# Cameco Corporation
# McArthur River Operation


# LIC-01

# Mining Facility Licensing Manual

**February 2023**

| Title: Mining Facility Licensing Manual | | Doc. No.: LIC-01 |
|---|---|---|
| Date Issued: June 2001 | Date Revised: February 2023 | Rev. No. 10 |

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# 1.0 INTRODUCTION

## 1.1 Purpose

The Cameco Corporation (Cameco) McArthur River Operation (McArthur River) *Mining Facility Licensing Manual* (MCA-MFLM) serves as a top-level document and is part of the licensing basis for the nuclear facility. The MCA-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 MCA-MFLM and becomes effective when the Canadian Nuclear Safety Commission (CNSC) approves the current version.

## 1.2 Scope

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

- *Nuclear Safety and Control Act* (NSCA) and associated regulations, including
  - *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* (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 McArthur River 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.
- 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: 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 (QMS) not performing to specification

### Operational Controls

Include, but are not limited to, procedures, training, inspections, preventative maintenance programs, engineered controls or monitoring, and measurements put in place to manage risks (safety, health, environment, security, quality, operational)

### Ore Slurry

A mixture of uranium ore solids and water that facilitates the pumping of uranium through the processing circuit

### Pachucas

Air agitated cylindrical tanks

## 1.4 Responsibilities

The general manager, McArthur River and Key Lake operations is responsible for ensuring that the policy and program commitments referenced in this manual are implemented. The manager, safety, health, environment & quality (SHEQ) is responsible for the administration of this manual.

Correspondence related to McArthur River matters are to be directed to the general manager with the manager, SHEQ and Cameco SHEQ regulatory records copied on the correspondence.

## 1.5 References

Unless identified as a specific version, the following references are deemed "as amended" and refer to the latest CNSC approved version.

### 1.5.1 Acts and Regulations

The following legislation is referenced in the MCA-MFLM. References to other regulatory documents are provided in the various site programs and procedures:

- *Nuclear Safety and Control Act*
  - *General Nuclear Safety and Control Regulations*
  - *Uranium Mines and Mill Regulations*
  - *Nuclear Substances and Radiation Devices Regulations*
  - *Packaging and Transport of Nuclear Substances Regulations*
  - *Radiation Protection Regulations*
- *Fisheries Act*
  - *Metal and Diamond Mining Effluent Regulations*

Further, as is the case for all Cameco operations, McArthur River is subject to the obligations arising from the International Atomic Energy Agency (IAEA) safeguards agreements.

### 1.5.2 McArthur River Programs

- LIC-02, *Mining Operations Program* (MCA-MOP)
- LIC-03, *Ore Processing Program* (MCA-OPP)
- LIC-04, *Environmental Protection Program* (MCA-EPP)
  - *Environmental Code of Practice* (ECOP)
- LIC-05, *Waste Management Program* (MCA-WMP)
- LIC-06, *Radiation Protection Program* (MCA-RPP)
  - *Radiation Code of Practice* (RCOP)
  - *Nuclear Substance Possession Limits*
- LIC-07, *Safety and Health Management Program* (MCA-SHMP)

- LIC-08, *Emergency Preparedness and Response Program* (MCA-EPRP)
- LIC-09, *Security Program* (MCA-SP)
- LIC-10, *Quality Management Program* (MCA-QMP)
- LIC-11, *Training and Development Program* (MCA-TDP)
- LIC-12, *Maintenance Program* (MCA-MP)
- LIC-13, *Public Information Program* (MCA-PIP)
- LIC-14, *Transportation Program* (MCA-TP)
- LIC-17, *Fire Protection Program* (MCA-FPP)

## 1.6 Document Control

The MCA-MFLM is managed as a controlled document in accordance with McArthur River *Quality Management Program* (MCA-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. Administrative changes to this document require notification to be sent to the designated CNSC project officer. Other revisions to this document require the acceptance of the designated CNSC project officer.

At a minimum, this document will be reviewed every 10 years. 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.

# 2.0 BACKGROUND

## 2.1 Facility and Business Address

McArthur River is a uranium mining facility located in the northern region of the Province of Saskatchewan approximately 65 kilometres (km) north-east of Cree Lake. It lies within the southern boundary of the Athabasca formation, 630 km to the north of Saskatoon, Saskatchewan. Figure 2.1 provides a general location of McArthur River in reference to the Province of Saskatchewan. There is no permanent settlement in the immediate area of McArthur River. The northern village of Pinehouse, the nearest community, is 280 km away by all-weather road.

The mineral property consists of one mineral lease covering 1,380 hectares (ha) and 21 mineral claims covering 83,438 ha. The mineral lease, which hosts the McArthur River deposit, sits on the northwestern edge of the mineral claims.

Under the McArthur River Surface Lease Agreement between Cameco and the Province of Saskatchewan, the province has leased to Cameco approximately 1,425 ha of land located at approximately UTM Zone 13/6402500mN/497500mE. The leased surface area is described in the legal McArthur River Operation Surface Lease Maps. A plan drawing indicating the boundaries of the surface lease, and the major structures within the lease, is provided in Appendix A. Further, Figure A-2, Appendix A, illustrates the corresponding underground working and planned ore zones for the licence application.

Cameco Corporation, with 69.8% ownership, is the operator and licensee of McArthur River. Orano Canada Inc. owns 30.2% of McArthur River. The business address of the licensee is:

Cameco Corporation – McArthur River Operation
2121 – 11th Street West
Saskatoon, Saskatchewan
S7M 1J3

If during the course of the licence period, the above information changes, the CNSC will be notified of the change.


**Figure 2.1: McArthur River location map.**

## 2.2 Summary of Licensed Activities

The purpose of McArthur River is to mine and process uranium ore. To achieve this purpose, the following scope of activities must be carried out by McArthur River during the upcoming licence period. The following outlines the scope of authorized activities within the CNSC licence UML-MINE-MCARTHUR.01/2023 or as amended or renewed:

a) prepare a site for, construct, operate, modify and decommission a nuclear facility for the mining of uranium ore at a site known as the McArthur River Operation in the Province of Saskatchewan.

b) mine a nuclear substance (uranium ore).

c) possess, transfer, import, use, store and dispose of nuclear substances; and

d) possess, transfer, import, use prescribed equipment that is required for or associated with laboratory studies, field studies, fixed gauge usage and borehole logging devices in relation to (a) and (b).

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

- operate and modify an underground uranium mine, including an associated underground ore-treatment system, to a maximum output of 9.6 million kilograms of uranium per year
- transfer, by use of a surface load-out system, the treated uranium ore to another facility authorized by the CNSC to accept the nuclear substance
- prepare hazardous non-nuclear materials for use in mining and treatment of the uranium
- implement and maintain a program for the appropriate treatment of all wastes arising from any part of the facility, including those containing nuclear substances
- possess, transfer, use, store, import and dispose of nuclear substances and radiation devices required for use in the facility or as part of the operation of the facility.

## 2.3 Site Evaluation

### 2.3.1 Pre-Operational Site Evaluation

Cameco, through its predecessor company, the Saskatchewan Mining Development Corporation, became operator of the McArthur River project in 1980. Surface exploration programs, ranging from small line-cutting crews to large helicopter-supported drilling and prospecting camps, were active from 1980 through to 1992.

In the summer of 1988, drilling along the northern portion of an electromagnetic conductor encountered structural disruption and sandstone alteration. The last hole of the year encountered the contact between the overlying sandstone and basement rock much higher than expected, however 65 metres (m) deeper it passed back into sandstone and intersected a 10 m thick zone of high-grade mineralization along the faulted basement/sandstone contact. Subsequent surface drilling programs in 1989 to 1992 delineated the mineralization over a strike length of 1,700 m, occurring at depths ranging between 500 to 640 m below surface.

In late 1989, work began on collecting baseline environmental data. The environmental assessment process began in 1990 with notification of Cameco's intention to mine the deposit. In 1991, the Joint Federal/Provincial Panel on Uranium Mining in northern Saskatchewan was formed, and in 1992, it undertook a series of scoping meetings to develop environmental impact statement (EIS) guidelines. Regulatory approval to undertake underground exploration in support of mine development and its assessment process was received in early 1993, following a public hearing in December 1992. Shaft sinking began in July 1993, and underground development in support of exploration began in August 1994.

The results of the environmental baseline work were summarized in the EIS, which was filed in December 1995, and its addendum in June 1996. The baseline conditions and predicted impacts were identified for air quality, surface water, aquatic ecology, hydrology, geology and soils, vegetation, archaeology, socio-economic factors, and radiological concerns. The Panel filed its recommendation in February 1997, and the provincial and federal governments announced support for development in May 1997. The CNSC predecessor, the Atomic Energy Control Board (AECB), granted construction licensing in two stages, in August 1997 and May 1998.

In 1993, an underground exploration program, consisting of shaft sinking, lateral development, and diamond drilling was approved by government agencies. The shaft was completed in 1994. Approvals for mine construction and development were obtained in 1997. Construction and development of the McArthur River mine was completed and mining commenced in December 1999.

Surface drillholes, comprising a combination of conventional and directional diamond drilling, have tested the P2 structure at approximately 200 m intervals for a distance of 4.3 km northeast and 6.4 km southwest of the mine, respectively. A number of segments of the P2 structure are identified for further follow-up drilling.

### 2.3.2 Activities Completed Under Previous Licences

McArthur River received its first AECB operating licence in October 1999. The underground development completed in 1999 was sufficient to allow production mining to begin in the fourth quarter as planned.

In 2000, two improvements were made to the production process. The first was a design change in the way in which ore was collected from the production raise. Originally, a transportable mining unit (TMU), placed below the raise, was used to screen and pump the ore slurry for processing. However, sloughing of large rocks from the raises caused safety and operational issues with the TMU. Subsequently, a design change was approved to direct the reamed ore to an ore collection chute (OCC). This reduced the need for workers to be in the vicinity of the raise, thereby lowering the collective dose and the potential for physical harm from sloughing incidents.

The second change in 2000 was associated with low-grade mineralization. Once production began, McArthur River identified larger than expected amounts of low-grade mineralization below the high-grade mineralization. This material caused problems with the grinding, slurry, and transportation circuits due to the highly siliceous low-grade nature. Subsequently, McArthur River submitted an application to transport low-grade mineralization from underground and ship to the Key Lake Operation (Key Lake) using highway haul trucks. Both Saskatchewan Environment and AECB accepted this proposal, with the controls and contingencies identified.

In 2003, further simplifications were sought in the raisebore ore recovery process. A "No OCC" method was first tested and then permanently approved. One of the advantages of this further simplification was reduced radiation exposure in the event of reamer problems, given the reduced amount of equipment under the open raise.

In April of 2003, a ground failure occurred resulting in an inflow of water into the mine. When combined with the base load inflow of approximately 250 cubic metres per hour ($m^3/h$), total mine inflow peaked at about 1,000 $m^3/h$.

Several actions were taken to respond to the inflow conditions, including sourcing and installing additional pumping capacity and modifying the water treatment process in order to treat the additional volume of water. After restoring control of the water inflow and taking action to backfill the fall of ground area, focus was placed on rehabilitating the mine and investigating the cause of the incident. On June 30, 2003, mining resumed at McArthur River.

In 2004 and 2005, improvements were made to the mine water pumping and treatment capacity to more quickly and effectively respond in the event of a future inflow event.

These improvements included increased mine water pumping, changes to the water treatment plant, and the construction of a contingency water treatment system.

In 2006 and 2007, mine development plans focused on constructing access drifts to the Zone 2 Panel 5 and Zone 4 areas for future ore production. A significant control for development and future mining of these areas included the use of freeze walls. Production mining commenced in late 2009 in Zone 2 Panel 5 and in late 2010 in Zone 4.

In 2006, a north exploration drift was started to provide access to drill targets to the north of the Pollock Shaft. Exploration and development is expected to continue during the proposed licence period to support future mining.

In 2009, McArthur River submitted an application for production flexibility to the CNSC. Production flexibility at McArthur River would allow the site to reduce operational and maintenance issues related to shutdowns, as well as make up for annual production shortfalls at Key Lake, while still remaining within the parameters of previously assessed production levels. The application received regulatory approval in 2010.

Overall the McArthur River mine development program continues to be effective in supporting the licenced activities. It assures the systematic risk assessment of ground conditions so that appropriate mitigations are in place to prevent ground failures or inflows and that appropriate contingency measures are in place to deal with the consequences. More specifically, in addition to the conventional ground support, dewatering and treatment contingencies, McArthur River continues to use targeted ground freezing in advance for certain development areas along with drift designs to facilitate quick installation of bulk heads as key management and control techniques for any potential inflow situations.

## 2.4 Activities Completed Under UMOL-MINE-MCARTHUR.00/2023

CNSC licence UMOL- MINE-MCARTHUR.00/2023 was issued in October of 2013. This licence was amended to UML- MINE-MCARTHUR.01/2023 in June of 2019 to reflect the updated McArthur River financial guarantee. The current licence term has been focussed on activities to support ongoing operation of the facility. Significant activities completed under the licence term included:

- Approval for production increase to 8.1 million kg U per year received in April of 2014 with an additional production increase to 9.6 million kg U per year received in April of 2015.
- Construction or modification of facility components to support the increased production capacity, such as:
  - Upgrades to Shaft 2 ventilation to increase the total mine ventilation capacity by optimizing existing infrastructure.

  - Increases in ground freeze capabilities including expansion to the existing main freeze plant on surface and construction of a new south freeze plant and underground distribution system.

- Decommissioning of four bridges and five culverts along the Fox Lake road. The Fox Lake Road was used as the initial access road from Key Lake to McArthur River prior to construction of the current haul road.

Further, during the licence term, McArthur River undertook additional projects to improve water use and management. These included:

- Completion of the Shaft #3 industrial water use project which enabled the use of clean Shaft #3 water for industrial use on site, reducing the amount of fresh water withdrawn from Toby Lake.
- Construction of the Read Creek conveyance channel, which bypasses Boomerang Lake and redirects treated water discharge to Read Creek.

During the licence term, production was suspended, and McArthur River entered into a temporary state of care and maintenance in 2018 as a result of ongoing uranium market conditions. During this period, Cameco utilized the opportunities realized while the facility was in shutdown in order to undertake improvements to equipment, with a specific focus on digitization and automation of existing processes at McArthur River. The most significant of these projects was the upgrades to the surface batch plant used to produce concrete for underground activities.

In February of 2022 Cameco made announcement of intent to begin the process of transitioning McArthur River from care and maintenance to production.

## 2.5 Future Outlook

As is the case with all mines, brownfield exploration is conducted as a means of maximizing the return on investment. Continued exploration of the McArthur River 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 McArthur River ore body in areas which are not currently categorized as resources.

During the next licence term, underground exploration drilling, development and freeze wall expansion will continue at McArthur River. McArthur River will continue to mine within the two active mine zones (Zone 2 and Zone 4) with Zone 1 being the next area planned to be brought into production. Current future mining zones also include Zone 4 south, Zone 3, Zone B and Zone A as shown in Figure A.2 (Appendix A).

McArthur River will also continue to consistently implement site programs and ensure the health and safety of workers and the public, as well as protect the environment and

maintain critical infrastructure to ensure their ability to safely transition from care and maintenance into production in the future. The decision to transition will be based on Cameco's success in securing our share of production under long-term uranium sales contracts that provide an acceptable rate of return.

During the next licence term, McArthur River may undertake the activities identified below. When sufficient information has been gathered and plans developed, Cameco will provide notification (with supporting information to demonstrate that the licence basis is respected) to the CNSC.

- Continue to investigate alternative mining methods.
- Review and management of the mine water pumping and treatment capacity.
- Continue to advance mine workings towards exploration targets for delineation drilling.
- Upgrade and expand freeze capabilities for mining future zones.
- Upgrade underground ventilation capacity to meet air volume requirements, including possible installation of a ventilation raise(s) as required.
- Maintain, optimize or upgrade infrastructure to ensure safe operations.

# 3.0 FACILITY COMPONENTS AND PROCESSES

## 3.1 Mining Facilities

This section briefly describes the mining and facilities at the McArthur River. Detailed descriptions are provided in the McArthur River *Mining Operations Program* (MCA-MOP).

### 3.1.1 Mining

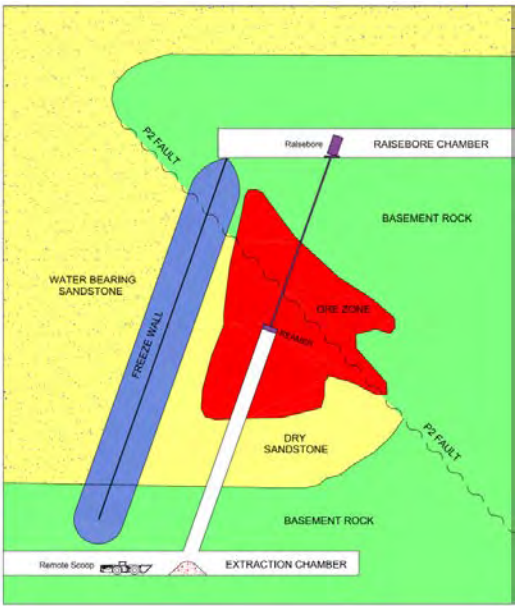
The approved mining methods that have been employed in the past at McArthur River include raisebore mining, boxhole mining, and drill and blast mining as shown in Figure 3.1. Future mining at McArthur River is expected to be primarily raisebore and drill and blast mining.

The raisebore mining method typically involves development of raisebore and extraction chambers above and below the orebody, respectively. The raisebore drill is set up in the upper raisebore chamber and a standpipe is installed. A pilot hole is then drilled to breakthrough into the lower extraction chamber. All cuttings from pilot drilling are contained and piped away to avoid radiation contamination of the work area. Once breakthrough occurs, the reamer is installed and reaming takes place through the waste and into the ore. The cuttings from the raisebore are mucked remotely as required. All cuttings from production raises are scanned for ore grade estimates and delivered to the appropriate dump locations.

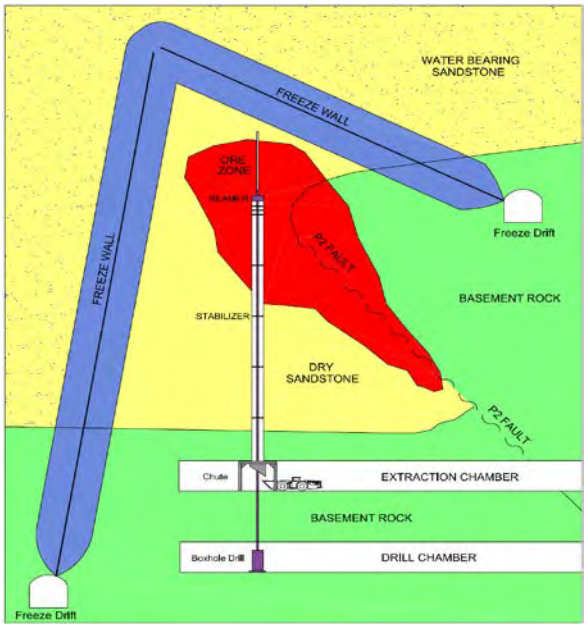
To produce ore with the drill and blast mining method, a drill access chamber is developed above the ore and an undercut muck access is developed below the ore. A slot is excavated and drill holes are placed around the slot. Drill standpipes are used to contain drill cuttings to avoid radiation contamination of the work area. The drill holes are then blasted into the slot, typically as several small blasts. Blasting takes place only in the ore zone to minimize dilution, and a waste cap is left at the top of the stope. Blasted ore is remotely mucked from the raise draw point and scanned for ore grade estimates and delivered to the appropriate dump location.

The boxhole mining method requires two chambers below the ore: a drill chamber and an extraction chamber. The drill from the lower drill chamber pushes the drill string through the extraction chamber and the reamer upwards through the ore. Ore falls down the raise to a chute in the extraction chamber, where it is collected for transport to an ore handling area. Currently, no future use of this mining method is planned at McArthur River.

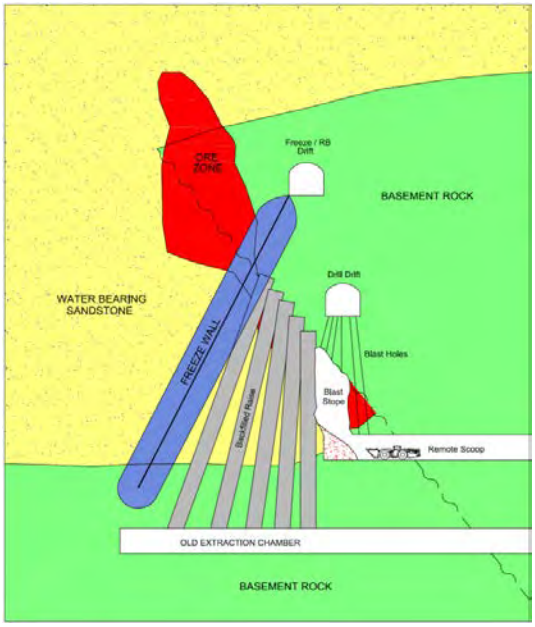
When a raise has been extracted of ore, it is filled with a concrete backfill that is produced at McArthur River. Components of the backfill include cement, sand, potentially acid generating (PAG) fines, aggregates and chemical admixtures.




**Raisebore Mining**




**Boxhole Mining**




**Drill and Blast Mining**

**Figure 3.1: McArthur River approved mining methods.**

### 3.1.2 Shaft Services

McArthur River currently has three shafts – Pollock Shaft (Shaft 1), Shaft 2 and Shaft 3 – that connect the underground workings to surface. Shaft 1 is the main egress into the mine for both personnel and materials. It is a 5.5 m diameter concrete lined shaft serviced by a single deck 28-person main cage, an auxiliary six-person cage and an eight-ton skip. Important mine services feeding the underground through this shaft consist of dewatering pipelines, communication cables, brine lines and a concrete slickline.

The primary purpose of Shaft 2 is to serve as the main ventilation exhaust for the mine. It is a 6.1 m diameter concrete lined shaft. Shaft 3 is the emergency egress from the mine, with a conveyance and ladder escapeway. Shaft 3 also serves as both a fresh air intake and exhaust from the mine. It is a 6.0 m concreted lined shaft served by a six-person auxiliary cage, a work platform and a material hoist. Mine services feeding the underground through this shaft consist of dewatering pipes, power cables, concrete slickline and ventilation ducts.

### 3.1.3 Ventilation

Two ventilation systems are used to ventilate the underground environment; these systems are described in further detail in MCA-MOP. The primary ventilation system is driven by surface exhaust fans that draw fresh air down through the shafts, through the main workings underground, and then up the shafts to be exhausted to the surface. This primary system is complemented by local secondary negative or positive ducting systems. These systems are driven by in-line booster fans that either capture potential contaminants for delivery to the main exhaust system (negative), or supply the appropriate amount of air for working in a specific area (positive). As the mine expands through development, there will be greater demands for ventilation and upgrades will be made, as appropriate, to ensure suitable ventilation is maintained.

### 3.1.4 Mine Water Supply and Mine Dewatering

Water required for underground operations is provided from several dams located in the underground that are fed by water collected from the shafts. Any shaft water that is not required for use underground is transferred to the dewatering system. This dewatering system utilizes a number of pumps and pipes to direct water out of the mine for treatment. A key component of the dewatering system is the Shaft 3 pump station and surface pipelines that direct water to the contingency water treatment system should an inflow event occur. Of note, clean water from Shaft 3 has been approved for direct discharge to the environment.

### 3.1.5 Coarse Ore Storages

The high-grade ore generated from the underground mining is temporarily stored in either extraction chambers or coarse ore storage areas until processed through the grinding circuit. Coarse ore storages help maintain relatively continuous process operations, minimizing the impact to operations from the mine production cycle or upsets.

### 3.1.6 Freeze Plant and Brine Distribution System

An ammonia freeze plant located on surface chills a calcium chloride brine (brine) distribution system which is used to deliver freezing underground. At the 530 level, a secondary brine loop, chilled from the primary loop, circulates the brine to freeze pipes installed in the ground freezing zones of the mine. As new ore zones are developed and brought into production, the site freeze capacity and distribution system is expanded, as required.

### 3.1.7 Batch Plant

A concrete batch plant, located on surface, is used to provide the mine with concrete underground, as required. At the batch plant, cement, sand, aggregate, water and various admixtures are mixed and transferred to a concrete truck. The concrete is then delivered to one of the slick lines through which it is sent into the mine. Once underground, the concrete is delivered for various uses including backfill, filling drill and extraction chambers, construction or shotcrete.

### 3.1.8 Refuge Stations

Underground refuge stations are strategically located in the underground and serve as safe muster points in the event of an underground emergency. Each refuge station can be positively pressured and ventilated with the underground compressed air system in the event of a loss of primary ventilation or an underground fire. As backup to failure of the compressed air lines, each refuge station is equipped with oxygen supply and carbon dioxide scrubbers. Designated underground refuge stations also serve as underground lunch and coffee rooms.

## 3.2 Ore Processing Facilities

This section briefly describes the ore processing and facilities at McArthur River. Full descriptions are provided in the McArthur River *Ore Processing Program* (MCA-OPP).

### 3.2.1 Underground Ore Processing

The purpose of the underground ore circuit is to process the ore into a fine particle size ore slurry that is suitable for pumping to surface. To accomplish this, the ore undergoes grinding and thickening prior to being directed to surface.

The grinding circuit utilizes several pieces of equipment, including a semi-autogenous grinding (SAG) mill and classification hydrocyclones. The slurry produced from the grinding circuit is directed to underground thickeners where the ore slurry is thickened and then pumped to the surface loadout facility through cased boreholes.

### 3.2.2 Slurry Loadout Facility

The ore slurry from underground is routed to one of several pachucas based on its uranium content. This segregation in the pachucas allows the ore slurry to be directed for mixing and blending to optimize the shipping. This blended ore is then pumped to a thickener to further reduce the water content before being pumped to the container feed tank. From the feed tank, the ore is pumped directly to the specially designed totes or containers, which are securely mounted on trailers for shipment to an approved facility for further processing, as described in the MCA-OPP.

The slurry totes have been constructed and meet the Industrial Package Type 2 (Type IP-2) requirements in accordance with the PTNSR.

## 3.3 Waste Management Facilities

This section provides a brief overview of the various processes and facilities associated with waste management at McArthur River. Full descriptions are provided in the McArthur River *Waste Management Program* (MCA-WMP).

### 3.3.1 Solid Waste Management

Solid waste materials are produced at McArthur River originating from industrial and domestic sources. The program of managing solid wastes encourages the 4Rs – reduce, reuse, recycle, and recover – to decrease the volumes of waste disposed of at the site.

The transfer and disposal of solid waste is managed through a controlled waste ticketing process, which documents the types and quantities of material being disposed at the landfills and the responsibilities of those involved.

Non-contaminated domestic and industrial materials are disposed of in a landfill where waste management practices are applied. Radioactively contaminated materials may be shipped to the Above Ground Tailings Management Facility (AGTMF) at Key Lake.

### 3.3.2 Wastewater Management

Contaminated groundwater seepage is collected within the mine through a system of sumps and dams that are utilized to dewater the individual levels of the mine and pumped the water to surface for treatment. This mine water, along with contaminated water from surface facilities is treated in the water treatment process prior to being released to the environment. The paved mine terrace acts as additional containment around the major surface structures, including the administration building, Pollock Shaft headframe, slurry loadout building, water treatment plant, freeze plant, diesel generating building and monitoring pond pump house. Any runoff from the mine terrace is collected in either the north or south surface drainage collection ponds. Several collection ponds serve as reservoirs for contaminated water storage.

Following the 2003 inflow event, additional treatment capacity was added in the event of another emergency inflow event. This contingency water treatment system is able to treat contaminated mine water in the event of an inflow and discharge effluent, meeting discharge limits, to the environment. The required treatment capacity of the contingency system is reassessed when additional information on the likelihood and potential characteristics of an inflow becomes available.

Domestic wastewater (i.e., sewage) is collected and treated in a facultative lagoon system and discharged to an exfiltration cell to percolate into the ground. Domestic wastewater that may be radiologically contaminated (e.g., mine dry showers, laundry, etc.) is directed to the contaminated water system for treatment.

### 3.3.3 Low-Grade Mineralized Material and Waste Rock Management

Low-grade mineralized material and potentially acid generating waste rock are stored on lined pads. Potentially acid generating waste rock is crushed and used as aggregate to make concrete for backfilling mined out raises and is approved for temporary storage on unlined areas adjacent to the batch plant. Low-grade mineralized material is hauled to approved facilities when required to manage site inventories. Clean waste rock is placed on the clean waste rock pad at McArthur River.

### 3.3.4 Waste Dangerous Goods Management

At McArthur River, hazardous substances are consumed and/or produced while carrying out licensed activities. Hazardous substances and waste dangerous goods include specific chemicals and reagents, gasoline and diesel fuel, and waste oil. The storage of

these hazardous substances employs specific operational controls, such as engineered containment, leak detection on fuel tanks and inventory reconciliation, as required by provincial regulations. The Province of Saskatchewan has approved McArthur River as a storage facility for hazardous substances through compliance to these requirements.

## 3.4 Ancillary Facilities

### 3.4.1 Site Access

Access to McArthur River is achieved by air via the site's private airstrip or by a semi-private road, with access controlled at the Key Lake security gate, approximately 80 km away. The road serves as the transportation route for shipping ore slurry and most materials to and from site.

### 3.4.2 Potable and Fire Protection Water

Fresh water is drawn from the nearby Toby Lake and serves as the raw water to feed the potable water treatment system, which is regulated by the Province of Saskatchewan. The raw water is also used to meet McArthur River's surface fire protection water requirements. That water is stored in tanks on a hill overlooking the mine site, adjacent to Shaft 3.

### 3.4.3 Electrical Distribution and Heating

The mine site is serviced by a 138 kilovolt (kV) branch line fed from the SaskPower I2P utility line, which runs from the Island Falls generating station to Points North in northern Saskatchewan. The power is transformed and distributed to the mine site, including electrical substations in the mine. In the event that the SaskPower feed is interrupted, a standby diesel power plant provides for essential services. Mine heaters and building furnaces are propane fired which is fed from a main propane storage area on site.

### 3.4.4 Administration Area

The administration area at McArthur River contains the surface maintenance shop, warehouse, health clinic, personnel wash/change facilities and offices. Maintenance activities including light and heavy-duty vehicle maintenance and welding are conducted in this fully equipped maintenance shop.

The warehouse provides the material management requirements for McArthur River. Inside the warehouse small goods are stored, while outside and cold storage areas are used for large or bulk materials.

The health clinic is serviced by a medical professional, typically a nurse. The medical professional is available daily during work hours at the clinic and is on call at all times for assessment and treatment for acute injuries and illnesses.

Personnel wash/change facilities (dry facilities) are also located in and near the administration building. They have designated clean and dirty sides to ensure proper zone control and have laundering facilities, which together minimize the spread of contamination. Wastewater from these facilities is treated at the mine water treatment plant. Monitoring is performed according to site procedures to ensure contamination is effectively managed.

The administration building contains offices used by the site department staff, including technical and administrative professionals. In addition, there are several meeting and conference rooms to facilitate site and department meetings.

### 3.4.5 Additional Ancillary Facilities

All personnel at McArthur River are provided with room and meal accommodations during their time at site.

The camp facilities consist of both a permanent structure as well as temporary facilities to accommodate increases in site manpower requirements. A cafeteria serves meals and is open 24 hours a day for snacks. A fully equipped gym, weight and exercise rooms, sauna and hot tub are also located in the camp.

A majority of employees commute to site via aircraft. The airport facilities consist of an airstrip, an apron, fuel storage and an arrivals/departures lounge.

Core samples from surface and underground drilling activities are logged and stored on site in a core storage facility. This facility includes a building, where core is logged, and a fenced in area where core boxes with samples are stored.

# 4.0 OPERATING POLICIES AND PRINCIPLES

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

This information is intended to provide an understanding of the strategic direction Cameco is pursuing, and the approach McArthur River takes in this regard with respect to SHEQ.

### 4.1.1 Vision and Values Statement

**Vision**

Cameco's vision is to energize a clean-air world.

**Values**

Our values guide our decisions and actions. They are:

*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*

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 in several locations at McArthur River and on Cameco's website, www.cameco.com. The policy statement, policy implementation and policy accountability text are reproduced in the following three subsections.

**Policy Statement**

Consistent with our vision, values and measures of success, Cameco's highest priorities during all stages of our business are the safety and health of our workers and the public, protection of the environment, and quality of our processes. Our business includes exploration, development, operations, restoration, decommissioning and reclamation. As such, we are pursuing excellence in all that we do through promotion of a strong safety culture and our commitment to the following:

- Preventing injury, ill health and pollution.
- Fulfilling regulatory, contractual and corporate requirements as well as commitments to local communities (defined as compliance obligations).
- Keeping risks at levels as low as reasonably achievable, taking into account economic and societal factors (ALARA).
- Ensuring quality of processes, products and services.
- Continually improving our overall performance.

**Policy Implementation**

To implement the policy statement, we:

- Ensure the effective implementation of the Cameco Management System, which is consistent with international and national standards.
- Implement Cameco's policies, programs and standards to meet our compliance obligations while balancing all our measures of success.
- Set risk-informed objectives that will lead us to continually improve our program areas.
- Maintain a robust radiation program to monitor and measure radiation doses while keeping doses ALARA.
- Promote a strong safety culture through a respectful and inclusive workplace, effective two-way communication, a questioning attitude and informed decision making.

- Manage waste, with a focus on tailings and waste rock and low-level radioactive waste.
- Regularly identify and assess potential impacts and required mitigations for climate-related physical risks.
- Contribute to the conservation of biodiversity, including no exploration or development of mines in World Heritage sites.
- Maintain financial guarantees to cover decommissioning liabilities and undertake progressive reclamation, as reasonably practicable.
- Continually improve water stewardship practices at our operations.
- 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 Sustainability 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.
- Provide a systematic approach when training employees, including when communicating this policy to employees and others performing tasks on behalf of Cameco.
- 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.

**Accountability**

The chief executive officer shall be responsible to ensure that this 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 periodically report on the status 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 this policy.

## 4.2 Operating Principles

General operating principles followed by McArthur River are to:

- Comply with the requirements of the NSCA and supporting regulations, with the Canada Labour Code (CLC) and regulations made under the CLC, and with laws of other jurisdictions as required by the CNSC, which are not inconsistent with the CNSC Act 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 which should allow adequate time to correct problems prior to reaching regulatory objectives.
- Design and manage working conditions at McArthur River 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 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 (Section 4). Radiation action levels are based on effective dose and are set at levels to indicate where a potential loss of control of the McArthur River *Radiation Protection Program* (MCA-RPP) may be occurring. These levels are defined in the McArthur River *Radiation Code of Practice* (RCOP) within the MCA-RPP, where measures to mitigate the potential for reaching action levels (i.e., administrative levels) are described.

### 4.3.2 Environmental Action Levels

The UMMR also require an environmental 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 McArthur River, the *Environmental Code of Practice* (ECOP) is designed to address liquid effluent, which is the most significant environmental aspect of the operation in terms of potential impacts to the environment. The ECOP is detailed in the McArthur River *Environmental Protection Program* (MCA-EPP).

# 5.0 FACILITY MANAGEMENT

McArthur River 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 site 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 Corporate *Quality Management Program* (CAM-QMP) 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

Cameco and McArthur River's management promote and support a strong safety culture through the continued development and enhancement of robust, integrated management systems, leveraged by passionate and committed leadership personnel that build and sustain trust through consistent behavior modeling and leadership presence that has a genuine impact in the workplace. Underpinning all of these formal mechanisms is senior management's commitment to excellence in the area of safety and quality 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 McArthur River and continues to look at opportunities for further improvement. Part of this process includes formally assessing the safety culture at McArthur River to measure its status and to gain insight into continued effective implementation of the planned changes and its ongoing development.

McArthur River leadership personnel are actively engaged in ongoing evaluation and searching for opportunities for continued improvement.

## 5.2 Governance

Cameco operates McArthur River and consequently, the corporate and site management structures are integrated as shown in 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 McArthur River. Corporate oversight and support are provided to the McArthur River operational management team in the following areas:

- Technical services.
  - Project management and implementation, mine engineering, geology, metallurgy and rock mechanics.
- SHEQ and regulatory relations.
  - Compliance and licensing (licence requirements and regulatory compliance).
  - SHEQ systems (leadership and guidance on SHEQ management through corporate-level programs).
  - Environmental assessment (assistance and guidance in preparing environmental assessment submissions).
  - Transportation and security.
- Human resources.
  - Administration.
  - Training.
- Risk management, through verification of
  - The site QMS.
  - Compliance to the corporate SHEQ systems.
  - Compliance to regulatory requirements.

### 5.2.2 Operational Organization and Management Roles

At the site level, the senior management team reports to the general manager, McArthur River and Key Lake operations. 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 McArthur River senior management team is responsible for implementing the requirements of the regulatory license and permits through the application of the supporting programs outlined in Section 6.0. The attached Appendix C provides brief descriptions of the Cameco management roles identified in the organizational chart also in Appendix C. These roles may be revised from time to time to further improve the organization and will be communicated to the regulators.

#### 5.2.2.1 Management of Contractors

Cameco has a contractor management program to guide site 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.
- Change control.

- Emergency preparedness.
- Non-conformance and corrective action.

#### 5.2.2.2 Exchange of Information

The exchange of information with regard to health, safety and environmental matters is developed by the participation of the employees in groups and committees. Reports generated by the committees are generally posted on bulletin boards to encourage employee review and comment.

Weekly meetings of the senior site departmental representatives are held to discuss pertinent operations and administration information, and related issues. Departmental heads discuss related health, safety, environmental and operational issues at informal meetings and safety meetings with their personnel on a regular 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, such as the Occupational Health and Safety Committee (OHC), as well as other teams, may make recommendations to the general manager on matters, on an as needed basis, that affect various areas of McArthur River. Management approval is required to implement recommended changes.

Members of the OHC include an appropriate cross-section of employees and managers to ensure that the workforce is adequately represented. As well, a number of the committee positions are rotated amongst employees so that, over time, employees have opportunities to participate in committee(s).

The employee co-chairperson of the OHC is designated as the “workers’ representative”, as referred to in the NSCA and associated regulations. The OHC is also a requirement of the provincial *Occupational Health and Safety Regulations* (OHSR). 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.

#### 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 McArthur River, 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; Cameco has adopted the SAT using the ADDIE model.

- *A*nalyze the activity to be done
- *D*esign training objectives
- *D*evelop the training
- *I*mplement the training
- *E*valuate 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

All personnel are responsible for the following, in addition to specific responsibilities outlined in the various program manuals. 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 (i.e., sickness), personnel have been trained with multiple skills in order to maintain the site activities. Work schedules of employees could be altered to ensure the security of McArthur River through a managed continuation of operations or an orderly and safe shut down.

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

## 6.0 OVERVIEW OF PROGRAMS

This section of the MCA-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 Mining Operations Program

The mining processes at McArthur River along with the supporting procedures in use to ensure mining is done safely are described in MCA-MOP. The program describes risk identification, reduction and mitigation measures. These are considered for each area of the mine, as it is recognized that each has its own unique challenges and risks, and that no single method can be used for risk mitigation. Instead, each area is assessed separately for risks related to water inflow, radiation and ground stability. These assessments include evaluations of area-specific risk, modeling of the area for ground support, interdepartmental co-ordination, and a third party review of the proposed ground support and development parameters. For example, some of the tools used to mitigate risk include ground freezing, extensive probe and grout covers, use of alternate mining methods, hydrostatic tunnel-lining techniques, steel sets in development areas, and hitches for bulkheads and water doors.

### 6.2 Ore Processing Program

Ore processing at is described in MCA-OPP. This program describes the specific steps, equipment, and procedures used to process uranium ore safely through the underground circuit and through the surface facility, where the ore is packaged for transport. Since McArthur River uranium ore is high-grade, this program also describes the specific controls that are in place to ensure that radiation protection of individuals and the protection of the environment are maintained.

### 6.3 Quality Management Program

McArthur River recognizes that quality management is essential to ensuring the operation of the facility is carried out safely, effectively, and efficiently. The system for managing quality at the operation is described in the MCA-QMP. Corporate requirements are described in detail in CAM-QMP. The MCA-QMP includes the health and safety and environmental management systems, and applies to all licensed activities at site. The MCA-QMP also describes the requirements necessary for each program to be consistent with internationally recognized management standards (including ISO 9001 and ISO 14001). This approach ensures that processes are systematically identified, controlled and monitored, and that those processes and the MCA-QMP are continually improved.

## 6.4 Environmental Protection Program

McArthur River recognizes environmental management and the protection of the environment as among the highest priorities. In support of this, McArthur River has implemented the MCA-EPP, which identifies the managed process in which the site activities are monitored for environmental impact and the processes undertaken to minimize potential impacts. The environmental protection program is based on the ISO 14001:2015 environmental management system standard and Cameco is currently registered to ISO14001:2015 by SAI Global.

Through a detailed environmental monitoring schedule encompassing the air, water, terrestrial, and aquatic environments, McArthur River is able to monitor for potential impacts and changes 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 (SMOE) every five years.

## 6.5 Waste Management Program

The managed process in which wastes generated at McArthur River are handled, disposed and tracked is identified in MCA-WMP.

The management and disposal of wastes are performed in compliance with applicable laws and regulations in such a manner, which reduces adverse impacts to the environmental and human health. While the storage and disposal of wastes does occur, McArthur River recognizes the value of the 4Rs system to reduce, reuse, recycle and recover materials to the extent practicable.

## 6.6 Radiation Protection Program

McArthur River is committed to keeping safety and health hazards, including radiation exposure ALARA. The process in which radiation exposure is managed is described in the MCA-RPP.

Core activities within the program include and are not limited to routine radiological measurements and monitoring, dosimetry, implementation of a RCOP (see Section 4.3), implementation of an ALARA protocol and reporting radiation exposure and dose results to nuclear energy workers at site and the regulatory agencies.

## 6.7 Safety and Health Management Program

In support of McArthur River's effort to foster and promote a strong safety culture among all employees and contractors, the operation has developed and implemented a *Safety and Health Management Program* (MCA-SHMP). The MCA-SHMP is made up of several components to support Cameco's SHEQ policy and its intent. The program is designed to meet legislated requirements, company standards and provide a healthy and safe rewarding workplace for all employees. The MCA-SHMP follows the 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.

Supervisory personnel and the safety department carry out routine safety inspections and monitoring activities. The safety department follows up on potential safety deficiencies and incidents and injuries are recorded for regulatory reporting and for internal measurement compared to established targets.

Apart from ensuring the safety of employees in terms of conventional and radiation safety, McArthur River is also concerned with issues of employee health and general wellness. Accordingly, McArthur River maintains a well-equipped health centre, which is staffed by professional registered nurses and/or paramedics. In emergency staffing situations, Cameco ensures that the requirements of the OHSR are met. Additionally, Cameco retains physicians to complete medical consultations, as required.

## 6.8 Emergency Preparedness and Response Program

McArthur River maintains a program to prepare for and respond to emergencies at the facility, which includes fires, explosions, environmental discharges, transportation incidents, and underground inflows. This program is described in the McArthur River *Emergency Preparedness and Response Program* (MCA-EPRP), and points to more detailed emergency response plans available on site. Core elements within this program that require planning and training include emergency response, first aid, fire protection, firefighting, and response to discharges.

## 6.9 Security Program and Safeguards

The McArthur River *Security Program* (MCA-SP) describes the measures taken to prevent unauthorized access to the McArthur River facility, theft of supplies or products, and alert Cameco of acts of sabotage or attempted sabotage pursuant to the NSCA and as part of Cameco's obligations arising from the IAEA safeguards agreements. A primary control is that road access to McArthur River is through the security gate at

Key Lake. All employees are responsible for reporting apparent or actual sabotage of the McArthur River facilities. Through a set of basic systems and/or procedures, unauthorized entry or unauthorized removal of materials can be detected. Systems are also in place to ensure that shipments of ore slurry and waste rock are being transported in a secure manner. Access control to McArthur River is also described in the MCA-SP. IAEA access to McArthur River is granted at all reasonable times to carry out activities pursuant to safeguards agreements.

## 6.10 Training and Development Program

McArthur River recognizes that skilled, knowledgeable and qualified employees, at all stages of our activities, are an integral component of an efficient, safe and environmentally responsible operation. To support this, McArthur River has implemented a SAT, as described in the McArthur River *Training and Development Program* (MCA-TDP). The MCA-TDP and its underlying documents identify the philosophy and the methodology of the training process and identify the mandatory training courses for site-based personnel and detail the record management system.

## 6.11 Maintenance Program

The fundamental responsibilities of maintenance management are to work together to achieve production goals while providing a safe workplace and minimizing any potential impact to the environment. The process whereby maintenance work requirements are efficiently planned, coordinated and scheduled at McArthur River is documented in the *Maintenance Program* (MCA-MP). Increased equipment availability is achieved through continual improvement of the maintenance program, including more efficient planning, predictive maintenance techniques, training and documentation.

## 6.12 Public Information Program

The purpose of the McArthur River *Public Information Program* (MCA-PIP) to inform persons living in the vicinity of McArthur River about the general nature of operations and the potential effects of the activities to the health and safety of persons and the environment that may result from the licensed activity. It is designed to keep the public informed regarding aspects of the operation. The MCA-PIP summarizes the measures Cameco undertakes to engage the people of northern Saskatchewan, to provide information, to elicit feedback and in turn, provide meaningful response in an effort to build trust and support from its stakeholders.

## 6.13 Transportation Program

McArthur River is committed to the safe, secure and timely transportation of materials to and from the McArthur River site, and on the McArthur River surface lease. A

description of the transportation process is contained in the McArthur River *Transportation Program* (MCA-TP), and encompasses the transportation of bulk goods, freight, ore slurry and various waste materials associated with McArthur River.

## 6.14 Fire Protection Program

McArthur River provides an organized, planned, coordinated and integrated approach to fire protection through a *Fire Protection Program* (MCA-FPP). There are several components of this program including fire hazard assessments for new or modified facilities, employee awareness of fire protection systems, maintenance testing and inspections, managing system impairments, fire safety plans, and emergency preparedness and pre-fire plans. These fire protection processes are intended to comply with the *National Fire Code* (NFC) of Canada, the *National Building Code* (NBC) of Canada and the requirements of the CNSC.

# 7.0 DECOMMISSIONING AND FINANCIAL GUARANTEE

Cameco recognizes environmental management and protection of the environment as being among the highest corporate priorities and, as a matter of policy, will ensure that the decommissioning and reclamation of its operating sites is in a planned and timely manner. Decommissioning entails the applications and approvals necessary for an operation to remove from service and close a facility to a condition, which does not require ongoing care and maintenance.

McArthur River will:

- Conduct progressive decommissioning and reclamation, where practicable.
- Maintain a *Preliminary Decommissioning Plan* (MCA-PDP), which provides a conceptual plan for the decommissioning of the entire site.
- Maintain a *Preliminary Decommissioning Cost Estimate* (MCA-PDCE), based on the decommissioning methodologies described within the MCA-PDP.
- Maintain a financial guarantee in the amount of the current MCA-PDCE.

Reclamation work is described each year in the McArthur River annual report. The conceptual plan for decommissioning is described in the MCA-PDP which forms the basis for the financial guarantee.

## 7.1 Decommissioning

The MCA-PDP and corresponding MCA-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 McArthur River 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 MCA-PDCE is prepared based on the methodologies described within the MCA-PDP and contains sufficient detail and justification of costs to arrive at a reasonable estimate of cost to decommission the McArthur River site. The plan and cost estimate are reviewed, at a minimum of, every five years, but may be revised earlier if deemed necessary by McArthur River and/or the regulatory agencies. As such, Cameco is committed to reviewing and making appropriate revisions to the MCA-PDP and MCA-PDCE for submission to meet all regulatory requirements.

## 7.2 Financial Guarantee

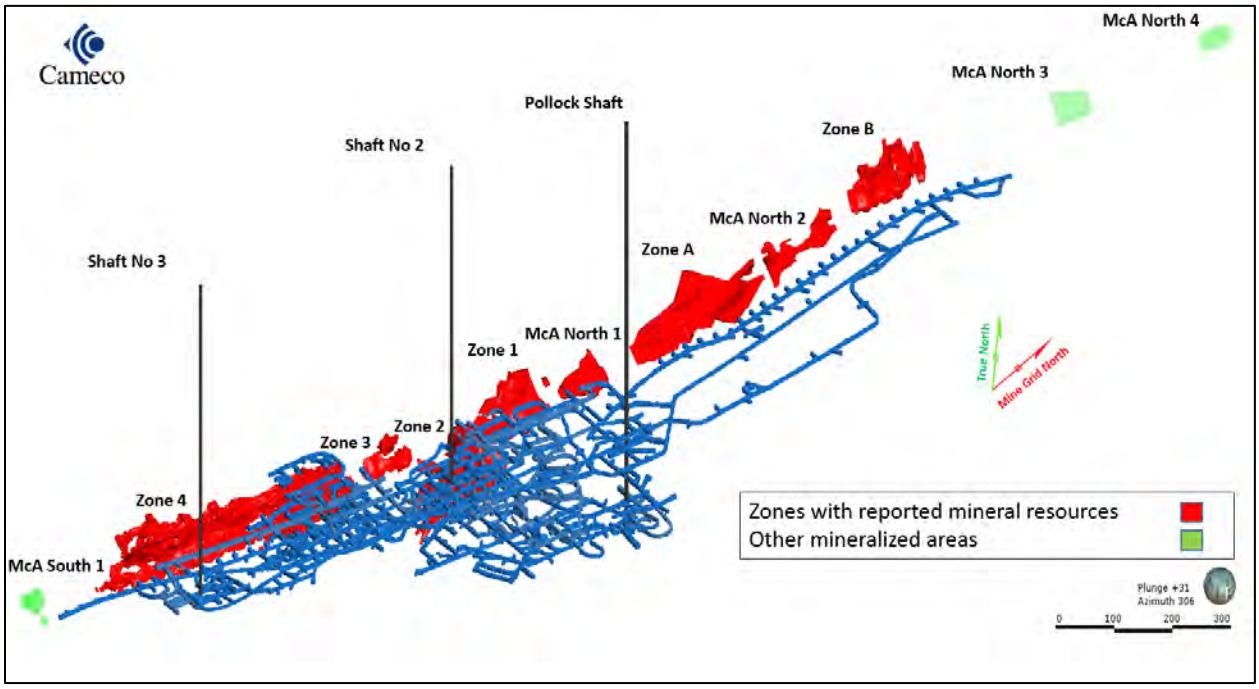
McArthur River is required to maintain a financial guarantee acceptable to the CNSC and the Government of Saskatchewan. The current financial guarantees in place for McArthur River total $42.1 million and received final approval from the CNSC and Government of Saskatchewan in 2019. The financial guarantee, in the amount of the MCA-PDCE, is valid until the end of 2023. Therefore, McArthur River submitted an updated MCA-PDP and MCA-PDCE in 2022 as part of the regular five-year review cycle. Cameco and its joint venture partners maintain the required financial guarantees made out to the Government of Saskatchewan. Upon final acceptance of the updated MCA-PDP and MCA-PDCE from the SMOE and CNSC and acceptance of the financial guarantee amount by the Commission, the revised financial guarantees will be updated and submitted.

**APPENDIX A**
**DRAWINGS**

***APPENDIX A***

| Title: Mining Facility Licensing Manual | | Doc. No. LIC-01 |
|---|---|---|
| Date Issued: June 2001 | Date Revised: February 2023 | Rev. No. 10 |


**Figure A-1: Site Layout**




Notes: Zone 4 includes Zone 4 South
As of December 31, 2018

**Figure A-2: Orthogonal view of underground development and mineralized zones.**

**APPENDIX B**
**LIST OF REVISIONS**

***APPENDIX B***

## Table B.1: List of Revisions

| Section | Description of Changes |
|---|---|
| **General Revision Themes Throughout the Document** | |
| | Revised to current Cameco document format and to align with the recently approved Cigar Lake Operation (Cigar Lake) Mining Facility Licensing Manual (CGR-MFLM).<br>Made wording more concise and general where possible. |
| **Cover Page & Header** | |
| | Revised to reflect current revision to document and current date. |
| **1.0 Introduction** | |
| All | No significant revisions to this section. |
| **2.0 Background** | |
| 2.2 | Summary of Site Licensed Activities Section revised to align with current licence and Licence Conditions Handbook (LCH). |
| 2.3.3 | Added Activities Completed Under UMOL-MINE-MCARTHUR.00/2023 Section to align with CGR-MFLM. |
| 2.4 | Future Outlook Section revised to align with potentially planned activities. |
| **3.0 Facility Components and Processes** | |
| All | No significant revisions to this section. |
| **4.0 Operating Policies and Principles** | |
| 4.1.1 | Vision, Mission and Values Statement Section revised to align with current Cameco vision statement. |
| 4.1.2 | Safety, Health, Environment and Quality (SHEQ) Policy Section revised to align with current Cameco SHEQ policy. |
| **5.0 Facility Management** | |
| 5.1 | Safety Culture Section revised to align with recently approved CGR-MFLM. |
| **6.0 Overview of Programs** | |
| All | Level of detail reduced. Applicable detail maintained in program documents. |
| **7.0 Decommissioning and Financial Assurance** | |
| All | Sections updated to reflect current approved PDP and PDCE. Level of detail revised to align with recently approved CGR-MFLM. |
| **Appendices** | |

| Title: Mining Facility Licensing Manual | | Doc. No.: LIC-01 |
|---|---|---|
| Date Issued: June 2001 | Date Revised: February 2023 | Rev. No. 10 |

| Section | Description of Changes |
|---|---|
| A | Updated figures to current. Moved mining figures to main body. |
| B | Updated to current list of revisions. |
| C | Updated to reflect current organizational chart. |

**APPENDIX C**
**INTEGRATED MANAGEMENT**
**ORGANIZATIONAL CHART DESCRIPTIONS**

***APPENDIX C***

# Appendix C: Integrated Management Organizational Chart Descriptions

## President and Chief Executive Officer (CEO)

Reporting to Cameco's Board of Directors, the president and chief executive officer is responsible for all executive management of Cameco.

## Senior Vice-President and Chief Corporate Officer

Reporting to the president and 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 president and CEO, the senior vice-president and chief operating officer is responsible for all executive management of Cameco's operating units.

## Senior Vice-President, Chief Legal Officer and Corporate Secretary

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

## Senior Vice-President and Chief Financial Officer

Reporting to the president and CEO, the senior vice-president and chief financial officer is responsible for executive management of Cameco's financial interests.

## Vice-President, Mining and Operational Excellence

Reporting to the senior vice-president and chief operating officer, the vice-president, mining and operational excellence is responsible for executive management of McArthur River within Cameco.

## Vice-President, Technical Services

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

## Vice-President, Safety, Health, Environment, & Quality

Reporting to the senior vice-president and chief corporate officer, the vice-president SHEQ is responsible for technical support to operations for all matters relating to licensing, environmental monitoring, health and safety, radiation safety, and quality assurance. This position is also the primary corporate contact for the CNSC.

## General Manager, McArthur River and Key Lake Operations

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