

LONG-TERM MONITORING PROGRAM

Decommissioned Beaverlodge Mine Site



Prepared for:
Cameco Corporation

Prepared by:
Canada North Environmental

November 2023





CanNorth

Canada North Environmental Services Limited Partnership

A First Nation Environmental Services Company

**DECOMMISSIONED BEAVERLODGE
MINE SITE
LONG-TERM MONITORING PROGRAM**

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Project No. 4150

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1.0 INTRODUCTION

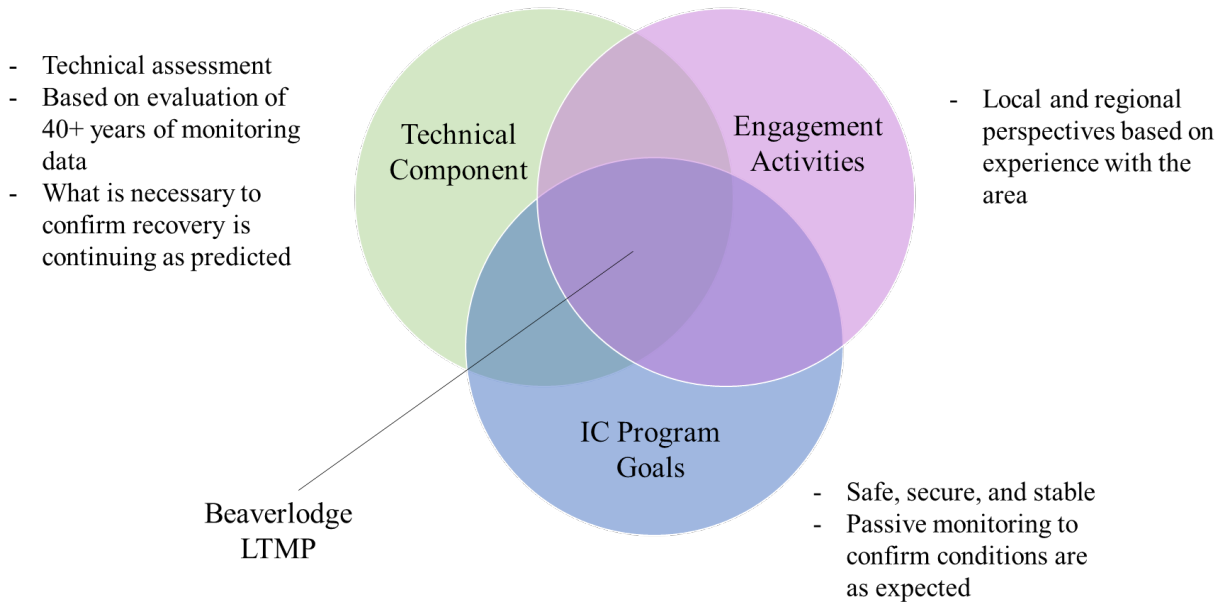
The Beaverlodge Environmental Monitoring Program (EMP) provides the core environmental monitoring requirements for the decommissioned Beaverlodge Mine Site. Once all the decommissioned Beaverlodge properties have been accepted into the Province of Saskatchewan's Institutional Control (IC) Program the EMP is expected to evolve into a Long-Term Monitoring Program (LTMP), which will be implemented at the discretion of Saskatchewan Ministry of Energy and Resources (SkMER).

The goal of managing the decommissioned Beaverlodge properties in transition phase monitoring has been to ensure the properties and areas downstream of the properties are meeting the objectives of being physically and radiologically safe, secure and stable. All physical activities related to the Beaverlodge properties have been completed and the properties are being proposed for transfer to the IC Program, to monitor natural recovery.

The LTMP will be used to confirm that those objectives continue to be assessed once the properties have entered the IC Program. In developing the Beaverlodge LTMP, multiple objectives and perspectives were incorporated. The technical evaluation builds off over 40 years of environmental monitoring and considers how monitoring can evaluate long-term trends while supporting the Saskatchewan Health Authority (SHA) in managing the Healthy Fish Consumption Guideline. Community engagement activities brought various stakeholders together to inform components of the LTMP including sample frequency and location. The expectation that long-term management of the properties under the jurisdiction of SkMER (within the IC Program) should be passive in nature, also informed program design. Together, these aspects were considered in the development of the Beaverlodge LTMP.

As shown below in Figure 1.1, the Beaverlodge LTMP is informed by inputs from a technical evaluation, engagement activities, as well as the goals of the IC Program. The following sections detail the technical evaluation; a summary of themes voiced during engagement activities with Uranium City community members, other communities in the Athabasca basin, the Northern Saskatchewan Environmental Quality Committee, and regulatory agencies; and the proposed LTMP which draws on these aspects.

Figure 1.1 Inputs to the Beaverlodge LTMP



1.1 IC Program

The Province of Saskatchewan’s IC Program was implemented by the Government of Saskatchewan as part of the promulgation of the *Reclaimed Industrial Sites Act* and associated regulations in March 2007. The purpose is to establish a formal process for transferring decommissioned mining and milling properties to provincial responsibility once remediation has been completed and a period of monitoring has shown the properties to be safe, secure, and stable. Funding for the long-term monitoring and maintenance of properties transferred to the IC Program are provided by the former site holder.

The development of a long-term monitoring program for the site (the focus of this report) is necessary to determine how much funding the site holder needs to provide for the Monitoring and Maintenance Fund. As properties accepted into the IC Program will have met the criteria of being safe, secure, and stable, at that point, a passive environmental monitoring program is sufficient to ensure contaminant levels are as expected.

2.0 TECHNICAL EVALUATION

This section details the technical evaluation completed to support development of a program to monitor long-term trends in surface water and fish quality after all the Beaverlodge properties have been released to the IC Program. The objectives of the evaluation are to define monitoring that would confirm long-term water trends continue to recover as expected and provide information to support the eventual removal of the healthy fish consumption guideline and drinking water advisories. The aim is to inform a sampling program that reflects an understanding of the conditions in the area gathered through 40 years of data collected from the site. Focusing solely on the technical components and objectives, the potential program consists of surface water and fish programs as presented below in Table 2.1.

Table 2.1 Technical evaluation to support the Beaverlodge LTMP

Sampling program component and locations	Objective	Proposed frequency	Comments
Surface Water			
Ace Creek Watershed (AN-5, DB-6, AC-6A, AC-14)	Confirm that trends in water quality are recovering, consistent with the understanding in the 2020 ERA	Every 5 years initially	Opportunity to decrease frequency after 15 years
Fulton Creek Watershed (TL-3, TL-4, TL-7, TL-9)			
Beaverlodge Lake and Downstream (BL-5, ML-1, CS-1, CS-2)			
Fish			
Beaverlodge, Martin, and Cinch Lakes	Support the removal of the healthy fish consumption guideline	Every 20 years	Discontinue after healthy fish consumption guideline removed for Beaverlodge, Martin, and Cinch lakes

Sediment quality and benthic invertebrate community composition change slowly over time while exhibiting high location-to-location variability within a given waterbody. In addition, the current understanding is that, without a substantial additional load to the environment, sediment quality and benthic invertebrate community are expected to continue to recover slowly over time. There is a long history of water quality data collected

from the area that has demonstrated that water is the leading indicator for environmental recovery. Extensive watershed modelling has incorporated these monitoring results, and has assessed and predicted water quality in the Ace Creek watershed, Fulton Creek Watershed, Beaverlodge Lake, and downstream through the Crackingstone River. For these reasons surface water is the best indicator of overall aquatic environment recovery. As a result, sediment and benthic invertebrate monitoring are not required as part of LTMP to meet program objectives.

2.1 Surface Water

Sampling locations considered for the surface water evaluation are presented below in Figure 2.1 and the sampling frequency is detailed below in Figure 2.2. This evaluation reflects the understanding of future behaviour based on water and sediment predictions developed as part of the 2020 Beaverlodge ERA (CanNorth 2020) and aims to ensure the predictions remain valid.

To meet program objectives, surface water sampling could initially occur every 5 years within the Ace Creek Watershed, Fulton Creek Watershed, Beaverlodge Lake, and farther downstream. As detailed in Figure 2.2, there would be potential to reduce surface water sampling frequency for each location to once every 10 years after 15 years of more frequent sampling if recovery continues to generally be in line with the predicted bounds (i.e., general trends are within the performance indicators established for the location).

The key components of the LTMP (frequency, timing of sample collection, locations, evaluation of results, duration) are discussed in the following text with additional information provided in appendices.

Recovery of the immediate and downstream areas is predicted to be a long process; in this context sampling frequencies ranging from every 5 to every 10 years are short. Some example figures showing program sampling frequency compared to predicted recovery are shown in APPENDIX B.

Historical surface water data was examined to determine the time of year which would best capture seasonality of water quality changes and be most reflective of annual average levels. Considering the results of this analysis as well as number of other important factors (such as water flow and safety considerations), June was determined to be the ideal

timeframe for collecting surface water samples associated with this program. This analysis is presented in APPENDIX B to this report.

Consideration was given to discontinuing stations that do not provide a useful indicator of the performance of the Beaverlodge properties. As indicated in Figure 2.1, several locations that are part of the Beaverlodge EMP could be discontinued under this LTMP. These include:

- Upstream station AN-3 is discontinued as part of this long-term program. Measured levels at this station are consistently low.
- Stations TL-6, BL-3, and BL-4 are not included in the LTMP as no Performance Indicators were developed for these stations and stations downstream of these locations will continue to be monitored to ensure recovery is occurring as predicted.
- Monitoring at station AC-8 (the outlet of Ace Lake) will be discontinued as part of this program as measured levels in Ace Lake are consistently at or below SEQGs and have been since 2012.

While no Performance Indicators were developed for ML-1, CS-1, or CS-2, these stations could be monitored within the LTMP to continue to evaluate natural recovery in the downstream environment. The LTMP would include ongoing monitoring at all locations (either within the waterbody or immediately downstream) with a water or fish consumption guideline (PHU and SkMOE 2016) currently in place.

Measured selenium, uranium, and radium-226 levels from the surface water program would be compared to the developed Performance Indicators to ensure recovery is progressing as predicted. Contingency for potential additional investigation if measured levels are above the upper PI bound are discussed in APPENDIX A to this report. The PI bounds were developed using predicted annual averages for comparison to measured annual averages; for this reason single measurements may be outside of the bounds periodically due to extreme conditions (drought, flooding, etc.).

The following are the criteria that could be employed for reducing surface water monitoring at various locations under this program:

- If established performance indicators are being met after 15 years of monitoring the upstream exposure locations within the Beaverlodge Tailings Management Area

within Fulton Creek (i.e., TL-3, TL-4, and TL-7) could also be discontinued from the regular monitoring program and ongoing recovery of the system could be monitored at the outlet of Greer Lake (i.e., TL-9).

- Surface water sampling at stations ML-1, CS-1, and CS-2 can be discontinued at the discretion of the province.
- Sampling at the remaining stations can be discontinued when measured levels of selenium, uranium, and radium-226 at that location are consistently (2 consecutive measurements) below SEQGs.

The assessment identified a process for evaluating the recovery of surface water for the Decommissioned Beaverlodge properties under the IC Program. The structure of the developed program is similar to the surface water program for the Cluff Lake Mine Site, which is currently in the process of being transferred to the IC Program (the Canadian Nuclear Safety Commission [CNSC] licence for the Cluff Lake Project was revoked in May of 2023¹).

¹ Record of Decision: <https://www.nuclearsafety.gc.ca/eng/the-commission/pdf/Decision-Orano-CluffLake-23-H8-e.pdf>

Figure 2.1 Summary of technical evaluation Beaverlodge LTMP surface water sampling locations

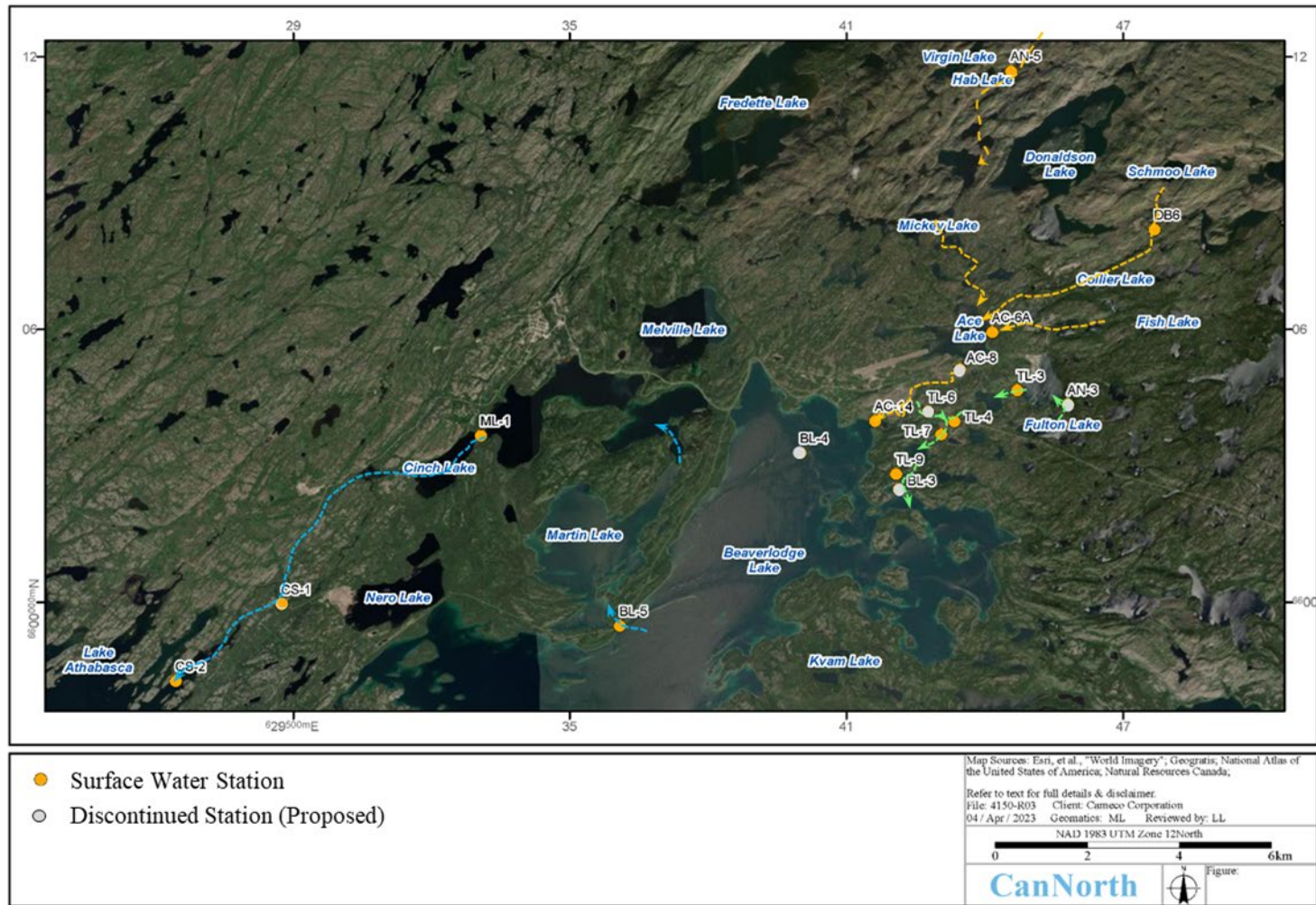
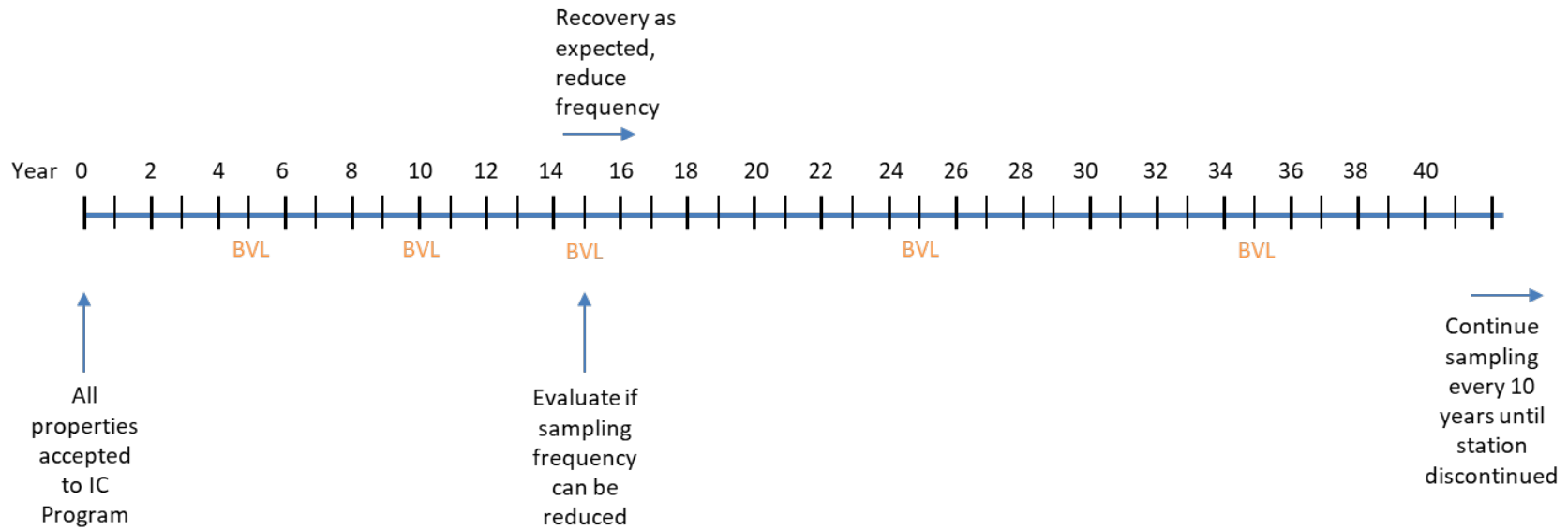


Figure 2.2 Summary of technical evaluation Beaverlodge LTMP surface water sampling frequency



BVL – Ace Creek Stations + Fulton Creek Stations + Beaverlodge Lake + Downstream

Evaluate:

- Are levels below SEQGs (where they apply)?
- If above SEQG or SEQG does not apply, are trends as predicted?

2.2 Fish Chemistry

The purpose of the long-term fish sampling program is to evaluate long-term trends for the purposes of determining when the fish consumption guideline currently in place for Beaverlodge Martin, and Cinch lakes (PHU and SkMOE 2016) can be updated and eventually removed. A 20-year interval with some potential triggers for more frequent sampling is defensible considering that fish tissue selenium concentration recovery will occur slowly over time as shown with the historical data (APPENDIX C).

In addition, fish surveys are destructive in nature requiring numerous fish samples and so it is preferable for infrequent campaigns to preserve natural fish populations. For example, the fish program conducted in the Beaverlodge area in 2017 collected 100 fish for analysis; this program is similar in size to the IC Program fish campaign (5 waterbodies, two species in each location).

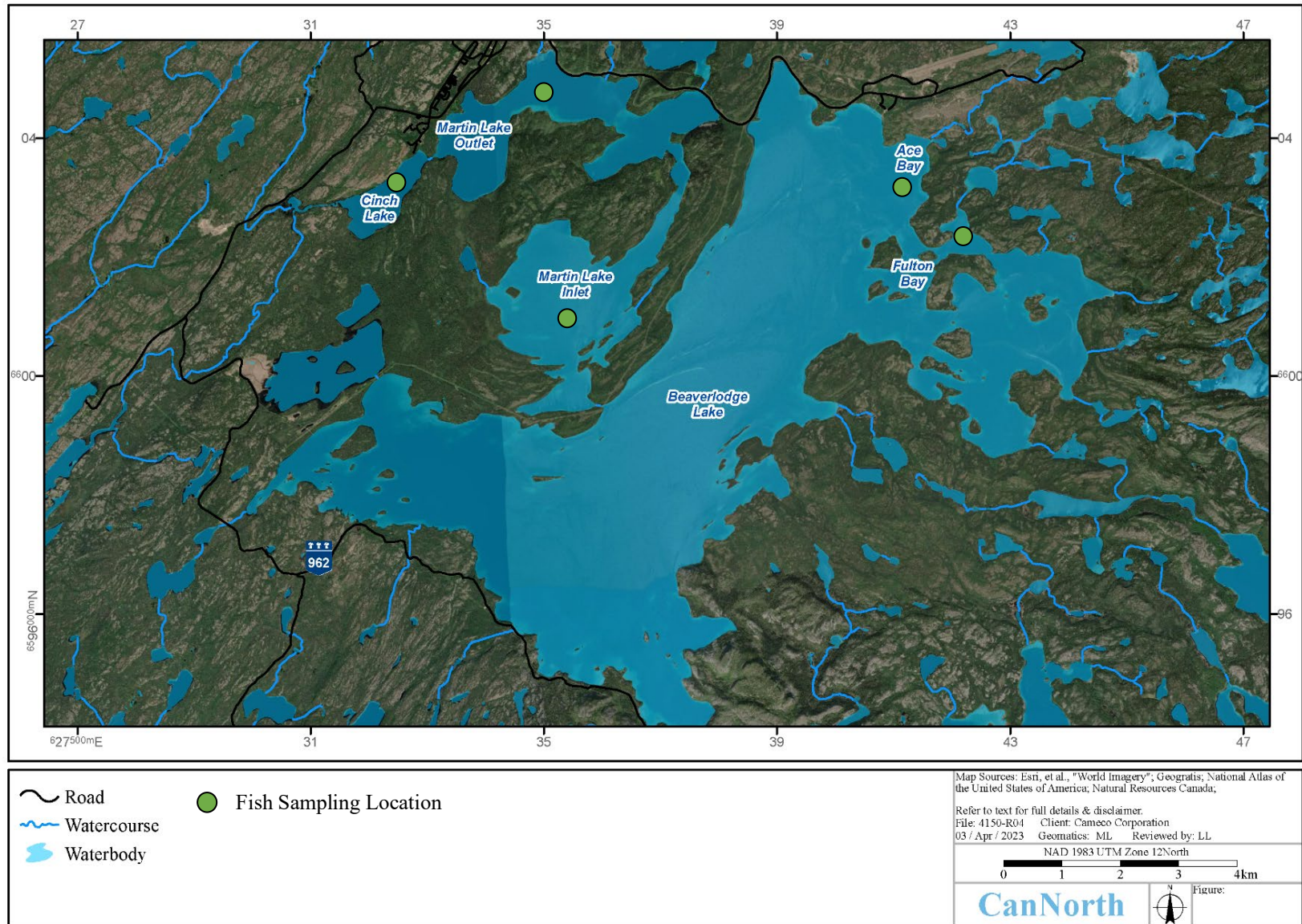
To support program objectives, locations that could be included in the Beaverlodge fish sampling program are indicated below in Figure 2.3 and include three locations in Beaverlodge Lake, locations in the north and south basins of Martin Lake, and within Cinch Lake; these locations are in line with historically sampled areas and cover all areas that currently have a fish consumption guideline in place.

A possible trigger for additional fish sampling between the regular 20-year sampling interval is if the Medical Health Officer or designate has reason to believe there is a good chance the healthy fish consumption guideline could be removed based on measured selenium levels in surface water (Beaverlodge, Martin, and Cinch lakes) or availability of new science/information which changes the understanding of long-term selenium toxicity.

The fish sampling program would be discontinued when the healthy fish consumption guideline is removed in Beaverlodge, Martin, and Cinch lakes.

To support the 20-year sampling interval, a fish sampling program was conducted in the fall of 2023 to update the baseline inventory for Beaverlodge Lake, Martin Lake, and Cinch Lake. The scope of the program was reviewed by the SHA to ensure program objectives would assist in the monitoring and removal of the healthy fish consumption guideline in the future.

Figure 2.3 Summary of technical evaluation Beaverlodge LTMP fish monitoring locations



3.0 ENGAGEMENT ACTIVITIES

In addition to the technical evaluation (presented above in Section 2.0), various engagement activities were conducted to obtain input from members of rights-bearing First Nation and Métis communities in the Athabasca Basin, residents and/or former residents of Uranium City, northern stakeholder organizations, and provincial and federal regulatory agencies on what they view as a reasonable long-term monitoring program based on their personal experience with these areas and the IC Program. The following sub-sections summarize these activities and the overall themes that were noted.

3.1 June 2023 Workshop

To help inform development of the LTMP, Cameco hosted an in-person workshop in Saskatoon in June 2023 to exchange information about the status of Beaverlodge and invite feedback from various stakeholders on specific aspects of the program. An overview of the workshop design and findings related to the water and fish sampling components are provided here.

Workshop design considered the need to balance information sharing, opportunities for questions and clarification, and collection of input and insights on specific areas of the LTMP. The early morning agenda featured an opening presentation from Cameco to provide an overview of the long history of environmental monitoring of the Beaverlodge area. Having set the stage with this information, the purpose of the late morning/afternoon workshop was to invite stakeholder input on specific topic areas for monitoring – primarily water and fish but also other topics of interest to stakeholders, including areas beyond the current scope of the Beaverlodge monitoring program.

Participants were divided into five (5) discussion groups. Groupings were pre-selected to support balanced representation. Facilitated by an external consultant, workshop activities included a series of mapping activities and discussion questions. Cameco employees supported the workshop by being on-hand to greet participants, deliver presentations, answer questions, and serve as facilitators and note-takers for the small group discussions.

Participants included rights-bearing First Nation and Métis communities in the Athabasca Basin, residents and/or former residents of Uranium City, northern stakeholder organizations, provincial and federal regulatory agencies, and Cameco staff. In addition to 11 Cameco staff, 27 people participated in the workshop consisting of 8 people from local communities (Uranium City, Camsell Portage, Fond du Lac, Black Lake, or Stony Rapids),

9 participants from the Ya'thi Néné Land and Resource Office, 3 participants from the Athabasca Joint Engagement and Environment Sub-committee, 1 participant from the Northern Saskatchewan Environmental Quality Committee, 2 representatives from the Canadian Nuclear Safety Commission, 3 personnel from the SkMER, and 1 person from the Saskatchewan Ministry of the Environment.

3.1.1 Surface Water and Fish Discussion

To collect input on preferences for water and fish monitoring in the LTMP, participants were asked questions with their table groups and marked their preferred areas for monitoring on maps of the Beaverlodge area. Facilitators kept the discussions going and encouraged participation by all group members. Feedback was captured on flipcharts; this feedback is summarized within the following sub-sections.

3.1.1.1 Surface Water Sampling Program Feedback

Common themes from engagement activities related to the surface water component of the LTMP are discussed below.

A common topic of conversation was the desire for additional communication to community residents on the monitoring process. This included information such as the collection procedure, how often samples were collected, and what the sample results were.

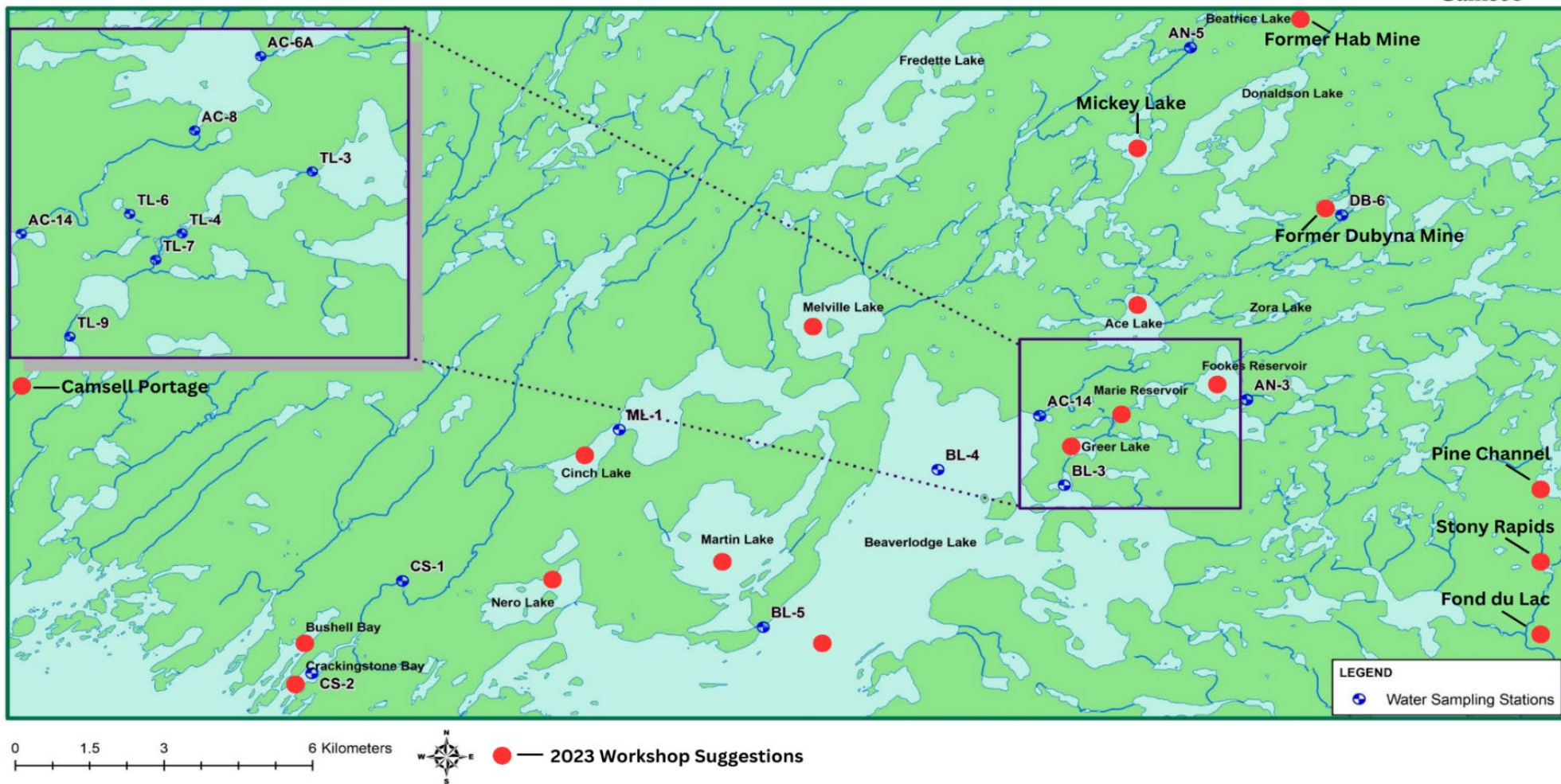
There was some general discussion about how decisions about future monitoring frequency would be made.

Participants identified many locations where they wanted water to be monitored (see Figure 3.1); not all were associated with the Beaverlodge properties. “Along the shoreline of communities” stood out as an important monitoring location, regardless of water body. Identified areas or waterbodies associated with the immediate or downstream Beaverlodge area included Crackingstone Bay, Dubyna, Greer Lake, Ace Lake, Beaverlodge Lake, Bolger, Cinch Lake, Fookes, Hab, Martin Lake, and Mickey Lake. Areas or waterbodies identified which are not influenced by the Beaverlodge properties include Fond du Lac, Bushell Bay, Camsell Portage, Melville Lake, Nero Lake, Pine Channel, and Stony Rapids.

While there was interest in monitoring water seasonally, the suggested frequency for monitoring ranged from every few months to every few years.

Figure 3.1 Summary of June 2023 Workshop surface water sampling location suggestions

Water Sampling Locations



3.1.1.2 Fish Sampling Program Feedback

Common themes from engagement activities related to the fish component of the LTMP are discussed below.

As with the surface water, participants voiced a desire to share even more information with community members about when and where monitoring is happening as well as the results.

The suggested frequency for fish monitoring ranged from annually to every five years, with some suggesting monitoring should be adjusted depending on the results. Waterbodies of interest (shown in Figure 3.2) included some relevant to the Beaverlodge properties (Ace Lake, Beaverlodge Lake, Martin Lake, Crackingstone River) as well as Bushell Bay, Donaldson Lake, Milliken Lake, Lake Athabasca, and Nero Lake.

There was interest in performing a fish study on the lakes that are the subject of the Healthy Fish Consumption Guideline before the properties are all accepted into the IC Program to develop a baseline to compare future sampling to.

Participants indicated the most interest in monitoring pike, lake trout, lake whitefish, sucker, and pickerel. There was general interest in testing what people are actually eating.

3.1.1.3 Insights and Recommendations

A key takeaway from workshop discussions is that Cameco should consider feedback from the workshop along with the results of decades of environmental studies to develop a LTMP that considers both technical recommendations for monitoring locations and frequency with input and concerns raised during engagement opportunities.

Cameco should continue to provide engagement opportunities to keep participants informed about the status of the LTMP until the Beaverlodge properties are accepted into the IC Program and the Provincial Government should continue engagement on the LTMP once the properties are transferred to the IC Program.

During the workshop, it was noted that it would be beneficial to establish a baseline for fish monitoring on the lakes that are the subject of the Healthy Fish Consumption Guideline to evaluate evolution of fish tissue levels moving forward.

3.2 Additional Engagement

To obtain additional community feedback related to the development of the draft LTMP, Cameco conducted engagement activities to solicit additional information from various organizations. The engagement included in-person sessions, virtual sessions, and community meetings and is discussed further below.

3.2.1 Métis Nation- Saskatchewan

The Métis Nation-Saskatchewan (MN-S) Director of Environment and Northern Region 1 Director attended a meeting on August 1 at the Cameco office in Saskatoon. Representatives from Cameco included the Lead Reclamation Specialist, Beaverlodge; Manager of Environment and Licensing; Environmental Specialist; Manager of Community and Indigenous Relations; and Indigenous Engagement Specialist.

Cameco representatives provided an overview of the Beaverlodge properties (as shown below in Figure 3.3) including a historical summary of the Beaverlodge properties from operation through decommissioning and an overview of the transition phase monitoring. Cameco then presented details of recent engagement activities; past and current activities involving geotechnical inspections; how general inspections are completed and involvement of the regulatory agencies in those inspections; water and fish monitoring completed on and downstream of the Beaverlodge properties; and community-based monitoring programs in the region. The 2021 virtual tour of the Beaverlodge properties

was shared as well to provide additional background regarding the Beaverlodge properties and the work that has been completed.

Also included in the discussion was the need for the development of a plan for monitoring under IC Program, including the development of a field inspection guide, in addition to water and fish monitoring programs.

No questions or comments were put forward regarding the development or implementation of the draft LTMP during the August 1 meeting.

Following the meeting on August 1, an additional information session was held with the Métis Local President from Uranium City and MN-S Director of Environment on August 31, 2023 in Saskatoon. Representatives from Cameco included the Lead Reclamation Specialist, Beaverlodge; Manager of Environment and Licensing; Environmental Specialist; Manager of Community and Indigenous Relations; and Indigenous Engagement Specialist. This session was intended to further discuss the Beaverlodge properties and obtain input to assist in the development of the long-term monitoring program.

During the session, a presentation was provided regarding the background of the current environmental monitoring program to facilitate discussion regarding the development of a long-term monitoring program. MN-S representatives were provided maps depicting the various lakes and Beaverlodge properties, and input was solicited with respect to what sample locations, frequency, and media should be included in a long-term monitoring program. In addition, information regarding the location of potential road closures and the location of warning signs to be maintained under the IC Program were also discussed. An example of the map used in this engagement exercise is provided as Figure 3.4, at the end of this section.

Feedback from this meeting aligned with the suggested monitoring frequency and locations noted during the June 2023 Workshop (discussed above). It was noted that an additional sign could be placed along the road on the shore of Beaverlodge Lake providing details of the healthy fish consumption guideline in the languages spoken in the area.

3.2.2 Athabasca Chipewyan First Nation

Representatives from the Athabasca Chipewyan First Nation (ACFN) participated in a virtual information session with Cameco representatives on August 31, 2023. Representatives attending the meeting included staff from the Dene Lands and Resource

Management (DRLM) and Elders from ACFN. Representatives from Cameco included the Lead Reclamation Specialist, Beaverlodge; Manager of Environment and Licensing; Environmental Specialist; Manager of Community and Indigenous relations; and Indigenous Engagement Specialist.

The purpose of the session was to continue building a relationship and to seek valuable insights that would assist in developing the long-term monitoring program.

Cameco provided an overview related to the Beaverlodge Site (as presented below in Figure 3.3) layout as well as past and current activities, which included general inspections, geotechnical inspections, the Beaverlodge Environmental Monitoring Program, and historical fish sampling campaigns. Cameco also discussed the transition to the IC Program, input, and next steps. Maps were provided depicting current and historical sampling locations, including both fish and water sampling programs, similar to the detail shown in Figure 3.1 and Figure 3.2.

Information was sought with respect to what ACFN members felt should be considered when developing a long-term monitoring program in the Beaverlodge area. Representatives from Cameco responded to a variety of questions from ACFN representatives on a variety of topics including program objectives, fish mortalities associated with sampling programs, and community-based monitoring in the region.

During the session, ACFN representatives also noted there would be value in conducting a fish sampling campaign in the fall of 2023 to establish baseline conditions in Beaverlodge Lake, Martin Lake and Cinch Lake to assist in managing the Beaverlodge Healthy Fish Consumption Guideline.

No other questions or comments were raised with respect to the LTMP at that time.

Following the August information session, Cameco reached out to provide an opportunity for ACFN to host interviews with a small number of ACFN community members, with the same materials that were shared at the workshop hosted by Cameco in June. The objectives of the interviews were to:

1. Provide ACFN community members with high-level information about current fish and water monitoring; and
2. Identify areas where ACFN members would like monitoring to take place as part of the Beaverlodge LTMP

Cameco provided the same list of questions in an effort to determine what ACFN members wanted to see in a long-term monitoring program related to the Beaverlodge properties and areas downstream. Cameco provide funding for ACFN to hire a consultant to facilitate gathering this information and prepare a report. Cameco received the report from ACFN in November 2023. Respondents reviewed the existing fish sampling and water quality locations, and provided insight as to where monitoring should take place downstream of the properties. Specifically, respondents noted that Beaverlodge Lake, Martin Lake, Cinch Lake, Crackingstone River, Crackingstone Bay and Lake Athabasca were all priority areas for fish and water monitoring. Respondents also suggested that fish should be monitored at Beaverlodge Lake (Pickerel, Suckers, and Whitefish), Martin Lake (Pickerel and Whitefish), Nero Lake, Cinch Lake, Goldfields, Crackingstone River/Crackingstone Bay (Trout, Pike, and Grayling), Milliken Lake, Tazin Lake, areas near the former Gunnar Mine, and locations within Lake Athabasca (Trout, Pike, Pickerel, Whitefish, and Mariah).

3.2.3 Uranium City Community

On September 11 and 12, 2023, Cameco, the CNSC, Saskatchewan Ministry of the Environment (SkMOE), and SkMER hosted a regulatory update in Uranium City to discuss the final set of Beaverlodge properties to be released from CNSC licensing and transferred to the IC Program. In addition, Cameco provided an update regarding the development of the LTMP, which would be implemented once the properties have entered the IC Program. Attendees over the two meetings included residents from Uranium City, representatives from MN-S, ACFN, the Northern Saskatchewan Environmental Quality Committee (NSEQC), Fond du Lac Denesųline First Nation, and the Ya'thi Néné Land and Resource Office.

During the LTMP development update, it was shared how the program was developed, including both the technical assessment and engagement activities completed to date, and how that information was used to establish the frequency and locations for water and fish sampling. Existing monitoring programs in the vicinity of Uranium City, including the Eastern Athabasca Regional Monitoring Program and the Community-based Environmental Monitoring Program, were also discussed.

The proposed LTMP frequency was presented to community members, detailing that water sampling was proposed to take place every 3 years, with fish sampling every 10 years. A question was posed regarding sample frequency, and Cameco responded noting the properties would only be accepted into the IC Program once the performance objectives

have been met, including the site being stable. Further, it was noted that more than 40 years of environmental monitoring have indicated that five years would be an acceptable frequency to monitor the trends in water quality, but Cameco has adjusted the frequency to every three years based on feedback received during engagement activities.

In addition, a question was posed as to how the three-year monitoring frequency was determined. Cameco responded by speaking to the objectives of the program, how monitoring has demonstrated water quality remains stable and is anticipated to remain stable over the long-term.

Questions were also raised related to sediment monitoring, and the potential to include this aspect in the LTMP. Cameco responded by noting that sediment monitoring has been completed in the region, which has informed the monitoring being proposed. It was also noted there is a long history of water quality data collected from the area that has demonstrated that water is the leading indicator for environmental recovery which is why sediment was not included in the LTMP.

One participant raised a question related to the seasonality analysis that supported the proposed sampling program. Cameco responded by providing an overview of how seasonality was considered in the LTMP, including environmental and safety aspects.

No other comments or questions were raised with respect to fish or water quality monitoring.

Land users were encouraged to provide feedback following the meeting regarding the locations where signs should be placed to ensure people are aware of the history of mining in the area as well as potential road closures on the Beaverlodge properties, based on their current and future land use. Numerous residents stayed after the meetings to discuss their land use and how potential road closures may, or will not, impact their land use. The information that was shared modified the original proposed road closure locations. Based on these targeted discussions, the new planned locations for road closures will have minimal effect on land users' ability to access the land for harvesting activities. The map that was used in this engagement activity is provided below in Figure 3.4.

3.2.4 Ya'thi Néné Land and Resource Office

The Ya'thi Néné Land and Resource Office Executive Director, Environmental Specialist, and Uranium City Community Land Technician attended a meeting on October 13 at the

Cameco office in Saskatoon. Representatives from Cameco included the Lead Reclamation Specialist, Beaverlodge; Manager of Environment and Licensing; Environmental Specialist; Manager of Community and Indigenous Relations; and Indigenous Engagement Specialist. This meeting provided an additional opportunity for Cameco and the Ya'thi Néné Land and Resource Office to discuss the development of the LTMP and monitoring expectations, in follow up to the September 11 meeting in Uranium City.

Cameco provided an overview of the considerations that went into developing the LTMP. Discussion points included the sample locations and frequency of water quality monitoring as well as fish monitoring. Additional information was provided regarding the planned road closures and the locations of signs indicating the Healthy Fish Consumption Advisory, issued by SHA and maintained by SkMOE. The LTMP frequency, as presented to community members, details that water sampling is to take place every 3 years initially, with fish sampling every 10 years. Feedback was received regarding communication and the use of maps and figures to assist in explaining how the LTMP will work moving forward. There was also a question about how much the seasonality impacts the water quality monitoring results. It was clarified that seasonality is generally minor and that a sample taken in spring vs fall would not affect whether a guideline was being met or not.

There were no concerns raised with respect to the proposed sample frequency or locations.

The Community Land Technician from Uranium City also shared that a sign for the Healthy Fish Consumption Guideline should be posted between where Beaverlodge Lake and Lake Athabasca meet for the winter road. It would notify anyone coming onto Beaverlodge Lake by ice road of the guideline. As well, it was suggested that a sign at Bushell Bay would notify people who are accessing the community by boat. It was also noted that there should be a sign posted at Cinch Lake because land users access the area by both boat and snow machine.

Figure 3.3 Overview of Beaverlodge area Institutional Control inspection areas

Institutional Control Inspection Areas

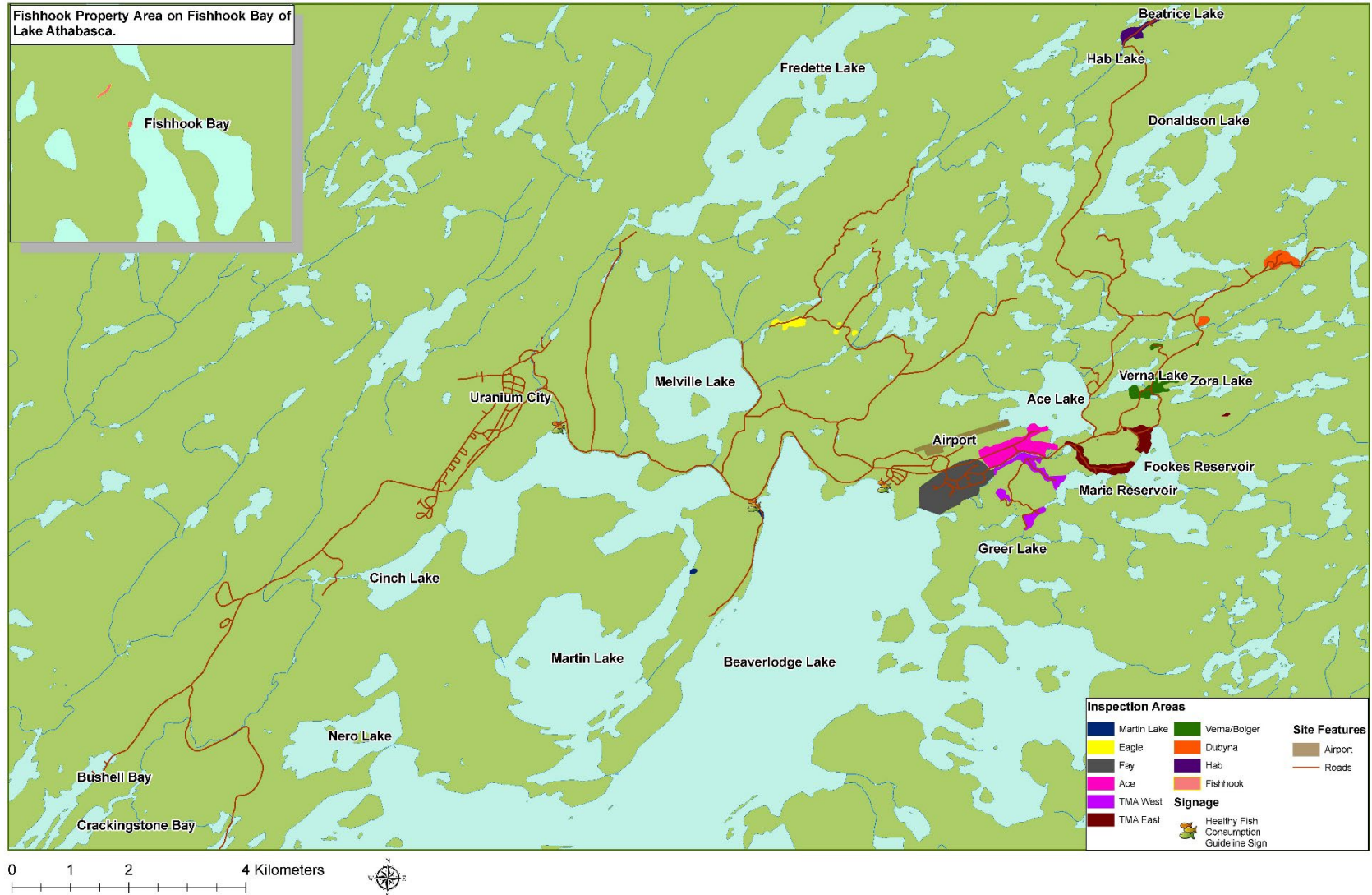
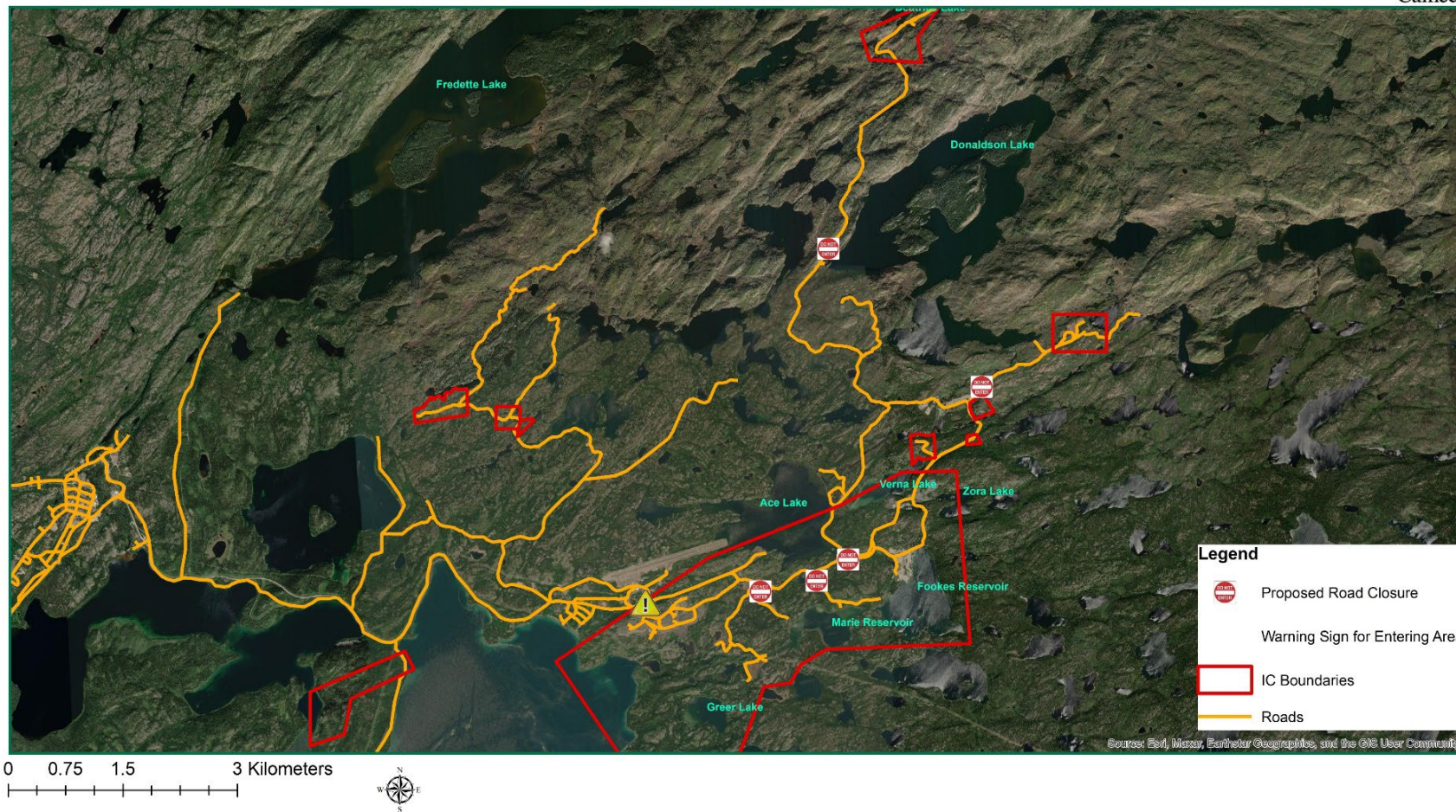


Figure 3.4 Overview of Beaverlodge area road closures and signage

Road Closures and Signage



4.0 BEAVERLODGE LTMP

As discussed above, the Beaverlodge LTMP for implementation once all Beaverlodge properties have been accepted into the IC Program draws from the technical evaluation, community input, and goals of the IC Program. Details of the selected surface water and fish sampling programs under the Beaverlodge LTMP are presented and further discussed below.

4.1 Surface Water Sampling Program

A surface water sampling frequency of every 3 years was selected for the Beaverlodge LTMP (as indicated below in Table 4.1); this is based on a 5 year sampling frequency presented within the technical evaluation and in consideration of a range of seasonal to every 5 years suggested by community members during engagement activities. The selected 3 year frequency is in line with the IC Program goals of ensuring environmental conditions remain stable and the area is recovering as expected through a passive sampling program.

Table 4.1 Beaverlodge LTMP surface water locations and frequency

Surface Water Locations	Objective	Frequency
Ace Creek Watershed (AN-5, DB-6, AC-6A, AC-14)	Confirm that trends in water quality are recovering, consistent with the understanding in the 2020 ERA	Every 3 years initially ^b
Fulton Creek Watershed (TL-3, TL-4, TL-7, TL-9) ^a		
Beaverlodge Lake and Downstream (BL-5, ML-1, CS-1, CS-2)		

Notes:

a Drop upstream Fulton Creek Watershed stations (i.e., TL-3, TL-4, and TL-7) after 15 years if recovering as predicted.

b Proposed program frequency consistent with the surface water program proposed for the Cluff Lake Mine Site for management within the IC Program.

A graduated approach, similar to the program proposed in the technical evaluation (Section 2.1), is selected for the Beaverlodge LTMP. Under this program, the surface water sampling frequency can be reduced after 15 years of monitoring (to every 5 years) and then further reduced after another 15 years of monitoring (to every 10 years) if recovery continues to occur as expected. Monitoring can be discontinued once SEQG are being met for Se, U, Ra-226 during 2 consecutive sampling events. This graduated approach and the

selected sampling frequencies are in line with the proposed surface water sampling for the Decommissioned Cluff Lake Mine Site proposed for transfer to the IC Program.

The contingency plan developed as part of the technical evaluation for implementation if unexpected surface water results are encountered (presented in APPENDIX A) is adopted as part of the Beaverlodge LTMP.

The identified areas of interest within the engagement activities are all either captured by the monitoring stations proposed in the technical evaluation or are areas not influenced by the Decommissioned Beaverlodge Mine Site. Therefore, the surface water stations identified in Section 2.0 were selected as the monitoring network for the Beaverlodge LTMP.

As discussed in the technical evaluation outlined in Section 2.0, upstream stations within the Fulton Creek Watershed (i.e., TL-3, TL-4, and TL-7) can be discontinued after the initial period (after 15 years of monitoring every 3 years) if recovery is occurring as predicted, as ongoing recovery of the system will continue to be monitored at the outlet of the watershed at TL-9 in Greer Lake.

4.2 Fish Quality Sampling Program

A fish sampling frequency of every 10 years was selected based on the results of the technical evaluation (20 years), discussions with the SHA, and suggestions from engagement activities ranging from “often” to every 5 years. As discussed above in Section 2.0, recovery of selenium levels in fish flesh is expected to be an extremely lengthy process and there is likely little potential benefit of monitoring fish tissue chemistry more often.

The identified areas of interest within the engagement activities are all either captured by the monitoring stations proposed in the technical evaluation or are areas not influenced by the Decommissioned Beaverlodge Mine Site. Therefore, the waterbodies identified for fish monitoring in Section 2.0 were selected for the Beaverlodge LTMP.

The species of fish to be collected from the three waterbodies are largely consistent with previous campaigns and are presented below in Table 4.1. These species were selected based on community input, fish availability in each waterbody, and to monitor recovery of piscivorous species (i.e., lake trout and northern pike) as well as those with benthic diets (i.e., white sucker and lake whitefish).

While some other fish species were noted as being of interest during the June 2023 workshop and during subsequent engagement activities, these species were not selected for inclusion in the fish program as recovery of these species is expected to mirror the recovery of included fish with similar diets.

Table 4.2 Fish species to be sampled by location

Location	Fish species
Beaverlodge Lake	White Sucker, Lake Whitefish, and Lake Trout
Martin Lake	White Sucker, Lake Whitefish, and Lake Trout
Cinch Lake	Northern Pike

During the engagement activities, participants indicated some interest in monitoring fish chemistry related to fish species and locations that are currently consumed. The purpose of the fish component of the Beaverlodge LTMP is to identify when the healthy fish consumption guideline can be removed from the three waterbodies it pertains to (i.e., Beaverlodge, Martin, and Cinch lakes) and therefore sampling is focused on these waterbodies. Previous studies have established preferred sampling locations within these waterbodies. As in the past, fish monitoring programs in Martin Lake should split fish capture effort between the north and south basins of the lake, while sampling in Beaverlodge Lake should focus on capturing fish from Ace Bay and Fulton Bay as much as possible.

Another idea captured during the June 2023 workshop was that it would be useful to perform a complete fish study to serve as baseline for fish sampling moving forward under the Beaverlodge LTMP. Cameco took this recommendation under advisement and completed a fish chemistry baseline program for Beaverlodge, Martin, and Cinch lakes in the fall of 2023. The information collected from that program will update the current understanding of selenium in fish flesh and provide the baseline for the review and eventual removal of the healthy fish consumption guideline in the various locations.

4.3 Summary of the Beaverlodge LTMP

A summary of the Beaverlodge LTMP, for implementation when all Beaverlodge properties have been accepted into the IC Program, is shown below in Table 4.2 and Figure 4.1 with sampling locations indicated in Figure 4.2 and Figure 4.3.

This program is based on input from a technical evaluation, engagement activities, as well as considering the overall goals of the IC Program.

Table 4.3 Summary of the Beaverlodge LTMP monitoring frequencies

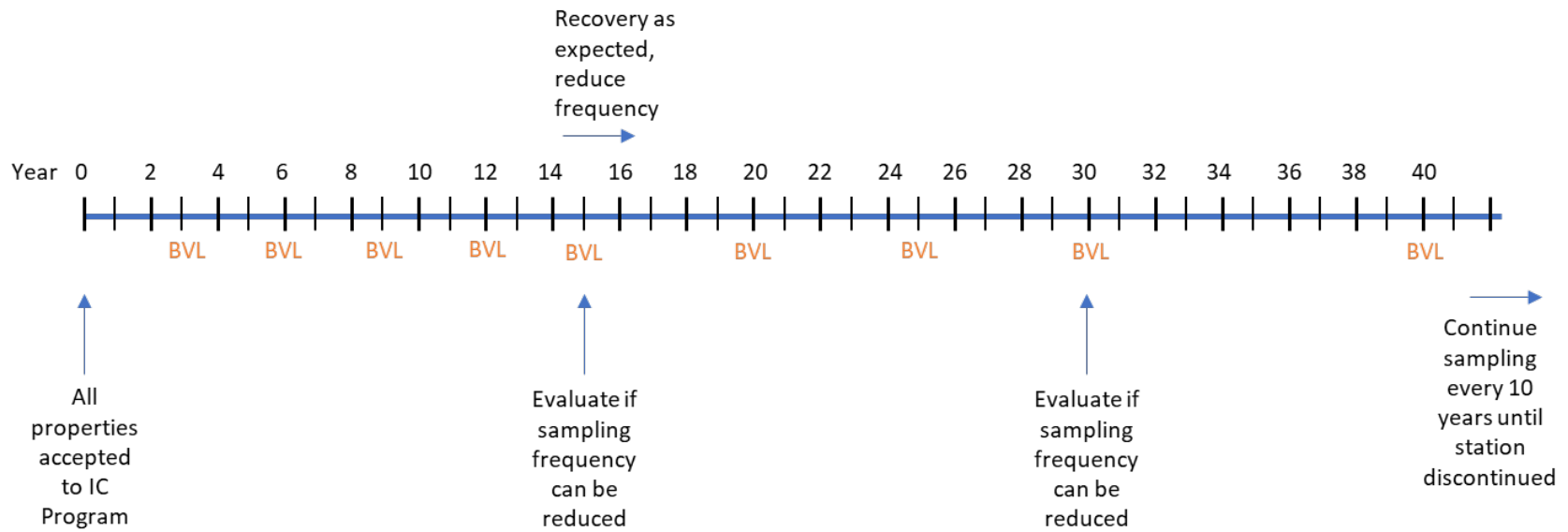
Sampling program component and Locations	Objective	Frequency	Comments
Surface Water			
Ace Creek Watershed (AN-5, DB-6, AC-6A, AC-14)	Confirm that the trends in water quality are recovering, consistent with the understanding in the 2020 ERA	Every 3 years initially ^b	Opportunity to decrease frequency after 15 years to sampling every 5 years. ^b Opportunity to decrease frequency after another 15 years to sampling every 10 years. ^b
Fulton Creek Watershed (TL-3, TL-4, TL-7, TL-9) ^a			
Beaverlodge Lake and Downstream (BL-5, ML-1, CS-1, CS-2)			
Fish			
Beaverlodge, Martin, and Cinch Lakes	Support the removal of the healthy fish consumption guideline	Every 10 years	Discontinue after healthy fish consumption guideline removed for Beaverlodge, Martin, and Cinch lakes

Notes:

a Drop upstream Fulton Creek Watershed stations (i.e., TL-3, TL-4, and TL-7) after 15 years if recovering as predicted.

b Proposed program frequency consistent with the surface water program proposed for the Cluff Lake Mine Site for management within the IC Program.

Figure 4.1 Summary of the Beaverlodge LTMP surface water sampling frequency



BVL – Ace Creek Stations + Fulton Creek Stations + Beaverlodge Lake + Downstream

Evaluate:

- Are levels below SEQGs (where they apply)?
- If above SEQG or SEQG does not apply, are trends as predicted?

Figure 4.2 Summary of the Beaverlodge LTMP surface water sampling locations

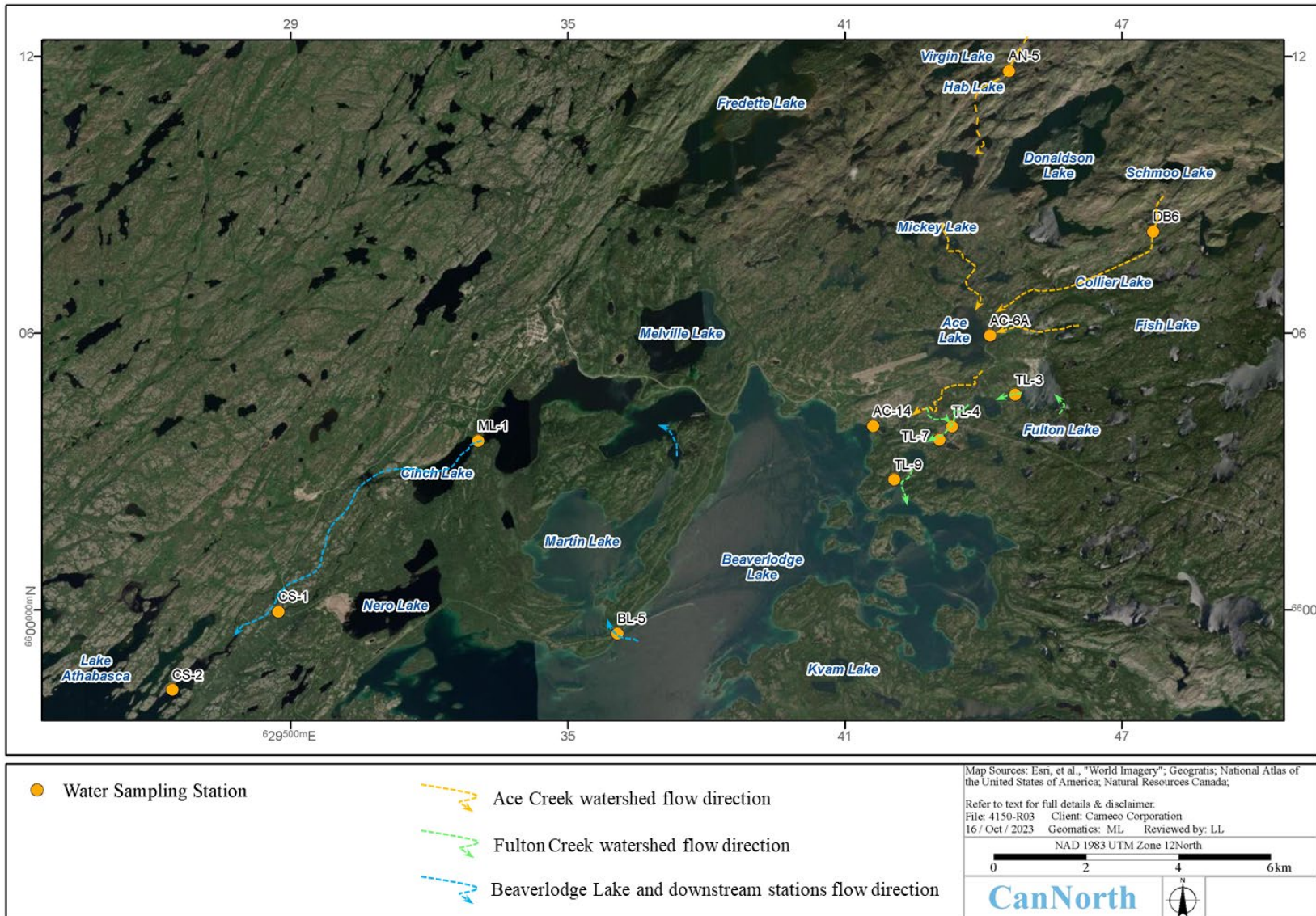
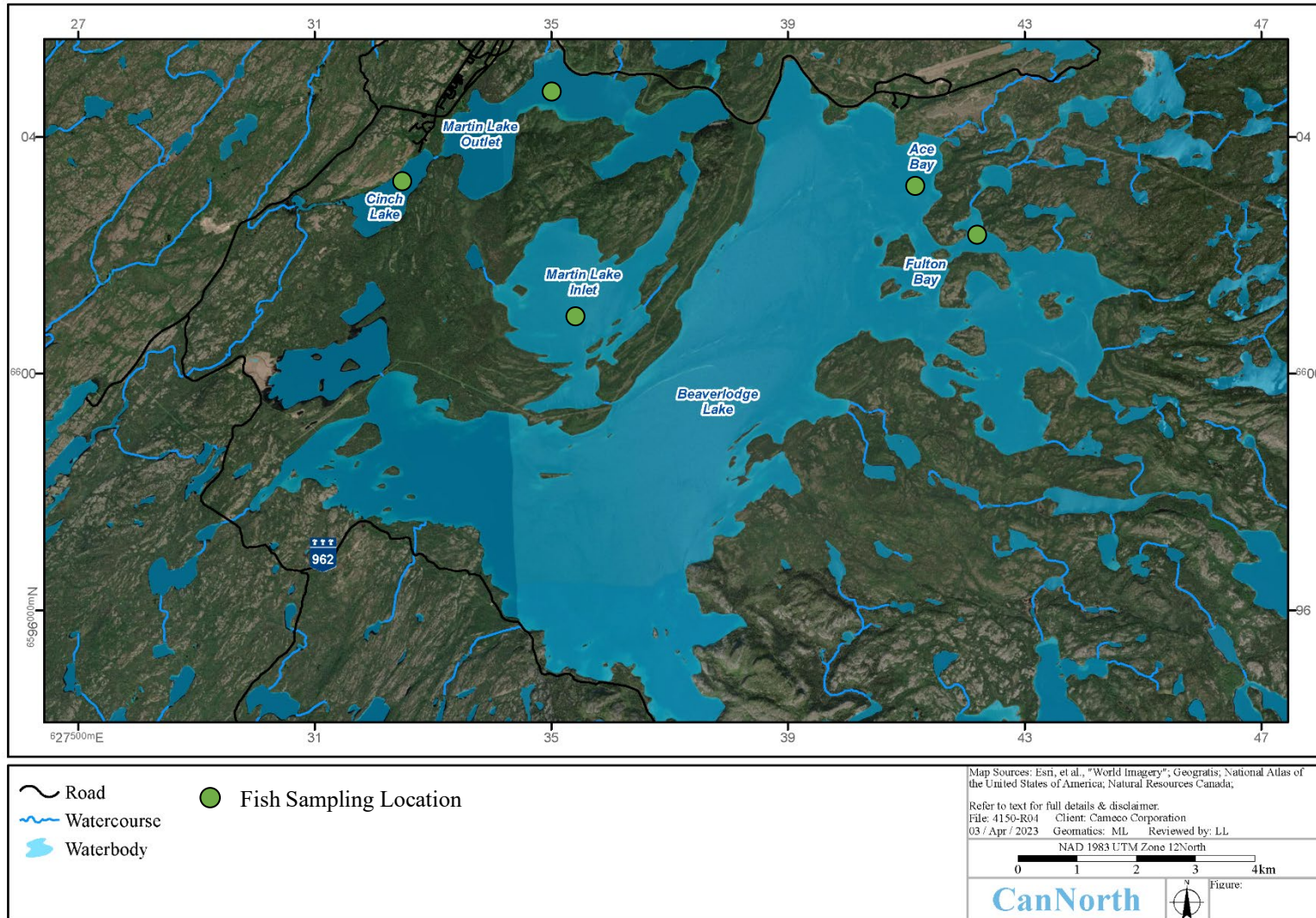


Figure 4.3 Summary of the Beaverlodge LTMP fish sampling locations



5.0 REFERENCES

CanNorth. 2020. Decommissioned Beaverlodge mine site: model update and environmental risk assessment. Prepared for Cameco Corporation.

PHU and SkMOE. 2016. Healthy Fish Consumption Guideline. Updated September 2016.

Saskatchewan Ministry of Energy and Resources. 2018. Post Closure Management of Decommissioned Mine/Mill Properties Located on Crown Land in Saskatchewan (Institutional Control Program). December.

APPENDICES

LIST OF APPENDICES

APPENDIX A: TECHNICAL EVALUATION SURFACE WATER SAMPLING PROGRAM
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SUPPORTING INFORMATION

APPENDIX C: TECHNICAL EVALUATION FISH SAMPLING PROGRAM ADDITIONAL
INFORMATION

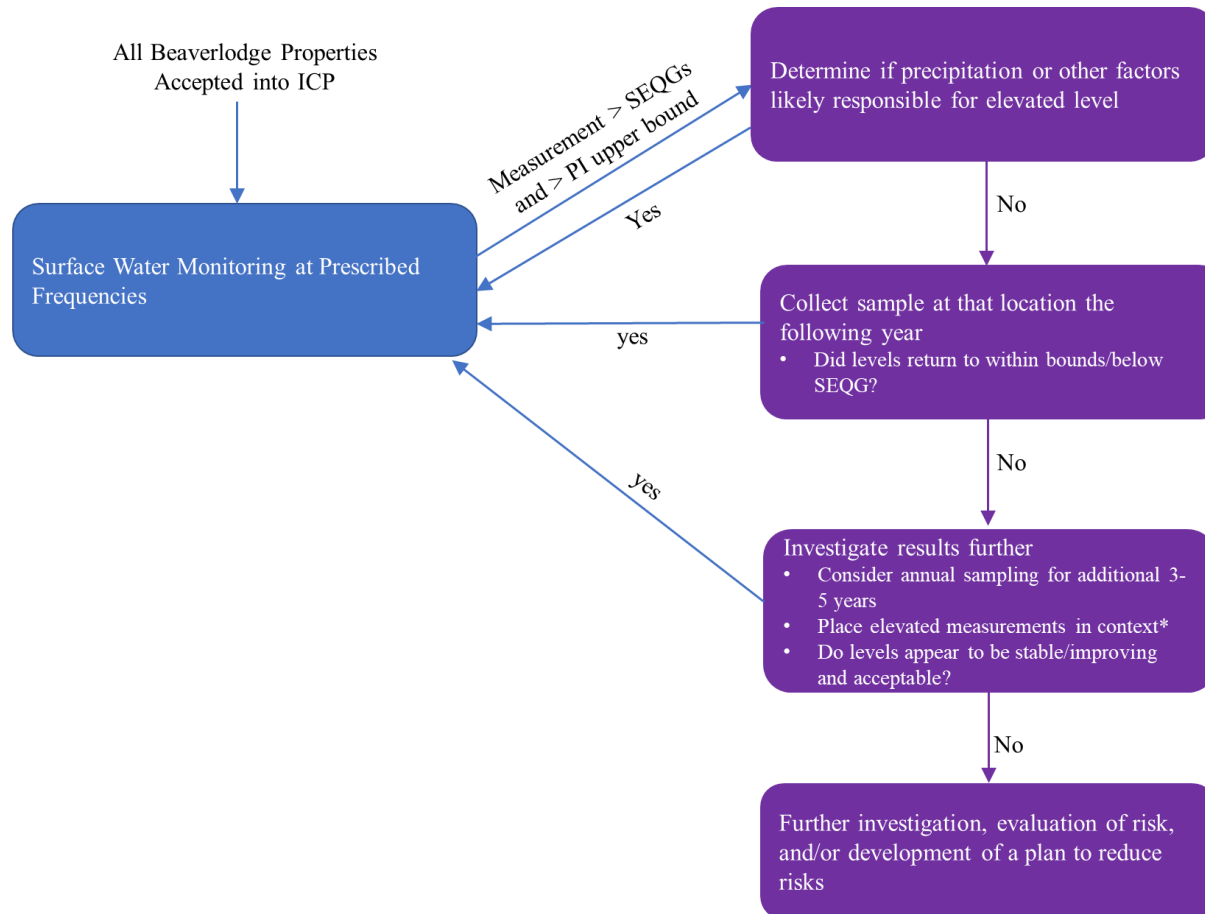
APPENDIX A: TECHNICAL EVALUATION SURFACE WATER SAMPLING PROGRAM CONTINGENCY PLAN

To meet program objectives, measured selenium, uranium, and radium-226 levels from the surface water program would be compared to the developed Performance Indicators to ensure recovery is progressing as predicted. Since the PI bounds were developed using predicted annual averages, single measurements will be outside of the bounds some fraction of the time, while the comparisons should be made to the overall predicted trends. If a measured level is above the developed Performance Indicator upper bound, the following framework is proposed to investigate further:

- Look to see if precipitation in the period before sampling was outside of normal or if there are other factors (e.g., beaver activity) that could explain the elevated levels.
 - Some professional judgment may be required when interpreting the data. This includes consideration for climate and physical changes as well as detection limits, extent of the exceedance, and spatial considerations (e.g., only one station in a watershed or multiple).
 - If elevated levels are explained by precipitation or other factors, no additional sampling is needed, continue sampling at the stipulated frequency.
- If elevated levels are not explained by precipitation or other factors, collect another sample from the station the following year to see if levels have returned to be consistent with expectations.
 - If the additional sampling is consistent with expectations (i.e., below SEQG, or below the PI upper bound), continue sampling at the stipulated frequency.
- If measured levels continue to deviate from predictions, investigate results further. This could include continuing annual sampling for an additional 3-5 years; placing elevated levels in context relative to range of observed variability and/or predicted levels for the waterbody; and evaluating if levels are stable/improving and acceptable.
 - If levels/risks are unreasonable conduct further investigation, evaluation of risk, and/or development of plan to reduce risks.

This framework is similar to the contingency in place for the decommissioned Cluff Lake Mine Site in the ICP and is detailed below in Figure A.1.

Figure A.1 Summary of Proposed Beaverlodge ICP Long-term Monitoring Plan Surface Water component, evaluation of monitoring data



*Are levels below the upper bound PI for any modelled year (risks associated with those levels were accepted)?
Are levels within the range of historical variation at this location?

APPENDIX B: TECHNICAL EVALUATION SURFACE WATER SAMPLING PROGRAM SUPPORTING INFORMATION

Additional analysis was completed in support of developing the Long-term Surface Water Sampling Program as discussed in this appendix. These lines of investigation include looking at the timescale for recovery in the context of the sampling frequency and examining surface water information to determine best time of year for sampling to occur.

B.1 Timescale for Recovery

Figure B.1 presents surface water predictions (Performance Indicators and predicted bounds) generated as part of the 2020 Beaverlodge ERA (CanNorth 2020) for selected locations and COPCs as well as indicating surface water sampling years under the developed Long-term Surface Water Sampling Program (assuming all properties are accepted into the ICP in 2025). These plots focus on COPC/location combinations where levels are anticipated to be above the SEQG in the near term. The predicted timeline for recovery in all of these cases is long in comparison to even the longest sampling frequency (i.e., 10 year interval).

For some locations (e.g., uranium in Dubyna and Verna lakes), recovery is predicted to occur more quickly in the near-term, the higher initial sampling frequency will allow these concentration decreases to be observed more closely.

Figure B.1 Example predicted recovery and sampling frequency

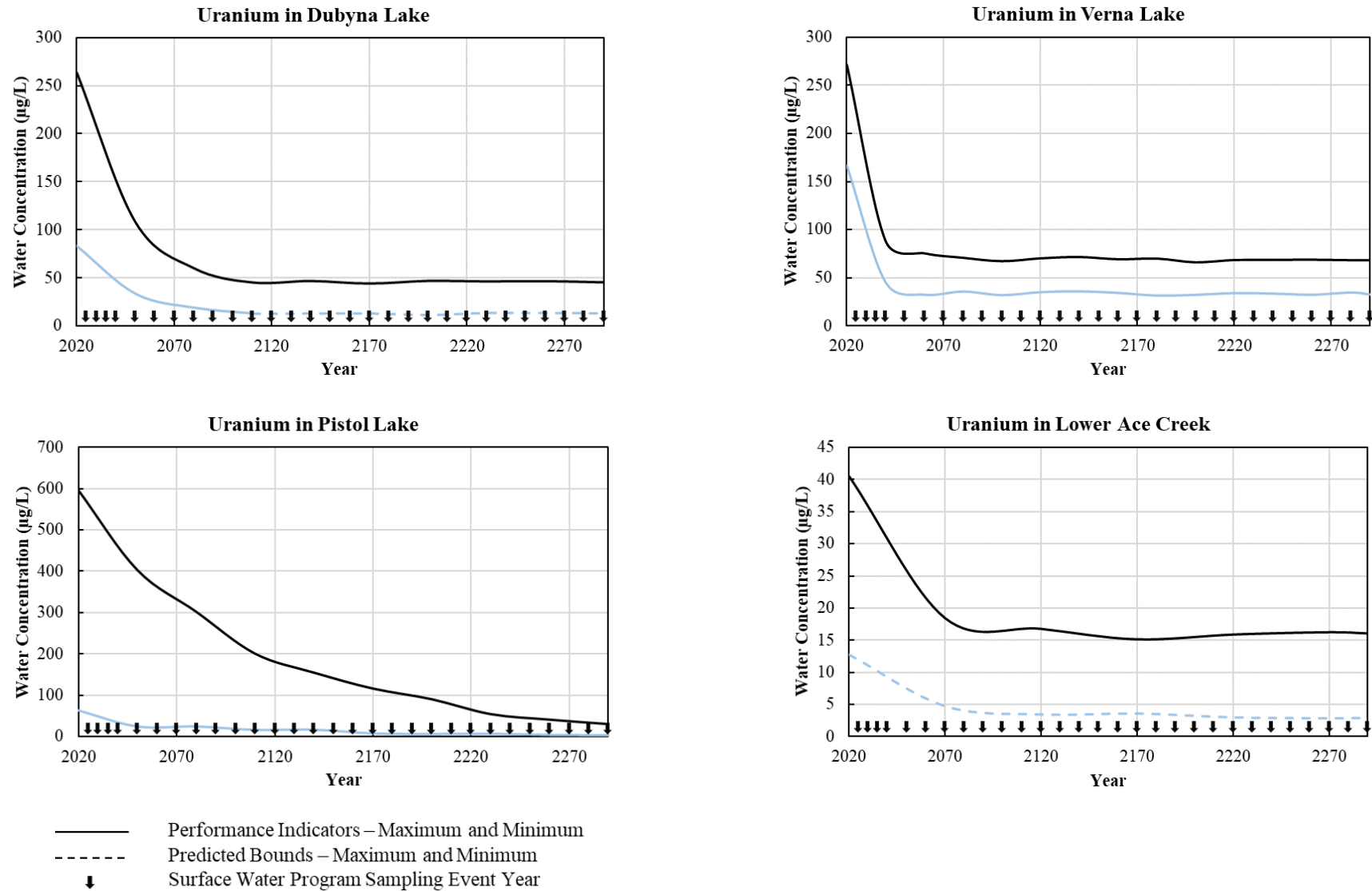


Figure B.1 Example predicted recovery and sampling frequency (Cont'd)

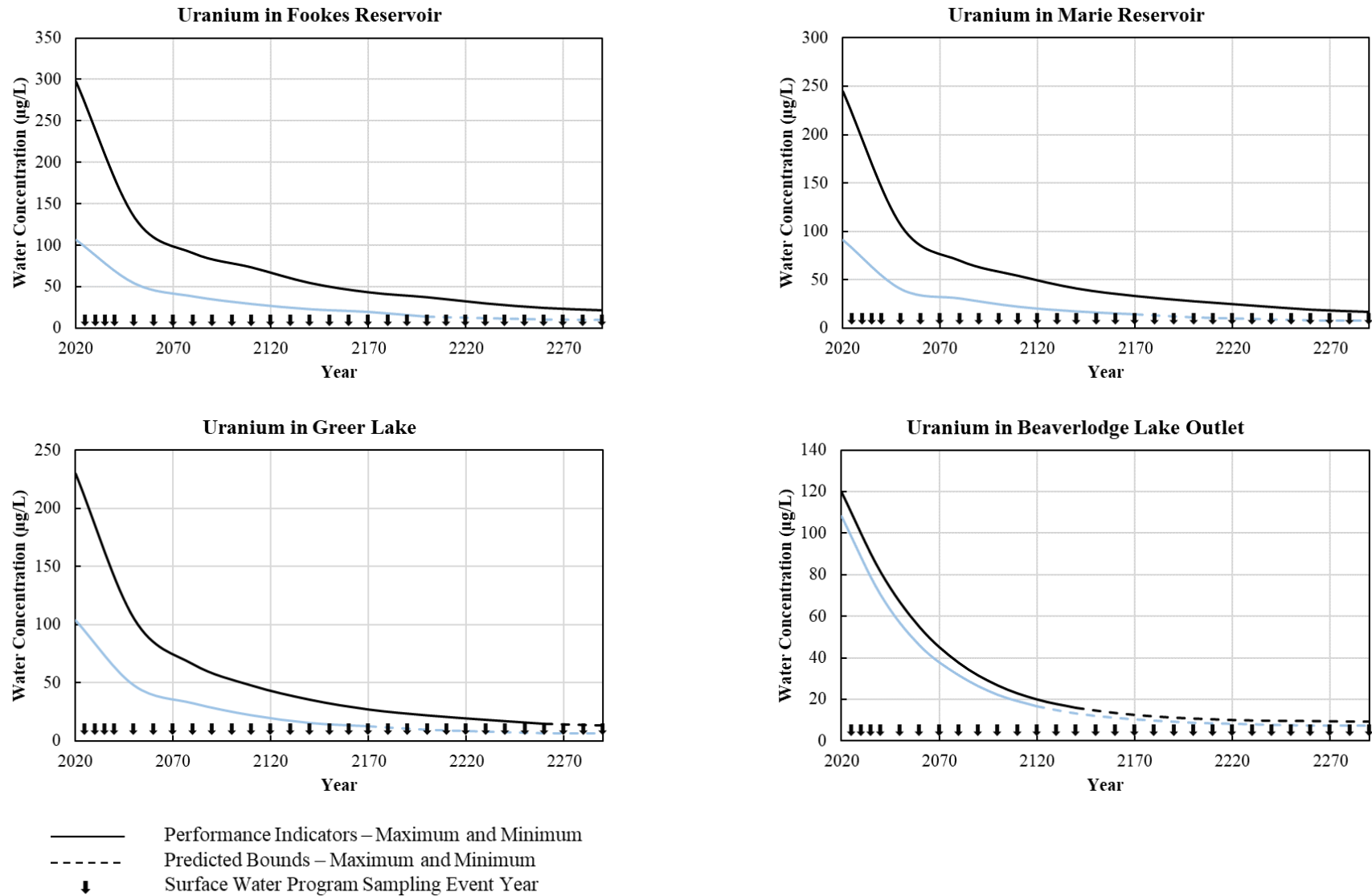


Figure B.1 Example predicted recovery and sampling frequency (Cont'd)

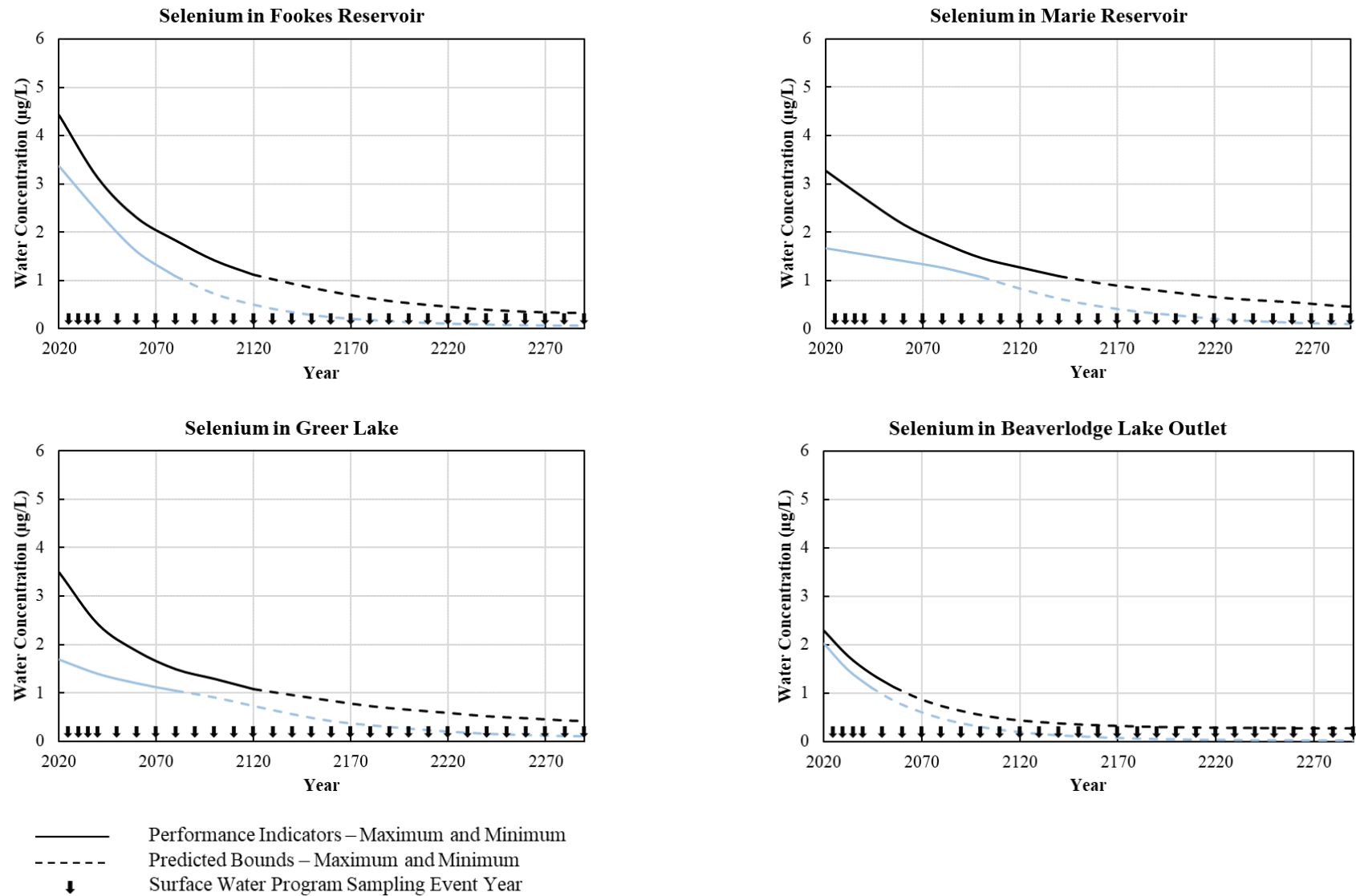
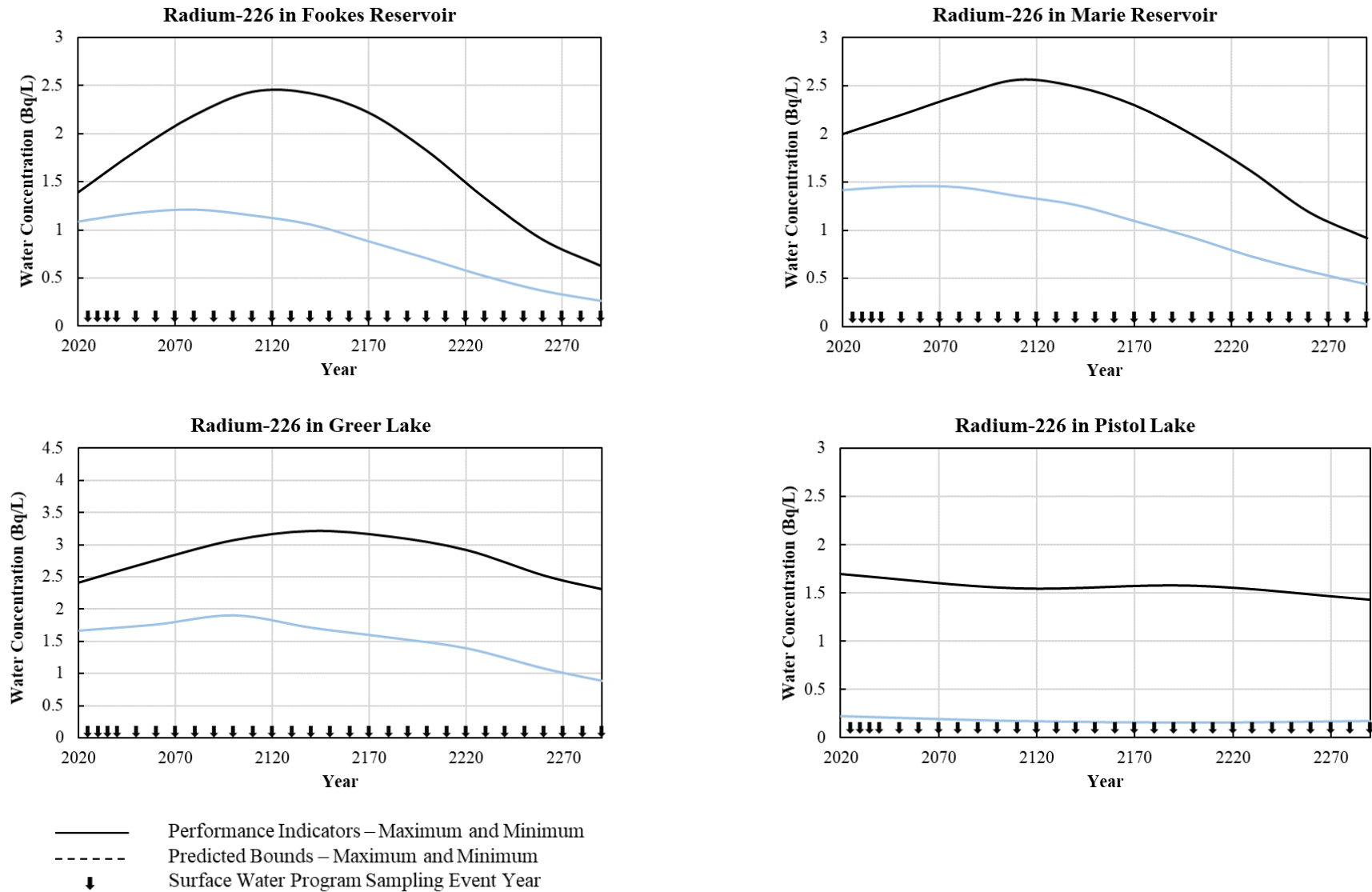


Figure B.1 Example predicted recovery and sampling frequency (Cont'd)



B.2 Seasonality and Surface Water Sampling Timing

Several factors were considered in selecting the most appropriate time of year for surface water sampling to occur. These factors include:

- Which timeframe will give the best representation of annual averages.
- Safety including ice cover/accessibility.
- Flow availability.

The Performance Indicators were developed to represent annual average levels at each location. As the Long-term Surface Water Sampling Program has a single sample collected in a sample year, it is important that sampling occur in the month/season which has the highest chance of the sample representing annual levels. To determine what time of year shows the best agreement with annual average levels, historical surface water measurements were examined. This investigation considered measured selenium, uranium, and radium-226 levels from 1983 to 2022.

For this analysis March, April, and May were taken to represent spring; June, July, and August represent summer; September and October were considered fall; and November, December, and January represent winter. For each year with measured data, the percent difference between the average calculated for samples from each season were compared to the average considering all measured data for that year; this was done for selenium, uranium, and radium-226 at each monitoring station. The results of this analysis are presented below in Table B.1 and Figure B.2.

Figure B.2 presents the deviation from annual average for stations where levels were generally elevated. Extremely high seasonality is seen at the outlet of Pistol Lake (AN-5). This is not surprising as the Pistol Lake area is very small and, as such, is significantly influenced by flow (rainfall and snowmelt).

Overall seasonal deviation from annual averages were calculated for stations where levels of each parameter were generally elevated; these results are presented in Table B.1. Some stations were not included in the analysis presented in Table B.1 so that the overall trends are not overshadowed by results of stations with highly variable data; these are discussed in the table.

Looking at the analysis which considered the entire available dataset (i.e., 1983 to 2022), the data suggest summer and fall are best for radium-226 and selenium while spring and fall are best for uranium.

Table B.1 Calculated differences between seasonal and annual averages

Radium-226	Spring	Summer	Fall	Winter
2018-2022	4%	1%	-5%	1%
2008-2022	-1%	5%	-5%	1%
1983-2022	-8%	2%	1%	6%

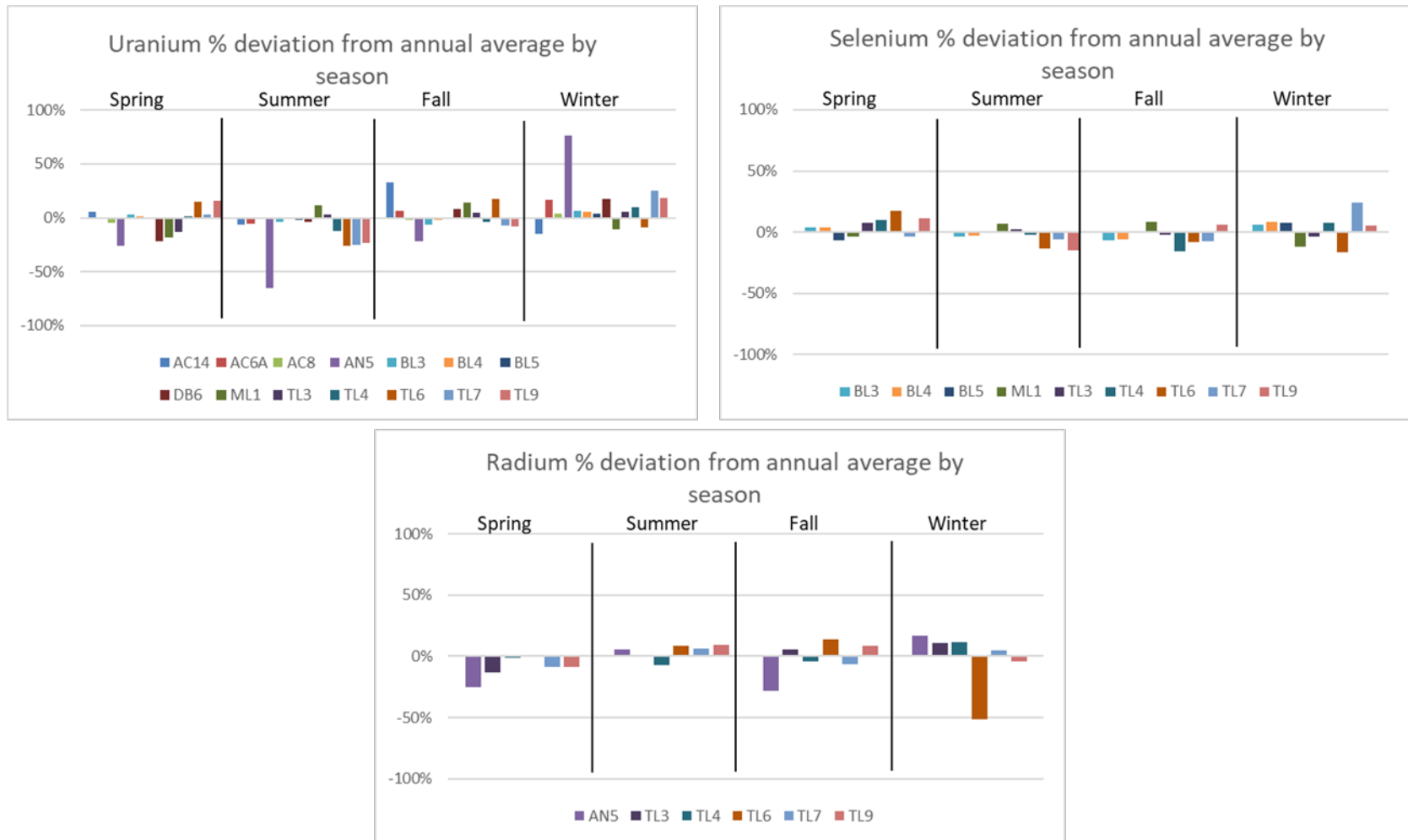
Selenium	Spring	Summer	Fall	Winter
2018-2022	2%	0%	-3%	5%
2008-2022	5%	-2%	-2%	2%
1983-2022	3%	-2%	-2%	5%

Uranium	Spring	Summer	Fall	Winter
2018-2022	6%	-6%	2%	7%
2008-2022	3%	-7%	2%	7%
1983-2022	-2%	-5%	3%	7%

Note: Summary of data shown in Figure B.2, however, stations AN-5 (Pistol Lake) and TL-6 (Minewater Reservoir) were not included (where relevant) due to high variability at these small waterbodies.

Considering the other factors discussed above, while flow availability would be good in the spring, accessibility would be uncertain and would need to be based on local environmental conditions each year. In contrast, there are many stations across the Decommissioned Beaverlodge Mine Site which are regularly dry with insufficient flow to collect a sample in the fall. All things considered, June was selected as the sampling window; there is reasonable agreement with annual average levels, and it has the best chance of being both ice-free and having enough flow to sample. Based on the analysis presented in Figure B.2, however, there is the potential for uranium to be underrepresented particularly in the Fulton Creek Watershed.

Figure B.2 Evaluation of seasonality within historical monitoring data

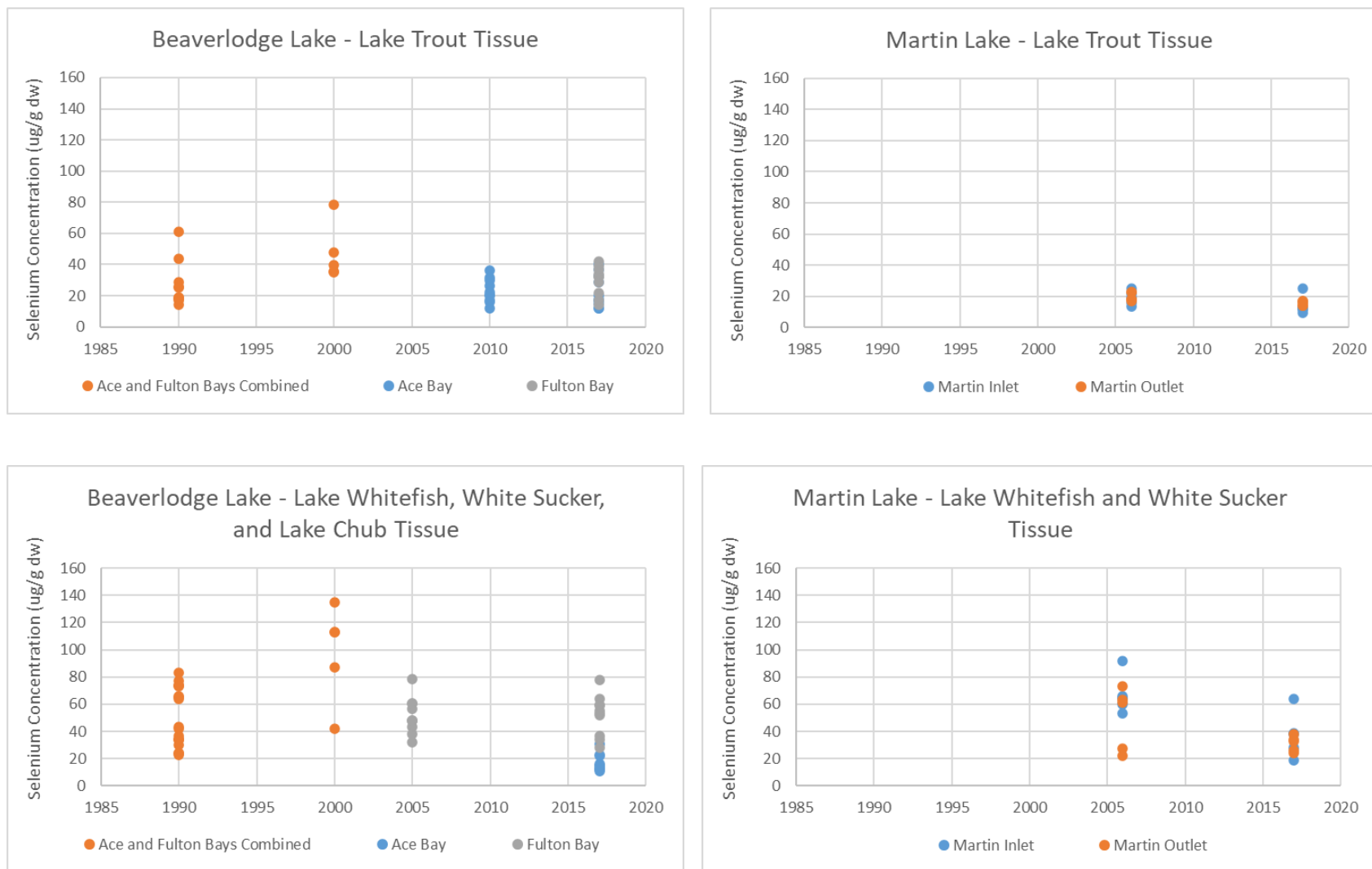


**APPENDIX C: TECHNICAL EVALUATION FISH SAMPLING PROGRAM
ADDITIONAL INFORMATION**

Figures C.1 and C.2 below show historical measurements of selenium in fish tissue in Beaverlodge Lake and Martin Lake both as raw data and as averages with standard deviations indicated. Results for a piscivorous species (i.e., lake trout) are shown on the top plots in each figure while species with a benthic diet are shown in the bottom plots. Available data are from 1990 through 2017.

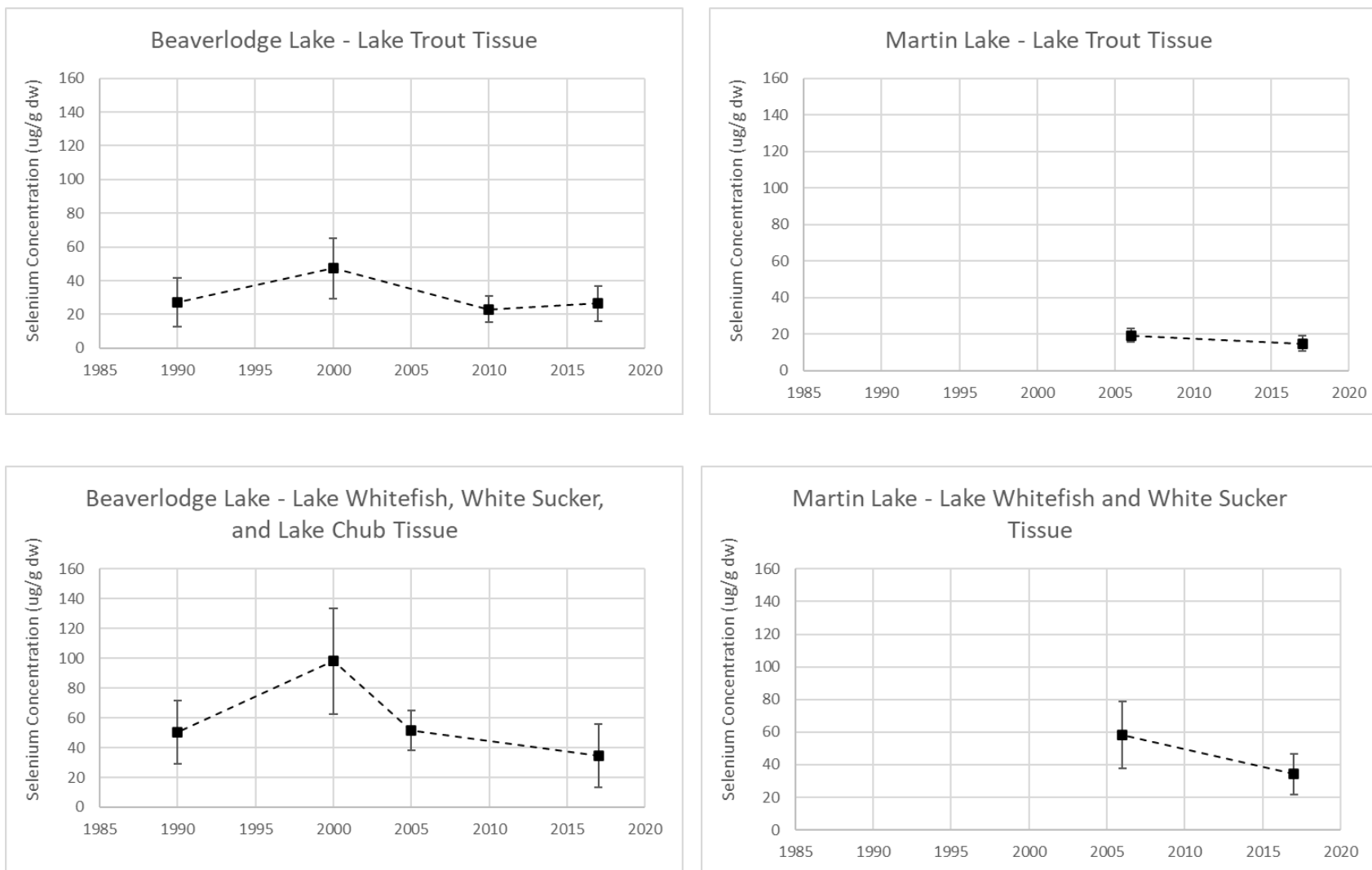
Examining measured fish tissue selenium concentrations from the Beaverlodge area for 1990 through 2017 to illustrate that recovery is occurring very slowly, particularly in Beaverlodge Lake. The proposed 20 year sampling frequency is quite short in comparison to the changes in fish concentrations. It should be noted that the exact approach for setting/removing the healthy fish consumption guideline is up to the SHA.

Figure C.1 Beaverlodge Lake and Martin Lake Fish Tissue Data



Note: each point represents a single fish tissue concentration

Figure C.2 Beaverlodge Lake and Martin Lake Fish Tissue Average and Standard Deviation



Note: data series represents average concentrations and error bars represent \pm a standard deviation