BEAVERLODGE PROJECT

Beaverlodge Project 2019 Annual Report

Year 34 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 2019a*).

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, 2019 and December 31, 2019. 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 2019 are provided, along with an overview of anticipated activities planned for 2020.

GENERAL INFORMATION

SECTION 2.0

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 at December 31, 2019 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
Daniel Camus
Donald Deranger
Catherine Gignac
Tim Gitzel
Jim Gowans
Kathryn Jackson
Don Kayne
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**).

Uranium-bearing minerals were first discovered in the Beaverlodge area in 1934. Since there was little demand for uranium at that time, further prospecting and development in the region was delayed for almost 10 years. In 1944 Eldorado Mining and Refining Ltd., a crown corporation owned by the Government of Canada, commenced detailed exploration in the area of Fishhook Bay on the north shore of Lake Athabasca. Between 1944 and 1948 Eldorado Mining and Refining Ltd. continued to explore the area around Beaverlodge Lake, discovering the Martin Lake and Ace Zones in 1946.

Exploration and initial development of a number of separate ore bodies continued until 1951 when Eldorado Mining and Refining Ltd. developed the Fay shaft and headframe. The following year, the foundations were laid for a 450 tonnes per day (t/day) carbonate-leach mill which started production in 1953. Mill production expanded to 680 t/day in 1954 and increased to 1800 t/day in 1956. 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.

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 (SMOE). 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**.

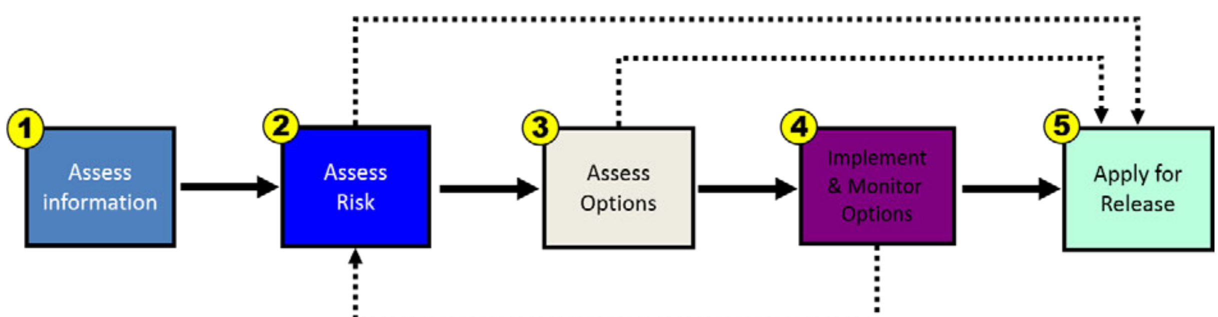


Figure 2.5-1 Simplified Beaverlodge Management Framework

As a part of the Beaverlodge Management Framework, Cameco and their consultants have gathered significant information regarding environmental conditions on the properties since 2009 (Box 1 of **Figure 2.5-1**). From 2009 to 2012, more than 20 environmental studies were completed in the Beaverlodge area, with reports summarizing this information provided to the regulatory agencies for review. The information gathered by Cameco and its consultants, combined with historical information, was used to develop the Beaverlodge Quantitative Site Model (QSM) in 2012.

A list of potential remedial options was initially developed during a 2009 stakeholder workshop. The workshop included residents of Uranium City and the Athabasca subcommittee of the NSEQC, along with industry and regulatory representatives. Following the workshop, a scoping level engineering cost assessment was completed for the potential remedial options identified.

The QSM was developed to assess ecological and human health risk from the 2012 baseline water and sediment quality (Box 2 of **Figure 2.5-1**) 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.

A second remedial options workshop was conducted in 2012 with local and regional stakeholders, as well as industry and regulatory participants. This workshop presented the various remedial options discussed during the 2009 workshop, options identified during the 2012 workshop, and the expected environmental benefits as evaluated in the QSM. Participant feedback regarding the various remedial options was gathered and summarized.

The results of this workshop informed the assessment of potential remedial options (Box 3 of **Figure 2.5-1**) and were instrumental in development of the Beaverlodge path forward plan. 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**).

Following the detailed assessment of potential remedial options and discussion with stakeholders, five options were selected for implementation at the decommissioned Beaverlodge properties to prepare the sites for transfer to the IC Program. The options consisted of:

1. Completion of a site wide surficial gamma survey and assessment.
2. Securing historic mine openings from access.

3. Decommission identified boreholes.
4. Re-establishment of the Zora Creek flow path.
5. Final inspection and cleanup of properties.

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, an application will be made to transfer the 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 SMOE, 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 are 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

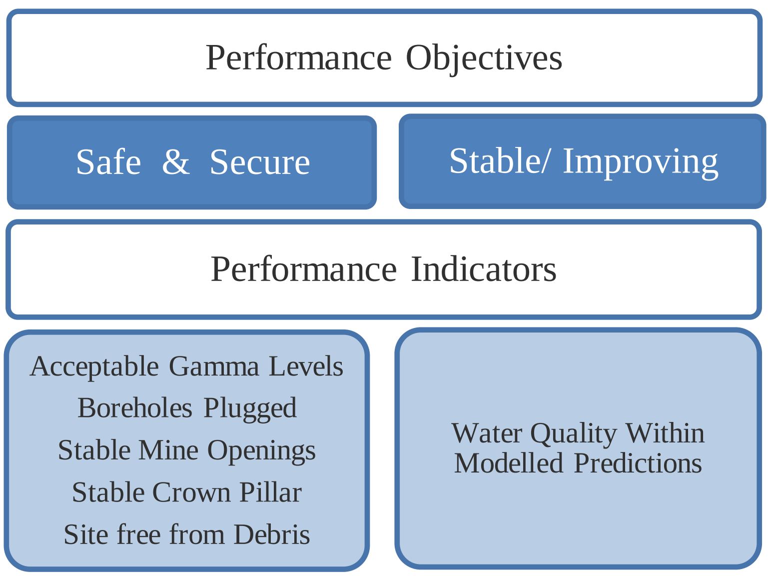


Table 2.5-1 Beaverlodge Performance Indicators

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	Exposed concrete caps on the vertical mine openings will be replaced with new engineered covers designed to improve the long-term safety of the site. In 2019, CNSC acknowledged that this performance indicator has been expanded in scope to include all mine openings.	Caps have been replaced and signed off by a qualified person.
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.

2.5.4 Release of the Beaverlodge Properties to Institutional Control

In 2009, five Beaverlodge properties located in two satellite areas (Eagle and Emar) were successfully transferred to the IC Program.

Based on the path forward plan, developed following the remedial options workshops, Cameco established a work plan and schedule to prepare the remaining properties for transfer to the IC Program. The work plan and schedule was presented at the CNSC annual update meeting to the Commission in October 2014.

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.

A submission requesting the release of decommissioned Beaverlodge properties from the provincial surface lease and CNSC licensing requirements, along with a custodial transfer to the IC Program was submitted for regulatory review in April 2016. Following receipt of review comments in June 2016, Cameco submitted two addendums in August and October 2016. The first addendum addressed the majority of SMOE comments from the April 2016 submission and the second provided an updated IC cost estimate and gamma scan results for the Bolger Pit. Cameco received a Letter of Intent from SMOE in February 2017 indicating they will grant a Release from Decommissioning and Reclamation, provided the properties are released from CNSC licensing.

An additional six properties were requested to be formally transferred into the IC Program in April 2018. Following receipt of review comments in April (CNSC) and November 2018 (SMOE), Cameco submitted a response to regulatory comments in December 2018. The SMOE issued a Letter of Intent in April 2019 stating that Cameco had adequately addressed all comments and fulfilled the requirements and obligations described in the Path Forward for the 20 properties. This letter served as notice to Cameco and the CNSC that SMOE will grant a Release from Decommissioning and Reclamation under the condition that the properties are released from CNSC licensing, in anticipation they are transferred to the IC Program.

As such, Cameco applied for the release of the 20 properties (14 from 2016; and 6 from 2018) from CNSC licensing and to amend the licence (WFOL-W5-2120.0/2023) to reflect changes. A public hearing was held on October 2, 2019 in Lac du Bonnet, Manitoba where the Commission considered written submissions and heard oral presentations from Cameco, CNSC staff, intervenors and other government representatives.

The CNSC issued a Record of Decision with a revised license (WFOL-W5-2120.1/2023) on December 19, 2019 granting Cameco’s request to remove the 20 properties from CNSC licensing, therefore making them eligible for transfer to the Province of Saskatchewan for long-term environmental stewardship under the IC Program or free-released depending on the presence of historical mining/milling activities.

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 Routine Inspections and Engagement Activities

3.1.1 Joint Regulatory Group Inspections

The JRG is comprised of representatives of various federal and provincial regulatory agencies. SMOE represents the Province of Saskatchewan and is responsible for oversight of uranium mining and milling activities in the province, while the CNSC 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 (SMOE)
- 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 2019, representatives from Cameco, CNSC, and SMOE completed a compliance inspection of the decommissioned Beaverlodge properties from June 3 to June 7.

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 one action notice and one recommendation. 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 recommendation was related to supplying the contractor on site the current Beaverlodge Environmental Management Program (EMP) and relevant documents, while the action notice indicated Cameco must ensure all expired conductivity standards, used to calibrate water quality monitoring equipment, are replaced and kept up to date. Cameco responded to the action notice and recommendation on July 23, 2019 outlining their process to ensure all conductivity standards are replaced, and the Uranium City contractor is supplied with the current Beaverlodge EMP and relevant documentation.

SMOE issued an Inspection Report on June 17, 2019. No new action items or recommendations were issued within the report. However, ten “Remediation Items Identified on Inspection to Address Before Release” were referenced from the 2017 inspection report.

Most remediation items referenced from the 2017 inspection report involved cleaning up debris (*SMOE 2019*), which was completed in 2019. Summaries of the work completed can be found in **Section 3.2**.

3.1.2 Geotechnical Inspection

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. The first third-party inspection following the change in frequency was conducted in 2015, with the next scheduled third-party inspection to occur in 2020. To accommodate the change in frequency of the third-party inspections, an inspection of the Fookes delta and two outlet structures is completed annually by Cameco personnel during the JRG inspection using a checklist developed by Cameco and SRK Consulting (Canada) Inc. (SRK).

The Geotechnical Inspection Checklist requires the assessment of the condition of the Fookes and Marie outlet structures and Fookes Tailings Delta. In addition, the checklist requires photographic record of each area. Should any significant changes to the deltas or outlet structures be observed, then a third-party inspection would be completed regardless of the regular schedule.

The Geotechnical Inspection Checklist was updated to include identified crown pillar areas at the Hab, Dubyna and Ace areas in response to recommendations from the site wide crown pillar assessment (*SRK 2015*). Based on the site wide crown pillar assessment, visual inspections of these areas was recommended annually until 2019. Visual inspections of the Hab, Dubyna and Ace areas will be completed until 2020, at which time the frequency of monitoring will be reassessed following a third party geotechnical inspection planned for 2020.

The 2019 inspection was completed by Cameco personnel and included the following areas:

- The Fookes tailings delta.
- The outlet spillways at Fookes and Marie Reservoirs.
- The Crown Pillar areas at Ace, Hab and Dubyna.

An overview of the inspection results at each location is provided below. 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 A**.

3.1.2.1 Fookes Tailings Delta

The 2015 third-party inspection of the Fookes Tailings Delta did not note any areas of concern and concluded that the delta was stabilized sufficiently to move towards final close out and transfer to the IC Program. Until the area is transferred to the IC Program, SRK recommended a continued internal annual inspection with a more formal inspection completed by a third party in 2020 (*SRK 2016*).

The 2019 inspection completed by Cameco and the JRG did not note any new tailings boils or tailings exposure. No significant changes or concerns with the performance of the sand cover were noted. There was no evidence of new vehicular traffic on the delta since the berms were repaired and reinforced, and vegetative growth cover in the area has been notably progressing. It was noted that the drainage area on the northeastern side of the delta and the drainage channel to Fookes Reservoir contained water and was performing as designed, as no standing water was observed on any other portion of the Fookes Delta.

3.1.2.2 Fookes and Marie Outlet Spillways

Observations made during the 2015 third-party inspection suggest that the condition of the grout-intruded rip-rap along the length of the Fookes Reservoir and Marie Reservoir outlet spillways were very similar to their condition during previous inspections. While some cracking and displacement of the grout has been observed, this was anticipated in the design and these structures continue to perform as expected. As such, SRK was of the opinion that it would be reasonable for these structures to be considered for transfer into the IC Program (*SRK 2016*).

During the 2019 inspection completed by Cameco and the JRG, the outlet structures were identified to be performing as expected with no additional concerns noted. Flows in 2019 decreased compared to the previous years, with monthly average discharges at TL-7 ranging from 0.0031 to 0.0160 m^3/s in 2019. Peak flows at TL-7 occurred in the spring and fall months of 2019 and did not exceed historic normal flow rates.

3.1.2.3 Crown Pillar Areas

The Ace area crown pillar was remediated with additional cover material in 2016. The 2019 follow-up inspection of this area found no signs of tension cracks or visible depressions. Inspections of the crown pillar areas at the Hab and Dubyna sites in 2019 showed no evidence of tension cracks or slumping. For a summary of the inspection report, please refer to **Appendix A**.

3.1.3 Community Engagement and Consultation: Public Meeting

Cameco continues to engage residents of northern Saskatchewan in relation to the decommissioned Beaverlodge properties. Cameco's practice of on-going engagement provides opportunities for information to be shared, questions and/or concerns to be raised. Public meetings provide Cameco the opportunity to meet directly with various groups to address questions and/or concerns raised in a meaningful way. The primary audience for the Beaverlodge properties is the Northern Hamlet of Uranium City, which is located 8km west of the former mine/mill site, with residents have year round road access. This community has become well versed in the activities occurring at the Beaverlodge properties and as a result, feedback received often centers on employment opportunities.

Cameco provides project plan updates and opportunities for feedback annually. The following groups are the focus of such engagement activities:

- The Northern Hamlet of Uranium City
- Athabasca Joint Engagement and Environment Subcommittee (AJES) – in June 2016 Cameco signed the Ya'thi Néné collaboration agreement with three First Nations and four municipalities in the Athabasca Basin (Denesuline First Nations of Black Lake, Hatchet Lake and Fond du Lac, along with the northern municipalities of Stony Rapids, Wollaston Lake, Uranium City and Camsell Portage) establishing the subcommittee and a direct link to the communities through committee representation. In addition, the Ya'thi Néné Lands and Resource office was established to provide technical support to the subcommittee regarding projects occurring in the Athabasca Basin and a point of contact for the communities. The Ya'thi Néné executive director is a member of AJES.
- The NSEQC – includes representatives from 32 northern municipal and First Nation communities in northern Saskatchewan, including those in the Athabasca Basin.

A public meeting was held on June 4, 2019 in Uranium City to provide an update on the decommissioned Beaverlodge properties. The meeting was advertised in Uranium City with posters in prominent gathering places around the local area along with direct invitations to various stakeholders. Representatives of the NSEQC, AJES, CNSC, Saskatchewan Ministry of Energy and Resources, SMOE, and Cameco were in attendance in addition to 24 community members. Cameco's primary goal of the 2019 meeting was to review the 2018 activities completed at the decommissioned Beaverlodge properties and the 2019/2020 plans for preparing and transferring properties to the provincial IC Program.

Cameco highlighted the processes Beaverlodge has gone through to ensure the properties are adequately prepared for transfer to the IC Program. For details, the presentation and meeting minutes are provided in **Appendix B**.

Presentations were also provided by the Saskatchewan Ministry of Energy and Resources, the CNSC, and SMOE. The presentations focused on describing 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.

The information shared provided an opportunity for community members to ask Cameco and regulatory agencies in attendance questions, and raise concerns regarding the project. General engagement discussions focused on environmental sampling methods, the IC Program control process, long term monitoring and maintenance, and employment opportunities.

On July 9, 2019, general updates on the decommissioned Beaverlodge properties were provided at the regularly scheduled NSEQC meeting. Discussions focused on the request to release 20 decommissioned Beaverlodge properties from CNSC licensing.

In addition, Cameco participated in a number of informal pre-hearing activities with various stakeholders; CNSC staff, Ya'thi Néné Land and Resource Office, and the Athabasca Basin community leaders. These discussions aimed to address questions and concerns raised by community leaders and provide an opportunity for additional information to be shared. The Athabasca Basin leadership meeting held on September 4th in Prince Albert, Saskatchewan included presentations from Cameco regarding the planned transfer of properties to the IC Program and Canada North Environmental Services (CanNorth) (a third party expert) about the Eastern Athabasca Regional Monitoring Program and Community Based Environmental Monitoring Program. In addition, the regional Medical Health Officer provided a presentation regarding Health Status Reporting in northern Saskatchewan.

3.2 2019 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 (*Kinsgmere 2018a*); 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 2019 in order to move the properties towards transfer to the IC Program.

3.2.1 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, in preparation for property transfer, an additional gamma survey was completed on the URA 3 property to assess the area along the south side of the main road on both the east and west sides of the mine site access road in August 2019.

Results did not exceed the *Saskatchewan Guidelines for Northern Mine Decommissioning and Reclamation*, EPB 381 (*SMOE 2008*), of 1 μSv/hr above background averaged over 1 hectare; therefore, no additional assessment of residual risk was completed. The condition of the URA 3 property remains unchanged from that presented in the Final Closure Report that described this property (*Kingsmere 2018*).

3.2.2 Rehabilitate Historic Mine Openings

The Province of Saskatchewan requires engineer stamped documentation regarding the final closure method of mine openings, including shaft, raise, adit or other opening, prior to properties being considered for transfer to the IC Program (*The Mines Regulations 2018*). As a result, Cameco is in the process of completing additional remediation where required on mine openings to ensure the long term security of the openings and to generate the required documentation to facilitate a transfer to the IC Program.

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		1985 Status	Current 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	Exposed	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	Located	Stainless steel cover designed, planned for installation in 2020.
Fay	Custom Ore Raise	URA 4	642623	6604658	Buried	Initiated investigation to determine potential remediation for 2020
Fay	Custom Ore Bin	URA 4	642625	6604658	Exposed	Initiated investigation to determine potential remediation for 2020.
Fay	CB-1 Access Raise	URA 7	642558	6604563	Buried	Inclined access raise located. Plan to seal as an adit.
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, will require a site-specific plan for sealing the raise- likely backfill.
Fay	Sorting Plant Bin	URA 7	642603	6604520	Buried	Beside the raise, will also be backfilled.
Fay	Fine Ore Dump	URA 4	642682	6604715	Buried	Stainless steel cover designed, approved and planned for installation 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	Initiated investigation to determine potential remediation for 2020.
Fay	Waste Haul Adit	URA 7	642638	6604450		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	Backfilled	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”.

Stainless steel covers were installed at the Hab Heater Raise and Verna Main Ventilation Raise in 2019. Engineer designed drawings for the two stainless steel covers were submitted to SMOE and the Saskatchewan Ministry of Labour Relations and Workplace Safety for review and approval on December 19, 2018. Exemption from *The Mines Regulations, 2003* and an Approval to Construct, Alter, or Extend Pollutant Control Facilities, Approval No. PD19-019 were received on January 3, 2019 and January 22, 2019, respectively.

The stainless steel covers 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 2019. Inspection results indicated the stainless steel covers were ready for transportation and installation (*Kova 2019a; Kova 2019b*). Subsequently, the stainless steel covers were transported to Uranium City via winter road across Lake Athabasca.

Installation of the stainless steel caps occurred in the summer of 2019. The post installation inspection of the Hab Heater Raise and Verna Main Ventilation Raise stainless steel covers was conducted by Kova in August 2019. 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 2020a; Kova 2020b*). Following final inspections, as-built drawings for the Hab and Verna stainless steel covers were provided for record to the regulatory agencies in February 2020.

Engineer designed drawings for stainless steel covers for the Fay Shaft and an adjacent dump raise were submitted to SMOE and the Saskatchewan Ministry of Labour Relations and Workplace Safety for review and approval on December 6, 2019. Approval to Construct, Alter, or Extend Pollutant Control Facilities, Approval No. PC20-009 and PD20-015 on January 10, 2020 and January 16, 2020, respectively, while approval for Abandoning Workings, Regulations 20-3 (2)(b) of *The Mine Regulations, 2018* was granted on January 15, 2020.

In addition to stainless steel cover design and installation, in response to the SMOE's request for more information regarding the status of locating Raises 199, 195, and 201 (G. Bihun to M. Webster, February 11, 2018), Cameco engaged with SRK to perform an assessment, comparing numerous data sources, to better approximate the raise locations (*SRK 2019a*).

As detailed in the SRK report (*2019b*), the 199 Raise was erroneously identified in 2017 report. A review of historical mine plans and reports did not support the existence of the 199 Raise and no additional effort is planned. Furthermore, while the 201 location is known all practical efforts to physically excavate the raise have been exhausted and further investigation is not planned. Additional sorted waste rock has been placed on top the raise and graded to further secure the area.

Field verification of the 195 and 195A was completed in July 2019. As outlined by SRK (*2019b*), it was expected that raises 195 and 195A were located within a building foundation footprint and could be located by excavating a series of trenches near the base of the hill that housed the Dorrclone. No clear sign of a defined collar was identified within the building foundation before the water table was reached. Based on historic documentation referenced in the SRK report (*2019b*), there is a high level of confidence that the raises 195 and 195A are underwater. The area was subsequently backfilled with excavated material and additional sorted waste rock, then graded. All practical efforts to locate the 195 and 195A raises have been exhausted and no further field investigation is planned, however the area will continue to be monitored. On December 3, 2019, SMOE agreed with this plan going forward (*G. Bihun to A. Kambeitz, December 3, 2019*).

The Fay Crusher area and associated openings (3) were also investigated in 2019 to assess final closure methods. The structure/openings are located on mill hill within the boundaries of the decommissioned Beaverlodge properties and reclamation activities are expected to begin in 2020.

In following with the requirements of Section 20-3 (3) of *The Mines Regulations, 2018*, the locations of the below mine openings were clearly marked in 2019 with a 1m high sign that identifies the location coordinates, the party responsible for the opening and the cover:

- Hab Heater Raise,
- Verna Raise,
- Eagle Shaft Cap,
- Dubyna Adit, and
- Martin Lake Adit

In 2020, signs are planned to be added at Raise 105#2, 195 and 195 Access Raise, 201 Raise, 46 Zone Adit, Hab Raises and Adits, 72 Zone Adit and the Waste Haul Adit.

3.2.3 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 SMOE in a report titled "*Bolger Flow Path Reconstruction: 2016 Final As-Built Report*" (*SRK 2017*) on March 10, 2017.

During the 2019 regulatory inspection, a visual inspection of the Zora Creek flow path was conducted by Cameco and the regulatory agencies. No notable changes to the condition of the channel were observed. Flows through Zora Creek were low in 2019, as reflected in a reduction of scheduled sample collections at stations ZOR-01, ZOR-02, and AC-6A. The next third party geotechnical assessment is scheduled for 2023, as recommended in the 2018 geotechnical report (*SRK 2019b*). Visual inspections will continue to be performed annually by Cameco personnel.

A description of the 2019 water quality results for sample stations ZOR-01, ZOR-02, AC-6A, and AC-8 are provided in **Section 4.4.1**. Water quality from this area will continue to be monitored in order to evaluate the success of implementing this remedial option.

3.2.4 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 2019, as a result of the final regulatory inspection, the SMOE identified minor remediation activities to be completed prior to transferring the properties to the IC Program. The identified activities included the following:

- Removal of applicable items including, but not limited to debris, materials and timber from the Lower Ace Creek, Milmine Lake and Hab mine site;
- Ensuring all rock and anchor bolts are flush with associated surfaces in the Lower Ace Creek area;
- Sealing three boreholes and confirming previously filled boreholes are sealed in the Lower Ace Creek and Hab area.

The projects were completed during the summer/fall of 2019 and were managed in accordance with the conditions listed in AHPP19-117, which was issued to Cameco by the SMOE on June 28, 2019.

Debris Disposal

The minor amount of additional debris identified during the 2018 and 2019 regulatory inspections has been collected and disposed of in the Fay Pit. In 2019, approximately 11 m^3 of woody debris, metal and concrete/rebar were placed in the Fay Pit. The table below has been updated to include the volume of waste disposed of in 2019.

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**

3.2.5 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.

In 2019, 12 dry boreholes were sealed with grout, and the casings cut at ground level. Collectively, 218 boreholes have been decommissioned since 2011 across the Beaverlodge properties.

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.

3.2.6 Crown Pillar Remediation

In response to failure of the crown pillar associated with the Ace Stope Area, 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 2019c*). Inspection of the Ace stope area was completed in 2019 and showed the area performing as expected with no signs of subsidence (tension cracks, slumping) noted. The crown pillars associated with the Ace

Stope Area as well as the Hab and Dubyna crown pillar areas were inspected by Cameco and results and photos are provided in the Geotechnical Inspection Report (**Appendix A)**.

The final As-built report for the 105#2 Raise describes how remediation of this raise fits with the crown pillar remediation project and was submitted on April 3, 2019.

As per recommendations from SRK, a geotechnical assessment is planned for 2020 to verify performance of the cover. Evaluation of the required frequency will take place at that time and are anticipated to continue under the IC Program in the long-term.

3.3 Additional Studies

3.3.1 Environmental Performance Report and Environmental Risk Assessment

Cameco retained the services of CanNorth to prepare the Beaverlodge Environmental Performance Report (EPR) covering the 2013 to 2017 reporting period. The report was submitted on October 29, 2018 to fulfill the requirements stated in the Beaverlodge Surface Lease Agreement dated December 24, 2006. The EPR also fulfills the requirement to submit a State of Environment report as identified in Section 5.3.4 of the Beaverlodge - Facility License Manual, which is one of the key documents submitted in support of CNSC licence number WFOL-W5-2120.1/2023. Comments were received from the CNSC on March 8, 2019 with a response from Cameco sent on June 11, 2019. Comment dispositions were received from the CNSC on August 22, 2019 with a response from Cameco sent on September 19, 2019. A CNSC technical review of Cameco's September 2019 response was received on December 4, 2019.

In the technical review, CNSC noted the QSM established in 2012 should be re-evaluated to better reflect site conditions and environmental factors. Based on this recommendation, Cameco plans to reassess the Beaverlodge QSM in 2020 and update the predictions and risk assessment accordingly.

SECTION 4.0

ENVIRONMENTAL MONITORING PROGRAMS

4.0 ENVIRONMENTAL MONITORING PROGRAMS

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.

4.1 Site Specific Objectives

The annual report provides water quality comparisons made against the site specific water quality predictions developed in the Beaverlodge QSM (*SENES 2012*).

4.1.1 Modelled Predictions (Performance Indicators)

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 and further updates are anticipated in 2020 as the Beaverlodge QSM is updated. For the purposes of this report, comparisons are made to the accepted 2013 predicted values (*SENES 2013)* 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 2019 water quality and corresponding trends are evaluated and discussed below.

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

Uranium	2019	SEQG	2019 QSM Bounding Range			Comments
	Concentration (µg/l)					
Ace Lake (AC-8)	12.50	15	6.77	to	13.3	Below SEQG
Beaverlodge Lake (BL-5)	103.67	15	97.2	to	134	2019 average within bounds
Dubyna Lake (DB-6)	177.50	15	57.9	to	128	Annual average exceeded the upper bound in 2019. Assessing model inputs in 2020
Fookes Reservoir (TL-3)	232.75	15	302	to	396	Trending below lower bound
Greer Lake (TL-9)	132.50	15	260	to	315	Trending below lower bound
Lower Ace (AC-14)	34.09	15	13.7	to	30.3	Annual average exceeded the upper bound in 2019. Trend will be monitored
Marie Reservoir (TL-4)	187.00	15	301	to	375	Trending below lower bound
Meadow Fen (TL-7)	148.67	15	316	to	411	Trending below lower bound
Pistol Lake (AN-5)	169.50	15	178	to	395	Trending below lower bound
Verna Lake (AC-6A)	271.50	15	102	to	218	Annual average exceeded the upper bound in 2019. Assessing model inputs in 2020.

Radium-226	2019	SEQG	2019 QSM Bounding Range			Comments
	Activity Level (Bq/l)					
Ace Lake (AC-8)	0.025	0.11	0.011	to	0.017	Below SEQG
Beaverlodge Lake (BL-5)	0.03	0.11	0.0355	to	0.046	Below SEQG
Dubyna Lake (DB-6)	0.032	0.11	0.0174	to	0.029	Below SEQG
Fookes Reservoir (TL-3)	1.35	0.11	1.09	to	1.35	2019 average within bounds
Greer Lake (TL-9)	2.033	0.11	1.64	to	2.32	2019 average within bounds
Lower Ace (AC-14)	0.061	0.11	0.0238	to	0.048	Below SEQG
Marie Reservoir (TL-4)	1.75	0.11	1.38	to	1.77	2019 average within bounds
Meadow Fen (TL-7)	1.55	0.11	1.34	to	1.72	2019 average within bounds
Pistol Lake (AN-5)	0.9	0.11	0.381	to	0.896	Annual average was at the upper bound in 2019. Assessing model inputs in 2020.
Verna Lake (AC-6A)	0.09	0.11	0.0687	to	0.169	Below SEQG

Selenium	2019	SEQG	2019 QSM Bounding Range			Comments
	Concentration (mg/l)					
Ace Lake (AC-8)	0.0001	0.001	0.0001	to	0.0001	Below SEQG
Beaverlodge Lake (BL-5)	0.0019	0.001	0.0021	to	0.0026	Trending below lower bound
Dubyna Lake (DB-6)	0.0001	0.001	0.0001	to	0.0001	Below SEQG
Fookes Reservoir (TL-3)	0.0024	0.001	0.0032	to	0.0037	Trending below lower bound
Greer Lake (TL-9)	0.0023	0.001	0.0031	to	0.0039	Trending below lower bound
Lower Ace (AC-14)	0.0002	0.001	0.0001	to	0.0001	Below SEQG
Marie Reservoir (TL-4)	0.0012	0.001	0.0030	to	0.0033	Trending below lower bound
Meadow Fen (TL-7)	0.0014	0.001	0.0031	to	0.0035	Trending below lower bound
Pistol Lake (AN-5)	0.0002	0.001	0.0001	to	0.0001	Below SEQG
Verna Lake (AC-6A)	0.0002	0.001	0.0001	to	0.0001	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. In 2019, only 2 of the scheduled 12 samples were collected at station AC-6A due to a lack of water flowing from Verna Lake into Ace Lake. These dry conditions are expected to have contributed to the deviation of uranium concentrations at station AC-6A in 2019. Continued monitoring at Verna Lake in 2020, will assist with determining the efficacy of the reconstruction project and evaluating recovery since construction activities.

Uranium concentrations at Dubyna Lake (DB-6) have shown improvements since 2008, but overall are above the predicted upper bound. Further discussion regarding uranium recovery in Dubyna Lake is provided in **Section 4.3.1** (DB-6 Dubyna Lake).

4.2 Transition-Phase Monitoring

During transition-phase monitoring, the results of four separate monitoring programs have been evaluated to assess the performance of the decommissioned Beaverlodge properties. These include water quality, ambient radon, air quality, and gamma radiation surveys.

The air quality monitoring program for dust fall and high volume sampling was discontinued following the third year of the transition-phase monitoring as all sampling results met the established close-out objectives.

The original gamma radiation surveys were completed in the first year of the transition phase (1985/1986) monitoring. Following this, gamma surveys were conducted on an ad-hoc basis or in support of applications to release specific properties from decommissioning and reclamation. In 2014, a detailed survey of the disturbed areas on all decommissioned Beaverlodge properties was conducted and a risk assessment completed (see **Section 3.2.1**) that considered the gamma survey results and the expected land use by stakeholders. Gamma surveys have since and will continue to be completed on an ad-hoc basis where required in support of transferring properties to the IC Program.

Currently, two routine environmental monitoring programs continue as per the Beaverlodge EMP: water quality and ambient radon.

On July 26, 2019, Cameco requested optimizing the Beaverlodge EMP to reflect an understanding of the conditions in the area and facilitate the transition into IC Program monitoring phase. The draft document was submitted for review to the SMOE and the CNSC (*M. Webster to G.Bihun/R.Snider*). The CNSC provided comments and recommendations on August 22, 2019 largely related to the surface water sampling program frequency. Comments from the SMOE were received on September 12, 2019 requesting further clarification and justification. Cameco provided the requested information to SMOE on November 19, 2019.

Cameco submitted the revised Beaverlodge EMP for regulatory review and acceptance on December 10, 2019. Final approval was received from SMOE on January 7, 2020. The CNSC provided comments and recommendations on December 20, 2019. 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 in January 2020.

4.3 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 previously noted, modelled predictions will be updated in 2020 to better reflect current site conditions and environmental factors in order to better predict the recovery and potential risks associated with the decommissioned Beaverlodge properties. 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 (selenium, uranium and radium^{226}). Total dissolved solids (TDS) is also included as a general indicator of water quality.

The two watersheds affected by historical mining activities are Ace Creek and Fulton Creek. **Figure 4.3** 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.

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 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 (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 Located in a central location within Beaverlodge Lake.

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 4.3.1-1 to **4.4-8** are graphical representations of the historical annual average concentrations of uranium (U), radium226 (Ra^{226}), selenium (Se), and total dissolved solids (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 SOE (*SENES 2013*). 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. As there are no guidelines for TDS under the current SEQG, no comparison to guidelines have been made.

Tables 4.3.1-1 to **4.4-2** show summary statistics and comparisons to historical results of parameters monitored at Beaverlodge water sampling stations. Please note, total phosphorus was missing from these tables in the 2016, 2017 and 2018 Beaverlodge Annual Reports and has been added to these tables from 2015 to 2019.

Sections 4.3.1 and **4.3.2** cover the water quality results and trends at each of the water quality stations located within each watershed. **Section 4.3.3** 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 30 years).

The detailed water quality results for the current reporting period, January 2019 to December 2019, are provided in **Appendix D**.

4.3.1 Ace Creek Watershed

AN-5 Pistol Lake

Station AN-5 is located in Pistol Creek downstream of the decommissioned Hab satellite mine (**Figure 4.3**). All six scheduled samples were collected at AN-5 in 2019.

A historical summary of annual average Ra^{226}, U, Se, and TDS concentrations at AN-5, along with the predicted recovery, are presented in **Figures 4.3.1-1** to **4.3.1-4**. The annual averages from 2015 to 2019 are presented in **Table 4.3.1-1**.

The long-term trend for Ra^{226} at AN-5 is predicted to remain relatively constant into the future, however notable season fluctuations in the year to year annual average concentration are expected. As shown in **Appendix D**, seasonal fluctuation varied in magnitude between 0.48 Bq/L and 1.70 Bq/L in 2019. The annual average Ra^{226} concentration at AN-5 increased from 0.646 Bq/L in 2018 to 0.900 in 2019 and was 0.004 Bq/L above the modelled predictions. This increase is within the five year range and will continue to be monitored.

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 in magnitude between 56 µg/L and 290 µg/L. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning (**Figure 4.3.1-1**). In comparison to modelled predictions, the annual average concentrations of U have been trending below the predicted range. The lower bound predicted concentration for U in 2019 was 178 µg/L and recorded average concentration was measured at 169.50 µg/L for 2019.

Similar to U and Ra^{226}, TDS concentrations exhibit a seasonal fluctuation that affects the annual average; however, the long-term trend has remained relatively consistent.

In order to better understand the variability observed at AN-5, the sensitivity of predicted concentrations at the outlet of Pistol Lake to various model assumptions within the QSM was assessed (*CanNorth 2018*). This investigation found that the range of flow observed in the area was much higher than the variability assumed within the QSM. If this higher precipitation/flow variation is considered, the model results show that a wider range of values for U and Ra^{226} levels observed at AN-5 are reasonable and should be expected. The high seasonality observed at AN-5 is expected due to the small, shallow nature of Pistol Lake, which would amplify the effects of seasonal influences such as ice cover. The risk evaluation included in the ERA (*CanNorth 2018*) also found that any potential risks to wildlife in the Pistol Lake area are related to U levels, not Ra^{226}. As U appears to be recovering more quickly than predicted (**Figures 4.3.1-1**), any predicted potential risks are conservative in nature. As noted by the CNSC, the QSM established in 2012 should be re-evaluated to better reflect site conditions and environmental factors (*R. Snider to M. Webster, December 4, 2019*). Based on this recommendation, Cameco plans to reassess the 2012 QSM in 2020.

Selenium values at AN-5 remained relatively consistent throughout 2019 and has remained 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 4.3**). There were a total of six scheduled samples at DB-6 in 2019, of which all were collected.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at DB-6, along with the predicted recovery, are presented in **Figures 4.3.1-5** to **4.3.1-8**. The annual averages from 2015 to 2019 are presented in **Table 4.3.1-2**.

Since decommissioning to 2012, U concentrations at DB-6 have shown a consistent long-term decreasing trend. Following the plugging of three flowing boreholes (2011 and 2012), the range of variation in U concentrations at DB-6 has decrease, as such annual average concentrations have become more consistent. Although the annual average U concentration exceeded the upper predicted bound in 2019, it has decreased from 2018 levels (193.5 µg/L to 177.5 µg/L).

Cameco has initiated a search for potential additional sources of U along the shoreline of Dubyna Lake in response to the annual U averages that have exceeded the modelled predictions in recent years. In particular, a cursory search of conductivity found increased conductivity levels in the lake adjacent to the mine, but no clear sources has been identified. An evaluation of the potential risk to aquatic biota was completed as part of the recent ERA (*CanNorth 2018*). As part of the sensitivity evaluation discussed in the ERA, the risk evaluation for Dubyna Lake was also reexamined using measured concentrations from the last five years in the pathways portion of the Beaverlodge QSM tool instead of the predicted values, which are marginally lower. This evaluation found that even if recovery is occurring at a slightly slower rate than predicted, the overall outcome of the assessment are unchanged. However, based on comments from the CNSC recommending the QSM be updated, Cameco will update the QSM in 2020 to better reflect current site conditions and environmental factors, which Cameco anticipates will more accurately predict recovery in Dubyna Lake.

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

Selenium has remained relatively stable since 2004. 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 2019.

AC-6A Verna Lake

Water quality monitoring at this station began in May 2010, and is located at a culvert between Verna Lake and Ace Lake (**Figure 4.3**). Flows from Verna Lake are largely dependent on spring snow melt and precipitation, and as such, not all scheduled samples can be collected during low precipitation years. Increased sample frequency at AC-6A began in 2015 in order to track changes in water quality as a result of the implementation of the Zora Creek Reconstruction project. In 2019, there were 12 samples scheduled; however, due to ice cover and lack of water, only 2 samples were collected.

A historical summary of annual average Ra^{226}, U, TDS and Se concentrations at AC-6A along with the predicted recovery, are presented in **Figures 4.3.1-9** to **4.3.1-12.** The annual averages from 2015 to 2019 are presented in **Table 4.3.1-3**.

The annual average U concentration has steadily decreased since 2015 and was recorded as 271.50 µg/L in 2019. Although this concentration is above the modelled predictions, it is expected to continue to decrease as a result of the Zora Creek Reconstruction project in the long term and as described in **Section 3.3.1** modelled predictions will be re-evaluated in 2020. 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 Ra^{226} concentration at AC-6A has shown a continued decreasing trend since 2017. The current annual average Ra^{226} concentrations have decreased from 0.1 Bq/L in 2018 to 0.09 Bq/L in 2019. Based on the modelled predictions, Ra^{226} is trending within the upper and lower bounds. The annual average concentration of Ra^{226} reported in 2019 at this station was also below the SEQG concentration of 0.11 Bq/L.

Selenium concentrations at station AC-6A remained relatively consistent throughout 2019 and the annual average concentration continues to measure well below the SEQG concentration of 0.001 mg/L.

Total dissolved solids concentrations have increased slightly since 2018, ranging from 211.0 mg/L to 245.0 mg/L in 2019. This increase was likely due to low levels of flowing water through the Verna Lake discharge into Ace Lake, which only allowed for 2 of 12 scheduled samples to be collected.

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 4.3**). Both of the scheduled samples for AC-8 were collected in 2019.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at AC-8 along with the predicted recovery, are presented in **Figures 4.3.1-13** to **4.3.1-16**. The annual averages from 2015 to 2019 are presented in **Table 4.3.1-4**.

The long-term trend for annual average U concentrations has followed a slowly decreasing trend since decommissioning. Since 2012, the annual average U concentration has been below the SEQG and within the modelled predictions.

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

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 4.3**). Out of the 12 scheduled samples, 11 were collected in 2019. The one sample not collected was due to heavy snowfall in November, which created unsafe sampling conditions.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at AC-14 along with the predicted recovery, are presented in **Figures 4.3.1-17** to **4.3.1-20.** The annual averages from 2015 to 2019 are presented in **Table 4.3.1-5**.

While U concentrations at station AC-14 have been following an overall downward trend since decommissioning, the short-term trend has fluctuated around 30 µg/L and has exhibited less variability than results reported prior to 2009. The 2019 average concentration of 34.09 µg/L exceeded the upper bound predicted concentration of 30.3 µg/L. The majority of samples collected in 2019 were within the U modeled predictions; however, 3 out of 11 samples collected exceeded the upper bound prediction of 30.3 µg/L. These deviations could be due to flushing of residual uranium from the mill area following heavy precipitation prior to sample collection in the 3 months with elevated U concentrations.

The long-term trend for the annual average Ra^{226} 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.

4.3.2 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.

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 4.3**). Water quality at this station is typical of background water quality in the region. Since 1986, sampling has been conducted on an annual basis.

A historical summary of Ra^{226}, U, TDS, and Se concentrations at AN-3 are presented in **Figures 4.3.2-1** to **4.3.2-4**. The annual averages from 2015 to 2019 are presented in **Table 4.3.2-1**.

As expected with a reference location, the long-term trend for concentrations of U, Ra^{226}, 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 1998.

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 Tailings Management Area (TMA; **Figure 4.3**). All four scheduled samples were collected in 2019.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at TL-3 along with the predicted recovery, are presented in **Figures 4.3.2-5** to **4.3.2-10**. The annual averages from 2015 to 2019 are presented in **Table 4.3.2-2**.

Overall, the long-term trend for the mean concentration of U has shown a decrease since 1991. The most recent five annual averages measured from 2015 to 2019 have also been below the lower bound for the modelled predictions.

Ra^{226} has, as expected, shown a long-term increasing trend as solid phase Ra^{226} levels in the sediments are depleted. This trend is expected to decline gradually starting in approximately 2025 as Ra^{226} release from the sediments becomes controlled by surface sorption (K_{D_SED}) dependent processes as opposed to those that are solubility controlled (*SENES 2012*). The 2019 annual Ra^{226} concentration (1.35 Bq/L) is within the bounds of the modelled predictions and has decreased from the 2018 average concentration of 1.43 Bq/L.

In the long-term Se has been slowly decreasing in concentration since decommissioning. In 2019, the Se concentration measured 0.0024 mg/L, which is below the lower bounds of the modelled predictions at TL-3.

Total dissolved solids concentrations have also slowly decreased 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 4.3**). All four scheduled samples were collected in 2019.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at TL-4 along with the predicted recovery, are presented in **Figures 4.3.2-11** to **4.3.2-16**. The annual averages from 2015 to 2019 are presented in **Table 4.3.2-3**.

Annual concentrations of U and TDS at TL-4 have decreased over the long-term. In 2019, the decreasing trend continued with the lowest annual average U concentrations at

TL-4 reported to date at 187.0 µg/L. The most recent seven years have had annual average concentrations below the lower bound of the modelled predictions.

Similar to TL-3, Ra^{226} has shown a long-term increasing trend as solid phase Ra^{226} levels in the sediments are depleted. This trend is expected to decline gradually starting in approximately 2075 as Ra^{226} release from the sediments becomes controlled by surface sorption (K_{D_SED}) dependent processes as opposed to those that are solubility controlled (*SENES 2012*). Ra^{226} concentrations at TL-4 have been within the model predicted range for the last 4 years.

Selenium has shown a slow and steady reduction over time with a 2019 annual average concentration of 0.0012 mg/L being reported, which was below the lower bound of the modelled prediction.

TL-6 Minewater Reservoir

Station TL-6 is located at the discharge of Minewater Reservoir (**Figure 4.3**), 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 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 four scheduled samples, two were collected; however, unscheduled sample were collected in June and August for a total of three sample collections in 2019. Samples were not collected in April or May due to no water being available.

The analysis performed as part of the 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, model predictions were not generated for TL-6. Contributions from this station are incorporated in the model predictions at the downstream station (TL-7).

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at TL-6 is presented in **Figures 4.3.2-17** to **4.3.2-20**. The annual averages from 2015 to 2019 are presented in **Table 4.3.2-4**.

Since decommissioning, U concentrations have been experiencing a decreasing trend at station TL-6 with a more consistent trend over the short-term. Annual average concentrations have ranged between 123.3 µg/L and 288.5 µg/L over the last five years with the lowest concentration being recorded in 2019.

The annual average Ra^{226} concentration has shown considerable fluctuation with an increasing trend being observed since decommissioning as solid phase Ra^{226} levels in the sediments are depleted. This trend is expected to decline gradually starting in approximately 2075, based on TL-7 Meadow Fen contributions, as Ra^{226} release from the sediments becomes controlled by surface sorption (K_{D_SED}) dependent processes as opposed to those that are solubility controlled (*SENES 2012*).

The annual average Ra^{226} concentration at station TL-6 has decreased from 7.0 Bq/L in 2018 to 5.06 Bq/L in 2019.

Monitoring of Se at TL-6 was initiated in 1996, with highly variable concentrations being observed until 2004. The 2019 annual average of 0.0021 mg/L is within range of values previously 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 4.3**) in the TMA. Of the 12 scheduled samples for the 2019 reporting period, 6 samples were collected due to ice cover or a lack of flowing water during winter months, which prevented sample collection.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at TL-7 along with the predicted recovery, are presented in **Figures 4.3.2-21** to **4.3.2-26**. The annual averages from 2015 to 2019 are presented in **Table 4.3.2-5**.

Since decommissioning, U and TDS have been experiencing a downward trend in their long-term concentrations. The annual average U concentration at TL-7 has been below the lower bound of the modelled predictions since they were developed in 2013.

The annual average Ra^{226} concentrations have decreased since 2017 when station TL-7 experienced an elevated annual average due to a single anomalous reading. In 2019 measurements have been within the predicted bounds. Ra^{226} has shown a long-term increasing trend as solid phase Ra^{226} levels in the sediments are depleted. As predicted in the QSM this trend is expected to decline gradually starting in approximately 2075 as Ra^{226} release from the sediments becomes controlled by surface sorption (K_{D_SED}) dependent processes as opposed to those that are solubility controlled (*SENES 2012*).

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 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 4.3)**. 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 2019, 6 of 12 scheduled samples were collected. Samples were not collected due to unsafe ice conditions or frozen conditions, resulting in no flowing water.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at TL-9 along with the predicted recovery, are presented in **Figures 4.3.2-27** to **4.3.2-32**. Average concentrations at TL-9 from 2015 to 2019 can be found in **Table 4.3.2-6**.

The long-term and short-term trends for U at TL-9 have shown a decrease in annual average concentrations following decommissioning. Compared to the modelled predictions, U concentrations since 2013 have been below the predicted range.

Since 1990, Ra^{226}has been experiencing an expected upward trend in concentrations despite occasional fluctuations over the past twenty years due to the depletion of solid phase Ra^{226} levels in the sediments. As predicted in the QSM, this trend is expected to decline gradually starting in approximately 2025 as Ra^{226} release from the sediments becomes controlled by surface sorption (K_{D_SED}) dependent processes as opposed to those that are solubility controlled (*SENES 2012*). Since 2013, concentrations have been within the modelled predictions. This trend will continue to be monitored.

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 2019, the average concentration was below the modelled predictions with a concentration of 0.0023 mg/L.

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

4.3.3 Downstream Monitoring Stations

While Beaverlodge Lake is the receiving environment for water from the decommissioned Beaverlodge properties, it is also the receiving environment for contaminants discharged from at least nine other non-Eldorado abandoned uranium mine sites and one former uranium mill tailings area (Lorado Uranium Mining Ltd. mill site) within the Beaverlodge Lake watershed.

BL-3 Fulton Bay

Station BL-3 is located in Fulton Bay of Beaverlodge Lake, approximately 100 metres from the Fulton Creek discharge (**Figure 4.3**). 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. Sampling frequency increased from semi-annual to quarterly in 2004 in order to better assess the conditions in Beaverlodge Lake. During the 2019 reporting period, all four scheduled samples were collected.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at BL-3 are presented in **Figures 4.3.3-1** to **4.3.3-4**. The annual averages from 2015 to 2019 are presented in **Table 4.3.3-1**.

Annual concentrations of U and Se at BL-3 have generally been trending downward from decommissioning to 2016, when concentrations began to stabilize. The 2019 annual average U and Se concentrations were recorded as132.25 µg/L and 0.0023 mg/L, respectively. Annual average Se concentration have remained constant at 0.0023 mg/L for the past four years.

Ra^{226} 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 4.3**). Samples collected at this station are a 3-depth composite. The sampling frequency at BL-4 was increased from semi-annual to quarterly in 2004 in order to better reflect any potential changes or seasonal trends. Following approval of the revised water sampling program, semi-annual sampling was resumed in 2011 at BL-4. Both samples were collected in 2019.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at BL-4 are presented in **Figures 4.3.3-5** to **4.3.3-8**. The annual averages from 2015 to 2019 are presented in **Table 4.3.3-2**.

The long-term trend for U at BL-4 has shown an overall decreasing trend since decommissioning. The 2019 annual average concentration of U at BL-4 was the same as in 2018 with a concentration of 126 µg/L. The concentration reported in 2019 continues to represent the lowest concentration of U observed at this station to date.

The 2019 annual average Ra^{226} concentration was 0.025 Bq/L and 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 over the short-term. In 2019, the average Se concentration was 0.0023 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 4.3**). This sampling station was implemented in the revised water sampling program in January 2011 in order to provide a point of reference to compare Beaverlodge Lake water quality and downstream Martin Lake water quality. Three of the four scheduled samples for 2019 were collected. No water was available for collection during December due to frozen conditions.

A historical summary of annual average Ra^{226}, U, TDS, and Se concentrations at BL-5, along with the predicted recovery, are presented in **Figures 4.3.3-9** to **4.3.3-12**. The annual averages from 2015 to 2019 are presented in **Table 4.3.3-3**.

The 2019 annual average concentrations for U and Se were measured at 103.6 µg/L and 0.0019 mg/L, respectively. U is within the bounds of the modelled predictions, while Se is below the lower bound (0.0021 mg/L).

$Radium^{226}$ was measured at 0.03 Bq/L in 2019, which is below the corresponding SEQG value of 0.11 Bq/L, as well as below the lower bound of the modelled predictions.

Total dissolved solids concentrations at station BL-5 have remained relatively stable since 2011. The 2019 average annual concentration is 125.67 mg/L, the lowest since measurements began in 2011.

ML-1 Martin Lake

Station ML-1 is located at the outlet of Martin Lake (**Figure 4.3**) and was implemented in the revised water sampling program in January 2011 to measure water quality downstream of Beaverlodge Lake. All four samples scheduled were collected at ML-1 in 2019.

A table comparing the average concentrations for all measured parameters from 2015 to 2019 is presented in **Table 4.3.3-4**. The data is also presented graphically in **Figures 4.3.3-13** to **4.3.3-16**.

Since monitoring started at ML-1, the U concentrations have ranged from 47.5 µg/L (2016) to 69.3 µg/L (2011). The 2019 average is within the range of values previously observed at this station at 55.7 µg/L.

The 2019 annual average Ra^{226} concentration of 0.007 Bq/L was below the SEQG.

The observed Se concentrations have shown a relatively stable trend since 2012, with the 2019 annual average (0.0009 mg/L) below the SEQG concentration of 0.001 mg/L.

The average TDS concentrations have remained relatively stable since sampling started and was 127.0 mg/L for the 2019 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 4.3**). Its purpose is to monitor water quality downstream of Uranium City. This station was implemented as part of the water sampling program in January 2011, with the first scheduled sample collected in September 2011. There was one sample collected at CS-1 in 2019, as scheduled.

A table comparing the annual concentrations for all measured parameters from 2015 to 2019 is presented in **Table 4.3.3-5**. The same information is presented graphically in **Figures 4.3.3-17** to **4.3.3-20**.

The U concentration at CS-1 was 56 µg/L in 2019, a decrease from 2018 levels and is similar to previously measured values over the past five years (**Table 4.3.3-5**). Both the Se and Ra^{226} concentrations were below their respective SEQG values; Se with a value of 0.0009 mg/L and Ra^{226}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 4.3.3-5**).

CS-2 Crackingstone Bay

Station CS-2 is located in Crackingstone Bay on Lake Athabasca (**Figure 4.3**), approximately 1 km from the mouth of the Crackingstone River. As with station CS-1, station CS-2 was implemented in 2011. There was one sample collected at CS-2 in 2019, as scheduled.

The measured parameter concentrations are presented in **Table 4.3.3-6**, while a graphical presentation of U, Se, Ra^{226}, and TDS trends can be found in **Figures 4.3.3-21** to **4.3.3-24**.

The U concentration at station CS-2 in 2019 was 1.4µg/L, which is below SEQG value and is consistent with results typically observed at this station. As mentioned in the 2016 annual report, the U concentration reported in 2016 is likely due to sample collection error and is not representative of the water quality at the sample location.

$Radium^{226}$, Se and TDS concentrations have remain remained relatively consistent since 2012. In 2019, Ra^{226} and Se annual average concentrations (0.007 Bq/L and <0.0001 mg/L, respectively) were below their respective SEQG. The Se concentration was measured below the detection limit of 0.0001 mg/L and the TDS annual average concentration was measured at 34.0 mg/L in 2019.

4.4 Additional Water Quality Sampling

4.4.1 ZOR-01 and ZOR-02

Cameco prepared the Beaverlodge Path Forward Report (*Cameco 2012*), which 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 4.4**).

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. Water samples are collected only during open water conditions and where flow is sufficient for sample collection.

In 2019, samples were collected at both stations from April to October and then again in December. In the remaining months, 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 4.4-1** and **Table 4.4-2**, respectively. A graphical representation of the data is presented in **Figures 4.4-1** to **4.4-8**.

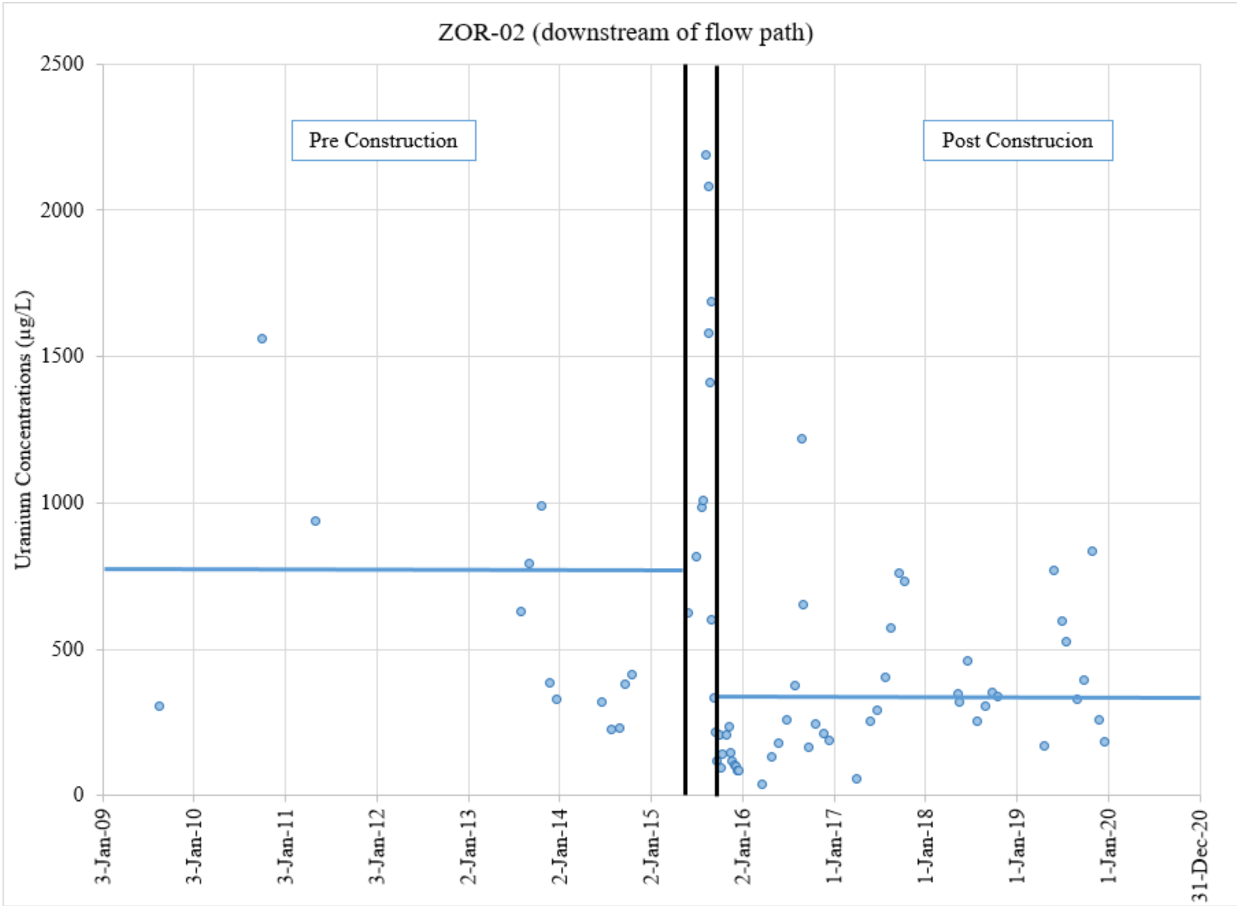
Sampling completed at ZOR-02 prior to 2015 represents water quality as it flowed through the Bolger waste rock pile prior to entering Verna Lake. Sampling completed during 2015 at this station represents construction activities during relocation of the waste rock, and samples from 2016 on represent water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

From the beginning of sampling in 2013 to date, Ra^{226}, 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 Ra^{226} concentrations are above the SEQG and have been variable since sampling began at ZOR-02.

In 2019, the U and TDS concentrations at ZOR-02 peaked in October at 834 µg/L and 295.0 mg/L, respectively. Concentrations of U exiting the re-established flow path continue to show fluctuating concentrations; however, the U deviation in October was likely due to heavy precipitation prior to sampling, flushing uranium particles from the disturbed waste rock pile. The higher than normal TDS concentration was also likely due to the heavy precipitation in October. **Figure 4.4-9** 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 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 been steadily decreasing since.

Figure 4.4-9 - ZOR-02 Uranium Concentrations Pre and Post Construction



A summary of annual mean U and Ra^{226} data from 2010 to 2019 at the three stations is presented in **Table 4.4-3**. As AC-6A flows into Ace Lake, data from the outlet of Ace Lake (AC-8) is presented for reference. Of note, the water quality measured in Ace Lake has remained below the provincial water quality guideline values since 2012.

4.4.2 Sealed Boreholes and Seeps

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 2019, areas associated with formerly flowing (now sealed) boreholes were inspected and it was confirmed that boreholes have remained sealed and no new flows have been identified (*CNSC 2019b*).

Surface water seeps were identified at the base of the waste rock pile along Ace Creek, and are associated with the main decommissioned facilities. Seeps 1, 2, and 3 are located at the point at which they emerge from the waste rock pile. The source of Seeps 4 and 5 are undetermined as they exit the waste rock pile and are therefore sampled where they enter Ace Creek. Although not part of the licensed sampling program, water quality samples have collected opportunistically during the spring and fall hydrology monitoring program from these locations. As discussed in the EPR (*CanNorth 2018*), most parameter concentrations have remained relatively consistent since 2004 and potential risk of exposure is negligible.

On May 12, 2019, water samples were collected at Seep 4 and Seep 5. Uranium concentrations at Seep 4 and Seep 5 were within the historical sample results, while Ra^{226} and Se concentrations were below historical sample results.

4.5 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 May, June, and July.

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 and December to Saskatchewan Research Council (SRC) and Bureau Veritas Laboratories (previously Maxxam 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 TL-7 trip and laboratory blank samples were prepared, collected, and analyzed in August 2019. When results from TL-7 TB (trip blank) and TL-7 FB (field blank) were compared, all results were found to be within acceptable range of variation.

Blind Replicate Samples (Split samples)

Blind replicate samples were collected in May 2019 at stations AC-14 (Blind-1) and DB-6 (Blind-2). When results from Blind-1 and Blind-2 were compared with sample results for AC-14 and DB-6, respectively, all results were found to be within acceptable range of variation.

Blind replicate samples were collected in June 2019 at stations TL-9 (Blind-4) and TL-7 (Blind-6). The Blind-4 and TL-9 QA/QC analysis for Fe and Pb had an absolute difference greater than 50%, a value greater than five times the detection limit and were outside their associated range of entered uncertainty, prompting further investigation. The samples were reanalyzed by SRC using different laboratory instruments, which ruled out any issues with a specific instrument. The original results were confirmed and spikes were verified to be within acceptable limits. Routine July blind samples were collected at AC-6A (Blind-3), while TL-6 (Blind-5) was scheduled for July, the sample was not collected due to dry conditions. All AC-6A (Blind-3) results were found to be within an acceptable range of variation.

Duplicate Samples (Side by side samples)

Duplicate samples at station TL-7 and TL-9 were collected in June; however, scheduled samples were not collected in December due to dry/frozen conditions. December duplicate sampling has been rescheduled to the 2020 sampling year. All duplicate results from June were found to be within acceptable range of variation between the Bureau Veritas and SRC results. Laboratory QA/QC reports are presented in **Appendix E**.

4.6 Hydrology

4.6.1 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 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.

4.6.2 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, 2019 to December 31, 2019. The report can be found in **Appendix F**.

From January to May 2019, the lowest mean monthly flow rates at AC-8 were recorded since monitoring began in 1980, while June to December mean monthly flow rates remained within the historic five year range. These results reflect below normal precipitation levels in the 2018/2019 winter months, which continued until June 2019. Heavy rainfall in June resulted in the highest average flow rate of the year, recorded at 0.678 m^3/s. The average annual flow rate at AC-8 for 2019 was 0.241 m^3/s.

Flow rates at TL-7 from May to June and September to December were higher than the 2019 average annual flow (0.0085 m^3/s) with the highest recorded mean monthly flow rate recorded in November (0.0160 m^3/s). In comparison, flow rates at TL-7 from January to April, July and August were below the 2019 average annual flow (0.0085 m^3/s) with the lowest recorded mean monthly flow rates recorded in February and March (both reported at 0.0031 m^3/s).

Climate records for Uranium City indicate that 2019 tended to be drier than normal with periodic above normal precipitation events, primarily occurring in summer months. The 2019 flow records generally reflected these climatic conditions.

4.7 Air Quality

This section presents a summary of the results of historic and on-going radon monitoring at 10 separate locations in and around the mill site, various satellite areas and at Uranium City (**Figure 4.7.1-1**).

4.7.1 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.

Monitors are collected and replaced semi-annually from ten stations established throughout the area, illustrated in **Figure 4.7.1-1** and listed below:

Beacon Hill
Eldorado Town Site
End of Airstrip
Ace Creek
Fay Waste Rock Pile
Fookes Delta
Marie Delta
Donaldson Lake
Fredette Lake
Uranium City

Table 4.7.1 presents a summary of the radon monitoring conducted at the 10 sites for the 2019 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 4.7.1-2** 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 2020.

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 structures, where required

Additional water samples will be collected monthly when water is flowing at the sample locations ZOR-01 and ZOR-02. These sampling locations have been established to create a baseline and 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**.

On July 26, 2019, Cameco requested optimization of the Beaverlodge EMP to reflect an understanding of current conditions in the area and facilitate the transition into the IC Program monitoring phase (*M. Webster to G. Bihun/R. Snider*). Final approval of the revised Beaverlodge EMP was received from SMOE and the CNSC on January 7, 2020 and January 14, 2020, respectively.

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 in January 2020.

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 in Uranium City, typically with the CNSC and SMOE 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.

With renewal of the NSEQC Ministerial Order at the end of 2017, Cameco resumed its updates on the Beaverlodge activities to the representatives at least annually. These updates occur as part of a larger presentation related to all Cameco activities during the NSEQC general meetings or specific to Beaverlodge. In 2020, Cameco plans to host Athabasca representatives of the NSEQC in Uranium City during a public meeting with local residents in Q2 pending the approval of the Ministerial Order. In addition, Cameco plans to invite members of the AJES as defined under the Yá thi Néné collaboration agreement. The public meeting is typically followed by a tour of the properties, focusing on changes that have occurred since the previous tour and properties proposed for transfer to the IC program.

In addition to the public meeting, Cameco will provide an overview of the IC Program and activities occurring at Beaverlodge during at least one AJES meeting in 2020 as well as increase 'boots on the ground' tours. Invitations for these tours are expected to be extended to interested First Nations and Metis groups 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.

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.

5.4 2020 Work Plan

Ultimately, the Beaverlodge properties are being managed for acceptance into the provincial IC Program, and future works undertaken will support the Beaverlodge Management Framework established to move properties towards this goal.

Cameco has prepared a work-plan and schedule based on the Path Forward, which was presented to the Commission during the 2013 relicensing process. The Path Forward describes the site activities required to address residual human health and ecological risk while demonstrating conditions on the properties are stable and/or improving. The Path Forward has been vetted through the JRG and reviewed with local and regional stakeholders.

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 not anticipated that any additional gamma scanning will be required in 2020.

5.4.2 Historic Mine Openings Rehabiliation

Assessment

In 2020, Cameco will be investigating the remaining openings (raises and mill feed portals) in order to develop plans and complete designs for the final remediation of each. The investigation will include an assessment of stainless steel covers and potential backfill options for some openings where backfill may be feasible.

Rehabilitation

Engineer designed drawings for stainless steel covers for the Fay Shaft and an adjacent dump raise were submitted to SMOE and the Saskatchewan Ministry of Labour Relations and Workplace Safety for review and approval on December 6, 2019. Approval to Construct, Alter, or Extend Pollutant Control Facilities, Approval No. PC20-009 and PD20-015 on January 10, 2020 and January 16, 2020, respectively, while approval for Abandoning Workings, Regulations 20-3 (2)(b) of *The Mine Regulations, 2018* was granted on January 15, 2020. The covers are currently being fabricated and are planned to be installed in 2020.

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.

5.4.4 Re-establishment of the Zora Creek flow path

Final construction of the Zora Creek flow path was completed in 2016, at which time a geotechnical inspection was completed. A geotechnical inspection was also completed by SRK Consulting in 2017 and again in 2018, to ensure the constructed channel was performing as expected. There were no immediate or significant areas of concern with regards to the geotechnical performance and/or stability of the reconstructed flow path identified. Based on the results of the geotechnical assessments completed in 2017 and 2018, SRK recommended the next inspection be completed in five years. Water quality sampling will continue as outlined in **Section 5.1** and monitoring data will be used to determine whether the water quality downstream of the Zora Creek flow path is recovering as expected as a result of the re-establishment of the flow path.

5.4.5 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 Fay Pit.

5.4.6 Work in Addition to the Path Forward Activities

Ace Creek Watershed Hydrologic Monitoring

The Ace Creek watershed hydrologic monitoring program is in addition to the routine hydrologic monitoring that occurs at AC-8 and TL-7. This program will continue to monitor the flows originating from the various sub-watersheds feeding Ace Creek.

The information from this program is used to support the pathways model predictions for the Ace Creek area.

Inspection of the Former Mill Area for Settling

Prior to transfer into the IC Program, it is anticipated that the former mill area will be inspected to ensure long-term safety in regards to settling of waste rock since the site was decommissioned.

IC Program Documentation Preparation

Preparation of closure documents for additional properties that meet performance objectives will occur in 2020 in anticipation of 2021 IC Program transfer.

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 4.3.1-1 AN-5 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	132.2	92.0	109.4	103.4	125.2	6	0	38.4	90.0	190.0
	Ca (mg/l)	38.8	28.0	32.2	30.8	37.2	6	0	10.4	28.0	55.0
	Cl (mg/l)	1.3	0.6	0.7	0.8	1.0	6	0	0.6	0.2	2.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	6	6	0.0	1.0	1.0
	Cond-L (µS/cm)	284	202	226	204	255	6	0	68	189	371
	Hardness (mg/l)	136	96	111	107	130	6	0	38	96	195
	HCO3 (mg/l)	161.0	112.2	133.6	126.0	152.7	6	0	46.9	110.0	232.0
	K (mg/l)	1.3	1.1	1.1	1.3	1.6	6	0	0.6	1.0	2.7
	Na (mg/l)	4.8	3.0	3.7	3.7	4.6	6	0	1.7	3.2	7.7
	OH (mg/l)	1.0000	<1.0000	<1.0000	<1.0000	<1.0000	6	6	0.0000	1.0000	1.0000
	SO4 (mg/l)	18.3	14.4	12.5	13.6	15.5	6	0	2.9	12.0	19.0
	Sum of Ions (mg/l)	235	166	192	184	222	6	0	65	161	332
Metal	As (µg/l)	0.4	0.3	0.4	0.3	0.3	6	0	0.1	0.2	0.4
	Ba (mg/l)	0.1493	0.1112	0.1360	0.1236	0.1500	6	0	0.0443	0.1100	0.2300
	Cu (mg/l)	0.0006	0.0012	0.0004	0.0007	0.0009	6	0	0.0006	0.0003	0.0019
	Fe (mg/l)	0.327	0.209	0.322	0.208	0.361	6	0	0.347	0.074	1.000
	Mo (mg/l)	0.0030	0.0027	0.0028	0.0032	0.0027	6	0	0.0011	0.0017	0.0047
	Ni (mg/l)	0.0005	0.0007	0.0006	0.0005	0.0005	6	0	0.0001	0.0004	0.0006
	Pb (mg/l)	0.0003	0.0002	0.0002	0.0001	0.0002	6	4	0.0001	0.0001	0.0003
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0002	6	4	0.0001	0.0001	0.0003
	U (µg/l)	174.7	130.4	168.4	163.2	169.5	6	0	89.9	56.0	290.0
	Zn (mg/l)	0.0013	0.0009	0.0006	0.0007	0.0019	6	0	0.0014	0.0006	0.0035
Nutrient	C-(org) (mg/l)	11.0	11.0	8.5	8.2	10.6	2	0	3.5	8.1	13.0
	NH3-N (mg/l)	0.21	0.05	0.05	0.04	0.31	2	0	0.25	0.13	0.49
	NO3 (mg/l)	0.05	0.11	0.09	0.09	0.09	6	2	0.06	0.04	0.20
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	0.02	2	1	0.01	0.01	0.02
Phys Para	pH-L (pH Unit)	7.6	7.6	7.7	7.8	7.6	6	0	0.3	7.3	8.0
	TDS (mg/l)	184.67	133.80	150.80	148.00	173.40	5	0	67.47	122.00	288.00
	Temp-H20 (°C)	6.1	9.2	9.3	7.2	10.7	6	0	7.9	3.1	24.0
	TSS (mg/l)	2.0	1.4	1.0	1.0	1.0	6	5	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.09	0.03	0.05	0.22	0.10	2	0	0.03	0.08	0.12
	Po210 (Bq/L)	0.070	0.020	0.010	0.008	0.040	2	0	0.028	0.020	0.060
	Ra226 (Bq/L)	1.070	0.686	0.798	0.646	0.900	6	0	0.455	0.480	1.700

Table 4.3.1-2 DB-6 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	89.8	90.0	87.8	85.5	91.7	6	0	8.5	81.0	102.0
	Ca (mg/l)	34.8	34.5	32.5	34.0	36.0	6	0	3.2	32.0	40.0
	Cl (mg/l)	0.7	0.6	0.6	0.6	0.7	6	0	0.1	0.4	0.8
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	6	6	0.0	1.0	1.0
	Cond-L (µS/cm)	226	222	207	204	217	6	0	23	190	250
	Hardness (mg/l)	108	107	101	106	112	6	0	10	100	125
	HCO3 (mg/l)	109.5	109.7	107.0	104.3	111.8	6	0	10.3	99.0	124.0
	K (mg/l)	0.6	0.8	0.7	0.9	0.9	6	0	0.1	0.8	1.0
	Na (mg/l)	2.0	2.0	1.9	2.0	2.1	6	0	0.2	1.9	2.4
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	6	6	0.0000	1.0000	1.0000
	SO4 (mg/l)	24.0	22.8	22.3	21.0	21.5	6	0	2.6	19.0	25.0
	Sum of Ions (mg/l)	177	176	170	168	179	6	0	16	159	200
Metal	As (µg/l)	0.1	0.1	0.1	0.1	0.1	6	0	0.0	0.1	0.1
	Ba (mg/l)	0.0473	0.0450	0.0420	0.0438	0.0445	6	0	0.0048	0.0390	0.0510
	Cu (mg/l)	0.0005	0.0008	0.0005	0.0007	0.0007	6	0	0.0001	0.0006	0.0007
	Fe (mg/l)	0.014	0.018	0.013	0.047	0.028	6	0	0.009	0.018	0.040
	Mo (mg/l)	0.0021	0.0020	0.0021	0.0021	0.0021	6	0	0.0001	0.0018	0.0022
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	6	0	0.0000	0.0002	0.0002
	Pb (mg/l)	<0.0001	0.0001	<0.0001	<0.0001	0.0001	6	5	0.0000	0.0001	0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	6	2	0.0000	0.0001	0.0001
	U (µg/l)	192.8	159.0	153.8	193.5	177.5	6	0	26.7	138.0	206.0
	Zn (mg/l)	0.0006	0.0009	0.0005	0.0005	0.0010	6	2	0.0006	0.0005	0.0018
Nutrient	C-(org) (mg/l)	8.8	8.7	8.2	8.6	8.9	2	0	1.3	7.9	9.8
	NH3-N (mg/l)	0.04	0.05	0.05	0.05	0.05	2	0	0.04	0.02	0.08
	NO3 (mg/l)	0.21	0.19	0.07	0.07	0.14	6	2	0.11	0.04	0.30
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	0.01	2	1	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	7.8	7.8	7.9	7.9	7.9	6	0	0.2	7.6	8.0
	TDS (mg/l)	154.50	146.50	144.25	146.50	157.40	5	0	26.84	137.00	200.00
	Temp-H20 (°C)	10.5	8.4	13.1	8.6	10.2	6	0	6.8	3.3	21.8
	TSS (mg/l)	1.0	1.0	1.3	<1.0	1.2	6	5	0.4	1.0	2.0
Rads	Pb210 (Bq/L)	<0.02	0.08	0.26	0.24	0.09	2	1	0.02	0.07	0.10
	Po210 (Bq/L)	0.008	0.006	0.008	<0.005	<0.005	2	2	0.000	0.005	0.005
	Ra226 (Bq/L)	0.038	0.040	0.033	0.040	0.032	6	0	0.008	0.020	0.040

Table 4.3.1-3 AC-6A Summary Statistics and Comparison to Historical Results Previous Period

		Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	105.2	107.7	103.2	95.0	95.5	2	0	0.7	95.0	96.0
	Ca (mg/l)	44.7	44.4	41.2	40.0	42.0	2	0	0.0	42.0	42.0
	Cl (mg/l)	0.8	0.7	0.6	0.5	0.5	2	0	0.1	0.4	0.6
	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	302	287	264	272	2	0	4	269	274
	Hardness (mg/l)	151	151	140	137	142	2	0	0	142	142
	HCO3 (mg/l)	128.3	131.4	126.0	115.8	116.5	2	0	0.7	116.0	117.0
	K (mg/l)	0.9	1.0	0.8	0.9	0.9	2	0	0.0	0.9	0.9
	Na (mg/l)	2.5	2.5	2.3	2.3	2.4	2	0	0.0	2.4	2.4
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	52.9	50.5	46.2	47.0	47.0	2	0	1.4	46.0	48.0
	Sum of Ions (mg/l)	240	239	226	215	219	2	0	2	217	220
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)	0.0212	0.0234	0.0227	0.0205	0.0210	2	0	0.0014	0.0200	0.0220
	Cu (mg/l)	0.0003	0.0003	0.0009	0.0005	0.0005	2	0	0.0001	0.0004	0.0005
	Fe (mg/l)	0.011	0.009	0.012	0.012	0.014	2	0	0.001	0.013	0.014
	Mo (mg/l)	0.0010	0.0011	0.0012	0.0010	0.0011	2	0	0.0000	0.0011	0.0011
	Ni (mg/l)	0.0001	0.0001	0.0001	0.0001	<0.0001	2	2	0.0000	0.0001	0.0001
	Pb (mg/l)	<0.0001	<0.0001	0.0002	<0.0001	0.0002	2	1	0.0001	0.0001	0.0003
	Se (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	2	0	0.0001	0.0001	0.0002
	U (µg/l)	389.3	331.0	279.3	278.5	271.5	2	0	6.4	267.0	276.0
	Zn (mg/l)	0.0005	0.0005	0.0012	<0.0005	0.0014	2	1	0.0012	0.0005	0.0022
Nutrient	C-(org) (mg/l)	7.3	7.1					0			
	NH3-N (mg/l)	0.04	0.04					0			
	NO3 (mg/l)	0.05	0.06	0.13	0.04	0.05	2	1	0.01	0.04	0.06
	P-(TP) (mg/l)	<0.01	<0.01					0			
Phys Para	pH-L (pH Unit)	7.8	7.9	7.9	8.0	8.0	2	0	0.1	7.9	8.0
	TDS (mg/l)	198.61	195.80	181.67	197.00	228.00	2	0	24.04	211.00	245.00
	Temp-H20 (°C)	6.6	9.3	12.8	14.4	22.7	2	0	0.2	22.5	22.8
	TSS (mg/l)	1.0	1.0	1.7	1.3	1.5	2	1	0.7	1.0	2.0
Rads	Pb210 (Bq/L)	<0.03	0.02					0			
	Po210 (Bq/L)	0.005	<0.005					0			
	Ra226 (Bq/L)	0.109	0.108	0.115	0.100	0.090	2	0	0.014	0.080	0.100

Table 4.3.1-4 AC-8 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	53.0	52.0	54.5	52.0	51.5	2	0	3.5	49.0	54.0
	Ca (mg/l)	17.0	17.0	16.5	17.0	17.0	2	0	1.4	16.0	18.0
	Cl (mg/l)	1.0	0.8	0.9	0.9	1.1	2	0	0.1	1.0	1.2
	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)	121	122	117	112	112	2	0	14	102	122
	Hardness (mg/l)	55	56	55	56	56	2	0	5	52	59
	HCO3 (mg/l)	64.5	63.5	66.5	63.0	63.0	2	0	4.2	60.0	66.0
	K (mg/l)	0.6	0.6	0.8	0.8	0.9	2	0	0.1	0.8	0.9
	Na (mg/l)	1.5	1.5	1.5	1.6	1.6	2	0	0.2	1.4	1.7
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	7.0	7.4	6.9	6.6	6.3	2	0	0.4	6.0	6.6
	Sum of Ions (mg/l)	94	95	96	93	94	2	0	6	89	98
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.1	2	0	0.0	0.1	0.1
	Ba (mg/l)	0.0235	0.0230	0.0220	0.0230	0.0240	2	0	0.0014	0.0230	0.0250
	Cu (mg/l)	0.0008	0.0003	0.0003	0.0005	0.0006	2	0	0.0001	0.0005	0.0006
	Fe (mg/l)	0.041	0.040	0.026	0.032	0.016	2	0	0.002	0.014	0.017
	Mo (mg/l)	0.0010	0.0011	0.0011	0.0010	0.0010	2	0	0.0000	0.0010	0.0010
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	2	0	0.0000	0.0002	0.0002
	Pb (mg/l)	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	2	2	0.0000	0.0001	0.0001
	Se (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	2	2	0.0000	0.0001	0.0001
	U (µg/l)	13.5	14.5	12.5	12.5	12.5	2	0	2.1	11.0	14.0
	Zn (mg/l)	0.0032	<0.0005	<0.0005	<0.0005	0.0006	2	1	0.0001	0.0005	0.0007
Nutrient	C-(org) (mg/l)	7.0	7.4	6.9	7.0	6.2	1	0		6.2	6.2
	NH3-N (mg/l)	0.06	0.08	0.08	0.08	0.14	1	0		0.14	0.14
	NO3 (mg/l)	<0.04	0.05	0.21	0.20	0.09	2	1	0.06	0.04	0.13
	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)	7.5	7.6	7.5	7.7	7.6	2	0	0.3	7.4	7.8
	TDS (mg/l)	80.50	85.50	85.50	86.50	85.00	2	0	41.01	56.00	114.00
	Temp-H20 (°C)	0.9	7.2	7.9	4.0	7.5	2	0	3.3	5.1	9.8
	TSS (mg/l)	2.0	<1.0	1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	0.03	<0.02	<0.02	1	1		0.02	0.02
	Po210 (Bq/L)	0.006	0.006	0.005	0.006	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.030	0.015	0.025	0.020	0.025	2	0	0.007	0.020	0.030

Table 4.3.1-5 AC-14 Summary Statistics and Comparison to Historical Results **Previous Period**

		Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	53.6	53.3	52.6	51.8	52.7	11	0	3.6	47.0	59.0
	Ca (mg/l)	17.5	17.4	17.3	17.4	17.5	11	0	1.1	16.0	20.0
	Cl (mg/l)	1.3	1.0	1.2	1.5	1.3	11	0	0.3	0.9	1.8
	CO3 (mg/l)	<1.0	<1.0	1.1	<1.0	<1.0	11	11	0.0	1.0	1.0
	Cond-L (µS/cm)	126	124	123	121	119	11	0	9	105	135
	Hardness (mg/l)	58	57	57	57	57	11	0	3	52	64
	HCO3 (mg/l)	65.4	64.9	63.6	63.3	64.2	11	0	4.6	57.0	72.0
	K (mg/l)	0.6	0.8	0.7	0.9	0.9	11	0	0.1	0.8	1.0
	Na (mg/l)	1.9	1.8	2.0	2.2	2.0	11	0	0.3	1.7	2.7
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	11	11	0.0000	1.0000	1.0000
	SO4 (mg/l)	8.6	8.9	9.2	9.3	8.6	11	0	1.9	7.0	13.0
	Sum of Ions (mg/l)	99	97	98	98	98	11	0	7	87	107
Metal	As (µg/l)	0.2	0.2	0.2	0.1	0.1	11	0	0.1	0.1	0.2
	Ba (mg/l)	0.0255	0.0239	0.0237	0.0241	0.0246	11	0	0.0020	0.0220	0.0290
	Cu (mg/l)	0.0006	0.0004	0.0004	0.0006	0.0007	11	0	0.0002	0.0005	0.0010
	Fe (mg/l)	0.062	0.058	0.066	0.051	0.046	11	0	0.013	0.034	0.080
	Mo (mg/l)	0.0010	0.0012	0.0011	0.0010	0.0010	11	0	0.0001	0.0008	0.0010
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	11	0	0.0000	0.0001	0.0002
	Pb (mg/l)	0.0004	0.0002	0.0002	0.0003	0.0004	11	0	0.0005	0.0001	0.0015
	Se (mg/l)	0.0002	0.0001	0.0001	0.0002	0.0002	11	0	0.0001	0.0001	0.0005
	U (µg/l)	33.1	28.7	33.5	35.8	34.1	11	0	15.4	18.0	64.0
	Zn (mg/l)	0.0009	0.0007	0.0008	0.0005	0.0011	11	6	0.0009	0.0005	0.0024
Nutrient	C-(org) (mg/l)	7.1	7.5	7.3	7.1	6.7	4	0	0.7	6.1	7.7
	NH3-N (mg/l)	0.07	0.08	0.10	0.12	0.11	4	0	0.04	0.08	0.16
	NO3 (mg/l)	0.24	0.16	0.16	0.13	0.11	11	4	0.08	0.04	0.28
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	4	4	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.6	7.7	7.9	7.8	11	0	0.1	7.6	8.0
	TDS (mg/l)	83.82	90.36	85.00	86.33	83.70	10	0	20.19	51.00	122.00
	Temp-H20 (°C)	1.1	8.8	8.5	7.6	10.3	11	0	6.9	2.0	22.3
	TSS (mg/l)	1.4	1.0	1.1	1.4	1.2	11	8	0.4	1.0	2.0
Rads	Pb210 (Bq/L)	0.02	0.03	0.03	0.02	0.04	4	1	0.03	0.02	0.08
	Po210 (Bq/L)	0.008	0.007	0.007	0.008	0.008	4	1	0.002	0.005	0.010
	Ra226 (Bq/L)	0.075	0.038	0.047	0.050	0.061	11	0	0.025	0.030	0.110

Table 4.3.2-1 AN-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	70.0	66.0	68.0	70.0	73.0	1	0		73.0	73.0
	Ca (mg/l)	20.0	21.0	19.0	21.0	21.0	1	0		21.0	21.0
	Cl (mg/l)	0.6	0.6	0.6	0.6	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)	146	145	136	135	140	1	0		140	140
	Hardness (mg/l)	69	72	66	72	72	1	0		72	72
	HCO3 (mg/l)	85.0	80.0	83.0	85.0	89.0	1	0		89.0	89.0
	K (mg/l)	0.6	0.8	0.8	0.8	0.8	1	0		0.8	0.8
	Na (mg/l)	1.8	1.9	1.8	2.0	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)	4.2	4.4	4.2	4.4	4.2	1	0		4.2	4.2
	Sum of Ions (mg/l)	117	114	114	119	122	1	0		122	122
Metal	As (µg/l)	0.1	0.1	0.1	<0.1	0.1	1	0		0.1	0.1
	Ba (mg/l)	0.0160	0.0180	0.0160	0.0170	0.0170	1	0		0.0170	0.0170
	Cu (mg/l)	<0.0002	0.0005	0.0003	0.0006	0.0005	1	0		0.0005	0.0005
	Fe (mg/l)	0.008	0.010	0.011	0.015	0.006	1	0		0.006	0.006
	Mo (mg/l)	0.0017	0.0019	0.0017	0.0018	0.0018	1	0		0.0018	0.0018
	Ni (mg/l)	0.0002	<0.0001	0.0001	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	1.7	1.8	1.6	1	0		1.6	1.6
	Zn (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	1	0		0.0006	0.0006
Nutrient	C-(org) (mg/l)	7.5	7.6	7.7	7.9	7.2	1	0		7.2	7.2
	NH3-N (mg/l)	0.08	0.06	0.07	0.10	0.11	1	0		0.11	0.11
	NO3 (mg/l)	<0.04	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)	7.9	7.7	7.6	7.9	8.0	1	0		8.0	8.0
	TDS (mg/l)	93.00	92.00	99.00	109.00	84.00	1	0		84.00	84.00
	Temp-H20 (°C)	11.4	12.5	14.2	9.5	10.4	1	0		10.4	10.4
	TSS (mg/l)	2.0	<1.0	1.0	2.0	<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)	0.008	0.007	0.006	<0.005	0.010	1	0		0.010	0.010

Table 4.3.2-2 TL-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	138.0	132.8	126.7	126.0	132.8	4	0	10.5	125.0	148.0
	Ca (mg/l)	29.0	29.0	28.0	28.7	30.3	4	0	3.2	28.0	35.0
	Cl (mg/l)	3.3	2.7	2.4	2.6	2.5	4	0	0.5	2.0	3.0
	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)	329	309	291	287	302	4	0	11	291	317
	Hardness (mg/l)	97	97	93	94	99	4	0	11	93	116
	HCO3 (mg/l)	167.8	162.0	154.3	153.3	161.8	4	0	12.6	152.0	180.0
	K (mg/l)	1.1	1.2	1.1	1.2	1.2	4	0	0.1	1.1	1.4
	Na (mg/l)	33.0	29.3	27.0	29.7	28.8	4	0	2.1	26.0	31.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	32.0	29.8	25.7	27.3	26.3	4	0	2.9	23.0	30.0
	Sum of Ions (mg/l)	272	260	244	248	257	4	0	12	245	274
Metal	As (µg/l)	0.8	0.8	0.7	0.8	0.7	4	0	0.1	0.7	0.8
	Ba (mg/l)	0.0370	0.0370	0.0367	0.0387	0.0408	4	0	0.0030	0.0370	0.0440
	Cu (mg/l)	0.0009	0.0013	0.0009	0.0011	0.0012	4	0	0.0001	0.0011	0.0013
	Fe (mg/l)	0.011	0.016	0.016	0.016	0.015	4	0	0.009	0.007	0.028
	Mo (mg/l)	0.0127	0.0119	0.0109	0.0117	0.0113	4	0	0.0010	0.0100	0.0120
	Ni (mg/l)	0.0003	0.0003	0.0003	0.0003	0.0003	4	0	0.0001	0.0003	0.0004
	Pb (mg/l)	0.0004	0.0006	0.0006	0.0008	0.0007	4	0	0.0005	0.0003	0.0014
	Se (mg/l)	0.0027	0.0023	0.0021	0.0023	0.0024	4	0	0.0002	0.0022	0.0026
	U (µg/l)	271.8	248.0	222.3	243.0	232.8	4	0	17.7	207.0	247.0
	Zn (mg/l)	0.0008	0.0021	0.0008	0.0006	0.0011	4	2	0.0009	0.0005	0.0023
Nutrient	C-(org) (mg/l)	7.3	7.2	7.6	7.5	7.1	1	0		7.1	7.1
	NH3-N (mg/l)	0.06	0.03	0.05	0.06	0.06	1	0		0.06	0.06
	NO3 (mg/l)	<0.04	0.05	0.11	<0.04	0.16	4	3	0.23	0.04	0.50
	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)	8.1	8.0	8.0	8.2	8.2	4	0	0.1	8.0	8.3
	TDS (mg/l)	204.75	198.50	189.67	202.67	189.25	4	0	18.87	171.00	207.00
	Temp-H20 (°C)	8.9	9.6	11.0	10.9	9.3	4	0	8.5	3.0	21.4
	TSS (mg/l)	1.5	1.0	1.7	<1.0	1.3	4	3	0.5	1.0	2.0
Rads	Pb210 (Bq/L)	0.10	0.09	0.46	0.10	0.18	1	0		0.18	0.18
	Po210 (Bq/L)	0.040	0.030	0.050	0.060	0.060	1	0		0.060	0.060
	Ra226 (Bq/L)	1.375	1.170	1.267	1.433	1.350	4	0	0.129	1.200	1.500

Table 4.3.2-3 TL-4 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	135.8	127.5	126.0	121.0	131.3	4	0	14.3	115.0	146.0
	Ca (mg/l)	21.8	23.5	25.0	23.0	24.3	4	0	2.9	22.0	28.0
	Cl (mg/l)	3.1	2.7	2.5	2.5	2.7	4	0	0.2	2.5	3.0
	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)	321	306	303	271	289	4	0	31	258	328
	Hardness (mg/l)	77	82	85	80	84	4	0	10	76	96
	HCO3 (mg/l)	165.8	155.5	154.0	147.7	160.0	4	0	17.6	140.0	178.0
	K (mg/l)	1.2	1.2	1.0	1.3	1.4	4	0	0.1	1.3	1.5
	Na (mg/l)	39.3	34.5	33.5	31.3	32.8	4	0	2.8	30.0	36.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	29.5	29.0	27.5	23.0	22.0	4	0	2.8	20.0	26.0
	Sum of Ions (mg/l)	266	252	250	234	249	4	0	27	221	279
Metal	As (µg/l)	1.5	1.1	1.0	0.9	1.0	4	0	0.1	0.9	1.1
	Ba (mg/l)	0.0805	0.0713	0.0720	0.0760	0.0870	4	0	0.0068	0.0800	0.0950
	Cu (mg/l)	0.0007	0.0006	0.0007	0.0005	0.0004	4	0	0.0001	0.0003	0.0005
	Fe (mg/l)	0.058	0.060	0.069	0.048	0.052	4	0	0.035	0.022	0.093
	Mo (mg/l)	0.0102	0.0101	0.0105	0.0081	0.0083	4	0	0.0011	0.0066	0.0091
	Ni (mg/l)	0.0006	0.0005	0.0005	0.0005	0.0005	4	0	0.0001	0.0004	0.0005
	Pb (mg/l)	0.0003	0.0005	0.0003	0.0002	0.0002	4	0	0.0001	0.0001	0.0003
	Se (mg/l)	0.0017	0.0017	0.0018	0.0013	0.0012	4	0	0.0001	0.0011	0.0014
	U (µg/l)	241.0	235.3	224.5	187.3	187.0	4	0	39.4	131.0	222.0
	Zn (mg/l)	0.0009	<0.0005	0.0006	<0.0005	0.0008	4	2	0.0004	0.0005	0.0014
Nutrient	C-(org) (mg/l)	9.2	8.0		9.0	8.6	1	0		8.6	8.6
	NH3-N (mg/l)	0.08	0.06		0.09	0.09	1	0		0.09	0.09
	NO3 (mg/l)	<0.04	0.05	0.14	0.04	0.05	4	3	0.01	0.04	0.06
	P-(TP) (mg/l)	<0.01	<0.01		<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	8.0	8.1	8.0	8.1	8.1	4	0	0.1	7.9	8.2
	TDS (mg/l)	202.25	197.50	191.50	181.33	195.00	4	0	35.00	161.00	244.00
	Temp-H20 (°C)	8.3	9.3	8.4	10.8	8.6	4	0	7.9	3.0	20.0
	TSS (mg/l)	1.3	1.0	2.5	1.3	<1.0	4	4	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.04	0.03		0.10	0.10	1	0		0.10	0.10
	Po210 (Bq/L)	0.030	0.030		0.020	0.030	1	0		0.030	0.030
	Ra226 (Bq/L)	2.075	1.600	1.650	1.733	1.750	4	0	0.265	1.500	2.100

Table 4.3.2-4 TL-6 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	281.3	260.0	226.3	228.0	300.3	3	0	16.0	285.0	317.0
	Ca (mg/l)	42.7	60.5	47.7	41.0	39.0	3	0	1.0	38.0	40.0
	Cl (mg/l)	47.7	31.5	24.7	31.0	44.7	3	0	5.0	40.0	50.0
	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)	743	728	542	558	741	3	0	30	707	763
	Hardness (mg/l)	156	207	158	144	148	3	0	5	144	153
	HCO3 (mg/l)	343.0	317.0	276.0	278.0	366.7	3	0	19.6	348.0	387.0
	K (mg/l)	2.3	2.1	1.4	2.1	3.3	3	0	0.4	3.0	3.7
	Na (mg/l)	105.0	87.5	60.0	72.0	116.7	3	0	4.2	112.0	120.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	3	3	0.0000	1.0000	1.0000
	SO4 (mg/l)	45.0	72.0	34.7	33.0	32.7	3	0	16.3	20.0	51.0
	Sum of Ions (mg/l)	598	584	454	468	615	3	0	14	601	628
Metal	As (µg/l)	4.0	1.4	1.9	2.5	2.1	3	0	0.6	1.7	2.8
	Ba (mg/l)	0.8933	0.9400	0.8667	0.9550	1.0533	3	0	0.0681	1.0000	1.1300
	Cu (mg/l)	0.0003	0.0007	0.0003	0.0007	0.0003	3	0	0.0002	0.0002	0.0006
	Fe (mg/l)	4.887	0.560	2.247	2.945	1.237	3	0	0.945	0.580	2.320
	Mo (mg/l)	0.0010	0.0020	0.0010	0.0014	0.0008	3	0	0.0005	0.0004	0.0014
	Ni (mg/l)	0.0004	0.0005	0.0003	0.0004	0.0003	3	0	0.0001	0.0003	0.0004
	Pb (mg/l)	0.0002	0.0003	0.0003	0.0004	0.0002	3	1	0.0001	0.0001	0.0003
	Se (mg/l)	0.0019	0.0021	0.0018	0.0026	0.0021	3	0	0.0007	0.0016	0.0029
	U (µg/l)	143.7	288.5	161.7	171.5	123.3	3	0	82.4	51.0	213.0
	Zn (mg/l)	0.0010	0.0009	0.0009	0.0007	0.0016	3	0	0.0005	0.0013	0.0022
Nutrient	C-(org) (mg/l)	32.0	30.5	30.5	55.0	38.5	2	0	2.1	37.0	40.0
	NH3-N (mg/l)	0.16	0.10	0.26		0.13	2	0	0.04	0.10	0.15
	NO3 (mg/l)	0.13	0.07	0.05	<0.04	<0.04	3	3	0.00	0.04	0.04
	P-(TP) (mg/l)	0.02	<0.01	0.02	0.01	0.02	2	0	0.01	0.01	0.02
Phys Para	pH-L (pH Unit)	7.8	8.0	7.8	7.9	7.9	3	0	0.2	7.7	8.1
	TDS (mg/l)	501.67	472.00	373.33	408.00	517.67	3	0	33.65	493.00	556.00
	Temp-H20 (°C)	8.6	10.5	14.6	12.1	14.0	3	0	6.7	7.1	20.5
	TSS (mg/l)	7.7	1.5	4.0	3.5	1.7	3	1	1.2	1.0	3.0
Rads	Pb210 (Bq/L)	0.08	0.07	0.06	0.37	0.20	2	0	0.08	0.14	0.25
	Po210 (Bq/L)	0.030	0.030	0.090	0.050	0.035	2	0	0.007	0.030	0.040
	Ra226 (Bq/L)	5.333	6.050	5.700	7.000	5.067	3	0	0.808	4.200	5.800

Table 4.3.2-5 TL-7 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	139.9	124.5	115.8	139.7	127.0	6	0	6.5	114.0	131.0
	Ca (mg/l)	24.0	22.9	23.3	26.7	25.0	6	0	1.5	23.0	27.0
	Cl (mg/l)	7.9	4.3	5.8	3.8	6.2	6	0	3.1	3.4	11.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	6	6	0.0	1.0	1.0
	Cond-L (µS/cm)	341	291	281	316	287	6	0	24	244	309
	Hardness (mg/l)	85	80	80	93	87	6	0	6	79	94
	HCO3 (mg/l)	170.7	151.9	141.3	170.4	155.2	6	0	8.1	139.0	160.0
	K (mg/l)	1.1	1.2	1.0	1.7	1.2	6	0	0.2	1.0	1.4
	Na (mg/l)	40.4	32.9	29.8	35.0	32.2	6	0	3.2	26.0	35.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	6	6	0.0000	1.0000	1.0000
	SO4 (mg/l)	29.0	25.2	23.5	26.2	19.8	6	0	2.6	16.0	23.0
	Sum of Ions (mg/l)	279	258	230	270	246	6	0	16	214	257
Metal	As (µg/l)	1.3	1.1	1.0	1.1	0.9	6	0	0.2	0.7	1.2
	Ba (mg/l)	0.3656	0.1990	0.4775	0.3467	0.4400	6	0	0.1088	0.3000	0.5900
	Cu (mg/l)	0.0005	0.0007	0.0005	0.0007	0.0005	6	0	0.0002	0.0004	0.0010
	Fe (mg/l)	0.066	0.060	0.094	0.104	0.064	6	0	0.082	0.024	0.230
	Mo (mg/l)	0.0094	0.0084	0.0061	0.0096	0.0062	6	0	0.0012	0.0049	0.0079
	Ni (mg/l)	0.0005	0.0005	0.0005	0.0005	0.0004	6	0	0.0001	0.0004	0.0005
	Pb (mg/l)	0.0002	0.0002	0.0002	0.0003	0.0002	6	4	0.0003	0.0001	0.0008
	Se (mg/l)	0.0019	0.0016	0.0018	0.0018	0.0014	6	0	0.0002	0.0012	0.0016
	U (µg/l)	226.6	196.9	125.0	238.4	148.7	6	0	57.4	95.0	247.0
	Zn (mg/l)	0.0006	0.0010	0.0007	0.0011	0.0012	6	2	0.0007	0.0005	0.0022
Nutrient	C-(org) (mg/l)	9.1	8.5	9.4	9.8	8.9	2	0	1.6	7.8	10.0
	NH3-N (mg/l)	0.07	0.08	<0.01	0.07	0.07	2	0	0.01	0.06	0.07
	NO3 (mg/l)	0.11	0.07	0.05	0.07	0.08	6	3	0.06	0.04	0.19
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	0.01	<0.01	2	2	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	7.8	8.0	7.9	6	0	0.1	7.7	8.1
	TDS (mg/l)	214.44	188.10	177.75	211.63	187.83	6	0	25.81	157.00	224.00
	Temp-H20 (°C)	8.0	10.0	8.7	8.1	12.8	6	0	6.5	4.2	20.7
	TSS (mg/l)	1.2	1.1	1.0	1.1	1.0	6	5	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.04	0.03	0.10	0.22	0.16	2	0	0.02	0.14	0.17
	Po210 (Bq/L)	0.017	0.020	0.010	0.023	0.008	2	0	0.003	0.006	0.010
	Ra226 (Bq/L)	1.667	1.590	2.250	1.744	1.550	6	0	0.339	1.100	1.900

Table 4.3.2-6 TL-9 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	125.5	128.8	130.0	116.3	108.7	6	0	8.2	104.0	125.0
	Ca (mg/l)	20.8	24.2	25.4	20.3	17.5	6	0	3.5	15.0	24.0
	Cl (mg/l)	4.6	4.3	3.8	3.9	4.0	6	0	0.3	3.5	4.3
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	6	6	0.0	1.0	1.0
	Cond-L (µS/cm)	299	303	304	268	245	6	0	12	235	268
	Hardness (mg/l)	77	86	88	76	68	6	0	9	61	85
	HCO3 (mg/l)	153.3	157.1	158.6	141.8	132.5	6	0	9.8	127.0	152.0
	K (mg/l)	1.0	1.3	1.1	1.2	1.2	6	0	0.1	1.1	1.3
	Na (mg/l)	35.8	34.3	31.6	30.8	30.3	6	0	0.5	30.0	31.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	6	6	0.0000	1.0000	1.0000
	SO4 (mg/l)	25.1	25.7	24.1	21.2	18.0	6	0	0.6	17.0	19.0
	Sum of Ions (mg/l)	247	235	251	226	210	6	0	14	202	237
Metal	As (µg/l)	1.6	1.3	1.3	1.3	1.2	6	0	0.3	1.0	1.7
	Ba (mg/l)	0.6550	0.4473	0.4671	0.6567	0.6217	6	0	0.0621	0.5600	0.7200
	Cu (mg/l)	0.0008	0.0005	0.0006	0.0005	0.0006	6	0	0.0002	0.0004	0.0009
	Fe (mg/l)	0.037	0.050	0.052	0.044	0.052	6	0	0.046	0.019	0.140
	Mo (mg/l)	0.0105	0.0083	0.0090	0.0084	0.0066	6	0	0.0006	0.0059	0.0075
	Ni (mg/l)	0.0004	0.0004	0.0004	0.0003	0.0003	6	0	0.0001	0.0002	0.0005
	Pb (mg/l)	0.0008	0.0006	0.0008	0.0005	0.0011	6	0	0.0010	0.0004	0.0030
	Se (mg/l)	0.0040	0.0021	0.0024	0.0022	0.0023	6	0	0.0006	0.0017	0.0033
	U (µg/l)	244.5	210.3	195.3	172.3	132.5	6	0	32.5	102.0	176.0
	Zn (mg/l)	0.0009	0.0007	0.0012	0.0006	0.0012	6	1	0.0008	0.0005	0.0026
Nutrient	C-(org) (mg/l)	9.3	9.2	8.8	9.4	8.7	2	0	0.4	8.4	9.0
	NH3-N (mg/l)	0.07	0.06	0.06	0.08	0.12	2	0	0.00	0.12	0.12
	NO3 (mg/l)	0.64	0.20	0.36	0.18	0.36	6	0	0.22	0.10	0.66
	P-(TP) (mg/l)	0.01	<0.01	0.02	<0.01	0.01	2	1	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	8.0	8.0	8.0	8.2	8.1	6	0	0.1	8.0	8.2
	TDS (mg/l)	189.50	194.10	191.71	177.83	162.00	6	0	11.03	148.00	176.00
	Temp-H20 (°C)	9.6	8.7	9.4	10.1	12.7	6	0	7.4	1.8	21.0
	TSS (mg/l)	1.5	1.6	1.7	1.3	1.7	6	4	1.2	1.0	4.0
Rads	Pb210 (Bq/L)	0.07	0.08	0.05	0.20	0.17	2	0	0.01	0.16	0.18
	Po210 (Bq/L)	0.053	0.030	0.030	0.037	0.045	2	0	0.021	0.030	0.060
	Ra226 (Bq/L)	2.275	1.955	2.071	2.333	2.033	6	0	0.516	1.500	2.900

Table 4.3.3-1 BL-3 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	72.5	70.8	69.8	69.5	72.8	4	0	5.6	68.0	79.0
	Ca (mg/l)	21.5	22.0	21.3	21.5	21.3	4	0	1.0	20.0	22.0
	Cl (mg/l)	12.5	12.0	13.3	12.5	13.0	4	0	0.8	12.0	14.0
	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)	255	240	237	236	237	4	0	15	223	255
	Hardness (mg/l)	76	77	75	76	75	4	0	3	71	78
	HCO3 (mg/l)	88.5	86.3	85.3	84.8	88.8	4	0	6.8	83.0	96.0
	K (mg/l)	1.0	1.1	1.1	1.2	1.2	4	0	0.1	1.1	1.3
	Na (mg/l)	19.0	18.5	18.5	18.5	18.8	4	0	1.0	18.0	20.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	31.5	38.3	30.5	30.5	29.0	4	0	0.8	28.0	30.0
	Sum of Ions (mg/l)	180	184	175	175	177	4	0	10	167	187
Metal	As (µg/l)	0.3	0.3	0.2	0.2	0.3	4	0	0.1	0.2	0.3
	Ba (mg/l)	0.0438	0.0410	0.0358	0.0360	0.0448	4	0	0.0163	0.0350	0.0690
	Cu (mg/l)	0.0009	0.0018	0.0009	0.0019	0.0014	4	0	0.0011	0.0003	0.0029
	Fe (mg/l)	0.007	0.011	0.006	0.009	0.007	4	0	0.004	0.002	0.011
	Mo (mg/l)	0.0037	0.0035	0.0036	0.0036	0.0037	4	0	0.0004	0.0034	0.0042
	Ni (mg/l)	0.0031	0.0014	0.0028	0.0058	0.0014	4	0	0.0009	0.0002	0.0022
	Pb (mg/l)	0.0001	0.0002	0.0001	0.0003	0.0002	4	1	0.0002	0.0001	0.0004
	Se (mg/l)	0.0026	0.0023	0.0023	0.0023	0.0023	4	0	0.0002	0.0022	0.0025
	U (µg/l)	138.0	127.5	128.5	129.8	132.3	4	0	12.4	121.0	143.0
	Zn (mg/l)	0.0031	0.0050	0.0028	0.0068	0.0035	4	0	0.0018	0.0018	0.0060
Nutrient	C-(org) (mg/l)	3.2	3.1	3.3	3.2	3.0	1	0		3.0	3.0
	NH3-N (mg/l)	0.07	0.08	0.06	0.08	0.11	1	0		0.11	0.11
	NO3 (mg/l)	<0.04	0.09	0.05	0.06	<0.04	4	4	0.00	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	7.9	8.0	8.0	4	0	0.1	7.9	8.2
	TDS (mg/l)	144.50	144.00	143.50	156.75	152.50	4	0	32.79	123.00	196.00
	Temp-H20 (°C)	6.0	8.6	7.5	6.4	7.9	4	0	7.1	1.6	16.9
	TSS (mg/l)	1.0	<1.0	1.0	1.3	<1.0	4	4	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.02	0.11	0.09	0.10	1	0		0.10	0.10
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.065	0.058	0.035	0.035	0.053	4	0	0.039	0.030	0.110

Table 4.3.3-2 BL-4 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	70.0	69.0	67.5	69.0	70.0	2	0	2.8	68.0	72.0
	Ca (mg/l)	22.0	21.0	20.5	21.5	21.0	2	0	0.0	21.0	21.0
	Cl (mg/l)	13.0	12.5	12.5	12.5	12.5	2	0	0.7	12.0	13.0
	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)	245	250	234	232	235	2	0	15	224	245
	Hardness (mg/l)	78	74	73	76	74	2	0	1	73	74
	HCO3 (mg/l)	85.5	84.0	82.5	84.5	85.5	2	0	3.5	83.0	88.0
	K (mg/l)	1.0	1.1	1.2	1.2	1.1	2	0	0.1	1.0	1.2
	Na (mg/l)	19.0	18.5	18.5	18.5	18.5	2	0	0.7	18.0	19.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	2	2	0.0000	1.0000	1.0000
	SO4 (mg/l)	31.5	31.5	30.0	30.0	28.5	2	0	0.7	28.0	29.0
	Sum of Ions (mg/l)	178	174	171	174	173	2	0	6	168	177
Metal	As (µg/l)	0.3	0.3	0.2	0.3	0.2	2	0	0.0	0.2	0.2
	Ba (mg/l)	0.0330	0.0355	0.0340	0.0345	0.0345	2	0	0.0007	0.0340	0.0350
	Cu (mg/l)	0.0016	0.0010	0.0010	0.0012	0.0012	2	0	0.0003	0.0010	0.0014
	Fe (mg/l)	0.005	0.006	0.005	0.004	0.007	2	0	0.001	0.007	0.008
	Mo (mg/l)	0.0036	0.0037	0.0037	0.0036	0.0036	2	0	0.0001	0.0035	0.0036
	Ni (mg/l)	0.0084	0.0031	0.0029	0.0012	0.0012	2	0	0.0003	0.0010	0.0014
	Pb (mg/l)	0.0001	<0.0001	0.0001	0.0003	0.0002	2	1	0.0001	0.0001	0.0003
	Se (mg/l)	0.0025	0.0025	0.0024	0.0024	0.0023	2	0	0.0001	0.0022	0.0023
	U (µg/l)	130.5	133.0	130.0	126.0	126.0	2	0	8.5	120.0	132.0
	Zn (mg/l)	0.0030	0.0023	0.0030	0.0047	0.0036	2	0	0.0005	0.0032	0.0039
Nutrient	C-(org) (mg/l)	3.1	3.2	3.3	3.4	3.3	2	0	0.6	2.9	3.7
	NH3-N (mg/l)	0.05	0.08	0.08	0.11	0.11	2	0	0.01	0.10	0.11
	NO3 (mg/l)	0.14	0.05	0.05	0.05	<0.04	2	2	0.00	0.04	0.04
	P-(TP) (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	2	2	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	7.8	7.9	7.7	8.0	8.0	2	0	0.0	8.0	8.0
	TDS (mg/l)	139.50	142.00	140.00	141.00	155.50	2	0	44.55	124.00	187.00
	Temp-H20 (°C)	5.9	7.7	8.4	4.6	10.3	1	0		10.3	10.3
	TSS (mg/l)	<1.0	<1.0	1.0	<1.0	<1.0	2	2	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	0.02	0.03	0.09	0.05	0.07	2	0	0.05	0.03	0.10
	Po210 (Bq/L)	<0.005	<0.005	<0.008	<0.005	<0.005	2	2	0.000	0.005	0.005
	Ra226 (Bq/L)	0.035	0.040	0.030	0.025	0.025	2	0	0.007	0.020	0.030

Table 4.3.3-3 BL-5 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	71.8	69.8	68.0	67.0	61.3	3	0	9.9	50.0	68.0
	Ca (mg/l)	21.3	20.8	20.3	20.5	19.0	3	0	3.5	15.0	21.0
	Cl (mg/l)	12.8	12.5	13.0	12.0	11.1	3	0	2.5	8.2	13.0
	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)	249	244	235	224	202	3	0	42	153	226
	Hardness (mg/l)	75	74	72	73	66	3	0	12	52	74
	HCO3 (mg/l)	87.8	85.3	83.0	82.0	74.7	3	0	11.9	61.0	83.0
	K (mg/l)	0.9	1.0	1.0	1.1	1.0	3	0	0.2	0.8	1.1
	Na (mg/l)	19.0	18.5	18.7	18.0	16.0	3	0	3.5	12.0	18.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	3	3	0.0000	1.0000	1.0000
	SO4 (mg/l)	31.8	36.5	30.0	29.5	25.7	3	0	4.9	20.0	29.0
	Sum of Ions (mg/l)	179	180	171	168	152	3	0	27	121	168
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	3	0	0.1	0.1	0.2
	Ba (mg/l)	0.0348	0.0350	0.0333	0.0330	0.0293	3	0	0.0072	0.0210	0.0340
	Cu (mg/l)	<0.0002	<0.0002	<0.0002	0.0004	0.0004	3	0	0.0001	0.0003	0.0005
	Fe (mg/l)	0.003	0.004	0.003	0.006	0.010	3	0	0.010	0.002	0.021
	Mo (mg/l)	0.0037	0.0036	0.0036	0.0035	0.0030	3	0	0.0008	0.0021	0.0036
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	3	0	0.0000	0.0002	0.0002
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	0.0003	0.0001	3	2	0.0001	0.0001	0.0002
	Se (mg/l)	0.0025	0.0025	0.0023	0.0022	0.0019	3	0	0.0005	0.0014	0.0022
	U (µg/l)	136.5	132.5	129.7	124.5	103.7	3	0	29.2	70.0	121.0
	Zn (mg/l)	<0.0005	<0.0005	<0.0005	0.0006	0.0008	3	1	0.0003	0.0005	0.0010
Nutrient	C-(org) (mg/l)	3.0	2.9	3.2	3.2	3.0	1	0		3.0	3.0
	NH3-N (mg/l)	0.06	0.05	0.07	0.09	0.11	1	0		0.11	0.11
	NO3 (mg/l)	<0.04	0.05	0.05	<0.04	<0.04	3	3	0.00	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	7.8	8.0	7.9	3	0	0.1	7.8	8.1
	TDS (mg/l)	142.50	143.75	140.33	149.00	125.67	3	0	33.02	92.00	158.00
	Temp-H20 (°C)	7.7	8.6	9.7	11.8	12.3	3	0	4.0	9.9	16.9
	TSS (mg/l)	<1.0	<1.0	1.3	<1.0	<1.0	3	3	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	0.12	0.06	0.11	1	0		0.11	0.11
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.028	0.030	0.030	0.025	0.030	3	0	0.000	0.030	0.030

Table 4.3.3-4 ML-1 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	66.5	64.0	65.5	66.3	67.5	4	0	4.7	63.0	72.0
	Ca (mg/l)	19.8	20.0	19.5	20.3	20.3	4	0	1.0	19.0	21.0
	Cl (mg/l)	7.0	6.1	7.0	7.4	7.1	4	0	2.3	3.7	8.8
	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)	186	179	183	181	182	4	0	18	162	205
	Hardness (mg/l)	67	68	67	69	69	4	0	3	65	73
	HCO3 (mg/l)	80.8	77.8	80.0	80.8	82.5	4	0	5.8	77.0	88.0
	K (mg/l)	0.9	1.0	1.1	1.2	1.2	4	0	0.1	1.1	1.3
	Na (mg/l)	9.7	9.0	10.5	10.6	10.1	4	0	2.5	6.4	12.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	4	4	0.0000	1.0000	1.0000
	SO4 (mg/l)	15.5	15.5	18.8	17.8	16.0	4	0	3.5	11.0	19.0
	Sum of Ions (mg/l)	138	134	142	143	142	4	0	9	135	155
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	4	0	0.0	0.2	0.2
	Ba (mg/l)	0.0438	0.0428	0.0430	0.0430	0.0440	4	0	0.0023	0.0420	0.0460
	Cu (mg/l)	0.0005	0.0007	0.0004	0.0009	0.0011	4	0	0.0006	0.0003	0.0017
	Fe (mg/l)	0.014	0.016	0.014	0.014	0.011	4	0	0.006	0.007	0.020
	Mo (mg/l)	0.0018	0.0017	0.0019	0.0019	0.0019	4	0	0.0005	0.0012	0.0022
	Ni (mg/l)	0.0002	0.0002	0.0001	0.0002	0.0002	4	0	0.0001	0.0001	0.0002
	Pb (mg/l)	0.0001	0.0001	<0.0001	0.0002	0.0002	4	1	0.0001	0.0001	0.0002
	Se (mg/l)	0.0009	0.0008	0.0010	0.0010	0.0009	4	0	0.0002	0.0006	0.0011
	U (µg/l)	49.5	47.5	58.5	60.8	55.8	4	0	16.8	31.0	68.0
	Zn (mg/l)	0.0014	0.0019	0.0009	0.0016	0.0023	4	0	0.0013	0.0007	0.0036
Nutrient	C-(org) (mg/l)	7.0	6.6	6.3	6.1	6.0	4	0	1.1	4.9	7.5
	NH3-N (mg/l)	0.08	0.07	0.14	0.12	0.11	4	0	0.03	0.07	0.14
	NO3 (mg/l)	0.22	0.15	0.12	0.13	0.07	4	2	0.06	0.04	0.16
	P-(TP) (mg/l)	<0.01	<0.01	0.01	0.01	0.01	4	3	0.00	0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.7	7.7	8.0	7.9	4	0	0.0	7.9	8.0
	TDS (mg/l)	114.50	114.25	117.75	123.75	127.00	4	0	28.57	97.00	165.00
	Temp-H20 (°C)	8.5	11.6	7.9	7.8	11.0	4	0	8.7	2.0	22.4
	TSS (mg/l)	1.3	1.5	1.5	1.5	<1.0	4	4	0.0	1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	0.03	0.09	0.04	0.07	4	2	0.06	0.02	0.12
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	4	4	0.000	0.005	0.005
	Ra226 (Bq/L)	0.015	0.009	0.014	0.007	0.007	4	1	0.002	0.005	0.009

Table 4.3.3-5 CS-1 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	66.0	59.0	64.0	64.0	67.0	1	0		67.0	67.0
	Ca (mg/l)	19.0	19.0	19.0	20.0	20.0	1	0		20.0	20.0
	Cl (mg/l)	7.6	6.4	8.1	7.2	8.0	1	0		8.0	8.0
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	192	178	179	180	182	1	0		182	182
	Hardness (mg/l)	66	65	65	68	68	1	0		68	68
	HCO3 (mg/l)	80.0	72.0	78.0	78.0	82.0	1	0		82.0	82.0
	K (mg/l)	0.8	1.1	1.1	1.1	1.1	1	0		1.1	1.1
	Na (mg/l)	11.0	9.6	11.0	11.0	11.0	1	0		11.0	11.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	17.0	16.0	17.0	17.0	16.0	1	0		16.0	16.0
	Sum of Ions (mg/l)	140	128	139	139	143	1	0		143	143
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	0.0420	0.0400	0.0430	1	0		0.0430	0.0430
	Cu (mg/l)	<0.0002	<0.0002	0.0005	0.0003	0.0003	1	0		0.0003	0.0003
	Fe (mg/l)	0.036	0.037	0.046	0.021	0.025	1	0		0.025	0.025
	Mo (mg/l)	0.0021	0.0019	0.0020	0.0020	0.0020	1	0		0.0020	0.0020
	Ni (mg/l)	0.0001	<0.0001	0.0001	0.0001	0.0001	1	0		0.0001	0.0001
	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	0.0009	1	0		0.0009	0.0009
	U (µg/l)	54.0	52.0	62.0	62.0	56.0	1	0		56.0	56.0
	Zn (mg/l)	<0.0005	<0.0005	0.0010	<0.0005	<0.0005	1	1		0.0005	0.0005
Nutrient	C-(org) (mg/l)	6.2	6.0	6.3	5.8	5.6	1	0		5.6	5.6
	NH3-N (mg/l)	0.08	0.06	0.08	0.09	0.11	1	0		0.11	0.11
	NO3 (mg/l)	<0.04	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	7.7	7.6	8.0	8.1	1	0		8.1	8.1
	TDS (mg/l)	123.00	109.00	118.00	124.00	100.00	1	0		100.00	100.00
	Temp-H20 (°C)	10.1	12.5	11.8	9.3	10.8	1	0		10.8	10.8
	TSS (mg/l)	2.0	1.0	1.0	1.0	<1.0	1	1		1.0	1.0
Rads	Pb210 (Bq/L)	<0.02	<0.02	0.11	0.07	0.12	1	0		0.12	0.12
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	<0.005	0.010	0.010	<0.005	<0.005	1	1		0.005	0.005

Table 4.3.3-6 CS-2 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	30.0	38.0	25.0	27.0	28.0	1	0		28.0	28.0
	Ca (mg/l)	7.3	12.0	6.1	7.1	7.3	1	0		7.3	7.3
	Cl (mg/l)	3.5	4.7	3.3	3.1	3.6	1	0		3.6	3.6
	CO3 (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	1	1		1.0	1.0
	Cond-L (µS/cm)	79	116	63	64	66	1	0		66	66
	Hardness (mg/l)	28	43	23	27	27	1	0		27	27
	HCO3 (mg/l)	37.0	46.0	30.0	33.0	34.0	1	0		34.0	34.0
	K (mg/l)	0.5	0.9	0.9	0.8	0.8	1	0		0.8	0.8
	Na (mg/l)	2.9	5.6	2.6	2.8	2.9	1	0		2.9	2.9
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	1	1		1.0000	1.0000
	SO4 (mg/l)	4.2	9.0	3.6	3.7	3.9	1	0		3.9	3.9
	Sum of Ions (mg/l)	58	81	48	53	55	1	0		55	55
Metal	As (µg/l)	0.2	0.2	0.2	0.1	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.0120	0.0240	0.0110	0.0110	0.0120	1	0		0.0120	0.0120
	Cu (mg/l)	<0.0002	0.0002	<0.0002	0.0022	0.0013	1	0		0.0013	0.0013
	Fe (mg/l)	0.006	0.022	0.004	0.006	0.010	1	0		0.010	0.010
	Mo (mg/l)	0.0003	0.0010	0.0002	0.0002	0.0003	1	0		0.0003	0.0003
	Ni (mg/l)	0.0002	<0.0001	0.0002	0.0046	0.0012	1	0		0.0012	0.0012
	Pb (mg/l)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	1	1		0.0001	0.0001
	Se (mg/l)	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	1	1		0.0001	0.0001
	U (µg/l)	2.4	21.0	0.4	0.5	1.4	1	0		1.4	1.4
	Zn (mg/l)	<0.0005	0.0008	<0.0005	0.0037	0.0034	1	0		0.0034	0.0034
Nutrient	C-(org) (mg/l)	3.2	4.1	3.2	3.3	3.0	1	0		3.0	3.0
	NH3-N (mg/l)	0.02	0.02	0.01	<0.01	0.02	1	0		0.02	0.02
	NO3 (mg/l)	<0.04	0.06	<0.04	<0.04	0.08	1	0		0.08	0.08
	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)	7.5	7.4	7.2	7.6	7.7	1	0		7.7	7.7
	TDS (mg/l)	51.00	71.00	37.00	53.00	34.00	1	0		34.00	34.00
	Temp-H20 (°C)	11.2	12.6	9.4	10.1	8.2	1	0		8.2	8.2
	TSS (mg/l)	2.0	<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)	0.005	0.006	<0.005	<0.005	<0.005	1	1		0.005	0.005
	Ra226 (Bq/L)	0.010	0.007	<0.005	<0.005	0.007	1	0		0.007	0.007

Table 4.4-1 ZOR-01 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	**2016**	**2017**	**2018**	**Avg**	**Count**	**Count < DL**	**StDev**	**Min**	**Max**
M Ions	Alk (mg/l)	100.2	102.7	97.0	95.5	93.9	8	0	14.8	60.0	111.0
	Ca (mg/l)	31.8	32.5	30.7	31.2	30.5	8	0	5.0	19.0	36.0
	Cl (mg/l)	0.3	0.9	0.3	0.3	0.3	8	0	0.1	0.2	0.4
	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)	224	226	218	213	204	8	0	30	136	236
	Hardness (mg/l)	113	115	108	110	108	8	0	17	68	127
	HCO3 (mg/l)	122.2	125.3	118.1	116.5	114.5	8	0	18.1	73.0	135.0
	K (mg/l)	0.7	0.8	0.7	0.8	0.8	8	0	0.1	0.6	0.9
	Na (mg/l)	1.7	1.8	1.8	1.8	1.8	8	0	0.2	1.2	2.0
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	8	8	0.0000	1.0000	1.0000
	SO4 (mg/l)	18.9	19.1	18.7	18.8	17.9	8	0	2.5	12.0	20.0
	Sum of Ions (mg/l)	184	189	178	178	174	8	0	27	111	203
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.1	8	1	0.0	0.1	0.2
	Ba (mg/l)	0.0224	0.0231	0.0212	0.0217	0.0208	8	0	0.0041	0.0120	0.0260
	Cu (mg/l)	0.0009	0.0006	0.0010	0.0009	0.0009	8	0	0.0005	0.0004	0.0017
	Fe (mg/l)	0.010	0.008	0.009	0.009	0.005	8	0	0.002	0.003	0.008
	Mo (mg/l)	0.0008	0.0009	0.0009	0.0008	0.0008	8	0	0.0002	0.0005	0.0010
	Ni (mg/l)	0.0002	0.0002	0.0002	0.0001	0.0002	8	0	0.0001	0.0001	0.0003
	Pb (mg/l)	0.0002	0.0001	0.0002	0.0001	0.0002	8	5	0.0001	0.0001	0.0003
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	8	1	0.0000	0.0001	0.0002
	U (µg/l)	15.3	14.6	16.1	15.8	15.4	8	0	2.0	12.0	19.0
	Zn (mg/l)	0.0013	0.0010	0.0026	0.0009	0.0019	8	0	0.0012	0.0006	0.0038
Nutrient	C-(org) (mg/l)		8.6	8.4	8.2	7.9	1	0		7.9	7.9
	NH3-N (mg/l)		0.06	0.05	0.07	0.08	1	0		0.08	0.08
	NO3 (mg/l)	0.06	<0.04	0.20	<0.04	0.11	8	4	0.12	0.04	0.37
	P-(TP) (mg/l)		<0.01	<0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	7.9	8.1	8.0	8	0	0.1	7.8	8.2
	TDS (mg/l)	140.45	148.10	143.56	147.83	133.75	8	0	25.82	75.00	158.00
	Temp-H20 (°C)	9.2	12.6	11.4	11.9	11.5	8	0	7.6	2.1	21.5
	TSS (mg/l)	1.3	2.1	2.2	1.3	1.6	8	4	0.7	1.0	3.0
Rads	Pb210 (Bq/L)		<0.02	<0.02	0.02	0.03	1	0		0.03	0.03
	Po210 (Bq/L)		0.010	0.006	0.009	0.005	1	0		0.005	0.005
	Ra226 (Bq/L)	0.029	0.022	0.027	0.030	0.019	8	0	0.006	0.010	0.030

Table 4.4-2 ZOR-02 Summary Statistics and Comparison to Historical Results

		Previous Period Averages				Year 2019 Statistics					
		2015	2016	2017	2018	Avg	Count	Count < DL	StDev	Min	Max
M Ions	Alk (mg/l)	121.7	108.5	102.6	95.3	99.3	8	0	13.6	77.0	118.0
	Ca (mg/l)	55.1	41.1	45.3	41.3	46.3	8	0	10.0	32.0	66.0
	Cl (mg/l)	0.7	0.5	0.6	0.5	0.6	8	3	0.3	0.2	1.0
	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)	303	277	308	272	297	8	0	64	213	430
	Hardness (mg/l)	183	140	152	138	154	8	0	31	110	214
	HCO3 (mg/l)	148.4	132.3	125.3	116.3	121.1	8	0	16.7	94.0	144.0
	K (mg/l)	0.9	0.9	0.9	0.8	0.9	8	0	0.1	0.8	1.0
	Na (mg/l)	2.7	2.1	2.5	2.0	2.1	8	0	0.3	1.6	2.6
	OH (mg/l)	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	8	8	0.0000	1.0000	1.0000
	SO4 (mg/l)	67.8	40.6	56.5	46.9	56.9	8	0	25.8	27.0	110.0
	Sum of Ions (mg/l)	288	231	241	216	238	8	0	46	171	331
Metal	As (µg/l)	0.4	0.2	0.3	0.2	0.2	8	0	0.1	0.1	0.3
	Ba (mg/l)	0.0321	0.0278	0.0373	0.0257	0.0251	8	0	0.0046	0.0200	0.0340
	Cu (mg/l)	0.0028	0.0019	0.0019	0.0015	0.0018	8	0	0.0009	0.0009	0.0040
	Fe (mg/l)	0.420	0.138	0.660	0.200	0.416	8	0	0.660	0.035	1.970
	Mo (mg/l)	0.0018	0.0016	0.0018	0.0014	0.0016	8	0	0.0003	0.0010	0.0020
	Ni (mg/l)	0.0005	0.0003	0.0004	0.0002	0.0004	8	0	0.0003	0.0002	0.0012
	Pb (mg/l)	0.0029	0.0002	0.0004	0.0002	0.0004	8	1	0.0006	0.0001	0.0018
	Se (mg/l)	0.0004	0.0003	0.0003	0.0003	0.0004	8	0	0.0002	0.0002	0.0007
	U (µg/l)	595.2	300.9	424.5	340.6	475.4	8	0	250.5	169.0	834.0
	Zn (mg/l)	0.0010	0.0007	0.0006	<0.0005	0.0011	8	4	0.0007	0.0005	0.0021
Nutrient	C-(org) (mg/l)		8.1	6.5	6.8	6.2	1	0		6.2	6.2
	NH3-N (mg/l)		0.05	0.28	0.17	0.10	1	0		0.10	0.10
	NO3 (mg/l)	0.38	0.43	1.03	0.61	0.99	8	0	0.57	0.51	2.30
	P-(TP) (mg/l)		<0.01	0.01	<0.01	<0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.9	7.9	7.9	8.0	7.9	8	0	0.2	7.6	8.0
	TDS (mg/l)	238.73	183.10	205.25	188.71	203.13	8	0	51.73	128.00	295.00
	Temp-H20 (°C)	5.8	9.2	10.1	8.2	9.7	8	0	6.2	4.0	18.4
	TSS (mg/l)	13.3	1.3	2.0	1.4	1.5	8	3	0.8	1.0	3.0
Rads	Pb210 (Bq/L)		<0.02	0.42	0.34	0.48	1	0		0.48	0.48
	Po210 (Bq/L)		0.020	0.030	0.010	0.010	1	0		0.010	0.010
	Ra226 (Bq/L)	0.667	0.219	0.311	0.253	0.238	8	0	0.059	0.110	0.300

Table 4.4-3 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

*Due to additional monitoring during construction and a switch to automated table generation, there have been minor discrepancies in reported data at this station in the past (2016 and 2017). Data has since been corrected and corrective actions have been implemented.

Table 4.7.1 Radon Track Etch Summary

	Annual Average (Bq/m3)					
	1982	**2015**	**2016**	**2017**	**2018**	**2019**
Ace Creek Track Etch Cup	395.9	210.9	186.7	252.5	257.5	285.5
Beacon Hill Track Etch Cup	51.8	9.3	13.1	35.0	12.5	11.5
Donaldson Lake Track Etch Cup		5.6	12.4	22.5	9.5	8.5
Eldorado Townsite Track Etch Cup	136.9	20.4	24.1	43.0	25.0	27.0
End of Airstrip Track Etch Cup	88.8	5.6	8.7	29.0	8.5	10.0
Fay Waste Rock Track Etch Cup	188.7	38.9	51.1	58.5	43.0	38.0
Fookes Delta Track Etch Cup	217.8	77.7	89.5	91.0	100.0	126.5
Fredette Lake Track Etch Cup		5.6	9.7	29.0	9.0	10.0
Marie Delta Track Etch Cup	144.5	88.8	75.2	104.0	94.5	96.0
Uranium City Town Track Etch Cup		5.6	7.7	29.5	5.5	7.0

FIGURES

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Figure 2.4
Beaverlodge Location Map

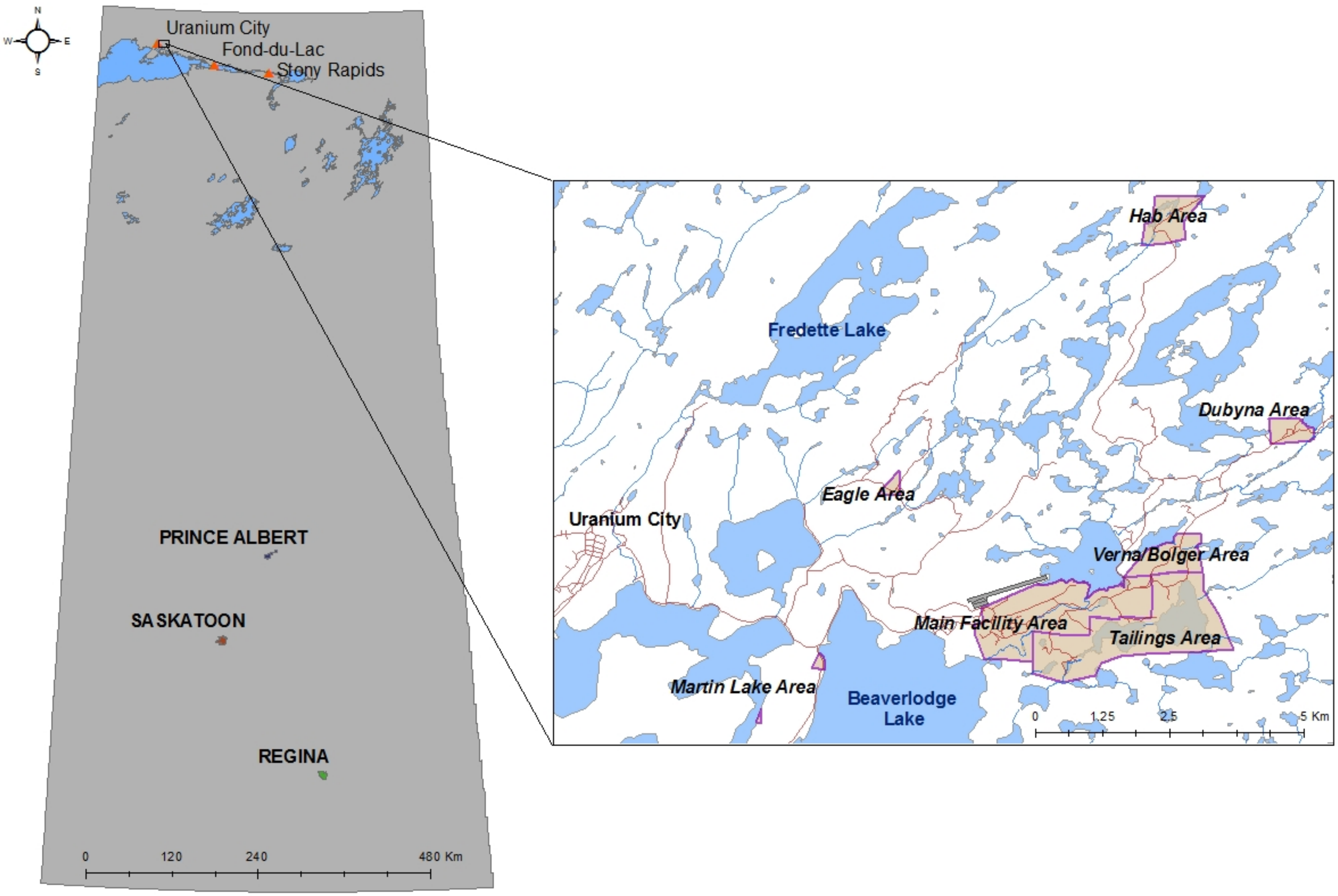


Figure 4.3
Regulatory Water Quality Monitoring Station Locations

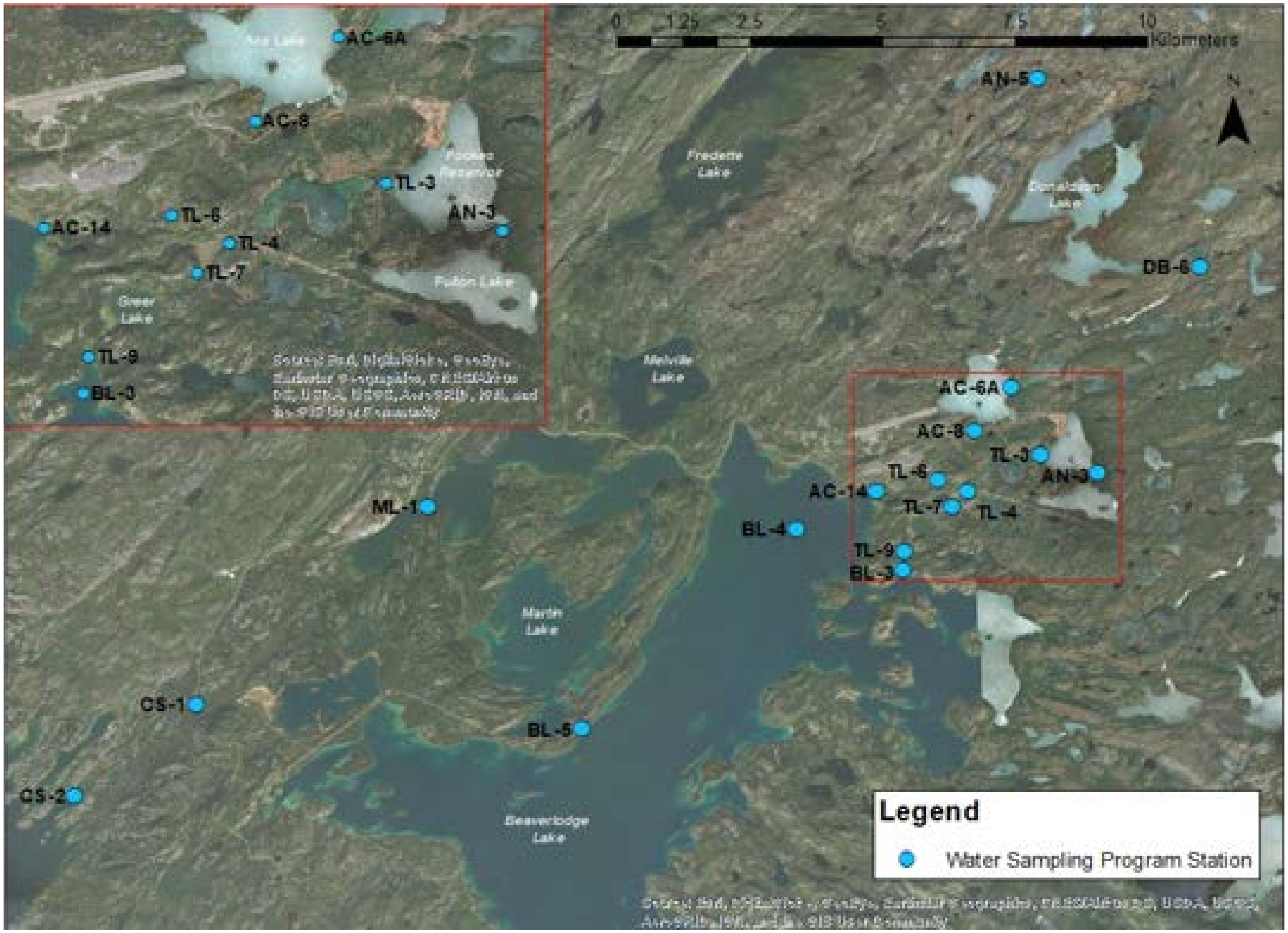


Figure 4.3.1-1 AN-5 Pistol Creek below Hab Site

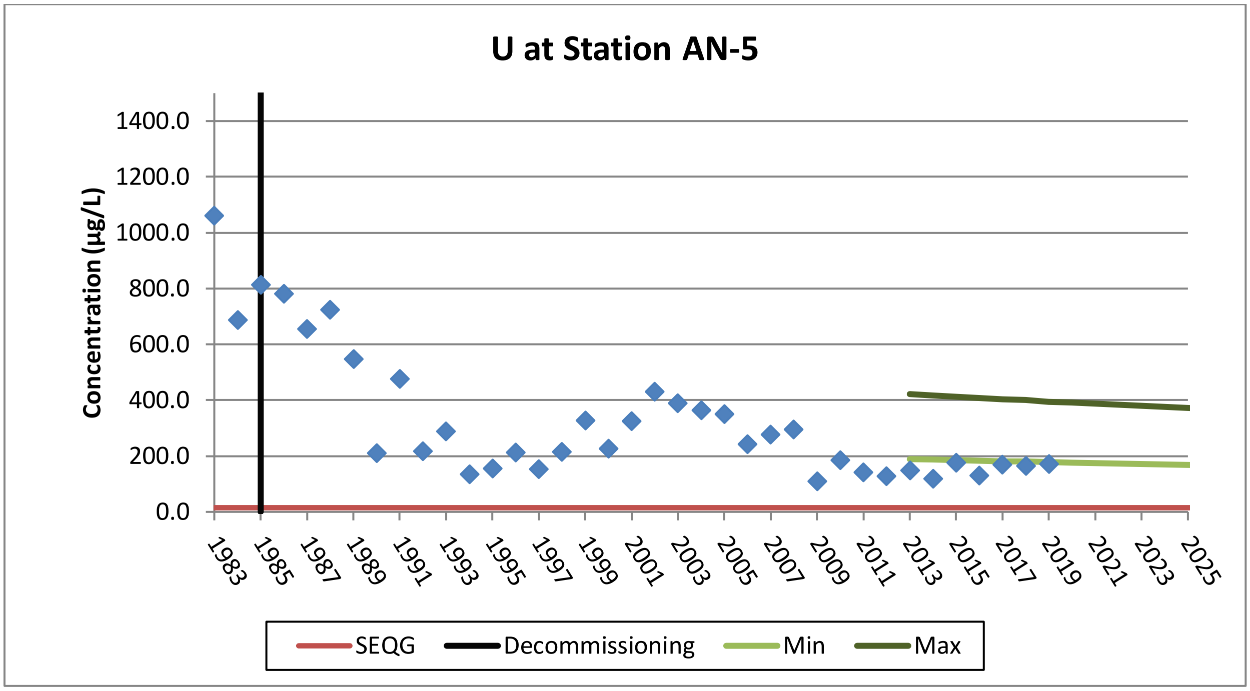


Figure 4.3.1-2 AN-5 Pistol Creek below Hab Site

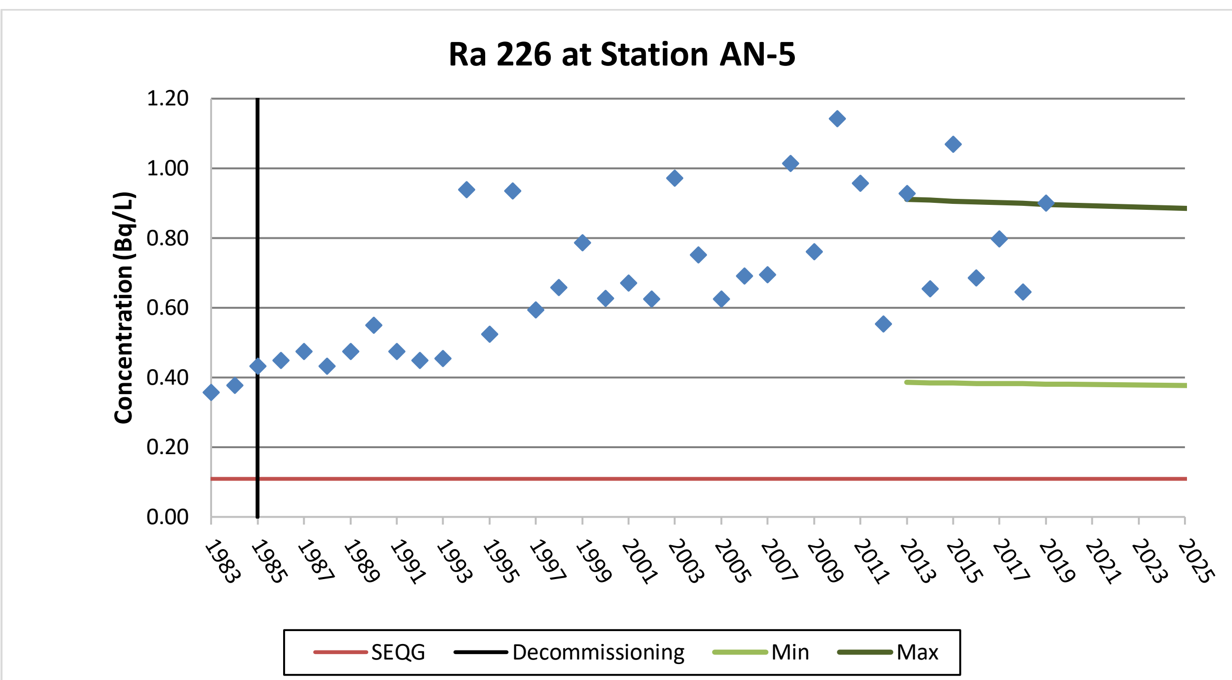
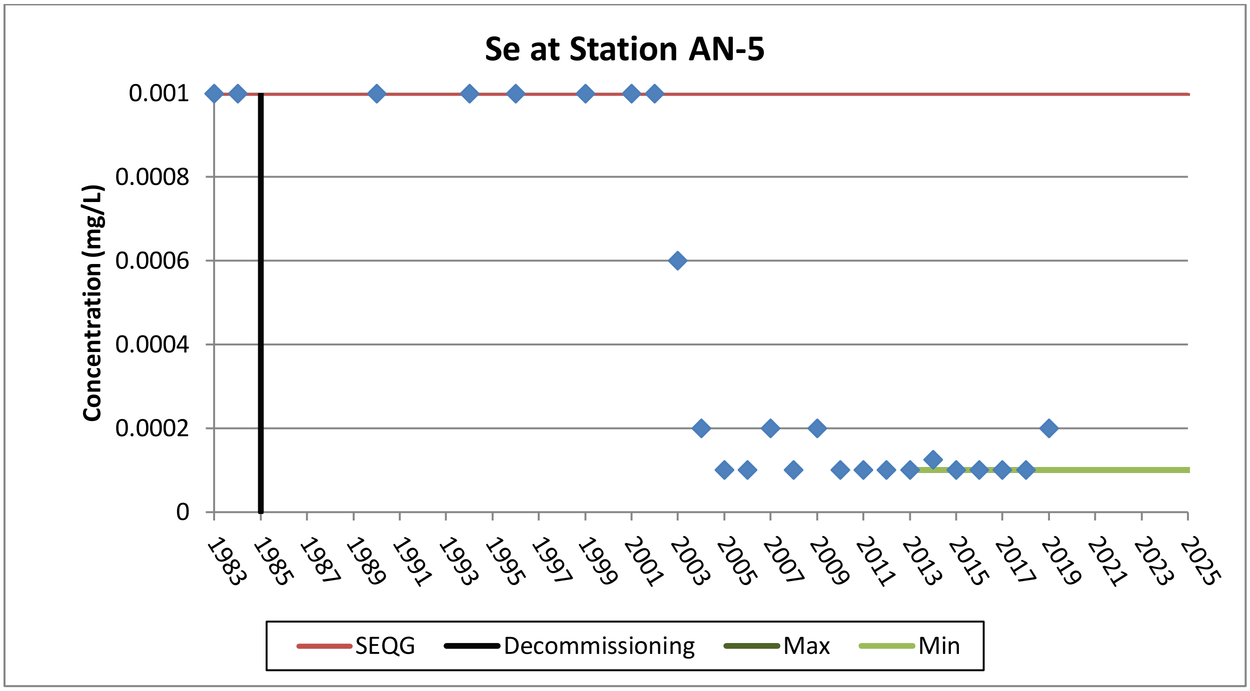


Figure 4.3.1-3 AN-5 Pistol Creek below Hab Site



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

Figure 4.3.1-4 AN-5 Pistol Creek below Hab Site

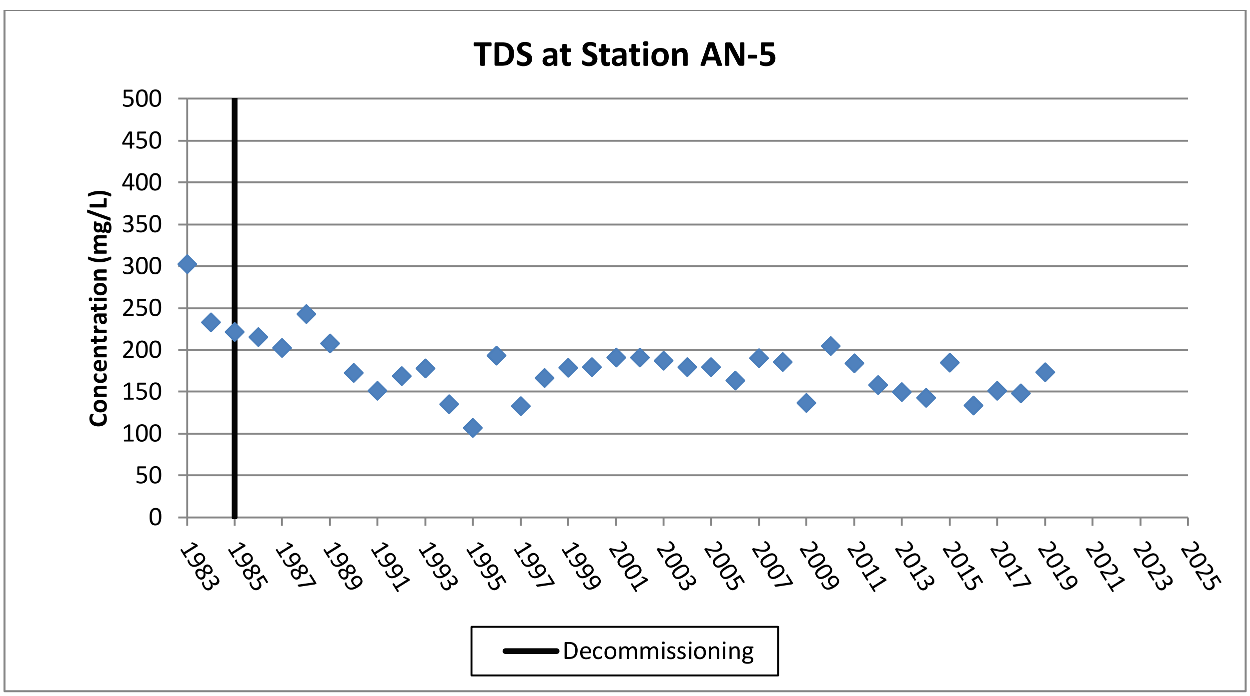


Figure 4.3.1-5 DB-6 Dubyna Creek

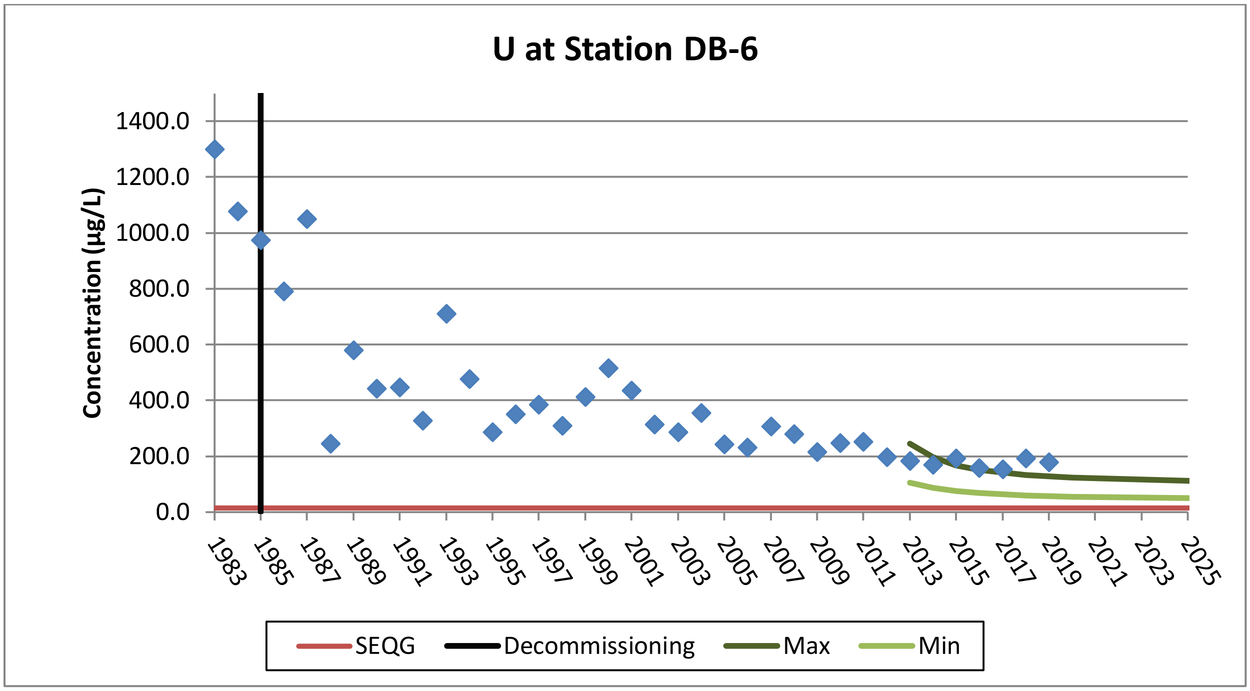


Figure 4.3.1-6 DB-6 Dubyna Creek

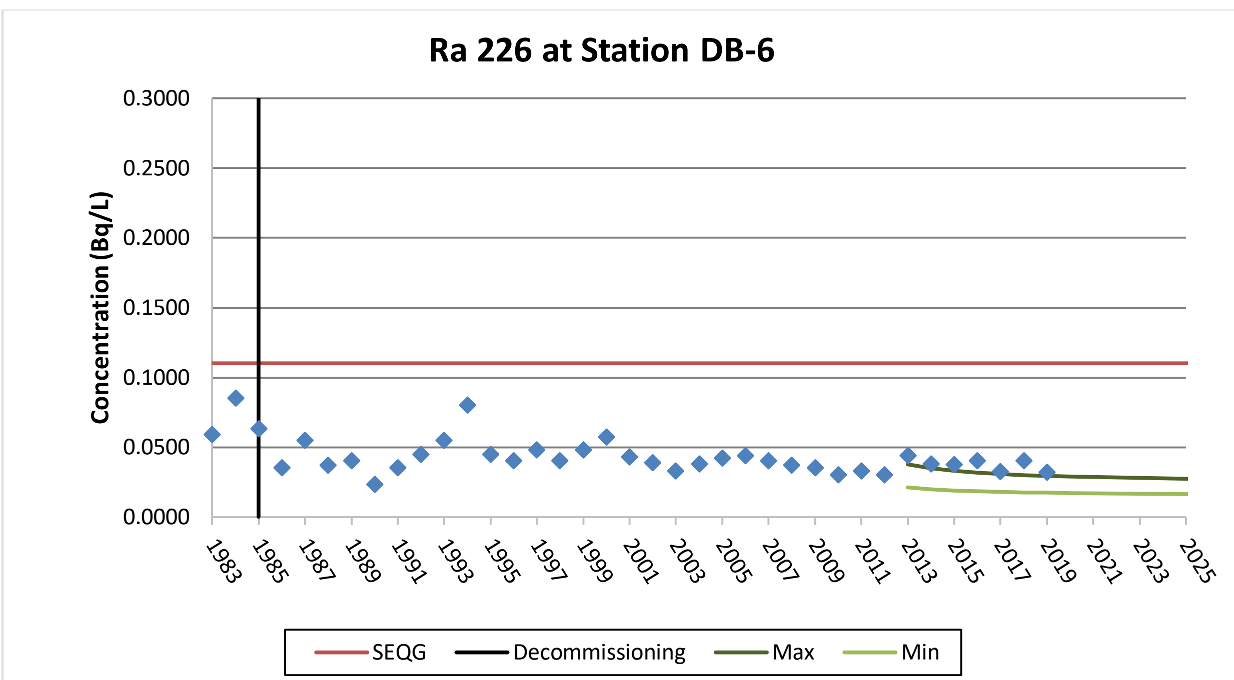
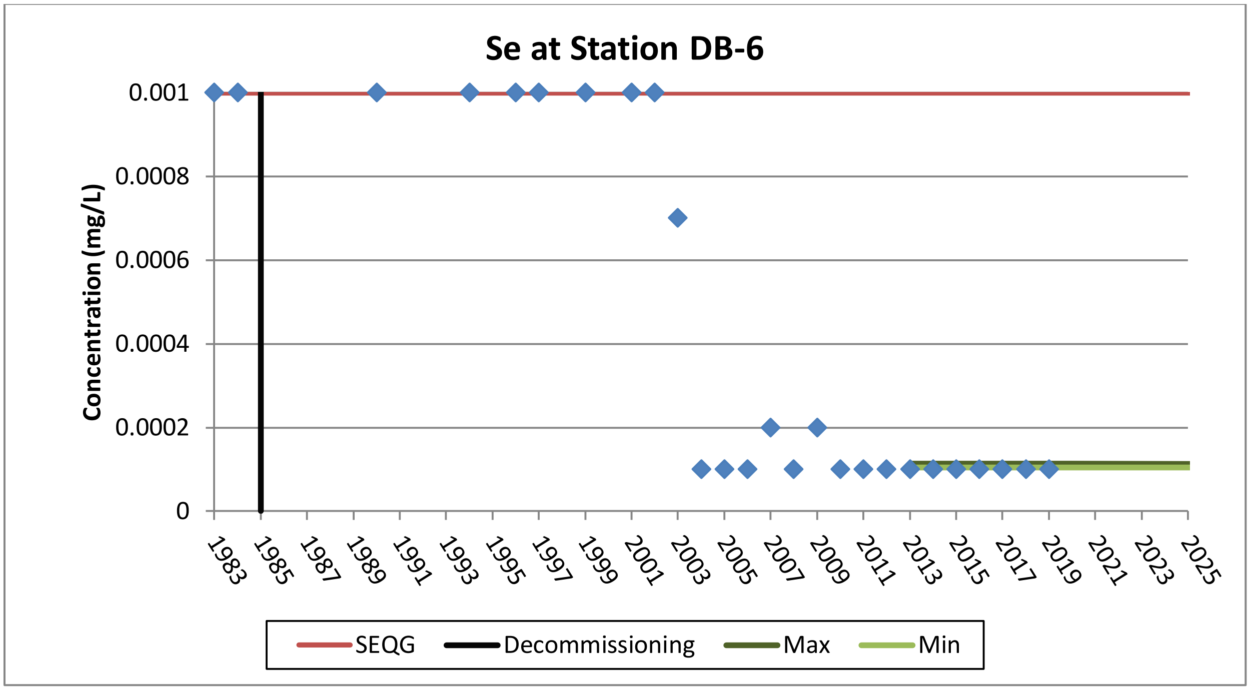


Figure 4.3.1-7 DB-6 Dubyna Creek



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

Figure 4.3.1-8 DB-6 Dubyna Creek

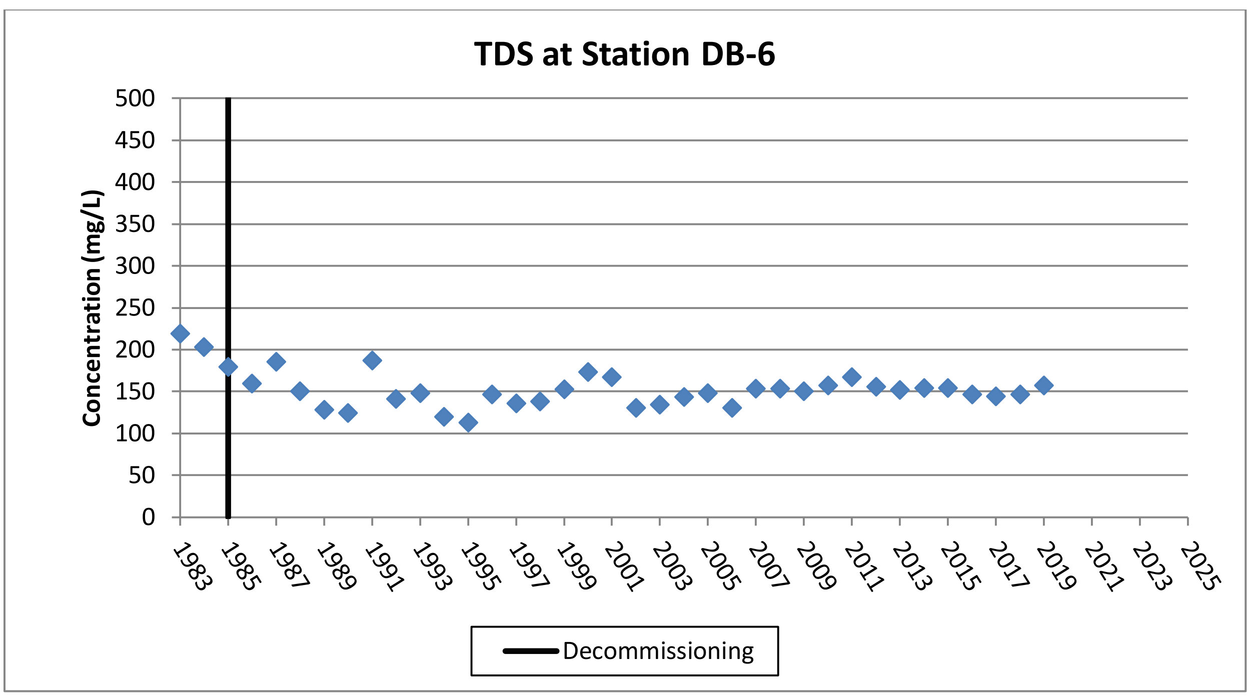


Figure 4.3.1-9 AC-6A Verna Lake Discharge to Ace Lake

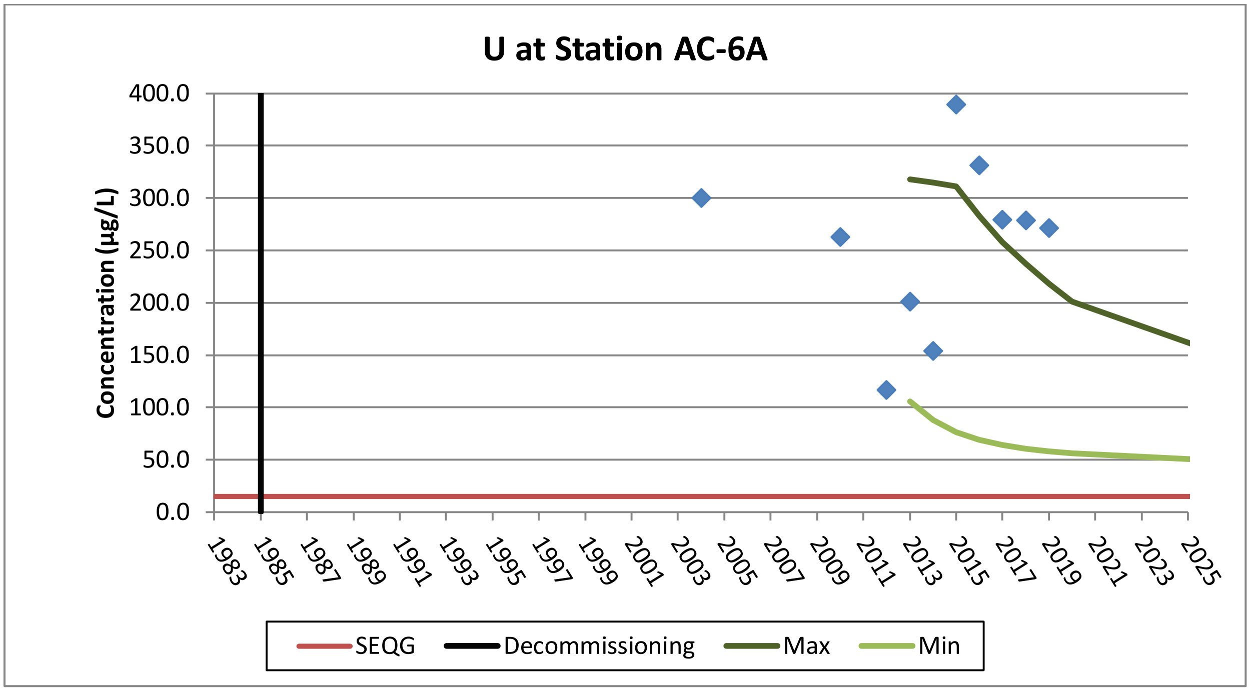


Figure 4.3.1-10 AC-6A Verna Lake Discharge to Ace Lake

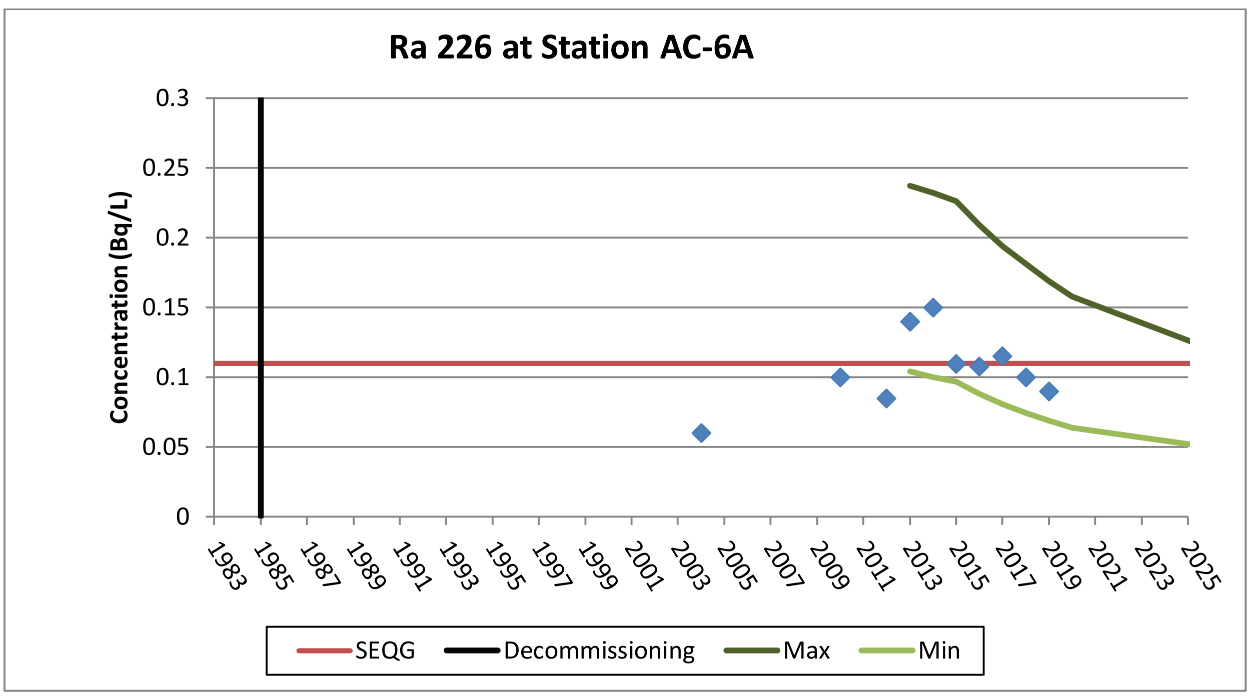
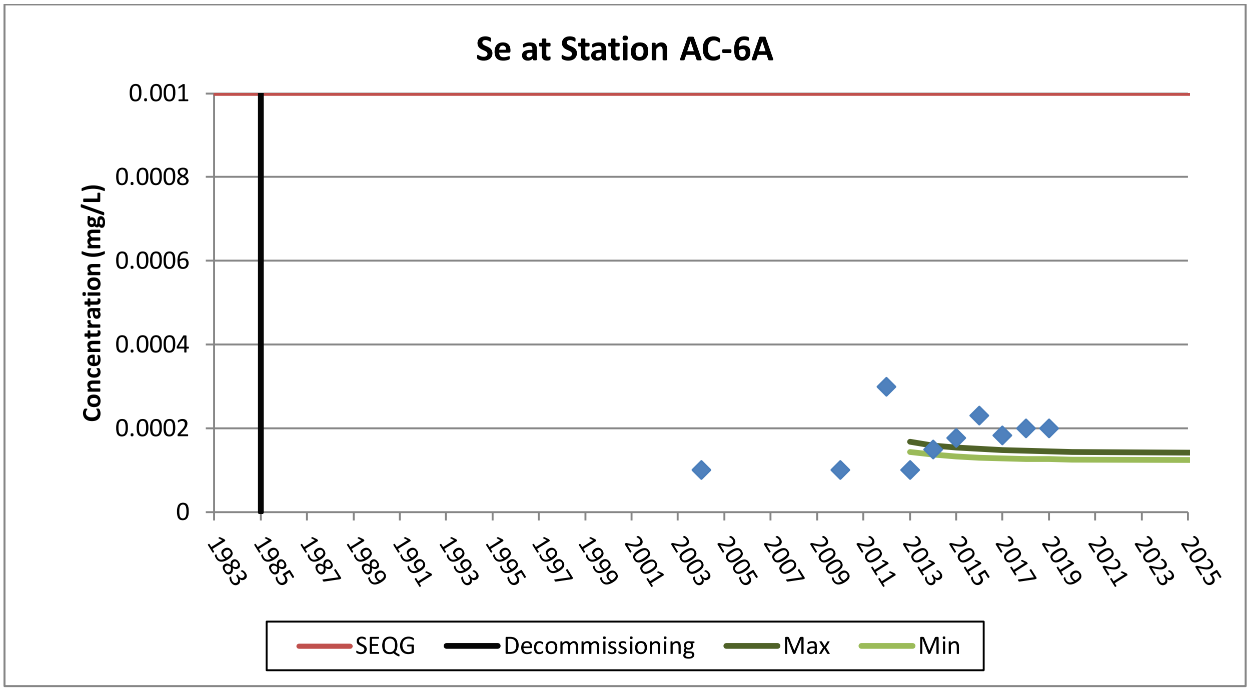


Figure 4.3.1-11 AC-6A Verna Lake Discharge to Ace Lake



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

Figure 4.3.1-12 AC-6A Verna Lake Discharge to Ace Lake

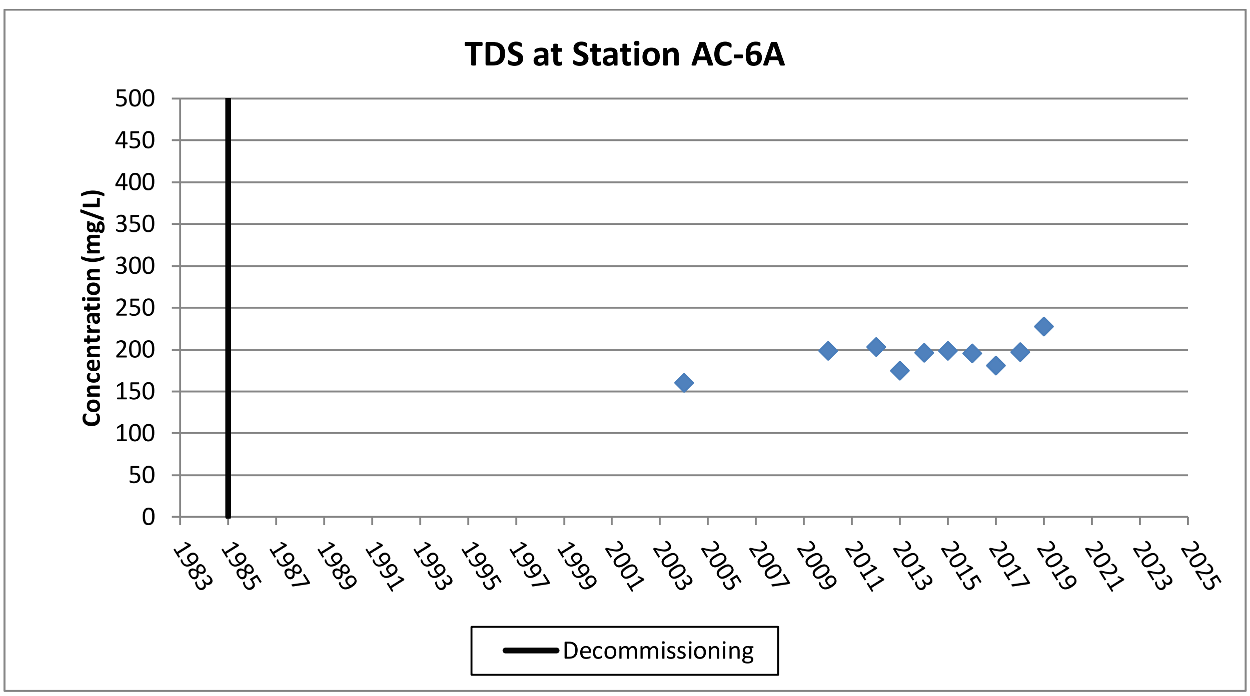


Figure 4.3.1-13 AC-8 Ace Lake Outlet to Ace Creek

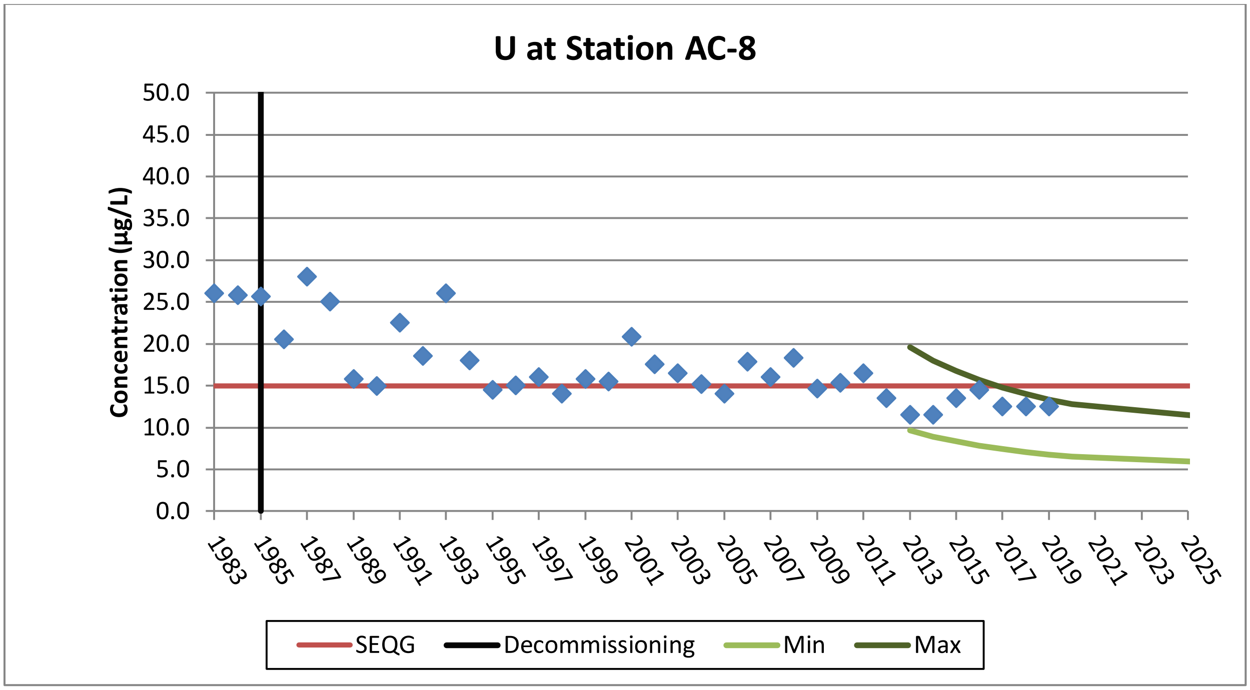


Figure 4.3.1-14 AC-8 Ace Lake Outlet to Ace Creek

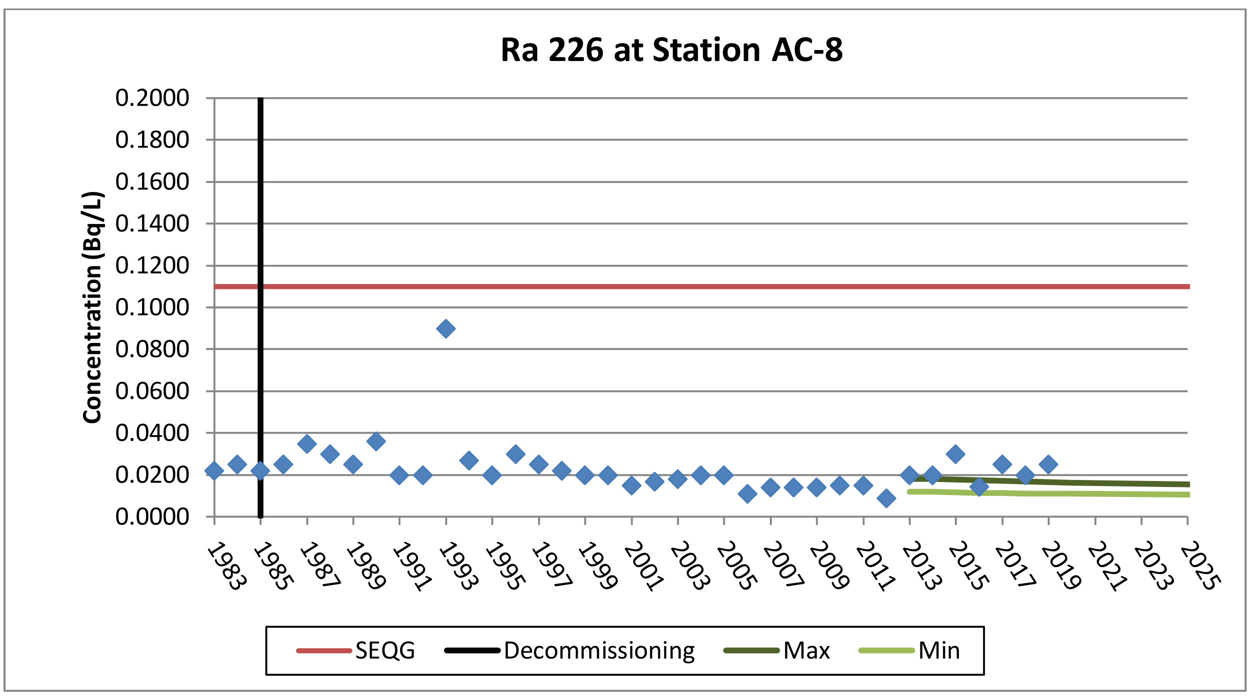
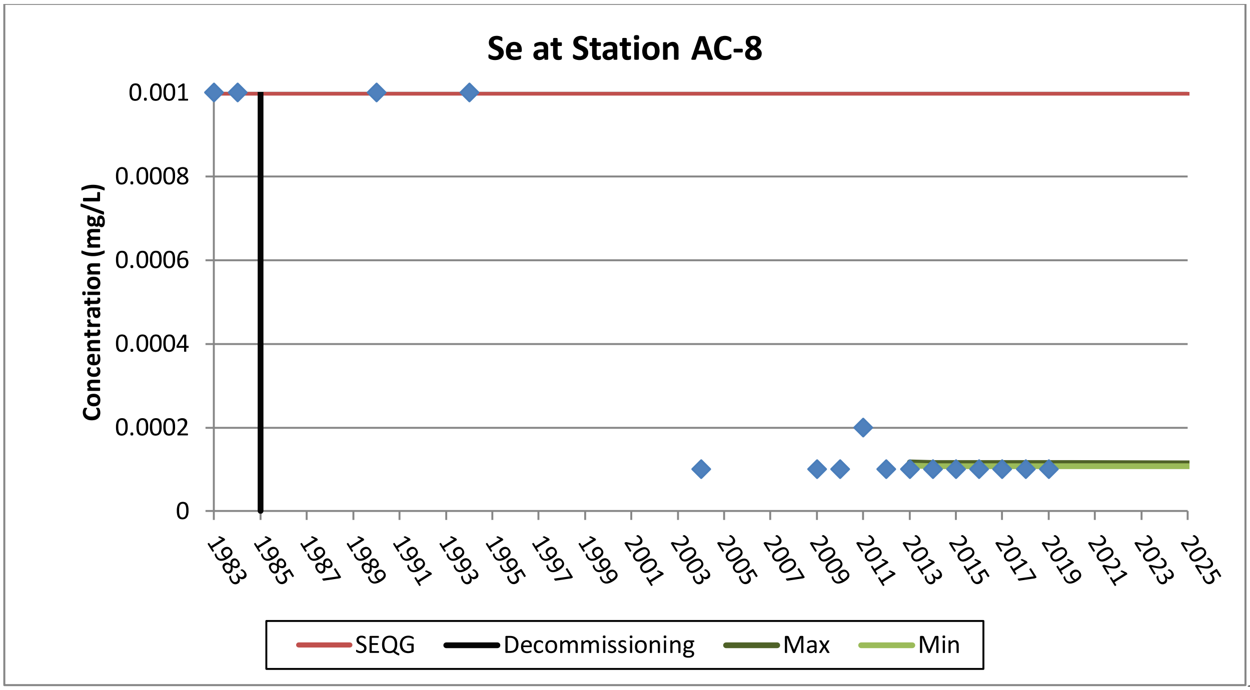


Figure 4.3.1-15 AC-8 Ace Lake Outlet to Ace Creek



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

Figure 4.3.1-16 AC-8 Ace Lake Outlet to Ace Creek

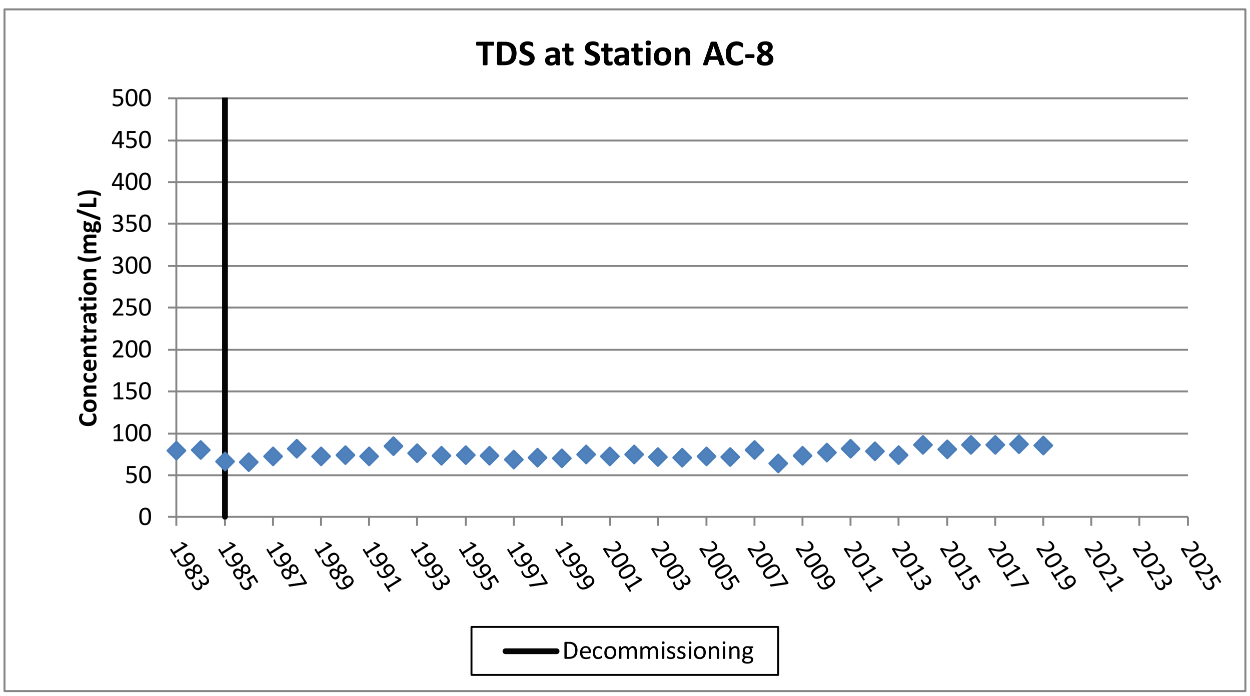


Figure 4.3.1-17 AC-14 - Ace Creek

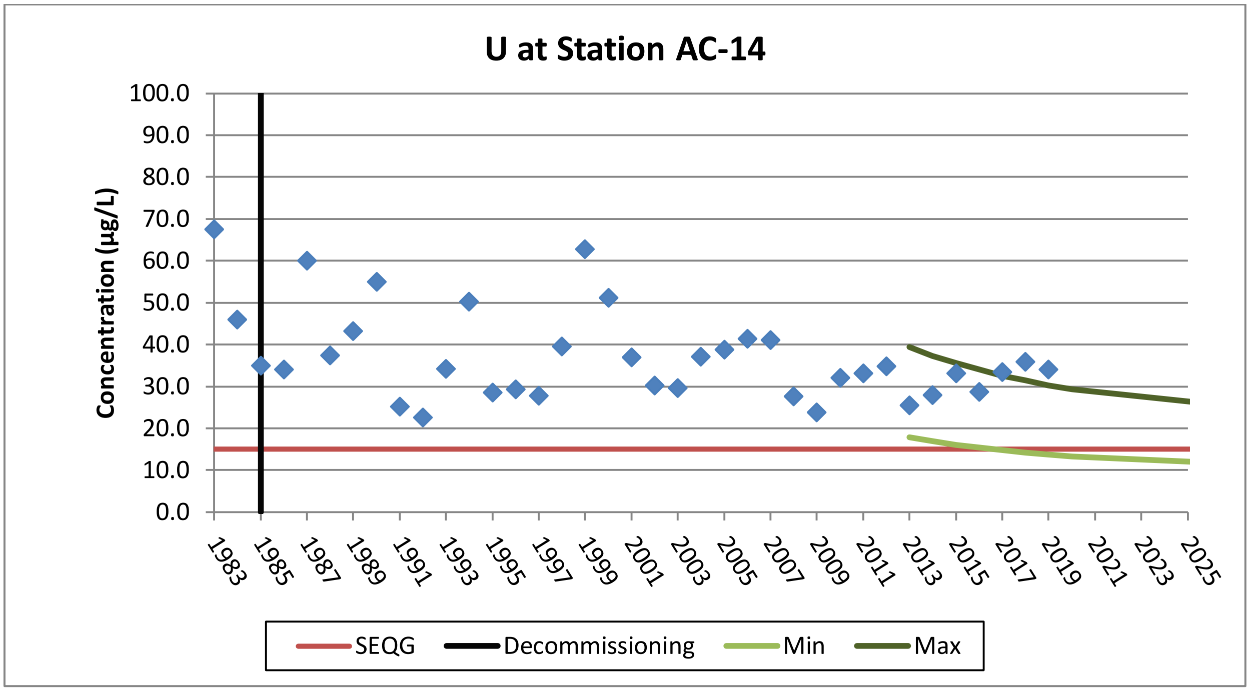


Figure 4.3.1-18 AC-14 - Ace Creek

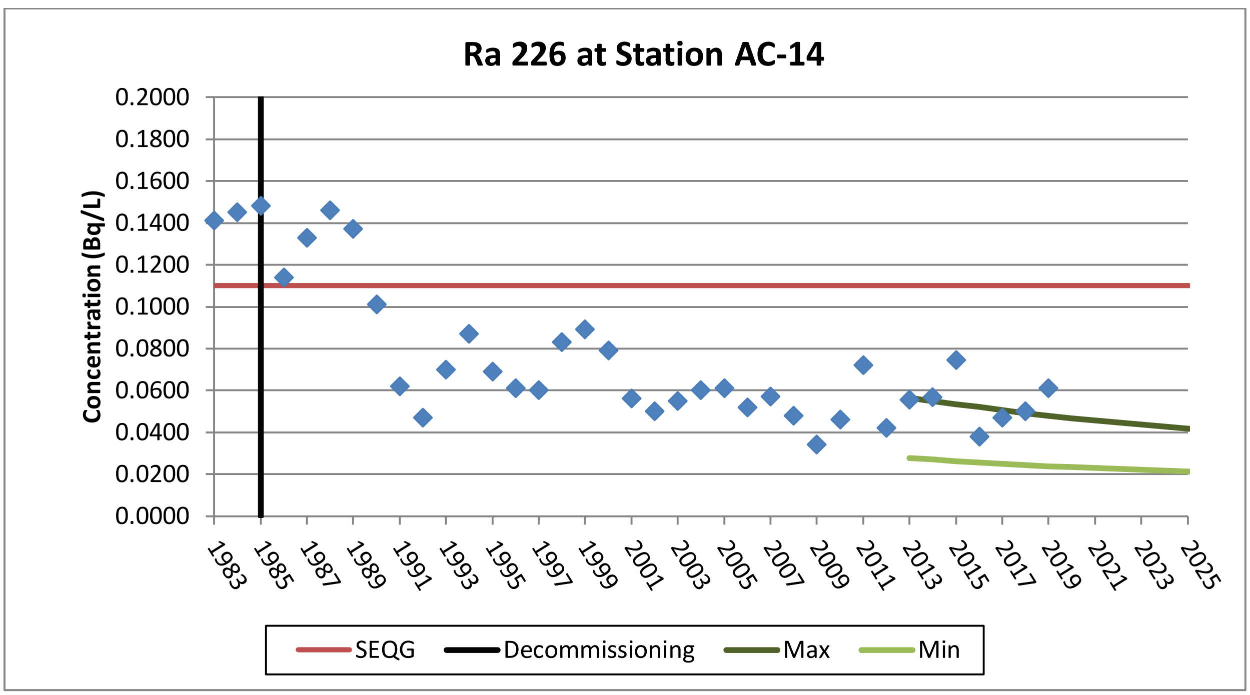
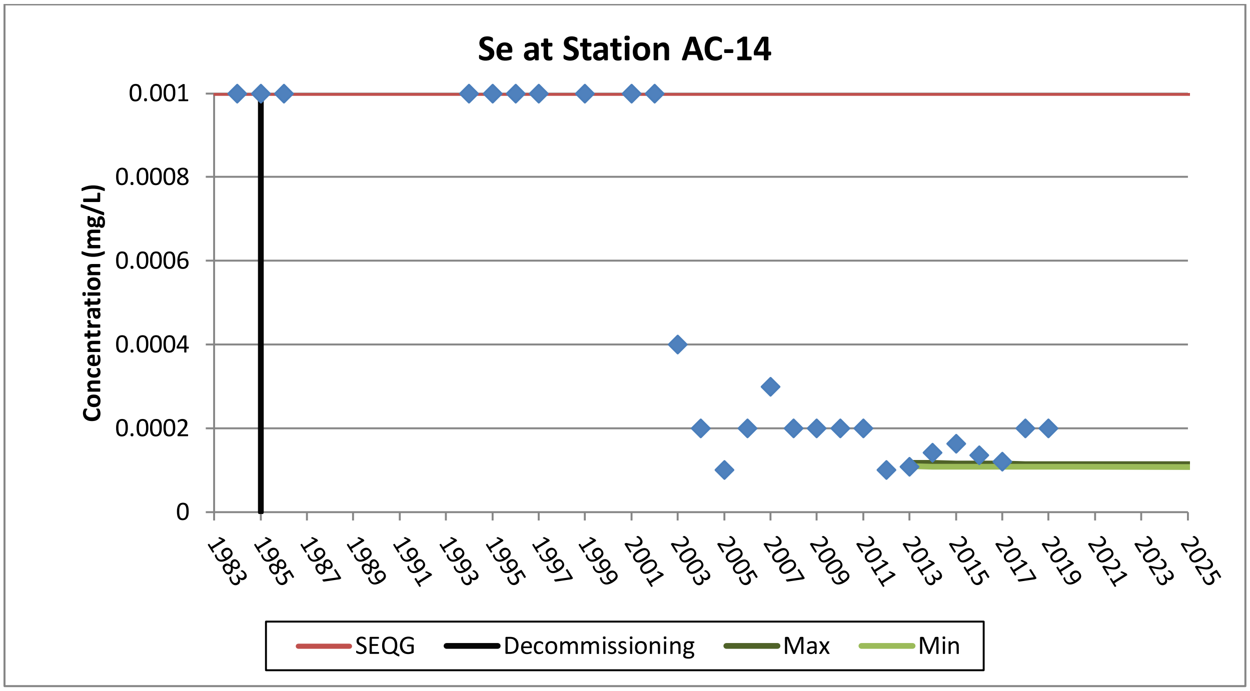


Figure 4.3.1-19 AC-14 - Ace Creek



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

Figure 4.3.1-20 AC-14 - Ace Creek

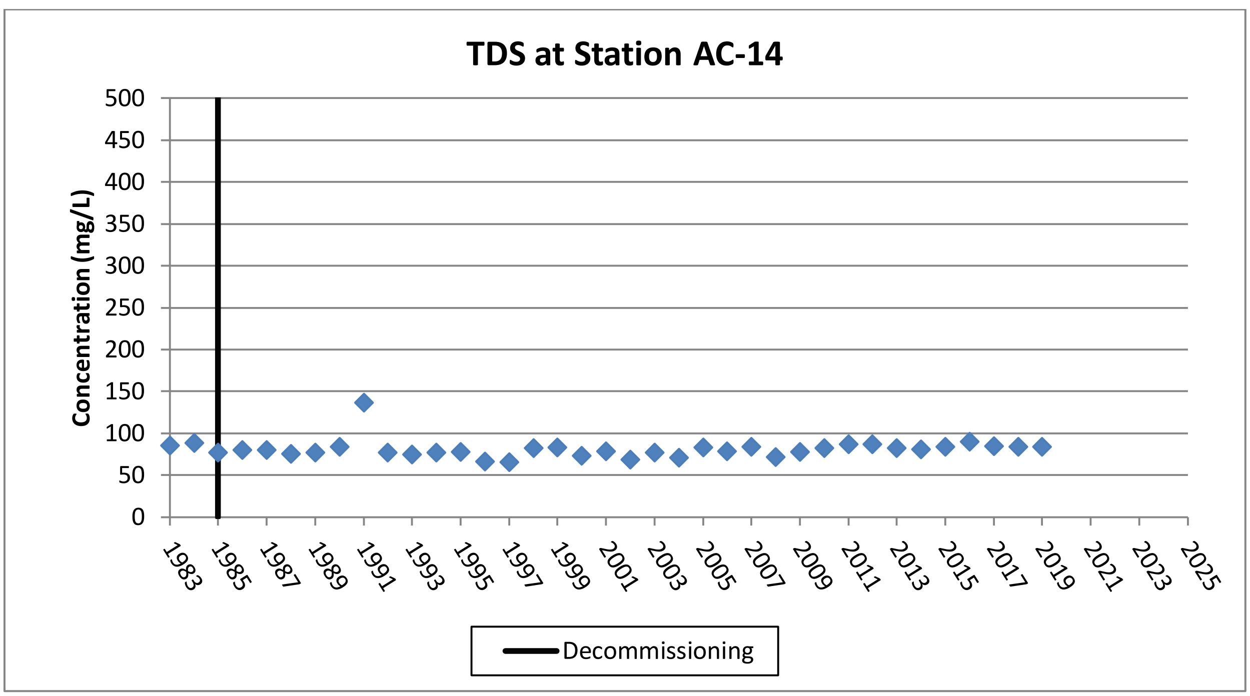
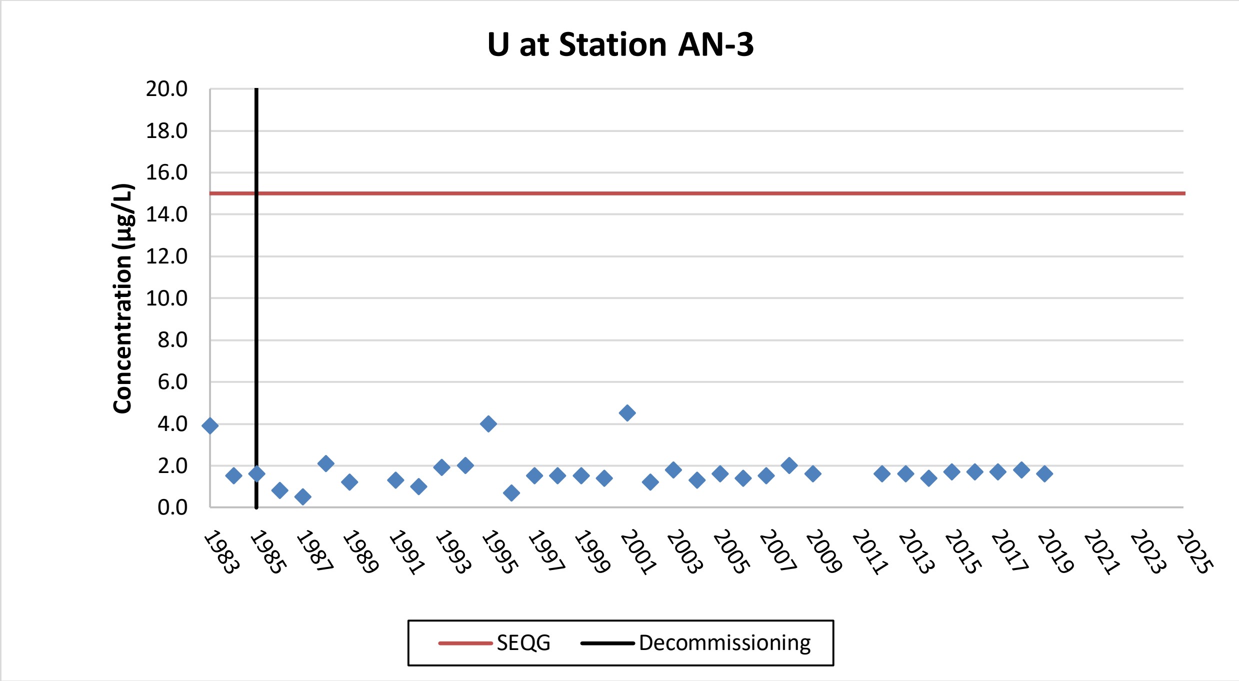
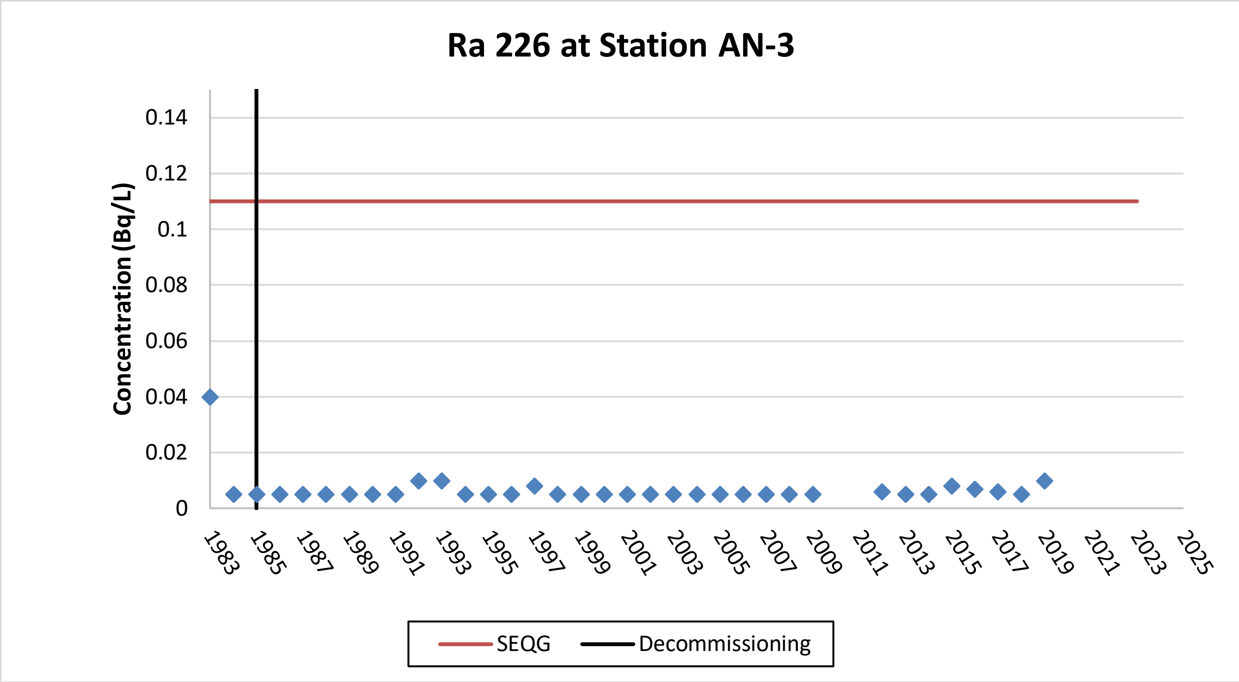


Figure 4.3.2-1 AN-3 Fulton Lake (Upstream of TL Stations)



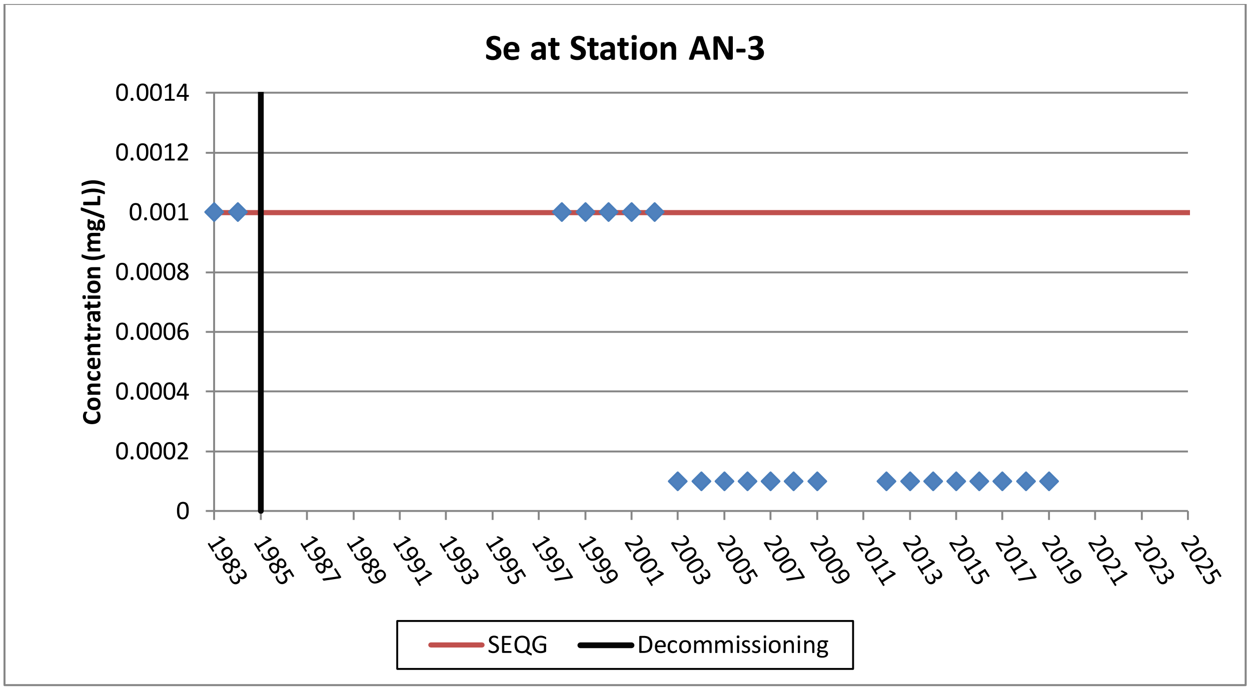
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.3.2-2 AN-3 Fulton Lake (Upstream of TL Stations)



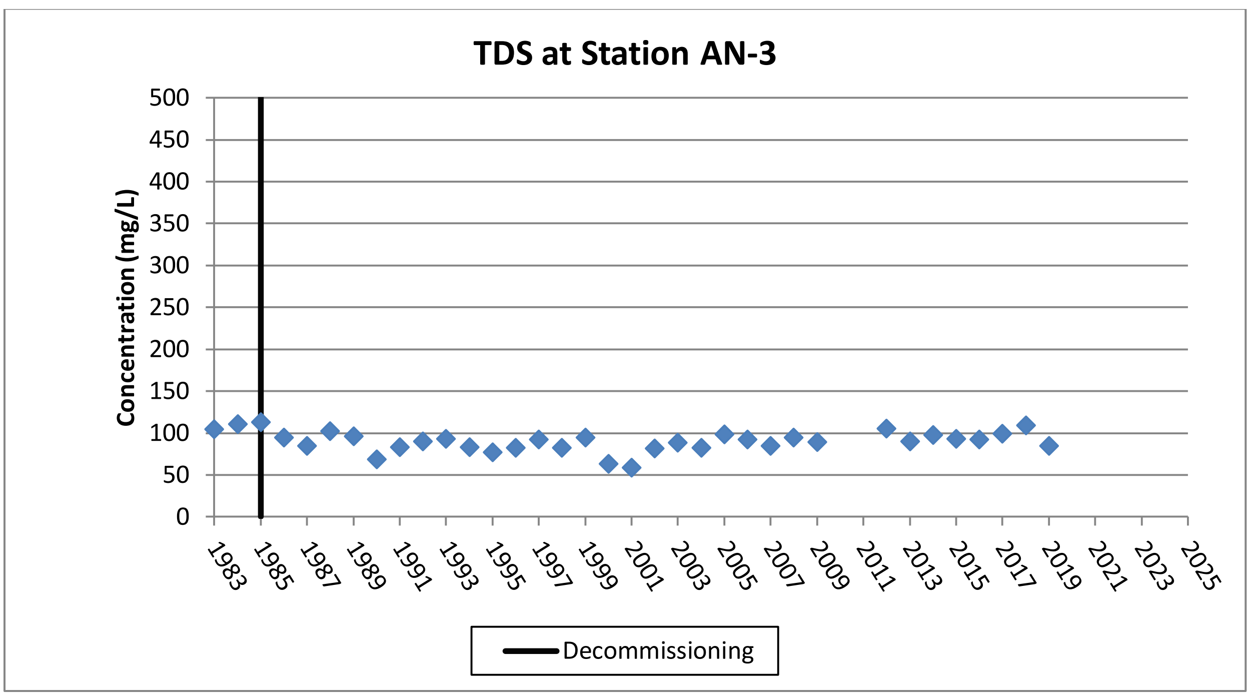
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.3.2-3 AN-3 Fulton Lake (Upstream of TL Stations)



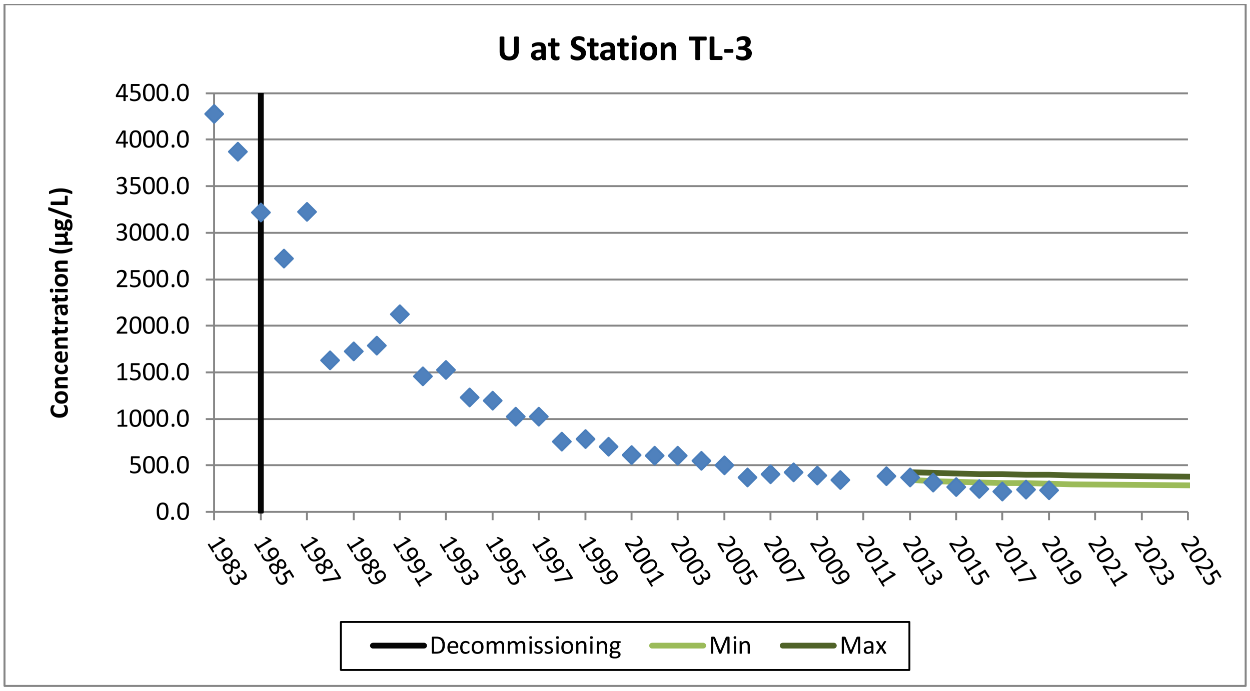
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003.

Figure 4.3.2-4 AN-3 Fulton Lake (Upstream of TL Stations)



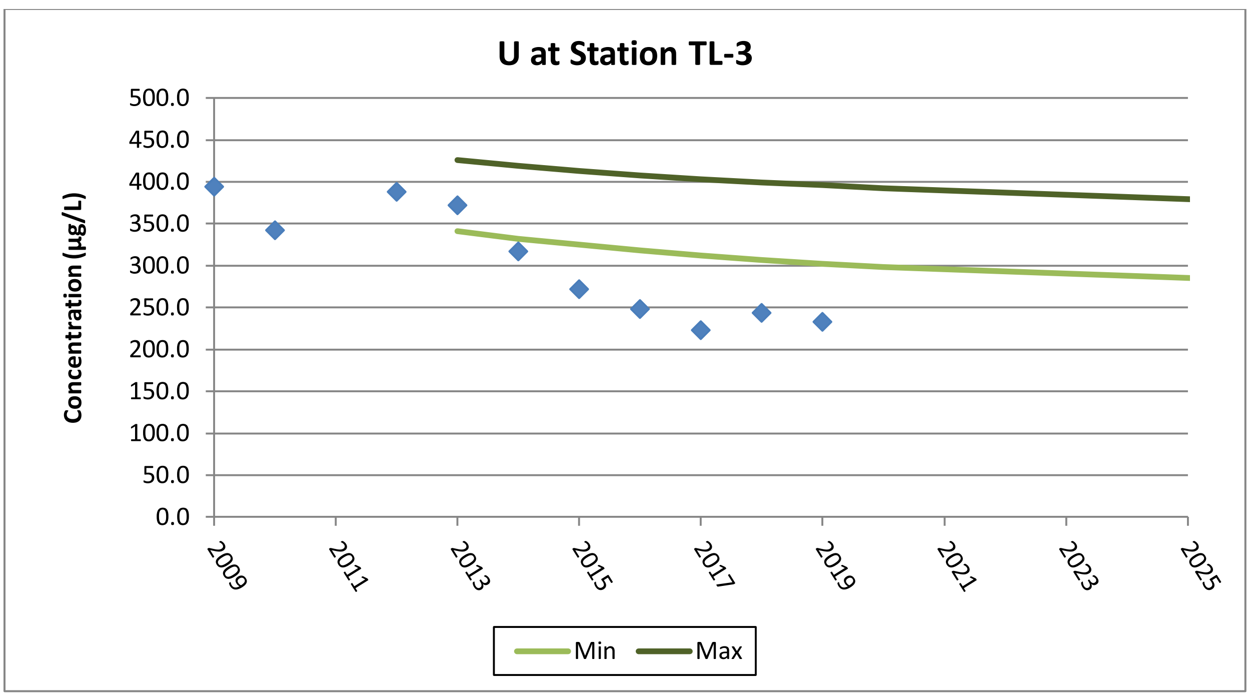
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

Figure 4.3.2-5 TL-3 Fookes Reservoir Discharge



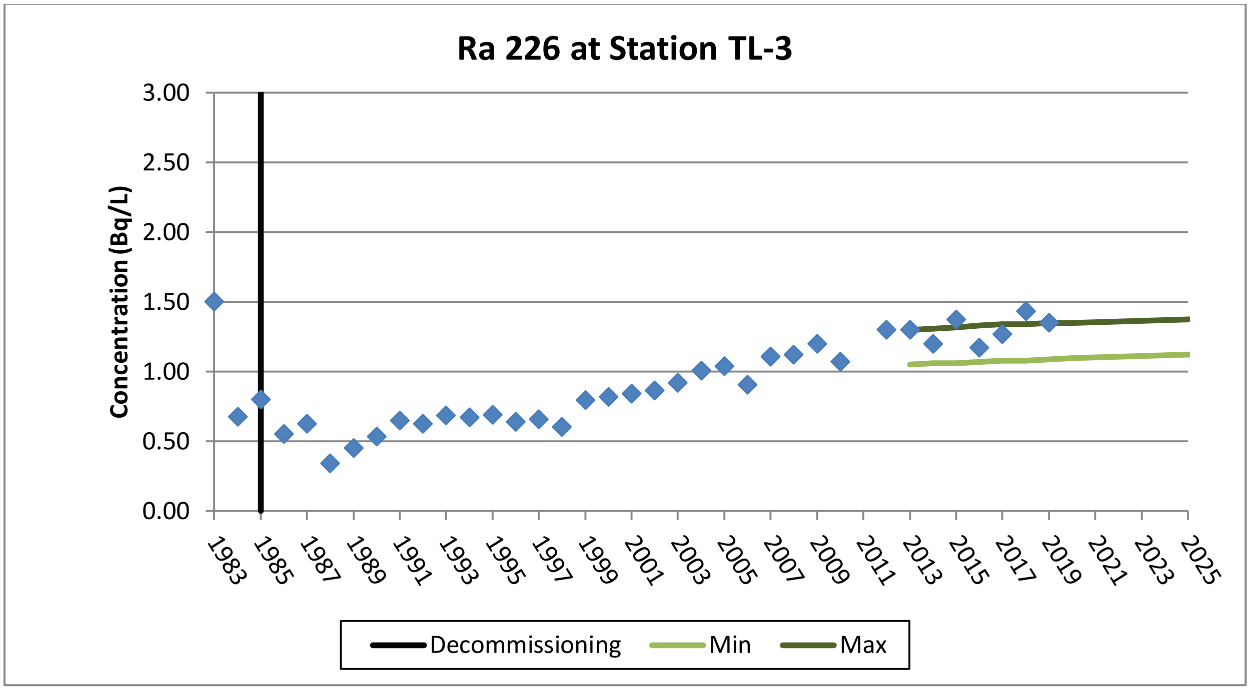
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-6 TL-3 Fookes Reservoir Discharge – Detailed Trend



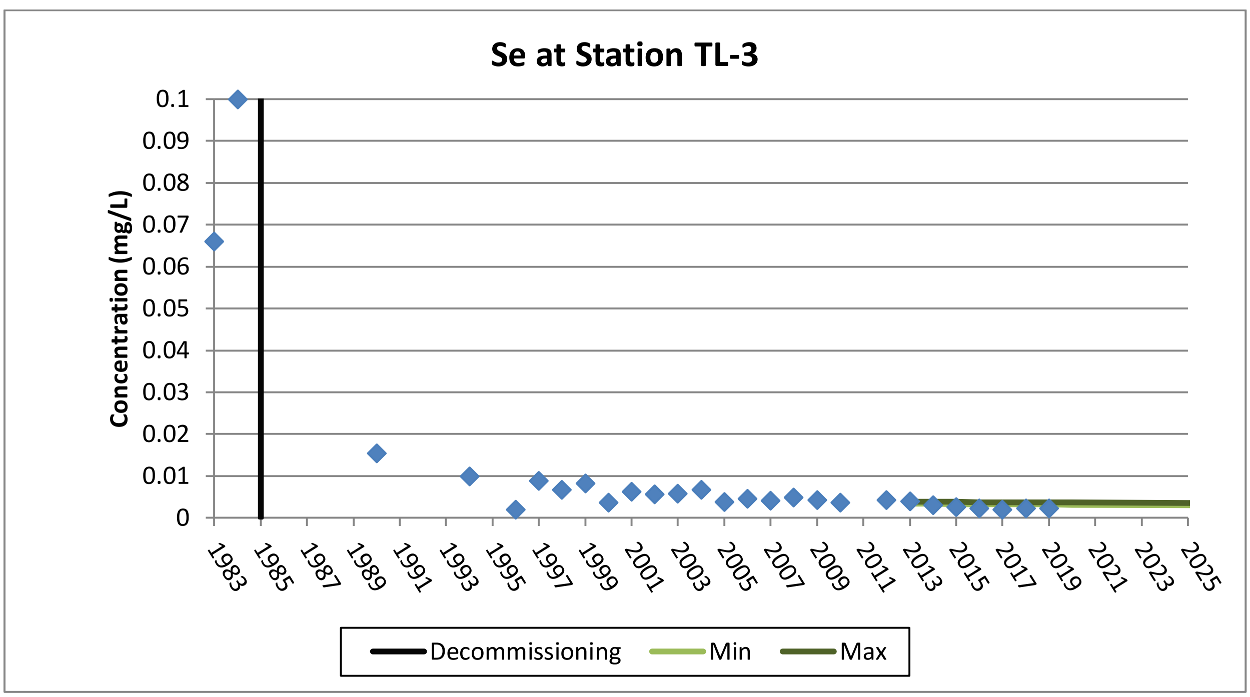
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-7 TL-3 Fookes Reservoir Discharge



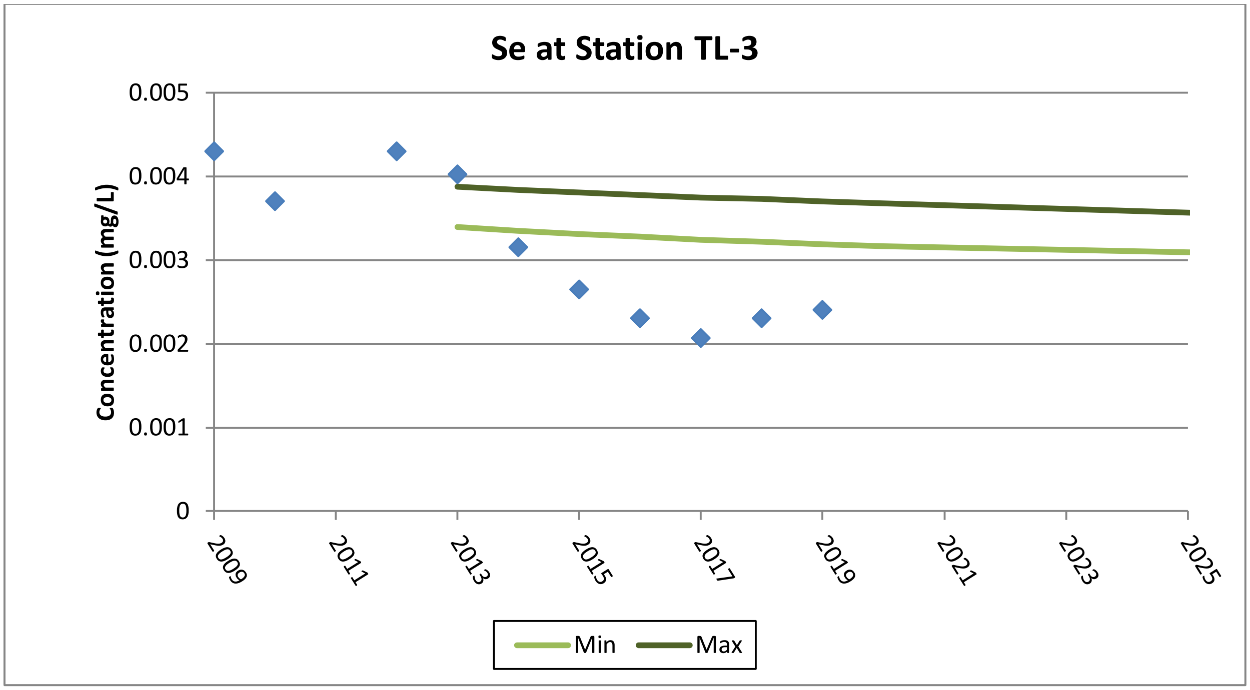
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-8 TL-3 Fookes Reservoir Discharge



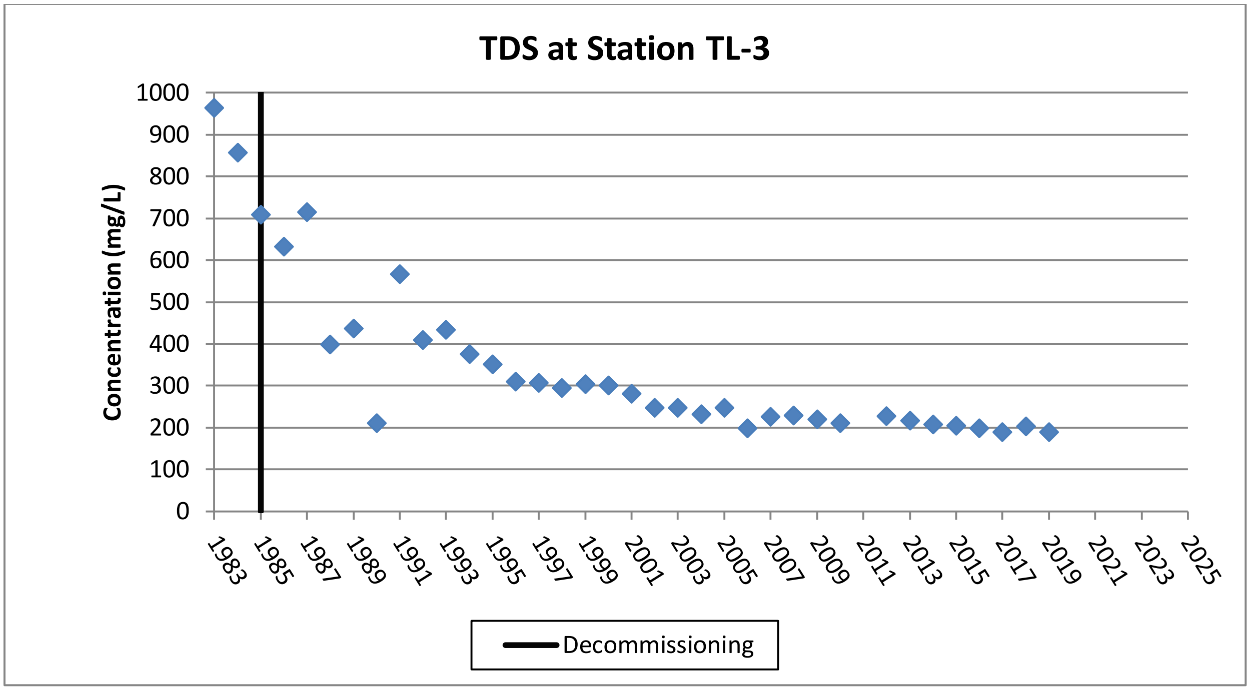
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-9 TL-3 Fookes Reservoir Discharge – Detailed Trend



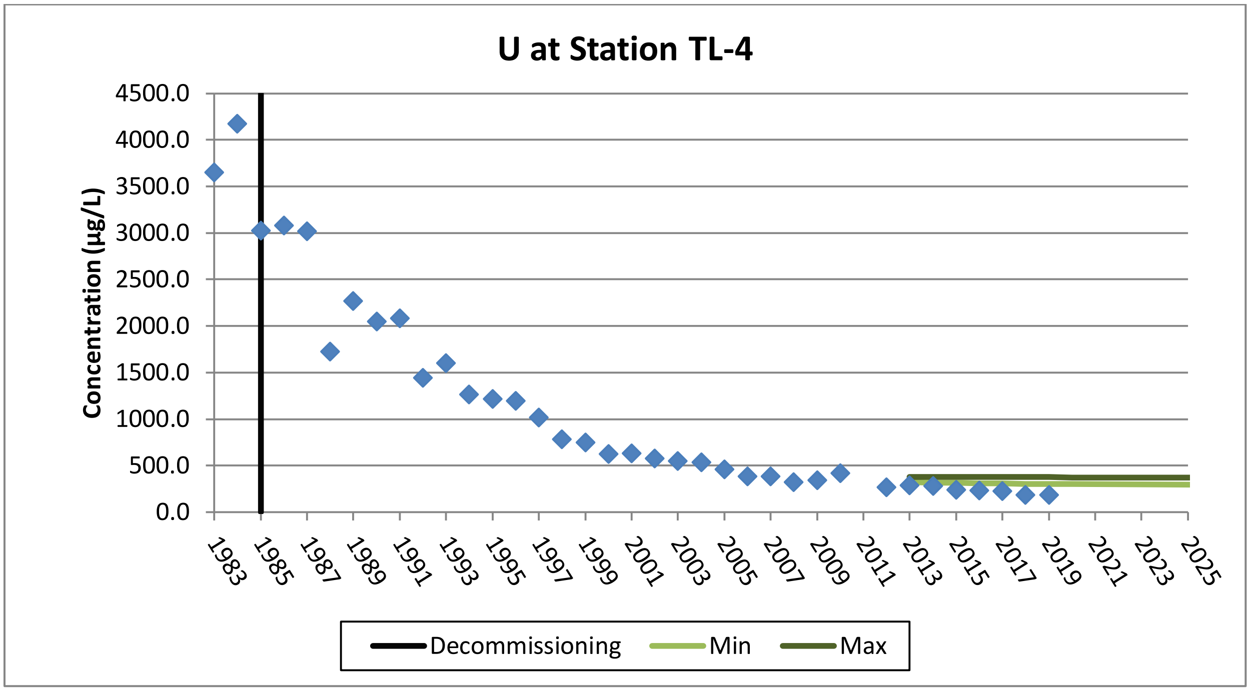
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-10 TL-3 Fookes Reservoir Discharge



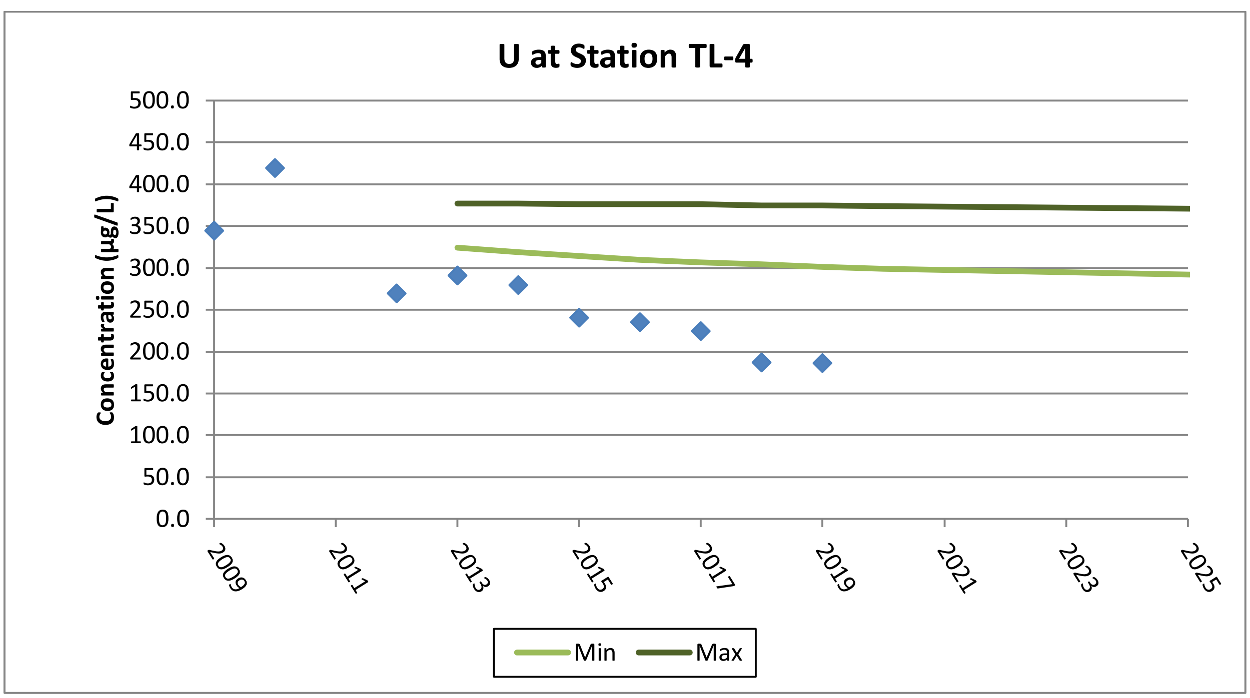
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-11 TL-4 Marie Reservoir Discharge



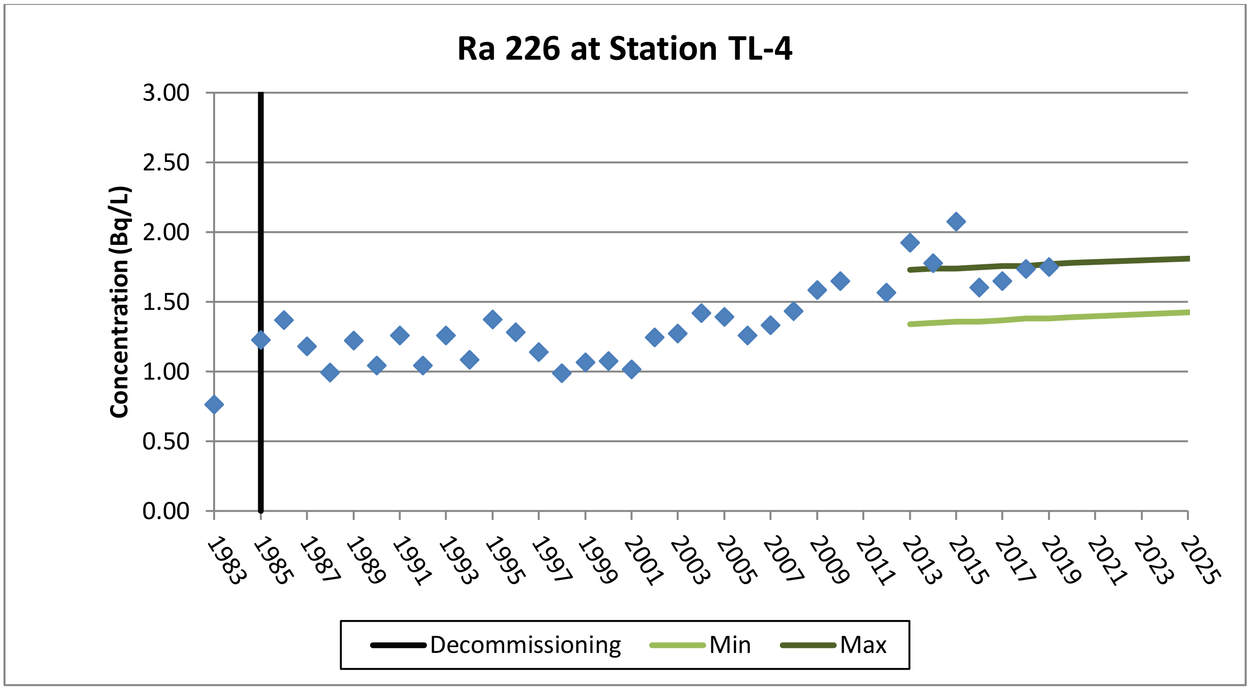
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-12 TL-4 Marie Reservoir Discharge – Detailed Trend



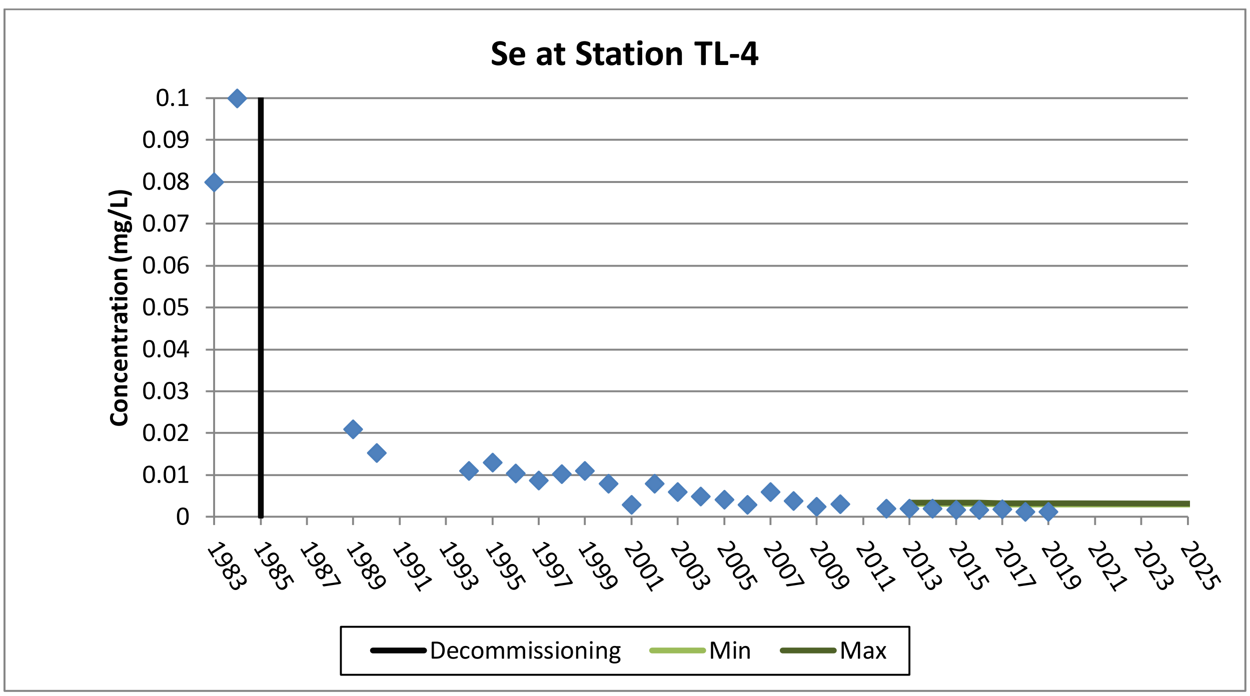
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-13 TL-4 Marie Reservoir Discharge



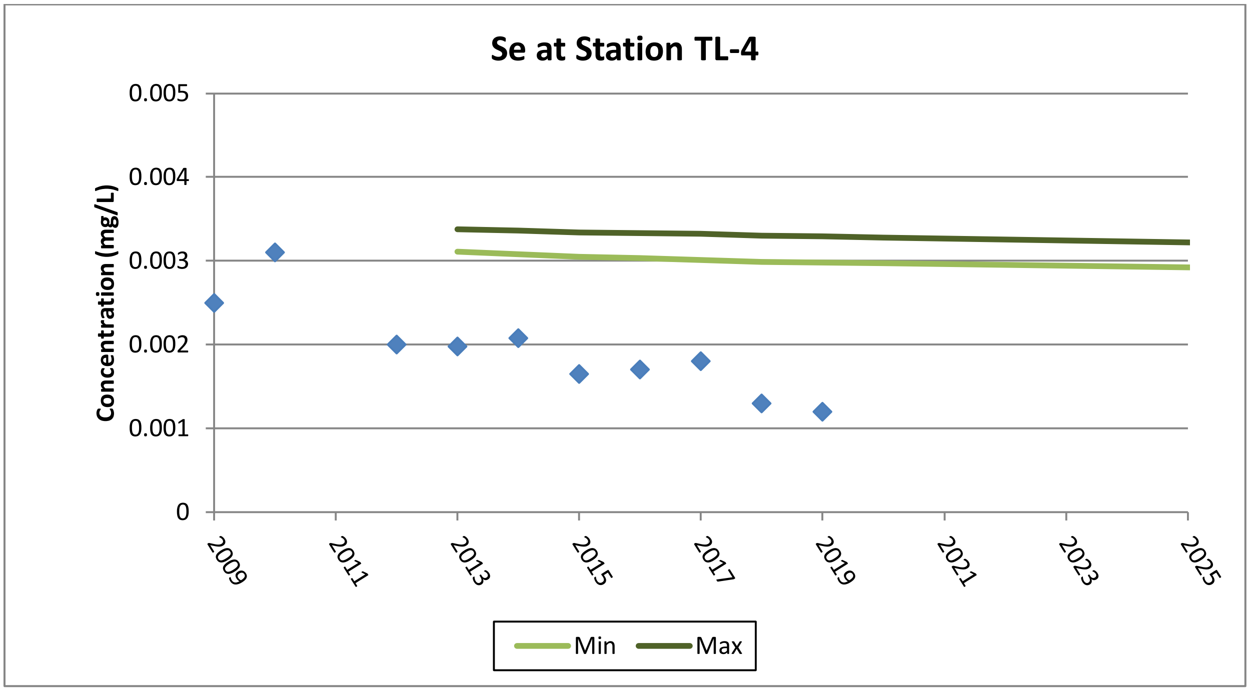
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-14 TL-4 Marie Reservoir Discharge



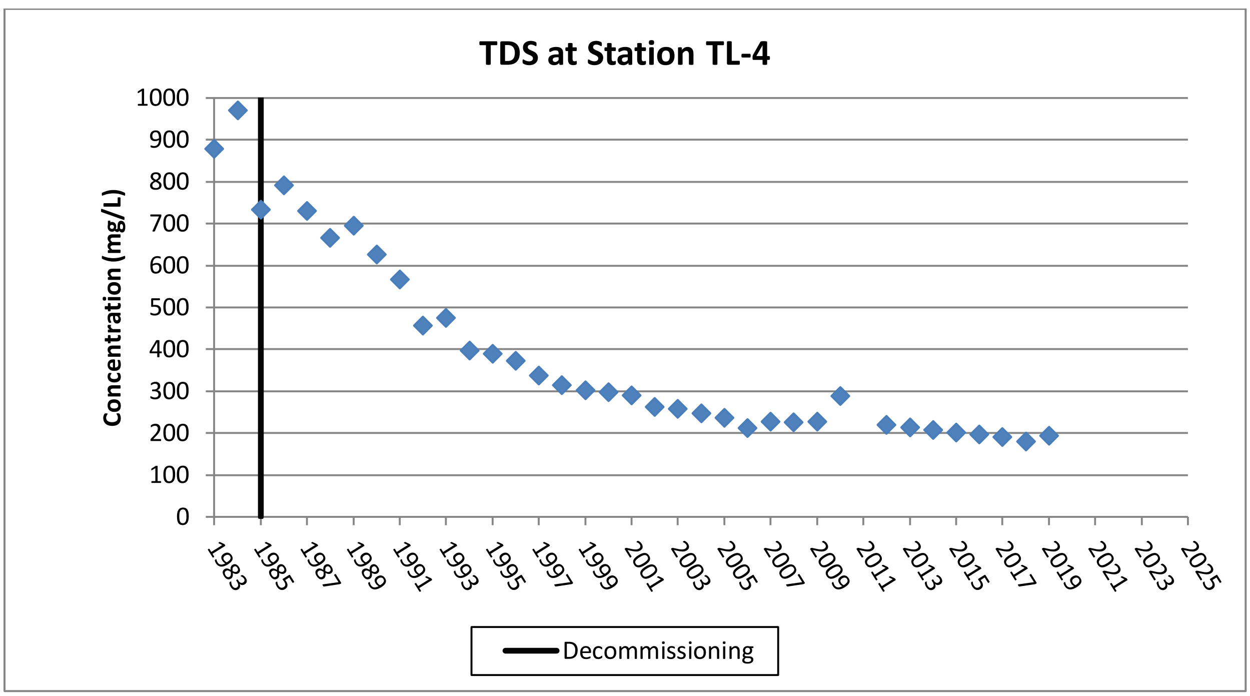
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-15 TL-4 Marie Reservoir Discharge – Detailed Trend



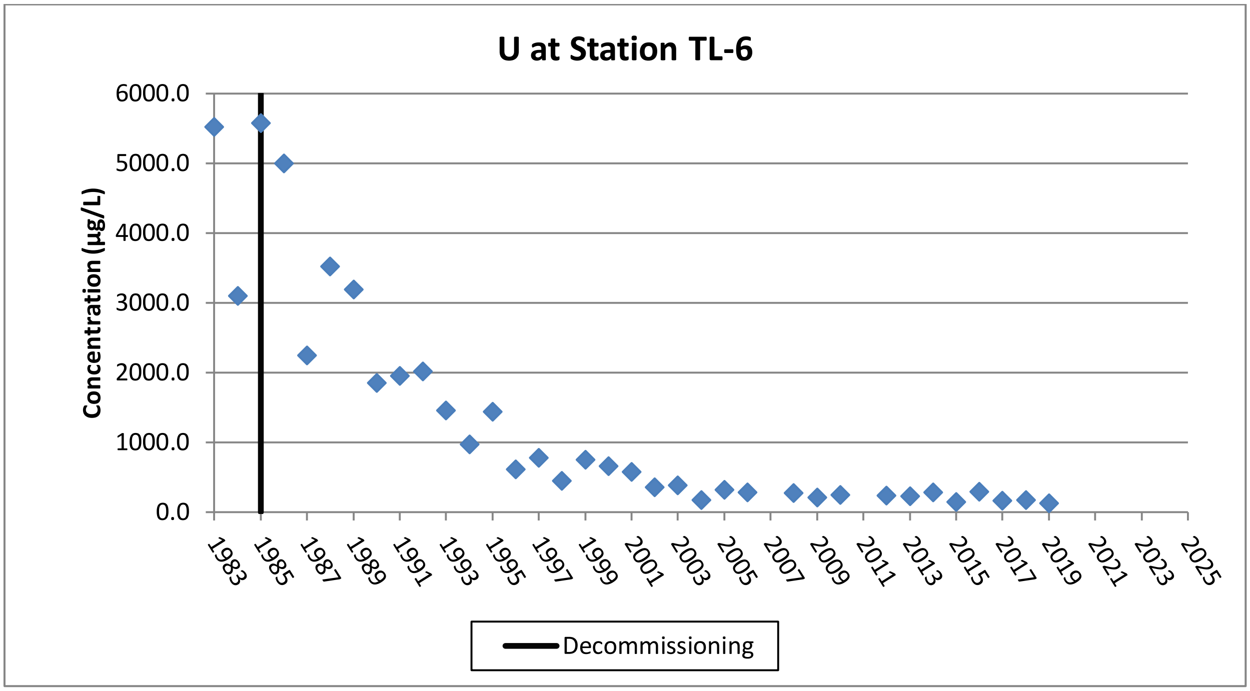
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-16 TL-4 Marie Reservoir Discharge



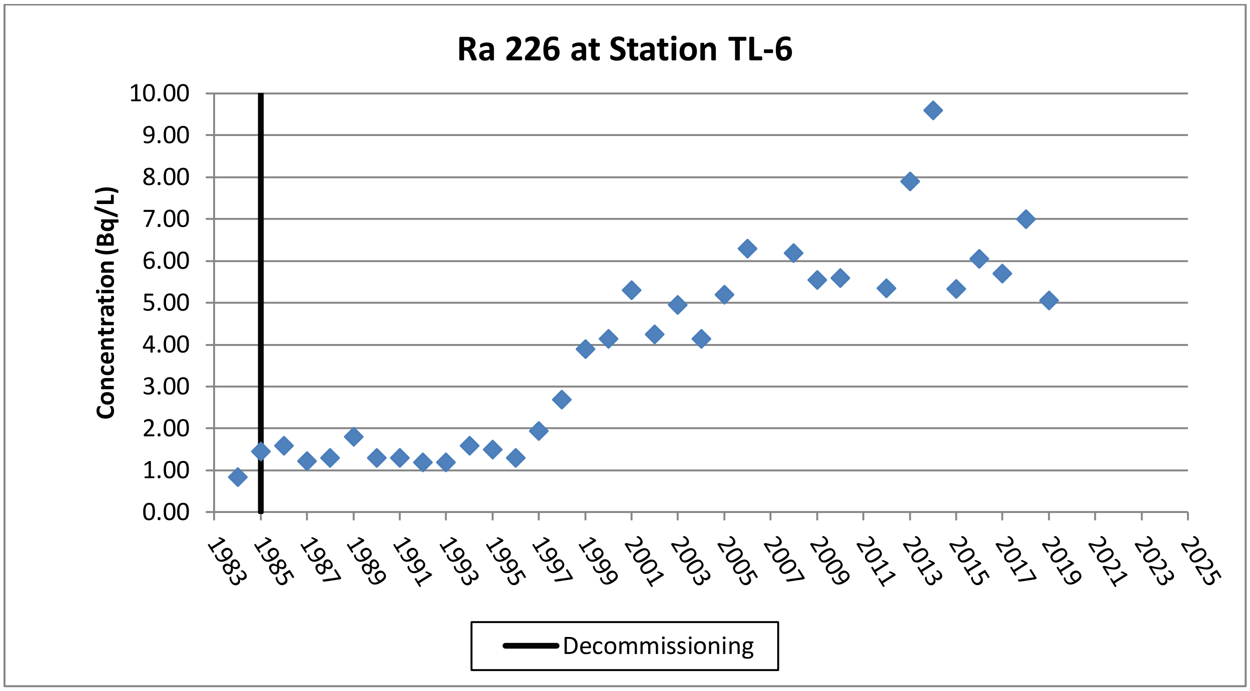
**No data available for 2011 due to a lack of water flow.*

Figure 4.3.2-17 TL-6 Minewater Reservoir Discharge



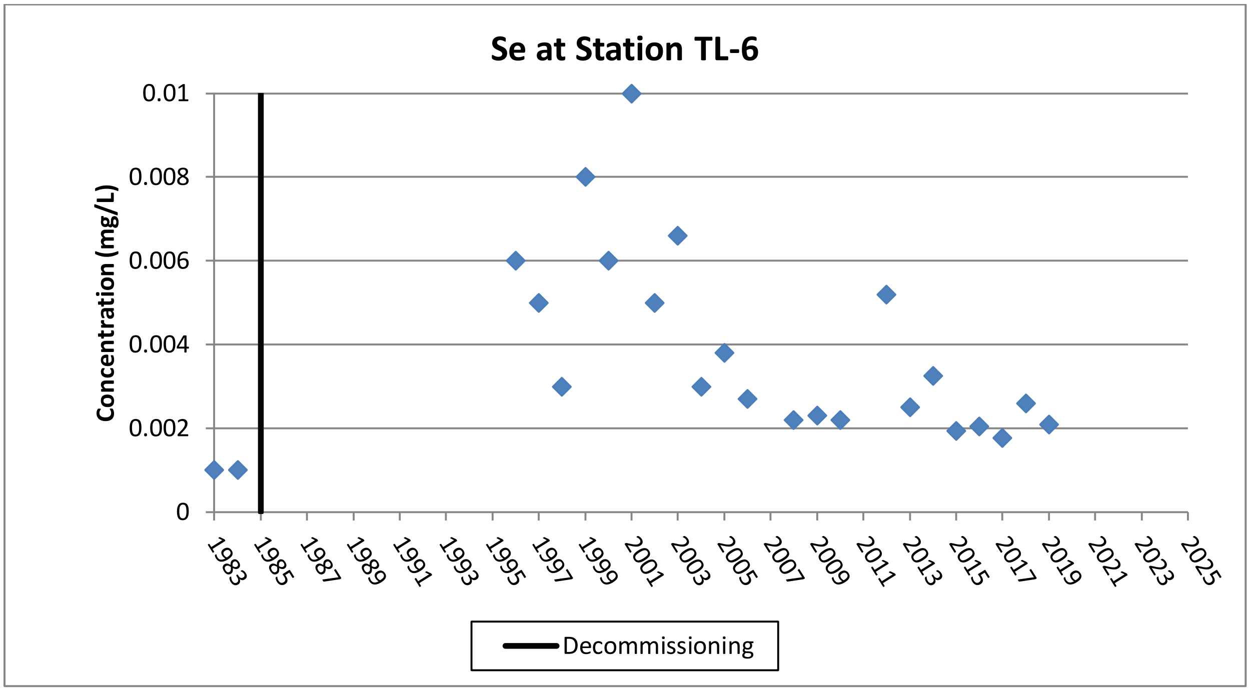
**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.3.2-18 TL-6 Minewater Reservoir Discharge



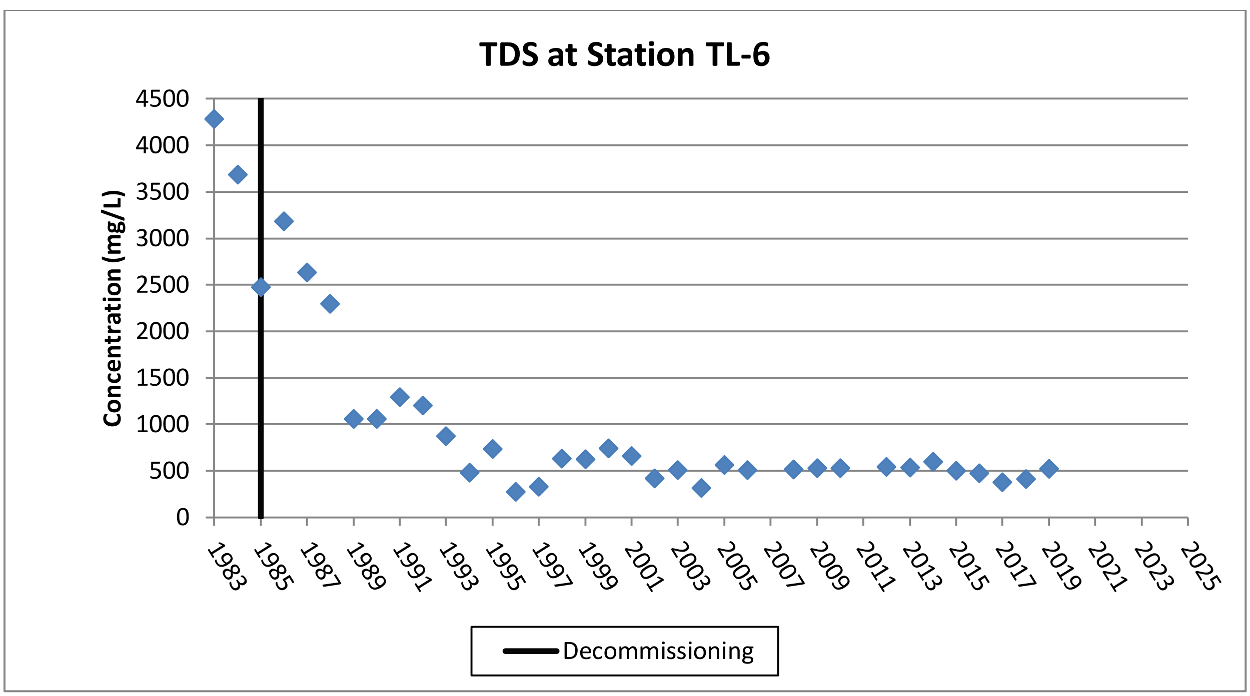
**No data available for 2007 and 2011 due to a lack of water flow.*

Figure 4.3.2-19 TL-6 Minewater Reservoir Discharge



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

Figure 4.3.2-20 TL-6 Minewater Reservoir Discharge



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

Figure 4.3.2-21 TL-7 Meadow Fen Discharge

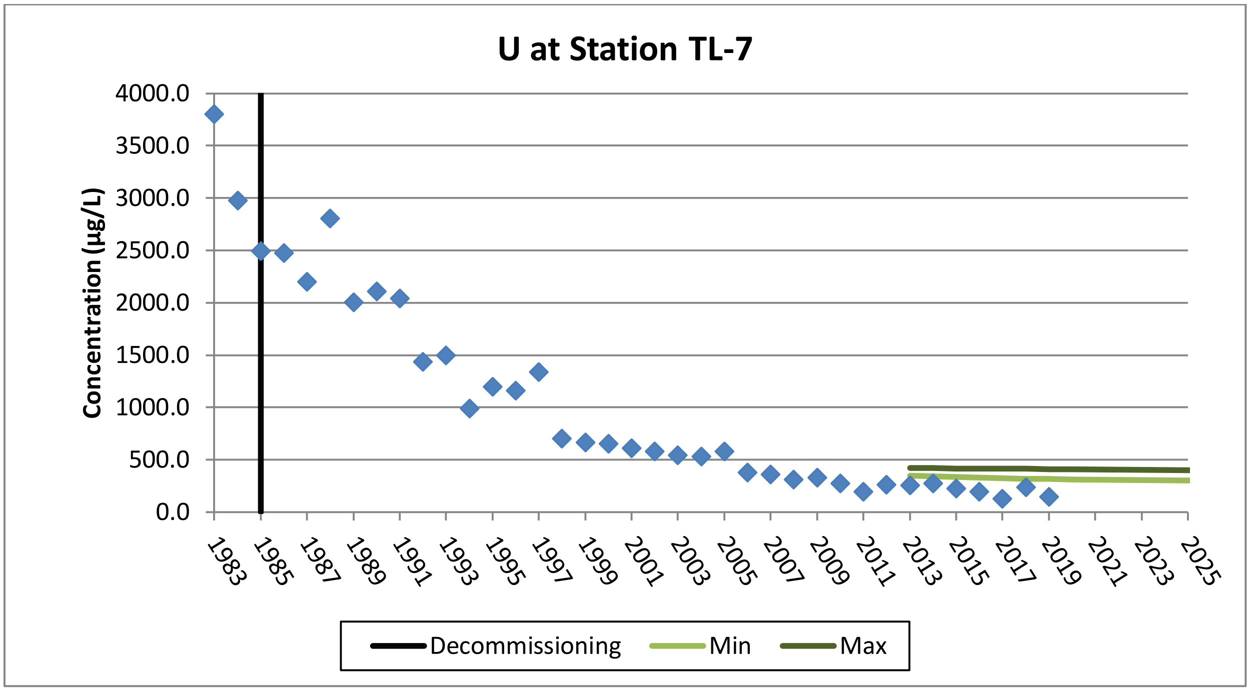


Figure 4.3.2-22 TL-7 Meadow Fen Discharge - Detailed Trend

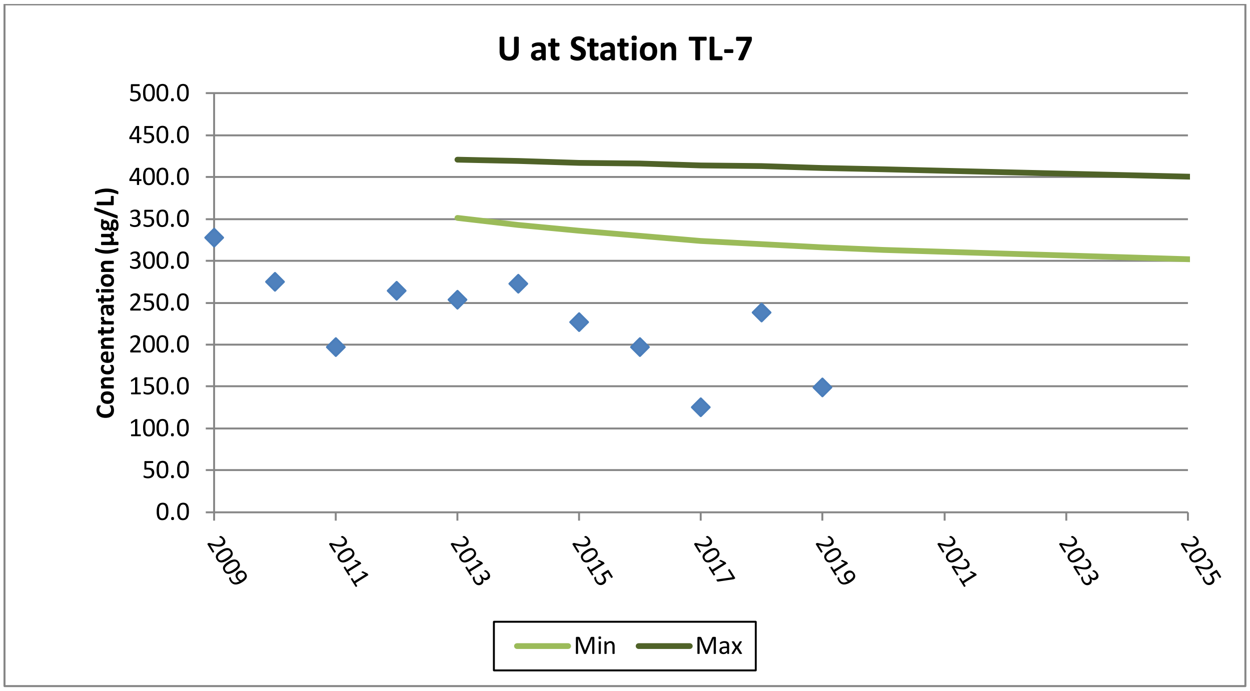


Figure 4.3.2-23 TL-7 Meadow Fen Discharge

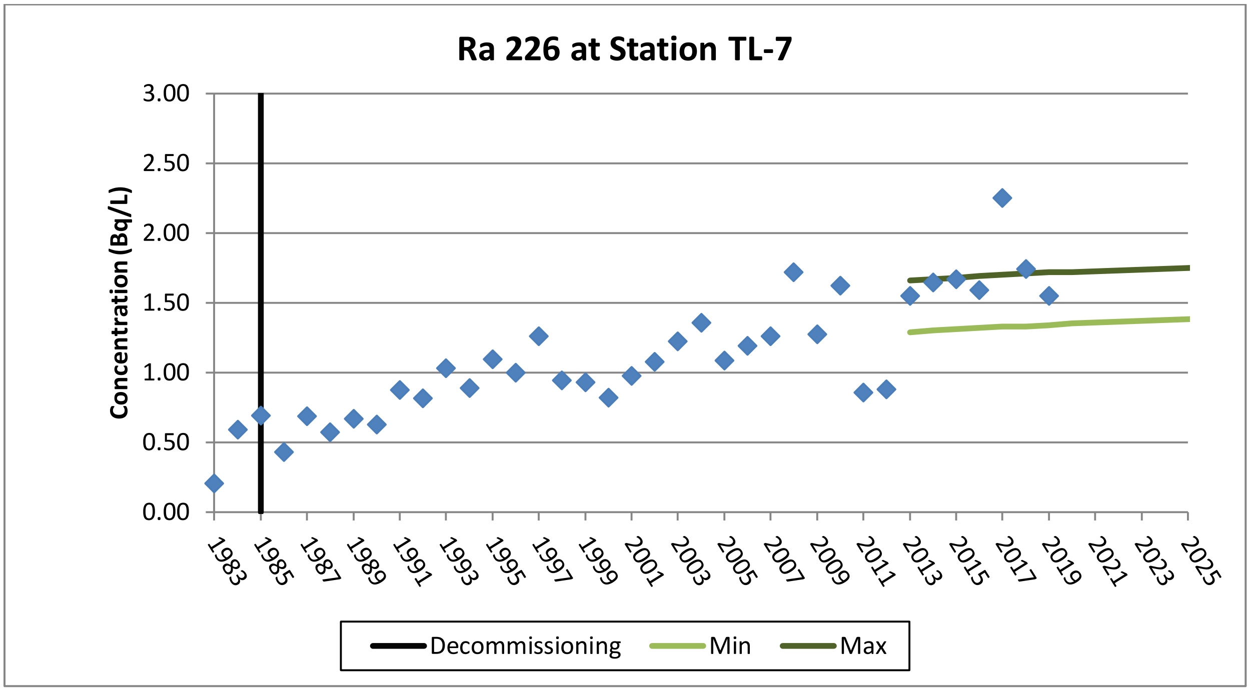


Figure 4.3.2-24 TL-7 Meadow Fen Discharge

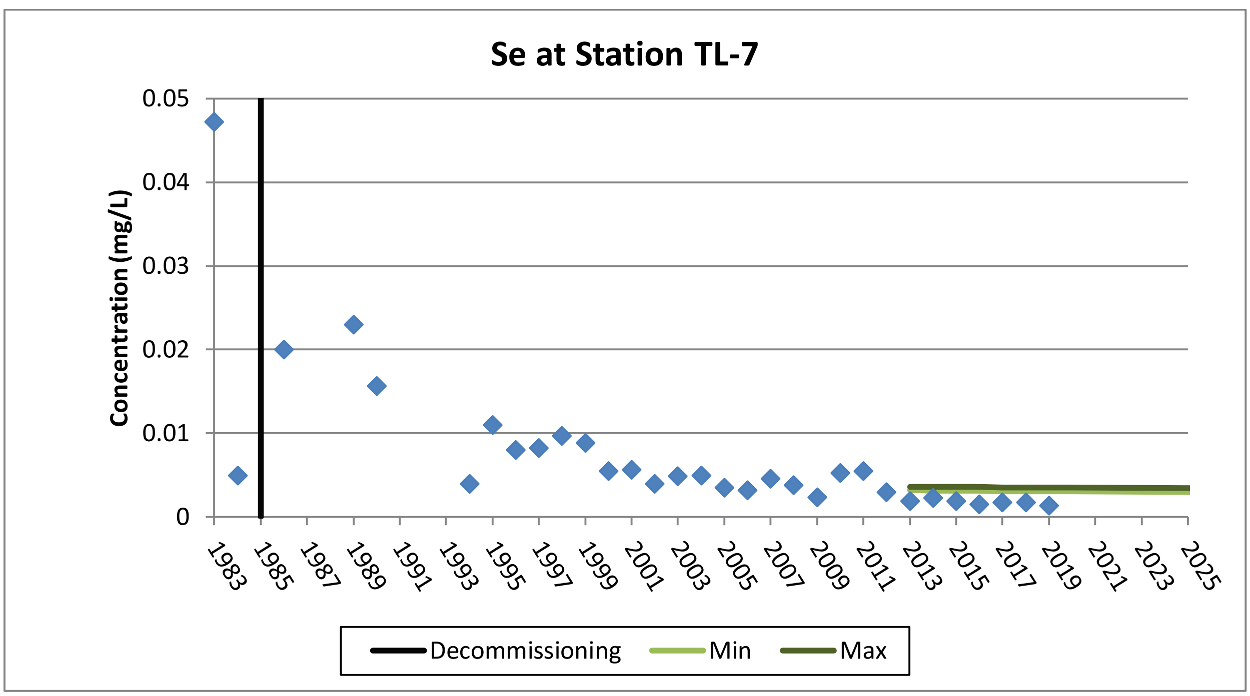


Figure 4.3.2-25 TL-7 Meadow Fen Discharge – Detailed Trend

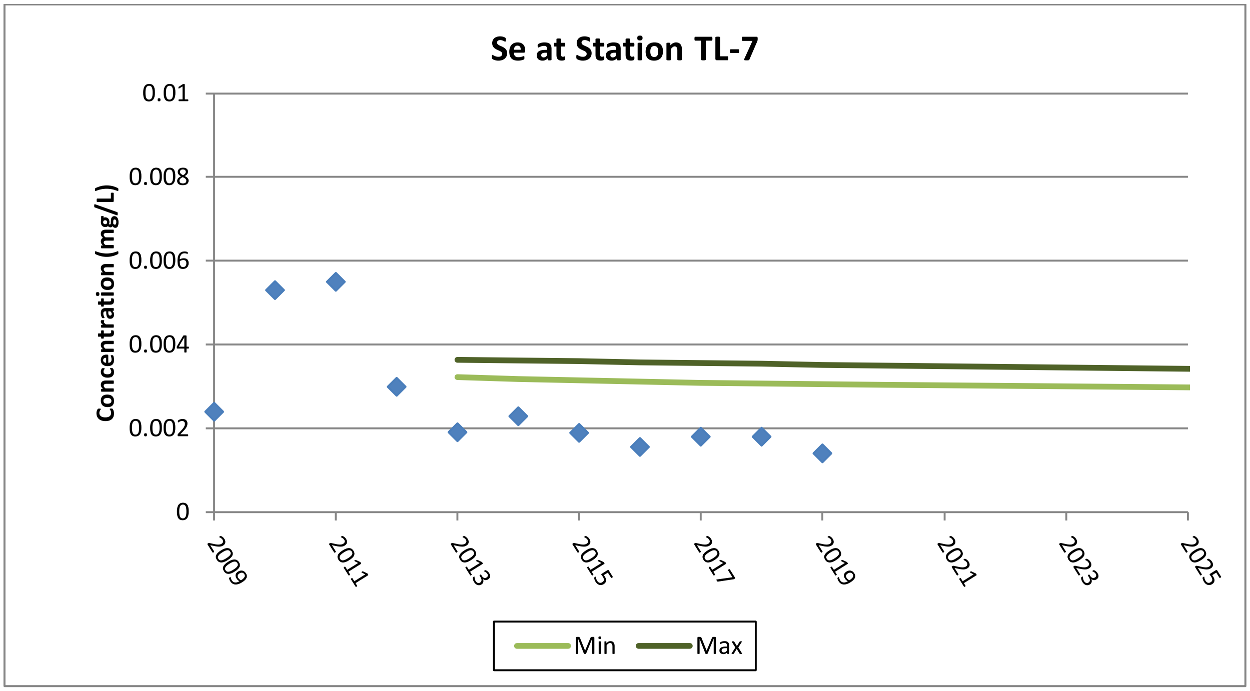


Figure 4.3.2-26 TL-7 Meadow Fen Discharge

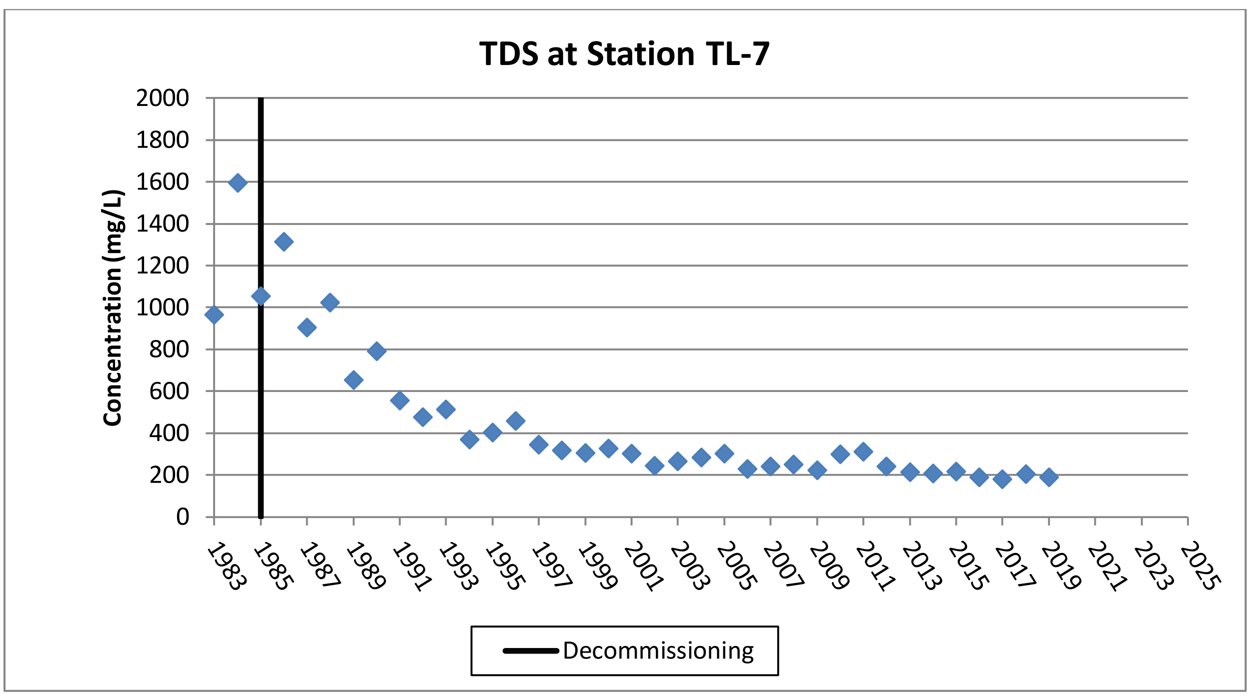
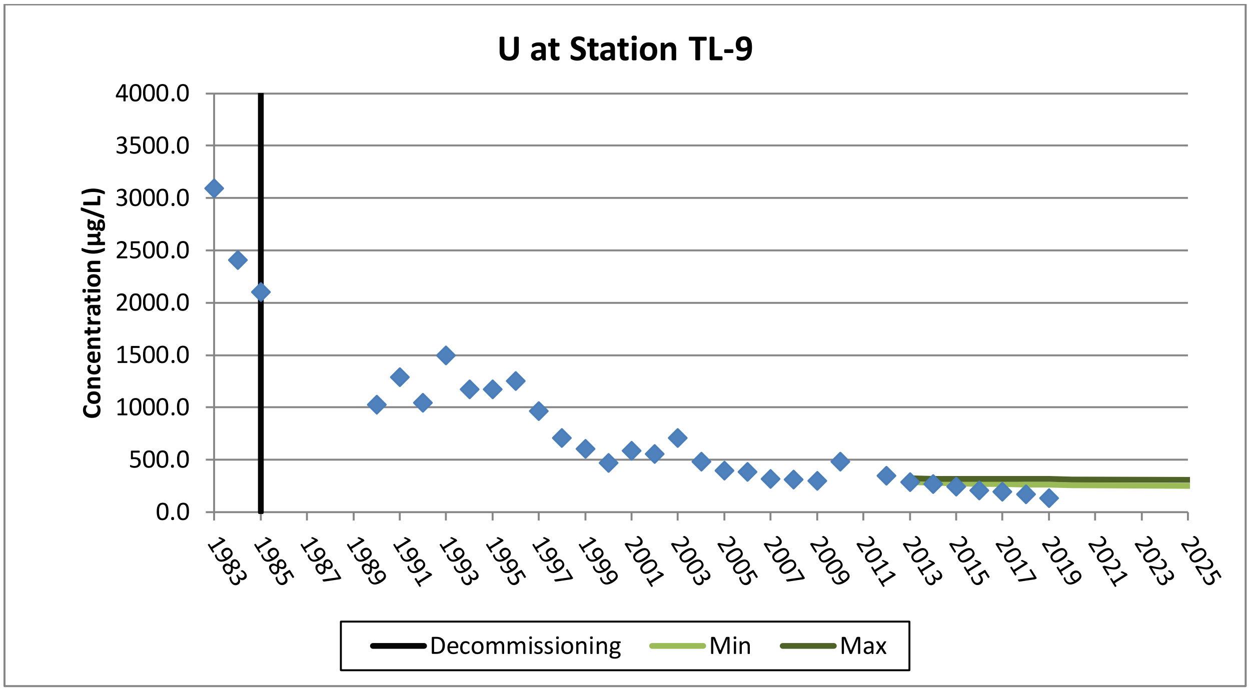
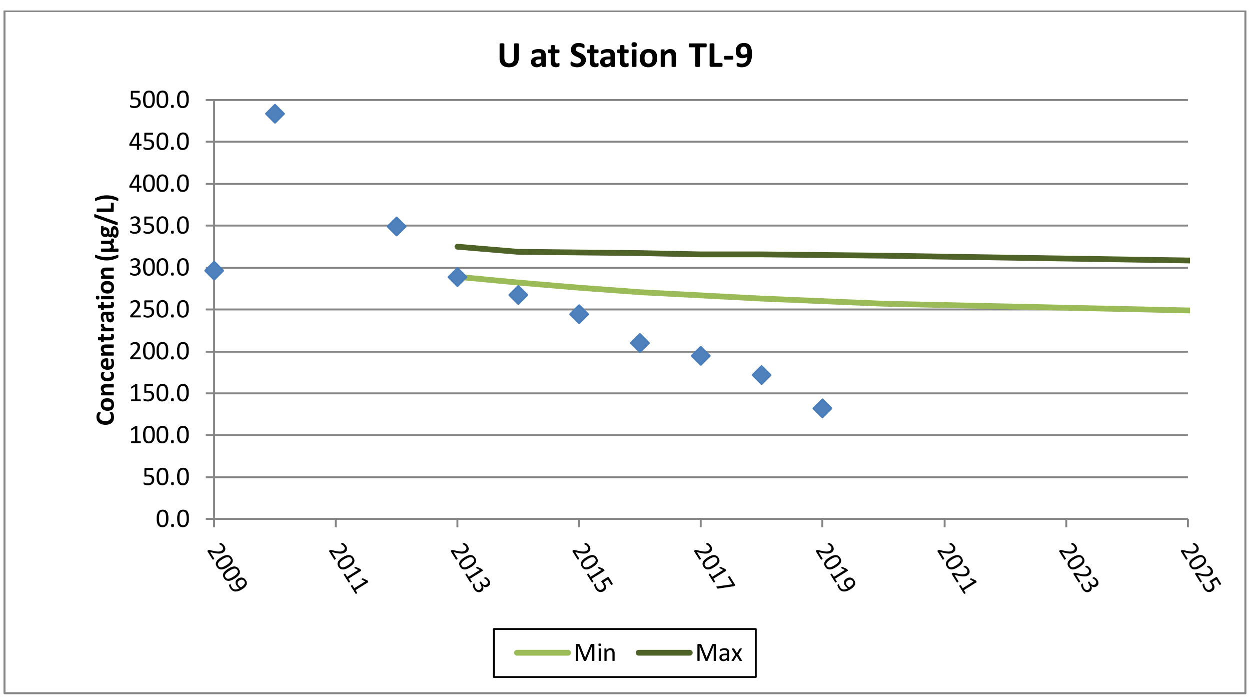


Figure 4.3.2-27 TL-9 Fulton Creek Downstream of Greer Lake



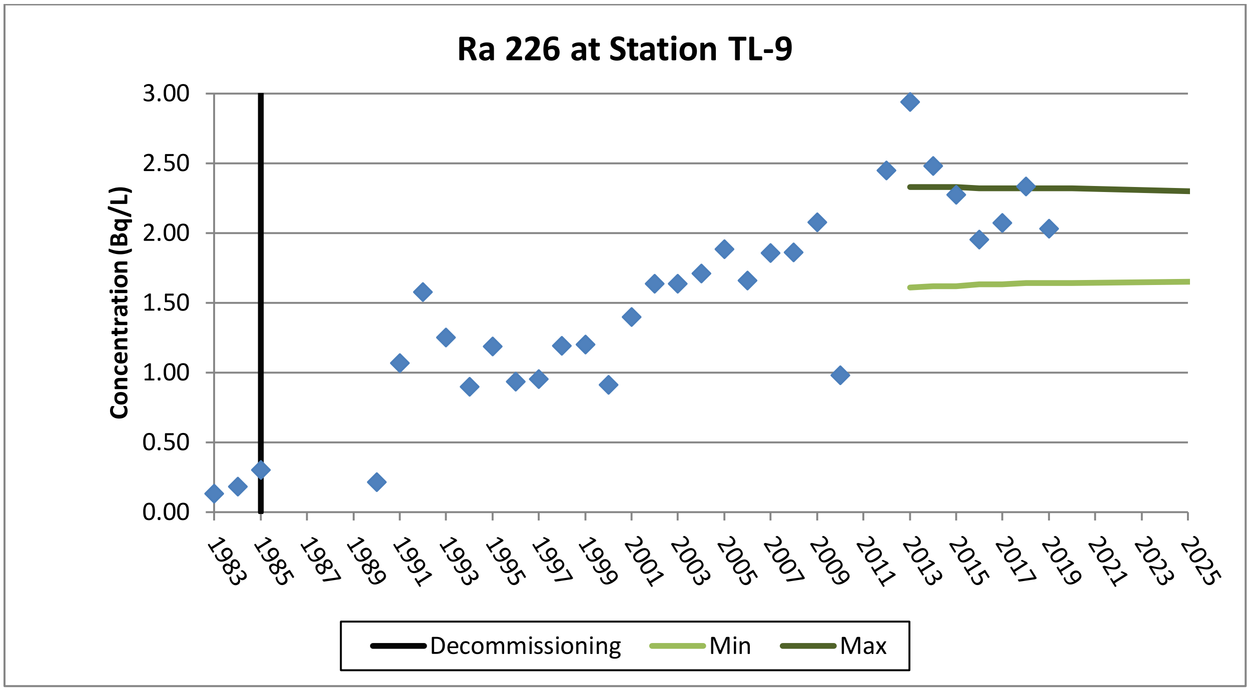
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-28 TL-9 Fulton Creek Downstream of Greer Lake – Detailed Trend



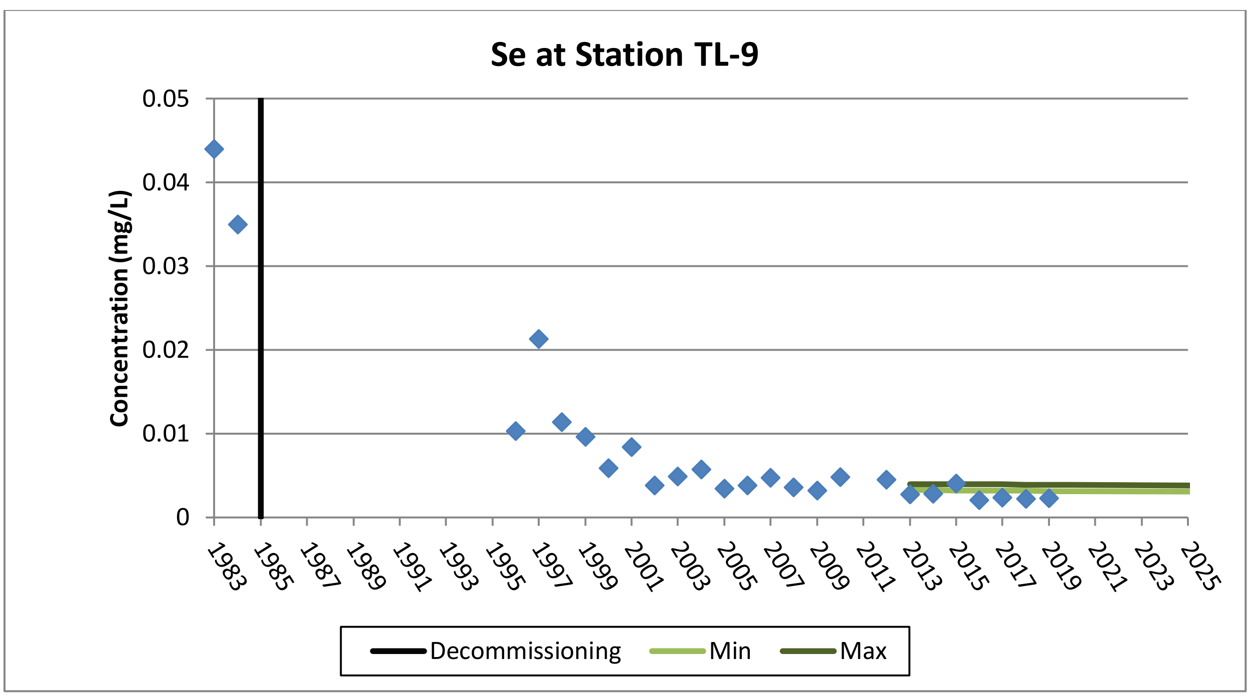
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-29 TL-9 Fulton Creek Downstream of Greer Lake



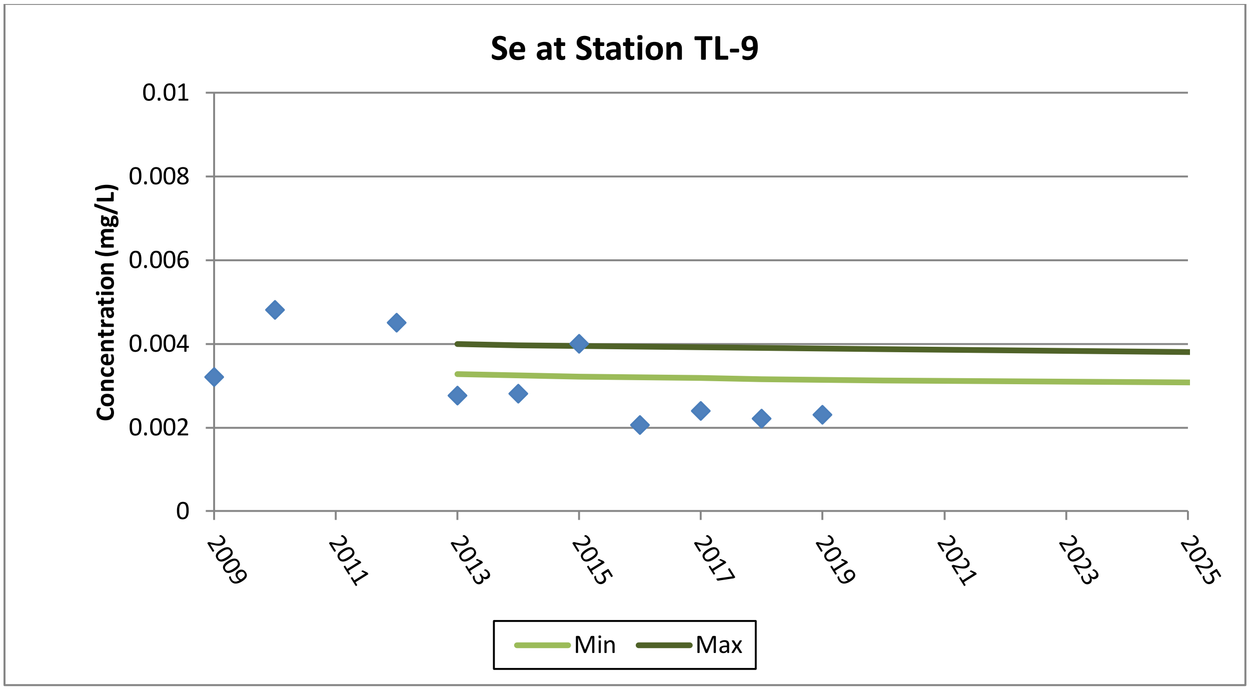
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-30 TL-9 - Fulton Creek Downstream of Greer Lake



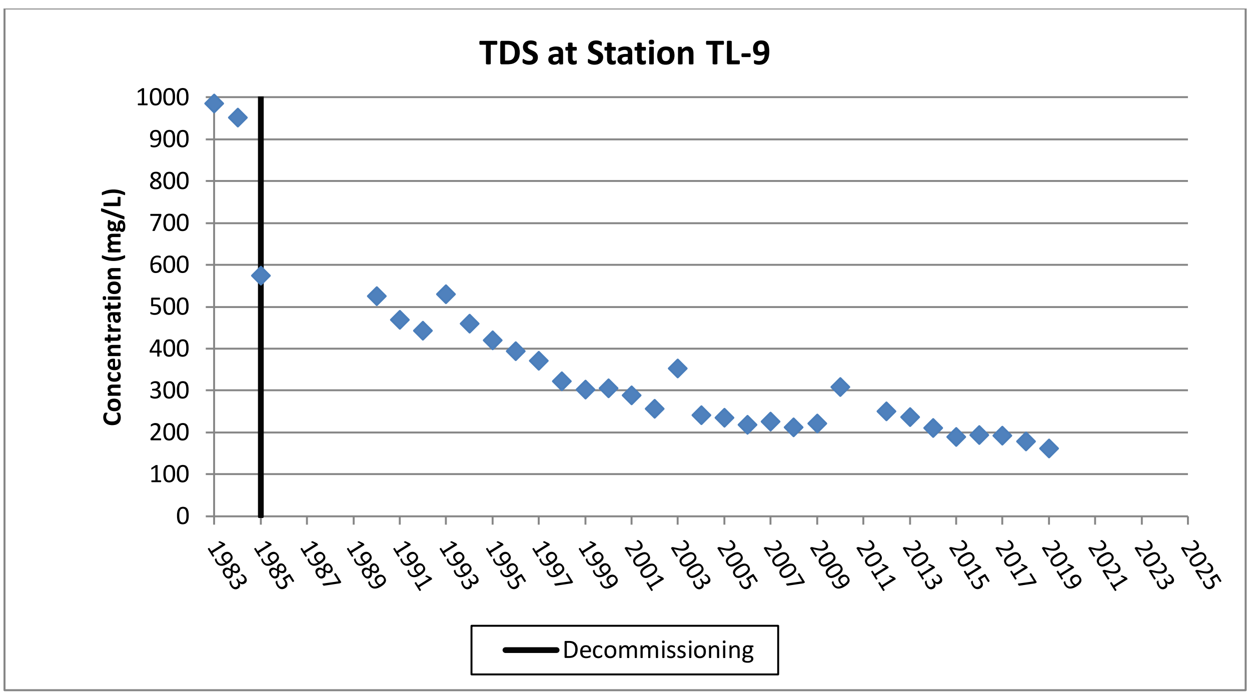
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-31 TL-9 - Fulton Creek Downstream of Greer Lake – Detailed Trend



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

Figure 4.3.2-32 TL-9 - Fulton Creek Downstream of Greer Lake



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

Figure 4.3.3-1 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

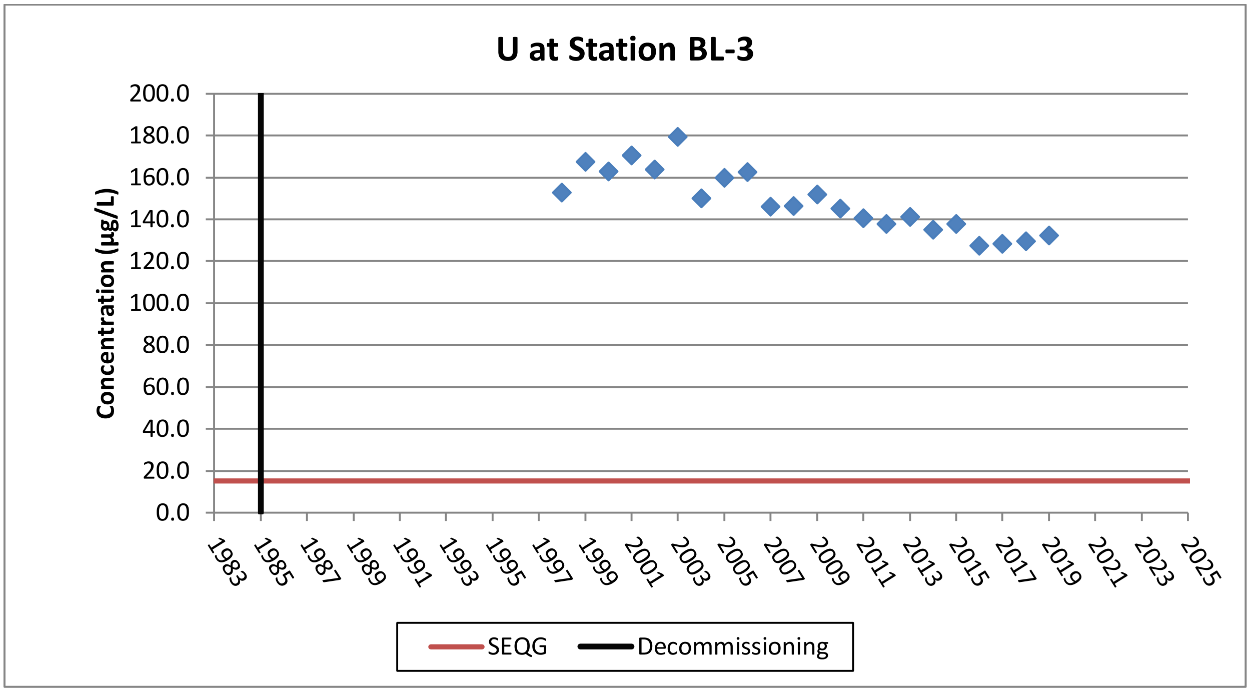


Figure 4.3.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

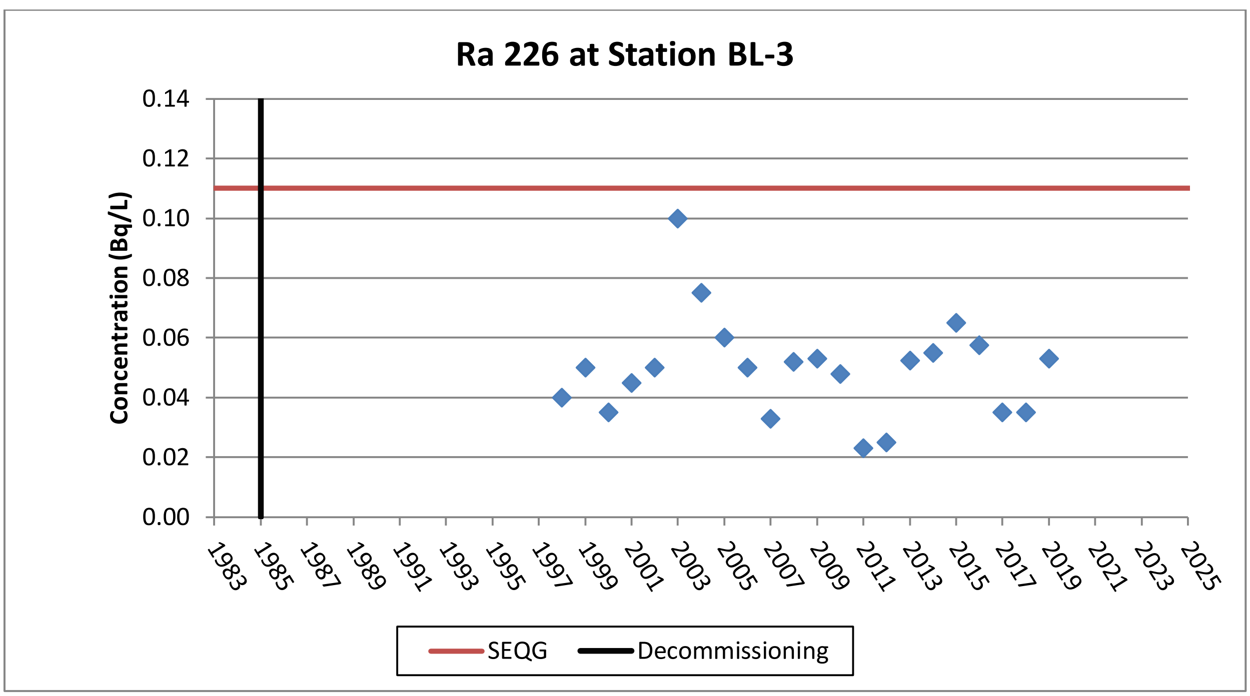
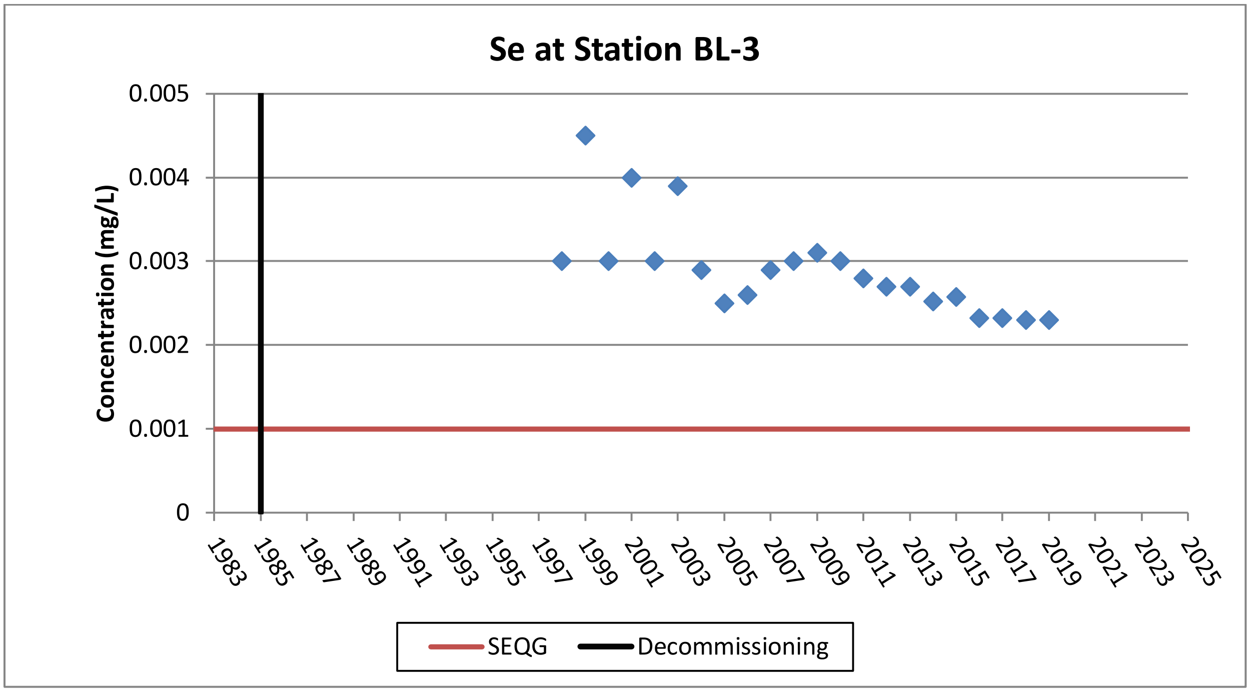


Figure 4.3.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



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

Figure 4.3.3-4 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

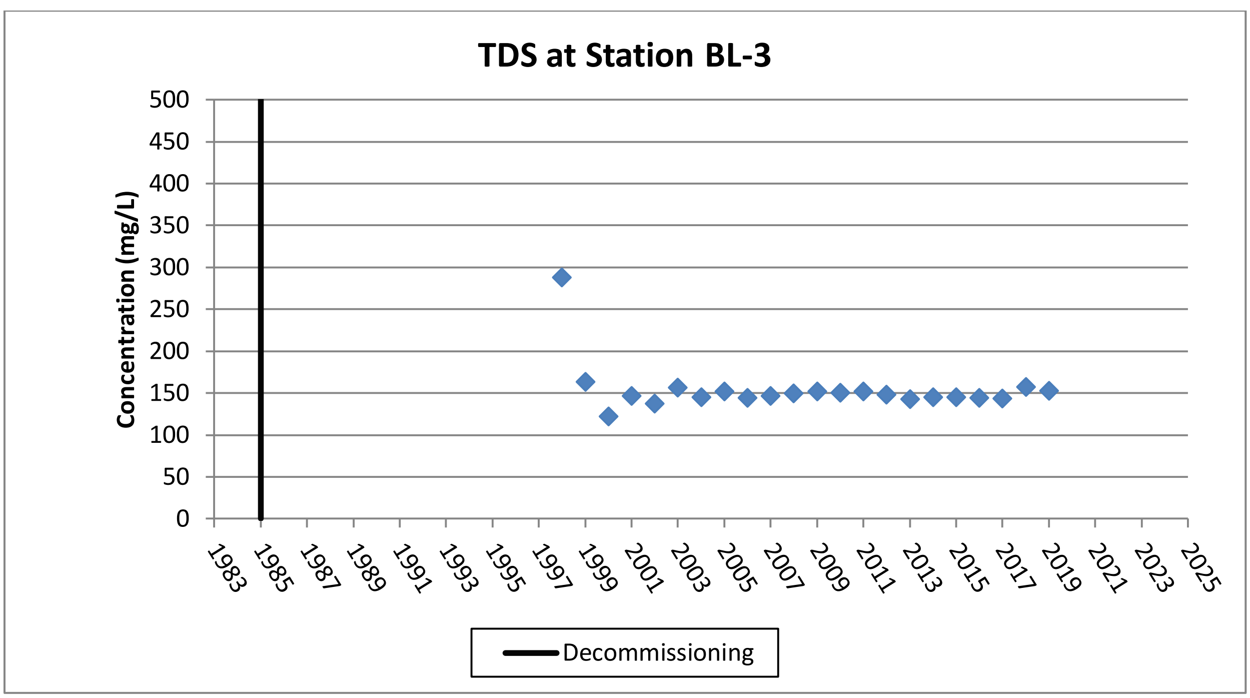


Figure 4.3.3-5 BL-4 Beaverlodge Lake Centre

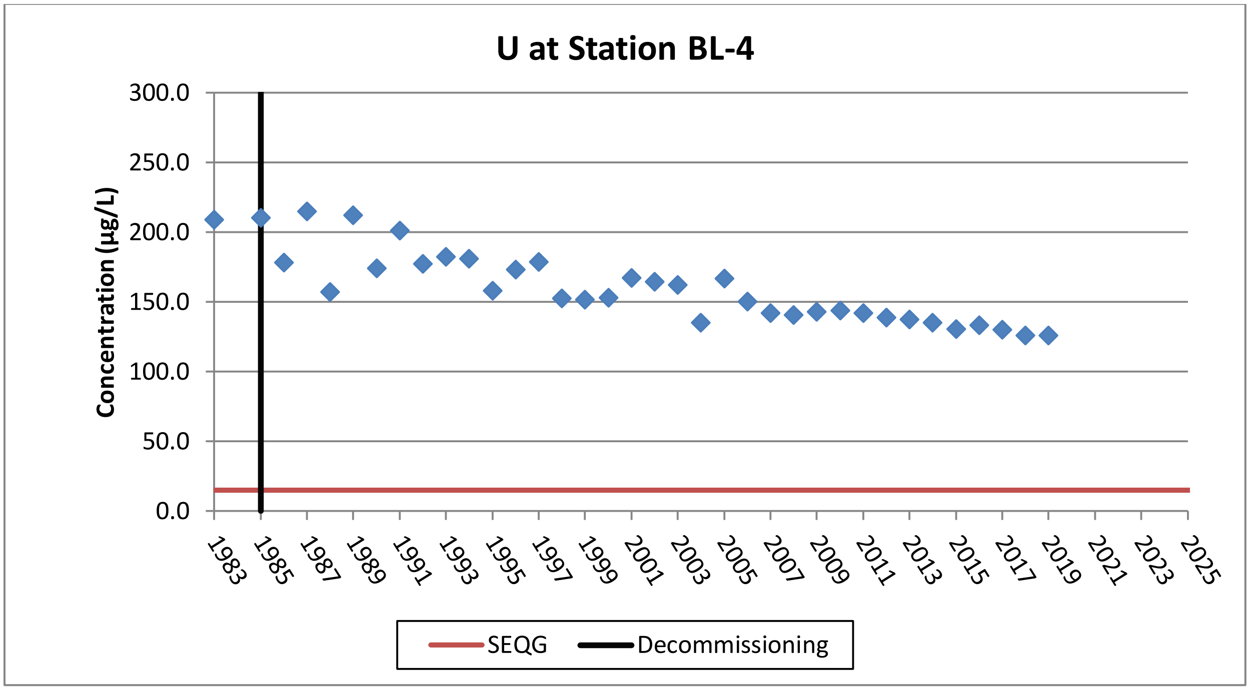


Figure 4.3.3-6 BL-4 Beaverlodge Lake Centre

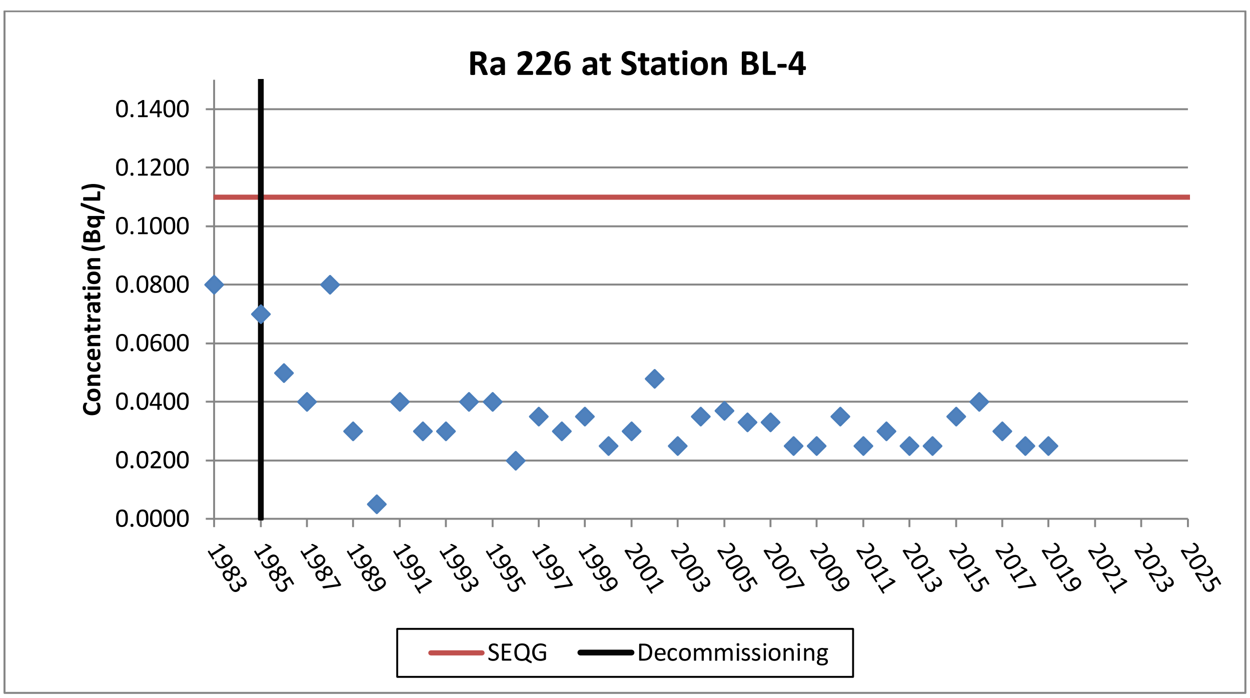
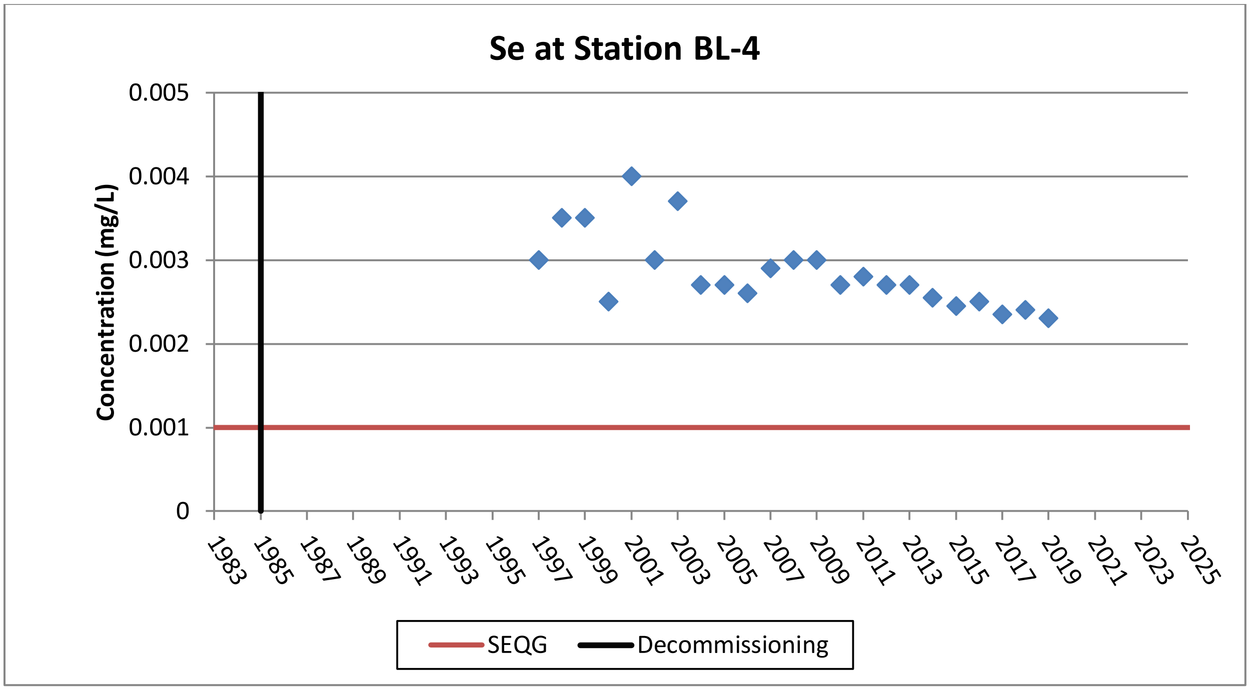


Figure 4.3.3-7 BL-4 Beaverlodge Lake Centre



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

Figure 4.3.3-8 BL-4 Beaverlodge Lake Centre

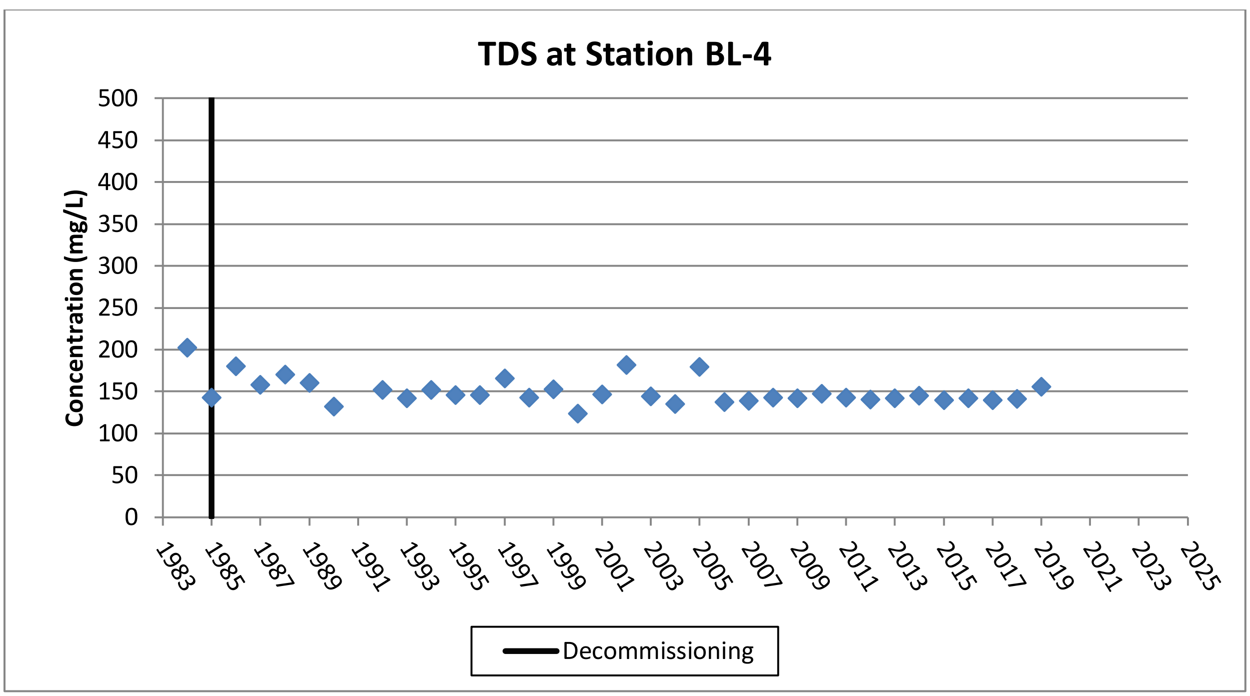
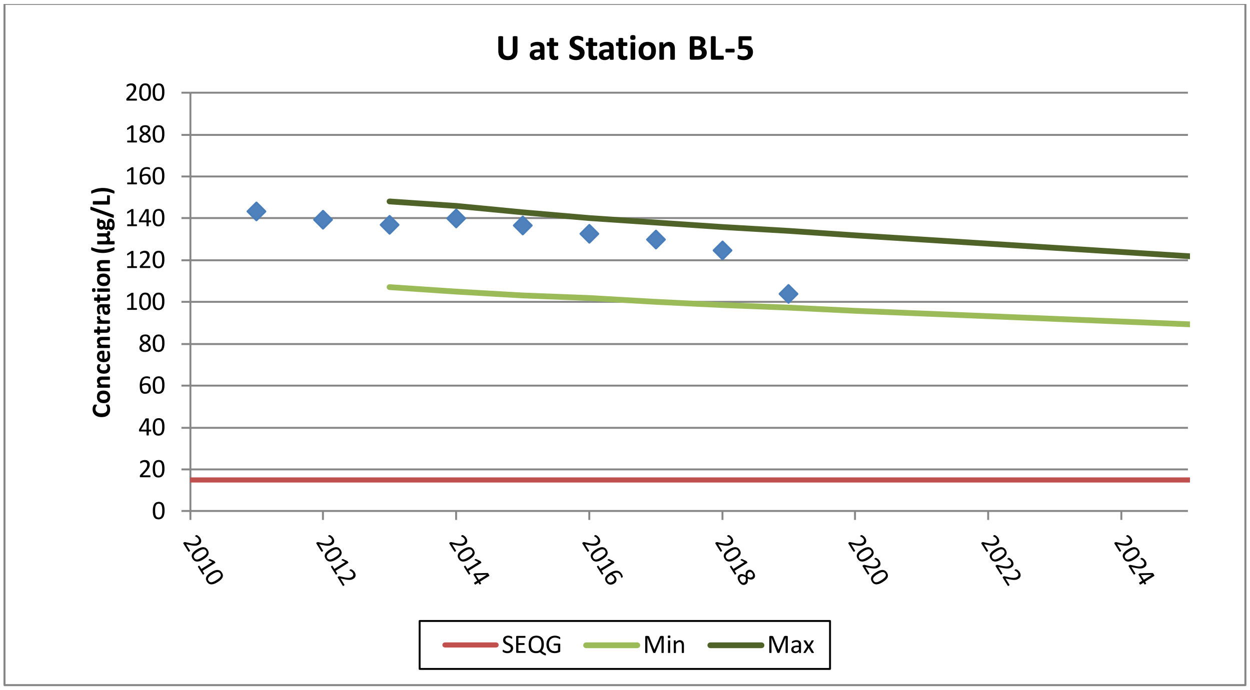
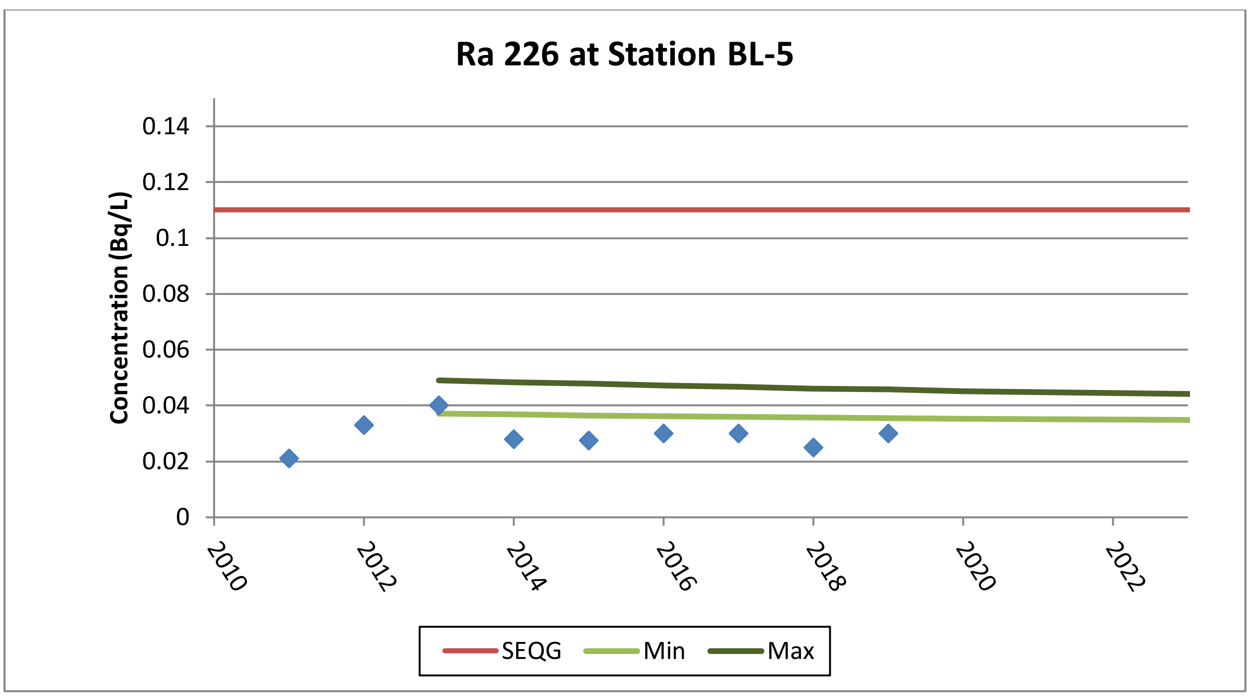


Figure 4.3.3-9 BL-5 Beaverlodge Lake Outlet



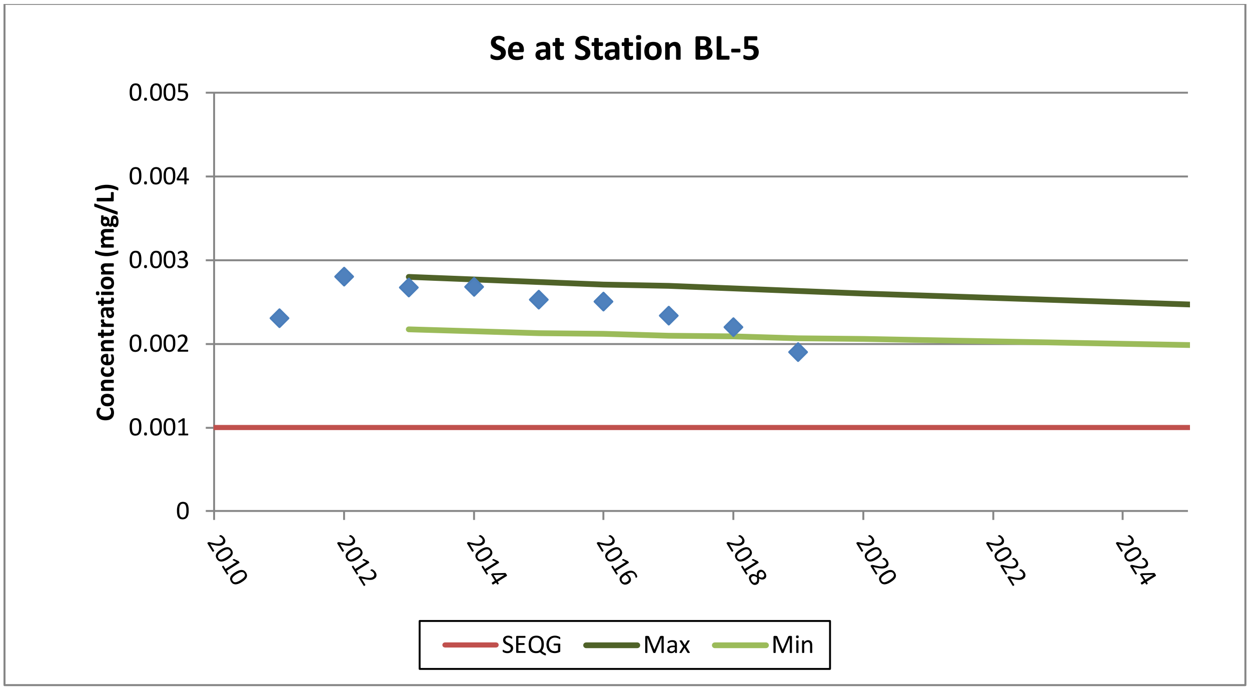
** Station implemented in water sampling program in 2011.*

Figure 4.3.3-10 BL-5 Beaverlodge Lake Outlet



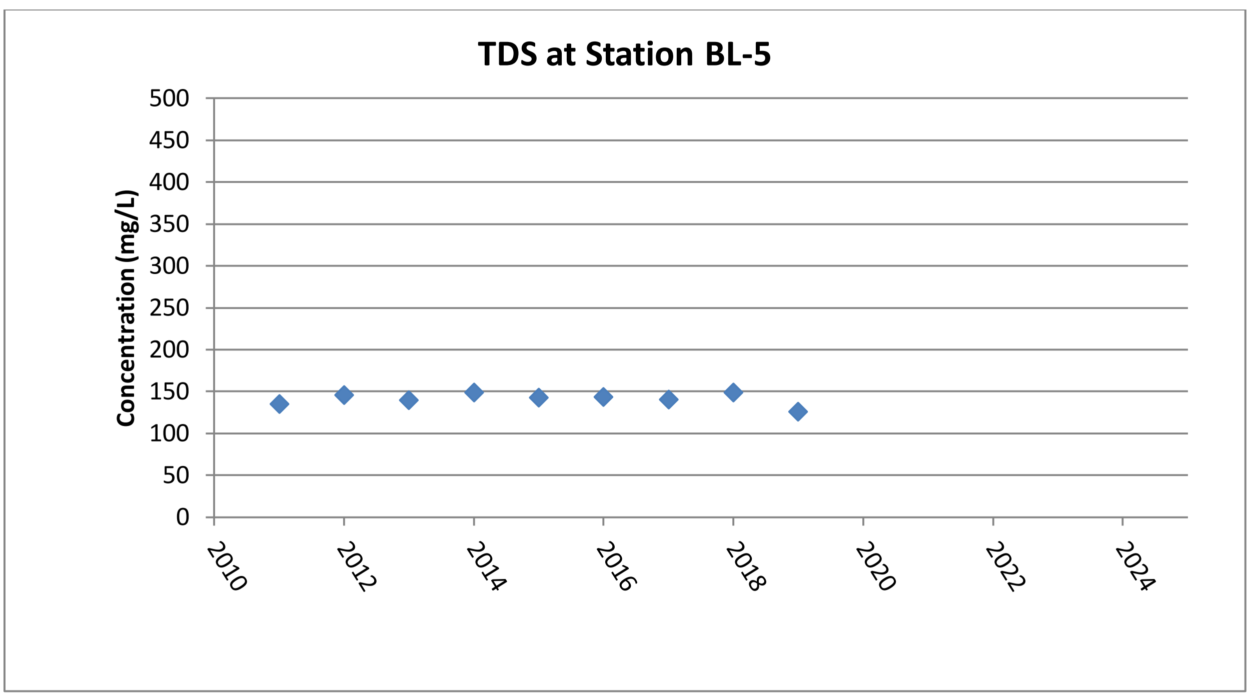
** Station implemented in water sampling program in 2011.*

Figure 4.3.3-11 BL-5 Beaverlodge Lake Outlet



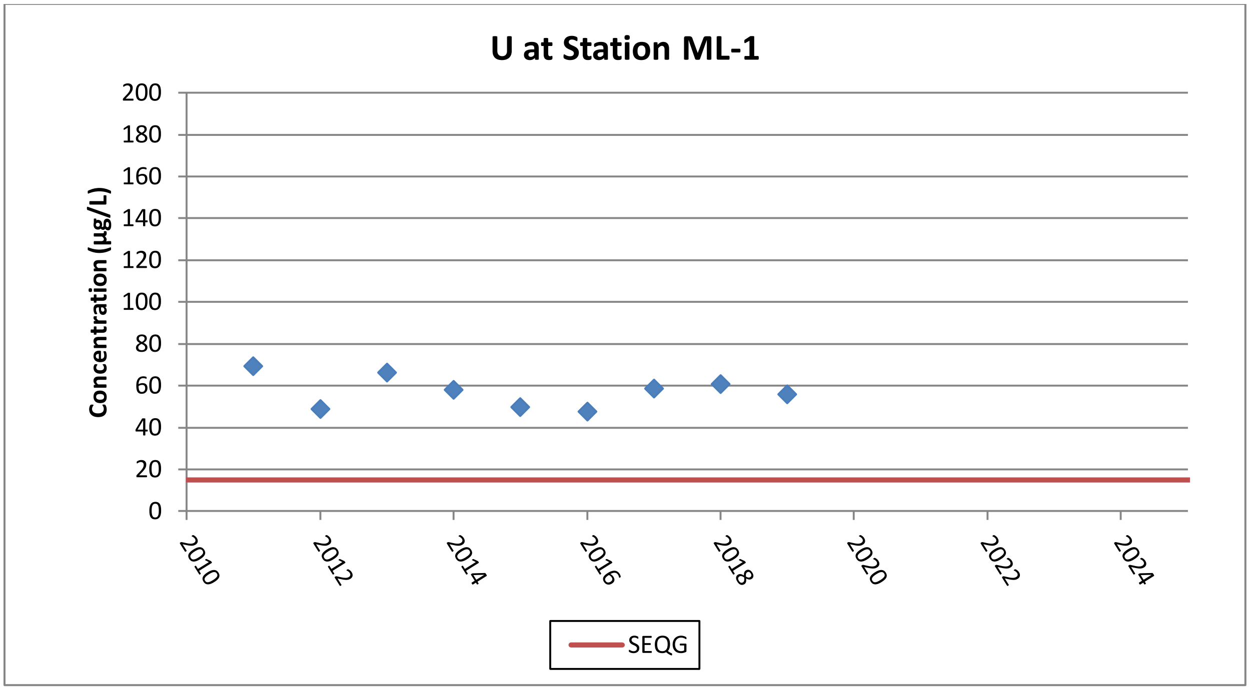
** Station implemented in water sampling program in 2011.*

Figure 4.3.3-12 BL-5 Beaverlodge Lake Outlet



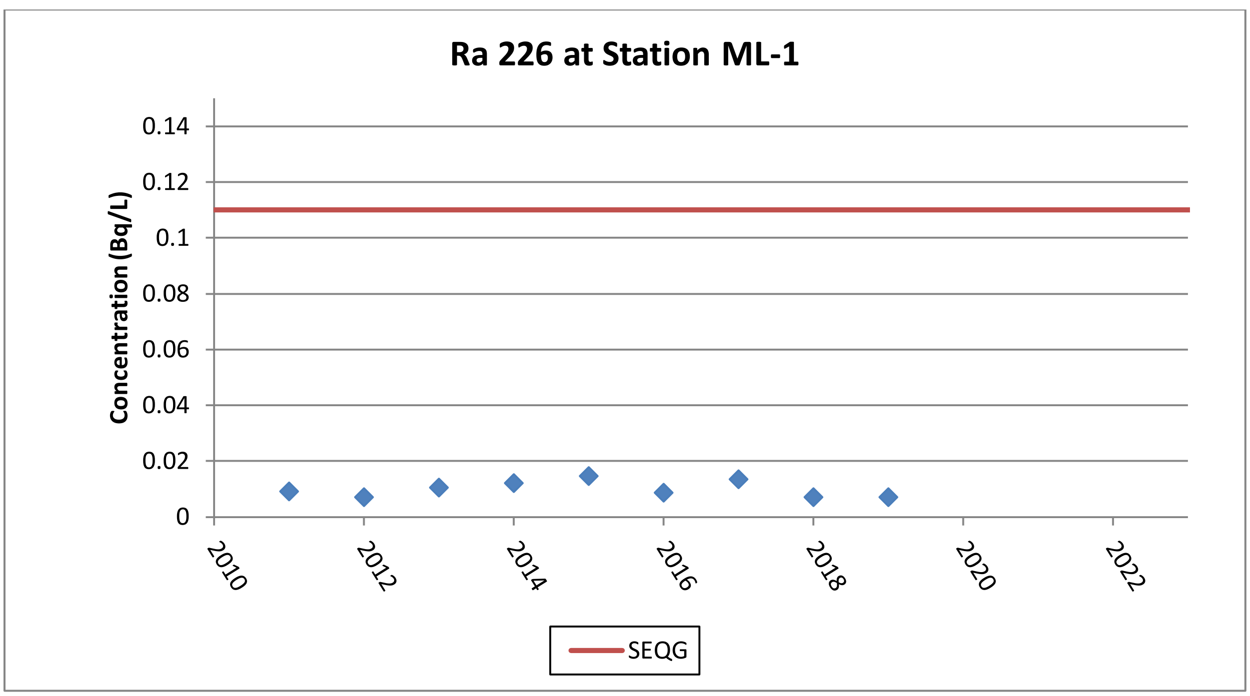
** Station implemented in water sampling program in 2011.*

Figure 4.3.3-13 ML-1 Outlet of Martin Lake



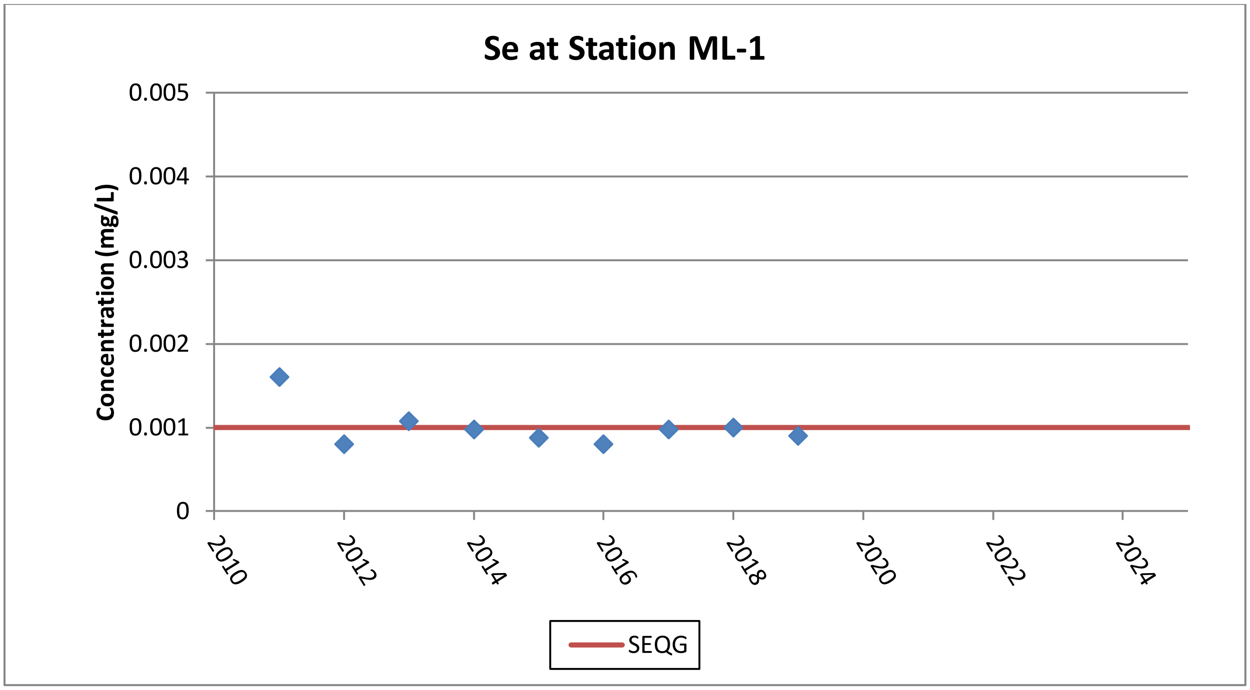
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-14 ML-1 Outlet of Martin Lake



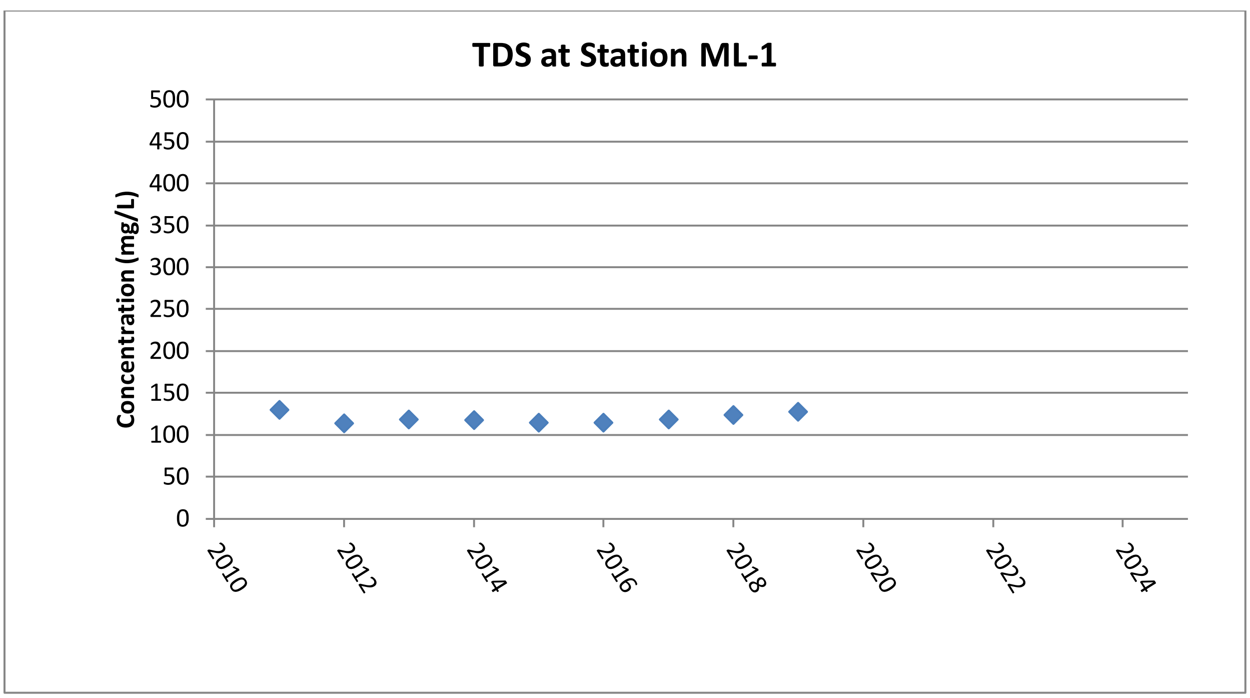
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-15 ML-1 Outlet of Martin Lake



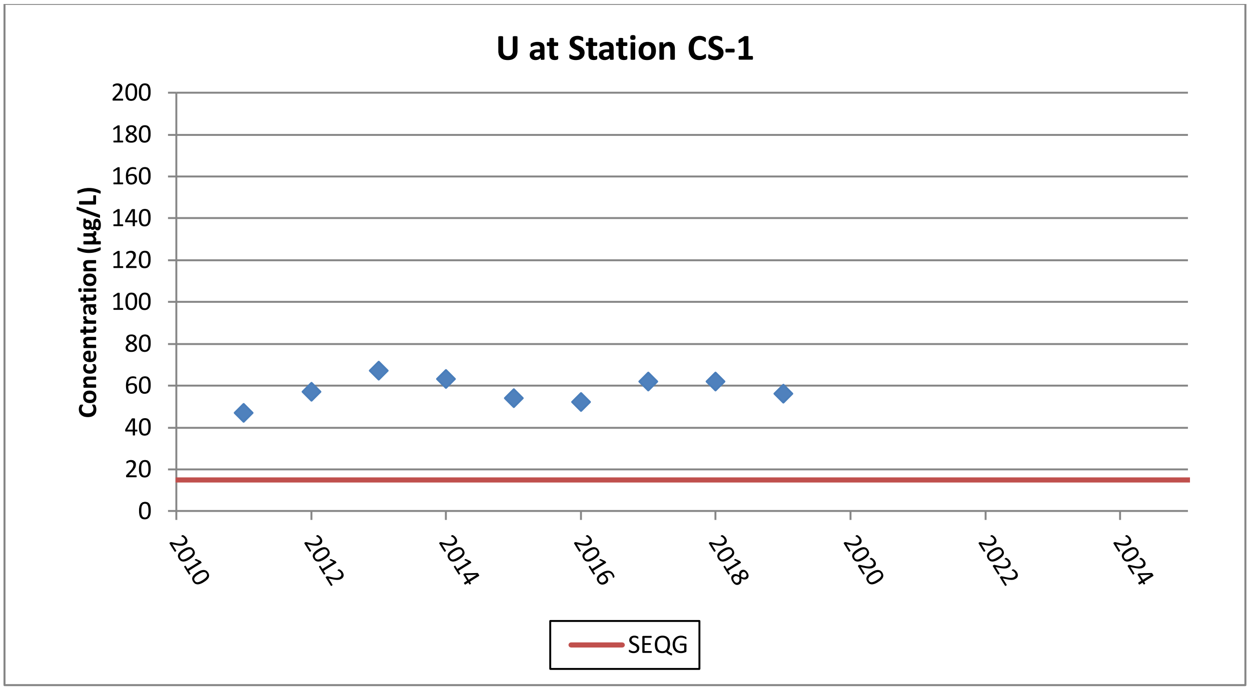
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-16 ML-1 Outlet of Martin Lake



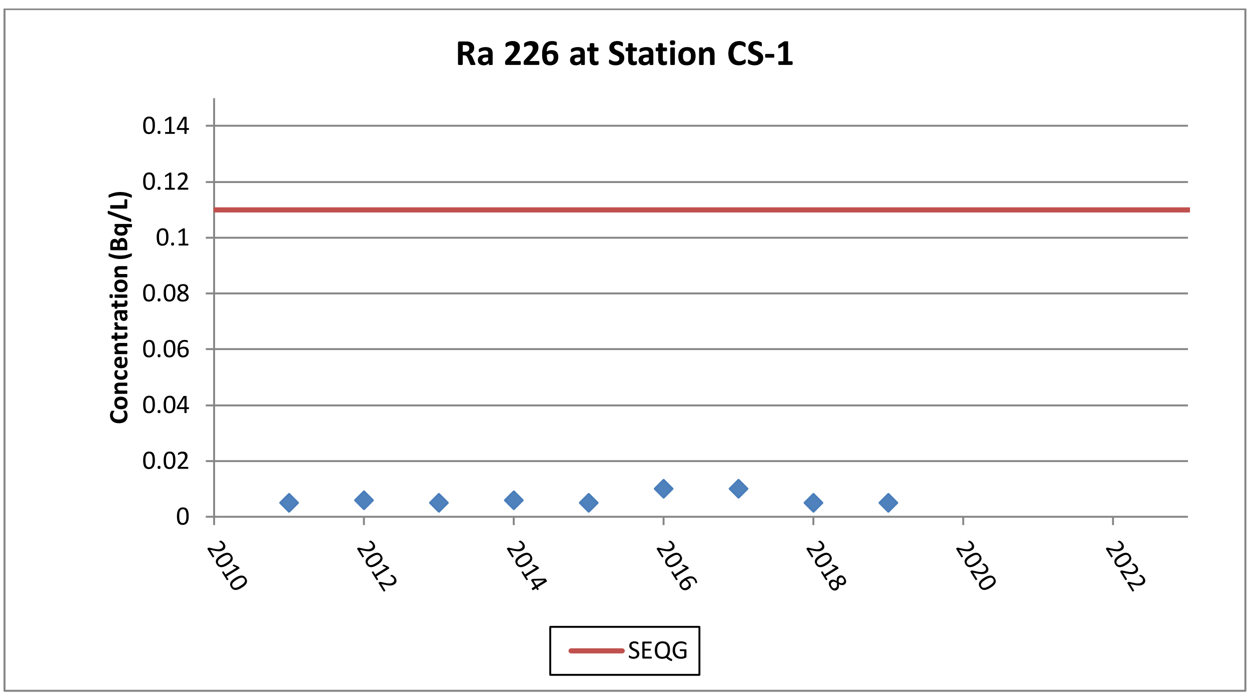
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-17 CS-1 Crackingstone River at Bridge



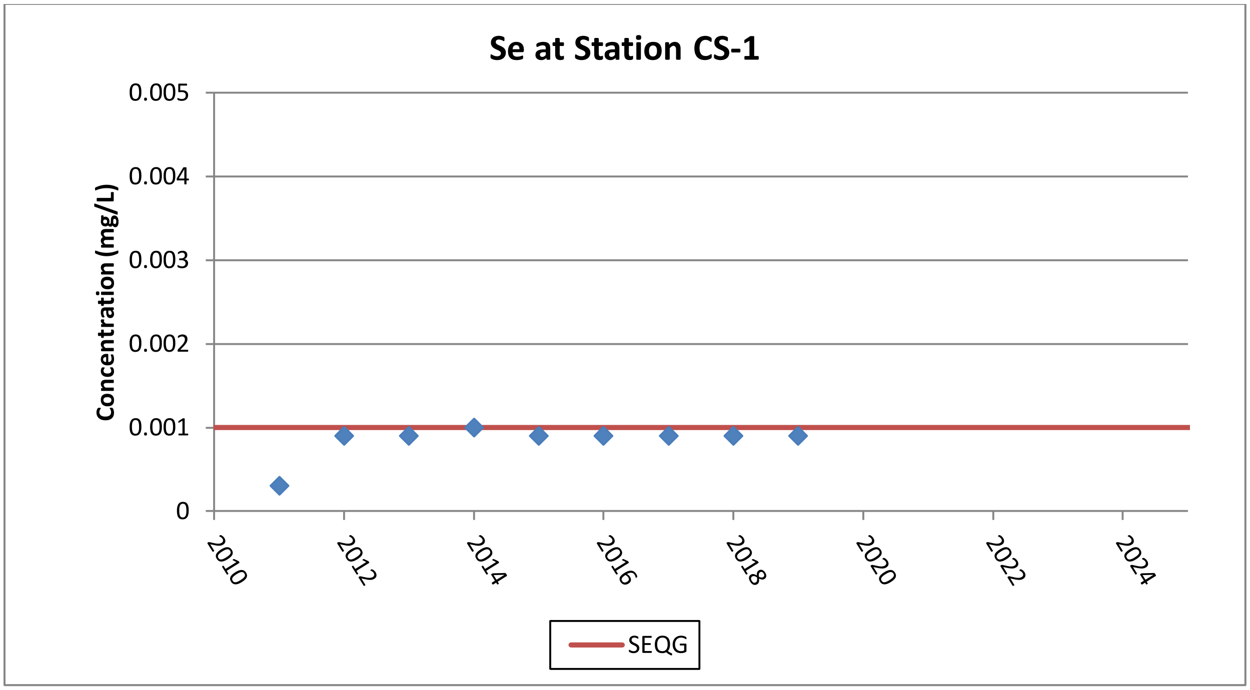
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-18 CS-1 Crackingstone River at Bridge



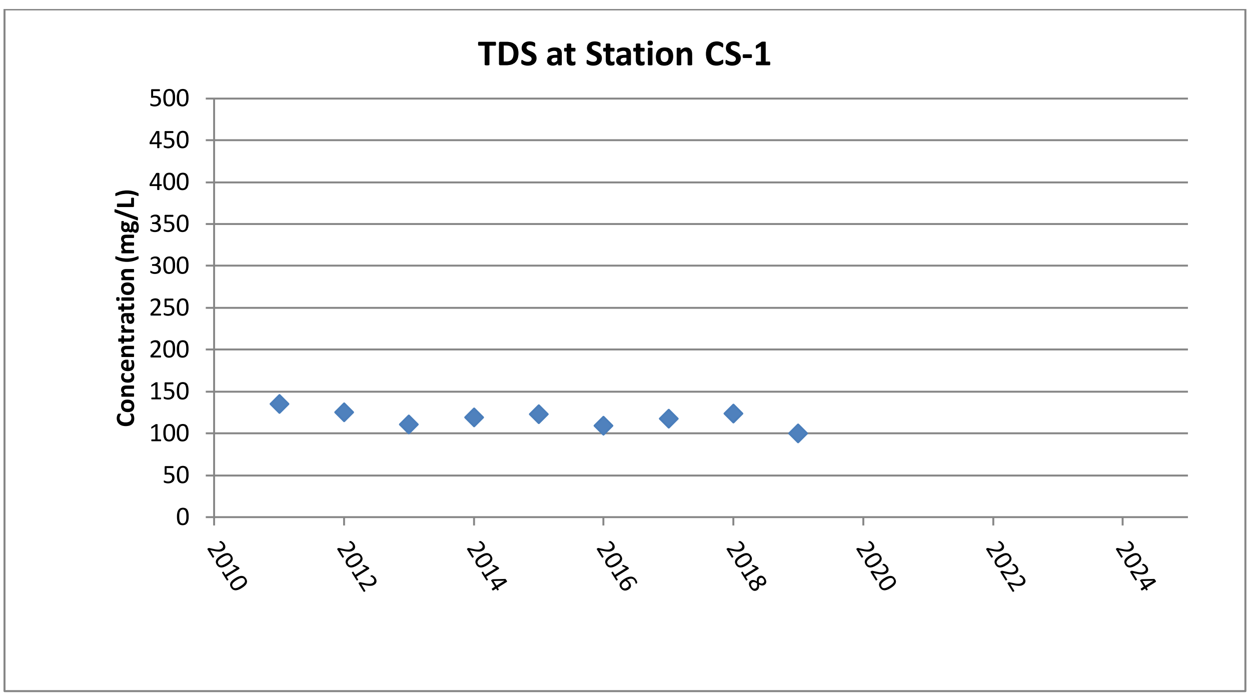
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-19 CS-1 Crackingstone River at Bridge



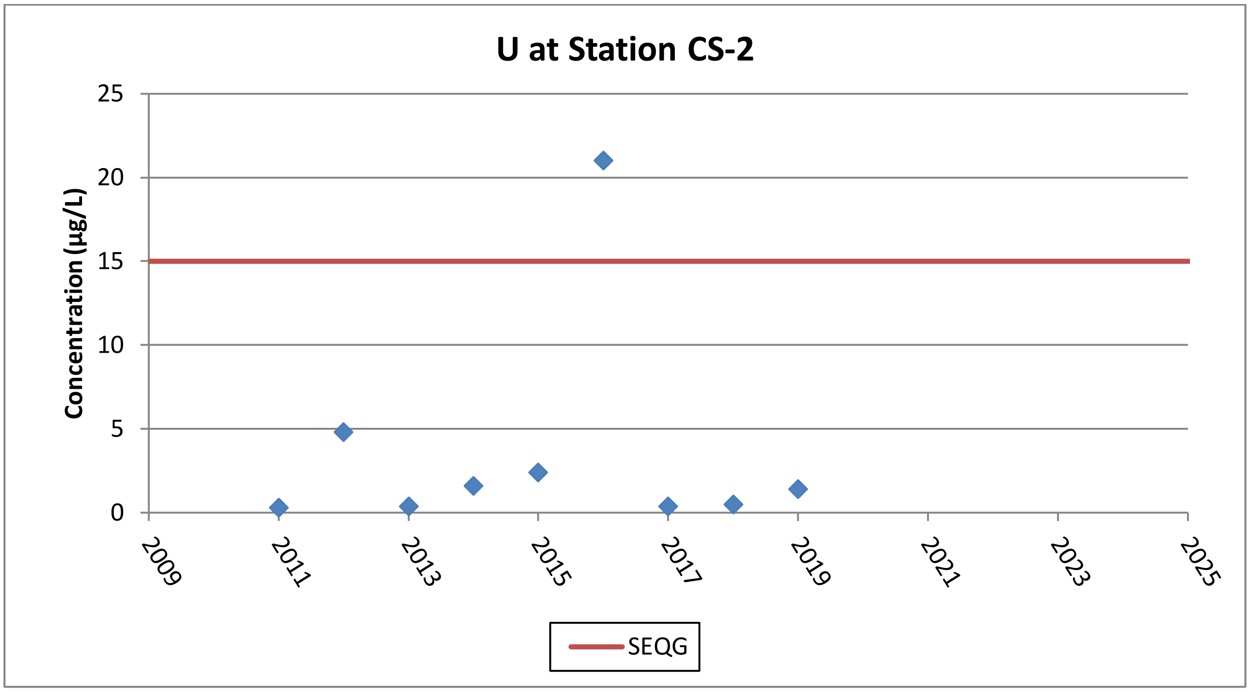
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-20 CS-1 Crackingstone River at Bridge



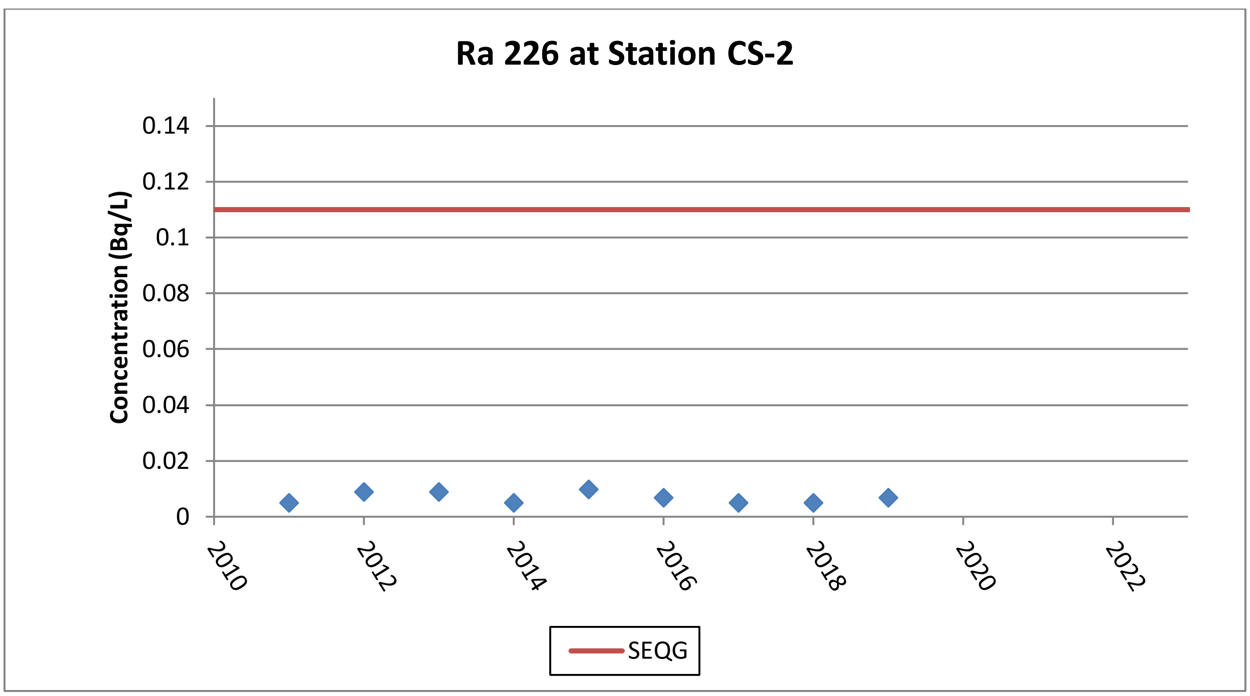
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-21 CS-2 Crackingstone Bay



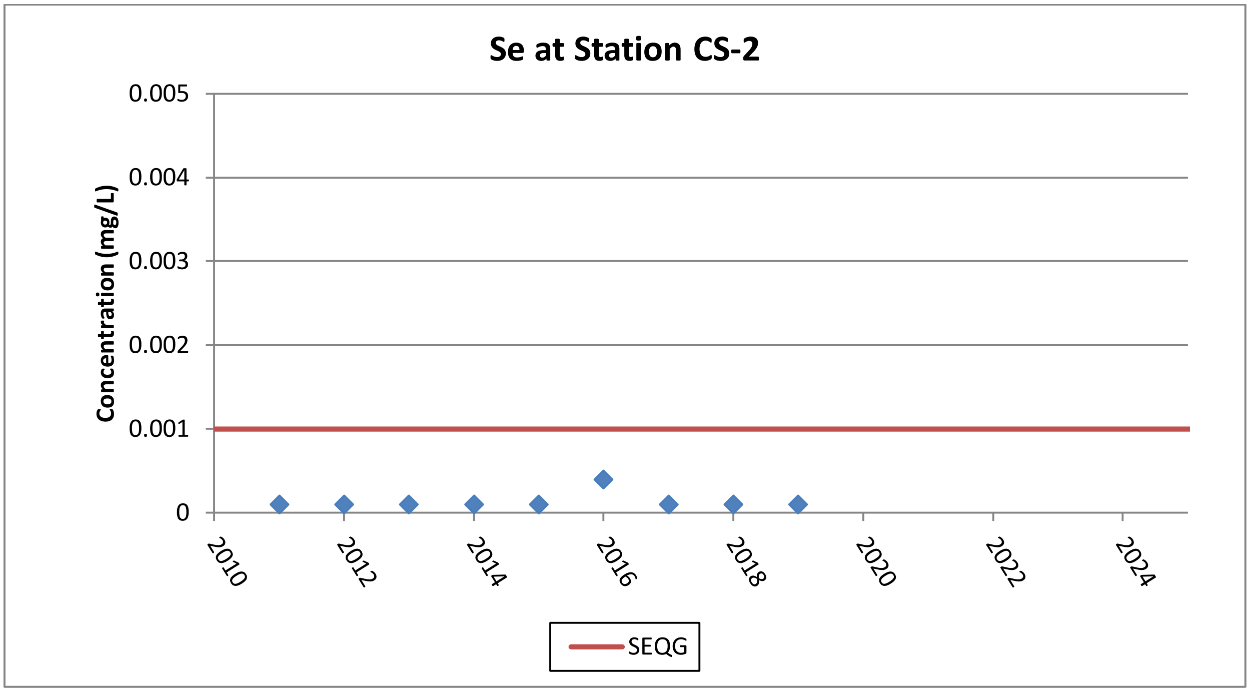
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-22 CS-2 Crackingstone Bay



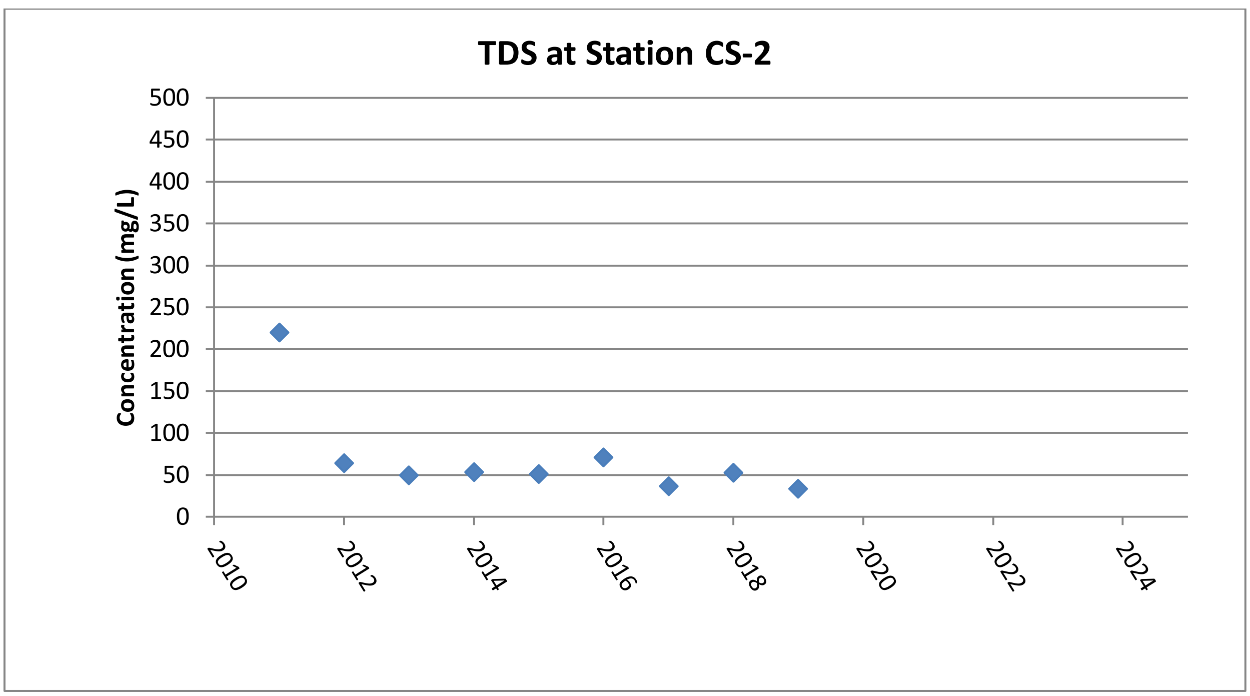
**Station implemented in water sampling program in 2011.*

Figure 4.3.3-23 CS-2 Crackingstone Bay



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

Figure 4.3.3-24 CS-2 Crackingstone Bay



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

Figure 4.4
ZOR-1 and ZOR-2 sampling locations

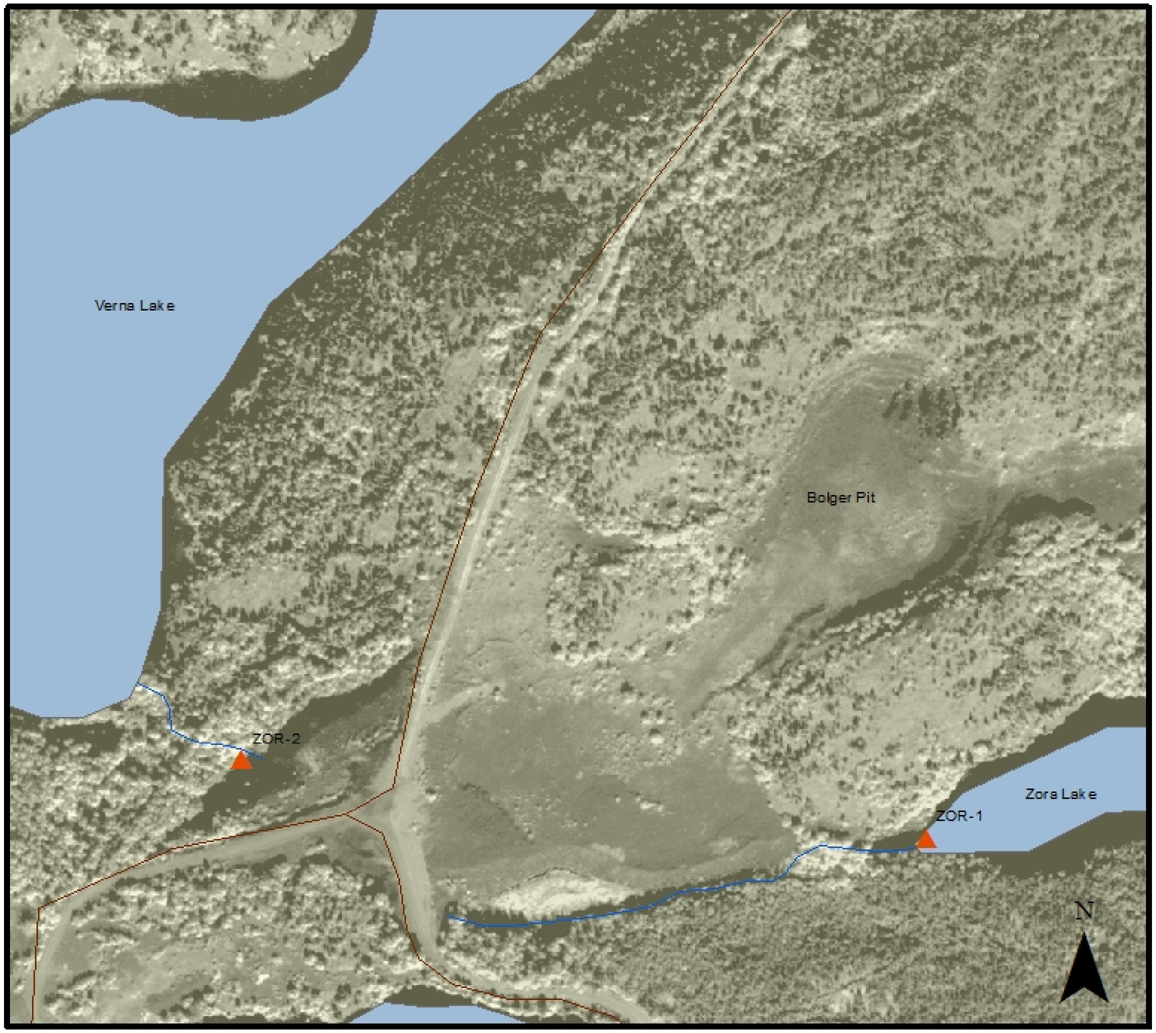
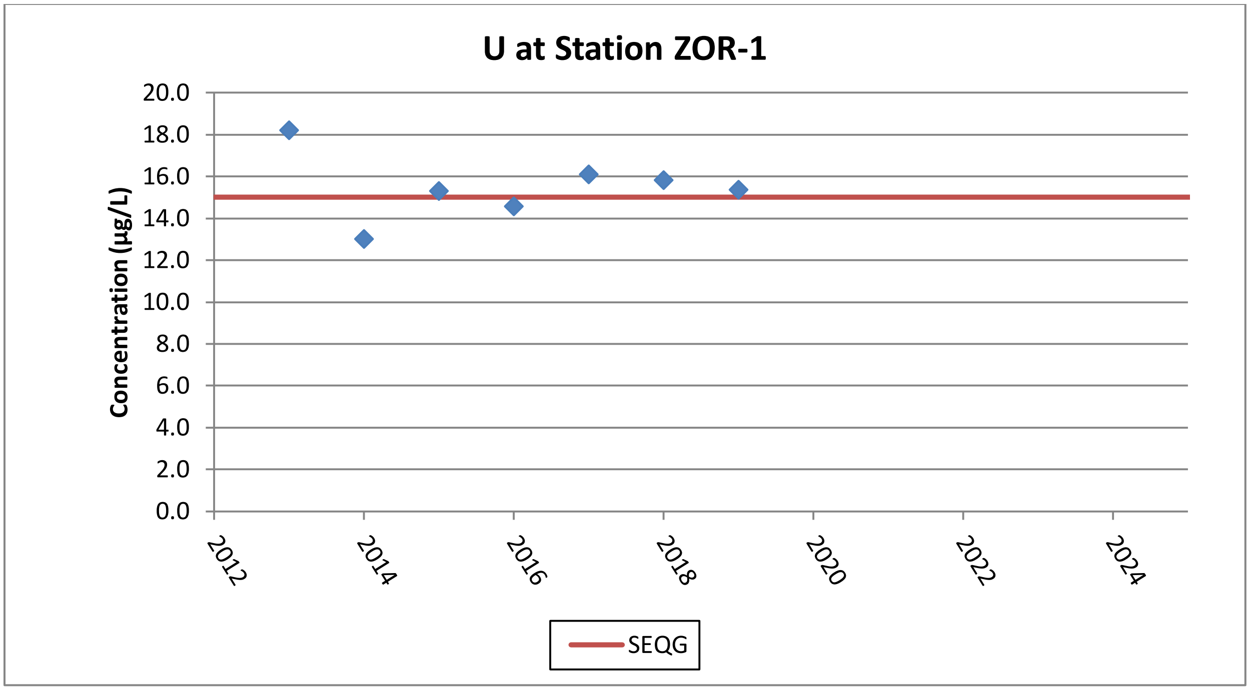
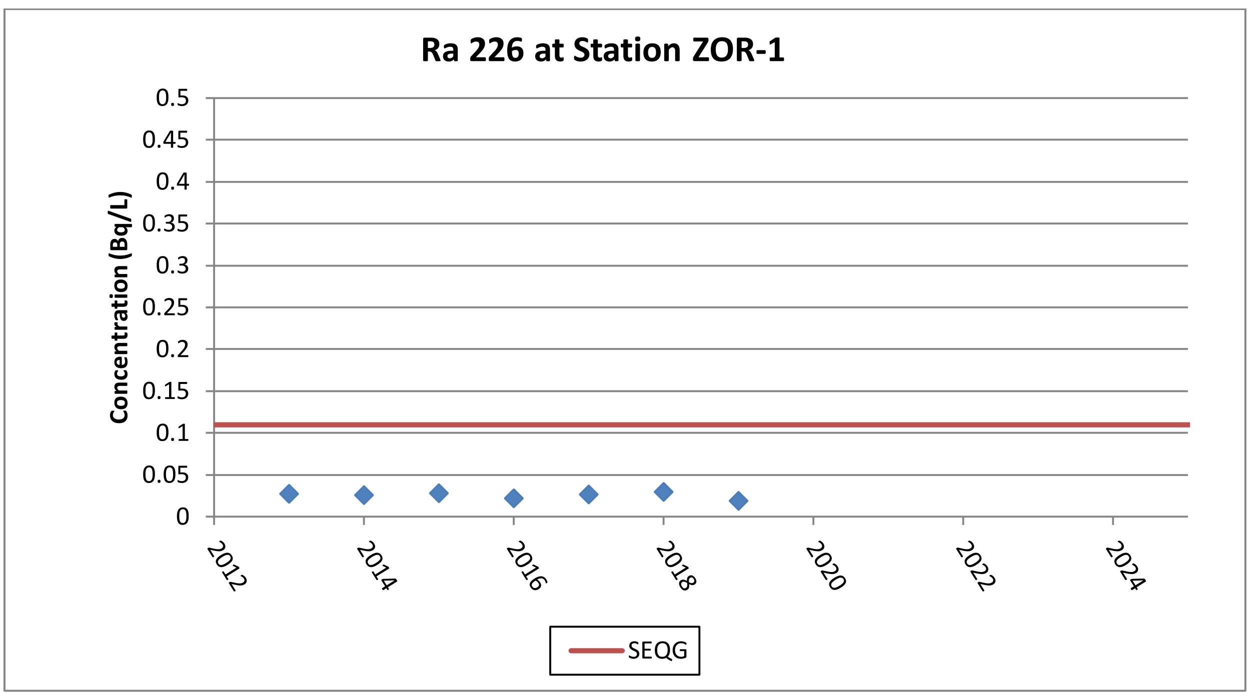


Figure 4.4-1 ZOR-01 Outlet of Zora Lake



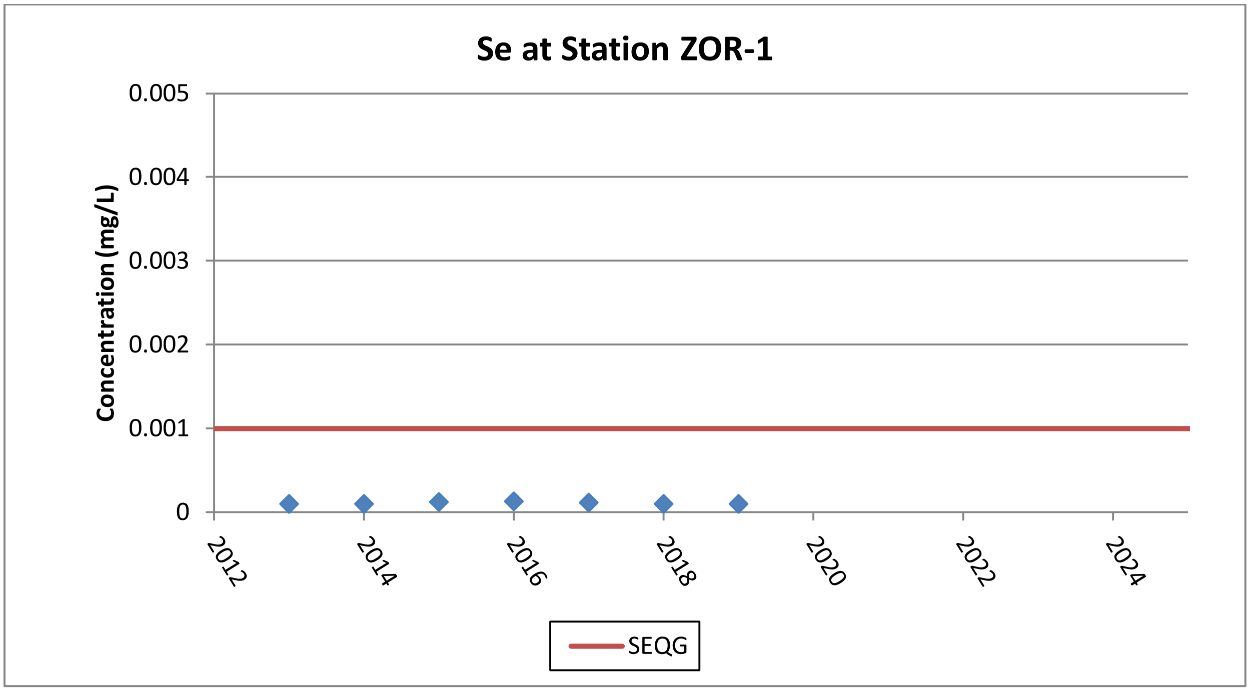
**Sampling initiated in 2013.*

Figure 4.4-2 ZOR-01 Outlet of Zora Lake



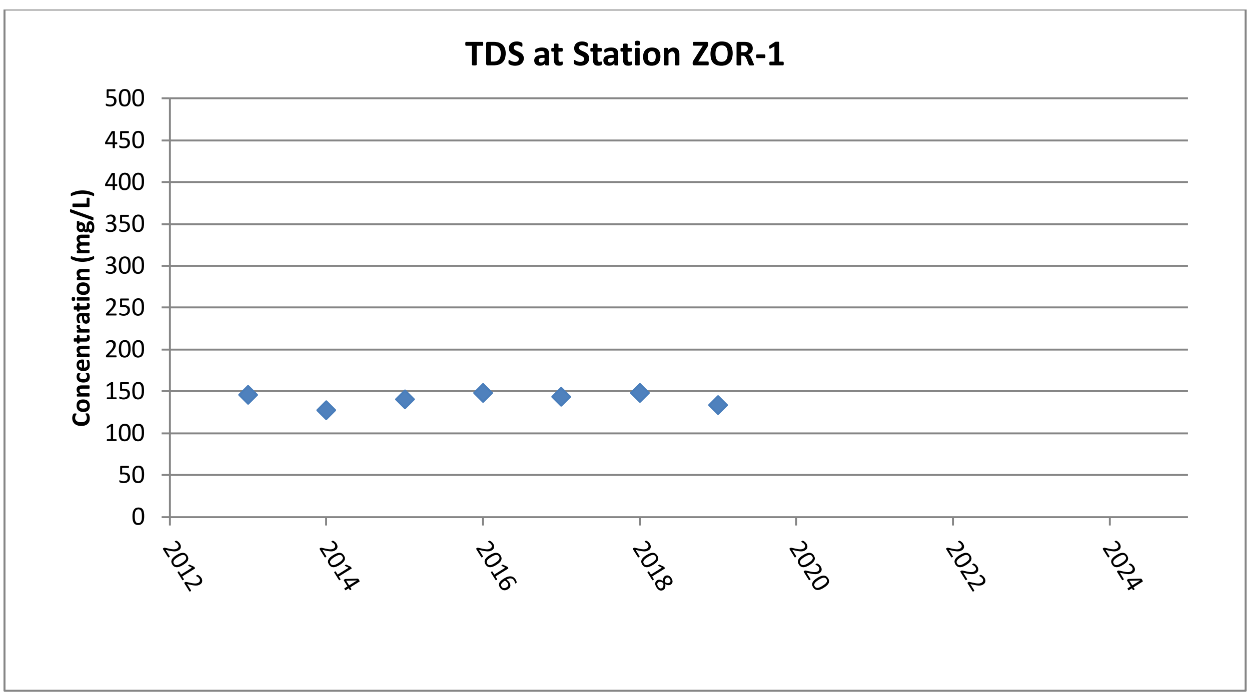
**Sampling initiated in 2013.*

Figure 4.4-3 ZOR-01 Outlet of Zora Lake



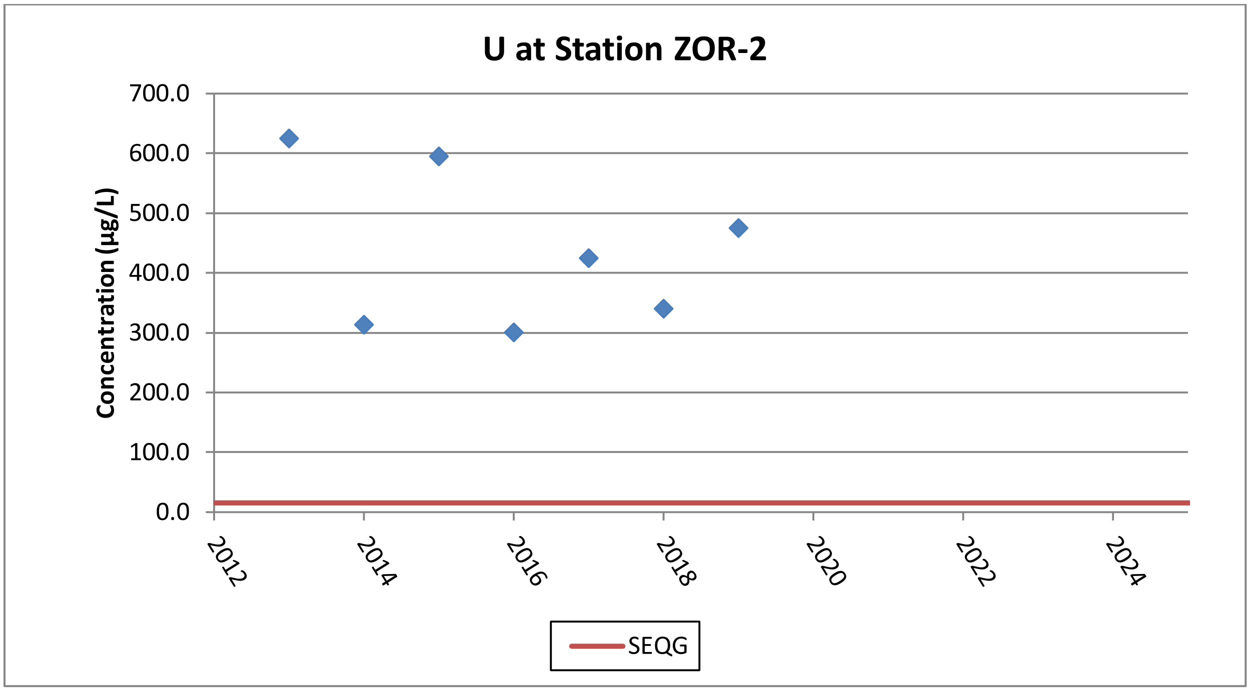
**Sampling initiated in 2013.*

Figure 4.4-4 ZOR-01 Outlet of Zora Lake



**Sampling initiated in 2013.*

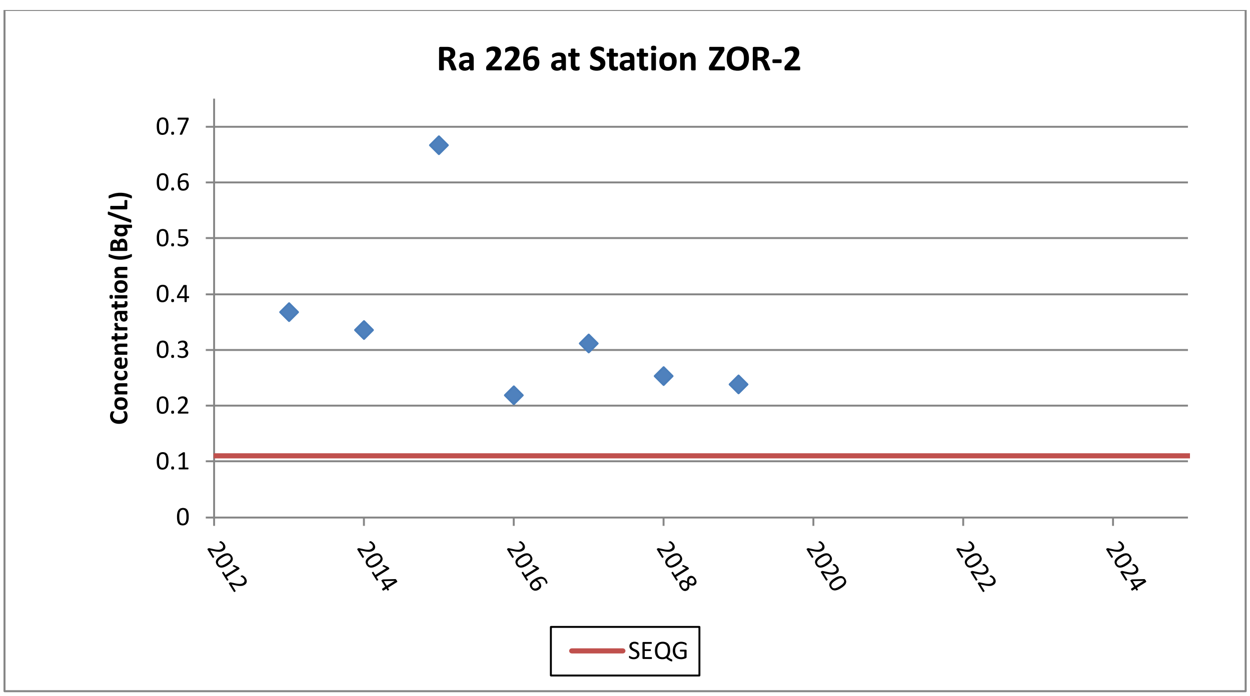
Figure 4.4-5 ZOR-02 Outlet of the Zora Creek Flow Path



*

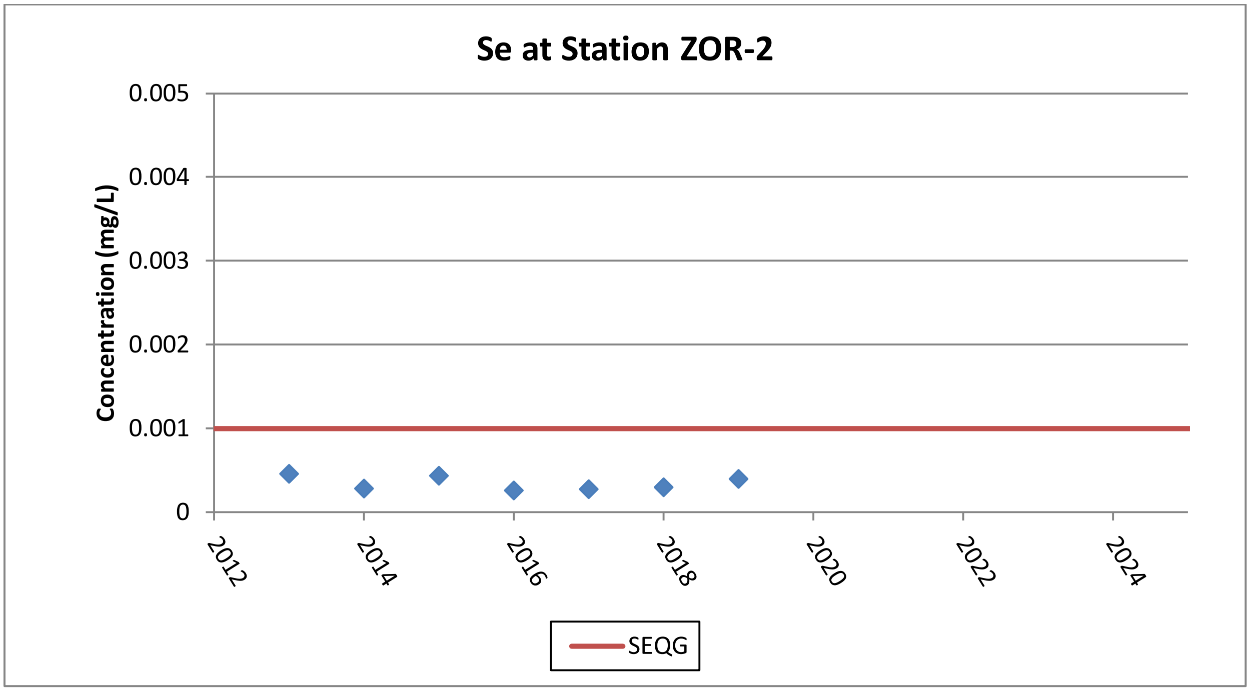
**Sampling initiated in 2013.*

Figure 4.4-6 ZOR-02 Outlet of the Zora Creek Flow Path



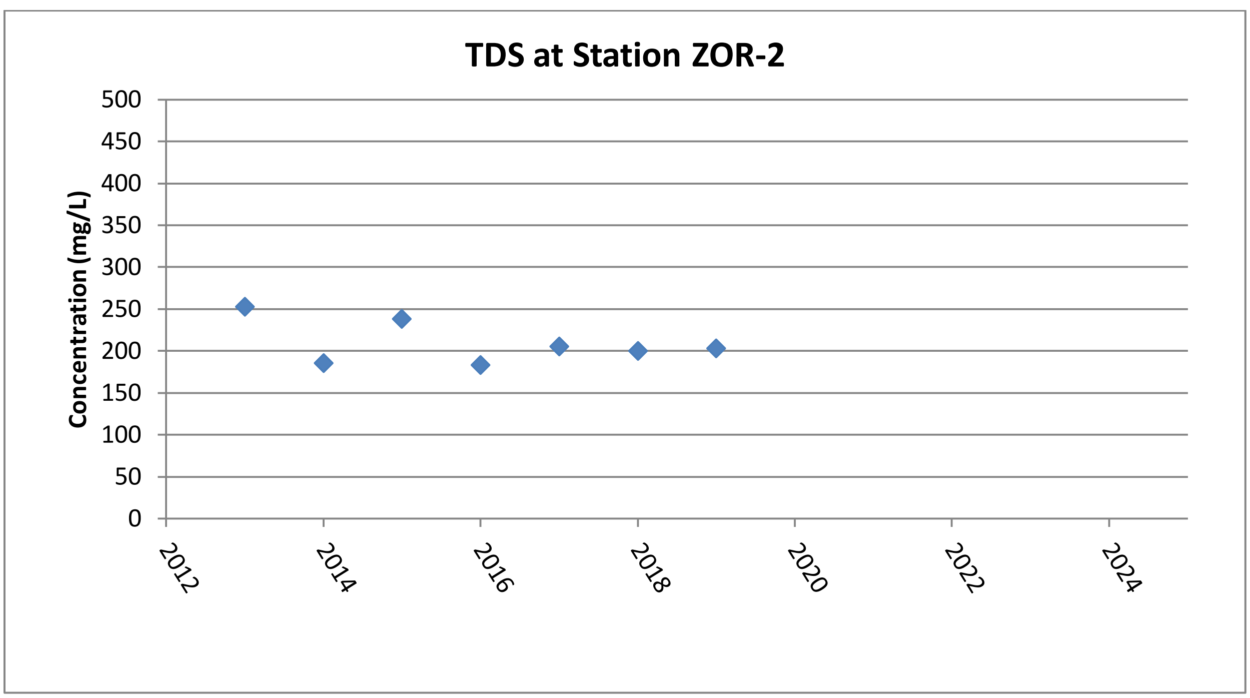
**Sampling initiated in 2013.*

Figure 4.4-7 ZOR-02 Outlet of the Zora Creek Flow Path



**Sampling initiated in 2013.*

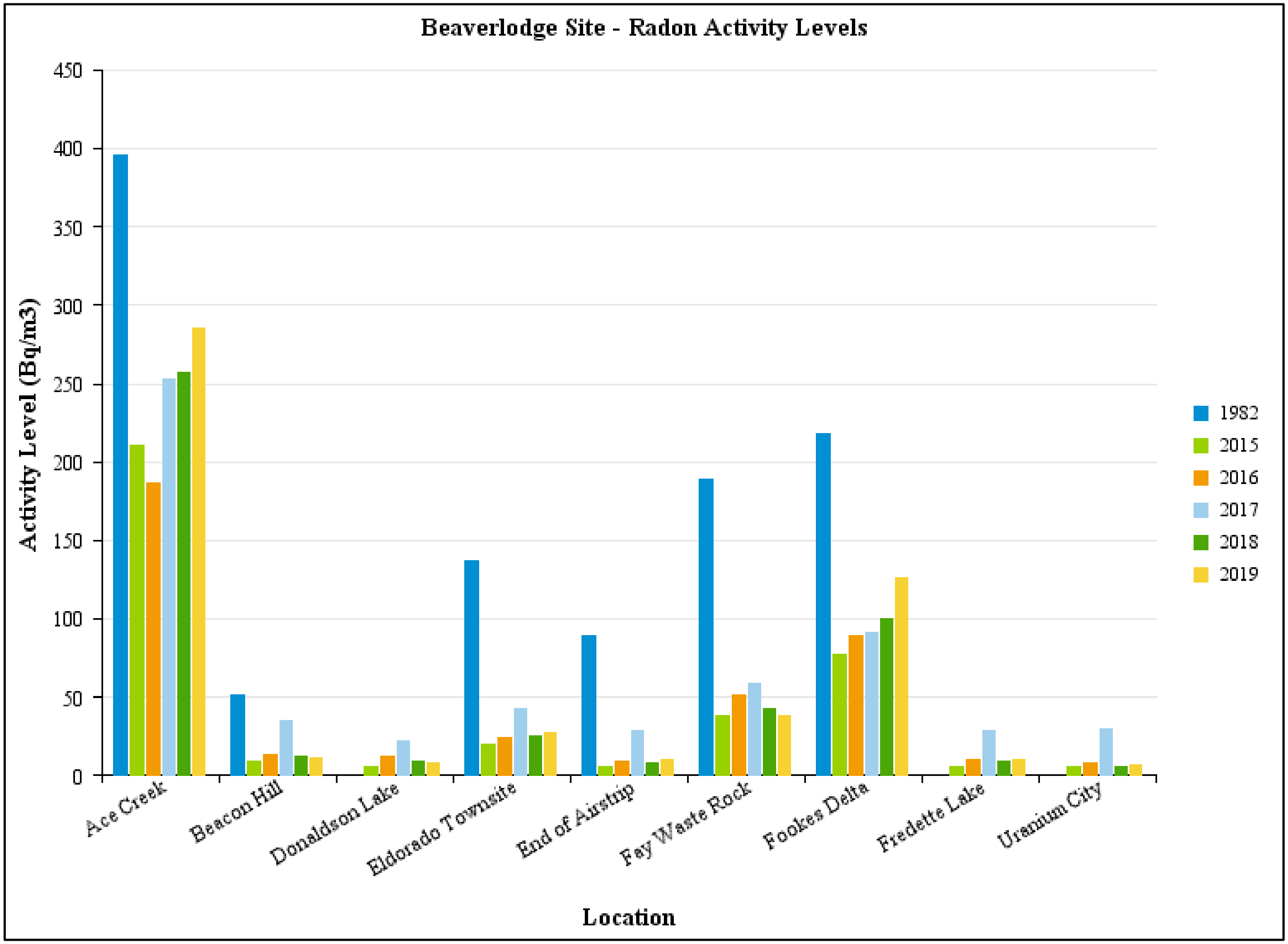
Figure 4.4-8 ZOR-02 Outlet of the Zora Creek Flow Path



**Sampling initiated in 2013.*

Figure 4.7.1-1 - Air Sampling Locations

Figure 4.7.1-2 Radon Summary (2015 - 2019 versus 1982)



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

APPENDIX A

APPENDIX A

BEAVERLODGE

Cameco

Beaverlodge

Decommissioned Beaverlodge Mine/Mill Site

2019 Geotechnical Inspection Report

February 2020

Table of Contents

1.0 INTRODUCTION

From June 3 - 7, 2019 Cameco, along with representatives of the Canadian Nuclear Safety Commission (CNSC) and the Saskatchewan Ministry of Environment (SkMOE), conducted an annual inspection of the Beaverlodge properties. As part of this inspection, the cover at the Fookes tailings delta and the two outlet spillways at Fookes and Marie reservoirs were inspected.

Prior to 2010, geotechnical inspections were completed on a three-year schedule by a qualified engineer. Past inspections of these areas were conducted by SRK Consulting (SRK) in September 1998, September 2001, June 2004, August 2007 and May 2010, with all reports submitted to the regulatory agencies.

Following the May 2010 inspection, SRK recommended the frequency of formal inspections by a qualified engineer be reduced from three to five years. In addition, SRK recommended that Cameco conduct annual inspections of the areas to ensure structures were performing as expected. SRK and Cameco collaborated in the development of an inspection checklist. The checklist was reviewed and accepted by the CNSC and SkMOE.

In 2011, Cameco initiated internal annual inspections of the areas identified above using the criterion based checklist. Annual inspections were completed by Cameco until 2015, when a formal inspection was completed by a qualified engineer. The 2015 inspection was conducted by SRK and indicated that overall; the Fookes tailings cover and the two outlet structures were performing as expected. The report concluded that it would be reasonable for Cameco to move towards final close out and a return to Institutional Control for the properties associated with the cover and outlet structures (*SRK, 2016*). SRK recommended that in the meantime, documented inspections by Cameco and/or regulators should continue on an annual basis until the next scheduled inspection by a geotechnical engineer, which is planned for 2020. The inspection frequency will be re-evaluated following the 2020 inspection. **Figure 1** provides the locations of the tailings delta, outlet structures.

In addition to the geotechnical inspections outlined above, Cameco personnel also conducts inspections of the crown pillar areas at the Hab, Dubyna and Ace properties during annual inspections with regulators. In 2019, these inspections took place in early June. These inspections were conducted based on recommendations following the assessment of site wide crown pillars conducted by SRK in 2014/2015 (*SRK, 2015*). Additional details are provided in **Section 5.0**, including **Figures 3**, **Figure 4**, and **Figure 5,** which provide the locations of applicable crown pillar monitoring.

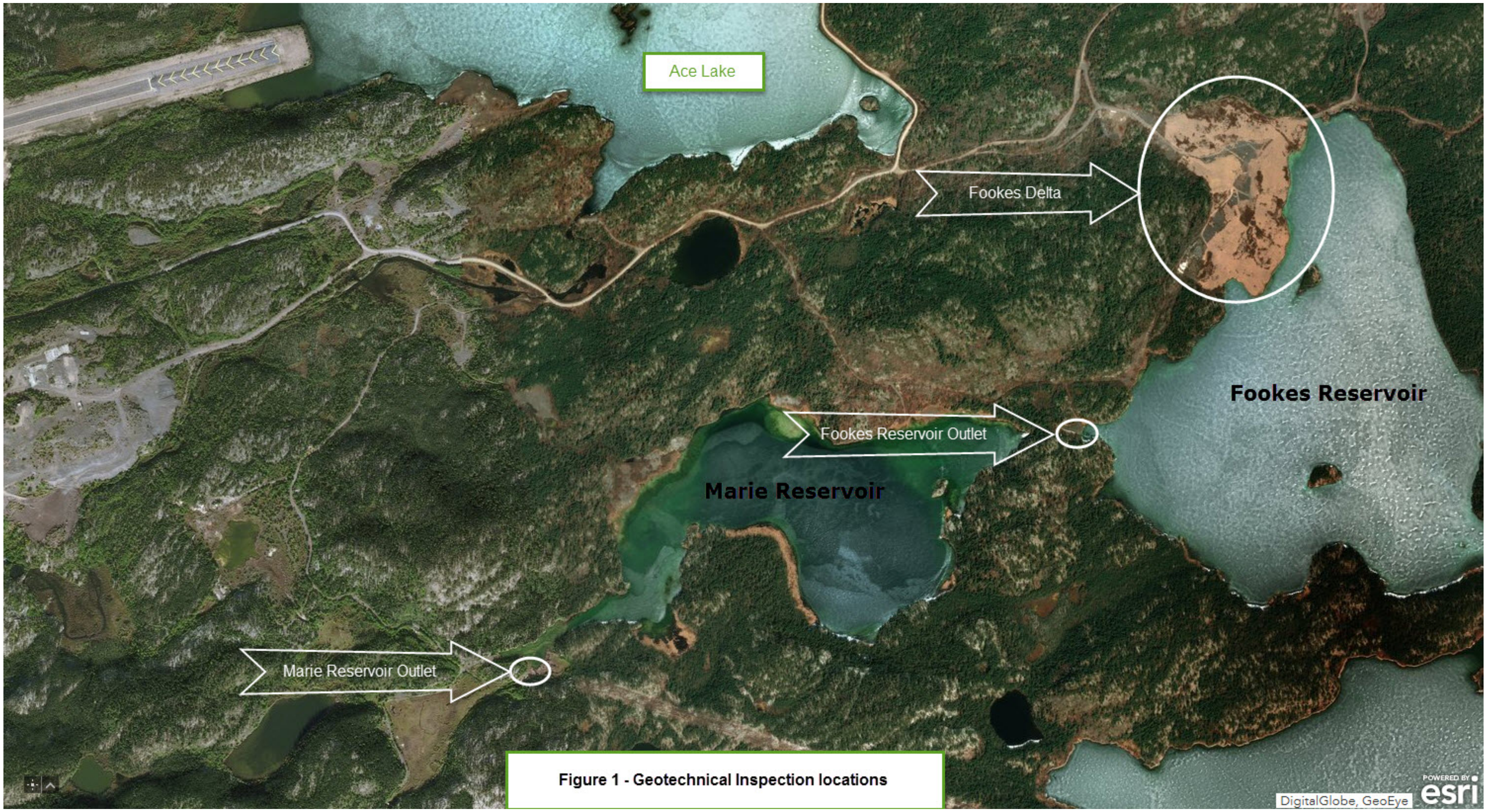


Figure 1 - Geotechnical Inspection locations

2.0 OUTLET STRUCTURE INSPECTIONS (FOOKES & MARIE RESERVOIR)

Both spillway structures consist of a rip-rap lined open channel (with trapezoidal cross-section), which discharge 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.

2.1 General Observations

The initial inspection years (2011 and 2012) saw very little to no flow through the tailings management area. The total annual precipitation measured in 2019 at the Uranium City weather station matched the historical average value (*Environment Canada, 2019*). With no extreme weather events noted.

As noted in previous geotechnical inspections beaver activity at the outlet of Marie Reservoir has resulted in construction of a dam. There does not appear to be any significant new activity over the last year and the water elevation in Marie Reservoir remains approximately 0.3 m above the entrance to the outlet structure. This condition will continue to be monitored during future inspections to ensure the integrity of the outlet structure is not compromised. There are currently no plans to remove this structure as it is naturally occurring. A photo of the Marie Outlet structure documenting the beaver dam is located in **Section 4.0**.

Comparisons of photos between inspection years is presented in **Section 4.0**. 2019 photos were taken in the summer (June).

2.2 Inspection Checklist for Outlet Structures

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

I. Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place.
II. 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.
III. Document conditions with photographs.

2.3 Marie Reservoir Outlet Inspection

I. Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place.

Previously, SRK identified that the grout-intruded rip-rap is relatively intact, except near the spillway entrance where one large block and several smaller ones on the right side of the spillway (looking downstream from Marie Reservoir) have been displaced due to ice-jacking.

In addition to the comparison photos provided in **Section 4.0,** photos taken during the 2019 inspection providing photographic record of the condition of the Marie Reservoir spillway channel are included in **Appendix A**. The spillway remains in a similar condition as observed in previous inspections.

It should be noted that cracking and displacement of the grout-intruded rip-rap was anticipated in the original design and does not affect the performance of the outlet spillway. The grout that was intruded into the rip-rap is meant to serve purely as a binding agent to increase the effective block size of the rip-rap, allowing it to more effectively resist erosion. It has been acknowledged by SRK that additional cracking and grout degradation will occur with time (*SRK*, *2016*).

The observations and photographic record from the 2019 inspection supports the observations made by SRK that the spillway continues to perform as designed.

II. *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*

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 left side of the spillway (looking upstream) continued to be displaced due to ice-jacking (**Appendix A, Photo A4**).

There is no evidence that water has overtopped the rip-rap in this area. Photographic evidence comparing past internal inspections show loose stones on the frost heaved section and other debris in the channel have not moved (or moved very little) from year to year. Photographic comparison to previous inspection photos is provided in **Section 4.0**.

2.4 Fookes Reservoir Outlet Inspection

I. *Check the condition of the spillway channel, with a view to confirming the grout-intruded rip-rap is still in place*

Similar to the Marie Outlet, SRK also identified that the grout-intruded rip-rap along the length of the Fookes Reservoir outlet spillway shows signs of cracking. In addition, there has been some ice-jacking, with the most significant displacements located near the upper part of the spillway (i.e., on the sides of the spillway, within 5 to 6 m of the spillway entrance; **Appendix B, Photo B2)**. The base of the channel does not show signs of displacement, and the middle to lower parts of the spillway remain in good condition. SRK noted during the 2015 inspection that the spillway continues to operate satisfactorily.

In addition to the comparison photos provided in **Section 4.0,** photos taken during the 2019 inspection providing photographic record of the condition of the Fookes Reservoir spillway channel are included in **Appendix B**. The overall condition of the spillway in

2019 was observed to be similar to previous inspections, and the spillway continues to perform as designed.

II. *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*

Photographic comparison to previous inspections results show that debris in the Fookes Outlet channel has generally not moved from year-to-year. There is no evidence that overtopping of the rip-rap areas of the spillway has occurred. As a result, Cameco has concluded that the channel has been able to accommodate the flows and no erosion of the channel has occurred. Photographic comparison to previous inspection photos is provided in **Section 4.0**.

3.0 FOOKES TAILINGS DELTA

3.1 General Observations

Historically, the area along the northeast side of the Fookes delta has contained standing water. The Fookes delta cover in this area was purposefully graded to establish an overall preferential gradient towards Fookes Reservoir. **Figure 2** provides an overview of the cover design (*SRK, 2008*), with the surface drainage paths outlined. As per the SRK design for the Fookes cover, the northern drainage ditch area of the delta was never intended to provide fully channelized flow to Fookes Reservoir. As a result, some ponding in higher precipitation years was anticipated and may be expected to occur.

During the June 2019 inspection of Fookes Delta, it was noted that the drainage area running along the north side of the delta and the drainage channel to Fookes Reservoir contained water and was performing as designed, with water present (**Appendix C, Photos C4, C6 and C7**). No standing water was observed on any other portion of the Fookes Delta.

Generally the cover was in good condition showing no areas of excessive erosion. There was no evidence of new vehicular traffic on the delta since the berms located at the access points were repaired and reinforced. There has also been notable progressive growth of vegetative cover over the last several years. Vegetation it is well established within 50 m of the shoreline and the engineered drainage structures. Vegetation continues to gradually encroach and thicken over all area of the delta.

Photographic comparison to previous inspection photos is provided in **Section 4.0**. Photos showing the conditions encountered during the site inspection are provided in **Appendix C**.

3.2 Inspection Checklist

I. Check for evidence of new tailing boils or tailings exposure due to frost action

II. Check for evidence of significant erosion of the cover material
   a. 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).
   b. 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.

III. Ensure erosion-protection devices are performing as expected on former north access road
   a. Waterbars (chevrons)
   b. Diversion ditches
   c. Erosion of cover adjacent to the former access road

IV. Ensure earthen berms are in place to limit access to the delta

3.3 Fookes Cover Inspection

I. *Check for evidence of new tailing boils or tailings exposure due to frost action*

No new boil development was noted on the tailings delta.

II. *Check for evidence of significant erosion of the cover material*

The shoreline, where the edge of the cover contacts Fookes Reservoir, was inspected and was in good condition. While the 2015 SRK inspection did note some erosion due to wave action, the overall condition of the shoreline was considered good with vegetation continuing to establish itself in the area. Photos taken in 2019 continue to show significant vegetation coverage along the shoreline.

The 2019 inspection showed that water is being captured in the drainage channels as per design and there is no evidence of any significant erosion of the cover.

The Fookes delta cover is in good condition and showed no signs of excessive erosion. As vegetation continues to establish on the shoreline it will provide additional armoring and increase the stability of the cover.

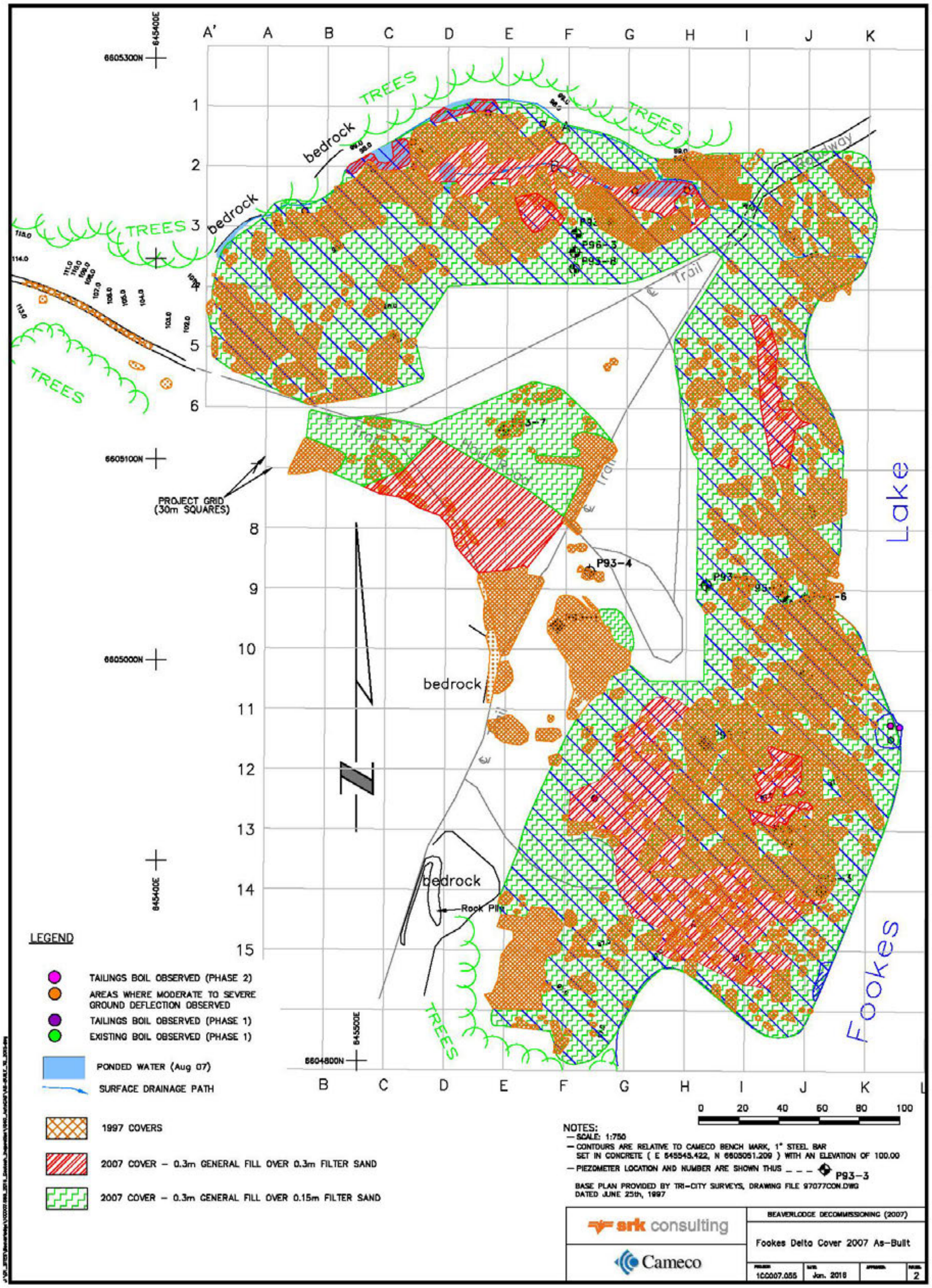
III. *Ensure erosion protection devices are performing as expected on former north access road*

As part of the design and installation of the covers in 2005 and 2007, the area considered most vulnerable to erosion was in the area on and below the access ramp at the northwest corner of the tailings delta (*SRK, 2010*). The general condition of the ramp is very good. Access to this ramp is closed off by a windrow of material at the top of the ramp. The water bars (chevrons) are performing as expected and show little sign of erosion (**Appendix C, Photo C1**).

In addition to the chevrons, run-out structures were installed to carry away excessive water during extreme run-off events. These run-out structures are also in good shape with no observed additional eroded material beyond that observed during previous inspections (**Appendix C, Photo C2**).

IV. *Ensure earthen berms are in place to limit access to the delta*

Since the earthen berms protecting the east and west access points to the Fookes Delta were repaired and reinforced in 2011 and 2012 respectively, there has not been any new evidence of passenger vehicular traffic accessing the tailings delta. It has been noted that there are occasional quad tracks on the tailings delta, which should not affect the integrity of the cover. Photos of the berm located on the east access point are provided in Appendix C (**Photo C8 and C9**).



TREES
bedrock
Roadway
Trail
Haul Road
P93-4
P93-5
P93-8
P93-7
PROJECT GRID
(30m SQUARES)
Rock Pile
Lake
Fookes
6605300N
6605100N
6605000N
6604800N
645400E
645500E
LEGEND
TAILINGS BOIL OBSERVED (PHASE 2)
AREAS WHERE MODERATE TO SEVERE GROUND DEFLECTION OBSERVED
TAILINGS BOIL OBSERVED (PHASE 1)
EXISTING BOIL OBSERVED (PHASE 1)
PONDED WATER (Aug 07)
SURFACE DRAINAGE PATH
1997 COVERS
2007 COVER – 0.3m GENERAL FILL OVER 0.3m FILTER SAND
2007 COVER – 0.3m GENERAL FILL OVER 0.15m FILTER SAND
NOTES:
– SCALE: 1:750
– CONTOURS ARE RELATIVE TO CAMECO BENCH MARK, 1" STEEL BAR SET IN CONCRETE (E 645545.422, N 6605051.209) WITH AN ELEVATION OF 100.00
– PIEZOMETER LOCATION AND NUMBER ARE SHOWN THUS P93-3
BASE PLAN PROVIDED BY TRI-CITY SURVEYS, DRAWING FILE 97077CON.DWG DATED JUNE 25th, 1997
srk consulting
Cameco
BEAVERLODGE DECOMMISSIONING (2007)
Fookes Delta Cover 2007 As-Built
1CC007.055
Jan. 2018
2

4.0 PHOTOGRAPHIC COMPARISONS

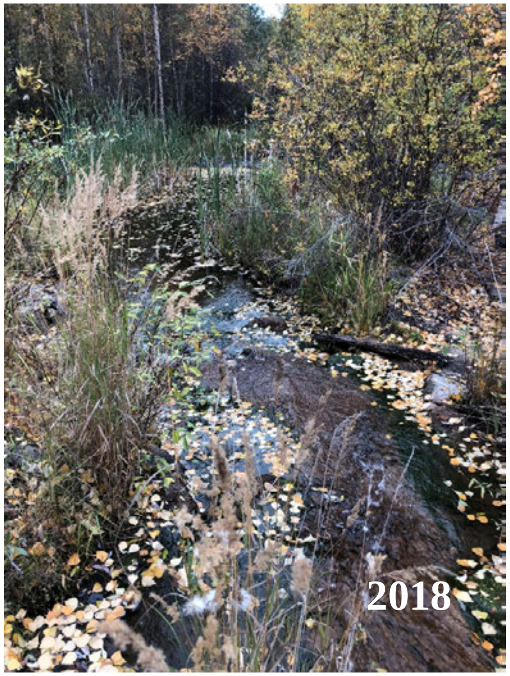
Beaver dam constuction at the outlet structure for Marie Reservoir

May 2018

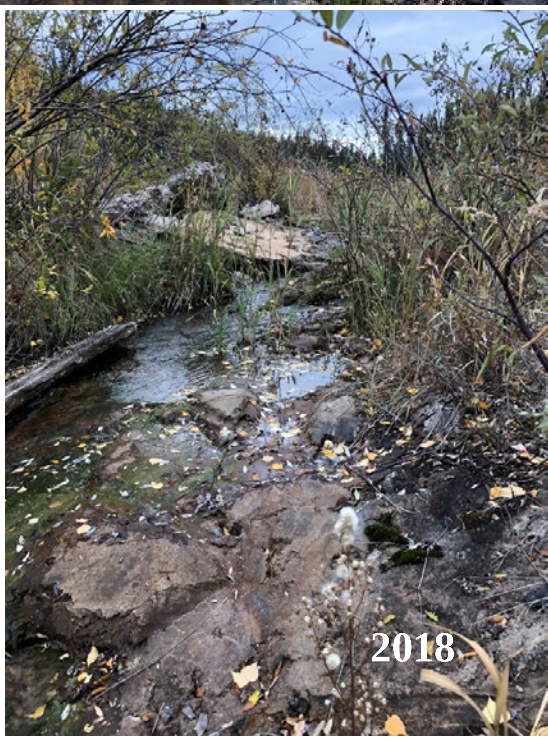
June 2019

Marie Outlet Structure looking upstream

Marie Outlet Structure looking downstream

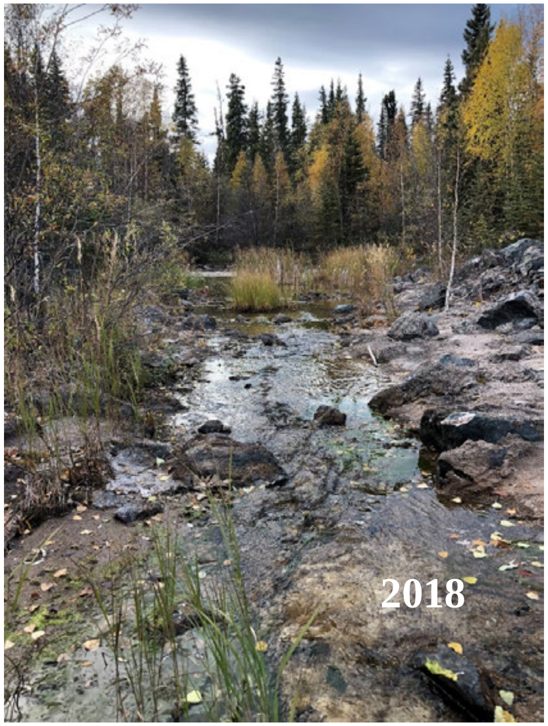


Marie Reservoir Outlet Structure
– Ice jacked block of grout intruded rip-rap



Fookes Outlet Structure looking upstream

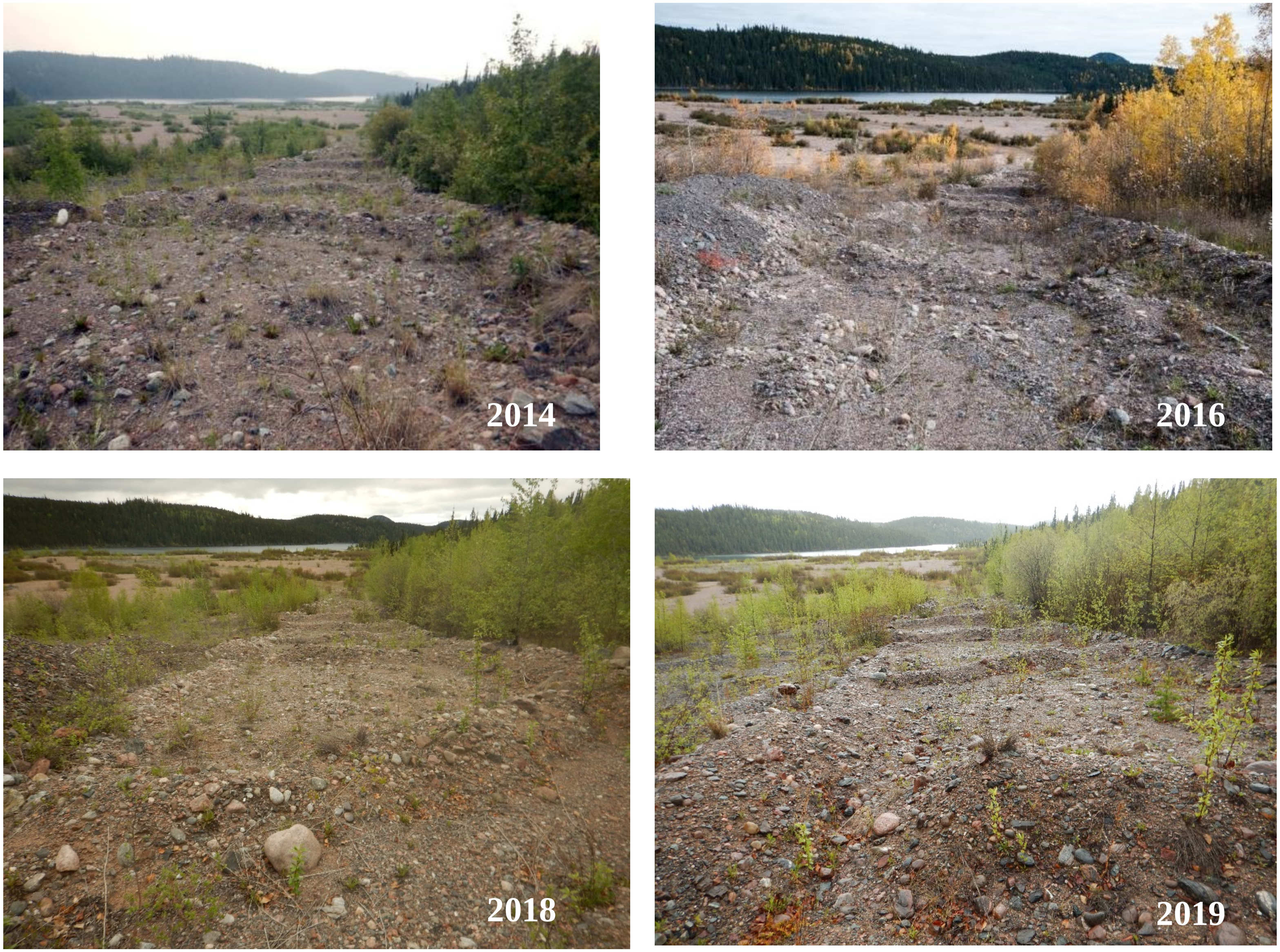
Fookes Outlet Structure looking downstream



Drainage area looking NW towards access point

Note: 2019 picture not taken from the exact location shown in 2018

Fookes Cover Shoreline



Chevrons in place on north access point to the Fookes delta

5.0 CROWN PILLAR AREAS

In 2016, the Geotechnical Inspection Checklist was updated to include the identified crown pillar areas at the Hab, Dubyna and Ace areas as per recommendations from SRK. Visual inspections of these areas will be completed until 2020, at which time the frequency of monitoring will be reassessed.

5.1 Site Wide Assessment

SRK was retained by Cameco Corporation to undertake a geotechnical assessment of the crown pillar stability at six historic Beaverlodge sites in 2014 (*SRK, 2015*). This included the Ace, Dubyna, Verna, Hab, Martin Lake, and main Fay shaft areas. The overall goal of the assessment was to determine the potential for long term ground surface subsidence above the crown pillars and complete an investigation into potential, associated safety risks.

From the review and evaluation of historic records, the Ace site was determined to present the most notable potential for subsidence to occur in the future. The Dubyna and Hab sites were found to have crown pillars that were relatively near surface, and thus were examined further. Based on the configuration of the underground workings at the remaining properties that were assessed, it was determined that no additional examination or remediation would be warranted.

5.2 Dubyna and Hab

Based on their assessment, SRK recommended visual monitoring of the crown pillar areas associated with the Dubyna and Hab areas. Specifically, looking for the development of tension cracks and observable changes in ground elevation. 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 (*SRK, 2015*).

Table 1 below provides GPS points for locations associated with the Dubyna area where visual monitoring was recommended. As shown in **Figure 3**, at the end of **Section 5**, the area between these points are expected to coincide with the Level 1 stoping area where crown pillar thicknesses would be expected to be the thinnest.

Table 1: 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

Similar to the Dubyna site, the recommended option for the Hab 039 Zone was to conduct visual monitoring looking for the development of tension cracks and/or any observable changes in ground elevation (depressions developing). The residual safety consequence for crown pillar failure at this site is also expected to be low due to its remote location and the fact that the pit has been backfilled with moderately graded to larger sized waste rock (*SRK, 2015*).

Table 2 below highlights locations associated with the Hab area where visual monitoring was recommended. As shown in **Figure 4**, at the end of **Section 5**, these locations are expected to align roughly with the 2nd level workings where some stoping was completed above the Hab 039 Zone area.

Table 2: 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

5.3 Ace Stope Area

While reviews of the Dubyna and Hab area concluded that visual monitoring of crown pillar condition was sufficient, the likelihood of additional failure of the crown pillar in the Ace Stope Area warranted additional remediation. Several options were proposed and ultimately it was decided to proceed with placing a cover of coarse material over the areas identified as having potential for future subsidence.

An optimized cover design to address identified areas of concern for future subsidence, based on the configuration of the historic stopes associated with the Ace mining area was selected.

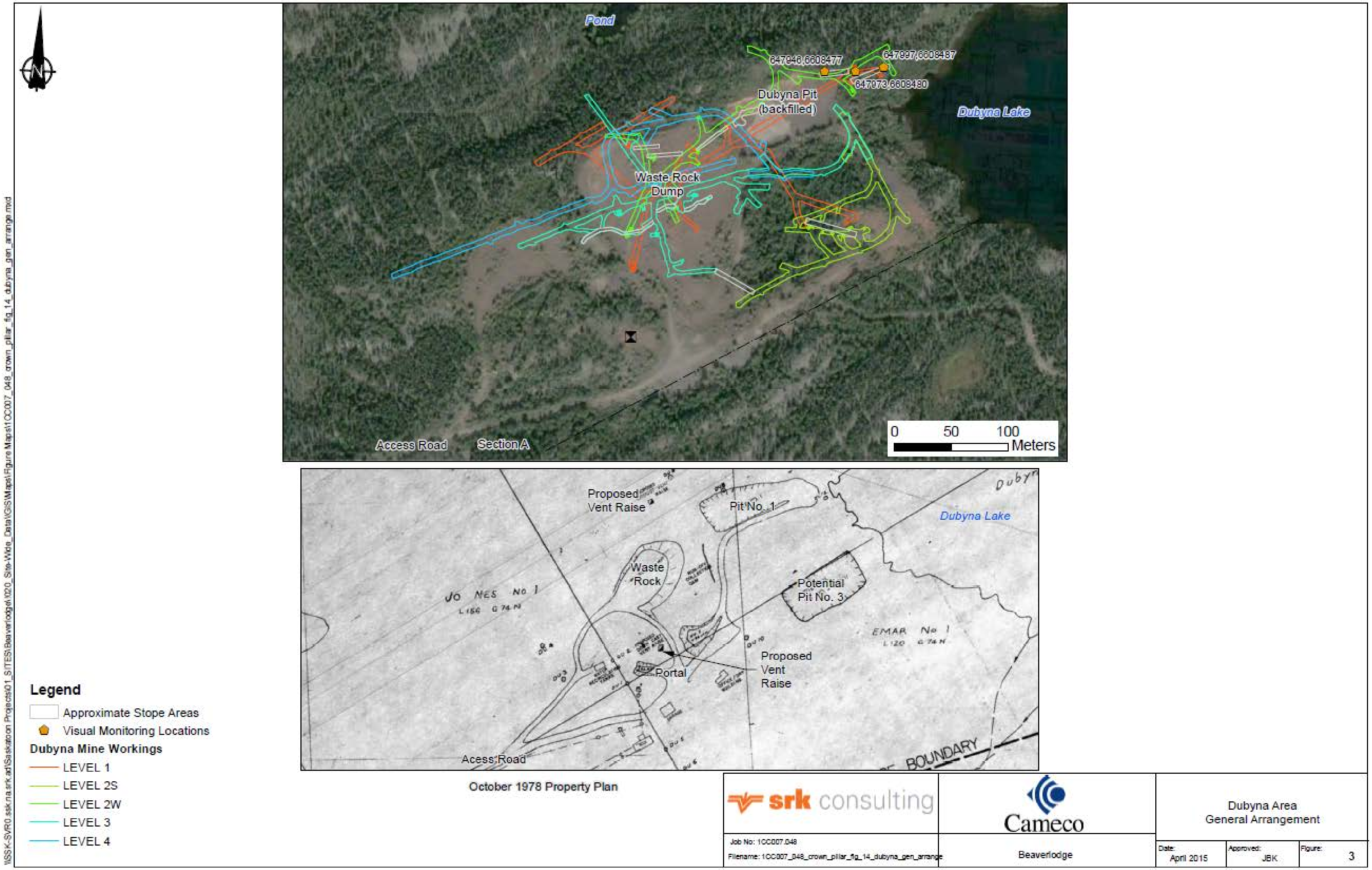
Placement of the cover material began on July 25th, 2016 under the supervision of SRK and was completed on September 2nd, 2016. The cover includes two main sections that run along strike with, and directly above, the historic stopes. The cover itself consists of a 1.5 to 2 meter base placed over the identified areas of risk and is comprised of a combination of broken concrete sourced from the building pads at the Fay mill site and sorted waste rock. Once the base was completed, a final 0.5 m layer of waste rock was placed on top. **Figure 5** provides the layout of the cover along with the locations of historic subsidence observed in the area.

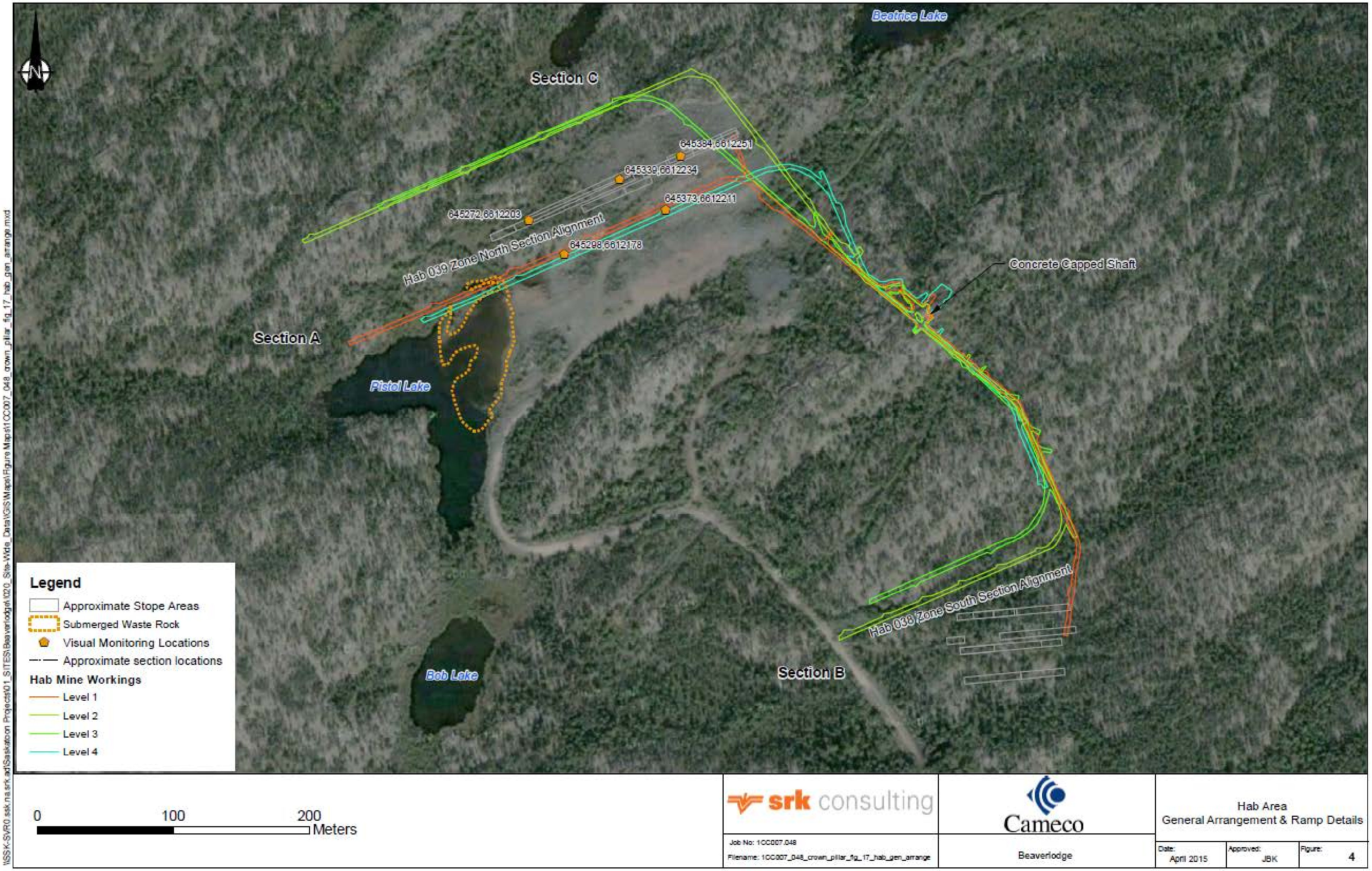
5.4 Inspections

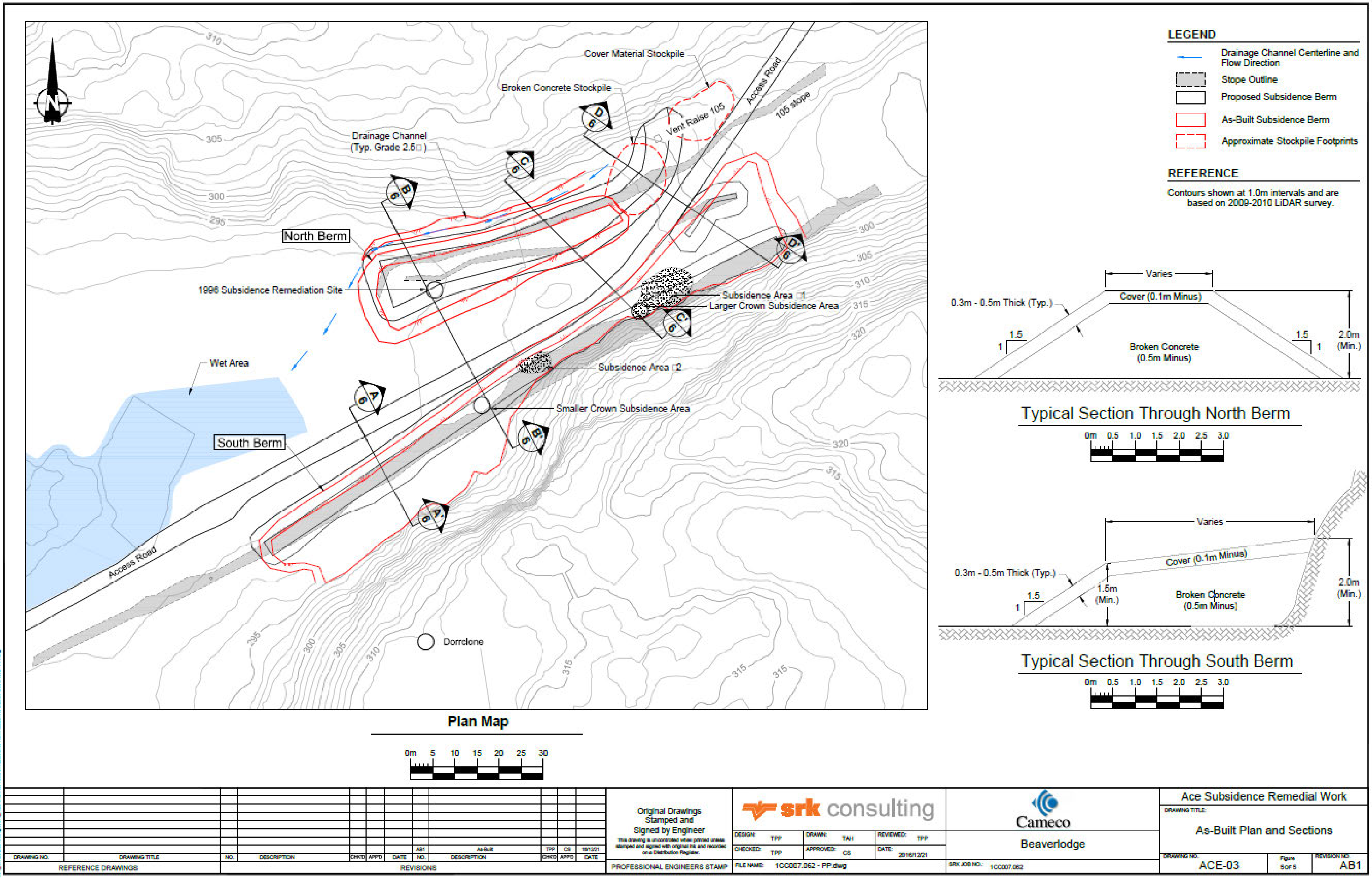
Crown pillar inspections were conducted at the Ace area on June 4, 2019, with an emphasis on the newly placed cover material, as well as at (and between) the Hab and Dubyna monitoring points. Photographs of the covered Ace Stope Area and the crown pillar areas at the Hab site are provided in **Appendix D**. Due to technical difficulties photographs of the Dubyna site are not available for 2019. These areas will be inspected again in 2020 and photographic record will be provided.

At the Ace site, the cover material over the stopes was inspected by walking the toe of the cover material, as well as the interface between the cover material and natural ground. No signs of tensions cracks or visible depressions were observed along the Ace stope cover material in 2019.

The crown pillar monitoring points at Hab and Dubyna were located, and a visual walking inspection was completed on June 3, 2019 at each site. The inspection involved walking between and around the points identified in Tables 1 and 2. Observations at both areas did not show any evidence of tension cracks or slumping in 2019.


Pond
647946,6608477
647997,6608487
647973,6608480
Dubyna Pit
(backfilled)
Dubyna Lake
Waste Rock
Dump
Access Road
Section A
0
50
100
Meters
Proposed
Vent Raise
Pit No. 1
Dubyna Lake
Waste
Rock
Potential
Pit No. 3
EMAR No 1
Proposed
Vent
Raise
Portal
Acess Road
BOUNDARY
October 1978 Property Plan
Legend
Approximate Stope Areas
Visual Monitoring Locations
Dubyna Mine Workings
LEVEL 1
LEVEL 2S
LEVEL 2W
LEVEL 3
LEVEL 4
srk consulting
Cameco
Dubyna Area
General Arrangement
Job No: 1CC007.048
Filename: 1CC007_048_crown_pillar_fig_14_dubyna_gen_arrange
Beaverlodge
Date:
April 2015
Approved:
JBK
Figure:
3


Beatrice Lake
Section C
645384,6612251
645339,6612234
645373,6612211
645272,6612203
645298,6612178
Hab 039 Zone North Section Alignment
Concrete Capped Shaft
Section A
Pistol Lake
Hab 038 Zone South Section Alignment
Section B
Bob Lake
Legend
Approximate Stope Areas
Submerged Waste Rock
Visual Monitoring Locations
Approximate section locations
Hab Mine Workings
Level 1
Level 2
Level 3
Level 4
0
100
200
Meters
srk consulting
Cameco
Hab Area
General Arrangement & Ramp Details
Job No: 1CC007.048
Filename: 1CC007_048_crown_pillar_fig_17_hab_gen_arrange
Beaverlodge
Date: April 2015
Approved: JBK
Figure: 4


LEGEND
Drainage Channel Centerline and Flow Direction
Stope Outline
Proposed Subsidence Berm
As-Built Subsidence Berm
Approximate Stockpile Footprints
REFERENCE
Contours shown at 1.0m intervals and are based on 2009-2010 LiDAR survey.
Cover Material Stockpile
Broken Concrete Stockpile
Drainage Channel (Typ. Grade 2.5□)
Vent Raise 105
Access Road
105 stope
North Berm
1996 Subsidence Remediation Site
Subsidence Area □1
Larger Crown Subsidence Area
Subsidence Area □2
Smaller Crown Subsidence Area
Wet Area
South Berm
Dorrclone
Plan Map
0m 5 10 15 20 25 30
Varies
0.3m - 0.5m Thick (Typ.)
Cover (0.1m Minus)
Broken Concrete (0.5m Minus)
2.0m (Min.)
Typical Section Through North Berm
0m 0.5 1.0 1.5 2.0 2.5 3.0
1.5m (Min.)
Typical Section Through South Berm
Original Drawings Stamped and Signed by Engineer
srk consulting
Cameco
Beaverlodge
Ace Subsidence Remedial Work
As-Built Plan and Sections
ACE-03
AB1
FILE NAME: 1CC007.062 - PP.dwg
REFERENCE DRAWINGS
REVISIONS
PROFESSIONAL ENGINEERS STAMP

6.0 REFERENCES

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SRK Consulting (2010). Beaverlodge Project: Inspection of Fookes Delta and Outlet Structures at Fookes Reservoir and Marie Reservoir. Report prepared for Cameco Corporation, September, 2010.

SRK Consulting (Canada) Inc. (2015). Beaverlodge Property – Crown Pillar Assessment (2014 – 2015), Project Number: 1CC007.048. Report submitted to Cameco Corporation, July 2015.

SRK Consulting (2016). Beaverlodge Project: Inspection of Select Areas within the Fookes and Marie Reservoirs and Ace Creek Catchment. Report prepared for Cameco Corporation, January, 2016.

7.0 APPENDICES

Appendix A – Marie Reservoir Outlet photos

Appendix B – Fookes Reservoir Outlet photos

Appendix C – Fookes Tailings Delta photos

Appendix D – Ace and Hab crown pillar inspection photos

APPENDIX A

Marie Outlet Photos

Photo A1 – Marie Reservoir Spillway looking upstream

Photo A2 - Marie Reservoir Spillway inlet; beaver dam noted in 2018

Photo A3 – Marie Reservoir Spillway (water flowing into stilling basin)

Photo A4 – Displaced grout intruded rip rap at the entrance to the spillway

Fookes Outlet Photos

APPENDIX B

Photo B1 – Fookes Reservoir Spillway looking upstream

Photo B2 – Fookes Reservoir Spillway looking upstream (near mouth)

Photo B3 – Fookes Reservoir Spillway looking downstream (mid channel)

Photo B4 – Fookes Reservoir Spillway stilling basin

Photo B5 – Fookes Reservoir Spillway broken rip-rap on south side of channel

APPENDIX C

Fookes Delta Cover Photos

Photo C1 – Chevrons in place on north access point to the Fookes delta

Photo C2 – Run-out structure along north access road (looking east)

Photo C3 – Drainage collection area on edge of Fookes Tailings Delta near access point (looking SE)

Photo C4 – Drainage collection area on edge of Fookes Tailings Delta approximately 100m from access point (looking SE)

Photo C5a-b – Panoramic views of the Fookes cover with vegetation establishing

Photo C6 – View of vegetation establishing along drainage channel

Photo C7 – View of vegetation establishing along drainage channel

Photo C5a-b – Panoramic views of the Fookes cover with vegetation establishing

Photo C6 – View of vegetation establishing along drainage channel

Photo C7 – View of vegetation establishing along drainage channel

Photo C8—Protective Berm on east side of Fookes Delta (looking east)

Photo C9—Protective Berm on east side of Fookes Delta (looking west)

Photo C10—Fookes Reservoir shoreline (looking west)

Photo C10—Fookes Reservoir shoreline (looking west). Note vegetation along shoreline is well established

APPENDIX D

Ace Crown Pillar Area Photos

Photo D1 - View of the cover placed over Ace 201 Stope

Photo D2 - View of the cover placed over Ace 201 Stope, with view to Ace 105 and 208 Stope cover on the right side of the photograph

Photo D3—Stockpiled material east of Ace Crown Pillar Remediation Area, adjacent to 105#2 Stope Raise. Material to be move to location of 201 Stope Raise

Photo D4—Stockpiled material covering the location of the 201 Stope Raise. Looking west.

Photo D5—View from near Hab CP04 looking along ridge towards Hab CP05

Photo D6—View looking west from middle of track between CP04 and CP05

Photo D7—View from near Hab CP05 looking east, back up ridge towards Hab CP04

Photo D8—View from near Hab CP01 looking east towards Hab CP02

Photo D9—View from near Hab CP02 looking east towards Hab Pit and Hab CP03

Photo D10—View along ridge looking east between Hab CP02 and Hab CP03

Photo D11—View along ridge looking west from Hab CP03 back down the ridge towards Hab CP02

APPENDIX B

APPENDIX B

June 4, 2019

Beaverlodge Presentation

Ben McIntyre School - Uranium City

Michael Webster / Alyse Kambeitz

cameco.com

Cameco

Safety Moment

cameco.com

Cameco

Presentation Overview

1. The Beaverlodge Process
2. Upcoming CNSC Hearing
3. Remaining Site Activities
4. Public Information Program
5. Regulatory Oversight

The Beaverlodge Process

Operating

1952 to 1982

Low-grade ore (by today's standard)

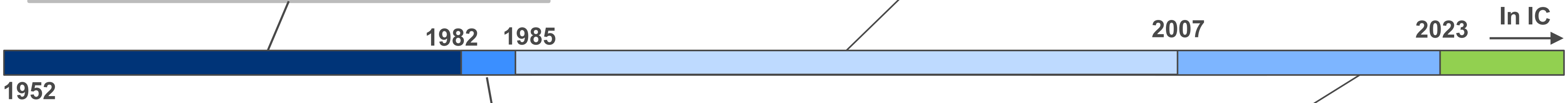
20 million kg of yellowcake

Main site + satellite mines

Transition Phase Monitoring

1985 to present

Routine monitoring and inspections



Decommissioning and reclamation

Implemented 1982 – 1985

Decommissioning plan approved by regulators of the day

Completed remediation accepted by regulatory agencies

To Institutional Control

2007 implemented Act & Regulations

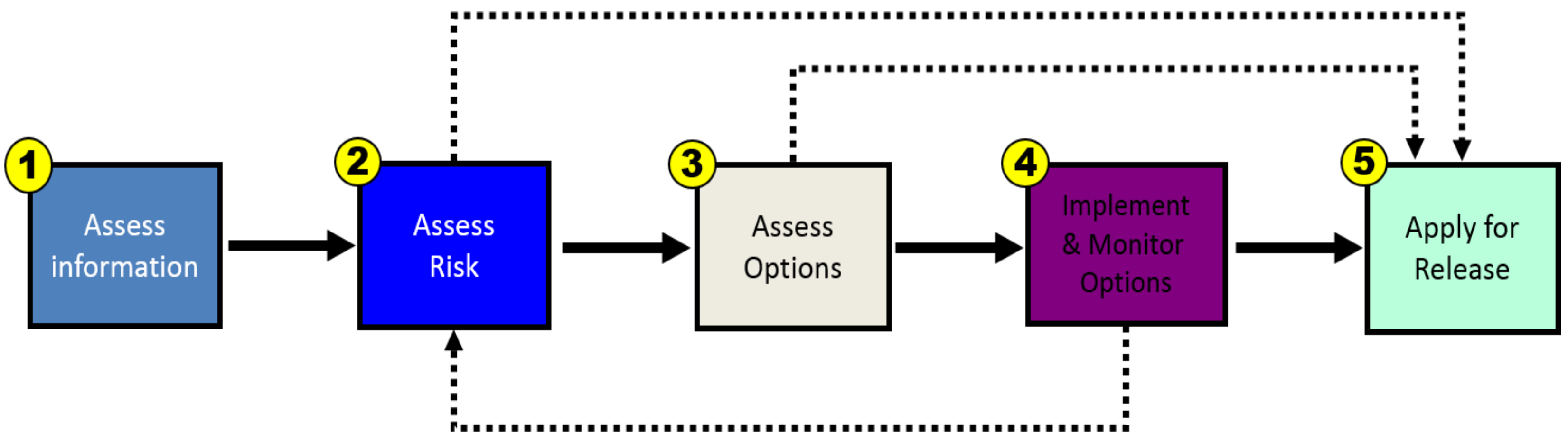
Beaverlodge Management Framework

The Path Forward Plan

Site remediation

The Beaverlodge Process

1. **Beaverlodge Management Framework**
   - Developed by Cameco with help from regulatory agencies and stakeholders
   - **Step by step process** for how the properties would be assessed and the final remedial options would be **selected, monitored and evaluated** to reach our end goal (IC program)



Cameco

The Beaverlodge Process

2. **Beaverlodge Quantitative Site Model**
   - Developed the QSM to use as a predictive tool to assess the potential outcomes of various remedial options

3. **Remedial Options Workshops**
   - Held in 2009 and 2012 with local and regional stakeholders
   - Presented various remedial options and their outcomes using the **QSM**
   - Participant feedback regarding the potential remedial options was gathered, summarized and informed the **Path Forward**

The Beaverlodge Process

4. Beaverlodge Path Forward Report

- Based on the Management Framework, QSM, and workshops
- In 2013, the CNSC Commission **accepted** the proposed Path Forward and granted Cameco a 10-year licence to implement the select remedial options
- Included **Performance Criteria** to evaluate success of remediation prior to transfer of the properties back to province

Performance Objectives

Safe & Secure	Stable/Improving

Performance Indicators

Safe & Secure	Stable/Improving
Acceptable Gamma Levels Boreholes Plugged Mine Openings Secure Stable Crown Pillar Site Free from Debris	Water Quality Within Modelled Predictions

The Beaverlodge Process

- **Once criteria are met, the properties are eligible for:**

  1) release from SkMOE decommissioning and reclamation requirements; and

  2) release from CNSC licensing

Saskatchewan Ministry of Environment

CNSC CCSN

Canada

- **Important because to be eligible for the IC program, properties must receive release from any and all licenses**

The Beaverlodge Process

- Properties being transferred in a **staged approach:**

2009
- 5 properties transferred
- Small properties with minimal activity

2019
- 20 properties proposed for transfer to ICP
- Received letter of intent from SkMOE
- CNSC Hearing this Oct. to request release

2023
- Remaining 45 properties planned for transfer by 2023

Upcoming CNSC Hearing

- Planned for October 2 & 3rd in Lac Du Bonnet, Manitoba
- Application to release 20 properties from CNSC licensing to facilitate transfer to the IC program
- Opportunity for public to intervene in hearing

Cameco

Upcoming CNSC Hearing

Performance Indicators	Acceptable Gamma Levels	Site Free From Debris	Boreholes Plugged	Stable Caps on Vertical Mine Openings	Stable Crown Pillar	Water Quality Within Modelled Predictions
	Reasonable use scenario demonstrating gamma levels at the site are acceptable.	Final site inspection and removal of remnant debris	All boreholes have been plugged at the time of transfer to institutional control.	Caps have been replaced and signed off by a qualified person.	Crown pillar assessed, remediated if required, and signed off by a qualified person.	Water quality is stable/improving
HAB 3	✓	✓	✓	N/A	✓	N/A
HAB 6	✓	✓	✓	N/A	N/A	N/A
EXC 2	✓	✓	✓	N/A	N/A	N/A
RA 6	✓	✓	N/A	✓	✓	N/A
RA 9	✓	✓	N/A	✓	✓	N/A
EAGLE 1	✓	✓	✓	N/A	N/A	N/A
BOLGER 2	✓	✓	✓	N/A	N/A	N/A
ATO 26	✓	✓	N/A	N/A	N/A	N/A
EXC ATO 26	✓	✓	N/A	N/A	N/A	N/A
URA MC	✓	✓	✓	N/A	N/A	N/A
EXC ACE 1	✓	✓	N/A	N/A	N/A	N/A
ACE 10	✓	✓	N/A	N/A	N/A	N/A
ACE 2	✓	✓	N/A	N/A	N/A	N/A
EXC ACE 3	✓	✓	N/A	N/A	N/A	N/A

Upcoming CNSC Hearing

Performance Indicators	Acceptable Gamma Levels	Site Free From Debris	Boreholes Plugged	Stable Caps on Vertical Mine Openings	Stable Crown Pillar	Water Quality Within Modelled Predictions
	Reasonable use scenario demonstrating gamma levels at the site are acceptable.	Final site inspection and removal of remnant debris	All boreholes have been plugged at the time of transfer to institutional control.	Caps have been replaced and signed off by a qualified person.	Crown pillar assessed, remediated if required, and signed off by a qualified person.	Water quality is stable/improving
URA 5	✓	✓	✓	N/A	N/A	N/A
EXC URA 5	✓	✓	N/A	N/A	N/A	N/A
URA 3	✓	✓	✓	✓	N/A	N/A
ACE 5	N/A	✓	✓	N/A	N/A	N/A
JO-NES	✓	✓	✓	✓	✓	N/A
HAB 2A	✓	✓	✓	✓	N/A	N/A

Upcoming CNSC Hearing

1. Acceptable Gamma Levels

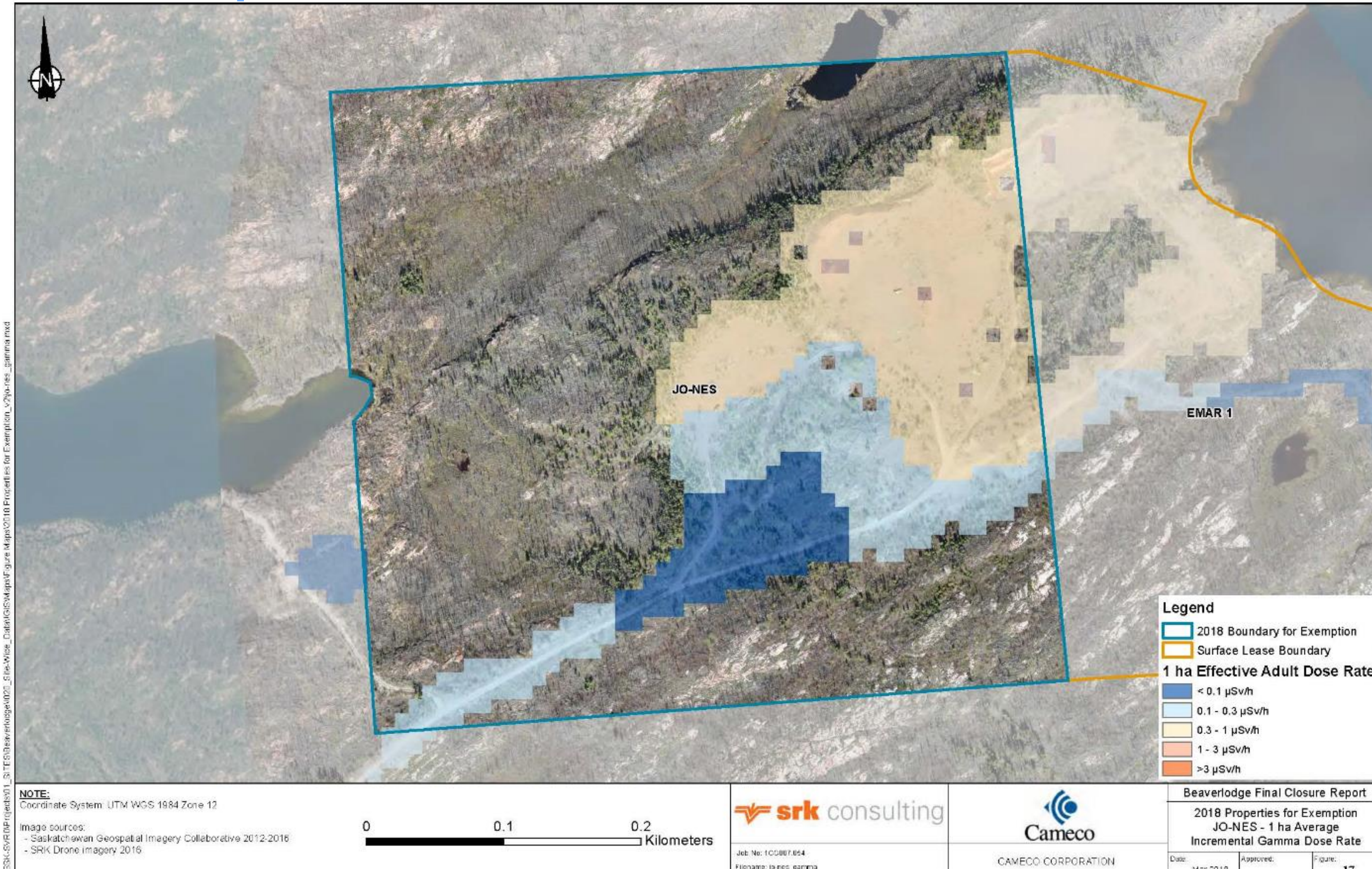
COMPLETED

- ✓ Properties were scanned
- ✓ Community members interviewed for land use survey
- ✓ Information was used to produce final risk assessment

Using a conservative estimate of potential doses based on surveyed land use, public exposure remained below the public dose limit on the Beaverlodge sites.

Upcoming CNSC Hearing

1. Acceptable Gamma Levels



Upcoming CNSC Hearing

2. Boreholes Plugged

All boreholes located on 20 properties have been remediated.

Upcoming CNSC Hearing

3. Site Free From Debris

3 YEAR
campaign cleaned up historic debris from 2015 to 2017

More than 2,465 hrs dedicated to inspections & clean-up

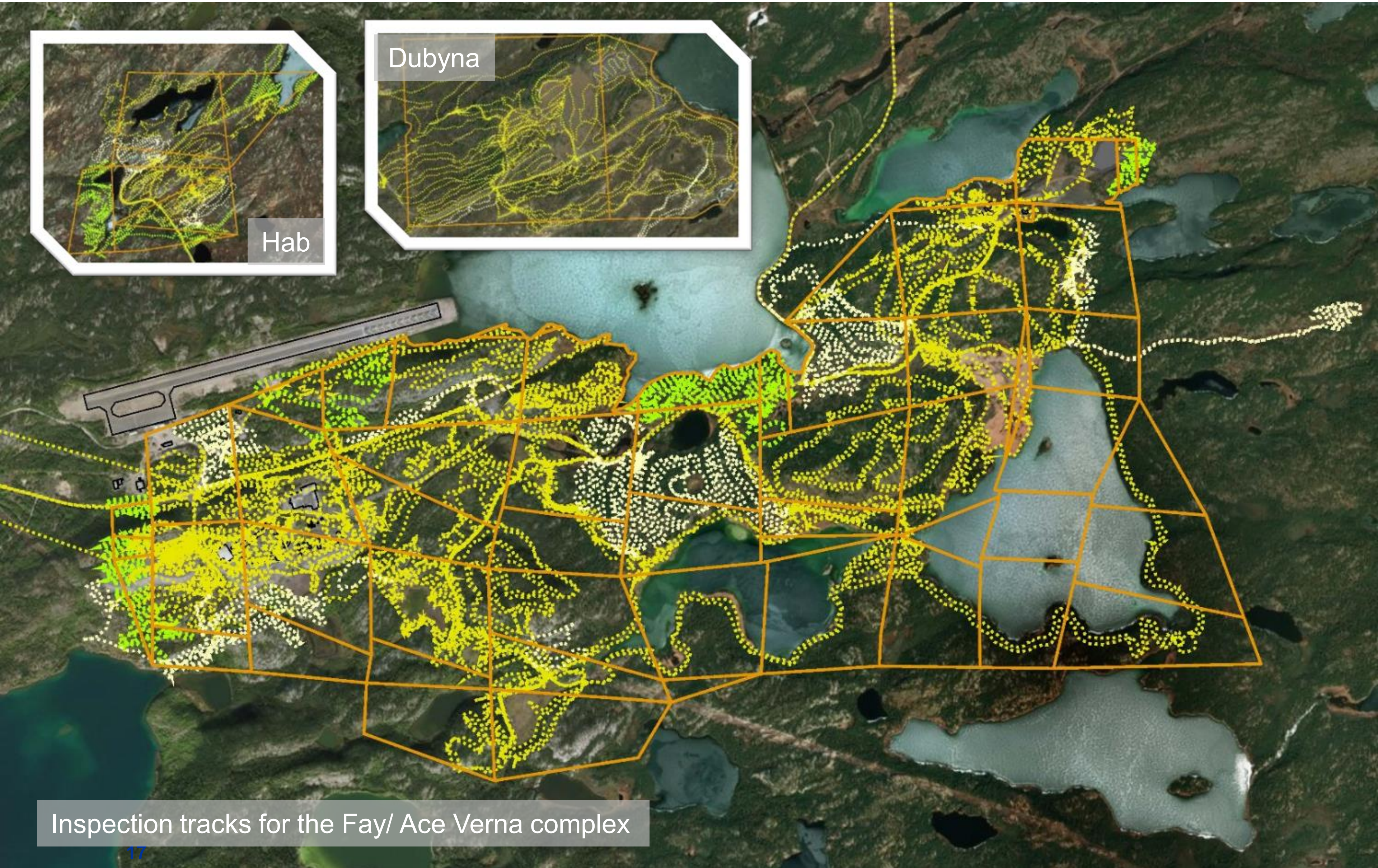
Tracks recorded and debris was flagged

2,533
cubic meters of material collected

Mine related debris deposited in former Bolger pit or Lower Fay pit

Upcoming CNSC Hearing

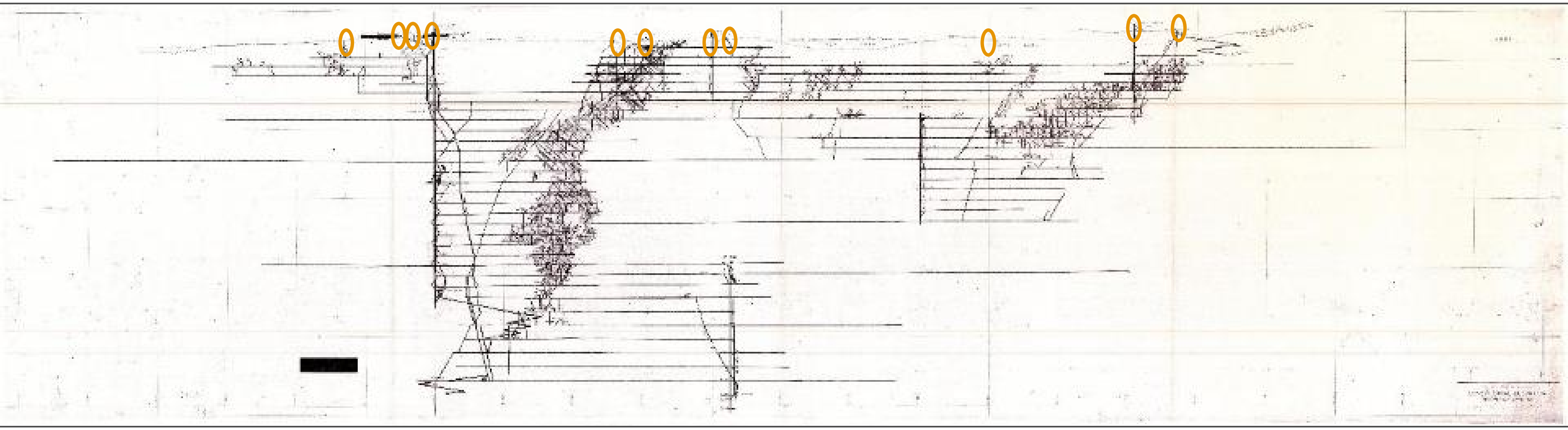
3. Site Free From Debris



Inspection tracks for the Fay/ Ace Verna complex

Upcoming CNSC Hearing

4. Mine Openings Secure



Beaverlodge Mine Longitudinal Section - 1982

5 of the 20 properties have historic mine openings that have been sealed via regulatory approved methods.

Upcoming CNSC Hearing

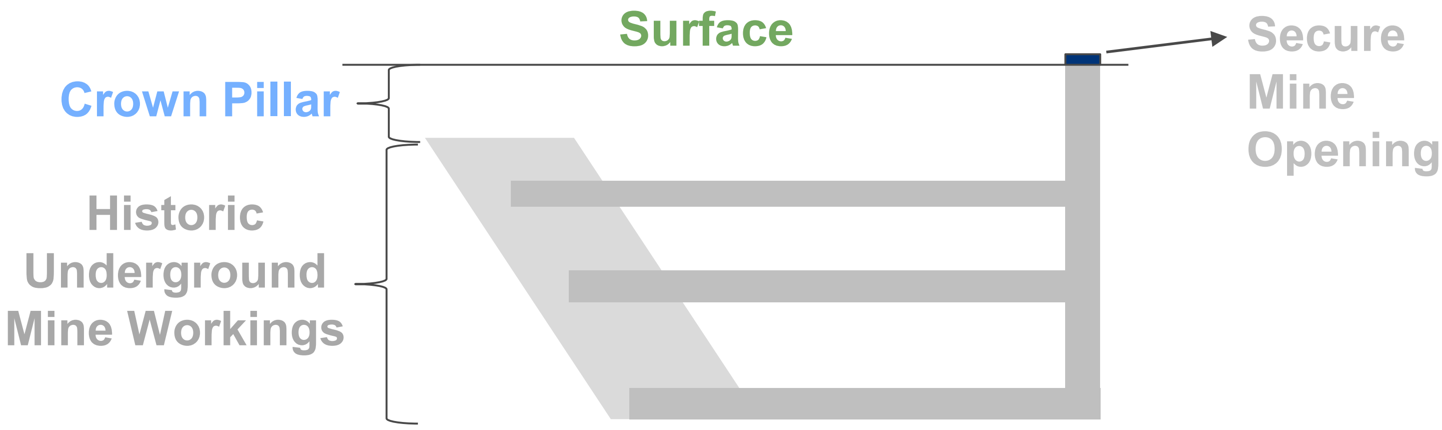
4. Mine Openings Secure

- **Once located, the caps and surrounding bedrock are cleaned and assessed for remedial options**

Cameco

Upcoming CNSC Hearing

5. Crown Pillars Secure



A site wide assessment of crown pillars was completed by a third party expert in 2015 and did not identify any areas of concern related to the 20 decommissioned properties.

Upcoming CNSC Hearing

6. Water Quality Within Modelled Predictions

There are no water quality predictions for the 20 properties

- However, recent studies show that water quality trends across the Beaverlodge site are largely following predictions
- Where there are differences, additional risk assessments say there are **no increased risks to humans**

Upcoming CNSC Hearing

- The 20 properties proposed for transfer **meet the Performance Objectives** of Safe, Secure and Stable/Improving

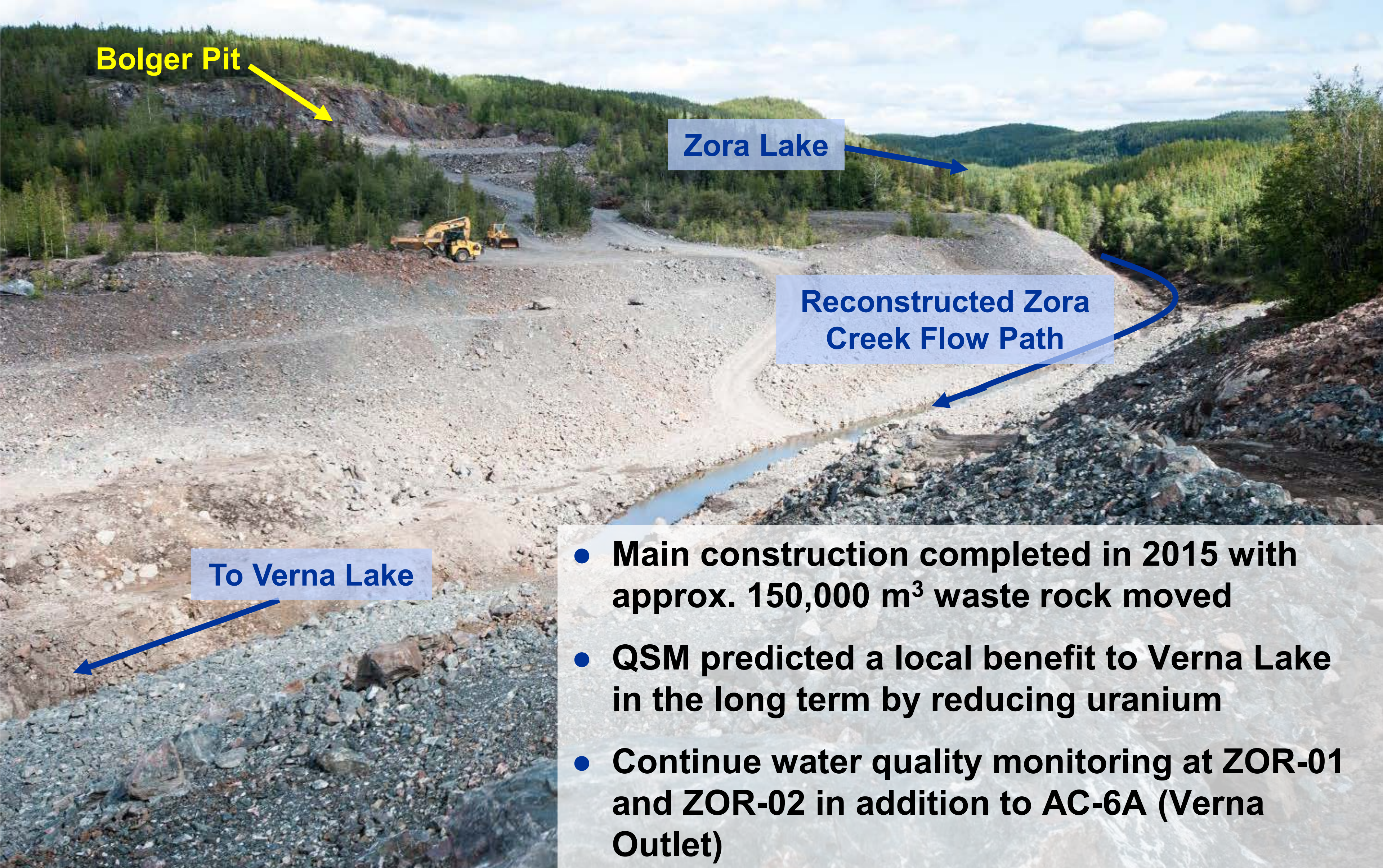
- Expect to transfer the properties into the **IC program** after CNSC hearing
  - Requires agreement between several regulatory agencies
  - Properties will continue to be monitored and managed

Cameco

Remaining Site Activities

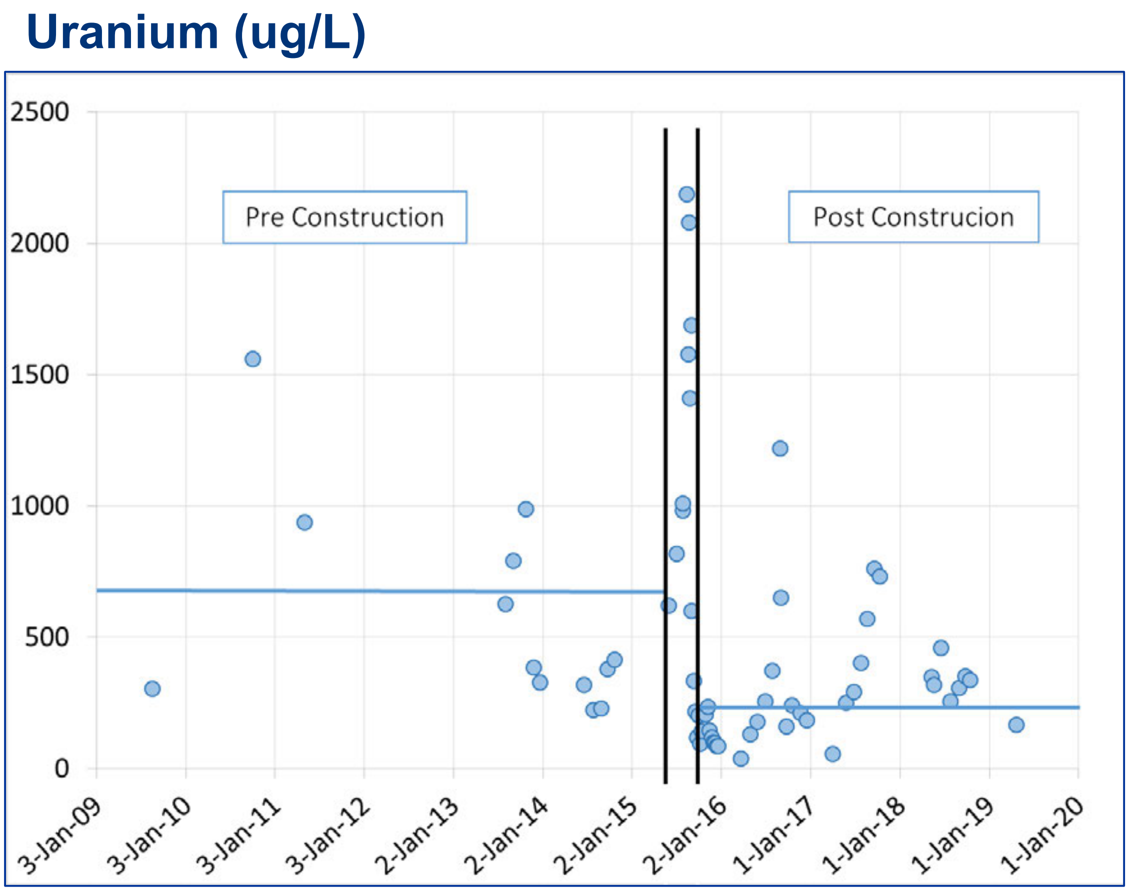
- Remaining site activities not directly related to the 20 properties:
  - Zora Flow Path (Remedial Option)
  - Continued securing of mine openings
  - Ongoing environmental monitoring

Zora Flow Path (Remedial Option)



- Main construction completed in 2015 with approx. 150,000 m^3 waste rock moved
- QSM predicted a local benefit to Verna Lake in the long term by reducing uranium
- Continue water quality monitoring at ZOR-01 and ZOR-02 in addition to AC-6A (Verna Outlet)

Zora Flow Path (Remedial Option)



- ↓ uranium concentrations exiting the new flow path
- Expect to see continued improvement in Verna Lake
- Ace Lake (downstream of Verna) meets the uranium guidelines

Continued Securing of Mine Openings

- **Plan to:**
  - Assess unique caps on the remaining properties (Verna Main Vent Raise and Hab Heater Raise)
  - Confirm adequate closure of raises in Ace Mine area
  - Propose alternative measure for closure of dump raise near Fay Shaft
  - Measure and design 2 remaining steel caps (Fay Shaft and Fishhook Bay Shaft)

Ongoing Environmental Monitoring

- Water and air quality is routinely monitored by local contractor

Public Information Program

- **Public Information Program**
  - Public Disclosure Protocol

  http://www.cameco.com/northernsk/cameco_in_north/public_disclosure/
- **Cameco Northern Website**

  http://www.cameco.com/northernsk
- **Beaverlodge website**

  www.beaverlodgesites.com

Cameco

Regulatory Oversight

- **SkMOE and CNSC will be in Uranium City conducting a regulatory inspection until June 7, 2019**

- **CNSC Contact Information**
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  CNSC Project Officer
  Telephone: 1 (306) 975-4955
  E-mail: richard.snider2@canada.ca

- **SkMOE Contact Information**
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  Environmental Protection Officer
  Telephone: 1 (306) 953-3669
  E-mail: george.bihun@gov.sk.ca

Cameco

MEETING TO DISCUSS THE
BEAVERLODGE DECOMMISSIONED PROPERTIES
2018, 2019 and proposed ACTIVITIES

Northern Settlement of Uranium City

Community Meeting Report:

Cameco compiles a community meeting report, which is shared with local residents. The report is part of the continual dialogue with Uranium City residents regarding Cameco’s remediation work on the decommissioned Beaverlodge properties as they are prepared for transfer to the Province of Saskatchewan’s Institutional Control (IC) program.

Meeting Information:

Date:	June 4, 2019
Location:	Uranium City
Time:	12:00 pm – 2:00 pm (presentation followed by site tour 2:00 to 3:30 pm)
Recorder:	Cameco
Handouts:	Cameco presentation made available in hard copy; and electronically upon request.

1. Meeting Participants

Cameco in coordination with the community advertised an update meeting in Uranium City with posters in prominent gathering places around the local area along with direct invitations to the Northern Saskatchewan Environmental Quality Committee (NSEQC), the Athabasca Joint Engagement and Environmental Subcommittee (AJES), and our government partners.
In attendance were four NSEQC representatives, four AJES representatives; Garret Schmidt the executive director of - Ya’thi Néné, two representative from the Canadian Nuclear Safety Commission (CNSC), three representatives from the Government of Saskatchewan, 24 community members (including students), and five Cameco staff.

2. Meeting Purpose and Objectives

Community engagement activities for the decommissioned Beaverlodge properties aim to seek out project-related questions and concerns, which are then addressed in a meaningful way by Cameco. Cameco's intention for the meeting was to review the 2018 activities completed on the decommissioned Beaverlodge properties and the 2019/2020 plans for transferring properties to the provincial IC program. All interested community members were encouraged to attend and links to additional resources were provided.

3. Meeting Agenda

12:00 pm	Lunch
12:30 pm – 2:00 pm	Cameco Presentation: Beaverlodge Decommissioned Properties • Beaverlodge Process • Upcoming CNSC Hearing • Cameco is proposing to have 20 properties released from CNSC licensing during a hearing scheduled for October 2019; and transfer 19 of those properties to the Province of Saskatchewan's Institutional Control Program Remaining Site Activities • Public Information Program • Regulatory Oversight
	Regulatory Presentations: Canadian Nuclear Safety Commission (CNSC) Roles and Responsibilities Saskatchewan Ministry of Environment (SkMOE) Roles and Responsibilities Saskatchewan Ministry of Energy and Resources (SkMER) • Institutional Control Program and How it Works
2:00 pm – 3:30 pm	Site Tour (included visiting a stainless steel cap and seeing five of the properties designated for release)

4. Meeting Logistics

Lunch was provided to all participants prior to the PowerPoint presentations being made by Cameco and the regulatory agencies. Participants were encouraged to ask questions during the presentation to facilitate immediate discussion regarding questions raised. The meeting was followed by a site tour lead by the Cameco project manager to show the NSEQC, AJES and interested Uranium City residents some of the sites designated for release.

5. Presentation Overview

The presentation developed by Cameco for this meeting highlighted the processes Beaverlodge has gone through to ensure the properties are adequately prepared for transfer to the Saskatchewan IC program, and the staged nature of this program. The presentation then focused on the upcoming CNSC hearing and detailed how the 20 properties proposed for transfer to IC meet the performance objectives of safe, secure and stable/improving. The CNSC hearing is planned for October 1 - 3 in Lac Du Bonnet, Manitoba. The presentation concluded with remaining site activities planned for the other properties, ongoing environmental monitoring, and the Public Information Program which is available to provide further information.

6. Questions Raised

There was some follow up discussion and questions following the Cameco and regulatory presentations. The Q and A are paraphrased below.

Question:	Are you going to continue to monitor the stainless steel covers to ensure they are safe?
CNSC:	In IC covers will continue to be monitored to ensure they are stable. For the properties transferred in 2009, they were all inspected again in 2014, and for a period of time will continue every five years. (During tour Cameco also referenced the life expectancy of the covers is 1200 years as determined by engineers).
Question:	Is there a financial guarantee?
Government of Saskatchewan Ministry of Energy and Resources:	Beaverlodge is guaranteed by the federal government. The federal government covers the costs and provides them to the province.
Question:	Who performs the monitoring for the IC program? Is any preference given to local and Indigenous groups?
Government of Saskatchewan Ministry of Energy and Resources:	An RFP will be posted to SaskTenders to provide an opportunity for bids on the work.

	In the past locals have assisted with the work. Beaverlodge currently have five properties in the program.
Question:	Is there a set time for the monitoring?
Cameco:	The plan is currently set out in five-year intervals. As we keep going and seeing the same results we expect monitoring to extend to every ten years. For the sites released in 2009 they are planned for monitored every five years through to 2029, then moving to every 10 years.
Question:	What kind of data is being collected?
Cameco:	It depends on the site. We are looking for erosion, water quality, stability of cover, gamma radiation scanning. We aren't expecting any risk changes or we wouldn't be releasing them for IC. Also looking at land use – are people camping, etc.? In terms of animals and vegetation that was monitored in 2011 for the country foods study. The results showed there was no risk in consuming animals.
Question:	Is the vegetation safe for consumption?
Cameco:	Berries and other traditionally harvested food sources were shown to be safe for consumption.
Question:	Is the monitoring only on water quality and not looking at animals and vegetation?
Cameco:	Part of the long-term monitoring includes fish sampling in areas like Beaverlodge Lake. We are careful about how frequently this is done because it takes a large sample, and we do not want over-fish the lake and deplete the fish population. There are other monitoring programs in place – such as EARMP and local people can submit samples to CanNorth who administers that program. For the sites in IC we don't anticipate conditions will get worse. The country foods study results showed food in the area was safe to consume.
Question:	How do you fill bore holes?
Cameco:	Where possible we go down 30 metres from surface…<<**I mean who do you use to fill them?**>> We use a local contractor.
Question:	Has the vegetation that grows on tailings covers (i.e., Fookes Delta) been tested? We see Moose eating the new growth alders.

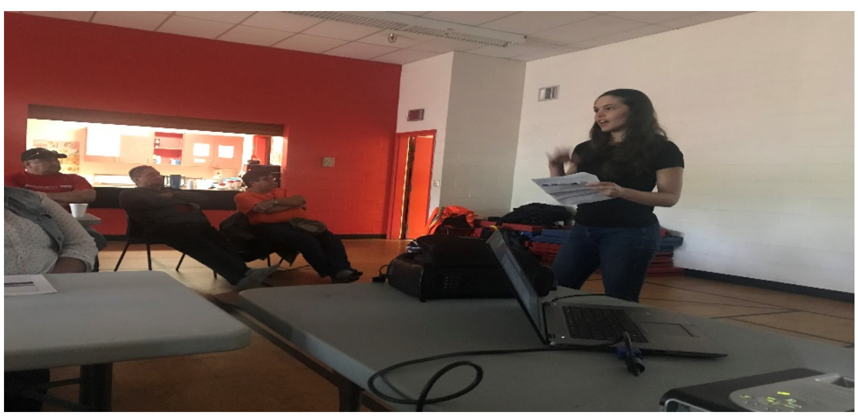
Cameco:	We are thinking about these things. So far the regional evidence does not indicate contamination.
Question:	Are reports given to the town?
SkMOE/SkMER: **Cameco:**	All reports are public. Inspection reports just require a request to be made. That can be done by emailing SkMOE or SkMER depending on the report you want to see. SkMER will investigate internal requirement to provide IC inspection reports via online platform. Beaverlodge annual reports (Cameco) are provided to the town.
Question:	Do you need a degree to read it?
Cameco:	Some areas are general descriptions and details around activities which should be easy to understand. The water quality results are a bit more technical.

7. Follow-up from Previous Meeting

There was no follow-up required from the 2018 community engagement meeting as all participant comments and questions were fully responded to during the meeting.

8. Upcoming Engagement

Cameco along with its regulators, SkMOE and CNSC, will plan a meeting with the community of Uranium City and Athabasca representatives from the NSEQC and AJES for June 2020, unless there is a need to have a meeting prior to that.



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 08	643877.856	6605963.863	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
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	2holes/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
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 33	645184.017	6612166.942	Dry	2013

Hab	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
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 07	645353.123	6606311.983	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[3]	647055	6605663	Dry	2019
	AC 21[4]	647001	6605642	Dry	2019

*Recent exploration activity (Not Eldorado/Cameco)

[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] AC 19 was previously listed under the “Ace” area mistakenly. These boreholes are located off Beaverlodge property, in the Moran Pit area.

[3] AC 20 was previously listed under the “Ace” area mistakenly. These boreholes are located off Beaverlodge property, in the Moran Pit area.

[4] AC 21 was previously listed under the “Ace” area mistakenly. These boreholes are located off Beaverlodge property, in the Moran Pit area.

APPENDIX D

APPENDIX D

Detailed Water Quality Results

AN-5

		12/01/19	12/03/19	30/05/19	16/07/19	28/09/19	25/11/19
M Ions	Alk (mg/l)	152.0	190.0	108.0	90.0	97.0	114.0
	Ca (mg/l)	44.0	55.0	33.0	28.0	29.0	34.0
	Cl (mg/l)	1.40	2.00	1.00	0.60	0.90	0.20
	Cond-L (µS/cm)	291	371	222	189	203	251
	Hardness (mg/l)	155	195	114	96	100	119
	K (mg/l)	1.8	2.7	1.4	1.0	1.2	1.3
	Na (mg/l)	5.1	7.7	4.2	3.2	3.3	4.1
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	16.0	18.0	16.0	12.0	12.0	19.0
	Sum of Ions (mg/l)	264	332	195	161	171	206
Metal	As (µg/l)	0.3	0.4	0.4	0.3	0.2	0.2
	Ba (mg/l)	0.170	0.230	0.140	0.120	0.110	0.130
	Cu (mg/l)	0.0011	0.0003	0.0019	0.0006	0.0003	0.0010
	Fe (mg/l)	0.510	1.000	0.160	0.170	0.074	0.250
	Mo (mg/l)	0.0023	0.0017	0.0047	0.0024	0.0021	0.0031
	Ni (mg/l)	0.00050	0.00050	0.00060	0.00050	0.00040	0.00060
	Pb (mg/l)	0.0003	<0.0001	0.0003	<0.0001	<0.0001	<0.0001
	Se (mg/l)	0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001
	U (µg/l)	290.000	198.000	181.000	56.000	72.000	220.000
	Zn (mg/l)	0.002	0.001	0.004	0.003	0.001	0.001
Nutrient	C-(org) (mg/l)		13.000			8.100	
	NH3-N (mg/l)		0.49			0.13	
	NO3 (mg/l)	0.110	<0.040	<0.040	0.050	0.080	0.200
	P-(TP) (mg/l)		0.02			<0.01	
Phys Para	pH-L (pH Unit)	7.30	7.32	7.66	7.71	7.82	7.96
	TDS (mg/l)		288.00	147.00	132.00	122.00	178.00
	Temp-H20 (°C)	4.3	6.0	13.1	24.0	13.7	3.1
	TSS (mg/l)	<1.000	<1.000	<1.000	1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)		0.08			0.12	
	Po210 (Bq/L)		0.060			0.020	
	Ra226 (Bq/L)	1.100	1.700	0.890	0.700	0.530	0.480

DB-6

		12/01/19	12/03/19	30/05/19	16/07/19	28/09/19	25/11/19
M Ions	Alk (mg/l)	95.0	102.0	81.0	83.0	90.0	99.0
	Ca (mg/l)	39.0	40.0	32.0	33.0	35.0	37.0
	Cl (mg/l)	0.70	0.70	0.60	0.70	0.80	0.40
	Cond-L (µS/cm)	223	250	190	194	212	230
	Hardness (mg/l)	122	125	100	102	109	115
	K (mg/l)	1.0	1.0	0.9	0.8	0.9	0.9
	Na (mg/l)	2.2	2.4	1.9	1.9	2.0	2.2
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	24.0	25.0	20.0	19.0	22.0	19.0
	Sum of Ions (mg/l)	189	200	159	161	176	186
Metal	As (µg/l)	0.1	0.1	0.1	0.1	0.1	0.1
	Ba (mg/l)	0.049	0.051	0.040	0.039	0.044	0.044
	Cu (mg/l)	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006
	Fe (mg/l)	0.023	0.018	0.040	0.038	0.024	0.022
	Mo (mg/l)	0.0021	0.0022	0.0018	0.0021	0.0021	0.0021
	Ni (mg/l)	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
	Pb (mg/l)	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
	Se (mg/l)	0.0001	0.0001	<0.0001	<0.0001	0.0001	0.0001
	U (µg/l)	206.000	206.000	161.000	138.000	170.000	184.000
	Zn (mg/l)	<0.001	<0.001	0.001	0.002	0.001	0.002
Nutrient	C-(org) (mg/l)		9.800			7.900	
	NH3-N (mg/l)		0.02			0.08	
	NO3 (mg/l)	0.250	0.300	<0.040	0.060	<0.040	0.120
	P-(TP) (mg/l)		0.01			<0.01	
Phys Para	pH-L (pH Unit)	7.59	7.96	7.82	7.92	7.95	8.02
	TDS (mg/l)		200.00	137.00	141.00	141.00	168.00
	Temp-H20 (°C)	6.6	5.1	13.3	21.8	10.8	3.3
	TSS (mg/l)	<1.000	<1.000	<1.000	2.000	<1.000	<1.000
Rads	Pb210 (Bq/L)		<0.10			0.07	
	Po210 (Bq/L)		<0.005			<0.005	
	Ra226 (Bq/L)	0.040	0.030	0.030	0.020	0.030	0.040

AC-6A

		28/06/19	16/07/19
M Ions	Alk (mg/l)	95.0	96.0
	Ca (mg/l)	42.0	42.0
	Cl (mg/l)	0.40	0.60
	Cond-L (µS/cm)	274	269
	Hardness (mg/l)	142	142
	K (mg/l)	0.9	0.9
	Na (mg/l)	2.4	2.4
	OH (mg/l)	<1.0	<1.0
	SO4 (mg/l)	46.0	48.0
	Sum of Ions (mg/l)	217	220
Metal	As (µg/l)	0.2	0.2
	Ba (mg/l)	0.022	0.020
	Cu (mg/l)	0.0004	0.0005
	Fe (mg/l)	0.013	0.014
	Mo (mg/l)	0.0011	0.0011
	Ni (mg/l)	<0.00010	<0.00010
	Pb (mg/l)	<0.0001	0.0003
	Se (mg/l)	0.0002	0.0001
	U (µg/l)	276.000	267.000
	Zn (mg/l)	<0.001	0.002
Nutrient	NO3 (mg/l)	<0.040	0.060
	P-(TP) (mg/l)		
Phys Para	pH-L (pH Unit)	7.92	8.01
	TDS (mg/l)	245.00	211.00
	Temp-H20 (°C)	22.5	22.8
	TSS (mg/l)	<1.000	2.000
Rads	Ra226 (Bq/L)	0.100	0.080

AC-8

		12/03/19	28/09/19
M Ions	Alk (mg/l)	54.0	49.0
	Ca (mg/l)	18.0	16.0
	Cl (mg/l)	1.00	1.20
	Cond-L (µS/cm)	122	102
	Hardness (mg/l)	59	52
	K (mg/l)	0.9	0.8
	Na (mg/l)	1.7	1.4
	OH (mg/l)	<1.0	<1.0
	SO4 (mg/l)	6.6	6.0
	Sum of Ions (mg/l)	98	89
Metal	As (µg/l)	0.1	0.1
	Ba (mg/l)	0.025	0.023
	Cu (mg/l)	0.0006	0.0005
	Fe (mg/l)	0.017	0.014
	Mo (mg/l)	0.0010	0.0010
	Ni (mg/l)	0.00020	0.00020
	Pb (mg/l)	<0.0001	<0.0001
	Se (mg/l)	<0.0001	<0.0001
	U (µg/l)	14.000	11.000
	Zn (mg/l)	<0.001	0.001
Nutrient	C-(org) (mg/l)		6.200
	NH3-N (mg/l)		0.14
	NO3 (mg/l)	0.130	<0.040
	P-(TP) (mg/l)		<0.01
Phys Para	pH-L (pH Unit)	7.36	7.80
	TDS (mg/l)	114.00	56.00
	Temp-H20 (°C)	5.1	9.8
	TSS (mg/l)	<1.000	<1.000
Rads	Pb210 (Bq/L)		<0.02
	Po210 (Bq/L)		<0.005
	Ra226 (Bq/L)	0.030	0.020

AC-14

		12/01/19	10/02/19	12/03/19	19/04/19	30/05/19	28/06/19	16/07/19	27/08/19	28/09/19	26/10/19	14/12/19
M Ions	Alk (mg/l)	52.0	59.0	57.0	53.0	51.0	47.0	48.0	52.0	51.0	54.0	56.0
	Ca (mg/l)	18.0	18.0	18.0	20.0	17.0	16.0	16.0	17.0	17.0	18.0	17.0
	Cl (mg/l)	1.20	1.20	1.00	1.80	1.40	1.00	1.30	1.20	1.60	1.70	0.90
	Cond-L (µS/cm)	117	125	124	135	115	109	105	117	116	129	115
	Hardness (mg/l)	59	59	59	64	56	53	52	56	56	59	56
	K (mg/l)	0.9	0.9	0.9	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.9
	Na (mg/l)	1.9	1.8	1.7	2.7	2.1	1.8	1.8	2.0	2.2	2.5	1.9
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	7.8	8.4	7.2	13.0	8.8	7.0	7.0	7.9	9.2	11.0	7.2
	Sum of Ions (mg/l)	96	106	102	107	95	87	88	95	96	104	99
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	Ba (mg/l)	0.025	0.029	0.026	0.027	0.024	0.023	0.022	0.024	0.023	0.024	0.024
	Cu (mg/l)	0.0006	0.0008	0.0006	0.0008	0.0009	0.0006	0.0006	0.0005	0.0006	0.0007	0.0010
	Fe (mg/l)	0.042	0.057	0.042	0.080	0.049	0.042	0.045	0.042	0.034	0.036	0.042
	Mo (mg/l)	0.0010	0.0010	0.0010	0.0010	0.0009	0.0010	0.0010	0.0009	0.0010	0.0008	0.0010
	Ni (mg/l)	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00010	0.00020	0.00020	0.00020
	Pb (mg/l)	0.0003	0.0015	0.0004	0.0012	0.0004	0.0002	0.0003	0.0001	0.0001	0.0001	0.0003
	Se (mg/l)	0.0001	0.0001	0.0001	0.0005	0.0002	0.0001	0.0001	0.0001	0.0002	0.0003	0.0001
	U (µg/l)	24.000	22.000	18.000	58.000	44.000	28.000	24.000	27.000	40.000	64.000	26.000
	Zn (mg/l)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002	0.001	<0.001	0.002
Nutrient	C-(org) (mg/l)			7.700			6.900			6.200		6.100
	NH3-N (mg/l)			0.08			0.10			0.16		0.09
	NO3 (mg/l)	0.210	0.160	0.140	0.280	<0.040	<0.040	0.070	<0.040	<0.040	0.120	0.080
	P-(TP) (mg/l)			<0.01			<0.01			<0.01		<0.01
Phys Para	pH-L (pH Unit)	7.63	8.04	7.96	7.79	7.92	7.79	7.85	7.63	7.86	7.63	7.89
	TDS (mg/l)		96.00	122.00	76.00	77.00	91.00	90.00	64.00	71.00	99.00	51.00
	Temp-H20 (°C)	6.2	6.9	5.4	4.8	8.2	22.0	22.3	16.0	7.8	12.2	2.0
	TSS (mg/l)	<1.000	<1.000	<1.000	2.000	<1.000	<1.000	1.000	2.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)			0.08			0.02			0.05		<0.02
	Po210 (Bq/L)			0.010			<0.005			0.007		0.010
	Ra226 (Bq/L)	0.060	0.110	0.060	0.100	0.080	0.040	0.050	0.050	0.030	0.050	0.040

AN-3

		28/09/19
M Ions	Alk (mg/l)	73.0
	Ca (mg/l)	21.0
	Cl (mg/l)	0.80
	Cond-L (µS/cm)	140
	Hardness (mg/l)	72
	K (mg/l)	0.8
	Na (mg/l)	1.9
	OH (mg/l)	<1.0
	SO4 (mg/l)	4.2
	Sum of Ions (mg/l)	122
Metal	As (µg/l)	0.1
	Ba (mg/l)	0.017
	Cu (mg/l)	0.0005
	Fe (mg/l)	0.006
	Mo (mg/l)	0.0018
	Ni (mg/l)	0.00020
	Pb (mg/l)	<0.0001
	Se (mg/l)	<0.0001
	U (µg/l)	1.600
	Zn (mg/l)	0.001
Nutrient	C-(org) (mg/l)	7.200
	NH3-N (mg/l)	0.11
	NO3 (mg/l)	<0.040
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	8.02
	TDS (mg/l)	84.00
	Temp-H20 (°C)	10.4
	TSS (mg/l)	<1.000
Rads	Pb210 (Bq/L)	<0.02
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.010

TL-3

		19/04/19	28/06/19	28/09/19	14/12/19
M Ions	Alk (mg/l)	127.0	125.0	131.0	148.0
	Ca (mg/l)	28.0	29.0	29.0	35.0
	Cl (mg/l)	3.00	2.30	2.80	2.00
	Cond-L (µS/cm)	303	291	296	317
	Hardness (mg/l)	93	94	94	116
	K (mg/l)	1.2	1.1	1.1	1.4
	Na (mg/l)	31.0	29.0	29.0	26.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	30.0	26.0	26.0	23.0
	Sum of Ions (mg/l)	254	245	253	274
Metal	As (µg/l)	0.7	0.7	0.8	0.7
	Ba (mg/l)	0.037	0.040	0.042	0.044
	Cu (mg/l)	0.0011	0.0011	0.0011	0.0013
	Fe (mg/l)	0.013	0.010	0.028	0.007
	Mo (mg/l)	0.0120	0.0110	0.0120	0.0100
	Ni (mg/l)	0.00030	0.00030	0.00030	0.00040
	Pb (mg/l)	0.0003	0.0006	0.0014	0.0005
	Se (mg/l)	0.0026	0.0023	0.0025	0.0022
	U (µg/l)	247.000	236.000	241.000	207.000
	Zn (mg/l)	<0.001	<0.001	0.001	0.002
Nutrient	C-(org) (mg/l)			7.100	
	NH3-N (mg/l)			0.06	
	NO3 (mg/l)	0.500	<0.040	<0.040	<0.040
	P-(TP) (mg/l)			<0.01	
Phys Para	pH-L (pH Unit)	8.02	8.16	8.28	8.16
	TDS (mg/l)	175.00	207.00	171.00	204.00
	Temp-H20 (°C)	3.7	21.4	9.0	3.0
	TSS (mg/l)	2.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)			0.18	
	Po210 (Bq/L)			0.060	
	Ra226 (Bq/L)	1.300	1.400	1.500	1.200

TL-4

		12/03/19	28/06/19	28/09/19	14/12/19
M Ions	Alk (mg/l)	146.0	115.0	124.0	140.0
	Ca (mg/l)	28.0	22.0	22.0	25.0
	Cl (mg/l)	3.00	2.60	2.80	2.50
	Cond-L (µS/cm)	328	258	272	299
	Hardness (mg/l)	96	76	76	86
	K (mg/l)	1.5	1.3	1.3	1.4
	Na (mg/l)	36.0	30.0	31.0	34.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	26.0	20.0	20.0	22.0
	Sum of Ions (mg/l)	279	221	233	262
Metal	As (µg/l)	1.0	1.0	0.9	1.1
	Ba (mg/l)	0.090	0.080	0.083	0.095
	Cu (mg/l)	0.0005	0.0005	0.0003	0.0004
	Fe (mg/l)	0.025	0.093	0.069	0.022
	Mo (mg/l)	0.0088	0.0066	0.0086	0.0091
	Ni (mg/l)	0.00050	0.00040	0.00040	0.00050
	Pb (mg/l)	0.0001	0.0001	0.0003	0.0002
	Se (mg/l)	0.0012	0.0012	0.0011	0.0014
	U (µg/l)	204.000	131.000	191.000	222.000
	Zn (mg/l)	<0.001	<0.001	0.001	0.001
Nutrient	C-(org) (mg/l)			8.600	
	NH3-N (mg/l)			0.09	
	NO3 (mg/l)	<0.040	0.060	<0.040	<0.040
	P-(TP) (mg/l)			<0.01	
Phys Para	pH-L (pH Unit)	8.15	7.94	8.13	8.17
	TDS (mg/l)	244.00	186.00	161.00	189.00
	Temp-H20 (°C)	3.4	20.0	7.8	3.0
	TSS (mg/l)	<1.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)			0.10	
	Po210 (Bq/L)			0.030	
	Ra226 (Bq/L)	2.100	1.600	1.500	1.800

TL-6

		28/06/19	27/08/19	28/09/19
M Ions	Alk (mg/l)	285.0	299.0	317.0
	Ca (mg/l)	40.0	39.0	38.0
	Cl (mg/l)	44.00	50.00	40.00
	Cond-L (µS/cm)	754	707	763
	Hardness (mg/l)	153	146	144
	K (mg/l)	3.3	3.0	3.7
	Na (mg/l)	118.0	112.0	120.0
	OH (mg/l)	<1.0	<1.0	<1.0
	SO4 (mg/l)	51.0	20.0	27.0
	Sum of Ions (mg/l)	617	601	628
Metal	As (µg/l)	1.8	2.8	1.7
	Ba (mg/l)	1.130	1.000	1.030
	Cu (mg/l)	0.0006	0.0002	0.0002
	Fe (mg/l)	0.580	2.320	0.810
	Mo (mg/l)	0.0014	0.0004	0.0006
	Ni (mg/l)	0.00040	0.00030	0.00030
	Pb (mg/l)	0.0003	<0.0001	0.0002
	Se (mg/l)	0.0029	0.0016	0.0018
	U (µg/l)	213.000	51.000	106.000
	Zn (mg/l)	0.001	0.002	0.001
Nutrient	C-(org) (mg/l)	37.000		40.000
	NH3-N (mg/l)	0.10		0.15
	NO3 (mg/l)	<0.040	<0.040	<0.040
	P-(TP) (mg/l)	0.02		0.01
Phys Para	pH-L (pH Unit)	7.90	7.69	8.14
	TDS (mg/l)	556.00	493.00	504.00
	Temp-H20 (°C)	20.5	14.4	7.1
	TSS (mg/l)	1.000	3.000	<1.000
Rads	Pb210 (Bq/L)	0.25		0.14
	Po210 (Bq/L)	0.040		0.030
	Ra226 (Bq/L)	5.800	5.200	4.200

TL-7

		30/05/19	28/06/19	16/07/19	27/08/19	28/09/19	26/10/19
M Ions	Alk (mg/l)	114.0	127.0	131.0	130.0	130.0	130.0
	Ca (mg/l)	23.0	27.0	26.0	24.0	24.0	26.0
	Cl (mg/l)	3.70	11.00	8.80	3.40	4.20	6.00
	Cond-L (µS/cm)	244	309	297	279	285	307
	Hardness (mg/l)	79	94	90	83	83	90
	K (mg/l)	1.4	1.1	1.0	1.2	1.3	1.4
	Na (mg/l)	26.0	34.0	35.0	33.0	32.0	33.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	16.0	22.0	20.0	18.0	20.0	23.0
	Sum of Ions (mg/l)	214	257	257	244	246	255
Metal	As (µg/l)	1.2	1.0	0.9	0.8	0.7	0.8
	Ba (mg/l)	0.350	0.490	0.590	0.510	0.400	0.300
	Cu (mg/l)	0.0010	0.0005	0.0005	0.0004	0.0004	0.0004
	Fe (mg/l)	0.230	0.040	0.030	0.033	0.024	0.025
	Mo (mg/l)	0.0061	0.0054	0.0049	0.0052	0.0074	0.0079
	Ni (mg/l)	0.00050	0.00050	0.00040	0.00040	0.00040	0.00040
	Pb (mg/l)	0.0008	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
	Se (mg/l)	0.0012	0.0016	0.0014	0.0012	0.0012	0.0016
	U (µg/l)	160.000	116.000	95.000	102.000	172.000	247.000
	Zn (mg/l)	0.002	<0.001	0.002	0.001	0.001	<0.001
Nutrient	C-(org) (mg/l)		10.000			7.800	
	NH3-N (mg/l)		0.06			0.07	
	NO3 (mg/l)	0.110	<0.040	0.080	<0.040	<0.040	0.190
	P-(TP) (mg/l)		<0.01			<0.01	
Phys Para	pH-L (pH Unit)	7.71	7.82	7.92	7.88	8.10	8.00
	TDS (mg/l)	157.00	224.00	207.00	170.00	171.00	198.00
	Temp-H20 (°C)	11.8	19.1	20.7	14.2	7.0	4.2
	TSS (mg/l)	<1.000	<1.000	1.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)		0.14			0.17	
	Po210 (Bq/L)		0.010			0.006	
	Ra226 (Bq/L)	1.900	1.800	1.800	1.500	1.200	1.100

TL-9

		30/05/19	28/06/19	16/07/19	27/08/19	28/09/19	26/10/19
M Ions	Alk (mg/l)	125.0	109.0	104.0	105.0	105.0	104.0
	Ca (mg/l)	24.0	19.0	16.0	15.0	15.0	16.0
	Cl (mg/l)	3.70	3.50	4.20	3.90	4.20	4.30
	Cond-L (µS/cm)	268	248	235	241	236	240
	Hardness (mg/l)	85	71	64	62	61	63
	K (mg/l)	1.3	1.1	1.2	1.2	1.1	1.1
	Na (mg/l)	30.0	30.0	31.0	31.0	30.0	30.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	19.0	18.0	18.0	17.0	18.0	18.0
	Sum of Ions (mg/l)	237	211	204	202	202	202
Metal	As (µg/l)	1.0	1.2	1.7	1.3	1.1	1.1
	Ba (mg/l)	0.720	0.670	0.620	0.580	0.560	0.580
	Cu (mg/l)	0.0009	0.0007	0.0008	0.0005	0.0004	0.0004
	Fe (mg/l)	0.019	0.038	0.140	0.063	0.028	0.022
	Mo (mg/l)	0.0065	0.0064	0.0063	0.0059	0.0070	0.0075
	Ni (mg/l)	0.00030	0.00030	0.00050	0.00030	0.00030	0.00020
	Pb (mg/l)	0.0007	0.0009	0.0030	0.0009	0.0004	0.0005
	Se (mg/l)	0.0033	0.0021	0.0020	0.0017	0.0020	0.0024
	U (µg/l)	176.000	110.000	110.000	102.000	127.000	170.000
	Zn (mg/l)	0.001	0.001	0.003	0.001	0.001	<0.001
Nutrient	C-(org) (mg/l)		8.400			9.000	
	NH3-N (mg/l)		0.12			0.12	
	NO3 (mg/l)	0.660	0.360	0.550	0.150	0.100	0.320
	P-(TP) (mg/l)		0.01			<0.01	
Phys Para	pH-L (pH Unit)	8.15	7.97	7.96	7.98	8.15	8.10
	TDS (mg/l)	168.00	176.00	168.00	148.00	150.00	162.00
	Temp-H20 (°C)	12.8	21.0	20.8	10.3	9.2	1.8
	TSS (mg/l)	<1.000	<1.000	4.000	2.000	<1.000	<1.000
Rads	Pb210 (Bq/L)		0.16			0.18	
	Po210 (Bq/L)		0.060			0.030	
	Ra226 (Bq/L)	2.900	2.200	2.200	1.800	1.600	1.500

BL-3

		12/03/19	28/06/19	28/09/19	14/12/19
M Ions	Alk (mg/l)	79.0	68.0	68.0	76.0
	Ca (mg/l)	22.0	21.0	20.0	22.0
	Cl (mg/l)	13.00	13.00	12.00	14.00
	Cond-L (µS/cm)	255	226	223	245
	Hardness (mg/l)	78	74	71	78
	K (mg/l)	1.3	1.1	1.1	1.2
	Na (mg/l)	20.0	18.0	18.0	19.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	29.0	29.0	28.0	30.0
	Sum of Ions (mg/l)	187	170	167	185
Metal	As (µg/l)	0.3	0.2	0.2	0.3
	Ba (mg/l)	0.069	0.036	0.035	0.039
	Cu (mg/l)	0.0029	0.0014	0.0010	0.0003
	Fe (mg/l)	0.011	0.004	0.009	0.002
	Mo (mg/l)	0.0042	0.0034	0.0035	0.0038
	Ni (mg/l)	0.00140	0.00170	0.00220	0.00020
	Pb (mg/l)	0.0004	0.0001	0.0001	<0.0001
	Se (mg/l)	0.0024	0.0022	0.0022	0.0025
	U (µg/l)	143.000	122.000	121.000	143.000
	Zn (mg/l)	0.006	0.003	0.003	0.002
Nutrient	C-(org) (mg/l)			3.000	
	NH3-N (mg/l)			0.11	
	NO3 (mg/l)	<0.040	<0.040	<0.040	<0.040
	P-(TP) (mg/l)			<0.01	
Phys Para	pH-L (pH Unit)	8.15	7.92	8.04	8.06
	TDS (mg/l)	196.00	159.00	123.00	132.00
	Temp-H20 (°C)	1.6	16.9	10.2	3.0
	TSS (mg/l)	<1.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)			0.10	
	Po210 (Bq/L)			<0.005	
	Ra226 (Bq/L)	0.110	0.030	0.030	0.040

BL-4

		12/03/19	28/09/19
M Ions	Alk (mg/l)	72.0	68.0
	Ca (mg/l)	21.0	21.0
	Cl (mg/l)	13.00	12.00
	Cond-L (µS/cm)	245	224
	Hardness (mg/l)	74	73
	K (mg/l)	1.2	1.0
	Na (mg/l)	19.0	18.0
	OH (mg/l)	<1.0	<1.0
	SO4 (mg/l)	29.0	28.0
	Sum of Ions (mg/l)	177	168
Metal	As (µg/l)	0.2	0.2
	Ba (mg/l)	0.035	0.034
	Cu (mg/l)	0.0014	0.0010
	Fe (mg/l)	0.008	0.007
	Mo (mg/l)	0.0036	0.0035
	Ni (mg/l)	0.00100	0.00140
	Pb (mg/l)	0.0003	<0.0001
	Se (mg/l)	0.0023	0.0022
	U (µg/l)	132.000	120.000
	Zn (mg/l)	0.004	0.003
Nutrient	C-(org) (mg/l)	3.700	2.900
	NH3-N (mg/l)	0.10	0.11
	NO3 (mg/l)	<0.040	<0.040
	P-(TP) (mg/l)	<0.01	<0.01
Phys Para	pH-L (pH Unit)	8.02	8.02
	TDS (mg/l)	187.00	124.00
	Temp-H20 (°C)		10.3
	TSS (mg/l)	<1.000	<1.000
Rads	Pb210 (Bq/L)	0.03	0.10
	Po210 (Bq/L)	<0.005	<0.005
	Ra226 (Bq/L)	0.030	0.020

BL-5

		30/05/19	28/06/19	28/09/19
M Ions	Alk (mg/l)	50.0	66.0	68.0
	Ca (mg/l)	15.0	21.0	21.0
	Cl (mg/l)	8.20	13.00	12.00
	Cond-L (µS/cm)	153	226	226
	Hardness (mg/l)	52	74	73
	K (mg/l)	0.8	1.1	1.1
	Na (mg/l)	12.0	18.0	18.0
	OH (mg/l)	<1.0	<1.0	<1.0
	SO4 (mg/l)	20.0	29.0	28.0
	Sum of Ions (mg/l)	121	167	168
Metal	As (µg/l)	0.1	0.2	0.2
	Ba (mg/l)	0.021	0.033	0.034
	Cu (mg/l)	0.0005	0.0004	0.0003
	Fe (mg/l)	0.021	0.002	0.005
	Mo (mg/l)	0.0021	0.0033	0.0036
	Ni (mg/l)	0.00020	0.00020	0.00020
	Pb (mg/l)	0.0002	<0.0001	<0.0001
	Se (mg/l)	0.0014	0.0022	0.0022
	U (µg/l)	70.000	120.000	121.000
	Zn (mg/l)	0.001	<0.001	0.001
Nutrient	C-(org) (mg/l)			3.000
	NH3-N (mg/l)			0.11
	NO3 (mg/l)	<0.040	<0.040	<0.040
	P-(TP) (mg/l)			<0.01
Phys Para	pH-L (pH Unit)	7.78	7.88	8.07
	TDS (mg/l)	92.00	158.00	127.00
	Temp-H20 (°C)	10.0	16.9	9.9
	TSS (mg/l)	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)			0.11
	Po210 (Bq/L)			<0.005
	Ra226 (Bq/L)	0.030	0.030	0.030

ML-1

		12/03/19	28/06/19	28/09/19	14/12/19
M Ions	Alk (mg/l)	72.0	63.0	64.0	71.0
	Ca (mg/l)	21.0	20.0	19.0	21.0
	Cl (mg/l)	8.30	8.80	7.50	3.70
	Cond-L (µS/cm)	205	180	180	162
	Hardness (mg/l)	73	68	65	70
	K (mg/l)	1.3	1.1	1.1	1.3
	Na (mg/l)	12.0	11.0	11.0	6.4
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	19.0	17.0	17.0	11.0
	Sum of Ions (mg/l)	155	139	138	135
Metal	As (µg/l)	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.046	0.042	0.042	0.046
	Cu (mg/l)	0.0017	0.0013	0.0003	0.0010
	Fe (mg/l)	0.008	0.009	0.007	0.020
	Mo (mg/l)	0.0022	0.0019	0.0021	0.0012
	Ni (mg/l)	0.00020	0.00020	0.00010	0.00020
	Pb (mg/l)	0.0002	0.0002	<0.0001	0.0001
	Se (mg/l)	0.0011	0.0010	0.0010	0.0006
	U (µg/l)	68.000	61.000	63.000	31.000
	Zn (mg/l)	0.003	0.002	0.001	0.004
Nutrient	C-(org) (mg/l)	6.100	5.600	4.900	7.500
	NH3-N (mg/l)	0.09	0.12	0.14	0.07
	NO3 (mg/l)	0.050	<0.040	<0.040	0.160
	P-(TP) (mg/l)	0.01	<0.01	<0.01	<0.01
Phys Para	pH-L (pH Unit)	7.93	7.90	7.98	7.92
	TDS (mg/l)	165.00	129.00	97.00	117.00
	Temp-H20 (°C)	7.1	22.4	12.6	2.0
	TSS (mg/l)	<1.000	<1.000	<1.000	<1.000
Rads	Pb210 (Bq/L)	0.11	0.12	<0.02	<0.02
	Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005
	Ra226 (Bq/L)	<0.005	0.009	0.005	0.009

CS-1

		28/09/19
M Ions	Alk (mg/l)	67.0
	Ca (mg/l)	20.0
	Cl (mg/l)	8.00
	Cond-L (µS/cm)	182
	Hardness (mg/l)	68
	K (mg/l)	1.1
	Na (mg/l)	11.0
	OH (mg/l)	<1.0
	SO4 (mg/l)	16.0
	Sum of Ions (mg/l)	143
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.043
	Cu (mg/l)	0.0003
	Fe (mg/l)	0.025
	Mo (mg/l)	0.0020
	Ni (mg/l)	0.00010
	Pb (mg/l)	<0.0001
	Se (mg/l)	0.0009
	U (µg/l)	56.000
	Zn (mg/l)	<0.001
Nutrient	C-(org) (mg/l)	5.600
	NH3-N (mg/l)	0.11
	NO3 (mg/l)	<0.040
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	8.05
	TDS (mg/l)	100.00
	Temp-H20 (°C)	10.8
	TSS (mg/l)	<1.000
Rads	Pb210 (Bq/L)	0.12
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	<0.005

CS-2

		28/09/19
M Ions	Alk (mg/l)	28.0
	Ca (mg/l)	7.3
	Cl (mg/l)	3.60
	Cond-L (µS/cm)	66
	Hardness (mg/l)	27
	K (mg/l)	0.8
	Na (mg/l)	2.9
	OH (mg/l)	<1.0
	SO4 (mg/l)	3.9
	Sum of Ions (mg/l)	55
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.012
	Cu (mg/l)	0.0013
	Fe (mg/l)	0.010
	Mo (mg/l)	0.0003
	Ni (mg/l)	0.00120
	Pb (mg/l)	<0.0001
	Se (mg/l)	<0.0001
	U (µg/l)	1.400
	Zn (mg/l)	0.003
Nutrient	C-(org) (mg/l)	3.000
	NH3-N (mg/l)	0.02
	NO3 (mg/l)	0.080
	P-(TP) (mg/l)	<0.01
Phys Para	pH-L (pH Unit)	7.67
	TDS (mg/l)	34.00
	Temp-H20 (°C)	8.2
	TSS (mg/l)	<1.000
Rads	Pb210 (Bq/L)	<0.02
	Po210 (Bq/L)	<0.005
	Ra226 (Bq/L)	0.007

ZOR-01

		19/04/19	30/05/19	28/06/19	16/07/19	27/08/19	28/09/19	26/10/19	14/12/19
M Ions	Alk (mg/l)	60.0	94.0	94.0	95.0	96.0	99.0	102.0	111.0
	Ca (mg/l)	19.0	31.0	31.0	31.0	32.0	31.0	33.0	36.0
	Cl (mg/l)	0.20	0.40	0.40	0.40	0.30	0.40	0.40	0.20
	Cond-L (µS/cm)	136	200	211	207	208	213	224	236
	Hardness (mg/l)	68	109	109	110	113	110	116	127
	K (mg/l)	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.9
	Na (mg/l)	1.2	1.8	1.8	1.8	1.8	1.8	1.9	2.0
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	12.0	18.0	18.0	18.0	19.0	19.0	19.0	20.0
	Sum of Ions (mg/l)	111	175	175	176	179	182	187	203
Metal	As (µg/l)	<0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
	Ba (mg/l)	0.012	0.021	0.021	0.020	0.020	0.022	0.024	0.026
	Cu (mg/l)	0.0005	0.0011	0.0009	0.0005	0.0017	0.0004	0.0012	0.0006
	Fe (mg/l)	0.008	0.007	0.004	0.003	0.004	0.003	0.006	0.004
	Mo (mg/l)	0.0005	0.0008	0.0009	0.0009	0.0008	0.0009	0.0007	0.0010
	Ni (mg/l)	0.00010	0.00020	0.00010	0.00010	0.00030	0.00010	0.00020	0.00020
	Pb (mg/l)	<0.0001	0.0003	0.0003	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
	Se (mg/l)	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
	U (µg/l)	12.000	15.000	16.000	16.000	14.000	15.000	16.000	19.000
	Zn (mg/l)	0.001	0.002	0.001	0.002	0.004	0.002	0.004	0.001
Nutrient	C-(org) (mg/l)						7.900		
	NH3-N (mg/l)						0.08		
	NO3 (mg/l)	0.370	<0.040	<0.040	0.060	<0.040	<0.040	0.110	0.190
	P-(TP) (mg/l)						<0.01		
Phys Para	pH-L (pH Unit)	7.82	8.00	8.05	8.17	8.15	8.12	7.93	7.79
	TDS (mg/l)	75.00	134.00	154.00	139.00	128.00	136.00	146.00	158.00
	Temp-H20 (°C)	3.8	13.6	21.5	20.4	15.2	11.0	2.1	4.0
	TSS (mg/l)	2.000	<1.000	<1.000	2.000	3.000	<1.000	2.000	<1.000
Rads	Pb210 (Bq/L)						0.03		
	Po210 (Bq/L)						0.005		
	Ra226 (Bq/L)	0.020	0.020	0.010	0.020	0.030	0.020	0.020	0.010

ZOR-02

		19/04/19	30/05/19	28/06/19	16/07/19	27/08/19	28/09/19	26/10/19	14/12/19
M Ions	Alk (mg/l)	83.0	77.0	98.0	101.0	102.0	103.0	112.0	118.0
	Ca (mg/l)	32.0	40.0	52.0	49.0	45.0	45.0	66.0	41.0
	Cl (mg/l)	0.30	0.50	<1.00	<1.00	0.30	0.60	<1.00	0.20
	Cond-L (µS/cm)	213	250	323	311	285	294	430	269
	Hardness (mg/l)	110	131	169	162	151	151	214	141
	K (mg/l)	1.0	0.8	0.9	0.9	0.8	0.9	1.0	0.9
	Na (mg/l)	1.6	1.8	2.1	2.2	2.1	2.1	2.6	2.2
	OH (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	SO4 (mg/l)	27.0	54.0	68.0	63.0	50.0	53.0	110.0	30.0
	Sum of Ions (mg/l)	171	200	254	248	232	238	331	228
Metal	As (µg/l)	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.020	0.020	0.028	0.027	0.023	0.024	0.034	0.025
	Cu (mg/l)	0.0013	0.0040	0.0017	0.0018	0.0018	0.0016	0.0015	0.0009
	Fe (mg/l)	0.035	1.970	0.066	0.085	0.120	0.400	0.600	0.054
	Mo (mg/l)	0.0010	0.0020	0.0019	0.0019	0.0014	0.0014	0.0015	0.0014
	Ni (mg/l)	0.00030	0.00120	0.00030	0.00020	0.00020	0.00030	0.00040	0.00020
	Pb (mg/l)	0.0001	0.0009	0.0001	0.0001	0.0001	0.0001	0.0018	<0.0001
	Se (mg/l)	0.0002	0.0004	0.0006	0.0004	0.0003	0.0003	0.0007	0.0002
	U (µg/l)	169.000	771.000	596.000	524.000	330.000	395.000	834.000	184.000
	Zn (mg/l)	0.001	0.002	<0.001	0.002	0.002	<0.001	<0.001	<0.001
Nutrient	C-(org) (mg/l)						6.200		
	NH3-N (mg/l)						0.10		
	NO3 (mg/l)	0.510	1.000	1.100	0.870	0.700	0.880	2.300	0.520
	P-(TP) (mg/l)						<0.01		
Phys Para	pH-L (pH Unit)	7.92	7.55	7.88	8.01	7.94	8.04	7.91	8.00
	TDS (mg/l)	128.00	177.00	250.00	225.00	180.00	192.00	295.00	178.00
	Temp-H20 (°C)	4.2	8.2	17.8	18.4	14.4	6.2	4.5	4.0
	TSS (mg/l)	1.000	2.000	<1.000	1.000	3.000	<1.000	2.000	<1.000
Rads	Pb210 (Bq/L)						0.48		
	Po210 (Bq/L)						0.010		
	Ra226 (Bq/L)	0.110	0.250	0.300	0.270	0.260	0.220	0.280	0.210

APPENDIX E

APPENDIX E

Beaverlodge Operation
Quality Control/Quality Assurance for Environmental Sample Analysis

Parent Field **Station: Blind-1**

Date: 2019/05/30

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty
Alk	51.0	Acid Titration	1.0	8.0
As	0.2	ICP-MS	0.1	0.1
Ba	0.024	ICP-MS	0.001	0.004
CO3	< 1.0	Acid Titration	1.0	
Ca	18.0	ICP-OES	0.1	2.0
Cl	1.40	Ion Chromatography	0.10	0.40
Cond-F	274			
Cond-L	113	Conductivity Meter	1	10
Cu	0.0009	ICP-MS	0.0002	0.0003
Fe	0.048	ICP-MS	0.001	0.007
HCO3	62.0	Acid Titration	1.0	9.0
Hardness	58	Calculated	1	9
K	0.8	ICP-OES	0.1	0.3
Mo	0.0009	ICP-MS	0.0001	0.0003
NO3	< 0.040	Automated Hydrazine Reduction	0.040	
Na	2.2	ICP-OES	0.1	0.3
Ni	0.00020	ICP-MS	0.00010	0.00010
OH	< 1.0	Acid Titration	1.0	
Pb	0.0004	ICP-MS	0.0001	0.0001
Ra226	0.070	Alpha Septroscopy	0.005	0.020
SO4	9.0	ICP-OES	0.2	1.0
Se	0.0002	ICP-MS	0.0001	0.0001
Sum of Ions	97	Calculated	1	10
TDS	75.00	Gravimetric	5.00	20.00
TSS	< 1.000	Gravimetric	1.000	
Temp-H20	12.9			
U	42.000	ICP-MS	0.100	4.000
Zn	0.001	ICP-MS	0.001	0.001
pH-F	8.2000			
pH-L	7.80	pH Meter	0.07	0.80

Child Field **Station: AC-14**

Date: 2019/05/30

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Alk	51.0	Acid Titration	1.0	8.0	0.0
As	0.2	ICP-MS	0.1	0.1	0.0
Ba	0.024	ICP-MS	0.001	0.004	0.000
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	17.0	ICP-OES	0.1	2.0	5.7
Cl	1.40	Ion Chromatography	0.10	0.40	0.00
Cond-F	274				0
Cond-L	115	Conductivity Meter	1	10	2
Cu	0.0009	ICP-MS	0.0002	0.0003	0.0000
Fe	0.049	ICP-MS	0.001	0.007	2.062
HCO3	62.0	Acid Titration	1.0	9.0	0.0
Hardness	56	Calculated	1	8	4
K	0.8	ICP-OES	0.1	0.3	0.0
Mo	0.0009	ICP-MS	0.0001	0.0003	0.0000
NO3	< 0.040	Automated Hydrazine Reduction	0.040		0.000
Na	2.1	ICP-OES	0.1	0.3	4.7
Ni	0.00020	ICP-MS	0.00010	0.00010	0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0004	ICP-MS	0.0001	0.0001	0.0000
Ra226	0.080	Alpha Septroscopy	0.005	0.020	13.333
SO4	8.8	ICP-OES	0.2	1.0	2.2
Se	0.0002	ICP-MS	0.0001	0.0001	0.0000
Sum of Ions	95	Calculated	1	10	2
TDS	77.00	Gravimetric	5.00	20.00	2.63
TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	8.2				44.5
U	44.000	ICP-MS	0.100	4.000	4.651
Zn	0.001	ICP-MS	0.001	0.001	13.333
pH-F	8.2000				0.0000
pH-L	7.92	pH Meter	0.07	0.80	1.53

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field **Station: Blind-2**

Date: 2019/05/30

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty
Alk	82.0	Acid Titration	1.0	10.0
As	0.1	ICP-MS	0.1	0.1
Ba	0.040	ICP-MS	0.001	0.006
CO3	<1.0	Acid Titration	1.0	
Ca	32.0	ICP-OES	0.1	3.0
Cl	0.60	Ion Chromatograph y	0.10	0.10
Cond-F	502			
Cond-L	190	Conductivity Meter	1	20
Cu	0.0007	ICP-MS	0.0002	0.0003
Fe	0.036	ICP-MS	0.001	0.005
HCO3	100.0	Acid Titration	1.0	10.0
K	0.8	ICP-OES	0.1	0.3
Mo	0.0018	ICP-MS	0.0001	0.0004
NO3	<0.040	Automated Hydrazine Reduction	0.040	
Na	1.9	ICP-OES	0.1	0.5
Ni	0.00020	ICP-MS	0.00010	0.00010
OH	<1.0	Acid Titration	1.0	
Pb	0.0001	ICP-MS	0.0001	0.0001
Ra226	0.030	Alpha Septroscopy	0.005	0.010
SO4	20.0	ICP-OES	0.2	2.0
Se	<0.0001	ICP-MS	0.0001	
Sum of Ions	160	Calculated	1	20
TDS	132.00	Gravimetric	5.00	20.00
TSS	<1.000	Gravimetric	1.000	
Temp-H20	13.3			
U	159.000	ICP-MS	0.100	20.000
Zn	<0.001	ICP-MS	0.001	
pH-F	8.0000			
pH-L	7.82	pH Meter	0.07	0.80

Child Field **Station: DB-6**

Date: 2019/05/30

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Alk	81.0	Acid Titration	1.0	10.0	1.2
As	0.1	ICP-MS	0.1	0.1	0.0
Ba	0.040	ICP-MS	0.001	0.006	0.000
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	32.0	ICP-OES	0.1	3.0	0.0
Cl	0.60	Ion Chromatograph y	0.10	0.10	0.00
Cond-F	502				0
Cond-L	190	Conductivity Meter	1	20	0
Cu	0.0007	ICP-MS	0.0002	0.0003	0.0000
Fe	0.040	ICP-MS	0.001	0.006	10.526
HCO3	99.0	Acid Titration	1.0	10.0	1.0
K	0.9	ICP-OES	0.1	0.3	11.8
Mo	0.0018	ICP-MS	0.0001	0.0004	0.0000
NO3	< 0.040	Automated Hydrazine Reduction	0.040		0.000
Na	1.9	ICP-OES	0.1	0.5	0.0
Ni	0.00020	ICP-MS	0.00010	0.00010	0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0001	ICP-MS	0.0001	0.0001	0.0000
Ra226	0.030	Alpha Septroscopy	0.005	0.010	0.000
SO4	20.0	ICP-OES	0.2	2.0	0.0
Se	< 0.0001	ICP-MS	0.0001		0.0000
Sum of Ions	159	Calculated	1	20	1
TDS	137.00	Gravimetric	5.00	20.00	3.72
TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	13.3				0.0
U	161.000	ICP-MS	0.100	20.000	1.250
Zn	0.001	ICP-MS	0.001	0.001	18.182
pH-F	8.0000				0.0000
pH-L	7.82	pH Meter	0.07	0.80	0.00

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field **Station: Blind-3**

Date: 2019/07/16

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty
Alk	96.0	Acid Titration	1.0	10.0
As	0.2	ICP-MS	0.1	0.1
Ba	0.020	ICP-MS	0.001	0.003
CO3	< 1.0	Acid Titration	1.0	
Ca	42.0	ICP-OES	0.1	4.0
Cl	0.60	Ion Chromatograph y	0.10	0.10
Cond-F	364			
Cond-L	272	Conductivity Meter	1	30
Cu	0.0005	ICP-MS	0.0002	0.0003
Fe	0.012	ICP-MS	0.001	0.002
HCO3	117.0	Acid Titration	1.0	10.0
Hardness	143	Calculated	1	10
K	0.9	ICP-OES	0.1	0.3
Mo	0.0011	ICP-MS	0.0001	0.0003
NO3	0.050	Automated Hydrazine Reduction	0.040	0.040
Na	2.4	ICP-OES	0.1	0.4
Ni	< 0.00010	ICP-MS	0.00010	
OH	< 1.0	Acid Titration	1.0	
Pb	< 0.0001	ICP-MS	0.0001	
Ra226	0.090	Alpha Septroscopy	0.005	0.020
SO4	48.0	ICP-OES	0.2	5.0
Se	0.0001	ICP-MS	0.0001	0.0001
Sum of Ions	220	Calculated	1	20
TDS	198.00	Gravimetric	5.00	30.00
TSS	1.000	Gravimetric	1.000	1.000
Temp-H20	22.8			
U	266.000	ICP-MS	0.100	30.000
Zn	0.001	ICP-MS	0.001	0.001
pH-F	8.1000			
pH-L	8.02	pH Meter	0.07	0.30

Child Field **Station: AC-6A**

Date: 2019/07/16

Assigned: SRC Lab

Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Alk	96.0	Acid Titration	1.0	10.0	0.0
As	0.2	ICP-MS	0.1	0.1	0.0
Ba	0.020	ICP-MS	0.001	0.003	0.000
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	42.0	ICP-OES	0.1	4.0	0.0
Cl	0.60	Ion Chromatograph y	0.10	0.10	0.00
Cond-F	364				0
Cond-L	269	Conductivity Meter	1	30	1
Cu	0.0005	ICP-MS	0.0002	0.0003	0.0000
Fe	0.014	ICP-MS	0.001	0.002	15.385
HCO3	117.0	Acid Titration	1.0	10.0	0.0
Hardness	142	Calculated	1	10	1
K	0.9	ICP-OES	0.1	0.3	0.0
Mo	0.0011	ICP-MS	0.0001	0.0003	0.0000
NO3	0.060	Automated Hydrazine Reduction	0.040	0.050	18.182
Na	2.4	ICP-OES	0.1	0.4	0.0
Ni	< 0.00010	ICP-MS	0.00010		0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0003	ICP-MS	0.0001	0.0001	100.0000
Ra226	0.080	Alpha Septroscopy	0.005	0.020	11.765
SO4	48.0	ICP-OES	0.2	5.0	0.0
Se	0.0001	ICP-MS	0.0001	0.0001	0.0000
Sum of Ions	220	Calculated	1	20	0
TDS	211.00	Gravimetric	5.00	30.00	6.36
TSS	2.000	Gravimetric	1.000	1.000	66.667
Temp-H20	22.8				0.0
U	267.000	ICP-MS	0.100	30.000	0.375
Zn	0.002	ICP-MS	0.001	0.001	44.444
pH-F	8.1000				0.0000
pH-L	8.01	pH Meter	0.07	0.30	0.12

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: Blind-4			
Date: 2019/06/28				
Assigned: SRC Lab				
Parameter	Value	Method	Entered DL	Entered Uncertainty
Alk	109.0	Acid Titration	1.0	10.0
As	1.2	ICP-MS	0.1	0.3
Ba	0.660	ICP-MS	0.001	0.070
CO3	< 1.0	Acid Titration	1.0	
Ca	19.0	ICP-OES	0.1	2.0
Cl	4.10	Ion Chromatography	0.10	0.60
Cond-F	267			
Cond-L	248	Conductivity Meter	1	20
Cu	0.0006	ICP-MS	0.0002	0.0003
Fe	0.016	ICP-MS	0.001	0.002
HCO3	133.0	Acid Titration	1.0	10.0
Hardness	71	Calculated	1	10
K	1.1	ICP-OES	0.1	0.3
Mo	0.0066	ICP-MS	0.0001	0.0010
NO3	0.380	Automated Hydrazine Reduction	0.040	0.100
Na	30.0	ICP-OES	0.1	3.0
Ni	0.00030	ICP-MS	0.00010	0.00020
OH	< 1.0	Acid Titration	1.0	
Pb	0.0003	ICP-MS	0.0001	0.0001
Ra226	2.100	Alpha Septroscopy	0.005	0.200
SO4	18.0	ICP-OES	0.2	3.0
Se	0.0021	ICP-MS	0.0001	0.0003
Sum of Ions	212	Calculated	1	20
TDS	183.00	Gravimetric	5.00	30.00
TSS	< 1.000	Gravimetric	1.000	
Temp-H20	21.0			
U	110.000	ICP-MS	0.100	10.000
Zn	0.001	ICP-MS	0.001	0.001
pH-F	7.8000			
pH-L	7.99	pH Meter	0.07	0.30

Child Field	Station: TL-9				
Date: 2019/06/28					
Assigned: SRC Lab					
Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Alk	109.0	Acid Titration	1.0	10.0	0.0
As	1.2	ICP-MS	0.1	0.3	0.0
Ba	0.670	ICP-MS	0.001	0.070	1.504
CO3	< 1.0	Acid Titration	1.0		0.0
Ca	19.0	ICP-OES	0.1	2.0	0.0
Cl	3.50	Ion Chromatography	0.10	0.50	15.79
Cond-F	267				0
Cond-L	248	Conductivity Meter	1	20	0
Cu	0.0007	ICP-MS	0.0002	0.0003	15.3846
Fe	0.038	ICP-MS	0.001	0.006	81.481
HCO3	133.0	Acid Titration	1.0	10.0	0.0
Hardness	71	Calculated	1	10	0
K	1.1	ICP-OES	0.1	0.3	0.0
Mo	0.0064	ICP-MS	0.0001	0.0010	3.0769
NO3	0.360	Automated Hydrazine Reduction	0.040	0.100	5.405
Na	30.0	ICP-OES	0.1	3.0	0.0
Ni	0.00030	ICP-MS	0.00010	0.00020	0.00000
OH	< 1.0	Acid Titration	1.0		0.0
Pb	0.0009	ICP-MS	0.0001	0.0002	100.0000
Ra226	2.200	Alpha Septroscopy	0.020	0.200	4.651
SO4	18.0	ICP-OES	0.2	3.0	0.0
Se	0.0021	ICP-MS	0.0001	0.0003	0.0000
Sum of Ions	211	Calculated	1	20	0
TDS	176.00	Gravimetric	5.00	30.00	3.90
TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	21.0				0.0
U	110.000	ICP-MS	0.100	10.000	0.000
Zn	0.001	ICP-MS	0.001	0.001	33.333
pH-F	7.8000				0.0000
pH-L	7.97	pH Meter	0.07	0.30	0.25

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	**Station: Blind-6**				**Child Field**	**Station: TL-7**				
Date: 2019/06/28					**Date: 2019/06/28**					
Assigned: SRC Lab					**Assigned: SRC Lab**					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	126.0	Acid Titration	1.0	10.0	Alk	127.0	Acid Titration	1.0	10.0	0.8
As	1.0	ICP-MS	0.1	0.2	As	1.0	ICP-MS	0.1	0.2	0.0
Ba	0.480	ICP-MS	0.001	0.050	Ba	0.490	ICP-MS	0.001	0.050	2.062
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0.0
Ca	27.0	ICP-OES	0.1	3.0	Ca	27.0	ICP-OES	0.1	3.0	0.0
Cl	11.00	Automated Colorimetry using Mercuric Thiocyanate	1.00	3.00	Cl	11.00	Automated Colorimetry using Mercuric Thiocyanate	1.00	3.00	0.00
Cond-F	337				Cond-F	337				0
Cond-L	309	Conductivity Meter	1	30	Cond-L	309	Conductivity Meter	1	30	0
Cu	0.0005	ICP-MS	0.0002	0.0003	Cu	0.0005	ICP-MS	0.0002	0.0003	0.0000
Fe	0.038	ICP-MS	0.001	0.006	Fe	0.040	ICP-MS	0.001	0.006	5.128
HCO3	154.0	Acid Titration	1.0	20.0	HCO3	155.0	Acid Titration	1.0	20.0	0.6
Hardness	94	Calculated	1	10	Hardness	94	Calculated	1	10	0
K	1.2	ICP-OES	0.1	0.3	K	1.1	ICP-OES	0.1	0.3	8.7
Mo	0.0053	ICP-MS	0.0001	0.0008	Mo	0.0054	ICP-MS	0.0001	0.0008	1.8692
NO3	< 0.040	Automated Hydrazine Reduction	0.040		NO3	< 0.040	Automated Hydrazine Reduction	0.040		0.000
Na	34.0	ICP-OES	0.1	3.0	Na	34.0	ICP-OES	0.1	3.0	0.0
Ni	0.00050	ICP-MS	0.00010	0.00030	Ni	0.00050	ICP-MS	0.00010	0.00030	0.00000
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0.0
Pb	< 0.0001	ICP-MS	0.0001		Pb	< 0.0001	ICP-MS	0.0001		0.0000
Ra226	1.900	Alpha Septroscopy	0.005	0.200	Ra226	1.800	Alpha Septroscopy	0.020	0.300	5.405
SO4	22.0	ICP-OES	0.2	2.0	SO4	22.0	ICP-OES	0.2	2.0	0.0
Se	0.0016	ICP-MS	0.0001	0.0004	Se	0.0016	ICP-MS	0.0001	0.0004	0.0000
Sum of Ions	256	Calculated	1	20	Sum of Ions	257	Calculated	1	20	0
TDS	220.00	Gravimetric	5.00	30.00	TDS	224.00	Gravimetric	5.00	30.00	1.80
TSS	< 1.000	Gravimetric	1.000		TSS	< 1.000	Gravimetric	1.000		0.000
Temp-H20	19.1				Temp-H20	19.1				0.0
U	110.000	ICP-MS	0.100	10.000	U	116.000	ICP-MS	0.100	10.000	5.310
Zn	< 0.001	ICP-MS	0.001		Zn	< 0.001	ICP-MS	0.001		0.000
pH-F	7.5000				pH-F	7.5000				0.0000
pH-L	7.88	pH Meter	0.07	0.30	pH-L	7.82	pH Meter	0.07	0.30	0.76

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: TL-7 Duplicate			
Date: 2019/06/28				
Assigned: Maxxam				
Parameter	Value	Method	Entered DL	Entered Uncertainty
Pb210	0.37	Beta Method		
Po210	< 0.010	Alpha Septroscopy		
Ra226	1.600	Alpha Septroscopy		
U	130.000	ICP-MS		

Child Field	Station: TL-7				
Date: 2019/06/28					
Assigned: SRC Lab					
Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Pb210	0.14	Beta Counting	0.02	0.07	90.20
Po210	0.010	Alpha Septroscopy	0.005	0.007	0.000
Ra226	1.800	Alpha Septroscopy	0.020	0.300	11.765
U	116.000	ICP-MS	0.100	10.000	11.382

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	**Station: TL-7 FB**			
Date: 2019/08/27				
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	
Mo	<0.0001	ICP-MS	0.0001	
NO3	<0.040	Automated Hydrazine Reduction	0.040	
Na	0.1	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	1.000
U	<0.100	ICP-MS	0.100	
Zn	0.002	ICP-MS	0.001	0.001
pH-L	5.77	pH Meter	0.07	0.20

Child Field		**Station: TL-7 TB**				
Date: 2019/08/27						
Assigned: SRC Lab						
Parameter		**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk		1.0	Acid Titration	1.0	1.0	66.7
As	<	0.1	ICP-MS	0.1		0.0
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
Mo	<	0.0001	ICP-MS	0.0001		0.0000
NO3	<	0.040	Automated Hydrazine Reduction	0.040		0.000
Na		0.1	ICP-OES	0.1	0.1	0.0
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		6.00	Gravimetric	5.00	6.00	18.18
TSS		1.000	Gravimetric	1.000	1.000	0.000
U	<	0.100	ICP-MS	0.100		0.000
Zn		0.002	ICP-MS	0.001	0.001	10.526
pH-L		5.57	pH Meter	0.07	0.20	3.53

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

Parent Field	Station: TL-9 Duplicate			
Date: 2019/06/28				
Assigned: Maxxam				
Parameter	Value	Method	Entered DL	Entered Uncertainty
Pb210	0.17	Beta Method		
Po210	0.062	Alpha Septroscopy		
Ra226	2.000	Alpha Septroscopy		
U	130.000	ICP-MS		

Child Field	Station: TL-9				
Date: 2019/06/28					
Assigned: SRC Lab					
Parameter	Value	Method	Entered DL	Entered Uncertainty	% Absolute Difference
Pb210	0.16	Beta Counting	0.02	0.08	6.06
Po210	0.060	Alpha Septroscopy	0.005	0.020	3.279
Ra226	2.200	Alpha Septroscopy	0.020	0.200	9.524
U	110.000	ICP-MS	0.100	10.000	16.667

Note: % Absolute Difference = abs(A-B)/((A+B)/2) Followup required where value is greater than 50%

APPENDIX F

APPENDIX F

2019 Hydrometric Monitoring near Beaverlodge Mine

Cameco Corporation
March 2020

MISSINIPI WATER SOLUTIONS INC.
FILE NUMBER: MWS-19-007
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)

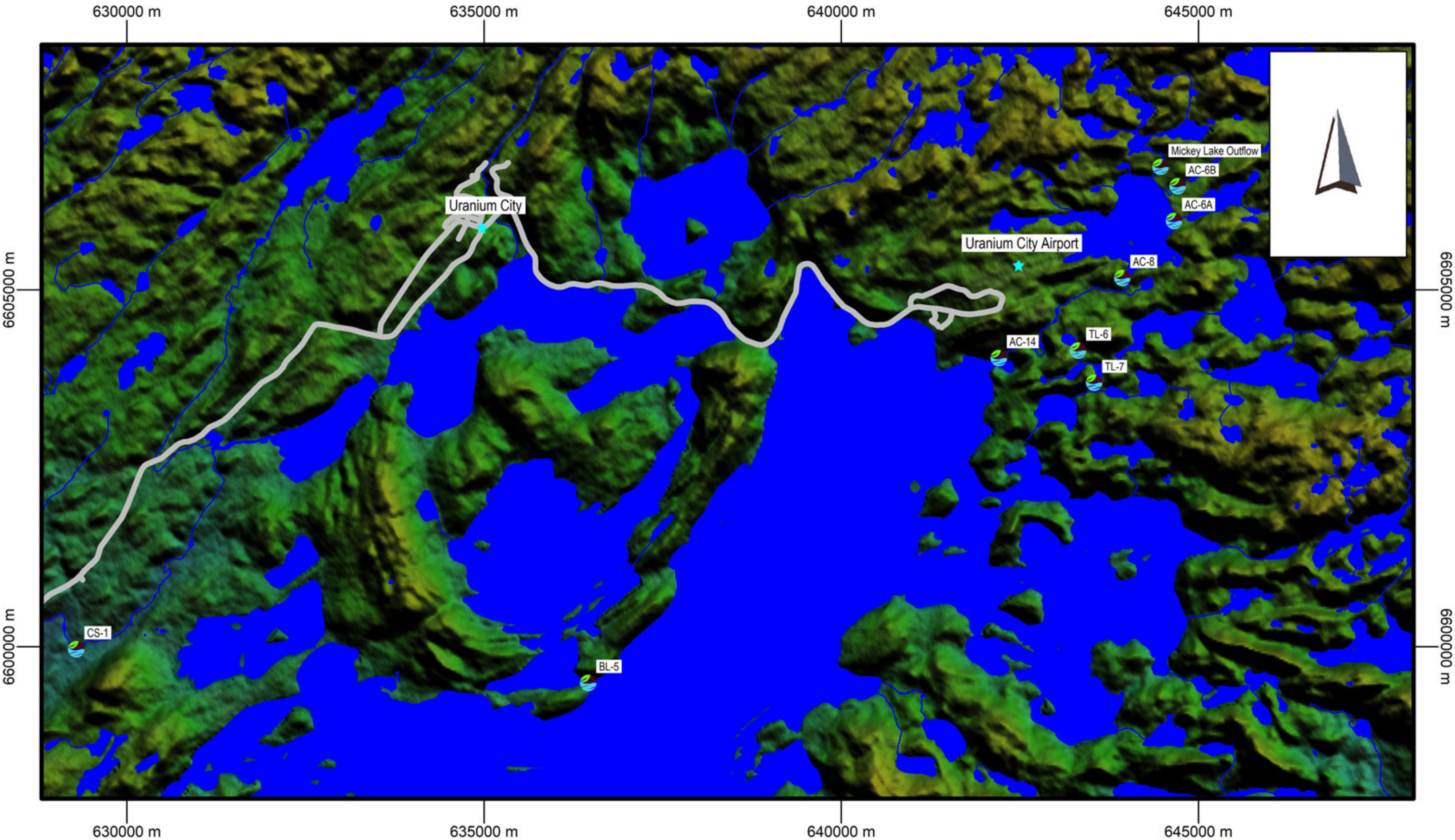
Monitoring activities have continued since the closure of the Site and include routine sampling such as measurement of water quality and water quantity. Cameco has retained Missinipi Water Solutions Inc. (MWSI) to perform annual hydrological monitoring in areas associated with the Site and downstream. 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;
- BL-5 – Beaverlodge Lake Outflow;
- CS-1 – Crackingstone River;
- Mickey Lake Outflow;
- 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.

A new station was added in 2019 located on the Fredette River immediately downstream of the intake for water supply to Uranium City.

Other activities were carried out at the request of Cameco in addition to the above noted flow monitoring and included visual inspection of formerly flowing (now sealed) boreholes in the area and installation of time lapse cameras at known seep locations. Details of those activities are summarized in this report following discussion of stream discharge monitoring.



Legend:
- Waterbody
- Stream Alignment
- Hydrometric Monitoring Station
- Local Landmark

0 km 1 km 2 km 3 km 4 km

missinipi WATER SOLUTIONS

Figure 1: Monitoring Locations
Project Number: MWS-19-007
Project Title: 2019 Hydrometric Monitoring near Beaverlodge Mine
Date: February 22, 2020
Projection: UTM NAD83 Zone 12 References: SRTM Digital Elevation Data

2.0 METHODS AND EQUIPMENT

Two field programs were undertaken during 2019. The first occurred between April 29 and May 12 and ran concurrently with other work in the Uranium City area. The second program ran from October 1 to 2.

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 has been tested 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 periodically checked against each other to confirm that individual loggers are reporting similar responses in a controlled environment, with no issues identified. Dataloggers deployed through the winter will be checked during the next field program. Any potential issues 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 both half-hourly discharge and 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 (2018).

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.

3.0 CLIMATIC CONDITIONS

The climate stations at Uranium City and Stony Rapids, SK reported 361 days (out of 365) and 327 days of climate data, respectively. Climate data are collected and reported by Environment and Climate Change Canada (2020) for these stations. For Uranium City, the winter of 2018/2019 (MWSI, 2019 and Environment and Climate Change Canada, 2020) had below normal precipitation up to and including May of 2019. Through the summer precipitation was above normal up to and including October of 2019. Stony Rapids data indicate a similar trend through 2019. 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
2019	January	23.8	19.3	123.3	31/31	7.8*	18.1	43.1	29/31
	February	2.0	15.5	12.9	28/28	0.0*	13.3	0.0	3/28
	March	3.4	17.8	19.1	31/31	1.6	18.2	8.8	31/31
	April	9.7	16.9	57.4	30/30	10.5	18.0	58.3	30/30
	May	13.4	17.5	76.6	31/31	10.6*	26.3	40.3	28/31
	June	70.1	31.3	224.0	30/30	52.2*	44.4	117.6	27/30
	July	29.1*	47.1	61.8	27/31	34.0*	56.3	60.4	29/31
	August	54.3	42.4	128.1	31/31	95.1*	63.9	148.8	30/31
	September	36.8	33.7	109.2	30/30	62.7*	48.4	129.5	28/30
	October	43.9	29.1	150.9	31/31	22.0	30.1	73.1	31/31
	November	19.3	28.0	68.9	30/30	5.0	27.6	18.1	30/30
	December	15.7	23.6	66.5	31/31	0.6	18.7	3.2	31/31
Totals		321.5*	322.2	99.8	361/365	302.1*	383.3	78.8	327/365

Notes: (a) Uranium City Normals, Golder (2011); (b) Stony Rapids Normals, Golder (2011); * indicates incomplete data set.

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. Daily average discharge data are averaged on a monthly basis only when complete months of data are available. 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 2019 based on trends observed at AC-8. The only datalogger downloaded with a record extending beyond October 2019 is AC-8; any station with a flow record extending beyond this period (AC-6B, CS-1 and TL-7) is synthesized from AC-8. 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. For this reason AC-8 is often used as a proxy to define the trend of winter water levels.

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.

As previously discussed, precipitation totals through the winter of 2018/19 were low until the summer when rain events resulted in above average precipitation until the end of the fall. These volumes are reflected in the flow data discussed in the following sections.

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 and Photo 2 were taken during the 2019 spring and fall field programs, respectively. The rating curve data are presented in Table 2 and graphically in Figure 2. The 2019 hydrograph for AC-6A is shown in Figure 3 and the data are presented in Table 3. 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. The sensor was installed on April 18 by a local resident and observed twice in the spring by MWSI.

Photo 1: AC-6A – May 11, 2019

Photo 2: AC-6A – October 1, 2019

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

Figure 2: AC-6A Rating Curve

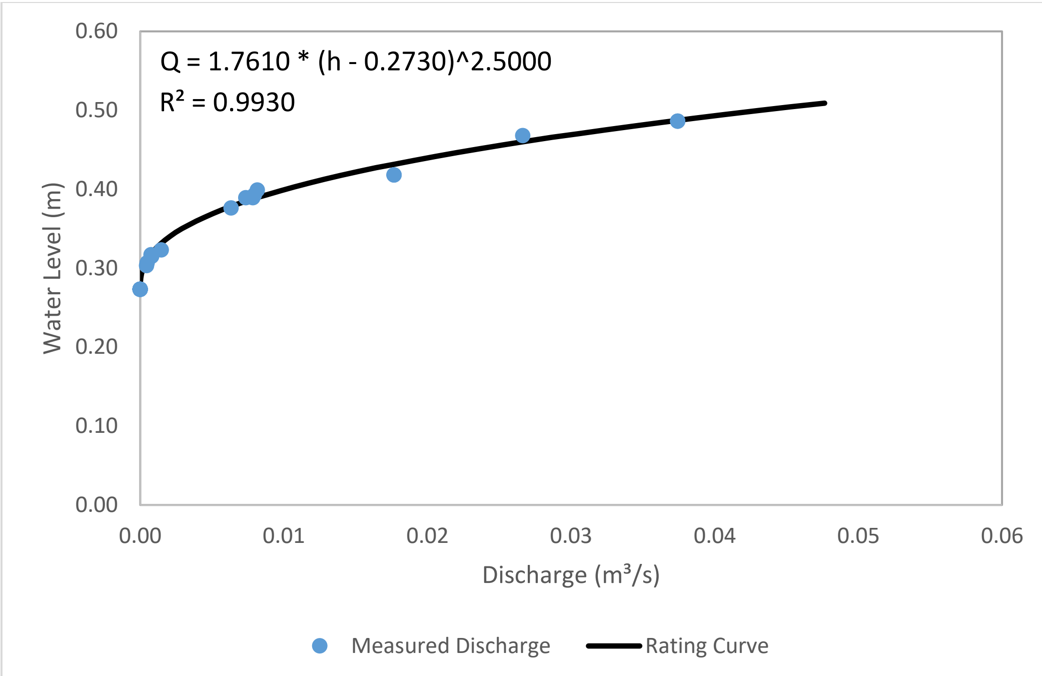


Figure 3: AC-6A 2019 Hydrograph

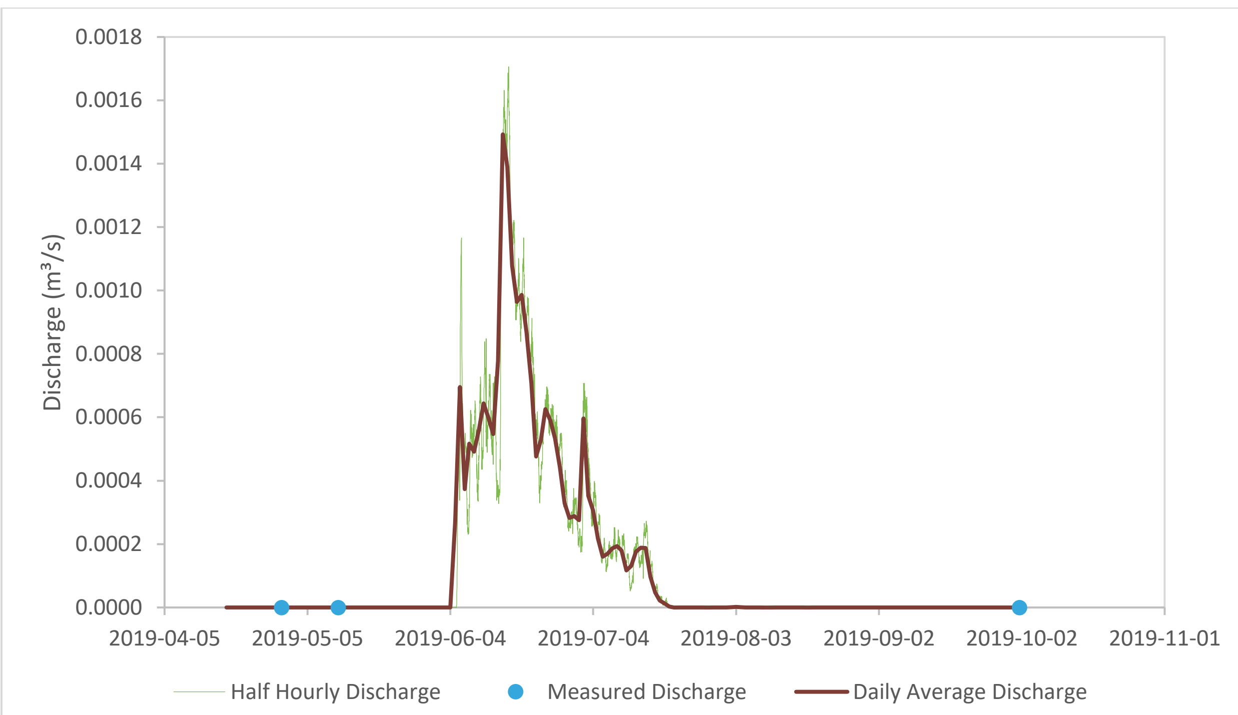


Table 3: AC-6A 2019 Daily Average Discharge (m³/s)

Day	Apr	May	Jun	Jul	Aug	Sep	Oct
1		0.0000	0.0000	0.0003	0.0000	0.0000	0.0000
2		0.0000	0.0000	0.0006	0.0000	0.0000	
3		0.0000	0.0000	0.0004	0.0000	0.0000	
4		0.0000	0.0000	0.0003	0.0000	0.0000	
5		0.0000	0.0003	0.0002	0.0000	0.0000	
6		0.0000	0.0007	0.0002	0.0000	0.0000	
7		0.0000	0.0004	0.0002	0.0000	0.0000	
8		0.0000	0.0005	0.0002	0.0000	0.0000	
9		0.0000	0.0005	0.0002	0.0000	0.0000	
10		0.0000	0.0006	0.0002	0.0000	0.0000	
11		0.0000	0.0006	0.0001	0.0000	0.0000	
12		0.0000	0.0006	0.0001	0.0000	0.0000	
13		0.0000	0.0005	0.0002	0.0000	0.0000	
14		0.0000	0.0008	0.0002	0.0000	0.0000	
15		0.0000	0.0015	0.0002	0.0000	0.0000	
16		0.0000	0.0014	0.0001	0.0000	0.0000	
17		0.0000	0.0011	0.0000	0.0000	0.0000	
18	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	
19	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	
20	0.0000	0.0000	0.0009	0.0000	0.0000	0.0000	
21	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000	
22	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000	
23	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000	
24	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	
25	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	
26	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000	
27	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	
28	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	
29	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	
30	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	
31		0.0000		0.0000	0.0000		
Average		0.0000	0.0006	0.0001	0.0000	0.0000	

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 spring (Photo 3) and fall (Photo 4) of 2019. Table 4 and Figure 4 present the measured flow data numerically and graphically (rating curve). The 2019 hydrograph is provided as Figure 5 and the daily average discharge data are presented in Table 5.

Photo 3: AC-6B – May 11, 2019

Photo 4: AC-6B – October 1, 2019

Table 4: 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

Figure 4: AC-6B Rating Curve

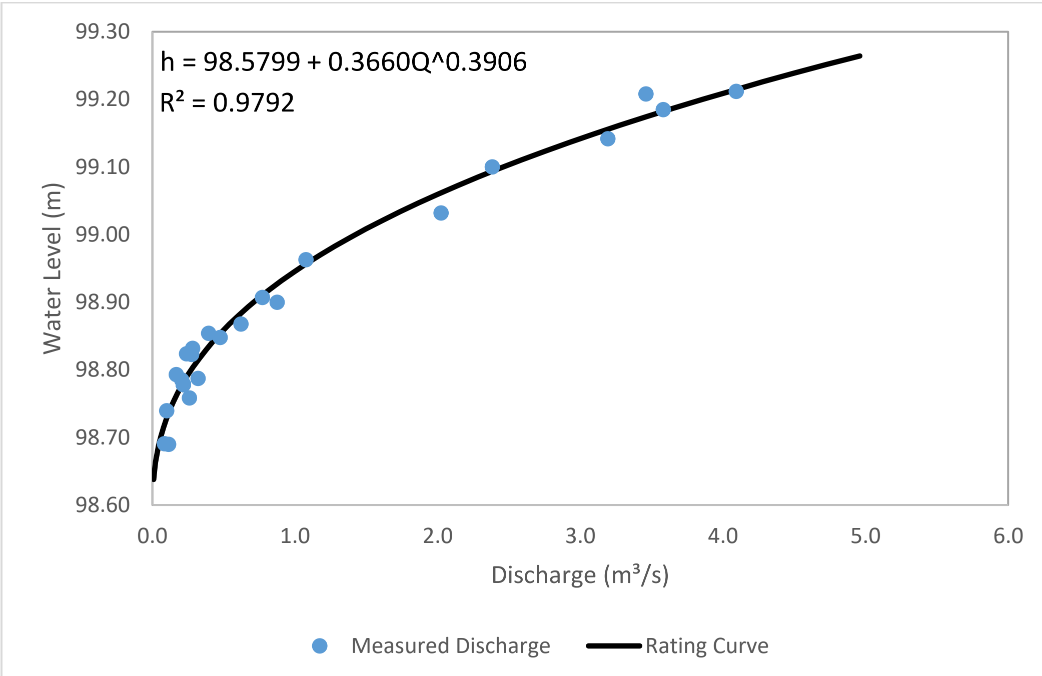


Figure 5: AC-6B 2019 Hydrograph

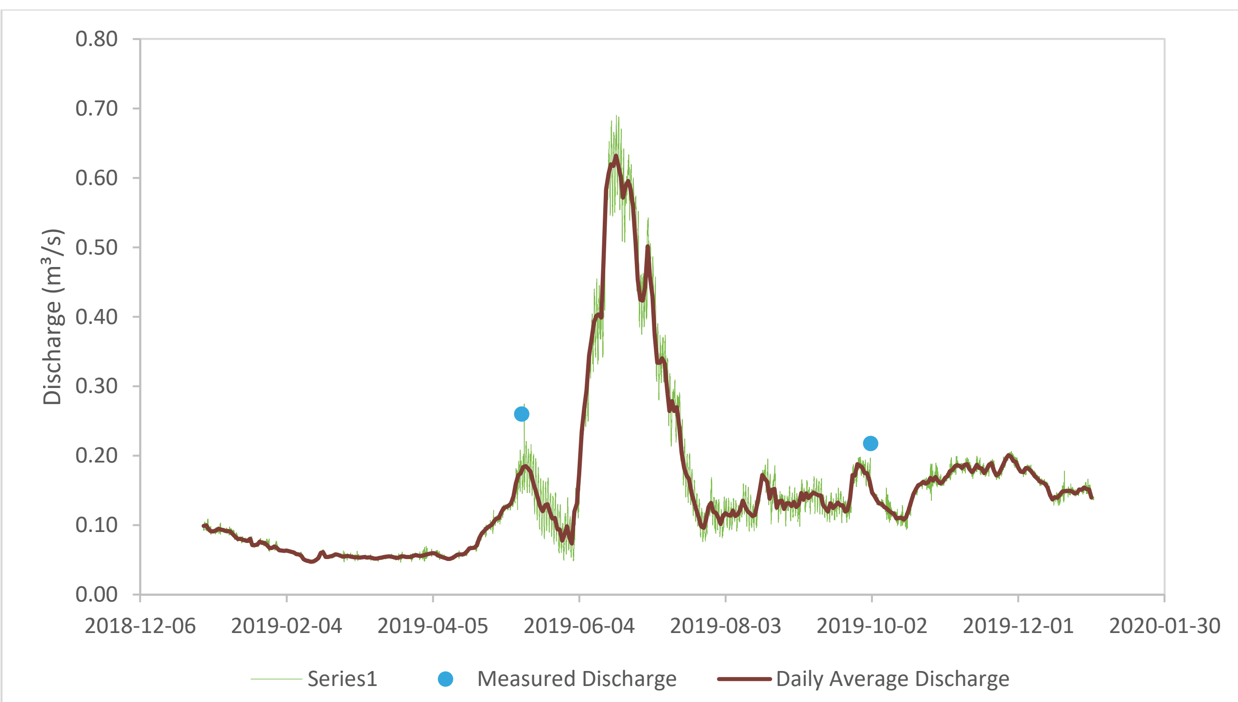


Table 5: AC-6B 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0989	0.0639	0.0557	0.0567	0.1096	0.0736	0.4426	0.1017	0.1262	0.1639	0.1682	0.1824
2	0.1001	0.0633	0.0554	0.0575	0.1106	0.1195	0.5014	0.1144	0.1298	0.1468	0.1707	0.1775
3	0.0946	0.0632	0.0544	0.0583	0.1179	0.1312	0.4589	0.1175	0.1464	0.1425	0.1779	0.1763
4	0.0914	0.0637	0.0538	0.0593	0.1246	0.1746	0.4292	0.1147	0.1367	0.1359	0.1797	0.1823
5	0.0912	0.0628	0.0537	0.0597	0.1260	0.2348	0.3733	0.1139	0.1458	0.1314	0.1852	0.1821
6	0.0927	0.0615	0.0536	0.0596	0.1279	0.2688	0.3339	0.1210	0.1389	0.1308	0.1867	0.1789
7	0.0947	0.0607	0.0538	0.0567	0.1314	0.2943	0.3341	0.1133	0.1438	0.1260	0.1852	0.1743
8	0.0940	0.0582	0.0541	0.0554	0.1417	0.3445	0.3402	0.1161	0.1469	0.1242	0.1822	0.1699
9	0.0928	0.0581	0.0536	0.0536	0.1597	0.3654	0.3336	0.1226	0.1449	0.1208	0.1870	0.1660
10	0.0915	0.0560	0.0537	0.0527	0.1721	0.3916	0.2946	0.1355	0.1431	0.1180	0.1879	0.1627
11	0.0915	0.0511	0.0528	0.0517	0.1746	0.4017	0.2643	0.1277	0.1429	0.1166	0.1810	0.1617
12	0.0908	0.0495	0.0521	0.0514	0.1838	0.4035	0.2788	0.1204	0.1287	0.1094	0.1765	0.1591
13	0.0870	0.0484	0.0518	0.0528	0.1852	0.3988	0.2641	0.1171	0.1245	0.1104	0.1811	0.1544
14	0.0834	0.0473	0.0528	0.0553	0.1818	0.4791	0.2697	0.1133	0.1199	0.1108	0.1869	0.1431
15	0.0802	0.0480	0.0536	0.0575	0.1774	0.5830	0.2402	0.1147	0.1317	0.1081	0.1825	0.1373
16	0.0805	0.0497	0.0542	0.0581	0.1621	0.6063	0.2046	0.1305	0.1249	0.1115	0.1819	0.1404
17	0.0792	0.0524	0.0546	0.0580	0.1515	0.6194	0.1824	0.1502	0.1280	0.1215	0.1749	0.1394
18	0.0783	0.0603	0.0551	0.0590	0.1390	0.6174	0.1715	0.1723	0.1327	0.1326	0.1803	0.1436
19	0.0771	0.0611	0.0546	0.0626	0.1270	0.6320	0.1668	0.1672	0.1284	0.1446	0.1871	0.1483
20	0.0807	0.0541	0.0540	0.0668	0.1202	0.6185	0.1462	0.1632	0.1291	0.1520	0.1893	0.1490
21	0.0713	0.0544	0.0531	0.0674	0.1287	0.6013	0.1349	0.1382	0.1197	0.1573	0.1783	0.1493
22	0.0715	0.0550	0.0535	0.0677	0.1305	0.5715	0.1218	0.1512	0.1215	0.1595	0.1718	0.1497
23	0.0725	0.0564	0.0551	0.0710	0.1185	0.5885	0.1105	0.1523	0.1380	0.1627	0.1741	0.1486
24	0.0766	0.0580	0.0553	0.0813	0.1097	0.5957	0.0985	0.1254	0.1722	0.1596	0.1810	0.1460
25	0.0746	0.0575	0.0544	0.0885	0.1105	0.5848	0.0964	0.1344	0.1712	0.1616	0.1888	0.1465
26	0.0746	0.0563	0.0544	0.0917	0.0946	0.5601	0.1072	0.1352	0.1879	0.1680	0.1964	0.1514
27	0.0713	0.0549	0.0541	0.0958	0.0937	0.5087	0.1264	0.1232	0.1859	0.1644	0.2006	0.1509
28	0.0670	0.0550	0.0561	0.0982	0.0777	0.4537	0.1321	0.1316	0.1832	0.1695	0.1987	0.1542
29	0.0674		0.0569	0.1004	0.0877	0.4245	0.1195	0.1315	0.1750	0.1646	0.1925	0.1518
30	0.0693		0.0562	0.1057	0.0985	0.4231	0.1178	0.1278	0.1748	0.1605	0.1910	0.1514
31	0.0672		0.0559		0.0817		0.1106	0.1334		0.1626		0.1401
Average	0.0824	0.0565	0.0543	0.0670	0.1308	0.4357	0.2357	0.1301	0.1441	0.1403	0.1835	0.1571

4.3 MICKEY LAKE OUTFLOW

The outflow from Mickey Lake represents the watershed in which the former Hab Mine was located. The location of discharge measurement has been in use since 2010. Due to concerns over the reliability of the station and a desire to ensure AC-8 data was not compromised, the datalogger was relocated to AC-8 (as a backup) during the spring 2017 program. With the additional dataloggers purchased in 2018 and the finding of the previously lost AC-6B logger (MWSI, 2018) the Mickey Lake Outflow datalogger was returned during the 2019 monitoring season. Measurements at the station were completed during the spring and fall field programs in 2019 (Photo 5 and Photo 6). The updated rating curve data are provided in Table 6 and the rating curve is presented in Figure 6. Figure 7 presents the 2019 hydrograph and daily average discharge data are provided in Table 7.

Photo 5: Mickey Lake Outflow – May 11, 2019

Photo 6: Mickey Lake Outflow – October 1, 2019

Table 6: Mickey Lake Outflow Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2010-04-27	99.528	0.0597
2010-07-01	99.458	0.0110
2010-09-17	99.367	0.0003
2011-05-18 11:35	99.523	0.0703
2011-10-05	99.465	0.0234
2012-05-09 17:30	99.662	0.5295
2012-09-29 8:25	99.514	0.0705
2013-05-15 12:10	99.700	0.5655
2013-10-12 9:30	99.419	0.0049
2014-05-08 9:10	99.652	0.2603
2014-10-10 13:05	99.397	0.0020
2015-05-03 15:30	99.522	0.0778
2015-10-02 11:10	99.560	0.1040
2016-05-04 9:30	99.694	0.4418
2016-10-07 9:29	99.578	0.1240
2017-05-06 8:30	99.578	0.1345
2017-10-14 9:30	99.383	0.0001
2018-05-05 8:40	99.656	0.2954
2018-09-29 8:49	99.342	0.0005
2019-05-11 8:30	99.488	0.0397
2019-10-01 8:30	99.423	0.0051

Figure 6: Mickey Lake Outflow Rating Curve

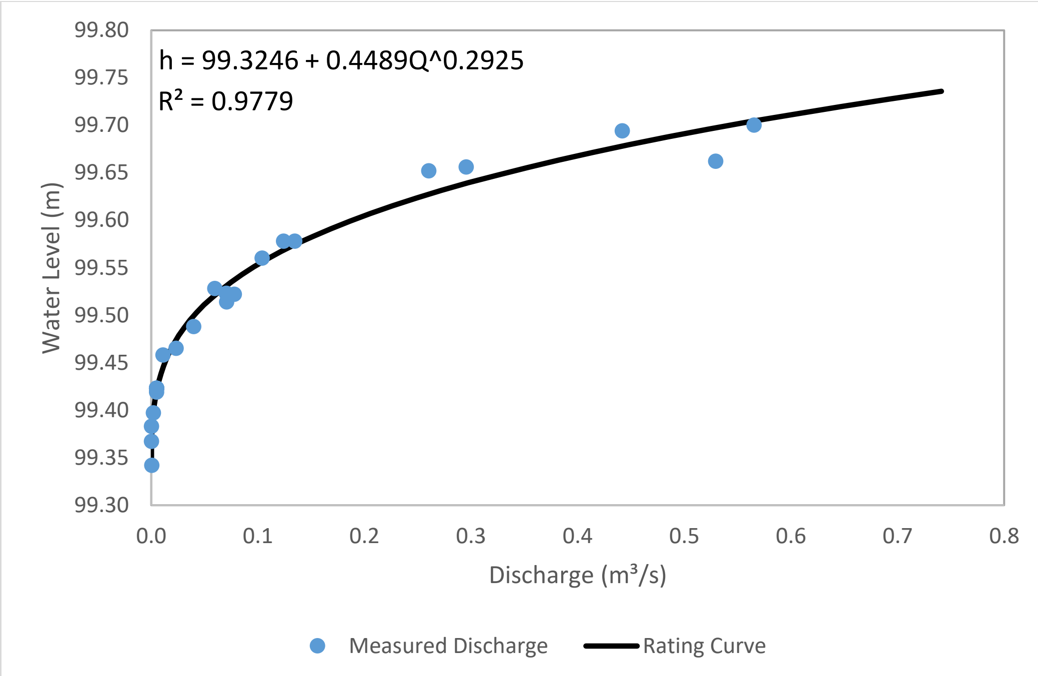


Figure 7: Mickey Lake Outflow 2019 Hydrograph

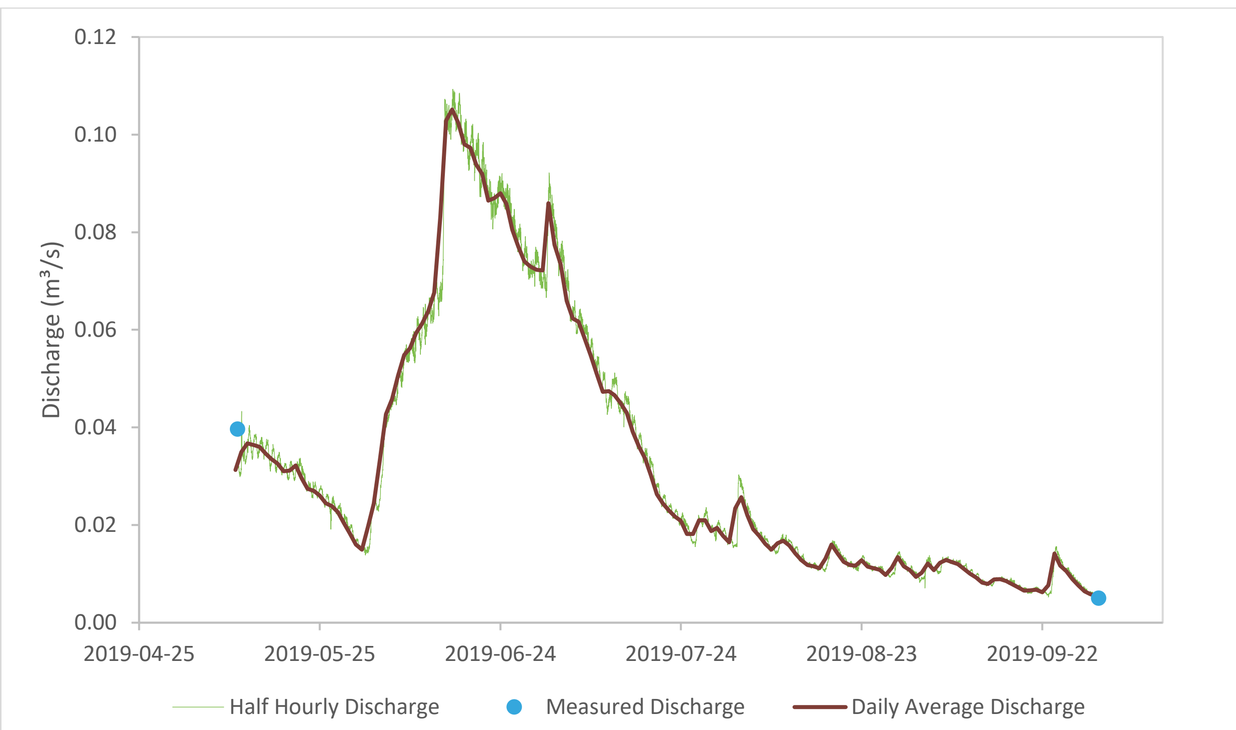


Table 7: Mickey Lake Outflow 2019 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.0150	0.0722	0.0165	0.0094	0.0055
2		0.0197	0.0860	0.0234	0.0103	
3		0.0244	0.0774	0.0257	0.0121	
4		0.0333	0.0735	0.0220	0.0107	
5		0.0427	0.0659	0.0191	0.0123	
6		0.0458	0.0623	0.0178	0.0128	
7		0.0507	0.0617	0.0161	0.0124	
8		0.0549	0.0583	0.0150	0.0120	
9		0.0562	0.0548	0.0163	0.0110	
10		0.0593	0.0510	0.0168	0.0101	
11	0.0313	0.0613	0.0473	0.0158	0.0092	
12	0.0349	0.0637	0.0474	0.0142	0.0082	
13	0.0367	0.0677	0.0466	0.0128	0.0079	
14	0.0364	0.0832	0.0450	0.0118	0.0088	
15	0.0360	0.1029	0.0430	0.0116	0.0089	
16	0.0346	0.1051	0.0391	0.0112	0.0085	
17	0.0335	0.1024	0.0361	0.0131	0.0079	
18	0.0326	0.0980	0.0336	0.0160	0.0072	
19	0.0310	0.0973	0.0302	0.0142	0.0066	
20	0.0312	0.0939	0.0263	0.0124	0.0066	
21	0.0322	0.0919	0.0244	0.0118	0.0067	
22	0.0295	0.0865	0.0229	0.0117	0.0062	
23	0.0274	0.0870	0.0217	0.0128	0.0077	
24	0.0271	0.0880	0.0209	0.0115	0.0142	
25	0.0261	0.0858	0.0182	0.0112	0.0117	
26	0.0245	0.0805	0.0182	0.0108	0.0105	
27	0.0239	0.0770	0.0210	0.0098	0.0089	
28	0.0226	0.0740	0.0210	0.0112	0.0076	
29	0.0205	0.0730	0.0188	0.0134	0.0064	
30	0.0183	0.0723	0.0194	0.0115	0.0058	
31	0.0160		0.0178	0.0108		
Average		0.0698	0.0413	0.0145	0.0093	

4.4 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. The station was visited by MWSI in the spring (Photo 7) and fall (Photo 8) of 2019. The field monitoring data are provided in Table 8 and the rating curve is presented in Figure 8. The hydrograph for 2019 is shown as Figure 9. Daily average discharge data are presented in Table 9 and the long term monthly data are provided in Table 10.

Photo 7: AC-8 – April 29, 2019

Photo 8: AC-8 – October 1, 2019

Table 8: 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

Figure 8: AC-8 Rating Curve

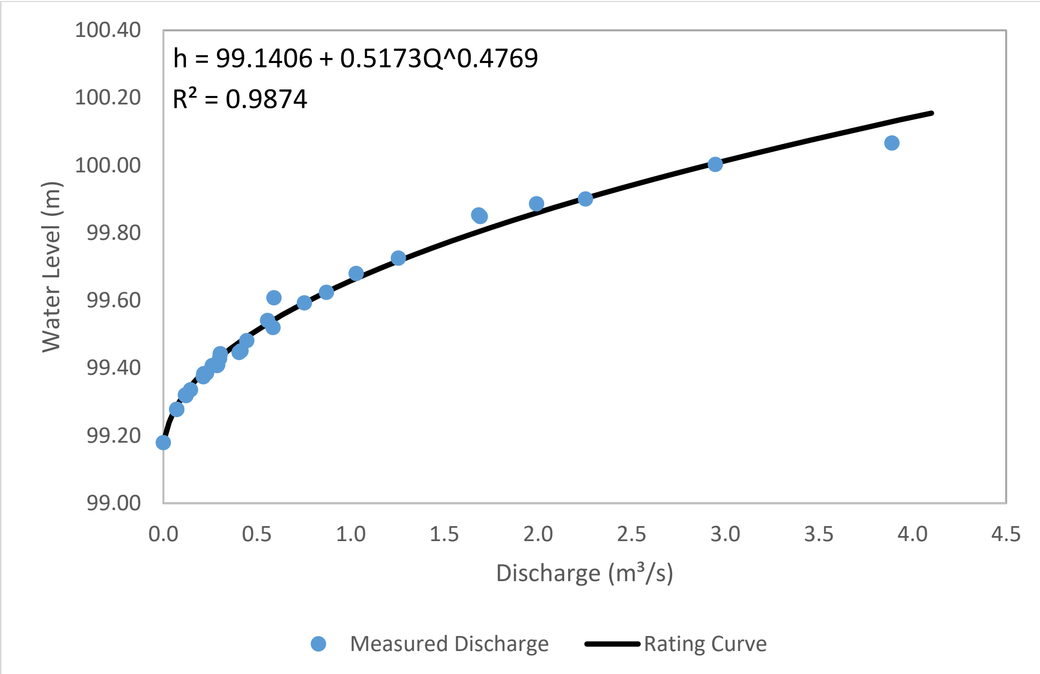


Figure 9: AC-8 2019 Hydrograph

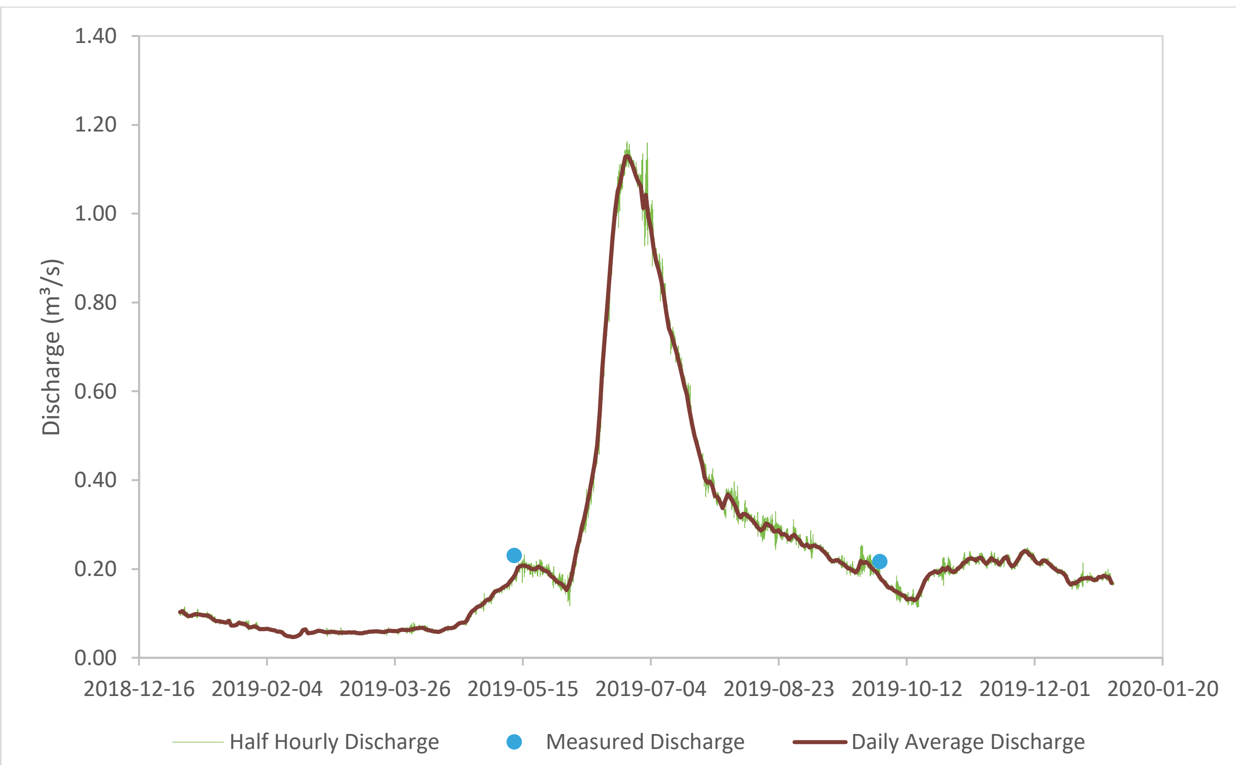


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Table 9: AC-8 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.103	0.065	0.058	0.063	0.131	0.152	1.013	0.337	0.254	0.186	0.202	0.219
2	0.105	0.064	0.058	0.065	0.132	0.165	1.043	0.353	0.252	0.176	0.205	0.213
3	0.098	0.064	0.057	0.066	0.141	0.183	0.992	0.368	0.255	0.171	0.213	0.212
4	0.094	0.065	0.057	0.067	0.149	0.214	0.966	0.361	0.248	0.163	0.216	0.219
5	0.094	0.064	0.057	0.068	0.151	0.244	0.923	0.351	0.252	0.158	0.222	0.219
6	0.096	0.063	0.057	0.068	0.153	0.266	0.893	0.341	0.253	0.157	0.224	0.215
7	0.099	0.062	0.057	0.064	0.158	0.294	0.874	0.325	0.250	0.151	0.222	0.209
8	0.098	0.059	0.057	0.063	0.161	0.316	0.850	0.316	0.248	0.149	0.219	0.204
9	0.097	0.059	0.057	0.061	0.164	0.344	0.818	0.324	0.242	0.145	0.224	0.199
10	0.095	0.057	0.057	0.060	0.173	0.372	0.777	0.323	0.236	0.142	0.225	0.195
11	0.095	0.051	0.056	0.059	0.179	0.405	0.742	0.318	0.230	0.140	0.217	0.194
12	0.095	0.049	0.055	0.058	0.188	0.438	0.726	0.313	0.221	0.131	0.212	0.191
13	0.090	0.048	0.055	0.060	0.203	0.480	0.707	0.306	0.218	0.132	0.217	0.185
14	0.086	0.047	0.057	0.063	0.207	0.553	0.687	0.299	0.219	0.133	0.224	0.172
15	0.082	0.048	0.058	0.066	0.208	0.651	0.664	0.291	0.220	0.130	0.219	0.165
16	0.083	0.050	0.058	0.067	0.207	0.725	0.639	0.286	0.215	0.134	0.218	0.168
17	0.081	0.053	0.059	0.067	0.205	0.797	0.613	0.291	0.211	0.146	0.210	0.167
18	0.080	0.063	0.060	0.068	0.201	0.873	0.594	0.302	0.207	0.159	0.216	0.172
19	0.079	0.064	0.059	0.073	0.200	0.946	0.559	0.299	0.202	0.173	0.225	0.178
20	0.084	0.055	0.059	0.078	0.200	1.006	0.528	0.295	0.200	0.182	0.227	0.179
21	0.072	0.056	0.058	0.079	0.205	1.050	0.500	0.285	0.196	0.189	0.214	0.179
22	0.073	0.057	0.058	0.079	0.202	1.070	0.479	0.285	0.192	0.191	0.206	0.180
23	0.074	0.059	0.060	0.083	0.197	1.102	0.457	0.287	0.200	0.195	0.209	0.178
24	0.079	0.061	0.061	0.096	0.196	1.128	0.435	0.278	0.218	0.192	0.217	0.175
25	0.077	0.060	0.060	0.105	0.192	1.129	0.406	0.279	0.213	0.194	0.227	0.176
26	0.077	0.059	0.060	0.109	0.183	1.119	0.395	0.275	0.216	0.202	0.236	0.182
27	0.073	0.057	0.060	0.114	0.180	1.105	0.396	0.267	0.211	0.197	0.241	0.181
28	0.068	0.058	0.062	0.117	0.172	1.087	0.387	0.273	0.203	0.203	0.238	0.185
29	0.069		0.063	0.119	0.169	1.072	0.364	0.277	0.198	0.198	0.231	0.182
30	0.071		0.063	0.126	0.167	1.062	0.362	0.269	0.194	0.193	0.229	0.182
31	0.069		0.062		0.161		0.350	0.265		0.195		0.168
Average	0.085	0.058	0.059	0.078	0.178	0.678	0.650	0.305	0.222	0.168	0.220	0.188

Table 10: AC-8 Monthly Average Discharge (m³/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	0.151	0.150	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	0.190	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	0.750	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	0.790	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	0.260	0.116	0.102	0.103	0.135	0.138	0.364
1988	0.154	0.114	0.108	0.100	0.361	0.817	1.120	0.819	0.254	0.181	0.202	0.191	0.368
1989	0.178	0.176	0.156	0.160	1.912	1.427	0.361	0.166	0.115	0.120	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	0.250	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	0.190	0.862	0.513	0.356	1.006	0.594	0.314	0.382	0.400	0.444
1994	0.277	0.225	0.205	0.186	3.014	1.459	0.339	0.117	0.097	0.105	0.130	0.131	0.524
1995	0.113	0.106	0.104	0.129	1.698	1.401	0.900	0.493	1.002	0.511	0.378	0.325	0.597
1996	0.252	0.190	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	0.970	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	0.410	0.614	0.404	0.260	0.208	0.208	0.199	0.394
1999	0.169	0.160	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	0.360	0.355	0.597	0.457	0.365	0.469
2002	0.350	0.220	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	2.240	2.284	0.668	0.522	0.458	0.422	0.410	0.345	0.689
2004	0.253	0.250	0.301	0.214	0.206	1.996	0.455	0.219	0.169	0.170	0.176	0.166	0.381
2005	0.143	0.164	0.150	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	2.280	0.978	0.365	0.240	0.226	0.228	0.220	0.200	0.510
2007	0.199	0.171	0.156	0.175	0.734	0.573	0.370	0.321	0.477	0.483	0.874	0.635	0.431
2008	0.463	0.343	0.294	0.252	1.110	1.125	0.361	0.318	0.265	0.509	0.735	0.495	0.523
2009	0.242	0.180	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	0.280	0.217	0.309	0.744	0.430	0.238	0.105	0.167	0.199	0.178	0.181	0.282
2011	0.173	0.140	0.113	0.092	0.299	0.319	0.207	0.240	0.358	0.250	0.224	0.241	0.221
2012	0.259	0.221	0.215	0.248	2.467	1.114	0.699	0.560	0.666	0.517	0.621	0.535	0.677
2013	0.351	0.280	0.247	0.237	1.891	1.579	0.637	0.324	0.240	0.218	0.237	0.243	0.540
2014	0.235	0.217	0.190	0.170	2.224	2.344	1.163	0.465	0.176	0.163	0.175	0.163	0.640
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
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	0.140	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	0.650	0.305	0.222	0.168	0.220	0.188	0.241
Mean	0.245	0.207	0.183	0.207	1.209	0.983	0.572	0.460	0.507	0.431	0.405	0.319	0.477

4.5 AC-14 – ACE CREEK UPSTREAM OF BEAVERLODGE

Discharge is measured on Ace Creek approximately 250 m upstream of the AC-14 station which is located at the confluence of Ace Creek and Beaverlodge Lake. The site was visited twice in 2019 during the spring and fall field programs (Photo 9 and Photo 10) although discharge was only measured during the fall field program. Field measurement data are summarized in Table 11 and the rating curve is presented as Figure 10. The 2019 hydrograph is shown in Figure 11 with daily average discharge data presented in Table 12.

Photo 9: AC-14 – May 11, 2019

Photo 10: AC-14 – October 1, 2019

Table 11: 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

Figure 10: AC-14 Rating Curve

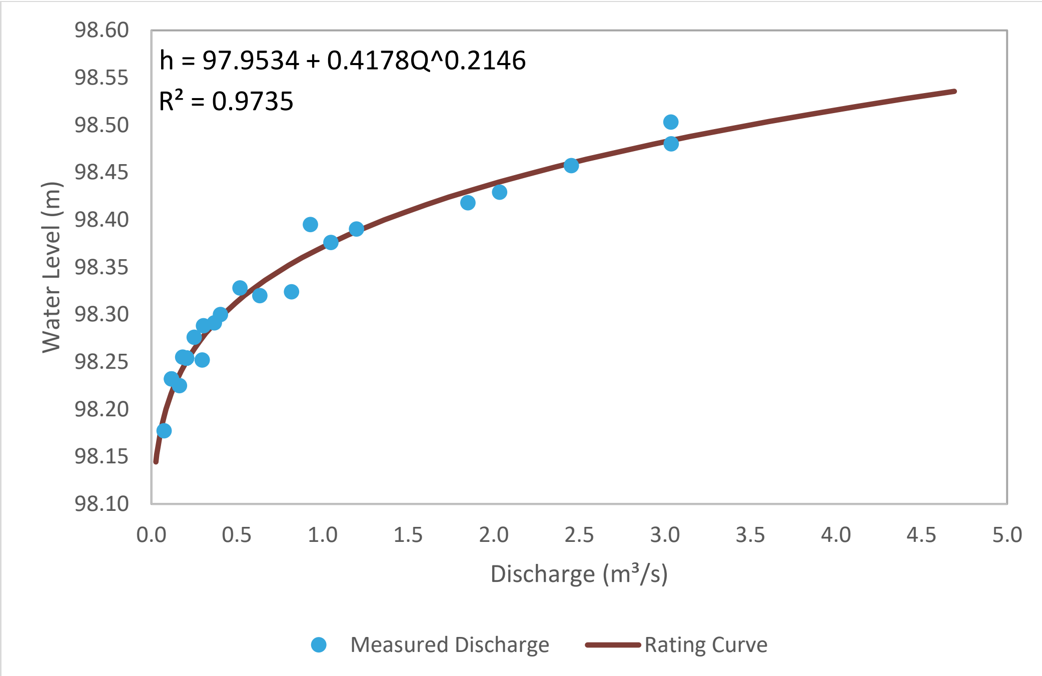


Figure 11: AC-14 2019 Hydrograph

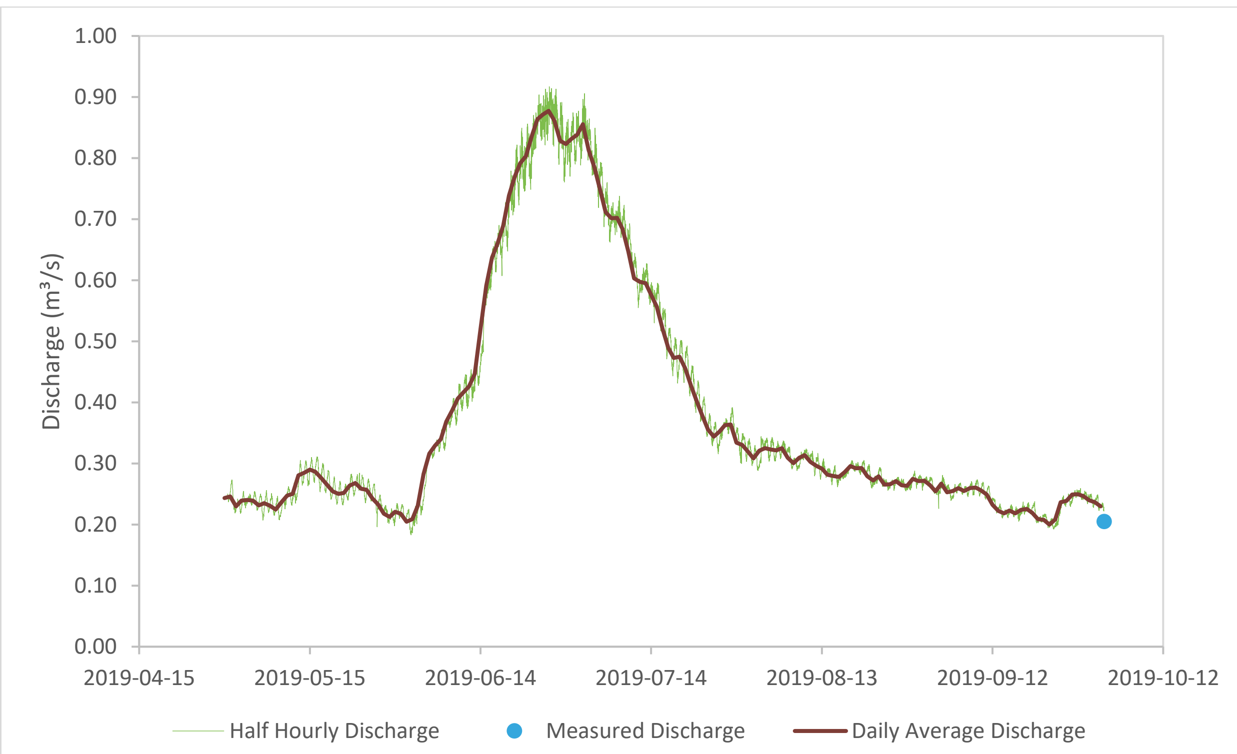


Table 12: AC-14 2019 Daily Average Discharge (m³/s)

Day	Apr	May	Jun	Jul	Aug	Sep	Oct
1		0.2461	0.2047	0.8385	0.3083	0.2649	0.2300
2		0.2296	0.2086	0.8557	0.3209	0.2543	
3		0.2393	0.2309	0.8131	0.3252	0.2667	
4		0.2400	0.2829	0.7849	0.3231	0.2528	
5		0.2390	0.3160	0.7497	0.3213	0.2550	
6		0.2315	0.3294	0.7116	0.3252	0.2598	
7		0.2351	0.3395	0.7015	0.3092	0.2549	
8		0.2310	0.3687	0.7020	0.3004	0.2595	
9		0.2248	0.3863	0.6840	0.3093	0.2608	
10		0.2365	0.4061	0.6469	0.3135	0.2561	
11		0.2478	0.4169	0.6031	0.3025	0.2494	
12		0.2501	0.4262	0.5974	0.2961	0.2325	
13		0.2806	0.4466	0.5955	0.2917	0.2225	
14		0.2847	0.5196	0.5762	0.2818	0.2185	
15		0.2898	0.5913	0.5567	0.2797	0.2228	
16		0.2861	0.6369	0.5206	0.2780	0.2183	
17		0.2763	0.6599	0.4887	0.2856	0.2242	
18		0.2652	0.6895	0.4727	0.2957	0.2256	
19		0.2543	0.7386	0.4749	0.2921	0.2192	
20		0.2499	0.7699	0.4554	0.2926	0.2090	
21		0.2518	0.7915	0.4274	0.2789	0.2077	
22		0.2640	0.8034	0.4016	0.2723	0.1999	
23		0.2678	0.8356	0.3785	0.2790	0.2082	
24		0.2584	0.8637	0.3554	0.2653	0.2363	
25		0.2572	0.8720	0.3440	0.2659	0.2389	
26		0.2430	0.8774	0.3521	0.2710	0.2492	
27		0.2329	0.8612	0.3629	0.2641	0.2498	
28		0.2180	0.8283	0.3636	0.2635	0.2464	
29		0.2125	0.8228	0.3341	0.2750	0.2398	
30	0.2436	0.2208	0.8316	0.3305	0.2714	0.2366	
31		0.2176		0.3195	0.2715		
Average		0.2478	0.5785	0.5419	0.2913	0.2380	

4.6 TL-6 – MINEWATER RESERVOIR OUTFLOW

The area known as Minewater Reservoir directs runoff from a perched collection basin towards the Fulton Watershed via a channel blasted through bedrock. A v-notch weir installed in 2011 is the monitoring station identified as TL-6. Photo 11 is from the spring field program of 2019 while Photo 12 was taken during the fall. Stage and discharge monitoring data are compiled in Table 13 and the rating curve is presented in Figure 12. The 2019 hydrograph is provided in Figure 13 with the daily average discharge data presented in Table 14. The sensor for TL-6 was installed on April 18 by a local resident.

Photo 11: TL-6– May 11, 2019

Photo 12: TL-6 – October 2, 2019

Table 13: 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

Figure 12: TL-6 Rating Curve

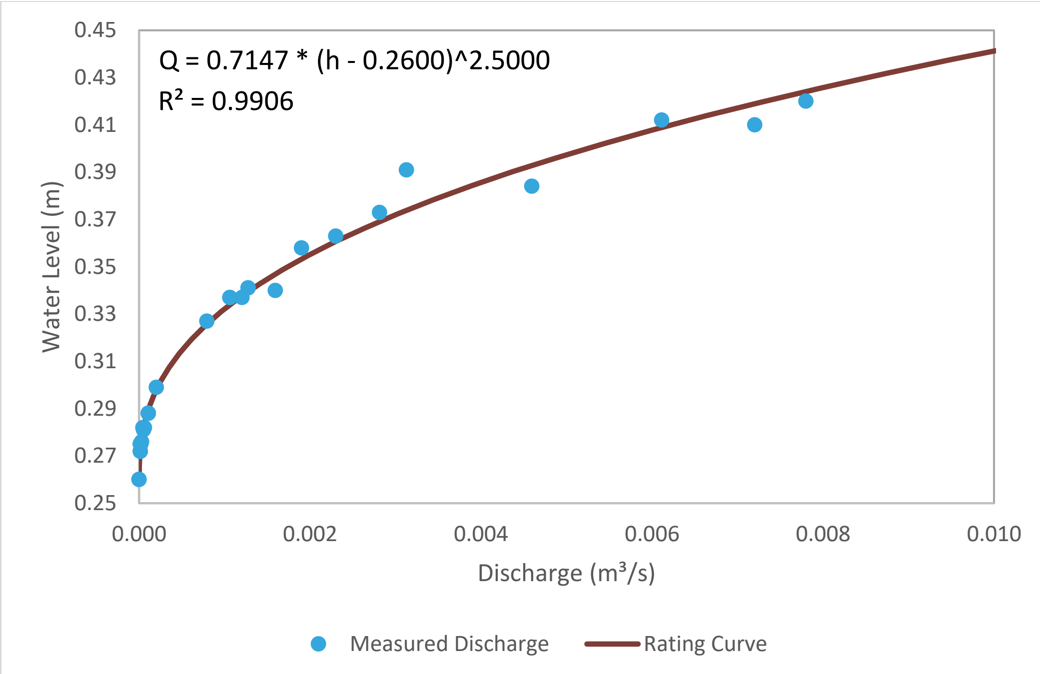


Figure 13: TL-6 2019 Hydrograph

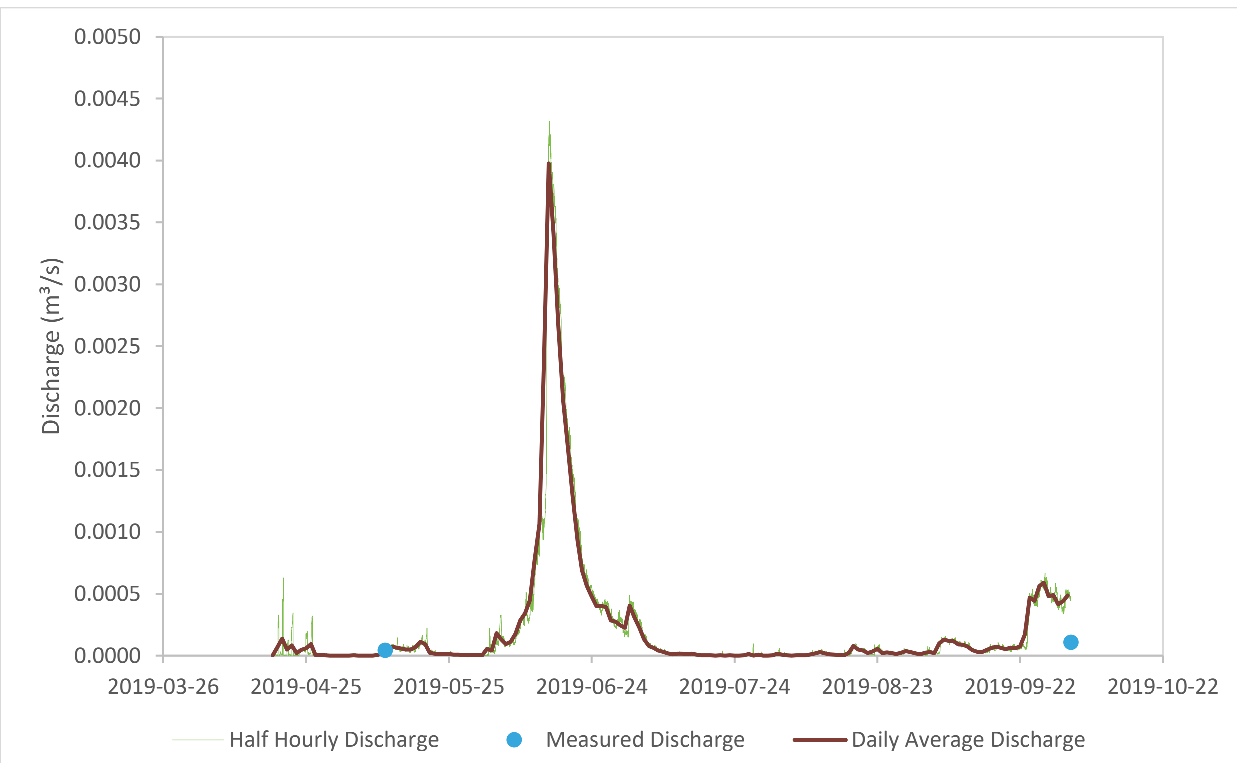


Table 14: TL-6 2019 Daily Average Discharge (m³/s)

Day	Apr	May	Jun	Jul	Aug	Sep	Oct
1		0.0000	0.0000	0.0002	0.0000	0.0000	0.0004
2		0.0000	0.0001	0.0004	0.0000	0.0000	0.0005
3		0.0000	0.0000	0.0003	0.0000	0.0000	
4		0.0000	0.0002	0.0002	0.0000	0.0000	
5		0.0000	0.0001	0.0001	0.0000	0.0001	
6		0.0000	0.0001	0.0001	0.0000	0.0001	
7		0.0000	0.0001	0.0001	0.0000	0.0001	
8		0.0000	0.0002	0.0000	0.0000	0.0001	
9		0.0000	0.0003	0.0000	0.0000	0.0001	
10		0.0000	0.0003	0.0000	0.0000	0.0001	
11		0.0000	0.0004	0.0000	0.0000	0.0001	
12		0.0000	0.0008	0.0000	0.0000	0.0000	
13		0.0001	0.0011	0.0000	0.0000	0.0000	
14		0.0001	0.0024	0.0000	0.0000	0.0000	
15		0.0001	0.0040	0.0000	0.0000	0.0000	
16		0.0000	0.0034	0.0000	0.0000	0.0001	
17		0.0000	0.0027	0.0000	0.0000	0.0001	
18	0.0000	0.0001	0.0021	0.0000	0.0001	0.0001	
19	0.0001	0.0001	0.0017	0.0000	0.0000	0.0001	
20	0.0001	0.0001	0.0013	0.0000	0.0000	0.0001	
21	0.0001	0.0000	0.0009	0.0000	0.0000	0.0001	
22	0.0001	0.0000	0.0007	0.0000	0.0000	0.0001	
23	0.0000	0.0000	0.0006	0.0000	0.0001	0.0002	
24	0.0000	0.0000	0.0005	0.0000	0.0000	0.0005	
25	0.0001	0.0000	0.0004	0.0000	0.0000	0.0004	
26	0.0001	0.0000	0.0004	0.0000	0.0000	0.0006	
27	0.0000	0.0000	0.0004	0.0000	0.0000	0.0006	
28	0.0000	0.0000	0.0003	0.0000	0.0000	0.0005	
29	0.0000	0.0000	0.0003	0.0000	0.0000	0.0005	
30	0.0000	0.0000	0.0002	0.0000	0.0000	0.0004	
31		0.0000		0.0000	0.0000		
Average		0.0000	0.0009	0.0001	0.0000	0.0002	

4.7 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). In 2019, the weir was fully covered during the spring field program and the datalogger was installed during that site visit by lowering it against the headwall (Photo 13). At that time, it was not possible to measure the flow rate. The fall field program flow condition is shown in Photo 14. The rating curve data are provided in Table 15 and shown graphically in Figure 14.

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 15 presents the 2019 hydrograph for TL-7 while Table 16 and Table 17 present the 2019 daily average discharge data and the long term monthly average discharge data, respectively.

Following a recommendation to Cameco from 2018 a datalogger was left installed at TL-7 during the 2019 fall field program to see if it was possible to collect data through the winter.

Photo 13: TL-7– May 11, 2019

Photo 14: TL-7 – October 2, 2019

Table 15: 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

Figure 14: TL-7 Rating Curve

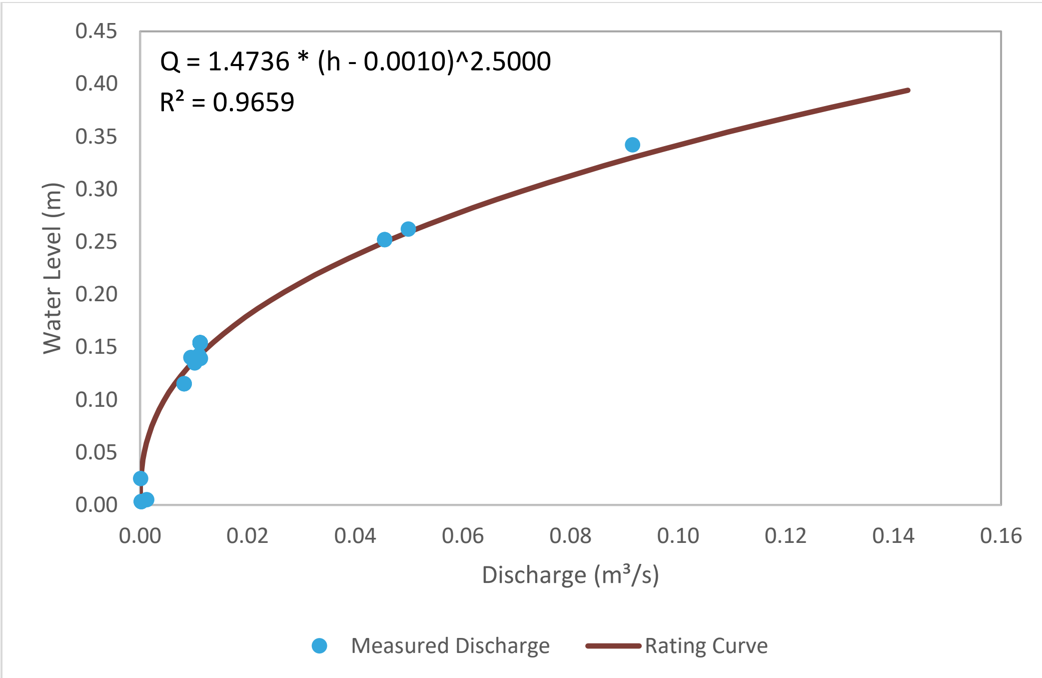


Figure 15: TL-7 2019 Hydrograph

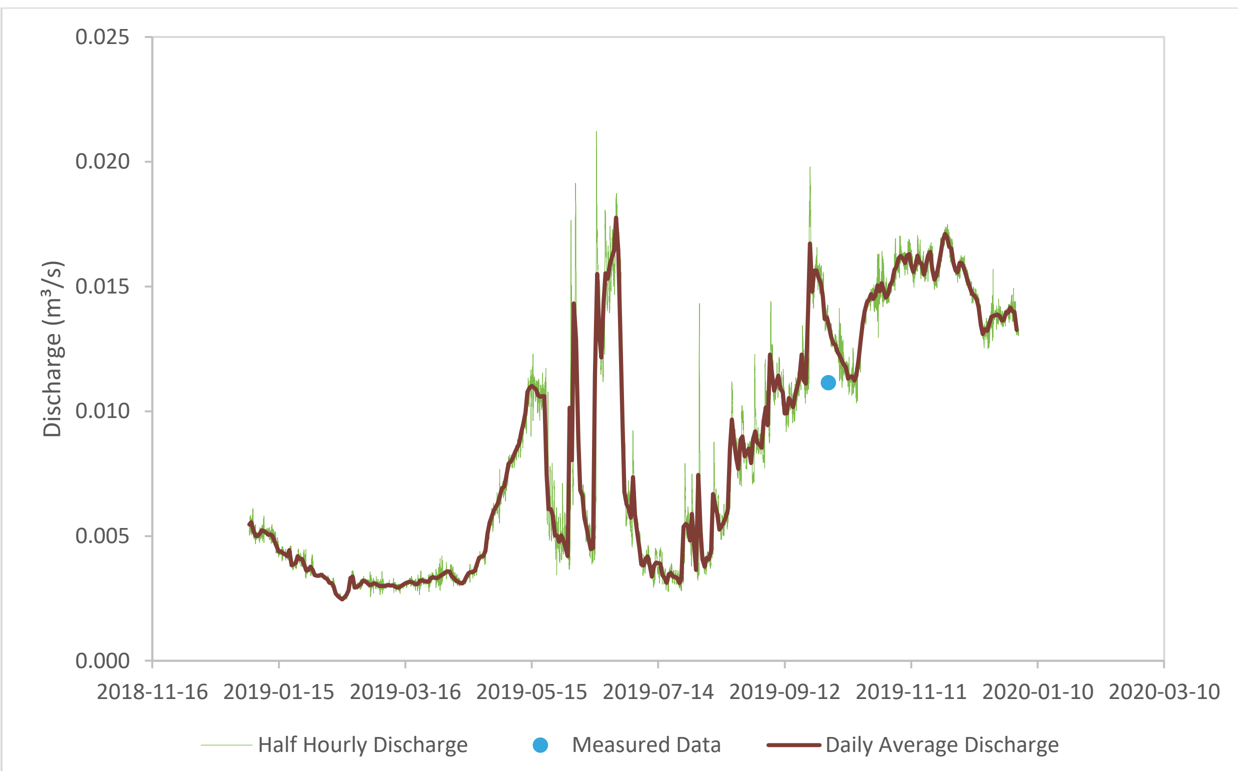


Table 16: TL-7 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0055	0.0034	0.0031	0.0034	0.0069	0.0042	0.0057	0.0036	0.0085	0.0137	0.0150	0.0160
2	0.0055	0.0034	0.0031	0.0034	0.0070	0.0101	0.0074	0.0074	0.0096	0.0138	0.0152	0.0156
3	0.0052	0.0034	0.0030	0.0035	0.0075	0.0080	0.0059	0.0052	0.0102	0.0134	0.0157	0.0156
4	0.0050	0.0034	0.0030	0.0036	0.0079	0.0143	0.0051	0.0041	0.0094	0.0130	0.0158	0.0159
5	0.0050	0.0034	0.0030	0.0036	0.0080	0.0129	0.0045	0.0038	0.0123	0.0127	0.0161	0.0159
6	0.0051	0.0033	0.0030	0.0036	0.0081	0.0089	0.0039	0.0041	0.0114	0.0127	0.0162	0.0157
7	0.0052	0.0033	0.0030	0.0034	0.0084	0.0068	0.0038	0.0041	0.0108	0.0124	0.0161	0.0154
8	0.0052	0.0031	0.0030	0.0033	0.0085	0.0066	0.0041	0.0044	0.0112	0.0123	0.0159	0.0152
9	0.0051	0.0031	0.0030	0.0032	0.0087	0.0057	0.0042	0.0067	0.0114	0.0120	0.0162	0.0149
10	0.0050	0.0030	0.0030	0.0032	0.0092	0.0053	0.0038	0.0062	0.0109	0.0119	0.0163	0.0147
11	0.0051	0.0027	0.0030	0.0031	0.0095	0.0049	0.0034	0.0059	0.0108	0.0118	0.0159	0.0146
12	0.0050	0.0026	0.0029	0.0031	0.0099	0.0045	0.0038	0.0053	0.0099	0.0113	0.0156	0.0145
13	0.0048	0.0025	0.0029	0.0032	0.0108	0.0045	0.0039	0.0054	0.0099	0.0114	0.0159	0.0142
14	0.0046	0.0025	0.0030	0.0034	0.0109	0.0114	0.0039	0.0055	0.0105	0.0114	0.0162	0.0135
15	0.0044	0.0025	0.0031	0.0035	0.0110	0.0155	0.0039	0.0058	0.0104	0.0112	0.0160	0.0131
16	0.0044	0.0026	0.0031	0.0036	0.0109	0.0132	0.0034	0.0060	0.0102	0.0114	0.0159	0.0133
17	0.0043	0.0028	0.0031	0.0035	0.0109	0.0122	0.0033	0.0085	0.0107	0.0121	0.0155	0.0132
18	0.0043	0.0033	0.0032	0.0036	0.0106	0.0143	0.0031	0.0097	0.0110	0.0128	0.0158	0.0135
19	0.0042	0.0034	0.0031	0.0039	0.0106	0.0155	0.0035	0.0088	0.0113	0.0135	0.0163	0.0138
20	0.0044	0.0029	0.0031	0.0041	0.0106	0.0153	0.0035	0.0081	0.0123	0.0140	0.0164	0.0138
21	0.0038	0.0030	0.0031	0.0042	0.0106	0.0159	0.0034	0.0077	0.0112	0.0144	0.0157	0.0138
22	0.0039	0.0030	0.0031	0.0042	0.0075	0.0162	0.0034	0.0089	0.0111	0.0145	0.0153	0.0139
23	0.0039	0.0031	0.0032	0.0044	0.0061	0.0165	0.0033	0.0090	0.0140	0.0147	0.0154	0.0138
24	0.0042	0.0032	0.0032	0.0051	0.0061	0.0178	0.0031	0.0082	0.0167	0.0145	0.0159	0.0136
25	0.0041	0.0032	0.0032	0.0055	0.0059	0.0164	0.0033	0.0084	0.0148	0.0146	0.0164	0.0137
26	0.0041	0.0031	0.0032	0.0058	0.0050	0.0134	0.0054	0.0085	0.0156	0.0150	0.0168	0.0140
27	0.0039	0.0030	0.0032	0.0060	0.0050	0.0097	0.0055	0.0079	0.0156	0.0148	0.0171	0.0139
28	0.0036	0.0031	0.0033	0.0062	0.0048	0.0068	0.0054	0.0089	0.0153	0.0151	0.0170	0.0142
29	0.0036		0.0034	0.0063	0.0050	0.0063	0.0048	0.0092	0.0152	0.0148	0.0166	0.0140
30	0.0038		0.0033	0.0067	0.0048	0.0061	0.0059	0.0087	0.0146	0.0146	0.0165	0.0140
31	0.0036		0.0033		0.0045		0.0046	0.0087		0.0147		0.0133
Average	0.0045	0.0031	0.0031	0.0041	0.0081	0.0106	0.0043	0.0069	0.0119	0.0132	0.0160	0.0143

Table 17: 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	0.0040
1981	0.0035	0.0035	0.0035	0.0044	0.0124	0.0046	0.0047	0.0050	0.0051	0.0049	0.0052	0.0049	0.0051
1982	0.0043	0.0042	0.0045	0.0051	0.0201	0.0151	0.0080	0.0048	0.0035	0.0039	0.0038	0.0041	0.0068
1983	0.0045	0.0041	0.0037	0.0064	0.0279	0.0200	0.0132	0.0101	0.0070	0.0061	0.0055	0.0051	0.0095
1984	0.0049	0.0050	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	0.0190	0.0100	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	0.0050	0.0099
1987	0.0050	0.0055	0.0060	0.0059	0.0828	0.0249	0.0101	0.0004	0.0001	0.0000	0.0032	0.0033	0.0123
1988	0.0039	0.0026	0.0024	0.0022	0.0180	0.0336	0.0376	0.0242	0.0095	0.0047	0.0053	0.0050	0.0124
1989	0.0045	0.0045	0.0038	0.0040	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	0.0070	0.0100	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	0.0730	0.0708	0.0189	0.0347
1993	0.0089	0.0060	0.0047	0.0050	0.0339	0.0175	0.0109	0.0413	0.0210	0.0093	0.0119	0.0126	0.0153
1994	0.0080	0.0061	0.0054	0.0048	0.2115	0.0530	0.0069	0.0032	0.0023	0.0030	0.0031	0.0031	0.0259
1995	0.0026	0.0024	0.0023	0.0030	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	0.0160	0.0168	0.0350	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	0.0530	0.0896	0.2373	0.1897	0.0740	0.0218	0.0621
1998	0.0114	0.0084	0.0068	0.0080	0.0522	0.0130	0.0216	0.0129	0.0074	0.0056	0.0056	0.0053	0.0132
1999	0.0043	0.0040	0.0041	0.0038	0.0157	0.0214	0.0130	0.0058	0.0054	0.0040	0.0038	0.0042	0.0075
2000	0.0042	0.0033	0.0030	0.0032	0.0091	0.0090	0.0076	0.0082	0.0089	0.0480	0.0962	0.0089	0.0175
2001	0.0067	0.0056	0.0053	0.0062	0.0817	0.0443	0.0093	0.0110	0.0041	0.0016	0.0149	0.0112	0.0168
2002	0.0107	0.0060	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	0.0130	0.0104	0.0336
2004	0.0071	0.0070	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	0.0050	0.0481	0.0438	0.0184	0.0139	0.0144	0.0147	0.0263	0.0196	0.0180
2006	0.0134	0.0090	0.0057	0.0133	0.1154	0.0459	0.0124	0.0073	0.0062	0.0062	0.0060	0.0053	0.0205
2007	0.0052	0.0045	0.0041	0.0051	0.0364	0.0212	0.0052	0.0017	0.0030	0.0187	0.0380	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	0.0000	0.0000	0.0000	0.0003	0.0002	0.0003	0.0004	0.0003	0.0002	0.0000	0.0000	0.0002
2012	0.0000	0.0000	0.0000	0.0000	0.0040	0.0090	0.0107	0.0042	0.0079	0.0039	0.0047	0.0041	0.0040
2013	0.0030	0.0009	0.0000	0.0000	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	0.0090	0.0941	0.1699	0.0976	0.0398	0.0174	0.0091	0.0093	0.0087	0.0407
2015	0.0082	0.0086	0.0073	0.0081	0.0179	0.0057	0.0025	0.0146	0.0689	0.0350	0.0312	0.0236	0.0193
2016	0.0180	0.0148	0.0108	0.0110	0.1361	0.0721	0.0142	0.0246	0.1335	0.0678	0.0382	0.0284	0.0475
2017	0.0177	0.0130	0.0094	0.0103	0.0337	0.0107	0.0002	0.0001	0.0001	0.0001	0.0000	0.0000	0.0079
2018	0.0079	0.0074	0.0060	0.0066	0.1100	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	0.0160	0.0143	0.0085
Mean	0.0070	0.0056	0.0049	0.0058	0.0542	0.0378	0.0203	0.0164	0.0203	0.0169	0.0163	0.0097	0.0179

4.8 BL-5 – BEAVERLODGE LAKE OUTFLOW

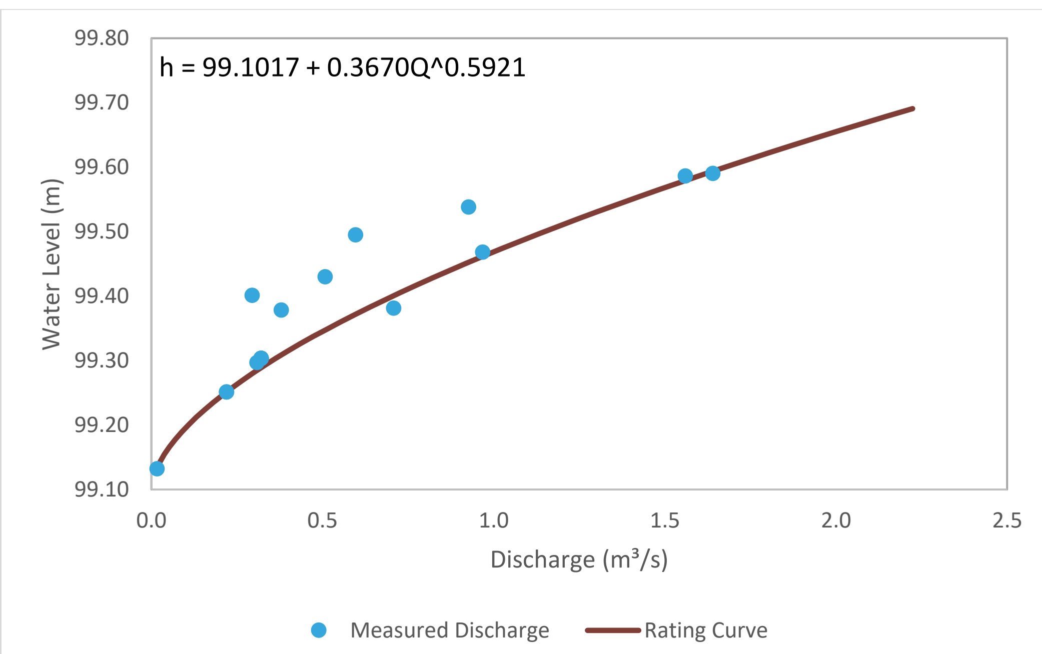
Station BL-5 monitors discharge at the outlet of Beaverlodge Lake. The station was visited during the 2019 fall field program (Photo 15). This location has been known to be impacted by a combination of beaver activity, debris jam and ice influences all with the potential to impact hydraulic characteristics of the channel; any such change to the geometry of the channel impacts the reliability of the rating curve typically evident in drifting points from the rating curve. As such, it was recommended to discontinue the preparation of an annual hydrograph at this station. Field measurements are continued at this location and a stage datalogger remains installed should the need for water level data in Beaverlodge Lake ever be required. The summary data are presented in Table 18 and the rating curve presented in Figure 16.

Photo 15: BL-5 – October 2, 2019

Table 18: BL-5 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
2010-09-15 16:40	99.589	0.7815
2011-05-18 9:00	99.507	0.3176
2011-10-04 12:51	99.448	0.0958
2012-06-04 18:45	99.640	0.7122
2012-09-28 12:25	99.538	0.9270
2013-07-21	99.586	1.5600
2013-10-13 12:00	99.401	0.2946
2014-05-04 15:00	99.430	0.5072
2014-10-10 17:00	99.378	0.3790
2015-05-02 9:00	99.297	0.3079
2015-10-01 12:40	99.495	0.5962
2016-08-11 11:35	99.468	0.9674
2016-10-07 17:10	99.590	1.6405
2017-04-27 14:30	99.381	0.7079
2017-10-15 12:00	99.132	0.0164
2018-09-30 9:30	99.251	0.2193
2019-07-20 6:30	99.470	
2019-10-02 13:30	99.304	0.3200

Figure 16: BL-5 Rating Curve



4.9 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 Crackingstone Bay of Lake Athabasca and flow monitoring occurs at a bridge crossing. Field monitoring occurred in the spring (Photo 16) and fall of 2019 (Photo 17). The measurement data for CS-1 are presented in Table 19 and the rating curve is shown in Figure 17. Figure 18 depicts the hydrograph for 2019. The daily average discharge data are presented in Table 20.

The datalogger installed at CS-1 appears to have failed in 2019 as it was reporting inconsistently through much of the monitoring period before ceasing collection of any usable data in mid-August. The record for this station has been estimated based on the available CS-1 logger data and other local stations. A different logger was left at CS-1 during the fall field program and replacement will be recommended to Cameco for the 2020 hydrometric monitoring program.

Photo 16: CS-1 – May 12, 2019

Photo 17: CS-1 – October 2, 2019

Table 19: 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

Figure 17: CS-1 Rating Curve

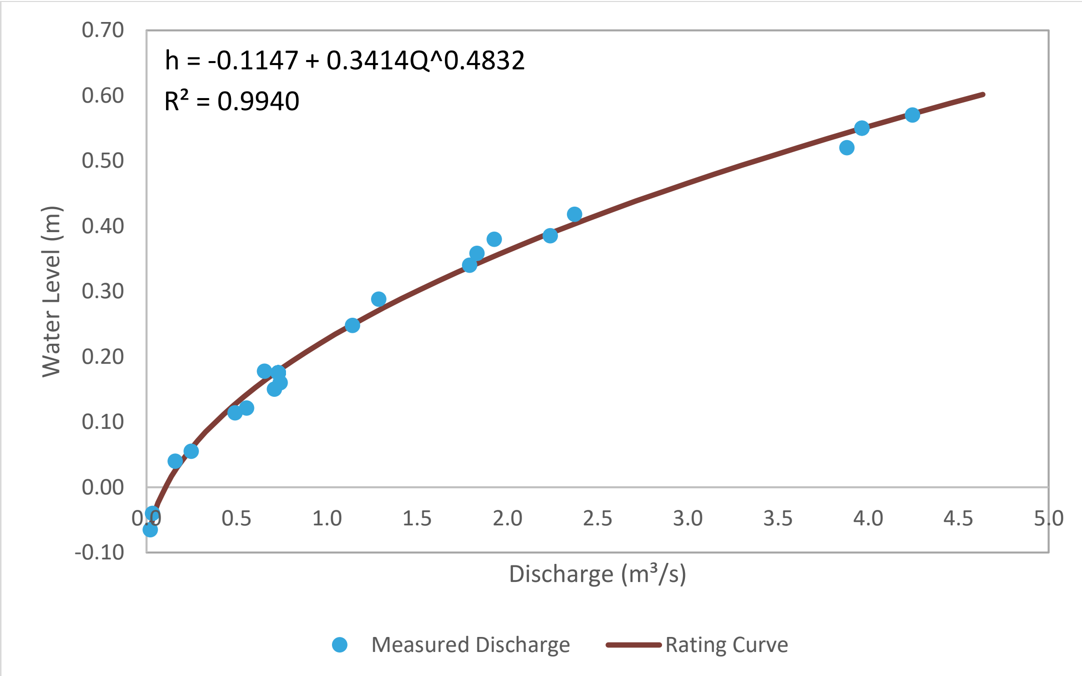


Figure 18: CS-1 2019 Hydrograph

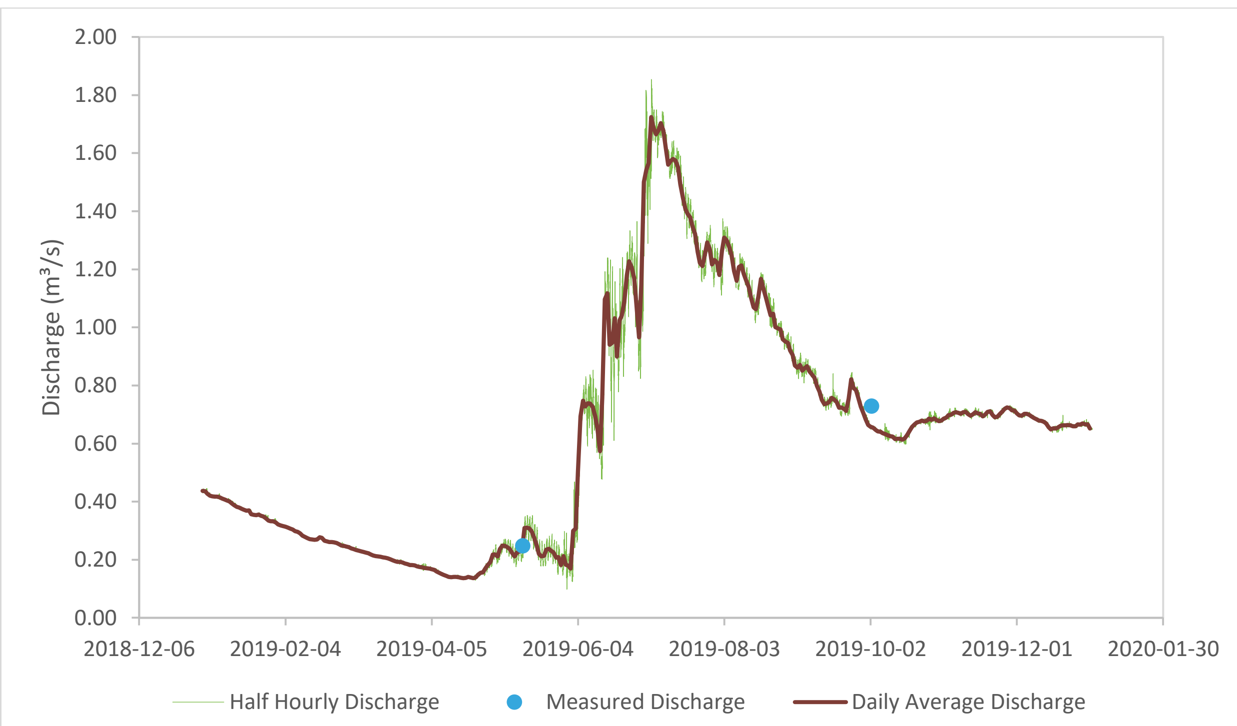


Table 20: CS-1 2019 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.4370	0.3217	0.2456	0.1734	0.2183	0.1696	1.5007	1.1801	0.8684	0.6635	0.6859	0.7030
2	0.4361	0.3186	0.2428	0.1720	0.2112	0.2990	1.5436	1.2626	0.8608	0.6578	0.6889	0.6971
3	0.4271	0.3161	0.2393	0.1706	0.2363	0.3071	1.5660	1.3095	0.8712	0.6550	0.6976	0.6956
4	0.4209	0.3143	0.2362	0.1695	0.2493	0.5026	1.7241	1.2989	0.8507	0.6471	0.6996	0.7028
5	0.4183	0.3109	0.2337	0.1676	0.2472	0.6933	1.6878	1.2757	0.8593	0.6417	0.7063	0.7026
6	0.4178	0.3070	0.2312	0.1650	0.2434	0.7471	1.6653	1.2488	0.8663	0.6410	0.7081	0.6987
7	0.4177	0.3037	0.2291	0.1592	0.2370	0.7275	1.6791	1.1935	0.8482	0.6353	0.7063	0.6933
8	0.4146	0.2983	0.2271	0.1552	0.2218	0.7393	1.7029	1.1601	0.8363	0.6331	0.7027	0.6880
9	0.4108	0.2958	0.2241	0.1508	0.2110	0.7381	1.6764	1.2078	0.8263	0.6290	0.7085	0.6833
10	0.4068	0.2909	0.2218	0.1474	0.2254	0.7262	1.6139	1.2136	0.7981	0.6256	0.7095	0.6793
11	0.4045	0.2826	0.2185	0.1438	0.2282	0.6933	1.5596	1.1842	0.7789	0.6239	0.7012	0.6781
12	0.4013	0.2783	0.2152	0.1410	0.2320	0.6504	1.5729	1.1601	0.7506	0.6154	0.6959	0.6750
13	0.3943	0.2747	0.2125	0.1403	0.3089	0.5735	1.5803	1.1380	0.7355	0.6165	0.7014	0.6693
14	0.3877	0.2710	0.2114	0.1410	0.3107	0.7575	1.5743	1.1017	0.7382	0.6171	0.7083	0.6558
15	0.3815	0.2695	0.2099	0.1413	0.3081	1.0961	1.5501	1.0690	0.7427	0.6138	0.7030	0.6489
16	0.3795	0.2691	0.2083	0.1396	0.2964	1.1177	1.4923	1.0622	0.7577	0.6179	0.7023	0.6525
17	0.3755	0.2701	0.2064	0.1371	0.2764	0.9398	1.4469	1.1065	0.7516	0.6299	0.6939	0.6514
18	0.3721	0.2771	0.2046	0.1360	0.2500	0.9474	1.4074	1.1674	0.7441	0.6432	0.7004	0.6564
19	0.3683	0.2757	0.2017	0.1379	0.2204	1.0317	1.3904	1.1352	0.7234	0.6576	0.7086	0.6620
20	0.3703	0.2650	0.1986	0.1405	0.2112	0.8998	1.3789	1.1048	0.7246	0.6664	0.7112	0.6628
21	0.3566	0.2630	0.1951	0.1389	0.2138	1.0239	1.3477	1.0699	0.7198	0.6728	0.6980	0.6632
22	0.3545	0.2613	0.1932	0.1369	0.2342	1.0400	1.3226	1.0417	0.7128	0.6754	0.6902	0.6636
23	0.3533	0.2606	0.1928	0.1385	0.2378	1.0901	1.2603	1.0468	0.7537	0.6792	0.6930	0.6624
24	0.3559	0.2602	0.1907	0.1486	0.2314	1.1801	1.2220	1.0009	0.8214	0.6756	0.7012	0.6592
25	0.3510	0.2571	0.1873	0.1547	0.2249	1.2273	1.2114	0.9964	0.7922	0.6780	0.7106	0.6599
26	0.3487	0.2534	0.1848	0.1563	0.2067	1.2060	1.2466	0.9928	0.7838	0.6856	0.7198	0.6658
27	0.3424	0.2494	0.1822	0.1709	0.2091	1.1685	1.2926	0.9585	0.7570	0.6814	0.7247	0.6651
28	0.3349	0.2472	0.1821	0.1814	0.1818	1.0750	1.2695	0.9518	0.7268	0.6875	0.7225	0.6691
29	0.3330		0.1807	0.1920	0.2128	0.9651	1.2171	0.9474	0.7045	0.6816	0.7151	0.6663
30	0.3329		0.1776	0.2182	0.1833	1.1469	1.2326	0.9202	0.6842	0.6766	0.7133	0.6657
31	0.3281		0.1748		0.1794		1.2225	0.9047		0.6792		0.6522
Average	0.3817	0.2808	0.2084	0.1555	0.2341	0.8493	1.4567	1.1100	0.7796	0.6517	0.7043	0.6725

4.10 ZORA LAKE OUTFLOW AND VERNA LAKE INFLOW

Zora Lake is upstream of Verna Lake and flows through a recently completed 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 spring and fall field programs. The measurement section at Zora is shown in Photo 18 and the inflow to Verna is depicted in Photo 19. During the spring, the small weir typically used to measure flow was covered in ice and a traditional measurement of stage and discharge was required. The discharge measurements at Zora outflow and Verna inflow are provided in Table 21.

Photo 18: Zora Outflow – October 2, 2019

Photo 19: Verna Inflow – October 2, 2019

Table 21: Zora Outflow and Verna Inflow Discharge Measurements

Measurement Date & Time	Zora Outflow Discharge (m^3/s)	Verna Inflow Discharge (m^3/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

4.11 BELOW FREDETTE RESERVOIR

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 2019 during the spring (Photo 20) and fall (Photo 21). The two measurements performed in 2019 are presented in Table 22. The two measurements collected are nearly identical in magnitude of stage and discharge and are insufficient for the development of a rating curve at this time. The datalogger record collected during 2019 will be reported with 2020 monitoring data as the rating curve develops.

Photo 20: Fredette – May 12, 2019

Photo 21: Fredette – October 2, 2019

Table 22: 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

5.0 BOREHOLE SURVEY

During the spring and fall field programs in 2019 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.

6.0 SEEP DISCHARGE MONITORING

During the spring field program, samples were collected on behalf of Cameco at Seeps 4 and 5. Seeps 1 through 3 were not flowing at that time. Seeps 4 and 5 were measured at 0.02 L/s and 0.36 L/s, respectively, on May 12, 2019.

During the fall field program the only flowing seep was Seep 4 which was measured at 0.02 L/s on October 1, 2019.

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 (pre-2012), Edge series (2012 – present) and LTC series dataloggers (2018 – present). The two Gold dataloggers (Table 23) are at AC-8 where one is the in-stream logger and the other is the barometric pressure logger. The Gold Series dataloggers are used as backup and gather information in case there are issues with the more recently installed dataloggers. The two LTC loggers are installed at AC-8 (year round) and AC-14 (seasonal). All other dataloggers at Site are the Edge series and were installed in 2012 with the exception of an Edge Series Barologger added in 2019 at AC-8.

Table 23: Datalogger Inventory

Location	Logger Type	Sensor Serial Number	Purchase Year
AC-14	LTC	1074783	2018
Fredette River	Edge	2002607	2012
AC-6A*	Edge	2008664	2012
Mickey Lake Outflow	Edge	2000172	2012
AC-6B	Edge	2000174	2012
AC-8	Gold	1050150	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	2000176	2012
TL-6	Edge	2008162	2012
TL-7	Edge	2008671	2012

* Moved to CS-1 during the fall field program

8.0 RECOMMENDATIONS

All recommendations from 2018 were incorporated in 2019. Additional dataloggers may be required in the future to replace aging dataloggers and MWSI will engage in discussion with Cameco in advance of any field work.

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 2019.

Climate records for Uranium City indicate that 2019 was dry through the winter of 2018/19 but above average during the summer and early fall of 2019. The flow records, especially later in the year, generally reflected this climate condition.

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

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APPENDIX A – CALIBRATION RECORDS

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.