



November 18, 2019

VIA EMAIL

Mr. Marc Leblanc
Commission Secretary
Secretariat
Canadian Nuclear Safety Commission
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Dear Mr. Leblanc:

Cigar Lake Operation: Request for Renewal of UML-MINE-CIGAR.00/2021

In accordance with section 24 of the *Nuclear Safety and Control Act* (NSCA), Cameco Corporation (Cameco) hereby applies to the Canadian Nuclear Safety Commission (CNSC) for renewal of the uranium mine licence for the Cigar Lake Operation (Cigar Lake). The current Cigar Lake licence UML-MINE-CIGAR.00/2021 is valid to June 30, 2021. Cameco is requesting a 10-year licence term for Cigar Lake, a term that is consistent with that which has been provided recently at other uranium mines and mills.

The revised Cigar Lake *Mining Facility Licensing Manual* (CGR-MFLM) is provided for review as part of the licence renewal application. Additional supporting program level documents are being provided to the CNSC staff for their review and acceptance concurrent to this application to the Commission. Further, a roadmap demonstrating compliance to the regulatory requirements for an application for a licence renewal is attached to this letter. We would note that the program level documents have been prepared by Cameco and represent years of experience and effort. Consequently, we treat them as confidential and proprietary. Additionally, these documents could reasonably be expected to prejudice Cameco's competitive position if disclosed to competitors or other stakeholders. We request that the confidential and proprietary nature of these documents be respected in the licensing process.

It is understood that the CNSC will notify Cameco regarding the specific hearing date(s), which we anticipate being in the first quarter of 2021, once the agenda has been finalized.

Should you have any questions concerning this application, please feel free to contact me at 306-956-6292.

Sincerely,

A handwritten signature in blue ink, appearing to read "Andy Thorne", with a long horizontal line extending to the right.

Andy Thorne
Vice-President, Mining & Operational Excellence
Cameco Corporation

c: CNSC: P. Fundarek, M. Langdon, G. Groskopf, UMMD
SMOE: C. McGuire
Cameco: L. Mooney, L. Rowson, K. Nagy, T. Hamilton, J. Pryzyk, Regulatory Records

General Nuclear Safety and Control Regulations (GNSCR)

GNSCR Section	MFLM Section	Relevant Program (if applicable)
5. An application for the renewal of a licence shall contain		
(a) the information required to be contained in an application for that licence by the applicable regulations made under the Act;	Noted in subsequent tables	
(b) a statement identifying the changes in the information that was previously submitted;	Section 2.2	
3. (1) An application for a licence shall contain the following information:		
(a) applicant's name and business address	Section 2.1	
(b) activity to be licensed and its purpose	Section 2.2	
(c) name, maximum quantity and form of any nuclear substance to be encompassed by the license	Section 2.2	
(d) description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the license	Section 3.0	Radiation Protection Program
(e) proposed measures to ensure compliance with the <i>Radiation Protection Regulations</i> and <i>Nuclear Safety Regulations</i>	Section 4.3.1 Section 6.4 Section 6.8	Radiation Protection Program Security Program
(f) proposed action levels for the purpose of section 6 of <i>Radiation Protection Regulations</i>	Section 4.3.1	Radiation Protection Program
(g) proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information	Section 6.8	Security Program
(h) proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information	Section 6.8	Security Program
(i) description and results of any test, analysis, calculation performed to substantiate information included in the application	Section 6.0	All programs
(j) name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity, including waste that may be stored, managed, processed, or disposed of at the site...and the proposed method of managing and disposing of that waste	Section 6.14	Waste Management Program
(k) the applicant's organizational management structure as it may bear on the applicant's compliance with the Act and regulations made under the Act, including the internal allocation of functions, responsibilities and authority	Section 5.2 Appendix C	
(l) description of any proposed financial guarantee relating to the activity to be licensed	Section 7.2	Preliminary Decommissioning Cost Estimate

Uranium Mines and Mills Regulations (UMMR)

UMMR Section	MFLM Section	Relevant Program (if applicable)
3. An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i> :		
(a) in relation to the plan and description of the mine or mill		
(i) a description of the site evaluation process and of the investigations and preparatory work to be done at the site and in the surrounding area,	Section 2.4	
(ii) a surface plan indicating the boundaries of the mine or mill and the area where the activity to be licensed is proposed to be carried on,	Appendix A	
(iii) a plan showing the existing and planned structures, excavations and underground development	Appendix A	Mine Operations Program
(iv) a description of the mine or mill, including the installations, their purpose and capacity, and any excavations and underground development	Section 3.0	Mining Facility Description Manual Mine Operations Program
(v) a description of the site geology and mineralogy,	Section 2.3	Mine Operations Program
(vi) a description of any activity that may have an impact on the development of the mine or mill, including any mining-related activity that was carried on at the site before the date of submission of the application to the Commission,	Section 2.4 Section 2.5 Section 2.6	
(vii) a description of the design of and the maintenance program for every eating area	Section 6.4 Section 6.5	Radiation Protection Program Safety and Health Management Program
(viii) the proposed plan for the decommissioning of the mine or mill, and	Section 7.1	Preliminary Decommissioning Plan
(ix) a description of the proposed emergency power systems and their capacities;	Section 3.1	Mining Facility Description Manual
(b) in relation to the activity to be licensed,		
(i) a description of and the schedule for the planned activity,	Section 2.4	
(ii) a description of the proposed methods for carrying on the activity,	Section 6.0	All programs
(iii) a list of the categories of material proposed to be mined and a description of the criteria used to determine those categories,	Section 3.1.7 Section 3.2.1	Mining Operations Program Waste Management Program
(iv) the anticipated duration of the activity, and	Section 2.4	
(v) the proposed quality assurance program for the activity;	Section 6.1	Quality Management Program
(c) in relation to the environment and waste management,		

UMMR Section	MFLM Section	Relevant Program (if applicable)
(i) the program to inform persons living in the vicinity of the mine or mill of the general nature and characteristics of the anticipated effects of the activity to be licensed on the environment and the health and safety of persons,	Section 6.11	Public Information Program
(ii) the program to determine the environmental baseline characteristics of the site and the surrounding area,	Section 2.4 Section 6.3	Environmental Management Program
(iii) the effects on the environment that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,	Section 2.4 Section 6.3	Environmental Management Program
(iv) the proposed positions for and qualifications and responsibilities of environmental protection workers,	Section 6.10	Training and Development Program
(v) the proposed environmental protection policies and programs,	Section 4.1	Environmental Management Program
(vi) the proposed effluent and environmental monitoring programs,	Section 6.3	Environmental Management Program
(vii) the proposed location, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics,	Section 2.4 Section 3.0 Section 6.3 Section 6.14	Mining Facility Description Manual Environmental Management Program Waste Management Program
(viii) the proposed measures to control releases of nuclear substances and hazardous substances into the environment,	Section 4.3 Section 6.3 Section 6.4 Section 6.14	Mining Facility Description Manual Environmental Management Program Radiation Protection Program Waste Management Program
(ix) a description of the anticipated liquid and solid waste streams within the mine or mill, including the ingress of fresh water and any diversion or control of the flow of uncontaminated surface and ground water,	Section 6.3 Section 6.14	Environmental Management Program Waste Management Program
(x) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including measures to	Section 6.3 Section 6.4 Section 6.6	Environmental Management Program Radiation Protection Program Emergency Preparedness and Response Program
(A) assist off-site authorities in planning and preparing to limit the adverse effects of an accidental release,	Section 6.6	Emergency Preparedness and Response Program
(B) notify off-site authorities of an accidental release or the imminence of an accidental release,	Section 6.6	Emergency Preparedness and Response Program
(C) report information to off-site authorities during and after an accidental release,	Section 6.6	Emergency Preparedness and Response Program
(D) assist off-site authorities in dealing with the adverse effects of an accidental release, and	Section 6.6	Emergency Preparedness and Response Program

UMMR Section	MFLM Section	Relevant Program (if applicable)
(E) test the implementation of the measures to control the adverse effects of an accidental release,	Section 6.6	Emergency Preparedness and Response Program
(xi) the anticipated quantities, composition and characteristics of backfill, and	Section 6.2	Mine Operations Program
(xii) a description of the proposed waste management system;	Section 6.14	Waste Management Program
<i>(d)</i> in relation to health and safety,		
(i) the effects on the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,	Section 6.4 Section 6.5	Safety and Health Management Program Radiation Protection Program
(ii) the proposed program for selecting, using and maintaining personal protective equipment,	Section 6.4 Section 6.5	Safety and Health Management Program Radiation Protection Program
(iii) the proposed worker health and safety policies and programs,	Section 4.1 Section 6.5	Safety and Health Management Program
(iv) the proposed positions for and qualifications and responsibilities of radiation protection workers,	Section 6.10	Training and Development Program
(v) the proposed training program for workers,	Section 6.10	Training and Development Program
(vi) the proposed measures to control the spread of any radioactive contamination,	Section 6.4	Radiation Protection Program
(vii) the proposed ventilation and dust control methods and equipment for controlling air quality, and	Section 6.4 Section 6.2	Radiation Protection Program Mine Operations Program
(viii) the proposed level of effectiveness of and inspection schedule for the ventilation and dust control systems; and	Section 6.4 Section 6.2 Section 6.13	Radiation Protection Program Mine Operations Program Maintenance Program
<i>(e)</i> in relation to security, the proposed measures to alert the licensee to acts of sabotage or attempted sabotage at the mine or mill.		Security Program
4. (2) An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain a proposed code of practice that includes		
<i>(a)</i> any action level that the applicant considers appropriate for the purpose of this subsection;	Section 4.3 Section 6.3 Section 6.4	Environmental Management Program Radiation Protection Program
<i>(b)</i> a description of any action that the applicant will take if an action level is reached; and	Section 4.3 Section 6.3 Section 6.4	Environmental Management Program Radiation Protection Program
<i>(c)</i> the reporting procedures that will be followed if an action level is reached.	Section 4.3 Section 6.3 Section 6.4	Environmental Management Program Radiation Protection Program
6. (1) An application for a licence to operate a uranium mine shall contain the following information in addition to the information required by section 3 and subsection 4(2):		

UMMR Section	MFLM Section	Relevant Program (if applicable)
(a) the results of any commissioning work;		
(b) a description of the structures, components, systems and equipment at the mine, including any changes to their design and their design operating conditions as a result of the commissioning;	Section 2.5 Section 3.0	Mining Facility Description Manual
(c) the proposed policies, methods and programs for operating and maintaining the mine; and	Section 6.0	All programs
(d) the proposed methods for handling, storing, loading and transporting nuclear substances and hazardous substances.	Section 6.0	All programs
7. An application for a licence to decommission a uranium mine or mill shall contain the following information in addition to the information required by section 3 and subsection 4(2):		
(a) a description of and the proposed schedule for the decommissioning work, including the proposed starting date and the expected completion date of the decommissioning work and the rationale for the schedule;	Section 7.1	Preliminary Decommissioning Plan
(b) the land, buildings, structures, components, systems, equipment, nuclear substances and hazardous substances that will be affected by the decommissioning;	Section 7.1	Preliminary Decommissioning Plan
(c) the proposed measures, methods and programs for carrying on the decommissioning; and	Section 7.1	Preliminary Decommissioning Plan
(d) a description of the planned state of the site upon completion of the decommissioning work	Section 7.1	Preliminary Decommissioning Plan

Nuclear Substance and Radiation Devices Regulations (NSRDR)

NSRDR Section	MFLM Section	Relevant Program (if applicable)
3. (1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i> :		
(a) the methods, procedures and equipment that will be used to carry on the activity to be licensed;	Section 6.4	Radiation Protection Program
(b) the methods, procedures and equipment that will be used while carrying on the activity to be licensed, or during and following an accident, to		
(i) monitor the release of any radioactive nuclear substance from the site of the activity to be licensed,	Section 6.4	Radiation Protection Program
(ii) detect the presence of and record the radiation dose rate and quantity in becquerels of radioactive nuclear substances at the site of the activity to be licensed,	Section 6.4	Radiation Protection Program

NSRDR Section	MFLM Section	Relevant Program (if applicable)
(iii) limit the spread of radioactive contamination within and from the site of the activity to be licensed, and	Section 6.4 Section 6.6	Radiation Protection Program Emergency Preparedness and Response Program
(iv) decontaminate any person, site or equipment contaminated as a result of the activity to be licensed;	Section 6.4	Radiation Protection Program
(c) a description of the circumstances in which the decontamination referred to in subparagraph (b)(iv) will be carried out;	Section 6.4	Radiation Protection Program
(d) the proposed location of the activity to be licensed, including a description of the site;	Section 2.1	
(e) the roles, responsibilities, duties, qualifications and experience of workers;	Section 5.2.2 Section 6.10	Training and Development Program
(f) the proposed training program for workers;	Section 6.10	Training and Development Program
(g) the proposed instructions for dealing with accidents, including fires and spills, in which the nuclear substance may be involved;	Section 6.4 Section 6.6	Radiation Protection Program Emergency Preparedness and Response Program
(h) the proposed inspection program for the equipment and systems that will be used to carry on the activity to be licensed;	Section 6.13	Maintenance Program
(k) the methods, procedures and equipment that will be used to conduct the leak tests and surveys required by these Regulations;	Section 6.4	Radiation Protection Program
(l) where the application is in respect of a nuclear substance that is an unsealed source and that is to be used in a room, the proposed design of the room;	Section 6.4	Radiation Protection Program
(m) if the application is in respect of a nuclear substance that is contained in a radiation device, the brand name and model number of the radiation device, and the quantity of the devices;	Section 6.4	Radiation Protection Program

**Cameco Corporation
Cigar Lake Operation**



LIC-01

**Mining Facility Licensing Manual
CGR-MFLM**

October 2019

Title: Mining Facility Licensing Manual		Doc. No.: CGR-MFLM
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1.0 INTRODUCTION

1.1 Purpose

The Cameco Corporation (Cameco) Cigar Lake Operation (Cigar Lake) *Mining Facility Licensing Manual* (CGR-MFLM) serves as a top-level document and is part of the licensing basis for the nuclear facility. The CGR-MFLM sets out the operating principles that will be followed under the facility licence by providing direction to the supporting licensing documents, programs and other supporting information necessary to ensure the activities of the licence are carried out in compliance with the licensing basis. This document supersedes previous versions of the CGR-MFLM and becomes effective when the Canadian Nuclear Safety Commission (CNSC) approves the current licensing application.

1.2 Scope

The MFLM has been prepared to provide information in support of the licensing requirements of:

- *Nuclear Safety and Control Act* (NSCA)
- *General Nuclear Safety and Control Regulations* (GNSCR)
- *Uranium Mines and Mill Regulations* (UMMR)
- *Nuclear Substances and Radiation Devices Regulation* (NSRDR)
- *Radiation Protection Regulations* (RPR), and
- *Packaging and Transport of Nuclear Substances Regulations, 2015* (PTNSR).

This manual deals with health and safety, security and protection of the environment. It contains an overview of the:

- Facilities and activities to be authorized by the licence.
- Policies, responsibilities and managed processes that Cigar Lake has committed to in order to meet the requirements of the NSCA, regulations and licence conditions
- Organization and staffing in place to meet these responsibilities.

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- Programs 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.

1.3 Definitions

ALARA

As low as reasonably achievable, social and economic factors considered.

Emergencies

Refers to site and nuclear material security issues, significant discharges, fires, major accidents and other types of disasters that may have a significant impact on the health and safety of personnel at site and/or the environment.

Hazardous Substance

As defined in UMMR as a substance, other than a nuclear substance, that is used in connection with or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons.

Non-conformance

Refers to system compliance deficiencies, objectives and targets missed, incidents and accidents, ineffective procedures, and other elements of the quality management system not performing to specification.

1.4 Responsibilities

The Cigar Lake general manager is responsible for ensuring that the policy and program commitments referenced in this manual are implemented.

Correspondence related to Cigar Lake matters is to be directed to the general manager and copied to the designated single point of contact.

1.5 References

Unless identified as a specific version, the following references are deemed “as amended” and refer to the latest CNSC-approved version for Cigar Lake.

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1.5.1 Acts and Regulations, and Regulatory Guides

The following regulatory documents are referenced in this document. References to other regulatory documents are provided in the various site programs and procedures:

- *Nuclear Safety and Control Act (NSCA)*
- *General Nuclear Safety and Control Regulations (GNSCR)*
- *Uranium Mines and Mill Regulations (UMMR)*
- *Nuclear Substances and Radiation Devices Regulations (NSRDR)*
- *Packaging and Transport of Nuclear Substances Regulations, 2015 (PTNSR)*
- *Radiation Protection Regulations (RPR)*
- *Metal and Diamond Mining Effluent Regulations (MDMER)*

1.5.2 Cigar Lake Programs and Codes of Practice

The following programs and codes of practice are the main reference sources in the CGR-MFLM:

- *Mining Operations Program*
- *Processing Operations Program*
- *Environmental Management Program*
- *Waste Management Program*
- *Radiation Protection Program*
- *Safety and Health Management Program*
- *Emergency Preparedness and Response Program*
- *Security Program*
- *Quality Management Program*
- *Training and Development Program*
- *Maintenance Program*
- *Public Information Program*
- *Transportation Program*

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- *Fire Protection Program*
- *Environmental Code of Practice*
- *Radiation Code of Practice*

1.6 Document Control

The CGR-MFLM is managed as a controlled document in accordance with the Cigar Lake Quality Management Program (CGR-QMP), which ensures that users of this document are using the most current version and that obsolete versions of this document are removed from service.

As a minimum, this document will be reviewed prior to any licensing application. The list of revisions to this document is managed and recorded through the site document control system. However, to facilitate regulatory review of this document, a list of revisions is provided in Appendix B.

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2.0 BACKGROUND

2.1 Facility and Business Address

Cigar Lake is a uranium mining facility in the Athabasca Basin region of the Province of Saskatchewan (see Figure 2.1). The site is about 660 km north of Saskatoon at the south end of Waterbury Lake generally located at 58° 04' 11" latitude and 104° 32' 17" longitude.

With a population of over 1200 people, the Hatchet Lake Denesuline First Nation and the adjoining Northern Hamlet of Wollaston Lake are the closest permanent communities and are located 81 km east of the site by air. Other communities of the Athabasca Basin located in the vicinity of Cigar Lake include:

- Black Lake Denesuline First Nation
- Fond du Lac Denesuline First Nation
- Northern Settlement of Camsell Portage
- Northern Hamlet of Stony Rapids
- Northern Settlement of Uranium City

The Rabbit Lake, McArthur River, and Key Lake facilities are the closest Cameco-operated licensed facilities in the area. Non-Cameco business operations in the vicinity of the site include the Points North freight forwarding facility (36 km northeast of the site by air) and the Orano Canada Inc. (Orano) McClean Lake Operation (McClean Lake) which is approximately 70 km northeast of the site.

The right to mine the deposit is granted by the Province of Saskatchewan under Mineral Lease ML-5521, which covers an area of 308 ha. The surface lease agreement with the Province of Saskatchewan (2011) covers approximately 1,042 hectares and expires in May 2044. The boundary of the licensed facility (identified as Cigar Lake Lands) and layout of the existing mine facilities are shown in Drawing SKET0408 (Appendix A).

Cameco operates Cigar Lake on behalf of the Cigar Lake Joint Venture (CLJV), which is currently owned by Cameco (50.025%), Orano Canada Inc. (37.1%), Idemitsu Canada Resources Ltd. (7.875%), and TEPCO Resources Inc. (5%).

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MAP OF SASKATCHEWAN



Figure 2.1: Cigar Lake location map.

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The business address for Cigar Lake is:

Cameco Corporation - Cigar Lake Operation
 2121 - 11th Street West
 Saskatoon, Saskatchewan S7M 1J3

During the licence period, the CNSC will be notified of changes of ownership or business address.

2.2 Summary of Licenced Activities

The purpose of Cigar Lake is to mine and process uranium ore. To achieve this purpose, the CNSC licence authorizes Cigar Lake to:

- Prepare a site for, construct, operate, modify and decommission a nuclear facility for the mining of uranium ore.
- Mine a nuclear substance (uranium ore).
- Import, possess, use, store, transfer and dispose of nuclear substances.
- Import, possess, use, store and transfer prescribed equipment that is required for or associated with laboratory studies, field studies, fixed gauge usage and borehole logging devices.

Further, as described in the CNSC Licence Conditions Handbook (LCH), the authorized activities at Cigar Lake include:

- Operation of the underground mine, underground ore-processing facility and surface ore load-out facility.
- Mining and processing ore from the facility.
- Mining up to 7.0 million kg of uranium per year, with a production flexibility up to 9.25 million kg of uranium.
- Use of a dosimetry service:
 - For gamma dosimetry, a CNSC-licensed service is used.
 - With regard to radon gas, radon progeny and long-lived radioactive dust, a separate dosimetry service licence is not required because these components of the effective dose are below 5 mSv/yr.
 - For full-time underground workers the use of a licensed dosimetry service for radon progeny and long-lived radioactive dust is used.

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- Operation of the water treatment plants.
- Storage of waste rock.
- Handling and storage of hazardous materials and disposal of hazardous wastes.
- Possession, storage, transfer, importation, use and disposal of nuclear substances and radiation devices.

2.3 The Uranium Deposit

The Cigar Lake deposit is inside the eastern edge of the Athabasca basin in northern Saskatchewan. The deposit is at the unconformity contact between rock of the Athabasca Group sandstone and underlying lower Proterozoic Wollaston Group metasedimentary basement rocks. The deposit is approximately 1,950 m long, 20 to 100 m wide, and ranges up to 13.5 m thick with an average thickness of about 5.4 metres. It occurs at depths ranging between 410 to 450 m below the surface

The deposit has three distinct mineralization zones:

- high grade mineralization at the unconformity
- fracture-controlled, vein-like mineralization higher up in the sandstone; and
- fracture-controlled, vein-like mineralization in the basement rock.

Most of the ore is in the high-grade mineralization at the unconformity, which has massive clay and high-grade uranium concentrations.

2.4 Pre-Construction Activities

The Joint Federal-Provincial Panel on Uranium Mining Developments in northern Saskatchewan conducted an environmental impact assessment (EIS) of the Cigar Lake Project in 1995. The panel recommended in 1997 that the Project proceed, pending identification of a suitable disposal location for PAG waste rock. In 2001, an EIS was submitted detailing the proposed strategy for disposal of PAG waste rock within the Sue C pit at McClean Lake. An addendum to this EIS was submitted in 2002, with all regulatory approvals obtained in 2003.

Further, in February 2004, Cameco submitted an environmental assessment study report (EASR) for Cigar Lake in accordance with the *Canadian Environmental Assessment Act* (CEAA). The CNSC concluded the Project, taking into account the appropriate mitigation measures identified in the 2004 EASR, was not likely to cause significant adverse

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environmental effects. The CNSC issued the initial Uranium Mine Construction Licence UMCL-MINE-CIGAR.00/2007 on December 22, 2004, approving construction of the mining and support facilities described in *The Cigar Lake Project – Mining Facilities Licensing Manual* (issued March 2004) along with its supporting documents.

As well, the Saskatchewan Ministry of Environment (SMOE) issued the *Cigar Lake Project Approval to Operate Pollutant Control Facilities IO-187* in May 2004. This document provided approval to operate facilities, such as the water treatment plant, the landfill and the hazardous substance and waste dangerous goods storage facilities.

2.5 Activities Completed Under Previous Licenses

During construction, Cigar Lake incurred several setbacks as a result of three water inflow incidents. The first occurred in April 2006, resulting in the flooding of the then partially completed Shaft No.2. The two subsequent incidents involved inflows into the mine workings connected to Shaft No. 1.

Due to the inflow events, a need was identified to manage the potentially higher water inflow that the mine could encounter during construction and operations. However, it was predicted that releasing non-routine, large volumes of treated water into the original effluent discharge point - a muskeg area drained by Aline Creek - could potentially result in erosion of that drainage system. As a result, Cameco proposed building a pipeline and discharge point through a diffusor directly to Seru Bay of Waterbury Lake. This proposal triggered a joint federal and provincial environmental assessment screening under CEAA and *Saskatchewan Environmental Assessment Act* (SEAA) respectively, with the final EIS submitted in 2011. Approval was granted later that year with construction and commissioning of the pipeline and discharge location, capable of accommodating a predicted non-routine inflow event, completed in 2012.

Because these inflow events occurred during the construction phase, the 2009 Cigar Lake relicensing process provided a detailed list of phased remediation activities leading to recovery of the mine and restoration of mine infrastructure and safety systems. In 2009, Cigar Lake received a licence renewal (UMCL-MINE-CIGAR.00/2013), which included a phased mine remediation and construction plan.

Cigar Lake developed and successfully executed these recovery and remediation plans for both the Shaft No. 2 inflow and the two inflows experienced in the mine workings connected to Shaft No. 1 in accordance with the phased remediation and construction plan. This involved inspecting the mine and completing any additional remedial work to protect

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it from an inflow or significant ground failure. The process also included studying whether additional reinforcement was required in higher risk areas. Successful re-entry to the mine workings was achieved in early 2010. A comprehensive underground rehabilitation program was implemented, which involved rehabilitating the remaining lower risk areas of the mine, including 480- and 500-metre levels, and re-establishing the full mine ventilation circuit. Also completed was backfilling of the 420- and 465-meter levels with concrete.

With the mine fully secured and the underground infrastructure rehabilitation items completed, Cameco resumed underground construction activities in 2011. These activities included reinforcing the large run of mine (ROM) opening underground with steel and concrete, installation of the remaining processing equipment and completing the furnishing of all ventilation, electrical and piping infrastructure within Shaft No.2.

A four staged approach was taken to commissioning of infrastructure at Cigar Lake. This process is described in detail in the Cigar Lake *Quality Management Program* (CGR-QMP). In Stage 1 of commissioning, systems were verified to ensure they have been installed as designed. In Stage 2 of commissioning, individual components were energized for the first time and motors and instrumentation are tested.

Subsequently, approximately 30 different integrated subsystems were commissioned in Stage 3. This involved testing the entire integrated processing circuit with water, followed by processing waste rock through the entire circuit. Stage 1, 2, and 3 commissioning work was completed throughout 2013 and was in process during the issuance of the Cigar Lake licence UML-MINE-CIGAR.00/2021.

2.6 Activities Completed Under Licence UML-MINE-CIGAR. 00/2021

CNSC licence UML-MINE-CIGAR.00/2021 was issued to Cigar Lake on July 1, 2013. Initial activities completed under this licence included final (Stage 4) commissioning and transition to commercial production. Cigar Lake submitted a final status report (Status Report 5) and a subsequent addendum in 2016 providing an overview of all Stage 4 commissioning activities.

Although the Stage 4 commissioning process did not directly prompt fundamental changes to facilities, equipment or processes, other operational factors necessitated revisions to mine freeze and tunnel development strategies. Chief amongst these were the following:

- Transitioning to a predominantly surface freeze system.

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- Changing tunnel liner technology to the *New Austrian Tunneling Method* (NATM) techniques.

Overall, commissioning activities were successful in maintaining worker health and safety, protecting the environment and ensuring operational performance targets were met during the transition to production. Cigar Lake ore production began on March 13, 2014 with the first shipment of ore slurry sent to McClean Lake. Production ramp up continued until May 22, 2015 when Cigar Lake formally announced that it had met all criteria necessary to achieve commercial production, including production cycle times and process specifications. In the first full calendar year of production (2016), Cigar Lake produced 6.8 million kg U, approaching the licensed nominal annual production rate of 7.0 million kg U.

Additional activities completed during the licence period were largely focussed on the transition from underground to predominantly surface freezing and included construction of:

- Surface freeze pads and freeze plants to support ground freezing from surface.
- Additional slimes pond (Slimes Pond 5).
- A new mechanical shop training and administrative offices.

2.7 Flex Production Provision

To allow production flexibility, Cigar Lake has a flex production rate in the CNSC licence that allows up to 9.25 million kg U to be produced annually, with a nominal annual production rate of 7.0 million kg U. Production and flex values are reported on an annual basis in the Cigar Lake Annual Report.

Maintaining the safety of people and the environment under all production scenarios is accomplished through a robust monitoring program, ensuring that at all times we are maintaining an acceptable level of performance. These performance levels are defined within the Cigar Lake *Radiation Code of Practice* and the *Environmental Code of Practice*.

2.8 Future Outlook

Over the term of the next licence, Cigar Lake will continue to conduct activities in accordance with the licensing basis. During the licence term, Cigar Lake will continue to identify and pursue opportunities to improve operational efficiency while continuing to maintain the safety of workers and the public as well as protection of the environment. Such opportunities may include, but are not limited to:

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- Examination of opportunities to improve efficiency of current freezing and mine ventilation practices.
- Examination of alternative mining methods.
- Ongoing evaluation of measures to improve environmental performance.

As is the case with all mines, brownfield exploration is conducted as a means of maximizing the return on investment. Continued exploration of the Cigar Lake orebody is considered an activity that is part of the licensing basis. As such, through additional exploration drilling, there is potential to identify ore reserves within the Cigar Lake ore body in areas which are not currently categorized as resources.

When sufficient information has been gathered and mine plans developed, including any additional infrastructure requirements that might be deemed necessary to support the continuance of the licensed activity within those areas, Cameco would provide notification (with supporting information to demonstrate that the licence basis is respected) to the CNSC. Additional infrastructure to support ongoing mining may include, but is not limited to:

- expansion of waste rock Stockpile C
- expansion of surface lease to support additional surface infrastructure
- additional surface freeze plants and/or pads
- additional underground freeze infrastructure
- additional ventilation infrastructure; and
- additional slimes pond(s).

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3.0 FACILITY COMPONENTS AND PROCESS

3.1 Mining Facilities

Set out below is an overview of the underground and surface facilities, with more detail being provided in the *Mining Facility Description Manual* (CGR-MFDM) and *Mine Operations Program* (CGR-MOP).

3.1.1 Shaft No. 1

Shaft No. 1 is a hydrostatically sealed, vertical mine service shaft that is 500 m deep and 4.9 m in diameter and includes:

- fresh air supply to the mine
- transportation of personnel and supplies
- a means of egress via a ladderway
- electrical cables
- compressed air lines
- fresh water supply; and
- dewatering lines.

3.1.2 Shaft No. 2

Shaft No. 2 is a hydrostatically sealed, vertical mine service shaft that is 500 m deep and includes:

- fresh air and exhaust air ventilation, separated by a sealed wall
- transportation of personnel and supplies
- secondary means of egress including a ladderway from the 500-metre level to the 480-metre level
- slick lines for the transport of cementitious products to the underground
- transportation of ore in the form of two slurry pipelines
- electrical cables

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- compressed air lines; and
- dewatering lines.

3.1.3 Mine Levels

The 480-metre level contains the main workings of the mine. The north end of this level (north of 480-959 DRE) contains the production mining area. The south end of the mine contains the majority of the services, shops, control rooms and labs, ore processing infrastructure, waste rock handling, and mine dewatering equipment. There are refuge stations in both ends of this level of the mine.

The 500-metre level, accessible via ramp from the 500-metre level, contains the ore slurry hoisting pumps, the bottoms of Shafts No. 1 and 2, ore processing infrastructure, mine dewatering equipment, a refuge station, and ventilation passageways.

3.1.4 Ground Freezing System

The surface freeze plants provide the freezing capabilities necessary to enhance ground stability and mitigate water inflow potential. The freeze plants reduce the temperature in a brine mixture. The chilled brine is pumped at high pressure to the surface freeze pads.

The freeze system on surface supplies chilled brine to the three surface freezepad: the central freeze pad, the east freeze pad and the west freeze pad. The freeze lines extend out on the pads and down individual freeze holes to below the orebody. The slightly warmer brine returns to the surface freeze plant where it is re-chilled and returned to the loop.

The freeze system that goes underground extends to a heat exchanger at the 480-metre level. This system is currently not operational, but remains in place in the event that it is required at a later date.

3.1.5 Ore Slurry Loadout Facility

The ore slurry loadout building receives the ore slurry from underground and stores it in either one of two pachucas. The facility has a mixing tank to allow a final adjustment in the ore grade of the slurry to be shipped. The slurry will also be thickened by removing water and transferred into slurry containers for hauling to the McClean Lake JEB mill for processing.

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These slurry containers have been constructed and approved as an Industrial Package Type 2 (Type IP-2).

3.1.6 Minewater Management Facilities

An overhead pipe rack, containing the minewater pipelines from Shaft No. 1 and is capable of delivering minewater to the minewater treatment plant surge pond, Production Contingency Pond No. 1 (PCP1) or Production Contingency Pond No. 2 (PCP2).

The minewater treatment facilities consist of the minewater treatment plant, various ponds and the associated linking pipelines. The minewater treatment facilities are operated to ensure that site effluent water is appropriately treated and meets all regulatory discharge requirements prior to release to the environment. Treated water is pumped to one of four monitoring ponds where it is tested prior to being released to the environment.

The minewater treatment plant is designed as a two-stage process that can be operated in series or parallel to treat routine or non-routine mine flows. The first stage provides pre-treatment of water, including that which is rich in molybdenum and/or selenium. This stage is capable of providing the same treatment as the second stage process. The second stage treats the majority of the water generated on site.

The contingency water handling facilities are utilized during a non-routine water inflow situation underground or if there are operational problems with the minewater treatment plant. The contingency water handling facilities are able to treat the predicted non-routine inflow event, up to 2,000 m³/hr releasing treated water to the environment via the pipeline to Seru Bay.

3.1.7 Waste and Waste Rock Storage

There are three waste rock stockpiles at Cigar Lake:

- Stockpile A and A-1 are unlined storage areas for clean waste rock.
- Stockpile B is lined and used to store mineralized waste rock and waste that is potentially contaminated with radioactive material.
- Stockpile C is lined and used for storage of potentially acid-generating waste rock.

Both lined stockpiles have gravity-fed, double-contained drain systems that empty into PCP1.

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A sealed concrete foundation-type pad behind the wash bay is used to store contaminated materials. Attached to the north of these structures is a lined contaminated materials laydown area. Water from all three of these structures drains to PCP1 for eventual treatment in the mine water treatment plant. An additional building for contaminated waste storage is also located on the eastern portion of the site. Domestic waste generated is disposed of at the domestic waste landfill.

In addition, there are five slimes ponds for storage of slimes generated in the mine. A filter cake storage pond located near the minewater treatment plant is used for storage of precipitated material from the minewater treatment plant.

3.1.8 Utilities and Essential Services

Potable water treatment facilities are operated continuously and have had the chlorination system upgraded since the start of construction to accommodate increased consumption. Freshwater is pumped from Waterbury Lake to a freshwater storage tank, a portion of which is allocated for feed to the potable water treatment system. Treatment consists of multimedia filtration, a sediment filter, ultraviolet disinfection and chlorine addition.

A large portion of the freshwater storage tank is reserved for the firefighting system. For firefighting purposes, diesel-powered pumps are in place to start automatically to ensure firefighting water supply should power failures be experienced.

A sewage lagoon system is used to treat sewage generated at the Cigar Lake site.

The mine site power is supplied by SaskPower, where it is transformed and distributed to site. Standby power is provided by permanent diesel generators located in the powerhouse, connected to the plant power distribution system. In addition, the site has a trailer-mounted, portable diesel generator that can be used as required for an additional backup power source.

Double-walled fuel storage tanks are used to store and distribute gasoline and diesel fuel for site equipment operation. The propane storage tanks are tied into an underground pipeline system used to distribute propane to the various propane-fired heaters throughout the site and residence.

A concrete batch plant is located at the Shaft No. 2 headframe and collarhouse facility. The batch plant provides concrete and shotcrete for surface and underground construction and development activities.

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The explosives storage facility provides secure licensed storage for explosive materials used at Cigar Lake.

3.1.9 Surface Ancillary and Support Facilities

The airstrip, mine property roads and the Cigar Lake site access road are maintained as required by site personnel. The Cigar Lake site all-weather access road permits two-way traffic and has been designed to have a nominal speed limit of 80 km/hr (reduced in locations as required for safety), and connects directly to provincial Highway 905 (*Drawing C455-G-005* attached as Document 8 in Appendix A).

The original exploration camp continues to be used for storage and logging of drilling core. The camp is located on a peninsula between Seru Bay and the main body of Waterbury Lake.

The wash bay is a covered structure with a concrete foundation that is used to clean equipment. Water from the wash bay is collected and treated in the minewater treatment plant prior to release.

The camp facilities consist of a permanent residence and a construction camp. Food services and recreational activities are provided. The original construction camp remains on site, but has been removed from service and is awaiting decommissioning or removal from site.

A maintenance shop is located to the north of the wash bay site. In addition to shop facilities, the building houses some of the office and administration facilities for the operation. The site administrative offices are housed in various trailer-type and permanent units. In addition, there are mine and construction dry facilities where workers change from camp clothes into work clothing. Water from the mine dry facilities used by underground workers is treated in the minewater treatment plant prior to release to the environment. Warehouse facilities are contained in various attached or standalone steel-framed, fabric-covered buildings. Some of the warehouse buildings are heated while others are not. Fenced-in laydown areas are also used for warehousing materials and equipment.

A security gatehouse has been constructed on the site access road southwest of the airstrip. The facility includes a chain link fence and a building with telephone and radio communications to the mine site.

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3.2 Processes

3.2.1 Mining

The Cigar Lake JBS mining process does not require workers to enter the ore area. After the ground is frozen, a pilot hole is drilled from the JBS on the 480-metre level up through the orebody, approximately 50 m above. The pilot hole is then lined with a steel casing up to the ore and a sacrificial fiberglass casing through the ore. The high pressure water-jet string is inserted into the prepared pilot hole and then is used to cut the ore, which flows in the annulus between the hole casing and the jetting string. The ore is piped directly to a slurry tank on the 480-metre level and from there is pumped to the run-of-mine (ROM) storage area. Upon completion of ore removal from a mining chamber, the chamber is backfilled with concrete.

3.2.2 Underground Ore Processing

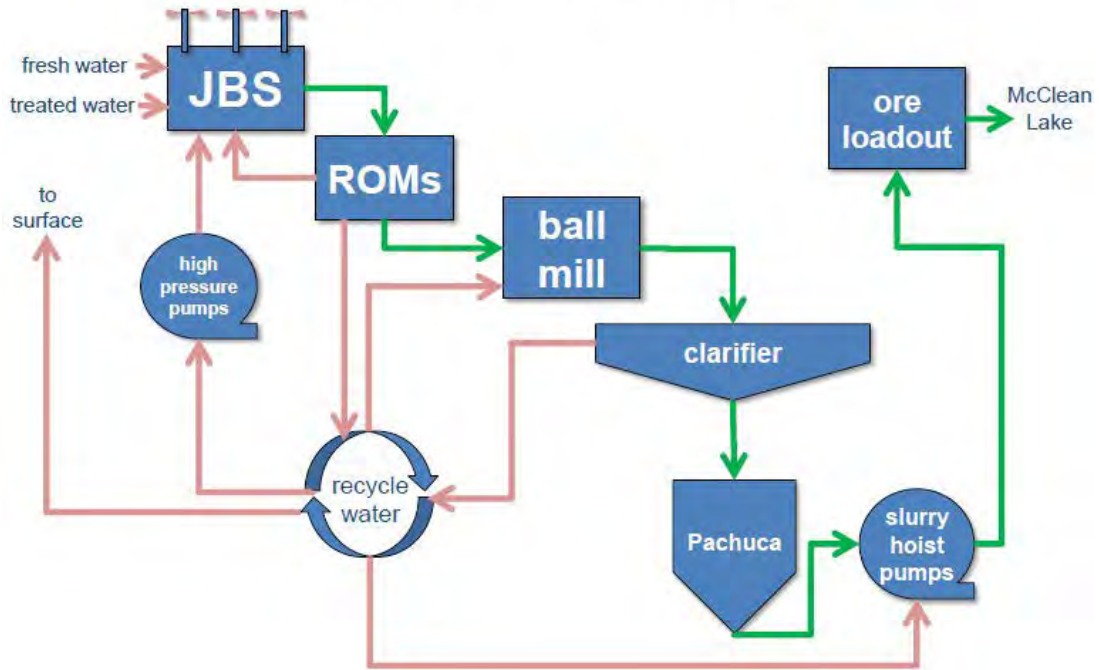
The purpose of the underground ore processing circuit is to grind the ore into a slurry that is of suitable density for pumping to surface. Ore is removed from the ROM and fed through the grinding circuit which reduces the particle size. From grinding the ore enters the clarifier. The clarifier serves two purposes. It will thicken the slurry to the appropriate density for pumping to surface and it clarifies the process water for recycling to the mining process. The thickened ore slurry is moved to the underground pachuca storage area in preparation for pumping to surface. Most of the capacity to blend slurry to an ore grade suitable for transport occurs underground. From the underground pachucas, the ore slurry is pumped into the surface pachucas in the slurry loadout building.

3.2.3 Surface Ore Processing, Loading and Shipping

Only minor ore processing occurs in the slurry loadout building. This processing consists of final blending of slurry from the two surface pachucas to obtain an acceptable ore grade for shipment. Once the slurry has been blended, it is loaded into containers and trucked to the McClean Lake JEB mill for processing into uranium concentrate.

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Ore processing flow chart



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4.0 OPERATING POLICIES AND PRINCIPLES

4.1 Cameco's Vision, Mission, Values and Policy Statements

This information is intended to provide an understanding of the strategic direction Cameco is pursuing, and the approach Cigar Lake takes in this regard with respect to safety, health, environment and quality.

4.1.1 Vision, Mission and Values Statements

Vision

Cameco will energize the world as the global leader of fuel supply for clean-air nuclear power.

Mission

Our mission is to bring the multiple benefits of nuclear energy to the world.

Goal

Our goal is to be the supplier, partner, investment and employer of choice in the nuclear industry.

Values

Our decisions and actions are guided by our values:

Safety and Environment

The safety of people and protection of the environment are the foundations of our work. All of us share in the responsibility of continually improving the safety of our workplace and the quality of our environment.

People

We value the contribution of every employee and we treat people fairly by demonstrating our respect for individual dignity, creativity and cultural diversity. By being open and honest we achieve the strong relationships we seek.

Integrity

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Through personal and professional integrity, we lead by example, earn trust, honour our commitments and conduct our business ethically.

Excellence

We pursue excellence in all that we do. Through leadership, collaboration and innovation, we strive to achieve our full potential and inspire others to reach theirs.

4.1.2 Safety, Health, Environment and Quality Policy

Cameco has established a corporate policy regarding the environment, worker health and safety and quality. This policy is posted at Cigar Lake as well as on Cameco's website, (www.cameco.com). The policy statement, policy implementation and policy accountability text is reproduced in the following three subsections.

4.1.2.1 Policy Statement

Consistent with our vision, values and measures of success, Cameco recognizes safety and health of our workers and the public, protection of the environment and quality of our processes as the highest corporate priorities during all stages of our activities, which include exploration, development, operations, decommissioning and reclamation. As such, we are striving to be a world class performer in all aspects of our business through a strong safety culture, environmental leadership, operational excellence and our commitment to the following:

- Preventing injury, ill health, and pollution.
- Fulfilling compliance obligations.
- Keeping risks at levels as low as reasonably achievable, taking into account economic and societal factors.
- Ensuring quality of processes, products and services.
- Continually improving our overall performance.

4.1.2.2 Policy Implementation

In support of these principles, we:

- Implement Cameco's policies, programs and standards to meet compliance obligations (legal requirements, commitments to local communities and corporate requirements).

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- Meet our compliance obligations through balancing all our measures of success.
- Have the Cameco Management System that provides a framework for the corporate and site management programs.
- Set risk-informed objectives that will lead us to continually improve our overall performance in our program areas.
- Manage waste, with a focus on tailings, waste rock and low level radioactive waste.
- Contribute to the conservation of biodiversity, including no exploration or development of mines in World Heritage sites.
- Conduct environmental assessments that consider environmental factors, as well as social and cultural values throughout the project’s lifecycle, including ensuring facilities are designed for closure before proceeding with new operational projects.
- Maintain financial guarantees to cover decommissioning liabilities.
- Identify and reduce the potential for accidents and emergency situations, including those involving the transport of our products, and implement emergency response plans to mitigate their impact.
- In accordance with our CSR policy, work with local communities, regulators and other stakeholders on the impact of our activities and our overall performance while responding to customers’ changing needs.
- Systematically identify and address non-conformances.
- Collaborate with all levels of government within the jurisdictions that we do business to enhance regulatory mechanisms.
- Communicate this policy to employees and others performing tasks on behalf of Cameco and provide a systematic approach when training employees.
- Monitor and measure the key performance indicators of our operations.
- Conduct regular audits to assess and ensure compliance with this policy.
- Conduct research and develop new processes and products in SHEQ areas to solve technical barriers preventing the achievement of objectives and targets.
- Provide adequate and appropriate resources to implement this policy.

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4.1.2.3 Accountability

The chief executive officer shall be responsible to ensure that the SHEQ policy is maintained and require compliance with this policy and implementation of its supporting programs and to monitor, from time to time, the status of the implementation of this policy.

The chief operating officer shall ensure senior management of each division, operation and subsidiary is accountable for and has necessary authority for the establishment, maintenance and implementation of documented programs, plans and procedures that support this policy.

The chief corporate officer shall ensure that this policy is implemented, that the senior management of SHEQ is accountable for and has necessary authority for the establishment, maintenance and implementation of programs, and to report on the status from time to time to senior management.

Senior management is accountable for and has necessary authority for the establishment, maintenance and implementation of documented programs, plans and procedures that support this policy.

All employees and contractors are accountable for the performance of their jobs in compliance with the SHEQ policy.

4.2 Operating Principles

General operating principles followed by Cigar Lake are to:

- Comply with the requirements of the NSCA and supporting regulations, with the Canada Labour Code and regulations made under the Code, and with laws of other jurisdictions as required by the CNSC, which are not inconsistent with the NSCA and Regulations.
- Accept the principle that doses of ionizing radiation should be kept as low as is reasonably achievable, economic and social considerations being taken into account (ALARA). Cameco will continue to guide its operations with this principle as it applies to all health, safety, and environmental hazards.
- Set action levels for radiation and environmental parameters that should allow adequate time to correct problems prior to reaching regulatory limits.

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- Design and manage working conditions at Cigar Lake to provide for the safety and health of all employees, and to promote a safety culture throughout the facility.
- Endeavour to provide a proper climate and appropriate mechanism for the free flow of relevant information through all levels of the facility's organization, enabling all employees to effectively carry out their tasks in a safe and environmentally conscious manner.
- Commit to honest and ethical communication, both in principle and practice. Cameco advocates open, responsive, clear communication that supports and furthers the vision and strategy of the corporation and acknowledges our stakeholders' need for timely and accurate information presented in a meaningful way.

4.3 Facility Action Levels

4.3.1 Radiation Action Levels

Radiation action levels are a requirement of the GNSCR (paragraph 3(1)(f)), the RPR (section 6) and the UMMR. Radiation action levels are based on effective dose and are set at levels to indicate where a potential loss of control of the radiation protection program may be occurring. These levels are defined in the Cigar Lake *Radiation Code of Practice* (CGR-RCOP) within the *Radiation Protection Program* (CGR-RPP), where measures to mitigate the potential for reaching action levels (i.e. administrative levels) are described.

4.3.2 Environmental Action Levels

UMMR also requires a code of practice that defines environmental action levels. The regulations define an action level as a specific dose or parameter that, if reached, may indicate a potential loss of control of the environmental protection program. With respect to Cigar Lake, the *Environmental Code of Practice* (CGR-ECOP) is designed to address treated effluent, which is the most significant environmental aspect of the operation in terms of potential impacts to the environment. The CGR-ECOP is detailed in the Cigar Lake *Environmental Management Program* (CGR-EMP).

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5.0 FACILITY MANAGEMENT

Cigar Lake strives to continually improve all aspects of governance, quality management and safety culture. Corporate policies and programs provide guidance and direction for the site programs that define the CGR-QMS. There are associated corporate-level programs that outline requirements for site-based programs, in areas of quality, safety, environment, radiation protection, contractor management and emergency response. In addition, there is a corporate audit program that outlines both corporate and site-level audit activities. The corporate programs are based on the ISO model (e.g. ISO 9001, ISO 14001). The Cameco *Quality Management Program* provides the overall guidance to the other programs in core areas such as risk assessment, communication, controls, non-conformance and corrective action.

5.1 Safety Culture

The governance and organizational structure and management programs are designed to support the ongoing growth of a strong safety culture through promoting and reinforcing a collective commitment to safety. Underpinning all these formal mechanisms is senior management's commitment to safety as the highest priority and clear communication of this to the workforce.

Cameco has adopted five key messages that form the framework of how we articulate and manage safety. They are:

- Safety is our first priority.
- We are accountable for safety.
- Safety is part of everything we do.
- Safety leadership is critical to Cameco.
- We are a learning organization.

From a safety culture perspective, this provides clear priorities and a realistic framework to deliver improvements. This will help to reinforce the appropriate behaviours needed for a strong safety culture.

Overall, Cameco has taken tangible steps to continue to improve quality and safety culture at Cigar Lake and continues to look at opportunities for further improvement. Part of this process includes formally assessing the safety culture at Cigar Lake to measure its status

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and to gain insight into continued effective implementation of the planned changes and its ongoing development. Cigar Lake leadership personnel are actively engaged in ongoing evaluation and searching for opportunities for continued improvement.

5.2 Governance

Cameco operates Cigar Lake and consequently, the corporate and site management structures are integrated as shown in the attached Appendix C. The current structure has been undertaken to support quality management and safety culture as well as to improve governance within the corporation and at site.

5.2.1 Corporate Oversight and Support

From a corporate governance perspective, all operational groups report to Cameco's senior vice-president and chief operating officer. Specific corporate departments provide guidance and oversight in their respective areas to Cigar Lake. Corporate oversight and support is provided to the Cigar Lake operational management team in the following areas:

- Technical services
 - Project management and implementation, mine engineering, geology, metallurgy and rock mechanics
- Safety, health, environment, quality and regulatory relations
 - Compliance and licensing
 - Safety, health, environment and quality (SHEQ) systems
 - Environmental affairs and geo-environmental engineering
 - Transportation and security
- Human resources
 - Administration
 - Training
- Risk management, through verification of
 - the implementation of the site quality management program
 - compliance to the corporate SHEQ systems
 - compliance to regulatory requirements

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5.2.2 Operational Organization and Management Roles

At the site level, a senior management team reports to the Cigar Lake general manager. Included in the senior management team are personnel responsible for the management of the following:

- Mine operations
- Process operations
- Safety, health, environment, quality and regulatory affairs
- Technical services
- Maintenance
- Projects

These individuals consult with and seek guidance from their respective counterparts in the corporate structure. The Cigar Lake senior management team is responsible for implementing the requirements of the regulatory licences and permits through the application of the supporting programs outlined in Section 6.

5.2.2.1 Management Oversight of Contractors

The Cameco contractor management program guides Cigar Lake management in dealings with any contractors working at the site. Key elements of the program are as follows:

- scope of work for the contractor
- risk assessments to the level commensurate with the level of risk
- responsibilities of Cameco and the contractor
- information for effective contract management in the procurement stage
- responsibilities of the Cameco contract managers
- training for safety-related activities
- contractor orientation
- supervision of the contractor
- communications
- documentation and document control

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- change control
- emergency preparedness; and
- non-conformance and corrective action.

5.2.2.2 Exchange of Information with Site Personnel

The exchange of information with respect to safety, health, environmental and quality matters is supported by the participation of the employees in groups and committees. Reports generated by the committees are posted on physical or electronic bulletin boards to encourage employee review and comment.

Meetings of senior site departmental representatives are held daily to discuss pertinent site and administration information and related issues. Departmental heads discuss related operational SHEQ issues at informal meetings and safety meetings with their personnel on a daily basis.

Safety and environmental control statistics are readily available for employees to review and in fact they are encouraged to read and understand this information.

5.2.2.3 Committees and Teams

On-site committees and teams are structures that make recommendations to the general manager on matters that affect various areas of Cigar Lake. Approval by management is required to implement changes.

For example, there are Occupational Health and Safety and Environmental committees. Representation on these committees and teams comprises a cross-section of employees to ensure that the workforce is adequately represented. As well, a number of positions are rotated amongst employees so that, over time, all employees have an opportunity to participate.

The employee co-chairperson of the Occupational Health and Safety Committee is designated as the “workers’ representative” as referred to in the NSCA and associated regulations. The Occupational Health and Safety Committee is also a requirement of the provincial *Occupational Health and Safety Regulations*. There is a requirement that there be a worker chairperson on the committee who is designated as the “workers’ representative” as is also referred to in the UMMR. All communications from the CNSC are available to both the employer and employee co-chairpersons.

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5.2.2.4 Training

Foundations of training and competency development are required to properly build an environment conducive to improvement and to fully promote human performance capabilities. At Cameco, and within Cigar Lake, training is a high priority. Qualifications are established and assessed for all functions related to safety critical work and training for personnel is systematically provided.

Underpinning the vital role training and development plays in the operation, Cigar Lake has adopted the systematic approach to training (SAT) using the “ADDIE” model:

- Analyze the activity to be done.
- Design training objectives.
- Develop the training.
- Implement the training.
- Evaluate the effectiveness of the training.

Following Cameco’s SAT process, training curricula have been developed to ensure that all employees are capable of performing all tasks relevant to their current roles.

5.2.2.5 Responsibilities for All Personnel and Supervisors

In addition to specific responsibilities outlined in the various Cigar Lake programs, all personnel are expected to follow company and site rules, procedures and work instructions as well as applicable laws and regulations. Management and supervisors support an environment of two-way communications and encourage all personnel to have a questioning attitude, be continually learning, and work as an effective team.

5.2.2.6 Staffing Contingency Plan

In the event of short-term staffing deficiencies (e.g. sickness), personnel have been trained with multiple skills in order to maintain the mine site activities. Work schedules of employees could be altered to ensure the security of Cigar Lake through a managed continuation of activities or an orderly and safe stand down.

In the event of long-term staff deficiencies that impair the ability of Cigar Lake to maintain safety standards, the activities will be suspended. Staff under the direction of the general manager would maintain security and essential services.

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6.0 OVERVIEW OF PROGRAMS

This section of the CGR-MFLM summarizes the site programs, which are in place for the protection of the public, the environment, the health and safety of people and the security of the facilities.

6.1 Quality Management Program

Cigar Lake recognizes that quality management is essential to ensuring the operation of the facility is carried out safely, efficiently and effectively. The CGR-QMP is the highest-level document in the overall site quality management system.

It describes the requirements necessary for each program to be compliant with the 'Plan-Do-Check-Act' (PDCA) approach to management outlined in internationally recognized management standards (including ISO 9001 and ISO 14001). The PDCA approach ensures that processes are systematically identified, controlled and monitored, and that those processes and the quality management system are continually improved.

The CGR-QMP incorporates the requirements established by the corporate integrated safety, health, environment and quality management system.

Key elements of the program include but are not limited to process identification and risk management, communication, information management, procurement, design, construction management, commissioning, contractor management, project management and audit.

6.2 Mining Operations Program

The CGR-MOP ensures that all mine geological, design, development and mining activities are executed in a controlled manner that incorporates all available information. Core activities of this program include geological and geotechnical core logging, ore grade, underground mapping, and 3D modeling of the orebody and other structures.

Mine engineering design is also part of the CGR-MOP Core activities of mine design include creating conceptual drawings, developing mine layout drawings, incorporating current geological, geotechnical, hydrogeological, and other available data while preparing mine drawings, design and monitoring of the ventilation systems and confirming as-built drawings.

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Mine development and mining is also covered under the CGR-MOP. The core elements of mine development include the implementation of ventilation design and control, supervision and management of the mining contractor following the Cameco contractor management system, maintenance of the mine services, and ground freezing.

6.3 Environmental Management Program

The CGR-EMP ensures that the influence of site activities on the environment surrounding Cigar Lake is mitigated.

Core activities within this program include ongoing effluent measuring and monitoring, environmental information gathering, spill response, decommissioning and reclamation, implementation of the CGR-ECOP, compliance with all regulatory requirements and tracking and interpretation of environmental data. Cigar Lake is included within Cameco's corporate certification to the ISO 14001:2015 environmental management system standard and Cigar Lake's environmental management system as described in the CGR-EMP is in conformance with Cameco's SHEQ Policy.

Through a detailed environmental monitoring schedule encompassing the air, water, terrestrial, and aquatic environments, Cigar Lake is able to monitor for potential impacts to the environment. The results of this monitoring follow a quality assurance process to ensure the data are scientifically sound and accurate. Monitoring results are routinely presented to regulatory agencies and are compared to previous EIS predictions, particularly through the environmental performance report, which is required by the Saskatchewan Ministry of Environment every five years.

6.4 Radiation Protection Program

The CGR-RPP manages personal radiation exposures and doses to levels that are consistent with the ALARA principle and comply with all radiation protection regulatory requirements.

Core activities within the program include ongoing radiation measurements and monitoring, dosimetry management, implementation of the CGR-RCOP, implementation of an ALARA protocol and reporting radiation testing results to nuclear energy workers at site and the regulatory agencies.

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6.5 Safety and Health Management Program

The Cigar Lake *Safety and Health Management Program* (CGR-SHMP) ensures that all individuals present at the site are able to work and live in an environment where all identified hazards are controlled so that risks are at acceptable levels. This program follows the PDCA model outlined in internationally recognized management standards (including ISO 9001 and ISO 14001).

Core elements within the program include planned inspections, pre-use inspections, safety permit systems, committees and meetings, incident investigations, compliance with regulations and the management of safety equipment.

6.6 Emergency Preparedness and Response Program

The *Emergency Preparedness and Response Program* (CGR-EPRP) ensures that emergency response plans for injury, fire, underground water inflows, spills and other identified potentially significant issues are in place and people are trained in their execution.

Core elements within this program that require planning and training include emergency response and mine rescue, mine evacuation, first aid, fire protection, firefighting, and spill response.

6.7 Fire Protection Program

The *Fire Protection Program* (CGR-FPP) promotes fire safety at the Cigar Lake. Fire protection is achieved through a combination of fire prevention measures and response systems. These include physical and administrative measures to prevent, detect, suppress, and mitigate fires. Modifications or additions to the facility are assessed for risk, including fire safety in accordance with a design control process and with licence conditions. When required, third-party reviews of modifications or changes occur.

Other administrative controls include third-party reviews of compliance to the *National Fire Code* (NFC) and the *National Building Code* (NBC), which can include inspections, testing and training. Physical controls include fire detection and alarm systems located throughout on-site facilities to detect and provide notice of a fire.

In the event of a fire, a variety of fire suppression equipment and an emergency response team is available on-site at all times.

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6.8 Security Program

The *Security Program* (CGR-SP) ensures that the Cigar Lake site has an effective system for controlling access to the site, protecting property on the site and controlling and securing all dangerous substances appropriately.

Core elements of the program include restricting site access, maintaining law and order on the site, monitoring vehicular traffic and preventing the unauthorized removal of material or equipment from the property. Due to the confidential nature of this program and its accompanying procedures and work instructions, they are treated as prescribed information and access is restricted to only those who are authorized.

6.9 Transportation Program

The *Transportation Program* (CGR-TP) ensures that all dangerous goods shipped from the site are packaged and shipped in accordance with the applicable laws and regulations.

Core elements of the program include: storage of dangerous goods while on site; packaging, labeling, and documentation for dangerous goods for shipping; loading transport vehicles; and ensuring the appropriate placards are displayed on vehicles before they leave site.

6.10 Training and Development Program

The *Training and Development Program* (CGR-TDP) ensures all Cigar Lake personnel receive the necessary training to complete their jobs safely and efficiently. Core elements of the program are the systematic approach to training (SAT), which follows the ADDIE model.

6.11 Public Information Program

The process in which Cigar Lake communicates with the public is described in the *Public Information Program* (CGR-PIP). The purpose of this program is to inform identified northern Saskatchewan stakeholders with an interest in Cigar Lake about the general nature of operations and the potential effects of the activities to the safety and health of the public and the environment. It is designed to keep the public informed regarding certain aspects of the operation and foster good relations with northern Saskatchewan communities, regulatory bodies, and the general public.

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6.12 Processing Operations Program

The *Processing Operations Program* (CGR-POP) ensures safe and effective operation of surface and underground processing and treatment circuits.

Core elements of this program include ore processing underground and on surface, mine dewatering, water and sewage treatment facilities, fresh and potable water supplies and ground-freezing facilities.

6.13 Maintenance Program

The *Maintenance Program* (CGR-MP) provides an overview of the maintenance processes conducted at Cigar Lake and how equipment and components of the site's physical systems are maintained.

Core elements of this program include maintenance planning, materials warehousing, maintenance engineering, site services and preventive and corrective maintenance services.

6.14 Waste Management Program

The *Waste Management Program* (CGR-WMP) provides an overview of the waste management activities conducted at Cigar Lake. The program applies to the management of waste rock and solid/liquid waste including, non-contaminated industrial and domestic waste, contaminated waste, contaminated water and sewage. Management of hazardous wastes is also detailed in this program.

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7.0 DECOMMISSIONING AND FINANCIAL GUARANTEE

Cameco recognizes environmental management and protection of the environment as among its highest corporate priorities. As a matter of policy, Cameco will decommission and reclaim its operating sites in a planned and timely manner. Decommissioning encompasses the application and approvals necessary for an operation to remove from service and close a facility to a state that does not require ongoing care and maintenance. With respect to decommissioning, Cameco will:

- Conduct progressive decommissioning and reclamation as soon as practical during operations, where reasonable and economically feasible.
- Maintain a *Preliminary Decommissioning Plan* (CGR-PDP), which provides a conceptual plan for the decommissioning of the entire site.
- Maintain a *Preliminary Decommissioning Cost Estimate* (CGR-PDCE), based on the decommissioning methodologies described within the PDP.
- Maintain a financial guarantee in the amount of the current CGR-PDCE.

The current CGR-PDP and corresponding CGR-PDCE have been developed for the period of 2018 to 2023 to provide the public and various regulatory bodies with assurance that the decommissioning of Cigar Lake has been addressed. These stand-alone documents are based on the removal of all infrastructure and returning the site to as near a pre-development state as reasonably possible with no requirements for long-term maintenance or reporting. The detailed methodologies and cost estimate assumptions are discussed within the CGR-PDP and CGR-PDCE, respectively.

7.1 Decommissioning

The CGR-PDP and corresponding CGR-PDCE are submitted to the federal and provincial regulatory agencies for review and approval. The plan identifies, in general, the activities that would be required to decommission Cigar Lake under a “decommission tomorrow” scenario. Prior to decommissioning activities, a detailed decommissioning plan will be prepared and submitted to the CNSC and SMOE for review and approval.

The CGR-PDCE is prepared based on the methodologies described within the CGR-PDP and contains sufficient detail and justification of costs to arrive at a reasonable estimate of cost to decommission the Cigar Lake site. The plan and cost estimate are reviewed, at a minimum of, every five years, but may be revised earlier if deemed necessary by Cigar

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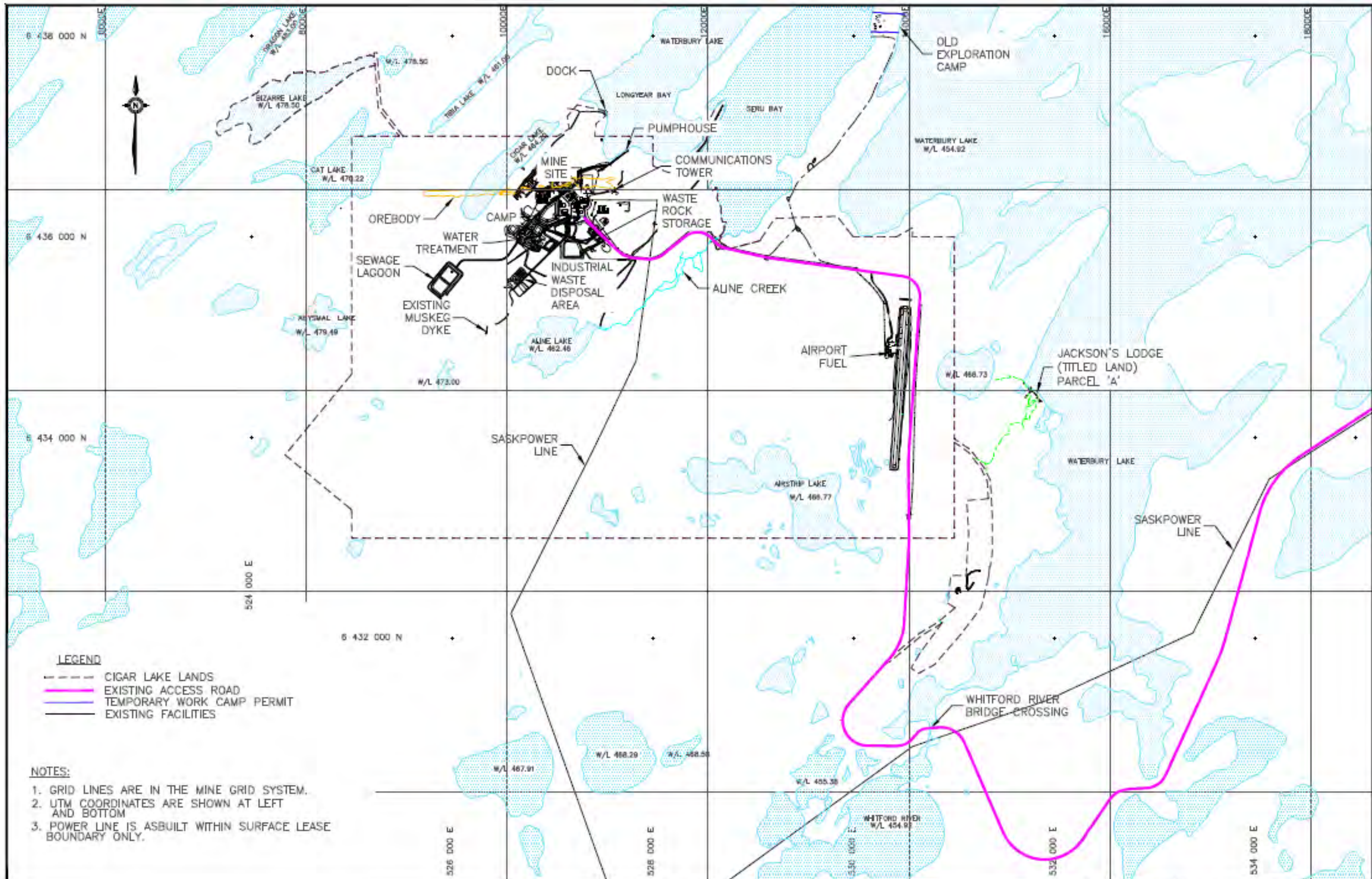
Lake and/or the regulatory agencies. As such, Cameco is committed to reviewing and making appropriate revisions to the CGR-PDP and CGR-PDCE for submission to meet all regulatory requirements.

7.2 Financial Guarantee

The current decommissioning cost estimate for Cigar Lake is estimated at \$61.8 million (Cdn). This value was approved by the CNSC in 2019 and is anticipated to remain adequate to the end of 2023. Cameco and its joint venture partners maintain a financial guarantee, in the form of irrevocable standby letters of credit, in favour of the SMOE.

**APPENDIX A
DRAWINGS**

APPENDIX A



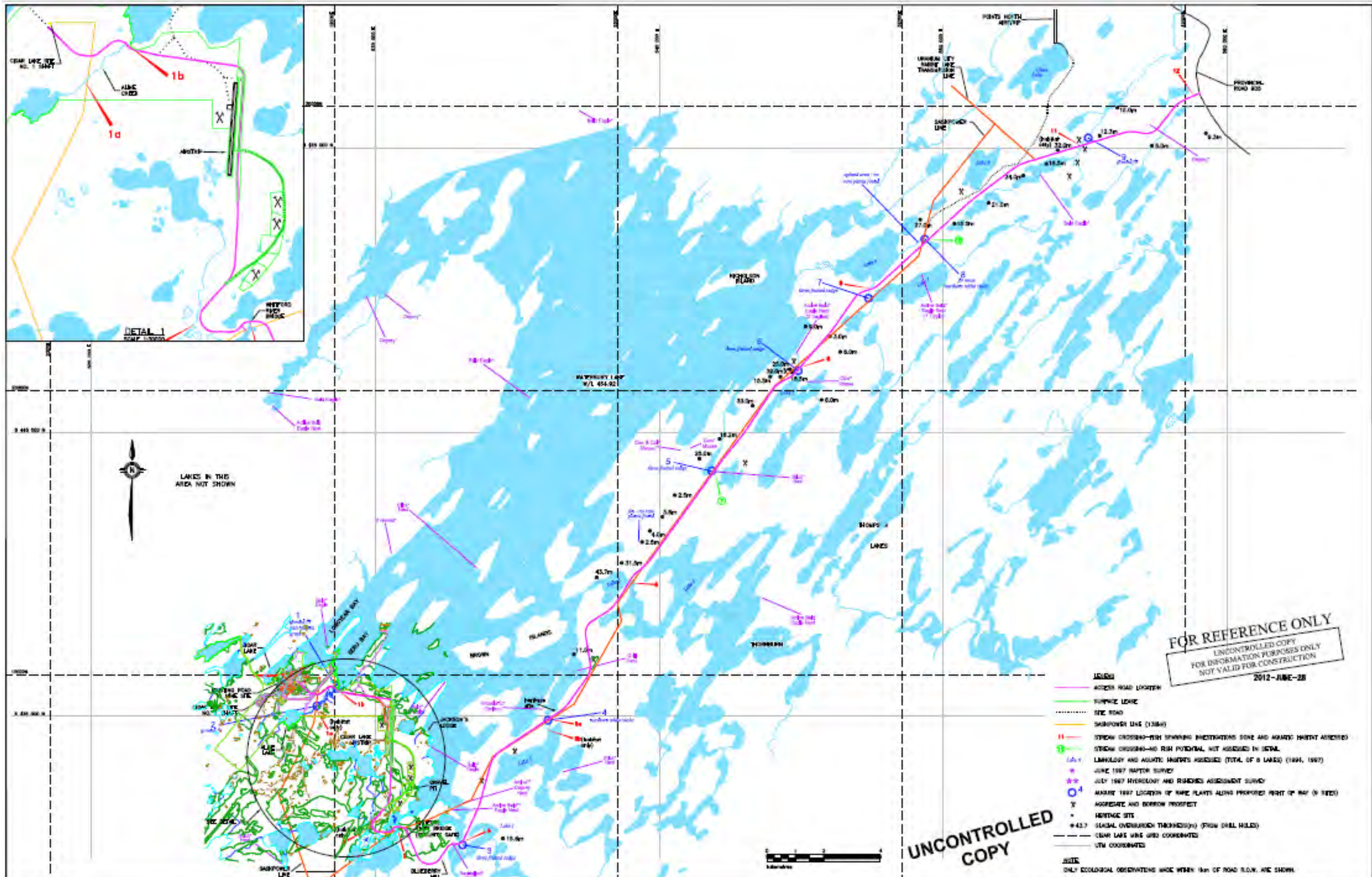
- LEGEND**
- CIGAR LAKE LANDS
 - EXISTING ACCESS ROAD
 - TEMPORARY WORK CAMP PERMIT
 - EXISTING FACILITIES

- NOTES:**
1. GRID LINES ARE IN THE MINE GRID SYSTEM.
 2. UTM COORDINATES ARE SHOWN AT LEFT AND BOTTOM
 3. POWER LINE IS ASBUILT WITHIN SURFACE LEASE BOUNDARY ONLY.

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SCALE (1:1)	NONE	LOC.	CIGAR LAKE PROJECT
		AREA	SERVICE FACILITIES AND UTILITIES
		TITLE	CIGAR LAKE LANDS LEASES, PERMITS EXPLORATION RIGHTS
		DWG. No.	SKET0408





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 2012-JUNE-28

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REV. NO.	DATE	DESCRIPTION	BY	DES. LGD APPL.	DES. AUTH. APPL.
F	04/23/09	GENERAL REVISION	TAA		
E	04/23/09	ISSUED FOR CONSTRUCTION LICENSE APPLICATION	TAA		
D	01/14/09	REPLACED TITLE BLOCK, GENERAL REVISION	TAA		
C	01/06/09	UPDATED ROAD BY AIRPORT (UMA)	TAG		
B	01/06/09	ISSUED FOR INFORMATION/COMMENTS	TAG		
A	01/06/09	ISSUED FOR INFORMATION/COMMENTS	TAG		

		SCALE (A1):	1:160,000	DATE:	04/27/09	LOC:	CIGAR LAKE PROJECT
		DESIGNED:	N. ABERNACE	DATE:	04/27/09	AREA:	PERMANENT ACCESS ROAD
UNCONTROLLED COPY IMMEDIATELY RELEASED		DRAWN:	T. SCRAPPEL	DATE:	04/27/09	TITLE:	PROPOSED LOCATION OF PERMANENT ACCESS ROAD CIGAR LAKE SITE TO PROVINCIAL ROAD 905
		DESIGN LEAD APPROVAL:		DESIGN AUTH. APPROVAL:		DRG. NO.:	C455-G-005

**APPENDIX B
LIST OF REVISIONS**

APPENDIX B

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Table B.1: List of Revisions

Section	Description of Changes
Cover Page & Header	
	Revised to current Cameco document format. Revised to reflect current revision to document and current date.
General Revision Themes Throughout the Document	
	Revised to reflect current operational state as opposed to transition from construction to operations.
1.0 Introduction	
1.3	Removed acronyms from definitions list (spelled out in document).
1.5	Removed Ventilation Code of Practice. Pertinent information will be included within the Radiation Code of Practice as per McArthur River.
2.0 Background	
2.1	Added list of communities in the vicinity of Cigar Lake.
2.2	Moved summary of licensed activities section forward in document. Revised wording of licensed activities to align with wording in anticipated new licence and LCH formats.
2.4, 2.5, 2.6	Summarized and re-organized. Added summary of activities completed under current licence.
2.8	Updated to reflect potential opportunities during next licence period.
3.0 Facility Components and Processes	
All	Summarized and removed information duplicated in other licence documents (MFDM). Updated to reflect current infrastructure.
4.0 Operating Policies and Principles	
All	Summarized and updated to reflect current information and removed detailed information duplicated in other program documents. Removed Ventilation Code of Practice. Pertinent information will be included within the Radiation Code of Practice as per McArthur River.
5.0 Facility Management	
All	Summarized and updated to reflect current systems and removed detailed information duplicated in other program documents.

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Section	Description of Changes
6.0 Programs	
All	Summarized and updated to reflect current systems and removed detailed information duplicated in other program documents.
7.0 Decommissioning and Financial Assurance	
7.2	Updated to reflect current PDP and PDCE submitted in 2019.
Appendices	
A	Drawing C000-F-096 moved into main body as Figure 2.1. Removed underground mine drawings as these are provided in the annual reports.
B	Revised to contain list of current revisions.
C	Updated to reflect current organizational structure. Removed positions below the vice president and Cigar Lake general manager level.
D	Not included with this version of MFLM. Roadmap to licence application regulatory requirements included within the licence application cover letter.
E	Not included with this version of MFLM. Financial assurances are provided in Appendix A of the current PDCE.

**APPENDIX C
INTEGRATED MANAGEMENT
ORGANIZATIONAL CHART DESCRIPTIONS**

APPENDIX C

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DESCRIPTION OF CAMECO CORPORATE AND SITE MANAGEMENT ROLES

Senior Management Responsibilities

Up-to-date organization charts are maintained by Cameco's corporate office, which are available on-line within Cameco's computer network. The organizational and reporting structure for senior management and corporate personnel responsible for Cigar Lake is noted in the figure below.

President and Chief Executive Officer (CEO)

Reporting to Cameco's board of directors, the president/CEO is responsible for all executive management of Cameco.

Senior Vice-President – Chief Legal Officer & Corporate Secretary

Reporting to the CEO, the senior vice-president - chief legal officer and corporate secretary is responsible for executive management of Cameco Corporation's legal affairs.

Senior Vice-President and Chief Corporate Officer

Reporting to the CEO, the senior vice-president and chief corporate officer is responsible for executive management of Cameco's safety, health, environment, quality & regulatory relations (SHEQ) group.

Senior Vice-President and Chief Operating Officer

Reporting to the CEO, the chief corporate officer is responsible for all executive management of Cameco's operating units.

Vice-President, Mining and Operational Excellence

Reporting to the COO, the vice-president, –mining and operational excellence, is responsible for Cigar Lake within Cameco.

Vice-President, Technical Services

Reporting to the COO, the vice-president, technical services is responsible for executive management of engineering and projects within Cameco.

Vice-President, Safety, Health, Environment & Quality (SHEQ) and Regulatory Relations

Reporting to the senior vice-president and chief corporate officer, Cameco's vice-president, SHEQ and regulatory relations is responsible for technical support to operations

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for all matters relating to licensing, environmental monitoring, health and safety, radiation protection, and quality assurance.

General Manager, Cigar Lake

Reporting to the vice-president, mining and operation excellence, the general manager, Cigar Lake has overall responsibility for managing Cigar Lake in accordance with corporate policies and principles. This position also has overall responsibility for ensuring regulatory requirements are met at Cigar Lake.

