BEAVERLODGE PROJECT

Beaverlodge Project
2015 Annual Report

Year 30 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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SECTION 1.0

INTRODUCTION

1.0 INTRODUCTION

This report is submitted in compliance with Canadian Nuclear Safety Commission (CNSC) Waste Facility Operating Licence WFOL-W5-2120.0/2023 issued to Cameco Corporation (Cameco) for the decommissioned Beaverlodge mine and mill site.

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 on the decommissioned Beaverlodge site between January 1, 2015 and December 31, 2015. Results of environmental monitoring programs conducted for Beaverlodge 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 2015 are provided, along with an overview of anticipated activities planned for 2016.

SECTION 2.0

GENERAL INFORMATION

2.0 GENERAL INFORMATION

2.1 Organizational Information

2.1.1 CNSC Licence/Provincial Surface Lease

The CNSC Waste Facility Operating Licence WFOL-W5-2120.0/2023 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, 2015 are as follows:

Officers

President and Chief Executive Officer	T.S. Gitzel
Senior Vice-President and Chief Operating Officer	R.A. Steane
Senior Vice-President and Chief Corporate Officer	A. Wong
Senior Vice-President and Chief Financial Officer	G.E. Isaac
Senior Vice-President, Chief Legal Officer, and Corporate Secretary	S.A. Quinn

Officer K.A Seitz resigned as Vice President and Chief Commercial Officer in 2015

Board of Directors

T.S. Gitzel	A.N. McMillan	C.A. Gignac	I. Bruce
D.R. Camus	J.H. Clappison	J.R. Curtiss	D.H.F. Deranger
N.E. Hopkins	A.A. McLellan	J.K. Gowans	

Directors V.J. Zaleschuk and J.F. Colvin retired in 2015

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 10-year licence term will allow implementation of selected remedial options and post remediation monitoring. The goal for the Beaverlodge properties is the successful transfer of the properties to the provincial 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 mine/mill 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 until 1944 when 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 small 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 with approximately 60% of the tailings placed into water bodies (fine fraction) within the Fulton Creek watershed with the remainder being deposited underground for use as backfill (coarse fraction).

During the early years of operation, uranium mining and milling activities conducted at the Beaverlodge site 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 did not exist either federally or 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 shutdown.

Mining operations at the Beaverlodge site ceased on June 25, 1982 and the mill discontinued processing ores in mid-August 1982. At that time Eldorado Resources Limited (formerly Eldorado Nuclear Limited) initiated site decommissioning. The decommissioning work was completed in 1985. Letters were issued by AECB indicating that the sites had been satisfactorily remediated (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 Corporation, 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 simply Cameco Corporation 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 Reclamation Co-Coordinator, SHEQ - Compliance and Licensing, Cameco.

2.5 The Path Forward Plan

2.5.1 The Beaverlodge Management Framework

In 2007, after significant consultation with various stakeholders, including the CNSC, the mining industry, aboriginal organizations and communities in the major mining regions of the province, the Government of Saskatchewan proclaimed *The Reclaimed Industrial Sites Act* and its associated regulations to establish and enforce the IC Program. The IC Program establishes a 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 stable.

The Beaverlodge Management Framework and supporting documents were developed in 2009 by Cameco and the Joint Regulatory Group (JRG), which included the CNSC, Environment Canada, the Department of Fisheries and Oceans Canada, and Saskatchewan Ministry of Environment. The intent of the Beaverlodge Management Framework is to provide a clear scope and objectives for the management of the Beaverlodge properties along with a systematic process for assessing site-specific risks to allow decisions to be made regarding the transfer of Beaverlodge properties to the IC

Program. The framework has been reviewed by public stakeholders, including the Environmental Quality Committee (EQC), as well as residents and leaders of the Uranium City community. A simplified version is provided below in Figure 2.5.1.

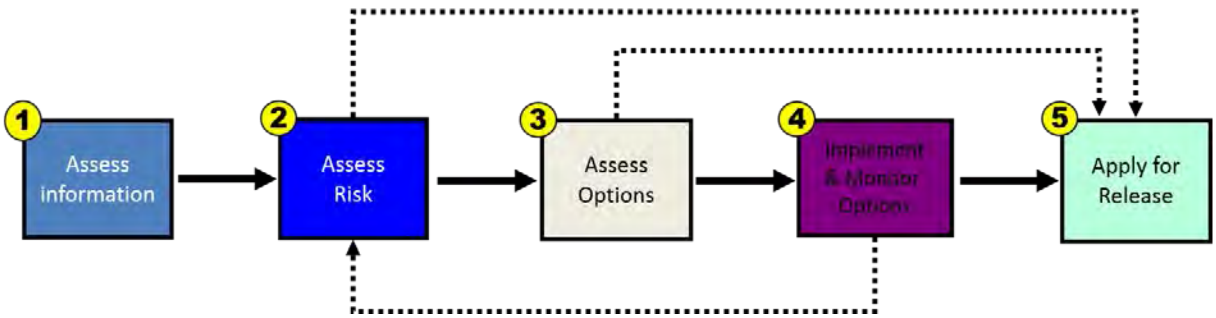


Figure 2.5.1 Simplified Beaverlodge Management Framework

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). Reports have been prepared summarizing this information and 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.

The QSM was developed in order to help quantify the environmental benefit and risk associated with potential remedial activities (Box 2 of Figure 2.5.1). The QSM provides insight into the interactions between potential contaminant sources and transport in the Beaverlodge area watersheds. In addition, the QSM was developed with a feature that allows the simulation of potential remedial activities and compares results to the baseline option (showing natural attenuation). This comparison allows an assessment of the potential environmental benefits and other effects of implementing each option alone or in combination with other options.

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

A remedial options workshop was conducted in 2012 with local and regional stakeholders, as well as industry and regulatory participants. The workshop focused on gathering participant feedback regarding the various remedial options, their expected environmental benefits and the associated cost of implementation.

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 path forward plan. The path forward plan describes specific remedial activities that were selected to be completed to improve local environmental conditions. In addition the path forward plan also describes the monitoring requirements to assess the success of the implemented activities (Box 4 of Figure 2.5.1).

Once it has been shown that the remedial activities have been successfully implemented and once properties are shown to meet the site performance objectives of "safe, secure and stable" an application will be made to transfer the property to the Province of Saskatchewan's Institutional Control Program for long term monitoring and maintenance (Box 5 of Figure 2.5.1).

2.5.2 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 developed 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.

The work plan and schedule provides the proposed timeline for transferring individual properties to the IC Program during the current license term of 2013 to 2023. The schedule is based on the features associated with each property as well as the time anticipated to complete the remaining remediation to ensure the properties are safe, secure and stable prior to transfer to IC.

In 2015, the work plan and schedule called for submission of documentation to support the transfer of 15 properties to the IC Program. A draft submission requesting the release of 15 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 August 2015. Comments were received from Saskatchewan Ministry of Environment (SMOE) in December 2015, and Cameco is working with the province to address the review comments and submit a final application to release 14 properties in 2016. One property was removed from the application as it requires additional assessment of remnant power distribution related infrastructure (power poles and lines).

SECTION 3.0

SITE ACTIVITIES

3.0 SITE ACTIVITIES

The performance of the remediated areas of the Beaverlodge site is assessed through routine inspections conducted by Cameco personnel, third party consultants and/or 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 aide 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 process at the Beaverlodge properties are communicated through regular meetings with the public. The following section outlines related activities around the 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 including:

- Canadian Nuclear Safety Commission (CNSC)
- The Department of Fisheries and Oceans Canada (DFO)
- Environment and Climate Change Canada (ECCC)
- Saskatchewan Ministry of Environment (SMOE)

There were no formal JRG meetings held in 2015. However, numerous meetings were held with the various regulatory agencies throughout the year to discuss issues as they arose.

Performance of the historical decommissioning activities at Beaverlodge, are assessed through routine visual inspection of the properties conducted by regulatory agencies and Cameco. Inspections are conducted in order to ensure that conditions on the properties do not impact the health and safety of people, protection of the environment and ensure the requirements of the license continue to be met.

From June 8, 2015 to June 12, 2015, representatives from Cameco, the CNSC, and SMOE completed a compliance inspection of the decommissioned Beaverlodge properties.

The objective of the inspection was to provide a general overview of the Beaverlodge site, while focussing on the properties scheduled for transfer to the IC Program and identifying any remaining issues prior to transferring the selected properties to IC. In addition, the inspection was completed to verify compliance with Cameco's approved licence documents, elements of the *Nuclear Safety and Control Act* and associated Regulations; while ensuring the properties remained safe, secure and stable.

Following the inspection, the CNSC and SMOE provided Cameco with four recommendations:

1. Cameco should permanently mark and seal the previously unidentified boreholes discovered in 2015.
2. Cameco should submit a remediation plan identifying the composition of the salts and explaining what will be done to deal with the salts present in the collapsed tank on the Fay waste rock pile.
3. Cameco should develop and submit to CNSC staff a remediation plan for the small pond located adjacent to Pistol Lake (north side).
4. Cameco should place the power lines and poles on ACE 5 in a safe state.

Cameco will work with the regulatory agencies in 2016 to fully address these recommendations.

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, with the next scheduled external inspection to occur in 2015. To accommodate the change in frequency of third-party inspections, an inspection of the Fookes delta and two outlet structures is completed annually by Cameco personnel during the JRG visit 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 Delta. In addition, the checklist requires a photographic record of each area. Should any changes to the deltas or to the outlet structures be observed, then a third-party inspection would be completed regardless of the regular schedule.

The 2015 inspection was completed by a third party geotechnical expert, as scheduled. SRK was contracted to undertake detailed geotechnical inspections of the following areas:

1. The Fookes Reservoir Delta
2. the two outlet spillways at Fookes and Marie Reservoirs
3. the Marie Reservoir Delta Area
4. Ace Catchment Area III

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 please refer to the inspection report provided in Appendix C.

Fookes Reservoir Delta

Overall the inspection did not note any areas of concern and concluded that the delta was generally stabilized sufficiently to move towards final close out and return to Institutional Control. Until the area is released to IC, SRK recommended a continued internal annual inspection with a more formal inspection completed by a third party every five years.

Fookes and Marie Outlet Spillways

Observations suggest that the condition of the grout-intruded rip-rap along the length of the Fookes Reservoir and Marie Reservoir outlet spillways in 2015 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.

Marie Reservoir Delta Areas

In general, the condition of the waste rock cover was considered good, with little change observed on the delta areas in comparison to previous inspections. Both deltas consist of mainly rock fill cover with some small trees, shrubs and grass. During the inspection, some areas of the cover were noted to be thin and tailings appeared to have worked their way to surface in some isolated locations due possibly to either frost action or high water table, or a combination of both.

Based on the results of the 2014 Site Wide Gamma Survey (SENES 2014) as well as the follow up Risk Assessment (Arcadis 2015), the risk to members of the public presented by gamma radiation at the Marie Reservoir Delta Areas was considered negligible. Low readings from the survey along with very low reported usage of these areas (along with limited access) led to the recommendation that no further cover was required.

Additionally, from a geotechnical perspective, it was deemed reasonable for Cameco to move towards final close out of these areas and a return to institutional control. As such, no further remediation is planned for the Marie Deltas.

It was concluded that formal, documented inspections by Cameco and/or regulators or a qualified geotechnical engineer should continue on a periodic basis, i.e. every 10 years.

Ace Catchment Area III

An inspection of this area was requested following observations of standing water during recent property inspections. In general, very few changes were evident at the Ace Creek catchment area III in 2015 as compared to the previous inspection in 2004. Similar to the Marie Reservoir Delta Areas, some areas of the waste rock cover were noted to be thin with some tailings worked to surface due to frost action or high water tables. With regards to the standing water, SRK noted that the natural topography of the area promotes drainage towards the Marie Reservoir, and did not recommend additional remediation to alter drainage direction.

Based on the results of the 2014 Site Wide Gamma Survey (SENES 2014) as well as the follow up Risk Assessment (Arcadis 2015), the risk to members of the public presented by gamma radiation at the Ace Catchment Area III was considered negligible. Low readings from the survey along with very low reported usage of these areas (along with limited access) led to the recommendation that no further cover was required. Additionally, from a geotechnical perspective, it was deemed reasonable for Cameco to move towards final close out of these areas and a return to institutional control. As such, no further remediation is planned for the Ace Catchment Area III.

It was concluded that formal, documented inspections by Cameco and/or regulators or a qualified geotechnical engineer should continue on a periodic basis, i.e. every 10 years.

3.1.3 Community Engagement and Consultation

3.1.3.1 Public Meetings

A public meeting and site tour were held on May 19, 2015 in Uranium City to provide information regarding the Beaverlodge properties to the residents of Uranium City and the Environment Quality Committee (EQC) (Athabasca sub-committee).

Community engagement activities for the Beaverlodge Decommissioned 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 discuss the 2015 activities for the Beaverlodge Decommissioned Properties and the plans for transferring some of these properties to the provincial IC Program. The EQC (Athabasca sub-committee) and all interested community members were encouraged to attend.

The activities discussed included:

- Crown Pillar Assessment: Continuation of the crown pillar assessment, which is being expanded into a site-wide assessment of all crown pillars on the Beaverlodge site. This project was initiated after the discovery of a crown pillar failure located near the access road to Ace Shaft in 2013. It was communicated that the focus of remediation will be on the Ace Stope Area along the access road to the Ace Shaft.
- Zora Creek flow path reconstruction: Following characterization work in 2014, the 2015 work plan was to complete the construction of the flow path and re-establish flow between Zora and Verna lakes. Cameco informed attendees that the road leading to this area would be inaccessible for general traffic at the Ace Lake turnoff. Warning signs and a locked gate were installed to prevent unauthorized access.
- Geotechnical Inspection: Discussed plans for a geotechnical engineer to complete a 5-year inspection of the Fookes Delta, the Marie Delta and the outlet structures at Marie and Fookes. An inspection of the Ace Uplands area was also planned for this inspection.
- Regional Environmental Monitoring Program (REMP): An overview of the proposed REMP was provided to community members. The intent of the REMP is to develop a regional monitoring program that would continue following the transfer of properties to the IC Program.

3.1.3.2 Northern Saskatchewan Environmental Quality Committee Meetings

The Northern Saskatchewan Environmental Quality Committee (NSEQC) is made up of representatives from designated northern municipal and First Nation communities. The NSEQC is broken into three sub-committees, with the Athabasca Environment Quality Committee (AEQC) representing Uranium City and other Athabasca communities.

1. <u>May 19, 2015: EQC Meeting (Athabasca sub-committee) – Combined with public meeting (Uranium City, Saskatchewan)</u>

A summary of the topics discussed during this meeting is provided in the previous section.

2. May 26, 2015 All EQC Meeting (La Ronge, Saskatchewan)

At this EQC meeting, a brief summary was provided to all EQC members regarding the work to re-establish Zora Creek and remediation and monitoring activities.

3.1.3.3 Athabasca Working Group Meetings

1. February 19, 2015 (Prince Albert, Saskatchewan)

At this Athabasca Working Group (AWG) meeting, a presentation was given on the current and future activities at the Beaverlodge sites such as an update on the work to re-establish Zora Creek and remediation and monitoring activities.

3.1.4 CNSC Update Meeting

In 2013, the Commission granted Cameco a 10-year Waste Facility Operating Licence (WFOL) effective from June 1, 2013 to May 31, 2023. The licence term is intended to provide adequate time for Cameco to implement the proposed remedial options identified in the Path Forward report (Cameco 2012) and complete necessary follow-up monitoring.

With the renewed Waste Facility Operating License for the Beaverlodge properties, Cameco is required to update the CNSC on the status of the activities occurring on the Beaverlodge properties on an annual basis.

Cameco provided a status update of the work completed at the site to CNSC staff who presented the information on October 1, 2015 (CNSC, CMD 15-M41.A).

3.2 2015 Remediation Activities to Prepare Sites for Transfer to IC Program

Cameco has prepared a work plan and schedule, based on the path forward recommendations, which was presented at the CNSC annual update meeting to the Commission in October 2014. The work plan 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 remediation activities selected for advancement at the Beaverlodge properties include:

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

Ultimately, the Beaverlodge properties are being managed for acceptance into the provincial IC Program, and all future works undertaken are intended to support the management framework established to move towards this goal. The following section describes some of the significant activities that were completed in 2015 to move the properties towards transfer to the IC Program. A summary of the activities that were completed to advance remediation at the Beaverlodge properties during the reporting period is provided below.

3.2.1 Site Wide Gamma Assessment

In 2014, SENES Consultants and Cameco developed the Beaverlodge gamma radiation survey plan in consultation with the CNSC and SMOE. The main purpose of the gamma radiation survey was to gather sufficient data to support a risk assessment in order to determine the safety and security of the properties in regards to gamma radiation. The survey included areas disturbed by mining and milling infrastructure, areas of known tailings spills within the licensed properties, access roads as well as appropriate background reference areas (ARCADIS SENES 2014).

SENES Consultants and Kingsmere Resources Services conducted a survey for Cameco and Saskatchewan Research Council (SRC) in December of 2014. The purpose of the survey was to collect information from Uranium City residents regarding their use of the areas around Uranium City to determine approximations of the time spent on nearby Cameco and SRC managed properties. The survey was carried out through door-to-door interviews with a focus on land use in the last five years and what is expected in the near future.

In general, reported use of the Beaverlodge properties was quite low. The maximum reported recreational land use did not exceed 40 hours per year for any of the sites. The survey also concluded that occupational land use for each site was typically less than 20 hours per year with the exception of workers near the airport and those involved with remediation work at the Verna/Bolger site.

A risk assessment was conducted by Arcadis Canada Inc. as a follow up to the gamma survey and public land use survey. The assessment estimated the potential risks from radiation exposure at the Beaverlodge properties based on spatial considerations, use of the properties and measured gamma radiation levels while also taking into consideration the consumption of country foods and exposure to other pathways.

In the risk assessment, comparison of gamma measurements were made to the Saskatchewan Ministry of Environment guidance document EPB 381 which considers gamma measurements on a one hectare basis. In addition to the comparison with the Saskatchewan Ministry of Environment guidance, a dose (risk) evaluation was conducted taking into account International Commission on Radiological Protection (ICRP), Canadian Nuclear Safety Commission (CNSC), Health Canada (HC), United States Environmental Protection Agency (U.S. EPA) and International Atomic Energy Agency (IAEA) guidance.

In order to evaluate levels measured across the Beaverlodge properties using the SMOE regulatory guidance, the gamma radiation survey results were evaluated on a one hectare basis, converted to µSv/h and background levels were removed to reflect the incremental dose. Of the 11 sub-areas evaluated, the majority fully met the SMOE regulatory guidance, while portions of five of the sub-areas exceeded the guidance criteria.

Despite most sub-areas meeting guidance, it was decided to evaluate all of the sub-areas using the risk-based approach to allow for estimation of cumulative doses from all Beaverlodge licensed properties as well as to provide additional evidence supporting the acceptance of these properties into the IC Program.

The risk based approach taken for the Beaverlodge properties included both a realistic scenario determined by reported site usage (based on public consultation) as well as a more conservative analysis based on potential maximum site usage. The annual incremental doses were also assessed on a cumulative basis by summing doses from exposure at all Beaverlodge sub-areas. Based on conservative assumptions, the cumulative incremental doses ranged from 0 to 0.24 mSv/yr. These conservative estimates of cumulative doses were well below the public dose criterion of one mSv/yr. In addition, dose estimates based on land use and dose rates from each of the sub areas remained below 0.3 mSv/yr.

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). Based on this evaluation, no remedial actions are justified at these sites to reduce gamma exposure levels (ARCADIS 2015).

3.2.2 Rehabilitate Historic Mine Openings

The Beaverlodge Mine closure reports developed following the cessation of mining states that in 1982 thirty seven vertical openings (from underground mine workings to surface) were identified as requiring closure on the Beaverlodge properties. The closure reports stated that “vertical openings be sealed with reinforced concrete bulkheads”.

A plan and method for sealing surface openings was submitted and approved by the regulatory agencies in 1982. As a result of the original decommissioning activities all horizontal and vertical openings were covered and remain covered. The plan and method described in 1982 and approved by the regulatory agencies outlines a set of principles to be followed for closing mine openings but does not provide “as-built drawings” detailing exactly how each opening was decommissioned. The province of Saskatchewan will require engineer stamped documentation regarding the shaft closure method prior to properties being considered for transfer to the IC Program.

As a result, Cameco began an assessment of the shaft and ventilation raise caps through a search of historical records and a ground search for vertical mine openings on the Beaverlodge properties. The intent of this assessment is to locate as many of the sealed openings as possible to assess their condition, consider the ease of public access, and to develop a plan and schedule for replacing the caps over the current license period. Field inspections of the caps using information from the record review was conducted by Kingsmere Resources in 2014 and 2015.

In order to prepare the mine openings for transfer to the IC Program, Cameco intends to install stainless steel caps over the existing openings. The new steel caps will ensure the safety and security of the mine openings for the long term, with an estimated design life of over 1000 years. Initially three caps are planned for replacement in 2016 and a request for exemption from the *Saskatchewan Mine Regulations*, Section 407 (2) was submitted on December 18, 2015 in order to allow the installation of these three stainless steel caps. Cameco received this exemption from the Ministry of Labour Relations and Workplace Safety on February 10, 2016.

3.2.3 Decommisison Identified Boreholes

A search of drilling records on file with the Government of Saskatchewan followed by site verification was conducted in 2011, which resulted in numerous boreholes being identified and sealed over the next two years. Since 2013, additional non-flowing boreholes have been discovered during regulatory inspections as well as final property inspections. As a permanent record of borehole locations associated with the Beaverlodge properties Cameco maintains a master list that includes the GPS locations and the method of closure completed for each borehole in the Annual Report (Appendix E). As additional boreholes are discovered the GPS locations are added to this record. As sites are transferred to the IC Program this permanent record will be transferred to the Province of Saskatchewan.

3.2.4 Re-establishment of the Zora Creek flow path

The Bolger Waste Rock Pile is located about 11km east of Uranium City and is the result of development of Bolger Pit and Verna Shaft. The Waste Rock Pile spanned a narrow valley adjacent to the Bolger Pit which overlies the former location of both Down Lake and a small creek linking Zora, Down and Verna lakes. The creek, often referred to as Zora Creek, flowed through the base of the waste rock pile and its flow has been intermittent.

SRK Consulting was contracted by Cameco to design and construct an excavation through the Bolger Waste Rock Pile to re-establish the Zora Creek flow path, reducing contact between Zora Creek water and the waste rock. Based on the Quantitative Site Model developed by SENES Consultants, the reconstructed flow path is predicted to result in improved water quality in Zora Creek, and to have a measureable improvement to the water quality of downstream Verna Lake.

The project was conducted in two phases, with work in 2014 consisting primarily of characterization activities. Only a small amount of waste rock, approximately 14,000 m^3, was excavated from the Bolger pile in 2014 (SRK 2014b).

The second phase, excavation of the proposed flow path, was conducted from May 2015 through to October 2015. Over this period the flow between Zora and Verna lakes was re-established. Some minor alterations in the channel alignment from the original design were necessary to accommodate “field fit” adjustments to optimize the channel flow path. A detailed description of the work conducted along with interim drawings has been provided to the regulatory agencies and is titled "2015 Construction As-Built Update".

Some minor work remains to be completed in 2016, and is discussed in Section 5.4.4.

3.2.5 Final Inspection and Cleanup of the Properties

3.2.5.1 Final Inspection and Cleanup

Prior to transferring sites to the IC Program a final site inspection and clean-up must be conducted to remove debris from the site and ensure the site is in a safe and stable condition.

In 2015, Kingsmere Resources conducted an inspection of the 15 properties initially proposed for transfer to the IC Program in 2015. Inspections consisted of walking transects over the entire property unless safety consideration, surface features or significant vegetation prohibited access to a specific area. The inspection routes were tracked with a GPS, and any foreign material and debris on the properties was marked.

Following completion of the inspections, all foreign material was collected and deposited in the former Bolger Pit area.

3.2.5.2 Bolger Pit Waste Disposal

In February 2010 Cameco received approval from SMOE and the CNSC to use the Bolger Pit as a disposal location for loose debris encountered during inspection or clean-up activities on the Beaverlodge sites. The Bolger Pit was selected as the disposal location as it was used by Eldorado Resources as a disposal area for similar materials during decommissioning. As a condition of using Bolger Pit as a disposal location Cameco is required to provide information regarding the type and volume of waste being disposed of in the pit on an annual basis.

The former Bolger Pit has been backfilled as a result of the Zora Flow Path Reconstruction project (see Section 3.2.5), however a small portion in the North West corner of the pit against the pit wall (approximate 59°34’10.9”N 108°24’58.3”W) has been left open to allow disposal of waste materials encountered during property inspections. In total approximately 612 m^3 of core and core boxes were deposited in the Bolger Pit in 2015. An additional 63.5 m^3 of debris found during the site inspections was deposited as well. Materials disposed of included tires, culverts, steel drums and debris, drill stems and casings, transmission line infrastructure, tailings pipeline and wire wrap, hoses and piping, as well as some signs.

The remaining properties are planned to be inspected throughout 2016 and 2017. Once all property inspections have been completed and remediation work complete, the pit will be backfilled with waste rock from the pit.

3.2.6 Additional Site Activities

3.2.6.1 Crown Pillar and Geophysics Assessment

In October 2013 it was noted that there had been a failure in the crown pillar associated with the Ace Stope area. Initial remediation to secure the subsidence area consisted of a gravel and sand cover, with fencing restricting access. In 2014 it was identified that the remediation work completed in 2013 had partially eroded and a long term solution was needed to permanently secure this settled area. The area remains fenced off and residents were notified of ground instability in the area.

As part of developing a long term remediation plan Cameco initiated an investigation of crown pillars on all Beaverlodge properties in 2014. A report assessing the crown pillars and related risks on all properties was submitted in 2015 for regulatory review. Based on the assessment of the available mining data, it was determined that the Ace Stope Area required additional remediation to address potential risk. Five potential remedial options being considered for the Ace site include:

1. Restrict access to site and continue annual monitoring of the area
2. Fence-off, backfill, thin cover over area and monitor area
3. Drill and blast ground directly above the underground working areas
4. Drill and blast neighbouring natural bedrock slope so large blocks are cast over the area
5. Load, haul, and dump larger sorted waste rock to cover over the area and place a buttress of waste rock against the existing bedrock slope

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 Quantitative Site Model (SENES 2012), as outlined in Section 4.1.1.

4.1.1 Modelled Predictions (Performance Indicators)

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

These predictions 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 document (Cameco 2012). With the path forward strategy accepted by the regulatory agencies, the water quality performance indicators were updated and incorporated in the Status of the Environment (SOE) report (SENES 2013) which was finalized at the end of 2013.

During preparation of the annual report it was noted that some individual annual average data was outside the maximum and minimum predictions generated using the Beaverlodge QSM (SENES 2012) and the model inputs employed in the 2008 – 2012 Beaverlodge SOE (SENES 2013). Although it is not the expectation that water quality results will be within the predicted max and min bounds every year, where trends are beginning to deviate from the expected trends an evaluation of the results was conducted to determine the potential contributing factors.

A comparison of 2015 annual averages to the model predictions, along with a description of differences is provided below in Table 4.1.1.

Table 4.1.1 Comparison of Key Parameter Annual Averages to Modelled Predictions

Uranium	2015	SEQG	Bounding Range			Comments
	Concentration (µg/L)					
Pistol Lake	174.7	15	186.0	to	413.0	Trending just below lower bound
Dubyna Lake	192.8	15	76.6	to	168.0	Trend starting to move outside upper bound, will be monitored
Verna Lake	386.6	15	146.0	to	311.0	Currently above predictions. Project related, anticipated to return within bounds in 2016
Ace Lake	13.5	15	8.4	to	16.8	Below SEQG
Lower Ace	33.1	15	16.1	to	35.6	5 year trend within bounds
Fookes Reservoir	271.8	15	325.0	to	413.0	5 year trend within bounds
Marie Reservoir	241.0	15	314.0	to	376.0	Trending just below lower bound
Meadow Fen	226.6	15	336.0	to	417.0	Trending below lower bound
Greer Lake	244.5	15	276.0	to	318.0	5 year trend within bounds
Beaverlodge Lake	136.5	15	103.0	to	143.0	5 year trend within bounds

$Radium^{226}$	2015	SEQG	Bounding Range			Comments
	Concentration (Bq/L)					
Pistol Lake	1.07	0.11	0.38	to	0.91	5 year trend within bounds
Dubyna Lake	0.04	0.11	0.02	to	0.03	Below SEQG
Verna Lake	0.11	0.11	0.10	to	0.23	5 year trend within bounds
Ace Lake	0.03	0.11	0.01	to	0.02	Below SEQG
Lower Ace	0.08	0.11	0.03	to	0.05	Below SEQG
Fookes Reservoir	1.38	0.11	1.06	to	1.32	5 year trend within bounds
Marie Reservoir	2.08	0.11	1.36	to	1.74	Trending above upper bound
Meadow Fen	1.67	0.11	1.31	to	1.68	5 year trend within bounds
Greer Lake	2.28	0.11	1.62	to	2.33	5 year trend within bounds
Beaverlodge Lake	0.03	0.11	0.04	to	0.05	Below SEQG

Selenium	2015	SEQG	Bounding Range			Comments
	Concentration (µg/L)					
Pistol Lake	0.0001	0.001	0.0001	to	0.0001	Below SEQG
Dubyna Lake	0.0001	0.001	0.0001	to	0.0001	Below SEQG
Verna Lake	0.0002	0.001	0.0001	to	0.0002	Below SEQG
Ace Lake	0.0001	0.001	0.0001	to	0.0001	Below SEQG
Lower Ace	0.0002	0.001	0.0001	to	0.0001	Below SEQG
Fookes Reservoir	0.0027	0.001	0.0033	to	0.0038	5 year trend within bounds
Marie Reservoir	0.0017	0.001	0.0031	to	0.0033	Trending below lower bound
Meadow Fen	0.0019	0.001	0.0032	to	0.0036	Trending just below lower bound
Greer Lake	0.0040	0.001	0.0032	to	0.0040	5 year trend within bounds
Beaverlodge Lake	0.0025	0.001	0.0021	to	0.0027	5 year trend within bounds

It is believed that the trends observed in recent years (2010 to 2015) which caused the measured concentrations to deviate from the model predictions are largely attributable to the extreme fluctuations which have been observed in flow through the Ace Creek and Fulton Creek Watershed systems in these years.

The maximum and minimum predictions were generated to get a reasonable idea of how changes in key parameters values would impact the model predictions; with flow being included as a key parameter in the model. Maximum and minimum flows for modeling purposes were generated based on regional annual precipitation data for the period from 1983 to 2010. Overall, the maximum and minimum flow rates used in the bounding runs were approximately +/- 15% of the nominal value (85% to 115% of the base case flows).

Looking at the reported measured flows at AC-8 and TL-7 over the 1980 to 2015 period, it is seen that flows in recent years are well outside the studied variability. Flows were particularly inconsistent at station TL-7 over the 2010 to 2015 period where the annual average ranged from 1.1% to 233% of the 1980 to 2015 mean flow rate.

It is expected that these variations in flow affect contaminant sources differently. For constituents which have largely diffusion limited transport, it is expected that high flows would serve to dilute the system, resulting in lower levels; this is typically seen for uranium, selenium, TDS and radium (in the Ace Creek Watershed). The opposite effect is seen for radium^{226} in the Fulton Creek Watershed, where diluted levels of TDS (and sulphates) result in increased solubility of the radium precipitates associated with barium and calcium in the sediments leading to higher concentrations in the water column. These trends are reversed for low flow conditions, as was seen in 2010.

The development of the SOE report includes a review of the previous five years of monitoring data along with comparisons to both regulatory guidelines and performance objectives, and if required, updates to the model will be incorporated. Bounding curves will be re-investigated as part of work performed for the next Beaverlodge SOE, in 2018, to take into account the extreme flow variation which has occurred in recent years. It is expected that when greater variability (wider bounds) in the annual flows and loads are employed in the QSM, that the bounding curves will more accurately reflect the variable conditions observed in recent years.

Section 4.3 provides a summary of water quality trends at each of the licensed monitoring stations at the Beaverlodge Site. An initial comparison to the Saskatchewan Environmental Quality Guidelines (SEQG; Saskatchewan Environment 2015) 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 SOE modelled predictions will be made. Surface water quality guidelines are not intended to be applied within tailings management areas, and thus they are not discussed for Stations TL-3, TL-4, TL-6 or TL-7. Once properties are shown to be meeting their respective water quality predictions and are chemically and physically stable, in accordance to those predicted values in the SOE, properties will become eligible for transfer to the IC Program.

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 closed-out site. These include water quality, ambient radon, air quality, and gamma radiation surveys.

The original gamma radiation surveys were completed in the first year of the transition phase (1985/86) 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 Beaverlodge properties was conducted. A summary of the site wide gamma survey is provided in Section 3.2.1.

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.

Currently two routine environmental monitoring programs continue:

1. water quality
2. ambient radon

Sections 4.3 to 4.7 summarize results for the water and ambient radon monitoring programs.

4.3 Water Quality Monitoring Program

This section summarizes the results of the approved water sampling program at Beaverlodge. The current water sampling program was approved by the CNSC and SMOE for implementation in 2011; there have been no permanent changes to monitoring program since. The water quality summary in this section focuses on the three main constituents of potential concern identified at the Beaverlodge properties (selenium, uranium and radium^{226}). TDS is also included as a general indicator of water quality.

In 2015, Cameco changed applications for managing environmental monitoring data from EIMS to SAP-EC. Due to implementation of the new database, personnel worked to ensure the data was being imported and received properly and that sample collection templates and requests for lab analysis were accurate. With the exception of the new environmental monitoring database, no other significant changes to the environmental monitoring program were made in 2015.

The two watersheds affected by the 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** - 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 permanent, routinely sampled 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.
- **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 below the discharge of Greer Lake and before it enters Beaverlodge Lake.

Additional permanent 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), radium^{226} (^{226}Ra), selenium (Se) and total dissolved solids (TDS) at each station and comparisons to their respective SEQG values where applicable, and comparisons to the predicted future recovery of water bodies that were presented in the SOE. 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 has been made.

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. Trends are noted 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). For the purposes of this report, no statistical methods were applied in the discussion surrounding trends at each station.

The current annual report presents a comparison of water quality to the performance indicators that have been presented to the CNSC at the 2013 Commission update meeting. Where a station meets SEQG, additional discussion comparing to model predictions are not provided.

The detailed water quality results for the current reporting period, January 2015 to December 2015, are provided in Appendix A.

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). There were a total of six scheduled samples at AN-5 in 2015. The January sample was resampled in February due to improper sampling technique resulting in elevated TSS.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.1-1.

The long-term trend for ^{226}Ra has been gradually increasing with fluctuations in the year to year average measured activity. As shown in Appendix A, seasonal fluctuation also varied in magnitude between 0.45 Bq/L and 2.0 Bq/L in 2015 resulting in an average ^{226}Ra measured activity of 1.1 Bq/L for AN-5. The 2015 average activity at AN-5 was also above the modelled predictions. This trend will be monitored and re-evaluated during the next SOE.

Uranium values have shown a distinct seasonal fluctuation as well, with the highest concentrations occurring in the winter months and late spring to late fall yielding lower values. Uranium concentrations measured throughout the year varied in magnitude between 41 µg/L and 344 µg/L. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning. In comparison to modelled predictions, the annual average concentrations of U have been slightly lower than the predicted range. The lower bound predicted for uranium in 2015 was 186 µg/L and recorded average concentration was measured at 175 µg/L for 2015.

Similar to U and ^{226}Ra, TDS concentrations exhibit a seasonal fluctuation that affects the annual average; however, the long-term trend has remained relatively consistent. The 2015 annual average concentration for TDS showed an increase from the 2014 average however the value remains within historical ranges measured at this station.

Se values at AN-5 are consistently below SEQG, and the annual average concentration noted in 2015 was <0.0001 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, upstream of Ace Lake (Figure 4.3). There were a total of six scheduled samples in 2014 at DB-6 with four samples collected. The two samples missed in January and March were due to a lack of flow at DB-6.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.1-2.

Uranium concentrations at DB-6 have shown a consistent long term decreasing trend. Following the plugging of three flowing boreholes in 2011 and 2012 water quality continued to improve, however concentrations measured in 2015 were above those measured in 2014. The 2015 average concentration also falls outside of modelled predictions for this station. Monitoring of this trend will continue in 2016.

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

Selenium has remained relatively stable since 2004. The water quality trend for Se has also remained below the SEQG since then, when the analytical lab detection limit for Se was lowered.

The TDS trend has been relatively consistent since decommissioning, and no changes were observed in 2015.

AC-6A Verna Lake

Water quality monitoring at this station began in May 2010, which is located at a culvert between Verna Lake and Ace Lake (Figure 4.3). Flows from Verna Lake are largely dependent on precipitation, and as such during low flow years not all scheduled samples are collected. Four samples were scheduled for AC-6A in 2015 but an increased sampling frequency was implemented in conjunction with the Zora Flow Path Reconstruction project. The scheduled samples of June and July were not collected because no water was present, however a total of seventeen samples were collected in 2015 from August through to December.

A historical summary of annual average ^{226}Ra activity and 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 2012 to 2015 are presented in Table 4.3.1-3. Detailed results discussed below are provided in Appendix A.

In 2015, the annual average U concentration was above the uranium concentrations observed recently at this station. The increased concentration is related to the Zora Creek project and is anticipated to be temporary. A description of the activities associated with the Zora Creek Project and the associated water quality monitoring program is provided in the 2015 Construction As-Built Update (SRK 2016b). Sampling at AC-6A began in late August when flow began through the culvert. Uranium concentrations showed a continual increase until late October, at which point they started to slowly decrease. Sampling was stopped in December 2015 when flows from the lake ceased. Once flows resume in 2016 sampling will continue and it is anticipated that the uranium concentrations will continue to decrease. Of note, the uranium concentrations measured flowing into Verna Lake, from the excavation of Zora Creek have decreased significantly following completion of the Zora project. These results are discussed in Section 4.4.

The current annual average ^{226}Ra measured activity of 0.11 Bq/L represents a slight decrease from values measured in 2014 of 0.15 Bq/L. Based on the modelled predictions, ^{226}Ra is trending within the upper and lower bounds.

Se at station AC-6A continues to measure below the SEQG of 0.001 mg/L.

TDS has remained relatively stable at this station since 2004, with no changes in 2015.

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 2015.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 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. This trend has continued in recent years, and since 2012 the annual average U concentration has been below the SEQG.

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

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

Long-term trends for concentrations of TDS have remained relatively stable at this station since 1982.

AC-14 Lower Ace Creek

AC-14 is located in Lower Ace Creek at the discharge into Beaverlodge Lake (Figure 4.3). With the exception of the December sample where safety was a concern due to ice conditions, 11 out of 12 of the scheduled samples were collected in 2015.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.1-5.

Uranium concentrations at station AC-14 have been following a downward trend since decommissioning. While the 2015 average concentration of 33.1 µg/L was above the recent averages measured in 2013 and 2014, the value remains within the normal variance of uranium concentrations observed at this station. In 2015, the AC-14 average U concentration was within the upper and lower bounds of the modelled predictions

The long-term trend for the annual average ^{226}Ra activity measured at this station has been consistently below the respective SEQG since 1989, following the decommissioning of the Beaverlodge mine/mill complex.

Since 2001, Se concentrations have been at or below the SEQG at this station.

TDS 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 applied to 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

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 on an annual basis.

A historical summary of annual average ^{226}Ra activity and 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 2012 to 2015 are presented in Table 4.3.2-1.

As expected with a reference location, the long-term trend for concentrations of U, Se, and ^{226}Ra recorded at AN-3 have remained relatively stable and below their respective SEQG. Selenium concentrations at AN-3 have been at or below the detectable laboratory limits since routine analysis began in 2000.

TL-3 Fookes Reservoir

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). Water did not flow at station TL-3 from May 2010 until freshet in the spring of 2012 and as such there is no data at this station during those years. All four scheduled samples were collected in 2015.

A historical summary of annual average ^{226}Ra activity and 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 2012 to 2015 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 two annual averages measured in 2014 and 2015 have also been below the lower bound for the modelled predictions.

The long-term trend for ^{226}Ra has been slowly increasing since 1988, with a 2015 average activity of 1.36 Bq/L. Elevated and increasing ^{226}Ra and barium levels observed along with decreasing sulphate concentrations are likely due to re-solubilisation through chemical disequilibrium and biological processes of the barium-radium-sulphate co-precipitate formed in the Beaverlodge TMA during operations. As barium treatment did not occur in the area upstream of TL-4, this precipitate was likely formed due to naturally occurring barium. In 2015, ^{226}Ra activity was above the upper bounds of the modelled predictions.

In the long-term Se has been slowly decreasing in concentration since decommissioning. In 2015, Se measured 0.0027 mg/L which is below the lower bounds of the modelled predictions at TL-3.

TDS concentrations have also slowly decreased in the long-term indicating improving conditions at this station.

TL-4 Marie Reservoir

TL-4 is located within Fulton Creek drainage downstream of TL-3 and at the discharge of Marie Reservoir (Figure 4.3). Water did not flow at TL-4 from October 2010 until freshet in the spring of 2012, thus there is no data available for the latter part of 2010 and for all of 2011. All four scheduled samples were collected in 2015.

A historical summary of annual average ^{226}Ra activity and U, TDS and Se concentrations at TL-3 along with the predicted recovery, are presented in Figures 4.3.2-11 to 4.3.2-16. The annual averages from 2012 to 2015 are presented in Table 4.3.2-3.

Annual concentrations of U and TDS at TL-4 have decreased over the long term indicating improving conditions at this station. In 2015, the decreasing trend continued with the lowest annual average U at TL-4 to date of 241.0 µg/L. The most recent three years have had annual average concentrations below the lower bound of the modelled predictions.

Similar to TL-3, ^{226}Ra activity has shown an increasing trend for approximately the past 15 years at TL-4. In 2015, ^{226}Ra activity was above the upper bound of the modelled predictions.

Selenium has shown a slow and steady reduction over time and had an annual average concentration of 0.0017 which was below the lower bound of the modelled prediction in 2015.

TL-6 Minewater Reservoir

TL-6 is located at the discharge of Minewater Reservoir which was used temporarily for tailings deposition in 1953 and settling of treated mine water during the last 10 years of Beaverlodge mill operations (Figure 4.3). During decommissioning activities the water level in Minewater Reservoir was lowered and efforts were made to relocate settled precipitate sludge to the Fay shaft.

This water quality station generally exhibits ephemeral flows. As a result, not all scheduled samples can be collected every year. All three scheduled samples were collected for 2015.

A historical summary of annual average ^{226}Ra activity and 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 2012 to 2015 are presented in Table 4.3.2-4. Model predictions were not generated for TL-6.

Since decommissioning, U concentrations have been experiencing a decreasing trend at station TL-6 which continued in 2015. Uranium concentrations varied considerably throughout the year ranging from 33.0 µg/L to 315.0 µg/L, with an annual average of 143.7 µg/L.

The annual measured activity of ^{226}Ra has shown considerable fluctuation and an increasing trend since decommissioning. From 1996 to present, concentrations of sulphate have been generally decreasing while barium has demonstrated a similar trend to that observed in ^{226}Ra. Cameco hypothesizes this is a result of dissolution of remnant barium-radium-sulphate precipitate that was generated during the active treatment of minewater during operations. The annual average activity was 5.3 Bq/L, which is in line with previous activities measured at TL-6 following increased values observed in 2013 and 2014 (following and extended period of drought).

Monitoring of Se at TL-6 was initiated in 1996, with concentrations fluctuating until 2004. The 2015 annual average of 0.002 mg/L is within range of values previously observed at this station.

Similar to U, TDS has also experienced a downward trend post-decommissioning, with concentrations stabilizing around 500 mg/L in 2005.

TL-7 Meadow Fen

TL-7 is located at the discharge of Meadow Fen (Figure 4.3) in the TMA. Of the twelve scheduled samples for the 2015 reporting period, nine samples were collected due to a lack of flow in February, March and April hindering sample collection.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.2-5.

Since decommissioning, U and TDS have been experiencing a downward trend in their long-term concentrations, while ^{226}Ra is experiencing an upward trend similar to the upstream stations in the TMA. The annual average U concentration at TL-7 is below the lower bound of the modelled predictions with a 2015 average concentration of 226.6 µg/L.^{226}Ra currently remains within the bounds of the modelled predictions with a 2015 average activity of 1.68 Bq/L.

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 while measuring below the lower bound of the modelled predictions.

TL-9 Greer Lake

TL-9 is located downstream of Greer Lake (Figure 4.3) immediately before the water enters Beaverlodge Lake. 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. Similar to the upstream stations in the Fulton Creek watershed, there was no water flowing at TL-9 from June 2010 to May 2012. Of the 12 scheduled samples for 2015 eight were collected. There was no flow from January through March and unsafe ice conditions in November prevented sample collection.

A historical summary of annual average ^{226}Ra activity and 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 2012 to 2015 can be found in Table 4.3.2-6.

The long-term trend for U at TL-9 has shown a decrease in annual concentrations following decommissioning. Concentrations in the short term have continued the trend, with a decrease in U from 267.8 µg/L to 244.5 µg/L, between 2014 and 2015. Compared to the modelled predictions, in 2014 and 2015 U concentrations were measured below the predicted range.

Since 1990, ^{226}Ra has been experiencing an overall upward trend in measured activity despite the occasional fluctuations over the past twenty years. While still trending up overall, the average activity of ^{226}Ra was lower in 2015 than the values measured in recent years. While recent annual average activities at this station have been above modelled predictions, the 2015 activity returned to being within the upper bound of 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 is another parameter at station TL-9 that has shown a decreasing trend over the long term. In 2015 the average concentration was at the upper bound prediction at a concentration of 0.004 mg/L.

The long term trend for TDS concentration has been decreasing since decommissioning. Over the short term, TDS has continued to follow this trend as TDS was measured at 210.3 mg/L in 2014 and has decreased to 189.5 mg/L in 2015.

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.

Previous experience has shown that at least some of the abandoned sites are likely contributing some level of contamination (heavy metals and radionuclides) to the watershed and ultimately to Beaverlodge Lake and Martin Lake, particularly during spring runoff and periods of heavy precipitation.

BL-3 Fulton Bay

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 1998-99 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 2015 reporting period, all four scheduled samples were collected.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.3-1.

Annual concentrations of U and Se at BL-3 have generally trended downward in the long term. While in the short term both parameters have started to stabilize and fluctuate around 140 µg/L (U) and 0.0027 mg/L (Se).

^{226}Ra activity has been variable year to year, however all measured activity continues to remain below the SSWQO 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) and is collected as a 3-depth composite. The sampling frequency 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 2015.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.3-2.

The long-term trends for U and ^{226}Ra at BL-4 have shown an overall decreasing trend since decommissioning, while TDS has been relatively stable. The annual average concentration of U at BL-4 for 2015 was 130.5 µg/L, while ^{226}Ra activity and TDS concentrations were 0.035 Bq/L and 139.5 mg/L, respectively. Annual average radium^{226} activity remains below the SEQG of 0.11 Bq/L.

Selenium concentrations have fluctuated over the long term; however, the short-term trend has been more consistent with values near 0.003 mg/L.

BL-5 Beaverlodge Lake Outlet

Station BL-5 is located at the Beaverlodge Lake outlet (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. All four scheduled samples for 2015 were collected.

A historical summary of annual average ^{226}Ra activity and 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 2011 to 2015 are presented in Table 4.3.3-3.

The 2015 annual average concentrations for U and Se were measured at 136.5 µg/L and 0.0025 mg/L. Both U and Se are within the bounds of the modelled predictions.

Radium^{226} was measured at 0.028 Bq/L in 2015 which is below the corresponding SEQG of 0.11 Bq/L.

Total Dissolved Solids concentrations at station BL-5 have remained relatively stable 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 2015.

A table comparing the average concentrations for all measured parameters from 2011 to 2015 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 shown a slight decrease year to year. For the 2015 reporting period, the average U concentration was 49.5 µg/L, compared to 69.3 µg/L measured in 2011.

The 2015 annual average ^{226}Ra activity was below the SEQG at 0.015 Bq/L.

The observed Se concentrations have varied around the SEQG of 0.001 mg/L, and averaged 0.0009 mg/L in 2015.

The average TDS concentrations have remained stable since sampling started and was 114.5 mg/L for the 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 2015.

A table comparing the annual concentrations for all measured parameters from 2011 to 2015 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 54 µg/L in 2015, which was a slight decrease from 63 µg/L measured in 2014. Both the Se concentration and ^{226}Ra activity had values at or below their respective SEQG; Selenium measured a value of 0.001 mg/L and ^{226}Ra measured a value of 0.005 Bq/L. Total dissolved solids increased slightly from a concentration of 119 mg/L in 2014 to 123 mg/L in 2015.

CS-2 Crackingstone Bay

Station CS-2 is located in Crackingstone Bay of Lake Athabasca (Figure 4.3) approximately 1km 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 2015.

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

Radium activity, as well as U and Se concentrations were all below their respective SEQG at this station. In 2015 U was measured to be 2.4 µg/L while TDS was measured at a value of 51 mg/L. The ^{226}Ra activity was 0.010 Bq/L while the Se concentration was measured at the detection limit of 0.0001 mg/L.

4.4 Additional Water Quality Sampling

Cameco has assessed additional remedial measures and developed a path forward for the Beaverlodge properties that will facilitate the eventual transfer of these properties to the IC Program. One of the potential remedial measures taken into consideration in the 2012 Path Forward Report (Cameco 2012) was the flow path reconstruction of the Zora Lake outflow. This project was implemented in 2014/2015 by relocating a portion of the waste rock pile to re-establish Zora Creek flow and to reduce the contact between Zora Creek and the Bolger waste rock pile before reaching Verna Lake (Figure 4.4).

Monthly sampling was scheduled beginning in August 2013 to monitor water quality at the discharge from Zora Lake outflow (ZOR-01) and the outlet from the waste rock pile to Verna Lake (ZOR-02). Water samples are collected only during open water conditions and where flow is sufficient for sample collection. In 2015 the sampling frequency was increased to weekly at ZOR-01 (upstream) and ZOR-02 (downstream) in conjunction with the Zora Flow path construction project. 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.

Of note for 2015, was an increase in U and ^{226}Ra at ZOR-2 when compared to previous years. The increase is attributed to the activities related to the flow path reconstruction project. Concentrations of all parameters quickly returned to normal levels following construction activities. Additionally, while the annual average uranium concentration was 595 µg/L at ZOR-02, it is important to highlight that a decreasing trend was observed following completion of the flow path with the last sample collected in 2015 measured at 87 µg/L. This value represents the lowest recorded uranium concentration at this station and speaks to the improvements in water quality following implementation of the Zora project.

4.5 QA/QC Analysis

In order to assure that field sampling and laboratory analyses produce reliable and accurate results, QC sampling is conducted each year. Blind samples are sent out in May, June, and July to SRC to test the ability of SRC to replicate results through their analytical methods. Duplicate samples are sent out in June and December to an alternative lab (i.e. Maxxam Laboratory) to determine whether both labs analyzing the samples obtain similar results. In the case that results from the regular monitoring and results from the duplicates vary, SRC would then be contacted to determine the source of inconsistency in the results. If there were discrepancies in the duplicate lab results, it would be at the discretion of the Reclamation Coordinator to investigate the discrepancy and determine if corrective action is warranted.

Results with an absolute difference greater than 20% are investigated further. Results above the 20% absolute difference that cannot be explained are subject to further investigation using the index of precision (IOP), which is a measure of percent mutual agreement among replicated samples. The IOP is expressed as:

Index of Precision (%) = 100*(MAXIMUM-MINIMUM)/MEAN

If the IOP is <100% the samples are considered compliant and no further action is required.

Blind Samples

When the results from Blind-1 and Blind-2 were compared with duplicate samples taken at AC-14 and DB-6 for the month of May, all but one result were found to be within acceptable variation. The sample exceeded the threshold for investigation, however the difference fell within the uncertainty variability of the analysis methodology and no further investigation was required.

June blind samples were collected at TL-9 (Blind-4) and TL-7 (Blind-6), and sent to SRC Lab for analysis. Five of the results met the threshold for investigation (absolute difference >20%), however three fell within the uncertainty variability of the analysis methodology and two were within the IOP criteria.

In July blind samples were scheduled for AC-6A (Blind-3) and TL-6 (Blind-5) to be sent to SRC for analysis. Blind-5 was collected successfully while Blind-3 could not be collected due to lack of flow at AC-6A during this time. The Blind-5 water sample was sent to SRC for analysis. One result exceeded the threshold for investigation, however the difference fell within the uncertainty variability of the analysis methodology and no further investigation was required.

Duplicate Samples

Duplicate samples for TL-7 and TL-9 were collected in June 2015 and sent to both SRC and Maxxam labs for analysis. A primary quality check was completed to compare sample results with the SRC results for TL-7 and TL-9. Four of the results met the threshold for investigation (absolute difference >20%). One sample fell within the detection limit and no further investigation was required. The remaining three samples were within the Index of Precision criteria (<100%).

In December the scheduled duplicate samples at station TL-9 and TL-7 were collected and sent to Maxxam and compared to SRC results. A quality check was performed and twelve results were over the threshold for investigation. Nine of the differences were within the detection limit and no further investigation was required. The remaining three samples were within the IOP criteria, however at the discretion of the Reclamation Coordinator Maxxam reran the radionuclide tests. Results of the re-analysis confirmed the original results.

Lab QA/QC reports are presented in Appendix D.

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. Flows are measured (or estimated using AC-8 data) in the Fulton Creek watershed at station TL-7.

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 Creek (AC-8) for the period January 1, 2015 to December 31, 2015. The report can be found in Appendix B.

Precipitation was higher than average in 2015, which resulted in some of the higher flows on record at the two primary flow monitoring stations, particularly during the months of July and August. At AC-8, the spring runoff flow values measured in May and June were typical of low flows measured in previous years. The majority of precipitation fell during July and August resulting in increased flows into September. The average flow for September was 1366 L/s where the annual average flow is 579 L/s for 2015.

The 2015 flow rates at TL-7 were at levels typically observed after the spring melt but experienced similar increases in September due to increased July/August precipitation. September average flow was measured at 68.9 L/s for 2015 which was more flow than what was recorded after spring melt. Mean annual flow for 2015 TL-7 was 19.3 L/s which is similar compared to previous years.

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.

4.7.1 Ambient Radon Monitoring

As part of the transitional phase monitoring program, radon levels have been monitored on and around the Beaverlodge mine and mill site and at other locations in the region since 1985. The sampling regime uses Terrace, track-etch type radon gas monitors (Tech/Ops Landauer Inc. Glenwood, Illinois). Monitors are collected and replaced semi-annually from ten stations established throughout the area.

The ten radon monitoring stations are illustrated in Figure 4.7.1-1 and are located in the following areas:

- Airport Beacon

- Eldorado Town Site
- Northwest of the Airport
- Ace Creek
- Fay Waste Rock Pile
- Fookes Delta
- Marie Lake Delta
- Donaldson Lake
- Fredette Lake
- Uranium City

Track-etch cups were set out at ten stations in the Beaverlodge area from January 2015 to July 2015 then again from July 2015 to January 2016. Table 4.7.1 presents a summary of the radon monitoring conducted at the 10 sites for the 2015 monitoring period and compares it to the previous seven years. Although the entire suite of stations monitored in 1982 is not applicable for comparison to the current monitoring results, applicable stations have been included in the summary table and Figure 4.7.1-2 compares the most recent six years of data to operational levels.

SECTION 5.0

OUTLOOK

5.0 OUTLOOK

This section of the report describes those tasks and activities planned for 2016.

5.1 Regular Scheduled Monitoring

Representatives of Cameco continue to implement the Beaverlodge Environmental Monitoring Program, assessing:

- water
- radon in air
- regional hydrology
- sealed boreholes and seeps

Additional water samples will be collected at least monthly when water is flowing at the sample locations named ZOR-01 and ZOR-02. These sampling locations have been established to create a baseline and monitor the success of the Zora Creek flow path reconstruction through the Bolger Waste Rock Pile. The flow path reconstruction is discussed in more detail in Section 5.4.4.

5.2 Planned Public and EQC 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 to review the results of any activities completed since the previous meeting and to review the plans for the upcoming year, including any activities or planned studies that are to be completed.

Cameco provides an update on the Beaverlodge activities to the EQC at least annually. These updates can occur as part of a larger presentation related to all Cameco activities or be specific to Beaverlodge, depending on the amount of activity occurring on the site. In the past when there have been significant activities occurring or consultation required Cameco will host an EQC meeting in Uranium City and invite local residents to attend. The meeting is then followed by a tour of the properties, typically focusing on any changes that have occurred since the previous tour.

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 checking that site conditions remain safe, stable, and secure. In addition, activities to address previous inspection recommendations are assessed to confirm that the activity was completed to the satisfaction of the regulatory agencies.

As discussed in Section 3.1.2 inspections of the Marie and Fookes Reservoir outlet structures and Fookes Delta cover are completed annually by Cameco during the JRG inspection. As Cameco continues the process of transferring properties to the Province of Saskatchewan IC Program, inspections will likely focus on the properties being requested for release.

5.4 2016 Work Plan

Cameco has prepared a path forward work-plan and schedule which was presented at the CNSC annual update meeting to the Commission in October 2014. The work plan 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 work plan has been vetted through the JRG and reviewed with local and regional stakeholders. Ultimately, the Beaverlodge properties are being managed for acceptance into the provincial IC program, and future works undertaken will support the management framework established to move towards this goal. The remediation activities selected for advancement at the Beaverlodge properties include:

1. Site wide gamma assessment
2. Rehabilitate historic mine openings
3. Decommission identified boreholes
4. Re-establishment of the Zora Creek flow path
5. 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

No additional work is planned related to gamma assessment in 2016.

5.4.2 Historic Mine Openings Rehabiliation

5.4.2.1 Assessment

In 2016 Cameco will continue to locate and assess the remaining vertical mine openings (raises and shafts) in order to develop a plan and schedule to replace the current caps with an engineer designed and stamped cover where required, with appropriate documentation to facilitate the properties transfer to the IC Program.

5.4.2.2 Rehabilitation

Cameco selected stainless steel caps as the preferred long term remediation option for mine openings. Investigation and design of three stainless steel caps was completed in 2015, with fabrication and installation planned for 2016.

KOVA Engineering (KOVA) was contracted to design the stainless steel caps in late 2015. Uranium City Contracting (UCC) will have the caps fabricated and shipped to Uranium City in early 2016. UCC will then install the caps, with KOVA providing installation QA/QC. Caps are planned to be installed in three locations in 2016: the Ace shaft, Ace vent raise, and Fay vent raise.

5.4.3 Decommission identified boreholes

In 2015, additional boreholes were discovered during final property inspections. Boreholes discovered during property inspections will be sealed prior to the property being transfer to the IC program.

5.4.4 Re-establishment of the Zora Creek flow path

The interim as-built configuration of the Zora Creek flow path (SRK 2016b) implemented in 2015 has re-established flow in the historic (pre-mining) Zora Creek area between Zora and Verna Lakes. Only minor construction activities remain to be completed, which include:

- Completion/grading of a final access ramp to facilitate access across the as-constructed channel.
- Additional excavation and grading along the southwest slopes (i.e. frozen area).
- Flattening of side slopes along the sub cut portion of the channel bottom prior to placement of remaining rip rap/erosion protection material.
- Placement of approximately 390 m^3 of rip rap along base channel sections excavated into original ground soils. A portion of this rip rap will be utilized along the south portion of the channel slope that is comprised of overburden.

Once the remaining work is complete, a survey will be conducted and an associated Final As-Built Report will be prepared.

The primary focus in 2016 will be monitoring channel performance. This will include continued water quality sampling, visual inspections, and a post-construction aquatic habitat assessment. This monitoring data will be used to determine what, if any, additional work is needed in conjunction with the reconstructed Zora Creek flow path.

5.4.5 Final Inspection and Cleanup of the Properties

Final inspections for the remaining properties are planned to be conducted in 2016 and 2017. Debris will be identified, marked and transported to the Bolger Pit for final disposal.

5.4.6 Additional Work

5.4.6.1 Crown Pillar Remediation

The results of the site wide crown pillar investigations outlined in Section 3.2.2 were compiled in a report which assessed the potential risk associated with the crown pillars of all the Beaverlodge properties. This report also identified potential remedial options to address the crown pillar at the Ace Stope Area. Following informal discussions with the regulatory agencies and assessing the pros and cons of each option, the preferred option that Cameco intends to implement in 2016 is to load, haul and dump sorted waste rock (or other suitable material) to cover the entire area and place a buttress at toe of the base of the ridge adjacent to the area of subsidence.

5.4.6.2 Transmission Line Assessment

During the final property inspections conducted in 2015, remnants of old power infrastructure including poles, supports and wires were discovered on some of the properties. An assessment of the transmission line infrastructure is planned to be completed in 2016 in order to assess potential remediation options.

5.4.6.3 Ace Creek Watershed Hydrologic Monitoring

This 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 in the various sub-watersheds feeding Ace Creek. The information supplied by the additional monitoring will be used to support the pathways model predictions for the Ace Creek area.

5.4.6.4 Concrete Pad Remediation

Concrete pads associated with the warehouse and Fay shaft have not deteriorated since decommissioning. To promote the re-establishment of vegetation in these areas the concrete will be fractured.

SECTION 6.0

REFERENCES

6.0 REFERENCES

ARCADIS SENES Canada Incorporated. November 2014. Surficial Gamma Radiation Survey of Disturbed Areas at the Former Beaverlodge Mine Site.

ARCADIS SENES Consultants Ltd. & Kingsmere Resource Services, January 2015. 2014 Uranium City Consultation on Land Use.

Atomic Energy Control Board. September 1982. Eldorado Nuclear Ltd., Eldorado, Saskatchewan, Decommissioning and Close-Out Approval. AECB-DCOA-130-0

Cameco Corporation. December 2012. Beaverlodge Path Forward Report.

Cameco Corporation. September 2014. Beaverlodge Project: Response to Inspection Report S14-0601-CNSC.

Eldorado Nuclear Ltd. June 1982, Decommissioning of the Beaverlodge Mine/Mill Operations and Reclamation of the Site.

Eldorado Resources Ltd. August 1983. Plan for the Close-Out of the Beaverlodge Site. August 1983, Vol. 5.

MacLaren Plansearch, for Eldorado. February 1987. Decommissioning of the Beaverlodge Mine/Mill Operations and Reclamation of the Site; Volume 6: Departure with Dignity.

SENES Consultants Ltd. February 2012. Beaverlodge Quantitative Site Model (QSM) Part A: Source Characterization and Dispersion Analysis.

SENES Consultants Ltd. February 2012. Beaverlodge Quantitative Site Model (QSM) Part B: Ecological and Human Health Risk.

SENES Consultants Ltd. December 2013. Beaverlodge Mine Site Status of the Environment 2008-2012.

SRK Consulting. February 2015. Beaverlodge – 2014 Construction Progress Report for the Zora Flow Path Reconstruction.

SRK Consulting. March 2016. 2015 External Geotechnical Inspection of the Fookes and Marie Reservoirs.

SRK Consulting. January 2016. Bolger Flow Path Reconstruction – 2015 Construction As-Built Update.

TABLES

TABLES

Table 4.3.1 – 1 AN-5 Summary Statistics and Comparison to Historical Results
Hab Site - upstream of confluence of Hab and Pistol creeks

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.4	0.3	0.3	0.4	0.4	6	0	0.1	0.2	0.6
	Ba (mg/l)	0.148	0.112	0.126	0.121	0.149	6	0	0.057	0.096	0.22
	Cu (mg/l)	0.0008	0.0018	0.0009	0.001	0.0006	6	1	0.0003	0.0002	0.001
	Fe (mg/l)	0.288	0.149	0.246	0.21	0.327	6	0	0.341	0.081	0.78
	Mo (mg/l)	0.0034	0.0033	0.0029	0.0026	0.003	6	0	0.0009	0.0019	0.0042
	Ni (mg/l)	0.00048	0.00058	0.00052	0.0007	0.0005	6	0	0.00015	0.0003	0.0007
	Pb (mg/l)	0.0001	0.0002	0.0004	0.0004	0.0003	6	3	0.0003	0.0001	0.0008
	Se (mg/l)	< 0.0001	< 0.0001	0.0001	0.0001	0.0001	6	5	0	0.0001	0.0001
	U (µg/l)	140.5	127.2	148.6	119.0	174.7	6	0	115.7	41.0	344.0
	Zn (mg/l)	0.002	0.003	0.002	0.003	0.001	6	3	0.002	0.001	0.005
M Ions	Alk (mg/l)	115.3	105.4	105.8	102.8	132.2	6	0	58.3	89	214
	Ca (mg/l)	35.8	33.6	33.6	29.8	38.8	6	0	14.9	27	60
	Cl (mg/l)	1.25	1.08	0.8	0.7	1.28	6	0	1	0.5	3
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	6	5	0	1	1
	Cond-F (µS/cm)	273	265	183	240	319	6	0	107	239	507
	Cond-L (µS/cm)	260	235	232	216	284	6	0	105	213	434
	Hardness (mg/l)	125	116	115	103	136	6	0	53	94	211
	HCO3 (mg/l)	140.5	128.6	129.2	125.5	161	6	0	71.3	108	261
	K (mg/l)	1.7	1.5	1.5	1.2	1.3	6	0	0.8	0.7	2.4
	Na (mg/l)	4.8	4.2	4	3.4	4.8	6	0	2	3.3	7.8
	OH (mg/l)	< 1	< 1	< 1	< 1	1	6	5	0	1	1
	SO4 (mg/l)	17.8	17.2	16.4	14.8	18.3	6	0	3.9	11	21
	Sum of Ions (mg/l)	211	194	193	182	235	6	0	96	168	371
Nutrient	C-(org) (mg/l)	11	11	8.1	8.2	11	2	0	0	11	11
	NH3-N (mg/l)	0.08	< 0.01	0.04	0.05	0.21	2	0	0.21	0.06	0.36
	NO3 (mg/l)	0.053	0.05	0.05	< 0.04	0.05	2	2	0.01	0.04	0.06
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	2	2	0	0.01	0.01
Phys Para	pH-L (pH Unit)	7.51	7.61	7.59	7.65	7.59	6	0	0.16	7.36	7.76
	TDS (mg/l)	183.8	158.2	149.4	143.0	184.7	6	0	60.5	141.0	268.0
	Temp-H20 (°C)	13.7	6.1	15	11.7	6.1	6	0	6.6	0.3	17.1
	TSS (mg/l)	4.8	1.2	3	1.3	2	6	3	2	1	6
Rads	Pb210 (Bq/L)	< 0.02	0.04	0.02	0.06	0.09	2	1	0.09	0.02	0.15
	Po210 (Bq/L)	0.01	0.01	0.01	0.01	0.07	2	0	0.071	0.02	0.12
	Ra226 (Bq/L)	0.96	0.55	0.93	0.66	1.07	6	0	0.69	0.45	2.00

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.1 – 2 DB-6 Summary Statistics and Comparison to Historical Results
Dubyna Site - Dubyna Creek downstream of Dubyna Lake

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.1	0.1	0.1	0.2	0.1	4	0	0	0.1	0.1
	Ba (mg/l)	0.051	0.047	0.048	0.047	0.047	4	0	0.003	0.045	0.051
	Cu (mg/l)	0.0006	0.0006	0.0007	0.0013	0.0005	4	0	0.0002	0.0003	0.0006
	Fe (mg/l)	0.012	0.017	0.017	0.024	0.014	4	0	0.005	0.009	0.019
	Mo (mg/l)	0.0022	0.0021	0.0021	0.0019	0.0021	4	0	0.0002	0.0019	0.0023
	Ni (mg/l)	0.0002	0.00018	0.00024	0.0003	0.0002	4	0	0	0.0002	0.0002
	Pb (mg/l)	< 0.0001	0.0001	0.0002	0.0001	0.0001	4	3	0	0.0001	0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	4	2	0	0.0001	0.0001
	U (µg/l)	252.4	197.333	184.2	169	192.8	4	0	40.3	140	233
	Zn (mg/l)	0.001	0.001	0.001	0.002	0.001	4	2	0	0.001	0.001
M Ions	Alk (mg/l)	90.4	90	92.4	92	89.8	4	0	4.3	85	95
	Ca (mg/l)	38.2	37.2	36.2	36.2	34.8	4	0	1	34	36
	Cl (mg/l)	0.74	0.7	0.62	0.64	0.7	4	0	0.12	0.6	0.8
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	Cond-F (µS/cm)	244	254	232	256	267	4	0	30	246	311
	Cond-L (µS/cm)	240	230	228	228	226	4	0	7	216	231
	Hardness (mg/l)	120	116	112	113	108	4	0	3	105	112
	HCO3 (mg/l)	110.2	109.8	112.6	112.4	109.5	4	0	5.2	104	116
	K (mg/l)	0.9	0.9	1	0.7	0.6	4	0	0.1	0.5	0.7
	Na (mg/l)	2.2	2.1	2.1	2	2	4	0	0.1	1.9	2.1
	OH (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	SO4 (mg/l)	28.8	26.7	25.2	24.4	24	4	0	1.6	22	26
	Sum of Ions (mg/l)	187	183	183	182	177	4	0	5	170	181
Nutrient	C-(org) (mg/l)	9.1	9.35	9.6	9.1	8.8	1	0		8.8	8.8
	NH3-N (mg/l)	0.05	0.02	0.1	0.05	0.04	1	0		0.04	0.04
	NO3 (mg/l)	0.33	0.162	0.076	0.238	0.21	1	0		0.21	0.21
	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)	7.76	7.73	7.73	7.75	7.78	4	0	0.06	7.7	7.83
	TDS (mg/l)	167	155.5	151.8	154.4	154.5	4	0	7.42	148	165
	Temp-H20 (°C)	15.2	5.3	14.1	10.3	10.5	4	0	6.6	1.8	17.7
	TSS (mg/l)	< 1	1.167	1.2	1	1	4	3	0	1	1
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	< 0.02	0.07	< 0.02	1	1		0.02	0.02
	Po210 (Bq/L)	0.006	0.008	0.007	0.009	0.008	1	0		0.008	0.008
	Ra226 (Bq/L)	0.033	0.03	0.044	0.038	0.038	4	0	0.01	0.03	0.05

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.1 – 3 AC-6A Summary Statistics and Comparison to Historical Results
Verna Site - Verna Lake discharge to Ace Lake

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		0.3	0.2	0.3	0.2	17	0	0	0.2	0.3
	Ba (mg/l)		0.019	0.022	0.024	0.021	17	0	0.001	0.019	0.024
	Cu (mg/l)		0.0017	0.001	0.0003	0.0003	17	6	0.0001	0.0002	0.0005
	Fe (mg/l)		0.095	0.028	0.036	0.011	17	0	0.009	0.004	0.034
	Mo (mg/l)		0.0007	0.001	0.0008	0.001	17	0	0.0001	0.0007	0.0012
	Ni (mg/l)		0.0003	0.0001	0.0002	0.0001	17	8	0	0.0001	0.0001
	Pb (mg/l)		< 0.0001	< 0.0001	< 0.0001	0.0001	17	16	0	0.0001	0.0001
	Se (mg/l)		0.0003	0.0001	0.0002	0.0002	17	0	0	0.0001	0.0002
	U (µg/l)		117	201	154	386.6	17	0	95.3	150	488
	Zn (mg/l)		0.001	0.001	0.001	0.001	17	15	0	0.001	0.001
M Ions	Alk (mg/l)		63	96	102.5	104.5	17	0	7.6	86	116
	Ca (mg/l)		32	42	43.5	44.5	17	0	2.8	39	49
	Cl (mg/l)		0.4	0.4	0.45	0.81	15	7	0.27	0.4	1
	CO3 (mg/l)		< 1	< 1	< 1	1	17	16	0	1	1
	Cond-F (µS/cm)		309	311	224	352	17	0	51	243	430
	Cond-L (µS/cm)		207	275	285	304	17	0	18	264	324
	Hardness (mg/l)		107	140	144	150	17	0	9	133	163
	HCO3 (mg/l)		77	117	125	127.5	17	0	9.3	105	142
	K (mg/l)		1.7	0.9	0.8	0.9	17	0	0.1	0.6	1.1
	Na (mg/l)		1.8	2.3	2.3	2.5	17	0	0.1	2.2	2.6
	OH (mg/l)		< 1	< 1	< 1	1	17	16	0	1	1
	SO4 (mg/l)		41	48	45.5	52.9	17	0	2.5	48	57
	Sum of Ions (mg/l)		161	219	226	238	17	0	15	207	260
Nutrient	C-(org) (mg/l)					7.3	1	0		7.3	7.3
	NH3-N (mg/l)					0.04	1	0		0.04	0.04
	NO3 (mg/l)		< 0.04	< 0.04	< 0.04	0.04	1	1	0	0.04	0.04
	P-(TP) (mg/l)		0.04			< 0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)		7.19	7.51	7.7	7.8	17	0	0.14	7.56	8.07
	TDS (mg/l)		203.5	175	196.5	198.12	17	0	14.37	151	221
	Temp-H20 (°C)		20.4	22.1	22.1	7.1	17	0	5.5	0.9	16.1
	TSS (mg/l)		< 1	< 1	< 1	1	17	10	0	1	1
Rads	Pb210 (Bq/L)		0.04			< 0.03	2	2	0.01	0.02	0.04
	Po210 (Bq/L)		0.03			0.005	2	0	0.007	0.001	0.01
	Ra226 (Bq/L)		0.085	0.14	0.15	0.108	17	0	0.014	0.08	0.14

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Ace Lake discharge at weir

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.2	0.1	0.2	0.2	0.2	2	0	0.1	0.1	0.2
	Ba (mg/l)	0.025	0.023	0.024	0.024	0.024	2	0	0.001	0.023	0.024
	Cu (mg/l)	0.0005	0.0003	0.0005	0.0005	0.0008	2	0	0.0008	0.0002	0.0014
	Fe (mg/l)	0.027	0.034	0.037	0.033	0.041	2	0	0.019	0.027	0.054
	Mo (mg/l)	0.001	0.001	0.001	0.0009	0.001	2	0	0.0001	0.0009	0.001
	Ni (mg/l)	0.00015	0.00013	0.00015	0.0002	0.0002	2	0	0	0.0002	0.0002
	Pb (mg/l)	< 0.0001	< 0.0001	0.0005	< 0.0001	0.0003	2	0	0.0002	0.0001	0.0004
	Se (mg/l)	0.0002	0.0001	< 0.0001	< 0.0001	0.0001	2	1	0	0.0001	0.0001
	U (µg/l)	16.5	13.5	11.5	11.5	13.5	2	0	2.1	12	15
	Zn (mg/l)	< 0.001	< 0.001	0.001	0.001	0.003	2	1	0.004	0.001	0.006
M Ions	Alk (mg/l)	52	50.5	52	52.5	53	2	0	4.2	50	56
	Ca (mg/l)	17.5	16.8	17.5	16.5	17	2	0	1.4	16	18
	Cl (mg/l)	1.3	1.08	0.95	0.9	0.95	2	0	0.21	0.8	1.1
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	2	1	0	1	1
	Cond-F (µS/cm)	130	136	130	132	131	2	0	11	124	139
	Cond-L (µS/cm)	122	115	116	119	121	2	0	7	116	126
	Hardness (mg/l)	58	55	58	55	55	2	0	6	50	59
	HCO3 (mg/l)	63.5	61.5	63.5	64	64.5	2	0	4.9	61	68
	K (mg/l)	0.7	0.8	0.9	0.8	0.6	2	0	0.1	0.5	0.7
	Na (mg/l)	1.5	1.6	1.6	1.5	1.5	2	0	0.1	1.4	1.6
	OH (mg/l)	< 1	< 1	< 1	< 1	1	2	1	0	1	1
	SO4 (mg/l)	7	6.9	6.8	6.9	7	2	0	0.4	6.7	7.2
	Sum of Ions (mg/l)	95	92	95	94	94	2	0	8	88	100
Nutrient	C-(org) (mg/l)	6	8.1	6.8	6.8	7	1	0		7	7
	NH3-N (mg/l)	0.07	0.02	0.06	0.04	0.06	1	0		0.06	0.06
	NO3 (mg/l)	0.085	0.12	0.175	0.24	0.04	1	1	0	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)	7.48	7.62	7.55	7.54	7.52	2	0	0.22	7.36	7.67
	TDS (mg/l)	81.5	78	74	86	80.5	2	0	4.95	77	84
	Temp-H20 (°C)	6.2	5.2	4.7	5.2	5.8	2	0	6.9	0.9	10.6
	TSS (mg/l)	< 1	< 1	< 1	< 1	2	2	1	1.4	1.0	3.0
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	0.008	< 0.005	< 0.005	0.006	1	0		0.006	0.006
	Ra226 (Bq/L)	0.015	0.009	0.02	0.02	0.03	2	0	0	0.03	0.03

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.1 – 5 AC-14 Summary Statistics and Comparison to Historical Results

Ace Creek discharge to Beaverlodge Lake

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	11	0	0	0.1	0.2
	Ba (mg/l)	0.026	0.024	0.024	0.025	0.026	11	0	0.002	0.024	0.028
	Cu (mg/l)	0.0012	0.0005	0.0005	0.001	0.0006	11	1	0.0004	0.0002	0.0015
	Fe (mg/l)	0.074	0.07	0.065	0.082	0.062	11	0	0.023	0.03	0.099
	Mo (mg/l)	0.0011	0.001	0.001	0.001	0.001	11	0	0.0001	0.0008	0.0011
	Ni (mg/l)	0.00024	0.00023	0.00022	0.0003	0.0002	11	0	0.00004	0.0001	0.0003
	Pb (mg/l)	0.0005	0.0003	0.0005	0.0006	0.0004	11	2	0.0004	0.0001	0.0015
	Se (mg/l)	0.0002	0.0001	0.0001	0.0001	0.0002	11	1	0.0001	0.0001	0.0003
	U (µg/l)	33.2	34.9	25.5	28.0	33.1	11	0	17.9	13.0	79.0
	Zn (mg/l)	0.002	0.001	0.001	0.003	0.001	11	7	0.001	0.001	0.002
M Ions	Alk (mg/l)	53.2	53	52.5	52.3	53.6	11	0	2.6	50	58
	Ca (mg/l)	18	18.2	17.5	17.2	17.5	11	0	1.2	16	20
	Cl (mg/l)	2	1.68	1.24	1.19	1.25	11	0	0.21	0.9	1.6
	CO3 (mg/l)	1.3	< 1	< 1	< 1	< 1	11	11	0	1	1
	Cond-F (µS/cm)	160	141	133	157	133	11	0	20	75	148
	Cond-L (µS/cm)	132	129	126	124	126	11	0	6	119	142
	Hardness (mg/l)	59	60	57	57	58	11	0	4	53	65
	HCO3 (mg/l)	64.2	64.7	63.9	63.8	65.4	11	0	3.3	61	71
	K (mg/l)	0.8	0.8	0.8	0.7	0.6	11	0	0.1	0.5	0.8
	Na (mg/l)	2.3	2.2	1.9	1.9	1.9	11	0	0.4	1.5	2.7
	OH (mg/l)	< 1	< 1	< 1	< 1	< 1	11	11	0	1	1
	SO4 (mg/l)	9.1	9.5	8.3	8.5	8.6	11	0	1.7	7.4	13
	Sum of Ions (mg/l)	100	101	97	97	99	11	0	6	91	112
Nutrient	C-(org) (mg/l)	7.4	8.3	8.6	7.8	7.1	3	0	0.5	6.6	7.5
	NH3-N (mg/l)	0.05	0.09	0.08	0.07	0.07	3	0	0.01	0.06	0.08
	NO3 (mg/l)	0.13	0.09	0.15	0.14	0.24	3	1	0.15	0.04	0.39
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	0.01	3	2	0	0.01	0.01
Phys Para	pH-L (pH Unit)	7.74	7.72	7.61	7.73	7.71	11	0	0.09	7.52	7.84
	TDS (mg/l)	86.82	87.08	82.73	81	83.82	11	0	3.25	78	88
	Temp-H20 (°C)	8.8	6.5	7.4	7.3	8.1	11	0	8.4	0.3	20.9
	TSS (mg/l)	1.27	1.08	1.182	1.25	1.36	11	5	0.51	1.00	2.00
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	0.03	0.03	0.02	3	1	0.01	0.02	0.03
	Po210 (Bq/L)	0.008	0.008	0.008	0.012	0.008	3	0	0.003	0.005	0.01
	Ra226 (Bq/L)	0.072	0.043	0.055	0.057	0.075	11	0	0.029	0.03	0.11

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Note: December 2013 sample for AC-14 was taken in the wrong location, station was resampled in January 2014 and those results were used in the calculation of 2013 averages.

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

Fulton Lake discharge

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		0.1	0.1	< 0.1	0.1	1	0		0.1	0.1
	Ba (mg/l)		0.017	0.017	0.017	0.016	1	0		0.016	0.016
	Cu (mg/l)		0.0005	0.0007	0.0005	< 0.0002	1	1		0.0002	0.0002
	Fe (mg/l)		0.011	0.016	0.01	0.008	1	0		0.008	0.008
	Mo (mg/l)		0.0019	0.0017	0.0015	0.0017	1	0		0.0017	0.0017
	Ni (mg/l)		0.0002	0.0003	0.0002	0.0002	1	0		0.0002	0.0002
	Pb (mg/l)		< 0.0001	0.0009	< 0.0001	< 0.0001	1	1		0.0001	0.0001
	Se (mg/l)		< 0.0001	< 0.0001	< 0.0001	< 0.0001	1	1		0.0001	0.0001
	U (µg/l)		1.6	1.6	1.4	1.7	1	0		1.7	1.7
	Zn (mg/l)		0.003	0.001	< 0.001	< 0.001	1	1		0.001	0.001
M Ions	Alk (mg/l)		71	72	76	70	1	0		70	70
	Ca (mg/l)		21	21	20	20	1	0		20	20
	Cl (mg/l)		0.7	0.6	0.6	0.6	1	0		0.6	0.6
	CO3 (mg/l)		< 1	< 1	< 1	< 1	1	1		1	1
	Cond-F (µS/cm)		158	159	54	144	1	0		144	144
	Cond-L (µS/cm)		144	145	145	146	1	0		146	146
	Hardness (mg/l)		72	72	70	69	1	0		69	69
	HCO3 (mg/l)		87	88	93	85	1	0		85	85
	K (mg/l)		0.9	0.9	0.6	0.6	1	0		0.6	0.6
	Na (mg/l)		2	2	1.9	1.8	1	0		1.8	1.8
	OH (mg/l)		< 1	< 1	< 1	< 1	1	1		1	1
	SO4 (mg/l)		4.5	4.4	4.3	4.2	1	0		4.2	4.2
	Sum of Ions (mg/l)		121	122	125	117	1	0		117	117
Nutrient	C-(org) (mg/l)		7.6	7.1	7.5	7.5	1	0		7.5	7.5
	NH3-N (mg/l)		0.02	0.05	0.06	0.08	1	0		0.08	0.08
	NO3 (mg/l)		< 0.04	< 0.04	< 0.04	< 0.04	1	1		0.04	0.04
	P-(TP) (mg/l)		< 0.01	< 0.01	< 0.01	< 0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)		7.63	7.68	7.77	7.86	1	0		7.86	7.86
	TDS (mg/l)		105	90	97	93	1	0		93	93
	Temp-H20 (°C)		11.8	12.2	10.1	11.4	1	0		11.4	11.4
	TSS (mg/l)		< 1	< 1	< 1	2	1	0		2	2
Rads	Pb210 (Bq/L)		< 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	1	1		0.005	0.005
	Ra226 (Bq/L)		0.006	< 0.005	< 0.005	0.008	1	0		0.008	0.008

*No water available for collection in 2010 or 2011

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.2 – 2 TL-3 Summary Statistics and Comparison to Historical Results
Fookes Reservoir discharge

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		1	1	0.9	0.8	4	0	0.1	0.6	0.9
	Ba (mg/l)		0.036	0.037	0.036	0.037	4	0	0.001	0.036	0.038
	Cu (mg/l)		0.0016	0.0013	0.001	0.0009	4	0	0.0002	0.0006	0.0011
	Fe (mg/l)		0.011	0.01	0.012	0.011	4	0	0.003	0.007	0.015
	Mo (mg/l)		0.0173	0.017	0.0143	0.0127	4	0	0.002	0.0098	0.014
	Ni (mg/l)		0.0003	0.00035	0.0003	0.00033	4	0	0.00005	0.0003	0.0004
	Pb (mg/l)		0.0007	0.0006	0.0005	0.0004	4	0	0.0002	0.0002	0.0006
	Se (mg/l)		0.0043	0.004	0.0032	0.0027	4	0	0.0006	0.0018	0.003
	U (µg/l)		387.7	372.0	316.8	271.8	4	0	57.2	186.0	303.0
	Zn (mg/l)		0.001	0.001	0.001	0.001	4	2	0	0.001	0.001
M Ions	Alk (mg/l)		140.3	142.8	137.3	138	4	0	8.1	130	145
	Ca (mg/l)		27.3	27.8	27.5	29	4	0	3.8	26	34
	Cl (mg/l)		4.33	3.75	3.25	3.25	4	0	0.5	3	4
	CO3 (mg/l)		< 1	< 1	< 1	1	4	3	0	1	1
	Cond-F (µS/cm)		386	416	345	343	4	0	37	292	371
	Cond-L (µS/cm)		353	346	331	329	4	0	12	318	346
	Hardness (mg/l)		91	92	91	97	4	0	14	86	115
	HCO3 (mg/l)		171	174	167.5	167.8	4	0	10.9	156	177
	K (mg/l)		1.4	1.4	1	1.1	4	0	0.3	0.8	1.4
	Na (mg/l)		43.7	40.8	36.3	33	4	0	6	24	36
	OH (mg/l)		< 1	< 1	< 1	< 1	4	4	0	1	1
	SO4 (mg/l)		43	40.5	34.8	32	4	0	4	26	34
	Sum of Ions (mg/l)		296	294	276	272	4	0	11	263	287
Nutrient	C-(org) (mg/l)		8.5	7.2	7.3	7.3	1	0		7.3	7.3
	NH3-N (mg/l)		< 0.01	0.04	0.05	0.06	1	0		0.06	0.06
	NO3 (mg/l)		< 0.04	< 0.04	0.053	0.04	1	1	0	0.04	0.04
	P-(TP) (mg/l)		< 0.01	< 0.01	< 0.01	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)		8.11	8.09	8.05	8.06	4	0	0.21	7.88	8.34
	TDS (mg/l)		227.67	216.5	207.75	204.75	4	0	9.46	194	217
	Temp-H20 (°C)		10.7	11.5	8.2	8.9	4	0	9.9	0.3	21.8
	TSS (mg/l)		1.333	< 1	1	1.5	4	2	0.6	1	2
Rads	Pb210 (Bq/L)		0.08	0.11	0.07	0.1	1	0		0.1	0.1
	Po210 (Bq/L)		0.04	0.04	0.04	0.04	1	0		0.04	0.04
	Ra226 (Bq/L)		1.3	1.3	1.2	1.4	4	0	0.1	1.3	1.5

*No water available for collection in 2011

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Marie Reservoir Outflow

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		1.9	1.6	1.4	1.5	4	0	0.4	1.2	2
	Ba (mg/l)		0.077	0.079	0.073	0.081	4	0	0.01	0.069	0.092
	Cu (mg/l)		0.0006	0.0007	0.0007	0.0007	4	0	0.0006	0.0002	0.0012
	Fe (mg/l)		0.099	0.033	0.024	0.058	4	0	0.082	0.008	0.18
	Mo (mg/l)		0.0097	0.0106	0.011	0.0102	4	0	0.0012	0.0092	0.012
	Ni (mg/l)		0.00057	0.00058	0.0006	0.00058	4	0	0.0001	0.0005	0.0007
	Pb (mg/l)		0.0003	0.0006	0.0003	0.0003	4	0	0.0001	0.0002	0.0004
	Se (mg/l)		0.002	0.002	0.0021	0.0017	4	0	0.0002	0.0014	0.0019
	U (µg/l)		270.0	291.3	280.3	241.0	4	0	47.1	178.0	287.0
	Zn (mg/l)		< 0.001	0.001	0.001	0.001	4	2	0.001	0.001	0.002
M Ions	Alk (mg/l)		139.3	143.3	141.5	135.8	4	0	19.8	121	164
	Ca (mg/l)		18	21.3	24	21.8	4	0	4.8	18	28
	Cl (mg/l)		4	3.75	3.45	3.1	4	0	0.62	2.6	4
	CO3 (mg/l)		< 1	< 1	< 1	< 1	4	4	0	1	1
	Cond-F (µS/cm)		357	393	359	361	4	0	55	305	435
	Cond-L (µS/cm)		329	334	333	321	4	0	42	291	381
	Hardness (mg/l)		68	76	83	77	4	0	15	65	96
	HCO3 (mg/l)		170	174.8	172.5	165.8	4	0	24.1	148	200
	K (mg/l)		1.5	1.5	1.1	1.2	4	0	0.2	0.9	1.4
	Na (mg/l)		47.7	45	40.5	39.3	4	0	4	36	45
	OH (mg/l)		< 1	< 1	< 1	< 1	4	4	0	1	1
	SO4 (mg/l)		33.3	32.8	32	29.5	4	0	3.7	26	34
	Sum of Ions (mg/l)		280	285	280	266	4	0	38	238	319
Nutrient	C-(org) (mg/l)		12	9.9	8.3	9.2	1	0		9.2	9.2
	NH3-N (mg/l)		0.03	0.12	0.06	0.08	1	0		0.08	0.08
	NO3 (mg/l)		< 0.04	0.04	0.053	< 0.04	1	1	0	0.04	0.04
	P-(TP) (mg/l)		< 0.01	< 0.01	< 0.01	< 0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)		7.97	8.06	8.05	8.03	4	0	0.19	7.92	8.31
	TDS (mg/l)		219.67	213.75	208.5	202.25	4	0	27.77	180	242
	Temp-H20 (°C)		10.8	11.4	8.2	8.3	4	0	9.3	0.5	21.1
	TSS (mg/l)		1.333	< 1	1.25	1.25	4	3	0.5	1	2
Rads	Pb210 (Bq/L)		0.02	0.06	0.08	0.04	1	0		0.04	0.04
	Po210 (Bq/L)		0.03	0.02	0.02	0.03	1	0		0.03	0.03
	Ra226 (Bq/L)		1.57	1.93	1.78	2.08	4	0	0.46	1.60	2.60

*No water available for collection in 2011

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.2 – 4 TL-6 Summary Statistics and Comparison to Historical Results
Minewater Reservoir discharge

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		3.3	3	4.4	4	3	0	2.1	1.8	5.9
	Ba (mg/l)		1.165	1.26	1.145	0.893	3	0	0.311	0.57	1.19
	Cu (mg/l)		0.0008	0.0006	0.0009	0.0003	3	1	0.0001	0.0002	0.0004
	Fe (mg/l)		3.543	1.79	3.53	4.887	3	0	4.187	0.97	9.3
	Mo (mg/l)		0.0018	0.0016	0.0019	0.001	3	0	0.001	0.0004	0.0022
	Ni (mg/l)		0.00045	0.0005	0.0006	0.00043	3	0	0.00006	0.0004	0.0005
	Pb (mg/l)		0.001	0.0002	0.0011	0.0002	3	0	0.0001	0.0001	0.0003
	Se (mg/l)		0.0052	0.0025	0.0033	0.0019	3	0	0.0007	0.0011	0.0024
	U (µg/l)		237.5	225.0	284.5	143.7	3	0	150.5	33.0	315.0
	Zn (mg/l)		0.001	0.001	0.002	0.001	3	0	0	0.001	0.001
M Ions	Alk (mg/l)		286	288	310	281.3	3	0	84.8	193	362
	Ca (mg/l)		41.8	55	46.5	42.7	3	0	3.5	39	46
	Cl (mg/l)		59.5	47	49.5	47.67	3	0	11.72	39	61
	CO3 (mg/l)		< 1	< 1	< 1	< 1	3	3	0	1	1
	Cond-F (µS/cm)		1029	841	946	945	2	0	25	927	963
	Cond-L (µS/cm)		780	790	838	743	3	0	192	525	887
	Hardness (mg/l)		152	186	167	156	3	0	16	138	168
	HCO3 (mg/l)		348.8	351	378	343	3	0	103.8	235	442
	K (mg/l)		3.4	2.8	2.6	2.3	3	0	0.4	2	2.8
	Na (mg/l)		122.8	108	129	105	3	0	41.6	59	140
	OH (mg/l)		< 1	< 1	< 1	< 1	3	3	0	1	1
	SO4 (mg/l)		53.5	62	74.5	45	3	0	28.7	26	78
	Sum of Ions (mg/l)		641	638	693	598	3	0	167	411	732
Nutrient	C-(org) (mg/l)		39	36	34	32	1	0		32	32
	NH3-N (mg/l)		0.08	0.12	0.11	0.16	1	0		0.16	0.16
	NO3 (mg/l)		0.075	< 0.04	0.065	0.13	1	0	0	0.13	0.13
	P-(TP) (mg/l)		0.01	0.01	0.02	0.02	1	0		0.02	0.02
Phys Para	pH-L (pH Unit)		7.73	7.87	8	7.8	3	0	0.23	7.62	8.05
	TDS (mg/l)		541.8	532	596.5	501.7	3	0	154.5	328	624
	Temp-H20 (°C)		9.7	16.4	16.5	8.6	3	0	4.5	5.5	13.7
	TSS (mg/l)		8	2	6.5	7.667	3	0	5.686	3	14
Rads	Pb210 (Bq/L)		0.11	0.07	0.14	0.08	1	0		0.08	0.08
	Po210 (Bq/L)		0.09	0.05	0.09	0.03	1	0		0.03	0.03
	Ra226 (Bq/L)		5.4	7.9	9.6	5.3	3	0	1.5	3.8	6.7

*No water available for collection in 2011

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.2 – 5 TL-7 Summary Statistics and Comparison to Historical Results
Discharge of Meadow Fen upstream of Greer Lake

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	1.1	1.7	1.5	1.3	1.3	9	0	0.2	1.1	1.6
	Ba (mg/l)	0.352	0.199	0.228	0.205	0.366	9	0	0.279	0.12	0.76
	Cu (mg/l)	0.0006	0.0008	0.0006	0.0007	0.0005	9	1	0.0002	0.0002	0.0007
	Fe (mg/l)	0.092	0.148	0.056	0.047	0.066	9	0	0.047	0.017	0.14
	Mo (mg/l)	0.008	0.0092	0.0097	0.0104	0.0094	9	0	0.0032	0.0064	0.017
	Ni (mg/l)	0.00062	0.00069	0.00055	0.0005	0.00053	9	0	0.00007	0.0004	0.0006
	Pb (mg/l)	0.0002	0.0004	0.0005	0.0003	0.0002	9	0	0.0001	0.0001	0.0004
	Se (mg/l)	0.0055	0.0033	0.0019	0.0023	0.0019	9	0	0.0003	0.0016	0.0025
	U (µg/l)	196.8	264.3	253.5	272.5	226.6	9	0	75.8	111.0	310.0
	Zn (mg/l)	0.001	0.001	0.001	0.001	0.001	9	7	0	0.001	0.001
M Ions	Alk (mg/l)	148.3	138.1	138.3	140.1	139.9	9	0	14.7	125	176
	Ca (mg/l)	41.8	25.8	21.4	23.7	24	9	0	2.8	20	29
	Cl (mg/l)	10.55	13.59	4.75	4.38	7.89	9	0	7.67	4	28
	CO3 (mg/l)	< 1	< 1	< 1	< 1	< 1	9	9	0	1	1
	Cond-F (µS/cm)	520	434	323	343	350	9	0	77	217	480
	Cond-L (µS/cm)	475	369	328	329	341	9	0	41	301	429
	Hardness (mg/l)	140	92	77	82	85	9	0	10	73	104
	HCO3 (mg/l)	180.8	168.5	168.8	170.8	170.7	9	0	18.1	152	215
	K (mg/l)	2.4	1.7	1.4	1.2	1.1	9	0	0.3	0.5	1.4
	Na (mg/l)	47.2	45	42.9	39.9	40.4	9	0	4.7	35	50
	OH (mg/l)	< 1	< 1	< 1	< 1	< 1	9	9	0	1	1
	SO4 (mg/l)	86.3	38	30.4	30.4	29	9	0	4	24	37
	Sum of Ions (mg/l)	378	299	275	276	279	9	0	30	251	343
Nutrient	C-(org) (mg/l)	11	13	10.133	9.45	9.1	3	0	0.866	8.1	9.6
	NH3-N (mg/l)	0.21	0.03	0.06	0.06	0.07	3	0	0.02	0.05	0.09
	NO3 (mg/l)	0.277	0.04	0.04	0.095	0.11	3	2	0.10	0.04	0.26
	P-(TP) (mg/l)	0.01	< 0.01	< 0.01	0.01	< 0.01	3	3	0	0.01	0.01
Phys Para	pH-L (pH Unit)	7.99	7.82	7.88	7.93	7.92	9	0	0.1	7.79	8.1
	TDS (mg/l)	309.5	239.38	211.5	208.09	214.44	9	0	25.66	184	259
	Temp-H20 (°C)	10.7	8.4	12.1	9.4	8	9	0	7.4	0.2	19.1
	TSS (mg/l)	1.3	1	< 1	1	1.2	9	6	0.4	1	2
Rads	Pb210 (Bq/L)	< 0.02	0.05	0.04	0.03	0.04	3	0	0.01	0.03	0.05
	Po210 (Bq/L)	0.015	0.06	0.033	0.02	0.017	3	0	0.012	0.01	0.03
	Ra226 (Bq/L)	0.86	0.88	1.55	1.65	1.67	9	0	0.53	1.10	2.40

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Greer Lake discharge at Beaverlodge Lake

	Previous Period Averages					Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)		1.9	1.9	1.6	1.6	8	0	0.4	1.2	2.3
	Ba (mg/l)		1.099	1.089	0.67	0.655	8	0	0.128	0.39	0.79
	Cu (mg/l)		0.0008	0.0009	0.0008	0.0008	8	0	0.0004	0.0002	0.0014
	Fe (mg/l)		0.055	0.054	0.065	0.037	8	0	0.024	0.008	0.075
	Mo (mg/l)		0.0144	0.0127	0.0109	0.0105	8	0	0.0012	0.0095	0.013
	Ni (mg/l)		0.00044	0.00049	0.0005	0.00041	8	0	0.00008	0.0003	0.0005
	Pb (mg/l)		0.0009	0.0008	0.0008	0.0008	8	0	0.0006	0.0002	0.0016
	Se (mg/l)		0.0045	0.0028	0.0028	0.004	8	0	0.0012	0.0026	0.0059
	U (µg/l)		349.3	289.2	267.8	244.5	8	0	112.9	138	480
	Zn (mg/l)		0.001	0.001	0.002	0.001	8	3	0	0.001	0.002
M Ions	Alk (mg/l)		152.6	156.1	143.2	125.5	8	0	13.7	106	149
	Ca (mg/l)		24.8	26.6	25.3	20.8	8	0	4.8	14	29
	Cl (mg/l)		9	6.9	4.52	4.6	8	0	1.83	1.5	6.8
	CO3 (mg/l)		< 1	< 1	< 1	< 1	8	8	0	1	1
	Cond-F (µS/cm)		439	393	423	312	8	0	78	137	402
	Cond-L (µS/cm)		374	366	330	299	8	0	26	255	342
	Hardness (mg/l)		93	95	88	77	8	0	13	58	100
	HCO3 (mg/l)		186	190.5	174.7	153.3	8	0	16.8	129	182
	K (mg/l)		1.8	1.7	1.2	1	8	0	0.2	0.8	1.2
	Na (mg/l)		46.8	43.9	38.6	35.8	8	0	1.6	34	39
	OH (mg/l)		< 1	< 1	< 1	< 1	8	8	0	1	1
	SO4 (mg/l)		34.9	30.6	28.3	25.1	8	0	2.2	23	29
	Sum of Ions (mg/l)		311	307	279	247	8	0	25	214	292
Nutrient	C-(org) (mg/l)		14	11.333	10	8.5	2	0	2.121	7	10
	NH3-N (mg/l)		0.07	0.12	0.07	0.07	2	0	0.03	0.05	0.09
	NO3 (mg/l)		0.236	0.24	0.31	0.945	2		0.855	0.09	1.8
	P-(TP) (mg/l)		0.01	0.01	< 0.01	0.01	2	1	0	0.01	0.01
Phys Para	pH-L (pH Unit)		7.99	8	8.08	8.02	8	0	0.15	7.76	8.16
	TDS (mg/l)		250.38	237.3	210.3	189.5	8	0	14.72	174	218
	Temp-H20 (°C)		8.6	9.2	9.6	9.6	8	0	6.5	1.8	16.7
	TSS (mg/l)		1.625	1.4	2	1.5	8	3	0.756	1	3
Rads	Pb210 (Bq/L)		0.08	0.13	0.06	0.09	2	0	0.05	0.05	0.12
	Po210 (Bq/L)		0.06	0.043	0.04	0.065	2	0	0.049	0.03	0.1
	Ra226 (Bq/L)		2.45	2.94	2.48	2.28	8	0	0.41	1.90	3.20

*No water available for collection in 2011

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.3 – 1 BL-3 Summary Statistics and Comparison to Historical Results
Beaverlodge Lake - 100m out from TL-9

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.3	0.3	0.3	0.3	0.3	4	0	0.1	0.2	0.3
	Ba (mg/l)	0.035	0.037	0.043	0.042	0.044	4	0	0.005	0.038	0.051
	Cu (mg/l)	0.0027	0.0009	0.0027	0.002	0.0009	4	0	0.0006	0.0002	0.0016
	Fe (mg/l)	0.008	0.003	0.011	0.007	0.007	4	0	0.003	0.003	0.01
	Mo (mg/l)	0.0038	0.0037	0.0038	0.0036	0.0037	4	0	0.0002	0.0035	0.004
	Ni (mg/l)	0.00348	0.0014	0.00558	0.0037	0.00308	4	0	0.00236	0.0003	0.0055
	Pb (mg/l)	0.0003	0.0001	0.0004	0.0002	0.0001	4	2	0	0.0001	0.0001
	Se (mg/l)	0.0028	0.0027	0.0027	0.0025	0.0026	4	0	0.0002	0.0024	0.0028
	U (µg/l)	140.5	138.0	141.3	135.0	138.0	4	0	11.0	128.0	153.0
	Zn (mg/l)	0.006	0.002	0.004	0.004	0.003	4	0	0.002	0.001	0.005
M Ions	Alk (mg/l)	70.7	72.3	73	73.5	72.5	4	0	5.3	68	78
	Ca (mg/l)	21.8	21.8	22.3	22	21.5	4	0	1.3	20	23
	Cl (mg/l)	13.5	13.25	12.75	12.5	12.5	4	0	0.58	12	13
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	Cond-F (µS/cm)	287	227	287	244	261	4	0	11	250	276
	Cond-L (µS/cm)	250	245	246	249	251	4	0	13	240	264
	Hardness (mg/l)	77	77	78	77	76	4	0	4	71	81
	HCO3 (mg/l)	86	88	89	89.5	88.5	4	0	6.4	83	95
	K (mg/l)	1.1	1.2	1.3	1	1	4	0	0.2	0.7	1.2
	Na (mg/l)	19.8	19.5	19.8	19.3	19	4	0	1.2	18	20
	OH (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	SO4 (mg/l)	33	32.8	32.5	31	31.5	4	0	1.9	30	34
	Sum of Ions (mg/l)	178	182	183	181	180	4	0	12	169	190
Nutrient	C-(org) (mg/l)	3.8	3.4	4.8	3.2	3.2	1	0		3.2	3.2
	NH3-N (mg/l)	0.21	0.08	0.08	0.05	0.07	1	0		0.07	0.07
	NO3 (mg/l)	0.057	< 0.04	0.045	0.075	0.04	1	1	0	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)	7.79	7.8	7.8	7.79	7.83	4	0	0.13	7.71	7.96
	TDS (mg/l)	151.33	147.5	142.75	144.75	144.5	4	0	7.59	137	152
	Temp-H20 (°C)	7	7.7	10.7	7	8.1	4	0	9	0.4	19.2
	TSS (mg/l)	< 1	1	< 1	< 1	1	4	2	0	1	1
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	0.03	< 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)	0.023	0.025	0.053	0.055	0.065	4	0	0.019	0.04	0.08

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Beaverlodge Lake - middle - composite of top, middle, bottom

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.3	0.3	0.2	0.3	0.3	2	0	0	0.3	0.3
	Ba (mg/l)	0.034	0.034	0.035	0.035	0.033	2	0	0	0.033	0.033
	Cu (mg/l)	0.0012	0.0017	0.0019	0.0016	0.0016	2	0	0.0016	0.0004	0.0027
	Fe (mg/l)	0.003	0.005	0.015	0.006	0.005	2	0	0.002	0.004	0.007
	Mo (mg/l)	0.0044	0.0038	0.0036	0.0035	0.0036	2	0	0.0001	0.0035	0.0036
	Ni (mg/l)	0.0022	0.0024	0.00245	0.0018	0.00835	2	0	0.00799	0.0027	0.014
	Pb (mg/l)	< 0.0001	0.0002	0.0005	0.0002	0.0001	2	1	0	0.0001	0.0001
	Se (mg/l)	0.0028	0.0027	0.0027	0.0026	0.0025	2	0	0.0001	0.0024	0.0025
	U (µg/l)	142.0	138.5	137.5	135.0	130.5	2	0	2.1	129.0	132.0
	Zn (mg/l)	0.002	0.004	0.005	0.004	0.003	2	0	0.002	0.001	0.005
M Ions	Alk (mg/l)	67.5	69.5	71	72.5	70	2	0	2.8	68	72
	Ca (mg/l)	21.5	21.5	21.5	21	22	2	0	0	22	22
	Cl (mg/l)	14	14	13	13	13	2	0	0	13	13
	CO3 (mg/l)	< 1	< 1	< 1	< 1	< 1	2	2	0	1	1
	Cond-F (µS/cm)	294	266	305	285	295	2	0	26	276	313
	Cond-L (µS/cm)	246	241	241	245	245	2	0	7	240	250
	Hardness (mg/l)	76	76	76	75	78	2	0	1	77	78
	HCO3 (mg/l)	82	85	86.5	88.5	85.5	2	0	3.5	83	88
	K (mg/l)	1.1	1.3	1.3	1	1	2	0	0	1	1
	Na (mg/l)	19.5	20	19.5	19	19	2	0	0	19	19
	OH (mg/l)	< 1	< 1	< 1	< 1	< 1	2	2	0	1	1
	SO4 (mg/l)	32.5	33.5	33	31.5	31.5	2	0	0.7	31	32
	Sum of Ions (mg/l)	176	181	180	180	178	2	0	3	176	180
Nutrient	C-(org) (mg/l)	3.4	3.45	3.85	3.7	3.1	2	0	0.141	3	3.2
	NH3-N (mg/l)	0.09	0.04	0.08	0.08	0.05	2	0	0.03	0.03	0.07
	NO3 (mg/l)	0.42	< 0.04	< 0.04	0.085	0.14	2	1	0.141	0.04	0.24
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	2	2	0	0.01	0.01
Phys Para	pH-L (pH Unit)	7.7	7.84	7.79	7.75	7.81	2	0	0.09	7.74	7.87
	TDS (mg/l)	143	140.5	142	145	139.5	2	0	2.12	138	141
	Temp-H20 (°C)	6.9	6.8	6.7	5.6	5.9	2	0	8.1	0.1	11.6
	TSS (mg/l)	< 1	< 1	< 1	1	< 1	2	2	0	1	1
Rads	Pb210 (Bq/L)	0.03	< 0.02	< 0.02	< 0.02	0.02	2	1	0	0.02	0.02
	Po210 (Bq/L)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	2	2	0	0.005	0.005
	Ra226 (Bq/L)	0.025	0.03	0.025	0.025	0.035	2	0	0.007	0.03	0.04

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Beaverlodge Lake Outlet

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.3	0.3	0.2	0.3	0.2	4	0	0.1	0.2	0.3
	Ba (mg/l)	0.038	0.034	0.034	0.036	0.035	4	0	0.002	0.033	0.038
	Cu (mg/l)	0.0009	0.0003	0.0004	0.0006	0.0002	4	3	0	0.0002	0.0002
	Fe (mg/l)	0.008	0.001	0.006	0.006	0.003	4	0	0.002	0.001	0.006
	Mo (mg/l)	0.0035	0.0038	0.0037	0.0037	0.0037	4	0	0.0002	0.0035	0.0039
	Ni (mg/l)	0.0002	0.00018	0.0002	0.0002	0.0002	4	0	0	0.0002	0.0002
	Pb (mg/l)	0.0001	< 0.0001	0.0004	0.0002	0.0001	4	3	0	0.0001	0.0001
	Se (mg/l)	0.0024	0.0028	0.0027	0.0027	0.0025	4	0	0.0001	0.0024	0.0027
	U (µg/l)	143.3	139.3	136.7	139.8	136.5	4	0	10.5	127.0	151.0
	Zn (mg/l)	0.001	0.001	0.001	0.002	0.001	4	3	0	0.001	0.001
M Ions	Alk (mg/l)	66.7	70.5	69.7	73.4	71.8	4	0	4.3	68	76
	Ca (mg/l)	21	21.8	21.3	21.8	21.3	4	0	1.5	20	23
	Cl (mg/l)	11.47	14	13	13.2	12.75	4	0	0.5	12	13
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	Cond-F (µS/cm)	213	318	288	313	281	4	0	25	250	308
	Cond-L (µS/cm)	227	248	241	255	249	4	0	12	237	262
	Hardness (mg/l)	73	77	75	77	75	4	0	5	70	80
	HCO3 (mg/l)	81.3	86	85	89.8	87.8	4	0	5.5	83	93
	K (mg/l)	1.1	1.2	1.2	1	0.9	4	0	0.2	0.8	1.1
	Na (mg/l)	16	20	19.3	19.8	19	4	0	1.2	18	20
	OH (mg/l)	< 1	< 1	< 1	< 1	1	4	3	0	1	1
	SO4 (mg/l)	27	33.5	32	32.4	31.8	4	0	2.1	30	34
	Sum of Ions (mg/l)	163	182	177	184	179	4	0	11	169	189
Nutrient	C-(org) (mg/l)	2.9	3.3	3.4	3.9	3	1	0		3	3
	NH3-N (mg/l)	0.06	< 0.01	0.09	0.08	0.06	1	0		0.06	0.06
	NO3 (mg/l)	1.067	< 0.04	< 0.04	0.058	0.04	1	1	0	0.04	0.04
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)	7.65	7.84	7.79	7.82	7.85	4	0	0.11	7.72	7.95
	TDS (mg/l)	135.33	145.5	139.33	148.8	142.5	4	0	6.45	136	149
	Temp-H20 (°C)	7.9	7.5	9.1	5.6	7.7	4	0	8	0.2	17.1
	TSS (mg/l)	2.333	1	< 1	1.2	1	4	3	0	1	1
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	< 0.02	0.03	0.02	1	0		0.02	0.02
	Po210 (Bq/L)	< 0.005	< 0.005	< 0.005	< 0.005	0.005	1	0		0.005	0.005
	Ra226 (Bq/L)	0.021	0.033	0.04	0.028	0.028	4	0	0.005	0.02	0.03

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Martin Lake outlet (North basin)

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	4	0	0	0.2	0.2
	Ba (mg/l)	0.042	0.042	0.044	0.043	0.044	4	0	0.001	0.042	0.045
	Cu (mg/l)	0.0004	0.0014	0.0015	0.0015	0.0005	4	1	0.0005	0.0002	0.0012
	Fe (mg/l)	0.006	0.016	0.012	0.012	0.014	4	0	0.009	0.006	0.027
	Mo (mg/l)	0.0031	0.0016	0.002	0.0018	0.0018	4	0	0.0005	0.0013	0.0022
	Ni (mg/l)	0.00013	0.00015	0.00028	0.0002	0.00015	4	0	0.00006	0.0001	0.0002
	Pb (mg/l)	< 0.0001	0.0015	0.0006	0.0002	0.0001	4	3	0.0001	0.0001	0.0002
	Se (mg/l)	0.0016	0.0008	0.0011	0.001	0.0009	4	0	0.0003	0.0006	0.0011
	U (µg/l)	69.25	48.75	66.25	57.75	49.5	4	0	15.33	33	64
	Zn (mg/l)	0.001	0.002	0.002	0.004	0.001	4	2	0.001	0.001	0.003
M Ions	Alk (mg/l)	68.3	63	67.5	69	66.5	4	0	1.7	65	69
	Ca (mg/l)	20.5	19.5	20	20	19.8	4	0	1	19	21
	Cl (mg/l)	10.3	5.2	8	7.6	6.95	4	0	1.59	4.9	8.4
	CO3 (mg/l)	< 1	< 1	< 1	< 1	< 1	4	4	0	1	1
	Cond-F (µS/cm)	214	202	213	197	215	4	0	20	191	237
	Cond-L (µS/cm)	213	174	188	191	186	4	0	13	168	196
	Hardness (mg/l)	71	66	68	68	67	4	0	2	65	70
	HCO3 (mg/l)	83.5	76.8	82.5	84	80.8	4	0	2.2	79	84
	K (mg/l)	1.1	1.1	1.2	1	0.9	4	0	0.2	0.8	1.1
	Na (mg/l)	14.5	9.3	11.6	10.8	9.7	4	0	2.7	6.7	12
	OH (mg/l)	< 1	< 1	< 1	< 1	< 1	4	4	0	1	1
	SO4 (mg/l)	23.3	15.1	18.5	17.5	15.5	4	0	3	12	18
	Sum of Ions (mg/l)	158	132	147	146	138	4	0	6	129	143
Nutrient	C-(org) (mg/l)	4.775	7.325	5.825	6.45	6.55	4	0	1.642	5.1	8.3
	NH3-N (mg/l)	0.07	0.06	0.06	0.06	0.07	4	0	0.01	0.06	0.08
	NO3 (mg/l)	0.195	0.098	0.075	0.165	0.255	4	1	0.209	0.04	0.5
	P-(TP) (mg/l)	< 0.01	0.01	0.01	0.01	< 0.01	4	4	0	0.01	0.01
Phys Para	pH-L (pH Unit)	7.78	7.67	7.71	7.87	7.7	4	0	0.25	7.39	7.94
	TDS (mg/l)	129.75	113.75	117.75	117	114.5	4	0	7.51	105	121
	Temp-H20 (°C)	8.6	9.5	11.2	8	8.5	4	0	9	0.5	19.8
	TSS (mg/l)	1	1	1	1	1.25	4	2	0.5	1	2
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	0.02	< 0.02	< 0.02	4	4	0	0.02	0.02
	Po210 (Bq/L)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	4	4	0	0.005	0.005
	Ra226 (Bq/L)	0.009	0.007	0.011	0.012	0.015	4	0	0.006	0.008	0.02

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.3.3– 5 CS-1 Summary Statistics and Comparison to Historical Results
Crackingstone River at bridge

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.056	0.042	0.045	0.042	0.042	1	0		0.042	0.042
	Cu (mg/l)	0.0004	< 0.0002	0.0006	< 0.0002	0.0002	1	0		0.0002	0.0002
	Fe (mg/l)	0.1	0.026	0.086	0.026	0.036	1	0		0.036	0.036
	Mo (mg/l)	0.0029	0.002	0.0021	0.0019	0.0021	1	0		0.0021	0.0021
	Ni (mg/l)	0.0003	0.0001	0.0002	< 0.0001	0.0001	1	0		0.0001	0.0001
	Pb (mg/l)	< 0.0001	< 0.0001	0.0011	< 0.0001	0.0001	1	0		0.0001	0.0001
	Se (mg/l)	0.0003	0.0009	0.0009	0.001	0.0009	1	0		0.0009	0.0009
	U (µg/l)	47	57	67	63	54	1	0		54	54
	Zn (mg/l)	0.001	< 0.001	0.001	< 0.001	0.001	1	0		0.001	0.001
M Ions	Alk (mg/l)	85	64	66	70	66	1	0		66	66
	Ca (mg/l)	28	20	20	20	19	1	0		19	19
	Cl (mg/l)	7.8	7.6	7.9	7.8	7.6	1	0		7.6	7.6
	CO3 (mg/l)	< 1	< 1	< 1	< 1	1	1	0		1	1
	Cond-F (µS/cm)	243	199	210	199	220	1	0		220	220
	Cond-L (µS/cm)	211	181	186	190	192	1	0		192	192
	Hardness (mg/l)	96	68	70	69	66	1	0		66	66
	HCO3 (mg/l)	104	78	80	85	80	1	0		80	80
	K (mg/l)	1.2	1.1	1.1	1	0.8	1	0		0.8	0.8
	Na (mg/l)	6.4	11	11	11	11	1	0		11	11
	OH (mg/l)	< 1	< 1	< 1	< 1	1	1	0		1	1
	SO4 (mg/l)	11	17	17	18	17	1	0		17	17
	Sum of Ions (mg/l)	165	139	142	148	140	1	0		140	140
Nutrient	C-(org) (mg/l)	11	6.2	6.2	6	6.2	1	0		6.2	6.2
	NH3-N (mg/l)	0.08	0.03	0.06	0.05	0.08	1	0		0.08	0.08
	NO3 (mg/l)	< 0.04	< 0.04	< 0.04	< 0.04	0.04	1	0		0.04	0.04
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	0.01	1	0		0.01	0.01
Phys Para	pH-L (pH Unit)	7.78	7.76	7.68	7.76	7.82	1	0		7.82	7.82
	TDS (mg/l)	135	125	111	119	123	1	0		123	123
	Temp-H20 (°C)	10.2	11	13.1	10.6	10.1	1	0		10.1	10.1
	TSS (mg/l)	< 1	< 1	4	< 1	2	1	0		2	2
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	< 0.02	< 0.02	0.02	1	0		0.02	0.02
	Po210 (Bq/L)	< 0.005	< 0.005	< 0.005	< 0.005	0.005	1	0		0.005	0.005
	Ra226 (Bq/L)	< 0.005	0.006	< 0.005	0.006	0.005	1	0		0.005	0.005

Note: This station was implemented in 2011.

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Crackingstone Bay in Lake Athabasca

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)	0.3	0.2	0.2	0.2	0.2	1	0		0.2	0.2
	Ba (mg/l)	0.011	0.014	0.012	0.012	0.012	1	0		0.012	0.012
	Cu (mg/l)	0.0006	< 0.0002	0.0002	0.0007	< 0.0002	1	1		0.0002	0.0002
	Fe (mg/l)	0.013	0.006	0.009	0.01	0.006	1	0		0.006	0.006
	Mo (mg/l)	0.0002	0.0003	0.0002	0.0002	0.0003	1	0		0.0003	0.0003
	Ni (mg/l)	0.0004	0.0003	0.0003	0.0023	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)	0.3	4.8	0.4	1.6	2.4	1	0		2.4	2.4
	Zn (mg/l)	0.001	< 0.001	< 0.001	0.002	< 0.001	1	1		0.001	0.001
M Ions	Alk (mg/l)	28	31	29	32	30	1	0		30	30
	Ca (mg/l)	7.1	8.3	7.5	7.6	7.3	1	0		7.3	7.3
	Cl (mg/l)	2	3.6	3.4	3.4	3.5	1	0		3.5	3.5
	CO3 (mg/l)	< 1	< 1	< 1	< 1	< 1	1	1		1	1
	Cond-F (µS/cm)		78	20	81	83	1	0		83	83
	Cond-L (µS/cm)	68	81	74	78	79	1	0		79	79
	Hardness (mg/l)	27	30	28	28	28	1	0		28	28
	HCO3 (mg/l)	34	38	35	39	37	1	0		37	37
	K (mg/l)	0.5	0.8	0.9	0.7	0.5	1	0		0.5	0.5
	Na (mg/l)	2.4	3.5	2.8	3	2.9	1	0		2.9	2.9
	OH (mg/l)	< 1	< 1	< 1	< 1	< 1	1	1		1	1
	SO4 (mg/l)	3.5	5	3.9	4.2	4.2	1	0		4.2	4.2
	Sum of Ions (mg/l)	52	62	56	60	58	1	0		58	58
Nutrient	C-(org) (mg/l)	2.8	3.5	3.4	3.2	3.2	1	0		3.2	3.2
	NH3-N (mg/l)	0.06	< 0.01	< 0.01	0.02	0.02	1	0		0.02	0.02
	NO3 (mg/l)	< 0.04	< 0.04	< 0.04	0.09	< 0.04	1	1		0.04	0.04
	P-(TP) (mg/l)	0.02	< 0.01	< 0.01	< 0.01	< 0.01	1	1		0.01	0.01
Phys Para	pH-L (pH Unit)	7.45	7.51	7.37	7.38	7.51	1	0		7.51	7.51
	TDS (mg/l)	220	64	50	54	51	1	0		51	51
	Temp-H20 (°C)		12.4	7.9	8.6	11.2	1	0		11.2	11.2
	TSS (mg/l)	< 1	< 1	< 1	< 1	2	1	0		2	2
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	0		0.005	0.005
	Ra226 (Bq/L)	< 0.005	0.009	0.009	< 0.005	0.01	1	0		0.01	0.01

Note: This station was implemented in 2011.

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Mouth of Zora Creek

	Previous Period Averages					Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)			0.20	0.20	0.19	21	0	0.03	0.10	0.20
	Ba (mg/l)			0.023	0.020	0.022	21	0	0.0016	0.02	0.025
	Cu (mg/l)			0.001	0.0022	0.0009	21	2	0.0008	0.0002	0.0037
	Fe (mg/l)			0.011	0.018	0.0097	21	0	0.0130	0.0034	0.066
	Mo (mg/l)			0.0009	0.0008	0.0008	21	0	0.00010	0.0005	0.0009
	Ni (mg/l)			0.00022	0.0003	0.0002	21	1	0.00005	0.0001	0.0003
	Pb (mg/l)			0.0007	0.0005	0.0002	21	13	0.00019	0.0001	0.001
	Se (mg/l)			0.0001	0.0001	0.0001	21	1	0.00004	0.0001	0.0002
	U (µg/l)			18.2	13.0	15.3	21	0	1.8	9.1	18.0
	Zn (mg/l)			0.003	0.003	0.0013	21	7	0.0008	0.0005	0.0032
M Ions	Alk (mg/l)			103.6	94.4	95.4	20	1	22.2	1.0	108.0
	Ca (mg/l)			33.4	29.4	31.8	21	0	1.9	29.0	35.0
	Cl (mg/l)			0.24	0.26	0.29	17	0	0.16	0.20	0.90
	CO3 (mg/l)			< 1	< 1	1.00	20	20	0.00	1.00	1.00
	Cond-F (µS/cm)			241.0	270.0	262.8	21	0	36.5	190.0	339.0
	Cond-L (µS/cm)			229.0	207.0	224.5	20	0	12	202	240
	Hardness (mg/l)			118.0	104.0	113.1	20	0	6.4	102.0	124.0
	HCO3 (mg/l)			126.4	115.2	122.2	20	0	6.2	110.0	132.0
	K (mg/l)			0.9	0.6	0.7	21	0	0.2	0.4	1.0
	Na (mg/l)			1.9	1.6	1.7	21	0	0.1	1.6	1.9
	OH (mg/l)			< 1	< 1	1.00	20	20	0.00	1.00	1.00
	SO4 (mg/l)			19.6	17.0	18.9	21	0	1.23	17.0	21.0
	Sum of Ions (mg/l)			191.0	171.0	184.0	20	0	9.5	166.0	198.0
Nutrient	C-(org) (mg/l)			8.733	9			0			
	NH3-N (mg/l)			0.03	0.05			0			
	NO3 (mg/l)			0.04	0.06	0.07	14	8	0.04	0.04	0.16
	P-(TP) (mg/l)			< 0.01				0			
Phys Para	pH-L (pH Unit)			7.91	7.94	7.89	20	0	0.21	7.45	8.44
	TDS (mg/l)			145.6	127.0	140.5	20	0	12.0	112.0	163.0
	Temp-H20 (°C)			11.5	9.4	9.2	21	0	7.1	0.2	23.3
	TSS (mg/l)			1.000	1.4	1.3	21	10	0.5	1.0	3.0
Rads	Pb210 (Bq/L)			< 0.02	0.05			0			
	Po210 (Bq/L)			0.006	0.005			0			
	Ra226 (Bq/L)			0.028	0.026	0.0286	21	0	0.008883	0.01	0.05

Note: This station was implemented in August 2013

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

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

Outlet from waste rock pile

		Previous Period Averages				Year 2015 Statistics					
		2011	2012	2013	2014	Average	Count	Count < DL	Std Dev	Min	Max
Metal	As (µg/l)			0.2	0.2	0.4	22	0	0.5	0.2	2.6
	Ba (mg/l)			0.03	0.02	0.03	22	0	0.01	0.01	0.07
	Cd (mg/l)			3E-05	1E-05	0.003	22	0	0.004	0.001	0.018
	Fe (mg/l)			0.02	0.03	0.42	22	0	1.22	0.01	5.80
	Mo (mg/l)			0.0013	0.0013	0.0018	22	0	0.0012	0.0010	0.0050
	Ni (mg/l)			0.0004	0.0003	0.0005	22	0	0.0009	0.0001	0.0045
	Pb (mg/l)			0.0006	0.0003	0.0029	22	4	0.0088	0.0001	0.0420
	Se (mg/l)			0.0005	0.0003	0.0004	22	0	0.0003	0.0002	0.0012
	U (µg/l)			624.8	313.8	595.2	22	0	663.9	87.0	2190.0
	Zn (mg/l)			0.002	0.001	0.001	22	16	0.001	0.001	0.006
M Ions	Alk (mg/l)			122.4	113.8	121.7	22	0	36.5	83.0	252.0
	Ca (mg/l)			61.4	44.4	55.1	22	0	31.3	34.0	159.0
	Cl (mg/l)			1.0	0.42	0.75	22	3	0.82	0.20	3.00
	CO3 (mg/l)			< 1	< 1	1.0	22	22	0.00	1.00	1.00
	Cond-F (µS/cm)			467	311	390.5	22	0	163.0	223.0	946.0
	Cond-L (µS/cm)			382	289	358.5	22	0	165.2	240.0	861.0
	Hardness (mg/l)			199	146	183.0	22	0	95.9	118.0	508.0
	HCO3 (mg/l)			149.4	138.6	148.4	22	0	44.5	101.0	307.0
	K (mg/l)			1	0.60	0.91	22	0	0.37	0.60	2.00
	Mg (mg/l)			11.2	8.6	11.12	22	0	4.40	7.00	27.00
	Na (mg/l)			2.4	1.9	2.7	22	0	1.3	1.5	6.8
	OH (mg/l)			< 1	< 1	1.0	22	21	0.00	1.00	1.00
	SO4 (mg/l)			78.2	41.6	68.8	22	0	62.9	25.0	260.0
	Sum of Ions (mg/l)			305.0	237.0	288.1	22	0	142.0	188.0	765.0
Nutrient	C-(org) (mg/l)			6.3	6.3						
	NH3-N (mg/l)			0.04	0.04						
	NO3 (mg/l)			0.92	0.66	0.48	16	0	0.61	0.12	2.00
	P-(TP) (mg/l)			< 0.01							
Phys Para	pH-L (pH Unit)			7.91	7.96	7.88	22	0	0.13	7.72	8.15
	TDS (mg/l)			253.0	185.4	238.7	22	0	135.6	139.0	668.0
	Temp-H20 (°C)			1.1	12.6	5.6	21	0	4.5	0.8	13.7
	TSS (mg/l)			< 1	1	13.3	22	13	32.5	1.0	148.0
Rads	Pb210 (Bq/L)			0.19	0.09						
	Po210 (Bq/L)			0.06	0.08						
	Ra226 (Bq/L)			0.37	0.34	0.67	22	0	1.35	0.10	6.60

Note: This station was implemented in August 2013

** For those samples measured below the method detection limit, each sample was given the value of the detection limit.

Table 4.7.1
Radon Track Etch Cup Summary

Annual Average pCi/L									
Location	1982	2008	2009	2010	2011	2012	2013	2014	2015
Airport Beacon	1.4	0.5	0.5	0.3	0.2	0.9	1	0.2	0.3
Eldorado Townsite	3.7	0.7	0.7	0.5	0.5	0.5	1.2	0.4	0.7
Northwest of Airport	2.4	0.3	0.4	0.3	0.2	1.1	1	0.1	<0.2
Ace Creek	10.7	6.7	5.3	5.4	7	4.1	6	5.8	5.1
Fay Waste Rock	5.1	1.2	1.2	0.9	1	1.1	0.6	0.4	1.2
Fookes Delta	5.1	3	2.9	2	1.9	2.1	3	2.2	2.4
Marie Reservoir	5.1	2.7	2.5	5.8	5.5	2.8	2.9	1.8	2.1
Donaldson Lake	5.1	0.7	0.6	0.2	0.2	0.2	0.9	0.1	0.2
Fredette Lake	5.1	0.3	0.8	1.2	0.8	0.2	0.2	0.1	<0.2
Uranium City	5.1	0.3	1.2	0.3	0.2	0.2	0.1	0.1	<0.2

FIGURES

FIGURES

Figure 2.4
Beaverlodge Location Map

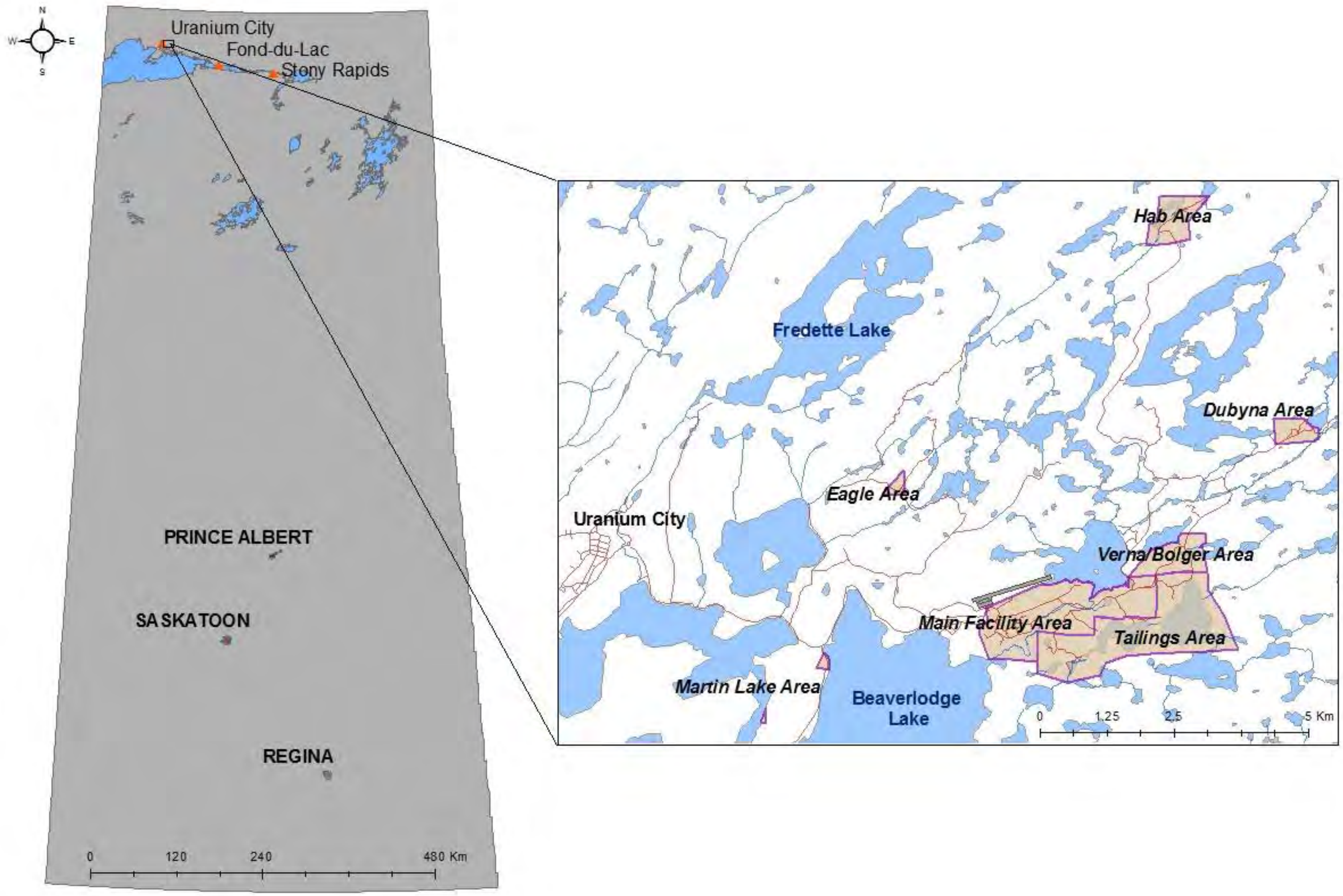


Figure 4.3
Water Quality Monitoring Station Locations

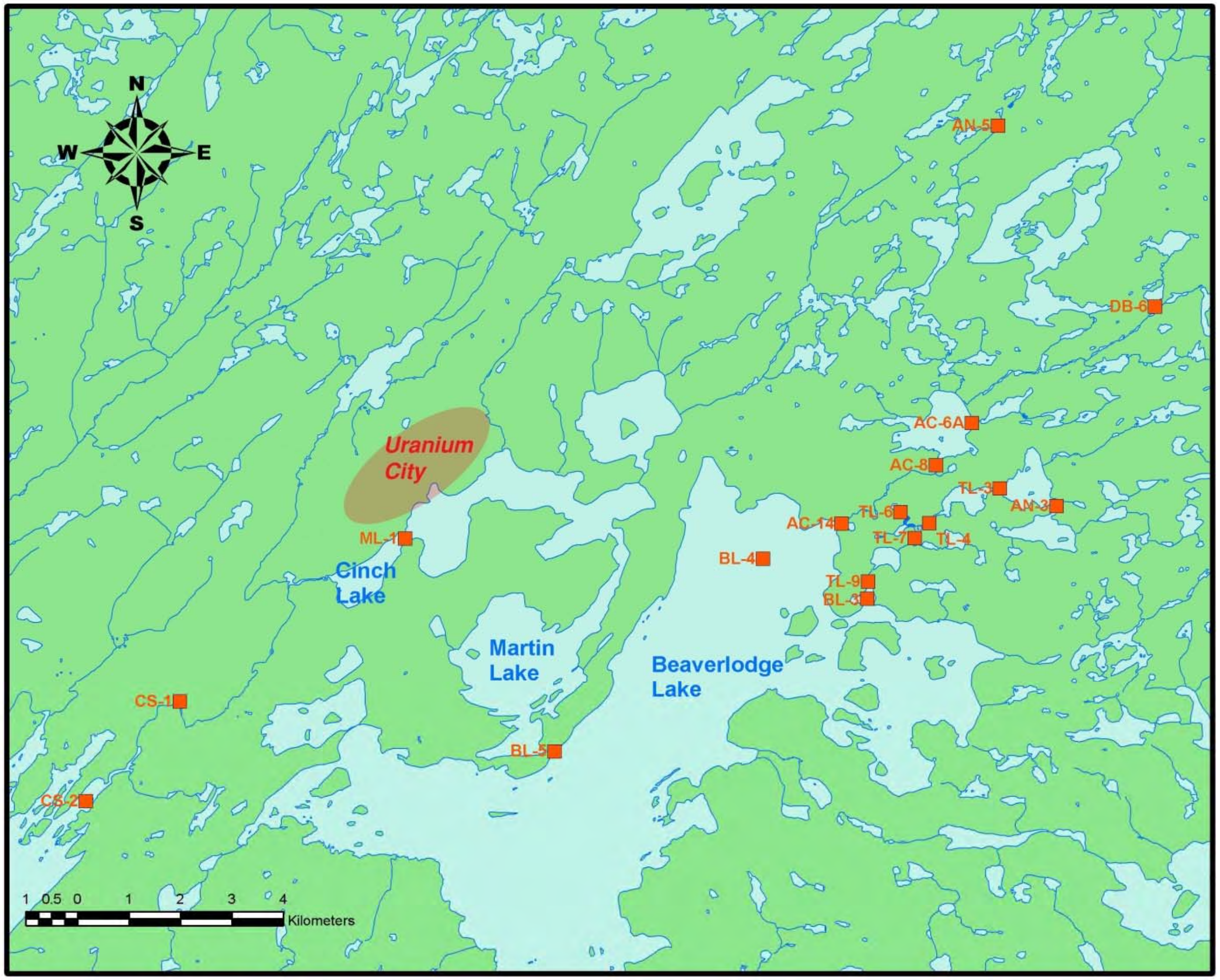


Figure 4.3.1-1 AN-5 Pistol Creek below Hab Site

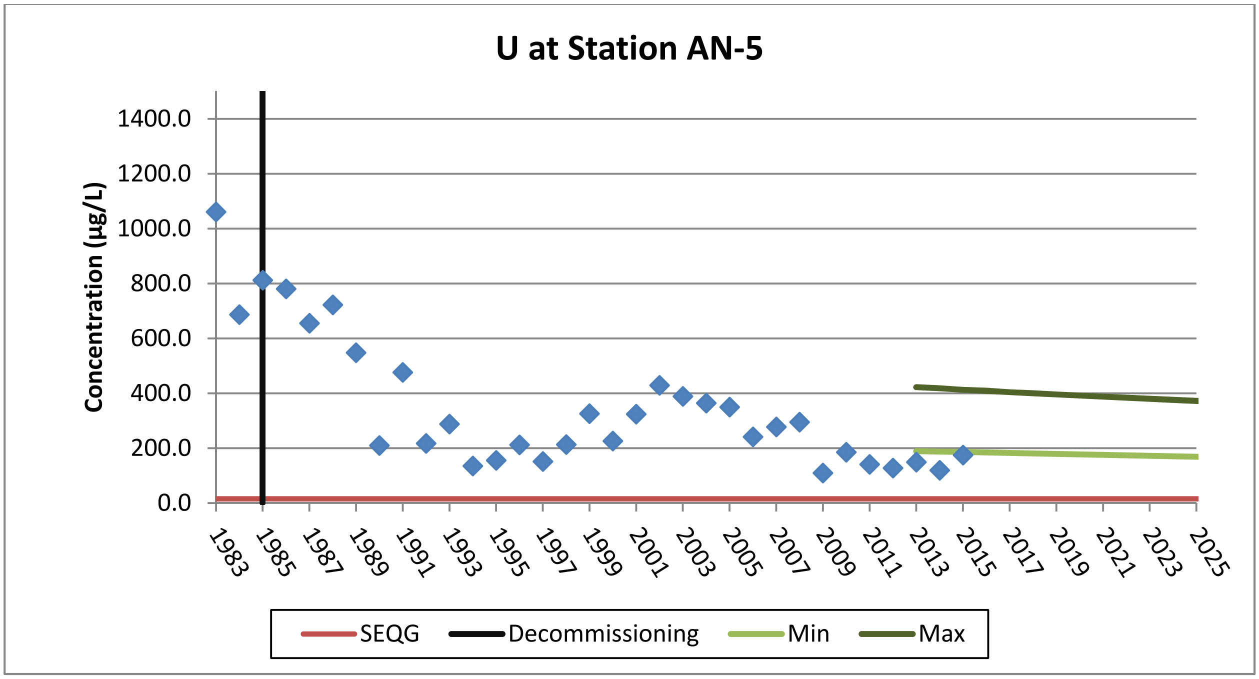


Figure 4.3.1-2 AN-5 Pistol Creek below Hab Site

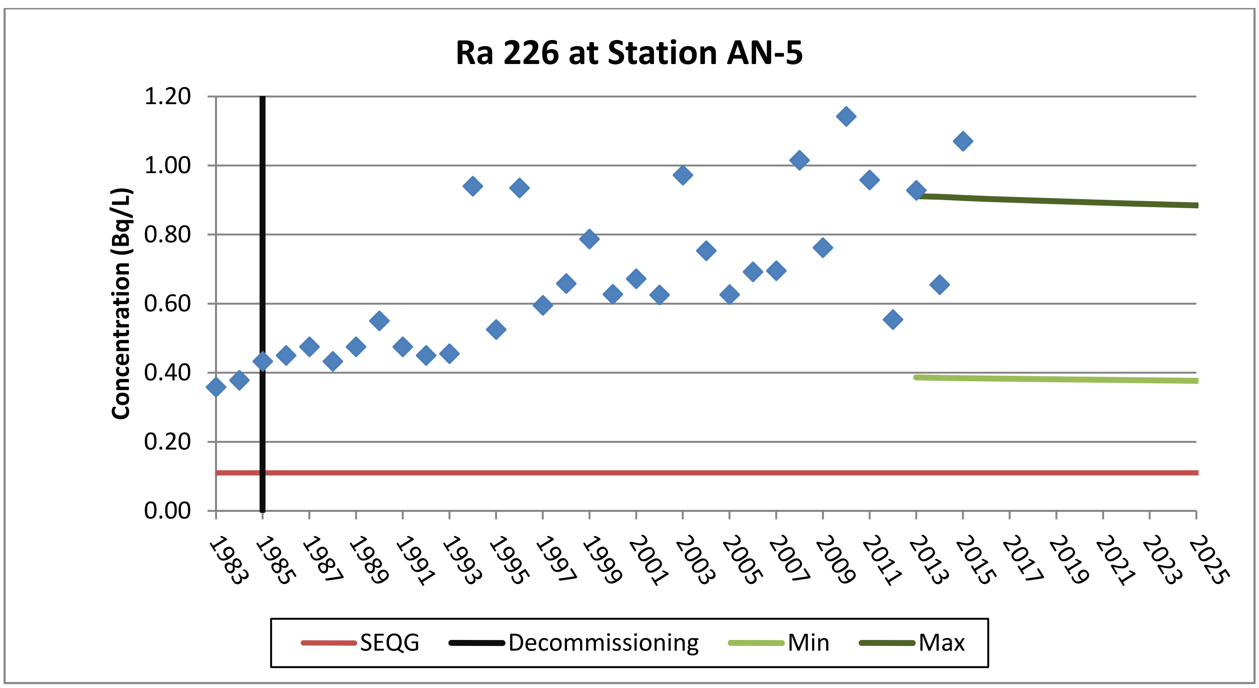
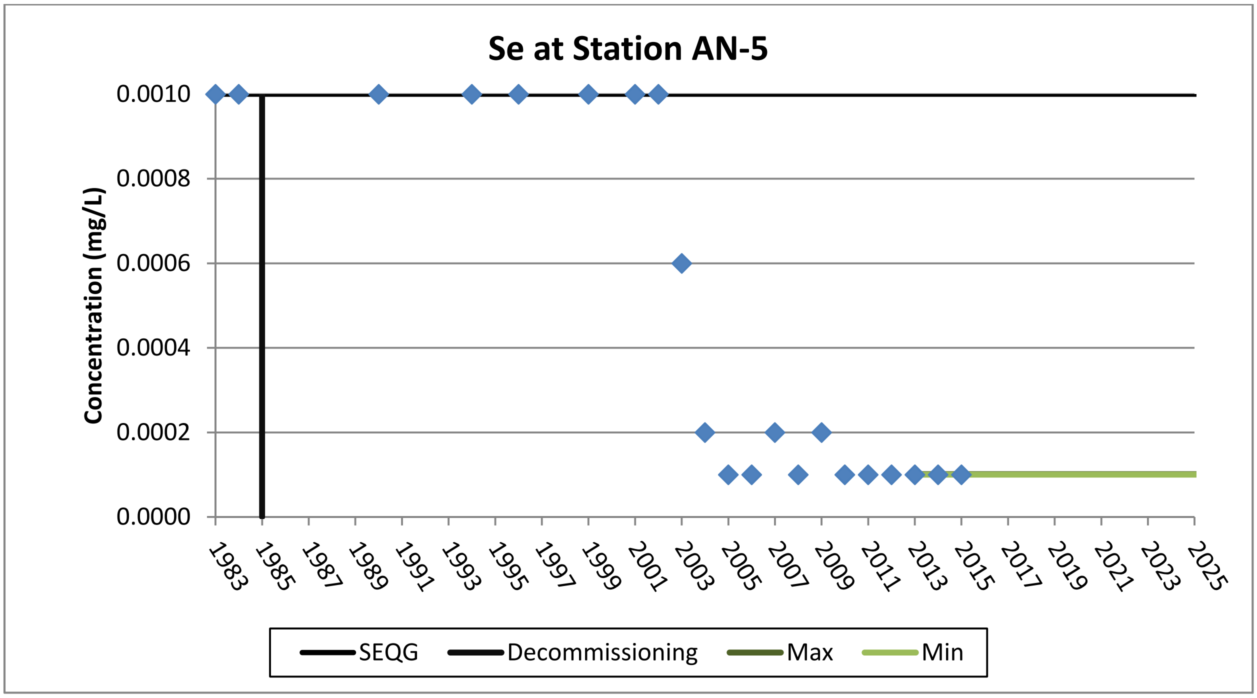


Figure 4.3.1-3 AN-5 Pistol Creek below Hab Site



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

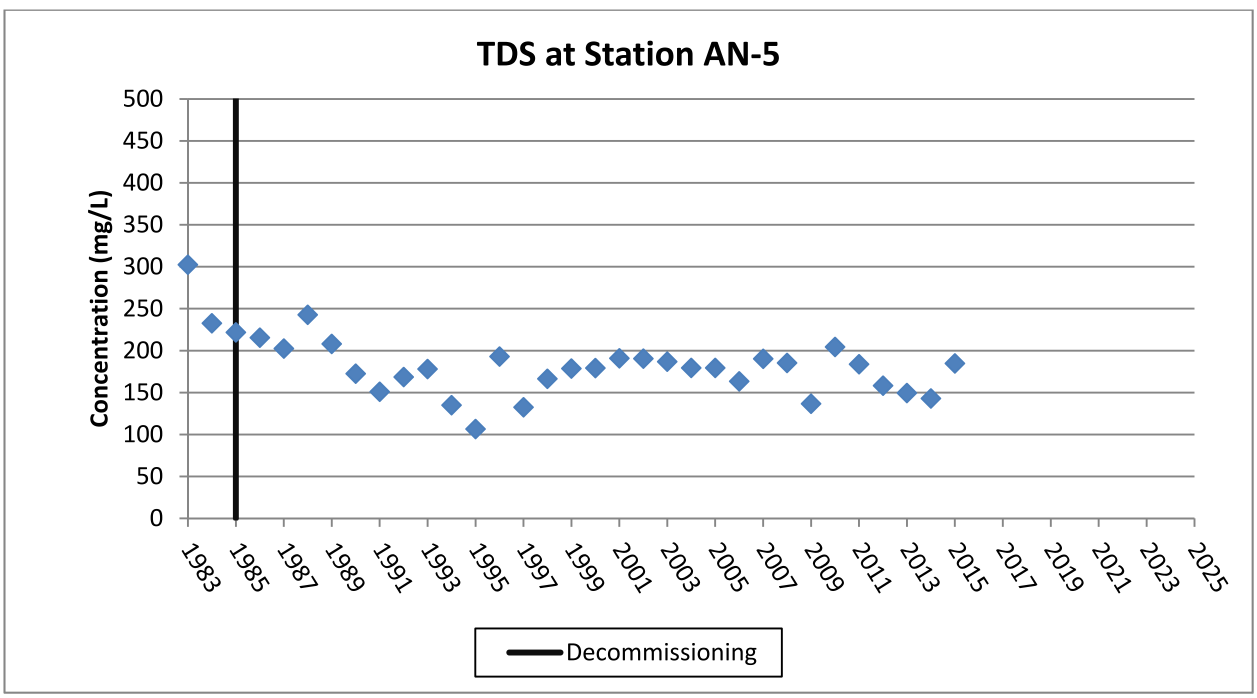


Figure 4.3.1-5 DB-6 Dubyna Creek

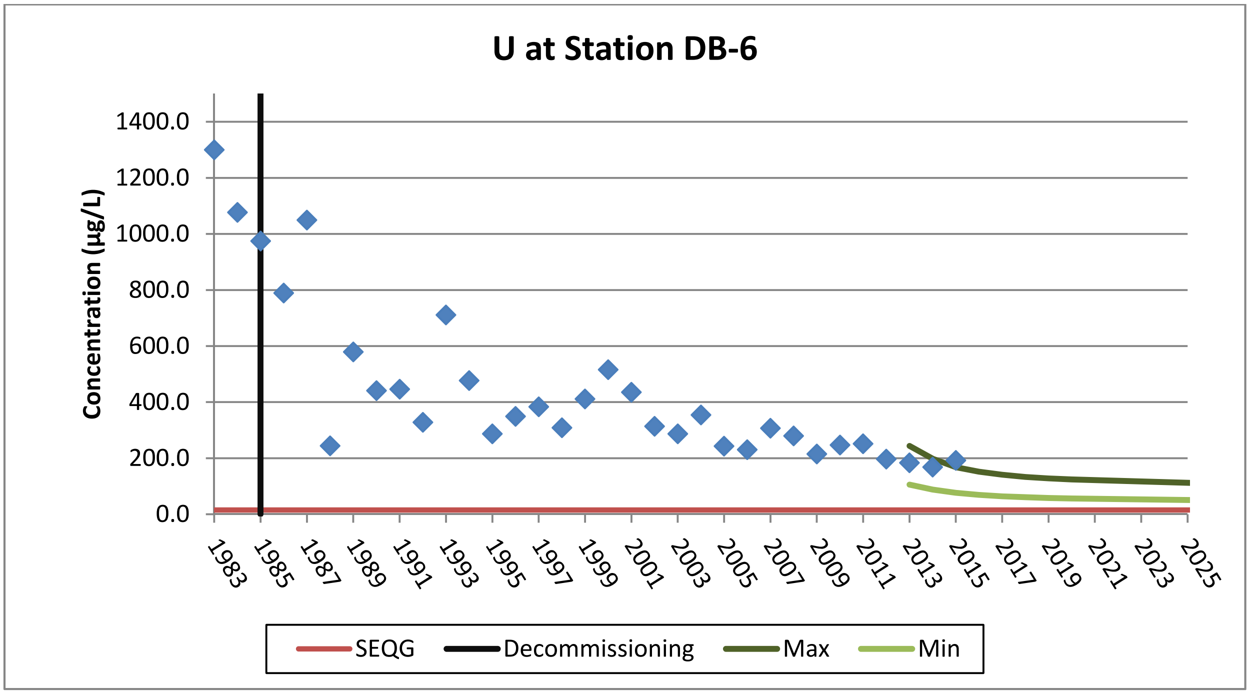


Figure 4.3.1-6 DB-6 Dubyna Creek

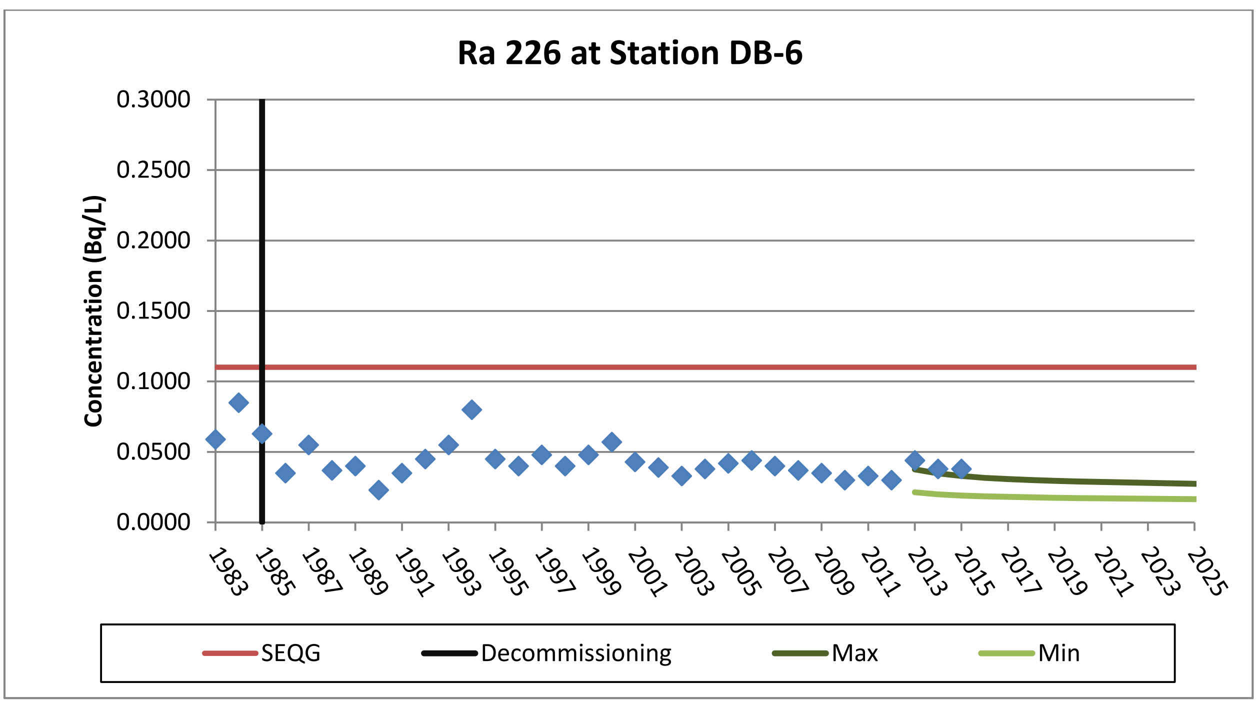
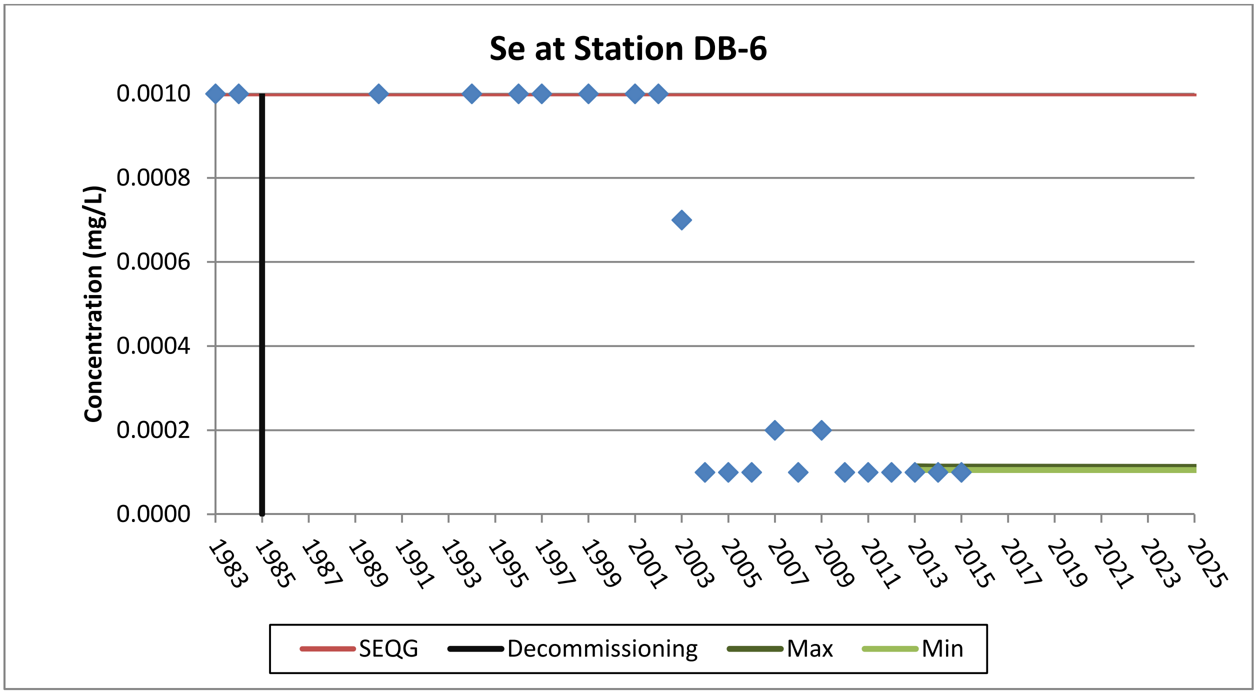


Figure 4.3.1-7 DB-6 Dubyna Creek



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

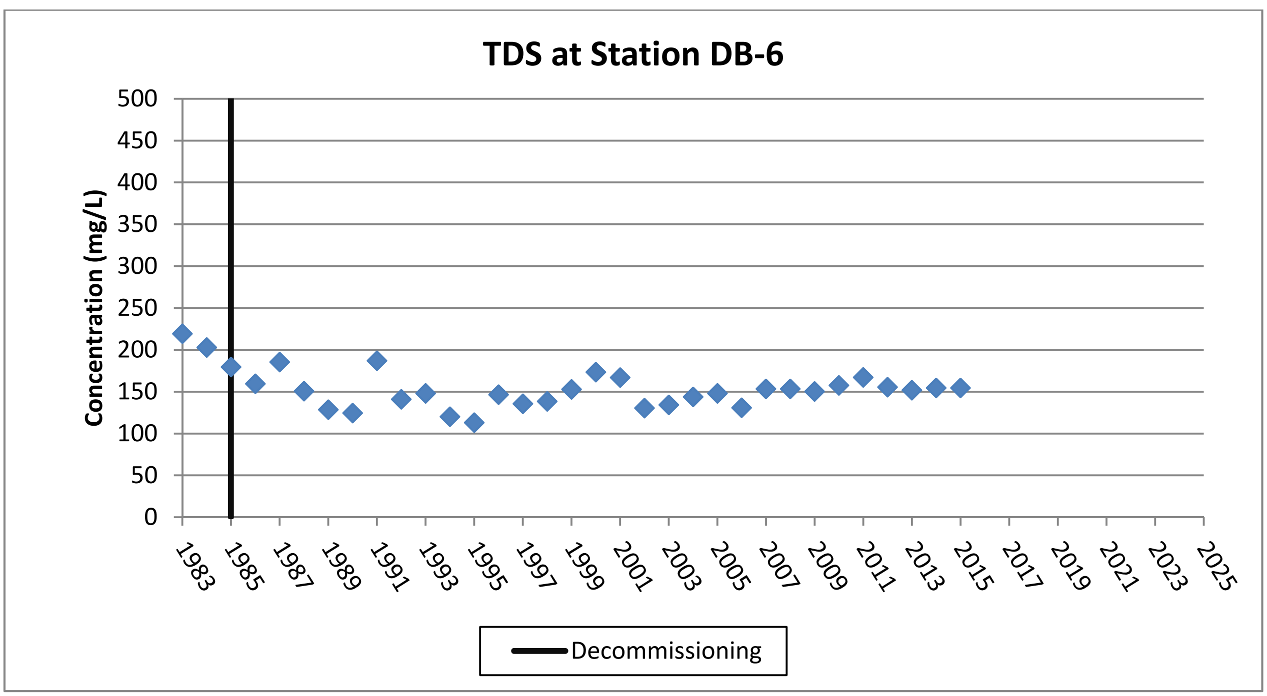


Figure 4.3.1-9 AC-6A Verna Lake Discharge to Ace Lake

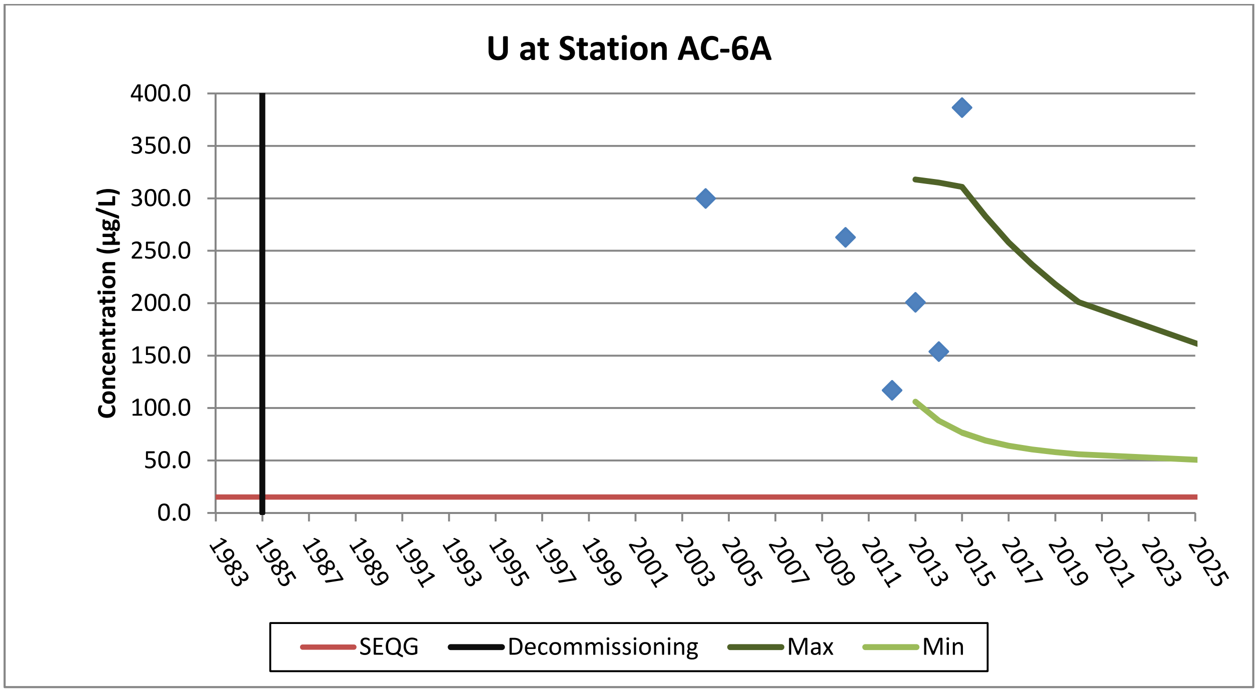


Figure 4.3.1-10 AC-6A Verna Lake Discharge to Ace Lake

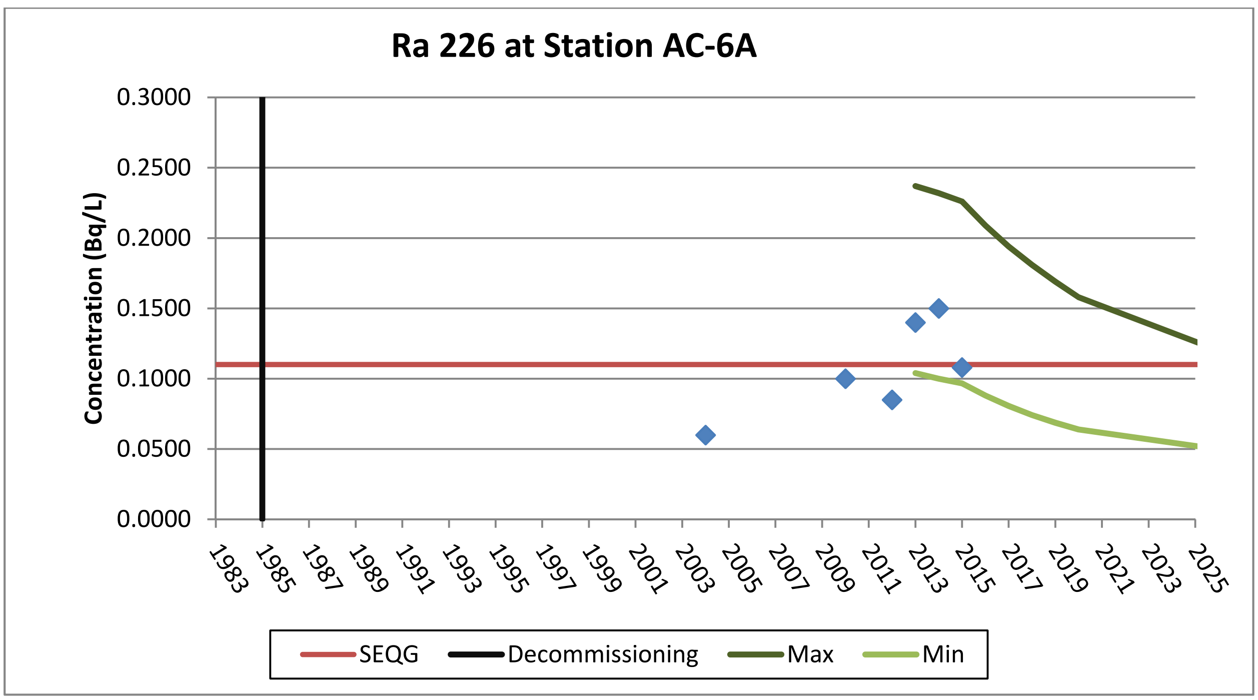
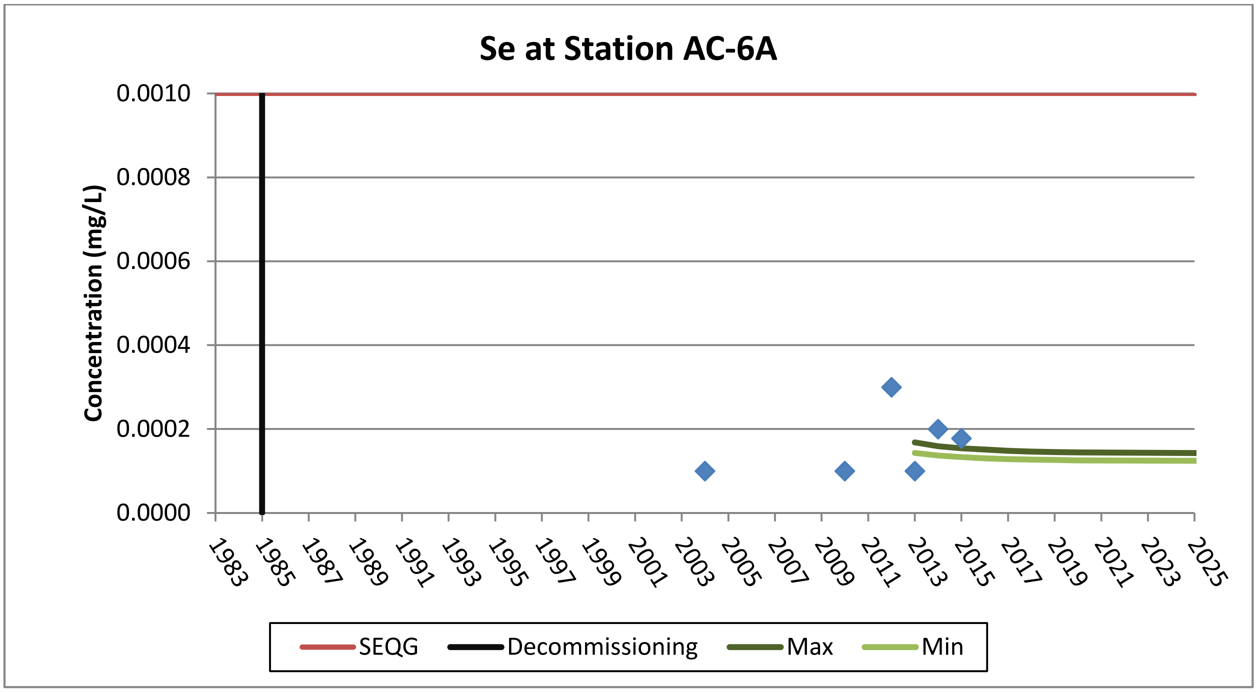


Figure 4.3.1-11 AC-6A Verna Lake Discharge to Ace Lake



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

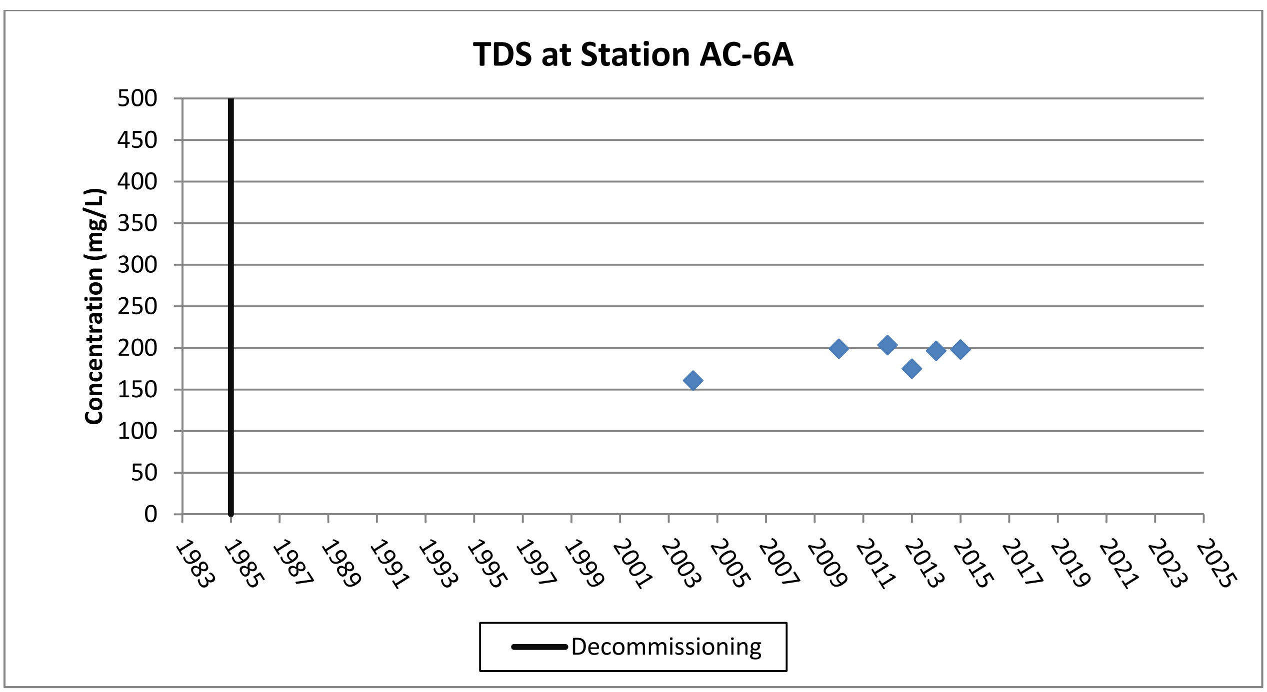


Figure 4.3.1-13 AC-8 Ace Lake Outlet to Ace Creek

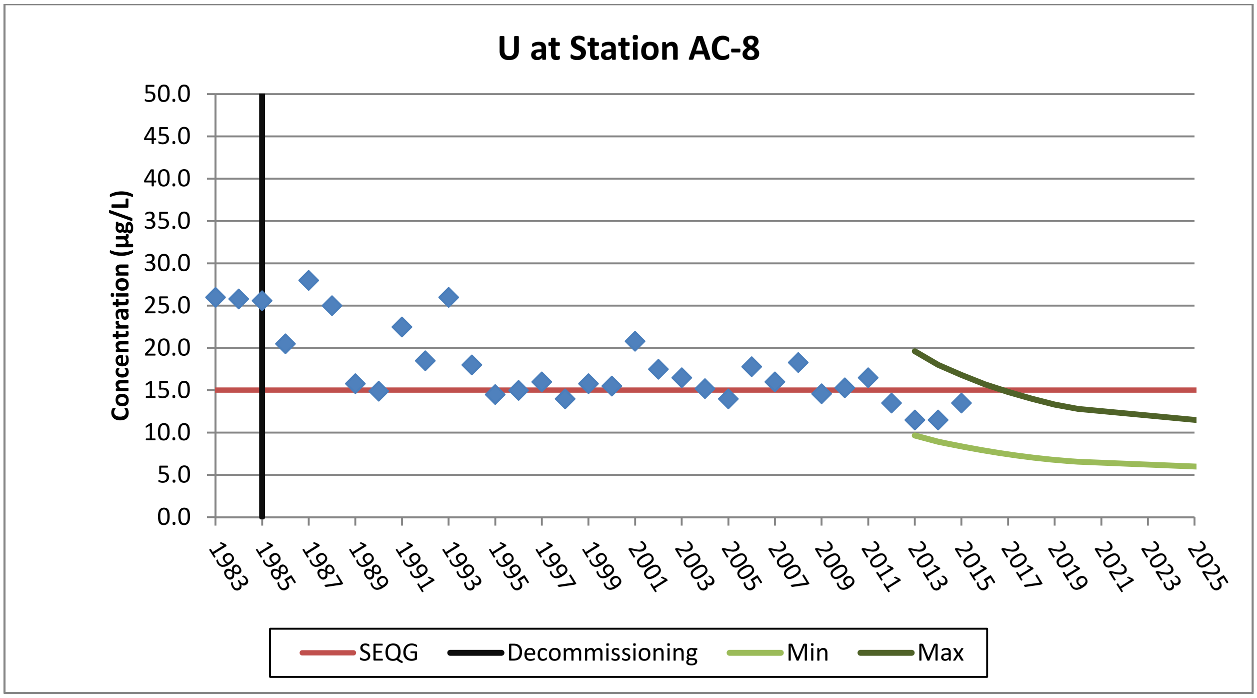


Figure 4.3.1-14 AC-8 Ace Lake Outlet to Ace Creek

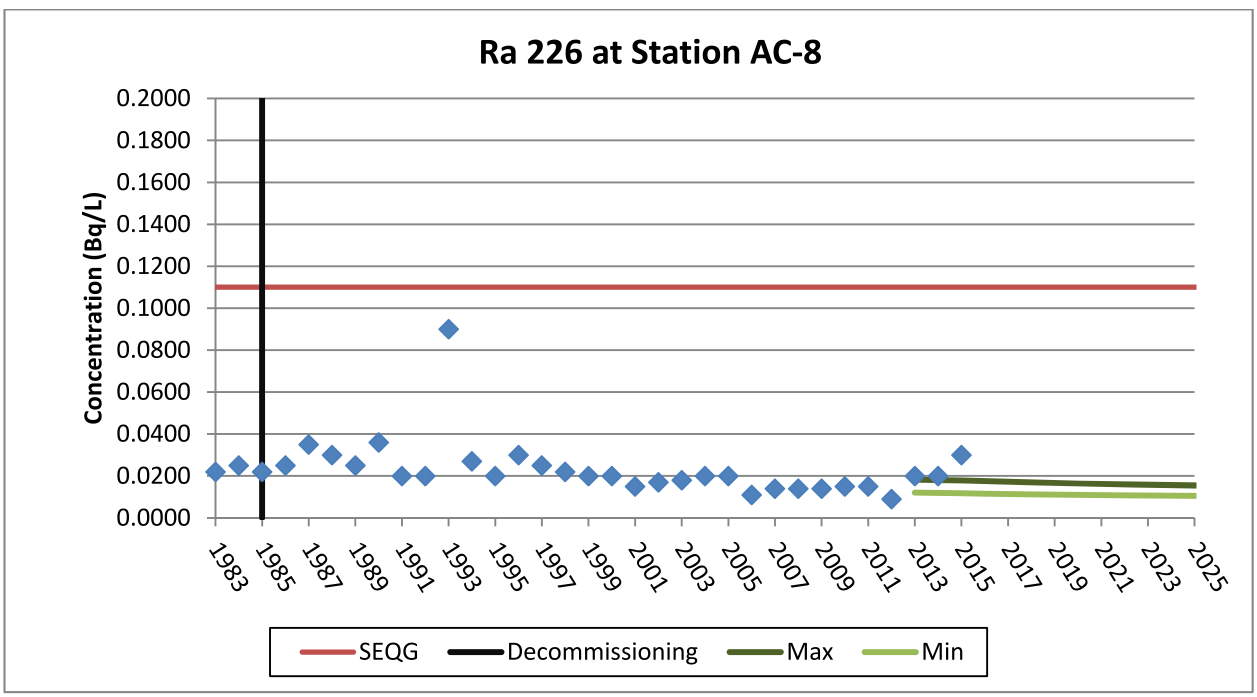
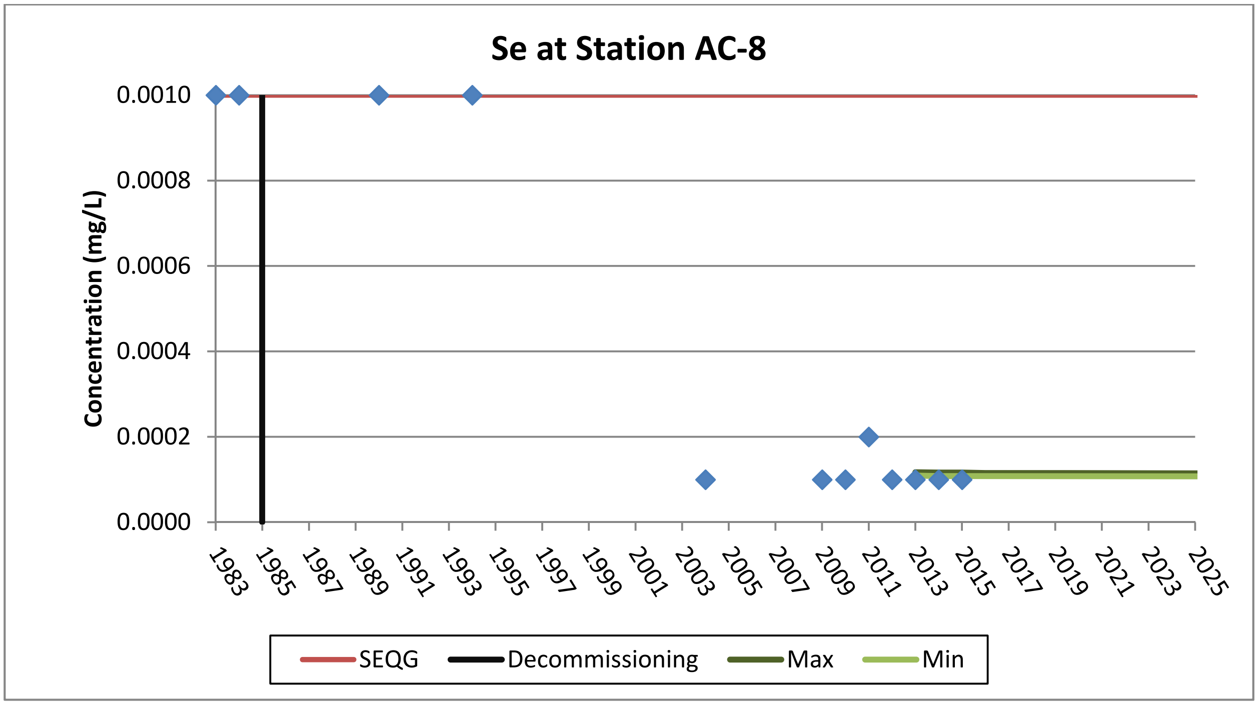


Figure 4.3.1-15 AC-8 Ace Lake Outlet to Ace Creek



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

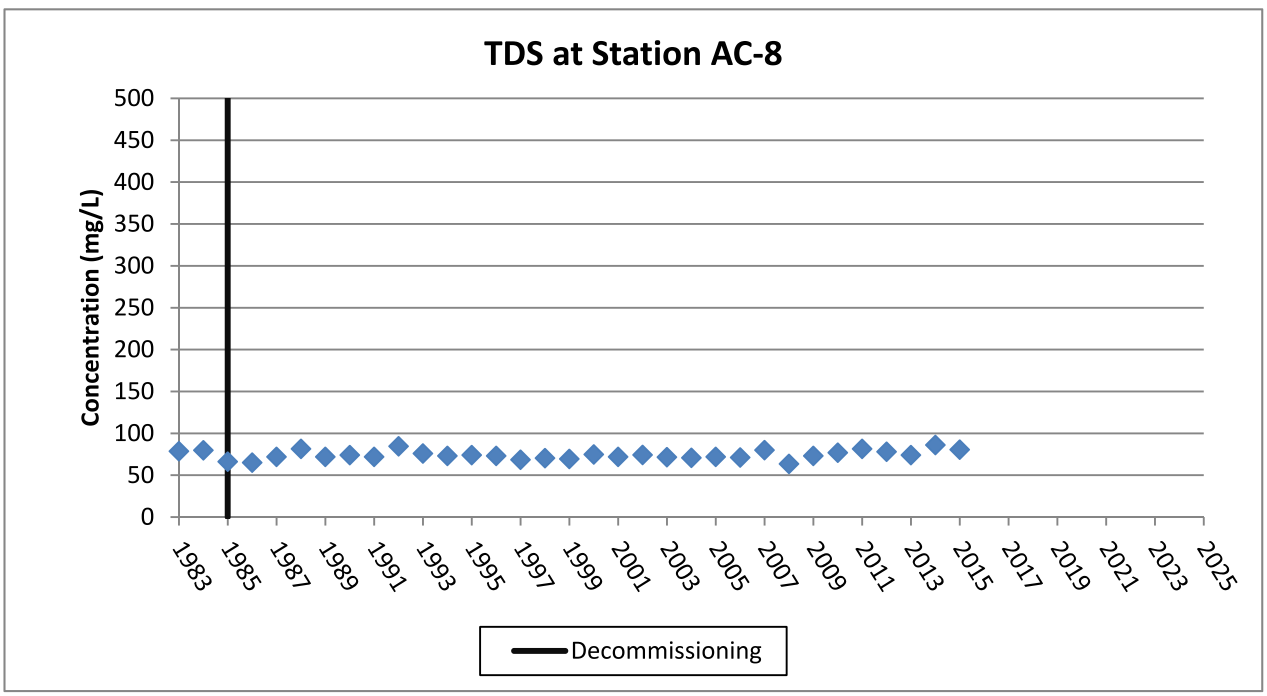


Figure 4.3.1-17 AC-14 - Ace Creek

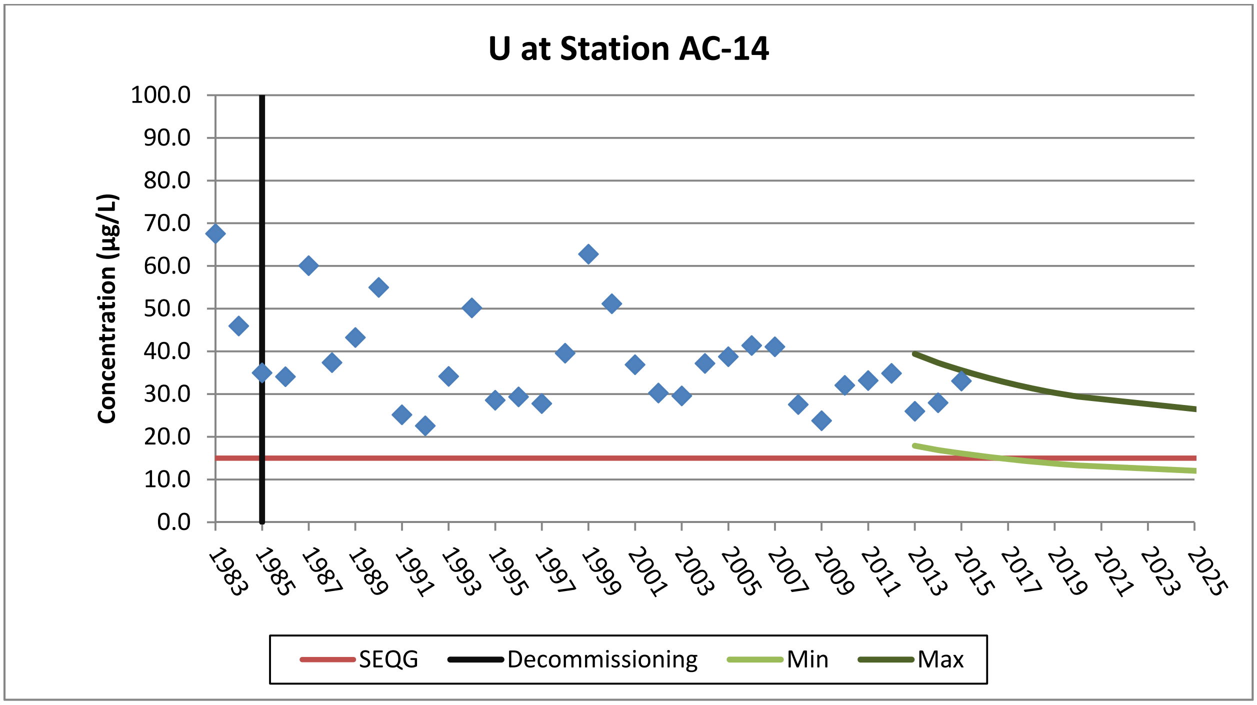


Figure 4.3.1-18 AC-14 - Ace Creek

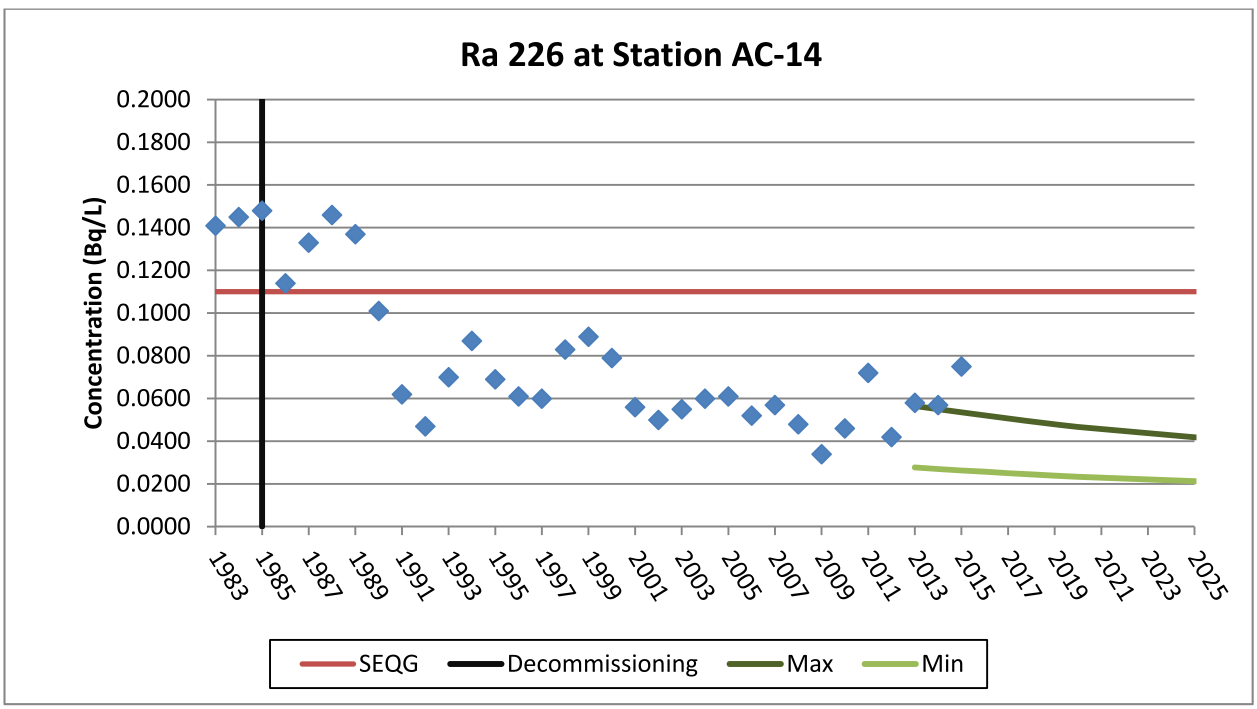
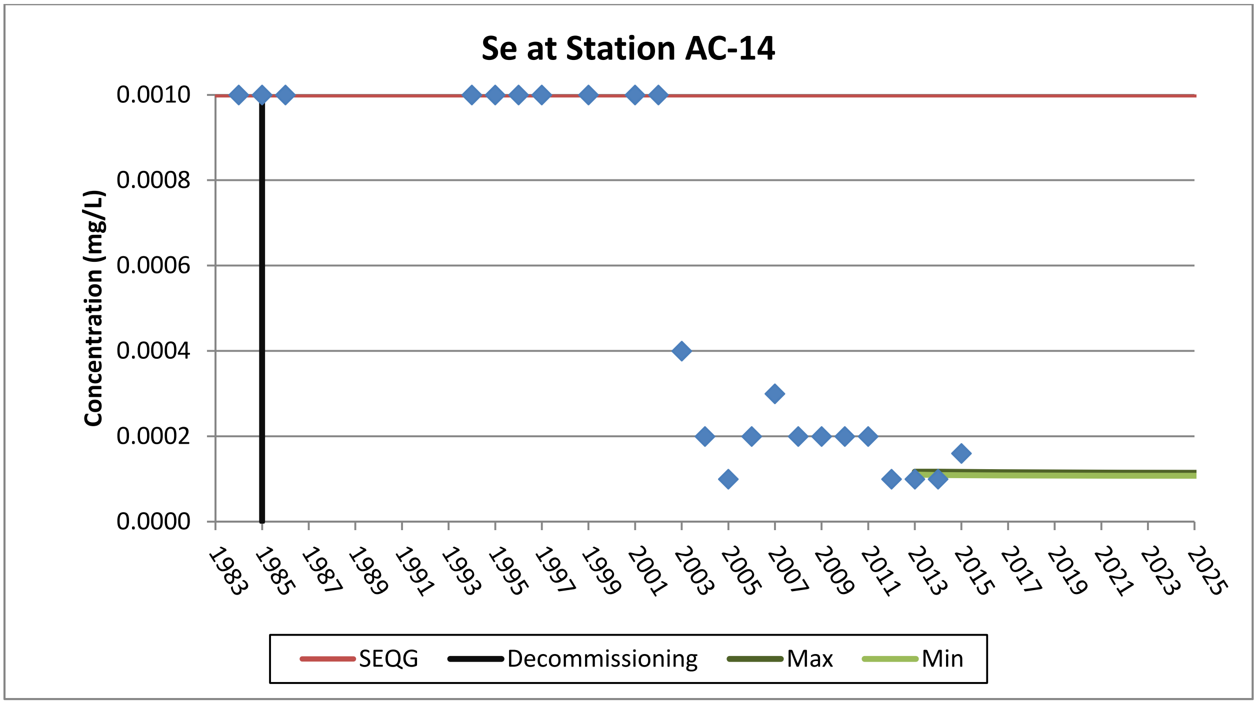


Figure 4.3.1-19 AC-14 - Ace Creek



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

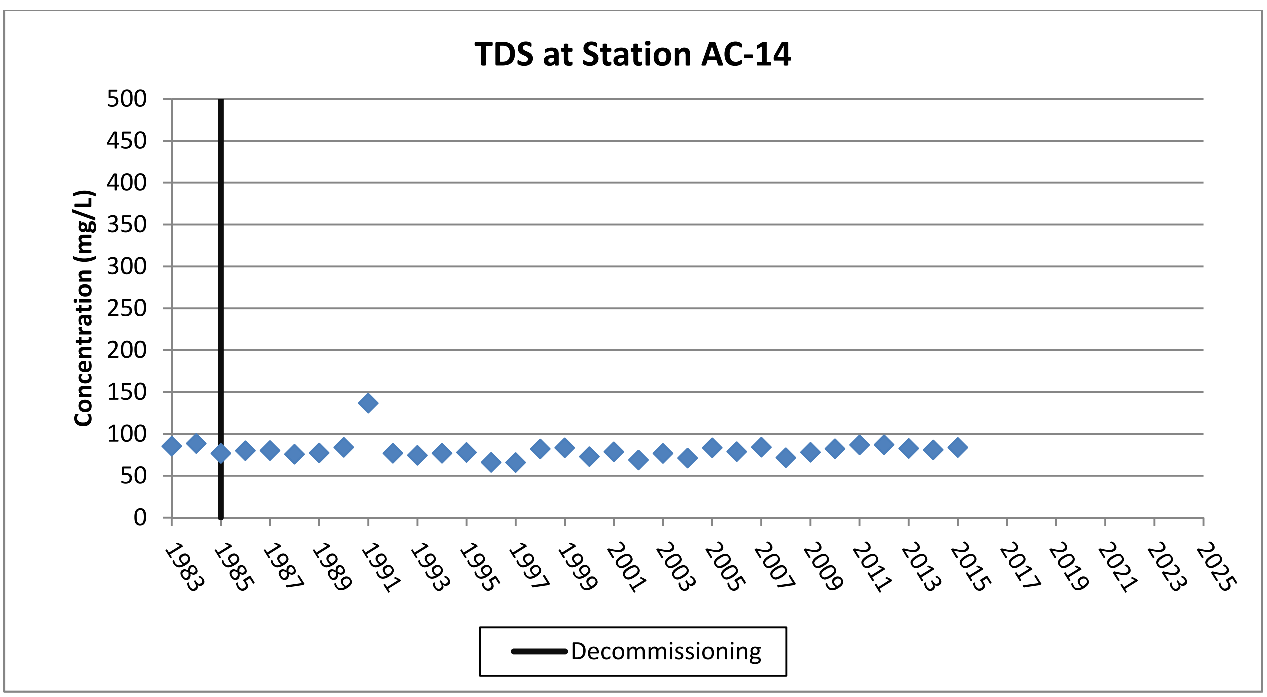
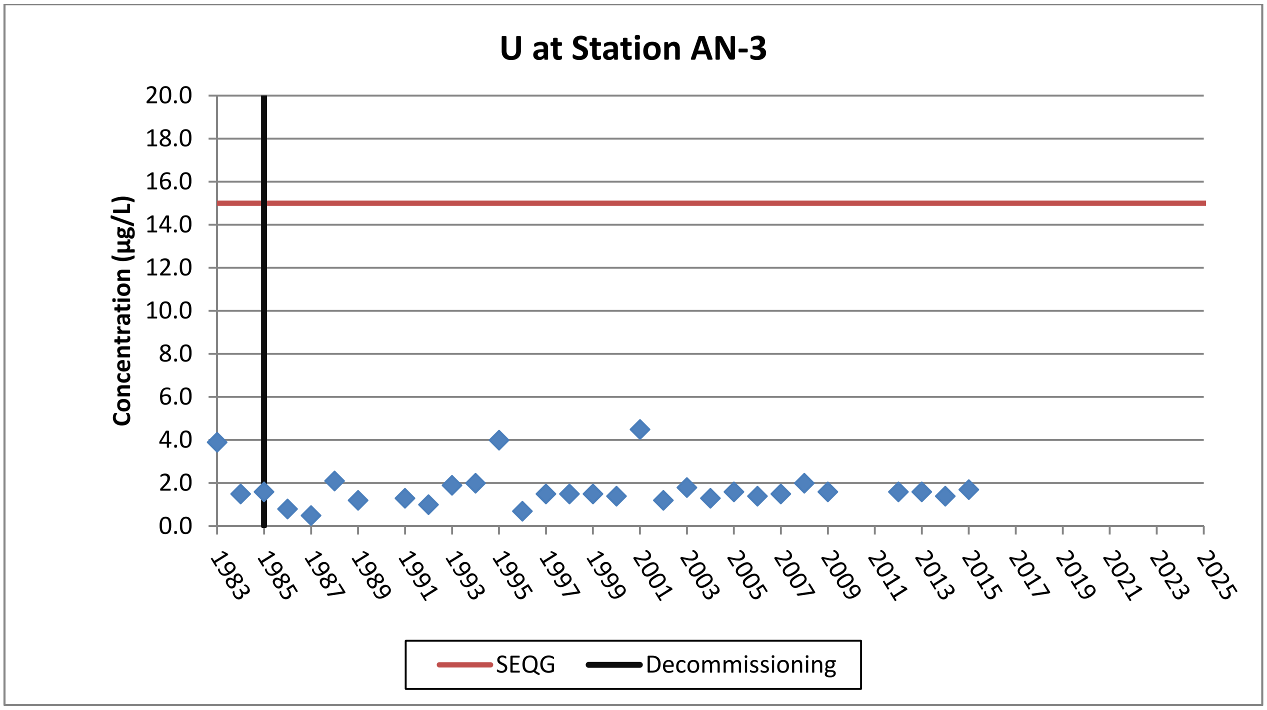
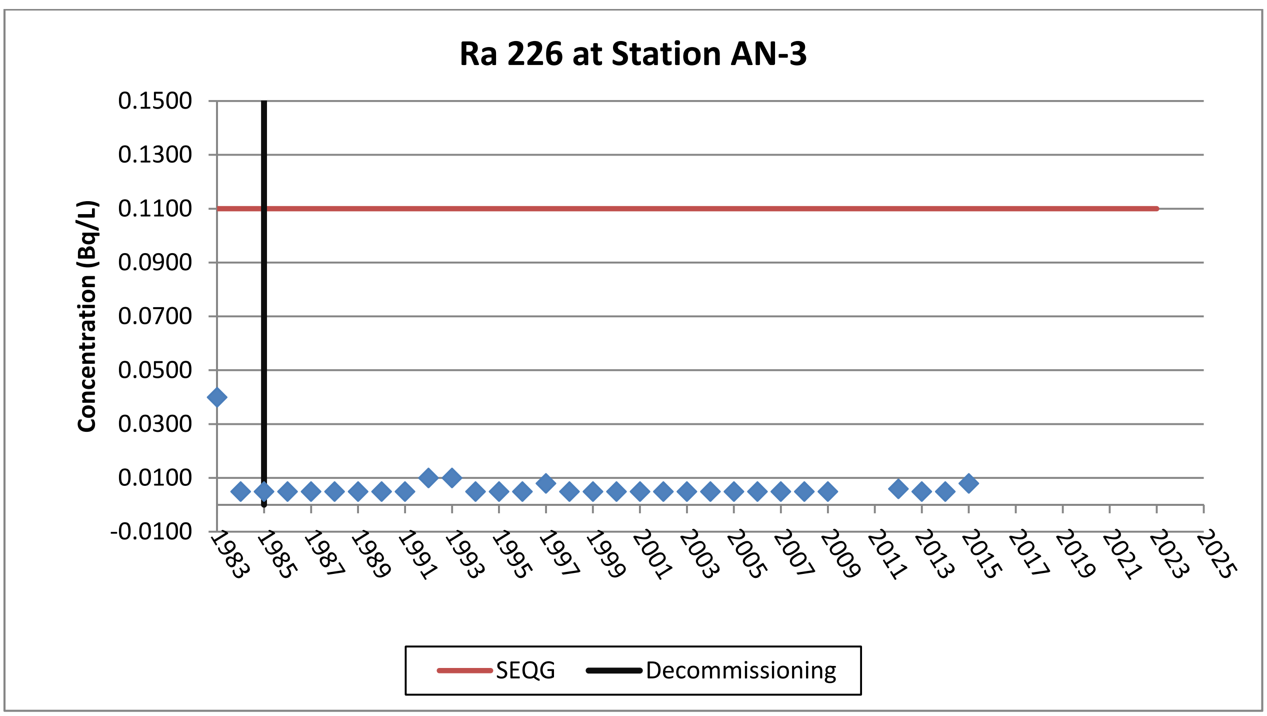


Figure 4.3.2-1 AN-3 Fulton Lake (Upstream of TL Stations)



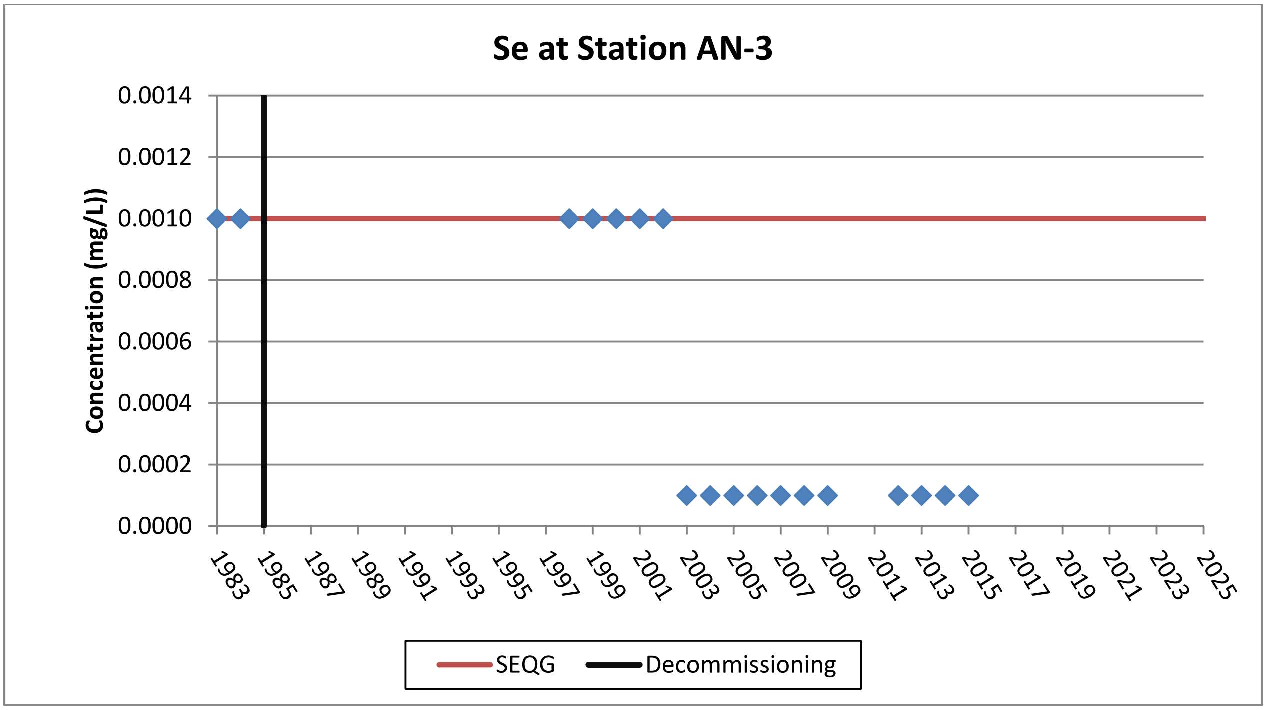
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

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*

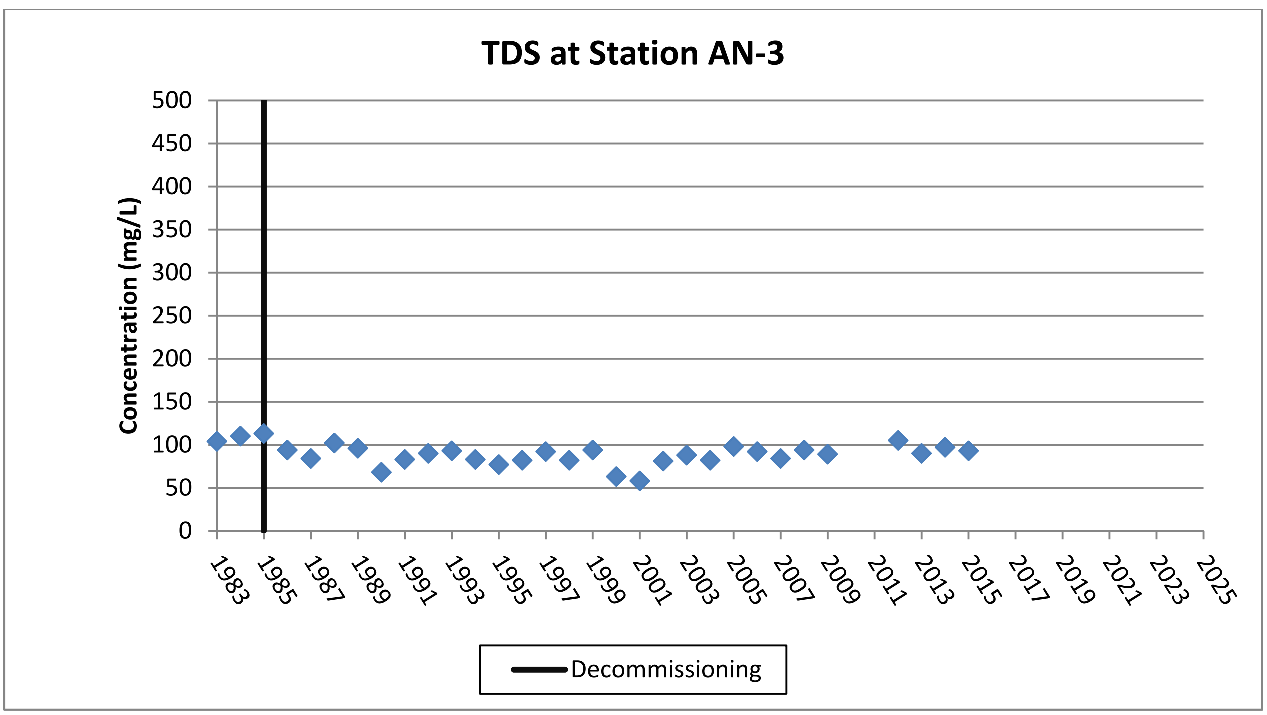
Figure 4.3.2-3 AN-3 Fulton Lake (Upstream of TL Stations)



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

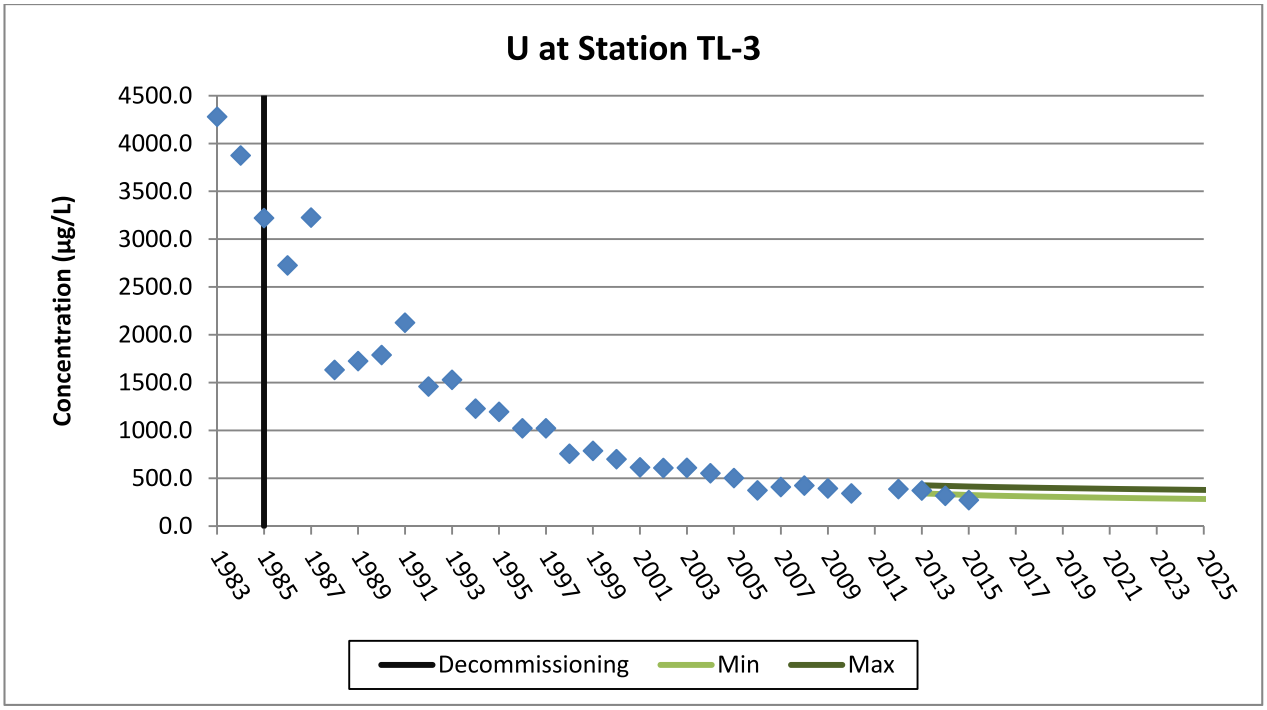
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003

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



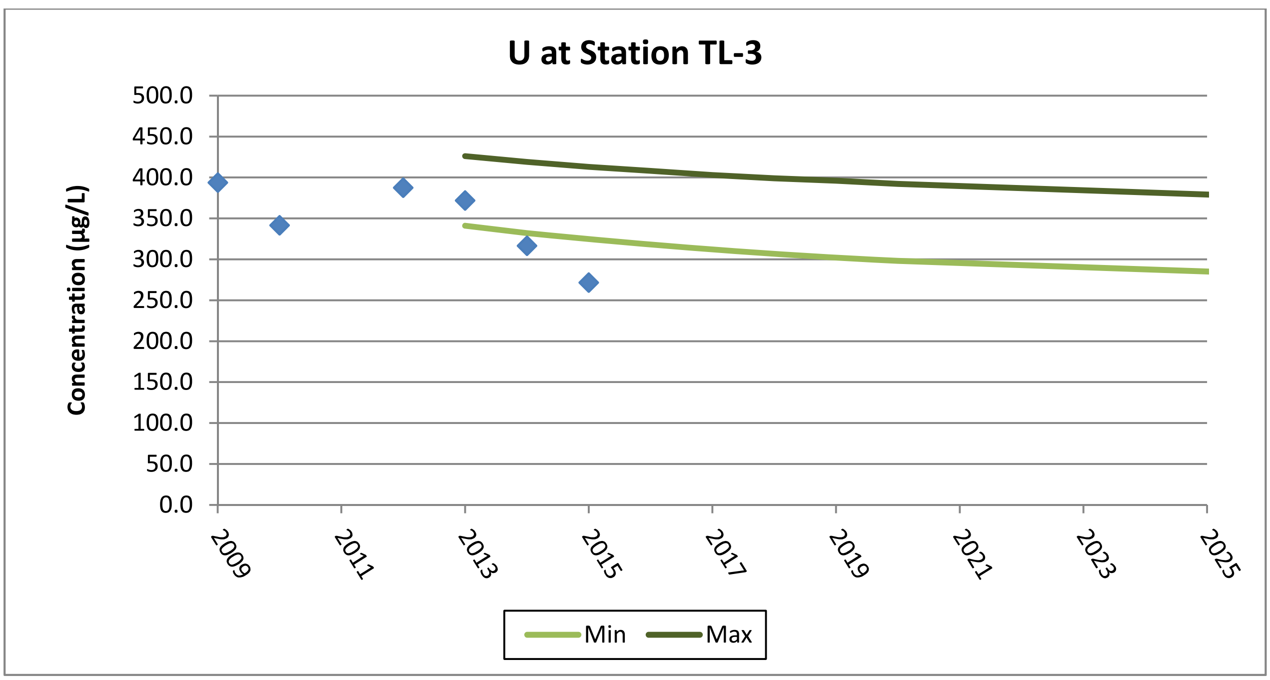
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*

Figure 4.3.2-5 TL-3 Fookes Reservoir Discharge



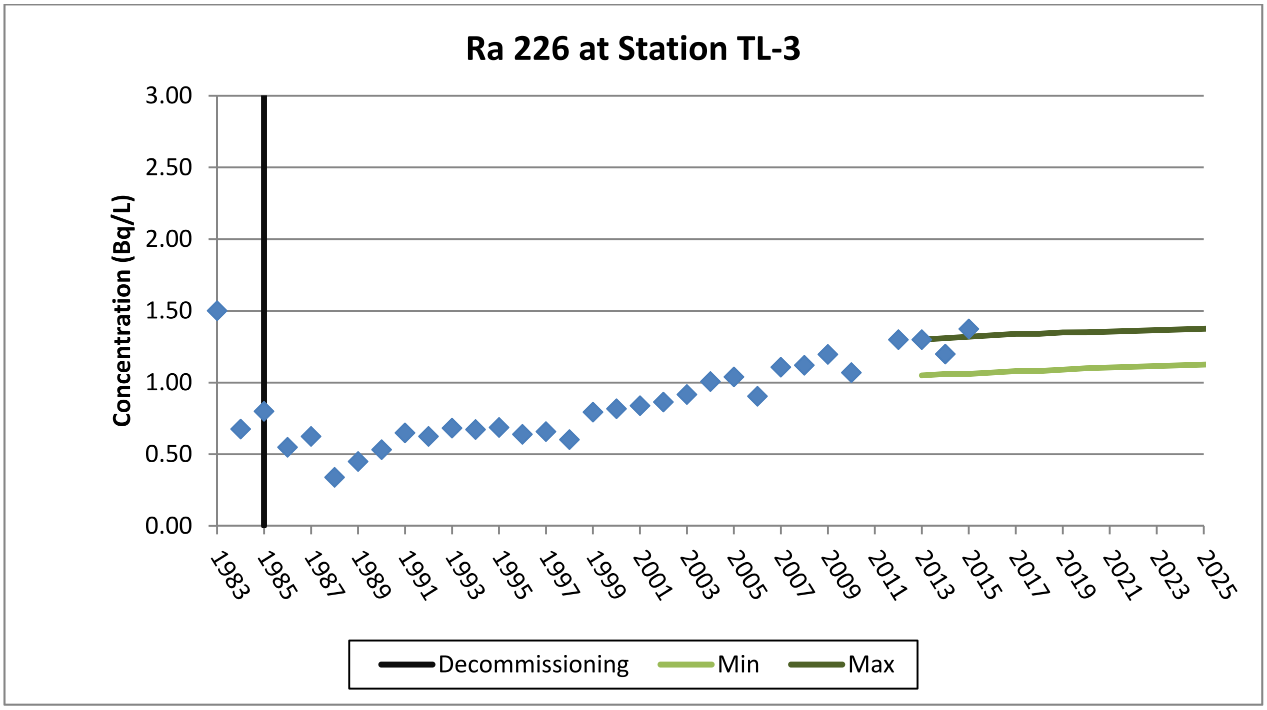
**No data available for 2011 due to a lack of water flow*

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



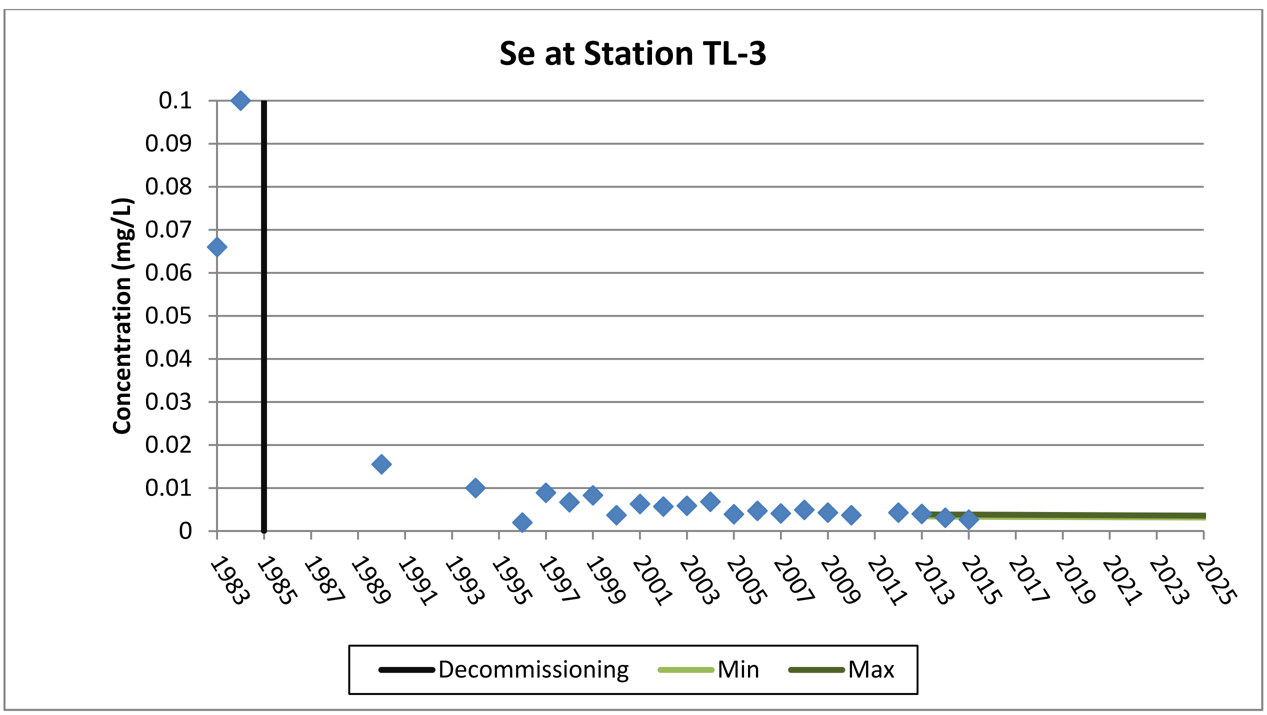
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-7 TL-3 Fookes Reservoir Discharge



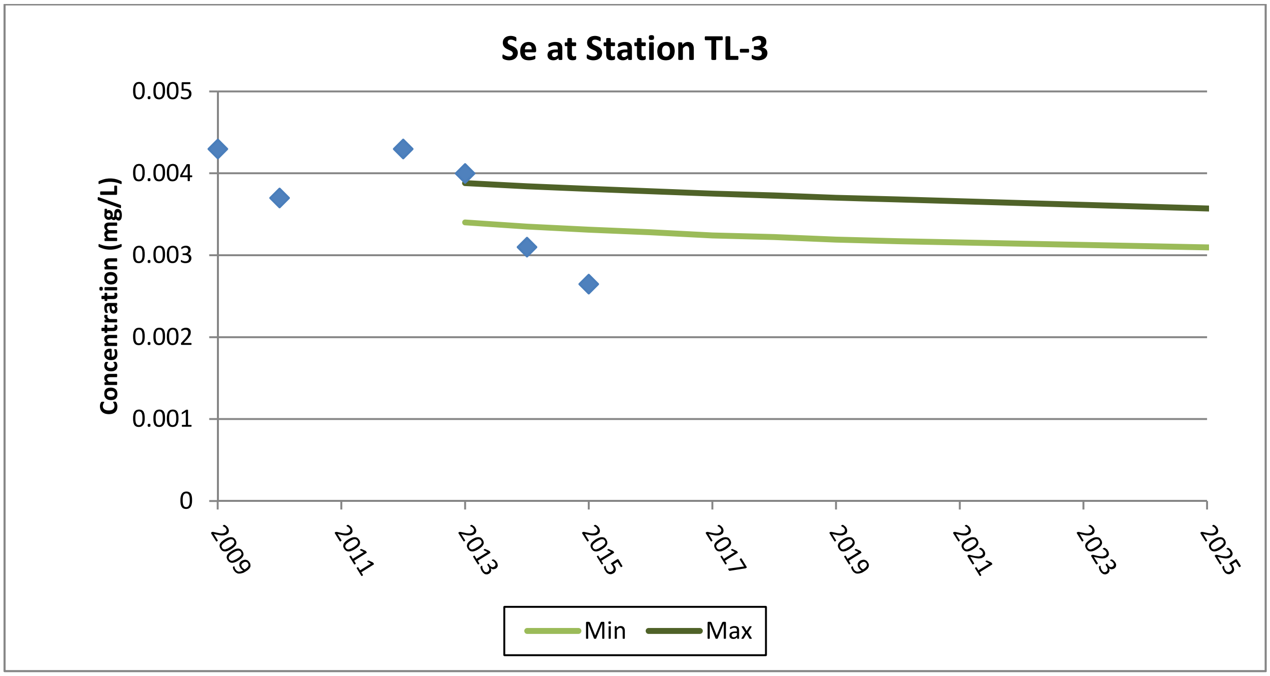
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-8 TL-3 Fookes Reservoir Discharge



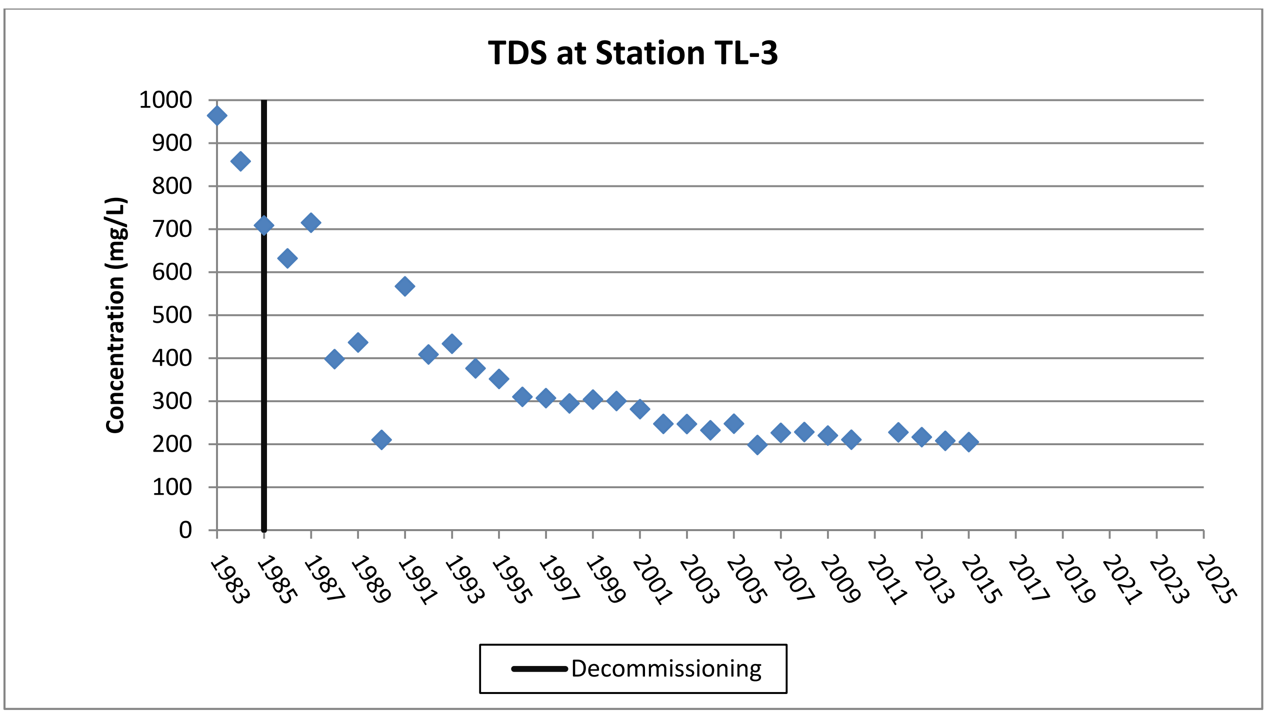
**No data available for 2011 due to a lack of water flow*

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



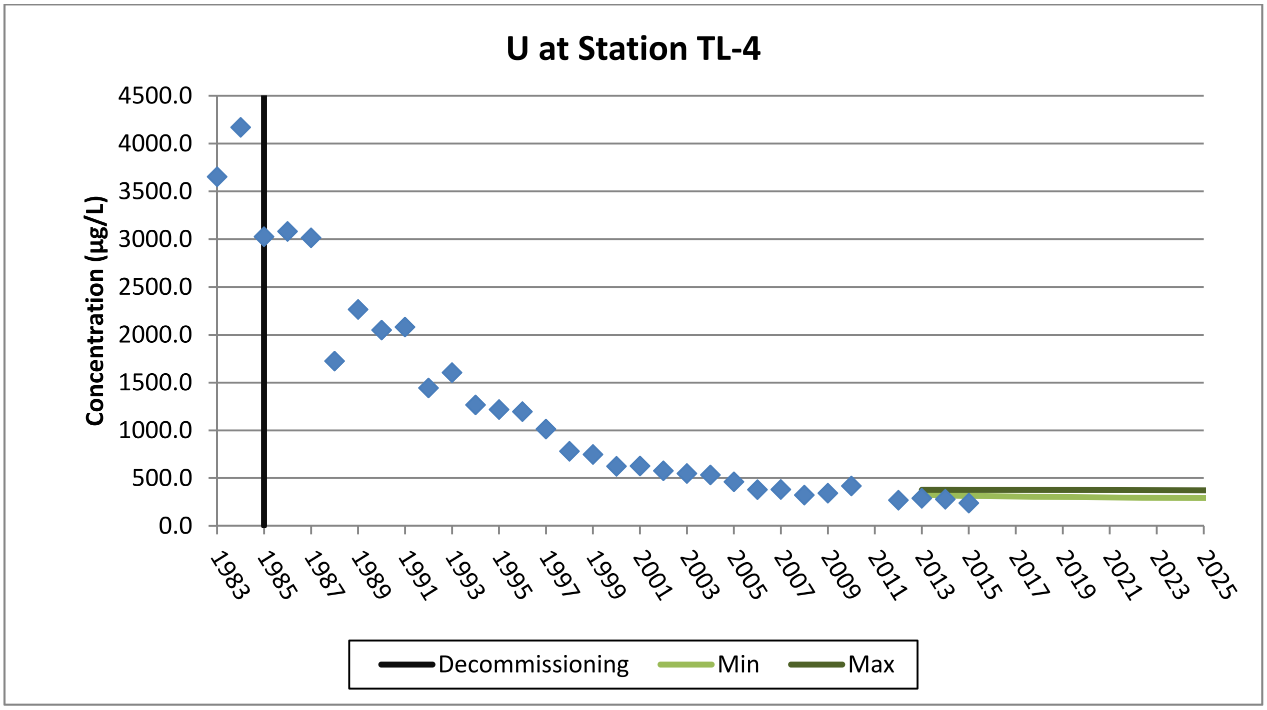
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-10 TL-3 Fookes Reservoir Discharge



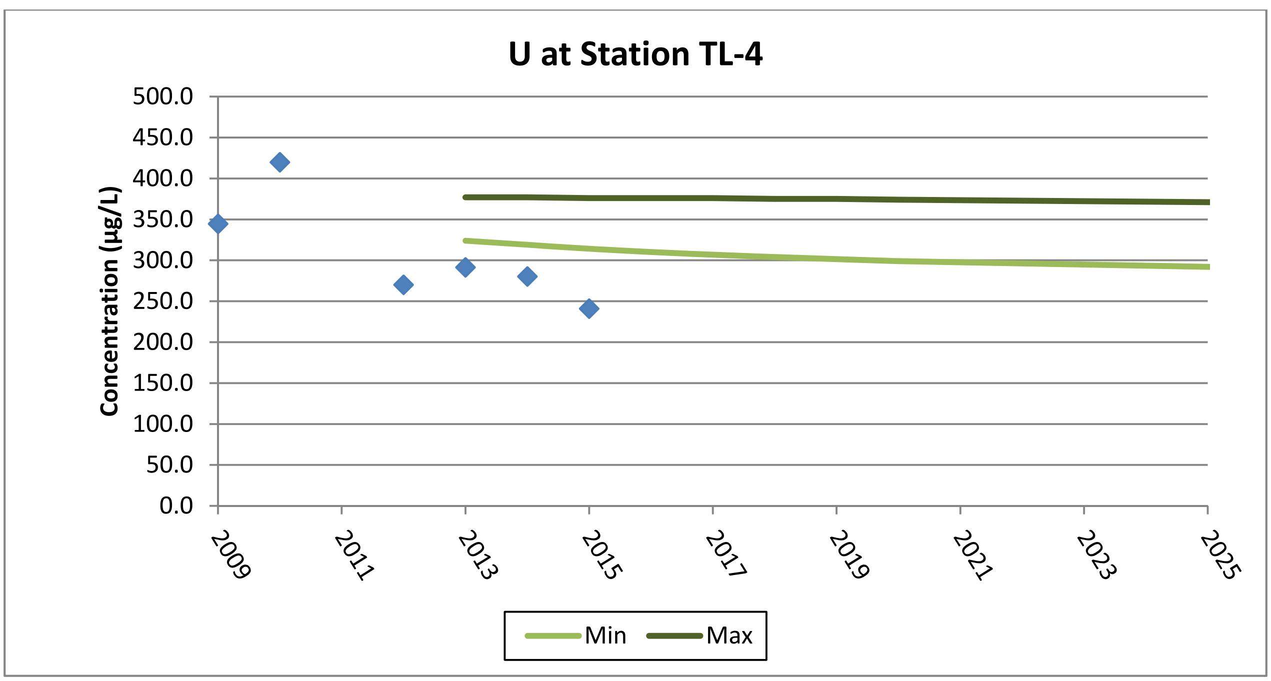
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-11 TL-4 Marie Reservoir Discharge



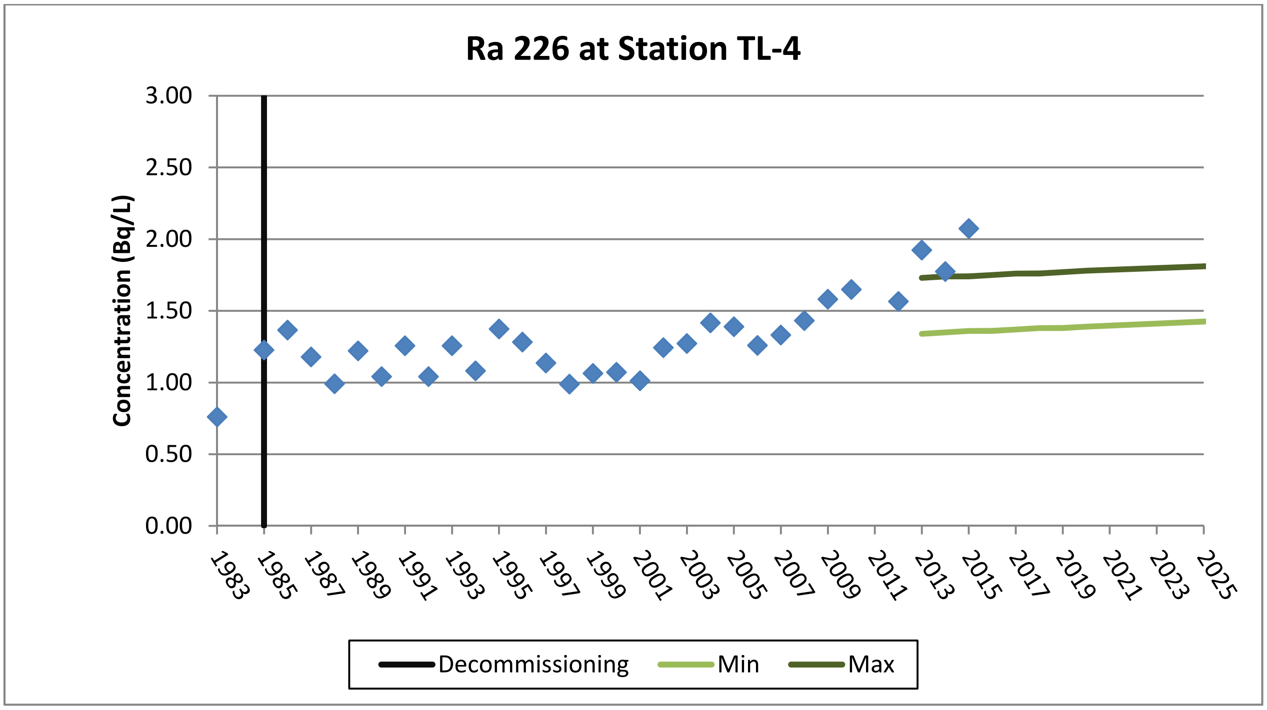
**No data available for 2011 due to a lack of water flow*

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



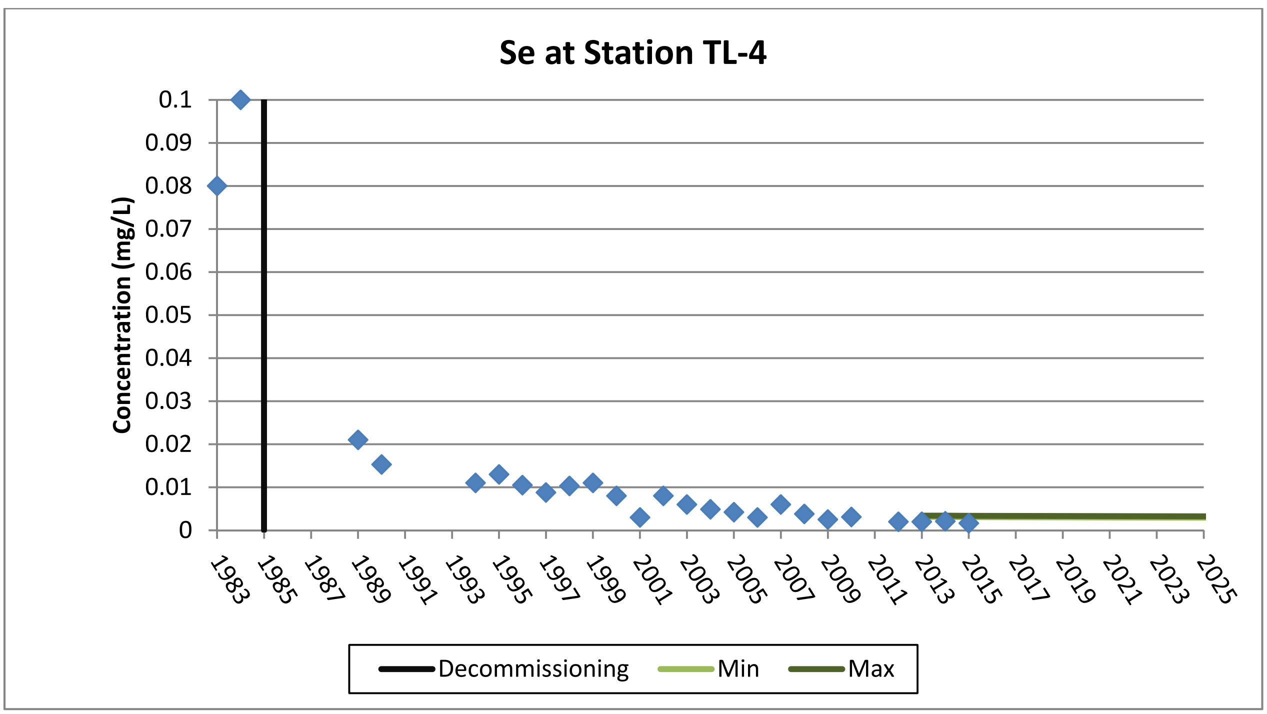
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-13 TL-4 Marie Reservoir Discharge



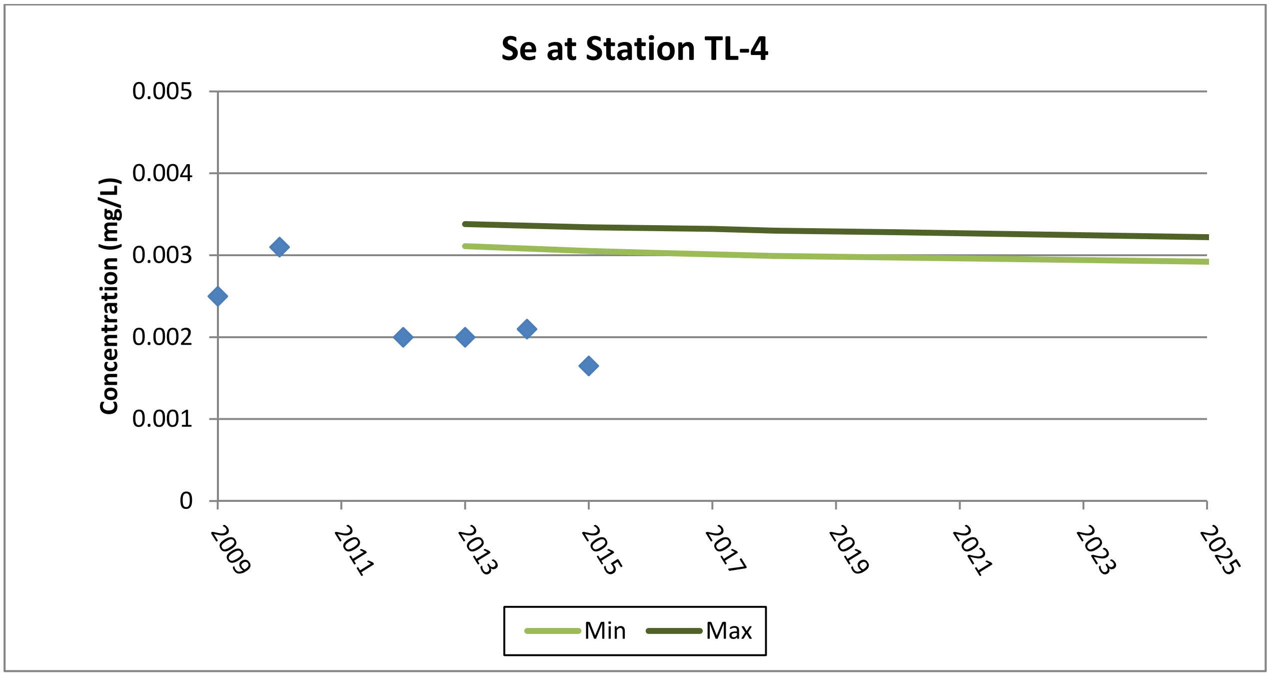
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-14 TL-4 Marie Reservoir Discharge



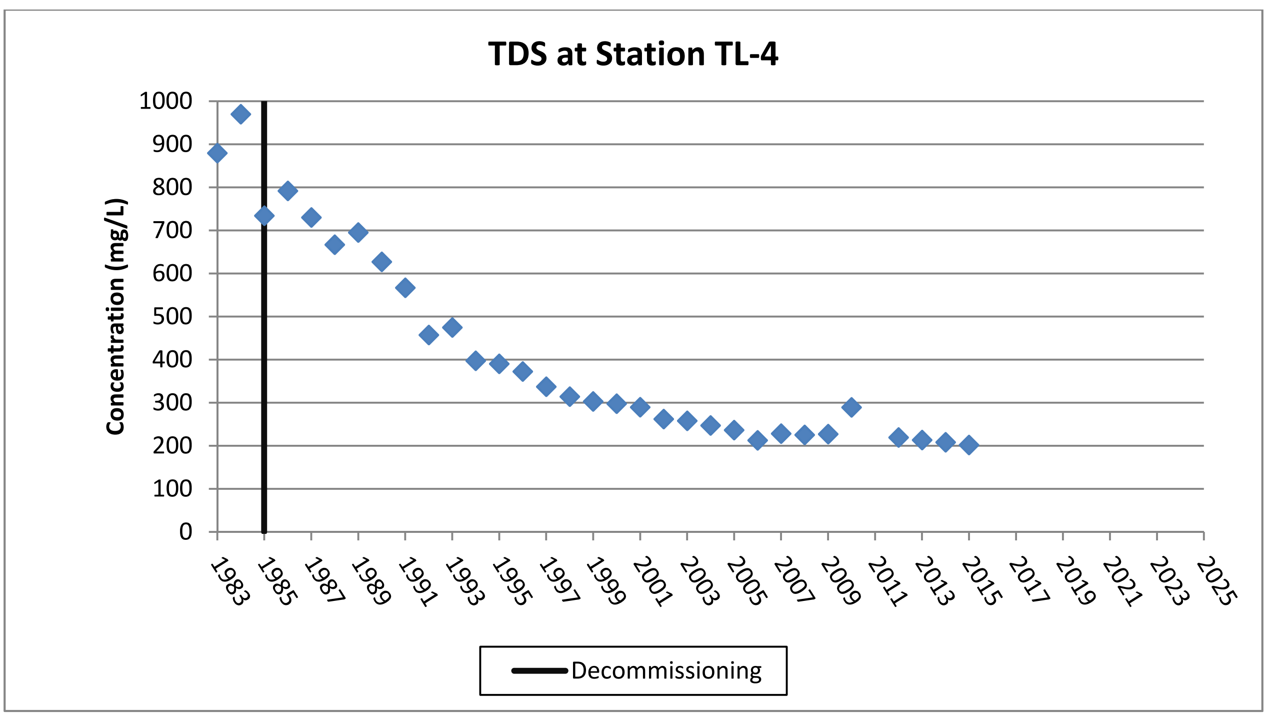
**No data available for 2011 due to a lack of water flow*

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



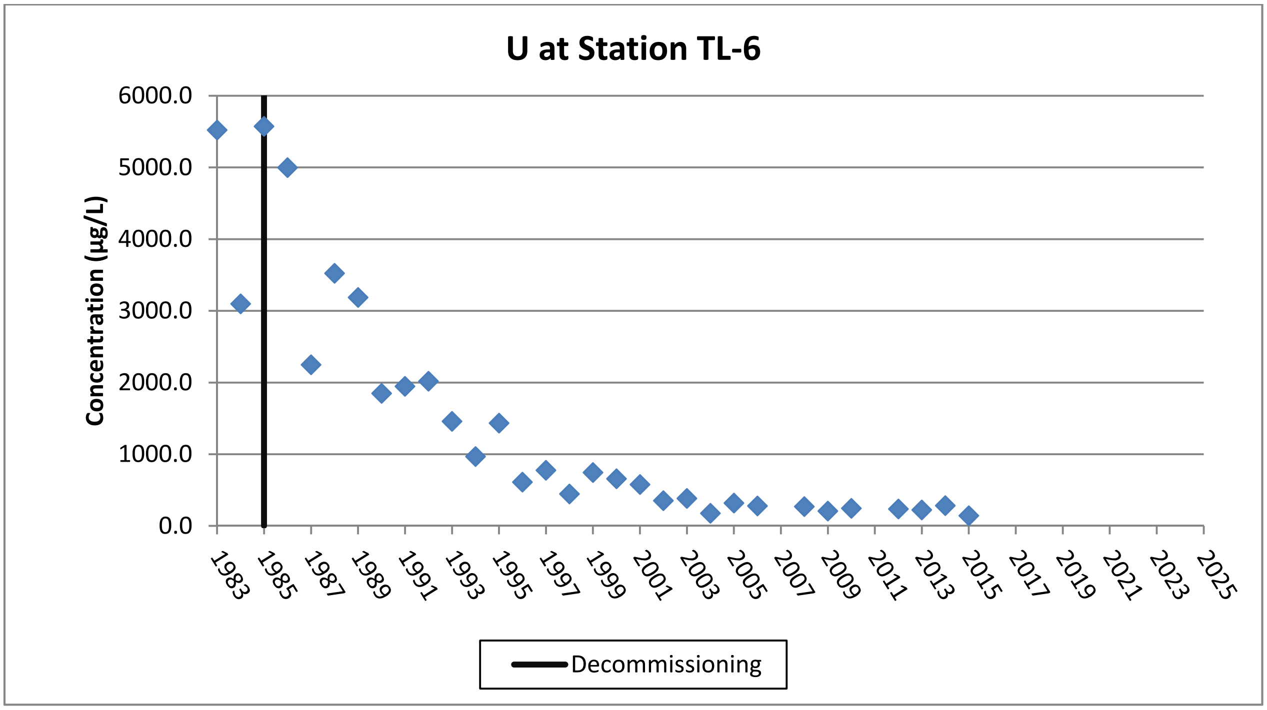
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-16 TL-4 Marie Reservoir Discharge



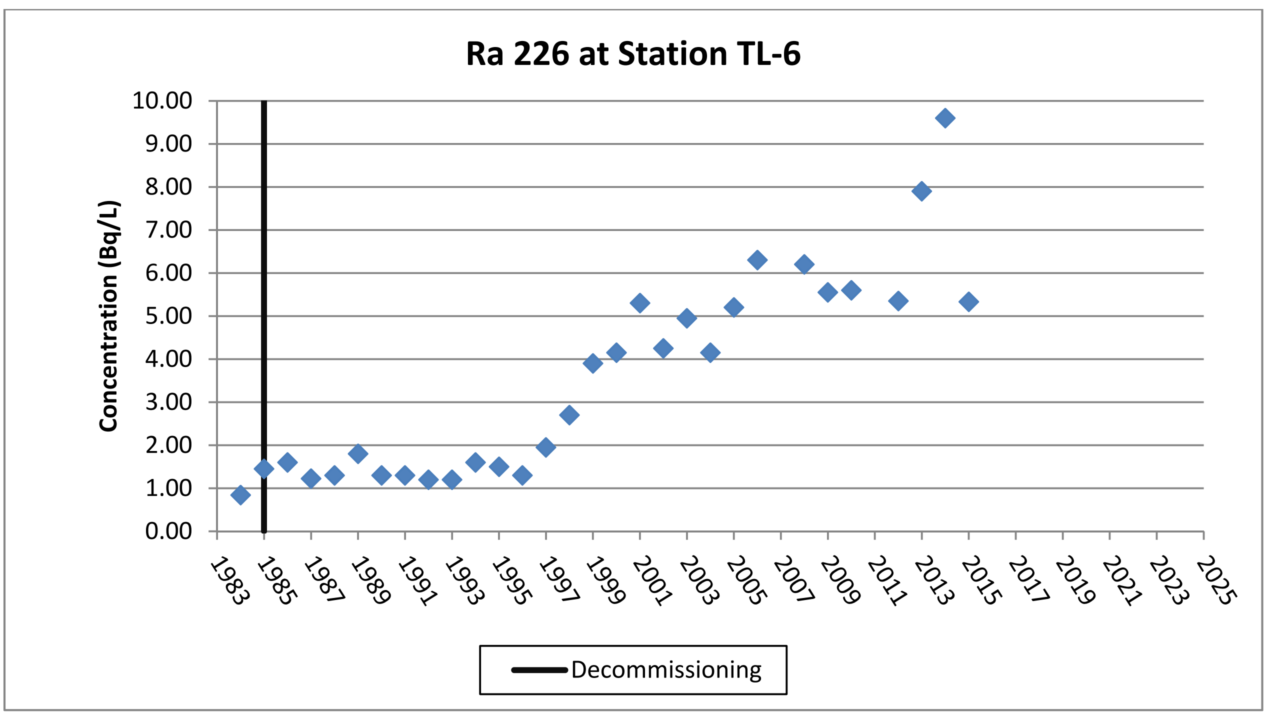
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-17 TL-6 Minewater Reservoir Discharge



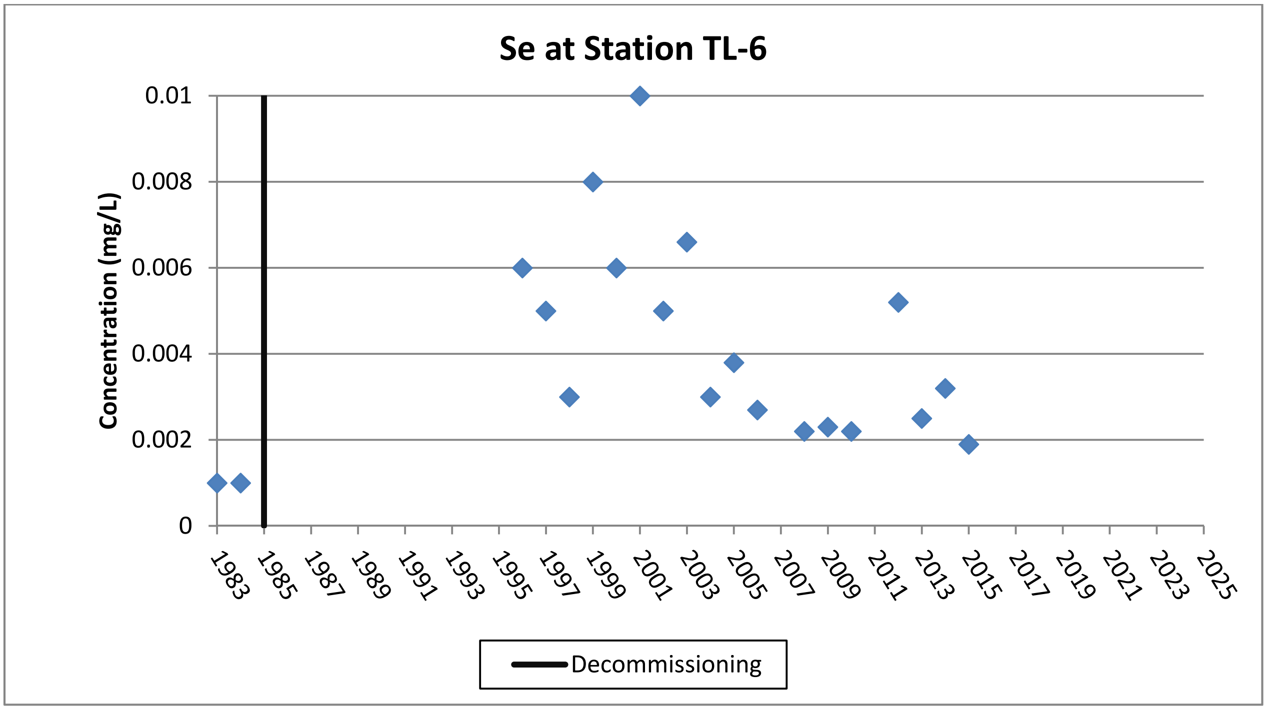
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-18 TL-6 Minewater Reservoir Discharge



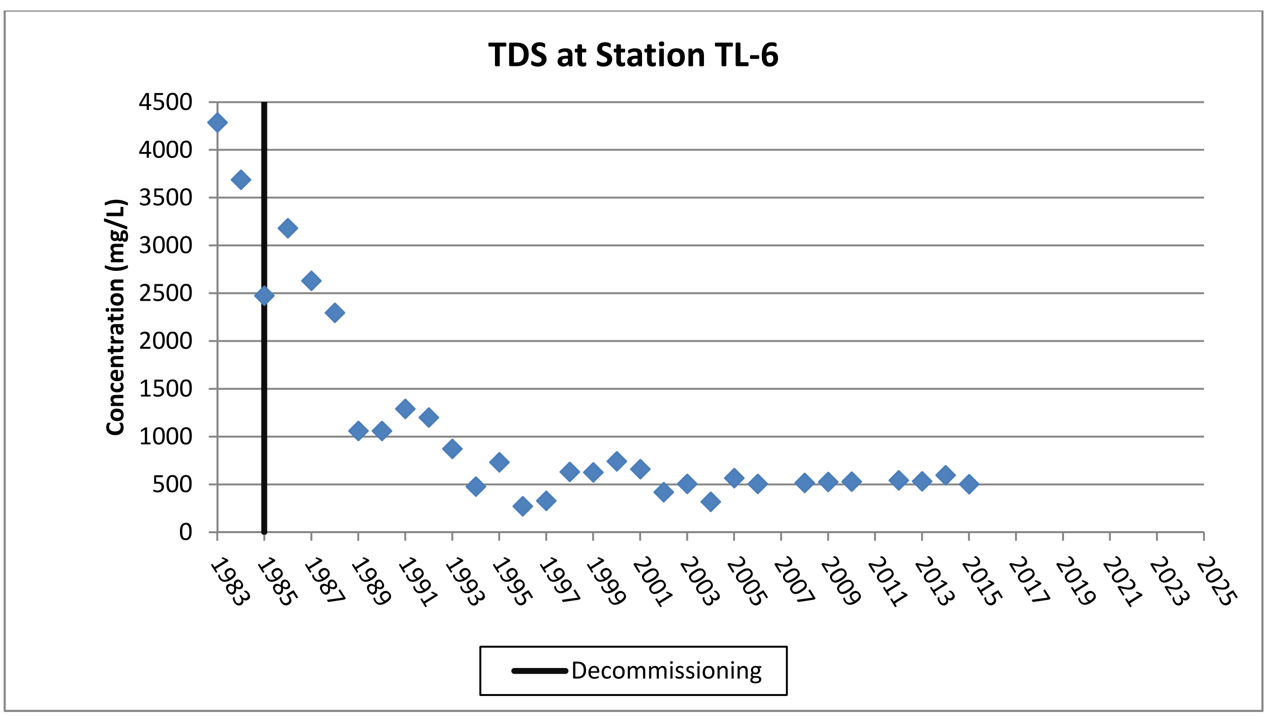
**No data available for 2007 and 2011 due to a lack of water flow*

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

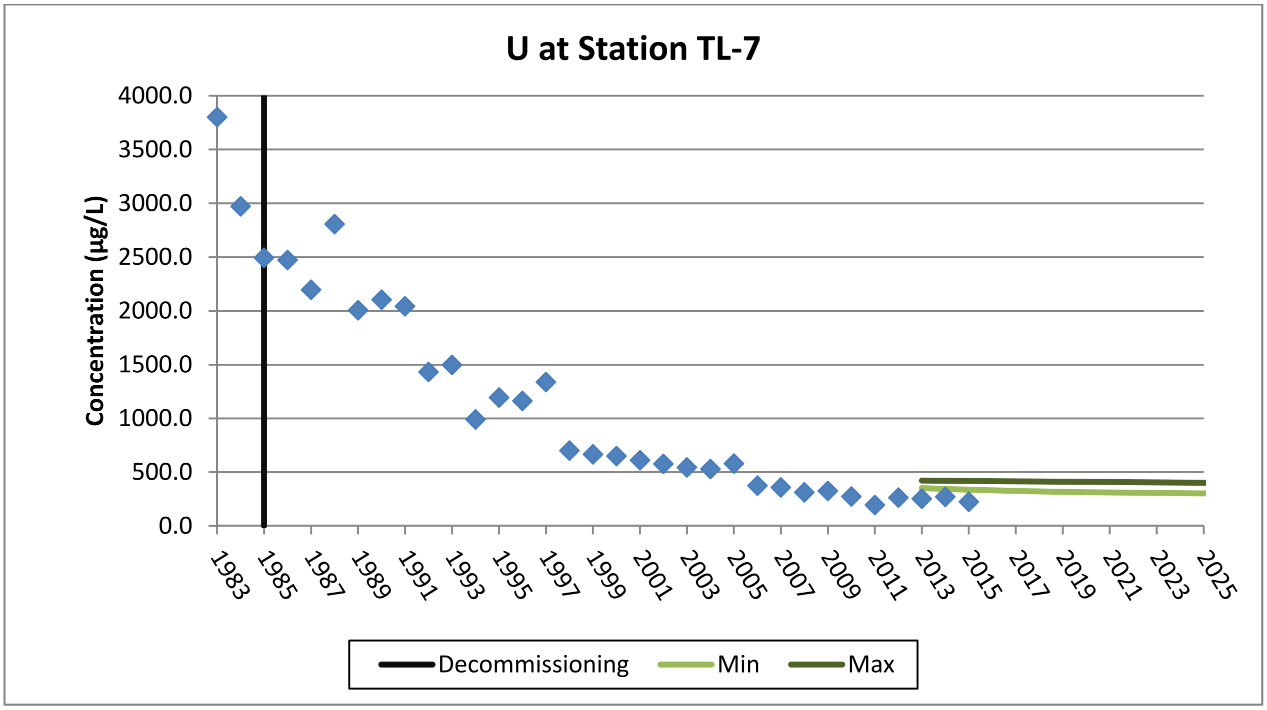


Figure 4.3.2-22 TL-7 Meadow Fen Discharge - Detailed Trend

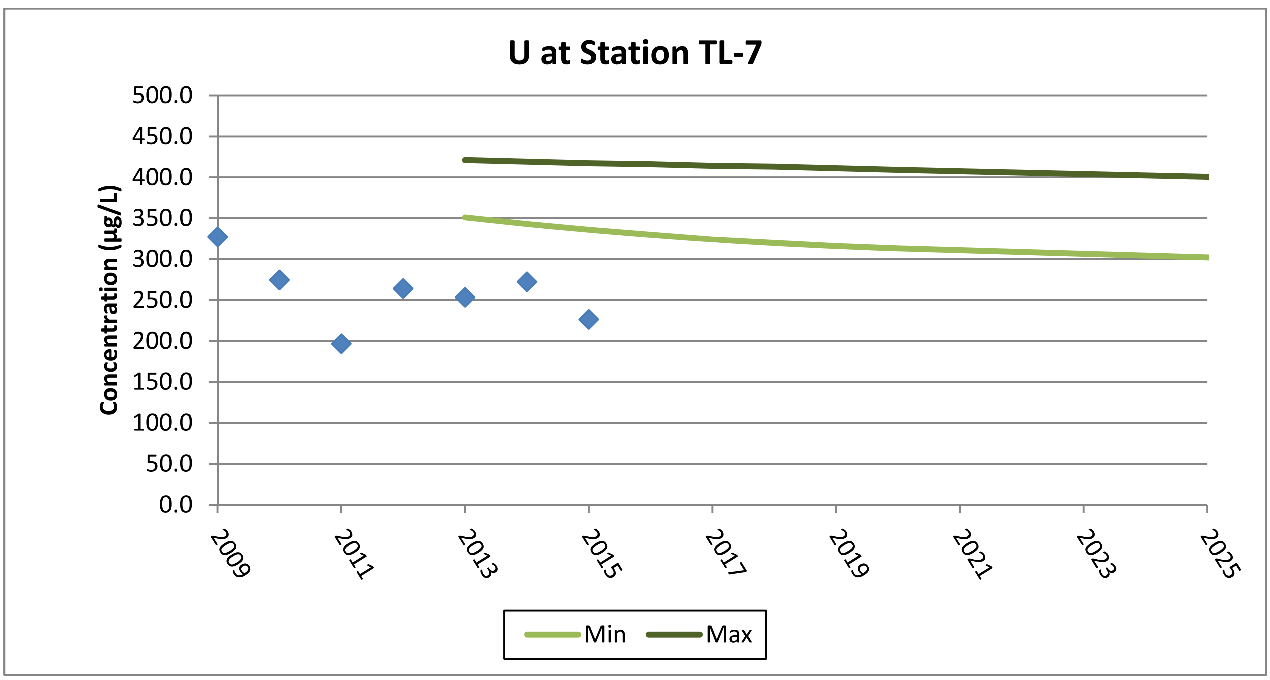


Figure 4.3.2-23 TL-7 Meadow Fen Discharge

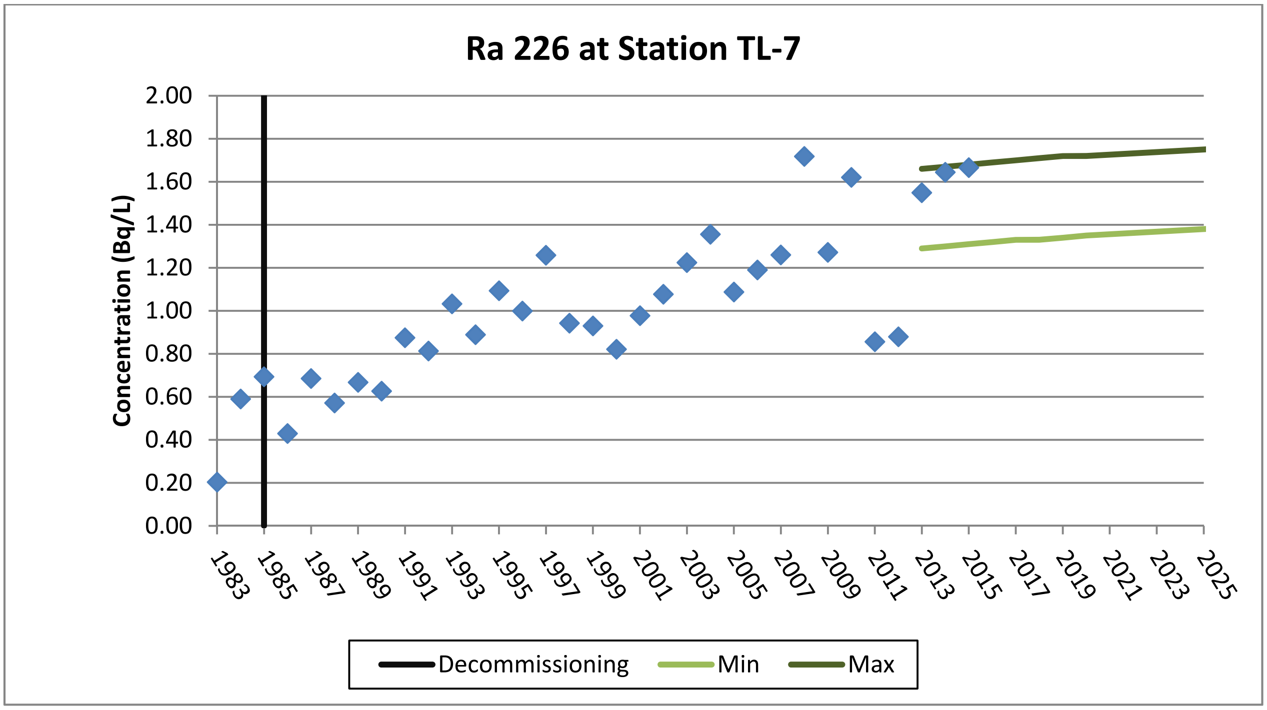


Figure 4.3.2-24 TL-7 Meadow Fen Discharge

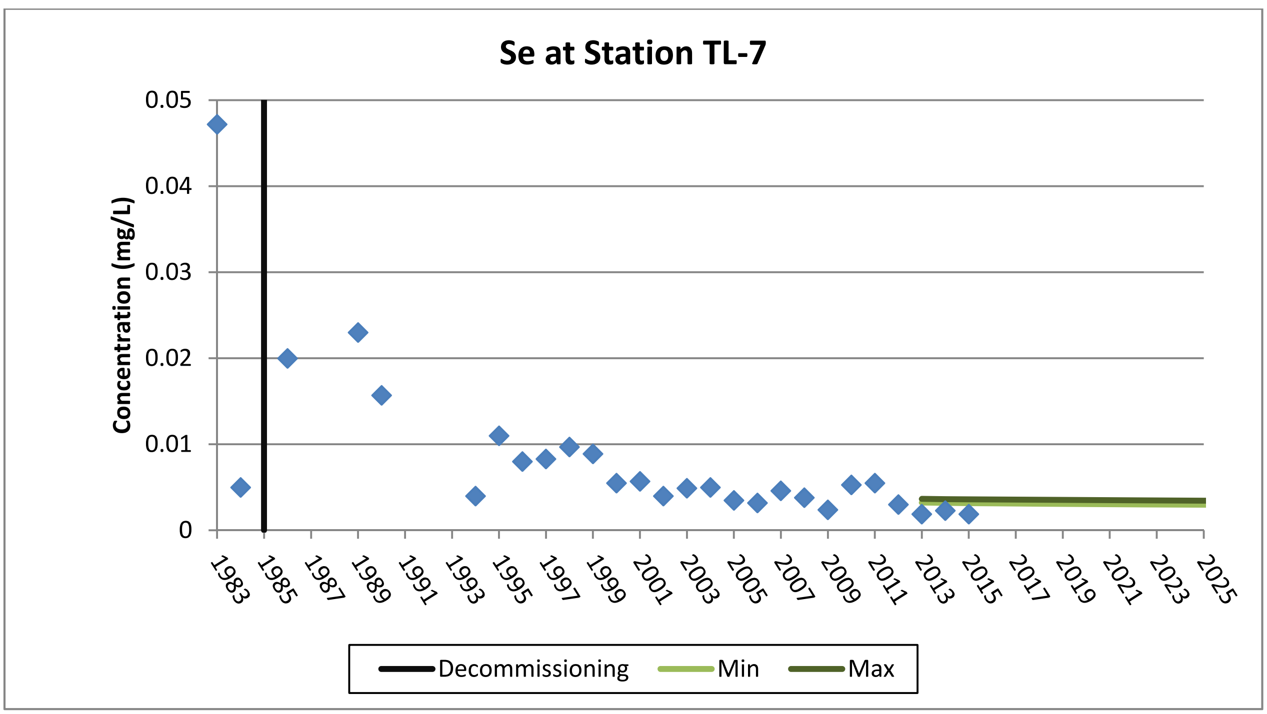


Figure 4.3.2-25 TL-7 Meadow Fen Discharge – Detailed Trend

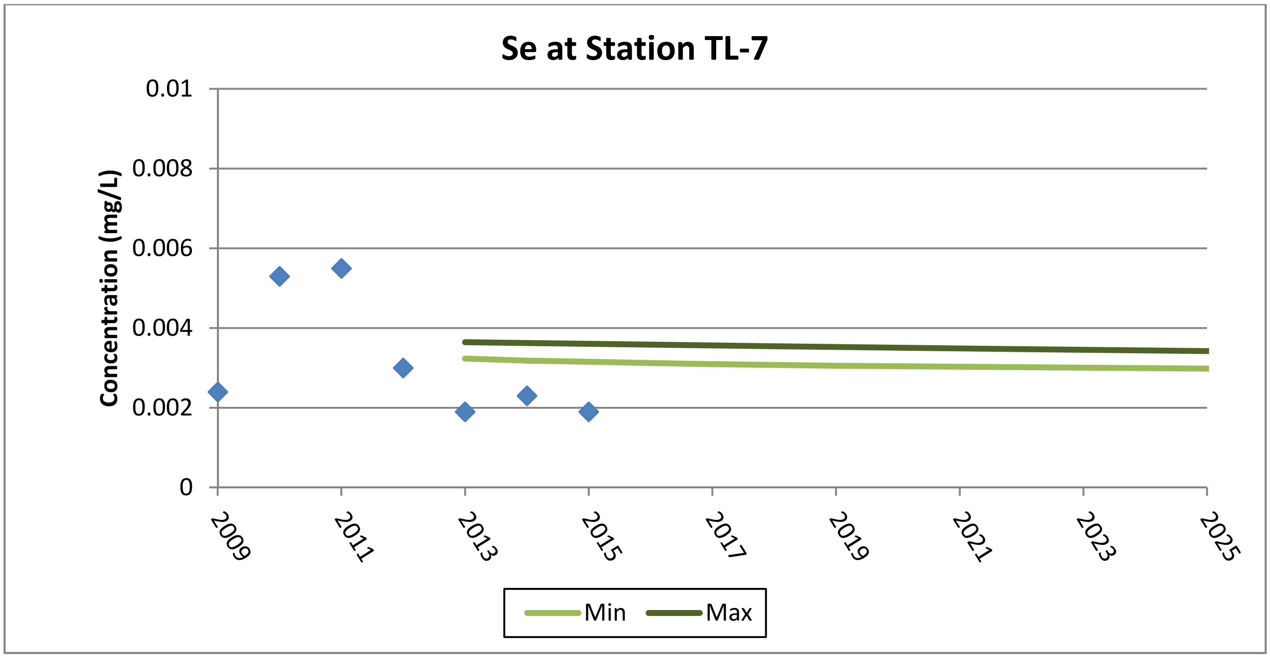


Figure 4.3.2-26 TL-7 Meadow Fen Discharge

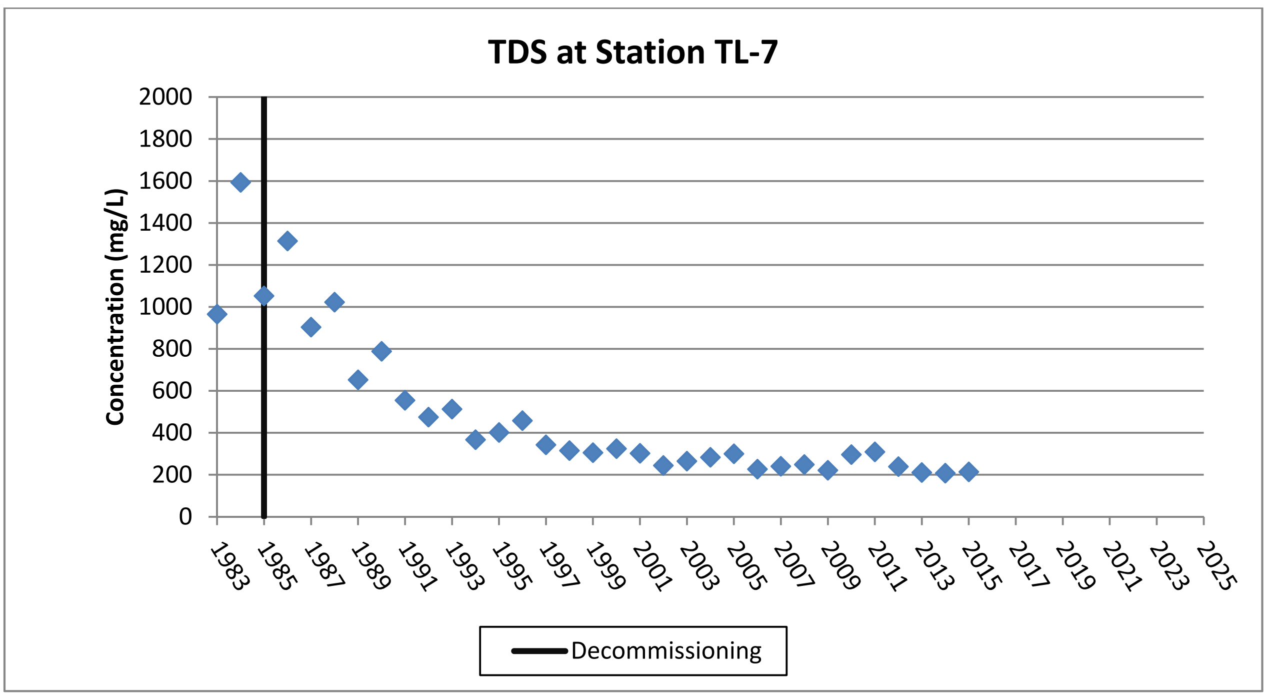
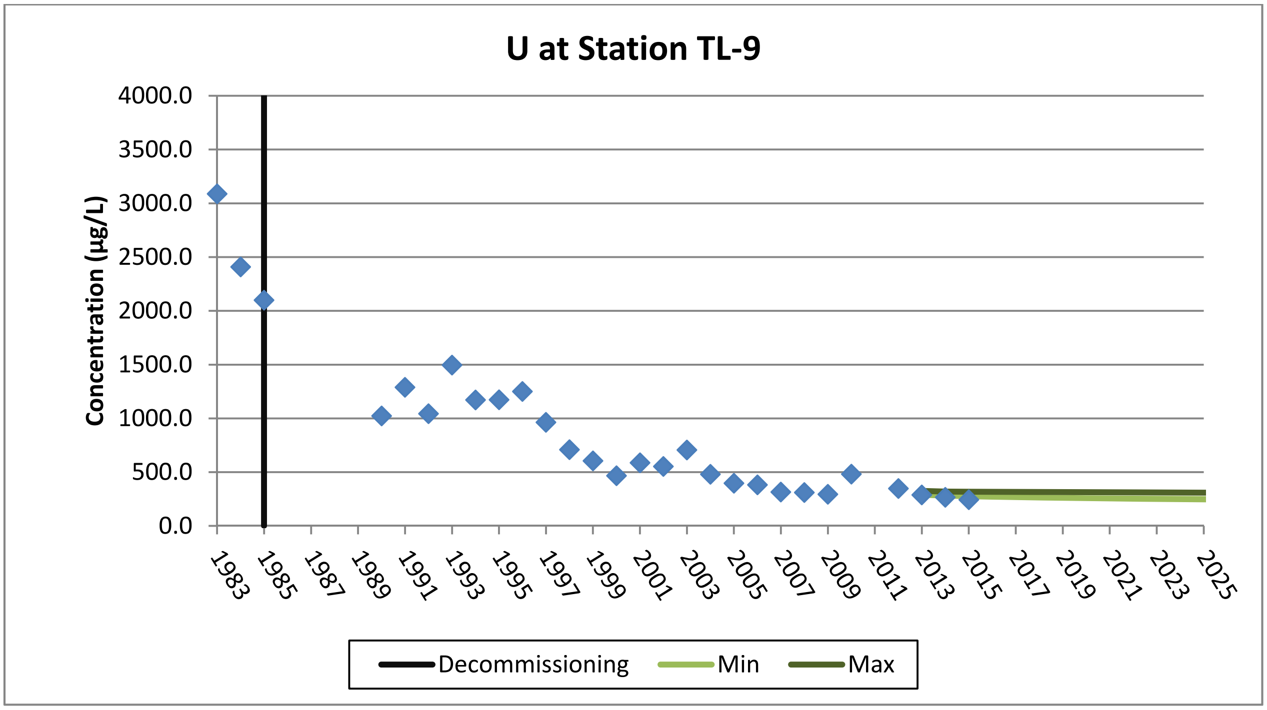
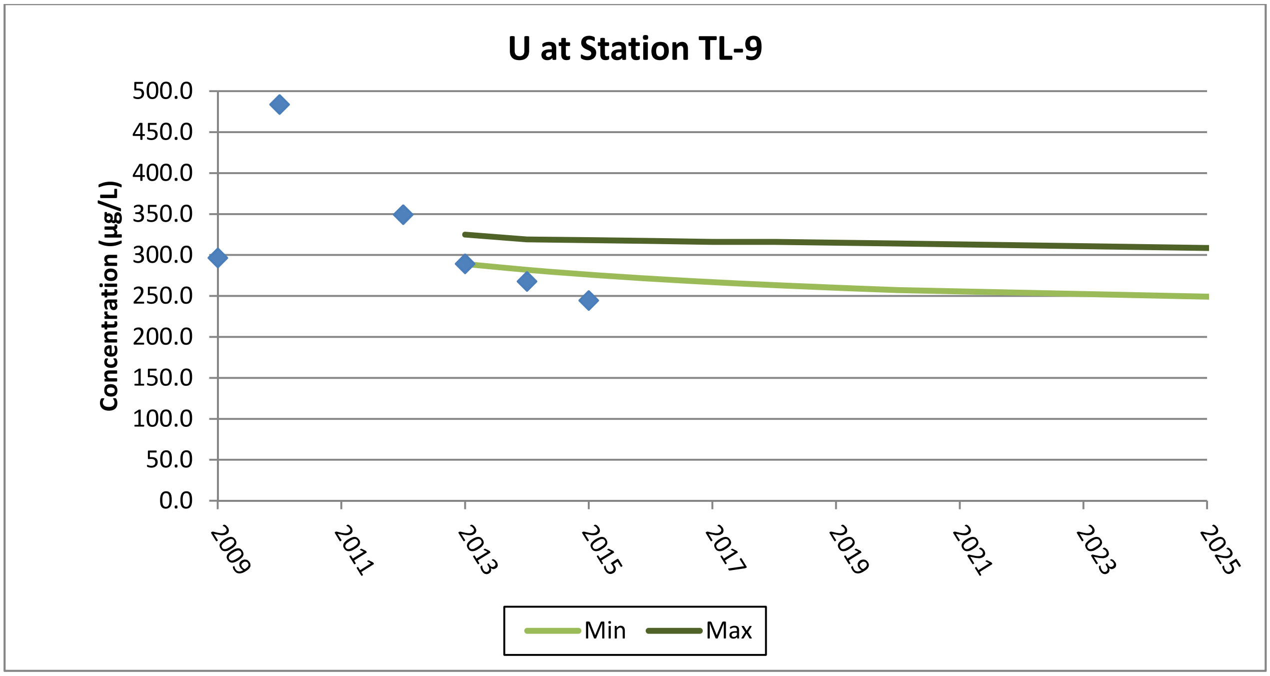


Figure 4.3.2-27 TL-9 Fulton Creek Below Greer Lake



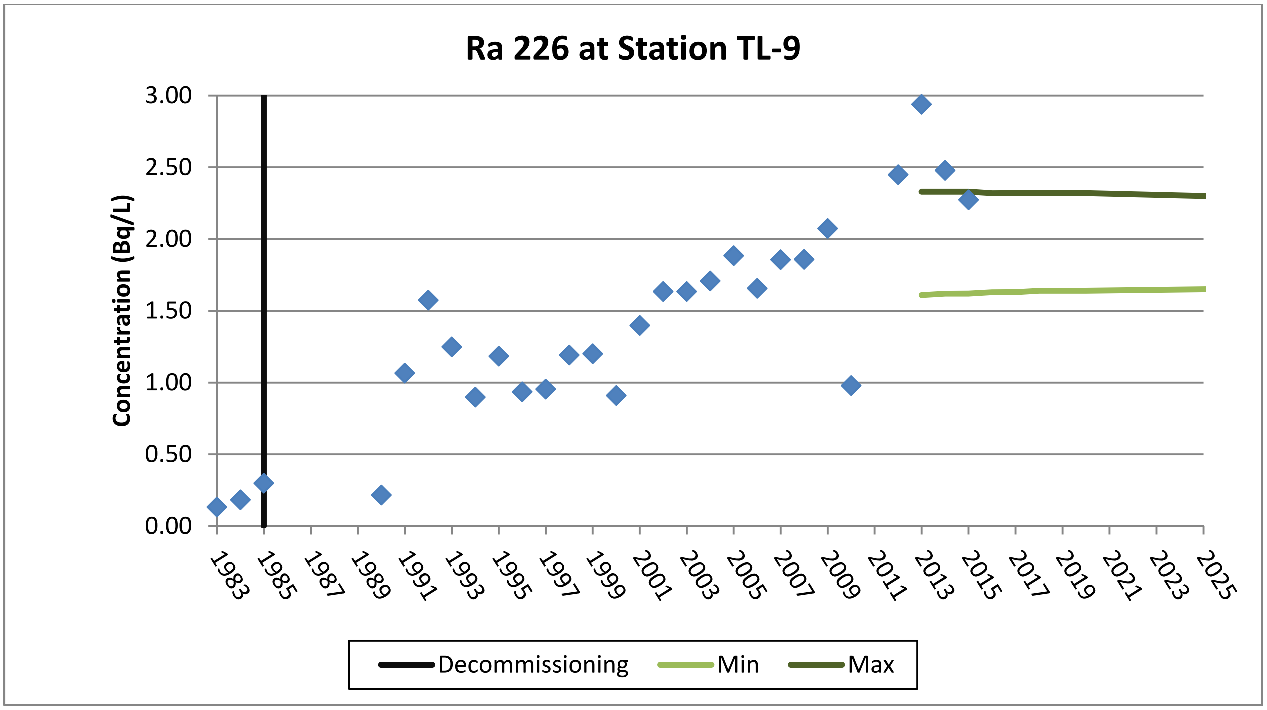
**There was no water flow at TL-9 in 2011.*

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



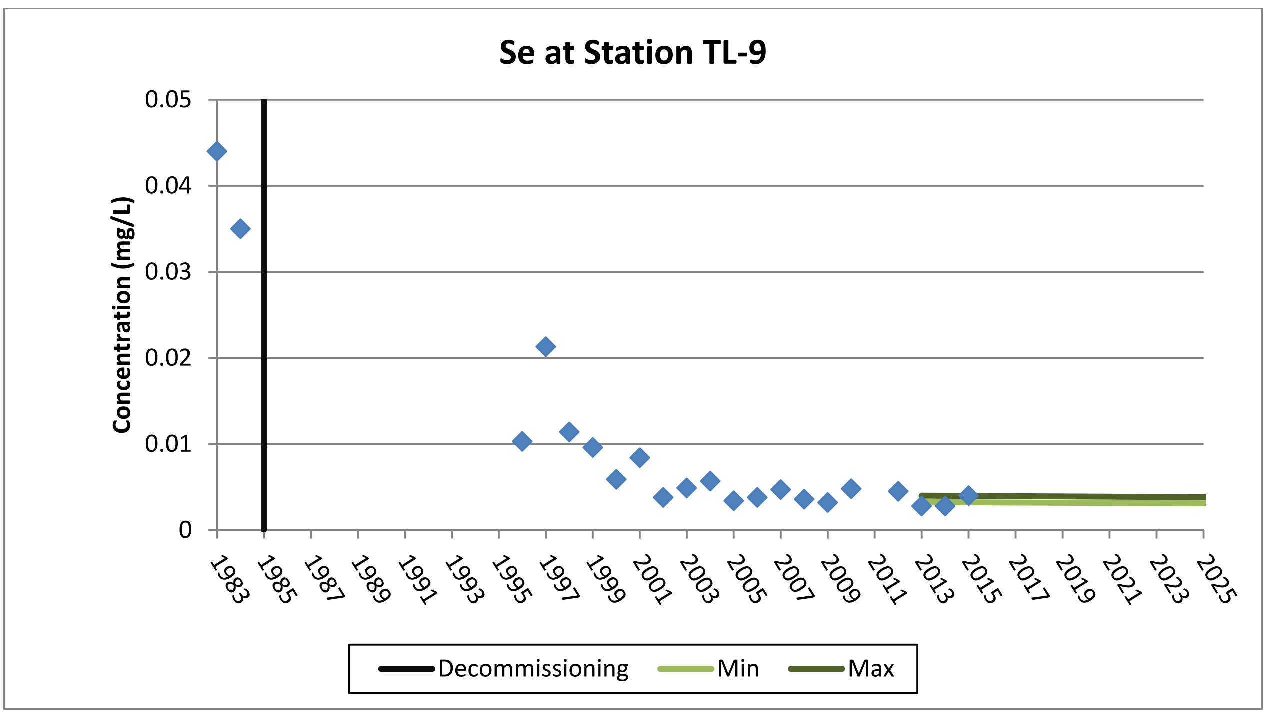
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-29 TL-9 Fulton Creek Below Greer Lake



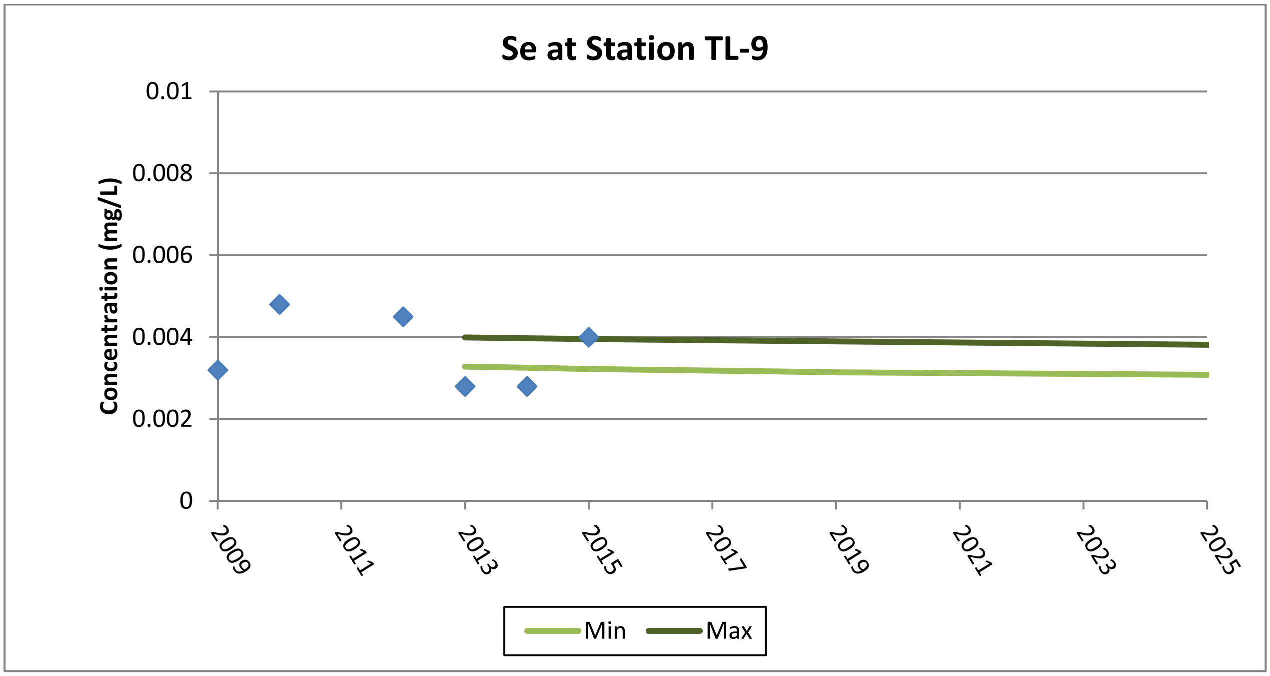
**There was no water flow at TL-9 in 2011.*

Figure 4.3.2-30 TL-9 - Fulton Creek Below Greer Lake



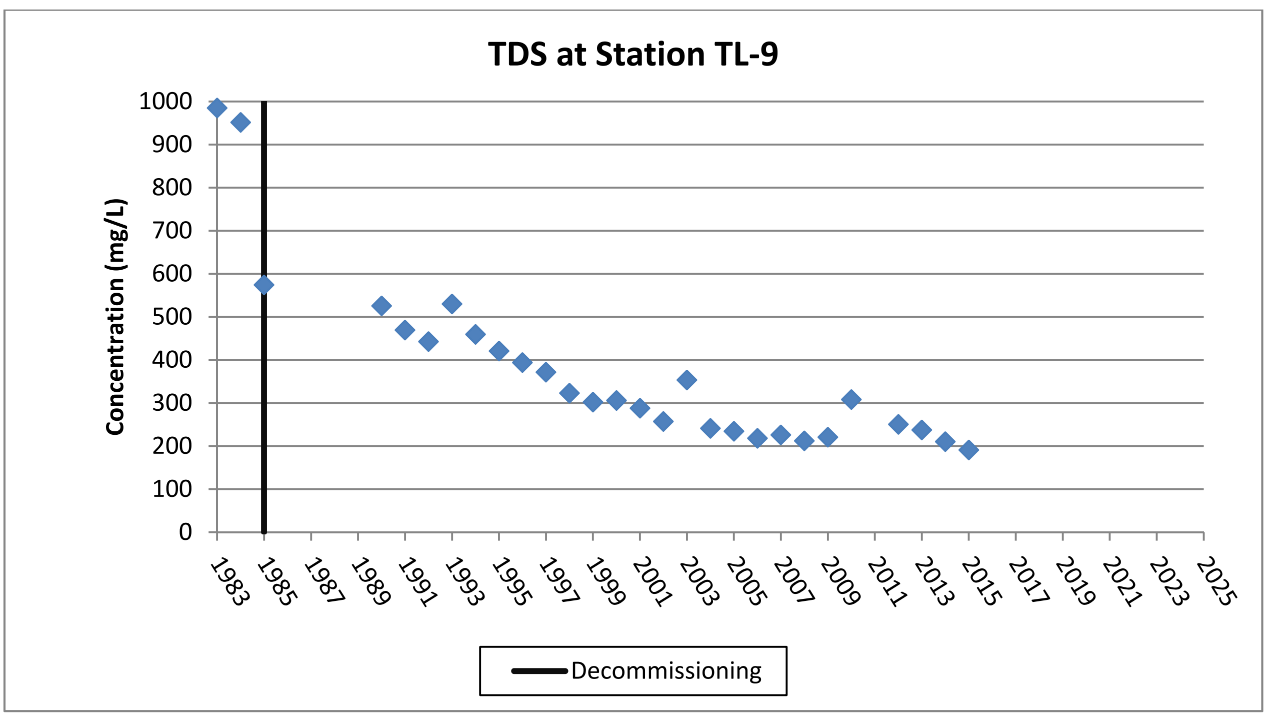
**There was no water flow at TL-9 in 2011.*

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



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

Figure 4.3.2-32 TL-9 - Fulton Creek Below 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

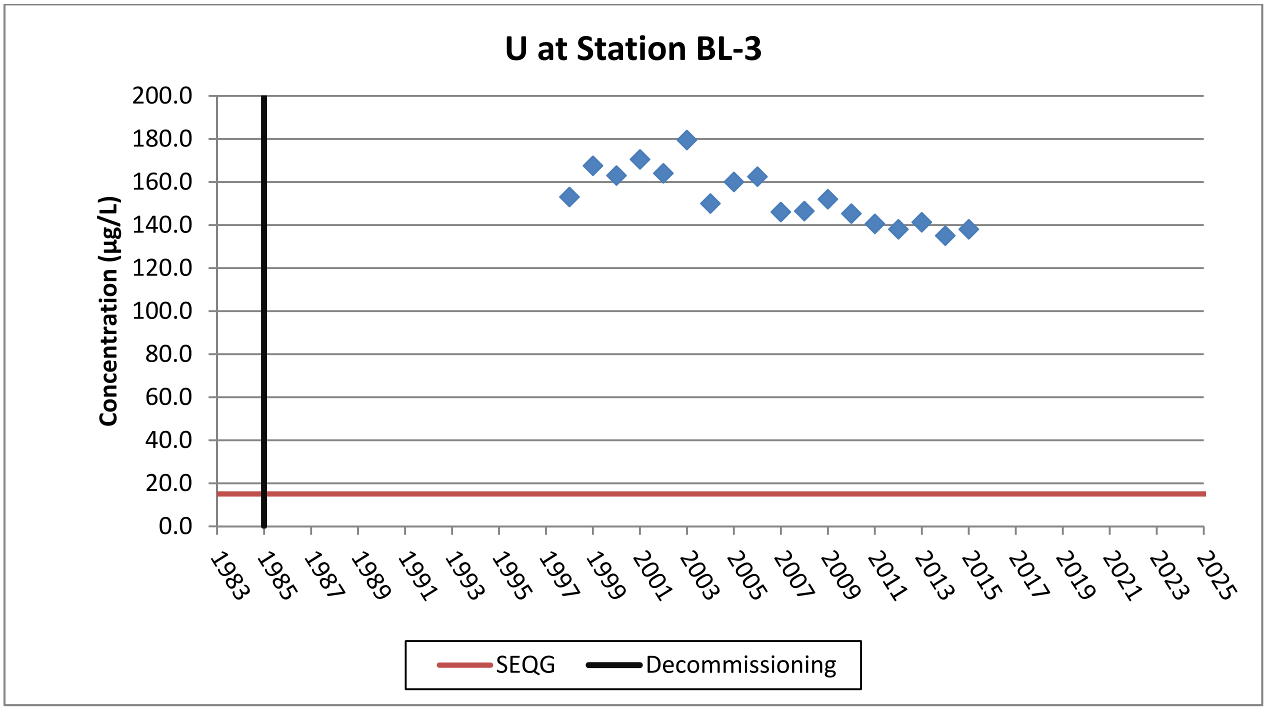


Figure 4.3.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

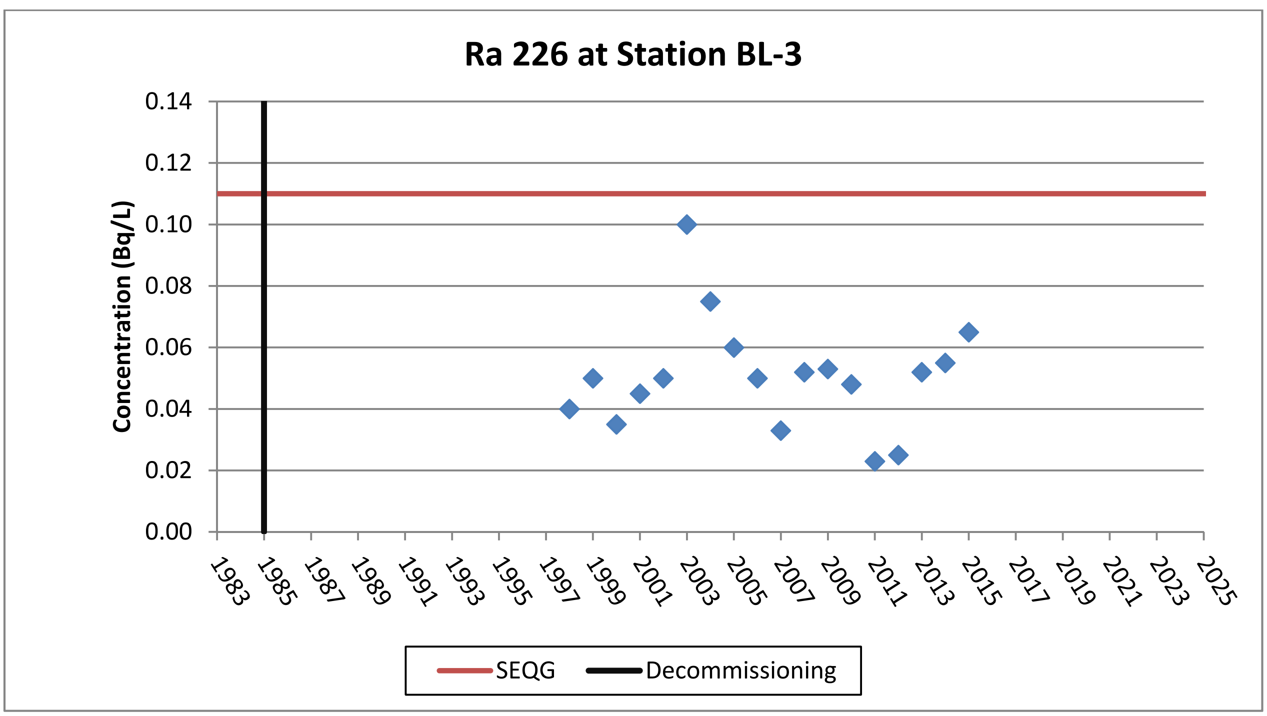
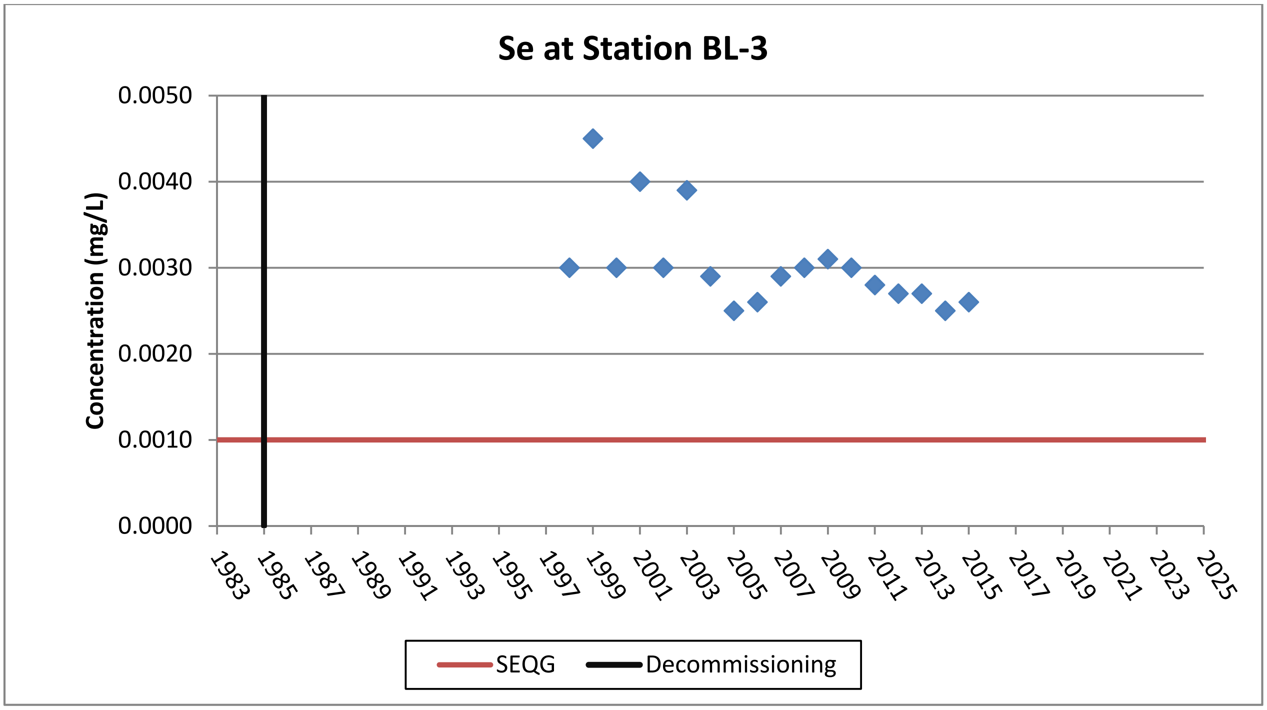


Figure 4.3.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



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

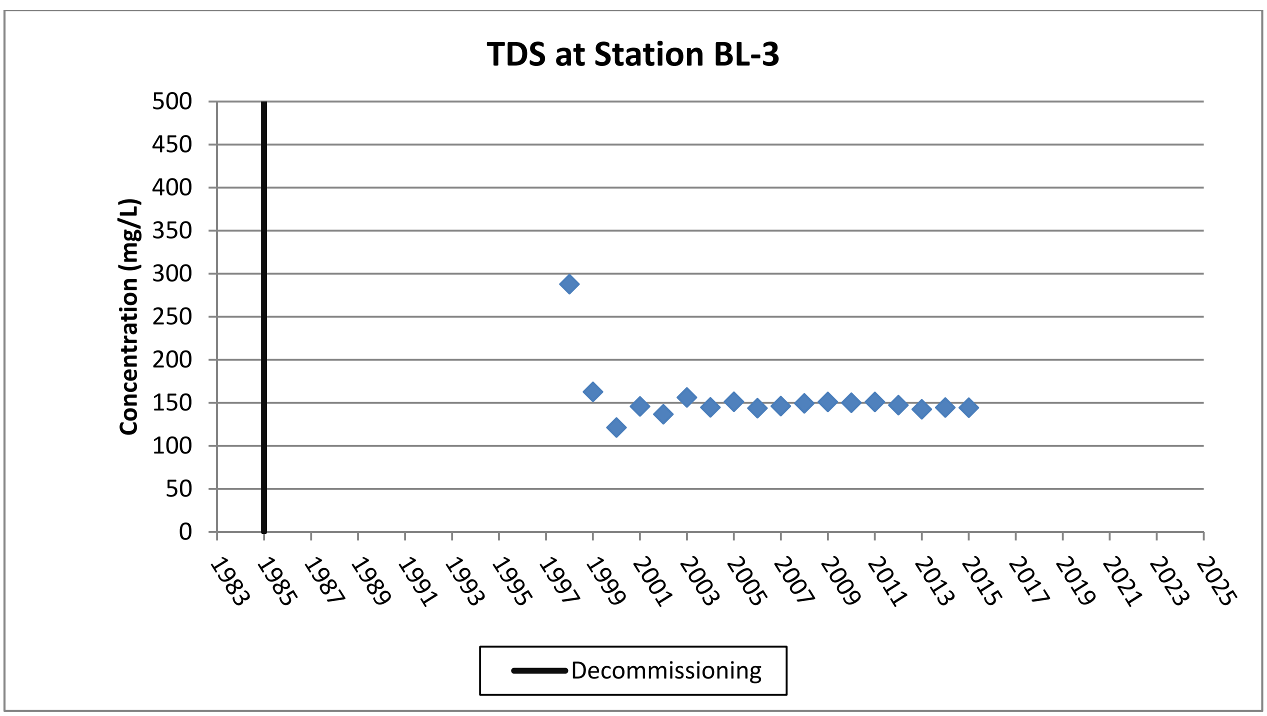


Figure 4.3.3-5 BL-4 Beaverlodge Lake Centre

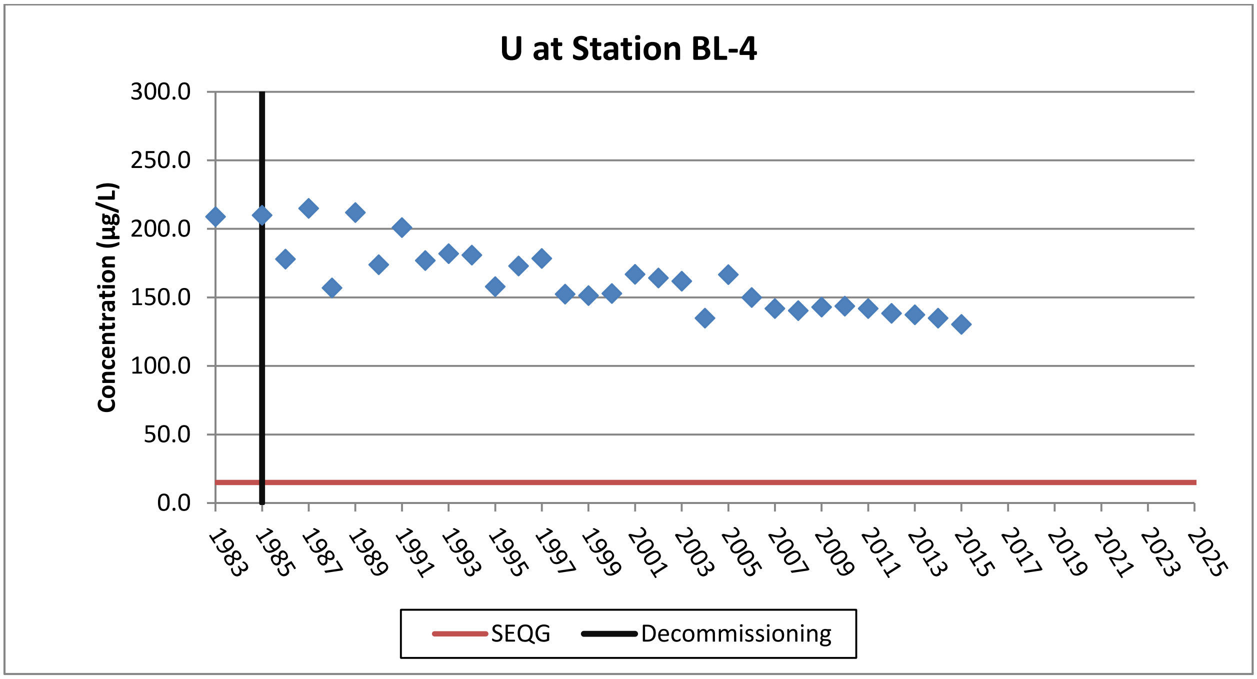


Figure 4.3.3-6 BL-4 Beaverlodge Lake Centre

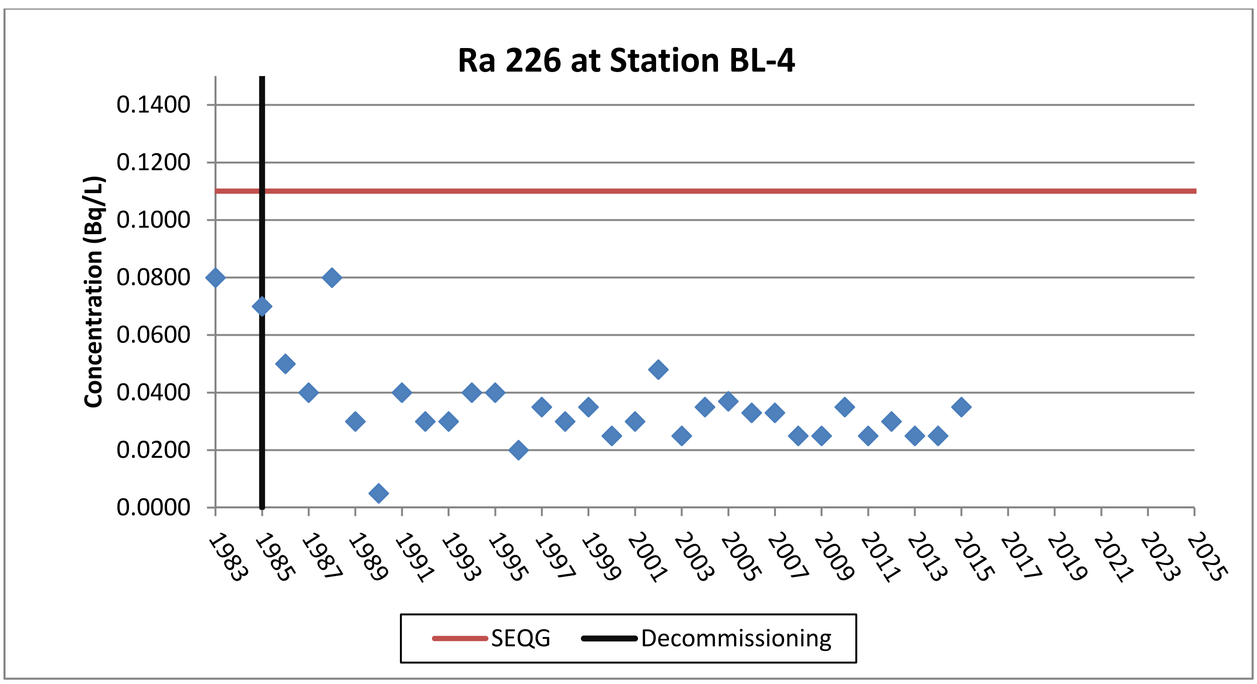
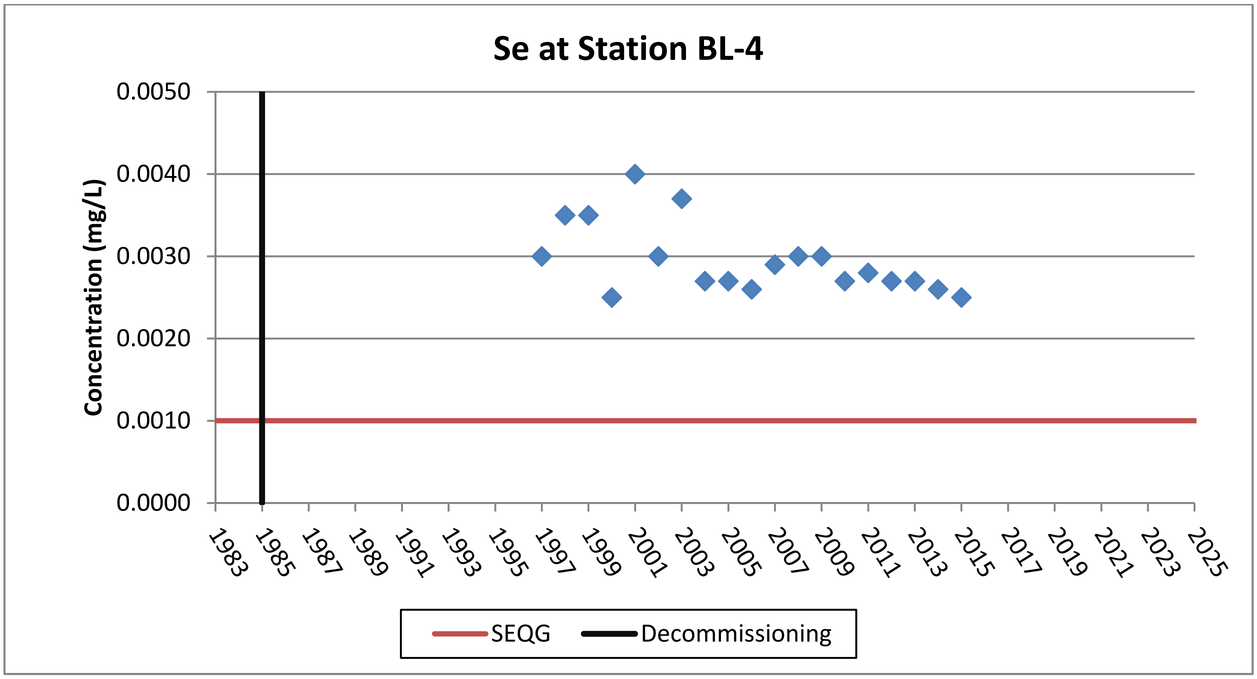


Figure 4.3.3-7 BL-4 Beaverlodge Lake Centre



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

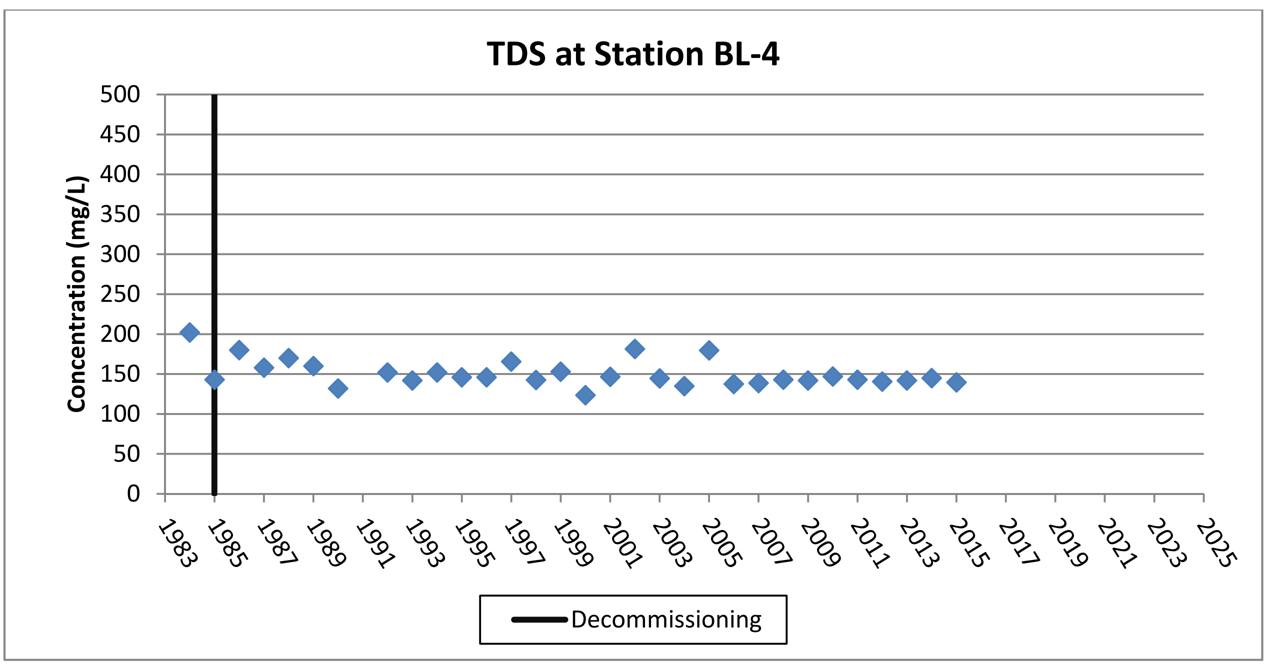
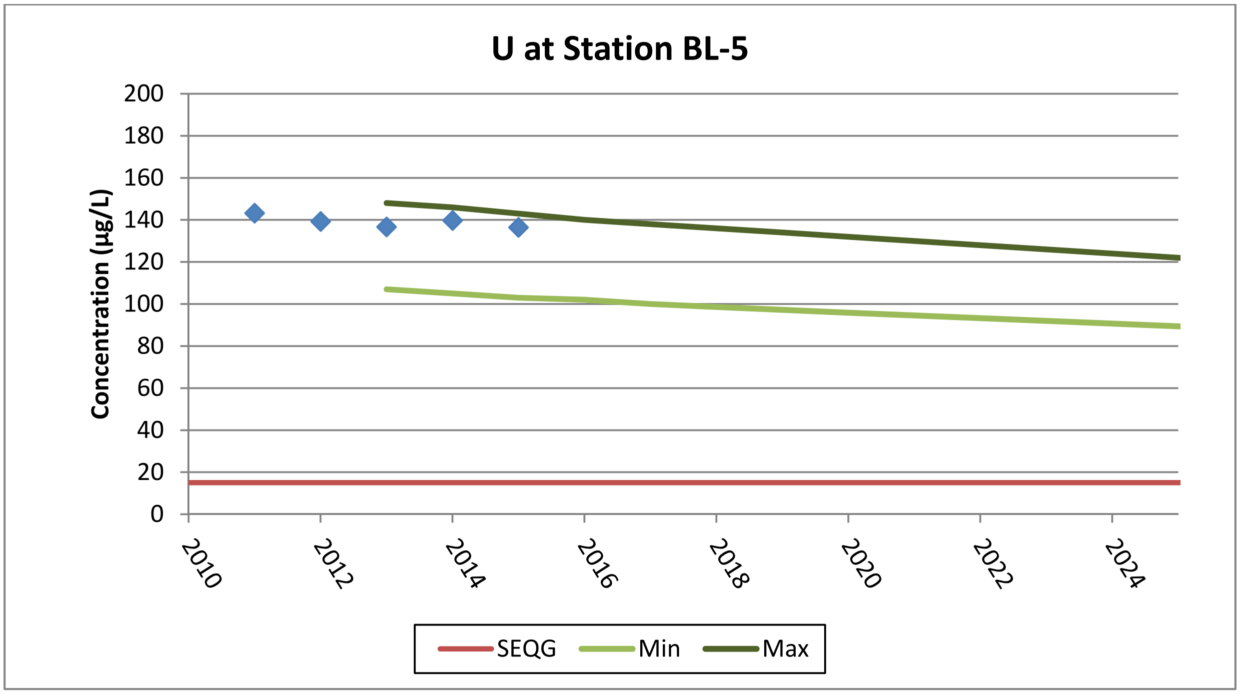
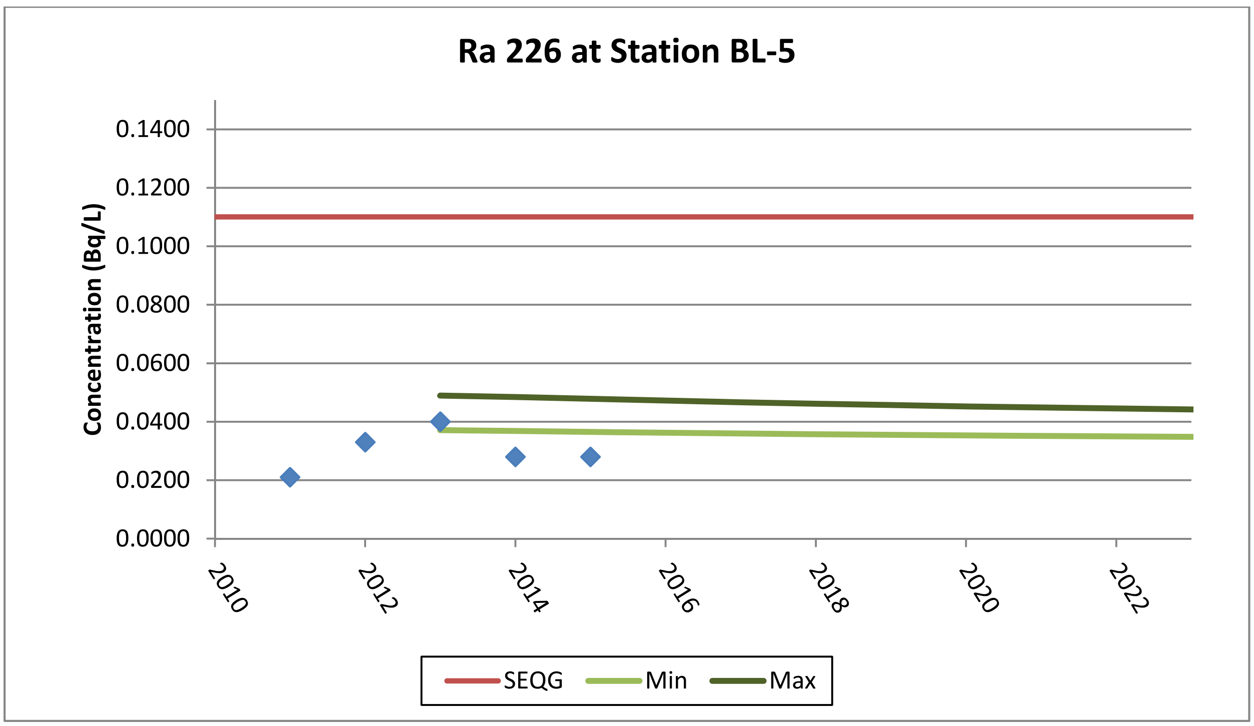


Figure 4.3.3-9 BL-5 Beaverlodge Lake Outlet



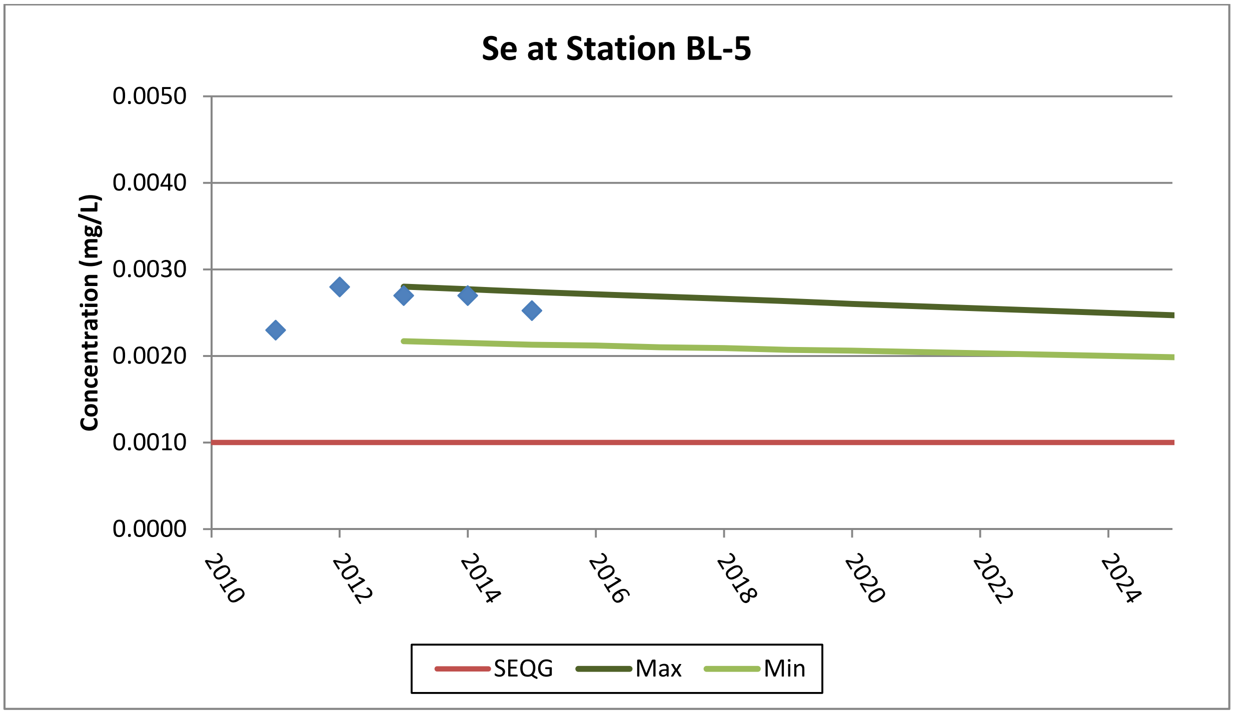
** Station implemented in water sampling program in 2011*

Figure 4.3.3-10 BL-5 Beaverlodge Lake Outlet



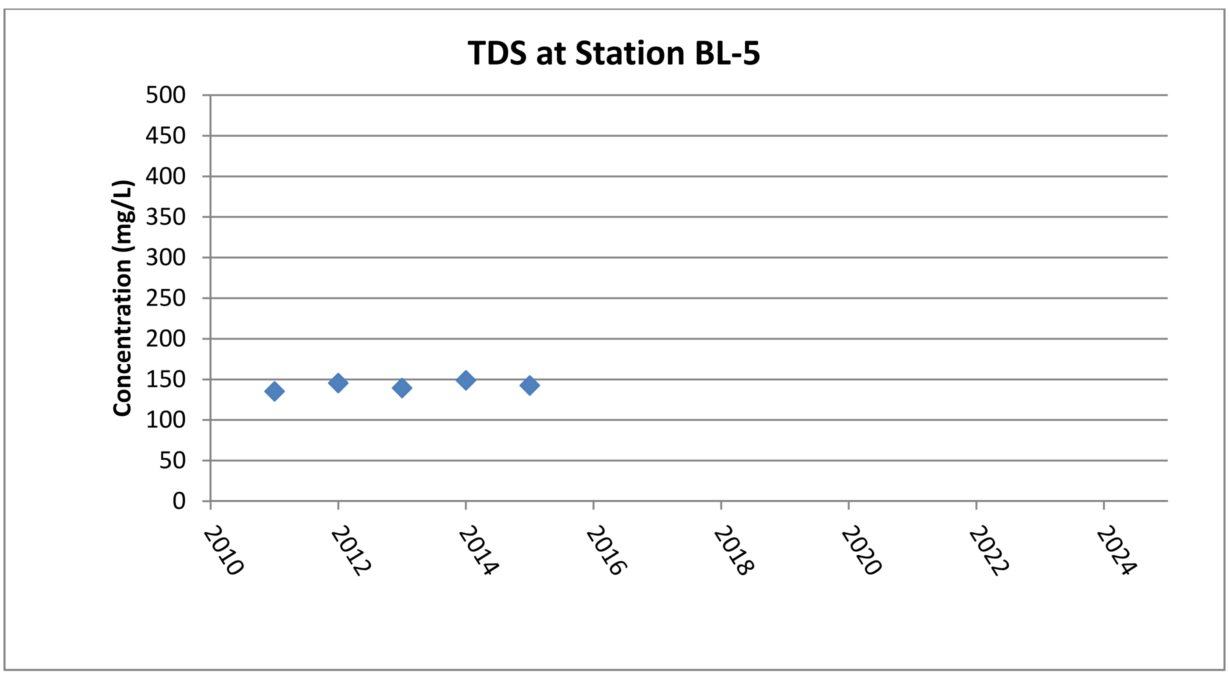
** Station implemented in water sampling program in 2011*

Figure 4.3.3-11 BL-5 Beaverlodge Lake Outlet



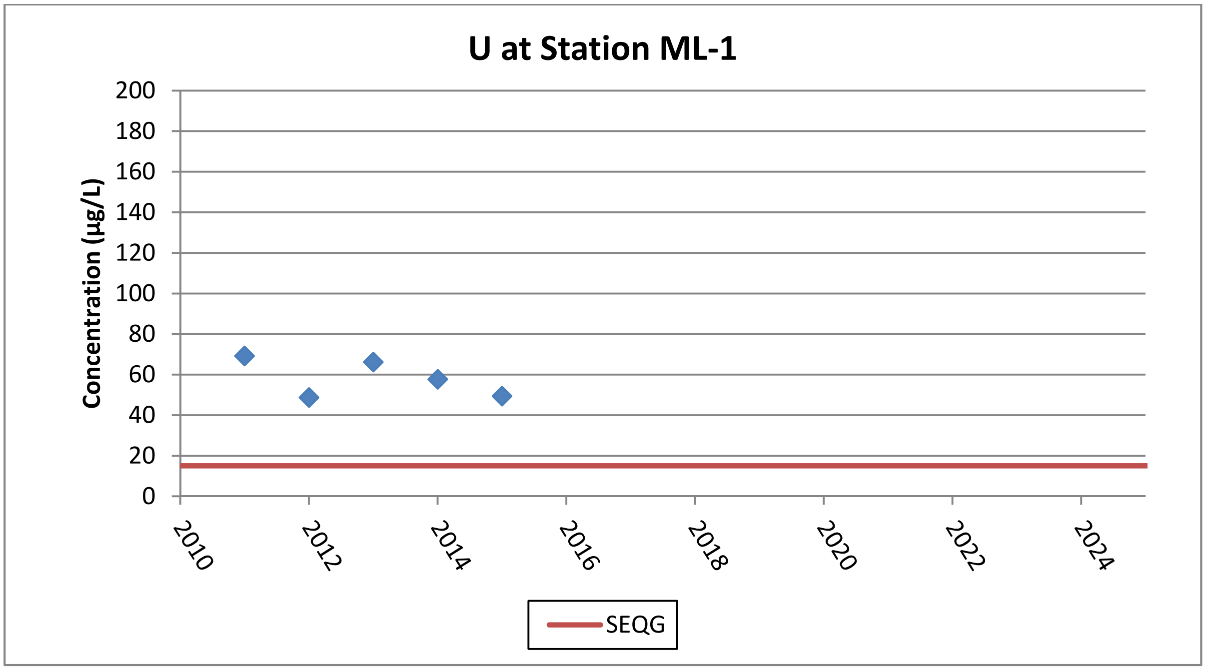
** Station implemented in water sampling program in 2011*

Figure 4.3.3-12 BL-5 Beaverlodge Lake Outlet



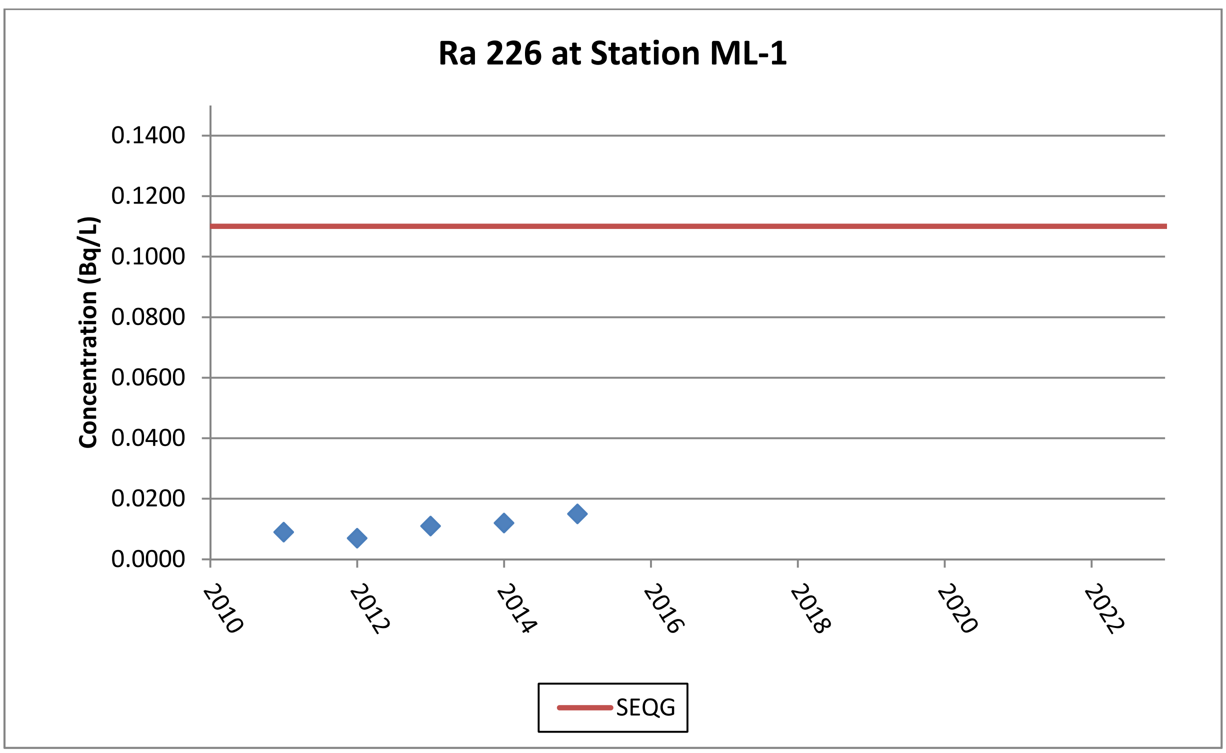
** Station implemented in water sampling program in 2011*

Figure 4.3.3-13 ML-1 Outlet of Martin Lake



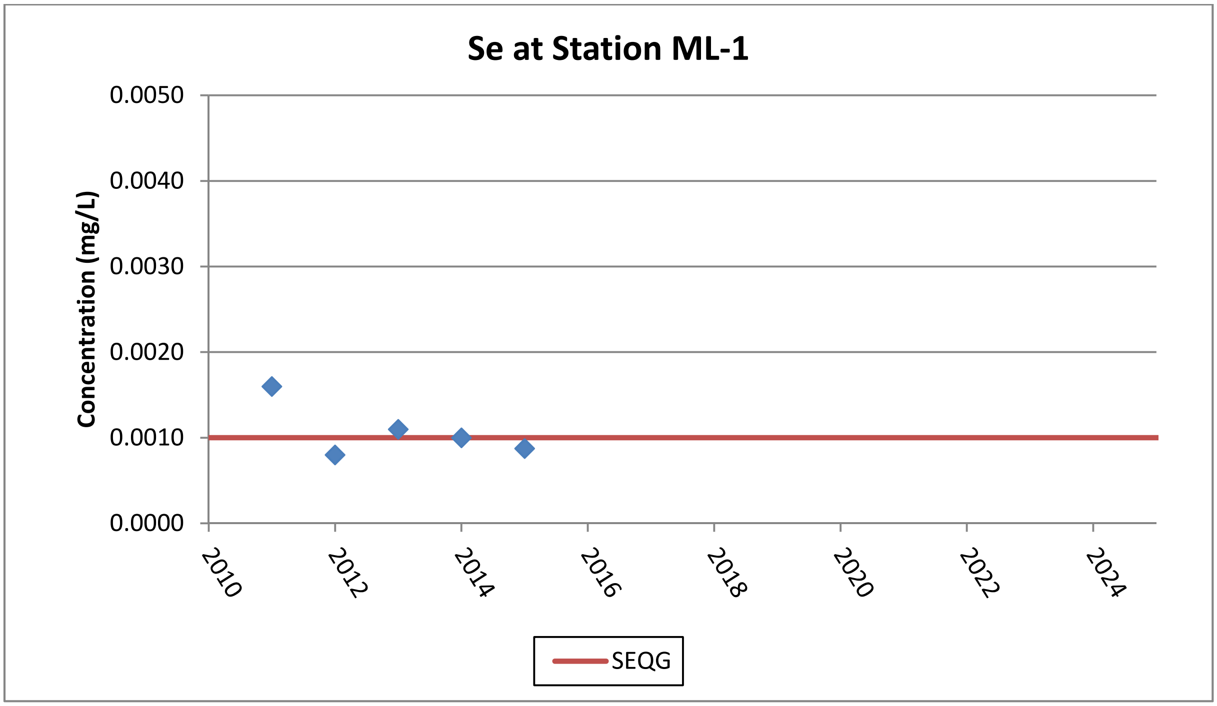
**Station implemented in water sampling program in 2011*

Figure 4.3.3-14 ML-1 Outlet of Martin Lake



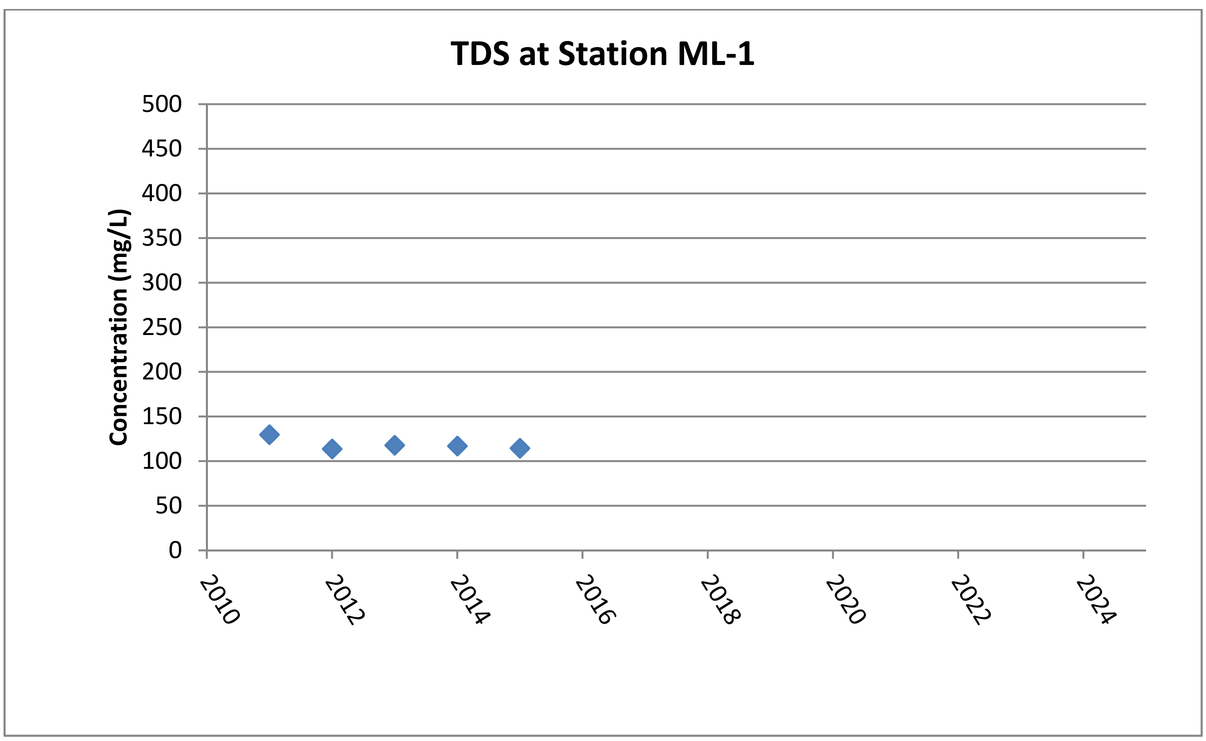
**Station implemented in water sampling program in 2011*

Figure 4.3.3-15 ML-1 Outlet of Martin Lake



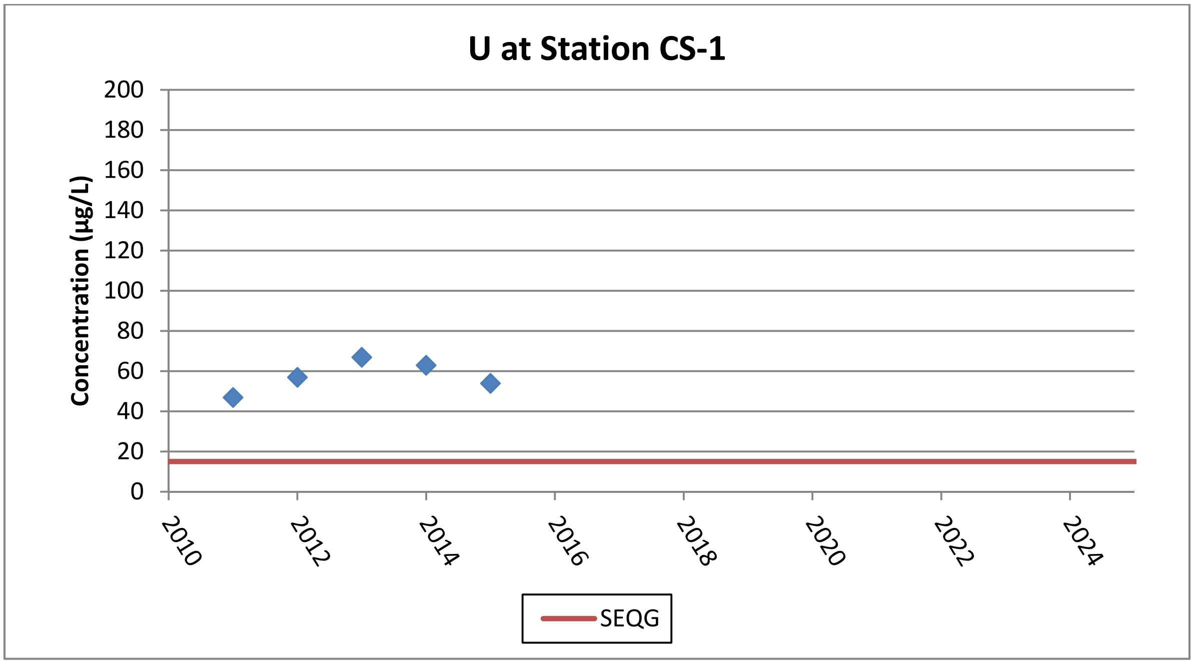
**Station implemented in water sampling program in 2011*

Figure 4.3.3-16 ML-1 Outlet of Martin Lake



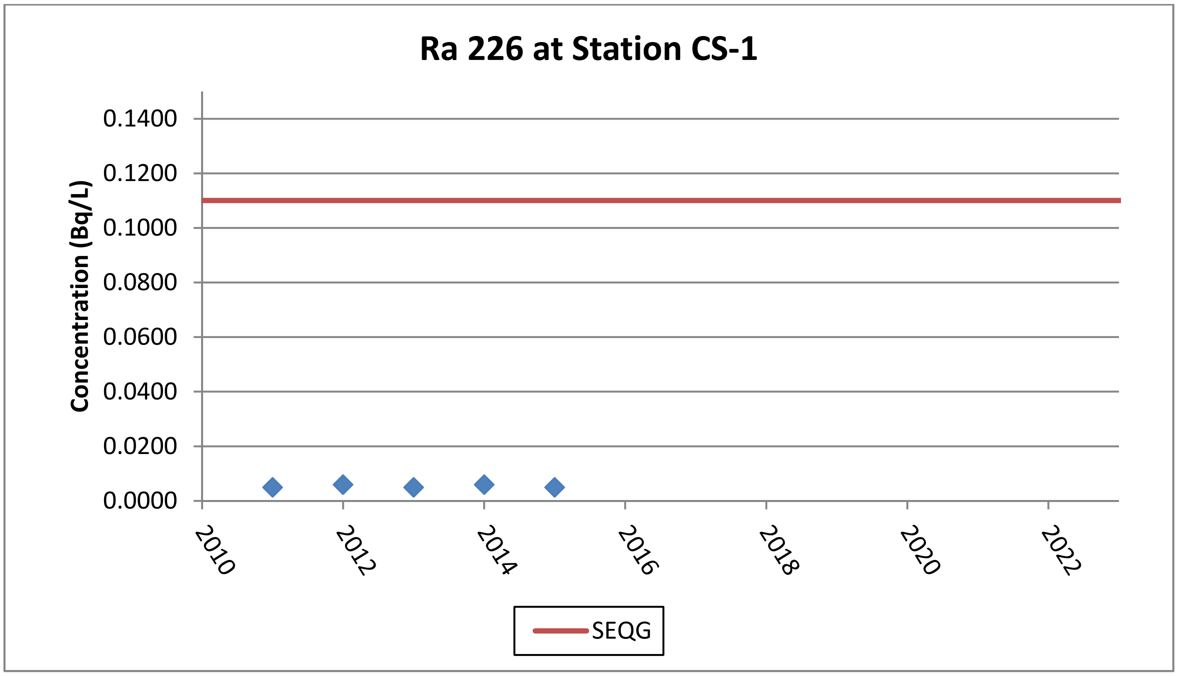
**Station implemented in water sampling program in 2011*

Figure 4.3.3-17 CS-1 Crackingstone River at Bridge



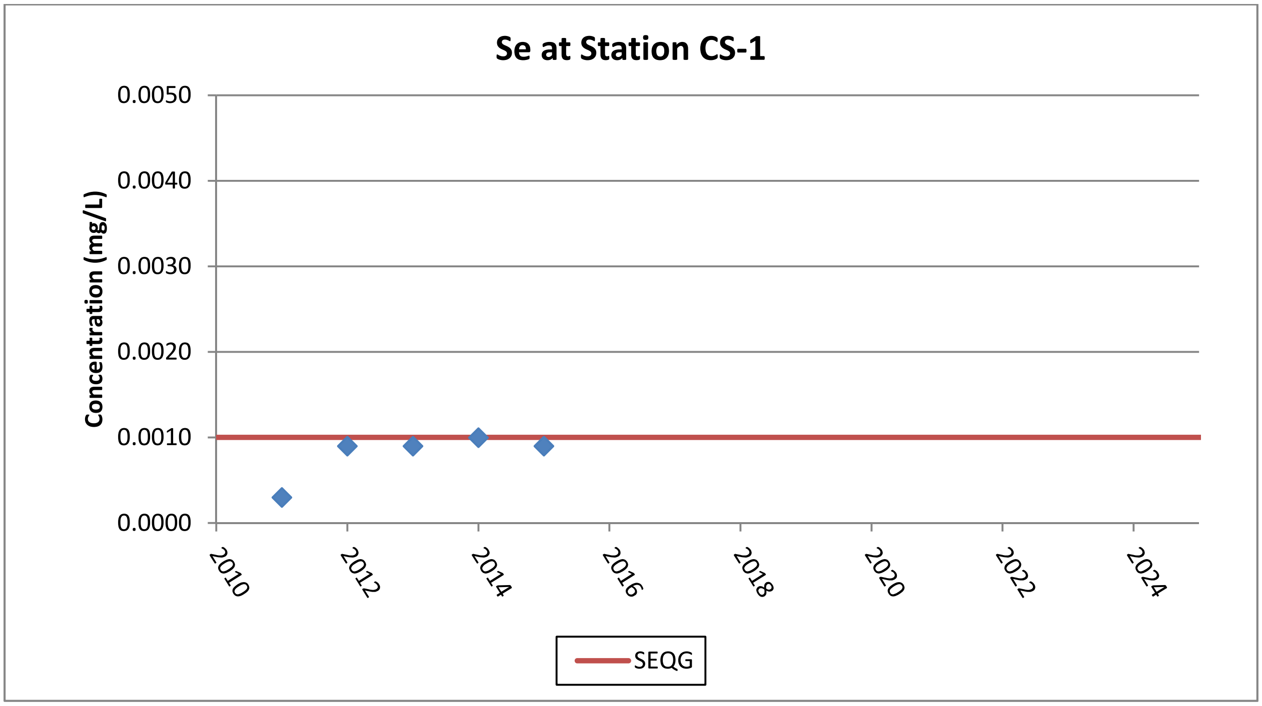
**Station implemented in water sampling program in 2011*

Figure 4.3.3-18 CS-1 Crackingstone River at Bridge



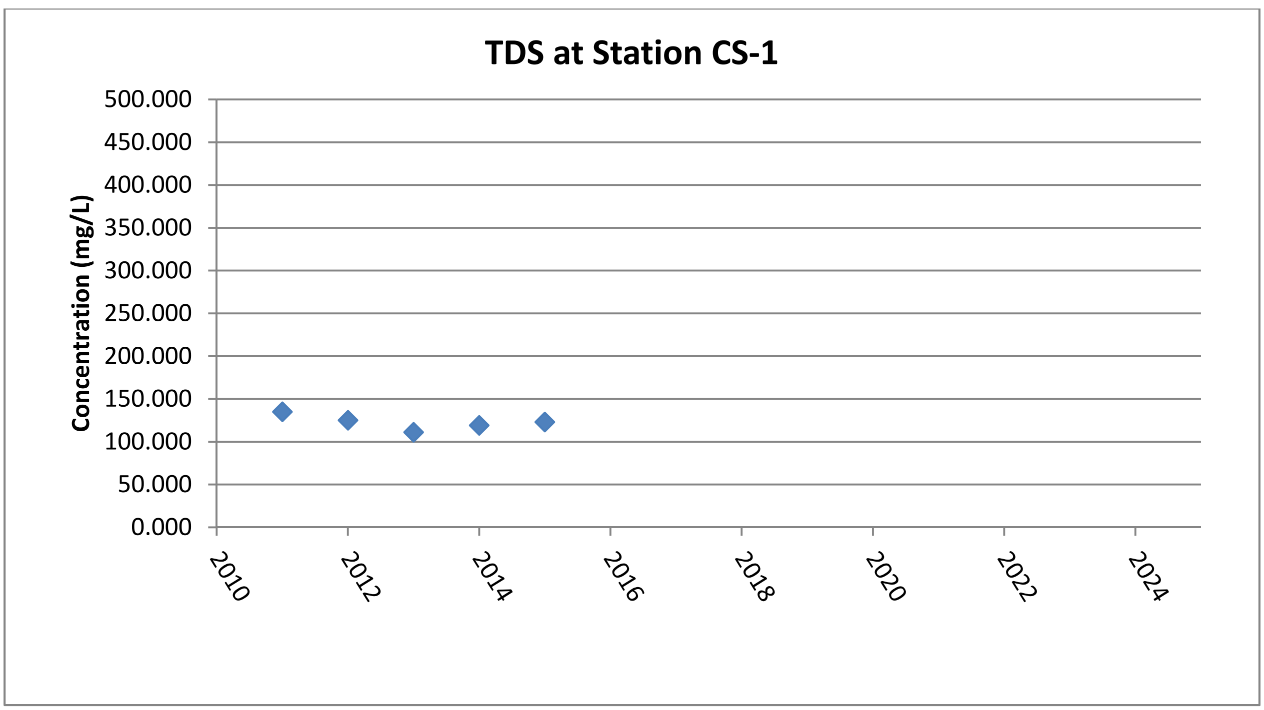
**Station implemented in water sampling program in 2011*

Figure 4.3.3-19 CS-1 Crackingstone River at Bridge



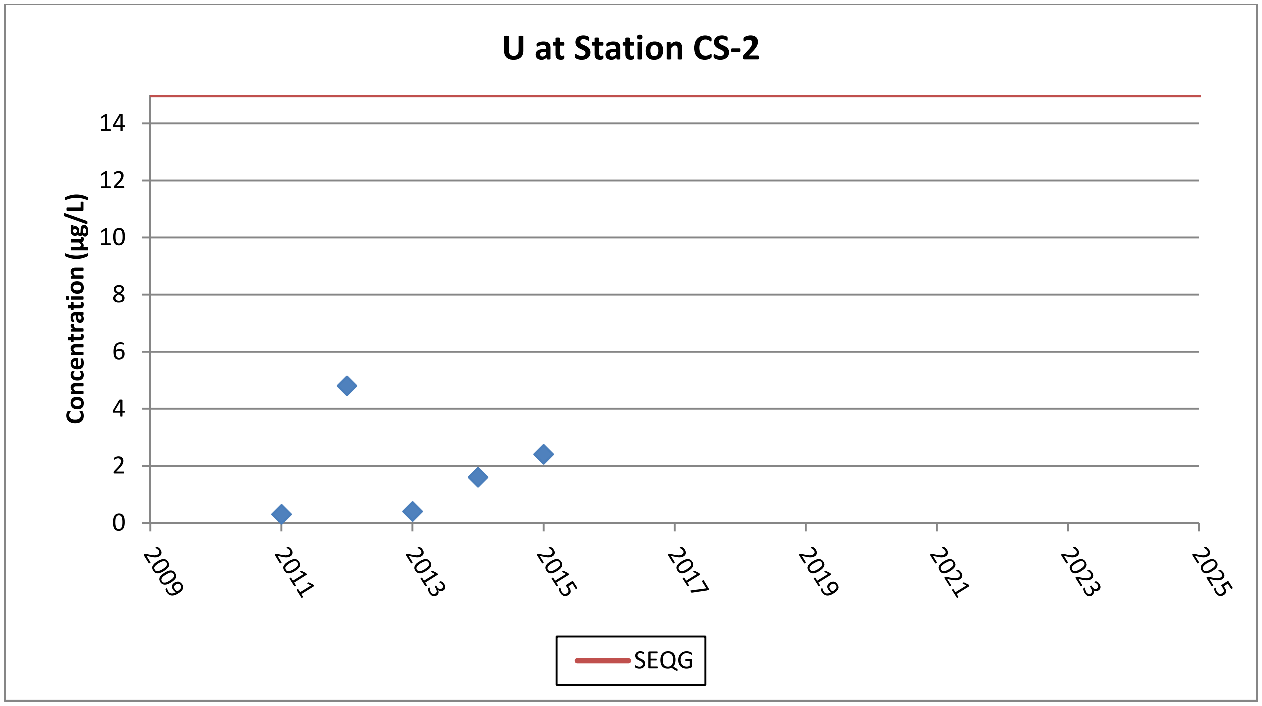
**Station implemented in water sampling program in 2011*

Figure 4.3.3-20 CS-1 Crackingstone River at Bridge



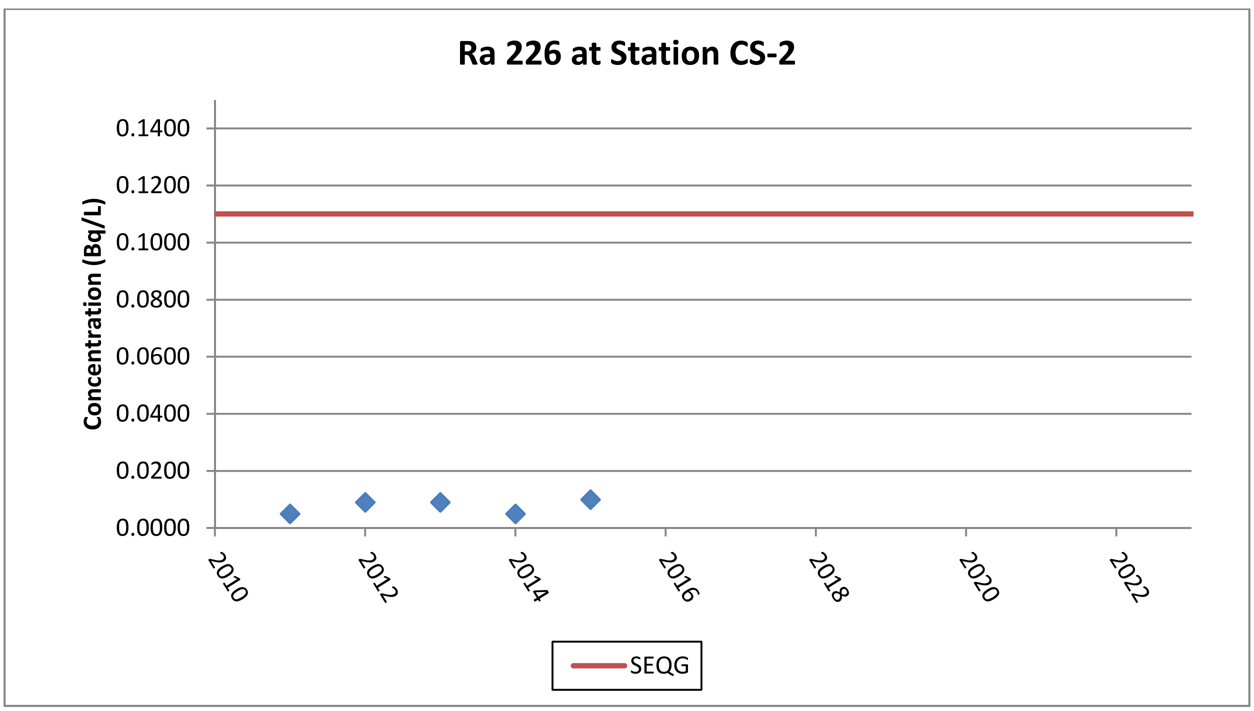
**Station implemented in water sampling program in 2011*

Figure 4.3.3-21 CS-2 Crackingstone Bay



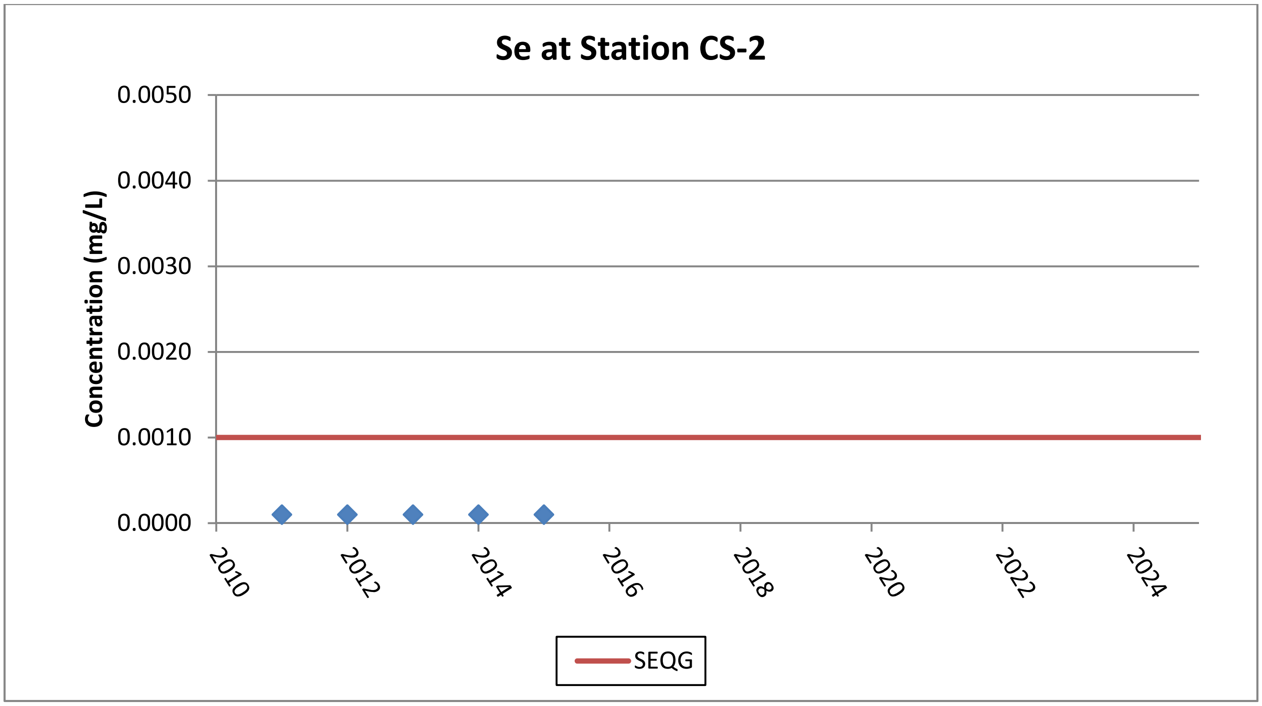
**Station implemented in water sampling program in 2011*

Figure 4.3.3-22 CS-2 Crackingstone Bay



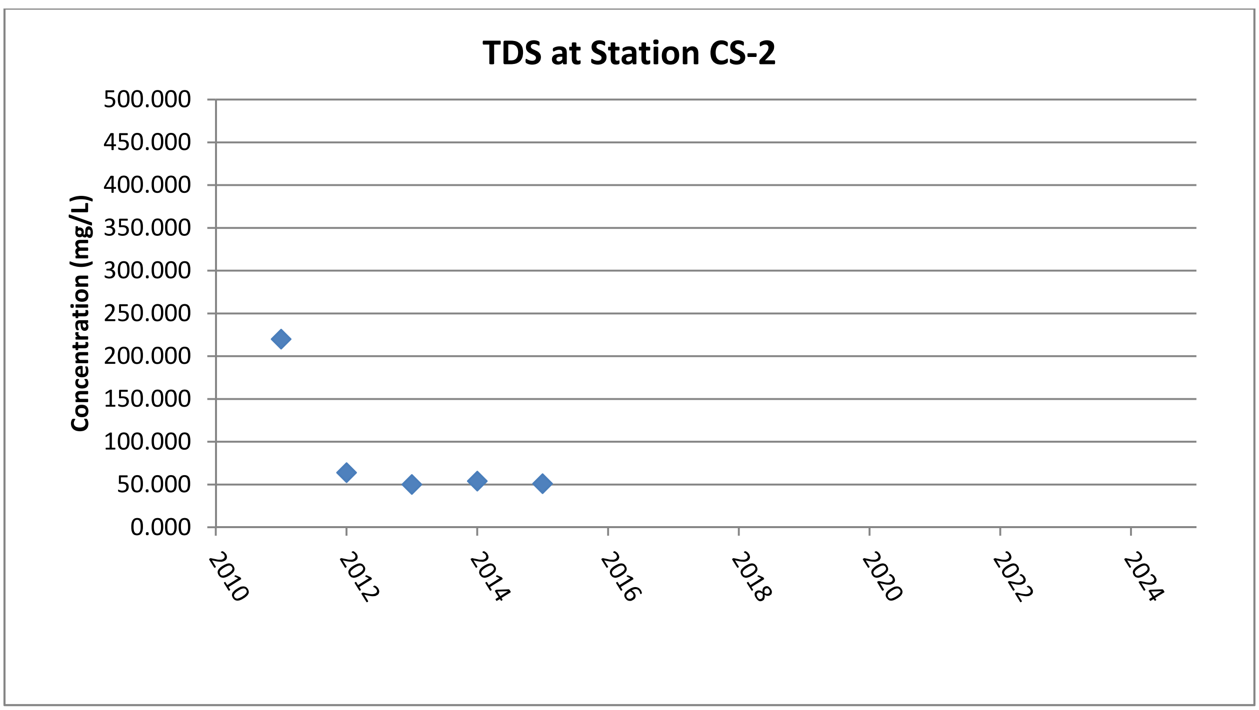
**Station implemented in water sampling program in 2011*

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

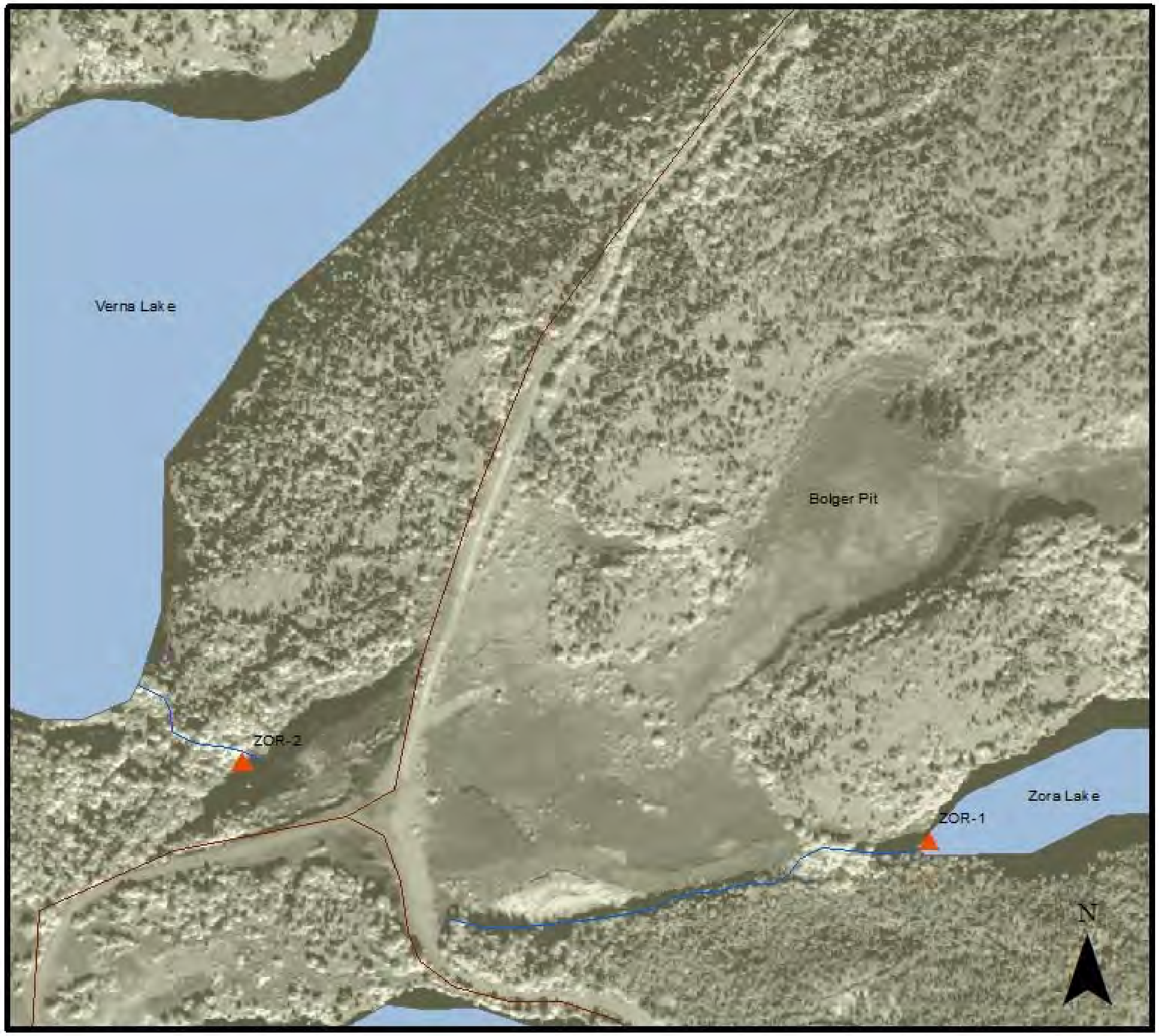
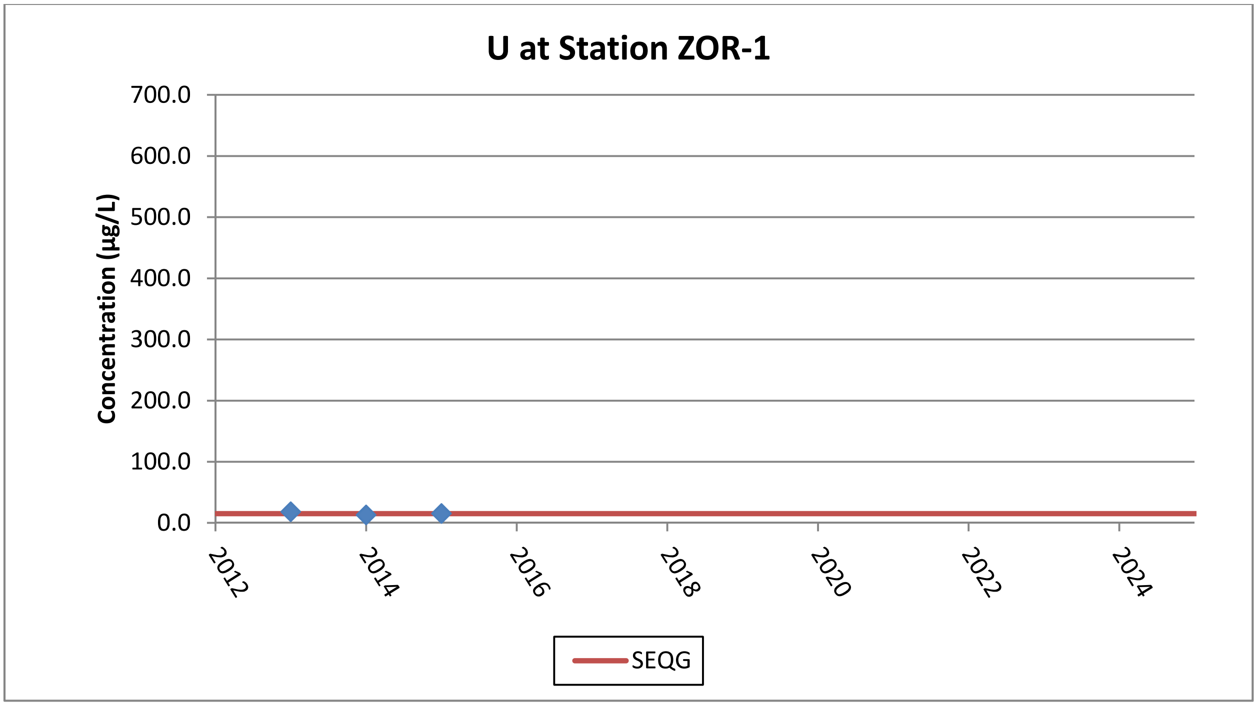
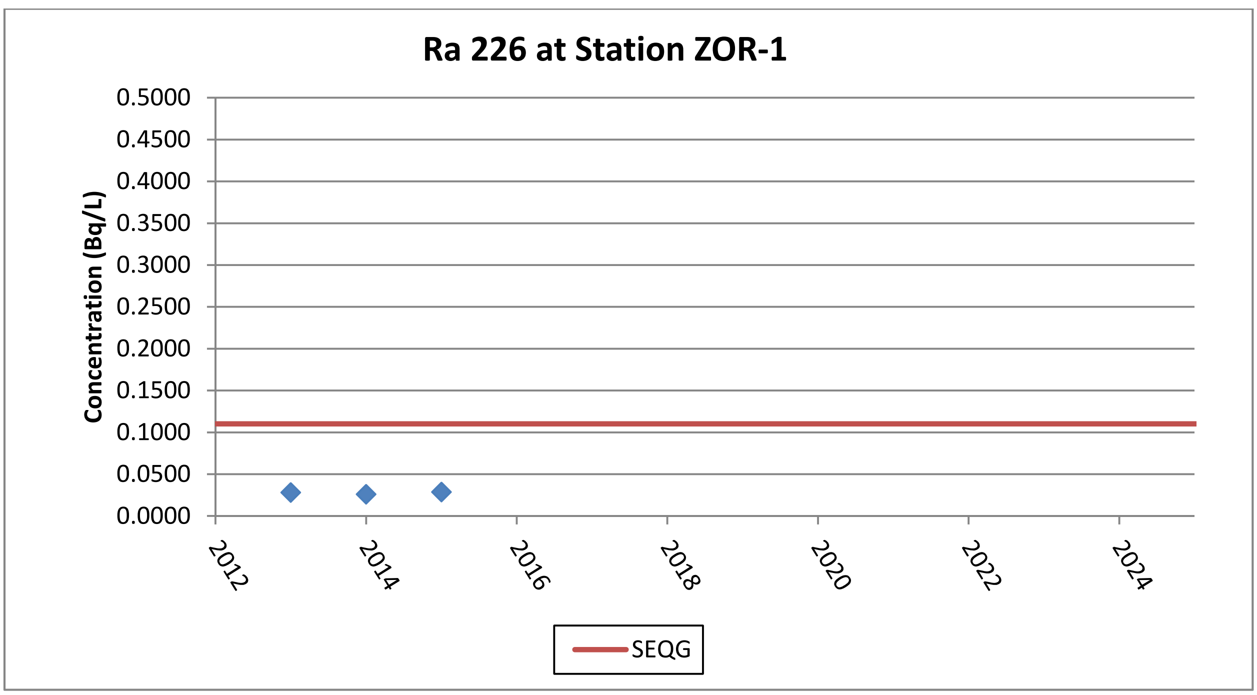


Figure 4.4-1 ZOR-01 Discharge from Zora Lake Outflow



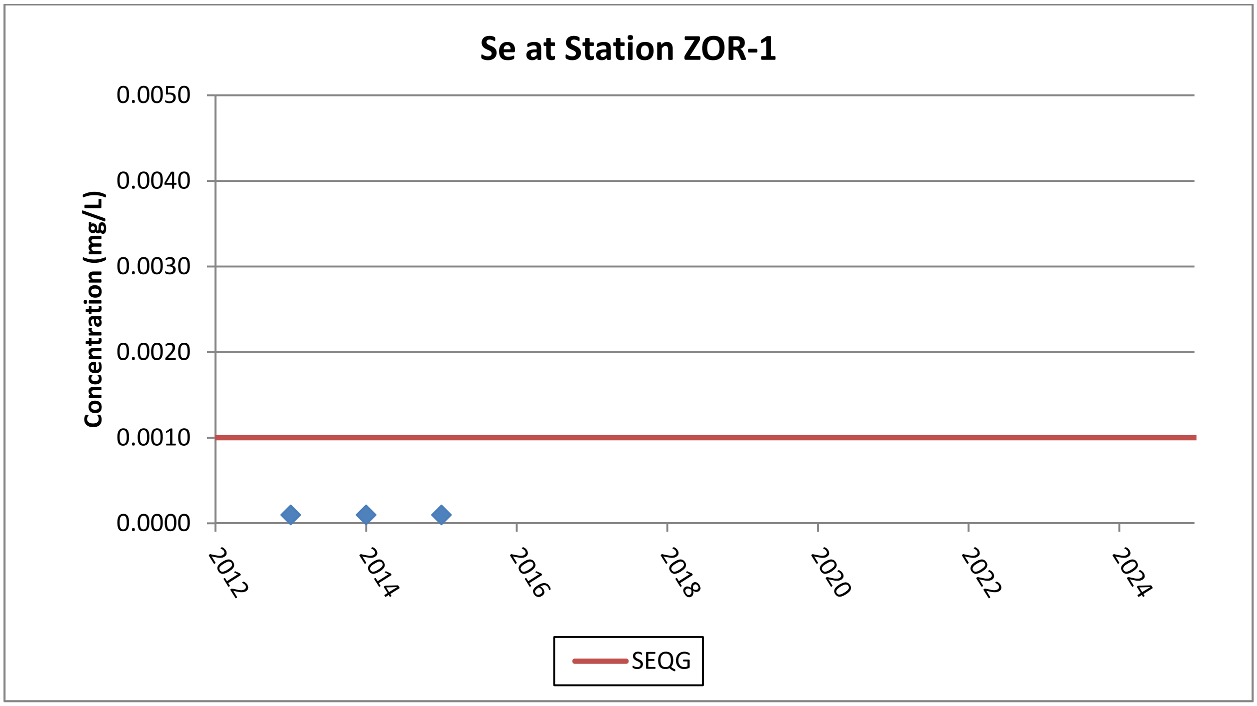
**Station implemented in water sampling program in 2013*

Figure 4.4-2 ZOR-01 Discharge from Zora Lake Outflow



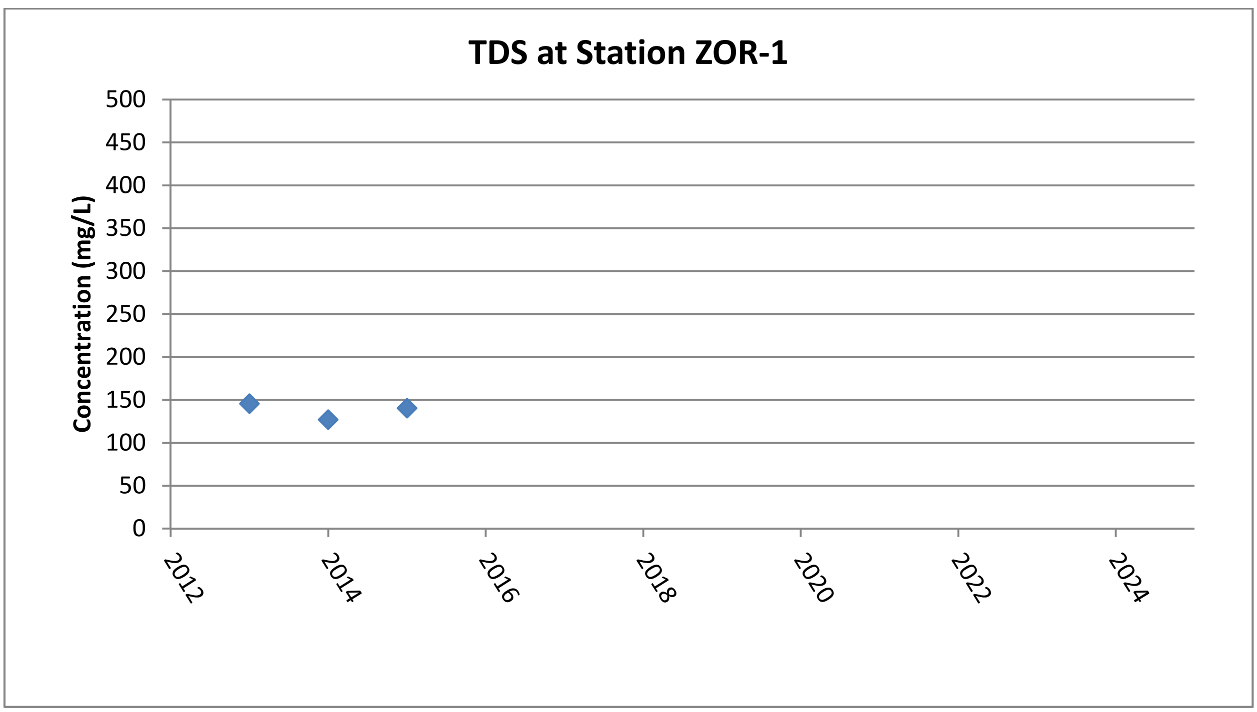
**Station implemented in water sampling program in 2013*

Figure 4.4-3 ZOR-01 Discharge from Zora Lake Outflow



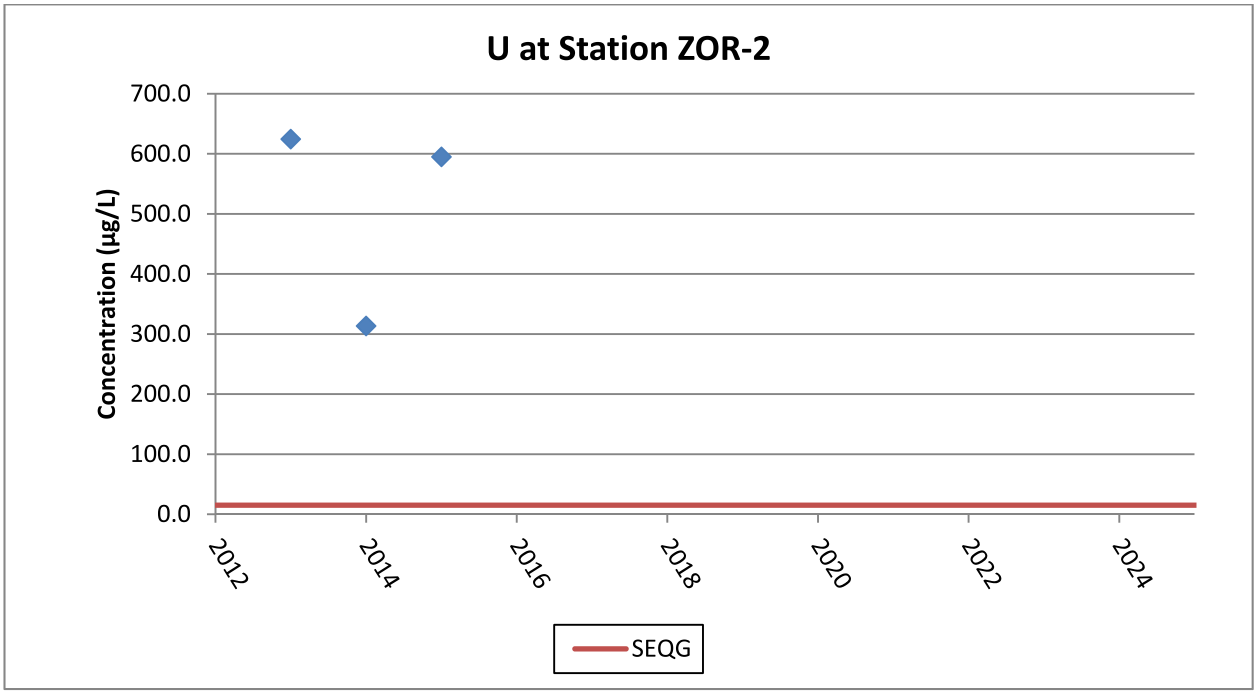
**Station implemented in water sampling program in 2013*

Figure 4.4-4 ZOR-01 Discharge from Zora Lake Outflow



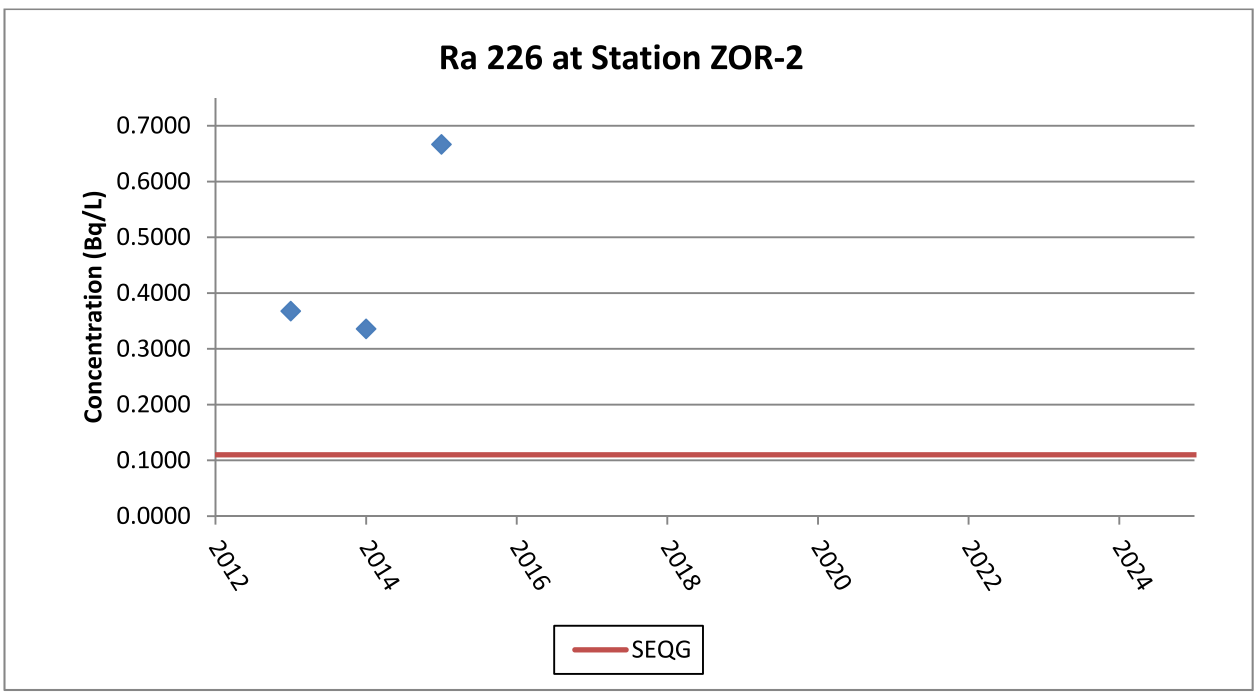
**Station implemented in water sampling program in 2013*

Figure 4.4-5 ZOR-02 Outlet from Waste Rock Pile to Verna Lake



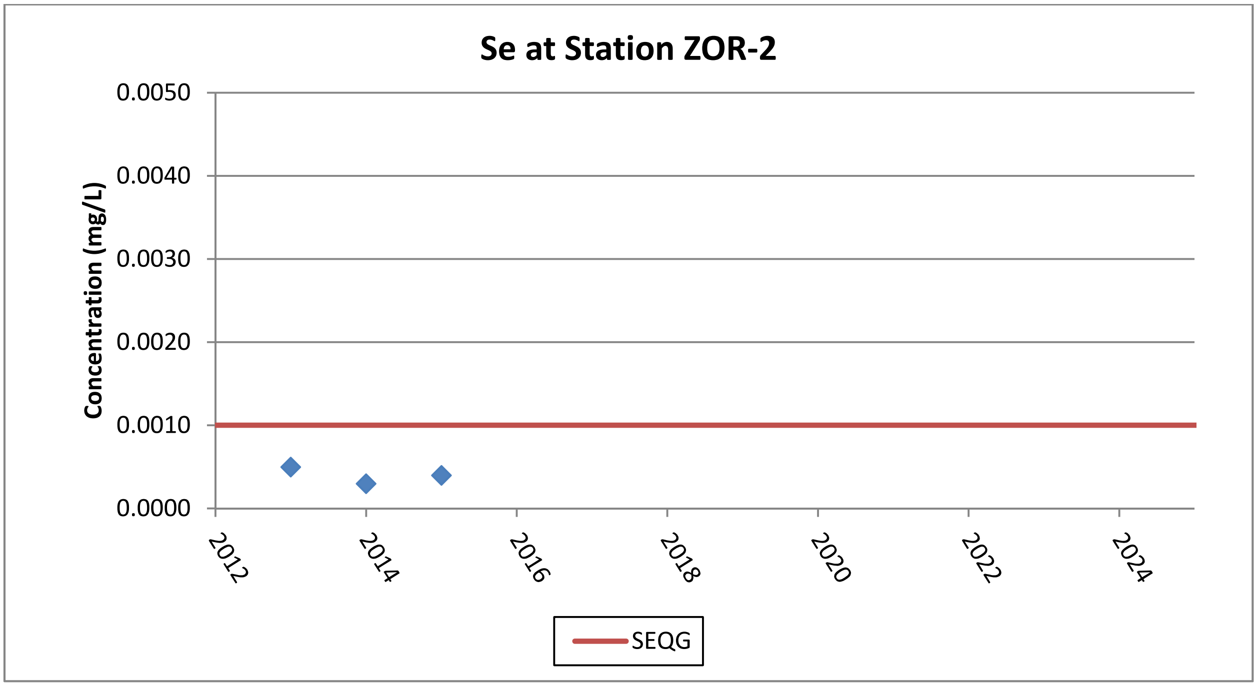
**Station implemented in 2013*

Figure 4.4-6 ZOR-02 Outlet from Waste Rock Pile to Verna Lake



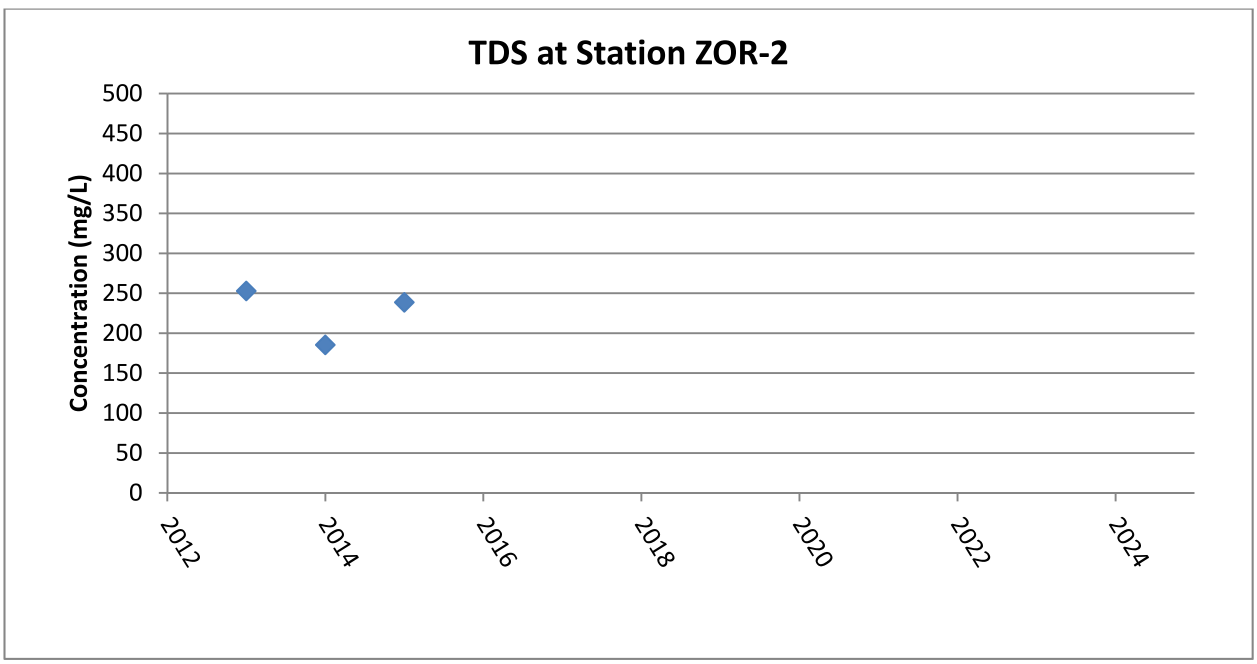
**Station implemented in 2013*

Figure 4.4-7 ZOR-02 Outlet from Waste Rock Pile to Verna Lake



**Station implemented in water sampling program in 2013*

Figure 4.4-8 ZOR-02 Outlet from Waste Rock Pile to Verna Lake



**Station implemented in water sampling program in 2013*

Figure 4.7.1-1 - Air Sampling Locations

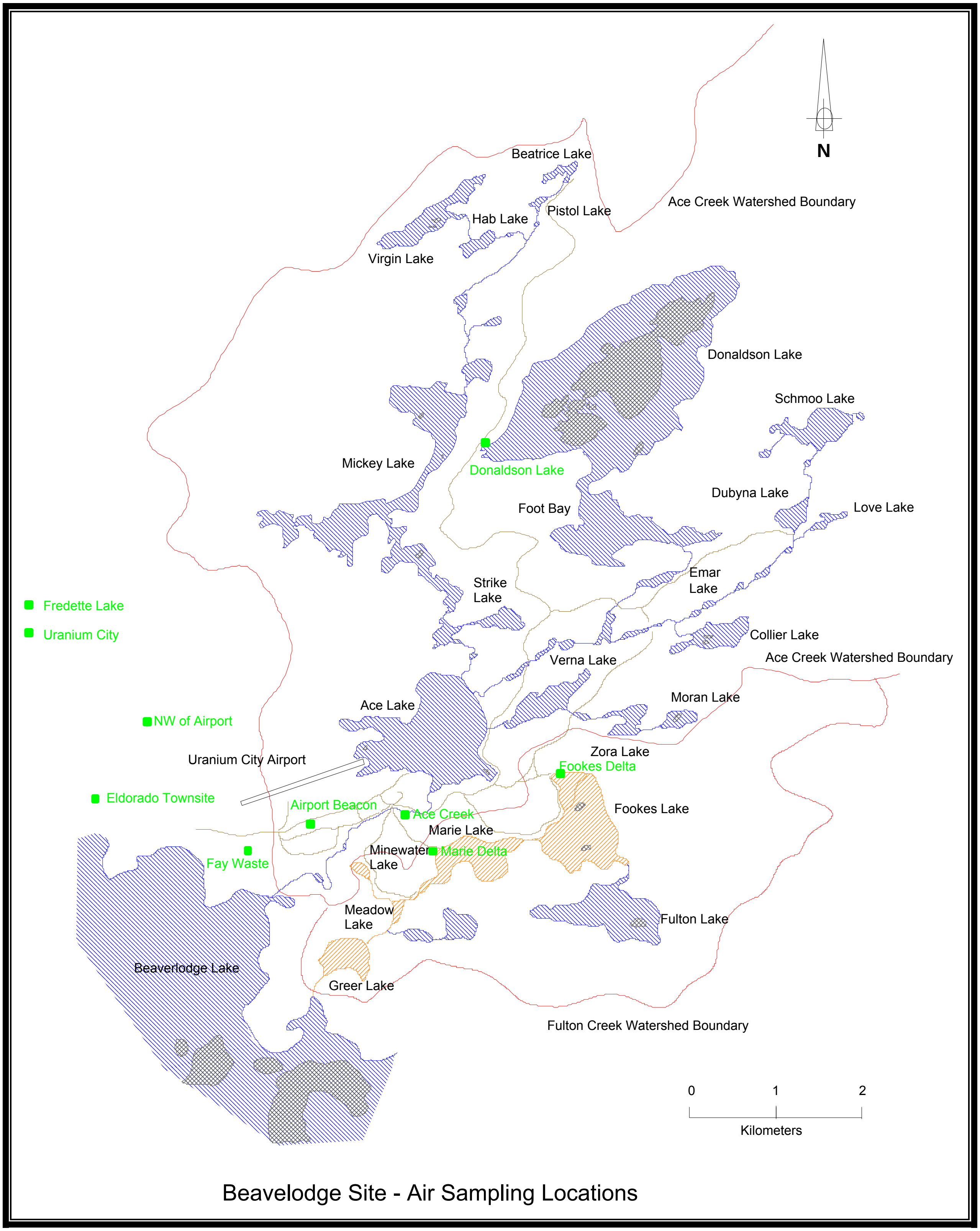
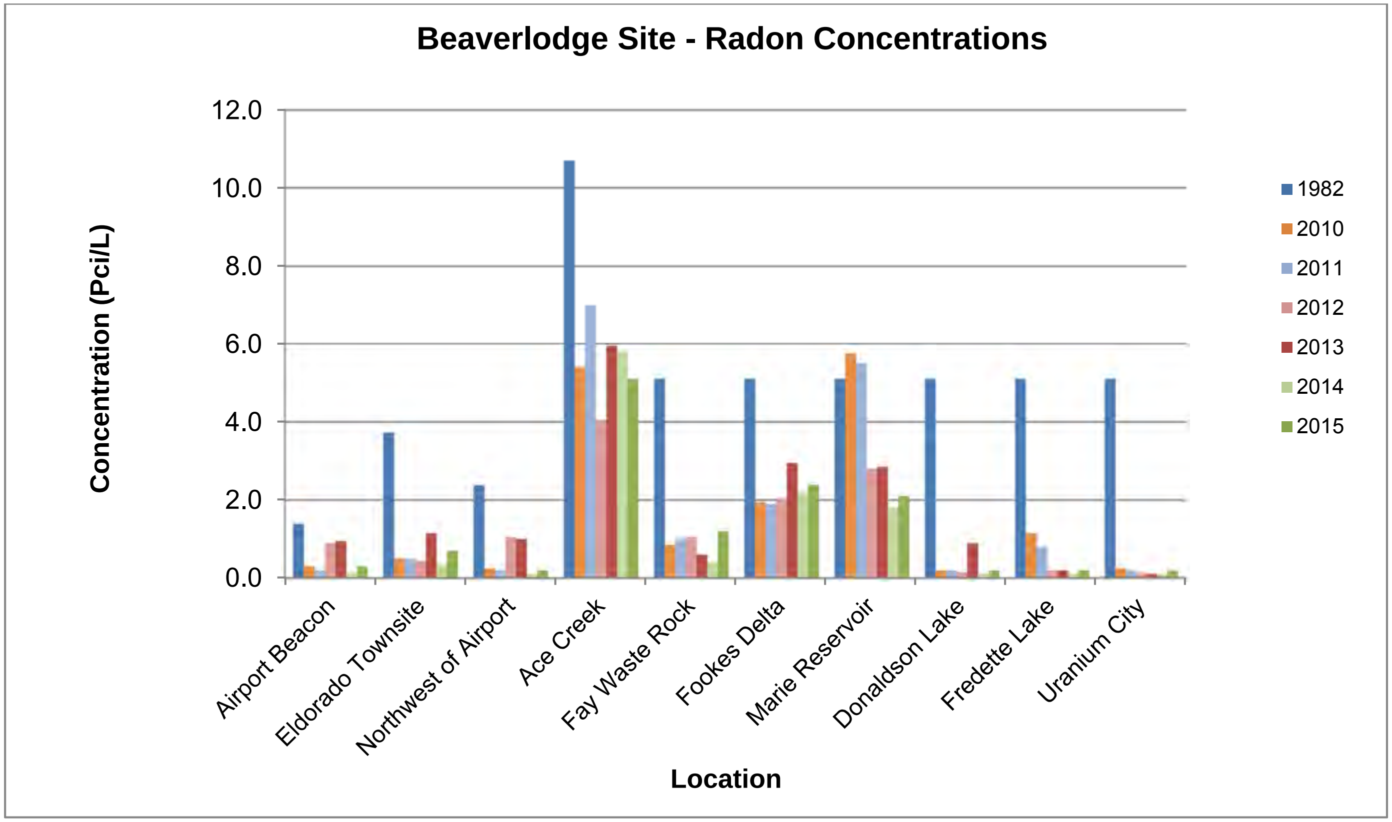


Figure 4.7.1-2
Radon Summary (2010 – 2015 versus 1982)



APPENDIX A

APPENDIX A

Beaverlodge Date Range Report

Beaverlodge Environment

AC-14

		2015/01/04	2015/02/21	2015/03/29	2015/04/26	2015/05/30	2015/06/30	2015/07/25	2015/08/18	2015/09/30	2015/10/31	2015/11/21
M Ions	**Alk (mg/l)**	58.0	56.0	55.0	52.0	50.0	52.0	51.0	57.0	52.0	53.0	54.0
	Ca (mg/l)	17.0	18.0	18.0	19.0	16.0	16.0	17.0	20.0	17.0	18.0	17.0
	Cl (mg/l)	1.20	1.00	1.20	1.60	1.40	1.40	1.40	1.40	0.90	1.20	1.10
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	148	146	146	142	127	130	130	75	131	140	143
	Cond-L (µS/cm)	130	128	128	126	119	122	124	142	123	126	123
	Hardness (mg/l)	56	59	59	62	53	53	56	65	56	59	56
	HCO3 (mg/l)	71.0	68.0	67.0	63.0	61.0	63.0	62.0	70.0	63.0	65.0	66.0
	K (mg/l)	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.8	0.5	0.8	0.5
	Na (mg/l)	1.7	1.6	1.7	2.1	1.5	1.9	2.1	2.7	1.6	2.0	1.6
	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)	7.7	7.4	7.5	10.0	7.4	7.6	8.8	13.0	7.9	9.0	8.3
	Sum of Ions (mg/l)	103	100	100	100	91	94	95	112	94	99	98
Metal	**As (µg/l)**	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.026	0.028	0.024	0.027	0.024	0.027	0.026	0.027	0.024	0.024	0.024
	Cu (mg/l)	0.0008	0.0008	0.0003	0.0015	0.0007	0.0008	0.0005	0.0004	< 0.0002	0.0004	0.0002
	Fe (mg/l)	0.092	0.030	0.049	0.078	0.046	0.066	0.099	0.084	0.046	0.044	0.046
	Mo (mg/l)	0.0011	0.0008	0.0009	0.0010	0.0008	0.0009	0.0010	0.0010	0.0010	0.0010	0.0010
	Ni (mg/l)	0.00020	0.00020	0.00020	0.00030	0.00020	0.00020	0.00020	0.00020	0.00010	0.00020	0.00020
	Pb (mg/l)	0.0005	0.0003	0.0003	0.0015	0.0003	0.0004	0.0003	0.0002	0.0002	< 0.0001	< 0.0001
	Se (mg/l)	< 0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0001	0.0002	0.0001
	U (µg/l)	22.000	13.000	18.000	45.000	34.000	22.000	36.000	79.000	26.000	36.000	33.000
	Zn (mg/l)	0.001	0.002	< 0.001	0.002	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nutrient	**C-(org) (mg/l)**			7.500			6.600			7.100		
	NH3-N (mg/l)			0.06			0.06			0.08		
	NO3 (mg/l)	0.180	0.220	0.390	0.260		0.280		0.090	< 0.040		
	P-(TP) (mg/l)			< 0.01			0.01			< 0.01		
Phys Para	**pH-L (pH Unit)**	7.79	7.66	7.52	7.70	7.78	7.72	7.64	7.84	7.72	7.68	7.77
	TDS (mg/l)	82.00	88.00	86.00	82.00	80.00	83.00	86.00	88.00	78.00	83.00	86.00
	Temp-H20 (°C)	0.7	0.3	0.3	3.2	13.0	20.9	18.8	18.7	9.4	2.6	1.0
	TSS (mg/l)	1.000	< 1.000	< 1.000	2.000	< 1.000	2.000	1.000	2.000	2.000	< 1.000	< 1.000
Rads	**Pb210 (Bq/L)**			0.03			0.02			< 0.02		
	Po210 (Bq/L)			0.010			0.005			0.008		
	Ra226 (Bq/L)	0.110	0.060	0.070	0.110	0.100	0.070	0.100	0.080	0.060	0.030	0.030

Beaverlodge Date Range Report

Beaverlodge Environment

AC-6A

		2015/08/18	2015/08/23	2015/09/01	2015/09/09	2015/09/15	2015/09/22	2015/09/30	2015/10/06	2015/10/13
M Ions	**Alk (mg/l)**	86.0	93.0	103.0	98.0	101.0	104.0	103.5	103.0	108.0
	Ca (mg/l)	40.0	39.0	42.0	42.0	45.0	43.0	44.0	44.0	44.0
	Cl (mg/l)	0.40	0.40	0.50		0.40	< 1.00	1.00	< 1.00	< 1.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	287	243	284	319	336	365	361	353	358
	Cond-L (µS/cm)	264	271	291	292	297	302	306	303	304
	Hardness (mg/l)	135	133	142	142	152	145	149	149	149
	HCO3 (mg/l)	105.0	113.0	126.0	120.0	123.0	127.0	126.0	126.0	132.0
	K (mg/l)	1.0	0.6	1.1	0.7	1.0	0.7	0.9	0.9	0.9
	Na (mg/l)	2.2	2.2	2.4	2.3	2.5	2.4	2.5	2.4	2.4
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.0	< 1.0	< 1.0
	SO4 (mg/l)	50.0	48.0	50.0	49.0	55.0	52.0	53.5	53.0	52.0
	Sum of Ions (mg/l)	207	212	231	224	236	234	237	236	241
Metal	**As (µg/l)**	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.019	0.020	0.020	0.020	0.020	0.021	0.020	0.020	0.020
	Cu (mg/l)	0.0005	0.0005	0.0002	0.0004	0.0003	0.0002	0.0002	< 0.0002	< 0.0002
	Fe (mg/l)	0.025	0.026	0.034	0.015	0.010	0.009	0.009	0.006	0.006
	Mo (mg/l)	0.0012	0.0011	0.0007	0.0010	0.0011	0.0011	0.0010	0.0009	0.0010
	Ni (mg/l)	0.00010	0.00010	< 0.00010	0.00010	0.00010	< 0.00010	0.00010	< 0.00010	< 0.00010
	Pb (mg/l)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
	Se (mg/l)	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002
	U (µg/l)	150.000	252.000	229.000	353.000	374.000	404.000	384.000	389.000	404.000
	Zn (mg/l)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Nutrient	**C-(org) (mg/l)**							7.300		
	NH3-N (mg/l)							0.04		
	NO3 (mg/l)		< 0.040	0.090	0.080	< 0.040	0.060	< 0.040	< 0.040	< 0.040
	P-(TP) (mg/l)							< 0.01		
Phys Para	**pH-L (pH Unit)**	7.56	7.62	7.97	7.88	7.70	7.68	7.93	7.66	7.92
	TDS (mg/l)	190.00	203.00	194.00	191.00	201.00	192.00	186.00	198.00	196.00
	Temp-H20 (°C)	16.1	15.5	13.9	13.1	10.8	8.6	9.6	6.9	5.4
	TSS (mg/l)	1.000	< 1.000	< 1.000	1.000	1.000	< 1.000	1.000	< 1.000	< 1.000
Rads	**Pb210 (Bq/L)**		< 0.04					< 0.02		
	Po210 (Bq/L)		0.010					0.001		
	Ra226 (Bq/L)	0.100	0.110	0.110	0.110	0.110	0.100	0.125	0.110	0.100

Beaverlodge Date Range Report

Beaverlodge Environment

AC-6A Continued

		2015/10/28	2015/11/07	2015/11/14	2015/11/21	2015/11/28	2015/12/05	2015/12/12
M Ions	**Alk (mg/l)**	105.0	107.0	108.0	110.0	113.0	116.0	115.0
	Ca (mg/l)	46.0	46.0	49.0	45.0	48.0	46.0	49.0
	Cl (mg/l)	< 1.00	0.50	1.00		< 1.00	1.00	< 1.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	389	393	406	413	430	302	388
	Cond-L (µS/cm)	310	318	322	321	323	322	324
	Hardness (mg/l)	155	155	163	152	161	156	163
	HCO3 (mg/l)	128.0	130.0	132.0	134.0	138.0	142.0	140.0
	K (mg/l)	1.0	1.0	1.0	0.7	1.0	0.9	1.0
	Na (mg/l)	2.5	2.5	2.6	2.5	2.6	2.6	2.6
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	54.0	54.0	57.0	53.0	55.0	53.0	57.0
	Sum of Ions (mg/l)	241	244	253	246	255	256	260
Metal	**As (µg/l)**	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.019	0.022	0.022	0.023	0.022	0.023	0.024
	Cu (mg/l)	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0002	0.0005	0.0003
	Fe (mg/l)	0.006	0.006	0.006	0.005	0.005	0.005	0.004
	Mo (mg/l)	0.0009	0.0010	0.0010	0.0011	0.0011	0.0010	0.0011
	Ni (mg/l)	< 0.00010	< 0.00010	< 0.00010	0.00010	0.00010	< 0.00010	0.00010
	Pb (mg/l)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Se (mg/l)	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	U (µg/l)	488.000	477.000	480.000	473.000	445.000	440.000	447.000
	Zn (mg/l)	< < 0.0001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Nutrient	**C-(org) (mg/l)**							
	NH3-N (mg/l)							
	NO3 (mg/l)	< 0.040	0.040	0.040		< 0.040	0.060	< 0.040
	P-(TP) (mg/l)							
Phys Para	**pH-L (pH Unit)**	7.70	7.97	7.84	7.94	7.81	7.84	7.70
	TDS (mg/l)	205.00	200.00	207.00	208.00	199.00	206.00	206.00
	Temp-H20 (°C)	2.3	1.4	3.9	1.1	1.2	0.9	0.9
	TSS (mg/l)	< 1.000	< 1.000	< 1.000	< 1.000	1.000	1.000	< 1.000
Rads	**Pb210 (Bq/L)**							
	Po210 (Bq/L)							
	Ra226 (Bq/L)	0.090	0.110	0.080	0.100	0.120	0.100	0.140

Beaverlodge Environment

AC-8

		2015/03/29	2015/09/30
M Ions	**Alk (mg/l)**	56.0	50.0
	Ca (mg/l)	18.0	16.0
	Cl (mg/l)	1.10	0.80
	CO3 (mg/l)	< 1.0	1.0
	Cond-F (µS/cm)	139	124
	Cond-L (µS/cm)	126	116
	Hardness (mg/l)	59	50
	HCO3 (mg/l)	68.0	61.0
	K (mg/l)	0.7	0.5
	Na (mg/l)	1.6	1.4
	OH (mg/l)	< 1.0	1.0
	SO4 (mg/l)	7.2	6.7
	Sum of Ions (mg/l)	100	88
Metal	**As (µg/l)**	0.2	0.1
	Ba (mg/l)	0.024	0.023
	Cu (mg/l)	0.0014	0.0002
	Fe (mg/l)	0.054	0.027
	Mo (mg/l)	0.0009	0.0010
	Ni (mg/l)	0.00020	0.00020
	Pb (mg/l)	0.0004	0.0001
	Se (mg/l)	< 0.0001	0.0001
	U (µg/l)	12.000	15.000
	Zn (mg/l)	0.006	< 0.001
Nutrient	**C-(org) (mg/l)**		7.000
	NH3-N (mg/l)		0.06
	NO3 (mg/l)	0.340	< 0.040
	P-(TP) (mg/l)		< 0.01
Phys Para	**pH-L (pH Unit)**	7.36	7.67
	TDS (mg/l)	84.00	77.00
	Temp-H20 (°C)	0.9	10.6
	TSS (mg/l)	< 1.000	3.000
Rads	**Pb210 (Bq/L)**		< 0.02
	Po210 (Bq/L)		0.006
	Ra226 (Bq/L)	0.030	0.030

Beaverlodge Environment

AN-3

			2015/09/30
M Ions	Alk (mg/l)		70.0
	Ca (mg/l)		20.0
	Cl (mg/l)		0.60
	CO3 (mg/l)	<	1.0
	Cond-F (µS/cm)		144
	Cond-L (µS/cm)		146
	Hardness (mg/l)		69
	HCO3 (mg/l)		85.0
	K (mg/l)		0.6
	Na (mg/l)		1.8
	OH (mg/l)	<	1.0
	SO4 (mg/l)		4.2
	Sum of Ions (mg/l)		117
Metal	As (µg/l)		0.1
	Ba (mg/l)		0.016
	Cu (mg/l)	<	0.0002
	Fe (mg/l)		0.008
	Mo (mg/l)		0.0017
	Ni (mg/l)		0.00020
	Pb (mg/l)	<	0.0001
	Se (mg/l)	<	0.0001
	U (µg/l)		1.700
	Zn (mg/l)	<	0.001
Nutrient	C-(org) (mg/l)		7.500
	NH3-N (mg/l)		0.08
	NO3 (mg/l)	<	0.040
	P-(TP) (mg/l)	<	0.01
Phys Para	pH-L (pH Unit)		7.86
	TDS (mg/l)		93.00
	Temp-H20 (°C)		11.4
	TSS (mg/l)		2.000
Rads	Pb210 (Bq/L)	<	0.02
	Po210 (Bq/L)	<	0.005
	Ra226 (Bq/L)		0.008

Beaverlodge Environment

AN-5

		2015/02/21	2015/03/29	2015/05/30	2015/07/25	2015/09/30	2015/11/21
M Ions	**Alk (mg/l)**	200.0	214.0	96.0	102.0	89.0	92.0
	Ca (mg/l)	56.0	60.0	30.0	30.0	30.0	27.0
	Cl (mg/l)	2.00	3.00	0.90	0.50	0.60	0.70
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	1.0	< 1.0
	Cond-F (µS/cm)	385	507	246	239	258	279
	Cond-L (µS/cm)	404	434	218	216	219	213
	Hardness (mg/l)	197	211	104	105	104	94
	HCO3 (mg/l)	244.0	261.0	117.0	124.0	108.0	112.0
	K (mg/l)	2.3	2.4	0.8	0.9	0.9	0.7
	Na (mg/l)	6.9	7.8	3.8	3.8	3.4	3.3
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	1.0	< 1.0
	SO4 (mg/l)	21.0	21.0	18.0	11.0	21.0	18.0
	Sum of Ions (mg/l)	346	371	178	178	171	168
Metal	**As (µg/l)**	0.4	0.6	0.3	0.4	0.3	0.2
	Ba (mg/l)	0.220	0.220	0.120	0.140	0.100	0.096
	Cu (mg/l)	0.0005	0.0008	0.0006	< 0.0002	0.0006	0.0010
	Fe (mg/l)	0.780	0.750	0.100	0.160	0.088	0.081
	Mo (mg/l)	0.0024	0.0036	0.0042	0.0019	0.0026	0.0033
	Ni (mg/l)	0.00060	0.00070	0.00040	0.00030	0.00040	0.00060
	Pb (mg/l)	0.0003	0.0008	< 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)	279.000	344.000	154.000	41.000	84.000	146.000
	Zn (mg/l)	0.001	0.005	< 0.001	< 0.001	< 0.001	0.001
Nutrient	**C-(org) (mg/l)**		11.000			11.000	
	NH3-N (mg/l)		0.36			0.06	
	NO3 (mg/l)	< 0.040	0.060			< 0.040	
	P-(TP) (mg/l)		< 0.01			< 0.01	
Phys Para	**pH-L (pH Unit)**	7.76	7.36	7.71	7.45	7.68	7.55
	TDS (mg/l)	257.00	268.00	147.00	146.00	149.00	141.00
	Temp-H20 (°C)	0.3	0.4	9.6	17.1	7.5	1.8
	TSS (mg/l)	6.000	< 1.000	< 1.000	1.000	2.000	< 1.000
Rads	**Pb210 (Bq/L)**		0.15			< 0.02	
	Po210 (Bq/L)		0.120			0.020	
	Ra226 (Bq/L)	2.000	1.900	0.630	0.850	0.590	0.450

Beaverlodge Environment

BL-3

		2015/03/29	2015/06/30	2015/09/30	2015/12/19
M Ions	**Alk (mg/l)**	78.0	68.0	68.0	76.0
	Ca (mg/l)	23.0	20.0	21.0	22.0
	Cl (mg/l)	13.00	12.00	12.00	13.00
	CO3 (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	Cond-F (µS/cm)	259	250	276	259
	Cond-L (µS/cm)	264	240	240	260
	Hardness (mg/l)	81	71	74	78
	HCO3 (mg/l)	95.0	83.0	83.0	93.0
	K (mg/l)	1.1	0.8	0.7	1.2
	Na (mg/l)	20.0	18.0	18.0	20.0
	OH (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	SO4 (mg/l)	32.0	30.0	30.0	34.0
	Sum of Ions (mg/l)	190	169	170	189
Metal	**As (µg/l)**	0.3	0.3	0.3	0.2
	Ba (mg/l)	0.051	0.038	0.043	0.043
	Cu (mg/l)	0.0016	0.0012	0.0002	0.0005
	Fe (mg/l)	0.009	0.007	0.010	0.003
	Mo (mg/l)	0.0038	0.0035	0.0036	0.0040
	Ni (mg/l)	0.00550	0.00450	0.00200	0.00030
	Pb (mg/l)	0.0001	< 0.0001	0.0001	< 0.0001
	Se (mg/l)	0.0025	0.0024	0.0026	0.0028
	U (µg/l)	139.000	128.000	132.000	153.000
	Zn (mg/l)	0.005	0.003	0.001	0.004
Nutrient	**C-(org) (mg/l)**			3.200	
	NH3-N (mg/l)			0.07	
	NO3 (mg/l)	0.050		< 0.040	
	P-(TP) (mg/l)			< 0.01	
Phys Para	**pH-L (pH Unit)**	7.74	7.96	7.92	7.71
	TDS (mg/l)	150.00	139.00	137.00	152.00
	Temp-H20 (°C)	0.4	19.2	11.6	1.3
	TSS (mg/l)	< 1.000	1.000	1.000	< 1.000
Rads	**Pb210 (Bq/L)**			< 0.02	
	Po210 (Bq/L)			< 0.005	
	Ra226 (Bq/L)	0.080	0.060	0.080	0.040

Beaverlodge Environment

BL-4

		2015/03/29	2015/09/30
M Ions	Alk (mg/l)	72.0	68.0
	Ca (mg/l)	22.0	22.0
	Cl (mg/l)	13.00	13.00
	CO3 (mg/l)	< 1.0	< 1.0
	Cond-F (µS/cm)	313	276
	Cond-L (µS/cm)	250	240
	Hardness (mg/l)	77	78
	HCO3 (mg/l)	88.0	83.0
	K (mg/l)	1.0	1.0
	Na (mg/l)	19.0	19.0
	OH (mg/l)	< 1.0	< 1.0
	SO4 (mg/l)	31.0	32.0
	Sum of Ions (mg/l)	180	176
Metal	As (µg/l)	0.3	0.3
	Ba (mg/l)	0.033	0.033
	Cu (mg/l)	0.0027	0.0004
	Fe (mg/l)	0.004	0.007
	Mo (mg/l)	0.0035	0.0036
	Ni (mg/l)	0.01400	0.00270
	Pb (mg/l)	0.0001	< 0.0001
	Se (mg/l)	0.0024	0.0025
	U (µg/l)	132.000	129.000
	Zn (mg/l)	0.005	0.001
Nutrient	C-(org) (mg/l)	3.200	3.000
	NH3-N (mg/l)	0.03	0.07
	NO3 (mg/l)	0.240	< 0.040
	P-(TP) (mg/l)	< 0.01	< 0.01
Phys Para	pH-L (pH Unit)	7.74	7.87
	TDS (mg/l)	138.00	141.00
	Temp-H20 (°C)	0.1	11.6
	TSS (mg/l)	< 1.000	< 1.000
Rads	Pb210 (Bq/L)	0.02	< 0.02
	Po210 (Bq/L)	< 0.005	< 0.005
	Ra226 (Bq/L)	0.030	0.040

Beaverlodge Environment

BL-5

		2015/03/29	2015/06/30	2015/09/30	2015/12/19
M Ions	Alk (mg/l)	75.0	68.0	68.0	76.0
	Ca (mg/l)	23.0	20.0	20.0	22.0
	Cl (mg/l)	13.00	12.00	13.00	13.00
	CO3 (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	Cond-F (µS/cm)	308	250	274	292
	Cond-L (µS/cm)	262	237	240	257
	Hardness (mg/l)	80	70	71	78
	HCO3 (mg/l)	92.0	83.0	83.0	93.0
	K (mg/l)	1.0	0.8	0.8	1.1
	Na (mg/l)	20.0	18.0	18.0	20.0
	OH (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	SO4 (mg/l)	33.0	30.0	30.0	34.0
	Sum of Ions (mg/l)	188	169	170	189
Metal	As (µg/l)	0.2	0.3	0.2	0.2
	Ba (mg/l)	0.034	0.034	0.033	0.038
	Cu (mg/l)	< 0.0002	< 0.0002	0.0002	< 0.0002
	Fe (mg/l)	0.001	0.002	0.006	0.003
	Mo (mg/l)	0.0037	0.0035	0.0036	0.0039
	Ni (mg/l)	0.00020	0.00020	0.00020	0.00020
	Pb (mg/l)	< 0.0001	< 0.0001	0.0001	< 0.0001
	Se (mg/l)	0.0025	0.0024	0.0025	0.0027
	U (µg/l)	137.000	127.000	131.000	151.000
	Zn (mg/l)	< 0.001	< 0.001	0.001	< 0.001
Nutrient	C-(org) (mg/l)			3.000	
	NH3-N (mg/l)			0.06	
	NO3 (mg/l)	< 0.040		0.040	
	P-(TP) (mg/l)			0.01	
Phys Para	pH-L (pH Unit)	7.81	7.95	7.93	7.72
	TDS (mg/l)	149.00	136.00	138.00	147.00
	Temp-H20 (°C)	0.2	17.1	11.5	2.1
	TSS (mg/l)	< 1.000	< 1.000	1.000	< 1.000
Rads	Pb210 (Bq/L)			0.02	
	Po210 (Bq/L)			0.005	
	Ra226 (Bq/L)	0.030	0.020	0.030	0.030

Beaverlodge Environment

CS-1

		2015/09/30
M Ions	Alk (mg/l)	66.0
	Ca (mg/l)	19.0
	Cl (mg/l)	7.60
	CO3 (mg/l)	1.0
	Cond-F (µS/cm)	220
	Cond-L (µS/cm)	192
	Hardness (mg/l)	66
	HCO3 (mg/l)	80.0
	K (mg/l)	0.8
	Na (mg/l)	11.0
	OH (mg/l)	1.0
	SO4 (mg/l)	17.0
	Sum of Ions (mg/l)	140
Metal	As (µg/l)	0.2
	Ba (mg/l)	0.042
	Cu (mg/l)	0.0002
	Fe (mg/l)	0.036
	Mo (mg/l)	0.0021
	Ni (mg/l)	0.00010
	Pb (mg/l)	0.0001
	Se (mg/l)	0.0009
	U (µg/l)	54.000
	Zn (mg/l)	0.001
Nutrient	C-(org) (mg/l)	6.200
	NH3-N (mg/l)	0.08
	NO3 (mg/l)	0.040
	P-(TP) (mg/l)	0.01
Phys Para	pH-L (pH Unit)	7.82
	TDS (mg/l)	123.00
	Temp-H20 (°C)	10.1
	TSS (mg/l)	2.000
Rads	Pb210 (Bq/L)	0.02
	Po210 (Bq/L)	0.005
	Ra226 (Bq/L)	0.005

Beaverlodge Environment

CS-2

			2015/09/30
M Ions	Alk (mg/l)		30.0
	Ca (mg/l)		7.3
	Cl (mg/l)		3.50
	CO3 (mg/l)	<	1.0
	Cond-F (µS/cm)		83
	Cond-L (µS/cm)		79
	Hardness (mg/l)		28
	HCO3 (mg/l)		37.0
	K (mg/l)		0.5
	Na (mg/l)		2.9
	OH (mg/l)	<	1.0
	SO4 (mg/l)		4.2
	Sum of Ions (mg/l)		58
Metal	As (µg/l)		0.2
	Ba (mg/l)		0.012
	Cu (mg/l)	<	0.0002
	Fe (mg/l)		0.006
	Mo (mg/l)		0.0003
	Ni (mg/l)		0.00020
	Pb (mg/l)	<	0.0001
	Se (mg/l)	<	0.0001
	U (µg/l)		2.400
	Zn (mg/l)	<	0.001
Nutrient	C-(org) (mg/l)		3.200
	NH3-N (mg/l)		0.02
	NO3 (mg/l)	<	0.040
	P-(TP) (mg/l)	<	0.01
Phys Para	pH-L (pH Unit)		7.51
	TDS (mg/l)		51.00
	Temp-H20 (°C)		11.2
	TSS (mg/l)		2.000
Rads	Pb210 (Bq/L)	<	0.02
	Po210 (Bq/L)		0.005
	Ra226 (Bq/L)		0.010

Beaverlodge Environment

DB-6

		2015/05/30	2015/07/25	2015/09/30	2015/11/21
M Ions	**Alk (mg/l)**	85.0	91.0	88.0	95.0
	Ca (mg/l)	34.0	35.0	36.0	34.0
	Cl (mg/l)	0.80	0.80	0.60	0.60
	CO3 (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	Cond-F (µS/cm)	246	248	261	311
	Cond-L (µS/cm)	216	231	228	228
	Hardness (mg/l)	106	110	112	105
	HCO3 (mg/l)	104.0	111.0	107.0	116.0
	K (mg/l)	0.5	0.7	0.5	0.5
	Na (mg/l)	1.9	2.1	2.0	1.9
	OH (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	SO4 (mg/l)	24.0	26.0	24.0	22.0
	Sum of Ions (mg/l)	170	181	176	180
Metal	**As (µg/l)**	0.1	0.1	0.1	0.1
	Ba (mg/l)	0.047	0.051	0.046	0.045
	Cu (mg/l)	0.0004	0.0006	0.0003	0.0006
	Fe (mg/l)	0.009	0.019	0.011	0.018
	Mo (mg/l)	0.0019	0.0023	0.0021	0.0020
	Ni (mg/l)	0.00020	0.00020	0.00020	0.00020
	Pb (mg/l)	< 0.0001	< 0.0001	0.0001	< 0.0001
	Se (mg/l)	< 0.0001	0.0001	0.0001	< 0.0001
	U (µg/l)	213.000	233.000	185.000	140.000
	Zn (mg/l)	< 0.001	0.001	0.001	< 0.001
Nutrient	**C-(org) (mg/l)**			8.800	
	NH3-N (mg/l)			0.04	
	NO3 (mg/l)			0.210	
	P-(TP) (mg/l)			< 0.01	
Phys Para	**pH-L (pH Unit)**	7.79	7.81	7.83	7.70
	TDS (mg/l)	148.00	154.00	151.00	165.00
	Temp-H20 (°C)	12.0	17.7	10.4	1.8
	TSS (mg/l)	< 1.000	< 1.000	1.000	< 1.000
Rads	**Pb210 (Bq/L)**			< 0.02	
	Po210 (Bq/L)			0.008	
	Ra226 (Bq/L)	0.030	0.050	0.040	0.030

Beaverlodge Environment

ML-1

		2015/03/29	2015/06/30	2015/09/30	2015/12/19
M Ions	Alk (mg/l)	69.0	66.0	65.0	66.0
	Ca (mg/l)	21.0	19.0	19.0	20.0
	Cl (mg/l)	6.50	8.40	8.00	4.90
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	237	209	223	191
	Cond-L (µS/cm)	183	196	196	168
	Hardness (mg/l)	70	65	65	67
	HCO3 (mg/l)	84.0	80.0	79.0	80.0
	K (mg/l)	1.0	0.8	0.8	1.1
	Na (mg/l)	8.2	12.0	12.0	6.7
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	14.0	18.0	18.0	12.0
	Sum of Ions (mg/l)	140	143	141	129
Metal	As (µg/l)	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.044	0.044	0.042	0.045
	Cu (mg/l)	0.0012	0.0003	< 0.0002	0.0004
	Fe (mg/l)	0.027	0.006	0.010	0.015
	Mo (mg/l)	0.0014	0.0021	0.0022	0.0013
	Ni (mg/l)	0.00020	0.00010	0.00010	0.00020
	Pb (mg/l)	0.0002	< 0.0001	< 0.0001	< 0.0001
	Se (mg/l)	0.0007	0.0011	0.0011	0.0006
	U (µg/l)	40.000	61.000	64.000	33.000
	Zn (mg/l)	0.003	< 0.001	< 0.001	0.002
Nutrient	C-(org) (mg/l)	8.300	5.100	5.200	7.600
	NH3-N (mg/l)	0.07	0.06	0.08	0.08
	NO3 (mg/l)	0.500	0.350	< 0.040	0.130
	P-(TP) (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01
Phys Para	pH-L (pH Unit)	7.39	7.94	7.86	7.59
	TDS (mg/l)	112.00	121.00	120.00	105.00
	Temp-H20 (°C)	0.5	19.8	11.5	2.2
	TSS (mg/l)	< 1.000	2.000	1.000	< 1.000
Rads	Pb210 (Bq/L)	< 0.02	< 0.02	< 0.02	< 0.02
	Po210 (Bq/L)	< 0.005	< 0.005	< 0.005	< 0.005
	Ra226 (Bq/L)	0.008	0.020	0.020	0.010

Beaverlodge Environment

TL-3

		2015/03/29	2015/06/30	2015/09/30	2015/12/19
M Ions	Alk (mg/l)	145.0	132.0	130.0	145.0
	Ca (mg/l)	30.0	26.0	26.0	34.0
	Cl (mg/l)	3.00	3.00	4.00	3.00
	CO3 (mg/l)	< 1.0	< 1.0	1.0	< 1.0
	Cond-F (µS/cm)	371	338	369	292
	Cond-L (µS/cm)	346	326	325	318
	Hardness (mg/l)	99	86	86	115
	HCO3 (mg/l)	177.0	161.0	156.0	177.0
	K (mg/l)	1.1	0.8	0.9	1.4
	Na (mg/l)	36.0	36.0	36.0	24.0
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	34.0	34.0	34.0	26.0
	Sum of Ions (mg/l)	287	266	263	273
Metal	As (µg/l)	0.8	0.9	0.9	0.6
	Ba (mg/l)	0.036	0.038	0.036	0.038
	Cu (mg/l)	0.0009	0.0009	0.0006	0.0011
	Fe (mg/l)	0.007	0.012	0.015	0.011
	Mo (mg/l)	0.0130	0.0140	0.0140	0.0098
	Ni (mg/l)	0.00030	0.00030	0.00030	0.00040
	Pb (mg/l)	0.0002	0.0004	0.0006	0.0002
	Se (mg/l)	0.0029	0.0030	0.0029	0.0018
	U (µg/l)	303.000	297.000	301.000	186.000
	Zn (mg/l)	0.001	< 0.001	< 0.001	0.001
Nutrient	C-(org) (mg/l)			7.300	
	NH3-N (mg/l)			0.06	
	NO3 (mg/l)	0.050		< 0.040	
	P-(TP) (mg/l)			0.01	
Phys Para	pH-L (pH Unit)	7.92	8.11	8.34	7.88
	TDS (mg/l)	217.00	205.00	194.00	203.00
	Temp-H20 (°C)	0.3	21.8	11.3	2.1
	TSS (mg/l)	< 1.000	2.000	2.000	< 1.000
Rads	Pb210 (Bq/L)			0.10	
	Po210 (Bq/L)			0.040	
	Ra226 (Bq/L)	1.300	1.300	1.400	1.500

Beaverlodge Environment

TL-4

		2015/03/29	2015/06/30	2015/09/30	2015/12/19
M Ions	**Alk (mg/l)**	164.0	123.0	121.0	135.0
	Ca (mg/l)	28.0	18.0	18.0	23.0
	Cl (mg/l)	4.00	2.60	2.80	3.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	435	305	337	367
	Cond-L (µS/cm)	381	291	291	319
	Hardness (mg/l)	96	65	66	81
	HCO3 (mg/l)	200.0	150.0	148.0	165.0
	K (mg/l)	1.3	0.9	1.0	1.4
	Na (mg/l)	45.0	37.0	36.0	39.0
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	34.0	26.0	27.0	31.0
	Sum of Ions (mg/l)	319	240	238	268
Metal	**As (µg/l)**	1.3	2.0	1.2	1.3
	Ba (mg/l)	0.083	0.092	0.069	0.078
	Cu (mg/l)	0.0003	0.0012	0.0002	0.0012
	Fe (mg/l)	0.008	0.180	0.029	0.014
	Mo (mg/l)	0.0120	0.0092	0.0097	0.0100
	Ni (mg/l)	0.00050	0.00060	0.00050	0.00070
	Pb (mg/l)	0.0002	0.0004	0.0003	0.0004
	Se (mg/l)	0.0018	0.0014	0.0015	0.0019
	U (µg/l)	287.000	178.000	235.000	264.000
	Zn (mg/l)	< 0.001	0.001	< 0.001	0.002
Nutrient	**C-(org) (mg/l)**			9.200	
	NH3-N (mg/l)			0.08	
	NO3 (mg/l)	< 0.040		< 0.040	
	P-(TP) (mg/l)			< 0.01	
Phys Para	**pH-L (pH Unit)**	7.92	7.96	8.31	7.94
	TDS (mg/l)	242.00	187.00	180.00	200.00
	Temp-H20 (°C)	0.5	21.1	8.9	2.5
	TSS (mg/l)	< 1.000	2.000	< 1.000	< 1.000
Rads	**Pb210 (Bq/L)**			0.04	
	Po210 (Bq/L)			0.030	
	Ra226 (Bq/L)	2.300	1.600	1.800	2.600

Beaverlodge Environment

TL-6

		2015/05/30	2015/07/25	2015/09/30
M Ions	**Alk (mg/l)**	193.0	362.0	289.0
	Ca (mg/l)	39.0	43.0	46.0
	Cl (mg/l)	39.00	61.00	43.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)		963	927
	Cond-L (µS/cm)	525	887	818
	Hardness (mg/l)	138	161	168
	HCO3 (mg/l)	235.0	442.0	352.0
	K (mg/l)	2.8	2.0	2.2
	Na (mg/l)	59.0	140.0	116.0
	OH (mg/l)	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	26.0	31.0	78.0
	Sum of Ions (mg/l)	411	732	650
Metal	**As (µg/l)**	4.2	5.9	1.8
	Ba (mg/l)	0.570	1.190	0.920
	Cu (mg/l)	< 0.0002	0.0002	0.0004
	Fe (mg/l)	9.300	4.390	0.970
	Mo (mg/l)	0.0004	0.0004	0.0022
	Ni (mg/l)	0.00040	0.00040	0.00050
	Pb (mg/l)	0.0001	0.0002	0.0003
	Se (mg/l)	0.0011	0.0023	0.0024
	U (µg/l)	33.000	83.000	315.000
	Zn (mg/l)	0.001	0.001	0.001
Nutrient	**C-(org) (mg/l)**			32.000
	NH3-N (mg/l)			0.16
	NO3 (mg/l)			0.130
	P-(TP) (mg/l)			0.02
Phys Para	**pH-L (pH Unit)**	7.72	7.62	8.05
	TDS (mg/l)	328.00	624.00	553.00
	Temp-H20 (°C)	6.6	13.7	5.5
	TSS (mg/l)	14.000	6.000	3.000
Rads	**Pb210 (Bq/L)**			0.08
	Po210 (Bq/L)			0.030
	Ra226 (Bq/L)	3.800	6.700	5.500

Beaverlodge Environment

TL-7

		2015/01/04	2015/05/30	2015/06/30	2015/07/25	2015/08/18	2015/09/30	2015/10/31	2015/11/21	2015/12/19
M Ions	**Alk (mg/l)**	176.0	128.0	140.0	143.0	139.0	125.0	135.0	135.0	138.0
	Ca (mg/l)	27.0	24.0	22.0	25.0	29.0	20.0	24.0	21.0	24.0
	Cl (mg/l)	6.00	4.00	4.00	5.00	28.00	7.00	8.00	5.00	4.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	480	349	285	319	217	362	422	325	391
	Cond-L (µS/cm)	429	301	320	333	389	310	331	324	329
	Hardness (mg/l)	94	82	77	87	104	73	86	76	84
	HCO3 (mg/l)	215.0	156.0	171.0	174.0	170.0	152.0	165.0	165.0	168.0
	K (mg/l)	1.4	1.1	0.5	0.8	1.3	1.0	1.3	1.0	1.3
	Na (mg/l)	50.0	35.0	39.0	39.0	46.0	38.0	40.0	37.0	40.0
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	37.0	26.0	24.0	26.0	32.0	27.0	29.0	28.0	32.0
	Sum of Ions (mg/l)	343	252	266	276	314	251	274	263	275
Metal	**As (µg/l)**	1.6	1.2	1.4	1.3	1.3	1.1	1.1	1.2	1.2
	Ba (mg/l)	0.160	0.420	0.660	0.760	0.730	0.160	0.150	0.130	0.120
	Cu (mg/l)	0.0007	0.0003	0.0005	0.0004	0.0007	< 0.0002	0.0004	0.0004	0.0005
	Fe (mg/l)	0.120	0.140	0.069	0.095	0.084	0.032	0.017	0.017	0.020
	Mo (mg/l)	0.0170	0.0086	0.0064	0.0064	0.0073	0.0095	0.0088	0.0100	0.0110
	Ni (mg/l)	0.00060	0.00040	0.00050	0.00050	0.00060	0.00050	0.00060	0.00050	0.00060
	Pb (mg/l)	0.0004	0.0003	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
	Se (mg/l)	0.0021	0.0017	0.0016	0.0020	0.0025	0.0016	0.0018	0.0018	0.0020
	U (µg/l)	310.000	255.000	111.000	114.000	170.000	240.000	265.000	287.000	287.000
	Zn (mg/l)	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nutrient	**C-(org) (mg/l)**			8.100			9.600			9.600
	NH3-N (mg/l)			0.05			0.08			0.09
	NO3 (mg/l)	< 0.040		0.260			< 0.040			< 0.040
	P-(TP) (mg/l)			< 0.01			< 0.01			< 0.01
Phys Para	**pH-L (pH Unit)**	8.10	7.81	8.00	7.79	7.90	8.01	7.91	7.95	7.85
	TDS (mg/l)	255.00	184.00	204.00	216.00	259.00	196.00	206.00	207.00	203.00
	Temp-H20 (°C)	0.2	8.6	19.1	15.2	16.2	8.2	1.3	1.0	2.0
	TSS (mg/l)	2.000	1.000	< 1.000	< 1.000	< 1.000	2.000	< 1.000	< 1.000	< 1.000
Rads	**Pb210 (Bq/L)**			0.03			0.05			0.05
	Po210 (Bq/L)			0.010			0.010			0.030
	Ra226 (Bq/L)	1.200	1.600	2.300	2.400	1.600	1.100	1.300	1.200	2.300

Beaverlodge Environment

TL-9

		2015/04/26	2015/05/30	2015/06/30	2015/07/25	2015/08/18	2015/09/30	2015/10/31	2015/12/19
M Ions	**Alk (mg/l)**	149.0	130.0	130.0	116.0	106.0	114.0	123.0	136.0
	Ca (mg/l)	29.0	25.0	22.0	17.0	14.0	17.0	20.0	22.0
	Cl (mg/l)	5.00	2.30	5.00	1.50	4.80	6.40	6.80	5.00
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	402	346	330	280	137	333	332	334
	Cond-L (µS/cm)	342	304	310	281	255	287	298	318
	Hardness (mg/l)	100	87	79	64	58	68	77	81
	HCO3 (mg/l)	182.0	159.0	159.0	142.0	129.0	139.0	150.0	166.0
	K (mg/l)	1.1	0.8	1.0	1.1	1.1	0.8	1.2	1.2
	Na (mg/l)	39.0	34.0	35.0	35.0	35.0	35.0	36.0	37.0
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	29.0	25.0	24.0	23.0	24.0	24.0	24.0	28.0
	Sum of Ions (mg/l)	292	252	254	226	214	228	245	266
Metal	**As (µg/l)**	1.6	1.2	1.8	1.9	2.3	1.4	1.4	1.2
	Ba (mg/l)	0.740	0.790	0.760	0.660	0.570	0.680	0.650	0.390
	Cu (mg/l)	0.0009	0.0007	0.0014	0.0012	0.0007	0.0002	0.0004	0.0007
	Fe (mg/l)	0.033	0.008	0.063	0.075	0.051	0.025	0.019	0.019
	Mo (mg/l)	0.0130	0.0110	0.0100	0.0110	0.0100	0.0095	0.0095	0.0098
	Ni (mg/l)	0.00040	0.00030	0.00050	0.00050	0.00040	0.00030	0.00040	0.00050
	Pb (mg/l)	0.0007	0.0002	0.0016	0.0016	0.0014	0.0004	0.0003	0.0003
	Se (mg/l)	0.0039	0.0054	0.0059	0.0045	0.0041	0.0028	0.0028	0.0026
	U (µg/l)	480.000	314.000	138.000	148.000	164.000	213.000	230.000	269.000
	Zn (mg/l)	0.001	< 0.001	0.001	0.002	0.001	< 0.001	< 0.001	0.001
Nutrient	**C-(org) (mg/l)**			7.000					10.000
	NH3-N (mg/l)			0.05					0.09
	NO3 (mg/l)	0.390		1.800					0.090
	P-(TP) (mg/l)			0.01					< 0.01
Phys Para	**pH-L (pH Unit)**	8.09	8.15	7.91	7.76	8.04	8.14	8.16	7.87
	TDS (mg/l)	218.00	181.00	190.00	180.00	174.00	184.00	184.00	205.00
	Temp-H20 (°C)	3.9	11.6	16.7	15.8	16.7	8.5	2.1	1.8
	TSS (mg/l)	1.000	< 1.000	< 1.000	2.000	2.000	1.000	3.000	< 1.000
Rads	**Pb210 (Bq/L)**			0.12					0.05
	Po210 (Bq/L)			0.100					0.030
	Ra226 (Bq/L)	2.400	3.200	2.300	2.200	1.900	2.200	1.900	2.100

Beaverlodge Date Range Report

Beaverlodge Environment

ZOR-01

		2015/05/31	2015/06/30	2015/07/25	2015/08/18	2015/11/21	2015/12/19
M Ions	**Alk (mg/l)**	90.0	93.0	93.0	97.0	105.0	106.0
	Ca (mg/l)	29.0	30.0	30.0	31.0	32.0	34.0
	Cl (mg/l)	0.30	0.30	0.20	0.20	0.20	0.30
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	295	243	228	235	283	286
	Cond-L (µS/cm)	202	207	210	211	236	239
	Hardness (mg/l)	102	106	105	109	114	120
	HCO3 (mg/l)	110.0	113.0	113.0	118.0	128.0	129.0
	K (mg/l)	0.7	0.6	0.6	0.7	0.4	0.8
	Na (mg/l)	1.6	1.6	1.6	1.6	1.7	1.9
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	17.0	17.0	18.0	17.0	19.0	21.0
	Sum of Ions (mg/l)	166	170	171	176	190	196
Metal	**As (µg/l)**	0.1	0.2	0.1	0.2	0.2	0.2
	Ba (mg/l)	0.020	0.021	0.021	0.022	0.025	0.025
	Cu (mg/l)	< 0.0002	0.0008	0.0006	< 0.0002	0.0003	0.0004
	Fe (mg/l)	0.004	0.004	0.006	0.066	0.003	0.008
	Mo (mg/l)	0.0007	0.0007	0.0007	0.0005	0.0009	0.0009
	Ni (mg/l)	< 0.00010	0.00010	0.00020	0.00010	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	0.0002	0.0002
	U (µg/l)	14.000	15.000	14.000	9.100	16.000	18.000
	Zn (mg/l)	< 0.001	0.001	0.001	< 0.001	< 0.001	< 0.001
Phys Para	**pH-L (pH Unit)**	7.73	8.05	8.07	7.45	7.92	7.68
	TDS (mg/l)	128.00	130.00	136.00	127.00	146.00	154.00
	Temp-H20 (°C)	0.2	18.5	18.6	16.9	2.0	1.5
	TSS (mg/l)	< 1.000	< 1.000	< 1.000	1.000	< 1.000	2.000
Rads	**Ra226 (Bq/L)**	0.010	0.020	0.020	0.050	0.030	0.040

Beaverlodge Environment

ZOR-01 Construction

		2015/08/09	2015/08/23	2015/09/01	2015/09/09	2015/09/15	2015/09/22	2015/09/30	2015/10/06	2015/10/13
Ino rgs	**Chlor (mg/l)**	0.30		0.20	0.20		0.20	0.20	0.30	0.30
M Ions	**Alk (mg/l)**	95.0		< 1.0	98.0	98.0	97.0	101.0	98.0	103.0
	Ca (mg/l)	32.0	29.0	30.0	30.0	31.0	30.0	32.0	31.0	32.0
	Cl (mg/l)			0.20		0.20	0.20	0.20	0.30	
	CO3 (mg/l)	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	217	190	206	237	248	260	242	264	285
	Cond-L (µS/cm)	210		213	217	221	224	226	220	226
	Hardness (mg/l)	113		107	107	110	107	114	110	114
	HCO3 (mg/l)	116.0		120.0	120.0	120.0	118.0	123.0	120.0	126.0
	K (mg/l)	0.8	0.4	0.8	0.5	0.7	0.5	0.8	0.6	0.6
	Na (mg/l)	1.7	1.6	1.7	1.6	1.7	1.6	1.8	1.7	1.9
	OH (mg/l)	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	19.0	18.0	19.0	18.0	19.0	18.0	18.0	19.0	19.0
	Sum of Ions (mg/l)	178		180	178	181	176	184	181	188
Metal	**As (µg/l)**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.021	0.021	0.020	0.020	0.022	0.022	0.022	0.022	0.022
	Cu (mg/l)	0.0002	0.0003	0.0037	0.0014	0.0004	0.0006	0.0007	0.0006	0.0005
	Fe (mg/l)	0.014	0.006	0.010	0.005	0.012	0.005	0.007	0.004	0.004
	Mo (mg/l)	0.0009	0.0008	0.0007	0.0008	0.0009	0.0009	0.0009	0.0008	0.0008
	Ni (mg/l)	0.00010	0.00010	0.00020	0.00020	0.00010	0.00020	0.00020	0.00010	0.00020
	Pb (mg/l)	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001
	U (µg/l)	15.000	16.000	13.000	15.000	16.000	16.000	16.000	15.000	15.000
	Zn (mg/l)	< 0.001	0.001	0.003	0.001	0.001	< 0.001	0.002	0.002	0.001
Nu trie	**NO3 (mg/l)**	0.080		0.160	0.090	< 0.040	0.070	< 0.040	< 0.040	< 0.040
Phys Para	**pH-L (pH Unit)**	8.00		8.44	8.02	7.88	7.86	8.14	7.74	7.98
	TDS (mg/l)	129.00		146.00	128.00	143.00	134.00	112.00	142.00	139.00
	Temp-H20 (°C)	23.3	17.6	16.2	14.8	12.5	10.0	10.1	8.5	7.3
	TSS (mg/l)	1.000	1.000	< 1.000	1.000	< 1.000	< 1.000	1.000	2.000	2.000
Rads	**Ra226 (Bq/L)**	0.030	0.040	0.020	0.030	0.020	0.030	0.030	0.020	0.020

Beaverlodge Environment

ZOR-01 Construction Continued

		2015/10/28	2015/11/07	2015/11/14	2015/11/28	2015/12/05	2015/12/12
In o	Chlor (mg/l)	0.30	0.20	0.30	0.30	0.30	0.30
M Ions	Alk (mg/l)	103.0	105.0	102.0	107.0	108.0	107.0
	Ca (mg/l)	34.0	33.0	35.0	35.0	33.0	35.0
	Cl (mg/l)	0.30	0.20	0.30	0.30	0.30	0.90
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	307	305	339	299	281	269
	Cond-L (µS/cm)	234	240	239	238	238	238
	Hardness (mg/l)	120	117	123	124	117	123
	HCO3 (mg/l)	126.0	128.0	124.0	130.0	132.0	130.0
	K (mg/l)	0.9	0.8	1.0	0.9	0.7	0.8
	Na (mg/l)	1.8	1.8	1.9	1.9	1.9	1.9
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	19.0	20.0	21.0	20.0	20.0	21.0
	Sum of Ions (mg/l)	190	192	192	197	196	198
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.024	0.025	0.024	0.023	0.024	0.024
	Cu (mg/l)	0.0013	0.0008	0.0012	0.0021	0.0016	0.0004
	Fe (mg/l)	0.011	0.006	0.004	0.004	0.011	0.009
	Mo (mg/l)	0.0008	0.0008	0.0009	0.0008	0.0008	0.0008
	Ni (mg/l)	0.00030	0.00020	0.00020	0.00020	0.00020	0.00020
	Pb (mg/l)	0.0002	0.0010	0.0001	0.0001	0.0002	< 0.0001
	Se (mg/l)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	U (µg/l)	15.000	16.000	16.000	16.000	17.000	18.000
	Zn (mg/l)	0.002	0.003	0.001	0.003	0.002	< 0.001
Nu trie	NO3 (mg/l)	< 0.040	< 0.040	< 0.040	< 0.040	0.060	0.130
Phys Para	pH-L (pH Unit)	7.76	7.98	7.87	7.75	7.91	7.59
	TDS (mg/l)	150.00	145.00	153.00	163.00	152.00	152.00
	Temp-H20 (°C)	4.7	2.2	3.6	2.1	1.9	1.1
	TSS (mg/l)	< 1.000	< 1.000	< 1.000	2.000	1.000	3.000
Ra ds	Ra226 (Bq/L)	0.040	0.030	0.030	0.030	0.030	0.030

Beaverlodge Environment

ZOR-02

		2015/05/31	2015/06/30	2015/07/25	2015/08/18	2015/11/21	2015/12/19
M Ions	**Alk (mg/l)**	83.0	109.0	107.0	203.0	110.0	113.0
	Ca (mg/l)	36.0	63.0	68.0	108.0	35.0	38.0
	Cl (mg/l)	0.30	· 1.00	· 1.00	3.00	0.30	0.30
	CO3 (mg/l)	· 1.0	· 1.0	· 1.0	· 1.0	· 1.0	· 1.0
	Cond-F (µS/cm)	223	465	480	711	336	312
	Cond-L (µS/cm)	241	408	440	655	261	264
	Hardness (mg/l)	118	206	215	347	123	133
	HCO3 (mg/l)	101.0	133.0	130.0	248.0	134.0	138.0
	K (mg/l)	0.7	0.6	0.8	1.8	0.6	1.0
	Na (mg/l)	1.5	2.2	2.4	5.5	2.0	2.2
	OH (mg/l)	· 1.0	· 1.0	· 1.0	· 1.0	· 1.0	· 1.0
	SO4 (mg/l)	41.0	99.0	110.0	160.0	26.0	27.0
	Sum of Ions	188	311	324	546	207	216
Metal	**As (µg/l)**	0.2	0.2	0.2	1.0	0.2	0.2
	Ba (mg/l)	0.010	0.025	0.026	0.054	0.025	0.027
	Cu (mg/l)	0.0037	0.0026	0.0026	0.0048	0.0012	0.0014
	Fe (mg/l)	0.012	0.035	0.062	1.080	0.035	0.046
	Mo (mg/l)	0.0010	0.0014	0.0014	0.0031	0.0010	0.0010
	Ni (mg/l)	0.00030	0.00040	0.00030	0.00100	0.00020	0.00020
	Pb (mg/l)	0.0002	0.0001	0.0004	0.0058	0.0002	0.0002
	Se (mg/l)	0.0004	0.0006	0.0006	0.0007	0.0002	0.0002
	U (µg/l)	623.000	818.000	984.000	1580.000	120.000	87.000
	Zn (mg/l)	· 0.001	· 0.001	· 0.001	0.001	· 0.001	0.001
Phys Para	**pH-L (pH Unit)**	7.99	7.90	7.75	7.86	7.98	7.72
	TDS (mg/l)	148.00	273.00	314.00	459.00	157.00	163.00
	Temp-H20 (°C)	13.7	0.9	1.4	8.9	1.8	0.9
	TSS (mg/l)	· 1.000	· 1.000	· 1.000	31.000	1.000	2.000
Ra	**Ra226 (Bq/L)**	0.360	0.330	0.480	1.400	0.150	0.130

Beaverlodge Environment

ZOR-02 Construction

		2015/08/09	2015/08/21	2015/08/23	2015/09/01	2015/09/09	2015/09/15	2015/09/22	2015/09/30	2015/10/06
M Ions	**Alk (mg/l)**	252.0	145.0	140.0	128.0	102.0	104.0	101.0	108.0	102.0
	Ca (mg/l)	159.0	100.0	76.0	77.0	41.0	39.0	34.0	39.0	34.0
	Cl (mg/l)	3.00	2.00	1.00	< 1.00	0.30	0.30	0.20	0.30	0.30
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	946	555	426	456	312	287	285	330	280
	Cond-L (µS/cm)	861	630	493	479	280	265	243	269	240
	Hardness (mg/l)	508	315	243	245	139	135	118	135	120
	HCO3 (mg/l)	307.0	177.0	171.0	156.0	124.0	127.0	123.0	132.0	124.0
	K (mg/l)	2.0	1.2	1.0	1.3	0.6	0.9	0.6	0.9	0.7
	Na (mg/l)	6.8	4.0	3.7	3.7	2.0	2.1	1.8	2.1	1.9
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	260.0	180.0	120.0	120.0	43.0	36.0	25.0	34.0	25.0
	Sum of Ions (mg/l)	765	482	387	373	220	214	193	218	194
Metal	**As (µg/l)**	2.6	1.2	0.5	0.3	0.4	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.066	0.067	0.054	0.046	0.031	0.027	0.023	0.024	0.023
	Cu (mg/l)	0.0180	0.0078	0.0030	0.0037	0.0025	0.0012	0.0013	0.0012	0.0007
	Fe (mg/l)	5.800	1.190	0.250	0.170	0.220	0.038	0.023	0.033	0.021
	Mo (mg/l)	0.0032	0.0036	0.0050	0.0041	0.0016	0.0016	0.0012	0.0013	0.0010
	Ni (mg/l)	0.00450	0.00150	0.00050	0.00040	0.00040	0.00020	0.00020	0.00020	0.00010
	Pb (mg/l)	0.0420	0.0100	0.0010	0.0008	0.0007	0.0002	0.0002	0.0002	< 0.0001
	Se (mg/l)	0.0008	0.0012	0.0012	0.0010	0.0003	0.0003	0.0002	0.0002	0.0002
	U (µg/l)	2190.000	2080.000	1410.000	1200.000	336.000	218.000	125.000	205.000	96.000
	Zn (mg/l)	0.006	0.002	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001
Nu trie	**NO3 (mg/l)**	0.300	1.400	1.800	2.000	0.260	0.120	0.130	0.180	0.130
Phys Para	**pH-L (pH Unit)**	7.72	7.72	7.79	8.13	7.96	7.88	7.80	8.15	7.77
	TDS (mg/l)	668.00	450.00	350.00	345.00	179.00	172.00	139.00	146.00	152.00
	Temp-H20 (°C)	8.2	7.1	11.7	9.4	12.3	13.6	8.2	8.4	7.3
	TSS (mg/l)	148.000	54.000	4.000	2.000	37.000	1.000	< 1.000	< 1.000	< 1.000
Ra ds	**Ra226 (Bq/L)**	6.600	1.400	0.940	0.720	0.530	0.200	0.170	0.180	0.120

Beaverlodge Environment

ZOR-02 Construction Continued

		2015/10/13	2015/10/28	2015/11/07	2015/11/14	2015/11/28	2015/12/05	2015/12/12
M Ions	Alk (mg/l)	107.0	110.0	110.0	111.0	110.0	112.0	111.0
	Ca (mg/l)	36.0	40.0	41.0	39.0	38.0	35.0	37.0
	Cl (mg/l)	0.30	0.40	0.40	0.30	0.30	0.30	0.30
	CO3 (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Cond-F (µS/cm)	312	331	321	343	318	289	274
	Cond-L (µS/cm)	255	276	290	266	259	257	254
	Hardness (mg/l)	126	139	141	135	133	123	130
	HCO3 (mg/l)	130.0	134.0	134.0	135.0	134.0	137.0	135.0
	K (mg/l)	0.6	0.9	0.8	0.8	0.8	0.6	0.8
	Na (mg/l)	2.1	2.2	2.2	2.2	2.1	2.0	2.1
	OH (mg/l)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	SO4 (mg/l)	29.0	34.0	37.0	30.0	26.0	25.0	26.0
	Sum of Ions (mg/l)	207	221	225	217	211	209	211
Metal	As (µg/l)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Ba (mg/l)	0.023	0.027	0.027	0.026	0.024	0.026	0.026
	Cu (mg/l)	0.0008	0.0009	0.0010	0.0010	0.0010	0.0011	0.0009
	Fe (mg/l)	0.022	0.041	0.040	0.033	0.028	0.031	0.033
	Mo (mg/l)	0.0012	0.0012	0.0012	0.0011	0.0010	0.0010	0.0011
	Ni (mg/l)	0.00010	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
	Pb (mg/l)	< 0.0001	<0.0001	0.0002	0.0001	0.0001	< 0.0001	0.0002
	Se (mg/l)	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	U (µg/l)	143.000	208.000	236.000	146.000	102.000	100.000	87.000
	Zn (mg/l)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nu trie	NO3 (mg/l)	0.270	0.200	0.170	0.160	0.150	0.210	0.250
Phys Para	pH-L (pH Unit)	8.05	7.92	8.00	7.72	7.83	7.91	7.76
	TDS (mg/l)	154.00	176.00	184.00	158.00	157.00	152.00	156.00
	Temp-H20 (°C)	5.2	2.5	1.4	2.5	0.8	0.9	0.8
	TSS (mg/l)	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000
Ra ds	Ra226 (Bq/L)	0.120	0.150	0.180	0.140	0.140	0.130	0.100

APPENDIX B

APPENDIX B

2015 Hydrometric Monitoring near Beaverlodge Mine

Cameco Corporation
February 2016

MISSINIPI WATER SOLUTIONS INC.
PO BOX 32089
SASKATOON, SK CANADA
S7S 1N8
FILE NUMBER: MWS-15-014

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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 owned by 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 to 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.

An additional station included in this 2015 monitoring report is a water level datalogger deployed in the Fay Shaft. The locations of monitoring stations are presented in Figure 1.

Other activities were carried out at the request of Cameco in addition to the above noted flow monitoring and include visual inspection of 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.

Figure 1: Monitoring Locations

2.0 METHODS

Two field programs were undertaken during 2015. The first occurred between April 25 and May 4 and ran concurrently with other work in the Uranium City area. The second program was executed between September 30 and October 4.

At each monitoring station discharge was measured either by in-stream velocity measurements or volumetric methods. 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 using a vessel of known volume and a stop watch. All measurements were completed using regularly calibrated equipment. Water levels are reported in reference to locally established benchmarks and are not corrected to geodetic elevation.

To calculate the hydrograph at each station, the measurements of stage and discharge are correlated to develop a rating curve. The resulting curve is then applied to the datalogger stage data records following correction 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 the 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 McElhanney (2015).

Cameco must exercise caution in regards to 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 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. 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 change to 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 and, especially during lower flow conditions, a station with good flow records, unimpeded by backwater conditions, can be used to estimate flows at a station where snow, ice and other backwater causing conditions exist.

3.0 CLIMATIC CONDITIONS

Environment Canada operates meteorological stations at Uranium City and Stony Rapids, Saskatchewan. Meteorological data from these sites provide an indication of climatic conditions through the hydrological monitoring period. The station near Uranium City is automated and has been subject to problems in the past resulting in gaps in the meteorological record. Data presented in Table 1 are total precipitation records for 2015 as available for Uranium City and Stony Rapids.

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
2015	January	21.3*	19.3	110.4	30/31	0.9*	18.1	5.0	28/31
	February	11.6	15.5	74.8	28/28	3.2*	13.3	24.1	24/28
	March	13.4	17.8	75.3	31/31	0.2*	18.2	1.1	25/31
	April	0.8	16.9	4.7	30/30	6.5*	18	36.1	24/30
	May	0.2*	17.5	1.1	30/31	1.0*	26.3	3.8	27/31
	June	18.5	31.3	59.1	30/30	17.4	44.4	39.2	30/30
	July	106.4	47.1	225.9	31/31	50.3*	56.3	89.3	29/31
	August	87	42.4	205.2	31/31	37.9*	63.9	59.3	28/31
	September	47.6*	33.7	141.2	25/30	78.7	48.4	162.6	30/30
	October	53.0*	29.1	182.1	28/31	30.6*	30.1	101.7	30/31
	November	30.5*	28	108.9	29/30	5.8*	27.6	21.0	28/30
	December	11.1	23.6	47.0	31/31	5.7	18.7	30.5	31/31
Totals		401.4*	322.2	124.6	354/365	238.2*	383.3	62.1	334/365

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

As previously mentioned the meteorological station at Uranium City has typically been subject to equipment problems resulting in data gaps in the climate record; however, in 2015 the data record indicated collection of more than 95% of the year with September having the greatest number of missed days with five. The data as presented in Table 1 confirm observations by MWSI that the winter leading into 2015 had relatively low precipitation resulting in reduced snow pack and low discharge magnitude snowmelt runoff. An extended dry period through late spring and early summer resulted in the occurrence of forest fires in the area (and in the whole of Saskatchewan's north in general) but was followed by rain events in the late summer and early fall resulting in hydrograph peaks more typical of spring freshet. Overall, 2015 experienced greater than normal precipitation (approximately 124% of normal) with more than 75% of the total precipitation occurring in the latter half of the year. The precipitation quantities reported in Table 1 reflect responses in streamflow observed during 2015 (as discussed in Section 4.0) though a large peak observed in the hydrographs in September appears to be coincident with a day of missing data (September 2) preceded by 34.4 mm on September 1.

The station at Stony Rapids collected fewer days than that at Uranium City but is included in this report as reference. The station at Stony Rapids indicates that 2015 was drier than normal (approximately 62%). This indicates that either the station at Stony Rapids failed to collect some of the rain events experienced at Uranium City or that Stony Rapids should be used with caution as a proxy when data for Uranium City is scarce.

4.0 STREAM DISCHARGE MONITORING

This section presents the measured discharge, measured water level (stage), rating curves, hydrographs and daily average discharge data for each station. Relevant observations at each station are also provided for each location. Monitoring periods reported in this section may differ from station to station dependent on whether or not 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 2015. The only datalogger downloaded with a record extending beyond October 2015 is AC-8; any station with a flow record extending beyond this period (AC-6B, BL-5, CS-1 and TL-7) are synthesized from AC-8. Only stations where flow is known to occur year round (AC-6B, BL-5, CS-1 and TL-7) have had their records extended with the exception of AC-14 which is monitored upstream at AC-8.

4.1 AC-6A – VERNA LAKE TO ACE LAKE

A v-notch weir installed in 2011 is used to monitor discharge at AC-6A. The weir is mounted to an existing culvert through the road which follows the perimeter of Ace Lake. The station monitors discharge from Verna Lake to Ace Lake.

The station was predominantly dry through the course of 2015 until the middle of August. It is assumed that the flow observed in the station is primarily driven by rainfall events; however, construction activities upstream may have impacted flow of water into Verna Lake which would impact discharge through AC-6A.

Photo 1 and Photo 2 were taken during the spring and fall field programs, respectively. Fall flow measurements helped to improve the accuracy of the rating curve at this station (Table 2 and Figure 2). Figure 3 presents the 2015 hydrograph for AC-6A and Table 3 provides the discharge data numerically.

Photo 1: AC-6A No Flow – May 2, 2015

Photo 2: AC-6A Fall Flow Condition – October 2, 2015

Table 2: AC-6A Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured 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
Weir Invert	0.273	0.0000
2013-10-12 11:47	Dry	No Flow
2014-05-04 9:50	0.323	0.0015
2014-05-08 12:05	0.303	0.0004
2014-10-09 16:00	Dry	No Flow
2015-05-02 15:45	0.266	No Flow
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

Figure 2: AC-6A Rating Curve

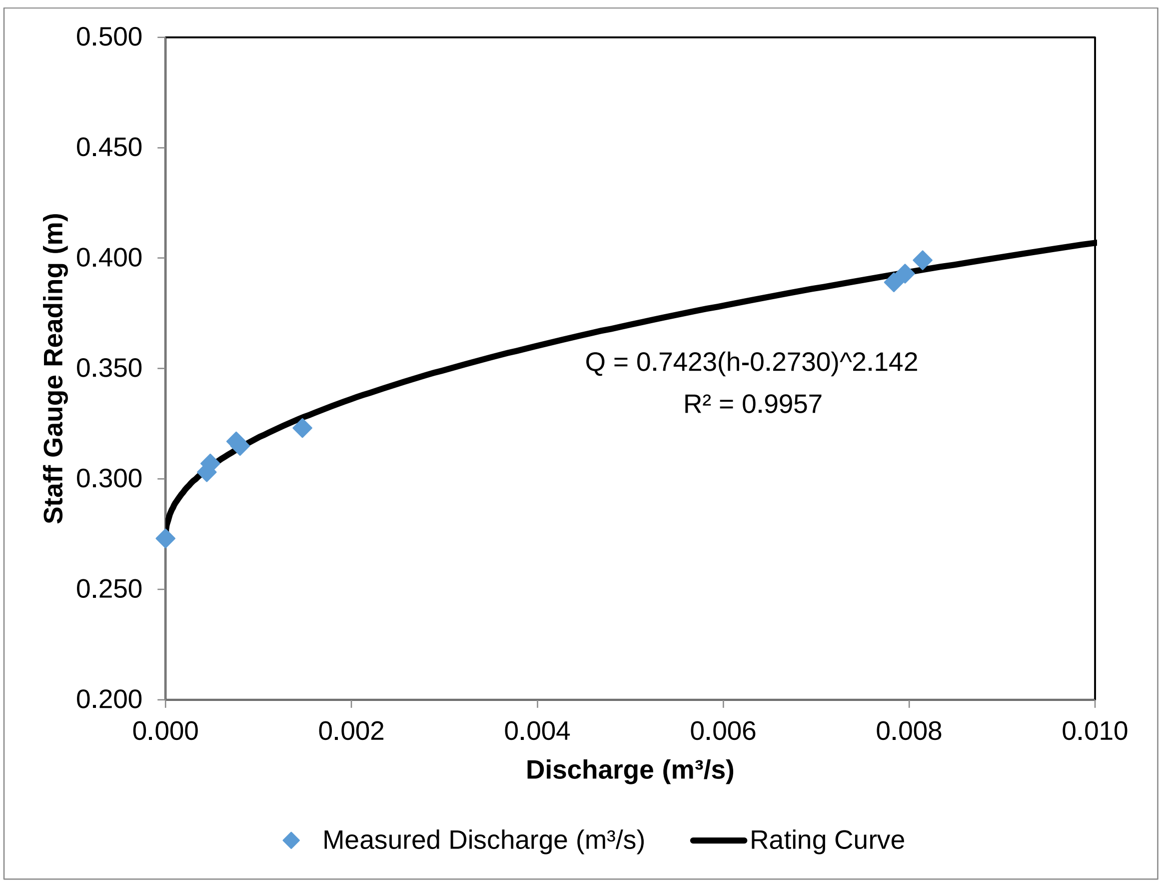


Figure 3: AC-6A 2015 Hydrograph

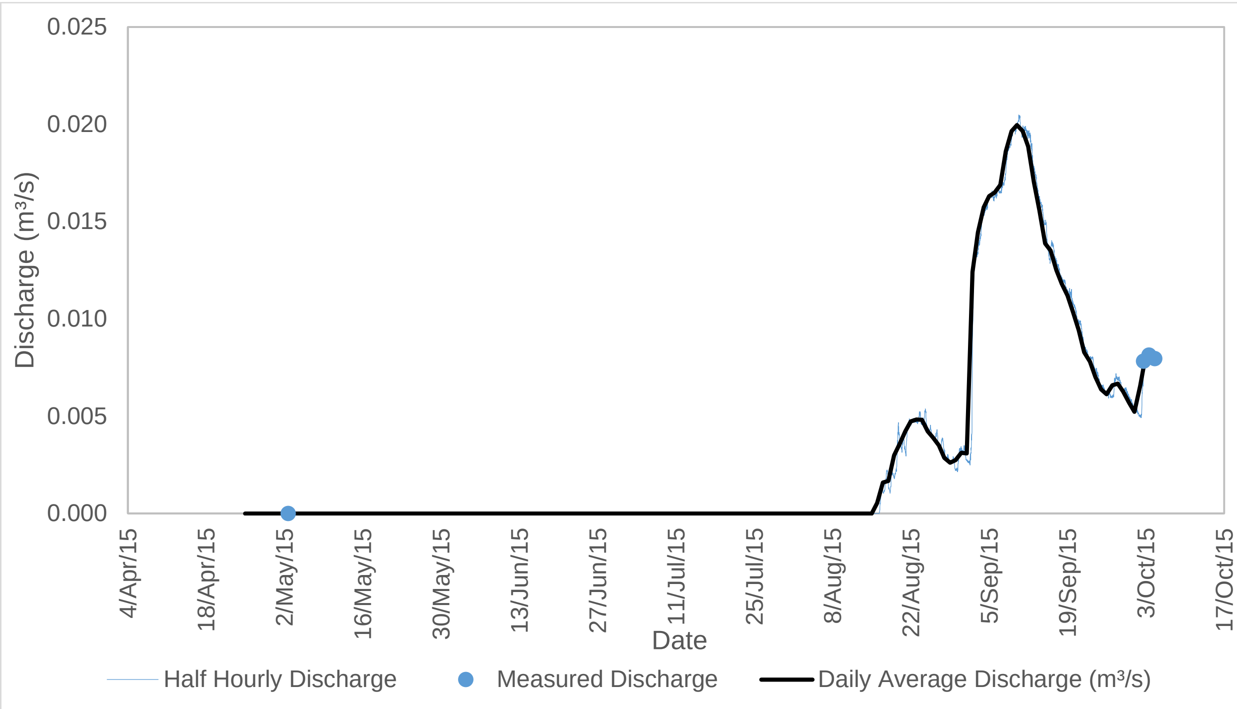


Table 3: AC-6A 2015 Daily Average Discharge (m³/s)

Day	Apr	May	Jun	Jul	Aug	Sep	Oct
1		0.000	0.000	0.000	0.000	0.003	0.005
2		0.000	0.000	0.000	0.000	0.012	0.007
3		0.000	0.000	0.000	0.000	0.014	0.008
4		0.000	0.000	0.000	0.000	0.016	
5		0.000	0.000	0.000	0.000	0.016	
6		0.000	0.000	0.000	0.000	0.016	
7		0.000	0.000	0.000	0.000	0.017	
8		0.000	0.000	0.000	0.000	0.019	
9		0.000	0.000	0.000	0.000	0.020	
10		0.000	0.000	0.000	0.000	0.020	
11		0.000	0.000	0.000	0.000	0.020	
12		0.000	0.000	0.000	0.000	0.019	
13		0.000	0.000	0.000	0.000	0.017	
14		0.000	0.000	0.000	0.000	0.016	
15		0.000	0.000	0.000	0.000	0.014	
16		0.000	0.000	0.000	0.001	0.014	
17		0.000	0.000	0.000	0.002	0.013	
18		0.000	0.000	0.000	0.002	0.012	
19		0.000	0.000	0.000	0.003	0.011	
20		0.000	0.000	0.000	0.004	0.010	
21		0.000	0.000	0.000	0.004	0.009	
22		0.000	0.000	0.000	0.005	0.008	
23		0.000	0.000	0.000	0.005	0.008	
24		0.000	0.000	0.000	0.005	0.007	
25	0.000	0.000	0.000	0.000	0.004	0.006	
26	0.000	0.000	0.000	0.000	0.004	0.006	
27	0.000	0.000	0.000	0.000	0.004	0.007	
28	0.000	0.000	0.000	0.000	0.003	0.007	
29	0.000	0.000	0.000	0.000	0.003	0.006	
30	0.000	0.000	0.000	0.000	0.003	0.006	
31		0.000		0.000	0.003		
Average	0.000	0.000	0.000	0.000	0.002	0.012	0.007

4.2 AC-6B – ACE CREEK TO ACE LAKE

The gauging station on Ace Creek upstream of Ace Lake is located immediately upstream of a bridge crossing. The station was visited in the spring (Photo 3) and fall (Photo 4) of 2015. Table 4 and Figure 4 present the measured flow data numerically and graphically (rating curve). The 2015 hydrograph is presented as Figure 5 and the daily average flow data are provided in Table 5.

Photo 3: AC-6B Spring Field Program – May 2, 2015

Photo 4: AC-6B Fall Field Program – October 3, 2015

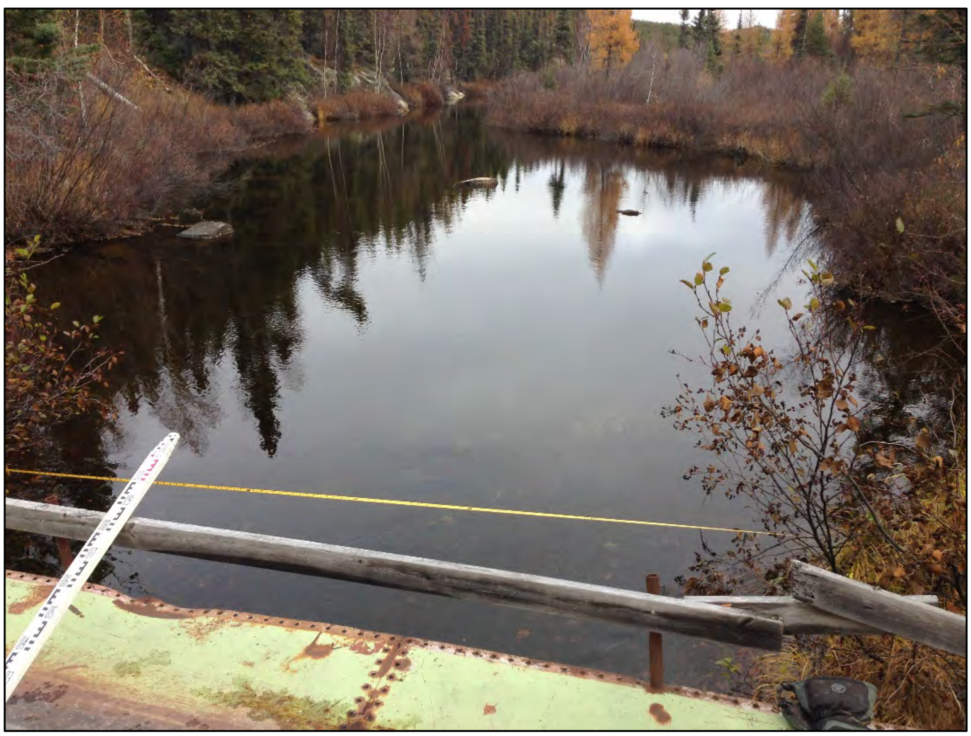


Table 4: AC-6B Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
27-Apr-10	98.907	0.7724
01-Jul-10	98.832	0.2823
17-Sep-10 15:25	98.793	0.1678
18-May-11 12:50	98.848	0.4747
28-Aug-11 09:14	98.824	0.2385
05-Oct-11	98.823	0.2759
07-May-12 18:00	99.208	3.4606
29-Sep-12 10:36	98.854	0.3937
15-May-13 13:40	99.185	3.5821
16-May-13 13:50	99.212	4.0941
12-Oct-13 10:20	98.785	0.2057
08-May-14 10:35	99.032	2.0231
10-Oct-14 09:20	98.690	0.1140
02-May-15 14:30	98.788	0.3213
03-Oct-15 12:10	98.868	0.6203

Figure 4: AC-6B Rating Curve

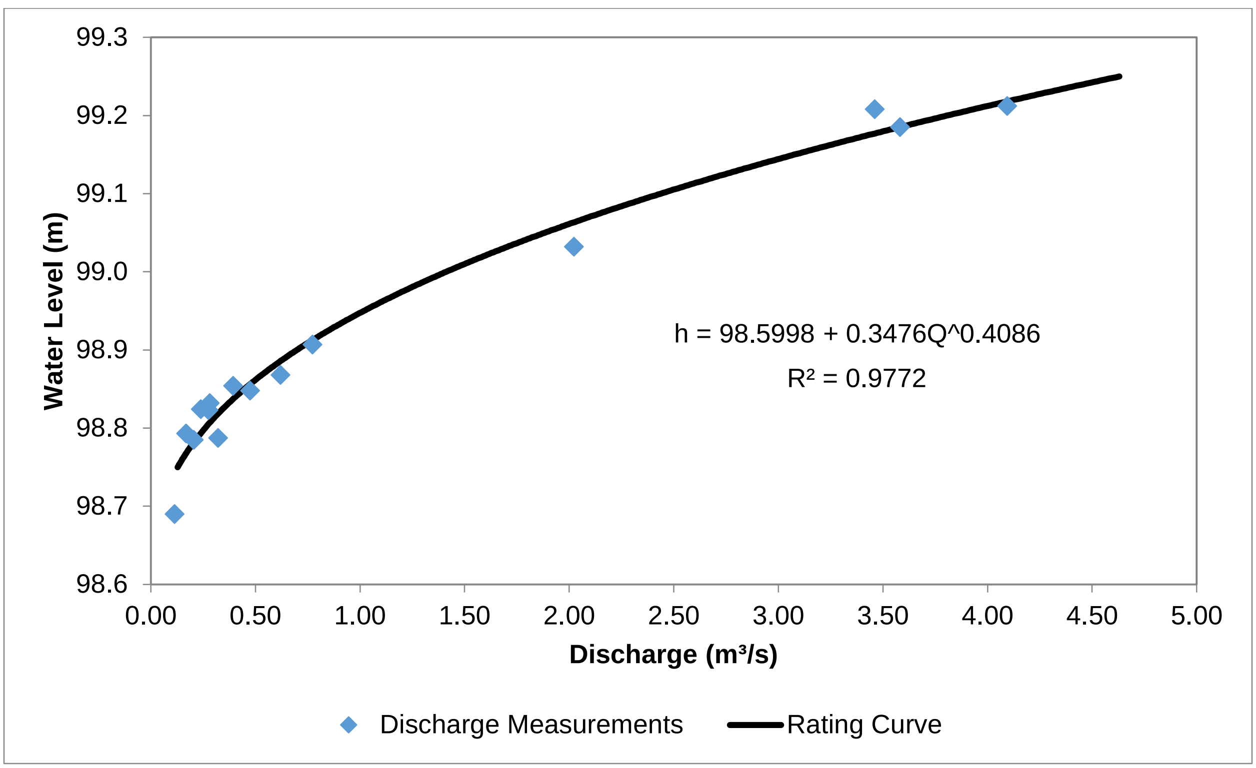


Figure 5: AC-6B 2015 Hydrograph

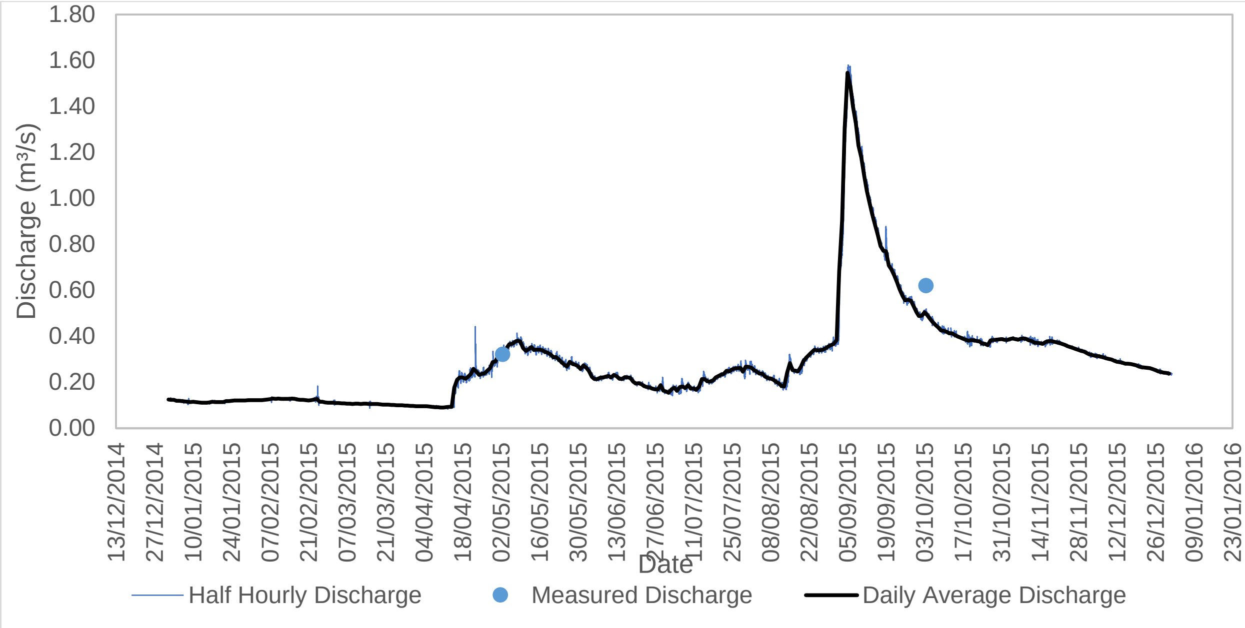


Table 5: AC-6B 2015 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.125	0.121	0.110	0.096	0.318	0.273	0.159	0.263	0.383	0.487	0.385	0.327
2	0.124	0.122	0.110	0.096	0.333	0.262	0.154	0.252	0.685	0.489	0.384	0.321
3	0.123	0.122	0.109	0.096	0.334	0.248	0.168	0.246	0.904	0.504	0.387	0.318
4	0.119	0.122	0.109	0.096	0.347	0.224	0.176	0.237	1.305	0.492	0.390	0.315
5	0.118	0.123	0.108	0.095	0.366	0.214	0.162	0.237	1.546	0.475	0.388	0.313
6	0.118	0.125	0.108	0.095	0.366	0.214	0.179	0.225	1.486	0.461	0.385	0.311
7	0.116	0.126	0.107	0.093	0.374	0.219	0.181	0.217	1.398	0.449	0.389	0.308
8	0.115	0.129	0.106	0.092	0.380	0.221	0.174	0.217	1.327	0.438	0.390	0.304
9	0.114	0.128	0.105	0.091	0.377	0.223	0.187	0.211	1.230	0.425	0.388	0.301
10	0.114	0.128	0.107	0.090	0.349	0.228	0.172	0.201	1.178	0.424	0.382	0.298
11	0.113	0.127	0.106	0.090	0.336	0.220	0.173	0.196	1.098	0.419	0.379	0.293
12	0.112	0.127	0.105	0.091	0.343	0.232	0.167	0.184	1.034	0.413	0.373	0.289
13	0.111	0.127	0.107	0.092	0.352	0.226	0.180	0.181	0.978	0.412	0.371	0.287
14	0.111	0.127	0.106	0.093	0.341	0.216	0.213	0.239	0.932	0.405	0.370	0.284
15	0.110	0.129	0.105	0.175	0.342	0.213	0.214	0.283	0.884	0.399	0.366	0.280
16	0.112	0.127	0.106	0.210	0.341	0.222	0.204	0.252	0.838	0.395	0.374	0.281
17	0.114	0.125	0.105	0.220	0.338	0.220	0.203	0.249	0.792	0.389	0.378	0.279
18	0.113	0.124	0.104	0.220	0.331	0.219	0.206	0.246	0.771	0.385	0.379	0.276
19	0.113	0.123	0.103	0.214	0.327	0.202	0.220	0.267	0.770	0.380	0.376	0.273
20	0.113	0.121	0.103	0.223	0.321	0.193	0.226	0.292	0.707	0.383	0.374	0.268
21	0.114	0.120	0.102	0.236	0.308	0.196	0.233	0.307	0.691	0.381	0.371	0.265
22	0.118	0.122	0.102	0.258	0.310	0.191	0.235	0.320	0.664	0.379	0.367	0.264
23	0.118	0.124	0.101	0.246	0.298	0.182	0.249	0.330	0.633	0.378	0.362	0.263
24	0.119	0.128	0.101	0.232	0.287	0.179	0.247	0.342	0.604	0.369	0.357	0.260
25	0.120	0.114	0.100	0.236	0.277	0.178	0.256	0.339	0.575	0.366	0.353	0.257
26	0.121	0.114	0.099	0.239	0.268	0.172	0.259	0.339	0.555	0.361	0.349	0.253
27	0.120	0.112	0.099	0.250	0.289	0.169	0.261	0.341	0.559	0.382	0.344	0.247
28	0.120	0.111	0.099	0.260	0.280	0.168	0.262	0.347	0.555	0.383	0.341	0.244
29	0.121		0.098	0.287	0.277	0.187	0.245	0.355	0.532	0.384	0.336	0.242
30	0.121		0.097	0.291	0.269	0.164	0.267	0.362	0.505	0.386	0.333	0.240
31	0.122		0.096		0.257		0.267	0.366		0.388		0.237
Average	0.117	0.123	0.104	0.170	0.324	0.209	0.210	0.272	0.871	0.412	0.371	0.281

4.3 MICKEY LAKE OUTFLOW

The outflow from Mickey Lake represents the watershed in which the former Hab Mine is located. The discharge measurement location has been used since 2010 but concerns over the reliability of this location have been raised in the past few years due to the presence of a beaver dam upstream of the station. Reconnaissance of other portions of the watershed have not identified a better location so the measurements remain at the present location. Photo 5 was taken during the fall field program. Table 6 presents the field measurement data and the rating curve is shown in Figure 6. Figure 7 shows the 2015 hydrograph while daily average discharge data are provided in Table 7.

Photo 5: Mickey Lake Outflow – October 3, 2015

Table 6: Mickey Lake Outflow Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m³/s)
27-Apr-10	99.528	0.0597
1-Jul-10	99.458	0.0110
17-Sep-10 14:20	99.367	0.0003
18-May-11 11:35	99.523	0.0703
5-Oct-11	99.465	0.0234
09-May-12 17:30	99.662	0.5295
29-Sep-12 08:25	99.514	0.0705
15-May-13 12:10	99.700	0.5655
12-Oct-13 09:30	99.419	0.0049
08-May-14 09:10	99.652	0.2603
10-Oct-14 13:05	99.397	0.0007
03-May-15 15:30	99.522	0.0778
02-Oct-15 11:10	99.560	0.1040

Figure 6: Mickey Lake Outflow Rating Curve

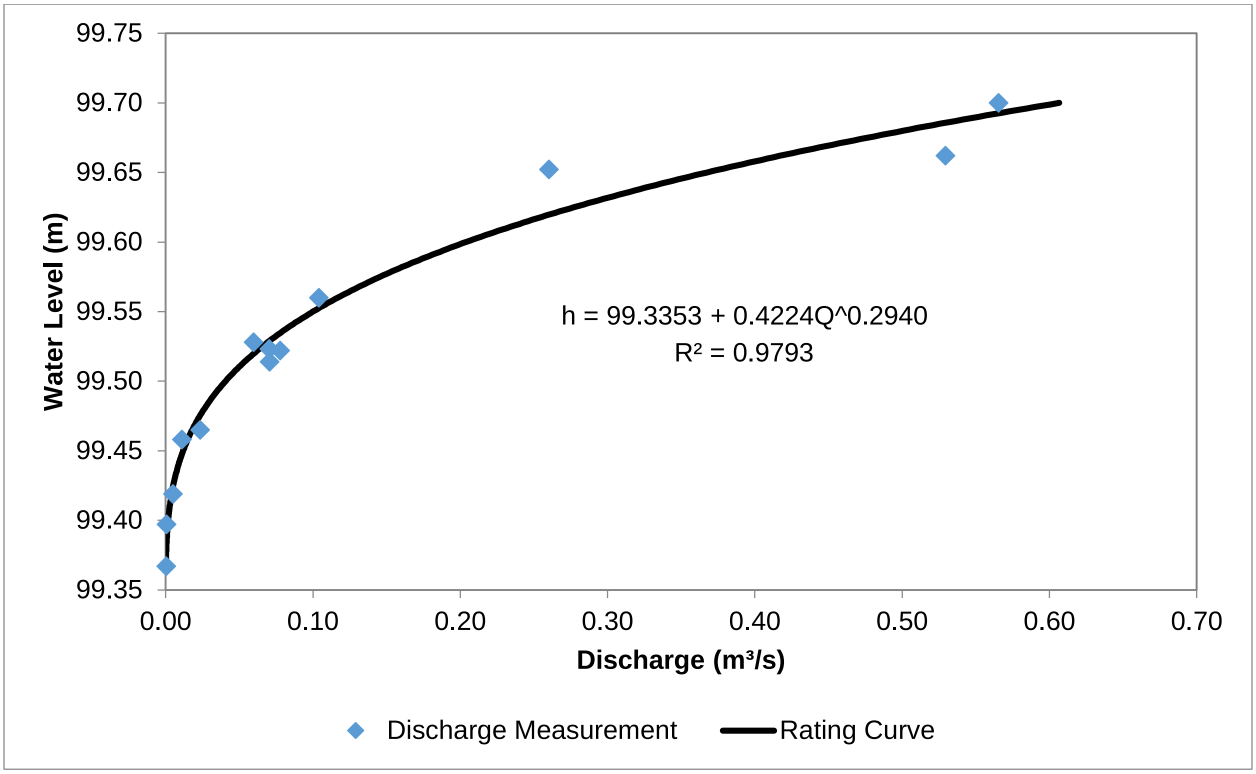


Figure 7: Mickey Lake Outflow 2015 Hydrograph

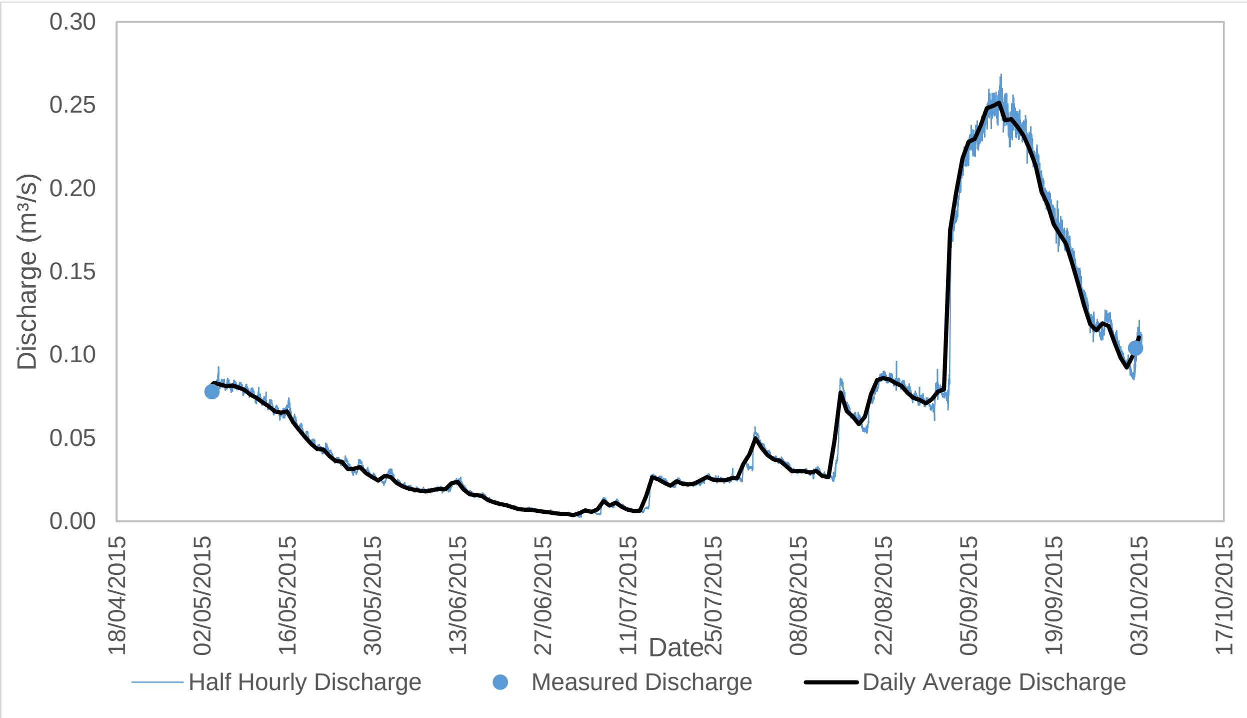


Table 7: Mickey Lake Outflow 2015 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.027	0.004	0.050	0.079	0.092
2		0.027	0.004	0.044	0.175	0.099
3	0.079	0.023	0.005	0.040	0.198	0.110
4	0.083	0.021	0.007	0.037	0.218	
5	0.082	0.020	0.006	0.036	0.228	
6	0.081	0.019	0.007	0.033	0.230	
7	0.082	0.018	0.012	0.030	0.238	
8	0.080	0.018	0.009	0.030	0.248	
9	0.079	0.019	0.011	0.030	0.249	
10	0.076	0.019	0.009	0.029	0.251	
11	0.074	0.019	0.007	0.030	0.241	
12	0.071	0.023	0.006	0.027	0.242	
13	0.069	0.024	0.006	0.027	0.237	
14	0.066	0.019	0.015	0.049	0.232	
15	0.065	0.016	0.026	0.077	0.224	
16	0.066	0.016	0.025	0.066	0.214	
17	0.059	0.015	0.023	0.063	0.198	
18	0.055	0.013	0.021	0.058	0.190	
19	0.050	0.011	0.024	0.063	0.178	
20	0.046	0.010	0.023	0.076	0.172	
21	0.043	0.010	0.022	0.085	0.167	
22	0.043	0.009	0.023	0.086	0.155	
23	0.039	0.007	0.025	0.085	0.143	
24	0.036	0.007	0.027	0.083	0.129	
25	0.036	0.007	0.025	0.081	0.118	
26	0.031	0.006	0.025	0.077	0.115	
27	0.032	0.006	0.025	0.074	0.119	
28	0.033	0.005	0.026	0.073	0.117	
29	0.029	0.005	0.026	0.071	0.107	
30	0.026	0.004	0.035	0.073	0.098	
31	0.024		0.040	0.078		
Average	0.057	0.015	0.018	0.057	0.184	0.101

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 in the spring (Photo 6) and fall (Photo 7) of 2015. The field monitoring data are provided in Table 8 and the rating curve is presented in Figure 8. The hydrograph for

2015 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 6: AC-8 Spring Field Program – April 25, 2015

Photo 7: AC-8 Fall Field Program – October 3, 2015

Table 8: AC-8 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
Weir Invert	99.179	0.0000
2005-08-16 0:00	99.451	0.4151
2006-01-24 15:00	99.446	0.4044
2006-05-24 0:00	99.848	1.6914
2010-04-30 0:00	99.593	0.7530
2010-07-01 0:00	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 0:00	99.407	0.2611
2011-10-03 0:00	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

Figure 8: AC-8 Rating Curve

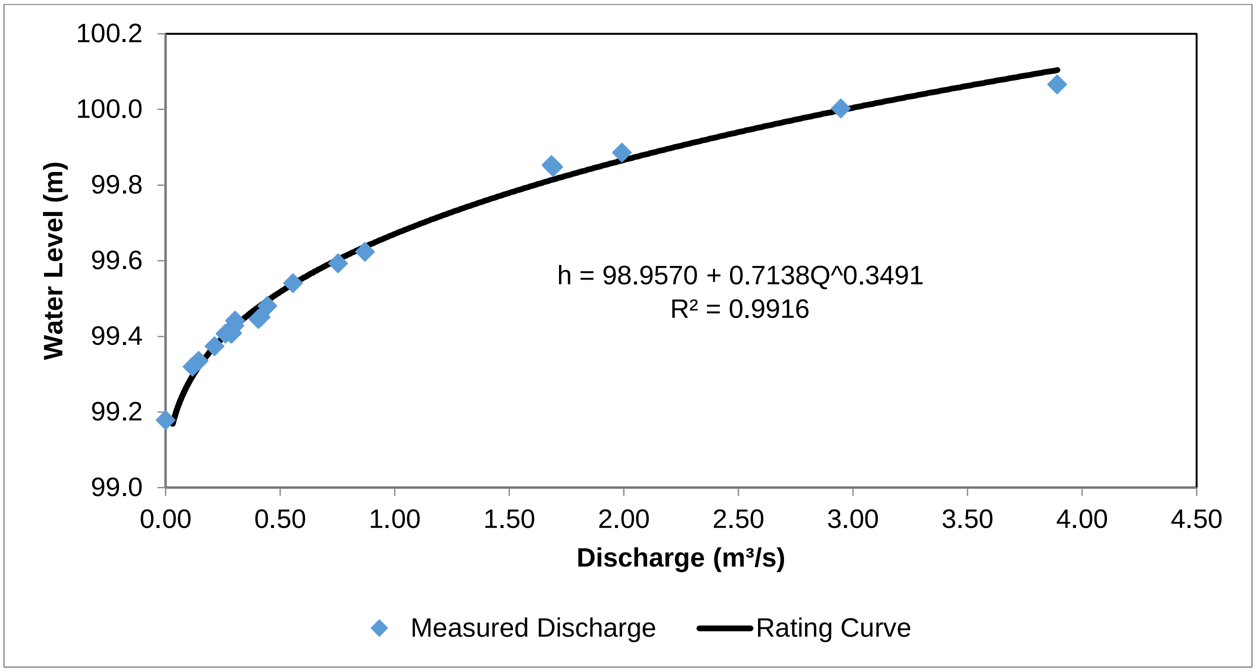


Figure 9: AC-8 2015 Hydrograph

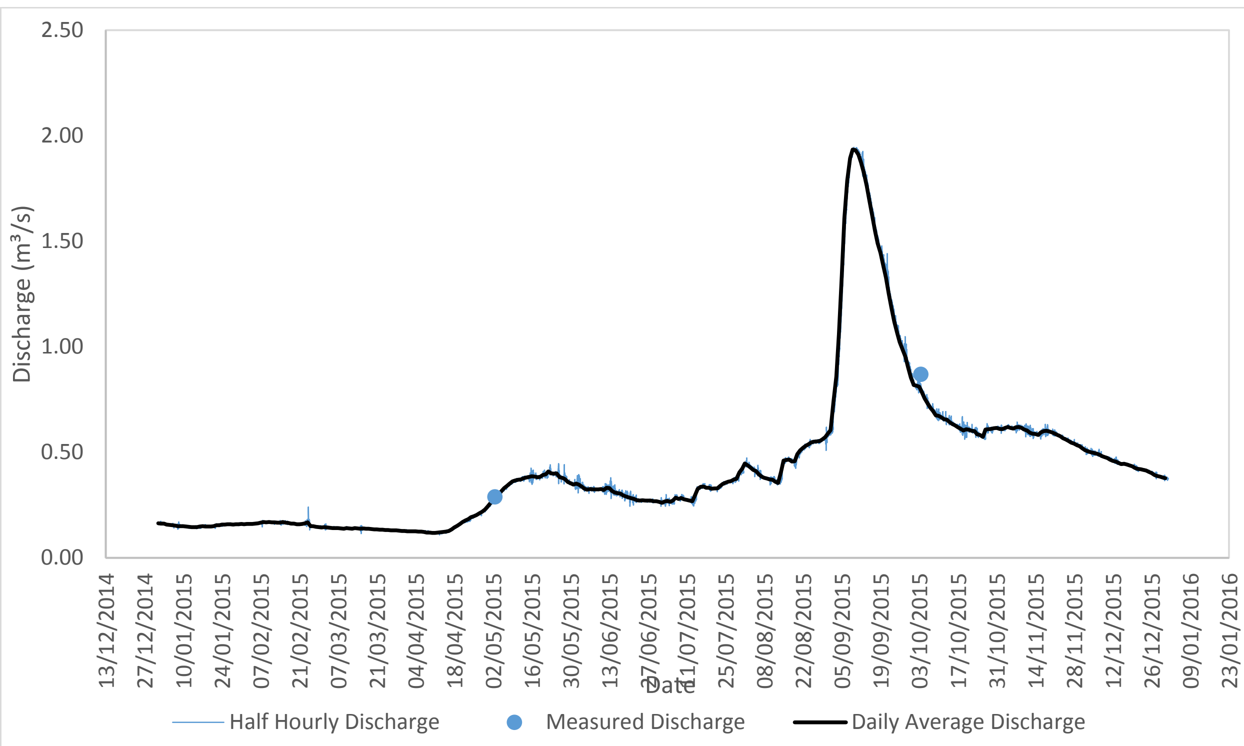


Table 9: AC-8 2015 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.164	0.160	0.145	0.126	0.260	0.352	0.266	0.447	0.605	0.820	0.612	0.519
2	0.163	0.161	0.146	0.126	0.277	0.348	0.261	0.439	0.740	0.816	0.610	0.510
3	0.162	0.161	0.144	0.126	0.286	0.338	0.267	0.428	0.860	0.812	0.616	0.505
4	0.158	0.161	0.143	0.126	0.301	0.327	0.270	0.417	1.060	0.782	0.620	0.500
5	0.156	0.163	0.142	0.125	0.316	0.324	0.266	0.411	1.338	0.755	0.617	0.498
6	0.155	0.164	0.142	0.125	0.330	0.326	0.272	0.397	1.607	0.733	0.612	0.494
7	0.153	0.167	0.141	0.123	0.342	0.325	0.285	0.385	1.787	0.713	0.619	0.490
8	0.151	0.170	0.140	0.121	0.352	0.324	0.279	0.379	1.894	0.696	0.620	0.483
9	0.150	0.169	0.139	0.120	0.363	0.325	0.284	0.376	1.935	0.675	0.616	0.478
10	0.151	0.169	0.141	0.119	0.368	0.327	0.278	0.371	1.932	0.674	0.608	0.474
11	0.150	0.168	0.140	0.119	0.370	0.322	0.274	0.371	1.911	0.666	0.603	0.466
12	0.148	0.168	0.139	0.120	0.372	0.333	0.271	0.362	1.875	0.656	0.593	0.460
13	0.147	0.167	0.141	0.122	0.377	0.331	0.269	0.356	1.825	0.655	0.589	0.457
14	0.146	0.167	0.140	0.122	0.381	0.318	0.299	0.406	1.762	0.644	0.588	0.451
15	0.145	0.170	0.139	0.124	0.384	0.309	0.328	0.461	1.695	0.635	0.582	0.445
16	0.148	0.168	0.139	0.128	0.387	0.307	0.337	0.464	1.622	0.627	0.595	0.446
17	0.151	0.165	0.139	0.136	0.385	0.305	0.339	0.466	1.549	0.619	0.600	0.444
18	0.149	0.163	0.138	0.144	0.382	0.296	0.333	0.456	1.490	0.612	0.602	0.438
19	0.149	0.162	0.136	0.152	0.384	0.292	0.333	0.458	1.445	0.604	0.599	0.434
20	0.149	0.160	0.136	0.161	0.394	0.287	0.329	0.491	1.390	0.609	0.594	0.427
21	0.150	0.159	0.135	0.170	0.396	0.282	0.330	0.509	1.328	0.607	0.589	0.422
22	0.155	0.161	0.134	0.177	0.409	0.279	0.329	0.521	1.250	0.603	0.583	0.420
23	0.156	0.164	0.134	0.184	0.400	0.274	0.339	0.530	1.186	0.600	0.576	0.418
24	0.158	0.169	0.133	0.193	0.398	0.272	0.351	0.538	1.119	0.586	0.568	0.414
25	0.159	0.151	0.132	0.198	0.400	0.273	0.356	0.547	1.066	0.582	0.561	0.409
26	0.160	0.151	0.131	0.204	0.383	0.272	0.361	0.550	1.022	0.573	0.554	0.402
27	0.159	0.148	0.130	0.211	0.380	0.272	0.364	0.552	0.987	0.608	0.547	0.392
28	0.159	0.146	0.130	0.219	0.373	0.272	0.372	0.554	0.952	0.610	0.542	0.388
29	0.159		0.129	0.230	0.359	0.269	0.375	0.562	0.904	0.611	0.534	0.385
30	0.160		0.128	0.243	0.353	0.268	0.405	0.572	0.854	0.614	0.529	0.381
31	0.161		0.127		0.348		0.423	0.589		0.617		0.377
Average	0.154	0.163	0.137	0.153	0.362	0.305	0.318	0.464	1.366	0.659	0.589	0.446

Table 10: AC-8 Monthly Average Discharge (m^3/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
Mean	0.248	0.210	0.188	0.213	1.190	0.981	0.569	0.468	0.482	0.439	0.418	0.328	0.478

4.5 AC-14 – ACE CREEK UPSTREAM OF BEAVERLODGE LAKE

Ace Creek is monitored approximately 250 m upstream of Beaverlodge Lake at the station known as AC-14. The site was visited three times in 2015 with two measurements during high flows in the fall (Photo 8). Field measurement data are summarized in Table 11 and the rating curve is presented as Figure 10. The 2015 hydrograph is shown in Figure 11 with daily average discharge data presented in Table 12.

Photo 8: AC-14 Fall Field Program – October 1, 2015

Table 11: AC-14 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
16-Aug-05		0.3561
24-Jan-06		0.5261
25-May-06		1.4651
22-May-09		1.4820
27-Sep-09 11:00		0.4276
27-Sep-09 11:30		0.4644
30-Apr-10		0.7067
1-Jul-10		0.2985
13-Sep-10 16:05		0.1596
18-May-11 09:05	98.291	0.3680
18-May-11 10:00	98.300	0.4034
28-Aug-11	98.276	0.2498
5-Oct-11	98.288	0.3034
08-May-12 11:39	98.480	3.0369
29-Sep-12 15:30	98.328	0.5166
15-May-13 16:55	98.429	2.0341
16-May-13 13:04	98.503	3.0361
12-Oct-13 14:28	98.255	0.1819
08-May-14 14:41	98.418	1.8495
10-Oct-14 14:57	98.225	0.1632
03-May-15 09:30	98.252	0.2976
01-Oct-15 10:50	98.395	0.9294
03-Oct-15 16:30	98.324	0.8194

Figure 10: AC-14 Rating Curve

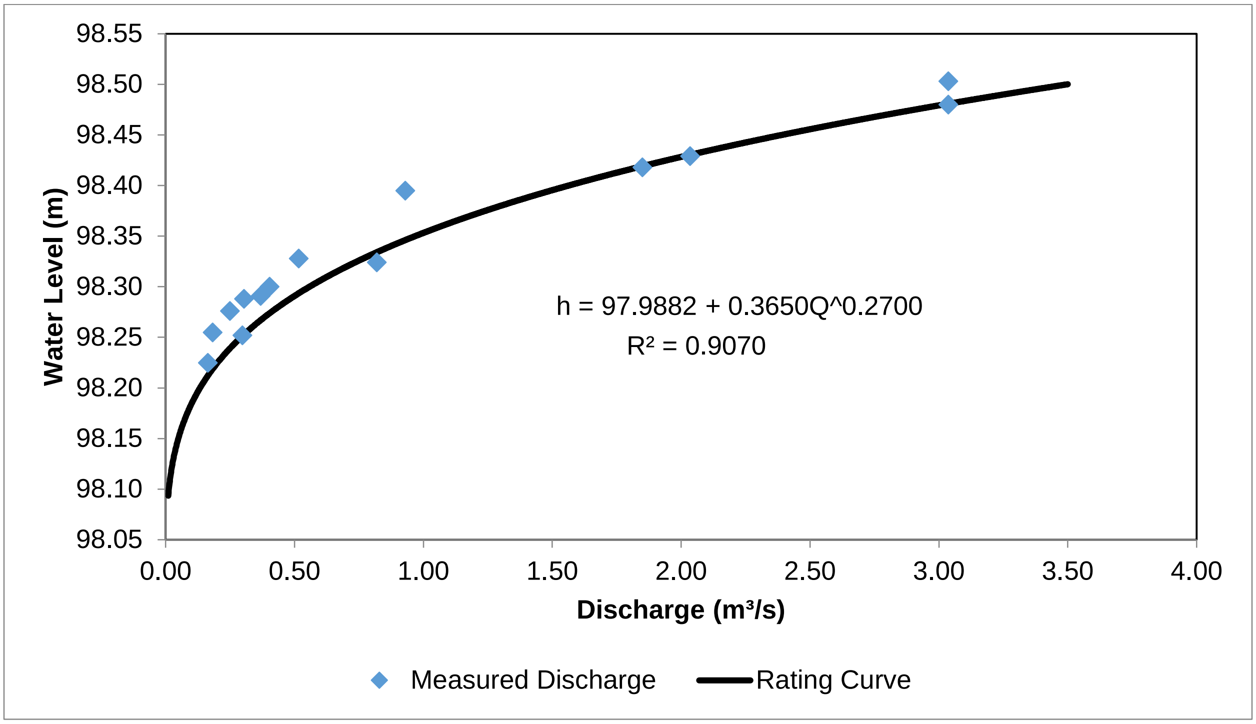


Figure 11: AC-14 2015 Hydrograph

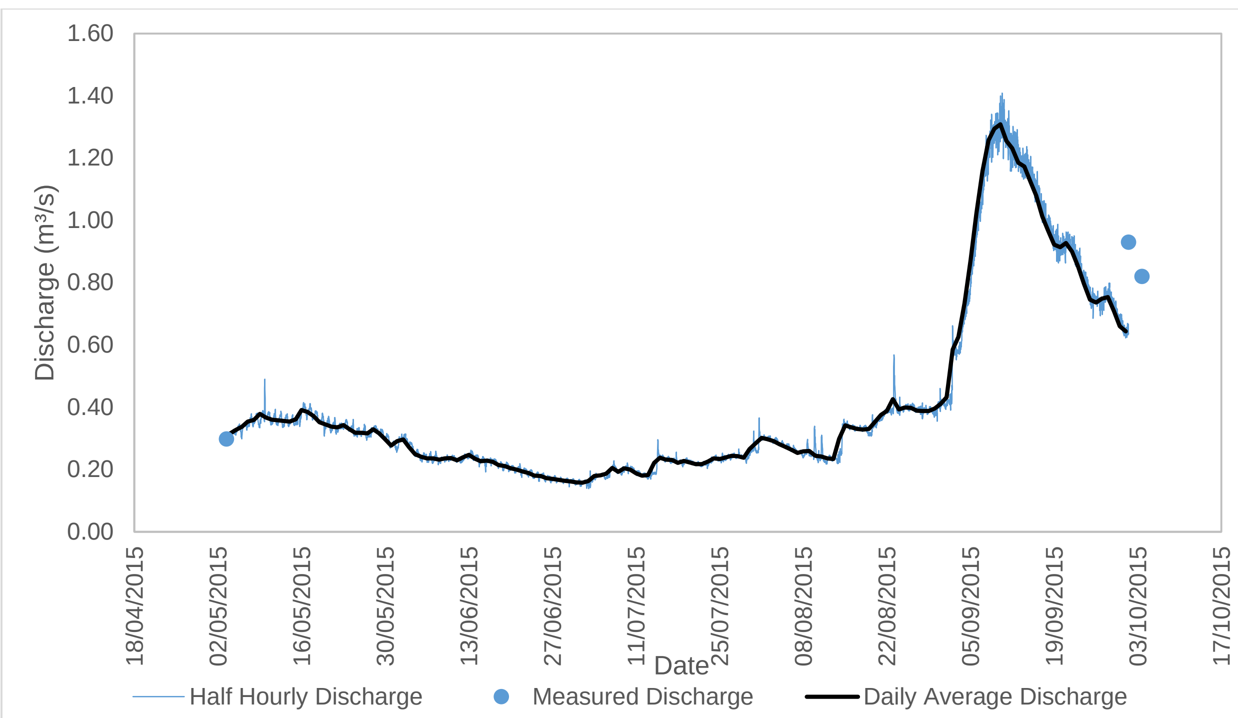


Table 12: AC-14 2015 Daily Average Discharge (m^3/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.291	0.159	0.301	0.432	0.644
2		0.296	0.158	0.297	0.585	
3	0.300	0.272	0.162	0.291	0.626	
4	0.315	0.249	0.179	0.281	0.734	
5	0.327	0.240	0.181	0.273	0.873	
6	0.337	0.236	0.186	0.263	1.022	
7	0.354	0.235	0.205	0.253	1.157	
8	0.359	0.232	0.192	0.258	1.257	
9	0.378	0.235	0.204	0.259	1.294	
10	0.367	0.236	0.200	0.244	1.308	
11	0.360	0.229	0.187	0.242	1.255	
12	0.357	0.239	0.180	0.235	1.231	
13	0.356	0.247	0.182	0.233	1.185	
14	0.354	0.235	0.221	0.298	1.172	
15	0.361	0.226	0.237	0.341	1.127	
16	0.391	0.229	0.232	0.335	1.079	
17	0.385	0.224	0.230	0.331	1.013	
18	0.371	0.214	0.221	0.328	0.967	
19	0.351	0.211	0.228	0.330	0.922	
20	0.345	0.204	0.222	0.353	0.914	
21	0.337	0.200	0.217	0.375	0.927	
22	0.335	0.194	0.217	0.387	0.900	
23	0.342	0.188	0.225	0.426	0.851	
24	0.329	0.180	0.236	0.393	0.796	
25	0.318	0.179	0.233	0.399	0.745	
26	0.318	0.172	0.238	0.398	0.736	
27	0.316	0.169	0.243	0.389	0.749	
28	0.329	0.166	0.243	0.387	0.754	
29	0.315	0.164	0.238	0.387	0.708	
30	0.296	0.161	0.265	0.396	0.660	
31	0.276		0.284	0.410		
Average	0.341	0.218	0.213	0.326	0.933	0.644

4.6 TL-6 – MINEWATER RESERVOIR OUTFLOW

The area known as Minewater Reservoir directs runoff towards the Fulton Drainage via a channel blasted through bedrock. A v-notch weir installed in 2011 is the monitoring station identified as TL-6. Photo 9 is from the spring field program of 2015 while Photo 10 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 2015 hydrograph is provided in Figure 13 with the daily average discharge data presented in Table 14.

Photo 9: TL-6 Spring Field Program – May 2, 2015

Photo 10: TL-6 Fall Field Program – October 2, 2015

Table 13: TL-6 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
07-May-12 15:30	0.363	0.00230
09-May-12 19:08	0.358	0.00190
27-Sep-12 18:00	0.299	0.00020
Notch Invert	0.260	0.00000
12-May-13 18:00	0.420	0.00780
16-May-13 08:50	0.260	0.00000
16-May-13 10:30	0.410	0.00720
12-Oct-13 17:03	0.281	0.00005
04-May-14 10:16	0.384	0.00459
07-May-14 16:30	0.340	0.00159
09-Oct-14 14:00	0.276	0.00003
02-May-15 17:11	0.282	0.00006
01-Oct-15 15:30	0.327	0.00079
02-Oct-15 13:25	0.337	0.00120
04-Oct-15 18:20	0.337	0.00106

Figure 12: TL-6 Rating Curve

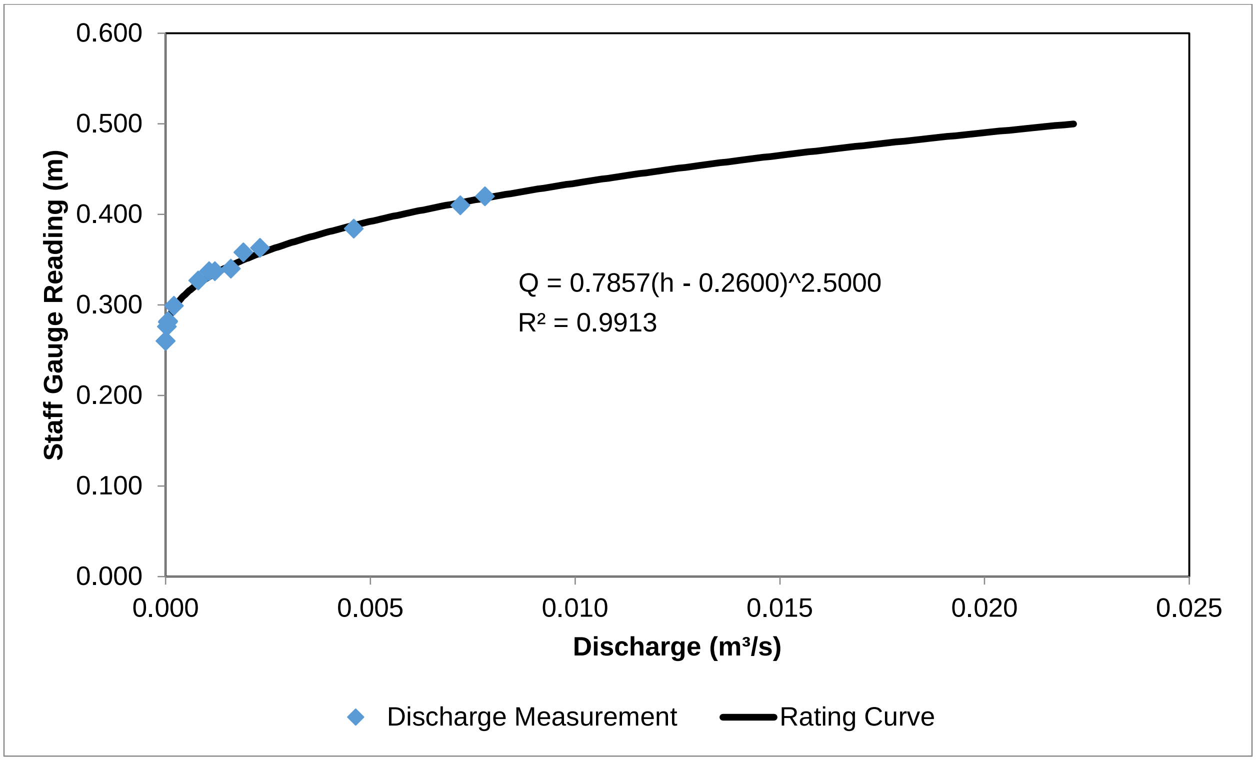


Figure 13: TL-6 2015 Hydrograph

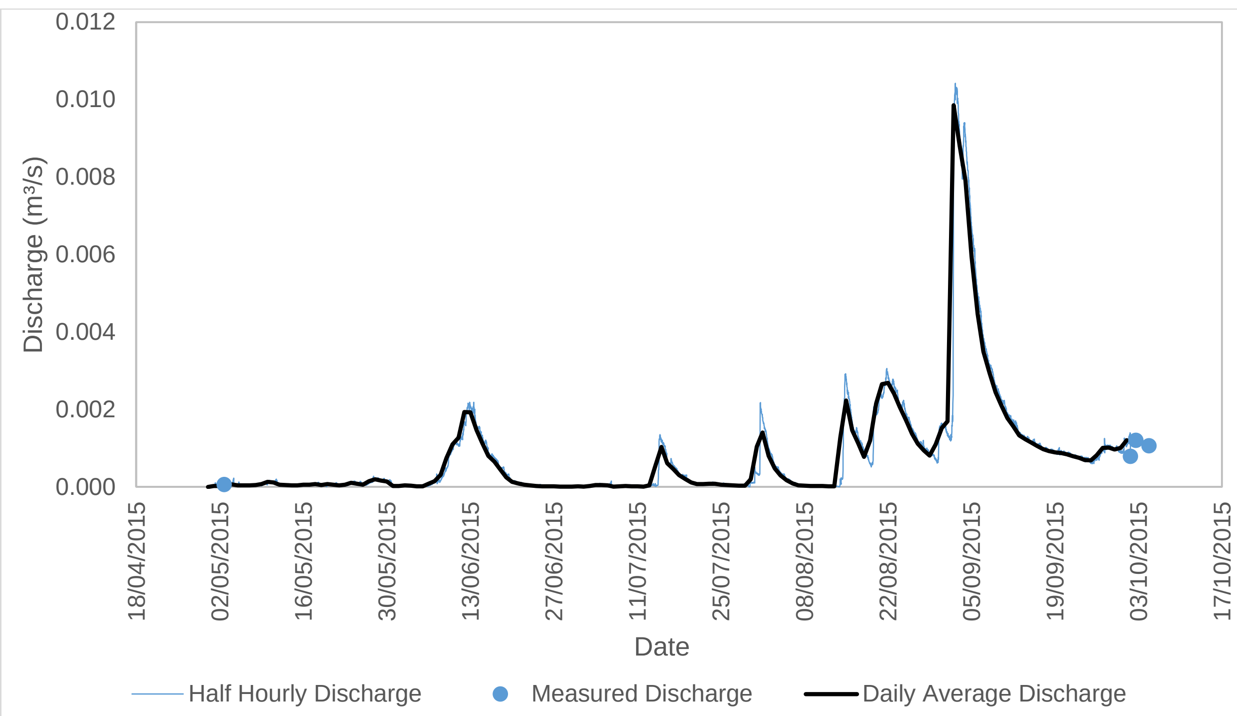


Table 14: TL-6 2015 Daily Average Discharge (m³/s)

Day	Apr	May	Jun	Jul	Aug	Sep	Oct
1		0.0000	0.0000	0.0000	0.0014	0.0017	0.0012
2		0.0000	0.0000	0.0000	0.0008	0.0099	
3		0.0000	0.0000	0.0000	0.0005	0.0088	
4		0.0001	0.0000	0.0001	0.0003	0.0079	
5		0.0000	0.0000	0.0000	0.0002	0.0059	
6		0.0000	0.0001	0.0000	0.0001	0.0045	
7		0.0000	0.0001	0.0000	0.0000	0.0035	
8		0.0000	0.0003	0.0000	0.0000	0.0029	
9		0.0001	0.0007	0.0000	0.0000	0.0024	
10		0.0001	0.0011	0.0000	0.0000	0.0021	
11		0.0001	0.0013	0.0000	0.0000	0.0018	
12		0.0001	0.0019	0.0000	0.0000	0.0016	
13		0.0001	0.0019	0.0000	0.0000	0.0013	
14		0.0000	0.0015	0.0005	0.0013	0.0012	
15		0.0000	0.0011	0.0010	0.0022	0.0011	
16		0.0001	0.0008	0.0006	0.0015	0.0011	
17		0.0001	0.0007	0.0005	0.0011	0.0010	
18		0.0001	0.0005	0.0003	0.0008	0.0009	
19		0.0000	0.0003	0.0002	0.0012	0.0009	
20		0.0001	0.0001	0.0001	0.0022	0.0009	
21		0.0001	0.0001	0.0001	0.0026	0.0008	
22		0.0000	0.0001	0.0001	0.0027	0.0008	
23		0.0001	0.0000	0.0001	0.0024	0.0008	
24		0.0001	0.0000	0.0001	0.0021	0.0007	
25		0.0001	0.0000	0.0001	0.0017	0.0007	
26		0.0001	0.0000	0.0000	0.0014	0.0008	
27		0.0002	0.0000	0.0000	0.0011	0.0010	
28		0.0002	0.0000	0.0000	0.0009	0.0010	
29		0.0002	0.0000	0.0000	0.0008	0.0010	
30	0.0000	0.0001	0.0000	0.0002	0.0011	0.0010	
31		0.0000		0.0010	0.0015		
Average	0.0000	0.0001	0.0004	0.0002	0.0010	0.0023	0.0012

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 standing 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); however, in 2015, an opening was accessible through the ice to install the datalogger (Photo 11) prior to the area being completely ice free. The fall field program successfully measured some of the highest flow rates observed during an open water condition (Photo 12) and assisted greatly in developing the rating curve (Table 15 and Figure 14).

Flow data for TL-7 are required by Cameco for the entire year of record. Estimates of the flow rate at TL-7 are calculated for the winter months from flow rates at AC-8 using the following relationship established by McElhanney (2014):

$$Q_{TL-7} = 0.053 * Q_{AC-8}$$

The above equation is used when measured data at TL-7 are not available. Figure 15 presents the 2015 hydrograph for TL-7 while Table 16 and Table 17 present the 2015 daily average discharge data and the long term monthly average discharge data, respectively. The half hourly data presented in Figure 15 indicate strong variations in discharge through the early portion of the hydrograph; it is believed this variation is due to the presence of ice above and upstream of the weir as well as potential influence from freeze-thaw processes. It is possible that the data are falsely influenced by the presence of the ice though water depths over the weir measured during the spring and fall correlate with the flow recorded stage data. A time lapse camera was installed in the spring to visually record flow over the notch but was knocked out of place shortly after installation and was not usable for flow observations.

Photo 11: TL-7 Spring Field Program – May 2, 2015

Photo 12: TL-7 Fall Field Program – October 2, 2015

Table 15: TL-7 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
21-May-11	0.005	0.0012
03-Oct-11	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	0.000	0.0815
2013-05-16 11:50	0.000	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

Figure 14: TL-7 Rating Curve

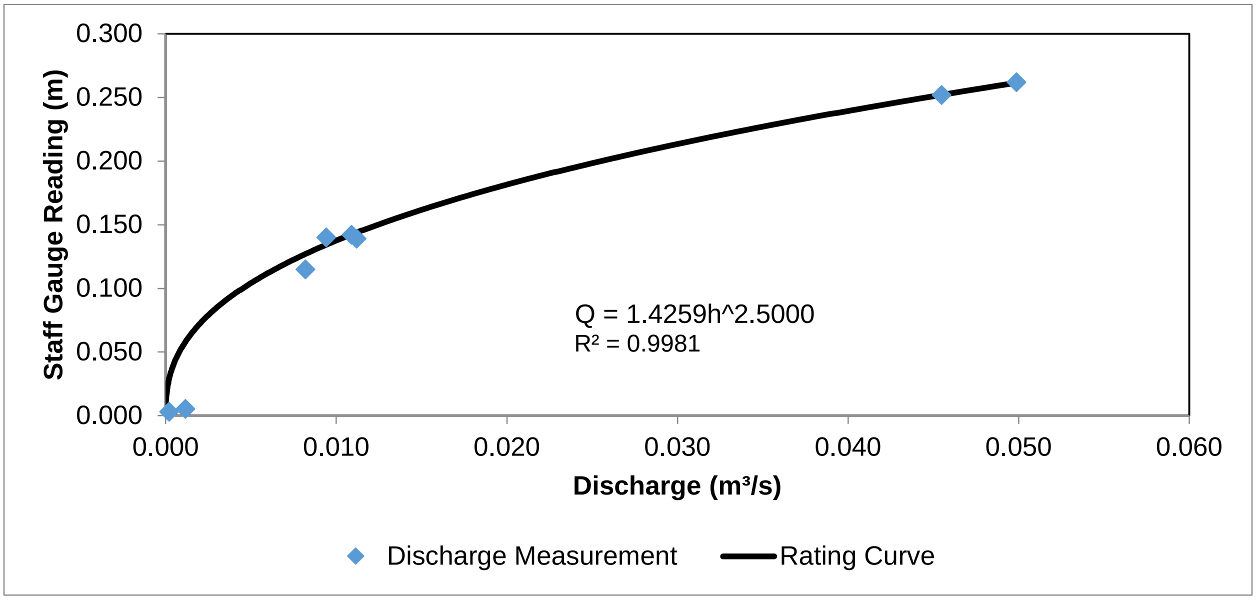


Figure 15: TL-7 2015 Hydrograph

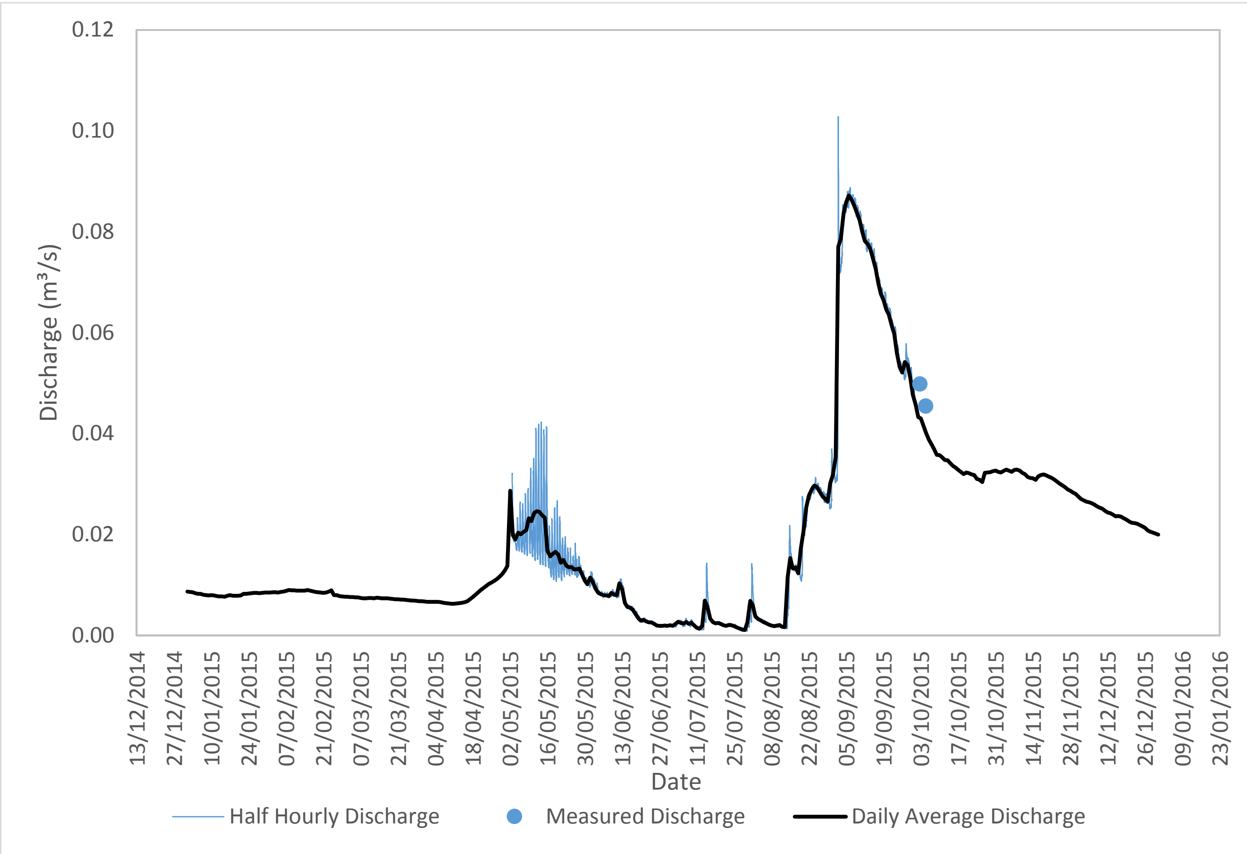


Table 16: TL-7 2015 Daily Average Discharge (m^3/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0087	0.0085	0.0077	0.0067	0.0138	0.0115	0.0020	0.0060	0.0354	0.0457	0.0324	0.0275
2	0.0087	0.0085	0.0077	0.0067	0.0287	0.0106	0.0019	0.0037	0.0770	0.0433	0.0323	0.0270
3	0.0086	0.0086	0.0076	0.0067	0.0198	0.0093	0.0023	0.0032	0.0786	0.0430	0.0326	0.0268
4	0.0084	0.0085	0.0076	0.0067	0.0190	0.0085	0.0027	0.0030	0.0838	0.0415	0.0329	0.0265
5	0.0083	0.0086	0.0075	0.0066	0.0204	0.0082	0.0025	0.0027	0.0859	0.0400	0.0327	0.0264
6	0.0082	0.0087	0.0075	0.0066	0.0201	0.0080	0.0024	0.0024	0.0872	0.0388	0.0325	0.0262
7	0.0081	0.0088	0.0075	0.0065	0.0205	0.0080	0.0027	0.0021	0.0863	0.0378	0.0328	0.0259
8	0.0080	0.0090	0.0074	0.0064	0.0209	0.0078	0.0023	0.0020	0.0851	0.0369	0.0329	0.0256
9	0.0080	0.0089	0.0073	0.0063	0.0232	0.0084	0.0025	0.0019	0.0838	0.0358	0.0327	0.0253
10	0.0080	0.0090	0.0075	0.0063	0.0226	0.0081	0.0019	0.0020	0.0822	0.0357	0.0322	0.0251
11	0.0079	0.0089	0.0074	0.0063	0.0243	0.0080	0.0015	0.0020	0.0800	0.0353	0.0320	0.0247
12	0.0078	0.0089	0.0074	0.0063	0.0246	0.0103	0.0013	0.0017	0.0782	0.0348	0.0314	0.0244
13	0.0078	0.0089	0.0075	0.0064	0.0245	0.0091	0.0019	0.0017	0.0775	0.0347	0.0312	0.0242
14	0.0077	0.0089	0.0074	0.0065	0.0238	0.0065	0.0069	0.0116	0.0767	0.0341	0.0312	0.0239
15	0.0077	0.0090	0.0074	0.0066	0.0234	0.0057	0.0057	0.0154	0.0748	0.0336	0.0308	0.0236
16	0.0079	0.0089	0.0074	0.0068	0.0169	0.0056	0.0033	0.0133	0.0727	0.0333	0.0316	0.0237
17	0.0080	0.0088	0.0074	0.0072	0.0156	0.0051	0.0027	0.0135	0.0698	0.0328	0.0318	0.0235
18	0.0079	0.0086	0.0073	0.0076	0.0162	0.0043	0.0024	0.0123	0.0677	0.0324	0.0319	0.0232
19	0.0079	0.0086	0.0072	0.0081	0.0166	0.0034	0.0025	0.0172	0.0664	0.0320	0.0317	0.0230
20	0.0079	0.0085	0.0072	0.0085	0.0160	0.0029	0.0023	0.0209	0.0646	0.0323	0.0315	0.0226
21	0.0080	0.0084	0.0072	0.0090	0.0144	0.0031	0.0020	0.0254	0.0636	0.0321	0.0312	0.0224
22	0.0082	0.0085	0.0071	0.0094	0.0150	0.0028	0.0019	0.0277	0.0614	0.0319	0.0309	0.0223
23	0.0082	0.0087	0.0071	0.0098	0.0138	0.0026	0.0021	0.0290	0.0597	0.0318	0.0305	0.0222
24	0.0083	0.0089	0.0070	0.0102	0.0135	0.0026	0.0020	0.0297	0.0560	0.0311	0.0301	0.0219
25	0.0084	0.0080	0.0070	0.0105	0.0136	0.0023	0.0018	0.0294	0.0532	0.0308	0.0297	0.0217
26	0.0085	0.0080	0.0069	0.0108	0.0131	0.0020	0.0016	0.0285	0.0521	0.0304	0.0294	0.0213
27	0.0084	0.0078	0.0069	0.0112	0.0131	0.0019	0.0014	0.0276	0.0542	0.0322	0.0290	0.0208
28	0.0084	0.0078	0.0069	0.0116	0.0132	0.0019	0.0011	0.0271	0.0536	0.0323	0.0287	0.0206
29	0.0084		0.0068	0.0122	0.0120	0.0020	0.0011	0.0265	0.0511	0.0324	0.0283	0.0204
30	0.0085		0.0068	0.0129	0.0109	0.0019	0.0026	0.0302	0.0477	0.0326	0.0281	0.0202
31	0.0085		0.0067		0.0102		0.0068	0.0317		0.0327		0.0200
Average	0.0082	0.0086	0.0073	0.0081	0.0179	0.0057	0.0025	0.0146	0.0689	0.0350	0.0312	0.0236

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
Mean	0.0064	0.0052	0.0046	0.0056	0.0522	0.0376	0.0212	0.0171	0.0181	0.0164	0.0164	0.0094	0.0175

4.8 BL-5 – BEAVERLODGE LAKE OUTFLOW

The station BL-5 monitors discharge at the outlet of Beaverlodge Lake. Spring and fall field program photos are shown as Photo 13 and Photo 14, respectively. This location has been known to be impacted by either beaver activity or debris jam or the sudden release of debris jam; any such change to the geometry of the channel impacts the reliability of the rating curve. The summary data are presented in Table 18 and the rating curve presented in Figure 16 is based only on the 2015 measurement points and a single high flow measurement from 2013 as it is believed that the channel changed again this year. The 2015 hydrograph is shown in Figure 17 and the daily average discharge data are provided in Table 19.

Photo 13: BL-5 Spring Field Program – May 2, 2015

Photo 14: BL-5 Fall Field Program – October 1, 2015

Table 18: BL-5 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m³/s)
15-Sep-10 16:40	99.589	0.7815
18-May-11 09:00	99.507	0.3176
04-Oct-11 12:51	99.448	0.0958
04-Jun-12 18:45	99.640	0.7122
28-Sep-12 12:25	99.540	0.9270
21-Jul-13	99.586	1.5600
13-Oct-13 12:00	99.401	0.2946
04-May-14 15:00	99.416	0.5072
10-Oct-14 17:00	99.379	0.3790
02-May-15 09:00	99.282	0.3079
01-Oct-15 12:40	99.405	0.5962

Figure 16: BL-5 Rating Curve

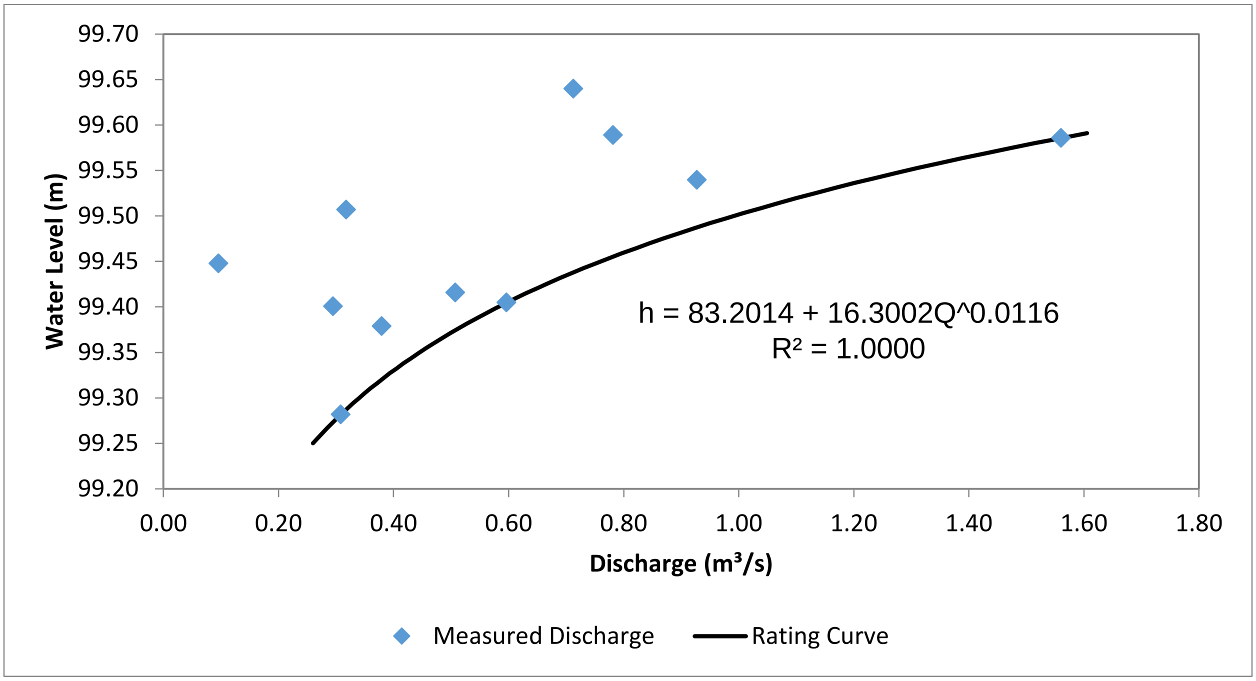


Figure 17: BL-5 2015 Hydrograph

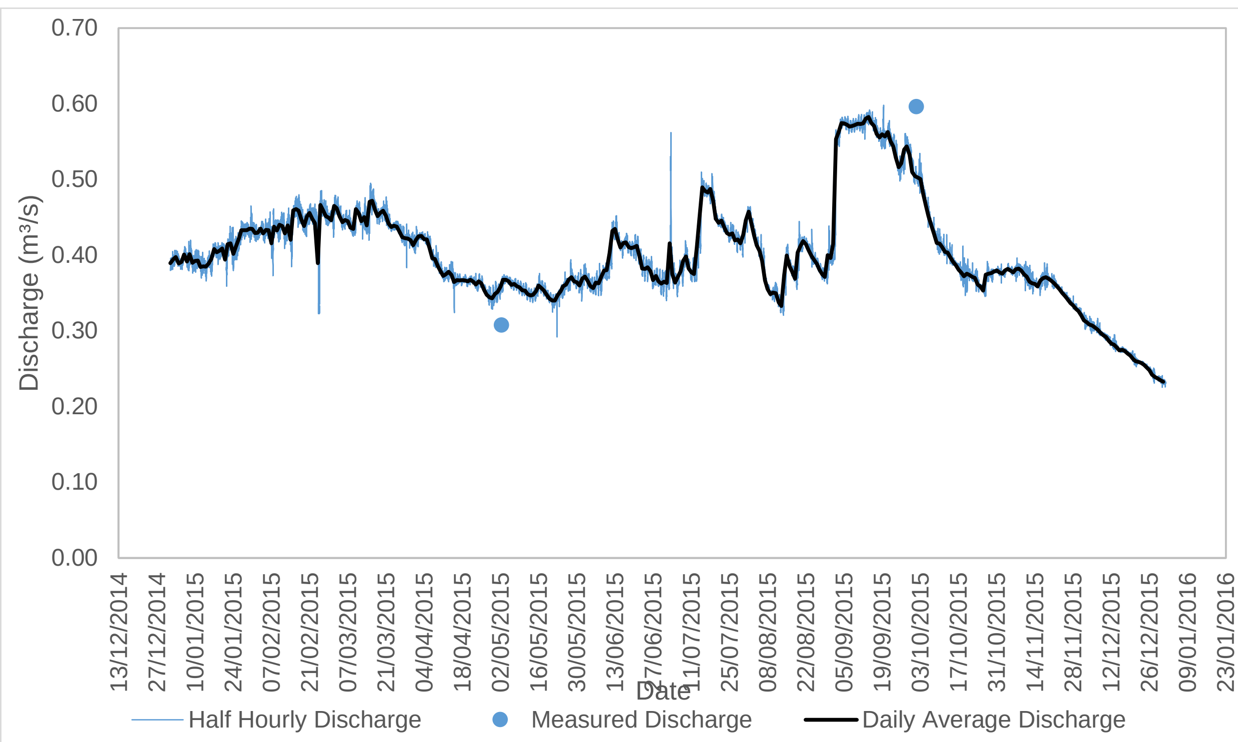


Table 19: BL-5 2015 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.389	0.429	0.446	0.420	0.351	0.369	0.365	0.457	0.415	0.504	0.377	0.320
2	0.394	0.429	0.465	0.425	0.358	0.372	0.363	0.443	0.553	0.503	0.376	0.314
3	0.397	0.435	0.462	0.425	0.367	0.366	0.416	0.425	0.562	0.500	0.379	0.311
4	0.389	0.429	0.451	0.421	0.367	0.359	0.375	0.413	0.574	0.482	0.382	0.308
5	0.391	0.433	0.444	0.421	0.365	0.356	0.364	0.405	0.574	0.465	0.380	0.307
6	0.401	0.433	0.446	0.410	0.361	0.364	0.371	0.392	0.572	0.451	0.377	0.304
7	0.391	0.415	0.445	0.396	0.362	0.363	0.378	0.366	0.570	0.439	0.381	0.302
8	0.401	0.437	0.436	0.395	0.359	0.371	0.392	0.355	0.571	0.429	0.382	0.297
9	0.390	0.432	0.434	0.386	0.357	0.380	0.398	0.348	0.572	0.416	0.379	0.294
10	0.392	0.440	0.461	0.379	0.353	0.380	0.382	0.351	0.574	0.415	0.374	0.292
11	0.393	0.438	0.455	0.372	0.353	0.403	0.377	0.350	0.573	0.410	0.371	0.287
12	0.384	0.428	0.445	0.374	0.348	0.432	0.375	0.337	0.574	0.404	0.365	0.283
13	0.385	0.439	0.450	0.378	0.347	0.435	0.411	0.333	0.580	0.403	0.363	0.281
14	0.385	0.420	0.439	0.374	0.347	0.420	0.448	0.374	0.582	0.396	0.362	0.278
15	0.389	0.459	0.471	0.364	0.352	0.410	0.490	0.400	0.575	0.391	0.358	0.274
16	0.395	0.461	0.472	0.367	0.360	0.416	0.485	0.385	0.571	0.386	0.367	0.275
17	0.408	0.458	0.459	0.366	0.356	0.417	0.483	0.378	0.560	0.381	0.370	0.273
18	0.404	0.446	0.452	0.367	0.353	0.410	0.487	0.369	0.555	0.377	0.371	0.270
19	0.406	0.438	0.456	0.367	0.347	0.409	0.472	0.403	0.560	0.372	0.369	0.267
20	0.409	0.451	0.459	0.365	0.342	0.410	0.448	0.412	0.557	0.375	0.366	0.263
21	0.394	0.456	0.452	0.367	0.340	0.412	0.442	0.418	0.562	0.374	0.363	0.260
22	0.414	0.448	0.442	0.365	0.340	0.398	0.445	0.414	0.551	0.371	0.359	0.259
23	0.415	0.442	0.437	0.361	0.347	0.382	0.437	0.407	0.543	0.370	0.355	0.257
24	0.402	0.389	0.439	0.365	0.352	0.382	0.429	0.399	0.529	0.361	0.350	0.255
25	0.411	0.466	0.437	0.363	0.359	0.384	0.427	0.394	0.516	0.358	0.346	0.252
26	0.422	0.459	0.430	0.354	0.361	0.379	0.429	0.388	0.521	0.353	0.341	0.248
27	0.433	0.451	0.423	0.347	0.367	0.367	0.419	0.381	0.539	0.374	0.337	0.242
28	0.433	0.449	0.422	0.344	0.371	0.372	0.421	0.375	0.544	0.375	0.334	0.239
29	0.433		0.422	0.343	0.365	0.365	0.415	0.371	0.532	0.376	0.329	0.237
30	0.435		0.420	0.349	0.364	0.362	0.427	0.400	0.510	0.378	0.326	0.235
31	0.435		0.413		0.360		0.446	0.396		0.380		0.232
Average	0.404	0.440	0.445	0.378	0.356	0.388	0.420	0.388	0.552	0.406	0.363	0.275

4.9 CS-1 CRACKINGSTONE RIVER

The Crackingstone River is located downstream of Cinch Lake which receives discharge from Beaverlodge Lake. The Crackingstone River ultimately discharges to Bushell Bay of Lake Athabasca and flow monitoring occurs at a bridge crossing. Field monitoring occurred in the spring (Photo 15) and fall (Photo 16) of 2015. The measurement data for CS-1 are presented in Table 20 and the rating curve is shown in Figure 18. Discussion with local contractors indicated that a beaver dam being constructed immediately upstream of the bridge was breached on several occasions during 2015. At least one of the dam breaches are evident in the hydrograph (Figure 19) occurring on July 23. The daily average discharge data are presented in Table 21. The hydrograph and daily average discharge data indicate that periods in August had very low flow and possibly no flow at all; there are insufficient low flow measurements to suggest that this was not the case during 2015 and likely a reflection of storage upstream influenced by beaver activity. The lowest discharge measurement on record was approximately 20 L/s with a staff gauge reading 6.5 cm below the bottom of the record. The stage data record indicate that the water level was approximately 15 cm below the bottom of the staff gauge in the lowest open water flow condition.

Photo 15: CS-1 Spring Field Program – May 2, 2015

Photo 16: CS-1 Fall Field Program – October 4, 2015

Table 20: CS-1 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/s)
19-Sep-10 17:00	0.248	1.1410
17-May-11 14:20	0.121	0.5550
29-Aug-11	-0.065	0.0200
3-Oct-11	-0.040	0.0340
08-May-12 17:31	0.340	1.7901
27-Sep-12 14:53	0.418	2.3729
16-May-13 09:00	0.550	3.9647
16-May-13 16:50	0.560	0.0000
12-Oct-13 18:00	0.150	0.7082
07-May-14 10:30	0.380	1.9275
10-Oct-14 18:45	0.160	0.7403
02-May-15 13:00	0.178	0.6533
04-Oct-15 09:30	0.358	1.8307

Figure 18: CS-1 Rating Curve

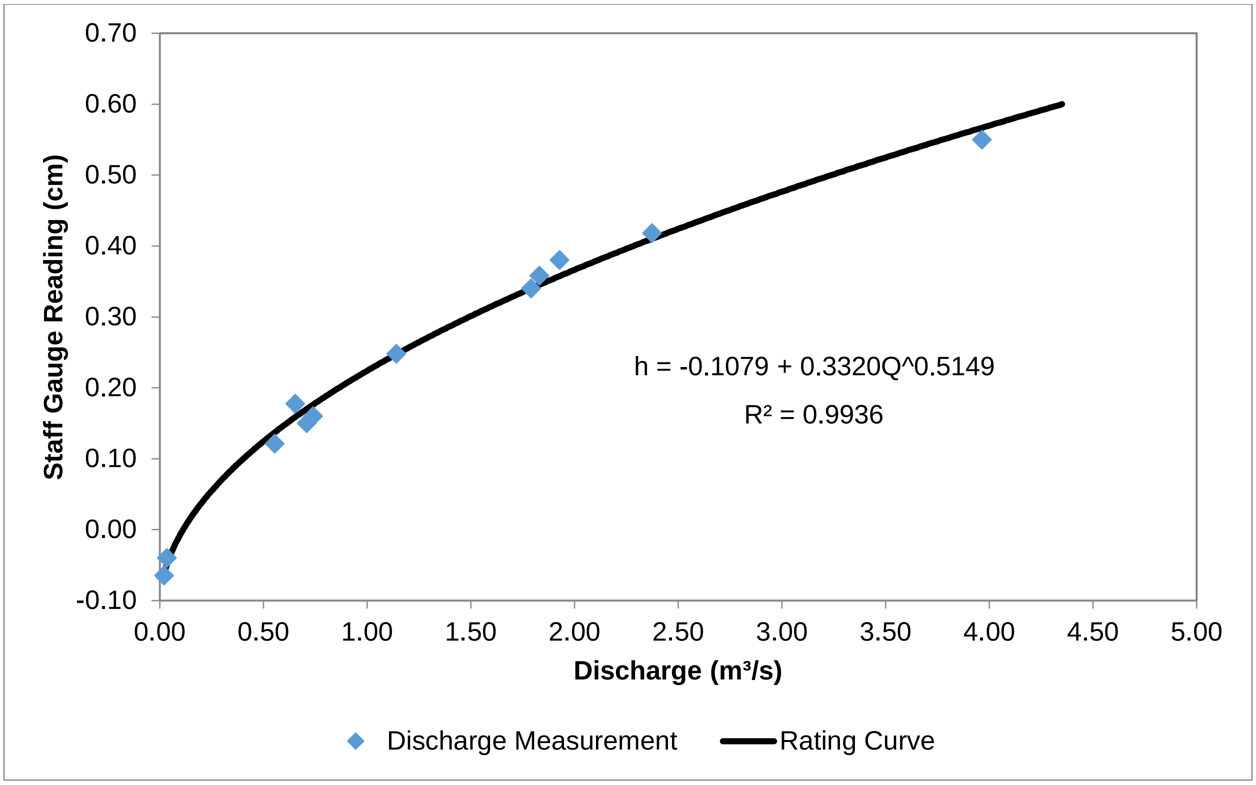


Figure 19: CS-1 2015 Hydrograph

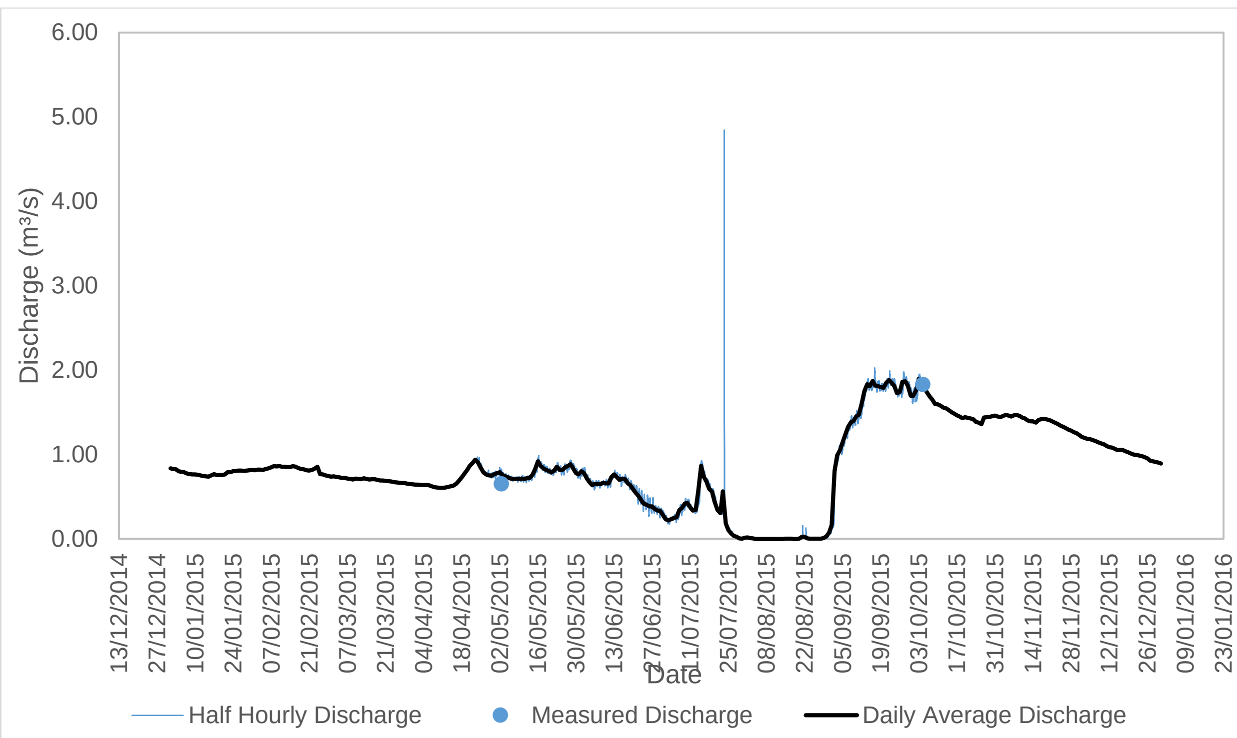


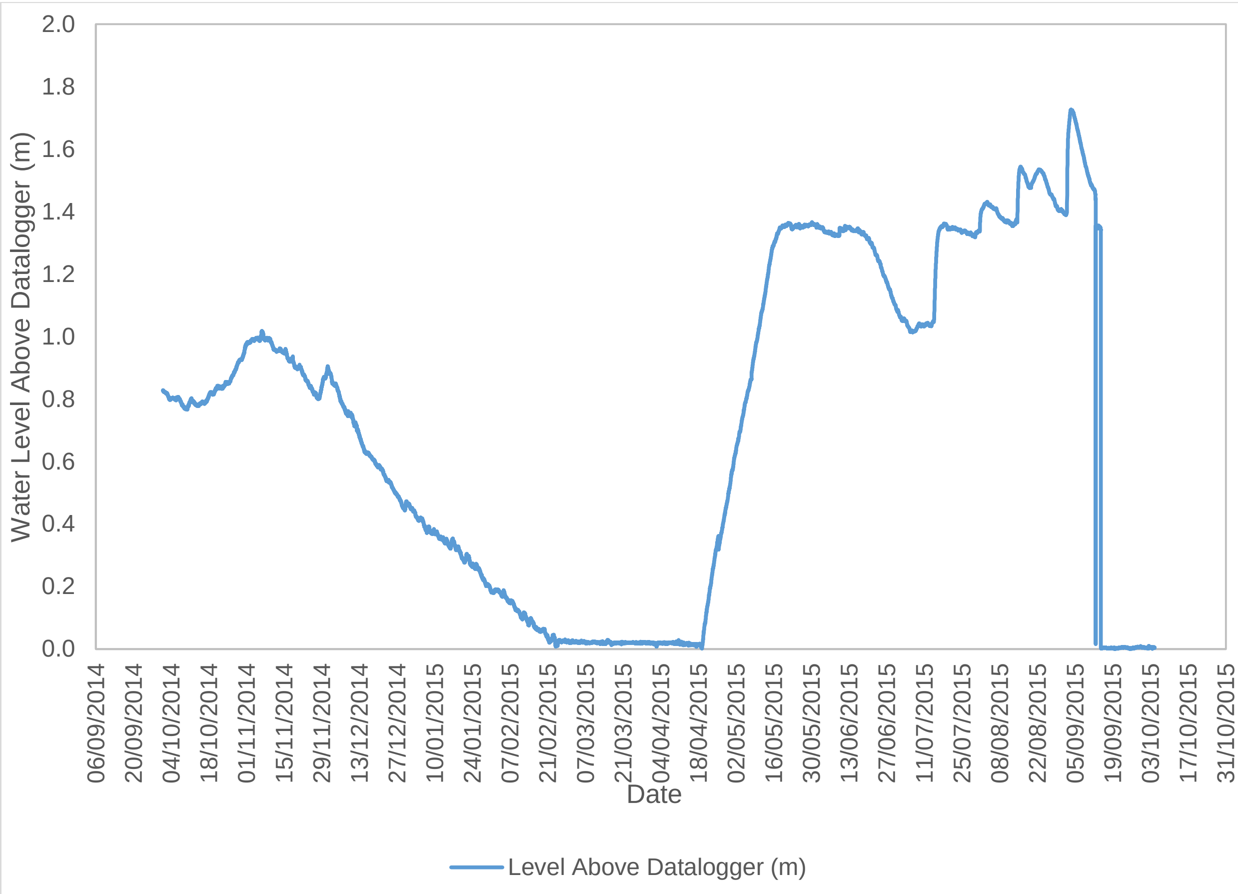
Table 21: CS-1 2015 Daily Average Discharge (m^3/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.836	0.815	0.738	0.643	0.780	0.802	0.281	0.020	0.167	1.698	1.449	1.230
2	0.831	0.821	0.741	0.642	0.792	0.782	0.235	0.012	0.805	1.760	1.444	1.207
3	0.824	0.822	0.733	0.641	0.757	0.715	0.217	0.007	0.988	1.896	1.459	1.197
4	0.802	0.818	0.730	0.641	0.743	0.672	0.235	0.001	1.053	1.853	1.468	1.185
5	0.795	0.827	0.723	0.638	0.731	0.636	0.248	0.000	1.145	1.789	1.460	1.180
6	0.791	0.837	0.723	0.635	0.714	0.653	0.255	0.000	1.241	1.736	1.450	1.170
7	0.777	0.849	0.716	0.625	0.713	0.650	0.345	0.000	1.324	1.689	1.466	1.159
8	0.769	0.864	0.710	0.615	0.712	0.651	0.365	0.000	1.382	1.648	1.469	1.143
9	0.764	0.859	0.705	0.609	0.712	0.665	0.420	0.000	1.396	1.599	1.459	1.131
10	0.766	0.862	0.715	0.606	0.716	0.657	0.428	0.000	1.454	1.596	1.440	1.122
11	0.761	0.855	0.711	0.606	0.711	0.658	0.373	0.000	1.474	1.577	1.428	1.103
12	0.751	0.856	0.707	0.608	0.720	0.730	0.338	0.000	1.610	1.555	1.403	1.088
13	0.745	0.852	0.717	0.618	0.723	0.765	0.345	0.000	1.751	1.551	1.395	1.082
14	0.743	0.852	0.712	0.623	0.760	0.735	0.566	0.000	1.832	1.524	1.392	1.069
15	0.739	0.864	0.706	0.632	0.826	0.701	0.866	0.003	1.811	1.503	1.378	1.054
16	0.754	0.854	0.709	0.654	0.919	0.711	0.737	0.004	1.870	1.486	1.410	1.057
17	0.767	0.840	0.706	0.690	0.867	0.713	0.676	0.002	1.817	1.465	1.421	1.051
18	0.758	0.830	0.701	0.732	0.837	0.662	0.594	0.000	1.809	1.449	1.425	1.038
19	0.758	0.823	0.694	0.773	0.819	0.636	0.560	0.000	1.798	1.430	1.417	1.028
20	0.758	0.814	0.691	0.819	0.805	0.589	0.441	0.002	1.793	1.443	1.408	1.010
21	0.765	0.808	0.688	0.866	0.788	0.545	0.343	0.026	1.848	1.436	1.395	0.999
22	0.791	0.819	0.683	0.902	0.811	0.509	0.307	0.025	1.883	1.428	1.380	0.994
23	0.792	0.834	0.680	0.938	0.856	0.459	0.562	0.009	1.850	1.422	1.364	0.990
24	0.801	0.857	0.675	0.905	0.817	0.417	0.185	0.004	1.811	1.388	1.345	0.980
25	0.807	0.767	0.672	0.845	0.818	0.403	0.105	0.004	1.728	1.378	1.329	0.968
26	0.812	0.766	0.667	0.788	0.847	0.386	0.065	0.004	1.744	1.358	1.313	0.953
27	0.808	0.753	0.663	0.763	0.862	0.385	0.036	0.003	1.864	1.439	1.294	0.929
28	0.807	0.744	0.661	0.754	0.884	0.355	0.026	0.003	1.867	1.444	1.283	0.919
29	0.810		0.655	0.750	0.838	0.338	0.008	0.009	1.815	1.447	1.265	0.911
30	0.814		0.651	0.767	0.781	0.334	0.003	0.028	1.695	1.455	1.253	0.903
31	0.817		0.647		0.764		0.014	0.074		1.460		0.894
Average	0.784	0.827	0.698	0.711	0.788	0.597	0.328	0.008	1.554	1.545	1.395	1.056

4.10 FAY SHAFT

The Fay Shaft was the main vertical access to the underground workings at the Site. The shaft is presently flooded and a stage datalogger has been installed in the shaft for several years suspended from the top of the cap. On April 25, 2015 at 11:30 am the water level was approximately 25.4 m below the top of the cap. Figure 20 shows the fluctuation of the water level in the shaft presented as "water level above the sensor". Late in 2015 (approximately September 14) it appears that the sensor was removed from the water and not returned to a depth where it was submerged in the shaft water.

Figure 20: Fay Shaft Recorded Water Level



5.0 BOREHOLE SURVEY

During the spring and fall field programs various known boreholes were observed either for leakage from the seals or if they have begun to discharge. BH-007 had a very small seep evident (not measureable) but this particular borehole has been slowly leaking for quite some time. The remaining boreholes were dry at the time of observation. Two new borehole features were identified during the fall program. The first borehole (Photo 17) was not flowing and had not been plugged, was not named during the survey and is located approximately at 12V 642254E 6604397N UTM NAD 83 on the edge of a bedrock bench.

Photo 17: New Borehole on Bedrock Bench

6.0 SEEP DISCHARGE MONITORING AND TIME LAPSE CAMERAS

At Cameco's request, MWSI deployed time lapse cameras at Seeps 1, 2, 3 and 4/5 to assist with determining the rainfall response of the seeps. The video sequences collected from each of the four cameras have been provided to Cameco electronically at the time of issuance of this document in its Final version.

On May 3, 2015 at 1:00 pm flow rates for Seeps 4 and 5 were measured at approximately 0.2 and 0.9 L/s, respectively. On October 4, 2015 at 2:30 pm Seep 5 was dry and Seep 4 was measured at approximately 0.1 L/s. During both field programs any flow evident at any of Seeps 1, 2 or 3 was not measureable to the very low flow rate and lack of an adequate measurement location.

No attempt has been made to correlate flow relationships to the photographic record at each station. The Seeps do show a visual response to rainfall events.

7.0 SUMMARY AND CLOSURE

Cameco has retained MWSI for monitoring and reporting of discharges in the vicinity of the former mine near Beaverlodge Lake. This reporting consists of the monitoring data and other pertinent observations recorded during the field programs.

Climate records for Uranium City indicate that 2015 was above normal based on annual totals but was very dry in the earlier half of the year and very wet in the latter. Flow records developed for each station reflect this observation as the peak flows in 2015 occurred not during snowmelt runoff but rather following rain events in August and September.

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. If there are any questions regarding this document please contact the undersigned.

Respectfully submitted,

Missinipi Water Solutions Inc.

ORIGINAL SIGNED BY

Tyrel J. Lloyd, M.Eng., P.Eng.

Senior Water Resources Engineer

8.0 REFERENCES

Environment Canada. 2016. National Climate Data and Information Archive. Website. http://climate.weather.gc.ca/. Last accessed on February 2, 2016.

McElhanney Consulting Services Ltd. 2015. 2014 Hydrometric Monitoring near Beaverlodge Mine. Final Report. Project No. 2711-15003-0. Saskatoon, Saskatchewan.

Smith, C.D. 1995. Hydraulic Structures. University of Saskatchewan Printing Services and Universal Bindery, Saskatoon.

SRK Consulting Engineers and Scientists. 2009. Remedial Options Workshop Report on Former Eldorado Beaverlodge Sites Prepared for Cameco Corporation. SRK Project Number 4CC008.15. Saskatoon, Saskatchewan.

APPENDIX C

APPENDIX C

Beaverlodge Project
Inspection of Select Areas within the Fookes and Marie Reservoirs and Ace Creek Catchment

Prepared for

Cameco Corporation

Prepared by

SRK Consulting (Canada) Inc.
1CC007.055
March 2016

Beaverlodge Project
Inspection of Select Areas within the Fookes and Marie Reservoirs and Ace Creek Catchment

March 2016

Prepared for

Cameco Corporation
2121 – 11th Street West
Saskatoon, SK S7M 1J3
Canada

Tel: +1 306 956 6200
Web: www.cameco.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel: +1 604 681 4196
Web: www.srk.com

Project No: 1CC007.055

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1 Introduction

1.1 General

In response to a request from Mr. Mike Webster of Cameco Corporation (Cameco), Mr. Cam Scott of SRK Consulting (Canada) Inc. (SRK) visited the decommissioned Beaverlodge mine site near Uranium City, Saskatchewan. The site visit was undertaken on June 8 and 9, 2015 with the purpose of undertaking detailed geotechnical inspections of the following areas, the location of which are shown on Figure 1:

- the Fookes Reservoir delta;
- the two outlet spillways at Fookes and Marie Reservoirs;
- the Marie Reservoir Delta; and
- Ace Creek Catchment Area III.

Conditions during the site visit were mostly overcast with temperatures ranging from approximately 7°C to 11°C on both days.

Previous inspections of the Fookes Reservoir delta and the outlet spillways at the Fookes and Marie Reservoirs were undertaken by SRK in September 1998 (SRK, 1998), September 2001 (SRK, 2001), June 2004 (SRK, 2005a), August 2007 (SRK, 2008) and May 2010 (SRK, 2010b). SRK previously undertook an inspection of the Marie Reservoir Delta and the catchment areas around Ace Creek in 2004 (SRK, 2005b).

This report summarizes the observations, conclusions and recommendations related to the detailed geotechnical inspections of the areas noted above. Information provided by surficial gamma radiation surveys and risk evaluations (Arcadis, 2014 and 2015, respectively) has been included in the development of the report's conclusions and recommendations.

1.2 Historic Overview of the Beaverlodge Mine Site

The Beaverlodge uranium mine and mill complex in northern Saskatchewan was operated by a federal Crown corporation, Eldorado Nuclear Limited, from 1951 to 1982. Figure 1 shows the mine site location and the general layout of the Beaverlodge facilities during the mine's operational life.

The approved mine decommissioning plan for the site was implemented in 1983 and 1984. Since 1985, the Beaverlodge mine site has been in the monitoring and maintenance phase, which is the last phase of activity in the decommissioning plan.

In 1988, Cameco Corporation was formed from Eldorado Nuclear Limited and a provincial Crown corporation, Saskatchewan Mining and Development Corporation. Cameco Corporation was given the responsibility of managing the Beaverlodge property as part of its original formation agreement. It is as a result of this ongoing responsibility that the work described in this report was initiated.

2 Fookes Reservoir Delta

2.1 Background

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

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

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

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

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

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

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

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

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

The 2007 geotechnical inspection of the cover occurred while the second stage of cover installation was under way. SRK geotechnical engineers completed a formal inspection of the cover in 2010, and an informal inspection in 2014. Consistent with SRK’s recommendations in 2010, Cameco undertook annual inspections of the cover in June of 2011, 2012 and 2013, and in

July of 2014. The timing of the 2015 inspection is consistent with the schedule defined in 2010 (SRK, 2010b).

2.2 Observations from the Fookes Reservoir Delta Inspection

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

In order to illustrate the state of the Fookes Reservoir delta in 2015, representative photos are attached in Appendix A as Photos 1 through 10.

The inspection revealed that, to date, the areas covered in 1997, 2005 and 2007 are performing well and are meeting the design objectives. In particular, no tailings boils were observed on the cover surface. Furthermore, no tailings boils were observed in areas adjacent to the “full cover” which remained uncovered following the three remedial cover installation stages (1997, 2005 and 2007).

As regards the cover condition, the cover is in generally good condition, although two new features of note (relative to the 2010 inspection) were observed during the 2015 inspection:

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

- There are a series of small depressions suggestive of subsidence within a small area of the cover surface at the south end of the delta, close to the external edge of the cover. Some of the small depressions appear to have formed relatively recently. Others have coalesced and formed shallow channels which drain to the reservoir. However, the residual gravel content is armouring these localized channels, and preventing further channel deepening. It is likely this subsidence has been caused by migration of the sand into the original rock fill cover. Assuming this to be the case, the sand may well continue to act as a filter against the potential movement of tailings up to the surface of the cover.

Although there are still extensive bare zones, vegetation continues to gradually spread and thicken over much of the cover (Photos 1 and 2). This is particularly evident, in the areas where “bundles” of shrubs were left in place on the 2007 cover to promote the establishment of vegetation “islands” and in areas where the water table is typically shallow, such as along the north side of the delta where drainage paths are present, and close to the Fookes Reservoir shoreline on the east side of the delta (Photo 3). The vegetation appears to be considerably more established than was the case in 2010 (Figure 3).

As was observed at the end of the 2007 construction season (Figure 2), ponded water was present along the north side of the delta in 2015, more or less coincident with the drainage paths. These ponds and the associated vegetation appear to be creating a natural habitat over this part of the cover surface. The drainage paths appear to be functioning as designed. As part of the installation of the covers in 2005 and 2007, the area considered most vulnerable to erosion was on and below the access ramp at the northwest corner of the tailings delta. In 2010, the general condition of the ramp was very good except for low points on three of the multiple water bars that were established on the access ramp in 2007. Access to this ramp was closed off by a windrow of material at the top of the ramp, but despite this deterrent, vehicles had been driving down the old access road to gain access to the tailings delta and in doing so, the vehicle tires were creating low points on some water bars. These low points were promoting short circuiting of surface flow over the respective water bars, thereby leading to erosion on both the access road and the tailings cover where the access road reaches the delta. The three damaged water bars were repaired in 2010 by relocating material to the low points in each water bar. It appears that the windrow at the top of the ramp was improved in 2010 and that, since that time, no vehicles have driven down the road and onto the delta. Observations during the 2015 inspection indicated that the condition of the ramp was good and that no obvious erosion of the water bars or the tailings cover has occurred.

The edge of the cover, where it contacts Fookes Reservoir, was inspected with a view to evaluating the degree of erosion along the shore. A nominal amount of erosion from wave action was evident along the cover edge in 2010. In particular, sand from the cover in some areas had been transported a nominal distance into the reservoir as a submerged, very narrow, thin, fan-like deposit. This fan-like deposit typically extends into the reservoir up to a metre (Photo 10), though at one 6 m wide location, the sand extends about 3 to 4 m into the reservoir. In 2010, grasses and some shrubs were growing in this littoral sandy material. In 2015, it appears the vegetation continues to establish itself in this shoreline area and, as expected, has stabilized the edge of the sand/gravel cover. Given the size (and fetch limitation) of this reservoir, as well as the continued growth of vegetation along the delta shoreline, the risk that significant erosion will occur at the margin of the water/cover is considered negligible.

2.3 Surficial Gamma Radiation Survey Data

A surficial gamma radiation survey was completed in the fall of 2014 with the intention of informing the need for potential remediation in the context of acceptable risk and transfer to institutional control (Arcadis, 2014).

Data from that survey was reviewed as part of the current geotechnical assessment. The collected data were averaged on a 10 m by 10 m basis in order to provide a series of data values. Several thousand values were obtained at the Fookes Reservoir delta, with approximately two thirds of the values being less than 0.2 µGy/h and approximately one third being between 0.2 and 2 µGy/h. No values greater than 2 µGy/h are shown on the map summarizing the survey results.

2.4 Conclusions and Recommendations

2.4.1 Inspections

No new boils or significant erosion features were observed during the 2015 inspection, which is consistent with the annual Cameco inspection reports completed between 2011 and 2014, inclusive. Notwithstanding a few localized features noted during the inspection, the conditions on the delta are generally stabilized sufficiently to move towards final close out of the Fookes Reservoir delta, and return to institutional control. Until such time that a shift to institutional control has been implemented, SRK is of the opinion that formal, documented inspections by Cameco and/or regulators should continue on an annual basis until the next scheduled inspection be a geotechnical engineer, planned for 2020. The specific elements that would be evaluated during these inspections would include the following:

- The potential presence of new tailings boils or tailings exposures due to frost action, etc.;
- The performance of the cover in relation to the long crack in the northern part of the delta and the depressions in the south end of the delta;
- Significant erosion of the cover, including the drainage paths in the northern part of the cover and the cover limit along its contact with Fookes Reservoir; and
- The condition of the water bars along the access road at the northwest corner of the site, as well as the two associated diversion ditches and the tailings cover immediately adjacent to this access road.

Furthermore, unless the annual inspections indicate new boils or cover degradation occurs to an extent that is deemed significant by Cameco or the regulators, the next inspection by a qualified geotechnical engineer should occur in 2020. An appropriate inspection schedule should be established as part of that inspection, taking into account the schedule for a potential shift to institutional control and the corresponding requirements of regulators.

2.4.2 Piezometer Monitoring

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

The eight operational piezometers should be left in place for the foreseeable future. In the unlikely event that circumstances conspire to cause new boils to form, and questions arise regarding potential changes in the seasonal piezometric levels, then the piezometers will be in place to provide additional data. At this point, however, no widespread changes in the seasonal piezometric levels within the delta are expected.

2.4.3 Gamma Radiation

Based on the gamma results collected in 2014 (Arcadis, 2014), and a subsequent risk evaluation by Arcadis in 2015, it appears the risk to people from incremental increase of gamma radiation from the Fookes Reservoir Delta is negligible. The Arcadis report concluded that no additional remediation is warranted to further mitigate gamma exposure based on current and reasonable future use scenarios.

3 Fookes and Marie Reservoir Outlet Structures

3.1 Background

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

During the 1986 spring-melt, flows through the Marie Reservoir outlet were higher than anticipated (due apparently to glaciation effects in the spillway) and this resulted in substantial erosion of the spillway channel and a 0.15 m drop in the lake level.

As a consequence of this experience, the outlets from both Fookes and Marie Reservoirs were upgraded to provide improved long term stability. The spillway crests controlling reservoir levels were set at elevations 2,824.0 and 2,815.2 m (based on the top of concrete in the spillway section of Stavely Dam as elevation 2,814.4 m, i.e. a local datum) in Fookes and Marie Reservoirs, respectively. These elevations are approximately 1 m above the elevation down to which the waste rock cover was placed on the tailings beaches. These elevations represent an increase of about 2 m and 1 m in the outlet levels of Fookes and Marie Reservoirs, respectively, compared with what they apparently were prior to mine development.

The general design objectives for the outlet structures were as follows:

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

These two spillways were upgraded in 1987 in accordance with the objectives noted above. The work was completed under SRK supervision and direction between late July and early September, 1987.

Design and as-built details are provided in the following SRK reports:

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

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

SRK has inspected the facilities periodically since 1990, and the last five inspections of the outlet structures were on September 11, 1998, September 10 and 12, 2001, June 14, 2004, August 28, 2007 and May 27, 2010. The results of each of these inspections were summarized in SRK reports to Cameco in 1998, 2001, 2005, 2008 and 2010 (b).

3.2 Observations

3.2.1 Fookes Reservoir Outlet Spillway

Representative photos of the Fookes Reservoir outlet spillway are provided in Appendix B, Photos 11 through 18.

Compared with previous years, a relatively significant flow, estimated at 12 L/s was observed in the spillway. However, consistent with past inspections, some flow was also evident under the grout-intruded rip-rap spillway.

Observations suggest that the condition of the grout-intruded rip-rap along the length of the Fookes Reservoir outlet spillway in 2015 was very similar to its condition in 2010. The extent of the ice-jacking, with its 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, presented no obvious changes. Photos 13 and 15 (looking downstream) show the displaced slabs of grout-intruded rip-rap on the left side of the outlet spillway. Figure 4 provides an indication of how ice-jacking has progressed based on photos from inspections since 2001. The base of the channel does not show any signs of significant displacement.

Compared to the upper part of the spillway (Photos 13 through 15), the middle and lower parts of the spillway (Photos 16 and 18) remain in much better condition. These areas have numerous cracks but there are no obvious changes to the cracks since 2010, nor is there significant evidence of ice-jacking. Vegetation continues to gradually develop a foothold in the cracks in the grout-intruded rip-rap along the spillway (Photos 13 to 18).

A small quantity of water was ponded in the stilling basin at the time of the inspection. Consistent with the visit in 2010, water was escaping the stilling basin under the shotcrete on the left side of the pool rather than via the endpoint at its extreme downstream end.

3.2.2 Marie Reservoir Outlet Spillway

Representative photos of the Marie Reservoir outlet spillway are provided in Appendix C, Photos 19 through 25.

The flow in the outlet spillway was estimated to be approximately 13 L/s although, like the Fookes Reservoir outlet spillway, there is an incremental flow beneath the grout-intruded rip-rap in the base of the spillway. This flow "daylights" at several points within the floor of the spillway and immediately upstream of the stilling basin.

Observations indicate the Marie Reservoir outlet spillway has, in general, changed little since 2004. The grout-intruded rip-rap is relatively intact except near the spillway entrance where one large block slab and several smaller ones on the right side of the spillway (looking downstream) continued to displace incrementally due to ice-jacking (Photos 19 to 21). The ice-jacking has been evident since 2004 but, as shown in Figure 5, one of the ice-jacked slabs, which was "supporting" another slab in 2010, appears to have settled noticeably by 2015.

As in the previous inspections, cracks were observed in the grout in the middle and lower parts of the spillway are more obvious on the left side of the spillway. The extent of this cracking diminishes in a downstream direction. The cracks are as wide as about 1.3 cm, but are typically about 0.2 to 0.3 cm in width. Vegetation continues to establish itself in many of these cracks.

One unusual feature evident in 2015, and not previously observed, was a zone of very spongy ground to the left of the spillway, very close to the spillway inlet (Photos 23 and 24). The spongy area was about 4 m by 2 m and was characterized by waste rock overlying what appeared to be grey, clayey silt; the silt appears to have worked its way to surface and was visible over a portion of the spongy ground. The silt classification was based on the fact that this material was highly dilatant and essentially non-plastic, i.e. it could not be rolled into a thread. While the silt looked somewhat like tailings, the Geiger counter indicated it was not emitting gamma rays. A sample of this material was collected for ICP and radiochemical analysis. The results of those analyses are provided in Appendix F and support the determination that the silt is something other than tailings. There was no definitive explanation behind the source of the silty material but it could be related to seasonal freezing of the original lake sediments. Regardless, this material shows no signs of impacting the performance of the outlet spillway.

The beaver dam observed at the entrance to the Marie Reservoir outlet spillway in May 1997 was removed prior to the 1998 inspection. It appeared during the 1998 inspection that the beavers were starting to build another dam but, by the time of the 2001 inspection, only some remnant branches were evident. No beaver dam was evident at the entrance to the outlet spillway in 2004, 2007, 2010 or in 2015 (Photos 19 and 21).

3.3 Conclusions and Recommendations

The grout that was intruded into the rip-rap in 1987 is meant to serve as a binding agent to increase the effective block size of the rip-rap, allowing it to more effectively resist erosion during peak flood events. Despite the fact that the sides of the entrance area at each of the spillways, particularly within a few metres of the respective reservoir, have undergone significant displacements due to ice-jacking (particularly the left side of the Fookes Reservoir outlet spillway and the right side of the Marie Reservoir outlet spillway), the outlet spillways continue to operate satisfactorily. The cracking and displacement of the grout-intruded rip-rap within the two spillways was anticipated in their original designs and does not affect the performance of either outlet spillway.

Additional cracking and ice-jacking are anticipated over time, but as noted above, the condition of the two outlet spillways continues to be satisfactory, and is expected to remain so over the foreseeable future. It would be reasonable, therefore, for Cameco to move towards final close out and a return to institutional control. Regardless of whether that occurs, SRK is of the opinion that formal, documented inspections by Cameco and/or regulators should continue on an annual basis until the next scheduled inspection be a geotechnical engineer, planned for 2020. The specific elements that would be evaluated during these inspections would include the following:

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

Furthermore, we recommend that unless a peak event leads to substantial erosion of the spillway channel and a drop in the level of either reservoir, the next inspection by a qualified geotechnical engineer should occur in 2020. An appropriate inspection schedule should be established as part of that inspection, taking into account the schedule for a potential shift to institutional control and the corresponding requirements of regulators.

4 Marie Reservoir Delta Area

4.1 Background

During the life of mine (discussed in Sections 1.2 and 3.1), tailings were deposited in various locations, including Marie Reservoir. The grey areas on Figure 6 illustrate the distribution of tailings in the vicinity of the Marie Reservoir delta based on studies undertaken by SRK in 1982 and 1983 (SRK, 1983).

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

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

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

The last inspection of the Marie Reservoir by a geotechnical engineer prior to 2015 was completed in 2004 (SRK, 2005b).

4.2 Observations

The Marie Reservoir delta area is comprised of two separate tailings deltas, one near the west end of Marie Reservoir and a second at the east end of Marie Reservoir. The west delta is about 300 m long and up to about 70 m wide. The surface exposure of the east delta is an area about 80 m long and up to about 25 m wide. Immediately above the west delta is an area 180 by 30 m which, for purposes of this report, is referred to as the Marie Reservoir catchment area.

Figure 7 provides a summary of the general conditions observed at the Marie Reservoir delta area. Representative photos are provided in Appendix D, Photos 26 to 33. In general, very few changes were evident at the Marie Reservoir area in 2015 as compared to 2004. Further comments on the area are provided below.

4.2.1 Marie Reservoir West Delta Area

Most of the Marie Reservoir west delta is covered by rock fill provided from three quarries which were developed immediately above the delta (one of the quarries is visible in the foreground of Photo 26). Small trees, shrubs and some grasses are present on some parts of the cover (Photos 26, 27, 29 and 32).

The rock fill cover appears, in general, to be very thin. In addition, the water table is very close to the cover surface over large portions of the delta. In the areas, where the cover is thin and/or the water table is just below the cover surface, there are numerous locations where tailings have squeezed up through the rock fill (Photos 28 to 31) and/or the tailings immediately below the cover can be easily “pumped” by the cyclic application of foot pressure. Salts are evident on the surface of some of these exposed tailings (Photos 29 to 31). Notwithstanding the presence of exposed tailings at a number of locations, the condition of the cover over the rest of the west delta is generally good.

4.2.2 Marie Reservoir East Delta Area

The Marie Reservoir east delta is much smaller than the Marie Reservoir west delta. Rock fill covers the delta (Photo 33); grasses and small shrubs are present on some parts of the cover. The condition of the cover is generally good despite the fact that tailings have come up through the rock fill at a few isolated locations.

The reservoir bed immediately south of the cover is shallow and rock fill is visible below the water line. Submerged tailings cover the reservoir bed south of the Marie Reservoir east delta.

There are some exposures of tailings on the slope immediately north of the delta, but grassy vegetation has largely overtaken most of the tailings on this slope.

4.2.3 Marie Reservoir Catchment Area

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

The area is heavily vegetated and part of the slope is quite steep with occasional exposures of till or colluvium. There were no signs of tailings at the Marie Reservoir catchment area, nor was there any waste rock or rock fill.

4.3 Surficial Gamma Radiation Survey Data

The surficial gamma radiation survey completed in the fall of 2014 included the east and west deltas at Marie Reservoir and the Marie Reservoir catchment area. Several hundred values were obtained at these areas. Data from that survey was reviewed as part of the current geotechnical assessment.

At the Marie Reservoir west delta, approximately one third of the values were less than 0.2 µGy/h; one third were between 0.2 and 0.5 µGy/h; and one third were between 0.5 and 2 µGy/h. No values greater than 2 µGy/h were shown on the map summarizing the survey results.

At the Marie Reservoir east delta, the gamma survey results were relatively variable. Quantifiable generalizations are more difficult to make in this area but it is clear that the vast majority of values are less than 2 µGy/h. At a few locations, values ranged between 2 and 5 µGy/h. However, no values greater than 5 µGy/h are shown on the map summarizing the survey results.

Despite the absence of observed tailings at the Marie Reservoir catchment area, the gamma survey results indicated the presence of low gamma radiation values. In particular, the vast majority of the values were between 0.2 and 2 μGy/h. At 2 locations, the values ranged between 2 and 5 μGy/h. However, no values greater than 5 μGy/h are shown on the map summarizing the survey results.

4.4 Conclusions and Recommendations

A thin cover of rock fill overlies the tailings at the west and east deltas; small trees, shrubs and some grasses are present on some parts of the rock fill cover. The condition of the cover is generally good despite the fact that tailings have worked their way to surface in some locations due possibly to frost action combined with high water tables.

As discussed above, there were no signs of tailings at the Marie Reservoir catchment area, nor was there any waste rock or rock fill.

Based on the gamma results collected in 2014 (Arcadis, 2014), and a subsequent risk evaluation by Arcadis in 2015, it appears the risk to people from incremental increase of gamma radiation from the Marie Reservoir Delta is negligible. The Arcadis report concluded that no additional remediation is warranted to further mitigate gamma exposure based on current and reasonable future use scenarios.

From a geotechnical perspective, it would be reasonable for Cameco to move towards final close out of the Marie Reservoir delta area and a return to institutional control. Regardless of whether that occurs, SRK is of the opinion that formal, documented inspections by Cameco and/or regulators or a qualified geotechnical engineer should continue on a periodic basis, i.e. every 10 years.

5 Ace Creek Catchment Area III

5.1 Background

During the life of mine (discussed in Section 1.2), tailings were deposited in various locations, including the Ace Creek catchment areas, as a result of spills which occurred along the tailings discharge pipeline. The grey areas on Figure 6 illustrate the distribution of tailings in the vicinity of the Ace Creek catchment areas based on studies undertaken by SRK in 1982 and 1983 (SRK, 1983).

The Ace Creek catchment areas comprise three “subareas” (I, II and III) situated south of the Ace stope area. Catchment area I is about 1 km long and up to about 400 m wide. Ace Creek runs though catchment area I. The southern end of catchment area I, which rises to the south, is connected with catchment area II, which occupies an area about 200 m long and up to 50 m wide. The southern end of catchment area II is connected with catchment area III, which occupies an area 150 m long and up to about 70 m wide. Catchment areas I through III coincide generally with the pipeline route to Marie Reservoir. Portions of the downstream end of this pipeline segment that directed tailings to the Marie Reservoir west delta are still visible at the south end of catchment area III.

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

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

The last inspection of the Ace Creek catchment areas by a geotechnical engineer prior to 2015 was completed in 2004 (SRK, 2005b). Ace Creek catchment area III was an area of focus for the 2015 inspection.

5.2 Observations

Figure 7 provides a summary of the general conditions observed at the Ace Creek catchment area III. In general, very few changes were evident at catchment area III in 2015 compared to 2004. Representative photos are provided in Appendix E, Photos 34 to 39. Further comments on the area are provided below.

Catchment area III is largely covered by waste rock (Photos 34 to 39). An area which was dry but clearly held ponded water previously was evident on the west side of Catchment area III, about 40 south of its north limit. The area has a footprint of about 20 m by 30 m.

There was also a small diameter shallow pond near the south end of catchment area III (Photos 34 to 36). The mud line of a previous pond level was about 82 m wide at its widest point and 95 m wide in a north-south direction, much larger than the pond area at the time of the visit.

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

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

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

Over the rest of the cover, there are occasional small exposures of tailings that have come up though the waste rock. One of these exposures occurs immediately adjacent to a bedrock outcrop. A comparison of the exposed tailings in 2004 (Photo 38) with the same tailings in 2015 (Photo 39) indicate there has been no obvious change in the volume of exposed tailings.

5.3 Surficial Gamma Radiation Survey Data

The surficial gamma radiation survey completed in the fall of 2014 included Ace catchment area III. Data from that survey was reviewed as part of the current geotechnical assessment.

Approximately 100 to 200 values were obtained at this area. The majority of values were between 0.5 and 2 μGy/h. This range of values was bracketed by some which ranged from 0.2 and 0.5 μGy/h, and a few between 2 and 5 μGy/h. However, no values greater than 5 μGy/h are shown on the map summarizing the survey results.

5.4 Conclusions and Recommendations

The results of the 2015 assessment of Ace Creek catchment area III can be summarized as follows:

- Much of the waste rock cover in catchment area III is performing acceptably based on the general absence of exposed tailings.
- The waste rock cover appears, in some areas, to be relatively thin. In these areas, tailings have worked their way to surface due to either frost action and/or high water tables.
- Water continues to pond at one or two locations at Ace Creek catchment area III; the larger of the two ponds is at the south end of this area, and its footprint appears to vary from month to month and year to year. Field evidence related to previous pond levels suggest that the south pond does, on occasion, spill southwards towards Marie Reservoir. It is not clear that the north pond has spilled off the surface of catchment area III, but available topographic data suggests that the natural flow direction of water in both ponds would be towards Marie Reservoir.
- Based on the gamma results collected in 2014 (Arcadis, 2014), and a subsequent risk evaluation by Arcadis in 2015, it appears the risk to people from incremental increase of gamma radiation from Ace Creek catchment area III is negligible. The Arcadis report concluded that no additional remediation is warranted to further mitigate gamma exposure based on current and reasonable future use scenarios.

From a geotechnical perspective, it would be reasonable for Cameco to move towards final close out of Ace Creek catchment area III and a return to institutional control. Regardless of whether that occurs, SRK is of the opinion that formal, documented inspections by Cameco and/or regulators or a qualified geotechnical engineer should continue on a periodic basis, i.e. every 10 years.

This report, *Beaverlodge Project - Inspection of Select Areas within the Fookes and Marie Reservoirs and Ace Creek Catchment Area*, was prepared by SRK Consulting (Canada) Inc.

Cam Scott, PEng
Practice Leader

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

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

6 References

ARCADIS SENES Canada Inc., 2014. Surficial Gamma Radiation Survey of Disturbed Areas at the Former Beaverlodge Mine Site, prepared for Cameco Corporation, November.

ARCADIS Canada Inc., 2015. Beaverlodge Surficial Gamma Radiation Risk Evaluation, prepared for Cameco Corporation, June.

Cameco Corporation, 2011. Geotechnical Inspection Results for 2011, Appendix D from an unspecified annual report.

Cameco Corporation, 2012. Geotechnical Inspection Results for 2012, Appendix C from an unspecified annual report.

Cameco Corporation, 2013. Geotechnical Inspection Results for 2013, from an unspecified annual report.

Cameco Corporation, 2014. Geotechnical Inspection Results for 2014, from an unspecified annual report.

SRK Consulting (2005a). Beaverlodge Project, Inspection of Fookes Lake Delta and Outlet Structures at Fookes Lake and Marie Lake, prepared for Cameco Corporation, May.

SRK Consulting (2005b). Beaverlodge Project, Inspection of Ace Stope, Ace Creek Catchment and Marie Lake Delta Areas, prepared for Cameco Corporation.

SRK Consulting (2006). Beaverlodge Decommissioning 2005 Construction Activities at the Fookes Lake Delta, Northern Saskatchewan, February.

SRK Consulting (2008). Beaverlodge Decommissioning 2007 Construction Activities at the Fookes Lake Delta, Northern Saskatchewan, February.

SRK Consulting (2010a). Beaverlodge - Fookes Tailings Delta, Review of Piezometer Data from January 2009 to December 2009, letter report to Cameco Corporation, September 7.

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

Steffen, Robertson and Kirsten (Canada) Inc., 1983. Beaverlodge Project, Closure Plan, prepared for Eldorado Nuclear Limited, February.

Steffen, Robertson and Kirsten (B.C.) Inc., 1986. Upgrading of Outlet Structures at Fookes and Marie Lakes for Beaverlodge Mine Close-Out, Design Report No. 53602/1, July.

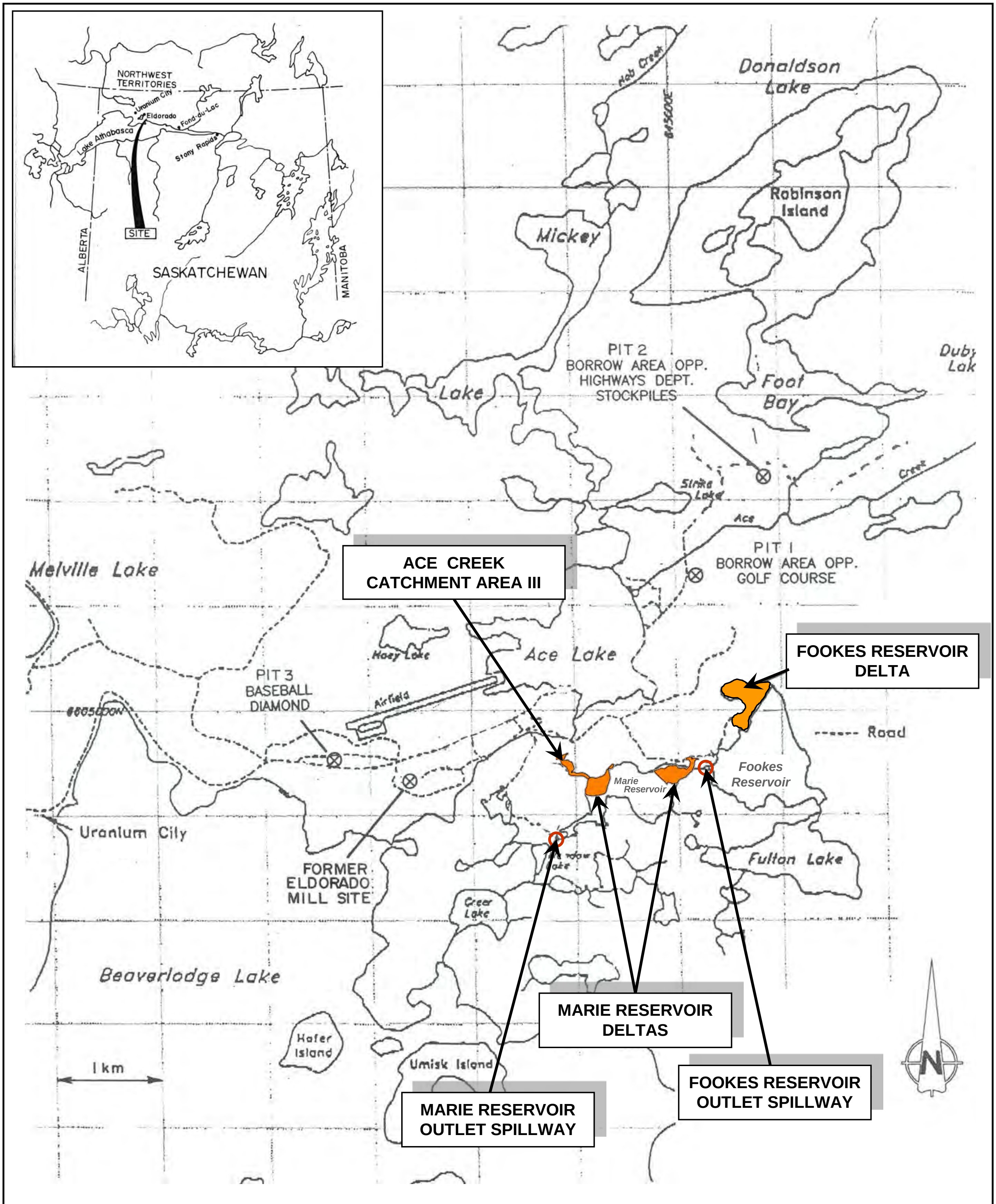
Steffen, Robertson and Kirsten (B.C.) Inc., 1988. Upgrading of Outlet Structures at Fookes and Marie Lakes for Beaverlodge Mine Close-Out, Construction Report No. 53603/1, January.

Steffen, Robertson and Kirsten (Canada) Inc., 1995. Beaverlodge Project, Saskatchewan, Report on Proposed Remedial Measures to Counter Sand “Boils” Adjacent to Fookes Lake, prepared for Cameco Corporation, September.

Steffen, Robertson and Kirsten (Canada) Inc., 1997. Beaverlodge Decommissioning, Fookes Lake Tailings Delta Remediation, 1997 Construction, prepared for Cameco Corporation, October.

Steffen, Robertson and Kirsten (Canada) Inc., 1998. Beaverlodge Project – Inspection of Fookes Lake Delta and Outlet Structures at Fookes Lake and Marie Lake, letter report prepared for Cameco Corporation, September 23.

Steffen, Robertson and Kirsten (Canada) Inc., 2001. Beaverlodge Project – Inspection of Fookes Lake Delta and Outlet Structures at Fookes Lake and Marie Lake, letter report prepared for Cameco Corporation, October 19.



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Beaverlodge Inspection

Layout Map

Job No: 1CC007.055

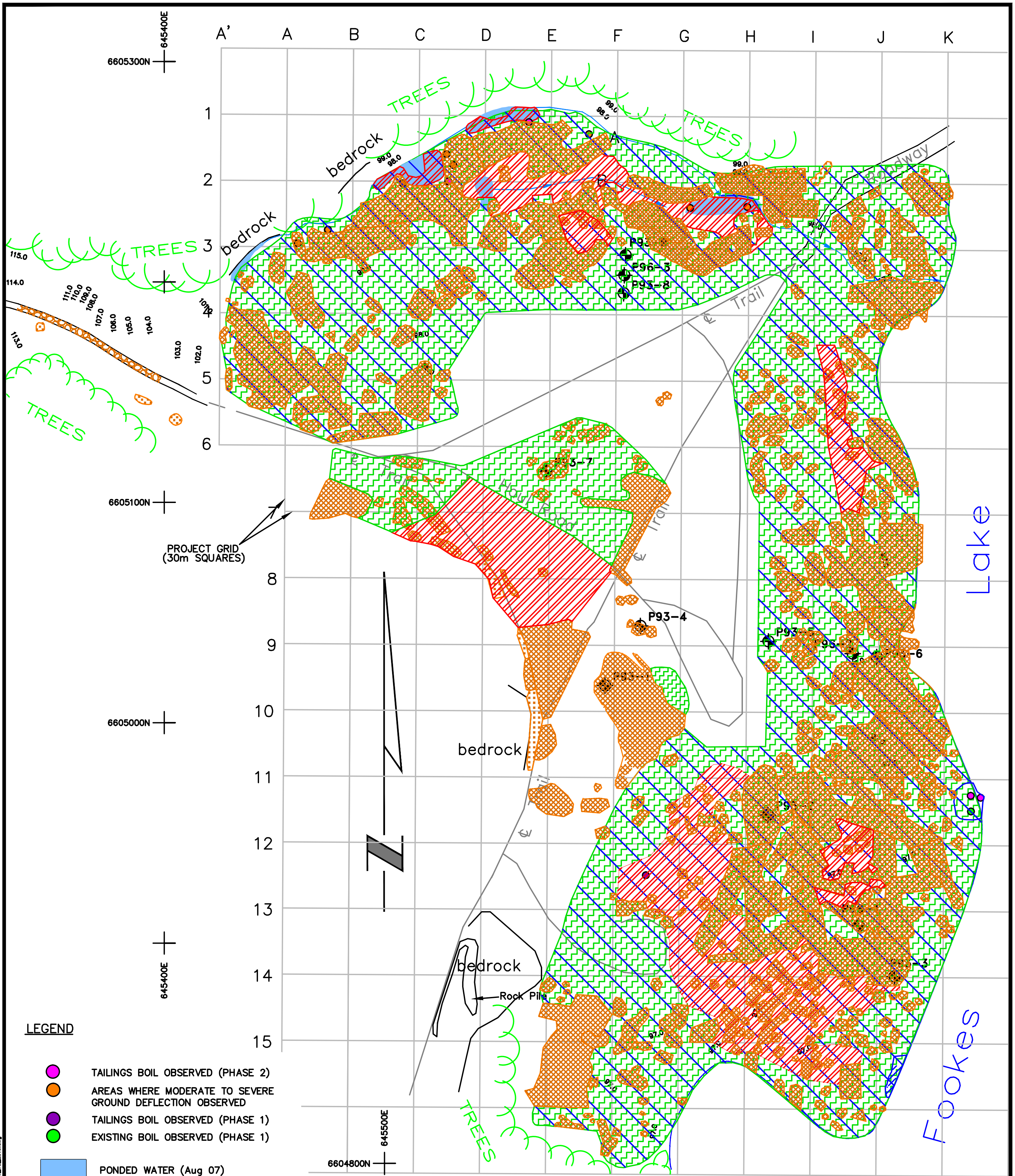
Filename: Figure 1_Layout_20151204.pptx

Beaverlodge Mine Site

Date: Feb. 2016

Approved: CCS

Figure: 1



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

0 20 40 60 80 100

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

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BEAVERLODGE DECOMMISSIONING (2007)

Fookes Delta Cover 2007 As–Built

PROJECT:	DATE:	APPROVED:	FIGURE:
1CC007.055	Jan. 2016		2

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Changes in Vegetation at Fookes Reservoir Cover Over Time

Job No: 1CC007.055

Filename: Figure 3-Cover_20160111.ppt

Beaverlodge Mine Site

Date: January 2016

Approved: CCS

Figure: 3

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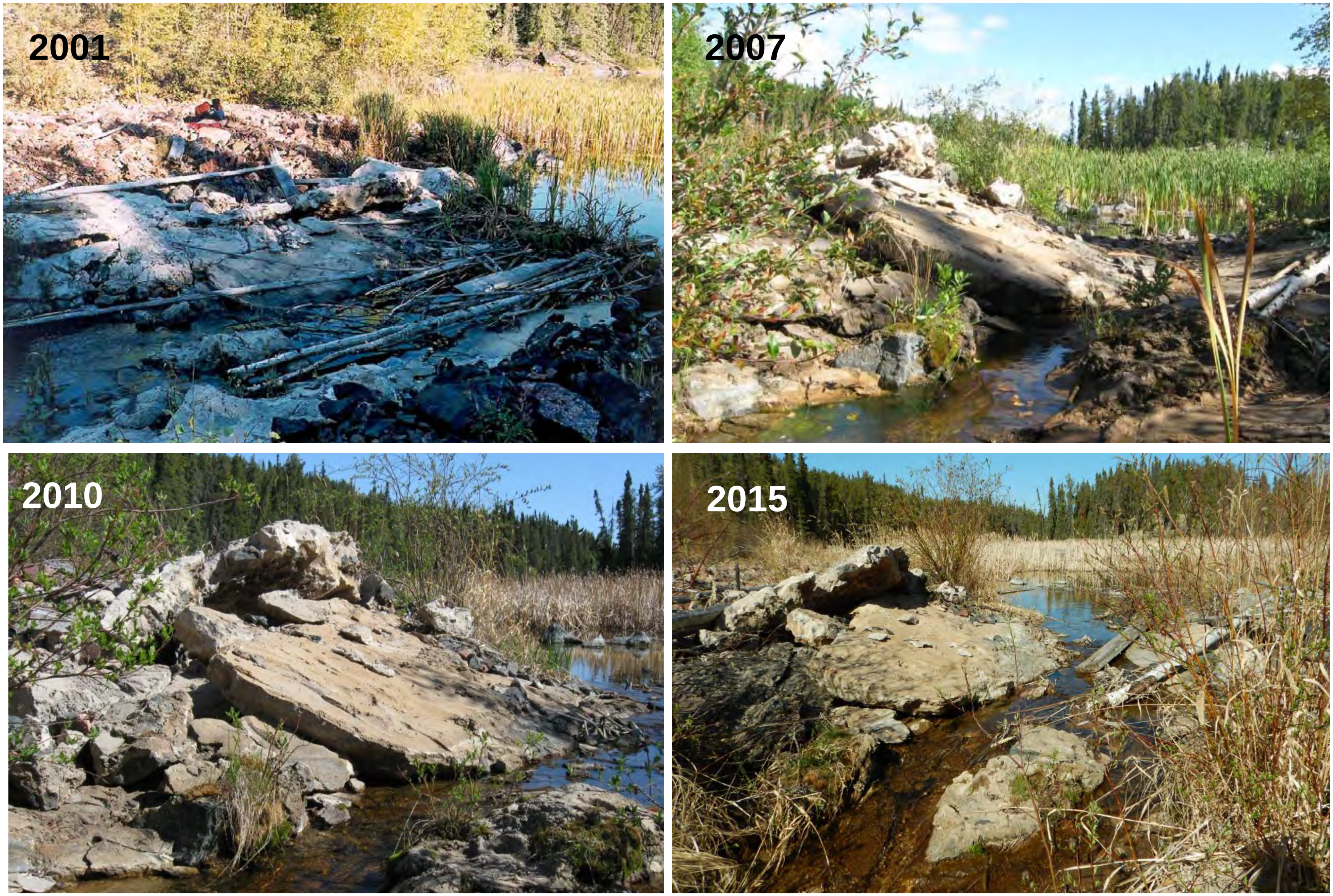
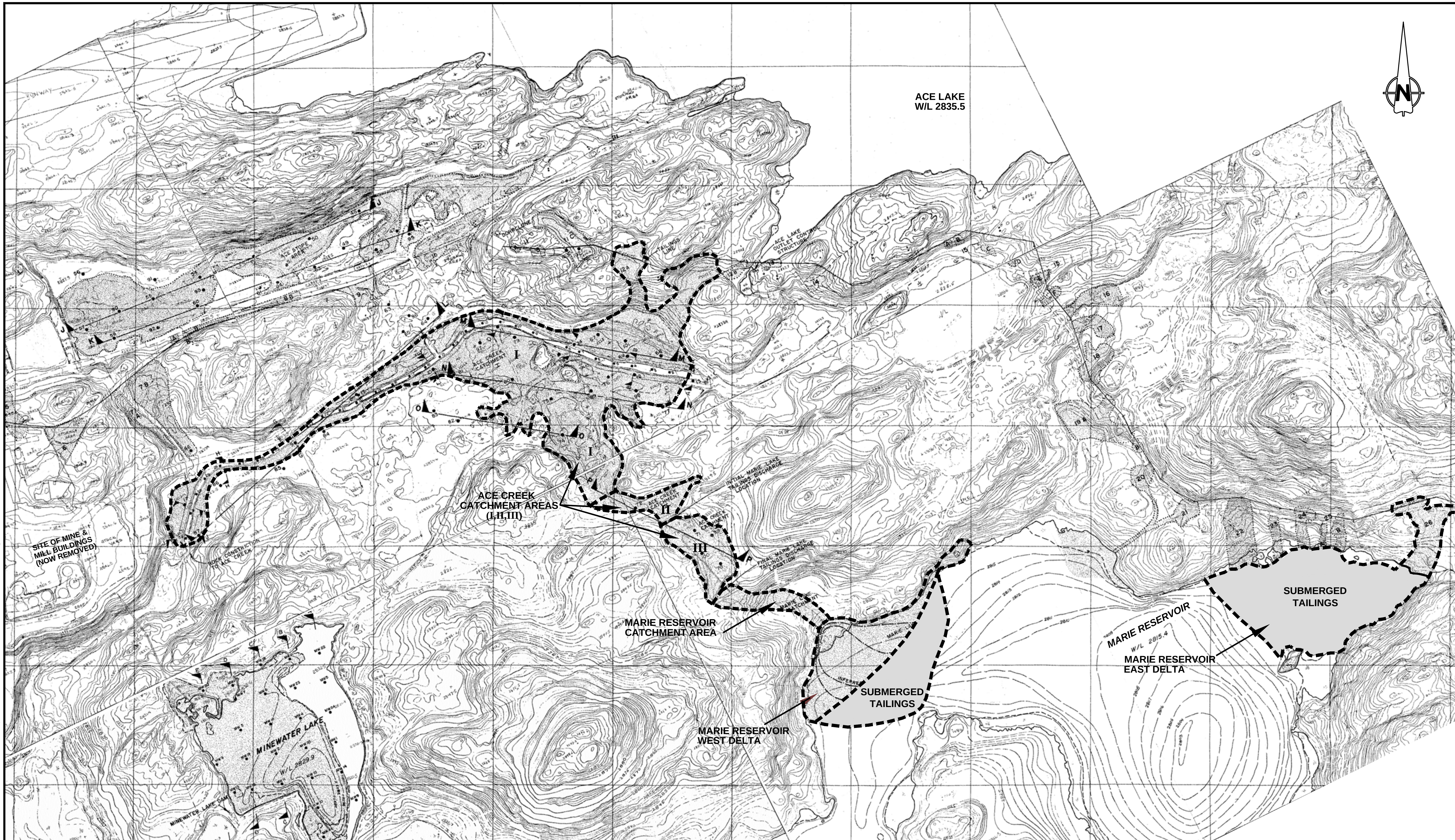
Changes in Fookes Reservoir Spillway Entrance Over Time

Job No: 1CC007.055	Beaverlodge Mine Site	Date: January 2016	Approved: CCS	Figure: 4
Filename: Figures 4_5-Spillways_20160111.ppt				



srk consulting VANCOUVER	Cameco	Beaverlodge Inspection
		Changes in Marie Reservoir Spillway Entrance Over Time
Job No: 1CC007.055 Filename: Figures 4_5-Spillways_20160111.ppt	Beaverlodge Mine Site	Date: January 2016 | Approved: CCS | Figure: **5**



0 50 100 150 200 250

Scale in Metres

NOTE:

COMPILED FROM 1:2000 SCALE SRK DRAWINGS 53601/3, /5, AND /6 FROM BEAVERLODGE TAILINGS CLOSEOUT PROJECT. PREPARED FOR ELDORADO NUCLEAR LIMITED IN FEB. 1983.

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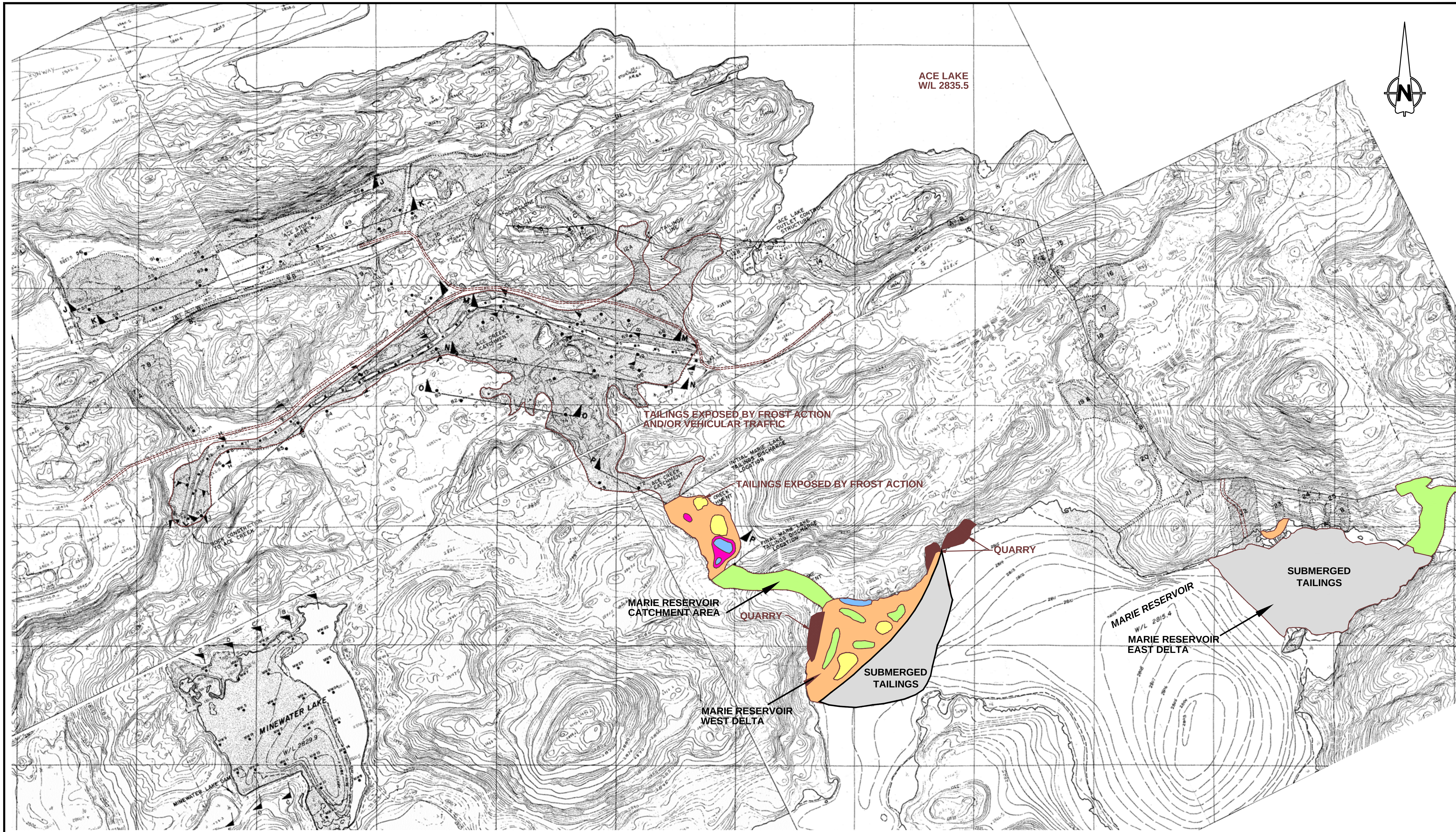
BEAVERLODGE INSPECTION

GENERAL ARRANGEMENT OF ACE CREEK CATCHMENT AREAS AND MARIE RESERVOIR DELTA AREAS

PROJECT NO.	DATE	APPROVED	FIGURE
1CC007.55	Feb. 2016	CCS	6

J:\01_SITES\Beaverlodge\1CC007.055_2015_Geotech_Inspection\040_AutoCAD\scan-data_2016.dwg



LEGEND

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

0 50 100 150 200 250

Scale in Metres

srk consulting

Cameco

BEAVERLODGE INSPECTION

COVER MAP BASED ON 2015 ASSESSMENT

PROJECT NO.	DATE	APPROVED	FIGURE
1CC007.055	Feb. 2016	CCS	7

J:\01_SITES\Beaverlodge\1CC007.055_2015_Geotech_Inspection\040_AutoCAD\scan-data_2016.dwg

Appendix A - Photographs of the Fookes Reservoir Delta Cover

Photo 1: Looking eastward, down the access ramp towards the central part of the delta cover on May 24, 2015. Water bars, visible on the access ramp, manage runoff down the ramp.

Photo 2: Looking southeastward across the delta cover on June 9, 2015. Note the vegetation "islands" that have formed.

Photo 3: Looking southwestward along the upstream segment of the diversion ditch that runs along the north limit of the cover area on May 24, 2015. Access ramp is visible in the distance.

Photo 4: Photo 3: Looking westward along the middle segment of the diversion ditch that runs along the north limit of the cover area on May 24, 2015. Access ramp is visible in the distance.

Photo 5: Looking southward along the shoreline in the northern part of the cover area on May 24, 2015.

Photo 6: Looking southward along the shoreline in the northern part of the cover area on May 24, 2015.

Photo 7: Looking southward at small depressions in the cover near the shoreline in the southern part of the cover area on May 24, 2015.

Photo 8: Looking westward, from close to the shoreline, where small depressions in the southern part of the cover have coalesced. Photo taken on May 24, 2015.

Photo 9: Looking westward across the central part of the cover, towards the access ramp, on May 24, 2015. The white pipe is the “housing” for a piezometer cable.

Photo 10: Looking southwestward across the central part of the cover on May 24, 2015. The access ramp is visible in the top right corner of the photograph.

Appendix B - Photographs of the Fookes Reservoir Outlet Structure

Photo 11: Looking southwest towards the upstream end of the Fookes Reservoir outlet spillway on May 21, 2015.

Photo 12: Close-up view of the upstream end of the outlet spillway on May 21, 2015.

Photo 13: Looking downstream along the outlet spillway showing the ice-jacked slabs of grout-intruded rip-rap on the sides of the spillway. Photo taken on May 21, 2015.

Photo 14: Similar view to Photo 13, taken on May 21, 2015. The stilling basin is visible in the distance.

Photo 15: Close-up view of the ice-jacked slabs of grout-intruded rip-rap on the left side of the spillway. Photo taken on May 21, 2015.

Photo 16: Photo looking downstream, taken near the middle segment of the outlet spillway, on May 21, 2015. The stilling basin in visible in the distance.

Photo 17: Looking upstream across the edge of the stilling basin at the location where most of the water leaves the basin.

Photo 18: Looking up the outlet spillway from the stilling basin on May 21, 2015.

Appendix C - Photographs of the Marie Reservoir Outlet Structure

Photo 19: Looking at ice-jacked slabs of grout-intruded rip-rap on the right side of the Marie Reservoir outlet spillway, near its upstream end on May 24, 2015.

Photo 20: Looking across the spillway at the same ice-jacked slabs shown on Photo 19. Photo taken on May 24, 2015.

Photo 21: Looking upstream near the upstream end of the outlet spillway on May 24, 2015. The ice-jacked slabs of the grout-intruded rip-rap are visible at the entrance.

Photo 22: Looking downstream along the outlet spillway on May 24, 2015. The stilling basin is visible in the distance.

Photo 23: Looking at the grey, clayey silt coinciding with the spongy area on the left side of the outlet spillway, near its upstream end. Photo taken on May 24, 2015.

Photo 24: Close-up of the grey, clayey silt shown in Photo 23 on May 24, 2015. Note the boil-like feature in the center of the photo.

Photo 25: Looking at the downstream edge of the stilling basin on May 24, 2015. The natural creek is visible downstream side of the basin.

Appendix D - Photographs of the Marie Reservoir Delta Area

Photo 26: Looking southeastward across the Marie Reservoir west delta area on May 24, 2015. The water body is Marie Reservoir.

Photo 27: Looking northwestward across west delta area on May 24, 2015.

Photo 28: Typical exposure of tailings which day-lighted through the rockfill cover on the west delta area, likely prior to the 2004 geotechnical inspection. Photo taken on May 24, 2015.

Photo 29: Another area on the cover where tailings have day-lighted. Salts are evident on the surface of the tailings (see close-ups on Photos 30 and 31). Photos taken on May 24, 2015.

Photo 30: Close-up of the exposed tailings shown in Photo 29.

Photo 31: Close-up of salts visible on the surface of exposed tailings on the west delta area.

Photo 32: Looking westward along the shoreline of the west delta cover. Rockfill cover is visible below the water surface. Photo taken on May 24, 2015.

Photo 33: Looking westward along the shoreline of the east delta cover on June 20, 2004.

Appendix E - Photographs of Ace Creek Catchment Area III

Photo 34: Looking northward across the pond area at the south end of Ace Creek catchment area III on May 20, 2015.

Photo 35: Looking southward across the pond area at the south end of Ace Creek catchment area III on May 20, 2015. Surface drainage would flow to the right, towards the background.

Photo 36: Looking southwestward across the pond area at the south end of Ace Creek catchment area III on June 9, 2015. Note the pond size compare to Photo 39.

Photo 37: Looking southward to the surface drainage where surface drainage would naturally flow. Photo taken on May 20, 2015.

Photo 38: View of a tailings exposure at the north end of Ace Creek catchment area III (same location as shown in Photo 39). Photo taken on June 20, 2004.

Photo 39: View of the same tailings exposure shown in Photo 38, 11 years later. Photo taken on May 20, 2015.

Appendix F - Test Results for Soil Sample from Marie Reservoir Outlet Spillway

SRC SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2015-6656

Jul 10, 2015

Cameco
Beaverlodge Mining Division
2121 11th Street West
Saskatoon, SK S7M 1J3
Attn: Mike Webster

Date Samples Received: Jun-29-2015 Client P.O.: 4500-453-073

This is a final report.

Organics results have been authorized by Pat Moser, Supervisor

Inorganics and ICP results have been authorized by Keith Gipman, Supervisor

Radiochemistry results have been authorized by Jeff Zimmer, Supervisor

SLOWPOKE-2 results have been authorized by Dave Chorney

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
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SRC Group # 2015-6656

Jul 10, 2015

Cameco, Beaverlodge Mining Division

2121 11th Street West
Saskatoon, SK S7M 1J3
Attn: Mike Webster

Date Samples Received: Jun-29-2015

Client P.O.: 4500-453-073

20174 **06/11/2015 MARIE 01 *SOIL***

Analyte	Units	20174
ICP		
Aluminum	ug/g	8800
Antimony	ug/g	<0.2
Arsenic	ug/g	1.0
Barium	ug/g	130
Beryllium	ug/g	0.4
Boron	ug/g	9
Cadmium	ug/g	0.2
Calcium	ug/g	4800
Chromium	ug/g	22
Cobalt	ug/g	3.8
Copper	ug/g	4.9
Iron	ug/g	13000
Lead	ug/g	4.4
Magnesium	ug/g	3300
Manganese	ug/g	180
Molybdenum	ug/g	0.3
Nickel	ug/g	6.6
Phosphorus	ug/g	490
Potassium	ug/g	2400
Selenium	ug/g	0.2
Silver	ug/g	<0.1
Sodium	ug/g	880
Strontium	ug/g	52
Thallium	ug/g	<0.2
Tin	ug/g	0.7
Titanium	ug/g	1000
Uranium	ug/g	2.7
Vanadium	ug/g	27
Zinc	ug/g	17
Radiochemistry		
Lead-210	Bq/g	<0.04

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SRC Group # 2015-6656

Jul 10, 2015

Cameco, Beaverlodge Mining Division

20174 **06/11/2015 MARIE 01 *SOIL***

Analyte	Units	20174
Radiochemistry		
Polonium-210	Bq/g	0.06
Radium-226	Bq/g	0.08

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a dry basis.

APPENDIX D

APPENDIX D

AC-14 QA/QC Blind Samples

Ace Creek discharge to Beaverlodge Lake

Parent Field	Station: AC-14				Child Field	Station: Blind-1				
Date: 2015/05/30					Date: 2015/05/30					
Assigned: SRC Lab					Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	50.0	Acid Titration	1.0	10.0	Alk	49.0	Acid Titration	1.0	10.0	2
As	0.2	ICP-MS	0.1	0.1	As	0.2	ICP-MS	0.1	0.1	0
Ba	0.024	ICP-MS	0.001	0.004	Ba	0.024	ICP-MS	0.001	0.004	0
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0
Ca	16.0	ICP-OES	0.1	2.0	Ca	16.0	ICP-OES	0.1	2.0	0
Cond-F	127	Field			Cond-F	127				0
Cond-L	119	Conductivity Meter	1	7	Cond-L	119	Conductivity Meter	1	7	0
Cu	0.0007	ICP-MS	0.0002	0.0003	Cu	0.0008	ICP-MS	0.0002	0.0003	13
Fe	0.046	ICP-MS	0.001	0.007	Fe	0.046	ICP-MS	0.001	0.007	0
HCO3	61.0	Acid Titration	1.0	9.0	HCO3	60.0	Acid Titration	1.0	9.0	2
Hardness	53	Calculated	1	8	Hardness	53	Calculated	1	8	0
K	0.6	ICP-OES	0.1	0.2	K	0.6	ICP-OES	0.1	0.2	0
Mo	0.0008	ICP-MS	0.0001	0.0003	Mo	0.0008	ICP-MS	0.0001	0.0003	0
Na	1.5	ICP-OES	0.1	0.4	Na	1.8	ICP-OES	0.1	0.4	18
Ni	0.00020	ICP-MS	0.00010	0.00010	Ni	0.00020	ICP-MS	0.00010	0.00010	0
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0
Pb	0.0003	ICP-MS	0.0001	0.0001	Pb	0.0003	ICP-MS	0.0001	0.0001	0
Ra226	0.100	Alpha Septroscopy	0.005	0.020	Ra226	0.100	Alpha Septroscopy	0.005	0.020	0
SO4	7.4	ICP-OES	0.2	1.0	SO4	8.4	ICP-OES	0.2	1.0	13
Se	0.0002	ICP-MS	0.0001	0.0001	Se	0.0002	ICP-MS	0.0001	0.0001	0
Sum of Ions	91	Calculated	1	10	Sum of Ions	91	Calculated	1	10	0
TDS	80.00	Gravimetric	5.00	10.00	TDS	78.00	Gravimetric	5.00	10.00	3
TSS	< 1.000	Gravimetric	1.000		TSS	< 1.000	Gravimetric	1.000		0
Temp-H20	13.0	Field			Temp-H20	13.0				0
U	34.000	ICP-MS	0.100	3.000	U	34.000	ICP-MS	0.100	3.000	0
Zn	< 0.001	ICP-MS	0.001		Zn	< 0.001	ICP-MS	0.001		0
pH-L	7.78	pH Meter	0.07	0.10	pH-L	7.79	pH Meter	0.07	0.10	0

DB-6 QA/QC Blind Samples
Crackingstone Bay in Lake Athabasca

Parent Field	Station: DB-6				Child Field	Station: Blind-2				
Date: 2015/05/30					Date: 2015/05/30					
Assigned: SRC Lab					Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	85.0	Acid Titration	1.0	20.0	Alk	85.0	Acid Titration	1.0	20.0	0
As	0.1	ICP-MS	0.1	0.1	As	0.1	ICP-MS	0.1	0.1	0
Ba	0.047	ICP-MS	0.001	0.007	Ba	0.047	ICP-MS	0.001	0.007	0
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0
Ca	34.0	ICP-OES	0.1	3.0	Ca	34.0	ICP-OES	0.1	3.0	0
Cond-F	246	Field			Cond-F	246	Conductivity Meter	1	10	0
Cond-L	216	Conductivity Meter	1	10	Cond-L	216	Conductivity Meter	1	10	0
Cu	0.0004	ICP-MS	0.0002	0.0003	Cu	0.0005	ICP-MS	0.0002	0.0003	**22**
Fe	0.009	ICP-MS	0.001	0.002	Fe	0.010	ICP-MS	0.001	0.002	3
HCO3	104.0	Acid Titration	1.0	10.0	HCO3	104.0	Acid Titration	1.0	10.0	0
K	0.5	ICP-OES	0.1	0.2	K	0.5	ICP-OES	0.1	0.2	0
Mo	0.0019	ICP-MS	0.0001	0.0005	Mo	0.0019	ICP-MS	0.0001	0.0005	0
Na	1.9	ICP-OES	0.1	0.5	Na	2.0	ICP-OES	0.1	0.3	5
Ni	0.00020	ICP-MS	0.00010	0.00010	Ni	0.00020	ICP-MS	0.00010	0.00010	0
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0
Pb	< 0.0001	ICP-MS	0.0001		Pb	< 0.0001	ICP-MS	0.0001		0
Ra226	0.030	Alpha Septroscopy	0.005	0.010	Ra226	0.030	Alpha Septroscopy	0.005	0.010	0
SO4	24.0	ICP-OES	0.2	2.0	SO4	25.0	ICP-OES	0.2	2.0	4
Se	< 0.0001	ICP-MS	0.0001		Se	< 0.0001	ICP-MS	0.0001		0
Sum of Ions	170	Calculated	1	20	Sum of Ions	172	Calculated	1	20	1
TDS	148.00	Gravimetric	5.00	10.00	TDS	142.00	Gravimetric	5.00	10.00	4
TSS	< 1.000	Gravimetric	1.000		TSS	< 1.000	Gravimetric	1.000		0
Temp-H20	12.0	Field			Temp-H20	12.0				0
U	213.000	ICP-MS	0.100	20.000	U	217.000	ICP-MS	0.100	20.000	2
Zn	< 0.001	ICP-MS	0.001		Zn	< 0.001	ICP-MS	0.001		0
pH-L	7.79	pH Meter	0.07	0.10	pH-L	7.86	pH Meter	0.07	0.10	1

TL-9 QA/QC Blind Samples

Greer Lake discharge at Beaverlodge Lake

Parent Field	Station: TL-9				Child Field	Station: Blind-4				
Date: 2015/06/30					Date: 2015/06/30					
Assigned: SRC Lab					Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	130.0	Acid Titration	1.0	30.0	Alk	129.0	Acid Titration	1.0	30.0	1
As	1.8	ICP-MS	0.1	0.4	As	1.7	ICP-MS	0.1	0.4	6
Ba	0.760	ICP-MS	0.001	0.080	Ba	0.760	ICP-MS	0.001	0.080	0
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0
Ca	22.0	ICP-OES	0.1	2.0	Ca	22.0	ICP-OES	0.1	2.0	0
Cond-F	330	Field			Cond-F	330				0
Cond-L	310	Conductivity Meter	1	10	Cond-L	308	Conductivity Meter	1	10	1
Cu	0.0014	ICP-MS	0.0002	0.0004	Cu	0.0013	ICP-MS	0.0002	0.0004	7
Fe	0.063	ICP-MS	0.001	0.006	Fe	0.050	ICP-MS	0.001	0.005	**23**
HCO3	159.0	Acid Titration	1.0	20.0	HCO3	157.0	Acid Titration	1.0	20.0	1
Hardness	79	Calculated	1	10	Hardness	79	Calculated	1	10	0
K	1.0	ICP-OES	0.1	0.2	K	1.0	ICP-OES	0.1	0.2	0
Mo	0.0100	ICP-MS	0.0001	0.0010	Mo	0.0100	ICP-MS	0.0001	0.0010	0
Na	35.0	ICP-OES	0.1	4.0	Na	35.0	ICP-OES	0.1	4.0	0
Ni	0.00050	ICP-MS	0.00010	0.00030	Ni	0.00050	ICP-MS	0.00010	0.00030	0
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0
Pb	0.0016	ICP-MS	0.0001	0.0004	Pb	0.0013	ICP-MS	0.0001	0.0003	**21**
Pb210	0.12	Beta Counting	0.02		Pb210	0.11	Beta Counting	0.02		9
Po210	0.100	Alpha Septroscopy	0.005		Po210	0.067	Alpha Septroscopy	0.005		**40**
Ra226	2.300	Alpha Septroscopy	0.020	0.200	Ra226	2.000	Alpha Septroscopy	0.005	0.200	14
SO4	24.0	ICP-OES	0.2	2.0	SO4	24.0	ICP-OES	0.2	2.0	0
Se	0.0059	ICP-MS	0.0001	0.0009	Se	0.0059	ICP-MS	0.0001	0.0009	0
Sum of Ions	254	Calculated	1	20	Sum of Ions	252	Calculated	1	20	1
TDS	190.00	Gravimetric	5.00	20.00	TDS	207.00	Gravimetric	5.00	20.00	9
TSS	< 1.000	Gravimetric	1.000		TSS	2.000	Gravimetric	1.000	1.000	**67**
Temp-H20	16.7	Field			Temp-H20	16.7				0
U	138.000	ICP-MS	0.100	10.000	U	138.000	ICP-MS	0.100	10.000	0
Zn	0.001	ICP-MS	0.001	0.001	Zn	0.001	ICP-MS	0.001	0.001	10
pH-L	7.91	pH Meter	0.07	0.10	pH-L	7.90	pH Meter	0.07	0.10	0

TL-6 QA/QC Blind Samples

Minewater Reservoir discharge

Parent Field	Station: TL-6				Child Field	Station: Blind-5				
Date: 2015/07/25					Date: 2015/07/25					
Assigned: SRC Lab					Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	362.0	Acid Titration	1.0	50.0	Alk	362.0	Acid Titration	1.0	50.0	0
As	5.9	ICP-MS	0.1	0.9	As	6.1	ICP-MS	0.1	0.9	3
Ba	1.190	ICP-MS	0.001	0.100	Ba	1.220	ICP-MS	0.001	0.100	2
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0
Ca	43.0	ICP-OES	0.1	4.0	Ca	43.0	ICP-OES	0.1	4.0	0
Cond-F	963	Field			Cond-F	936				3
Cond-L	887	Conductivity Meter	1	30	Cond-L	893	Conductivity Meter	1	30	1
Cu	0.0002	ICP-MS	0.0002	0.0002	Cu	< 0.0002	ICP-MS	0.0002		0
Fe	4.390	ICP-MS	0.001	0.400	Fe	4.470	ICP-MS	0.001	0.400	2
HCO3	442.0	Acid Titration	1.0	40.0	HCO3	442.0	Acid Titration	1.0	40.0	0
Hardness	161	Calculated	1	20	Hardness	161	Calculated	1	20	0
K	2.0	ICP-OES	0.1	0.3	K	2.0	ICP-OES	0.1	0.3	0
Mo	0.0004	ICP-MS	0.0001	0.0002	Mo	0.0004	ICP-MS	0.0001	0.0002	0
Na	140.0	ICP-OES	0.1	10.0	Na	140.0	ICP-OES	0.1	10.0	0
Ni	0.00040	ICP-MS	0.00010	0.00020	Ni	0.00040	ICP-MS	0.00010	0.00020	0
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0
Pb	0.0002	ICP-MS	0.0001	0.0001	Pb	0.0002				0
Ra226	6.700	Alpha Septroscopy	0.020	0.700	Ra226	11.000	Alpha Septroscopy	0.020	1.000	**49**
SO4	31.0	ICP-OES	0.2	3.0	SO4	31.0	ICP-OES	0.2	3.0	0
Se	0.0023	ICP-MS	0.0001	0.0003	Se	0.0022	ICP-MS	0.0001	0.0003	4
Sum of Ions	732	Calculated	1	70	Sum of Ions	732	Calculated	1	70	0
TDS	624.00	Gravimetric	5.00	60.00	TDS	613.00	Gravimetric	5.00	60.00	2
TSS	6.000	Gravimetric	1.000	2.000	TSS	4.000	Gravimetric	1.000	2.000	**40**
Temp-H20	13.7	Field			Temp-H20	13.7				0
U	83.000	ICP-MS	0.100	8.000	U	86.000	ICP-MS	0.100	9.000	4
Zn	0.001	ICP-MS	0.001	0.001	Zn	0.001	ICP-MS	0.001	0.001	12
pH-L	7.62	pH Meter	0.07	0.10	pH-L	7.66	pH Meter	0.07	0.10	1

TL-7 QA/QC Blind Samples
Minewater Reservoir discharge

Parent Field Station: TL-7 Date: 2015/06/30 Assigned: SRC Lab					Child Field Station: Blind-6 Date: 2015/06/30 Assigned: SRC Lab					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Alk	140.0	Acid Titration	1.0	30.0	Alk	139.0	Acid Titration	1.0	30.0	1
As	1.4	ICP-MS	0.1	0.4	As	1.4	ICP-MS	0.1	0.4	0
Ba	0.660	ICP-MS	0.001	0.070	Ba	0.660	ICP-MS	0.001	0.070	0
CO3	< 1.0	Acid Titration	1.0		CO3	< 1.0	Acid Titration	1.0		0
Ca	22.0	ICP-OES	0.1	2.0	Ca	22.0	ICP-OES	0.1	2.0	0
Cond-F	285	Field			Cond-F	285				0
Cond-L	320	Conductivity Meter	1	10	Cond-L	322	Conductivity Meter	1	10	1
Cu	0.0005	ICP-MS	0.0002	0.0003	Cu	0.0006	ICP-MS	0.0002	0.0003	18
Fe	0.069	ICP-MS	0.001	0.007	Fe	0.070	ICP-MS	0.001	0.007	1
HCO3	171.0	Acid Titration	1.0	20.0	HCO3	170.0	Acid Titration	1.0	20.0	1
Hardness	77	Calculated	1	10	Hardness	76	Calculated	1	10	1
K	0.5	ICP-OES	0.1	0.2	K	0.5	ICP-OES	0.1	0.2	0
Mo	0.0064	ICP-MS	0.0001	0.0010	Mo	0.0063	ICP-MS	0.0001	0.0009	2
Na	39.0	ICP-OES	0.1	4.0	Na	38.0	ICP-OES	0.1	4.0	3
Ni	0.00050	ICP-MS	0.00010	0.00030	Ni	0.00050	ICP-MS	0.00010	0.00030	0
OH	< 1.0	Acid Titration	1.0		OH	< 1.0	Acid Titration	1.0		0
Pb	0.0001	ICP-MS	0.0001	0.0001	Pb	0.0001	ICP-MS	0.0001	0.0001	0
Pb210	0.03	Beta Counting	0.02	0.02	Pb210	0.03	Beta Counting	0.02	0.02	0
Po210	0.010	Alpha Septroscopy	0.005	0.007	Po210	0.020	Alpha Septroscopy	0.005	0.010	**67**
Ra226	2.300	Alpha Septroscopy	0.020	0.200	Ra226	2.100	Alpha Septroscopy	0.005	0.200	9
SO4	24.0	ICP-OES	0.2	2.0	SO4	24.0	ICP-OES	0.2	2.0	0
Se	0.0016	ICP-MS	0.0001	0.0004	Se	0.0016	ICP-MS	0.0001	0.0004	0
Sum of Ions	266	Calculated	1	30	Sum of Ions	264	Calculated	1	30	1
TDS	204.00	Gravimetric	5.00	20.00	TDS	182.00	Gravimetric	4.00	20.00	11
TSS	< 1.000	Gravimetric	1.000		TSS	< 1.000	Gravimetric	1.000		0
Temp-H20	19.1	Field			Temp-H20	19.1				0
U	111.000	ICP-MS	0.100	10.000	U	112.000	ICP-MS	0.100	10.000	1
U	111.000	ICP-MS	0.100	10.000	U	112.000	ICP-MS	0.100	10.000	1
Zn	< 0.001	ICP-MS	0.001		Zn	0.001	ICP-MS	0.001	0.001	0
pH-L	8.00	pH Meter	0.07	0.10	pH-L	7.98	pH Meter	0.07	0.10	0

TL-7 QA/QC Duplicate Samples
Minewater Reservoir discharge

Parent Field	Station: TL-7				Child Field	Station: TL-7				
Date: 2015/06/30					Date: 2015/06/30					
Assigned: SRC					Assigned: Maxxam					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Pb210	0.03	Beta Method	0.02	0.02	Pb210	< 0.1	Becq Pb210			**108**
Po210	0.01	Alpha Septroscopy	0.01	0.01	Po210	0.03	Po-210			**100**
Ra226	2.3	Alpha Septroscopy	0.02	0.2	Ra226	2.17	Alpha Septroscopy			6
U	111.0	ICP-MS	0.1	10.0	U	120.0	ICP-MS			8

TL-9 QA/QC Duplicate Samples

Minewater Reservoir discharge

Parent Field	**Station: TL-9**				**Child Field**	**Station: TL-9**				
Date: 2015/06/30					**Date: 2015/06/30**					
Assigned: SRC					**Assigned: Maxxam**					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
Pb210	0.12	Beta Method	0.02	0.06	Pb210	0.25	Becq Pb210			**70**
Po210	0.10	Alpha Septroscopy	0.01	0.02	Po210	0.067	Po-210			**40**
Ra226	2.3	Alpha Septroscopy	0.02	0.2	Ra226	2.1	Alpha Septroscopy			9
U	138.0	ICP-MS	0.1	10.0	U	150.0	ICP-MS			8

TL-7 QA/QC Duplicate Samples
Minewater Reservoir discharge

Parent Field	**Station: TL-7**				**Child Field**	**Station: TL-7**				
Date: 2015/12/19					**Date: 2015/12/19**					
Assigned: SRC Lab					**Assigned: Maxxam**					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
As	1.2	ICP-MS	0.1	0.3	As	1.2				0
Ba	0.120	ICP-MS	0.001	0.010	Ba	0.120				0
Cu	0.0005	ICP-MS	0.0002	0.0003	Cu	0.0012				**82**
Fe	0.020	ICP-MS	0.001	0.003	Fe	< 0.100				**133**
Mo	0.0110	ICP-MS	0.0001	0.0010	Mo	0.0110				0
Ni	0.00060	ICP-MS	0.00010	0.00030	Ni	< 0.00100				**50**
Pb	0.0003	ICP-MS	0.0001	0.0001	Pb	< 0.0005				**50**
Ra226	2.300	Alpha Septroscopy	0.005	0.200	Ra226	1.360				**51**
Se	0.0020	ICP-MS	0.0001	0.0003	Se	< 0.0020				0
U	287.000	ICP-MS	0.100	30.000	U	280.000				2
Zn	< 0.001	ICP-MS	0.001		Zn	< 0.005				**164**

TL-9 QA/QC Duplicate Samples

Minewater Reservoir discharge

Parent Field	Station: TL-9				Child Field	Station: TL-9				
Date: 2015/12/19					Date: 2015/12/19					
Assigned: SRC Lab					Assigned: Maxxam					
Parameter	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**Parameter**	**Value**	**Method**	**Entered DL**	**Entered Uncertainty**	**% Absolute Difference**
As	1.2	ICP-MS	0.1	0.3	As	1.1				9
Ba	0.39	ICP-MS	0.001	0.040	Ba	0.410				5
Cu	0.0007	ICP-MS	0.0002	0.0003	Cu	< 0.0010				**35**
Fe	0.019	ICP-MS	0.001	0.003	Fe	< 0.100				**136**
Mo	0.0098	ICP-MS	0.0001	0.0010	Mo	0.0110				12
Ni	0.00050	ICP-MS	0.00010	0.00030	Ni	< 0.00100				**67**
Pb	0.0003	ICP-MS	0.0001	0.0001	Pb	< 0.0005				**50**
Ra226	2.1	Alpha Septroscopy	0.005	0.200	Ra226	1.350				**43**
Se	0.0026	ICP-MS	0.0001	0.0004	Se	< 0.0022				17
U	269.000	ICP-MS	0.100	30.000	U	280.000				4
Zn	0.001	ICP-MS	0.001	0.001	Zn	< 0.005				**157**

APPENDIX E

APPENDIX E

Table 1 provides the coordinates of exploration drill holes located to date within 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.

Table 1: Borehole Log - Beaverlodge Properties

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
Lower Ace	BH-001	641929.000	6604081.000	Flowing	2012
	BH-002	641956.000	6604091.000	Flowing	2011
	BH-003	641922.000	6604146.000	Flowing	2011
	BH-005	641966.000	6604143.000	Flowing	2011
	BH-006	641972.000	6604165.000	Flowing	2011
	BH-007	642090.000	6604218.000	Flowing	2011
	BH-009	641110.000	6604137.000	Flowing	2012
	BH-014	642168.000	6604158.000	Flowing	2011
	BH-15	642101.665	6604192.497	Dry/seep around	Scheduled for 2016
	BH-Seep	641932.000	6604142.000		2012
Ace-Verna	Ace 01	645193.055	6605813.101	Dry	Scheduled for 2016
	EXC 01	644740.299	6605272.359	Dry	Scheduled for 2016
Dubyna	DB 01	648069.018	6608350.909	Dry	Not located
	DB 02	648021.018	6608416.903	Flowing	2011
	DB 03	648010.017	6608430.961	Flowing	2012
	DB 04	648009.018	6608430.921	Dry	2013
	DB 05	648074.019	6608329.926	Dry	2013
	DB 06	648059.016	6608350.960	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
	DB 13A	647937.016	6608388.951	Dry	2013
	DB 14	647942.019	6608319.921	Flowing	2011
	DB 15	647912.017	6608307.923	Dry	2013
	DB 16	648002.017	6608424.960	Flowing	2012
	DB 17	647310.016	6608147.994	Dry	2013

Area	Designation	Coordinate System: WGS 84 UTM Zone 12		Status When Located	Year Remediated
		Easting	Northing		
Dubyna	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	Flowing	2011
	DB 26	647374.017	6608190.976	Dry	2013
	DB 27	647379.020	6608180.916	Dry	2013
Eagle	EG 01	640289.749	6607204.128	Dry	Scheduled for 2016
	EG 02	640322.527	6607209.033	Dry	Scheduled for 2016
	EG 03	640292.348	6607226.853	Dry	Scheduled for 2016
	EG 04	640328.697	6607263.213	Dry	Scheduled for 2016
	EG 05	640351.111	6607264.052	Dry	Scheduled for 2016
	EG 06	640486.081	6607170.013	Dry	Scheduled for 2016
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	6612306.940	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	6612340.940	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	6612278.930	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	6612161.970	Dry	2013
	HAB 32	645188.016	6612161.970	Dry	2013
	HAB 33	645184.017	6612166.942	Dry	2013
	HAB 34	645185.015	6612332.966	Dry	2013
	HAB 35	645170.015	6612318.896	Dry	2013
	HAB 36	645146.014	6612300.909	Dry	2013
	Hab 37	645635.866	6611795.114	Dry	Scheduled for 2016

Area	Designation	Coordinate System: WGS 84 UTM Zone 12		Status When Located	Year Remediated
		Easting	Northing		
	Hab 38	645957.616	6612503.136	Dry	Scheduled for 2016
	HAB 39	645944.833	6612429.845	Dry	Scheduled for 2016
	Hab 40 & 41	645134.075	6611789.562	2 holes/dry	Scheduled for 2016
	Hab 42 & 43	645047.948	6611855.227	2 holes/dry	Scheduled for 2016
	Hab 44	620185.770	7237167.323	Dry	Scheduled for 2016
Martin Lake	MC 1	638979.011	6604055.980	Dry	2013
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	Scheduled for 2016

*Recent exploration activity (Not Eldorado/Cameco)