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Request for a Licensing Decision:

Regarding:
Beaverlodge Decommissioned Mining & Milling Facilities

Submitted by:
Cameco Corporation

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EXECUTIVE SUMMARY

The Beaverlodge uranium mines and mill were operated by Eldorado Mining and Refining Limited (later known as Eldorado Nuclear Inc.), a federal Crown corporation, from 1952 to 1982. The properties were decommissioned by 1985 following a regulatory-approved decommissioning plan. Since then, routine post-decommissioning monitoring, some targeted environmental investigations and maintenance has been completed to ensure the continued protection of the environment as well as the health and safety of people. In 1988, management of the properties became the responsibility of Cameco Corporation as the licensee. Canada Eldor Inc., a federal Crown corporation, is wholly responsible for financial liabilities associated with them.

The Beaverlodge properties are managed pursuant a waste facility operating licence (WFOL-W5-2120.0/2013) issued by the Canadian Nuclear Safety Commission (CNSC) to possess, manage and store nuclear substances. In the application to renew the licence, Cameco has requested a ten-year term to continue routine monitoring and maintenance activities of the properties and to complete some additional and follow-up monitoring to verify effectiveness.

Management of the Beaverlodge properties has met expectations in all areas over the current licence term. There were no safety or environmental incidents at the properties. The environmental recovery from the impact of historic operations in the area continues as expected. Environmental performance was improved by continuing to seal identified flowing boreholes, which has removed localized contaminant sources.

Cameco completed a two-year study of country foods in the Uranium City area during the licence period. Overall, the results of the study indicate that traditional harvesting of country foods does not present health risks to Uranium City residents, as long as the posted fish consumption advisories are followed. The *Uranium City Country Foods Study* reports for years one and two were shared with the community of Uranium City in 2012 and submitted to the CNSC for review.

The Beaverlodge Management Framework, developed in consultation with the joint regulatory group (JRG), outlines a systematic process to bring the properties to final closure and transfer to the Province of Saskatchewan under the institutional control (IC) program, which was established through the provincial *Reclaimed Industrial Sites Act*. This framework is intended to ensure risks have been adequately mitigated to facilitate transferring the licenced properties to the IC program.

Once conditions on a given property are considered to be stable and/or improving and protective of human health and the environment in the long-term, Cameco will apply for the transfer of the property to the IC program under which the responsibility for long-term monitoring and maintenance will be transferred to the province. Those monitoring and maintenance activities would be fully funded by Canada Eldor prior to the transfer of the land back to the province. An additional financial contribution would also be made by Canada Eldor into a general fund dedicated toward the remediation or management of unforeseen events.

Through the Beaverlodge Management Framework, Cameco has developed the Path Forward plan as presented herein through consultation and engagement with the JRG, the community and other stakeholders. This plan includes some additional remediation and maintenance to ensure residual risks to the environment and human health remain acceptable in the long-term.

Several activities were undertaken in order to develop the Path Forward plan. Cameco completed a series of studies and assessments to collect information on the current condition of the local environment. This data was then used to develop a Quantitative Site Model (QSM) for the area as a means to assist Cameco and stakeholders in understanding the relationship between the historic contaminant loads from the licensed properties under current conditions and the receiving environment. The QSM allows for the consideration of the potential benefit(s) which might result from remedial activities. A concept-level costing study was also undertaken to provide context to potential remedial measures.

The remedial measures considered were first identified through a two-day remedial options workshop conducted by Cameco in 2009 with community and regulatory stakeholders. The QSM was designed to be able to assess the expected benefits of those options identified in 2009 as well as combinations of them.

Using this information, a subsequent remedial options workshop, led by Cameco but facilitated by a third party, was held in April 2012. Forty-six people participated in the workshop, including representatives from JRG, consulting companies, industry, the Environmental Quality Committees and the community of Uranium City. Those representing Uranium City included the Métis Nation of Saskatchewan (Local #50), elected leadership, youth and a community Elder.

At the 2012 workshop, participants were asked to consider the benefits and estimated conceptual costs of the previously identified potential remedial options, along with some additional remedial options identified during the workshop. The general conclusions of this effort can be summarized as follows:

- none of the participant groups felt that doing nothing was an acceptable option because there were several minor activities with both measureable benefits and reasonable cost available
- participants did identify some options of which both the benefits and feasibility were uncertain, and
- large-scale remedial options were generally deemed to be too expensive for their projected benefits.

Informed by the 2012 workshop process and supported by Canada Eldor, the Path Forward plan forms the basis for the activities to be carried out under a renewed licence. The remedial activities within this Path Forward plan include measures considered to be good engineering practice and may improve conditions in the aquatic environment, while other measures will ensure the continued of protection of the health and safety of people and the environment. Specifically, Cameco proposes to proceed with the following activities under the renewed licence:

- re-establish the natural seasonal flow path for Zora Creek, which currently travels through a portion of the Bolger waste rock pile before flowing into Verna Lake. This will reduce potential downstream loading when there is flow
- continue to monitor the boreholes sealed over the current licence period at Dubyna and Lower Ace Creek to verify their long-term integrity
- ensure all identified boreholes are sealed to prevent the potential for future contaminated minewater reporting to surface
- replace the caps on all vertical mine openings on the Beaverlodge properties to assure continued long-term safety
- perform a confirmatory gamma-radiation survey at all waste rock and tailings areas, and
- Survey and cover, where applicable, any readily accessible areas with elevated gamma fields to meet the principle of ALARA (as low as reasonably achievable, social and economic factors considered).

Using the QSM, Cameco has developed a set of site-specific performance objectives for water quality in order to assess the success of implementing these remedial activities over the short-term (5 to 7 years). These site-specific performance objectives have been developed in consultation with the regulatory agencies and reviewed with stakeholders. Once the site-specific performance objectives have been achieved, Cameco will propose the properties be exempt from the Canadian Nuclear Safety Commission (CNSC) licensing regime and transferred to the provincial IC program in accordance with the Beaverlodge Management Framework.

The QSM has also been used to predict long-term recovery of water quality on the properties and areas downstream. The long-term water quality objectives can be used as a comparison tool for water quality information gathered after the properties have been transferred to the IC program. The IC program will ensure that long-term monitoring of the properties continues and that water quality results are being compared to long-term recovery predictions.

During the proposed licence term, sampling in accordance with the approved water sampling program will continue throughout the Beaverlodge study area. In addition, Cameco is working with Saskatchewan Research Council, which is responsible for the decommissioning of Gunnar, Lorado and other legacy sites in the Uranium City area, to develop a regional aquatic monitoring program to assess the long-term recovery of the Uranium City mining district waterbodies which are impacted by past uranium mining practices and report to Lake Athabasca.

Cameco's performance in managing the Beaverlodge licensed properties throughout the licence period has demonstrated that the company is fully capable and qualified to continue carrying out planned activities. Cameco believes that the planned course of action will provide assurance to the CNSC, the Government of Saskatchewan, and public stakeholders that adequate provision has been made to maintain the safety and security of the Beaverlodge properties and that the health and safety of people and the environment will remain protected in the near and long-term.

1.0 INTRODUCTION

1.1 Background

The licensed Beaverlodge facilities consist primarily of several decommissioned uranium mines, a decommissioned uranium mill and a tailings management area near Beaverlodge Lake, which is located north of Lake Athabasca in northern Saskatchewan (Figure 1.1-1). Sixty-two individual decommissioned properties ranging in size from one to 30 hectares are included under this licence (Figure 1.1-2). Uranium City is situated eight kilometres west of the former main mine and mill area and is the only community with road access to the site.

Beaverlodge was operated by Eldorado Mining and Refining Ltd., later known as Eldorado Nuclear Limited (Eldorado), from 1952 to 1982. The primary mining and mill facilities, which included extensive underground workings, were located to the north of Beaverlodge Lake. Uranium ore was also recovered from a number of nearby satellite mines, which included both underground and open-pit operations. During the mill's operating period, mill tailings were placed underground or in waterbodies located within the tailings management area.

During the operational period, Beaverlodge was managed using the accepted practices of the day; however, these practices did not involve the same degree of rigour related to the protection of the environment required for similar activities today. The legacy impacts affecting the area are not only the result of the Beaverlodge mine and mill, but also of other historical mining/milling operators in the vicinity.

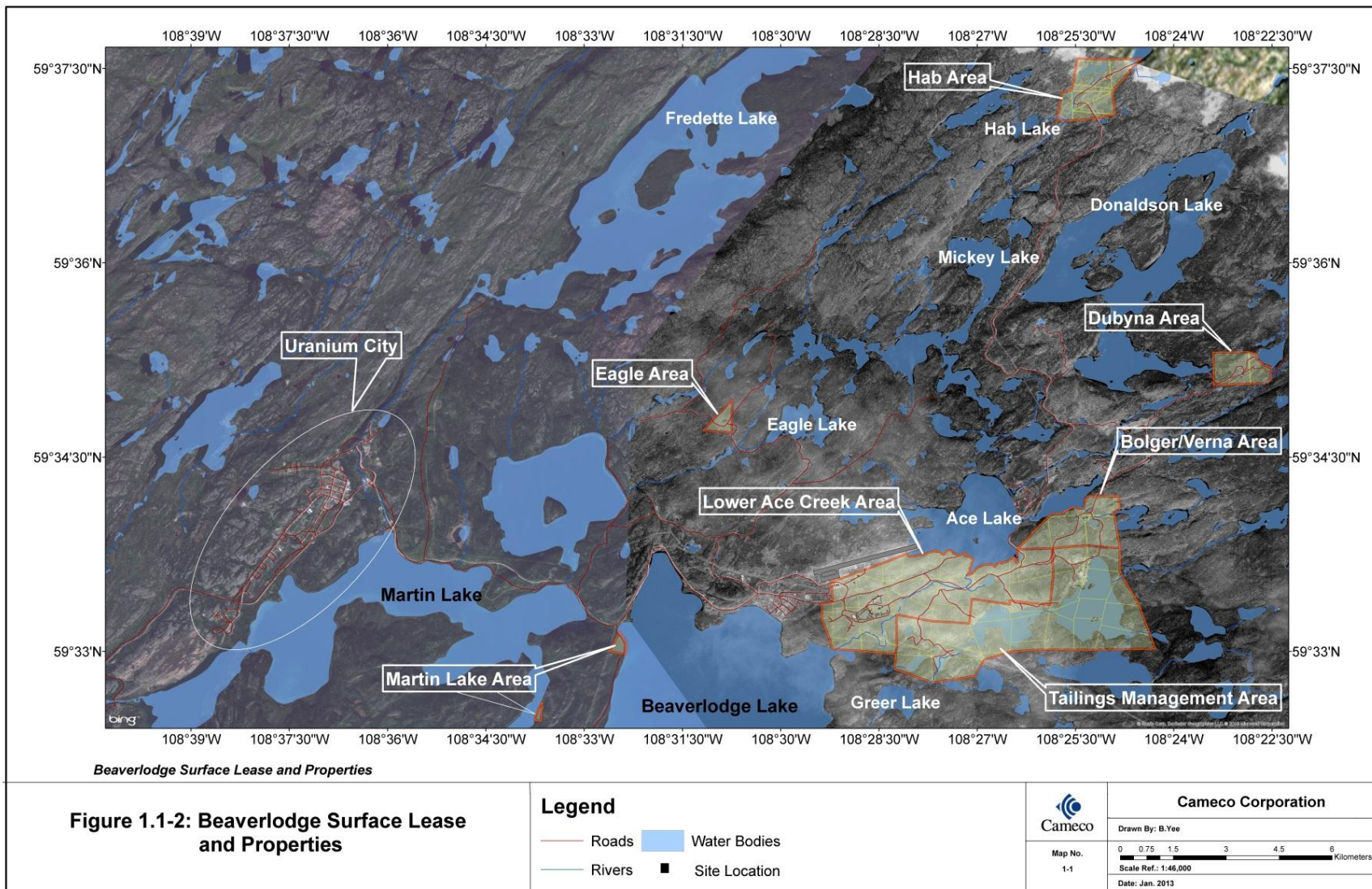
A decommissioning plan was approved by federal and provincial regulators in 1982, and decommissioning activities were completed in 1985. To meet the decommissioning objective of leaving the properties in a physically stable and safe condition, buildings and structures were removed or dismantled and all mine openings were permanently sealed. Since that time, environmental monitoring has been performed to ensure the area remains safe and that environmental conditions improve over the long-term, which was the expectation at decommissioning.

Cameco has been the licensee for the decommissioned Beaverlodge properties since 1988 when the company was created from the merger of the Saskatchewan Mining Development Corporation and Eldorado. Following the merger, Cameco became responsible for managing the decommissioned Beaverlodge facilities, while the Government of Canada, through Canada Eldor Inc., retained all liability associated with the Beaverlodge facilities, including responsibility for funding the ongoing management activities.

Figure 1.1-1: The Beaverlodge properties are located near Uranium City in northern Saskatchewan



Figure 1.1-2: The Beaverlodge Surface Lease and Properties



1.2 Summary of Application

In November 2009, the Commission granted Cameco a three-year licence (WFOL-W5-2120.0/2012) to possess, manage and store nuclear substances for the Beaverlodge decommissioned mining and milling facilities. In addition, the Commission requested annual updates to be provided in the fourth quarter of each year during the licence period.

Annual updates were provided to the Commission by Cameco and the Canadian Nuclear Safety Commission (CNSC) staff in November 2010 and December 2011.

On May 23, 2012, Cameco applied to the CNSC for the renewal of the waste facility operating licence (WFOL-W5-2120.0/2012). Subsequently, on July 17, 2012, Cameco requested an extension to the operating licence for six months to facilitate additional consultation with respect to the proposed Path Forward plan for Beaverlodge and the performance objectives for selected remedial options. On September 25, 2012, a new licence was granted (WFOL-W5-2120.0/2013) for the period of December 1, 2012 to May 31, 2013.

Cameco is requesting a ten-year licence in order to implement the additional remedial options identified during the current licence period and complete the necessary follow-up monitoring to verify effectiveness of these options.

This CMD is Cameco's written submission for the CNSC licensing hearing. Information provided in support of this CMD covers the licence review period between December 1, 2009 to January 1, 2013, unless otherwise specified. The format of the CMD follows the guidance provided by the CNSC and is structured to address the safety and control areas defined by the CNSC.

2.0 Business Plan

In accordance with the licence and the corresponding Beaverlodge Management Framework, Cameco continues to prepare the properties for custodial transfer to the Government of Saskatchewan under the provincial *Reclaimed Industrial Sites Act*. This legislation created an IC framework under which long-term monitoring would continue at a level appropriate to the risk posed by the reclaimed land and, if required, impose restrictions with respect to future land use as deemed appropriate by the provincial government. The first Beaverlodge properties released into the institutional control (IC) program occurred in 2009 as part of the previous licence application.

Following the February 2009 licensing hearing, the Commission requested a detailed plan of activities to be undertaken during the three-year licence period. Cameco developed the Beaverlodge Management Framework with the goal to protect the health and safety of the public and environment and to meet the requirements for transfer of the properties to the provincial IC program. The Management Framework is designed to ensure that the Beaverlodge properties are systematically assessed and to ensure that all reasonable measures are taken to maintain the long-term security and stability of the properties and

the areas immediately downstream of the licenced properties, including Greer Lake, as well as Ace and Fulton bays of Beaverlodge Lake. In addition, the Management Framework is intended to demonstrate that due consideration was taken in the application for release from licencing and transfer to the IC program.

The Management Framework contains a mission statement describing the objective for managing the Beaverlodge properties, a management philosophy identifying the spatial extent to which the Management Framework applies, and a set of management principles are to be followed. The Management Framework also includes a decision-making process and provides the steps necessary to ensure identified risks on each property are systematically assessed and addressed to facilitate the transfer to the IC program.

The Beaverlodge Action Plan was completed during the current licence period and was developed through the Beaverlodge Management Framework to address the CNSC's request for a detailed plan of activities to be undertaken during the three-year licence period. The plan set out a list of studies for gathering information required to adequately assess residual risk on the properties.

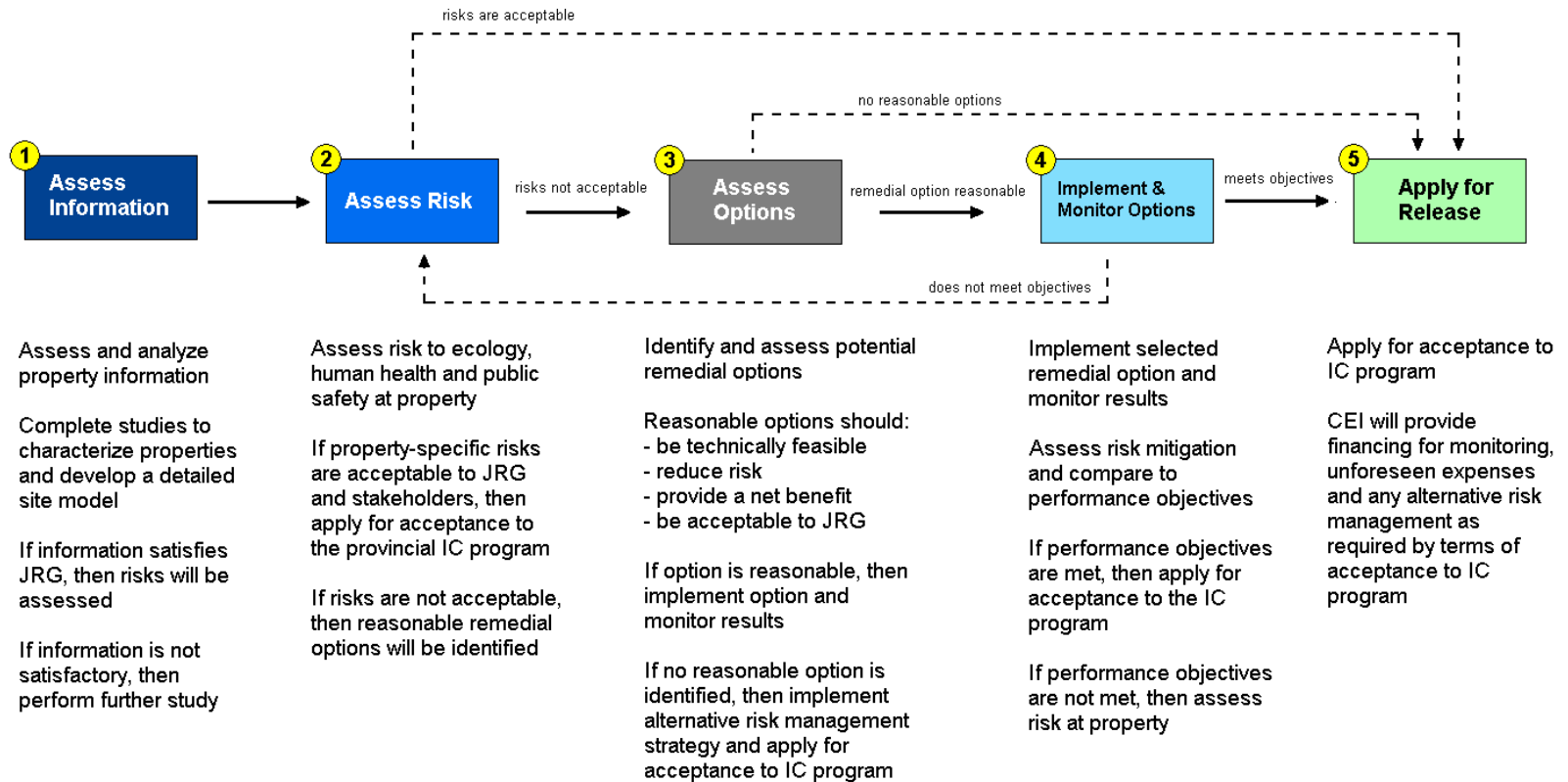
The Beaverlodge Management Framework was and the Beaverlodge Action Plan were developed in consultation with the joint regulatory group (JRG), which consists of representatives from the CNSC, the Saskatchewan Ministry of the Environment (SMOE), Environment Canada and Fisheries and Oceans Canada, reviewed with stakeholders, and presented to the CNSC at the November 5, 2009 public hearing.

The Management Framework process involves five general stages for each property:

1. Establish a comprehensive foundation of information upon which specific risks can be assessed.
2. Assess the risk posed by the properties.
3. If necessary, develop and assess reasonable remedial options that could mitigate risk on or immediately downstream the properties.
4. Implement selected remedial option(s) and monitor results.
5. If implemented options are successful in achieving the expected benefit or if it is determined that nothing more could reasonably be done to mitigate the risk(s) beyond natural recovery, then an application will be made to transfer the property to the IC program.

A simplified process flowchart illustrating the stages of the Management Framework is provided in [Figure 2.0-1](#).

Figure 2.0-1: The Beaverlodge Management Framework outlines a process to transfer licensed properties to the provincial institutional control program



Decision points exist between each stage of the process where Cameco and the JRG will determine if a particular property is ready to be advanced to the next stage. Community members are continually informed of progress made throughout the plan and have had the opportunity to provide feedback at key intervals.

The properties are currently moving beyond the third stage of the Management Framework process, which included the evaluation of several potential remedial activities based on an assessment of:

- expected benefits to the local and downstream environment
- estimated capital and operating costs
- the duration of the long-term maintenance or operational requirements
- the level of uncertainty regarding the predicted benefits, costs, or technical feasibility
- regulatory requirements, and
- stakeholder feedback.

The results of this effort were incorporated into the *Beaverlodge Path Forward Report*, which was submitted to the CNSC in December 2012. The process to develop the Path Forward will be discussed within the sections that follow.

The relationship between the Beaverlodge Management Framework, the Beaverlodge Action Plan, the Quantitative Site Model (QSM) and the Path Forward is illustrated in [Table 2.0-1](#).

Table 2.0-1: Status of the Beaverlodge Management Framework

Beaverlodge Management Framework					
Stage	1	2	3	4	5
Goal	Assess Information	Assess Risk	Assess Options	Implement & Monitor Options	Apply for release to IC program
Process and Documentation	Beaverlodge Action Plan	Quantitative Site Model		Path Forward	
Status	Complete	Complete		Moving to implementation	

3.0 Safety and Control Areas

3.1 Management System

Consistent with our vision, values and measures of success, Cameco recognizes safety and health of our workers and the public and protection of the environment as our highest corporate priorities. This applies to all of our activities, including the management of the decommissioned Beaverlodge properties. Cameco strives to be leading a performer through a strong safety culture and commitment to the following principles:

- preventing injury, ill health, and pollution
- complying with and moving beyond legal and other requirements
- keeping risks at levels as low as reasonably achievable
- ensuring quality of processes, products and services, and
- continually improving our overall performance.

The current licence provides for the possession, storage and management of the decommissioned uranium mines, mill tailings and residual waste rock at the properties.

As the properties remain in transition to the provincial IC program, Cameco will continue environmental monitoring to verify the effectiveness of decommissioning and remediation activities and to ensure the ongoing protection of people and the environment.

As there are no operating facilities remaining on the site, and no Cameco personnel located at the site on a full-time basis, monitoring activities are carried out through contractors and consultants. Cameco's management system, through procurement processes, ensures that only qualified contractors or consultants that meet Cameco's Safety, Health, Environment and Quality (SHEQ) Policy expectations are retained to carry out any activities on the site.

Cameco carries out regular site inspections and in doing so ensures oversight of the consultant's activities. The inspections can verify if any maintenance or additional studies deemed necessary in the context of the Beaverlodge Management Framework are being effectively managed.

Cameco's SHEQ department, specifically the compliance and licencing group, manages activities under the Beaverlodge waste facility operating licence. Financial responsibility for the management of Beaverlodge and responsibility for all liabilities associated with the Beaverlodge properties rests with Canada Eldor.

Cameco, as the CNSC licensee, is responsible to meet the requirements of the CNSC licence and other regulatory requirements. Canada Eldor, a wholly owned subsidiary of

Canada Development Investment Corporation (CDIC), is financially responsible for any and all efforts required by Cameco in regards to the management of the Beaverlodge properties. As such, Cameco management has a reporting obligation to Canada Eldor.

3.1.1 Path Forward Development

The Beaverlodge Management Framework ensures that activities associated with the Path Forward plan are consistent with fulfilling the goal to transfer responsibility of the properties to the provincial IC program.

The Path Forward plan was developed under the guidance of the Management Framework and through extensive consultations with public stakeholders (see [Section 4.4](#)), Canada Eldor and the regulatory agencies.

Information necessary to develop the Path Forward was compiled by moving the properties through the first three stages of the Management Framework, which included a comprehensive assessment of risk to people and environmental receptors in the area ([Section 3.4](#)). As part of this effort, a QSM was developed to provide the means to assess site-specific risk as well as to measure the potential benefit of various remedial options, which were proposed as a result of a two-day workshop in 2009. Following this, a conceptual-level cost assessment was completed for the remedial activities identified.

The QSM was developed to assess a number of potential remedial options or any combination of options, based on the outcomes of the 2009 Remedial Options Workshop. The model allowed for an evaluation of measures such as:

- covering sediments in affected lakes with clay, sand or other cover material
- dredging lake sediments in affected lakes for disposal in a secure location
- removing waste rock from the shoreline of lake or stream sections
- applying a cover on waste rock
- sealing boreholes
- isolating or covering exposed tailings spill areas
- treating contaminated water, and
- diverting clean flow around a contaminant source.

Other options considered included the backfilling of lakes to eliminate them as a risk to receptors, flooding Minewater Reservoirs to provide a cover to an exposed gamma source and introducing algal blooms to increase sedimentation rates in lakes.

Potential remedial options were then assessed during the 2012 Remedial Options Workshop in accordance with the Beaverlodge Management Framework. The criteria used to perform the assessment were described in [Section 2.0](#) of this document.

3.1.2 Path Forward Summary

Based on information assessed through the Management Framework, there are no practical measures that could be implemented to meaningfully reduce the overall recovery time of waterbodies downstream of the Beaverlodge properties, specifically Beaverlodge and Martin lakes.

The Path Forward plan provides clear direction regarding additional remedial activities on the Beaverlodge properties to facilitate their transfer into the IC program. The identified remedial activities include measures considered to be good engineering practice and may improve localized conditions in the aquatic environment, while other measures will ensure ongoing safety for people and the environment.

The remedial activities identified in the Path Forward plan are summarized as follows:

- re-establishment of the natural seasonal flow path for Zora Creek, which currently travels through a portion of the Bolger waste rock pile before entering Verna Lake. This will reduce potential downstream loading
- continue to monitor the boreholes sealed over the current licence period at Dubyna and Lower Ace Creek to verify their long-term integrity
- ensure all identified boreholes are sealed to prevent the potential for future contaminated minewater reporting to surface
- replacing the caps on all vertical mine openings on the Beaverlodge properties to assure continued long-term safety
- performing a confirmatory gamma-radiation survey at all waste rock and tailings areas, and
- surveying and covering, where applicable, any readily accessible areas with elevated gamma fields to meet the principle of ALARA.

A number of the peripheral licensed sites will require little or no further remediation and we expect to apply for their release to the IC program within five years.

Cameco anticipates those areas requiring additional remediation may be transferred to the IC program following implementation of the proposed remedial actions followed by a brief period of monitoring (i.e., within 10 years) to confirm that performance objectives have been met.

3.2 Human Performance Management

There are no Cameco employees based at Beaverlodge. All activities at the properties, including monitoring and maintenance, are conducted by qualified contractors or consultants.

Multidisciplinary experts at Cameco and external consultants ensure the activities on the properties are managed in accordance with the Management Framework, the applicable legislation, and Cameco's integrated corporate SHEQ policy.

Cameco has developed and implemented a *Contractor Management Program* (CMP) to apply quality principles to management and oversight of contractors at all sites. The CMP ensures that such contractors, including those at Beaverlodge, work in accordance with, or at an equivalent to, the standards set out in Cameco's SHEQ policy and the integrated SHEQ management system requirements. The program sets out comprehensive requirements for the management of contractors, including participation in job-hazard analyses and other safety programs, and it ensures clarity on the contractor's scope of work and specific accountabilities while on site.

Cameco remains fully capable and qualified to carry out licensed activities with respect to this safety and control area (SCA).

3.3 Operating Performance

Activities at the Beaverlodge site are limited to ongoing monitoring and maintenance. Cameco's management of Beaverlodge is overseen by the JRG.

The results of monitoring programs for water quality, air quality and gamma radiation have been compiled to assess the performance of the site since the completion of decommissioning in 1985. The air quality program for dust fall and high-volume sampling was completed in 1987-88 after confirming that monitoring results were below operational levels. The original gamma radiation surveys were completed in 1985-86 and are now only conducted in support of special projects, such as with applications to release specific properties. Monitoring programs for water quality and radon continue on a scheduled basis as described in the *Beaverlodge Environmental Monitoring Program* (EMP) document.

Monitoring results are reviewed by Cameco and anomalous results are investigated. Quality assurance samples are collected as part of the Beaverlodge EMP to ensure quality sampling techniques and repeatability of sample results from the contract laboratory.

In September 2012, Cameco submitted the *Beaverlodge Project Annual Report*, which reviewed performance at the sites from January 1, 2011 to June 30, 2012, and provides an outlook for proposed activities to January 1, 2013. The report confirms performance is consistent with previous years and recovery continues as expected.

The JRG completed its most recent annual inspection of the Beaverlodge properties in June 2012. No action notices or directives were issued, and there are no outstanding items from previous inspections.

The Beaverlodge Action Plan set out a schedule of activities to be completed during the current licence period in accordance with the Beaverlodge Management Framework. Cameco completed the plan as committed to, which included in excess of 20 special studies and investigations that ultimately led to the development of the QSM and in turn, the *Beaverlodge Path Forward Report*, which sets out the recommendations for advancing the properties to the IC program.

Cameco's operating performance in managing the Beaverlodge licensed properties throughout the licence period has demonstrated that the company is fully capable and qualified to continue carrying out planned activities.

3.4 Safety Analysis

Risk assessment and control measures of the Beaverlodge Management Framework are arrived at systematically by identifying chemical, physical and biological hazards, assessing their risks and implementing the control measures. This process is implemented through the use of operating history, the review of historical records, ongoing observations, special studies and inspection of the work environment.

As a result of historical contamination in Beaverlodge Lake and downstream, the Population Health Unit representing the Uranium City area and SMOE have issued a fish consumption advisory recommending people limit their consumption of fish from Beaverlodge and Martin lakes. In addition, this notice reminds people to not consume water from various waterbodies associated with the Beaverlodge properties, Beaverlodge and Martin lakes, as they may contain elements not eliminated by boiling.

3.4.1 Country Foods Study

From 2010 to 2012, third-party environmental experts conducted the Country Foods Study in the Uranium City area to address stakeholder questions related to traditional harvesting of local country foods and to provide data for the risk assessment stage of the Management Framework. The study found that all Uranium City residents interviewed obtain a portion of their diet from country foods and that country foods make up a significant portion of the diet of some residents. Residents consume plenty of fish, which is mostly harvested from Lake Athabasca, and important hunting and gathering locations mainly consist of easily accessible areas, such as roadways, the Uranium City town site, power line right-of-ways and lakes.

The overall results of the study indicate that traditional harvesting of country foods does not present health risks to Uranium City residents as long as the posted fish consumption advisories are followed. Engagement activities with residents of Uranium City indicate that people are aware of the fish consumption advisories for Beaverlodge and Martin lakes and do not consume fish from these waters for sustenance. The *Uranium City*

Country Foods Study reports for years one and two were shared with the community of Uranium City in 2012 and submitted to the CNSC for review.

3.4.2 Quantitative Site Model Development

The information assessment stage of the Beaverlodge Management Framework (Figure 2.0-1), featured more than 20 studies completed over the current licence period. Together these are referred to as the Beaverlodge Action Plan. These assessments addressed data gaps in the characterization of the properties.

This information was required to support development of the Beaverlodge QSM, which was developed to be able to assess the risks to the aquatic environment from the condition of the respective properties, predict the recovery of the properties and the area as a whole and evaluate the potential benefit of additional risk mitigation (remedial options) to the predicted recovery.

In summary, the QSM was designed as a means to support risk-based decisions regarding the benefit of additional remediation of historical contaminant sources at the properties and predict environmental recovery of waterbodies in the Beaverlodge area so that performance objectives can be established going forward. In the context of the Beaverlodge Management Framework, the QSM represents stages 2 and 3 - assessment of risk and options. Specifically, the QSM is intended to:

- enhance the understanding of contaminant sources, transport mechanisms and environmental interactions in watersheds in the Beaverlodge area
- assist in screening conceptual remedial strategies, and
- facilitate establishing environmental performance objectives in the context of present and future environmental risks.

3.4.3 Assessment of Risk and Remedial Options

Over the licence term, Cameco completed a screening-level risk assessment of all the Beaverlodge properties. The goal of this assessment was to characterize, at a preliminary level, the current nature of the risks associated with the decommissioned properties.

The results of the 2010 risk assessment considered the outcome of the 2009 Remedial Options Workshop, including the priorities of stakeholders. It formed the basis for identifying which properties required the investigation of mitigation options. Therefore, it provided the direction for the identification of potential remedial options which would be considered in the context of the QSM.

The risk assessment was revised based on the additional information gathered during the current licence period and the development of the QSM. The results of the updated risk assessment are included in the *Beaverlodge Path Forward Report*.

QSM Predictions

In examining the various remedial options, the QSM made predictions regarding the expected benefits of implementing various remedial options to the local and downstream waterbodies. The QSM results were then compared to the baseline option (showing natural attenuation) in order to assess the potential environmental benefits and other effects of implementing each option alone or in combination with other options.

None of the remedial options considered were predicted by the QSM to have a significant benefit to the environment over the next 150 years. In particular, for model purposes, if it was assumed that water quality from the licensed properties currently met Saskatchewan Surface Water Quality Objectives (SSWQO), the recovery of uranium and selenium in downstream waterbodies (e.g. Beaverlodge Lake) would not occur at a measurably faster rate. Radium-226 concentrations in Beaverlodge Lake and downstream currently meet SSWQO.

The model did predict a small, localized improvement to water quality at two stations as a result of remedial action which was commensurate to the cost of implementation: uranium and radium-226 concentrations measured at the outlet of Verna Lake, and uranium concentrations measured at the outlet of Dubyna Lake.

Performance Objectives

Using the QSM, a set of site-specific performance objectives were derived to assess the performance of the properties in the long-term, including objectives for those areas where additional remedial measures are implemented. [Addendum A](#) features the risk-informed performance objectives for all sampling locations at the Beaverlodge properties as well as the outlet of Greer Lake and in Beaverlodge Lake.

The performance objectives account for the variability of the model predictions and depict the upper-bound performance of the key parameters examined. In establishing the values, if the upper bound on a prediction was above the applicable surface water-quality guideline, then the upper-bound value was selected as the performance objective; if it was below the criterion, then the applicable surface water-quality guideline was taken as the performance objective.

If these performance objectives are being met, then Cameco would be of the view that the properties are meeting the condition of stable and/or improving and, in accordance with the last phase of the Beaverlodge Management Framework, application for their transfer to the IC program would be made. If water-quality trends fall outside the performance objectives, then additional assessment of residual risk may be required in accordance with the Beaverlodge Management Framework.

3.4.4 Path Forward Plan

The Path Forward plan represents the fourth and fifth stages of the Beaverlodge Management Framework. It is based on the preceding work which culminates with information derived from the QSM.

Generally, the QSM concluded that while there may be a few small-scale activities which show some localized improvement in water quality, there remains no reasonable means to significantly accelerate the recovery of the Beaverlodge licenced properties and the downstream waterbodies, including Beaverlodge Lake. With the implementation of relatively minor improvements to some of the Beaverlodge properties, Cameco is of the view that the risks are manageable.

Over the licence period, the test of “stable and/or improving” will continue to be demonstrated and the course towards continued long-term monitoring and maintenance under the provincial IC program remains sound.

The remedial activities identified through the Management Framework process are detailed in the sections below.

Through the Beaverlodge Management Framework, Cameco effectively and systematically assessed the residual risk at the Beaverlodge properties during the current licence term. This effort helped to ensure the health and safety of people and protection of the environment, and demonstrated that Cameco remains fully capable and qualified to carry out licensed activities.

3.5 Physical Design

The overall approach to decommissioning activities in 1982-85 minimized or eliminated the need for man-made structures in closing out the site as close as possible to its natural state. This philosophy was based on the premise that natural systems are inherently more stable in the long term than man-made systems.

All buildings associated with the Beaverlodge mines and mill were decommissioned by 1985. Remnant aspects related to mining activities at the site consists of concrete caps on vertical mine openings, numerous boreholes, a few small mining pits, waste rock piles and the tailings management area which is made up of a series of small interconnected waterbodies. Engineered covers for surface-placed portions of the tailings were developed and implemented.

3.5.1 Path Forward Plan

Through the Management Framework, Cameco has identified one activity to be carried out that meets the practice of good engineering with respect to physical design and provides a localized albeit minor environmental benefit in the Beaverlodge area.

As outlined in the *Beaverlodge Path Forward Report*, Cameco plans to re-establish the ephemeral flow path from Zora Creek into Verna Lake by excavating a channel through the Bolger waste rock pile. The Bolger waste rock pile currently impedes that flow path, which is traveling through the base of the pile and contributing a contaminant load to Verna Lake (Figure 3.5.1-1). Although there is only a localized environmental benefit predicted, this remediation is proposed as it represents good engineering practice.

Currently, uranium and radium-226 exceed the SSWQO at the outflow from Verna Lake. The site-specific benefit of implementing this option, based on the QSM predictions, is provided in Figures 3.5.1-2 and 3.5.1-3.

Figure 3.5.1-1: The Bolger waste rock pile sits on Zora Creek, the water flow path between Zora Lake and Verna Lake

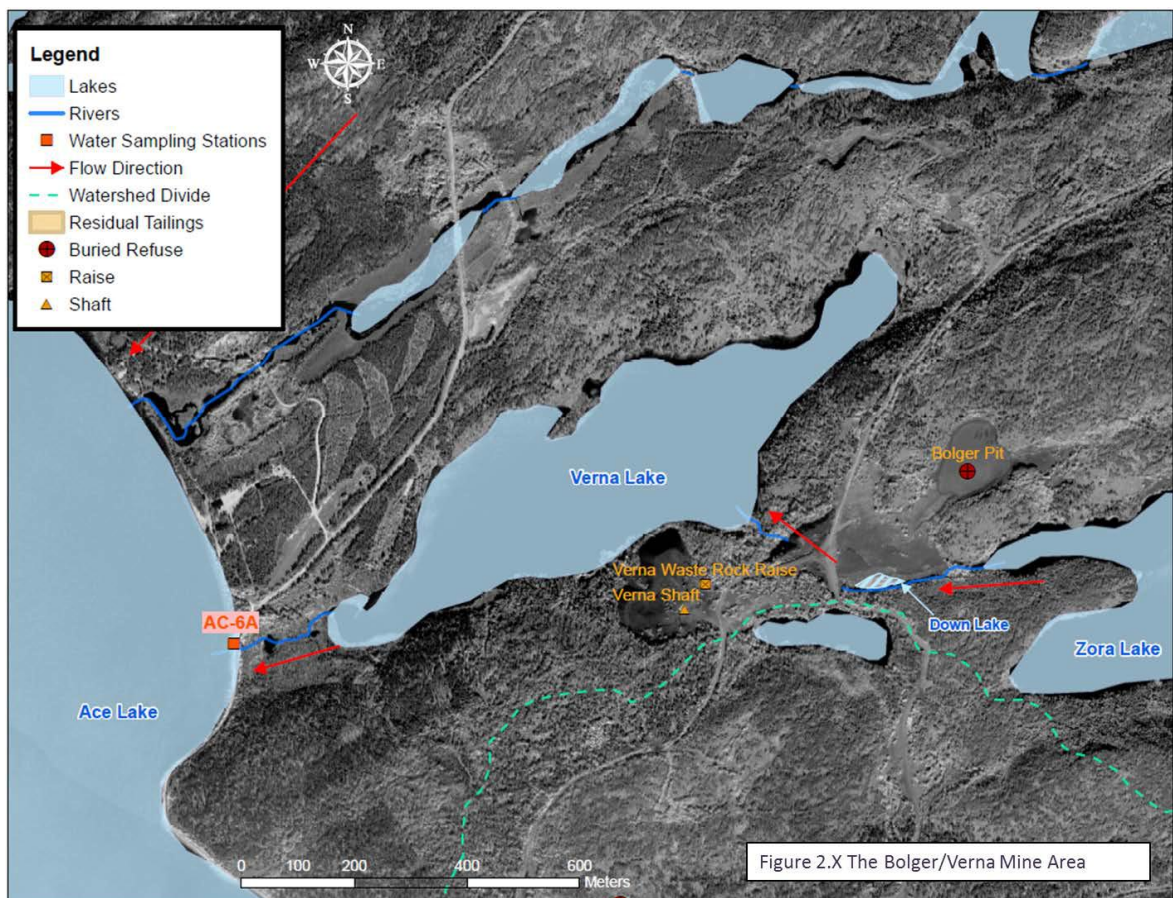


Figure 3.5.1-2: Predicted uranium concentration at the outflow of Verna Lake as a result of re-establishing the natural flow path of Zora Creek

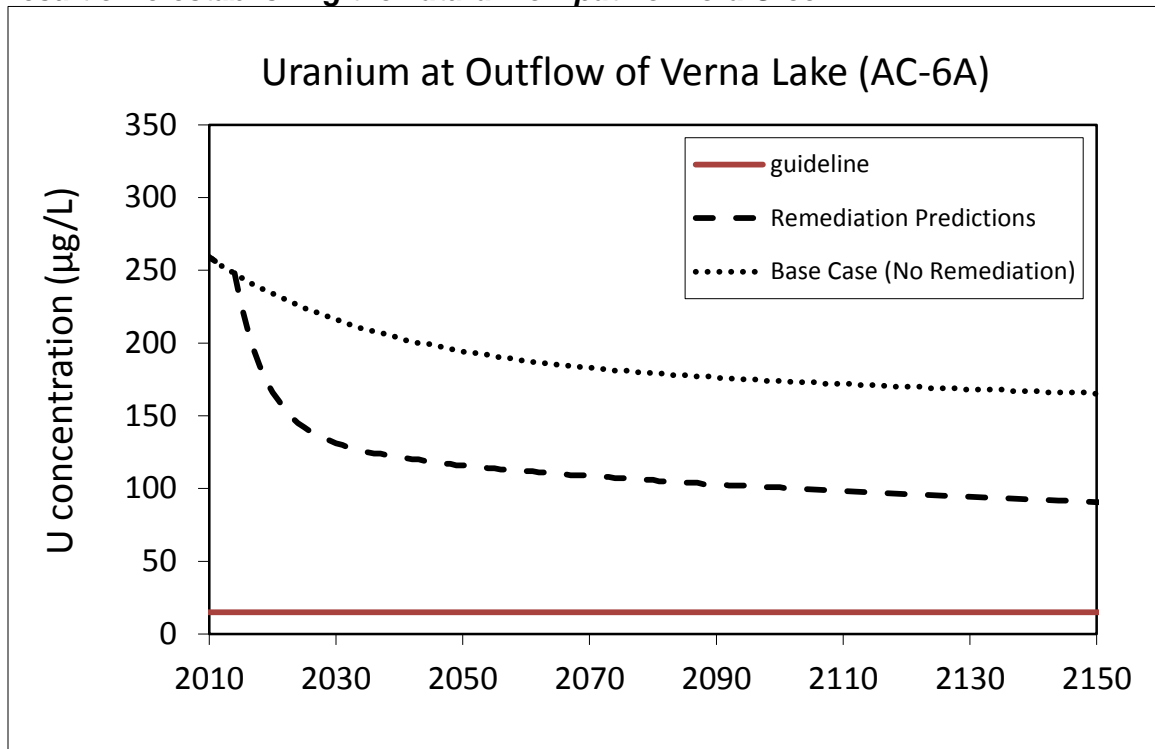
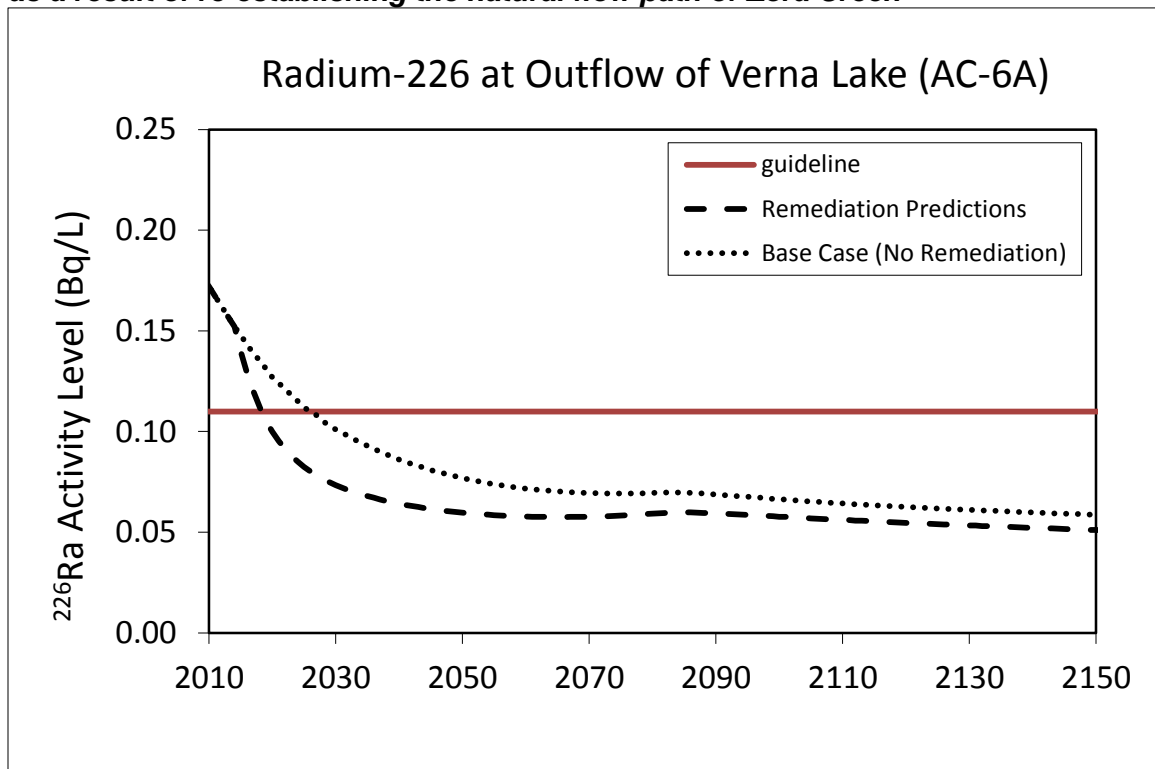


Figure 3.5.1-3: Predicted radium-226 concentrations at the outflow of Verna Lake as a result of re-establishing the natural flow path of Zora Creek



This remedial improvement to the design of physical structures at the Beaverlodge properties will help ensure the health and safety of people and protection of the environment, and demonstrates that Cameco remains fully capable and qualified to carry out licensed activities.

3.6 Fitness for Service

There are some areas and structures at the Beaverlodge site that require periodic inspection to ensure they continue to perform as expected.

An engineered sand cover is in place on the portion of the Fookes Reservoir tailings delta situated above the waterline. The cover prevents tailings from becoming aurally exposed. Cameco and the JRG continue to perform and document annual inspections of the cover, and a qualified engineer currently conducts third party inspections every five years.

Outlet structures were constructed to maintain water levels in Fookes and Marie reservoirs in the tailings management area. These structures maintain water levels in these reservoirs one metre above the elevation to which tailings were deposited, thereby providing assurance that the tailings remain sub-aqueous. These outlet structures provide passive control of water levels and, as a result, long-term maintenance of these structures is not anticipated. Formal inspections are conducted every five years by a qualified third-party engineer. At the most recent inspection, it was concluded that both outlet structures are performing as designed and will continue to do so for the foreseeable future. Cameco and the JRG will continue to perform and document annual inspections of these structures until 2015 at which time the inspection frequency would be re-assessed by a qualified engineer.

In 2010, the walls of former open-pit mines at Beaverlodge were assessed by a qualified third-party engineer who concluded that no action was required or recommended to further remediate these structures. The engineer also assessed the slope stability of the various waste rock piles at Beaverlodge and came to the conclusion that no remedial action was required or recommended.

Thirty-five vertical openings were identified and sealed with reinforced concrete during decommissioning. Further, the shaft caps are inspected annually during the JRG inspections.

During the licence period, two maintenance activities were carried out on the properties to ensure they remain safe.

More specifically, in follow-up to a concern expressed by a local resident during the May 31, 2010 public meeting, Cameco and the JRG conducted an inspection of the former Fay mine services building area. This inspection identified settling features in the cover material applied to the foundation of the decommissioned building that housed the Fay shaft hoists. Although the risk was considered low, Cameco engaged local contractors to assess the condition of the site and undertake further rehabilitation work.

The work was completed in July 2010. A final report detailing the rehabilitation was submitted to the JRG on September 17, 2010.

Rehabilitation activities were completed in 2010 at the properties known as the Martin Lake adits. During routine inspections it was noted that erosion had created a small opening in the waste rock covering the adit. A plan was developed to improve the design of the adit cover and, in consultation with the JRG, the waste rock plug was removed and replaced following the approved design. Application for transfer to the IC program has been made following consultation with the JRG and stakeholders, a final inspection of the property is required prior to a decision regarding transfer.

3.6.1 Path Forward Summary

Through the Beaverlodge Management Framework, Cameco has proposed to replace the original concrete caps on vertical mine openings with new caps constructed in accordance with modern engineering standards. This maintenance activity will reduce any potential of cap failure.

Once this work has been completed, the caps will be routinely monitored and maintained under the Management Framework and, it is anticipated, within the IC program.

This remedial action will ensure that the physical condition of the cap structures will remain effective in the long-term. It will provide assurance of the continued health and safety of people and protection of the environment, and it will further demonstrate that Cameco remains fully capable and qualified to carry out licensed activities.

3.7 Radiation Protection

The Beaverlodge properties pose little radiological risk to the public. The focus of the decommissioning activities completed in 1985 was to address residual risk of exposure to public and workers. As a result, radiation hazards at the properties are minor. Gamma surveys conducted following the original decommissioning activities and verification gamma radiation monitoring conducted annually by Cameco and confirmed by the CNSC during annual site inspections support this conclusion.

In 2003, third-party experts completed a detailed radiological risk assessment of the Beaverlodge area, which determined that radionuclide dose estimates for receptors, including humans, were below the incremental dose limit for members of the public of 1.0 mSv/a. The study noted that casual access to the Beaverlodge Lake area by hikers, hunters or persons operating recreational vehicles would result in a minimal radiation dose.

Evaluation of the Beaverlodge site through annual inspections and monitoring provide assurance that the health and safety of persons is maintained.

3.7.1 Path Forward Summary

Radiation hazards will be assessed during the implementation of identified remedial options as part of a job-hazard analysis, and, if necessary, controls will be implemented to ensure compliance with legislation and potential exposures meet the ALARA principle.

As part of the Beaverlodge Management Framework, a step towards preparing the sites for release to the provincial IC program will include a confirmatory gamma survey to verify conditions. In that process, if elevated areas are identified and can be reasonably mitigated (e.g. placing additional fill), then actions will be taken to do so.

This activity will ensure that contamination and radiation doses received by the public are effectively monitored and controlled. Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

3.8 Conventional Health and Safety

There were no conventional health and safety incidents or lost-time injuries reported at the Beaverlodge properties in the current licence term.

Given the remote nature of the facility, Cameco contracts the majority of the routine monitoring and maintenance activities out to third parties. Through Cameco's procurement process, compliance with Cameco's SHEQ policy is a requirement for those doing work on our behalf. Cameco's CMP provides direction as to how Cameco oversees and manages the safe execution of any work being done by third parties at the site. This is confirmed through routine field inspections.

Conventional health and safety is managed primarily through public engagement initiatives during which residents are encouraged to report any incidents or potential safety issues/hazards to Cameco personnel or representatives of the provincial or federal government.

Warning signs at the Beaverlodge property boundaries advise that the site is a licensed nuclear facility with only Cameco-authorized activities allowed. They are in place to help prevent unauthorized materials or activities which may cause harm to people or the environment. The signs also provide the Cameco contact information and CNSC licensing information.

Cameco verifies the conditions of the licensed properties through annual site inspections to ensure the properties remain safe to people. If inspections identify minor maintenance or clean-up work requirements, then the issues are safely addressed by qualified personnel soon after. Further, if non-routine tasks are performed at the site under approved licensed activities, then they will undergo a job-hazard analysis. Relevant incidents that occur at the site are managed through the Cameco's incident reporting system.

3.8.1 Path Forward Plan

Through public engagement under the Management Framework, Cameco has verified that local community members and other stakeholders do not believe the conditions at the Beaverlodge properties pose an acute safety risk to residents or people in the area.

Cameco will continue with routine monitoring and inspection of the properties to ensure the health and safety of people. Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

3.9 Environmental Protection

Since the end of decommissioning, environmental protection efforts at Beaverlodge have consisted primarily of water sampling and radon monitoring at several locations. In addition, flow monitoring stations are maintained in the two watersheds flowing into Beaverlodge Lake to provide data for calculating environmental loadings from the licensed properties.

The Beaverlodge *Water Sampling Program* monitors the long-term trends of radium-226, pH, total suspended solids, copper, zinc, arsenic, iron, lead, uranium and total dissolved solids, and compares these parameters to environmental close-out objectives established at the completion of site decommissioning. The program was revised and approved by the JRG in March 2011. The frequency of the collection of samples was adjusted for numerous stations to reflect the historical data and stability of analytical results over time. Four stations have been added to the program at the request of community members, and these are located downstream of the licensed properties.

The close-out objective for radon has been consistently met since decommissioning activities were completed in 1985. Radon levels have been monitored continuously in the vicinity of the Beaverlodge mine and mill area since 1985. Monitors collect air samples and are replaced semi-annually from 10 stations established throughout the area.

In addition, several special studies have been undertaken in response to specific concerns in order to better understand the environmental condition of the properties.

The Beaverlodge QSM has helped enhance the understanding of remnant contaminant sources, transport mechanisms, environmental interactions and ecological and human health risks, as well as to act as a guide in the development of potential remedial options and associated performance objectives. The model was an important instrument used by stakeholders to assess the potential benefits and detriments of a variety of potential remedial options, and it will continue to serve an important role as the Beaverlodge properties move through the stages of the Management Framework.

In recent years, a number of flowing boreholes have been identified in the Lower Ace Creek area, which is located adjacent to the main mine and mill area, and at the Dubyna area. Inspections determined that these boreholes, which are likely connected to underground mine workings, were producing water with elevated levels of contaminants

of concern, specifically radium-226, uranium and selenium from the Lower Ace Creek boreholes, and radium-226 and uranium from the Dubyna boreholes. Temporary plugs were installed in the boreholes associated with Lower Ace Creek in 2009 and were monitored for two years to ensure the minewater was not diverted to another location on the surface. The boreholes at Lower Ace Creek and Dubyna have since been sealed permanently, as discussed in the next section.

3.9.1 Path Forward Plan

Through the Beaverlodge Management Framework, Cameco has identified and assessed risks associated with the release of contaminants from the Beaverlodge properties, and an effective plan has been established to reasonably control these releases where possible. The Management Framework helps ensure the health and safety of people and protection of the environment, and it demonstrates that Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

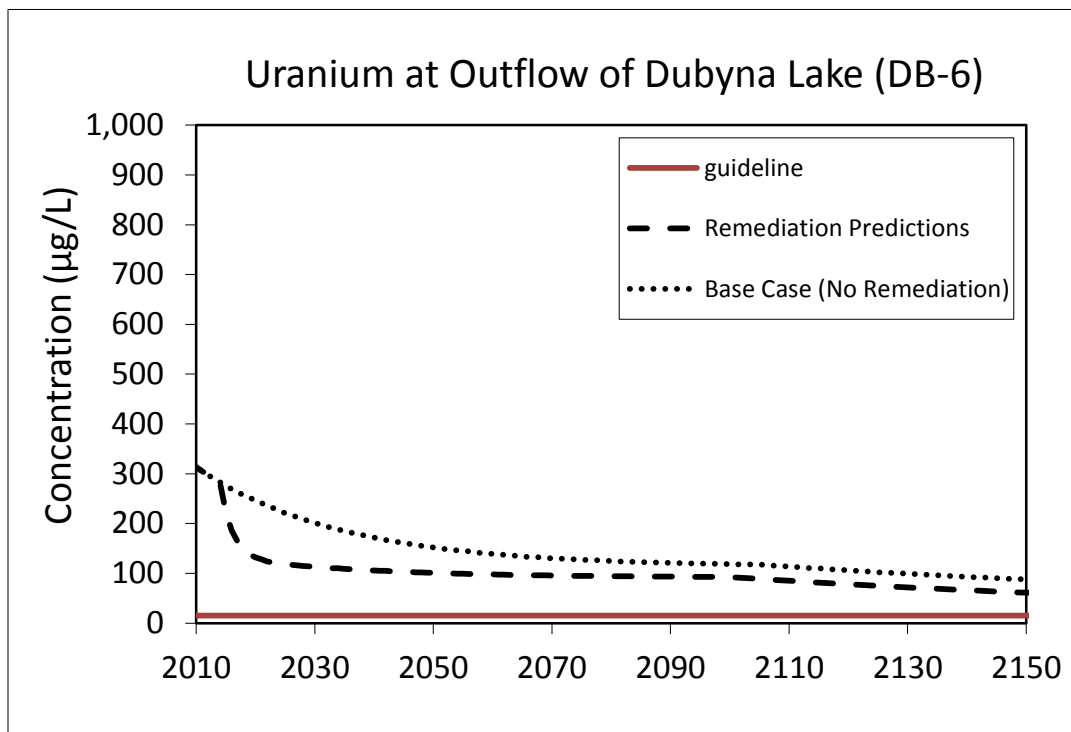
Anticipating that one of the recommendations stemming from the Management Framework process would be to remediate the flowing boreholes at the Dubyna site and Lower Ace Creek, Cameco sealed the boreholes during September 2011 and June 2012.

As part of the Path Forward, the boreholes already sealed will be monitored through the next licence term into the IC program. In addition all boreholes identified on the Beaverlodge properties will be sealed to reduce the risk of flowing boreholes developing in the future.

The flowing boreholes associated with Lower Ace Creek reported directly to Ace Bay of Beaverlodge Lake. The QSM has shown that there is no expected improvement in the water quality of Beaverlodge Lake as a result of sealing the flowing boreholes in Lower Ace Creek. Therefore, site-specific performance objectives for this option have not been developed. This option has been implemented to meet the standard of good engineering practice. If any additional flowing boreholes are identified on the Beaverlodge properties, then they will be sealed and monitored.

A localized improvement in water quality at Dubyna Lake is predicted now that flowing boreholes originating from Dubyna site have been sealed. Currently, uranium is the only contaminant of concern that exceeds the SSWQO at the outflow from Dubyna Lake. The site-specific benefit of implementing this option, based on the expected benefit predicted by the QSM, is provided in [Figure 3.9.1-1](#).

Figure 3.9.1-1: Predicted uranium concentration at Dubyna Lake as a result of sealing flowing boreholes



3.9.2 Regional Aquatic Monitoring Program

In addition to the current EMP, Cameco, in partnership with Saskatchewan Research Council, will engage the JRG and local stakeholders to establish a regional aquatic monitoring program. This program would be initiated in the near-term following acceptance by the JRG, and will continue after all licensed properties have been transferred to the IC program to ensure recovery of the downstream environment continues as expected. In the Beaverlodge context, water-quality data gathered as part of the long-term regional aquatic monitoring program will be compared to the downstream recovery predictions noted in the 2012 *Path Forward Report*.

3.10 Emergency Management and Fire Protection

There are no broad emergency management or fire protection plans specific to the Beaverlodge properties.

Contact information is provided on the warning signs at the access points to the properties. Through the administration of the CMP, Cameco emergency contact information is provided to those doing work on the site.

Forest fire-protection services in Uranium City are overseen by the wildfire management branch of the SMOE.

3.11 Waste Management

Currently, the tailings and waste rock produced during the mining and milling of uranium ore do not pose any acute risks to people or wildlife in the Beaverlodge area.

For most of the operating period, fine-grained tailings produced at Beaverlodge were deposited in what is known as the Fookes tailings reservoir, located in the tailings management area in the Fulton Creek watershed. Coarse-grained tailings generated during operations were used as backfill within the underground mine workings.

At the time of decommissioning, a tailings delta had been created at the Fookes reservoir. The aerially exposed tailings were covered with clean waste rock at decommissioning to control gamma radiation to an acceptable level. An engineered sand cover was later added to prevent tailings from becoming aerially exposed.

Waste rock is stored in several different locations throughout the Beaverlodge properties:

- the main mine and mill area
- the Ace shaft area
- the Bolger mine and Verna shaft area
- the Dubyna mine area, and
- the Hab mine area.

The waste rock is not acid-generating and residual gamma radiation presents minimal risk to casual users of the areas and levels are confirmed during annual inspections of the properties.

Debris and industrial waste that is accumulated from clean-up efforts from the respective properties is disposed of in the Bolger pit.

3.11.1 Path Forward Plan

Waste rock removed from the clearing of Zora Creek will be placed into the Bolger pit along the pit walls. The Bolger pit will continue to act as a repository for industrial waste collected from other properties as final inspections are performed. Waste rock is used to cover the industrial waste and debris placed in the Bolger pit.

Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

3.12 Security

Because of the remote location and limited population in the area, there are minimal security requirements at the decommissioned facilities. Signs are posted at all road access

points to the surface lease boundaries to inform visitors of potential safety hazards at the properties. The signs also provide contact information for inquiries.

During the current licence period, there were no changes made to the security plan and no reportable incidents with respect to security-related issues.

In addition, there were no requests made during the review period by exploration companies to traverse the licensed properties in order to access adjacent land claims. Any future request of this kind would be subject to conditions to ensure the safety of persons and the continued protection of the environment.

Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

3.13 Safeguards

Cameco continues to work with the CNSC and the International Atomic Energy Agency (IAEA) to ensure compliance with Canada's international obligations. Information provided to the IAEA is reviewed and updated annually.

Cameco received no access requests from the IAEA related to the Beaverlodge facilities during the current licence period.

Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

3.14 Packaging and Transport

Cameco is committed to the safe, secure and timely transportation of materials to and from the Beaverlodge properties. Controlled shipments from Beaverlodge during the current licence period were limited to samples of waste rock and tailings sent to laboratories for analysis. All sample shipments of waste rock and tailings were handled in accordance with Transport Canada's *Transportation of Dangerous Goods Regulations* and CNSC's *Packaging and Transport of Nuclear Substances Regulations*.

There were no significant shipments of ore, tailings, special waste, waste rock or process solutions to or from Beaverlodge during the current licence period.

Cameco remains fully capable and qualified to carry out licensed activities with respect to this SCA.

4.0 OTHER MATTERS OF REGULATORY INTEREST

4.1 Aboriginal Consultation

Cameco recognizes the right of Aboriginal groups to be consulted and, where applicable, to have their interests accommodated by the Crown with respect to any Crown authorization, disposition, licence, permit or approval associated with CNSC-licensed operations and projects, the granting of which could potentially impact the exercise of Aboriginal or treaty rights. Cameco assists the CNSC and other regulators in the discharge of Aboriginal consultation and accommodation obligations where they arise. The Crown's duty to consult and accommodate aligns with Cameco's corporate values, commitments and measures of success, and as such constitutes sound business practice.

Cameco's public engagement activities relating to the Beaverlodge facilities provide opportunities for the CNSC and Cameco to effectively consult with Aboriginal groups in northern Saskatchewan. The majority of northern Saskatchewan residents are of Aboriginal origin, including First Nations and Métis.

Representatives from the Métis Nation–Saskatchewan (MN-S) Local #50 and other interested parties in Uranium City are invited to all public meetings in the community and are asked to participate in all engagement events related to the Beaverlodge facilities.

Public engagement efforts with respect to the Beaverlodge properties are outlined in [Section 4.4](#).

4.2 Financial Guarantees

The federal government is responsible for all liabilities and ensures all financial guarantees associated with the Beaverlodge properties through Canada Eldor Inc., a wholly owned subsidiary of CDIC. All costs associated with the management of the properties are reimbursed to Cameco by Canada Eldor. Both Canada Eldor and CDIC report to the federal Minister of Finance.

The federal Ministry of Finance has confirmed via letter to the CNSC that:

Canada Eldor Inc. is an agent of the Crown in right of Canada for all purposes. It follows that any undischarged obligations and liabilities of Canada Eldor Inc. are the obligations and liabilities of the Crown in right of Canada. That will include Canada Eldor Inc.'s obligations and liabilities to decommission the Beaverlodge Site and the expenses associated with possession, management and control of nuclear substances at that site.

The CNSC has acknowledged receipt of the letter and acceptance that the information fulfilled the requirements of condition 2.2 of Waste Facility Operating Licence WFOL-W5-2120.0/2007.

4.3 Other Regulatory Approvals

In accordance with the *Canadian Environmental Assessment Act* and its regulations, no environmental assessment is required to be conducted prior to the implementation of the activities related to the Beaverlodge Management Framework.

4.4 Licensee's Public Information Program

As Uranium City is the only community in close proximity to the Beaverlodge decommissioned properties, the main audiences for Cameco's public engagement activities with respect to the licensed properties are residents of the community of Uranium City and surrounding area. Secondary audiences include residents of the other communities of the Athabasca Basin (Hatchet Lake Denésuline First Nation, the northern settlement of Wollaston Lake, Black Lake Denésuline First Nation, the northern hamlet of Stony Rapids, Fond du Lac Denésuline First Nation, and the northern settlement of Camsell Portage) and northern Saskatchewan generally. Métis Local #50 Uranium City is the primary focus of engagement efforts with the MN-S with respect to the Beaverlodge facilities.

Public engagement activities for Beaverlodge are managed through Cameco's corporate social responsibility (CSR) department. The department is based in Saskatoon and includes a northern affairs office in La Ronge and satellite offices in more remote northern Saskatchewan communities. The satellite office located in Fond-du-Lac is the point of contact for residents of Uranium City. The CSR department also manages public engagement in northern Saskatchewan related to major project development, business development, community investment, and employment and training.

Cameco engagement has generally adhered to the *Principles of Northern Engagement*, which were developed through collaboration between Cameco and northern Saskatchewan leaders. The principles incorporate First Nation and Métis perspectives in guiding our engagement efforts, and they help ensure that Cameco will continue to build and maintain strong relationships in the north through its engagement efforts.

The Beaverlodge *Public Information Program* (PIP) was developed in 2012 to more fully describe the continuing effort made by Cameco to ensure the public is fully engaged with respect to the Beaverlodge properties in a manner that complies with established requirements. As part of the PIP, the Beaverlodge Public Disclosure Protocol has been developed to ensure compliance with the CNSC *Regulatory Document and Guidance Document 99.3*. The commitments within the protocol describe the types of routine and non-routine information that Cameco is committed to providing the target audience described in the PIP. This protocol has been posted on the Beaverlodge website, www.beaverlodgesites.com, and residents are encouraged to provide feedback.

During the current licence period, engagement activities have included annual public meetings in Uranium City and annual site tours with representatives from the Northern Saskatchewan Environmental Quality Committee (EQC). When warranted, northern residents are engaged with respect to Beaverlodge at regular meetings of the EQC or

Athabasca Working Group. This engagement is in addition to the annual Cameco Northern Tour held every October which includes four stops in Athabasca Basin communities.

4.4.1 Stakeholder Engagement in Developing the Path Forward

Over the current licence term, residents of Uranium City and other northern Saskatchewan stakeholders were engaged extensively during the development and implementation of the Beaverlodge Management Framework and the Beaverlodge Action Plan, and during the development of the Path Forward.

In April 2009, stakeholders gathered to develop potential remedial options at a workshop facilitated by third-party experts. Participants included representatives from Uranium City, the MN-S, the EQC, the Athabasca Working Group, Cameco, consultants and regulators. While a number of potentially viable remedial measures were identified, the workshop concluded that not enough information was known regarding the costs or benefits of these measures.

Through the Beaverlodge Management Framework, a process to provide more detailed information on the costs and benefits of the identified measures was established. This information was presented to participants at another remedial options workshop held on April 3-4, 2012.

The 2012 workshop contingent consisted of a similar representation as those present for the 2009 workshop. Participants were provided estimates on the costs, benefits and potential risks associated with a series of potential remedial options, and they were then asked to provide some feedback.

There was a clear mandate to ensure that all options undertaken needed to be reasonable and realistic from a cost perspective in relation to the predicted benefit. However, the consensus of the participants was that doing nothing was not an acceptable option.

The results from the 2012 workshop were considered during the development of the Path Forward plan. Some of the general conclusions were that there may be a few small-scale activities that show some localized improvement in water quality, there remains no reasonable means of significantly accelerating the naturally occurring rate of recovery of Beaverlodge Lake and downstream waterbodies.

A public meeting was held on January 15, 2013, in Uranium City primarily to engage with local residents on the Path Forward for the proposed licence period and to present the performance objectives for the remedial activities planned. No significant concerns were raised by local community members with respect to the planned activities.

4.4.2 Path Forward Plan

Engagement has been designed and is evolving to ensure that relevant questions and concerns have been adequately elicited from members of interested parties and respectfully acknowledged and addressed in a meaningful manner by Cameco.

Through the Beaverlodge Management Framework, Cameco will continue to fully engage stakeholders as the Path Forward is implemented and as the properties are advanced towards the provincial IC program.

REFERENCES

1. Cameco, *Beaverlodge Path Forward Report* (2012)
2. Cameco, *Beaverlodge, Public Information Program* (2012)
3. Cameco, *Beaverlodge Water Sampling Program* (2011)

ADDENDUM A: PERFORMANCE OBJECTIVES

Uranium Concentration Performance Objectives				
<u>Location</u>	<u>Station #</u>	<u>Performance Objectives (µg/L)</u>		
		<u>2020</u>	<u>2050</u>	<u>2100</u>
Dubyna Lake	DB-6	181	139	120
Pistol Lake	AN-5	401	305	193
Verna Lake	AC-6a	213	150	129
Ace Lake	AC-8	16	15	15
Lower Ace	AC-14	32	21	16
Fookes Reservoir	TL-3	389	321	233
Marie Reservoir	TL-4	374	354	276
The Meadow Fen	TL-7	410	366	277
Greer Lake	TL-9	301	275	221
Ace Bay, Beaverlodge Lake	N/A	123	77	42
Fulton Bay, Beaverlodge Lake	BL-3	130	82	45
Beaverlodge Lake West	BL-5	132	82	44
Radium Activity Performance Objectives				
<u>Location</u>	<u>Station #</u>	<u>Performance Objectives (Bq/L)</u>		
		<u>2020</u>	<u>2050</u>	<u>2100</u>
Dubyna Lake	DB-6	0.11	0.11	0.11
Pistol Lake	AN-5	0.89	0.86	0.84
Verna Lake	AC-6a	0.15	0.11	0.11
Ace Lake	AC-8	0.11	0.11	0.11
Lower Ace	AC-14	0.11	0.11	0.11
Fookes Reservoir	TL-3	1.36	1.24	0.90
Marie Reservoir	TL-4	1.78	1.96	1.83
The Meadow Fen	TL-7	1.76	1.89	1.77
Greer Lake	TL-9	2.10	2.01	1.77
Ace Bay, Beaverlodge Lake	N/A	0.11	0.11	0.11
Fulton Bay, Beaverlodge Lake	BL-3	0.11	0.11	0.11
Beaverlodge Lake West	BL-5	0.11	0.11	0.11
Selenium Concentration Performance Objectives				
<u>Location</u>	<u>Station #</u>	<u>Performance Objectives (µg/L)</u>		
		<u>2020</u>	<u>2050</u>	<u>2100</u>
Dubyna Lake	DB-6	1.0	1.0	1.0
Pistol Lake	AN-5	1.0	1.0	1.0
Verna Lake	AC-6a	1.0	1.0	1.0
Ace Lake	AC-8	1.0	1.0	1.0
Lower Ace	AC-14	1.0	1.0	1.0
Fookes Reservoir	TL-3	3.46	2.9	2.34
Marie Reservoir	TL-4	3.21	2.88	2.45
The Meadow Fen	TL-7	3.44	3.04	2.53
Greer Lake	TL-9	2.97	2.69	2.32
Ace Bay, Beaverlodge Lake	N/A	2.45	1.80	1.23
Fulton Bay, Beaverlodge Lake	BL-3	2.58	1.91	1.30
Beaverlodge Lake West	BL-5	2.60	1.91	1.30