BEAVERLODGE PROJECT

Beaverlodge Project
2020 Annual Report
Year 35 Transition Phase Monitoring

Prepared for:
Canadian Nuclear Safety Commission
Compliance Report for Licence: WFOL-W5-2120.0/2023 &
Saskatchewan Ministry of Environment
Compliance Report: Beaverlodge Surface Lease

Prepared and Submitted by:
Cameco Corporation

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INTRODUCTION

1.0 INTRODUCTION

This report is submitted in compliance with Canadian Nuclear Safety Commission (CNSC) Waste Facility Operating Licence WFOL-W5-2120.1/2023 issued to Cameco Corporation (Cameco) for the decommissioned Beaverlodge properties (*CNSC 2019*).

The report is also submitted in compliance with the Beaverlodge Surface Lease Agreement between the Province of Saskatchewan and Cameco Corporation, dated December 24, 2006.

The report describes observations and activities on the decommissioned Beaverlodge properties between January 1, 2020 and December 31, 2020. Results of environmental monitoring programs conducted for the decommissioned Beaverlodge properties during this period are provided in the report and, where applicable, historical environmental data has been included and discussed as part of the overall assessment of the decommissioned properties. The status of current projects and activities conducted as of the end of December 2020 are provided, along with an overview of anticipated activities planned for 2021.

SECTION 2.0

GENERAL

2.0 GENERAL INFORMATION

2.1 Organizational Information

2.1.1 CNSC Licence/Provincial Surface Lease

The CNSC Waste Facility Operating Licence WFOL-W5-2120.1/2023 and the Province of Saskatchewan - Beaverlodge Surface Lease, December 24, 2006 are issued to:

Cameco Corporation
2121 - 11th Street West
Saskatoon, Saskatchewan S7M 1J3
Telephone: (306) 956-6200
Fax: (306) 956-6201

2.1.2 Officers and Directors

The officers and board of directors of Cameco as of December 31, 2020 are as follows:

Officers

Tim Gitzel	President and Chief Executive Officer
Brian Reilly	Senior Vice-President and Chief Operating Officer
Alice Wong	Senior Vice-President and Chief Corporate Officer
Grant Isaac	Senior Vice-President and Chief Financial Officer
Sean Quinn	Senior Vice-President, Chief Legal Officer, and Corporate Secretary

Board of Directors

Ian Bruce, chair	Tim Gitzel
Leontine Atkins	Jim Gowans
Daniel Camus	Kathryn Jackson
Donald Deranger	Don Kayne
Catherine Gignac	Anne McLellan

2.2 CNSC Licence

On May 27, 2013 the CNSC notified Cameco that the Commission had renewed the Waste Facility Operating Licence for a period of 10 years, from June 1, 2013 until May 31, 2023. The license was revised in 2019 to accommodate the release of 20 properties from CNSC licensing.

The 10-year licence term will allow implementation of selected remedial options and post remediation monitoring. The goal for managing the decommissioned Beaverlodge properties is to show the properties meet the performance objectives to allow for transfer of the properties to the Province of Saskatchewan's Institutional Control (IC) Program.

2.3 Provincial Surface Lease

The current provincial surface lease for the decommissioned Beaverlodge properties was issued to Cameco on December 24, 2006 with an expiry date of December 24, 2026.

2.4 Beaverlodge History

The decommissioned Beaverlodge properties are located north of Lake Athabasca, northeast of Beaverlodge Lake, in the northwest corner of Saskatchewan at approximately N59° 33'15" and W108° 27'15" (**Figure 2.4**).

In 1950 Eldorado Mining and Refining Ltd. began development of the Ace Shaft followed by the Fay Shaft in 1951. In 1953 the carbonate-leach mill began production A small acid-leach circuit was added in 1957 to handle a small amount of ore containing sulphides. Non-sulphide ore was sent directly to the carbonate circuit, while the sulphide concentrate was treated in the acid-leach circuit.

During mining, the primary focus was on an underground area north and east of Beaverlodge Lake where the Ace, Fay and Verna shafts were located. Production from these areas continued until 1982. Over the entire 30-year production period (1952 to 1982) the majority of the ore used to feed the mill came from these areas; however, a number of satellite mines, primarily in the Ace Creek watershed, were also developed and operated for shorter periods of time. During the mill operating period, tailings were separated into fine and coarse fractions. The fine fraction (approximately 60% of the tailings) was placed into water bodies within the Fulton Creek watershed, and the course fraction (remaining 40% of the tailings) was deposited underground for use as backfill.

During the early years of operation, uranium mining and milling activities conducted at the decommissioned Beaverlodge properties were undertaken using what were considered acceptable practices at the time. However, these practices did not have the same level of rigor for the protection of the environment as is currently expected. Although the Atomic Energy Control Board (AECB) licensed the Beaverlodge activities, environmental protection legislation and regulation existed neither federally nor provincially and therefore was not a consideration during the early operating period. It was not until the mid-1970s, some 22-plus years after operations began, that effluent treatment processes were initiated at the Beaverlodge site in response to discussions with provincial and federal regulatory authorities.

At the request of the AECB, a conceptual decommissioning plan was submitted in June 1981. On December 3, 1981 Eldorado Nuclear Limited (formerly Eldorado Mining and Refining Ltd.) announced that its operation at Beaverlodge would be shut down.

Mining operations at the Beaverlodge site ceased on June 25, 1982 and the mill discontinued processing ores in mid-August 1982. Eldorado Resources Limited (formerly Eldorado Nuclear Limited) initiated site decommissioning in 1982 and completed it in 1985. Letters were issued by AECB indicating that the sites had been satisfactorily remediated (*Eldorado Nuclear Ltd. 1982*; *Eldorado Resources Ltd. 1983*; *MacLaren Plansearch 1987*). Transition-phase monitoring was then initiated to monitor the status of the remediation efforts.

On February 22, 1988 the Government of Canada and the Province of Saskatchewan publicly announced their intention to establish an integrated uranium company as the initial step in privatizing their respective uranium investments.

On October 5, 1988 Cameco, a Canadian Mining and Energy Corporation, was created from the merger of the assets of the Saskatchewan Mining Development Corporation and Eldorado Resources Ltd. Following the merger, management (monitoring and maintenance) of the decommissioned Beaverlodge properties became the responsibility of Cameco, while the Government of Canada, through Canada Eldor Inc. (CEI), retained responsibility for the financial liabilities associated with the properties.

In 1990, the corporate name was changed to Cameco, with shares of Cameco being traded on both the Toronto and New York stock exchanges.

The management of the Beaverlodge monitoring program and any special projects associated with the properties is the responsibility of the Senior Reclamation Specialist, SHEQ - Compliance and Licensing, Cameco.

2.5 The Path Forward Plan

2.5.1 Institutional Control Program

In 2007, after significant consultation with various stakeholders, including the CNSC, the mining industry, Indigenous organizations and communities in the major mining regions of the province, the Government of Saskatchewan proclaimed *The Reclaimed Industrial Sites Act (2014)* and its associated regulations to establish and enforce the Institutional Control Program (IC Program). The IC Program establishes 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/improving.

2.5.2 The Beaverlodge Management Framework

The Beaverlodge Management Framework and supporting documents were developed in 2009 by Cameco and the Joint Regulatory Group (JRG), which included the CNSC, Environment and Climate Change Canada (ECCC), the Department of Fisheries and Oceans Canada (DFO), and the Saskatchewan Ministry of Environment (SkMOE). The intent of the Beaverlodge Management Framework is to provide a clear scope and objectives for the management of the decommissioned Beaverlodge properties along with a systematic process for assessing site-specific risks to allow decisions to be made regarding the transfer of decommissioned Beaverlodge properties to the IC Program. The framework has been reviewed by public stakeholders, including the Northern Saskatchewan Environmental Quality Committee (NSEQC), as well as residents and leaders of the Uranium City community. A simplified version is provided below in **Figure 2.5-1**.

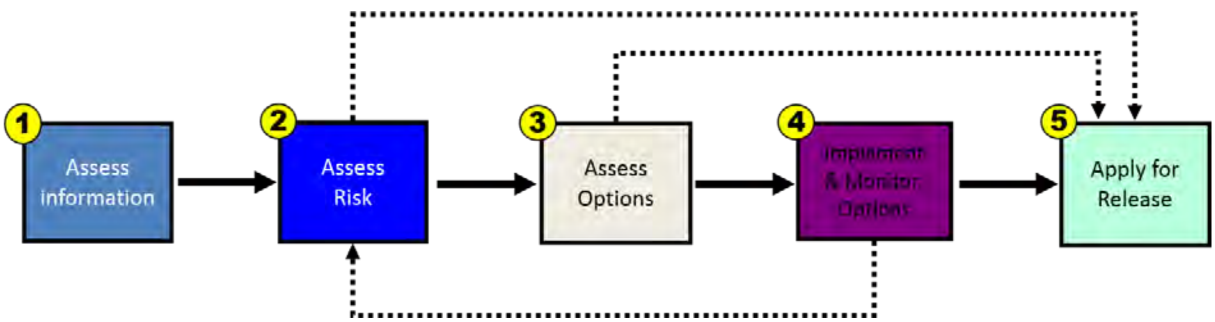


Figure 2.5-1 Simplified Beaverlodge Management Framework

The information gathered by Cameco and its consultants, combined with historical information, was used to develop the Beaverlodge Quantitative Site Model (QSM) in 2012.

The information gathered as part of Box 1 (of **Figure 2.5-1**) by Cameco and its consultants, combined with historical information, was used to develop the Beaverlodge Quantitative Site Model (QSM) in 2012 (Box 2 of **Figure 2.5-1**). The QSM was developed to assess ecological and human health risk from the 2012 baseline water and sediment quality established by information gathered in the first phase of the Management Framework. The QSM provides insight into the interactions between potential contaminant sources and transport in the Beaverlodge area watersheds, which established the predicted rates of natural recovery for the system. In addition, the QSM was developed with a feature that allows the simulation of potential remedial activities and compares results to the baseline option (natural recovery). This comparison allowed an assessment of the potential environmental benefits and other effects of implementing each remedial option alone or in combination with other options (Box 3 of **Figure 2.5-1**).

In 2020 the QSM was replaced with the 2020 Beaverlodge Environmental Risk Assessment (ERA). The performance indicators were updated alongside water quality predictions.

The path forward plan describes specific remedial activities selected to improve local environmental conditions. In addition, the path forward plan also describes the monitoring expectations to assess the success of the implemented activities (Box 4 of **Figure 2.5-1**).

Once it has been shown that the selected remedial activities have been successfully implemented, and once properties are shown to meet the site performance objectives of safe, secure, and stable/improving, Cameco will initiate the process to transfer the eligible property to the Province of Saskatchewan's IC Program for long-term monitoring and maintenance (Box 5 of **Figure 2.5-1**).

The remaining licensed Beaverlodge properties will continue to be managed in accordance with the Beaverlodge Management Framework and related timelines, with additional groups of properties expected to be released in stages over the next few years. As properties are assessed to meet the performance objectives, an application will be made to have these properties Released from Decommissioning and Reclamation by SkMOE, released from CNSC licensing, and transferred to the IC Program for long-term monitoring and maintenance. Ultimately, it is Cameco's intent to transfer all Beaverlodge properties to the Province of Saskatchewan's IC Program for long-term monitoring and maintenance.

2.5.3 Performance Objectives and Indicators

Criteria to determine the eligibility for release from CNSC licensing were presented to the Commission with the intent that each of the properties associated with the decommissioned Beaverlodge properties will be assessed through the Beaverlodge Management Framework. The performance objectives for the decommissioned Beaverlodge properties were later defined and presented to the Commission as "safe, secure, and stable/improving" (*CNSC 2014*).

- Safe – The site is safe for unrestricted public access. This objective is to ensure that the long-term safety is maintained.
- Secure – There must be confidence that long-term risks to public health and safety have been assessed by qualified person and are acceptable.

- Stable/Improving – Environmental conditions (e.g., water quality) on and downstream of the decommissioned properties are stable and continue to naturally recover as predicted.

Site specific performance indicators were established as a measure to determine if a site is meeting the performance objectives. The applicable indicators vary depending on the nature of the property, but generally include ensuring that risks associated with residual gamma radiation and crown pillars are acceptable, mine openings to surface are secure, boreholes are sealed, and the site is free from historical mining debris. To ensure the performance objectives of safe and secure continue to be met, once the properties have been transferred to the IC Program, inspections will be scheduled as part of the IC monitoring and maintenance plan.

The stable/improving objective is also related to the performance indicators discussed in the previous paragraph; however, it is more relevant to monitoring water quality. In order to verify that conditions on and downstream of the properties are stable/improving, Cameco will continue to monitor the progress of natural recovery and the expected localized improvements from the additional remedial measures implemented at the properties until they are transferred to the IC Program. To ensure the performance objective of stable/improving continues to be met once properties have been transferred to the IC Program, a long-term monitoring program will be implemented at the time of transfer. **Figure 2.5-2** is an illustration of the performance objectives and associated performance indicators. Further explanation on the performance indicators and the criteria to satisfy them are provided in **Table 2.5-1**.

Figure 2.5-2 Beaverlodge Performance Objectives

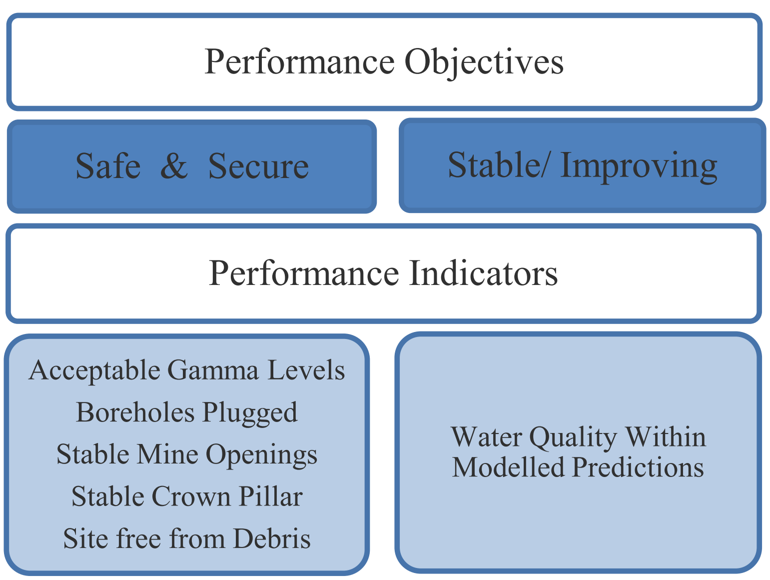


Table 2.5-1 Beaverlodge Performance Indicators

Performance Indicators	Description	Acceptance Criteria
Acceptable Gamma Levels	Cameco will complete a site wide gamma survey which will indicate where additional material may need to be applied to cover existing waste rock or tailings. Following the application of the cover material, a final survey will be completed of the remediated areas verifying that the cover was adequate.	Reasonable use scenario demonstrating gamma levels at the site are acceptable.
Boreholes Plugged	Cameco will plug all identified boreholes on the site to prevent groundwater outflow to the surface.	All boreholes have been sealed.
Stable Mine Openings*	The current concrete caps on the vertical mine openings will be replaced with new engineered caps with established designs to improve the long-term safety of the site, where applicable.	Mine openings have been secured and signed off by a qualified person, where applicable*
Stable Crown Pillar	Based on the surface subsidence in the Lower Ace Creek area, a crown pillar assessment will be completed for the four areas that have mine workings close to surface including Hab, Dubyna, Bolger/Verna, and Lower Ace Creek.	Crown pillar assessed, remediated if required, and signed off by a qualified person.
Site Free From Debris	Inspection and removal of residual debris will be completed prior to releasing the properties from CNSC licensing and transferring them into the provincial Institutional Control Program.	Site free of former mining debris at the time of transfer to institutional control.
Water Quality Within Modelled Predictions	Water quality monitoring will be compared to model predictions to verify: 1. That remedial options expected to result in localized improvements are having the desired effects; and 2. That natural recovery on and downstream of the decommissioned properties is continuing as predicted.	Water quality data is stable/improving.

*Note: The performance indicator identified above as "Stable Mine Openings" was originally labelled as "Stable Caps on Vertical Mine Openings".

The scope and acceptable criteria for this performance indicator was expanded to include all mine openings.

2.5.4 Release of the Beaverlodge Properties to Institutional Control

Once a property has been adequately remediated and meets the performance objective of safe, secure and stable/improving, a request will be made by Cameco to obtain the regulatory releases required to facilitate transferring the properties to the IC Program.

To facilitate release from CNSC licensing and transfer to the IC program, Cameco proposed advancing properties in a staged approach. In 2009, Cameco successfully transferred 5 properties to the provincial IC Program, following release from decommissioning and reclamation by SkMOE, release from CNSC licensing and acceptance by the Saskatchewan Ministry of Energy and Resources (SkMER). Most recently, in 2019 and 2020, Cameco successfully transferred 18 properties to the provincial IC Program, following release from decommissioning and reclamation by SkMOE, release from CNSC licensing and acceptance by the Saskatchewan Ministry of Energy and Resources (SkMER). One property and portions of some properties were free-released due to the absence of historical mining/milling activities and lack of any safety or environmental risk and therefore have not required any long-term monitoring or ongoing administrative controls. In January 2021 Cameco submitted a final closure report to initiate the process for transferring an additional 18 properties to the IC program or free released if applicable. A summary of all properties transferred or free released to date, as well as those remaining is provided in **Appendix A.**

SECTION 3.0

SITE ACTIVITIES

3.0 SITE ACTIVITIES

The performance of the decommissioned Beaverlodge properties compared to the performance objectives is assessed through routine inspections conducted by Cameco personnel, third party consultants and/or members of the Joint Regulatory Group (JRG). In addition, special monitoring/investigation projects are completed where required to gather information to support characterization of the site, and aid in assessing the performance of specific components of the decommissioned areas. Results from the activities completed each year as well as updates on the status of the remediation projects at the Beaverlodge properties are communicated through regular meetings with the public. The following section outlines activities related to the decommissioned Beaverlodge properties during the reporting period.

3.1 COVID-19

Cameco has implemented many measures to limit the transmission of COVID-19 to workers and the communities in which they reside. Site activities at Beaverlodge were largely scoped to what onsite contractors could complete in 2020 to reduce potential transmission of the virus. When it was deemed safe to do so and following provincial government requirements, Cameco personnel, regulators and contractors from outside the Uranium City community conducted limited activities in 2020. During these site activities, Cameco actively promoted the general public health measures of hand washing and social distancing as well as increased the use of personal protective equipment (e.g., masks) and disinfectants. The following were also implemented at site:

- Personnel outside of the Uranium City community remained within their own cohort (e.g., no shared accommodation or vehicles with non-Beaverlodge related personnel and limited interaction with local residents)
- Screening protocols for all flights, included temperature checks and screening surveys that align with the guidance of government and public health authorities.

3.2 Routine Inspections and Engagement Activities

3.2.1 Joint Regulatory Group Inspections

The JRG is comprised of representatives of various federal and provincial regulatory agencies. Saskatchewan Ministry of Environment represents the Province of Saskatchewan and is responsible for oversight of uranium mining and milling activities in the province, while the Canadian Nuclear Safety Commission is responsible for regulating and licensing all uranium mining and milling operations in Canada and is the lead federal agency. The additional federal regulatory agencies listed below are considered part of the JRG and are utilized as resources, when required:

- Canadian Nuclear Safety Commission (CNSC)
- Saskatchewan Ministry of Environment (SkMOE)
- The Department of Fisheries and Oceans Canada (DFO)

- Environment and Climate Change Canada (ECCC)

JRG inspections are conducted to ensure conditions on the properties do not impact the health and safety of people; the continued protection of the environment; and that the requirements of the licence continue to be met. In 2020, representatives from Cameco, CNSC, and SkMOE completed a compliance inspection of the decommissioned Beaverlodge properties from September 28 to October 2, 2020. The inspection took place in fall after being delayed due to COVID-19 related travel restrictions.

The objective of the inspection was to complete a general assessment of the safety, security and stability of the decommissioned Beaverlodge properties, while focussing on the properties planned for transfer to the IC Program and to identify any remaining tasks to be completed prior to transferring the selected properties. In addition, the inspection was completed to verify compliance with Cameco's approved licence documents, elements of the Saskatchewan *Environmental Management and Protection Act (2010)* and associated regulations.

As a result of the JRG inspection, the CNSC issued an Inspection Report on October 14, 2020 titled CAMECO-BVL-2020-01. As a result of this inspection two recommendations were provided by the CNSC. The findings were considered low risk and did not pose concern regarding the protection of the environment or the health and safety of workers or the public. The recommendations were related to activities required prior to the properties being considered for release from CNSC licensing in anticipation of them being transferred to the IC program. Cameco provided written responses regarding the actions completed or plans to address the recommendations listed in the Inspection Report. Due to the timing of the inspection, an early snowfall in 2020, and equipment availability following the October 2nd inspection, the outstanding activities are planned for completion in 2021.

SkMOE issued an Inspection Report on November 17, 2020. No new action items or recommendations were issued within the report, however, "remediation items to address before release to Institutional Control" were identified on the inspection report, and the Ministry's expectation was to receive a written response from Cameco. On December 2, 2020, Cameco acknowledged the inspection report was received, and that Cameco will respond to the items following the 2021 field season.

3.2.2 Geotechnical Inspection

Third party geotechnical inspections have been conducted on the Beaverlodge properties since decommissioning was completed. The frequency of the third-party inspections has decreased over time and following the 2010 geotechnical inspection, the frequency of the third-party inspections of the Fookes Delta and outlet structures at Marie and Fookes reservoirs was adjusted from every three years to every five years until such time as the properties are ready for transfer to the IC Program. Following this change in frequency, inspection checklists were developed with the third-party experts to guide Cameco personnel to perform annual inspections of the areas during years where a third-party inspection is not scheduled. The first third-party inspection following the change in frequency was conducted in 2015, with the third-party inspection occurring in 2020 as scheduled. Since 2015 additional geotechnical aspects have been added to the inspection and are also discussed below.

The 2020 geotechnical inspection of the decommissioned Beaverlodge mine site was completed by SRK Consulting on September 16 and 17, 2020. The report is provided as **Appendix B**. The site visit was conducted with the purpose of completing geotechnical inspections of the following areas:

- The two outlet spillways at Fookes and Marie Reservoirs;
- Marie Reservoir Delta;
- Ace Creek Catchment Area III;
- Ace Stope Area;
- Bolger Pit, including the flow path from Zora Lake to Verna Lake;

Inspections of the ground surface overlying crown pillars were completed at the following two mine areas:

- The Hab Area; and
- The Dubyna Area.

The observations from the 2020 inspection were assessed relative to the observations from past inspections, with a focus on changes since the 2015 SRK inspection and the annual inspections by Cameco from 2016 to 2019, inclusive. Based on this assessment, SRK concluded that these sites are stable and are expected to remain so in the future. It is SRK's opinion, therefore, that the conditions at the areas noted above are appropriate for final close out and a transfer to the IC program.

Until such time that the transition to the IC program has been completed, SRK recommended that Cameco continue with annual inspections performed using the existing inspection protocols. Involvement by an external geotechnical engineer would not be required except in the unlikely event that geotechnical concerns arise. Following the transition to the IC Program, inspections are planned every five years for two cycles.

Thereafter, assuming these sites remain stable, the frequency of inspections may be reduced. SRK noted that this plan for future inspections is acceptable for evaluating the long-term performance of these features.

The person or persons (Qualified Persons in some instances) performing these inspections should use the 2020 Geotechnical Inspection Report and Check List as the basis for future inspections, where they exist. Elsewhere, the existing inspection protocols should be used. Cameco will resume annual geotechnical inspections, in 2021, of the relevant areas utilizing the checklists developed with SRK.

For a general map showing the locations of these areas and detailed findings, including photographic records, please refer to the inspection report provided in **Appendix B**.

3.2.3 Community Engagement and Consultation: Public Meeting

Cameco is committed to its engagement with residents of northern Saskatchewan in relation to the decommissioned Beaverlodge properties. Cameco builds strong relationships in the north through its northern strategy and its commitments in maintaining open channels of communication. The Beaverlodge Public Information Program (PIP) was developed to assist in ensuring that Cameco's activities at the decommissioned properties are efficiently communicated to the public in a manner that complies with established regulations.

General updates on the Beaverlodge properties are provided annually during a Public meeting, normally held in the northern hamlet of Uranium City (Uranium City). Cameco engages directly with those interested and provides project plan updates in an effort to elicit feedback and provide meaningful responses. The primary audience for the Beaverlodge properties is Uranium City, which is located 8km west of the former mine/mill site, with residents that have year-round road access. This community has become well versed in the activities occurring at the Beaverlodge properties and during engagement activities discussion often focuses on employment opportunities.

The following groups are the focus of engagement activities as identified in the regulatory approved PIP:

- Uranium City
- Uranium City Métis (Local #50)
- Athabasca Joint Engagement and Environment Subcommittee (AJES) – a joint committee of community and industry representatives that meets regularly to discuss operational and environment-related matters of importance to the Athabasca communities and provides a channel for the communities to share traditional knowledge with the companies.

  - Yá thi Néné Land and Resource Office – established to provide support to the AJES subcommittee and the executive director is an AJES member.
- Athabasca sub-committee of the Northern Saskatchewan Environment Quality Committee (EQC) – includes representatives from the Athabasca Basin communities Fond du Lac First Nation (Fond du Lac), Hatchet Lake First Nation (Hatchet Lake), Black Lake First Nation (Black Lake), Uranium City, the northern hamlet of Stony Rapids (Stony Rapids), the northern settlement of Wollaston Lake (Wollaston Lake) and the northern settlement of Camsell Portage (Camsell Portage).

Based on the most recent Record for Decision (DEC 19-H6; CNSC 2019) and in addition to the groups listed above Cameco has also focused engagement efforts on leadership of the Athabasca Basin communities, the Métis Nation of Saskatchewan (MN-S) and the Athabasca Chipewyan First Nation.

Due to the COVID-19 pandemic, a public meeting was held virtually on November 18, 2020 to provide an update on the decommissioned Beaverlodge properties. The meeting was advertised locally to Uranium City community members, and invites were sent to the Uranium City Métis (Local # 50) President, NSEQC and AJES. The invite was also made public on Yá thi Néné's social media channel, focused on Athabasca Basin community members, to help promote the event. In addition, the Athabasca Chipewyan First Nation through the Dene Lands and Resources Management and the MN-S through the Uranium City Métis (Local #50) President were invited to attend as they had expressed interest during the Commission hearing regarding release of properties from CNSC licensing.

Representatives of the CNSC, Saskatchewan Ministry of Energy and Resources (SkMER), SkMOE, and Cameco provided presentations. The presentations described how the various agencies assess the decommissioned Beaverlodge properties and determine if they have met the requirements to proceed with transfer to the IC Program.

Cameco's primary goal of the 2020 meeting was to present the activities completed in 2020 and plans for the upcoming year. The meeting also provided an opportunity to engage on the plan and schedule for transferring properties to the Province of Saskatchewan's IC program. This engagement opportunity allows interested parties to provide feedback to Cameco and the JRG regarding potential concerns with the properties and their suitability for transfer to the IC program.

16 people attended the meeting virtually. A recording of the public meeting has been posted to the Beaverlodge website and sent as a follow-up to participants, in addition to the Beaverlodge properties 2020 factsheet. The meeting recording has also been distributed broadly to Athabasca Basin communities through the Ya'thi Nene Lands and Resource Office and has been translated into Dene. A link to the presentation, recorded

meeting and Dene translation are available on the Beaverlodge website (www.beaverlodgesites.com).

Questions could be raised during the meeting through a question-and-answer function, or after the meeting as part of follow-up. There were no questions raised during the meeting but following the activity, a Uranium City community member and the Ya'thi Néné Lands and Resource Office submitted questions/feedback which was responded to by Cameco and the regulatory agencies.

Cameco had plans to increase the 'boots on the ground' tours of the Beaverlodge site with First Nations and Métis communities to ensure physical interaction with and provide opportunities for reconnection with the Beaverlodge lands; however, the pandemic forced Cameco to pivot and expand its engagement efforts in other ways since a physical tour was not possible do the pandemic. To help people reconnect with the land, a drone pilot was contracted in 2020 to capture footage of the area to facilitate development of a virtual site tour that provides an aerial overview of some of the areas that make up the decommissioned Beaverlodge properties. A link to that video is available on the Beaverlodge website (www.beaverlodgesites.com) and was provided to all invited participants to the virtual meeting, as described above. Additionally, it has been shared on the Cameco Facebook page.

3.3 2020 Remediation Activities to Prepare Sites for Transfer to IC Program

Cameco has prepared a work plan and schedule, based on the path forward recommendations (*Cameco 2012*), which was presented to the CNSC at the 2013 re-licensing hearing. The Path Forward describes remedial activities selected to improve local environmental conditions in order to meet performance objectives, and describes monitoring requirements to assess the success of implemented activities. The work plan describes specific site activities required to address residual human health and ecological risk, while demonstrating conditions on the properties are stable and/or improving. As outlined in **Section 2.5.2** the remediation activities selected for advancement at the decommissioned Beaverlodge properties included:

- Site wide surficial gamma survey and assessment.
- Rehabilitating historic mine openings.
- Re-establishment of the Zora Creek flow path.
- Final inspection and cleanup of properties.
- Decommission identified boreholes.

Since the development of the work plan, Cameco has undertaken numerous remedial activities. These activities include, but are not limited to the development of the Beaverlodge gamma radiation survey plan (*ARCADIS SENES 2014*); reconstruction of the Zora Creek flow path (*SRK 2017*); debris clean-up (*Kingsmere 2018*); closure of historic mine openings; and, sealing boreholes throughout the decommissioned Beaverlodge properties. In addition, crown pillars related to the underground working have been assessed and remediated as required.

Ultimately, the Beaverlodge properties are being managed for acceptance into the Saskatchewan IC Program or free-release, and all future works undertaken are intended to support the management framework established to move towards this goal. The following sections provide an overview of remedial activities completed in 2020 to advance the properties towards transfer to the IC Program.

3.3.1 Site Wide Gamma Assessment

The initial survey of gamma radiation levels estimated the potential risks from radiation exposure at the Beaverlodge properties based on spatial considerations, use of the properties and measured gamma radiation levels. Overall, the evaluation found that from a risk perspective, the gamma radiation levels on the Beaverlodge properties are acceptable regardless of approach taken (conservative or realistic, by individual sub-areas or cumulative) and predicted doses are below the public dose limit of 1 mSv/year. Based on this evaluation, no further remedial actions were justified at these sites to reduce gamma exposure levels (*ARCADIS 2015*).

However, follow up gamma surveys are completed where areas are disturbed during remediation such as around the Fay shaft in 2020 after excavation in the area. Results in this area met the *Saskatchewan Guidelines for Northern Mine Decommissioning and Reclamation*, EPB 381 (*SkMOE 2008*), of 1 μSv/hr above background averaged over 1 hectare. The condition of the Fay Shaft excavation area (i.e., property URA 4) remained unchanged from that presented in the Final Closure Report that described this property (*Kingsmere 2021*). Scanning of areas disturbed during remediation activities is expected to occur in 2021 as areas are readied for transfer to the IC program.

3.3.2 Rehabilitate Historic Mine Openings

While the original decommissioning of the mine site included sealing the majority of historic mine openings with concrete, final drawings detailing the closure methods were not created for each opening. To ensure Cameco meets the performance objectives of safe, secure and stable/improving, mine openings have since been secured and signed off by a qualified person, where applicable. An overview of the remediation progress for mine openings undertaken to date is provided in **Table 3.2-1**.

Table 3.2-1 Mine Openings

Site	Opening	Property	Location		Status	Notes
Ace	Shaft	ACE MC	643697	6605390	Exposed	Stainless steel cover installed in 2016.
Ace	2157 Raise	ACE 1	643366	6605115	Exposed	Stainless steel cover installed in 2017.
Ace	2157 Finger Raise	ACE 1	643338	6605106	Exposed	Stainless steel cover installed in 2017.
Ace	130 Raise	ACE MC	643773	6605394	Exposed	Stainless steel cover installed in 2017.
Ace	195 Access Raise	ACE 1	643512	6605180	Buried	Leave “as-is”; Buried by substantial waste rock below the Dorrclone.
Ace	195 Raise	ACE 1	643512	6605180	Buried	Leave “as-is”; Buried by substantial waste rock below the Dorrclone.
Ace	105*2 Raise	ACE 1	643584	6605288	Buried	Engineered rock cover installed in 2018.
Ace	201 Raise	ACE MC	643615	6605277	Backfilled	Leave “as-is”. Removed concrete cap and excavated below, no indication of a raise opening. Raise area was backfilled, no further remediation planned at this location.
Dubyna	810394 Raise	JONES	647794	6608256	Exposed	Stainless steel cover installed in 2017.
Dubyna	820694 Raise	JONES	647820	6608451	Exposed	Stainless steel cover installed in 2017.
Dubyna	Dubyna Portal (Adit)	JONES	647806	6608229	Backfilled	Leave “as is”.
Eagle	Shaft	EAGLE 7	639549	6607252	Exposed	Concrete cap installed in 2001.
Eagle	Adit	EAGLE 1	640379	6607245	Submerged	Leave “as is”.
Fay	Shaft	URA 4	642668	6604711	Exposed	Stainless steel cover installed in 2020.
Fay	Custom Ore Raise	URA 4	642623	6604658	Buried	Engineered rock cover placed in 2020.
Fay	Custom Ore Bin	URA 4	642625	6604658	Buried	Engineered rock cover placed in 2020.
Fay	CB-1 Access Raise	URA 7	642558	6604563	Buried	Inclined access raise located. Plan to seal as an adit in 2021.
Fay	Surface Dump Raise	URA 4	642595	6604639	Exposed	Stainless steel cover installed in 2018.
Fay	Sorting Plant Raise	URA 7	642603	6604520	Buried	Located, plan to leave backfill left in place. Location marker will be added in 2021
Fay	Sorting Plant Bin	URA 7	642603	6604520	Backfilled	Beside the raise, plan to leave backfill in place. Location marker will be added in 2021.
Fay	Fine Ore Dump	URA 4	642682	6604715	Backfilled	Stainless steel cover installed in 2020.
Fay	Pipe Drift Raise	URA 4			Buried	Leave “as-is”. Small diameter raise (borehole) for piping, backfilled in reservoir.
Fay	25373 Raise	URA 3	642253	6604665	Exposed	Stainless steel cover installed in 2017.
Fay	24094 Raise (Vent)	URA 4	642702	6604632	Exposed	Stainless steel cover installed in 2018.
Fay	Manway	URA 4	642606	6604655	Buried	Engineered rock cover placed in 2020.
Fay	Waste Haul Adit	URA 7	642638	6604450	Backfilled	Backfilled in 2017.
Hab	Vent Plant Raise	EXC 1	645542	6612182	Inaccessible	Leave “as-is”, Vent raise is in the adit (within mine workings).
Hab	13904 Raise	EXC 1	645229	6612203	Exposed	Stainless steel cover installed in 2017.
Hab	13905 Raise	EXC 1	645246	6612213	Exposed	Stainless steel cover installed in 2017.
Hab	13918 Raise	HAB 1	645292	6612236	Buried	No further remediation required- backfilled in Hab pit.
Hab	13927 Raise	HAB 1	645295	6612230	Exposed	Stainless steel cover installed in 2017.
Hab	13909 Raise	HAB 1	645308	6612255	Buried	No further remediation required- backfilled in Hab pit.
Hab	13929 Raise	HAB 1	645352	6612255	Buried	No further remediation required- backfilled in Hab pit.
Hab	13810 Raise	HAB 2A	645561	6611886	Exposed	Stainless steel cover installed in 2017.
Hab	Shaft	HAB 2	645568	6612133	Exposed	Stainless steel cover installed in 2018.
Hab	Heater Raise	EXC 1	645519	6612198	Exposed	Stainless steel cover installed in 2019
Hab	Hauage Adit (west)	EXC 1	645505	6612187	Backfilled	Leave “as is”.
Hab	Service Adit (east)	EXC 1	645519	6612200	Backfilled	Leave “as is”.
Martin	Adit (BVL)	RA 9	639081	6602968	Backfilled	Leave “as is”.
Martin	Adit (BVL)	RA 6	638063	6602968	Backfilled	Leave “as is”.
Verna	Shaft	ACE 8	645470	6606022	Exposed	Stainless steel cover installed in 2018.
Verna	026594 Raise	NW 3 EX	645659	6606028	Exposed	Stainless steel cover installed in 2019.
Verna	026594 Finger Raise	NW 3 EX	645668	6606030	Exposed	Stainless steel cover installed in 2018.
Verna	Bored Raise	ACE 3	644806	6605250	Exposed	Stainless steel cover installed in 2017.
Verna	Verna Manway	NW 3 EX	645669	6606035	Exposed	Stainless steel cover installed in 2018.
Verna	72 Zone Portal	NW 3	645836	6605771	Backfilled	Leave “as is”.
Verna	Shaft Adit	-	-	-	Backfilled	Leave “as is. Listed as sealed during operations (*Departure with Dignity 1987*)
Verna	46 Zone Portal	EMAR 21	645318	6607236	Backfilled	Leave “as is”.

On December 6, 2019 and July 23, 2020, Cameco submitted engineer design drawings for the closure of five mine openings (Fay Shaft, Fay Fine Ore Dump Raise, Fay Manway, Fay Custom Crusher Ore Raise and Fay Custom Ore Bin) to SkMOE and the Saskatchewan Ministry of Labour Relations and Workplace Safety (LRWS) for review and approval. Cameco also provided the plans to the CNSC for review and comment. Approvals as per *The Mine Regulations, 2018* Section 20-3(2)(b) were received from LRWS on January 15 and August 10, 2020. Additionally, two Approvals to Construct, Alter, or Extend Pollutant Control Facilities (Approval No. PD20-009 and PD20-148) were received on January 16 and August 5, 2020 from SkMOE. All covers were installed by a local contractor and inspected by the design engineer during the 2020 field season and associated as-built drawings were submitted on December 22, 2020.

Of the five mine closures that occurred in 2020, two were stainless steel caps. The stainless steel caps were fabricated in Saskatoon Saskatchewan by Shear Fabrication personnel in accordance with the approved drawing set. A final fabrication inspection was conducted by Kova Engineering (Kova) in March 2020. Inspection results indicated the stainless steel covers were ready for transportation and installation (*Kova 2020a; Kova 2020b*). Subsequently, the stainless steel covers were transported to Uranium City via winter road across Lake Athabasca. The post installation field inspection by Kova occurred in September 2020. The inspection verified the stainless steel cap installation was performed with satisfactory workmanship and no surface defects were identified. Kova recommended that long-term inspections are performed on the covers as detailed in the QA/QC (*Kova 2020c*).

The remaining three mine closures (Fay Manway, Fay Custom Crusher Ore Raise and Fay Custom Ore Bin) were completed using an engineered rock cover. The remediation was completed under the supervision of an SRK engineer. The engineer was responsible for ensuring quality assurance and completing field documentation and as-built reporting.

An investigation into the potential location of the Verna Shaft Adit was submitted by Cameco to SkMOE and CNSC on April 27, 2020, with supplemental information provided on April 28, 2020. It has been assumed that the Verna Shaft Adit was buried in the waste rock pile near the Verna Shaft. Historical documentation describing the location of the adit is not available. By comparing historic (pre-mining) aerial photos to recent aerial imagery, the thickness of the waste rock covering this area was completed. It was concluded, based on the waste rock thickness and no evidence of instability of the waste rock pile, the that the adit would remain safe, secure, and stable. However, in response to the SkMOE regulatory inspection report, further field investigations are planned for 2021.

3.3.3 Re-establishment of the Zora Creek flow path

Final construction work on the Zora Creek Reconstruction was completed in 2016. A detailed description of the work conducted along with final As-built drawings was submitted to the CNSC and SkMOE in a report titled "*Bolger Flow Path Reconstruction: 2016 Final As-Built Report*" (*SRK 2017*) on March 10, 2017.

In 2020, the Zora flow path was visually inspected during the regulatory inspection. In addition, a geotechnical inspection was performed by SRK with no notable changes recorded (SRK, 2020). For more information regarding the 2020 inspection completed by SRK see **Appendix B**.

A description of the 2020 water quality results for sample stations ZOR-01, ZOR-02, AC-6A, and AC-8 are provided in **Section 4.3.1**. Water quality from this area will continue to be monitored in order to evaluate the success of implementing this remedial option.

3.3.4 Final Inspection and Clean-up of the Properties

Prior to free-releasing or transferring properties to the IC Program, a final site inspection and clean-up must be conducted in order to identify and remove debris from the properties, and ensure the site is in a safe and stable condition.

A site wide inspection of all the decommissioned Beaverlodge properties was performed by Kingsmere Resources (Kingsmere) from 2015 to 2017, resulting in a significant amount of debris being removed from the properties (*Kinsgmere 2018a*). In addition, prior to properties being transferred to the IC Program, the regulatory agencies will typically conduct a final inspection of the property to ensure the clean-up and remediation is adequate. During this process, additional minor amounts of debris may be identified for clean-up or additional effort may be required to address other concerns raised by the regulatory agencies. In 2020, as a result of the final regulatory inspection, the regulatory agencies identified minor amount of debris on the properties requiring removal prior to transferring the properties to the IC Program. The removal and disposal of the identified debris will be completed in 2021.

Debris Disposal

Due to the regulatory inspection being delayed, no debris clean up occurred on any of the properties in 2020. The table below includes the volume of waste disposed of to date.

Table 3.2-2
Summary of the materials (m^3) deposited to Bolger and Fay Pits since 2015.

	Bolger	*Fay*	***Total***
Debris	82	602	**684**
Core	1303	116	**1419**
Concrete	0	631	**631**
Total	**1385**	**1349**	**2734**

3.3.5 Decommission Identified Boreholes

A search of drilling records on file with the Government of Saskatchewan, followed by field investigations was conducted in 2010 (*SRK 2011*). This investigation resulted in numerous historic boreholes dating from the Eldorado operation (exploration drill holes) being identified and sealed over the next two years. Since 2013, additional non-flowing historic boreholes have been discovered during regulatory inspections as well as during the final property inspections and have since been sealed. Collectively, 218 boreholes have been decommissioned since 2011 across the Beaverlodge properties.

Due to the regulatory inspection being delayed, no additional boreholes were sealed on any of the properties in 2020; however, those identified will be sealed in 2021. As a permanent record of borehole locations associated with the decommissioned Beaverlodge properties, Cameco maintains a master list that includes the GPS locations for each borehole in the Annual Report (**Appendix C**). If additional boreholes are discovered, the GPS locations and status will be added to this record. As sites are transferred to the IC Program, this permanent record will be transferred to the Province of Saskatchewan.

3.3.6 Crown Pillar Remediation

Cameco retained SRK to assess the potential risk associated with crown pillars across all Beaverlodge properties, and provide recommendations for long term remediation/inspection of potential areas of concern.

Results of the *Beaverlodge Property – Crown Pillar Assessment* (*2015*) identified one area that warranted physical remediation and two additional areas for future monitoring (Hab and Dubyna). It was recommended that the crown pillar associated with the Ace Stope Area undergo remediation to limit risks from settling related to the crown pillar failure. The majority of remediation was undertaken in 2016 and completed in 2019 with the closure of the 105#2 Raise (*SRK 2019*).

As per recommendations from SRK, a geotechnical assessment of the crown pillars in the Ace Stope, Hab and Dubyna areas took place in 2020. The 2020 observations were assessed relative to the observations from past inspections, with a focus on changes since the 2015 SRK inspection and the annual inspections by Cameco from 2016 to 2019, inclusive. Based on this assessment, SRK has concluded that these sites are stable and are expected to remain so in the future. It is SRK's opinion, therefore, that the conditions at the areas noted above are appropriate for final close out and a transfer to institutional control. Results and photos are provided in the Geotechnical Inspection Report (**Appendix B)**.

3.4 Additional Studies

3.4.1 Environmental Risk Assessment

In the technical review of the 2018 Beaverlodge Environmental Performance Report, CNSC noted that the QSM established in 2012 should be re-evaluated to better reflect site conditions and environmental factors. Based on this recommendation, the water dispersion modelling was updated in 2020 along with an examination of the potential risks to human and ecological receptors that use the area. The model assumptions were revisited based on the current understanding of the environmental conditions informed by almost 40 years of monitoring results and the environmental performance indicators related to the assessment of water quality at various monitoring stations were also updated. The resulting Beaverlodge ERA was submitted to the CNSC and SkMOE on September 8, 2020 and complies with applicable components of the Canadian Standards Agency (CSA) N288.6-12 standard for Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills. Consistent with previously accepted assessments, the 2020 ERA concluded that the immediate and downstream environments will continue to gradually recover over time. As shown previously, based on reported use of the land, there are not expected to be risks to humans residing near, or consuming food harvested from properties related to the decommissioned Beaverlodge Mine. Therefore, living a traditional lifestyle and consuming country foods from the area, while respecting the water and fish advisories, can continue to be done safely (CanNorth 2020c).

The ADEPT model was used to develop the 2020 ERA, replacing the previously used LAKEVIEW QSM model. On October 27, 2020 CanNorth and Cameco hosted an information session with a presentation for SkMOE, CNSC staff and specialists on the ADEPT model (Assessment of the Dispersion and Effects of Parameter Transport) to discuss any concerns the specialists may have had while reviewing the document.

Cameco received comments from the CNSC regarding the ERA on December 12, 2020 where CNSC staff indicated the "updated performance indicators are appropriate".

3.4.2 Up and Watson Lakes Supporting Information

During the 2020 regulatory inspection of the decommissioned Beaverlodge properties, further information was requested regarding the water quality and presence absence of fish in Up and Watson Lakes. Both lakes are located on properties being considered for transfer to the IC program and are relatively small with a surface area of approximately

1.25 and 2.0 hectares, respectively. Both waterbodies are isolated (i.e., not permanently, open flow channel) with limited discharge and have not been identified as a significant source of COPCs (SENES 2012).

The shoreline along Up Lake is heavily sloped, which makes accessing the water body difficult and further supports the land use survey conducted in Uranium City that indicated people do not frequent Up Lake (SENES and Kingsmere 2015). In addition, due to the size and isolated nature it is highly unlikely that Up Lake supports a viable fishery. The catchment area feeding Up Lake is only 7.49 ha resulting in a small ephemeral discharge from the lake, while the elevation difference between Up Lake and downstream Zora Lake (11.3 m) eliminates the potential for fish migration from Zora Lake.

The land use survey did not indicate Watson Lake as a frequented water body (SENES and Kingsmere 2015); however, the small waterbody is adjacent to a main road with potential connection to Ace Creek therefore it was surveyed for presence of large-bodied fish as well as lake morphometry (CanNorth 2020b). No large-bodied fish were captured in Watson Lake and the survey indicated a mean and maximum depth of 2.505 m and 5.060 m, respectively.

Available water quality data were also used to determine the potential risk from the consumption of lake water as drinking water from Watson and Up lakes in order to support the transfer of these areas into IC. As uranium and radium-226 exceed the drinking water guidelines they were carried forward for further assessment, while the available data for selenium and total dissolved solids were below the drinking water guidelines. As previously noted, Watson and Up lakes are very small bodies of water with limited attraction for camping or other land use. With that in mind the risk evaluation showed that the short-term consumption of drinking water (i.e., 7 days from Up Lake and 32 days from Watson Lake) is unlikely to pose a risk to people considering both the chemical toxicity of uranium and radioactivity.

The fish survey results (CanNorth, 2020b) and the drinking water risk assessment (CanNorth, 2020c) were submitted to SkMOE and CNSC on December 2, 2020 and demonstrate that the risks associated with Watson and Up lakes are acceptable (i.e., to ensure site conditions are safe, secure, and stable/improving). Cameco will continue moving forward with plans to obtain a release from decommissioning and reclamation from the SkMOE, release from CNSC licensing and acceptance into the Province of Saskatchewan's IC Program.

3.4.3 Grout Longevity

During the CNSC hearing regarding the release of properties from CNSC licensing conducted on October 2, 2019, the CNSC inquired as to the expected longevity of grout used to seal boreholes on the decommissioned Beaverlodge properties. In the *Record of*

Decision on Cameco Corporation's Application to Amend the Waste Facility Operating Licence for Beaverlodge Project, issued by the CNSC on December 19, 2019, the CNSC requested additional information regarding the longevity of grout used to seal boreholes as outlined below:

> *The Commission is satisfied with the information provided on this point but notes that Cameco was not able to provide information on the expected lifespan of the grout used to backfill the boreholes. Although the Commission is satisfied that not having information about the lifespan of the grout does not present an impediment to release from licensing of these properties, the Commission directs Cameco to have this information available for future proceedings in regard to the release of Beaverlodge properties from CNSC licensing.*

In response to the CNSC grout longevity query, Cameco reached out the Saskatchewan Mining Association (SMA) about performing a literature review and potentially canvassing the mining and exploration companies in Saskatchewan for information regarding their extensive experience with grout as a method of sealing boreholes. Based on observed 60+ years of practical experience (B. Sigurdson to M. Webster, June 19, 2020), Cameco was able to conclude that the grout mixture used to seal boreholes at the Beaverlodge site is very robust and sees little to no degradation over time. More details were submitted to the CNSC on June 24 and July 14, 2020.

3.4.4 Fort Chipewyan Dock

On October 2, 2019, the CNSC held a Commission Hearing to consider an application from Cameco to amend its Waste Facility Operating License to allow for the removal of 20 properties at the Beaverlodge Project from its license. During this hearing, concerns were brought forth regarding testing the "Forestry Dock" in Fort Chipewyan for radiation because it is believed by the community that uranium and other radioactive waste from barges transporting ore from Uranium City were spilled at this location. Based on the community's concern, the Commission expected Cameco to engage with Athabasca Chipewyan First Nation (ACFN) regarding the "Forestry Dock" contamination and take any action if needed.

As described in the January 22, 2020 submission to the CNSC, the Fort Chipewyan "Forestry Dock" is considered a Northern Transpiration Route (NTR) site. The NTR was a route used to carry uranium ore and ore concentrates from Port Radium, NWT to Fort McMurray, AB. Fort Chipewyan was a major stop along the NTR and was used to supply surrounding communities. Based on the available information related to the clean-up of the NTR, it is Cameco's position that the "Forestry Dock" has been adequately assessed as part of that federal government initiative. Additionally, the Status Report for the Historic NTR as well as the CNSC website has identified a separate entity responsible for the clean-up of the historic contamination along the NTR.

3.4.5 Environmental Contingency Plan

The Beaverlodge Surface lease stipulates that the site is to maintain an Environmental Contingency Plan and provide annual updates. An Environmental Contingency Plan is intended to provide information regarding the storage and use of Hazardous Substances and Waste Dangerous Goods (HSWDG) on a site. As the Beaverlodge site does not have any HSWDG located on site, an Environmental Contingency Plan is not maintained.

Cameco has prepared a Wildfire Protection Plan (WPP) identifying relevant site features (powerlines, locked gates) as well as relevant contact information for responsible Cameco employees and local contractors. Also provided in the WPP are the expected work locations and the onsite precautions in place, including firefighting equipment to be available during site activities. This plan is updated annually and submitted to SkMOE. The 2020 WPP was submitted to the Government of Saskatchewan on January 22, 2020.

SECTION 4.0

ENVIRONMENTAL MONITORING

4.0 ENVIRONMENTAL MONITORING PROGRAMS

Cameco provided for regulatory review and acceptance a revision of the Beaverlodge Environmental Monitoring Program (EMP) on December 10, 2019. The CNSC provided comments and recommendations on December 20, 2019. On January 7, 2020, the Saskatchewan Ministry of Environment (SkMOE) notified Cameco that they had accepted the proposed program as well as reviewed comments provided by the CNSC on December 20, 2019 and had no concerns with any proposed changes that may occur related directly to these comments. Cameco made the revisions recommended by the CNSC and resubmitted the Beaverlodge EMP to the CNSC for final approval January 14, 2020. Final approval was received from the CNSC on January 14, 2020.

The newly approved Beaverlodge EMP includes optimization of the water sampling monitoring program, a reduction in radon monitoring stations, and elimination of seep monitoring. These changes were implemented as of January 14, 2020.

Cameco retains a local contractor (Urdel Ltd.) to conduct the required water quality and radon sampling throughout the year. While collecting samples, employees from Urdel Ltd., also perform cursory inspections and report any unusual conditions to Cameco.

Saskatchewan Research Council (SRC) and Bureau Veritas Labs (BV Labs) are used to analyze water samples, while Radonova is used to analyze radon in air. All labs used in the Beaverlodge EMP are accredited. SRC is CALA accredited, and is certified in several other inter-laboratory performance assessment programs as seen in **Appendix D**. Bureau Veritas Quality Program is designed to comply with or exceed the data quality objectives of the industry, Canadian Regulators, US EPA and International Standards Organization (ISO/IEC 17025). Additional information on the QAQC Program at Bureau Veritas Labs can be found in **Appendix D**. Radonova is recognized by the American Association of Radon Scientists and Technologists-National Radon Proficiency Program (AARST-NRPP), the National Radon Safety Board (NRSB), and the Canadian National Radon Proficiency Program (C-NRPP). A 62-page QAQC manual from Radonova Laboratories was provided to Cameco, but due to the size it was not attached in the report. It can be provided upon request.

4.1 Site Specific Objectives

The performance objectives of safe, secure and stable/improving have been established as benchmarks for entering the provincial IC Program. Performance indicators consisting of modelled water quality for several stations were developed to assess when the performance objective has been met for the associated properties. The predictions provide an expected range to which water quality trends will be compared when defining whether the station is stable or improving.

These predicted water quality concentrations were originally modelled as part of the development of the QSM and provided the foundation for assessing the outcome of remedial options presented in the Path Forward report (*Cameco 2012*). With the path forward strategy accepted by the regulatory agencies, the water quality performance indicators were updated and incorporated in the 2013 Status of the Environment (SOE) report (*SENES 2013*). A revised EPR was submitted in October 2018 that included updates to the model based on data gathered since 2013. In 2020, the Beaverlodge ERA model was updated. The current model utilizes an updated format with the ability to better assess a wide range of environmental variability. The model assumptions are based on the current understanding of environmental conditions informed by almost 40 years of monitoring. The preliminary regulatory correspondence has stated the updated performance indicators are appropriate, as such, for the purposes of this report, comparisons are made to the 2020 ERA predicted values (*CanNorth 2020a*) and are provided in **Table 4.1-1**.

Note that it is not the expectation that water quality results will be within the predicted maximum and minimum bounds every year. The 2020 water quality and corresponding trends are evaluated and discussed below.

Table 4.1-1 Comparison of Key Parameter Annual Averages to ERA Predictions

Uranium	2020	SEQG	2020 ERA Bounding Range			Comments
	Concentration (µg/l)					
Ace Lake (AC-8)	12.0	15	8.8	to	14.7	Below SEQG
Beaverlodge Lake (BL-5)	120.0	15	108.3	to	120.0	Annual average was at the upper bound in 2020.
Dubyna Lake (DB-6)	118.8	15	83.3	to	263.2	2020 average within bounds
Fookes Reservoir (TL-3)	147.0	N/A	106.7	to	296.8	2020 average within bounds
Greer Lake (TL-9)	187.0	N/A	103.7	to	229.8	2020 average within bounds
Lower Ace (AC-14)	18.8	15	12.7	to	40.5	2020 average within bounds
Marie Reservoir (TL-4)	197.5	N/A	91.2	to	244.8	2020 average within bounds
Meadow Fen (TL-7)	200.7	N/A	106.0	to	270.8	2020 average within bounds
Pistol Lake (AN-5)	78.0	15	62.6	to	596.0	2020 average within bounds
Verna Lake (AC-6A)	292.0	15	166.5	to	271.4	Annual average exceeded the upper bound in 2020

Radium-226	2020	SEQG	2020 ERA Bounding Range			Comments
	Activity Level (Bq/l)					
Ace Lake (AC-8)	0.005	0.11	0.00746	to	0.0201	Below SEQG
Beaverlodge Lake (BL-5)	0.02	0.11	0.0353	to	0.0444	Below SEQG
Dubyna Lake (DB-6)	0.028	0.11	0.0164	to	0.0458	Below SEQG
Fookes Reservoir (TL-3)	0.895	N/A	1.09	to	1.39	Annual average is below the lower bound in 2020
Greer Lake (TL-9)	1.70	N/A	1.67	to	2.42	2020 average within bounds
Lower Ace (AC-14)	0.03	0.11	0.0151	to	0.0604	Below SEQG
Marie Reservoir (TL-4)	1.55	N/A	1.42	to	2.00	2020 average within bounds
Meadow Fen (TL-7)	1.67	N/A	1.38	to	1.92	2020 average within bounds
Pistol Lake (AN-5)	0.497	0.11	0.223	to	1.70	2020 average within bounds
Verna Lake (AC-6A)	0.099	0.11	0.0822	to	0.138	Below SEQG

Selenium	2020	SEQG	2020 ERA Bounding Range			Comments
	Concentration (mg/l)					
Ace Lake (AC-8)	0.0001	0.001	0.00000902	to	0.000278	Below SEQG
Beaverlodge Lake (BL-5)	0.0021	0.001	0.00203	to	0.00228	2020 average within bounds
Dubyna Lake (DB-6)	0.0001	0.001	0.00000581	to	0.000275	Below SEQG
Fookes Reservoir (TL-3)	0.0016	0.001	0.00337	to	0.00443	Trending below lower bound
Greer Lake (TL-9)	0.0017	0.001	0.00170	to	0.00349	Annual average was at the lower bound in 2020.
Lower Ace (AC-14)	0.0001	0.001	0.00000893	to	0.000278	Below SEQG
Marie Reservoir (TL-4)	0.0017	0.001	0.00166	to	0.00327	2020 average within bounds
Meadow Fen (TL-7)	0.0017	0.001	0.00175	to	0.00335	Trending below lower bound
Pistol Lake (AN-5)	0.0001	0.001	0.0000100	to	0.000282	Below SEQG
Verna Lake (AC-6A)	0.0002	0.001	0.0000880	to	0.000357	Below SEQG

Uranium concentrations at Verna Lake (AC-6A) have shown improvements since the Zora Creek Reconstruction Project was completed, but overall are above the predicted upper bound. Continued monitoring at Verna Lake in 2021 will assist with determining the efficacy of the reconstruction project and evaluating recovery since construction activities. Further discussion is provided in **Section 4.4.1**.

4.2 Water Quality Monitoring Program

This section provides a summary of water quality trends at each of the licensed monitoring stations at the decommissioned Beaverlodge properties. An initial comparison to the Saskatchewan Environmental Quality Guidelines (SEQG; *Government of Saskatchewan 2020*) will be made and if the data shows a stable trend below the SEQG, no detailed discussion will be provided. If the data is above the SEQG, a comparison to the modelled predictions will be made. As surface water quality guidelines are not intended to be applied within tailings management areas, they are not discussed for stations TL-3, TL-4, TL-6, or TL-7.

The water quality summary in this section focuses on three main constituents of potential concern identified for the decommissioned Beaverlodge properties Se, U and ^{226}Ra). Total dissolved solids (TDS) is also included as a general indicator of water quality.

The two watersheds influenced by historic mining activities are Ace Creek and Fulton Creek. **Figure 4.2** provides an overview of the various stations at which water quality is monitored. Within the Ace Creek watershed, the routine sampling stations (from upstream to downstream) include:

AN-5 Pistol Creek downstream of the decommissioned Hab mine site and upstream of the first confluence. This system flows through Mickey Lake into Ace Lake.

DB-6 Dubyna Creek downstream of the decommissioned Dubyna mine site and before the creek enters Ace Creek upstream of Ace Lake.

AC-6A Verna Lake discharge to Ace Lake.

AC-8 Ace Lake outlet to Lower Ace Creek.

AC-14 Lower Ace Creek at the discharge into Beaverlodge Lake.

The Fulton Creek watershed contains the bulk of the decommissioned tailings deposited during operations. Within the Fulton Creek watershed, the regulatory approved sampling stations (from upstream to downstream) include:

AN-3 Fulton Lake at discharge into Fookes Reservoir (represents un-impacted or background condition).

TL-3 Discharge of Fookes Reservoir.

TL-4 Discharge of Marie Reservoir (which flows into Meadow Fen).

TL-6 Discharge of Minewater Reservoir (which flows into Meadow Fen).

TL-7 Discharge of Meadow Fen upstream of Greer Lake.

TL-9 Fulton Creek downstream of Greer Lake and before it enters Beaverlodge Lake.

Additional sampling stations located downstream of the Beaverlodge site include:

BL-3 Located in Fulton Bay, Beaverlodge Lake immediately opposite the Fulton Creek discharge.

BL-4 Beaverlodge Lake (central location).

BL-5 Outlet of Beaverlodge Lake.

ML-1 Outlet of Martin Lake.

CS-1 Crackingstone River at bridge.

CS-2 Crackingstone Bay in Lake Athabasca.

Figures 4.2.1-1 to **4.3-8** are graphical representations of the historical annual average concentrations of U, ^{226}Ra, Se, and TDS at each station with comparisons to their respective SEQG values where applicable, as well as comparisons to the predicted future recovery of waterbodies that were presented in the ERA (*CanNorth 2020a*). It should be noted that Se monitoring began at selected water stations in 1996. Prior to 1996, Se was not identified as a contaminant of concern at Beaverlodge.

Tables 4.2.1-1 to **4.3-2** show summary statistics and comparisons to historical results of parameters monitored at Beaverlodge water sampling stations.

Sections 4.2.1 and **4.2.2** cover the water quality results and trends at each of the water quality stations located within each watershed. **Section 4.2.3** covers the water quality trends at each of the water quality locations in Beaverlodge Lake and downstream. Trends are identified through visual interpretation of the graphs and include trends in the short-term (less than five years) and in the long-term trends (10 to 35 years).

The detailed water quality results for the current reporting period, January 2020 to December 2020, are provided in **Appendix E**.

4.2.1 Ace Creek Watershed

During operations several satellite mines operated within the Ace Creek watershed. Water quality is monitored at stations within the Ace Creek watershed as part of the Beaverlodge EMP. The results of the 2020 Beaverlodge ERA show that immediate and downstream environments associated with the Ace Creek watershed will continue to naturally recover over time. The water quality predictions for the various waterbodies within the Ace Creek watershed are based on aquatic and sediment studies and more than 35 years of water quality monitoring.

AN-5 Pistol Lake

Station AN-5 is located in Pistol Creek downstream of the decommissioned Hab satellite mine (**Figure 4.2**). Pistol Lake is a small non-fishing waterbody which typically exhibits higher variability in measured data than other areas within the Ace Creek Watershed. Due to the small size and depth of Pistol Lake, and the hydraulic connection between the flooded Hab underground workings and the surface water, measured data exhibits high variability correlated to fluctuations in annual precipitation rates. Three of four scheduled samples were collected at AN-5 in 2020, regularly scheduled March sampling did not occur due to no water being available.

A historical summary of annual average ^{226}Ra, U, Se, and TDS concentrations at AN-5, along with the predicted recovery, are presented in **Figures 4.2.1-1** to **4.2.1-4**. The annual averages from 2016 to 2020 are presented in **Table 4.2.1-1**.

Uranium concentrations have shown a distinct seasonal fluctuation as well, with the highest concentrations occurring in the winter months, which decrease through the spring and summer months, followed by an increase again in fall. Uranium concentrations measured throughout the year varied between 51.0 µg/L and 128 µg/L. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning (**Figure 4.2.1-1**). In comparison to modelled predictions, the annual average U concentration is within the predicted range.

The long-term trend for ^{226}Ra at AN-5 is predicted to remain relatively constant into the future, however notable season fluctuations have occurred in the past and can significantly influence annual average results As shown in **Appendix E**, results in 2020 were consistent and varied in magnitude between 0.44 Bq/L and 0.58 Bq/L. The annual average ^{226}Ra concentration at AN-5 was 0.497 Bq/L in 2020 and is within modelled predictions.

Similar to U and ^{226}Ra, TDS concentrations exhibit a seasonal fluctuation that affects the annual average; however, the 2020 average was lower than previous years. This is likely the result of increased precipitation measured in 2020. Selenium values at AN-5 remained relatively consistent throughout 2020 and remain below the SEQG of (0.001 mg/L).

DB-6 Dubyna Lake

Station DB-6 is located in Dubyna Creek, downstream of Dubyna Lake and the decommissioned Dubyna satellite mine, before the creek enters Ace Creek, and upstream of Ace Lake (**Figure 4.2**). All four scheduled samples at DB-6 were collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at DB-6, along with the predicted recovery, are presented in **Figures 4.2.1-5** to **4.2.1-8**. The annual averages from 2016 to 2020 are presented in **Table 4.2.1-2**.

The average U concentrations at DB-6 in 2020 was 118.8 µg/L and is within modelled predictions.

The long-term trend for ^{226}Ra at DB-6 has been relatively consistent and has remained below the SEQG since 1981.

Selenium has remained relatively stable over the past decade. The water quality trend for Se has also remained below the SEQG since the analytical laboratory detection limit for Se was lowered.

The TDS trend has been relatively consistent since decommissioning, and no notable changes were observed in 2020.

AC-6A Verna Lake

Water quality monitoring at this station began in May 2010, and is located at a road crossing between Verna Lake and Ace Lake (**Figure 4.2**). Flows from Verna Lake are largely dependent on spring snow melt and precipitation events, and as such, not all scheduled samples can be collected during low precipitation years. In 2020, there were eight samples scheduled; sampling efforts in March and April were unsuccessful due to lack of water. Due to the regional high-water levels through the summer and fall, two additional samples were collected in November and December. As a result, eight samples were collected at AC-6A in 2020.

A historical summary of annual average ^{226}Ra, U, TDS and Se concentrations at AC-6A along with the predicted recovery, are presented in **Figures 4.2.1-9** to **4.2.1-12.** The annual averages from 2016 to 2020 are presented in **Table 4.2.1-3**.

The annual average U concentration has steadily decreased since 2016, but a slight increase was recorded in 2020 (292.0 µg/L). In 2019, flows from Verna Lake were very low with only 2 of 12 scheduled samples being collected due to a lack of water. While the flows feeding Verna Lake from ZOR-02 were also relatively low in 2019 the U concentrations entering Verna Lake were elevated in 2019. This may have resulted in a temporary accumulation of uranium in Verna Lake, which was measured in 2020. Given the high regional flows observed in 2020 and the improved water quality measured at ZOR-02 in 2020 it is expected that U concentrations at the outlet of Verna Lake will improve in 2021 and will continue to improve as a result of the Zora Creek Reconstruction project in the long term. A description of the activities associated with the Zora Creek Reconstruction project and the water quality monitoring program is provided in **Section 4.4.1**. Results will continue to be monitored.

The annual average ^{226}Ra concentration at AC-6A is trending within the upper and lower bounds of modelled predictions and has been hovering at or below the SEQG concentration of 0.11 Bq/L since 2015.

Selenium concentrations at station AC-6A remained consistent throughout 2020 and the annual average concentration continues to measure well below the SEQG concentration of 0.001 mg/L.

Total dissolved solids concentrations ranged from 168.0 mg/L to 220.0 mg/L in 2020 with an average of 192.9 mg/l, which is within the range of results measured over the previous four years as seen in **Table 4.2.1-3**.

AC-8 Ace Lake

Station AC-8 is located at the discharge of Ace Lake into Lower Ace Creek. Ace Lake is the receiving environment for waters discharged from DB-6, AN-5, and AC-6A (**Figure 4.2**). As a result of changes to the approved Beaverlodge EMP, sample collection is scheduled once per year. As such results discussed within the below text are of a single sample result.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at AC-8 along with the predicted recovery, are presented in **Figures 4.2.1-13** to **4.2.1-16**. The annual averages from 2016 to 2020 are presented in **Table 4.2.1-4**.

The long-term trend for U concentrations has followed a slowly decreasing trend since decommissioning. Since 2012, the annual average U concentration has remained below the SEQG and the sample from 2020 was below the SEQG.

The long-term trend for ^{226}Ra concentrations is below the SEQG value of 0.11 Bq/L and the 2020 results continued that trend.

Selenium concentrations have also remained stable and well below the SEQG.

The long-term trend for concentrations of TDS have remained relatively stable at this station since 1982.

AC-14 Lower Ace Creek

Station AC-14 is located in Lower Ace Creek at the discharge into Beaverlodge Lake (**Figure 4.2**). All four of the scheduled samples were collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at AC-14 along with the predicted recovery, are presented in **Figures 4.2.1-17** to **4.2.1-20.** The annual averages from 2016 to 2020 are presented in **Table 4.2.1-5**.

Uranium concentrations at station AC-14 have been following an overall downward trend since decommissioning. Annual average uranium levels are currently above SEGQ and are predicted to improve in the future. In 2020 the average U concentration was lower than the previous four years. The annual average decreased from 2019 (34.1 µg/L) to 2020 (18.8 µg/L). The decrease in concentration is a potential consequence of the above average regional precipitation that was recorded in 2020. The 2020 uranium average concentration at AC-14 falls at the low end of the predicted water quality bounding range.

The long-term trend for the annual average ^{226}Ra concentration measured at this station has been consistently below the SEQG since 1989, following the decommissioning of the Beaverlodge properties.

Since the analytical laboratory detection limit for Se was lowered, Se concentrations have been below the SEQG value at AC-14.

Total dissolved solids concentrations have remained relatively stable at this station since decommissioning with one anomaly occurring in 1991.

4.2.2 Fulton Creek Watershed

As discussed previously, surface water quality guidelines are not intended to be applied within tailings management areas, and thus they are not compared to water quality at stations TL-3, TL-4, TL-6, or TL-7. No predictions are provided for station AN-3 as this station is considered a reference area, un-impacted by historic mining activities.

The water quality predictions for the Tailings Management Area (TMA) are based on sediment studies and more than 35 years of water quality monitoring. The results of the

2020 ERA show that immediate and downstream environments will continue to naturally recover over time. Radium-226 is anticipated to be steady or slightly increase in the Fulton Creek watershed until approximately 2150 and then decline gradually. The inflection point of these curves occurs as solid phase ^{226}Ra levels within the sediments are depleted to a point where the ^{226}Ra release from the sediments becomes controlled by surface sorption dependent processes as opposed to those that are solubility controlled.

It is important to note that the predicted ^{226}Ra trends in the TMA do not result in a predicted increase of ^{226}Ra concentrations in Beaverlodge Lake, located immediately downstream of the TMA. As a result, Cameco does not anticipate that ^{226}Ra concentrations in the TMA will pose any risk to the natural recovery of the TMA and downstream environment in the future.

AN-3 Fulton Lake

Station AN-3 is located at the outflow of Fulton Lake prior to Fookes Reservoir and was not impacted by mining activities in the area (**Figure 4.2**). Water quality at this station is typical of background water quality in the region. Since 1986, sampling has been conducted on an annual basis. The one scheduled sample for AN-3 was collected in 2020.

A historical summary of ^{226}Ra, U, TDS, and Se concentrations at AN-3 are presented in **Figures 4.2.2-1** to **4.2.2-4**. The concentrations from 2016 to 2020 are presented in **Table 4.2.2-1**.

As expected with a reference location, the long-term trend for concentrations of U, ^{226}Ra, recorded at AN-3 have remained relatively stable and below their respective SEQG concentrations. Total dissolved solids concentrations have also remained stable since before decommissioning in 1985. Selenium concentrations at AN-3 have been at or below the detectable laboratory limits since monitoring Se began.

TL-3 Fookes Reservoir

Station TL-3 is located at the discharge of Fookes Reservoir, which received the majority of tailings during operation, and is the first sampling location within the recovering TMA (**Figure 4.2**). The two scheduled samples for TL-3 were collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at TL-3 along with the predicted recovery as outlined in the 2020 ERA, are presented in **Figures 4.2.2-5** to **4.2.2-10**. The annual averages from 2016 to 2020 are presented in **Table 4.2.2-2**.

Overall, the long-term trend for the mean concentration of U has shown a decrease since 1991. The average U concentration measured in 2020 was 147.0 µg/L, which is lower than the trend observed over the previous 4 years, but within the bounds of the modelled predictions. Above average precipitation recorded in 2020 may have contributed to the larger decrease observed compared to the short-term trend.

The 2020 annual ^{226}Ra concentration (0.895 Bq/L) is below the lower bounds of the modelled predictions and has decreased from the 2019 average concentration of 1.350 Bq/L.

In the long-term Se has been slowly decreasing in concentration since decommissioning. In 2020, the Se concentration measured 0.0016 mg/L, which is below the lower bounds of the modelled predictions at TL-3.

Total dissolved solids concentrations continue to slowly decrease in the long-term.

TL-4 Marie Reservoir

Station TL-4 is located within the Fulton Creek drainage downstream of TL-3 and at the discharge of Marie Reservoir (**Figure 4.2**). The two scheduled TL-4 samples were collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at TL-4 along with the predicted recovery, are presented in **Figures 4.2.2-11** to **4.2.2-16**. The annual averages from 2016 to 2020 are presented in **Table 4.2.2-3**.

Annual average concentration of U at TL-4 in 2020 was 197.5 µg/L, which is within the range of average values measure since 2016 as seen in **Table 4.2.2-3** and is within the model predictions.

The annual average ^{226}Ra concentration in 2020 at TL-4 is 1.55 Bq/L and is within the model predictions.

Annual average Se concentrations have shown a gradual reduction over time with 2020 values ranging from 0.0015 mg/l and 0.0019 mg/l. The 2020 annual average for Se was within modelled predictions.

Annual average concentrations of TDS at TL-4 have continued to see a gradually decreasing trend. The annual average concentration in 2020 was 170.5 mg/L in 2020.

TL-6 Minewater Reservoir

Station TL-6 is located at the discharge of Minewater Reservoir (**Figure 4.2**), which was used temporarily for tailings deposition in 1953, then as a settling pond for treated mine water during the last 10 years of Beaverlodge operations. During decommissioning activities, the water level in Minewater Reservoir was lowered and efforts were made to relocate settled precipitate sludge to the Fay shaft. Although a large volume of precipitate was relocated, these efforts were not successful in removing all sludge, which is reflected by the water quality and the variability of the results observed to date.

This water quality station represents the outflow of a small drainage area and generally exhibits ephemeral flows dependent on local precipitation. As a result, not all scheduled samples are typically collected. Of the two scheduled samples, one was collected. The December sample was not collected due to a lack of flowing water at the station.

The analysis performed as part of the original QSM showed that the contributions of loads from the Minewater Reservoir influencing the downstream Meadow Fen area are quite small, estimated at no more than 10%. As such, 2020 ERA model predictions were not generated for TL-6 (*CanNorth 2020a*). Contributions from this station are incorporated in the model predictions at the downstream station (TL-7).

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at TL-6 is presented in **Figures 4.2.2-17** to **4.2.2-20**. The annual averages from 2016 to 2020 are presented in **Table 4.2.2-4**.

Since decommissioning, U concentrations have been experiencing a decreasing trend at station TL-6 with a more consistent trend over the short-term. The concentration measured in 2020 of 241 µg/L falls within the range measured over the last five years.

The annual average ^{226}Ra concentration at station TL-6 was measured to be 7.7 Bq/L in 2020. The 2020 result is within the long-term range of results observed at this station.

Monitoring of Se at TL-6 was initiated in 1996, with highly variable concentrations being observed until 2004. The 2020 annual average of 0.0038 mg/L is within the long term range observed at this station.

Total dissolved solids experienced an initial downward trend post-decommissioning, with concentrations stabilizing around 500 mg/L since 2005.

TL-7 Meadow Fen

Station TL-7 is located at the discharge of Meadow Fen (**Figure 4.2**) in the TMA. Three of the four scheduled samples for the 2020 reporting period were collected; the regularly scheduled March sample was not collected due to no water being available.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at TL-7 along with the predicted recovery, are presented in **Figures 4.2.2-21** to **4.2.2-26**. The annual averages from 2016 to 2020 are presented in **Table 4.2.2-5**.

Since decommissioning, U and TDS have been experiencing a downward trend in their long-term concentrations. The 2020 annual average U concentration at TL-7 was 200.7 µg/L and is within modelled predictions.

The annual average ^{226}Ra concentrations have decreased since 2017 when station TL-7 experienced an elevated annual average due to a single anomalous reading. In 2020 the annual average concentration was 1.667 Bq/L and was within the predicted bounds.

Since 1995, annual average Se concentrations at TL-7 have been decreasing in the long-term. In recent years, the annual average Se measurements have remained relatively stable and are currently slightly below the lower bound of the modelled predictions.

TL-9 Greer Lake

Station TL-9 is located downstream of Greer Lake immediately before the water enters Beaverlodge Lake (**Figure 4.2)**. Sampling at this station began in 1981 and continued until 1985 at which time it was discontinued. Sampling resumed in 1990 in order to re-assess the water quality entering Beaverlodge Lake. In 2020, three of the four scheduled samples were collected. The regularly scheduled March sample was not collected due to no water being available.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at TL-9 along with the predicted recovery, are presented in **Figures 4.2.2-27** to **4.2.2-32**. Average concentrations at TL-9 from 2016 to 2020 can be found in **Table 4.2.2-6**.

The long-term trends for U at TL-9 have shown a decrease in annual average concentrations following decommissioning. The average U concentrations at TL-9 in 2020 was 176.0 µg/L and is within the range of annual average results measured over past 5 years and is within modelled predictions.

The 2020 annual average ^{226}Ra concentration is 1.70 Bq/L and is within the modelled predictions.

Routine monitoring of Se at TL-9 was not conducted until 1996, at which time it was identified as a contaminant of concern. Selenium at station TL-9 has shown a decreasing trend over the long-term. In 2020, the average concentration was within the modelled predictions with a value of 0.0017 mg/L.

The long-term trend for TDS concentration has been decreasing since decommissioning.

4.2.3 Downstream Monitoring Stations

While Beaverlodge Lake is the receiving environment for water from the decommissioned Beaverlodge properties, it is also the receiving environment for other, non-Eldorado, former uranium mine sites and one former uranium mill tailings area (Lorado Uranium Mining Ltd. mill site) within the Beaverlodge Lake watershed. The results of the 2020 ERA show that downstream environments will continue to naturally recover over time. Model predictions to assess natural recovery of Beaverlodge Lake have been applied to Station BL-5, collected at the outlet of Beaverlodge Lake.

BL-3 Fulton Bay

Station BL-3 is located in Fulton Bay of Beaverlodge Lake, approximately 100 metres from the Fulton Creek discharge (**Figure 4.2**). Sampling at this station was originally carried out during the operational mining and milling phase in order to monitor the near-field impacts of the operations on Beaverlodge Lake.

Post-decommissioning sampling at this location commenced during the 1998-1999 reporting period, and has continued since that time. In 2020, both scheduled samples were collected.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at BL-3 are presented in **Figures 4.2.3-1** to **4.2.3-4**. The annual averages from 2016 to 2020 are presented in **Table 4.2.3-1**.

Annual average concentrations of U and Se at BL-3 have generally been trending downward from decommissioning. The 2020 annual average U and Se concentrations were recorded as 123.5 µg/L and 0.0022 mg/L, respectively.

^{226}Ra activity has been variable year to year; however, all measured activity continues to remain below the SEQG value of 0.11 Bq/L.

The long-term trend for annual average concentrations of TDS has remained relatively stable since 2001.

BL-4 Beaverlodge Lake Centre

Station BL-4 is located in the approximate center of the north end of Beaverlodge Lake **(Figure 4.2**). The scheduled 3-depth composite sample was collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at BL-4 are presented in **Figures 4.2.3-5** to **4.2.3-8**. The annual averages from 2016 to 2020 are presented in **Table 4.2.3-2**.

The long-term trend for U at BL-4 has shown an overall decreasing trend since decommissioning. The U concentration at BL-4 in 2020 was 121 µg/L and is the lowest U concentration reported at this station to date.

The ^{226}Ra concentration was 0.03 Bq/L in 2020and remains below the SEQG value of 0.11 Bq/L. The annual average has been between 0.02 Bq/L and 0.04 Bq/L consistently since 2003.

Selenium concentrations have fluctuated over the long-term; however, a decreasing trend since 2008 has been observed. In 2020, the Se concentration was 0.0021 mg/L, which is the lowest annual average Se concentration measured at this station to date.

The long-term trend for annual average concentrations of TDS has remained relatively stable since 2005 and is within the historic range.

BL-5 Beaverlodge Lake Outlet

Station BL-5 provides a measure of water quality as it flows out of Beaverlodge Lake (**Figure 4.2**). Only one sample was scheduled and collected in 2020.

A historical summary of annual average ^{226}Ra, U, TDS, and Se concentrations at BL-5, along with the predicted recovery, are presented in **Figures 4.2.3-9** to **4.2.3-12**. The annual averages from 2016 to 2020 are presented in **Table 4.2.3-3**.

Uranium and Se concentrations in 2020 were measured at 120.0 µg/L and 0.0021 mg/L, respectively. Both are within the modeled predictions.

Radium^{226} was measured at 0.02 Bq/L in 2020, which is below the corresponding SEQG value of 0.11 Bq/L.

Total dissolved solids concentrations at station BL-5 have remained relatively stable since 2011.

ML-1 Martin Lake

Station ML-1 is located at the outlet of Martin Lake (**Figure 4.2**) and both scheduled samples were collected in 2020.

A table comparing the average concentrations for all measured parameters from 2016 to 2020 is presented in **Table 4.2.3-4**. The data is also presented graphically in **Figures 4.2.3-13** to **4.2.3-16**.

In 2020, the average U concentration was recorded with a value of 23.4 µg/L. This average result was impacted by an extremely low value measured in December 2020 of 2.7 µg/L. It is theorized that this sample was impacted by fresh water from Fredette Lake and is not representative of the U concentration in the rest of Martin Lake. Fredette Lake flows into the Martin Lake approximately 2.5 km from the Martin Lake outlet. It is possible that fresh water from Fredette Lake flowed across or within ice lenses on Martin Lake and did not adequately mix with Martin Lake water when it was sampled. The sampling contractor was contacted to ask about any unusual observations and did not note anything unusual during the sample collection. A similar result was observed in December of 2016. The result of 44.0 µg/L collected in June 2020 is likely more representative of the U concentration within Martin Lake.

The 2020 annual average ^{226}Ra concentration of 0.005 Bq/L was below the SEQG. The average readings were also influenced by the same phenomenon as the U concentrations, but due to the low ^{226}Ra concentrations the change in results is not as noticeable.

The observed Se concentrations have shown a relatively stable trend since 2012, with the 2020 annual average (0.0005 mg/L) below the SEQG concentration of 0.001 mg/L.

The average TDS concentrations have remained relatively stable since sampling started and was 100.0 mg/L for the 2020 reporting year.

CS-1 Crackingstone River

Station CS-1 is located near the bridge in Crackingstone River approximately half way between the outlet of Martin Lake and Lake Athabasca (**Figure 4.2**). The scheduled sample was collected in 2020.

A table comparing the annual concentrations for all measured parameters from 2016 to 2020 is presented in **Table 4.2.3-5**. The same information is presented graphically in **Figures 4.2.3-17** to **4.2.3-20**.

The U concentration at CS-1 was 44 µg/L in 2020, a decrease from 2019 levels. Both the Se and ^{226}Ra concentrations were below their respective SEQG values; Se with a value of 0.0008 mg/L and ^{226}Ra below the laboratory detection limit of 0.005 Bq/L.

Total dissolved solids concentrations have remained relatively stable, fluctuating between 100 mg/L and 124 mg/L over the past five years (**Table 4.2.3-5**).

CS-2 Crackingstone Bay

Station CS-2 is located in Crackingstone Bay on Lake Athabasca (**Figure 4.2**), approximately 1 km from the mouth of the Crackingstone River. The scheduled sample was collected in June, but due to irregular results a resample was collected in July, confirming the June results.

The measured parameter concentrations are presented in **Table 4.2.3-6**, while a graphical presentation of U, Se, ^{226}Ra, and TDS trends can be found in **Figures 4.2.3-21** to **4.2.3-24**.

The U concentration at station CS-2 in June 2020 was 18 µg/L, which is above SEQG value and is higher than typically observed results at this station. In 2020 regional water levels were unusually high and Lake Athabasca water levels were measured more than 2m higher than those observed in 2019. The increased water levels in Lake Athabasca may have influenced the mixing regime in Crackingstone Bay, thereby limiting dispersion and resulting in higher-than-normal U concentrations. Once regional water levels normalize it is expected that Crackingstone Bay water quality will return to historic levels.

Radium^{226} and selenium concentrations have remained consistent since 2011 and remain below their respective SEQGs. Total Dissolved Solids concentrations remain within the historic range (34 mg/L to 220 mg/L).

4.3 Additional Water Quality Sampling

4.3.1 ZOR-01 and ZOR-02

The Beaverlodge Path Forward Report (*Cameco 2012*) describes the activities required to prepare the Beaverlodge properties for transfer to the IC Program. One of the potential remedial measures identified in the 2012 Path Forward Report was the flow path reconstruction of the Zora Lake outflow. This project was initiated in 2014 and completed in 2016 and involved relocating a portion of the waste rock pile to re-establish Zora Creek flow and reduce the contact between water from Zora Creek and the Bolger waste rock pile before reaching Verna Lake (**Figure 4.3**).

As a result of the implementation of the project to re-establish the Zora Creek flow path, monthly water sampling was implemented in August 2013 to monitor water quality at the discharge from Zora Lake outflow (ZOR-01) and the outlet from the waste rock pile, which flowed into Verna Lake (ZOR-02). As ZOR-01 station is at the outlet of Zora Lake, which is the lake upstream of the new flow path, it represents the baseline for comparing water quality to ZOR-02.

In 2020, samples were collected at both stations from March to December, with the exception of ZOR-02 in April as it was frozen. In January and February, ice cover or dry conditions prevented sampling at both stations. The measured parameter concentrations for the current reporting period for ZOR-01 and ZOR-02 are presented in **Table 4.3-1** and **Table 4.3-2**, respectively. A graphical representation of the data collected since 2013 is presented in **Figures 4.3-1** to **4.3-8**.

Sampling completed at ZOR-02 prior to 2015 represents water quality as it flowed through the Bolger waste rock pile prior to entering Verna Lake. Sampling completed during 2015 at this station represents construction activities during relocation of the waste rock, and samples post-2016 represent water flowing through the newly created flow path.

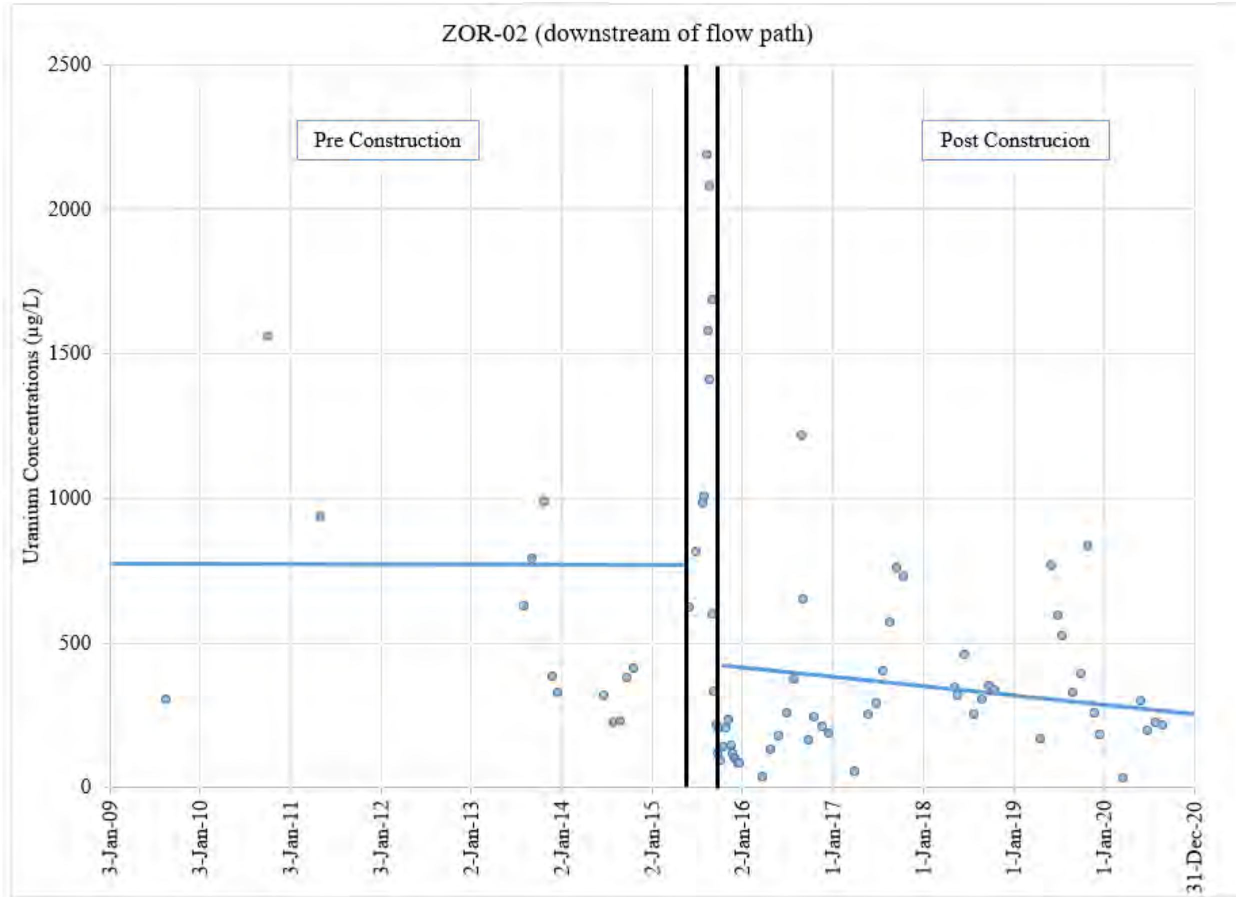
From the beginning of sampling in 2013 to date, ^{226}Ra, U, Se, and TDS concentrations at ZOR-01 have remained relatively stable. Radium^{226} and Se have both remained below their respective SEQG values, while U fluctuates around the SEQG value.

Selenium and TDS at ZOR-02 have also remained relatively stable, with Se remaining below the SEQG value. The U and ^{226}Ra concentrations are above the SEQG and have been variable since sampling began at ZOR-02.

The U and ^{226}Ra concentrations at ZOR-02 saw an overall lower trend through much of the year compared to previous years. The peak concentration of 300 µg/L for U was measured in May and was likely impacted by freshet following a relatively dry year in 2019, which saw elevated levels of U measured through much of the year. The peak concentration of ^{226}Ra measured in 2020 was 0.21 Bq/L measured in July.

Figure 4.3-9 shows the results of water sample data collected at ZOR-02 through the various phases of pre-construction, construction and post construction. Also provided are general trend lines showing the relative improvement in water quality post-construction. The Pre-Construction trend line is the overall average U concentration for that period, while the Post-Construction is a linear trend line created using the annual U concentration averages.

Figure 4.3-9 - ZOR-02 Uranium Concentrations Pre and Post Construction



The fluctuations in U concentrations observed through construction and following construction are reflected in the concentration of U measured at AC-6A which increased, as expected, immediately following construction but has seen some improvement in subsequent years. Uranium concentrations measured at the monitoring station AC-8 located in Ace Lake (immediately downstream) have remained below the SEQG since 2012. A summary of annual mean U and ^{226}Ra data from 2010 to 2020 at ZOR-02, AC-6A, and AC-8 is presented in **Table 4.3-3**. As AC-6A flows into Ace Lake, data from the outlet of Ace Lake (AC-8) is presented for reference.

4.3.2 Sealed Boreholes

Boreholes have been identified on most decommissioned Beaverlodge properties and are the result of the original exploration and mine development activities. Following decommissioning, the Beaverlodge mine was allowed to flood. As a result, boreholes that intersect or otherwise have made hydraulic connection with the now flooded mine workings have the potential to discharge water. In 2020, areas associated with formerly flowing (now sealed) boreholes were inspected and it was confirmed that boreholes have remained sealed.

Two drain holes that connected surface water drainage from the Ace Stope area to a former vent raise were discussed in the 2020 SkMOE Inspection Report. The holes were created at decommissioning to promote drainage of surface water from the Ace Stope area into the mine workings, versus Ace Creek. During dry periods water has been observed draining into the underground workings via these holes; however, during high water periods water has been observed flowing out of the mine and into the drainage channel that leads to Ace Creek. No water sampling was required as the decision was made, in consultation with the regulatory agencies, to seal these drain holes in 2021.

4.4 QA/QC Analysis

As outlined in the Beaverlodge EMP, Cameco's QA/QC program involves the collection of field and trip blank, blind, and duplicate samples in order to assure that field sampling and laboratory analyses produce reliable and accurate results.

Field blanks are used to identify contamination arising from equipment, preservatives, sampling techniques and handling, and the general ambient conditions during sampling. Field blanks are collected by obtaining analyte-free water from the laboratory, transporting the water into the field, and taking it through all sample collection, handling and processing steps that the primary samples undergo. Field blanks are transported, stored and analyzed in the same manner as primary samples.

Trip blanks are used to determine if any errors are being introduced through transport, storage, sample bottles, preservatives or analysis. Samples of analyte-free water are sent from the laboratory to the field and then back to the laboratory along with primary samples. The trip blank sample seal remains unbroken in the field. Blind replicate samples involve the collection of two homogenous samples of water from a single sampling location, with the water sent to the same analytical laboratory to test the labs ability to duplicate results through their analytical methods. The blind samples are labelled differently, as a result the identity of the field blind replicate sample is known only to the submitter and not to the analyst. Blind samples check the labs ability to provide consistent results and are sent out in September and December.

Duplicate samples involve collection of two homogeneous samples of water from a single sample location that are sent for analysis to two different labs to determine if the labs analyzing the samples obtain similar results. Duplicate samples are sent out in June to Saskatchewan Research Council (SRC) and Bureau Veritas Laboratories.

In a case where results from the regular monitoring and results from the blind sample vary, SRC would be contacted to determine the source of inconsistency in the results. If there were discrepancies in the blank or duplicate laboratory results, it would be at the discretion of the Senior Reclamation Specialist to investigate the discrepancy and determine if corrective action is warranted.

Results with an absolute difference greater than 50%, that cannot be explained, are subject to further investigation. If either value is greater than five times the entered detection limit and are outside their associated range of entered uncertainty (= Value +/- Entered Uncertainty) then samples are considered noncompliant and additional investigation is required.

Blank Samples

Station DB-6 trip and laboratory blank samples were prepared, collected, and analyzed in September 2020. When results from DB-6 TB (trip blank) and DB-6 FB (field blank) were compared, alkalinity, bicarbonates and sodium all recorded absolute differences above 50%. After further investigation the value was less than five times the entered detection limit, therefore all results were found to be within acceptable range of variation.

Blind Replicate Samples (Split samples)

Blind replicate samples were collected in September 2020 at stations TL-7 (Blind-6) and in December 2020 at AC-14 (Blind-1). When results from Blind-6 were compared with the sample results for TL-7, all results were found to be within the acceptable range of variation. When results from Blind 1 were compared with sample results from AC-14 Zinc had an absolute difference greater than 50%, after further investigating the value was less than five times the entered detection limit, therefore discrepancy was considered within the acceptable range.

Duplicate Samples (Side by side samples)

Duplicate samples at station TL-4 were collected in June, results from June indicated that copper, lead-210 and selenium exceeded the absolute difference of 50%. Further investigation indicated that the selenium and lead-210 parent values were less than five times the entered detection limit for both the parent and child samples. Copper values differed greater than five times the entered detection limit but fell within the associated range of entered uncertainty. Although the values are not listed in Appendix F, the Entered Detection Level and Entered Uncertainty for Cu were found to be 0.00036 mg/l from SRC and 0.0020 mg/l from BV lab. Therefore, all results were found to be within acceptable range of variation between the Bureau Veritas and SRC results. Laboratory QA/QC reports are presented in **Appendix F**.

4.5 Hydrology

4.5.1 Introduction

Water flows are measured year-round in the Ace Creek watershed at the outlet of Ace Lake (station AC-8). This station has a well-defined flow rating curve and is typically ice-free year round making it an ideal location to estimate regional flows in the Beaverlodge area. In the Fulton Creek watershed, glaciation prevents year-round flow data collection; therefore, estimates of the flow rate during the winter months at station TL-7 are calculated using flow rates from AC-8.

4.5.2 Hydrological Data

Missinipi Water Solutions Inc. was retained by Cameco to complete an assessment of the stage and flow data for stream flow monitoring stations at Fulton Creek (TL-7) and Ace Lake (AC-8) for the period January 1, 2020 to December 31, 2020. The report can be found in **Appendix G**.

There was an abundance of spring snow, as the months of March and April both recorded greater than 60 cm of snow on ground at month end. In comparison, over the past seven years the average snow on ground measured at the end of March was 46.6 cm. Over that same period the average snow on ground at the end of April was 8.7 cm. The above average snowpack resulted in an abundance of freshet, and water levels continued to be high throughout 2020 due to the higher-than-normal precipitation. Monthly precipitation recorded in 2020 met or exceeded the 10-year monthly average values for precipitation at Uranium City. The total precipitation recorded in 2020 of 377.0 mm is 117% above normal. It is important to mention that the climate station at Uranium City did not report data from July 29 to August 13. During this time multiple intense rainfall events occurred which went unrecorded. The 2020 flow records generally reflected these climatic conditions.

The 2020 average annual flow rate at AC-8 was recorded as 1.194 m^3/s, the highest recorded value since 1997. There were two peak flow periods noted in 2020 with the first occurring during freshet, which is expected year-to-year, and a second peak that occurred in late summer and decreased much more gradually than freshet. Higher than normal snowpack resulted in an abundance of freshet and the highest recorded average monthly flow occurring in June (2.284 m^3/s) for 2020, although the highest single day flow for 2020 was recorded on May 23 at 2.744 m^3/s. Following freshet, flows decreased into August. The lowest recorded flow rate prior to the second peak occurred on August 7 (0.543 m^3/s). However, significant precipitation in August followed by above average precipitation through the fall months resulted in a second flow peak in 2020. The maximum flow during the second flow peak occurred on September 3 with a measured flow of 2.57 m^3/s.

Similar to AC-8, TL-7 recorded the highest annual average flow rates since 1997. TL-7 also recorded two peak flow periods, one after freshet and one after late summer precipitation events. The abundance of freshet initiated the first flow peak experienced in June, where TL-7 recorded a monthly average of 0.1005 m^3/s, with the peak flow day occurring on June 9 (0.1339 m^3/s). Flows decreased in July, with the lowest flow rate occurring on July 11 recording a value of 0.0318 m^3/s. After significant precipitation events throughout August, a second peak flow period occurred in September where a monthly flow rate average of 0.1991 m^3/s was recorded. The maximum flow during the second flow peak period occurred on September 30th (0.2918 m^3/s).

4.6 Air Quality

This section presents a summary of the results of historic and on-going radon monitoring at five separate locations in and around the mill site and at Uranium City (**Figure 4.6.1-1**). The radon sampling program was revised in the 2020 EMP, and the radon monitoring stations were reduced from ten to five stations.

4.6.1 Ambient Radon Monitoring

As part of the transitional phase monitoring program, radon levels have been monitored on and around the decommissioned Beaverlodge properties and at other locations in the region since 1985. Cameco utilizes the RadTrak2 model, supplied by Radonova, to monitor radon in the Uranium City area.

Radon monitoring devices are collected and replaced semi-annually from five stations established throughout the area, illustrated in **Figure 4.6.1-1** and listed below:

Eldorado Town Site
Ace Creek
Fookes Delta
Marie Delta
Uranium City

Table 4.6.1 presents a summary of the radon monitoring conducted at the five sites for the 2020 monitoring period. Although the entire suite of stations monitored in 1982 is not applicable for comparison to the current monitoring results, the applicable stations have been included in the summary table and **Figure 4.6.1-2** compares the most recent five years of data to operational levels. Overall, measured radon levels have remained relatively constant in recent years and are much lower than during operation. The radon levels measured for the background stations display a rapid decrease to background levels as the distance from the former mine and mill site increases.

SECTION 5.0

OUTLOOK

5.0 OUTLOOK

This section of the report describes those tasks and activities planned for 2021.

5.1 Regular Scheduled Monitoring

Representatives of Cameco continue to implement the Beaverlodge EMP, assessing:

- Water,
- Radon in air,
- Local hydrology,
- Formerly flowing boreholes, and
- Geotechnical stability of features, where required

Additional water samples will be collected at the sample locations ZOR-01 and ZOR-02 to continue to monitor the success of the Zora Creek Reconstruction project through the Bolger Waste Rock Pile. The flow path reconstruction is discussed in more detail in **Section 3.2.3**.

5.2 Planned Public Meetings

Cameco has developed a Public Information Program (PIP) for Beaverlodge that describes communication with stakeholders. The PIP formalizes the communication process, ensuring that Cameco's activities or plans at the decommissioned Beaverlodge properties are effectively communicated to the public in a manner that complies with established guidelines. It is based on the PLAN-DO-CHECK-ACT model outlined in internationally recognized management standards.

Each year Cameco hosts a public meeting, typically with the CNSC and SkMOE in attendance, to review the results of any activities completed since the previous meeting and to preview the plans for the upcoming year, including any activities or planned studies that are to be completed. This meeting also provides an opportunity for Cameco to engage local residents regarding the plan and schedule for transferring properties to the Province of Saskatchewan's IC Program. This engagement opportunity allows residents to provide feedback to Cameco and the JRG regarding potential concerns with the properties and their suitability for transfer to the IC Program.

In 2021, Cameco plans to host its annual public meeting in Uranium City and will continue to invite representatives from the NSEQC as well as Uranium City Métis Local #50 President. In addition, Cameco plans to invite members of the AJES as defined under the Yá thi Néné collaboration agreement. The annual public meeting is typically followed by a 'boots on the ground' tour of the properties, focused on changes that have occurred since the previous tour and properties proposed for transfer to the IC program If public health restrictions permit, the intent of the 2021 tour is to increase transparency, provide opportunities for reconnection with Beaverlodge lands and enhance Cameco’s understanding of the land in which it has been used by Indigenous Peoples through time. A second virtual tour video is also anticipated to be completed in 2021 to help those interested reconnect with the lands and see the site from a new perspective. Some of the properties are in remote areas, which makes access difficult. This second virtual tour will increase access to remote areas not normally seen.

In addition to the annual public meeting, Cameco plans to provide an overview of the IC Program and activities occurring at Beaverlodge during an AJES quarterly meeting and a general NSEQC meeting (pending a signed Minster's Order) in 2021.

5.3 Planned Regulatory Inspections

The JRG conducts an annual inspection of the Beaverlodge properties, often in conjunction with the annual Uranium City public meeting, usually in June or July. The regulatory inspection involves travelling to the Beaverlodge properties and ensuring that site conditions remain safe, stable, and secure. In addition, activities to address previous inspection recommendations are assessed to confirm that the activity or action was completed to the satisfaction of the regulatory agencies. As Cameco continues the process of transferring properties to the Province of Saskatchewan IC Program, inspections will focus on the properties being requested for release. The timing related to the regulatory inspection in 2021 will be dependent on several factors and will include consideration of public health advisories in place.

5.4 2021 Work Plan

As the WFOL-W5-2120.1/2023 expires in 2023 and the Beaverlodge Surface Lease Agreement expires in 2026, it is Cameco’s goal that all of the properties will meet the established criteria for a release from licensing with no need for a new CNSC licence or Provincial Surface Lease Agreement.

As outlined in **Section 2.5**, the remediation activities identified in the path forward work plan for the Beaverlodge properties include:

- Site wide gamma assessment.
- Rehabilitate historic mine openings.
- Decommission identified boreholes.
- Re-establishment of the Zora Creek flow path.
- Final inspection and cleanup of properties.

The following section describes the planned activities associated with the work plan as well as some of the additional activities that will be occurring in the upcoming years to prepare the properties for transfer to the IC Program.

5.4.1 Site Wide Gamma Assessment

The site wide gamma scanning program and assessment was completed in 2014 and 2015. As minor reclamation and site clean-up activities are completed as part of preparing the sites for transfer to the IC Program, some areas of waste rock may be disturbed. The disturbed waste rock will be scanned once all work in the area is complete, and the results will be compared to the 2014 site wide surficial gamma survey.

Additional gamma surveys may also be completed to augment the initial 2014 survey and fill in potential data gaps. Final gamma survey results will be provided to the regulatory agencies once completed and records will be maintained by the Province of Saskatchewan once the property is accepted into the IC Program. It is anticipated that additional gamma scanning will be required in 2021 in the mill area and in other smaller areas where waste rock is disturbed during remediation activities.

5.4.2 Historic Mine Openings Rehabiliation

In 2021, Cameco will be investigating the CB-1 access raise in order to develop plans and complete designs for the final remediation of this raise. This raise was used to feed ore from the crusher area to the mill during operation. The investigation will include an assessment of potential backfill options. As noted in Section 3.3.2, additional field investigations related to the Verna Shaft adit are also planned for 2021.

5.4.3 Decommission identified boreholes

A master list of all boreholes found on the properties, and their status, is provided in **Appendix C**. If any additional boreholes are located prior to properties being transferred to the IC Program they will be sealed and their status recorded in the master list. In 2021, boreholes identified in the 2020 SkMOE Inspection Report will be sealed.

5.4.4 Final Inspection and Clean-up of the Properties

This site-wide project was largely completed from 2015 to 2017. However, as individual properties go through final assessment to ensure all performance indicators have been met, minor amounts of debris may be encountered. This debris will be collected and disposed of in the Lower Fay Pit. Further organization and compaction of the debris in the Lower Fay Pit will occur in 2021 to facilitate application of a waste rock cover.

5.4.5 Re-establishment of the Zora Creek flow path

Water quality monitoring and inspections in the area will continue in 2021.

5.4.6 Work in Addition to the Path Forward Activities

Site Inspection Follow-Up

Due to a delayed regulatory inspection resulting from travel restrictions related to COVID-19, SkMOE and CNSC issued inspection reports on October 14 and November 17, 2020. As discussed in **Section 3.2.1**, associated remediation work and updates will be completed in 2021 after the field season is complete.

Cover Application of Former Mill Area

The former mill area was inspected to ensure long-term safety regarding settling of waste rock since the site was decommissioned. Small ‘spot’ areas of settling were identified and are associated with the former mill site in addition to general settling that has occurred within the former mill building foundation. ‘Spot’ areas are expected to be filled with angular clean waste rock and expose I-beams associated with the walls of the mill that have become exposed will be cut off at ground level and the area covered with waste rock. The waste rock for the cover will be sourced from one of the roads towards Verna/Bolger area.

IC Program Documentation Preparation

In accordance with the Path Forward and following a similar process from previous, successful applications, Cameco submitted an application on January 20, 2021 for the following 18 Beaverlodge properties to initiate the regulatory processes required to support a transfer to the IC program or free-release where applicable: ACE 1, ACE 3, ACE 7, ACE 8, ACE 9, ACE 14, ACE MC, EXC ACE 15, EXC URA 7, GC 2, NW 3 Ext, NW 3, URA 4, URA FR, EMAR 1, EXC 1, HAB 1, and HAB 2. Cameco understands the CNSC, SkMOE, SkMER and Saskatchewan Ministry of Government Relations (SkMGR), must all agree that the Properties have met all the requirements to be considered for transfer. Cameco therefore requested that SkMOE consider the submission as a formal request for “Release from Decommissioning and Reclamation” pursuant to Section 22 of *The Mineral Industry Environmental Protection Regulations, 1996*. Cameco also provided this report to SkMER for review, in support of an application for custodial transfer of the properties into the IC Program in accordance with *The Reclaimed Industrial Sites Act*. The process for entry to the IC Program also requires Cameco to receive a Partial Surrender of Surface Lease (Beaverlodge Surface Lease Agreement, 2006) from SkMGR before the SkMER will accept the Properties into the IC Program. If a specific property is licensed pursuant to the federal NSCA, the CNSC must agree, in writing, to grant an exemption or release from the obligation to hold a licence under the NSCA in order for an individual property to be accepted into the provincial IC Program. Activities on the Beaverlodge site are currently managed under a CNSC Waste Facility Operating License (WFOL-W5-2120.01/2023) issued pursuant to the NSCA and which expires on May 31, 2023. By way of the January submission, Cameco provided the information required to support a decision by the CNSC to release the Properties from CNSC licensing.

Comments regarding this application were received from the CNSC on February 3, 2021. Once all regulatory comments are received and addressed, it is anticipated that a CNSC hearing will be held in 2022.

Cameco will continue to prepare documentation in 2021 to support the transfer of additional properties that meet performance objectives to the IC program.

Cameco will also provide all archived records (including reports, maps, drawings, slides and photos) related to the decommissioned Beaverlodge properties to Saskatchewan Ministry of Economy as the properties are being transferred to the IC Program.

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SECTION 6.0

6.0 REFERENCES

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TABLES

TABLES

Table 4.2.1-1 AN-5 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	92.0	109.4	103.4	125.2	71.7	3	0	12.9	61.0	86.0
	Ca (mg/l)	28.0	32.2	30.8	37.2	24.0	3	0	4.0	20.0	28.0
	Cl (mg/l)	0.6	0.7	0.8	1.0	0.5	3	0	0.2	0.3	0.6
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	3	3	0.0	1.0	1.0
	Cond-L (µS/cm)	202	226	204	255	168	3	0	27	144	198
	Hardness (mg/l)	96	111	107	130	82	3	0	14	68	96
	HCO3 (mg/l)	112.2	133.6	126.0	152.7	87.3	3	0	15.9	74.0	105.0
	K (mg/l)	1.1	1.1	1.3	1.6	0.9	3	0	0.1	0.8	1.0
	Na (mg/l)	3.0	3.7	3.7	4.6	2.5	3	0	0.5	2.0	3.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	3	3	0.0000	1.0000	1.0000
	SO4 (mg/l)	14.4	12.5	13.6	15.5	14.3	3	0	1.5	13.0	16.0
	Sum of Ions (mg/l)	166	192	184	222	135	3	0	22	115	158
Metal	As (µg/l)	0.3	0.4	0.3	0.3	0.3	3	0	0.0	0.3	0.3
	Ba (mg/l)	0.1112	0.1360	0.1236	0.1500	0.1013	3	0	0.0076	0.0960	0.1100
	Cu (mg/l)	0.0012	0.0004	0.0007	0.0009	0.0014	3	0	0.0001	0.0013	0.0015
	Fe (mg/l)	0.2090	0.3220	0.2084	0.3607	0.2050	3	0	0.1626	0.0850	0.3900
	Mo (mg/l)	0.0027	0.0028	0.0032	0.0027	0.0027	3	0	0.0004	0.0024	0.0032
	Ni (mg/l)	0.0007	0.0006	0.0005	0.0005	0.0007	3	0	0.0001	0.0006	0.0008
	Pb (mg/l)	0.0002	0.0002	0.0001	0.0002	0.0001	3	1	0.0001	0.0001	0.0002
	Se (mg/l)	0.0001	0.0001	0.0001	0.0002	0.0001	3	2	0.0000	0.0001	0.0001
	U (µg/l)	130.4	168.4	163.2	169.5	78.0	3	0	43.3	51.0	128.0
	Zn (mg/l)	0.0009	0.0006	0.0007	0.0019	0.0020	3	0	0.0015	0.0006	0.0036
Nutrient	C-(org) (mg/l)	11.0	8.5	8.2	10.6	13.0	1	0		13.0	13.0
	NH3-N (mg/l)	0.05	0.05	0.04	0.31			0			
	NO3 (mg/l)	0.11	0.09	0.09	0.09	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	0.02	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)	7.6	7.7	7.8	7.6	7.7	3	0	0.3	7.5	8.0
	TDS (mg/l)	133.80	150.80	148.00	173.40	111.67	3	0	23.18	87.00	133.00
	Temp-H20 (°C)	9.2	9.3	7.2	10.7	17.3	3	0	6.1	13.3	24.3
	TSS (mg/l)	1.4	1.0	1.0	1.0	<1.0	3	3	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.03	0.05	0.22	0.10	0.06	1	0		0.06	0.06
	Po210 (Bq/L)	0.020	0.010	0.008	0.040	0.030	1	0		0.030	0.030
	Ra226 (Bq/L)	0.686	0.798	0.646	0.900	0.497	3	0	0.074	0.440	0.580

Table 4.2.1-2 DB-6 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	90.0	87.8	85.5	91.7	84.8	4	0	9.9	77.0	99.0
	Ca (mg/l)	34.5	32.5	34.0	36.0	32.8	4	0	2.5	30.0	36.0
	Cl (mg/l)	0.6	0.6	0.6	0.7	0.6	4	0	0.2	0.5	0.8
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	4	4	0.0	1.0	1.0
	Cond-L (µS/cm)	222	207	204	217	203	4	0	22	187	234
	Hardness (mg/l)	107	101	106	112	101	4	0	9	92	113
	HCO3 (mg/l)	109.7	107.0	104.3	111.8	103.3	4	0	12.3	94.0	121.0
	K (mg/l)	0.8	0.7	0.9	0.9	0.8	4	0	0.1	0.8	0.9
	Na (mg/l)	2.0	1.9	2.0	2.1	1.9	4	0	0.2	1.8	2.2
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	22.8	22.3	21.0	21.5	19.0	4	0	2.0	18.0	22.0
	Sum of Ions (mg/l)	176	170	168	179	163	4	0	18	149	189
Metal	As (µg/l)	0.1	0.1	0.1	0.1	0.1	4	2	0.0	0.1	0.1
	Ba (mg/l)	0.0450	0.0420	0.0438	0.0445	0.0405	4	0	0.0067	0.0350	0.0500
	Cu (mg/l)	0.0008	0.0005	0.0007	0.0007	0.0007	4	0	0.0001	0.0006	0.0007
	Fe (mg/l)	0.0180	0.0128	0.0473	0.0275	0.0253	4	0	0.0081	0.0180	0.0360
	Mo (mg/l)	0.0020	0.0021	0.0021	0.0021	0.0020	4	0	0.0001	0.0019	0.0021
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	4	0	0.0000	0.0002	0.0002
	Pb (mg/l)	0.0001	<0.0001	<0.0001	0.0001	<0.0001	4	4	0.0000	0.0001	0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	4	3	0.0000	0.0001	0.0001
	U (µg/l)	159.0	153.8	193.5	177.5	118.8	4	0	38.0	83.0	172.0
	Zn (mg/l)	0.0009	0.0005	0.0005	0.0010	0.0008	4	3	0.0006	0.0005	0.0016
Nutrient	C-(org) (mg/l)	8.7	8.2	8.6	8.9	9.8	1	0		9.8	9.8
	NH3-N (mg/l)	0.05	0.05	0.05	0.05			0			
	NO3 (mg/l)	0.19	0.07	0.07	0.14	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.8	7.9	7.9	7.9	7.7	4	0	0.0	7.7	7.8
	TDS (mg/l)	146.50	144.25	146.50	157.40	133.75	4	0	19.03	112.00	157.00
	Temp-H20 (°C)	8.4	13.1	8.6	10.2	13.5	4	0	7.1	4.5	21.7
	TSS (mg/l)	1.0	1.3	<1.0	1.2	1.5	4	3	1.0	1.0	3.0
Rads	Pb210 (Bq/L)	0.08	0.26	0.24	0.09	0.10	1	0		0.10	0.10
	Po210 (Bq/L)	0.006	0.008	<0.005	<0.005	0.006	1	0		0.006	0.006
	Ra226 (Bq/L)	0.040	0.033	0.040	0.032	0.028	4	0	0.010	0.020	0.040

Table 4.2.1-3 AC6-A Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	107.7	103.2	95.0	95.5	107.5	8	0	10.0	98.0	125.0
	Ca (mg/l)	44.4	41.2	40.0	42.0	42.5	8	0	2.1	40.0	46.0
	Cl (mg/l)	0.7	0.6	0.5	0.5	0.5	8	0	0.1	0.4	0.6
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	8	8	0.0	1.0	1.0
	Cond-L (µS/cm)	302	287	264	272	282	8	0	11	269	298
	Hardness (mg/l)	151	140	137	142	144	8	0	7	135	156
	HCO3 (mg/l)	131.4	126.0	115.8	116.5	131.3	8	0	12.1	120.0	152.0
	K (mg/l)	1.0	0.8	0.9	0.9	1.0	8	0	0.1	0.8	1.1
	Na (mg/l)	2.5	2.3	2.3	2.4	2.4	8	0	0.1	2.3	2.5
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	8	8	0.0000	1.0000	1.0000
	SO4 (mg/l)	50.5	46.2	47.0	47.0	45.6	8	0	1.4	44.0	48.0
	Sum of Ions (mg/l)	239	226	215	219	233	8	0	13	216	248
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	8	0	0.0	0.2	0.2
	Ba (mg/l)	0.0234	0.0227	0.0205	0.0210	0.0216	8	0	0.0017	0.0200	0.0240
	Cu (mg/l)	0.0003	0.0009	0.0005	0.0005	0.0005	8	0	0.0002	0.0003	0.0010
	Fe (mg/l)	0.0094	0.0118	0.0125	0.0135	0.0077	8	0	0.0044	0.0030	0.0150
	Mo (mg/l)	0.0011	0.0012	0.0010	0.0011	0.0012	8	0	0.0003	0.0009	0.0018
	Ni (mg/l)	0.0001	0.0001	0.0001	<0.0001	0.0001	8	5	0.0000	0.0001	0.0001
	Pb (mg/l)	<0.0001	0.0002	<0.0001	0.0002	<0.0001	8	8	0.0000	0.0001	0.0001
	Se (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	8	0	0.0000	0.0002	0.0002
	U (µg/l)	331.0	279.3	278.5	271.5	292.0	8	0	62.1	173.0	368.0
	Zn (mg/l)	0.0005	0.0012	<0.0005	0.0014	0.0007	8	6	0.0005	0.0005	0.0018
Nutrient	C-(org) (mg/l)	7.1				8.0	1	0		8.0	8.0
	NH3-N (mg/l)	0.04						0			
	NO3 (mg/l)	0.06	0.13	0.04	0.05	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01				<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	8.0	8.0	7.9	8	0	0.1	7.8	8.0
	TDS (mg/l)	195.80	181.67	197.00	228.00	192.88	8	0	15.03	168.00	220.00
	Temp-H20 (°C)	9.3	12.8	14.4	22.7	12.5	8	0	7.7	0.3	22.0
	TSS (mg/l)	1.0	1.7	1.3	1.5	1.6	8	6	1.8	1.0	6.0
Rads	Pb210 (Bq/L)	0.02				0.18	1	0		0.18	0.18
	Po210 (Bq/L)	<0.005				0.010	1	0		0.010	0.010
	Ra226 (Bq/L)	0.108	0.115	0.100	0.090	0.099	8	0	0.010	0.080	0.110

Table 4.2.1-4 AC-8 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	52.0	54.5	52.0	51.5	44.0	1	0		44.0	44.0
	Ca (mg/l)	17.0	16.5	17.0	17.0	14.0	1	0		14.0	14.0
	Cl (mg/l)	0.8	0.9	0.9	1.1	0.8	1	0		0.8	0.8
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	122	117	112	112	98	1	0		98	98
	Hardness (mg/l)	56	55	56	56	46	1	0		46	46
	HCO3 (mg/l)	63.5	66.5	63.0	63.0	54.0	1	0		54.0	54.0
	K (mg/l)	0.6	0.8	0.8	0.9	0.7	1	0		0.7	0.7
	Na (mg/l)	1.5	1.5	1.6	1.6	1.4	1	0		1.4	1.4
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	7.4	6.9	6.6	6.3	5.6	1	0		5.6	5.6
	Sum of Ions (mg/l)	95	96	93	94	79	1	0		79	79
Metal	As (µg/l)	0.2	0.2	0.2	0.1	0.1	1	0		0.1	0.1
	Ba (mg/l)	0.0230	0.0220	0.0230	0.0240	0.0210	1	0		0.0210	0.0210
	Cu (mg/l)	0.0003	0.0003	0.0005	0.0006	0.0005	1	0		0.0005	0.0005
	Fe (mg/l)	0.0395	0.0255	0.0320	0.0155	0.0300	1	0		0.0300	0.0300
	Mo (mg/l)	0.0011	0.0011	0.0010	0.0010	0.0008	1	0		0.0008	0.0008
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	1	0		0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	U (µg/l)	14.5	12.5	12.5	12.5	12.0	1	0		12.0	12.0
	Zn (mg/l)	<0.0005	<0.0005	<0.0005	0.0006	0.0014	1	0		0.0014	0.0014
Nutrient	C-(org) (mg/l)	7.4	6.9	7.0	6.2	8.8	1	0		8.8	8.8
	NH3-N (mg/l)	0.08	0.08	0.08	0.14			0			
	NO3 (mg/l)	0.05	0.21	0.20	0.09	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.6	7.5	7.7	7.6	7.6	1	0		7.6	7.6
	TDS (mg/l)	85.50	85.50	86.50	85.00	57.00	1	0		57.00	57.00
	Temp-H20 (°C)	7.2	7.9	4.0	7.5	18.4	1	0		18.4	18.4
	TSS (mg/l)	<1.0	1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.03	<0.02	<0.02	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	0.006	0.005	0.006	<0.005	0.005	1	0		0.005	0.005
	Ra226 (Bq/L)	0.015	0.025	0.020	0.025	<0.005	1	1		0.005	0.005

Table 4.2.1-5 AC-14 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	53.3	52.6	51.8	52.7	49.3	4	0	3.0	46.0	53.0
	Ca (mg/l)	17.4	17.3	17.4	17.5	15.8	4	0	0.5	15.0	16.0
	Cl (mg/l)	1.0	1.2	1.5	1.3	0.9	4	0	0.1	0.8	1.1
	CO3 (mg/l)	<1.0	1.1	<1.0	<1.0	<1.0	4	4	0.0	1.0	1.0
	Cond-L (µS/cm)	124	123	121	119	109	4	0	6	102	115
	Hardness (mg/l)	57	57	57	57	52	4	0	2	49	53
	HCO3 (mg/l)	64.9	63.6	63.3	64.2	60.0	4	0	3.9	56.0	65.0
	K (mg/l)	0.8	0.7	0.9	0.9	0.8	4	0	0.1	0.7	0.8
	Na (mg/l)	1.8	2.0	2.2	2.0	1.7	4	0	0.1	1.6	1.8
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	8.9	9.2	9.3	8.6	6.7	4	0	0.4	6.2	7.0
	Sum of Ions (mg/l)	97	98	98	98	89	4	0	5	83	95
Metal	As (µg/l)	0.2	0.2	0.1	0.1	0.2	4	0	0.1	0.1	0.2
	Ba (mg/l)	0.0239	0.0237	0.0241	0.0246	0.0230	4	0	0.0014	0.0210	0.0240
	Cu (mg/l)	0.0004	0.0004	0.0006	0.0007	0.0006	4	0	0.0001	0.0005	0.0007
	Fe (mg/l)	0.0576	0.0656	0.0513	0.0465	0.0448	4	0	0.0116	0.0290	0.0540
	Mo (mg/l)	0.0012	0.0011	0.0010	0.0010	0.0010	4	0	0.0001	0.0009	0.0010
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	4	0	0.0000	0.0002	0.0002
	Pb (mg/l)	0.0002	0.0002	0.0003	0.0004	0.0002	4	1	0.0002	0.0001	0.0004
	Se (mg/l)	0.0001	0.0001	0.0002	0.0002	0.0001	4	3	0.0000	0.0001	0.0001
	U (µg/l)	28.7	33.5	35.8	34.1	18.8	4	0	2.1	16.0	21.0
	Zn (mg/l)	0.0007	0.0008	0.0005	0.0011	0.0018	4	1	0.0009	0.0005	0.0023
Nutrient	C-(org) (mg/l)	7.5	7.3	7.1	6.7	9.0	1	0		9.0	9.0
	NH3-N (mg/l)	0.08	0.10	0.12	0.11			0			
	NO3 (mg/l)	0.16	0.16	0.13	0.11	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.6	7.7	7.9	7.8	7.7	4	0	0.1	7.7	7.8
	TDS (mg/l)	90.36	85.00	86.33	83.70	79.00	4	0	16.75	59.00	100.00
	Temp-H20 (°C)	8.8	8.5	7.6	10.3	12.3	4	0	5.4	6.0	18.9
	TSS (mg/l)	1.0	1.1	1.4	1.2	<1.0	4	4	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.03	0.03	0.02	0.04	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	0.007	0.007	0.008	0.008	0.010	1	0		0.010	0.010
	Ra226 (Bq/L)	0.038	0.047	0.050	0.061	0.030	4	0	0.008	0.020	0.040

Table 4.2.2-1 AN-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	66.0	68.0	70.0	73.0	69.0	1	0		69.0	69.0
	Ca (mg/l)	21.0	19.0	21.0	21.0	20.0	1	0		20.0	20.0
	Cl (mg/l)	0.6	0.6	0.6	0.8	0.6	1	0		0.6	0.6
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	145	136	135	140	138	1	0		138	138
	Hardness (mg/l)	72	66	72	72	68	1	0		68	68
	HCO3 (mg/l)	80.0	83.0	85.0	89.0	84.0	1	0		84.0	84.0
	K (mg/l)	0.8	0.8	0.8	0.8	0.7	1	0		0.7	0.7
	Na (mg/l)	1.9	1.8	2.0	1.9	1.9	1	0		1.9	1.9
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	4.4	4.2	4.4	4.2	4.1	1	0		4.1	4.1
	Sum of Ions (mg/l)	114	114	119	122	116	1	0		116	116
Metal	As (µg/l)	0.1	0.1	<0.1	0.1	0.1	1	0		0.1	0.1
	Ba (mg/l)	0.0180	0.0160	0.0170	0.0170	0.0170	1	0		0.0170	0.0170
	Cu (mg/l)	0.0005	0.0003	0.0006	0.0005	0.0006	1	0		0.0006	0.0006
	Fe (mg/l)	0.0098	0.0110	0.0150	0.0063	0.0150	1	0		0.0150	0.0150
	Mo (mg/l)	0.0019	0.0017	0.0018	0.0018	0.0017	1	0		0.0017	0.0017
	Ni (mg/l)	<0.0001	0.0001	0.0002	0.0002	0.0002	1	0		0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	U (µg/l)	1.7	1.7	1.8	1.6	1.9	1	0		1.9	1.9
	Zn (mg/l)	<0.0005	<0.0005	<0.0005	0.0006	0.0019	1	0		0.0019	0.0019
Nutrient	C-(org) (mg/l)	7.6	7.7	7.9	7.2	8.4	1	0		8.4	8.4
	NH3-N (mg/l)	0.06	0.07	0.10	0.11			0			
	NO3 (mg/l)	0.05	0.04	<0.04	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.6	7.9	8.0	7.9	1	0		7.9	7.9
	TDS (mg/l)	92.00	99.00	109.00	84.00	81.00	1	0		81.00	81.00
	Temp-H20 (°C)	12.5	14.2	9.5	10.4	23.0	1	0		23.0	23.0
	TSS (mg/l)	<1.0	1.0	2.0	<1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	<0.02	<0.02	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.007	0.006	<0.005	0.010	0.006	1	0		0.006	0.006

Table 4.2.2-2 TL-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	132.8	126.7	126.0	132.8	113.5	2	0	14.8	103.0	124.0
	Ca (mg/l)	29.0	28.0	28.7	30.3	28.5	2	0	0.7	28.0	29.0
	Cl (mg/l)	2.7	2.4	2.6	2.5	1.8	2	0	0.5	1.4	2.1
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
	Cond-L (µS/cm)	309	291	287	302	252	2	0	39	224	279
	Hardness (mg/l)	97	93	94	99	94	2	0	4	91	97
	HCO3 (mg/l)	162.0	154.3	153.3	161.8	138.5	2	0	17.7	126.0	151.0
	K (mg/l)	1.2	1.1	1.2	1.2	1.1	2	0	0.0	1.1	1.1
	Na (mg/l)	29.3	27.0	29.7	28.8	18.0	2	0	11.3	10.0	26.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	29.8	25.7	27.3	26.3	17.0	2	0	8.5	11.0	23.0
	Sum of Ions (mg/l)	260	244	248	257	211	2	0	36	185	236
Metal	As (µg/l)	0.8	0.7	0.8	0.7	0.5	2	0	0.1	0.4	0.6
	Ba (mg/l)	0.0370	0.0367	0.0387	0.0408	0.0365	2	0	0.0092	0.0300	0.0430
	Cu (mg/l)	0.0013	0.0009	0.0011	0.0012	0.0017	2	0	0.0007	0.0012	0.0022
	Fe (mg/l)	0.0157	0.0160	0.0160	0.0145	0.0165	2	0	0.0035	0.0140	0.0190
	Mo (mg/l)	0.0119	0.0109	0.0117	0.0113	0.0075	2	0	0.0035	0.0050	0.0100
	Ni (mg/l)	0.0003	0.0003	0.0003	0.0003	0.0004	2	0	0.0001	0.0003	0.0004
	Pb (mg/l)	0.0006	0.0006	0.0008	0.0007	0.0005	2	0	0.0004	0.0002	0.0008
	Se (mg/l)	0.0023	0.0021	0.0023	0.0024	0.0016	2	0	0.0011	0.0008	0.0023
	U (µg/l)	248.0	222.3	243.0	232.8	147.0	2	0	104.7	73.0	221.0
	Zn (mg/l)	0.0021	0.0008	0.0006	0.0011	0.0019	2	1	0.0019	0.0005	0.0032
Nutrient	C-(org) (mg/l)	7.2	7.6	7.5	7.1	8.4	1	0		8.4	8.4
	NH3-N (mg/l)	0.03	0.05	0.06	0.06			0			
	NO3 (mg/l)	0.05	0.11	<0.04	0.16	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	8.0	8.0	8.2	8.2	8.0	2	0	0.1	7.9	8.1
	TDS (mg/l)	198.50	189.67	202.67	189.25	158.00	2	0	42.43	128.00	188.00
	Temp-H20 (°C)	9.6	11.0	10.9	9.3	16.7	2	0	3.8	14.0	19.4
	TSS (mg/l)	1.0	1.7	<1.0	1.3	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.09	0.46	0.10	0.18	0.13	1	0		0.13	0.13
	Po210 (Bq/L)	0.030	0.050	0.060	0.060	0.060	1	0		0.060	0.060
	Ra226 (Bq/L)	1.170	1.267	1.433	1.350	0.895	2	0	0.573	0.490	1.300

Table 4.2.2-3 TL-4 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	127.5	126.0	121.0	131.3	131.5	2	0	6.4	127.0	136.0
	Ca (mg/l)	23.5	25.0	23.0	24.3	29.0	2	0	4.2	26.0	32.0
	Cl (mg/l)	2.7	2.5	2.5	2.7	2.1	2	0	0.1	2.0	2.1
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
	Cond-L (µS/cm)	306	303	271	289	289	2	0	20	275	303
	Hardness (mg/l)	82	85	80	84	94	2	0	13	85	103
	HCO3 (mg/l)	155.5	154.0	147.7	160.0	160.5	2	0	7.8	155.0	166.0
	K (mg/l)	1.2	1.0	1.3	1.4	1.2	2	0	0.0	1.2	1.2
	Na (mg/l)	34.5	33.5	31.3	32.8	26.0	2	0	0.0	26.0	26.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	29.0	27.5	23.0	22.0	21.0	2	0	2.8	19.0	23.0
	Sum of Ions (mg/l)	252	250	234	249	245	2	0	16	234	256
Metal	As (µg/l)	1.1	1.0	0.9	1.0	0.9	2	0	0.2	0.7	1.0
	Ba (mg/l)	0.0713	0.0720	0.0760	0.0870	0.0750	2	0	0.0198	0.0610	0.0890
	Cu (mg/l)	0.0006	0.0007	0.0005	0.0004	0.0009	2	0	0.0002	0.0007	0.0010
	Fe (mg/l)	0.0595	0.0687	0.0477	0.0523	0.0375	2	0	0.0177	0.0250	0.0500
	Mo (mg/l)	0.0101	0.0105	0.0081	0.0083	0.0087	2	0	0.0018	0.0074	0.0100
	Ni (mg/l)	0.0005	0.0005	0.0005	0.0005	0.0005	2	0	0.0001	0.0004	0.0005
	Pb (mg/l)	0.0005	0.0003	0.0002	0.0002	0.0004	2	0	0.0002	0.0002	0.0005
	Se (mg/l)	0.0017	0.0018	0.0013	0.0012	0.0017	2	0	0.0003	0.0015	0.0019
	U (µg/l)	235.3	224.5	187.3	187.0	197.5	2	0	43.1	167.0	228.0
	Zn (mg/l)	<0.0005	0.0006	<0.0005	0.0008	0.0012	2	1	0.0009	0.0005	0.0018
Nutrient	C-(org) (mg/l)	8.0		9.0	8.6	12.0	1	0		12.0	12.0
	NH3-N (mg/l)	0.06		0.09	0.09			0			
	NO3 (mg/l)	0.05	0.14	0.04	0.05	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01		<0.01	<0.01	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)	8.1	8.0	8.1	8.1	8.1	2	0	0.0	8.0	8.1
	TDS (mg/l)	197.50	191.50	181.33	195.00	170.50	2	0	2.12	169.00	172.00
	Temp-H20 (°C)	9.3	8.4	10.8	8.6	16.5	2	0	5.7	12.5	20.5
	TSS (mg/l)	1.0	2.5	1.3	<1.0	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.03		0.10	0.10	0.04	1	0		0.04	0.04
	Po210 (Bq/L)	0.030		0.020	0.030	0.030	1	0		0.030	0.030
	Ra226 (Bq/L)	1.600	1.650	1.733	1.750	1.550	2	0	0.071	1.500	1.600

Table 4.2.2-4 TL-6 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	260.0	226.3	228.0	300.3	277.0	1	0		277.0	277.0
	Ca (mg/l)	60.5	47.7	41.0	39.0	54.0	1	0		54.0	54.0
	Cl (mg/l)	31.5	24.7	31.0	44.7	34.0	1	0		34.0	34.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	728	542	558	741	743	1	0		743	743
	Hardness (mg/l)	207	158	144	148	184	1	0		184	184
	HCO3 (mg/l)	317.0	276.0	278.0	366.7	338.0	1	0		338.0	338.0
	K (mg/l)	2.1	1.4	2.1	3.3	2.4	1	0		2.4	2.4
	Na (mg/l)	87.5	60.0	72.0	116.7	94.0	1	0		94.0	94.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	72.0	34.7	33.0	32.7	71.0	1	0		71.0	71.0
	Sum of Ions (mg/l)	584	454	468	615	605	1	0		605	605
Metal	As (µg/l)	1.4	1.9	2.5	2.1	1.6	1	0		1.6	1.6
	Ba (mg/l)	0.9400	0.8667	0.9550	1.0533	1.2700	1	0		1.2700	1.2700
	Cu (mg/l)	0.0007	0.0003	0.0007	0.0003	0.0007	1	0		0.0007	0.0007
	Fe (mg/l)	0.5600	2.2467	2.9450	1.2367	0.4300	1	0		0.4300	0.4300
	Mo (mg/l)	0.0020	0.0010	0.0014	0.0008	0.0020	1	0		0.0020	0.0020
	Ni (mg/l)	0.0005	0.0003	0.0004	0.0003	0.0005	1	0		0.0005	0.0005
	Pb (mg/l)	0.0003	0.0003	0.0004	0.0002	0.0003	1	0		0.0003	0.0003
	Se (mg/l)	0.0021	0.0018	0.0026	0.0021	0.0038	1	0		0.0038	0.0038
	U (µg/l)	288.5	161.7	171.5	123.3	241.0	1	0		241.0	241.0
	Zn (mg/l)	0.0009	0.0009	0.0007	0.0016	0.0020	1	0		0.0020	0.0020
Nutrient	C-(org) (mg/l)	30.5	30.5	55.0	38.5	38.0	1	0		38.0	38.0
	NH3-N (mg/l)	0.10	0.26		0.13			0			
	NO3 (mg/l)	0.07	0.05	<0.04	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	0.02	0.01	0.02	0.02	1	0		0.02	0.02
Phys Para	pH-L (pH Unit)	8.0	7.8	7.9	7.9	7.8	1	0		7.8	7.8
	TDS (mg/l)	472.00	373.33	408.00	517.67	521.00	1	0		521.00	521.00
	Temp-H20 (°C)	10.5	14.6	12.1	14.0	20.4	1	0		20.4	20.4
	TSS (mg/l)	1.5	4.0	3.5	1.7	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	0.07	0.06	0.37	0.20	0.07	1	0		0.07	0.07
	Po210 (Bq/L)	0.030	0.090	0.050	0.035	0.050	1	0		0.050	0.050
	Ra226 (Bq/L)	6.050	5.700	7.000	5.067	7.700	1	0		7.700	7.700

Table 4.2.2-5 TL-7 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	124.5	115.8	139.7	127.0	132.3	3	0	3.2	130.0	136.0
	Ca (mg/l)	22.9	23.3	26.7	25.0	30.0	3	0	2.0	28.0	32.0
	Cl (mg/l)	4.3	5.8	3.8	6.2	3.1	3	0	0.2	3.0	3.3
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	3	3	0.0	1.0	1.0
	Cond-L (µS/cm)	291	281	316	287	294	3	0	14	286	311
	Hardness (mg/l)	80	80	93	87	98	3	0	7	91	104
	HCO3 (mg/l)	151.9	141.3	170.4	155.2	161.7	3	0	3.8	159.0	166.0
	K (mg/l)	1.2	1.0	1.7	1.2	1.2	3	0	0.1	1.2	1.3
	Na (mg/l)	32.9	29.8	35.0	32.2	26.7	3	0	0.6	26.0	27.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	3	3	0.0000	1.0000	1.0000
	SO4 (mg/l)	25.2	23.5	26.2	19.8	20.7	3	0	2.1	19.0	23.0
	Sum of Ions (mg/l)	258	230	270	246	249	3	0	8	244	258
Metal	As (µg/l)	1.1	1.0	1.1	0.9	0.8	3	0	0.2	0.7	1.0
	Ba (mg/l)	0.1990	0.4775	0.3467	0.4400	0.1600	3	0	0.0400	0.1200	0.2000
	Cu (mg/l)	0.0007	0.0005	0.0007	0.0005	0.0007	3	0	0.0002	0.0005	0.0009
	Fe (mg/l)	0.0598	0.0938	0.1042	0.0637	0.0283	3	0	0.0110	0.0210	0.0410
	Mo (mg/l)	0.0084	0.0061	0.0096	0.0062	0.0091	3	0	0.0013	0.0076	0.0100
	Ni (mg/l)	0.0005	0.0005	0.0005	0.0004	0.0004	3	0	0.0001	0.0004	0.0005
	Pb (mg/l)	0.0002	0.0002	0.0003	0.0002	0.0002	3	0	0.0001	0.0001	0.0003
	Se (mg/l)	0.0016	0.0018	0.0018	0.0014	0.0017	3	0	0.0004	0.0013	0.0020
	U (µg/l)	196.9	125.0	238.4	148.7	200.7	3	0	35.6	160.0	226.0
	Zn (mg/l)	0.0010	0.0007	0.0011	0.0012	<0.0005	3	3	0.0000	0.0005	0.0005
Nutrient	C-(org) (mg/l)	8.5	9.4	9.8	8.9	10.0	1	0		10.0	10.0
	NH3-N (mg/l)	0.08	<0.01	0.07	0.07			0			
	NO3 (mg/l)	0.07	0.05	0.07	0.08	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.8	8.0	7.9	7.9	3	0	0.1	7.8	8.0
	TDS (mg/l)	188.10	177.75	211.63	187.83	188.33	3	0	0.58	188.00	189.00
	Temp-H20 (°C)	10.0	8.7	8.1	12.8	15.2	3	0	4.6	12.1	20.5
	TSS (mg/l)	1.1	1.0	1.1	1.0	<1.0	3	3	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.03	0.10	0.22	0.16	0.06	1	0		0.06	0.06
	Po210 (Bq/L)	0.020	0.010	0.023	0.008	0.020	1	0		0.020	0.020
	Ra226 (Bq/L)	1.590	2.250	1.744	1.550	1.667	3	0	0.115	1.600	1.800

Table 4.2.2-6 TL-9 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	128.8	130.0	116.3	108.7	138.3	3	0	9.7	130.0	149.0
	Ca (mg/l)	24.2	25.4	20.3	17.5	29.3	3	0	2.5	27.0	32.0
	Cl (mg/l)	4.3	3.8	3.9	4.0	3.2	3	0	0.2	3.0	3.4
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	3	3	0.0	1.0	1.0
	Cond-L (µS/cm)	303	304	268	245	286	3	0	19	275	308
	Hardness (mg/l)	86	88	76	68	97	3	0	8	90	105
	HCO3 (mg/l)	157.1	158.6	141.8	132.5	169.0	3	0	11.8	159.0	182.0
	K (mg/l)	1.3	1.1	1.2	1.2	1.2	3	0	0.1	1.2	1.3
	Na (mg/l)	34.3	31.6	30.8	30.3	25.3	3	0	0.6	25.0	26.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	3	3	0.0000	1.0000	1.0000
	SO4 (mg/l)	25.7	24.1	21.2	18.0	19.0	3	0	2.6	17.0	22.0
	Sum of Ions (mg/l)	235	251	226	210	253	3	0	10	242	261
Metal	As (µg/l)	1.3	1.3	1.3	1.2	1.0	3	0	0.2	0.8	1.2
	Ba (mg/l)	0.4473	0.4671	0.6567	0.6217	0.4267	3	0	0.1834	0.2200	0.5700
	Cu (mg/l)	0.0005	0.0006	0.0005	0.0006	0.0006	3	0	0.0002	0.0004	0.0008
	Fe (mg/l)	0.0503	0.0516	0.0435	0.0517	0.0383	3	0	0.0225	0.0220	0.0640
	Mo (mg/l)	0.0083	0.0090	0.0084	0.0066	0.0083	3	0	0.0017	0.0065	0.0097
	Ni (mg/l)	0.0004	0.0004	0.0003	0.0003	0.0004	3	0	0.0001	0.0003	0.0004
	Pb (mg/l)	0.0006	0.0008	0.0005	0.0011	0.0005	3	0	0.0005	0.0002	0.0011
	Se (mg/l)	0.0021	0.0024	0.0022	0.0023	0.0017	3	0	0.0003	0.0014	0.0019
	U (µg/l)	210.3	195.3	172.3	132.5	187.0	3	0	41.5	145.0	228.0
	Zn (mg/l)	0.0007	0.0012	0.0006	0.0012	0.0013	3	2	0.0014	0.0005	0.0029
Nutrient	C-(org) (mg/l)	9.2	8.8	9.4	8.7	11.0	1	0		11.0	11.0
	NH3-N (mg/l)	0.06	0.06	0.08	0.12			0			
	NO3 (mg/l)	0.20	0.36	0.18	0.36	0.16	1	0		0.16	0.16
	P-(TP) (mg/l)	<0.01	0.02	<0.01	0.01	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)	8.0	8.0	8.2	8.1	8.1	3	0	0.0	8.0	8.1
	TDS (mg/l)	194.10	191.71	177.83	162.00	176.00	3	0	10.44	169.00	188.00
	Temp-H20 (°C)	8.7	9.4	10.1	12.7	13.3	3	0	6.5	7.8	20.5
	TSS (mg/l)	1.6	1.7	1.3	1.7	<1.0	3	3	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.08	0.05	0.20	0.17	0.07	1	0		0.07	0.07
	Po210 (Bq/L)	0.030	0.030	0.037	0.045	0.080	1	0		0.080	0.080
	Ra226 (Bq/L)	1.955	2.071	2.333	2.033	1.700	3	0	0.400	1.300	2.100

Table 4.2.3-1 BL-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	70.8	69.8	69.5	72.8	69.0	2	0	1.4	68.0	70.0
	Ca (mg/l)	22.0	21.3	21.5	21.3	21.0	2	0	1.4	20.0	22.0
	Cl (mg/l)	12.0	13.3	12.5	13.0	12.0	2	0	0.0	12.0	12.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
	Cond-L (µS/cm)	240	237	236	237	228	2	0	4	225	230
	Hardness (mg/l)	77	75	76	75	74	2	0	5	70	77
	HCO3 (mg/l)	86.3	85.3	84.8	88.8	84.0	2	0	1.4	83.0	85.0
	K (mg/l)	1.1	1.1	1.2	1.2	1.1	2	0	0.1	1.0	1.1
	Na (mg/l)	18.5	18.5	18.5	18.8	17.0	2	0	0.0	17.0	17.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	38.3	30.5	30.5	29.0	27.5	2	0	0.7	27.0	28.0
	Sum of Ions (mg/l)	184	175	175	177	168	2	0	4	165	170
Metal	As (µg/l)	0.3	0.2	0.2	0.3	0.2	2	0	0.0	0.2	0.2
	Ba (mg/l)	0.0410	0.0358	0.0360	0.0448	0.0395	2	0	0.0049	0.0360	0.0430
	Cu (mg/l)	0.0018	0.0009	0.0019	0.0014	0.0012	2	0	0.0004	0.0009	0.0014
	Fe (mg/l)	0.0108	0.0061	0.0093	0.0066	0.0040	2	0	0.0011	0.0032	0.0047
	Mo (mg/l)	0.0035	0.0036	0.0036	0.0037	0.0034	2	0	0.0001	0.0033	0.0034
	Ni (mg/l)	0.0014	0.0028	0.0058	0.0014	0.0018	2	0	0.0003	0.0016	0.0020
	Pb (mg/l)	0.0002	0.0001	0.0003	0.0002	<0.0001	2	2	0.0000	0.0001	0.0001
	Se (mg/l)	0.0023	0.0023	0.0023	0.0023	0.0022	2	0	0.0001	0.0021	0.0022
	U (µg/l)	127.5	128.5	129.8	132.3	123.5	2	0	2.1	122.0	125.0
	Zn (mg/l)	0.0050	0.0028	0.0068	0.0035	0.0017	2	0	0.0004	0.0014	0.0020
Nutrient	C-(org) (mg/l)	3.1	3.3	3.2	3.0	3.7	1	0		3.7	3.7
	NH3-N (mg/l)	0.08	0.06	0.08	0.11			0			
	NO3 (mg/l)	0.09	0.05	0.06	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.8	7.9	8.0	8.0	7.9	2	0	0.1	7.8	8.0
	TDS (mg/l)	144.00	143.50	156.75	152.50	120.50	2	0	2.12	119.00	122.00
	Temp-H20 (°C)	8.6	7.5	6.4	7.9	15.9	2	0	3.5	13.4	18.3
	TSS (mg/l)	<1.0	1.0	1.3	<1.0	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.02	0.11	0.09	0.10	0.02	1	0		0.02	0.02
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.058	0.035	0.035	0.053	0.050	2	0	0.000	0.050	0.050

Table 4.2.3-2 BL-4 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	69.0	67.5	69.0	70.0	67.0	1	0		67.0	67.0
	Ca (mg/l)	21.0	20.5	21.5	21.0	20.0	1	0		20.0	20.0
	Cl (mg/l)	12.5	12.5	12.5	12.5	12.0	1	0		12.0	12.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	250	234	232	235	224	1	0		224	224
	Hardness (mg/l)	74	73	76	74	70	1	0		70	70
	HCO3 (mg/l)	84.0	82.5	84.5	85.5	82.0	1	0		82.0	82.0
	K (mg/l)	1.1	1.2	1.2	1.1	1.0	1	0		1.0	1.0
	Na (mg/l)	18.5	18.5	18.5	18.5	17.0	1	0		17.0	17.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	31.5	30.0	30.0	28.5	27.0	1	0		27.0	27.0
	Sum of Ions (mg/l)	174	171	174	173	164	1	0		164	164
Metal	As (µg/l)	0.3	0.2	0.3	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.0355	0.0340	0.0345	0.0345	0.0360	1	0		0.0360	0.0360
	Cu (mg/l)	0.0010	0.0010	0.0012	0.0012	0.0006	1	0		0.0006	0.0006
	Fe (mg/l)	0.0064	0.0048	0.0042	0.0074	0.0031	1	0		0.0031	0.0031
	Mo (mg/l)	0.0037	0.0037	0.0036	0.0036	0.0033	1	0		0.0033	0.0033
	Ni (mg/l)	0.0031	0.0029	0.0012	0.0012	0.0008	1	0		0.0008	0.0008
	Pb (mg/l)	<0.0001	0.0001	0.0003	0.0002	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	0.0025	0.0024	0.0024	0.0023	0.0021	1	0		0.0021	0.0021
	U (µg/l)	133.0	130.0	126.0	126.0	121.0	1	0		121.0	121.0
	Zn (mg/l)	0.0023	0.0030	0.0047	0.0036	0.0018	1	0		0.0018	0.0018
Nutrient	C-(org) (mg/l)	3.2	3.3	3.4	3.3	3.5	1	0		3.5	3.5
	NH3-N (mg/l)	0.08	0.08	0.11	0.11			0			
	NO3 (mg/l)	0.05	0.05	0.05	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.7	8.0	8.0	7.8	1	0		7.8	7.8
	TDS (mg/l)	142.00	140.00	141.00	155.50	116.00	1	0		116.00	116.00
	Temp-H20 (°C)	7.7	8.4	4.6	10.3	14.4	1	0		14.4	14.4
	TSS (mg/l)	<1.0	1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	0.03	0.09	0.05	0.07	0.08	1	0		0.08	0.08
	Po210 (Bq/L)	<0.005	<0.008	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.040	0.030	0.025	0.025	0.030	1	0		0.030	0.030

Table 4.2.3-3 BL-5 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	69.8	68.0	67.0	61.3	66.0	1	0		66.0	66.0
	Ca (mg/l)	20.8	20.3	20.5	19.0	20.0	1	0		20.0	20.0
	Cl (mg/l)	12.5	13.0	12.0	11.1	11.0	1	0		11.0	11.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	244	235	224	202	221	1	0		221	221
	Hardness (mg/l)	74	72	73	66	70	1	0		70	70
	HCO3 (mg/l)	85.3	83.0	82.0	74.7	80.0	1	0		80.0	80.0
	K (mg/l)	1.0	1.0	1.1	1.0	1.0	1	0		1.0	1.0
	Na (mg/l)	18.5	18.7	18.0	16.0	17.0	1	0		17.0	17.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	36.5	30.0	29.5	25.7	27.0	1	0		27.0	27.0
	Sum of Ions (mg/l)	180	171	168	152	161	1	0		161	161
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.0350	0.0333	0.0330	0.0293	0.0360	1	0		0.0360	0.0360
	Cu (mg/l)	<0.0002	<0.0002	0.0004	0.0004	0.0003	1	0		0.0003	0.0003
	Fe (mg/l)	0.0044	0.0029	0.0056	0.0095	0.0030	1	0		0.0030	0.0030
	Mo (mg/l)	0.0036	0.0036	0.0035	0.0030	0.0033	1	0		0.0033	0.0033
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	1	0		0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	0.0003	0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	0.0025	0.0023	0.0022	0.0019	0.0021	1	0		0.0021	0.0021
	U (µg/l)	132.5	129.7	124.5	103.7	120.0	1	0		120.0	120.0
	Zn (mg/l)	<0.0005	<0.0005	0.0006	0.0008	<0.0005	1	1		0.0005	0.0005
Nutrient	C-(org) (mg/l)	2.9	3.2	3.2	3.0	3.6	1	0		3.6	3.6
	NH3-N (mg/l)	0.05	0.07	0.09	0.11			0			
	NO3 (mg/l)	0.05	0.05	<0.04	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.8	7.8	8.0	7.9	8.0	1	0		8.0	8.0
	TDS (mg/l)	143.75	140.33	149.00	125.67	128.00	1	0		128.00	128.00
	Temp-H20 (°C)	8.6	9.7	11.8	12.3	15.7	1	0		15.7	15.7
	TSS (mg/l)	<1.0	1.3	<1.0	<1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.12	0.06	0.11	0.08	1	0		0.08	0.08
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.030	0.030	0.025	0.030	0.020	1	0		0.020	0.020

Table 4.2.3-4 ML-1 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	64.0	65.5	66.3	67.5	54.5	2	0	4.9	51.0	58.0
	Ca (mg/l)	20.0	19.5	20.3	20.3	16.5	2	0	0.7	16.0	17.0
	Cl (mg/l)	6.1	7.0	7.4	7.1	3.5	2	0	2.8	1.5	5.5
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
	Cond-L (µS/cm)	179	183	181	182	135	2	0	33	112	158
	Hardness (mg/l)	68	67	69	69	56	2	0	4	53	58
	HCO3 (mg/l)	77.8	80.0	80.8	82.5	66.5	2	0	6.4	62.0	71.0
	K (mg/l)	1.0	1.1	1.2	1.2	1.0	2	0	0.0	1.0	1.0
	Na (mg/l)	9.0	10.5	10.6	10.1	5.2	2	0	4.5	2.0	8.3
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	15.5	18.8	17.8	16.0	8.9	2	0	5.8	4.8	13.0
	Sum of Ions (mg/l)	134	142	143	142	106	2	0	21	91	120
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	2	0	0.0	0.2	0.2
	Ba (mg/l)	0.0428	0.0430	0.0430	0.0440	0.0365	2	0	0.0049	0.0330	0.0400
	Cu (mg/l)	0.0007	0.0004	0.0009	0.0011	0.0004	2	0	0.0001	0.0003	0.0004
	Fe (mg/l)	0.0157	0.0143	0.0140	0.0109	0.0207	2	0	0.0161	0.0093	0.0320
	Mo (mg/l)	0.0017	0.0019	0.0019	0.0019	0.0010	2	0	0.0007	0.0005	0.0015
	Ni (mg/l)	0.0002	0.0001	0.0002	0.0002	0.0002	2	0	0.0001	0.0001	0.0002
	Pb (mg/l)	0.0001	<0.0001	0.0002	0.0002	<0.0001	2	2	0.0000	0.0001	0.0001
	Se (mg/l)	0.0008	0.0010	0.0010	0.0009	0.0005	2	0	0.0005	0.0001	0.0008
	U (µg/l)	47.5	58.5	60.8	55.8	23.4	2	0	29.2	2.7	44.0
	Zn (mg/l)	0.0019	0.0009	0.0016	0.0023	0.0009	2	1	0.0006	0.0005	0.0013
Nutrient	C-(org) (mg/l)	6.6	6.3	6.1	6.0	6.3	1	0		6.3	6.3
	NH3-N (mg/l)	0.07	0.14	0.12	0.11			0			
	NO3 (mg/l)	0.15	0.12	0.13	0.07	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	0.01	0.01	0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.7	8.0	7.9	7.8	2	0	0.0	7.8	7.8
	TDS (mg/l)	114.25	117.75	123.75	127.00	100.00	2	0	45.25	68.00	132.00
	Temp-H20 (°C)	11.6	7.9	7.8	11.0	14.0	2	0	2.8	12.0	15.9
	TSS (mg/l)	1.5	1.5	1.5	<1.0	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.03	0.09	0.04	0.07	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.009	0.014	0.007	0.007	0.005	2	1	0.000	0.005	0.005

Table 4.2.3-5 CS-1 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	59.0	64.0	64.0	67.0	60.0	1	0		60.0	60.0
	Ca (mg/l)	19.0	19.0	20.0	20.0	18.0	1	0		18.0	18.0
	Cl (mg/l)	6.4	8.1	7.2	8.0	5.8	1	0		5.8	5.8
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	178	179	180	182	163	1	0		163	163
	Hardness (mg/l)	65	65	68	68	61	1	0		61	61
	HCO3 (mg/l)	72.0	78.0	78.0	82.0	73.0	1	0		73.0	73.0
	K (mg/l)	1.1	1.1	1.1	1.1	1.0	1	0		1.0	1.0
	Na (mg/l)	9.6	11.0	11.0	11.0	8.7	1	0		8.7	8.7
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	16.0	17.0	17.0	16.0	14.0	1	0		14.0	14.0
	Sum of Ions (mg/l)	128	139	139	143	124	1	0		124	124
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.0420	0.0420	0.0400	0.0430	0.0420	1	0		0.0420	0.0420
	Cu (mg/l)	<0.0002	0.0005	0.0003	0.0003	0.0012	1	0		0.0012	0.0012
	Fe (mg/l)	0.0370	0.0460	0.0210	0.0250	0.0450	1	0		0.0450	0.0450
	Mo (mg/l)	0.0019	0.0020	0.0020	0.0020	0.0017	1	0		0.0017	0.0017
	Ni (mg/l)	<0.0001	0.0001	0.0001	0.0001	0.0002	1	0		0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	0.0009	0.0009	0.0009	0.0009	0.0008	1	0		0.0008	0.0008
	U (µg/l)	52.0	62.0	62.0	56.0	44.0	1	0		44.0	44.0
	Zn (mg/l)	<0.0005	0.0010	<0.0005	<0.0005	0.0028	1	0		0.0028	0.0028
Nutrient	C-(org) (mg/l)	6.0	6.3	5.8	5.6	6.4	1	0		6.4	6.4
	NH3-N (mg/l)	0.06	0.08	0.09	0.11			0			
	NO3 (mg/l)	0.05	<0.04	<0.04	<0.04	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.6	8.0	8.1	7.7	1	0		7.7	7.7
	TDS (mg/l)	109.00	118.00	124.00	100.00	118.00	1	0		118.00	118.00
	Temp-H20 (°C)	12.5	11.8	9.3	10.8	16.4	1	0		16.4	16.4
	TSS (mg/l)	1.0	1.0	1.0	<1.0	1.0	1	0		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.11	0.07	0.12	0.03	1	0		0.03	0.03
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.010	0.010	<0.005	<0.005	<0.005	1	1		0.005	0.005

Table 4.2.3-6 CS-2 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	38.0	25.0	27.0	28.0	41.0	1	0		41.0	41.0
	Ca (mg/l)	12.0	6.1	7.1	7.3	12.0	1	0		12.0	12.0
	Cl (mg/l)	4.7	3.3	3.1	3.6	4.4	1	0		4.4	4.4
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	116	63	64	66	111	1	0		111	111
	Hardness (mg/l)	43	23	27	27	42	1	0		42	42
	HCO3 (mg/l)	46.0	30.0	33.0	34.0	50.0	1	0		50.0	50.0
	K (mg/l)	0.9	0.9	0.8	0.8	0.9	1	0		0.9	0.9
	Na (mg/l)	5.6	2.6	2.8	2.9	5.4	1	0		5.4	5.4
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	9.0	3.6	3.7	3.9	8.1	1	0		8.1	8.1
	Sum of Ions (mg/l)	81	48	53	55	84	1	0		84	84
Metal	As (µg/l)	0.2	0.2	0.1	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.0240	0.0110	0.0110	0.0120	0.0230	1	0		0.0230	0.0230
	Cu (mg/l)	0.0002	<0.0002	0.0022	0.0013	0.0012	1	0		0.0012	0.0012
	Fe (mg/l)	0.0220	0.0040	0.0057	0.0100	0.0300	1	0		0.0300	0.0300
	Mo (mg/l)	0.0010	0.0002	0.0002	0.0003	0.0008	1	0		0.0008	0.0008
	Ni (mg/l)	<0.0001	0.0002	0.0046	0.0012	0.0017	1	0		0.0017	0.0017
	Pb (mg/l)	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	0.0004	<0.0001	<0.0001	<0.0001	0.0003	1	0		0.0003	0.0003
	U (µg/l)	21.0	0.4	0.5	1.4	18.0	1	0		18.0	18.0
	Zn (mg/l)	0.0008	<0.0005	0.0037	0.0034	0.0020	1	0		0.0020	0.0020
Nutrient	C-(org) (mg/l)	4.1	3.2	3.3	3.0	4.4	1	0		4.4	4.4
	NH3-N (mg/l)	0.02	0.01	<0.01	0.02			0			
	NO3 (mg/l)	0.06	<0.04	<0.04	0.08	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.4	7.2	7.6	7.7	7.6	1	0		7.6	7.6
	TDS (mg/l)	71.00	37.00	53.00	34.00	92.00	1	0		92.00	92.00
	Temp-H20 (°C)	12.6	9.4	10.1	8.2	19.4	1	0		19.4	19.4
	TSS (mg/l)	<1.0	<1.0	1.0	<1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	<0.02	<0.02	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	0.006	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.007	<0.005	<0.005	0.007	0.006	1	0		0.006	0.006

Table 4.3-1 ZOR-01 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	102.7	97.0	95.5	93.9	100.6	10	0	7.3	92.0	115.0
	Ca (mg/l)	32.5	30.7	31.2	30.5	32.1	10	0	1.7	30.0	35.0
	Cl (mg/l)	0.9	0.3	0.3	0.3	0.3	10	0	0.1	0.3	0.5
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	10	10	0.0	1.0	1.0
	Cond-L (µS/cm)	226	218	213	204	218	10	0	13	203	238
	Hardness (mg/l)	115	108	110	108	112	10	0	6	105	121
	HCO3 (mg/l)	125.3	118.1	116.5	114.5	122.7	10	0	8.8	112.0	140.0
	K (mg/l)	0.8	0.7	0.8	0.8	0.8	10	0	0.1	0.7	0.9
	Na (mg/l)	1.8	1.8	1.8	1.8	1.8	10	0	0.1	1.7	2.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	10	10	0.0000	1.0000	1.0000
	SO4 (mg/l)	19.1	18.7	18.8	17.9	18.0	10	0	0.7	17.0	19.0
	Sum of Ions (mg/l)	189	178	178	174	184	10	0	11	172	204
Metal	As (µg/l)	0.2	0.2	0.2	0.1	0.2	10	0	0.1	0.1	0.2
	Ba (mg/l)	0.0231	0.0212	0.0217	0.0208	0.0230	10	0	0.0024	0.0200	0.0280
	Cu (mg/l)	0.0006	0.0010	0.0009	0.0009	0.0016	10	0	0.0009	0.0004	0.0033
	Fe (mg/l)	0.0079	0.0086	0.0087	0.0048	0.0092	10	0	0.0026	0.0056	0.0150
	Mo (mg/l)	0.0009	0.0009	0.0008	0.0008	0.0009	10	0	0.0001	0.0008	0.0011
	Ni (mg/l)	0.0002	0.0002	0.0001	0.0002	0.0002	10	0	0.0001	0.0002	0.0004
	Pb (mg/l)	0.0001	0.0002	0.0001	0.0002	0.0003	10	4	0.0003	0.0001	0.0011
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	10	0	0.0000	0.0001	0.0001
	U (µg/l)	14.6	16.1	15.8	15.4	15.4	10	0	1.3	14.0	18.0
	Zn (mg/l)	0.0010	0.0026	0.0009	0.0019	0.0031	10	1	0.0053	0.0005	0.0180
Nutrient	C-(org) (mg/l)	8.6	8.4	8.2	7.9	9.2	1	0		9.2	9.2
	NH3-N (mg/l)	0.06	0.05	0.07	0.08			0			
	NO3 (mg/l)	<0.04	0.20	<0.04	0.11	<0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	8.1	8.0	7.9	10	0	0.1	7.8	8.1
	TDS (mg/l)	148.10	143.56	147.83	133.75	148.20	10	0	15.68	125.00	173.00
	Temp-H20 (°C)	12.6	11.4	11.9	11.5	10.8	10	0	7.9	0.6	21.1
	TSS (mg/l)	2.1	2.2	1.3	1.6	1.4	10	8	1.3	1.0	5.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	0.02	0.03	0.03	1	0		0.03	0.03
	Po210 (Bq/L)	0.010	0.006	0.009	0.005	0.008	1	0		0.008	0.008
	Ra226 (Bq/L)	0.022	0.027	0.030	0.019	0.022	10	0	0.008	0.010	0.040

Table 4.3-2 ZOR-02 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2020 Statistics					
		2016	2017	2018	2019	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	108.5	102.6	95.3	99.3	102.8	9	0	5.7	97.0	111.0
	Ca (mg/l)	41.1	45.3	41.3	46.3	38.2	9	0	2.4	34.0	42.0
	Cl (mg/l)	0.5	0.6	0.5	0.6	0.4	9	0	0.1	0.3	0.4
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	9	9	0.0	1.0	1.0
	Cond-L (µS/cm)	277	308	272	297	254	9	0	11	242	277
	Hardness (mg/l)	140	152	138	154	130	9	0	7	120	140
	HCO3 (mg/l)	132.3	125.3	116.3	121.1	125.2	9	0	6.7	118.0	135.0
	K (mg/l)	0.9	0.9	0.8	0.9	0.8	9	0	0.1	0.7	0.9
	Na (mg/l)	2.1	2.5	2.0	2.1	1.9	9	0	0.1	1.8	2.1
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	9	9	0.0000	1.0000	1.0000
	SO4 (mg/l)	40.6	56.5	46.9	56.9	31.8	9	0	8.6	19.0	48.0
	Sum of Ions (mg/l)	231	241	216	238	207	9	0	7	199	220
Metal	As (µg/l)	0.2	0.3	0.2	0.2	0.2	9	0	0.0	0.1	0.2
	Ba (mg/l)	0.0278	0.0373	0.0257	0.0251	0.0229	9	0	0.0015	0.0210	0.0250
	Cu (mg/l)	0.0019	0.0019	0.0015	0.0018	0.0013	9	0	0.0004	0.0006	0.0018
	Fe (mg/l)	0.1378	0.6596	0.1996	0.4163	0.0476	9	0	0.0242	0.0160	0.0940
	Mo (mg/l)	0.0016	0.0018	0.0014	0.0016	0.0012	9	0	0.0002	0.0010	0.0014
	Ni (mg/l)	0.0003	0.0004	0.0002	0.0004	0.0002	9	0	0.0000	0.0002	0.0002
	Pb (mg/l)	0.0002	0.0004	0.0002	0.0004	0.0001	9	4	0.0000	0.0001	0.0002
	Se (mg/l)	0.0003	0.0003	0.0003	0.0004	0.0002	9	0	0.0000	0.0002	0.0003
	U (µg/l)	300.9	424.5	340.6	475.4	164.0	9	0	81.0	34.0	300.0
	Zn (mg/l)	0.0007	0.0006	<0.0005	0.0011	0.0006	9	7	0.0003	0.0005	0.0013
Nutrient	C-(org) (mg/l)	8.1	6.5	6.8	6.2	8.3	1	0		8.3	8.3
	NH3-N (mg/l)	0.05	0.28	0.17	0.10			0			
	NO3 (mg/l)	0.43	1.03	0.61	0.99	0.19	1	0		0.19	0.19
	P-(TP) (mg/l)	<0.01	0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	8.0	7.9	7.9	9	0	0.1	7.8	8.0
	TDS (mg/l)	183.10	205.25	188.71	203.13	177.44	9	0	11.16	159.00	189.00
	Temp-H20 (°C)	9.2	10.1	8.2	9.7	10.3	9	0	7.5	0.3	20.0
	TSS (mg/l)	1.3	2.0	1.4	1.5	1.0	9	8	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.42	0.34	0.48	0.11	1	0		0.11	0.11
	Po210 (Bq/L)	0.020	0.030	0.010	0.010	0.020	1	0		0.020	0.020
	Ra226 (Bq/L)	0.219	0.311	0.253	0.238	0.140	9	0	0.055	0.020	0.210

Table 4.3-3 Downstream Water Quality

Year	Flow Path (ZOR-02)*		Verna Lake (AC-6A)		Ace Lake (AC-8)	
	Uranium (µg/l)	Radium (Bq/L)	Uranium (µg/l)	Radium (Bq/L)	Uranium (µg/l)	Radium (Bq/L)
2010	1560.0	0.400	263.0	0.100	15.3	0.015
2011	940.0	1.200			16.5	0.015
2012			117.0	0.085	13.5	0.009
2013	624.8	0.368	201.0	0.140	11.5	0.020
2014	313.8	0.336	154.0	0.150	11.5	0.020
2015	595.2	0.667	389.3	0.109	13.5	0.030
2016	332.7	0.235	331.0	0.108	14.5	0.015
2017	424.5	0.311	279.3	0.115	12.5	0.025
2018	340.6	0.253	278.5	0.100	12.5	0.020
2019	451.1	0.232	271.5	0.090	12.5	0.025
2020	164.0	0.140	292.0	0.099	12.0	0.005

Table 4.6-1 Radon Track Etch Summary

	Annual Average (Bq/m3)					
	1982	2016	2017	2018	2019	2020
Ace Creek Track Etch Cup	395.9	186.7	252.5	257.5	285.5	203.0
Beacon Hill Track Etch Cup	51.8	13.1	35.0	12.5	11.5	13.0
Donaldson Lake Track Etch Cup		12.4	22.5	9.5	8.5	7.0
Eldorado Townsite Track Etch Cup	136.9	24.1	43.0	25.0	27.0	31.0
End of Airstrip Track Etch Cup	88.8	8.7	29.0	8.5	10.0	7.0
Fay Waste Rock Track Etch Cup	188.7	51.1	58.5	43.0	38.0	55.0
Fookes Delta Track Etch Cup	217.8	89.5	91.0	100.0	126.5	101.0
Fredette Lake Track Etch Cup		9.7	29.0	9.0	10.0	7.0
Marie Delta Track Etch Cup	144.5	75.2	104.0	94.5	96.0	59.0
Uranium City Town Track Etch Cup		7.7	29.5	5.5	7.0	7.0

FIGURES

FIGURES

Figure 2.4
Beaverlodge Location Map

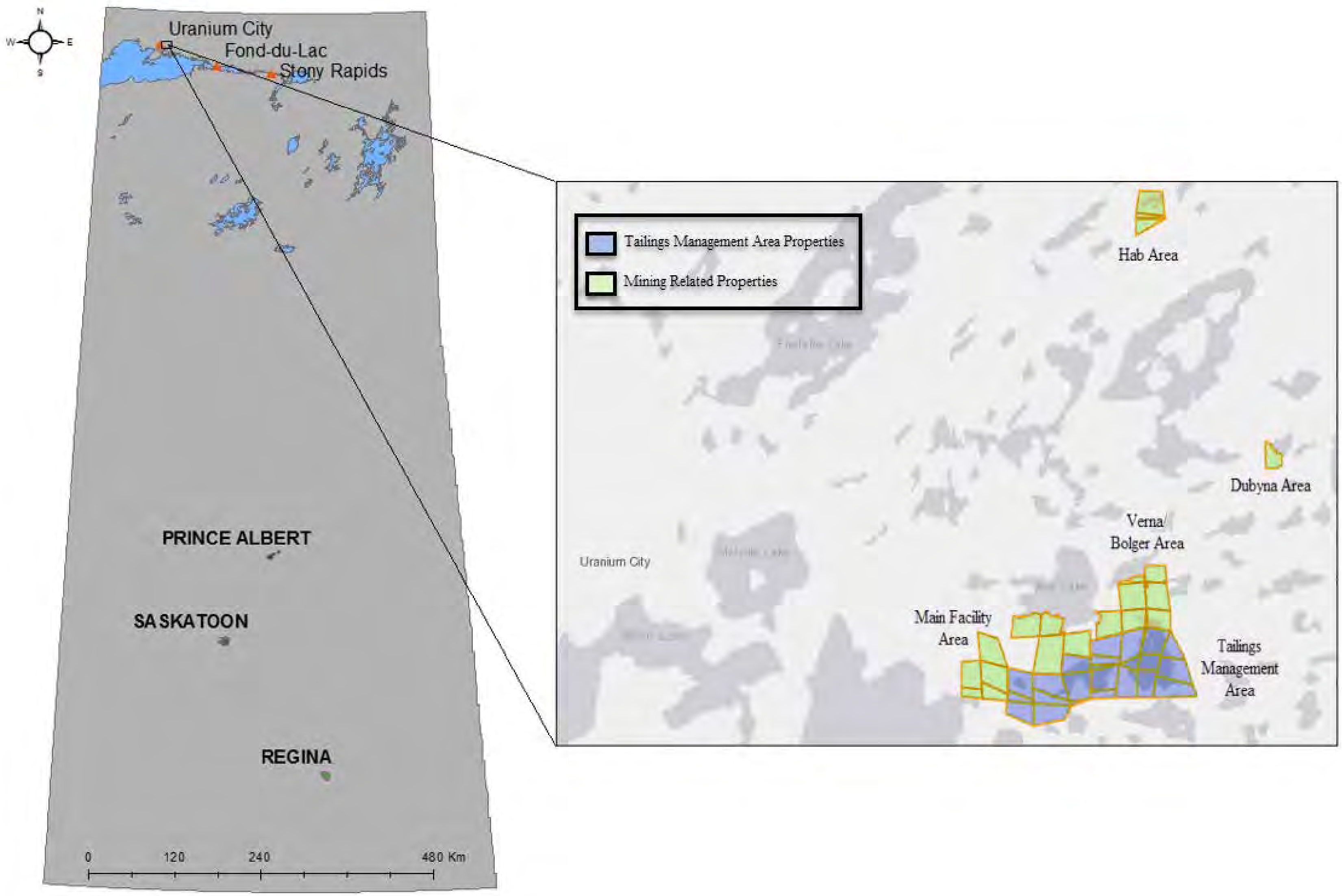


Figure 4.2
Regulatory Water Quality Monitoring Station Locations

Figure 4.2.1-1 AN-5 Pistol Creek below Hab Site

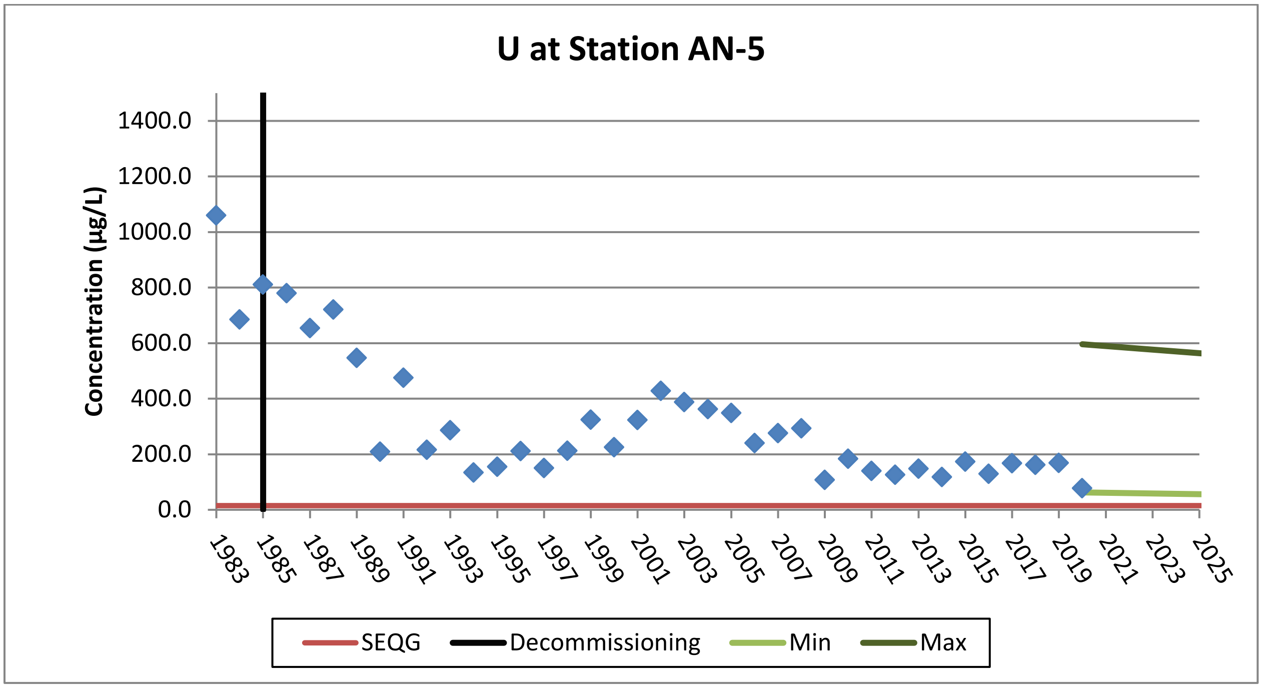


Figure 4.2.1-2 AN-5 Pistol Creek below Hab Site

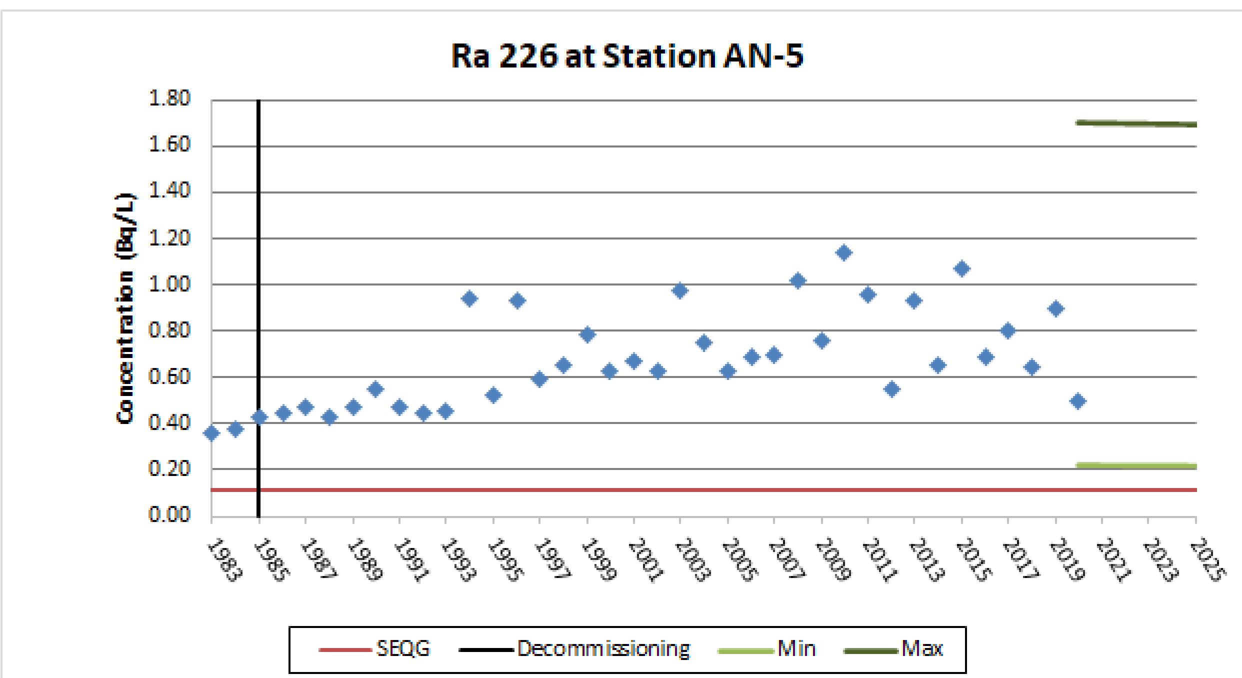
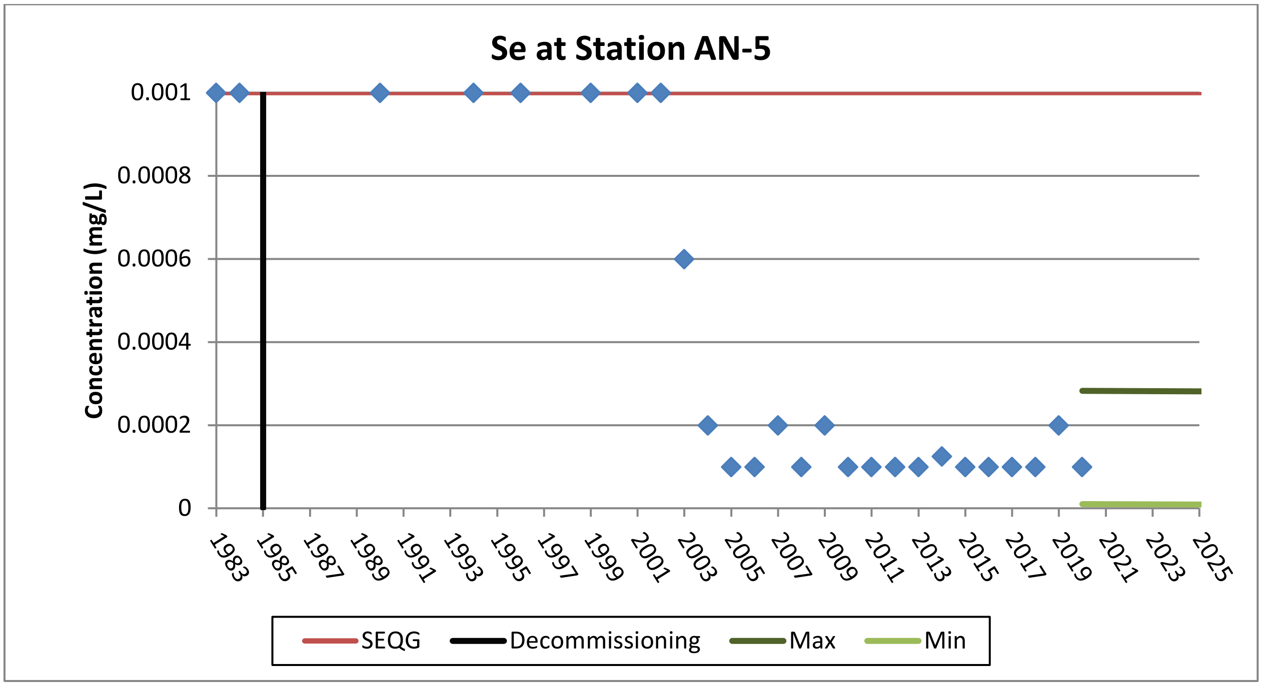


Figure 4.2.1-3 AN-5 Pistol Creek below Hab Site



Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.2.1-4 AN-5 Pistol Creek below Hab Site

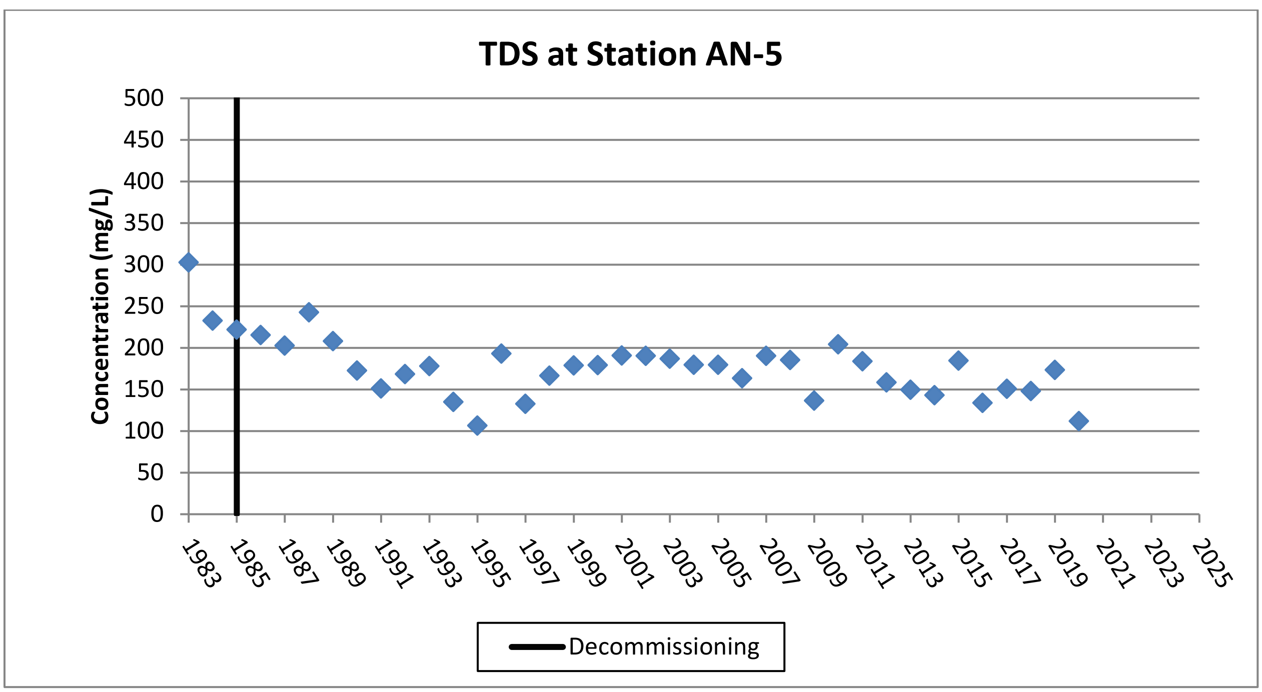


Figure 4.2.1-5 DB-6 Dubyna Creek

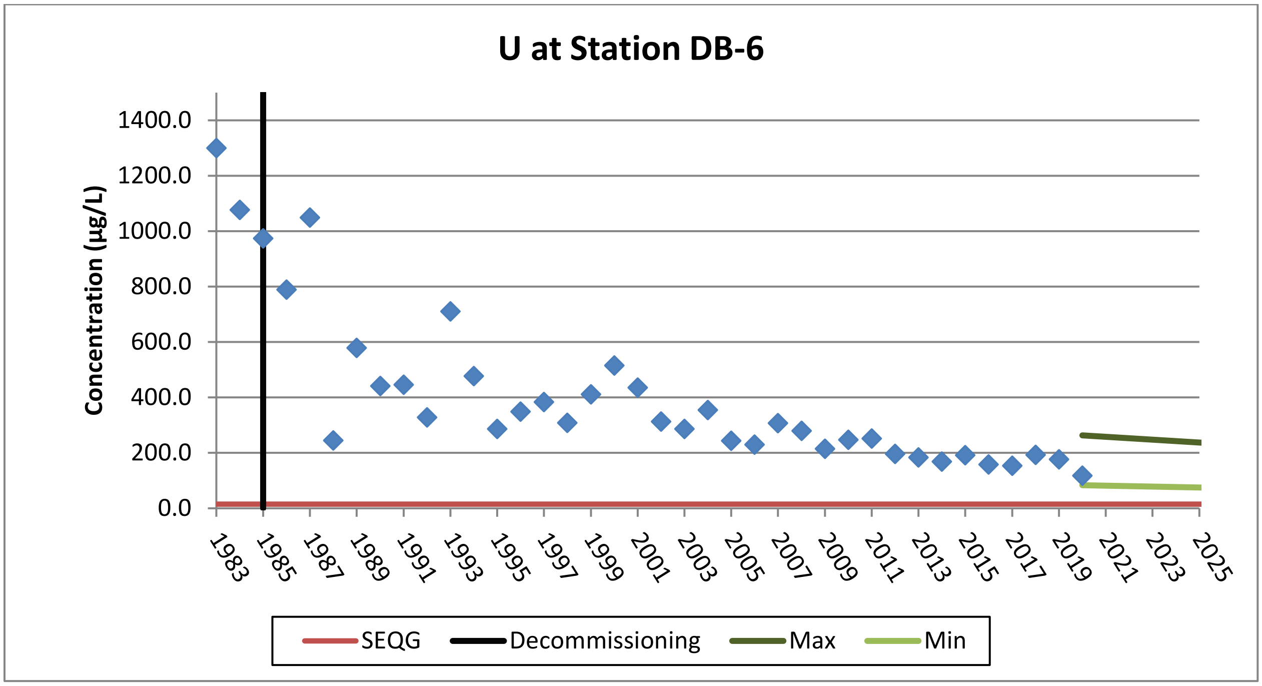


Figure 4.2.1-6 DB-6 Dubyna Creek

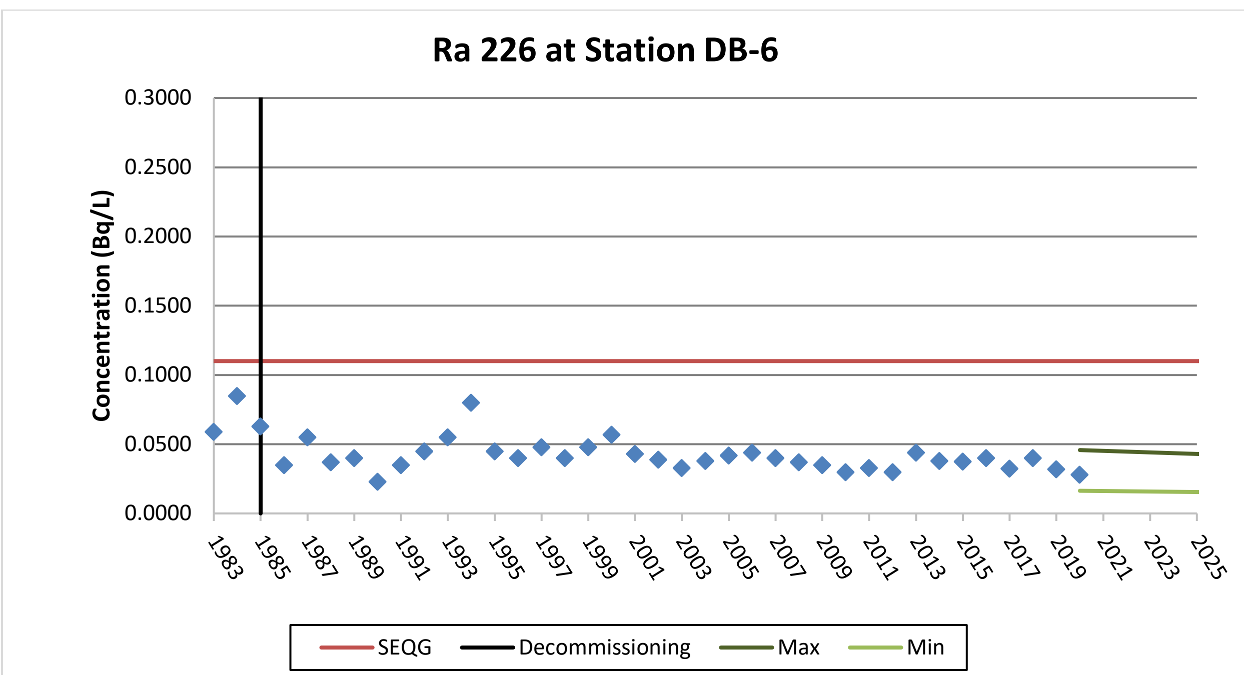


Figure 4.2.1-7 DB-6 Dubyna Creek

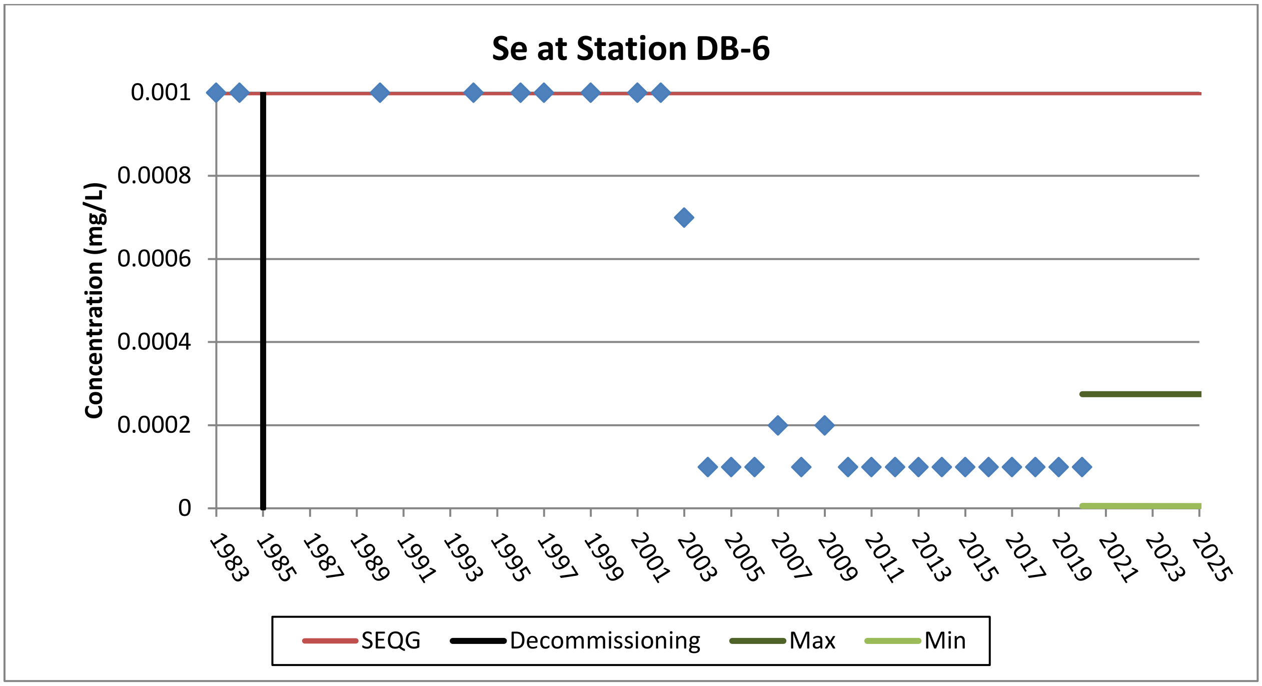


Figure 4.2.1-8 DB-6 Dubyna Creek

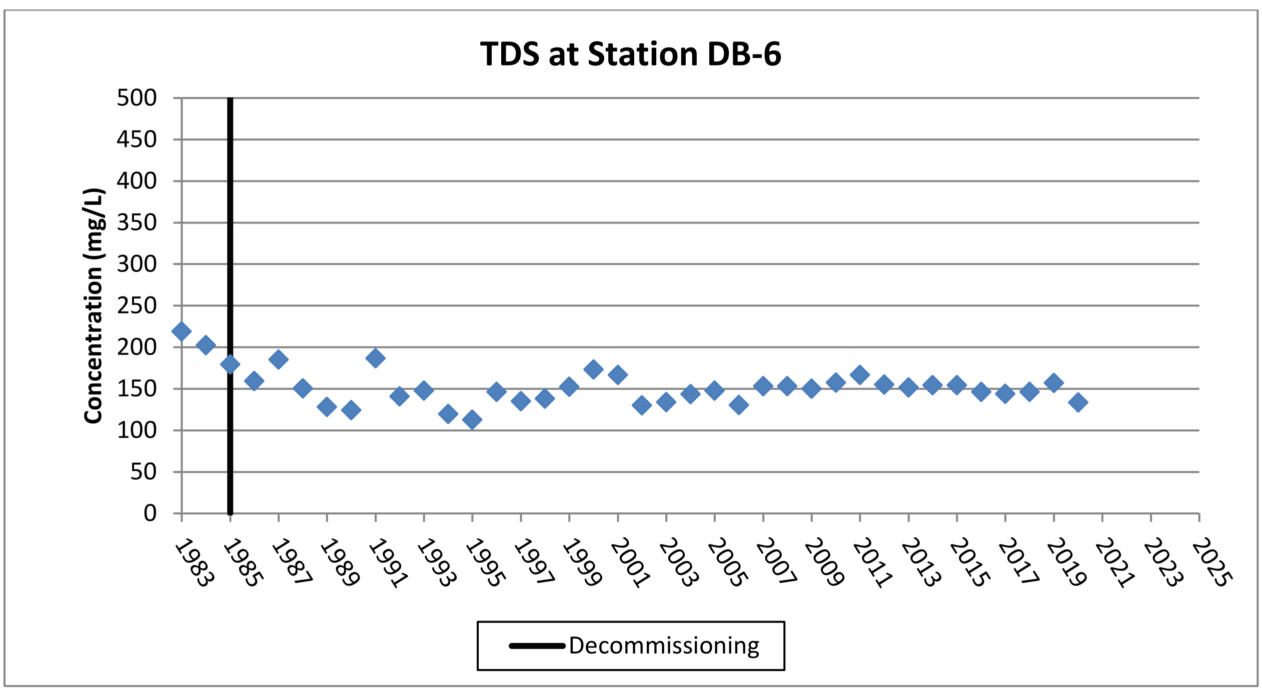


Figure 4.2.1-9 AC-6A Verna Lake Discharge to Ace Lake

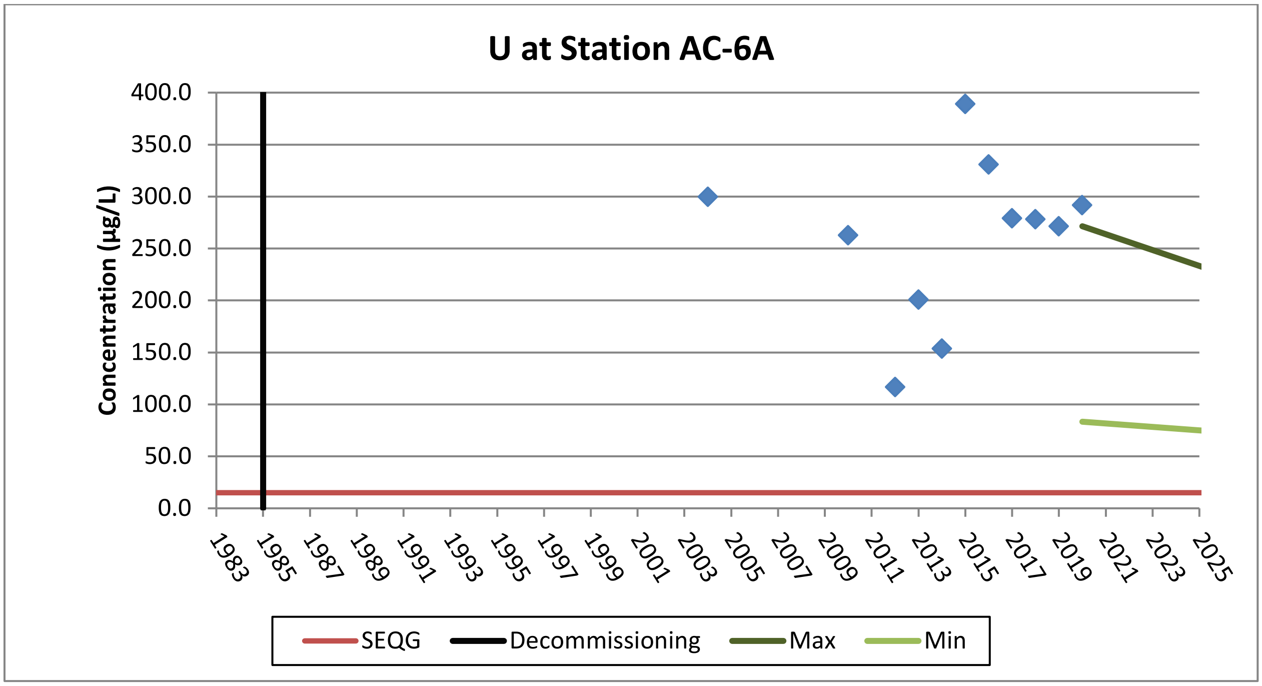


Figure 4.2.1-10 AC-6A Verna Lake Discharge to Ace Lake

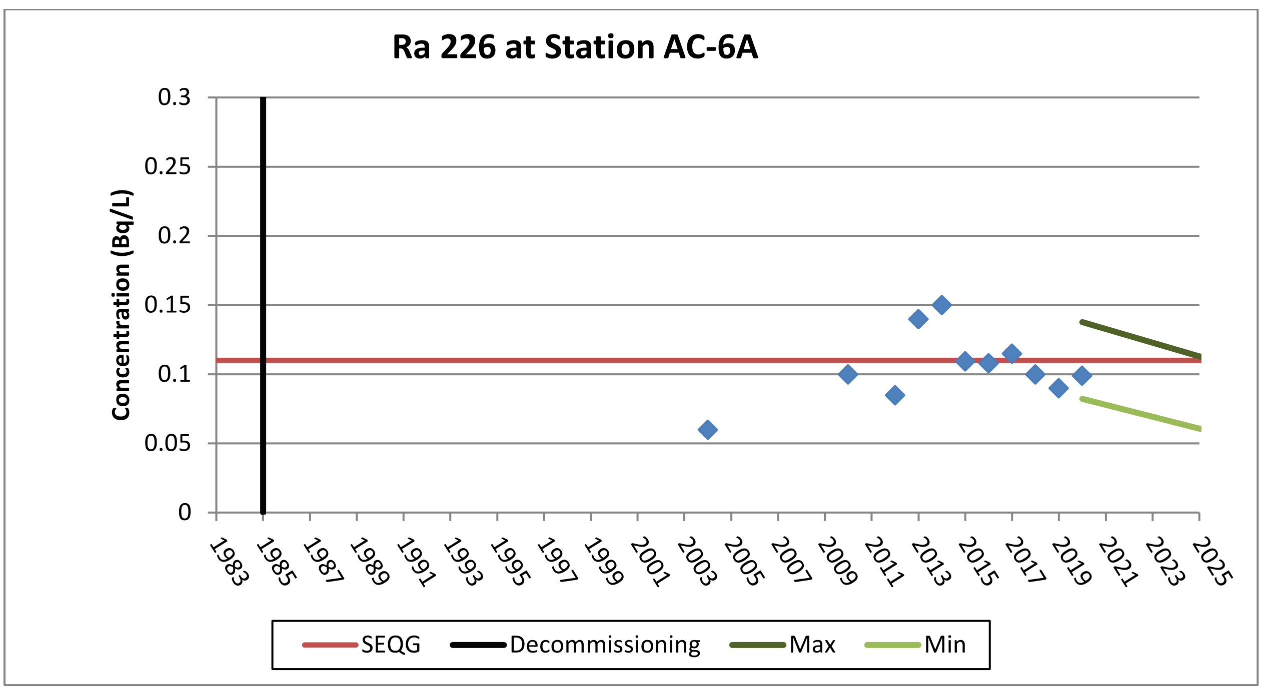
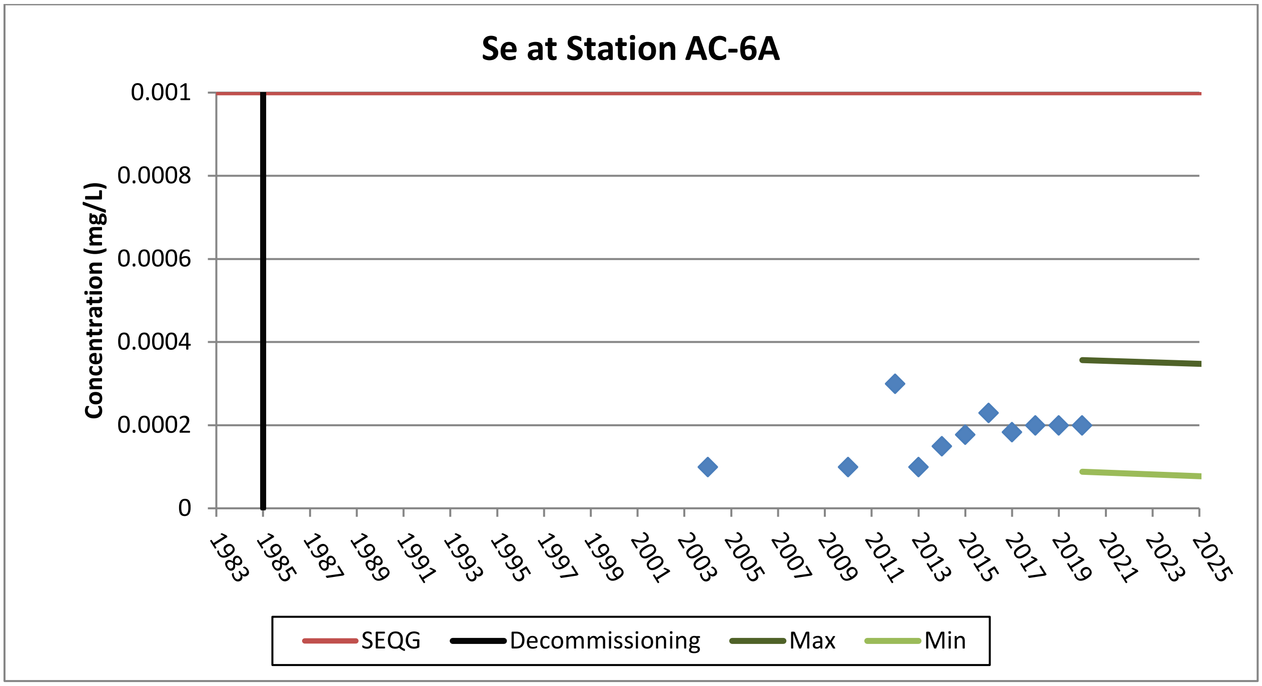


Figure 4.2.1-11 AC-6A Verna Lake Discharge to Ace Lake



Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.2.1-12 AC-6A Verna Lake Discharge to Ace Lake

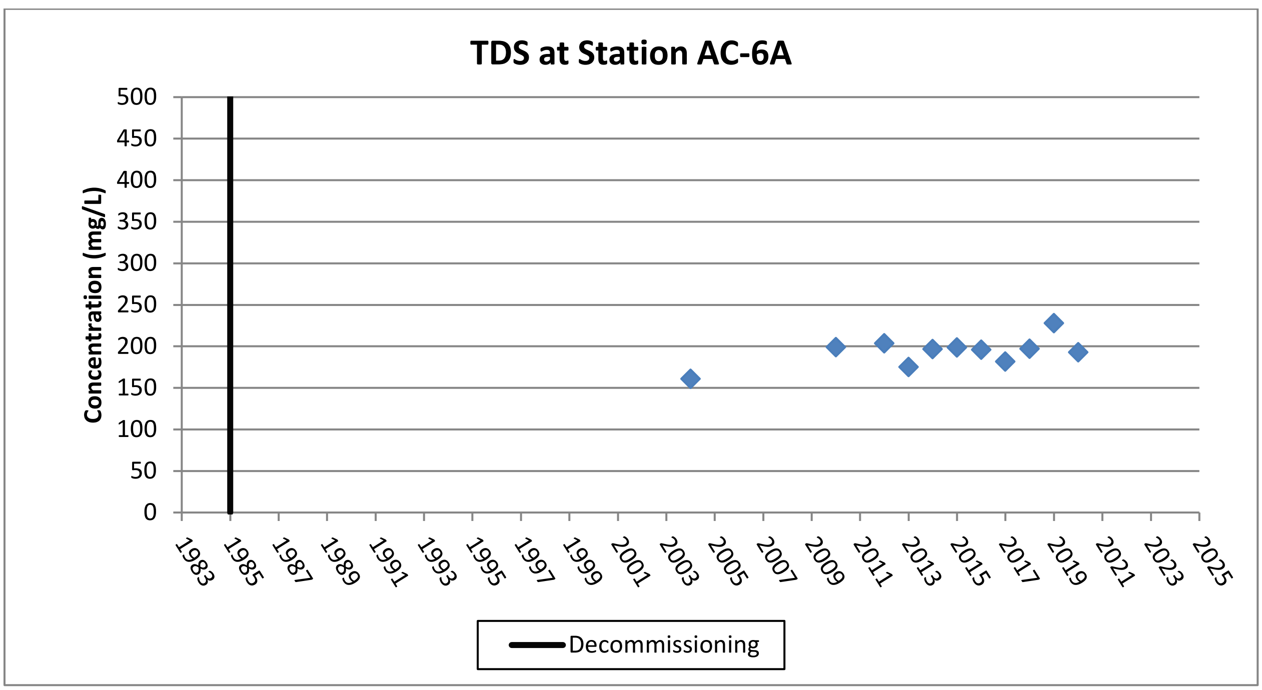


Figure 4.2.1-13 AC-8 Ace Lake Outlet to Ace Creek

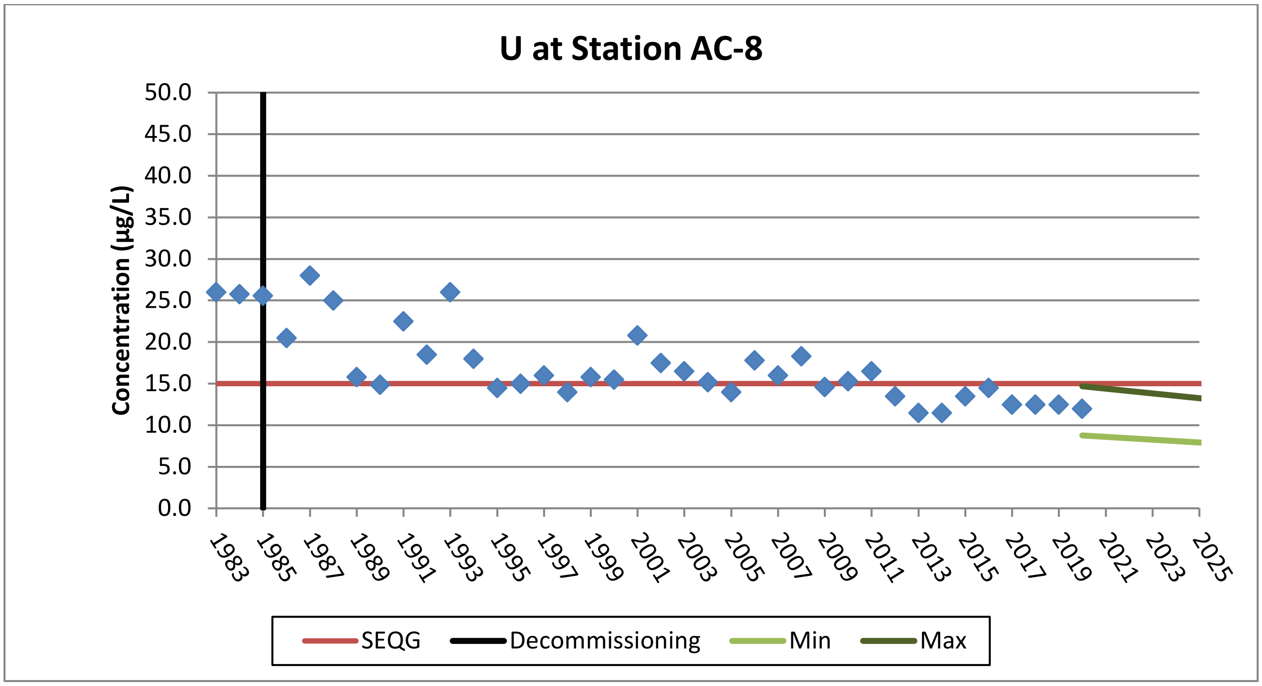


Figure 4.2.1-14 AC-8 Ace Lake Outlet to Ace Creek

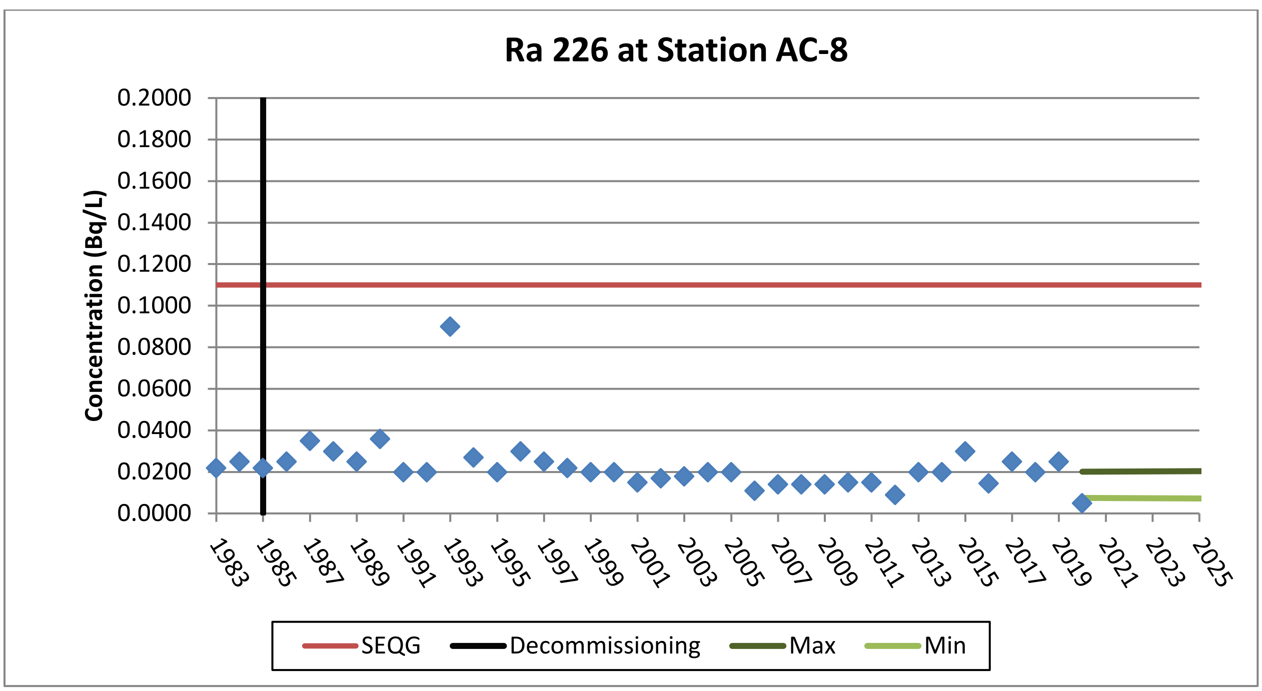
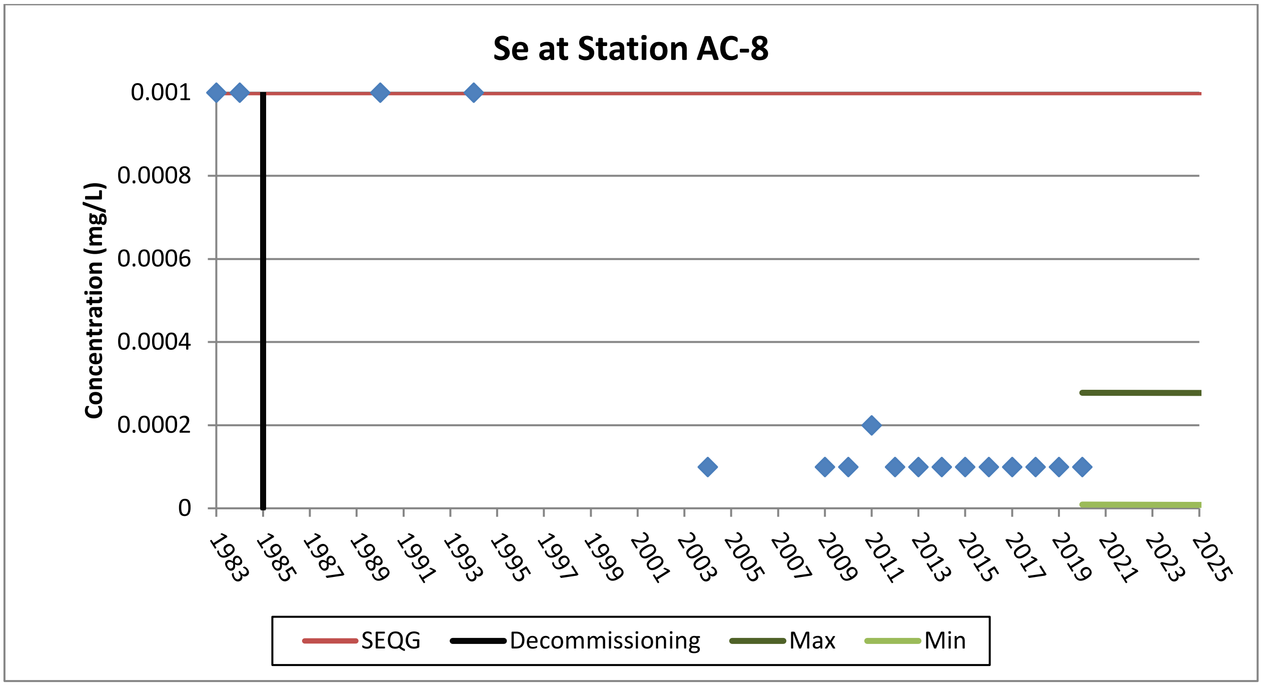


Figure 4.2.1-15 AC-8 Ace Lake Outlet to Ace Creek



Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.2.1-16 AC-8 Ace Lake Outlet to Ace Creek

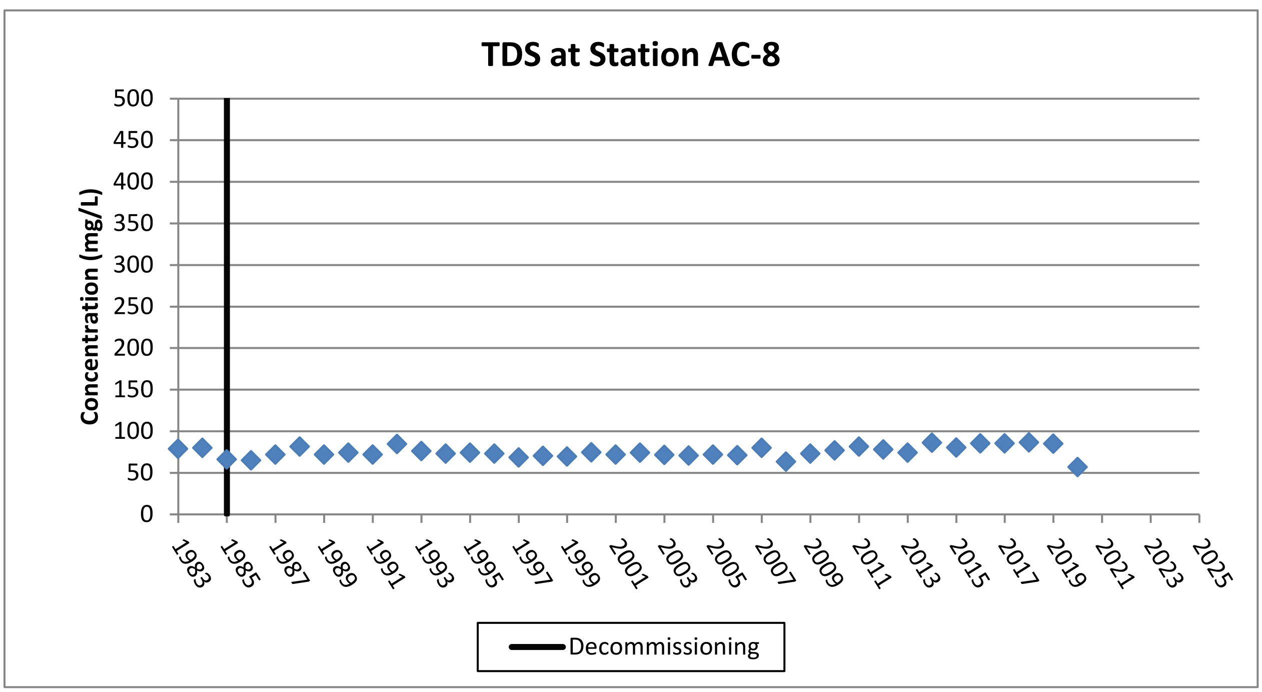


Figure 4.2.1-17 AC-14 - Ace Creek

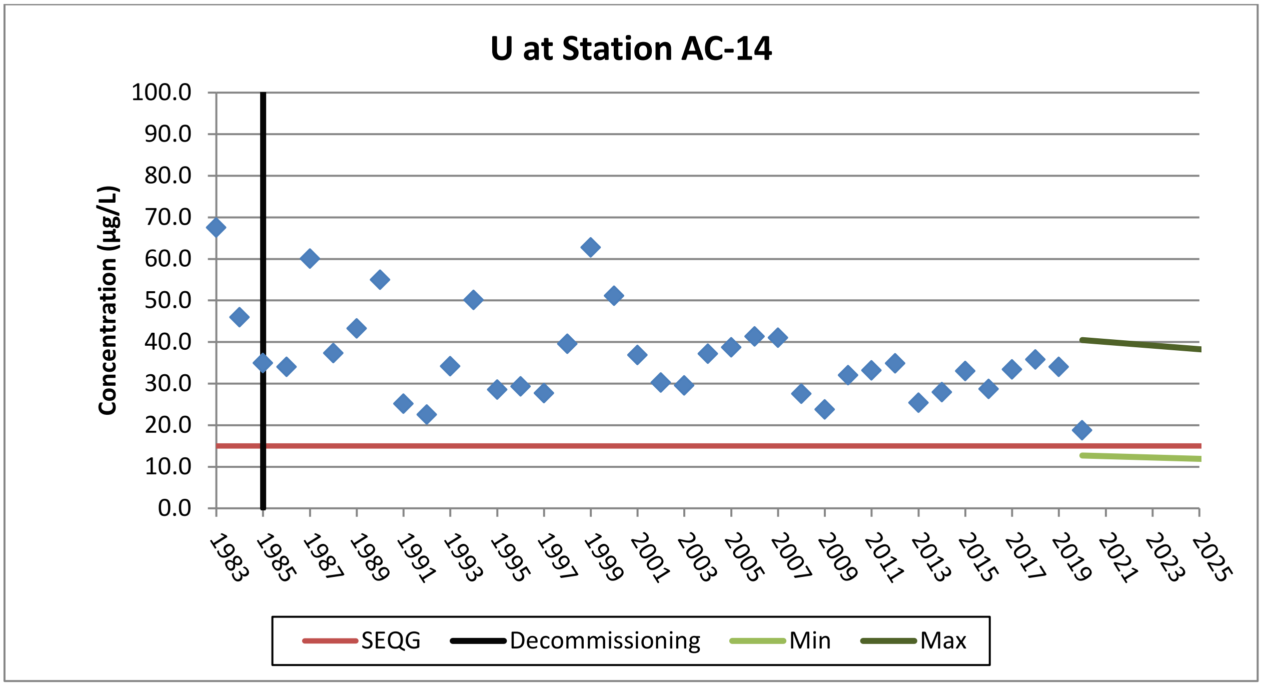


Figure 4.2.1-18 AC-14 - Ace Creek

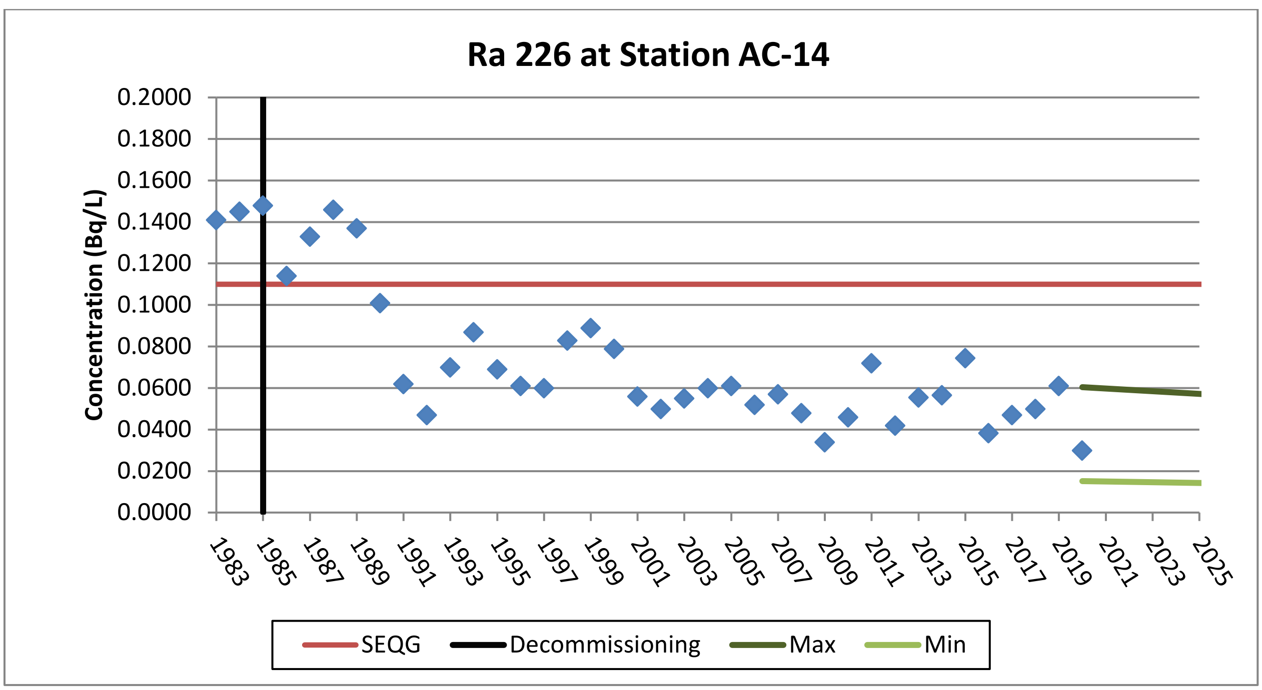
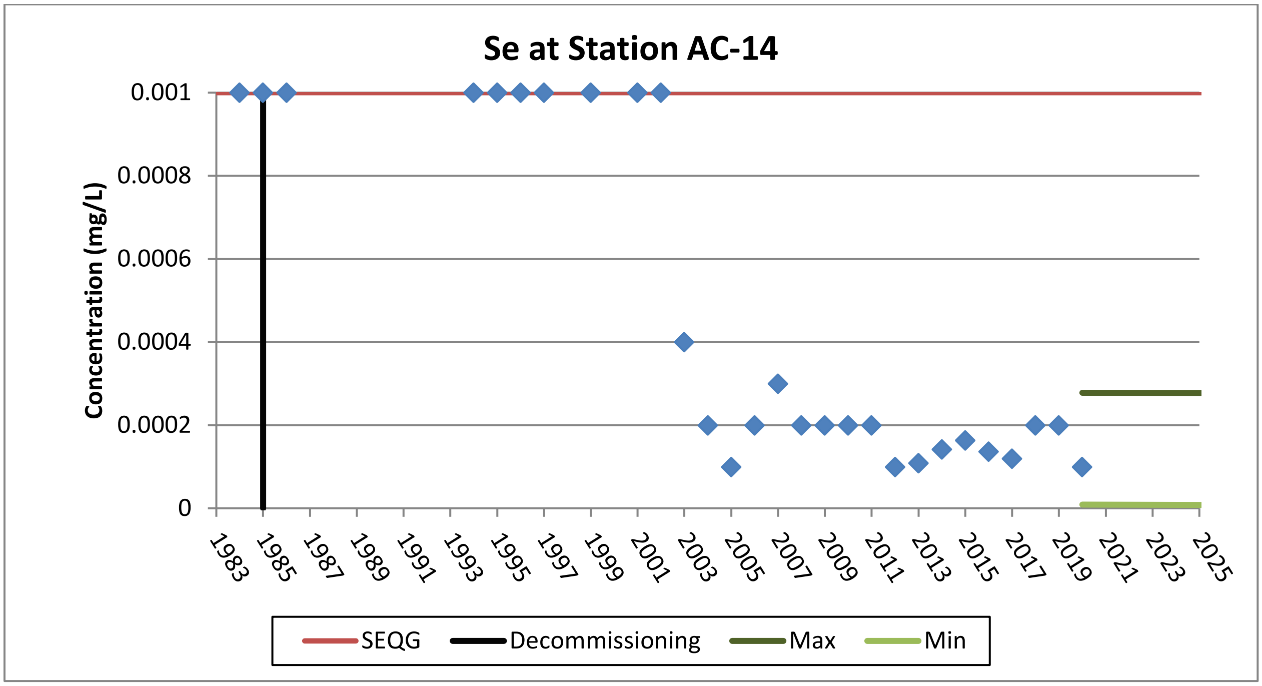


Figure 4.2.1-19 AC-14 - Ace Creek



Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.2.1-20 AC-14 - Ace Creek

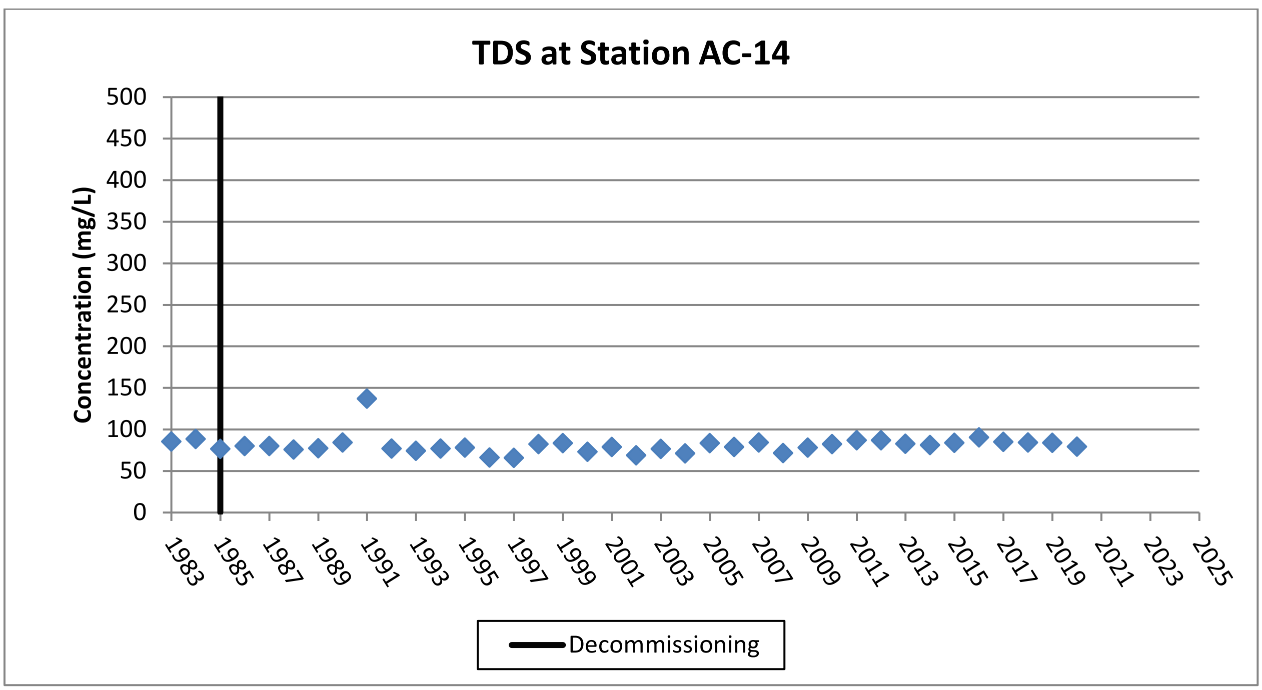
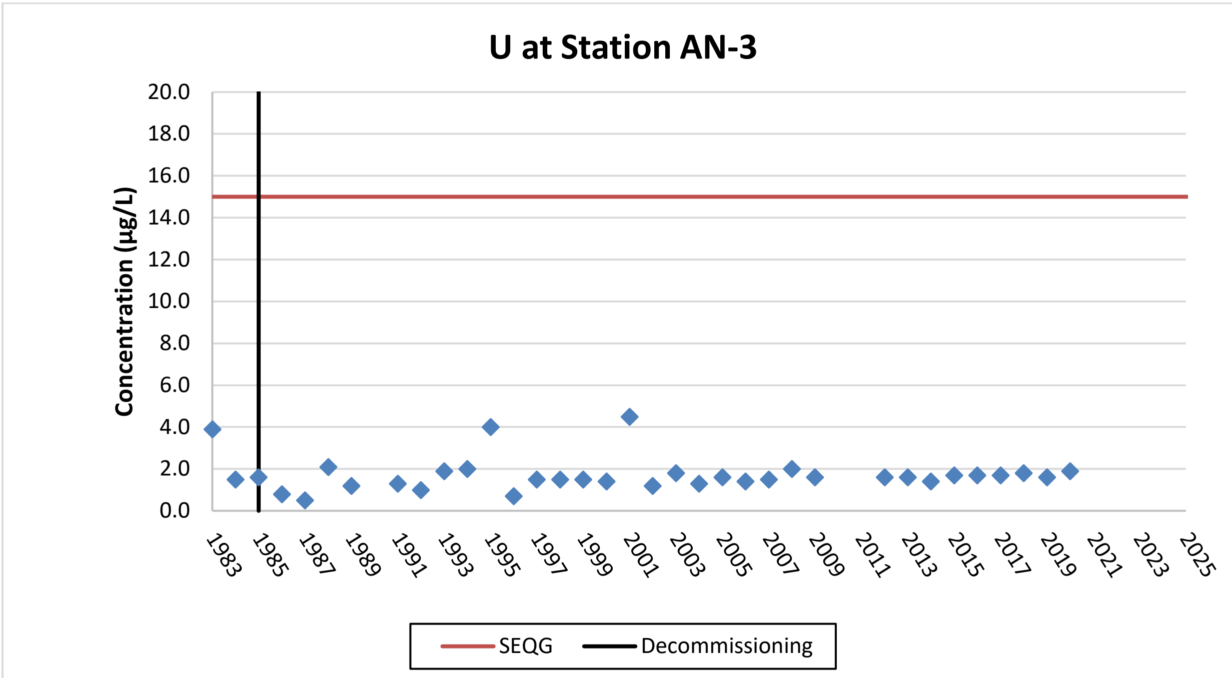
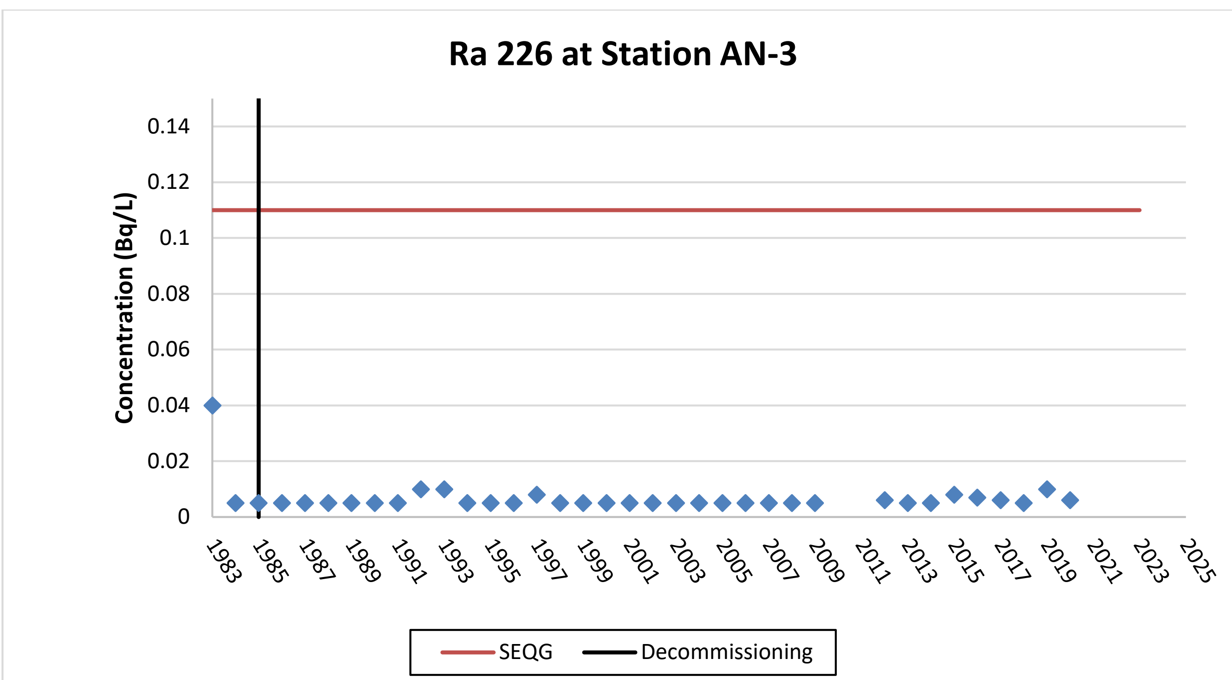


Figure 4.2.2-1 AN-3 Fulton Lake (Upstream of TL Stations)



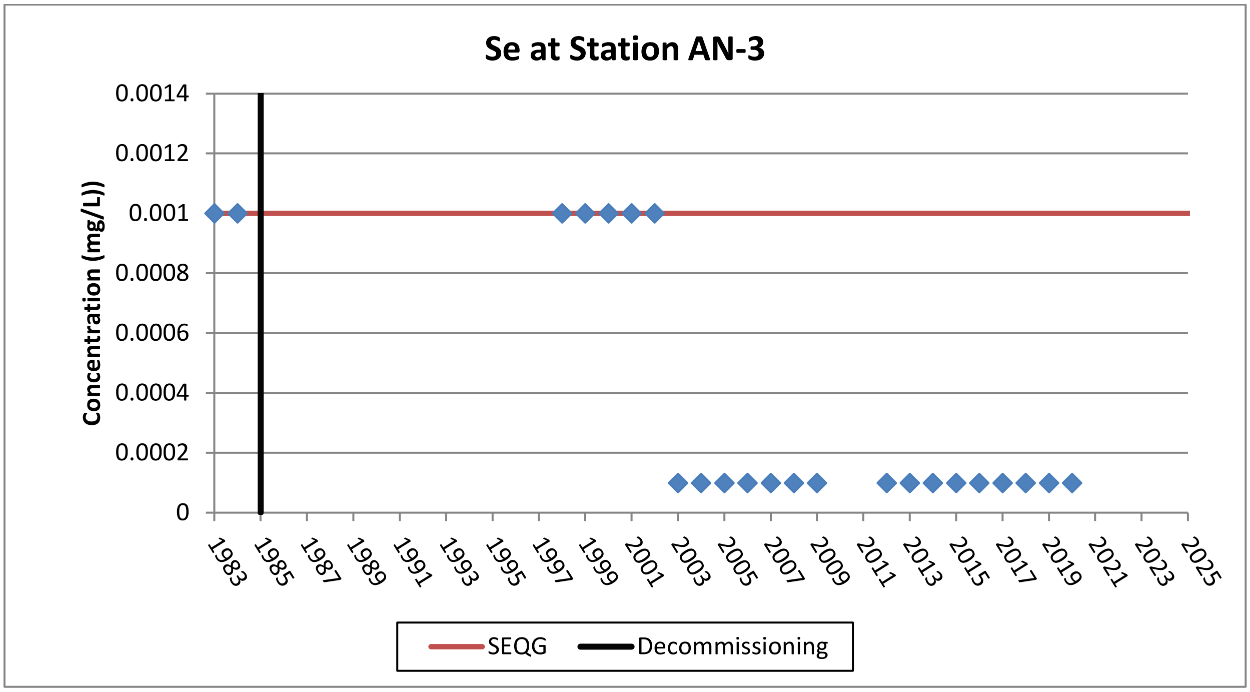
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.2.2-2 AN-3 Fulton Lake (Upstream of TL Stations)



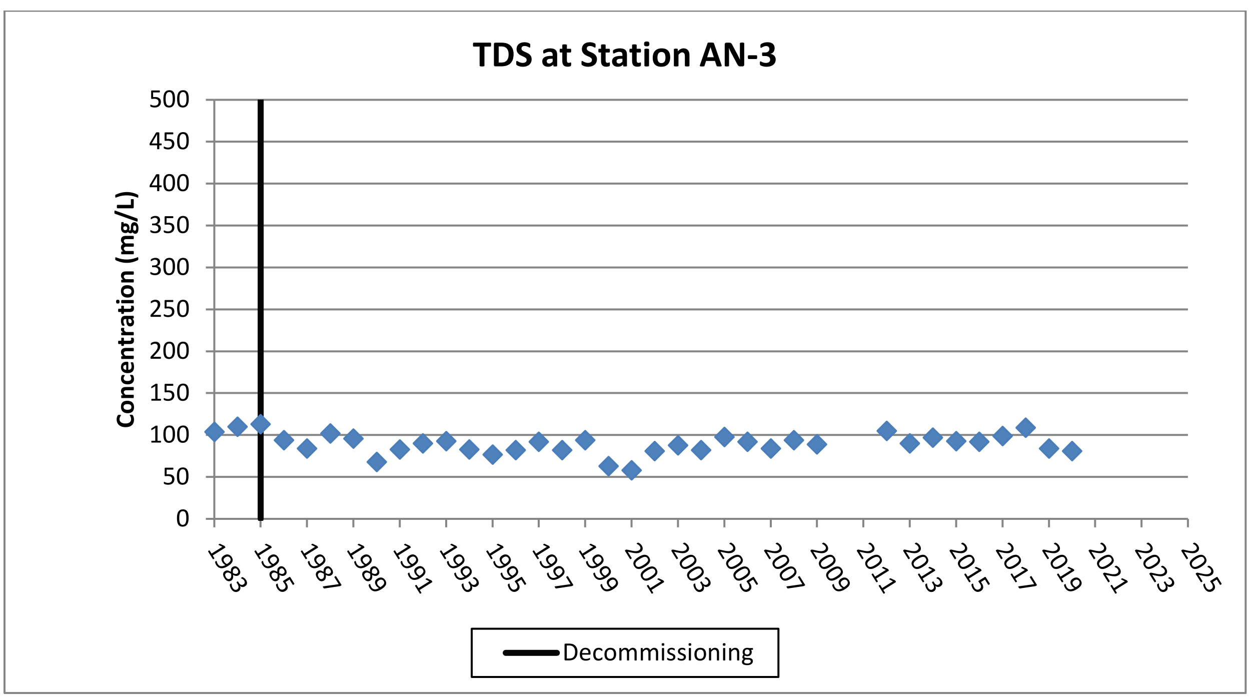
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.2.2-3 AN-3 Fulton Lake (Upstream of TL Stations)



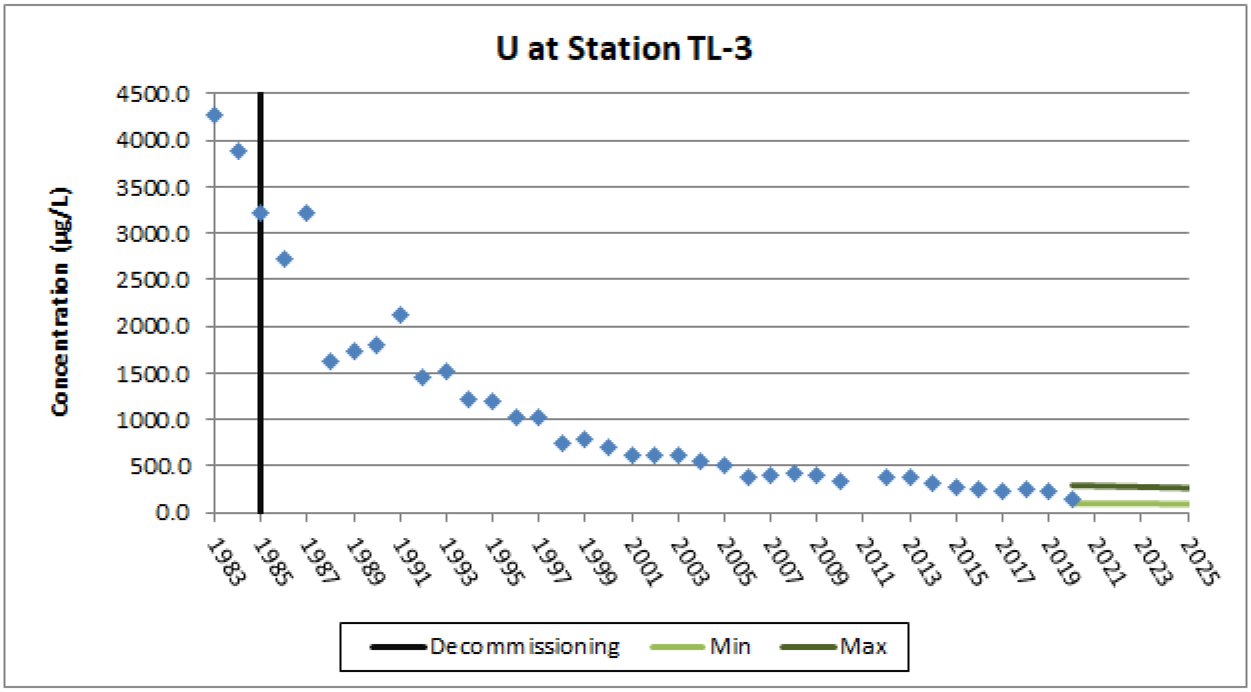
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.2.2-4 AN-3 Fulton Lake (Upstream of TL Stations)



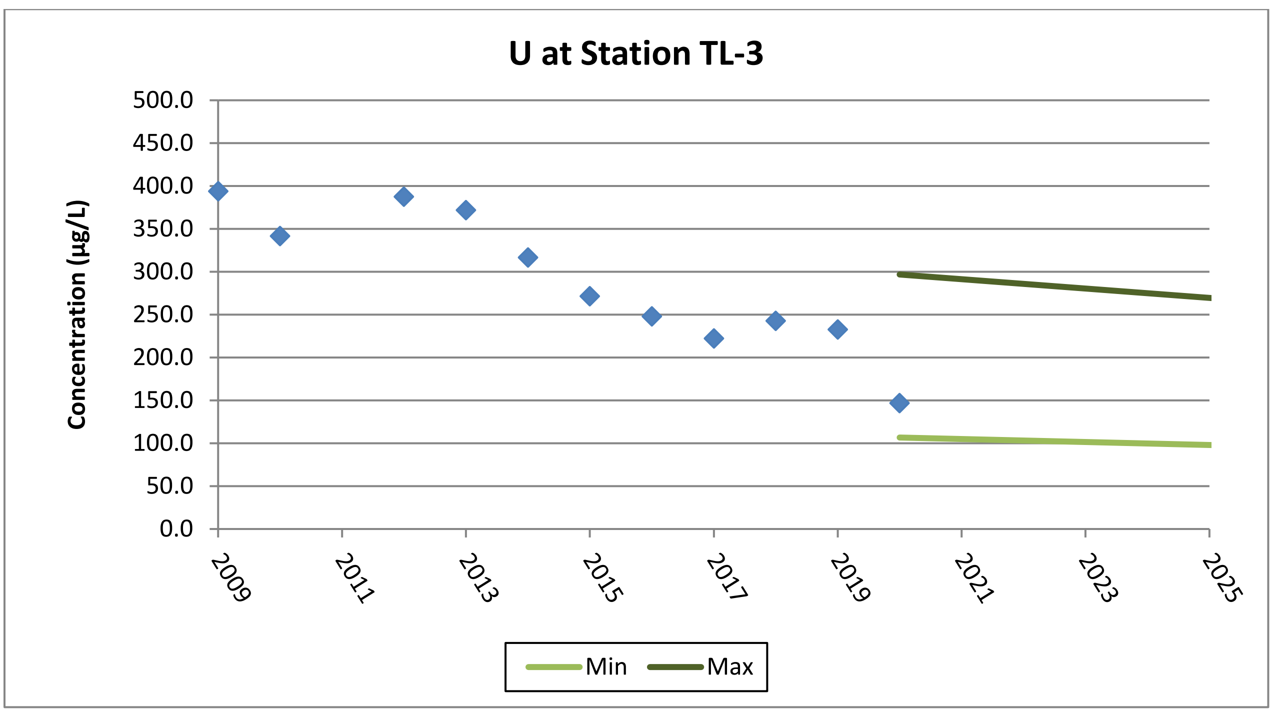
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.2.2-5 TL-3 Fookes Reservoir Discharge



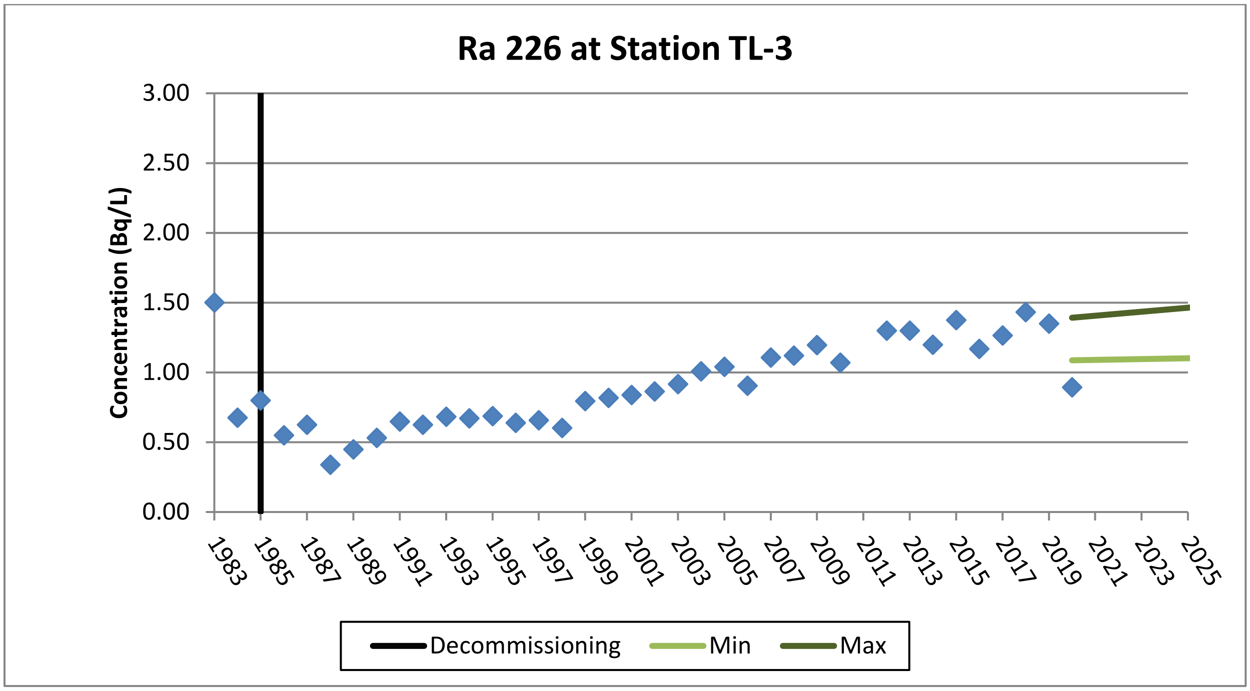
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-6 TL-3 Fookes Reservoir Discharge – Detailed Trend



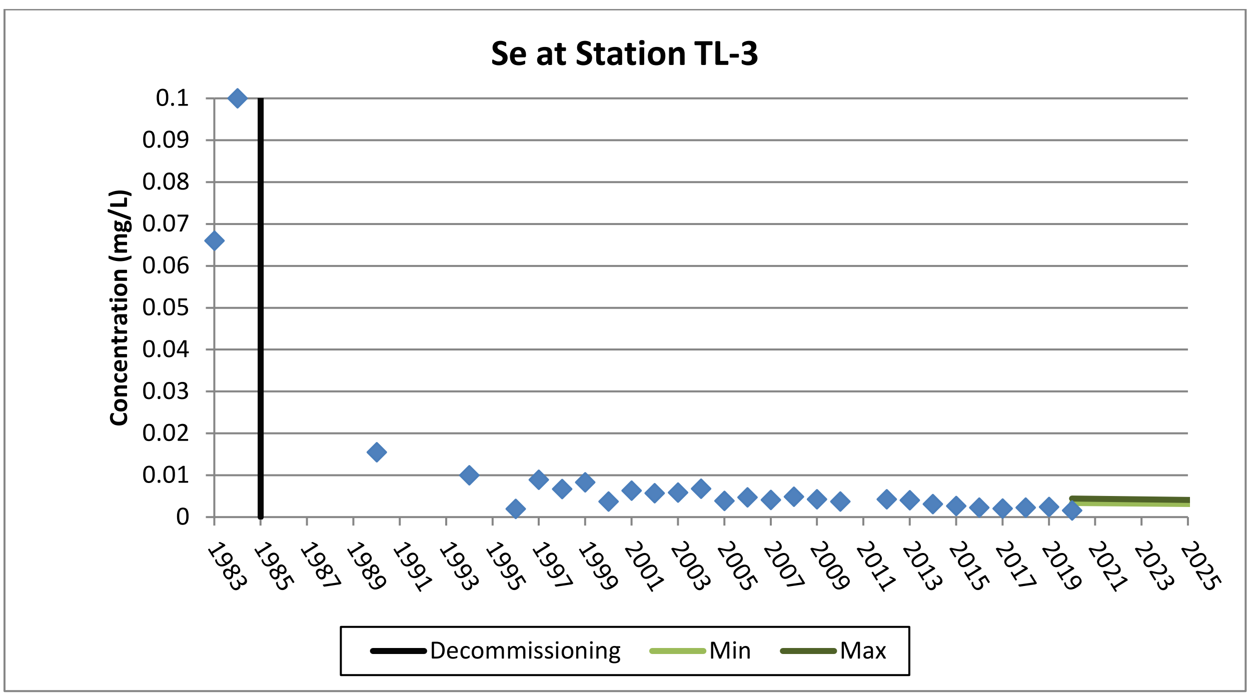
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-7 TL-3 Fookes Reservoir Discharge



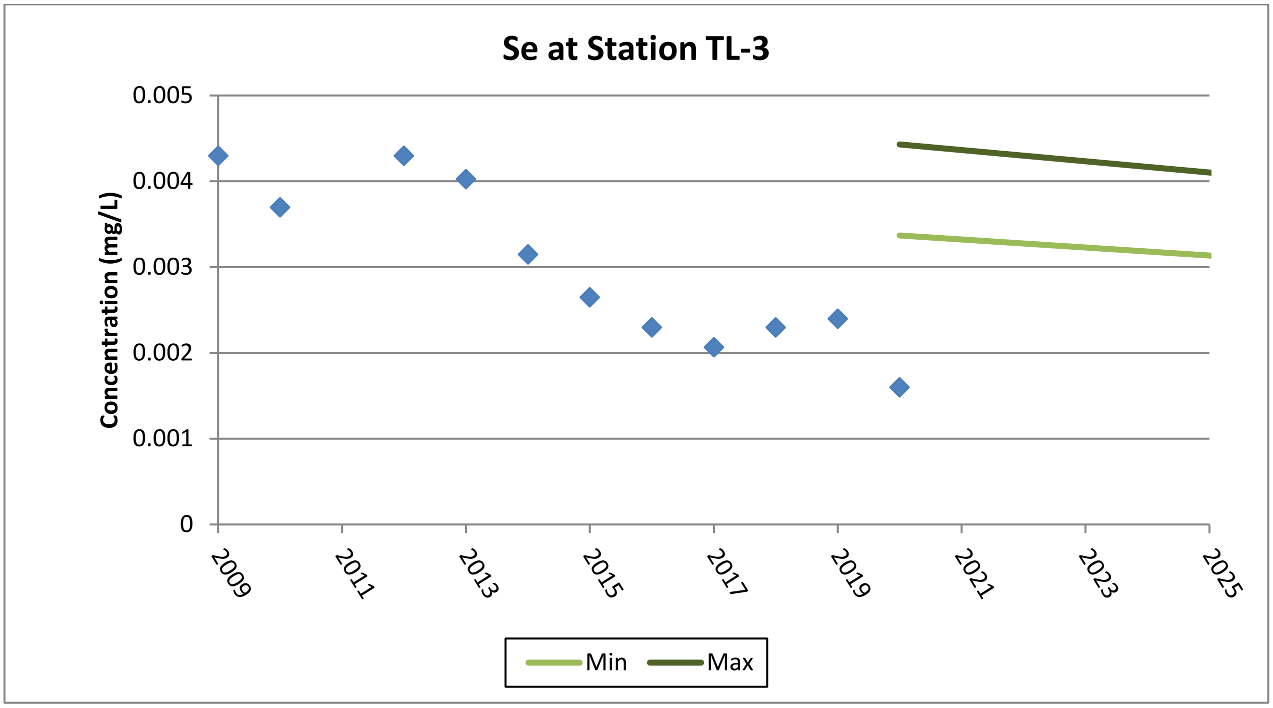
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-8 TL-3 Fookes Reservoir Discharge



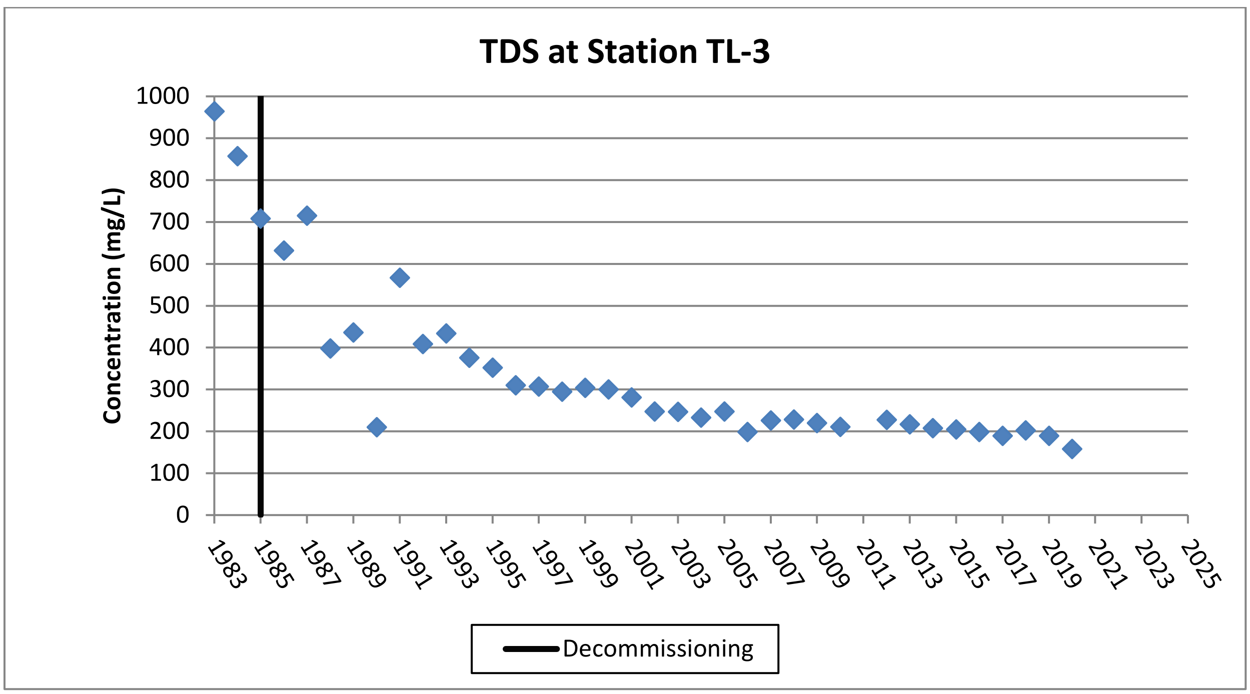
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-9 TL-3 Fookes Reservoir Discharge – Detailed Trend



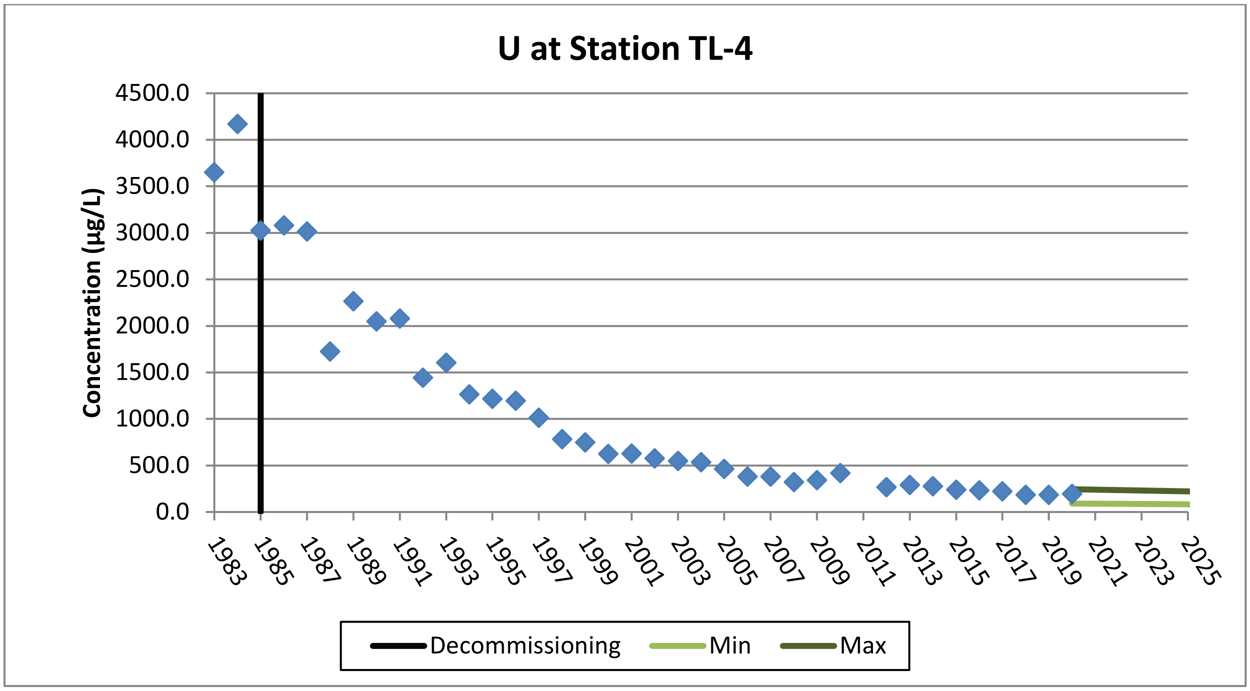
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-10 TL-3 Fookes Reservoir Discharge



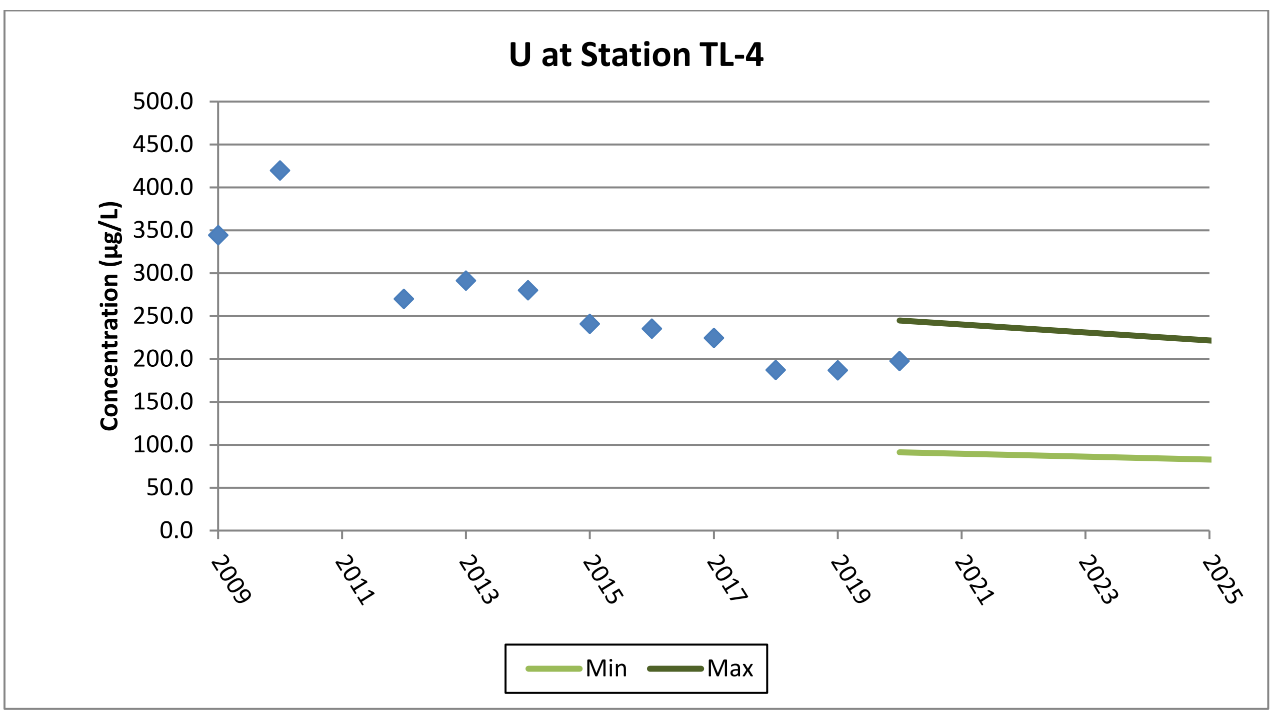
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-11 TL-4 Marie Reservoir Discharge



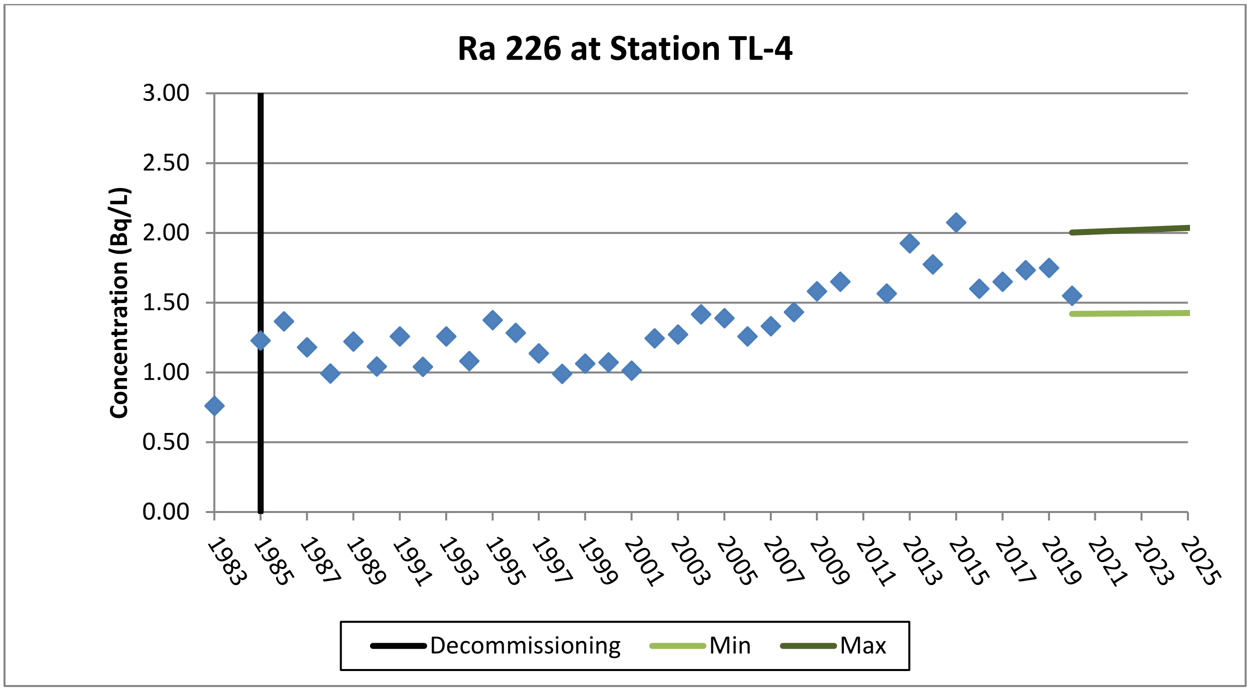
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-12 TL-4 Marie Reservoir Discharge – Detailed Trend



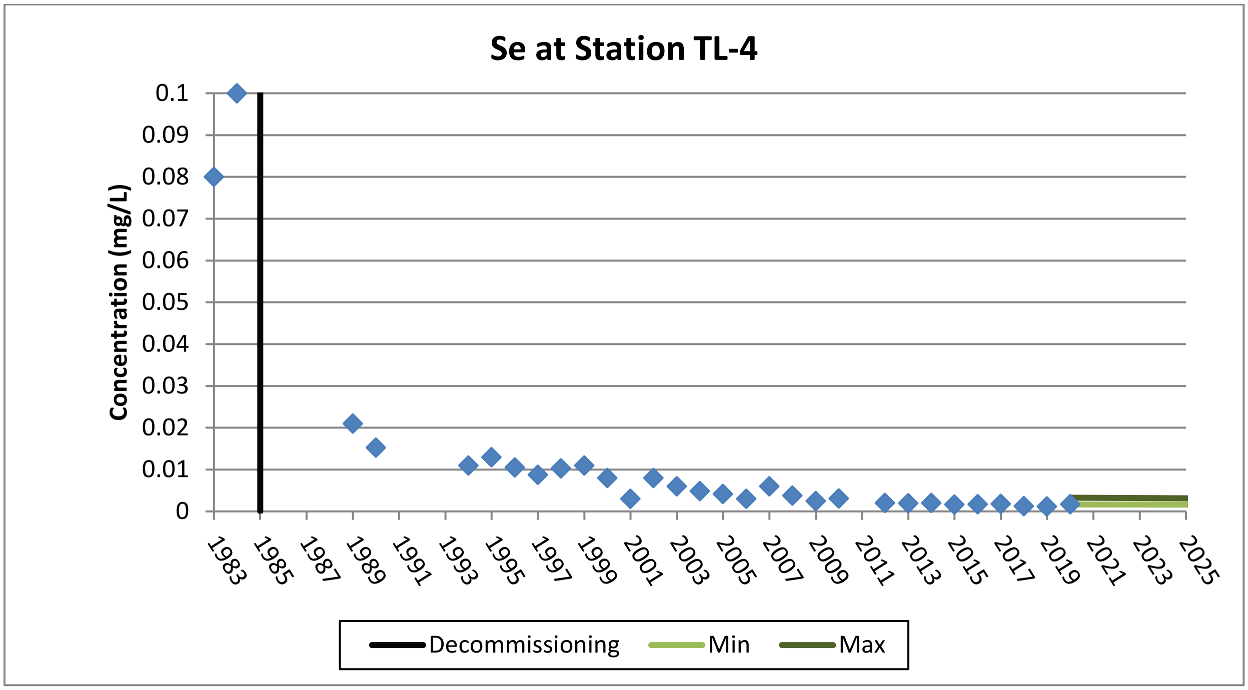
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-13 TL-4 Marie Reservoir Discharge



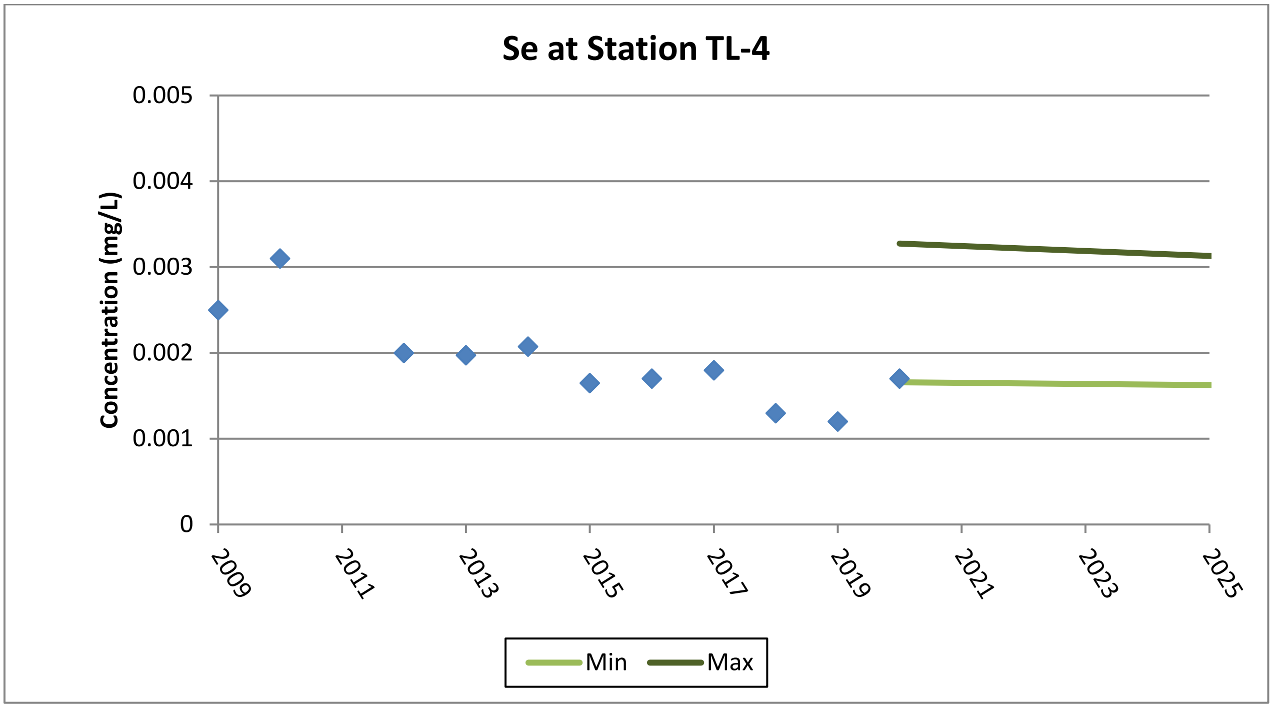
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-14 TL-4 Marie Reservoir Discharge



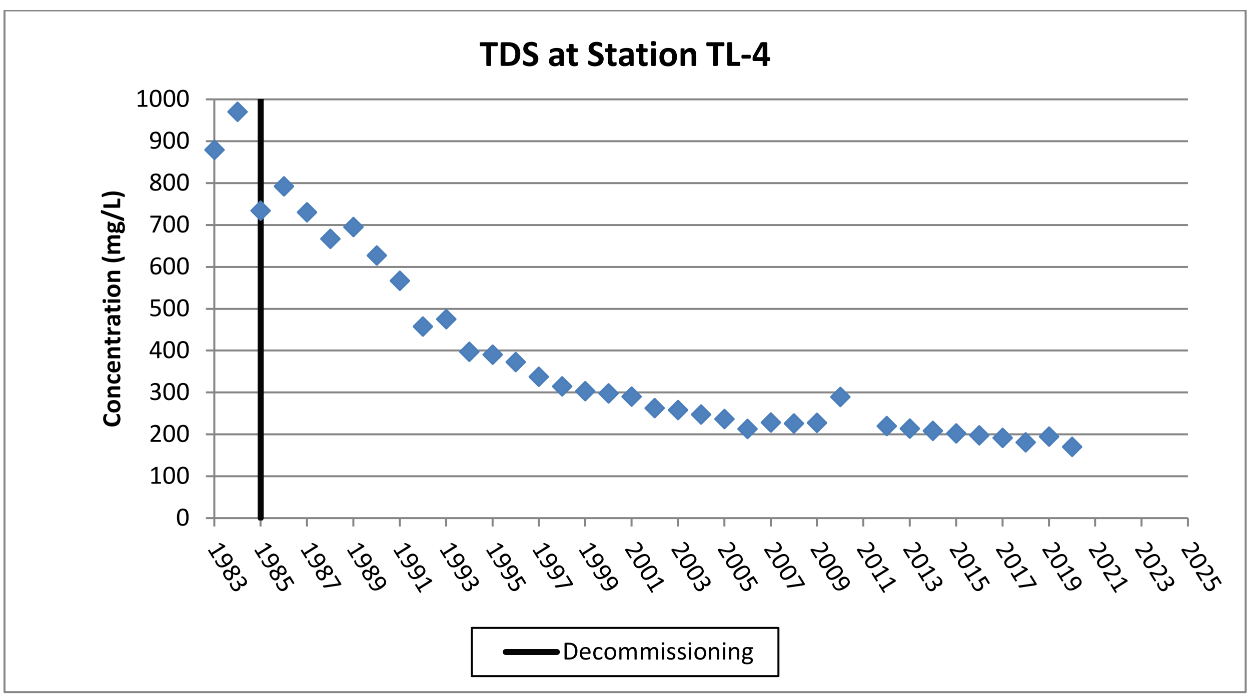
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-15 TL-4 Marie Reservoir Discharge – Detailed Trend



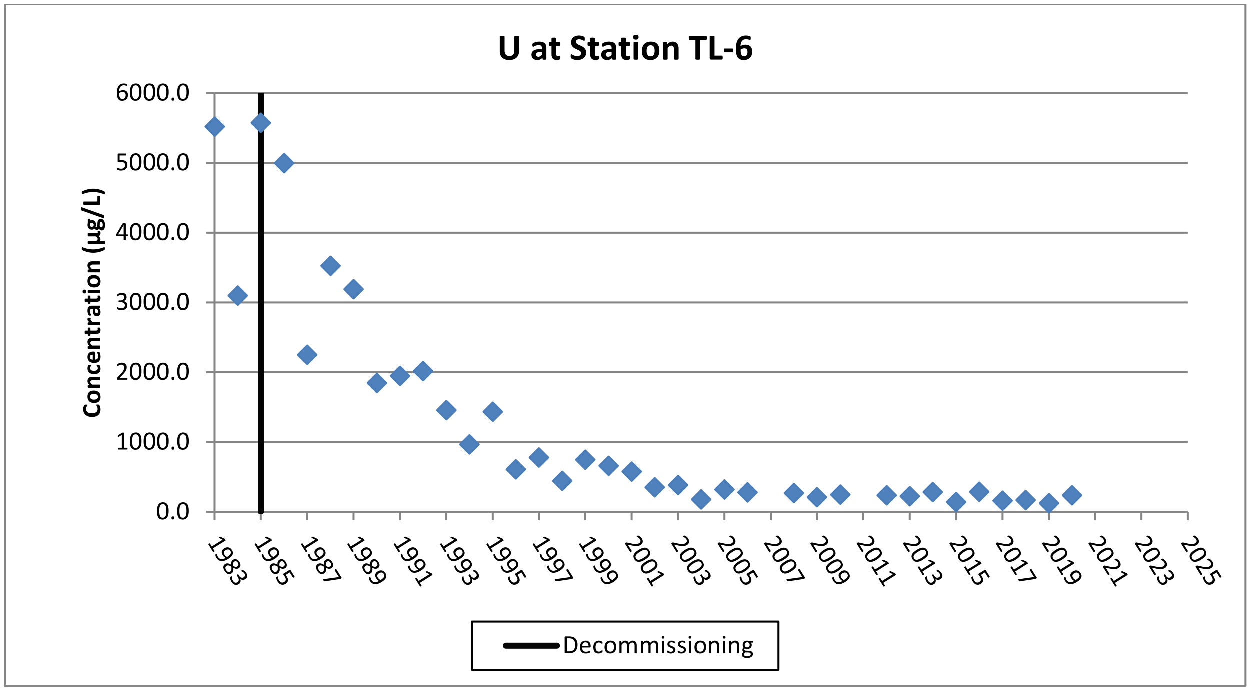
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-16 TL-4 Marie Reservoir Discharge



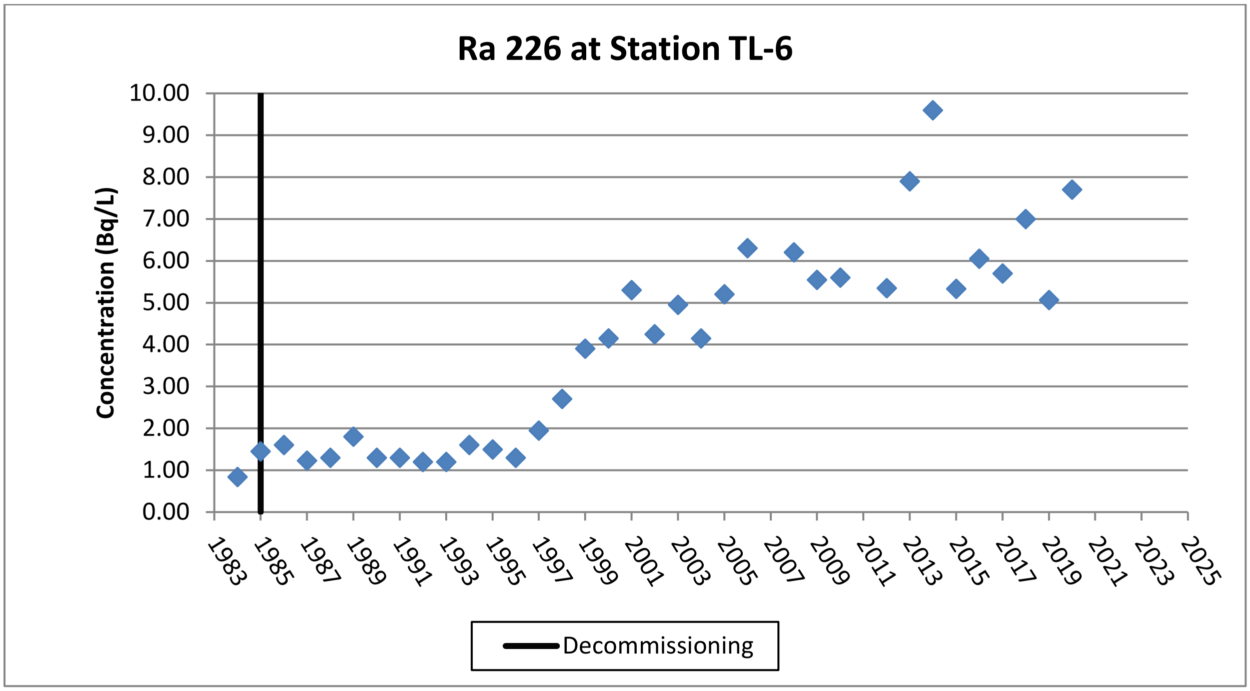
**No data available for 2011 due to a lack of water flow.*

Figure 4.2.2-17 TL-6 Minewater Reservoir Discharge



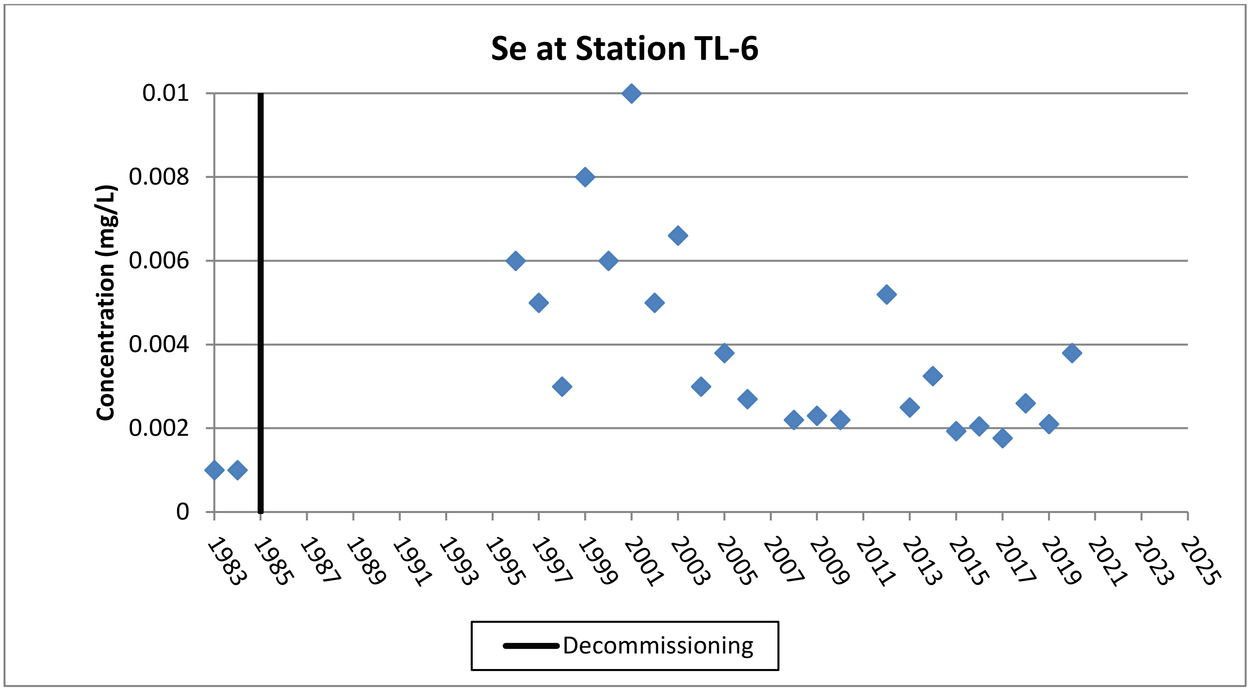
**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.2.2-18 TL-6 Minewater Reservoir Discharge



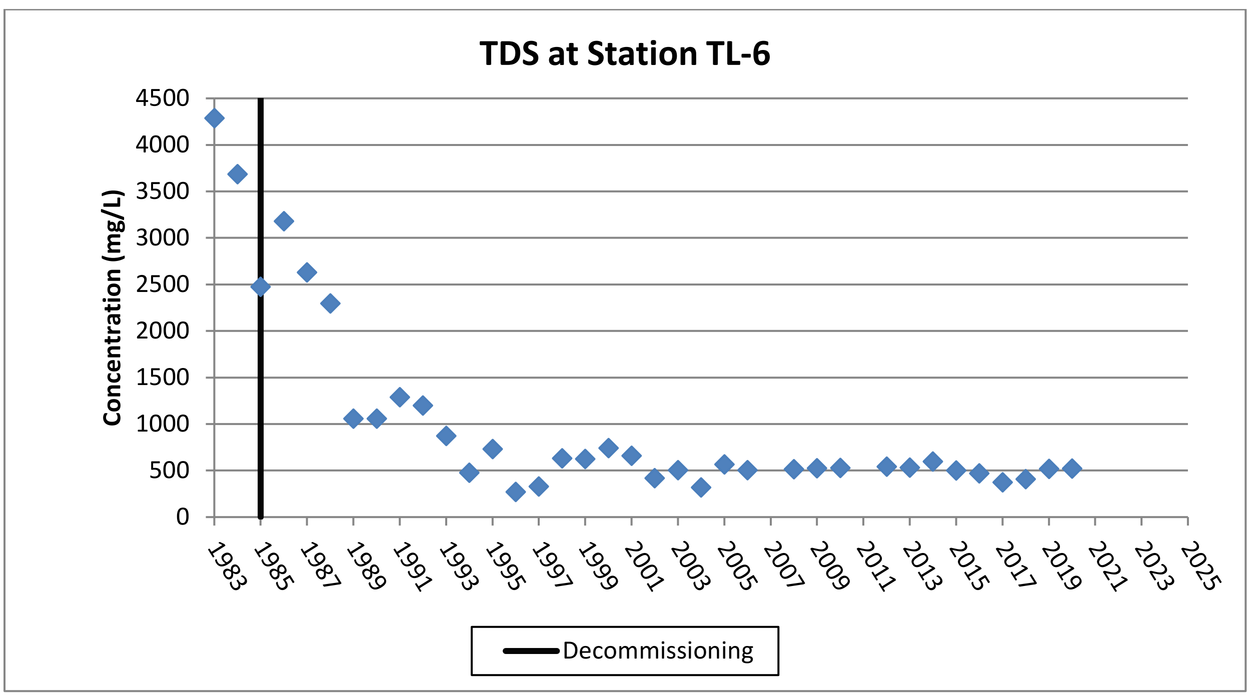
**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.2.2-19 TL-6 Minewater Reservoir Discharge



**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.2.2-20 TL-6 Minewater Reservoir Discharge



**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.2.2-21 TL-7 Meadow Fen Discharge

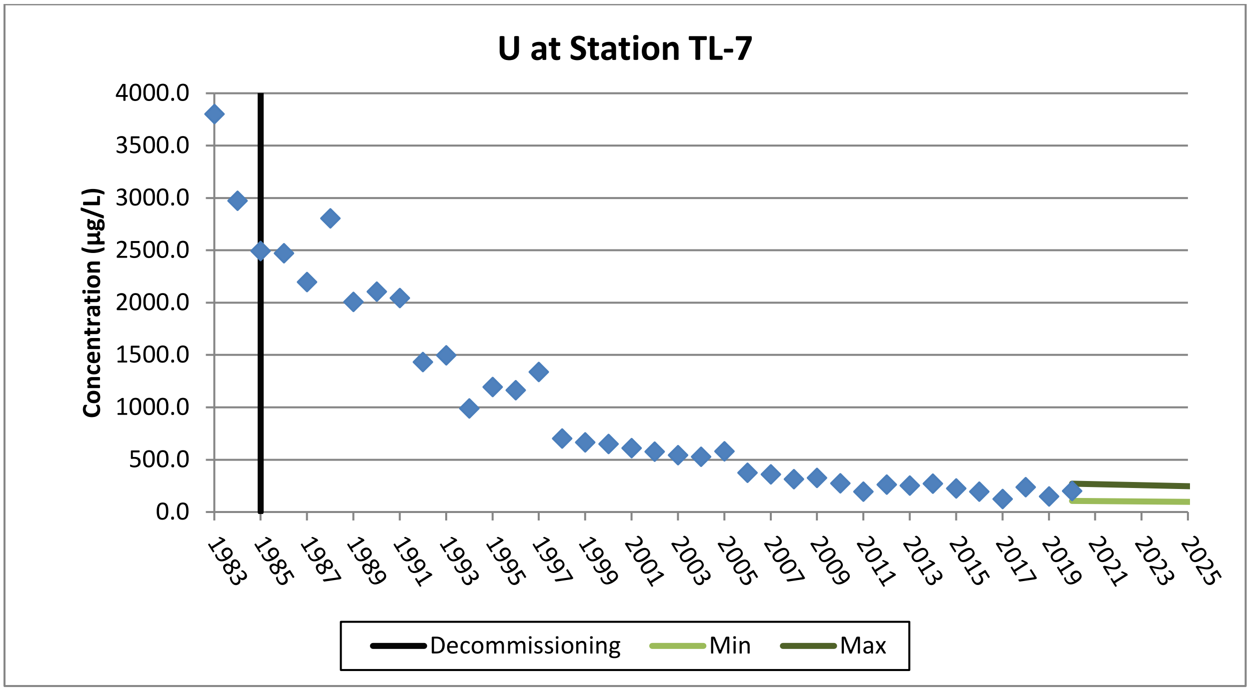


Figure 4.2.2-22 TL-7 Meadow Fen Discharge - Detailed Trend

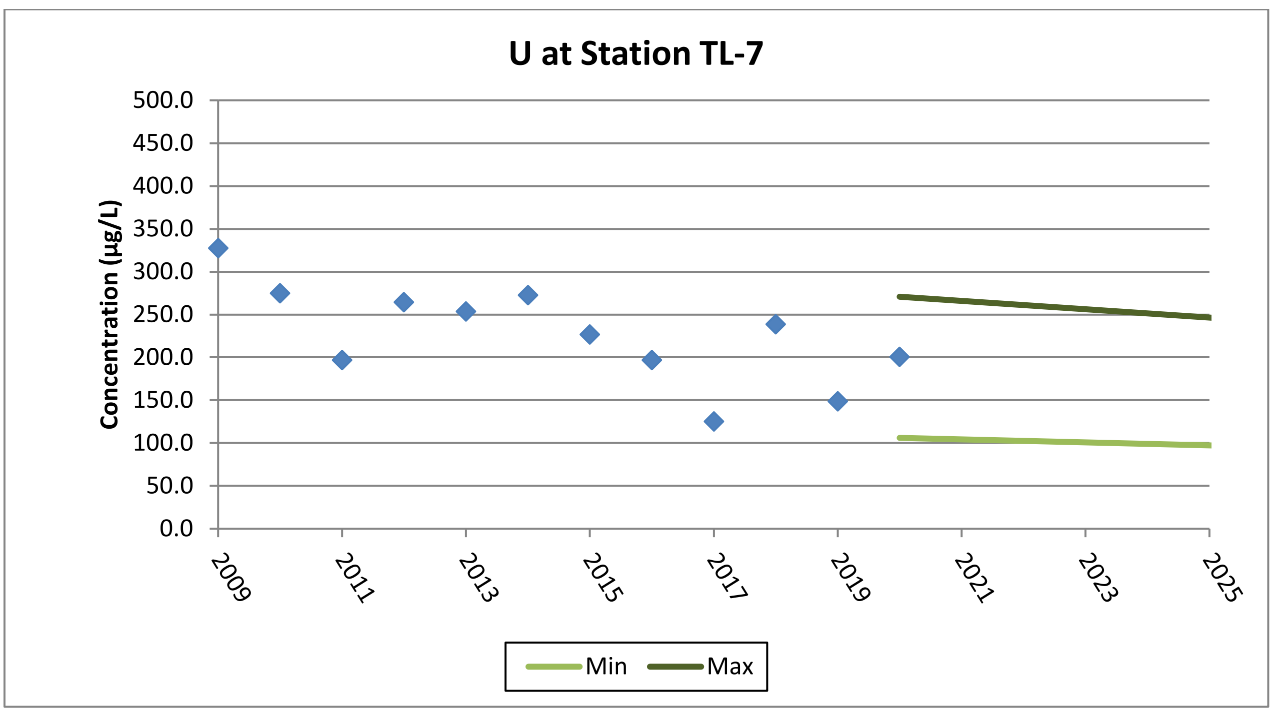


Figure 4.2.2-23 TL-7 Meadow Fen Discharge

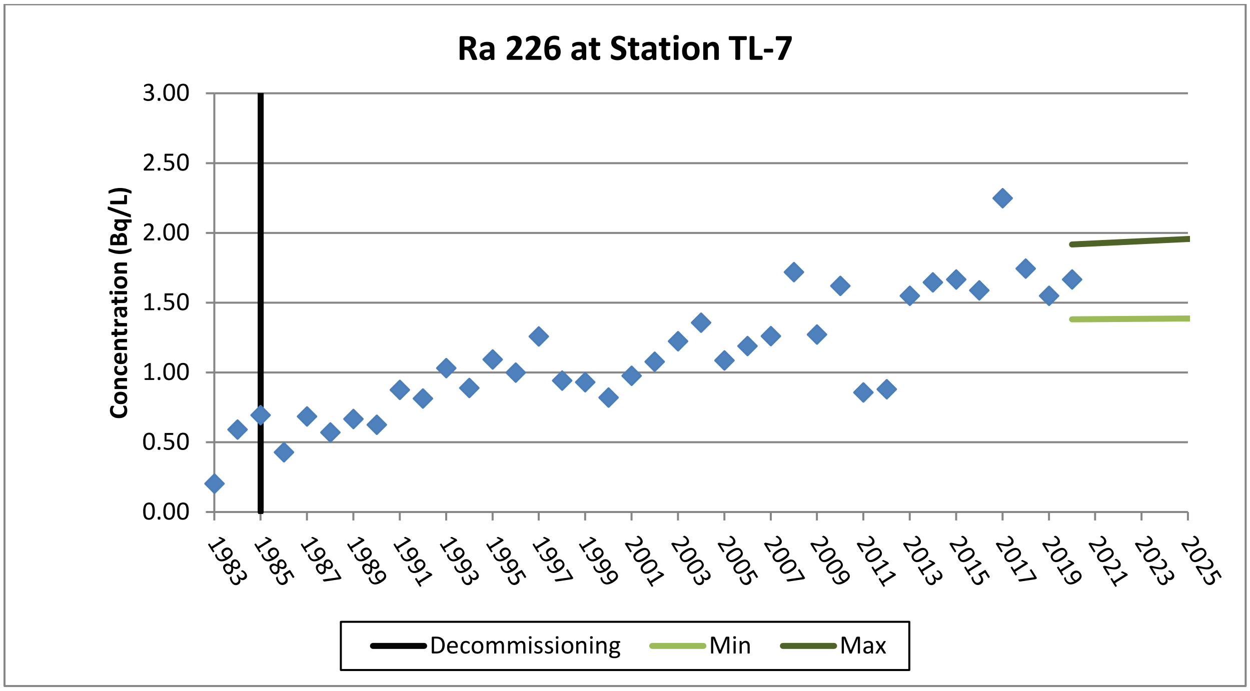


Figure 4.2.2-24 TL-7 Meadow Fen Discharge

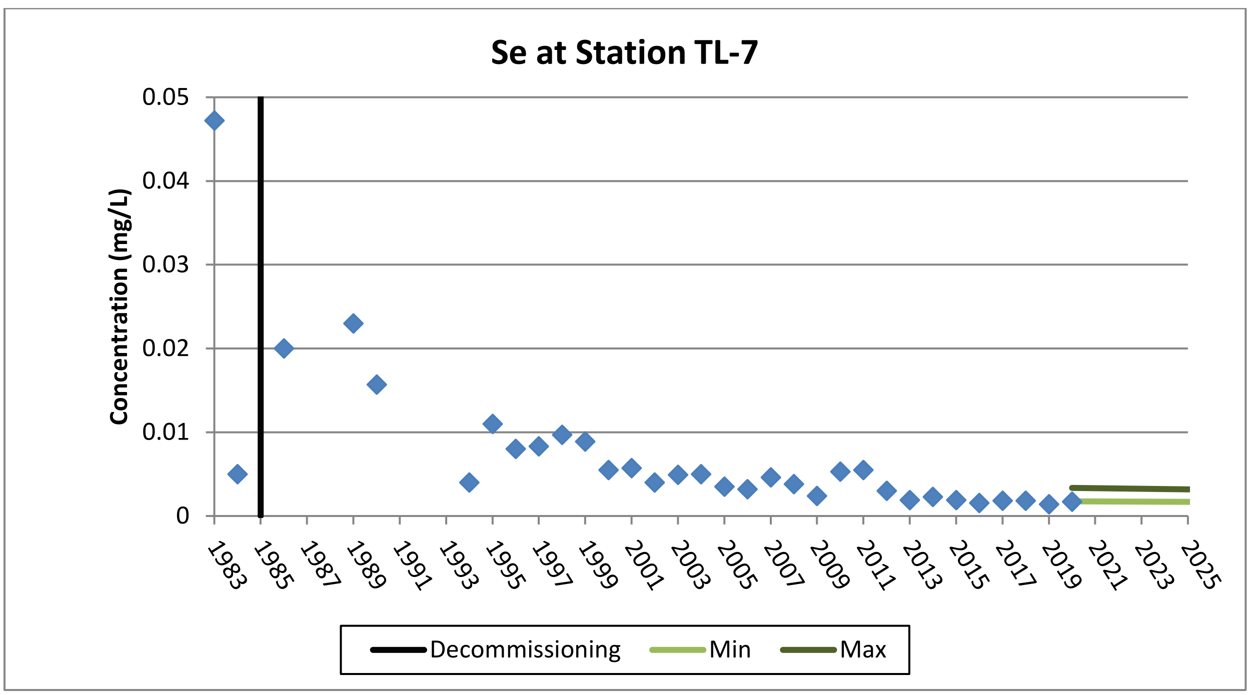


Figure 4.2.2-25 TL-7 Meadow Fen Discharge – Detailed Trend

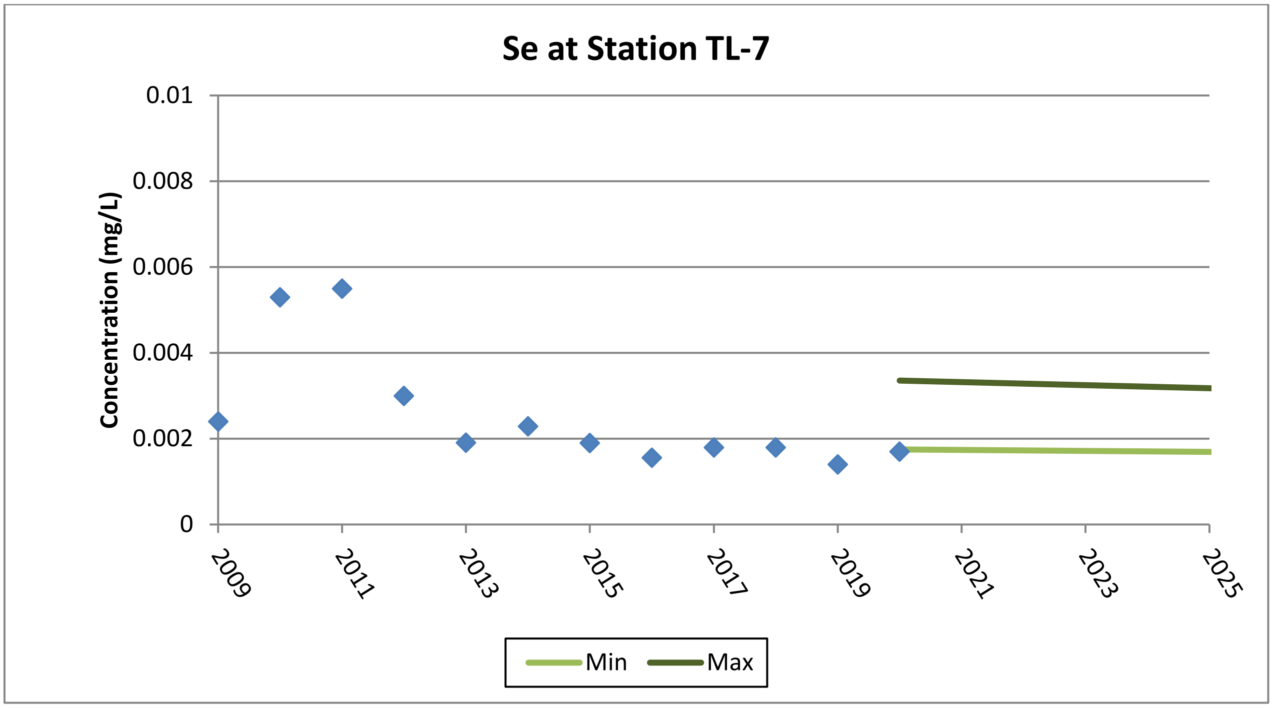


Figure 4.2.2-26 TL-7 Meadow Fen Discharge

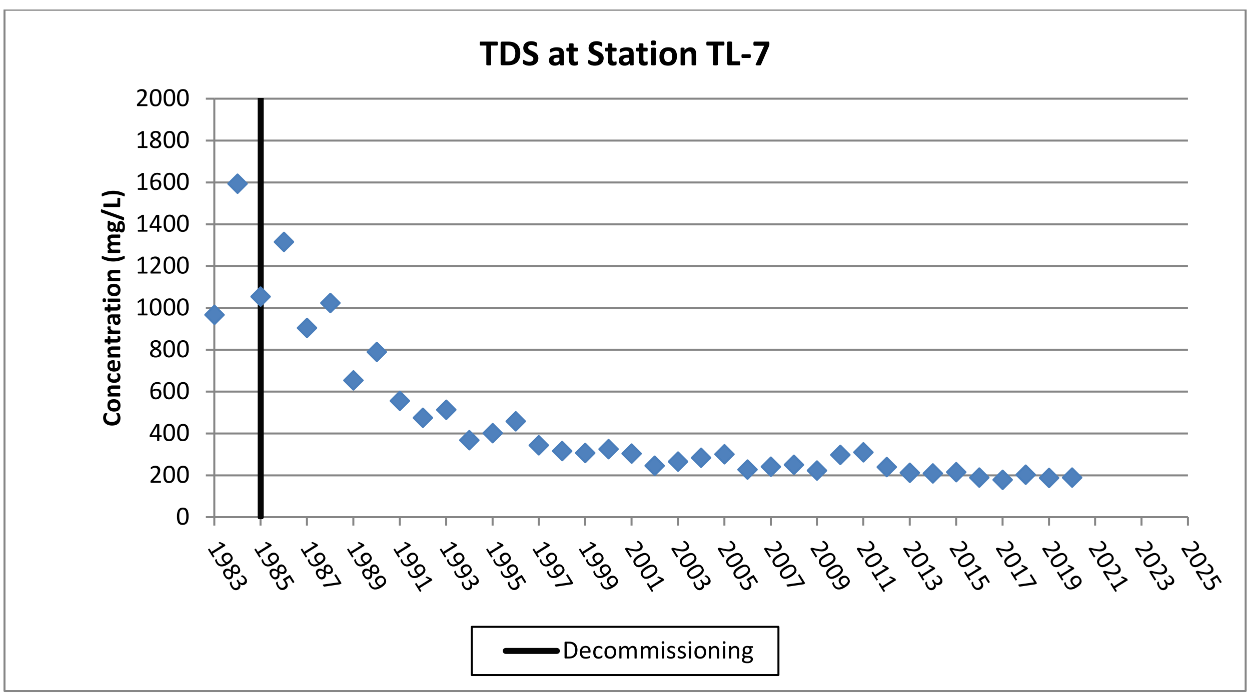
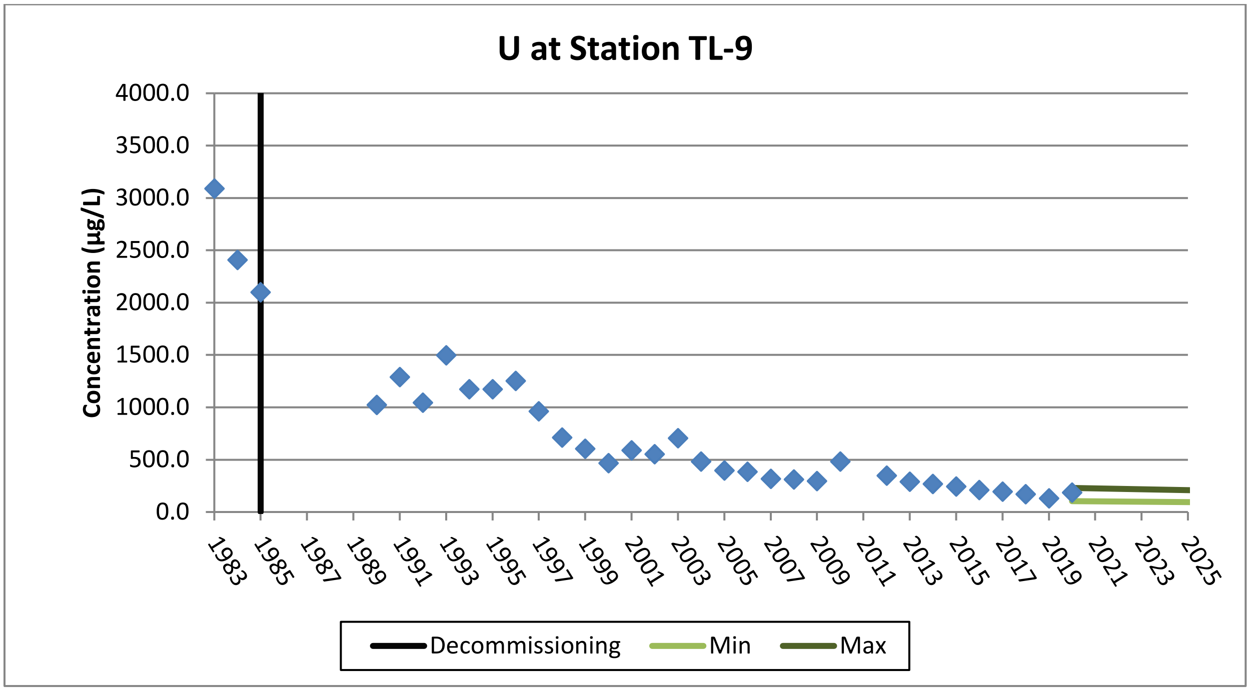
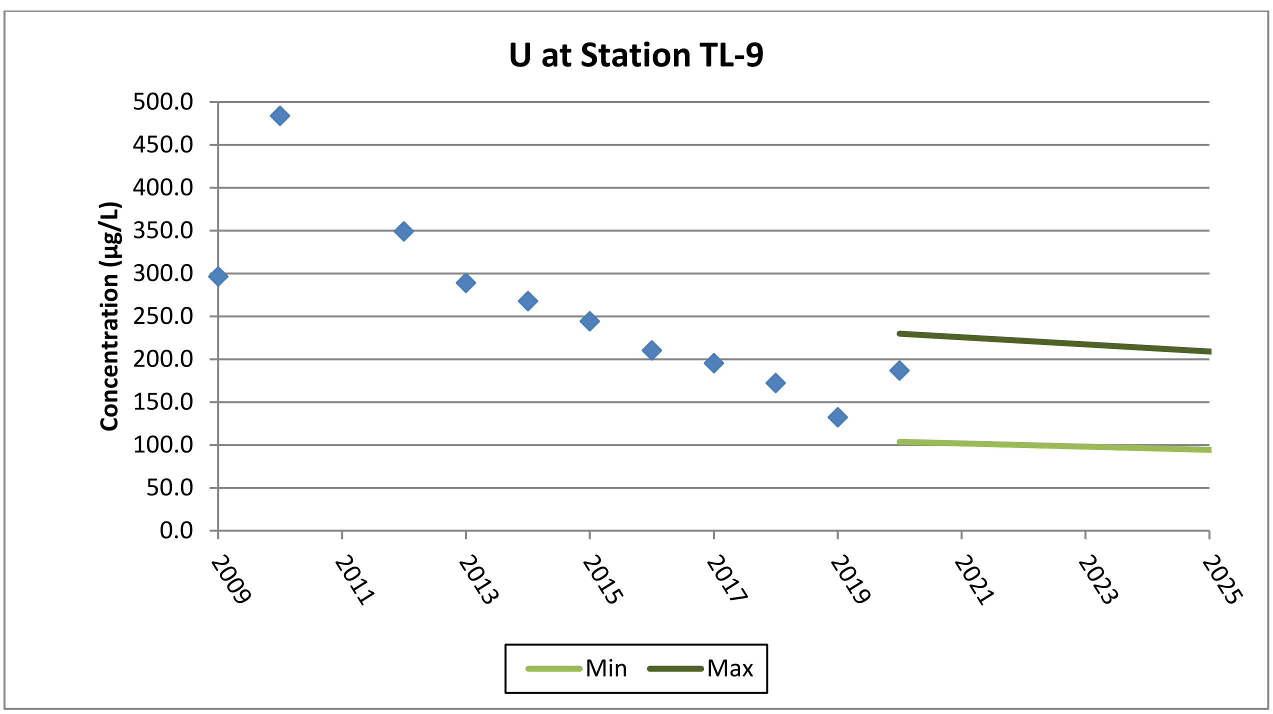


Figure 4.2.2-27 TL-9 Fulton Creek Downstream of Greer Lake



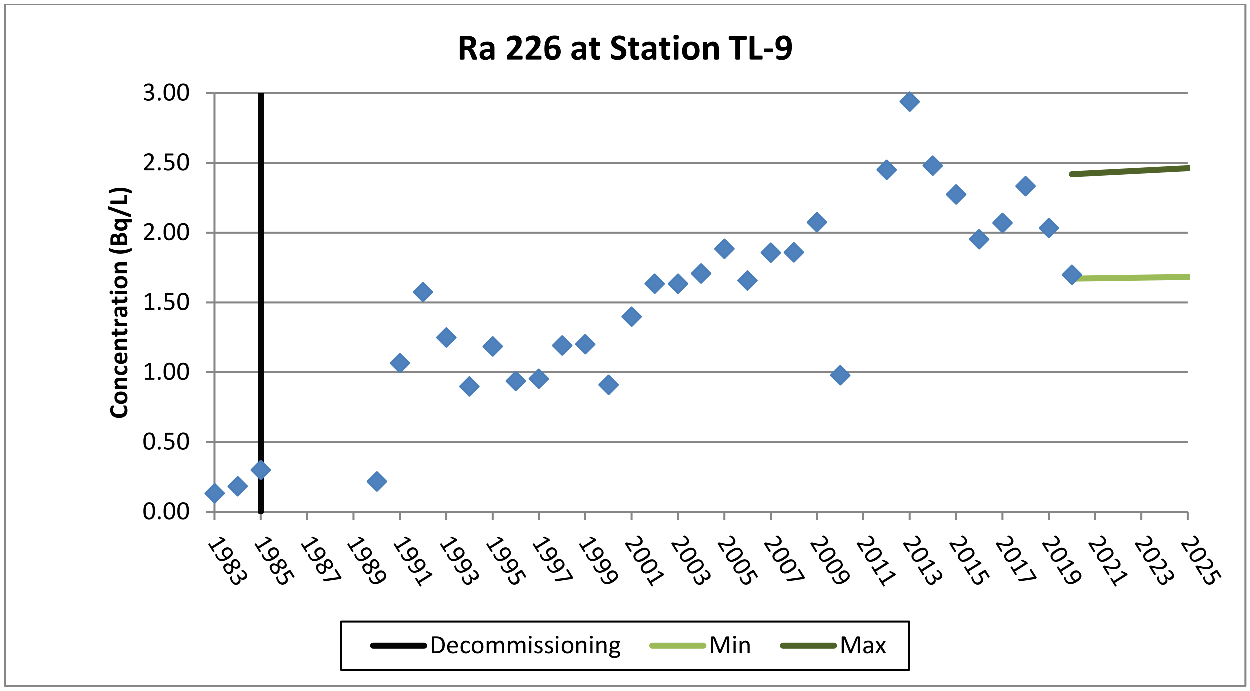
**There was no water flow at TL-9 in 2011.*

Figure 4.2.2-28 TL-9 Fulton Creek Downstream of Greer Lake – Detailed Trend



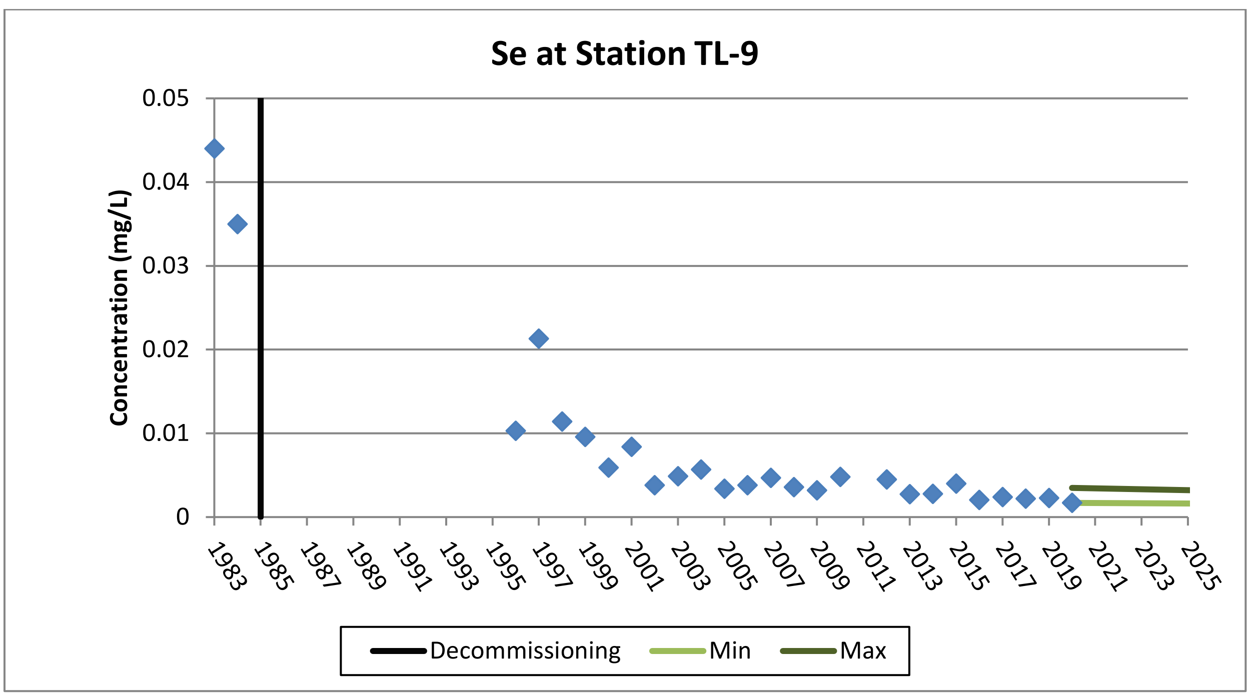
**There was no water flow at TL-9 in 2011.*

Figure 4.2.2-29 TL-9 Fulton Creek Downstream of Greer Lake



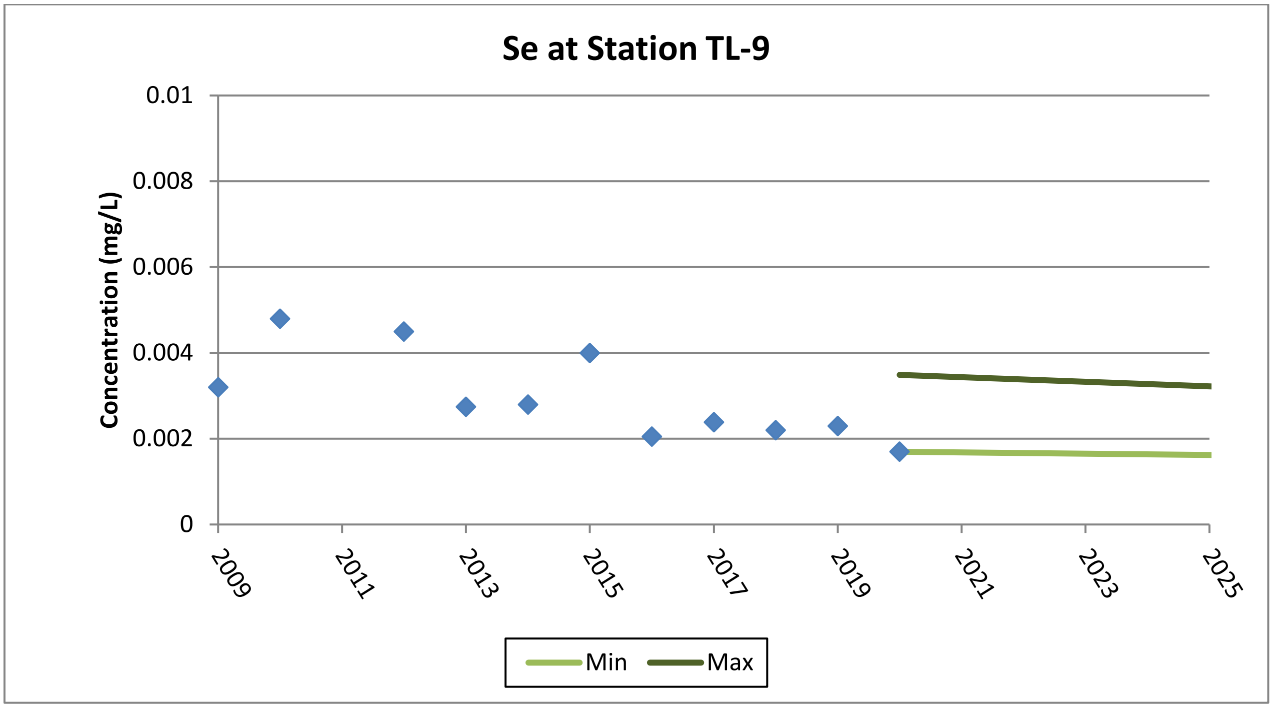
**There was no water flow at TL-9 in 2011.*

Figure 4.2.2-30 TL-9 - Fulton Creek Downstream of Greer Lake



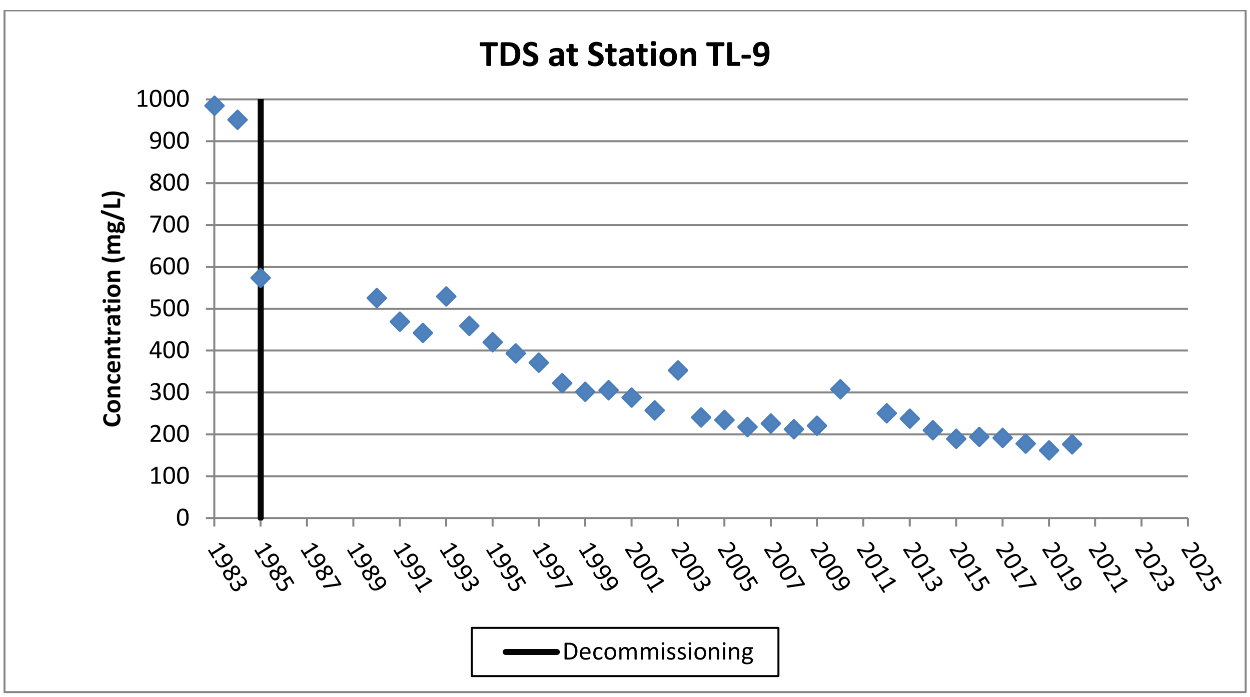
**There was no water flow at TL-9 in 2011.*

Figure 4.2.2-31 TL-9 - Fulton Creek Downstream of Greer Lake – Detailed Trend



**There was no water flow at TL-9 in 2011.*

Figure 4.2.2-32 TL-9 - Fulton Creek Downstream of Greer Lake



**There was no water flow at TL-9 in 2011.*

Figure 4.2.3-1 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

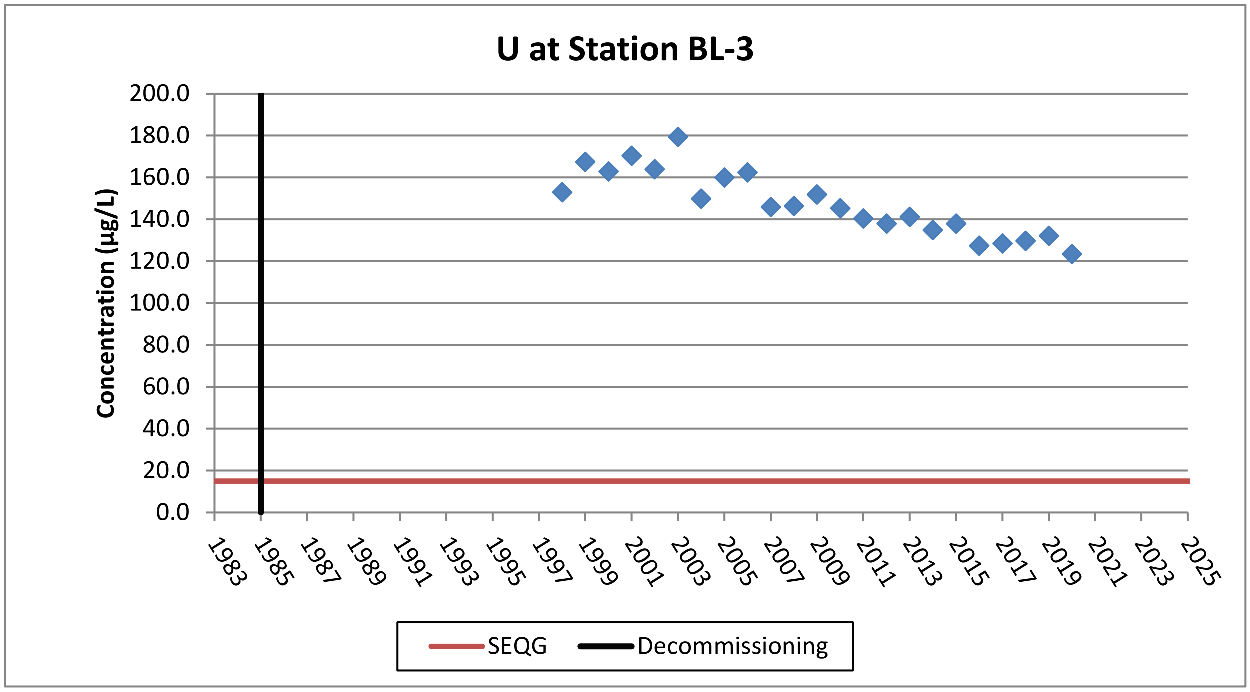


Figure 4.2.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

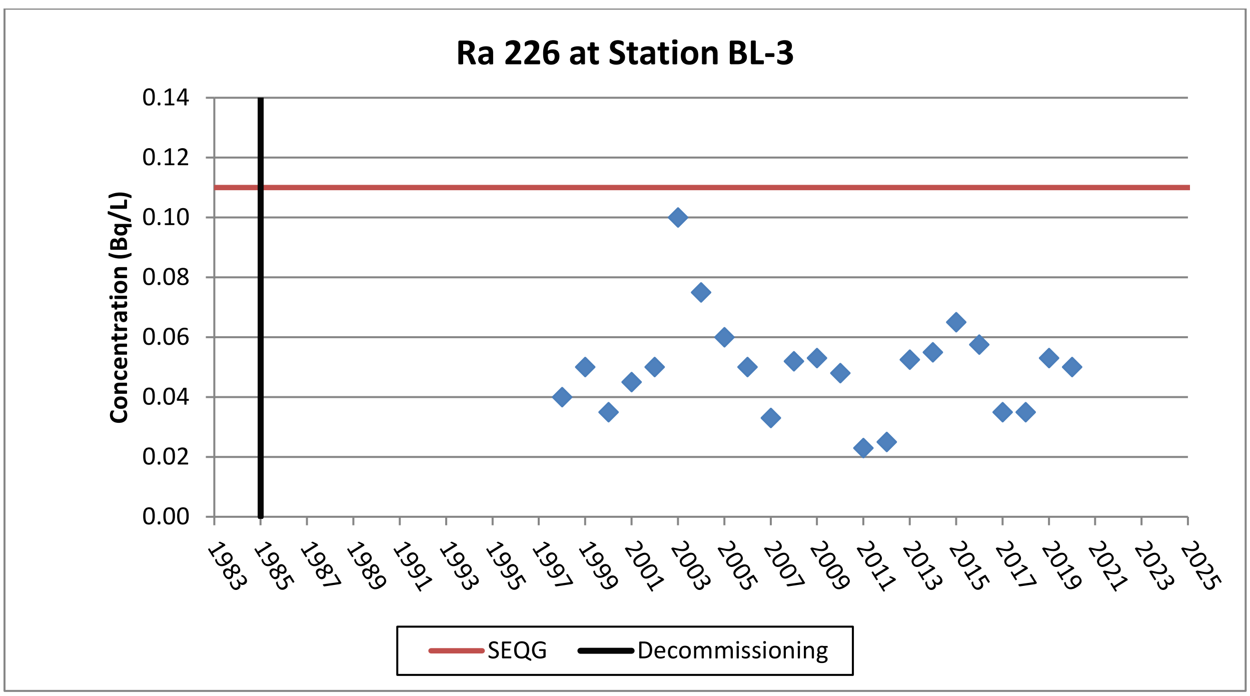
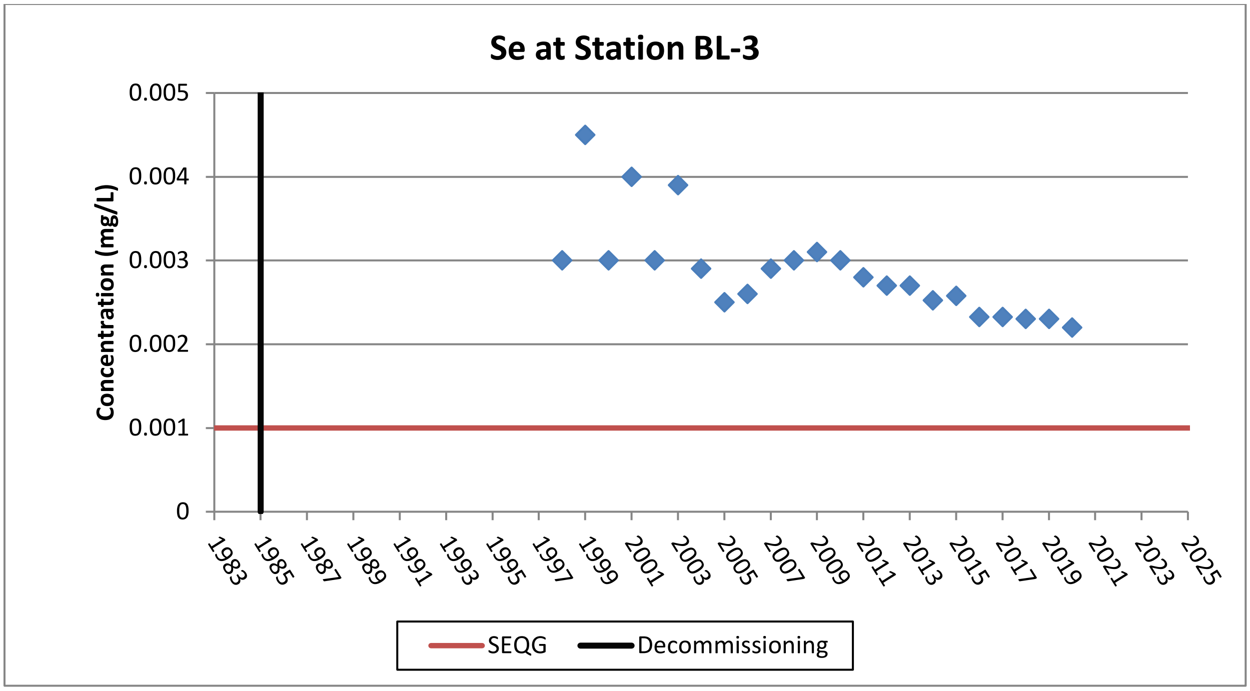


Figure 4.2.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



Note: Method detection limit changed from 0.001mg/L to 0.0001mg/L in 2003.

Figure 4.2.3-4 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

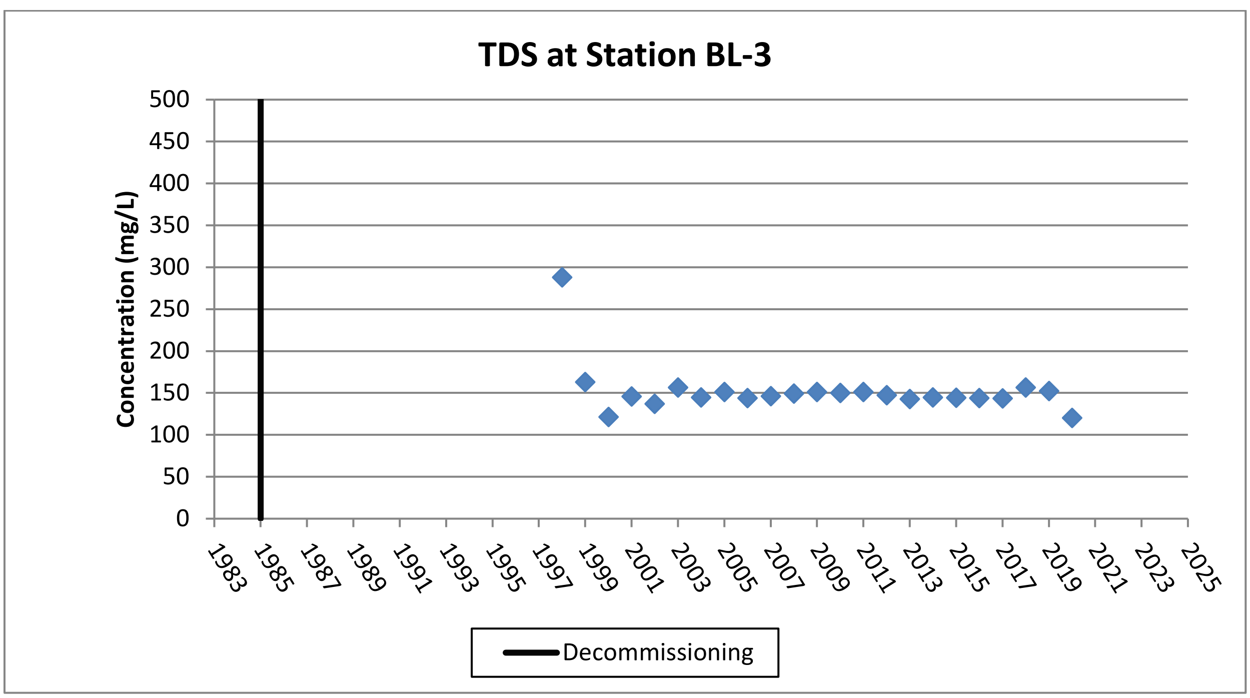


Figure 4.2.3-5 BL-4 Beaverlodge Lake Centre

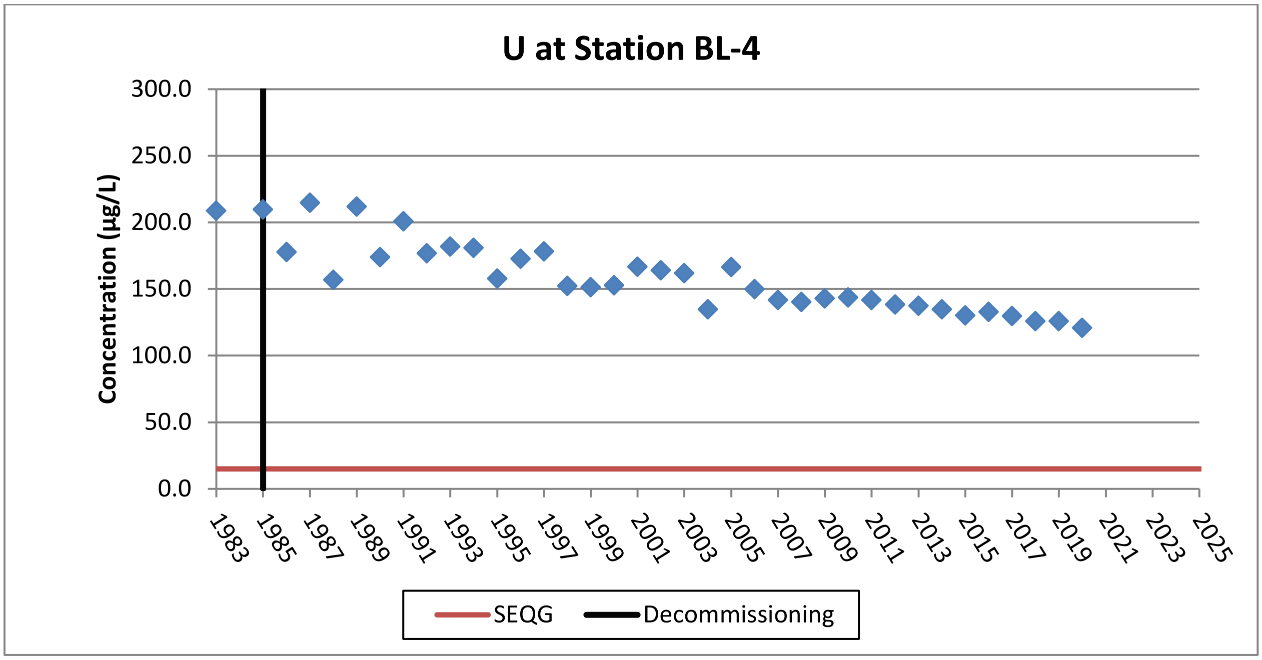


Figure 4.2.3-6 BL-4 Beaverlodge Lake Centre

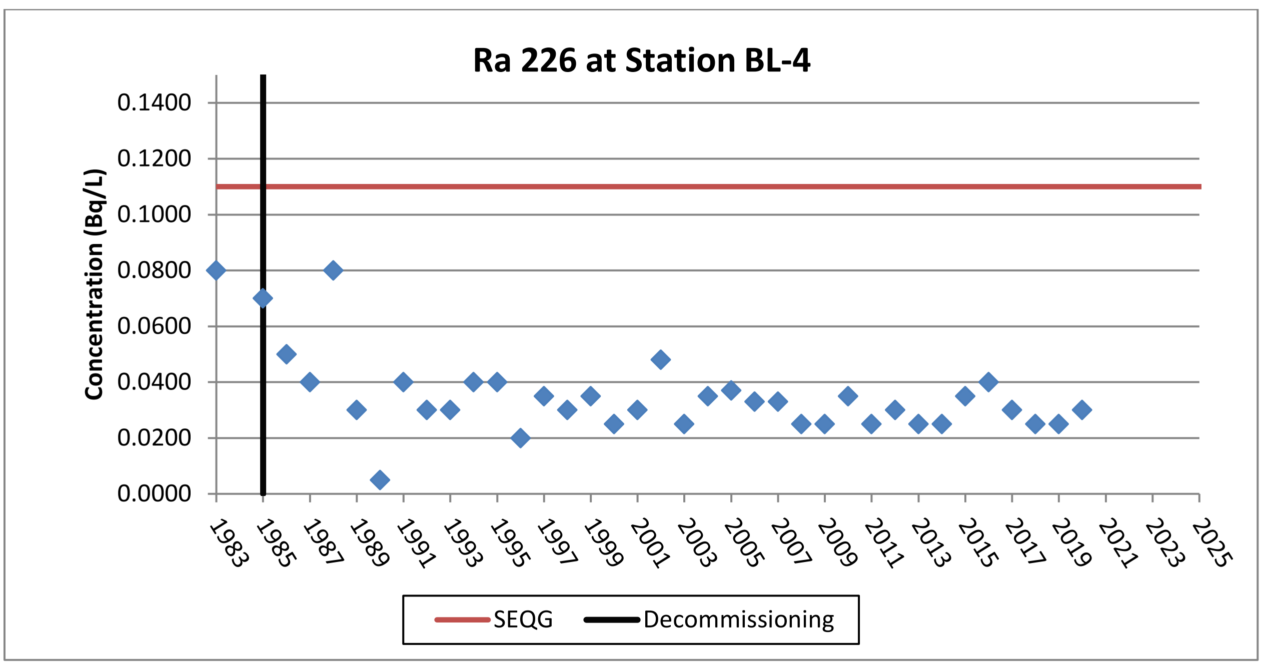
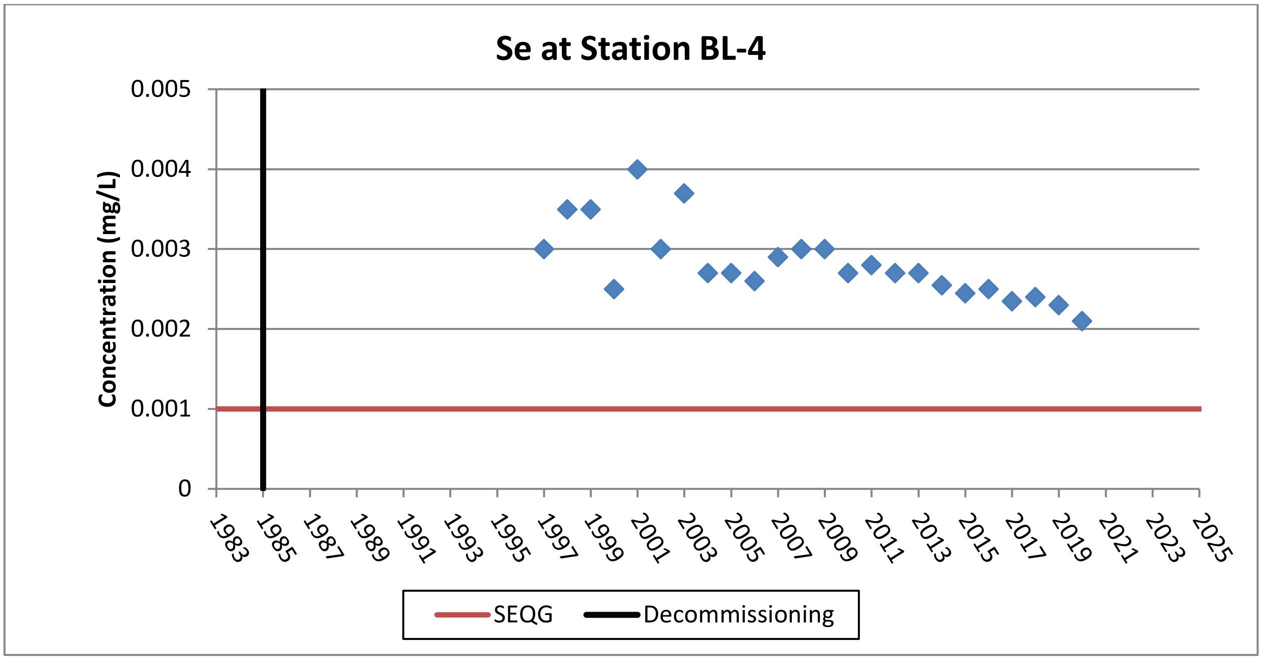


Figure 4.2.3-7 BL-4 Beaverlodge Lake Centre



Note: Method detection limit changed from 0.001mg/L to 0.0001mg/L in 2003.

Figure 4.2.3-8 BL-4 Beaverlodge Lake Centre

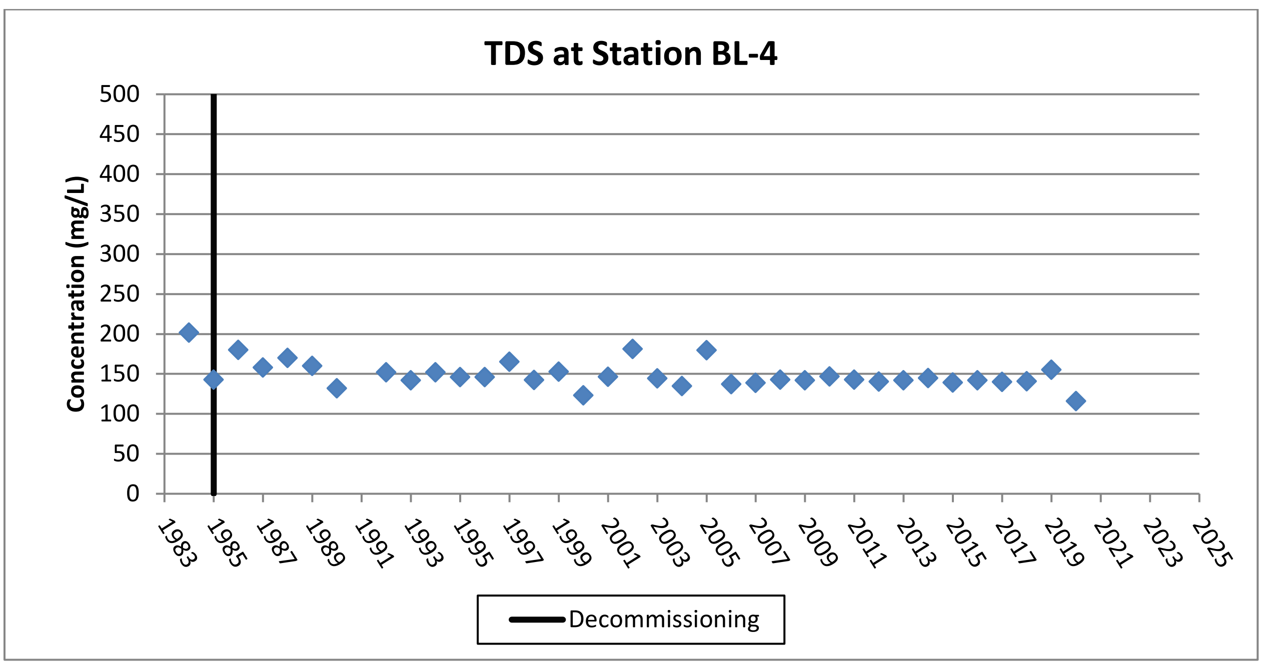
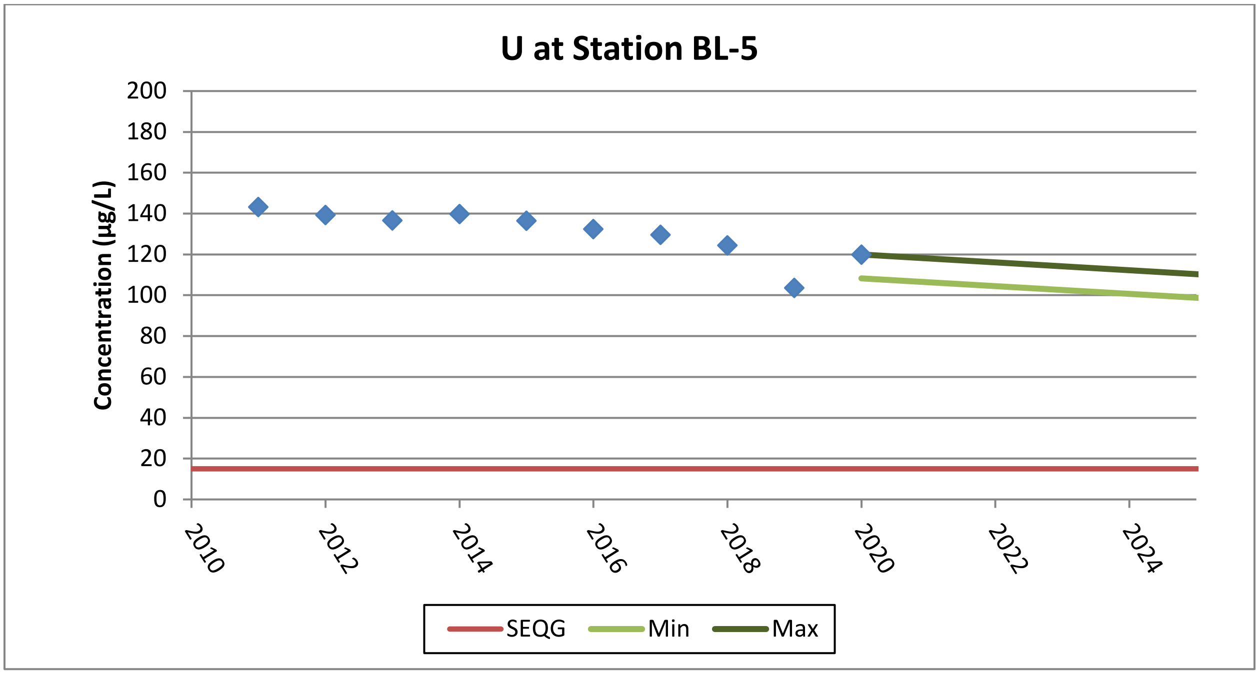
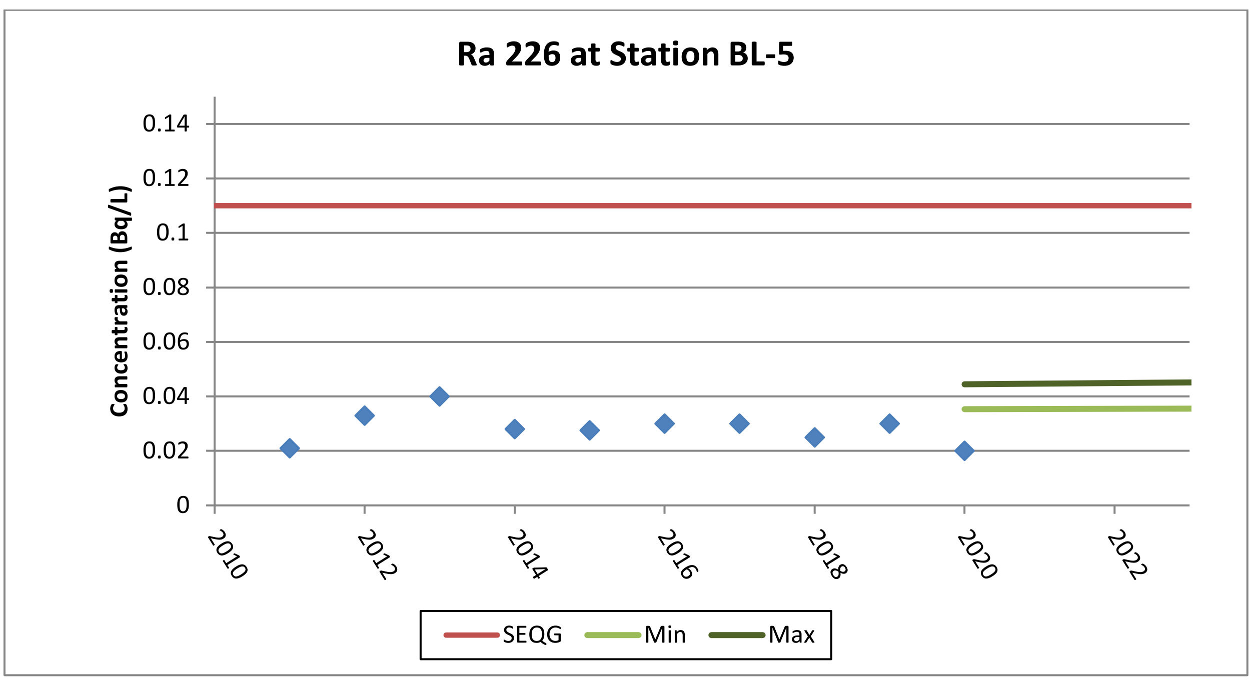


Figure 4.2.3-9 BL-5 Beaverlodge Lake Outlet



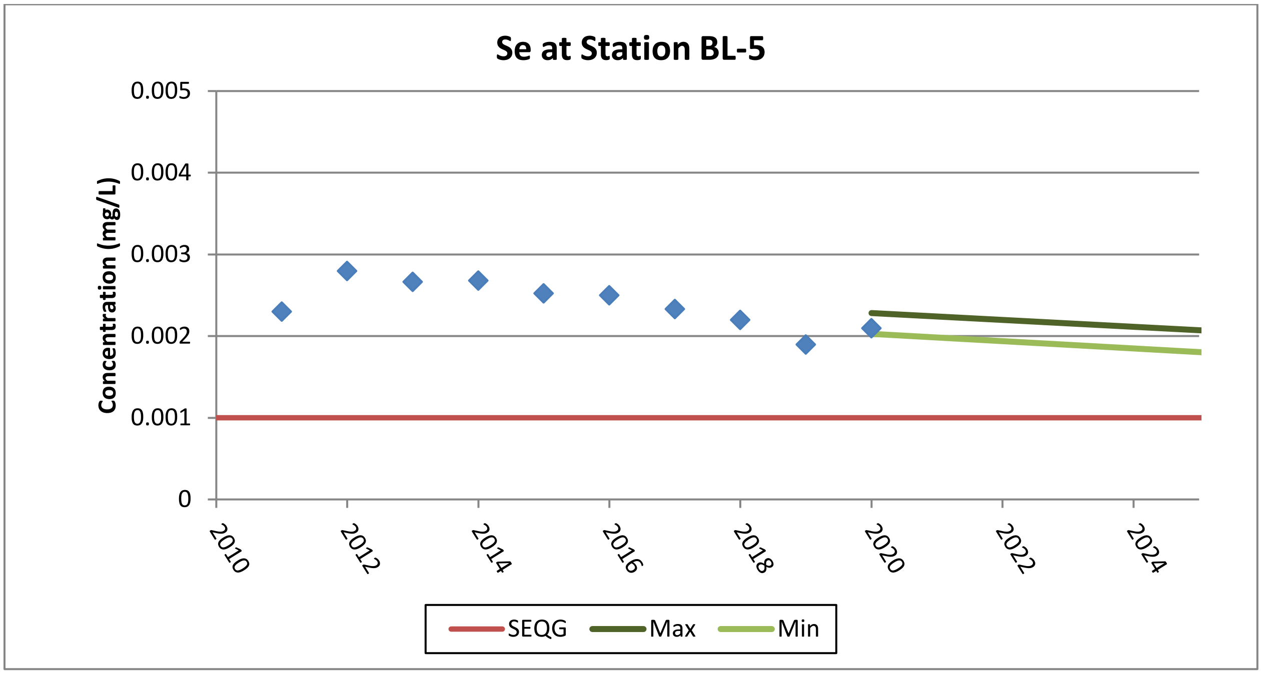
** Station implemented in water sampling program in 2011.*

Figure 4.2.3-10 BL-5 Beaverlodge Lake Outlet



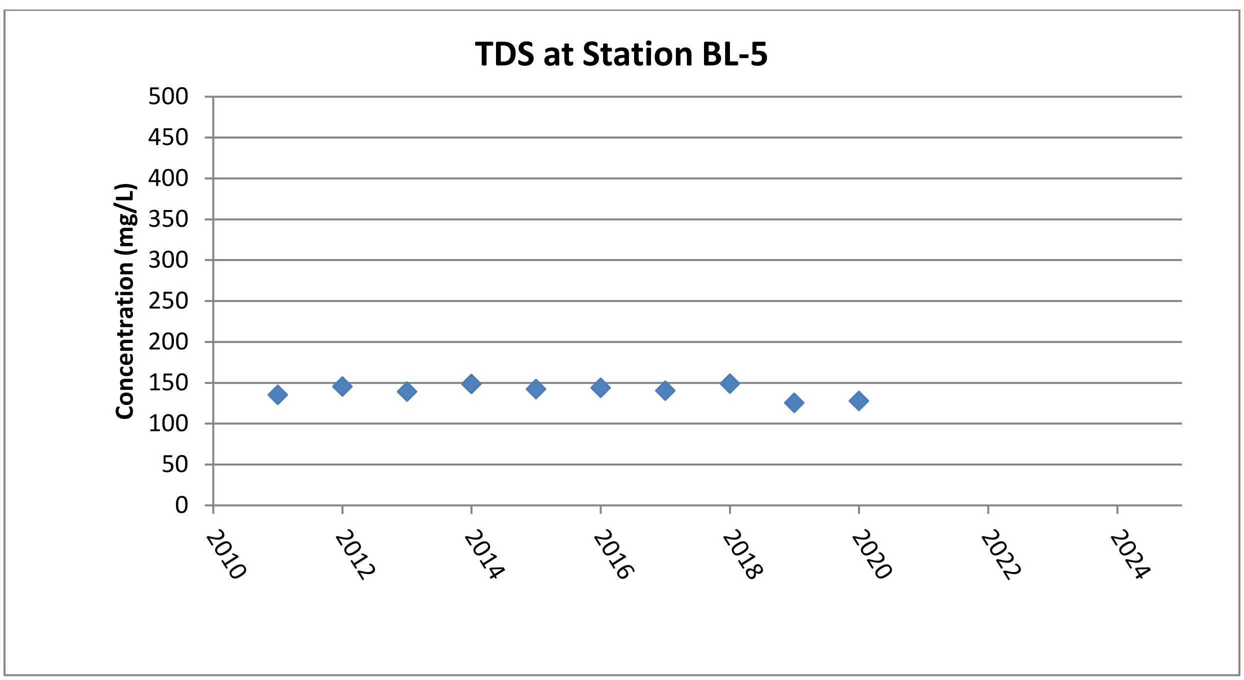
** Station implemented in water sampling program in 2011.*

Figure 4.2.3-11 BL-5 Beaverlodge Lake Outlet



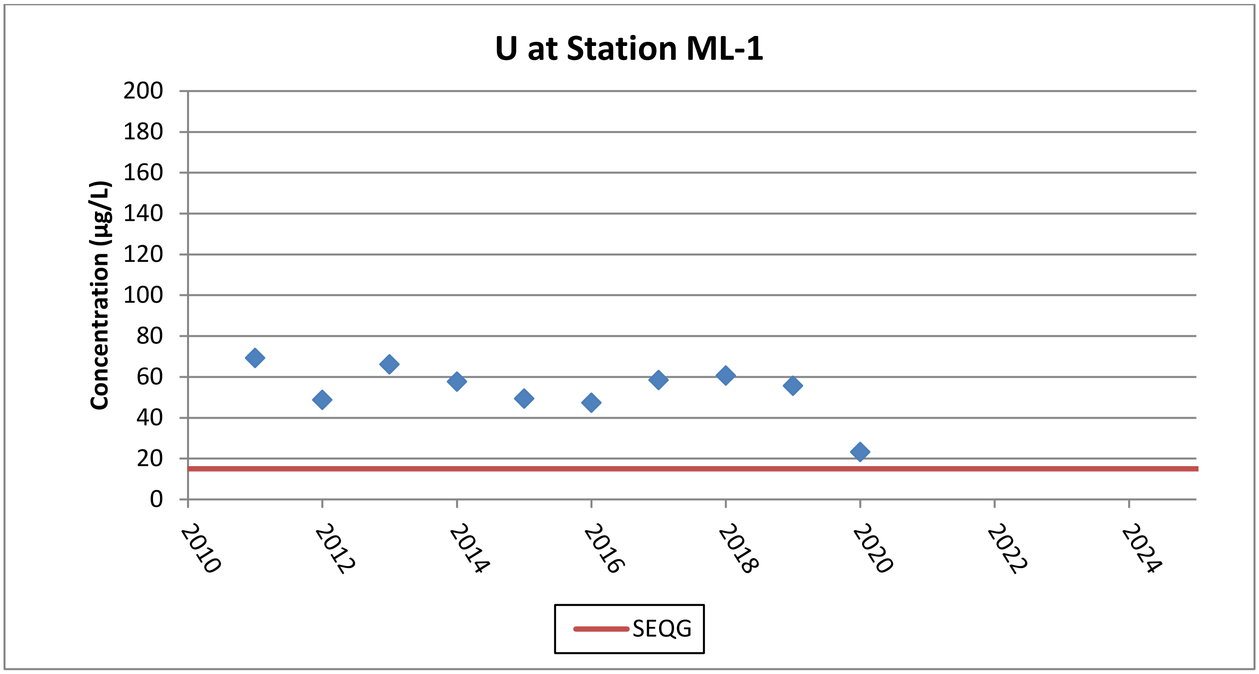
** Station implemented in water sampling program in 2011.*

Figure 4.2.3-12 BL-5 Beaverlodge Lake Outlet



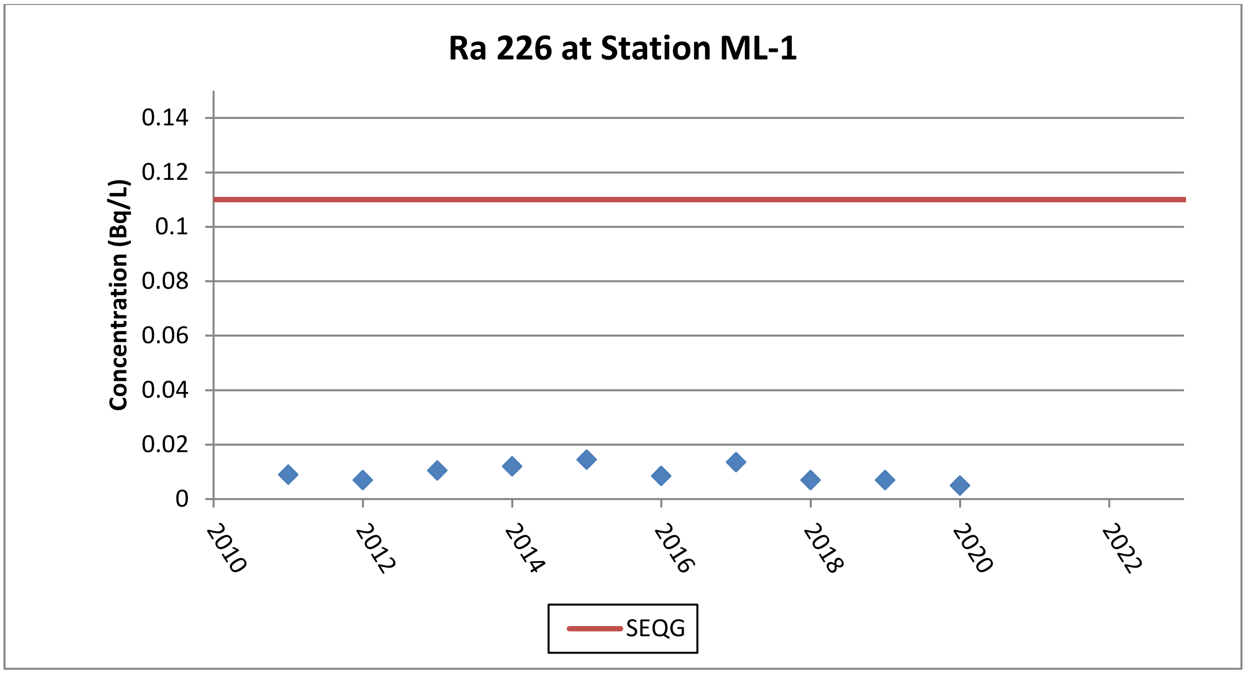
** Station implemented in water sampling program in 2011.*

Figure 4.2.3-13 ML-1 Outlet of Martin Lake



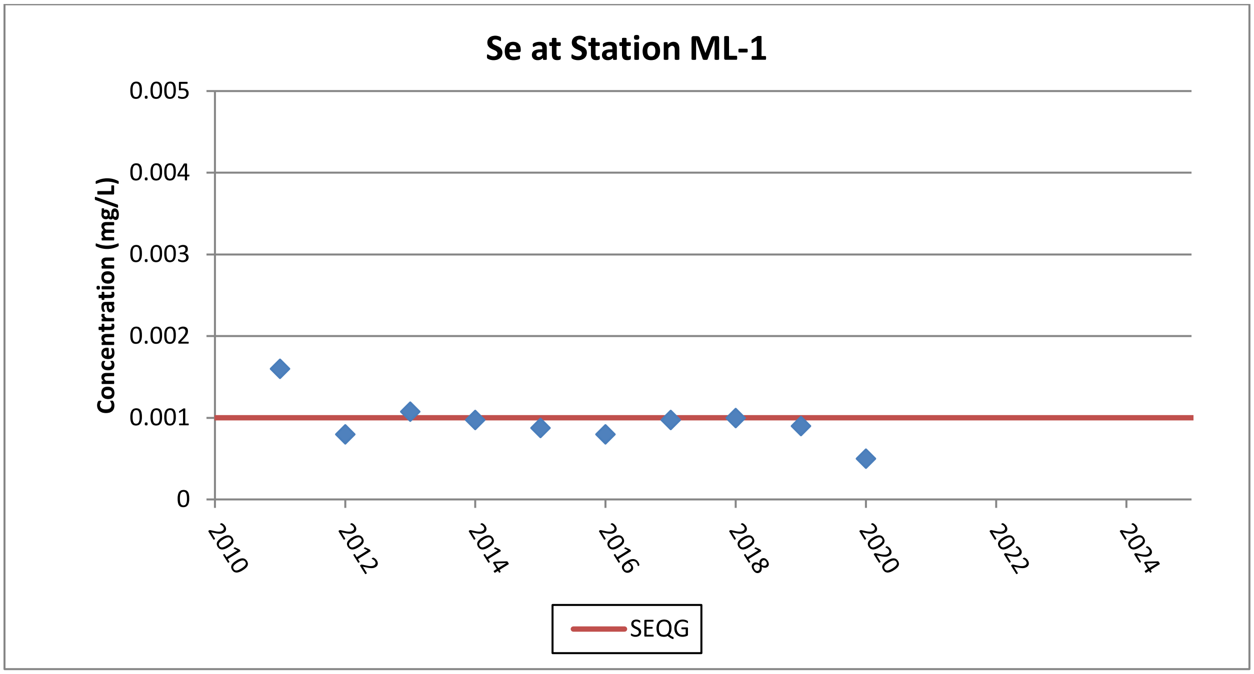
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-14 ML-1 Outlet of Martin Lake



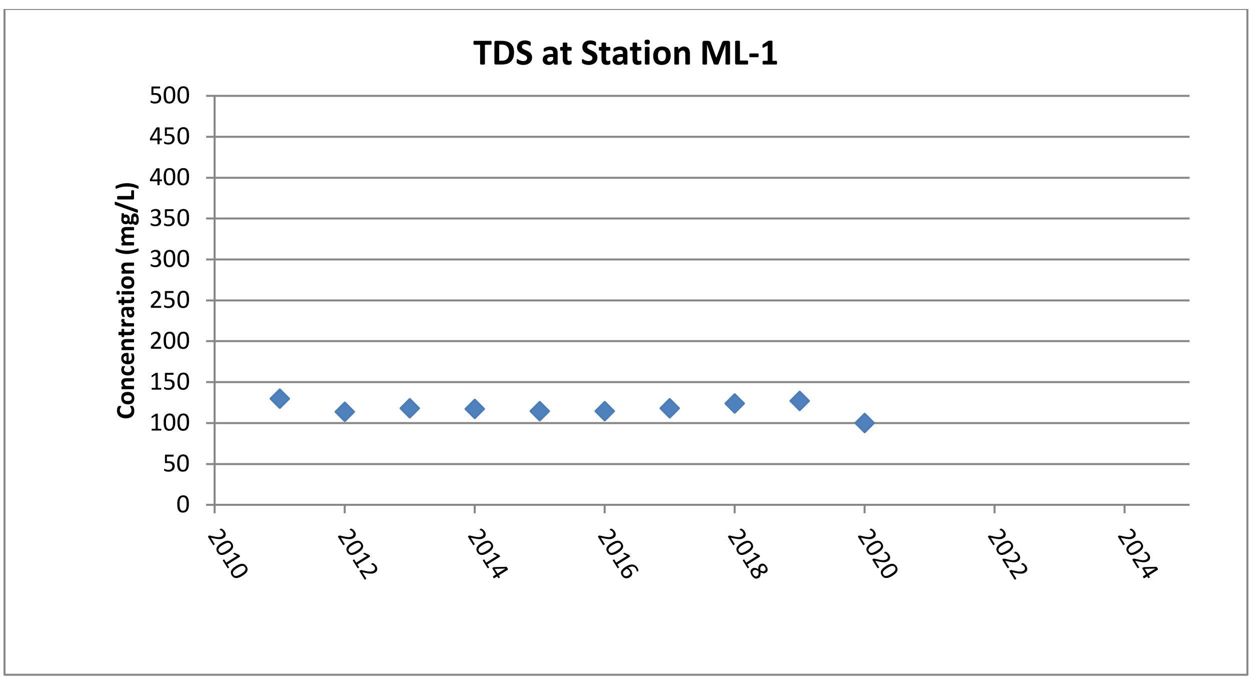
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-15 ML-1 Outlet of Martin Lake



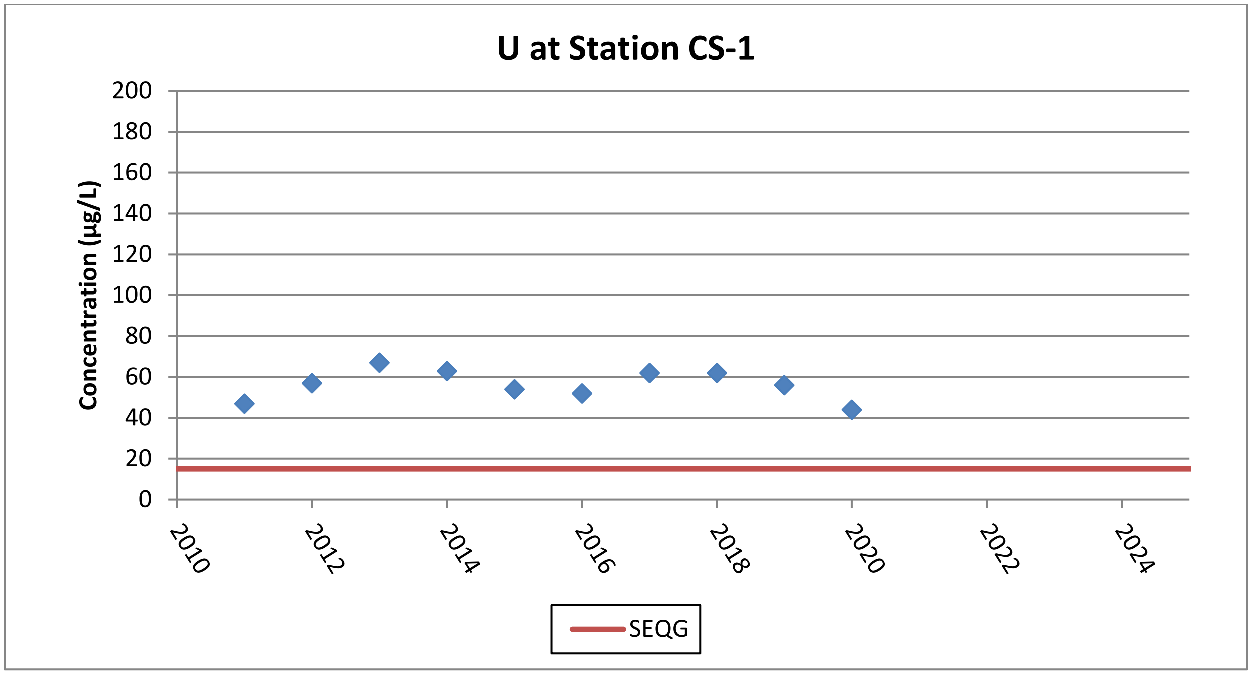
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-16 ML-1 Outlet of Martin Lake



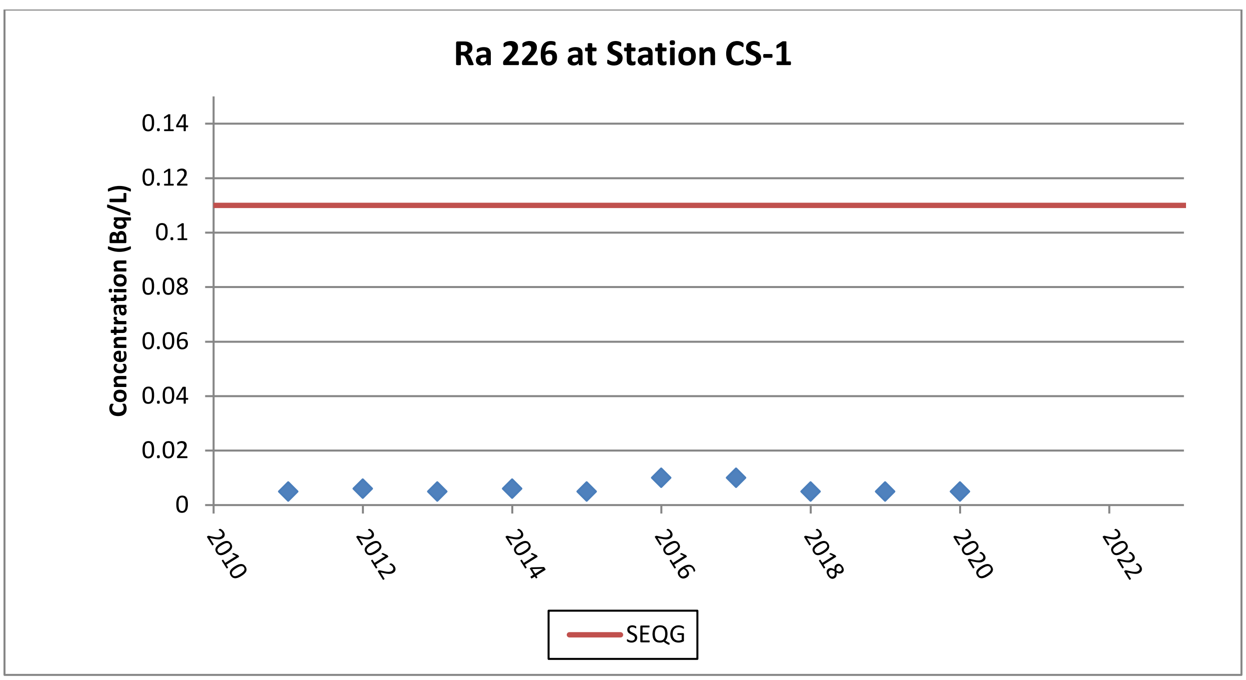
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-17 CS-1 Crackingstone River at Bridge



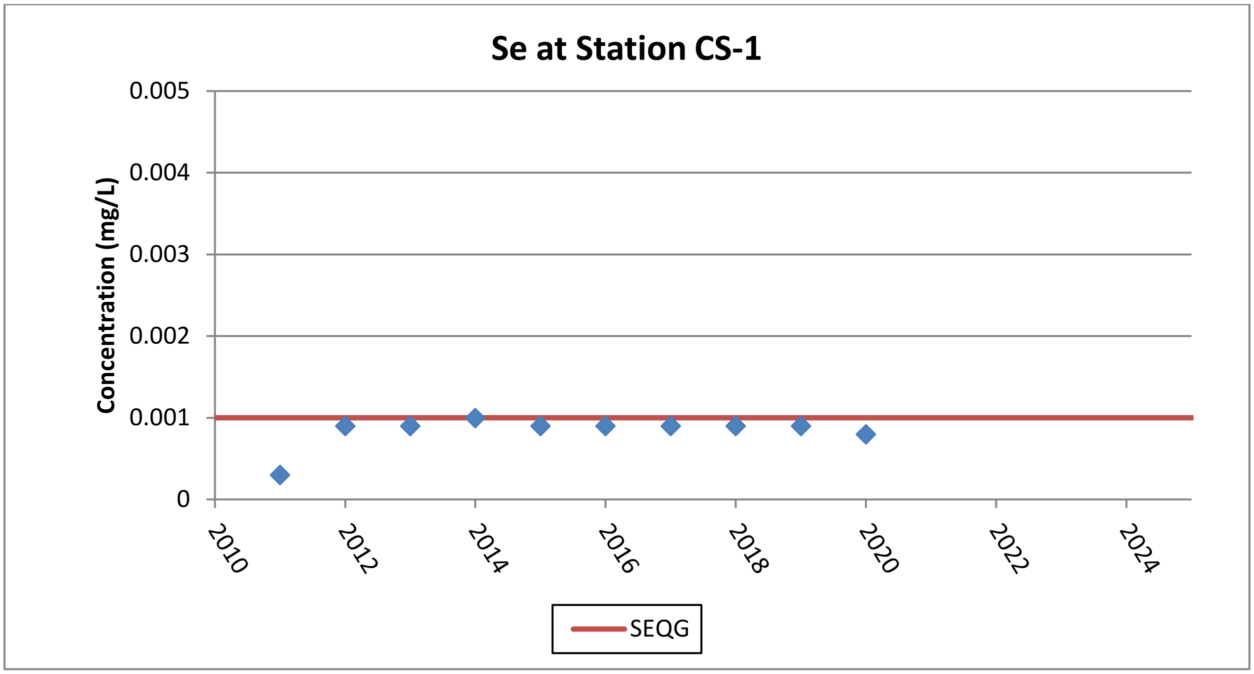
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-18 CS-1 Crackingstone River at Bridge



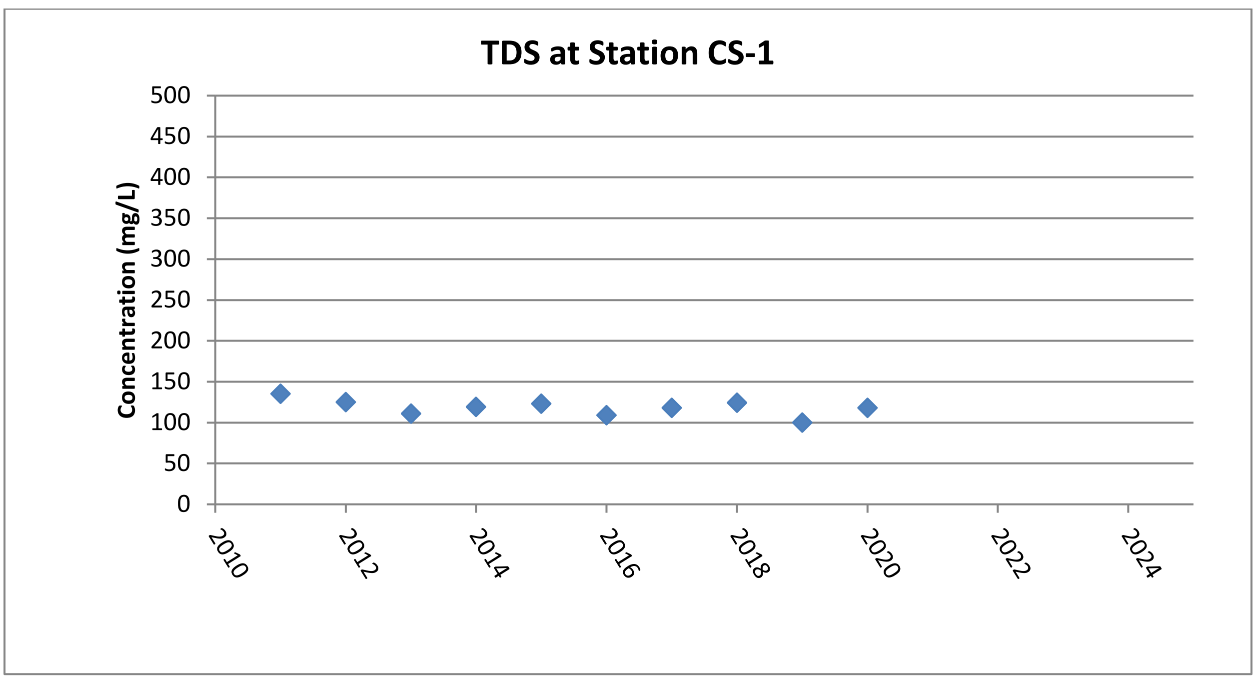
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-19 CS-1 Crackingstone River at Bridge



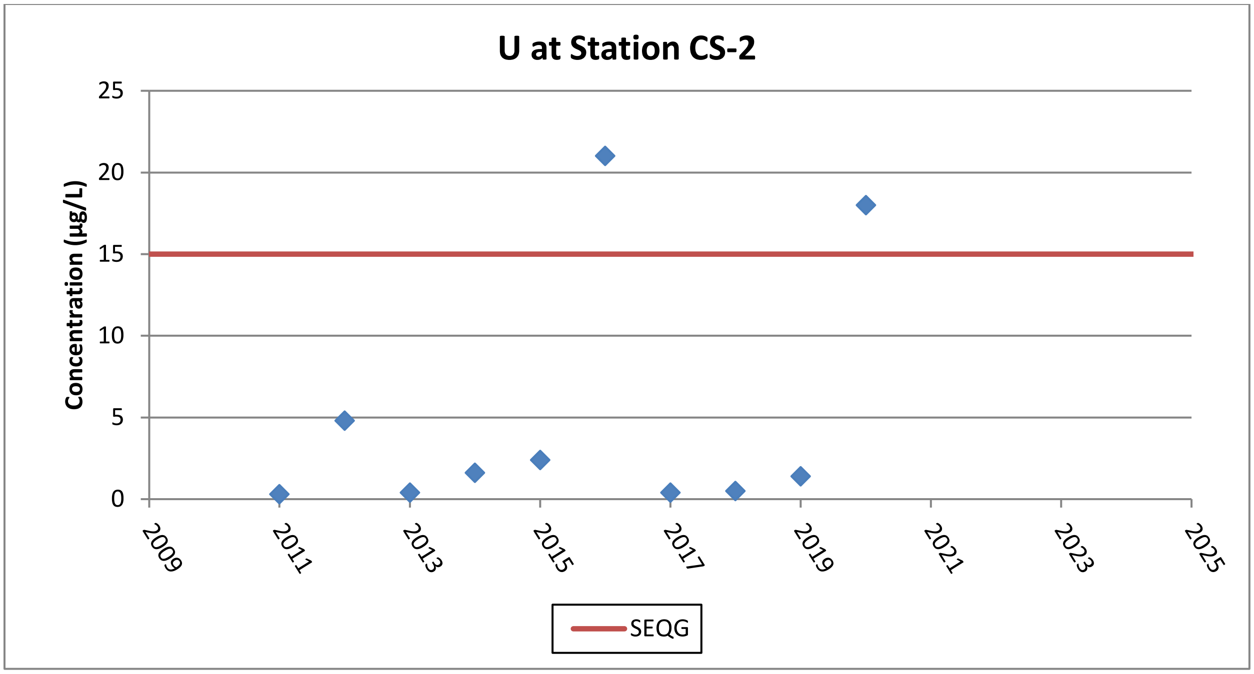
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-20 CS-1 Crackingstone River at Bridge



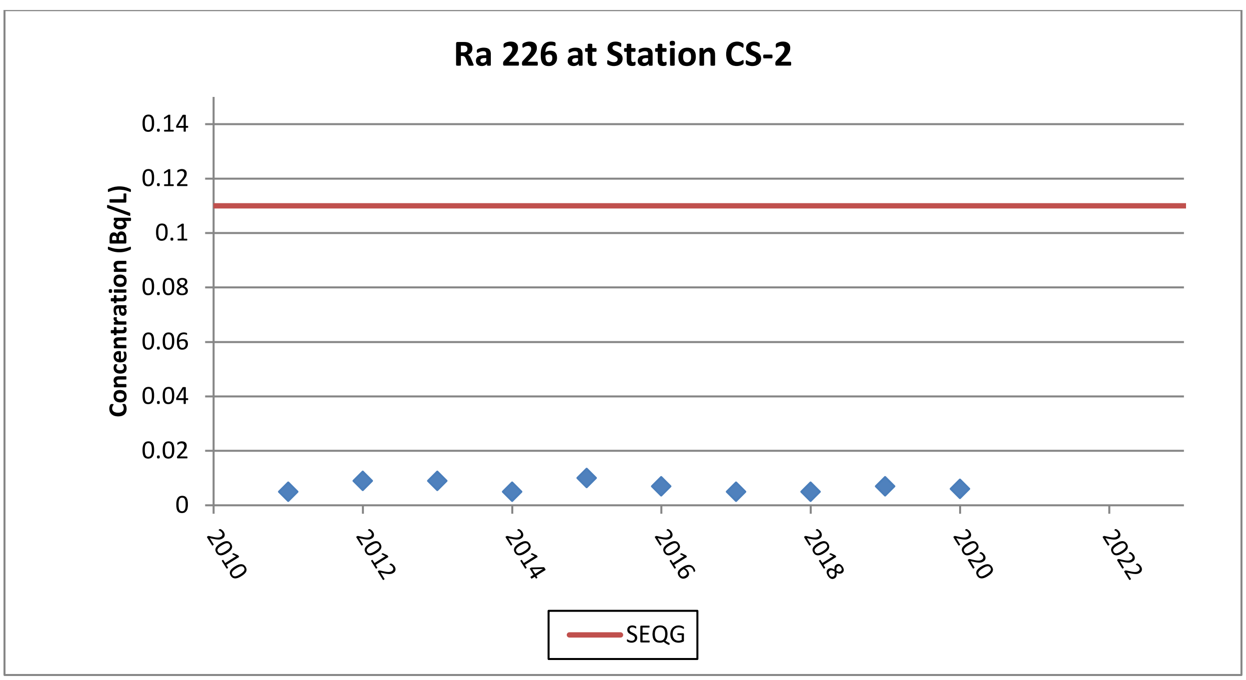
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-21 CS-2 Crackingstone Bay



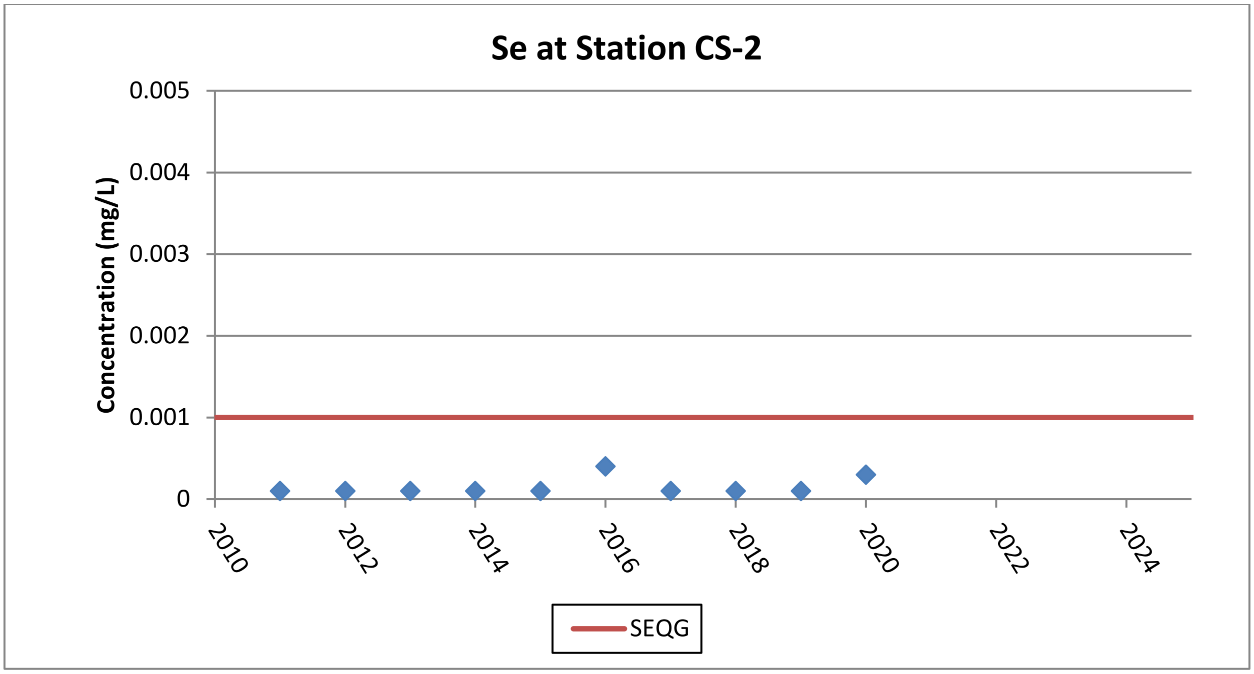
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-22 CS-2 Crackingstone Bay



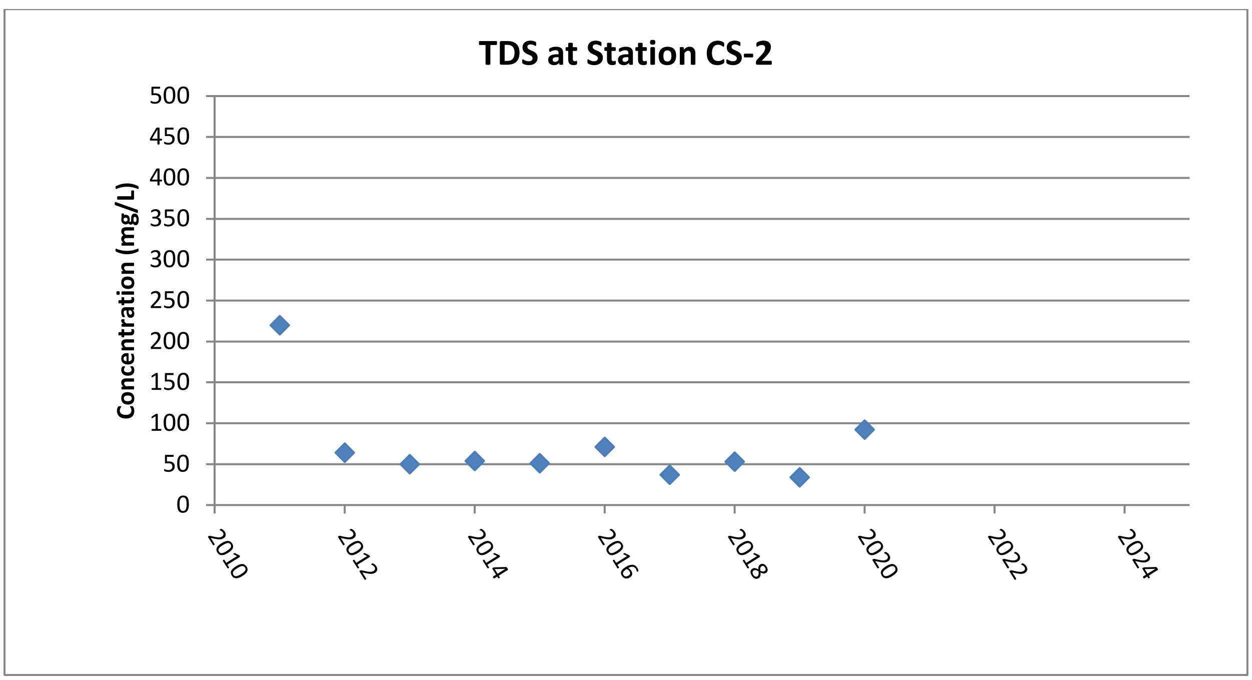
**Station implemented in water sampling program in 2011.*

Figure 4.2.3-23 CS-2 Crackingstone Bay



**Station implemented in water sampling program in 2011.*

Figure 4.2.3-24 CS-2 Crackingstone Bay

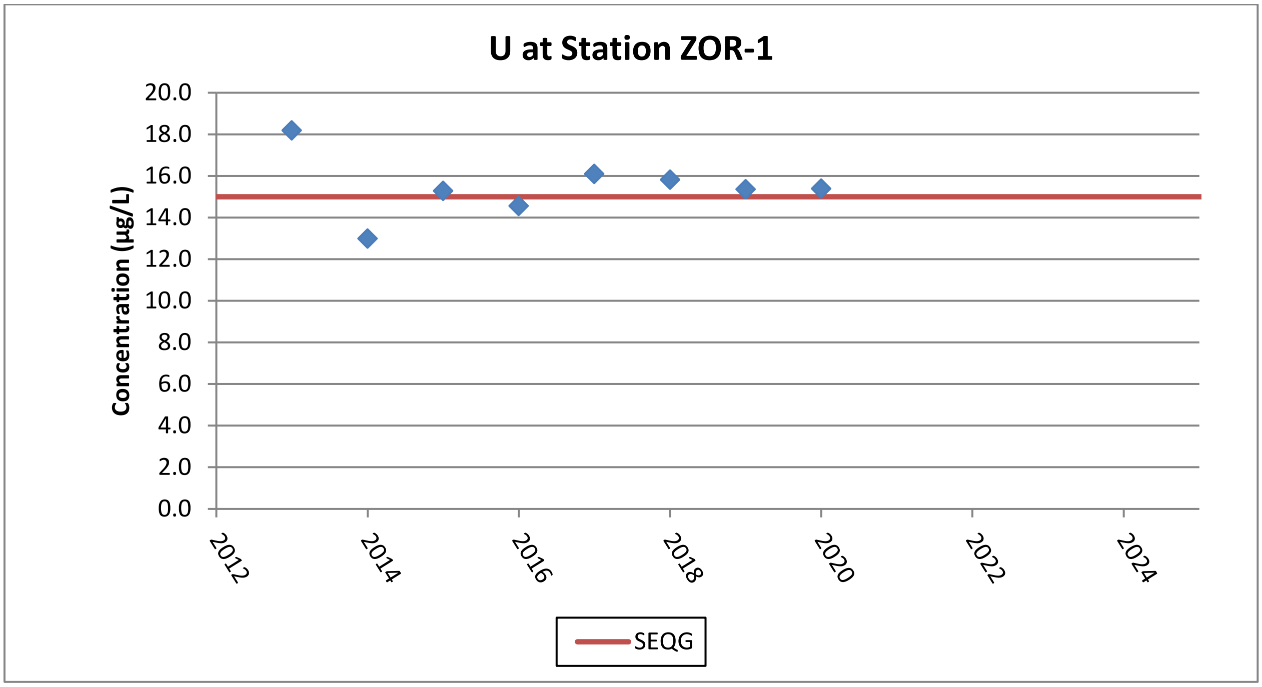


**Station implemented in water sampling program in 2011.*

Figure 4.3

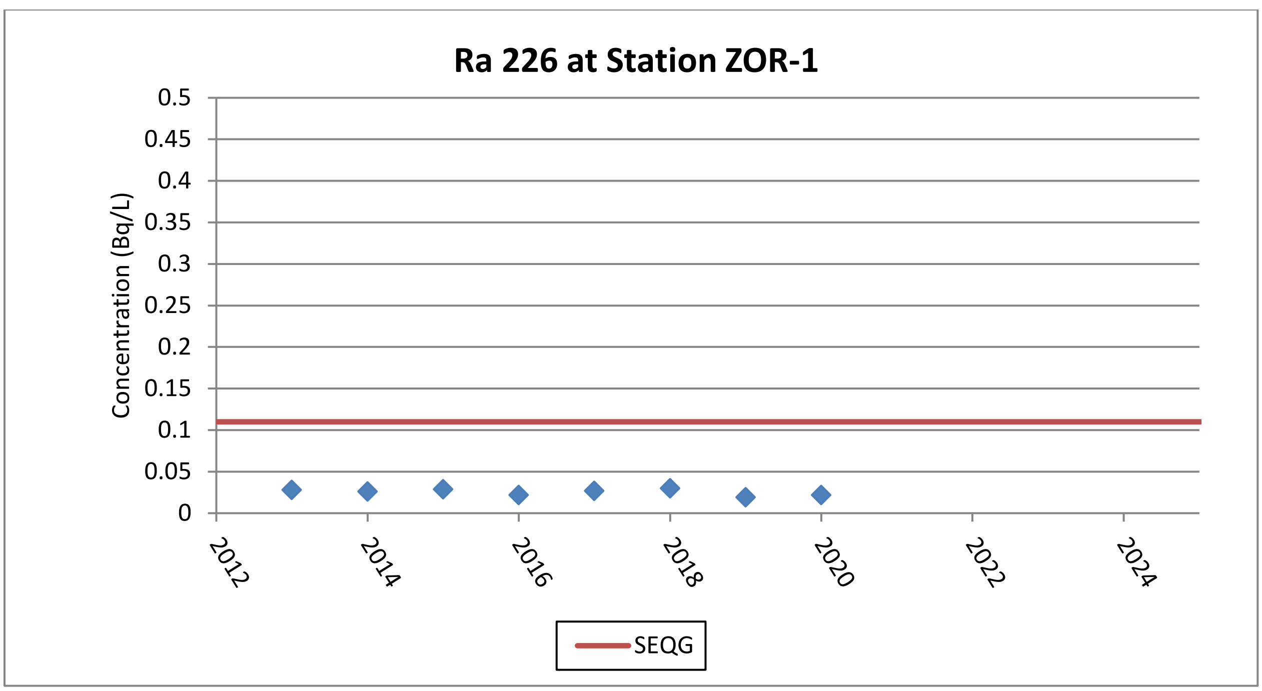
ZOR-01 and ZOR-02 sampling locations

Figure 4.3-1 ZOR-01 Outlet of Zora Lake



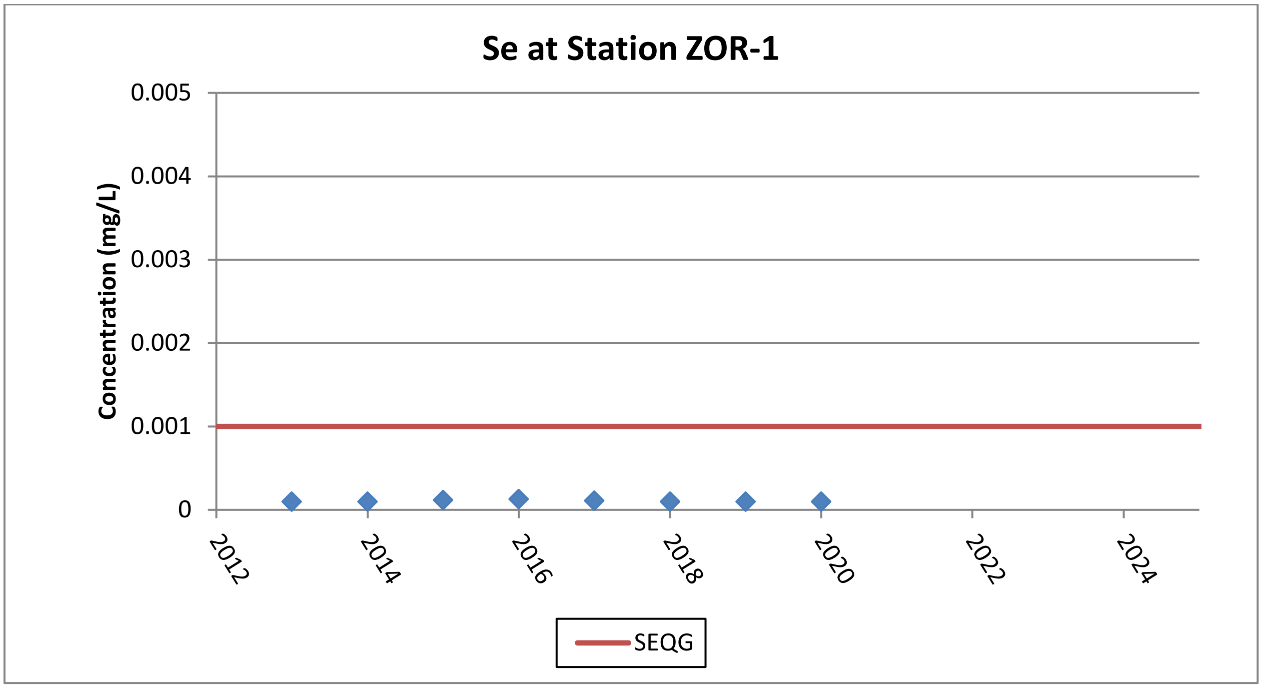
**Sampling initiated in 2013.*

Figure 4.3-2 ZOR-01 Outlet of Zora Lake



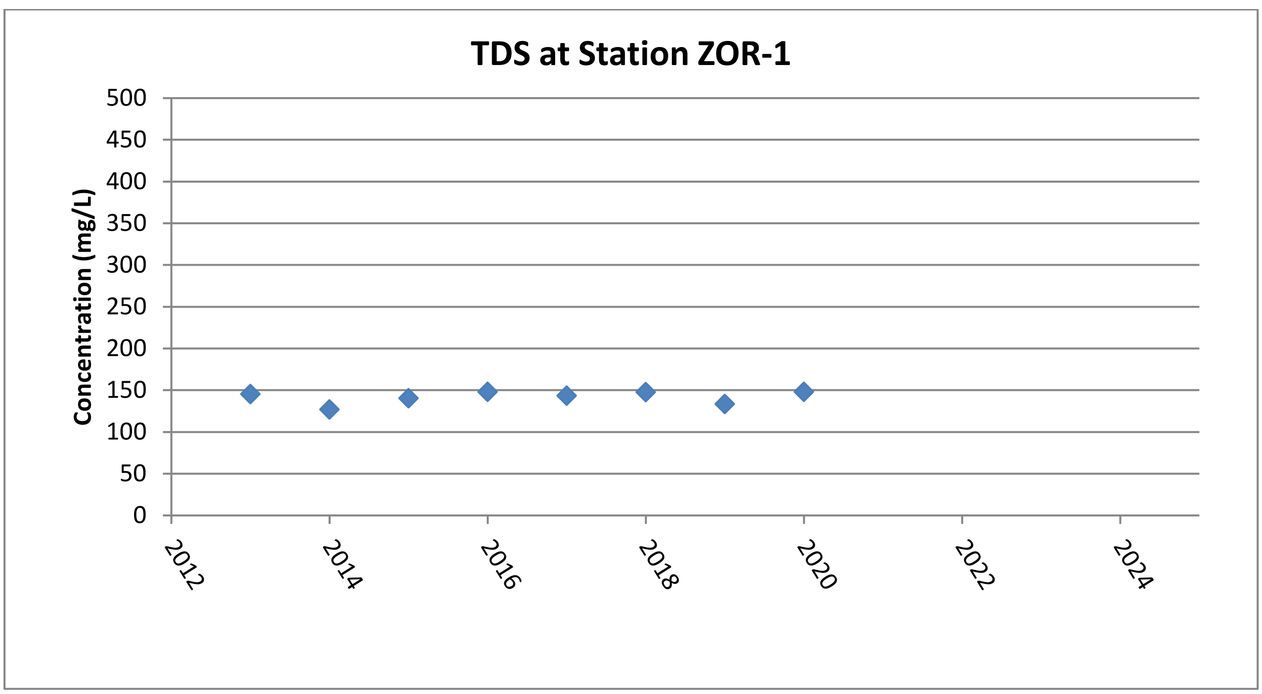
**Sampling initiated in 2013.*

Figure 4.3-3 ZOR-01 Outlet of Zora Lake



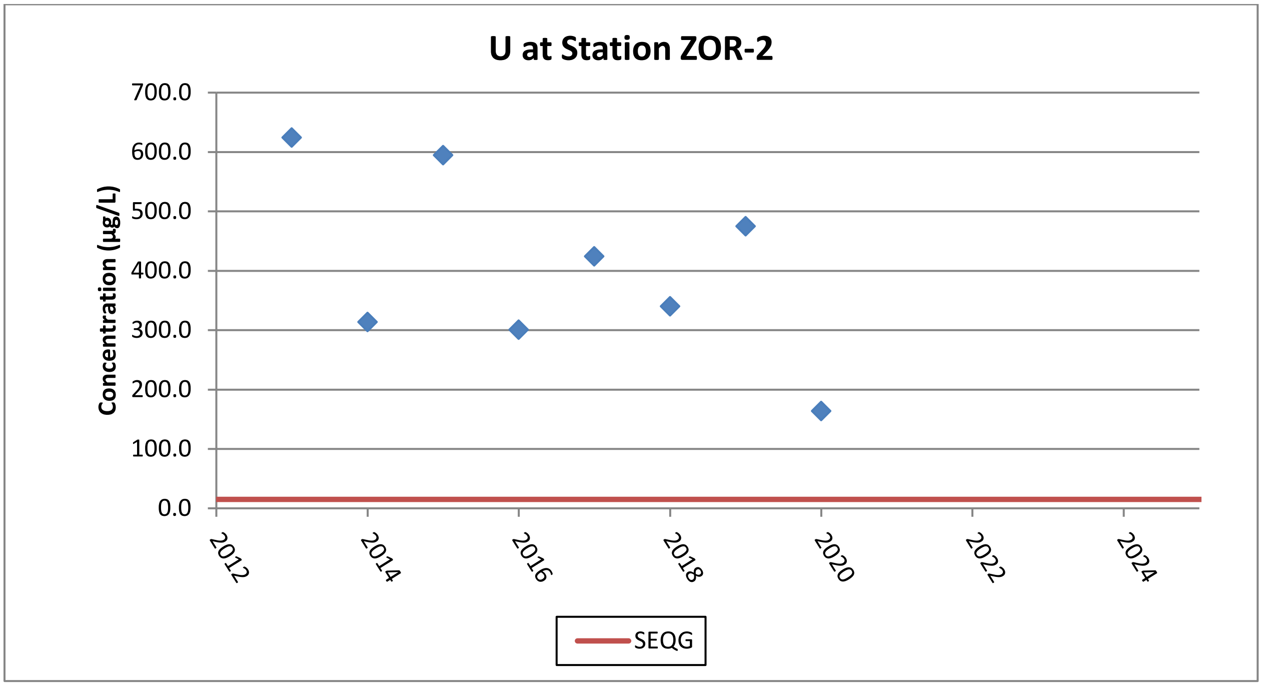
**Sampling initiated in 2013.*

Figure 4.3-4 ZOR-01 Outlet of Zora Lake



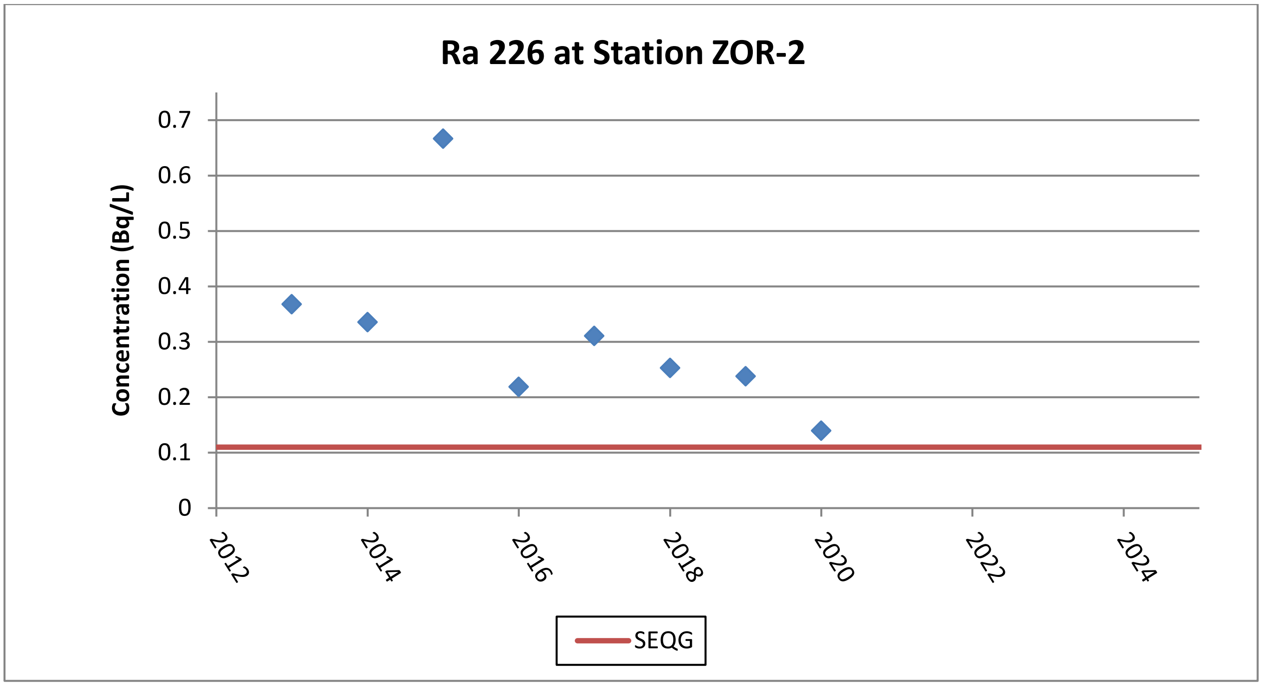
**Sampling initiated in 2013.*

Figure 4.3-5 ZOR-02 Outlet of the Zora Creek Flow Path



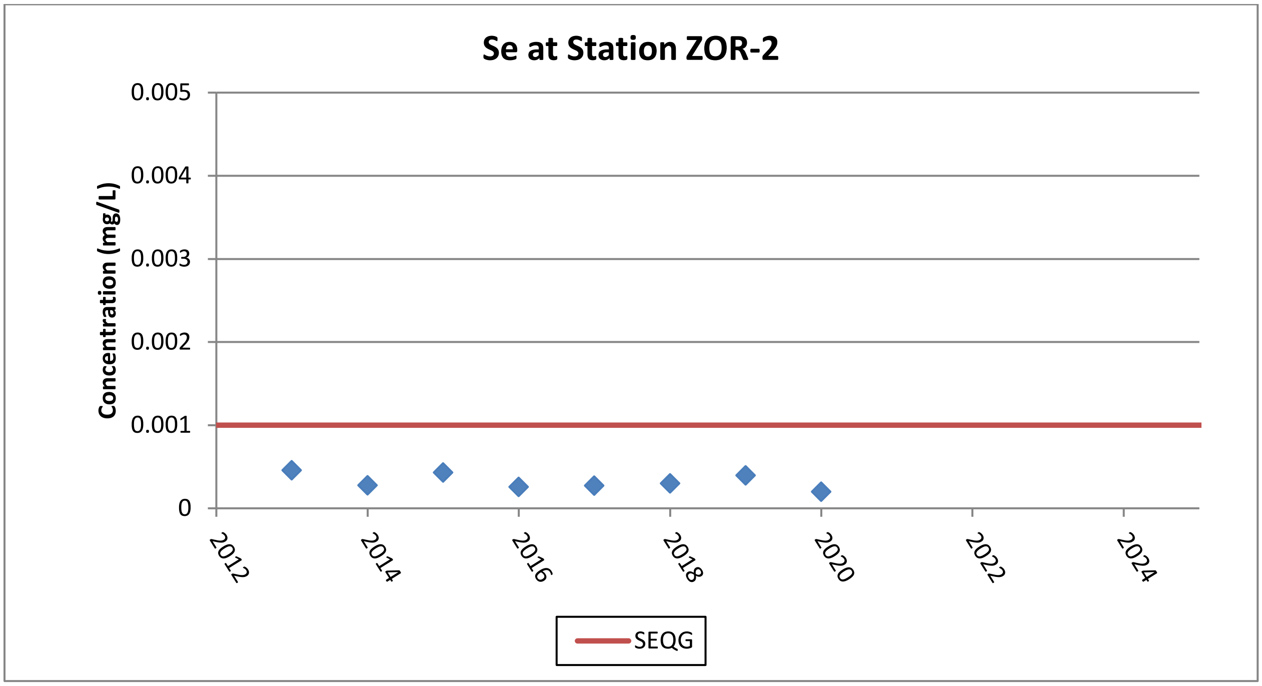
**Sampling initiated in 2013.*

Figure 4.3-6 ZOR-02 Outlet of the Zora Creek Flow Path



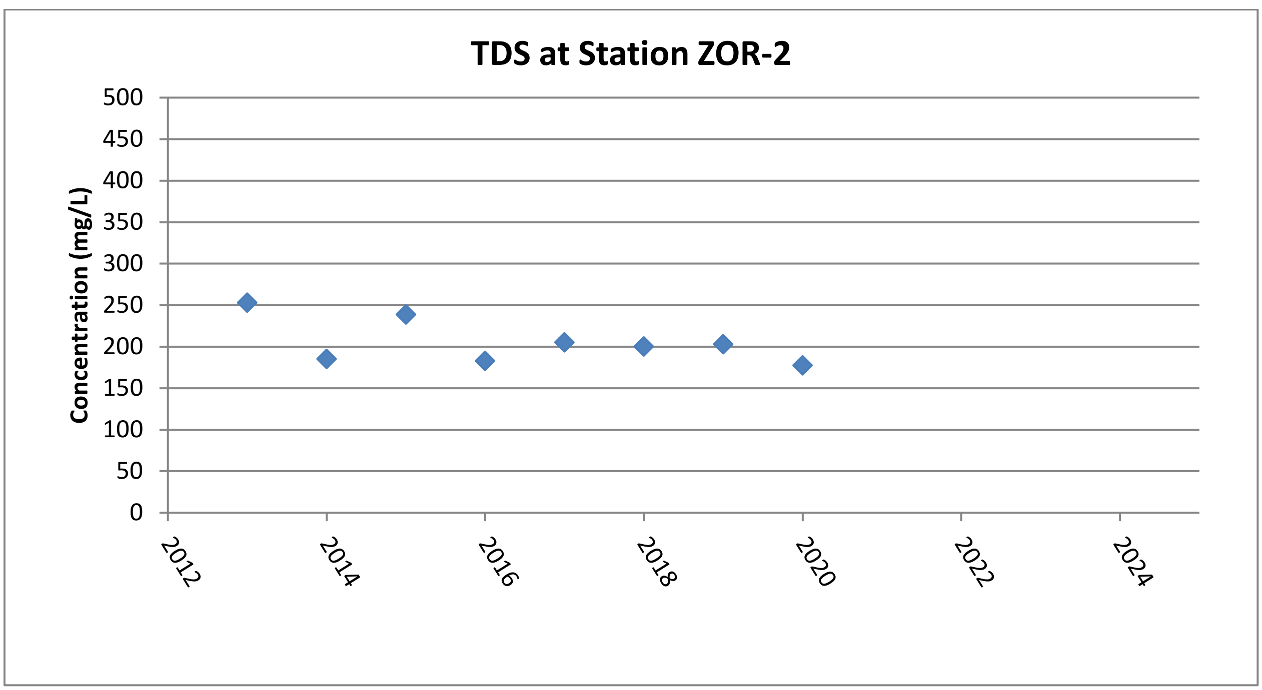
**Sampling initiated in 2013.*

Figure 4.3-7 ZOR-02 Outlet of the Zora Creek Flow Path



**Sampling initiated in 2013.*

Figure 4.3-8 ZOR-02 Outlet of the Zora Creek Flow Path



**Sampling initiated in 2013.*

Figure 4.6.1-1 - Air Sampling Locations

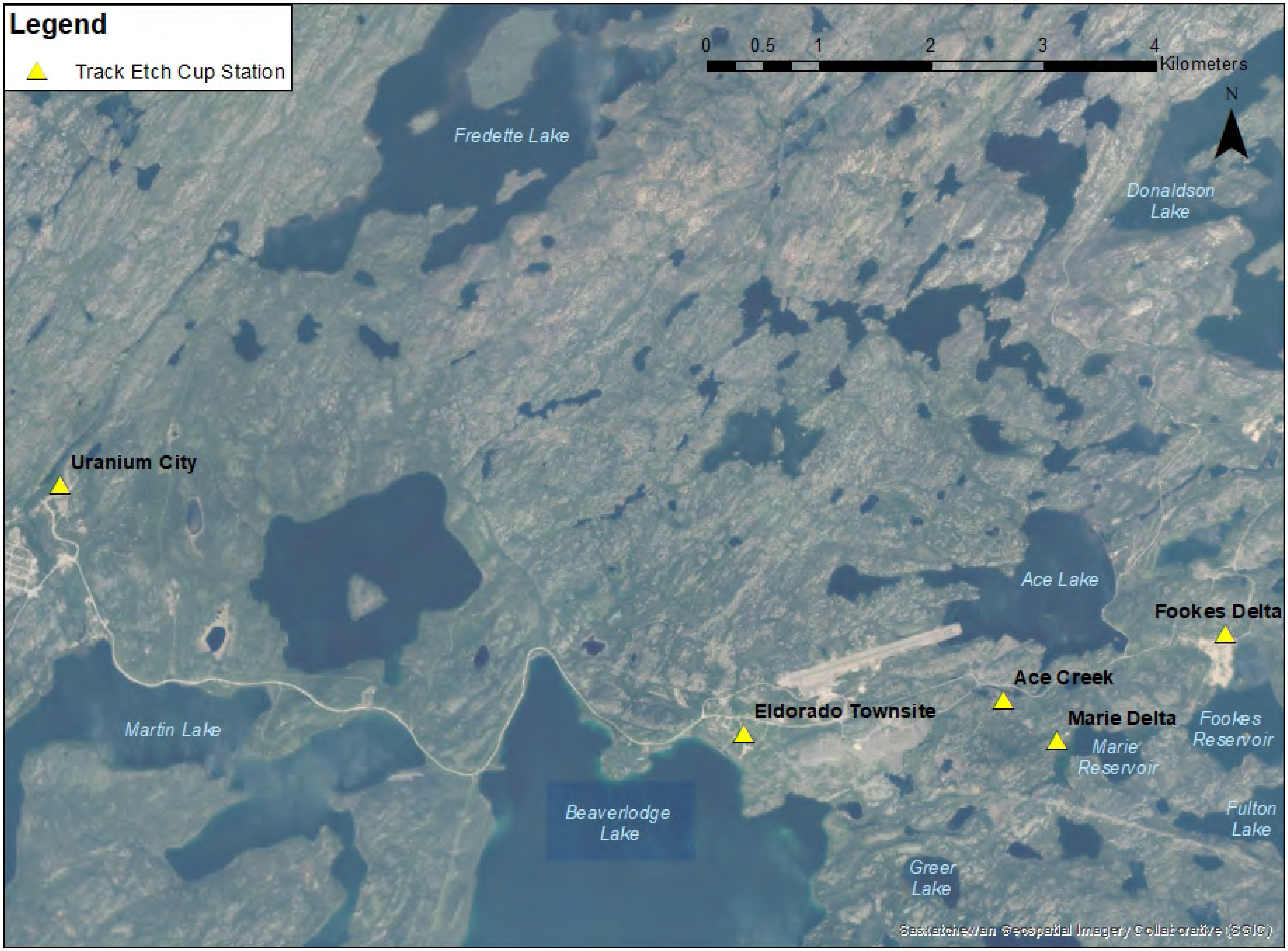
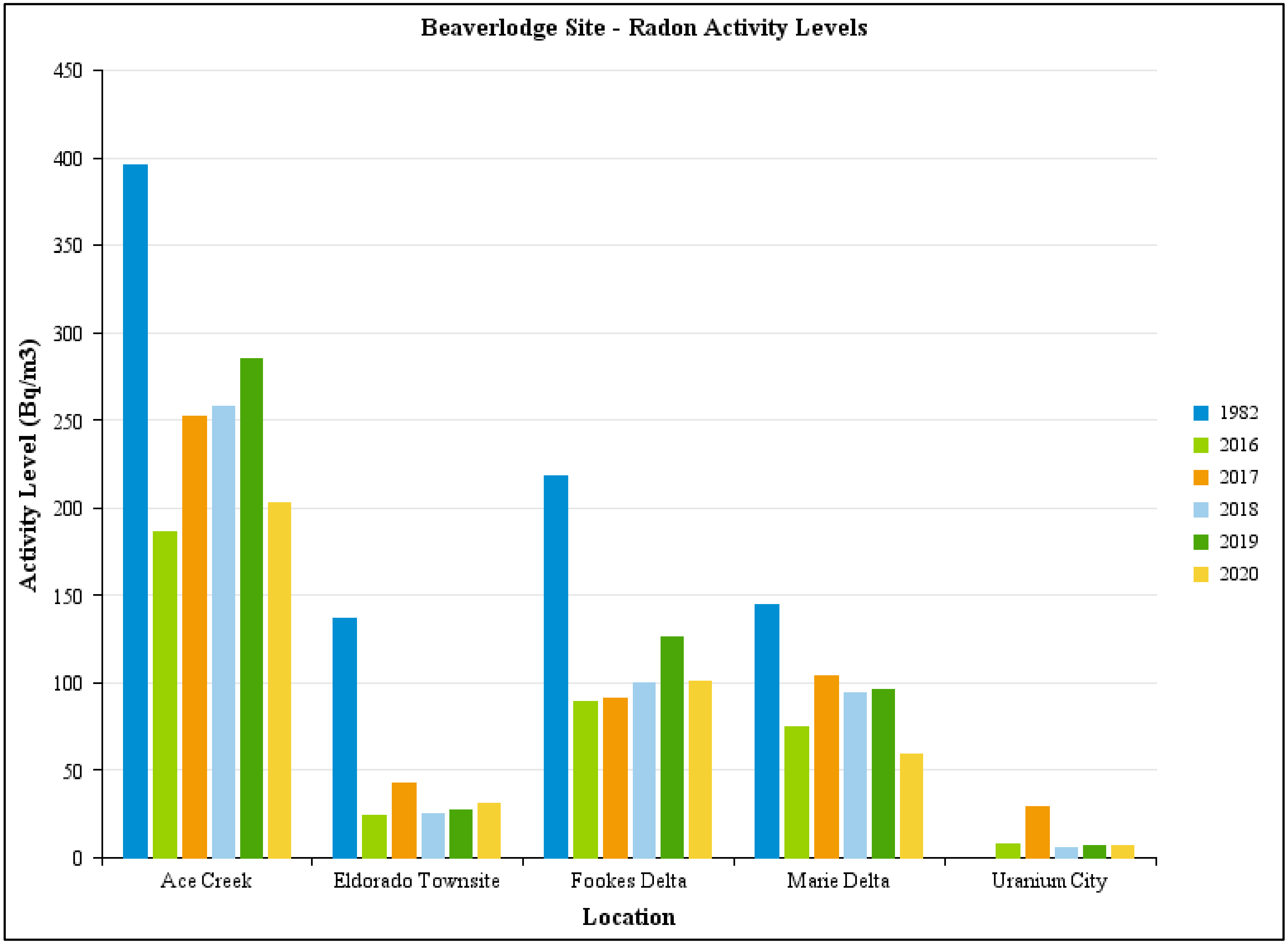


Figure 4.6.1-2 Radon Summary (2016 - 2020 versus 1982)



**Data reporting methods were reviewed in 2017, leading to the correction of values in the above figure.*

APPENDIX A

APPENDIX A

Property Name	Acceptable Gamma Levels	Boreholes Plugged	Stable Mine Openings	Stable Crown Pillar	Water Quality Within Modelled Predictions	Waste Rock	Tailings	IC Monitoring	IC Maintenance	Land Status
EAGLE 4/7	Meets Criteria	Y	Eagle shaft concrete collar and cap constructed in 2000.	Yes, no indication of instability or subsidence identified.	NA - Shaft Lake water sample	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of concrete cap, evidence of artesian flow from boreole, evidence of significant pit wall failure, condition of vegetation.	Concrete cap will require maintenance or replacement.	Managed in IC
EAGLE (02 Zone)	Meets Criteria	Not Required in 2009	No mine openings to surface	NA	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of significant pit wall failure, condition of vegetation.	No maintenance required	Managed in IC
EMAR 16 (K260)	Meets Criteria	Not Required in 2009	No mine openings to surface	NA	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of significant pit wall failure, condition of vegetation.	No maintenance required	Managed in IC
EMAR 19 (11 Zone)	Meets Criteria	Not Required in 2009	No mine openings to surface	NA	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of significant pit wall failure, condition of vegetation.	No maintenance required	Managed in IC
EMAR 21 (46 Zone)	Meets Criteria	Not Required in 2009	Adit was backfilled during original decommissioning. Shows no signs of deterioration	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of significant pit wall failure, condition of adit, evidence of instability of crown pillar above adit, condition of vegetation.	No maintenance required	Managed in IC
EXC ATO 26	Meets Criteria	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of significant waste rock slope failure and condition of vegetation.	No maintenance required	Managed in IC
EXC ACE 1	Above Criteria, Risk Evaluated	NA	No mine openings to surface	NA	NA	N	Accessible tailings were covered with 600mm of waste rock. Inaccessible exposed tailings were left in place as vegetation cover had established.	Inspection of evidence of recent human visitation, evidence of disturbance of the waste rock covered tailings and condition of vegetation.	No maintenance required	Managed in IC and portion free released
ACE 2	Meets Criteria	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	N	All accessible tailings were covered with 600 mm of waste rock.	Inspection of evidence of recent human visitation, condition of waste rock cover of tailings, and cover of vegetation	No maintenance required	Managed in IC
EXC ACE 3	Meets Criteria	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Managed in IC
HAB 6	Meets Criteria	Y	No mine openings to surface	NA	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, evidence of disturbance of the waste rock used to construct the trail, condition of waste rock used to construct the trail and the condition of vegetation on the trail.	No maintenance required	Managed in IC
EXC 2	Meets Criteria	Y	No mine openings to surface	NA	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Managed in IC
ATO 26	Meets Criteria	NA	No mine openings to surface	NA	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Managed in IC and portion free released
URA MC	Meets Criteria	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of the plugged artesian drill holes, evidence of significant sluffing of waste rock slope and condition of vegetation	No maintenance required	Managed in IC
HAB 3	Lack of Disturbance-No Readings	Y	No mine openings to surface	No indication of instability or subsidence identified.	Monitor AN-5	N	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of the crown pillar area, condition of vegetation	No maintenance required	Managed in IC
BOLGER 2	Above Criteria, Risk Evaluated	NA	No mine openings to surface	NA	NA	Y	No tailings spilled or deposited	Inspection of recent human visitation, general pit wall stability, evidence of significant pit wall failure, evidence of significant sluffing of waste rock slope, and condition of vegetation	No maintenance required	Managed in IC
RA 6	Meets Criteria	NA	Adits RA6 was sealed with steel graitng using #10 steel rail	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, RA 6 adit closure condition, condition of crown pillar, evidence of slumping of waste rock slopes, evidence of surface seeps from the adit, and condition of vegetation.	Steel grate is scheduled for replacement	Managed in IC
RA 9	Meets Criteria	Y	Adit was backfilled to a suffficient depth to eliminate future erosion to ensure long term stability.	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, RA 9 adit closure condition, condition of crown pillar, evidence of slumping of waste rock slopes, evidence of surface seeps from the adit, and condition of vegetation.	No maintenance required	Managed in IC
Eagle 1	Meets Criteria	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor 12 Zone	Y	No tailings spilled or deposited	Inspection of pit wall stability, vegetation condition, evidence of human visitation, sand cover over areas with elevated gamma, & status of flooded pit	No maintenance required	Managed in IC
ACE 10	Lack of Disturbance-No Readings	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Managed in IC and portion free released
URA 5	Above Criteria, Risk Evaluated	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor AC-14	Y	Tailing spills identified in Ace Catchment Area I and Ace Stope Area were excavated and disposed of underground, covered with 600mm of waste rock or left undisturbed (if inaccessible).	Inspections of areas where residual tailings remain on URA 5 property	No maintenance required	Managed in IC
EXC URA 5	Above Criteria, Risk Evaluated	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	Y	Accessible tailing spills were covered with 600 mm of waste rock. Tailings at Ace Catchment I were removed.	Inspection of evidence of past tailing spill area for evidence of disturbance, the condition of waste rock slope, and the condition of vegetation.	No maintenance required	Managed in IC
URA 3	Above Criteria, Risk Evaluated	Y	25373 Raise secured with a stainless steel cap in 2017.	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	Inspection of evidence of recent human visitation, the condition of stainless steel raise cap.	Stainless steel cap will require periodic material assessments.	Managed in IC and portion free released
ACE 5	Lack of Disturbance-No Readings	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Managed in IC
JO-NES	Meets Criteria	Y	810394 Vent Raise and 820694 Vent Raise filled with waste rock in 1982 and covered with a concrete cap. In 2017, stainless steel caps were placed over the concrete caps. Adit was filled with waste rock from site.	Yes, no indication of instability or subsidence identified.	NA	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, general pit wall stability, evidence of significant pit wall failure, evidence of significant sluffing of waste rock within the former pit, condition of stainless steel caps and adit, condition of vegetation.	Stainless steel caps will need periodic material assessments.	Managed in IC and portion free released

HAB 2A	Meets Criteria	Y	D013810 Raise (645553E; 6611886N) was made secure via installation of stainless steel cap in 2017.	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of stainless-steel caps installed on D013810 raise and condition of vegetation	Stainless steel cap will need periodic material assessment	Managed in IC
ACE MC	Above Criteria, Risk Evaluated	Y	Ace Shaft closed with concrete cap in 1984, secured by covering concrete cap with stainless steel cap in 2016. 103 Raise temporarily sealed in 1984, then sealed with concrete cap in 1985. Secured in 2017 by covering concrete cap with stainless steel cap. 201 Raise was backfilled at decomissioning with no evidence of material settling, additional sorted waste rock was placed on the raise.	Yes, no indication of instability or subsidence identified.	NA	Y	Spills from tailing pipeline were present on property. Accessible exposed tailings were covered with 600mm of waste rock.	Inspection of evidence of human visitation, past tailing spill areas for evidence of disturbance, condition of vegetation, waste rock slope stability, evidence of ARD from waste rock and condition of stainless steel cap on Ace Shaft and 130 Raise, and the 201 Raise area	Stainless steel caps will need periodic material assessments.	Proposed for IC
URA FR	Lack of Disturbance-No Readings	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor AC-14	N	No tailings spilled or deposited	Inspection of seeps (642304E; 6604123N) and formerly flowing borehole plugs will require inspection	No maintenance required	Proposed for IC
URA 4	Meets Criteria	Y	Fine Ore Bin Raise, Surface Dump Raise, Fay Shaft, and 024094 Vent Raise all were permanently secured with stainless steel cap in 2020, 2018, 2020 and 2017 respectivley. Custom Ore Raise, Custom Ore Raise and Access to Custom Crusher (Adit) closed in 2020 with engineered waste rock covers.	No indication of instability or subsidence identified	N/A	Y	Accessible tailings were covered with 600mm of waste rock. Inaccessible areas were assessed on individual basis.	Inspection of evidence of recent human visitation, evidence of ARD from waste rock and the conditioning of mine closures (stainless steel caps/ backfilled raises)	Stainless steel caps will require periodic material assessments	Proposed for IC
ACE 7	Meets Criteria	NA	Shaft adit closed during operation and is now burried, adit closure is sufficient and no additional investigation required.	Yes, no indication of instability or subsidence identified.	N/A	Y	No tailings spilled or deposited	Inspections of evidence of recent human visitation, evidence of sluffing of waste rock and generally waste rock slope stability, evidence of ARD from waste rock, and condition of vegetation	No maintenance required	Proposed for IC
ACE 8	Meets Criteria	Y	Verna Shaft (645470E: 6606022N) closed with concrete cap in 1982, secured by replacing concrete cap with a stainless steel cap in 2018	Yes, no indication of instability or subsidence identified.	Monitor at AC-14	Y	No tailings spilled or deposited	Inspections of evidence of recent human visitation, condition of waste rock slope, evidence of ARD from waste rock and condition of stainless steel cap	Stainless steel cap will require periodic material assessments	Proposed for IC
ACE 1	Above Criteria, Risk Evaluated	Y*	105#2 Raise closed with reinforced concrete cap during September 1982, resecured with engineered rock cover in 2018. 2157 Raise and Finger Raise sealed during summer 1984 with concrete caps, further secured in 2017 by covering the existing concrete caps with stainless steal caps. 195 Access Raise and 195 Raise were sealed in summer of 1984, field verification conducted in 2019 and additional sorted waste rock placed above the area.	Placement of cover consisting of 1.5 to 2 meter berm over identified areas of risk placed in September 2016. No indication of instability or subsidence identified	NA	N	Exposed tailings covered with 600mm of waste rock, exposed tailings in inaccessible areas left undisturbed	Inspection of evidence of human visitation, condition of vegetation, past tailing spill areas for evidence of disturbance, evidence of crown pillar subsidence, evidence of subsidence in areas of 195 Raise and Access Raise, and the condition of stainless steel caps and the engineered rock cover.	Stainless steel caps will need periodic material assessments.	Portions proposed for IC and Free Release
ACE 3	Meets Criteria	Y	Bored Vent Raise had a concrete cover installed in 1984, permanently sealed in 2017 with a stainless steel cap over the concrete cap.	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	Inspection of evidence of recent human visitation and the condition of stainless steel cap	Stainless steel cap will require periodic material assessments	Proposed for IC
ACE 9	Above Criteria, Risk Evaluated	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	NA	N	Exposed tailings from pipeline infrastructure dismantling were removed. Other accessible tailings were covered with 600mm of waste rock. Inaccessible areas left undisturbed.	Inspection of evidence of human visitation, past tailing spill areas for evidence of disturbance and condition of vegetation	No maintenance required	Proposed for IC
EXC URA 7	Lack of Disturbance-No Readings	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor at AC-14	N	No tailings spilled or deposited	NA	NA	Proposed for IC
GC 2	Meets Criteria	NA	No mine openings to surface	NA	Yes	N	Tailings considered inaccessible, showed signs of revegetation or were within Marie Reservoir drainage basin, and were left undisturbed.	Inspection of evidence of human visitation, past tailing spill area for evidence of disturbance and condition of vegetation	No maintenance required	Proposed for IC
NW 3 Ext	Meets Criteria	NA	Verna mine 026594 Ventilation Raise has a stainless steel cap covering the existing concrete cap, 026594 Finger Raise and Verna Manway had concrete caps replaced with stainless steel caps.	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	Inspection of evidence of recent human visitation and the condition of stainless-steel caps on the Ventilation Raise, Verna Finger Raise and Verna Manway	Stainless steel caps will requrie periodic material assessments	Proposed for IC
NW 3	Meets Criteria	NA	72 Zone Portal (645831E: 6605769N) was sealed with waste rock by backfilling to a depth of 17m in 1982.	Yes, no indication of instability or subsidence identified.	NA	N	No tailings spilled or deposited	Inspection of recent human visitation, evidence of ARD from waste rock and condition of 72 Zone Portal plug particularily the overall condition of the waste rock plug and the evidence of erosion/slumping along brow area	No maintenance required	Proposed for IC
ACE 14	Above Criteria, Risk Evaluated	NA	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor at AC-14	N	Tailings considered inaccessible, showed signs of revegetation or were within Marie Reservoir drainage basin, and were left undisturbed.	Inspection of evidence of human visitation, past tailing spill areas for evidence of disturbance and condition of vegetation	No maintenance required	Proposed for IC
EXC ACE 15	Lack of Disturbance-No Readings	NA	No mine openings to surface	NA	NA	N	No tailings spilled or deposited	No monitoring required	No maintenance required	Portions proposed for IC and Free Release
EMAR 1	Meets Criteria	Y	No mine openings to surface	Yes, no indication of instability or subsidence identified.	Monitor at DB-6	Y	No tailings spilled or deposited	Inspections of evidence of recent human visitation, condition of pit wall, evidence of ARD from waste rock, evidence of crown pillar subsidence and water quality in Dubyna Lake	No maintenance required	Proposed for IC
EXC 1	Meets Criteria	Y	Vertical mine openings: 013904 Raise and 013905 Raise were permanently sealed by covering original concrete cap with a stainless steel cap in 2017. Vertical Mine opening Heater Raise was permanently sealed by replacing concrete cap with stainless stealed cap in 2019. Two sealed adits: Haulage Adit and The Service Adit both had two walls constructed of 2" by 6" timbers with reinforced wire and 6" shotcrete applied to outside of form to prohibit access to shaft collar and entrance of Adit. The Vent Plant Raise located in the Haulage Adit was capped in 1975 and further secured with waste rock.	Yes, no indication of instability or subsidence identified.	Monitor at AN-5	Y	No tailings spilled or deposited	Inspections of evidence of recent human visitation, condition of waste rock slope, evidence of ARD from waste rock, condition of stainless steel caps, and condition of 013904 Raise, 013905 Raise, Heater Raise, Haulage Adit and Service Adit	Stainless steel caps will requrie periodic material assessments	Proposed for IC

HAB 1	Meets Criteria	Y	013918 Raise, 013909 Raise and 013929 Raise were backfilled with waste rock during mining of small pit, 013927 Raise was backfilled with waste rock and capped with concrete cap during original decommissioning. In 2017 a stainless steel cap covered the concrete cap.	Yes, no indication of instability or subsidence identified.	Monitor at AN-5	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of waste rock slope, evidence of ARD from waste rock, evidence of crown pillar subsidence, condition of backfilled 013918 Raise, 013909 Raise and 013929 Raise; and the condition of the stainless steel 013927 Raise cap.	Stainless steel cap will require periodic material assessments.	Portions proposed for IC and Free Release
HAB 2	Meets Criteria	Y	The Hab shaft was made secure in 2018 when the original concrete cap was replaced with a stainless steel cap.	Yes, no indication of instability or subsidence identified.	Monitor at AN-5	Y	No tailings spilled or deposited	Inspection of evidence of recent human visitation, condition of vegetation, evidence of ARD from waste rock, water quality of Pistol Lake, and condition of Hab shaft stainless steel cap.	Stainless steel cap will require periodic material assessments.	Proposed for IC
URA 7	Once the Final Closure Report for these properties is submitted, these columns will be updated accordingly									
BOLGER 1										
EXC URA 6										
ACE 19										
URA 6										
EXC ACE 18										
EXC ACE 17										
ACE 17										
ACE 15										
EXC ACE 14										
GORE										
EXC GC 2										
GC 4										
EXC GC 4										
GC 3										
EXC GC 3										
GC 5										
GC 1										
GORE 1										
NW 2										
NW 1										
LEE 4										
GORE 2										
LEE 3										
EXC LEE 3										
LEE 2										
URA 1										

* Drill holes will be plugged in 2021

APPENDIX B

APPENDIX B

FINAL

2020 Geotechnical Inspection Report Decommissioned Beaverlodge Mine/Mill Site

Beaverlodge Project, Saskatchewan, Canada

Cameco Corporation

SRK Consulting (Canada) Inc. ▪ 1CC007.067 ▪ February 2021

srk consulting

FINAL

2020 Geotechnical Inspection Report Decommissioned Beaverlodge Mine/Mill Site

Beaverlodge Project, Saskatchewan, Canada

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

Contents

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Appendices

1 Executive Summary

The 2020 geotechnical inspection of the decommissioned Beaverlodge mine site was completed by SRK Consulting on September 16 and 17, 2020.

The site visit was conducted with the purpose of completing geotechnical inspections of the following areas:

- The two outlet spillways at Fookes and Marie Reservoirs;
- Marie Reservoir Delta;
- Ace Creek Catchment Area III;
- Ace Stope Area; and
- Bolger Pit, including the flow path from Zora Lake to Verna Lake.

Inspections of the ground surface overlying crown pillars were completed at the following two mine areas:

- The Hab Area; and
- The Dubyna Area.

The observations from the 2020 inspection have been assessed relative to the observations from past inspections, with a focus on changes since the 2015 SRK inspection and the annual inspections by Cameco from 2016 to 2019, inclusive. Based on this assessment, SRK has concluded that these sites are stable and are expected to remain so in the future. It is SRK's opinion, therefore, that the conditions at the areas noted above are appropriate for final close out and a transfer to institutional control.

Until such time that the transition to the Institutional Control (IC) Program has been completed, we recommend that Cameco continue with annual inspections performed using the existing inspection protocols. Involvement by an external geotechnical engineer would not be required except in the unlikely event that geotechnical concerns arise. Examples of observations which could warrant potential involvement by a qualified geotechnical engineer are as follows:

- Potentially active boils or significant cover erosion at the Fookes Reservoir Delta, the Fookes and Marie Reservoir Outlet Structures, the Marie Delta Area or Ace Creek Catchment Area III;
- Significant instability at the Bolger Pit or significant erosion of the Drainage Channel between Zora and Verna Lakes; and
- Potential development of tension cracks and observable changes in the ground elevation at the Ace Stope, Hab or Dubyna areas.

It is our understanding that, following the transition to the IC Program, inspections are planned every 5 years for two cycles. Thereafter, assuming these sites remain stable, the frequency of inspections may be reduced. This plan for future inspections is acceptable for evaluating the long-term performance of these features.

The person or persons (Qualified Persons in some instances) performing these inspections should use the 2020 Geotechnical Inspection Report and the inspection checklists as the basis for future inspections. A table summarizing the inspection requirements for each of the sites covered by this report is provided in Appendix J.

2 Introduction

2.1 General

In response to a request from Mr. Mike Webster of Cameco Corporation (Cameco), Miss Alida Hartzenberg of SRK Consulting (Canada) Inc. (SRK) visited the decommissioned Beaverlodge mine site near Uranium City, Saskatchewan. The site visit occurred on September 16 and 17, 2020 with the purpose of completing geotechnical inspections of the following areas, the locations of which are shown on Figure 1 (Google Earth Pro, 2020):

- The Fookes Reservoir Delta;
- The two outlet spillways at Fookes and Marie Reservoirs;
- The Marie Reservoir Delta;
- Ace Creek Catchment Area III;
- The Ace Stope Area; and
- The Bolger Pit, including the flow path from Zora Lake to Verna Lake;

Inspections of the ground surface overlying crown pillars were completed at the following two mine areas, the locations of which are shown on Figure 2:

- The Hab Area; and
- The Dubyna Area.

Conditions during the site visit were mostly sunny with temperatures ranging from approximately 7°C to 10°C on both days.

Subsequent to the remediation of the Fookes Reservoir Delta in 1997, geotechnical inspections of the Fookes Reservoir Delta and the outlet spillways at the Fookes and Marie Reservoirs were undertaken by SRK in September 1998 (SRK, 1998), September 2001 (SRK, 2001), June 2004 (SRK, 2005a), August 2007 (SRK, 2008), May 2010 (SRK, 2010b) and June 2015 (SRK, 2015). SRK undertook an inspection of the Marie Reservoir Delta and the catchment areas around Ace Creek in 2004 (SRK, 2005b) as well as in June 2015 (SRK, 2015).

The May 2010 inspection that included the Fookes Reservoir Delta and the outlet spillways at the Fookes and Marie Reservoirs formed the baseline of areas that required inspection. Additional sites have been included since 2010 and the list above show all the sites inspected in 2020, including the original sites.

From 1998 to 2010, geotechnical inspections were completed by SRK every three years. The 2010 inspection report (SRK, 2010b) recommended changing the inspection frequency as follows. Documented inspections should be completed by Cameco and/or regulators on an annual basis for the next five years (to 2015) at the sites identified in the report. Regardless of the findings from the annual inspections, at the end of the 5-year period (2015), a qualified geotechnical engineer should inspect the condition of the cover, assess its performance and determine an appropriate inspection schedule following that inspection (SRK, 2010b). In 2015, SRK recommended the next 3rd party geotechnical inspection should occur in 2020, with Cameco continuing with annual inspections in the interim.

Investigations and reports related to the Hab and Dubyna areas are listed below:

- Proposed 2014 Crown Pillar Drilling Investigation (SRK, 2014a); and
- Crown Pillar Assessment, 2014 – 2015 (SRK, 2015a).

Reports prepared and investigations for the Ace Stope Area are listed below:

- Proposed 2014 Crown Pillar Drilling Investigation (SRK, 2014a);
- Crown Pillar Assessment, 2014 – 2015 (SRK, 2015a);
- Ace Mine – 2016 Subsidence Remediation – Optimization Study (SRK, 2017b);
- Ace Stope Area and Ace Creek Catchment Areas I and II (SRK, 2016);
- Ace 7 105 #2 – Vent Raise Closure Design (SRK, 2018); and
- Ace Subsidence Remediation and Ace 7 105 #2 Vent Raise – As-Built (SRK, 2019a).

Reports and investigations related to the Zora flow path are listed below:

- Stream reconstruction between Zora and Verna Lakes (sometimes referred to as the Bolger Diversion) (SRK, 2013);
- Design Report for the Flow Path Reconstruction at the Bolger Waste Rock Pile (SRK 2014);
- 2014 Construction Progress Report for the Bolger Flow Path Reconstruction (SRK, 2015b);
- Bolger Flow Path Reconstruction – Phase One Geochemical Characterization (SRK, 2015c);
- Bolger Flow Path Reconstruction – 2015 Construction As-Built Update (SRK, 2016a);
- Bolger Flow Path Reconstruction 2016 Final As-Built Report (SRK 2017);
- Bolger Flow Path Reconstruction - 2017 Geotechnical Inspection (SRK, 2017c); and
- Bolger Flow Path Reconstruction - 2018 Geotechnical Inspection (SRK, 2019a).

Additionally, Cameco completes annual geotechnical inspections outside of the 5-year cycle of geotechnical assessments completed by an SRK geotechnical engineer. The annual Cameco inspections are guided by a Geotechnical Inspection Checklist developed by SRK specially for the Fookes and Marie outlet structures and Fookes Delta. The Cameco inspections completed since 2015 are listed below:

- 2016 – completed July 11 – 15 (Cameco, 2016);
- 2017 – inspection completed May 29 – June 2 (Cameco, 2017);
- 2018 – inspection completed May 28 – June 1 and September 21. (Cameco, 2018); and
- 2019 – Inspection completed June 3 – 7 (Cameco, 2019).

The list below provides the areas that should be inspected on an annual basis (based on the 2010 and 2015 reports):

- Fookes Delta;
- Fookes Reservoir Outlet; and
- Marie Reservoir Outlet.

Additional areas that have been added since 2015:

- Hab Crown Pillars;
- Dubyna Crown Pillars;
- Ace Stope Crown Pillar; and
- Zora Creek Reconstruction Channel.

This report summarizes the observations, conclusions and recommendations related to the detailed geotechnical inspections of the areas noted above in 2020.

2.2 Recent Precipitation Records

Based on annual precipitation data obtained for Uranium City from Environment Canada (2021), the total mean precipitation from 2013 to 2020 was 309 mm (Table 1). As regards the total annual precipitation since 2015, 2016 was slightly above this mean; 2017 and 2018 were below the mean; and 2019 and 2020 were above the mean.

The spring freshet is understood to be the dominant contributor to peak reservoir levels and peak flows in local streams and channels. However, anecdotal information based on inspections by SRK over the past 22 years indicates rainy periods during the summer and fall can significantly influence lake levels and stream/channel flows. As can be seen in Table 1, 2020 saw higher than normal precipitation. Through discussions with local residents and observations made during the September geotechnical inspection water levels in the area remained higher than normal through the summer and fall in 2020.

Table 1: Annual Precipitation from 2013 to 2020

Year	Annual Precipitation (mm)
2013	245
2014	312
2015	401
2016	324
2017	203
2018	286
2019	322
2020	377
Mean	309

2.3 Historic Overview of the Beaverlodge Mine Site

The decommissioned Beaverlodge uranium mine/mill and associated properties, located northwest of Beaverlodge Lake in northern Saskatchewan (see Figure 1), were operated by Eldorado Mining and Refining Limited for nearly 30 years between 1952 and 1982. Operations ceased in 1982, at which time Eldorado Nuclear Limited initiated site decommissioning activities. The site was decommissioned over the 1983 to 1985 period to meet the regulatory requirements of the day and post-decommissioning monitoring was subsequently initiated. In 1988, Cameco Corporation (Cameco) took over the responsibility for the Beaverlodge properties on behalf of the Government of Canada and has continued to carry out routine environmental monitoring as well as targeted environmental investigations, remediation activities and maintenance work, as required, on the decommissioned facilities. It is as a result of this ongoing responsibility that the work described in this report was initiated.

3 Fookes Reservoir Delta

3.1 Background

During operations at the Beaverlodge uranium mine and mill complex, tailings from the milling process were deposited in Fookes Reservoir, forming a delta at the location shown on Figure 1. In 1983 and 1984, as part of mine decommissioning, the exposed tailings delta was covered with mine waste rock. The objectives of the cover were to control gamma radiation, to provide protection against direct contact with the tailings, and to reduce the potential for erosion and dispersion. Following completion of the waste rock cover, some of the tailings began working their way upward through the waste rock, forming small mounds, or “boils”, of exposed tailings on the surface of the cover. This boil activity was attributable to seasonally high piezometric pressures within the tailings related to the geometry and stratigraphy of the delta (SRK, 1995), which resulted in localized flowing artesian conditions ("flowing artesian" refers to groundwater that is upwelling above the ground surface due to piezometric levels that exceed the surface elevation of the delta). As a result of these boils, additional remedial work was proposed.

The original remedial work, which was completed in 1997, consisted of covering the exposed tailings boils with two layers of sand: 0.3 m of fine-grained filter sand, overlain by 0.3 m of sand and gravel (“general fill”). Strict grain size distribution requirements were set for the lower filter sand layer to ensure that the sand is fine enough to prevent tailings particles from migrating upwards through the void spaces in the sand, while at the same time allowing groundwater to flow upwards through the filter sand without pore pressure build-up. The upper sand and gravel layer serve only to weigh down the filter sand layer (to reduce the potential for “blow-out” due to high upward seepage gradients) and to protect the filter sand layer from erosion. Stockpiles of additional filter sand and general fill were placed on the delta for future maintenance work, as recommended in the 1997 scope of work, should new boils form in areas not covered during the 1997 remedial work. Other work completed in 1997 included the provision of a surface drainage channel at the northeast end of the delta, and placement of erosion protection on the roadway at the northwest end of the delta. A detailed description of the work completed in 1997 is provided in an SRK report entitled "Beaverlodge Decommissioning, Fookes Lake Tailings Delta Remediation, 1997 Construction" (October 1997). Drawing 001 from that report illustrates the 1997 remedial work.

The 1997 cover construction revealed that tailings boils could also be caused by construction traffic. In particular, new boils frequently erupted on the surface of the old waste rock cover where trucks and loaders were operating. The wheel loads were causing localized liquefaction of the underlying tailings. The first indication of this localized liquefaction was pronounced deflection of the ground surface (‘rolling”) under the wheels, indicating a reduction in shear strength. If the vehicle continued to travel over the same area, liquefied tailings would flow through the waste rock cover, forming conical mounds (see Photo 6 in the 1997 Construction Report). Similar observations of tailings upwelling through the waste rock cover were reported by equipment operators during the initial placement of the waste rock cover in 1983 and 1984. Special construction methods, as described in Section 3.3 of the 1997 Construction Report, were developed and implemented to prevent the formation of these tailings eruptions during the cover construction activities.

Nine pneumatic piezometers (P93-1 through P93-9) were installed in the tailings delta in 1993. These piezometers were monitored regularly (although P93-7 was abandoned in 2005 due to instrument malfunction) and provided an indication of piezometric levels at select locations over the delta for a period of approximately 10 years. Piezometric data indicated that, generally, no artesian levels were observed at any time in some locations, i.e. well back from the Fookes Reservoir shoreline. However, close to the Fookes Reservoir shoreline, artesian levels were observed either seasonally or, at some locations, most of the year.

In addition to piezometer monitoring, the surface of the delta was inspected by a geotechnical engineer every three years, starting in 1998. The expectation was that, when the inspections no longer detected any signs of renewed boil activity over a three-year period, it would be reasonable to assume that conditions on the delta are sufficiently stabilized for final site close out. At that point, subject to regulatory approval, the inspections would be discontinued.

In 2004, at the request of Cameco, SRK completed a six-year review of the cover at the Fookes tailings delta. As a result of that assessment, SRK recommended that incremental cover material be placed over the tailings delta in accordance with, or as a variant of, one of the following two options:

- Place a “strategic cover” that corresponds to areas of exposed tailings observed during the inspections of 2001 and/or 2004; or
- Place a “full cover” over those areas of the delta believed to be prone to forming tailings boils.

Following discussions between Cameco, SRK and others, Cameco decided to proceed with the “full cover” option, with installation proceeding in two-stages. During the first stage, the “strategic cover” would be placed using borrow materials which were stockpiled on the delta in 1997. Concurrent with the borrow placement, additional investigations would be undertaken to identify the design and limits of the “full cover” and to identify sufficient quantities of borrow materials to complete its installation the following year. During the second stage, the borrow areas developed during the first stage would be used to complete the installation of the “full cover.”

The “strategic cover” was placed and supporting investigations were completed in 2005. The installation of the optimized “full cover” in 2006 using material hauled from local borrow areas was postponed until 2007 for budgetary reasons. As-built reports describing the placement of the “strategic cover” in 2005 and the “full cover” in 2007 were prepared by SRK in 2006 and 2008, respectively. Figure 3 illustrates the extent of cover placement following the completion of the “full cover” in 2007 (Figure 2 in SRK, 2015).

The 2007 geotechnical inspection of the cover occurred while the second stage of cover installation was under way. SRK geotechnical engineers completed a formal inspection of the cover in 2010 and 2015, and an informal inspection in 2014. Consistent with SRK’s recommendations in 2010, Cameco undertook annual inspections of the cover in June of 2011, 2012 and 2013 and July of 2014, as well as in 2016, 2017, 2018 and 2019, as stated in Section 1.1. The timing of the 2020 inspection is consistent with the schedule defined in 2015 (SRK, 2015).

Based on recommendations in SRK’s 2010 inspection report, Cameco has since conducted annual inspections at the Fookes Reservoir Delta. SRK provided a checklist in 2015 that Cameco has used for the subsequent annual inspections. The annual inspection results are included in Cameco’s Annual Reports.

3.2 Observations from the Fookes Reservoir Delta Inspection

Previous inspections in 1998, 2001 and 2004 focused primarily on the extent and location of tailings boils evident on the surface of the cover. At the time of the 2007 inspection, the "full cover" installation was still under way and observations therefore focused primarily on the remaining construction activities, such as the actions required to handle the runoff along the access road at the northwest corner of the delta. The next two inspections, in 2010 and 2015, focused on the effectiveness of the "full cover" as well as its condition relative to potential erosion due to surface runoff and wave action. Similarly, the 2020 site inspection focused on the effectiveness of the "full cover" as well as its condition relative to revegetation and potential erosion due to surface runoff and wave action (Figure 4).

Photos illustrating the state of the Fookes Reservoir delta in 2020 are provided in Appendix A as Photos 1 through 14.

The cover is in generally good condition. Comments specific to 2020 based on the features observed in 2015 are as follows:

- In 2015, a crack was encountered on the sand and gravel cover in the northern quarter of the delta, approximately 100 m from the shoreline. The crack was several tens of metres long and 1 to 2 cm wide. The middle third was approximately 10 m long, relatively straight and oriented approximately northeast-southwest. The segments north and south of the middle segment were of a length similar to the middle segment and oriented in an east-west direction. No tailings were visible in any of the crack segments, nor were there any signs of moisture. The Cameco inspection of June 2011 made the initial reference to these cracks and postulated they could be linked to settlement associated with the drought the region had been experiencing, and the fact the winter of 2010/11 being particularly severe. More normal precipitation occurred over the next three years and the cracks were apparently less evident during that period. Cameco reckoned the observations supported the link to drought induced settlement. SRK believes this is a plausible explanation, particularly since the crack observed in 2015 was approximately parallel to what would likely have been the elevation contours on the surface of the tailings beach.

This crack could not be located in 2020. The significant increase in the amount of rainfall experienced in 2019 and 2020 (Table 1) may have eroded the sides of the crack, making it difficult to identify. In addition, assuming the postulated explanation of their cause, above, is correct, it is expected that the amount of deformation responsible for the crack is linked to long term settlement of the tailings and is likely to be small and to diminish over time.

- There are a series of small depressions that were identified during the 2015 inspection, mainly at the south end of the delta, close to the external edge of the cover. They were also seen during the 2020 inspection (Photos 6 and 7). The depressions in the southern part of the delta have typically coalesced and formed relatively short, shallow channels which drain to the reservoir. The residual gravel content is armouring these localized channels and preventing further channel deepening. It is likely this subsidence has been caused by migration of the sand into the original rock fill cover. Assuming this to be the case, the sand may well continue to act as a filter against the potential movement of tailings up to the surface of the cover. Small, shallow depressions were also observed in the northern part of the delta (Photo 13). The depressions in the northern part of the delta are largely unconnected. They could be linked to sand migration, as discussed above. Alternatively, they could either be caused by settlement linked to the infiltration of water into cover material of varying densities (there was no formal compaction of the cover material, only irregular compaction linked to construction traffic) or wildlife disturbance. Under any of these scenarios, these depressions are not expected to impact the cover performance.

Although there are still bare zones, vegetation continues to gradually spread and thicken over much of the cover (Photos 1 and 2). This is particularly evident, in the areas where “bundles” of shrubs were left in place on the 2007 cover to promote the establishment of vegetation “islands” and in areas where the water table is typically shallow, such as along the north side of the delta where drainage paths are present, and close to the Fookes Reservoir shoreline on the east side of the delta (Photo 3). The vegetation appears to be considerably more established than what was observed in 2015 (Figure 4).

As was observed at the end of the 2007 construction season (Figure 2 of SRK, 2015), ponded water was present along the north side of the delta in 2015 and 2020, more or less coincident with the drainage paths. These ponds and the associated vegetation are creating a natural habitat over this part of the cover surface. The drainage path appears to be functioning as designed (Photos 11 and 12 in Appendix A).

As part of the installation of the covers in 2005 and 2007, the area considered most vulnerable to erosion was on and below the access ramp at the northwest corner of the tailings delta. In 2010, the general condition of the ramp was very good except for low points on three of the multiple water bars that were established on the access ramp in 2007. Access to this ramp was closed off by a windrow of material at the top of the ramp, but despite this deterrent, vehicles had been driving down the old access road to gain access to the tailings delta and in doing so, the vehicle tires were creating low points on some water bars. These low points were promoting short circuiting of surface flow over the respective water bars, thereby leading to erosion on both the access road and the tailings cover where the access road reaches the delta. The three damaged water bars were repaired in 2010 by relocating material to the low points in each water bar. It appears that the windrow at the top of the ramp was improved in 2010 and that, since that time, no vehicles have driven down the road and onto the delta. Observations during the 2015 and 2020 inspections indicated that the condition of the ramp was good and that no obvious erosion of the water bars or the tailings cover has occurred (Figure 4).

The edge of the cover, where it contacts Fookes Reservoir, was inspected with a view to evaluating the degree of erosion along the shore. A nominal amount of erosion from wave action was evident along the cover edge in 2010. In particular, sand from the cover in some areas had been transported a nominal distance into the reservoir as a submerged, very narrow, thin, fan-like deposit. Photo 10 show that looking southward across the central part of the cover on September 16, 2020. Vegetation is also present along the shoreline as can be seen on the left side of this photo. In 2010, grasses and some shrubs were growing in this littoral sandy material. In 2015 and in 2020, it appears the vegetation continues to establish itself in this shoreline area and, as expected, has stabilized the edge of the sand/gravel cover. Given the size (and fetch limitation) of this reservoir, as well as the continued growth of vegetation along the delta shoreline, the risk that significant erosion will occur at the margin of the water/cover is considered negligible.

3.3 Conclusions and Recommendations

3.3.1 Inspections

No new boils or significant erosion features were observed during the 2020 inspection, which is consistent with the annual Cameco inspection reports completed between 2016 and 2019, inclusive. Notwithstanding a few localized features noted during the inspection, the conditions on the delta have stabilized sufficiently to support the transfer of properties associated with the Fookes Reservoir delta to the Institutional Control (IC) Program.

Until such time the transition to institutional control has been completed, we recommend that Cameco continue with annual inspections performed using the existing inspection protocols (see inspection checklist below).

It is our understanding that, following the transition to the IC Program, inspections are planned every five years for two cycles. Thereafter, assuming the Fookes Reservoir delta remains stable, the frequency of inspections may be reduced.

Inspection Checklist

The specific elements to be evaluated during these inspections include the following:

- Check for evidence of new tailing boils or tailings exposure due to frost action;
- Check for evidence of significant erosion of the cover material:
  - Trench along the northeast edge of the delta (sand flows, erosion of waste rock, slumping, etc.) – maintain photographic and GPS record (identify areas of concern on map).
  - Cover limit along its contact with Fookes Reservoir – maintain photographic and GPS record (identify areas of concern on map) where sand from the delta cover extends into the reservoir.
- Check for evidence of erosional features;
- Ensure erosion-protection devices are performing as expected on former north access road:
  - Waterbars (chevrons);
  - Diversion ditches; and
  - Erosion of cover adjacent to the former access road.
- Ensure earthen berms are in place to limit access to the delta.

Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

3.3.2 Piezometer Monitoring

Between 1997 and 2010, piezometric levels were quite consistent in terms of annual and seasonal trends. In addition, no boils (new or old) were observed during the tailings surface inspection completed by SRK in May 2010. In consideration of these facts, SRK (2010a) concluded there was no technical reason for continuing the collection of piezometer data and that, subject to regulatory approval, the collection of incremental piezometric data could be discontinued as of the fall of 2010. Regulatory approval to discontinue the collection of piezometer data was subsequently granted, and as a result, no incremental piezometer data was collected for review as part of the 2015 and 2020 inspections.

Considering no new boils or significant erosion features have been observed and conditions on the delta have largely stabilized, the eight operational piezometers and single non-operational piezometer should be decommissioned to prepare the associated Beaverlodge properties for the IC Program. Piezometer decommissioning will consist of removing each pneumatic piezometer cable, to the extent possible, followed by cutting off the standpipe at or just below the ground surface and then backfilling to surface with local sand and/or fine gravelly sand.

4 Marie Reservoir Delta Area

4.1 Background

During the life of mine (discussed in Sections 1.3 and 3.1), tailings were deposited in various locations, including two general locations at the Marie Reservoir: one near the west end of Marie Reservoir and a second at the east end. Tailings were delivered to the reservoir using wood stave pipelines that discharged tailings into channels cut into the natural slopes. Given the steepness of these gullies, the vast majority of the tailings flowed into the reservoir as planned, thereby forming each of the two deltas. These channels are heavily vegetated today and only very minor traces of the tailings are evident in the vicinity of these channels. The grey areas on Figure 5 illustrate the distribution of tailings in the vicinity of the Marie Reservoir delta based on studies undertaken by SRK in 1982 and 1983 (SRK, 1983). During 2014, a regulatory approved surficial gamma survey was conducted of the accessible delta areas and resulting radiation dose rates were found to meet the *Guidelines for Northern Mine Decommissioning and Reclamation* (Saskatchewan MOE 2008; ARCADIS SENES 2014).

In 1983 and 1984, as part of the approved mine decommissioning plan, the following activities were undertaken in relation to the Marie Reservoir tailings:

- Tailings near the surface of Marie Reservoir were moved to a deeper part of the reservoir; and
- Tailings deltas in Marie Reservoir were covered with waste rock.

SRK is unaware of any activities subsequent to 1984 that have been undertaken in relation to the Marie Reservoir tailings.

The last inspections of the Marie Reservoir by a geotechnical engineer prior to 2020 were completed in 2004 (SRK, 2005b) and 2015 (SRK, 2015).

4.2 Observations

Figure 5 provides a summary of the general conditions observed in 2004 and at the Marie Reservoir delta area. The observations and findings will be discussed in the sections to follow.

4.2.1 Marie Reservoir West Delta Area

Representative photos of the west delta are provided in Appendix D, Photos 29 to 34. In general, very few changes were evident at the Marie Reservoir area along the west delta in 2020 as compared to 2004 and 2015. Further comments on the area are provided below.

Most of the west delta is covered by rock fill obtained from three quarries developed immediately upslope of the delta. Small trees, shrubs and grasses are present on parts of the cover (Photos 29, 30 and 31). One of the quarries, now covered in vegetation, is visible in the foreground of Photo 29.

Consistent with previous inspections, the rock fill cover appears, in general, to be thin and the water table is close to the cover surface over large portions of the delta. In areas where the cover is thin and/or the water table is just below the cover surface, there continues to be numerous locations where fine grained particles (presumably tailings, although gamma readings from the area are acceptable) have squeezed up through the rock fill and/or can be easily "pumped" by the cyclic application of foot pressure. Salts are evident on the surface of some of these exposed tailings. Notwithstanding the presence of exposed tailings at a number of locations, the condition of the cover over the rest of the west delta is generally good.

Observations aside, gamma levels measured on the Marie Delta meet the criteria identified in the Saskatchewan *Guidelines for Northern Mine Decommissioning and Reclamation*, EPB 381 (SkMOE 2008) and support the recommendation for transition to the IC Program.

4.2.2 Marie Reservoir Catchment Area

The Marie Reservoir catchment area occupies the sloped ground between the south limit of Ace Creek catchment area III and the Marie Reservoir west delta. As discussed above, tailings were discharged from the top of the slope into a small channel about 0.3 m deep and 1 to 1.3 m wide which had been cut into the hillside. Tailings flowed down the channel and into Marie Reservoir.

The area is heavily vegetated, and part of the slope is quite steep with occasional exposures of till or colluvium. No signs of tailings were observed in the Marie Reservoir catchment area in 2015 and confirmed in 2020.

4.3 Conclusions and Recommendations

Consistent with previous assessments, the condition of the cover is generally good despite the observation that tailings have worked their way to surface in some locations due possibly to frost action combined with high water tables. As discussed above, there were no signs of tailings at the Marie Reservoir catchment area.

From a geotechnical perspective, the conditions on the delta have stabilized sufficiently to support the transfer of properties associated with the Marie Reservoir delta to the IC Program.

Inspections should be carried out prior to and following the transition to the IC Program at a frequency that matches the inspections of the Fookes Reservoir delta. The inspections should follow existing protocols (see inspection checklist below).

Inspection Checklist

The specific elements to be evaluated during these inspections include the following:

- Check for evidence of new tailing boils or tailings exposure due to frost action;
- Check for evidence of significant erosion of the cover material; and
- Check for evidence of erosional features.

Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

5 Fookes and Marie Reservoir Outlet Structures

5.1 Background

Close-out measures at the Beaverlodge mine in the early 1980's included covering of tailings beaches in Fookes and Marie Reservoirs and, in 1985, stabilization measures at the outlets at Fookes and Marie Reservoirs (Figure 1) in an effort to maintain minimum water outlet levels 1 m above the highest level of uncovered tailings.

During the 1986 spring-melt, flows through the Marie Reservoir outlet were higher than anticipated (due apparently to glaciation effects in the spillway) and this resulted in substantial erosion of the spillway channel and a 0.15 m drop in the lake level. As a consequence of this experience, the outlets from both Fookes and Marie Reservoirs were upgraded to provide improved long-term stability. The spillway invert controlling reservoir levels were set at elevations 2,824.0 and 2,815.2 m (based on the top of concrete in the spillway section of Stavely Dam as elevation 2,814.4 m, i.e. a local datum) in Fookes and Marie Reservoirs, respectively. These elevations are approximately 1 m above the elevation down to which the waste rock cover was placed on the tailings beaches. These elevations represent an increase of about 2 m and 1 m in the outlet levels of Fookes and Marie Reservoirs, respectively, compared with what they apparently were prior to mine development. The general design objectives for the outlet structures were as follows:

- Prevent piping into the coarse embankment fill by constructing an embankment with a low permeability upstream zone (Marie Reservoir outlet);
- Enhance the erosion resistance of the spillway in the long term (both outlets);
- Raise the embankment to reduce the potential for overtopping (Fookes Reservoir outlet and the northern arm of Marie Reservoir outlet); and
- Prevent erosion of the embankment in the event that glaciations of the spillway results in overtopping of the embankment (both Fookes and Marie Reservoirs).

These two spillways were upgraded in 1987 in accordance with the objectives noted above. The work was completed under SRK supervision and direction between late July and early September 1987. Design and as-built details are provided in the following SRK reports:

- Design Report No. 53602/1, Upgrading of Outlet Structures at Fookes and Marie Lakes for Beaverlodge Mine Close-Out, July 1986; and
- Construction Report No. 53603/1, Upgrading of Outlet Structures at Fookes and Marie Lakes for Beaverlodge Mine Close-Out, January 1988.

Both spillway structures consist of a rip-rap lined open channel (with trapezoidal cross section) discharging into a rip-rap lined stilling basin. The rip-rap lining in both the spillway channels and the stilling basins was intruded with grout for added erosion protection; however, the rip-rap in the spillway was designed to be stable in the absence of grout intrusion. The spillways are capable of passing a 500-year flood event with a depth of 0.3 m (680 L/sec) and 0.35 m (760 L/sec) at the entrances of the

Fookes and Marie Reservoir outlet spillways, respectively. In the event of embankment overtopping, the coarse rip-rap will resist erosion of the upper surfaces and downslope embankments.

Subsequent to the remediation of the Fookes Reservoir delta in 1997, inspections of the outlet spillways at the Fookes and Marie Reservoirs were undertaken by SRK on September 11, 1998; September 10 and 12, 2001; June 14, 2004; August 28, 2007; May 27, 2010 and June 8, 2015. The results of each of these inspections are summarized in SRK reports to Cameco in 1998, 2001, 2005, 2008, 2010b and 2015. The timing of the 2020 inspection was consistent with the schedule defined in 2015 (SRK, 2015).

Following the 2010 inspection, Cameco has conducted annual inspections of the Fookes and Marie Reservoir Outlets. Those inspection results have been provided in Cameco's Annual Reports each year.

5.2 Observations

5.2.1 Fookes Reservoir Outlet Spillway

Representative photos of the Fookes Reservoir outlet spillway are provided in Appendix B, Photos 15 through 22. Changes in the Fookes Reservoir Spillway entrance over time are shown in Figure 6.

Observations suggest that the condition of the grout-intruded rip-rap along the length of the Fookes Reservoir outlet spillway in 2020 was very similar to its condition in 2015. The extent of the ice-jacking, with its most significant displacements located at the upper part of the spillway, i.e. on the sides of the spillway within 5 to 6 m of the spillway entrance, presented no obvious changes. Photo 17, looking upstream, and Photo 19, looking downstream along the outlet structure, show displaced slabs of grout-intruded rip-rap on both sides of the outlet spillway. Figure 6 provides an indication of how ice-jacking has progressed based on photos from inspections since 2001. The base of the channel does not show any signs of significant displacement.

Compared to the upper part of the spillway (Photos 17 through 19), the middle and lower parts of the spillway (Photos 20 and 22) remain in much better condition. These areas have numerous cracks but there are no obvious changes to the cracks since 2015, nor is there significant evidence of ice-jacking. Vegetation continues to establish a foothold in the cracks in the grout-intruded rip-rap along the spillway (Photos 15 to 22).

A significant volume of water was ponded in the stilling basin at the time of the inspection. Consistent than with the 2010 and 2015 inspections, water was escaping the stilling basin under the shotcrete on the left side of the pool rather than via the endpoint at its extreme downstream end. This condition is not expected to significantly impact the structure's integrity.

Figure 6 demonstrates that, over time, vegetation is thickening along the sides of the spillway.

5.2.2 Marie Reservoir Outlet Spillway

Representative photos of the Marie Reservoir outlet spillway are provided in Appendix C, Photos 23 through 28.

Observations indicate the Marie Reservoir outlet spillway has, in general, changed little since 2004. The grout-intruded rip-rap is relatively intact except near the spillway entrance where one large block slab and several smaller ones on the right side of the spillway (looking downstream) continued to displace incrementally due to ice-jacking (Photos 23 to 25). The ice-jacking has been evident since 2004 but, as shown in Figure 7, one of the ice-jacked slabs, which was “supporting” another slab in 2010, appears to have settled noticeably by 2015 and this was again confirmed in 2020.

As in the previous inspections, cracks observed in the grout in the middle and lower parts of the spillway are more obvious on the left side of the spillway. The extent of this cracking diminishes in a downstream direction. The cracks are as wide as about 1.3 cm but are typically about 0.2 to 0.3 cm in width. Vegetation continues to establish itself in many of these cracks. Consistent with all inspections since 1998, other than 2015, no spongy ground was observed on the left side of the spillway. Furthermore, the clayey silt observed in 2015 was absent in the 2020 inspection (Photo 27), possibly due to the significant flows in the spillway at the time of the 2020 inspection.

The beaver dam observed at the entrance to the Marie Reservoir outlet spillway in May 1997 was removed prior to the 1998 inspection. It appeared during the 1998 inspection that the beavers were starting to build another dam but, by the time of the 2001 inspection, only some remnant branches were evident. No beaver dam was evident at the entrance to the outlet spillway in 2004, 2007, 2010 or 2015. However, in 2020, a low beaver dam was observed at the entrance to the spillway (Photos 23 and 24). Cameco also noted to presence of the beaver dam during their annual inspection.

Figure 7 demonstrates that, over time, vegetation is thickening along the sides of the spillway.

5.3 Conclusions and Recommendations

The grout that was intruded into the rip-rap in 1987 is meant to serve as a binding agent to increase the effective block size of the rip-rap, allowing it to more effectively resist erosion during peak flood events. The cracking and displacement of the grout-intruded rip-rap within the two spillways was anticipated in their original designs and does not affect the performance of either outlet spillway. Additional cracking and ice-jacking are anticipated over time, but the condition of the two outlet spillways continues to be satisfactory and is expected to remain so moving forward.

From a geotechnical perspective, the conditions at the outlet spillways have stabilized sufficiently to support the transfer of associated properties to the IC Program.

Inspections should be carried out prior to and following the transition to the IC Program at a frequency that matches the inspections of the Fookes Reservoir delta. The inspections should follow existing protocols (see inspection checklist below).

Inspection Checklist for Outlet Structures

The specific elements to be evaluated during these inspections include the following:

- Check the condition of the spillway channel, with a view to confirming the grout intruded rip-rap is still in place;
- Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event; and
- Document conditions with photographs.

Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

6 Ace Creek Catchment Area III

6.1 Background

During the life of mine (discussed in Section 1.3), tailings were deposited in various locations, including the Ace Creek catchment areas, as a result of spills which occurred along the tailings discharge pipeline. The grey areas on Figure 5 illustrate the distribution of tailings in the vicinity of the Ace Creek catchment areas based on studies undertaken by SRK in 1982 and 1983 (SRK, 1983).

The Ace Creek catchment areas comprise three “subareas” (I, II and III) situated south of the Ace stope area. Catchment area I is about 1 km long and up to about 400 m wide. Ace Creek runs though catchment area I. The southern end of catchment area I, which rises to the south, is connected with catchment area II, which occupies an area about 200 m long and up to 50 m wide. The southern end of catchment area II is connected with catchment area III, which occupies a relatively flat area approximately 150 m long and up to 70 m wide. Catchment areas I through III coincide generally with the pipeline route to Marie Reservoir.

In 1983 and 1984, as part of the approved mine decommissioning plan, tailings spilled along the Ace Creek catchment areas were either moved underground, covered (with waste rock) or, if the location was already stable, left as is.

SRK is unaware of any activities subsequent to 1984 that have been undertaken in relation to the Ace Creek catchment areas.

The most recent inspections of the Ace Creek catchment areas by a geotechnical engineer prior to 2020 were completed in 2004 (SRK, 2005b) and 2015 (SRK, 2015). Cameco requested the Ace Creek catchment area III be included in the 2020 geotechnical inspections.

6.2 Observations

Figure 5 provides a summary of the general conditions observed at Ace Creek catchment area III. In general, very few changes were evident at catchment area III in 2020 compared to 2004 and 2015. Representative photos are provided in Appendix E, Photos 35 to 41. Further comments on the area are provided below.

Catchment area III is largely covered by waste rock (Photos 35 to 39). Water was ponding on the west side of catchment area III (Photos 35, 36 and 38), near its discharge point at the southwest limit of the area.

Much of the waste rock cover in catchment area III is performing acceptably based on the general absence of exposed tailings. However, there are some notable exceptions, as discussed below.

East (Photo 40 and 41) and north (Photo 39) of the pond are a significant zone where the cover is relatively thin (measured in 2005 at one location to be 5 cm) and the water table is very close to the surface of the waste rock cover. As a consequence, there continues to be numerous locations within this zone where tailings have squeezed up through the waste rock cover and/or can be easily "pumped" by the cyclic application of foot pressure.

At the northeast corner of catchment area III, the cover is relatively thin (20 to 25 cm). Freeze-thaw cycles in this area over the past 20 years have led to the formation of isolated occurrences of patterned ground and the formation of cracks which expose tailings.

Over the rest of the cover, there are occasional small exposures of tailings that have come up though the waste rock. One of these exposures occurs immediately adjacent to a bedrock outcrop. A comparison of the exposed tailings in 2015 with the same tailings in 2020 (Photo 39) indicate there has been no obvious change in the extent of exposed tailings.

Photo 40 is looking east along the eastern boundary of the Ace Creek catchment area III. Small depressions that coalesced into one another were observed with some tailings exposed in this area.

6.3 Conclusions and Recommendations

The results of the 2020 assessment of Ace Creek catchment area III are generally consistent with the 2004 and 2015 inspections and can be summarized as follows:

- Much of the waste rock cover in catchment area III is performing acceptably based on the general absence of exposed tailings.
- As noted in the SRK (2015) report, the waste rock cover appears, in some areas, to be relatively thin. In these areas, tailings have worked their way to surface due to either frost action (cryoturbation) and/or high water tables. This was observed again during the 2020 inspection.
- Water continues to pond at Ace Creek catchment area III; the larger of the two ponds is at the south end of this area, and its footprint appears to vary from month to month and year to year. Field evidence related to previous pond levels suggest that the south pond does, on occasion, spill southwards towards Marie Reservoir. It is not clear that the north pond has spilled off the surface of catchment area III, but available topographic data suggests that the natural flow direction of water in both ponds would be towards Marie Reservoir.

From a geotechnical perspective, the conditions at catchment area III have stabilized sufficiently to support the transfer of properties associated with the Ace Creek catchment area III to the IC Program.

Inspections should be carried out prior to and following the transition to the IC Program at a frequency that matches the inspections of the Fookes Reservoir delta. The inspections should follow existing protocols (see checklist below).

Inspection Checklist

The specific elements to be evaluated during these inspections include the following:

- Check for evidence of new tailing boils or tailings exposure due to frost action;
- Check for evidence of significant erosion of the cover material; and
- Check for evidence of erosional features.

Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

7 Ace Stope Area

7.1 Background

An inspection was completed in 1983 by SRK. Based on the findings contained in the 1983 report, and the improved understanding of the location of the approximate stope backs, a new (optimized) remediation plan was developed that focused on covering the higher risk areas above the stope backs with berms comprised, in part, of durable coarse waste rock and broken concrete. Based on the available information, SRK identified higher probability areas for possible future subsidence, and recommended covering, paired with visual monitoring of the performance of the remediated areas, as the most appropriate approach to mitigating risk associated with potential further subsidence (SRK, 1983).

Since 1983, localized subsidence has occurred at two locations on the Ace Mine property. Based on the SRK (2013a) report, subsidence was discovered in 2013 which prompted Cameco to commission a review of the subsidence potential at the Ace Mine. SRK completed a site review of the two subsidence areas at the Ace Mine site in early October 2013. In mid-October 2013, a sand cover was placed over subsidence areas in accordance with SRK's recommendations. Post coverage, circa June 2014, it was discovered that some of the sand had begun to erode due to surface runoff, and that future remediation would require a more coarsely graded material so that washout does not occur (SRK, 2015d).

This led to a remediation plan in 2015 that was based on the placement of fill to mitigate the risks associated with potential future subsidence. The SRK (2015d) crown pillar report discussed the assessment work and provided additional recommendations for the Ace Stope area. The recommendations included the continuation of (minimum annually) monitoring of the area by Cameco using the Geotechnical Inspection Checklist. The checklist focuses on visual monitoring, looking for the development of tension cracks and/or any observable changes in ground elevation (developing depressions) in the vicinity of the crown pillar area at specific survey points.

In 2016, implementation of the crown pillar remediation included partial construction of a North Berm over the 208 Stope and a portion of the 105 Stope; and construction of a South Berm over the 103 Stope and a portion of the 201 Stope (SRK, 2017b).

Both the Ace Subsidence Remediation (South and North Berms) and the Ace 7 105#2 Vent Raise Closure Cap have been constructed in accordance with the approved designs (SRK, 2017a and SRK, 2018). The final configuration reduces the risk of surface expression should there be additional failure of the crown pillars in this area and eliminates any risks associated with access to the Ace 7 105#2 Vent Raise opening.

To complete the remediation of the site, the closure design for Vent Raise 105 was developed (SRK, 2019a). A unique solution was required as installation of a reinforced concrete cap in accordance with The Mines Regulations, 2003 or installation of a stainless-steel cap would not accommodate completion of the North Berm. The selected design consisted of sealing the vent raise opening with competent boulders and waste rock (engineered rock cover). Specifically, this consisted of wedging a large conical and durable boulder in the vent raise opening, placement of additional large boulders in front (to the south) and, directly above the wedged boulder, placement of a coarse waste rock layer followed by a transition waste rock layer and, lastly, a crushed rock/gravel cover layer consistent with the cover material for the North Berm. The as-built report prepared by SRK in 2019 provides the background on the remedial work that has been carried out at the Ace Stope Area.

Since 2015, Cameco has conducted visual inspections on an annual basis following the Geotechnical Inspection Checklist.

7.2 Observations

Figure 8 show the Ace Subsidence Remedial Work that was completed. Photos 42 to 44 in Appendix F provide an overview of the current conditions of the Ace Stope Area. The waste rock cover is still intact with no significant tension cracks or observable changes at ground elevation in this area. The visual monitoring locations are summarized in Table 2.

Table 2: Visual Monitoring Location Recommendations for Ace Stope Area

Survey Point	Position	Elevation (approx.)
8	Zone:12 V 6605203, 643484.7	294 m
11	Zone:12 V 6605272, 643600.5	297 m
13	Zone:12 V 6605272; 643580.8	296 m
15	Zone:12 V 6605281; 643591.5	298 m
21	Zone:12 V 6605256; 643514	294 m
26	Zone:12 V 6605301; 643575.8	297 m

7.3 Conclusions and Recommendations

The results of the 2020 assessment of the Ace Stope Area can be summarized as follows:

- The waste rock cover on the Vent Raise 105 and stope area is performing acceptably; and
- No signs of subsidence or tension cracks are visible along the crushed rock cover layer.

From a geotechnical perspective, it would be reasonable for Cameco to transfer the properties associated with the Ace Stope Area to the IC Program.

Until such time the transition to institutional control has been completed, we recommend that Cameco continue with annual inspections performed using the existing inspection protocols, i.e. the Geotechnical Inspection Form and Checklist shown below.

It is our understanding that, following the transition to the IC Program, inspections are planned every five years for two cycles. Thereafter, assuming the Ace Stope area remains stable, the frequency of inspections may be reduced.

Inspection Checklist for the Ace Stope Area

The specific elements to be evaluated during these inspections at the visual monitoring locations include the following:

- Check for signs of tension cracks along the stope cover material;
- Check for signs of visible depressions along the stope cover material;
- Check for signs of slumping along the slope cover material; and
- Check for signs of erosional features along the Ace Stope area.

Involvement of a geotechnical engineer would not be required except in the unlikely event that geotechnical concerns arise.

8 Bolger Pit and Drainage Channel

8.1 Background

Remedial work completed at the Bolger Pit site from 2014 to 2016 included the excavation of a channel through the existing Bolger Waste Rock Pile and the relocation of the excavated waste rock to the Bolger Pit. The intent of this work was to improve water quality, specifically uranium concentrations, in both Zora Creek and Verna Lake and to re-establish a more natural Zora Creek flow path. An overview of the flow path reconstruction of the Bolger Waste Rock Pile and as-built flow channel is shown in Figure 9.

In the Design Report (SRK, 2014), it was recommended to complete a geotechnical inspection in each of the first two years following construction. Subsequently, SRK completed geotechnical inspections in 2017 (SRK, 2017c) and 2018 (SRK, 2019) of the reconstructed Zora Creek flow path. Both the 2017 and 2018 inspections revealed there were no immediate or significant areas of concern with regards to the performance or geotechnical stability of the reconstructed flow path. Continued monitoring of water quality and the potential presence of accumulated sediment were recommended. In addition, it was recommended that the next geotechnical inspection occur in 2023, or earlier if requested by Cameco (SRK, 2019). Cameco requested a geotechnical inspection for the area be completed in 2020 to align with other geotechnical inspections at the Beaverlodge site. The observations and recommendations following this inspection are summarized in the sections below.

In years when SRK has not performed a geotechnical inspection of the Bolger Stream Reconstruction Project, Cameco has conducted annual visual inspections and provided a summary in the Beaverlodge Annual Report.

As previously noted, Cameco has continued to monitor water quality in the Drainage Channel and a brief summary is provided below in order to augment the geotechnical inspection. Upstream of the Drainage Channel (station ZOR-01), total dissolved solids (TDS) concentrations have remained stable with an annual average value hovering below 150 mg/l since 2013 (Figure 10). At the outlet of the Drainage Channel, TDS annual average concentrations show a peak during channel construction in 2015 and have since declined to hover around 200 mg/l (Figure 10). Additionally, Figure 11 shows the annual average uranium concentrations collected at the channel outlet (station ZOR-02) through the various phases of pre-construction, construction and post construction. Also provided are general trend lines showing the relative improvement in water quality post-construction.

Figure 10: Water Quality Monitoring Data in the Drainage Channel

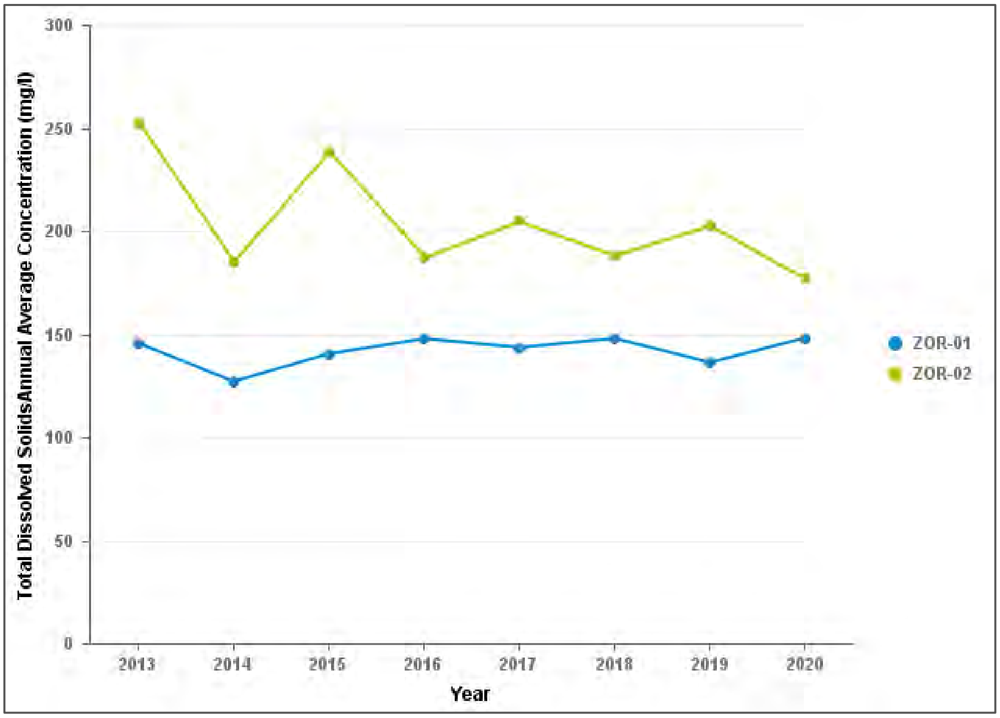
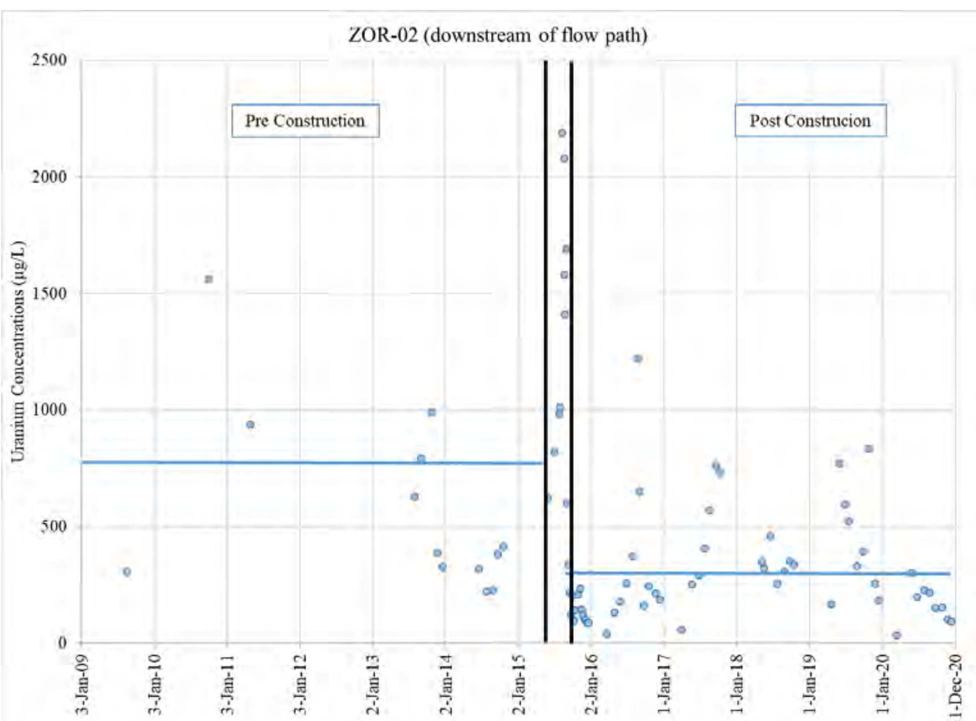


Figure 11: Annual Average Uranium Concentrations



8.2 Observations

Figure 8 (SRK, 2017) show the plan layout and overview of the flow path reconstruction at the Bolger Pile. Photos 45 to 55 in Appendix G show the photos of the Bolger Pit and the Drainage Channel. The areas included in the Geotechnical Inspection Form and Checklist were used as guidance for the inspection at this site. Photo 46 to 47 show the Bolger Pit where the berms are still intact.

8.2.1 Access Roads

The reduced road width promotes decreased speeds prior to driving down towards the excavated channel.

Recommendations:

- No recommendations, as the access roads are in good condition.

8.2.2 Channel Inlet

A beaver dam and heavy vegetation were observed at the inlet of the channel restricting flow from Zora Lake into the channel (Photos 48). As stated in the 2017 Geotechnical Inspection Report (SRK, 2017c), based on discussions with Cameco, it is understood that the beaver dam was present well prior to channel excavation. The beaver dam corresponds to the start of the Drainage Channel flow path. The estimated width at this location is 10 m with an average depth of 1.7 m. The beaver dam is intact but, in the event it fails suddenly, it could have an impact on the condition of the Drainage Channel. Due to the robustness and size of rock used to form the channel it is a more likely that a sudden failure of the beaver dam will result in erosion of the area immediately adjacent to the beaver dam and the area downstream of the drainage channel prior to entering Verna Lake.

Recommendations:

- No maintenance is required at the channel inlet at this time. The channel inlet will be re-inspected by Cameco during annual inspections.

8.2.3 Channel Side Slope Crest

The vegetation growth was sparse on the slope crest. Overall, the slope crest was in good condition and there are no geotechnical concerns. Current conditions of the slope crest are shown in Figure 49.

Recommendations:

- No maintenance required at this time.

8.2.4 Channel Side Slopes

As stated in the As-Built Report (SRK, 2016), the lower portion of the channel slope from approximately Station 0+015 to Station 0+060 was steeper than the design slope of 1.5H:1V. This configuration was not deemed a geotechnical stability concern, which is discussed in the report; however, it was recommended to inspect this area as part of the geotechnical inspection. This area was inspected and there were no apparent changes since 2017. Sparse vegetation on the side slopes at the time of inspection (Photo 53).

Photos 50 and 51 show the berms along the Drainage Channel at the ramp in the area where the access road crosses the channel. The berms on both the northeast and southern sides of the Drainage Channel are intact. Photos 52 and 53 were taken from the road that crosses the Drainage Channel. It shows the wide flow path and the robust rock fill that was used for the construction of this Drainage Channel. The rock fill is expected to mitigate the impacts of flooding associated with a potentially sudden failure of the beaver dam.

Recommendations:

- No maintenance required at this time.

8.2.5 Channel Base

Overall, vegetation was observed to be sparse throughout the channel with the exception of the inlet (Photo 49). At the time of inspection, this heavier vegetation growth was not restricting channel flow and is therefore not a concern related to channel performance. No sediment accumulation was observed throughout the channel (Photos 52 and 53). There are no geotechnical related concerns to the occurrence of sediment.

Recommendations:

- No action is required at this time. In the case that during Cameco's routine water quality monitoring of the channel, total suspended solids (TSS) is identified as a concern then it may need to be reassessed as it may be indicative of erosion.

8.2.6 Channel Outlet

The outlet of the Drainage Channel is shown in Photos 54 and 55. Vegetation covers the area surrounding the channel and no fines were identified within the channel.

Recommendations:

- No maintenance is required at this time.

8.2.7 Bolger Pit

As part of the channel reconstruction the Bolger Pit was backfilled with waste rock was inspected and there were no geotechnical concerns (Photos 45 to 47). The pit walls and berms at the pit are intact.

Recommendations:

- No maintenance is required at this time.

8.3 Conclusions and Recommendations

The results of the 2020 assessment of the Bolger Pit and the Drainage Channel can be summarized as follows:

- The berms along the Drainage Channel are intact; and
- The condition of the beaver dam should be noted during future inspections. Although the beaver dam does not impact the geotechnical stability of the channel; should there be a global failure of the beaver dam, it is likely that scour of the channel will occur as well as sedimentation loading downstream. Such failure will not result in instability of the channel, but maintenance may be required.

From a geotechnical perspective, it would be reasonable for Cameco to transfer the properties associated with the Bolger Pit and the Drainage Channel to the IC Program.

Until such time the transition to institutional control has been completed, we recommend that Cameco's Qualified Person continue with annual inspections using the Field Inspection Form, Channel Inspection prepared specifically for the reconstructed Bolger flow path (Appendix I). Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

It is our understanding that, following the transition to the IC Program, inspections are planned every five years for two cycles. Thereafter, assuming the reconstructed Bolger flow path remain stable, the frequency of inspections may be reduced.

9 Hab and Dubyna Area

9.1 Background

Figures 12 and 13 show the locations of the Hab and Dubyna areas, respectively, where crown pillar site investigations were conducted. From the review and evaluation of historic records (SRK, 2015a), the Dubyna and Hab sites were found to have crown pillars that were relatively near surface and were therefore examined further. A five-year period of visual monitoring of the Hab and Dubyna areas was recommended by SRK using the Geotechnical Inspection Checklist. The checklist focuses on visual monitoring, looking for the development of tension cracks and/or any observable changes in ground elevation (depressions developing) in the vicinity of the crown pillar area at specific survey points. Cameco does annual inspections following the Geotechnical Inspection Checklist. These visual monitoring locations recommended by SRK are summarized in Table 3 and Table 4 and are shown in Figures 12 and 13. It is important to note that some areas identified with the thinnest estimated crown pillar thickness are contained within former open pits that have been partially filled with waste rock. If the crown pillars were to fail below the pit area, surface expression in the waste rock backfill would likely occur, however is expected to be minor. Therefore, the residual safety consequence for crown pillar failure at these remote locations is expected to be low.

Table 3: Visual Monitoring Location Recommendations for Hab

Location	Position	Elevation (approx.)	Comment
HAB039-01	Zone:12 V 645272, 6612203	408 m	Near the edge of the mine waste backfill.
HAB039-02	Zone:12 V 645339, 6612234	415 m	Covered by mine waste backfill in the pit.
HAB039-03	Zone:12 V 645384, 6612251	419 m	Covered by mine waste backfill, near the edge of the pit rim.
HAB039-04	Zone:12 V 645373, 6612211	408 m	Approximately above the 2nd level workings.
HAB039-05	Zone:12 V 645298, 6612178	403 m	Approximately above the 2nd level workings.

Table 4: Visual Monitoring Location Recommendations for Dubyna

Location	Position	Elevation (approx.)	Comment
DUB-01	Zone:12 V 647946, 6608477	339 m	In mine waste backfill.
DUB-02	Zone:12 V 647973, 6608480	339 m	Near edge of waste rock backfill.
DUB-03	Zone:12 V 647997, 6608487	333 m	Close to lake.

9.2 Observations

A handheld GPS was used to locate these positions at the Hab and Dubyna areas in order to complete the visual monitoring. Figures 11 and 12 show the locations relative to the sites. Photos 56 to 67 in Appendix H show the photos of the Hab and Dubyna areas that were identified for monitoring. Orange ribbons were located at some of the monitoring sites from previous investigations.

Photos 56 to 62 show the monitoring locations at the Hab area. No evidence of significant tension cracks or observable changes in ground elevation was observed at this area.

Photos 63 to 67 show the monitoring locations at the Dubyna area. No evidence of significant tension cracks or observable changes in ground elevation was observed at this area. However, minor surface depressions were identified in close proximity to the DUB-01 location (Photo 65).

9.3 Conclusions and Recommendations

The results of the 2020 assessment of the Hab and Dubyna Areas:

- All the visual monitoring locations were identified with a handheld GPS; and
- No evidence of significant tension cracks or observable changes in ground elevation at these locations was identified.

From a geotechnical perspective, it would be reasonable for Cameco to transfer the properties associated with the Hab and Dubyna Areas to the IC Program.

Until such time the transition to institutional control has been completed, we recommend that Cameco's Qualified Person continue with annual inspections using the Geotechnical Inspection Form and Check List prepared specifically for the Hab and Dubyna Areas (shown below).

It is our understanding that, following the transition to the IC Program, inspections are planned every five years for two cycles. Thereafter, assuming the Hab and Dubyna areas remain stable, the frequency of inspections may be reduced.

Inspection Checklist for the Hab and Dubyna Areas

The specific elements to be evaluated during these inspections at the visual monitoring locations include the following:

- Check for signs of tension cracks along surface;
- Check for signs of visible depressions along surface; and
- Check for signs of slumping along surface.

Involvement by a geotechnical engineer should not be required except in the unlikely event that significant geotechnical concerns arise.

10 Conclusions

The observations from the 2020 inspection have been assessed relative to the observations from past inspections, with a focus on changes since the 2015 SRK inspection and the annual inspections by Cameco from 2016 to 2019, inclusive. Based on this assessment, SRK has concluded that these sites are stable and are expected to remain so in the future. It is SRK's opinion, therefore, that the conditions at the areas noted above are appropriate for final close out and a transfer to institutional control.

Until such time the transition to institutional control has been completed, we recommend that Cameco continue with annual inspections performed using the existing inspection protocols. Involvement by an external geotechnical engineer would not be required except in the unlikely event that geotechnical concerns arise. Examples of observations which could warrant potential involvement by a qualified geotechnical engineer are as follows:

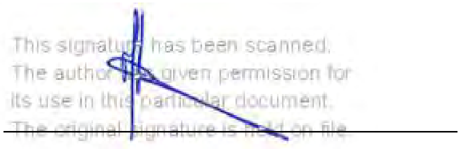
- New boils or significant cover erosion at the Fookes Reservoir Delta, the Fookes and Marie Reservoir outlet structures, the Marie Delta Area or Ace Creek Catchment Area III;
- Significant instability at the Bolger Pit or significant erosion of the Drainage Channel or Reservoir spillways; and
- Potential development of tension cracks and observable changes in ground elevation at the Ace Stope, Hab or Dubyna areas,

It is our understanding that, following the transition to the IC Program, inspections are planned every five years for two cycles. Thereafter, assuming these sites remain stable, the frequency of inspections may be reduced. This plan for future inspections is appropriate for evaluating the long-term performance of these features.

The person or persons (Qualified Persons in some instances) performing these inspections should use the 2020 Geotechnical Inspection Report and the inspection checklists as the basis for future inspections. A table summarizing the inspection requirements for each of the sites covered by this report is provided in Appendix J.

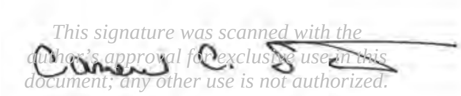
Closure

This report, 2020 Geotechnical Inspection Report Decommissioned Beaverlodge Mine/Mill Site, was prepared by



Alida Hartzenberg, MSc.
Consultant – Rock Mechanics

and reviewed by



Cam Scott, PEng
Principal Consultant

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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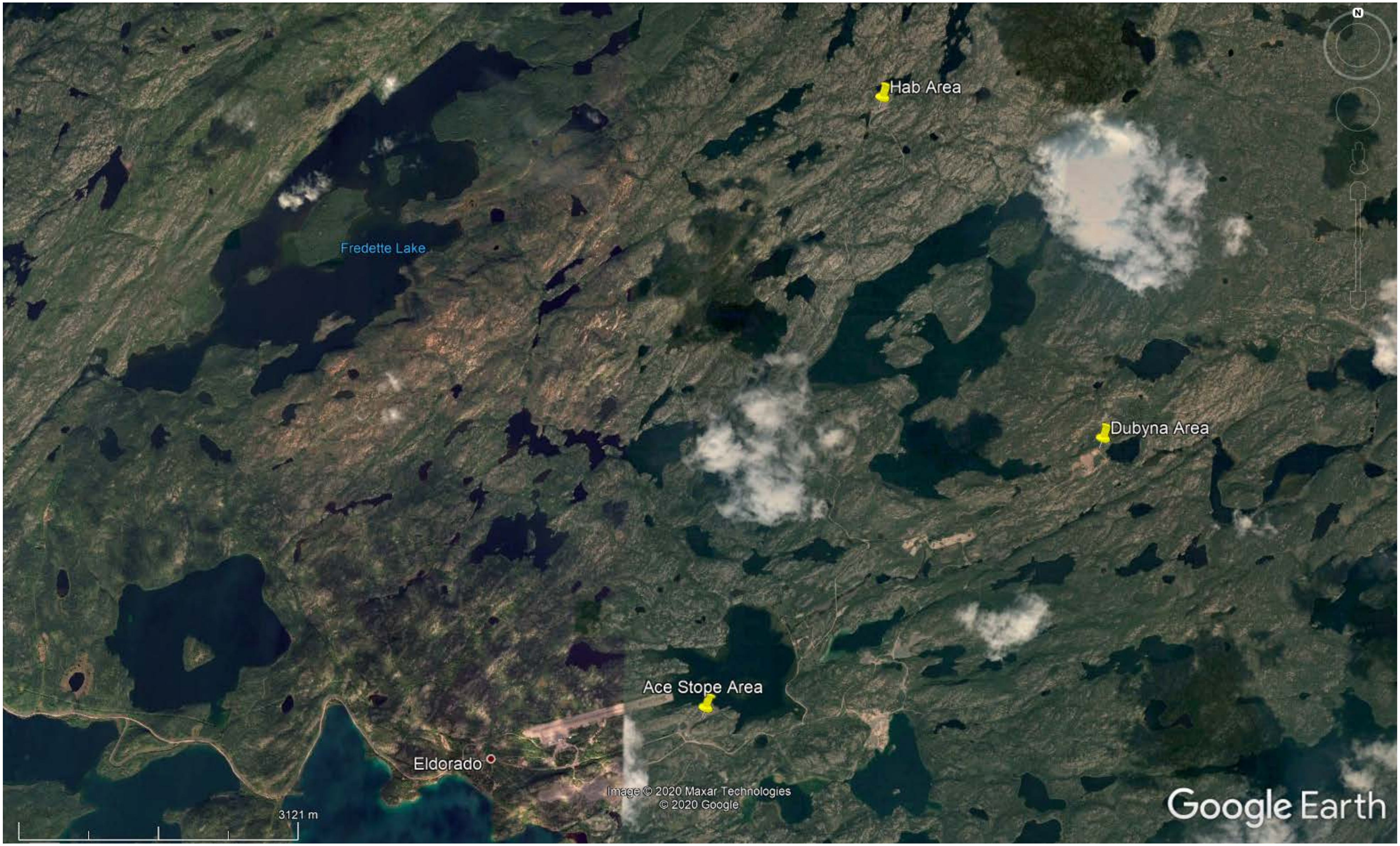
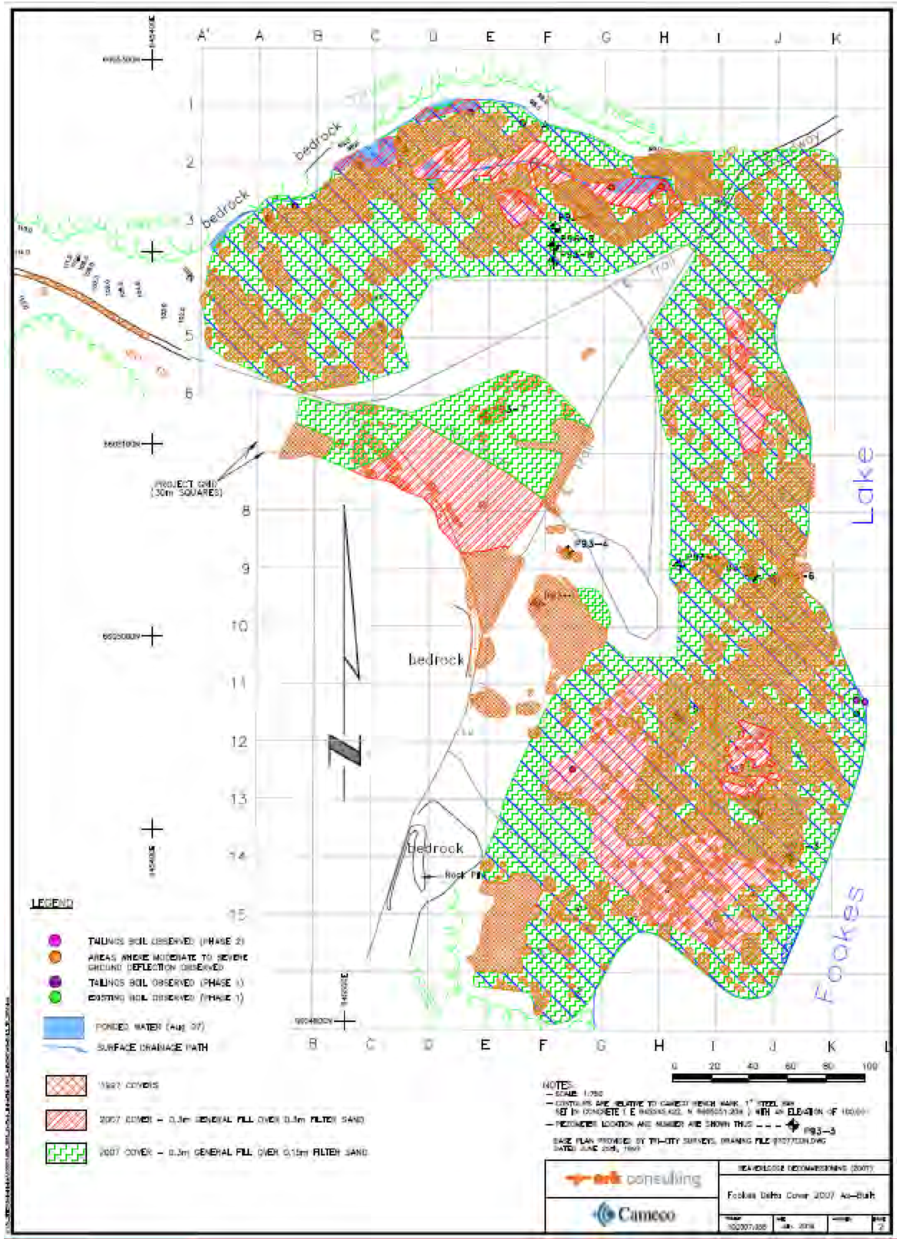
Figures

srk consulting	Cameco	2020 Geotech Inspection **General Site Layout Map**
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 / Approved: CCS / Figure: 1



srk consulting	Cameco	2020 Geotech Inspection **Location of Hab and Dubyna Areas**
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 / Approved: CCS / Figure: 2



srk consulting

Cameco

2020 Geotech Inspection

Extent of the Cover Placement at the Fookes Reservoir Delta

Job No: 1CC007.067

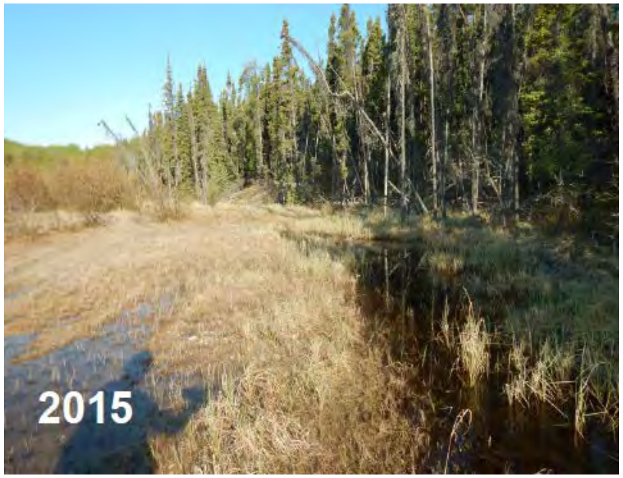
Filename: BL_1CC007.067

Beaverlodge Mine Site

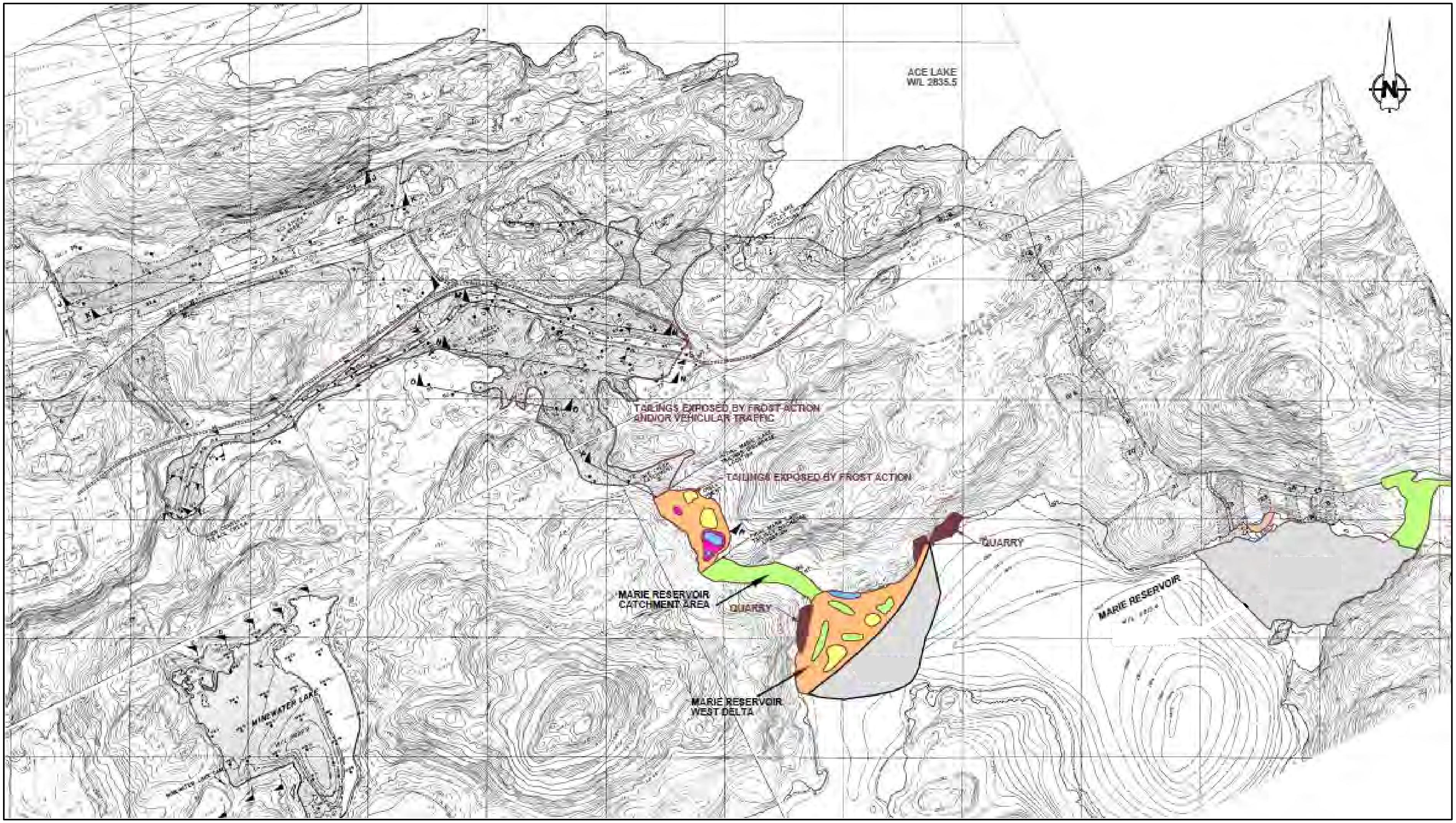
Date: October 2020

Approved: CCS

Figure: 3



srk consulting	Cameco	2020 Geotech Inspection
		Changes in Vegetation at Fookes Reservoir Cover Over Time
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 · Approved: CCS · Figure: 4



LEGEND
- WASTE ROCK COVER OVER TAILINGS
- WASTE ROCK COVER (THIN) SOME TAILINGS EXPOSED
- UNCOVERED TAILINGS
- TREES
- SWAMP/WETLAND WITH PONDED WATER
- PONDED WATER
- DRY POND
- ACCESS ROAD

0 50 100 150 200 250
Scale in Metres

srk consulting

Cameco

2020 Geotech Inspection

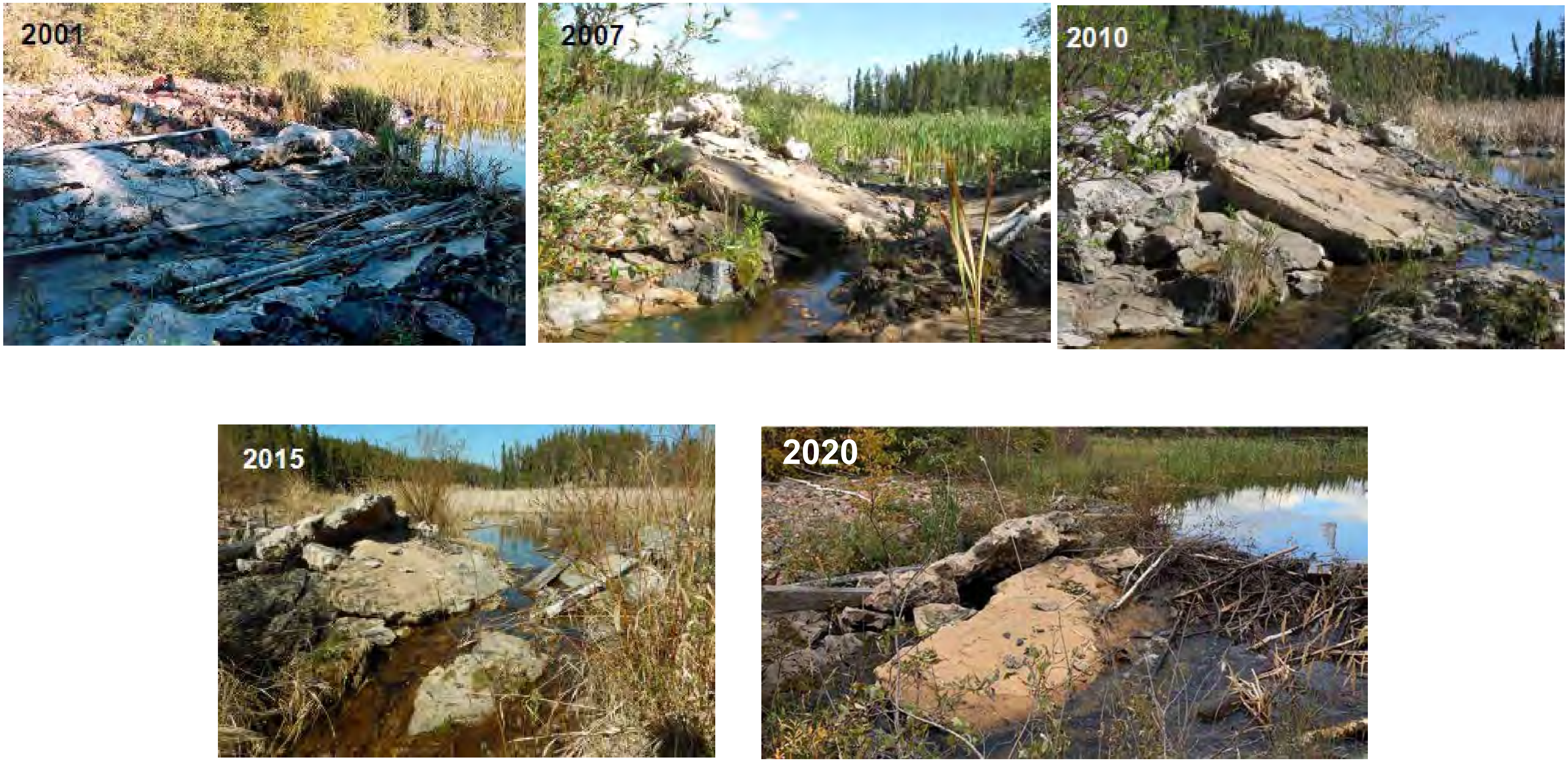
Cover Map Based on 2015 Assessment

Job No: 1CC007.067
Filename: BL_1CC007.067

Beaverlodge Mine Site

Date: October 2020
Approved: CCS
Figure: 5

srk consulting	Cameco	2020 Geotech Inspection **Changes in Fookes Reservoir Outlet Spillway Over Time**
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 · Approved: CCS · Figure: 6



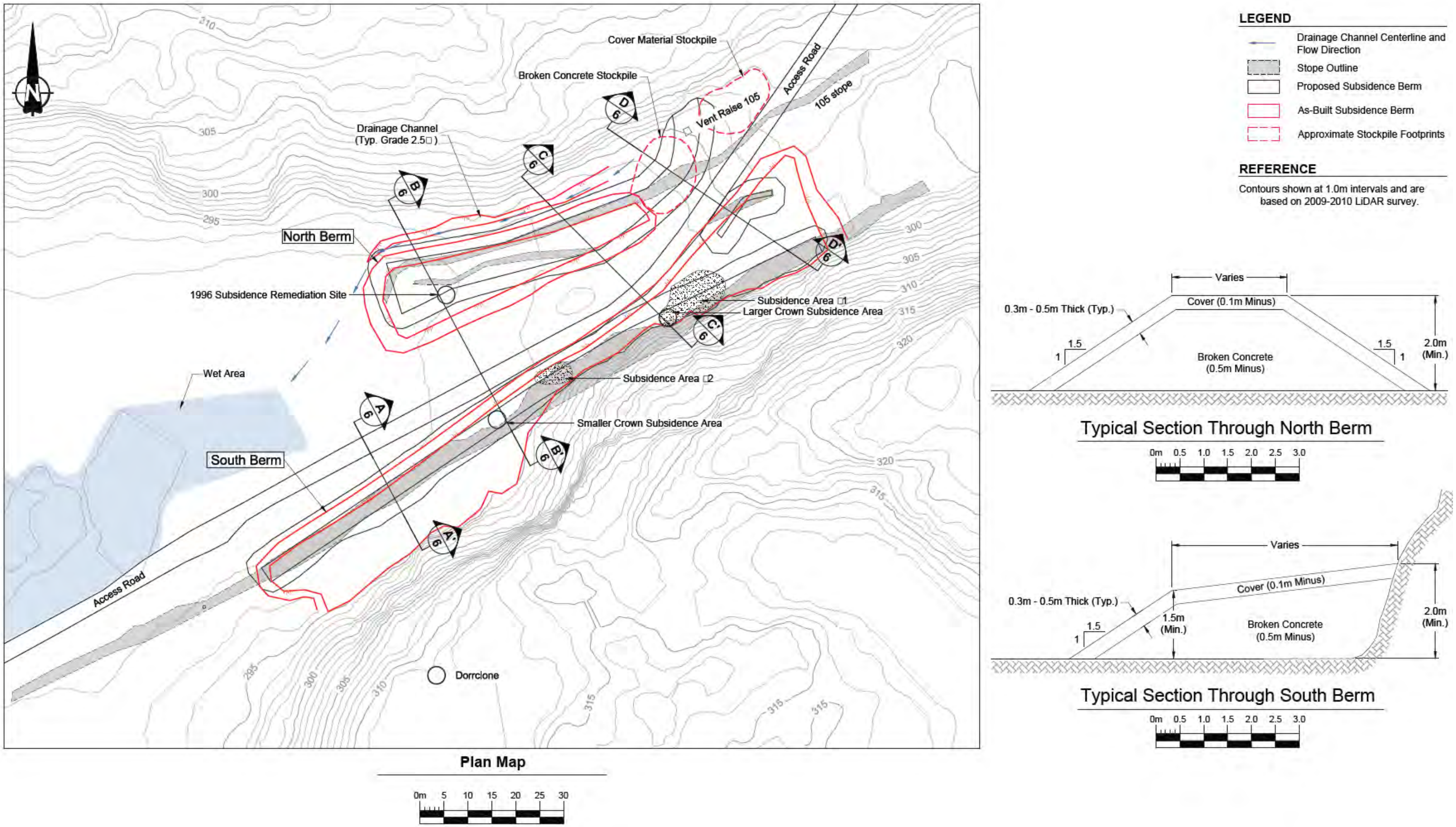
srk consulting

Cameco

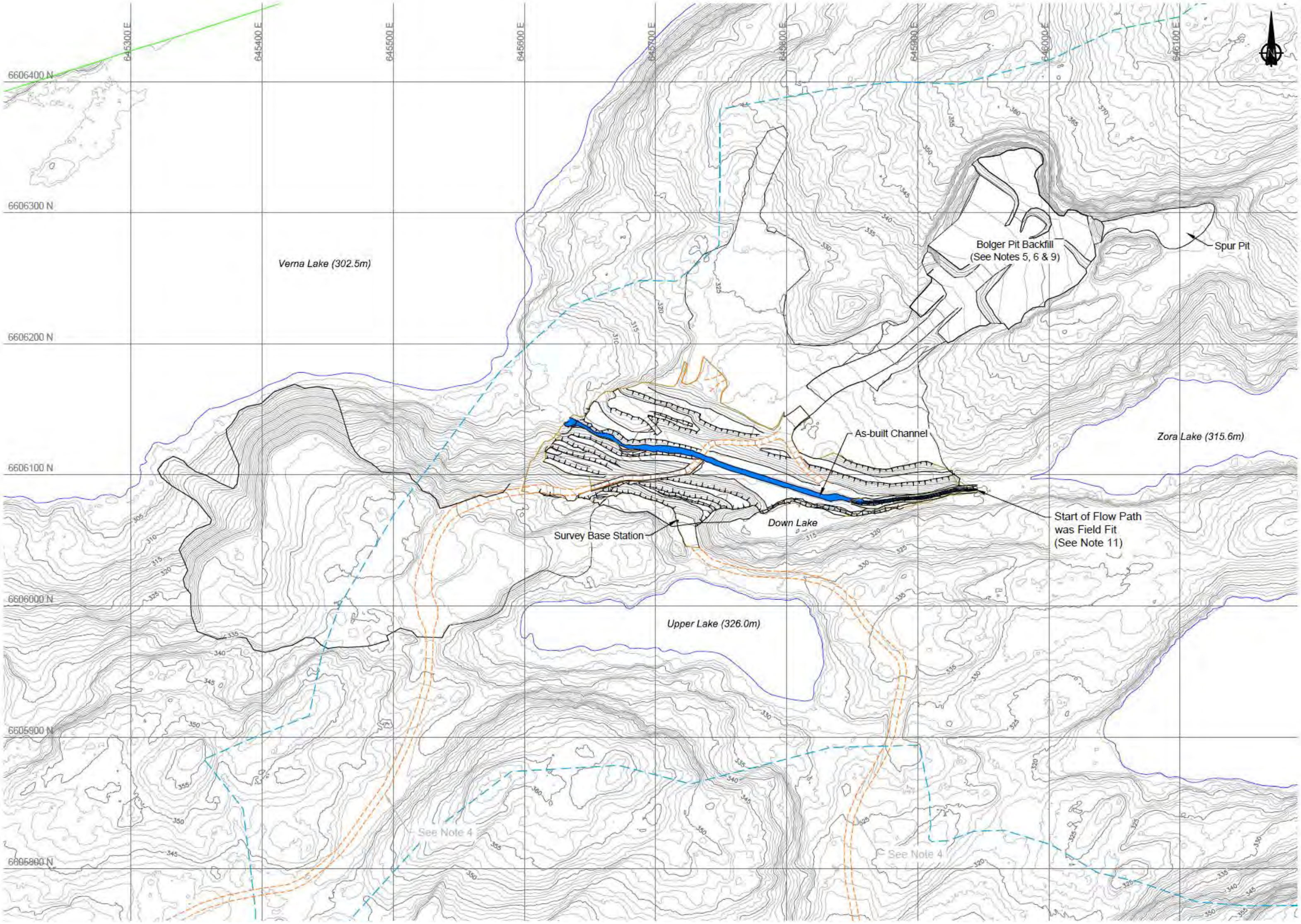
2020 Geotech Inspection

Changes in Marie Reservoir Outlet Spillway Over Time

Job No: 1CC007.067	Beaverlodge Mine Site	Date: October 2020	Approved: CCS	Figure: 7
Filename: BL_1CC007.067				



srk consulting	Cameco	2020 Geotech Inspection
		Ace Subsidence Remedial Work
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 / Approved: CCS / Figure: **8**



NOTES

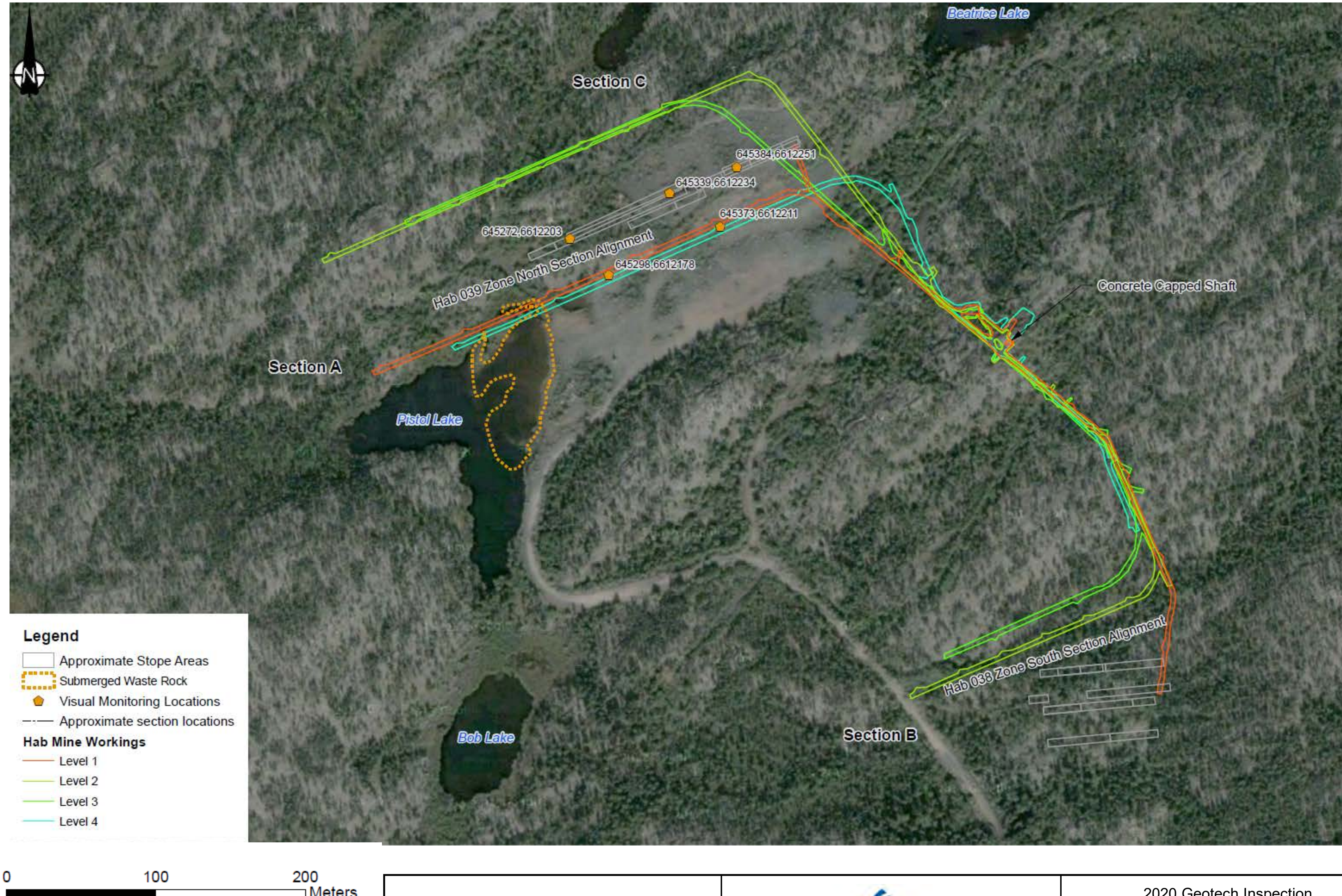
1. Estimate of pre-development topography (1948 DEM) provided by Cameco.
2. All dimensions are in meters unless noted otherwise.
3. The co-ordinate system is UTM NAD 83, Zone 12V.
4. Access roads were re-established and updated by the contractor so that equipment access to and from site was maintained throughout construction activities.
5. Vegetation within the construction limits was cleared, grubbed and stockpiled for reclamation at Bolger pit prior to bulk excavation.
6. Fill material placed in the Bolger pit was placed in lifts not exceeding 3m in height.
7. A topographic as-built survey was performed after the construction activities were completed.
8. Sediment control and surface water management measures were installed prior to and during this work.
9. To prevent the ponding of water, top slope of the waste rock backfill was graded away from the Bolger Pit highwall.
10. During construction the channel was evaluated by the field engineer and was optimized to suit field conditions.
11. Inlet (start) and outlet (end) of the flow path reconstruction was field fit, as directed by the site engineer. The field fit tie-ins to the existing ground were brought back from the Zora Lake outlet and Verna Lake inlet as much as practical.
12. Notes on this drawing apply to all other drawings.

LEGEND

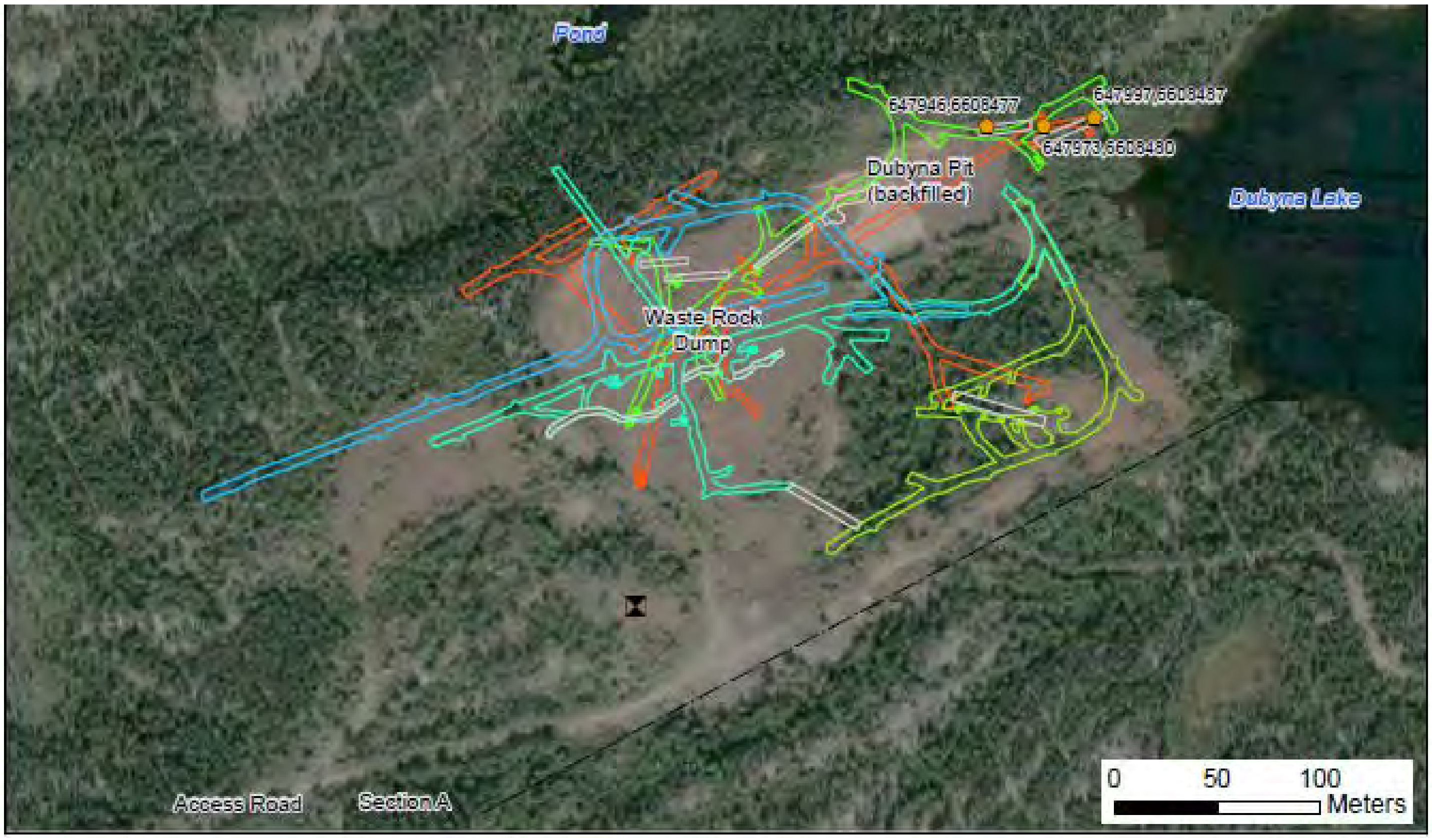
- 1m Contour
- Proposed Flow Path Reconstruction/Excavation
- Approximate Extent of Waste Rock
- Flow Path Excavation and Pit Backfill
- Catchment Boundary
- Site Access Road
- As-built Footprint / Excavation Limit
- As-built Crest
- As-built Toe

0 20 40 60 80 100
Scale in Metres

srk consulting	Cameco	2020 Geotech Inspection
		Plan Layout – Overview of Flow Path Reconstruction near the Bolger Pit
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 / Approved: CCS / Figure: 9



srk consulting	Cameco	2020 Geotech Inspection **Hab Area General Arrangement and Ramp Details**
Job No: 1CC007.067 Filename: BL_1CC007.067	Beaverlodge Mine Site	Date: October 2020 / Approved: CCS / Figure: 12



Legend

Approximate Stope Areas

Visual Monitoring Locations

Dubyna Mine Workings

LEVEL 1

LEVEL 2S

LEVEL 2W

LEVEL 3

LEVEL 4

srk consulting

Cameco

2020 Geotech Inspection

Dubyna Area General Arrangement

Job No: 1CC007.067

Filename: BL_1CC007.067

Beaverlodge Mine Site

Date:	Approved:	Figure:
October 2020	CCS	13

Appendix A Photographs of the Fookes Reservoirs Delta Cover

Photo 1: Looking south-eastward, down the access ramp towards the central part of the delta cover on September 17, 2020. The water bars, visible on the access ramp, manage the runoff down the ramp. The extent and height of the cover vegetation has continued to increase.

Photo 2: Looking eastward across the delta cover on September 17, 2020. There has been a significant increase in the amount of cover vegetation associated with the previously established “islands”.

Photo 3: Looking northwest along the upstream segment of the diversion ditch that runs along the north limit of the cover area on September 17, 2020. There has been a significant increase in the cover vegetation along the northern edge of the Fookes Reservoir Delta.

Photo 4: Looking north westward along the middle segment of the diversion ditch that runs along the north limit of the cover area on September 16, 2020.

Photo 5: Looking southward along the shoreline in the northern part of the cover area on September 17, 2020.

Photo 6: Looking westward at the small depressions in close proximity to the shoreline along the southern part of the cover area on September 16, 2020.

Photo 7: Looking westward, from close to the shoreline, where small depressions in the southern part of the cover area have coalesced. Photo was taken on September 16, 2020.

Photo 8: Looking westward across the central part of the cover, towards the access ramp, on September 16, 2020.

Photo 9: Looking westward across the central part of the cover, towards the access ramp, on September 16, 2020. The access ramp is visible in the middle of the photo.

Photo 10: Looking southward across the central part of the cover on September 16, 2020. Vegetation is also present along the shoreline as can be seen on the left side of this photo.

Photo 11: Facing northeastwards along the upstream segment of the diversion ditch that runs along the north limit of the cover area. Photo taken on September 17, 2020.

Photo 12: Similar view as in Photo 11, showing the depth of water in the ditch. Photo taken on September 17, 2020.

Photo 13: Facing northwest along the northern edge of the delta where surface depressions are evident. Photo taken on September 17, 2020.

Photo 14: Facing westward on September 16, 2020. The vertical white pipe and black cap are the "housing" for a piezometer cable.

Appendix B Photographs of the Fookes Reservoirs Outlet Structure

Photo 15: Looking southwest towards the upstream end of the Fookes Reservoir outlet spillway on September 16, 2020.

Photo 16: Close-up view of the upstream end of the outlet spillway on September 16, 2020.

Photo 17: Looking upstream along the outlet spillway showing the ice-jacked slabs of grout-intruded rip-rap on the sides of the spillway. Photo taken on September 16, 2020.

Photo 18: Similar view to Photo 17, taken September 16, 2020. The stilling basin is visible in the distance.

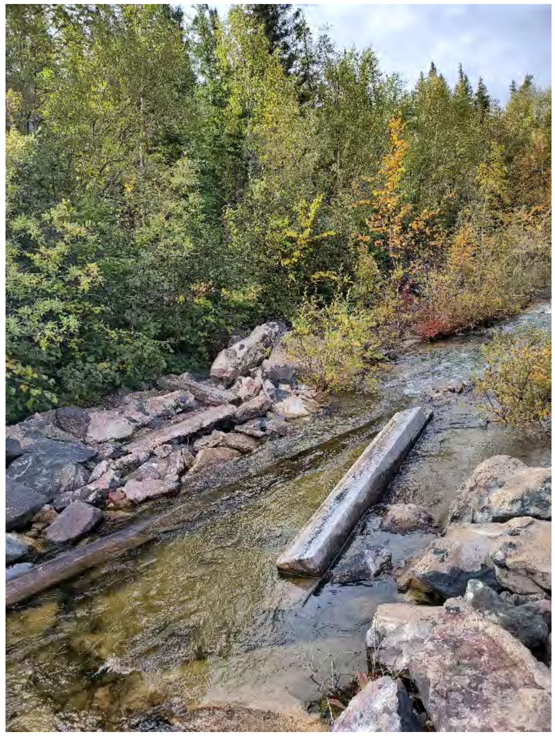


Photo 19: Close-up view of the ice-jacked slabs of grout-intruded rip-rap on the left side of the spillway, facing downstream. Photo taken on September 16, 2020.

Photo 20: Photo looking downstream, taken near the middle segment of the outlet spillway, on September 16, 2020. The stilling basin is visible in the distance.

Photo 21: Looking upstream across the edge of the stilling basing at the location where most of the water leaves the basin.

Photo 22: Looking up the outlet spillway from the stilling basin on September 16, 2020.

Appendix C Photographs of the Marie Reservoir Outlet Structure

Photo 23: Looking at the ice-jacked slabs of grout-intruded rip-rap on the right side of the Marie Reservoir outlet spillway, near its upstream end on September 16, 2020. Beaver dam is visible immediately to the right of the slabs.

Photo 24: Looking downstream in a southeastern direction at the same ice-jacked slabs shown in Photo 23. Photo taken on September 16, 2020. Note the water level difference on either side of the beaver dam.

Photo 25: Looking upstream near the upstream end of the outlet spillway on September 17, 2020. The ice-jacked slabs of the grout-intruded rip-rap are visible at the entrance.

Photo 26: Looking downstream along the outlet spillway on September 17, 2020. The stilling basin is visible in the distance.

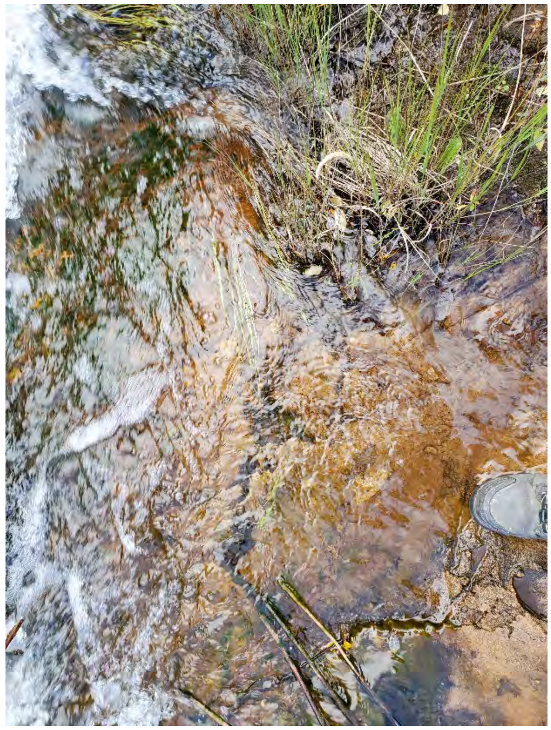


Photo 27: Close-up view of the stream. No clayey silt material is visible. Photo taken on September 17, 2020.

Photo 28: Looking at the downstream edge of the stilling basin on September 17, 2020. The natural creek is visible on the downstream side of the basin.

Appendix D Photographs of the Marie Reservoir Delta Area

Photo 29: Looking southeastward across the Marie Reservoir west delta area on September 16, 2020. The water body is the Marie Reservoir.

Photo 30: Looking eastward along the edge of the Marie Reservoir west delta area on September 16, 2020. The water body is the Marie Reservoir.

Photo 31: Looking northwest ward across the west delta on September 16, 2020.

Photo 32: Looking southeast along the edge of the Marie Reservoir Delta. Photo taken September 16, 2020. Typical exposure of tailings which day-lighted through the rockfill cover on the west delta area could still be identified.

Photo 33: Close-up of salts visible on the surface of exposed tailing on the west delta area.

Photo 34: Looking westward along the shoreline of the west delta cover. Photo taken September 16, 2020.

Appendix E Photographs of Ace Creek Catchment Area III

Photo 35: Looking northward across the pond area at the south end of Ace Creek catchment area III on September 16, 2020.

Photo 36: Looking southward across the pond area at the south end of Ace Creek catchment area III on September 16, 2020. Surface drainage would flow to the right, towards the background.

Photo 37: Looking southwestward across the area at the south end of the Ace Creek catchment area III on September 16, 2020. No pond visible in this area.

Photo 38: Looking southeast to the surface drainage where surface drainage would naturally flow. Photo taken on September 16, 2020.

Photo 39: View of the tailings exposure at the north end of Ace Creek catchment area III. Photo taken on September 16, 2020.

Photo 40: Looking east along the eastern boundary of the Ace Creek catchment area III. Small depressions that coalesced into one another can be seen. Photo taken on September 16, 2020.

Photo 41: Along the eastern boundary of the Ace Creek catchment area III, same location as Photo 40, possible tailings have day-lighted at surface. Photo taken on September 16, 2020.

Appendix F Photographs of the Ace Stope Area

Photo 42: Looking eastward across the Ace Stope Area. Photo taken September 16, 2020.

Photo 43: Looking northeast along the southern area. No surface subsidence or tension cracks visible along the surface. Photo taken on September 16, 2020.

Photo 44: Looking south along the northern area. No surface subsidence or tension cracks visible along the surface. Photo taken on September 16, 2020.

Appendix G Photographs of the Bolger Pit and Drainage Channel

Photo 45: Looking southwest along the Bolger Pit, in the direction of the Drainage Channel. Photo taken September 17, 2020.

Photo 46: Looking northeast towards the Bolger Pit, the berms are still intact. Photo taken September 17, 2020.

Photo 47: Looking north towards the Bolger Pit, the berms are still intact. The pit walls are visible in the background of this photo. Photo taken September 17, 2020.

Photo 48: Looking south at the edge of the beaver dam at the upstream limit of the Zora Creek channel. This is the start of the Drainage Channel flow path (Figure 9). Photo taken September 17, 2020.

Photo 49: Looking northeast (upstream) along the Drainage Channel flow path towards the beaver dam at Zora Lake. Photo taken September 17, 2020.

Photo 50: Panoramic view looking south towards the drainage channel and berms along the southeastern side of the Drainage Channel. Photo taken September 17, 2020.

Photo 51: Panoramic view looking northeast towards the Drainage Channel and berms along the northeastern side of the channel. Photo taken September 17, 2020.

Photo 52: Looking east-southeast (upstream) along the Drainage Channel. Photo taken September 17, 2020.

Photo 53: Looking west-northwest (downstream) along the Drainage Channel towards Verna Lake. Photo taken September 17, 2020.

Photo 54: Looking west-northwest (downstream) along the Drainage Channel near the inlet to Verna Lake. Photo taken September 17, 2020.

Photo 55: Looking west-northwest, at the inlet to Verna Lake. Photo taken September 17, 2020.

Appendix H Photographs of the Hab and Dubyna Areas

Photo 56: Looking north towards the Hab area. Photo taken September 17, 2020.

Photo 57: Looking northeast at the HAB039-01 monitoring location. Photo taken September 17, 2020.

Photo 58: Looking west at the HAB039-02 monitoring location. Photo taken September 17, 2020.

Photo 59: Looking southeast at the HAB039-03 monitoring location. Photo taken September 17, 2020.

Photo 60: Looking southwest down the ridge at the HAB039-03 monitoring location. Photo taken September 17, 2020.

Photo 61: Looking south at the HAB039-04 monitoring location. Photo taken September 17, 2020.

Photo 62: Looking northwest at the HAB039-05 monitoring location. Photo taken September 17, 2020.

Photo 63: Looking west towards the Dubyna area. Photo taken September 17, 2020.

Photo 64: Looking northwest at the DUB-01 monitoring location. Photo taken September 17, 2020.

Photo 65: Looking southwest at the DUB-01 monitoring location. Minor surface depressions identified. Photo taken September 17, 2020.

Photo 66: Looking southeast at the DUB-02 monitoring location. Photo taken September 17, 2020.

Photo 67: Looking east at the DUB-03 monitoring location. Photo taken September 17, 2020.

Appendix I Reconstructed Bolger Flow Path – Inspection Form

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

All parts of this inspection form should be completed. Adverse conditions should be described and location stated. Additional information and relevant photographs should be attached.

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________ (DD/MM/YR)

Weather: ____________
Temperature — Wind Direction/Strength (light/high/gusting) — (General Conditions)

ACCESS ROADS

A) Access Roads Photographs: ____________

Entrance restricted to public ☐ yes ☐ ____________

Maintenance required ☐ none ☐ ____________

CHANNEL SIDESLOPE CREST

A) Stability Photographs: ____________

cracking ☐ none ☐ ____________
settlement ☐ none ☐ ____________
erosion ☐ none ☐ ____________
animal burrows ☐ none ☐ ____________
other ☐ ____________

B) Vegetation Photographs: ____________

none ☐ ____________
sparse ☐ ____________
moderate ☐ ____________
heavy ☐ ____________

Additional Comments:

Do any inspection items require corrective action? If yes, what is the degree of severity? Is immediate action required or monitor?

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ________________ Inspector's Employer: ________________ Inspection Date: ________________
(DD/MM/YR)

CHANNEL SIDE SLOPES

A) Stability Photographs: ____________________

scour at base	☐ none	☐	____________
cracking	☐ none	☐	____________
slumping	☐ none	☐	____________
rilling	☐ none	☐	____________
bulging	☐ none	☐	____________
sloughing	☐ none	☐	____________
erosion	☐ none	☐	____________
animal burrows	☐ none	☐	____________
other		☐	____________

B) Vegetation Photographs: ____________________

none	☐	
sparse	☐	____________
moderate	☐	____________
heavy	☐	____________

C) Rip-rap Photographs: ____________________

erosion/movement	☐ none	☐	____________
dis-coloration	☐ none	☐	____________
high water mark visible	☐ none	☐	____________
adequate armor			
other	☐ yes	☐	____________
		☐	____________

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ________________ Inspector's Employer: ________________ Inspection Date: ________________
(DD/MM/YR)

CHANNEL SIDE SLOPES (Continued)

E) Seepage Photographs: ______________________________

Seepage ☐ none ☐ Location 1 ______________________________

Rate: ☐ damp ☐ trickle ☐ steady ☐ _____ (L/s)

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

Photographs: ______________________________

☐ Location 2 ______________________________

Rate: ☐ damp ☐ trickle ☐ steady ☐ _____ (L/s)

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

Additional Comments:

Do any inspection items require corrective action? If yes, what is the degree of severity? Is immediate action required or monitor?

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________
(DD/MM/YR)

CHANNEL BASE

A) Rip-rap Photographs: ____________

erosion/movement ☐ none ☐ ____________
dis-coloration ☐ none ☐ ____________
Adequate armor ☐ yes ☐ ____________
other ☐ ____________

B) Ponding Photographs: ____________

Positive drainage ☐ yes ☐ Location 1 ____________

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

Photographs: ____________

☐ Location 2 ____________

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

C) Sediment Accumulation Photographs: ____________

Present ☐ none ☐ Location 1 ____________

Sample taken: ☐ yes ☐ no

Photographs: ____________

☐ Location 2 ____________

Sample taken: ☐ yes ☐ no

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________
(DD/MM/YR)

CHANNEL BASE (Continued)

D) Vegetation

Photographs: ____________

- none ☐
- sparse ☐
- moderate ☐
- heavy ☐

E) Blockage

Photographs: ____________

- none ☐
- debris ☐
- beaver dam ☐
- siltation ☐
- ice ☐

Correction action: ☐ taken ☐ to follow

Priority Rating (Immediate Action or Monitor): ____________

Additional Comments:

Do any inspection items require corrective action? If yes, what is the degree of severity? Is immediate action required or monitor?

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________
(DD/MM/YR)

CHANNEL INLET

A) Blockage

Photographs: ____________

- none ☐
- debris ☐ ____________
- beaver dam ☐ ____________
- siltation ☐ ____________
- ice ☐ ____________

Correction action: ☐ taken ☐ to follow

Priority Rating (Immediate Action or Monitor): ____________

B) Erosion

Photographs: ____________

erosion/movement of rip rap ☐ none ☐ ____________

C) Vegetation

Photographs: ____________

- none ☐ ____________
- sparse ☐ ____________
- moderate ☐ ____________
- heavy ☐ ____________

D) Flow

Photographs: ____________

In-flow ☐ none ☐ Rate: ☐ damp ☐ trickle ☐ steady ☐ _____ (L/s)

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________
(DD/MM/YR)

CHANNEL INLET (Continued)

Additional Comments:

Do any inspection items require corrective action? If yes, what is the degree of severity? Is immediate action required or monitor?

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector: ____________ Inspector's Employer: ____________ Inspection Date: ____________
(DD/MM/YR)

CHANNEL OUTLET

A) Blockage Photographs: ____________

none ☐
debris ☐ ____________
beaver dam ☐ ____________
siltation ☐ ____________
ice ☐ ____________

Correction action: ☐ taken
☐ to follow

Priority Rating (Immediate Action or Monitor): ____________

B) Erosion Photographs: ____________

erosion/movement of rip rap ☐ none ☐ ____________

C) Vegetation Photographs: ____________

none ☐ ____________
sparse ☐ ____________
moderate ☐ ____________
heavy ☐ ____________

D) Flow Photographs: ____________

Discharge ☐ none ☐ Rate: ☐ damp ☐ trickle ☐ steady ☐ _____ (L/s)

Clarity: ☐ clear ☐ muddy ☐ ____________

Sample taken: ☐ yes ☐ no

FIELD INSPECTION FORM
CHANNEL INSPECTION
BOLGER FLOW PATH RECONSTRUCTION

Inspector:________________ Inspector's Employer:________________ Inspection Date: ________________
(DD/MM/YR)

CHANNEL OUTLET (Continued)

Additional Comments:

Do any inspection items require corrective action? If yes, what is the degree of severity? Is immediate action required or monitor?

Appendix J Summary of Beaverlodge Inspection Requirements

Table Summarizing the Areas and Key Inspection Features for Future Investigations

Area	**Key Inspection Features**

Fookes Reservoir Delta	• Check for evidence of new tailing boils or tailings exposure due to frost action
	• Check for evidence of significant erosion of the cover material
	  o Trench along the northeast edge of the delta (sand flows, erosion of waste rock, slumping, etc.) – maintain photographic and GPS record (identify areas of concern on map).
	  o Cover limit along its contact with Fookes Reservoir – maintain photographic and GPS record (identify areas of concern on map) where sand from the delta cover extends into the reservoir.
	• Check for evidence of erosional features
	• Ensure erosion-protection devices are performing as expected on former north access road
	  o Waterbars (chevrons)
	  o Diversion ditches
	  o Erosion of cover adjacent to the former access road
	• Ensure earthen berms are in place to limit access to the delta

Marie Reservoir Delta	• Check for evidence of new tailing boils or tailings exposure due to frost action • Check for evidence of significant erosion of the cover material • Check for evidence of erosional features
Fookes and Marie Reservoir Outlet Structures	• Check the condition of the spillway channel, with a view to confirming the grout intruded rip-rap is still in place. • Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event. • Document conditions with photographs.
Ace Creek Catchment Area lll	• Check for evidence of new tailing boils or tailings exposure due to frost action • Check for evidence of significant erosion of the cover material • Check for evidence of erosional features

Ace Stope Area	• Check for signs of tension cracks along the stope cover material. • Check for signs of visible depressions along the stope cover material. • Check for signs of slumping along the slope cover material. • Check for signs of erosional features along the Ace Stope area.
Bolger Pit and Drainage Channel	• Refer to the Geotechnical Inspection Form for the Checklist in Appendix I
Hab and Dubyna Area	• Check for signs of tension cracks along surface. • Check for signs of visible depressions along surface. • Check for signs of slumping along surface.

APPENDIX C

APPENDIX C

Table 1: Borehole summary including the coordinates of exploration drill holes located to date in and adjacent to the former Eldorado Beaverlodge properties. The table also identifies the condition of each hole when it was initially identified and the year in which each was permanently plugged.

Area	Designation	Coordinate System: WGS 84 UTM Zone 12		Status When Located	Year Remediated
		Easting	Northing		
Ace	AC 01	644022.013	6605350.955	Dry	2013
	AC 02	643881.016	6605325.928	Dry	2013
	AC 03	643969.014	6605393.956	Dry	2013
	AC 04	643958.014	6605381.941	Dry	2013
	AC 05	643943.013	6605376.906	Dry	2013
	AC 06	643929.017	6605371.911	Dry	2013
	AC 07	643914.011	6605366.988	Dry	2013
	AC 09	643888.017	6605351.946	Dry	2013
	AC 10	643876.015	6605374.894	Dry	2013
	AC 11	643965.016	6605324.914	Dry	2013
	AC 12	643877.017	6605339.931	Dry	2013
	AC 13	643857.016	6605337.938	Dry	2013
	AC 14	643848.015	6605331.908	Dry	2013
	AC 15	643792.014	6605338.902	Dry	2013
	AC 16	643560.257	6605183.669	Dry	2017
	AC 17	644021.3	6604729.1	Dry	2017
	AC 18	642872.1	6604789.8	Dry	2018
	AC 22	645034	6605863	2 holes/Dry	2019
	AC 23	645038	6605837	Dry	2019
	AC 24	643327	6605101	2 holes/1 flowing	2021
Lower Ace	BH-001	641929	6604081	Discharging	2012
	BH-002	641956	6604091	Discharging	2011
	BH-003	641922	6604146	Discharging	2011
	BH-004	641932	6604142	Discharging	2012
	BH-005	641966	6604143	Discharging	2011
	BH-006	641972	6604165	Discharging	2011
	BH-007	642090	6604218	Discharging	2011
	BH-009	642110	6604137	Discharging	2012
	BH-014	642168	6604158	Discharging	2011
	BH-15	642101.665	6604192.497	Dry/seep around	2016
	BH-16	643009.193	6604465.019	Dry	2017
	BH-17	642993.852	6604455.146	Dry	2017
	BH-18	642995.637	6604466.051	Dry	2017
	BH-19	642978.88	6604452.098	Dry	2017
	BH-20	643007.541	6604467.124	Dry	2017
	BH-21	642966.862	6604445.757	Dry	2017

Lower Ace	BH-22	642959.407	6604439.281	Dry	2017
	BH-23	642954.958	6604432.3	Dry	2017
	BH-24	642940.515	6604415.339	Dry	2017
	BH-25	642930.8	6604406.299	Dry	2017
	BH-26	642972.143	6604451.532	Dry	2017
	BH-27	643250.316	6604979.231	Dry	2017
	BH-28	643113.492	6604895.363	Dry	2017
	BH-29	643174.26	6604925.548	Dry	2017
	BH-30	643285.271	6604977.469	Dry	2017
	BH-31	642101.048	6604195.52	Discharging	2017
	BH-32	642260.649	6604592.012	Dry	2017
	BH-33	642423.877	6604597.892	Dry	2017
	BH-34	642401.708	6604647.831	Dry	2017
	BH-35	642268.019	6604629.757	Dry	2017
	BH-36	643698.938	6605341.629	Dry	2017
	BH-37	642456.049	6604665.374	2 holes/dry	2017
	BH-38	642424.846	6604667.596	Dry	2017
	BH-39	643709.725	6605142.015	Dry	2017
	BH-40	642242.735	6604550.461	Dry	2017
	BH-41	642296.4	6604025.8	Dry	2017
	BH-42	642552.3	6604731	Dry	2017
	BH-43	642254	6604397	Dry	Covered with debris
	BH-44	642402	6604639	Dry	2019
	BH-45	643250	6604981	2 holes/Dry	2019
Ace-Verna	Ace 01	645193.055	6605813.101	Dry	2016
	EXC 01	644740.299	6605272.359	Dry	2016
	Ace 02	645409.239	6605930.196	Dry	2017
	Ace 03	645627.645	6605877.357	Dry	2017
	Ace 04	645187.707	6605816.337	Dry	2017
Dubyna	DB 01	648069.018	6608350.909	Dry	Not located
	DB 02	648021.018	6608416.903	Discharging	2011
	DB 03	648010.017	6608430.961	Discharging	2012
	DB 04	648009.018	6608430.921	Dry	2013
	DB 05	648074.019	6608329.926	Dry	2013
	DB 06	648059.016	6608350.96	Dry	Not located
	DB 07	648060.013	6608305.962	Dry	2013
	DB 08	648047.018	6608326.964	Dry	2013
	DB 09	648004.013	6608445.996	Dry	2011
	DB 10	647927.019	6608395.914	Dry	2013
	DB 11	647906.016	6608372.901	Dry	2013
	DB 12	647907.015	6608373.943	Dry	2013
	DB 13	647922.017	6608349.899	Dry	2013

Dubyna	DB 13A	647937.016	6608388.951	Dry	2013
	DB 14	647942.019	6608319.921	Discharging	2011
	DB 15	647912.017	6608307.923	Dry	2013
	DB 16	648002.017	6608424.96	Discharging	2012
	DB 17	647310.016	6608147.994	Dry	2013
	DB 18	647296.012	6608143.988	Dry	2013
	DB 19	647294.014	6608148.926	Dry	2013
	DB 20	647291.018	6608147.917	Dry	2013
	DB 21	647289.015	6608145.943	Dry	2013
	DB 22	647285.016	6608153.923	Dry	2013
	DB 23	647282.019	6608145.891	Dry	2013
	DB 24	647351.018	6608172.904	Dry	2013
	DB 25	648014.014	6608458.988	Discharging	2011
	DB 26	647374.017	6608190.976	Dry	2013
	DB 27	647379.02	6608180.916	Dry	2013
	DB 28	647715.679	6608234.967	Dry	2017
	DB 29	647513.47	6608225.766	Dry	2017
	DB 30	647413.386	6608235.144	Dry	2017
	DB 31	647411.222	6608290.178	Dry	2017
	DB 32	647603.393	6608298.979	Dry	2017
	DB 33	646948.652	6608333.328	Dry	2017
	DB 34	645934.9	6607576	2 holes/dry	2016
	DB 35	645991.5	6607578.2	Dry	2017
	DB 36	647421	6608222	Dry	2017
	DB 37	647661.2	6608361.3	Dry	2017
	DB 38	647561.2	6608066.9	Dry	2017
	DB 39	647742.5	6608236	Dry	2017
	DB 40	647593.6	6608297.4	Dry	2017
	DB 41	647611	6608249.4	Dry	2018
	DB 42	647579.4	6608258.1	Dry	2018
	DB 43	647579.4	6608255	Dry	2018
	DB 44	647585.8	6608256.1	Dry	2018
	DB 45	647572	6608231.8	Dry	2018
	DB 46	647521.1	6608238.1	2 holes/Dry	2018
	DB 47	647572.5	6608251.3	Dry	2018
	DB 48	647575.6	6608248.3	Dry	2018
	DB 49	647572.3	6608242.3	Dry	2018
	DB 50	647558.3	6608239.3	Dry	2018
	DB 51	647547	6608230.5	Dry	2018
	DB 52	647578.7	6608236.1	Dry	2018
	DB 53	647427.7	6608225.5	Dry	2018
	DB 54	647419	6608244.3	Dry	2018

Dubyna	DB 55	647413.4	6608238.8	Dry	2018
	DB 56	647395.2	6608229.4	Dry	Unknown
	DB 57	647406.3	6608226.8	Dry	2018
	DB 58	647417.4	6608225.7	Dry	2018
	DB 59	647245.6	6608220.8	Dry	2018
	DB 60	647613.1	6608506.8	2 holes/Dry	2018
	DB 61	647683.9	6608518.9	Dry	2018
	DB 62	647785.2	6608518.5	Dry	2018
	DB 63	647703.9	6608176.9	Dry	2018
	DB 64	647946	6608148	Dry	Planned for 2021
Hab	HAB 01	645518.015	6612550.898	Dry	2013
	HAB 02	645531.009	6612559.987	Dry	2013
	HAB 03	645560.017	6612566.911	Dry	2013
	HAB 04	645559.011	6612570.997	Dry	2013
	HAB 05	645570.017	6612585.916	Dry	2013
	HAB 06	645516.013	6612592.957	Dry	2013
	HAB 07	645490.014	6612737.978	Dry	2013
	HAB 08	645473.016	6612730.963	Dry	2013
	HAB 09	645458.015	6612730.938	Dry	2013
	HAB 10	645444.016	6612727.941	Dry	2013
	HAB 11	645428.014	6612729.995	Dry	2013
	HAB 12	645531.017	6612306.94	Dry	2013
	HAB 13	645454.012	6612205.961	Dry	2013
	HAB 14	645203.016	6612156.978	Dry	2013
	HAB 15	645180.016	6612129.889	Dry	2013
	HAB 16	645197.013	6612184.948	Dry	2013
	HAB 17	645236.014	6612327.921	Dry	2013
	HAB 18	645265.016	6612338.968	Dry	2013
	HAB 19	645265.016	6612338.968	Dry	2013
	HAB 20*	645244.013	6612340.94	Dry	No Remediation
	HAB 21*	645216.013	6612306.969	Dry	No Remediation
	HAB 22*	645206.015	6612316.948	Dry	No Remediation
	HAB 23	645196.016	6612315.891	Dry	2013
	HAB 24*	645157.014	6612278.93	Dry	No Remediation
	HAB 25*	645195.017	6612271.932	Dry	No Remediation
	HAB 26*	645193.013	6612334.948	Dry	No Remediation
	HAB 27	645199.014	6612341.981	Dry	2013
	HAB 28	645237.012	6612367.979	Dry	2013
	HAB 29	645186.014	6612187.977	Dry	2013
	HAB 30	645196.016	6612166.962	Dry	2013
	HAB 31	645188.016	6612161.97	Dry	2013
	HAB 32	645188.016	6612161.97	Dry	2013

Hab	HAB 33	645184.017	6612166.942	Dry	2013
	HAB 34	645185.015	6612332.966	Dry	2013
	HAB 35	645170.015	6612318.896	Dry	2013
	HAB 36	645146.014	6612300.909	Dry	2013
	Hab 37	645635.866	6611795.114	Dry	2016
	Hab 38	645957.616	6612503.136	Dry	2016
	HAB 39	645944.833	6612429.845	Dry	2016
	Hab 40 & 41	645134.075	6611789.562	2 holes/dry	2016
	Hab 42 & 43	645047.948	6611855.227	2 holes/dry	2016
	Hab 44	645155.8	6612277.4	Dry	2016
	Hab 45	645120.288	6612036.091	Dry	2017
	Hab 46	645119.989	6612043.82	Dry	2017
	Hab 47	645737.923	6612087.024	Dry	2017
	Hab 48	645053.768	6611971.583	Dry	2017
	Hab 49 & 50	645291.031	6612001.84	2 holes/dry	2017
	Hab 51	644786.442	6611947.92	Dry	2017
	Hab 52	645309.971	6612079.678	Dry	2017
	Hab 53	644794.3	6611948.2	Dry	2017
	Hab 54	645613.7	6611925.2	Dry	2017
	Hab 55	645670.8	6612093.7	Dry	2017
	Hab 56	645653.1	6612056.8	Dry	2017
	Hab 57	645680.6	6612065.6	Dry	2017
	Hab 58	644798.2	6612050.6	Dry	2017
	Hab 59	645648.7	6611994.7	Dry	2017
	Hab 60	645671.6	6612016.6	Dry	2017
	Hab 61	645622.4	6611980.3	Dry	2017
	Hab 62	645076.2	6611788.8	Dry	2017
	Hab 63	645737	6612086.1	Dry	2018
	Hab 64	645685.9	6612061.4	Dry	2018
	Hab 65	645655.5	6612055.3	Dry	2018
	Hab 66	645412	6611924	Dry	2019
	Hab 67	645332	6611876	Dry	2019
	Hab 68	645631	6612339	Dry	2019
	Hab 69	645276	6612220	Dry	Planned for 2021
	Hab 70 & 71	645704	6612168	Dry	Planned for 2021
Verna-Bolger	VR 01	645583.015	6605976.917	Dry	2013
	VR 02	645612.016	6605959.984	Dry	2013
	VR 03	645987.422	6606161.403	Dry	2016
	VR 04	644794.274	6611948.222	Dry	2017
	VR 05	645751.166	6606305.443	Dry	2017
	VR 06	645976.488	6606405.551	Dry	2017
	VR 08 & 09	645934.866	6607575.955	2 holes/dry	2016

	VR 10	645991.476	6607578.159	Dry	2017
Eagle	EG 01	640289.749	6607204.128	Dry	2016
Eagle	EG 02	640322.527	6607209.033	Dry	2016
	EG 03	640292.348	6607226.853	Dry	2016
	EG 04	640328.697	6607263.213	Dry	2016
	EG 05	640351.111	6607264.052	Dry	2016
	EG 06	640486.081	6607170.013	Dry	2016
Martin Lake	MC 1	638979.011	6604055.98	Dry	2013
Off Property[1]	OP 01	647251.597	6607892.5	Dry	2017
	OP 02	646998.6	6605635.1	Dry	2017
	OP 03	647108.6	6605695.2	Dry	2017
	BH-NW02	641471	6604205	Dry	2017
	BH-NW01	641343.6	6604130.1	Discharging	2017
	AC 19[2]	647069	6605704	Dry	2019
	AC 20[2]	647055	6605663	Dry	2019
	AC 21[2]	647001	6605642	Dry	2019

*Recent exploration activity (Not Eldorado/Cameco)
Note: AC 08 and VR 07 have been removed from past records due to coordinate error.

[1] The 'Off Property' areas were operated as part of the former Eldorado Beaverlodge activities; however, these areas were not listed in the *Eldorado Resources Limited Decommissioning Approval AECB-DA-142-0*. In addition, these areas do not appear on the current Beaverlodge surface lease or in the Canadian Nuclear Safety Commission licence; however, Cameco intends to prepare these areas for transfer into the IC Program and has remediated the boreholes identified in these areas accordingly.

[2] Previously listed under the "Ace" area mistakenly. These boreholes are located off Beaverlodge property, in the Moran Pit area.

APPENDIX D

APPENDIX D

SRC ENVIRONMENTAL ANALYTICAL LABORATORIES
QUALITY ASSURANCE PROGRAM

Introduction

As one of the most modern, well-equipped laboratory complexes in Canada, SRC Environmental Analytical Laboratories (SRC Analytical) provides a wide range of commercial analytical services. SRC Analytical maintains an extensive *Quality Assurance Program* designed to ensure the reliability of analytical data. Key components of the Quality Assurance program are:

- Accreditation by Canadian Association for Laboratory Accreditation (CALA).
- Participation in interlaboratory performance assessment programs.
- Routine quality control practices.
- Computerized sample management.

Accreditation by CALA

SRC Analytical is accredited by the Canadian Association for Laboratory Accreditation (CALA), for specific environmental tests listed in the scope of accreditation approved by CALA. Accreditation ensures that procedures, facilities, and methods conform to ISO/IEC 17025:2017, the internationally recognized standard. The accreditation program consists of a biennial on-site assessment which assesses the accredited methods as well as the quality management system.

Proficiency Testing and Interlaboratory Performance Assessment

Proficiency Testing helps to ensure the accuracy of results through interlaboratory comparisons and is a mandatory requirement of accreditation. SRC Analytical participates in several proficiency testing and interlaboratory performance assessment programs including:

- Proficiency Testing Canada (PTC)
- Environment Canada's Ecosystems Interlaboratory Quality Assurance program.
- ASTM's proficiency studies
- International Atomic Energy Agency programs.
- Commercially available programs such as those supplied by Environmental Resource Associates (ERA)

Quality Control

SRC Analytical employs a variety of techniques, such as the analysis of reference materials, control samples, duplicates, and spike recovery to ensure the validity of analytical results. If a problem is identified, the samples are repeated or other corrective action is taken to demonstrate that the analytical results are acceptable. If this is not possible, then the client is notified.

Computerized Sample Management

A computerized Laboratory Information Management System (LIMS) uniquely identifies samples, specifies the required analyses, monitors workflow, and stores the analytical results. All analytical data generated is the property of the client and is not released to a third party except at the written request of the client. The LIMS also prepares analytical reports and invoices.

Quality Assurance Department

Quality Assurance staff at SRC Analytical manages all aspects of the quality system. This includes reviews of quality control data, method validation, and quality audits. For further information, contact the SRC Analytical Laboratory.

Corporate FCD Publish to All COR FCD-00180 / 5 **Corporate**

Corporate Quality Statement of Qualifications

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Document Identity			
Document Status and Ownership			
Current Status	**Approved - Released**		
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Release and Audit Schedule	
Release Schedule	When Approved ☐ **Allow Administrator to Release Document Early**
Expiration Schedule	When Superseded or Obsoleted
Audit Schedule	0 Month(s)
Special Handling on Release	
☑ **Update Completed Trainee Records**	

Attach Document

- COR FCD-00180 v5 (EN)
- COR FCD-00180 v5 (FR)

Associated Documents

Reason for Change

Date of Change February 20, 2012 **Version** 1
Section Changed New
Change Made New Form

Date of Change January 13, 2015 **Version** 2
Section Changed all
Change Made various updates, not highlighted since this is a customer facing document.

Date of Change June 12, 2017 **Version** 3
Section Changed table
Change Made Limits column: changed <2xRDL to <RDL. Changed EPA Limits to CCME or Provincial Limits
Optional Field A Updated logo and branding.
Updated number of QA staff members
Added 12 month audit schedule

Date of Change June 4, 2019 **Version** 4
Section Changed See below
Change Made Rebranded for Bureau Veritas Laboratories

Date of Change February 5, 2020 **Version** 5
Section Changed See below:
Change Made - Rebranded font and colors. Correct grammar throughout.
- 1.0 Updated first sentence and second paragraph and added seventh paragraph to align with https://www.bvlabs.com/our-story/corporate-overview.
- 2.0 Updated number of QA staff
- 2.1 Removed statement about scorecarding NSCs, CARs, MIAs

- 2.3 Removed statement about scorecarding customer complaints.
- 2.6 Change frequency of CCVs for organics from "Verified every 12 hr" to "Every 20 samples & at end". Removed "daily" from inorganic calibration frequency.
- 2.7 Added NVLAP
- 2.8 Updated PT providers

Notification List

Notification Recipients

Additional Readers

Read Restriction	☐ At All Times ☐ When Draft or Requested state ☐ When Superseded or Obsolete status

Approval Status Table

Approver Source **Role for Approvers** **Parallel-Everybody** Segment

Approver	Action	Date	Comment
Elizabeth McKinnon	Approve	February 5, 2020 3:05 PM GMT-4	
Paul Fewer	Approve	February 5, 2020 4:21 PM GMT-6	

2/22/21 3:58 PM

Bureau Veritas Laboratories

Quality Assurance & Quality Control Program

COR FCD-00180 / 5

Table of Contents

1.0 Laboratory Company Profile

For over 50 years, Bureau Veritas Laboratories (formerly Maxxam) has been a leader in analytical services and solutions to the energy, environmental, industrial hygiene, food and DNA industries. Our 2,200 dedicated employees proudly lead the industry in depth of technical and scientific expertise and serve customers through our national network of laboratories. In processing over 2.4 million samples and generating in excess of 43 million results annually, we skilfully combine efficiency and customer service with rigorous science and uncompromising quality management. We are committed to success with responsibility – to our stakeholders, to our communities, and to the environment.

Our mission is to improve our customers' performance, help reduce their risks and enable our custumers to meet or exceed challenges of quality, health and safety, environmental and social responsibility. We want to be the clear choice in testing, inspection and certification services.

A major focus is analytical services for an exhaustive list of environmental contaminants. Solid wastes, effluents, potable water, receiving waters, ground waters, soils, sediments, stack emissions, ambient air, plant, animal and fish tissues are analysed for everything from pH to Dioxins.

We provide these services to a wide range of customers in North America and over 20 foreign countries. Our clients include consulting engineers, industry, businesses, all levels of government as well as private individuals.

Our laboratories function as a tight network operating under a single Quality Management System, utilizing the strengths of each and working together to ensure customer requirements are met. All major laboratories provide the full range of environmental testing services using a uniform Quality System and IT infrastructure to deliver a standardized high quality service across the country. In addition, certain locations have special areas of expertise, such as seawater analysis at our Burnaby and Bedford facilities and High Resolution Dioxin analysis in our Mississauga and Ville St-Laurent facilities.

Operating within one Laboratory Information and Quality System across Canada provides uniform report formats, management performance measurements, turnaround time measurements, corrective action management, and a number of other key performance indicators making us a reliable partner.

Bureau Veritas is a world leader in laboratory testing, inspection and certification services. Established in 1828, the Group has more than 75,000 employees located in over 1,500 offices and laboratories around the globe. Since our founding our name has been synonymous with integrity - all the more crucial in an industry built on trust. As a business to business company that has a profound impact our world (or community) we are dedicated to building trust between client companies, public authorities and consumers.

2.0 Quality Program

Bureau Veritas Laboratories currently employs 35 full-time Quality Assurance (QA) staff. This group reports to the Senior Quality Assurance Manager, whose responsibility it is to ensure consistency of approach and program independence from operations. The QA team is strengthened through a web-based document control and management system that ensures consistent formats while minimizing routine administrative tasks. Authorized staff have immediate secure access to all corporate and individual laboratory SOPs and support documentation.

The Quality Program is designed to comply with or exceed the data quality objectives of Industry, Canadian Regulators, United States EPA and the International Standards Organization (ISO). The QA team is assisted in performing audits with the help of many trained internal auditors that are composed of operations and support services personnel. This brings many benefits to the customer and to our company. These benefits include improved client and accreditation audits, increased communication between groups within our company, greater variety of work for staff and increased understanding of ISO/IEC 17025, our customer requirements and our own quality requirements.

The keys to the Quality Program are Prevention and Verification.

2.1 Prevention through Quality Assurance

Extensive control charting practices ensure that analyses with biases or which are potentially out of control are recognized early so that potential problems can be rectified before exceedences occur. Comprehensive internal audits of methods, Quality Control (QC) practices, sample analyses, and quality system elements confirm adherence to Standard Operating Procedures. Regular system reviews and a structured Continuous Improvement Program combine to provide the strongest possible Quality System.

Evaluated monthly, score carding of key performance indicators such as Proficiency Testing Performance drives the Program, defining successes and highlighting areas for improvement. We also have a corporate Management of Change procedure whereby substantive changes in the laboratory are adequately reviewed, communicated and documented.

2.2 Training

Upon hire, personnel are required to participate in the Corporate New Employee Orientation Program (NEOP) where they are trained on the quality management system, Ethics & Integrity, and the Environment, Health and Safety program. In addition to their initial training, they are provided technical training, delivered by designated individuals (supervisor or senior analyst level) with comprehensive working knowledge and experience in the area they are training. To ensure full traceability and auditability, training records for all employees are maintained in our online document control system and in the employee's personal training file, which is maintained by his/her supervisor.

Analyst competence is essential to the production of accurate data. Prior to beginning work in the laboratory, technicians and analysts are required to thoroughly understand the QA objectives and the relevant SOP. This, in conjunction with hands-on training from a senior analyst, ensures successful transfer of information is effective. Demonstration of acceptable performance on laboratory control samples or reference materials by the analyst is required for final certification to perform the method. Ongoing demonstration of capability is provided through blind performance evaluation samples, audits and annual recertification.

2.3 Customer Complaints

Formal responses are required to any customer complaints, discrepancies, deficiencies or quality issues. The deficiencies are recorded in an electronic database and cascade to the supervisor and the analyst for immediate attention. An acknowledgment of the deficiency is required within a specified timeframe accompanied by an action plan, which must include any corrective measures taken along with results of these actions. A follow-up report on the same form must be completed and returned documenting the effectiveness of the improvements implemented. If closure of the issue is not done in the required timeframe the issue is escalated to the next management level promoting prompt resolution of the issue.

2.4 Ethics and Data Integrity

All employees are required to undergo annual ethics training and to read and sign an Ethics and Data Integrity Agreement annually, promising to not knowingly commit an unethical act or through inaction, allow a coworker to do so. Senior management reinforces the program through presentations, discussion and written tests.

2.5 Verification through Quality Control

Public safety, environmental impact and major financial decisions are routinely based on our analytical data. Legal data defensibility is essential to these activities and is verified through a comprehensive quality control program. The protocols and procedures described below are routinely employed and are described in detail in our Standard Operating Procedures (SOPs) for analysis, laboratory practice and staff training. The quality assurance objectives are translated into specific requirements that are written into all standard operating procedures.

2.6 Quality Control Protocols

Each project is conducted under a defined quality control program. Our standard quality control protocols meet or exceed the requirements of Canadian and United States regulators. In addition to this, most large projects have a defined Quality Assurance Project Plan (QAPP) that includes all required data quality objectives. The following table outlines the quality control practices routinely employed in all laboratories. Additional elements or different limits may be used on a project specific basis.

Elements of Quality Control		
Element	**Frequency**	**Limits***
Field QC		
Sample Containers	Precleaned to EPA Specs	Non Detect
Traveling Blanks	Project Specific	<RDL
Field Duplicates	Project Specific	Project Specific
Run QC, All Methods		
Method Blanks	1 in 20 or 1/batch	<RDL
Blank Spikes	1 in 20 or 1/batch	CCME or Provincial limits
Matrix Spikes	1 in 20 or 1/batch	CCME or Provincial limits
Duplicates Analysis	1 in 20 or 1/batch	± 20%-50%
Real Time Control Charts	Key parameters, all tests	± 3 SD, trend analysis
Inorganic QC		
Instrument Calibration	Multipoint	>0.995 correlation
Calibration Verification	Daily (second source)	± 10% of initial
Continuing Cal. Verification	Every 20 samples & at end	± 10% of initial
Standard Reference Material	Daily – As Required (if available)	SRM limits
Organic QC		
Instrument Calibration	Multipoint	RSD ± 20%
Calibration Verification	Daily (second source)	± 20% of initial
Continuing Cal. Verification	Every 20 samples & at end	RF or RRF ± 30% of initial
Surrogate Standards	All samples, all organic analyses	CCME or Provincial limits
Internal Standards (IS)	All Samples (method specific)	-50% to +100% of IS in Cal'n
Standard Reference Material	As required (if available)	SRM limits
External QC		
Interlaboratory Comparisons	>50/year	Top 10% overall, >95% acceptable
Double Blind Program	Annually (Inorganic and Organic where applicable)	Statistical Limits
Internal QC Checks	As required	In house limits

* Typical QC acceptance criteria. Values may vary for specific tests.

2.7 Accreditation

Bureau Veritas Laboratories hold several accreditations granted by Canadian and United States regulatory organizations. The intent of accreditation is to document through laboratory audit, check samples, and round robin studies, each laboratory's conformance to ISO/IEC 17025, an internationally accepted quality system. The accreditation process is also an integral part of our philosophy of Continuous Improvement. The following organizations have endorsed our quality system. These endorsements are granted on a facility specific basis. In addition, many tier one industries have audited and approved our laboratories.

- Canadian Association for Laboratory Accreditation (CALA)
- Standards Council of Canada (SCC)
- Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)
- National Environmental Laboratory Accreditation (NELAC)
- National Voluntary Laboratory Accreditation Program (NVLAP)
- U.S. Environmental Protection Agency Contract Laboratory
- American Industrial Hygiene Association (AIHA)
- Various US States

2.8 Proficiency Testing

Our laboratories participate in many national and international proficiency testing and double blind check sample programs. As per ISO 17025 requirements, we are required to successfully participate in proficiency testing programs for tests included on our scope of accreditation. We go above and beyond these minimum requirements. Some of the programs in which we are currently participating include:

- Corporate Double Blind Program
- Proficiency Testing Canada (PT Canada) (formerly CALA)
- Phenova
- Environment and Climate Change Canada
- Collaborative Testing Services
- State of New York – Environmental Laboratory Approval Program

2.9 Double Blind Program

The Double Blind Program was implemented to measure the quality of data and service provided to customers. Proficiency testing samples are required as part of standard accreditation programs (ISO/IEC 17025), however they do not adequately simulate lab performance for client samples since the lab knows it is being tested. The double blind program involves using a sample from an accredited proficiency testing provider and having the sample "disguised" as a client sample so the lab is completely unaware their performance is being evaluated. The sample is sent to our laboratories as a regular sample, which upon completion is assessed by the Quality Assurance Department for turnaround time (TAT), data accuracy and traceability. This program best simulates lab performance for real client samples.

2.10 Customer Service / Project Management

The quality process extends beyond accreditations, methods and staff expertise. It includes the management system for all activities from project awards to follow-up customer satisfaction surveys. The heart of the process is the Project Management (PM) team, the largest laboratory customer service team in Canada. This team consists of dedicated professionals whose responsibility it is to ensure the customer gets the tests meeting their requirements, when promised. Project managers are also aware of current and emerging regulations and thus are able to assist customers in choosing the correct testing protocol.

Supporting the PM team is our unique Laboratory Information Management System (MaxxLIMS). MaxxLIMS tracks and monitors all project information and provides a direct link between analysis and reporting. Employing barcodes, MaxxLIMS monitors each sample's progress through the lab as it is received and logged, extracted, analyzed and the resulting data is approved, validated and reported. Comprehensive sample tracking, combined with instrument capacity and staff commitment to customer service, allows clients to be confident in our ability to deliver quality data on time. Customer feedback and PM process insight has driven a number of innovations, mostly made possible through MaxxLIMS.

- Client website access to approved data
- Client website access to project status
- On line bottle orders
- Sample integrity forms
- Custom electronic and hard copy deliverables packages.
- Regulatory reports
- Consolidated invoicing
- Project summary performance reports
- Real time, automated sample log-in and data checks

2.11 The Quality Promise

The Quality Pyramid summarizes our quality promise to our customers. Each component of the pyramid strengthens the overall customer experience and ultimately converges at a single point, the promise to deliver accurate, defensible data to our clients.


Accurate,
Defensible Results
Blind Proficiency Testing
Internal Auditing Program &
Continuous Improvement
Customer Feedback Tools
(CAR, NCR, MOC)
Unbiased Customer Protection
QA Independent of Operations
Comprehensive Employee
Education & Training Program
Experienced, Ethusiastic,
Passionate Staff
Strong Core Values,
Data Integrity & Ethics
Quality Promise = ∑
(Ethics, Experience, Training,
Corporate Committment
Accreditation, Internal Audits,
Continuous Improvement,
Blind PTs)

APPENDIX E

APPENDIX E

Detailed Water Quality Results

AN-5

		6/21/20	9/22/20	12/15/20
M Ions	Alk (mg/l)	61.0	68.0	86.0
	Ca (mg/l)	20.0	24.0	28.0
	Cl (mg/l)	0.3	0.5	0.6
	Cond-L (µS/cm)	144	162	198
	Hardness (mg/l)	68	82	96
	K (mg/l)	0.8	1.0	1.0
	Na (mg/l)	2.0	2.4	3.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	13.0	16.0	14.0
	Sum of Ions (mg/l)	115	132	158
Metal	As (µg/l)	0.3	0.3	0.3
	Ba (mg/l)	0.0980	0.0960	0.1100
	Cu (mg/l)	0.0015	0.0013	0.0015
	Fe (mg/l)	0.0850	0.1400	0.3900
	Mo (mg/l)	0.0032	0.0024	0.0025
	Ni (mg/l)	0.0006	0.0006	0.0008
	Pb (mg/l)	<0.0001	0.0001	0.0002
	Se (mg/l)	0.0001	<0.0001	<0.0001
	U (µg/l)	51.0	55.0	128.0
	Zn (mg/l)	0.0017	0.0006	0.0036
Nutrient	C-(org) (mg/l)	13.0		
	NO3 (mg/l)	<0.04		
	P-(TP) (mg/l)	0.01		
Phys Para	pH-L (pH Unit)	7.5	7.6	8.0
	TDS (mg/l)	87.00	115.00	133.00
	Temp-H20 (°C)	24.3	13.3	14.4
	TSS (mg/l)	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.06		
	Po210 (Bq/L)	0.030		
	Ra226 (Bq/L)	0.470	0.440	0.580

DB-6

		3/14/20	6/21/20	9/22/20	12/15/20
M Ions	Alk (mg/l)	99.0	77.0	79.0	84.0
	Ca (mg/l)	36.0	30.0	32.0	33.0
	Cl (mg/l)	0.8	0.5	0.5	0.5
	Cond-L (µS/cm)	234	187	188	201
	Hardness (mg/l)	113	92	99	101
	K (mg/l)	0.9	0.8	0.8	0.8
	Na (mg/l)	2.2	1.8	1.9	1.8
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	22.0	18.0	18.0	18.0
	Sum of Ions (mg/l)	189	149	154	161
Metal	As (µg/l)	0.1	0.1	<0.1	<0.1
	Ba (mg/l)	0.0500	0.0400	0.0370	0.0350
	Cu (mg/l)	0.0007	0.0006	0.0007	0.0007
	Fe (mg/l)	0.0270	0.0200	0.0180	0.0360
	Mo (mg/l)	0.0021	0.0019	0.0020	0.0019
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001
	Se (mg/l)	0.0001	<0.0001	<0.0001	<0.0001
	U (µg/l)	172.0	116.0	104.0	83.0
	Zn (mg/l)	<0.0005	0.0016	<0.0005	<0.0005
Nutrient	C-(org) (mg/l)		9.8		
	NO3 (mg/l)		<0.04		
	P-(TP) (mg/l)		<0.01		
Phys Para	pH-L (pH Unit)	7.7	7.7	7.8	7.8
	TDS (mg/l)	157.00	112.00	139.00	127.00
	Temp-H20 (°C)	4.5	21.7	12.7	15.0
	TSS (mg/l)	<1.0	3.0	<1.0	<1.0
Rads	Pb210 (Bq/L)		0.10		
	Po210 (Bq/L)		0.006		
	Ra226 (Bq/L)	0.030	0.040	0.020	0.020

AC-6A

		5/25/20	6/21/20	7/27/20	8/23/20	9/22/20	10/25/20	11/24/20	12/13/20
M Ions	Alk (mg/l)	98.0	125.0	102.0	98.0	99.0	116.0	108.0	114.0
	Ca (mg/l)	40.0	40.0	43.0	41.0	42.0	44.0	44.0	46.0
	Cl (mg/l)	0.5	0.4	0.5	0.5	0.5	0.6	0.6	0.5
	Cond-L (µS/cm)	271	276	275	269	277	295	292	298
	Hardness (mg/l)	136	135	146	140	143	149	149	156
	K (mg/l)	0.9	0.9	1.0	0.8	1.0	1.0	1.1	1.0
	Na (mg/l)	2.3	2.3	2.4	2.3	2.4	2.5	2.4	2.5
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	44.0	44.0	46.0	45.0	46.0	47.0	48.0	45.0
	Sum of Ions (mg/l)	216	248	226	219	222	247	238	244
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.0200	0.0240	0.0200	0.0200	0.0210	0.0220	0.0220	0.0240
	Cu (mg/l)	0.0004	0.0004	0.0003	0.0003	0.0004	0.0004	0.0010	0.0006
	Fe (mg/l)	0.0120	0.0100	0.0150	0.0084	0.0040	0.0030	0.0041	0.0048
	Mo (mg/l)	0.0009	0.0011	0.0018	0.0011	0.0011	0.0012	0.0011	0.0012
	Ni (mg/l)	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Se (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	U (µg/l)	368.0	252.0	173.0	269.0	294.0	354.0	322.0	304.0
	Zn (mg/l)	<0.0005	0.0018	<0.0005	<0.0005	<0.0005	<0.0005	0.0011	<0.0005
Nutrient	C-(org) (mg/l)		8.0						
	NO3 (mg/l)		<0.04						
	P-(TP) (mg/l)		<0.01						
Phys Para	pH-L (pH Unit)	7.8	7.8	7.8	8.0	7.8	7.9	7.9	7.9
	TDS (mg/l)	203.00	168.00	195.00	189.00	186.00	220.00	186.00	196.00
	Temp-H20 (°C)	8.4	22.0	20.0	16.7	12.3	3.8	0.3	16.3
	TSS (mg/l)	6.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)		0.18						
	Po210 (Bq/L)		0.010						
	Ra226 (Bq/L)	0.100	0.100	0.110	0.110	0.080	0.100	0.090	0.100

AC-8

		6/21/20
M Ions	Alk (mg/l)	44.0
	Ca (mg/l)	14.0
	Cl (mg/l)	0.8
	Cond-L (µS/cm)	98
	Hardness (mg/l)	46
	K (mg/l)	0.7
	Na (mg/l)	1.4
	OH (mg/l)	<1.0000
	SO4 (mg/l)	5.6
	Sum of Ions (mg/l)	79
Metal	As (µg/l)	0.1
	Ba (mg/l)	0.0210
	Cu (mg/l)	0.0005
	Fe (mg/l)	0.0300
	Mo (mg/l)	0.0008
	Ni (mg/l)	0.0002
	Pb (mg/l)	<0.0001
	Se (mg/l)	<0.0001
	U (µg/l)	12.0
	Zn (mg/l)	0.0014
Nutrient	C-(org) (mg/l)	8.8
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.6
	TDS (mg/l)	57.00
	Temp-H20 (°C)	18.4
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	<0.02
	Po210 (Bq/L)	0.005
	Ra226 (Bq/L)	<0.005

AC-14

		3/14/20	6/22/20	9/23/20	12/13/20
M Ions	Alk (mg/l)	53.0	46.0	48.0	50.0
	Ca (mg/l)	16.0	15.0	16.0	16.0
	Cl (mg/l)	1.1	0.8	0.9	0.9
	Cond-L (µS/cm)	115	102	107	111
	Hardness (mg/l)	53	49	53	53
	K (mg/l)	0.8	0.7	0.8	0.8
	Na (mg/l)	1.7	1.6	1.6	1.8
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	6.4	6.2	7.0	7.0
	Sum of Ions (mg/l)	95	83	88	91
Metal	As (µg/l)	0.1	0.2	0.1	0.2
	Ba (mg/l)	0.0240	0.0240	0.0230	0.0210
	Cu (mg/l)	0.0005	0.0006	0.0005	0.0007
	Fe (mg/l)	0.0290	0.0530	0.0430	0.0540
	Mo (mg/l)	0.0009	0.0009	0.0010	0.0010
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002
	Pb (mg/l)	<0.0001	0.0004	0.0001	0.0003
	Se (mg/l)	<0.0001	<0.0001	<0.0001	0.0001
	U (µg/l)	16.0	19.0	19.0	21.0
	Zn (mg/l)	0.0020	0.0023	<0.0005	0.0023
Nutrient	C-(org) (mg/l)		9.0		
	NO3 (mg/l)		<0.04		
	P-(TP) (mg/l)		<0.01		
Phys Para	pH-L (pH Unit)	7.8	7.7	7.7	7.8
	TDS (mg/l)	100.00	59.00	79.00	78.00
	Temp-H20 (°C)	6.0	18.9	10.6	13.7
	TSS (mg/l)	<1.0	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)		<0.02		
	Po210 (Bq/L)		0.010		
	Ra226 (Bq/L)	0.030	0.040	0.030	0.020

AN-3

		6/21/20
M Ions	Alk (mg/l)	69.0
	Ca (mg/l)	20.0
	Cl (mg/l)	0.6
	Cond-L (µS/cm)	138
	Hardness (mg/l)	68
	K (mg/l)	0.7
	Na (mg/l)	1.9
	OH (mg/l)	<1.0000
	SO4 (mg/l)	4.1
	Sum of Ions (mg/l)	116
Metal	As (µg/l)	0.1
	Ba (mg/l)	0.0170
	Cu (mg/l)	0.0006
	Fe (mg/l)	0.0150
	Mo (mg/l)	0.0017
	Ni (mg/l)	0.0002
	Pb (mg/l)	<0.0001
	Se (mg/l)	<0.0001
	U (µg/l)	1.9
	Zn (mg/l)	0.0019
Nutrient	C-(org) (mg/l)	8.4
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.9
	TDS (mg/l)	81.00
	Temp-H20 (°C)	23.0
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	<0.02
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.006

TL-3

		6/21/20	12/15/20
M Ions	Alk (mg/l)	124.0	103.0
	Ca (mg/l)	28.0	29.0
	Cl (mg/l)	2.1	1.4
	Cond-L (µS/cm)	279	224
	Hardness (mg/l)	91	97
	K (mg/l)	1.1	1.1
	Na (mg/l)	26.0	10.0
	OH (mg/l)	<1.0000	<1.0000
	SO4 (mg/l)	23.0	11.0
	Sum of Ions (mg/l)	236	185
Metal	As (µg/l)	0.6	0.4
	Ba (mg/l)	0.0430	0.0300
	Cu (mg/l)	0.0012	0.0022
	Fe (mg/l)	0.0140	0.0190
	Mo (mg/l)	0.0100	0.0050
	Ni (mg/l)	0.0003	0.0004
	Pb (mg/l)	0.0008	0.0002
	Se (mg/l)	0.0023	0.0008
	U (µg/l)	221.0	73.0
	Zn (mg/l)	<0.0005	0.0032
Nutrient	C-(org) (mg/l)	8.4	
	NO3 (mg/l)	<0.04	
	P-(TP) (mg/l)	<0.01	
Phys Para	pH-L (pH Unit)	8.1	7.9
	TDS (mg/l)	188.00	128.00
	Temp-H20 (°C)	19.4	14.0
	TSS (mg/l)	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.13	
	Po210 (Bq/L)	0.060	
	Ra226 (Bq/L)	1.300	0.490

TL-4

		6/21/20	12/13/20
M Ions	Alk (mg/l)	127.0	136.0
	Ca (mg/l)	26.0	32.0
	Cl (mg/l)	2.1	2.0
	Cond-L (µS/cm)	275	303
	Hardness (mg/l)	85	103
	K (mg/l)	1.2	1.2
	Na (mg/l)	26.0	26.0
	OH (mg/l)	<1.0000	<1.0000
	SO4 (mg/l)	19.0	23.0
	Sum of Ions (mg/l)	234	256
Metal	As (µg/l)	1.0	0.7
	Ba (mg/l)	0.0890	0.0610
	Cu (mg/l)	0.0007	0.0010
	Fe (mg/l)	0.0500	0.0250
	Mo (mg/l)	0.0074	0.0100
	Ni (mg/l)	0.0005	0.0004
	Pb (mg/l)	0.0002	0.0005
	Se (mg/l)	0.0015	0.0019
	U (µg/l)	167.0	228.0
	Zn (mg/l)	0.0018	<0.0005
Nutrient	C-(org) (mg/l)	12.0	
	NO3 (mg/l)	<0.04	
	P-(TP) (mg/l)	0.01	
Phys Para	pH-L (pH Unit)	8.0	8.1
	TDS (mg/l)	172.00	169.00
	Temp-H20 (°C)	20.5	12.5
	TSS (mg/l)	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.04	
	Po210 (Bq/L)	0.030	
	Ra226 (Bq/L)	1.500	1.600

TL-6

		6/21/20
M Ions	Alk (mg/l)	277.0
	Ca (mg/l)	54.0
	Cl (mg/l)	34.0
	Cond-L (µS/cm)	743
	Hardness (mg/l)	184
	K (mg/l)	2.4
	Na (mg/l)	94.0
	OH (mg/l)	<1.0000
	SO4 (mg/l)	71.0
	Sum of Ions (mg/l)	605
Metal	As (µg/l)	1.6
	Ba (mg/l)	1.2700
	Cu (mg/l)	0.0007
	Fe (mg/l)	0.4300
	Mo (mg/l)	0.0020
	Ni (mg/l)	0.0005
	Pb (mg/l)	0.0003
	Se (mg/l)	0.0038
	U (µg/l)	241.0
	Zn (mg/l)	0.0020
Nutrient	C-(org) (mg/l)	38.0
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	0.02
Phys Para	pH-L (pH Unit)	7.8
	TDS (mg/l)	521.00
	Temp-H20 (°C)	20.4
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	0.07
	Po210 (Bq/L)	0.050
	Ra226 (Bq/L)	7.700

TL-7

		6/22/20	9/22/20	12/13/20
M Ions	Alk (mg/l)	131.0	130.0	136.0
	Ca (mg/l)	28.0	30.0	32.0
	Cl (mg/l)	3.3	3.1	3.0
	Cond-L (µS/cm)	286	286	311
	Hardness (mg/l)	91	98	104
	K (mg/l)	1.2	1.3	1.2
	Na (mg/l)	27.0	26.0	27.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	19.0	20.0	23.0
	Sum of Ions (mg/l)	244	245	258
Metal	As (µg/l)	1.0	0.8	0.7
	Ba (mg/l)	0.2000	0.1600	0.1200
	Cu (mg/l)	0.0007	0.0005	0.0009
	Fe (mg/l)	0.0410	0.0230	0.0210
	Mo (mg/l)	0.0076	0.0096	0.0100
	Ni (mg/l)	0.0005	0.0004	0.0004
	Pb (mg/l)	0.0001	0.0001	0.0003
	Se (mg/l)	0.0020	0.0013	0.0018
	U (µg/l)	160.0	216.0	226.0
	Zn (mg/l)	<0.0005	<0.0005	<0.0005
Nutrient	C-(org) (mg/l)	10.0		
	NO3 (mg/l)	<0.04		
	P-(TP) (mg/l)	<0.01		
Phys Para	pH-L (pH Unit)	7.8	8.0	8.0
	TDS (mg/l)	189.00	188.00	188.00
	Temp-H20 (°C)	20.5	13.0	12.1
	TSS (mg/l)	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.06		
	Po210 (Bq/L)	0.020		
	Ra226 (Bq/L)	1.800	1.600	1.600

TL-9

		6/22/20	9/23/20	12/13/20
M Ions	Alk (mg/l)	149.0	130.0	136.0
	Ca (mg/l)	27.0	29.0	32.0
	Cl (mg/l)	3.3	3.4	3.0
	Cond-L (µS/cm)	276	275	308
	Hardness (mg/l)	90	97	105
	K (mg/l)	1.3	1.2	1.2
	Na (mg/l)	25.0	25.0	26.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	17.0	18.0	22.0
	Sum of Ions (mg/l)	261	242	256
Metal	As (µg/l)	1.2	0.9	0.8
	Ba (mg/l)	0.5700	0.4900	0.2200
	Cu (mg/l)	0.0008	0.0004	0.0007
	Fe (mg/l)	0.0640	0.0290	0.0220
	Mo (mg/l)	0.0065	0.0088	0.0097
	Ni (mg/l)	0.0004	0.0003	0.0004
	Pb (mg/l)	0.0011	0.0002	0.0003
	Se (mg/l)	0.0019	0.0014	0.0017
	U (µg/l)	145.0	188.0	228.0
	Zn (mg/l)	0.0029	<0.0005	<0.0005
Nutrient	C-(org) (mg/l)	11.0		
	NO3 (mg/l)	0.16		
	P-(TP) (mg/l)	0.01		
Phys Para	pH-L (pH Unit)	8.0	8.1	8.1
	TDS (mg/l)	188.00	169.00	171.00
	Temp-H20 (°C)	20.5	7.8	11.6
	TSS (mg/l)	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.07		
	Po210 (Bq/L)	0.080		
	Ra226 (Bq/L)	2.100	1.700	1.300

BL-3

		6/22/20	12/13/20
M Ions	Alk (mg/l)	68.0	70.0
	Ca (mg/l)	20.0	22.0
	Cl (mg/l)	12.0	12.0
	Cond-L (µS/cm)	225	230
	Hardness (mg/l)	70	77
	K (mg/l)	1.0	1.1
	Na (mg/l)	17.0	17.0
	OH (mg/l)	<1.0000	<1.0000
	SO4 (mg/l)	27.0	28.0
	Sum of Ions (mg/l)	165	170
Metal	As (µg/l)	0.2	0.2
	Ba (mg/l)	0.0430	0.0360
	Cu (mg/l)	0.0009	0.0014
	Fe (mg/l)	0.0032	0.0047
	Mo (mg/l)	0.0033	0.0034
	Ni (mg/l)	0.0016	0.0020
	Pb (mg/l)	<0.0001	<0.0001
	Se (mg/l)	0.0022	0.0021
	U (µg/l)	125.0	122.0
	Zn (mg/l)	0.0014	0.0020
Nutrient	C-(org) (mg/l)	3.7	
	NO3 (mg/l)	<0.04	
	P-(TP) (mg/l)	<0.01	
Phys Para	pH-L (pH Unit)	7.8	8.0
	TDS (mg/l)	119.00	122.00
	Temp-H20 (°C)	18.3	13.4
	TSS (mg/l)	<1.0	<1.0
Rads	Pb210 (Bq/L)	0.02	
	Po210 (Bq/L)	<0.005	
	Ra226 (Bq/L)	0.050	0.050

BL-4

		6/22/20
M Ions	Alk (mg/l)	67.0
	Ca (mg/l)	20.0
	Cl (mg/l)	12.0
	Cond-L (µS/cm)	224
	Hardness (mg/l)	70
	K (mg/l)	1.0
	Na (mg/l)	17.0
	OH (mg/l)	<1.0000
	SO4 (mg/l)	27.0
	Sum of Ions (mg/l)	164
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.0360
	Cu (mg/l)	0.0006
	Fe (mg/l)	0.0031
	Mo (mg/l)	0.0033
	Ni (mg/l)	0.0008
	Pb (mg/l)	<0.0001
	Se (mg/l)	0.0021
	U (µg/l)	121.0
	Zn (mg/l)	0.0018
Nutrient	C-(org) (mg/l)	3.5
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.8
	TDS (mg/l)	116.00
	Temp-H20 (°C)	14.4
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	0.08
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.030

BL-5

		6/22/20
M Ions	Alk (mg/l)	66.0
	Ca (mg/l)	20.0
	Cl (mg/l)	11.0
	Cond-L (µS/cm)	221
	Hardness (mg/l)	70
	K (mg/l)	1.0
	Na (mg/l)	17.0
	OH (mg/l)	<1.0000
	SO4 (mg/l)	27.0
	Sum of Ions (mg/l)	161
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.0360
	Cu (mg/l)	0.0003
	Fe (mg/l)	0.0030
	Mo (mg/l)	0.0033
	Ni (mg/l)	0.0002
	Pb (mg/l)	<0.0001
	Se (mg/l)	0.0021
	U (µg/l)	120.0
	Zn (mg/l)	<0.0005
Nutrient	C-(org) (mg/l)	3.6
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	8.0
	TDS (mg/l)	128.00
	Temp-H20 (°C)	15.7
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	0.08
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.020

ML-1

		6/22/20	12/13/20
M Ions	Alk (mg/l)	58.0	51.0
	Ca (mg/l)	17.0	16.0
	Cl (mg/l)	5.5	1.5
	Cond-L (µS/cm)	158	112
	Hardness (mg/l)	58	53
	K (mg/l)	1.0	1.0
	Na (mg/l)	8.3	2.0
	OH (mg/l)	<1.0000	<1.0000
	SO4 (mg/l)	13.0	4.8
	Sum of Ions (mg/l)	120	91
Metal	As (µg/l)	0.2	0.2
	Ba (mg/l)	0.0400	0.0330
	Cu (mg/l)	0.0003	0.0004
	Fe (mg/l)	0.0093	0.0320
	Mo (mg/l)	0.0015	0.0005
	Ni (mg/l)	0.0001	0.0002
	Pb (mg/l)	<0.0001	<0.0001
	Se (mg/l)	0.0008	0.0001
	U (µg/l)	44.0	2.7
	Zn (mg/l)	<0.0005	0.0013
Nutrient	C-(org) (mg/l)	6.3	
	NO3 (mg/l)	<0.04	
	P-(TP) (mg/l)	<0.01	
Phys Para	pH-L (pH Unit)	7.8	7.8
	TDS (mg/l)	132.00	68.00
	Temp-H20 (°C)	15.9	12.0
	TSS (mg/l)	<1.0	<1.0
Rads	Pb210 (Bq/L)	<0.02	
	Po210 (Bq/L)	<0.005	
	Ra226 (Bq/L)	<0.005	0.005

CS-1

		6/22/20
M Ions	Alk (mg/l)	60.0
	Ca (mg/l)	18.0
	Cl (mg/l)	5.8
	Cond-L (µS/cm)	163
	Hardness (mg/l)	61
	K (mg/l)	1.0
	Na (mg/l)	8.7
	OH (mg/l)	<1.0000
	SO4 (mg/l)	14.0
	Sum of Ions (mg/l)	124
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.0420
	Cu (mg/l)	0.0012
	Fe (mg/l)	0.0450
	Mo (mg/l)	0.0017
	Ni (mg/l)	0.0002
	Pb (mg/l)	<0.0001
	Se (mg/l)	0.0008
	U (µg/l)	44.0
	Zn (mg/l)	0.0028
Nutrient	C-(org) (mg/l)	6.4
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.7
	TDS (mg/l)	118.00
	Temp-H20 (°C)	16.4
	TSS (mg/l)	1.0
Rads	Pb210 (Bq/L)	0.03
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	<0.005

CS-2

		6/22/20
M Ions	Alk (mg/l)	41.0
	Ca (mg/l)	12.0
	Cl (mg/l)	4.4
	Cond-L (µS/cm)	111
	Hardness (mg/l)	42
	K (mg/l)	0.9
	Na (mg/l)	5.4
	OH (mg/l)	<1.0000
	SO4 (mg/l)	8.1
	Sum of Ions (mg/l)	84
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.0230
	Cu (mg/l)	0.0012
	Fe (mg/l)	0.0300
	Mo (mg/l)	0.0008
	Ni (mg/l)	0.0017
	Pb (mg/l)	<0.0001
	Se (mg/l)	0.0003
	U (µg/l)	18.0
	Zn (mg/l)	0.0020
Nutrient	C-(org) (mg/l)	4.4
	NO3 (mg/l)	<0.04
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.6
	TDS (mg/l)	92.00
	Temp-H20 (°C)	19.4
	TSS (mg/l)	<1.0
Rads	Pb210 (Bq/L)	<0.02
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.006

ZOR-01

		3/14/20	4/21/20	5/25/20	6/21/20	7/27/20	8/23/20	9/22/20	10/25/20	11/24/20	12/13/20
M Ions	Alk (mg/l)	115.0	104.0	95.0	94.0	96.0	92.0	95.0	106.0	104.0	105.0
	Ca (mg/l)	33.0	33.0	30.0	30.0	31.0	31.0	31.0	34.0	33.0	35.0
	Cl (mg/l)	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
	Cond-L (µS/cm)	238	231	208	212	206	205	203	227	220	232
	Hardness (mg/l)	116	115	105	105	109	109	109	119	114	121
	K (mg/l)	0.9	0.8	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0.8
	Na (mg/l)	1.9	1.9	1.7	1.8	1.8	1.7	1.7	1.9	1.8	2.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	19.0	18.0	17.0	17.0	18.0	18.0	18.0	19.0	18.0	18.0
	Sum of Ions (mg/l)	204	190	173	172	177	172	176	193	189	195
Metal	As (µg/l)	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2
	Ba (mg/l)	0.0250	0.0240	0.0210	0.0230	0.0210	0.0200	0.0210	0.0280	0.0230	0.0240
	Cu (mg/l)	0.0009	0.0033	0.0020	0.0006	0.0016	0.0013	0.0020	0.0012	0.0026	0.0004
	Fe (mg/l)	0.0096	0.0150	0.0110	0.0086	0.0056	0.0083	0.0079	0.0110	0.0084	0.0070
	Mo (mg/l)	0.0008	0.0009	0.0009	0.0009	0.0009	0.0010	0.0010	0.0008	0.0009	0.0011
	Ni (mg/l)	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002
	Pb (mg/l)	<0.0001	0.0004	0.0011	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0002	<0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	U (µg/l)	18.0	16.0	14.0	16.0	14.0	16.0	15.0	15.0	14.0	16.0
	Zn (mg/l)	0.0012	0.0180	0.0022	0.0008	0.0012	0.0009	0.0016	0.0009	0.0039	<0.0005
Nutrient	C-(org) (mg/l)				9.2						
	NO3 (mg/l)				<0.04						
	P-(TP) (mg/l)				<0.01						
Phys Para	pH-L (pH Unit)	7.8	7.8	7.9	8.0	8.1	8.0	8.0	7.8	8.0	7.8
	TDS (mg/l)	173.00	125.00	147.00	144.00	154.00	150.00	149.00	172.00	130.00	138.00
	Temp-H20 (°C)	1.9	4.6	10.0	21.1	21.0	18.1	12.6	3.0	0.6	14.6
	TSS (mg/l)	5.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)				0.03						
	Po210 (Bq/L)				0.008						
	Ra226 (Bq/L)	0.010	0.020	0.020	0.020	0.020	0.030	0.020	0.040	0.020	0.020

ZOR-02

		3/14/20	5/25/20	6/21/20	7/27/20	8/23/20	9/22/20	10/25/20	11/24/20	12/13/20
M Ions	Alk (mg/l)	111.0	97.0	98.0	102.0	97.0	98.0	107.0	105.0	110.0
	Ca (mg/l)	34.0	42.0	36.0	39.0	40.0	37.0	40.0	37.0	39.0
	Cl (mg/l)	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4
	Cond-L (µS/cm)	245	277	248	249	261	245	260	242	256
	Hardness (mg/l)	120	140	122	132	135	127	136	126	133
	K (mg/l)	0.9	0.8	0.8	0.8	0.8	0.7	0.8	0.9	0.8
	Na (mg/l)	2.0	1.9	1.8	1.9	1.9	1.8	2.0	1.9	2.1
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
	SO4 (mg/l)	19.0	48.0	32.0	34.0	40.0	32.0	31.0	25.0	25.0
	Sum of Ions (mg/l)	200	220	199	209	210	200	213	202	211
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
	Ba (mg/l)	0.0240	0.0220	0.0250	0.0240	0.0210	0.0210	0.0240	0.0220	0.0230
	Cu (mg/l)	0.0006	0.0012	0.0015	0.0018	0.0014	0.0013	0.0010	0.0018	0.0014
	Fe (mg/l)	0.0160	0.0580	0.0470	0.0940	0.0700	0.0330	0.0350	0.0240	0.0510
	Mo (mg/l)	0.0010	0.0014	0.0013	0.0014	0.0014	0.0012	0.0010	0.0011	0.0012
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	Pb (mg/l)	<0.0001	0.0001	0.0001	0.0002	0.0001	<0.0001	<0.0001	0.0001	<0.0001
	Se (mg/l)	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002
	U (µg/l)	34.0	300.0	198.0	228.0	217.0	150.0	153.0	103.0	93.0
	Zn (mg/l)	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0013	<0.0005
Nutrient	C-(org) (mg/l)			8.3						
	NO3 (mg/l)			0.19						
	P-(TP) (mg/l)			<0.01						
Phys Para	pH-L (pH Unit)	7.9	7.9	7.9	8.0	7.8	7.9	8.0	7.9	7.9
	TDS (mg/l)	189.00	184.00	183.00	178.00	182.00	174.00	188.00	160.00	159.00
	Temp-H20 (°C)	1.3	8.1	18.0	20.0	16.5	11.3	2.9	0.3	14.5
	TSS (mg/l)	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Rads	Pb210 (Bq/L)			0.11						
	Po210 (Bq/L)			0.020						
	Ra226 (Bq/L)	0.110	0.140	0.150	0.210	0.200	0.160	0.140	0.130	0.020

APPENDIX F

APPENDIX F

Beaverlodge Operation
Quality Control/Quality Assurance for Environmental Sample Analysis

Parent Field	Station: AC-14				Child Field	Station: Blind-1				
Date: 2020/12/13					Date: 2020/12/13					
Assigned: SRC Lab					Assigned: SRC Lab					
Parameter	Value	Method	Entered DL	Entered Uncertainty	Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Alk	50.0	Acid Titration	1.0	8.0	Alk	49.0	Acid Titration	1.0	7.0	2.0
As	0.2	ICP-MS	0.1	0.1	As	0.200	ICP-MS	0.100	0.100	0.000
Ba	0.021	ICP-MS	0.001	0.003	Ba	0.020	ICP-MS	0.001	0.003	4.878
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0.0
Ca	16.0	ICP-OES	0.1	2.0	Ca	17.0	ICP-OES	0.1	2.0	6.1
Cl	0.90	Ion Chromatograph y	0.10	0.10	Cl	0.90	Ion Chromatograph y	0.10	0.10	0.00
Cond-F	137				Cond-F	142				4
Cond-L	111	Conductivity Meter	1	10	Cond-L	112	Conductivity Meter	1	10	1
Cu	0.0007	ICP-MS	0.0002	0.0003	Cu	0.0007	ICP-MS	0.0002	0.0003	0.0000
Fe	0.054	ICP-MS	0.001	0.005	Fe	0.053	ICP-MS	0.001	0.005	1.869
HCO3	61.0	Acid Titration	1.0	9.0	HCO3	60.0	Acid Titration	1.0	9.0	1.7
Hardness	53	Calculated	1	8	Hardness	56	Calculated	1	8	6
K	0.8	ICP-OES	0.1	0.3	K	0.8	ICP-OES	0.1	0.3	0.0
Mg	3.2	ICP-OES	0.1	0.5	Mg	3.2	ICP-OES	0.1	0.5	0.0
Mo	0.0010	ICP-MS	0.0001	0.0002	Mo	0.0010	ICP-MS	0.0001	0.0002	0.0000
Na	1.8	ICP-OES	0.1	0.4	Na	1.9	ICP-OES	0.1	0.5	5.4
Ni	0.00020	ICP-MS	0.00010	0.00010	Ni	0.00020	ICP-MS	0.00010	0.00010	0.00000
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0003	ICP-MS	0.0001	0.0001	Pb	0.0003	ICP-MS	0.0001	0.0001	0.0000
Ra226	0.020	Alpha Septroscopy	0.005	0.010	Ra226	0.030	Alpha Septroscopy	0.005	0.010	40.000
SO4	7.0	ICP-OES	0.2	1.0	SO4	7.3	ICP-OES	0.2	1.0	4.2
Se	0.0001	ICP-MS	0.0001	0.0001	Se	0.0001	ICP-MS	0.0001	0.0001	0.0000
Sum of Ions	91	Calculated	1	10	Sum of Ions	91	Calculated	1	10	0
TDS	78.00	Gravimetric	5.00	20.00	TDS	72.00	Gravimetric	5.00	20.00	8.00
TSS	< 1.000	Gravimetric	1.000		TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	13.7				Temp-H20	13.7				0.0
U	21.000	ICP-MS	0.100	2.000	U	21.000	ICP-MS	0.100	2.000	0.000
Zn	0.002	ICP-MS	0.001	0.001	Zn	0.004	ICP-MS	0.001	0.002	62.687
pH-F	6.7000				pH-F	6.7000				0.0000
pH-L	7.76	pH Meter	0.07	0.30	pH-L	7.75	pH Meter	0.07	0.30	0.13

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: DB-6 FB			
Date: 2020/09/22				
Assigned: SRC Lab				
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**
Alk	2.0	Acid Titration	1.0	1.0
As	<0.1	ICP-MS	0.1	
Ba	<0.001	ICP-MS	0.001	
CO3	<1.0	Acid Titration	1.0	
Ca	<0.1	ICP-OES	0.1	
Cl	<0.10	Ion Chromatography	0.10	
Cond-L	<1	Conductivity Meter	1	
Cu	<0.0002	ICP-MS	0.0002	
Fe	<0.001	ICP-MS	0.001	
HCO3	2.0	Acid Titration	1.0	1.0
Hardness	<1	Calculated	1	
K	<0.1	ICP-OES	0.1	
Mg	<0.1	ICP-OES	0.1	
Mo	<0.0001	ICP-MS	0.0001	
Na	0.2	ICP-OES	0.1	0.1
Ni	<0.00010	ICP-MS	0.00010	
OH	<1.0	Acid Titration	1.0	
Pb	<0.0001	ICP-MS	0.0001	
Ra226	<0.005	Alpha Septroscopy	0.005	
SO4	<0.2	ICP-OES	0.2	
Se	<0.0001	ICP-MS	0.0001	
Sum of Ions	2	Calculated	1	1
TDS	<5.00	Gravimetric	5.00	
TSS	<1.000	Gravimetric	1.000	
U	<0.100	ICP-MS	0.100	
Zn	<0.001	ICP-MS	0.001	
pH-L	5.29	pH Meter	0.07	0.20

Child Field	Station: DB-6 TB				
Date: 2020/09/22					
Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	1.0	Acid Titration	1.0	1.0	66.7
As	< 0.100	ICP-MS	0.100		0.000
Ba	< 0.001	ICP-MS	0.001		0.000
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	< 0.1	ICP-OES	0.1		0.0
Cl	< 0.10	Ion Chromatography	0.10		0.00
Cond-L	< 1	Conductivity Meter	1		0
Cu	< 0.0002	ICP-MS	0.0002		0.0000
Fe	< 0.001	ICP-MS	0.001		0.000
HCO3	1.0	Acid Titration	1.0	1.0	66.7
Hardness	< 1	Calculated	1		0
K	< 0.1	ICP-OES	0.1		0.0
Mg	< 0.1	ICP-OES	0.1		0.0
Mo	< 0.0001	ICP-MS	0.0001		0.0000
Na	< 0.1	ICP-OES	0.1		66.7
Ni	< 0.00010	ICP-MS	0.00010		0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	< 0.0001	ICP-MS	0.0001		0.0000
Ra226	< 0.005	Alpha Septroscopy	0.005		0.000
SO4	< 0.2	ICP-OES	0.2		0.0
Se	< 0.0001	ICP-MS	0.0001		0.0000
Sum of Ions	1	Calculated	1	1	67
TDS	< 5.00	Gravimetric	5.00		0.00
TSS	< 1.000	Gravimetric	1.000		0.000
U	< 0.100	ICP-MS	0.100		0.000
Zn	< 0.001	ICP-MS	0.001		0.000
pH-L	5.13	pH Meter	0.07	0.20	3.07

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: TL-4 Duplicate			
Date: 2020/06/21				
Assigned: None-Selected				
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**
As	0.7			
Ba	0.082			
Cu	0.0012			
Fe	0.064			
Mo	0.0085			
Ni	0.00060			
Pb	< 0.0002			
Pb210	< 0.10			
Po210	0.027			
Ra226	1.100			
Se	0.0009			
U	180.000			
Zn	< 0.003			

Child Field	Station: TL-4				
Date: 2020/06/21					
Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
As	1.0	ICP-MS	0.1	0.2	33.9
Ba	0.089	ICP-MS	0.001	0.009	8.187
Cu	0.0007	ICP-MS	0.0002	0.0003	52.6316
Fe	0.050	ICP-MS	0.001	0.005	24.561
Mo	0.0074	ICP-MS	0.0001	0.0010	13.8365
Ni	0.00050	ICP-MS	0.00010	0.00030	18.18182
Pb	0.0002	ICP-MS	0.0001	0.0001	0.0000
Pb210	0.04	Beta Counting	0.02	0.03	85.71
Po210	0.030	Alpha Septroscopy	0.005	0.020	10.526
Ra226	1.500	Alpha Septroscopy	0.010	0.200	30.769
Se	0.0015	ICP-MS	0.0001	0.0004	51.0460
U	167.000	ICP-MS	0.100	20.000	7.493
Zn	0.002	ICP-MS	0.001	0.001	50.000

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: TL-7			
Date: 2020/09/22				
Assigned: SRC Lab				
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**
Alk	130.0	Acid Titration	1.0	10.0
As	0.8	ICP-MS	0.1	0.2
Ba	0.160	ICP-MS	0.001	0.020
CO3	< 1.0	Acid Titration	1.0	
Ca	30.0	ICP-OES	0.1	3.0
Cl	3.10	Ion Chromatography	0.10	0.50
Cond-F	352			
Cond-L	286	Conductivity Meter	1	30
Cu	0.0005	ICP-MS	0.0002	0.0003
Fe	0.023	ICP-MS	0.001	0.003
HCO3	159.0	Acid Titration	1.0	20.0
Hardness	98	Calculated	1	10
K	1.3	ICP-OES	0.1	0.3
Mg	5.6	ICP-OES	0.1	0.8
Mo	0.0096	ICP-MS	0.0001	0.0010
Na	26.0	ICP-OES	0.1	3.0
Ni	0.00040	ICP-MS	0.00010	0.00020
OH	< 1.0	Acid Titration	1.0	
Pb	0.0001	ICP-MS	0.0001	0.0001
SO4	20.0	ICP-OES	0.2	2.0
Se	0.0013	ICP-MS	0.0001	0.0003
Sum of Ions	245	Calculated	1	20
TDS	188.00	Gravimetric	5.00	30.00
TSS	< 1.000	Gravimetric	1.000	
Temp-H20	13.0			
U	216.000	ICP-MS	0.100	20.000
Zn	< 0.001	ICP-MS	0.001	
pH-F	7.6000			
pH-L	8.02	pH Meter	0.07	0.30

Child Field	Station: Blind-6				
Date: 2020/09/22					
Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	131.0	Acid Titration	1.0	10.0	0.8
As	0.8	ICP-MS	0.1	0.2	0.0
Ba	0.160	ICP-MS	0.001	0.020	0.000
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	30.0	ICP-OES	0.1	3.0	0.0
Cl	3.10	Ion Chromatography	0.10	0.50	0.00
Cond-F	352				0
Cond-L	281	Conductivity Meter	1	30	2
Cu	0.0005	ICP-MS	0.0002	0.0003	0.0000
Fe	0.023	ICP-MS	0.001	0.003	0.000
HCO3	160.0	Acid Titration	1.0	20.0	0.6
Hardness	97	Calculated	1	10	1
K	1.2	ICP-OES	0.1	0.3	8.0
Mg	5.5	ICP-OES	0.1	0.8	1.8
Mo	0.0096	ICP-MS	0.0001	0.0010	0.0000
Na	27.0	ICP-OES	0.1	3.0	3.8
Ni	0.00040	ICP-MS	0.00010	0.00020	0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0001	ICP-MS	0.0001	0.0001	0.0000
SO4	20.0	ICP-OES	0.2	2.0	0.0
Se	0.0014	ICP-MS	0.0001	0.0004	7.4074
Sum of Ions	247	Calculated	1	20	1
TDS	192.00	Gravimetric	5.00	30.00	2.11
TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	12.1				7.2
U	212.000	ICP-MS	0.100	20.000	1.869
Zn	< 0.001	ICP-MS	0.001		0.000
pH-F	7.6000				0.0000
pH-L	8.02	pH Meter	0.07	0.30	0.00

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

APPENDIX G

APPENDIX G

2020 Hydrometric Monitoring near Beaverlodge Mine

Cameco Corporation
March 2021

MISSINIPI WATER SOLUTIONS INC.
FILE NUMBER: MWS-20-006
PO BOX 32089 ERINDALE
SASKATOON, SK CANADA S7S 1N8

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1.0 INTRODUCTION

The development of uranium mines in the area of Beaverlodge Lake near Uranium City, Saskatchewan began in the 1950s. At that time, the Beaverlodge operations were owned by Eldorado Mining and Refining Ltd., a crown corporation of the Government of Canada and consisted of a mill and underground mine, in addition to numerous satellite mine sites in the area. The Beaverlodge mill and associated mine sites (the Site) were closed in 1982 and decommissioning and reclamation works were completed in 1985. The project transferred into a monitoring and maintenance phase following decommissioning and reclamation. The site is currently managed by Cameco Corporation (Cameco) on behalf of the Government of Canada. (SRK Consulting, 2009)

Monitoring activities have continued since the closure of the Site and include routine sampling such as measurement of water quality and water quantity. Cameco has retained Missinipi Water Solutions Inc. (MWSI) to perform annual hydrological monitoring in areas associated with the Site and downstream. This report documents field and desktop activities carried out by MWSI related to the development of flow records at the Site. The scope of work covered in this report includes hydrometric monitoring and reporting for the following stations:

- AC-6A – Verna Lake to Ace Lake;
- AC-6B – Ace Creek Upstream of Ace Lake;
- AC-8 – Ace Lake Outflow;
- AC-14 – Ace Creek Upstream of Beaverlodge Lake;
- CS-1 – Crackingstone River;
- Fredette River;
- TL-6 – Minewater Reservoir Outflow; and,
- TL-7 – Fulton Creek Weir.

Spot measurements were completed at the outflow from Zora Lake and the inflow to Verna Lake along the same stream alignment. The locations of permanent monitoring stations are presented in Figure 1. Through discussion between Cameco and MWSI, measurements at BL-5 (Beaverlodge Lake Outflow) and Mickey Lake Outflow are no longer reported due to the potential instability of the rating curves at these stations.

In addition to the above noted flow monitoring visual inspection of formerly flowing boreholes was also completed at the request of Cameco. Details of those activities are summarized in this report following discussion of stream discharge monitoring.

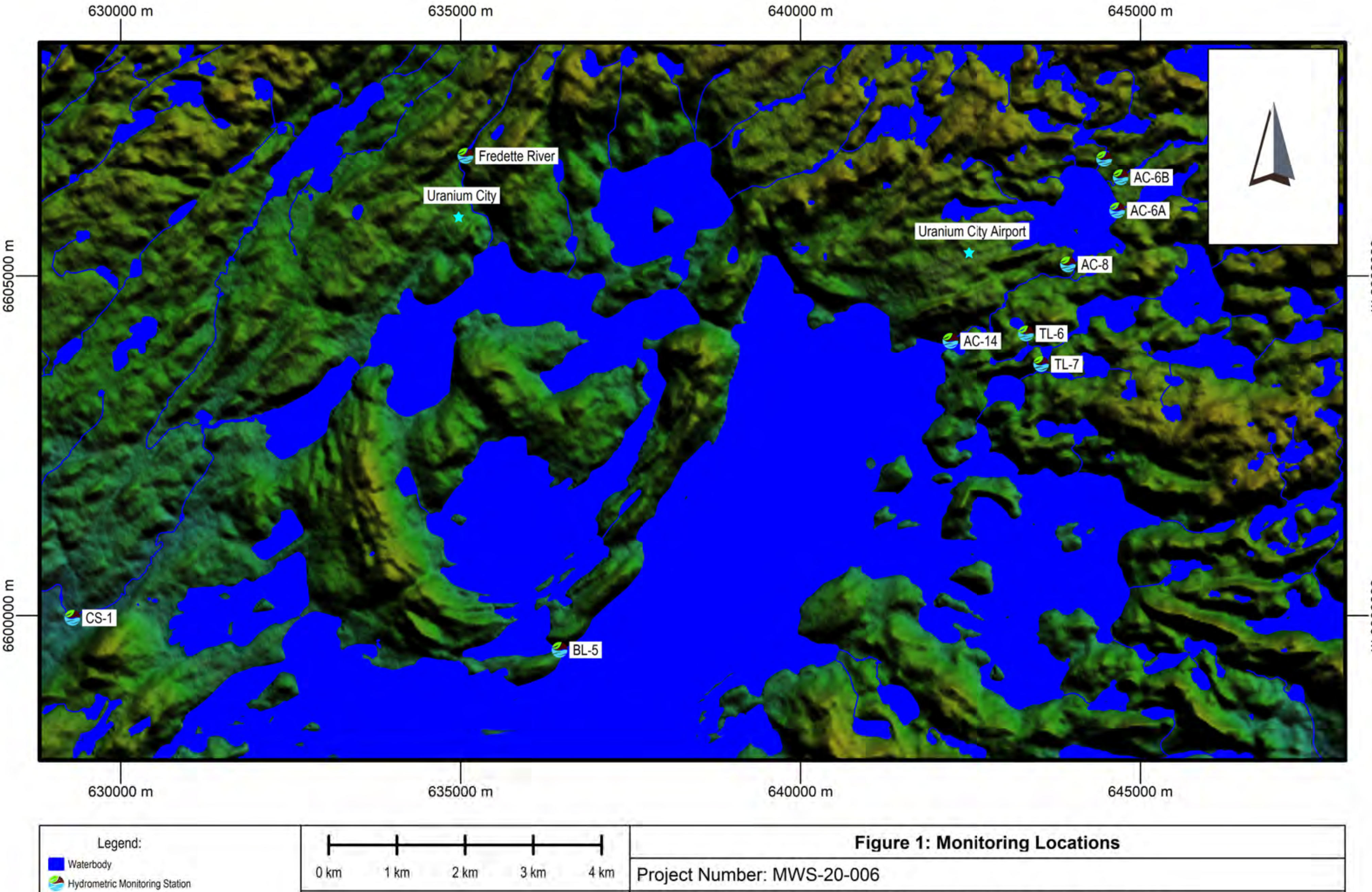

Figure 1: Monitoring Locations

Project Number: MWS-20-006

Project Title: 2020 Hydrometric Monitoring near Beaverlodge Mine

Date: March 9, 2021

Projection: UTM NAD83 Zone 12
References: SRTM Digital Elevation Data

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2.0 METHODS AND EQUIPMENT

Two field programs were undertaken during 2020. The first program ran from August 12 to 14 while the second program ran from October 14 to 16. The first program began later in the year than usual due to restrictions placed on travel associated with the COVID-19 pandemic.

At each monitoring station discharge was measured either by in-stream velocity measurements via the Mid-Section Method (Terzi, 1981) or direct volumetric measurement. Water levels were recorded either by elevation surveys using an engineer's rod and level or by reading a staff gauge. Automated water level readings were recorded using stage dataloggers (Solinst Leveloggers). To perform in-stream velocity measurements either a Sontek FlowTracker or a Price-style meter was used; volumetric measurements were performed by filling a vessel of known volume and timing with a stop watch. All equipment used for measuring flow velocity are regularly checked for quality data acquisition and calibrated as required with most recent calibrations in 2017. The calibration sheet for the Price-style meter used in this project is provided in Appendix A. The Price-style meters are not used often so calibration is undertaken on an as needed basis; the flow meters are checked against each other annually as a verification step. Facilities do not currently exist in Canada to calibrate the FlowTracker; however, the meter performs a beam check at the start of each measurement and is tested annually by MWSI side-by-side to the calibrated Price-style meters in a flume with acceptable agreement in velocity measurements. Water levels are reported in reference to locally established benchmarks and are not corrected to geodetic elevation. MWSI's survey equipment is regularly checked via the two-peg method (Anderson and Mikhail, 1998).

The current deployment of Solinst Leveloggers were initially installed in 2012. To prevent freezing some dataloggers are removed each fall. Each datalogger's voltage and battery capacity were checked and appeared to be within guidelines provided by Solinst Canada. These loggers are not calibrated beyond the condition in which they are provided from factory but are checked by field surveys of water level. The loggers removed from the field are checked against each other to confirm that individual loggers are reporting similar responses in a controlled environment, but no immediate problems have been identified. Dataloggers deployed through the winter will be checked during the next field program. Any potential problems with dataloggers are communicated to Cameco as required.

To calculate the hydrograph at each station, the measurements of stage and discharge are used to develop a rating curve. The resulting curve is then applied to the datalogger stage data records following compensation of the datalogger with barometric pressure and correction of the record to measured water levels. The flow rate estimated from the rating curve and stage record forms the hydrograph which is presented for each station as daily average discharge. The daily average discharge is presented in a summary table for each station. The rating curves reported in this document are continuations of the data presented by MWSI (2020).

Cameco must exercise caution regarding the use of any hydrograph data which are calculated from extrapolation above the highest or below the lowest measured data on the rating curve for any given monitoring station. Rating curves are typically exponential in nature and may become inaccurate beyond the measured range of data.

Stage-discharge relationships (rating curves) have been developed for open water conditions using measured discharges and water levels. In addition, stage-discharge relationships can be estimated when weirs are constructed to standardized dimensions and verified by field data. These relationships allow discharge to be estimated using measured water levels during open water conditions; however, if the channel configuration changes due to debris or physical augmentation of the channel the stage-discharge relationship is no longer valid and the calculation of discharge based on stage height may not reflect actual conditions at the station (i.e. backwater over a station resulting in false discharge peaks). In this situation, it is often possible to correlate flows from one station to another; a station with good flow records and unimpeded by backwater conditions, can be used to estimate flows at a station where snow, ice and other backwater causing conditions exist.

Winter flow manual discharge measurements have not been carried out at any of these sites apart from AC-8 in 2006. At that time AC-8 was observed to be flowing unimpeded by ice or snow encroachment on the weir and the upstream stream bed. AC-8 stage logger data collected through ice covered periods typically do not indicate back water effects normally observed at other channels where ice and snow cover are known to occur. All other stations with dataloggers installed year-round appear to have ice and snow influence on the hydraulic characteristics of the channel thus altering the stage and discharge relationships; therefore, winter hydrographs for all other stations are estimated based on AC-8; however in 2020 the AC-8 hydrograph was supplemented with data from Charlot River at Outlet of Webb Lake (Station No. 07QC008) operated by Environment and Climate Change Canada (2021a) due to a malfunction of the datalogger at some point following the October field program. This is discussed in more detail in section 4.0.

3.0 CLIMATIC CONDITIONS

The climate stations at Uranium City and Stony Rapids, SK reported 347 days (out of 366) and 346 days of climate data, respectively. Climate data are collected and reported by Environment and Climate Change Canada (2021b) for these stations. For Uranium City, the winter of 2019/2020 (MWSI, 2019 and Environment and Climate Change Canada, 2021b) had a below average start to winter precipitation increasing through early 2020 resulting in below normal totals from October through to April; however, anecdotal conversations with local residents indicated a significant snowpack not observed in 20 years. Precipitation was above normal from May to November in 2020 and the total precipitation of 377.0 mm for 2020 is 117% of normal. It is important to mention that the climate station at Uranium City did not report data from July 29 to August 13. MWSI was working at Site and in the area during that time frame and observed several days of substantial rainfall not recorded in the aforementioned 2020 precipitation total. Stony Rapids data indicate a similar trend through 2020 but with considerably less winter precipitation. Precipitation totals for Uranium City and Stony Rapids are presented in Table 1.

Table 1: Climate Conditions

Year	Month	Uranium City				Stony Rapids			
		Precipitation (mm)	Normal Precipitation (mm)[(a)]	Percent of Normal	Recorded Days of Data	Precipitation (mm)	Normal Precipitation (mm)[(b)]	Percent of Normal	Recorded Days of Data
2020	January	30.0	19.3	155.4	31/31	0.1*	18.1	0.6	29/31
	February	14.0	15.5	90.3	29/29	1.0*	13.3	7.5	29/29
	March	12.1*	17.8	68.0	30/31	1.2	18.2	6.6	31/31
	April	19.9	16.9	117.8	30/30	21.0	18	116.7	30/30
	May	26.4	17.5	150.9	31/31	12.1	26.3	46.0	31/31
	June	37.4	31.3	119.5	30/30	55.1*	44.4	124.1	26/30
	July**	56.6*	47.1	120.2	26/31	62.2*	56.3	110.5	25/31
	August**	52.6*	42.4	124.1	18/31	76.2*	63.9	119.2	29/31
	September	49.3	33.7	146.3	30/30	76.4*	48.4	157.9	26/30
	October	33.8	29.1	116.2	31/31	15.6	30.1	51.8	31/31
	November	35.3	28	126.1	30/30	0.0*	27.6	0.0	29/30
	December	9.6	23.6	40.7	31/31	3.2*	18.7	17.1	30/31
Totals		377.0*	322.2	117.0	347/366	324.1*	383.3	84.6	346/366

Notes: (a) Uranium City Normals, Golder (2011); (b) Stony Rapids Normals, Golder (2011); * indicates incomplete data set; ** a large rain event over several days was not recorded at the Uranium City station but was reflected in hydrographs as discussed below.

4.0 STREAM DISCHARGE MONITORING

This section presents the measured discharge, measured water level (stage), rating curves, hydrographs and daily average discharge data for each station. Relevant observations at each station are also provided for each location. Monitoring periods reported in this section may differ from station to station dependent on whether a data logger was installed through the winter or if winter discharge records indicate an influence on stage height from ice/snow encroachment. In some cases, records have been extended either forwards, backwards or both to create a full record for 2020 based on trends observed at AC-8.

There are two dataloggers installed at AC-8 one of which is typically downloaded in early January to provide data for this assessment. Based on historical data collection the AC-8 winter data do not show evidence of ice and snow encroachment at the weir; other stations through ice covered periods show substantial fluctuations in the stage record believed to be influenced by ice and snow encroachment. For this reason, AC-8 is often used as a proxy to define the trend of winter water levels. That datalogger normally available for download in January failed at some point after October and the data are not available from its memory. The other datalogger is not accessible during the winter, but should be available later in 2021. As such, data for the latter portion of 2020 are correlated from Station No. 07QC008 operated by Environment and Climate Change Canada (2021). Station 07QC008 is approximately 17 km northwest of Uranium City and has a gross drainage area of 169 km² which is comparable to the AC-8 drainage area of 152 km². The data from 07QC008 are preliminary and subject to change during quality review; however, MWSI believes that the trend of the data, which is most important for this assessment, will be consistent. Any station with a flow record extending beyond the open water season (AC-6B, CS-1 and TL-7) is synthesized from AC-8.

Only stations where flow is known to typically occur year-round (AC-6B, CS-1 and TL-7) have had their records extended except for AC-14 which is similar to AC-8. Through discussion with Cameco, hydrograph reporting for BL-5 has been discontinued due to concerns over the stability of the rating curve at this station. BL-5 has shown evidence of “drift” in the rating curve consistent with a potentially changing hydraulic geometry. BL-5 is still monitored for stage and discharge when accessibility allows.

Though precipitations records do not necessarily indicate as such, 2020 had substantial discharges related to above normal late winter snow pack and precipitation events. These events are reflected in the hydrographs discussed below.

4.1 AC-6A – VERNA LAKE TO ACE LAKE

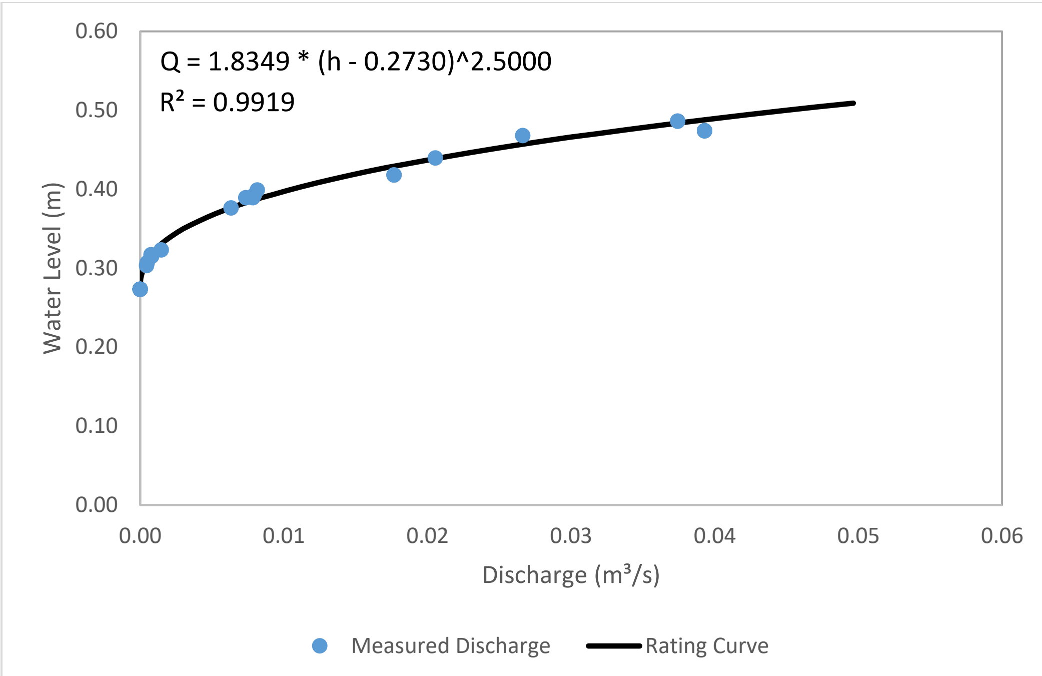
A V-notch weir installed in 2011 is used to monitor discharge from Verna Lake to Ace Lake at station AC-6A. The weir is mounted to an existing culvert through the road which follows the perimeter of Ace Lake. Photo 1 was taken during the 2020 fall field program. The rating curve data are presented in Table 2 and graphically in Figure 2. The logger at this location was found to have failed in 2020. A replacement logger was installed during the summer field program but has not been located since its installation. As a result, no hydrograph is available for 2020. The invert of the v-notch is located at 0.273 m on the staff gauge which corresponds to the “zero flow” point on the rating curve.

Photo 1: AC-6A – October 14, 2020

Table 2: AC-6A Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2012-05-07 14:54	0.307	0.0005
2012-05-08 8:06	0.315	0.0008
2012-05-09 18:16	0.317	0.0008
2013-10-12 11:47	0.273	0.0000
2014-05-04 9:50	0.323	0.0015
2014-05-08 12:05	0.303	0.0004
2014-10-09 16:00	0.273	0.0000
2015-05-02 15:45	0.273	0.0000
2015-10-02 14:35	0.389	0.0078
2015-10-03 13:18	0.399	0.0081
2015-10-04 14:00	0.393	0.0080
2016-05-04 12:15	0.468	0.0266
2016-05-05 18:00	0.486	0.0374
2016-09-09 11:16	0.509	Not measured
2016-10-07 12:00	0.418	0.0177
2017-04-27 10:00	0.373	Not measured
2017-04-27 16:00	0.376	0.0063
2017-05-06 11:30	0.389	0.0073
2017-10-14 12:30	0.273	0.0000
2018-04-25 16:00	No Flow	0.0000
2018-05-05 11:14	0.341	Not measured
2018-09-29 11:06	No Flow	0.0000
2019-04-29 14:30	No Flow	0.0000
2019-05-11 11:25	No Flow	0.0000
2019-10-01 11:55	No Flow	0.0000
2020-08-13 15:30	0.440	0.0205
2020-10-14 11:00	0.474	0.0393

Figure 2: AC-6A Rating Curve



4.2 AC-6B – ACE CREEK UPSTREAM OF ACE LAKE

AC-6B is located on Ace Creek upstream of Ace Lake. The station is located immediately upstream of a bridge structure which provides the hydraulic control for the cross-section. The station was visited in the summer (Photo 2) and fall (Photo 3) of 2020. Table 3 and Figure 4 present the measured flow data numerically and graphically (rating curve). The 2020 hydrograph is provided as Figure 4 and the daily average discharge data are presented in Table 4.

Photo 2: AC-6B – August 13, 2020

Photo 3: AC-6B – October 14, 2020

Table 3: AC-6B Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2010-04-27	98.907	0.7724
2010-07-01	98.832	0.2823
2010-09-17 15:25	98.793	0.1678
2011-05-18 12:50	98.848	0.4747
2011-08-28 9:14	98.824	0.2385
2011-10-05	98.823	0.2759
2012-05-07 18:00	99.208	3.4606
2012-09-29 10:36	98.854	0.3937
2013-05-15 13:40	99.185	3.5821
2013-05-16 13:50	99.212	4.0941
2013-10-12 10:20	98.785	0.2057
2014-05-08 10:35	99.032	2.0231
2014-10-10 9:20	98.690	0.1140
2015-05-02 14:30	98.788	0.3213
2015-10-03 12:10	98.868	0.6203
2016-05-04 11:05	99.142	3.1934
2016-10-07 10:30	98.963	1.0768
2017-05-06 10:30	98.900	0.8753
2017-10-14 10:30	98.691	0.0842
2018-05-05 9:44	99.100	2.3828
2018-09-29 9:43	98.740	0.1011
2019-05-11 10:00	98.759	0.2599
2019-10-01 10:30	98.779	0.2176
2020-08-13 14:30	99.081	1.9272
2020-10-14 10:00	99.038	1.6234

Figure 3: AC-6B Rating Curve

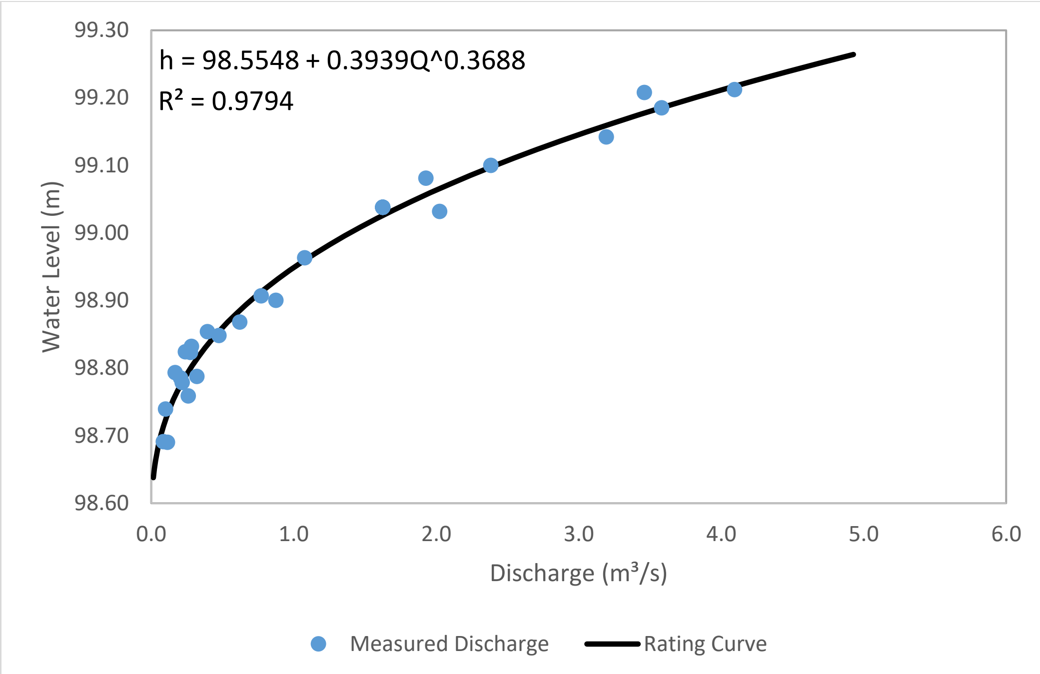


Figure 4: AC-6B 2020 Hydrograph

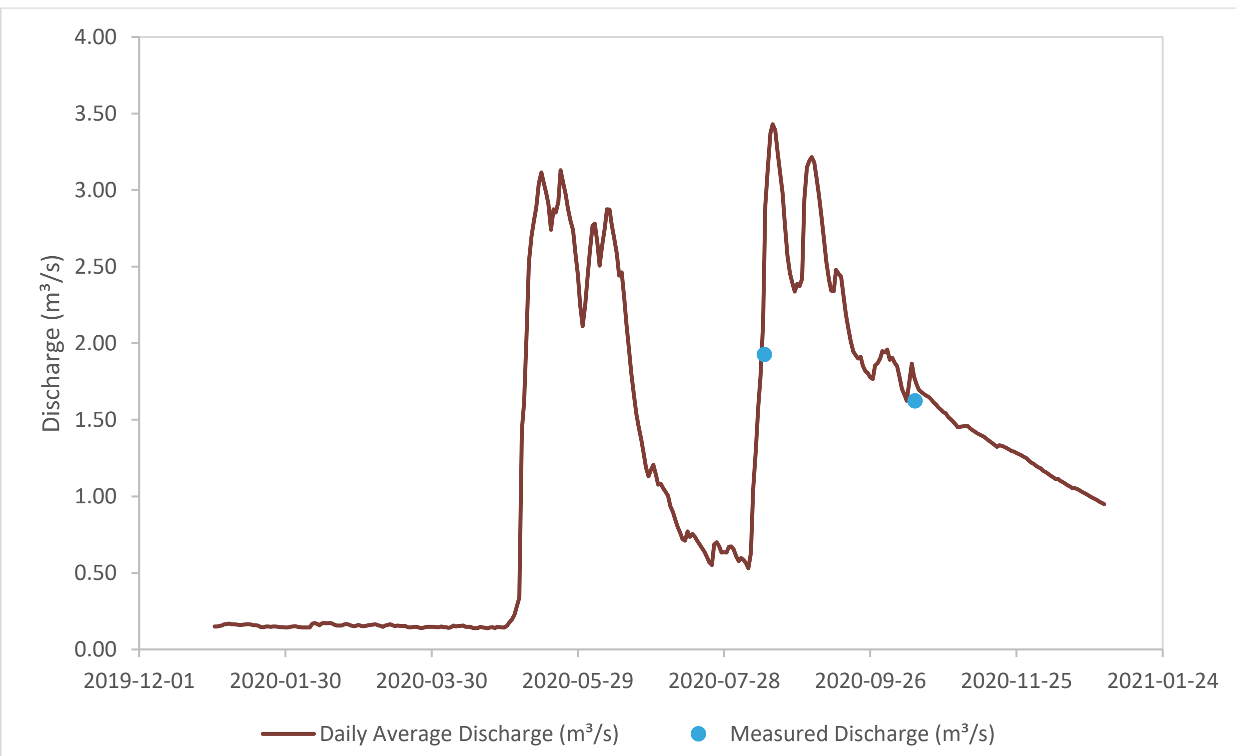


Table 4: AC-6B 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.1508	0.1482	0.1549	0.1457	0.1766	2.2491	1.0757	0.6540	3.1918	1.9481	1.4508	1.2206
2	0.1510	0.1501	0.1531	0.1452	0.1961	2.4227	1.0830	0.6076	3.2151	1.9402	1.4550	1.2120
3	0.1537	0.1518	0.1537	0.1490	0.2265	2.6093	1.0552	0.5763	3.1806	1.9597	1.4562	1.1999
4	0.1561	0.1469	0.1585	0.1463	0.2799	2.7683	1.0303	0.5980	3.0814	1.8930	1.4603	1.1888
5	0.1653	0.1464	0.1602	0.1448	0.3386	2.7800	1.0027	0.5852	2.9598	1.9051	1.4593	1.1822
6	0.1673	0.1440	0.1636	0.1408	1.4331	2.6558	0.9360	0.5614	2.8186	1.8736	1.4439	1.1674
7	0.1691	0.1435	0.1645	0.1466	1.6157	2.5072	0.8983	0.5314	2.6839	1.8499	1.4321	1.1584
8	0.1644	0.1439	0.1592	0.1559	2.0771	2.6381	0.8439	0.6306	2.5270	1.7757	1.4217	1.1472
9	0.1637	0.1430	0.1544	0.1510	2.5306	2.7499	0.8009	1.0451	2.4151	1.7021	1.4108	1.1359
10	0.1621	0.1676	0.1482	0.1537	2.6974	2.8747	0.7610	1.2910	2.3436	1.6650	1.4031	1.1247
11	0.1613	0.1737	0.1569	0.1545	2.8028	2.8733	0.7219	1.5861	2.3393	1.6248	1.3935	1.1135
12	0.1606	0.1672	0.1611	0.1559	2.8871	2.7730	0.7099	1.7843	2.4795	1.7458	1.3854	1.1150
13	0.1627	0.1594	0.1636	0.1489	3.0434	2.6797	0.7705	2.1269	2.4542	1.8674	1.3719	1.1024
14	0.1639	0.1707	0.1588	0.1476	3.1147	2.5813	0.7356	2.9005	2.4330	1.7808	1.3602	1.0934
15	0.1640	0.1729	0.1531	0.1475	3.0499	2.4424	0.7547	3.1487	2.3166	1.7313	1.3488	1.0833
16	0.1626	0.1714	0.1573	0.1389	2.9807	2.4623	0.7362	3.3737	2.1860	1.6959	1.3347	1.0728
17	0.1587	0.1722	0.1551	0.1405	2.9094	2.2946	0.7104	3.4304	2.0905	1.6798	1.3241	1.0639
18	0.1592	0.1718	0.1542	0.1399	2.7410	2.1229	0.6859	3.3909	2.0133	1.6688	1.3332	1.0537
19	0.1547	0.1628	0.1533	0.1471	2.8751	1.9566	0.6630	3.2377	1.9471	1.6585	1.3298	1.0524
20	0.1456	0.1567	0.1470	0.1442	2.8549	1.8035	0.6378	3.1170	1.9237	1.6489	1.3233	1.0462
21	0.1468	0.1561	0.1429	0.1413	2.9225	1.6665	0.6012	2.9796	1.8998	1.6336	1.3145	1.0379
22	0.1510	0.1565	0.1459	0.1387	3.1310	1.5363	0.5690	2.7817	1.9105	1.6146	1.3062	1.0289
23	0.1499	0.1616	0.1489	0.1439	3.0475	1.4555	0.5515	2.5765	1.8513	1.5990	1.2968	1.0202
24	0.1486	0.1674	0.1483	0.1452	2.9715	1.3737	0.6844	2.4565	1.8171	1.5795	1.2917	1.0126
25	0.1496	0.1620	0.1408	0.1405	2.8785	1.2763	0.7003	2.3981	1.8058	1.5654	1.2828	1.0015
26	0.1491	0.1567	0.1394	0.1484	2.7993	1.1882	0.6735	2.3366	1.7779	1.5487	1.2760	0.9938
27	0.1478	0.1528	0.1437	0.1454	2.7386	1.1300	0.6324	2.3870	1.7670	1.5430	1.2685	0.9850
28	0.1455	0.1537	0.1480	0.1430	2.5948	1.1713	0.6341	2.3728	1.8545	1.5176	1.2579	0.9756
29	0.1448	0.1613	0.1477	0.1436	2.4493	1.2056	0.6331	2.4213	1.8687	1.5020	1.2497	0.9665
30	0.1432		0.1487	0.1569	2.2537	1.1421	0.6711	2.9394	1.9011	1.4880	1.2357	0.9582
31	0.1446		0.1481		2.1113		0.6737	3.1496		1.4693		0.9495
Average	0.1554	0.1584	0.1527	0.1464	2.2816	2.1130	0.7625	2.0637	2.3018	1.6992	1.3559	1.0795

4.3 AC-8 – ACE LAKE OUTFLOW

The outflow from Ace Lake has been monitored for over three decades at a concrete box weir located at the outlet of the lake (Station AC-8). The station was visited by MWSI in the summer (Photo 4) and fall (Photo 5) of 2020. The field monitoring data are provided in Table 5 and the rating curve is presented in Figure 5. The hydrograph for 2020 is shown as Figure 6. Daily average discharge data are presented in Table 6 and the long term monthly data are provided in Table 7.

As discussed earlier, two dataloggers are installed at this location of which one is accessible during winter. Though this datalogger was accessible in January for the winter download it was found that the datalogger has failed. The data reported for AC-8 beyond the October measurement is correlated from 07QC008 which is operated by Environment and Climate Change Canada. The data from the primary logger at AC-8 will be downloaded in early 2021 and the 2020 hydrograph can be updated if required.

Photo 4: AC-8 – August 13, 2020

Photo 5: AC-8 – October 14, 2020

Table 5: AC-8 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2005-08-16	99.451	0.4151
2006-01-24	99.446	0.4044
2006-05-24	99.848	1.6914
2010-04-30	99.593	0.7530
2010-07-01	99.407	0.2857
2010-09-11 10:15	99.335	0.1438
2011-05-16 15:30	99.442	0.3026
2011-05-22 8:11	99.481	0.4443
2011-08-28	99.407	0.2611
2011-10-03	99.428	0.3006
2012-05-08 15:09	100.003	2.9464
2012-05-10 9:06	100.066	3.8907
2012-09-29 11:20	99.541	0.5555
2013-05-15 14:58	99.886	1.9917
2013-10-12 12:45	99.374	0.2129
2014-05-08 11:53	99.853	1.6840
2014-10-10 11:10	99.320	0.1172
2015-05-02 16:00	99.409	0.2899
2015-10-03 15:00	99.624	0.8705
Weir Invert	99.179	0.0000
2016-05-04 12:50	99.900	2.2535
2016-08-11 14:30	99.608	0.5906
2016-10-07 12:20	99.725	1.2544
2017-05-06 12:36	99.520	0.5859
2017-10-14 13:05	99.278	0.0714
2018-04-25 17:05	99.357	Not measured
2018-05-04 17:21	99.605	Not measured
2018-05-05 12:00	99.680	1.0290
2018-09-29 11:30	99.318	0.1201
2019-05-11 12:30	99.385	0.2306
2019-10-01 13:00	99.383	0.2169
2020-08-13 17:00	99.786	1.3646
2020-10-14 13:00	99.872	1.8884
2020-10-16 9:00	99.854	Not measured

Figure 5: AC-8 Rating Curve

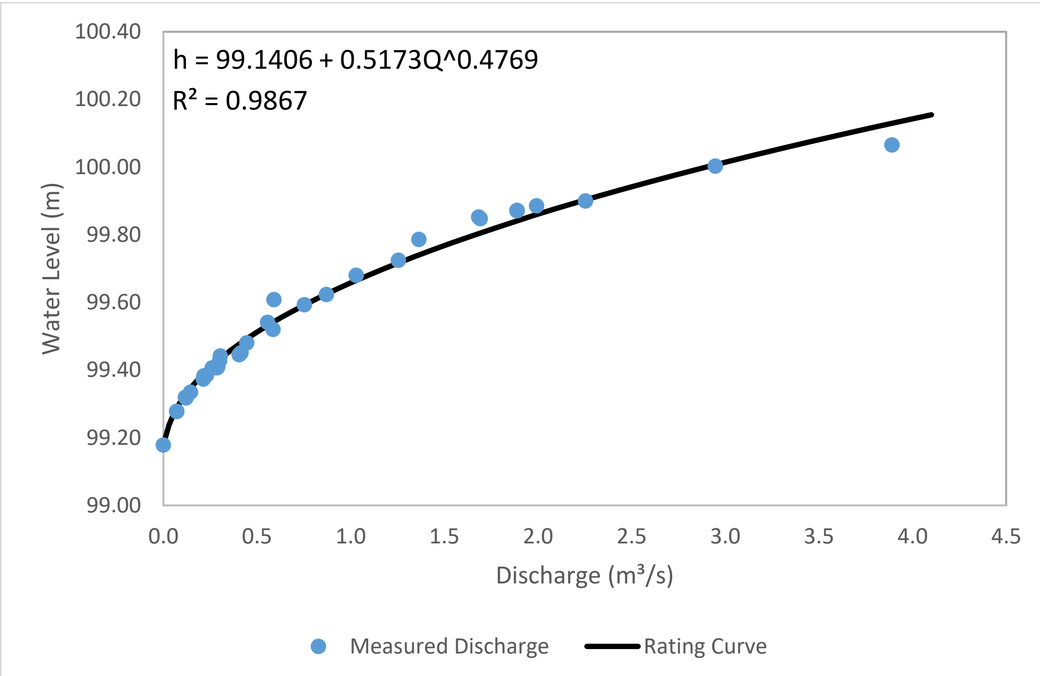


Figure 6: AC-8 2020 Hydrograph

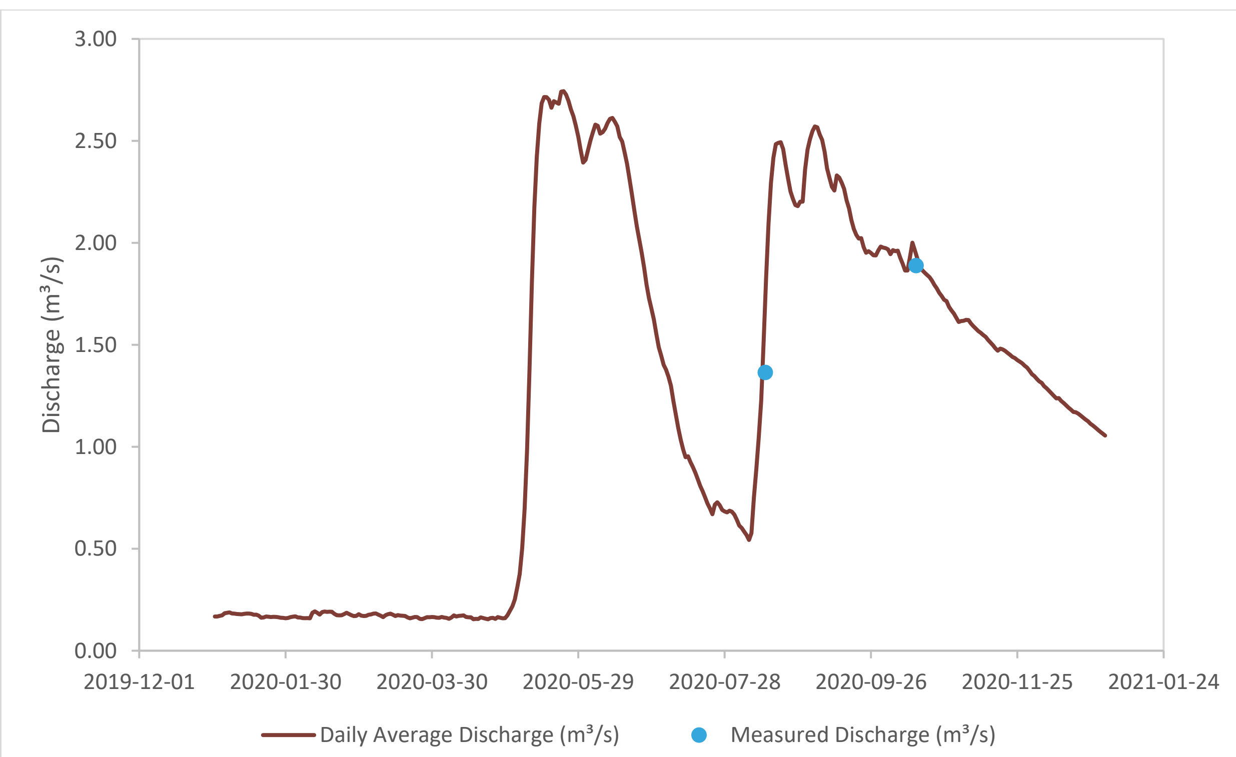


Table 6: AC-8 2020 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.1676	0.1646	0.1721	0.1618	0.1962	2.4068	1.4882	0.6671	2.5080	1.9768	1.6119	1.3561
2	0.1678	0.1668	0.1701	0.1613	0.2179	2.4546	1.4471	0.6425	2.5471	1.9739	1.6165	1.3466
3	0.1708	0.1687	0.1707	0.1655	0.2517	2.5022	1.4018	0.6136	2.5708	1.9681	1.6179	1.3331
4	0.1734	0.1632	0.1761	0.1626	0.3110	2.5422	1.3777	0.6021	2.5663	1.9444	1.6225	1.3208
5	0.1837	0.1626	0.1780	0.1609	0.3762	2.5796	1.3432	0.5841	2.5309	1.9644	1.6213	1.3135
6	0.1859	0.1599	0.1817	0.1564	0.5017	2.5736	1.2990	0.5671	2.5044	1.9591	1.6043	1.2970
7	0.1879	0.1595	0.1828	0.1629	0.6938	2.5355	1.2247	0.5431	2.4468	1.9617	1.5911	1.2870
8	0.1826	0.1599	0.1769	0.1732	0.9827	2.5425	1.1577	0.5765	2.3651	1.9270	1.5795	1.2745
9	0.1819	0.1589	0.1716	0.1678	1.3754	2.5594	1.0918	0.7489	2.3182	1.8975	1.5674	1.2621
10	0.1801	0.1862	0.1646	0.1708	1.8102	2.5876	1.0347	0.8904	2.2748	1.8643	1.5589	1.2496
11	0.1792	0.1930	0.1743	0.1717	2.1747	2.6079	0.9868	1.0456	2.2565	1.8644	1.5482	1.2372
12	0.1785	0.1858	0.1790	0.1732	2.4224	2.6124	0.9488	1.2265	2.3306	1.9307	1.5393	1.2388
13	0.1807	0.1771	0.1818	0.1654	2.5845	2.5937	0.9537	1.5156	2.3199	2.0008	1.5242	1.2248
14	0.1821	0.1897	0.1765	0.1640	2.6843	2.5714	0.9247	1.8266	2.2950	1.9628	1.5112	1.2148
15	0.1822	0.1921	0.1701	0.1638	2.7150	2.5186	0.9004	2.0934	2.2646	1.9235	1.4986	1.2036
16	0.1806	0.1904	0.1748	0.1543	2.7144	2.4973	0.8729	2.2934	2.2086	1.8843	1.4830	1.1919
17	0.1763	0.1913	0.1724	0.1561	2.7015	2.4437	0.8408	2.4173	2.1694	1.8663	1.4711	1.1821
18	0.1768	0.1909	0.1713	0.1555	2.6624	2.3874	0.8081	2.4839	2.1103	1.8541	1.4812	1.1707
19	0.1719	0.1809	0.1703	0.1634	2.6948	2.3132	0.7819	2.4902	2.0675	1.8427	1.4775	1.1692
20	0.1617	0.1741	0.1633	0.1602	2.6881	2.2377	0.7520	2.4935	2.0390	1.8320	1.4703	1.1624
21	0.1631	0.1734	0.1587	0.1570	2.6819	2.1583	0.7213	2.4597	2.0209	1.8150	1.4605	1.1531
22	0.1677	0.1739	0.1621	0.1541	2.7413	2.0817	0.6972	2.3837	2.0231	1.7939	1.4513	1.1432
23	0.1666	0.1796	0.1654	0.1599	2.7438	2.0169	0.6692	2.3163	1.9791	1.7765	1.4408	1.1334
24	0.1650	0.1859	0.1648	0.1613	2.7267	1.9514	0.7165	2.2522	1.9514	1.7548	1.4351	1.1251
25	0.1663	0.1800	0.1564	0.1561	2.6957	1.8786	0.7278	2.2159	1.9590	1.7392	1.4252	1.1127
26	0.1657	0.1741	0.1548	0.1648	2.6540	1.7942	0.7135	2.1854	1.9504	1.7207	1.4176	1.1042
27	0.1642	0.1698	0.1596	0.1616	2.6210	1.7282	0.6904	2.1801	1.9391	1.7144	1.4094	1.0943
28	0.1616	0.1708	0.1645	0.1589	2.5742	1.6772	0.6830	2.2020	1.9383	1.6862	1.3976	1.0839
29	0.1609	0.1792	0.1641	0.1596	2.5209	1.6236	0.6784	2.2019	1.9626	1.6688	1.3884	1.0738
30	0.1592		0.1652	0.1743	2.4537	1.5539	0.6865	2.3598	1.9816	1.6532	1.3730	1.0646
31	0.1606		0.1645		2.3934		0.6816	2.4570		1.6325		1.0550
Average	0.1727	0.1759	0.1696	0.1626	1.9860	2.2844	0.9452	1.6624	2.2133	1.8501	1.5065	1.1993

Table 7: AC-8 Monthly Average Discharge (m³/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	0.151	0.15	0.149	0.221	0.204	0.156	0.145	0.145	0.145	0.163	0.151	0.146	0.161
1981	0.146	0.145	0.145	0.169	0.392	0.178	0.182	0.192	0.194	0.19	0.198	0.188	0.193
1982	0.169	0.167	0.176	0.196	0.577	0.459	0.279	0.185	0.146	0.157	0.154	0.162	0.236
1983	0.177	0.164	0.151	0.223	0.75	0.574	0.414	0.334	0.251	0.226	0.206	0.194	0.305
1984	0.189	0.192	0.208	0.413	0.501	0.723	0.789	0.564	0.399	0.571	0.79	0.725	0.505
1985	0.471	0.378	0.335	0.395	2.768	1.366	0.551	0.332	0.256	0.215	0.174	0.169	0.618
1986	0.181	0.186	0.185	0.218	0.462	0.541	0.608	0.544	0.343	0.233	0.201	0.193	0.325
1987	0.191	0.208	0.221	0.219	1.988	0.685	0.26	0.116	0.102	0.103	0.135	0.138	0.364
1988	0.154	0.114	0.108	0.1	0.361	0.817	1.12	0.819	0.254	0.181	0.202	0.191	0.368
1989	0.178	0.176	0.156	0.16	1.912	1.427	0.361	0.166	0.115	0.12	0.154	0.172	0.425
1990	0.197	0.183	0.169	0.108	0.556	0.764	0.317	0.175	0.145	0.151	0.25	0.333	0.279
1991	0.262	0.219	0.207	0.436	2.038	1.962	0.788	0.395	0.393	0.431	0.464	0.398	0.666
1992	0.319	0.254	0.215	0.247	2.634	1.386	0.663	0.489	0.408	1.223	0.985	0.508	0.778
1993	0.302	0.221	0.183	0.19	0.862	0.513	0.356	1.006	0.594	0.314	0.382	0.4	0.444
1994	0.277	0.225	0.205	0.186	3.014	1.459	0.339	0.117	0.097	0.105	0.13	0.131	0.524
1995	0.113	0.106	0.104	0.129	1.698	1.401	0.9	0.493	1.002	0.511	0.378	0.325	0.597
1996	0.252	0.19	0.155	0.146	0.272	0.524	1.408	0.499	0.341	0.286	0.293	0.262	0.386
1997	0.229	0.202	0.167	0.171	0.593	0.97	1.251	1.897	4.109	3.439	1.629	0.617	1.273
1998	0.369	0.291	0.246	0.279	1.236	0.41	0.614	0.404	0.26	0.208	0.208	0.199	0.394
1999	0.169	0.16	0.165	0.156	0.467	0.608	0.408	0.216	0.203	0.161	0.153	0.166	0.253
2000	0.166	0.136	0.129	0.136	0.307	0.305	0.267	0.274	0.674	0.824	1.211	0.744	0.431
2001	0.365	0.298	0.236	0.203	1.176	0.763	0.457	0.36	0.355	0.597	0.457	0.365	0.469
2002	0.35	0.22	0.176	0.189	1.304	2.353	0.516	2.216	1.102	0.688	0.561	0.437	0.843
2003	0.288	0.246	0.201	0.179	2.24	2.284	0.668	0.522	0.458	0.422	0.41	0.345	0.689
2004	0.253	0.25	0.301	0.214	0.206	1.996	0.455	0.219	0.169	0.17	0.176	0.166	0.381
2005	0.143	0.164	0.15	0.191	1.158	1.077	0.549	0.443	0.456	0.464	0.728	0.579	0.509
2006	0.433	0.321	0.229	0.397	2.28	0.978	0.365	0.24	0.226	0.228	0.22	0.2	0.51
2007	0.199	0.171	0.156	0.175	0.734	0.573	0.37	0.321	0.477	0.483	0.874	0.635	0.431
2008	0.463	0.343	0.294	0.252	1.11	1.125	0.361	0.318	0.265	0.509	0.735	0.495	0.523
2009	0.242	0.18	0.124	0.175	1.066	0.852	1.478	0.681	0.454	0.432	0.431	0.414	0.544
2010	0.341	0.28	0.217	0.309	0.744	0.43	0.238	0.105	0.167	0.199	0.178	0.181	0.282
2011	0.173	0.14	0.113	0.092	0.299	0.319	0.207	0.24	0.358	0.25	0.224	0.241	0.221
2012	0.259	0.221	0.215	0.248	2.467	1.114	0.699	0.56	0.666	0.517	0.621	0.535	0.677
2013	0.351	0.28	0.247	0.237	1.891	1.579	0.637	0.324	0.24	0.218	0.237	0.243	0.54
2014	0.235	0.217	0.19	0.17	2.224	2.344	1.163	0.465	0.176	0.163	0.175	0.163	0.64
2015	0.154	0.163	0.137	0.153	0.362	0.305	0.318	0.464	1.366	0.659	0.589	0.446	0.426

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2016	0.339	0.279	0.204	0.192	2.155	1.239	0.681	0.834	2.446	1.095	0.721	0.536	0.893
2017	0.333	0.245	0.178	0.195	1.165	0.698	0.231	0.125	0.082	0.078	0.113	0.132	0.298
2018	0.149	0.14	0.114	0.124	1.993	1.371	0.804	0.284	0.163	0.099	0.096	0.096	0.453
2019	0.085	0.058	0.059	0.078	0.178	0.678	0.65	0.305	0.222	0.168	0.22	0.188	0.241
2020	0.173	0.176	0.170	0.163	1.986	2.284	0.945	1.662	2.213	1.850	1.506	1.199	1.194
Mean	0.244	0.206	0.183	0.206	1.228	1.014	0.581	0.489	0.549	0.466	0.432	0.340	0.495

4.4 AC-14 – ACE CREEK UPSTREAM OF BEAVERLODGE

Ace Creek is monitored approximately 250 m upstream of Beaverlodge Lake at station AC-14. The site was visited twice in 2020 during the summer and fall field programs (Photo 6 and Photo 7). Field measurement data are summarized in Table 8 and the rating curve is presented as Figure 7. The 2020 hydrograph is shown in Figure 8 with daily average discharge data presented in Table 9.

Photo 6: AC-14 – August 12, 2020

Photo 7: AC-14 – October 14, 2020

Table 8: AC-14 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2005-08-16	No WL Measured	0.3561
2006-01-24	No WL Measured	0.5261
2006-05-25	No WL Measured	1.4651
2009-05-22	No WL Measured	1.4820
2009-09-27 11:00	No WL Measured	0.4276
2009-09-27 11:30	No WL Measured	0.4644
2010-04-30	No WL Measured	0.7067
2010-07-01	No WL Measured	0.2985
2010-09-13 16:05	No WL Measured	0.1596
2011-05-18 9:05	98.291	0.3680
2011-05-18 10:00	98.300	0.4034
2011-08-28	98.276	0.2498
2011-10-05	98.288	0.3034
2012-05-08 11:39	98.480	3.0369
2012-09-29 15:30	98.328	0.5166
2013-05-15 16:55	98.429	2.0341
2013-05-16 13:04	98.503	3.0361
2013-10-12 14:28	98.255	0.1819
2014-05-08 14:41	98.418	1.8495
2014-10-10 14:57	98.225	0.1632
2015-05-03 9:30	98.252	0.2976
2015-10-01 10:50	98.395	0.9294
2015-10-03 16:30	98.324	0.8194
2016-05-04 16:14	98.457	2.4539
2016-10-07 15:55	98.390	1.1979
2017-05-06 14:30	98.320	0.6327
2017-10-14 15:00	98.177	0.0748
2018-05-05 15:03	98.376	1.0486
2018-09-29 14:45	98.232	0.1166
2019-05-11 14:00	98.273	Not Measured
2019-10-01 15:00	98.254	0.2052
2020-08-12 15:30	98.376	1.0711
2020-10-14 16:00	98.434	1.8385

Figure 7: AC-14 Rating Curve

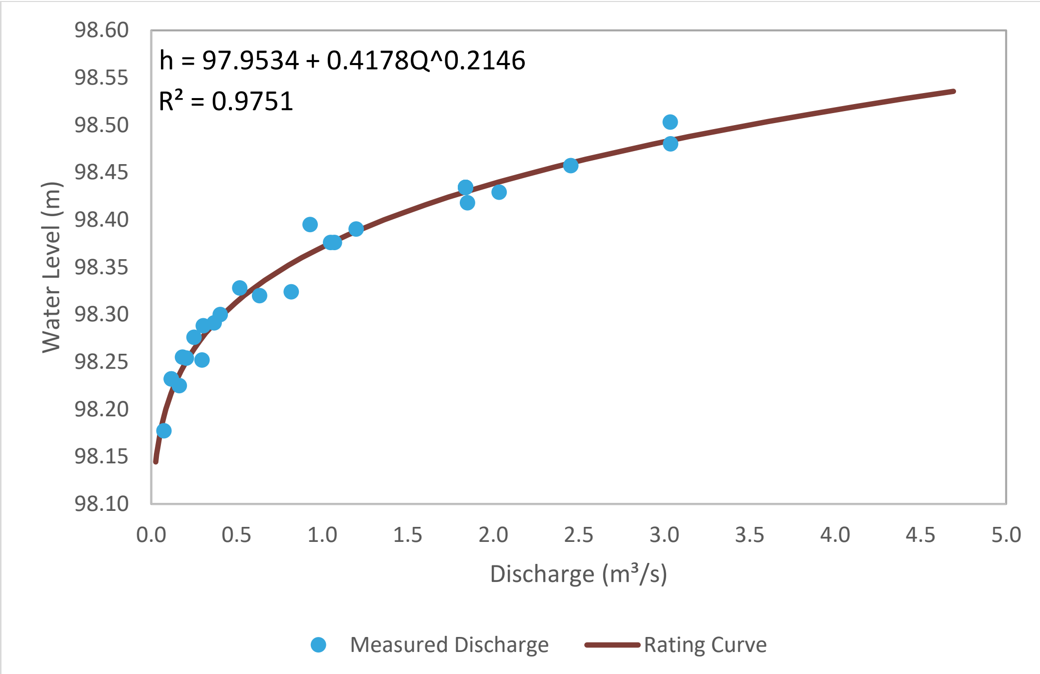


Figure 8: AC-14 2020 Hydrograph

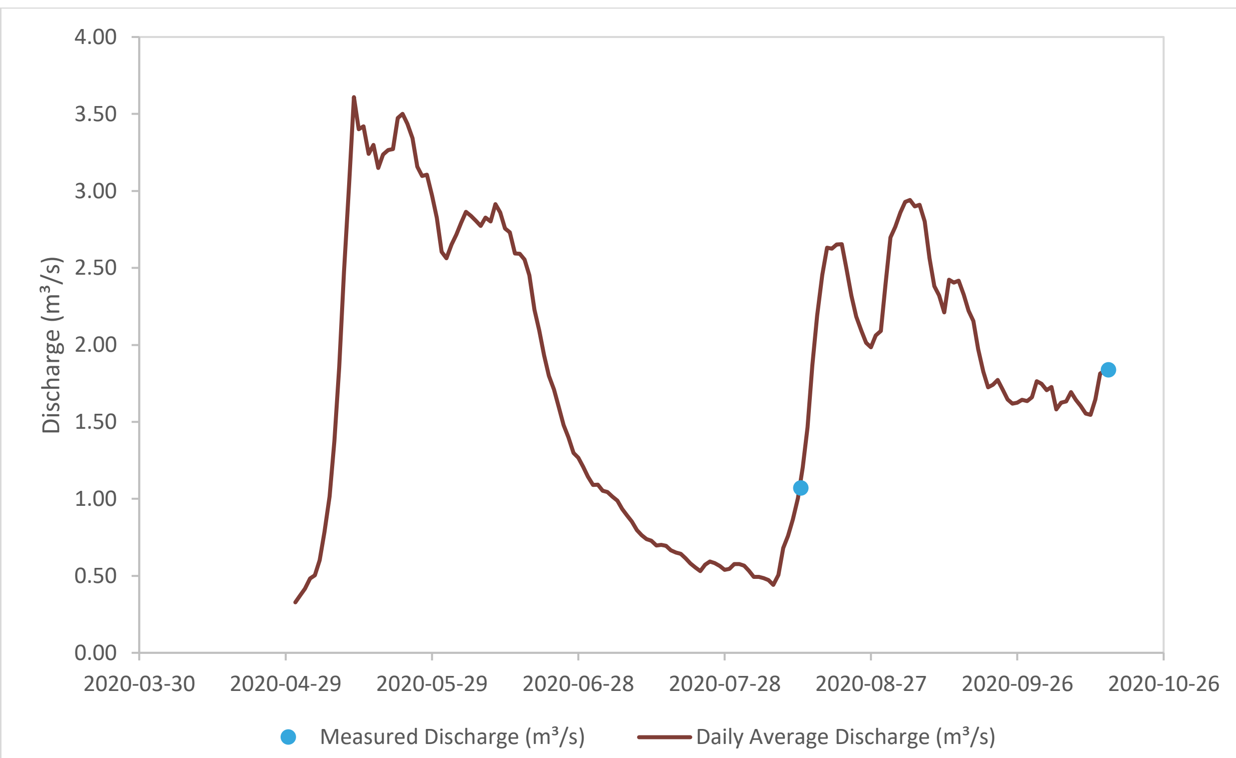


Table 9: AC-14 2020 Daily Average Discharge (m^3/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1	0.3279	2.5622	1.0912	0.5665	2.7656	1.7483
2	0.3719	2.6519	1.0926	0.5322	2.8606	1.7049
3	0.4164	2.7177	1.0535	0.4929	2.9281	1.7269
4	0.4826	2.7941	1.0441	0.4930	2.9406	1.5802
5	0.5046	2.8645	1.0151	0.4846	2.8989	1.6250
6	0.6016	2.8371	0.9886	0.4723	2.9099	1.6326
7	0.7838	2.8060	0.9350	0.4422	2.8017	1.6941
8	1.0162	2.7725	0.8922	0.5056	2.5631	1.6426
9	1.3750	2.8279	0.8528	0.6806	2.3828	1.6030
10	1.8544	2.8017	0.7976	0.7596	2.3210	1.5541
11	2.4747	2.9143	0.7626	0.8654	2.2107	1.5459
12	3.0435	2.8597	0.7381	1.0055	2.4229	1.6452
13	3.6092	2.7556	0.7292	1.2056	2.4046	1.8142
14	3.4015	2.7315	0.6968	1.4647	2.4180	1.8325
15	3.4187	2.5930	0.7020	1.8676	2.3263	
16	3.2398	2.5912	0.6953	2.1899	2.2222	
17	3.2980	2.5540	0.6654	2.4539	2.1557	
18	3.1494	2.4528	0.6508	2.6309	1.9717	
19	3.2359	2.2274	0.6422	2.6257	1.8271	
20	3.2650	2.0931	0.6131	2.6520	1.7255	
21	3.2713	1.9319	0.5801	2.6548	1.7413	
22	3.4736	1.7985	0.5542	2.4905	1.7727	
23	3.5010	1.7091	0.5308	2.3186	1.7086	
24	3.4357	1.5955	0.5719	2.1834	1.6466	
25	3.3427	1.4792	0.5929	2.0927	1.6182	
26	3.1575	1.3999	0.5835	2.0139	1.6245	
27	3.0968	1.2980	0.5648	1.9853	1.6433	
28	3.1060	1.2669	0.5391	2.0621	1.6350	
29	2.9709	1.2097	0.5452	2.0906	1.6608	
30	2.8253	1.1449	0.5764	2.4026	1.7633	
31	2.6045		0.5765	2.6977		
Average	2.4082	2.2747	0.7379	1.5930	2.1957	

4.5 TL-6 – MINEWATER RESERVOIR OUTFLOW

The area known as Minewater Reservoir directs runoff towards the Fulton Drainage via a channel blasted through bedrock. A v-notch weir installed in 2011 is the monitoring station identified as TL-6. Photo 8 is from the fall field program. Stage and discharge monitoring data are compiled in Table 10 and the rating curve is presented in Figure 9. The 2020 hydrograph is provided in Figure 10 with the daily average discharge data presented in Table 11.

The sensor for TL-6 was installed into snow and ice on May 1 by a local resident. Based on the logger data MWSI believes that the snow and ice were cleared of the notch on May 5. The logger functioned until August 22 until it seems to have malfunctioned and no data are available after that time for this station. This logger will be inspected and repaired or replaced prior to its reuse.

Photo 8: TL-6– October 15, 2020

Table 10: TL-6 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2012-05-07 15:30	0.363	0.00230
2012-05-09 19:08	0.358	0.00190
2012-09-27 18:00	0.299	0.00020
2013-05-12 18:00	0.420	0.00780
Notch Invert	0.260	0.00000
2013-05-16 8:50	0.260	0.00000
2013-05-16 10:30	0.410	0.00720
2013-10-12 17:03	0.281	0.00005
2014-05-04 10:16	0.384	0.00459
2014-05-07 16:30	0.340	0.00159
2014-10-09 14:00	0.276	0.00003
2015-05-02 17:11	0.282	0.00006
2015-10-01 15:30	0.327	0.00079
2015-10-02 13:25	0.337	0.00120
2015-10-04 18:20	0.337	0.00106
2016-05-01 13:00	0.460	Not measured
2016-05-04 14:17	0.412	0.00611
2016-10-08 11:00	0.341	0.00127
2017-04-27 15:30	Not measurable	0.00012
2017-05-06 16:00	0.373	0.00281
2017-10-14 17:00	0.275	0.00001
2018-04-25 16:40	Not measurable	0.00005
2018-05-06 15:59	0.391	0.00313
2018-07-26 15:28	0.275	0.00002
2018-09-28 16:17	0.272	0.00001
2019-04-29 15:05	Not measurable	0.00000
2019-05-11 15:15	0.282	0.00004
2019-10-02 16:30	0.288	0.00011
2020-08-13 11:30	0.390	0.00344
2020-10-15 14:30	0.352	0.00248

Figure 9: TL-6 Rating Curve

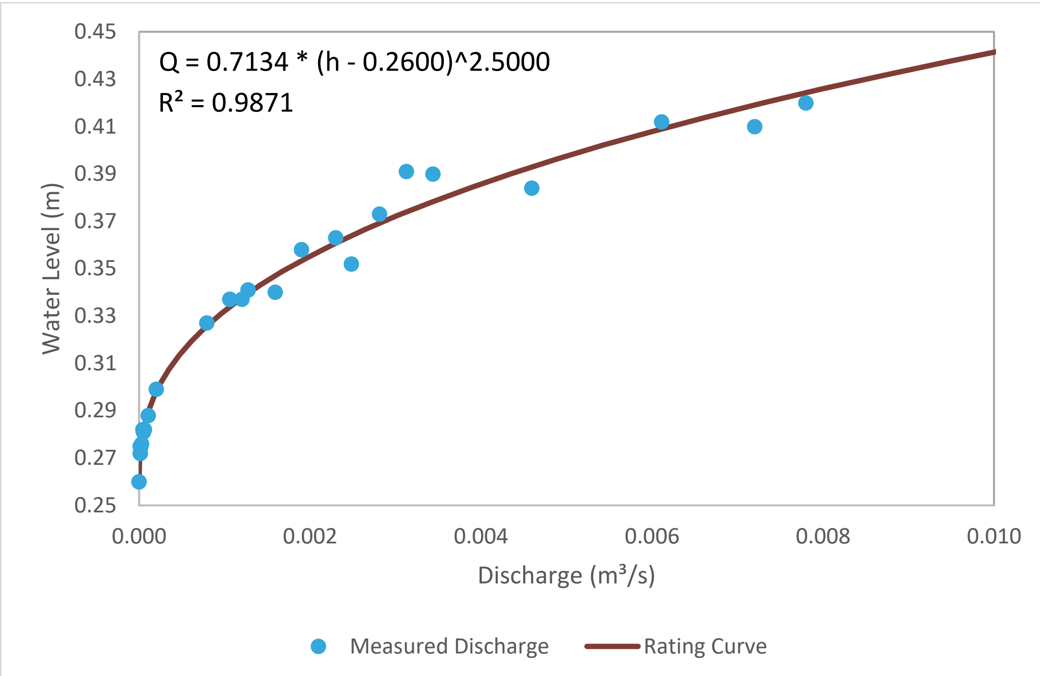


Figure 10: TL-6 2020 Hydrograph

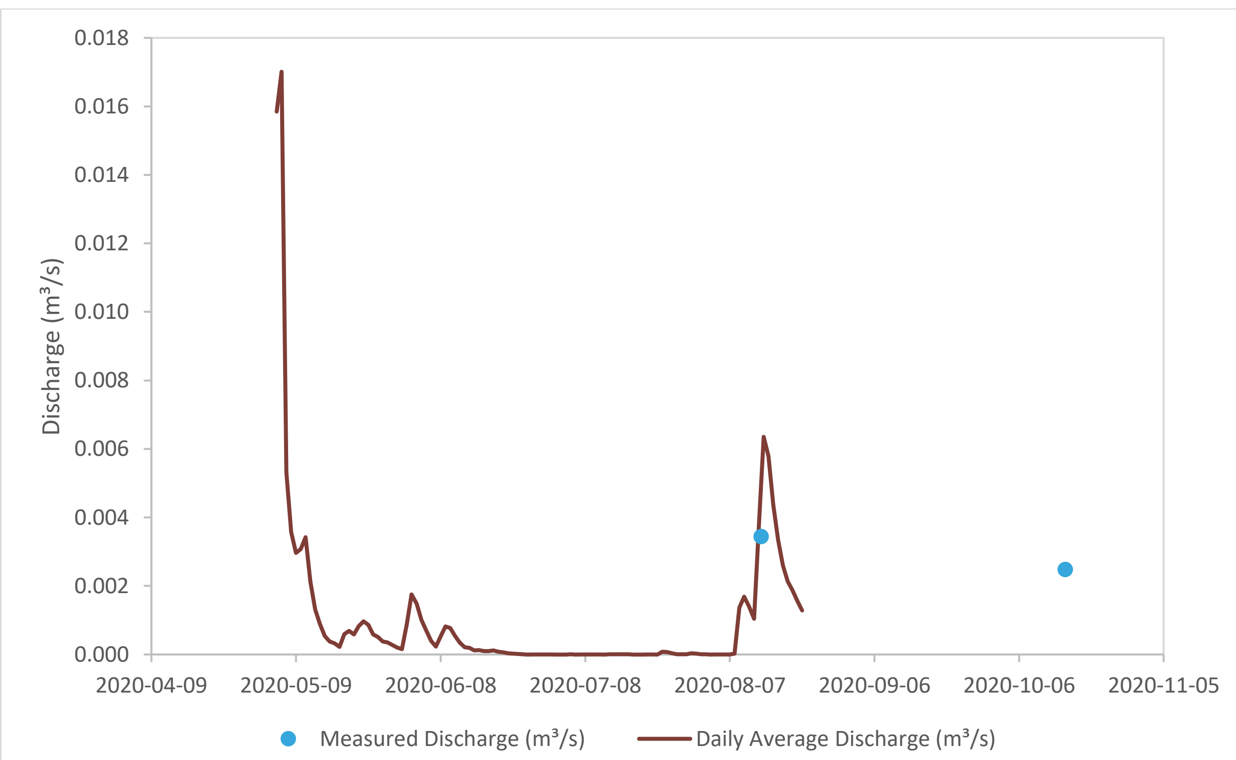


Table 11: TL-6 2020 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug
1		0.0009	0.0000	0.0000
2		0.0018	0.0000	0.0000
3		0.0015	0.0000	0.0000
4		0.0010	0.0000	0.0000
5	0.0158	0.0007	0.0000	0.0000
6	0.0170	0.0004	0.0000	0.0000
7	0.0053	0.0002	0.0000	0.0000
8	0.0036	0.0005	0.0000	0.0000
9	0.0030	0.0008	0.0000	0.0014
10	0.0031	0.0008	0.0000	0.0017
11	0.0034	0.0005	0.0000	0.0014
12	0.0021	0.0003	0.0000	0.0010
13	0.0013	0.0002	0.0000	0.0038
14	0.0009	0.0002	0.0000	0.0064
15	0.0005	0.0001	0.0000	0.0058
16	0.0004	0.0001	0.0000	0.0044
17	0.0003	0.0001	0.0000	0.0033
18	0.0002	0.0001	0.0000	0.0026
19	0.0006	0.0001	0.0000	0.0021
20	0.0007	0.0001	0.0000	0.0019
21	0.0006	0.0001	0.0000	0.0016
22	0.0008	0.0000	0.0000	0.0013
23	0.0010	0.0000	0.0000	
24	0.0009	0.0000	0.0001	
25	0.0006	0.0000	0.0001	
26	0.0005	0.0000	0.0000	
27	0.0004	0.0000	0.0000	
28	0.0004	0.0000	0.0000	
29	0.0003	0.0000	0.0000	
30	0.0002	0.0000	0.0000	
31	0.0002		0.0000	

4.6 TL-7 – FULTON CREEK WEIR

The headwaters of TL-7 include Fulton Lake as part of the Fulton drainage but also receive water from Fookes and Marie Reservoirs which were used as tailings disposal locations during the operation of the Beaverlodge Mill in addition to receiving water from TL-6. TL-7 is also a long-term monitoring station having operated since Site closure (similar record length to AC-8). TL-7 frequently glaciates through the winter months as water free-falls over the V-notch thus impounding a large volume of ice behind the structure. The ice impoundment can take several weeks to thaw and often the datalogger is not installed until later in the year (after the passing of snowmelt runoff). Based on discussion with Cameco, MWSI left the logger installed through the winter of 2019/2020 such that ice free flow conditions would be recorded regardless of when the first field program occurred. Photo 9 was taken during the summer program and Photo 10 was from the fall. The rating curve data are provided in Table 12 and shown graphically in Figure 11.

Estimates of the flow rate at TL-7 are calculated for the winter months from flow rates at AC-8 using the following relationship:

$$Q_{TL-7} = 0.053 * Q_{AC-8}$$

The above equation is used when measured data at TL-7 are not available. Figure 12 presents the 2020 hydrograph for TL-7 while Table 13 and Table 14 present the 2020 daily average discharge data and the long term monthly average discharge data, respectively. The estimated discharge based on AC-8 data beyond October 14 was not in agreement with measured data collected in the fall of 2020 as it substantially was underpredicting the actual flow measured during the fall field program. Therefore, a decision was made to not provide the estimated flow to the end of 2020.

Photo 9: TL-7– August 13, 2020

Photo 10: TL-7 – October 15, 2020

Table 12: TL-7 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2011-05-21	0.005	0.0012
2011-10-03	0.003	0.0002
2012-05-07 16:30	0.096	0.0000
2012-05-09 19:30	0.090	0.0000
2012-09-27 17:30	0.115	0.0082
2013-05-12 9:15	Ice covered	0.0815
2013-05-16 11:50	Ice covered	0.1328
2013-10-13 14:54	0.142	0.0109
2014-10-09 15:15	0.139	0.0112
2014-10-10 8:40	0.140	0.0094
2015-10-02 13:00	0.262	0.0499
2015-10-04 18:03	0.252	0.0455
2016-05-04 14:45	0.394	Not measured
2016-10-08 11:30	0.342	0.0915
2017-10-14 17:35	0.025	0.0001
2018-09-28 16:34	0.135	0.0102
2019-10-02 17:00	0.154	0.0111
2020-08-13 12:00	0.418	0.1352
2020-10-15 15:30	0.432	0.1570

Figure 11: TL-7 Rating Curve

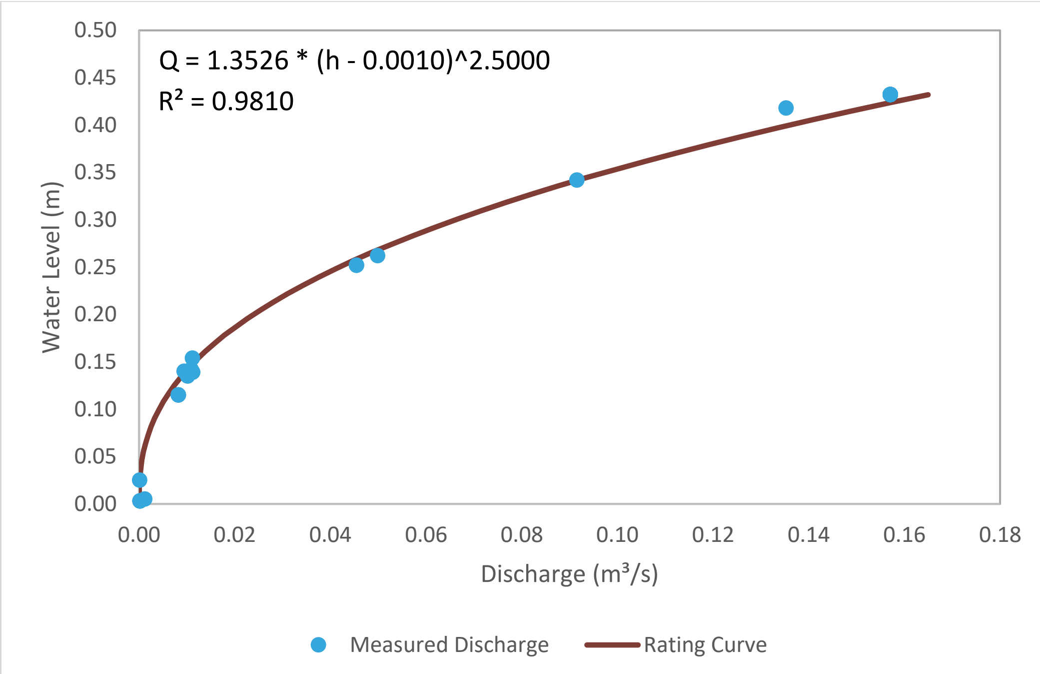


Figure 12: TL-7 2020 Hydrograph

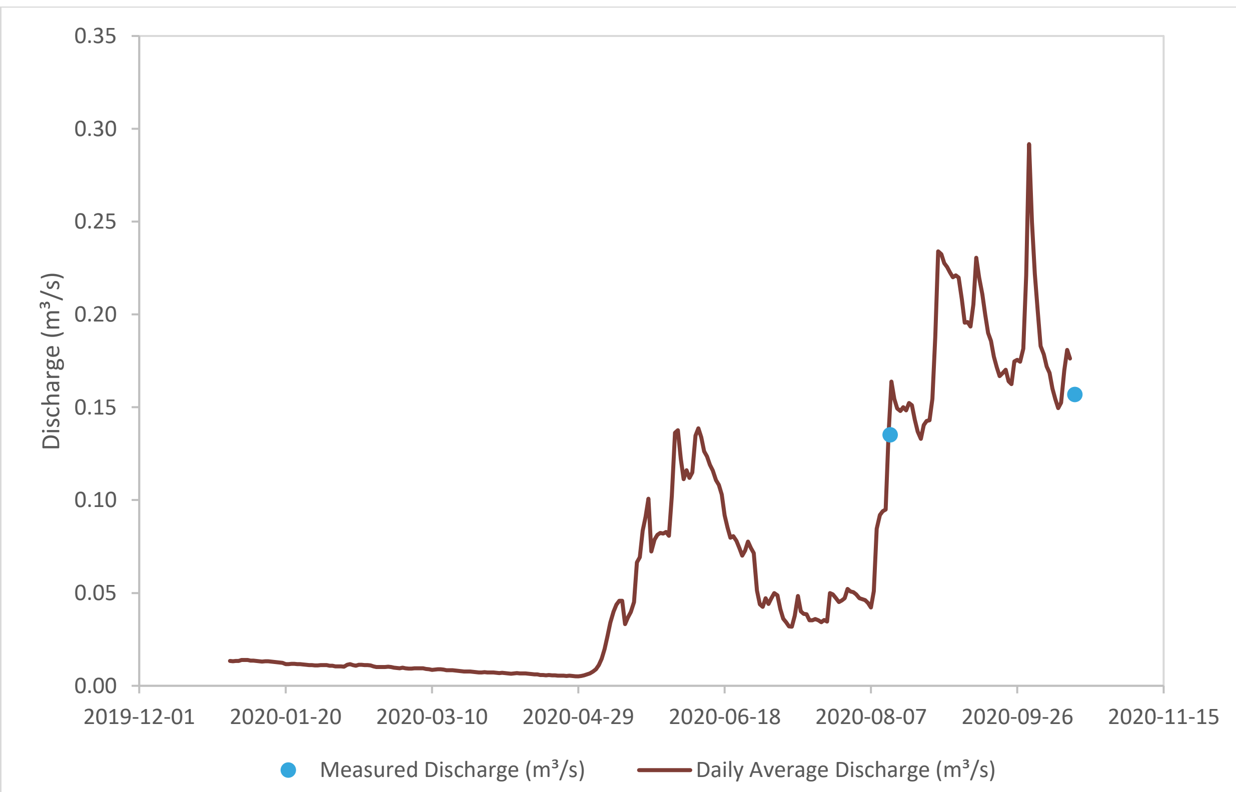


Table 13: TL-7 2020 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	0.0133	0.0111	0.0094	0.0070	0.0057	0.1362	0.0426	0.0505	0.2277	0.2498
2	0.0132	0.0111	0.0093	0.0069	0.0061	0.1376	0.0471	0.0492	0.2256	0.2217
3	0.0133	0.0111	0.0092	0.0070	0.0067	0.1223	0.0441	0.0471	0.2226	0.2020
4	0.0134	0.0108	0.0093	0.0068	0.0077	0.1112	0.0472	0.0467	0.2201	0.1830
5	0.0139	0.0107	0.0093	0.0067	0.0089	0.1160	0.0500	0.0462	0.2211	0.1785
6	0.0139	0.0105	0.0094	0.0065	0.0111	0.1119	0.0487	0.0447	0.2199	0.1719
7	0.0139	0.0104	0.0094	0.0066	0.0146	0.1148	0.0412	0.0422	0.2082	0.1686
8	0.0136	0.0104	0.0091	0.0068	0.0197	0.1347	0.0361	0.0509	0.1956	0.1601
9	0.0135	0.0103	0.0088	0.0066	0.0266	0.1386	0.0342	0.0846	0.1959	0.1543
10	0.0133	0.0114	0.0085	0.0066	0.0340	0.1339	0.0320	0.0920	0.1934	0.1495
11	0.0132	0.0116	0.0088	0.0066	0.0400	0.1263	0.0318	0.0941	0.2054	0.1524
12	0.0131	0.0112	0.0089	0.0065	0.0437	0.1236	0.0376	0.0950	0.2305	0.1698
13	0.0131	0.0108	0.0089	0.0063	0.0458	0.1190	0.0483	0.1352	0.2198	0.1809
14	0.0131	0.0112	0.0087	0.0062	0.0458	0.1159	0.0402	0.1639	0.2109	0.1762
15	0.0131	0.0113	0.0084	0.0061	0.0331	0.1107	0.0387	0.1545	0.1999	
16	0.0129	0.0111	0.0085	0.0058	0.0369	0.1082	0.0386	0.1493	0.1901	
17	0.0126	0.0111	0.0083	0.0058	0.0397	0.1029	0.0352	0.1480	0.1858	
18	0.0126	0.0110	0.0082	0.0057	0.0451	0.0918	0.0353	0.1501	0.1773	
19	0.0123	0.0105	0.0081	0.0058	0.0665	0.0852	0.0359	0.1483	0.1715	
20	0.0117	0.0102	0.0078	0.0057	0.0693	0.0798	0.0353	0.1522	0.1669	
21	0.0117	0.0101	0.0076	0.0056	0.0835	0.0806	0.0343	0.1510	0.1685	
22	0.0119	0.0100	0.0077	0.0054	0.0910	0.0781	0.0355	0.1434	0.1703	
23	0.0118	0.0102	0.0077	0.0055	0.1007	0.0743	0.0347	0.1370	0.1641	
24	0.0116	0.0104	0.0076	0.0055	0.0724	0.0701	0.0500	0.1330	0.1625	
25	0.0116	0.0101	0.0073	0.0053	0.0787	0.0728	0.0492	0.1405	0.1747	
26	0.0115	0.0098	0.0072	0.0054	0.0813	0.0777	0.0473	0.1426	0.1756	
27	0.0114	0.0095	0.0072	0.0053	0.0823	0.0743	0.0452	0.1430	0.1746	
28	0.0112	0.0095	0.0073	0.0051	0.0820	0.0715	0.0460	0.1545	0.1817	
29	0.0111	0.0097	0.0072	0.0051	0.0829	0.0513	0.0472	0.1881	0.2210	
30	0.0110		0.0072	0.0053	0.0807	0.0440	0.0521	0.2341	0.2918	
31	0.0110		0.0071		0.1022		0.0507	0.2324		
Average	0.0125	0.0106	0.0083	0.0060	0.0498	0.1005	0.0417	0.1208	0.1991	

Table 14: TL-7 Monthly Average Discharge (m³/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	0.0037	0.0037	0.0036	0.0061	0.0054	0.0038	0.0035	0.0035	0.0035	0.0041	0.0037	0.0035	0.004
1981	0.0035	0.0035	0.0035	0.0044	0.0124	0.0046	0.0047	0.005	0.0051	0.0049	0.0052	0.0049	0.0051
1982	0.0043	0.0042	0.0045	0.0051	0.0201	0.0151	0.008	0.0048	0.0035	0.0039	0.0038	0.0041	0.0068
1983	0.0045	0.0041	0.0037	0.0064	0.0279	0.02	0.0132	0.0101	0.007	0.0061	0.0055	0.0051	0.0095
1984	0.0049	0.005	0.0055	0.0135	0.0168	0.0267	0.0297	0.0195	0.0126	0.0203	0.0297	0.0267	0.0176
1985	0.0156	0.0117	0.0101	0.0127	0.1452	0.0598	0.019	0.01	0.0072	0.0058	0.0044	0.0043	0.0255
1986	0.0046	0.0048	0.0048	0.0059	0.0151	0.0187	0.0216	0.0174	0.0089	0.0064	0.0053	0.005	0.0099
1987	0.005	0.0055	0.006	0.0059	0.0828	0.0249	0.0101	0.0004	0.0001	0	0.0032	0.0033	0.0123
1988	0.0039	0.0026	0.0024	0.0022	0.018	0.0336	0.0376	0.0242	0.0095	0.0047	0.0053	0.005	0.0124
1989	0.0045	0.0045	0.0038	0.004	0.0989	0.0646	0.0113	0.0042	0.0026	0.0028	0.0038	0.0043	0.0174
1990	0.0052	0.0047	0.0044	0.0024	0.0201	0.0288	0.0095	0.0045	0.0035	0.0037	0.007	0.01	0.0087
1991	0.0074	0.0059	0.0055	0.0144	0.0993	0.0942	0.0299	0.0125	0.0124	0.0139	0.0152	0.0125	0.0269
1992	0.0095	0.0071	0.0058	0.0069	0.1133	0.0396	0.0324	0.0167	0.0227	0.073	0.0708	0.0189	0.0347
1993	0.0089	0.006	0.0047	0.005	0.0339	0.0175	0.0109	0.0413	0.021	0.0093	0.0119	0.0126	0.0153
1994	0.008	0.0061	0.0054	0.0048	0.2115	0.053	0.0069	0.0032	0.0023	0.003	0.0031	0.0031	0.0259
1995	0.0026	0.0024	0.0023	0.003	0.0822	0.0672	0.0687	0.0621	0.0407	0.0171	0.0117	0.0097	0.0308
1996	0.0071	0.0049	0.0038	0.0035	0.016	0.0168	0.035	0.0292	0.0103	0.0083	0.0085	0.0074	0.0126
1997	0.0063	0.0053	0.0042	0.0043	0.0207	0.0385	0.053	0.0896	0.2373	0.1897	0.074	0.0218	0.0621
1998	0.0114	0.0084	0.0068	0.008	0.0522	0.013	0.0216	0.0129	0.0074	0.0056	0.0056	0.0053	0.0132
1999	0.0043	0.004	0.0041	0.0038	0.0157	0.0214	0.013	0.0058	0.0054	0.004	0.0038	0.0042	0.0075
2000	0.0042	0.0033	0.003	0.0032	0.0091	0.009	0.0076	0.0082	0.0089	0.048	0.0962	0.0089	0.0175
2001	0.0067	0.0056	0.0053	0.0062	0.0817	0.0443	0.0093	0.011	0.0041	0.0016	0.0149	0.0112	0.0168
2002	0.0107	0.006	0.0045	0.0049	0.0559	0.0244	0.0121	0.0632	0.0446	0.0056	0.0193	0.0141	0.0221
2003	0.0083	0.0068	0.0053	0.0046	0.1105	0.1132	0.0518	0.0296	0.0247	0.0247	0.013	0.0104	0.0336
2004	0.0071	0.007	0.0088	0.0057	0.0055	0.0456	0.0076	0.0026	0.0018	0.0013	0.0045	0.0042	0.0085
2005	0.0035	0.0041	0.0037	0.005	0.0481	0.0438	0.0184	0.0139	0.0144	0.0147	0.0263	0.0196	0.018
2006	0.0134	0.009	0.0057	0.0133	0.1154	0.0459	0.0124	0.0073	0.0062	0.0062	0.006	0.0053	0.0205
2007	0.0052	0.0045	0.0041	0.0051	0.0364	0.0212	0.0052	0.0017	0.003	0.0187	0.038	0.0226	0.0138
2008	0.0152	0.0104	0.0086	0.0071	0.0489	0.0474	0.0112	0.0095	0.0075	0.0173	0.0272	0.0166	0.0189
2009	0.0029	0.0022	0.0015	0.0021	0.0277	0.0204	0.0422	0.0146	0.0069	0.0061	0.0061	0.0055	0.0115
2010	0.0041	0.0034	0.0026	0.0046	0.0167	0.0066	0.0002	0.0001	0.0002	0.0004	0.0002	0.0003	0.0033
2011	0.0002	0	0	0	0.0003	0.0002	0.0003	0.0004	0.0003	0.0002	0	0	0.0002
2012	0	0	0	0	0.004	0.009	0.0107	0.0042	0.0079	0.0039	0.0047	0.0041	0.004
2013	0.003	0.0009	0	0	0.0988	0.0837	0.0338	0.0171	0.0127	0.0116	0.0125	0.0129	0.0239
2014	0.0125	0.0115	0.0101	0.009	0.0941	0.1699	0.0976	0.0398	0.0174	0.0091	0.0093	0.0087	0.0407

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2015	0.0082	0.0086	0.0073	0.0081	0.0179	0.0057	0.0025	0.0146	0.0689	0.035	0.0312	0.0236	0.0193
2016	0.018	0.0148	0.0108	0.011	0.1361	0.0721	0.0142	0.0246	0.1335	0.0678	0.0382	0.0284	0.0475
2017	0.0177	0.013	0.0094	0.0103	0.0337	0.0107	0.0002	0.0001	0.0001	0.0001	0	0	0.0079
2018	0.0079	0.0074	0.006	0.0066	0.11	0.0669	0.0294	0.0098	0.0132	0.0053	0.0051	0.0051	0.0227
2019	0.0045	0.0031	0.0031	0.0041	0.0104	0.0106	0.0043	0.0069	0.0119	0.0132	0.016	0.0143	0.0085
2020	0.013	0.011	0.008	0.006	0.050	0.101	0.042	0.121	0.199				
Mean	0.007	0.006	0.005	0.006	0.054	0.039	0.021	0.019	0.025	0.017	0.016	0.010	0.018

4.7 CS-1 – CRACKINGSTONE RIVER

Station CS-1 on the Crackingstone River is located downstream of Cinch Lake which receives discharge from Beaverlodge Lake through Martin Lake. The Crackingstone River ultimately discharges to Bushell Bay of Lake Athabasca and flow monitoring occurs at a bridge crossing. Field monitoring occurred in the spring (Photo 11) and fall of 2020 (Photo 12). The measurement data for CS-1 are presented in Table 15 and the rating curve is shown in Figure 13. Figure 14 depicts the hydrograph for 2020. The daily average discharge data are presented in Table 16.

Photo 11: CS-1 – August 12, 2020

Photo 12: CS-1 – October 13, 2020

Table 15: CS-1 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2010-09-19 17:00	0.248	1.1410
2011-05-17 14:20	0.121	0.5550
2011-08-29	-0.065	0.0200
2011-10-03	-0.040	0.0340
2012-05-08 17:31	0.340	1.7901
2012-09-27 14:53	0.418	2.3729
2013-05-16 9:00	0.550	3.9647
2013-05-16 16:50	0.560	Not measured
2013-10-12 18:00	0.150	0.7082
2014-05-07 10:30	0.380	1.9275
2014-10-10 18:45	0.160	0.7403
2015-05-02 13:00	0.178	0.6533
2015-10-04 9:30	0.358	1.8307
2016-05-05 13:00	0.520	3.8811
2016-10-08 16:40	0.570	4.2456
2017-05-07 14:30	0.385	2.2372
2017-10-16 9:25	0.040	0.1588
2018-05-06 14:30	0.288	1.2873
2018-09-30 12:00	0.114	0.4900
2019-05-12 8:00	0.055	0.2482
2019-10-02 9:00	0.175	0.7300
2020-08-12 9:30	0.619	4.5701
2020-10-13 17:00	0.685	5.2072

Figure 13: CS-1 Rating Curve

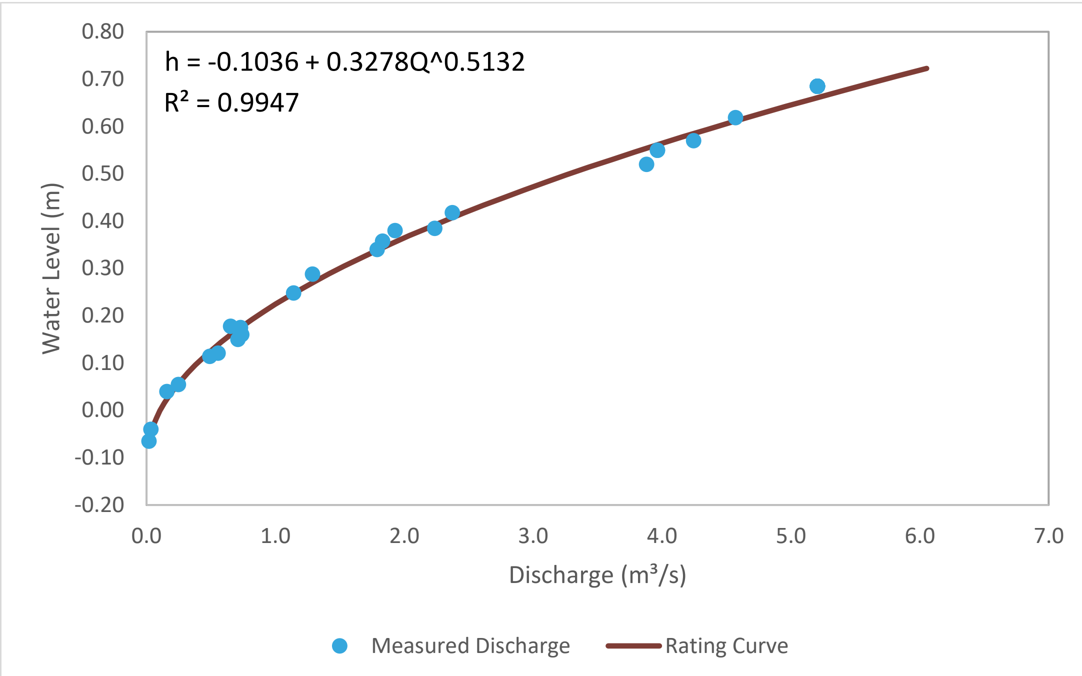


Figure 14: CS-1 2019 Hydrograph

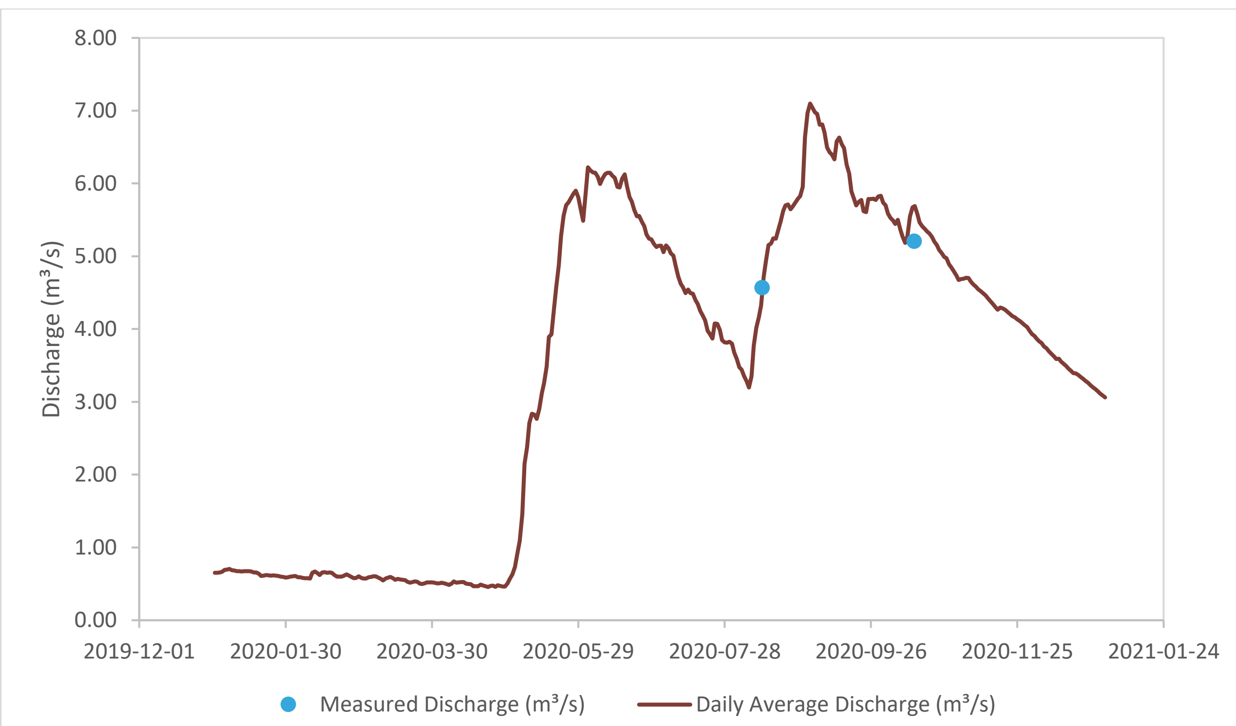


Table 16: CS-1 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.6522	0.6003	0.5815	0.5085	0.5691	5.8707	5.1459	3.6783	7.0978	5.7363	4.6746	3.9327
2	0.6512	0.6052	0.5742	0.5056	0.6318	6.2224	5.1448	3.5875	7.0443	5.6994	4.6880	3.9052
3	0.6586	0.6093	0.5747	0.5163	0.7299	6.1763	5.0578	3.4742	6.9775	5.5890	4.6918	3.8660
4	0.6649	0.5921	0.5889	0.5064	0.9018	6.1512	5.1515	3.4433	6.9543	5.5256	4.7052	3.8302
5	0.6933	0.5889	0.5929	0.5001	1.0910	6.1486	5.1096	3.3520	6.8057	5.4934	4.7019	3.8092
6	0.6982	0.5797	0.6025	0.4857	1.4549	6.0911	5.0385	3.2821	6.8090	5.4440	4.6524	3.7613
7	0.7027	0.5770	0.6041	0.5030	2.1510	5.9947	5.0067	3.1979	6.7013	5.5015	4.6142	3.7323
8	0.6860	0.5767	0.5856	0.5316	2.3810	6.0744	4.8495	3.3535	6.4945	5.3635	4.5806	3.6962
9	0.6825	0.5725	0.5687	0.5145	2.7088	6.1311	4.7229	3.7713	6.4298	5.2661	4.5456	3.6600
10	0.6758	0.6504	0.5472	0.5219	2.8367	6.1463	4.6209	4.0185	6.3978	5.1850	4.5209	3.6239
11	0.6720	0.6686	0.5738	0.5229	2.8241	6.1482	4.5730	4.1657	6.3339	5.2755	4.4899	3.5877
12	0.6684	0.6463	0.5862	0.5261	2.7650	6.1095	4.4960	4.3250	6.5777	5.5485	4.4639	3.5925
13	0.6735	0.6197	0.5928	0.5020	2.9011	6.0765	4.5441	4.7202	6.6299	5.6715	4.4202	3.5519
14	0.6761	0.6547	0.5760	0.4966	3.1175	5.9531	4.4939	4.9338	6.5383	5.6921	4.3826	3.5229
15	0.6751	0.6604	0.5560	0.4947	3.2594	5.9444	4.4846	5.1543	6.4875	5.5782	4.3459	3.4904
16	0.6691	0.6542	0.5682	0.4657	3.4847	6.0681	4.3994	5.1749	6.2607	5.4643	4.3006	3.4566
17	0.6552	0.6554	0.5599	0.4696	3.8935	6.1243	4.3427	5.2443	6.1374	5.4122	4.2661	3.4280
18	0.6552	0.6527	0.5554	0.4662	3.9255	5.9634	4.2463	5.2423	5.8910	5.3770	4.2956	3.3950
19	0.6395	0.6223	0.5511	0.4879	4.2781	5.8119	4.1912	5.3677	5.7917	5.3438	4.2847	3.3908
20	0.6087	0.6011	0.5295	0.4772	4.5778	5.7500	4.1189	5.4809	5.6987	5.3129	4.2638	3.3709
21	0.6113	0.5978	0.5148	0.4666	4.8761	5.6322	3.9735	5.6261	5.7481	5.2635	4.2353	3.3441
22	0.6233	0.5979	0.5230	0.4567	5.2777	5.5485	3.9318	5.7004	5.7721	5.2024	4.2087	3.3152
23	0.6185	0.6129	0.5314	0.4721	5.5576	5.5531	3.8694	5.7104	5.6200	5.1519	4.1783	3.2870
24	0.6127	0.6300	0.5281	0.4747	5.7024	5.4772	4.0764	5.6460	5.6079	5.0890	4.1618	3.2627
25	0.6148	0.6114	0.5025	0.4582	5.7368	5.4147	4.0706	5.6854	5.7867	5.0437	4.1330	3.2268
26	0.6118	0.5929	0.4965	0.4822	5.7982	5.2985	3.9881	5.7376	5.7867	4.9900	4.1112	3.2021
27	0.6061	0.5790	0.5090	0.4714	5.8627	5.2417	3.8499	5.7931	5.7922	4.9716	4.0872	3.1736
28	0.5972	0.5804	0.5217	0.4622	5.9030	5.2337	3.8152	5.8256	5.7754	4.8899	4.0531	3.1433
29	0.5937	0.6034	0.5193	0.4628	5.8093	5.1726	3.8138	5.9538	5.8229	4.8395	4.0265	3.1140
30	0.5872		0.5211	0.5055	5.6546	5.1266	3.8271	6.6360	5.8307	4.7942	3.9816	3.0873
31	0.5900		0.5175		5.4883		3.7980	6.9702		4.7341		3.0594
Average	0.6460	0.6136	0.5534	0.4905	3.6177	5.8218	4.4114	4.8468	6.2534	5.3048	4.3688	3.4780

4.8 ZORA LAKE OUTFLOW AND VERNA LAKE INFLOW

Zora Lake is upstream of Verna Lake and flows through the stream reconstruction project. Cameco requested that MWSI monitor discharge, if possible, at the outlet of Zora Lake and the subsequent inflow to Verna Lake. Measurements were completed at both stations during the summer field program. The measurement section at Zora is shown in Photo 13 and the inflow to Verna is depicted in Photo 14. The discharge measurements at Zora outflow and Verna inflow are provided in Table 17.

Photo 13: Zora Outflow – August 13, 2020

Photo 14: Verna Inflow – August 13, 2020

Table 17: Zora Outflow and Verna Inflow Discharge Measurements

Measurement Date & Time	Zora Outflow Discharge (m³/s)	Verna Inflow Discharge (m³/s)
2017-04-27	0.0027	Not Measurable (Glaciation)
2017-05-05	0.0030	Not Measurable (Glaciation)
2017-10-15	0.0000	0.0006
2018-05-06	0.0278	0.0273
2018-09-28	0.0012	0.0080
2019-05-12	0.0005	0.0028
2019-10-02	0.0023	0.0024
2020-08-13	0.0195	0.0275

4.9 BELOW FREDETTE LAKE

In 2019, a monitoring station was added on the Fredette River below Uranium City's water supply reservoir. Though this river would be considered as a regulated system MWSI believes this station will provide supporting data for BL-5 and CS-1 in the future. The station was visited twice in 2020 during the summer (Photo 15) and fall (Photo 16). Stage and discharge measurements collected at this station are presented in Table 18 and shown graphically in Figure 15. The 2019 and 2020 hydrograph are presented in Figure 16 and daily average discharge data are provided in Table 19 and Table 20.

Photo 15: Fredette – August 13, 2020

Photo 16: Fredette – October 15, 2020

Table 18: Fredette Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2019-05-12 15:30	99.370	0.2409
2019-10-02 10:30	99.370	0.2388
2020-08-13 10:00	99.665	1.8020
2020-10-15 9:30	99.693	2.1912

Figure 15: Fredette Rating Curve

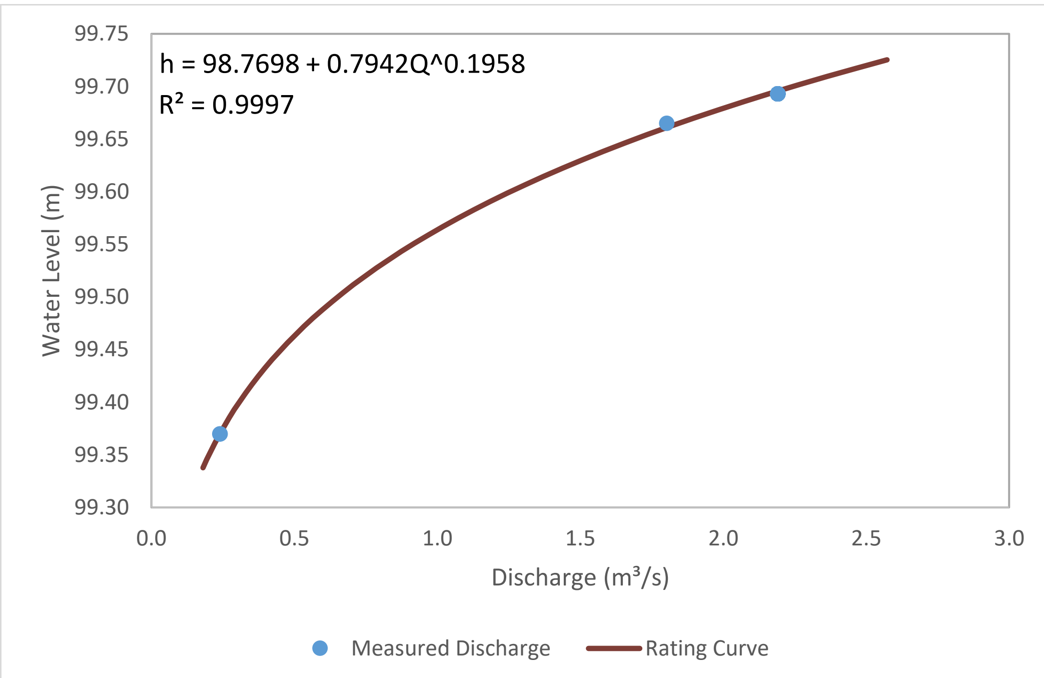


Figure 16: Fredette 2019 and 2020 Hydrograph

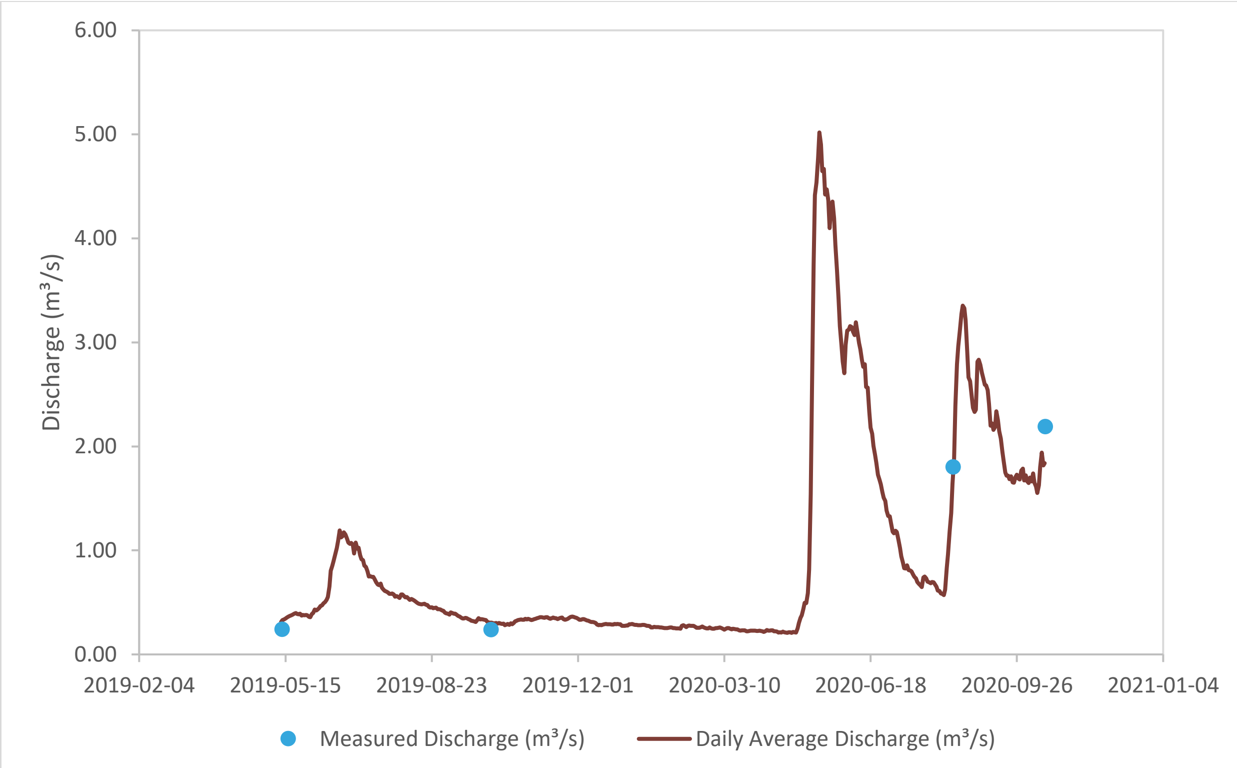


Table 19: Fredette 2019 Daily Average Discharge (m^3/s)

Day	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		0.3583	0.9717	0.5418	0.4012	0.3066	0.3385	0.3412
2		0.3892	1.0740	0.5762	0.3947	0.3068	0.3410	0.3348
3		0.3971	1.0182	0.5754	0.3926	0.3053	0.3492	0.3328
4		0.4315	1.0270	0.5613	0.3827	0.2995	0.3508	0.3395
5		0.4213	0.9526	0.5483	0.4040	0.3000	0.3570	0.3388
6		0.4321	0.9148	0.5507	0.3993	0.3011	0.3583	0.3345
7		0.4468	0.9047	0.5372	0.3909	0.2957	0.3560	0.3286
8		0.4670	0.8532	0.5234	0.3909	0.3032	0.3520	0.3228
9		0.4707	0.8416	0.5342	0.3832	0.2967	0.3572	0.3176
10		0.4896	0.7996	0.5272	0.3710	0.2943	0.3578	0.3131
11		0.5034	0.7480	0.5175	0.3645	0.2954	0.3490	0.3114
12	0.3115	0.5254	0.7529	0.5077	0.3550	0.2805	0.3432	0.3079
13	0.3302	0.5510	0.7453	0.4975	0.3470	0.2864	0.3483	0.3017
14	0.3372	0.6546	0.7450	0.4882	0.3452	0.2945	0.3547	0.2877
15	0.3463	0.8056	0.7237	0.4844	0.3517	0.2829	0.3489	0.2803
16	0.3556	0.8523	0.6920	0.4811	0.3496	0.2993	0.3477	0.2835
17	0.3649	0.9010	0.6706	0.4851	0.3393	0.2898	0.3388	0.2819
18	0.3703	0.9612	0.6658	0.4879	0.3320	0.3025	0.3449	0.2864
19	0.3774	1.0239	0.6805	0.4791	0.3226	0.3165	0.3526	0.2915
20	0.3817	1.0906	0.6400	0.4751	0.3224	0.3249	0.3547	0.2919
21	0.3914	1.1929	0.6227	0.4560	0.3168	0.3307	0.3410	0.2917
22	0.3992	1.1237	0.6097	0.4504	0.3110	0.3329	0.3327	0.2917
23	0.3893	1.1361	0.6034	0.4528	0.3277	0.3362	0.3350	0.2900
24	0.3857	1.1730	0.5951	0.4431	0.3493	0.3321	0.3428	0.2863
25	0.3904	1.1534	0.5826	0.4475	0.3374	0.3340	0.3517	0.2865
26	0.3739	1.1127	0.5820	0.4491	0.3382	0.3411	0.3604	0.2919
27	0.3795	1.0743	0.5844	0.4354	0.3367	0.3364	0.3648	0.2908
28	0.3770	1.0642	0.5772	0.4337	0.3323	0.3421	0.3621	0.2943
29	0.3808	1.0729	0.5539	0.4321	0.3289	0.3357	0.3542	0.2909
30	0.3770	1.0549	0.5597	0.4240	0.3156	0.3302	0.3519	0.2899
31	0.3618		0.5515	0.4188		0.3323		0.2759
Average		0.7777	0.7369	0.4910	0.3545	0.3118	0.3499	0.3035

Table 20: Fredette 2020 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	0.2749	0.2570	0.2505	0.2253	0.3507	2.9750	1.3277	0.6761	2.7844	1.6713
2	0.2746	0.2587	0.2480	0.2243	0.3765	3.1148	1.2587	0.6498	2.7076	1.7229
3	0.2771	0.2601	0.2482	0.2280	0.4393	3.1232	1.1796	0.6146	2.6571	1.6668
4	0.2793	0.2542	0.2531	0.2246	0.4966	3.1568	1.1654	0.6110	2.5936	1.6474
5	0.2891	0.2531	0.2545	0.2224	0.4925	3.1483	1.1899	0.5858	2.5872	1.6991
6	0.2908	0.2499	0.2578	0.2175	0.5903	3.1042	1.1761	0.5812	2.5414	1.6637
7	0.2923	0.2490	0.2583	0.2235	0.8165	3.0699	1.1033	0.5706	2.4106	1.7390
8	0.2866	0.2489	0.2519	0.2333	1.5405	3.1941	1.0220	0.6235	2.1984	1.6499
9	0.2854	0.2474	0.2461	0.2274	2.5696	3.0936	0.9435	0.8275	2.2199	1.6149
10	0.2830	0.2743	0.2387	0.2300	3.7446	2.9938	0.8835	0.9638	2.1596	1.5518
11	0.2817	0.2806	0.2479	0.2303	4.4140	2.9345	0.8282	1.1808	2.1856	1.6269
12	0.2805	0.2729	0.2522	0.2314	4.5401	2.8299	0.8262	1.3578	2.3382	1.8019
13	0.2823	0.2637	0.2544	0.2231	4.7734	2.7658	0.8554	1.6407	2.2524	1.9415
14	0.2832	0.2758	0.2486	0.2212	5.0186	2.7907	0.8101	1.8805	2.1475	1.8178
15	0.2828	0.2777	0.2417	0.2206	4.9031	2.5707	0.8084	2.3890	2.0760	1.8395
16	0.2807	0.2756	0.2460	0.2106	4.6450	2.5639	0.7976	2.7904	1.9480	
17	0.2759	0.2760	0.2431	0.2119	4.6681	2.3314	0.7689	2.9639	1.8559	
18	0.2760	0.2751	0.2415	0.2108	4.4223	2.1803	0.7467	3.1135	1.7485	
19	0.2705	0.2646	0.2401	0.2182	4.4718	2.1207	0.7298	3.2723	1.7185	
20	0.2599	0.2573	0.2326	0.2146	4.3631	2.0060	0.6979	3.3537	1.7201	
21	0.2608	0.2562	0.2275	0.2109	4.0970	1.9192	0.6793	3.3297	1.6863	
22	0.2650	0.2562	0.2304	0.2075	4.3173	1.8410	0.6617	3.2121	1.7127	
23	0.2633	0.2614	0.2332	0.2128	4.3528	1.7292	0.6459	2.9131	1.6542	
24	0.2613	0.2672	0.2321	0.2137	4.1927	1.6784	0.7404	2.6651	1.6519	
25	0.2620	0.2609	0.2233	0.2080	3.9398	1.6358	0.7486	2.6257	1.7050	
26	0.2610	0.2544	0.2212	0.2163	3.6950	1.5592	0.7315	2.4836	1.7292	
27	0.2590	0.2497	0.2255	0.2125	3.4145	1.5067	0.6982	2.3728	1.6910	
28	0.2559	0.2501	0.2299	0.2094	3.1577	1.4744	0.6933	2.3306	1.6804	
29	0.2547	0.2581	0.2291	0.2514	2.9733	1.3828	0.6856	2.3527	1.7682	
30	0.2525		0.2297	0.3030	2.8148	1.3294	0.6965	2.8158	1.7878	
31	0.2535		0.2285		2.7053		0.6932	2.8323		
Average	0.2728	0.2616	0.2408	0.2232	3.1386	2.4041	0.8643	1.9542	2.0639	

5.0 BOREHOLE SURVEY

During the summer field program in 2020 the sealed boreholes that had previously been flowing were inspected for any signs of new flow. As in previous years, BH-007 was noted to have a very small, unmeasurable seepage. All other boreholes were dry at the time of observation with no evidence of new flow. The boreholes were not inspected during the fall program due to recent snow cover.

7.0 DATALOGGER INSTALLATION TABLE

The Solinst Levelogger products have evolved since their initial designs. At the Site, three versions of the Levelogger products are in use which include the Gold series, Edge series and LTC series dataloggers. Table 21 identifies all dataloggers used at the Site and their last installed location in 2020. As previously discussed, some dataloggers malfunctioned during 2020 and this will be discussed with Cameco in advance of any 2021 monitoring.

Table 21: Datalogger Inventory

Location	Logger Type	Sensor Serial Number	Purchase Year
AC-14	LTC	1074783	2018
Fredette River	Edge	2002607	2012
AC-6A	Edge	2000174	2012
AC-6B	Gold	1050150	2012
AC-8 (from October 2020 onward)	Edge	2008162	Prior to 2012
AC-8	LTC	1075605	2018
Barometric Pressure	Gold	1050563	Prior to 2012
Barometric Pressure	Edge	2104714	2019
BL-5	Edge	2000175	2012
CS-1	Edge	2008664	2012
TL-6	Edge	2008162	2012
TL-7	Edge	2008671	2012

8.0 RECOMMENDATIONS

All recommendations from 2019 were incorporated in 2020. Cameco may need to consider the replacement of additional dataloggers during 2021 and MWSI will engage in discussion with Cameco in advance of any field work. It may also be important to review the current field monitoring requirements for the Site in context of replacing any of the current dataloggers as monitoring of the Site winds down in anticipation of moving the Site to the Province of Saskatchewan's Institutional Control Program.

9.0 SUMMARY AND CLOSURE

Cameco has retained MWSI for monitoring and reporting of discharges in the vicinity of the former Beaverlodge Mine. This reporting consists of the monitoring data and other pertinent observations recorded during field programs in 2020.

Climate records for Uranium City indicate that, anecdotally speaking, 2020 freshet started with an above normal snowpack and measured above normal precipitation through the summer which does not include record of a substantial rainfall event from July 29 to Aug 13. Flow records for this area reflect these precipitation conditions.

This report has been prepared by MWSI for the exclusive use of Cameco. MWSI is not responsible for any unauthorized use or modification of this document. All third parties relying on information presented herein do so at their own risk.

MWSI appreciates the opportunity to work with Cameco on this project. Should Cameco have any questions regarding this document please contact the undersigned.

Respectfully submitted,

Missinipi Water Solutions Inc.

Tyrel J. Lloyd, M.Eng., P.Eng.

Senior Water Resources Engineer

10.0 REFERENCES

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APPENDIX A – CALIBRATION RECORDS

Environment Canada
Environnement Canada

National Calibration Service
Service National D'Étalonnage

CURRENT METER S/N:	**Gurley 12**	CERTIFICATE # :	**17-251**
PROPELLER:	**N/A.**	DATE OF CAL.	**30-Aug-17**
CURRENT METER TYPE:	**Price (Gurley)1205 Mini**	METER CONDITION:	**Repaired**
METER OWNER:	**Missinipi Water Solutions**	CAL. BY: **R. McFadyen**	RM
SUSPENSION:	**Wading Rod**	WATER TEMP.:	**21.9° C**

The calibration was carried out in accordance with ISO 3455 (2007):
Hydrometry — Calibration of current meters in straight open tanks

The combined standard uncertainty of this calibration is: 0.03 m/sec.
Uncertainties include those of the accredited facilities to whom these measurements are traceable.

The following velocity equation has been derived from the calibration data as shown below:

Velocity in m/sec = 0.3108 x Current Meter Revs (N) + 0.0058
The standard error of estimate in m/sec for this equation is: 0.0045

The combined standard uncertainty (u_c) in m/sec associated with this equation using the RSS method is:

$$uc = \sqrt{(0.03)^2 + (0.005)^2} = 0.030$$

The expanded uncertainty (U) in m/sec associated with this equation is: 0.061
using a coverage factor k=2 for a level of confidence of ~95% assuming normal distribution.