BEAVERLODGE PROJECT

Cameco

Beaverlodge
2014 Annual Report

Year 29 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

April 2015

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SECTION 1.0
INTRODUCTION

SECTION 1.0

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, 2014 and December 31, 2014. 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 2014 are provided, along with an overview of anticipated activities planned for 2015.

SECTION 2.0

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, 2014 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 Commercial Officer	K.A. Seitz
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 G.M.S. Chad retired and was replaced by S. Quinn in 2014.

Board of Directors

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

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 ultimate goal for the management of 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 Background Information

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+ 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 and reclamation work was completed in 1985. Letters were issued by AECB indicating that the sites had been satisfactorily reclaimed (*MacLaren Plansearch, 1987*). Transition-phase monitoring was then initiated and continues today.

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 (Cameco) with shares of Cameco being traded on both the Toronto and New York stock exchanges.

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

2.4.1 The Beaverlodge Management Framework

The Beaverlodge Management Framework and supporting documents were developed in 2009 by the Joint Regulatory Group (JRG), which includes the CNSC, Environment Canada, the Department of Fisheries and Oceans Canada, and Saskatchewan Ministry of Environment, and Cameco. The intent of the Beaverlodge Management Framework is to provide clear scope and objectives for the management of the Beaverlodge properties and a systematic process for assessing site-specific risks to allow decisions to be made regarding the transfer of Beaverlodge properties to IC. The framework has been reviewed by public stakeholders, including the Environmental Quality Committees (EQC), as well as residents and leaders of the Uranium City community. A simplified version is provided below in Figure 2.4.1.

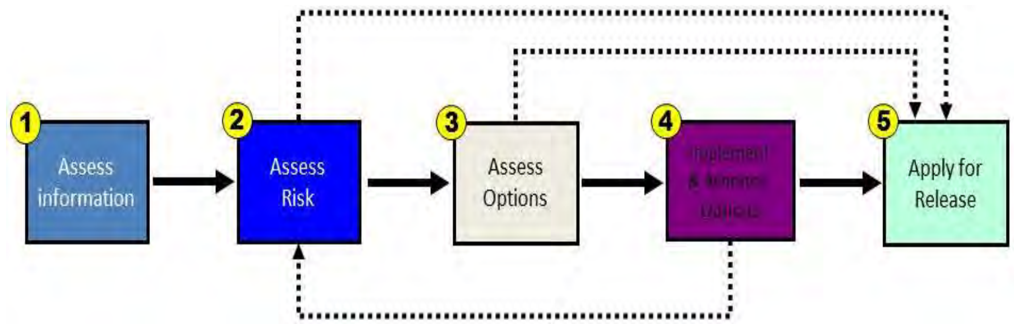

Figure 2.4.1 Simplified Beaverlodge Management Framework

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 2.4.1). 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 2.4.1). 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) in order to assess 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 2.4.1) and were instrumental in development of the path forward plan. The path forward plan describes specific remedial activities that are to be completed in the near term 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 2.4.1).

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 (IC) program for long term monitoring and maintenance (Box 5 of Figure 2.4.1).

To date, five Beaverlodge properties located in two satellite areas (Eagle and Emar) have been successfully transferred to the IC program.

2.4.2 Confounding Factors

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. These abandoned sites are the responsibility of the Province of Saskatchewan and are currently managed by Saskatchewan Research Council (SRC) and are in the process of being remediated.

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.

SECTION 3.0
SITE ACTIVITIES

SECTION 3.0

3.0 SITE ACTIVITIES

The performance of the decommissioned and reclaimed 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 reclamation 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 Canada (EC); and,
- Saskatchewan Ministry of Environment (SMOE).

There were no formal JRG meetings held in 2014. However, numerous JRG meetings were held informally throughout the year to discuss issues as they arose.

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

From July 14, 2014 to July 18, 2014, representatives from Cameco, the CNSC, and SMOE completed a compliance inspection of the decommissioned Beaverlodge properties.

The focus of the inspection was to provide a general overview of the properties and the remaining issues that may prevent the property from transferring 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 two recommendations:

1. *Cameco should create a more permanent means of identifying all of the crown pillar failures on site to better facilitate future inspections.*
2. *Cameco should investigate the small pond located adjacent to Pistol Lake to determine if there are any boreholes or other sources of contamination that can be practically remediated in or around the pond.*

A response to the recommendations and the steps Cameco would take to address the recommendations was provided to the regulatory agencies on September 22, 2014 *(Cameco, 2014)*.

In response to the first recommendation Cameco identified that locations of ground subsidence will be recorded permanently using a Global Positioning System (GPS) to facilitate follow up monitoring. In addition Cameco will work with a local contractor to develop and implement a method of effectively labeling the remediated areas. It is anticipated that these labels will be in place prior to June 30, 2015.

In response to the second recommendation Cameco committed to assessing the pond to determine the volume of water contained, collecting water samples to determine the concentration of various parameters of concern, and reviewing the results with the regulatory agencies to determine the path forward.

The small pond was investigated as part of the fall hydrology program. The "2014 Hydrometric Monitoring near Beaverlodge Mine" is attached to this report in Appendix B. A summary of the investigation, including photos and complete water quality results can be found on pages 45 and 46 of the report in Appendix B. Water quality results from the small pond indicated that polonium and lead-210 were elevated when compared to Pistol Lake, immediately downstream. Although the results were not at radiological equilibrium with uranium activity the results suggest that the small pond is likely fed in part from the underground workings or other nearby source.

3.1.2 Community Engagement and Consultation

3.1.2.1 Public Meetings

Three public meetings were held in 2014 to provide an overview to the residents of Uranium City and the Environment Quality Committee (EQC) regarding the completed activities, an update on the current condition of the Beaverlodge properties, as well as the outlook for future planned activities. Two of these meetings were held in Uranium City while the final meeting was held in La Ronge.

<u>June 16, 2014: Meeting to Discuss 2014 Activities (Uranium City, Saskatchewan)</u>

The purpose of this meeting was to discuss the 2014 activities for the Beaverlodge Decommissioned properties.

1. Outlined plans to re-establish Zora Creek flow between Zora and Verna Lakes to improve the water quality to Verna Lake. Cameco informed attendees the road will be inaccessible for general traffic at the Ace Lake

turnoff. Warning signs will be placed and access to the Bolger waste rock pile will be restricted with a locked gate.

2. Discussed the site-wide gamma radiation survey planned for the fall of 2014
3. Continue locating and assessing historical shaft caps on the Beaverlodge properties and prioritizing their replacement to ensure ongoing safety of the sites prior to transferring properties to the IC program.
4. 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.

3.1.2.2 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.

<u>February 26 – 27, 2014: EQC Meeting (La Ronge, Saskatchewan)</u>

Due to some recent turnover of EQC members a workshop titled “Uranium 101” was held in La Ronge on February 26 – 27, 2014. This all-EQC meeting was intended to familiarize the new members with uranium mining, water sampling, and other environmental issues.

A presentation specific to the Beaverlodge project was provided on February 26 describing the history and path forward for managing the site, with the goal of transferring the property to the IC program.

<u>October 8, 2014: EQC Meeting (La Ronge, Saskatchewan)</u>

During this EQC meeting a presentation was given on the Beaverlodge properties. This presentation included background information as well as current and future activities occurring on the site. The activities discussed included the re-establishment of Zora Creek, the site-wide gamma survey and assessment of Crown Pillars.

3.1.2.3 AWG Meetings

<u>December 12, 2014 (Prince Albert, Saskatchewan)</u>

At this AWG meeting, a presentation was given on the current and future activities occurring at the Beaverlodge sites. This included an update on the work to re-establish Zora Creek, the site-wide gamma survey, the Crown Pillar assessment and future remediation and monitoring activities.

3.1.3 October 1, 2014: CNSC Update Meeting (Ottawa, Ontario)

In 2013, the Commission granted Cameco a 10-year Waste Facility Operating Licence (WFOL) that would be 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.

In April 2013, during the Beaverlodge licence renewal hearing, the Commission requested the following information for the 2014 update meeting:

- Property by property timeline estimates for Institutional Control transfer eligibility; and
- Defined predicted performance objectives and actual performance indicators for each property.

Cameco responded to the above requests and also provided a status update of the work completed at the site to CNSC staff as they prepared Commission Member Documents (CMD 14-M60 and CMD 14-M60.A).

3.1.4 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. To accommodate the change in frequency of third-party inspections, an inspection of the delta and outlet structures is completed annually by Cameco personnel during the JRG visit using a checklist developed by Cameco and SRK Consulting. 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.

During July 15-17, 2014 Cameco and representatives of the CNSC and SOME conducted an annual inspection of the cover at the Fookes tailings delta and the two outlet spillways at Fookes and Marie reservoirs. This inspection represents the fourth year of internal inspections, with a formal inspection by a qualified engineer scheduled for 2015.

During the 2014 inspection, the condition of the Marie and Fookes Reservoir spillway channels was documented using photographic record. There were no immediate concerns noted at the Marie or Fookes Reservoir outlet structures and the structures appear to be functioning as designed.

The Fookes delta was inspected for evidence of tailings boils, tailings exposure, erosion of the cover, or any sand wash into the lake. In 2014, Fookes Reservoir water levels were higher than previous years and standing water was noted in the drainage areas of the delta indicating the water table was higher than in past years. Generally the cover was in good condition. There was some evidence that excessive water has flowed in the drainage channels during runoff events, however no evidence of significant erosion was observed. No tailings boils were identified on the cover despite the higher than normal water table. There was no evidence of new vehicular traffic on the delta since the berms located at the access points were repaired and reinforced. Although vegetation on much of the delta remains sparse it is well established within 50 m of the Fookes Reservoir shoreline, and the engineered drainage structures.

As a result of the standing water on Fookes Delta Cameco contacted SRK Consulting to assess whether or not these drainage areas were functioning as intended. SRK was able to perform a cursory inspection of the delta, and reviewed the cover design intents. SRK indicated that the drainage areas appear to be functioning as intended. This area was noted to be allowing excess water to be directed away from the main tailings area tailings area, and/ or towards Fookes Reservoir. The northern drainage ditch area was never designed to provide fully channelized flow to Fookes Reservoir. Instead the cover in this area was purposefully graded only to establish an overall preferential gradient towards Fookes Reservoir. Some ponding, in higher precipitation years, was expected and may be expected to occur in future years at this area. This ponding is not expected to compromise the constructed reverse filter and confining tailings cover.

Cameco has prepared a report on the geotechnical inspection with the results and photographic record included in Appendix C.

3.1.5 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 on 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.

As the Bolger Pit is currently being backfilled as a result of the Zora Flow Path Reconstruction project (see Section 3.2.5) it was not used in 2014 for disposal of industrial waste material.

In the future if there is a need for disposal of industrial waste Cameco will work with the regulatory agencies to develop an acceptable plan for disposing waste material in Bolger Pit.

3.2 2014 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 reclamation activites 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

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 following section describes some of the significant activities that were completed in 2014 to move the properties towards transfer to the IC program. A summary of the activities that were completed to advance reclamation at the Beaverlodge properties during the reporting period is provided below.

3.2.1 Site Wide Gamma Assessment

3.2.1.1 Surficial Gamma Radiation Survey

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. This risk assessment will help determine if and where remedial action may be required to support release of the properties to the provincial IC Program. 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.

The field survey was conducted from September 12 to October 3, 2014. Gamma radiation levels were measured throughout seven survey unit areas on the Beaverlodge site: Dubyna, Hab, Verna/Bolger, Lower Ace Creek, the Tailings Management Area, Martin Lake Adit and the 12 Zone Pit Area (see Figure 2.4). Four reference areas were also included in the survey to assist in determining background gamma radiation levels in the region. To conduct the field survey, GPS Integrated Gamma Radiation Survey measurement systems were employed. The study was conducted using both walking surveys and ATV surveys depending on terrain and vegetation cover. After the completion of the field survey the data was averaged on a 10 m by 10 m basis, mapped and summarized to characterize the current gamma radiation levels present in the area *(ARCADIS SENES 2014)*.

Where the results of the gamma survey meet the radiation guidance provided by the Province of Saskatchewan the results will be used to support the transfer of the properties to the IC program, once all other performance objectives are met. Where the gamma survey results are above the guidance provided by the Province of Saskatchewan, Cameco will develop site specific gamma radiation criteria based on reasonable use scenarios, and take remedial action where required to ensure members of the public do not exceed the public dose limit as a result of activities conducted on the Beaverlodge properties.

A report detailing the survey methodology and results was prepared by SENES Consultants in November 2014 and submitted to regulatory agencies on December 2, 2014.

3.2.1.2 Public Consultation on Land Use

SENES Consultants and Kingsmere Resources Services conducted a study for Cameco and Saskatchewan Research Council (SRC) in December of 2014. The purpose of the study 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 study 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. Sixty two percent of the households in Uranium City participated in the study.

The study concluded that Lorado and Lower Ace Creek were the most frequented SRC and Cameco managed sites in the area for any type of land use (including travel). The Beaverlodge specific area used most frequently by the participants for non-travel use was Lower Ace Creek. The relatively frequent use of this site was mainly due sightseeing, as the waste rock pile affords a lookout over Beaverlodge Lake.

When estimating the reported maximum time spent on each area a conservative approach was used, looking separately at occupational and recreational land uses. 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.

The results of this study can be used to inform the decision-making process regarding additional remediation to control gamma exposure by incorporating a risk based approach through assessment of site-specific gamma exposures using realistic land-use scenarios (*ARCADIS SENES & Kingsmere Resource Services, 2015*).

3.2.2 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 eroded and a long term solution was needed to permanently secure this settled area. The area remains fenced off and residents were notified of the instability of the ground 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. The investigation’s purpose was to assess the potential for crown pillar collapses which could jeopardize the safety of those who frequent the areas. After SRK Consulting completed a preliminary geotechnical desktop assessment supplemented with site GPR surveys, it was recommended that diamond core drilling be completed at the Ace Mine site area. This drilling investigation was undertaken in late 2014 and a final report will be submitted to Cameco in May 2015.

3.2.3 Shaft Cap Assessment

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. All horizontal and vertical openings are currently capped. 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 caps through a search of historical records and a ground search for vertical mine openings on the Beaverlodge properties. The purpose of this assessment is to locate as many of the sealed openings as possible, assess their condition, and consider the ease of public access, to develop a plan and schedule for replacing the caps over the current license period.

In total 18 caps have been identified and assessed during this program to date. Work to locate the remaining caps is planned to continue in 2015.

3.2.4 Beaverlodge Borehole Decommissioning

A search of drilling records and site verification was completed in 2011, which resulted in numerous boreholes being identified and sealed in 2013. Any boreholes discovered during final property inspections will be tagged and sealed prior to the property being proposed for transfer to the IC program.

Two additional boreholes were discovered during the regulatory inspection in July 2014. The boreholes were located well above the regional water table and showed no evidence of past flowing conditions. Cameco is planning to seal these boreholes in 2015.

3.2.5 Zora Flow Path Reconstruction

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 currently spans 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, currently flows through the base of the waste rock pile and its flow is intermittent.

SRK Consulting was contacted by Cameco to design and construct an excavation through the Bolger Waste Rock Pile to remove the waste rock in contact with Zora Creek and re-establish the Zora Creek flow path. 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.

In 2014, SRK Consulting completed preliminary characterization construction activities, with a focus on the physical and chemical characterization of the waste rock pile to verify assumptions in design and in the model predictions. Following a site kick off meeting June 15th, the primary construction activities took place between June 17th and June 30th. Using GPS a ground survey of the existing waste rock pile was completed. In addition a Ground Penetrating Radar (GPR) geophysics survey was completed prior to kick off the 2014 characterization work. Following these initial surveys the primary contractor (Uranium City Contracting (UCC)) began to work on the bulk waste rock excavation and backfilling of the Bolger pit. The focus of this 2014 characterization work was to gather more information near the west and central areas of the Bolger pile; where the waste rock was expected to be the thickest, and where the most uncertainty about the location of bedrock below the pile existed.

Due to other projects occurring concurrently in Uranium City in the summer of 2014, UCC was required to stop work at the Bolger site around the beginning of July 2014. In total 1270 (30 ton truck) loads were hauled as part of the 2014 characterization work between June 18th and June 30th. This represents approximately 12 to 15% of the total estimated waste rock excavation requirement for the Zora Flow Path Reconstruction. All waste rock was short hauled to the Bolger Pit (less than 1km away) and placed in the base of the pit as backfill.

In October 2014, the decision was made to complete some additional test pit characterization and waste rock sampling at the Bolger Pile. In total, six 20 liter samples of waste rock were collected as part of the 2014 characterization activities. All six bulk rock samples that were collected as part of the 2014 work were shipped to the SRC laboratory in Saskatoon for geochemical testing. This testing is now underway and is expected to be completed in the spring of 2015 (*SRK Consulting, 2015)*.

Reconstruction of the Zora Flow Path is planned to resume in the spring of 2015.

SECTION 4.0

ENVIRONMENTAL MONITORING PROGRAMS

SECTION 4.0

4.0 ENVIRONMENTAL MONITORING PROGRAMS

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

4.1 Site Specific Objectives

4.1.1 Historic Close-Out Objectives

In 1982 Eldorado Nuclear Limited submitted a document which described their approach to decommissioning and reclamation of the Beaverlodge site (*ENL, June 198*2). This document included proposed Close-Out Objectives (COOs). The AECB then issued close out requirements and objectives specific to the close-out of the Beaverlodge operation (*AECB, 1982*).

As indicated in Section 2.3.3 of Volume 5, *Plan for the Close-Out of the Beaverlodge Site*, (*ERL, 1983*) it was predicted that at Station TL-7, radium-226 (^{226}Ra) and total dissolved solids (TDS) would not meet the COOs at any point in the foreseeable future and uranium (U) concentrations were expected to meet the COOs only in the long term (i.e. >200 years).

It is generally recognized that the original COOs are no longer relevant to the management of the Beaverlodge site due to the acknowledgement that the remaining objectives, discussed above, would not be achieved in the foreseeable future. In addition, changing expectations and scientific knowledge have resulted in re-assessing human health and ecological risk posed by the Beaverlodge site. As a result, the 2013 annual report was the final year with comparisons to COOs. Present and future annual reports detail water quality comparisons made against the site specific water quality predictions developed in the Beaverlodge Quantitative Site Model (*SENES 2012*), as outlined in Section 4.1.2.

4.1.2 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 max and min bounds every year, some trends were beginning to take shape that initiated an evaluation of the factors contributing to the anomalous results.

It is believed that the trends observed in recent years (2010 to 2014) 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 max and min 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. Max and min flows for modeling purposes were generated based on regional annual precipitation data for the period from 1983 to 2010. Overall, the max and min 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 2014 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 2014 period where the annual average ranged from 1.1% to 233% of the 1980 to 2014 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 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 SSWQOs will be made and if the data shows a stable trend below the SSWQOs, no detailed discussion will be provided. If the data is above the SSWQOs a comparison to the SOE modelled predictions will be made (*Saskatchewan Environment, 2006*). 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. Gamma surveys since then have since been 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.

In 2014 only two routine environmental monitoring programs continue:

1. water quality, and
2. ambient radon.

Sections 4.3 to 4.8 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 changes 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.

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 SSWQO 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 SSWQO 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 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 SSWQOs, additional discussion comparing to model predictions are not provided.

The detailed water quality results for the current reporting period, January 2014 to December 2014, are provided in Appendix A.

4.3.1 Ace Creek Watershed

AN-5

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 2014 with only four samples collected due to lack of water flow in January and March.

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 2009 to 2014 are presented in Table 4.3.1-1.

Uranium values have shown a distinct seasonal fluctuation, with the highest concentrations occurring in the winter months while late spring to late fall yielding lower values. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning. Based on the modelled predictions, concentrations of U are lower than the predicted minimum in 2013 and 2014. Uranium values throughout the year varied in magnitude between 41 µg/L and 321 µg/L with an average concentration of 119 µg/L.

The long-term trend for ^{226}Ra has shown a gradually increasing trend with fluctuation in year to year average measured activity. As shown in Appendix A seasonal fluctuation varied in magnitude between 0.370 Bq/L and 0.910 Bq/L in 2014 resulting in an average ^{226}Ra measured activity of 0.655 Bq/L. This value represents a decrease from the 2013 value of 0.928 Bq/L.

Se values at AN-5 are consistently below SSWQO, the annual average concentrated noted in 2014 was 0.0001 mg/L.

Similar to U and Ra-226, TDS concentrations exhibit seasonal fluctuation that affects the annual average; however, the long-term trend has remained relatively consistent. The 2014 annual average concentration for TDS reported a decrease from the 2013 value.

DB-6

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 five samples collected. The one sample missed was due to a lack of flow at DB-6 in November 2014.

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 2009 to 2014 are presented in Table 4.3.1-2.

Uranium concentrations at DB-6 have shown a consistent decreasing trend in the long term. The average U concentration decreased from 184.2 µg/L in 2013, to 169.0 µg/L in 2014. Three flowing boreholes identified along the shoreline of Dubyna Lake were plugged in 2011 and 2012 in an effort to reduce loadings to Dubyna Lake. Since plugging the boreholes the U concentrations at DB-6 have shown a marked improvement. This trend will continue to be monitored in the future. In 2014, U has been trending within the upper and lower bounds of the modelled predictions.

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

Selenium experienced a decrease in concentration in 2002 and has remained relatively stable since 2004. The water quality trend for Se has also remained below the SSWQO since 2003.

The TDS trend has been relatively consistent since decommissioning.

AC-6A

AC-6A is located at a culvert between Verna Lake and Ace Lake (Figure 4.3). Water quality monitoring at this station began in May 2010; however, due to low flows only the May 2010 sample was able to be collected. The station was dry in 2011 and no water samples were able to be collected or analyzed. Flow resumed in 2012 and all scheduled samples were collected that year. Four water samples were scheduled for AC-6A in 2014, although two samples were collected throughout the year. Samples were not collected in August and September of 2014 due to issues with a beaver plugging the culvert, causing backwater conditions.

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 2014 are presented in Table 4.3.1-3. Detailed results discussed below are provided in Appendix A.

In 2014, the annual average U concentration was within the upper and lower bounds of the modelled predictions at station AC-6A.

The annual average ^{226}Ra measured activity in 2014 reported higher values than in 2013. 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 SSWQO of 0.001 mg/L.

TDS has remained relatively stable at this station since 2004.

AC-8

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 2014.

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 2009 to 2014 are presented in Table 4.3.1-4.

The long-term trend for U concentration has been relatively stable, following a slightly decreasing trend since decommissioning. Since 2012, the annual average U concentration has been below the SSWQO.

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

Selenium concentrations are well below the SSWQO.

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

AC-14

AC-14 is located in Lower Ace Creek at the discharge into Beaverlodge Lake (Figure 4.3). All twelve of the scheduled samples were collected in 2014.

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 2009 to 2014 are presented in Table 4.3.1-5.

Uranium concentrations at station AC-14 have been experiencing a downward trend since decommissioning. In 2014, the U concentration was within the upper and lower bounds of the modelled predictions at this station.

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

Since 2001, Se concentrations have been at or below the SSWQO 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 well since this station was not impacted by historic mining activities.

Additional graphs for uranium and selenium are provided for select stations within the TMA to provide an expanded view of the most recent data along with the modelled predictions.

AN-3

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. Due to low flows in the region, samples were not able to be collected in 2010 or 2011. The 2014 sample was collected as scheduled in September.

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 2008 to 2014 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 SSWQOs. Selenium concentrations at AN-3 have been at or below the detectable laboratory limits since routine analysis began in 2000.

TL-3

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. All four scheduled samples were collected in 2014.

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 2009 to 2014 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. Uranium also showed a decrease in the annual average concentration from 372.0 µg/L in 2013 to 316.8 µg/L in 2014. This value measured in 2014 is below the lower bound for the modelled predictions.

The long-term trend for ^{226}Ra has been slowly increasing since 1988. 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 2014, ^{226}Ra activity was within the upper and lower bounds of the modelled predictions.

In the long-term Se has been slowly decreasing in concentration since decommissioning. In 2014, Se measured a value below the lower bounds of the modelled predictions at TL-3.

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

TL-4

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 2014.

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 2009 to 2014 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 2014, U has shown a concentration below the minimum range 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 2014, ^{226}Ra activity was slightly above the maximum range of the modelled predictions.

Selenium has shown a slow and steady reduction over time and has a concentration below the lower bound of the modelled prediction in 2014.

TL-6

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.

A historical summary of annual average ^{226}Ra activity and U, TDS and Se concentrations at TL-4 is presented in Figures 4.3.2-17 to 4.3.2-20. The annual averages from 2009 to 2014 are presented in Table 4.3.2-4. Modelled predictions were not generated for TL-6.

This water station generally exhibits ephemeral flows. As a result, only one sample was collected in 2010, with no water collected in 2011. Four samples were collected in 2012, while only one of the scheduled samples was able to be collected in 2013. Due to the lack of flow in September, two of the three scheduled samples were collected in 2014.

Since decommissioning, U has been experiencing a decreasing trend at station TL-6. Uranium concentrations have varied considerably throughout the year ranging from 121.0 µg/L to 448.0 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.

Monitoring of Se at TL-6 was initiated in 1996, with concentrations fluctuating until 2004. The short-term trend for Se concentrations has stabilized in recent years.

Similar to U, TDS has also experienced a downward trend post-decommissioning.

TL-7

TL-7 is located at the discharge of Meadow Fen (Figure 4.3) in the BTMA. Of the twelve scheduled samples for the 2014 reporting period, eleven samples were collected due to ice build-up hindering water flow at the station in December.

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 2009 to 2014 are presented in Table 4.3.2-5.

Since decommissioning, U and TDS have been experiencing a downward trend in the long-term concentrations, while ^{226}Ra is experiencing an upward trend. The annual average U concentration at TL-7 in 2014 is below the lower bound of the modelled predictions. The increasing ^{226}Ra trend is similar to what has been seen in upstream stations.^{226}Ra currently remains within the upper and lower bounds of the modelled predictions.

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

TL-9 is located downstream of Greer Lake 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. There had not been water flowing at TL-9 from June 2010 to May 2012. Due to the lack of water flow in November and December of 2014, ten of twelve scheduled samples were collected during this reporting period.

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 4.3.2-27 to 4.3.2-32. Average concentrations at TL-9 from 2009 to 2014 can be found in Table 4.3.2-6.

The long-term trend for U at TL-9 has shown a decrease in concentration following decommissioning. Concentrations in the short term have been relatively stable, with a decrease in U from 289.2 µg/L to 267.8 µg/L, between 2013 and 2014. Compared to the modelled predictions, in 2013 and 2014 U concentrations were measured below the predicted range.

Since 1990, ^{226}Ra has been experiencing an overall upward trend in radium activity despite the occasional fluctuations over the past twenty years. Although the average activity of ^{226}Ra in 2014 was lower than the value in 2013; the average activity remained above the upper bound concentration in the modelled predictions.

Routine monitoring of Se at TL-9 was not conducted until 1996 at which time it was identified as a contaminant of concern. Selenium is another parameter at station TL-9 that has shown a decreasing trend over the long term. In both 2013 and 2014 Se has been below the lower bounds of the modelled predictions.

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 237.3 mg/L in 2013 and has decreased to 210.3 mg/L in 2014.

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

BL-3 is located in Fulton Bay of Beaverlodge Lake, approximately 100 m from the Fulton Creek discharge (TL-9) (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 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 2004-05 in order to better assess the conditions in Beaverlodge Lake. During the 2014 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 2009 to 2014 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 Se has fluctuated slightly around 0.003 mg/L.

^{226}Ra 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, with slight fluctuations, since 2001.

BL-4

Station BL-4 is located in the approximate center of the north end of Beaverlodge Lake (Figure 4.3). The sample is collected as a 3-depth composite sample. The sampling frequency was increased from semi-annual to quarterly in 2004-05 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.

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 2009 to 2014 are presented in Table 4.3.32.

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 2014 was 135.0 µg/L, while ^{226}Ra activity and TDS concentrations were 0.025 Bq/L and 145.0 mg/L, respectively. Annual average radium-226 activity remains below the SSWQO of 0.11 Bq/L.

Selenium concentrations have fluctuated over the long term; however, the short-term trend has been more consistent.

BL-5

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. As a result, there is only data point from 2011 to the present reporting period. All four scheduled samples for 2014 were collected.

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 4.3.3-9 to 4.3.3-12. The annual averages from 2011 to 2014 are presented in Table 4.3.3-3.

The 2014 annual average concentrations for U and Se were measured at 139.8 µg/L and 0.0027 mg/L. Both U and Se had values in 2014 fall within the upper and lower bounds of the modelled predictions.

Radium-226 was measured at 0.028 Bq/L in 2014 which is below the corresponding SSWQO of 0.11 Bq/L.

Total Dissolved Solids concentrations at station BL-5 have remained relatively stable since measurements began in 2011.

ML-1

Station ML-1 is located at the outlet of Martin Lake and was implemented in the revised water sampling program in January 2011 to measure water quality downstream of Beaverlodge Lake. Four samples were collected at ML-1 in 2014,

A table comparing the average concentrations for all measured parameters from 2011 to 2014 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.

For the 2014 reporting period, the average U concentration was 57.8 µg/L. The annual average ^{226}Ra activity was below the SSWQO, measured to be 0.012 Bq/L. The average

Se concentration was equal to the SSWQO of 0.001 mg/L; while the average TDS concentration was 117 mg/L for the reporting year. Discussion of trends is not yet appropriate since there is currently a limited dataset.

CS-1

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 2014.

A table comparing the annual concentrations for all measured parameters from 2011 to 2014 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 63 µg/L in 2014, which was a slight decrease from 67 µg/L measured in 2013. Both Se concentration and ^{226}Ra activity had values at or below their respective SSWQOs; Selenium measured a value of 0.001 mg/L and ^{226}Ra measured a value of 0.006 Bq/L. Total Dissolved Solids increased slightly from a concentration of 111 mg/L in 2013 to 119 mg/L in 2014.

CS-2

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 is newly implemented and therefore data is available from 2011 to 2014. There was one sample collected at CS-2 in 2014.

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 below their respective SSWQOs at this station. In 2014 U was measured to be 1.6 µg/L while TDS was measured at a value of 54 mg/L. The ^{226}Ra activity and Se concentrations were 0.005 Bq/L and 0.0001 mg/L respectively.

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 Province of Saskatchewan's Institutional Control 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 diversion would reduce contact between Zora Creek and the Bolger waste rock pile in which it currently flows through before reaching Verna Lake (Figure 4.4).

Regular 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 where flow is sufficient for sample collection. 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.

In 2014, there were five water samples collected for both ZOR-01 (upstream) and ZOR-02 (downstream). When comparing upstream to downstream results, the downstream U, ^{226}Ra, Se and TDS all had annual averages well above those measured at ZOR-01. However, the annual averages at ZOR-02 all showed a decrease in 2014 when compared to 2013 data.

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. Becquerel/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 manager to investigate the discrepancy and determine if corrective action is warranted.

In May there are two scheduled blind samples, Blind-1 was collected successfully and Blind-2 could not be collected due to an inability to access to the sampling area. The Blind-1 water sample was sent to SRC for analysis. 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*(MAX-MIN)/MEAN

When the results from Blind-1 were compared with AC-14 the results were found to be within acceptable variation, with Index of Precision (IOP) values below 100% and thus did not require further investigation. However, field conductivity had a % difference of 694.6 and an Index of Precision of 155%. This is believed to be caused by an error made while recording temperature and conductivity data during sampling. As a result, these field values have been removed from the dataset for AC-14 and Blind-1.

In June lab duplicates were sampled and sent to Becquerel labs. All values were compliant with the exception of ^{210}Pb which had a % difference of 550.0 with an IOP of 146.67% at station TL-7 and % difference of 333.3 with an IOP of 124% at station TL-9. Becquerel lab was notified and acknowledged the error and initiated a Non-systemic Corrective Action Report (NSC) and a revised report was issued. An NSC is an internal report used by Becquerel to identify and correct a non-systemic issue and involves a detailed investigation and measures to eliminate recurrence.

Blind samples for TL-7 and TL-9 (Blind-6 and Blind-4 respectively) were collected in June 2014. A primary quality check was completed to compare these blind sample results with the SRC results for TL-7 and TL-9. All results reported within acceptable variation. The Blind-4 and Blind-6 samples were also compared to the corresponding station data received from Becquerel lab. All values were compliant with the exception of Pb-210 (see explanation above).

QA/QC reports for May, June and July are presented in Appendix D.

In July blind samples were collected as scheduled for AC-6A (Blind-3) and TL-6 (Blind-5) and sent to SRC for analysis. A Quality Check was performed and all values were compliant. In December the scheduled sample at station TL-9 was unable to be collected due to lack of flow and station TL-7's blind sample was not collected due to a sample scheduling error.

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 to calculate the loadings from the TMA.

Loadings calculations were made during the preparation of decommissioning documents to estimate loadings during the final years of operation and at shutdown. A close-out objective was established stating "annual radioactive and non-radioactive contaminant loadings to the environment would not be greater after close-out than those which occurred during operations" *(Eldorado, 1983).* Historically, loadings have been compared to the Operational benchmark established in 1983, however following development of the Beaverlodge Path Forward report (*Cameco 2012*) and an extensive assessment of potential remedial options for the Beaverlodge properties it was determined that no remedial option considered would materially improve the recovery time or reduce the risk to receptors in Beaverlodge Lake.

Following development of the Path Forward report (*Cameco 2012*) it was determined that comparisons to the original close-out objectives were no longer relevant and that comparisons to the predicted water quality made in the Path Forward report would be used to assess recovery associated with the Beaverlodge properties.

As a result, comparisons to Operational loadings are no longer presented in the annual report. Starting with the 2014 Annual Report comparisons will be made to the 5-year average loadings from both Ace Creek and Fulton Creek drainage systems as well as the total sum of the loadings to Beaverlodge Lake. Hydrological Data and Loading Calculations

McElhanney Consulting Service Ltd. 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, 2014 to December 31, 2014. The report can be found in Appendix B.

Precipitation was higher than average in 2014, which resulted in some of the highest flows on record at the two primary flow monitoring stations. At AC-8, the spring runoff flow values measured in May and June was the highest in the 35 years of records available. The average May stream-flow discharge at AC-8 was 2224 L/s with a maximum daily average of 2882 L/s measured on May 22, 2015. The average June streamflow discharge at AC-8 was 2344 L/s with a maximum daily average of 3002 L/s measured on June 7, 2015. The mean annual flow for 2014 (643 L/s) calculated using the daily average flow data, was higher than the mean long term flow average of 480 L/s, calculated using flow data from 1980 to 2014.

The 2014 flow rates at TL-7 were the second highest recorded since 1980. The mean annual flow for 2014 was 40.7 L/s; which is above the mean long term flow average of 17.4 L/s, calculated using average flow data from 1980 to 2014.

Total loadings of U, ^{226}Ra, Se and TDS are calculated using the monthly water quality monitoring data for AC-14 and TL-7 along with the corresponding average monthly flow data for Ace Creek and Fulton Creek. The total loadings from the former Eldorado properties to Beaverlodge Lake are calculated by adding both Ace Creek and Fulton Creek loadings, for each parameter.

Total environmental loadings of U, ^{226}Ra, TDS, and Se to Beaverlodge Lake from TL-7 and AC-14 in 2014 have been calculated and are reported in Tables 4.6.2–1 and 4.6.2–2 respectively. As a result of the extremely high flows measured in 2014 the total loading values for all parameters were elevated when compared to recent years.

4.7 Air Quality

This section presents a summary of the results of historic and on-going radon monitoring at ten 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, and
- Uranium City.

Track-etch cups were set out at ten stations in the Beaverlodge area from January 2014 to July 2014 then again from July 2014 to January 2015. Table 4.7.1 presents a summary of the radon monitoring conducted at the ten sites for the 2014 monitoring period and compares it to the previous six 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 and Figure 4.7.1-2 compares the most recent seven years of data to operational levels.

4.8 Five-Year Inspection of the Marie Reservoir Outlet structure and the Fookes Delta and Outlet Structure

Annual inspections of the Marie and Fookes Reservoir outlet structures and Fookes Delta are completed by Cameco during the JRG inspection and the results are provided in Appendix C of this document. The next third-party inspection of Marie and Fookes Reservoir outlet structures and the Fookes Delta will occur in 2015.

SECTION 5.0
OUTLOOK

SECTION 5.0

5.0 OUTLOOK

This section of the report describes those tasks and activities planned for 2015.

5.1 Regular Scheduled Monitoring

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

- water;
- radon in air;
- regional hydrology; and,
- 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 5.4.7.

5.2 Planned Public and AEQC 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 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.

The schedule provided during the CNSC annual update to the Commission in October 2014 identifies that application will be made to transfer 15 Beaverlodge properties to the Province of Saskatchewan IC Program in 2015. In addition, implementation of the Zora Creek flow path reconstruction will continue in 2015. As a result, it is anticipated that the annual regulatory inspection will focus on the activities related to these projects.

As discussed in Section 4.8 inspections of the Marie and Fookes Reservoir outlet structures and Fookes Delta cover are completed annually by Cameco during the JRG inspection. The results of the inspection are provided in Appendix C. The next scheduled third party inspection of these areas is 2015.

5.4 2015 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 following section describes some of the significant activities that will be occurring in the upcoming years to move the properties towards transfer to the IC program.

5.4.1 Integrated Receiving Environment Monitoring Program (REMP)

Cameco and the Saskatchewan Research Council (SRC) are collaborating to develop a regional monitoring program to assess chemical and biological conditions in the aquatic environments receiving input from not only the Beaverlodge properties, but the regional contribution of contaminants by neighbouring sites including the Gunnar, Lorado, and various other satellite sites. A long-term framework was developed by Minnow Environmental Inc. in 2013 and regulatory comments were addressed in 2014.

Cameco and SRC are working with Minnow Environmental Inc. to develop a detailed study design that we will provide to the CNSC and SMOE for review and comment prior to implementation of the initial round of sampling, which is anticipated to occur in 2016.

It is planned that the REMP will be implemented in the near-term by Cameco and SRC, and will eventually transfer to the Province. The intent of the program is to ensure that long term regional monitoring will be in place prior to properties being transferred into the IC program, and provides a framework for the continued monitoring following transfer.

The framework includes criteria that will be used to assess whether additional monitoring or investigation is required, as well as whether monitoring for a particular area can be stopped. This criterion relates to the contaminants, receptors, and exposure pathways associated with potential mine-related effects. Decisions to alter the monitoring program would be based on the magnitude of measured effects, the predicted risks to human health or aquatic biota, and the degree of inherent uncertainty involved.

Once an acceptable criterion is met at a specific location, monitoring of that component would no longer be necessary. The REMP would discontinue once all criteria is met at all locations and receiving environment conditions are considered to be acceptable.

5.4.2 Preparation of Documentation to Support Transfer of Properties to IC Program

In the schedule provided during the CNSC annual update to the Commission in October 2014 Cameco identified that application will be made to transfer 15 Beaverlodge properties to the Province of Saskatchewan IC Program in 2015.

To meet that schedule Cameco will put together the required documentation to support these properties being released from the SMOE requirement for Decommissioning and Reclamation and exemption from CNSC licensing, making them eligible for transfer to the IC program. A final inspection of these properties will be completed in May and June 2015 and any remaining issues that may prevent the properties from being transferred to the IC program will be addressed.

5.4.3 Gamma Risk Assessment

As discussed in Section 3.2.1, following completion of the site wide gamma survey, Cameco worked with SENES and Kingsmere Resources to conduct a survey of local land use in the Uranium City area. Cameco has provided the results of the site-wide gamma survey to the regulatory agencies and is planning to submit the results of the Public Consultation on Land Use report in April 2015.

The information gathered in these two studies will be used to evaluate the risk of gamma exposures at the Beaverlodge properties. For the sites that are above the provincial reclamation criteria, site specific gamma criteria will be developed using measured values and realistic land use scenarios to ensure members of the public do not exceed the public dose limit from gamma exposure from the Beaverlodge properties.

A gamma risk assessment will be used to determine if additional site specific remediation is warranted based on the site specific criteria. If it is determined that additional remediation is warranted, a detailed gamma survey of the licensed properties will be performed following implementation of the remediation to confirm the results prior to transferring properties to the IC program.

5.4.4 Crown Pillar Assessment

The results of the site wide crown pillar investigations outlined in Section 3.2.2 are currently being compiled in a report which will assess the potential risk associated with the crown pillars of all the Beaverlodge properties. This report is expected to be completed by May 2015 and will identify potential remedial options and a recommended path forward to address the risk of a crown pillar failures on the Beaverlodge properties.

5.4.5 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 Shaft Cover Assessment

In 2015 Cameco will continue to locate and assess all vertical mine caps (raises and shafts) and develop a plan and schedule to replace the current caps with an engineer designed and stamped cover, with appropriate documentation to facilitate the properties transfer to the IC program. The timing of cap replacement will be prioritized based on an assessment of condition and potential risk.

In addition Cameco is assessing various options for replacing the existing caps. Currently the options identified are long-lived (ie. >200 year) concrete caps, which contain a long lasting concrete mix and stainless steel rebar versus stainless steel caps, which have been installed at other locations near Uranium City.

5.4.7 Implementation of the Zora/Verna flow path reconstruction

As outlined in the Beaverlodge Path Forward Report (*Cameco, 201*2), Cameco plans to re-establish the ephemeral flow path from Zora Creek into Verna Lake by excavating a channel through the Bolger waste rock pile. The Bolger waste rock pile currently impedes that flow path, which is traveling through the base of the waste rock pile and contributing a contaminant load to Verna Lake. This remedial option is predicted to have a measureable benefit to the water quality in Verna Lake and meets the standard of good engineering practice.

As discussed in Section 3.2.5 the 2014 work on the flow path reconstruction was limited to characterization work, with only 12 to 15% of the waste rock being relocated to Bolger Pit. Cameco anticipates that this project will continue in 2015 as additional resources have been made available in the area to perform this work.

SECTION 6.0
REFERENCES

SECTION 6.0

6.0 REFERENCES

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TABLES

TABLES

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

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	195	313	260	235	232	216	4
pH-L (pH Unit)	7.66	7.6	7.51	7.61	7.59	7.65	4
TSS (mg/L)	2	2.17	4.75	1.2	3	1.25	4
Major Ions							
Alk-T (mg/L)	88.2	145.3	115.3	105.4	105.8	102.8	4
Ca (mg/L)	27	43	35.8	33.6	33.6	29.8	4
Cl (mg/L)	0.74	1.68	1.25	1.08	0.8	0.7	4
CO3 (mg/L)	1	1	1	1	1	1	4
Hardness (mg/L)	95	150	125	116	115	103	4
HCO3 (mg/L)	107.8	177.7	140.5	128.6	129.2	125.5	4
K (mg/L)	1.4	2	1.7	1.5	1.5	1.1	4
Mg (mg/L)	6.7	10.3	8.7	7.8	7.6	7	4
Na (mg/L)	3.2	6	4.8	4.2	4	3.4	4
OH (mg/L)	1	1	1	1	1	1	4
SO4 (mg/L)	14.5	18.2	17.8	17.2	16.4	14.8	4
Sum of Ions (mg/L)	161	259	211	194	193	182	4
TDS (mg/L)	136.6	204.33	183.75	158.2	149.4	143	4
Metals							
As (µg/L)	0.3	0.5	0.4	0.3	0.3	0.4	4
Ba (mg/L)	0.115	0.178	0.148	0.112	0.126	0.121	4
Cu (mg/L)	0.001	0.001	0.001	0.002	0.0009	0.001	4
Fe (mg/L)	0.18	0.557	0.287	0.149	0.246	0.21	4
Mo (mg/L)	-	0.003	0.003	0.003	0.0029	0.0026	4
Ni (mg/L)	0.00055	0.00052	0.00047	0.00058	0.00052	0.00068	4
Pb (mg/L)	0.0001	0.0003	0.0001	0.0003	0.0004	0.0004	4
Se (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	4
Zn (mg/L)	0.001	0.003	0.002	0.003	0.002	0.003	4
Nutrients							
NH3-N (mg/L)	-	0.06	0.08	0.01	0.04	0.05	1
NO3 (mg/L)	-	0.04	0.05	0.05	0.05	0.04	4
P-(TP) (mg/L)	-	0.03	0.01	0.01	0.01	0.01	1
Radionuclides							
Pb210 (Bq/L)	0.03	0.06	0.02	0.04	0.02	0.06	1
Po210 (Bq/L)	0.02	0.035	0.009	0.008	0.01	0.01	1
Ra226 (Bq/L)	0.762	1.142	0.958	0.554	0.928	0.655	4
U (µg/L)	109	184.8	140.5	127.2	148.6	119	4
Organics							
C-(org) (mg/L)	-	12	11	11	8.1	8.2	1

- Parameter was not analyzed.
** 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 Lake discharge at road crossing

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	218	232	240	230	228	228	5
pH-L (pH Unit)	7.85	7.8	7.76	7.73	7.73	7.75	5
TSS (mg/L)	1	1	1	1.167	1.2	1	5
Major Ions							
Alk-T (mg/L)	85.5	87	90.4	90	92.4	92	5
Ca (mg/L)	34.8	37	38.2	37.2	36.2	36.2	5
Cl (mg/L)	0.65	0.66	0.74	0.7	0.62	0.64	5
CO3 (mg/L)	1	1	1	1	1	1	5
Hardness (mg/L)	109	116	120	116	112	113	5
HCO3 (mg/L)	104.3	106.2	110.2	109.8	112.6	112.4	5
K (mg/L)	1	1	0.9	0.9	1	0.7	5
Mg (mg/L)	5.3	5.8	6	5.6	5.4	5.4	5
Na (mg/L)	2.1	2.2	2.2	2.1	2.1	2	5
OH (mg/L)	1	1	1	1	1	1	5
SO4 (mg/L)	25.5	28.4	28.8	26.7	25.2	24.4	5
Sum of Ions (mg/L)	174	181	187	183	183	182	5
TDS (mg/L)	150.33	157.6	167	155.5	151.8	154.4	5
Metals							
As (µg/L)	0.1	0.1	0.1	0.01	0.1	0.2	5
Ba (mg/L)	0.047	0.047	0.051	0.047	0.048	0.047	5
Cu (mg/L)	0.0008	0.001	0.0006	0.0006	0.0007	0.0013	5
Fe (mg/L)	0.02	0.015	0.012	0.017	0.017	0.024	5
Mo (mg/L)	-	0.0021	0.0022	0.0021	0.0021	0.0019	5
Ni (mg/L)	0.00023	0.00018	0.0002	0.00018	0.00024	0.00026	5
Pb (mg/L)	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	5
Se (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	5
Zn (mg/L)	0.001	0.002	0.001	0.001	0.001	0.002	5
Nutrients							
NH3-N (mg/L)	-	0.05	0.05	0.01	0.1	0.05	2
NO3 (mg/L)	-	0.16	0.33	0.16	0.08	0.24	5
P-(TP) (mg/L)	-	0.02	0.01	0.01	0.01	0.01	2
Radionuclides							
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	0.02	0.07	2
Po210 (Bq/L)	0.013	0.007	0.006	0.007	0.007	0.009	2
Ra226 (Bq/L)	0.035	0.03	0.033	0.03	0.044	0.038	5
U (µg/L)	215.5	247.6	252.4	197.3	184.2	169	5
Organics							
C-(org) (mg/L)	-	8.7	9.1	9.35	9.6	9.1	2

- Parameter was not analyzed.

** 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 Lake discharge to Ace Lake

Measured Parameter	Previous Period Average		Current Reporting Period	
	2012	2013	2014	Count
Physical Properties				
Cond-L (µS/cm)	207	275	285	2
pH-L (pH Unit)	7.19	7.51	7.7	2
TSS (mg/L)	1	1	1	2
Major Ions				
Alk-T (mg/L)	63	96	102.5	2
Ca (mg/L)	32	42	43.5	2
Cl (mg/L)	0.4	0.4	0.45	2
CO3 (mg/L)	1	1	1	2
Hardness (mg/L)	107	140	144	2
HCO3 (mg/L)	77	117	125	2
K (mg/L)	1.7	0.9	0.8	2
Mg (mg/L)	6.7	8.7	8.7	2
Na (mg/L)	1.8	2.3	2.3	2
OH (mg/L)	1	1	1	2
SO4 (mg/L)	41	48	45.5	2
Sum of Ions (mg/L)	161	219	226	2
TDS (mg/L)	203.5	175	196.5	2
Metals				
As (µg/L)	0.3	0.2	0.3	2
Ba (mg/L)	0.018	0.022	0.024	2
Cu (mg/L)	0.0017	0.001	0.0003	2
Fe (mg/L)	0.095	0.028	0.036	2
Mo (mg/L)	0.0007	0.001	0.0008	2
Ni (mg/L)	0.0003	0.0001	0.00015	2
Pb (mg/L)	0.0001	0.0001	0.0001	2
Se (mg/L)	0.0003	0.0001	0.0002	2
Zn (mg/L)	0.001	0.001	0.001	2
Nutrients				
NH3-N (mg/L)	-	-	-	0
NO3 (mg/L)	0.04	0.04	0.04	2
P-(TP) (mg/L)	0.04	-	-	0
Radionuclides				
Pb210 (Bq/L)	0.04	-	-	0
Po210 (Bq/L)	0.03	-	-	0
Ra226 (Bq/L)	0.085	0.14	0.15	2
U (µg/L)	117	201	154	2
Organics				
C-(org) (mg/L)	-	-	-	0

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Average					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	109	114	122	115	116	119	2
pH-L (pH Unit)	7.69	7.69	7.47	7.62	7.54	7.54	2
TSS (mg/L)	1.4	1	1	1	1	1	2
Major Ions							
Alk-T (mg/L)	50.4	49.8	52	50.5	52	52.5	2
Ca (mg/L)	15.6	16	17.5	16.8	17.5	16.5	2
Cl (mg/L)	0.92	1.02	1.3	1.08	0.95	0.9	2
CO3 (mg/L)	1	1	1	1	1	1	2
Hardness (mg/L)	52	53	58	55	58	55	2
HCO3 (mg/L)	61.4	60.5	63.5	61.5	63.5	64	2
K (mg/L)	0.6	0.8	0.7	0.8	0.9	0.8	2
Mg (mg/L)	3.1	3.2	3.4	3.2	3.5	3.4	2
Na (mg/L)	1.5	1.6	1.5	1.6	1.6	1.5	2
OH (mg/L)	1	1	1	1	1	1	2
SO4 (mg/L)	6.5	6.6	7	6.8	6.8	6.8	2
Sum of Ions (mg/L)	90	90	95	92	95	94	2
TDS (mg/L)	73	77	81.5	78	74	86	2
Metals							
As (µg/L)	0.1	0.2	0.2	0.1	0.2	0.2	2
Ba (mg/L)	0.022	0.039	0.025	0.023	0.024	0.024	2
Cu (mg/L)	0.0005	0.0006	0.0004	0.0003	0.0004	0.0005	2
Fe (mg/L)	0.027	0.287	0.027	0.034	0.037	0.033	2
Mo (mg/L)	0.001	0.001	0.001	0.001	0.001	0.0009	2
Ni (mg/L)	0.00015	0.00015	0.00015	0.00013	0.00015	0.00015	2
Pb (mg/L)	0.0001	0.0002	0.0001	0.0001	0.0005	0.0001	2
Se (mg/L)	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	2
Zn (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001	2
Nutrients							
NH3-N (mg/L)	-	0.06	0.07	0.02	0.06	0.04	1
NO3 (mg/L)	0.04	0.08	0.09	0.12	0.17	0.24	2
P-(TP) (mg/L)	-	0.01	0.01	0.01	0.01	0.01	1
Radionuclides							
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.007	0.005	0.008	0.005	0.005	1
Ra226 (Bq/L)	0.014	0.015	0.015	0.009	0.02	0.02	2
U (µg/L)	14.6	15.3	16.5	13.5	11.5	11.5	2
Organics							
C-(org) (mg/L)	-	7.55	6	8.1	6.8	6.8	1

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	115	121	132	129	126	124	12
pH-L (pH Unit)	7.79	7.72	7.74	7.71	7.61	7.73	12
TSS (mg/L)	1.385	2.917	1.273	1.083	1.181	1.25	12
Major Ions							
Alk-T (mg/L)	52.4	49.1	53.2	53	52.5	52.3	12
Ca (mg/L)	16.5	16.8	18	18.2	17.5	17.2	12
Cl (mg/L)	1.17	1.47	2	1.68	1.24	1.19	12
CO3 (mg/L)	1	1	1.3	1	1	1	12
Hardness (mg/L)	55	55	59	60	57	57	12
HCO3 (mg/L)	63.8	59.8	64.2	64.7	63.9	63.8	12
K (mg/L)	0.7	0.7	0.8	0.8	0.85	0.7	12
Mg (mg/L)	3.2	3.3	3.5	3.5	3.4	3.4	12
Na (mg/L)	1.8	2.1	2.3	2.2	1.95	1.9	12
OH (mg/L)	1	1	1	1	1	1	12
SO4 (mg/L)	7.5	8.8	9.1	9.5	8.3	8.5	12
Sum of Ions (mg/L)	95	93	100	101	97	97	12
TDS (mg/L)	78.08	82.25	86.82	87.08	82.7	81	12
Metals							
As (µg/L)	0.2	0.2	0.2	0.2	0.2	0.2	12
Ba (mg/L)	0.025	0.024	0.026	0.024	0.024	0.025	12
Cu (mg/L)	0.001	0.001	0.001	0.001	0.0005	0.001	12
Fe (mg/L)	0.068	0.085	0.074	0.07	0.065	0.082	12
Mo (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001	12
Ni (mg/L)	0.00033	0.00017	0.00024	0.00023	0.00022	0.00026	12
Pb (mg/L)	0.0006	0.0008	0.0005	0.0003	0.0005	0.0006	12
Se (mg/L)	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	12
Zn (mg/L)	0.002	0.001	0.002	0.001	0.001	0.003	12
Nutrients							
NH3-N (mg/L)	-	0.08	0.05	0.09	0.08	0.07	5
NO3 (mg/L)	0.04	0.14	0.13	0.09	0.15	0.14	12
P-(TP) (mg/L)	-	0.01	0.01	0.01	0.01	0.01	5
Radionuclides							
Pb210 (Bq/L)	0.02	0.03	0.02	0.02	0.03	0.03	5
Po210 (Bq/L)	0.011	0.01	0.008	0.007	0.008	0.012	5
Ra226 (Bq/L)	0.034	0.046	0.072	0.042	0.055	0.057	12
U (µg/L)	23.8	32.1	33.2	34.9	25.5	28	12
Organics							
C-(org) (mg/L)	-	7.5	7.4	8.25	8.63	7.8	5

\- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2008	2009	2012	2013	2014	Count
Physical Properties						
Cond-L (µS/cm)	137	136	144	145	145	1
pH-L (pH Unit)	7.88	7.88	7.63	7.68	7.77	1
TSS (mg/L)	2	1	1	1	1	1
Major Ions						
Alk-T (mg/L)	67	69	71	72	76	1
Ca (mg/L)	21	20	21	21	20	1
Cl (mg/L)	0.7	0.6	0.7	0.6	0.6	1
CO3 (mg/L)	1	1	1	1	1	1
Hardness (mg/L)	70	68	72	72	70	1
HCO3 (mg/L)	82	84	87	88	93	1
K (mg/L)	0.7	0.8	0.9	0.9	0.6	1
Mg (mg/L)	4.4	4.5	4.9	4.9	4.8	1
Na (mg/L)	1.8	1.8	2	2	1.9	1
OH (mg/L)	1	1	1	1	1	1
SO4 (mg/L)	4.6	4.3	4.5	4.4	4.3	1
Sum of Ions (mg/L)	115	116	121	122	125	1
TDS (mg/L)	94	89	105	90	97	1
Metals						
As (µg/L)	0.1	0.1	0.1	0.1	0.1	1
Ba (mg/L)	-	-	0.017	0.017	0.017	
Cu (mg/L)	0.001	0.0005	0.0005	0.0007	0.0005	1
Fe (mg/L)	0.029	0.013	0.011	0.016	0.01	1
Mo (mg/L)	-	-	0.0019	0.0017	0.0015	1
Ni (mg/L)	0.001	0.0001	0.0002	0.0003	0.0002	1
Pb (mg/L)	0.002	0.0001	0.0001	0.0009	0.0001	1
Se (mg/L)	0.0001	0.0001	0.0001	0.0001	0.0001	1
Zn (mg/L)	0.005	0.001	0.003	0.001	0.001	1
Nutrients						
NH3-N (mg/L)	-	-	0.02	0.05	0.06	1
NO3 (mg/L)	-	-	0.04	0.04	0.04	1
P-(TP) (mg/L)	-	-	0.01	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.006	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.005	0.006	0.005	0.005	1
U (µg/L)	2	1.6	1.6	1.6	1.4	1
Organics						
C-(org) (mg/L)	-	-	7.6	7.1	7.5	1

- Parameter was not analyzed.

*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

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2009	2010	2012	2013	2014	Count
Physical Properties						
Cond-L (µS/cm)	349	334	353	346	331	4
pH-L (pH Unit)	8.18	8.08	8.11	8.09	8.05	4
TSS (mg/L)	1.417	1	1.333	1	1	4
Major Ions						
Alk-T (mg/L)	135.1	129	140.3	142.8	137.3	4
Ca (mg/L)	26.2	27	27.3	27.8	27.5	4
Cl (mg/L)	4.17	3.64	4.33	3.75	3.25	4
CO3 (mg/L)	1	1	1	1	1	4
Hardness (mg/L)	86	89	91	92	91	4
HCO3 (mg/L)	164.9	157.6	171	174	167.5	4
K (mg/L)	1.4	1.2	1.4	1.3	1	4
Mg (mg/L)	5	5.2	5.5	5.5	5.5	4
Na (mg/L)	42.6	36.6	43.7	40.8	36.3	4
OH (mg/L)	1	1	1	1	1	4
SO4 (mg/L)	44.2	38.2	43.0	40.5	34.8	4
Sum of Ions (mg/L)	289	270	296	294	276	4
TDS (mg/L)	220.25	210.6	227.67	216.5	207.75	4
Metals						
As (µg/L)	1.1	0.9	1.0	1.0	0.9	4
Ba (mg/L)	0.036	0.034	0.036	0.037	0.036	4
Cu (mg/L)	0.0014	0.0012	0.0016	0.0013	0.001	4
Fe (mg/L)	0.008	0.006	0.011	0.010	0.012	4
Mo (mg/L)	0.019	0.015	0.017	0.017	0.0142	4
Ni (mg/L)	0.00040	0.00028	0.00030	0.00035	0.0003	4
Pb (mg/L)	0.0006	0.0004	0.0007	0.0006	0.0004	4
Se (mg/L)	0.0043	0.0037	0.0043	0.0040	0.0031	4
Zn (mg/L)	0.001	0.001	0.001	0.001	0.001	4
Nutrients						
NH3-N (mg/L)	-	-	0.01	0.04	0.05	1
NO3 (mg/L)	0.04	0.1	0.04	0.04	0.05	4
P-(TP) (mg/L)	-	0.03	0.01	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	-	0.07	0.08	0.11	0.07	1
Po210 (Bq/L)	-	0.04	0.04	0.04	0.04	1
Ra226 (Bq/L)	1.198	1.07	1.3	1.3	1.2	4
U (µg/L)	393.9	341.8	387.7	372.0	316.8	4
Organics						
C-(org) (mg/L)		9.5	8.5	7.2	7.3	1

- Parameter was not analyzed.

*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

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2009	2010	2012	2013	2014	Count
Physical Properties						
Cond-L (µS/cm)	341	445	329	334	333	4
pH-L (pH Unit)	8.13	7.79	7.97	8.06	8.05	4
TSS (mg/L)	1.273	2.000	1.333	1.000	1.25	4
Major Ions						
Alk-T (mg/L)	136.8	146.6	139.3	143.3	141.5	4
Ca (mg/L)	22	38.6	18	21.3	24	4
Cl (mg/L)	4.18	4.7	4	3.75	3.45	4
CO3 (mg/L)	1	1	1	1	1	4
Hardness (mg/L)	77	124	68	76	83	4
HCO3 (mg/L)	165.1	178.8	170	174.8	172.5	4
K (mg/L)	1.5	1.5	1.5	1.5	1.1	4
Mg (mg/L)	5.2	6.6	5.6	5.6	5.8	4
Na (mg/L)	45.2	47	47.7	45	40.5	4
OH (mg/L)	1	1	1	1	1	4
SO4 (mg/L)	39.7	78.1	33.3	32.8	32	4
Sum of Ions (mg/L)	286	355	280	285	280	4
TDS (mg/L)	227	290	220	214	208.5	4
Metals						
As (µg/L)	1.7	1.6	1.9	1.6	1.4	4
Ba (mg/L)	0.066	0.108	0.077	0.079	0.073	4
Cu (mg/L)	0.0008	0.0014	0.0006	0.0006	0.0007	4
Fe (mg/L)	0.028	0.311	0.099	0.033	0.024	4
Mo (mg/L)	0.014	0.0105	0.010	0.0106	0.011	4
Ni (mg/L)	0.0006	0.00126	0.00057	0.000570	0.00055	4
Pb (mg/L)	0.0008	0.0004	0.0003	0.0006	0.0003	4
Se (mg/L)	0.0025	0.0031	0.0020	0.0020	0.0021	4
Zn (mg/L)	0.001	0.003	0.001	0.001	0.001	4
Nutrients						
NH3-N (mg/L)	-	0.05	0.03	0.12	0.06	1
NO3 (mg/L)	0.04	0.05	0.04	0.04	0.05	4
P-(TP) (mg/L)	-	0.02	0.01	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	-	0.23	0.02	0.06	0.08	1
Po210 (Bq/L)	-	0.055	0.03	0.02	0.02	1
Ra226 (Bq/L)	1.582	1.650	1.567	1.925	1.775	4
U (µg/L)	344.5	419.8	270	291.3	280.3	4
Organics						
C-(org) (mg/L)	-	8.8	12	9.9	8.3	1

- Parameter was not analyzed.
*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

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2009	2010	2012	2013	2014	Count
Physical Properties						
Cond-L (µS/cm)	765	791	780	790	838	2
pH-L (pH Unit)	7.94	7.94	7.73	7.87	8	2
TSS (mg/L)	5	2	8	2	6.5	2
Major Ions						
Alk-T (mg/L)	289.5	306	286	288	310	2
Ca (mg/L)	47	46	41.8	55	46.5	2
Cl (mg/L)	56	54	59.5	47	49.5	2
CO3 (mg/L)	1	1	1	1	1	2
Hardness (mg/L)	165	160	152	186	167	2
HCO3 (mg/L)	353	373	348.8	351	378	2
K (mg/L)	2.8	3.1	3.4	2.8	2.6	2
Mg (mg/L)	11.6	11	11.6	12	12.5	2
Na (mg/L)	110.5	118	122.8	108	129	2
OH (mg/L)	1	1	1	1	1	2
SO4 (mg/L)	43.5	41	53.5	62	74.5	2
Sum of Ions (mg/L)	625	646	641	638	693	2
TDS (mg/L)	526	529	541.75	532	596.5	2
Metals						
As (µg/L)	-	1.2	3.3	3	4.4	2
Ba (mg/L)	1.14	1.16	1.165	1.26	1.145	2
Cu (mg/L)	-	0.0003	0.0008	0.0006	0.0009	2
Fe (mg/L)	-	0.71	3.543	1.79	3.53	2
Mo (mg/L)	-	0.0017	0.0018	0.0016	0.0019	2
Ni (mg/L)	-	0.0003	0.00045	0.0005	0.00055	2
Pb (mg/L)	-	0.0001	0.001	0.0002	0.0011	2
Se (mg/L)	0.0023	0.0022	0.0052	0.0025	0.0032	2
Zn (mg/L)	-	0.001	0.001	0.001	0.002	2
Nutrients						
NH3-N (mg/L)	-	-	0.08	0.12	0.11	1
NO3 (mg/L)	-	0.04	0.07	0.04	0.07	2
P-(TP) (mg/L)	-	-	0.01	0.01	0.02	1
Radionuclides						
Pb210 (Bq/L)	-	-	0.11	0.07	0.14	1
Po210 (Bq/L)	-	-	0.09	0.05	0.09	1
Ra226 (Bq/L)	5.55	5.6	5.35	7.9	9.6	2
U (µg/L)	210	248	237.5	225	284.5	2
Organics						
C-(org) (mg/L)	-	-	39	36	34	1

- Parameter was not analyzed.

*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

Meadow Fen discharge at weir

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	352	454	475	369	328	329	11
pH-L (pH Unit)	8	7.87	7.99	7.82	7.88	7.93	11
TSS (mg/L)	1.364	1.333	1.333	1	1	1	11
Major Ions							
Alk-T (mg/L)	140.1	150.4	148.3	138.1	138.3	140.1	11
Ca (mg/L)	23.5	36.9	41.8	25.8	21.4	23.7	11
Cl (mg/L)	5.8	7.4	10.55	13.59	4.75	4.38	11
CO3 (mg/L)	1	1	1	1	1	1	11
Hardness (mg/L)	81	123	140	92	77	82	11
HCO3 (mg/L)	170.9	183.4	180.8	168.5	168.8	170.8	11
K (mg/L)	1.5	1.5	2.4	1.7	1.4	1.2	11
Mg (mg/L)	5.5	7.6	8.7	6.8	5.7	5.7	11
Na (mg/L)	45.5	50	47.2	45	42.9	39.9	11
OH (mg/L)	1	1	1	1	1	1	11
SO4 (mg/L)	39.2	74.7	86.3	38	30.4	30.4	11
Sum of Ions (mg/L)	292	362	378	299	275	276	11
TDS (mg/L)	222	297.11	309.5	239.38	211.5	208.09	11
Metals							
As (µg/L)	1.5	1.4	1.1	1.7	1.5	1.3	11
Ba (mg/L)	0.162	0.353	0.352	0.199	0.227	0.205	11
Cu (mg/L)	0.0011	0.001	0.0006	0.0008	0.0006	0.0007	11
Fe (mg/L)	0.055	0.177	0.092	0.148	0.056	0.047	11
Mo (mg/L)	0.013	0.0107	0.008	0.0092	0.0097	0.0104	11
Ni (mg/L)	0.00064	0.00063	0.00062	0.00069	0.00055	0.0005	11
Pb (mg/L)	0.0007	0.0004	0.0002	0.0004	0.0005	0.0003	11
Se (mg/L)	0.0024	0.0053	0.0055	0.0033	0.0019	0.0023	11
Zn (mg/L)	0.001	0.002	0.001	0.001	0.001	0.001	11
Nutrients							
NH3-N (mg/L)	-	0.03	0.21	0.03	0.06	0.06	4
NO3 (mg/L)	0.04	0.06	0.28	0.04	0.040	0.09	11
P-(TP) (mg/L)	-	0.02	0.01	0.01	0.01	0.01	4
Radionuclides							
Pb210 (Bq/L)	0.06	0.07	0.02	0.05	0.04	0.03	4
Po210 (Bq/L)	0.043	0.02	0.015	0.06	0.033	0.02	4
Ra226 (Bq/L)	1.273	1.621	0.857	0.88	1.55	1.645	11
U (µg/L)	327.5	274.9	196.8	264.3	253.5	272.5	11
Organics							
C-(org) (mg/L)	-	9.667	11	13	10.1	9.45	4

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2009	2010	2012	2013	2014	Count
Physical Properties						
Cond-L (µS/cm)	348	464	374	366	330	10
pH-L (pH Unit)	8.11	8.04	8	8.0	8.08	10
TSS (mg/L)	1.375	1.25	1.625	1.4	2	10
Major Ions						
Alk-T (mg/L)	139	186.5	152.6	156.1	143.2	10
Ca (mg/L)	22.6	32.5	24.8	26.6	25.3	10
Cl (mg/L)	6.63	9.25	9	6.9	4.52	10
CO3 (mg/L)	1	1	1	1	1	10
Hardness (mg/L)	82	122	93	95	88	10
HCO3 (mg/L)	169.5	227.5	186	190.5	174.7	10
K (mg/L)	1.5	2.3	1.7	1.6	1.2	10
Mg (mg/L)	6.3	9.8	7.6	6.9	6.1	10
Na (mg/L)	43.4	57.3	46.8	43.9	38.6	10
OH (mg/L)	1	1	1	1	1	10
SO4 (mg/L)	36.8	46	34.9	30.6	28.3	10
Sum of Ions (mg/L)	287	385	311	307	279	10
TDS (mg/L)	220.63	308	250.4	237.3	210.3	10
Metals						
As (µg/L)	1.7	1.1	1.9	1.9	1.6	10
Ba (mg/L)	0.824	0.563	1.099	1.089	0.67	10
Cu (mg/L)	0.0008	0.0009	0.0008	0.0009	0.0008	10
Fe (mg/L)	0.047	0.02	0.055	0.054	0.064	10
Mo (mg/L)	-	0.0107	0.0144	0.0127	0.0109	10
Ni (mg/L)	0.00057	0.00047	0.00044	0.00049	0.0005	10
Pb (mg/L)	0.0012	0.0003	0.0009	0.0008	0.0008	10
Se (mg/L)	0.0032	0.0048	0.0045	0.0028	0.0028	10
Zn (mg/L)	0.002	0.001	0.001	0.001	0.002	10
Nutrients						
NH3-N (mg/L)	-	-	0.07	0.12	0.07	3
NO3 (mg/L)	-	0.13	0.24	0.238	0.31	10
P-(TP) (mg/L)	-	0.03	0.01	0.0083	0.01	3
Radionuclides						
Pb210 (Bq/L)	0.07	0.06	0.08	0.13	0.06	3
Po210 (Bq/L)	0.04	0.02	0.06	0.043	0.04	3
Ra226 (Bq/L)	2.075	0.98	2.45	2.94	2.48	10
U (µg/L)	296.4	483.8	349.3	289.2	267.8	10
Organics						
C-(org) (mg/L)	-	14	14	11.3	10	3

- Parameter was not analyzed.
*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

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	253	252	250	245	246	249	4
pH-L (pH Unit)	7.97	7.98	7.79	7.8	7.80	7.79	4
TSS (mg/L)	1	1	1	1	1	1	4
Major Ions							
Alk-T (mg/L)	74.3	72.7	70.7	72.3	73	73.5	4
Ca (mg/L)	22.5	22	21.8	21.8	22.3	22	4
Cl (mg/L)	14.25	13.67	13.5	13.25	12.75	12.5	4
CO3 (mg/L)	1	1	1	1	1	1	4
Hardness (mg/L)	79	77	77	77	78	77	4
HCO3 (mg/L)	90.5	89	86	88	89	89.5	4
K (mg/L)	1.2	1.2	1.1	1.2	1.3	1	4
Mg (mg/L)	5.5	5.5	5.4	5.5	5.5	5.4	4
Na (mg/L)	20.5	20	19.8	19.5	19.8	19.3	4
OH (mg/L)	1	1	1	1	1	1	4
SO4 (mg/L)	34.3	33.7	33	32.8	32.5	31	4
Sum of Ions (mg/L)	189	185	178	182	183	181	4
TDS (mg/L)	151.25	150.33	151.33	147.5	142.75	144.75	4
Metals							
As (µg/L)	0.3	0.5	0.3	0.3	0.3	0.3	4
Ba (mg/L)	-	0.039	0.035	0.037	0.043	0.042	4
Cu (mg/L)	0.0014	0.0017	0.0027	0.0009	0.0027	0.002	4
Fe (mg/L)	0.01	0.007	0.008	0.003	0.011	0.007	4
Mo (mg/L)	-	0.0037	0.0037	0.0037	0.0038	0.0036	4
Ni (mg/L)	0.00178	0.0033	0.00347	0.0014	0.0056	0.0037	4
Pb (mg/L)	0.0006	0.0002	0.0003	0.0001	0.0004	0.0002	4
Se (mg/L)	0.0031	0.0029	0.0028	0.0027	0.0027	0.0025	4
Zn (mg/L)	0.004	0.005	0.006	0.002	0.004	0.004	4
Nutrients							
NH3-N (mg/L)	-	0.22	0.21	0.08	0.08	0.05	1
NO3 (mg/L)	-	0.04	0.06	0.04	0.05	0.07	4
P-(TP) (mg/L)	-	0.01	0.01	0.01	0.01	0.01	1
Radionuclides							
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	0.03	0.02	1
Po210 (Bq/L)	0.005	0.004	0.005	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.052	0.048	0.023	0.025	0.052	0.055	4
U (µg/L)	152	145.3	140.5	138	141.3	135	4
Organics							
C-(org) (mg/L)	-	-	3.8	3.4	4.8	3.2	1

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2009	2010	2011	2012	2013	2014	Count
Physical Properties							
Cond-L (µS/cm)	244	246	246	241	241	245	2
pH-L (pH Unit)	7.98	7.94	7.7	7.84	7.79	7.75	2
TSS (mg/L)	1	1	1	1	1	1	2
Major Ions							
Alk-T (mg/L)	71	69.5	67.5	69.5	71	72.5	2
Ca (mg/L)	21.3	21.3	21.5	21.5	21.5	21	2
Cl (mg/L)	13.5	14	14	14	13	13	2
CO3 (mg/L)	1	1	1	1	1	1	2
Hardness (mg/L)	75	75	76	76	76	75	2
HCO3 (mg/L)	86.5	85	82	85	86.5	88.5	2
K (mg/L)	1.2	1.2	1.1	1.3	1.3	1	2
Mg (mg/L)	5.3	5.3	5.3	5.4	5.4	5.4	2
Na (mg/L)	19.5	19.5	19.5	20	19.5	19	2
OH (mg/L)	1	1	1	1	1	1	2
SO4 (mg/L)	32.8	33	32.5	33.5	33	31.5	2
Sum of Ions (mg/L)	180	179	176	181	180	180	2
TDS (mg/L)	142	147	143	140.5	142	145	2
Metals							
As (µg/L)	0.3	0.3	0.3	0.3	0.2	0.3	2
Ba (mg/L)		0.035	0.034	0.034	0.035	0.035	2
Cu (mg/L)	0.0018	0.0013	0.0012	0.0017	0.0019	0.0016	2
Fe (mg/L)	0.014	0.043	0.003	0.005	0.014	0.006	2
Mo (mg/L)	-	0.0037	0.0044	0.0038	0.0036	0.0035	2
Ni (mg/L)	0.00235	0.00173	0.0022	0.0024	0.00245	0.0018	2
Pb (mg/L)	0.0006	0.0002	0.0001	0.0002	0.0005	0.0002	2
Se (mg/L)	0.003	0.0028	0.0028	0.0027	0.0027	0.0026	2
Zn (mg/L)	0.006	0.005	0.002	0.004	0.005	0.004	2
Nutrients							
NH3-N (mg/L)	-	0.06	0.08	0.04	0.08	0.08	2
NO3 (mg/L)	-	0.05	0.42	0.04	0.04	0.09	2
P-(TP) (mg/L)	-	0.01	0.01	0.01	0.01	0.01	2
Radionuclides							
Pb210 (Bq/L)	0.02	0.03	0.03	0.02	0.02	0.02	2
Po210 (Bq/L)	0.005	0.005	0.005	0.005	0.005	0.005	2
Ra226 (Bq/L)	0.025	0.035	0.025	0.03	0.025	0.025	2
U (µg/L)	143.8	143.8	142	138.5	137.5	135	2
Organics							
C-(org) (mg/L)	-	3.3	3.4	3.45	3.85	3.7	2

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Averages			Current Reporting Period	
	2011	2012	2013	2014	Count
Physical Properties					
Cond-L (µS/cm)	227	248	249	255	5
pH-L (pH Unit)	7.65	7.84	7.8	7.82	5
TSS (mg/L)	2.333	1	1	1.2	5
Major Ions					
Alk-T (mg/L)	66.7	70.5	71.0	73.4	5
Ca (mg/L)	21	21.8	21.8	21.8	5
Cl (mg/L)	11.47	14	13.25	13.2	5
CO3 (mg/L)	1	1	1	1	5
Hardness (mg/L)	73	77	77	77	5
HCO3 (mg/L)	81.3	86	86.8	89.8	5
K (mg/L)	1.1	1.2	1.3	1	5
Mg (mg/L)	5	5.5	5.5	5.6	5
Na (mg/L)	16	20	19.8	19.8	5
OH (mg/L)	1	1	1	1	5
SO4 (mg/L)	27	33.5	32.8	32.4	5
Sum of Ions (mg/L)	163	182	181	184	5
TDS (mg/L)	135.33	145.5	142.75	148.8	5
Metals					
As (µg/L)	0.3	0.3	0.3	0.3	5
Ba (mg/L)	0.038	0.034	0.035	0.036	5
Cu (mg/L)	0.0009	0.0003	0.0003	0.0006	5
Fe (mg/L)	0.008	0.001	0.005	0.006	5
Mo (mg/L)	0.0034	0.0037	0.0038	0.0037	5
Ni (mg/L)	0.0002	0.00018	0.0002	0.00016	5
Pb (mg/L)	0.0001	0.0001	0.0004	0.0002	5
Se (mg/L)	0.0023	0.0028	0.0028	0.0027	5
Zn (mg/L)	0.001	0.001	0.001	0.002	5
Nutrients					
NH3-N (mg/L)	0.06	0.01	0.09	0.08	1
NO3 (mg/L)	1.07	0.04	0.04	0.06	5
P-(TP) (mg/L)	0.01	0.01	0.01	0.01	1
Radionuclides					
Pb210 (Bq/L)	0.02	0.02	0.02	0.03	1
Po210 (Bq/L)	0.005	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.021	0.033	0.037	0.028	5
U (µg/L)	143.3	139.3	141.8	139.8	5
Organics					
C-(org) (mg/L)	2.9	3.3	3.4	3.9	1

- Parameter was not analyzed.
** 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)

Measured Parameter	Previous Period Averages			Current Reporting Period	
	2011	2012	2013	2014	Count
Physical Properties					
Cond-L (µS/cm)	213	174	188	191	4
pH-L (pH Unit)	7.78	7.67	7.71	7.87	4
TSS (mg/L)	1	1	1	1	4
Major Ions					
Alk-T (mg/L)	68.3	63	67.5	69	4
Ca (mg/L)	20.5	19.5	20	20	4
Cl (mg/L)	10.3	5.2	8	7.6	4
CO3 (mg/L)	1	1	1	1	4
Hardness (mg/L)	71	66	68	68	4
HCO3 (mg/L)	83.5	76.8	82.5	84	4
K (mg/L)	1.1	1.1	1.2	1	4
Mg (mg/L)	4.8	4.3	4.5	4.5	4
Na (mg/L)	14.5	9.3	11.6	10.8	4
OH (mg/L)	1	1	1	1	4
SO4 (mg/L)	23.3	15.1	18.5	17.5	4
Sum of Ions (mg/L)	158	132	147	146	4
TDS (mg/L)	129.75	113.75	117.75	117	4
Metals					
As (µg/L)	0.2	0.2	0.2	0.2	4
Ba (mg/L)	0.042	0.042	0.044	0.043	4
Cu (mg/L)	0.0004	0.0014	0.0014	0.0015	4
Fe (mg/L)	0.006	0.016	0.012	0.012	4
Mo (mg/L)	0.0031	0.0016	0.0020	0.0018	4
Ni (mg/L)	0.00013	0.00015	0.00028	0.00015	4
Pb (mg/L)	0.0001	0.0015	0.0006	0.0002	4
Se (mg/L)	0.0016	0.0008	0.0011	0.001	4
Zn (mg/L)	0.001	0.002	0.002	0.004	4
Nutrients					
NH3-N (mg/L)	0.07	0.06	0.06	0.06	4
NO3 (mg/L)	0.2	0.1	0.08	0.17	4
P-(TP) (mg/L)	0.01	0.01	0.01	0.01	4
Radionuclides					
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	4
Po210 (Bq/L)	0.005	0.005	0.005	0.005	4
Ra226 (Bq/L)	0.009	0.007	0.0110	0.012	4
U (µg/L)	69.3	48.8	66.3	57.8	4
Organics					
C-(org) (mg/L)	4.8	7.3	5.8	6.45	4

- Parameter was not analyzed.

** 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

Measured Parameter	Previous Period Average			Current Reporting Period	
	2011	2012	2013	2014	Count
Physical Properties					
Cond-L (µS/cm)	211	199	186	190	1
pH-L (pH Unit)	7.78	7.76	7.68	7.76	1
TSS (mg/L)	1	1	4	1	1
Major Ions					
Alk-T (mg/L)	85	64	66	70	1
Ca (mg/L)	28	20	20	20	1
Cl (mg/L)	7.8	7.6	7.9	7.8	1
CO3 (mg/L)	1	1	1	1	1
Hardness (mg/L)	96	68	70	69	1
HCO3 (mg/L)	104	78	80	85	1
K (mg/L)	1.2	1.1	1.1	1	1
Mg (mg/L)	6.3	4.5	4.8	4.6	1
Na (mg/L)	6.4	11	11	11	1
OH (mg/L)	1	1	1	1	1
SO4 (mg/L)	11	17	17	18	1
Sum of Ions (mg/L)	165	139	142	148	1
TDS (mg/L)	135	125	111	119	1
Metals					
As (µg/L)	0.2	0.2	0.2	0.2	1
Ba (mg/L)	0.056	0.042	0.045	0.042	1
Cu (mg/L)	0.0004	0.0002	0.0006	0.0002	1
Fe (mg/L)	0.1	0.026	0.086	0.026	1
Mo (mg/L)	0.003	0.002	0.0021	0.0019	1
Ni (mg/L)	0.0003	0.0001	0.0002	0.0001	1
Pb (mg/L)	0.0001	0.0001	0.0011	0.0001	1
Se (mg/L)	0.0003	0.0009	0.0009	0.001	1
Zn (mg/L)	0.001	0.001	0.001	0.001	1
Nutrients					
NH3-N (mg/L)	0.08	0.03	0.06	0.05	1
NO3 (mg/L)	0.04	0.04	0.04	0.04	1
P-(TP) (mg/L)	0.01	0.01	0.01	0.01	1
Radionuclides					
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.006	0.005	0.006	1
U (µg/L)	47	57	67	63	1
Organics					
C-(org) (mg/L)	11	6.2	6.2	6	1

Note: This station was implemented in 2011.
- Parameter was not analyzed.
** 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

Measured Parameter	Previous Period Averages			Current Reporting Period	
	2011	2012	2013	2014	Count
Physical Properties					
Cond-L (µS/cm)	68	81	74	78	1
pH-L (pH Unit)	7.45	7.51	7.37	7.38	1
TSS (mg/L)	1	1	1	1	1
Major Ions					
Alk-T (mg/L)	28	31	29	32	1
Ca (mg/L)	7.1	8.3	7.5	7.6	1
Cl (mg/L)	2	3.6	3.4	3.4	1
CO3 (mg/L)	1	1	1	1	1
Hardness (mg/L)	27	30	28	28	1
HCO3 (mg/L)	34	38	35	39	1
K (mg/L)	0.5	0.8	0.9	0.7	1
Mg (mg/L)	2.2	2.4	2.3	2.3	1
Na (mg/L)	2.4	3.5	2.8	3	1
OH (mg/L)	1	1	1	1	1
SO4 (mg/L)	3.5	5	3.9	4.2	1
Sum of Ions (mg/L)	52	62	56	60	1
TDS (mg/L)	220	64	50	54	1
Metals					
As (µg/L)	0.3	0.2	0.2	0.2	1
Ba (mg/L)	0.011	0.014	0.012	0.012	1
Cu (mg/L)	0.0006	0.0002	0.0002	0.0007	1
Fe (mg/L)	0.013	0.006	0.009	0.01	1
Mo (mg/L)	0.0002	0.0003	0.0002	0.0002	1
Ni (mg/L)	0.0004	0.0003	0.0003	0.0023	1
Pb (mg/L)	0.0001	0.0001	0.0001	0.0001	1
Se (mg/L)	0.0001	0.0001	0.0001	0.0001	1
Zn (mg/L)	0.001	0.001	0.001	0.002	1
Nutrients					
NH3-N (mg/L)	0.06	0.01	0.01	0.02	1
NO3 (mg/L)	0.04	0.04	0.04	0.09	1
P-(TP) (mg/L)	0.02	0.01	0.01	0.01	1
Radionuclides					
Pb210 (Bq/L)	0.02	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.009	0.0090	0.005	1
U (µg/L)	0.3	4.8	0.4	1.6	1
Organics					
C-(org) (mg/L)	2.8	3.5	3.4	3.2	1

Note: This station was implemented in 2011
-Parameter was not analyzed
** For those samples measured below the method detection limit, each sample was given the value of the detection limit

Table 4.4 – 1 ZOR-1 Summary Statistics
Mouth of Zora Creek

Measured Parameter	Previous Period Averages	Current Reporting Period	
	2013	2014	Count
Physical Properties			
Cond-L (µS/cm)	229	207	5
pH-L (pH Unit)	7.91	7.94	5
TSS (mg/L)	1	1.4	5
Major Ions			
Alk-T (mg/L)	103.6	94.4	5
Ca (mg/L)	33.4	29.4	5
Cl (mg/L)	0.24	0.26	5
CO3 (mg/L)	1	1	5
Hardness (mg/L)	118	104	5
HCO3 (mg/L)	126.4	115.2	5
K (mg/L)	0.9	0.6	5
Mg (mg/L)	8.4	7.4	5
Na (mg/L)	1.9	1.6	5
OH (mg/L)	1	1	5
SO4 (mg/L)	19.6	17	5
Sum of Ions (mg/L)	191	171	5
TDS (mg/L)	145.6	127	5
Metals			
As (µg/L)	0.2	0.2	5
Ba (mg/L)	0.023	0.02	5
Cu (mg/L)	0.0010	0.0022	5
Fe (mg/L)	0.01	0.018	5
Mo (mg/L)	0.0009	0.0008	5
Ni (mg/L)	0.00022	0.00032	5
Pb (mg/L)	0.00070	0.0005	5
Se (mg/L)	0.0001	0.0001	5
Zn (mg/L)	0.0030	0.003	5
Nutrients			
NH3-N (mg/L)	0.03	0.05	1
NO3 (mg/L)	0.04	0.06	5
P-(TP) (mg/L)	0.01		0
Radionuclides			
Pb210 (Bq/L)	0.02	0.05	1
Po210 (Bq/L)	0.006	0.005	1
Ra226 (Bq/L)	0.028	0.026	5
U (µg/L)	18.2	13	5
Organics			
C-(org) (mg/L)	8.733	9	1

Note: 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-2 Summary Statistics
Outlet from waste rock pile

Measured Parameter	Previous Period Averages	Current Reporting Period	
	2013	2014	Count
Physical Properties			
Cond-L (µS/cm)	382	289	5
pH-L (pH Unit)	7.91	7.96	5
TSS (mg/L)	1	1	5
Major Ions			
Alk-T (mg/L)	122.4	113.8	5
Ca (mg/L)	61.4	44.4	5
Cl (mg/L)	1	0.42	5
CO3 (mg/L)	1	1	5
Hardness (mg/L)	199	146	5
HCO3 (mg/L)	149.4	138.6	5
K (mg/L)	1	0.6	5
Mg (mg/L)	11.2	8.6	5
Na (mg/L)	2.4	1.9	5
OH (mg/L)	1	1	5
SO4 (mg/L)	78.2	41.6	5
Sum of Ions (mg/L)	305	237	5
TDS (mg/L)	253	185.4	5
Metals			
As (µg/L)	0.2	0.2	5
Ba (mg/L)	0.025	0.021	5
Cu (mg/L)	0.0034	0.0036	5
Fe (mg/L)	0.022	0.032	5
Mo (mg/L)	0.0013	0.0013	5
Ni (mg/L)	0.00036	0.00032	5
Pb (mg/L)	0.0006	0.0003	5
Se (mg/L)	0.0005	0.0003	5
Zn (mg/L)	0.002	0.001	5
Nutrients			
NH3-N (mg/L)	0.04	0.04	1
NO3 (mg/L)	0.92	0.66	5
P-(TP) (mg/L)	0.01		0
Radionuclides			
Pb210 (Bq/L)	0.19	0.09	1
Po210 (Bq/L)	0.06	0.08	1
Ra226 (Bq/L)	0.368	0.336	5
U (µg/L)	624.8	313.8	5
Organics			
C-(org) (mg/L)	6.3	6.3	1

Note: 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 4.5-1 – May 2014 QA/QC IOP Investigations and Rechecks

AC-14	SRC	Blind	% Difference	Required IOP investigation	IOP (%)	Recheck
Cond-L (µS/cm)	112	890	694.6	Yes	155.29	No
Temp. (w) (°C)	10.9	14.5	33	Yes	28.35	No

Table 4.5-2 – June 2014 QA/QC IOP Investigations and Rechecks

TL-7	SRC	Becquerel	% Difference	Required IOP investigation	IOP (%)	Recheck
Pb210 (Bq/L)	0.04	0.26	**550**	Yes	146.67	Yes
Po210 (Bq/L)	0.02	0.029	45	Yes	36.73	No
Ra226 (Bq/L)	1.9	1.47	22.6	Yes	25.52	No
U (µg/L)	228	240	5.3	No	N/A	No
TL-9	**SRC**	**Becquerel**	**% Difference**	**Required IOP investigation**	**IOP (%)**	**Recheck**
Pb210 (Bq/L)	0.06	0.26	**333.3**	Yes	125	Yes
Po210 (Bq/L)	0.06	0.072	20	Yes	18.18	No
Ra226 (Bq/L)	2.7	2.7	0	No	N/A	No
U (µg/L)	202	210	4	No	N/A	No

Table 4.6.2 – 1
January 2014 - December 2014 Monthly Loading Calculations at TL-7

Month	Days in Month	Estimated Average Flows (L/s)	Uranium (µg/L)	U Loadings (kg)	^{226}Ra (Bq/L)	^{226}Ra Loadings (Bq) x 10^7	TDS (mg/L)	TDS Loadings (kg) x 10^4	Se (mg/L)	Se Loadings (kg)	Comments
January	31	12.46	333	11.113	1.9	6.341	226	0.754	0.0024	0.080	
February	28	11.51	343	9.551	1.8	5.012	236	0.657	0.0041	0.114	
March	31	10.08	326	8.801	1.8	4.860	242	0.653	0.0025	0.067	
April	30	9.00	169	3.942	1.2	2.799	174	0.406	0.0022	0.051	
May	31	94.10	244	61.497	1.4	35.285	196	4.940	0.0020	0.504	
June	30	169.89	228	100.401	1.9	83.667	189	8.323	0.0020	0.881	
July	31	97.60	220	57.511	1.8	47.054	197	5.150	0.0019	0.497	
August	31	39.83	208	22.190	1.6	17.069	164	1.750	0.0017	0.181	
September	30	17.37	255	11.481	1.6	7.204	201	0.905	0.0017	0.077	
October	31	9.14	256	6.267	1.9	4.651	195	0.477	0.0017	0.042	
November	30	9.28									No water was flowing due to ice build-up.
December	31	8.66	416	9.649	1.2	2.783	269	0.624	0.0030	0.070	
2014 Annual Summary		**40.74**	**272.55**	**302.40**	**1.6**	**216.73**	**208.09**	**24.64**	**0.0023**	**2.56**	

Table 4.6.2 – 2

January 2014- December 2014 Monthly Loading Calculations at AC-14

Month	*Days in Month*	*Estimated Average Flows (L/s)*	*Uranium (µg/L)*	*U Loadings (kg)*	*^{226}Ra (Bq/L)*	*^{226}Ra Loadings (Bq) x 10^7*	*TDS (mg/L)*	*TDS Loadings (kg) x 10^4*	*Se* (mg/L)*	*Se Loadings (kg)*
January	31	235.18	20	12.598	0.03	1.890	83	5.228	0.0001	0.063
February	28	217.11	17	8.929	0.04	2.101	79	4.149	0.0002	0.105
March	31	190.17	18	9.168	0.04	2.037	85	4.329	0.0001	0.051
April	30	170.35	57	25.168	0.07	3.091	88	3.886	0.0004	0.177
May	31	2223.68	21	125.074	0.05	29.780	69	41.096	0.0001	0.596
June	30	2344.01	17	103.286	0.05	30.378	80	48.605	0.0001	0.608
July	31	1162.82	23	71.633	0.06	18.687	81	25.227	0.0001	0.311
August	31	464.81	22	27.389	0.05	6.225	79	9.835	0.0001	0.124
September	30	176.39	35	16.002	0.06	2.743	84	3.841	0.0001	0.046
October	31	162.82	55	23.985	0.08	3.489	78	3.402	0.0002	0.087
November	30	175.16	27	12.258	0.07	3.178	84	3.814	0.0001	0.045
December	31	163.48	24	10.509	0.08	3.503	82	3.590	0.0001	0.044
2014 Annual Summary		**640.50**	**28.0**	**446.00**	**0.68**	**107.10**	**81.0**	**157.0**	**0.0001**	**2.26**

Note: Data for the estimated average flows was obtained from station AC-8 while U, ^{226}Ra, TDS, and Se concentrations were obtained from station AC-14.

* - Where selenium concentrations were below the detection limit for a given month (0.0001mg/L), the detection limit value was used as a proxy for the actual concentration to calculate the monthly loadings. The calculation method described will likely result in a significant overestimation of the actual selenium loadings.

Table 4.7.1

Radon Track Etch Cup Summary

	Annual Average pCi/L								
Location	**1982**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Airport Beacon	1.4	0.3	0.5	0.5	0.3	0.2	0.9	1.0	0.2
Eldorado Townsite	3.7	0.4	0.7	0.7	0.5	0.5	0.5	1.2	0.5
Northwest of Airport	2.4	0.2	0.3	0.4	0.3	0.2	1.1	1.0	0.2
Ace Creek	10.7	4.9	6.7	5.3	5.4	7	4.1	6.0	5.9
Fay Waste Rock	5.1	1.1	1.2	1.2	0.9	1.0	1.1	0.6	1.0
Fookes Delta	5.1	1.8	3	2.9	2	1.9	2.1	3.0	2.1
Marie Reservoir	5.1	2.5	2.7	2.5	5.8	5.5	2.8	2.9	2.1
Donaldson Lake	5.1	0.2	0.7	0.6	0.2	0.2	0.2	0.9	< 0.2
Fredette Lake	5.1	0.2	0.3	0.8	1.2	0.8	0.2	0.2	0.3
Uranium City	5.1	0.2	0.3	1.2	0.3	0.2	0.2	< 0.2	0.2

Note: Values presented are an average of two 6 month samples collected from: January 2014 to July 2014 and July 2014 to January 2015.
** In order to calculate the annual averages, those samples measured below the detection limit were given half the value of the detection limit. In the case a station was below the detection limit for the length of the year, it is indicated as such in the table.

FIGURES

FIGURES

Figure 2.4
Beaverlodge Location Map

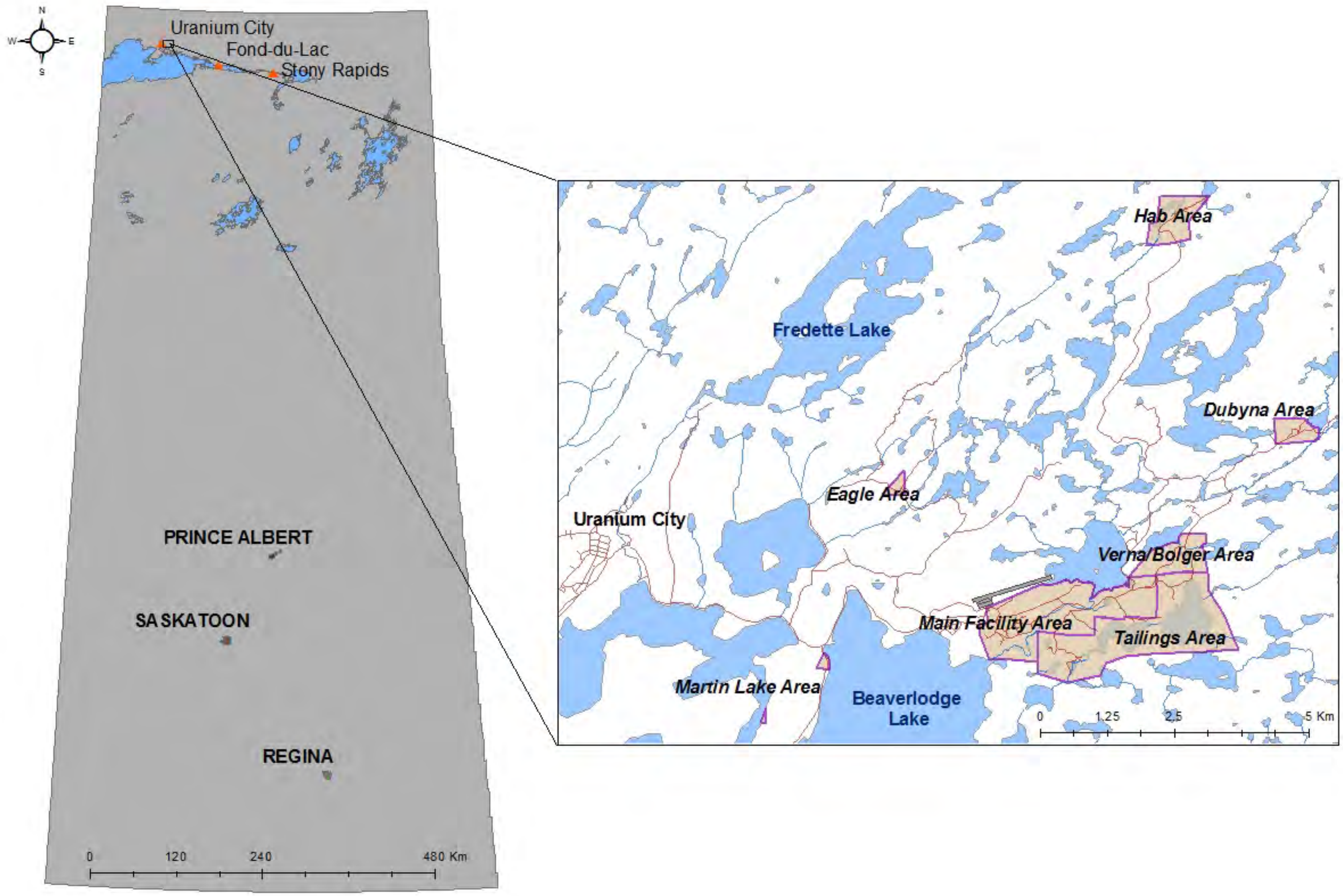


Figure 4.3
Water Quality Monitoring Station Locations

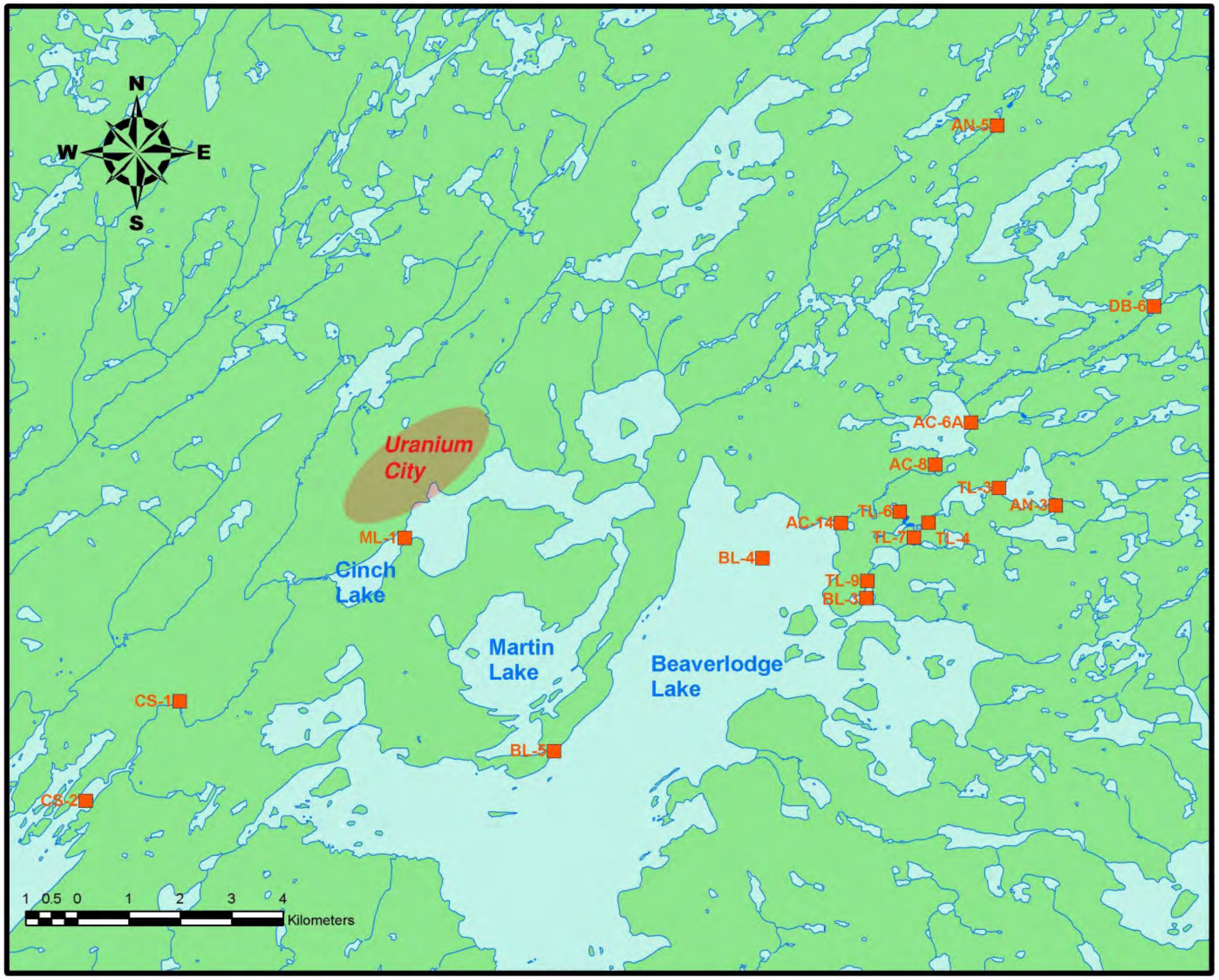


Figure 4.3.1-1 AN-5 Pistol Creek below Hab Site

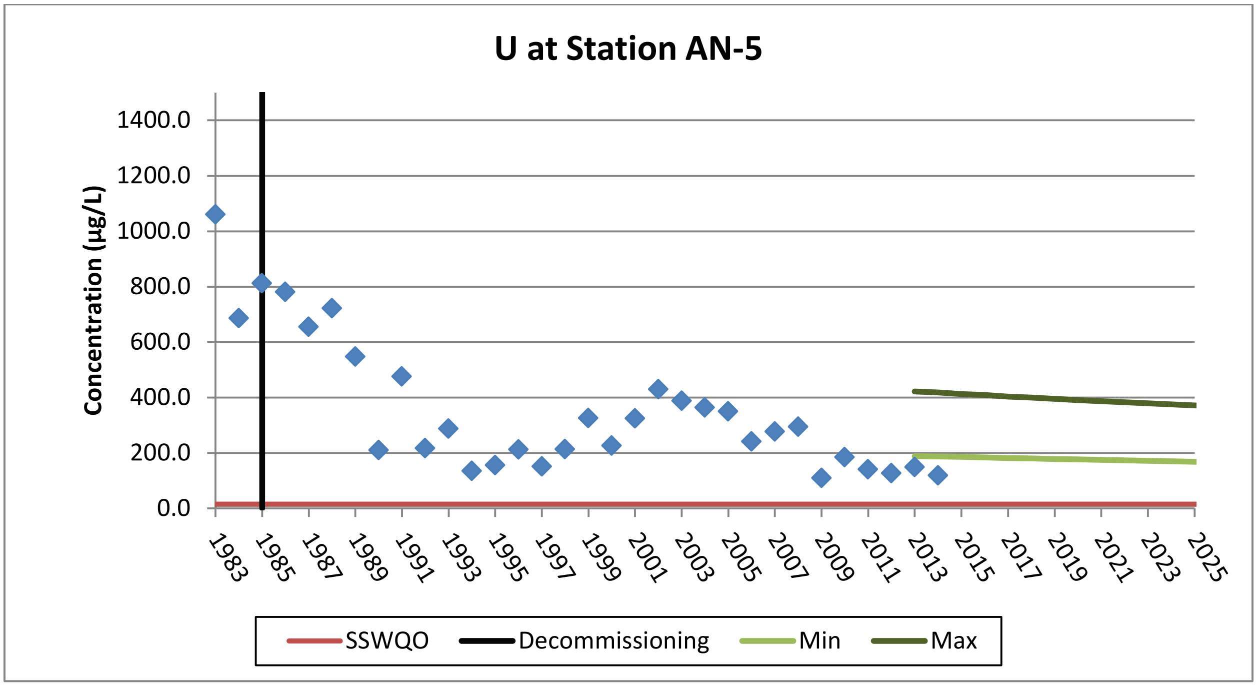


Figure 4.3.1-2 AN-5 Pistol Creek below Hab Site

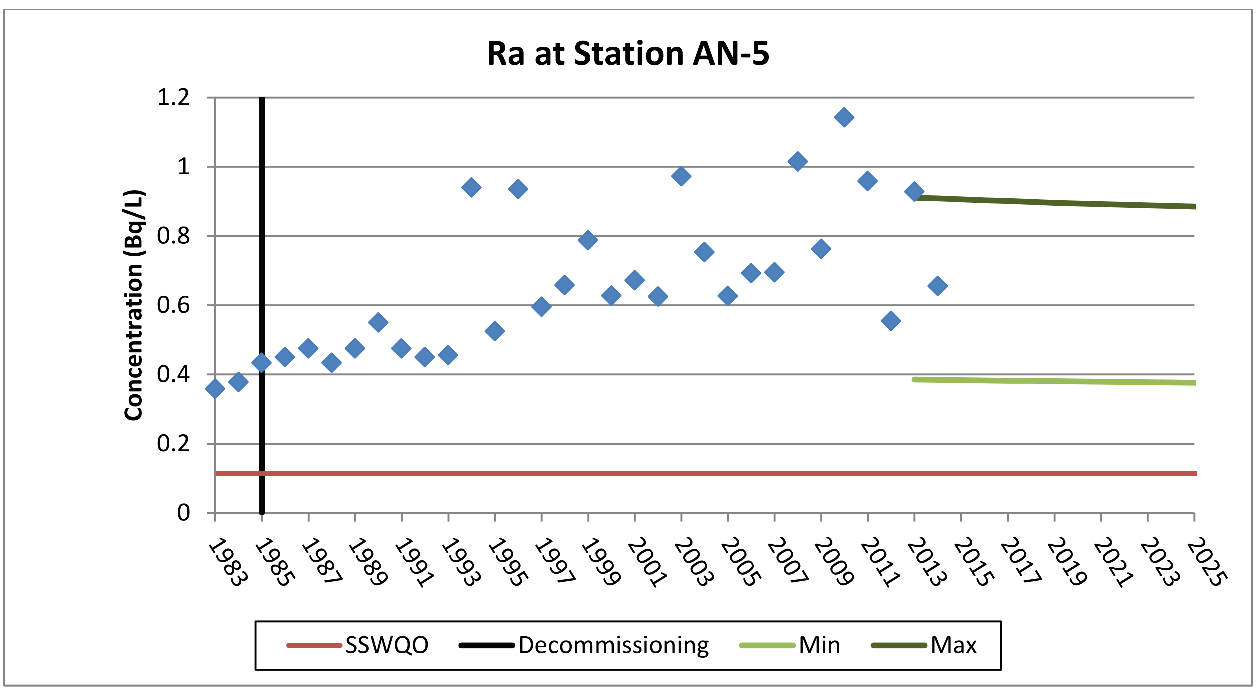
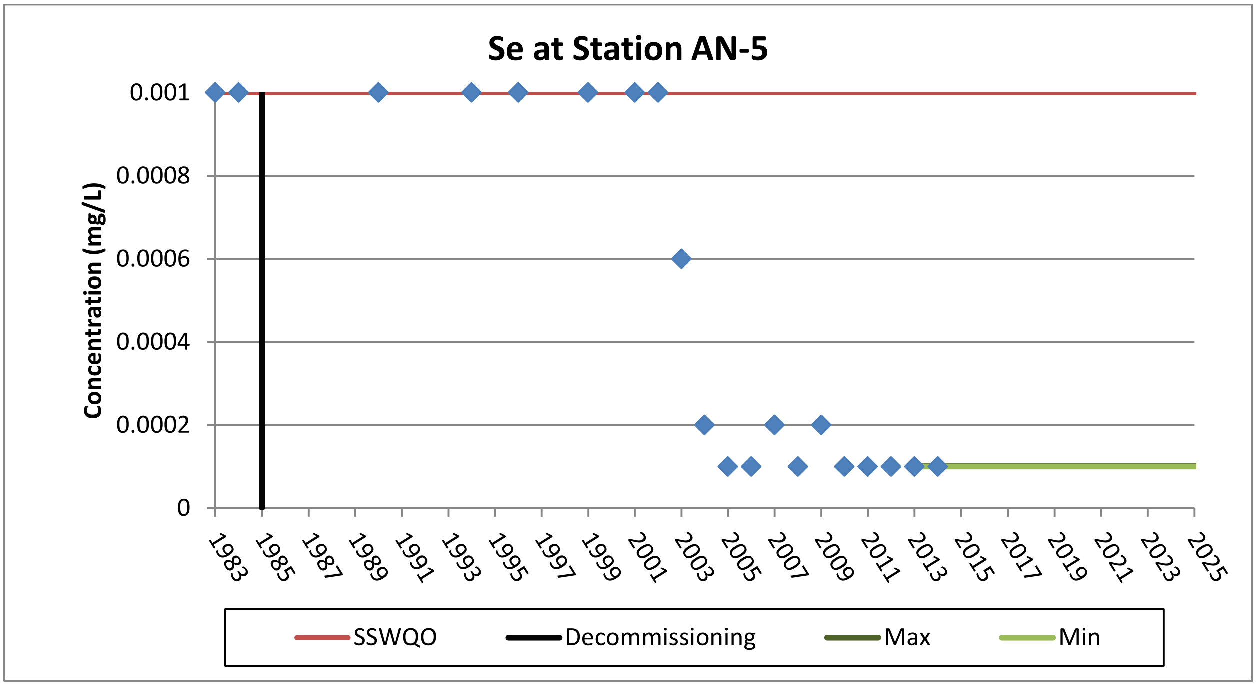


Figure 4.3.1-3 AN-5 Pistol Creek below Hab Site



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

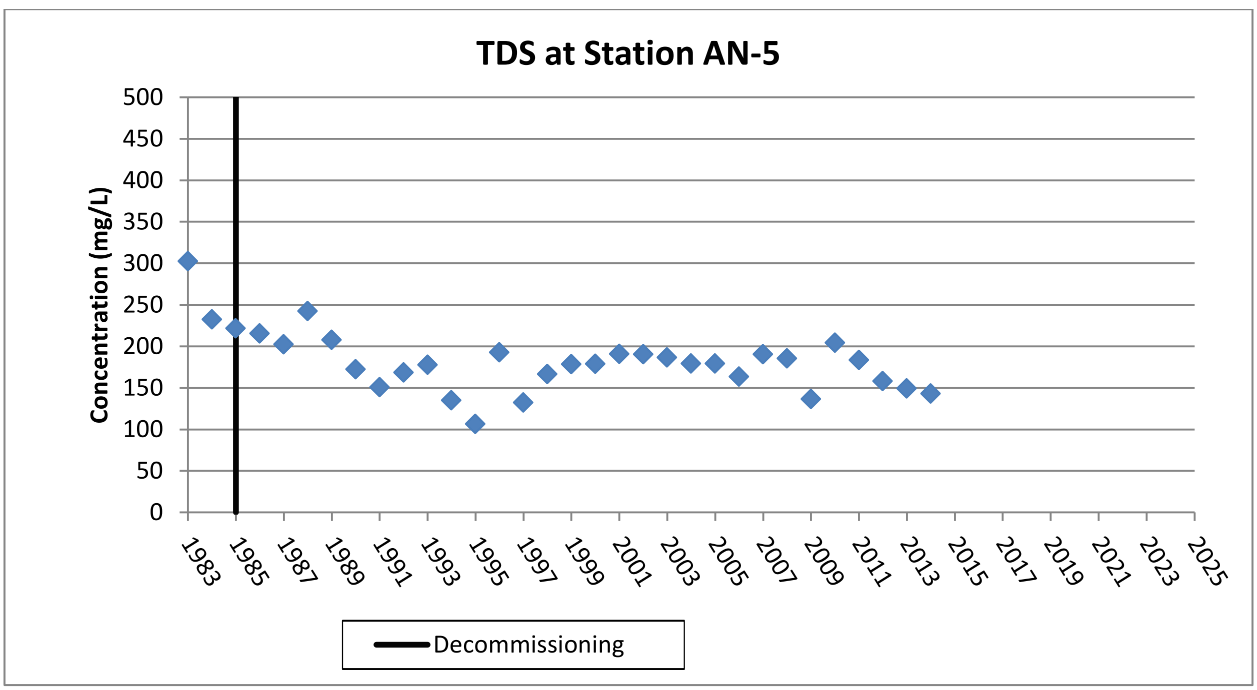


Figure 4.3.1-5 DB-6 Dubyna Creek

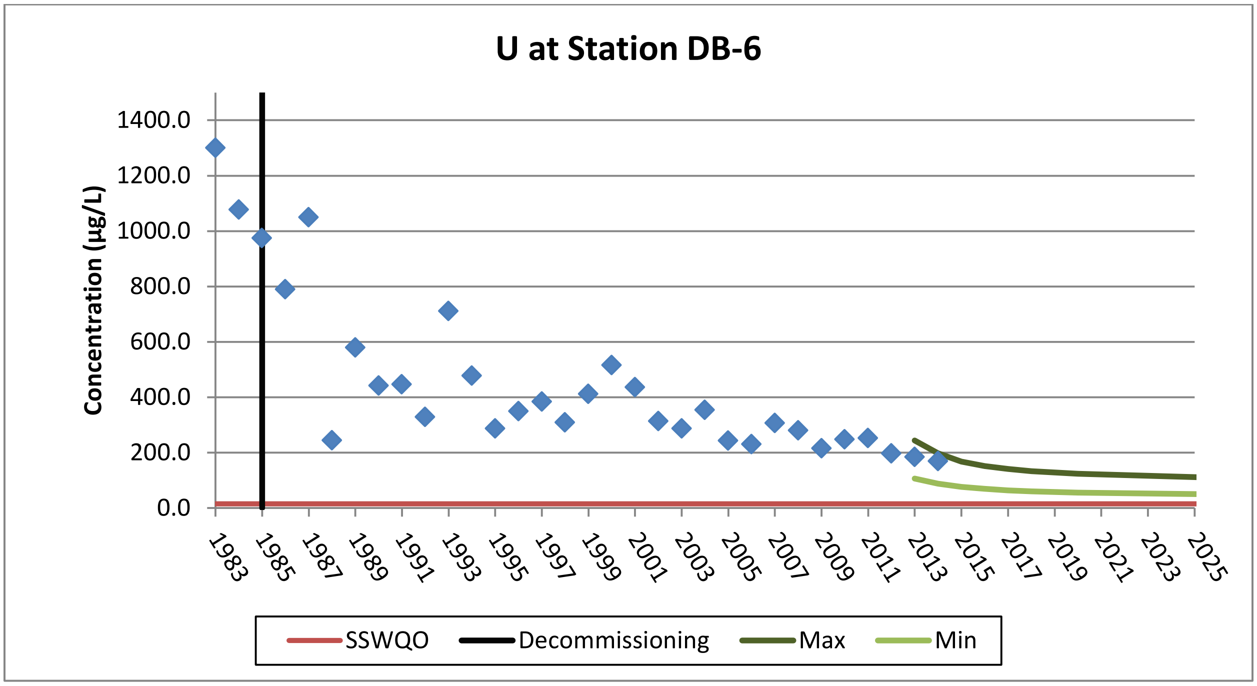


Figure 4.3.1-6 DB-6 Dubyna Creek

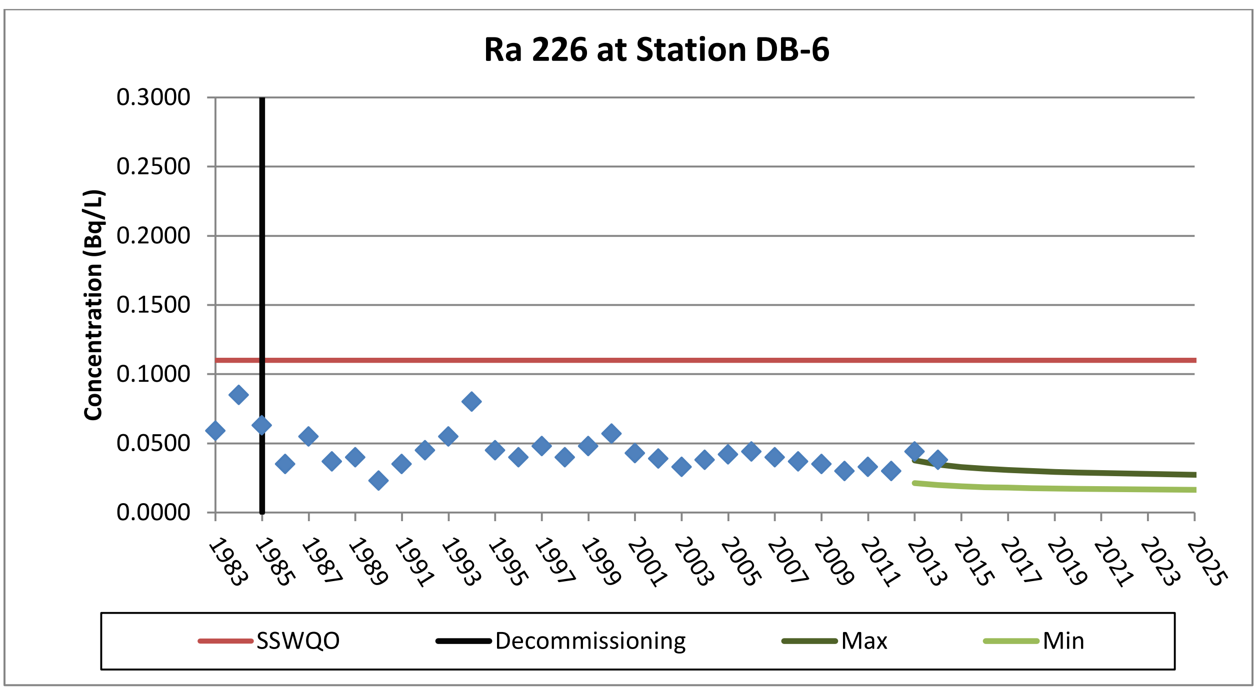
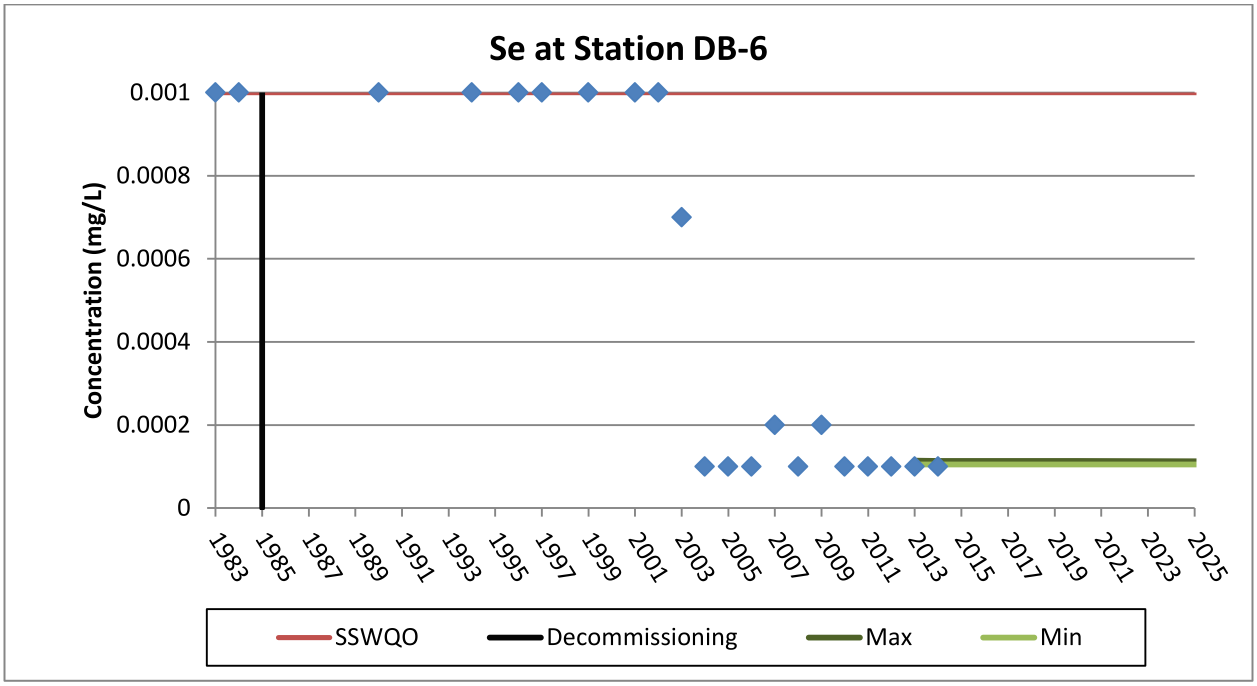


Figure 4.3.1-7 DB-6 Dubyna Creek



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

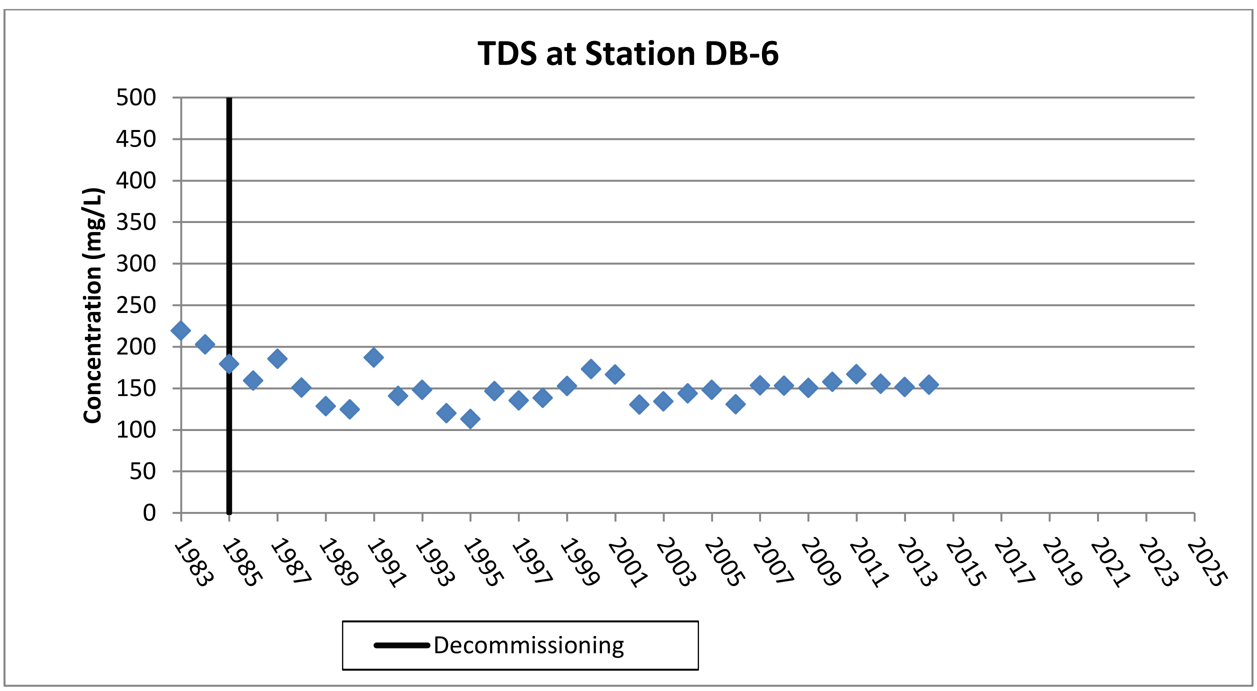


Figure 4.3.1-9 AC-6A Verna Lake Discharge to Ace Lake

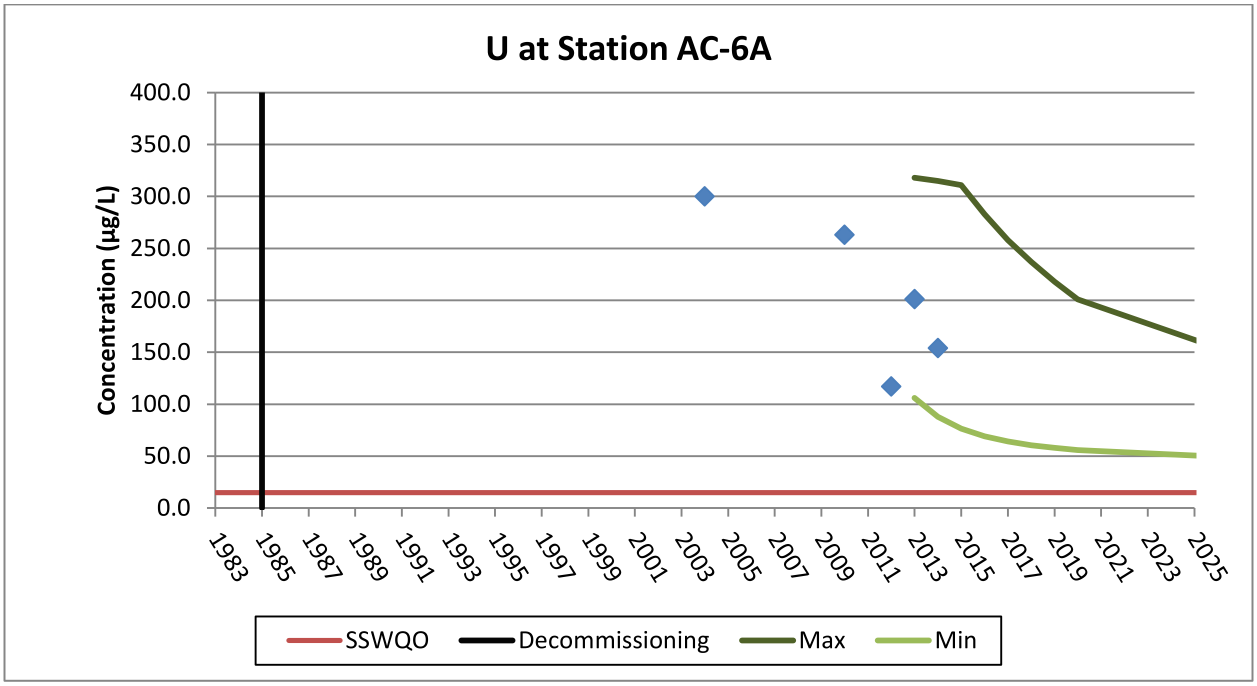


Figure 4.3.1-10 AC-6A Verna Lake Discharge to Ace Lake

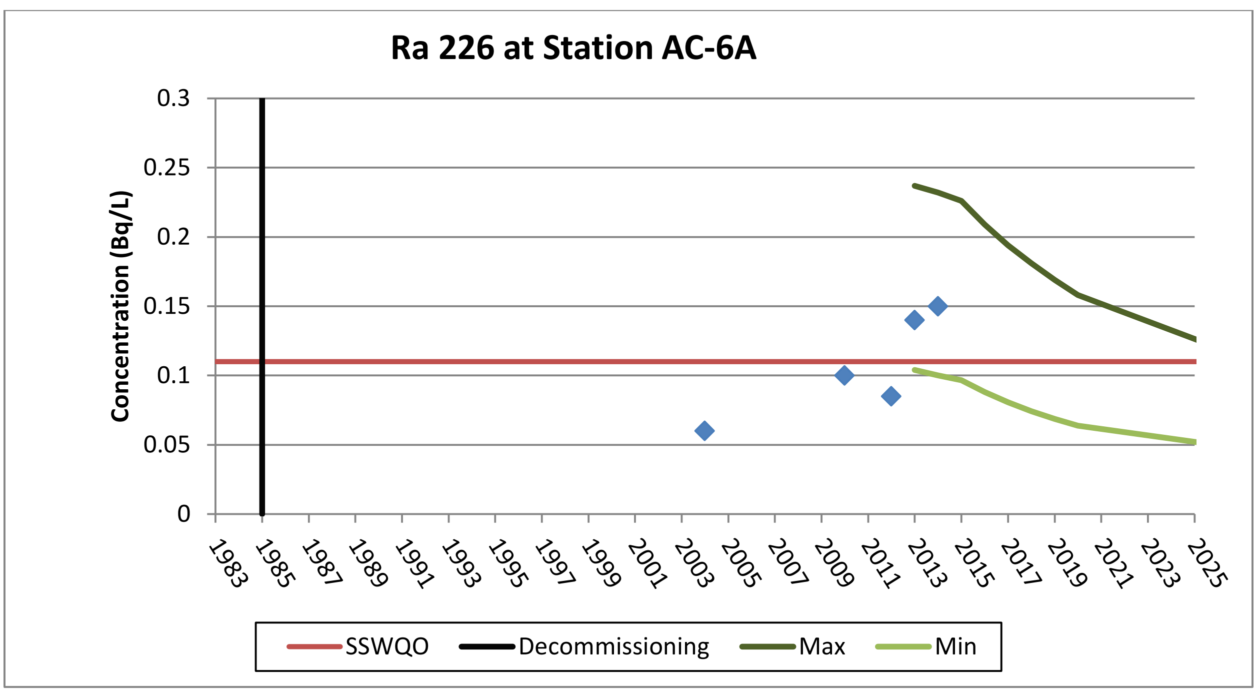
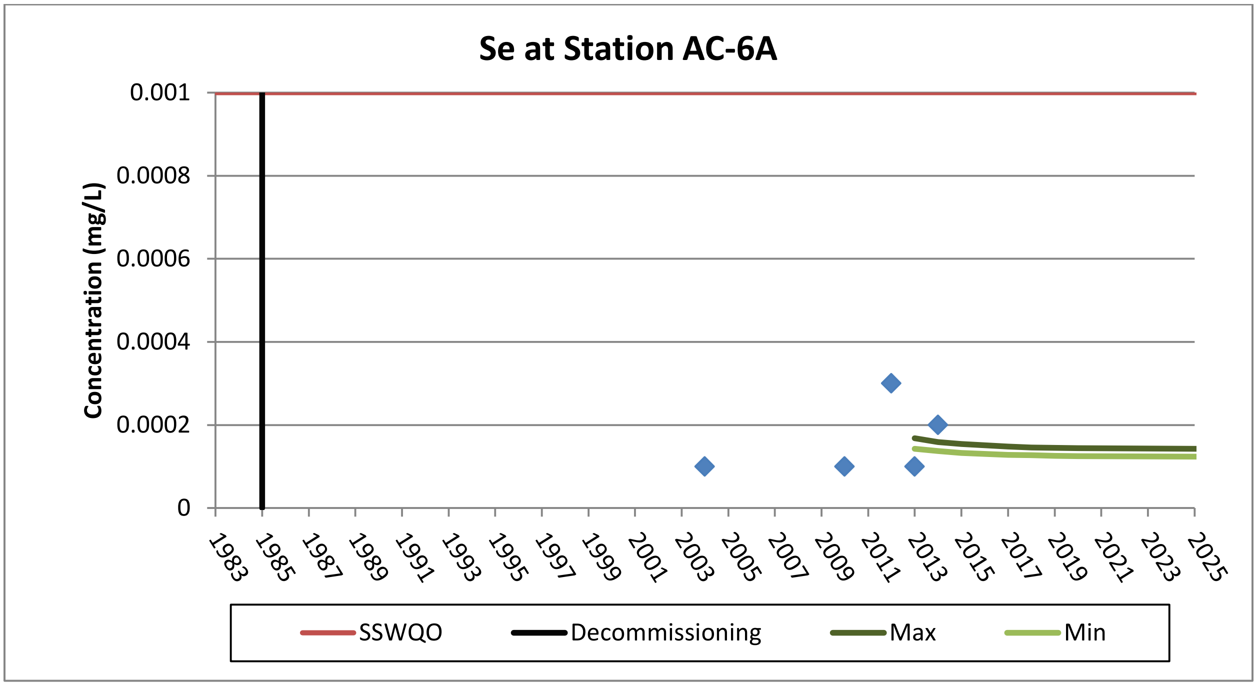


Figure 4.3.1-11 AC-6A Verna Lake Discharge to Ace Lake



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

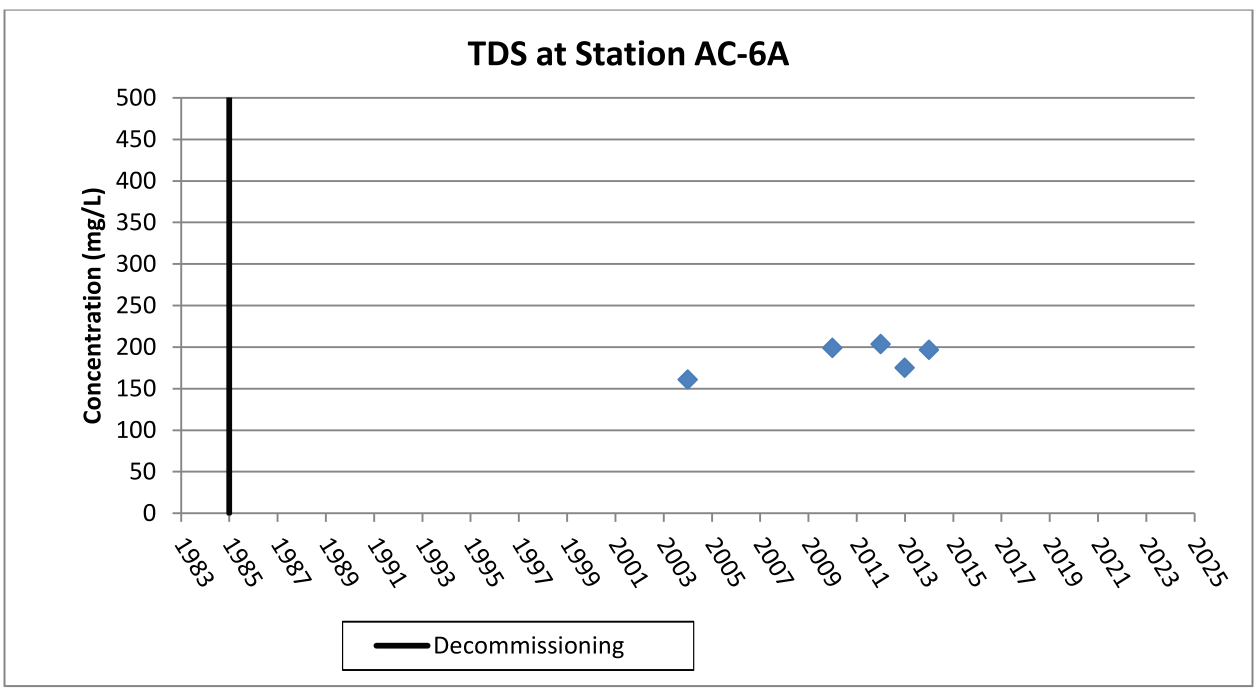


Figure 4.3.1-13 AC-8 - Ace Lake Outlet to Ace Creek

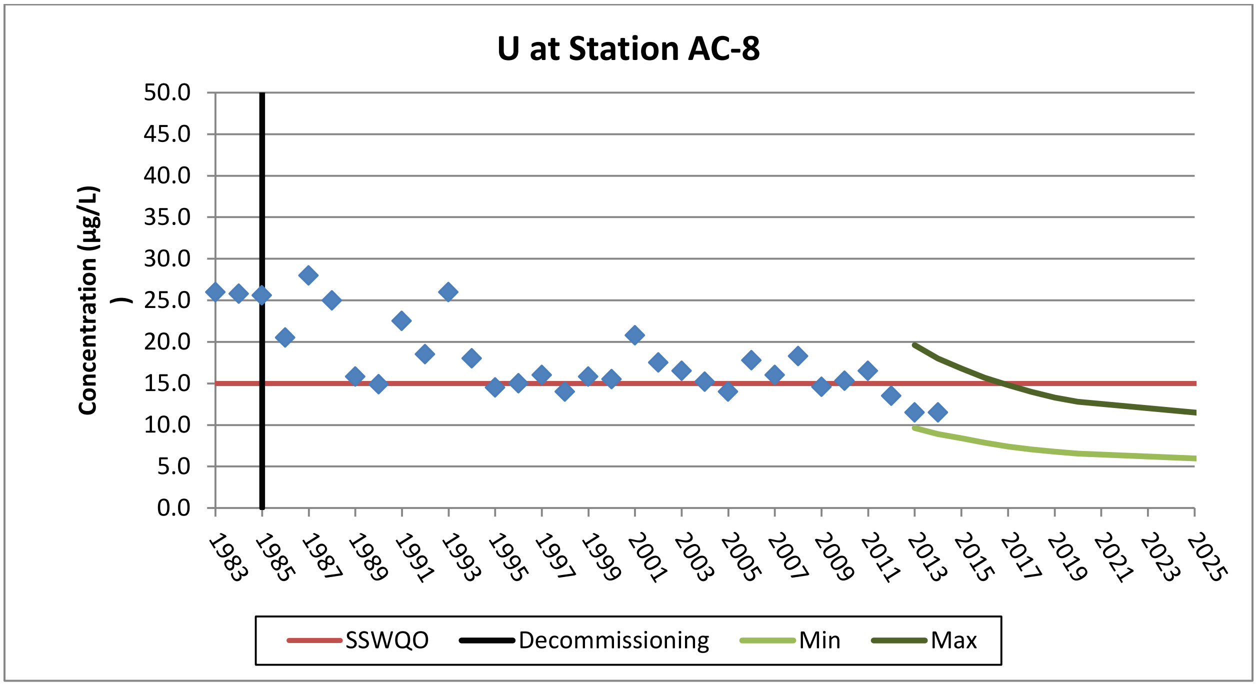


Figure 4.3.1-14 AC-8 - Ace Lake Outlet to Ace Creek

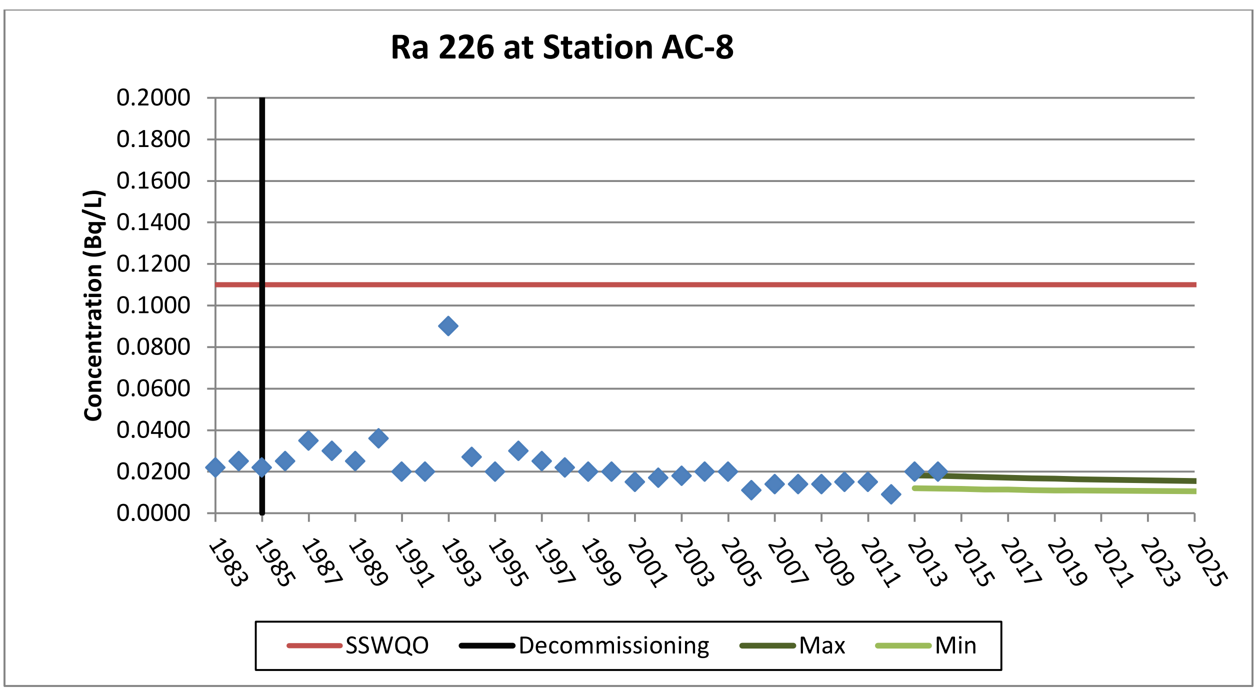


Figure 4.3.1-15 AC-8 - Ace Lake Outlet to Ace Creek

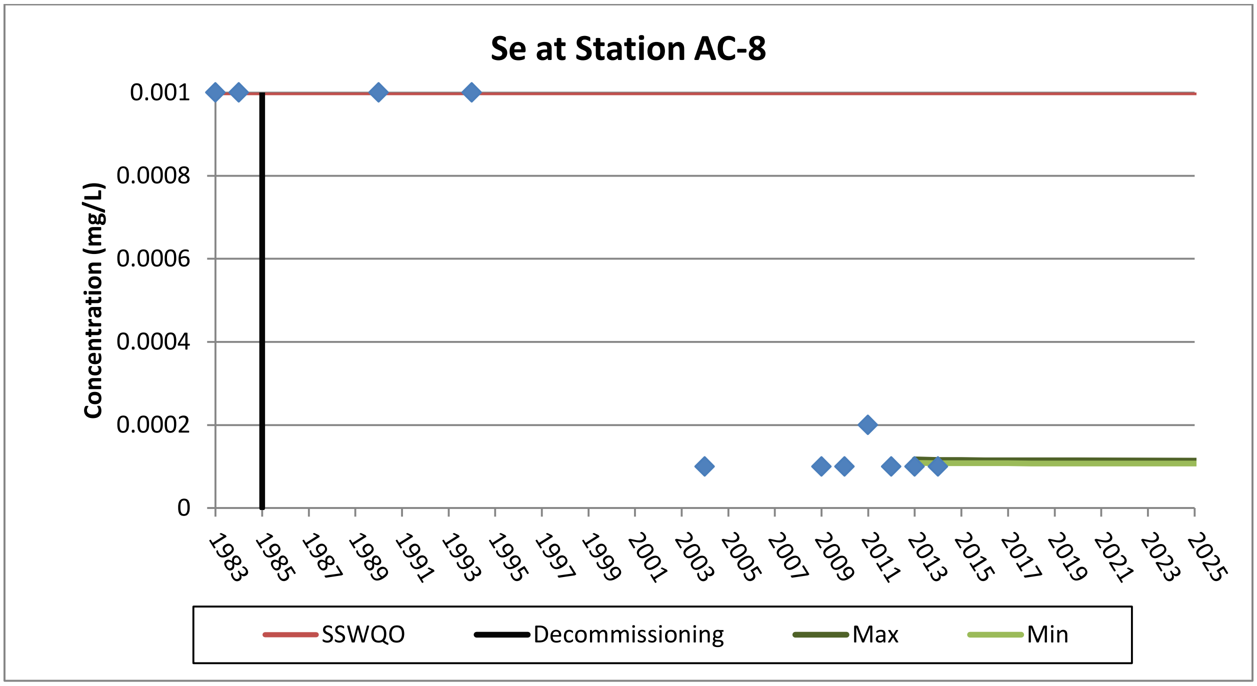


Figure 4.3.1-16 AC-8 - Ace Lake Outlet to Ace Creek

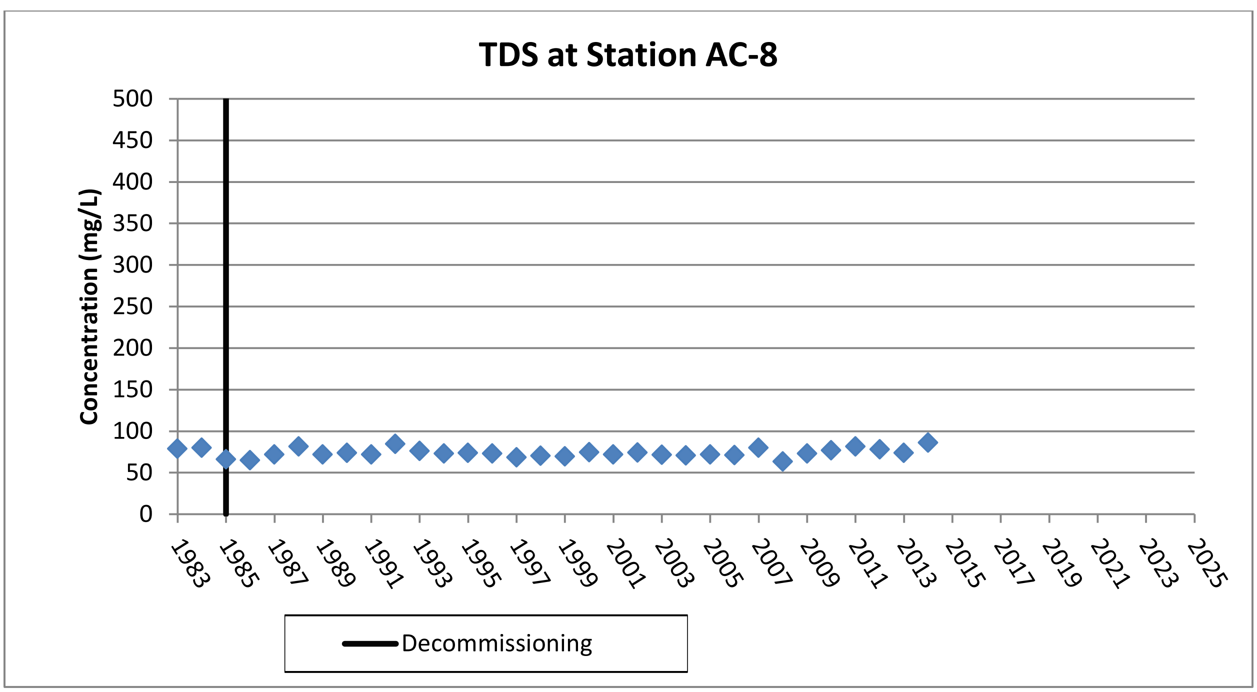


Figure 4.3.1-17 AC-14 - Ace Creek

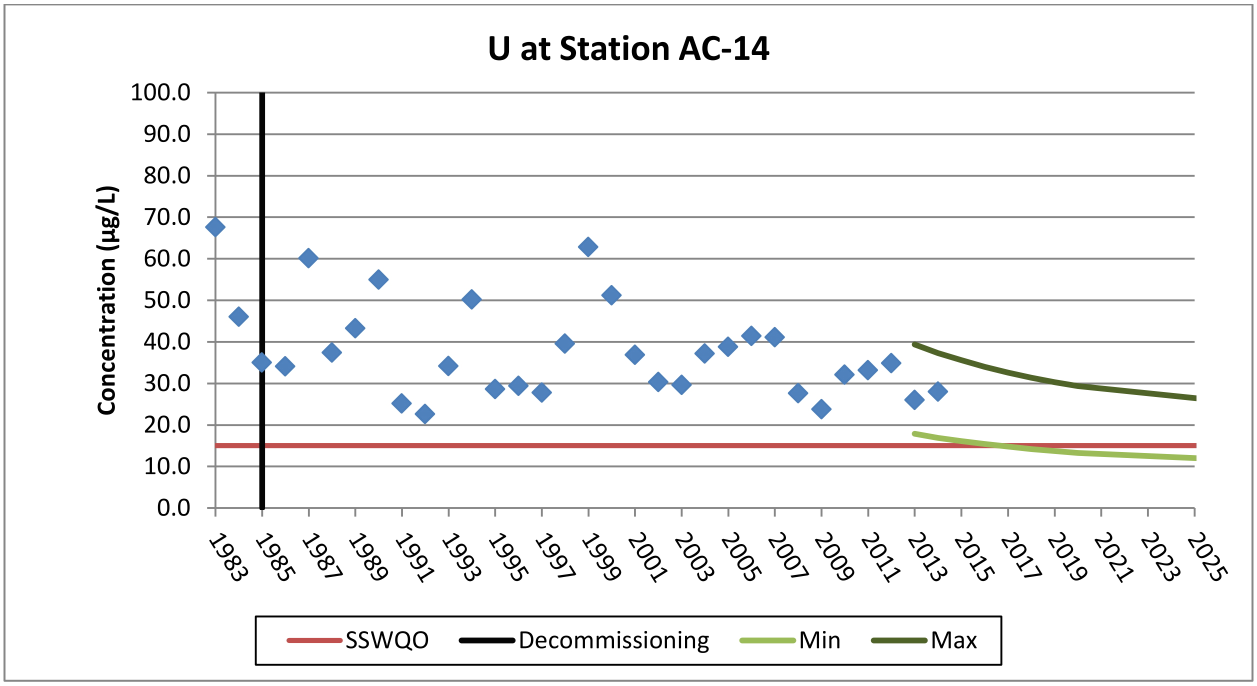


Figure 4.3.1-18 AC-14 - Ace Creek

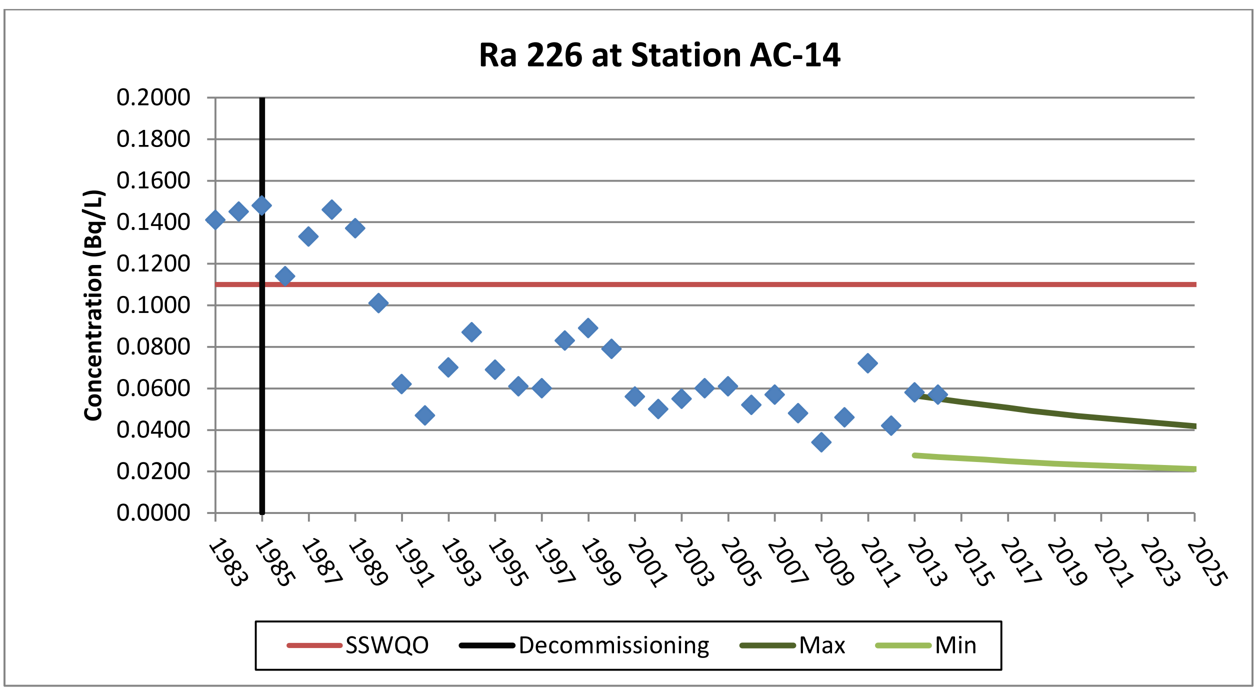
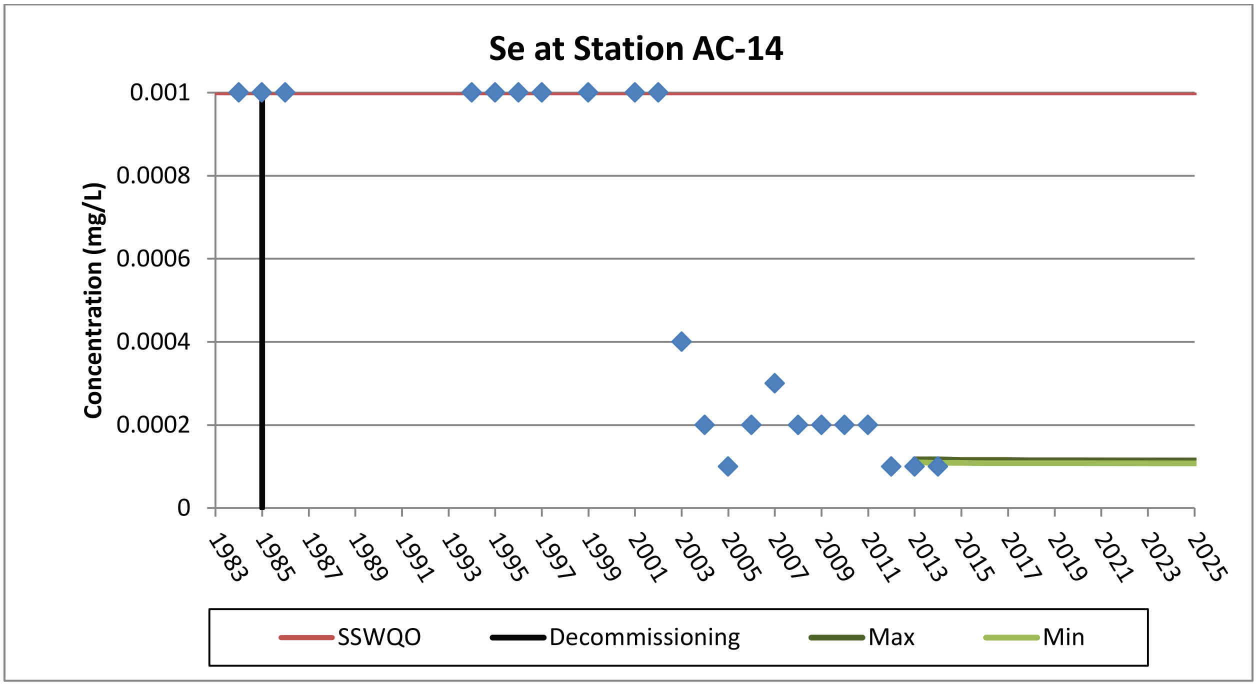


Figure 4.3.1-19 AC-14 - Ace Creek



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

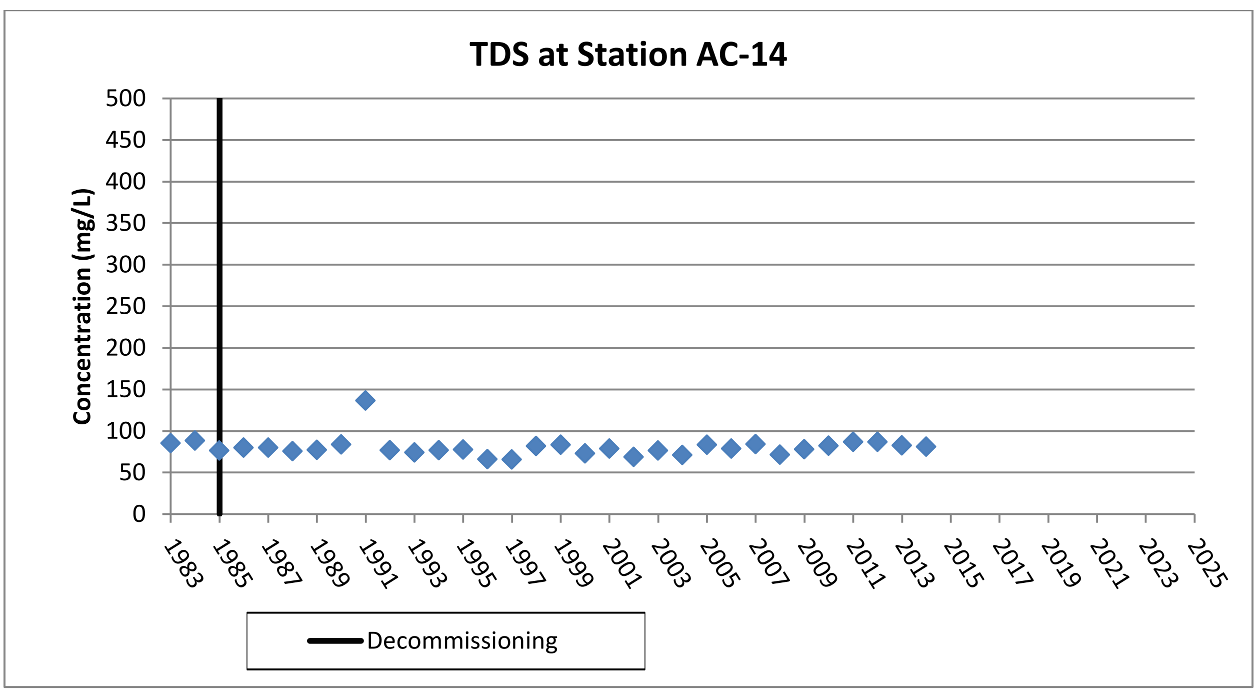
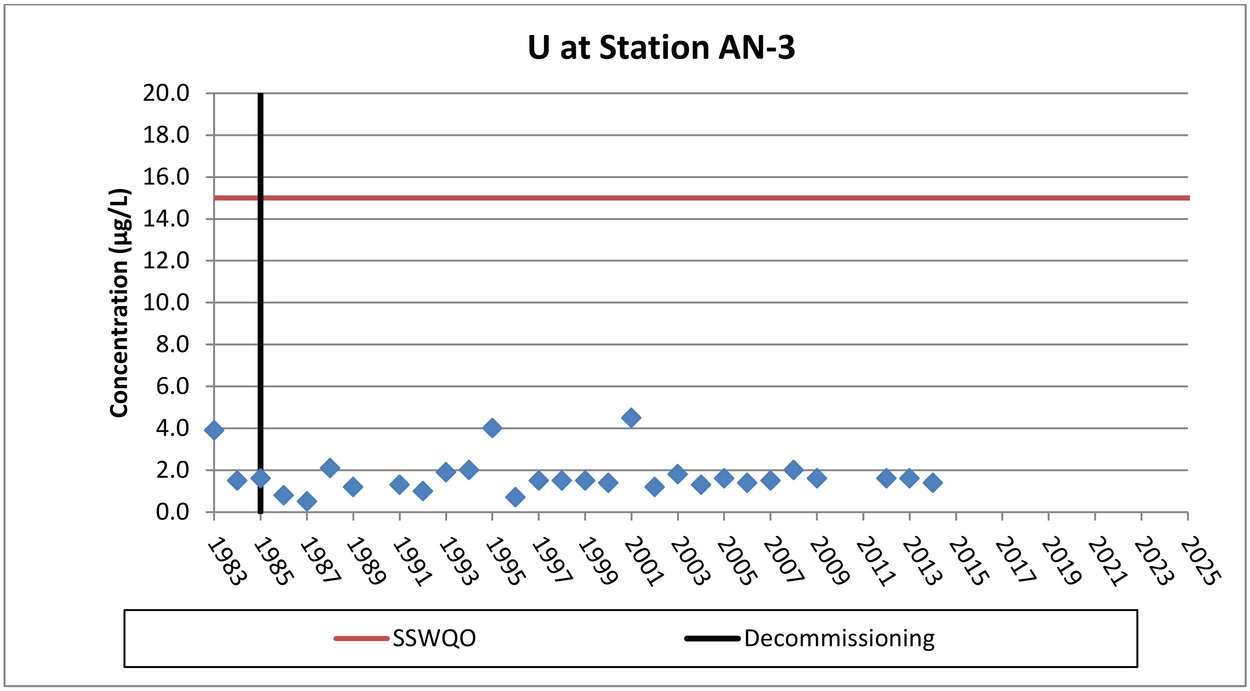
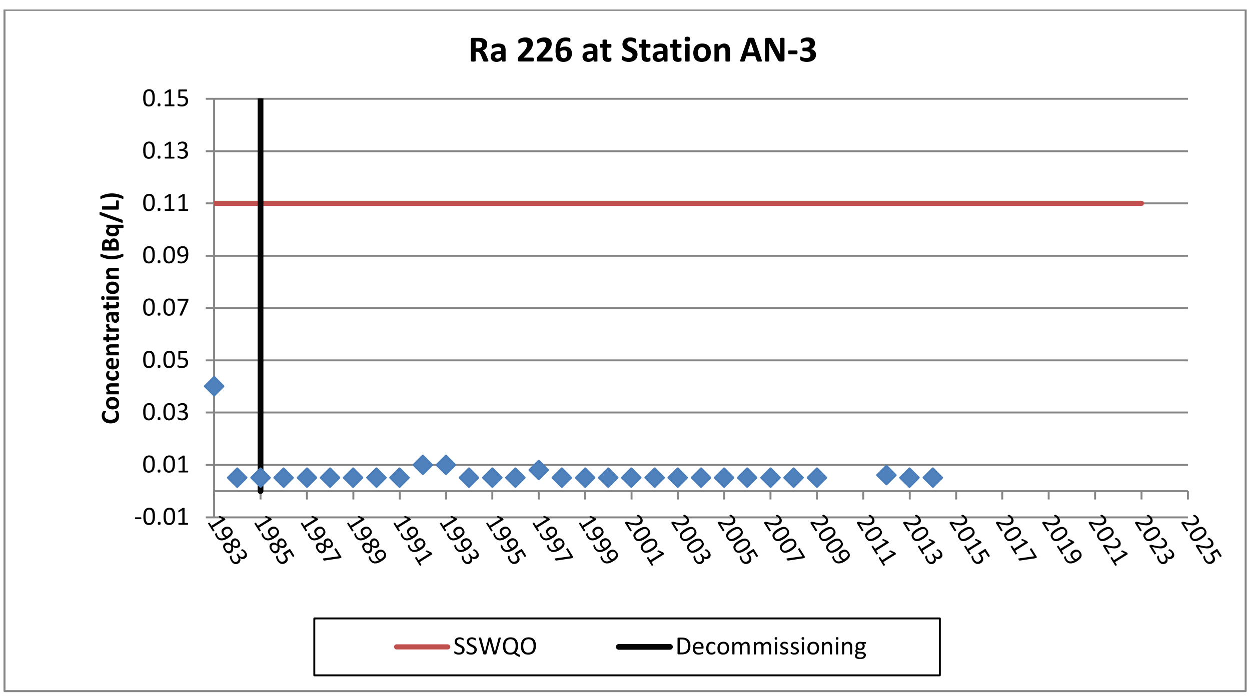


Figure 4.3.2-1 AN-3 Fulton Lake (upstream of TL Stations)



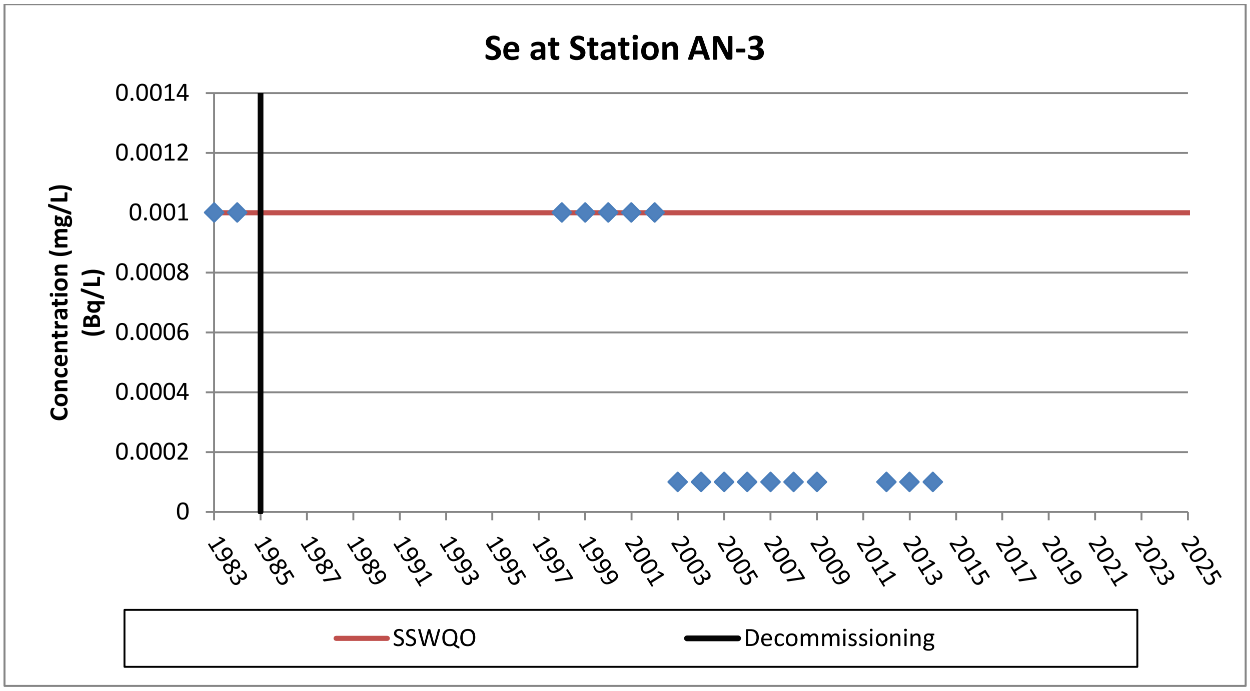
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*

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.*

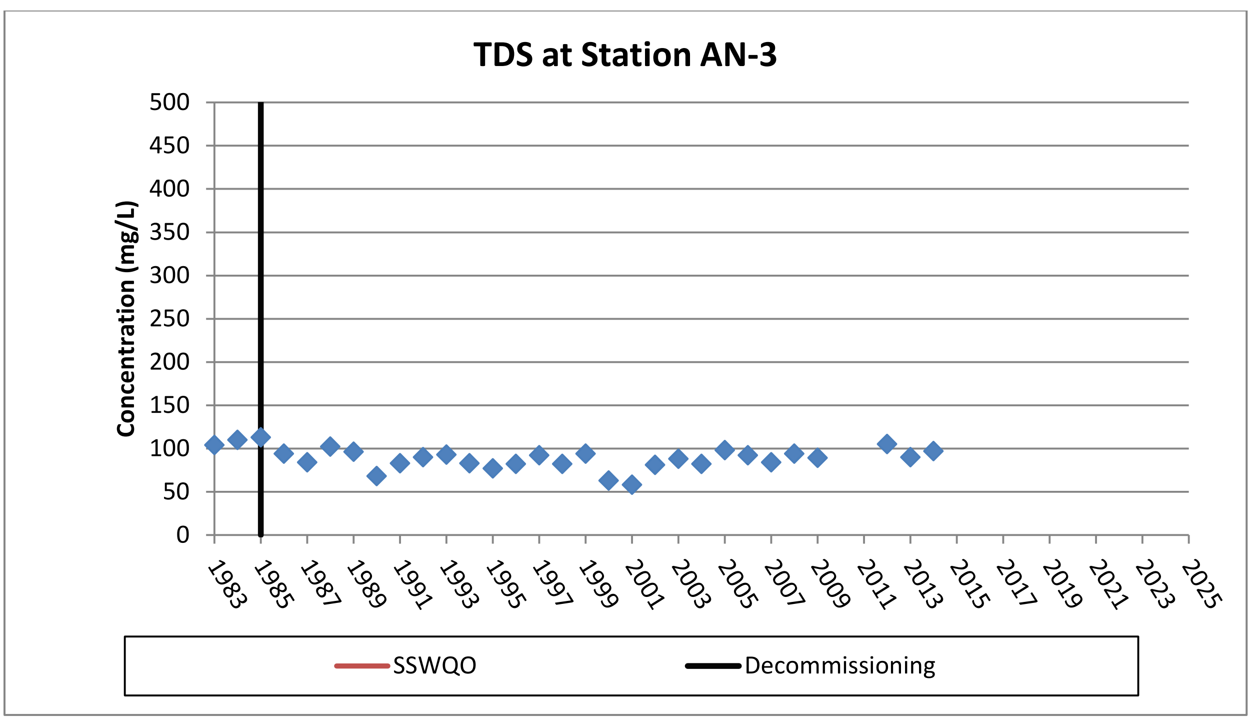
Figure 4.3.2-3 AN-3 Fulton Lake (upstream of TL Stations)



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

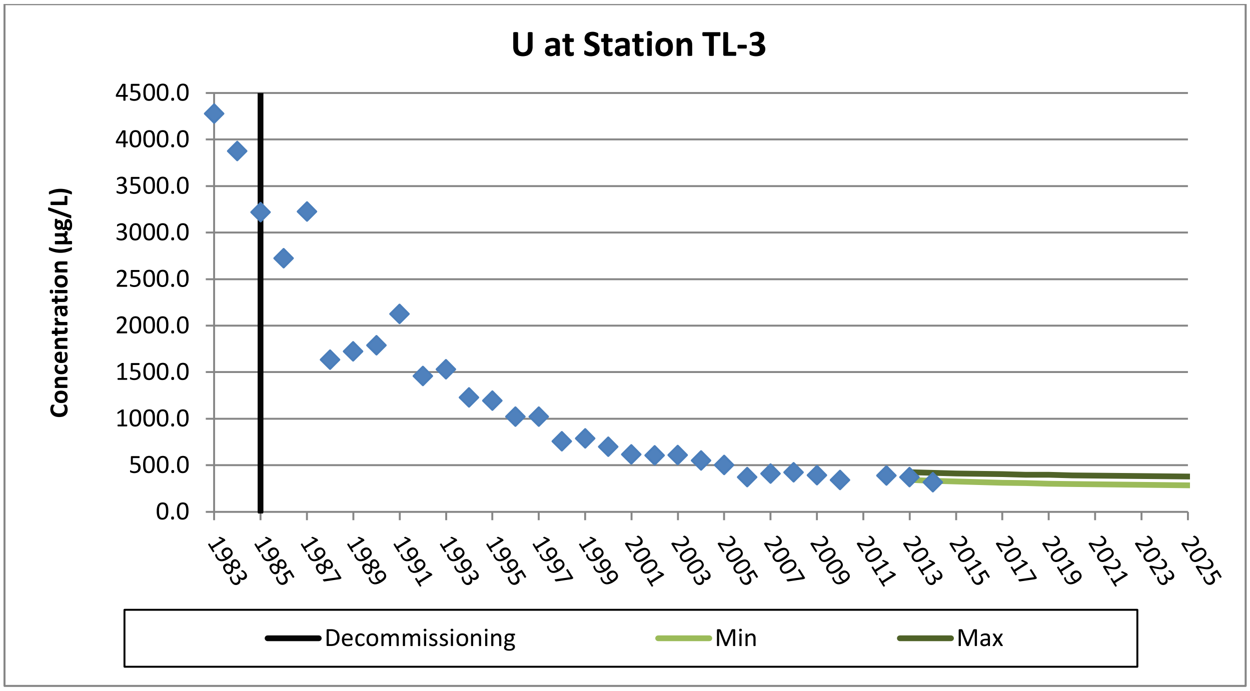
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003

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



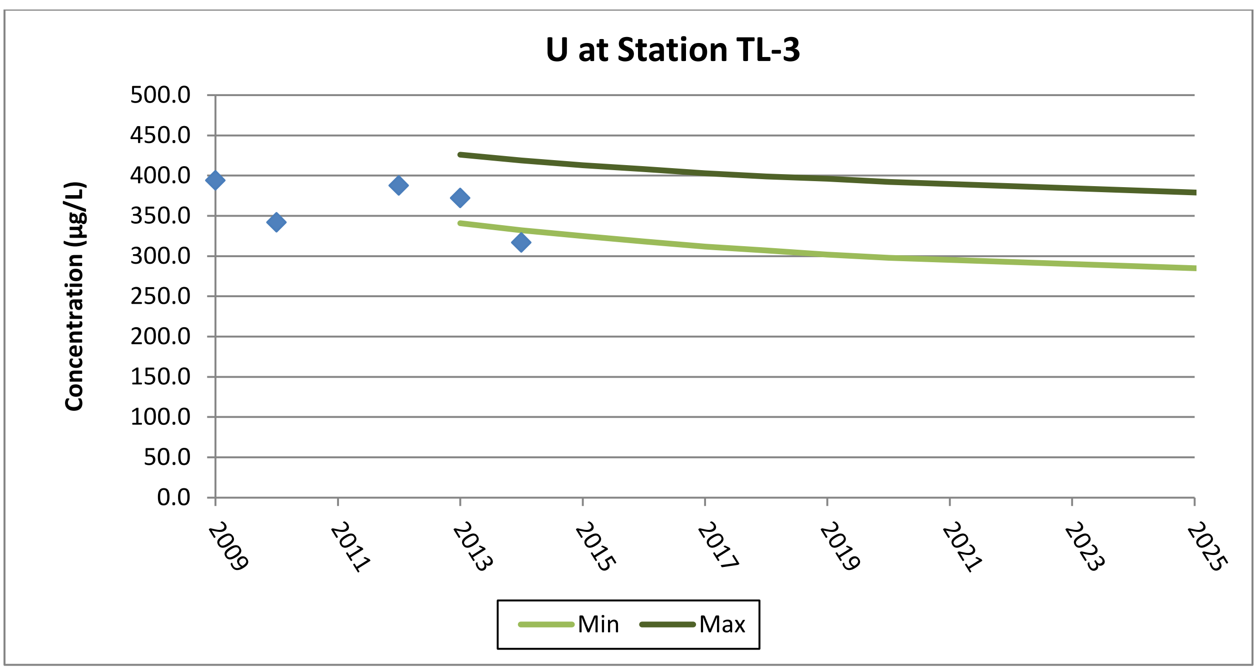
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*

Figure 4.3.2-5 TL-3 Fookes Reservoir Discharge



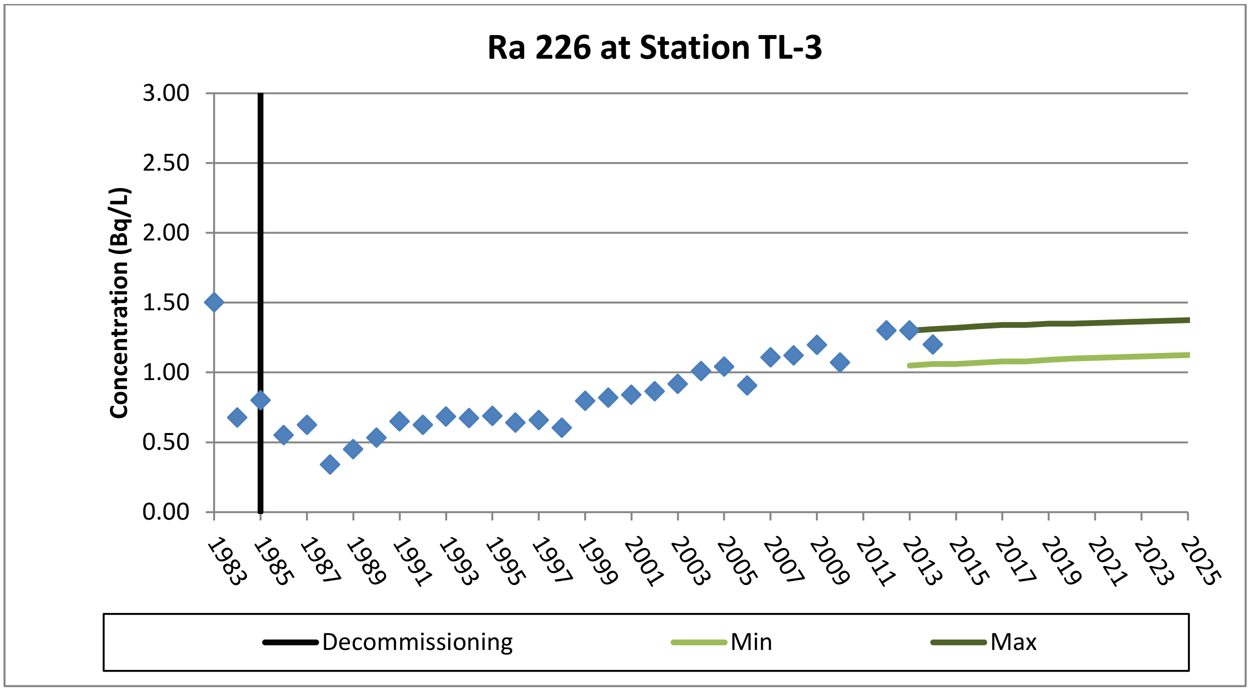
**No data available for 2011 due to a lack of water flow*

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



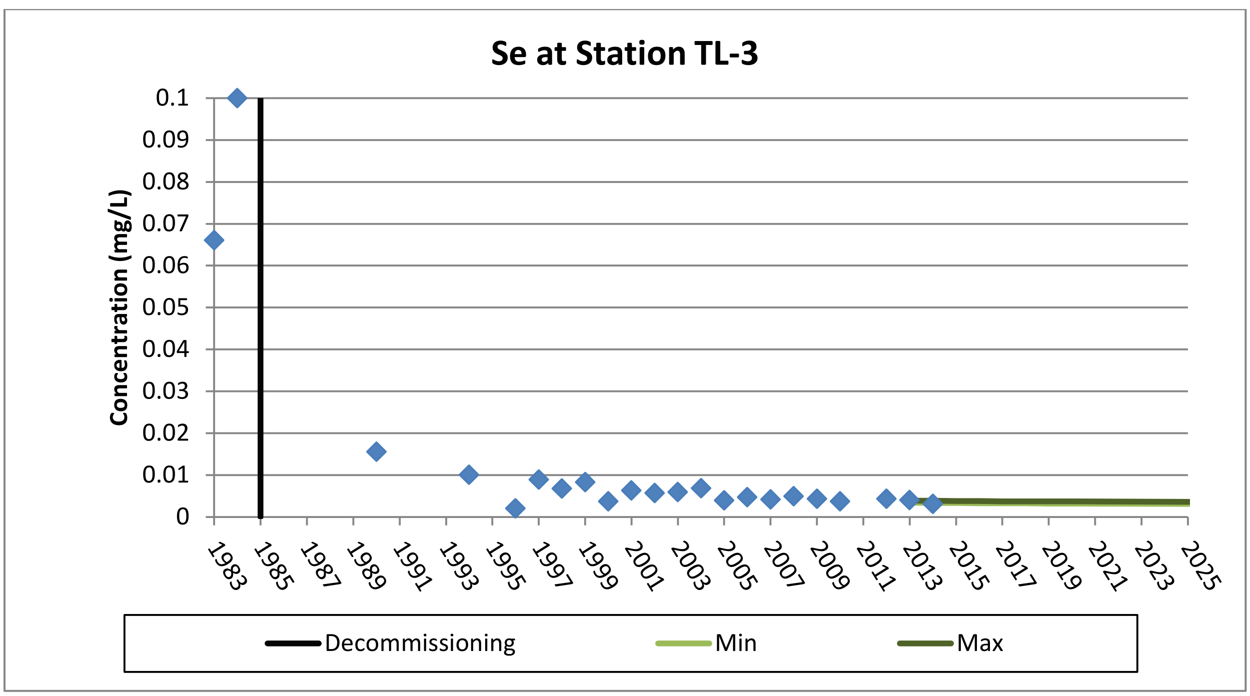
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-7 TL-3 Fookes Reservoir Discharge



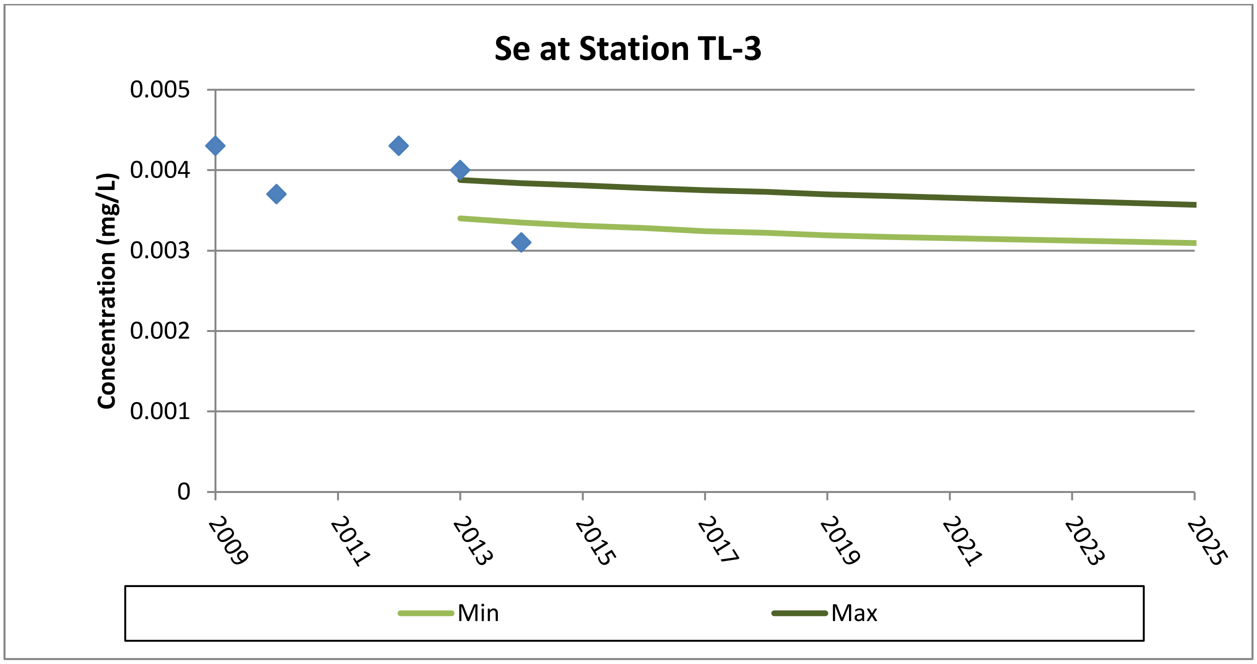
No data available for 2011 due to a lack of water flow

Figure 4.3.2-8 TL-3 Fookes Reservoir Discharge



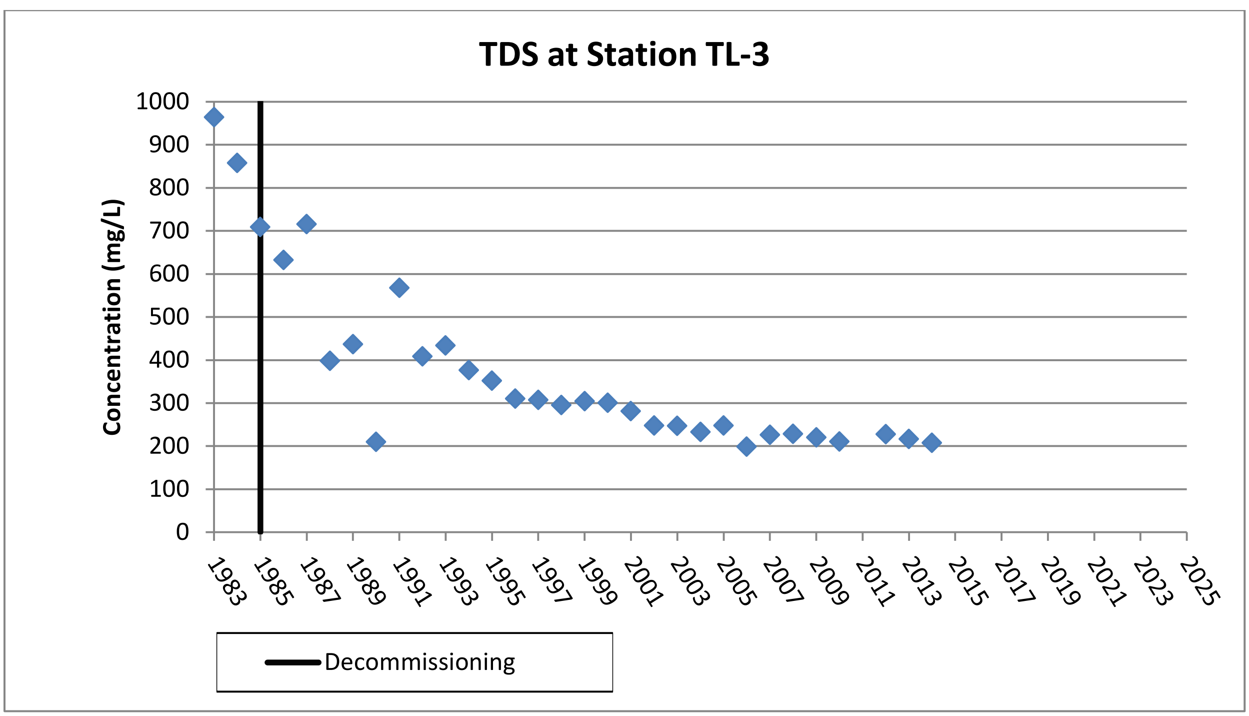
No data available for 2011 due to a lack of water flow

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



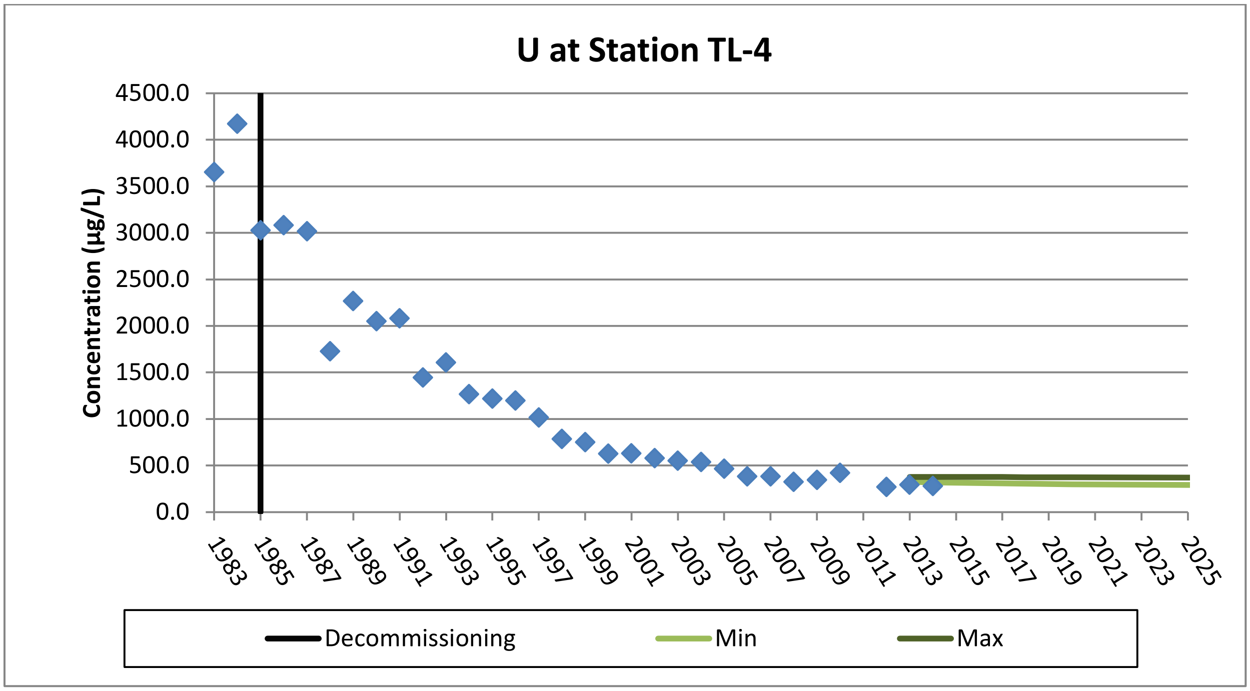
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-10 TL-3 Fookes Reservoir Discharge



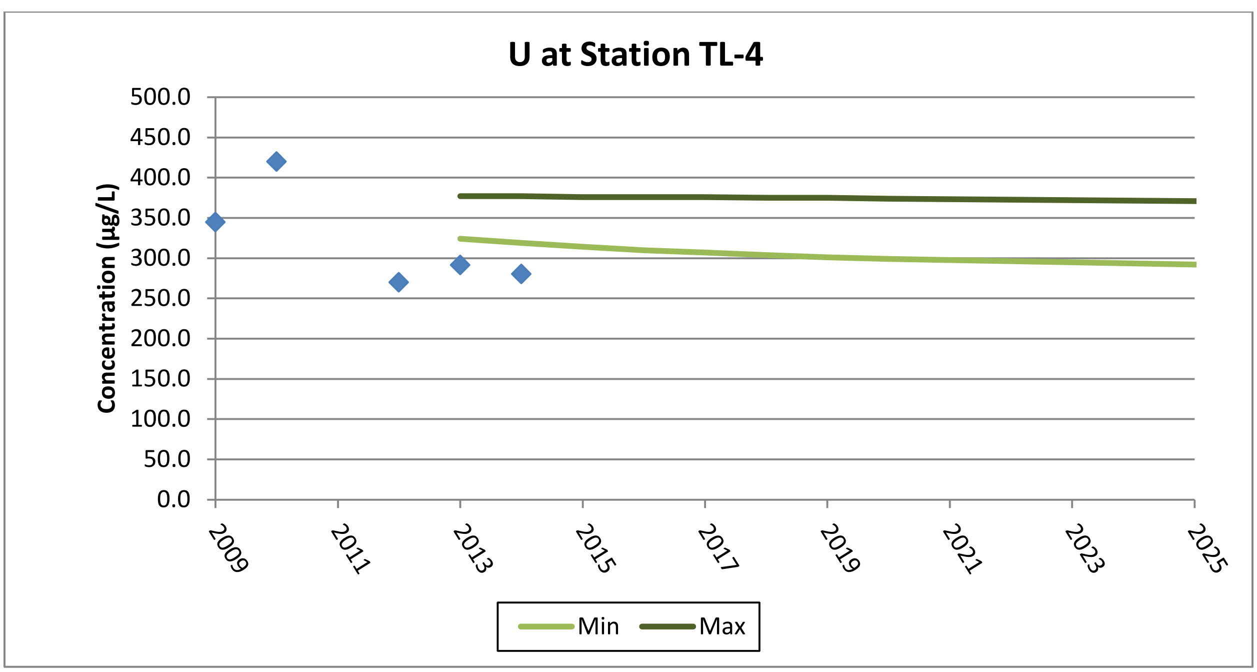
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-11 TL-4 Marie Reservoir Discharge



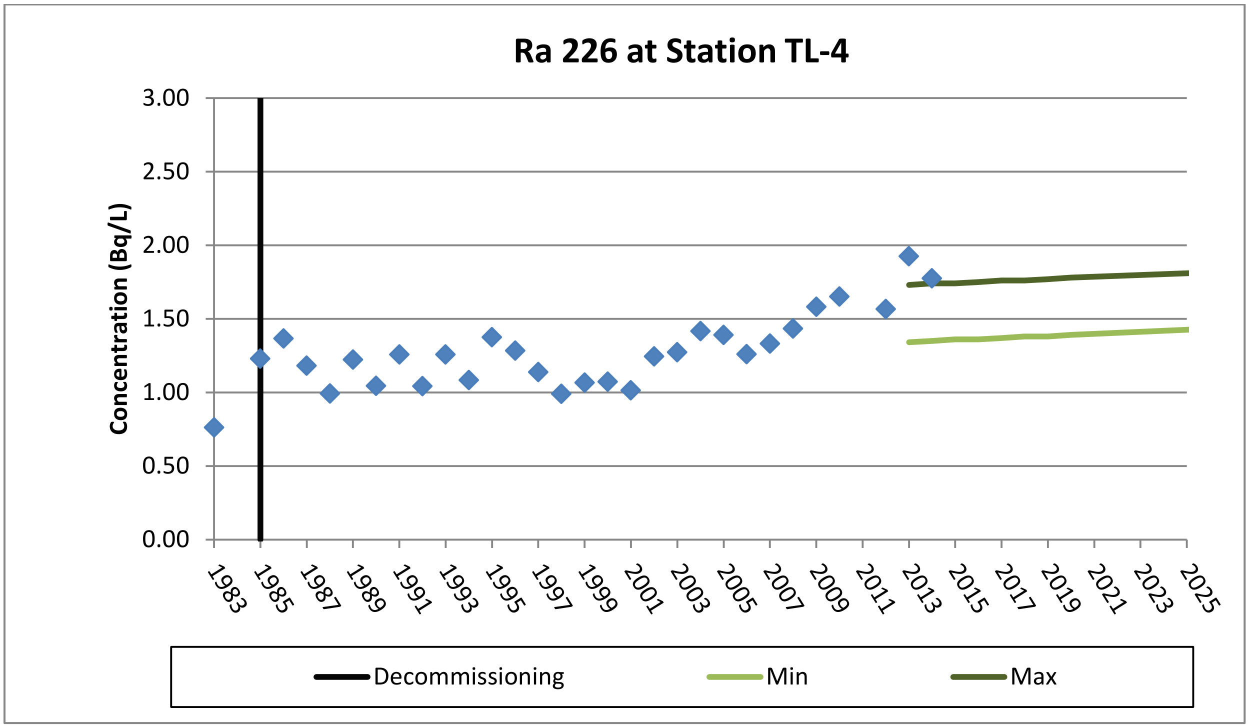
**No data available for 2011 due to a lack of water flow*

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



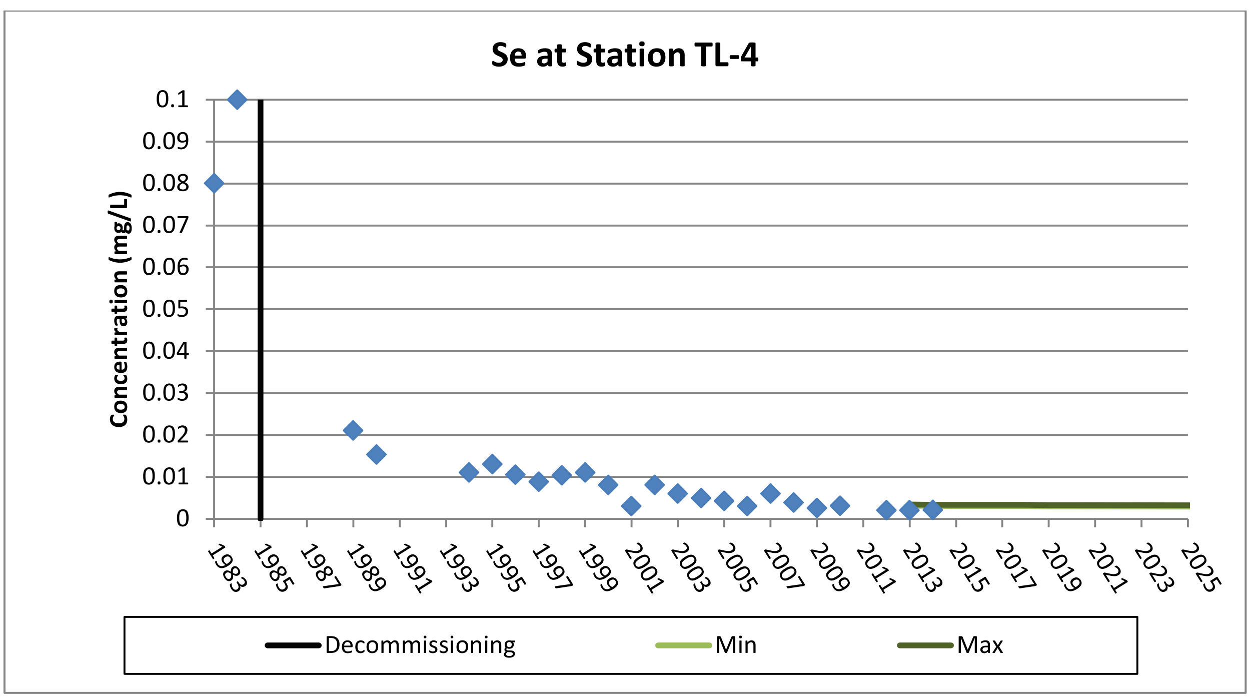
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-13 TL-4 Marie Reservoir Discharge



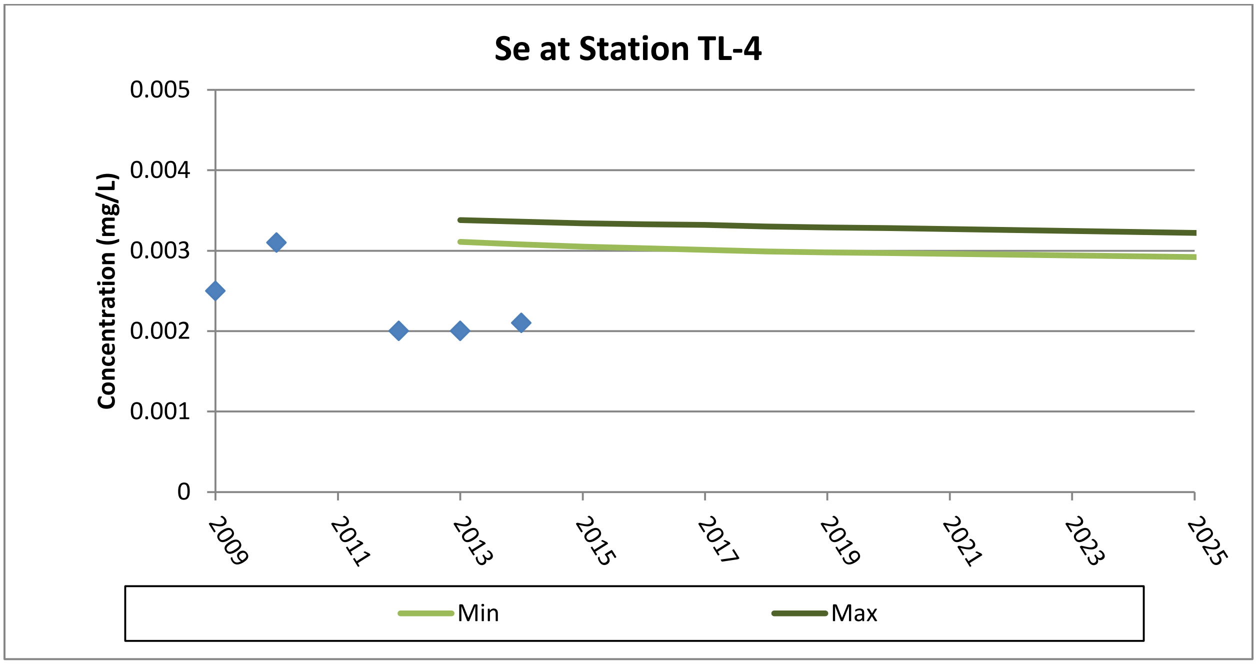
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-14 TL-4 Marie Reservoir Discharge



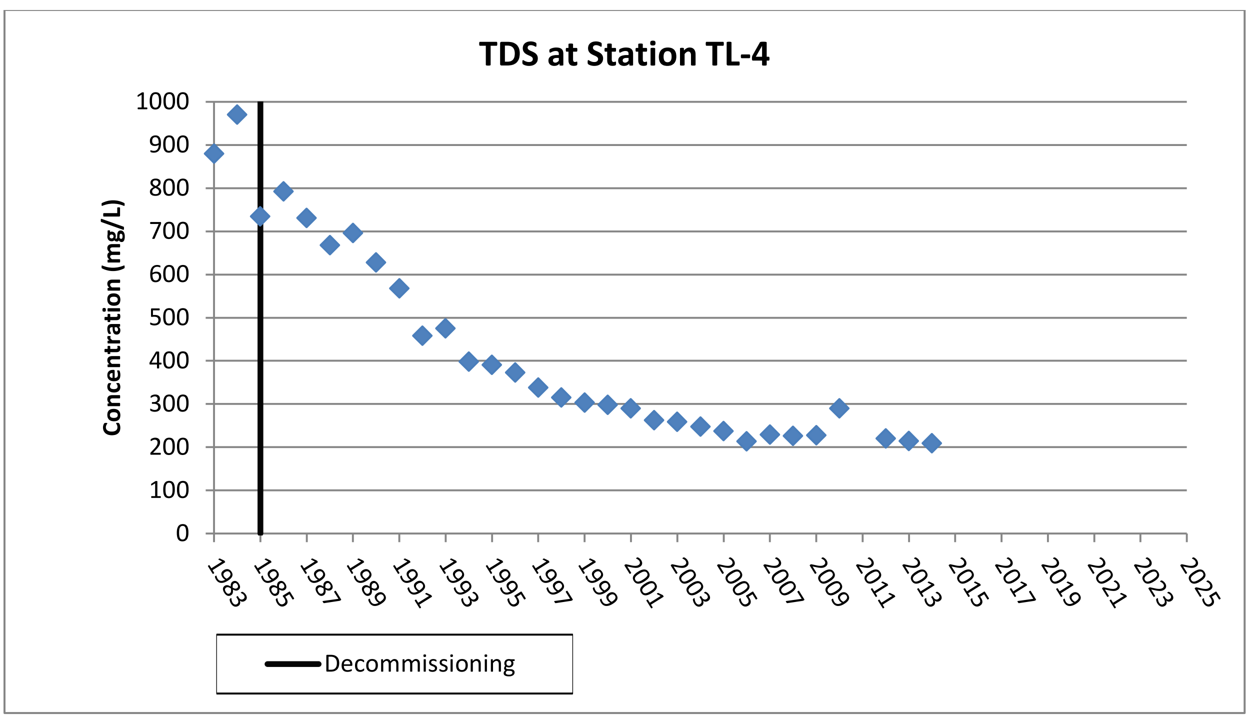
**No data available for 2011 due to a lack of water flow*

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



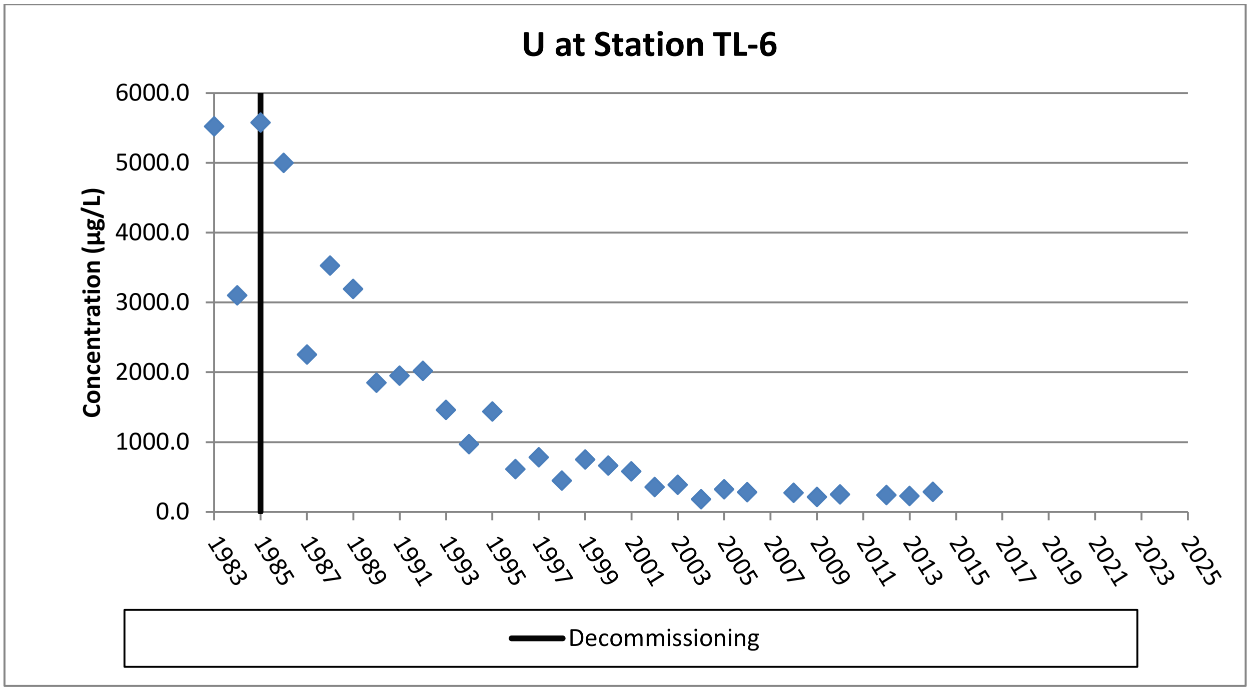
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-16 TL-4 Marie Reservoir Discharge



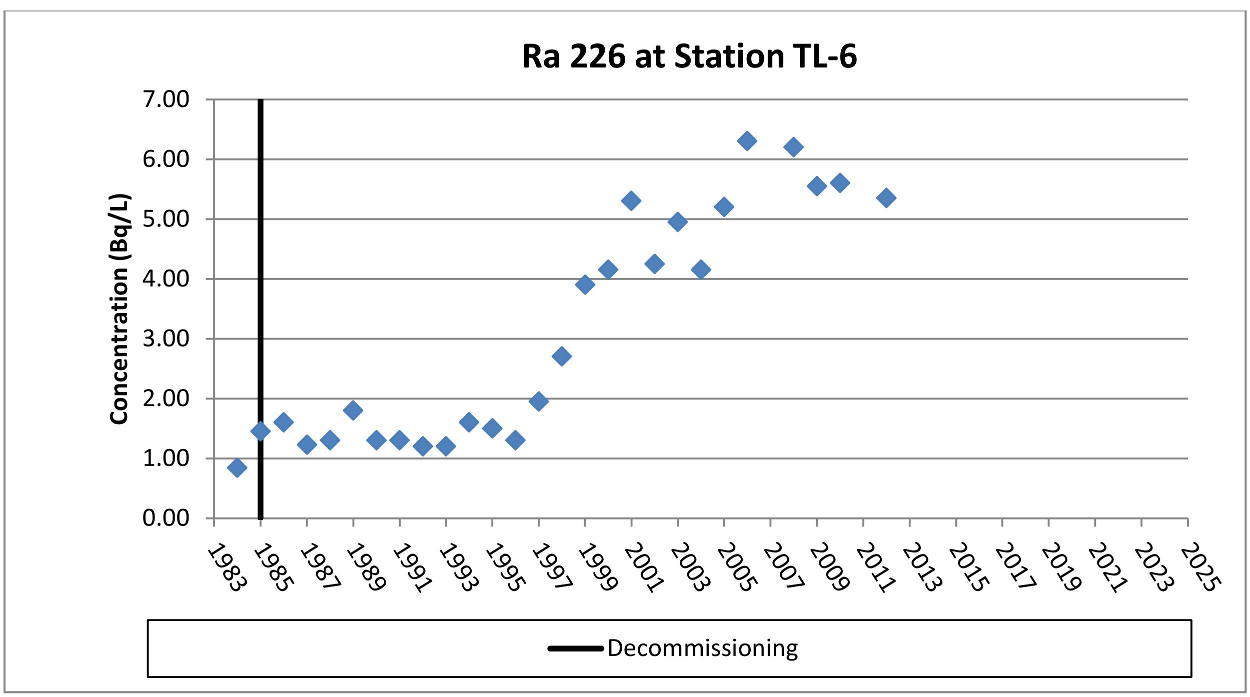
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-17 TL-6 Minewater Reservoir Discharge



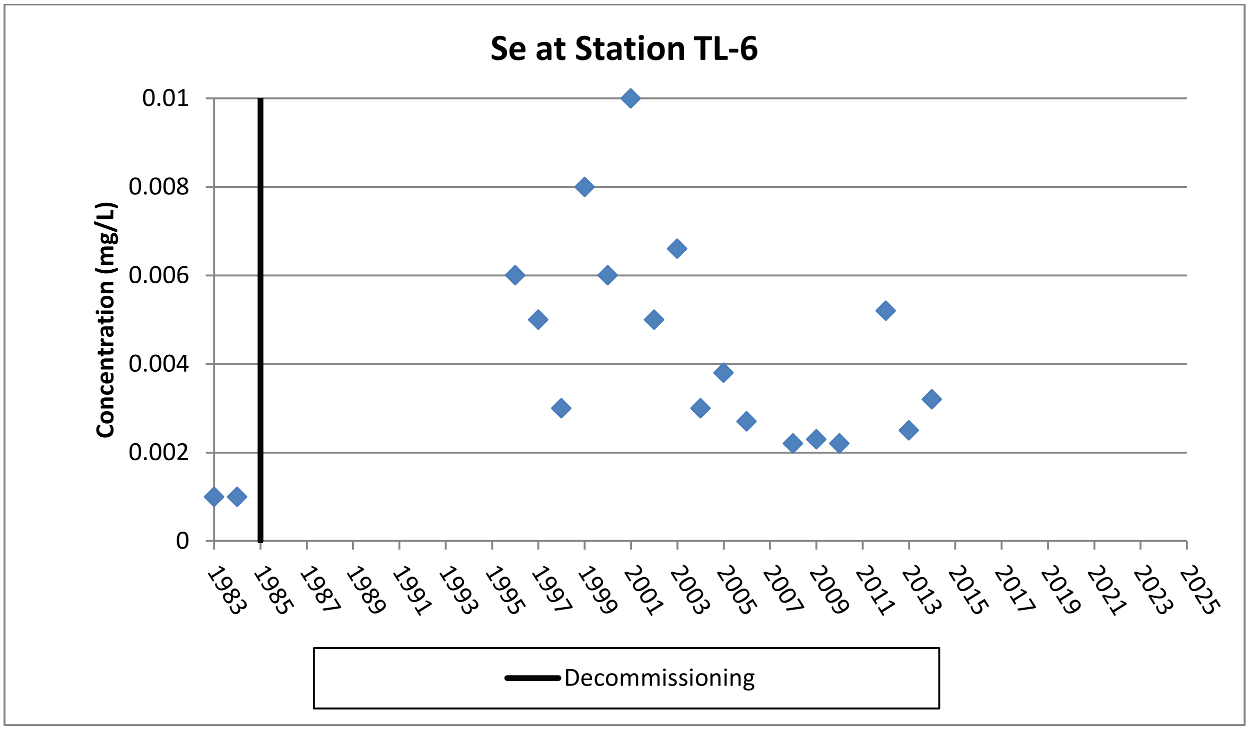
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-18 TL-6 Minewater Reservoir Discharge



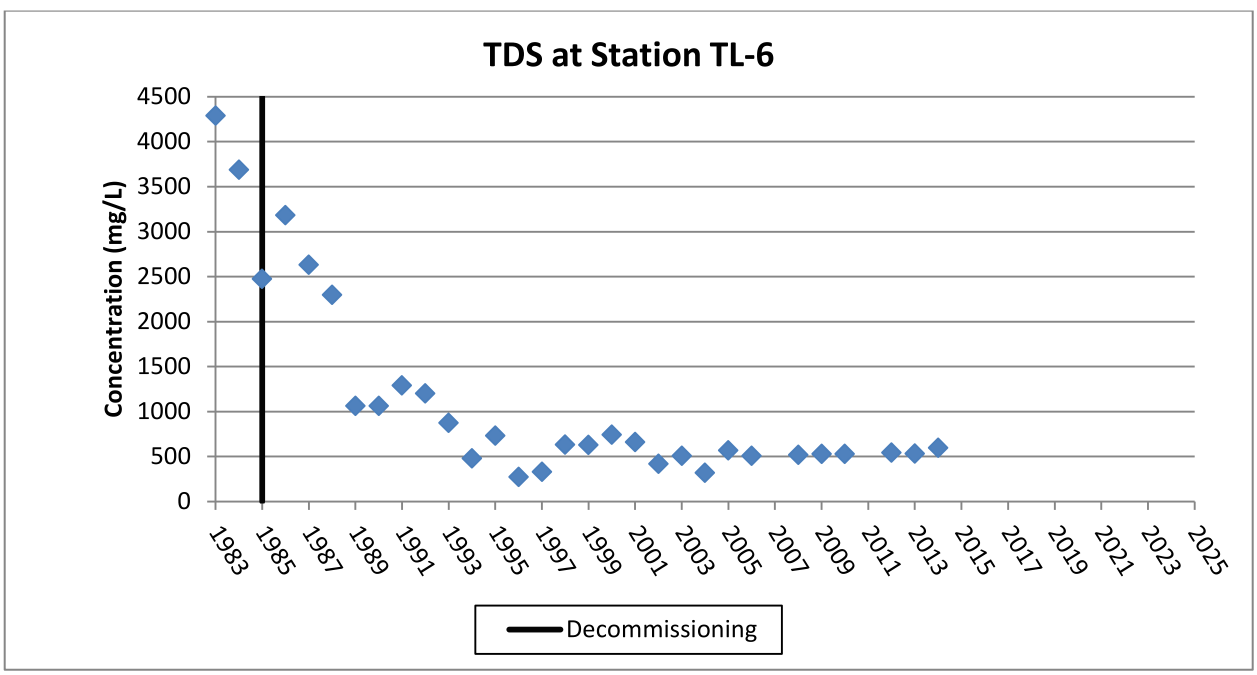
**No data available for 2007 and 2011 due to a lack of water flow*

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

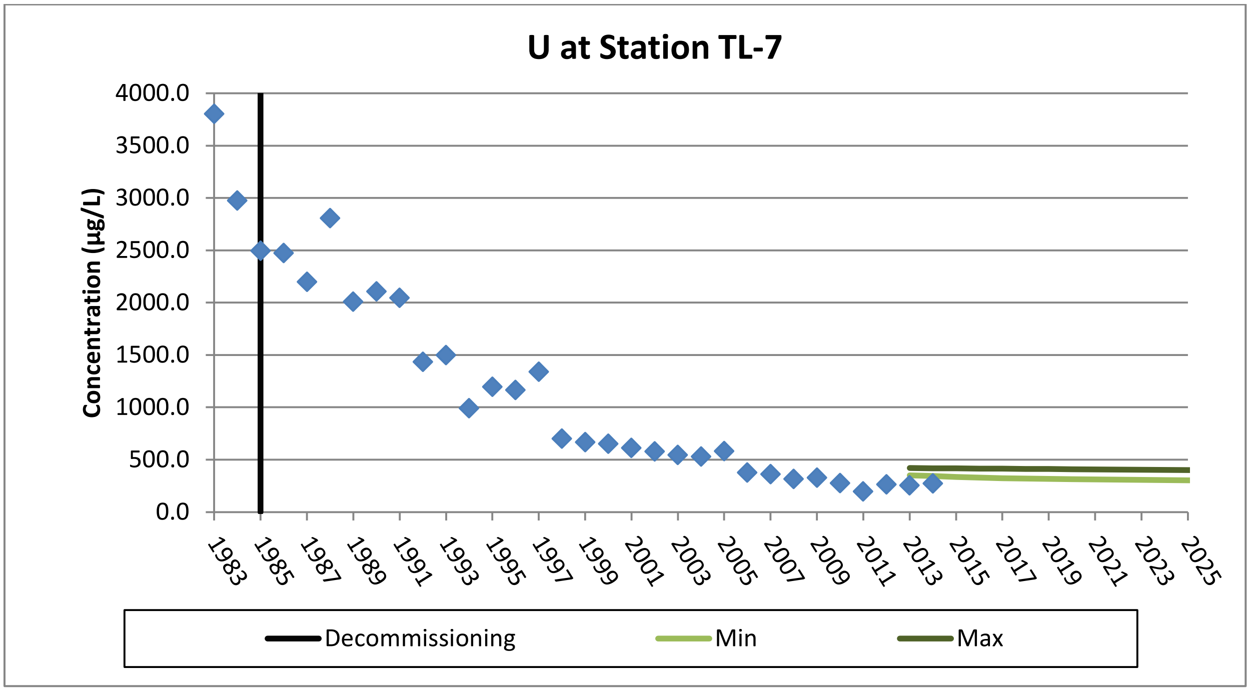


Figure 4.3.2-22 TL-7 Meadow Fen Discharge - Detailed Trend

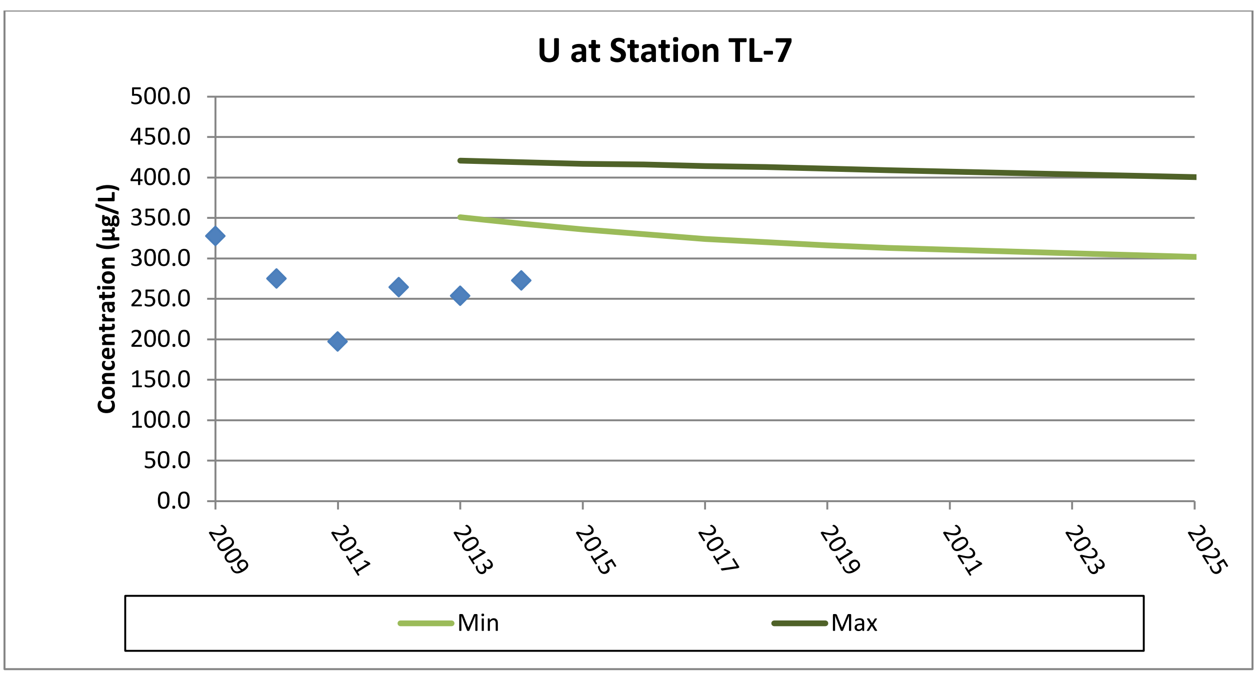


Figure 4.3.2-23 TL-7 Meadow Fen Discharge

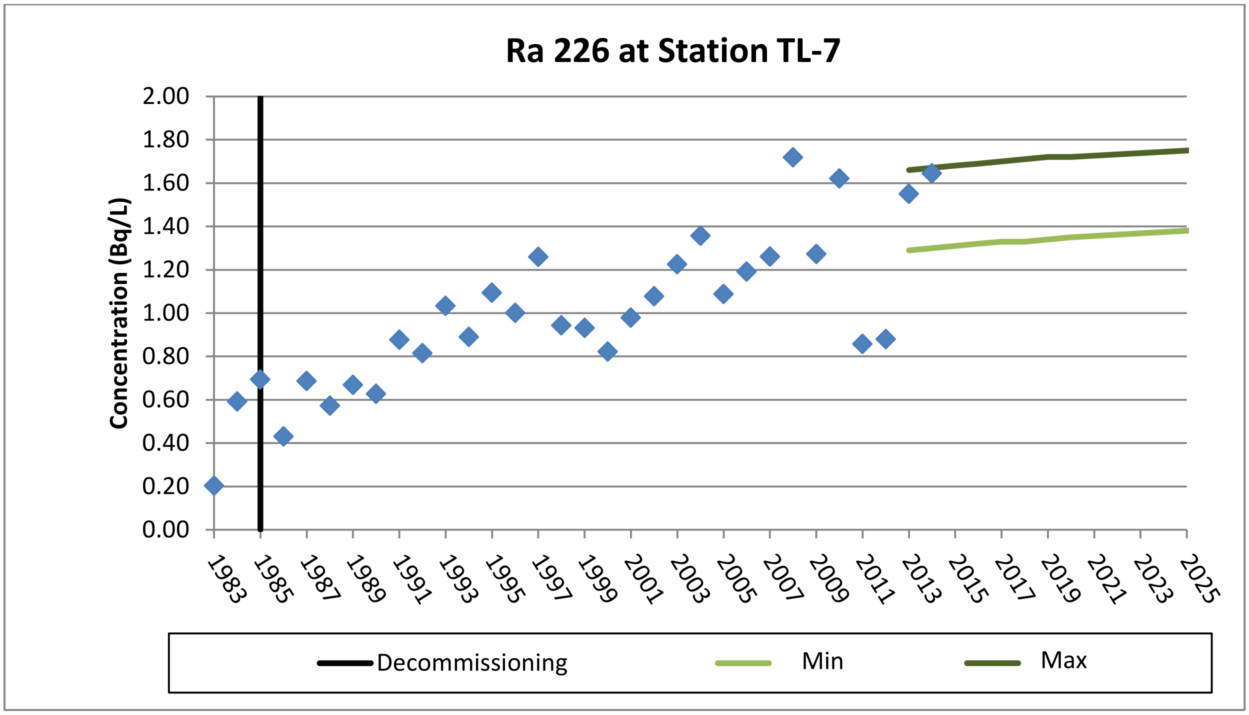


Figure 4.3.2-24 TL-7 Meadow Fen Discharge

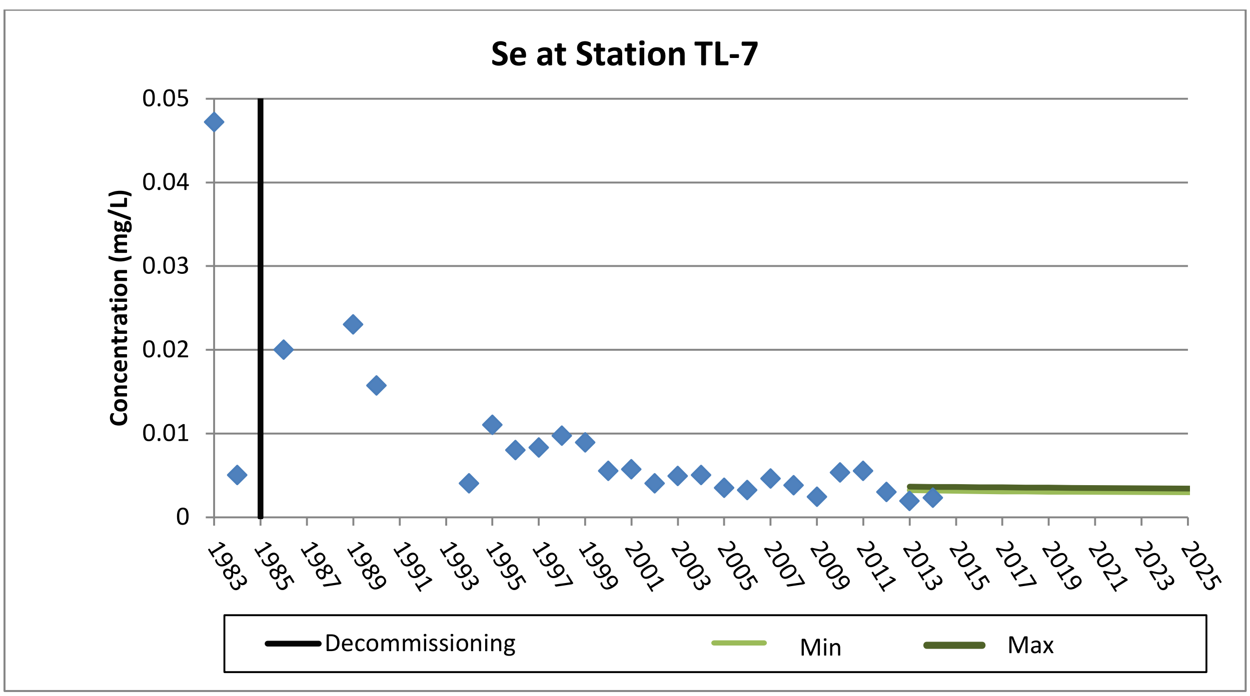


Figure 4.3.2-25 TL-7 Meadow Fen Discharge – Detailed Trend

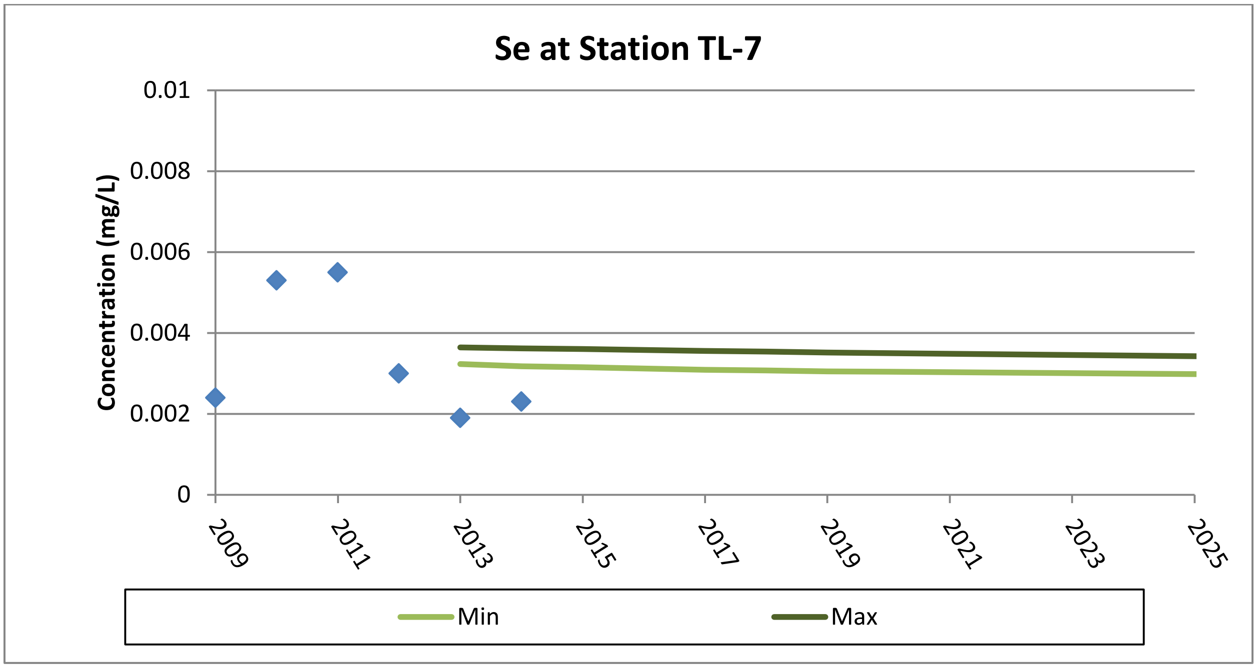


Figure 4.3.2-26 TL-7 Meadow Fen Discharge

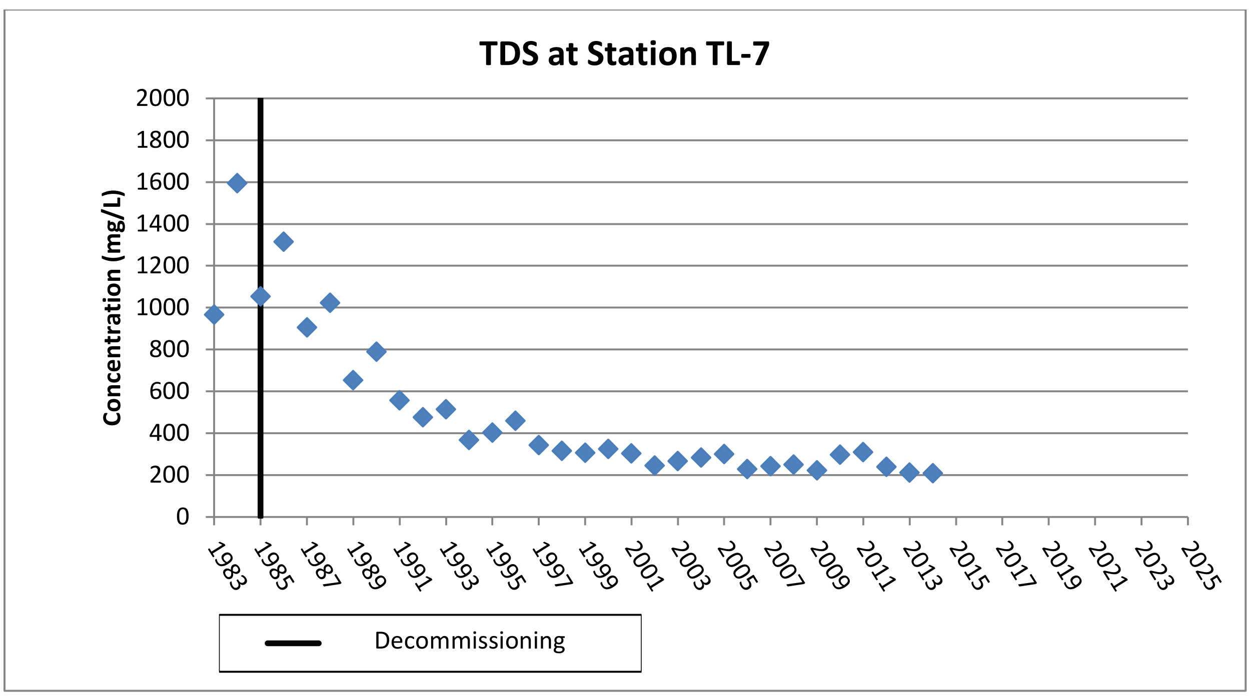
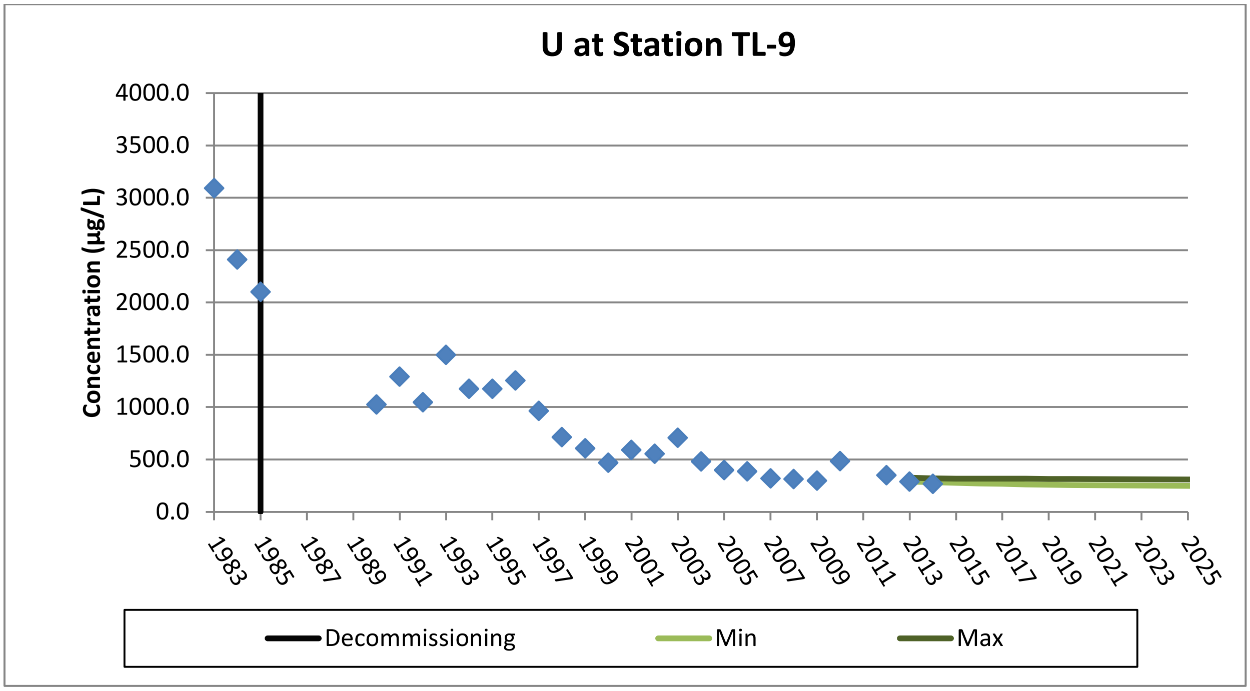
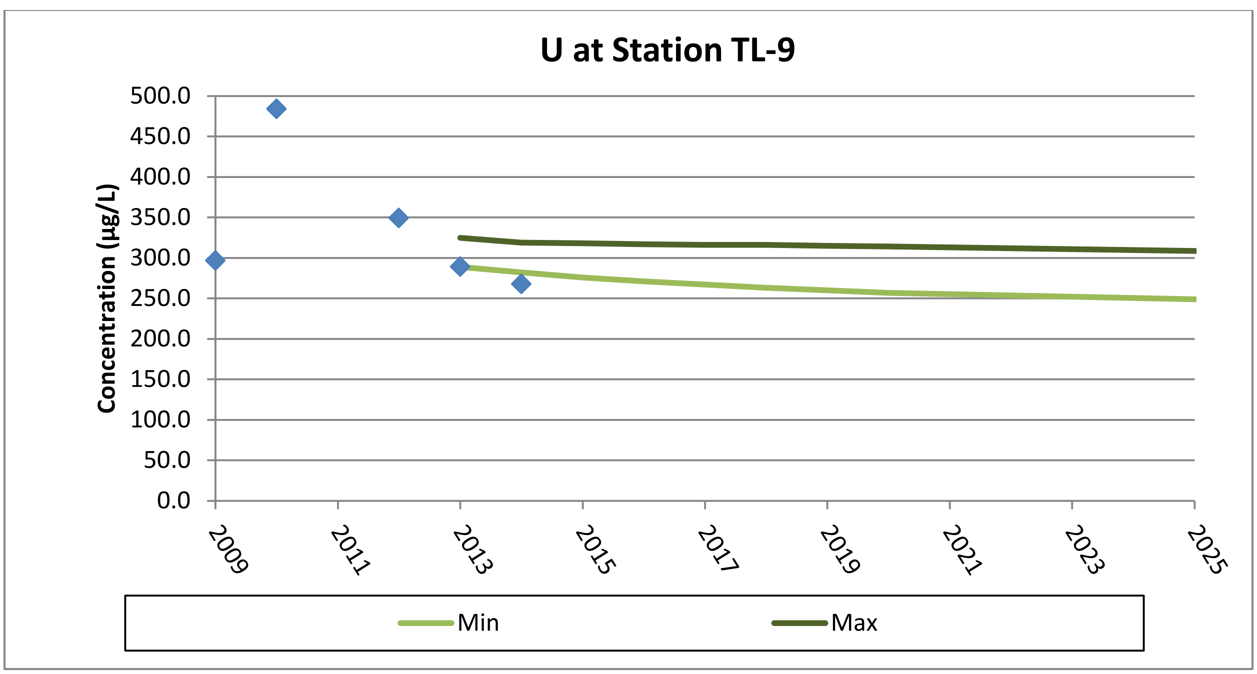


Figure 4.3.2-27 TL-9 - Fulton Creek Below Greer Lake



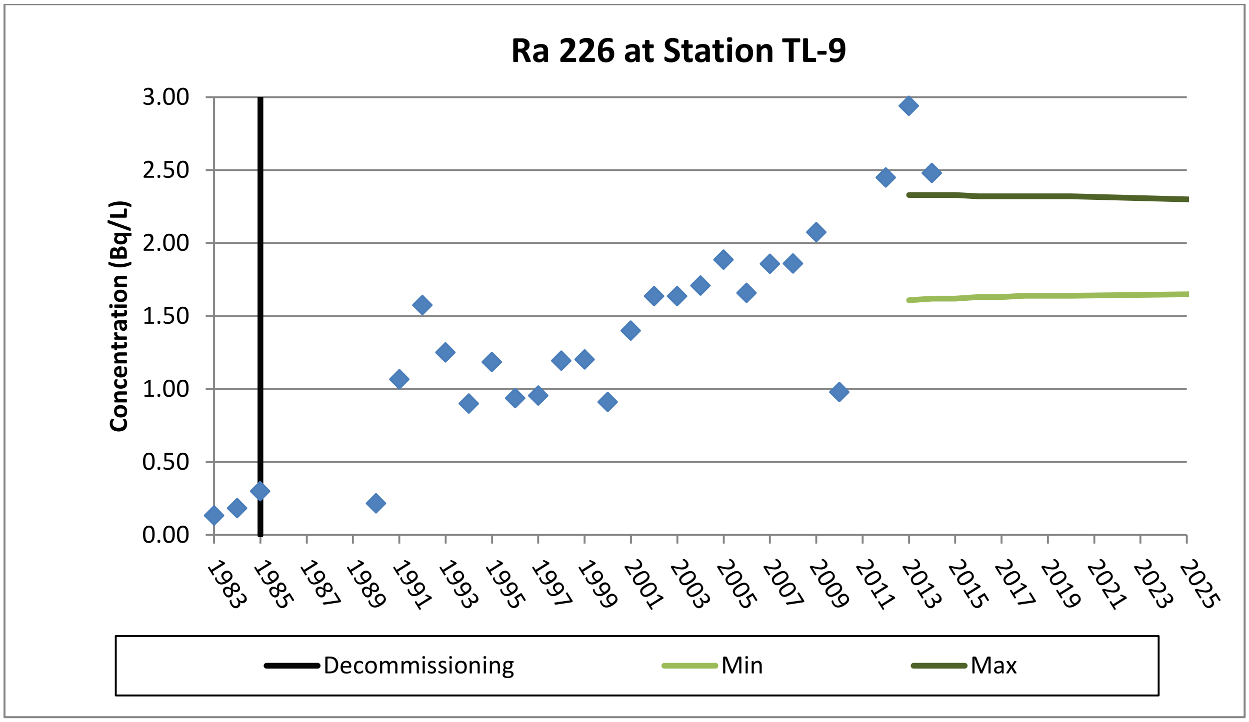
**There was no water flow at TL-9 in 2011.*

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



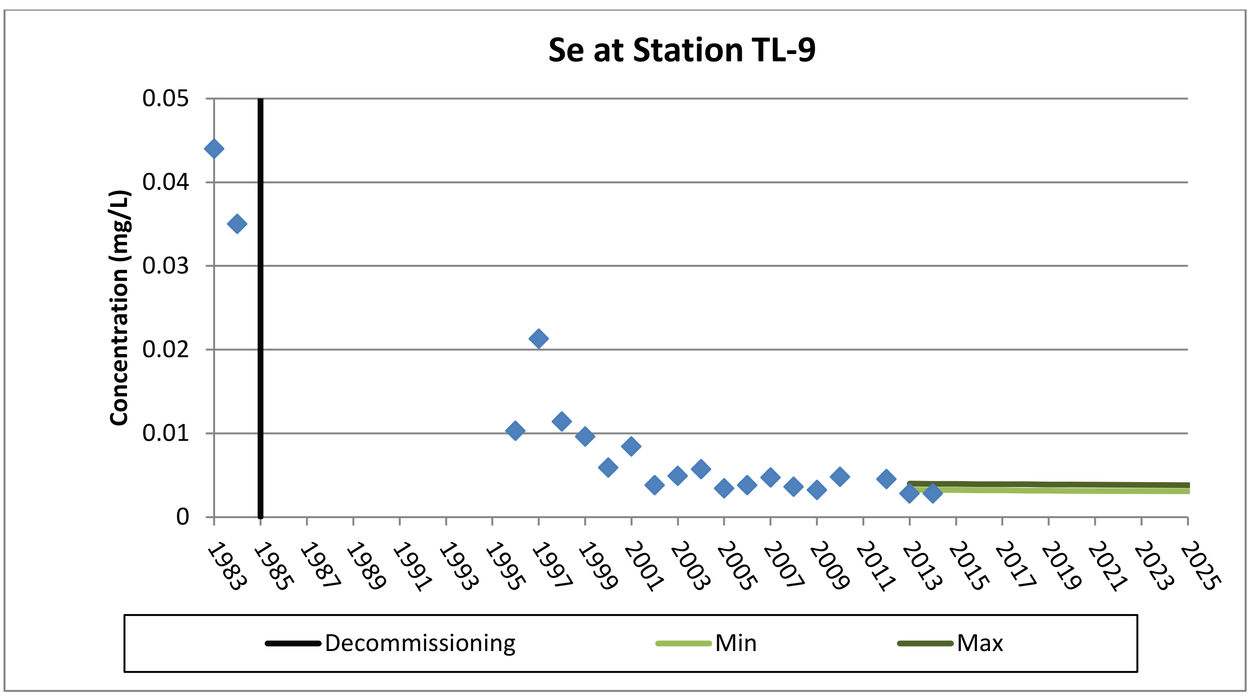
**There was no water flow at TL-9 in 2011.*

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



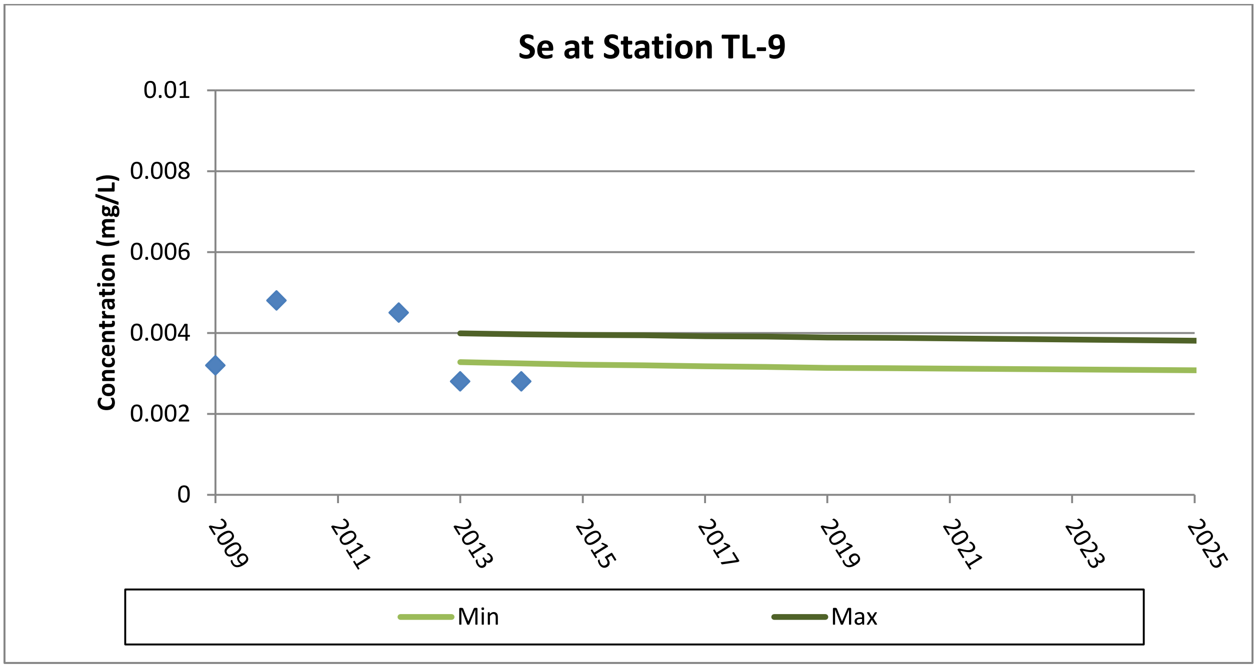
**There was no water flow at TL-9 in 2011.*

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



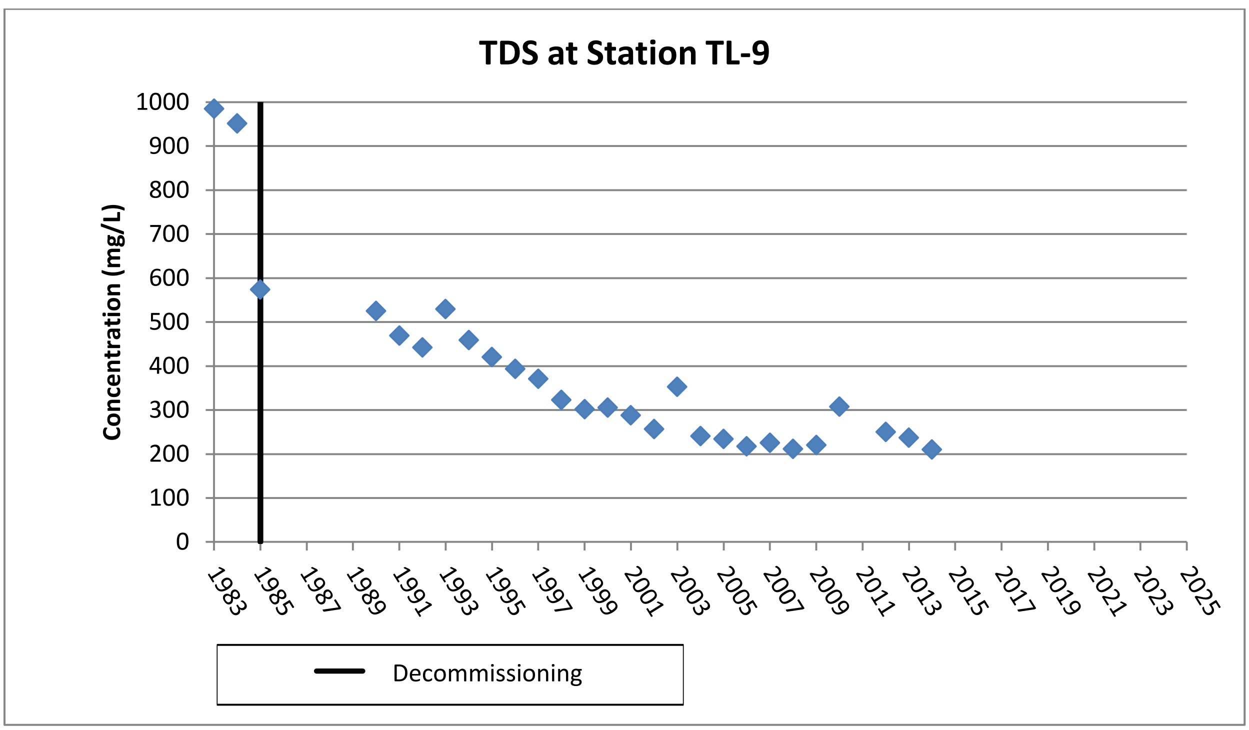
**There was no water flow at TL-9 in 2011.*

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

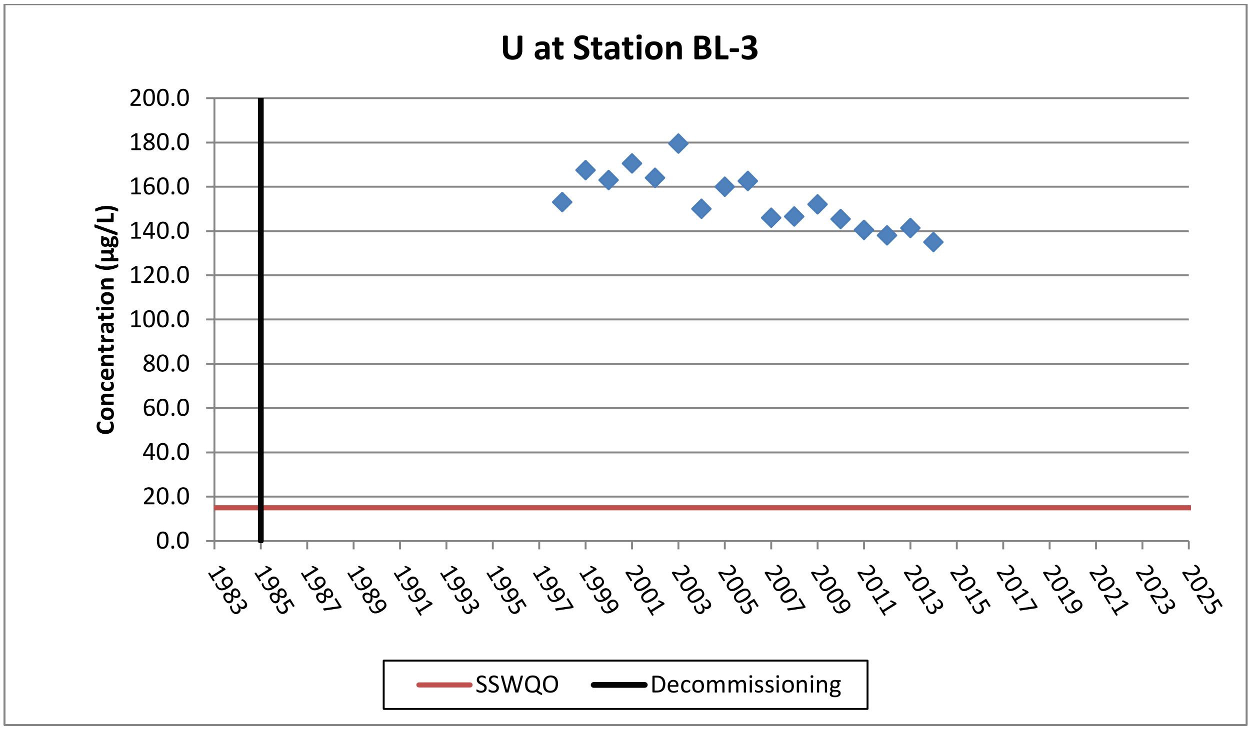


Figure 4.3.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

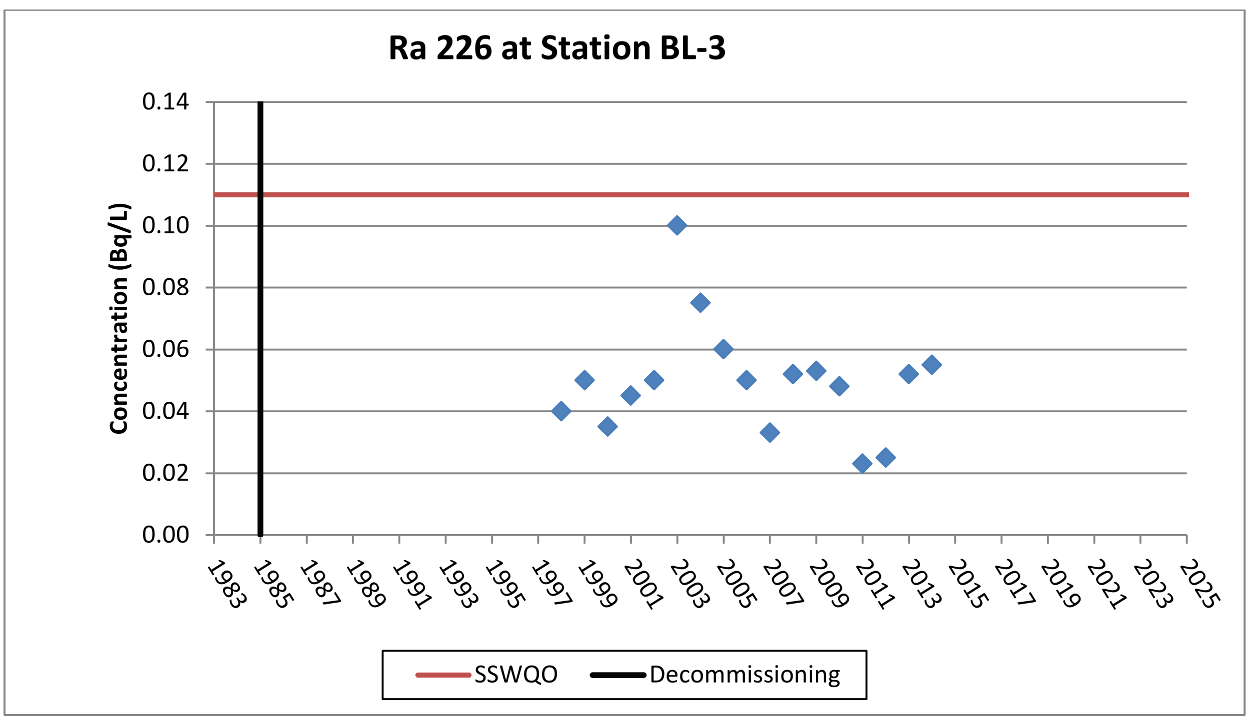
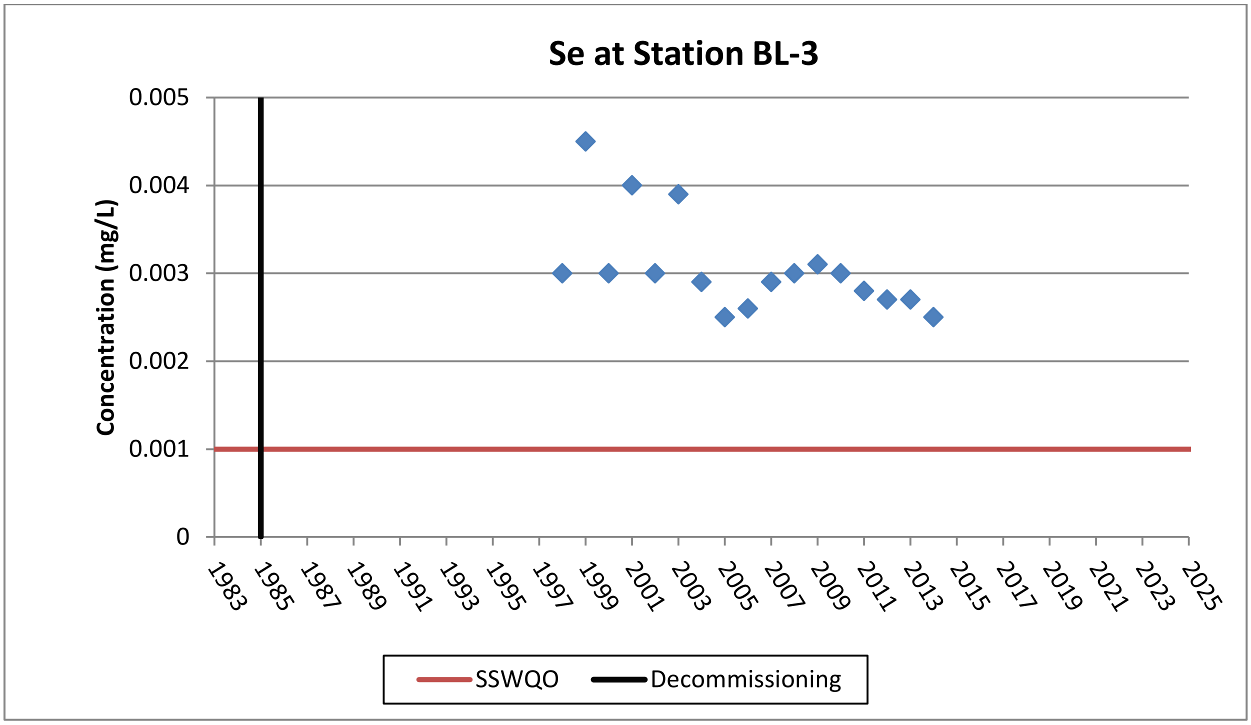


Figure 4.3.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



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

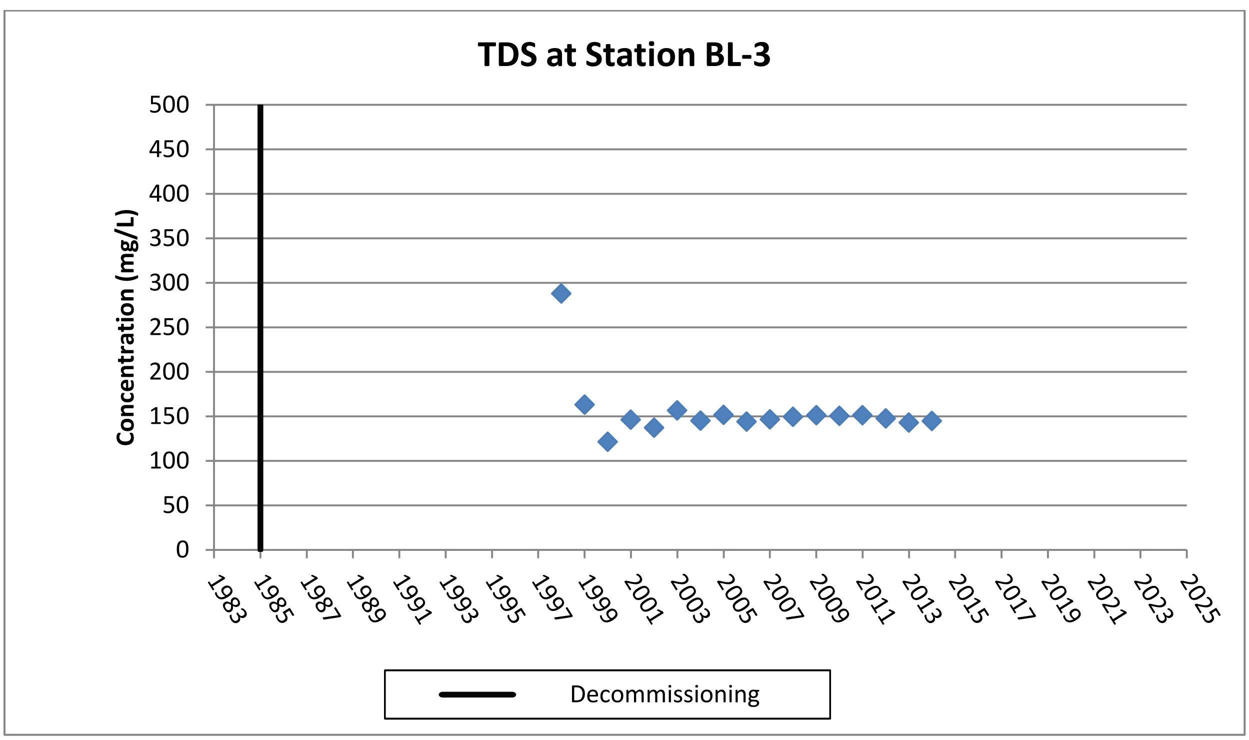


Figure 4.3.3-5 BL-4 Beaverlodge Lake Centre

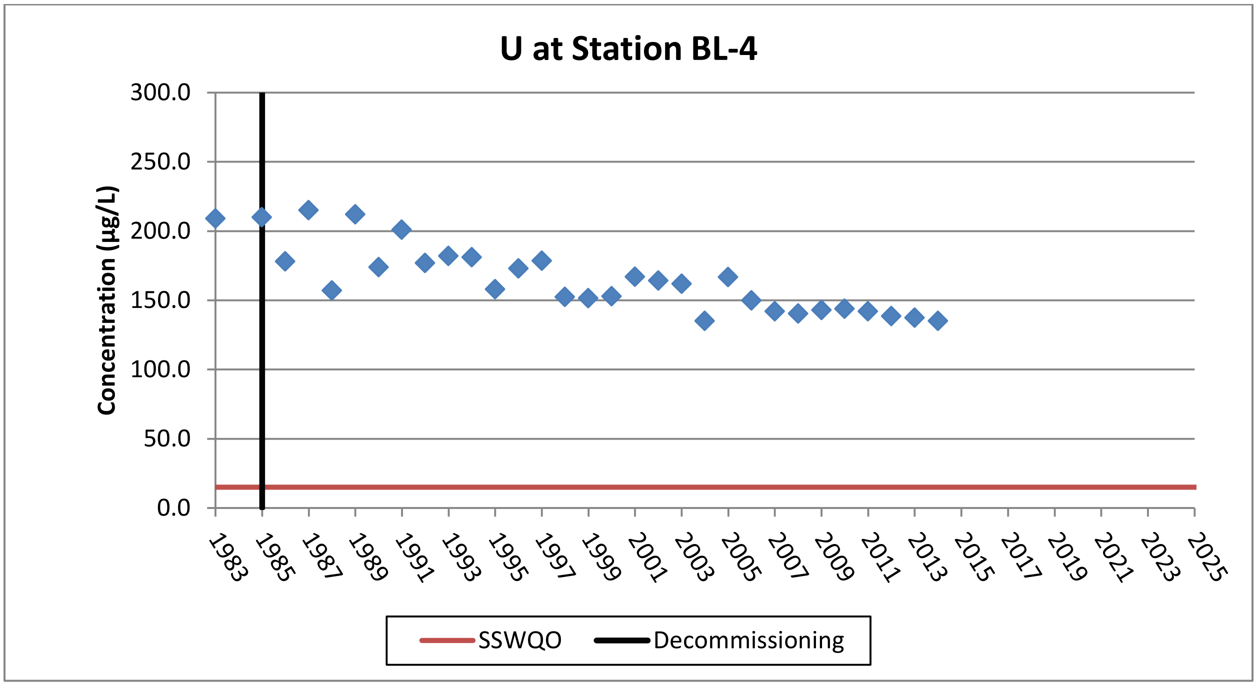


Figure 4.3.3-6 BL-4 Beaverlodge Lake Centre

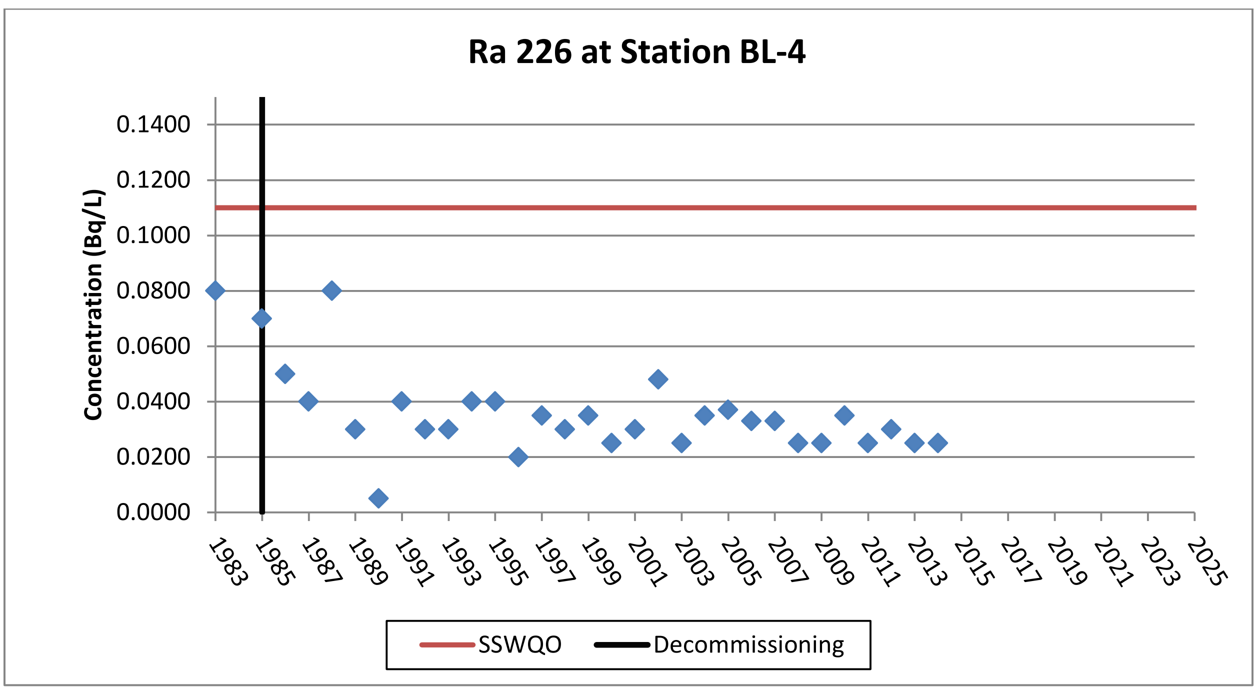
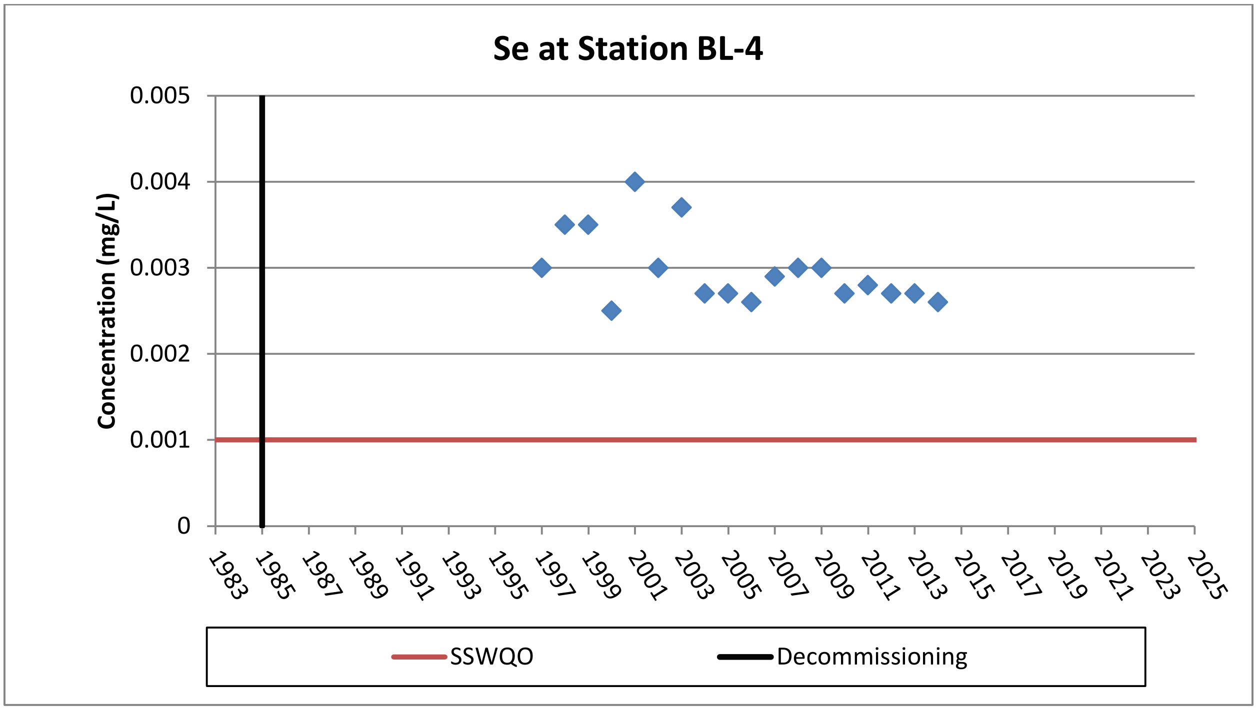


Figure 4.3.3-7 BL-4 Beaverlodge Lake Centre



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

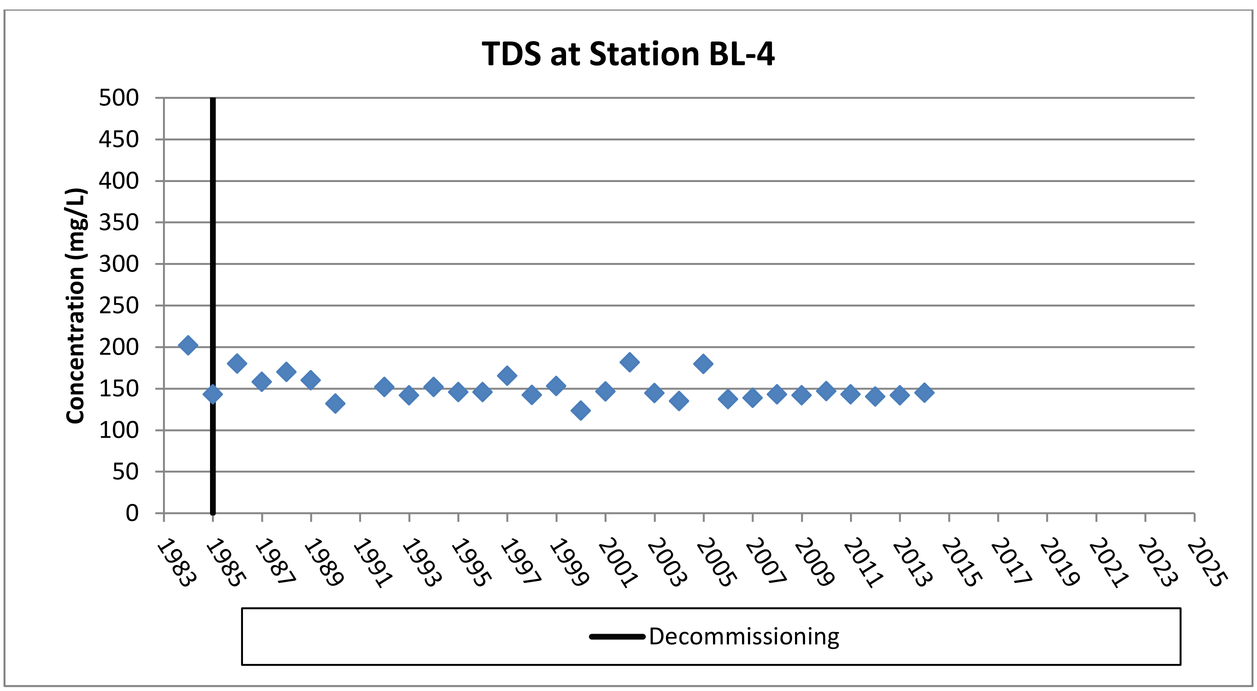
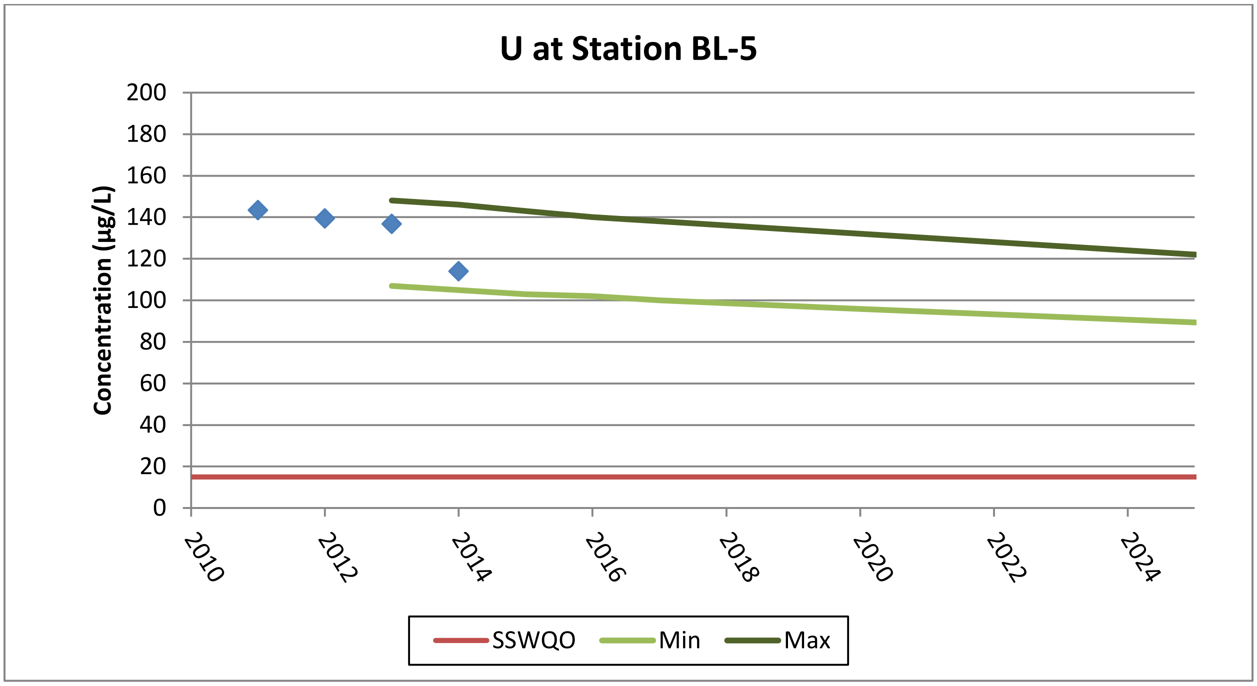
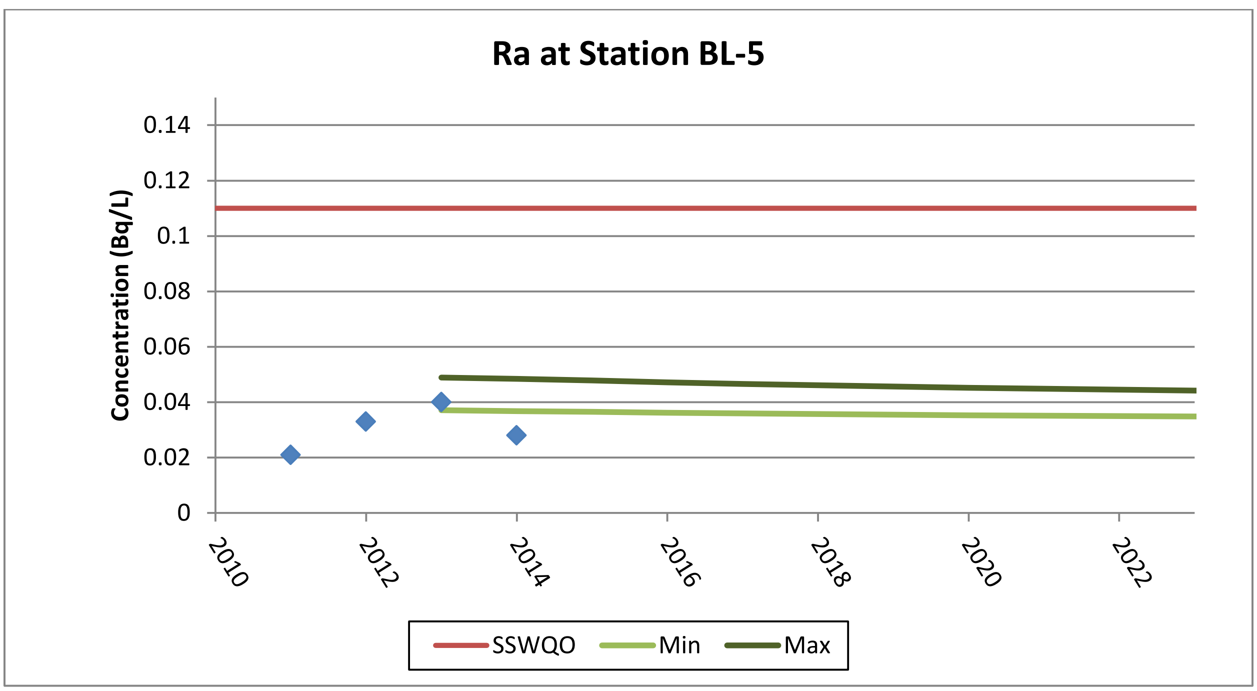


Figure 4.3.3-9 BL-5 Beaverlodge Lake Outlet



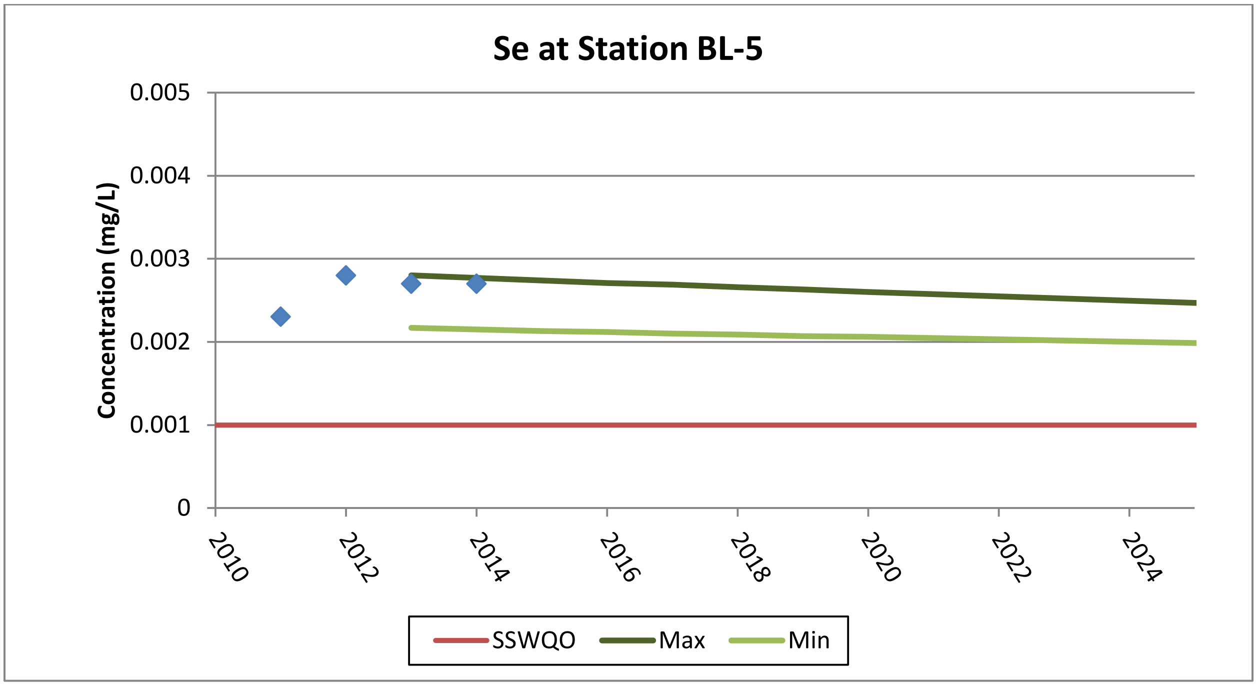
** Station implemented in water sampling program in 2011*

Figure 4.3.3-10 BL-5 Beaverlodge Lake Outlet



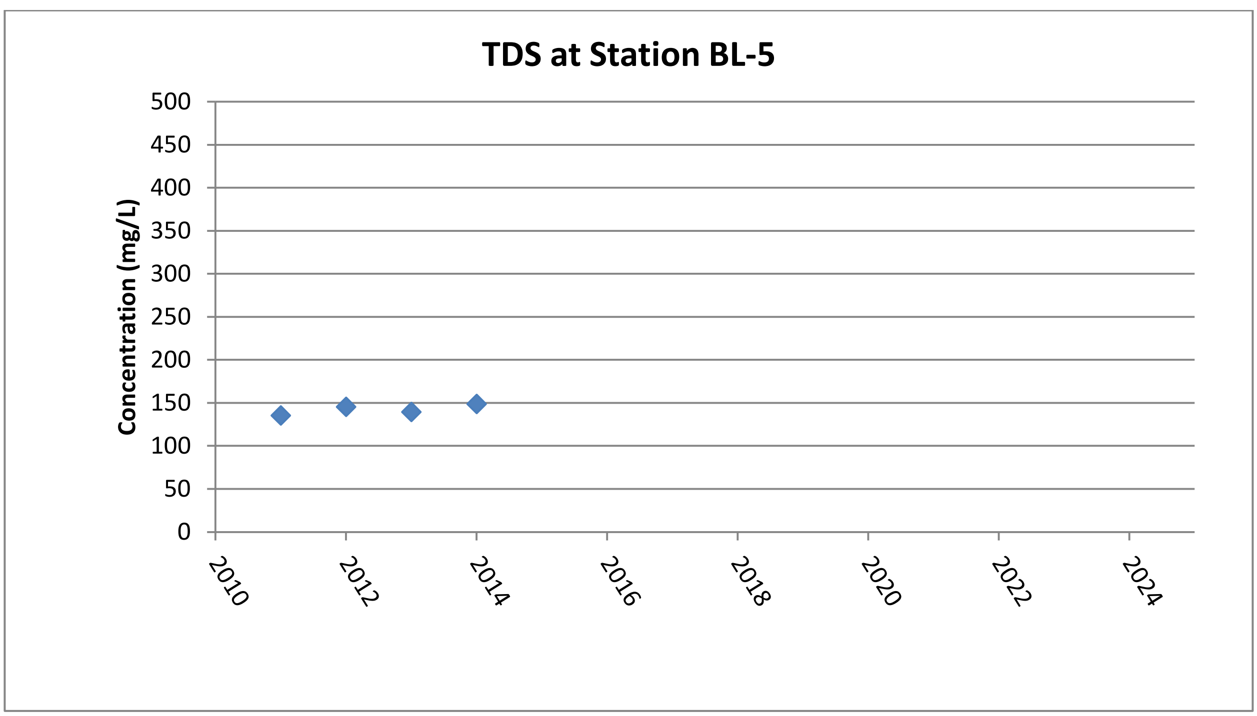
** Station implemented in water sampling program in 2011*

Figure 4.3.3-11 BL-5 Beaverlodge Lake Outlet



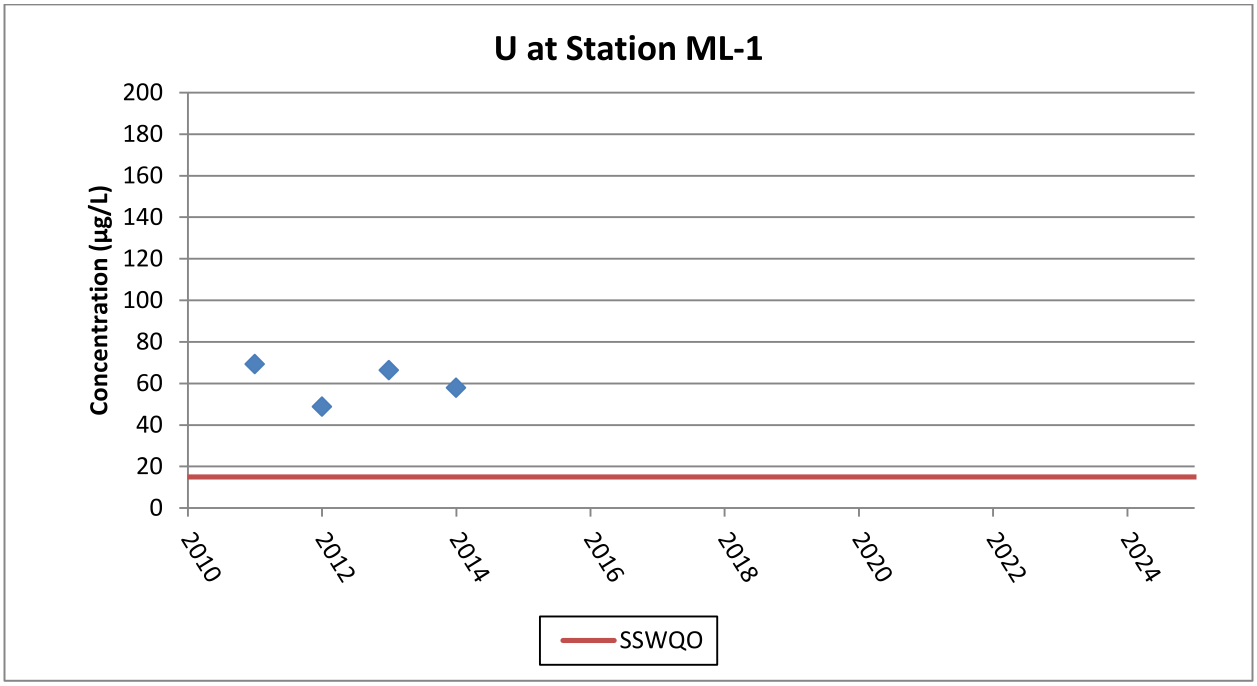
** Station implemented in water sampling program in 2011*

Figure 4.3.3-12 BL-5 Beaverlodge Lake Outlet



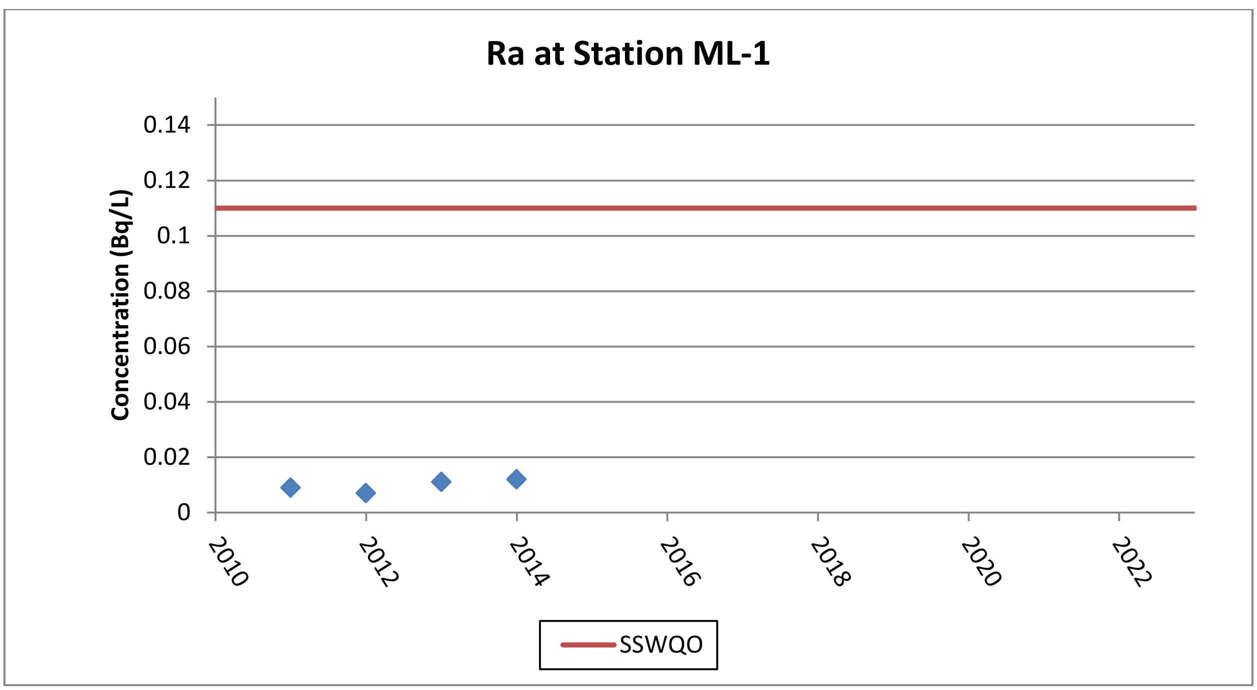
** Station implemented in water sampling program in 2011*

Figure 4.3.3-13 ML-1 Outlet of Martin Lake



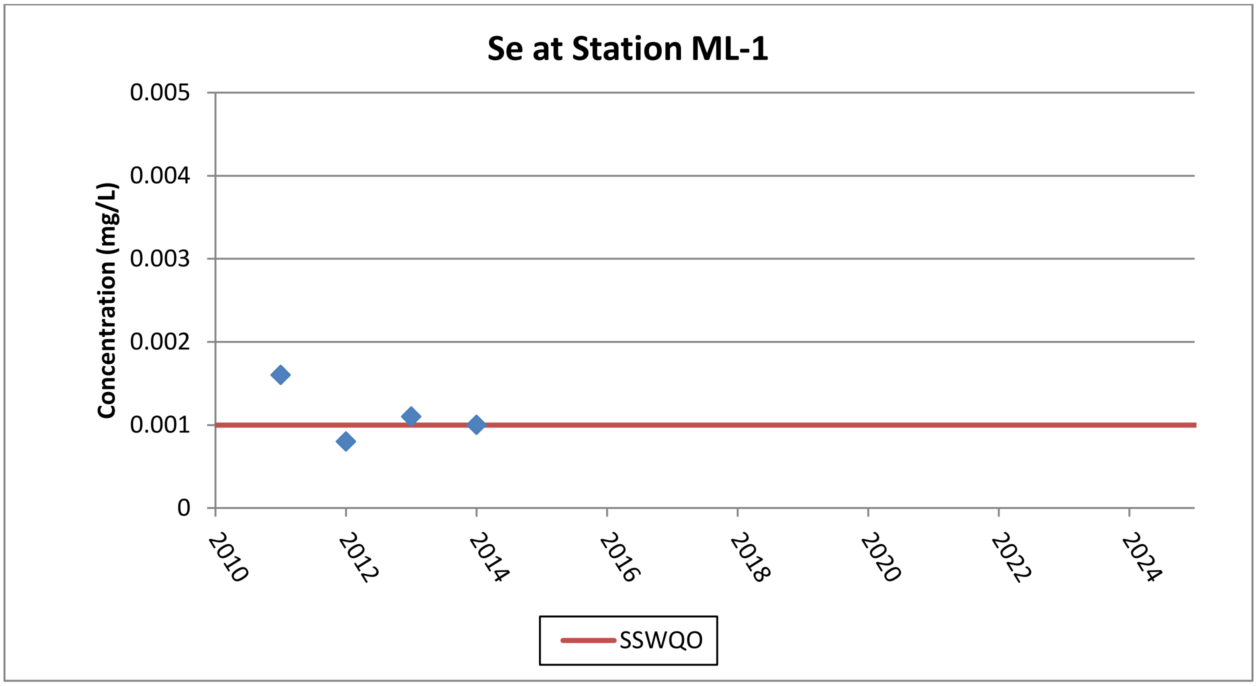
**Station implemented in water sampling program in 2011*

Figure 4.3.3-14 ML-1 Outlet of Martin Lake



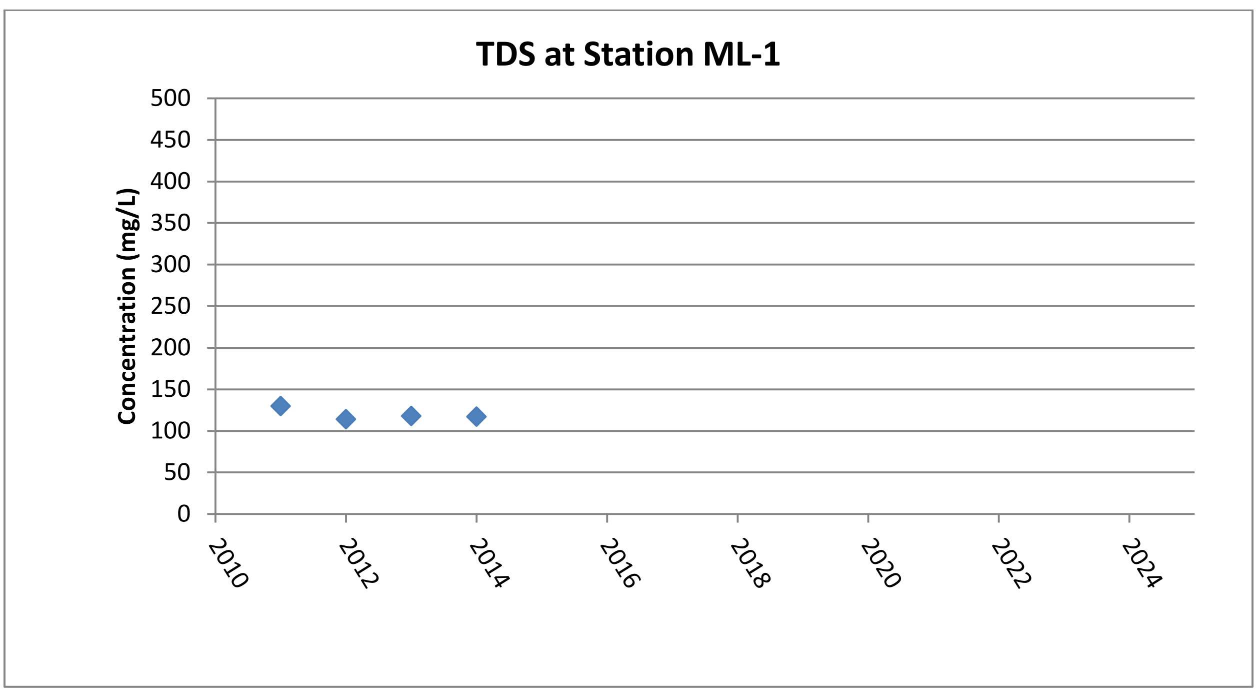
**Station implemented in water sampling program in 2011*

Figure 4.3.3-15 ML-1 Outlet of Martin Lake



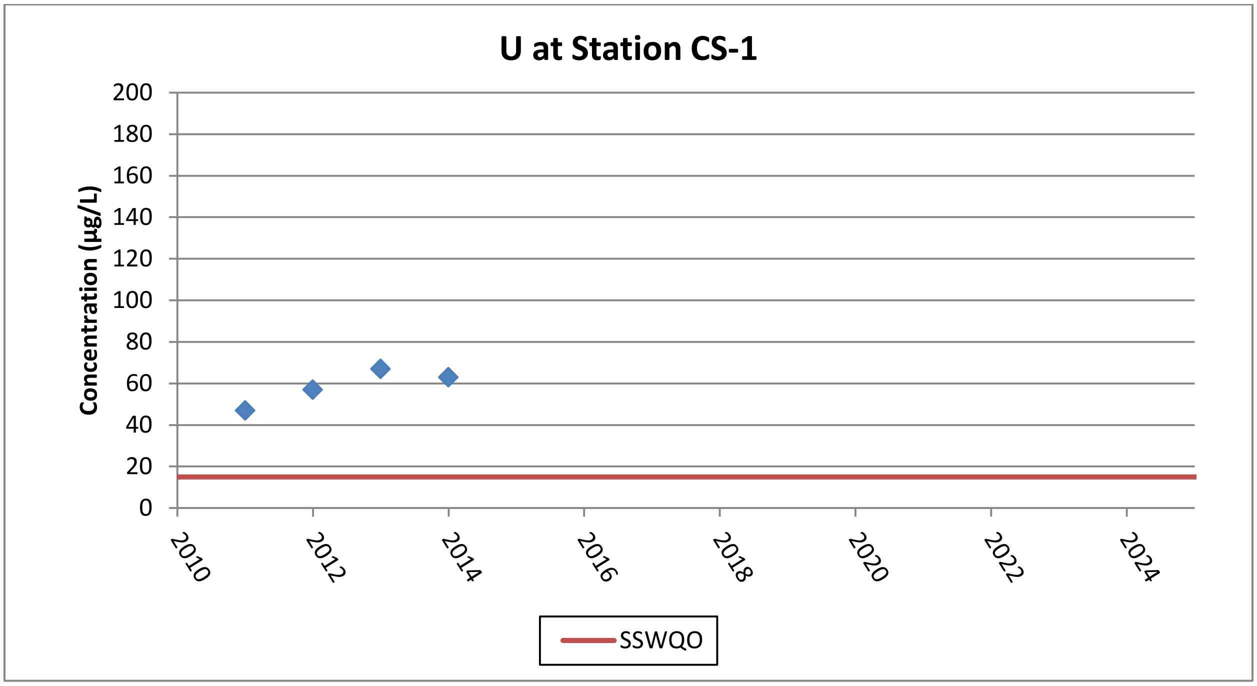
**Station implemented in water sampling program in 2011*

Figure 4.3.3-16 ML-1 Outlet of Martin Lake



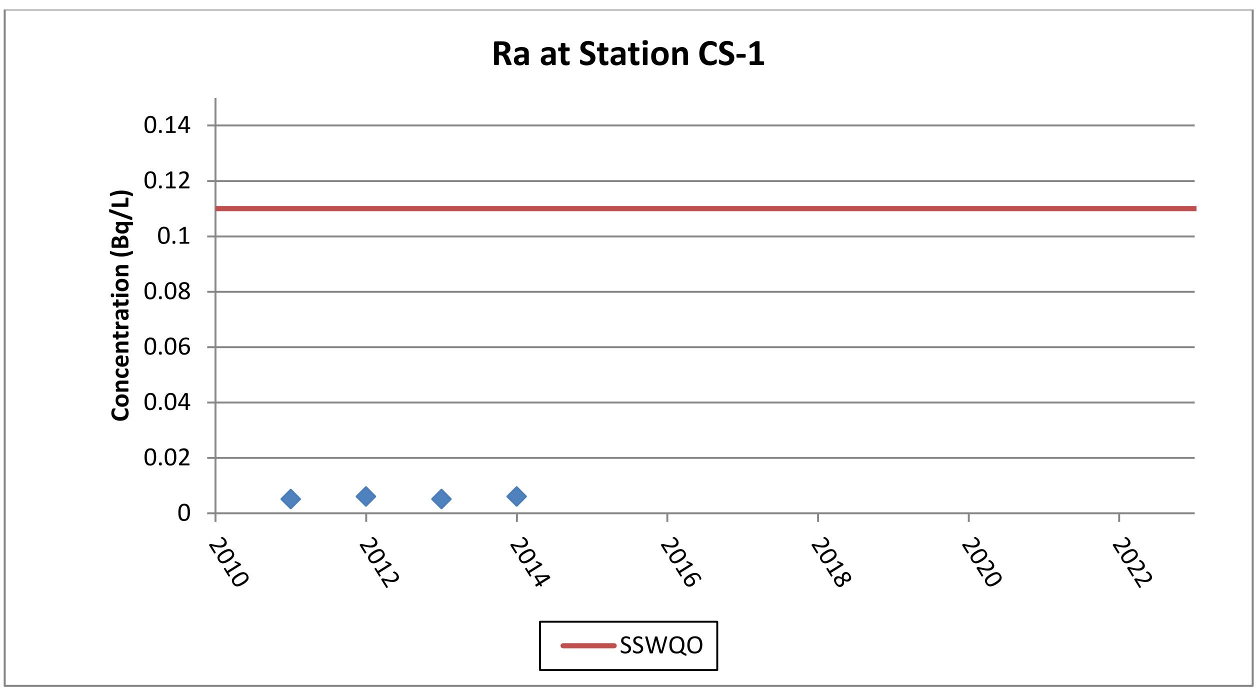
**Station implemented in water sampling program in 2011*

Figure 4.3.3-17 CS-1 Crackingstone River at Bridge



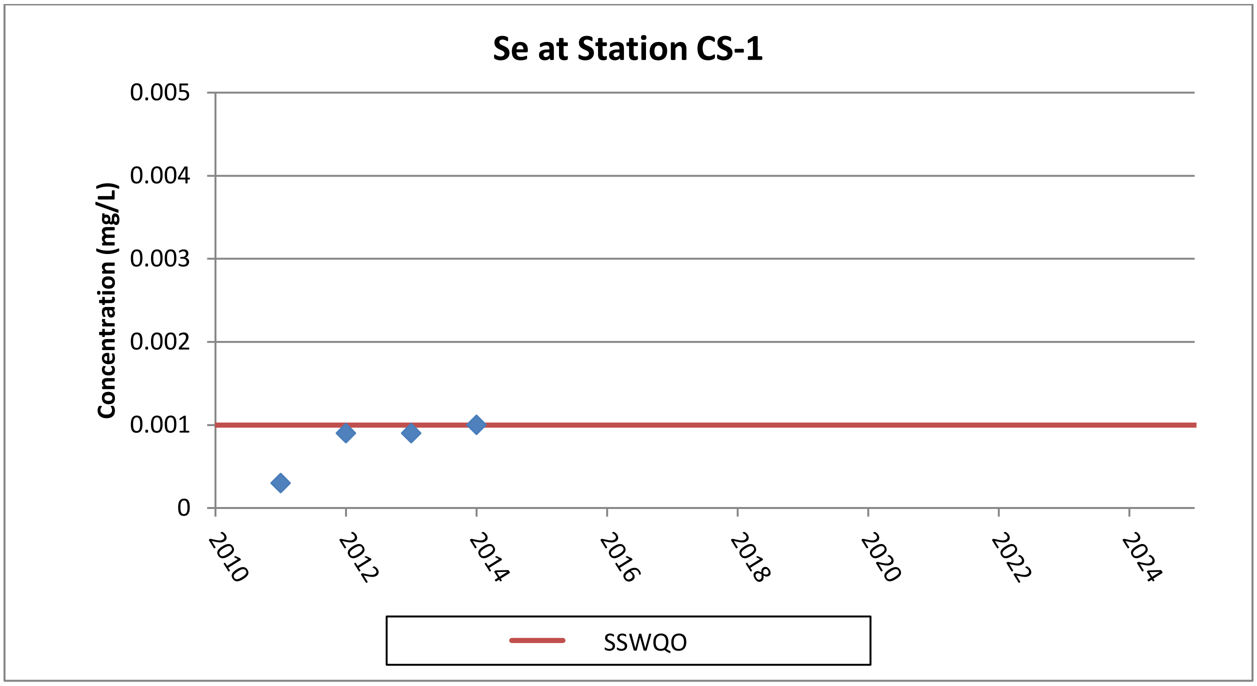
**Station implemented in water sampling program in 2011*

Figure 4.3.3-18 CS-1 Crackingstone River at Bridge



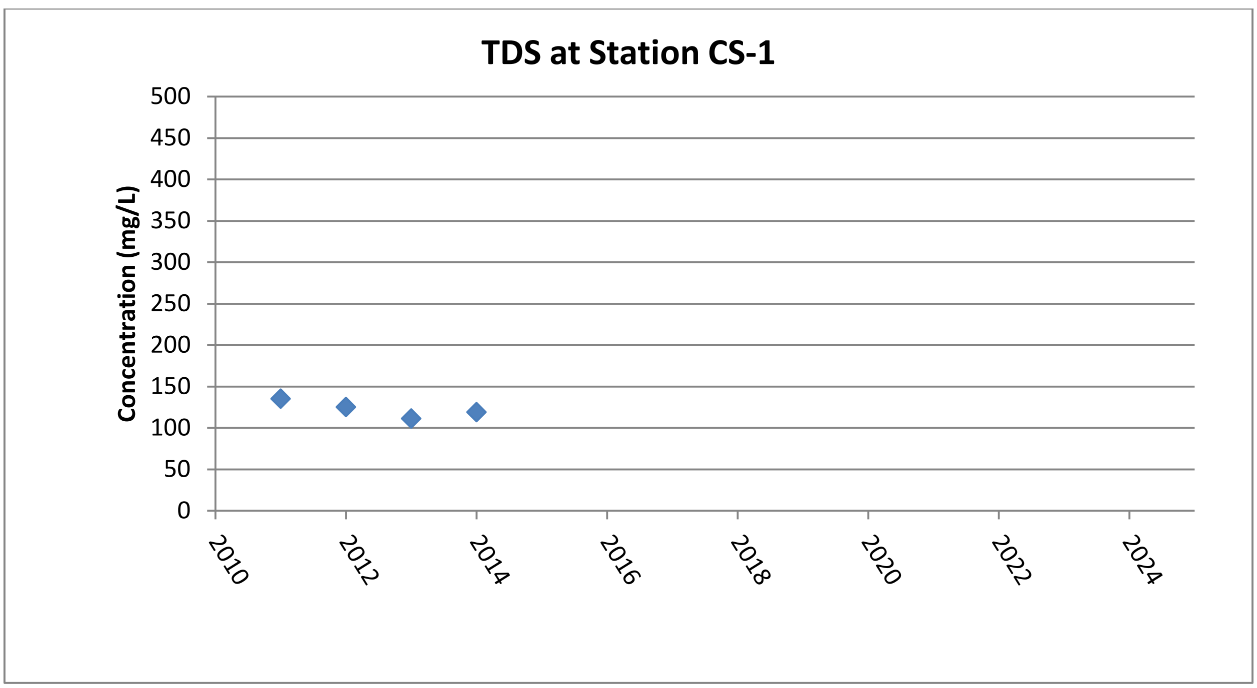
**Station implemented in water sampling program in 2011*

Figure 4.3.3-19 CS-1 Crackingstone River at Bridge



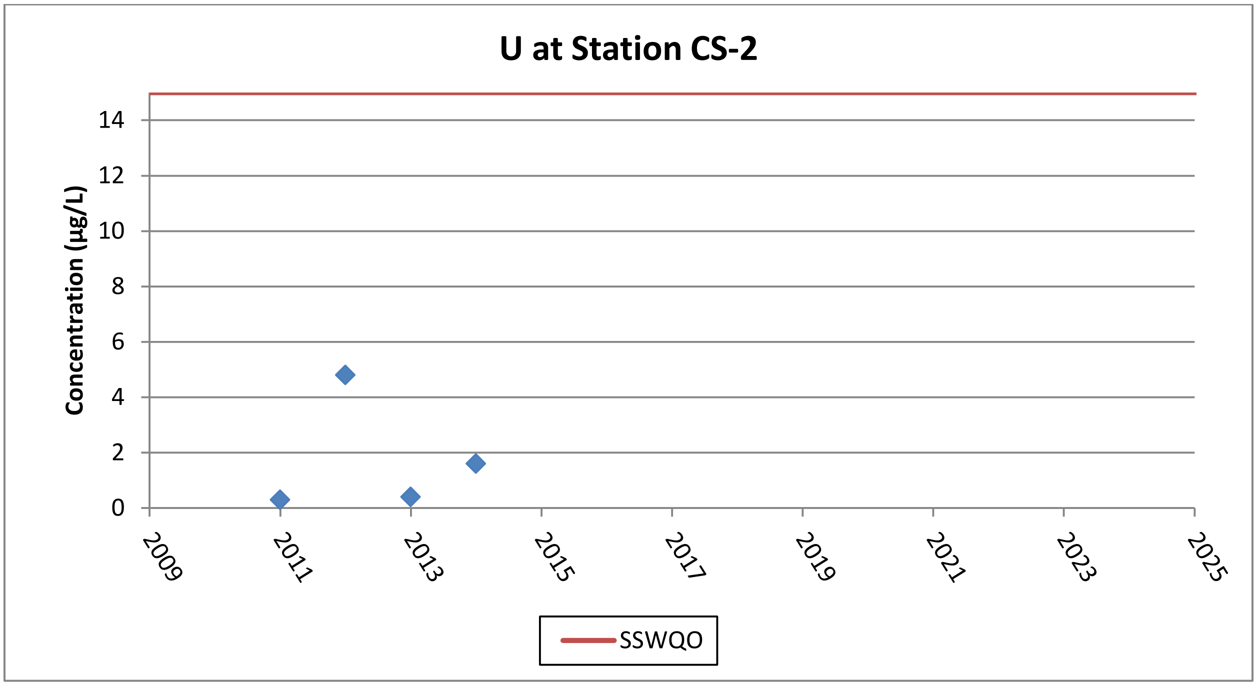
**Station implemented in water sampling program in 2011*

Figure 4.3.3-20 CS-1 Crackingstone River at Bridge



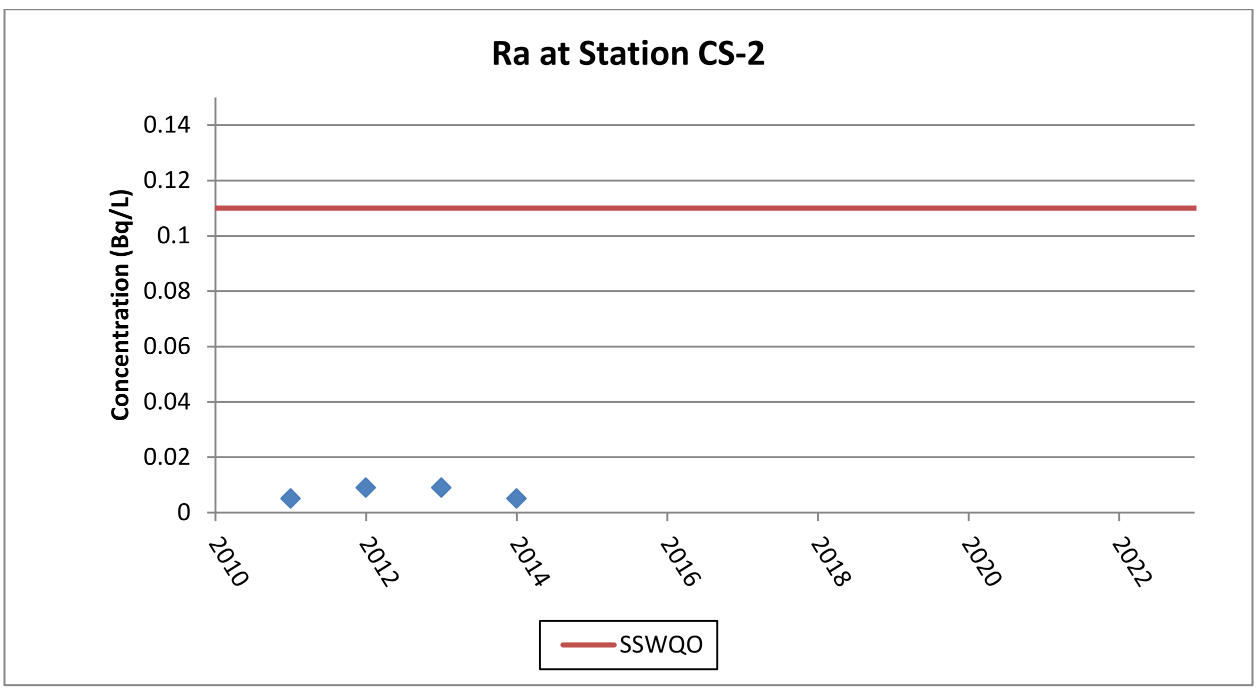
**Station implemented in water sampling program in 2011*

Figure 4.3.3-21 CS-2 Crackingstone Bay



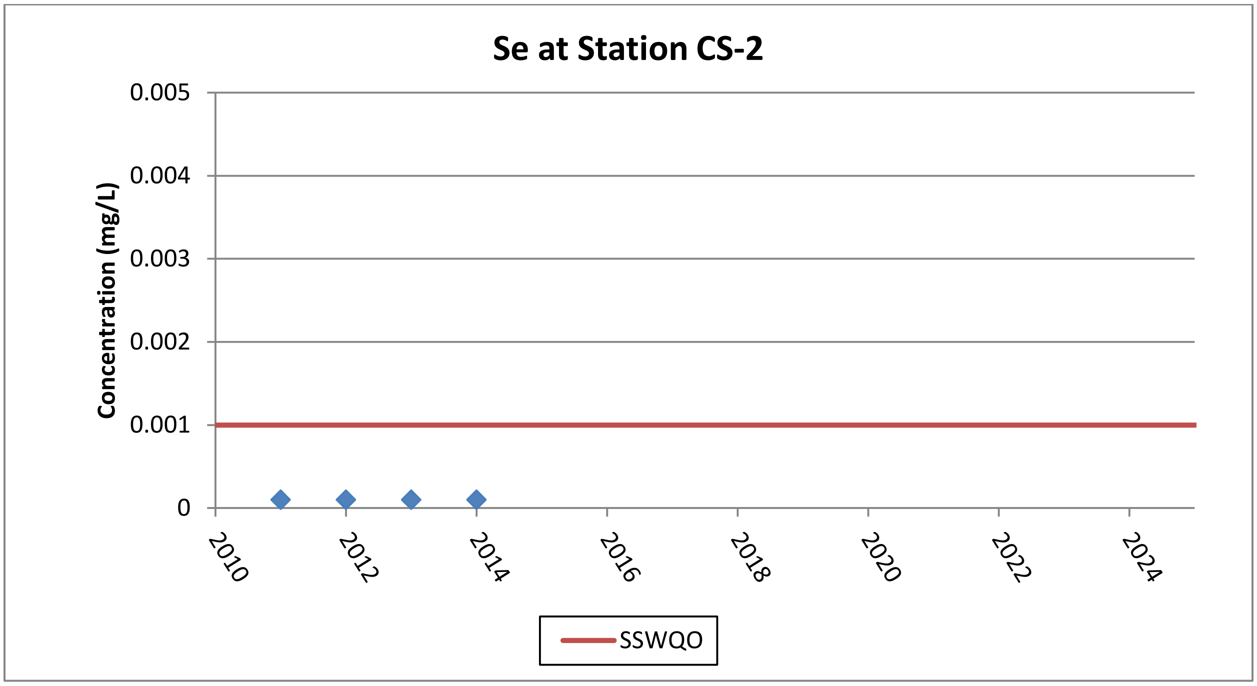
**Station implemented in water sampling program in 2011*

Figure 4.3.3-22 CS-2 Crackingstone Bay



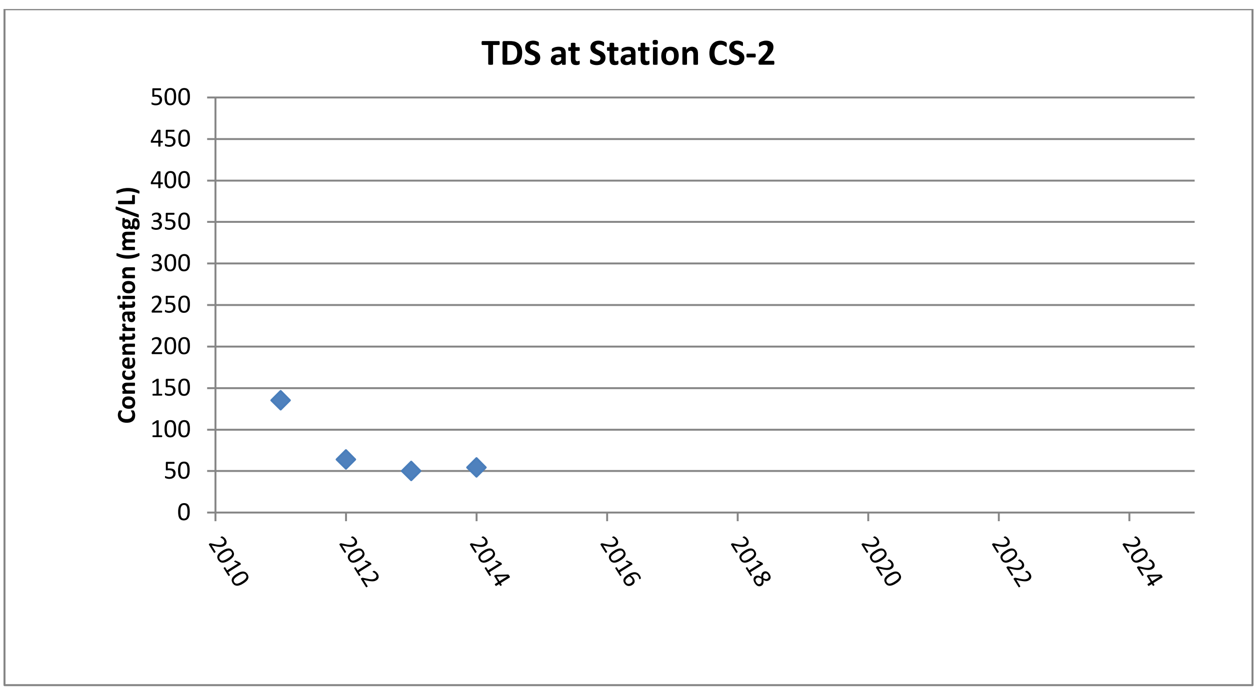
**Station implemented in water sampling program in 2011*

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

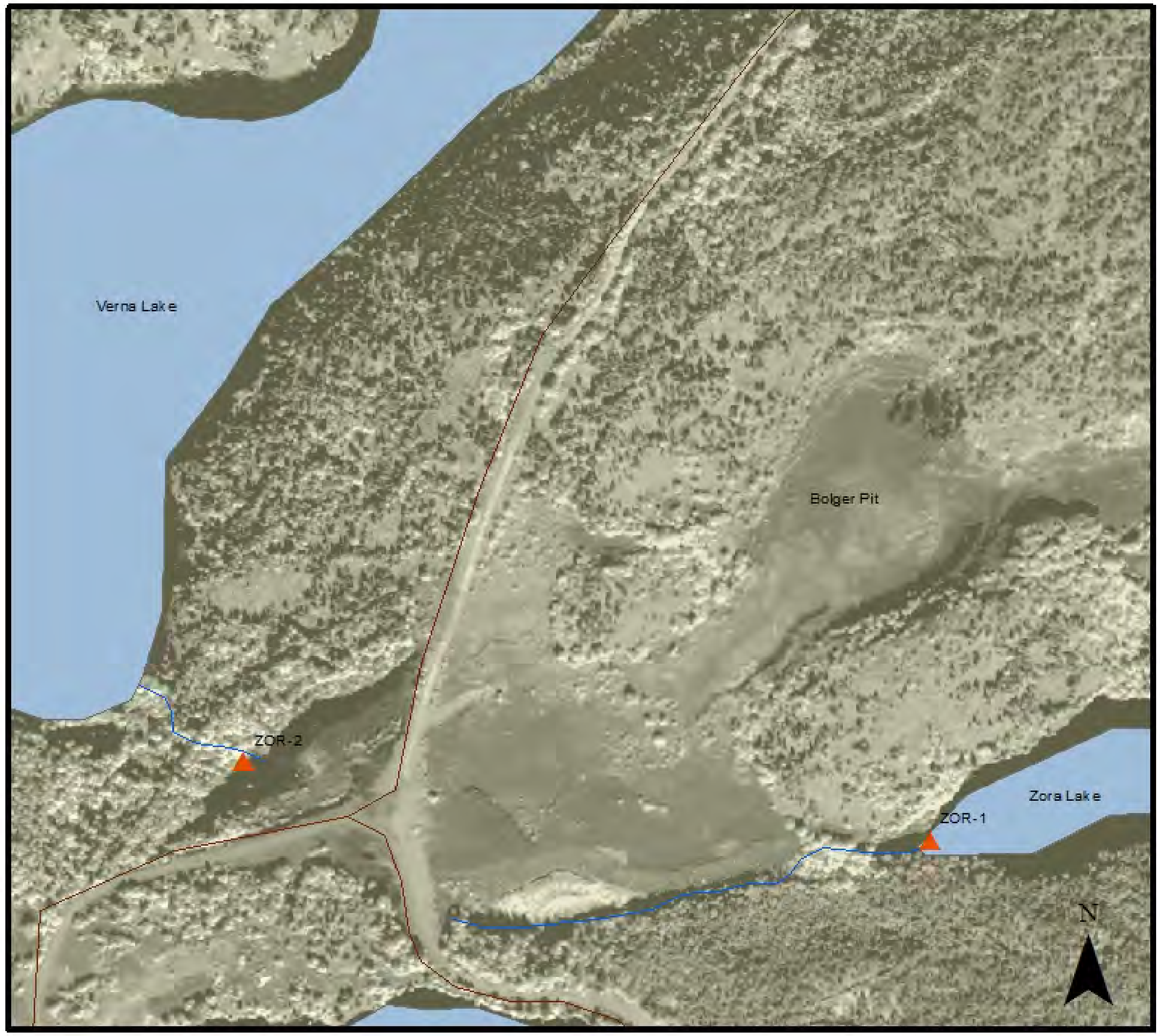
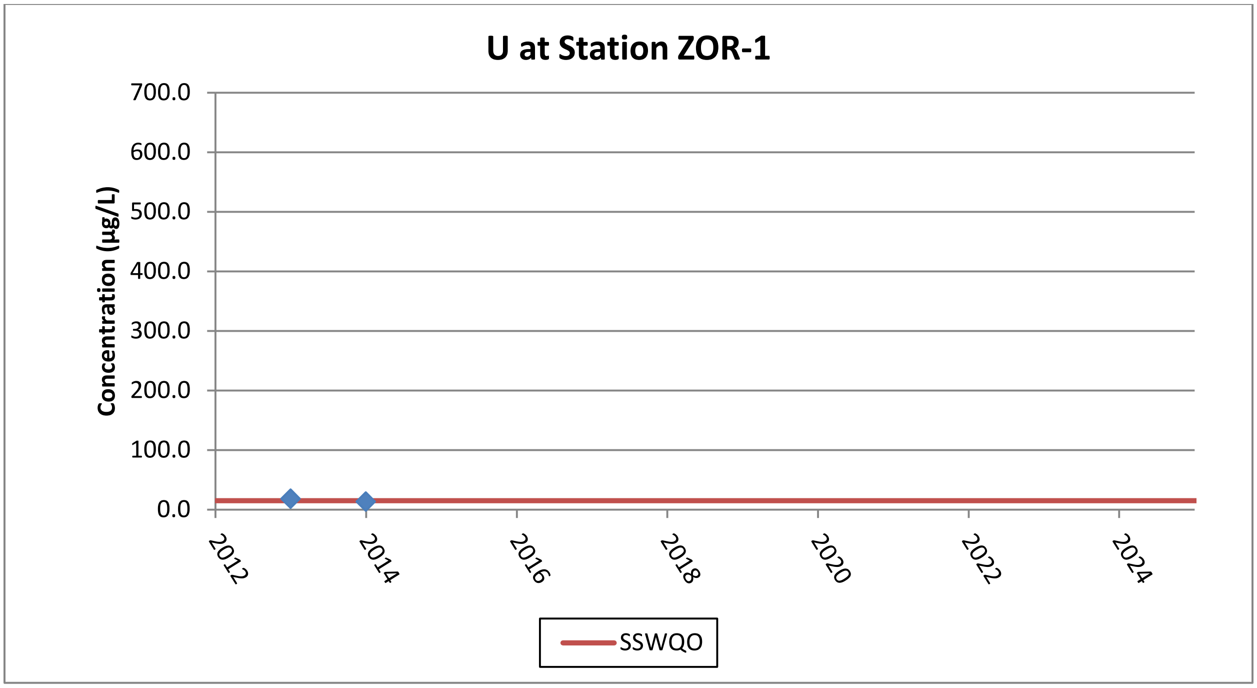
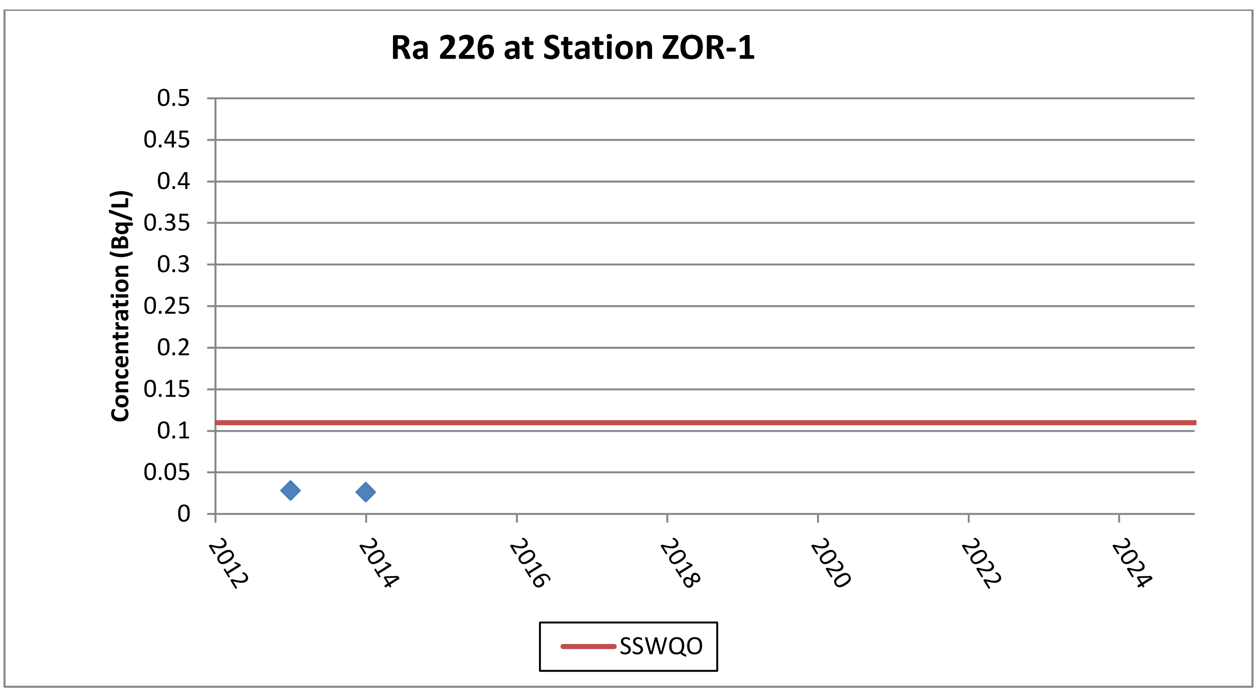


Figure 4.4-1 ZOR-01 Discharge from Zora Lake Outflow



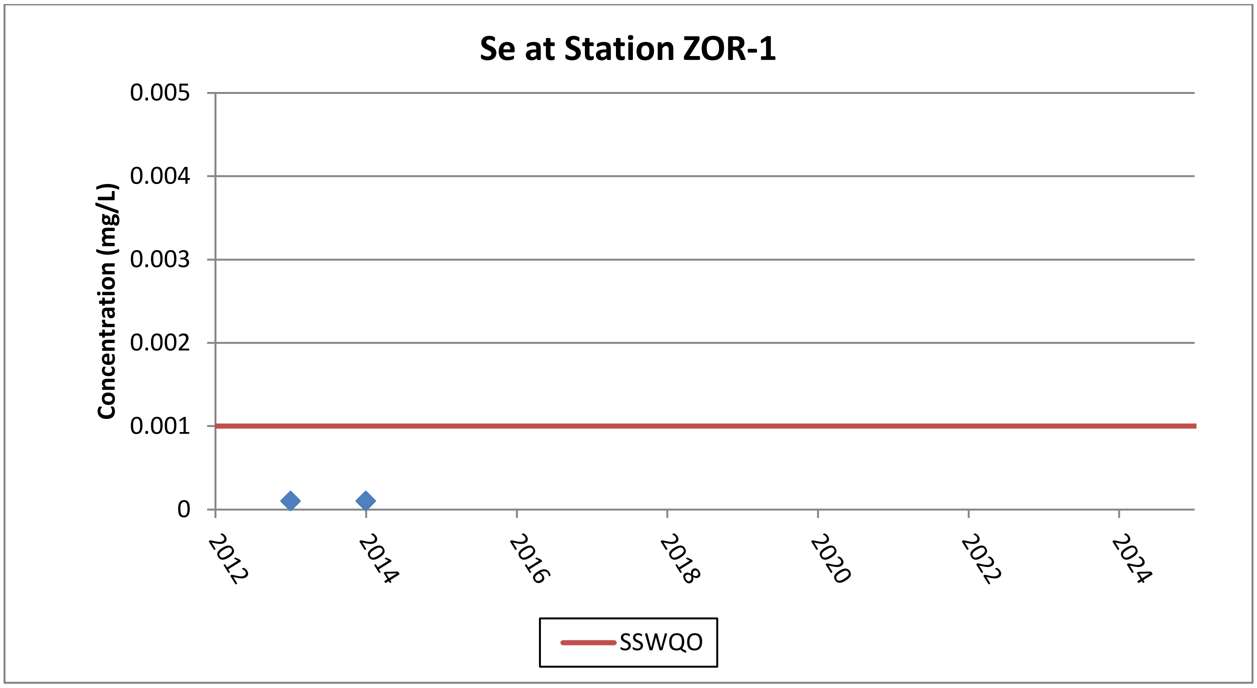
**Station implemented in water sampling program in 2013*

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



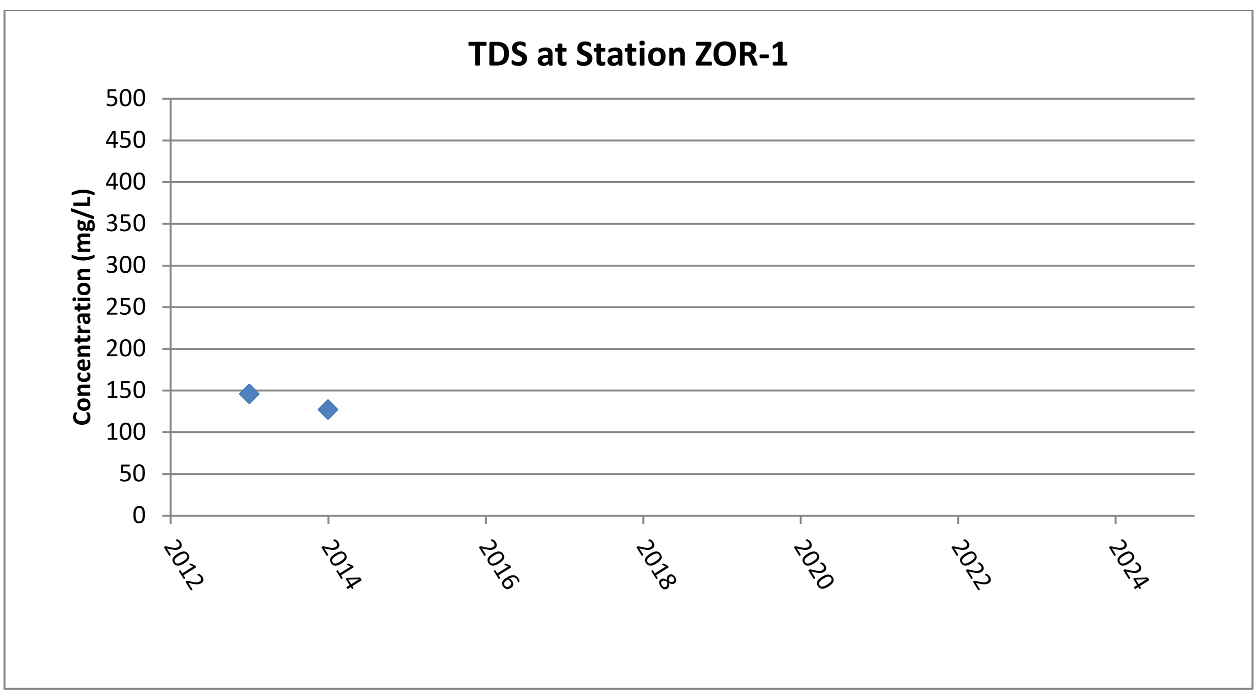
**Station implemented in water sampling program in 2013*

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



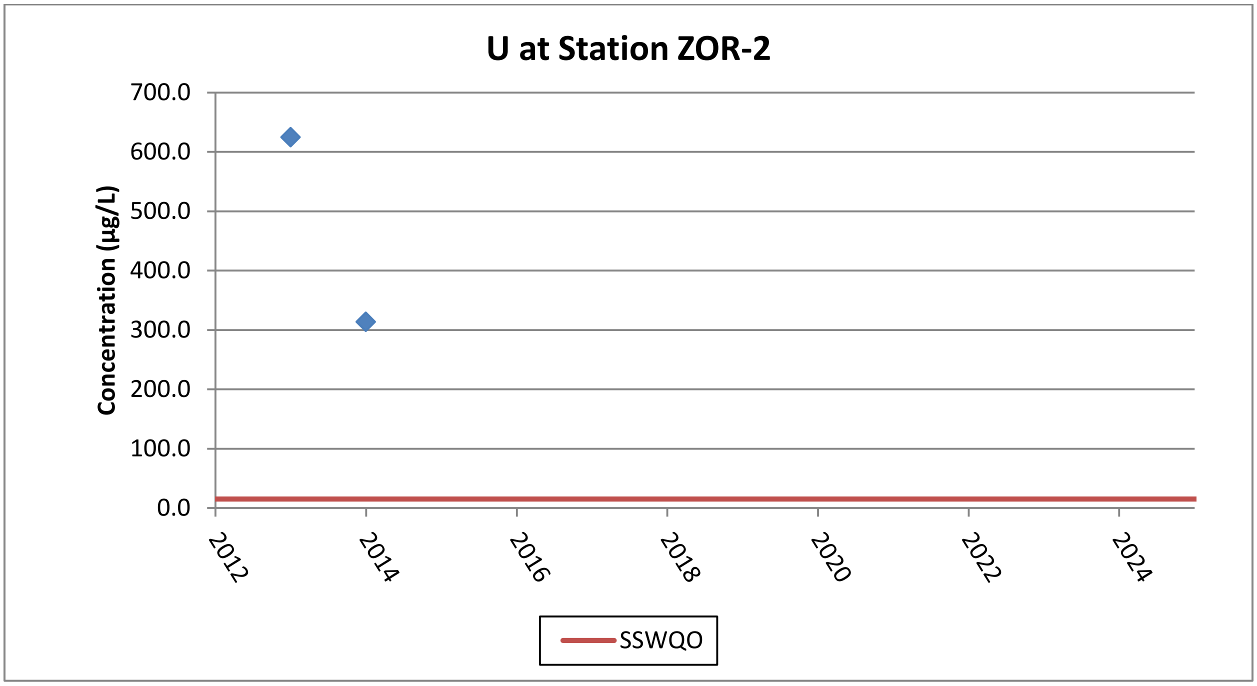
**Station implemented in water sampling program in 2013*

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



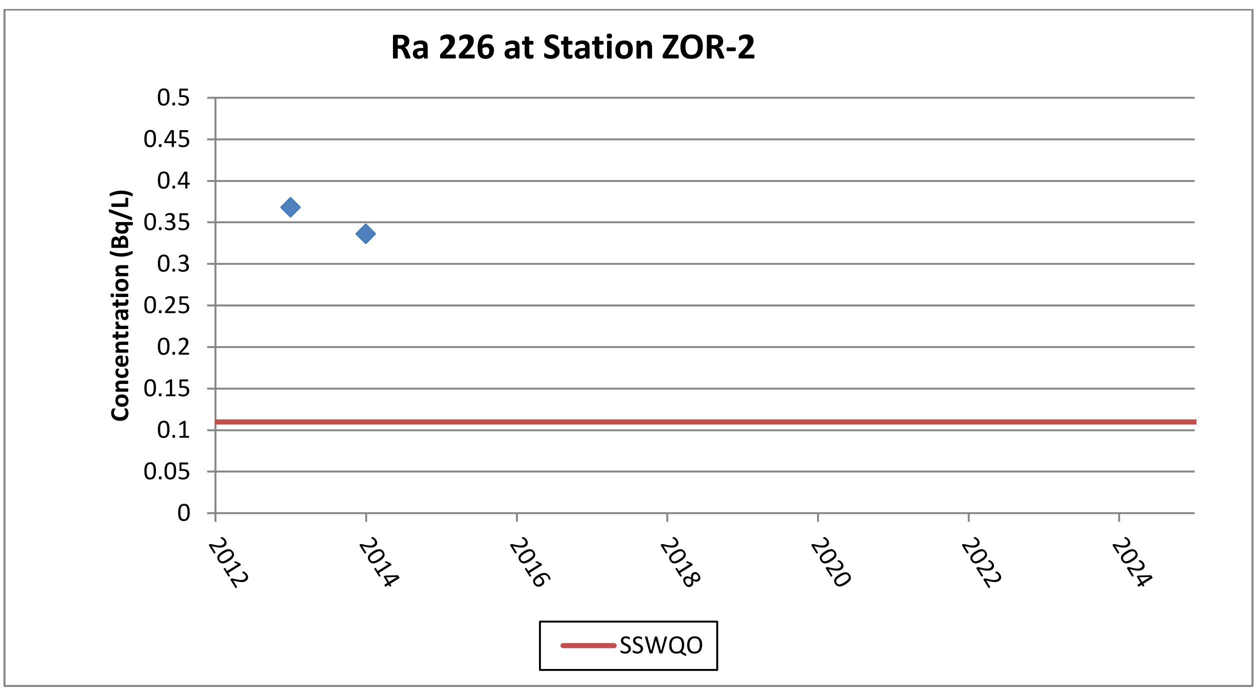
**Station implemented in water sampling program in 2013*

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



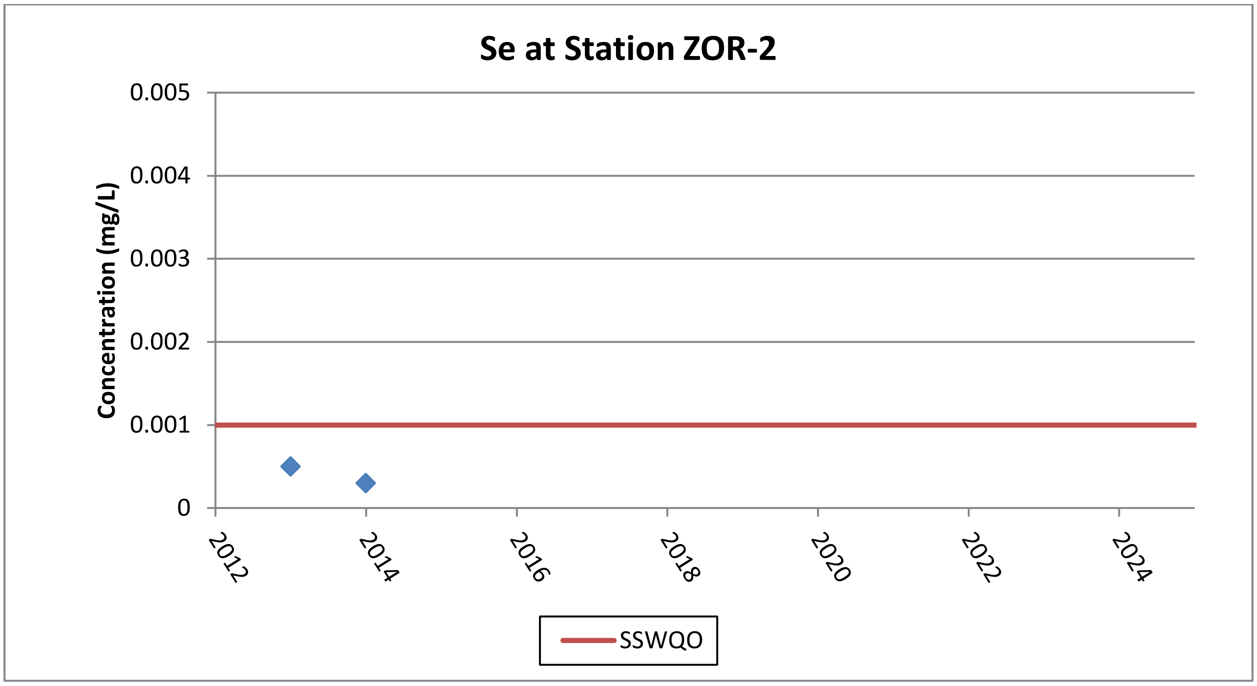
**Station implemented in water sampling program in 2013*

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



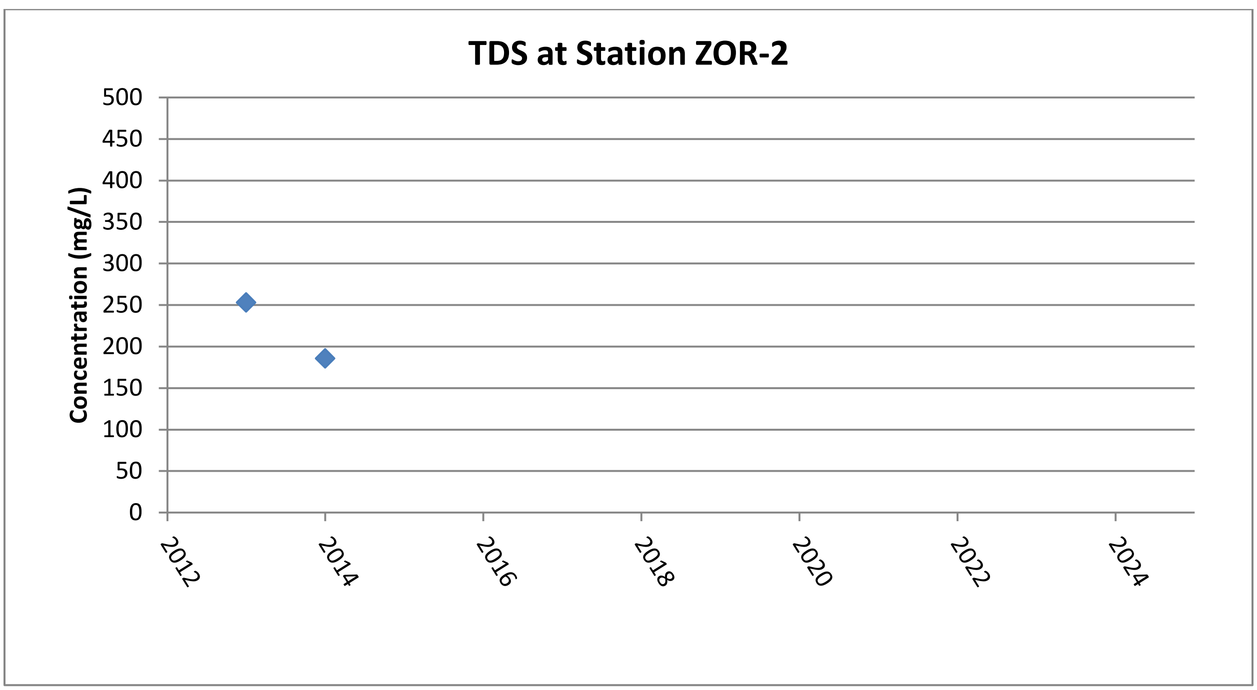
**Station implemented in water sampling program in 2013*

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

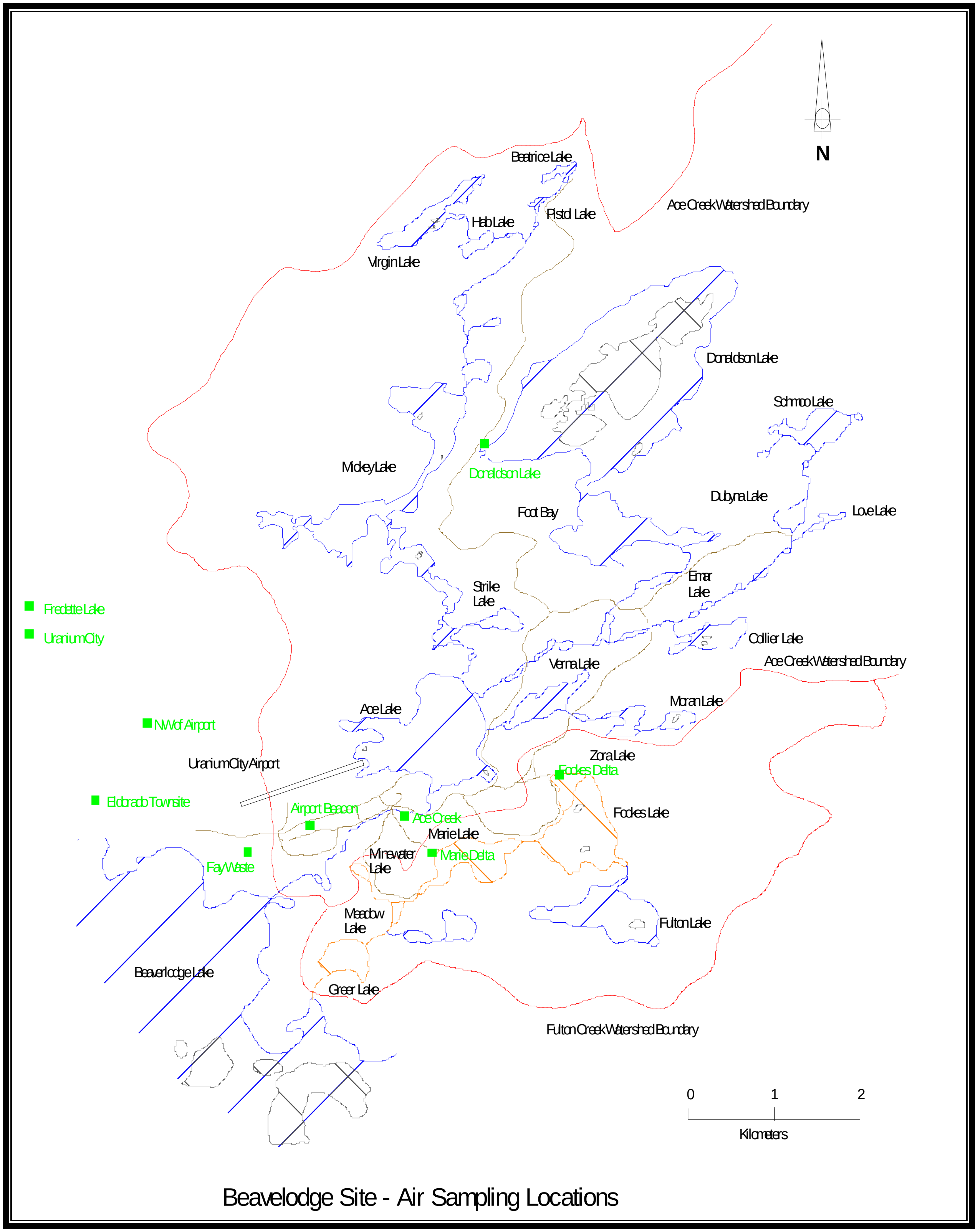
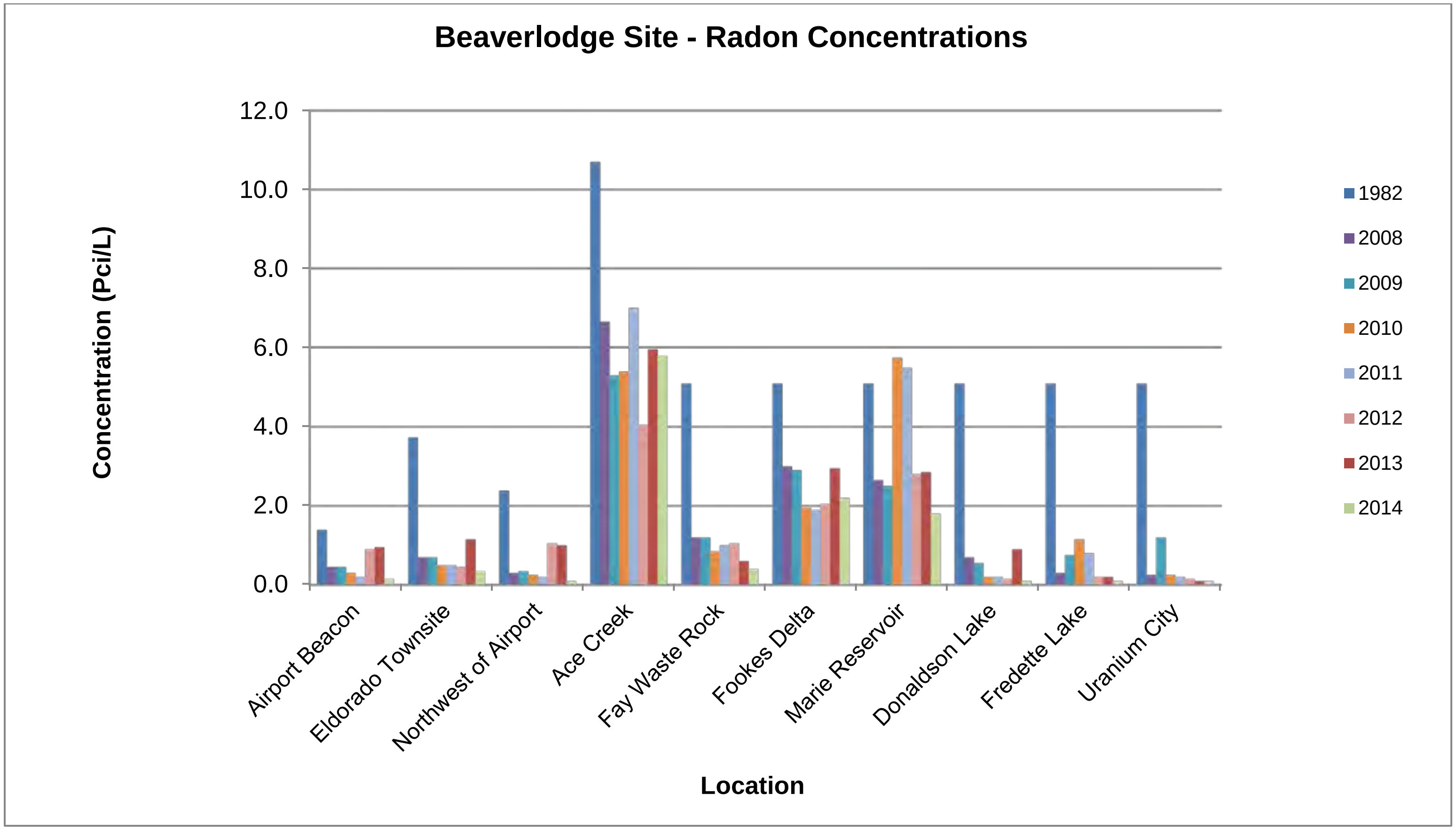


Figure 4.7.1-2
Radon Summary (2008 – 2014 versus 1982)



APPENDIX A

APPENDIX A

Station: AN-5

Parameter	2014-05-31	2014-07-27	2014-09-20	*2014-12-07
Alk-T (mg/L)	54	91	104	162
As (µg/L)	0.3	0.4	0.3	0.6
Ba (mg/L)	0.072	0.12	0.12	0.17
Ca (mg/L)	18	27	29	45
Cl (mg/L)	0.4	0.4	0.6	1.4
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	132	189	213	330
Cu (mg/L)	0.0017	0.0004	<0.0002	0.0016
Fe (mg/L)	0.14	0.21	0.12	0.37
Hardness (mg/L)	62	92	101	157
HCO3 (mg/L)	66	111	127	198
K (mg/L)	1	0.8	1.1	1.7
Mg (mg/L)	4.1	6.1	7	11
Mo (mg/L)	0.0035	0.0022	0.0015	0.0031
Na (mg/L)	2	2.7	3.4	5.5
NH3-N (mg/L)			0.05	
Ni (mg/L)	0.0006	0.0004	0.0003	0.0014
NO3 (mg/L)	<0.04	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01	
Pb (mg/L)	0.0003	<0.0001	<0.0001	0.0009
pH-L (pH Unit)	7.75	7.71	7.56	7.58
Po210 (Bq/L)			0.01	
Ra226 (Bq/L)	0.37	0.75	0.59	0.91
Se (mg/L)	0.0001	<0.0001	<0.0001	0.0002
SO4 (mg/L)	13	12	12	22
Sum of Ions (mg/L)	104	160	180	285
TSS (mg/L)	<1.000	2	1	<1.000
U (µg/L)	63	41	51	321
Zn (mg/L)	0.001	0.001	<0.001	0.011

*November's scheduled sample was collected on December 7th.

Station: DB-6

Parameter	2014-01-21	2014-03-28	*2014-06-18	2014-07-27	2014-09-20	**2014-12-07
Alk-T (mg/L)	100	101	76	85	98	
As (µg/L)	0.2	0.2	0.1	0.2	0.1	
Ba (mg/L)	0.055	0.054	0.039	0.039	0.049	
Ca (mg/L)	40	41	30	33	37	
Cl (mg/L)	0.8	0.8	0.5	0.5	0.6	
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
Cond-L (µS/cm)	257	258	189	205	232	
Cu (mg/L)	0.0016	0.0026	0.0009	0.0007	0.0005	
Fe (mg/L)	0.027	0.034	0.019	0.024	0.014	
Hardness (mg/L)	125	127	93	102	116	
HCO3 (mg/L)	122	123	93	104	120	
K (mg/L)	1	0.8	0.6	0.5	0.8	
Mg (mg/L)	6.2	6.1	4.4	4.8	5.7	
Mo (mg/L)	0.002	0.0018	0.0018	0.002	0.002	
Na (mg/L)	2.4	2.4	1.6	1.7	2.1	
NH3-N (mg/L)		0.06			0.04	
Ni (mg/L)	0.0003	0.0004	0.0002	0.0002	0.0002	
NO3 (mg/L)	0.44	0.58	0.09	<0.04	0.04	
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
P-(TP) (mg/L)		<0.01			<0.01	
Pb (mg/L)	0.0002	0.0002	0.0001	<0.0001	<0.0001	
pH-L (pH Unit)	7.53	7.64	7.98	7.84	7.78	
Po210 (Bq/L)		0.01			0.008	
Ra226 (Bq/L)	0.04	0.04	0.03	0.04	0.04	
Se (mg/L)	0.0001	0.0001	<0.0001	0.0001	0.0001	
SO4 (mg/L)	28	27	20	21	26	
Sum of Ions (mg/L)	201	202	150	166	192	
TDS (mg/L)	163	172	135	141	161	
TSS (mg/L)	<1.000	<1.000	<1.000	1	<1.000	
U (µg/L)	180	187	116	153	209	
Zn (mg/L)	0.003	0.006	0.001	0.001	<0.001	

*May's sample was collected on June 18 due to road inaccessibility issues.

**An attempt was made to collect the November scheduled sample on December 7th, however there was no water flowing.

Station: AC-6A

Parameter	2014-06-21	2014-07-27	*2014-08-26	*2014-09-20
Alk-T (mg/L)	102	103		
As (µg/L)	0.3	0.2		
Ba (mg/L)	0.026	0.022		
Ca (mg/L)	44	43		
Cl (mg/L)	0.5	0.4		
CO3 (mg/L)	<1.0	<1.0		
Cond-L (µS/cm)	286	283		
Cu (mg/L)	0.0004	0.0002		
Fe (mg/L)	0.048	0.023		
Hardness (mg/L)	145	143		
HCO3 (mg/L)	124	126		
K (mg/L)	0.8	0.8		
Mg (mg/L)	8.7	8.7		
Mo (mg/L)	0.0008	0.0008		
Na (mg/L)	2.3	2.3		
NH3-N (mg/L)				
Ni (mg/L)	0.0002	<0.00010		
NO3 (mg/L)	<0.04	<0.04		
OH (mg/L)	<1.0	<1.0		
P-(TP) (mg/L)				
Pb (mg/L)	<0.0001	<0.0001		
pH-L (pH Unit)	7.78	7.62		
Po210 (Bq/L)				
Ra226 (Bq/L)	0.18	0.12		
Se (mg/L)	0.0002	0.0001		
SO4 (mg/L)	44	47		
Sum of Ions (mg/L)	224	228		
TDS (mg/L)	196	197		
TSS (mg/L)	<1.000	<1.000		
U (µg/L)	150	158		
Zn (mg/L)	<0.001	0.001		

* No water flowing during scheduled sample collection

Station: AC-8

Parameter	2014-03-28	2014-09-20
Alk-T (mg/L)	56	49
As (µg/L)	0.2	0.1
Ba (mg/L)	0.025	0.023
Ca (mg/L)	18	15
Cl (mg/L)	1	0.8
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	129	108
Cu (mg/L)	0.0007	0.0003
Fe (mg/L)	0.041	0.025
Hardness (mg/L)	60	50
HCO3 (mg/L)	68	60
K (mg/L)	0.9	0.7
Mg (mg/L)	3.7	3
Mo (mg/L)	0.0009	0.0009
Na (mg/L)	1.6	1.4
NH3-N (mg/L)		0.04
Ni (mg/L)	0.0002	0.0001
NO3 (mg/L)	0.44	<0.04
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)		<0.01
Pb (mg/L)	<0.0001	<0.0001
pH-L (pH Unit)	7.53	7.55
Po210 (Bq/L)		<0.005
Ra226 (Bq/L)	0.02	0.02
Se (mg/L)	<0.0001	<0.0001
SO4 (mg/L)	7.4	6.3
Sum of Ions (mg/L)	101	87
TDS (mg/L)	96	76
TSS (mg/L)	<1.000	<1.000
U (µg/L)	12	11
Zn (mg/L)	0.002	0.001

Station: AC-14

Parameter	2014-01-21	2014-02-28	2014-03-28	2014-05-04	2014-05-31	2014-06-21	2014-07-27	2014-08-26	2014-09-20	2014-10-19	*2014-12-07	2014-12-16
Alk-T (mg/L)	55	55	57	52	44	47	49	52	52	54	57	53
As (µg/L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2
Ba (mg/L)	0.026	0.026	0.025	0.025	0.021	0.023	0.023	0.024	0.025	0.03	0.03	0.026
Ca (mg/L)	18	18	18	19	14	15	16	17	18	18	18	17
Cl (mg/L)	1.2	1.1	1.2	1.5	0.9	0.8	0.9	1	1.4	1.8	1.3	1.2
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	<1.0
Cond-L (µS/cm)	128	126	131	134	103	107	113	121	128	141	131	126
Cu (mg/L)	0.0007	0.002	0.0008	0.0012	9E-04	5E-04	4E-04	4E-04	0.0007	0	0	0.001
Fe (mg/L)	0.056	0.066	0.05	0.052	0.056	0.075	0.078	0.08	0.06	0.15	0.12	0.14
Hardness (mg/L)	60	60	60	62	46	49	53	56	59	59	59	56
HCO3 (mg/L)	67	67	70	63	54	57	60	63	63	66	70	65
K (mg/L)	0.9	0.8	0.8	0.9	0.9	0.6	0.6	0.5	0.6	0.8	0.5	0.6
Mg (mg/L)	3.7	3.6	3.7	3.5	2.8	2.9	3.1	3.3	3.4	3.4	3.5	3.4
Mo (mg/L)	0.001	0.001	0.0009	0.001	8E-04	9E-04	0.001	0.001	0.0008	0	0	0.001
Na (mg/L)	1.8	1.8	1.8	2.2	1.7	1.5	1.6	1.8	2.2	2.7	1.7	1.8
NH3-N (mg/L)	0.08		0.05			0.06			0.12			0.06
Ni (mg/L)	0.0002	4E-04	0.0002	0.0003	2E-04	2E-04	2E-04	2E-04	0.0002	0	0	3E-04
NO3 (mg/L)	0.22	0.26	0.44	0.31	0.09	0.04	<0.04	0.04	<0.04	<0.04	<0.04	0.13
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	<1.0
P-(TP) (mg/L)	<0.01		<0.01			<0.01			<0.01			<0.01
Pb (mg/L)	0.0002	3E-04	0.0003	0.0018	3E-04	3E-04	3E-04	4E-04	0.0003	0	0	0.001
pH-L (pH Unit)	7.74	7.79	7.69	7.8	7.8	7.68	7.7	7.94	7.52	7.63	7.7	7.8
Po210 (Bq/L)	0.007		<0.005			0.01			0.006			0.03
Ra226 (Bq/L)	0.03	0.04	0.04	0.07	0.05	0.05	0.06	0.05	0.06	0.08	0.07	0.08
Se (mg/L)	0.0001	2E-04	<0.0001	0.0004	1E-04	<0.0001	<0.0001	1E-04	0.0001	0	0	1E-04
SO4 (mg/L)	7.7	7.5	7.8	12	7	6.5	6.9	8.6	10	12	8.4	8
Sum of Ions (mg/L)	101	100	104	102	81	84	89	95	99	105	103	97
TDS (mg/L)	83	79	85	88	69	80	81	79	84	78	84	82
TSS (mg/L)	<1.000	2	<1.000	2	1	<1.000	1	<1.000	<1.000	2	<1.000	<1.000
U (µg/L)	20	17	18	57	21	17	23	22	35	55	27	24
Zn (mg/L)	0.002	0.003	0.001	0.018	0.002	<0.001	<0.001	<0.001	<0.001	0	0.01	0.003

*November's sample was sampled in December.

Station: AN-3

Parameters	2014-09-20
Alk-T (mg/L)	76
As (µg/L)	<0.1
Ba (mg/L)	0.017
Ca (mg/L)	20
Cl (mg/L)	0.6
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	145
Cu (mg/L)	0.0005
Fe (mg/L)	0.01
Hardness (mg/L)	70
HCO3 (mg/L)	93
K (mg/L)	0.6
Mg (mg/L)	4.8
Mo (mg/L)	0.0015
Na (mg/L)	1.9
NH3-N (mg/L)	0.06
Ni (mg/L)	0.0002
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	<0.01
Pb (mg/L)	<0.0001
pH-L (pH Unit)	7.77
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	<0.0001
SO4 (mg/L)	4.3
Sum of Ions (mg/L)	125
TDS (mg/L)	97
Temp. (w) (°C)	10.1
TSS (mg/L)	<1.000
U (µg/L)	1.4
Zn (mg/L)	<0.001

Station: TL-3

Parameters	2014-03-28	2014-06-21	2014-09-20	2014-12-16
Alk-T (mg/L)	146	121	133	149
As (µg/L)	1	0.8	0.8	1
Ba (mg/L)	0.037	0.034	0.035	0.038
Ca (mg/L)	30	25	26	29
Cl (mg/L)	3	3	3	4
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	353	301	312	358
Cu (mg/L)	0.0009	0.0011	0.0007	0.0013
Fe (mg/L)	0.007	0.02	0.013	0.008
Hardness (mg/L)	99	83	87	96
HCO3 (mg/L)	178	148	162	182
K (mg/L)	1.2	0.8	0.9	1
Mg (mg/L)	6	5.1	5.3	5.7
Mo (mg/L)	0.015	0.013	0.013	0.016
Na (mg/L)	40	33	33	39
NH3-N (mg/L)			0.05	
Ni (mg/L)	0.0003	0.0003	0.0002	0.0004
NO3 (mg/L)	0.09	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01	
Pb (mg/L)	0.0002	0.0006	0.0005	0.0005
pH-L (pH Unit)	8.05	8.03	8.1	8.03
Po210 (Bq/L)			0.04	
Ra226 (Bq/L)	1.2	1.1	1.1	1.4
Se (mg/L)	0.0036	0.0028	0.003	0.0032
SO4 (mg/L)	38	32	32	37
Sum of Ions (mg/L)	296	247	262	298
TDS (mg/L)	219	189	200	223
TSS (mg/L)	<1.000	1	<1.000	<1.000
U (µg/L)	348	289	300	330
Zn (mg/L)	<0.001	<0.001	<0.001	0.002

Station: TL-4

Parameters	2014-03-28	2014-06-21	2014-09-20	2014-12-16
Alk-T (mg/L)	161	123	131	151
As (µg/L)	1.6	1.2	1.3	1.4
Ba (mg/L)	0.074	0.068	0.067	0.084
Ca (mg/L)	28	22	20	26
Cl (mg/L)	4	2.8	3	4
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	380	294	301	355
Cu (mg/L)	0.0006	0.0014	0.0004	0.0004
Fe (mg/L)	0.009	0.045	0.026	0.016
Hardness (mg/L)	96	75	72	90
HCO3 (mg/L)	196	150	160	184
K (mg/L)	1.3	1.1	1	1.1
Mg (mg/L)	6.5	5	5.5	6.2
Mo (mg/L)	0.012	0.01	0.01	0.012
Na (mg/L)	48	35	37	42
NH3-N (mg/L)			0.06	
Ni (mg/L)	0.0005	0.0007	0.0004	0.0006
NO3 (mg/L)	0.09	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01	
Pb (mg/L)	0.0002	0.0004	0.0002	0.0003
pH-L (pH Unit)	8.03	8.03	8.16	7.97
Po210 (Bq/L)			0.02	
Ra226 (Bq/L)	1.8	2	1.3	2
Se (mg/L)	0.0026	0.002	0.002	0.0017
SO4 (mg/L)	37	28	30	33
Sum of Ions (mg/L)	321	244	257	296
TDS (mg/L)	235	189	195	215
TSS (mg/L)	<1.000	2	<1.000	<1.000
U (µg/L)	322	237	275	287
Zn (mg/L)	<0.001	0.001	<0.001	<0.001

Station: TL-6

Parameters	2014-05-31	2014-07-27	2014-09-20
Alk-T (mg/L)	296	324	
As (µg/L)	2.2	6.6	
Ba (mg/L)	0.86	1.43	
Ca (mg/L)	41	52	
Cl (mg/L)	50	49	
CO3 (mg/L)	<1.0	<1.0	
Cond-L (µS/cm)	827	848	
Cu (mg/L)	0.0015	0.0003	
Fe (mg/L)	0.36	6.7	
Hardness (mg/L)	147	187	
HCO3 (mg/L)	361	395	
K (mg/L)	3.4	1.8	
Mg (mg/L)	11	14	
Mo (mg/L)	0.0028	0.0009	
Na (mg/L)	134	124	
NH3-N (mg/L)	0.11		
Ni (mg/L)	0.0007	0.0004	
NO3 (mg/L)	0.09	<0.04	
OH (mg/L)	<1.0	<1.0	
P-(TP) (mg/L)	0.02		
Pb (mg/L)	0.0018	0.0004	
pH-L (pH Unit)	8.18	7.82	
Po210 (Bq/L)	0.09		
Ra226 (Bq/L)	6.2	13	
Se (mg/L)	0.0042	0.0023	
SO4 (mg/L)	77	72	
Sum of Ions (mg/L)	678	708	
TDS (mg/L)	581	612	
TSS (mg/L)	2	11	
U (µg/L)	448	121	
Zn (mg/L)	0.002	0.001	

* No water flowing during scheduled sample collection

Station: TL-7

Parameters	2014-01-21	2014-02-28	2014-03-28	2014-05-04	2014-05-31	2014-06-21	2014-07-27	2014-08-26	2014-09-20	2014-10-19	*2014-12-07	2014-12-16
Alk-T (mg/L)	160	160	163	102	122	126	124	131	136	138		179
As (µg/L)	1.7	1.6	1.3	1.1	1.2	1.4	1.6	1.3	1	0.9		1.6
Ba (mg/L)	0.1	0.097	0.1	0.093	0.14	0.16	0.2	0.29	0.34	0.44		0.29
Ca (mg/L)	24	28	29	18	23	23	21	20	21	23		31
Cl (mg/L)	4	4	4	5.2	5.9	4.1	4	3	3	5		6
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-L (µS/cm)	370	377	380	249	302	303	291	292	307	323		424
Cu (mg/L)	0.0006	0.0005	0.0006	0.0015	0.0008	0.0007	0.0005	0.0004	0.0003	0.0003		0.0014
Fe (mg/L)	0.016	0.014	0.012	0.13	0.046	0.056	0.068	0.037	0.022	0.024		0.089
Hardness (mg/L)	84	96	100	62	78	78	73	72	75	80		107
HCO3 (mg/L)	195	195	199	124	149	154	151	160	166	168		218
K (mg/L)	1.6	1.2	1.5	1.6	1.4	1	1	0.9	0.9	1.1		1.4
Mg (mg/L)	6	6.5	6.7	4.3	5.1	5.1	5.1	5.3	5.6	5.6		7.3
Mo (mg/L)	0.011	0.014	0.012	0.0065	0.0088	0.0094	0.0095	0.0092	0.0094	0.0086		0.016
Na (mg/L)	47	44	49	28	35	36	36	39	37	38		50
NH3-N (mg/L)			0.07			0.06			0.06			0.05
Ni (mg/L)	0.0006	0.0005	0.0005	0.0007	0.0005	0.0006	0.0004	0.0004	0.0004	0.0005		0.0004
NO3 (mg/L)	<0.04	<0.04	0.13	0.13	0.04	<0.04	<0.04	0.09	0.13	0.18		0.18
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
P-(TP) (mg/L)			<0.01			<0.01			<0.01			0.01
Pb (mg/L)	0.0004	0.0002	0.0001	0.0011	0.0003	0.0002	0.0002	0.0001	<0.0001	0.0001		0.0006
pH-L (pH Unit)	7.92	8.21	7.97	7.7	8.11	7.92	7.96	7.99	7.86	7.83		7.75
Po210 (Bq/L)			0.01			0.02			0.01			0.04
Ra226 (Bq/L)	1.9	1.8	1.8	1.2	1.4	1.9	1.8	1.6	1.6	1.9		1.2
Se (mg/L)	0.0024	0.0041	0.0025	0.0022	0.002	0.002	0.0019	0.0017	0.0017	0.0017		0.003
SO4 (mg/L)	34	34	38	22	27	27	27	29	29	29		38
Sum of Ions (mg/L)	312	313	327	203	246	250	245	257	263	270		352
TDS (mg/L)	226	236	242	174	196	189	197	164	201	195		269
TSS (mg/L)	<1.000	1	<1.000	1	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000		<1.000
U (µg/L)	333	343	326	169	244	228	220	208	255	256		416
Zn (mg/L)	<0.001	0.001	<0.001	0.009	0.001	<0.001	<0.001	0.001	<0.001	<0.001		0.001

* An attempt was made to collect the November scheduled sample on December 7, however there was no water flowing

Station: TL-9

Parameters	2014-01-21	2014-02-28	2014-03-28	2014-05-04	2014-05-31	2014-06-21	2014-07-27	2014-08-26	2014-09-20	2014-10-19	*2014-12-07	*2014-12-16
Alk-T (mg/L)	165	164	178	108	133	135	131	136	143	139		
As (µg/L)	1.6	1.7	1.4	1.2	1.4	1.6	2.1	2.1	1.5	1.5		
Ba (mg/L)	0.57	0.25	0.51	0.33	0.82	0.67	0.67	0.8	0.98	1.1		
Ca (mg/L)	26	27	31	20	26	25	23	24	26	25		
Cl (mg/L)	5	4	5	2.8	4.9	5	4.9	4.6	4	5		
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
Cond-L (µS/cm)	381	384	417	249	308	312	299	307	319	322		
Cu (mg/L)	0.0007	0.0005	0.0006	0.0015	0.001	0.0008	0.0006	0.0007	0.0011	0.0005		
Fe (mg/L)	0.023	0.017	0.017	0.18	0.049	0.052	0.11	0.087	0.045	0.065		
Hardness (mg/L)	92	94	108	70	88	86	82	85	90	87		
HCO3 (mg/L)	201	200	217	132	162	165	160	166	174	170		
K (mg/L)	1.7	1.2	1.5	1.5	1.4	0.9	0.9	1	0.8	0.9		
Mg (mg/L)	6.7	6.6	7.5	5	5.7	5.7	5.9	6.1	6.2	5.9		
Mo (mg/L)	0.012	0.014	0.012	0.0076	0.0083	0.0092	0.0084	0.0089	0.013	0.016		
Na (mg/L)	47	45	53	29	34	36	34	38	35	35		
NH3-N (mg/L)			0.09			0.07			0.06			
Ni (mg/L)	0.0006	0.0006	0.0005	0.0006	0.0004	0.0005	0.0005	0.0005	0.0004	0.0004		
NO3 (mg/L)	0.09	0.18	0.35	0.31	0.18	0.4	0.22	0.4	0.53	0.44		
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
P-(TP) (mg/L)			<0.01			<0.01			<0.01			
Pb (mg/L)	0.0005	0.0001	0.0002	0.0018	0.0005	0.0007	0.0018	0.0011	0.0004	0.0007		
pH-L (pH Unit)	8.01	8.27	8.08	7.98	8.16	8.01	8.07	8.12	8.05	8.03		
Po210 (Bq/L)			0.02			0.06			0.04			
Ra226 (Bq/L)	2	1.7	2.1	1.4	2.6	2.7	2.6	2.9	2.8	4		
Se (mg/L)	0.0029	0.0044	0.0028	0.0023	0.0022	0.0024	0.002	0.0026	0.0029	0.0035		
SO4 (mg/L)	33	32	39	24	23	25	24	27	28	28		
Sum of Ions (mg/L)	320	316	354	215	257	263	253	267	275	270		
TDS (mg/L)	238	242	260	172	205	196	205	172	214	199		
TSS (mg/L)	<1.000	1	<1.000	2	2	2	4	2	2	3		
U (µg/L)	368	355	363	193	238	202	178	168	269	344		
Zn (mg/L)	0.001	<0.001	<0.001	0.011	0.001	0.001	0.001	0.002	<0.001	0.001		

* Attempted to collect the November scheduled sample on December 7, however there was no water flowing. No water flowing during the December scheduled sample.

Station: BL-3

Parameters	2014-03-28	2014-06-21	2014-09-20	2014-12-16
Alk-T (mg/L)	79	70	72	73
As (µg/L)	0.3	0.3	0.3	0.3
Ba (mg/L)	0.048	0.046	0.039	0.036
Ca (mg/L)	24	21	21	22
Cl (mg/L)	13	12	12	13
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	263	243	240	250
Cu (mg/L)	0.0017	0.0012	0.0009	0.0043
Fe (mg/L)	0.008	0.007	0.006	0.006
Hardness (mg/L)	84	74	74	77
HCO3 (mg/L)	96	85	88	89
K (mg/L)	1.2	1	0.9	0.8
Mg (mg/L)	5.9	5.2	5.2	5.4
Mo (mg/L)	0.0036	0.0035	0.0034	0.0039
Na (mg/L)	21	19	18	19
NH3-N (mg/L)			0.05	
Ni (mg/L)	0.0035	0.0031	0.0042	0.004
NO3 (mg/L)	0.18	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01	
Pb (mg/L)	0.0002	0.0001	<0.0001	0.0002
pH-L (pH Unit)	7.85	7.71	7.78	7.81
Po210 (Bq/L)			<0.005	
Ra226 (Bq/L)	0.09	0.07	0.04	0.02
Se (mg/L)	0.0026	0.0024	0.0026	0.0025
SO4 (mg/L)	33	30	30	31
Sum of Ions (mg/L)	194	173	175	180
TDS (mg/L)	153	141	142	143
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000
U (µg/L)	143	132	131	134
Zn (mg/L)	0.004	0.003	0.001	0.009

Station: BL-4

Parameters	2014-03-28	2014-09-20
Alk-T (mg/L)	73	72
As (µg/L)	0.3	0.2
Ba (mg/L)	0.035	0.034
Ca (mg/L)	22	20
Cl (mg/L)	13	13
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	250	240
Cu (mg/L)	0.0028	0.0004
Fe (mg/L)	0.005	0.007
Hardness (mg/L)	78	71
HCO3 (mg/L)	89	88
K (mg/L)	1.1	0.8
Mg (mg/L)	5.6	5.2
Mo (mg/L)	0.0036	0.0034
Na (mg/L)	20	18
NH3-N (mg/L)	0.11	0.05
Ni (mg/L)	0.0026	0.001
NO3 (mg/L)	0.13	<0.04
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)	<0.01	<0.01
Pb (mg/L)	0.0002	<0.0001
pH-L (pH Unit)	7.8	7.7
Po210 (Bq/L)	<0.005	<0.005
Ra226 (Bq/L)	0.03	0.02
Se (mg/L)	0.0026	0.0025
SO4 (mg/L)	33	30
Sum of Ions (mg/L)	184	175
TDS (mg/L)	146	144
TSS (mg/L)	<1.000	1
U (µg/L)	138	132
Zn (mg/L)	0.006	0.001

Station: BL-5

Parameters	2014-01-21	2014-03-28	2014-06-21	2014-09-20	2014-12-16
Alk-T (mg/L)	75	77	68	72	75
As (µg/L)	0.3	0.3	0.2	0.2	0.3
Ba (mg/L)	0.038	0.037	0.035	0.035	0.037
Ca (mg/L)	23	24	20	20	22
Cl (mg/L)	14	14	12	12	14
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	271	270	237	239	260
Cu (mg/L)	0.0003	0.0007	0.0005	<0.0002	0.0014
Fe (mg/L)	0.002	0.013	0.006	0.004	0.006
Hardness (mg/L)	81	84	71	71	78
HCO3 (mg/L)	92	94	83	88	92
K (mg/L)	1.3	1.1	0.9	0.9	0.9
Mg (mg/L)	5.8	6	5.2	5.2	5.6
Mo (mg/L)	0.004	0.0036	0.0034	0.0034	0.004
Na (mg/L)	21	22	18	19	19
NH3-N (mg/L)				0.08	
Ni (mg/L)	0.0002	0.0002	0.0002	0.0001	<0.00010
NO3 (mg/L)	<0.04	0.13	<0.04	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)				<0.01	
Pb (mg/L)	<0.0001	0.0002	0.0002	<0.0001	0.0002
pH-L (pH Unit)	7.83	7.82	7.79	7.79	7.85
Po210 (Bq/L)				<0.005	
Ra226 (Bq/L)	0.03	0.03	0.03	0.02	0.03
Se (mg/L)	0.0031	0.0028	0.0024	0.0026	0.0025
SO4 (mg/L)	35	35	30	30	32
Sum of Ions (mg/L)	192	196	169	175	186
TDS (mg/L)	153	168	134	140	149
TSS (mg/L)	<1.000	2	<1.000	<1.000	<1.000
U (µg/L)	157	147	129	130	136
Zn (mg/L)	<0.001	0.002	0.002	<0.001	0.003

Station: ML-1

Parameters	2014-03-28	2014-06-21	2014-09-20	2014-12-16
Alk-T (mg/L)	69	61	68	78
As (µg/L)	0.2	0.2	0.2	0.2
Ba (mg/L)	0.044	0.039	0.041	0.048
Ca (mg/L)	21	18	19	22
Cl (mg/L)	6.9	6.5	8.2	8.8
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	190	168	193	212
Cu (mg/L)	0.0048	0.0006	<0.0002	0.0003
Fe (mg/L)	0.019	0.01	0.006	0.011
Hardness (mg/L)	71	61	66	75
HCO3 (mg/L)	84	74	83	95
K (mg/L)	1	0.8	1.1	0.9
Mg (mg/L)	4.6	3.9	4.5	4.9
Mo (mg/L)	0.0015	0.0016	0.002	0.0022
Na (mg/L)	9.9	9.2	12	12
NH3-N (mg/L)	0.07	0.08	0.05	0.05
Ni (mg/L)	0.0002	0.0002	<0.00010	0.0001
NO3 (mg/L)	0.4	<0.04	<0.04	0.18
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)	0.01	<0.01	<0.01	0.01
Pb (mg/L)	0.0004	<0.0001	<0.0001	<0.0001
pH-L (pH Unit)	7.74	7.73	7.72	8.28
Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005
Ra226 (Bq/L)	0.01	0.02	0.008	0.01
Se (mg/L)	0.0009	0.0008	0.0012	0.001
SO4 (mg/L)	16	15	19	20
Sum of Ions (mg/L)	144	128	147	164
TDS (mg/L)	118	101	117	132
TSS (mg/L)	<1.000	<1.000	1	1
U (µg/L)	49	46	69	67
Zn (mg/L)	0.016	0.001	<0.001	0.001

Station: CS-1

Parameters	2014-09-20
Alk-T (mg/L)	70
As (µg/L)	0.2
Ba (mg/L)	0.042
Ca (mg/L)	20
Cl (mg/L)	7.8
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	190
Cu (mg/L)	<0.0002
Fe (mg/L)	0.026
Hardness (mg/L)	69
HCO3 (mg/L)	85
K (mg/L)	1
Mg (mg/L)	4.6
Mo (mg/L)	0.0019
Na (mg/L)	11
NH3-N (mg/L)	0.05
Ni (mg/L)	<0.00010
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	<0.01
Pb (mg/L)	<0.0001
pH-L (pH Unit)	7.76
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	0.006
Se (mg/L)	0.001
SO4 (mg/L)	18
Sum of Ions (mg/L)	148
TDS (mg/L)	119
TSS (mg/L)	<1.000
U (µg/L)	63
Zn (mg/L)	<0.001

Station: CS-2

Parameters	2014-09-20
Alk-T (mg/L)	32
As (µg/L)	0.2
Ba (mg/L)	0.012
Ca (mg/L)	7.6
Cl (mg/L)	3.4
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	78
Cu (mg/L)	0.0007
Fe (mg/L)	0.01
Hardness (mg/L)	28
HCO3 (mg/L)	39
K (mg/L)	0.7
Mg (mg/L)	2.3
Mo (mg/L)	0.0002
Na (mg/L)	3
NH3-N (mg/L)	0.02
Ni (mg/L)	0.0023
NO3 (mg/L)	0.09
OH (mg/L)	<1.0
P-(TP) (mg/L)	<0.01
Pb (mg/L)	<0.0001
pH-L (pH Unit)	7.38
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	<0.0001
SO4 (mg/L)	4.2
Sum of Ions (mg/L)	60
TDS (mg/L)	54
TSS (mg/L)	<1.000
U (µg/L)	1.6
Zn (mg/L)	0.002

Station: ZOR-01

Parameters	2014-06-18	2014-07-27	2014-08-26	2014-09-20	2014-10-19
Alk-T (mg/L)	82	88	94	104	104
As (µg/L)	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.019	0.019	0.021	0.019	0.023
Ca (mg/L)	27	28	30	31	31
Cl (mg/L)	0.2	0.2	0.4	0.2	0.3
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	189	197	208	218	224
Cu (mg/L)	0.0019	0.002	0.0034	0.0009	0.0027
Fe (mg/L)	0.029	0.02	0.027	0.005	0.01
Hardness (mg/L)	95	99	106	110	110
HCO3 (mg/L)	100	107	115	127	127
K (mg/L)	0.6	0.6	0.8	0.6	0.6
Mg (mg/L)	6.7	7.1	7.5	7.9	7.9
Mo (mg/L)	0.0008	0.0009	0.0009	0.0008	0.0008
Na (mg/L)	1.5	1.5	1.8	1.5	1.7
NH3-N (mg/L)				0.05	
Ni (mg/L)	0.0004	0.0002	0.0005	0.0002	0.0003
NO3 (mg/L)	0.09	<0.04	0.09	0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)					
Pb (mg/L)	0.0004	0.0002	0.0014	<0.0001	0.0003
pH-F (pH Unit)					
pH-L (pH Unit)	8.02	8.03	8.06	7.85	7.76
Po210 (Bq/L)				0.005	
Ra226 (Bq/L)	0.02	0.02	0.02	0.02	0.05
Se (mg/L)	0.0001	0.0001	0.0001	0.0001	0.0001
SO4 (mg/L)	16	16	17	18	18
Sum of Ions (mg/L)	152	160	172	186	186
TDS (mg/L)	134	134	107	144	116
TSS (mg/L)	1	1	3	<1.000	1
U (µg/L)	12	13	12	13	15
Zn (mg/L)	0.004	0.002	0.006	0.001	0.002

Station: ZOR-02

Parameters	2014-06-18	2014-07-27	2014-08-26	2014-09-20	2014-10-19
Alk-T (mg/L)	95	106	115	124	129
As (µg/L)	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.016	0.02	0.022	0.023	0.022
Ca (mg/L)	37	39	45	50	51
Cl (mg/L)	0.3	0.2	0.3	0.3	1
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	247	257	287	322	334
Cu (mg/L)	0.0048	0.0043	0.0034	0.0028	0.0029
Fe (mg/L)	0.06	0.033	0.03	0.022	0.017
Hardness (mg/L)	124	130	148	163	166
HCO3 (mg/L)	116	129	140	151	157
K (mg/L)	0.6	0.7	0.7	0.6	0.6
Mg (mg/L)	7.6	7.9	8.7	9.3	9.4
Mo (mg/L)	0.0013	0.0014	0.0012	0.0013	0.0014
Na (mg/L)	1.7	1.7	1.9	2	2
NH3-N (mg/L)				0.04	
Ni (mg/L)	0.0004	0.0003	0.0003	0.0003	0.0003
NO3 (mg/L)	0.4	0.26	0.84	0.84	0.98
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)					
Pb (mg/L)	0.0005	0.0002	0.0002	0.0003	<0.0001
pH-F (pH Unit)					
pH-L (pH Unit)	8.06	7.96	8.11	7.89	7.76
Po210 (Bq/L)				0.08	
Ra226 (Bq/L)	0.3	0.4	0.3	0.36	0.32
Se (mg/L)	0.0003	0.0003	0.0003	0.0003	0.0002
SO4 (mg/L)	34	32	39	52	51
Sum of Ions (mg/L)	198	211	236	266	273
TDS (mg/L)	172	177	163	213	202
TSS (mg/L)	1	<1.000	<1.000	<1.000	<1.000
U (µg/L)	319	224	230	381	415
Zn (mg/L)	<0.001	0.001	0.001	<0.001	<0.001

APPENDIX B

APPENDIX B

Report on

2014 Hydrometric Monitoring near Beaverlodge Mine

Project No. 2711-15003-0
Cameco Corporation | Michael Webster | (306) 956-6200
March 18, 2015

McElhanney Resource Services Ltd.
www.mcelhanney.com

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1 INTRODUCTION

Development of uranium mines in the area of Beaverlodge Lake, Saskatchewan near Uranium City 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 McElhanney Resource Services Ltd. (MRSL) to perform annual hydrological monitoring in areas associated with the Site and downstream. MRSL has retained Missinipi Water Solutions Inc. (MWSI) for the provision of most services associated with work activities including report development. The report documents field and desktop activities carried out by MRSL and 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 – Downstream of the Tailings Management Area.

An additional station included in the 2014 reporting is a water level datalogger deployed in the Fay Shaft. The locations of monitoring locations are presented in Figure 1. Also reported in this document are survey and water chemistry data collected for a small pond located near the former Hab Mine as requested by Cameco for the fall field program.

Figure 1: Site Location Map

2 METHODS

Two field programs were undertaken to complete this project. The first program ran concurrently with other work in the Uranium City area from May 4 to 9, 2014 and the second from October 9 to 12, 2014. At each monitoring station discharge was measured either by in-stream velocity measurements or volumetric methods, elevation surveys were performed using an engineer's rod and level or by reading a staff gauge and stage data loggers (Solinst Leveloggers) were downloaded. To perform in-stream velocity measurements, either a Sontek FlowTracker or a Price-style meter were used; volumetric measurements were performed using a vessel of known volume and a stop watch. All measurements were completed using calibrated equipment. Water levels are reported in reference locally established benchmarks and are not corrected to geodetic elevation.

To calculate hydrographs at each station, the measurements of stage and discharge are correlated to develop a rating curve. The resulting rating curve is then applied to the Levelogger data records following correction of the Levelogger data with barometric pressure data. The discharge calculated 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 report are continuations of the data presented in McElhanney (2014).

Cameco should exercise caution in regards to the use of any hydrograph data which is calculated from extrapolation above the highest measured point on the rating curve for a particular station. Rating curves are typically exponential in nature and can become inaccurate beyond the measured range of data.

Stage-discharge relationships (rating curves) have been developed for open water conditions using recorded 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 low flow periods, 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 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 the Uranium City is automated and has been subject to problems in the past resulting in meteorological data gaps. Data presented in Table 1 are for reference to the type of year but should not be considered the true value of precipitation in 2014.

Environment Canada identified that the stations data link failed in July and was not repaired until September. The station transmits real time information to other parts of Canada and though there is an onboard data logger the data was lost when the link was re-established in September 2014. It is known from communication with local residents and supported by the in-stream data loggers that a large storm event occurred in July (212% of monthly normal) and was followed by an extended dry period in August and September with virtually no precipitation.

Table 1: Climatic 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
2014	January	33.5	19.3	173.6	31/31	2.8*	18.1	15.5	28/31
	February	7.1*	15.5	45.8	26/28	0.0*	13.3	0.0	25/28
	March	12.7	17.8	71.3	31/31	0.0*	18.2	0.0	30/31
	April	25.7*	16.9	152.1	29/30	2.3*	18	12.8	27/30
	May	32.1*	17.5	183.4	27/31	48.3*	26.3	183.7	29/31
	June	37.5	31.3	119.8	30/30	20.6*	44.4	46.4	29/30
	July	100.1*	47.1	212.5	27/31	56.7*	56.3	100.7	29/31
	August	0.0*	42.4	0.0	0/31	49.4*	63.9	77.3	30/31
	September	0.0*	33.7	0.0	5/30	49.7	48.4	102.7	30/30
	October	33.5*	29.1	115.1	30/31	21.1*	30.1	70.1	28/31
	November	16.5	28	58.9	30/30	5.4*	27.6	19.6	29/30
	December	13.3*	23.6	56.4	30/31	0.0*	18.7	0.0	30/31
Totals		312.0*	322.2	96.8	296/365	256.3*	383.3	66.9	344/365

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

4 DISCHARGE MONITORING

This section presents the measured discharge, measured water level (stage), rating curves, hydrographs and daily average discharges 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. In some cases, records have been extended either forwards, backwards or both to create the full record. As the only data logger downloaded with a continuous record extending beyond October 2014 is AC-8 all hydrographs at other stations with a record extending beyond October 2014 (AC-6B, BL-5, CS-1 and TL-7) are synthesized from AC-8. There are stations other than AC-8 with data loggers installed year round (AC-6B, BL-5 and CS-1) but the winter download is carried out by a local contractor and AC-8 is the only station where the logger is readily accessible. 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. Discharge values are typically reported to the fourth decimal place throughout this report for ease of comparison between stations as well as high and low flows.

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. This station monitors discharge from Verna Lake to Ace Lake.

Through the course of 2014, beavers were active in the area and were creating obstructions at the monitoring structure. Local residents removed the obstruction periodically as the water level resulted in overtopping the road. No evidence of beaver activity was noted in the spring field program (Photo 1) but a spoil pile was observed beside the structure in the fall (Photo 2). Stage data collected by the datalogger showed random spikes not coincident with a climatic influence. Conversations with local residents indicated that the beavers were active between approximately June 15 and July 26, 2014; as such, the data for this period has been removed from the presented record as correlation to other stations has not resulted in reasonable results. The stage and discharge measurement data are presented in Table 2 and graphically in Figure 2. The hydrograph and daily average discharge values are presented in Figure 3 and Table 3, respectively.

Photo 1: AC-6A – May 8, 2014

Photo 2: AC-6A – October 9, 2014 – Spoil Pile of Removed Material beside Gauging Structure

Table 2: AC-6A Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m³/s)
5/7/2012 14:54	0.307	0.0005
5/8/2012 8:06	0.315	0.0008
5/9/2012 18:16	0.317	0.0008
Weir Invert	0.273	0.0000
10/12/2013 11:47	0.000	0.0000
5/4/2014 9:50	0.323	0.0015
5/8/2014 12:05	0.303	0.0004
10/9/2014 16:00	0.000	0.0000

Figure 2: AC-6A Rating Curve

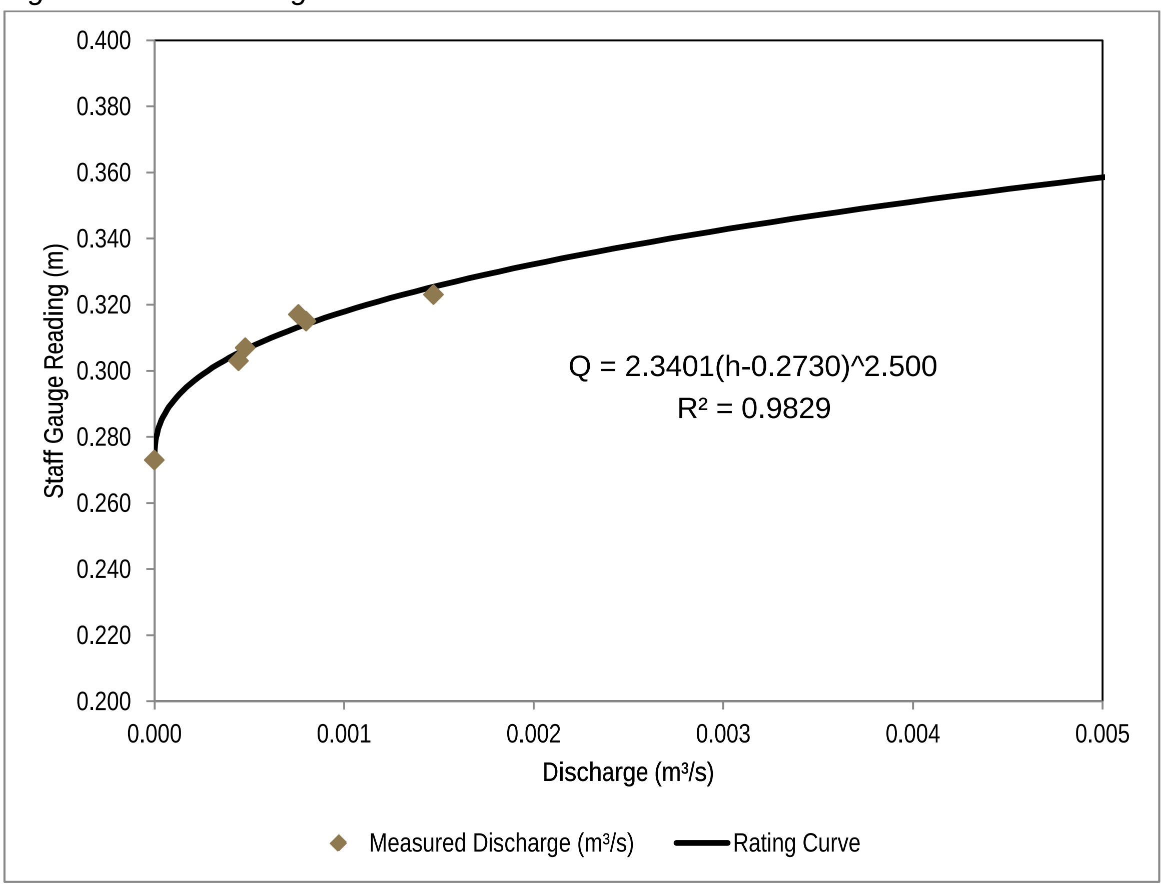


Figure 3: AC-6A 2014 Hydrograph

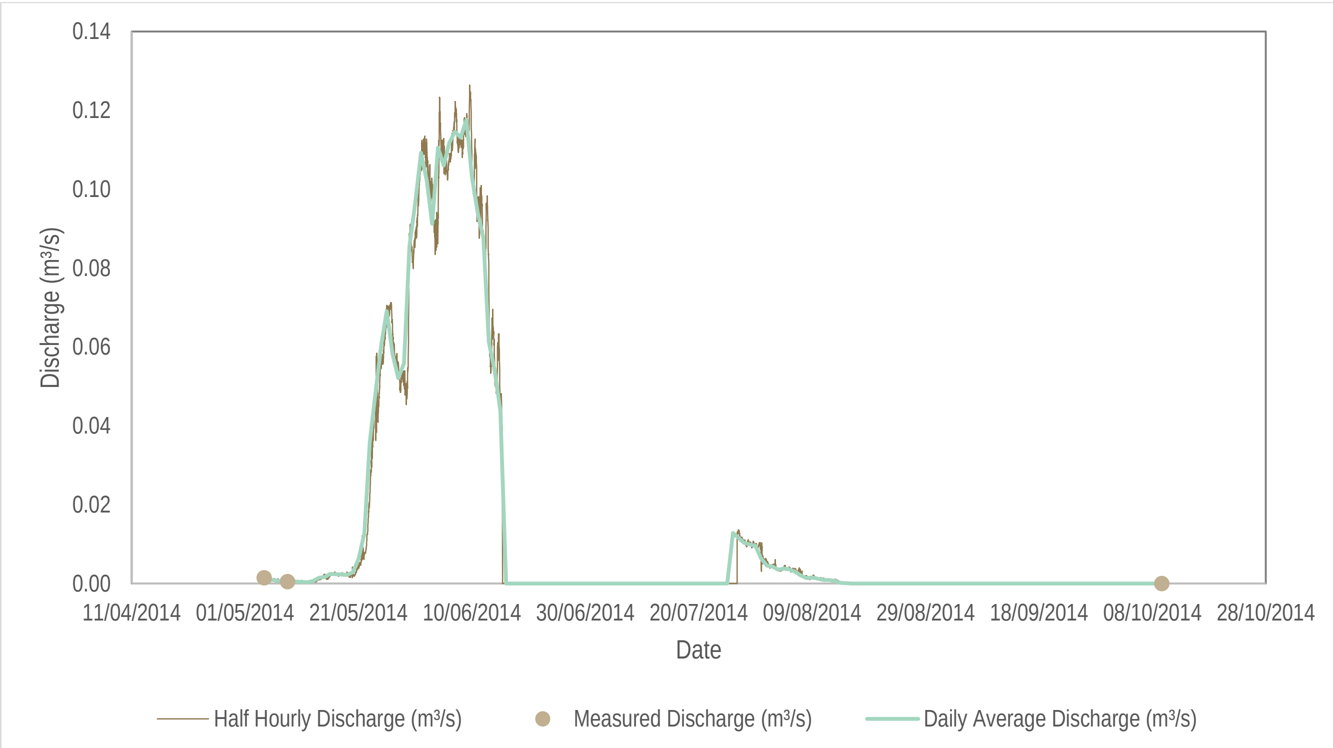


Table 3: AC-6A 2014 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sept	Oct
1		0.1092	No Record	0.0046	0.0000	0.0000
2		0.1023	No Record	0.0044	0.0000	0.0000
3		0.0912	No Record	0.0035	0.0000	0.0000
4	0.0010	0.1105	No Record	0.0039	0.0000	0.0000
5	0.0008	0.1060	No Record	0.0036	0.0000	0.0000
6	0.0009	0.1116	No Record	0.0031	0.0000	0.0000
7	0.0007	0.1146	No Record	0.0020	0.0000	0.0000
8	0.0005	0.1131	No Record	0.0014	0.0000	0.0000
9	0.0004	0.1176	No Record	0.0015	0.0000	0.0000
10	0.0005	0.1032	No Record	0.0012	0.0000	
11	0.0004	0.0942	No Record	0.0009	0.0000	
12	0.0004	0.0877	No Record	0.0009	0.0000	
13	0.0007	0.0613	No Record	0.0007	0.0000	
14	0.0015	0.0542	No Record	0.0001	0.0000	
15	0.0016	0.0440	No Record	0.0001	0.0000	
16	0.0025	No Record	No Record	0.0000	0.0000	
17	0.0024	No Record	No Record	0.0000	0.0000	
18	0.0023	No Record	No Record	0.0000	0.0000	
19	0.0022	No Record	No Record	0.0000	0.0000	
20	0.0029	No Record	No Record	0.0000	0.0000	
21	0.0063	No Record	No Record	0.0000	0.0000	
22	0.0127	No Record	No Record	0.0000	0.0000	
23	0.0359	No Record	No Record	0.0000	0.0000	
24	0.0485	No Record	No Record	0.0000	0.0000	
25	0.0606	No Record	No Record	0.0000	0.0000	
26	0.0691	No Record	0.0129	0.0000	0.0000	
27	0.0583	No Record	0.0116	0.0000	0.0000	
28	0.0521	No Record	0.0103	0.0000	0.0000	
29	0.0558	No Record	0.0099	0.0000	0.0000	
30	0.0856	No Record	0.0096	0.0000	0.0000	
31	0.0965		0.0064	0.0000		
Average	0.0215	0.0947	0.0101	0.0010	0.0000	0.0000

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 2014. A member of the public found and removed the data logger at this station on approximately July 16 and re-installed on July 20, 2014. The re-installation of the data logger was at a placement slightly downstream of the sensor housing and in a portion of the channel with seemingly different hydraulic characteristics. The data for this station was corrected from the time of removal until the end of 2014 from the data record at AC-8. Additionally, winter data at this station appears to be impacted by snow encroachment on the channel and pre-freshet data are corrected using the data record at AC-8 as well. Discharge and stage measurements are presented in Table 4. Figure 4 presents the stage-discharge data graphically. Figure 5 and Table 5 present the 2014 hydrograph graphically and daily average discharge data, respectively.

Photo 3: AC-6B – May 8, 2014

Photo 4: AC-6B – October 10, 2014

Table 4: AC-6B Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m³/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

Figure 4: AC-6B Rating Curve

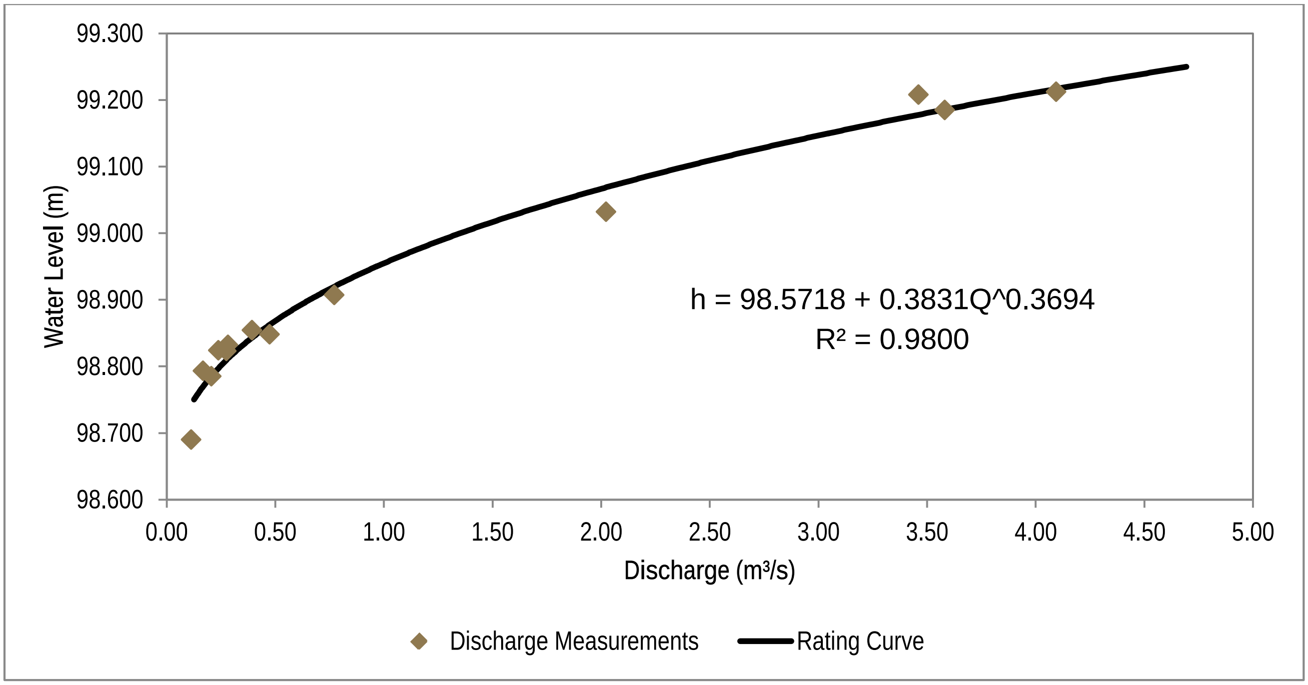


Figure 5: AC-6B 2014 Hydrograph

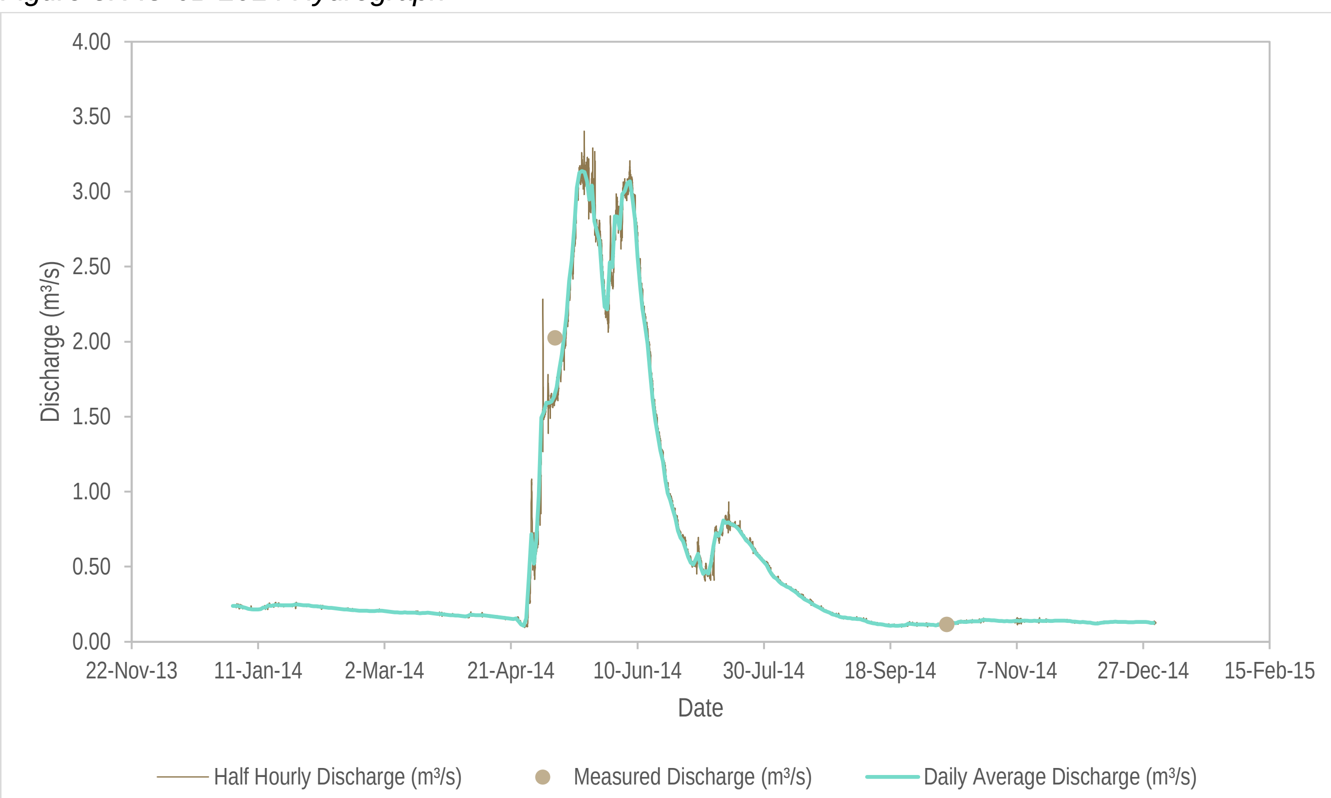


Table 5: AC-6B Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.238	0.239	0.206	0.172	0.694	2.837	0.526	0.477	0.158	0.114	0.139	0.130
2	0.238	0.237	0.204	0.171	0.970	2.834	0.514	0.449	0.156	0.113	0.136	0.129
3	0.237	0.236	0.202	0.169	1.494	2.753	0.546	0.431	0.153	0.113	0.137	0.131
4	0.234	0.233	0.200	0.172	1.531	2.983	0.587	0.420	0.152	0.113	0.137	0.129
5	0.230	0.231	0.198	0.180	1.594	3.004	0.499	0.401	0.151	0.111	0.135	0.128
6	0.224	0.229	0.196	0.178	1.592	3.058	0.452	0.386	0.150	0.109	0.137	0.127
7	0.220	0.228	0.195	0.177	1.600	3.069	0.470	0.378	0.145	0.113	0.140	0.123
8	0.217	0.226	0.193	0.176	1.634	2.951	0.454	0.365	0.139	0.115	0.138	0.122
9	0.215	0.224	0.194	0.177	1.696	2.810	0.520	0.359	0.131	0.115	0.141	0.122
10	0.214	0.223	0.196	0.175	1.811	2.561	0.638	0.346	0.127	0.113	0.140	0.125
11	0.214	0.221	0.194	0.173	1.912	2.366	0.724	0.337	0.123	0.115	0.139	0.127
12	0.217	0.219	0.193	0.171	2.032	2.220	0.706	0.324	0.121	0.123	0.139	0.129
13	0.227	0.216	0.194	0.169	2.183	2.108	0.740	0.310	0.117	0.124	0.138	0.130
14	0.228	0.215	0.193	0.168	2.404	1.986	0.809	0.298	0.115	0.124	0.140	0.131
15	0.241	0.214	0.192	0.166	2.539	1.795	0.791	0.283	0.114	0.131	0.139	0.132
16	0.238	0.212	0.190	0.163	2.757	1.612	0.796	0.274	0.111	0.133	0.139	0.133
17	0.243	0.210	0.190	0.162	3.026	1.479	0.782	0.265	0.107	0.132	0.138	0.132
18	0.244	0.210	0.192	0.159	3.126	1.375	0.779	0.252	0.106	0.132	0.138	0.131
19	0.245	0.208	0.192	0.156	3.137	1.277	0.765	0.243	0.107	0.133	0.139	0.131
20	0.243	0.207	0.191	0.155	3.131	1.204	0.749	0.234	0.107	0.135	0.138	0.131
21	0.243	0.206	0.190	0.152	3.068	1.073	0.723	0.224	0.107	0.135	0.138	0.130
22	0.242	0.205	0.187	0.152	2.947	0.989	0.698	0.214	0.108	0.136	0.140	0.130
23	0.242	0.205	0.185	0.154	3.042	0.943	0.677	0.207	0.108	0.136	0.139	0.130
24	0.242	0.205	0.184	0.136	2.802	0.880	0.662	0.199	0.110	0.142	0.140	0.130
25	0.245	0.204	0.183	0.113	2.733	0.823	0.640	0.193	0.119	0.146	0.140	0.131
26	0.249	0.204	0.180	0.106	2.670	0.740	0.611	0.183	0.118	0.145	0.139	0.132
27	0.247	0.206	0.179	0.155	2.429	0.692	0.585	0.178	0.116	0.144	0.138	0.131
28	0.245	0.206	0.177	0.425	2.233	0.669	0.568	0.174	0.115	0.142	0.137	0.130
29	0.243		0.175	0.717	2.214	0.617	0.549	0.166	0.113	0.142	0.134	0.128
30	0.242		0.175	0.520	2.528	0.565	0.530	0.160	0.114	0.140	0.133	0.126
31	0.241		0.173		2.496		0.511	0.161		0.139		0.126
Average	0.235	0.217	0.190	0.201	2.259	1.809	0.632	0.287	0.124	0.128	0.138	0.129

4.3 MICKEY LAKE OUTFLOW

The outflow from Mickey Lake was visited twice in 2014 in the spring (Photo 5) and the fall (Photo 6). Discharge and stage measurements recorded in 2014 are presented in Table 6 and the rating curve is shown in Figure 6. The 2014 hydrograph is presented in Figure 7 with daily average discharges presented in Table 7.

The gauging station is located immediately downstream of a beaver pond. In the few years this station has been monitored, questions as to the reliability of the station have been raised in context of the potential impact of beaver activity. To date, there is no indication that the dam is actively maintained and there does not seem to be much deviation from the existing rating curve. It is recommended that the location continue to be used until further evidence indicates that that action should be taken.

In the 2014 programs, Cameco had requested that reconnaissance into an alternate gauging location be undertaken. The purpose of the gauging station is to monitor discharge from the former Hab Mine. There is no suitable gauging station in the vicinity of the former Hab Mine; however, a short distance downstream of the site and downstream of a confluence to a larger drainage system the stream flows through a pinch point between bedrock outcrops. This location was visited twice in 2014 but deemed to be unsuitable for a permanent station without modifications to the channel or installation of a gauging structure. The stream path in the area meandered regularly and seemingly disappeared into the substrate at several locations; this type of flow pattern is evident in other locations in the area where peak flow magnitudes are low and not sufficient to maintain a clear and open channel.

Photo 5: Mickey Lake Outflow – May 8, 2014

Photo 6: Mickey Lake Outflow – October 10, 2014

Table 6: Mickey Lake Outflow Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Measured Discharge (m^3/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

Figure 6: Mickey Lake Outflow Rating Curve

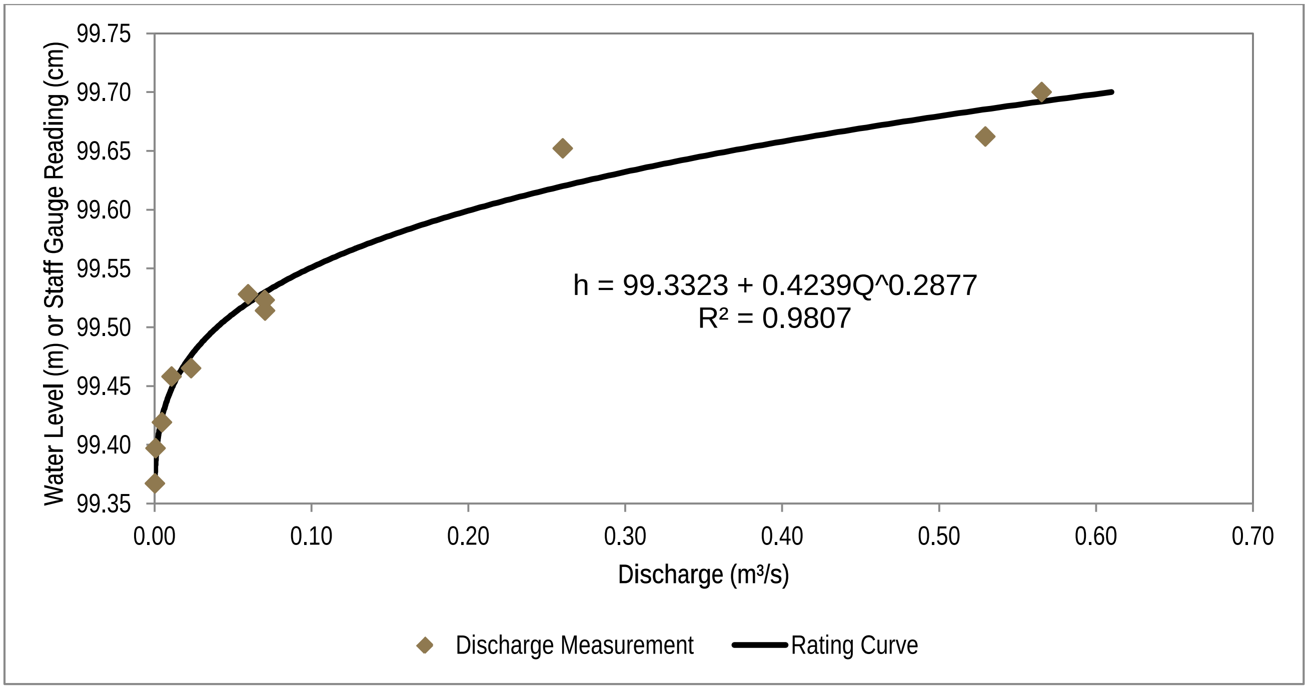


Figure 7: Mickey Lake Outflow 2014 Hydrograph

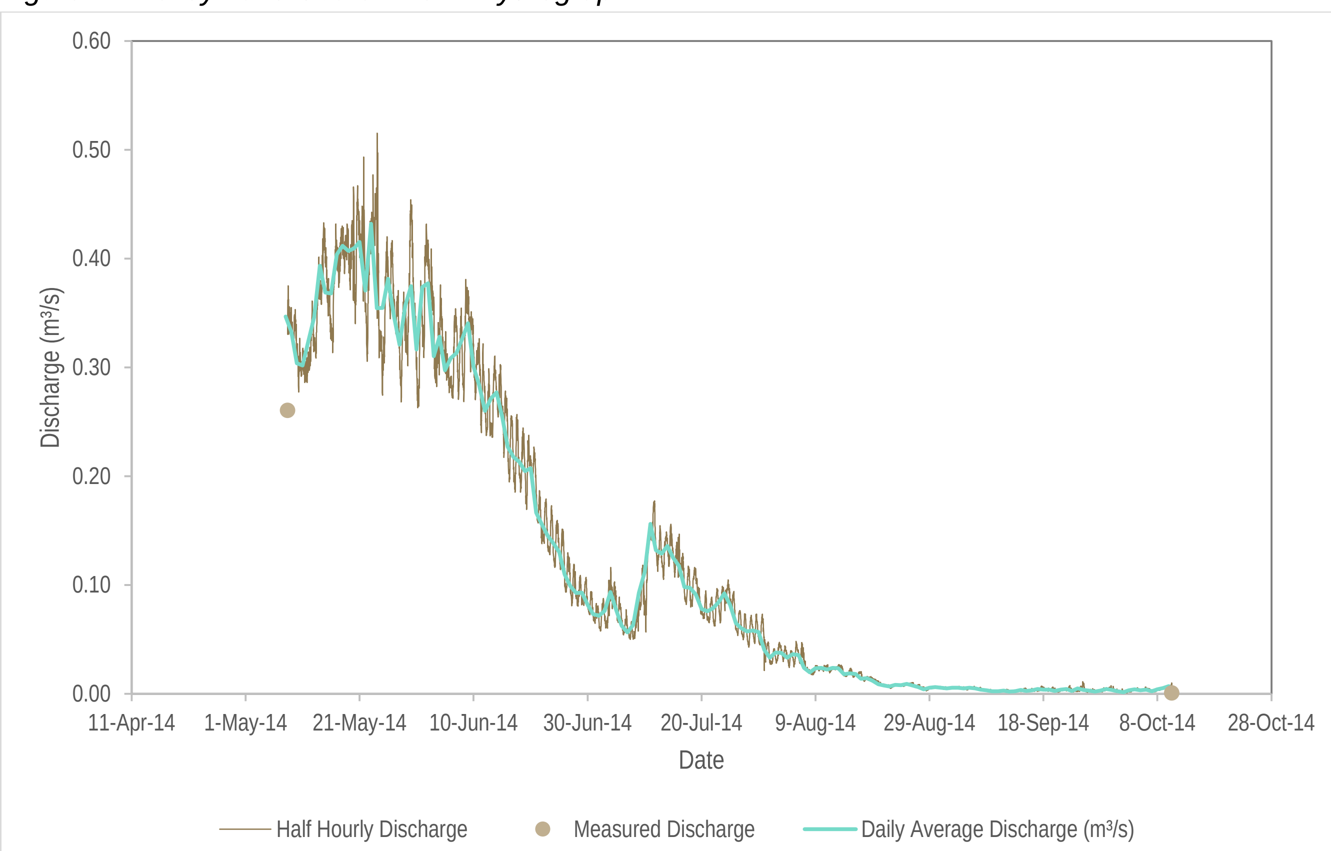


Table 7: Mickey Lake Outflow Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sept	Oct
1		0.3738	0.0733	0.0333	0.0051	0.0023
2		0.3773	0.0717	0.0379	0.0055	0.0015
3		0.3102	0.0762	0.0375	0.0056	0.0030
4		0.3282	0.0935	0.0331	0.0050	0.0040
5		0.2972	0.0769	0.0363	0.0054	0.0032
6		0.3085	0.0627	0.0354	0.0050	0.0038
7		0.3131	0.0565	0.0236	0.0039	0.0024
8	0.3468	0.3263	0.0632	0.0196	0.0030	0.0041
9	0.3325	0.3406	0.0928	0.0236	0.0022	0.0051
10	0.3038	0.3007	0.1116	0.0237	0.0022	0.0070
11	0.3016	0.2835	0.1562	0.0223	0.0029	
12	0.3239	0.2599	0.1321	0.0238	0.0019	
13	0.3458	0.2710	0.1288	0.0236	0.0024	
14	0.3935	0.2769	0.1359	0.0179	0.0036	
15	0.3688	0.2544	0.1248	0.0186	0.0027	
16	0.3678	0.2269	0.1177	0.0182	0.0031	
17	0.4036	0.2177	0.0981	0.0138	0.0044	
18	0.4117	0.2132	0.0974	0.0144	0.0039	
19	0.4069	0.2046	0.0911	0.0120	0.0038	
20	0.4094	0.2073	0.0778	0.0088	0.0025	
21	0.4151	0.1665	0.0759	0.0077	0.0037	
22	0.3705	0.1556	0.0784	0.0066	0.0042	
23	0.4321	0.1451	0.0839	0.0081	0.0026	
24	0.3544	0.1383	0.0924	0.0079	0.0050	
25	0.3547	0.1304	0.0818	0.0090	0.0036	
26	0.3815	0.1098	0.0650	0.0075	0.0028	
27	0.3480	0.0989	0.0601	0.0061	0.0021	
28	0.3207	0.0926	0.0572	0.0041	0.0030	
29	0.3571	0.0930	0.0581	0.0056	0.0045	
30	0.3746	0.0817	0.0568	0.0061	0.0034	
31	0.3164		0.0401	0.0055		
Average	0.3642	0.2301	0.0867	0.0178	0.0036	0.0036

4.4 AC-8 – ACE LAKE OUTFLOW

Monitoring at AC-8, the outflow from Ace Lake, has been ongoing since the closure of the Site in the early 1980s. The station was visited on May 8, 2014 (Photo 7) and October 10, 2014 (Photo 8). The current rating curve has been in ongoing development since 2005 (Table 8 and Figure 8). Cameco desires to have the concrete piers located upstream of the weir removed from the channel and the datalogger housing and staff gauge relocated to an alternate location. Relocation of the datalogger housing and staff gauge had been planned for 2014 but local contractors were not available for the work during the field programs; this work will be re-assessed for 2015. Water levels at AC-8 are read from a staff gauge which has been surveyed to a local arbitrary benchmark.

Discharge at AC-8 peaked at approximately 3.00 m^3/s on June 7, 2014 as shown in Figure 9. Daily average discharge data are presented in Table 9. Monthly average discharge data for AC-8 are presented in Table 10.

Photo 7: AC-8 – May 8, 2014

Photo 8: AC-8 – October 10, 2014

Table 8: AC-8 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m³/s)
16-Aug-05	99.451	0.4151
24-Jan-06	99.446	0.4044
24-May-06	99.848	1.6914
30-Apr-10	99.593	0.7530
1-Jul-10	99.407	0.2857
11-Sep-10 10:15	99.335	0.1438
16-May-11 15:30	99.442	0.3026
22-May-11 08:11	99.481	0.4443
28-Aug-11	99.407	0.2611
3-Oct-11	99.428	0.3006
08-May-12 15:09	100.003	2.9464
10-May-12 09:06	100.066	3.8907
29-Sep-12 11:20	99.541	0.5555
15-May-13 14:58	99.886	1.9917
12-Oct-13 12:45	99.374	0.2129
08-May-14 11:53	99.853	1.6840
10-Oct-14 11:10	99.320	0.1172

Figure 8: AC-8 Rating Curve

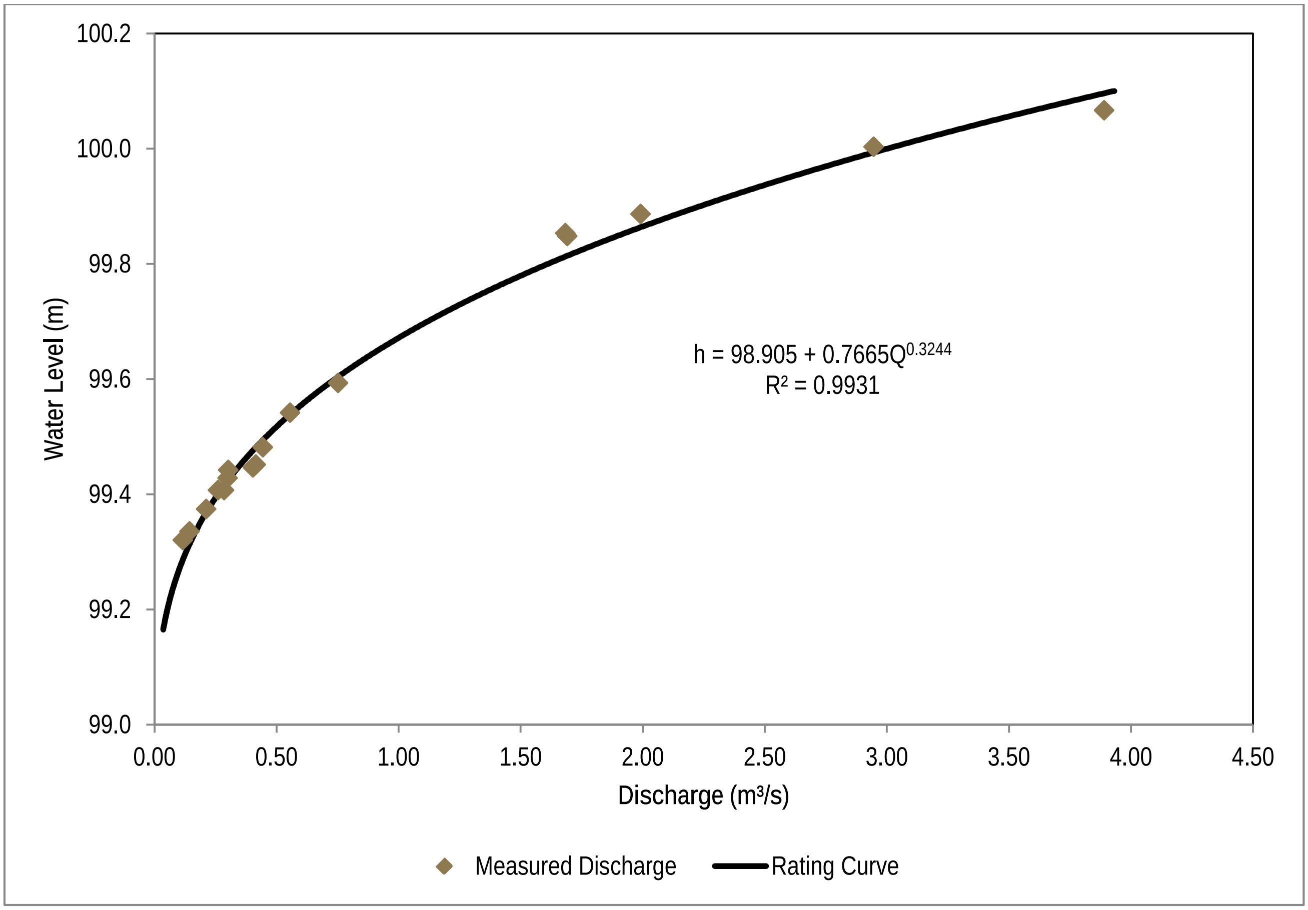


Figure 9: AC-8 2014 Hydrograph

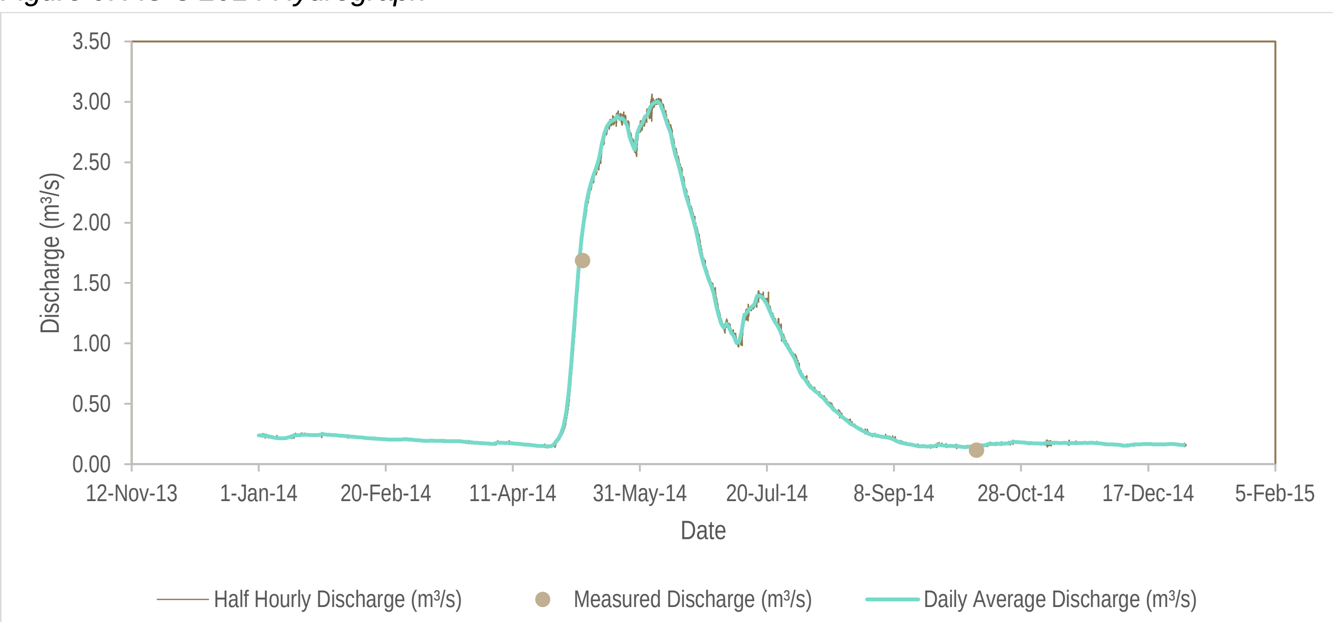


Table 9: AC-8 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.238	0.239	0.206	0.172	0.321	2.825	1.235	0.808	0.237	0.151	0.176	0.165
2	0.238	0.237	0.204	0.171	0.433	2.878	1.164	0.758	0.234	0.149	0.173	0.164
3	0.237	0.236	0.202	0.169	0.605	2.893	1.132	0.725	0.229	0.148	0.174	0.166
4	0.234	0.233	0.200	0.172	0.847	2.954	1.165	0.704	0.226	0.147	0.173	0.163
5	0.230	0.231	0.198	0.180	1.120	2.983	1.137	0.670	0.224	0.144	0.171	0.162
6	0.224	0.229	0.196	0.178	1.404	2.997	1.085	0.642	0.221	0.141	0.174	0.161
7	0.220	0.228	0.195	0.177	1.666	3.002	1.059	0.626	0.213	0.146	0.178	0.156
8	0.217	0.226	0.193	0.176	1.876	2.981	1.004	0.603	0.204	0.147	0.175	0.154
9	0.215	0.224	0.194	0.177	2.034	2.925	1.015	0.591	0.191	0.146	0.178	0.154
10	0.214	0.223	0.196	0.175	2.168	2.862	1.100	0.567	0.184	0.144	0.178	0.159
11	0.214	0.221	0.194	0.173	2.265	2.799	1.227	0.550	0.178	0.146	0.177	0.161
12	0.217	0.219	0.193	0.171	2.343	2.745	1.256	0.527	0.173	0.156	0.176	0.164
13	0.227	0.216	0.194	0.169	2.406	2.648	1.284	0.502	0.168	0.157	0.175	0.165
14	0.228	0.215	0.193	0.168	2.464	2.559	1.305	0.481	0.165	0.157	0.178	0.166
15	0.241	0.214	0.192	0.166	2.539	2.496	1.320	0.455	0.162	0.167	0.176	0.167
16	0.238	0.212	0.190	0.163	2.650	2.415	1.392	0.439	0.156	0.168	0.177	0.168
17	0.243	0.210	0.190	0.162	2.736	2.326	1.396	0.423	0.151	0.168	0.176	0.168
18	0.244	0.210	0.192	0.159	2.796	2.235	1.386	0.401	0.149	0.167	0.175	0.166
19	0.245	0.208	0.192	0.156	2.827	2.165	1.357	0.385	0.150	0.169	0.177	0.166
20	0.243	0.207	0.191	0.155	2.844	2.096	1.324	0.370	0.148	0.171	0.175	0.166
21	0.243	0.206	0.190	0.152	2.852	2.019	1.273	0.353	0.148	0.171	0.175	0.165
22	0.242	0.205	0.187	0.152	2.882	1.941	1.226	0.335	0.148	0.173	0.177	0.164
23	0.242	0.205	0.185	0.152	2.858	1.843	1.183	0.323	0.148	0.172	0.177	0.165
24	0.242	0.205	0.184	0.149	2.863	1.739	1.153	0.309	0.150	0.181	0.177	0.165
25	0.245	0.204	0.183	0.150	2.840	1.660	1.111	0.298	0.162	0.185	0.178	0.167
26	0.249	0.204	0.180	0.150	2.798	1.593	1.058	0.283	0.159	0.184	0.176	0.167
27	0.247	0.206	0.179	0.158	2.712	1.530	1.009	0.273	0.156	0.182	0.174	0.166
28	0.245	0.206	0.177	0.188	2.650	1.477	0.976	0.267	0.154	0.179	0.173	0.165
29	0.243		0.175	0.215	2.602	1.415	0.941	0.253	0.151	0.180	0.170	0.163
30	0.242		0.175	0.256	2.739	1.319	0.905	0.243	0.151	0.177	0.168	0.159
31	0.241		0.173		2.795		0.868	0.243		0.176		0.159
Average	0.235	0.217	0.190	0.170	2.224	2.344	1.163	0.465	0.176	0.163	0.175	0.163

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
Mean	0.250	0.211	0.189	0.215	1.214	1.000	0.577	0.468	0.457	0.433	0.414	0.325	0.479

4.5 AC-14 – ACE CREEK UPSTREAM OF BEAVERLODGE LAKE

Ace Creek is measured approximately 2 km downstream of Ace Lake (AC-8) at the station known as AC-14. This location is approximately 0.25 km upstream of Beaverlodge Lake. The photos presented below are from the spring (Photo 9) and fall (Photo 10) of 2014 from very nearly the same location and facing the same direction. The stage-discharge relationship for AC-14 (Table 11 and Figure 10) is still under development in comparison to AC-8. Additionally, the cross-section associated with AC-14 can be turbulent with erratic data spikes as compared to AC-8 (Figure 11). Data for AC-14 are only reported based on the logger installation period due the preliminary curve and erratic logger data as well as the close proximity to AC-8. Daily average discharge data for AC-14 are presented in Table 12.

Photo 9: AC-14 – May 8, 2014

Photo 10: AC-14 – October 10, 2014

Table 11: AC-14 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m³/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

Figure 10: AC-14 Rating Curve

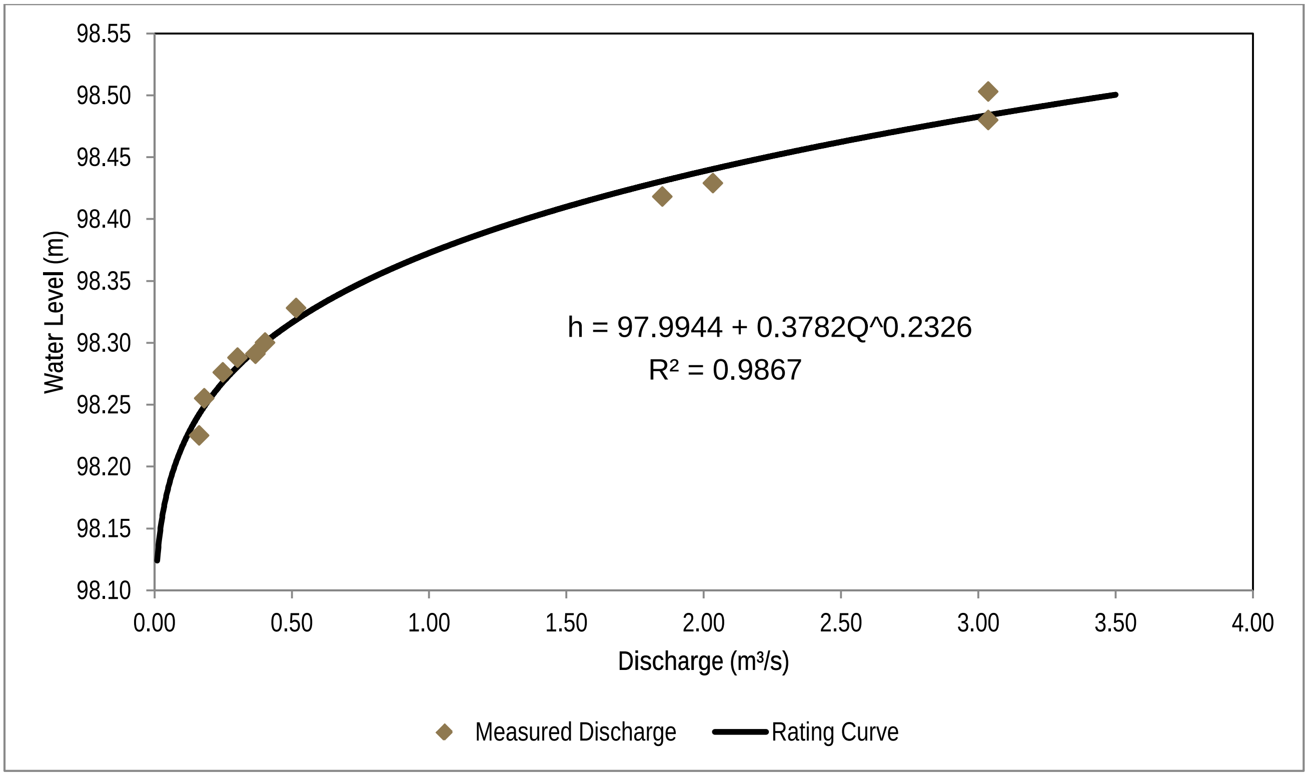


Figure 11: AC-14 2014 Hydrograph

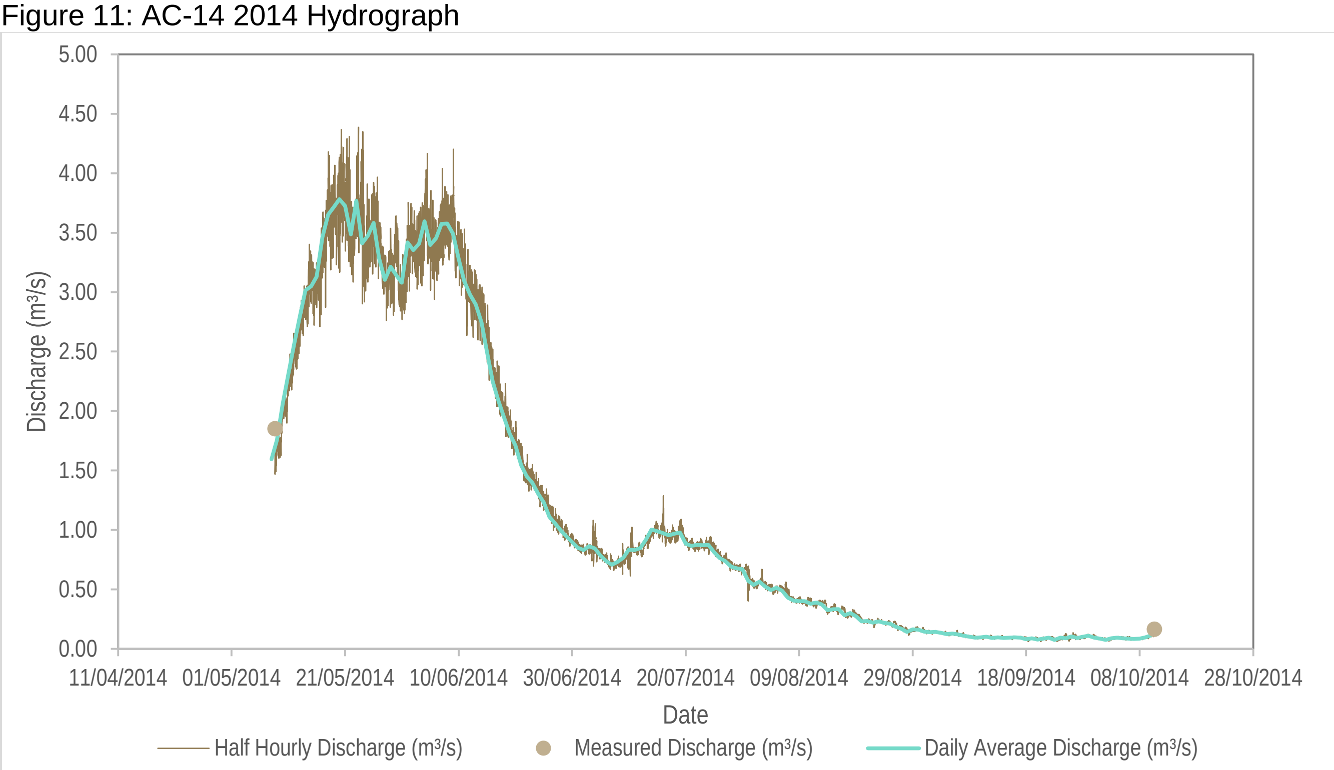


Table 12: AC-14 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sept	Oct
1		3.4176	0.8512	0.5387	0.1392	0.0868
2		3.3540	0.8324	0.5649	0.1421	0.0758
3		3.4068	0.8646	0.5256	0.1348	0.0890
4		3.5960	0.8451	0.4961	0.1246	0.0950
5		3.3957	0.7819	0.5130	0.1282	0.0893
6		3.4524	0.7359	0.4899	0.1209	0.0851
7		3.5750	0.7069	0.4310	0.1093	0.0838
8	1.5947	3.5777	0.7313	0.4053	0.1035	0.0868
9	1.7557	3.4899	0.7654	0.4007	0.0939	0.0975
10	2.0591	3.2762	0.8333	0.4019	0.0969	0.1119
11	2.3168	3.0927	0.8320	0.3799	0.1024	
12	2.5526	2.9791	0.8473	0.3893	0.0922	
13	2.7895	2.8963	0.9205	0.3749	0.0968	
14	3.0153	2.7461	1.0032	0.3251	0.0923	
15	3.0493	2.4976	0.9909	0.3341	0.0939	
16	3.1302	2.2477	0.9740	0.3340	0.0978	
17	3.4621	2.0832	0.9540	0.2829	0.0945	
18	3.6524	1.9501	0.9675	0.3012	0.0811	
19	3.7180	1.8107	0.9788	0.2732	0.0901	
20	3.7825	1.7104	0.8838	0.2310	0.0794	
21	3.7243	1.5434	0.8673	0.2353	0.0866	
22	3.4855	1.4518	0.8754	0.2213	0.0951	
23	3.7668	1.3970	0.8715	0.2311	0.0757	
24	3.4115	1.3057	0.8754	0.2190	0.0946	
25	3.4761	1.2300	0.8157	0.2113	0.0894	
26	3.5812	1.1099	0.7649	0.1862	0.1041	
27	3.2854	1.0535	0.7377	0.1685	0.0904	
28	3.1038	0.9957	0.6923	0.1433	0.1011	
29	3.2133	0.9479	0.6788	0.1645	0.1110	
30	3.1427	0.8970	0.6710	0.1611	0.0931	
31	3.0802		0.5721	0.1454		
Average	3.0895	2.3496	0.8297	0.3251	0.1018	0.0901

4.6 TL-6 – MINEWATER RESERVOIR

A blasted channel at the outlet of the area known as Minewater Reservoir directs runoff towards the Fulton Creek drainage. A v-notch installed in the blasted channel is known as TL-6. Photos from the spring and fall programs are shown as Photo 11 and Photo 12, respectively. Stage and discharge measurement data are presented as Table 13 while the rating curve is graphically presented in Figure

12. The 2014 hydrograph is presented as Figure 13 and the daily average discharges are provided in Table 14.

Photo 11: TL-6 – May 4, 2014

Photo 12: TL-6 – October 9, 2014

Table 13: TL-6 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	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 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

Figure 12: TL-6 Rating Curve

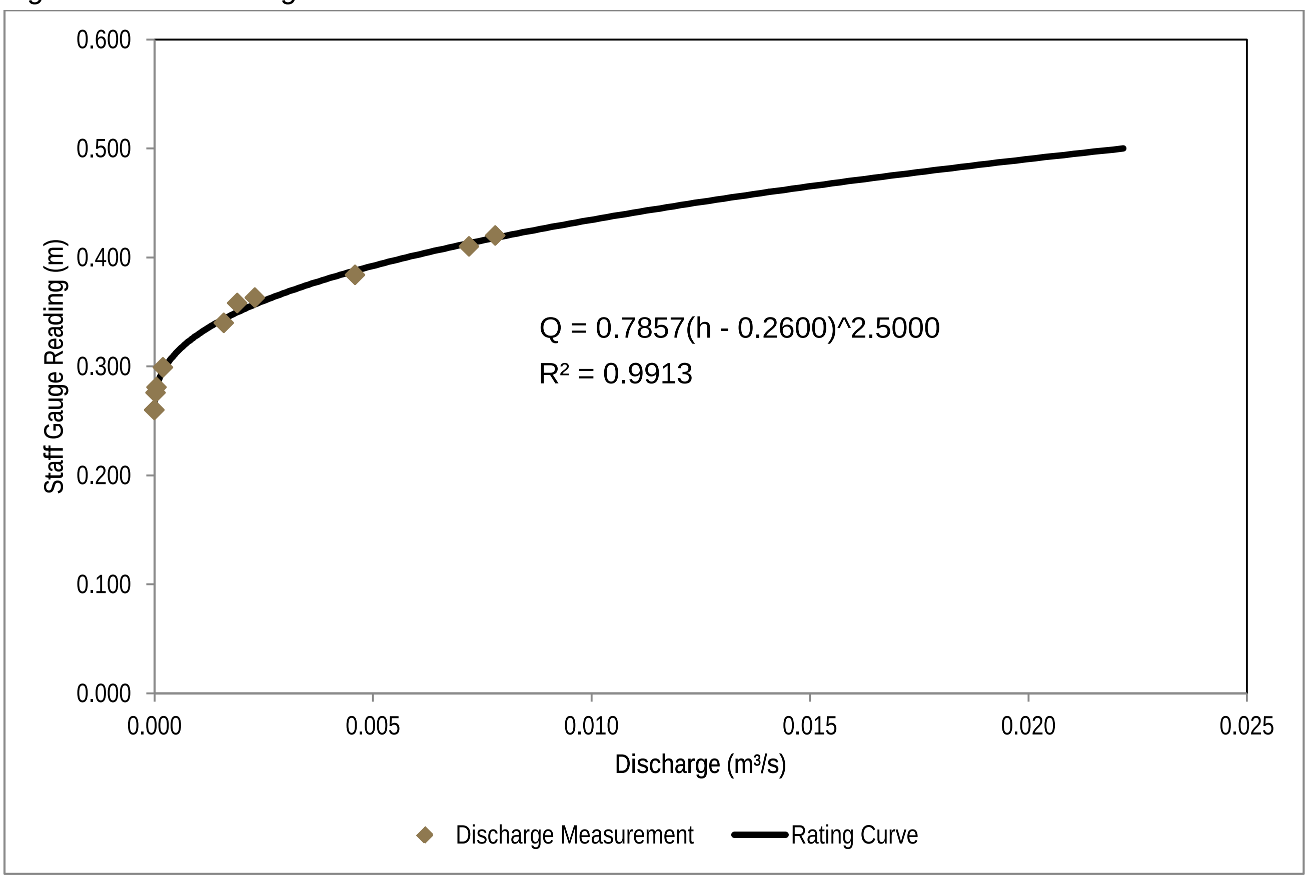


Figure 13: TL-6 2014 Hydrograph

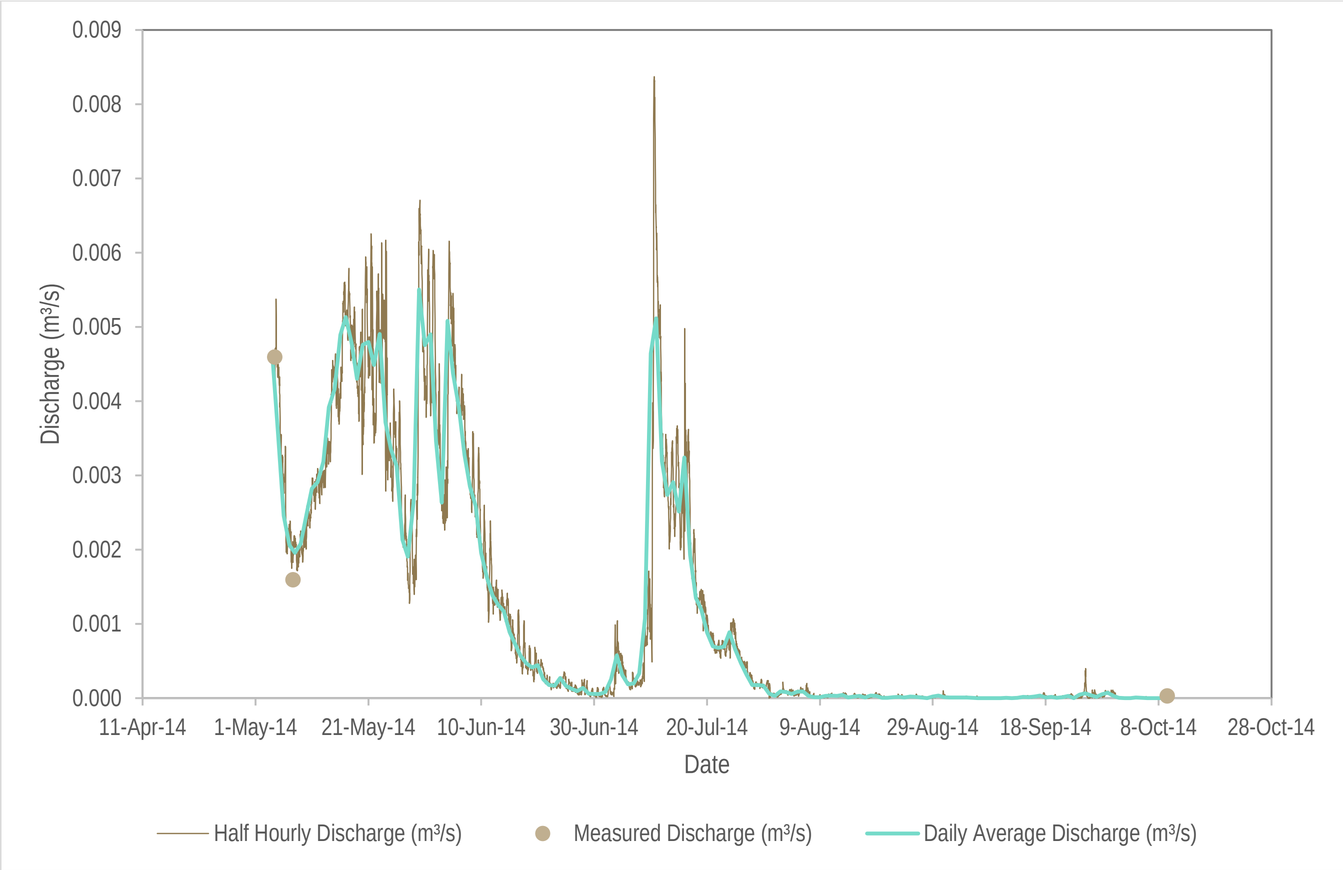


Table 14: TL-6 Daily Average Discharge (m^3/s)

Day	May	Jun	Jul	Aug	Sept	Oct
1		0.00490	0.00006	0.00003	0.00001	0.00000
2		0.00346	0.00008	0.00009	0.00001	0.00000
3		0.00263	0.00026	0.00008	0.00001	0.00000
4	0.00459	0.00508	0.00058	0.00006	0.00001	0.00001
5	0.00358	0.00437	0.00031	0.00009	0.00001	0.00001
6	0.00246	0.00393	0.00019	0.00009	0.00000	0.00000
7	0.00206	0.00328	0.00020	0.00003	0.00000	0.00000
8	0.00196	0.00285	0.00033	0.00001	0.00000	0.00000
9	0.00208	0.00259	0.00107	0.00002	0.00000	0.00000
10	0.00247	0.00196	0.00464	0.00003	0.00000	
11	0.00282	0.00163	0.00512	0.00003	0.00001	
12	0.00291	0.00138	0.00319	0.00003	0.00000	
13	0.00318	0.00126	0.00274	0.00004	0.00000	
14	0.00392	0.00117	0.00291	0.00001	0.00002	
15	0.00416	0.00089	0.00251	0.00002	0.00002	
16	0.00489	0.00073	0.00324	0.00003	0.00002	
17	0.00513	0.00056	0.00193	0.00001	0.00004	
18	0.00479	0.00047	0.00135	0.00004	0.00001	
19	0.00430	0.00041	0.00120	0.00003	0.00002	
20	0.00476	0.00044	0.00088	0.00001	0.00000	
21	0.00480	0.00025	0.00070	0.00001	0.00001	
22	0.00449	0.00018	0.00068	0.00001	0.00003	
23	0.00491	0.00017	0.00069	0.00002	0.00000	
24	0.00371	0.00027	0.00089	0.00001	0.00005	
25	0.00335	0.00017	0.00066	0.00002	0.00007	
26	0.00312	0.00012	0.00047	0.00002	0.00004	
27	0.00213	0.00009	0.00032	0.00001	0.00002	
28	0.00191	0.00014	0.00018	0.00000	0.00005	
29	0.00264	0.00006	0.00018	0.00002	0.00007	
30	0.00550	0.00006	0.00017	0.00003	0.00003	
31	0.00475		0.00006	0.00001		
Average	0.00362	0.00152	0.00122	0.00003	0.00002	0.00000

4.7 TL-7 – TAILINGS CREEK AT MEADOW DAM

The headwaters of TL-7 include Fulton Lake as a part of the Fulton drainage but also receive water from Fookes Lake which is in contact with a covered tailings facility. TL-7 receives discharge from TL-6 and is also a long standing station having operated since Site closure. TL-7 frequently glaciates through the winter as water free falls over the v-notch, super cools and immediately freezes to any surface it contacts; this process impounds a large volume of ice behind the v-notch structure (Photo 13) which develops as a part of the process of super cooling water (resident water behind the dam). The ice impoundment can take several weeks to thaw and installation of the datalogger does not always occur during the spring field program. In 2014, the datalogger was not installed until July 5, 2014.

An addition to the monitoring at TL-7 in 2014 included the use of a time lapse camera installed downstream of the weir facing upstream. The camera was programmed to collect a photograph every four hours. The camera log was used to develop the flow record at TL-7 from the first day of "ice free flow" up until the installation of the datalogger in July. A staff gauge was also installed on the downstream side of TL-7 to provide a visual reference of water level (Photo 14).

The stage and discharge measurements collected at TL-7 are presented in Table 15. The rating curve is still in development as the weir is typically impacted by glaciation during high flow periods. Literature reference (Smith, 1995) indicates that the relationship between stage and discharge for a 90° v-notch weir is:

$$Q = 1.37 * h^{2.5}$$

Further assessment for the 2013 reporting (McElhanney, 2014) indicated a relationship between AC-8 and TL-7 as follows:

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

The hydrograph for TL-7 in the 2014 monitoring period is presented as Figure 14. Data not collected at TL-7 has been calculated from AC-8 as discussed above. Table 16 and Table 17 present the daily and monthly average data, respectively. As discussed above, the development of the hydrograph for TL-7 is combination of three different approaches: 1) the direct record of water levels from the Levelogger (July to October, 2014); 2) an estimated water level from the camera record (May to July, 2014); and, 3) correlation to AC-8 data. This combination is necessary due to the various challenges associated with monitoring at this location.

Photo 13: TL-7 – May 4, 2014

Photo 14: TL-7 – October 9, 2014

Table 15: TL-7 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
21-May-11	0.005	0.0012
3-Oct-11	0.003	0.0002
5/7/2012 16:30	0.096	Not Measured
5/9/2012 19:30	0.090	Not Measured
9/27/2012 17:30	0.115	0.0082
5/12/2013 9:15	Not Available	0.0815
5/16/2013 11:50	Not Available	0.1328
10/13/2013 14:54	0.142	0.0109
10/9/2014 15:15	0.139	0.0112
10/10/2014 8:40	0.140	0.0094

Figure 14: TL-7 2014 Hydrograph

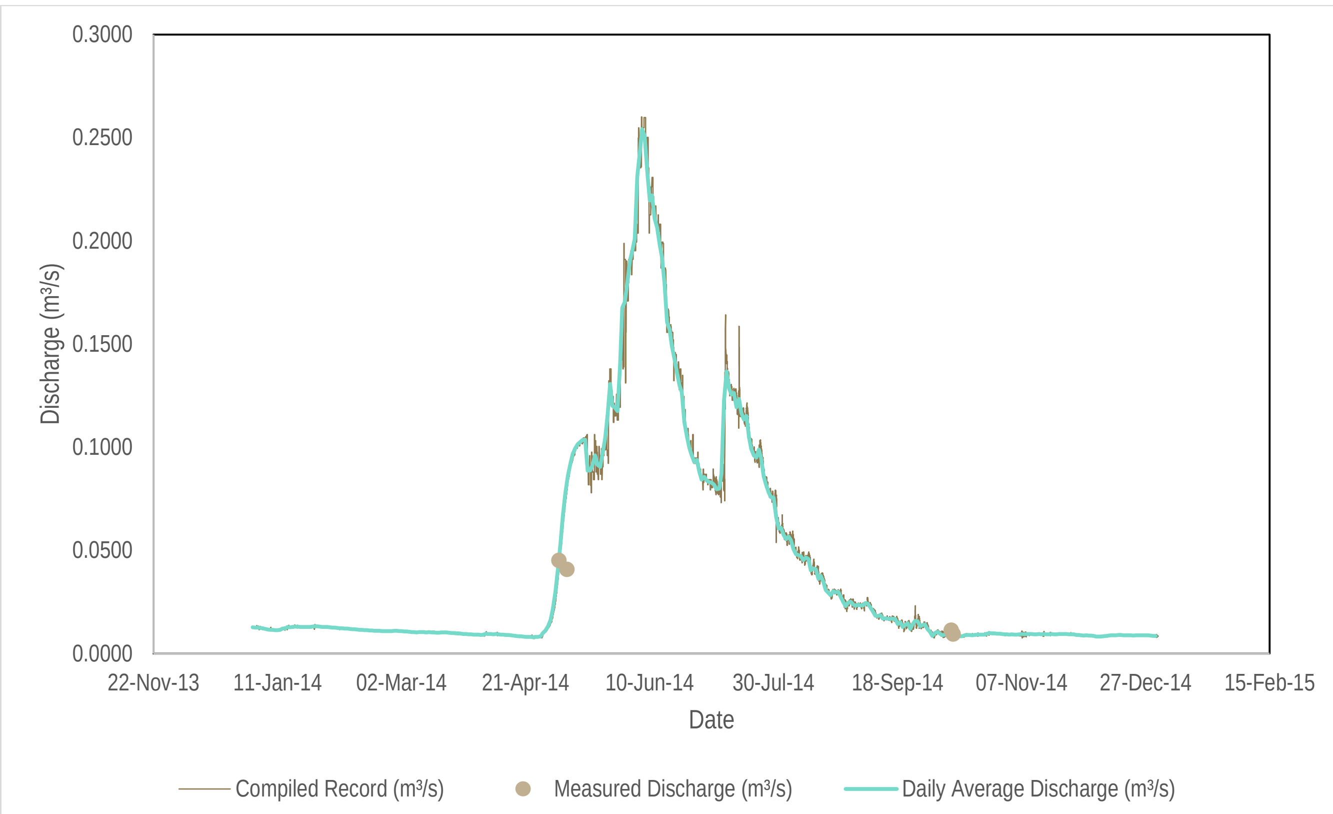


Table 16: TL-7 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.013	0.013	0.011	0.009	0.016	0.180	0.084	0.060	0.023	0.010	0.009	0.009
2	0.013	0.013	0.011	0.009	0.022	0.190	0.086	0.061	0.024	0.009	0.009	0.009
3	0.013	0.012	0.011	0.009	0.030	0.195	0.084	0.057	0.023	0.010	0.009	0.009
4	0.012	0.012	0.011	0.009	0.041	0.201	0.083	0.055	0.023	0.010	0.009	0.009
5	0.012	0.012	0.010	0.010	0.054	0.231	0.083	0.057	0.024	0.010	0.009	0.009
6	0.012	0.012	0.010	0.009	0.066	0.243	0.082	0.055	0.024	0.009	0.009	0.009
7	0.012	0.012	0.010	0.009	0.078	0.254	0.080	0.051	0.022	0.009	0.009	0.008
8	0.012	0.012	0.010	0.009	0.086	0.251	0.080	0.048	0.021	0.010	0.009	0.008
9	0.011	0.012	0.010	0.009	0.092	0.234	0.087	0.048	0.018	0.009	0.009	0.008
10	0.011	0.012	0.010	0.009	0.097	0.220	0.123	0.047	0.018	0.008	0.009	0.008
11	0.011	0.012	0.010	0.009	0.100	0.222	0.137	0.045	0.019	0.008	0.009	0.009
12	0.011	0.012	0.010	0.009	0.101	0.211	0.128	0.047	0.017	0.008	0.009	0.009
13	0.012	0.011	0.010	0.009	0.103	0.206	0.125	0.046	0.017	0.008	0.009	0.009
14	0.012	0.011	0.010	0.009	0.103	0.198	0.126	0.040	0.017	0.008	0.009	0.009
15	0.013	0.011	0.010	0.009	0.104	0.192	0.119	0.041	0.017	0.009	0.009	0.009
16	0.013	0.011	0.010	0.009	0.089	0.180	0.123	0.041	0.017	0.009	0.009	0.009
17	0.013	0.011	0.010	0.009	0.089	0.161	0.117	0.036	0.017	0.009	0.009	0.009
18	0.013	0.011	0.010	0.008	0.091	0.157	0.113	0.038	0.014	0.009	0.009	0.009
19	0.013	0.011	0.010	0.008	0.096	0.149	0.115	0.035	0.015	0.009	0.009	0.009
20	0.013	0.011	0.010	0.008	0.091	0.143	0.105	0.031	0.013	0.009	0.009	0.009
21	0.013	0.011	0.010	0.008	0.090	0.136	0.099	0.029	0.014	0.009	0.009	0.009
22	0.013	0.011	0.010	0.008	0.097	0.130	0.096	0.028	0.015	0.009	0.009	0.009
23	0.013	0.011	0.010	0.008	0.104	0.127	0.095	0.030	0.012	0.009	0.009	0.009
24	0.013	0.011	0.010	0.008	0.115	0.112	0.099	0.030	0.014	0.010	0.009	0.009
25	0.013	0.011	0.010	0.008	0.131	0.105	0.095	0.030	0.016	0.010	0.009	0.009
26	0.013	0.011	0.010	0.008	0.120	0.100	0.086	0.027	0.016	0.010	0.009	0.009
27	0.013	0.011	0.009	0.008	0.119	0.096	0.081	0.025	0.013	0.010	0.009	0.009
28	0.013	0.011	0.009	0.010	0.117	0.093	0.078	0.023	0.014	0.010	0.009	0.009
29	0.013		0.009	0.011	0.139	0.094	0.076	0.025	0.014	0.010	0.009	0.009
30	0.013		0.009	0.013	0.167	0.088	0.076	0.025	0.012	0.009	0.009	0.008
31	0.013		0.009		0.170		0.066	0.024		0.009		0.008
Average	0.012	0.012	0.010	0.009	0.094	0.170	0.098	0.040	0.017	0.009	0.009	0.009

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
Mean	0.0063	0.0051	0.0045	0.0055	0.0532	0.0385	0.0217	0.0171	0.0167	0.0159	0.0160	0.0090	0.0175

4.8 BL-5 – BEAVERLODGE LAKE OUTFLOW

The outflow from Beaverlodge Lake is monitored at the lake outlet at the station known as BL-5. Spring and fall program photos are presented as Photo 15 and Photo 16, respectively. This location as previously been known to be impacted by either beaver activity or debris jam which has created a backwater condition and affected the usability of the rating curve. Stage and discharge data are presented in Table 18. The rating curve for BL-5 is based on the last five collected measurement points as presented in Figure 15; it is believed that the previous measurements were influenced by a debris jam or other backwater flow condition and have been filtered from the curve. The channel seems to be encroached by snowpack during the winter and some data are correlated to the station from AC-8; all data after the fall field program are based on AC-8. The 2014 hydrograph is shown in Figure 16 and the daily average discharge data are presented as Table 19.

Photo 15: BL-5 – May 4, 2014

Photo 16: BL-5 – October 10, 2014

Table 18: BL-5 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/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

Figure 15: BL-5 Rating Curve

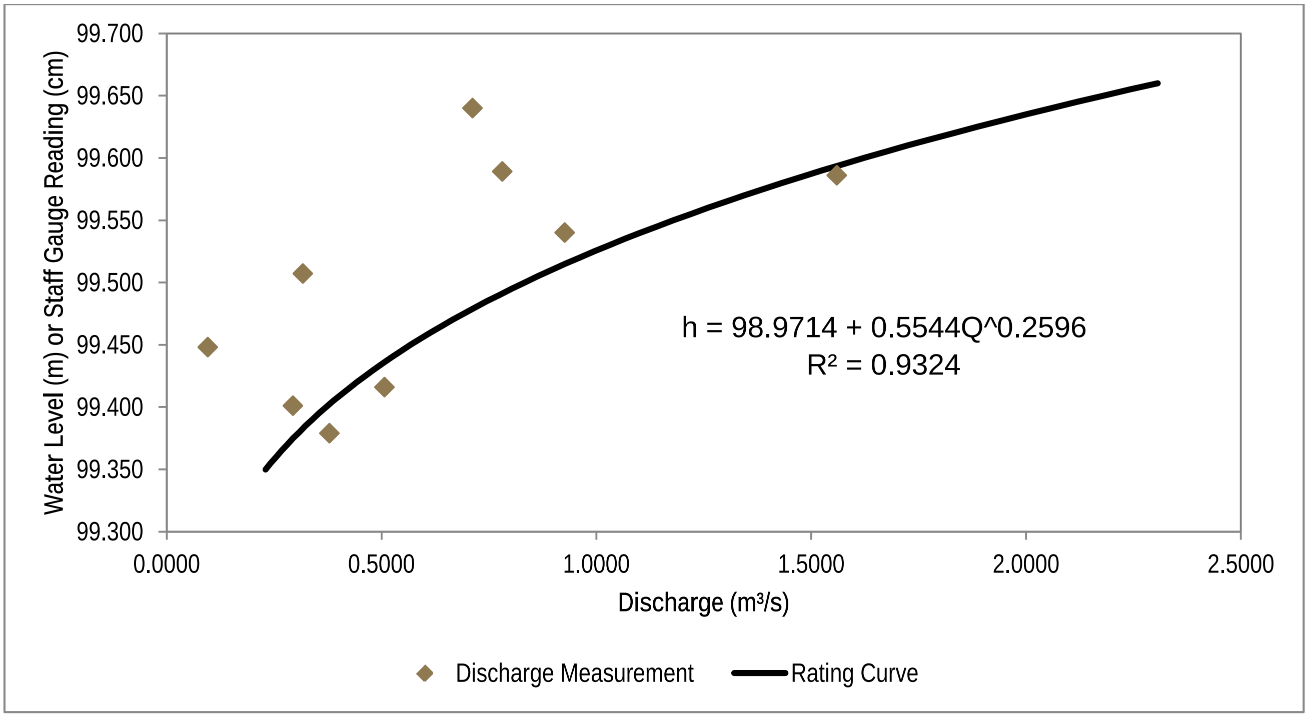


Figure 16: BL-5 2014 Hydrograph

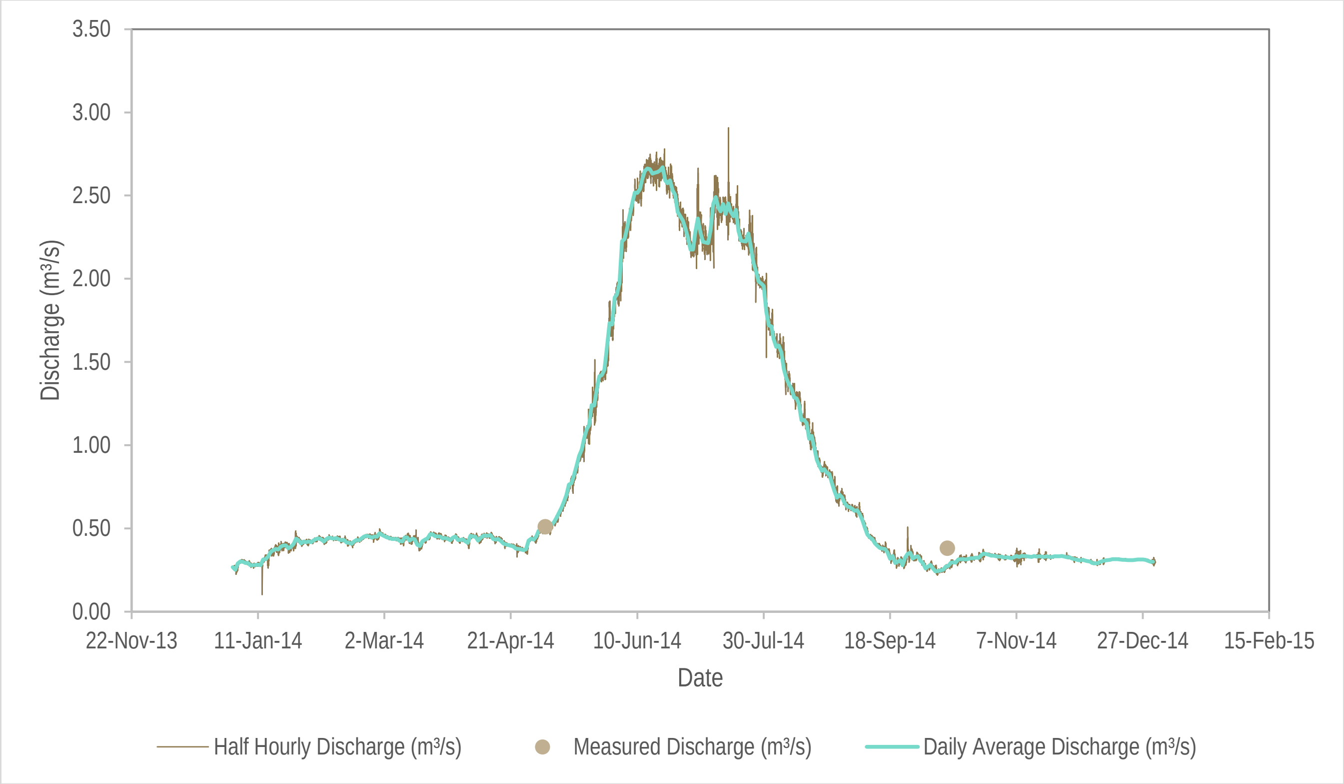


Table 19: BL-5 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.2670	0.4173	0.4614	0.4300	0.4514	1.8865	2.1764	1.7203	0.6319	0.2895	0.3297	0.3103
2	0.2509	0.4283	0.4535	0.4336	0.4840	1.9055	2.1752	1.7140	0.6262	0.2599	0.3246	0.3076
3	0.2902	0.4357	0.4447	0.4233	0.4898	1.9717	2.2785	1.6369	0.6193	0.2705	0.3255	0.3114
4	0.3018	0.4391	0.4423	0.4135	0.4910	2.2253	2.3617	1.5906	0.6054	0.2799	0.3250	0.3061
5	0.2999	0.4334	0.4368	0.4559	0.4928	2.2399	2.2787	1.5978	0.6100	0.2590	0.3210	0.3036
6	0.2908	0.4212	0.4367	0.4513	0.4882	2.3069	2.2219	1.5577	0.5850	0.2418	0.3262	0.3013
7	0.2924	0.4356	0.4351	0.4494	0.5201	2.3836	2.2181	1.4557	0.5507	0.2439	0.3335	0.2917
8	0.2773	0.4436	0.4249	0.4267	0.5354	2.4552	2.2132	1.4009	0.5047	0.2478	0.3281	0.2891
9	0.2781	0.4412	0.4211	0.4427	0.5628	2.5189	2.2940	1.3647	0.4622	0.2507	0.3345	0.2895
10	0.2803	0.4373	0.4452	0.4559	0.5942	2.5158	2.4480	1.3367	0.4459	0.2701	0.3336	0.2976
11	0.2821	0.4409	0.4449	0.4572	0.6253	2.5396	2.4905	1.2870	0.4340	0.2735	0.3317	0.3029
12	0.2790	0.4338	0.4271	0.4559	0.6563	2.5976	2.4273	1.2815	0.4083	0.2931	0.3295	0.3076
13	0.3133	0.4277	0.4385	0.4588	0.6987	2.6466	2.4045	1.2451	0.3963	0.2954	0.3274	0.3098
14	0.3140	0.4293	0.4331	0.4355	0.7623	2.6623	2.4482	1.1497	0.3822	0.2938	0.3335	0.3112
15	0.3328	0.4144	0.4014	0.4330	0.7711	2.6588	2.3885	1.1520	0.3782	0.3125	0.3299	0.3138
16	0.3591	0.4120	0.3935	0.4369	0.8212	2.6319	2.4521	1.1326	0.3772	0.3152	0.3311	0.3153
17	0.3684	0.4069	0.4234	0.4253	0.8770	2.6381	2.4004	1.0380	0.3553	0.3143	0.3293	0.3147
18	0.3766	0.4207	0.4317	0.4096	0.9362	2.6404	2.3755	1.0557	0.3159	0.3135	0.3287	0.3121
19	0.3731	0.4292	0.4403	0.4025	0.9735	2.6505	2.4140	0.9844	0.3330	0.3168	0.3313	0.3116
20	0.3902	0.4289	0.4647	0.3993	1.0445	2.6707	2.2894	0.9104	0.2915	0.3206	0.3279	0.3112
21	0.3978	0.4391	0.4653	0.3957	1.0974	2.5910	2.2293	0.8742	0.2992	0.3208	0.3276	0.3092
22	0.3978	0.4517	0.4541	0.3911	1.1188	2.5740	2.2252	0.8451	0.3086	0.3239	0.3319	0.3084
23	0.3804	0.4545	0.4509	0.3773	1.2403	2.5918	2.2235	0.8561	0.2778	0.3227	0.3311	0.3093
24	0.3891	0.4506	0.4514	0.3766	1.2376	2.5313	2.2725	0.8336	0.3243	0.3386	0.3322	0.3103
25	0.4047	0.4444	0.4397	0.3743	1.3351	2.5049	2.1883	0.8270	0.3473	0.3473	0.3339	0.3126
26	0.4372	0.4512	0.4425	0.3680	1.4142	2.4011	2.0956	0.7727	0.3538	0.3454	0.3304	0.3132
27	0.4273	0.4500	0.4388	0.3739	1.4214	2.3748	2.0442	0.7245	0.3187	0.3423	0.3272	0.3120
28	0.4095	0.4707	0.4291	0.4257	1.4545	2.3506	1.9836	0.6839	0.3283	0.3366	0.3253	0.3101
29	0.4208		0.4429	0.4371	1.5898	2.3018	1.9713	0.7006	0.3320	0.3368	0.3194	0.3053
30	0.4170		0.4513	0.4313	1.7331	2.2459	1.9570	0.6852	0.3058	0.3321	0.3153	0.2990
31	0.4211		0.4309		1.7255		1.8029	0.6517		0.3297		0.2986
Average	0.3458	0.4353	0.4386	0.4216	0.9240	2.4404	2.2500	1.1312	0.4170	0.3012	0.3286	0.3067

4.9 CS-1 – CRACKINGSTONE RIVER

The Crackingstone River is located downstream of Cinch Lake which receives discharge from Beaverlodge Lake. The Crackingstone River discharges to Bushell Bay of Lake Athabasca and is measured at a bridge crossing. The station was visited in May and October of 2014 as shown in Photo 17 and Photo 18. During the fall program a beaver dam was observed immediately upstream of the bridge at the station; this dam is well maintained and was not present during the spring program. A datalogger is installed at this station year round but seems to freeze during the winter resulting in bad data points. Any missing data is infilled through relationships to BL-5.

The stage and discharge measurement data are presented in Table 20 and the rating curve is provided in Figure 17. The 2014 hydrograph is presented in Figure 18 with the daily average discharge data provided in Table 21.

Photo 17: CS-1 – May 7, 2014 – Facing Upstream

Photo 18: CS-1 – October 10, 2014 – Beaver Dam Upstream of Bridge

Table 20: CS-1 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	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
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

Figure 17: CS-1 Rating Curve

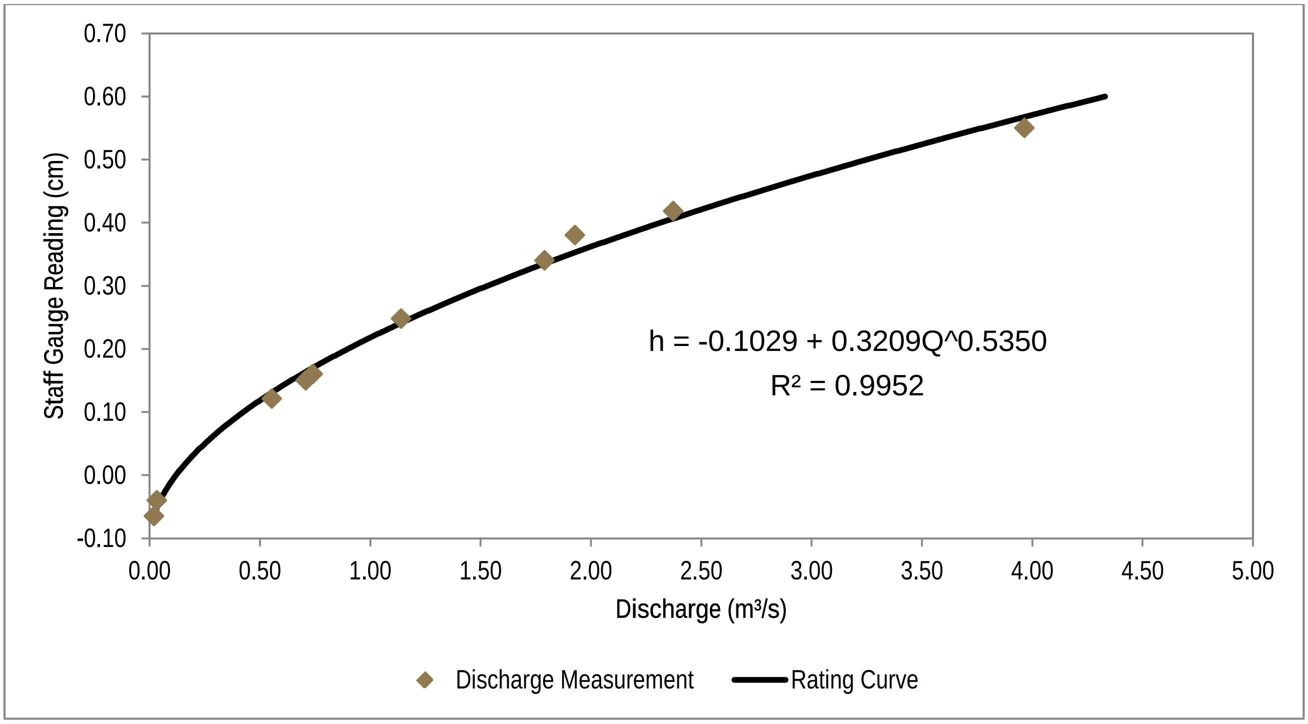


Figure 18: CS-1 2014 Hydrograph

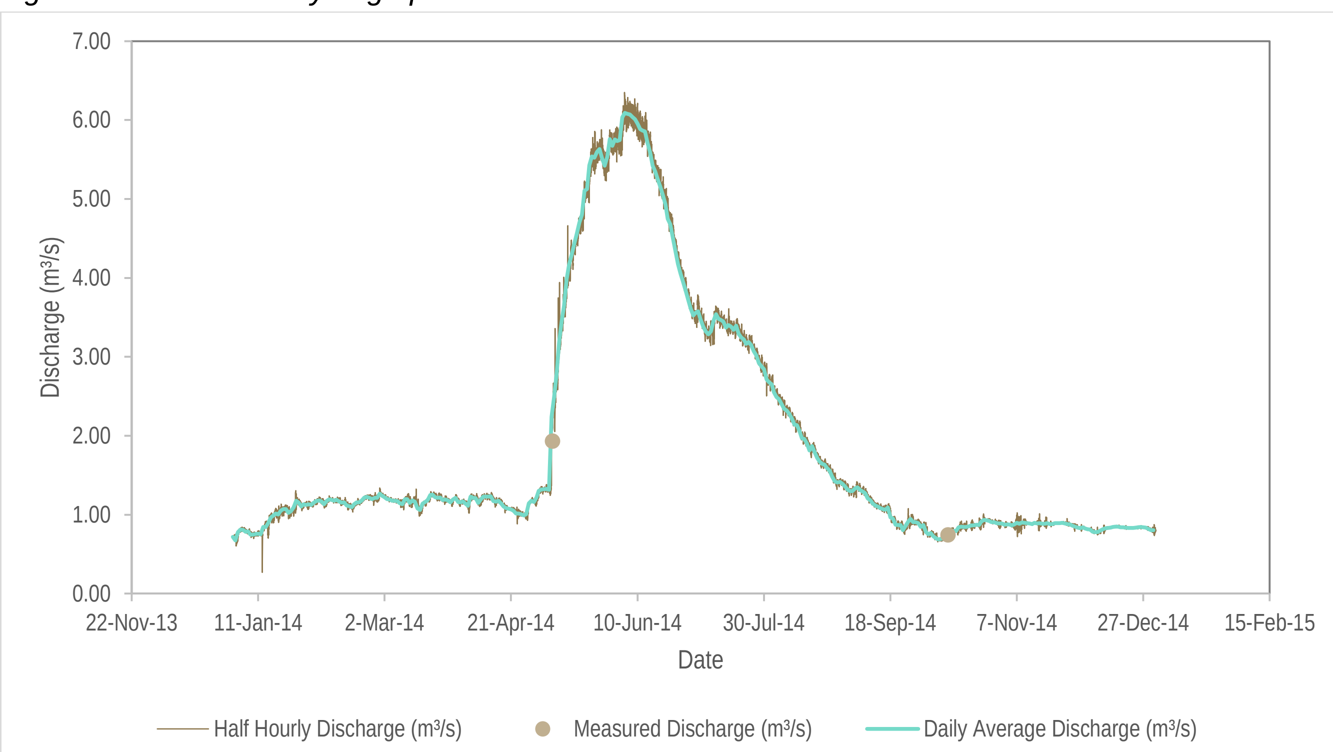


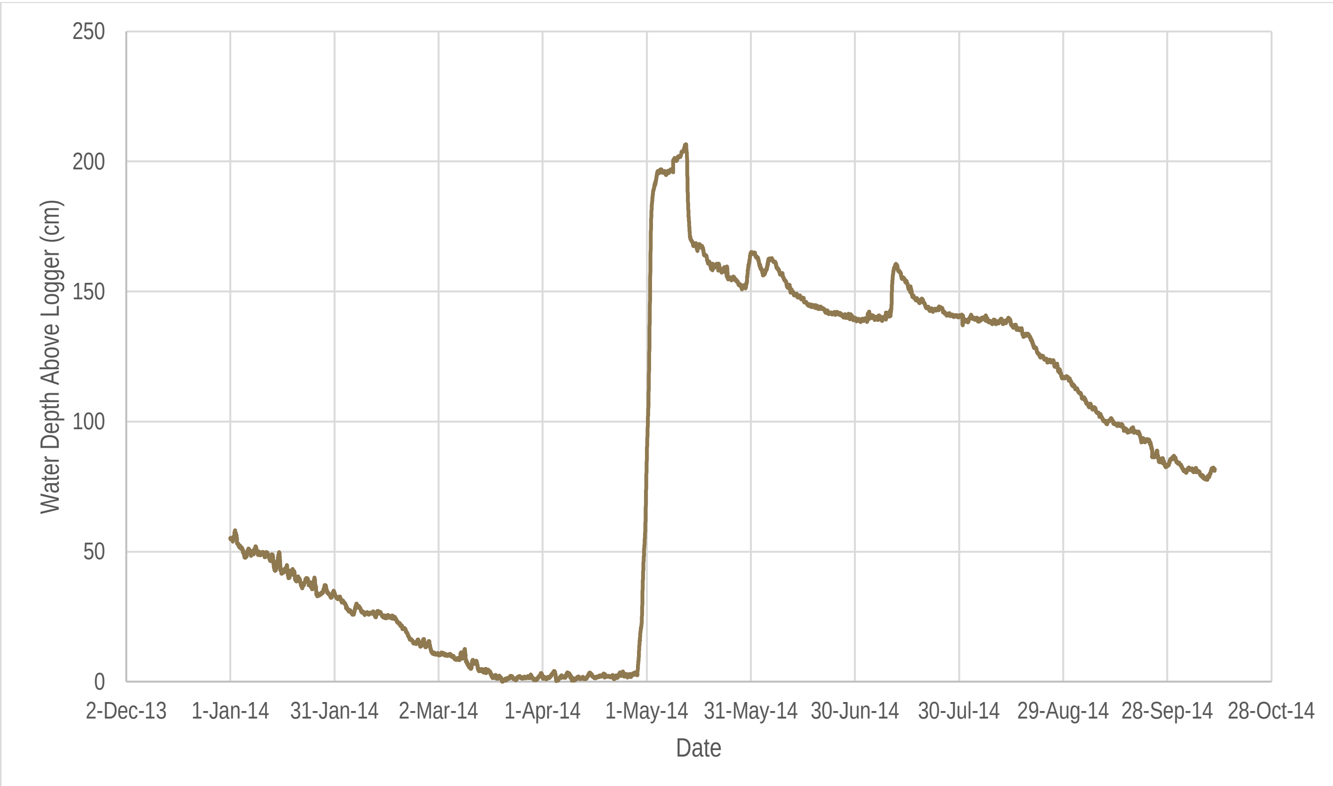
Table 21: CS-1 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.7194	1.1243	1.2430	1.1586	1.2162	5.7530	3.6092	2.6792	1.3202	0.8676	0.8883	0.8360
2	0.6761	1.1540	1.2217	1.1681	1.3041	5.7339	3.5227	2.6534	1.2995	0.7811	0.8745	0.8287
3	0.7819	1.1738	1.1980	1.1405	1.3196	5.7462	3.5571	2.5534	1.3004	0.7529	0.8770	0.8391
4	0.8131	1.1830	1.1918	1.1141	1.3230	6.0342	3.5793	2.4897	1.3326	0.7675	0.8757	0.8247
5	0.8081	1.1676	1.1767	1.2284	1.3277	6.0912	3.4723	2.4618	1.3491	0.7294	0.8648	0.8181
6	0.7834	1.1348	1.1766	1.2159	1.3152	6.0774	3.3809	2.4032	1.3136	0.7049	0.8789	0.8117
7	0.7878	1.1735	1.1722	1.2108	2.2378	6.0712	3.3222	2.3428	1.2946	0.6864	0.8987	0.7859
8	0.7471	1.1951	1.1447	1.1498	2.4902	6.0365	3.2846	2.3193	1.2755	0.6965	0.8839	0.7790
9	0.7493	1.1887	1.1347	1.1927	2.7900	6.0078	3.3232	2.2759	1.2053	0.7009	0.9012	0.7801
10	0.7553	1.1783	1.1994	1.2283	3.2022	5.9517	3.4551	2.2180	1.1843	0.7256	0.8989	0.8018
11	0.7602	1.1880	1.1988	1.2317	3.4593	5.8841	3.5417	2.1440	1.1416	0.7369	0.8936	0.8160
12	0.7517	1.1689	1.1507	1.2283	3.6456	5.8664	3.4814	2.1360	1.1158	0.7896	0.8879	0.8287
13	0.8442	1.1523	1.1815	1.2360	3.9790	5.8571	3.4689	2.0705	1.1050	0.7958	0.8821	0.8346
14	0.8459	1.1565	1.1669	1.1733	4.1732	5.7103	3.4480	1.9723	1.0853	0.7917	0.8985	0.8385
15	0.8965	1.1164	1.0816	1.1666	4.2960	5.5932	3.3695	1.9591	1.0704	0.8419	0.8889	0.8454
16	0.9674	1.1101	1.0602	1.1771	4.4337	5.4224	3.4021	1.9040	1.0654	0.8493	0.8921	0.8495
17	0.9927	1.0962	1.1406	1.1458	4.5634	5.3495	3.3842	1.8134	1.0919	0.8469	0.8872	0.8478
18	1.0146	1.1334	1.1633	1.1037	4.7000	5.2480	3.3421	1.8692	0.9656	0.8447	0.8856	0.8410
19	1.0052	1.1565	1.1862	1.0844	4.8025	5.1551	3.3956	1.7922	0.9510	0.8535	0.8927	0.8396
20	1.0512	1.1556	1.2521	1.0758	5.1045	5.0489	3.2886	1.7190	0.8720	0.8637	0.8835	0.8385
21	1.0719	1.1831	1.2535	1.0661	5.1252	4.9331	3.2461	1.6720	0.8692	0.8644	0.8826	0.8332
22	1.0717	1.2171	1.2234	1.0537	5.4277	4.7483	3.2190	1.6422	0.8712	0.8726	0.8943	0.8310
23	1.0250	1.2245	1.2149	1.0167	5.5401	4.6803	3.1653	1.6372	0.8030	0.8694	0.8920	0.8333
24	1.0484	1.2140	1.2162	1.0147	5.5231	4.5107	3.1883	1.5906	0.8567	0.9123	0.8951	0.8360
25	1.0904	1.1972	1.1846	1.0084	5.5969	4.3427	3.1465	1.5590	0.9081	0.9357	0.8995	0.8422
26	1.1779	1.2158	1.1923	0.9915	5.6321	4.1777	3.0706	1.4801	0.9476	0.9306	0.8901	0.8437
27	1.1513	1.2124	1.1822	1.0073	5.5160	4.0569	3.0173	1.4234	0.9064	0.9223	0.8815	0.8406
28	1.1034	1.2683	1.1561	1.1469	5.4223	3.9488	2.9186	1.4070	0.9070	0.9070	0.8766	0.8355
29	1.1339		1.1932	1.1776	5.5305	3.8417	2.8783	1.4165	0.8953	0.9075	0.8606	0.8226
30	1.1235		1.2159	1.1620	5.7568	3.7216	2.8439	1.3906	0.8439	0.8947	0.8496	0.8055
31	1.1345		1.1609		5.6721		2.7150	1.3584		0.8882		0.8044
Average	0.9317	1.1728	1.1817	1.1358	3.9492	5.2533	3.2915	1.9469	1.0716	0.8236	0.8852	0.8262

4.10 FAY SHAFT

The Fay Shaft is the former main vertical access associated with the Site. A stage data logger has been installed in the shaft to monitor water level fluctuations. A single depth measurement was collected on May 8, 2014 at 14:20 of 23.5 m below the surface of the concrete cap over the shaft. Figure 19 presents the shaft water level as observed above the datalogger; the water level dropped below the datalogger during the late winter/early spring of 2014. The datalogger was not downloaded during the winter of 2014/2015 which is why the data record ends in October, 2014 (during the fall field program).

Figure 19: Fay Shaft 2014 Recorded Water Level



4.11 SMALL POND NEAR THE FORMER HAB MINE

A small pond (Photo 19) in the vicinity of the former Hab Mine is believed to collect seepage water from local waste rock piles. For the fall field program Cameco requested that a rough volume of the pond be estimated and a water sample collected. A brief survey of the pond was completed on October 11, 2014 using an engineer's rod and level. The volume of the pond is estimated to be 123 m³ with a surface area of approximately 200 m². The maximum measured depth was approximately 1.35 m and the calculated average depth is 0.6 m. One unfiltered water sample was collected at this location and the lab analysis results provided by the Saskatchewan Research Council Analytical Lab are presented in Table 22.

Photo 19: Small Pond near the Former Hab Mine

Table 22: Water Chemistry Data for Small Pond near the Former Hab Mine

Parameter	Units	Value	Parameter	Units	Value
Bicarbonate	mg/L	212	Radium-226	Bq/L	1.9
Carbonate	mg/L	<1	Calcium	mg/L	48
Chloride	mg/L	3	Magnesium	mg/L	13
Hydroxide	mg/L	<1	Potassium	mg/L	2.2
P. alkalinity	mg/L	<1	Sodium	mg/L	7.7
pH	pH units	7.84	Sulfate	mg/L	27
Specific conductivity	uS/cm	372	Arsenic	ug/L	0.7
Sum of ions	mg/L	313	Barium	mg/L	0.30
Total alkalinity	mg/L	174	Copper	mg/L	0.0006
Total hardness	mg/L	173	Iron	mg/L	6.3
Ammonia as nitrogen	mg/L	0.16	Lead	mg/L	0.0005
Nitrate	mg/L	<0.04	Molybdenum	mg/L	0.012
Organic carbon	mg/L	9.7	Nickel	mg/L	0.0010
Total dissolved solids	mg/L	238	Selenium	mg/L	0.0001
Total suspended solids	mg/L	8	Uranium	ug/L	418
Lead-210	Bq/L	1.5	Zinc	mg/L	0.0022
Polonium-210	Bq/L	1.1	Phosphorus	mg/L	<0.01

5 SUMMARY AND CLOSURE

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

Climate records for Uranium City indicate that 2014 was approximately normal based on annual totals though all of August and most of September were missing from the record due to equipment malfunction. Local residents indicate that August and September were predominantly dry; as such, the missing data records may inadvertently represent the actual precipitation totals.

Though the climate data may indicate that precipitation has been approximately normal, long term records for AC-8 and TL-7 show that flows are above average for 2014. In fact, annual discharges for both stations have been above average for the past two years. Residents to the area have indicated that winter snowpack have been greater than usual in the past couple years even though summer precipitation has been normal or below.

MRSL appreciates the opportunity to work with Cameco on this project. If there are any questions regarding this assessment please do not hesitate to contact either of the undersigned.

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APPENDIX C

APPENDIX C

Cameco

Beaverlodge
Annual Geotechnical Inspection of:

Fookes Delta

Fookes Outlet Structure

Marie Outlet Structure

July 2014

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1.0 INTRODUCTION

July 15-17, 2014 Cameco along with representatives of the Canadian Nuclear Safety Commission (CNSC) and the Saskatchewan Ministry of Environment (SMOE) conducted an annual inspection of the cover at the Fookes tailings delta and the two outlet spillways at Fookes and Marie reservoirs.

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

Following the May 2010 inspection SRK Consulting recommended the frequency of formal inspections by a qualified engineer to be reduced from three years to five years. In addition SRK Consulting recommended that Cameco and/or the JRG conduct annual inspections of the area to ensure structures were behaving as expected. SRK Consulting and Cameco collaborated in the development of an inspection checklist and the checklist was reviewed and accepted by the CNSC and SMOE.

In 2011 Cameco initiated internal annual inspections of these areas using a criterion based checklist prepared by a qualified engineer. The 2014 inspection of the Fookes tailings delta and the outlet structures at Marie and Fookes reservoirs represent the fourth year of internal inspections, with a formal inspection, by a qualified engineer scheduled for 2015.

As per the accepted inspection checklist, the specific elements evaluated at the outlet spillway structures during this inspection included the following:

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

With respect to the Fookes delta, the specific elements that were evaluated during this inspection included the following:

- The potential presence of new tailings boils or tailings exposures due to frost action, etc.
- Significant erosion of the cover, including the diversion ditches in the northern part of the cover and the cover limit along its contact with Fookes Reservoir.
- 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.

This report summarizes the observations and recommendations made during the July 15 - 17, 2014 inspection of these areas.

2.0 OUTLET STRUCTURE INSPECTIONS (FOOKES & MARIE RESERVOIR)

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.

It should be noted that cracking and displacement of the grout-intruded rip-rap was anticipated in the original design and does not affect the performance of the outlet spillway. The grout that was intruded into the rip-rap is meant to serve purely as a binding agent to increase the effective block size of the rip-rap, allowing it to more effectively resist erosion. It has been acknowledged by SRK that additional cracking and grout degradation will occur with time. (*SRK 2010*)

2.1 General Observations

Flow in the Uranium City area generally appeared higher than previous years. The Uranium City weather station shows that the preceding two weeks saw 78.1 mm of precipitation. This observation is supported by the Cameco's hydrometric monitoring, which shows the flow from the tailings management area (measured at TL-7) increased from approximately 80 L/sec the week prior to the inspection to 120 L/sec and was approximately 4X higher than during the 2013 regulatory inspection.

Flow measured through the tailings management area during the peak flow periods (May – July) of 2014 was approximately 2X higher than 2013, which was also considered a year of high flows.

Despite the higher than normal flows the outlet channels appeared to be stable and all flow was contained within the rip-rapped channel and stilling basins.

Normally inspections are completed in early June when there is very little vegetation growth encroaching on the areas being inspected. Both the 2013 and 2014 inspections occurred in mid-July resulting in increased vegetation growth in the area; however the similar inspection timeframes for the last two years makes photographic comparison between the two years relevant.

2.2 Inspection Checklist for Outlet Structures

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

2.3 Marie Reservoir Outlet Structure Checklist

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

Photos 1 to 3, taken on the July 15, 2014 inspection, provide photographic record of the condition of the Marie Reservoir spillway channel.

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

The photographic record supports the observations made by SRK Consulting and the spillway continues to perform as designed.

Photo 1 – Marie Reservoir Spillway looking upstream

Photo 2 – Marie Reservoir Spillway (water flowing into stilling basin)

Photo 3 - Ice-jacked block on north side of Marie Spillway

2.3.2 Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event

Despite the noted increased flows observed at the outlet of Marie Reservoir there is no evidence that water has overtopped the rip-rap in this area. Photographic evidence comparing the 2012 and 2013 inspections to the 2014 inspection show loose stones on the frost-heaved block of grout intruded rip-rap in Photo 3 have not moved from year to year and the birch tree in the channel is in the same location as during the 2013 inspection.

Photographic comparison to 2013 inspection photos is provided in Section 4.0.

2.4 Fookes Reservoir Outlet Structure Checklist

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

Photos 4 and 5, taken on the July16, 2014 inspection, provide photographic record of the condition of the Fookes Reservoir spillway channel.

Previously SRK Consulting identified that the grout-intruded rip-rap along the length of the Fookes Reservoir outlet spillway show signs of cracking. In addition, there has been some ice-jacking, with the most significant displacements located near the upper part of the spillway, i.e., on the sides of the spillway, within 5 to 6 m of the spillway entrance.

The photographic record shows there has been no change in the condition of the spillway from previous inspections and the spillway continues to perform as designed.

Photo 4 – Fookes Reservoir Spillway looking upstream

Photo 5 – Fookes Reservoir Spillway looking downstream towards the stilling basin

2.4.2 Check the condition of the rip-rap on either side of the spillway, with a view to confirming no erosion has occurred due to overtopping associated with an extreme flood event

Photographic comparison of 2013 to 2014 inspections results show that debris in the Fookes Outlet channel has not moved from year-to-year, despite the elevated flows observed during the last 2 inspections. As a result Cameco has concluded that the channel has been able to accommodate the flows and no erosion of the channel has occurred. In addition there was no evidence that overtopping of the rip-rap areas of the spillway has occurred.

Photographic comparison to the 2013 inspection photos is provided in Section 4.0.

3.0 TAILINGS DELTA

3.1 General Observations

After a period of drought which saw water levels in Fookes Reservoir drop in 2011, to the point that there was no discharge, water levels have rebounded and water levels in 2014 were higher than previous years. On Fookes Delta it was noted that there was more standing water along the drainage area on the northeastern portion of the delta than in past years (Photo 6). Comparative photos to 2013 are provided in section 4.0. The standing water may be due to recent precipitation events combined with an unusually high water table in the area. Generally the cover was in good condition showing no areas of excessive erosion. There was no evidence of new vehicular traffic on the delta since the berms located at the access points were repaired and reinforced. There has been notable growth of vegetative cover over the last couple of years. Although vegetation on much of the delta remains sparse it is well established within 50 m of the Fookes Reservoir shoreline, and the engineered drainage structures.

The Fookes Tailings Delta was inspected on July 17, 2014. Photos 6 through 11 shows the conditions encountered during this site inspection.

Photo 6 – drainage collection area on NE edge of Fookes Tailings Delta (looking SE)

Photo 7 – drainage channel on Fookes Delta with standing water (looking north west)

As standing water in the Fookes cover drainage area was greater than observed during past inspections Cameco contacted SRK Consulting to have them assist in assessing whether or not these drainage areas were functioning as intended. As SRK was on the Beaverlodge property in the summer of 2014 for other work, they opportunistically visited the northern extents of the Fookes Delta / cover area to complete a brief visual inspection.

Based on this inspection, and review of the cover design intents, SRK indicated that the drainage areas appear to be functioning as intended. This area was noted to be allowing excess water to be directed away from the main tailings area tailings area, and/ or towards Fookes Lake. The northern drainage ditch area was never designed to provide fully channelized flow to Fookes Lake. Instead the cover in this area was purposefully graded only to establish an overall preferential gradient towards Fookes Lake. Some ponding, in higher precipitation years, was expected and may be expected to occur in future years at this area. This ponding is not expected to compromise the constructed reverse filter and confining tailings cover.

The primary cause of the additional ponding in this area is likely from increased snow pack melting and precipitation in 2014. At the time of the SRK site visit (end of July 2014) evidence of higher water levels around the area were noted; as the Fookes Lake water level was noted to have progressed upwards into the end of this graded diversion ditch.

No new boil development was noted through the cover in this northern drainage area of the tailings delta and, although evidence that excessive water has flowed in the drainage channels during runoff events, no evidence of any significant erosion was observed.

3.2 Inspection Checklist

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

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

As previously noted there was more standing water than previously observed along the drainage areas on the northeastern portion of the tailings delta, likely attributable to recent precipitation events and an unusually high water table in the area.

Due to these conditions additional attention was placed on searching for new tailings boils, particularly in areas that were not covered with filter sand during the last cover application in 2007. No new tailings boils were noted on the cover.

3.2.2 Check for evidence of significant erosion of the cover material

As mentioned previously Fookes Reservoir water levels are higher than past years and there is more standing water in the drainage areas of the delta than have been observed in the past. Despite the elevated water table the sand cover was in good condition and showed no signs of excessive erosion. Photo 8 shows a picture of the shoreline where the water level meets the sand cover. A small amount of erosion of the sand cover can be seen due to wave action, which is to be expected. It is not anticipated that this small amount of erosion will affect the performance of the sand cover. As vegetation continues to encroach on the shoreline it will provide additional armoring and increase the stability of the cover.

Photo 8 – Fookes Reservoir shoreline

The small fractures noted in the sand cover during the 2011 inspection were not prevalent in any year since then, supporting the theory that they were caused by a low regional water table, which has rebounded. Future inspections will continue to look for evidence of fractures in the cover.

It was noted during previous inspections that sand has flowed along the base of the drainage trench that has a rock-fill base. As the drainage trench was designed to channel surface runoff during heavy precipitation events and spring freshet this sand flow is not expected to threaten the functionality of the ditch in the medium term. In the longer term, as vegetation continues to establish itself, the risk to ditch functionality will diminish further. Photo 9 shows some evidence of recent runoff in the drainage ditch but no signs of excessive erosion.

Photo 9 – Drainage ditch showing signs of flow during recent runoff event

3.2.3 Ensure erosion protection devices are performing as expected on former north access road

As part of the design and installation of the covers in 2005 and 2007, the area considered most vulnerable to erosion was in the area on and below the access ramp at the northwest corner of the tailings delta (*SRK 2010*). The general condition of the ramp is very good. Access to this ramp is closed off by a windrow of material at the top of the ramp. The water bars (chevrons) are performing as expected and show little sign of erosion (Photo 10).

Photo 10 – Chevrons in place on north access point to the Fookes delta

In addition to the chevrons, run-out structures were installed to carry away excessive water during extreme run-off events. These run-out structures are also in good shape and have seen no additional eroded material beyond that observed during previous inspections (Photo 11).

Photo 11 – Run-out structure along north access road (looking east)

3.2.4 Ensure earthen berms are in place to limit access to the delta

Since the earthen berms protecting the east and west access points to the Fookes Delta were repaired and reinforced in 2011 and 2012 respectively there has not been any new evidence of vehicular traffic accessing the tailings delta.

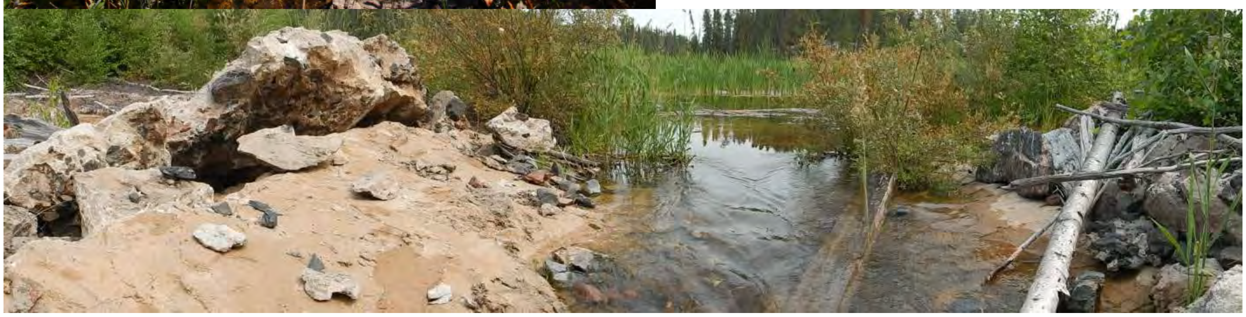
4.0 PHOTOGRAPHIC COMPARISONS

4.1 Marie Outlet Structure

Marie Outlet Structure looking upstream (left – 2013; right – 2014)

Marie Outlet Structure looking downstream (left – 2013; right – 2014)

**Marie Reservoir Outlet Structure –
Ice jacked block of grout intruded rip-rap
(top – 2013; bottom – 2014)**



4.2 Fookes Outlet Structure

Fookes Outlet Structure looking upstream (left – 2013; right 2014)

Fookes Outlet Structure looking downstream (left – 2013; right 2014)

4.3 Fookes Delta

Drainage area NE edge of Fookes Delta along tree-line (left – 2013; right – 2014)

Drainage area looking NW towards access point (top left of photos) (left – 2012; right 2014). Note significant growth of alders

5.0 REFERENCES

Environment Canada. 2014. National Climate Data and Information Archive. Website. http://climate.weather.gc.ca/. Last accessed on July 31, 2014.

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

APPENDIX D

APPENDIX D

Blind Sample QC Report

Filtered by Start Date: 2014-05-31; Finish Date: 2014-05-31; Stations: Blind-1,AC-14; Relationship Type: Blind;

Parent Field #: W-AC-14-20140531 17:	Station: AC-14 - Ace Creek dishcarge to Beaverloge Lake	Child Field #: W-Blind-1-20140531 17:	Station: Blind-1 - Blind duplicate sample taken at station AC-14
Lab Sample: <4573073>	Assigned: SRC Lab	Lab Sample: <4573313>	Assigned: SRC Lab

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	**% Diff**
Ag	<0.00005 mg/L	Primary	ICP-MS	0.00		Ag	<0.00005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Al	0.018 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.020 mg/L	Blind Sample	ICP-MS	0.00	0.00	**11.1**
Alk-Phenol	<1 mg/L	Primary	SRC	1.00		Alk-Phenol	<1 mg/L	Blind Sample	SRC	1.00		**0.0**
Alk-T	44 mg/L	Primary	Acid Titr.	1.00	10.00	Alk-T	45 mg/L	Blind Sample	Acid Titr.	1.00	10.00	**2.3**
As	0.2 µg/L	Primary	ICP-MS	0.10	0.10	As	0.2 µg/L	Blind Sample	ICP-MS	0.10	0.10	**0.0**
B	<0.01 mg/L	Primary	ICP-MS	0.01		B	<0.01 mg/L	Blind Sample	ICP-MS	0.01		**0.0**
Ba	0.021 mg/L	Primary	ICP-MS	0.00	0.00	Ba	0.022 mg/L	Blind Sample	ICP-MS	0.00	0.00	**4.8**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Ca	14 mg/L	Primary	ICP-IRS	0.10	2.00	Ca	15 mg/L	Blind Sample	ICP-IRS	0.10	1.00	**7.1**
Cd	<0.00001 mg/L	Primary	ICP-MS	0.00		Cd	<0.00001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Cl	0.9 mg/L	Primary	IC	0.10	0.10	Cl	0.9 mg/L	Blind Sample	IC	0.10	0.10	**0.0**
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.	1.00		CO3	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
Cond-L	103 µS/cm	Primary	SRC	1.00	7.00	Cond-L	103 µS/cm	Blind Sample	SRC	1.00	7.00	**0.0**
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Cu	0.0009 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0005 mg/L	Blind Sample	ICP-MS	0.00	0.00	**44.4**
F	0.13 mg/L	Primary	Electrode	0.01	0.04	F	0.14 mg/L	Blind Sample	Electrode	0.01	0.03	**7.7**
Fe	0.056 mg/L	Primary	ICP-MS	0.00	0.01	Fe	0.060 mg/L	Blind Sample	ICP-MS	0.00	0.01	**7.1**
Hardness	46 mg/L	Primary	Calculate	1.00	7.00	Hardness	49 mg/L	Blind Sample	Calculate	1.00	7.00	**6.5**
HCO3	54 mg/L	Primary	Acid Titr.	1.00	8.00	HCO3	55 mg/L	Blind Sample	Acid Titr.	1.00	8.00	**1.9**
K	0.9 mg/L	Primary	ICP-IRS	0.10	0.30	K	0.8 mg/L	Blind Sample	ICP-IRS	0.10	0.30	**11.1**
Mg	2.8 mg/L	Primary	ICP-IRS	0.10	0.40	Mg	2.8 mg/L	Blind Sample	ICP-IRS	0.10	0.40	**0.0**
Mn	0.0080 mg/L	Primary	ICP-MS	0.00	0.00	Mn	0.0086 mg/L	Blind Sample	ICP-MS	0.00	0.00	**7.5**
Mo	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0008 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Na	1.7 mg/L	Primary	ICP-IRS	0.10	0.40	Na	1.6 mg/L	Blind Sample	ICP-IRS	0.10	0.40	**5.9**
Ni	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	Ni	0.0002 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
NO3	0.09 mg/L	Primary	SRC	0.04	0.06	NO3	0.09 mg/L	Blind Sample	SRC	0.04	0.06	**0.0**
OH	<1 mg/L	Primary	Acid Titr.	1.00		OH	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
Pb	0.0003 mg/L	Primary	ICP-MS	0.00	0.00	Pb	0.0003 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
pH-L	7.80 ph Units	Primary	SRC	0.07	0.10	pH-L	7.74 ph Units	Blind Sample	SRC	0.07	0.10	**0.8**
Ra226	0.05 Bq/L	Primary	Alpha Spec	0.01	0.02	Ra226	0.04 Bq/L	Blind Sample	Alpha Spec	0.01	0.01	**20.0**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Se	0.0001 mg/L	Primary	ICP-MS	0.00	0.00	Se	0.0001 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
SO4	7.0 mg/L	Primary	ICP-IRS	0.20	1.00	SO4	6.7 mg/L	Blind Sample	ICP-IRS	0.20	1.00	**4.3**
Sr	0.046 mg/L	Primary	ICP-MS	0.00	0.01	Sr	0.046 mg/L	Blind Sample	ICP-MS	0.00	0.01	**0.0**
Sum of Ions	81 mg/L	Primary	Calculate	1.00	10.00	Sum of Ions	83 mg/L	Blind Sample	Calculate	1.00	10.00	**2.5**
TDS	69 mg/L	Primary	Gravimetric	5.00	10.00	TDS	75 mg/L	Blind Sample	Gravimetric	4.00	10.00	**8.7**
Ti	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	Ti	0.0004 mg/L	Blind Sample	ICP-MS	0.00	0.00	**100.0**
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
TSS	1 mg/L	Primary	Gravimetric	1.00		TSS	<1 mg/L	Blind Sample	Gravimetric	1.00	1.00	**0.0**
U	21 µg/L	Primary	ICP-MS	0.10	2.00	U	21 µg/L	Blind Sample	ICP-MS	0.10	2.00	**0.0**
V	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0002 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Zn	0.0017 mg/L	Primary	ICP-MS	0.00	0.00	Zn	0.0008 mg/L	Blind Sample	ICP-MS	0.00	0.00	**52.9**

Blind Sample QC Report

Filtered by Start Date: 2014-06-21; Finish Date: 2014-06-21; Stations: Blind-4,Blind-6,TL-7,TL-9; Relationship Type: Blind;

Parent Field #: W-TL-9-20140621 15: Station: TL-9 - Greer Lake discharge at Beaverlodge Lake
Lab Sample: <4920358> Assigned: SRC Lab

Child Field #: W-Blind-4-20140621 15: Station: Blind-4 - Blind duplicate sample collected from TL-9
Lab Sample: <4918354> Assigned: SRC Lab

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Ag	<0.00005 mg/L	Primary	ICP-MS	0.00		Ag	<0.00005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Al	0.016 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.015 mg/L	Blind Sample	ICP-MS	0.00	0.00	**6.3**
Alk-Phenol	<1 mg/L	Primary	SRC	1.00		Alk-Phenol	<1 mg/L	Blind Sample	SRC	1.00		**0.0**
Alk-T	135 mg/L	Primary	Acid Titr.	1.00	30.00	Alk-T	135 mg/L	Blind Sample	Acid Titr.	1.00	30.00	**0.0**
As	1.6 µg/L	Primary	ICP-MS	0.10	0.40	As	1.7 µg/L	Blind Sample	ICP-MS	0.10	0.40	**6.3**
B	0.02 mg/L	Primary	ICP-MS	0.01	0.01	B	0.02 mg/L	Blind Sample	ICP-MS	0.01	0.01	**0.0**
Ba	0.67 mg/L	Primary	ICP-MS	0.00	0.07	Ba	0.67 mg/L	Blind Sample	ICP-MS	0.00	0.07	**0.0**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
C-(org)	9.5 mg/L	Primary	Non-Disp.Infrared	0.20	1.00	C-(org)	9.8 mg/L	Blind Sample	Non-Disp.Infrared	0.20	1.00	**3.2**
Ca	25 mg/L	Primary	ICP-IRS	0.10	2.00	Ca	25 mg/L	Blind Sample	ICP-IRS	0.10	2.00	**0.0**
Cd	0.00002 mg/L	Primary	ICP-MS	0.00	0.00	Cd	0.00002 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Cl	5 mg/L	Primary	Color	0.10	0.80	Cl	5.0 mg/L	Blind Sample	IC	1.00	1.00	**0.0**
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.	1.00		CO3	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
Cond-L	312 µS/cm	Primary	SRC	1.00	10.00	Cond-L	306 µS/cm	Blind Sample	SRC	1.00	10.00	**1.9**
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Cu	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0009 mg/L	Blind Sample	ICP-MS	0.00	0.00	**12.5**
F	0.35 mg/L	Primary	Electrode	0.01	0.05	F	0.35 mg/L	Blind Sample	Electrode	0.01	0.05	**0.0**
Fe	0.052 mg/L	Primary	ICP-MS	0.00	0.01	Fe	0.053 mg/L	Blind Sample	ICP-MS	0.00	0.01	**1.9**
Hardness	86 mg/L	Primary	Calculate	1.00	10.00	Hardness	86 mg/L	Blind Sample	Calculate	1.00	10.00	**0.0**
HCO3	165 mg/L	Primary	Acid Titr.	1.00	20.00	HCO3	165 mg/L	Blind Sample	Acid Titr.	1.00	20.00	**0.0**
K	0.9 mg/L	Primary	ICP-IRS	0.10	0.20	K	1.0 mg/L	Blind Sample	ICP-IRS	0.10	0.30	**11.1**
Mg	5.7 mg/L	Primary	ICP-IRS	0.10	0.90	Mg	5.8 mg/L	Blind Sample	ICP-IRS	0.10	0.80	**1.8**
Mn	0.035 mg/L	Primary	ICP-MS	0.00	0.01	Mn	0.034 mg/L	Blind Sample	ICP-MS	0.00	0.01	**2.9**
Mo	0.0092 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0092 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Na	36 mg/L	Primary	ICP-IRS	0.10	4.00	Na	35 mg/L	Blind Sample	ICP-IRS	0.10	4.00	**2.8**
NH3-N	0.07 mg/L	Primary	Color	0.01	0.03	NH3-N	0.06 mg/L	Blind Sample	Color	0.01	0.03	**14.3**
Ni	0.0005 mg/L	Primary	ICP-MS	0.00	0.00	Ni	0.0005 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
NO3	0.40 mg/L	Primary	SRC	0.04	0.10	NO3	0.31 mg/L	Blind Sample	SRC	0.04	0.10	**22.5**
OH	<1 mg/L	Primary	Acid Titr.	1.00		OH	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
P-(TP)	<0.01 mg/L	Primary	ICP-IRS	0.01		P-(TP)	<0.01 mg/L	Blind Sample	ICP-IRS	0.01		**0.0**
Pb	0.0007 mg/L	Primary	ICP-MS	0.00	0.00	Pb	0.0007 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Pb210	0.06 Bq/L	Primary	Beta Method	0.02	0.04	Pb210	0.06 Bq/L	Blind Sample	Beta Method	0.02	0.04	**0.0**
pH-L	8.01 ph Units	Primary	SRC	0.07	0.10	pH-L	8.04 ph Units	Blind Sample	SRC	0.07	0.10	**0.4**
Po210	0.06 Bq/L	Primary	Alpha Spec	0.01	0.02	Po210	0.07 Bq/L	Blind Sample	Alpha Spec	0.01	0.02	**16.7**
Ra226	2.7 Bq/L	Primary	Alpha Spec	0.01	0.30	Ra226	2.6 Bq/L	Blind Sample	Alpha Spec	0.02	0.30	**3.7**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Se	0.0024 mg/L	Primary	ICP-MS	0.00	0.00	Se	0.0020 mg/L	Blind Sample	ICP-MS	0.00	0.00	**16.7**
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
SO4	25 mg/L	Primary	ICP-IRS	0.20	2.00	SO4	24 mg/L	Blind Sample	ICP-IRS	0.20	2.00	**4.0**
Sr	0.14 mg/L	Primary	ICP-MS	0.00	0.01	Sr	0.14 mg/L	Blind Sample	ICP-MS	0.00	0.01	**0.0**
Sum of Ions	263 mg/L	Primary	Calculate	1.00	30.00	Sum of Ions	261 mg/L	Blind Sample	Calculate	1.00	30.00	**0.8**
TDS	196 mg/L	Primary	Gravimetric	5.00	20.00	TDS	210 mg/L	Blind Sample	Gravimetric	5.00	20.00	**7.1**
Ti	0.0003 mg/L	Primary	ICP-MS	0.00	0.00	Ti	0.0003 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
TSS	2 mg/L	Primary	Gravimetric	1.00	1.00	TSS	2 mg/L	Blind Sample	Gravimetric	1.00	1.00	**0.0**
U	202 µg/L	Primary	ICP-MS	0.10	20.00	U	205 µg/L	Blind Sample	ICP-MS	0.10	20.00	**1.5**
V	0.0030 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0031 mg/L	Blind Sample	ICP-MS	0.00	0.00	**3.3**
Zn	0.0007 mg/L	Primary	ICP-MS	0.00	0.00	Zn	0.0014 mg/L	Blind Sample	ICP-MS	0.00	0.00	**100.0**

Blind Sample QC Report

Filtered by Start Date: 2014-07-27; Finish Date: 2014-07-27; Stations: Blind-3,TL-6,Blind-5,AC-6A; Relationship Type: Blind;

Parent Field #: W-AC-6A-20140727 15:		Station: AC-6A - Verna Lake discharge to Ace Lake				Child Field #: W-Blind-3-20140727 15:			Station: Blind-3 - Blind duplicate sample collected from AC-6A			
Lab Sample: <4961126>		Assigned: SRC Lab				Lab Sample: <4961274>			Assigned: SRC Lab			
Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	**% Diff**
Ag	<0.00005 mg/L	Primary	ICP-MS	0.00		Ag	<0.00005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Al	0.0010 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.0010 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Alk-Phenol	<1 mg/L	Primary	SRC	1.00		Alk-Phenol	<1 mg/L	Blind Sample	SRC	1.00		**0.0**
Alk-T	103 mg/L	Primary	Acid Titr.	1.00	20.00	Alk-T	103 mg/L	Blind Sample	Acid Titr.	1.00	20.00	**0.0**
As	0.2 µg/L	Primary	ICP-MS	0.10	0.10	As	0.2 µg/L	Blind Sample	ICP-MS	0.10	0.10	**0.0**
B	0.01 mg/L	Primary	ICP-MS	0.01	0.01	B	0.01 mg/L	Blind Sample	ICP-MS	0.01	0.01	**0.0**
Ba	0.022 mg/L	Primary	ICP-MS	0.00	0.00	Ba	0.022 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Ca	43 mg/L	Primary	ICP-IRS	0.10	4.00	Ca	43 mg/L	Blind Sample	ICP-IRS	0.10	4.00	**0.0**
Cd	0.00001 mg/L	Primary	ICP-MS	0.00		Cd	<0.00001 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Cl	0.4 mg/L	Primary	IC	0.10	0.10	Cl	0.4 mg/L	Blind Sample	IC	0.10	0.10	**0.0**
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.	1.00		CO3	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
Cond-L	283 µS/cm	Primary	SRC	1.00	10.00	Cond-L	285 µS/cm	Blind Sample	SRC	1.00	10.00	**0.7**
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Cu	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0002 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
F	0.16 mg/L	Primary	Electrode	0.01	0.04	F	0.16 mg/L	Blind Sample	Electrode	0.01	0.04	**0.0**
Fe	0.023 mg/L	Primary	ICP-MS	0.00	0.00	Fe	0.024 mg/L	Blind Sample	ICP-MS	0.00	0.00	**4.3**
Hardness	143 mg/L	Primary	Calculate	1.00	10.00	Hardness	143 mg/L	Blind Sample	Calculate	1.00	10.00	**0.0**
HCO3	126 mg/L	Primary	Acid Titr.	1.00	10.00	HCO3	126 mg/L	Blind Sample	Acid Titr.	1.00	10.00	**0.0**
K	0.8 mg/L	Primary	ICP-IRS	0.10	0.30	K	0.8 mg/L	Blind Sample	ICP-IRS	0.10	0.30	**0.0**
Mg	8.7 mg/L	Primary	ICP-IRS	0.10	1.00	Mg	8.8 mg/L	Blind Sample	ICP-IRS	0.10	1.00	**1.1**
Mn	0.0067 mg/L	Primary	ICP-MS	0.00	0.00	Mn	0.0072 mg/L	Blind Sample	ICP-MS	0.00	0.00	**7.5**
Mo	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0008 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Na	2.3 mg/L	Primary	ICP-IRS	0.10	0.30	Na	2.3 mg/L	Blind Sample	ICP-IRS	0.10	0.30	**0.0**
Ni	<0.0001 mg/L	Primary	ICP-MS	0.00		Ni	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
NO3	<0.04 mg/L	Primary	SRC	0.04		NO3	<0.04 mg/L	Blind Sample	SRC	0.04		**0.0**
OH	<1 mg/L	Primary	Acid Titr.	1.00		OH	<1 mg/L	Blind Sample	Acid Titr.	1.00		**0.0**
Pb	<0.0001 mg/L	Primary	ICP-MS	0.00		Pb	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
pH-L	7.62 ph Units	Primary	SRC	0.07	0.10	pH-L	7.69 ph Units	Blind Sample	SRC	0.07	0.10	**0.9**
Ra226	0.12 Bq/L	Primary	Alpha Spec	0.01	0.02	Ra226	0.13 Bq/L	Blind Sample	Alpha Spec	0.01	0.02	**8.3**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Se	0.0001 mg/L	Primary	ICP-MS	0.00	0.00	Se	0.0001 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
SO4	47 mg/L	Primary	ICP-IRS	0.20	5.00	SO4	47 mg/L	Blind Sample	ICP-IRS	0.20	5.00	**0.0**
Sr	0.14 mg/L	Primary	ICP-MS	0.00	0.01	Sr	0.14 mg/L	Blind Sample	ICP-MS	0.00	0.01	**0.0**
Sum of Ions	228 mg/L	Primary	Calculate	1.00	20.00	Sum of Ions	228 mg/L	Blind Sample	Calculate	1.00	20.00	**0.0**
TDS	197 mg/L	Primary	Gravimetric	5.00	20.00	TDS	195 mg/L	Blind Sample	Gravimetric	5.00	20.00	**1.0**
Ti	<0.0002 mg/L	Primary	ICP-MS	0.00		Ti	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Blind Sample	ICP-MS	0.00		**0.0**
TSS	<1 mg/L	Primary	Gravimetric	1.00		TSS	<1 mg/L	Blind Sample	Gravimetric	1.00		**0.0**
U	158 µg/L	Primary	ICP-MS	0.10	20.00	U	162 µg/L	Blind Sample	ICP-MS	0.10	20.00	**2.5**
V	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0002 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**
Zn	0.0005 mg/L	Primary	ICP-MS	0.00		Zn	<0.0005 mg/L	Blind Sample	ICP-MS	0.00	0.00	**0.0**

QC Duplicate Report - Comparison of SRC to Becquerel Labs

Filtered by Start Date: 2014-06-21; Finish Date: 2014-06-21; Stations: TL-7 and TL-9;

Field Number	Type - Class	Status	Sampled On	Station
W-TL-7-20140621 16:	Water - Surf.	Completed	2014-06-21 16:30	TL-7 - Meadow Lake discharge at weir

Pb210

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	0.04 Bq/L		SRC LAB	0.02	0.03	Beta Method	Posted	Normal	ESSUMMER	2014-07-04 08:28	<4918542>
Duplicate #1	0.26 Bq/L	**550.0**	Becquerel	0.10		Becq Pb210	Posted	N/A	ESSUMMER	2014-07-18 00:00	<4920408>
Duplicate #1 Recheck	<0.10 Bq/L	**150.0**	Becquerel	0.10		Becq Pb210	Posted	N/A	ESSUMMER	2014-07-18 00:00	<4920408>

Po210

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	0.02 Bq/L		SRC LAB	0.005	0.010	Alpha Spec	Posted	Normal	ESSUMMER	2014-07-04 10:56	<4918542>
Duplicate #1	0.029 Bq/L	**45.0**	Becquerel	0.010		Po-210	Posted	N/A	ESSUMMER	2014-07-10 00:00	<4920408>

Ra226

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	1.9 Bq/L		SRC LAB	0.020	0.300	Alpha Spec	Posted	Normal	ESSUMMER	2014-07-08 13:38	<4918542>
Duplicate #1	1.47 Bq/L	**22.6**	Becquerel	0.010		Ra-226	Posted	N/A	ESSUMMER	2014-07-12 00:00	<4920408>

U

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	228 µg/L		SRC LAB	0.1	20.0	ICP-MS	Posted	Normal	ESSUMMER	2014-06-27 08:57	<4918542>
Duplicate #1	240 µg/L	**5.3**	Becquerel	1.0		U-UVF	Posted	N/A	ESSUMMER	2014-07-04 00:00	<4920408>

Field Number	Type - Class	Status	Sampled On	Station
W-TL-9-20140621 15:	Water - Surf.	Completed	2014-06-21 15:10	TL-9 - Greer Lake discharge at Beaverlodge Lake

Pb210

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	0.06 Bq/L		SRC LAB	0.02	0.04	Beta Method	Posted	N/A	ESSUMMER	2014-07-04 08:28	<4920358>
Duplicate #1	0.26 Bq/L	**333.3**	Becquerel	0.10		Becq Pb210	Posted	N/A	ESSUMMER	2014-07-18 00:00	<4920409>
Duplicate #1 Recheck	0.14 Bq/L	**133.3**	Becquerel	0.10		Becq Pb210	Posted	N/A	ESSUMMER	2014-07-18 00:00	<4920409>

Po210

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	0.06 Bq/L		SRC LAB	0.005	0.020	Alpha Spec	Posted	N/A	ESSUMMER	2014-07-04 10:55	<4920358>
Duplicate #1	0.072 Bq/L	**20.0**	Becquerel	0.010		Po-210	Posted	N/A	ESSUMMER	2014-07-10 00:00	<4920409>

Ra226

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	2.7 Bq/L		SRC LAB	0.020	0.300	Alpha Spec	Posted	N/A	ESSUMMER	2014-07-08 13:39	<4920358>
Duplicate #1	2.70 Bq/L	**0.0**	Becquerel	0.010		Ra-226	Posted	N/A	ESSUMMER	2014-07-12 00:00	<4920409>

U

Meas QC Type	Entered Value	% Diff	Assigned To	Entered DL	Entered Uncert	Method	Meas Status	Meas Qualifier	Meas By	Meas On	Lab Field #
Primary	202 µg/L		SRC LAB	0.1	20.0	ICP-MS	Posted	N/A	ESSUMMER	2014-06-27 08:57	<4920358>
Duplicate #1	210 µg/L	**4.0**	Becquerel	1.0		U-UVF	Posted	N/A	ESSUMMER	2014-07-04 00:00	<4920409>