**	96	**179**	
PHP LTWMF South	**Average* (µg/m^3)**	14	16	14	20	14	15	
	Maximum (µg/m^3)	51	85	53	**162**	85	73	
Transportation route, 192 Toronto Road	**Average* (µg/m^3)**	17	27	20	26	18	19	
	Maximum (µg/m^3)	69	**151**	57	119	75	58	

*average presented as geometric mean
Bolded numbers indicate levels exceeding overriding TSP limit of 120 µg/m^3 [47].

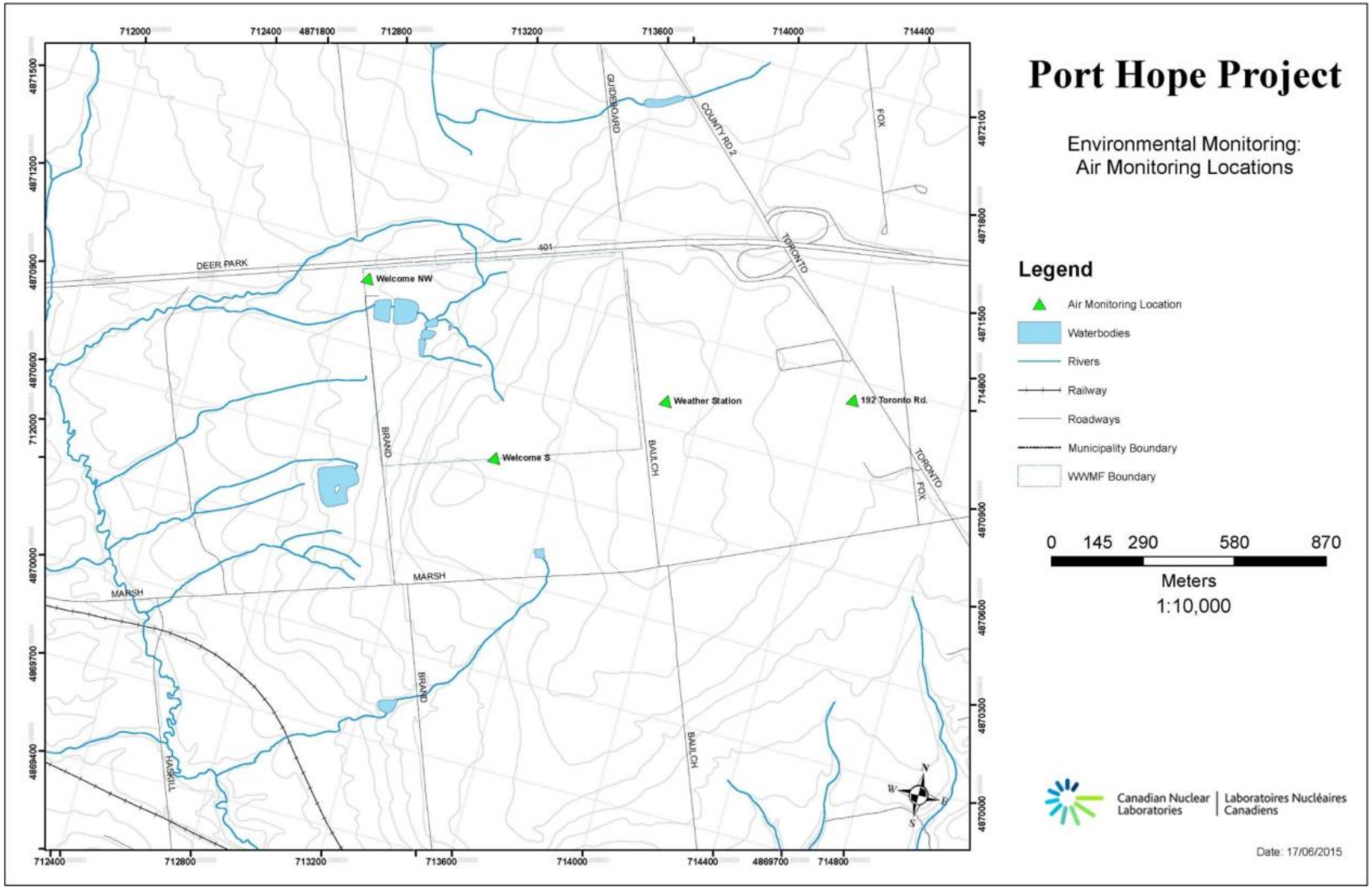
For the independent dust monitoring, in 2019 and 2020, there were 0 confirmed instances when the 15-minute average exceeded the AL. However, in 2015, 2016, 2017 and 2018, there were 10, 65, 37 and 7 instances, respectively, of exceedances that were attributed to site activities at the PHP LTWMF. When exceedances occurred, the contractor used water as a dust suppressant, minimized dust generating activities, and worked to optimize dust-mitigation practices. Although the dust AL was exceeded, there were no exceedances of the TSP limit from the high-volume air samplers located at the perimeter of the controlled area on those days.

Radon measurements are taken monthly at the fenceline as a representative reading of doses to the public. Measurements were often below the reporting AL of 150 Bq/m^3. For instance, the average radon measurements ranged between 22 Bq/m^3 to 118 Bq/m^3 in 2021.

Findings

Based on the review of CNL's EA and the results of the atmospheric monitoring program for the PHP LTWMF, CNSC staff have found that airborne emissions from the PHP LTWMF were within the EA predictions, which predicted occasional exceedances of the provincial standards. Exceedances of TSP and dust were followed up on appropriately, and all metals and radionuclides remained within their respective criteria. CNSC staff are satisfied that ambient air quality remains at levels protective of human health and the environment and, therefore, it is unlikely that CNL activities are having a measurable impact on the surrounding atmospheric environment.

Figure 3.3: Air monitoring locations for the Construction and Development Phase of the Port Hope Project [38]



Noise monitoring

Noise monitoring takes place during the Construction and Development Phase at the PHP LTWMF site to capture potential noise levels from construction activity. Noise monitoring is performed quarterly at several locations around the PHP LTWMF to confirm the accuracy of predictions made during the EA and the effectiveness of mitigation measures.

The guidance level of 70 decibels (dBA) (24-hour weighted average), as per the World Health Organization's Guideline for Community Noise [78], is used for the project, as construction activities are being limited to daytime hours.

Comparison to EA predictions

The predicted environmental effect for noise in the EA was an increase in noise levels of 12 dBA for residents adjacent to the LTWMF during construction and development. All noise values from 2015 to 2020 around the PHP LTWMF were below the predicted range of a 12 dBA increase and the World Health Organization's (WHO) guideline of 70 dB over a 24-hour period. The North, South and Central Transportation Routes were also monitored in 2020. Monitoring along the transportation routes showed little to no increase from the baseline monitoring that took place prior to the remedial activities.

Findings

Based on the review of CNL's EA and the results of the noise monitoring program for the PHP LTWMF, CNSC staff found that noise from the PHP LTWMF activities is below guidelines and within the EA predictions. Therefore, CNSC staff are satisfied that noise levels remain protective of human health.

Terrestrial and aquatic environment

Soil quality

The project is expected to have the beneficial effect of improving soil quality at cleanup sites by removing contaminated materials. Potential adverse effects, however, would be expected on soil quality for areas beyond the excavation sites, related to the accumulation of contaminants on surface soil from the airborne transport of soil and dust. Soil quality data is collected for comparison to the existing baseline soil quality data in these areas in order to identify any incremental increases due to dust deposition.

Monitoring in surface soil at the LTWMF site perimeter is carried out annually at 5 locations (see figure 3.4), for both radiological COPCs (e.g., radium-226) and non-radiological COPCs (e.g., uranium, arsenic). A full list of monitored COPCs can be found in CNL's monitoring plan [38]. Soil monitoring results are compared to baseline data and EA predictions [68].

Comparison to EA predictions

The EA studies predicted mean incremental concentration increases for most radiological contaminants of less than 20% of background at the LTWMF, and the resulting increased amounts were considered not measurable. The exception was thorium-230. Its concentrations were predicted to increase 63% over baseline concentrations assuming no mitigation measures are applied. The mean incremental concentration increases for most non-radiological contaminants at the LTWMF were predicted to be less than 20% of background; these resulting

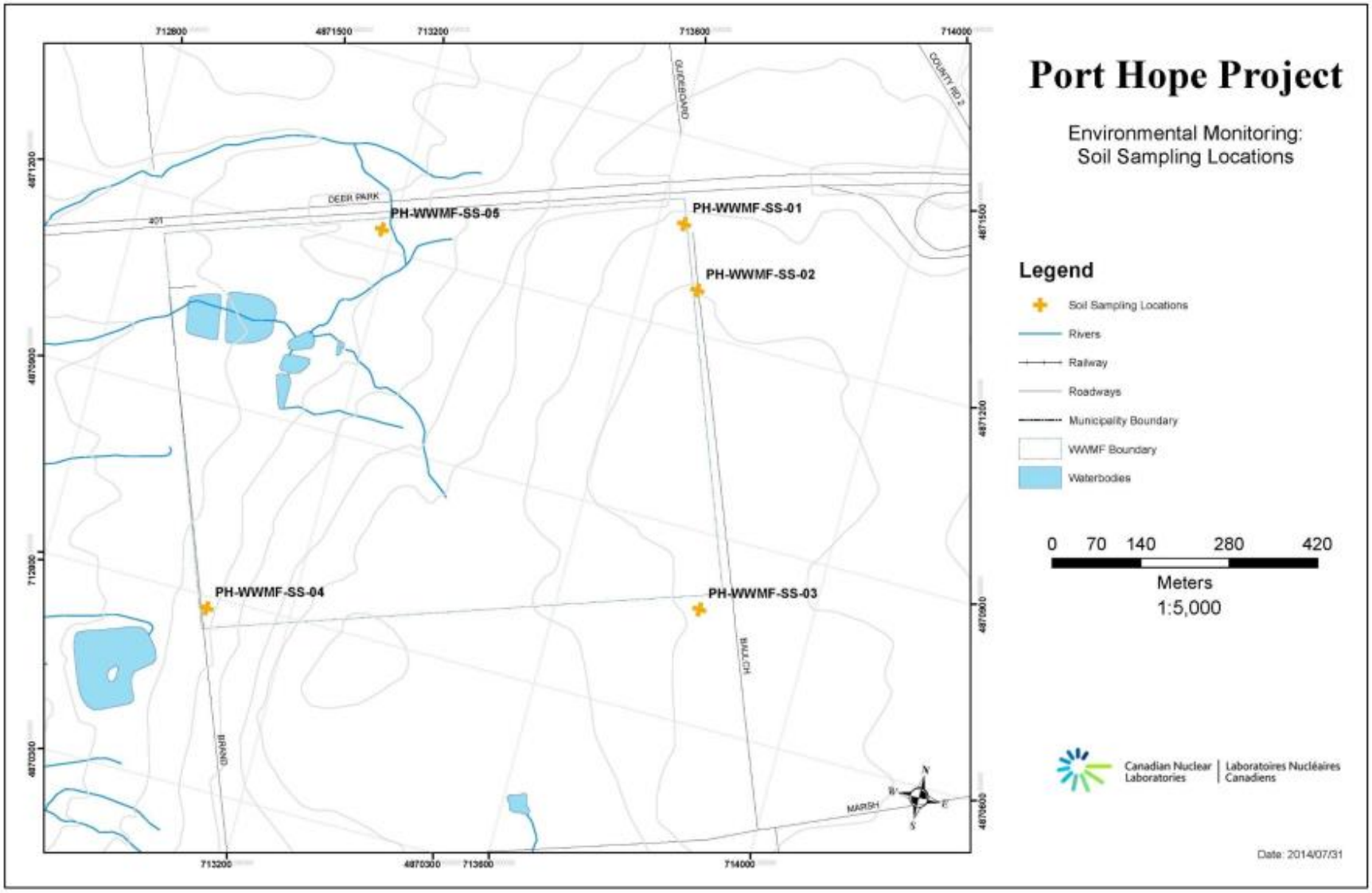
increased amounts were also considered not measurable. The exceptions were arsenic and cobalt. The predicted mean incremental concentration increases for arsenic and cobalt over baseline concentrations at the LTWMF perimeter were 130% (e.g., 4.7 µg/g), and 28% (e.g., 6.67 µg/g), respectively. The predicted concentrations were noted to be well below applicable soil quality guidelines for Ontario [79].

Concentrations of some parameters in soil have been greater than predicted throughout the monitoring period for some locations. For instance, concentrations of arsenic (at location 1 in 2017 and at location 5 from 2015 to 2019) and cobalt (at location 3 in 2018 and 2020) were greater than predicted. Arsenic was also above MECP soil quality guidelines [79] at location 5. This location is an area known to be slightly contaminated with arsenic due to surface water runoff. Therefore, it was concluded that the contamination was not caused by elevated concentrations due to wind-blown dust deposition from construction activities of the LTWMF. The area will be remediated as part of the PHAI cleanup and there are no immediate concerns with this location. Thorium-230 concentrations were also above predictions at some locations. However, this was due to the laboratory detection limit being above the predicted levels.

Findings

Based on the review of CNL's EA and the results of the soil monitoring program for the PHP LTWMF, CNSC staff are satisfied that soil quality remains at levels protective of human health and the environment, and that airborne transport of soil and dust from the project is not affecting the soil quality around the site. Areas that exceeded provincial guidelines due to surface water runoff will be remediated as part of the PHAI cleanup.

Figure 3.4 Soil sampling locations for the Construction and Development Phase of the Port Hope Project [38]



Surface water quality

The EA follow-up activities with respect to surface water quality involve the collection and analyses of surface water samples at locations down-gradient of the PHP LTWMF to:

- verify predicted improvements in surface water
- ensure that discharges are not deleterious to aquatic life
- verify reduction of contaminant loadings due to leachate discharging to Lake Ontario

Decreases in contaminant concentrations are not expected until the waste is remediated. At that point, water quality is expected to improve over the longer term as a result of the cleanup.

Surface water sampling in Brand Creek and in Lake Ontario around the treated leachate discharge are performed on a quarterly basis throughout the Construction and Development Phase. There are 4 sampling locations in Brand Creek and 3 in Lake Ontario (see figure 3.5). The surface water quality of Lake Ontario is sampled at the PHAI diffuser to verify that the water quality in the vicinity of the PHP LTWMF leachate discharge and the associated mixing zone is not affected by PHP LTWMF operations. The mixing zone is approximately 12 m around the diffuser. Sampling is conducted at the diffuser and approximately 20 m east and west of the diffuser. Sampling in Lake Ontario is not always possible due to winter weather or other safety concerns.

Many parameters are analyzed in surface water samples, ranging from general chemistry (e.g., pH, hardness, TSS), total metals (e.g., arsenic, lead, uranium), radionuclides (e.g., radium-226, lead-210, thorium-230), and field-measured parameters (e.g., dissolved oxygen, temperature, turbidity). A full list of parameters can be found in CNL's monitoring plan [38]. However, the key COPCs identified in the EA were arsenic, radium-226 and uranium.

The surface water results are compared to the Canadian Water Quality Guidelines for Protection of Aquatic Life (CCME) [70] and PWQO [71]. CNL must also ensure that the discharge is not deleterious to the aquatic environment (fish) at the point of discharge; and appropriate monitoring must be employed to confirm this.

Comparison to EA predictions

The EA predicted that during the Construction and Development Phase, changes in water quality in Brand Creek would be small. Loadings to Brand Creek were expected to increase slightly (less than 1%). The EA predicted loadings to Lake Ontario via pipeline from the LTWMF would increase by 12%. Water quality is expected to improve over the longer term because of the cleanup.

Results from quarterly samples in Brand Creek were generally consistent from 2015 to 2020, suggesting that construction of the PHP LTWMF is not having an adverse effect on the surface water quality in Brand Creek. There have been occasional exceedances of the PWQO [71] over the monitoring period for some parameters. For instance, an increase in uranium concentrations was observed in a tributary of Brand Creek (sample location BC-T) relative to the other locations in monitoring years 2017 to 2020. This tributary is fed mainly by Clark's Ditch, which receives surface water runoff from the PHP LTWMF. Exceedances for uranium had been observed in previous years, prior to the construction of the PHP LTWMF, suggesting historical contamination as the cause. The water quality of this tributary is expected to improve over time as remediation progresses. Criteria for iron, chloride and phosphorus were also exceeded at both

downstream and upstream locations in Brand Creek over the monitoring period. This suggests that an offsite source may be responsible for these elevated levels, as it is typical for agricultural/urban watersheds in the region to exceed these limits. It is suspected that the elevated chloride concentration may be due to road salt as Highway 401 is located just to the north of the PHP LTWMF.

In the Lake Ontario samples, there were no exceedances of the PWQOs [71] or Canadian Water Quality guidelines (CWQG) [70], except for fluoride (which had only slight elevations over the monitoring years), cadmium and selenium in 2017 (due to detection limits being elevated above the CWQGs), and uranium in 2018 (see table 3.7 for uranium results from 2015 to 2020). Elevated fluoride concentrations are typical for the nearshore zone of the lake in this region, and results were well under the Ontario drinking water quality standard of 1.5 mg/L [80]. In 2018, there was an exceedance of uranium at the Lake Ontario diffuser location. In 2018, CNL operated the water treatment buildings (in addition to the newly engineered WWTP as described in section 3.1.2) to increase the treatment capacity required for the Collection Pond expansion activities. However, the results for the sampling locations around the diffuser did not show elevated results for uranium; this suggests no impact past the mixing zone. Other monitoring results are generally consistent with the monitoring data for the past few years, suggesting that PHAI operations are not having an adverse effect on Lake Ontario water quality.

Table 3.7: Annual average concentrations of uranium in the Lake Ontario surface water sampling locations, in µg/L

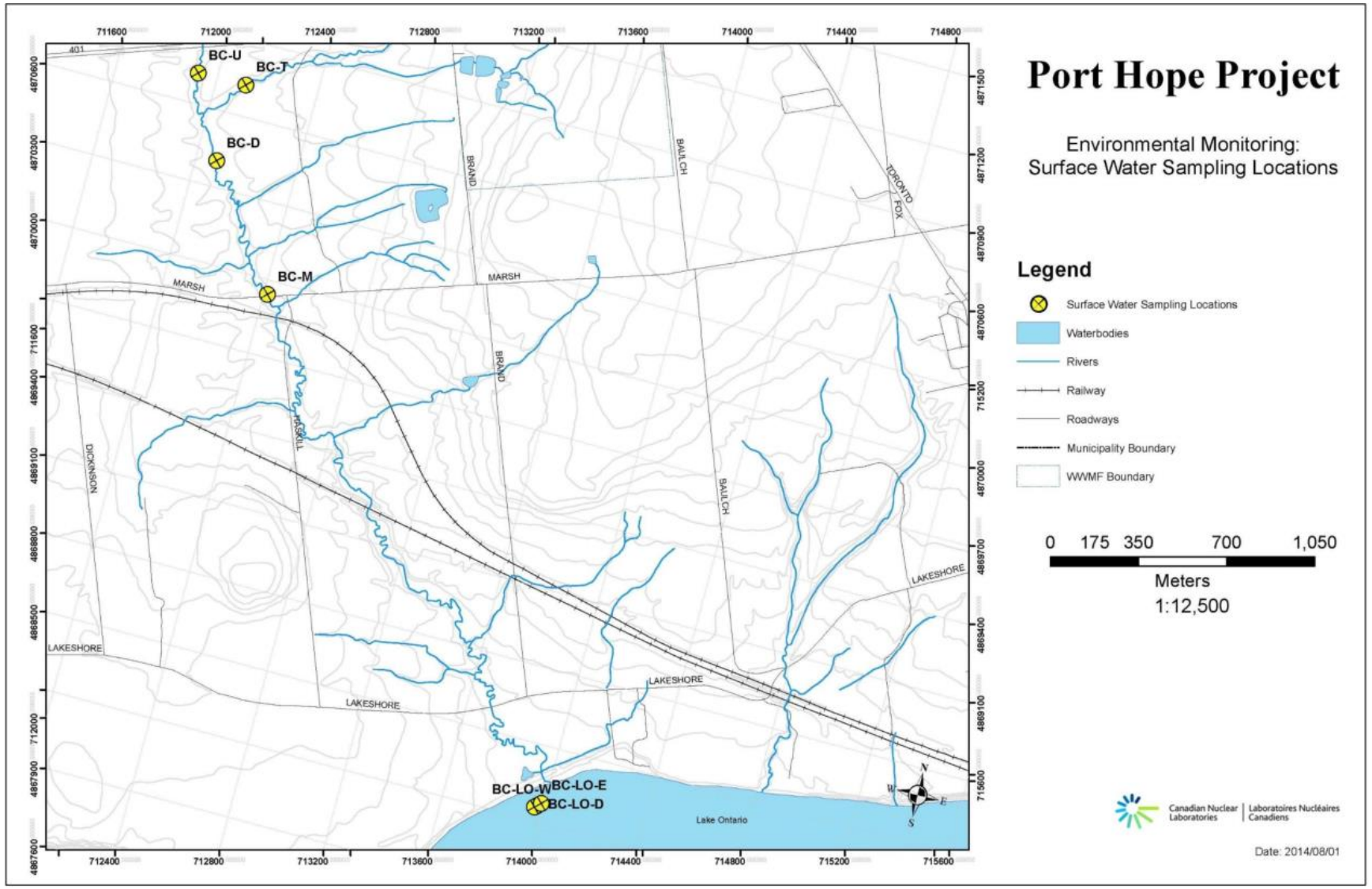
Location	2015	2016	2017	2018	2019	2020	Limits
BC-LO-D	2.71	0.36	0.35	**9.69**	0.38	0.35	**PWQO: 5 µg/L** [71]
BC-LO-E	0.42	0.45	0.36	0.54	0.38	0.38	
BC-LO-W	1.36	0.35	0.36	0.33	0.38	0.35	

Bolded number indicates an exceedance of applicable guideline.

Findings

Based on the review of CNL's EA and the results of the surface water monitoring program for PHP LTWMF, CNSC staff found that water quality from the PHP LTWMF activities is often below guidelines and within the EA predictions, which predicted increased loadings during phase 2. CNSC are satisfied that surface water quality remains at levels protective of human health and that the environment and expect water quality will continue to improve once the project is completed.

Figure 3.5: Surface water sampling locations for the Construction and Development Phase of the Port Hope Project [38]



Sediment quality

In the Brand Creek Watershed, sediment sampling was undertaken during the Pre-Construction Phase, to supplement existing baseline information, in areas below the remediation zone where expected discharge to the aquatic environment had the potential to influence sediment quality. This serves as a point of comparison for future sediment concentrations. Sediment sampling will not take place in the Construction and Development Phase. Sediment sampling in the Monitoring and Maintenance Phase will only be required if upset releases of suspended solids have occurred, or if water quality objectives have been frequently exceeded over the Construction and Development Phase (i.e., 25% of quarterly samples). As this section of the report focuses on phase 2, sediment monitoring is not discussed further for the PHP LTWMF Brand Creek Watershed.

Findings

CNSC will review Brand Creek Watershed sediment sampling results in the Monitoring and Maintenance Phase if required as per the criteria above.

Hydrogeological environment

The PHP LTWMF site, including the Welcome WMF, is located in the Iroquois Plain physiographic region, south of the Oak Ridges Moraine and the former glacial Lake Iroquois shoreline. This is primarily a glaciolacustrine clay and sand plain that extends south to Lake Ontario. The surficial geology consists of glacial lake deposits either of sand and gravel or of silt and clay.

Groundwater in the region generally flows south, mimicking the ground surface and the top of bedrock trends. Aquifers are found in both the overburden and the bedrock, with both near-surface and deeper overburden aquifers in zones of sand and gravel. At the PHP LTWMF site, horizontal groundwater flow occurs in 3 separate hydro-stratigraphic units. All groundwater ultimately discharges into Lake Ontario.

The construction of the LTWMF reduces the infiltration to groundwater over the footprint of the facility and causes a localized change in the groundwater level, flow rate and direction [76]. The low-permeability cover and liner system of the LTWMF causes the volume of water collected as surface runoff to be much greater than during baseline conditions. On the other hand, it reduces the volume of contaminated drainage and groundwater that requires collection in the groundwater/drainage water collection and treatment system.

Comparison to EA predictions

Groundwater levels were measured quarterly from 2015 to 2020 [4]–[9]. The average groundwater levels in monitoring wells were generally stable over this period.

Groundwater samples were collected from the following wells (see figure 3.6 for the monitoring well locations) and analyzed for contaminants twice annually from 2015 to 2020 [4]–[9]:

- In 2015 and 2016, of the 22 monitoring wells around the Welcome WMF, 20 wells were suitable for monitoring.
- From 2017 to 2020, of the 22 (26 in 2019 and 2020) monitoring wells around the PHP LTWMF, 20 (21 in 2020) wells were suitable for monitoring.

The results were compared against water quality criteria for potable groundwater conditions listed in the Port Hope Screening Report [76]. This is a conservative approach, as water is not potable onsite. In addition, results were compared to Ontario's groundwater standards [79].

Barium concentrations at a monitoring well, WC-MW3A-11R, were found to exceed the criterion identified in the Port Hope Screening Report from 2015 to 2020 ([4] – [9]). There were no exceedances of the Ontario groundwater standards, specifically table 3, in this period. Exceedances are the result of the effects of the previous Welcome WMF, which does not have a complete engineered liner or cover system in place. Monitoring of the groundwater conditions will continue throughout the phases of the project, and improvements to groundwater quality are expected to occur as the Welcome WMF is remediated and through natural attenuation.

Before construction of the PHP LTWMF, all impacted drainage water at the PHP LTWMF site was collected in the drainage collection system and treated onsite at the old water treatment building, prior to discharge via pipeline to Lake Ontario. Drainage water quality in the western portion of the site represents groundwater discharge that exhibits impacts related to the presence of the Welcome WMF burial area. According to the screening report [68], before construction of the PHP LTWMF, the concentrations of aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, nickel, phosphorous, silver, thallium, uranium, vanadium, zinc, uranium and radium-226 commonly exceeded the PWQO [71].

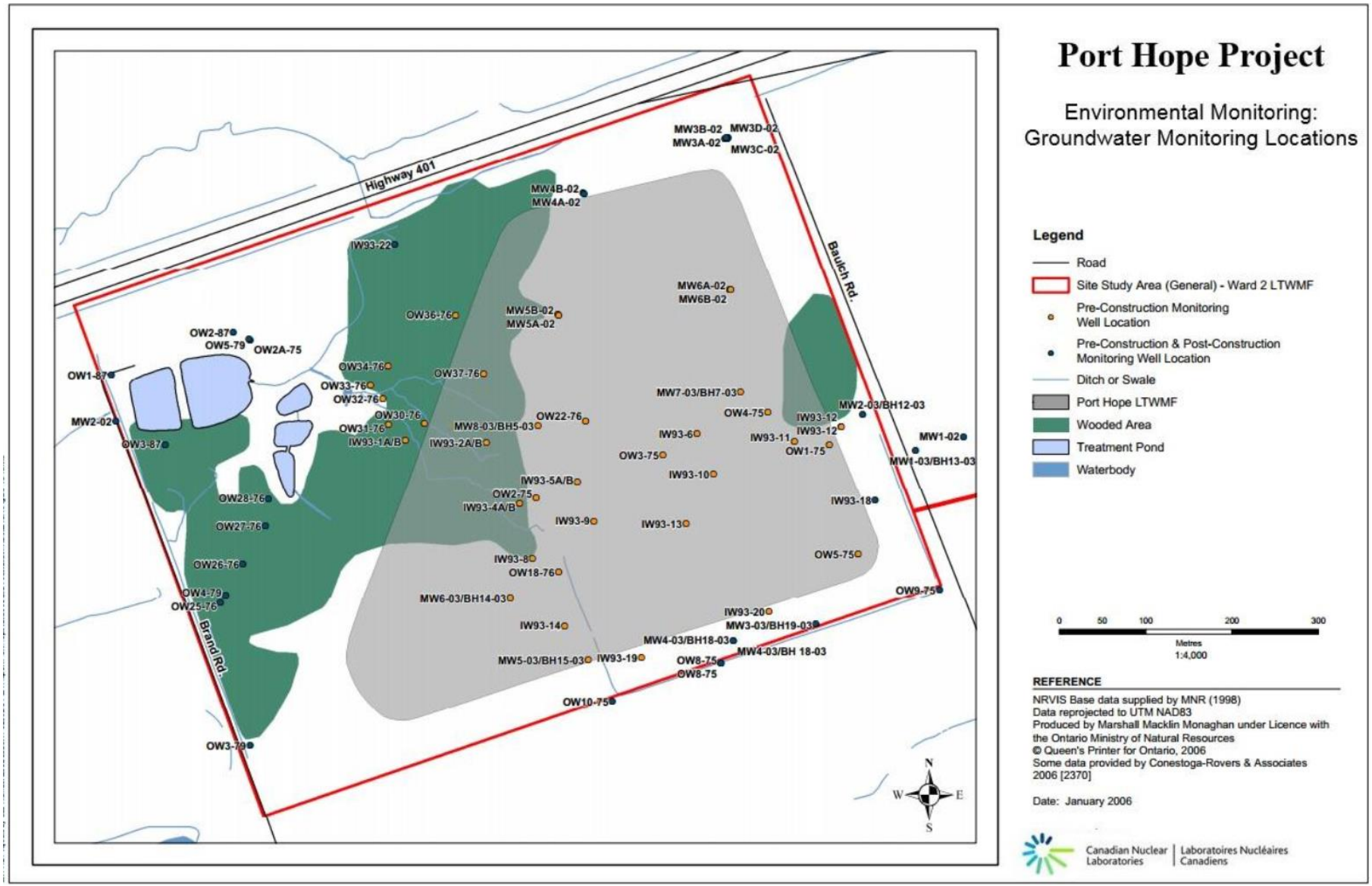
The drainage (i.e., leachate appearing as groundwater seepage) from the Welcome WMF mound (from 2015 to 2016) and the PHP LTWMF mound (from 2017 to 2020) collected in the treatment ponds was sampled twice every year. Slight fluctuations in water quality have been observed over the years. Changes in drainage water quality and volume are expected to occur after remediation work commences. Drainage water onsite is treated prior to release to the environment.

The use of wells and groundwater for water supply in Port Hope is limited mainly to the rural areas. From 2015 to 2020, CNL voluntarily sampled domestic wells on residential properties (ranging from 6 to 16 properties) near the WWMF and analyzed the samples for arsenic, radium-226, uranium and nitrate concentrations as well as for pH. All results were below the Ontario Drinking Water Standards for 2015 to 2020 ([4] – [9]), except in 2015 when nitrate concentration from 1 well exceeded the standard. The source of the elevated nitrate was assumed to be the fertilizers used in the farm fields in the area surrounding the well. Residents have been notified in writing about the results.

Findings

Based on the review of CNL's EA and the results of the groundwater monitoring program for the PHP LTWMF, CNSC staff have found that groundwater quality from the PHP LTWMF activities is often below guidelines and within the EA predictions. CNSC are satisfied that groundwater quality remains at levels protective of human health and the environment and that groundwater quality will continue to improve once the project is completed.

Figure 3.6: Groundwater monitoring locations for the Port Hope LTWMF [38]



Human environment

An assessment of the human environment at the PHP LTWMF site consists of identifying representative persons located within or in proximity to the site and determining whether they could be exposed to radiological or hazardous COPCs, such as by breathing the air, being on the land, drinking and swimming in surface water, and eating plants, fish and wildlife from the area. Representative persons are those individuals who, because of their location and habits, are likely to receive the highest exposures to radiological or hazardous substances from a particular source and therefore potentially have their health harmed by these exposures. In general, human receptors may be exposed to contaminants through 4 primary routes: dermal (i.e., skin), inhalation, incidental ingestion (e.g., soil) and ingestion of food and water.

The EA [68] reviewed the project works and activities to determine the potential of each to interact with the existing human health and safety components of the environment. Each interaction was evaluated to identify if it would result in a measurable change to the environment. Residents in the rural areas adjacent to the LTWMF during construction and development were determined to be the most exposed individuals for potential radiological and hazardous contaminant exposures.

Exposure to radiological substances

The *Radiation Protection Regulations* [46] prescribe radiation dose limits to protect workers and the public from exposure to radiation from licensed activities. Doses are either monitored by direct measurement or by estimates of the quantities and concentrations of any nuclear substance released as a result of the licensed activities. The annual effective dose limit for a member of the public is 1 mSv per year.

At the PHP LTWMF, dose to the public is determined through calculation of exposures based on fenceline thermoluminescent dosimeters (TLDs) and radon monitors around the PHP LTWMF and takes into account estimated time spent in proximity to these fences daily. The TLDs are strategically placed along the PHP LTWMF fenceline to account for any dose to members of the public. In the EA, the highest predicted radiation dose to the public as a result of the PHP was 0.25 mSv/y for an infant who is a Ward 2 resident adjacent to the LTWMF during the Construction and Development Phase. This dose is 25% of the public dose limit of 1 mSv/y.

Results from monthly and quarterly deployment of environmental radon monitors and TLDs confirm that public doses from 2012 to 2021 were significantly less than the annual public dose limit (see table 3.8).

Table 3.8: Estimated annual public doses PHP LTWMF

Percentage of the public dose limit										
Public dose limit (µSv)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
1,000	9% (90.3 µSv/a)	10% (99.8 µSv/a)	9% (87.1 µSv/a)	10% (93.52 µSv/a)	1% (11.95 µSv/a),	1% (4.5 µSv/a)	3% (27.5 µSv/a)	3.6% (36 µSv/a)	3.3% (33 µSv /a)	2.3% (23 µSv/a)

Exposure to hazardous substances

In the EA [68], each of the PHP LTWMF works and activities was reviewed to consider its potential to interact with human health. Air quality was considered in the evaluation for potential effects. Dispersion modelling indicated that there would be measurable changes in the concentrations of TSP, PM_{10}, and $PM_{2.5}$ at all residential locations, and that the predicted concentrations would exceed the applicable criteria at adjacent residential locations for PM_{10}, as well as at the LTWMF fenceline and residential locations adjacent to the remediation site for $PM_{2.5}$. Air quality modelling also predicted a measurable increase in concentrations of nitrogen oxides (NO_2) that would exceed MECP criteria at Wards 1 and 2 adjacent residential locations, and at the LTWMF fenceline. Even with the proposed mitigation measures, it was predicted that PM_{10}, $PM_{2.5}$ and NO_2 would exceed their 24-hour AAQC [73]. It was concluded there would be no residual effects given most exceedances were eliminated in models that consider plume depletion. The EA follow-up monitoring includes monitoring for TSP and $PM_{2.5}$ to ensure levels remain protective of human health.

Findings

Estimated radiological doses to the public have remained well below the public dose limit of 1 mSv per year, indicating that radiological releases from the PHP LTWMF pose a negligible risk to human health (i.e., potential risk to humans is similar to health outcomes in the general public).

With respect to hazardous substances, CNSC staff's review indicated that hazardous releases from the PHP LTWMF pose a negligible risk to human health (i.e., potential risk to humans is similar to health outcomes in the general public).

Based on assessments conducted for the PHP LTWMF, including the review of the annual reports, as well as quarterly and annual environmental monitoring data, CNSC staff have found that impacts to the human environment from radiological and hazardous substances released from the PHP are negligible, and they are satisfied that people living and working near the facility remain protected.

3.2.2 Port Granby Project

The PGP involves the design and construction of an engineered above-ground mound to isolate the waste by encasing it in multiple layers of natural and specially manufactured materials. These layers are designed to prevent contaminants from entering the environment. The proposed design and location were approved by the Commission as part of the EA. The PGP LTWMF consists of 2 cells that have been constructed in phases. CNL completed the construction of the cells and commenced waste emplacement in 2016. In 2020, CNL completed the transfer of historic LLRW from the Port Granby WMF into the engineered above-ground LTWMF. In total, 1,315,061 metric tonnes of LLRW were safely transported to the LTWMF from the start of the remediation until the transfer was completed. Progress continues including final grading, erosion control measures, and the construction of the groundwater collection system at the Port Granby site. These activities are expected to be finalized in the fall of 2022. Environmental monitoring is carried out by CNL to ensure the waste remains isolated from the environment. The main environmental monitoring measurements are taken for air, surface water, soil, and groundwater.

By removing the source of contamination from the site, groundwater improvements are expected over time, which will reduce the environmental impact on Lake Ontario. The PGP site will remain in a maintenance and monitoring period for the foreseeable future. CNSC staff will continue their regulatory oversight of the PGP to ensure the protection of the public and environment. The assessment below focuses on the monitoring results from the Construction and Development Phase for the PGP.

3.2.2.1 Port Granby LTWMF

Atmospheric environment

CNL is required to characterize the ambient air quality around the PGP (PGP WMF and PGP LTWMF) during the Construction and Development Phase to ensure the project is not impacting the environment. The EA follow-up monitoring activities as described in CNL's monitoring plan for the PGP [40] include monitoring of air quality (radiological and non-radiological parameters) and noise. Air quality monitoring is required primarily during the Construction and Development Phase. However, radon monitoring at the boundary of the LTWMF will extend into the Maintenance and Monitoring Phase.

Ambient air quality

Air quality monitoring addresses concentrations of suspended particulate that could be caused by PGP project activities. Management of air quality uses a hierarchical approach starting with observation of visible dust. Personnel trained in the evaluation of visible dust are onsite during construction activities to evaluate the need for improved dust control. During periods of visible dust and to assist trained observers, portable real-time dust monitors are used to take readings at downwind locations along the property line. A PHAI dust administrative control level of 100 $\mu g/m^3$ total dust particulate (TSP) and PHAI dust AL of 120 $\mu g/m^3$ TSP averaged over 15 minutes at the site perimeter is outlined for the real-time dust monitoring at the work sites, as per CNL's Dust Management and Requirements Plan [72]. These are internal levels and not required to be reported to external regulators. However, exceeding these levels does trigger actions. These levels are set to ensure that, over the long term, airborne metals levels remain below Ontario's AAQC [73], which are desirable concentrations of a contaminant in air, based on protection against adverse effects on health or the environment. An IDMP is also carried out in addition to that conducted by the prime contractor and CNL. The IDMP designed to monitor dust at the perimeter of PHAI work sites and is not controlled by the prime contractor or CNL. Continuous monitoring occurs during the work hours, and results are reported on a 15-minute interval. An exceedance of the 15-minute interval dust AL triggers an immediate response by CNL and the prime contractor to initiate corrective action to reduce dust levels.

In addition, both TSP and $PM_{2.5}$ (fine particulate matter) are measured using Hi-Vol air samplers operating at 2 locations (see figure 3.7), which must be analyzed in an accredited laboratory. Samplers are located outside the fenceline at the northwestern boundary of the LTWMF, one east of the LTWMF and one south of the LTWMF, and generally allow an evaluation of "upwind" and "downwind" concentrations. Mini-Vol portable air samplers (for both TSP and $PM_{2.5}$) are at the PGP Northwest location as an alternative to high-volume air samplers due to the lack of a power source at that location; the Mini-Vol samplers allow measurements upwind of the Port Granby hamlet. As per CNL's Dust Management and Requirements Plan [72], the TSP filters results are assessed against an overriding limit of 120 $\mu g/m^3$ averaged over 24 hours. This limit

is adopted from Ontario's AAQC. An exceedance of this overriding limit triggers internal actions. Any TSP filter exceeding 100 µg/m^3, or the highest TSP sample measured during the week (if none are above 100 µg/m^3), is also analyzed for metals from each monitoring location. For $PM_{2.5}$, in 2012, the Canadian Council of Ministers of the Environment (CCME) adopted the Air Quality Management System as a new comprehensive approach to managing air issues [74]. Prior to that, the monitoring results for $PM_{2.5}$ 98th percentile were compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m^3. In 2020, a value of 27 µg/m^3 was published by CCME for fine particulate matter ($PM_{2.5}$).

Radiological air quality measurements include TSP, LLA, and radon. Levels of radionuclides are measured on the same TSP filters selected for metals analysis. Radionuclide analysis is carried out for natural uranium, natural thorium, thorium-230, thorium-232, radium-226 and lead-210. LLA is also measured daily at the perimeter locations generally downwind of remedial activities. The LLA results are reviewed daily to provide early indication of any unexpected or unusual levels of airborne radioactivity. Radon monitors are located along the perimeter of the LTWMF as well as at a distance from the LTWMF. Comparison of the baseline levels with the levels measured during the Construction and Development Phase and Maintenance and Monitoring Phase determines the levels associated with project activities.

As per the PHAI Radiation Protection Plan [75], a value of 0.5 Bq/m^3, averaged over the time period the sample was acquired, has been adopted as the investigative threshold for LLA in air measurements taken at work sites. The PHAI Radiation Protection Plan also established a limit of incremental average radon levels of 150 Bq/m^3 for the PHP LTWMF during phase 2 activities.

Comparison to EA predictions

The EA studies predicted TSP to be within Ontario's AAQC annual average of 60 µg/m^3 and the 24-hour AAQC of 120 µg/m [73] [3]. For $PM_{2.5}$ particulate emissions, the Canada-Wide Standard of 30 µg/m^3 is not expected to be exceeded at any receptor site, except for occasional slight exceedances along the very edge of the existing PGP WMF property boundary. The concentrations of particulate-bound metals are also predicted to be below 24-hour AAQC limits [73].

Likely effects on radiological air quality were assessed using an air dispersion model in the EA, and it was identified that predicted levels of radionuclides would be below Health Canada reference levels. The highest annual average predicted radon concentration was 5.1 Bq/m^3. Since the EA, CNL indicated that the predicted levels in the EA were set to an unachievable level and should be re-evaluated. CNL also noted that during the baseline study, different radon monitoring equipment was used for radon measurements and that it is not recommended for comparison to the current monitoring scheme which uses RSSI alpha-track detectors. In a memorandum to the CNSC, CNL defined the radon gas concentration of 150 Bq/m^3 as the base concentration and received approval in July 2014. Exceeding this concentration triggers follow-up actions such as ascertaining of dose to the public.

Atmospheric monitoring data for TSP from 2015 to 2020 is summarized below (see table 3.9). Between 68 and 248 samples at each location have been collected per year from each high-volume air sampler (TSP and $PM_{2.5}$) for the PGP site. The overriding limit of 120 µg/m^3 for TSP has been exceeded occasionally over the years. For instance, the TSP limit was exceeded from 2016 to 2020, with the highest number of exceedances representing 8% of total samples (e.g., in 2016 at the PGP Northwest location during a period of very dry and hot weather conditions).

Exceedances were attributed to a mixture of both onsite and offsite activities based on wind directions and dust exceedances observed by independent real-time dust monitoring. Appropriate follow-up actions were performed. The AAQC for $PM_{2.5}$ of 30 µg/m^3 (98th percentile averaged over 3 years) was exceeded occasionally over the monitoring period, as predicted in the EA. There was 1 exceedance of the AAQC [73] for iron in 2016 and for nickel in 2020. However, these exceedances were attributed to offsite activities. All radionuclides remained well below the Health Canada reference values. As the Construction and Development Phase is coming to an end at the PGP (as of 2022), particulate exceedances due to site activities are no longer expected.

For the independent dust monitoring, there were occasional exceedances of the 15-minute average AL of 120 µg/m^3 [72]. When exceedances occurred, the contractor used water as a dust suppressant, minimized dust-generating activities and worked to optimize dust mitigation practices. Although the dust AL was exceeded, there were no exceedances of the AAQC for metals or the Health Canada reference levels from the high-volume air samplers located at the perimeter of the controlled area on those days.

Radon measurements are taken monthly at the fenceline for a total of 7 locations at the PGP LTWMF and PGP WMF as a representative reading of doses to the public. Measurements were below the reporting AL of 150 Bq/m. For instance, the average radon measurement was 111 Bq/m^3 in 2020.

Findings

Based on the review of CNL's EA and the results of the atmospheric monitoring program for the PGP, CNSC staff have found that airborne emissions from the PGP often remained below the provincial standards and within the EA predictions; therefore, they are satisfied that ambient air quality remained at levels protective of human health and the environment. Exceedances due to the project activities of TSP and dust were followed up on appropriately, and all metals and radionuclides remained below their respective criteria. As the PGP is moving into the Maintenance and Monitoring Phase, the risks for atmospheric contamination during construction and development are no longer present and exceedances are not expected moving forward.

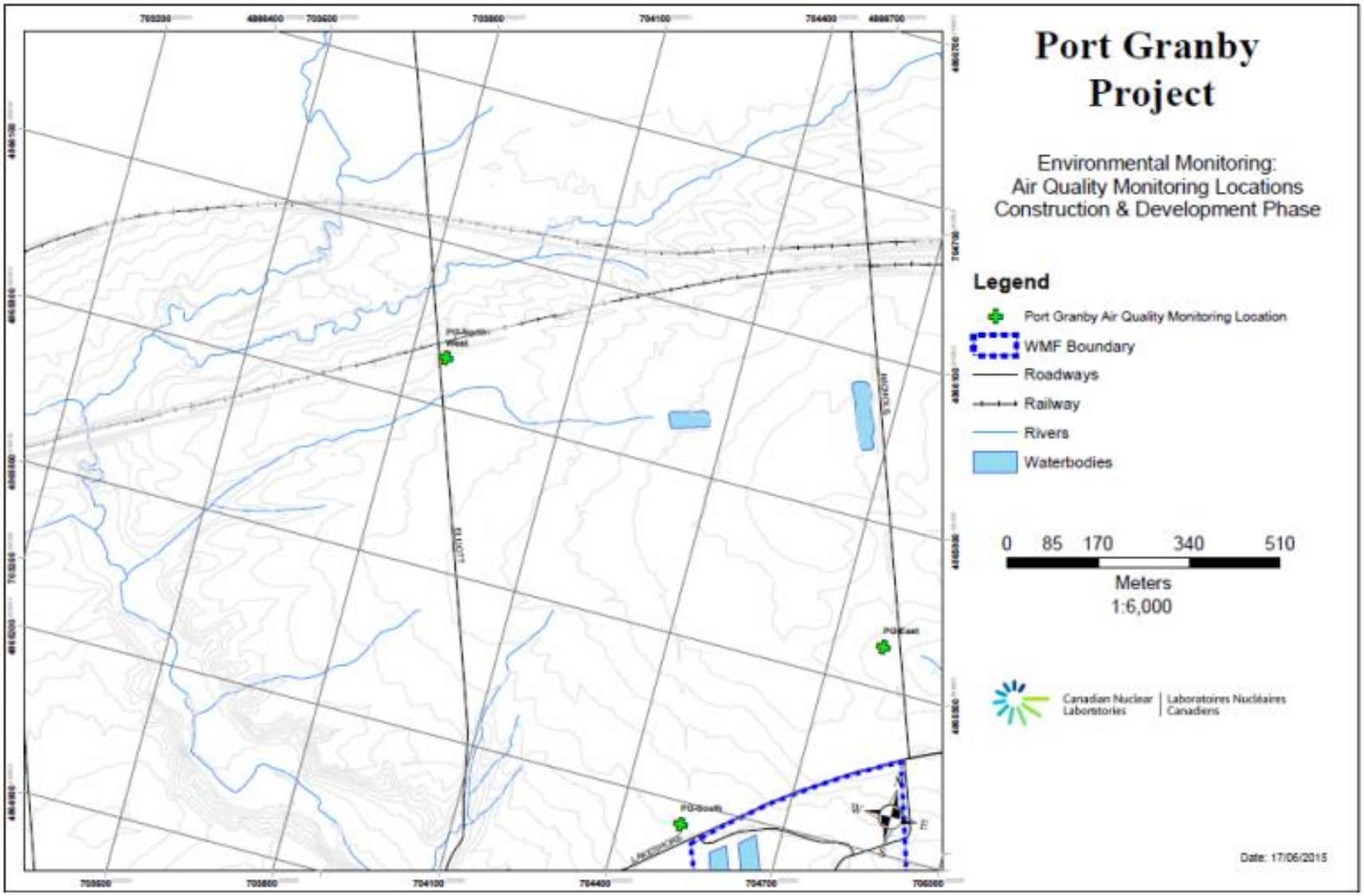
Table 3.9: Annual concentrations of TSP in ambient air as measured around the PGP LTWMF facility

Hi-Vol station		2015	2016	2017	2018	2019	2020	Overriding limits
PGP South	**Average* (µg/m^3)**	12	20	16	22	17	18	**120 µg/m^3 TSP** [48]
	Maximum (µg/m^3)	47	**166**	**170**	**223**	**161**	**184**	
PGP East	**Average* (µg/m^3)**	12	20	16	20	15	16	
	Maximum (µg/m^3)	48	**259**	**179**	**157**	71	56	
PGP Northwest	**Average* (µg/m^3)**	NA	23	16	17	17	14	
	Maximum (µg/m^3)	NA	**1392**	91	120	106	**271**	

*average presented as geometric mean

Bolded numbers indicate above overriding TSP limit of 120 µg/m^3 [48]

Figure 3.7: Air quality monitoring locations for the Construction and Development Phase of the Port Granby Project [40]



Noise monitoring

Noise monitoring takes place at 9 locations during the Construction and Development Phase, to capture potential noise levels from construction activity at locations surrounding the PGP WMF and PGP LTWMF. Continuous sound measurements using an integrated sound measurement meter are undertaken seasonally, 4 times per year, for 3 days in each season during anticipated times of peak construction activity. No noise monitoring will take place in the Maintenance and Monitoring Phase as there are no sources of noise associated with the PGP in this phase.

The guidance level of 70 decibels (dBA) (24-hour weighted average), as per the WHO Guideline for Community Noise [78], is used for the project, as construction activities are being limited to daytime hours.

Comparison to EA predictions

The EA studies predicted the worst-case hourly noise levels at maximum zones of influence to be 56 dBA at the PGP WMF and PGP LTWMF. There has been a general increase in noise levels unrelated to the project since the initial 2004 EA due to an increase in road and train traffic. Therefore, CNL has proposed that data from 2015 provides a better baseline as there was no outdoor construction in 2015. Baseline values from 2015 occasionally exceeded the 70 dBA WHO guideline [78]. Noise values since 2015 have been comparable to the 2015 baseline values.

Findings

Based on the review of CNL's EA and the results of the noise monitoring program for the PGP, CNSC staff found that noise levels from the PGP activities are comparable to baseline levels and, therefore, that noise remains at levels protective of human health.

Terrestrial and aquatic environment

Soil quality

The project is expected to have the beneficial effect of improving soil quality at cleanup sites through the removal of contaminated materials. Potential adverse effects would be expected on soil quality for areas beyond the excavation sites related to the accumulation of contaminants on surface soil from the airborne transport of soil and dust. Soil quality data is collected for comparison to the existing baseline soil quality data in these areas in order to identify any incremental increases. Soil monitoring around the site perimeters will be continued for a year following completion of remedial activities to demonstrate that any accumulation of soil contaminants that may have been observed over the Construction and Development Phase has ceased.

Comparison to EA predictions

Monitoring in surface soil at the PGP site perimeter is carried out annually at 5 locations: 4 at the LTWMF perimeter and 1 at the PGP WMF perimeter (see figure 3.8), for both radiological COPCs (e.g., radium-226) and hazardous COPCs (e.g., arsenic, uranium). A full list of monitored COPCs can be found in CNL's monitoring plan [40]. Soil monitoring results are compared to baseline values [48] and EA predictions.

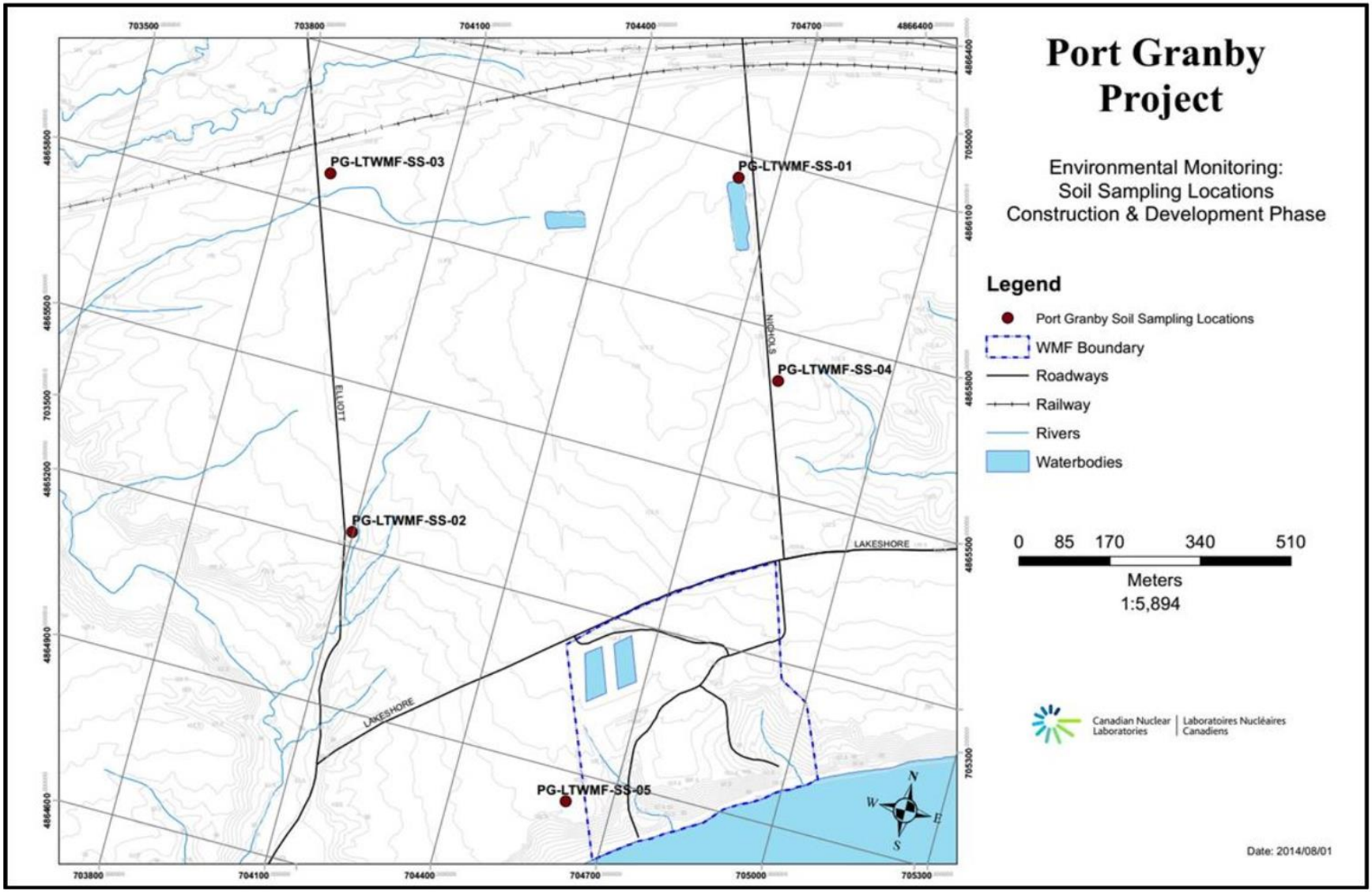
The EA studies predicted that the largest mean incremental concentrations of most radiological contaminants will be less than 20% of background at remediation sites. The exception is thorium-230, which is expected to increase 38% over baseline levels during the construction and development phase of the project. In 2021, soil concentrations of thorium-230 have remained consistent with baseline data.

Concentrations of all parameters are comparable to previous years' concentrations, indicating PGP activities are not having an adverse impact on soil quality from airborne transport of radiological and hazardous substances.

Findings

Based on the review of CNL's EA and the results of the soil monitoring program for the PGP, CNSC staff have found that soil surrounding the PGP activities is below the guidelines and within the EA predictions. Therefore, soil quality remains at levels protective of human health and the environment, and airborne transport of soil and dust from the project is not affecting the soil quality around the site. As the PGP is almost transitioned to phase 3 (as of 2022), impacts on soil due to project activities are not expected, moving forward.

Figure 3.8: Soil sampling locations for the Construction and Development Phase of the Port Granby Project [40]



Surface water quality

The EA follow-up activities with respect to surface water quality involve the collection and analyses of surface water samples at locations down-gradient of the PGP to:

- verify predicted improvements in surface water
- ensure that discharges are not deleterious to aquatic life
- verify reduction of contaminant loadings due to leachate discharging to Lake Ontario

Decreases in contaminant concentrations are not expected until the waste is remediated. At that point, water quality is expected to improve over the longer term as a result of the cleanup. Surface water sampling in Port Granby Creek and in Lake Ontario will be continued for a period of at least a year following completion of phase 2.

Surface water sampling in Port Granby Creek, a tributary of Port Granby Creek, and in Lake Ontario around the treated effluent discharge, is sampled quarterly throughout the Construction and Development Phase. There are 7 sampling locations: 2 in Port Granby Creek, 2 within the Port Granby Creek Tributary (flow permitting), and 3 in Lake Ontario (see figure 3.9). Lake Ontario samples include 1 sample near/at the diffuser in Lake Ontario, 1 sample 20 m west of the diffuser location and 1 sample 20 m east of the diffuser location. Many parameters are analyzed in surface water samples, ranging from general chemistry (e.g., hardness, TSS), total metals (e.g., arsenic, lead, uranium), radionuclides (e.g., radium-226, lead-210, thorium-230), and field-measured parameters (e.g., dissolved oxygen, temperature, turbidity). A full list of parameters can be found in CNL's monitoring plan [40].

The surface water results are compared to CCME [70] and PWQO [71]. CNL must also ensure that the discharge is not deleterious to the aquatic environment (fish) at the point of discharge; and appropriate monitoring must be employed to confirm this.

Comparison to EA predictions

The EA predicted that the removal of contaminated material at the existing PGP WMF site would result in a short-term increase in contaminant concentrations during the Construction and Development Phase. However, levels were not predicted to exceed criteria and overall the removal would provide a long-term improvement to down-gradient surface water quality. Concentrations of arsenic and uranium in the treated leachate plume in Lake Ontario were predicted to increase by approximately 70% due to an increased volume of leachate arising from collection and treatment of waste contact water during excavation. Concentrations are predicted to approach, but not exceed, chronic toxicity effect levels for aquatic invertebrates; concentrations are also not predicted to exceed effect levels for fish. Loadings to Port Granby Creek were predicted to increase slightly (6% or less). Water quality over the longer term is expected to return to baseline in Port Granby Creek and will be improved relative to baseline in Lake Ontario near the treated effluent discharge.

Results from quarterly samples in Port Granby Creek were generally consistent from 2015 to 2020, suggesting that construction of the PGP is not having an adverse effect on Port Granby Creek water quality. There have been occasional exceedances of the PWQO [71] over the monitoring period for some parameters. For instance, the PWQOs [71] and the CWQGs [71] [70] for iron were exceeded at the upstream locations in Port Granby Creek in January 2020. An offsite source is likely responsible for the elevated level as streams in the local study area exceeded water quality guidelines for fluoride and iron during the baseline monitoring. Such

exceedances are typical for agricultural/urban watersheds in the region, and iron is not a key COPC associated with the PGP. In the Lake Ontario samples, there were no exceedances of the PWQOs [71] or CWQGs [70], except for fluoride (which had only slight elevations over the monitoring years). Elevated fluoride concentrations are typical for the nearshore zone of the lake in this region and results were well under the Ontario drinking water quality standard of 1.5 mg/L [80]. Other monitoring results are generally consistent with the monitoring data for the past few years, suggesting that PGP operations are not having an adverse effect on Lake Ontario water quality.

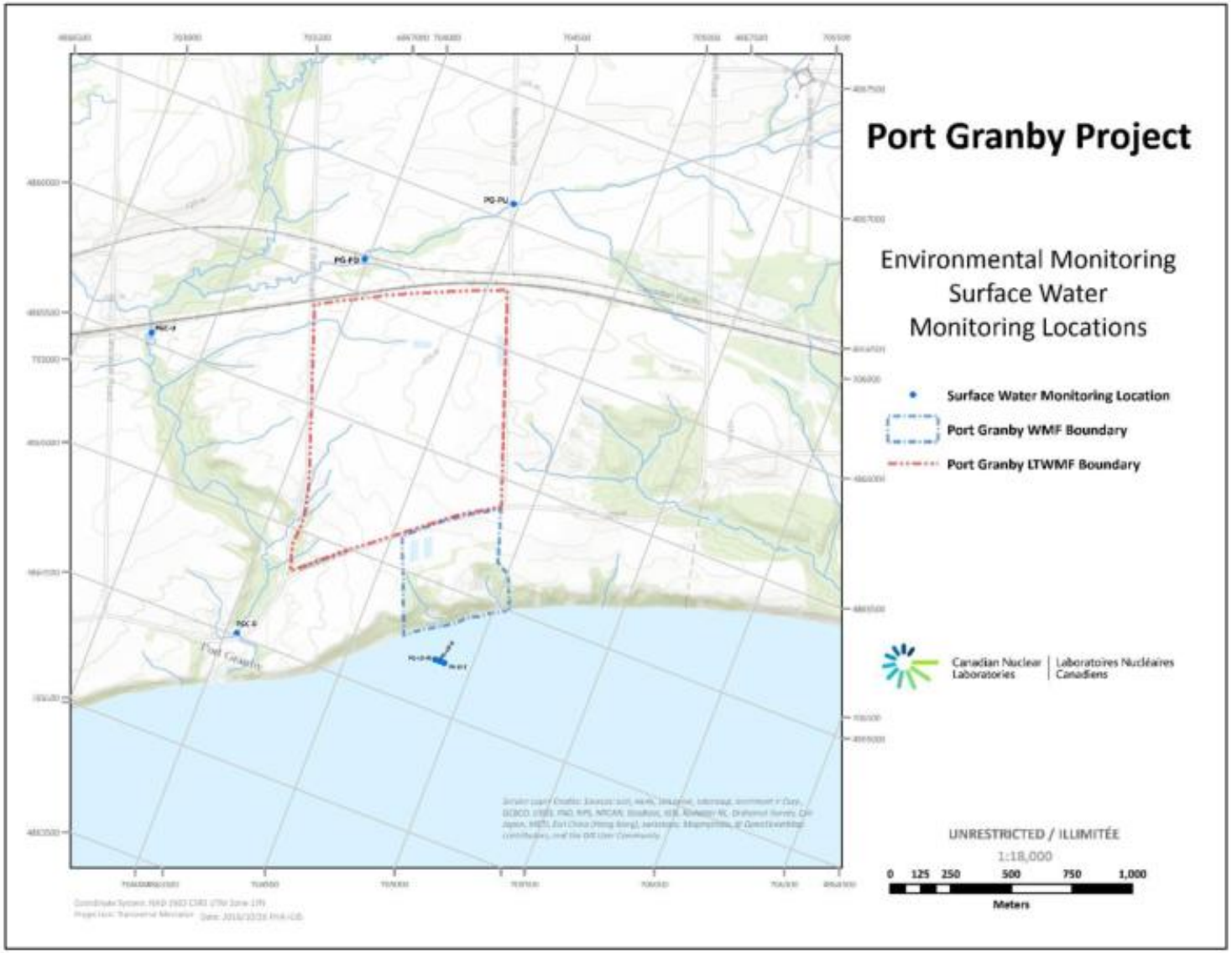
Table 3.10: Annual average concentrations of uranium in the Lake Ontario average surface water monitoring locations, in µg/L

Location	2015	2016	2017	2018	2019	2020	Limits
PG-LO-D	0.40	0.36	0.35	0.37	0.36	0.33	**PWQO: 5 µg/L** [71] **CWQG: 15 µg/L** [70]
PG-LO-E	0.39	0.36	0.36	0.37	0.35	0.34	
PG-LO-W	0.40	0.36	0.35	0.38	0.35	0.33	

Findings

Based on the review of CNL's EA and the results of the surface water monitoring program for the PGP, CNSC staff found that water quality from the PGP activities is below guidelines and within the EA predictions and, therefore, surface water quality remains at levels protective of human health and the environment (see table 3.10). Water quality will continue to improve as the PG WMF has been remediated.

Figure 3.9: Surface water monitoring locations for the Construction and Development Phase of the Port Granby Project [40]



Sediment quality

For the Port Granby Creek, no EA follow-up sediment quality monitoring during the Construction and Development Phase is required, unless receiving water quality monitoring suggests the possibility of sediment quality impairment. In that case, sediment monitoring would focus on depositional areas. If upset releases of suspended solids occur during the Construction and Development Phase, then biannual sediment sampling will take place during the first year of the Maintenance and Monitoring Phase of the PGP.

For Lake Ontario, during the Construction and Development Phase sediment quality samples are collected in the spring and fall in two locations along the Lake Ontario shoreline in the vicinity of the East and West Gorge and analyzed for radium-226, thorium-230, thorium-232, lead-210, and metals.

Arsenic has often exceeded the applicable provincial and federal sediment quality guidelines and several effect-based benchmarks at 2 locations with the exception of 2016, which was below guidelines and benchmarks. These results are likely due to natural sediment susceptibility to erosion which may lead to the brief deposition of near shore sediments with elevated levels of metals and radionuclides in Lake Ontario after every storm event. Sediment quality is expected to improve once remediation of the PGP site is complete. Monitoring will continue throughout the construction and development phase to evaluate the efficacy of mitigation measures intended to control off-site migration of contaminated wastes during excavation.

Findings

Based on the review of CNL's EA and the results of the sediment monitoring program for Lake Ontario at the PGP, CNSC staff have found that sediment quality was below guidelines for most parameters measured. CNSC staff are satisfied that sediment quality remains at levels protective of human health and the environment and sediment quality is expected to improve once remediation of the PGP site is complete.

Hydrogeological environment

Geology and groundwater environment

The Port Granby site (PGP LTWMF and PGP WMF) is located in the Lake Iroquois Plain physiographic region, south of the Oak Ridges Moraine and the former glacial Lake Iroquois shoreline. This is primarily a glaciolacustrine clay and sand plain that extends south to Lake Ontario. The surficial geology in the area around the site is primarily sand and gravel, with sandy silt to sand till glacial deposits. The main surface water features include Lake Ontario, as well as the Port Granby Creek and East Granby Creek.

Groundwater in the region generally flows south toward Lake Ontario, mimicking the ground surface topography and the top of bedrock trends. Aquifers are found in both the overburden (including sand and gravel) and the bedrock. The local shallow groundwater flow in the area north of Lakeshore road follows a west-to-east pattern towards Port Granby Creek, whereas flow in the area south of Lakeshore Road is in a more north-to-south pattern. All groundwater ultimately discharges into Lake Ontario.

Groundwater quality

Of the 39 groundwater wells to be monitored as part of the biophysical effects management program, 37 wells were suitable for monitoring in 2015 (see figure 3.10 for monitoring well locations). The groundwater wells were sampled on a quarterly basis in 2015. On the site of the PGP WMF, the groundwater quality is expected to be improved significantly once waste removal is completed.

Of the 39 groundwater wells to be monitored as part of the PGP Environmental and Biophysical Monitoring Plan [40], 4 have not been located on the PGP WMF since 2013, 3 were decommissioned in April 2016 due to the construction of the PGP LTWMF, and 11 located on the PGP WMF site have not been sampled since the remediation on the site commenced in 2016 due to ongoing construction and inaccessibility. The remaining 21 wells located around the PGP LTWMF were sampled on a quarterly basis from 2016 to 2020.

The sampling results (quarterly measurement and annual average) of the 21 wells for 2015 to 2020 were compared against the Water Quality Criteria for Potable Groundwater Conditions tabled in the PGP Screening Report [34], which is conservative since onsite water is not potable. In addition, results were compared to the EA predictions [69] and Ontario's groundwater standards [79]. Overall, sampling results for key COPCs have been consistently below the limits since 2015.

Drainage water quality

Drainage water is defined as runoff water and water contained within ditches (which may include groundwater discharging to a ditch) that does not support aquatic resources.

At the PGP LTWMF, drainage water samples were collected from 2 locations (PG-SW1 and PG-SW2) from 2015 to 2020. It should be noted that PGSW2/DP2-02 was not sampled from 2016 to 2020 as the existing pond had been removed as part of the site preparation work for the PGP LTWMF. The results of the sampling were compared against the PWQOs [71] and the CWQGs [70] and indicated that fluoride exceeded the CWQG at PG-SW1/DP1-02 from 2018 to 2020, and phosphorus exceeded CWQG from 2015 to 2020. However, exceedances had been observed in previous years for fluoride and phosphorus in drainage water prior to emplacement of the waste, and as such are not likely related to the operation of the facility. The rural nature of the site and the associated farming activities would likely contribute to the elevated phosphorus levels in the pond.

Operational groundwater monitoring

Operational wells on the PGP WMF were used to detect any migration of contaminants from the PGP WMF via the groundwater pathway. Twelve of 17 available observation wells were sampled in October 2015. Each groundwater sample was analyzed for concentrations of radium-226, arsenic, uranium, fluoride, nitrate and ammonium. The elevated concentration of the contaminants in groundwater is a result of the existing PGP WMF, which does not have an engineered liner or cover system in place. These elevated levels are expected to decline following the remediation. The operational groundwater wells were decommissioned in 2016 as they were located within or adjacent to the PGP WMF excavation areas. The re-installation of these wells will be evaluated in the Maintenance and Monitoring Phase after the remediation and final grading of the sites are complete.

Groundwater seepage monitoring (bluff)

Bluff seepage to Lake Ontario is occurring along the midpoint of the bluffs below the PGP WMF. This seepage, consisting of shallow groundwater flow from a till layer, is estimated at the rate of 51,100 m^3 per year [69]. A sampling program of typical seepage water from the south bluffs was initiated in 2010 at the request of the CNSC.

Seepage from the south bluffs is sampled quarterly from 3 locations (PG-S-1, PG-S-2, and PG-S-3) along the Lake Ontario bluffs between the East George and West George (see figure 3.10), accessibility and other conditions permitting. Sampling from PG-S-3 was not conducted in October 2020 due to limitations from accessibility and will be ceased in the future.

The sampling results [19] during the monitoring period indicates that the sampled contaminant concentrations fluctuate over time and that some contaminants have been decreasing since 2015. There are elevated levels of fluoride, arsenic, uranium and nitrates that are above Ontario's PWQO [71] and/or the CWQG [70]. Contaminants being released to Lake Ontario through bluff seepage are expected to decrease over time as the PGP WMF has been remediated. Surface water sampling for bluff seepage will continue for at least a year following completion of the LTWMF. Subsequently, if bluff seepage water quality is at baseline or improved relative to baseline, as expected, then both the sampling frequency analytical parameters will be reduced.

Residential wells

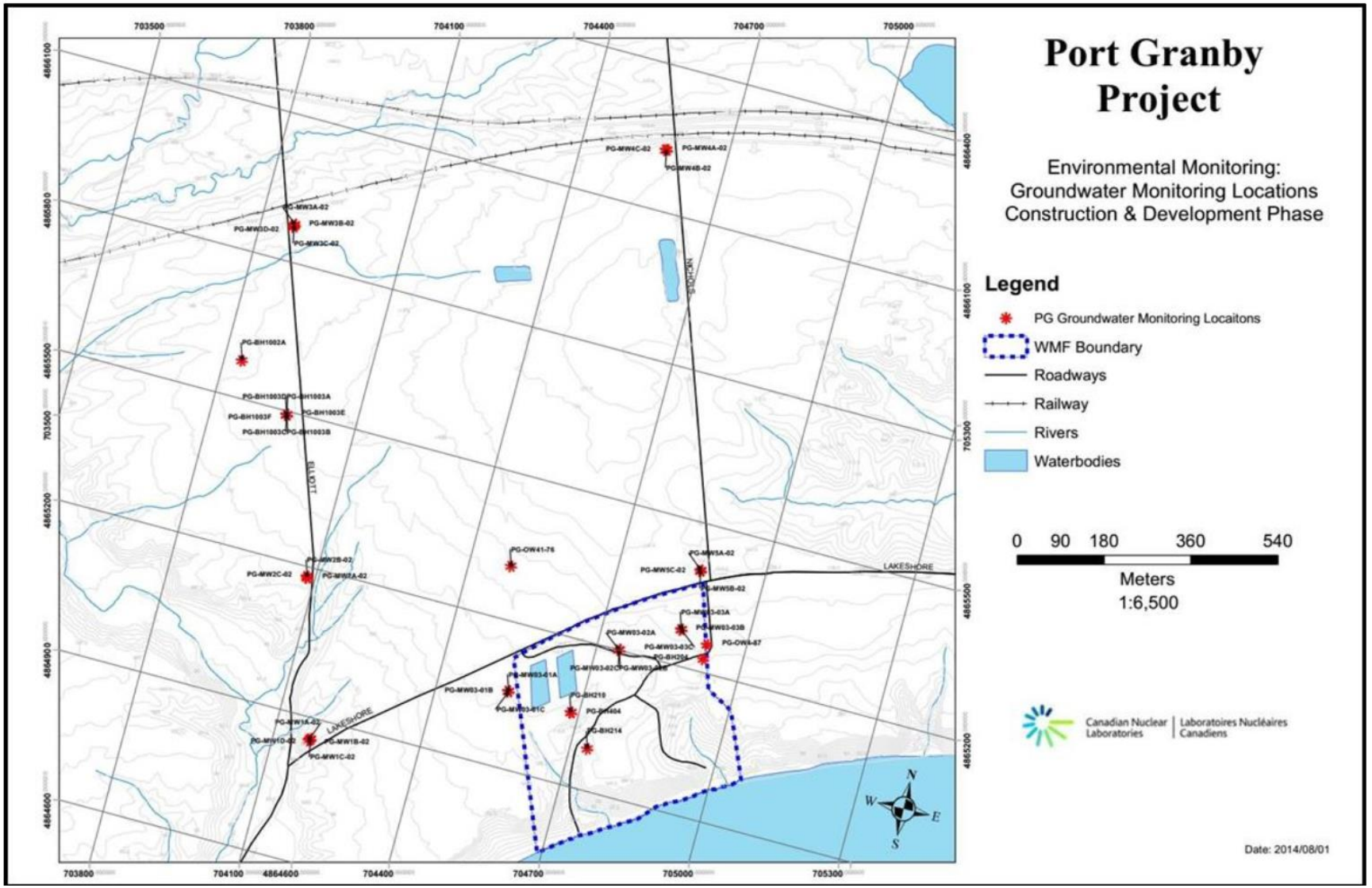
The PGP LTWMF and the WMF site is in the southern portion of the Municipality of Clarington and the south western portion of the Municipality of Port Hope. The majority of residents in this area depend on private wells for their water supply. All of these private wells are located up gradient of the WMF. It is not expected the site would have impact on the residential wells. There are no actively used private water wells in the immediate area of the PGP LTWMF and the PGP WMF [69].

Geotechnical monitoring program

The contractor and CNL have conducted geotechnical inspections and monitoring (including instrument monitoring and regular visual observations) in order to provide continued assurance that erosion does not threaten the integrity of the waste storage area during the remaining lifetime of the PGP WMF site. Weekly and monthly geotechnical reporting ceased in 2020 as they were no longer required [19].

Some surface sloughing occurred in areas of exposed soil with high water content. Minor sloughing was repaired using rip-rap, silt fencing and/or clean fill as required

Figure 3.10: Groundwater monitoring locations for the Construction and Development Phase of the Port Granby Project [40]



Human environment

An assessment of the human environment at the PGP site consists of identifying representative persons located within or in proximity to the site and determining whether they could be exposed to radiological or hazardous COPCs, such as by breathing the air, being on the land, drinking and swimming in surface water, and eating plants, fish and wildlife from the area. In general, human receptors may be exposed to contaminants through 4 primary routes: dermal (i.e., skin), inhalation, incidental ingestion (e.g., soil) and ingestion of food and water. Representative persons are those individuals who, because of their location and habits, are likely to receive the highest exposures to radiological or hazardous substances from a particular source and therefore potentially have their health harmed by these exposures.

The EA [69] reviewed the project works and activities to determine the potential of each to interact with the existing human health and safety components of the environment. Each interaction was evaluated to identify if it would result in a measurable change to the environment. Residents adjacent to the PGP during construction and development were determined to be the most exposed individuals for potential radiological and hazardous contaminant exposures.

Exposure to radiological substances

The *Radiation Protection Regulations* [46] prescribe radiation dose limits to protect workers and the public from exposure to radiation from licensed activities. Doses are either monitored by direct measurement or by estimates of the quantities and concentrations of any nuclear substance released as a result of the licensed activities. The annual effective dose limit for a member of the public is 1 mSv per year.

At the PGP, dose to the public is determined through calculation of exposures based on fenceline TLDs and radon monitors around the PGP, as well as accounting for estimated time spent in proximity to these fences daily. The highest predicted radiation dose to the public as a result of the PGP was 0.12 to 0.15 mSv/y (upper bound dietary intakes) for an adjacent resident child and infant. This dose is within 15% of the CNSC public dose limit of 1 mSv/y

Results from monthly and quarterly deployment of environmental radon monitors and TLDs confirm that a public doses from 2012 to 2020 were significantly less than the annual public dose limit (see table 3.11).

Table 3.11: Estimated annual public doses for the PGP

Percentage of public dose limit										
Public dose limit (µSv)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
1,000	1% (7.2 µSv/a)	1% (8.4 µSv/a)	1% (6.6 µSv/a)	<1% (8.4 µSv/a)	<1% (5.43 µSv/a)	<1% (5.71 µSv/a)	2% (20 µSv/a-)	<4% (39.6 µSv/a)	2% (20 µSv/a)	4.1% (41 µSv/a)

Exposure to hazardous substances

In the EA [69], each of the PGP LTWMF works and activities was reviewed to consider its potential to interact with human health. Air quality was considered in the evaluation for potential effects. Dispersion modelling indicated that there would be measurable changes in the concentrations of PM_{10}, and $PM_{2.5}$ at all adjacent residential locations. However, air quality modelling also predicts that all 24-hour average concentrations of PM_{10}, and $PM_{2.5}$ would be below the established criteria. Similarly, measurable changes in CO, NO_2 and SO_2 were predicted, but no exceedances of established ambient air quality criteria for any of the parameters at any residential location are expected. The EA predicted that no unacceptable health risks would occur as a result of the project works and activities. However, EA follow-up monitoring includes monitoring for TSP and $PM_{2.5}$ to ensure levels remain protective of human health.

Findings

Estimated radiological doses to the public remain well below the annual public dose limit of 1 mSv per year, indicating that radiological releases from the PGP pose a negligible risk to human health (i.e., potential risk to humans is similar to health outcomes in the general public).

With respect to hazardous substances, CNSC staff's findings indicate that hazardous releases from the PGP pose a negligible risk to human health (i.e., potential risk to humans is similar to health outcomes in the general public).

Based on assessments of the PGP, including the review of the annual reports and annual environmental monitoring data, CNSC staff have found that impacts to the human environment from radiological and hazardous substances released from the PGP are negligible, and that people living and working near the facility remain protected. As the PGP is moving into phase 3, potential effects from project activities are expected to decrease.

4.0 CNSC Independent Environmental Monitoring Program

The IEMP implemented by the CNSC is meant to add to the body of evidence that Indigenous peoples, the public and the environment around licensed nuclear facilities are protected and that there are no anticipated health impacts. It is separate from, but complementary to the CNSC's ongoing compliance verification program. The IEMP involves taking samples from public areas around the facilities and measuring and analyzing the amount of radiological and hazardous substances in those samples. CNSC staff collect the samples and send them to the CNSC's laboratory in Ottawa for testing and analysis.

4.1 IEMP at the PHAI sites

CNSC staff conducted IEMP sampling around the PHAI sites in 2013, 2014, 2017 and 2019. The sampling plan focused on radiological and hazardous contaminants and took into consideration CNL's environmental monitoring program and the CNSC's regulatory knowledge of the site.

In 2019, the most recent campaign, CNSC staff collected the following samples in publicly accessible areas outside the perimeter of the PHAI sites:

- water (15 locations)
- sediment (4 locations)

Samples were analyzed by qualified laboratory specialists in the CNSC's laboratory, using appropriate protocols. CNSC staff measured radionuclides (i.e., radium-226, uranium), hazardous substances (i.e., arsenic, ammonia), phosphorous, pH and total dissolved solids in the collected samples.

Figure 4.1 provides an overview of the sampling locations for the 2019 IEMP sampling campaign around the PHAI sites. The IEMP results were published on the CNSC's PHAI IEMP dashboard [81].

Figure 4.1: Overview of the 2019 sampling locations [22]

4.2 Indigenous participation in the IEMP

It is a priority for the CNSC that IEMP sampling reflect Indigenous traditional land use, values and knowledge, where possible. In 2019, in advance of the IEMP sampling campaigns at the PHAI sites, notification emails were sent to all Indigenous Nations and communities near Port Hope and Port Granby, inviting suggestions for species of interest, valued components or potential sampling locations where traditional practices and activities may take place.

CNSC staff did not receive any comments specific to the 2019 IEMP at the PHAI sites. The CNSC is committed to engaging with Indigenous Nations and communities and will collaborate with interested Nations and communities for the upcoming campaign, tentatively planned for 2023.

4.3 Summary of results

The levels of radium-226, uranium, arsenic, ammonia, phosphorous, pH and total dissolved solids in all the water and sediment samples measured during the 2019 IEMP sampling campaign were below available guidelines and CNSC screening levels and were similar to the range of results from the 2013, 2014 and 2017 IEMP sampling campaigns for the PHAI sites. Results for all PHAI campaigns are published on the CNSC website [81].

The IEMP results add to the body of evidence that Indigenous Nations and communities, the public and the environment in the vicinity of the PHAI sites are protected and that there are no anticipated health impacts from operations at the facilities. These results are consistent with those submitted by CNL and reviewed by the CNSC's environmental protection staff, demonstrating that the licensee's environmental protection program protects the health and safety of people and the environment.

5.0 Health studies

The following section draws from the results of regional, national and international health studies, reports and publications to provide further independent verification that the health of people living near or working at CNL's PHAI sites is protected. Various organizations and institutions in Ontario—such as Cancer Care Ontario; Public Health Ontario; the Haliburton, Kawartha, Pine Ridge District Health Unit; and the Durham Region Health Department—monitor the health of local and surrounding populations.

To complement the CNSC's regulatory oversight, CNSC staff continuously work towards strengthening relationships with the various health units and offices. CNSC staff also keep abreast of any new publications and data related to the health of populations living near or working at diverse nuclear facilities. Lastly, CNSC staff, at times, conduct health studies on select populations through their research on the effects of low dose (and low dose-rate) exposures. Select community and Canadian publications are discussed below. Additional information on health studies related to nuclear facilities is available on the CNSC web page on health studies [82].

5.1 Population and community health studies and reports

The PHAI sites are situated in Northumberland County, where Port Hope is located, as well as in Durham Region, which encompasses Port Granby and Clarington. Information about these regions is captured by their respective health districts—the Haliburton, Kawartha, Pine Ridge District Health Unit and the Durham Region Health Department—as well as more broadly by the statistics reported by Cancer Care Ontario. It is important to note that Durham Region is largely urban, and health statistics may not be as representative of Port Granby, a rural area within the region.

5.1.1 Haliburton, Kawartha, Pine Ridge District Health Unit

The Haliburton, Kawartha, Pine Ridge (HKPR) District Health Unit routinely monitors the prevalence of known risk factors and the health status of residents within the health district. Existing provincial cancer incidence, mortality and risk factor databases are used for disease and risk factor surveillance and health planning.

The most recent community health summary (2020) and profile (2017) examine health outcomes and factors that affected the health of people living in areas serviced by the HKPR District [83] [84]. Reports use data from a variety of sources, including from the Ontario Ministry of Health and Long-term Care, Public Health Ontario, the Canadian Cancer Care Registry, and the Canadian Community Health Survey. The leading causes of mortality in 2015 for the HKPR District and for Ontario were cancers, circulatory diseases (e.g., heart attack, heart disease and stroke) and respiratory diseases (e.g., influenza, pneumonia and chronic obstructive pulmonary disease). The age-standardized mortality rate from overall preventable causes in 2015 in the HKPR District was higher than in Ontario for preventable injury mortality, but not significantly different for preventable cancer mortality. This may reflect limited medical access (e.g., screening) given the rural characteristics of much of the area. While cancer incidence rates were similar to the rates for Ontario from 2012 to 2014, higher lung cancer incidence was observed. This may be due to generally higher smoking rates in the HKPR District compared to Ontario.

5.1.2 Durham Region Health Department

The Durham Region Health Department (DRHD) routinely monitors the health status of Durham Region using health indicators and health data from sources such as hospitals and laboratories, among other record-storing facilities and databases.

The DRHD publishes an overview report through the Health Neighbourhood Project [85], which examines information for 50 health neighbourhoods in Durham Region. The report provides a picture of how health varies among communities and includes demographic and health indicators. As expected, due to Durham Region's diverse population, with a mix of urban and rural populations, Durham Region's performance compared to the province of Ontario is better or poorer, depending on the health indicator. For example, Durham Region has a higher prevalence of diabetes and lung disease (including chronic obstructive pulmonary disease) compared to Ontario, whereas life expectancy and reported cancer screening levels are higher than the province of Ontario.

The DRDH has also published community health reports that specifically examined mortality [86] and cancer incidence [87] in Durham Region. The reports use data collected by the Office of the Registrar General, Service Ontario, and from the Ontario Cancer Registry. The leading causes of mortality in Durham Region and in Ontario from 2010 to 2012 were heart disease, lung cancer and dementia, which accounted for close to a third of all deaths. The most common cancers in males were prostate, lung and colorectal, accounting for half of new cancer cases. In females, breast, lung and colorectal cancer made up half of new cancer cases. This is similar to cancer incidence statistics for the general Canadian population [88].

5.1.3 Cancer Care Ontario

Cancer Care Ontario, through its Ontario Cancer Profiles [89], provides interactive map-based dashboards that display key public health indicators including cancer incidence, mortality and risk factors. Major risk factors for cancer development include physical inactivity, excess body weight or obesity, smoking, poor diet, and excessive alcohol consumption. Regional statistics are available by public health unit and the Local Health Integration Network (LHIN). The PHAI sites lie within the Central East LHIN, encompassing a large area that includes Northumberland County and Durham Region.

In 2018, the Central East LHIN, the HKPR District Health Unit and the DRHD had similar incidence and mortality rates for all cancers combined compared to Ontario. Incidence rates for lung cancer for both sexes and lung cancer mortality rates in females were higher in the HKPR District Health Unit. From 2015 to 2017, the rates for alcohol consumption and sedentary behaviour were higher for the HKPR District Health Unit and the DRHD than for Ontario. Rates for smoking and excessive body weight were significantly higher for the HKPR District Health Unit.

The Cancer Risk Factors Atlas of Ontario [90] outlines geographic distribution patterns of risk factors related to cancer and other chronic diseases in LHINs. From 2000 to 2014 within the Central East LHIN, alcohol consumption and excess body weight were higher around the PHAI sites compared to the Ontario average. While the “current” smoking status was similar to Ontario’s, the “ever-smoked” status was significantly higher. Inadequate fruit and vegetable consumption was also higher among males in the region compared to Ontario. These findings are supported by an additional report, Cancer Risk Factors in Ontario [91], specific to healthy weights, healthy eating and active living.

5.1.4 Findings

The review of health reports is an important component for ensuring that the health of people living near nuclear facilities is protected. The population and community health studies and reports indicate that common mortality causes among the populations surrounding the PHAI sites include circulatory and respiratory diseases, cancers and dementia. This is similar to the rest of Ontario and Canada, where heart disease and cancers are the 2 leading causes of death [92]. Major health risk factors such as smoking, excess body weight, alcohol consumption, physical inactivity, and poor diet may account for the occurrence of these diseases and play a contributing role in disease patterns across the province of Ontario.

5.2 Studies of radiation health effects – living near or working at CNL's PHAI sites

Several environmental and epidemiological studies have been conducted to assess the potential contamination effects in the Port Hope community over the last 70 years. The lines of evidence from these studies support each other and reveal that the levels of exposure in local area residents and workers are low, and that there is no evidence of adverse health effects resulting from past and present nuclear operations or activities in the region. These findings are consistent with the international scientific understanding of radiation effects on human health and with other studies examining similar populations worldwide.

5.2.1 Understanding health studies and risk assessments conducted in the Port Hope community from the 1950s to the present

In 2009, the CNSC created a synthesis report [93], which identified and summarized the scientific information needed to understand and assess the health effects of the past and present radium and uranium refining and processing activities in Port Hope.

The cancer incidence rates of Port Hope residents have been analyzed over the last 30 years through 5 descriptive ecological epidemiological studies. Overall, cancer incidence in local residents for all cancers combined was comparable with the general population of Ontario and Canada, and other similar communities. The most common types of cancer in Port Hope were lung, colon and rectum, breast and prostate. This is consistent with the rest of the province and the entire country. Port Hope residents, especially women, had a significant excess of lung cancer. This pattern was seen for the whole Northumberland County and is consistent with the known main risk factor of lung cancer (tobacco smoking) within the community. The rate of all childhood cancers was comparable with the general Ontario population, including leukemia.

The 5 descriptive ecological studies also examined the residents' mortality over the last 50 years. The leading causes of death in Port Hope were circulatory disease, cancer and respiratory disease. This finding was consistent with the rest of Ontario and Canada. Port Hope residents had a statistically significant excess of circulatory disease, especially heart disease. This pattern was also seen for the whole Northumberland County and is consistent with the known main risk factors of disease within the community. Mortality from all types of cancer was comparable to that for the general Ontario population. The leading causes of cancer death were cancers of the lung, colon and rectum, breast and prostate, which was consistent with the general trend in the provincial and national population, and with the rates of cancer incidence in Port Hope. All childhood cancer mortality was comparable with that for the general population of Ontario, as was mortality from congenital anomalies (birth defects).

5.2.2 Use of a weight of evidence approach to determine the likelihood of adverse effects on human health from the presence of uranium facilities in Port Hope, Ontario

In 2011, CNSC staff used a weight of evidence approach to assess the types and levels of contaminants of concern in the environment and the potential human exposure to these contaminants [94]. Their toxicological and radio-toxicological properties were also assessed to determine their potential health effects. The results of these assessments were further compared to findings of earlier epidemiological studies of Port Hope residents and nuclear industry workers.

The conclusions of this study indicated that levels of exposure to radioactive and non-radiological contaminants in Port Hope are below levels known to cause adverse health effects. Further, epidemiological studies provide no evidence of health effects resulting from past and present activities of the Port Hope nuclear industries. These findings are consistent with ERAs completed for nuclear facilities in Port Hope and results of over 40 epidemiological studies conducted elsewhere on populations living around similar facilities or exposed to similar environmental contaminants.

5.2.3 An ecological study of cancer incidence in Port Hope, Ontario from 1992 to 2007

In 2013, CNSC staff studied cancer incidence rates in Port Hope for a 16-year period (1992–2007) for continued periodic cancer incidence surveillance of the community [95]. The cancer incidence in the local community for all cancers combined was similar to that for the Ontario and Canadian population. No statistically significant differences in childhood cancer, leukemia or other radiosensitive cancer incidence were observed when compared to rates for populations of similar socio-economic characteristics. The study indicated that large differences in cancer incidence are not occurring in Port Hope compared to other similar communities and the general population.

5.2.4 Mortality (1950–1999) and cancer incidence (1969–1999) of workers in the Port Hope cohort study exposed to a unique combination of radium, uranium and gamma-ray doses

In 2013, CNSC staff conducted a study looking at cancer incidence and mortality among workers exposed to radium, uranium and gamma-ray doses in the Port Hope community [96]. Mortality (1950–1999) and cancer incidence (1969–1999) from exposures to these radiation types were examined in a cohort of workers from the Port Hope radium and uranium refinery and processing plant, which continues to operate today as Cameco Corporation’s PHCF. Overall, the study demonstrated that workers had lower mortality and cancer incidence compared with the general Canadian population.

5.2.5 Findings

The environmental and epidemiological studies conducted in Port Hope support each other and lead to the conclusion that the low levels of radiological and non-radiological environmental exposures within the Port Hope region resulting from the radium and uranium industry have not caused any adverse effects on human health.

5.3 Current scientific understanding of radiation health effects

The current scientific knowledge of the sources, effects and risks of ionizing radiation is reviewed and published by international experts at the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) [97]. This information comes from many population studies, animal and cell studies, and clinical investigations. These studies build the foundation of the knowledge about the relationship between radiation exposure and health effects, such as cancer. This knowledge, in turn, informs the recommendations of the International Commission on Radiological Protection (ICRP) [98], which are focused on the protection of human health.

5.3.1 Radiation epidemiology

The epidemiological evidence of radiation-related health effects comes from several main research populations. These populations include the lifespan studies of the atomic bomb survivors [98], people involved in the Chernobyl disaster [97] [99], patients treated with radiotherapy for cancer and non-cancer diseases [100], miners exposed to radon and radon decay products [101] [102], and nuclear energy workers [96] [103] [104] [105].

Two major findings consistent within all these studies are:

- excess risk of cancer increases as radiation dose increases
- statistically significant population effects are typically observed at doses above approximately 100 mSv (either acutely or chronically exposed)

Importantly, the absence of statistically significant data does not indicate the absence of risk. To put these findings into perspective, 100 mSv is much higher than the average Canadian natural background of 1.8 mSv per year, which varies between 1 and 4 mSv/y [106]. Similarly, 100 mSv is much higher than the average doses experienced by workers at the PHP and PGP (less than 1 mSv/y) and the public living nearby (less than 0.04 mSv/y).

5.3.2 Radiation exposure and cancer incidence (1990 to 2008) around nuclear power plants in Ontario, Canada (RADICON)

In 2013, the CNSC conducted a study on radiation exposure and cancer incidence around Ontario nuclear power plants. The RADICON study determined radiation doses to members of the public living within 25 kilometres of the Pickering, Darlington and Bruce nuclear power plants, and compared cancer cases of this population with the general population of Ontario from 1990 to 2008 [107].

A main finding of the study was that there was no evidence of childhood leukemia clusters around the 3 Ontario nuclear power plants, and no consistent pattern of cancer across the populations in question. Some types of cancer were higher than expected, but, in other cases, they were lower or no different. Although this study detected variations for all cancers combined and for radiosensitive cancers, the pattern was found to be within the natural variation of cancer in Ontario.

5.3.3 International Nuclear Worker Study

The largest and most relevant study on nuclear energy workers is the International Nuclear Worker Study, a multinational cohort study that assessed cancer risk from 1943 to 2005 in 308,297 workers from the nuclear industry in France, the United Kingdom, and the United States [108] [109] [110] [111]. The series of studies provides strong evidence of a linear relationship between radiation exposures and cancer risk. The results are consistent with the current radiation protection system, whereby dose limits are set conservatively, below levels where adverse health effects are expected.

5.3.4 Findings

Experts worldwide study radiation health effects to provide objective scientific evidence that support the CNSC's environmental and radiation protection programs for ensuring that workers and members of the public are protected. The current international understanding is that very low exposures of radiation result in very low risks to health, indiscernible from the natural variation of disease. CNSC staff are confident that those living near and working at any nuclear facility in Canada are adequately protected.

5.4 Summary of health studies

Reviewing and conducting health studies and reports comprise an important component of ensuring protection of the health of people living near or working at nuclear facilities. CNSC staff have considered the most recent international radiation epidemiology reports and the CNSC's own information and scientific publications, as well as various community, provincial and national-level studies and reports to inform their evaluation of the health of populations living or working near the PHAI sites.

The population and community health studies and reports indicate that cancer incidence and mortality rates, as well as the prevalence of specific health indicators and risk factors related to cancer, are largely consistent with the population of Ontario. The current understanding of the risks associated with radiation exposures is supported by the publications by international agencies like UNSCEAR and the ICRP, as well as academics and researchers worldwide. Very low exposures of radiation result in very low risks to health, indiscernible from the natural variation of disease.

The health studies and reports presented in this section provide a snapshot of the health of people living near the PHAI sites. Based on the assessed exposure and health data, CNSC staff have not observed and do not expect to observe any adverse health outcomes attributable to the remediation of the PHAI sites.

6.0 Other environmental monitoring programs

Several monitoring programs are carried out by other levels or bodies of government and are reviewed by CNSC staff to confirm that the environment and the health of persons around the facility in question are protected. A summary of the findings of these programs is provided below.

6.1 National pollutant release inventory

Environment and Climate Change Canada operates the National Pollutant Release Inventory (NPRI) [112], which is Canada's public inventory of pollutant releases, disposals and transfers, tracking over 320 pollutants from over 7,000 facilities across the country. Reporting facilities include factories that manufacture a variety of goods; mines, oil and gas operations; power plants; and sewage treatment plants. Information that is collected includes:

- releases from facilities to air, water or land
- disposals at facilities or other locations
- transfers to other locations for treatment and recycling
- facilities' activities, locations and contacts
- pollution prevention plans and activities [113]

CNSC staff conducted a search of the NPRI database and found that 5 facilities in the Port Hope area, including CNL's Port Hope Radioactive WMF and CNL's Port Granby WMF in Clarington, report to the NPRI. While reviewing the data, CNSC staff did not notice any trends or unusual results. It is also worth noting that radionuclides are not included in the inventory of pollutants in the NPRI database. The CNSC receives radionuclide loadings from the licensees through other means; that is, annual and quarterly reports. This information has been used in this report, but the complete dataset is available for download on the CNSC's Open Government Portal [114].

7.0 Findings

This EPR report has focused on items historically of interest to Indigenous, public and regulatory interest, including physical stressors, and airborne and waterborne releases from ongoing operations at the PHAI sites.

CNSC staff's findings from this EPR report may inform and support staff recommendations to the Commission in future licensing and regulatory decision making that pertain to the PHAI sites. These findings are based on CNSC staff's reviews of documents associated with CNL's PHAI, such as those related to the submitted environmental documentation and the conduct of compliance verification activities, including the review of annual and quarterly reports, and onsite inspections. CNSC staff also reviewed the results from various relevant or comparable health studies, and other environmental monitoring programs conducted by other levels of government, to substantiate their findings. CNSC staff also conducted IEMP sampling around the PHAI sites in 2013, 2014, 2017 and 2019.

Based on CNSC staff's assessment of CNL's documentation, CNSC staff have found that the potential risks from physical stressors, as well as from radiological and hazardous releases to the atmospheric, aquatic, terrestrial and human environments from the PHAI sites are negligible.

The potential risks to the environment from these releases or stressors are similar to natural background, and the potential risks to human health are indistiguishable from health outcomes in the general public. Therefore, CNSC staff have found that CNL has and will continue to implement and maintain effective environmental protection measures to adequately protect the environment and the health of persons. CNSC staff will continue to verify and ensure that, through ongoing licensing and compliance activities and reviews, the environment and the health of persons are protected.

ABBREVIATIONS

AAQC	Ambient Air Quality Criteria
AECL	Atomic Energy of Canada Limited
AL	action level
CCME	Canadian Council of Ministers of the Environment
CEAA	*Canadian Environmental Assessment Act* (1992)
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CMD	commission member document
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
COPC	contaminant of potential concern
CSA	Canadian Standards Association (former name of CSA Group)
CWQG	Canadian Water Quality Guidelines
dBA	a-weighted decibels
EA	environmental assessment
EBRL	exposure-based release limits
EMP	environmental monitoring program
EP	environmental protection
EPP	environmental protection program
EPR	environmental protection review
ERA	environmental risk assessment
DRHD	Durham Region Health Department
HKPR	Haliburton, Kawartha, Pine Ridge
IAA	*Impact Assessment Act of Canada*
ICRP	International Commission on Radiological Protection
IDMP	independent dust monitoring program
IEMP	independent environmental monitoring program
LCH	licence conditions handbook
LHIN	local health integration network
LLA	long-lived alpha
LLRW	low-level radioactive waste
LTWMF	long-term waste management facility

OMOE	Ontario Ministry of the Environment (Former)
NPRI	national pollutant release inventory
NSCA	*Nuclear Safety and Control Act*
MDMER	*Metal and Diamond Mining Effluent Regulations*
MECP	Ministry of the Environment, Conservation and Parks
MOU	memorandum of understanding
mSv	millisievert
PHAI	port hope area initiative
PHP	port hope project
$PM_{2.5}$	fine particulate matter
PWQO	provincial water quality objectives
ROR	regulatory oversight report
TLD	thermoluminescent dosimeter
TSP	total suspended particulate
TSS	total suspended solids
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
VC	valued component
WHO	World Health Organization
WMF	waste management facility
WTP	water treatment plant
WWTP	waste water treatment plant

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Appendix A – Activities under the current Port Hope EA follow-up program [37]

Environmental component	Activity and objective(s)	Sampling locations	Parameters
Atmospheric Environment	Air quality will not have residual adverse effects with mitigation measures	Offsite and public receptor locations	AS, Co, PM_{10}, $PM_{2.5}$ and NO_2
	Odours not to have residual adverse effects with mitigation measures	Highland Drive Landfill and Port Hope Harbour	Odour analysis
	Noise impacts will comply with by-laws remaining under 67 dBA	LTWMF, Alexander Ravine and Strachan Street	Noise levels
	Radiological effects from Rn gas concentration pathways eliminated	Downwind of LTWMF during construction and development In area immediately surrounding methane gas piping exit vents at Cell 3 of the LTWMF	Rn gas concentrations
	Radiological effects from particulate radioactivity will be below Health Canada reference levels	Work sites and haul roads	Ra-226, Th-230, Th-232 and U
Aquatic Environment	Sediment quality will not have residual adverse effects after remediation work in Sculthorpe Marsh	Sculthorpe Marsh	Benthic invertebrate and aquatic communities
	Radiological effects in surface water quality to have no residual adverse effects with mitigation measures.	Highland Drive, South Creek and Brewery Creek Alexander Creek and the area between harbour and Ganaraska River Groundwater and down-gradient surface water in the LTWMF	As and U U and Ra-226 U

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	Surface water quality to experience long-term improvement to down-gradient surface water quality, reduced contaminant loadings to down-gradient streams and no measurable changes to Ganaraska River	Point of discharge, the harbour, Ganaraska River Fish tissue Lake Ontario	Non-radiological contaminan concentrations Mercury and levels of other COPC Contaminant loadings
	Sediment qualtiy improves in the harbour and habitat conditions	Harbour	Sediment quality and fish habitat conditions
Geology and Groundwater Environment	Soil concentrations of radiological contaminants are expected to have less than 10% of background at remediation sitess and less than 20% of background at the LTWMF	All remediation sites and LTWMF	All radiological contaminant concentrations
	Soil concentrations of Th-230 are expected to increase to a maximum predicted concentration of 141.p Bq/kg	LTWMF perimeter fence and surface soils adjacent	Th-230
	Non-radiological contaminants in soil will not exceed predicted maximum concentrations and will have no residual adverse effects with mitigation measures	Perimeter of the LTWMF	As and Co
	Radiological contaminants in groundwater will decline below applicable guidelines within 25 years	Remediated Mill and Alexander Street sites	U
	Groundwater volume treated at the LTWMF will have a decrease of approximately 30% and contaminant concentrations to decrease over time	LTWMF groundwater collection system	Volume and concentrations of contaminants
	Groundwater and drainage water discharge will reduce by a predicted volume of 44%	LTWMF	Volume of drainage water
	Groundwater flow to decrease	Water table beneath and adjacent to the LTWMF	Water table levels

Environmental component	Activity and objective(s)	Sampling locations	Parameters
		Onsite drainage system and Lake Ontario Existing facility	Stream flow and groundwater discharge Groundwater flow and direction
	Groundwater will not have changes in quality or quantity during the construction of the LTWMF and COPC will be 1% of PWQO and Ontario Drinking Water Standards criteria	LTWMF	Quality and quantity of groundwater and drainage water
	Hydraulic conductivity of the LTWMF liners and covers will not exceed a maximum of 10^{-8} cm/s and leachate generated will be 150 m^3	LTWMF	Leakage between liners Settlement of LTWMF cover Infiltration rate of the cover
	LTWMF waste volumes and contaminant concentrations to be verified	Excavated waste sites	Volume and contaminant concentrations of excavated waste
Terrestrial Environment	Temporary loss of vegetation due to LTWMF site preparation and remediation in Ward 1 and outside the Highland Drive Site Permanent conversion of vegetation communities in the Local Study Area and Site Study Area	Storm water management pond Waterworks site Remediation sites	Verify relocation of storm water management pond Verify development of protection and rehabilitation plans Verify implementation of erosion and sediment control structures; application of dust suppression techniques Verify extent and duration of temporary and permanent vegetation loss/change

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	Wildlife corridors and habitat complexes within the Local Study Area will be affected	Local Study Area	Vegetation clearing Nest surveys Structural habitat qualities and variability
Sculthorpe Marsh	Should remediation take place, no net loss of wetland function would be ensured	Sculthorpe Marsh	No net loss of wetland functions
Human Health and Safety	Workers exposed to non-radiological contaminants will be limited to established weighted average criteria for acute 8-hour exposures	Work sites	Accident rate, compliance to federally legislated health and safety regulations, operational policy
	Workers exposed to radiological contaminants for onsite and offsite wastes will receive annual radiation doses between 1.6-2.7 mSv/y; workers dewatering sediment during harbour remediation will receive doses up to 7.6 mSv/y	Onsite and offsite waste work sites and the harbour cleanup site	Radiation doses of workers
	Noise levels will range 88 to 96 dBA for workers	Construction areas	Accident rate, compliance to federally legislated health and safety regulations, operational policy
	Assuage members of the public's concern regarding non-radiological contaminants throughout the project	Members of the public	Level of satisfaction, communications protocols
	Ward 1 adjacent residents will not be exposed to more than 0.16 mSv/y of radiation during remediation		Radiation doses
	During construction and development, residents will not be exposed to more than 0.25 mSv/y		Radiation doses
Socio-economic Environment	Manage relocation of tenants, out-migration of residents and decrease in property values near remediation sites, transportation routes and the LTWMF	Area around remediation sites, transportation routes and the LTWMF	Percentage of out-migration of residents, new and resale housing property values, complaint resolution process and PVP program

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	Manage relocation of tenant business operations, short-term disruption of outdoor business operations and farm operations. Increased employment and business activity related to project	Businesses and farms around the project	Business-oriented communication plan, business surveys
	Minor impacts due to nuisance effects on outdoor tourism events	Transportation routes and Port Hope Tourism	Traffic levels, project related accidents, tourism rates
	Short term disruption of outdoor recreational activities, increased safety risks for educational facilities in close proximity of remediation sites and disruption of traffic and transportation. Project to provide improvements to the harbour, waterfront and natuarl areas		Mitigation measures, quality of roads and bridges
	Adjacent residents may see a decrease in enjoyment of properties		Public attitudes, omplaints and communications
	No impacts to cultural and heritage sites are predicted as there are no known heritage sites		Discovery and disturbances of heritage or archaeological resources and sites
Aboriginal Interests	No likely residual adverse effects anticipated		
Cumulative Effects	Incremental annual average Rn concentrations should be indistinguishable from background from a 2km radius and not measurable beyond 1km	1km from site 2km from site	Radiological constituents of re-suspended dust Rn concentrations

Appendix B – Activities under the current Port Granby EA follow-up program [36]

Environmental component	Activity and objective(s)	Sampling locations	Parameters
Atmospheric Environment	Air quality will not have residual adverse effects with mitigation measures. Anticipated slight exceedances for particulate emissions of $PM_{2.5}$ along the edge of the existing WMF site	Site adjacent to construction activities	TSP, PM_{10}, $PM_{2.5}$
	Noise impacts are anticipated to increase by 6-56 dBA at the LTWMF and the existing facility. Nuisance noise will impact local receptors	Receptor locations near the Site Study Area during the Construction and Development Phase	Noise levels and mitigation measures
	Radon concentrations may reach 5.1 Bq/m^3 during construction and development		Rn and long-lived alpha
	Radiological effects from particulate radioactivity will be below Health Canada reference levels		Radionuclide levels
Aquatic Environment	Improvements in sediment quality due to decreased contaminant transport and mitigation measures for offsite contaminated waste mitigation during excavation	Port Granby Creek Lake Ontario shoreline	Post-cleanup monitoring plan established in case of a sedimentation event or spill Remediation of excavation water after rainfall if necessary
	Beneficial long-term improvement to downgradient surface water quality, reduced contaminant loading to down-gradient lake and no measurable changes to Port Granby Creek.	Groundwater, stormwater and drainage water collection and treatment systems, Lake Ontario	Effluent quality performance, toxicity testing, contaminant loadings
Geology and Groundwater Environment	Radiological effects in soil quality will have no residual adverse effects with mitigation measures with contaminant concentrations to be less than 20% of background	Two Port Granby WMF sites and 5 other sample sites from EASR	Soil quality

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	Soil concentrations of Th-230 are expected to increase by 38% in concentration over baseline during the Construction and Development Phase of the LTWMF	Two Port Granby WMF sites and 5 other sample sites from EASR	Th-230
	Volume of groundwater collected for treatment in the LTWMF site groundwater and drainage water collection system would decrease and contaminant concentrations in groundwater quality will decline over time	Selected monitoring wells, with additional wells near the LTWMF if required	Volume and concentrations of contaminants
	Groundwater and drainage water discharge to Port Granby Creek will decrease by 1.6%	Groundwater monitoring wells	Groundwater levels
	Groundwater will have no measurable changes in quality or quantity during LTWMF construction	Groundwater and drainage water Downgradient of the current WMF and East and West Gorges	Quantity and quality of water Contaminant concentrations, bluff seepage
	Groundwater flow to decrease	Water table beneath and adjacent to the LTWMF Onsite drainage system and Lake Ontario	Water table levels Stream flow and groundwater discharge Groundwater flow and direction
	Hydraulic conductivity of the LTWMF liners and covers will not exceed a maximum of 10^{-7} cm/s; leachate generated will be 100 m^3	LTWMF	Leakage between liners Settlement of LTWMF cover Infiltration rate of the cover
	LTWMF waste volumes and contaminant concentrations to be verified	Excavated waste sites	Volume and contaminant concentrations of excavated waste

Environmental component	Activity and objective(s)	Sampling locations	Parameters
Terrestrial Environment	Temporary loss of vegetation in the Local Study Area and the Site Study Area Permanent conversion of vegetation communities in the Local Study Area and Site Study Area	Storm water management pond East Gorge Remediation sites	Verify relocation of storm water management pond Verify development of protection and rehabilitation plans Verify implementation of erosion and sediment control structures; application of dust suppression techniques Monitor radiological and non-radiological COPC in surficial soil Verify extent and duration of temporary and permanent vegetation loss/change Structural habitat qualities and variability
Human Health and Safety	Workers exposed to non-radiological contaminants are not predicted to have measurable effects on workers health. Construction activities aim to be at a total of 4.6 lost time accidents and 15.3 recordable accidents	Work sites	Accident rate, compliance to federally legislated health and safety regulations, operational policy
	Workers exposed to radiological contaminants will receive annual radiation doses between 2.1-7.1 mSv/y; workers will receive doses around 0.1 mSv/y during the Maintenance and Monitoring Phase		Radiation doses of workers

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	Noise levels can reach 93 to 95 dBA within 15 m of the LTWMF and the existing WMF	Construction areas	Accident rate, compliance to federally legislated health and safety regulations, operational policy
	Assuage members of the public's concern regarding non-radiological contaminants throughout the project	Members of the public	Level of satisfaction, communications protocols and complaints resolution process
	Air quality and noise	Members of the public	Level of satisfaction, communications protocols and complaints resolution process
	Members of the public will not be exposed to more than 15% of the CNSC public dose limit of 1 mSv/y		Radiation doses
Socio-economic Environment	Manage relocation of tenants, out-migration of residents and decrease in property values near remediation sites, transportation routes and the LTWMF	Area around remediation sites, transportation routes and the LTWMF	Percentage of out-migration of residents, new and resale housing property values, complaint resolution process and PVP program
	Manage relocation of tenant business operations, short-term disruption of outdoor business operations and farm operations. Increased employment and business activity related to project	Businesses and farms around the project	Farmer-oriented communication plan, impacts to farmers and businesses
	Minor impacts due to nuisance effects on outdoor tourism events	Transportation routes and Port Hope Tourism	Traffic levels, project related accidents, tourism rates
	Short term disruption of outdoor trails and natural areas with disruption of community and recreational activities within the zone of influence for LTWMF and transportation routes		PVP Program, public perception
	Increased safety risks for educational facilities in close proximity of remediation sites and disruption of traffic and transportation.	Transportation routes	Traffic levels, accidents, pavement road quality

Environmental component	Activity and objective(s)	Sampling locations	Parameters
	No impacts to cultural and heritage sites are predicted as there are no known heritage sites		Discovery and disturbances of heritage or archaeological resources and sites
Indigenous Interests	Some residual adverse environmental effects on the ability of current and future generations to exercise inherent Indigenous and Treaty rights		First Nation's concerns and ability to exercise inherent Indigenous and Treaty Rights
Cumulative Effects	Incremental annual average Rn concentrations should be indistinguishable from background from a 2km radius and not measurable beyond 2km	2km from site	Radiological constituents of re-suspended dust Rn concentrations

Appendix C – Clean-up criteria for inorganic contaminants of potential concern applicable to historic LLRW sites during phase 2 of the PHP [38]

	Port Hope Sites Residential/Parkland/Institutional Non-radiaoctive based on 2011 former Ontario Ministry of the Environment (OMOE) Generic[2]	Port Hope Sites Industrial/Commercial/Community (with exeception of column C) Non-radioactive based on 2011 OMOE Generic[2]	Welcome WMF and Highland Drive Landfill
Primary COPC			
^{226}Ra (Bq/g)	0.24	0.92	0.92
^{230}Th (Bq/g)	1.11	4.62	4.62
^{232}Th (Bq/g)	0.103	0.343	0.343
Arsenic (ppm)	18 (11)	18	40[3,4]
Antimony (ppm)	7.5	40 (50)	40 (50)
Cobalt (ppm)	22	80 (100)	80 (100)
Copper (ppm)	140 (180)	230 (300)	230 (300)
Nickel (ppm)	100 (130	270 (340)	270 (340)
Uranium (ppm)	23	33	76[3]
Lead (ppm)	120 [45]	120	120
Secondary COPC			
Barium (ppm)	390	670	670
Beryllium (ppm)	4 (5)	8 (10)	8 (10)
Boron, hot water soluble (ppm)	1.5	2.0	2.0

	Port Hope Sites Residential/Parkland/Institutional Non-radiaoctive based on 2011 former Ontario Ministry of the Environment (OMOE) Generic[2]	Port Hope Sites Industrial/Commercial/Community (with exeception of column C) Non-radioactive based on 2011 OMOE Generic[2]	Welcome WMF and Highland Drive Landfill
Boron, total (ppm)	120	120	120
Cadmium (ppm)	1.2 [1]	1.9	1.9
Mercury (ppm)	0.27 [0.25] (1.8)	3.9 (20)	3.9 (20)
Molybdenum (ppm)	6.9	40	40
Selenium (ppm)	2.4	5.5	5.5
Silver (ppm)	20 (25)	40 (50)	40 (50)
Vanadium (ppm)	86	86	86
Zinc (ppm)	340	340	340

( ) standard in round brackets applies to medium and fine textured soils

[ ] standard in square brackets represents 2011 OMOE "Table 2" values for agricultural use in potable groundwater situations.

Other values are applicable to residential land uses (where two values are listed or to both residential and agricultural land uses (where only one value is given).

[1] Summation rules apply to 226Ra, 230Th and 232 Th. Criteria used for these COPC represent incremental concentrations above background.

[2] Concentrations higher than criteria listed may be acceptable at depths >1.5m, as well as for special circumstance sites.

[3] Project-specific clean-up criteria [LLRWMO, Port Hope Area Initiative Clean-up Criteria, LLRWMO-01611-TE-1104, Rev 5, 2006 December]

[4] Soils subject to an alternative management strategy, as delineated in Figure A on page 7, are excluded from the Phase 2 clean-up criterion for arsenic.

Appendix D – Port Granby Project Clean-up criteria for inorganic contaminants of potential concern in surface soils [40]

	Clean-up critieria for PGP
Primary COPC	
^{226}Ra (Bq/g)	0.92
^{230Th} (Bq/g)	4.62
^{232}Th (Bq/g)	0.343
Arsenic (ppm)	40
Antimony (ppm)	40
Cobalt (ppm)	80
Copper (ppm)	225
Fluoride (ppm)	2000
Lead (ppm)	1000
Nickel (ppm)	150
Uranium (ppm)	76
Secondary COPC	
Barium (ppm)	1500
Beryllium (ppm)	-
Boron (ppm)	2.0
Cadmium (ppm)	12
Mercury (ppm)	10
Molybdenum (ppm)	40
Selenium (ppm)	2
Silver (ppm)	40
Vanadium (ppm)	200

PART TWO

Part Two provides all relevant information pertaining directly to the licence, including:

1. The current licences;
2. Any proposed changes to the conditions, licensing period, or formatting of an existing licence;
3. The proposed licence; and
4. The draft licence conditions handbook.

CURRENT LICENCES

CNL currently has four (4) licences, issued by the CNSC, that are associated with the PHAI and are proposed to be consolidated into a single WNSL as part of this licence renewal. This includes:

- WNSL-W1-2310.02/2022 PHP - e-Doc 5334041 (PDF)
- WNSL-W1-2311.00/2022 PGP - e-Doc 6572726 (PDF)
- WNSL-W1-182.0/2022 PSETSS - e-Doc 6699634 (PDF)
- WNSL-W1-344-1.8/ind. PHRWMF - e-Doc 5081344 (PDF)

PDF Ref: e-Doc 5334041
Word Ref: e-Doc 5328138
File: 2.02

WASTE NUCLEAR SUBSTANCE LICENCE

PORT HOPE LONG-TERM LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PROJECT

I) LICENCE NUMBER: WNSL-W1.2310.02/2022

II) LICENSEE: Pursuant to section 24 of the *Nuclear Safety and Control Act* this licence is issued to:

Canadian Nuclear Laboratories Limited
Laboratoires nucléaires canadiens limitée
1 Plant Road
Chalk River, Ontario
K0J 1J0

III) LICENCE PERIOD: This licence is valid from **November 29, 2017** to **December 31, 2022**, unless otherwise suspended, amended, revoked or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

a) possess, manage and store nuclear substances that are required for, associated with or arise from Phase 1[1] activities associated with the Port Hope Area Initiative – Port Hope Long-Term Waste Management Facility, located at the Welcome Waste Management Facility, as more particularly described in Appendix A to this licence, and

1 - Phase 1 activities are defined as those activities related to the continued operation of the Welcome Waste Management Facility associated with ongoing care and maintenance.

b) possess, package, transport, transfer, manage and store the nuclear substances except Category I, II and III nuclear- material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from Phases 2 and 3[2] of the Port Hope Area Initiative – Port Hope Long-Term Waste Management Facility, as more particularly described in Appendix A to this licence.

V) EXPLANATORY NOTES:

a) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations;

b) The contents of Appendix A "DESCRIPTION of Port Hope Long-Term Low-Level Radioactive Waste Management Facility", Appendix B "RELEASE LIMITS", and Appendix C "CLEAN-UP CRITERIA" attached to this licence forms part of the licence;

c) The Port Hope Long-Term Low-Level Radioactive Waste Management Facility LICENCE CONDITIONS HANDBOOK (LCH) provides compliance verification criteria in order to meet the conditions listed in the licence;

VI) CONDITIONS:

The licensee shall comply with the following conditions, established pursuant to subsection 24(5) of the *Nuclear Safety and Control Act*.

1. GENERAL

1.1 Changes that are outside of the licence conditions are not permitted without the prior written approval of the Canadian Nuclear Safety Commission (hereinafter "the Commission") or a person authorized by the Commission.

1.2 The licensee shall, in the event of any conflict or inconsistency between licence conditions or documents referenced in this licence, direct the conflict or inconsistency to the Commission or a person authorized by the Commission, for regulatory interpretation.

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2 - Phase 2 on-site activities are those activities related to the continued operation of the Welcome Waste Management Facility and those related to the redevelopment of the facility into the Port Hope Long-Term Waste Management Facility.
- Phase 2 off-site activities are those activities related to the operation of the Port Hope Long-Term Waste Management Facility, the continued development of the Port Hope Long-Term Waste Management Facility and off-site remedial activities associated with the project.
- Phase 3 activities are those activities related to the post-closure operations of the Port Hope Long-Term Waste Management Facility associated with ongoing care and maintenance.

2. OPERATIONS

2.1 The licensee shall conduct remedial work in accordance with the clean-up criteria specified in Appendix C to this licence.

2.2 The licensee shall implement and maintain a quality assurance program for the project.

2.3 The licensee shall prepare written reports on any failure to meet the requirements of this licence, any action level exceedance, results of monitoring programs, progress and end-state of project activities as required by the Commission, or a person authorized by the Commission.

2.4 The licensee shall have a program for public information for the project.

2.5 The licensee shall have a training program for the project.

2.6 The licensee shall conduct the project activities in accordance with the design documentation.

2.7 The licensee shall have a program for radiation protection for the project.

2.8 The licensee shall have a program for occupational health and safety for the project.

2.9 The licensee shall have an environmental management and protection program for the project.

2.10 The licensee shall control, monitor and record releases to the environment from the facilities such that the releases do not exceed the release limits specified in Appendix B.

2.11 The licensee shall implement an Environmental Assessment follow-up program.

2.12 The licensee shall have a program for emergency preparedness.

2.13 The licensee shall have a security program for the project.

2.14 The licensee shall have a program for radioactive material transport and packaging for the project.

SIGNED at OTTAWA, this 29 day of November , 2017

M. Binder

Michael Binder, President
on behalf of the Canadian Nuclear Safety Commission

APPENDIX A

Welcome Waste Management Facility

The Welcome Waste Management Facility is located on lands described as all that portion of Lots 13 and 14, Concession 2, in the Municipality of Hope, in the County of Northumberland, designated as Parts 1 and 2 on a reference plan deposited in the Land Registry Office for the Registry Division of Port Hope as Plan 9R-734. The Welcome Waste Management Facility is located within the perimeter of the Port Hope Long-Term Waste Management Facility

Port Hope Long-Term Waste Management Facility

The Port Hope Long-Term Waste Management Facility will be located in Ward 2 of the Municipality of Port Hope, in the County of Northumberland; bordered on the west by Brand Road, on the north by Highway 401, on the east by Baulch Road and on the south by rural and residential lots on the north side of Marsh Road. The location of the Long-Term Waste Management Facility is shown on the following figure.

APPENDIX B

RELEASE LIMITS FOR LIQUIDE EFFLUENT

1. Phase 1: Continued Operation of the Welcome Waste Management Facility

Substance and Form	Monthly Average Limit
Radium-226 (Ra-226)	0.37 Bq/L
Arsenic (As)	0.50 mg/L
pH	Between 6 and 9
Toxicity Testing	Effluent cannot be toxic

2. Phase II: Portable Water Treatment System at On-Land Remediation Sites

Substance and Form	Release Limit
Uranium	0.33 mg/L
Radium-226 (Ra-226)	0.37 Bq/L
All other	Must meet municipal by-law and applicable provincial regulations and requirements

APPENDIX C

CLEAN UP CRITERIA FOR REMEDIATION - PHASE II

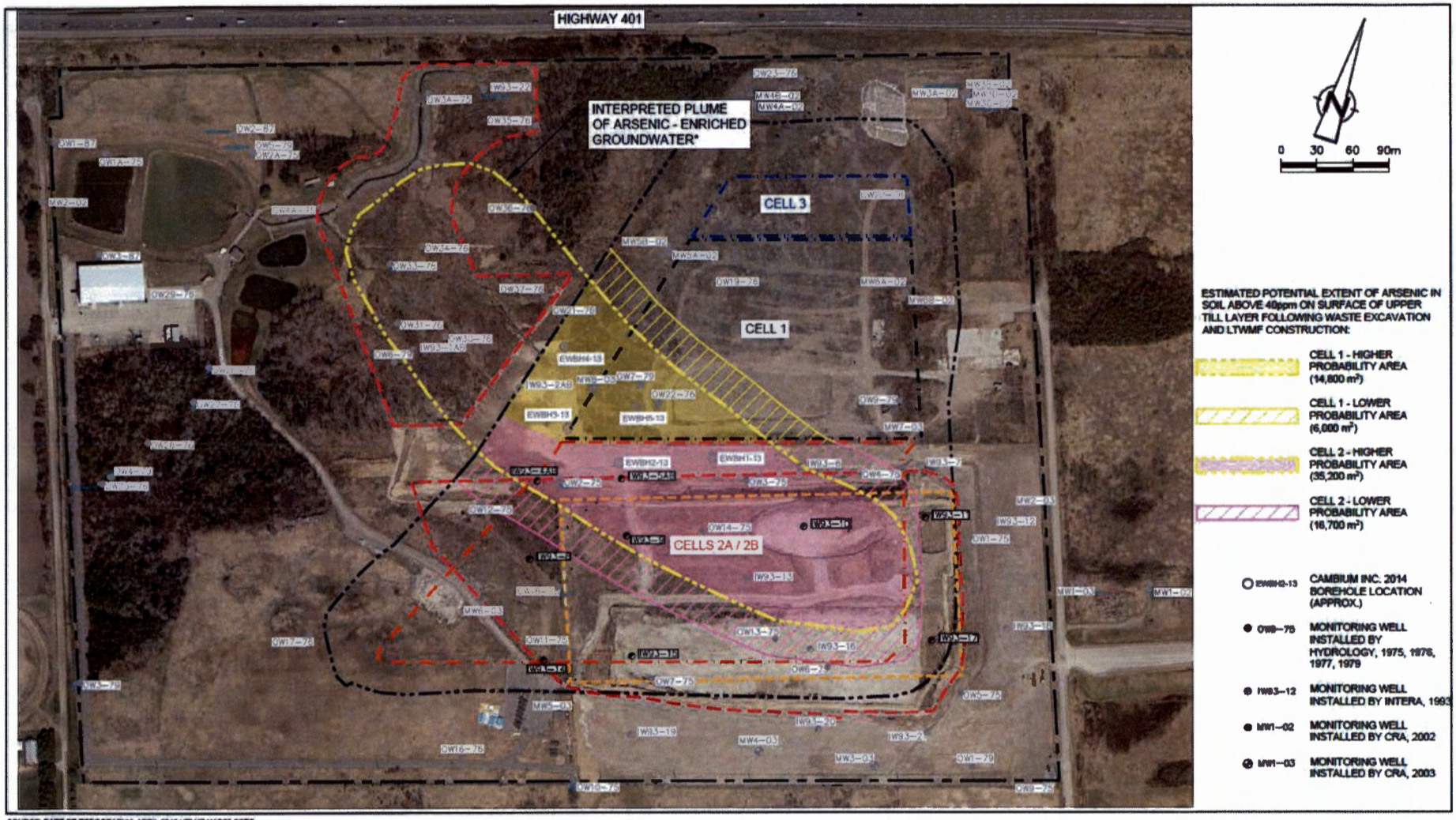
	Units	A Port Hope Sites Residential/Parkland/ Institutional Non-radioactive based on 2011 OMOE Generic[2]	B Port Hope Sites Industrial/Commercial/ Community (with exception of column C) Non-radioactive based on 2011 OMOE Generic[2]	C Welcome WMF and Highland Drive Landfill
Primary COPC				
^{226}Ra	(Bq/g)[1]	0.24	0.92	0.92
^{230}Th	(Bq/g)[1]	1.11	4.62	4.62
^{232}Th	(Bq/g)[1]	0.103	0.343	0.343
Arsenic	ppm	18[11]	18	40[3, 4]
Antimony	ppm	7.5	40 (50)	40 (50)
Cobalt	ppm	22	80 (100)	80 (100)
Copper	ppm	140 (180)	230 (300)	230 (300)
Nickel	ppm	100 (130)	270 (340)	270 (340)
Uranium	ppm	23	33	76[3]
Lead		120[45]	120	120
Secondary COPC				
Barium	ppm	390	670	670
Beryllium	ppm	4 (5)	8 (10)	8 (10)
Boron hot water soluble	ppm	1.5	2.0	2.0
Boron total	ppm	120	120	120
Cadmium	ppm	1.2 [1]	1.9	1.9
Mercury	ppm	0.27 [0.25](1.8)	3.9 (20)	3.9 (20)
Molybdenum	ppm	6.9	40	40
Selenium	ppm	2.4	5.5	5.5
Silver	ppm	20 (25)	40 (50)	40 (50)
Vanadium	ppm	86	86	86
Zinc	ppm	340	340	340

Notes:

( ) standard in round brackets applies to medium and fine textured soils

[ ] standard in square brackets represents 2011 OMOE "Table 2" values for agricultural use in potable groundwater situations. Other values are applicable to residential land uses (where two values are listed) or to both residential and agricultural land uses (where only one value is given).

1. Summation rules apply to ^{226}Ra, ^{230}Th and ^{232}Th. Criteria used for these COPC represent incremental concentrations above background.
2. Concentrations higher than criteria listed may be acceptable at depths >1.5 m as well as for special circumstance sites.
3. Project-specific clean-up criteria [LLRWMO, *Port Hope Area Initiative Clean-up Criteria*, LLRWMO-01611-TE-1104, Rev 5, 2006 December]
4. Soils subject to an alternative management strategy, as delineated in Figure A on page 7, are excluded from the Phase II clean-up criterion for arsenic.



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e-Doc 5334041 PDF

PDF Ref: eDoc 6572726
PDF Ref: eDoc 6570598
File / Dossier: 2.05

WASTE NUCLEAR SUBSTANCE LICENCE
CANADIAN NUCLEAR LABORATORIES LTD.
PORT GRANBY LONG-TERM LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PROJECT

I) LICENCE NUMBER: **WNSL-W1-2311.00/2022**

II) LICENSEE: Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:

Canadian Nuclear Laboratories Ltd.
Laboratoires Nucléaires Canadiens ltée
286 Plant Road
Chalk River, Ontario K0J 1J0

III) LICENCE PERIOD: This licence is valid from **January 1, 2022** to **December 31, 2022**, unless suspended in whole or in part, amended, revoked, or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to conduct the following activities located in the Municipality of Clarington, Regional Municipality of Durham, Province of Ontario:

(a) possess, package, transport, transfer, manage, and store nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the Port Hope Area Initiative - Port Granby Long-Term Low-Level Waste Management Facility, located in the Municipality of Clarington, Regional Municipality of Durham, Province of Ontario.

V) EXPLANATORY NOTES:

(a) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.

(b) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations.

(c) The Port Granby Long-Term Low-Level Radioactive Waste Management Project Licence Conditions Handbook (LCH) provides compliance verification criteria including the codes, standards and regulatory documents used to verify compliance with the conditions in the licence. The LCH also provides information regarding applicable versions of documents and non-mandatory recommendations and guidance on how to achieve compliance.

VI) CONDITIONS:

G. GENERAL

G.1 Licensing Basis

The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as:

(i) the regulatory requirements set out in the applicable laws and regulations;

(ii) the conditions and safety and control measures described in the licence and the documents directly referenced in that licence;

(iii) the safety and control measures described in the licence application and the documents needed to support that licence application;

unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission").

G.2 Notification of Changes

The licensee shall give written notification of changes to the licensed activity or its operation, including deviation from design, operating conditions, policies, programs and methods referred to in the licensing basis.

G.3 Remedial Cleanup Criteria

The licensee shall conduct remedial work in accordance with the project developed cleanup criteria.

G.4 Public Information and Disclosure Program

The licensee shall implement and maintain a public information and disclosure program.

1. MANAGEMENT SYSTEM

1.1 Management System

The licensee shall implement and maintain a management system.

2. HUMAN PERFORMANCE MANAGEMENT

2.1 Training Program

The licensee shall implement and maintain a training program.

3. OPERATING PERFORMANCE

3.1 Reporting Requirements

The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission.

4. PHYSICAL DESIGN

4. 1 Design Program

The licensee shall implement and maintain a design program.

5. RADIATION PROTECTION

5.1 Radiation Protection Program

The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

6. CONVENTIONAL HEALTH AND SAFETY

6.1 Conventional Health and Safety Program

The licensee shall implement and maintain a conventional health and safety program.

7. ENVIRONMENTAL PROTECTION

7.1 Environmental Protection Program

The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

8. EMERGENCY MANAGEMENT AND FIRE PROTECTION

8.1 Emergency Preparedness Program

The licensee shall implement and maintain an emergency preparedness program.

8.2 Fire Protection Program

The licensee shall implement and maintain a fire protection program.

9. SECURITY

9.1 Security Program

The licensee shall implement and maintain a security program.

10. PACKAGING AND TRANSPORT

10.1 Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

SIGNED at OTTAWA, this 16th day of December 2021

Velshi, Rumina

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Rumina Velshi, President
On behalf of the Canadian Nuclear Safety Commission

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Word Ref: eDoc 6673114
File / Dossier: 2.05

WASTE NUCLEAR SUBSTANCE LICENCE
CANADIAN NUCLEAR LABORATORIES LTD.
PINE STREET EXTENSION TEMPORARY STORAGE SITE

I) LICENCE NUMBER: **WNSL-W1-182.0/2022**

II) LICENSEE: Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:

Canadian Nuclear Laboratories Ltd.
Laboratoires Nucléaires Canadiens Ltée
286 Plant Road
Chalk River, Ontario K0J 1J0

III) LICENCE PERIOD: This licence is valid from **January 1, 2022** to **December 31, 2022**, unless suspended in whole or in part, amended, revoked, or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to conduct the following activities located in the Municipality of Port Hope, Province of Ontario:

(a) possess, transfer, use, process, manage and store nuclear substances, except Category I, II and III nuclear material as defined in Section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the operation of the Pine Street Extension Temporary Storage Site located within the Municipality of Port Hope.

V) EXPLANATORY NOTES:

(a) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.

(b) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations.

(c) The Pine Street Extension Temporary Storage Site Licence Conditions Handbook (LCH) provides compliance verification criteria including the codes, standards and regulatory documents used to verify compliance with the conditions in the licence. The LCH also provides information regarding applicable versions of documents and non-mandatory recommendations and guidance on how to achieve compliance.

VI) CONDITIONS:

G. GENERAL

G.1 Licensing Basis

The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as:

(i) the regulatory requirements set out in the applicable laws and regulations;

(ii) the conditions and safety and control measures described in the licence and the documents directly referenced in that licence;

(iii) the safety and control measures described in the licence application and the documents needed to support that licence application;

unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission").

G.2 Notification of Changes

The licensee shall give written notification of changes to the licensed activity or its operation, including deviation from design, operating conditions, policies, programs and methods referred to in the licensing basis.

1. MANAGEMENT SYSTEM

1.1 Management System

The licensee shall implement and maintain a management system.

2. HUMAN PERFORMANCE MANAGEMENT

2.1 Training Program

The licensee shall implement and maintain a training program.

3. OPERATING PERFORMANCE

3.1 Reporting Requirements

The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission.

4. RADIATION PROTECTION

4.1 Radiation Protection Program

The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

5. CONVENTIONAL HEALTH AND SAFETY

5.1 Conventional Health and Safety Program

The licensee shall implement and maintain a conventional health and safety program.

6. ENVIRONMENTAL PROTECTION

6.1 Environmental Protection Program

The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

7. EMERGENCY MANAGEMENT AND FIRE PROTECTION

7.1 Emergency Preparedness Program

The licensee shall implement and maintain an emergency preparedness program.

7.2 Fire Protection Program

The licensee shall implement and maintain a fire protection program.

8. SECURITY

8.1 Security Program

The licensee shall implement and maintain a security program.

9. PACKAGING AND TRANSPORT

9.1 Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

SIGNED at OTTAWA, this 16th day of December, 2021.

Murthy, Kavita

Digitally signed by Murthy, Kavita
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Kavita Murthy, Designated Officer
Directorate of Nuclear Cycle and Facilities Regulation
Canadian Nuclear Safety Commission

Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

PDF Ref: e-Doc 5081344
Word Ref: e-Doc 5050808
File: 2.05

WASTE NUCLEAR SUBSTANCE LICENCE

PORT HOPE RADIOACTIVE WASTE MANAGEMENT FACILITY

I) LICENCE NUMBER: WNSL-W1-344-1.8/ind.

II) LICENSEE: Pursuant to section 37 of the *Nuclear Safety and Control Act*, this licence is issued to:

Canadian Nuclear Laboratories Limited
Laboratoires nucléaires canadiens limitée
Chalk River, Ontario
K0J 1J0

III) LICENCE PERIOD: This licence is valid **indefinitely** from **September 26, 2016**, unless otherwise suspended, amended, revoked, replaced, or transferred.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to possess, transfer, use, manage and store the nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from the operation of the Port Hope Waste Management Facility located within the Municipality of Port Hope, Ward 1, at the sites more precisely described in Appendix "A".

V) CONDITIONS:

GENERAL

1. The contents of the appendices attached to this licence form part of this licence.

2. The licensee shall post at the facility, at a location visible to the workers and the public the notice specified in subparagraph 14(1)(*b*) of the *General Nuclear Safety and Control Regulations*.

3. With respect to subparagraph 6(2)(c) of the *Radiation Protection Regulations*, the licensee shall, within twenty-four hours of becoming aware that an action level specified in the documents listed in Appendix "B" has been reached or exceeded, notify the Commission of the situation.

OPERATIONS

4. The licensee shall carry out the activities described in Part IV of this licence for the purposes and according to the methods, procedures, and subject to the terms and conditions, and within the limits described in the documents listed in Appendix "B" and any approved modifications made pursuant to condition 6 of this licence.

5. The licensee shall maintain the inventory of nuclear substances in the radioactive waste in the areas identified in Appendix "A" at current levels. No inventory may be added without the prior written approval of the Commission or a person authorized by the Commission.

MODIFICATIONS

6. The licensee shall not make modifications to, or deviate from the design, operating conditions, purposes, methods, procedures, limits or equipment described in the documents referred to in condition 4 of this licence, that would render inaccurate the information contained in those documents or otherwise adversely affect the safe conduct of the activities described in Part IV of this licence, without the prior written approval of the Commission or a person authorized by the Commission.

REPORTING

7. The licensee shall, within 60 days after the end of the calendar year, submit to the Commission a written report on the activities at the Waste Management Facility for that year, containing the following information:

   a) the principal licensed activities completed;

b) the results of the monitoring programs described in the documents listed in Appendix "B" and any approved modifications pursuant to condition 6 of this licence;

c) a summary description of events reported to the Commission pursuant to section 29 of the *General Nuclear Safety and Control Regulations*; and,

d) a summary description of any changes in the methods, procedures and equipment used to carry out the licensed activities, and any modifications made to the Waste Management Facility.

8. The licensee shall, within 21 days of notifying the Commission pursuant to condition 3 of this licence, file with the Commission a written report on the situation containing the following information:

a) the date, time, location and description of the action level reached or exceeded;

b) a description of the investigation conducted and the cause established for reaching or exceeding the action level;

c) the effects on the environment and the health and safety of persons that have resulted or may result from the situation; and,

d) the actions taken to restore the effectiveness of the radiation protection program in accordance with section 4 of the *Radiation Protection Regulations*, identifying any actions still to be taken.

Amended in Ottawa, Ontario this 26 day of September 2016

Haidy Tadros
Designated Officer
Director General, Directorate of Nuclear Cycle and Facilities Regulation

APPENDIX "A"

The Port Hope Waste Management Facility comprises the Sewage Treatment Plant Temporary Storage Site, the Strachan Street Consolidation Site, and the Pine Street Extension Consolidation Site; all located within the Municipality of Port Hope, Ontario, Ward 1.

The Sewage Treatment Plant Temporary Storage Site is located west of the Municipality of Port Hope Sewage Treatment Plant as described by the as-built drawing titled "Port Hope Remedial Measures-Phase V Revisions to Temporary Waste Management Site" which forms Attachment D of the letter from R.W. Pollock to W.D. Smythe, dated 1988-09-06, and titled "Licence Application for Certain Port Hope Soils".

The Strachan Street Consolidation Site is located near the intersection of Strachan and Thomas Streets, as described by Drawings SR-I, SR-2, and SR-3 of the MacLarentech Inc. report titled "Port Hope 1988 Remedial Program, Project Summary Report" and dated November 1990.

The Pine Street Extension Consolidation Site fronts on Pine Street Extension, north of the intersection of Highland Drive and Pine Street Extension, as described by Drawings 1 and 6 of the MacLarentech Inc. report titled "Port Hope 1989/1990 Remedial Program - Project Summary Report" and dated February 1990.

APPENDIX "B"

1) *Port Hope Licensed Sites Environmental Monitoring Program Specifications*, 4500-507608-OLC-001.

2) *Port Hope Area Initiative Radiation Protection Plan*, 4500-508740-PLA-001.

3) *Environmental Assessment Follow-up Program Port Hope Project*, 4501-509246-PLA-001.

4) Letter from Miller, J. (AECL) to Howard, D. (CNSC), "Application for Amendments of Two Low-Level Radioactive Waste Management Offices Licences", April 2, 2013. e-Doc 4118512.

PROPOSED LICENCE CHANGES

Overview

CNL currently has a waste nuclear substance licence (WNSL-W1-2310.02/2022) for the PHP. CNL submitted an application for the renewal of its waste nuclear substance licence for the Port Hope Project for a 10-year period. As a part of this renewal request, CNL is also requesting the consolidation of the Port Hope Project licence with three other waste nuclear substance licences associated with the PHAI. The three other waste nuclear substance licences include the: PGP (WNSL-W1-2311.00/2022), PSETSS (WNSL-W1-182.0/2022) and PHRWMF (WNSL-W1-344-1.8/ind.).

Should the Commission authorize the consolidation of the licences, CNSC staff recommend that the PHP licence number remain the same, but the name of the licence be changed to the Port Hope Area Initiative Waste Management Project. The proposed name change is reflected in the draft licence and LCH.

In previous PHAI licences, under licenced activities, CNL was authorized to package and transport radioactive material. Based on the materials and activities taking place at the PHAI, there is no need to specifically authorize these activities as this is covered under the *Packaging and Transport of Nuclear Substances Regulations 2015*. Consequently, CNSC staff recommend that the licenced activities of package and transport be removed from the licence.

Section IV subsection (a) of the current PSETSS licence, authorizes CNL to "process" nuclear substances that are required for, associated with or arise from the operation of the PSETSS. Based on the activities taking place under the PSETSS licence, "process" is not a required activity. Consequently, "process" is not included as an authorized activity in the proposed licence.

Licence Conditions

The current Port Hope Project licence does not include CNSC's standardized licence conditions. CNSC staff have taken the opportunity through this licence renewal and consolidation to update the licence to reflect these standardized licence conditions.

In addition to the standardization, licence conditions G.3 for financial guarantee, 5.1 for fitness for service, 10.1 and 10.2 for waste management and decommissioning, and 12.1 for safeguards were added to the proposed licence.

Details of modifications due to standardization and addition of new licence conditions is discussed throughout this CMD and reflected in table 19.

Table 19: Licence and Licence Conditions Handbook Change Matrix

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
G.1 Licensing Basis for Licensed Activities The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as: (i) the regulatory requirements set out in the applicable laws and regulations; (ii) the conditions and safety and control measures described in the facility's or activity's licence and the documents directly referenced in that licence; (iii) the safety and control measures described in the licence application and the documents needed to support that licence application; unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission").	VI) CONDITIONS: The licensee shall comply with the following conditions, established pursuant to subsection 24(5) of the *Nuclear Safety and Control Act*. 1.1 Changes that are outside of the licence conditions are not permitted without the prior written approval of the Canadian Nuclear Safety Commission (hereinafter "the Commission") or a person authorized by the Commission.	The licensee requires prior written approval of the Commission for changes that are outside of the conditions set by the licensing basis, such as they are: • not compliant with a regulatory requirements; • not compliant with a licence condition; • adversely affecting the safe conduct of the licensed activities;	New LC – G.1 No significant change between old and new LC. New standard text adds clarity.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
G.2 Notification of Changes The licensee shall give written notification of changes to the facility or its operation, including deviation from design, operating conditions, policies, programs, and methods referred to in the licensing basis.	VI) CONDITIONS: The licensee shall comply with the following conditions, established pursuant to subsection 24(5) of the *Nuclear Safety and Control Act*. 1.2 The licensee shall, in the event of any conflict or inconsistency between licence conditions or documents referenced in this licence, direct the conflict or inconsistency to the Commission or a person authorized by the Commission, for regulatory interpretation.	The CNSC is the regulatory body responsible to provide the regulatory oversight for all activities involving the use of nuclear substances in Canada. Regulatory interpretation shall be provided by the CNSC, its staff and where necessary, the Commission. The generic statement: "or a person authorized by the Commission" allows the Commission to delegate certain authority to staff. Delegation of authority to interpret by the Commission applies to the following staff: • Director, Nuclear Processing and Facilities Division (NPFD); • Director General, Directorate of Nuclear Cycle and Facilities Regulation; and • Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch. Any conflict or inconsistency identified would be discussed between the licensee and CNSC staff and/or Commission where necessary. The outcome of such discussions will be documented to ensure a common understanding.	New LC – G.2 No significant change between old and new LC. New standard text adds clarity.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		Appendix B of this LCH has been included to facilitate the addition of any definitions that may be required for clarification during the future licence period. Changes to the interpretation of the content of this handbook will be recorded using the change process as described in section 1.3 of this LCH. The LCH will then be revised accordingly and reissued	
G.3 Financial Guarantee The licensee shall maintain a financial guarantee for decommissioning that is acceptable to the Commission.	No Existing LC.	Not in current LCH	New LC – G.3 Proposed to be added as a new licence condition.
G.4 Public Information and Disclosure The licensee shall implement and maintain a public information and disclosure program.	2.4 The licensee shall have a program for public information for the project.	The licensee shall have a Public Information Program that is based on the expectations found in CNSC Regulatory Guide G-217 *Licensee Public Information Programs.* It is recommended as a best practice, to develop and implement a Public Information Program and Disclosure Protocol that is based on the CNSC Regulatory Guide RD/GD 99.3 *Public Information and Disclosure*.	New LC – G.4 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		The public information program must address, *inter alia*, the following items: ▪ the Stakeholders for the project must be clearly identified and documented; ▪ it must identify current community and public views, opinions and concerns about the project; ▪ it should describe and analyse media coverage of the project; ▪ changes made to the web site should be documented; ▪ direct communications with the local community.	
1.1 Management System The licensee shall implement and maintain a management system.	2.2 The licensee shall implement and maintain a quality assurance program for the project.	The licensee shall implement the Quality Assurance plan as described in detail in the document referenced below. This will ensure meeting the requirements of ISO 9001:2008 "Quality Management Systems – Requirements".	New LC – 1.1 No significant change between old and new LC.
2.1 Training Program The licensee shall implement and maintain a training program	2.3 The licensee shall have a training program for the project.	The licensee shall implement and maintain the training plan as described in the document referenced below. Specific training activities are also covered in the Quality Assurance Plan, the Radiation Protection Plan, the	New LC – 2.1 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		Environmental Monitoring Plan and the Occupational Health and Safety Plan. CNSC staff will monitor training as part of normal compliance activities, and will initiate follow-up, as required. Records of training are required to be kept and will be inspected by CNSC staff.	
3.1 Reporting Requirements The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission.	2.2 The licensee shall prepare written reports on any failure to meet the requirements of this licence, any action level exceedance, results of monitoring programs, progress and end-state of project activities as required by the Commission, or a person authorized by the Commission.	a) In addition to the reporting requirements in the *Nuclear Safety and Control Act* and its Regulations, the process under licence condition 2.3 includes the following reports detailed below: b) If any action level set out in this LCH is reached or exceeded, the licensee shall notify the CNSC within 24 hours of becoming aware of the matter and shall file a final written report within 21 working days of becoming aware of the matter. c) Failure of equipment, component, or process system, or an inappropriate procedure or human action that resulted in or could have resulted in the release of a nuclear substance or hazardous substance from the facility.	New LC – 3.1 Standardized LC is less specific on reporting requirements. Specific details on reporting are proposed to be described in the LCH for greater clarity (as needed) and in referenced CVC and documents. Action level notifications will be captured in the standardized LC for Radiation Protection and Environmental Protection.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		d) Quarterly written reports on monitoring of liquid effluent releases to the environment e) Quarterly written reports on liquid effluent toxicity testing f) During off-site remediation, monthly written reports on results of on-sites water treatment g) An annual compliance report must be submitted to the CNSC by the end of April of each year, covering the previous calendar year's operation and the results of all monitoring programs associated with the licence. h) Written quarterly progress reports on project activities i)Written reports at completion of project activities	The timeframe for filing a full report will be modified in the LCH to be consistent with the reporting requirements found in section 29(2) of the *General Nuclear Safety Regulations* (21 days after becoming aware of it, unless some other period is specified in the licence). Item b) in the LCH will be removed from the LCH as this licence is not a facility. Furthermore, section 29(1) of the GNSR more appropriately describes all situations for when the licensee is to file a report.
4.1 Design Program The licensee shall implement and maintain a design program.	2.4 The licensee shall conduct the project activities in accordance with the design documentation.	The licensee shall implement the design for the Long-term Waste Management Facility and remediation activities to ensure that the equipment and processes accurately reflect the designed condition as intended in design documents referenced below.	New LC – 4.1 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		Water Treatment System at Welcome WMF The licensee must construct and commission the new water treatment system at Welcome LTWMF before initiating the remediation of Welcome WMF. When finalizing the design of the water treatment system, the licensee must consider the design objectives presented in the Design Objectives table for the LTWMF Water Treatment System Prior to commissioning the new water treatment system, the licensee is required to submit to CNSC a plan for testing and commissioning of the system. **Water Treatment at Remediation Sites** The licensee must treat water at on-land remediation sites which may come into contact with the waste and become contaminated, such as storm water, groundwater, waste water, effluent during sediment dewatering. Prior to using a Portable Water Treatment System (PWTS) at remediation sites, the licensee is required to submit to CNSC a report addressing the type of the portable	The LTWMF and WWTF are now constructed. Design objectives no longer needed as effluent release limits have been proposed to the Commission as part of this licence amendment.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		system, the potential sources of water contamination, the type of expected contamination, the expected volume of contaminated water that will need to be treated. **Detailed Design for LTWMF and Remediation Sites** Prior to implementation phase, the licensee is required to address the commitments they have made with respect to the completion of the Detailed Design Description reports (DDDR) for the LTWMF, the Remediation Sites 1A, 1B, 2A, 2D and the Port Hope Harbour Remediation summarized below in references 3 and 4, 9 and 10, and 12 and 13. The compliance expectation is that continuous improvements to safety are encouraged and therefore not all changes to the design or equipment of the facility require approval by the Commission. The expectation is that all design and equipment changes are subject to the controls defined in the licensee's Quality Assurance Plan.	

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
5.1 Fitness for Service Program The licensee shall implement and maintain a fitness for service program.	No Existing LC.	Not in current LCH	New LC – 5.1 Previously the PHAI licences did not include a licence condition for the fitness for service SCA. Now that the PHP and PGP LTWMF and WWTP are operational and CNL has gained sufficient operating experience, CNSC staff have recommended a licence condition for a fitness for service program.
6.1 Radiation Protection Program The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.	2.5 The licensee shall have a program for radiation protection for the project.	The radiation protection program is described in detail in the document referenced below. Compliance against this document is monitored by CNSC staff and corrective actions enforced, if necessary. The action levels for the occupational radiation exposure from Phase 2 construction and remediation activities are noted in the Occupational Radiation Exposure Action Levels for the PHAI.	New LC – 6.1 No significant change between old and new LC. Propose a 7-day notification period in the standardized LC. This is consistent with other CNL licences.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		The Effective Dose Action Level for Pregnant Nuclear Energy Workers is 0.3 mSv / four week monitoring period. Action levels should be periodically reviewed by the licensee's management to ensure that they are effective and appropriate. This review should be documented and the results reported in the annual compliance report. Proposed changes to these action levels should be notified to the CNSC in accordance with section 1.3 of this LCH.	Action levels are included in CNL program documentation referenced in the LCH rather than inserting table directly into the LCH.
7.1 Conventional Health and Safety Program The licensee shall implement and maintain a conventional health and safety program.	2.6 The licensee shall have a program for occupational health and safety for the project.	The licensee must implement and maintain the PHAI Occupational Health and Safety Plan as described in the document referenced below. The Port Granby Project is federally regulated and therefore must be in compliance with the Canada Labour Code *Part II*, and its associated applicable regulations.	New LC – 7.1 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
8.1 Environmental Protection Program The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.	2.7 The licensee shall have an environmental management and protection program for the project. 2.8 The licensee shall control, monitor, and record releases to the environment from the facilities such that the releases do not exceed the release limits specified in Appendix B. 2.9 The licensee shall implement an Environmental Assessment follow-up program.	2.9 The licensee shall have a well-documented environmental protection program for the project. The licensee shall implement and maintain the Environmental Management and Protection Plan as described in the documents listed below. An Environmental Protection Program identifies the control and the monitoring of all releases of radioactive and hazardous substances from the facility. It includes effluent and environmental monitoring, unplanned releases, assessment of environmental protection systems, and compliance with federal and provincial environmental regulations. 2.10 Phase I: Continue Operation of Welcome WMF During the continued operation of the Welcome WMF, the licensee is required to not exceed Phase I release limits as set out in Appendix B of the licence. As specified on the licence, the licensee is required to ensure that the effluent at the final point of control is not toxic. The remaining contaminants of potential concern will be addressed through the toxicity testing. For toxicity testing, the licensee is required	New LC – 8.1 Propose combining LC 2.10, 2.11 and 2.12 into one standardized LC. Propose a 7-day notification period in the standardized LC. This is consistent with other CNL licences. No longer require text on Phase I as these activities are no longer required. Text related to WWTP action levels to be removed as they are now established. Reporting on effluent releases is captured under the Reporting Requirements LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		to use the Environment Canada protocol for rainbow trout and *Daphnia magna* acute toxicity tests. In accordance with this protocol the toxicity tests are originally performed on a monthly basis using a sample of effluent collected from the point of compliance. The licensee is required to report the triggering of an Action Level when "three consecutive exceedances" occur. The licensee shall report the results of the effluent monitoring and toxicity testing on a quarterly basis. Phase II: Development of LTWMF Release limits is set for the purpose of protection of members of the public from unreasonable risk from releases of radionuclides into the environment from the normal operation of the licensed facility and will be used for CNSC compliance verification. The licensee must establish acceptable action levels associated with the operation of the new water treatment system within 12 months following the commissioning of the system Action levels are set to provide additional level of protection. Action Levels are	New program document has amalgamated the EP program with the biophysical and EA follow-up. Further justifies combining the 3 LCs into one LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		set for specific parameters that, if reached, may indicate a loss of control of portion of the process and trigger a requirement for a specific action to be taken. The identified action levels should be periodically reviewed by the licensee to ensure that they are effective and appropriate. This review should be documented, and the results reported in the annual compliance and performance report. Proposed changes to these action levels should be notified to the CNSC in accordance with section 1.3 of this LCH. In addition, for purposes of compliance and verification, part of the Environmental Protection Program, shall include water effluent sampling procedures. The licensee shall report the results of the effluent monitoring on a quarterly basis. Phase II: Remediation of On-land sites The licensee is required to use PWTS to treat contaminated water at remediation sites. During the remediation activities at on-land sites, the licensee is required to not exceed the Phase II release limits	

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		for PWTS as set out in Appendix B of the licence. During off-site remediation, the licensee shall report the results of the on-site water treatment on a monthly basis. 2.11 The Environmental Assessment follow-up program must be implemented at the early stages of the project. The results must be reported as part of the annual compliance and performance report as required by licence condition 2.3.	
9.1 Emergency Preparedness Program The licensee shall implement and maintain an emergency preparedness program**.**	2.12 The licensee shall have a program for emergency preparedness.	The licensee shall have a documented emergency preparedness plan for the project. The expectation is that the PHAI Emergency Plan, as referenced below, is maintained, and updated when necessary. The plan must be tested with drills as defined in the document.	New LC – 9.1 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
9.2 Fire Protection Program The licensee shall implement and maintain a fire protection program.	No Existing LC	Not in current LCH	New LC – 9.2 The standardized LC has a distinct separation for Emergency Preparedness and Fire Protection. However, the SCA combines them. This new LC does not add any new requirements. Propose adding the fire protection LC.
10.1 Waste Management Program The licensee shall implement and maintain a waste management program.	No Existing LC.	Not in current LCH	New LC – 10.1 The current PHAI licences do not include a licence condition for the waste management SCA. CNSC staff are of the opinion that a waste management program be required for the PHAI as it transitions to Phase III, long-term maintenance, and monitoring.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
10.2 Decommissioning Plan The licensee shall maintain a decommissioning plan.	No Existing LC.	Not in current LCH	New LC – 10.2 CNSC staff are of the opinion that a decommissioning plan be required for the PHAI as it transitions to Phase III, long-term maintenance and monitoring.
11.1 Security Program The licensee shall implement and maintain a security program.	2.13 The licensee shall have a security program for the project	The licensee shall have a project specific security plan that covers facility security and security systems that the licensee is to comply with. Prior to implementation of Phase 2 of the Port Hope project, the licensee shall develop project specific procedures based on their threat and risk assessment/site security survey, established to meet the requirements of paragraphs 12(1)(c), (g), (h) and (j) of the *General Nuclear Safety and Control Regulations*. Once the procedures are developed, they shall be submitted to the Commission, or a person authorized by the Commission.	New LC – 11.1 No significant change between old and new LC.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
12.1 Safeguards and Non-Proliferation The licensee shall implement and maintain a safeguards program.	No Existing LC.	Not in current LCH	The IAEA has requested wastes at the PHP be subject to safeguards.
13.1 Packaging and Transport Program The licensee shall implement and maintain a packaging and transport program	2.14 The licensee shall have a program for radioactive material transport and packaging for the project.	The licensee must have a written procedure(s) that must be maintained to ensure compliance with the *Transportation of Dangerous Goods Regulations* and the CNSC *Packaging and Transport of Nuclear Substances Regulations.* These are identified in the document referenced below.	New LC – 13.1 No significant change between old and new LC.
14 Facility Specific Licence Condition **14.1 Remedial Clean-up Criteria** The licensee shall conduct remedial work in accordance with the project developed and clean-up criteria.	2.1 The licensee shall conduct remedial work in accordance with the clean-up criteria specified in Appendix C to this licence.	The clean-up criteria were developed and introduced during the environmental assessment phase of the project. Consequently, the clean-up criteria cannot be amended without reconsideration of the environmental assessment for the project. This is meant to apply in one direction only, as the licensee may make changes in a safe direction without approval of the Commission.	New LC – 13.1 No significance changes between old and new LC. Contents of Appendix C to be included in LCH or documents referenced in LCH.

Standardized Licence Conditions, in Proposed Licence	Current Port Hope Project WNSL Licence Conditions	Current Port Hope Project WNSL LCH Text	Comment
		The Ontario Ministry of the Environment (OMOE) generic standards as per O. Reg. 153/04 (as amended in 2011) will apply for the clean-up of sites with and sites without development constrains as shown in Columns A and B of Appendix C of the licence. With exception of Welcome WMF and the Highland Drive Landfill sites which will be remediated in accordance with originally developed project specific clean-up criteria for sites with development constrains, Column C, Appendix C of the licence.	

Licence Format

Since 2013, the CNSC has implemented a process for standardizing licence conditions in licences issued. The current licences for the PGP and PSETSS were renewed for a period of one year in 2021. At the time of the renewals, the licences were updated to include CNSC's standardized licence conditions. However, the current licences for the PHP and PHRWMF do not follow CNSC's standardized licence conditions. The standardization of the PHP licence will be completed as part of this licence renewal and consolidation. The proposed consolidated PHP licence reflects CNSC's standardized licence conditions and modernized form.

Licence Period

CNL has requested a renewal of its licence for a period of 10 years for the PHP. The current licence was issued for a 10-year period, starting in 2012. The requested 10-year licence period is anticipated to cover the remediation activities at the PHP. Additionally, during the 10-year period, CNSC staff anticipate that CNL will request an amendment to remove both the PSETSS and PHRWMF following the remediation of these sites. CNSC has drafted a standardized licence and licence conditions handbook (LCH) framework which provides for effective regulatory oversight of operating facilities. CNL is required by its licence to report on its performance through annual compliance reports, including significant changes to its planned activities. CNSC staff verify compliance through desktop reviews, inspections, and event reviews. In addition, CNSC staff report compliance performance on the PHAI annually to the Commission in public meetings through the regulatory oversight reports for Canadian Nuclear Laboratories. Based on CNSC staff's review of CNL's application, performance, and supporting information, CNSC staff recommend the Commission authorize CNL's request for a licence period of 10 years, with an expiry date of December 31, 2032.

PROPOSED LICENCE

e-Doc 6749879 (Word)

e-Doc 6828786 (PDF)

DRAFT

File / Dossier: 2.05

WASTE NUCLEAR SUBSTANCE LICENCE
CANADIAN NUCLEAR LABORATORIES LTD.
PORT HOPE AREA INITIATIVE
WASTE MANAGEMENT PROJECT

I) LICENCE NUMBER: **WNSL-W1-2310.00/2032**

II) LICENSEE: Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:

Canadian Nuclear Laboratories Ltd.
Laboratoires Nucléaires Canadiens ltée
286 Plant Road
Chalk River, Ontario K0J 1J0

III) LICENCE PERIOD: This licence is valid from **January 1, 2023** to **December 31, 2032**, unless suspended in whole or in part, amended, revoked, or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to conduct the following activities located in the Municipality of Port Hope and Municipality of Clarington, Regional Municipality of Durham, Province of Ontario:

(a) possess, transfer, manage, and store nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from historic waste remediation operations as more precisely described in the application.

V) EXPLANATORY NOTES:

(a) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.

(b) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations.

(c) The Port Hope Area Initiative Long-Term Low-Level Radioactive Waste Management Project Licence Conditions Handbook (LCH), LCH-WNSL-W1-2310.00/2032, provides compliance verification criteria including the codes, standards and regulatory documents used to verify compliance with the conditions in the licence. The LCH also provides information regarding applicable versions of documents and non-mandatory recommendations and guidance on how to achieve compliance.

VI) CONDITIONS:

G. GENERAL

G.1 Licensing Basis

The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as:

(i) the regulatory requirements set out in the applicable laws and regulations;

(ii) the conditions and safety and control measures described in the licence and the documents directly referenced in that licence;

(iii) the safety and control measures described in the licence application and the documents needed to support that licence application;

unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission").

G.2 Notification of Changes

The licensee shall give written notification of changes to the licensed activity or its operation, including deviation from design, operating conditions, policies, programs and methods referred to in the licensing basis

G.3 Financial Guarantee

The licensee shall maintain a financial guarantee for decommissioning that is acceptable to the Commission.

G.4 Public Information and Disclosure Program

The licensee shall implement and maintain a public information and disclosure program.

1. MANAGEMENT SYSTEM

1.1 Management System

The licensee shall implement and maintain a management system.

2. HUMAN PERFORMANCE MANAGEMENT

2.1 Training Program

The licensee shall implement and maintain a training program.

3. OPERATING PERFORMANCE

3.1 Reporting Requirements

The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission.

4. PHYSICAL DESIGN

4. 1 Design Program

The licensee shall implement and maintain a design program.

5. FITNESS FOR SERVICE

5.1 Fitness for Service Program

The licensee shall implement and maintain a fitness for service program.

6. RADIATION PROTECTION

6.1 Radiation Protection Program

The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

7. CONVENTIONAL HEALTH AND SAFETY

7.1 Conventional Health and Safety Program

The licensee shall implement and maintain a conventional health and safety program.

8. ENVIRONMENTAL PROTECTION

8.1 Environmental Protection Program

The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

9. EMERGENCY MANAGEMENT AND FIRE PROTECTION

9.1 Emergency Preparedness Program

The licensee shall implement and maintain an emergency preparedness program.

9.2 Fire Protection Program

The licensee shall implement and maintain a fire protection program.

10. WASTE MANAGEMENT

10.1 Waste Management Program

The licensee shall implement and maintain a waste management program.

10.2 Decommissioning Plan

The licensee shall maintain a decommissioning plan.

11. SECURITY

11.1 Security Program

The licensee shall implement and maintain a security program.

12. SAFEGUARDS AND NON-PROLIFERATION

12.1 Safeguards Program

The licensee shall implement and maintain a safeguards program.

13. PACKAGING AND TRANSPORT

13.1 Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

14. FACILITY SPECIFIC

14.1 Remedial Cleanup Criteria

The licensee shall conduct remedial work in accordance with the project developed cleanup criteria.

SIGNED at OTTAWA, this _____ day of _____, 2022.

_____

Rumina Velshi, President
On behalf of the Canadian Nuclear Safety Commission

DRAFT LICENCE CONDITIONS HANDBOOK

e-Doc 6750017 (Word)

e-Doc 6828812 (PDF)

Canada's Nuclear Regulator

e-Doc 6750017 (WORD)
e-Doc 6828812 (PDF)

LICENCE CONDITIONS HANDBOOK

LCH-WNSL-W1-2310.00/2032

PORT HOPE AREA INITIATIVE WASTE MANGEMENT PROJECT

WASTE NUCLEAR SUBSTANCE LICENCE

WNSL-W1-2310.00/2032

Revision 0

DRAFT

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada

Licence Conditions Handbook **Effective: Month day, year**

LCH-WNSL-W1-2310.00/2032

Port Hope Area Initiative Waste Management Project

Waste Nuclear Substance Licence

WNSL-W1-2310.00/2032

SIGNED at OTTAWA this___day of Month, year

Kimberley Campbell, Director

Canadian Nuclear Laboratories Regulatory Program Division
Directorate of Nuclear Cycle and Facilities Regulations
CANADIAN NUCLEAR SAFETY COMMISSION

Revision History:

Effective Date	Rev. #	e-Doc #	Description	CAF e-Doc #
Month day, year	0	xxxxxxx	Original Document	N/A

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INTRODUCTION

The general purpose of the Licence Conditions Handbook (LCH) is to identify and clarify the relevant parts of the licensing basis for each licence condition. This will help ensure that the licensee performs the licensed activities under the Port Hope Area Initiative (PHAI) Waste Management Project licence in accordance with the licensing basis for the PHAI Waste Management Project and the intent of the PHAI Waste Management Project licence. The LCH should be read in conjunction with the licence.

The LCH typically has three parts under each licence condition: the Preamble, Compliance Verification Criteria (CVC), and Guidance. The Preamble explains, as needed, the regulatory context, background, and/or history related to the licence condition. CVC are criteria used by Canadian Nuclear Safety Commission (CNSC) staff to verify and oversee compliance with the licence condition. Guidance is non-mandatory information, including direction, on how to comply with the licence condition.

The documents referenced in the LCH by e-Access number are not publicly available. The links provided in the LCH are referenced to the internal CNSC electronic filing system, and those documents cannot be opened from outside of the CNSC network.

Current versions of CNL licensing basis documents referenced in the LCH that require notification of change, are tracked in *Licensing documents for the PHAI Waste Management Project* (e-Doc 6751607) and *Canadian Nuclear Laboratories Licence Conditions Handbook CNL 900 Company-Wide Documents* (e-Doc 5507946), which are controlled by the Canadian Nuclear Laboratories Regulatory Program Division and are available to the licensee upon request.

Most CNSC documents referenced in the LCH are available through the CNSC public website. Documents listed on the CNSC website may contain prescribed information as defined by the *General Nuclear Safety and Control Regulations*. Information in these documents will be made available only to stakeholders with appropriate security clearance on a valid need to know basis.

The licensee documents referenced in the LCH are not publicly available; they contain proprietary information or prescribed information as defined by the *General Nuclear Safety and Control Regulations*.

Domestic and international standards (in particular consensus standards produced by the Canadian Standards Association (CSA) Group) are an important component of the CNSC's regulatory framework. Standards support the regulatory requirements established through the *Nuclear Safety and Control Act* (NSCA), its regulations and licences by setting out the necessary elements for acceptable design and performance at a regulated facility or regulated activity. Standards are one of the tools used by the CNSC to evaluate whether licensees are qualified to carry out licensed activities.

The CNSC offers complimentary access to the CSA Group suite of nuclear standards through the CNSC website. This access platform allows interested stakeholders to view these standards online through any device that can access the Internet.

Up to date lists of the licensed sites at the PHAI Waste Management Project that are subject to CNSC regulatory oversight, are maintained in the Canadian Nuclear Laboratories (CNL) document 900-514300-LST-001, *Controlled List Site Licences, Certificates, Permits, Building/Facility Contacts, & Licence Representatives*.

Appendix A to the LCH provides definitions of terms and a list of acronyms used throughout it.

Unless otherwise specified in the LCH, days are to be interpreted as calendar days.

G. GENERAL

Licence Condition G.1: Licensing Basis

The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as:

(i) the regulatory requirements set out in the applicable laws and regulations;

(ii) the conditions and safety and control measures described in the facility's or activity's licence and the documents directly referenced in that licence; and

(iii) the safety and control measures described in the licence application and the documents needed to support that licence application;

unless otherwise approved in writing by the Canadian Nuclear Safety Commission (hereinafter "the Commission").

Preamble:

The licensing basis sets the boundary conditions for acceptable performance at a regulated facility or activity, thus establishes the basis for the CNSC's compliance program in respect of that regulated facility or activity. The degree to which the regulatory requirements are applied to the PHAI Waste Management Project and activities should reflect their importance to health and safety of persons, environment, national security, international obligations to which Canada has agreed, licensee's quality and economic expectations, the complexity of facility or activity, and the possible consequences if accidents occur or the activity is carried out incorrectly.

Where the licence condition requires the licensee to implement and maintain a particular program, the licensee documents that describe and implement the program are part of the licensing basis. Programs required by licence conditions or referred to in the LCH may or may not be health, safety, security, environment, and quality programs as defined in the Canadian Nuclear Laboratories Ltd. (CNL)'s management system.

Compliance Verification Criteria:

Part (i) of licensing basis

Part (i) of the licensing basis refers to applicable laws and regulations. There are many federal and provincial acts and regulations, and international laws, agreements, guidelines, etc., applicable to activities performed at the PHAI Waste Management Project sites.

The laws, regulations and international agreements for which CNSC has a regulatory role are:

- *Nuclear Safety and Control Act* (NSCA) and its regulations;
- *Canadian Environmental Assessment Act, 1992 (CEAA 1992)*;
- *Transportation of Dangerous Goods Act, 1992* and its regulations;
- *Canada Labour Code* and *Canada Occupational Health and Safety Regulations*;
- *Nuclear Liability and Compensation Act* and its regulations;
- *Fisheries Act*; and
- Canada/IAEA safeguards agreements

All Memoranda of Understandings between the CNSC and other regulatory agencies or government departments are available on the CNSC Webpage under Acts and Regulations/Domestic Arrangements.

Part (ii) of the Licensing Basis

Part (ii) of the licensing basis refers to the conditions and the safety and control measures included in the PHAI Waste Management Project licence and in the documents directly referenced in the licence,

Under the standardized format and content, the PHAI Waste Management Project licence requires the licensee to implement and maintain certain programs. For the purposes of meeting a licence requirement, a program may be a series of documented, coordinated activities, not necessarily a single document.

Part (iii) of the Licensing Basis

Part (iii) of the licensing basis refers to the safety and control measures described in the licence application and the documents needed to support that licence application. The safety and control measures include important aspects of documentation such as, but not limited to: the facility-specific design basis and operational information documented in the most recent safety analysis and operational limits and conditions documents.

Part (iii) of the licensing basis also includes safety and control measures outlined in CNSC regulatory documents, CSA standards, and other standards, codes and references that are cited in the application or in the licensee's supporting documentation.

Applicable licensee documents are listed in the LCH under the heading "Licensee Documents that Require Notification of Change". Applicable CNSC regulatory documents, CSA standards and other documents are listed in the LCH under the heading "Licensing Basis Publications". The licensee documents listed in the LCH could cite other documents that also contain safety and control measures (i.e., there may be safety and control measures in "nested" references in the application). The licensee documents listed in the LCH and their "nested" references define the licensing basis for the programs required by the licence as long as they include safety and control measures.

Regulatory Role of the Licensing Basis

The licensing basis is established when the Commission renders its decision regarding the licence application.

Licence condition G.1 requires the licensee to conduct the licensed activities in accordance with the licensing basis. For activities that are not in accordance with the licensing basis, the licensee shall take action as soon as practicable to return to a state consistent with the licensing basis, taking into account the risk significance of the situation.

The applicability of the licensing basis publications may be graded based on the specific activity being considered.

CNSC Staff's Approach to Assessing the Licensing Basis for the PHAI Waste Management Project

Licence condition G.1 is not intended to unduly inhibit the ongoing management and operation of the facility or the licensee's ability to adapt to changing circumstances and continuously improve, in accordance with its management system. Where the licensing basis refers to specific configurations, methods, solutions, designs, etc., the licensee is free to propose alternate approaches as long as they remain, overall, in accordance with the licensing basis and have a neutral or positive impact on health, safety, the environment, security, and safeguards. However, the licensee shall assess changes to confirm that operations remain in accordance with the licensing basis. The assessment shall be documented and made available to CNSC staff upon request.

For any proposed activity to be carried out on the PHAI Waste Management Project sites, CNSC staff will review the information submitted by CNL to independently determine if the proposed activity remains within the licensing basis. CNSC staff assess a proposed activity as being within the licensing

basis based on the hazard and risk of the change, and its impact on the overall safety of the PHAI Waste Management Project.

CNSC staff will submit to the Commission for consideration any proposed activity which CNSC staff consider to be outside of the licensing basis. If the Commission grants approval to such an activity, it will become part of the licensing basis for the PHAI Waste Management Project and reflected in updates to the LCH as appropriate.

Activities Included in the PHAI Waste Management Project Licensing Basis

The PHAI Waste Management Project licence consolidates all previous licences associated with the PHAI, which includes the licences for the Port Hope Project, Port Granby Project, Pine Street Extension Temporary Storage Site and Port Hope Waste Management Facility.

Authorized licensed activities under the PHAI Waste Management Project licence include:

- possess, transfer, manage, and store nuclear substances, except Category I, II and III nuclear material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from historic waste remediation operations as more precisely described in the application.

For any licence condition, or any specific CVC or guidance that is not applicable to all aspects of the PHAI Waste Management Project licence, this will be indicated in the preamble text or next to the specific CVC guidance.

Licence Application Documents and Supporting Documents

Document Number	Document Title	e-Doc
4501-CNNO-21-0020-L	Application for the Renewal of the Port Hope Project Waste Nuclear Substance Licence WNSL-W1-2310.02/2022	6638975
4500-CNNO-22-0009-L	Addendum to the Application for Renewal of the Port Hope Project Waste Nuclear Substance Licence WNSL-W1-2310.02/2022	6750777

Guidance:

The CNSC regulatory document REGDOC-3.5.3, *Regulatory Fundamentals*, outlines the CNSC's regulatory philosophy and approach to applying the NSCA. It provides information for licensees, applicants and the public, and contains neither guidance nor requirements. In particular, subsection 6.1.1 of REGDOC-3.5.3 provides information about the licensing basis.

When the licensee becomes aware that a proposed change or activity might be outside the licensing basis, it should first seek direction from CNSC staff regarding the potential acceptability of this change or activity. The licensee should take into account that certain types of proposed changes might require significant lead times before CNSC staff can make recommendations and/or the Commission can properly consider them.

Licence Condition G.2: Notification of Changes

The licensee shall give written notification of changes to the facility or its operation, including deviation from design, operating conditions, policies, programs and methods referred to in the licensing basis.

Preamble:

Most changes to the PHAI Waste Management Project are captured as changes to corresponding licensee documents. The LCH identifies licensee documents that require written notification of changes to the CNSC.

Compliance Verification Criteria:

The licensee shall, at a minimum, notify CNSC staff of changes to licensee documents identified in the LCH.

CNL program requirements documents (PRDs) and program description documents (PDDs) are accompanied by governing document indices (GDIs). The licensee shall provide updated versions of GDIs annually or upon request from the CNSC.

Licensee documents listed in the LCH are subdivided into groups having different requirements for notification of change.

Prior Notification Requirement	Definition
Requires prior notification	The licensee shall submit the revised document to the CNSC as far in advance of planned implementation as practicable, but no less than 30 days prior to planned implementation. The licensee shall allow sufficient time for the CNSC to review the change proportionate to its complexity and the importance of the safety and control measures being affected. This is denoted by a Y in the column "prior notification". Where a document or some part of it requires acceptance by CNSC staff prior to implementation, a footnote has been added to the notification column.
Requires notification at time of implementation	The licensee shall notify the CNSC at the time of implementing a revised document. This is denoted by an N in the column "prior notification".

Notifications of changes to licensee documents shall be provided in writing to CNSC staff. Written notifications shall include a summary description of the change, the rationale for the change, expected duration (if not a permanent change), and a summary explanation of how the licensee has concluded that the change remains in accordance with the licensing basis (e.g., an evaluation of the impact on health, safety, security, the environment and Canada's international obligations). A copy of the revised written notification document shall accompany the notification. All written notifications shall be transmitted to CNSC per established communications protocols.

The above also applies to a notice of change that requires CNSC staff acceptance, due to some other requirement in the licensing basis.

Changes that may affect the licensing basis, including any change that is not captured as a change to a document listed in the LCH (e.g., construction of new buildings, transitioning any building/land from one phase of the project to another, or design changes to structures, systems and components related to the activities authorized in the licence), requires written notification to the CNSC to verify they are in accordance with the licensing basis. The licensee shall provide written notification to the CNSC for these types of changes as far in advance as possible, but no less than 30 days prior to planned implementation.

For any change that is outside the licensing basis defined in subsection G.1 of the LCH, the licensee shall obtain Commission approval before proceeding with the change.

Guidance:

For proposed changes that would not be in accordance with the licensing basis, the guidance for licence condition G.1 applies.

Licence Condition G.3: Financial Guarantee

The licensee shall maintain a financial guarantee for decommissioning that is acceptable to the Commission.

Preamble:

The *General Nuclear Safety and Control Regulations* requires that a licence application contain "*a description of any proposed financial guarantee relating to the activities to be licensed*".

The financial guarantee for the PHAI Waste Management Project is in the form of an expressed commitment. Atomic Energy of Canada Limited (AECL) is a Schedule III, Part 1 Crown Corporation under the *Financial Administration Act* and an agent of Her Majesty in Right of Canada. As an agent of Her Majesty in Right of Canada, AECL's liabilities are ultimately liabilities of Her Majesty in Right of Canada. While the restructuring of AECL has seen the ownership of CNL transferred to a private-sector contractor, the Canadian National Energy Alliance (CNEA), AECL retains ownership of the lands, assets and liabilities associated with CNL's licences. These liabilities have been officially recognized by the Minister of Natural Resources in a letter dated July 31, 2015 and was reaffirmed in 2020 (e-Doc 4803454, 6373440, 6373441, 6373442).

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-3.3.1	Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities	2021	January 1, 2023

CNL has performed a gap analysis and developed an implementation plan of decommissioning regulatory documents. This information was submitted in a letter to CNSC entitled *Submission of Implementation Plan and Gap Analysis of Decommissioning Regulatory Documents for the Port Hope Area Initiative Project* (see LCH section LC#10.2), which outlines CNL's commitment to meeting the following licensing basis publications:

Document Number	Document Title	Version
REGDOC-2.11.2	Decommissioning	2021
CSA N294	Decommissioning of facilities containing nuclear substances	2019

Guidance:

None Provided.

Licence Condition G.4: Public Information and Disclosure Program

The licensee shall implement and maintain a public information and disclosure program.

Preamble:

The primary goal of a public information and disclosure program, as it relates to the licensed activities, is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of the nuclear facilities are effectively communicated to the public. The public information program includes a public disclosure protocol describing the information and the medium of disclosure in regard to information and reports of interest to the public.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
4500-513000-PLA-003	Port Hope Area Initiative Public Information and Disclosure Program	6751607	N

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-3.2.1	Public Information and Disclosure	2018

SCA – MANAGEMENT SYSTEM

Licence Condition 1.1: Management System

The licensee shall implement and maintain a management system.

Preamble:

Safe and reliable operation of nuclear facilities requires a commitment and adherence to a set of management system principles and, consistent with those principles, the implementation of planned and systematic processes that achieve expected results consistently and safely. The management system requirements apply to and support the safe conduct of all licensed activities.

The *General Nuclear Safety and Control Regulations* require that a licence application contain the applicant's organizational management structure, including the internal allocation of functions, responsibilities and authority.

The management system is in place to satisfy the requirements set out in the NSCA, regulations made pursuant to the NSCA, the licence and the measures necessary to ensure that safety is of paramount consideration in the implementation of the management system. The management system promotes and supports a healthy safety culture. Characteristics of a healthy safety culture are as follows:

- Safety is a clearly recognized value;
- Accountability for safety is clear;
- Safety is integrated into all activities;
- A safety leadership process exists; and
- Safety culture is learning driven

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
CSA N286-12	Management System Requirements for Nuclear Facilities	2012 (R2017)	2017

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-514100-MAN-001	CNL Management System Manual	5507946	Y
900-514200-PDD-001	Quality	5507946	N
900-514200-PRD-001	Quality	5507946	Y

900-514100-LST-001	Functional Authorities	5507946	N
900-514300-LST-001	Site Licences, Certificates, Permits, Building/Facility Contacts, & Licence Representatives	5507946	N
900-514100-LST-002	Codes, Regulations, Standards, and other Documents	5507946	N
236-514200-QAP-001	Historic Waste Program Quality Assurance Plan	6751607	N

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-2.1.2	Safety Culture	2018
CSA N286.0.1	Commentary on N286-12, Management System Requirements for Nuclear Facilities	2021

SCA – HUMAN PERFORMANCE MANAGEMENT

Licence Condition 2.1: Training Program

The licensee shall implement and maintain a training program.

Preamble:

This licence condition requires the licensee to develop and implement training programs for workers.

It also provides the requirements regarding the program and processes necessary to support responsibilities of, qualifications and requalification training of persons at the nuclear facility.

As defined by the *General Nuclear Safety and Control Regulations*, a worker is a person who performs work that is referred to in a licence. This includes contractors and temporary employees. Training requirements apply equally to these types of workers as to the licensee's own employees.

The *General Nuclear Safety and Control Regulations* require that licensees ensure that there are a sufficient number of properly trained and qualified workers to safely conduct the licensed activities.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-2.2.2	Personnel Training, Version 2	2016	October 2021

Licensee Documents that Require Notification of Change

Document Number	Document Title	Version	Prior Notification
900-510200-PDD-001	Training and Development	5507946	N
900-510200-PRD-001	Training and Development	5507946	Y
4500-510200-PLA-001	Port Hope Area Initiative Training Plan	6751607	N

Guidance:

None provided.

SCA – OPERATING PERFORMANCE

Licence Condition 3.1: Reporting Requirements

The licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission.

Preamble:

This licence condition requires the licensee to implement and maintain a program for reporting information to CNSC, including compliance monitoring, operational performance, event reporting, and various types of notifications.

Many reportable occurrences included in REGDOC-3.1.3 do not necessarily show a degradation of licensee's performance, and do not fall under CNSC definition of a "reportable event" as included in REGDOC-3.6, *Glossary of CNSC Terminology*. An exercise of judgment is needed to select from all occurrences reported to CNSC; those that really constitute "reportable events". Sections 29 and 30 of the *General Nuclear Safety and Control Regulations* provides requirements for reportable events.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-3.1.3	Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices	2020	March 3, 2020

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-514300-MCP-006	CNL Reporting to Regulatory Agencies	5507946	N

Compliance Monitoring: Annual Reporting

The licensee shall prepare and submit to the CNSC staff, by end of April each calendar year, an annual compliance report as per REGDOC-3.1.3 for the period of January 1 to December 31 of the previous calendar year.

Guidance:

None Provided.

SCA – PHYSICAL DESIGN

Licence Condition 4.1: Design Program

The licensee shall implement and maintain a design program.

Preamble:

A design program ensures that the facility design is managed using a well-defined systematic approach. Implementing and maintaining a design program confirms that safety-related SSCs and any modifications to them continue to meet their design bases given new information arising over time and taking changes in the external environment into account. It also confirms that SSCs continue to be able to perform their safety functions under all facility states. An important cross-cutting element of a design program is design basis management.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
	National Building Code of Canada	2015	
	National Fire Code of Canada	2015	

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508120-PDD-001	Design Authority and Design Engineering	5507946	N
900-508120-PRD-001	Design Authority and Design Engineering	5507946	Y
2010-12-22-60154177-DDDR-RA	Port Granby Project - Detailed Design Description Report	6751607	Y
4502-508120-DBD-001	Port Granby Project - Detailed Design Description Addendum	6751607	Y
PHP-RS3-RPT-002	Port Hope Project - RS3: Detailed Design Description Report: Long-term Waste Management Facility	6751607	Y
4501-508120-DBD-001	Port Hope Project - Addendum to the Detailed Design Description Report: Long-term Waste Management Facility	6751607	Y
PHP-RS3-RPT-003	Port Hope Project - RS3: Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Sites Group 1A	6751607	Y

Document Number	Document Title	e-Doc	Prior Notification
PHP-RS3-RPT-004	Port Hope Project - RS3: Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites Group 1B	6751607	Y
PHP-RS3-RPT-006	Port Hope Project - RS3: Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Sites Group 2A	6751607	Y
PHP-RS3-RPT-007	Port Hope Project - RS3: Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites & Industrial Waste Remediation Sites Group 2C	6751607	Y
PHP-RS3-RPT-011	Port Hope Project - RS3: Detailed Design Description Report for Low-Level Radioactive Waste Remediation Sites Group 2D	6751607	Y
PHP-RS3-RPT-005	Port Hope Project - Detailed Design Description Report for Low-Level Radioactive Waste Remediation Port Hope Harbour	6751607	Y

Guidance:

None Provided.

SCA – FITNESS FOR SERVICE

Licence Condition 5.1: Fitness for Service Program

The licensee shall implement and maintain a fitness for service program.

Preamble:

The fitness for service SCA covers activities that impact the physical condition of structures, systems and components to ensure that they remain effective over time. This area includes programs that verify equipment is available to perform its intended design function when called upon to do so.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508230-PDD-001	Fitness for Service	5507946	N
900-508230-PRD-001	Fitness for Service	5507946	Y

Guidance:

None Provided.

SCA – RADIATION PROTECTION

Licence Condition 6.1: Radiation Protection Program

The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

Preamble:

The *Radiation Protection Regulations* (RPR) require that the licensee implement a radiation protection program and also ascertain and record doses for each person who performs any duties in connection with any activity that is authorized by the NSCA or is present at a place where that activity is carried out. This program must ensure that doses to persons do not exceed prescribed dose limits and are kept as low as reasonably achievable (ALARA), social and economic factors being taken into account. Also, the program must ensure that occupational exposures are ascertained and recorded in accordance with the RPR through the establishment of dosimetry requirements. The regulatory dose limits for workers are explicitly provided in the RPR.

The RPR also specifies the requirements related to action levels (ALs) and indicate that the licence will be used to identify their notification timeframes.

By definition, if an AL is reached, a loss of control of some part of the associated radiation protection program may have occurred, and specific action is required, as defined in the RPR and the licence. ALs are not intended to be static and are to reflect operating conditions at the PHAI Waste Management Project sites.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508740-PDD-001	Radiation Protection	5507946	N
900-508740-PRD-001	Radiation Protection	5507946	Y
900-508740-LST-002	Radiation Protection Action Levels	5507946	Y
900-508740-MCP-006	Radiation Protection Action Levels	5507946	Y
900-508740-MCP-007	Dose Control Points	5507946	N
900-508740-MCP-026	ALARA Review and Assessment – Planning and Control of Radiation Work	5507946	N
900-508740-STD-005	Design and Modification Considerations	5507946	N
4500-508740-PLA-001	Port Hope Area Initiative Radiation Protection Plan	6751607	Y

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-2.7.1	Radiation Protection	2021
REGDOC-2.7.2	Dosimetry, Volume I: Ascertaining Occupational Dose	2021

The licensee should conduct a documented review and, if necessary, revise the ALs at least once every five years in order to validate their effectiveness. The results of such reviews should be provided to CNSC staff.

SCA – CONVENTIONAL HEALTH AND SAFETY

Licence Condition 7.1: Conventional Health and Safety Program

The licensee shall implement and maintain a conventional health and safety program.

Preamble:

As federally regulated sites, the PHAI Waste Management Project is also subject to the requirements of *Canada Labour Code* and *Canada Occupational Health and Safety Regulations*. Many activities at the PHAI Waste Management Project sites may be performed by contractors who are subject to requirements under Ontario's *Occupational Health and Safety Act, R.S.O. 1990, c. O. 1*.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-510400-PDD-001	Occupational Safety and Health	5507946	N
900-510400-PRD-001	Occupational Safety and Health	5507946	Y
4500-510400-PLA-001	Port Hope Area Initiative Occupational Safety and Health Plan	6751607	N

The Employment and Social Development Canada is mandated with overseeing and enforcing compliance with the *Canada Labour Code* and its regulations. CNSC staff monitor licensee compliance with its conventional health and safety program, and will take regulatory actions for any potential unsafe work practice situations.

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-2.8.1	Conventional Health and Safety	2019

SCA – ENVIRONMENTAL PROTECTION

Licence Condition 8.1: Environmental Protection Program

The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

Preamble:

The *General Nuclear Safety and Control Regulations* requires every licensee to take all reasonable precautions to protect the environment. The *Radiation Protection Regulations* prescribe the radiation dose limits for the general public of 1 mSv per calendar year.

The release of hazardous substances is regulated by the CNSC as well as both the Ontario Ministry of the Environment, Conservation and Parks and Environment and Climate Change Canada through various acts and regulations.

The environmental protection SCA includes the following:

- Effluent and emissions control (releases);
- Environmental management system (EMS);
- Assessment and monitoring;
- Protection of the public; and
- Environmental Risk Assessment.

Action levels (ALs) for environmental releases are calculated by the licensees and aim to alert licensees of a potential loss of control of their environmental protection program. By definition, if an action level is reached, a loss of control of some part of the associated environmental protection program may have occurred, and specific action is required. ALs are not intended to be static and are to reflect operating conditions at the PHAI Waste Management Project sites.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-2.9.1	Environmental Protection: Environmental Principles, Assessments and Protection Measures	2020 (Version 1.2)	September 2020

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-509200-PDD-001	Environmental Protection	5507946	N
900-509200-PRD-001	Environmental Protection	5507946	Y

Document Number	Document Title	e-Doc	Prior Notification
4501-509200-PLA-003	Port Hope Project Environmental Protection Plan	6751607	Y
4501-509247-PLA-001	Port Hope Project Environmental and Biophysical Monitoring Plan	6751607	Y
4502-509247-PLA-001	Port Granby Project Environmental and Biophysical Monitoring Plan	6751607	Y
4500-509200-PLA-001	Port Hope Area Initiative Dust Management Plan	6751607	N
LLRWMO-508760-LBD-11001	Environmental Parameters, Investigative and Corrective Measures Thresholds for Environmental Monitoring of WNSL-W1-182 Licensed Activities	6751607	Y

The licensee shall implement all follow-up actions identified as a result of impact or environmental assessments.

The licensee will ensure effluent monitoring for nuclear and/or hazardous substances is designed, implemented and managed to respect applicable laws/regulation and to incorporate best practices. The effluent monitoring program will provide for control of waterborne effluents. The licensee shall control, monitor and record releases of radioactive and/or hazardous substances such that the releases do not exceed the reference levels (limits) specified in *Port Granby Project Environmental and Biophysical Monitoring Plan* and *Port Hope Project Environmental and Biophysical Monitoring Plan*.

Action levels for environmental releases are included in *Port Granby Project Environmental and Biophysical Monitoring Plan* and *Port Hope Project Environmental and Biophysical Monitoring Plan*.

Guidance:

Guidance Documents

Document Number	Document Title	Version
CSA N288.8	Establishing and Implementing Action Levels to Control Releases to the Environment from Nuclear Facilities	2017

SCA – EMERGENCY MANAGEMENT AND FIRE PROTECTION

Licence Condition 9.1: Emergency Preparedness Program

The licensee shall implement and maintain an emergency preparedness program.

Preamble:

This licence condition requires the licensee to establish an emergency preparedness program to prepare for, to respond to, and to recover from the effects of accidental radiological/nuclear and/or hazardous substance release. As part of the emergency preparedness program, the licensee establishes an onsite emergency response plan and an emergency response organization and makes arrangements for coordinating off-site activities and cooperating with external response organizations throughout all phases of an emergency.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508730-PDD-001	Emergency Preparedness	5507946	N
900-508730-PRD-001	Emergency Preparedness	5507946	Y
4500-508730-PLA-001	Port Hope Area Initiative Emergency Plan	6751607	N

The requirements of this licence condition apply to all sites where the licence is posted.

Guidance:

None Provided.

Licence Condition 9.2: Fire Protection Program

The licensee shall implement and maintain a fire protection program.

Preamble:

Licensees require a comprehensive fire protection program to ensure the licensed activities do not result in unreasonable risk to the health and safety of persons and to the environment due to fire and to ensure that the licensee is able to efficiently and effectively respond to emergency fire situations.

The *National Fire Code of Canada* sets out technical provisions regulating (a) activities related to the construction, use or demolition of buildings and facilities; (b) the condition of specific elements of buildings and facilities; (c) the design or construction of specific elements of facilities related to certain hazards; and (d) protection measures for the current or intended use of buildings.

The *National Building Code of Canada* sets out technical provisions for the design and construction of new buildings. It also applies to the alteration, change of use and demolition of existing buildings on federal properties.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
	National Fire Code of Canada	2015	
	National Building Code of Canada	2015	

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508720-PDD-001	Fire Protection	5507946	N
900-508720-PRD-001	Fire Protection	5507946	Y
4500-508720-PLA-001	Port Hope Area Initiative Fire Protection Plan	6751607	N

The licensee shall, prior to implementation of any proposed modifications of the facility with the potential to negatively impact protection from fire, determine the need for a third-party review based on a risk based approach using the fire protection screening process.

The requirements of this licence condition apply to all sites where the licence is posted.

Guidance:

None Provided.

SCA – WASTE MANAGEMENT

Licence Condition 10.1: Waste Management Program

The licensee shall implement and maintain a waste management program.

Preamble:

The "waste management" safety and control area covers internal waste-related programs that form part of the PHAI Waste Management Project sites' operations up to the point where the waste is removed from the PHAI Waste Management Project sites to a separate waste management facility, location, or site. Specific areas include waste characterization, waste minimization, waste management practices, and decommissioning plans.

CNSC regulatory document REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada* describes the national framework and philosophy underlying the CNSC's approach to regulating the management of radioactive waste and decommissioning, and explains the principles taken into account in CNSC regulatory decisions.

CNSC Regulatory Document REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* defines radioactive waste as any material (liquid, gaseous, or solid) that contains a radioactive nuclear substance, as defined in section 2 of the NSCA, for which no further use is foreseen. In addition to containing nuclear substances, radioactive waste may also contain hazardous substances that are not radioactive, as defined in section 1 of the *General Nuclear Safety and Control Regulations*.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-2.11.1	Waste Management, Volume I: Management of Radioactive Waste	2021	January 1, 2023
CSA N292.0	General principles for the management of radioactive waste and irradiated fuel	2019	January 1, 2023
CSA N292.3	Management of low- and intermediate-level radioactive waste	2014	January 1, 2023

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508600-PDD-001	Waste Management	5507946	N
900-508600-PRD-001	Waste Management	5507946	Y
145-CNNO-22-0005-L	Submission of Implementation Plan and Gap Analysis of Waste Management Regulatory	6751607	N

	Documents for the Port Hope Area Initiative Project		

CNL's commitment to establish program documentation for the Waste Management SCA is outlined in its letter to CNSC entitled *Submission of Implementation Plan and Gap Analysis of Waste Management Regulatory Documents for the Port Hope Area Initiative Project*.

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-2.11	Framework for Radioactive Waste Management and Decommissioning Canada, Version 2	2021
REGDOC-2.11.1	Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste, Version 2	2021
CSA N292.6	Long-term management of radioactive waste and irradiated fuel	2018
CSA N292.5	Guideline for the exemption or clearance from regulatory control of materials that contain or potentially contain, nuclear substances	2011 (R2021)

Licence Condition 10.2: Decommissioning Plan

The licensee shall maintain a decommissioning plan.

Preamble:

The "waste management" safety and control area covers internal waste-related programs that form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. This area also covers the planning for decommissioning.

CNSC Regulatory Document REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada*, describes the national framework and philosophy underlying the CNSC's approach to regulating decommissioning.

CNSC Regulatory Document REGDOC-2.11.2, *Decommissioning* defines decommissioning as the administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility, location or site where nuclear substances are managed, used, possessed or stored. Decommissioning actions are the procedures, processes and work activities (e.g., storage with surveillance, decontamination, dismantling or cleanup) that are taken to retire a facility, location or site from service with due regard for the health and safety of people and the environment.

Compliance Verification Criteria:

Licensing Basis Publications

CNL has performed a gap analysis and developed an implementation plan of decommissioning regulatory documents. This information was submitted in a letter to CNSC entitled *Submission of Implementation Plan and Gap Analysis of Decommissioning Regulatory Documents for the Port Hope Area Initiative Project*, which outlines CNL's commitment to meeting the following licensing basis publications:

Document Number	Document Title	Version
REGDOC-2.11.2	Decommissioning	2021
CSA N294	Decommissioning of facilities containing nuclear substances	2019

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508300-PDD-001	Cleanup	5507946	N
900-508300-PRD-001	Cleanup	5507946	Y
145-CNNO-22-0006-L	Submission of Implementation Plan and Gap Analysis of Decommissioning Regulatory Documents for the Port Hope Area Initiative Project	6751607	N

CNL's commitment to establish preliminary decommissioning plans for the Port Hope Project and Port Granby Project sites is outlined in its letter to CNSC entitled *Submission of Implementation Plan and Gap Analysis of Decommissioning Regulatory Documents for the Port Hope Area Initiative Project*.

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-3.3.1	Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities	2021

SCA – SECURITY

Licence Condition 11.1: Security Program

The licensee shall implement and maintain a security program.

Preamble:

Nuclear security puts in place provisions to prevent, detect and stop malevolent acts, such as theft, sabotage, unauthorized access, illegal transfer or other acts involving nuclear material, other radioactive substances or their associated facilities.

The *General Nuclear Safety and Control Regulations* require that a licence application contain information related to site access control and measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508710-PDD-001	Security	5507946	N
900-508710-PRD-001	Security	5507946	Y
4500-508710-PLA-001	Port Hope Area Initiative Security Plan	6751607	N

Guidance:

Guidance Documents

Document Number	Document Title	Version
REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material	Version 2.1 (2020)

e-Doc 6570017 (Word)
e-Doc 6828812 (PDF)

SCA – SAFEGUARDS AND NON-PROLIFERATION

Licence Condition 12.1: Safeguards Program

The licensee shall implement and maintain a safeguards program.

Preamble:

Safeguards is a system of inspection and other verification activities undertaken by the International Atomic Energy Agency (IAEA) in order to evaluate a Member State's compliance with its obligations pursuant to its safeguards agreements with the IAEA.

The *General Nuclear Safety and Control Regulations* requires the licensee to take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement.

Canada has entered into a safeguards agreement with the IAEA pursuant to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons. The objective of the Canada/IAEA safeguards agreements is for the IAEA to provide assurance on an annual basis to Canada and to the international community that all declared nuclear materials are in peaceful, non-explosive uses and that there is no indication of undeclared nuclear materials or activities. This conclusion confirms that Canada is in compliance with its obligations under the following Canada/IAEA safeguards agreements:

- *Treaty on the Non-Proliferation of Nuclear Weapons*;
- *Agreement Between the Government of Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons*; and
- *Protocol Additional to the Agreement Between Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons*.

These are reproduced in information circulars INFCIRC/140, INFCIRC/164, and INFCIRC/164/Add. 1.

This licence condition only applies to the Port Hope Project and excludes the Port Granby Project, Pine Street Extension Temporary Storage Site and Port Hope Waste Management Facility.

Compliance Verification Criteria:

Licensing Basis Publications

Document Number	Document Title	Version	Effective Date
REGDOC-2.13.1	Safeguards and Nuclear Material Accountancy	2018	June 2018

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508510-PDD-001	Nuclear Materials and Safeguards Management	5507946	N
900-508510-PRD-001	Nuclear Materials and Safeguards Management	5507946	Y

The licensee shall obtain prior written approval of the CNSC, for any changes to operation, equipment or procedures requested by the licensee that would affect the implementation of safeguards measures.

Guidance:

None Provided.

SCA – PACKAGING AND TRANSPORT

Licence Condition 13.1: Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

Preamble:

Every person who transports radioactive material, or requires it to be transported, shall act in accordance with the requirements of the *Transportation of Dangerous Goods Regulations* (TDGR) and the *Packaging and Transport of Nuclear Substances Regulations, 2015* (PTNSR).

The TDGR and PTNSR provide specific requirements for the design of transport packages, the packaging, marking and labeling of packages and the handling and transport of nuclear substances.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
900-508520-PDD-001	Transportation of Dangerous Goods	5507946	N
900-508520-PRD-001	Transportation of Dangerous Goods	5507946	Y
4500-508520-PLA-001	Port Hope Area Initiative Transportation of Dangerous Goods Plan	6751607	N

The licensee shall implement and maintain a packaging and transport program that will ensure compliance with all the requirements set out in the TDGR and PTNSR for all shipments of nuclear substances to and from the PHAI Waste Management Project sites.

Guidance:

None Provided.

SCA – FACILITY SPECIFIC

Licence Condition 14.1: Remedial Cleanup Criteria

The licensee shall conduct remedial work in accordance with the project developed cleanup criteria.

Preamble:

The cleanup criteria were developed and introduced during the impact or environmental assessment phase of the project. Consequently, the cleanup criteria cannot be amended without reconsideration of the impact or environmental assessment for the project. This is meant to apply in one direction only, as the licensee may make changes in a safe direction without approval of the Commission, i.e., making the cleanup criteria more stringent than originally accepted in the impact or environmental assessment.

The PHAI cleanup criteria apply to radiological and hazardous substances. To verify the achievement of the PHAI cleanup criteria, or to confirm that a site already achieves the cleanup criteria, CNL has implemented a remediation verification procedure. The procedure provides guidance on field screening, verification sampling and laboratory analysis.

Compliance Verification Criteria:

Licensing Basis Publications

There are no licensing basis publications provided for this licence condition.

Licensee Documents that Require Notification of Change

Document Number	Document Title	e-Doc	Prior Notification
4501-121250-OV-002	Port Hope Project Small-Scale Site Remedial Process	6751607	N
4501- 01611-OP-006	Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure - Harbour	6751607	N
4501-01611-OP-001	Operating Procedure - Port Hope Area Initiative Special Circumstances Protocol- Port Hope Project	6751607	N
4501-01611-OP-002	Operating Procedure – Port Hope Project Remediation Verification Standard Operating Procedure - Soil on Remediated Site	6751607	N
4501-01611-OP-003	Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure - Contaminated Surfaces and Objects	6751607	N

4501- 01611-OP-004	Operating Procedure - Port Hope Project Remediation Verification Standard Operating Procedure - Radon	6751607	N
4501-01611-OP-005	Port Hope Project Remediation Verification Standard Operating Procedure - Soil for Sites Without Remediation	6751607	N
4501-508120-TD-001	Arsenic/Coal Ash Decision Matrix for Identification of Historic LLRW in Port Hope Soils	6751607	N
4502-01611-OP-001	PHAI Port Granby Remediation Verification Procedure	6751607	N
4502-509247-PLA-001	Port Granby Project Environmental and Biophysical Monitoring Plan	6751607	Y
4501-509247-PLA-001	Port Hope Project Environmental and Biophysical Monitoring Plan	6751607	Y

PHAI cleanup criteria, including radiological and hazardous substances, is found in Appendix C-1 of the *Port Granby Project Environmental and Biophysical Monitoring Plan* and *Port Hope Project Environmental and Biophysical Monitoring Plan*.

Guidance:

None provided.

APPENDIX A: DEFINITIONS AND ACRONYMS

1. DEFINITIONS

The following is a list of definitions of words or expressions used in the LCH that may need clarification; they are defined for the purpose of the LCH only. All other terms and expressions used in the LCH are consistent with the definitions provided in the NSCA, the regulations made pursuant to the NSCA, or in the CNSC regulatory document REGDOC-3.6 *Glossary of CNSC Terminology*.

Approval – Commission's permission to proceed, for situations or changes where the licensee would be:

- not compliant with a regulatory requirements set out in applicable laws and regulations;
- not compliant with a licence condition; and
- not in the safe direction but the objective of the licensing basis is met.

Boundary Conditions – procedural, administrative rules and operating limits for ensuring safe operation of the facility based on safety analyses and any applicable regulatory requirements.

Certified Staff – trained licensee staff, certified by the Commission as qualified to perform the duties of their respective roles.

Compliance Verification Criteria – regulatory criteria used by CNSC staff to verify compliance with the licence conditions.

Design Basis – the entire range of conditions for which the nuclear facility is designed, in accordance with established design criteria, and for which damage to the fuel and/or the release of radioactive material is kept within authorized limits.

Effective Date – the date that a given document becomes effective within the licensing period. The effective date is either set to the licence issue date or to a future date when the given document becomes effective.

Guidance – guidance in the LCH is non-mandatory information, including direction, on how to comply with the licence condition.

Important to Safety – items important to safety include, but are not limited to:

(a) SSCs whose malfunction or failure could lead to undue radiation exposure of the facility/site personnel, or members of the public;

(b) SSCs that prevent anticipated operational occurrences from leading to accident conditions;

(c) those features that are provided to mitigate the consequences of malfunctions or failures of SSCs; and

(d) tasks, duties, activities, aging mechanisms, findings, or any work that improperly performed could lead to radiation exposure of the facility/site personnel, or members of the public.

Program(s) – a documented group of planned activities, procedures, processes, standards and instructions coordinated to meet a specific purpose.

Qualified Staff – trained licensee staff, deemed competent and qualified to carry out tasks associated with their respective positions.

Safe Direction – changes in facility safety levels that would not result in:

(a) a reduction in safety margins;

(b) a breakdown of barrier;

(c) an increase (in certain parameters) above accepted limits;

(d) an increase in risk;

(e) impairment(s) of safety systems;

(f) an increase in the risk of radioactive releases or spills of hazardous substances;

(g) injuries to workers or members of the public;

(h) introduction of a new hazard;

(i) reduction of the defence-in-depth provisions;

(j) reducing the capability to control, cool and contain the reactor while retaining the adequacy thereof; or

(k) causing hazards or risks different in nature or greater in probability or magnitude than those stated in the safety analysis of the nuclear facility.

Safety and Control Measures – measures or provisions which demonstrate that the applicant:

(i) is qualified to carry on the licensed activities; and

(ii) has made adequate provision for the protection of the environment, the health and safety of persons, the maintenance of national security and any measures required to implement international obligations to which Canada has agreed.

Written Notification – a physical or electronic communication between CNSC staff and a person authorized to act on behalf of the licensee.

2. ACRONYMS LIST

Acronym	Definition
AECL	Atomic Energy of Canada Limited
AL	Action Level
ALARA	As Low As Reasonably Achievable
CEAA	Canadian Environmental Assessment Act
CNEA	Canadian National Energy Alliance
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CVC	Compliance Verification Criteria
GDI	Governing Document Indices
IAEA	International Atomic Energy Agency
LCH	Licence Conditions Handbook
NSCA	Nuclear Safety and Control Act
PDD	Program Description Document
PHAI	Port Hope Area Initiative
PRD	Program Requirements Document
PTNSR	Packaging and Transport of Nuclear Substances Regulations
REGDOC	Regulatory Document
RPR	Radiation Protection Regulations
SCA	Safety and Control Area
TDGR	Transportation of Dangerous Goods Regulations