BEAVERLODGE

Cameco

Beaverlodge

2013 Beaverlodge Annual Report

April 2014

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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, 2013 and December 31, 2013. 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 2013 are provided, along with an overview of anticipated activities planned for 2014.

SECTION 2.0
GENERAL INFORMATION

SECTION 2.0

2.0 GENERAL INFORMATION

2.1 Organizational Information

2.1.1 CNSC Licence/Provincial Surface Lease

The CNSC Waste Facility Operating Licence WFOL-W5-2120.0/2023 and the Province of Saskatchewan - Beaverlodge Surface Lease, December 24, 2006 are issued to:

CAMECO CORPORATION
2121 - 11th Street West
Saskatoon, Saskatchewan
S7M 1J3
(306) 956-6200 (Phone)
(306) 956-6201 (FAX)

2.1.2 Officers and Directors

The officers and board of directors of Cameco as at December 31, 2013 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	G.M.S. Chad

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

2.2 CNSC Licence

A CNSC licensing hearing was conducted on April 3 and 4, 2013 in Saskatoon, Saskatchewan, to review the Beaverlodge application for a 10-year licence renewal. 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.

Prior to the licence renewal Cameco was conducting activities in accordance with WFOL-W5-2120.0/2013, valid from December 1, 2012 to May 31, 2013.

The 10-year licence term will allow implementation of remedial options and post remediation monitoring. The ultimate goal for the Beaverlodge properties is the successful transfer of the properties to the provincial institutional control program (IC).

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 (1952-1982) 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, approximately 60% of the tailings were placed into water bodies within the Fulton Creek watershed with the remainder being deposited underground.

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 initiated at that time 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) and residents and leaders of the Uranium City community. A simplified version is provided below in Figure 2.4.1.

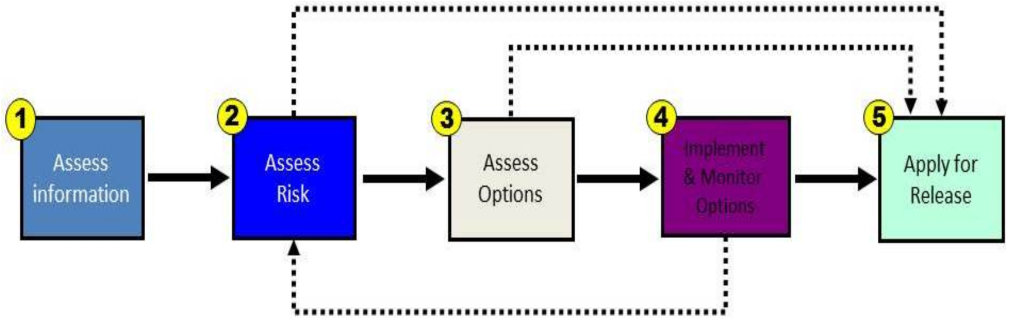

Figure 2.4.1 Simplified Beaverlodge Management Framework

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. The predicted water quality changes over time as presented in the QSM are described in more detail in Section 4.1.1.

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 the site activities that are to be completed in the near term (five years) to meet the objectives of the Beaverlodge Management Framework and prepare the sites for transfer to the IC program (Box 4 of Figure 2.4.1).

To date, five 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
DECOMMISSIONED AND RECLAIMED AREAS ACTIVITIES

SECTION 3.0

3.0 DECOMMISSIONED AND RECLAIMED AREAS ACTIVITIES

The performance of the decommissioned and reclaimed areas of the Beaverlodge site is assessed through routine scheduled sampling/analysis as well as routine inspections conducted by Cameco personnel and the Joint Regulatory Group (JRG). In addition, special monitoring/investigation projects are completed to gather information to support characterization of the site, and aide in assessing the performance of specific components of the decommissioned areas. The following section outlines related activities around the Beaverlodge properties during the reporting period.

3.1 Joint Regulatory Group

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).

3.1.1 JRG Meeting

February 7, 2013: Path Forward Meeting (Saskatoon, Saskatchewan)

The purpose of this meeting was to discuss with the CNSC and SMOE any outstanding questions regarding the Path Forward report for the upcoming Beaverlodge relicensing hearing. Discussed items included whether the current frequency of scheduled water quality sampling is sufficient to establish water quality trends in areas where remediation is to occur. It was determined that with the implementation of additional monitoring related to the stream diversion remediation, the current sampling frequency will serve as an appropriate determinant of the overall effectiveness of specific remedial options. In addition, current licensed monitoring program was deemed sufficient to monitor general water quality trends that may result from implementation of remedial options in the area.

The topic of assessing risks once properties are released to IC was discussed. It was concluded that ideally, once the properties are released, that there should be little to no residual risks and conditions should be stable and therefore requiring only monitoring. Performance of the properties would be compared to predictions made in the Beaverlodge QSM, which was developed as a tool to assess the baseline water and sediment quality as well as the predicted effects of implementing remedial measures within the Beaverlodge study area.

The management of gamma dose rates at the Martin Lake adit property and surrounding area would be determined via a risk based approach, where mitigation would be conducted in locations that are accessible and pose risk to humans and/or the environment.

3.2 Regulatory Inspections

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 licence continue to be met.

3.2.1 2013 Inspection (Beaverlodge properties)

From July 15, 2013 to July 19, 2013, representatives from Cameco, the CNSC, and SMOE completed a compliance inspection of the 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, 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:*
    - *the seeps at the base of the Fay Waste Rock Pile in the former mill area; and*
    - *boreholes throughout the site for future inspection purposes.*

Cameco's Response:

The locations of all boreholes and seeps are recorded using GPS coordinates as a permanent record of their location.

Beaverlodge Remedial Options Workshop conducted in 2012 Cameco produced the Beaverlodge Path Forward document which lists the activities to be conducted on the properties as they are prepared for transfer to the Province of Saskatchewan's Institutional Control Program. In the Path Forward document Cameco has committed to sealing all boreholes on the Beaverlodge properties. As Cameco locates and seals boreholes, GPS locations are being recorded as a permanent means of identifying the borehole locations. Additionally, a metal stamped tag is placed at each borehole for ease of identifying the borehole while in the field.

Boreholes located at the base of the Fay waste rock pile were sealed in 2011 and 2012. GPS locations were recorded for each borehole as a permanent means of identifying the locations. Cameco will work with a local contractor to develop and implement a method of marking these boreholes to allow easy identification in the field. The boreholes located near the Fay Waste Rock Pile will have labels placed on them prior to July 31, 2014.

GPS locations have been recorded for each of the seeps associated with the Fay waste rock pile. The exact location the seeps exit the waste rock pile has been seen to move from year to year making permanent identification of the locations difficult. Therefore a semi-permanent label will be developed for marking the seeps, likely a metal plate fastened to rebar that can be pounded into overburden near the seep location and can be moved in association the with seep should the location change. Cameco will work with a local contractor to develop and implement a method of effectively labeling the seeps to allow easy identification in the field. It is anticipated that these labels will be in place prior to July 31, 2014.

2. *As tailings boils have been identified in areas that were covered with waste rock during decommissioning, Cameco should characterize and document the geotechnical conditions at Fookes, Marie, Ace Uplands and Lowlands, and the Dorrclone areas during the next geotechnical inspection (by a qualified engineer). Cover stability assessment criteria should be clearly identified and documented for each of these locations. Cameco should also assess the risk associated with the tailings boils and identify a potential trigger for when cover maintenance is required.*

Cameco's Response:

The next scheduled geotechnical assessment (by a qualified engineer) is to be completed in 2015. Cameco will add the assessment criteria identified in recommendation S13-0601-CNSC-R-02 to the scope of the geotechnical assessment. The final report and engineering recommendations will be provided to the regulatory group by September 30, 2015.

3.3 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 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 called in regardless of the regular schedule.

During the 2013 inspection, there was evidence of some ice-jacking in the form of fracturing of the grout-intruding rip-rap. With the most significant displacements near the upper portion of the spillway and specifically located on the sides of the spillway which were within 5 to 6 m of the spillway entrance. In addition, some natural debris was noted upstream of the structure. Photographic evidence was collected for the structure. While there was no evidence of erosion of the grout-intruding rip-rap, some displacement is present due to ice-jacking. There were no immediate concerns at the Marie Reservoir outlet structure that were noted as the structure seems to be functioning as designed.

The Fookes delta was inspected for any evidence of tailings boils, tailings exposure, erosion of the cover, or any sand wash into the lake. In 2012 it was noted that vehicular traffic had gained access to the delta by driving over a berm at the bypass access road put in place to eliminate traffic to the delta. In October 2012, the berm was repaired and made higher. The repaired berm was inspected in 2013 with no evidence of vehicle access over the berm, and no new vehicle tracks were found on the delta itself. Some minor washout from wave action was noted along the shoreline of the tailings cover, erosion was less substantial in areas where aquatic vegetation was emergent. It is indicated in the report that this activity should continue to be closely monitored in future inspections.

The geotechnical inspection took place during the July 2013 JRG inspection. Cameco has prepared a report with the results and photographic record included in Appendix C.

3.4 Studies/Reports

The following section provides a summary of the studies that were completed and provided to the regulatory agencies during the reporting period.

Status of the Environment Report 2008- 2012

As stated in Cameco's Saskatchewan Surface Lease agreement for the Beaverlodge properties, issued in December 2006, as a requirement Cameco must prepare a Status of the Environment (SOE) report on a five-year cycle. The first SOE report for the Beaverlodge properties was completed for the period of 1985 to 2007.The report was prepared by SENES Consultants (SENES) in 2008 and submitted to regulators in January 2009.

Another SOE report has been completed by SENES for the period of January 2008 to December 2012 and submitted in December 2013. The current report examines all relevant environmental data collected since the last SOE was prepared for the Beaverlodge site; from January 2008 to the end of 2012. The report also presents a summary of the current environmental monitoring program and compiles findings from a number of special investigations that have been completed for the site over the study period.

The comparison of SOE predictions to measured data focuses on the on-site environment (Ace Creek and Fulton Creek watersheds) and immediate downstream conditions (i.e Beaverlodge Lake and Martin Lake). Information on water bodies located in further downstream environments is also presented, where appropriate.

Since the Beaverlodge SOE was developed using the majority of surface water and sediment quality data from the 2008 to 2012 period in addition to previous periods, comparison of water and sediment measurements to model predictions were considered not applicable for this iteration of the SOE. Comparisons of water quality data to SOE predictions will be presented for the 2013 to 2017 Beaverlodge SOE as additional data will be available at that time.

Framework for an 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 discharges 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 has been developed and prepared by Minnow Environmental Inc. in 2013, with focus to ensure a consistent approach for data collection and cumulative assessment of downstream water bodies. This framework was provided to the regulatory agencies for comment. Once comments have been addressed Cameco and SRC will begin development of a detailed study design for implementing the program.

It is planned that the REMP will be implemented in the near-term by Cameco and SRC and will ensure that long term monitoring will continue after properties have been transferred into the IC program.

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 at that location. The REMP would discontinue once all criteria is met at all locations and receiving environment conditions are considered to be acceptable.

3.5 2013 Activities

The following section provides a summary of the activities that were completed in 2013. Activities ranged from implementing additional remedial options to developing the path forward for managing the Beaverlodge properties towards eventual transfer to the IC program.

3.5.1 Beaverlodge Borehole Decommissioning

MDH Engineered Solutions Corp. was contracted by Cameco to seal flowing boreholes located on the Beaverlodge property in 2011 and 2012. In total 15 boreholes were identified exhibiting artesian conditions. It is hypothesized that the flowing boreholes, drilled during initial exploration activities, were acting as a conduit for groundwater to flow from the flooded underground mine workings (*MDH, 2011; MDH, 2012*). In 2013 inspections of these areas confirmed that the boreholes have remained sealed.

In 2013 a local contracting company was hired to locate, tag and seal 59 identified non-flowing boreholes on the Beaverlodge properties, with reference to a 2011 SRK borehole investigation report (*SRK, 2011*). This work was successfully completed with the exception of two boreholes, which had previously been identified in the Dubyna area but could not be located at the time of remediation activities. The two boreholes not located during the 2013 campaign are in an area that is not expected to see flowing conditions, therefore the risk posed by leaving them is minimal. However, if during final preparatory activities, additional boreholes are identified they will be tagged and sealed.

While performing the borehole reclamation the contractor identified additional non-flowing boreholes to be plugged. The additional boreholes identified were labelled; AC-02, DB-26, DB-27, and Hab 29 through 36. All the boreholes were successfully plugged using the same strategy as that utilized to plug the previously identified boreholes. The final total of all plugged boreholes as a result of the reclamation activities in 2013 was 68.

In addition, six drill holes were identified by SRK 2011 in the vicinity of the Hab area that were drilled recently by an exploration company and are not the responsibility of Cameco as these boreholes may have future value to the company that performed the drilling.

See Appendix D for a detailed summary of the 2013 borehole reclamation activities that took place on the Beaverlodge properties.

Inspections of these areas will be conducted during annual regulatory inspections to ensure these boreholes remain sealed.

3.5.2 Ace Stope Area Crown Pillar Collapse

On October 3, 2013 a Cameco contractor, working on an unrelated project, discovered an area of subsidence in the area commonly referred to as the Ace Stope Area and notified Cameco of the discovery.

The subsidence occurred in a heavily wooded area near a previous crown pillar collapse that was remediated in 1995 and 1996. Cameco immediately contacted a local contractor and barrier fencing was installed around the area of subsidence to provide warning and prevent people from inadvertently accessing the area.

The CNSC and SMOE were notified on the morning of October 4, 2013. Following conversations with the regulatory agencies a metal fence with hazard signs was posted across the trail to warn local residents and restrict access to the area.

A third party engineering firm conducted a geotechnical inspection of the site and developed recommendations to address the short-term and long-term stability of the area.

Cameco provided a notice to community members describing the incident and requesting they avoid the affected area. The notice was placed in all mailboxes in the community and posted in the local general store and bulk fuel station. This notice was also posted on the Beaverlodge website http://www.beaverlodgesites.com/.

Cameco had a local contractor implement the short term remediation of the surface subsidence areas, which consisted of filling the areas with locally sourced material as per the recommendations provided by the geotechnical consultant. The closure work was completed on October 17, 2013. Following the remediation of the area, Cameco erected additional signage warning people to proceed slowly and with extreme caution due to the potential for additional subsidence in the area. Section 5.4.4 provides a summary of Cameco's plans to assess the site's long term stability and the need for additional remediation.

A detailed report was submitted to regulators in accordance with section 29(2) of the *General Nuclear Safety Regulations*.

3.5.3 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.

A trench was excavated with dimensions of approximately 26 m long x 15 m wide x 1.5 m deep to dispose of materials encountered during the clean-up of remaining debris on the Beaverlodge properties. A lockable gate at the entrance to the Bolger Pit was installed to control access to the area.

Cameco is required to provide information regarding the volume and type of material being disposed of in this area. No material was disposed of in Bolger pit in 2012 and 2013.

3.6 Community Engagement and Consultation

3.6.1 Public Meetings

Two public meetings were held in Uranium City during the 2013 reporting period with the intent of providing 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. In addition, Cameco met with representatives of the Saskatchewan Environmental Society (SES) in February 2013 to discuss the Path Forward report and the remediation plans at Beaverlodge.

January 15, 2013: Path Forward Public Meeting (Uranium City, Saskatchewan)

The 2013 Path Forward public meeting was held at the Ben McIntyre School in Uranium City, Saskatchewan. Attendees included Uranium City residents, EQC members, and representatives from both the CNSC and SMOE.

The purpose of the meeting was to present the Path Forward report and associated performance objectives regarding additional remediation of the Beaverlodge properties, and to gain public feedback. As well, a CNSC representative was in attendance to provide information regarding the relicensing process and public participation in the upcoming relicensing hearing in April 2013.

Cameco began the meeting by distinguishing which properties it is responsible for in the Uranium City area. A summary of the Beaverlodge management framework was provided, identifying the properties emerging from the options assessment phase and entering the ‘implement & monitor options’ phase of the framework. Cameco discussed the Path Forward report which has aided in planning the mitigation of Beaverlodge properties.

Afterwards, time was allocated in to discussion of the path forward and the upcoming relicensing hearing.

September 24, 2013: EQC Meeting (Uranium City, Saskatchewan)

At this meeting there were six attendees from the EQC, nine community members, and representatives from SMOE, the CNSC, Cameco and Canada Eldor. It took place in Uranium City, Saskatchewan at the Ben McIntyre School. All participants were provided fact sheets, a map and an agenda before the formal presentation.

The purpose of this meeting was to provide the EQC and Uranium City residents information regarding the activities related to the management of the Beaverlodge properties. In addition a site tour was conducted to show the EQC and local residents the Beaverlodge properties and respond to any questions regarding the management of the properties.

During the meeting a review of the location and background history of the site was presented. As well, a summary of the 2013 activities was provided to the group, including the most recent water quality sampling results. The presentation also demonstrated how the participation of the EQC and Uranium City residents contributed to the development of the Path Forward.

Management activities that will occur during the new 10-year licence were summarized. These activities include the implementation of remedial options, monitoring the effects of future remediation activities and preparing sites for the transfer to the IC program. It was also emphasized that there would be no change to the regular updates that Cameco provides the CNSC and public meetings and engagement will continue to occur. Afterwards participants were given direction to additional resources including the Beaverlodge website.

February 6, 2013: Saskatchewan Environmental Society Meeting (Saskatoon, Saskatchewan)

The SES was provided with participant funding from the CNSC for the Beaverlodge Licensing Hearing in April 2013. Coordinated through the CNSC via the participant funding program, the SES requested a meeting with Cameco to review the project and receive all the relevant documents they would need to prepare an intervention for the Beaverlodge relicensing hearings.

Two members from the SES, along with representatives from the CNSC and Cameco met on February 6, 2013 at Cameco's Operations Center. The meeting began with an open discussion, followed by a virtual Beaverlodge site tour and discussion led by the site's reclamation coordinator. Key messages that were relayed to the SES by Cameco were the low risks of human or ecological effect, and that the recent country foods study showed that there was no risk to human health from consuming locally harvested food.

3.6.2 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.

EQC representatives attended two Beaverlodge public meetings in Uranium City, as discussed above, and were provided a tour of the properties during the September meeting.

3.6.3 Workshops

No workshops took place in 2013.

3.7 April 3 – 4, 2013: CNSC Relicensing Hearing (Saskatoon, Saskatchewan)

In 2013, Cameco applied to the CNSC for the renewal of the Waste Facility Operating Licence (WFOL) for a 10-year period for the Beaverlodge properties to provide adequate time for Cameco to implement the proposed remedial options identified in the Path Forward report and complete necessary follow-up monitoring.

In making its decision, the CNSC considered information presented in the public hearing held on April 3 and 4 in Saskatoon, Saskatchewan. Information presented included written submissions and oral presentations from eight interveners, CNSC staff and representatives of Cameco. After considering all presented information, the Commission recognized that Cameco is qualified to carry on the licensed activities that were presented in the hearing. The Commission made the decision to grant Cameco a 10-year licence that would be effective from June 1, 2013 to May 31, 2023.

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 Close-Out Objectives and Requirements

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*, *1983b*) it is predicted that at Station TL-7, radium-226 (^{226}Ra) and total dissolved solids (TDS) will not meet the COOs at any point in the foreseeable future and uranium (U) concentrations are expected to meet the COOs only in the long term (i.e. >200 years).

Table 4.1.1 provides a summary of the water quality COOs as originally established by the AECB in 1982 (*AECB, 1982*). In the case that no water quality COOs were established for a specific parameter the most current Saskatchewan Surface Water Qualities would be applicable. In the interest of completeness, the table also provides a summary of the most recent *Saskatchewan Surface Water Quality Objectives for the Protection of Aquatic Life (SSWQO)* and *General Surface Water Quality Objectives* (*Saskatchewan Environment*, *2006*), the *Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME*, *2013*), the *Saskatchewan Municipal Drinking Water Quality Objectives* (*2002*) and the *Guidelines for Canadian Drinking Water Quality (Health Canada, 2012)*.

The estimated operational loadings are summarized in Table 4.1.2, while details regarding current site loadings are discussed in Section 4.6.2.

It is generally recognized that the original COOs are no longer relevant to the management of the Beaverlodge site as changing expectations and scientific knowledge have resulted in re-assessing human health and ecological risk posed by the Beaverlodge site. This annual report will provide comparisons to COOs to ensure consistency with past reporting practices however, this will be the final year for water quality comparisons to COOs. This and future annual reports will see water quality comparisons made against the water quality predictions provided in the SOE.

4.1.1 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 were water quality, ambient radon, air quality, and gamma radiation surveys.

In 2013 only two environmental monitoring programs continue:

1. water quality, and
2. ambient radon.

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. Various water quality concentration averages for a number of stations are compared to the COOs that were established at the time of decommissioning and are presented in Table 4.2 for the current reporting period.

The original gamma radiation surveys were completed in the first year of the transition phase (1985/86) and are now only conducted in specific areas in support of applications to release specific properties from decommissioning and reclamation. Section 5.4.3 provides a summary of the proposed site wide gamma survey that will be conducted at the Beaverlodge properties.

The following sub-sections summarize results for the water and ambient radon monitoring programs.

4.2 Performance Objectives Development

Performance objectives for water quality have been established for all of the licensed sampling locations on the Beaverlodge Site. These performance objectives were originally identified during the development of the QSM and provided the foundation for developing the Path Forward document and determining which additional remedial options considered for implementation.

The performance objectives will be evaluated every five years through the Status of the Environment reports. The SOEs provide a review of the previous five years of monitoring data with comparisons to both regulatory guidelines and performance objectives. Part of the SOE process also includes an evaluation of the recovery predictions and potential updates if necessary.

These predictions will help quantify changes in water quality based on remedial actions implemented as identified in the path forward. It is important to note that once properties are shown to be meeting their respective water quality performance objectives 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.

With the path forward strategy accepted by the regulatory agencies, the water quality performance objectives were updated and incorporated in the SOE report which was finalized at the end of 2013. The performance objectives provide an expected range of water quality values to which water quality trends will be compared.

It is noted that some water quality results lie outside the expected range identified in the SOE, however as this is the first year that comparisons are being made to the SOE predictions interpretation of water quality trends is not possible.

4.3 Water Quality Monitoring Program

This section summarizes the results of the approved water sampling program at Beaverlodge. A revised 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.

In May of 2010, Cameco began monitoring water quality at the Verna Lake discharge to Ace Lake. This station has been labelled as AC-6A, and is now part of the approved environmental monitoring program.

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 4.3.3-36 are graphical representations of the historical annual average concentrations of U, ^{226}Ra, Se and TDS at each station and comparisons to their respective COOs or SSWQO values, and comparisons to the predicted future recovery of water bodies that were presented in the SOE. In the interest of completeness, where data collected during the final six years of operation (1977-1982) was available, it has also been included in the graphs. It should be noted that selenium (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. As there is no guideline under the 2006 SSWQO for ^{226}Ra, the previous 1997 guideline is referred to and serves as an objective for water bodies on the Beaverlodge properties.

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.

Operational and model predictions for the stations AC-14, TL-7, and BL-4 are presented in Table 4.3-1. Table 4.3-2 summarizes the status of each station compared to the COO in the current reporting year.

The current annual report presents both a comparison to the COOs and to the performance objectives provided in the SOE. For the 2013 data, most concentrations are within the predicted recovery ranges while a few are outside these predictions. Since this is the first year that water quality data is being presented in comparison to the SOE predictions, it is inappropriate to formulate any trends in regards to water quality recovery since only a single data point is presented. Once more data is collected it will be possible to establish whether each station is consistently meeting the expected recovery from the SOE report. In the following years, water quality data will no longer be compared to the COOs, but instead will be compared to those values predicted in the SOE.

The detailed water quality results for the current reporting period, January 2013 to December 2013, 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). It is one of the four stations identified in the Eldorado decommissioning documents (*Eldorado, 1982*) at which COOs are applied. During the 2013 reporting period, concentrations of U and TDS met their respective COOs while ^{226}Ra did not. The annual averages of various parameters can be seen in Table 4.3.1-1.

There were a total of six scheduled samples in 2013 with only five samples collected due to lack of water flow in March 2013.

Uranium values have shown a distinct seasonal fluctuation, with highest concentrations occurring in the winter months while late spring to late fall yielding lower U concentrations. This in turn affects the annual average resulting in the COO for U being met since 2009. Overall, the long-term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning up until 2012; with a slight increase in average concentration noted in 2013, from 127.2 µg/L in 2012 to148.6 µg/L.

The long-term trend for ^{226}Ra has shown a gradually increasing trend with considerable fluctuation in year to year average measured activity. Seasonal fluxes varied in magnitude between 0.410 and 1.400 Bq/L in 2013 resulting in an average ^{226}Ra measured activity of 0.928 Bq/L. While this value represents an increase from the 2012 ^{226}Ra average of 0.554 Bq/L the measured activity is still within historical ranges observed at this station.

Similar to U, TDS concentrations exhibit seasonal fluctuation that affect the annual average; however, the long-term trend has remained relatively consistent and below the COO following decommissioning. This trend continued in 2013.

Selenium values at AN-5 are consistently at or below the detection limit of 0.0001 mg/L, and have been well below the SSWQO of 0.001 mg/L since 2001.

All parameters, except for ^{226}Ra, are meeting the COOs for the current reporting period (Table 4.2). A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at AN-5 are presented in Figures 4.3.1-1 to 4.3.1-4. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.1-5 to 4.3.1-8.

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). It is one of the four stations identified in the Eldorado decommissioning document (*Eldorado, 1982*) at which COOs are applied. There were a total of six scheduled samples in 2013 at DB-6 with only five samples collected due to lack of water flow in March 2013.

All parameters were at or below the established COOs during the 2013 reporting period at this station.

Uranium concentrations at DB-6 have shown a consistent decreasing trend in the long term, with U levels meeting the COO in 6 of the last nine years. The average U concentration decreased from 197.3 µg/L in 2012, to 184.2 µg /L in 2013. Three flowing boreholes identified along the shoreline of Dubyna Lake were plugged in 2011 and 2012. Since plugging the boreholes in 2011 it appears that U concentrations at DB-6 are improving. This trend will continue to be monitored in the future.

The long-term trends for ^{226}Ra and TDS at DB-6 have been consistent, with annual averages for both parameters meeting the COOs since 1981 and 1983 respectively.

The water quality trend for Se at DB-6 has remained at or below the SSWQO since 2002.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station DB-6 are presented in Figures 4.3.1-9 to 4.3.1-12. The annual averages from 2008 to 2012 are presented comparatively to those of the current reporting period, as seen in Table 4.3.1-2. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.1-13 to 4.3.1-16.

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 analysed. Flow resumed in 2012 and all scheduled samples were collected that year. Four water samples were scheduled for AC-6A in 2013, although only one sample was collected throughout the year due to lack of flow.

U concentrations and ^{226}Ra measured activity from the one sample collected in 2013 were measured higher than in 2012, while it is the opposite case for TDS and Se concentrations. There appears to be considerable variation in water quality results on a year-to-year basis at this station, with results presented in Table 4.3.1-3. Results are provided according to sample date in Appendix A.

As station AC-6A was added to the water sampling program in 2010, there is not enough data to assess trends. The data is presented graphically in Figures 4.3.1-17 to 4.3.1-20. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.1-21 to 4.3.1-24.

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). Annual average concentrations for 2008 to 2012, and averages from the current reporting period, can be found in Table 4.3.1-4. Long-term trends for concentrations of TDS have remained relatively stable at this station since 1982. The long-term trend for U has been relatively stable, following a slightly decreasing trend since decommissioning. The long-term trend for measured ^{226}Ra activity is well below the COO of 0.11 Bq/L. A slight increase was measured from 2012 to 2013, 0.009 Bq/L and 0.02 Bq/L, respectively.

Prior to August of 2009, selenium was not a part of the routine monitoring program at AC-8. As a result, there is not enough data to confidently identify long-term trends; however, Se concentrations are well below the SSWQO.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station AC-8 are presented in Figures 4.3.1-25 to 4.3.1-28. As the current SSWQOs do not include TDS, a comparison has been made to the COOs. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.1-29 to 4.3.1-32.

AC-14

AC-14 is located in Lower Ace Creek at the discharge into Beaverlodge Lake (Figure 4.3). It is one of the four stations identified in the Eldorado decommissioning document (*Eldorado*, *1982*) at which COOs are applied. Ten of the twelve scheduled samples were collected in 2013, one sample was not collected due to unsafe ice conditions at the sampling location in November and December's sample was collected in January 2014, as the original sample was not collected in the proper location. These results were included in the annual average calculations for AC-14.

The long-term trends for annual average 226Ra activity and U and TDS concentrations measured at this station have been consistently below the COOs since the decommissioning of the Beaverlodge mine/mill complex.

During the 2013 reporting period, U, ^{226}Ra, and TDS were below the COOs, while Se was below the SSWQO. Annual average concentrations from 2008 to 2012, with the averages for 2013 can be found in Table 4.3.1-5.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station AC-14 are presented in Figures 4.3.1-33 to 4.3.1-36. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.1-37 to 4.3.1-40.

4.3.2 Fulton Creek Watershed

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 2013 sample was collected as scheduled in September.

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

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station AN-3 are presented in Figures 4.3.2-1 to 4.3.2-4. The annual average values of the current reporting period are also presented in a comparative fashion in Table 4.3.2-1 to those of the years of 2007 to 2009 and 2012 (low flows in 2011 and 2012 resulted in no sampling at this station).

TL-3

TL-3 is located at the discharge of Fookes Reservoir and is the first sampling location in the recovering tailings management system area (Figure 4.3). Water had not been flowing at TL-3 since May 2010, until freshet in the spring of 2012. All four scheduled samples were collected in 2013.

As discussed previously, surface water quality guidelines are not intended to be applied within tailings management areas, and so they are not applied to Stations TL-3, TL-4, TL-6 or TL-7. Overall, the long-term trend for mean concentrations of U, TDS, and Se has shown a decrease since 1990. 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 BTMA during operations. As barium treatment did not occur in the area upstream of TL-4, this precipitate was likely formed due to natural occurring barium.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station TL-3 are presented in Figures 4.3.2-5 to 4.3.2-8. The annual averages from 2008 to 2010, and the annual average for the current reporting period can be found in Table 4.3.2-2. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.2-9 to 4.3.2-12.

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 had not been flowing at TL-4 since October 2010, thus there is no data available for the latter part of 2010 and for all of 2011. Water began flowing again in the spring of 2012, and all four scheduled samples were collected in 2013.

Annual concentrations of U and TDS at TL-4 have shown sizeable decreases over the long term. Selenium has shown a slow and steady reduction over time and has nearly met the SSWQO at 0.002 mg/L. Similar to TL-3, ^{226}Ra seems to be following a slightly increasing trend for approximately the past 15 years at TL-4. Annual averages from 2008 to the current reporting are presented in Table 4.3.2-3.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station TL-4 are presented in Figures 4.3.2-13 to 4.3.2-16. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.2-17 to 4.3.2-20.

TL-6

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

This water 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. Following the removal of contaminated sediment from minewater reservoir at decommissioning the long-term trend for U and TDS at TL-6 showed a sharp decrease in concentrations.

The annual measured activity of ^{226}Ra has shown considerable fluctuation over the past years ranging from 1.3 Bq/L in 1996 to 7.9 Bq/L in 2013. During the same time period, concentrations of sulphate have been generally decreasing while barium has demonstrated a similar trend to that observed in ^{226}Ra. Cameco hypothesizes this is a result of dissolution of remnant barium-radium-sulphate precipitate that was generated during the active treatment of minewater during operations. The annual average concentrations for 2008 to 2010, 2012 and the current reporting period can be found in Table 4.3.2-4.

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

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station TL-6 are presented in Figures 4.3.2-21 to 4.3.2-24.

TL-7

TL-7 is located at the discharge of Meadow Fen (Figure 4.3). It is the only station within the BTMA identified in the Eldorado decommissioning document (*Eldorado, 1982*) at which COOs are applied. It was noted at the time of decommissioning in the *"Decommissioning of the Beaverlodge Mine/Mill Operations and Reclamation of the Site, Volume 5 - Plan for the Close-Out of the Beaverlodge Site"* that "At TL-7, uranium concentrations will meet the close-out objectives only in the long term. Radium and total dissolved solids concentrations will not meet the objectives, even in the long term" (*ERL, 1983a*).

Of the twelve scheduled samples for the 2013 reporting period, only eight samples were collected due to ice build-up hindering water flow at the station between January and April. During the 2013 reporting period, average U concentration was 253.5 µg/L; slightly above the COO of 250 µg/L established for this station. The trend for TDS at TL-7 has been relatively stable over the last 10 years, however concentrations decreased from 239.4 mg/L in 2012 to 211.5 mg/L for the current reporting period; below the established COO. Similar to upstream stations, ^{226}Ra activity has been following an increasing trend since decommissioning and remains well above the COO of 0.11 Bq/L.

As selenium was not identified as a contaminant of concern at decommissioning there was no established COO for Se, as a result the SSWQO is used for comparison. Annual average selenium concentrations at TL-7 have been relatively stable while following a long-term decreasing trend since 1995, and are nearing the SSWQO.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station TL-7 are presented in Figures 4.3.2-25 to 4.3.2-28. The annual averages for 2008 to 2012, and the current reporting period can be found in Table 4.3.2-5. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.2-29 to 4.3.2-32.

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 unsafe ice conditions in March and November, only ten of twelve scheduled samples were collected in 2013. Average concentrations at TL-9 for 2008 to 2010, 2012 and the current reporting year 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 stable, with a decrease in U from 349.3 µg/L to 289.2 µg/L, between 2012 and 2013.

Radium activity has displayed some fluctuation over the past twenty years but in general the trend has been increasing since 1990.

Concentrations of TDS have shown a decreasing trend in the long term. The annual average TDS concentration has been consistent in the short term. The 2013 average followed the decreasing trend at 237.3 mg/L as compared to the 2012 average of 250.4 mg/L.

Routine monitoring of Se at TL-9 was not conducted until 1996 at which time it was identified as a contaminant of concern. Although Se concentrations are above SSWQO, as with U and TDS, Se had shown a decreasing trend over the long term.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station TL-9 are presented in Figures 4.3.2-33 to 4.3.2-36. Long term trends have been compared to COOs established for TL-7, as water samples collected from TL-9 represent the water flowing into Beaverlodge Lake from the tailings management area. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.2-37 to 4.3.2-40.

4.3.3 Other Transition Phase Monitoring Stations

BL-3

BL-3 is located in 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 collection of samples 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.

The long-term trend for annual average concentrations of TDS and Se at BL-3 has remained relatively consistent from 1998 to 2013, with 2013 concentrations measured at 142.75 mg/L and 0.0027 mg/L respectively. Annual concentrations of U have generally trended downward over the last 10 years, although, U annual concentrations slightly increased from 138 µg/L in 2012 to 141.3 µg/L in 2013. ^{226}Ra at BL-3 increased between 2012 and 2013 from 0.025 Bq/L to 0.052 Bq/L, the respective long-term trend has shown more variability than the other parameters.

Concentrations of Se are typically around 0.003 mg/L and above the SSWQO of 0.001mg/L.

A historical summary of annual average ^{226}Ra activity and of U, TDS and Se concentrations at station BL-3 are presented in Figures 4.3.3-1 to 4.3.3-4. Table 4.3.3-1 displays a comparison of annual average concentrations for the period of 2008 to 2012, and the current reporting period averages. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.3-5 to 4.3.3-8.

BL-4

Station BL-4 is located in the approximate center of the north end of Beaverlodge Lake (Figure 4.3). The sampling frequency was increased from semi-annual to quarterly in 2004-05 in order to better reflect any potential changes or trends. Following approval of the revised water sampling program, semi-annual sampling was resumed in 2011 at BL-4.

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 consistent. The annual average concentration of U at BL-4 for 2013 was 137.5 µg/L, while ^{226}Ra activity and TDS concentrations were 0.025 Bq/L and 142 mg/L, respectively.

Se concentrations have fluctuated over the long term; however, the short-term trend has been more consistent, Se annual average concentrations remained the same at BL-4 from that measured in 2012 at 0.0027 mg/L. All of the measured parameters and their average annual concentrations at BL-4 for 2008 to 2012, and the current reporting period can be found in Table 4.3.3-2.

Historical sampling results are presented in Figures 4.3.3-9 to 4.3.3-12. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.3-13 to 4.3.3-16.

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 from 2011 to the present reporting period. Average concentrations for 2011 to 2013 are presented in Table 4.3.3-3. All four scheduled samples for 2013 were collected, however the December sample was preserved with acid incorrectly resulting in the sample being discarded. The station was resampled in January 2014 and the results are included with the 2013 data in Table 4.3.3-3.

Both U and Se have exceeded their corresponding SSWQOs at BL-5 since monitoring started in 2011, 2013 annual average concentrations were measured at 141.8 µg/L and 0.0028 mg/L, respectively. ^{226}Ra increased from 0.033 Bq/L in 2012 to 0.037 Bq/L in 2013. While TDS slightly decreased from 145.5 mg/L to 142.75 mg/L from 2012 to 2013. Discussion of trends is not yet appropriate since the only data available is for a three year period.

The data is presented graphically in Figures 4.3.3-17 to 4.3.3-20. A comparison of the current reporting year's water quality data and the predicted recovery is presented in Figures 4.3.3-21 to 4.3.3-24.

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.

For the 2013 reporting period, U and Se were above their respective SSWQOs, measuring 66.3 µg/L and 0.0011 mg/L, respectively. The annual average ^{226}Ra activity for 2013 was measured to be 0.011 Bq/L, while the average TDS concentration was 117.75 mg/L for the reporting year. Discussion of trends is not yet appropriate since the only data available is for 2011 to 2013. A table comparing the average concentrations for all measured parameters for 2011 to the present reporting period are presented in Table 4.3.3-4.

The data is presented graphically in Figures 4.3.3-25 to 4.3.3-28.

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 from 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.

The U concentration was above the SSWQO, measured at 67 µg/L, while the ^{226}Ra activity decreased from 2012 to 2013 and was measured at 0.005 Bq/L. Selenium was unchanged from 2012 and measured to be 0.0009 mg/L, while TDS decreased from 125 mg/L in 2012 to 111 mg/L in 2013.

A table comparing the average concentrations for all measured parameters for 2011 to the present reporting period are presented in Table 4.3.3-5. The same information is presented graphically for CS-1 can be found in the figures section under Figure 4.3.3-29 to 4.3.3-32.

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 the only data is from 2011 to 2013.

SSWQO for all parameters are met at this station. The U concentration was measured to be 0.4 µg/L in 2013. The ^{226}Ra activity and Se concentrations were 0.009 Bq/L and 0.0001 mg/L respectively. 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 4.3.3-33 to 4.3.3-36.

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). 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.

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 duplicate samples are sent out in May, June, and July to SRC to test the ability of the laboratory to duplicate results through their analytical methods. Duplicate samples are sent out in June and December to an alternative lab (i.e. Becquerel laboratory or Rabbit Lake laboratory) to determine whether both labs analyzing the samples obtain the same or 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 to determine if the error was a result of methodology and deduce if a reanalysis is warranted.

May's blind duplicate samples were collected successfully at DB-6 and AC-14 and sent to SRC. All results were found to be in within acceptable variation and did not require further investigation.

June's blind duplicate samples were sent to SRC and duplicates of the laboratory samples sent to Becquerel Laboratories for TL-7 and TL-9. Results that had an absolute difference greater than 20% were investigated further. For most analyses, investigation revealed the variation in values were the result of different detection limits being used by both labs or the sample concentrations were approaching laboratory detections limits (e.g 0.04 Bq/L and 0.05 Bq/L). Results that were above the 20% absolute difference and could not be explained, were 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

June's IOP investigations are presented in Table 4.5. Blind duplicate samples from SRC were comparable to those results measured from the primary sample, with exception of TL-9's Pb210 which following and IOP investigation was determined to be acceptable and required no recheck. The lab duplicate sample results comparing results for radionuclides and uranium found absolute differences greater than 20% which resulted in an IOP investigation, that determined ^{226}Ra would require rechecks for both TL-7 and TL-9. Although both samples were within the respective two-standard deviations at both stations, it was determined that the SRC primary results were lower than typically expected. An investigation was ordered from SRC for ^{226}Ra at both stations and it was determined that the original results were a product of volume conversion error and not analytical error. After recalculating the results with the proper volume produced results with similar values measured by Becquerel Labs and in the blind duplicates, the new calculated results were then posted in EIMS replacing the original values.

QA/QC reports for May and June are presented in Appendix E.

July's scheduled samples were not able to be collected due to lack of water flow at both AC-6A and TL-6, resulting in no QC check being conducted for this month. In December, TL-7 and TL-9 were scheduled for duplicate sampling, however the samples were not received by the Rabbit Lake lab in a timely fashion and were found to be frozen in transit. As a result the samples are considered invalid for the QC check report. Corrective actions are being implemented to ensure proper shipping and chain-of-custody to prevent a recurrence of this incident.

4.6 Hydrology

4.6.1 Introduction

MacLaren Plansearch initially estimated the stream flows for various locations within the Ace Creek and Fulton Creek drainage basins in 1983 (*MacLaren Plansearch, 1983*) as part of the Eldorado Resources Ltd. decommissioning documentation. During the 1996-97 reporting period revisions were made to both the Ace Creek and Fulton Creek stream flow estimates using 10 years of actual flow.

A review of post closure monitoring was conducted using data from 1983 to 1996, and confirmed the 1983 estimates were low. A re-assessment of the hydrology in the

Beaverlodge area was subsequently conducted as part of the *Current Period Environmental Assessment* (*Connor Pacific, 1999*).

In summary, the original (1983) streamflow for the predicted shut down and reclamation scenarios (*SENES*, *1983*) were:

- 150 L/s at AC-14
- 7.5 L/s at TL-7

The revised (*TAEM*, *1997*) streamflow predictions were:

- 426 L/s at AC-14
- 16 L/s at TL-7

Table 4.1.2 presents the estimated operational loadings from both the Ace Creek and Fulton Creek drainage systems as well as the total sum of the loadings to Beaverlodge Lake.

4.6.2 . 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, 2013 to December 31, 2013. The report can be found in Appendix B.

At AC-8, the spring runoff flow value was measured to be higher than the long-term mean, but less than that measured the previous spring. The May stream-flow discharge at AC-8 was 1891 L/s compared to the 2467 L/s measured during May 2012. The mean annual flow for 2013 (540 L/s) was higher than the mean long term flow average (475 L/s) however.

The 2013flow rates at TL-7 from May to September were the highest since 2008, with average flows above the long term averages for the months of May, June, July and December. The mean annual flow for 2013 was 23.9 L/s; which is above the mean long term flow average of 16.8 L/s at TL-7.

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 2013 have been calculated and are reported in Tables 4.6.2–1 and 4.6.2–2 respectively.

The loading requirement identified at decommissioning states "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)*. A review of this information shows the loadings of U, ^{226}Ra and TDS to Beaverlodge Lake in 2013 were below that measured during operations. Comparisons for Se loadings with the estimated operational loadings and predicted shutdown loadings are not possible as Se was not monitored until after decommissioning.

Table 4.6.2–3 provides a comparison of the total 2013 loadings from AC-14 and TL-7 to model predictions made at the time of decommissioning. Due to higher average uranium concentrations combined with a higher than normal average flow at Station TL-7 the estimated total loadings were higher in 2013 than what was predicted for uranium under the maximum and minimum reclamation scenarios tabulated in Table 4.6.2–3. The U loadings and concentrations from Station AC-14 met both the long term predictions.

The estimated ^{226}Ra loadings for both AC-14 and TL-7 were above predicted long-term loadings values for minimum and maximum reclamation. The increased 2013 loadings are attributed to higher than average flow rates in 2013 than those used in the predictions for minimum and maximum reclamation at both stations. Additionally, the 2013 average ^{226}Ra concentrations at TL-7 were higher than those predicted, further contributing to the higher loading calculations at this station. Both stations' respective TDS loadings are below the predicted long-term averages.

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 2013 and to July 2013 then again from July 2013 to January 2014. Table 4.7.1 presents a summary of the radon monitoring conducted at the ten sites for the 2013 monitoring period and compares it to the previous six years data. 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 Reservoir outlet structure and the Fookes Delta and outlet structure 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 2014. .

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 our 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 in June or July 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.

A meeting is held, usually in September, with the AEQC and residents of Uranium City. At this meeting an update on current and planned activities is presented, followed by a tour of the licensed properties.

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

With the implementation of the Zora Creek flow path reconstruction planned for 2014 it is anticipated that the annual inspection will focus on the activities related to this project.

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 typically provided in the Appendix of the Beaverlodge Project Annual Report. The next scheduled third party inspection of these areas is 2015.

5.4 2014 Work Plan

Cameco has prepared a path forward workplan which 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 workplan 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 Development of Beaverlodge Program Documents

Property Description Manual (PDM)

The PDM is the final program level document remaining to be developed. Originally the PDM was intended to describe the boundaries of the current licensed properties, the key features within the decommissioned Beaverlodge mine/mill site, as well as provide clarification to the 2006 Beaverlodge Surface Lease Agreement property names and locations. Following the 2013 Beaverlodge Licence Hearing, through discussions with the CNSC, the scope of this document was increased to include the expected conditions required for the properties to be eligible for transfer to the Province of Saskatchewan's Institutional Control Program.

5.4.2 Reports and Documentation

Release of Martin Lake Adits

Cameco previously submitted a request to SMOE for release from decommissioning and reclamation of the Martin Lake adit sites, RA-6 and RA-9. Comments were received from SMOE and the CNSC requesting additional information, specifically related to elevated gamma readings detected on discrete areas on property RA-9 (Beaverlodge Lake side). Cameco is developing a gamma release criteria for the Beaverlodge properties and is confident that once this criteria is accepted by the regulatory agencies these properties will be eligible for transfer to the provincial IC program.

5.4.3 Activities in Support of the Path Forward

Site Wide Gamma Monitoring

Cameco is developing a corporate wide standard that will describe the methodology and expectations for conducting closure gamma surveys.

Cameco intends to initiate a site-wide gamma scanning program to quantify residual site specific gamma levels. The initial focus of the program will be on areas of known tailings spills and elevated gamma. The results of this monitoring will be assessed through the Beaverlodge Management Framework to determine if additional site specific remediation is warranted. In addition, a detailed gamma survey of the licensed properties is required prior to transferring properties to the IC program.

5.4.4 Crown Pillar Assessment

As discussed in Section 3.5.2 it was noted in October 2013 there had been a failure in the crown pillar associated with the Ace Stope area. Short-term recommendations were implemented to ensure the stability of the area.

Long-term remedial actions provided by SRK include additional geotechnical evaluation of the area to determine the extent of voids, crown pillar and overburden thickness in both the 01 and 08 Zones. This assessment may consist of some type of geophysical investigation or geotechnical drilling.

As a result of Cameco's desire to move the Beaverlodge properties into the Provincial IC program, an investigation of crown pillars on all remaining Beaverlodge properties will be undertaken. The first phase of this investigation would consist of a desktop study of all available data. Based on the findings, the desktop study could be followed by a field investigation which may include geophysical or more intrusive studies such as geotechnical drilling. The results of these investigations would be compiled in a report which would identify, and where possible quantify, any potential risk associated with the crown pillars of all the Beaverlodge properties. If required a remediation plan will be developed for the crown pillars proportionate to the level of risk identified.

5.4.5 Ace Creek Watershed Hydrologic Monitoring

This program will continue to monitor the flows originating in the various sub-watersheds feeding Ace Creek. This information will be used to support the pathways model predictions for the Ace Creek area.

5.4.6 Shaft Cover Assessment

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 the 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.

In 2014 Cameco will build on previous work to locate and assess all vertical mine caps (raises and shafts) and develop a plan 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.

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 pile and contributing a contaminant load to Verna Lake. SRK developed conceptual level design and costs of this remedial option. Predicted costs were revised in the Path Forward document based on more detailed information.

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. Cameco has worked with SRK to develop a detailed engineering design and a host of supporting documentation in 2013. The detailed engineering plan has been submitted to the regulatory agencies for review and implementation is expected to begin in May 2014. It is desirable that this project be completed in one season, however contingencies to the plan have been built in that will see the project extended to two years if required.

Stakeholder communication and regulatory inspections will focus on this project in 2014.

5.4.8 Development of Receiving Environment Monitoring Program

Cameco, in partnership with Saskatchewan Research Council, provided the regulatory agencies with a framework for the Receiving Environment Monitoring Program. This program will be a regional program to monitor environmental recovery of the Uranium City mining district. Cameco and SRC will work with the regulatory agencies to have the framework accepted and develop an approved study design with a target implementation of 2015.

The regional monitoring program will provide a tool for assessing the long-term recovery predictions made in the Beaverlodge Path Forward report for Beaverlodge Lake and the downstream environment. The Receiving Environment Monitoring Program will be in addition the approved monitoring program currently in place on the Beaverlodge properties; however results from these separate programs will feed into future monitoring requirements of both programs.

SECTION 6.0
REFERENCES

SECTION 6.0

6.0 REFERENCES

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TABLES

TABLES

Table 4.1.1
Summary of Applicable Water Quality Objectives

Parameter	Units	Close Out Objectives[1]	SSWQO For the Protection of Aquatic Life[2]	Canadian Water Quality Guidelines for the Protection of Aquatic Life[3]	Saskatchewan Municipal Drinking Water Quality Objectives[4]	Guidelines for Canadian Drinking Water Quality[5]
Ammonia, Total	mg/L	-	1.04 at pH 8.0:10°C 32.4 at pH 6.5:10°C	1.04 at pH 8.0:10°C 32.4 at pH 6.5:10°C	-	-
Arsenic	µg/L	10	5	5	25	10
Barium	mg/L	-	-	-	1	1
Cadmium	µg/L	-	0.017 at $[CaCO_3]$=0-48.5 µg/L 0.032 at $[CaCO_3]$=48.5-97 µg/L 0.058 at $[CaCO_3]$= 97-194 µg/L 0.10 at [CaCo3] >194 µg/L	$10^{\{.86[\log(hardness)]-3.2\}}$	5	5
Chromium	mg/L	-	0.001 (Cr VI)	Cr(III) 0.0089 Cr(VI) 0.001	0.05	0.05
Copper	mg/L	0.02	0.002 at $[CaCO_3]$=0-120 mg/L 0.003 at $[CaCO_3]$=120-180 mg/L 0.004 at $[CaCO_3]$ >180 mg/L	$e^{0.8545[\ln(\underline{hardness})]-1.465} * 0.2$ 0.002 -0.004 mg/L Cu	1	AO: 1
Iron	mg/L	0.3	0.3	0.3	0.3	AO: 0.3
Lead	mg/L	0.05	0.001 at $[CaCO_3]$=0-60 mg/L 0.002 at $[CaCO_3]$=60-120 mg/L 0.004 at $[CaCO_3]$=120-180 mg/L 0.007 at $[CaCO_3]$ >180 mg/L	$e^{1.273[\ln(\underline{hardness})]-4.705}$ 0.001- 0.007 mg/L Pb	0.01	0.01
Mercury	µg/L	-	0.026 (inorganic)	0.026 (inorganic)	1.0	1.0
Nickel	mg/L	-	0.025 at $[CaCO_3]$=0-60 mg/L 0.065 at $[CaCO_3]$=60-120 mg/L 0.110 at $[CaCO_3]$=120-180 mg/L 0.150 at $[CaCO_3]$ >180 mg/L	$e^{0.76[\ln(\underline{hardness})]+1.06}$ 0.025- 0.150 mg/L Ni	-	-
pH	-	6.5 – 9.5	-	6.5 – 9.0	6.5 – 9.0	6.5 – 8.5
Radium 226	Bq/L	0.11	0.11 (general) CCME, 1997	-	-	0.5
Selenium	mg/L	-	0.001	0.001	0.01	0.01
Silver	µg/L	-	0.1	0.1	-	-
TDS	mg/L	250	-	-	1500	500
TSS	mg/L	BkGd + 10	-	-	-	-
Uranium	µg /L	250	15	15	20 (Amended 2002)	20
Zinc	mg/L	0.05	0.03	0.03	5	AO: 5

1 Close Out Objectives, Atomic Energy Control Board, 1982
2 Saskatchewan Surface Water Quality Objectives for the Protection of Aquatic Life, Interim Edition, 2006.
3 Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table, CCME, 2013
4 Saskatchewan Municipal Drinking Water Quality Standards and Objectives EPB207/2002.
5 Guidelines for Canadian Drinking Water Quality: Summary Table, Health Canada, August 2012.
AO Aesthetic Objective, adverse health effects occur at much higher concentrations than the indicated aesthetic objective

Table 4.1.2

Estimated Operational Loadings to Beaverlodge Lake

Parameter	Ace Creek	Fulton Creek	Total
Uranium (kg/year)	4,400	11,600	16,000
Total Dissolved Solids (kg/year)	1,180,000	5,060,000	6,240,000
^{226}Radium (Bq/year)	14.9×10^{8}	12.4×10^{8}	27.3×10^{8}

Source: Conor Pacific/ SENES April, 1999

Table 4.2
January 2013 – December 2013 Average Concentrations versus Close-Out Objectives

Parameter	Unit	AC-14	AN-5	DB-6	TL-7	TL-9[1]	Close-Out Objective
Arsenic	(µg/L)	0.2	0.34	0.14	1.45	1.86	**10**
Barium	(mg/L)	0.0243	0.1258	0.048	0.2275	1.089	**-**
Copper	(mg/L)	0.00051	0.00094	0.0007	0.00061	0.00089	**0.02**
Iron	(mg/L)	0.066	0.246	0.0166	0.05625	0.0543	**0.3**
Nickel	(mg/L)	0.00022	0.00052	0.00024	0.00055	0.00049	**-**
Lead	(mg/L)	0.00055	0.00042	0.0002	0.00053	0.00076	**-**
Radium 226	(Bq/L)	0.058	0.928	0.044	1.55	2.94	**0.11**
TDS	(mg/L)	82.7	149.4	151.8	211.5	237.3	**250**
TSS	(mg/L)	0.95	2.8	0.8	< 1.0	1.15	**Background + 10**
Uranium	(µg/L)	26	148.6	184.2	253.5	289.2	**250**
Zinc	(mg/L)	0.00105	0.0022	0.0007	0.00094	0.0016	**0.05**

1- Close-out Objectives were not specified for TL-9, however it is included as it is located at the discharge of the decommissioned tailings management area, immediately before the water enters Beaverlodge Lake.
** In order to calculate the averages of each station, those samples measured below the detection limit were given half the value of the detection limit. In the case a parameter was below the detection for the length of the year, it is indicated as such in the table.

Table 4.3 – 1
Operational and Predicted Water Quality Values

Scenario	Ace Creek (AC14)			Meadow Lake (TL7)			Beaverlodge Lake (BL4)		
	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)	U (mg/L)	^{226}Ra (Bq/L)	TDS (mg/L)
Operation Phase	0.65	0.22	174	4.06	0.44	1793	0.2	0.11	150
Predicted at Shutdown	0.035	0.06	129	3.16	0.53	1130	0.2	0.11	150
Minimum Reclamation (Long Term Predicted*)	0.035	0.06	129	0.1	0.38	389	0.03	0.06	128
Maximum Reclamation (Long Term Predicted*)	0.03	0.06	125	0.1	0.27	414	0.03	0.06	127

* Long term indicates a 200 year time period.

Table 4.3 – 2
Transition Phase Monitoring – Year 28 (January 2013-December 2013)

	AC14	*AN5*	*DB6*	*TL-7*	*AC14*	*TL-7*
	Close Out Objective Concentration				*Model Long Term* Concentration Predicted at Shutdown v. Actual Results*	
Parameter	Met	Met	Met	Met	Met	Met
Arsenic	**Y**	**Y**	**Y**	**Y**	**-**	**-**
Barium	**-**	**-**	**-**	**-**	**-**	**-**
Copper	**Y**	**Y**	**Y**	**Y**	**-**	**-**
Iron	**Y**	**Y**	**Y**	**Y**	**-**	**-**
Nickel	**-**	**-**	**-**	**-**	**-**	**-**
Lead	**-**	**-**	**-**	**-**	**-**	**-**
Radium-226	**Y**	**N**	**Y**	**N**	**Y**	**N**
TDS	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
TSS	**Y**	**Y**	**Y**	**Y**	**-**	**-**
Uranium	**Y**	**Y**	**Y**	**N**	**Y**	**N**
Zinc	**Y**	**Y**	**Y**	**Y**	**-**	**-**

Y – Yes **N** – No

* Long term indicates a 200 year time period.

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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	287	195	313	260	235	232	5
pH-L (pH Unit)	7.77	7.66	7.6	7.51	7.61	7.59	5
TSS (mg/L)	5.833	2	2.167	4.75	1.2	3	5
Major Ions							
Alk-T (mg/L)	135.2	88.2	145.3	115.3	105.4	105.8	5
Ca (mg/L)	40.8	27	43	35.8	33.6	33.6	5
Cl (mg/L)	1.37	0.74	1.68	1.25	1.08	0.8	5
CO3 (mg/L)	1	1	1	1	1	1	5
Hardness (mg/L)	142	95	150	125	116	115	5
HCO3 (mg/L)	164.7	107.8	177.7	140.5	128.6	129.2	5
K (mg/L)	1.9	1.4	2	1.7	1.5	1.5	5
Mg (mg/L)	9.7	6.7	10.3	8.7	7.8	7.6	5
Na (mg/L)	5.2	3.2	6	4.8	4.2	4	5
OH (mg/L)	1	1	1	1	1	1	5
SO4 (mg/L)	18.3	14.5	18.2	17.8	17.2	16.4	5
Sum of Ions (mg/L)	242	161	259	211	194	193	5
TDS (mg/L)	185.33	136.6	204.33	183.75	158.2	149.4	5
Metals							
As (µg/L)	0.5	0.3	0.5	0.4	0.3	0.3	5
Ba (mg/L)	0.167	0.115	0.178	0.148	0.112	0.126	5
Cu (mg/L)	0.002	0.001	0.001	0.001	0.002	0.0009	5
Fe (mg/L)	0.447	0.18	0.557	0.287	0.149	0.246	5
Mo (mg/L)	-	-	0.003	0.003	0.003	0.0029	5
Ni (mg/L)	0.001	0.00055	0.00052	0.00047	0.00058	0.00052	5
Pb (mg/L)	0.002	0.0001	0.0003	0.0001	0.0003	0.0004	5
Se (mg/L)	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	5
Zn (mg/L)	0.005	0.001	0.003	0.002	0.003	0.002	5
Nutrients							
NH3-N (mg/L)	-	-	0.06	0.08	0.01	0.04	1
NO3 (mg/L)	-	-	0.04	0.05	0.05	0.05	5
P-(TP) (mg/L)	-	-	0.03	0.01	0.01	0.01	1
Radionuclides							
Pb210 (Bq/L)	0.11	0.03	0.06	0.02	0.04	0.02	1
Po210 (Bq/L)	0.053	0.02	0.035	0.009	0.008	0.01	1
Ra226 (Bq/L)	1.015	0.762	1.142	0.958	0.554	0.928	5
U (µg/L)	294.5	109	184.8	140.5	127.2	148.6	5
Organics							
C-(org) (mg/L)	-	-	12	11	11	8.1	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 culvert
Dubyna Lake discharge at culvert

Measured Parameter	Previous Period Averages					Current Reporting Period	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	224	218	232	240	230	228	5
pH-L (pH Unit)	7.96	7.85	7.8	7.76	7.73	7.73	5
TSS (mg/L)	1	1	1	1	1.167	1.2	5
Major Ions							
Alk-T (mg/L)	84.3	85.5	87	90.4	90	92.4	5
Ca (mg/L)	35.5	34.8	37	38.2	37.2	36.2	5
Cl (mg/L)	0.65	0.65	0.66	0.74	0.7	0.62	5
CO3 (mg/L)	1	1	1	1	1	1	5
Hardness (mg/L)	112	109	116	120	116	112	5
HCO3 (mg/L)	102.8	104.3	106.2	110.2	109.8	112.6	5
K (mg/L)	0.8	1	1	0.9	0.9	1	5
Mg (mg/L)	5.7	5.3	5.8	6	5.6	5.4	5
Na (mg/L)	2.3	2.1	2.2	2.2	2.1	2.1	5
OH (mg/L)	1	1	1	1	1	1	5
SO4 (mg/L)	27.8	25.5	28.4	28.8	26.7	25.2	5
Sum of Ions (mg/L)	175	174	181	187	183	183	5
TDS (mg/L)	153.25	150.33	157.6	167	155.5	151.8	5
Metals							
As (µg/L)	0.1	0.1	0.1	0.1	0.01	0.1	5
Ba (mg/L)	0.046	0.047	0.047	0.051	0.047	0.048	5
Cu (mg/L)	0.002	0.0008	0.001	0.0006	0.0006	0.0007	5
Fe (mg/L)	0.021	0.02	0.015	0.012	0.017	0.017	5
Mo (mg/L)	-	-	0.0021	0.0022	0.0021	0.0021	5
Ni (mg/L)	0.001	0.00023	0.00018	0.0002	0.00018	0.00024	5
Pb (mg/L)	0.002	0.0001	0.0001	0.0001	0.0001	0.0002	5
Se (mg/L)	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	5
Zn (mg/L)	0.005	0.001	0.002	0.001	0.001	0.001	5
Nutrients							
NH3-N (mg/L)	-	-	0.05	0.05	0.01	0.1	1
NO3 (mg/L)	-	-	0.16	0.33	0.16	0.08	5
P-(TP) (mg/L)	-	-	0.02	0.01	0.01	0.01	1
Radionuclides							
Pb210 (Bq/L)	0.04	0.02	0.02	0.02	0.02	0.02	1
Po210 (Bq/L)	0.013	0.013	0.007	0.006	0.007	0.007	1
Ra226 (Bq/L)	0.037	0.035	0.03	0.033	0.03	0.044	5
U (µg/L)	280	215.5	247.6	252.4	197.3	184.2	5
Organics							
C-(org) (mg/L)	-	-	8.7	9.1	9.35	9.6	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 – 3 AC-6A Summary Statistics and Comparison to Historical Results
Verna Lake discharge to Ace Lake

Measured Parameter	Previous Period Average		Current Reporting Period	
	2010	2012	2013	Count
Physical Properties				
Cond-L (µS/cm)	298	207	275	1
pH-L (pH Unit)	7.77	7.19	7.51	1
TSS (mg/L)	1	1	1	1
Major Ions				
Alk-T (mg/L)	97	63	96	1
Ca (mg/L)	43	32	42	1
Cl (mg/L)	0.4	0.4	0.4	1
CO3 (mg/L)	1	1	1	1
Hardness (mg/L)	143	107	140	1
HCO3 (mg/L)	118	77	117	1
K (mg/L)	0.9	1.7	0.9	1
Mg (mg/L)	8.8	6.7	8.7	1
Na (mg/L)	2.4	1.8	2.3	1
OH (mg/L)	1	1	1	1
SO4 (mg/L)	51	41	48	1
Sum of Ions (mg/L)	225	161	219	1
TDS (mg/L)	199	203.5	175	1
Metals				
As (µg/L)	0.2	0.3	0.2	1
Ba (mg/L)	0.022	0.018	0.022	1
Cu (mg/L)	0.0005	0.0017	0.001	1
Fe (mg/L)	0.021	0.095	0.028	1
Mo (mg/L)	0.0013	0.0007	0.001	1
Ni (mg/L)	0.0001	0.0003	0.0001	1
Pb (mg/L)	0.0001	0.0001	0.0001	1
Se (mg/L)	0.0001	0.0003	0.0001	1
Zn (mg/L)	0.001	0.001	0.001	1
Nutrients				
NH3-N (mg/L)	-	-	-	0
NO3 (mg/L)	0.04	0.04	0.04	1
P-(TP) (mg/L)	-	0.04	-	0
Radionuclides				
Pb210 (Bq/L)	-	0.04	-	0
Po210 (Bq/L)	-	0.03	-	0
Ra226 (Bq/L)	0.1	0.085	0.14	1
U (µg/L)	263	117	201	1
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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	108	109	114	122	115	116	2
pH-L (pH Unit)	7.87	7.69	7.69	7.47	7.62	7.54	2
TSS (mg/L)	1	1.4	1	1	1	1	2
Major Ions							
Alk-T (mg/L)	46.5	50.4	49.8	52	50.5	52	2
Ca (mg/L)	15.5	15.6	16	17.5	16.8	17.5	2
Cl (mg/L)	1	0.92	1.02	1.3	1.08	0.95	2
CO3 (mg/L)	1	1	1	1	1	1	2
Hardness (mg/L)	51	52	53	58	55	58	2
HCO3 (mg/L)	56.5	61.4	60.5	63.5	61.5	63.5	2
K (mg/L)	0.6	0.6	0.8	0.7	0.8	0.9	2
Mg (mg/L)	3.1	3.1	3.2	3.4	3.2	3.5	2
Na (mg/L)	1.5	1.5	1.6	1.5	1.6	1.6	2
OH (mg/L)	1	1	1	1	1	1	2
SO4 (mg/L)	6.8	6.5	6.6	7	6.8	6.8	2
Sum of Ions (mg/L)	85	90	90	95	92	95	2
TDS (mg/L)	63.5	73	77	81.5	78	74	2
Metals							
As (µg/L)	-	0.1	0.2	0.2	0.1	0.2	2
Ba (mg/L)	-	0.022	0.039	0.025	0.023	0.024	2
Cu (mg/L)	-	0.0005	0.0006	0.0004	0.0003	0.0004	2
Fe (mg/L)	-	0.027	0.287	0.027	0.034	0.037	2
Mo (mg/L)	-	0.001	0.001	0.001	0.001	0.001	2
Ni (mg/L)	-	0.00015	0.00015	0.00015	0.00013	0.00015	2
Pb (mg/L)	-	0.0001	0.0002	0.0001	0.0001	0.0005	2
Se (mg/L)	-	0.0001	0.0001	0.0002	0.0001	0.0001	2
Zn (mg/L)	-	0.001	0.001	0.001	0.001	0.001	2
Nutrients							
NH3-N (mg/L)	-	-	0.06	0.07	0.02	0.06	1
NO3 (mg/L)	-	0.04	0.08	0.09	0.12	0.17	2
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	0.02	1
Po210 (Bq/L)	-	0.005	0.007	0.005	0.008	0.005	1
Ra226 (Bq/L)	0.014	0.014	0.015	0.015	0.009	0.02	2
U (µg/L)	18.3	14.6	15.3	16.5	13.5	11.5	2
Organics							
C-(org) (mg/L)	-	-	7.55	6	8.1	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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	116	115	121	132	129	126	11
pH-L (pH Unit)	7.86	7.79	7.72	7.74	7.71	7.61	11
TSS (mg/L)	1.083	1.385	2.917	1.273	1.083	1.181	11
Major Ions							
Alk-T (mg/L)	49.5	52.4	49.1	53.2	53	52.5	11
Ca (mg/L)	16.2	16.5	16.8	18	18.2	17.5	11
Cl (mg/L)	1.38	1.17	1.47	2	1.68	1.24	11
CO3 (mg/L)	1	1	1	1.3	1	1	11
Hardness (mg/L)	53	55	55	59	60	57	11
HCO3 (mg/L)	60.4	63.8	59.8	64.2	64.7	63.9	11
K (mg/L)	0.7	0.7	0.7	0.8	0.8	0.85	11
Mg (mg/L)	3.2	3.2	3.3	3.5	3.5	3.4	11
Na (mg/L)	1.9	1.8	2.1	2.3	2.2	1.95	11
OH (mg/L)	1	1	1	1	1	1	11
SO4 (mg/L)	7.8	7.5	8.8	9.1	9.5	8.3	11
Sum of Ions (mg/L)	92	95	93	100	101	97	11
TDS (mg/L)	71.58	78.08	82.25	86.82	87.08	82.7	11
Metals							
As (µg/L)	0.2	0.2	0.2	0.2	0.2	0.2	11
Ba (mg/L)	0.025	0.025	0.024	0.026	0.024	0.024	11
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.0005	11
Fe (mg/L)	0.099	0.068	0.085	0.074	0.07	0.065	11
Mo (mg/L)	-	0.001	0.001	0.001	0.001	0.001	11
Ni (mg/L)	0.001	0.00033	0.00017	0.00024	0.00023	0.00022	11
Pb (mg/L)	0.002	0.0006	0.0008	0.0005	0.0003	0.0005	11
Se (mg/L)	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	11
Zn (mg/L)	0.005	0.002	0.001	0.002	0.001	0.001	11
Nutrients							
NH3-N (mg/L)	-	-	0.08	0.05	0.09	0.08	4
NO3 (mg/L)	-	0.04	0.14	0.13	0.09	0.15	11
P-(TP) (mg/L)	-	-	0.01	0.01	0.01	0.01	4
Radionuclides							
Pb210 (Bq/L)	0.02	0.02	0.03	0.02	0.02	0.03	4
Po210 (Bq/L)	0.014	0.011	0.01	0.008	0.007	0.008	4
Ra226 (Bq/L)	0.048	0.034	0.046	0.072	0.042	0.055	11
U (µg/L)	27.6	23.8	32.1	33.2	34.9	25.5	11
Organics							
C-(org) (mg/L)	-	-	7.5	7.4	8.25	8.63	4

- 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	
	2007	2008	2009	2012	2013	Count
Physical Properties						
Cond-L (µS/cm)	139	137	136	144	145	1
pH-L (pH Unit)	8.02	7.88	7.88	7.63	7.68	1
TSS (mg/L)	2	2	1	1	1	1
Major Ions						
Alk-T (mg/L)	70	67	69	71	72	1
Ca (mg/L)	20	21	20	21	21	1
Cl (mg/L)	0.7	0.7	0.6	0.7	0.6	1
CO3 (mg/L)	1	1	1	1	1	1
Hardness (mg/L)	68	70	68	72	72	1
HCO3 (mg/L)	85	82	84	87	88	1
K (mg/L)	0.8	0.7	0.8	0.9	0.9	1
Mg (mg/L)	4.5	4.4	4.5	4.9	4.9	1
Na (mg/L)	1.8	1.8	1.8	2	2	1
OH (mg/L)	1	1	1	1	1	1
SO4 (mg/L)	4.3	4.6	4.3	4.5	4.4	1
Sum of Ions (mg/L)	117	115	116	121	122	1
TDS (mg/L)	84	94	89	105	90	1
Metals						
As (µg/L)	0.1	0.1	0.1	0.1	0.1	1
Ba (mg/L)	-	-	-	0.017	0.017	
Cu (mg/L)	0.001	0.001	0.0005	0.0005	0.0007	1
Fe (mg/L)	0.023	0.029	0.013	0.011	0.016	1
Mo (mg/L)	-	-	-	0.0019	0.0017	1
Ni (mg/L)	0.001	0.001	0.0001	0.0002	0.0003	1
Pb (mg/L)	0.002	0.002	0.0001	0.0001	0.0009	1
Se (mg/L)	0.0001	0.0001	0.0001	0.0001	0.0001	1
Zn (mg/L)	0.005	0.005	0.001	0.003	0.001	1
Nutrients						
NH3-N (mg/L)	-	-	-	0.02	0.05	1
NO3 (mg/L)	-	-	-	0.04	0.04	1
P-(TP) (mg/L)	-	-	-	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	0.005	0.006	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.005	0.005	0.006	0.005	1
U (µg/L)	1.5	2	1.6	1.6	1.6	1
Organics						
C-(org) (mg/L)	-	-	-	7.6	7.1	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	
	2008	2009	2010	2012	2013	Count
Physical Properties						
Cond-L (µS/cm)	366	349	334	353	346	4
pH-L (pH Unit)	8.21	8.18	8.08	8.11	8.09	4
TSS (mg/L)	1.167	1.417	1	1.333	1	4
Major Ions						
Alk-T (mg/L)	140.7	135.1	129	140.3	142.8	4
Ca (mg/L)	28	26.2	27	27.3	27.8	4
Cl (mg/L)	4.17	4.17	3.64	4.33	3.75	4
CO3 (mg/L)	1	1	1	1	1	4
Hardness (mg/L)	91	86	89	91	92	4
HCO3 (mg/L)	171.6	164.9	157.6	171	174	4
K (mg/L)	1.3	1.4	1.2	1.4	1.3	4
Mg (mg/L)	5.2	5	5.2	5.5	5.5	4
Na (mg/L)	44.2	42.6	36.6	43.7	40.8	4
OH (mg/L)	1	1	1	1	1	4
SO4 (mg/L)	44.9	44.2	38.2	43.0	40.5	4
Sum of Ions (mg/L)	299	289	270	296	294	4
TDS (mg/L)	228.33	220.25	210.6	227.67	216.5	4
Metals						
As (µg/L)	-	1.1	0.9	1.0	1.0	4
Ba (mg/L)	0.035	0.036	0.034	0.036	0.037	4
Cu (mg/L)	-	0.0014	0.0012	0.0016	0.0013	4
Fe (mg/L)	-	0.008	0.006	0.011	0.010	4
Mo (mg/L)	-	0.019	0.015	0.017	0.017	4
Ni (mg/L)	-	0.00040	0.00028	0.00030	0.00035	4
Pb (mg/L)	-	0.0006	0.0004	0.0007	0.0006	4
Se (mg/L)	0.0049	0.0043	0.0037	0.0043	0.0040	4
Zn (mg/L)	-	0.001	0.001	0.001	0.001	4
Nutrients						
NH3-N (mg/L)	-	-	-	0.01	0.04	1
NO3 (mg/L)	-	0.04	0.1	0.04	0.04	4
P-(TP) (mg/L)	-	-	0.03	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	-	-	0.07	0.08	0.11	1
Po210 (Bq/L)	-	-	0.04	0.04	0.04	1
Ra226 (Bq/L)	1.122	1.198	1.07	1.3	1.3	4
U (µg/L)	423.3	393.9	341.8	387.7	372.0	4
Organics	-					
C-(org) (mg/L)	-		9.5	8.5	7.2	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	
	2008	2009	2010	2012	2013	Count
Physical Properties						
Cond-L (µS/cm)	358	341	445	329	334	4
pH-L (pH Unit)	8.14	8.13	7.79	7.97	8.06	4
TSS (mg/L)	2.083	1.273	2.000	1.333	1.000	4
Major Ions						
Alk-T (mg/L)	140.3	136.8	146.6	139.3	143.3	4
Ca (mg/L)	23.8	22	38.6	18	21.3	4
Cl (mg/L)	4.35	4.18	4.7	4	3.75	4
CO3 (mg/L)	1.1	1	1	1	1	4
Hardness (mg/L)	81	77	124	68	76	4
HCO3 (mg/L)	170.3	165.1	178.8	170	174.8	4
K (mg/L)	1.4	1.5	1.5	1.5	1.5	4
Mg (mg/L)	5.3	5.2	6.6	5.6	5.6	4
Na (mg/L)	47.5	45.2	47	47.7	45	4
OH (mg/L)	1	1	1	1	1	4
SO4 (mg/L)	40.8	39.7	78.1	33.3	32.8	4
Sum of Ions (mg/L)	294	286	355	280	285	4
TDS (mg/L)	226	227	290	220	214	4
Metals						
As (µg/L)	-	1.7	1.6	1.9	1.6	4
Ba (mg/L)	0.083	0.066	0.108	0.077	0.079	4
Cu (mg/L)	-	0.0008	0.0014	0.0006	0.0006	4
Fe (mg/L)	-	0.028	0.311	0.099	0.033	4
Mo (mg/L)	-	0.014	0.0105	0.010	0.0106	4
Ni (mg/L)	-	0.0006	0.00126	0.00057	0.000570	4
Pb (mg/L)	-	0.0008	0.0004	0.0003	0.0006	4
Se (mg/L)	0.0038	0.0025	0.0031	0.0020	0.0020	4
Zn (mg/L)	-	0.001	0.003	0.001	0.001	4
Nutrients						
NH3-N (mg/L)	-	-	0.05	0.03	0.12	1
NO3 (mg/L)	-	0.04	0.05	0.04	0.04	4
P-(TP) (mg/L)	-	-	0.02	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	-	-	0.23	0.02	0.06	1
Po210 (Bq/L)	-	-	0.055	0.03	0.02	1
Ra226 (Bq/L)	1.433	1.582	1.650	1.567	1.925	4
U (µg/L)	324.3	344.5	419.8	270	291.3	4
Organics						
C-(org) (mg/L)	-	-	8.8	12	9.9	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 Lake discharge

Measured Parameter	Previous Period Averages				Current Reporting Period	
	2008	2009	2010	2012	2013	Count
Physical Properties						
Cond-L (µS/cm)	794	765	791	780	790	1
pH-L (pH Unit)	8.07	7.94	7.94	7.73	7.87	1
TSS (mg/L)	3	5	2	8	2	1
Major Ions						
Alk-T (mg/L)	312	289.5	306	286	288	1
Ca (mg/L)	54	47	46	41.8	55	1
Cl (mg/L)	54	56	54	59.5	47	1
CO3 (mg/L)	1	1	1	1	1	1
Hardness (mg/L)	184	165	160	152	186	1
HCO3 (mg/L)	381	353	373	348.8	351	1
K (mg/L)	2.6	2.8	3.1	3.4	2.8	1
Mg (mg/L)	12	11.6	11	11.6	12	1
Na (mg/L)	112	110.5	118	122.8	108	1
OH (mg/L)	1	1	1	1	1	1
SO4 (mg/L)	48	43.5	41	53.5	62	1
Sum of Ions (mg/L)	664	625	646	641	638	1
TDS (mg/L)	516	526	529	541.75	532	1
Metals						
As (µg/L)	-	-	1.2	3.3	3	1
Ba (mg/L)	1.11	1.14	1.16	1.165	1.26	1
Cu (mg/L)	-	-	0.0003	0.0008	0.0006	1
Fe (mg/L)	-	-	0.71	3.543	1.79	1
Mo (mg/L)	-	-	0.0017	0.0018	0.0016	1
Ni (mg/L)	-	-	0.0003	0.00045	0.0005	1
Pb (mg/L)	-	-	0.0001	0.001	0.0002	1
Se (mg/L)	0.0022	0.0023	0.0022	0.0052	0.0025	1
Zn (mg/L)	-	-	0.001	0.001	0.001	1
Nutrients						
NH3-N (mg/L)	-	-	-	0.08	0.12	1
NO3 (mg/L)	-	-	0.04	0.07	0.04	1
P-(TP) (mg/L)	-	-	-	0.01	0.01	1
Radionuclides						
Pb210 (Bq/L)	-	-	-	0.11	0.07	1
Po210 (Bq/L)	-	-	-	0.09	0.05	1
Ra226 (Bq/L)	6.2	5.55	5.6	5.35	7.9	1
U (µg/L)	273	210	248	237.5	225	1
Organics						
C-(org) (mg/L)	-	-	-	39	36	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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	402	352	454	475	369	328	8
pH-L (pH Unit)	8.17	8	7.87	7.99	7.82	7.88	8
TSS (mg/L)	1.75	1.364	1.333	1.333	1	1	8
Major Ions							
Alk-T (mg/L)	153.4	140.1	150.4	148.3	138.1	138.3	8
Ca (mg/L)	29.3	23.5	36.9	41.8	25.8	21.4	8
Cl (mg/L)	6.33	5.8	7.4	10.55	13.59	4.75	8
CO3 (mg/L)	1.3	1	1	1	1	1	8
Hardness (mg/L)	98	81	123	140	92	77	8
HCO3 (mg/L)	186.5	170.9	183.4	180.8	168.5	168.8	8
K (mg/L)	1.4	1.5	1.5	2.4	1.7	1.4	8
Mg (mg/L)	6	5.5	7.6	8.7	6.8	5.7	8
Na (mg/L)	50.4	45.5	50	47.2	45	42.9	8
OH (mg/L)	1	1	1	1	1	1	8
SO4 (mg/L)	47.9	39.2	74.7	86.3	38	30.4	8
Sum of Ions (mg/L)	328	292	362	378	299	275	8
TDS (mg/L)	249.58	222	297.11	309.5	239.38	211.5	8
Metals							
As (µg/L)	1.4	1.5	1.4	1.1	1.7	1.5	8
Ba (mg/L)	0.356	0.162	0.353	0.352	0.199	0.227	8
Cu (mg/L)	0.001	0.0011	0.001	0.0006	0.0008	0.0006	8
Fe (mg/L)	0.064	0.055	0.177	0.092	0.148	0.056	8
Mo (mg/L)		0.013	0.0107	0.008	0.0092	0.0097	8
Ni (mg/L)	0.001	0.00064	0.00063	0.00062	0.00069	0.00055	8
Pb (mg/L)	0.002	0.0007	0.0004	0.0002	0.0004	0.0005	8
Se (mg/L)	0.0038	0.0024	0.0053	0.0055	0.0033	0.0019	8
Zn (mg/L)	0.005	0.001	0.002	0.001	0.001	0.001	8
Nutrients							
NH3-N (mg/L)	-	-	0.03	0.21	0.03	0.06	3
NO3 (mg/L)	-	0.04	0.06	0.28	0.04	0.040	8
P-(TP) (mg/L)	-	-	0.02	0.01	0.01	0.01	3
Radionuclides							
Pb210 (Bq/L)	0.05	0.06	0.07	0.02	0.05	0.04	3
Po210 (Bq/L)	0.037	0.043	0.02	0.015	0.06	0.033	3
Ra226 (Bq/L)	1.719	1.273	1.621	0.857	0.88	1.55	8
U (µg/L)	313.8	327.5	274.9	196.8	264.3	253.5	8
Organics							
C-(org) (mg/L)	-	-	9.667	11	13	10.1	3

- 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	
	2008	2009	2010	2012	2013	Count
Physical Properties						
Cond-L (µS/cm)	372	348	464	374	366	10
pH-L (pH Unit)	8.16	8.11	8.04	8	8.0	10
TSS (mg/L)	1.6	1.375	1.25	1.625	1.4	10
Major Ions						
Alk-T (mg/L)	143.6	139	186.5	152.6	156.1	10
Ca (mg/L)	25.1	22.6	32.5	24.8	26.6	10
Cl (mg/L)	6.7	6.63	9.25	9	6.9	10
CO3 (mg/L)	1	1	1	1	1	10
Hardness (mg/L)	88	82	122	93	95	10
HCO3 (mg/L)	175.1	169.5	227.5	186	190.5	10
K (mg/L)	1.4	1.5	2.3	1.7	1.6	10
Mg (mg/L)	6.3	6.3	9.8	7.6	6.9	10
Na (mg/L)	46.2	43.4	57.3	46.8	43.9	10
OH (mg/L)	1	1	1	1	1	10
SO4 (mg/L)	41.6	36.8	46	34.9	30.6	10
Sum of Ions (mg/L)	303	287	385	311	307	10
TDS (mg/L)	212	220.63	308	250.4	237.3	10
Metals						
As (µg/L)	1.9	1.7	1.1	1.9	1.9	10
Ba (mg/L)	0.597	0.824	0.563	1.099	1.089	10
Cu (mg/L)	0.003	0.0008	0.0009	0.0008	0.0009	10
Fe (mg/L)	0.14	0.047	0.02	0.055	0.054	10
Mo (mg/L)	-	-	0.0107	0.0144	0.0127	10
Ni (mg/L)	0.001	0.00057	0.00047	0.00044	0.00049	10
Pb (mg/L)	0.002	0.0012	0.0003	0.0009	0.0008	10
Se (mg/L)	0.0036	0.0032	0.0048	0.0045	0.0028	10
Zn (mg/L)	0.005	0.002	0.001	0.001	0.001	10
Nutrients						
NH3-N (mg/L)	-	-	-	0.07	0.12	3
NO3 (mg/L)	-	-	0.13	0.24	0.238	10
P-(TP) (mg/L)	-	-	0.03	0.01	0.0083	3
Radionuclides						
Pb210 (Bq/L)	0.13	0.07	0.06	0.08	0.13	3
Po210 (Bq/L)	0.042	0.04	0.02	0.06	0.043	3
Ra226 (Bq/L)	1.86	2.075	0.98	2.45	2.94	10
U (µg/L)	311.9	296.4	483.8	349.3	289.2	10
Organics						
C-(org) (mg/L)	-	-	14	14	11.3	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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	254	253	252	250	245	246	4
pH-L (pH Unit)	8.08	7.97	7.98	7.79	7.8	7.80	4
TSS (mg/L)	1	1	1	1	1	1	4
Major Ions							
Alk-T (mg/L)	72.8	74.3	72.7	70.7	72.3	73	4
Ca (mg/L)	21.5	22.5	22	21.8	21.8	22.3	4
Cl (mg/L)	14.5	14.25	13.67	13.5	13.25	12.75	4
CO3 (mg/L)	1	1	1	1	1	1	4
Hardness (mg/L)	75	79	77	77	77	78	4
HCO3 (mg/L)	88.8	90.5	89	86	88	89	4
K (mg/L)	1.2	1.2	1.2	1.1	1.2	1.3	4
Mg (mg/L)	5.3	5.5	5.5	5.4	5.5	5.5	4
Na (mg/L)	20.8	20.5	20	19.8	19.5	19.8	4
OH (mg/L)	1	1	1	1	1	1	4
SO4 (mg/L)	32	34.3	33.7	33	32.8	32.5	4
Sum of Ions (mg/L)	184	189	185	178	182	183	4
TDS (mg/L)	149.5	151.25	150.33	151.33	147.5	142.75	4
Metals							
As (µg/L)	0.3	0.3	0.5	0.3	0.3	0.3	4
Ba (mg/L)	0.035	-	0.039	0.035	0.037	0.043	4
Cu (mg/L)	0.004	0.0014	0.0017	0.0027	0.0009	0.0027	4
Fe (mg/L)	0.048	0.01	0.007	0.008	0.003	0.011	4
Mo (mg/L)	-	-	0.0037	0.0037	0.0037	0.0038	4
Ni (mg/L)	0.00575	0.00178	0.0033	0.00347	0.0014	0.0056	4
Pb (mg/L)	0.002	0.0006	0.0002	0.0003	0.0001	0.0004	4
Se (mg/L)	0.003	0.0031	0.0029	0.0028	0.0027	0.0027	4
Zn (mg/L)	0.005	0.004	0.005	0.006	0.002	0.004	4
Nutrients							
NH3-N (mg/L)	-	-	0.22	0.21	0.08	0.08	1
NO3 (mg/L)	-	-	0.04	0.06	0.04	0.05	4
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	0.02	0.03	1
Po210 (Bq/L)	0.005	0.005	0.004	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.052	0.052	0.048	0.023	0.025	0.052	4
U (µg/L)	146.5	152	145.3	140.5	138	141.3	4
Organics							
C-(org) (mg/L)	-	-	-	3.8	3.4	4.8	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 4.3.3 – 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	
	2008	2009	2010	2011	2012	2013	Count
Physical Properties							
Cond-L (µS/cm)	249	244	246	246	241	241	2
pH-L (pH Unit)	8.06	7.98	7.94	7.7	7.84	7.79	2
TSS (mg/L)	1	1	1	1	1	1	2
Major Ions							
Alk-T (mg/L)	68.8	71	69.5	67.5	69.5	71	2
Ca (mg/L)	21	21.3	21.3	21.5	21.5	21.5	2
Cl (mg/L)	14	13.5	14	14	14	13	2
CO3 (mg/L)	1	1	1	1	1	1	2
Hardness (mg/L)	73	75	75	76	76	76	2
HCO3 (mg/L)	84	86.5	85	82	85	86.5	2
K (mg/L)	1.1	1.2	1.2	1.1	1.3	1.3	2
Mg (mg/L)	5.2	5.3	5.3	5.3	5.4	5.4	2
Na (mg/L)	20	19.5	19.5	19.5	20	19.5	2
OH (mg/L)	1	1	1	1	1	1	2
SO4 (mg/L)	32	32.8	33	32.5	33.5	33	2
Sum of Ions (mg/L)	177	180	179	176	181	180	2
TDS (mg/L)	143	142	147	143	140.5	142	2
Metals							
As (µg/L)	0.3	0.3	0.3	0.3	0.3	0.2	2
Ba (mg/L)	0.034		0.035	0.034	0.034	0.035	2
Cu (mg/L)	0.002	0.0018	0.0013	0.0012	0.0017	0.0019	2
Fe (mg/L)	0.006	0.014	0.043	0.003	0.005	0.014	2
Mo (mg/L)	-	-	0.0037	0.0044	0.0038	0.0036	2
Ni (mg/L)	0.0025	0.00235	0.00173	0.0022	0.0024	0.00245	2
Pb (mg/L)	0.002	0.0006	0.0002	0.0001	0.0002	0.0005	2
Se (mg/L)	0.003	0.003	0.0028	0.0028	0.0027	0.0027	2
Zn (mg/L)	0.005	0.006	0.005	0.002	0.004	0.005	2
Nutrients							
NH3-N (mg/L)	-	-	0.06	0.08	0.04	0.08	2
NO3 (mg/L)	-	-	0.05	0.42	0.04	0.04	2
P-(TP) (mg/L)	-	-	0.01	0.01	0.01	0.01	2
Radionuclides							
Pb210 (Bq/L)	0.02	0.02	0.03	0.03	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	0.025	0.035	0.025	0.03	0.025	2
U (µg/L)	140.5	143.8	143.8	142	138.5	137.5	2
Organics							
C-(org) (mg/L)	-	-	3.3	3.4	3.45	3.85	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	Count
Physical Properties				
Cond-L (µS/cm)	227	248	249	4
pH-L (pH Unit)	7.65	7.84	7.8	4
TSS (mg/L)	2.333	1	1	4
Major Ions				
Alk-T (mg/L)	66.7	70.5	71.0	4
Ca (mg/L)	21	21.8	21.8	4
Cl (mg/L)	11.47	14	13.25	4
CO3 (mg/L)	1	1	1	4
Hardness (mg/L)	73	77	77	4
HCO3 (mg/L)	81.3	86	86.8	4
K (mg/L)	1.1	1.2	1.3	4
Mg (mg/L)	5	5.5	5.5	4
Na (mg/L)	16	20	19.8	4
OH (mg/L)	1	1	1	4
SO4 (mg/L)	27	33.5	32.8	4
Sum of Ions (mg/L)	163	182	181	4
TDS (mg/L)	135.33	145.5	142.75	4
Metals				
As (µg/L)	0.3	0.3	0.3	4
Ba (mg/L)	0.038	0.034	0.035	4
Cu (mg/L)	0.0009	0.0003	0.0003	4
Fe (mg/L)	0.008	0.001	0.005	4
Mo (mg/L)	0.0034	0.0037	0.0038	4
Ni (mg/L)	0.0002	0.00018	0.0002	4
Pb (mg/L)	0.0001	0.0001	0.0004	4
Se (mg/L)	0.0023	0.0028	0.0028	4
Zn (mg/L)	0.001	0.001	0.001	
Nutrients				
NH3-N (mg/L)	0.06	0.01	0.09	1
NO3 (mg/L)	1.07	0.04	0.04	4
P-(TP) (mg/L)	0.01	0.01	0.01	1
Radionuclides				
Pb210 (Bq/L)	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.021	0.033	0.037	4
U (µg/L)	143.3	139.3	141.8	4
Organics				
C-(org) (mg/L)	2.9	3.3	3.4	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	Count
Physical Properties				
Cond-L (µS/cm)	213	174	188	4
pH-L (pH Unit)	7.78	7.67	7.71	4
TSS (mg/L)	1	1	1.00	4
Major Ions				
Alk-T (mg/L)	68.3	63	67.5	4
Ca (mg/L)	20.5	19.5	20	4
Cl (mg/L)	10.3	5.2	8	4
CO3 (mg/L)	1	1	1	4
Hardness (mg/L)	71	66	68	4
HCO3 (mg/L)	83.5	76.8	82.5	4
K (mg/L)	1.1	1.1	1.2	4
Mg (mg/L)	4.8	4.3	4.5	4
Na (mg/L)	14.5	9.3	11.6	4
OH (mg/L)	1	1	1	4
SO4 (mg/L)	23.3	15.1	18.5	4
Sum of Ions (mg/L)	158	132	147	4
TDS (mg/L)	129.75	113.75	117.75	4
Metals				
As (µg/L)	0.2	0.2	0.2	4
Ba (mg/L)	0.042	0.042	0.044	4
Cu (mg/L)	0.0004	0.0014	0.0014	4
Fe (mg/L)	0.006	0.016	0.012	4
Mo (mg/L)	0.0031	0.0016	0.0020	4
Ni (mg/L)	0.00013	0.00015	0.00028	4
Pb (mg/L)	0.0001	0.0015	0.0006	4
Se (mg/L)	0.0016	0.0008	0.0011	4
Zn (mg/L)	0.001	0.002	0.002	4
Nutrients				
NH3-N (mg/L)	0.07	0.06	0.06	4
NO3 (mg/L)	0.2	0.1	0.08	4
P-(TP) (mg/L)	0.01	0.01	0.01	4
Radionuclides				
Pb210 (Bq/L)	0.02	0.02	0.02	4
Po210 (Bq/L)	0.005	0.005	0.005	4
Ra226 (Bq/L)	0.009	0.007	0.0110	4
U (µg/L)	69.3	48.8	66.3	4
Organics				
C-(org) (mg/L)	4.8	7.3	5.8	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	Count
Physical Properties				
Cond-L (µS/cm)	211	199	186	1
pH-L (pH Unit)	7.78	7.76	7.68	1
TSS (mg/L)	1	1	4	1
Major Ions				
Alk-T (mg/L)	85	64	66	1
Ca (mg/L)	28	20	20	1
Cl (mg/L)	7.8	7.6	7.9	1
CO3 (mg/L)	1	1	1	1
Hardness (mg/L)	96	68	70	1
HCO3 (mg/L)	104	78	80	1
K (mg/L)	1.2	1.1	1.1	1
Mg (mg/L)	6.3	4.5	4.8	1
Na (mg/L)	6.4	11	11	1
OH (mg/L)	1	1	1	1
SO4 (mg/L)	11	17	17	1
Sum of Ions (mg/L)	165	139	142	1
TDS (mg/L)	135	125	111	1
Metals				
As (µg/L)	0.2	0.2	0.2	1
Ba (mg/L)	0.056	0.042	0.045	1
Cu (mg/L)	0.0004	0.0002	0.0006	1
Fe (mg/L)	0.1	0.026	0.086	1
Mo (mg/L)	0.003	0.002	0.0021	1
Ni (mg/L)	0.0003	0.0001	0.0002	1
Pb (mg/L)	0.0001	0.0001	0.0011	1
Se (mg/L)	0.0003	0.0009	0.0009	1
Zn (mg/L)	0.001	0.001	0.001	1
Nutrients				
NH3-N (mg/L)	0.08	0.03	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	1
Po210 (Bq/L)	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.006	0.005	1
U (µg/L)	47	57	67	1
Organics				
C-(org) (mg/L)	11	6.2	6.2	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 4.3.3 – 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	Count
Physical Properties				
Cond-L (µS/cm)	68	81	74	1
pH-L (pH Unit)	7.45	7.51	7.37	1
TSS (mg/L)	1	1	1	1
Major Ions				
Alk-T (mg/L)	28	31	29	1
Ca (mg/L)	7.1	8.3	7.5	1
Cl (mg/L)	2	3.6	3.4	1
CO3 (mg/L)	1	1	1	1
Hardness (mg/L)	27	30	28	1
HCO3 (mg/L)	34	38	35	1
K (mg/L)	0.5	0.8	0.9	1
Mg (mg/L)	2.2	2.4	2.3	1
Na (mg/L)	2.4	3.5	2.8	1
OH (mg/L)	1	1	1	1
SO4 (mg/L)	3.5	5	3.9	1
Sum of Ions (mg/L)	52	62	56	1
TDS (mg/L)	220	64	50	1
Metals				
As (µg/L)	0.3	0.2	0.2	1
Ba (mg/L)	0.011	0.014	0.012	1
Cu (mg/L)	0.0006	0.0002	0.0002	1
Fe (mg/L)	0.013	0.006	0.009	1
Mo (mg/L)	0.0002	0.0003	0.0002	1
Ni (mg/L)	0.0004	0.0003	0.0003	1
Pb (mg/L)	0.0001	0.0001	0.0001	1
Se (mg/L)	0.0001	0.0001	0.0001	1
Zn (mg/L)	0.001	0.001	0.001	1
Nutrients				
NH3-N (mg/L)	0.06	0.01	0.01	1
NO3 (mg/L)	0.04	0.04	0.04	1
P-(TP) (mg/L)	0.02	0.01	0.01	1
Radionuclides				
Pb210 (Bq/L)	0.02	0.02	0.02	1
Po210 (Bq/L)	0.005	0.005	0.005	1
Ra226 (Bq/L)	0.005	0.009	0.0090	1
U (µg/L)	0.3	4.8	0.4	1
Organics				
C-(org) (mg/L)	2.8	3.5	3.4	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	Current Reporting Period	
	2013	Count
Physical Properties		
Cond-L (µS/cm)	229	5
pH-L (pH Unit)	7.91	5
TSS (mg/L)	1	5
Major Ions		
Alk-T (mg/L)	103.6	5
Ca (mg/L)	33.4	5
Cl (mg/L)	0.24	5
CO3 (mg/L)	1	5
Hardness (mg/L)	118	5
HCO3 (mg/L)	126.4	5
K (mg/L)	0.9	5
Mg (mg/L)	8.4	5
Na (mg/L)	1.9	5
OH (mg/L)	1	5
SO4 (mg/L)	19.6	5
Sum of Ions (mg/L)	191	5
TDS (mg/L)	145.6	5
Metals		
As (µg/L)	0.2	5
Ba (mg/L)	0.023	5
Cu (mg/L)	0.0010	5
Fe (mg/L)	0.01	5
Mo (mg/L)	0.0009	5
Ni (mg/L)	0.00022	5
Pb (mg/L)	0.00070	5
Se (mg/L)	0.0001	5
Zn (mg/L)	0.0030	5
Nutrients		
NH3-N (mg/L)	0.03	2
NO3 (mg/L)	0.04	5
P-(TP) (mg/L)	0.01	5
Radionuclides		
Pb210 (Bq/L)	0.02	3
Po210 (Bq/L)	0.006	3
Ra226 (Bq/L)	0.028	5
U (µg/L)	18.2	5
Organics		
C-(org) (mg/L)	8.733	3

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	Current Reporting Period	
	2013	Count
Physical Properties		
Cond-L (µS/cm)	382	5
pH-L (pH Unit)	7.91	5
TSS (mg/L)	1	5
Major Ions		
Alk-T (mg/L)	122.4	5
Ca (mg/L)	61.4	5
Cl (mg/L)	1	5
CO3 (mg/L)	1	5
Hardness (mg/L)	199	5
HCO3 (mg/L)	149.4	5
K (mg/L)	1	5
Mg (mg/L)	11.2	5
Na (mg/L)	2.4	5
OH (mg/L)	1	5
SO4 (mg/L)	78.2	5
Sum of Ions (mg/L)	305	5
TDS (mg/L)	253	5
Metals		
As (µg/L)	0.2	5
Ba (mg/L)	0.025	5
Cu (mg/L)	0.0034	5
Fe (mg/L)	0.022	5
Mo (mg/L)	0.0013	5
Ni (mg/L)	0.00036	5
Pb (mg/L)	0.0006	5
Se (mg/L)	0.0005	5
Zn (mg/L)	0.002	5
Nutrients		
NH3-N (mg/L)	0.04	2
NO3 (mg/L)	0.92	5
P-(TP) (mg/L)	0.01	5
Radionuclides		
Pb210 (Bq/L)	0.19	3
Po210 (Bq/L)	0.06	3
Ra226 (Bq/L)	0.368	5
U (µg/L)	624.8	5
Organics		
C-(org) (mg/L)	6.3	3

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 - June QA/QC IOP Investigations and Rechecks

TL-7	SRC	Becquerel	% Difference	Required IOP investigation	IOP (%)	Recheck
Pb210 (Bq/L)	0.05	<0.1	**100**	No	N/A	No
Po210 (Bq/L)	0.04	0.05	**25**	No	N/A	No
Ra226 (Bq/L)	0.41	1.51	**268.3**	Yes	114.58	Yes
U (µg/L)	198	210	6.8	No	N/A	No
TL-9	**SRC**	**Becquerel**	**% Difference**	**Required IOP investigation**	**IOP (%)**	**Recheck**
Pb210 (Bq/L)	0.14	0.12	14.3	No	N/A	No
Po210 (Bq/L)	0.06	0.11	**83.3**	Yes	58.8	No
Ra226 (Bq/L)	0.74	3	**305.4**	Yes	120.9	Yes
U (µg/L)	220	230	4.5	No	N/A	No
TL-9	**SRC Primary**	**SRC Blind Duplicate**	**% Difference**	**Required IOP investigation**	**IOP (%)**	**Recheck**
Pb210 (Bq/L)	0.14	0.07	50	Yes	66.67	No

Table 4.6.2 – 1
January 2013 - December 2013 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	3.00									No water was flowing due to ice build up at weir
February	28	0.90									
March	31	0.00									
April	30	0.00									
May	31	98.80	241	63.775	1.7	44.986	202	5.345	0.0025	0.662	
June	30	83.70	198	42.956	1.4	30.373	198	4.296	0.0022	0.477	
July	31	33.80	222	20.098	1.5	13.579	187	1.693	0.0016	0.145	
August	31	17.10	174	7.969	1.7	7.786	209	0.957	0.0014	0.064	
September	30	12.70	247	8.131	1.6	5.267	215	0.708	0.0016	0.053	
October	31	11.60	307	9.538	1.4	4.350	214	0.665	0.0019	0.059	
November	30	12.50	322	10.433	1.4	4.536	227	0.735	0.0021	0.068	
December	31	12.90	317	10.953	1.7	5.874	240	0.829	0.002	0.069	
2013 Annual Summary		23.9	253.5	173.85	1.55	116.75	211.5	15.23	0.00191	1.60	

Table 4.6.2 – 2
January 2013- December 2013 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)	Comments
January	31	351.00	20	18.802	0.04	3.760	93	8.743	0.0001	0.094	
February	28	280.00	21	14.225	0.04	2.710	75	5.080	0.0001	0.068	
March	31	247.00	17	11.247	0.04	2.646	85	5.623	0.0001	0.066	
April	30	237.00	15	9.215	0.05	3.072	99	6.082	0.0001	0.061	
May	31	1891.00	18	91.167	0.04	20.259	76	38.493	0.0001	0.506	
June	30	1579.00	19	77.763	0.06	24.557	69	28.240	0.0001	0.409	
July	31	637.00	24	40.947	0.08	13.649	72	12.284	0.0001	0.171	
August	31	324.00	28	24.298	0.09	7.810	86	7.463	0.0001	0.087	
September	30	240.00	49	30.482	0.07	4.355	84	5.225	0.0001	0.062	
October	31	218.00	49	28.611	0.07	4.087	88	5.138	0.0002	0.117	
November	30	237.00									No water collected due to unsafe ice conditions
December	31	243.00	20	13.017	0.03	1.953	83	5.402	0.0001	0.065	Sample collected in wrong location, resampled in January at the proper location
2013 Annual Summary		540.00	25.5	359.8	0.055	88.86	82.7	127.8	0.0001	1.71	

* - 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 4.6.2 – 3
Comparison of Predicted Loadings to Actual January 2013 - December 2013 Loadings

Scenario	Parameter	AC-14			TL-7			Estimated Site Total Loadings
		Estimated Average Flows (L/s)	Average Concentration	Loadings	Estimated Average Flows (L/s)	Average Concentration	Loadings	
Predicted Loadings								
During Operations	U	215	65	4410	89.4	4.1	11,600	16,010
	Ra226	215	0.22	1,490,000,000.0	89.4	0.44	1,240,000,000	2,730,000,000
	TDS	215	174	1,180,000.0	89.4	1,793	5,060,000	6,240,000
At Shutdown (Predicted)	U	426	35	470.0	16	3.16	1,590	2,060
	Ra226	426	0.06	806,000,000.0	16	0.53	267,000,000	1,073,000,000
	TDS	426	129	1,730,000.0	16	1130	570,000	2,300,000
Minimum Reclamation (Long Term Predicted)	U	426	35	470.0	16	0.1	50.5	520.5
	Ra226	426	0.06	806,000,000.0	16	0.38	192,000,000	998,000,000
	TDS	426	129	1,730,000.0	16	389	196,000	1,926,000
Max. Reclamation (Long Term Predicted)	U	426	30	403.0	16	0.1	50.5	453.5
	Ra226	426	0.06	806,000,000.0	16	0.27	136,000,000	942,000,000
	TDS	426	125	1,680,000.0	16	414	209,000	1,889,000
Actual (January – December 2013) *	U	540	25.5	359.8	23.9	253.5	173.85	533.65
	Ra226	540	0.055	888,600,000.0	23.9	1.55	1,167,500,000	2,056,100,000
	TDS	540	82.7	1,278,000.0	23.9	211.5	28,200	152,300

**Note: Loading values in this table were calculated using monthly flow volumes, not the annual averages that are presented in this table.*
Units:
U [=] ~~ug/L~~µg/L, Ra226 [=] Bq/L, TDS [=] mg/L
Loadings U [=] Kg, Loadings Ra226 [=] Bq, Loadings TDS [=] Kg

Table 4.7.1
Radon Track Etch Cup Summary

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

Note: Values presented are an average of two 6 month samples collected from: January 2013- July 2013 and July 2013- January 2014.
** 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 parameter was below the detection for the length of the year, it is indicated as such in the table

FIGURES

FIGURES

Figure 2.4
Beaverlodge Location Map

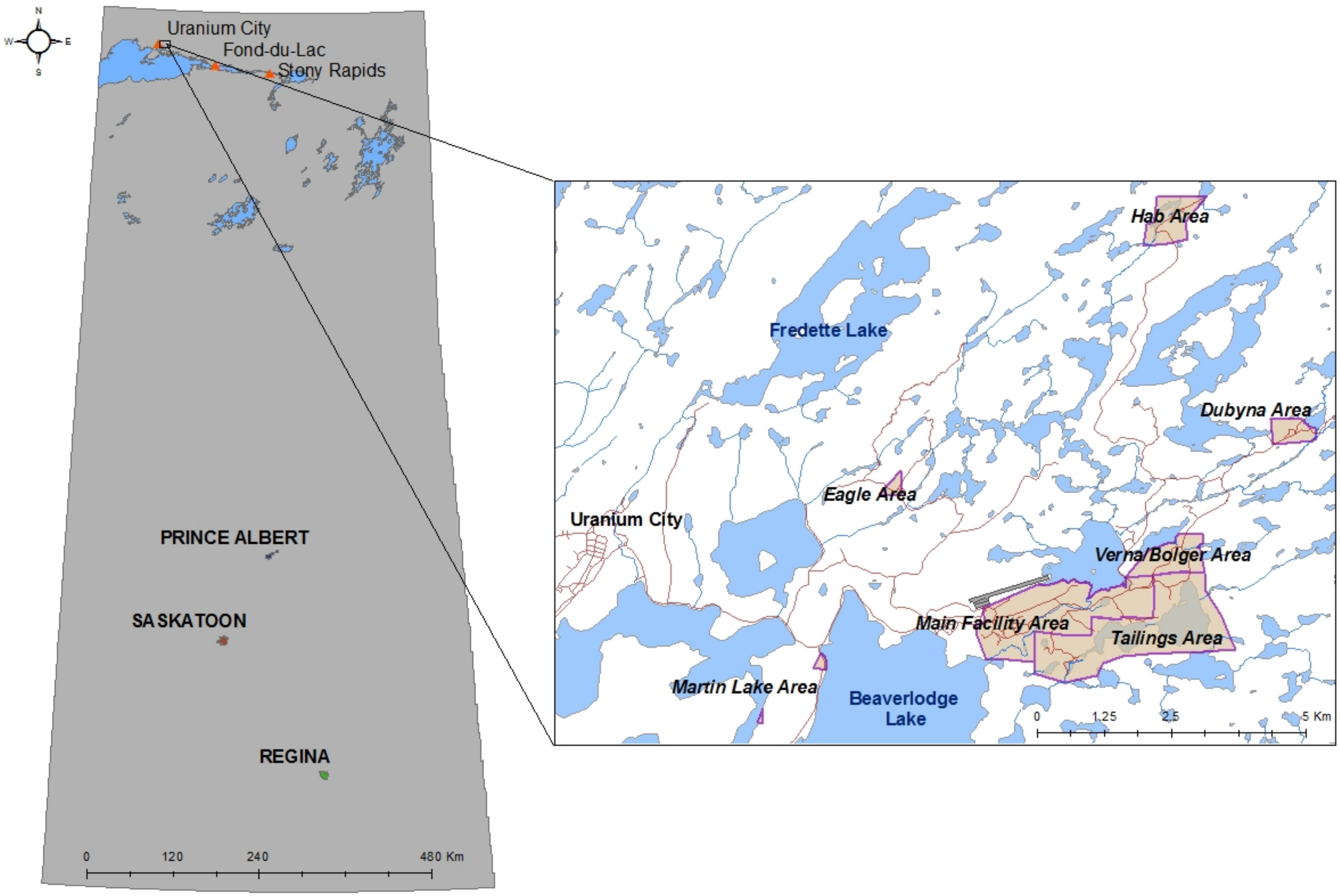


Figure 4.3
Aquatic Sampling Station Locations

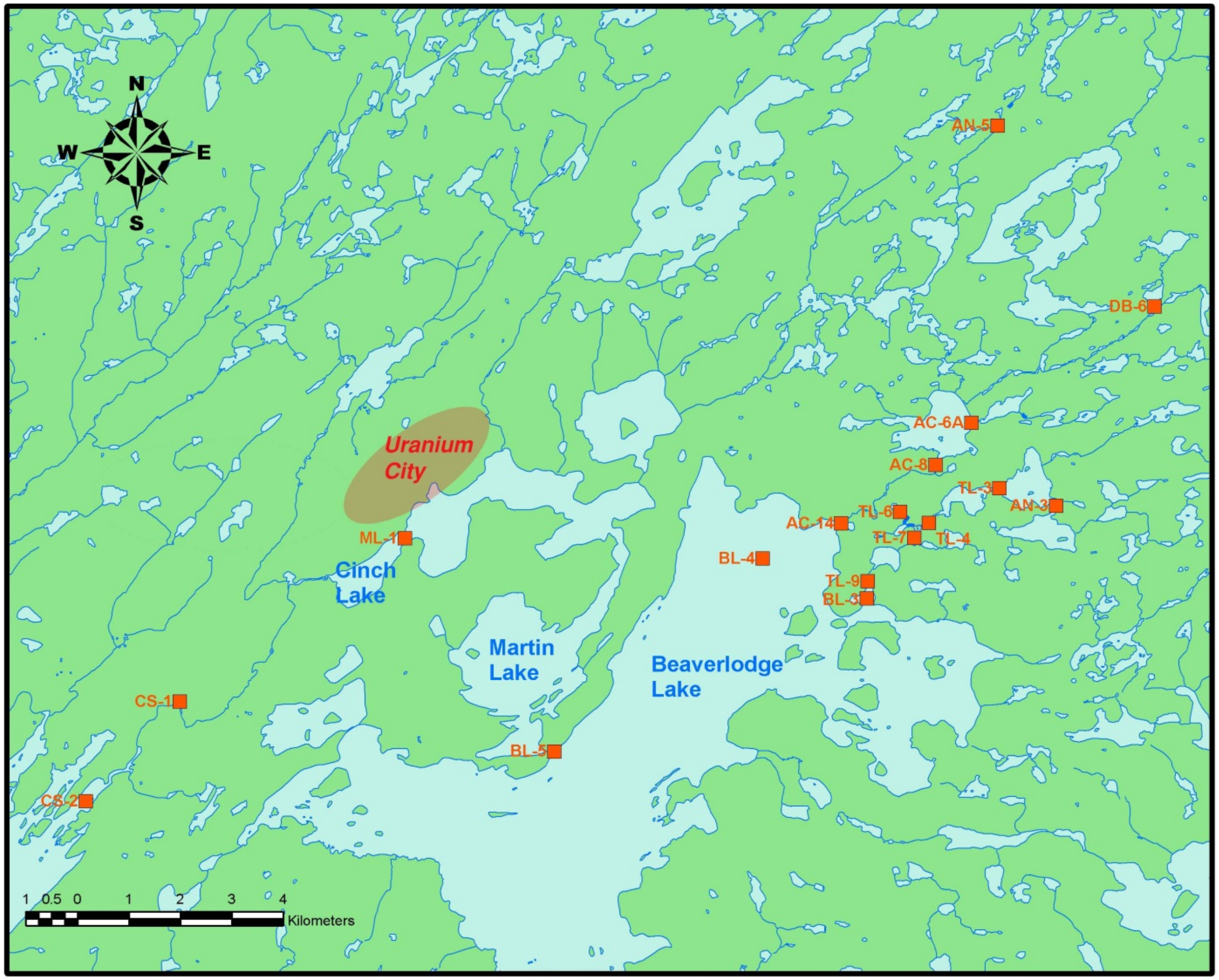


Figure 4.3.1-1 AN-5 Pistol Creek below Hab Site

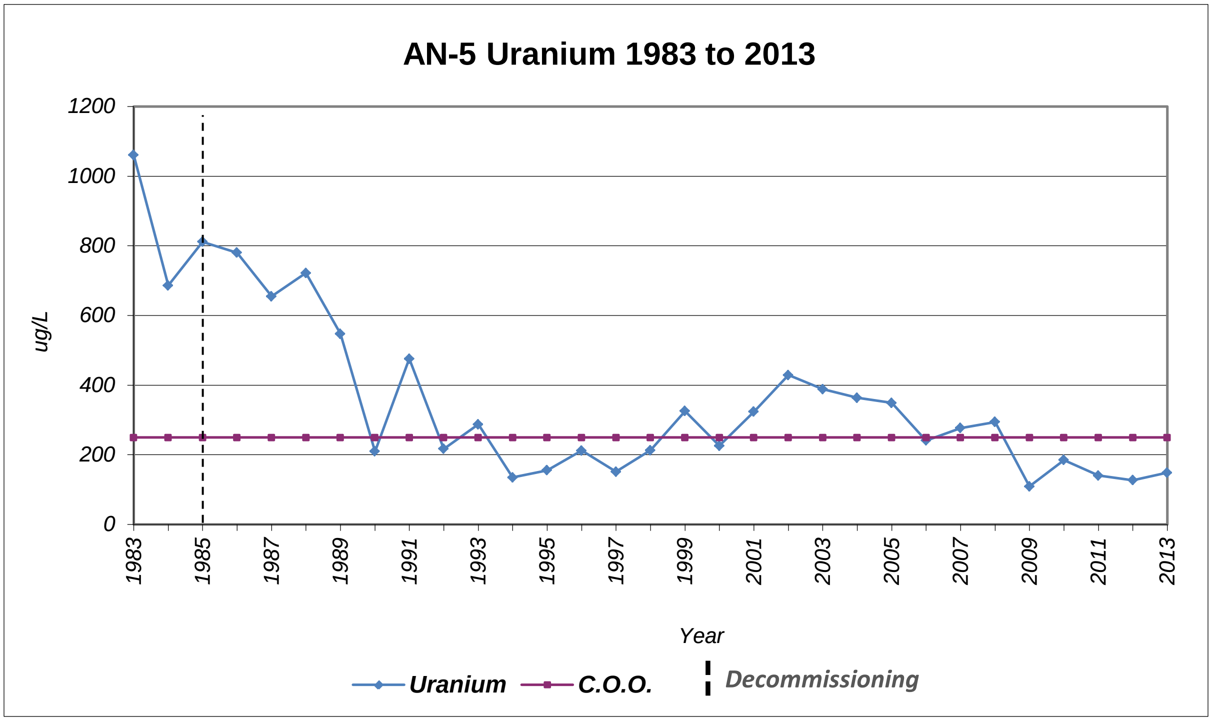


Figure 4.3.1-2 AN-5 Pistol Creek below Hab Site

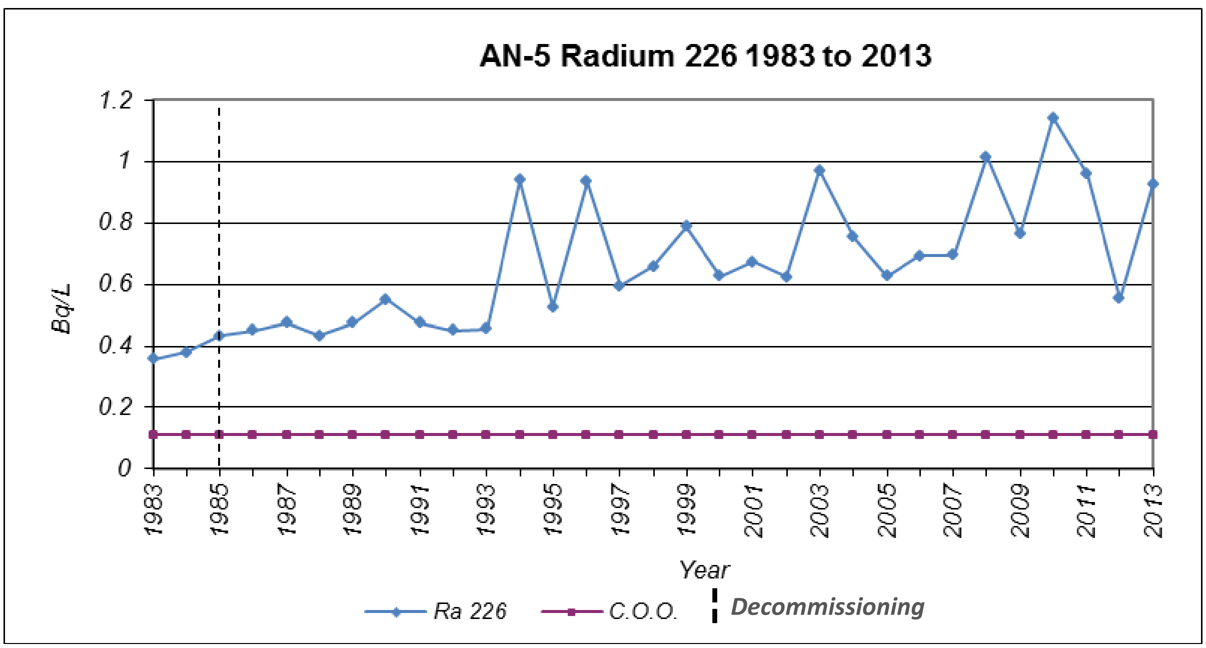


Figure 4.3.1-3 AN-5 Pistol Creek below Hab Site

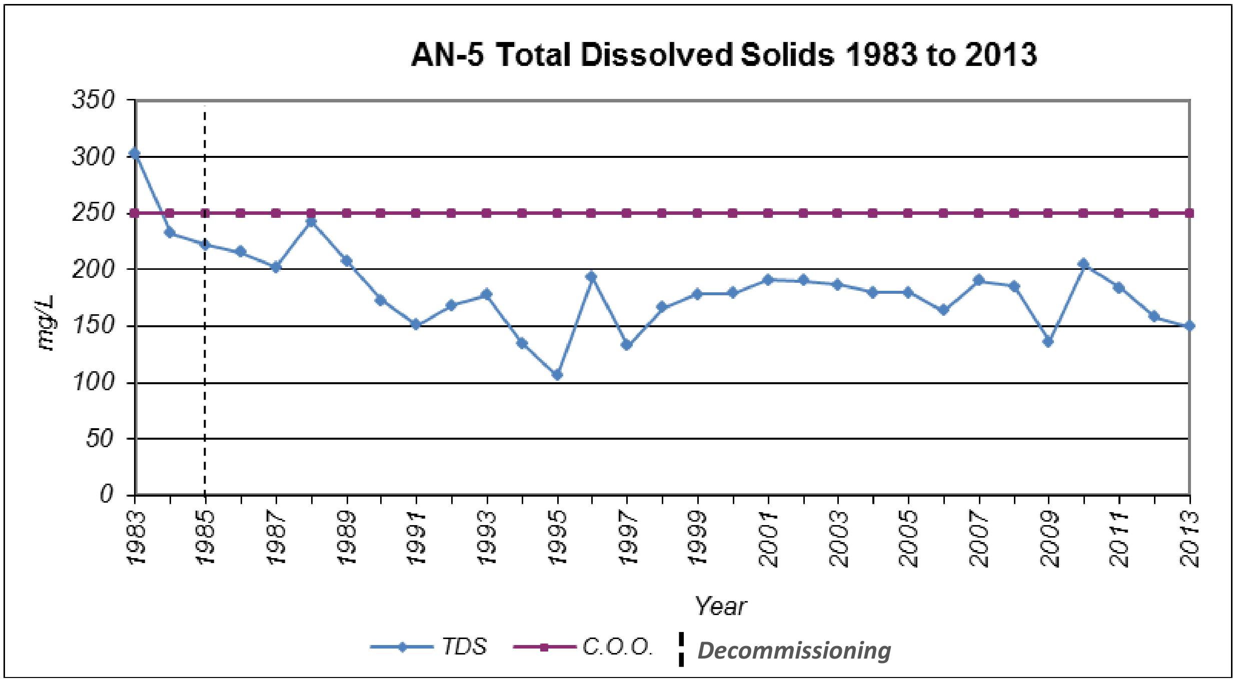
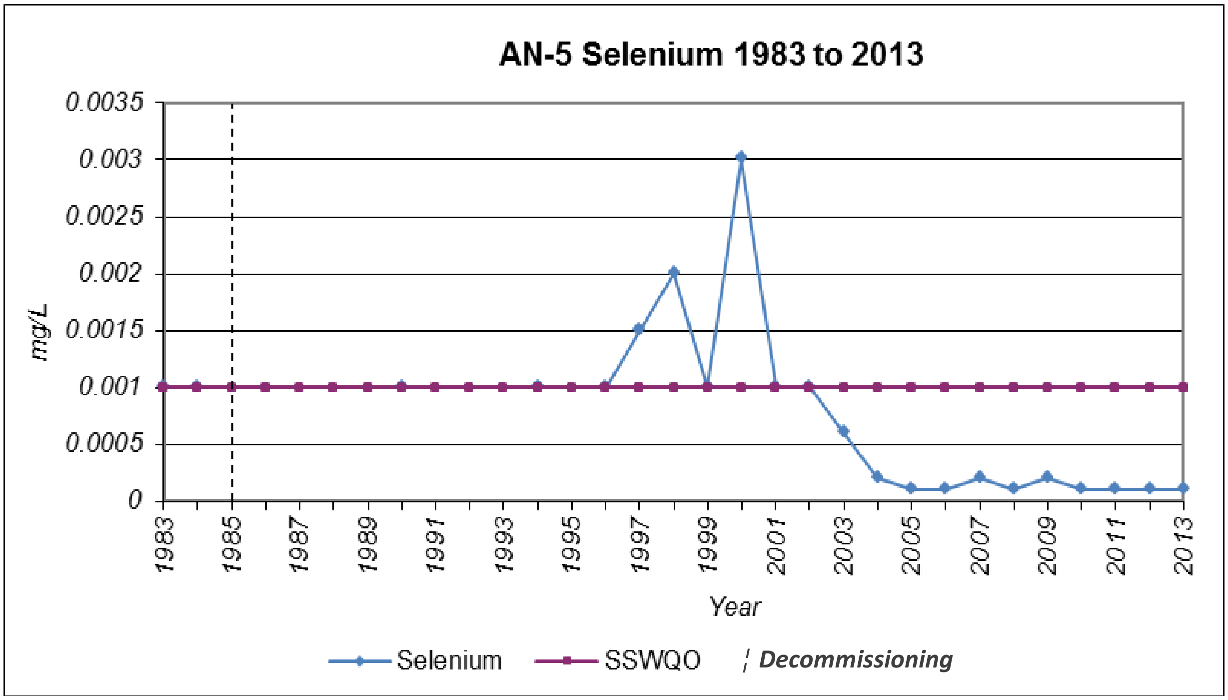


Figure 4.3.1-4 AN-5 Pistol Creek below Hab Site



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

Figure 4.3.1-5 AN-5 Comparison to Predicted Recovery

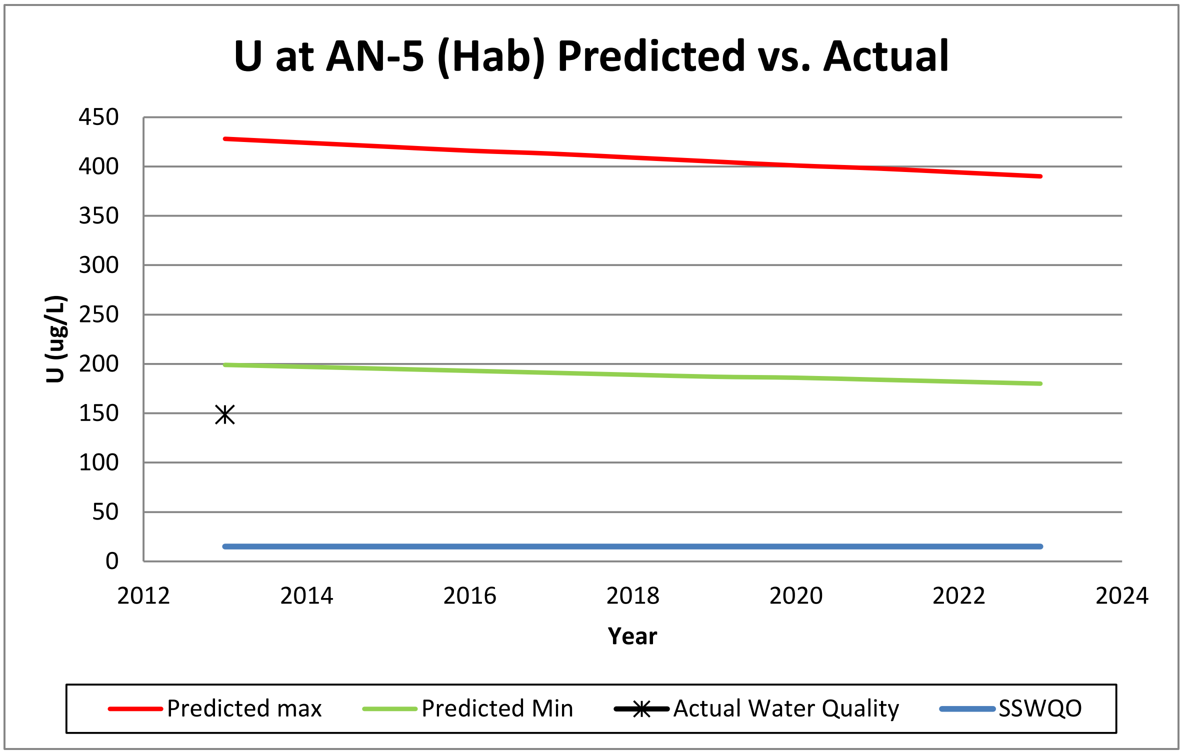


Figure 4.3.1-6 AN-5 Comparison to Predicted Recovery

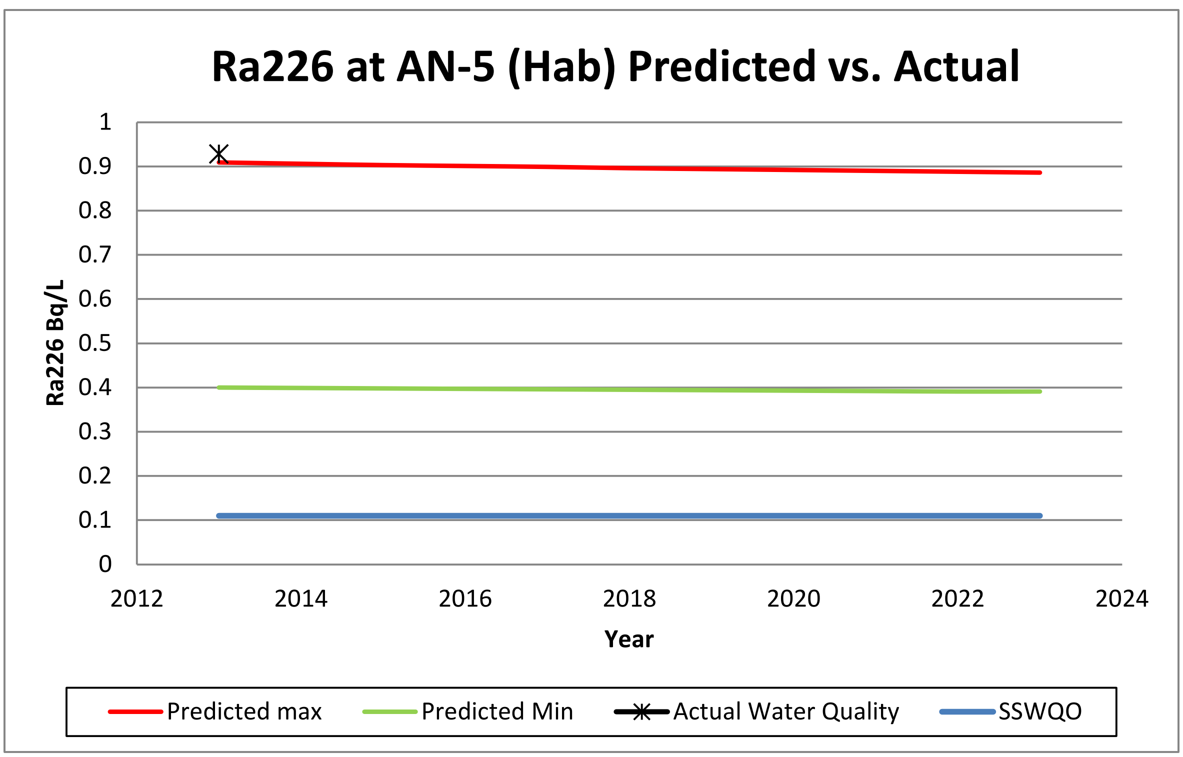


Figure 4.3.1-7 AN-5 Comparison to Predicted Recovery

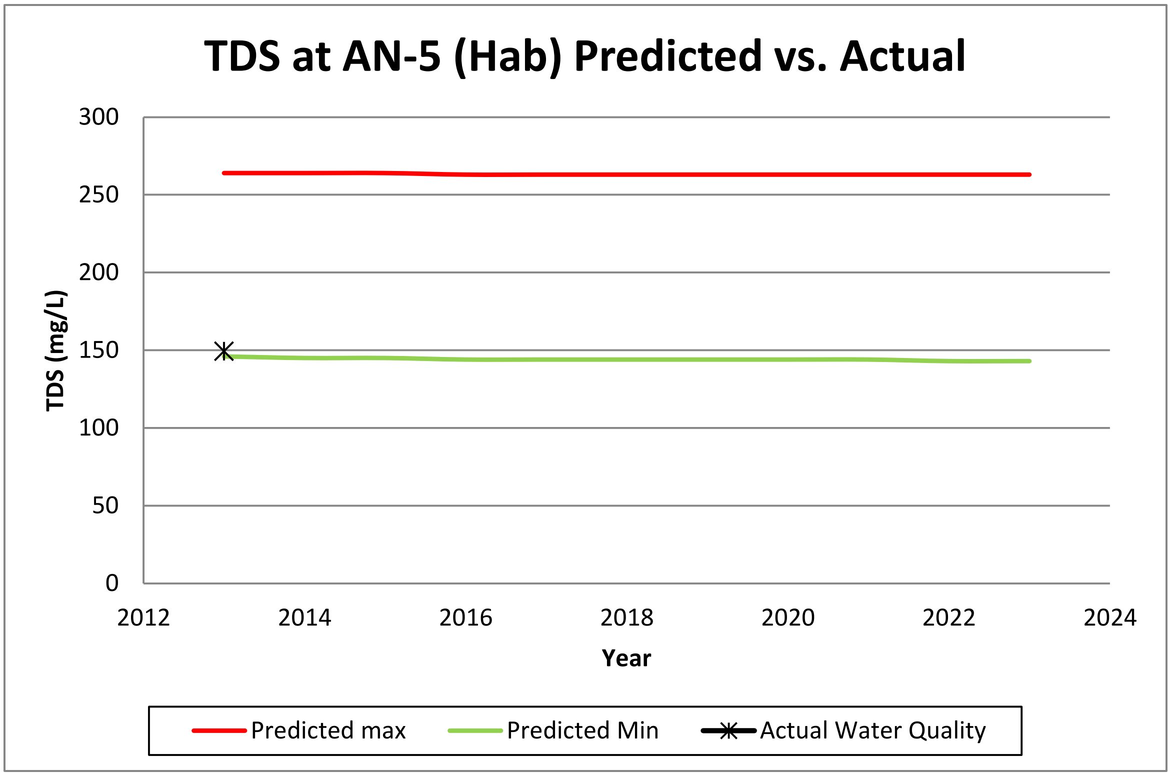


Figure 4.3.1-8 AN-5 Comparison to Predicted Recovery

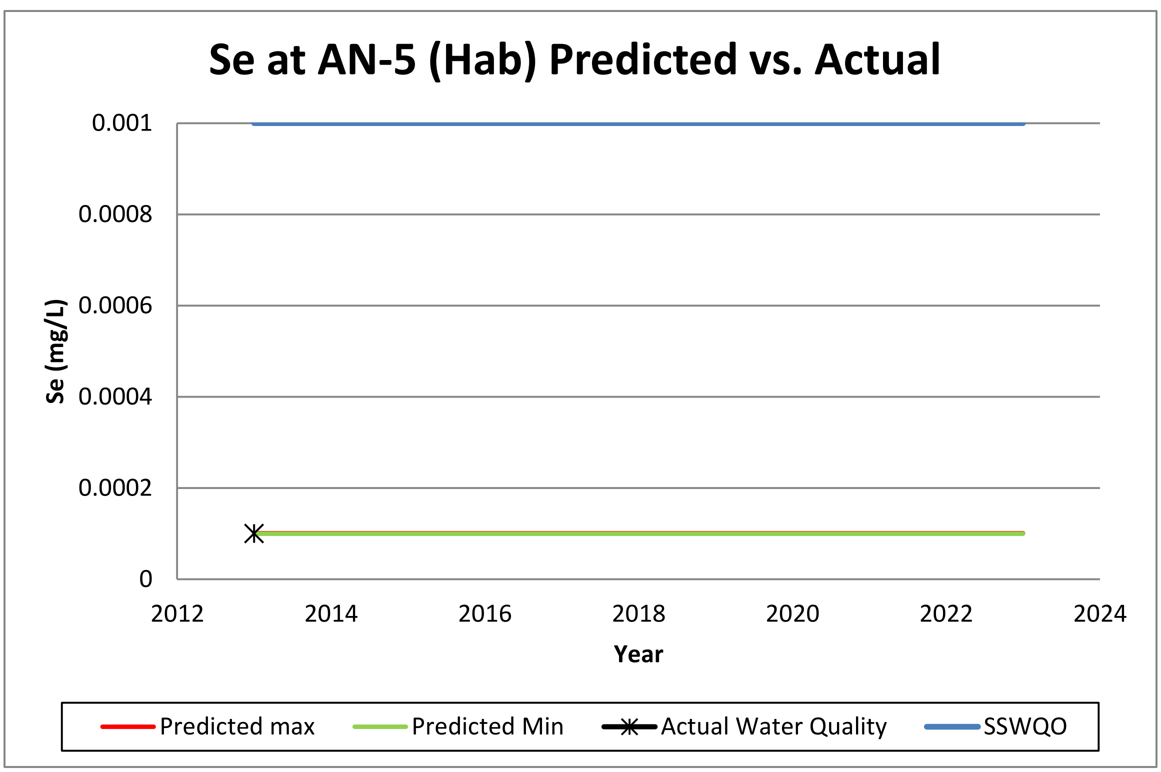


Figure 4.3.1-9 DB-6 Dubyna Creek

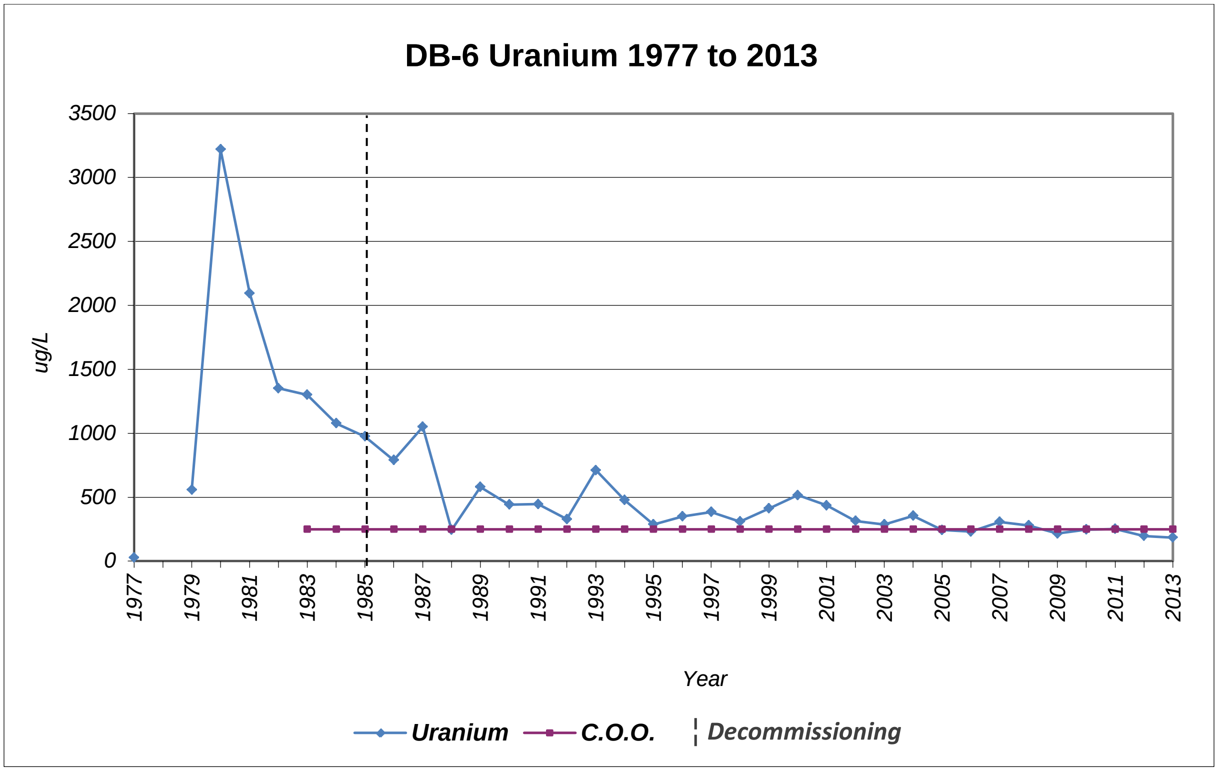


Figure 4.3.1-10 DB-6 Dubyna Creek

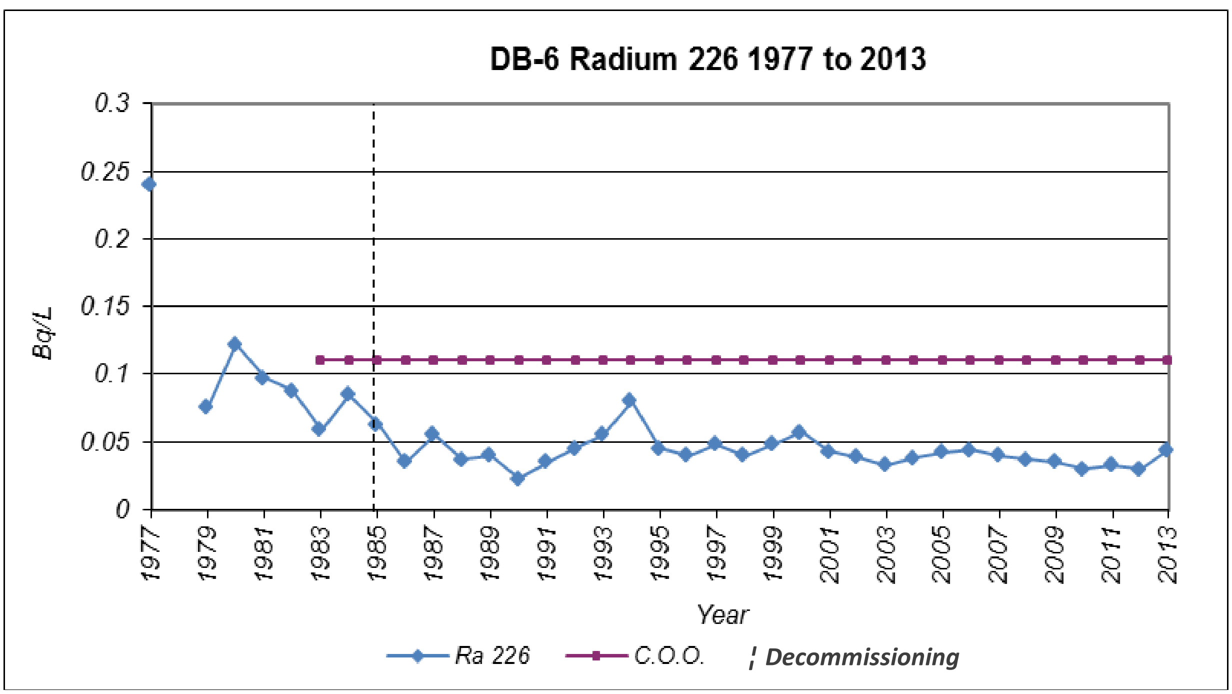


Figure 4.3.1-11 DB-6 Dubyna Creek

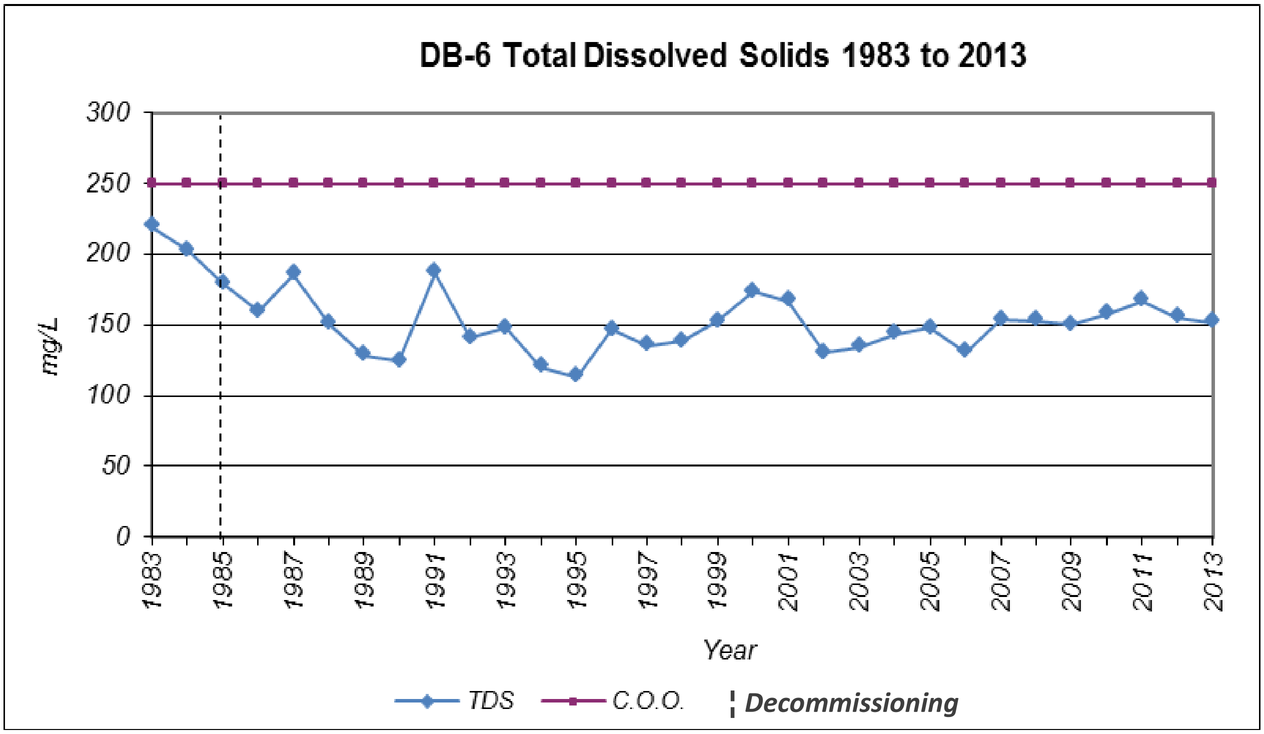
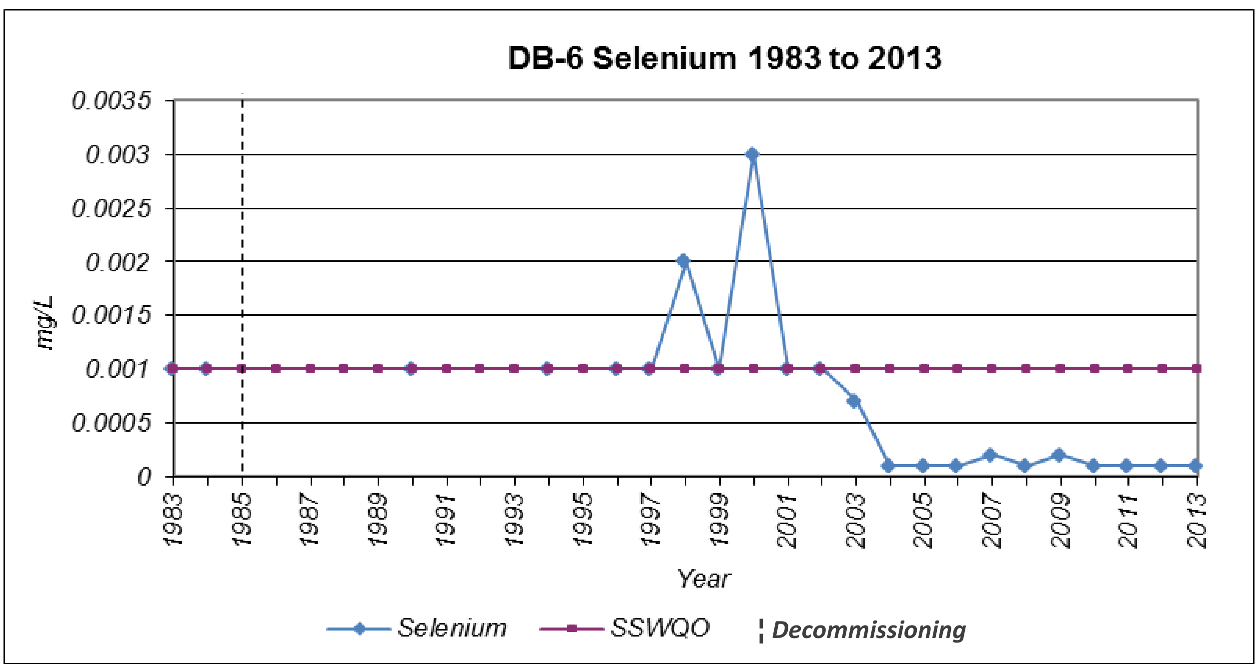


Figure 4.3.1-12 DB-6 Dubyna Creek



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

Figure 4.3.1-13 DB-6 Comparison to Predicted Recovery

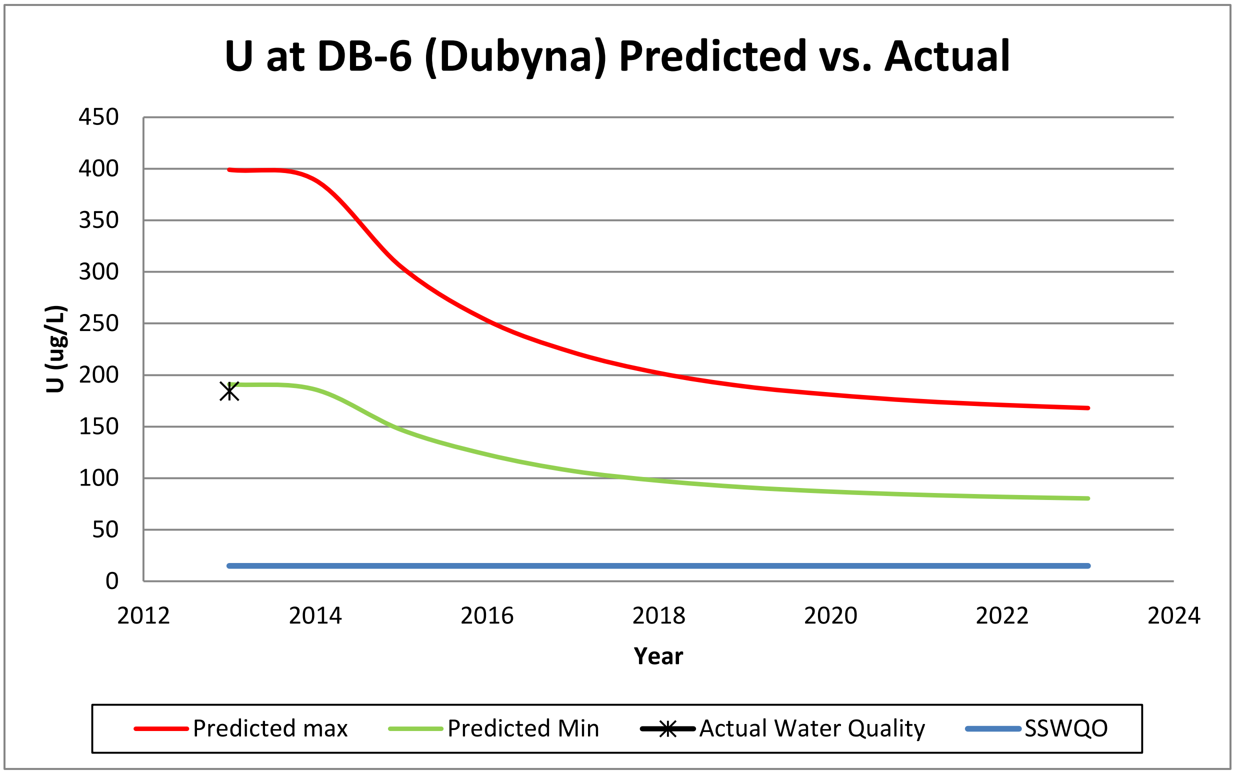


Figure 4.3.1-14 DB-6 Comparison to Predicted Recovery

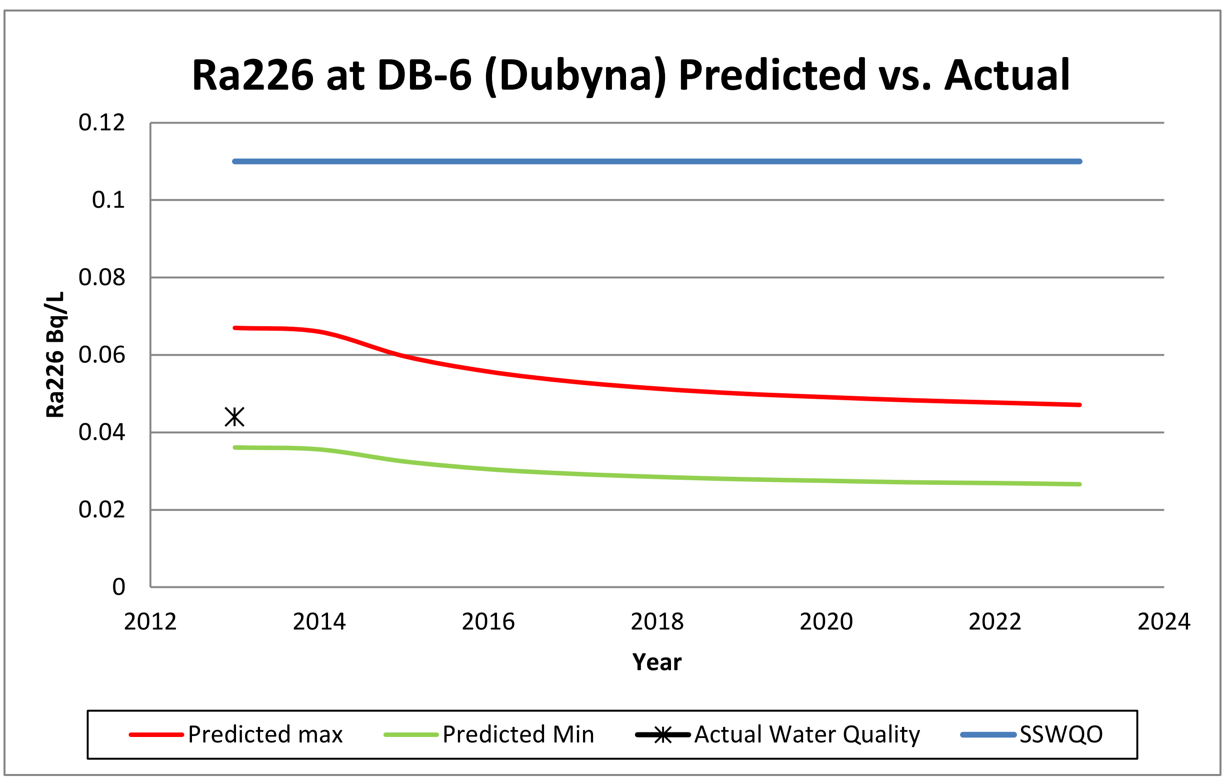


Figure 4.3.1-15 DB-6 Comparison to Predicted Recovery

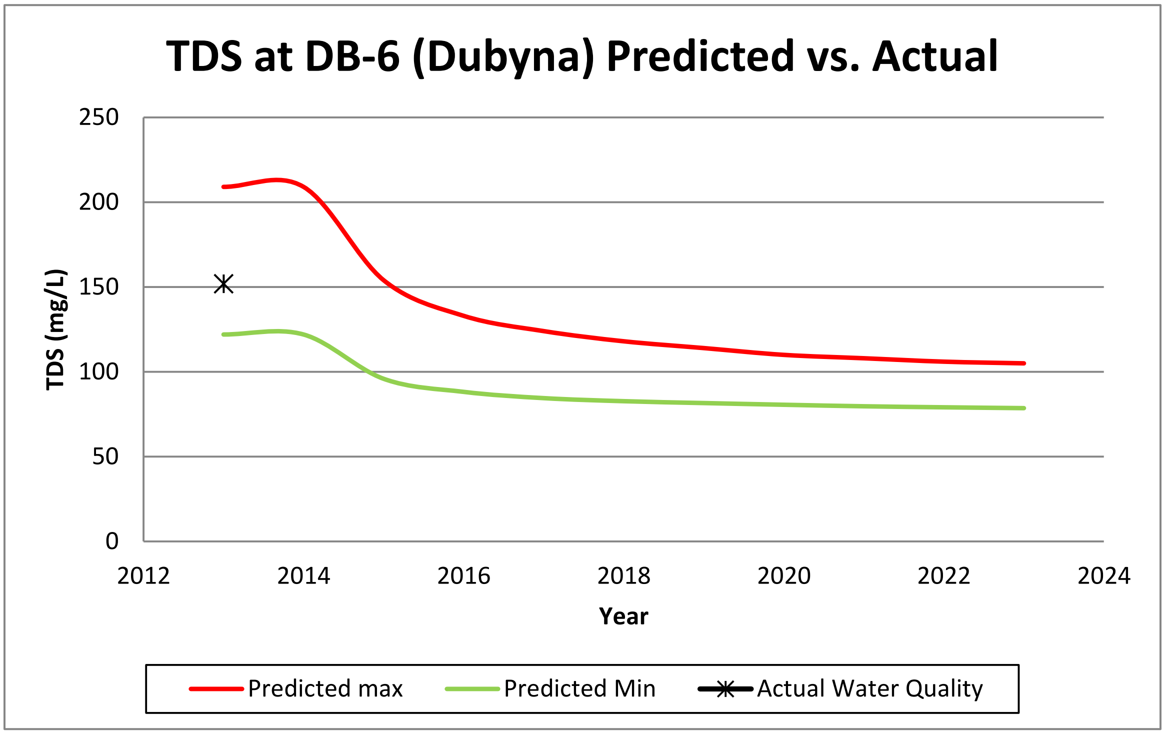


Figure 4.3.1-16 DB-6 Comparison to Predicted Recovery

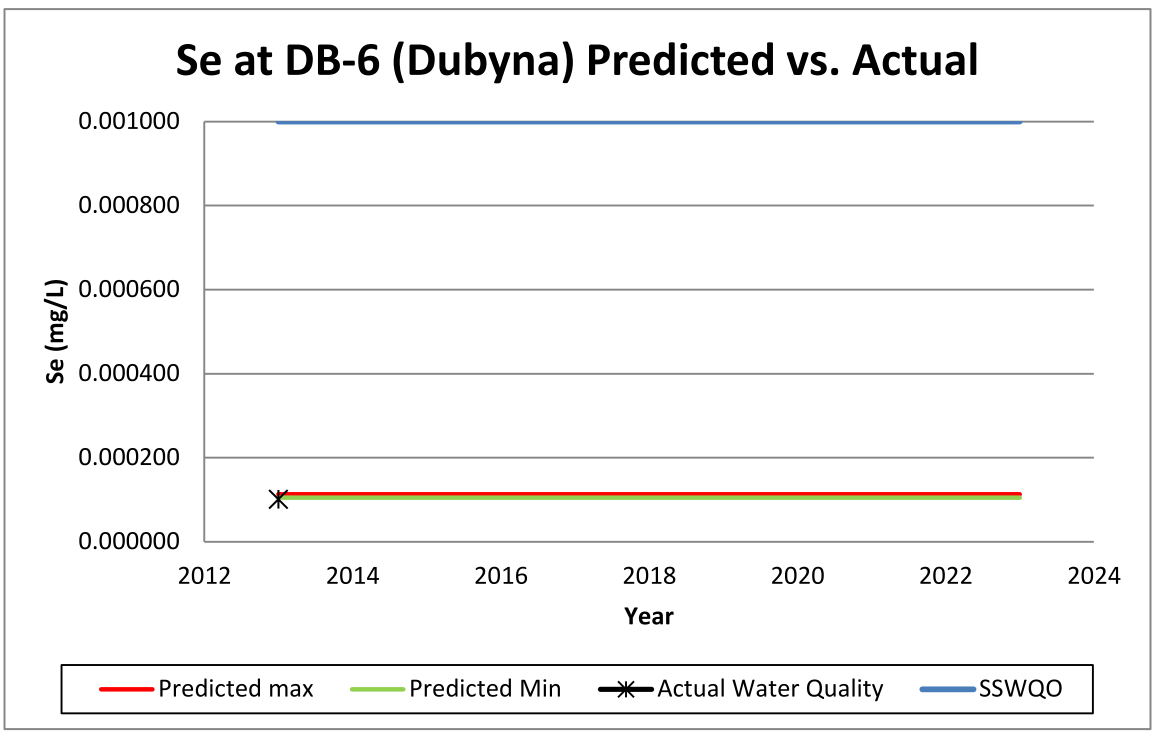


Figure 4.3.1-17 AC-6A Verna Lake Discharge to Ace Lake

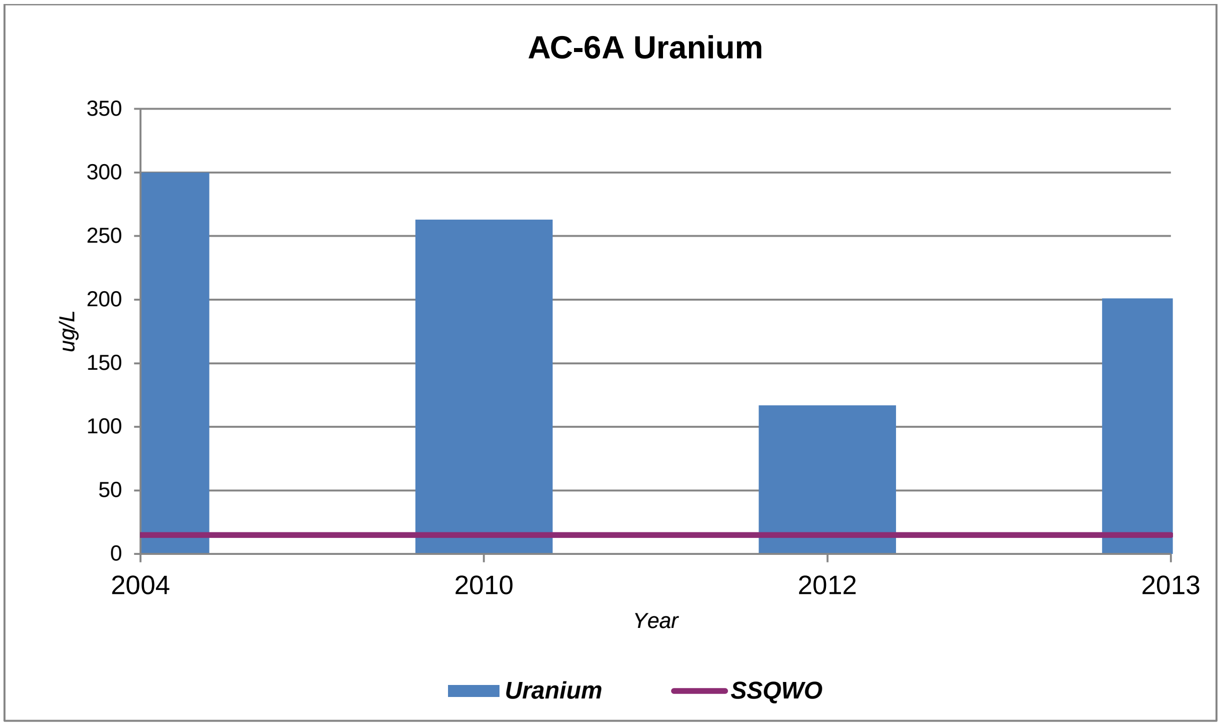


Figure 4.3.1-18 AC-6A Verna Lake Discharge to Ace Lake

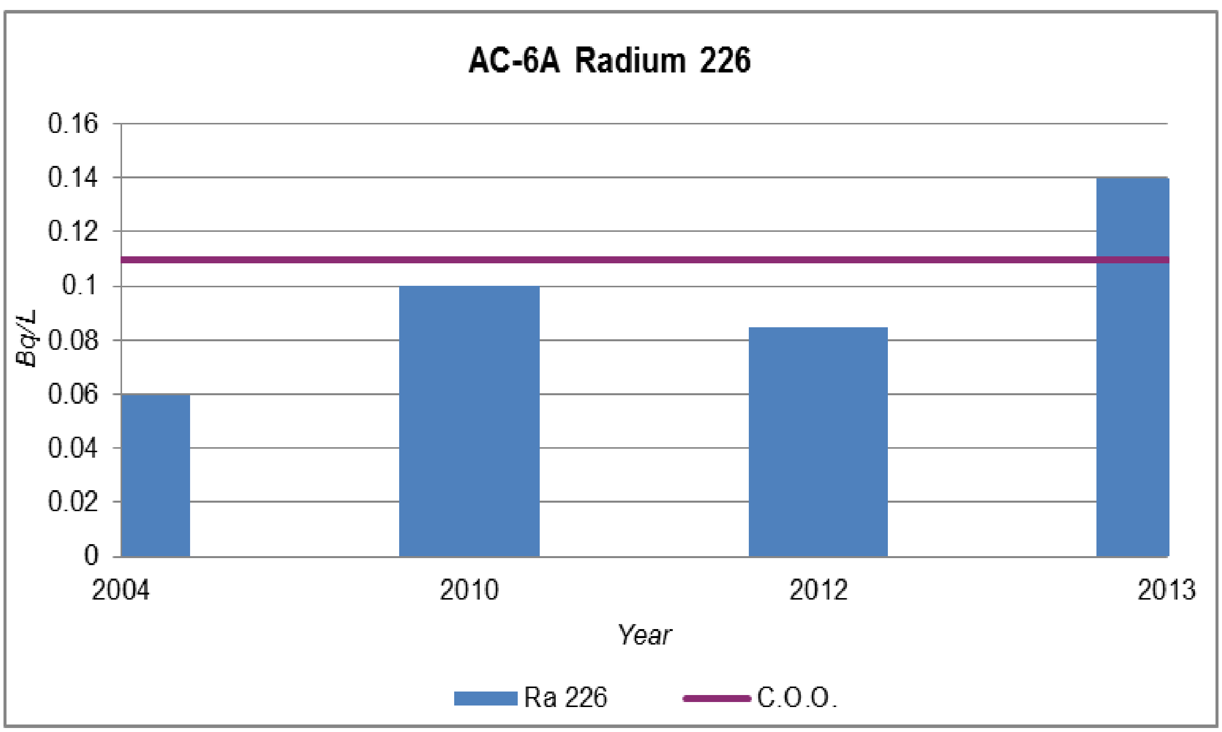


Figure 4.3.1-19 AC-6A Verna Lake Discharge to Ace Lake

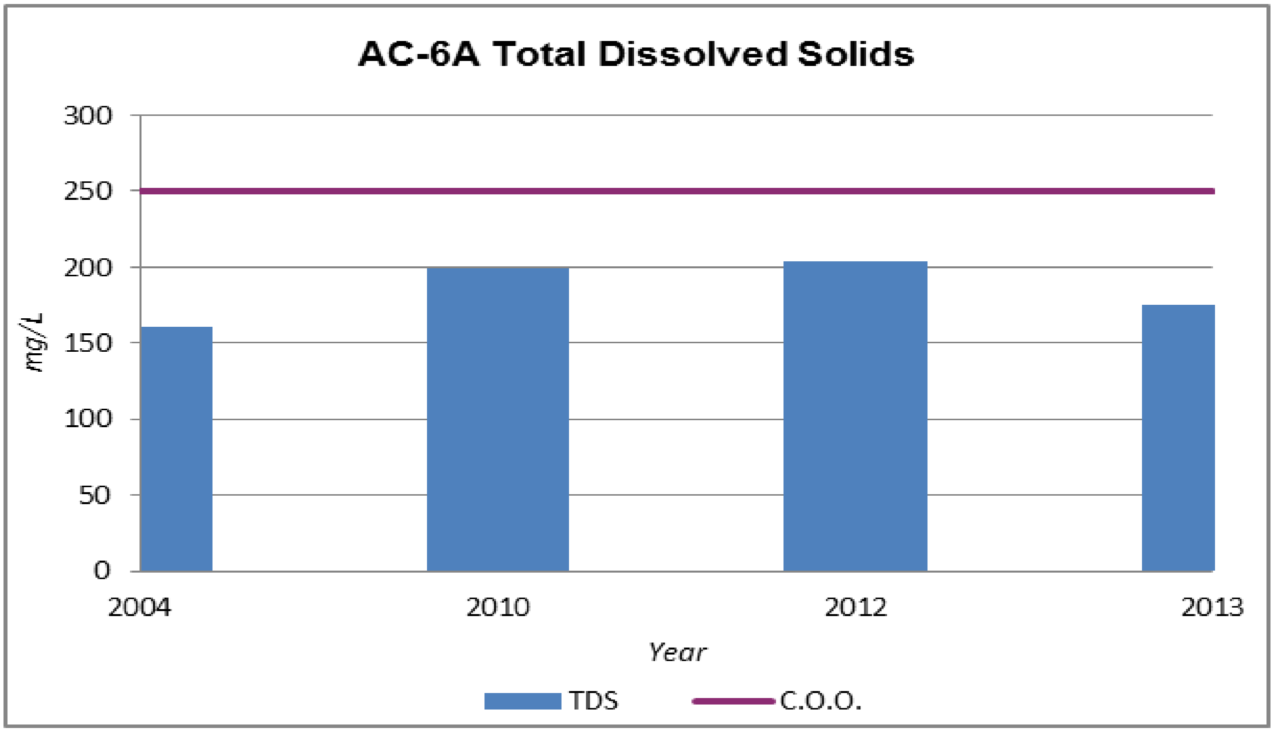


Figure 4.3.1-20 AC-6A Verna Lake Discharge to Ace Lake

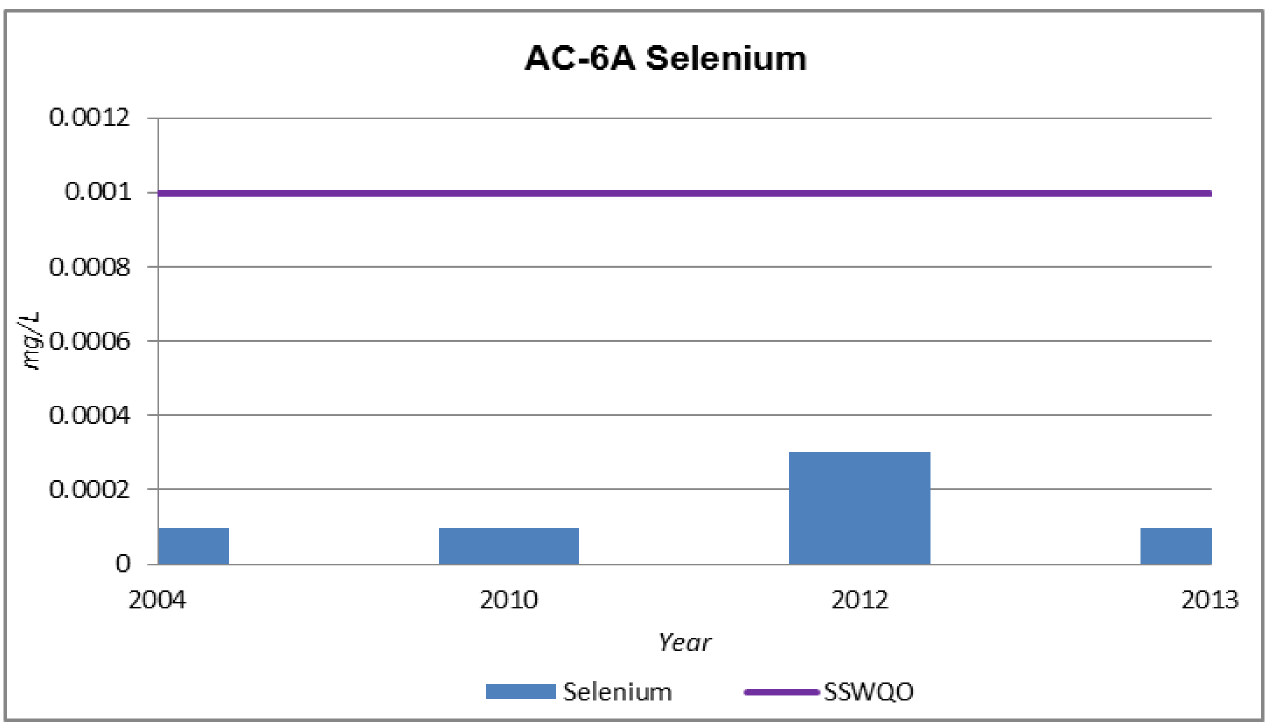


Figure 4.3.1-21 AC-6A Comparison to Predicted Recovery

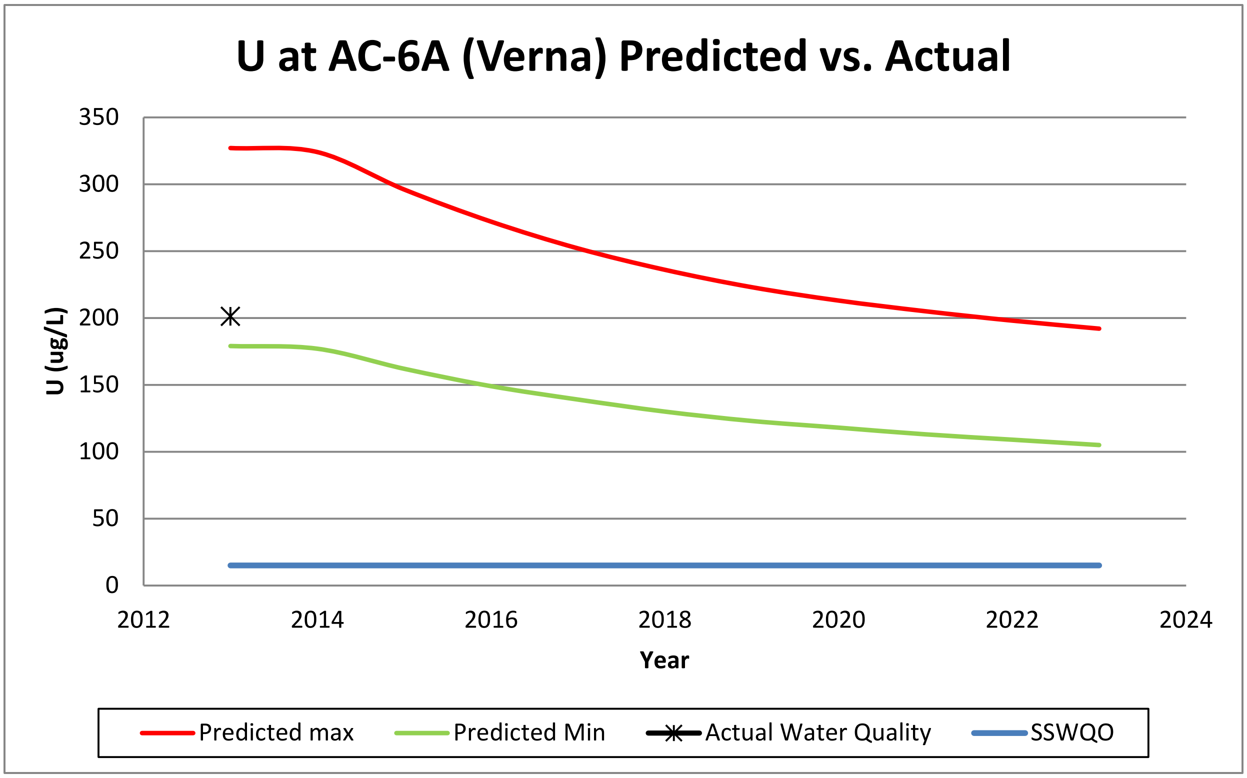


Figure 4.3.1-22 AC-6A Comparison to Predicted Recovery

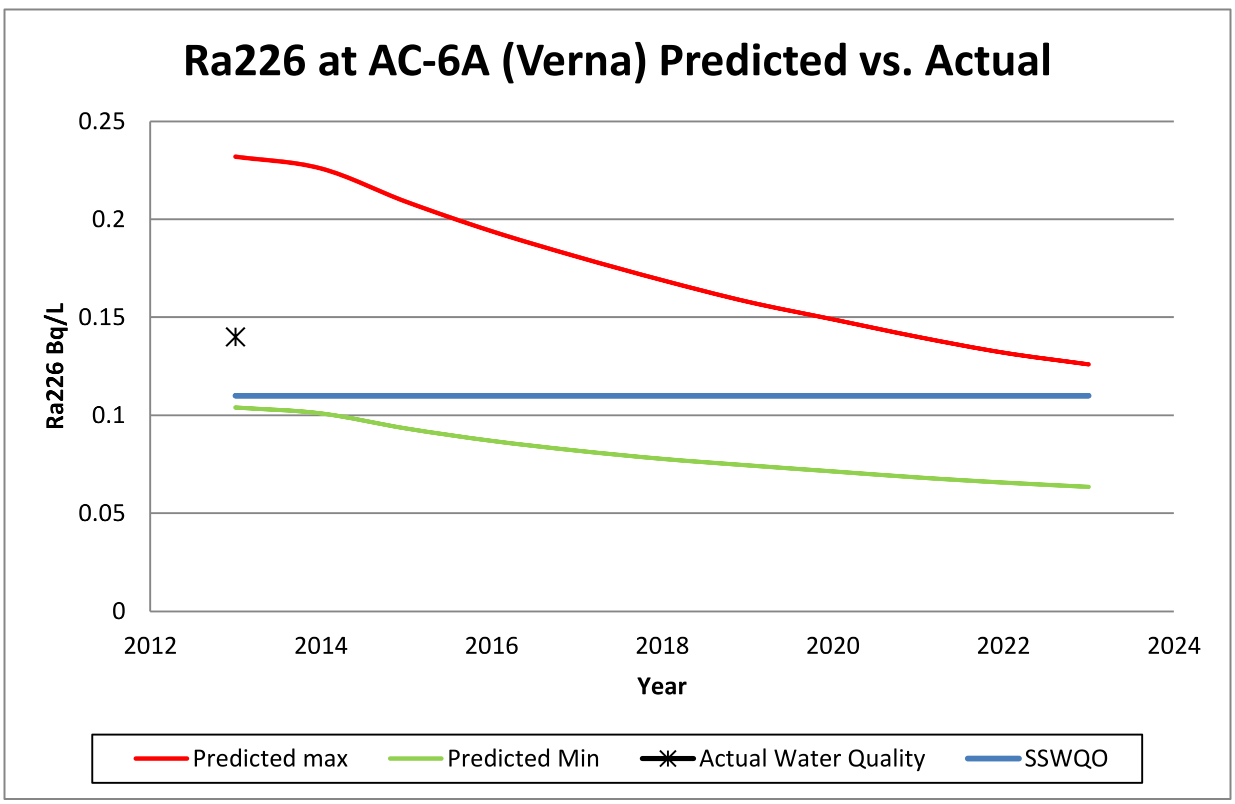


Figure 4.3.1-23 AC-6A Comparison to Predicted Recovery

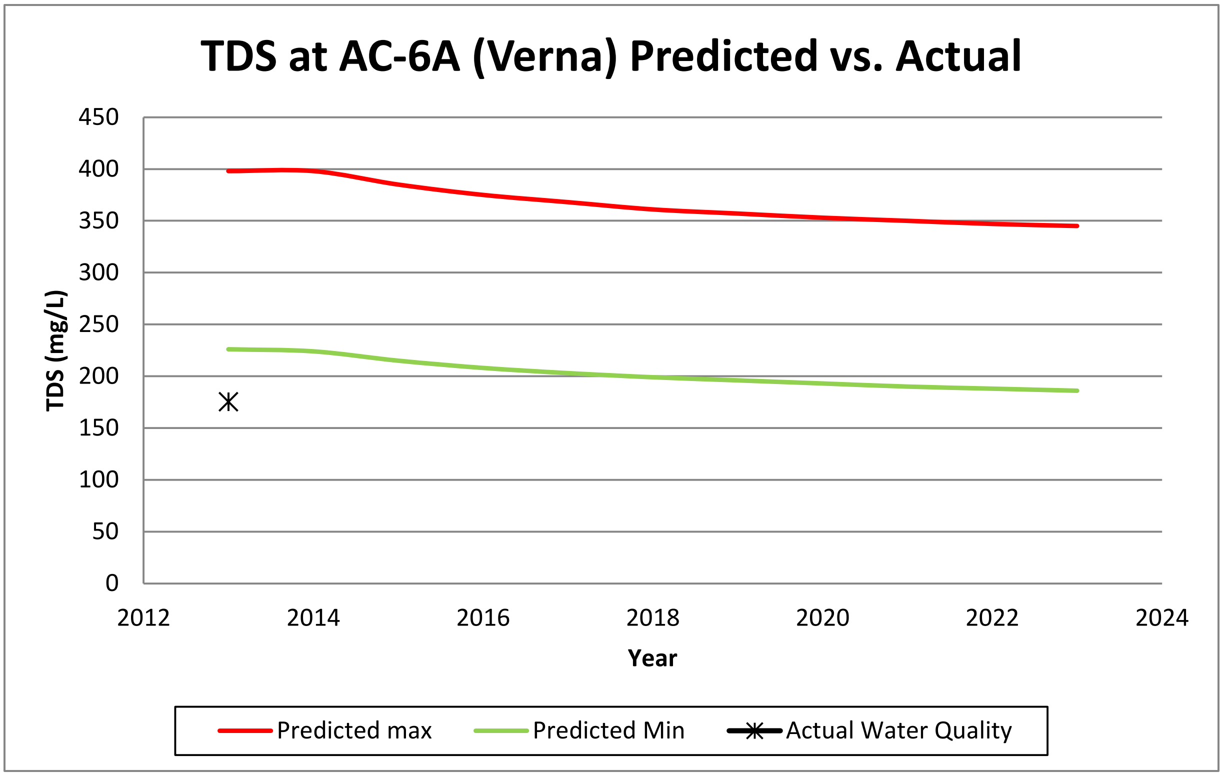


Figure 4.3.1-24 AC-6A Comparison to Predicted Recovery

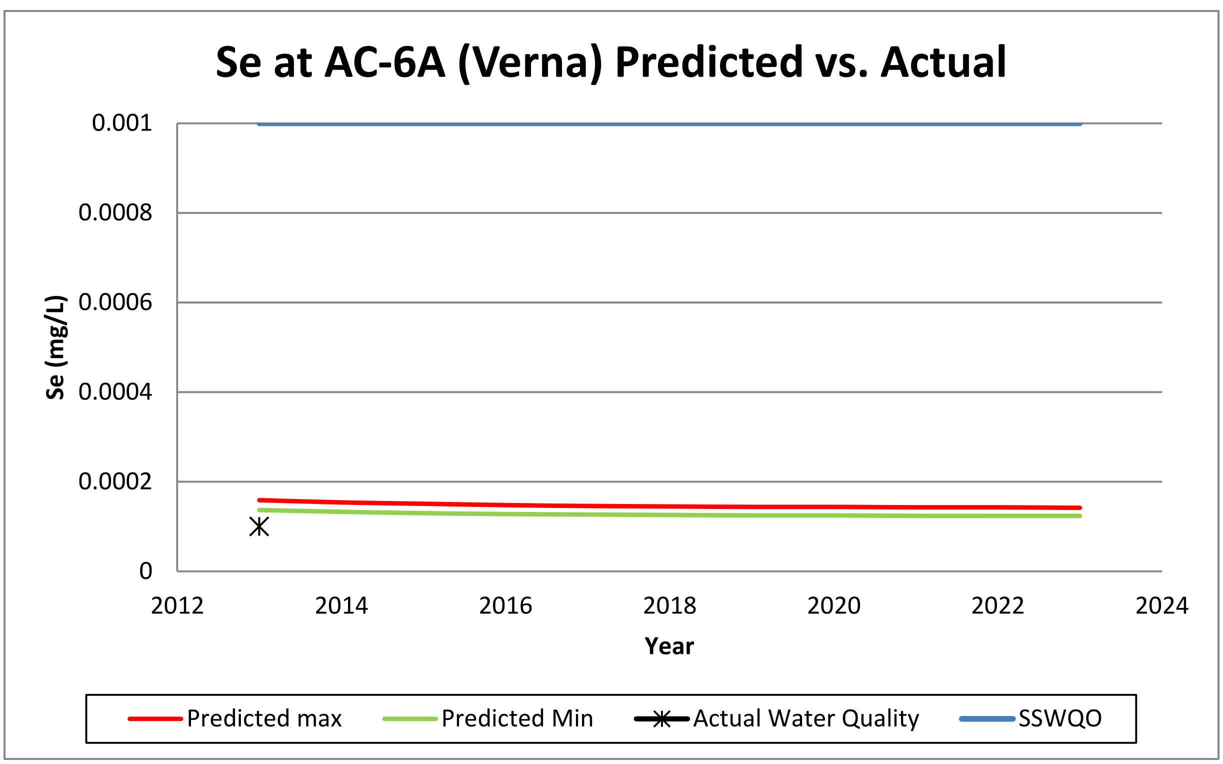


Figure 4.3.1-25 AC-8 - Ace Lake Outlet to Ace Creek

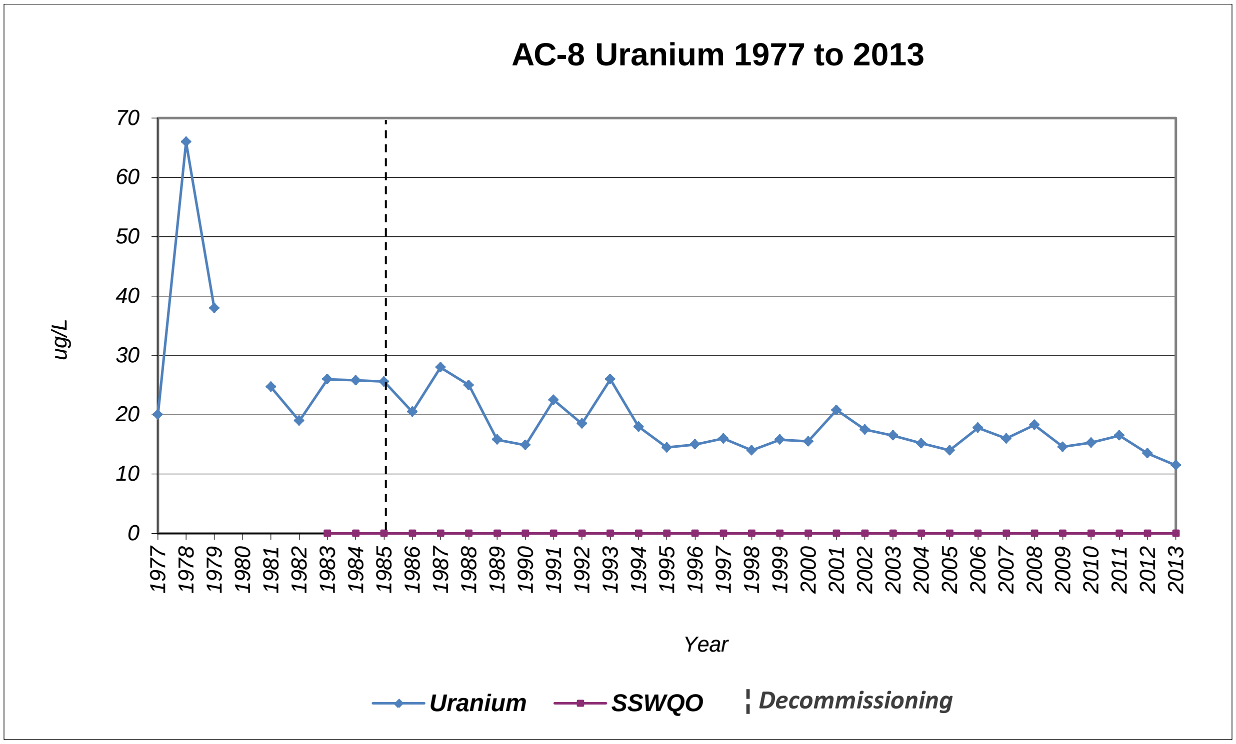


Figure 4.3.1-26 AC-8 - Ace Lake Outlet to Ace Creek

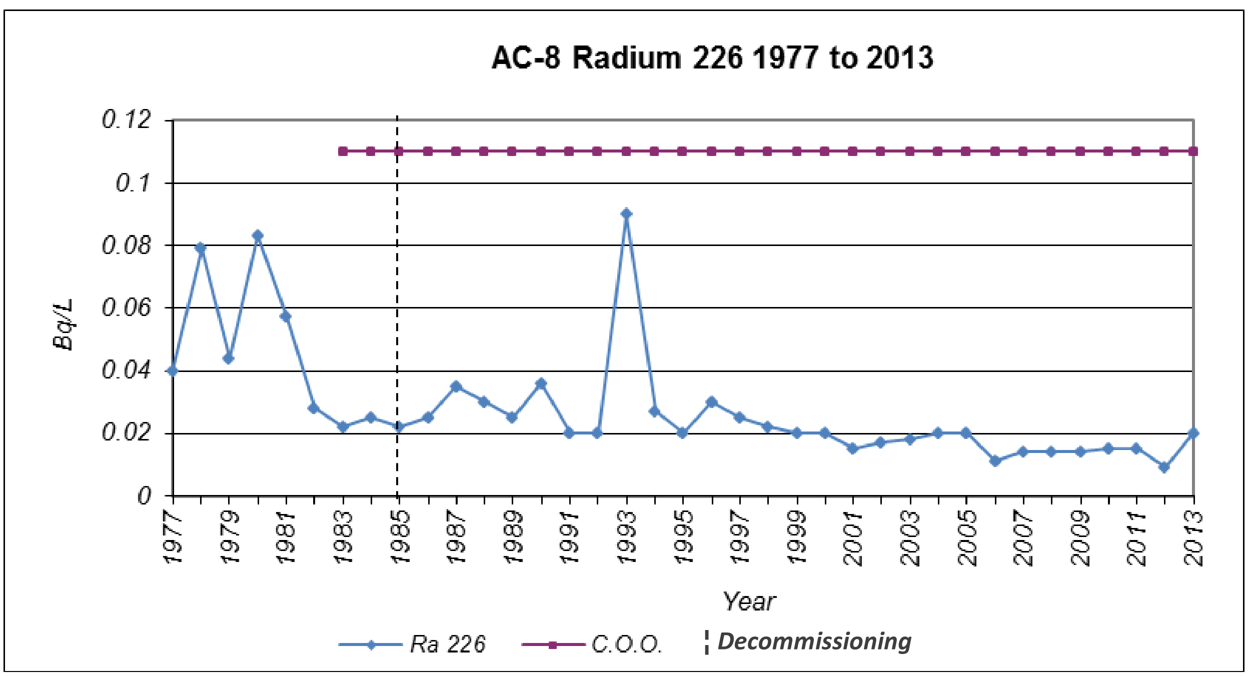


Figure 4.3.1-27 AC-8 - Ace Lake Outlet to Ace Creek

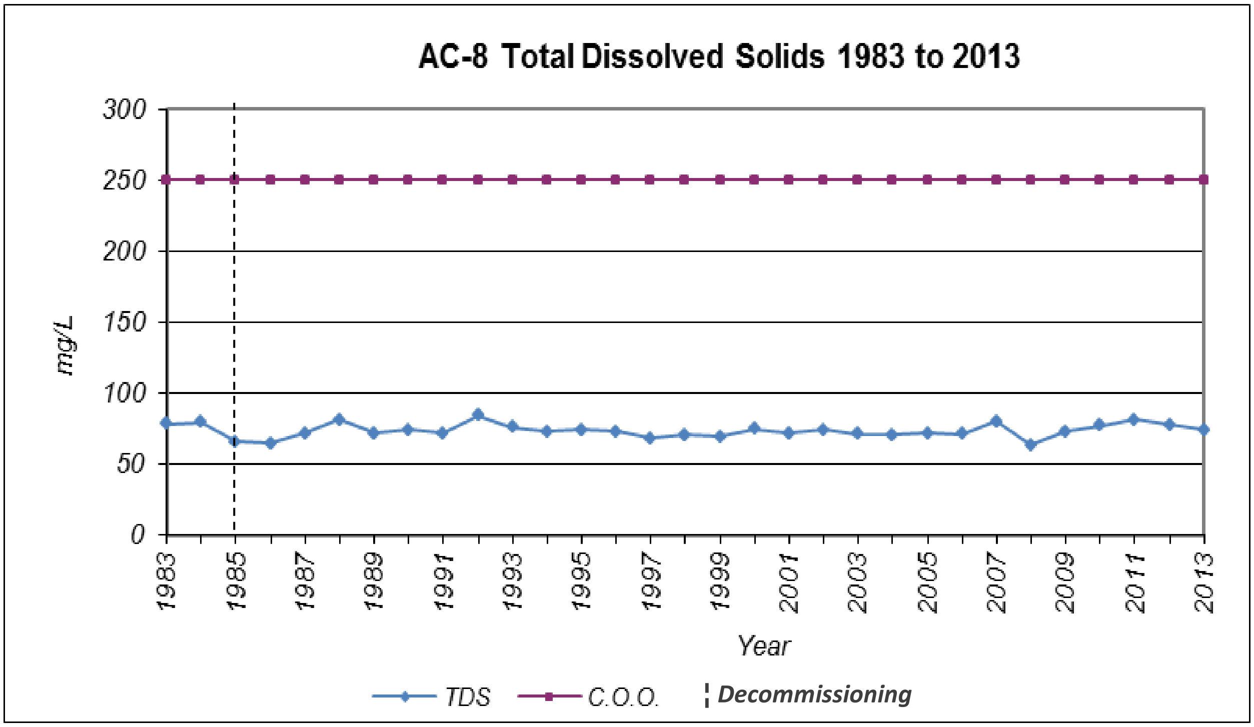


Figure 4.3.1-28 AC-8 - Ace Lake Outlet to Ace Creek

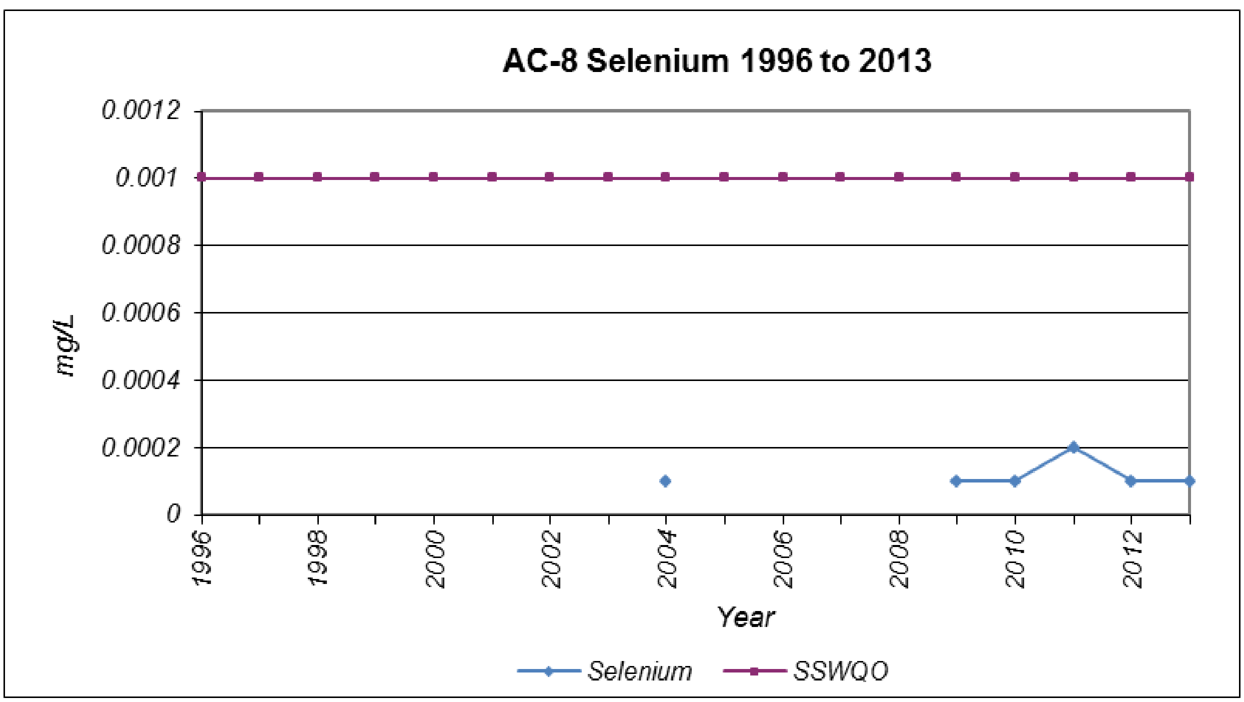


Figure 4.3.1-29 AC-8 Comparison to Predicted Recovery

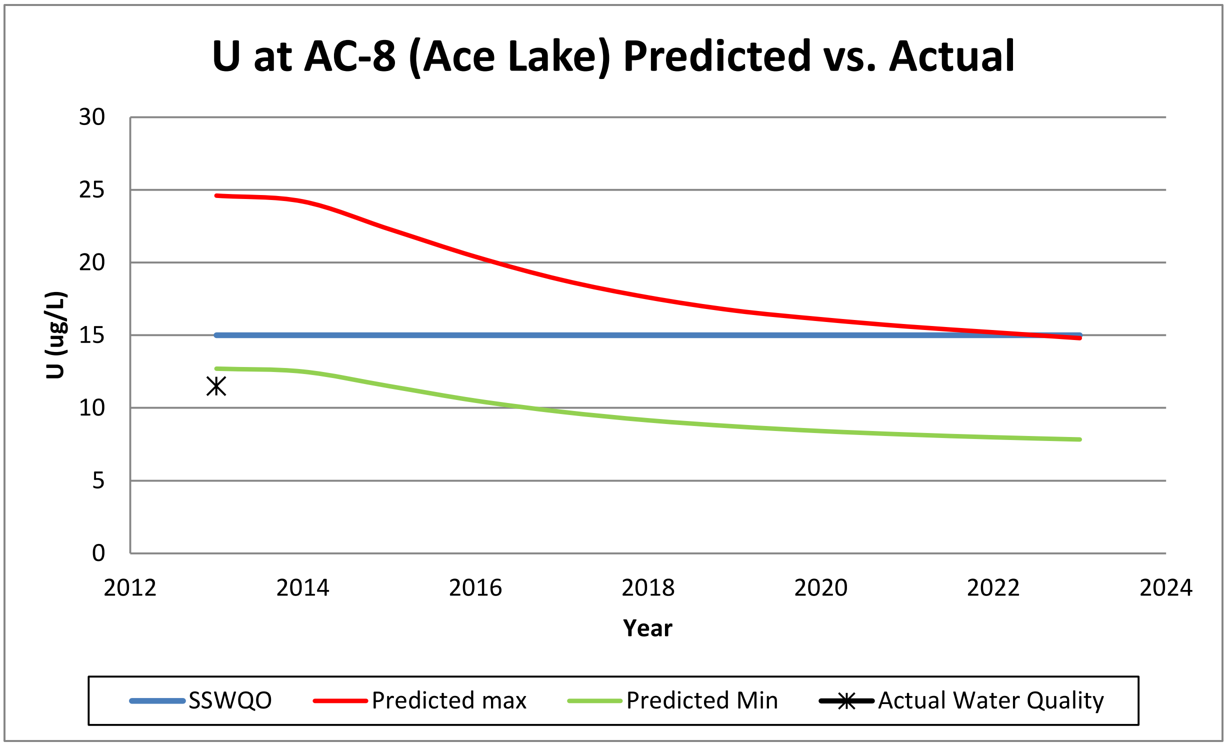


Figure 4.3.1-30 AC-8 Comparison to Predicted Recovery

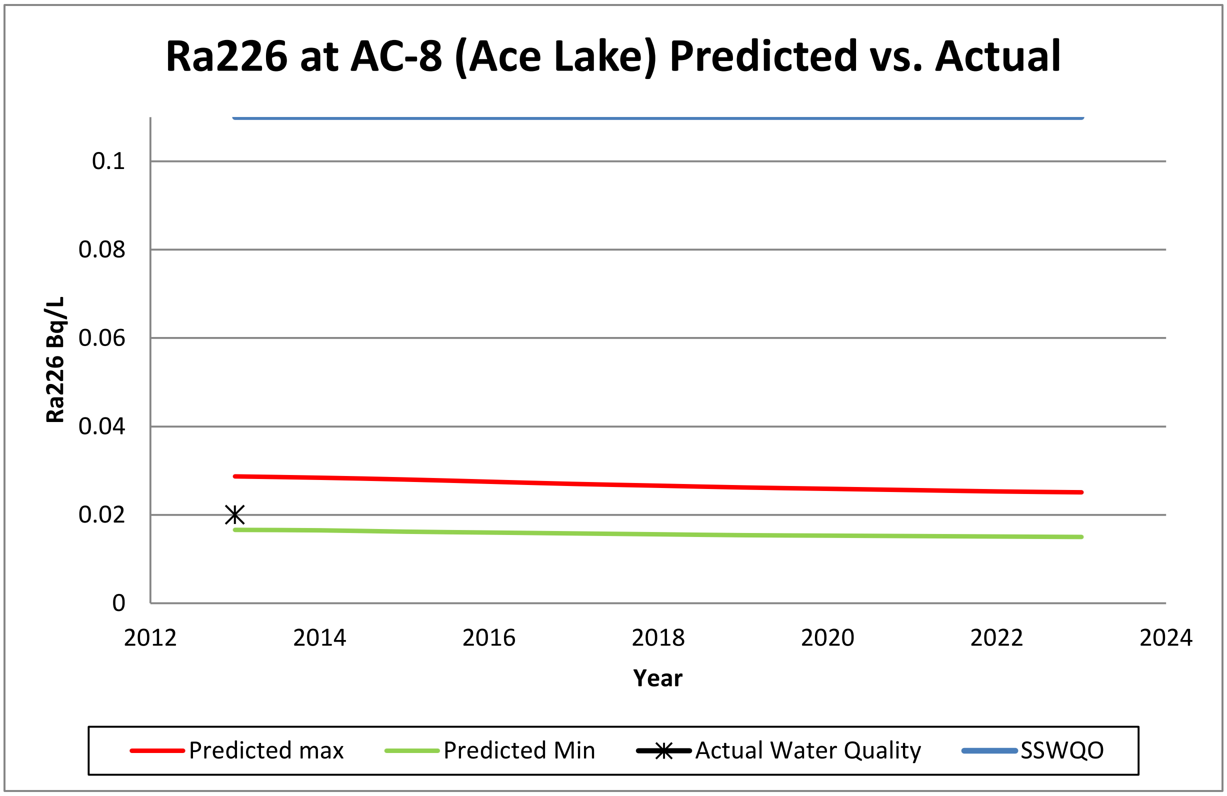


Figure 4.3.1-31 AC-8 Comparison to Predicted Recovery

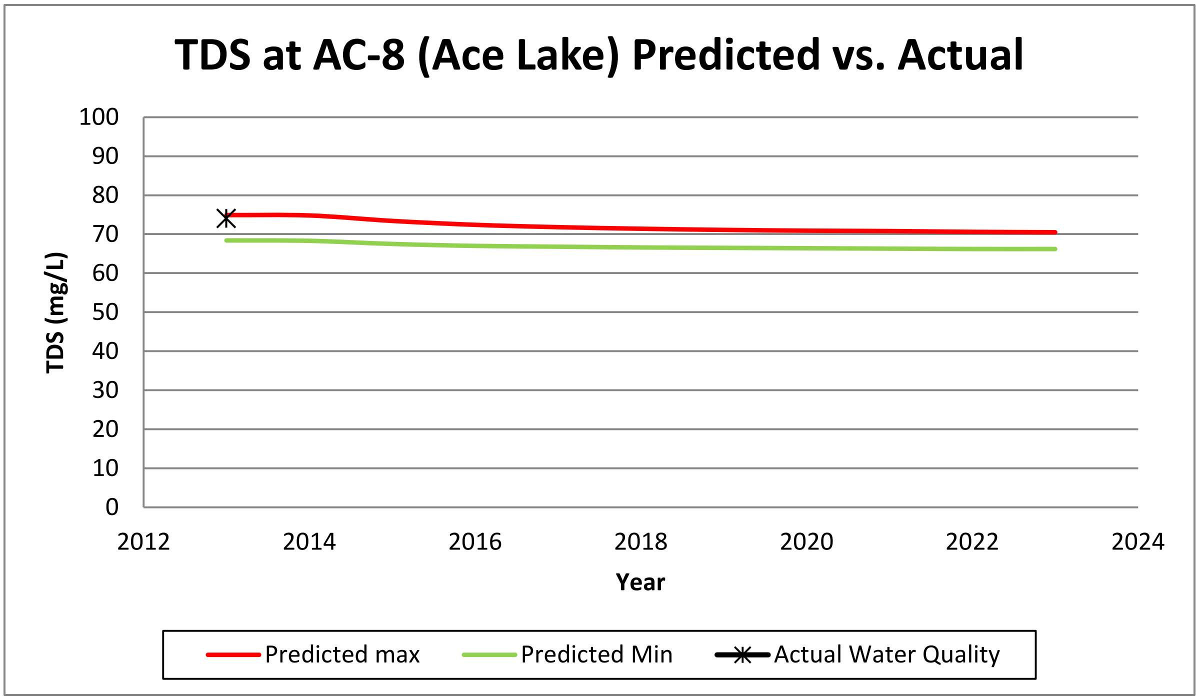


Figure 4.3.1-32 AC-8 Comparison to Predicted Recovery

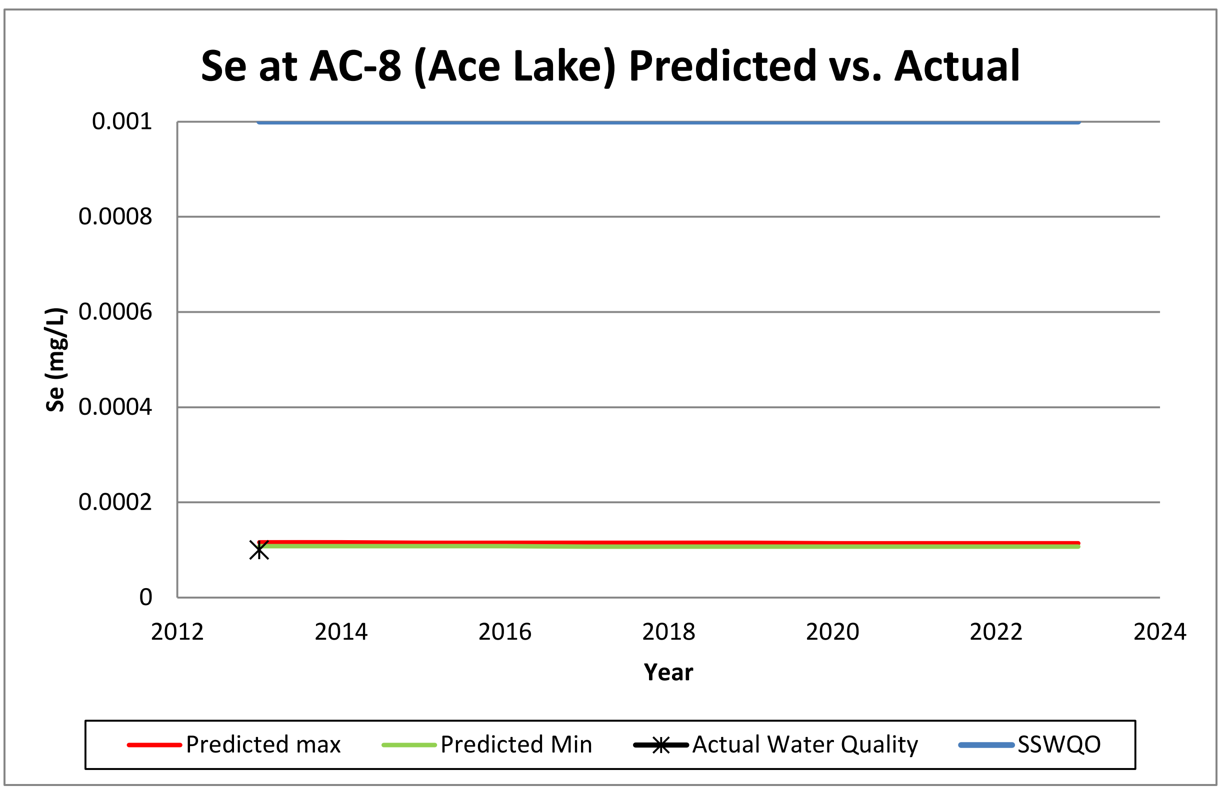


Figure 4.3.1-33 AC-14 - Ace Creek

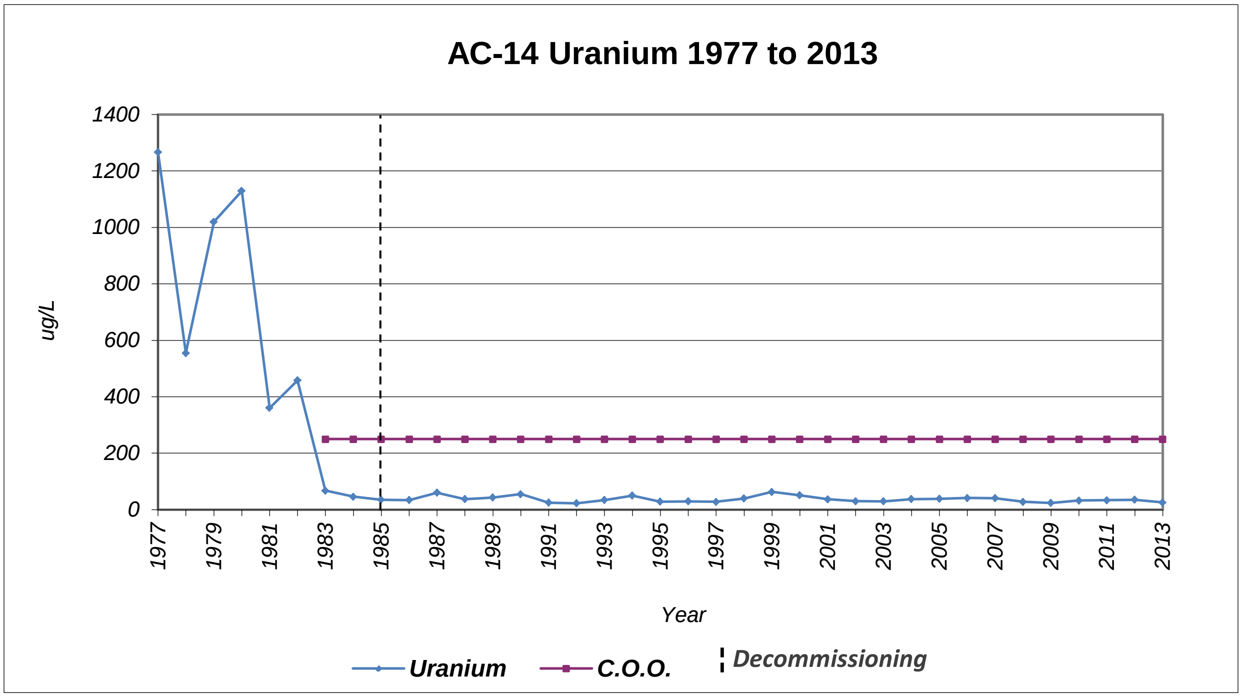


Figure 4.3.1-34 AC-14 - Ace Creek

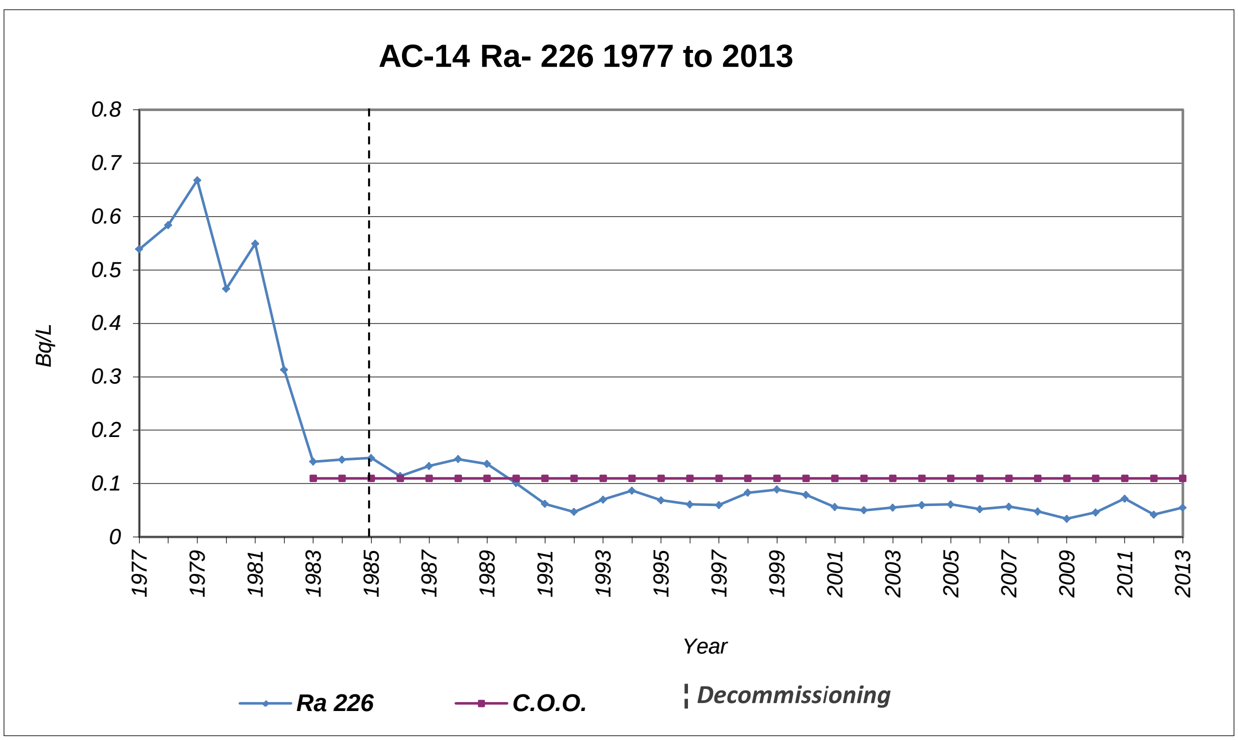


Figure 4.3.1-35 AC-14 - Ace Creek

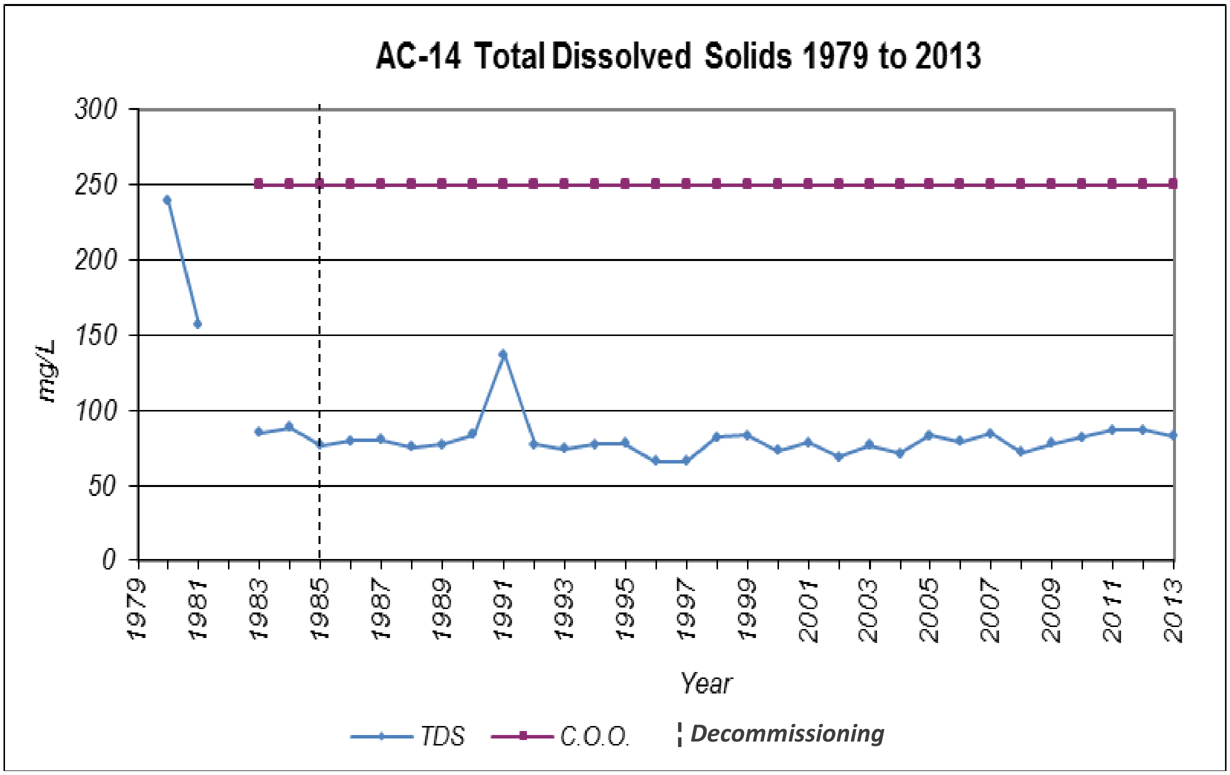
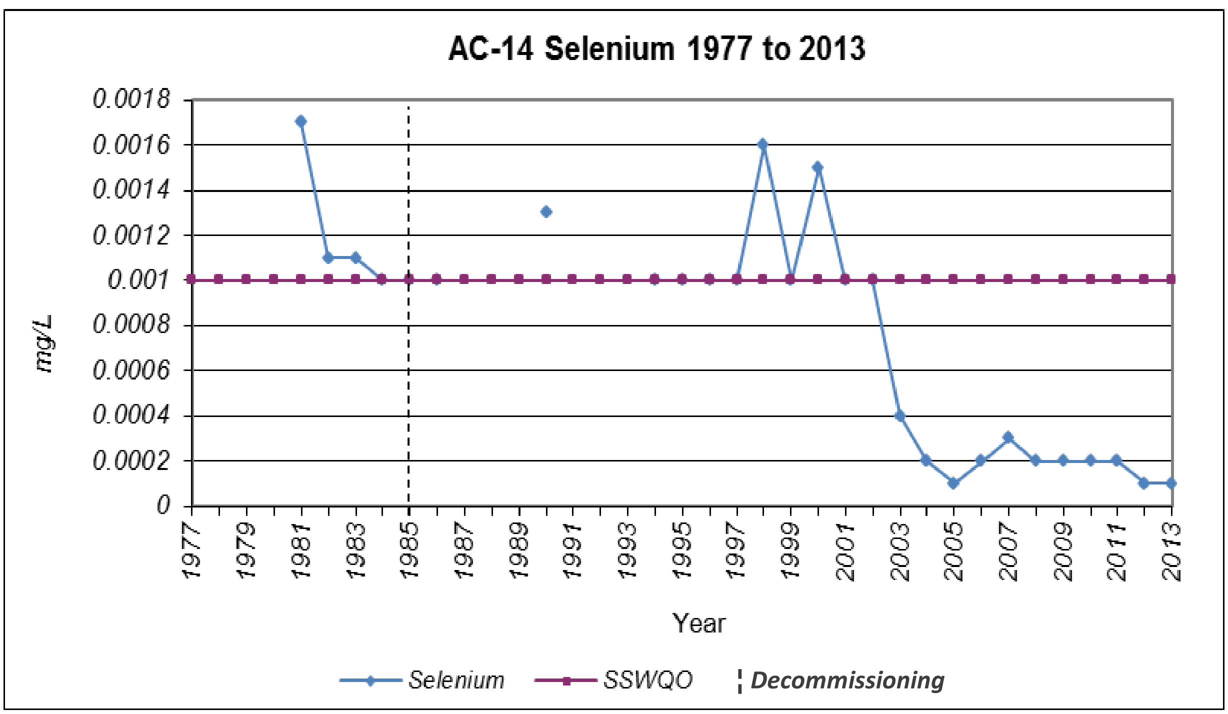


Figure 4.3.1-36 AC-14 - Ace Creek



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

Figure 4.3.1-37 AC-14 Comparison to Predicted Recovery

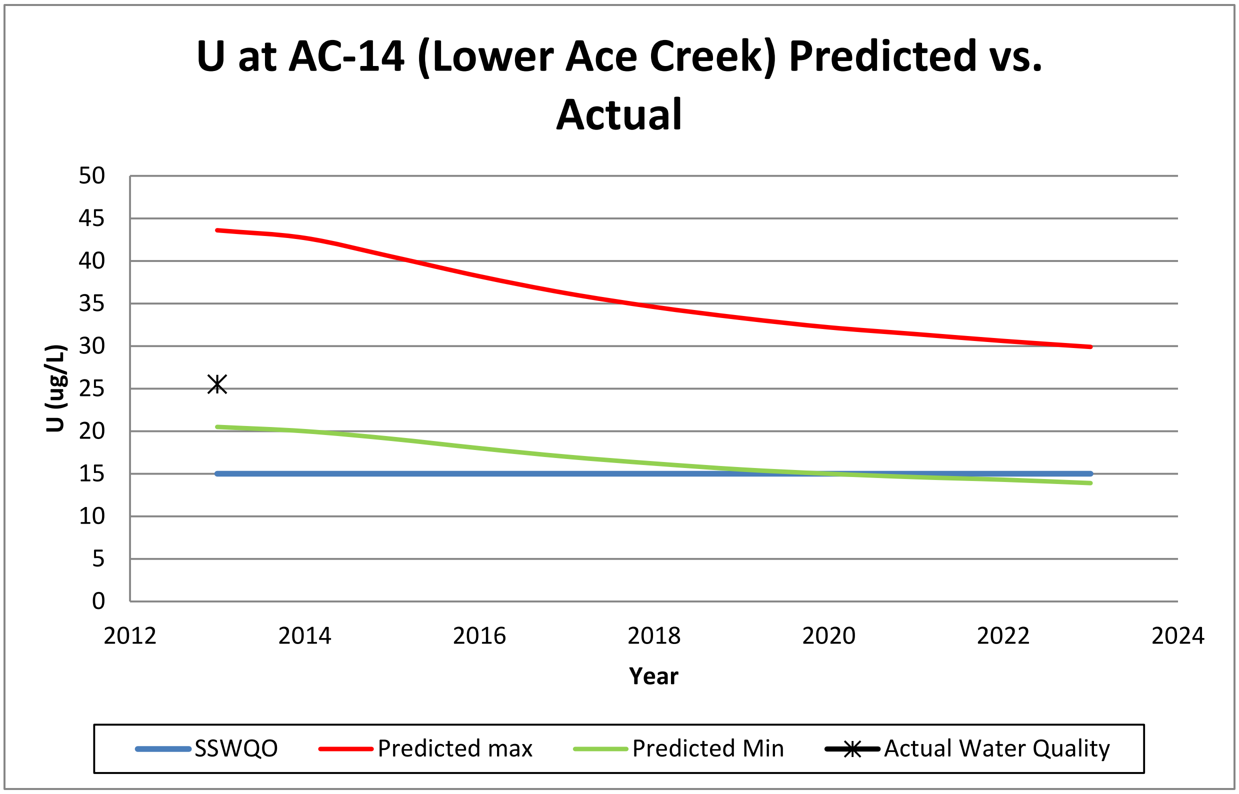


Figure 4.3.1-38 AC-14 Comparison to Predicted Recovery

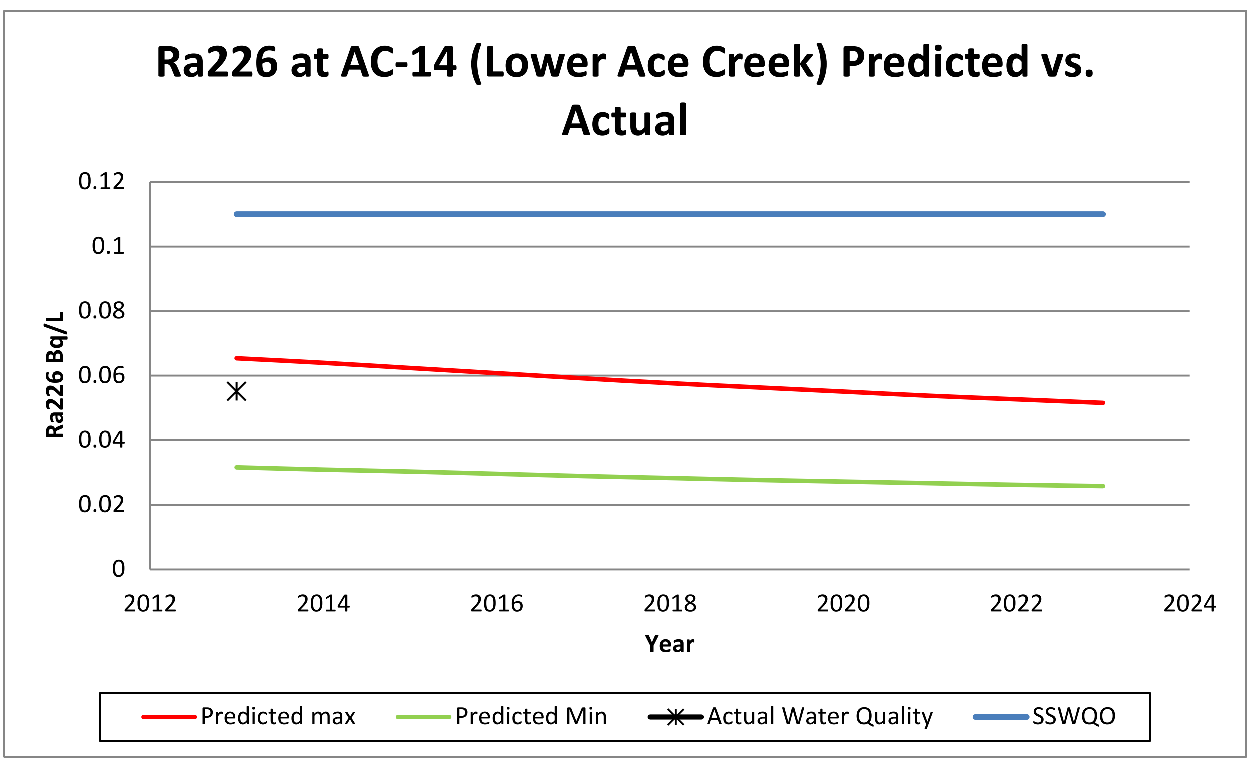


Figure 4.3.1-39 AC-14 Comparison to Predicted Recovery

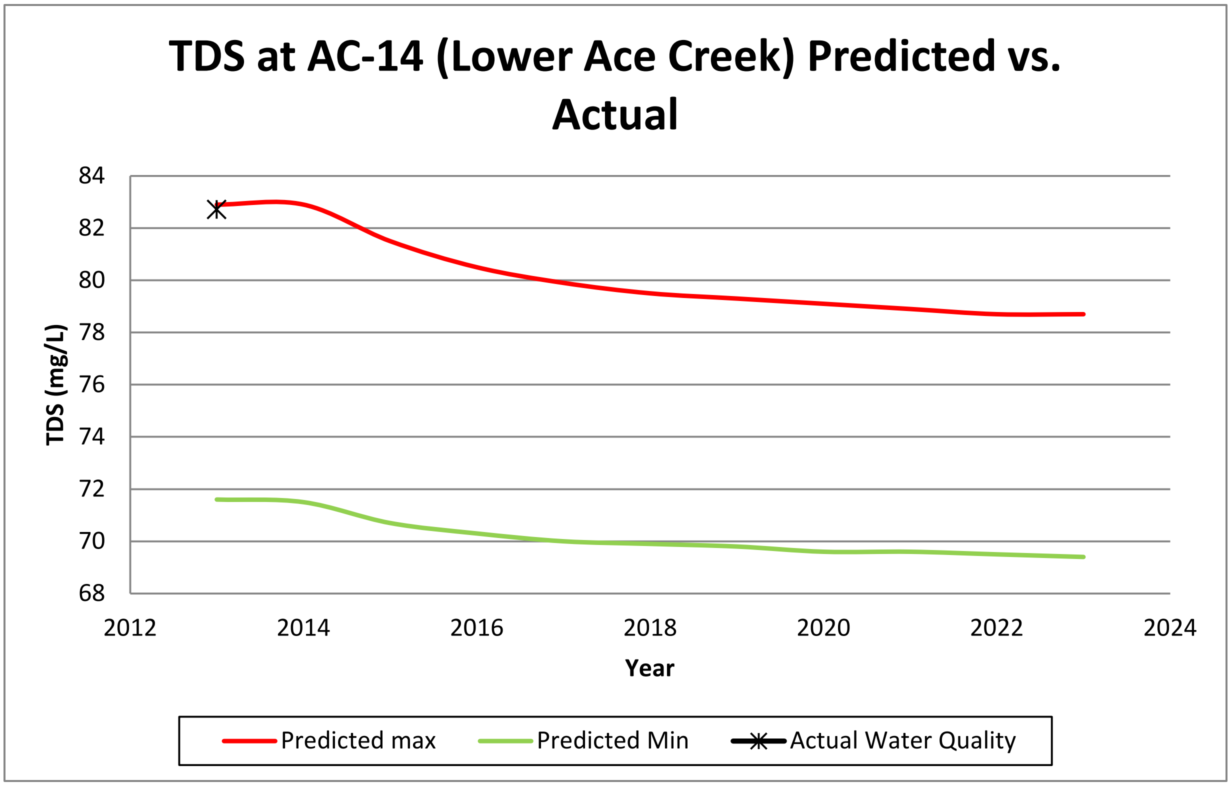


Figure 4.3.1-40 AC-14 Comparison to Predicted Recovery

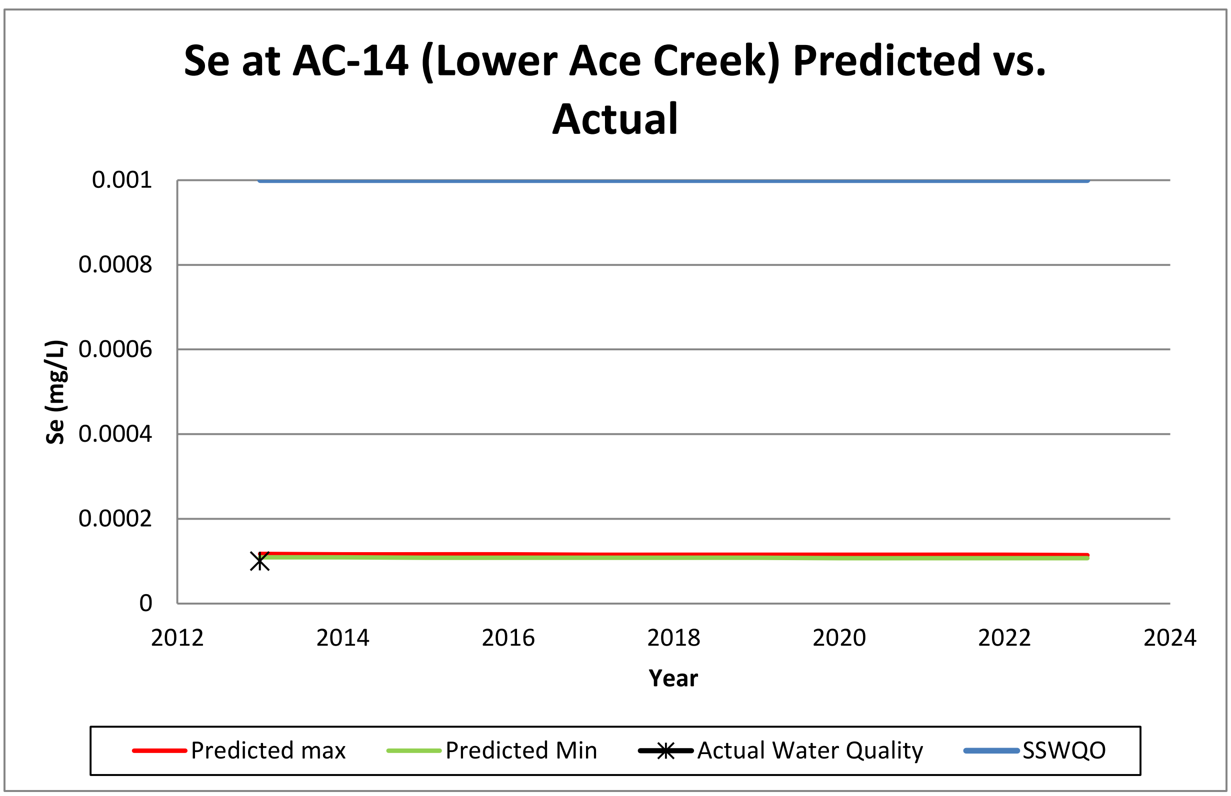
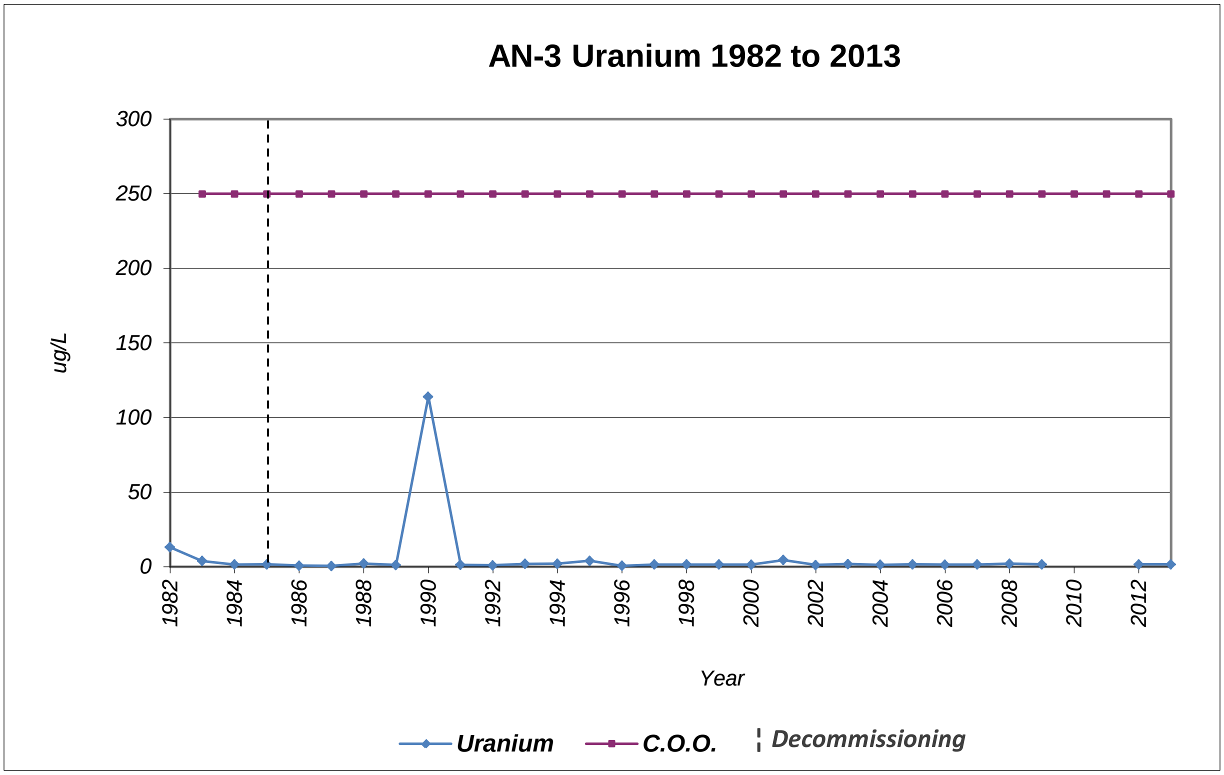
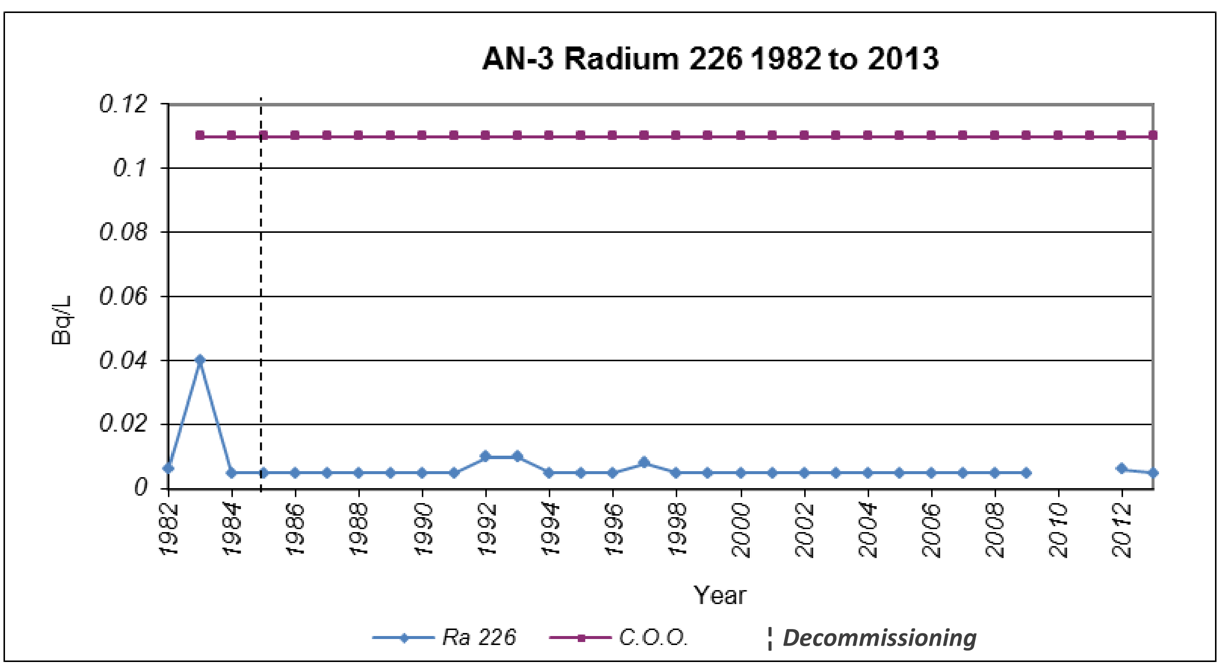


Figure 4.3.2-1 AN-3 Fulton Lake (upstream of TL Stations)



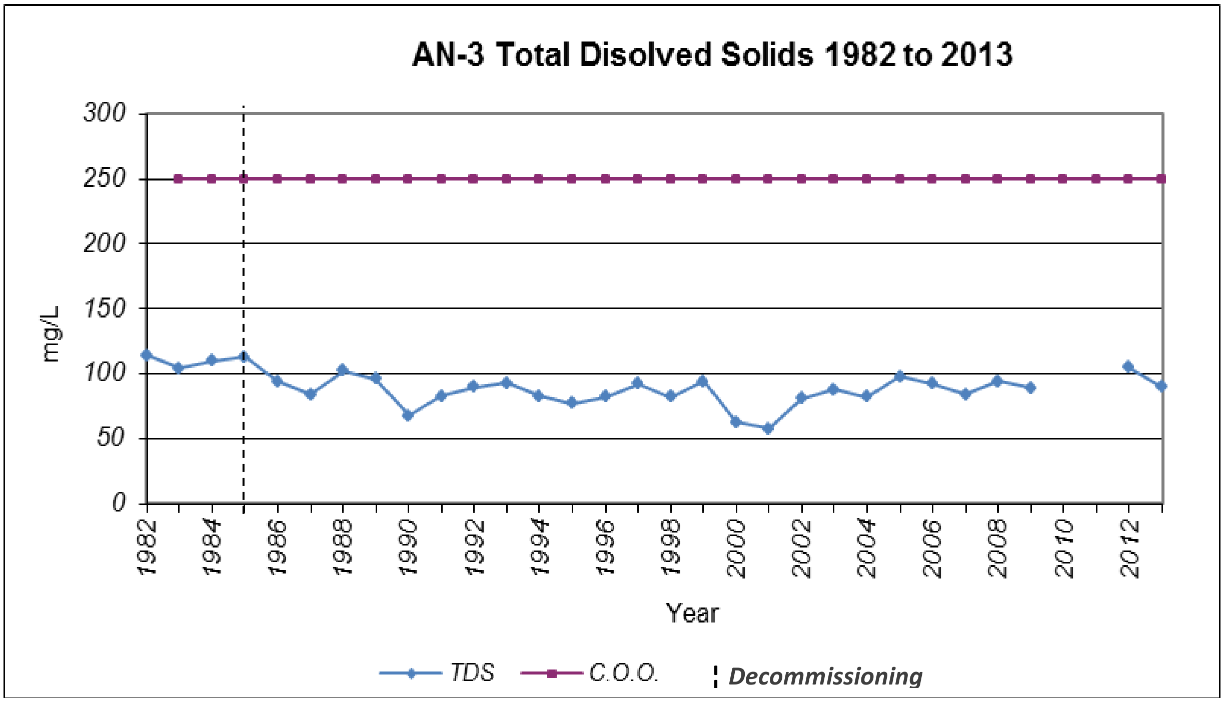
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow*

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



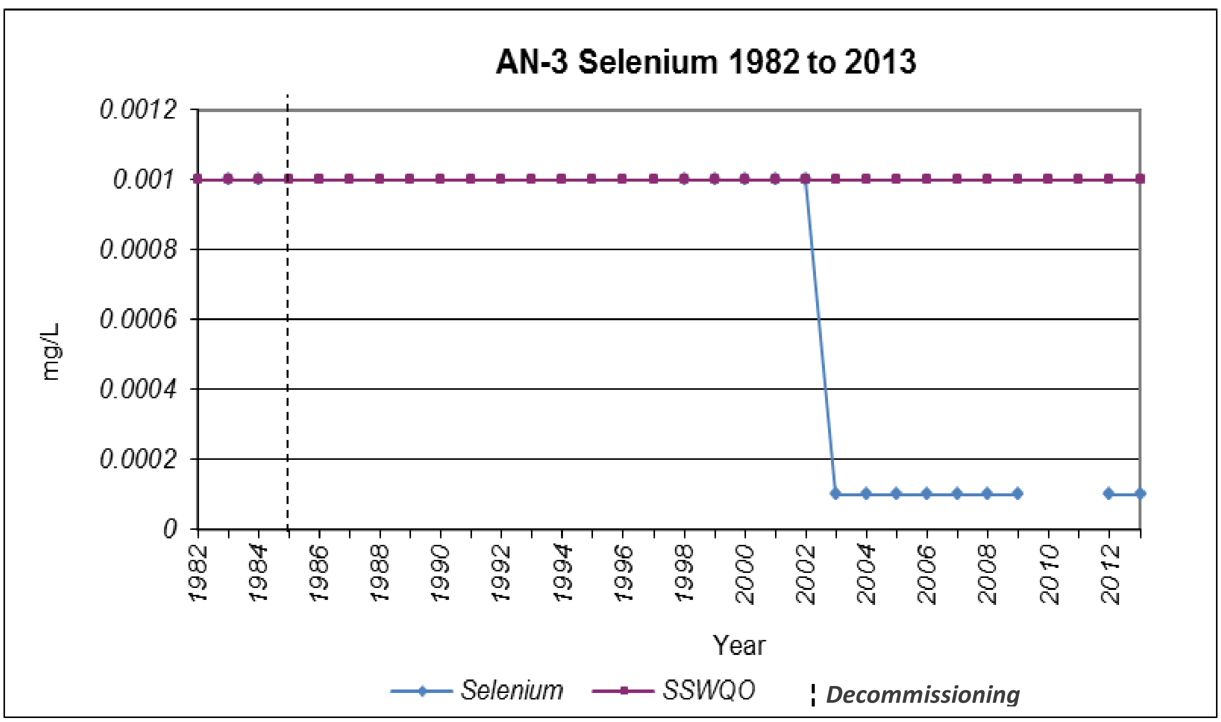
**The 2010 and 2011 scheduled sampling was not completed due to a lack of water flow.*

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*

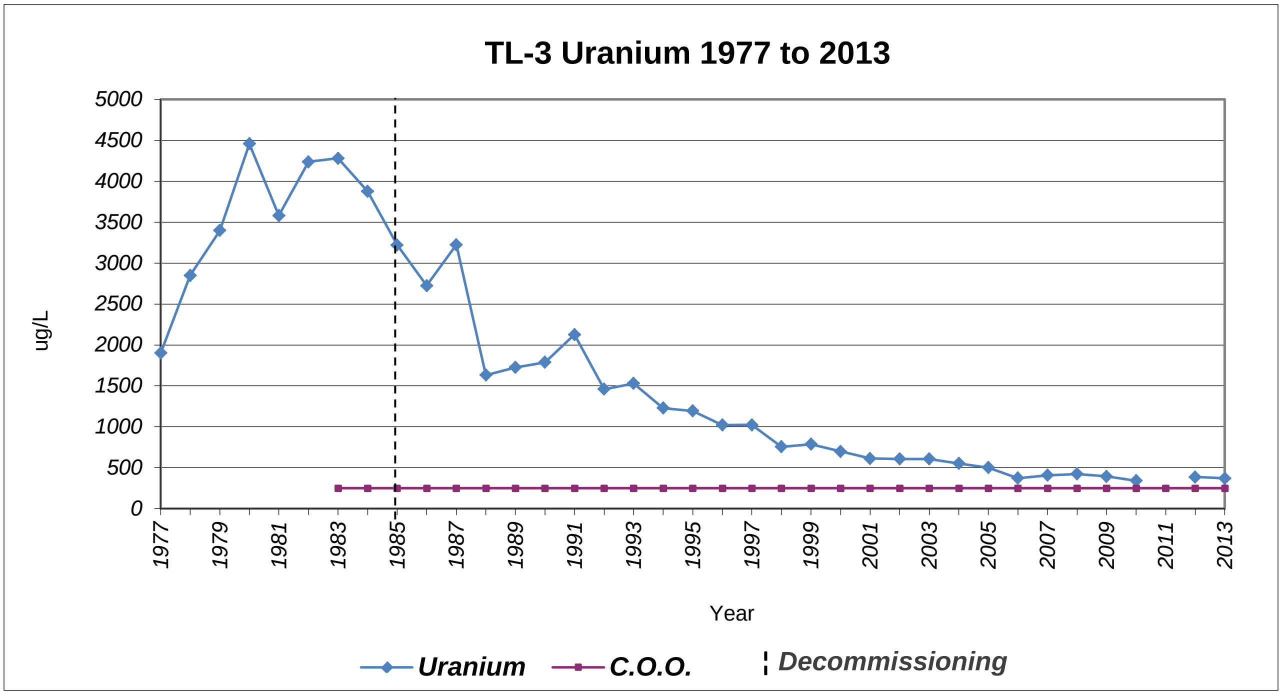
Figure 4.3.2-4 AN-3 Fulton Lake (upstream of TL Stations)



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

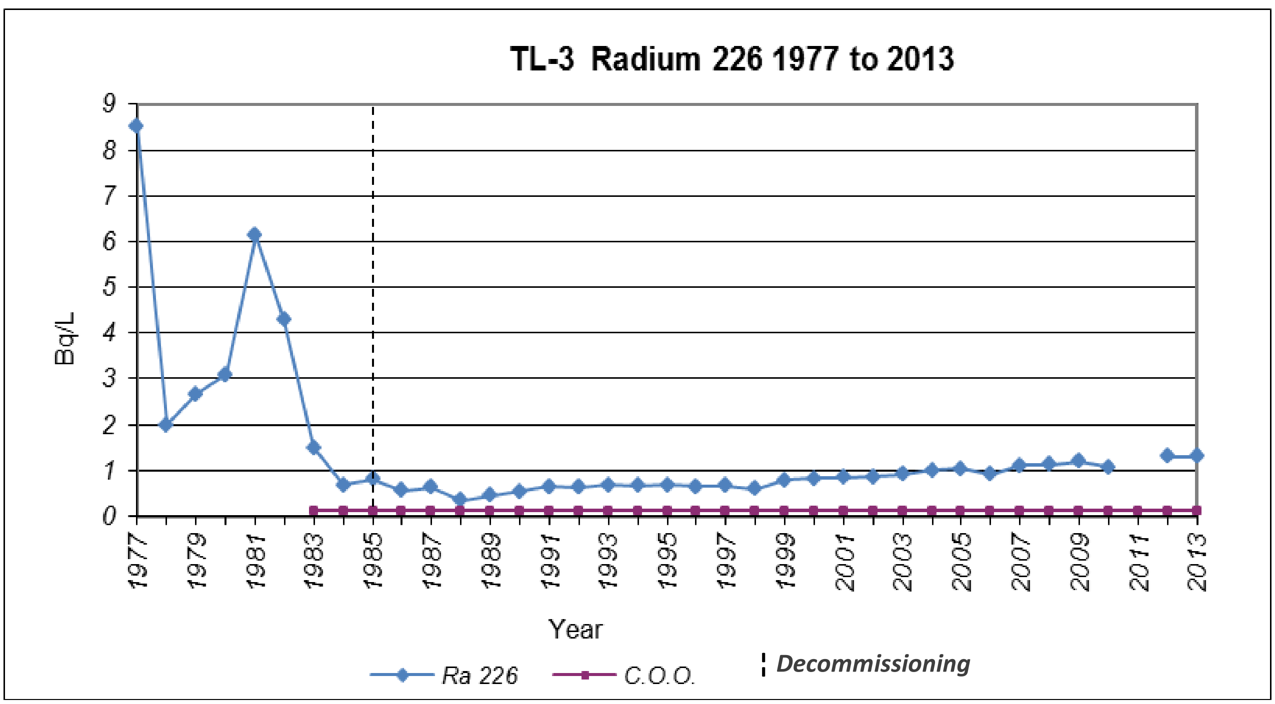
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003

Figure 4.3.2-5 TL-3 Fookes Reservoir Discharge



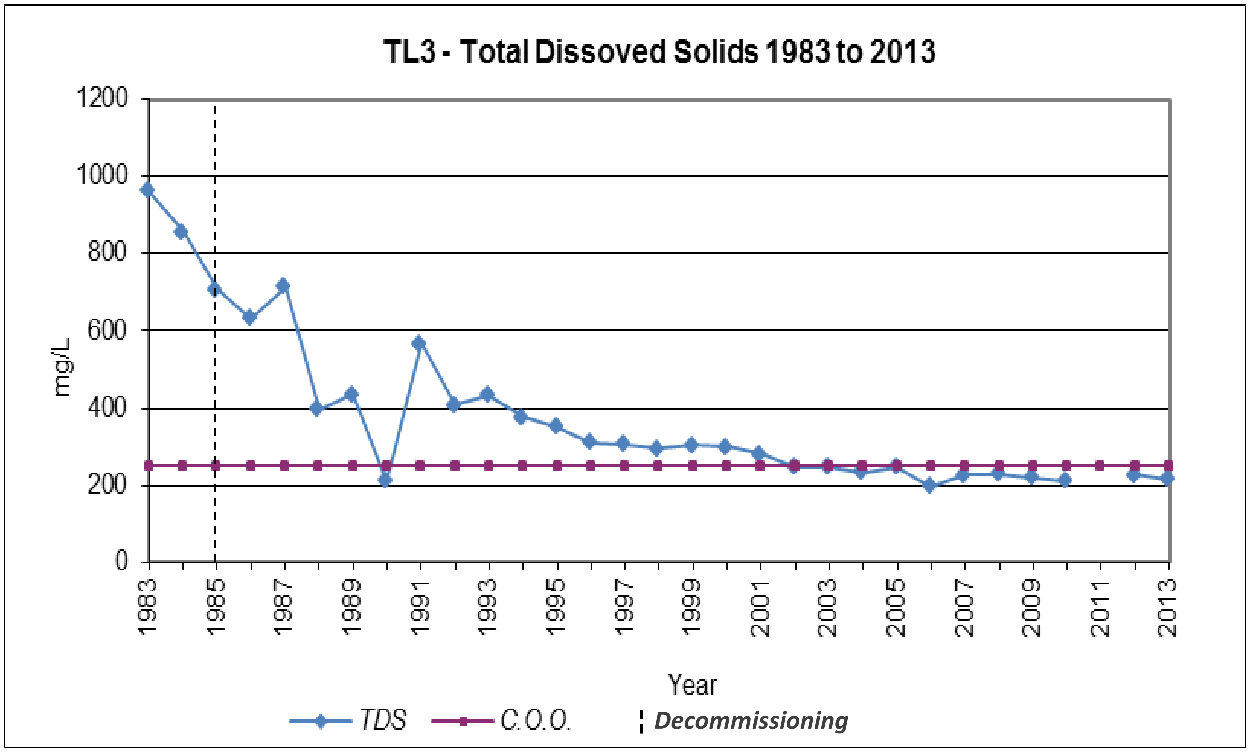
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-6 TL-3 Fookes Reservoir Discharge



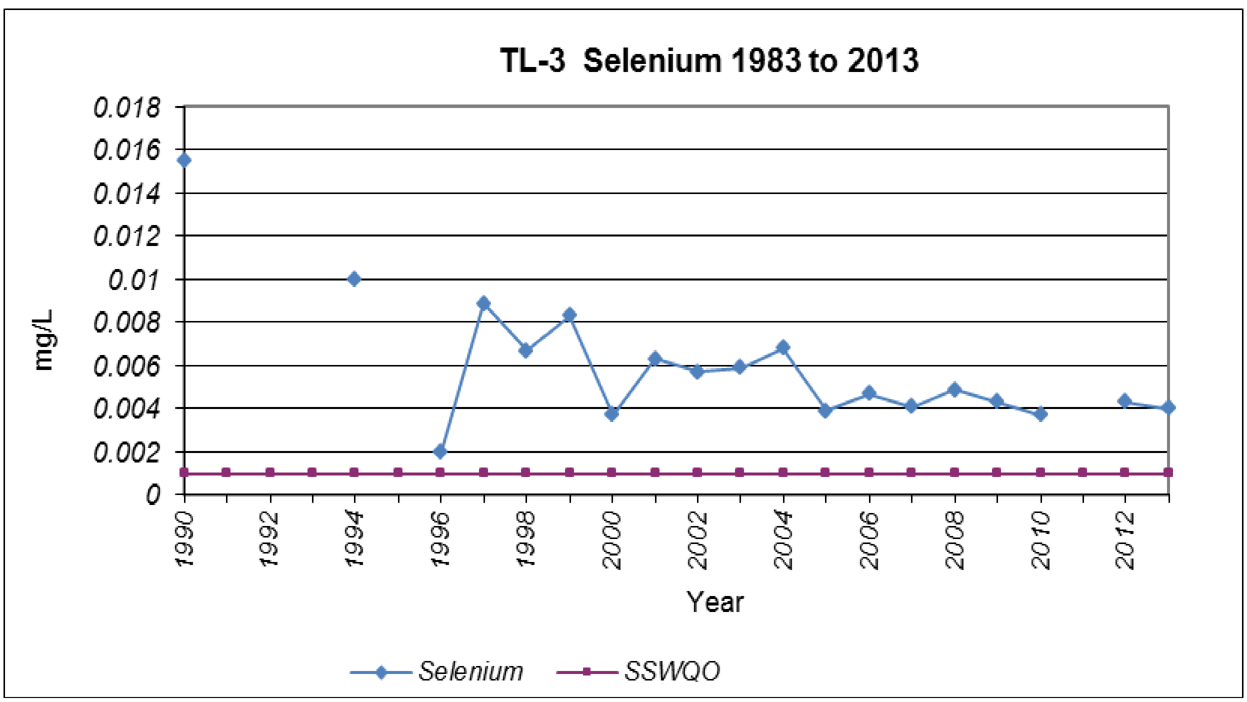
**No data available for 2011 due to a lack of water flow*

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 Comparison to Predicted Recovery

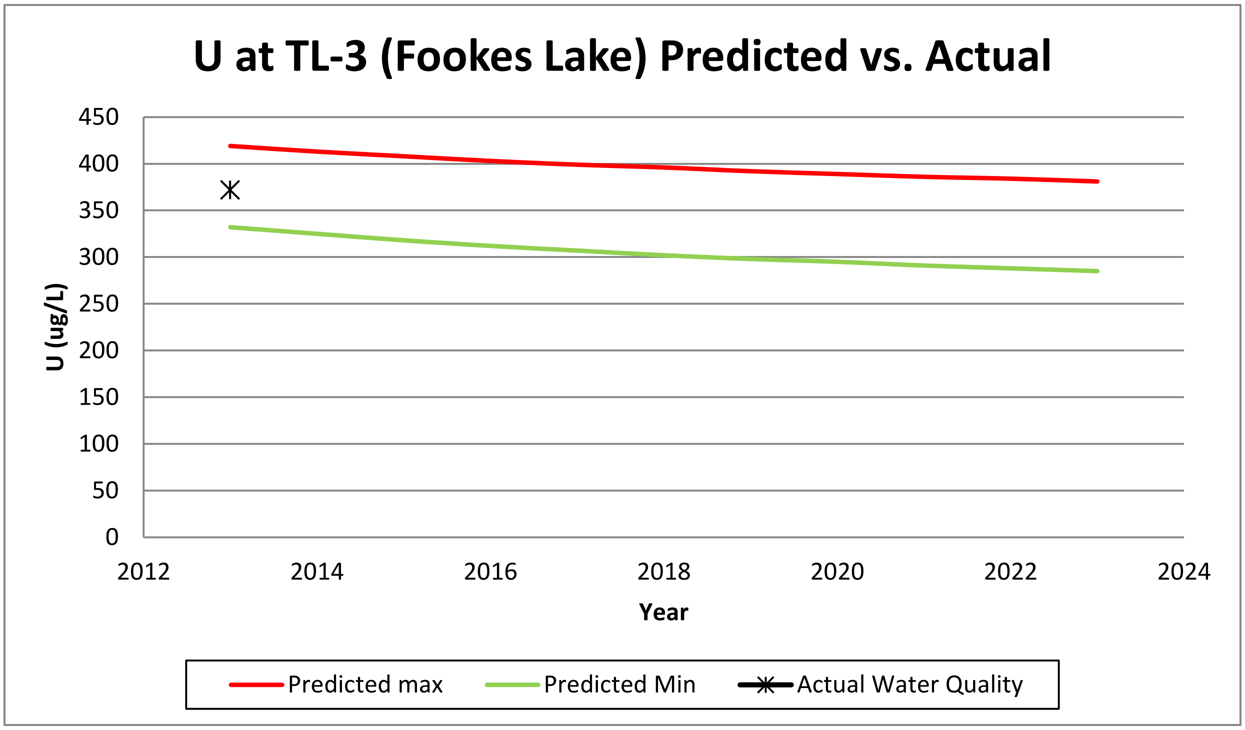


Figure 4.3.2-10 TL-3 Comparison to Predicted Recovery

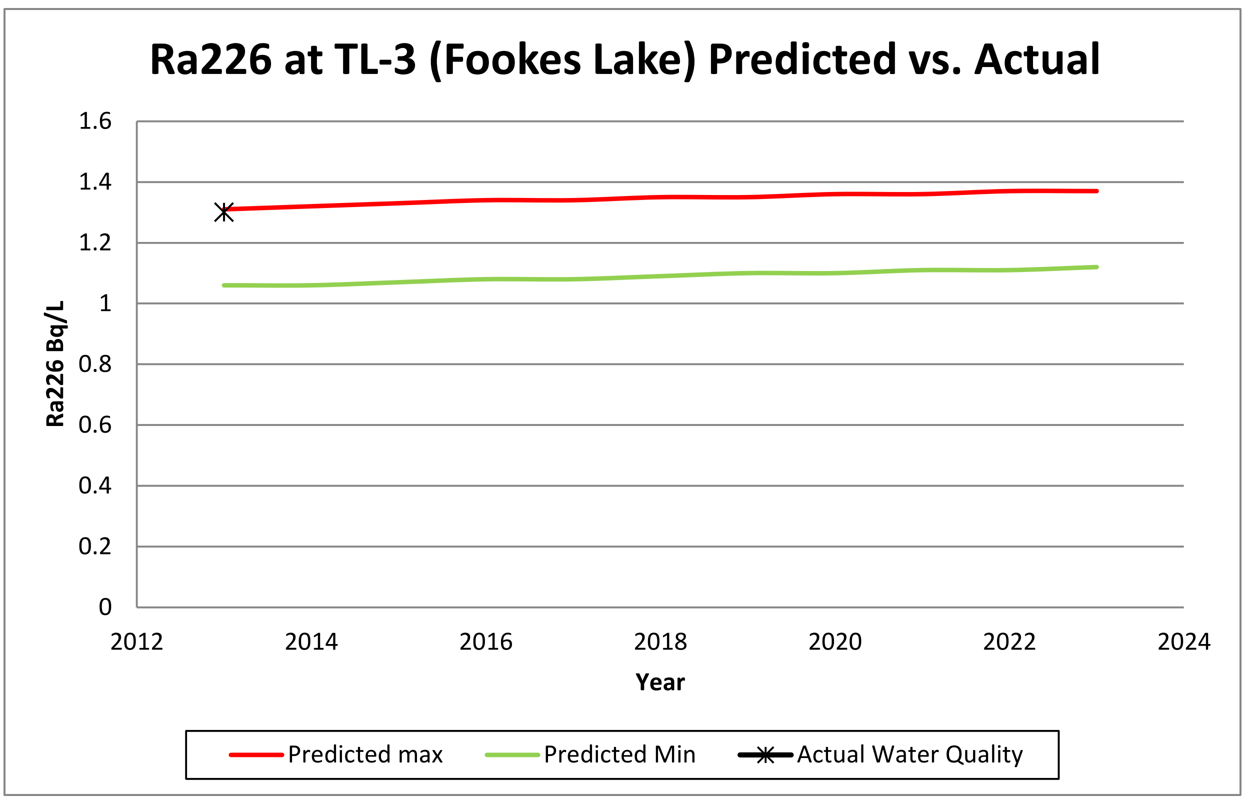


Figure 4.3.2-11 TL-3 Comparison to Predicted Recovery

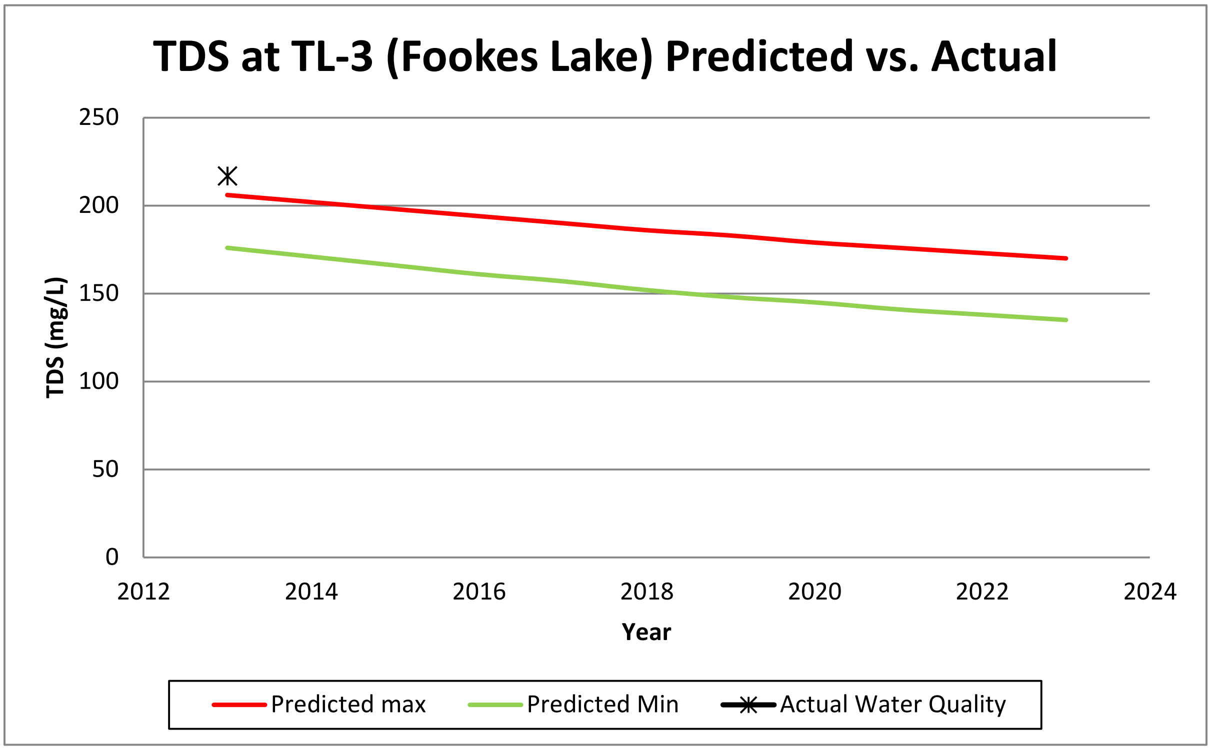


Figure 4.3.2-12 TL-3 Comparison to Predicted Recovery

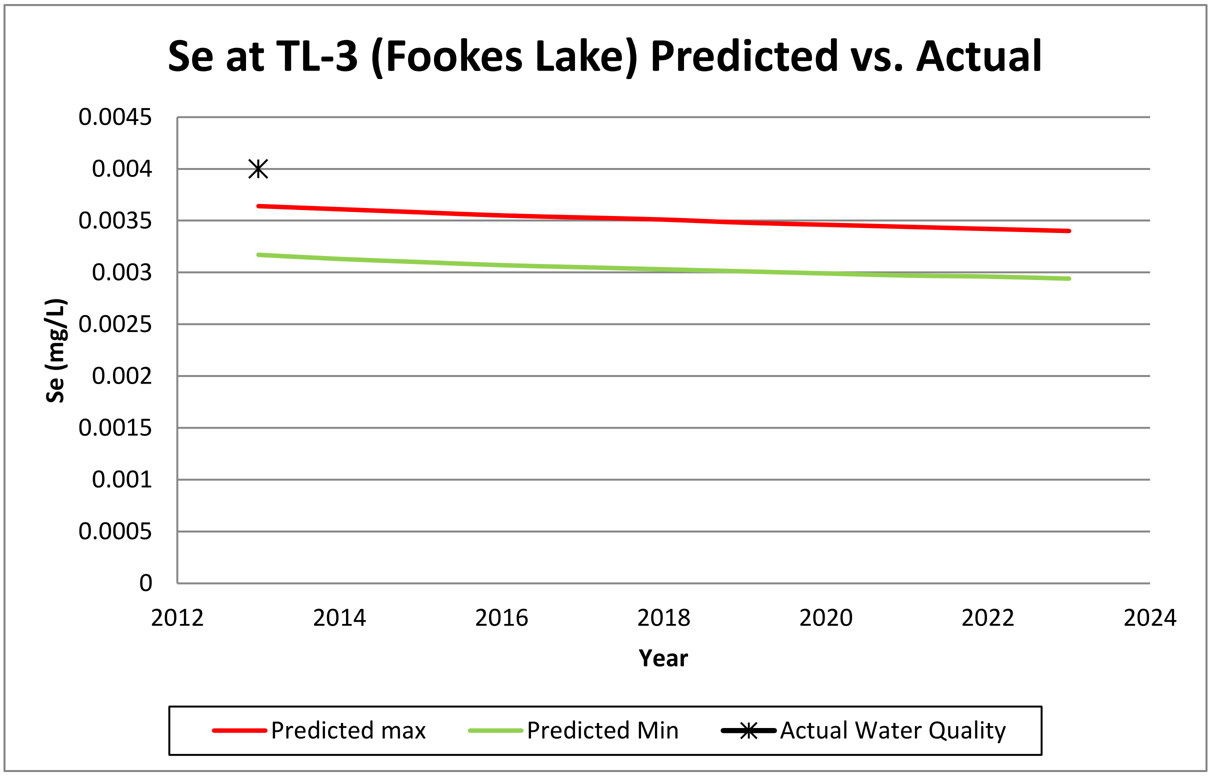
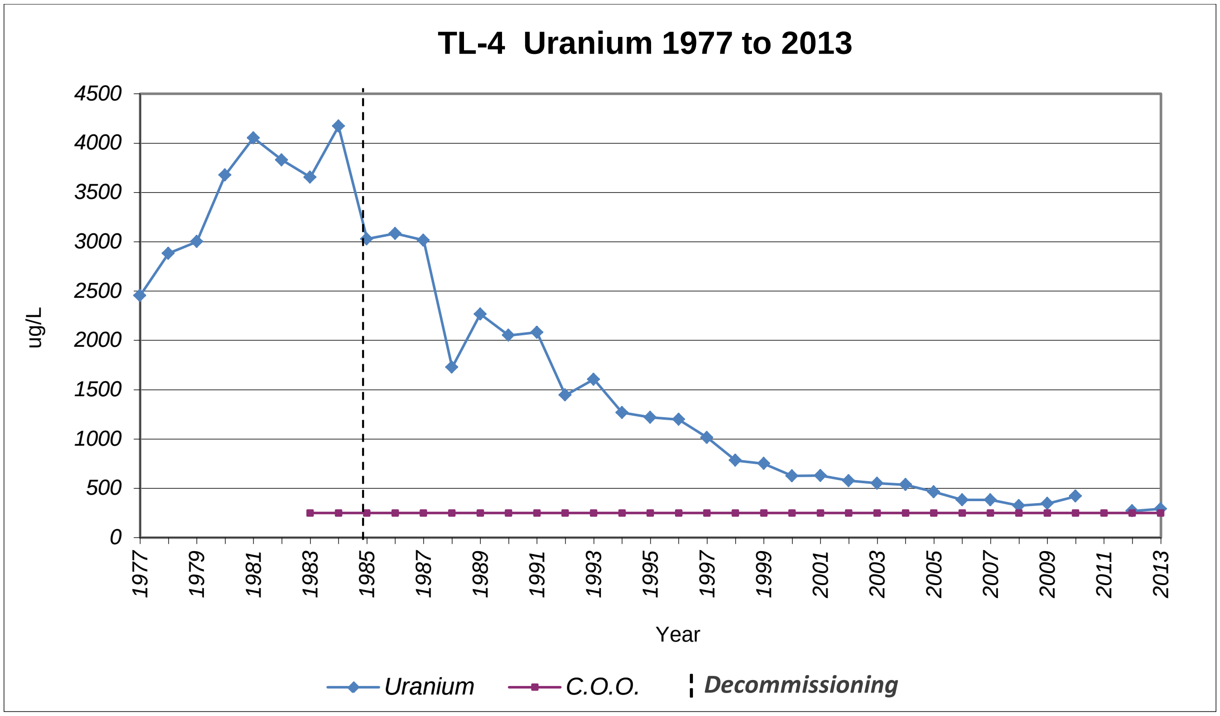
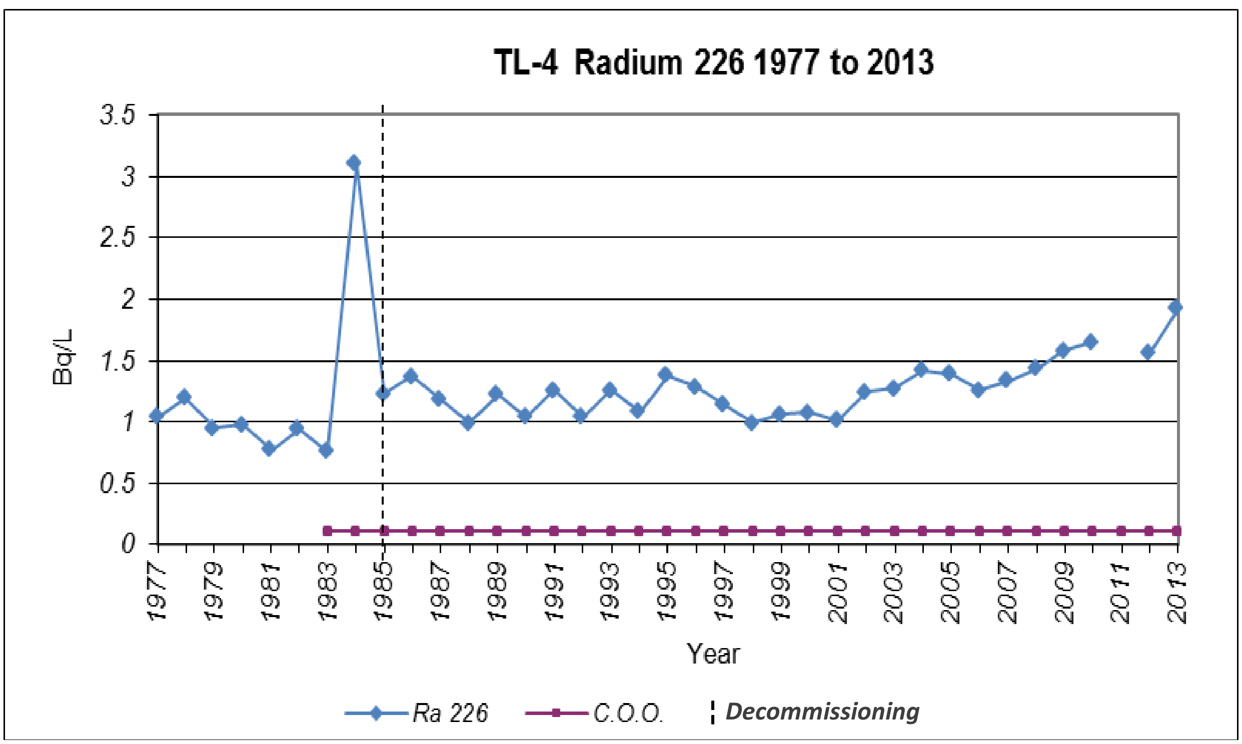


Figure 4.3.2-13 TL-4 Marie Reservoir Discharge



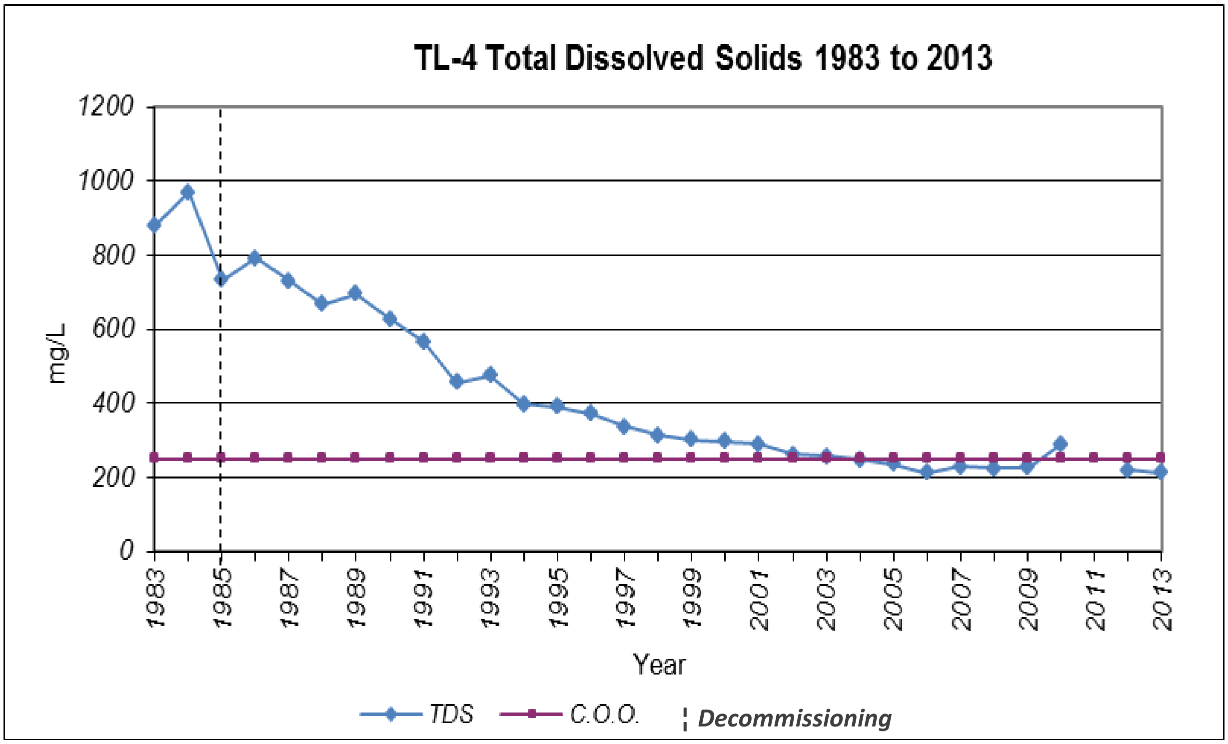
**No data available for2011 due to a lack of water flow*

Figure 4.3.2-14 TL-4 Marie Reservoir Discharge



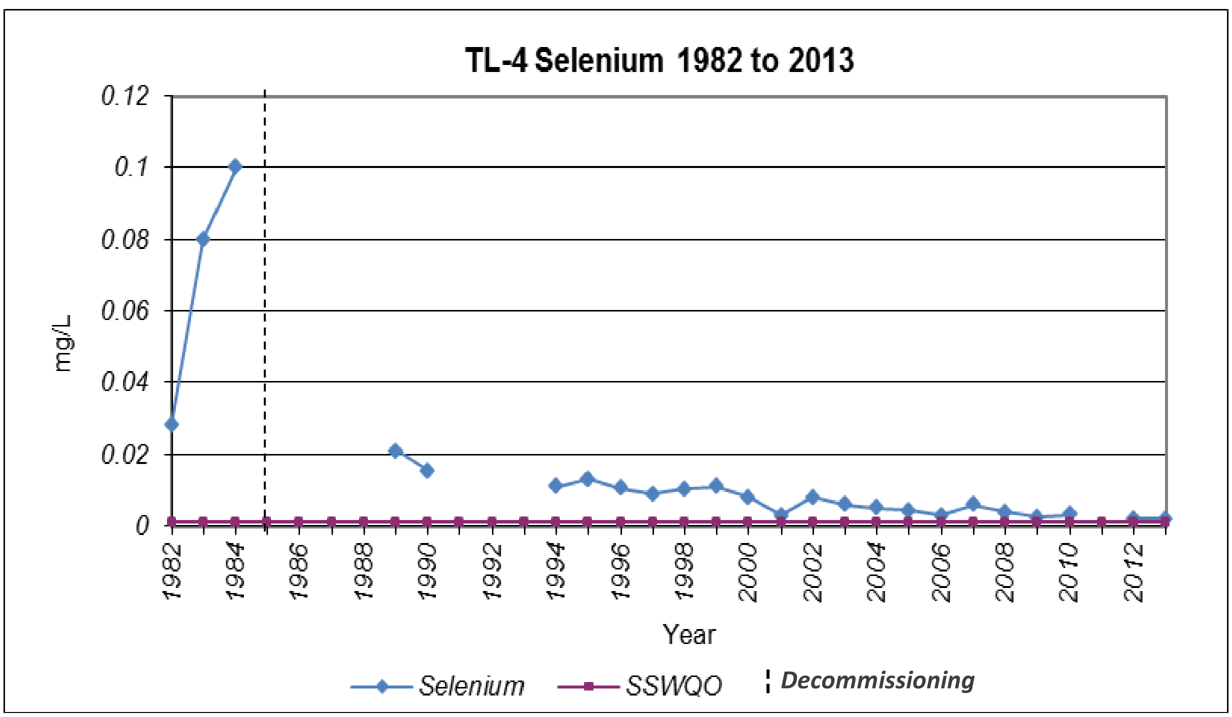
**No data available for 2011 due to a lack of water flow*

Figure 4.3.2-15 TL-4 Marie Reservoir Discharge



**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-4 Comparison to Predicted Recovery

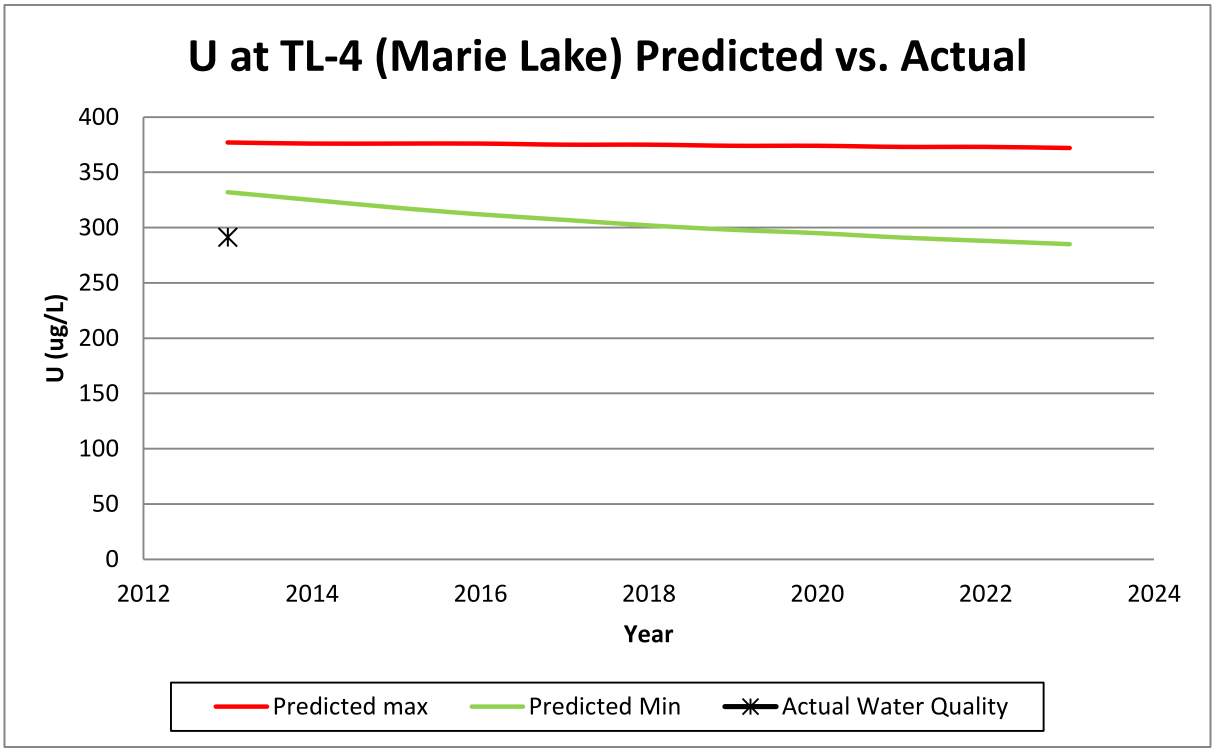


Figure 4.3.2-18 TL-4 Comparison to Predicted Recovery

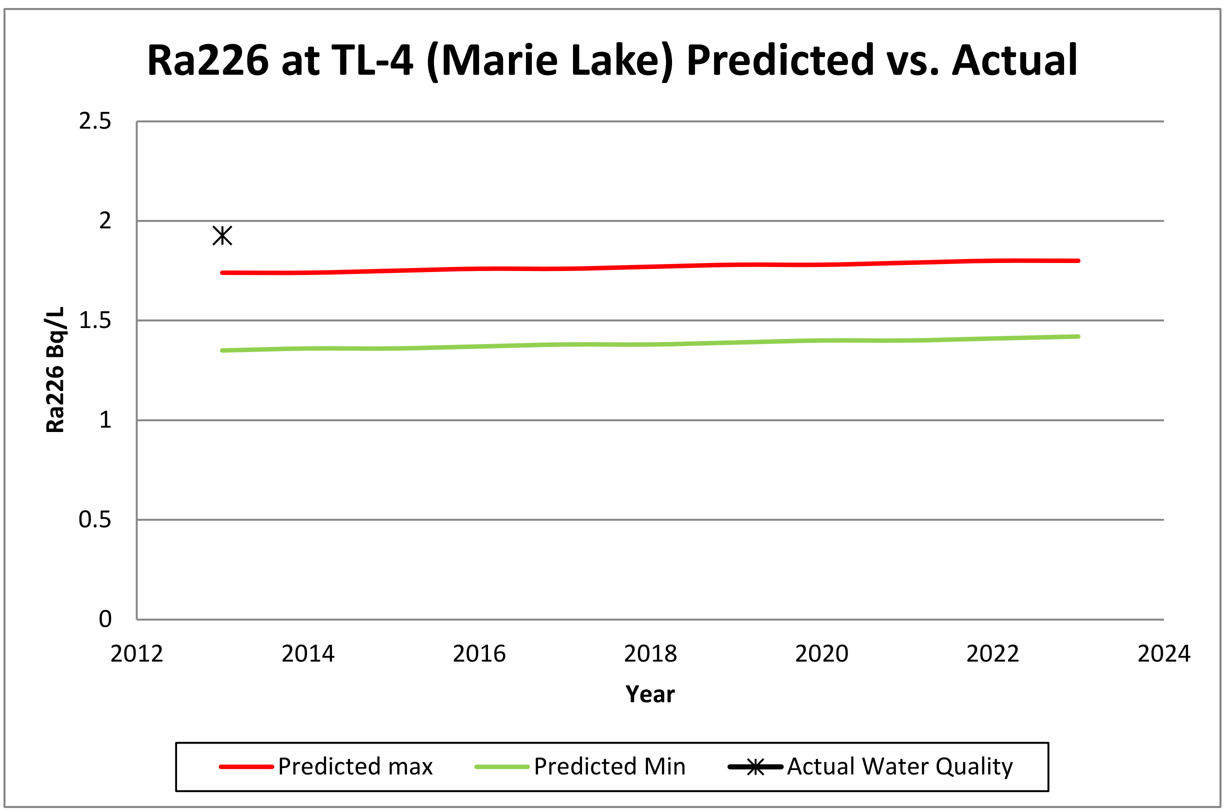


Figure 4.3.2-19 TL-4 Comparison to Predicted Recovery

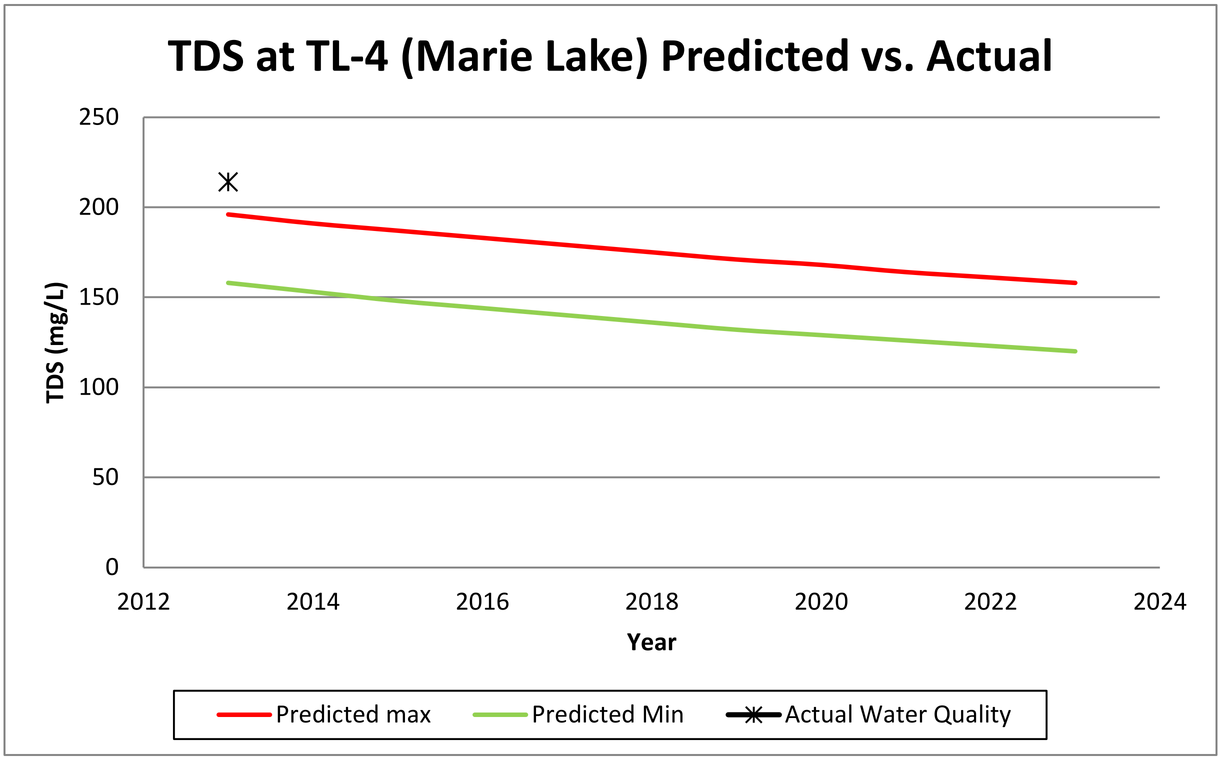


Figure 4.3.2-20 TL-4 Comparison to Predicted Recovery

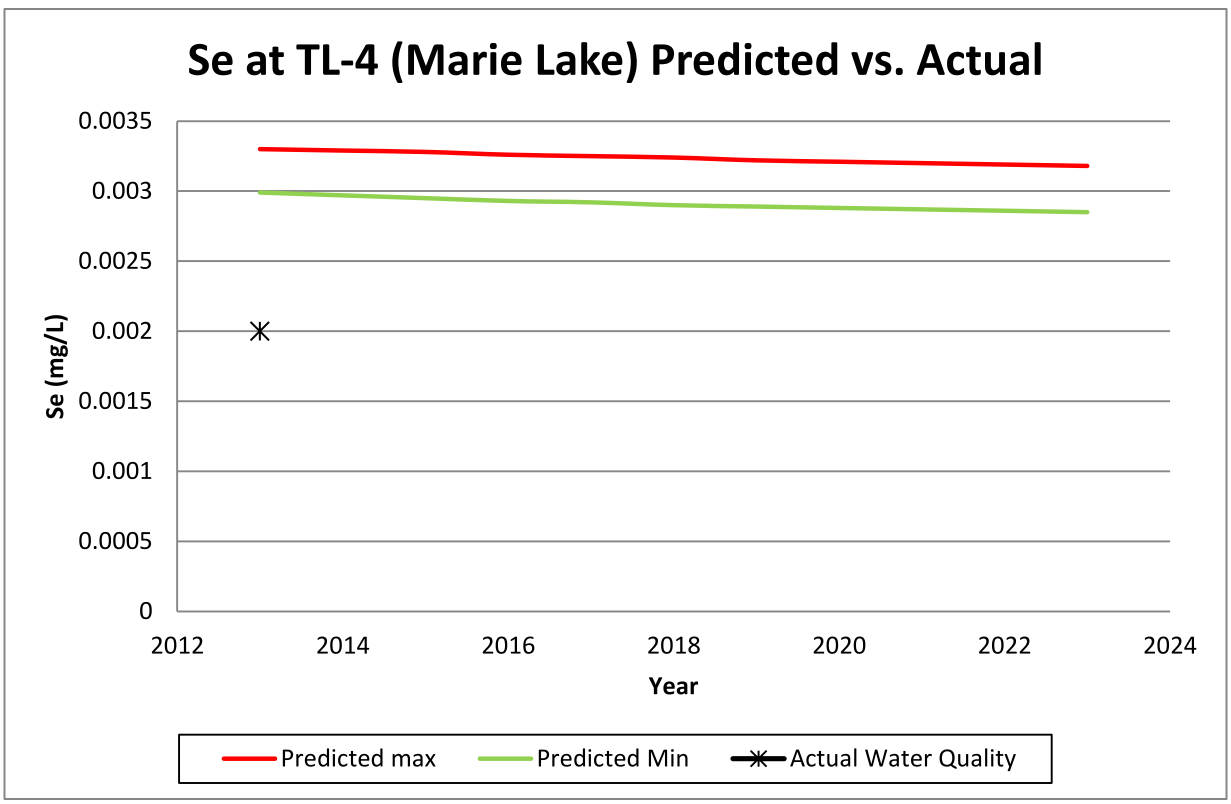
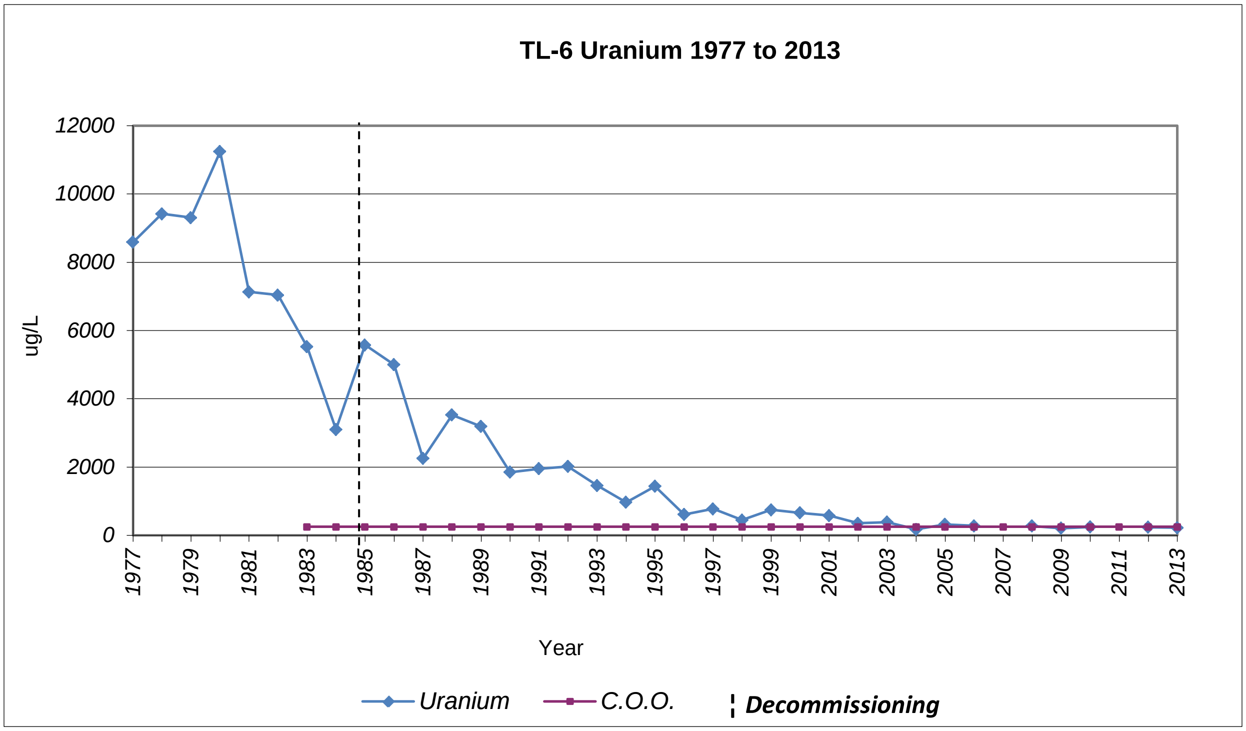
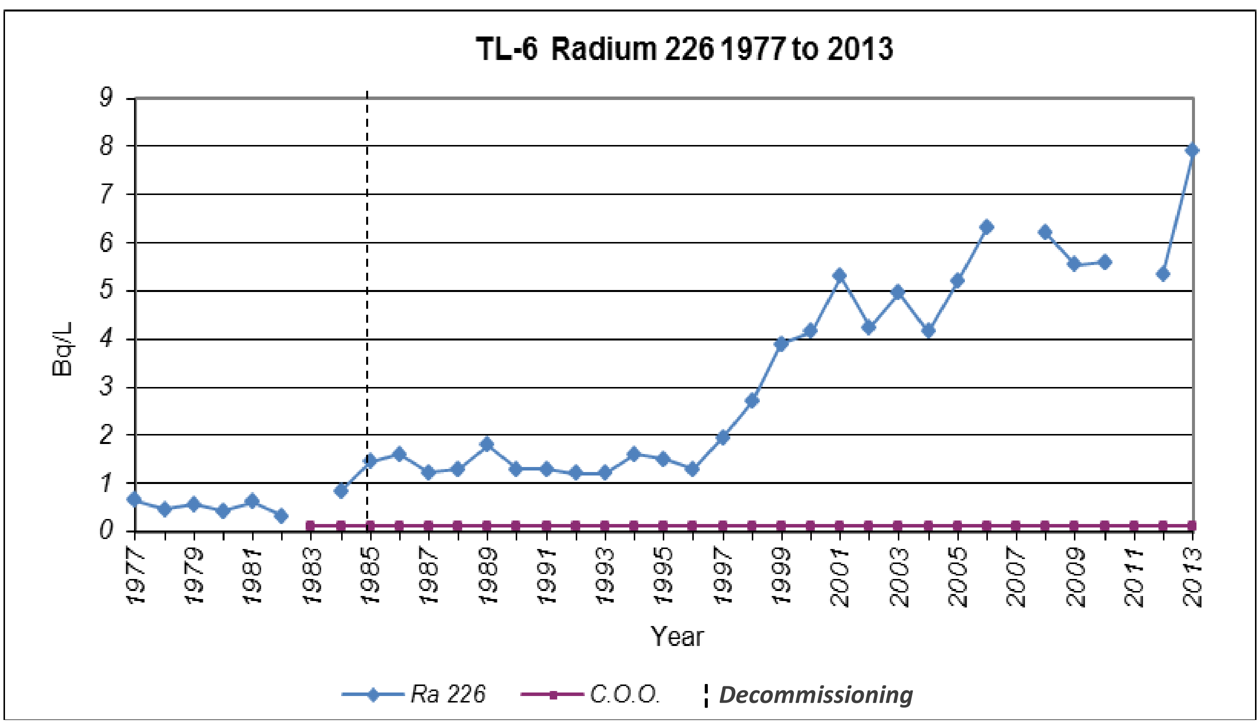


Figure 4.3.2-21 TL-6 Minewater Reservoir Discharge



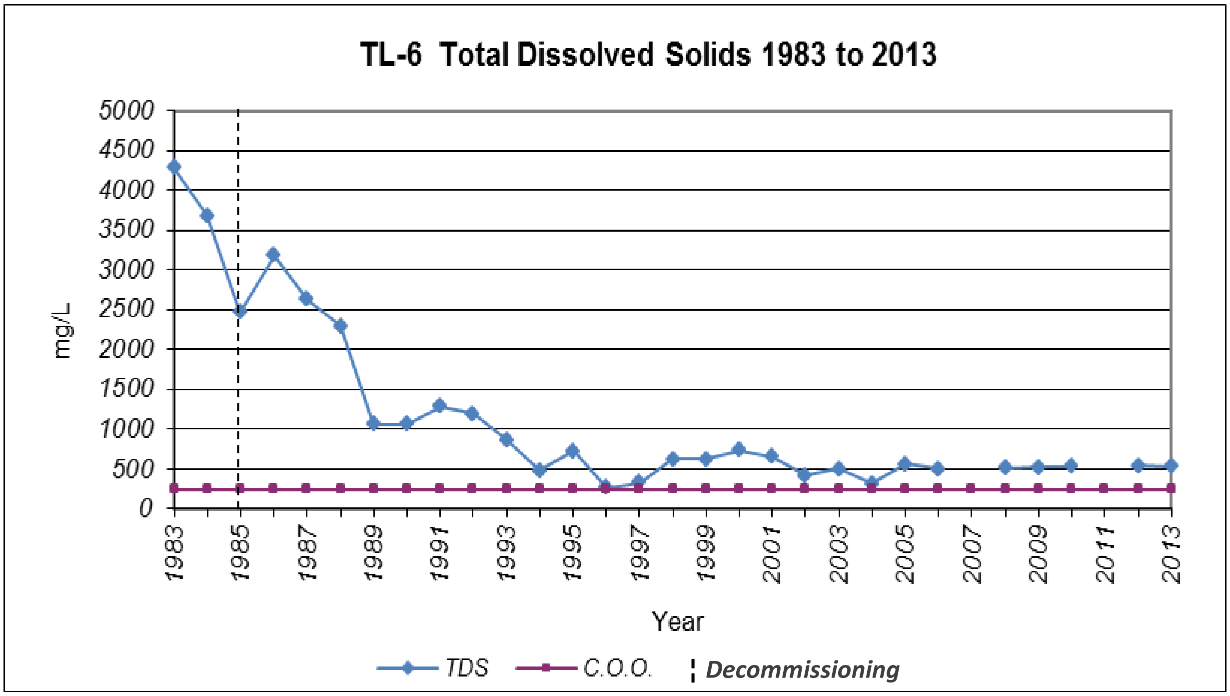
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-22 TL-6 Minewater Reservoir Discharge



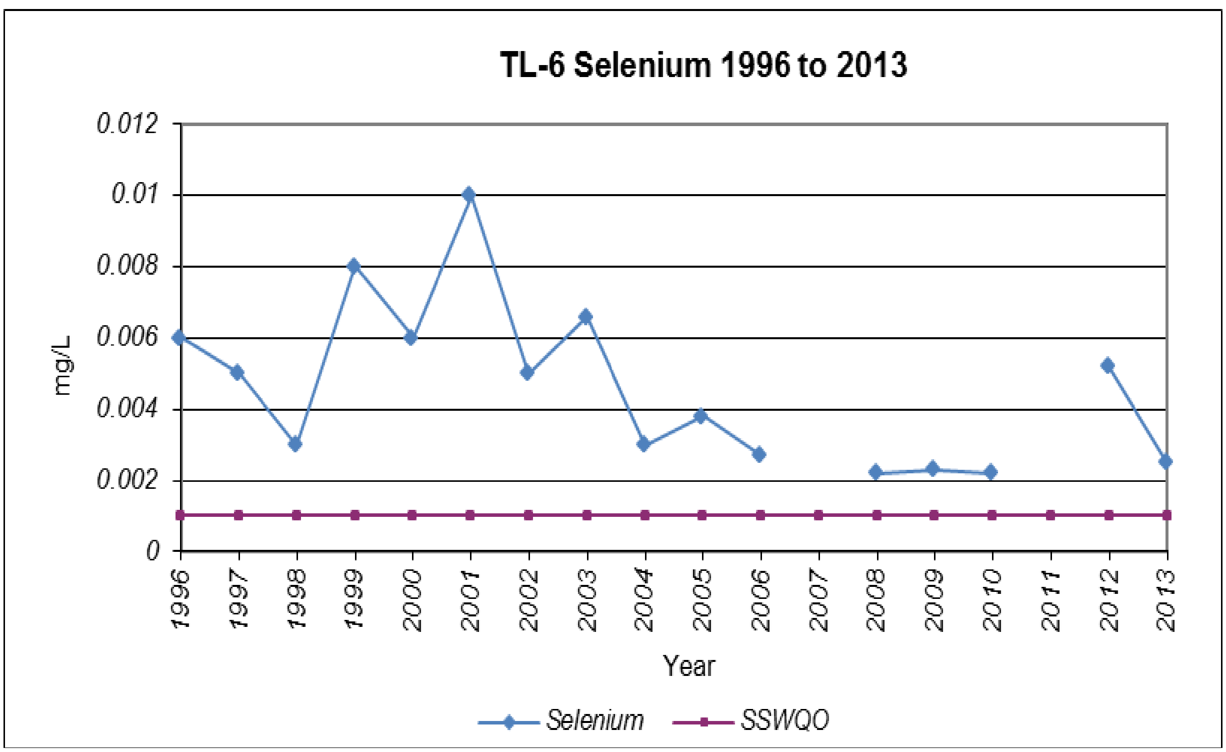
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.2-23 TL-6 Minewater Reservoir Discharge



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

Figure 4.3.2-24 TL-6 Minewater Reservoir Discharge



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

Figure 4.3.2-25 TL-7 Meadow Lake Discharge

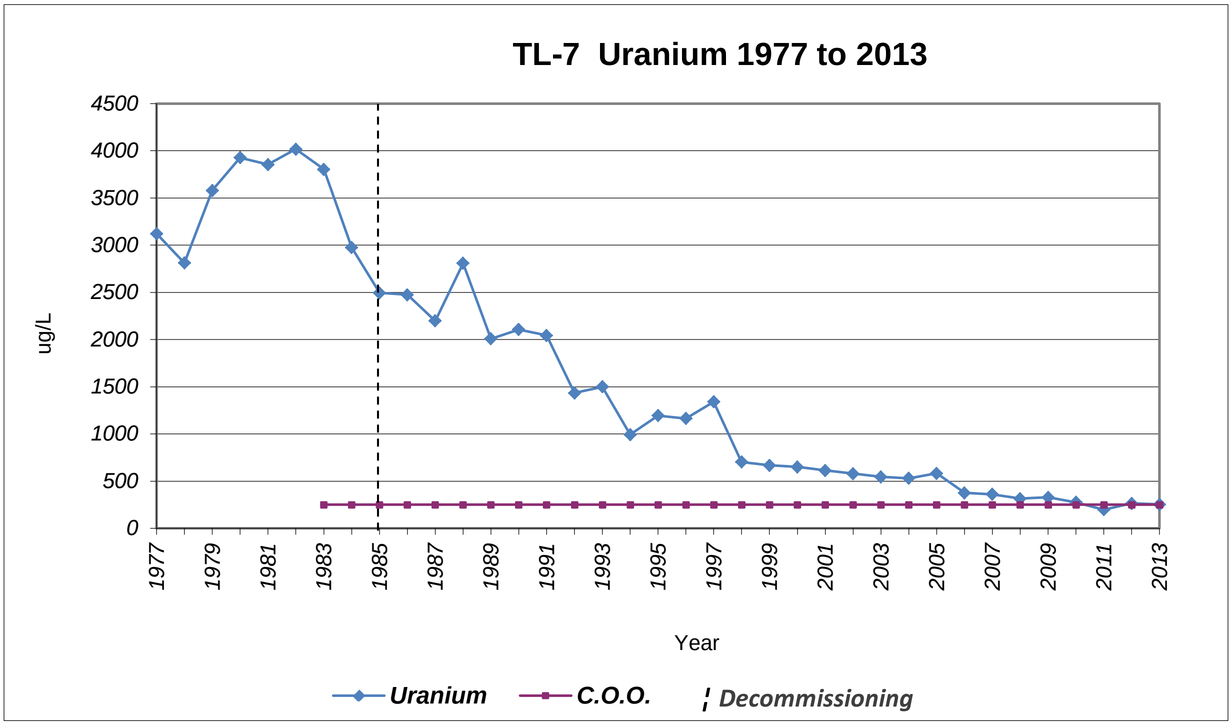


Figure 4.3.2-26 TL-7 Meadow Lake Discharge

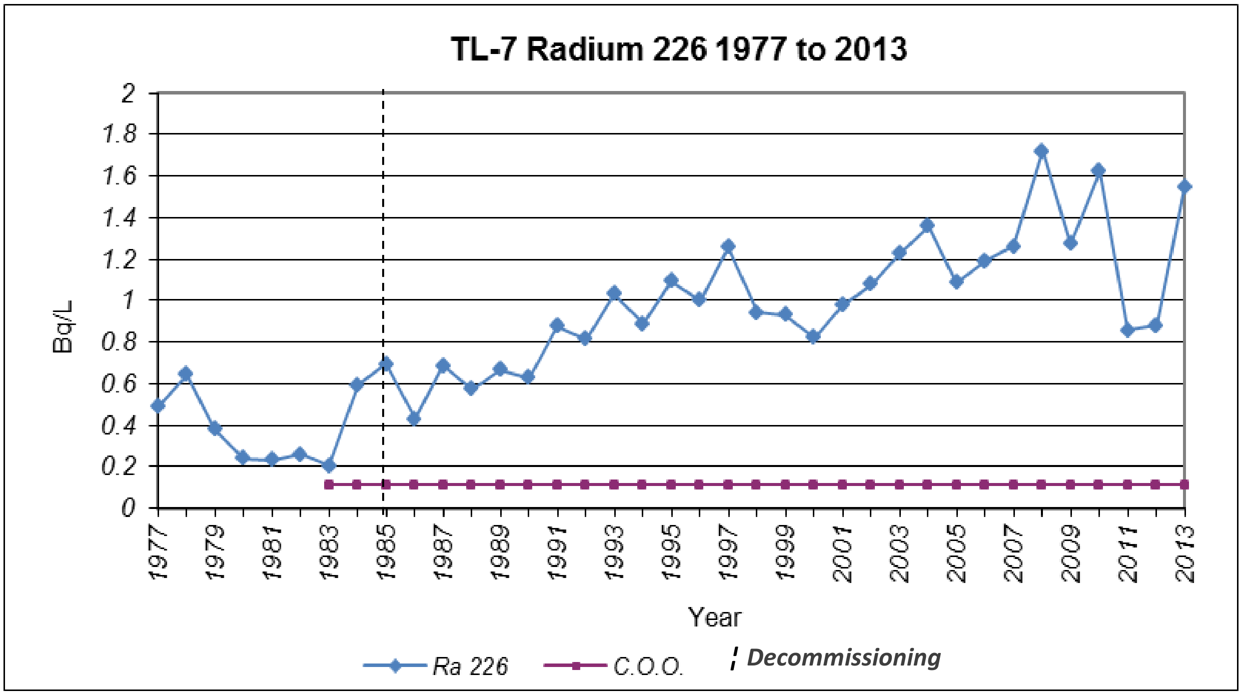


Figure 4.3.2-27 TL-7 Meadow Lake Discharge

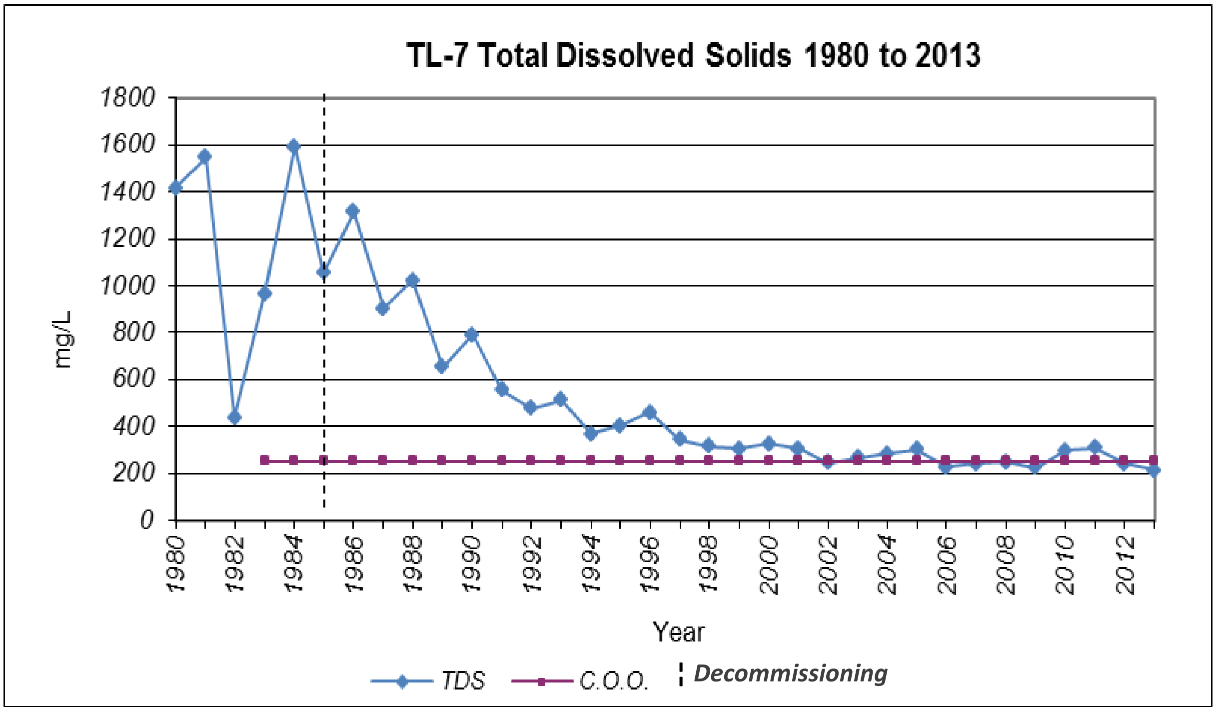


Figure 4.3.2-28 TL-7 Meadow Lake Discharge

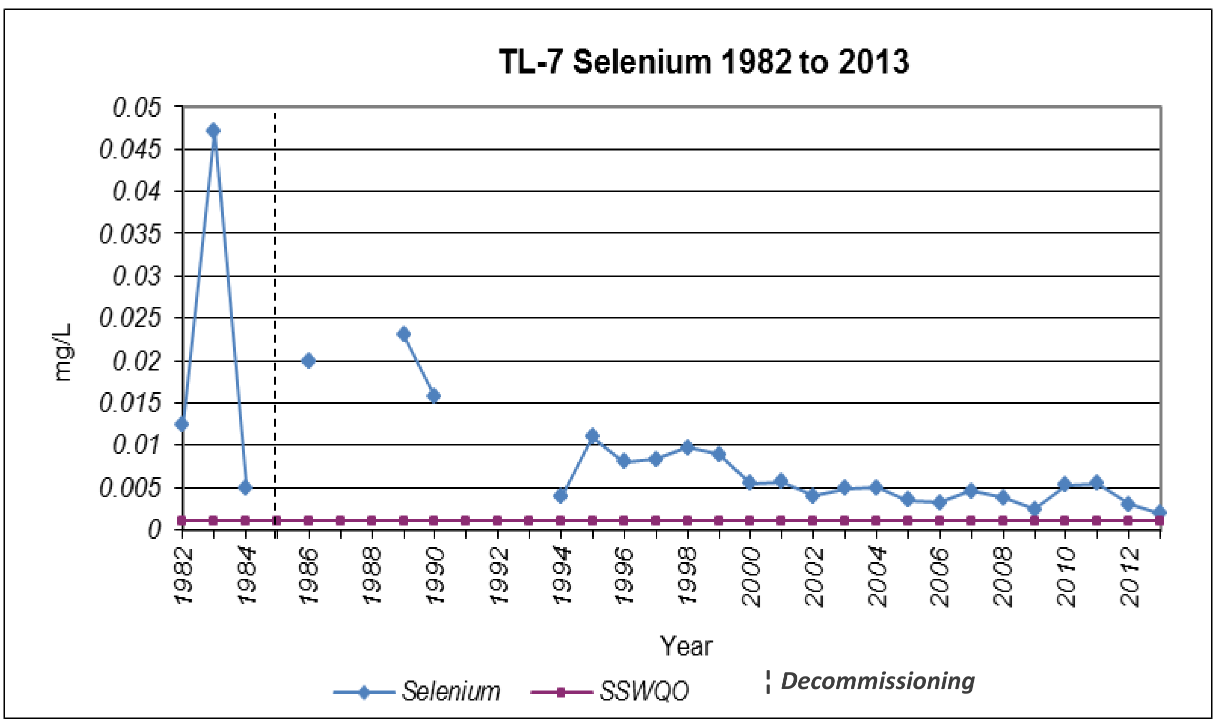


Figure 4.3.2-29 TL-7 Comparison to Predicted Recovery

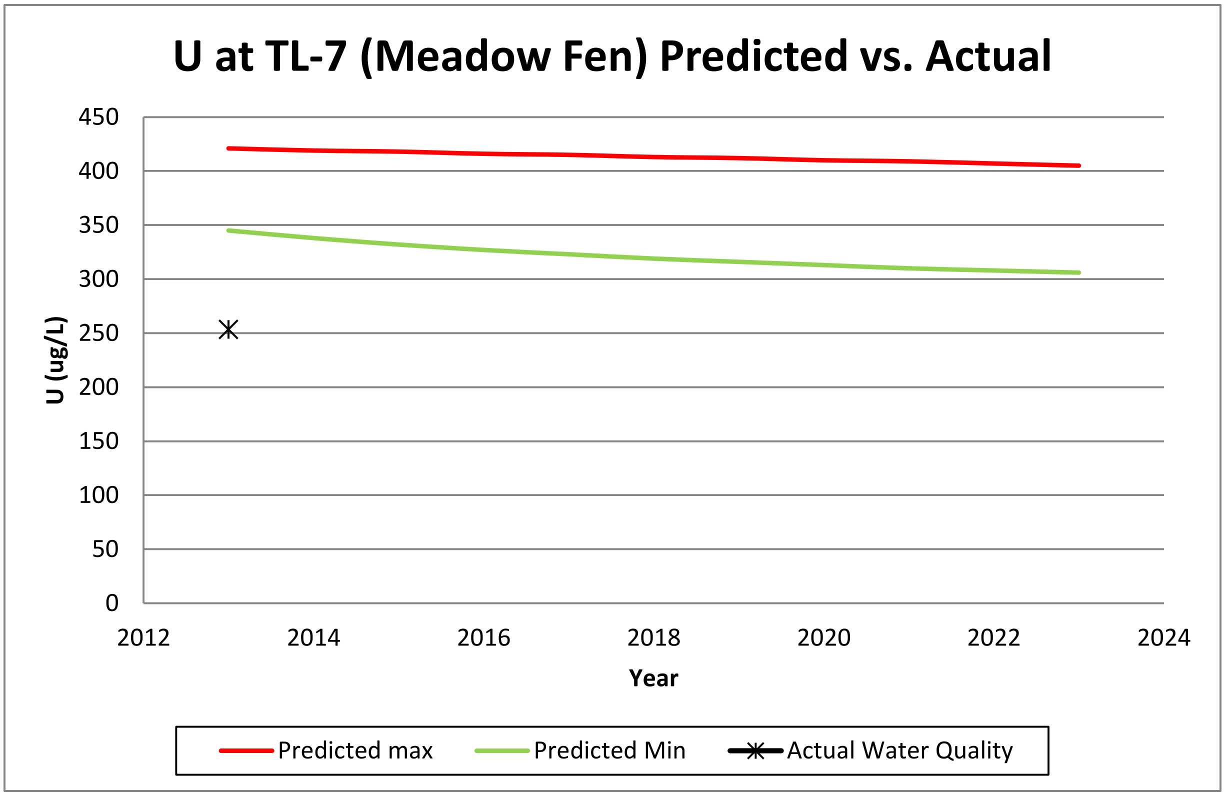


Figure 4.3.2-30 TL-7 Comparison to Predicted Recovery

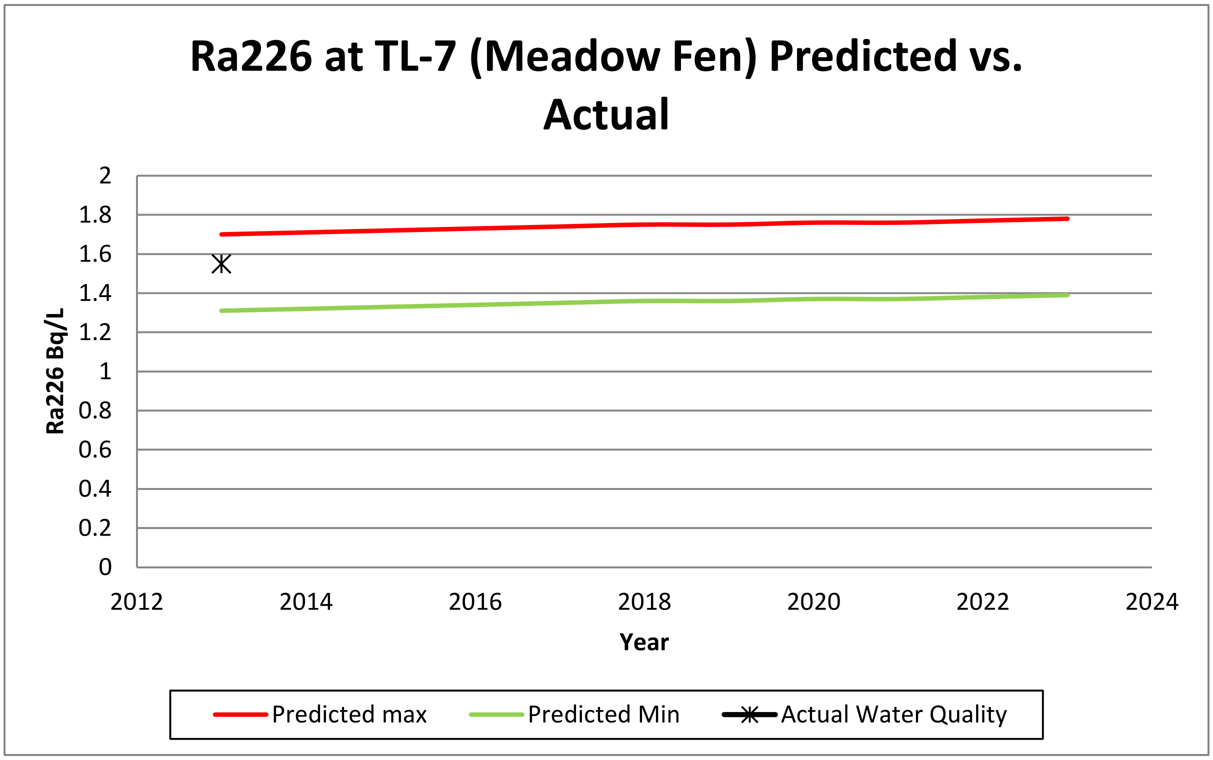


Figure 4.3.2-31 TL-7 Comparison to Predicted Recovery

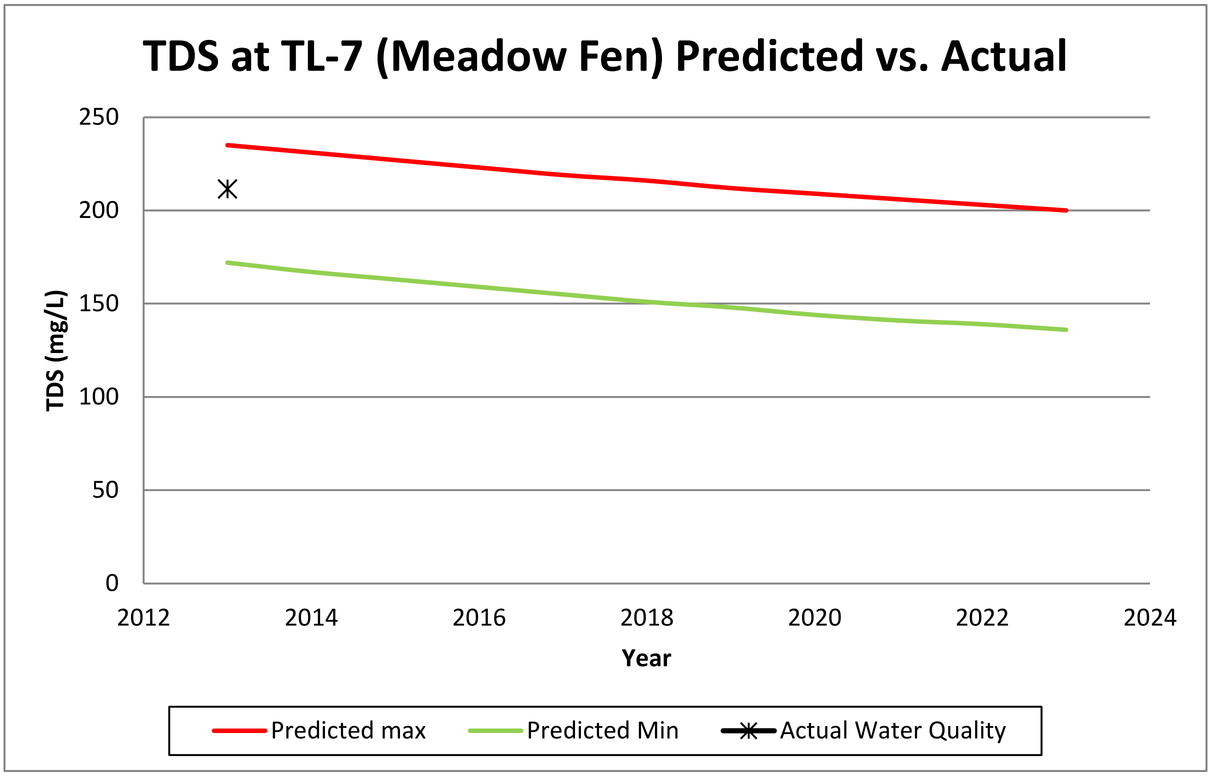


Figure 4.3.2-32 TL-7 Comparison to Predicted Recovery

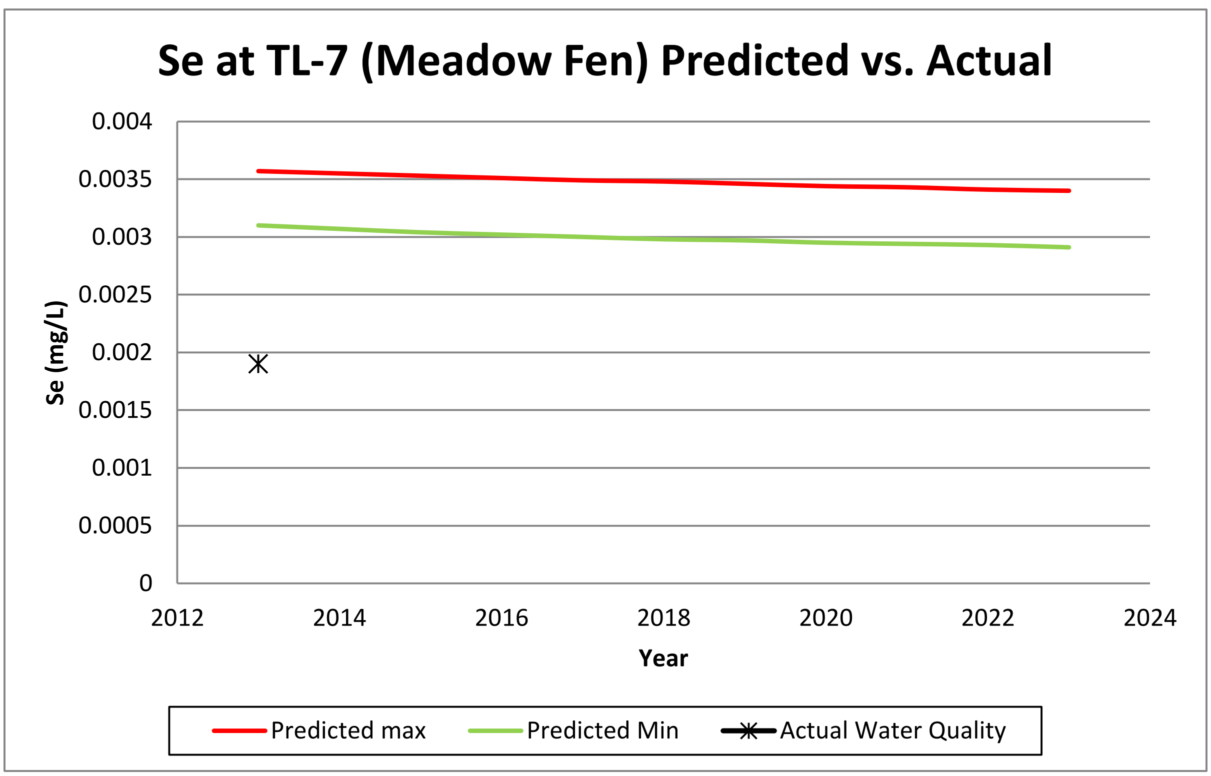
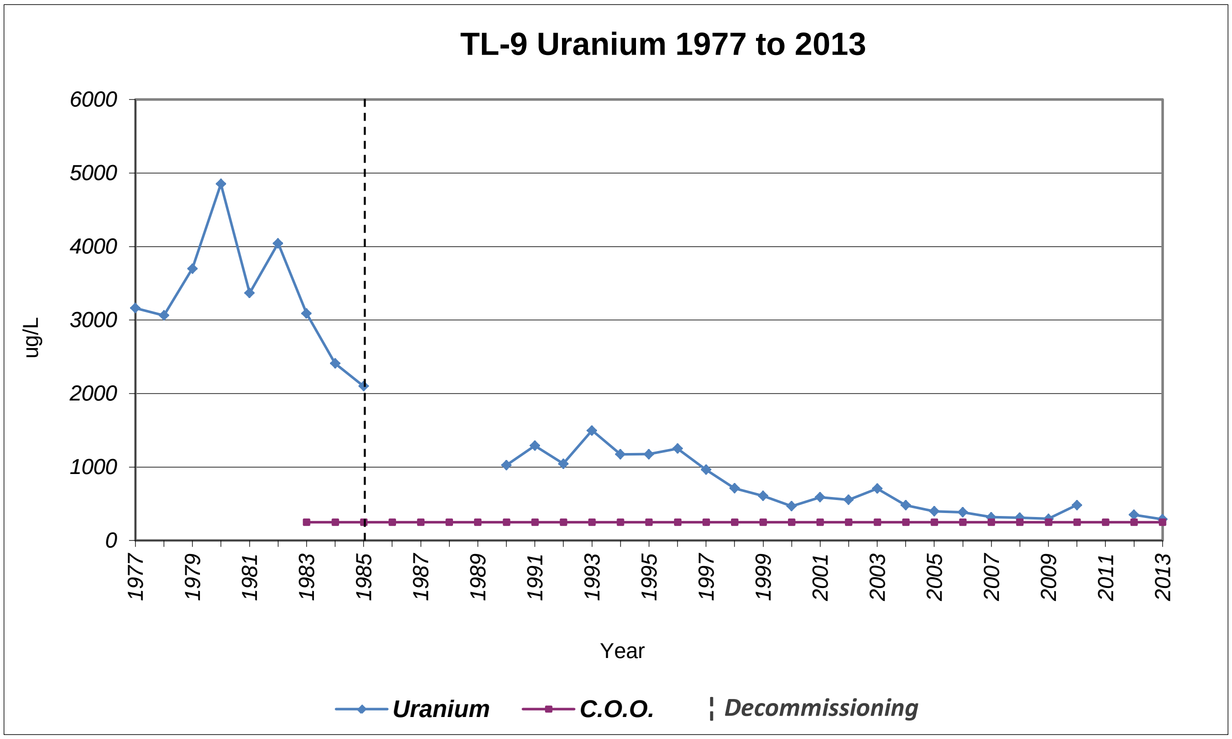
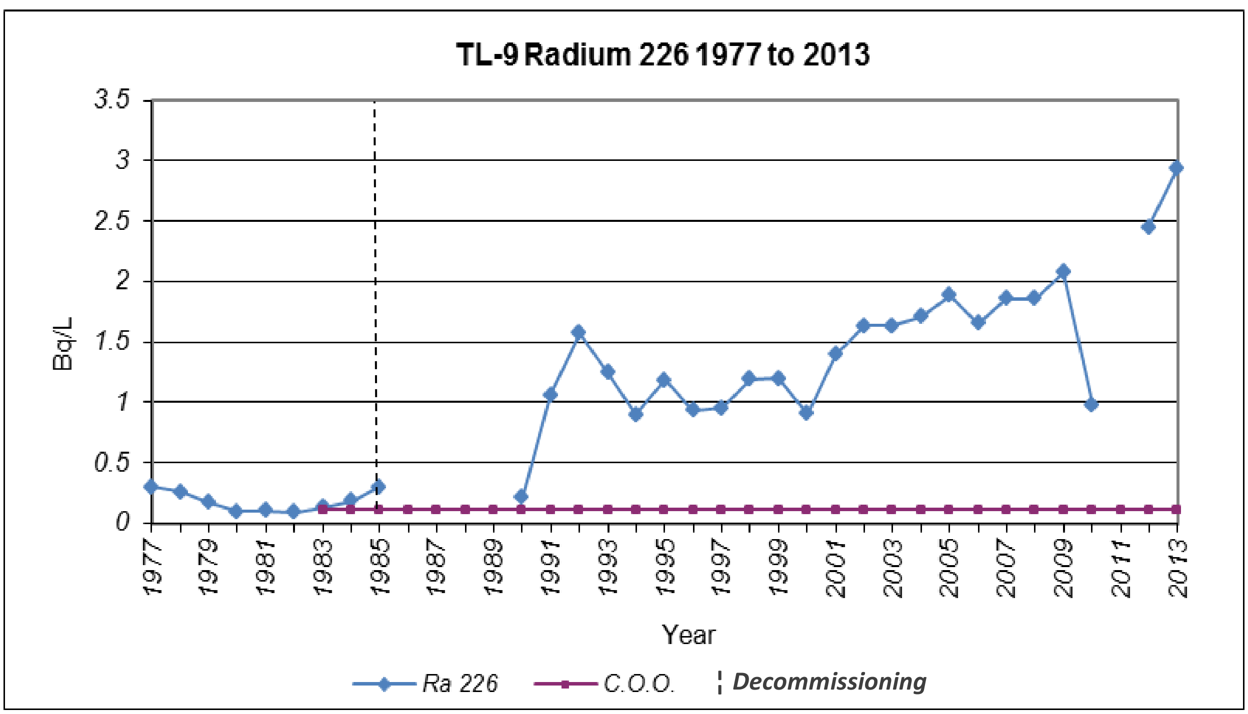


Figure 4.3.2-33 TL-9 - Fulton Creek Below Greer Lake



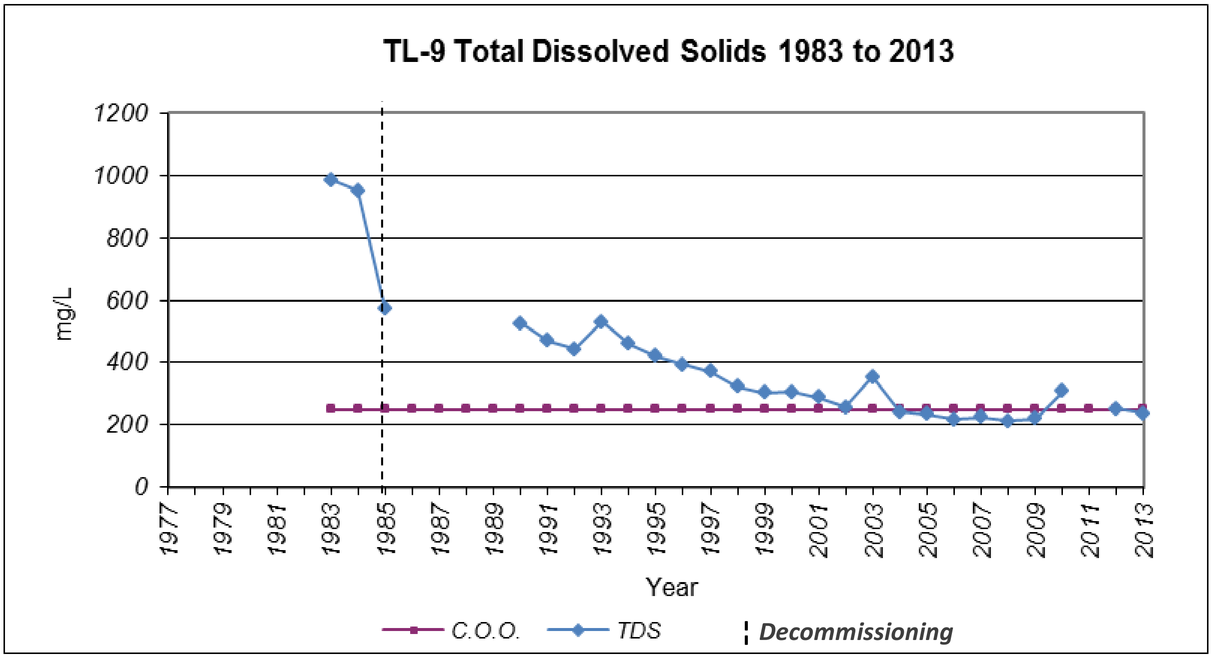
**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-34 TL-9 - Fulton Creek Below Greer Lake



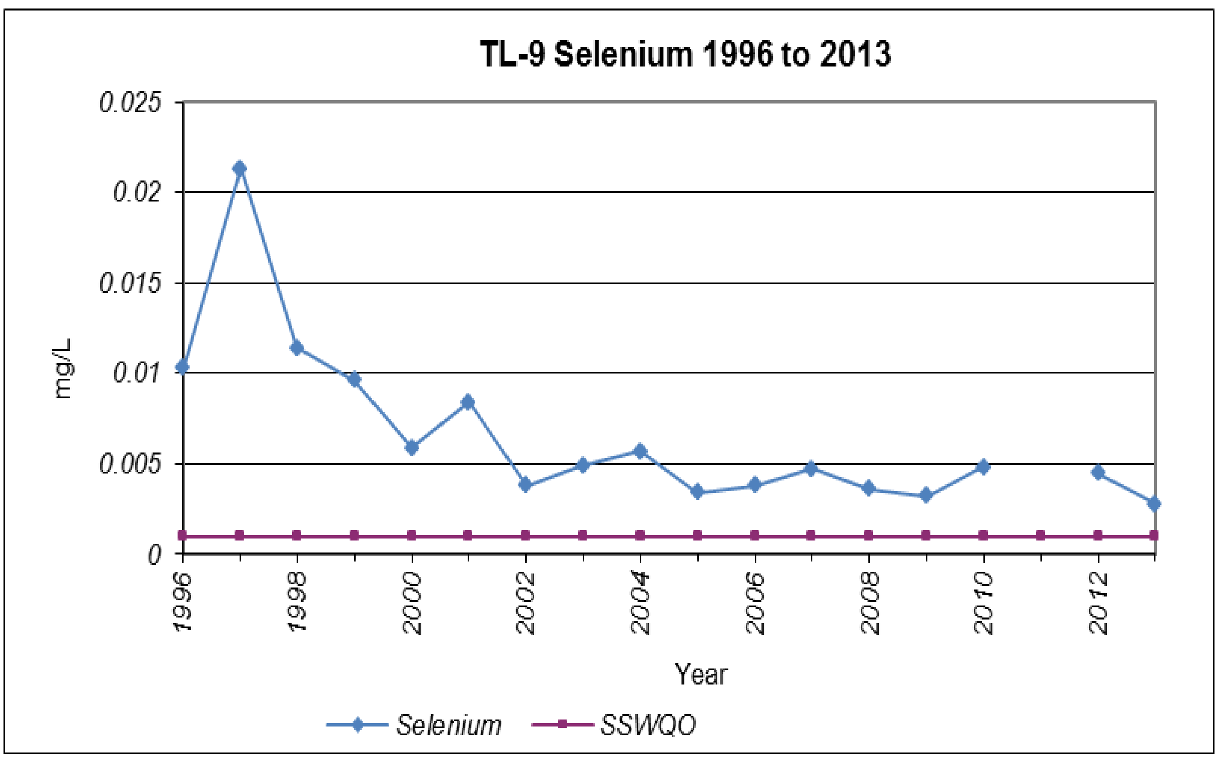
**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-35 TL-9 - Fulton Creek Below Greer Lake



**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-36 TL-9 - Fulton Creek Below Greer Lake



**There was not water flow at TL-9 in 2011.*

Figure 4.3.2-37 TL-9 Comparison to Predicted Recovery

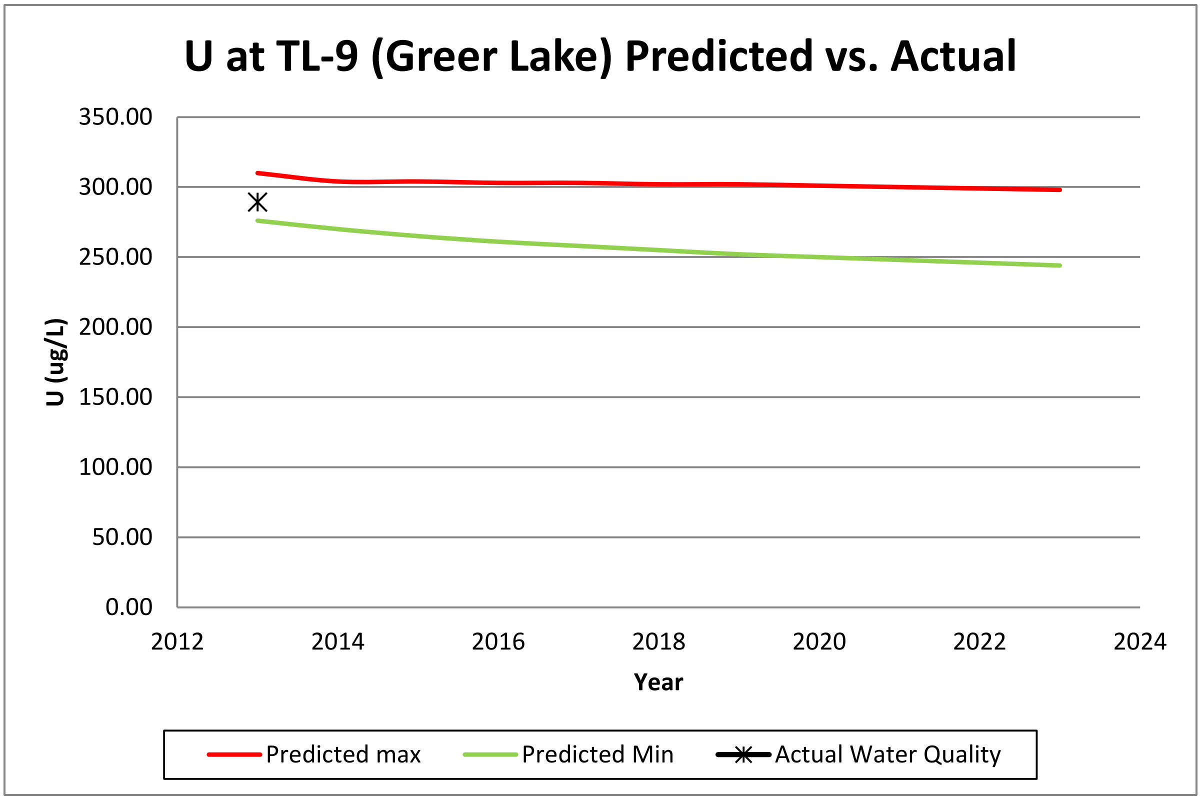


Figure 4.3.2-38 TL-9 Comparison to Predicted Recovery

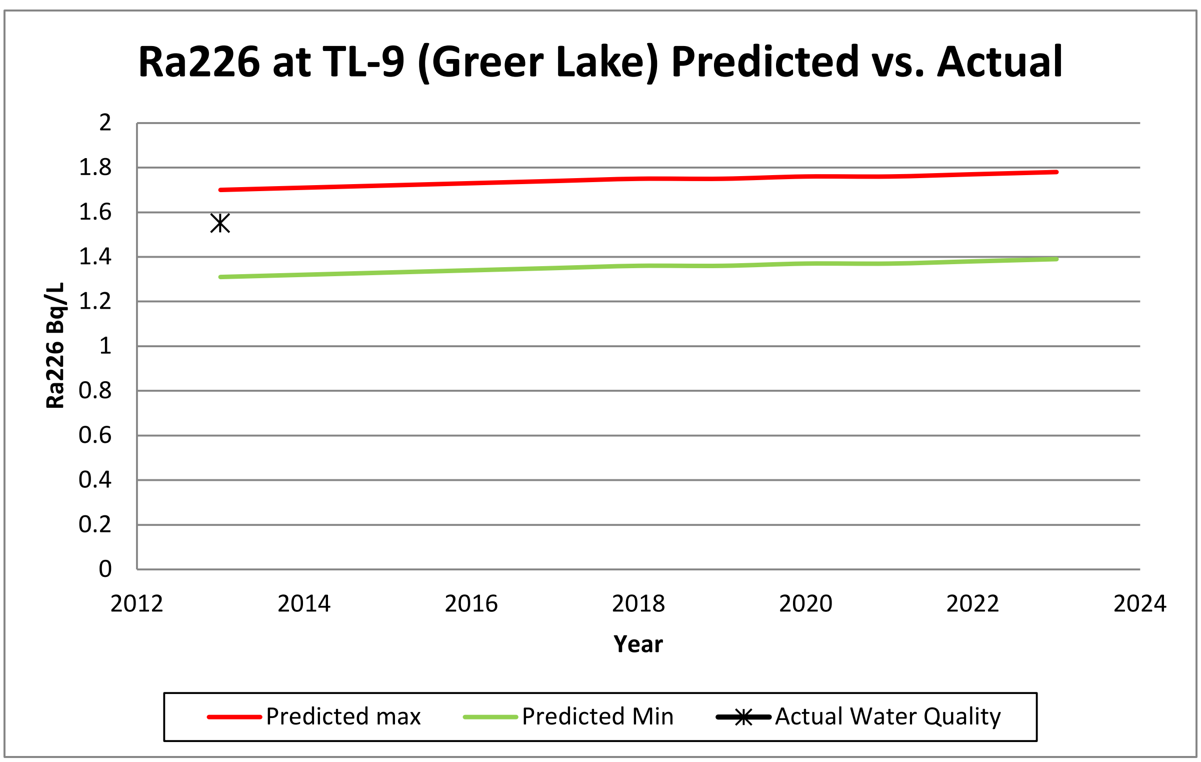


Figure 4.3.2-39 TL-9 Comparison to Predicted Recovery

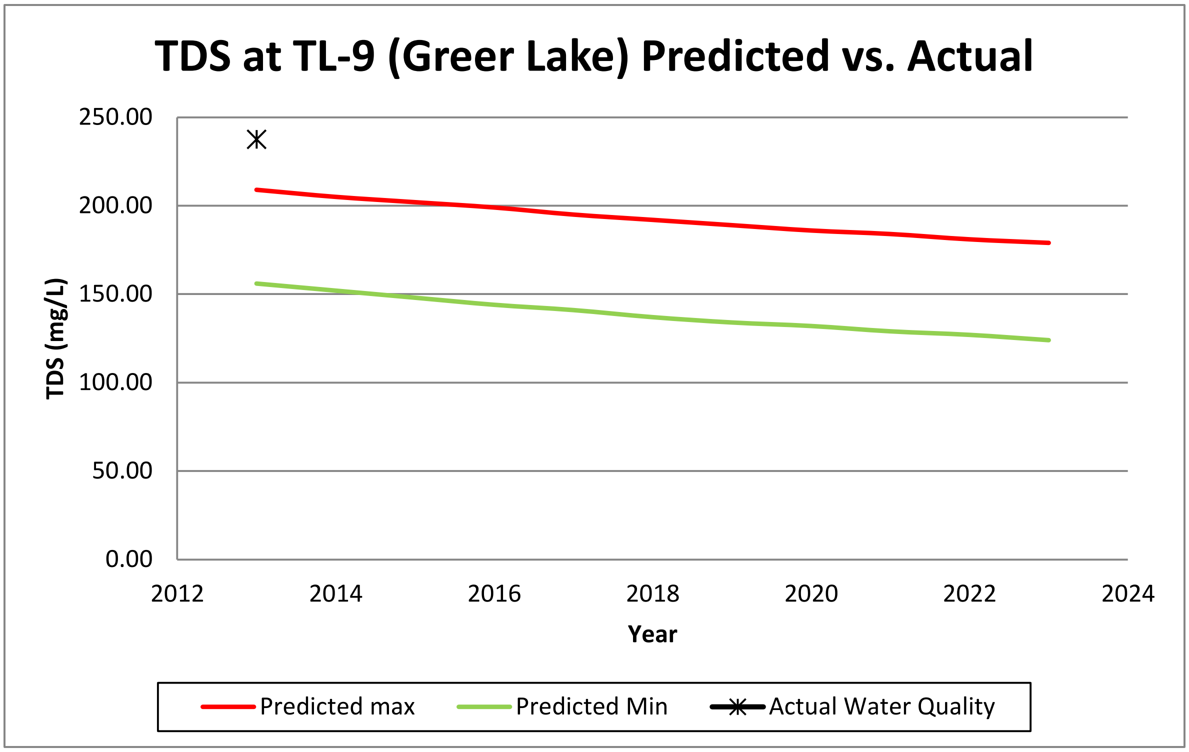


Figure 4.3.2-40 TL-9 Comparison to Predicted Recovery

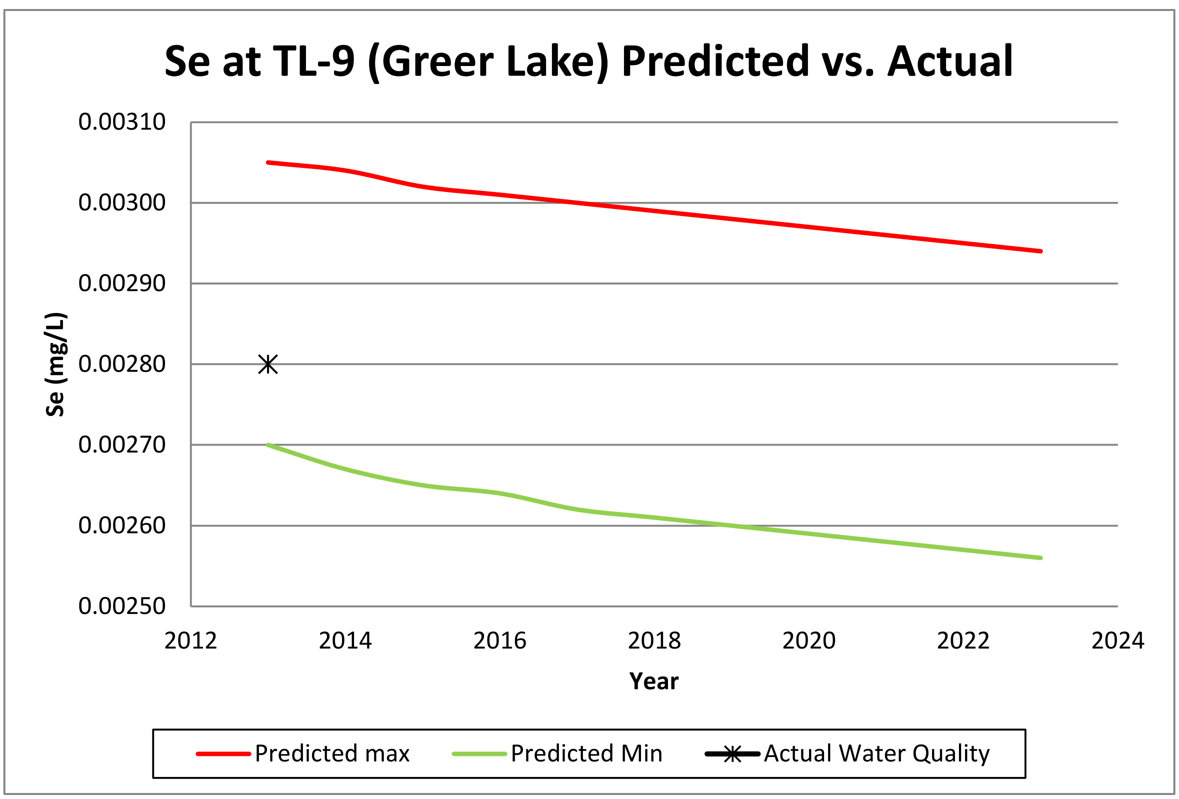


Figure 4.3.3-1 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

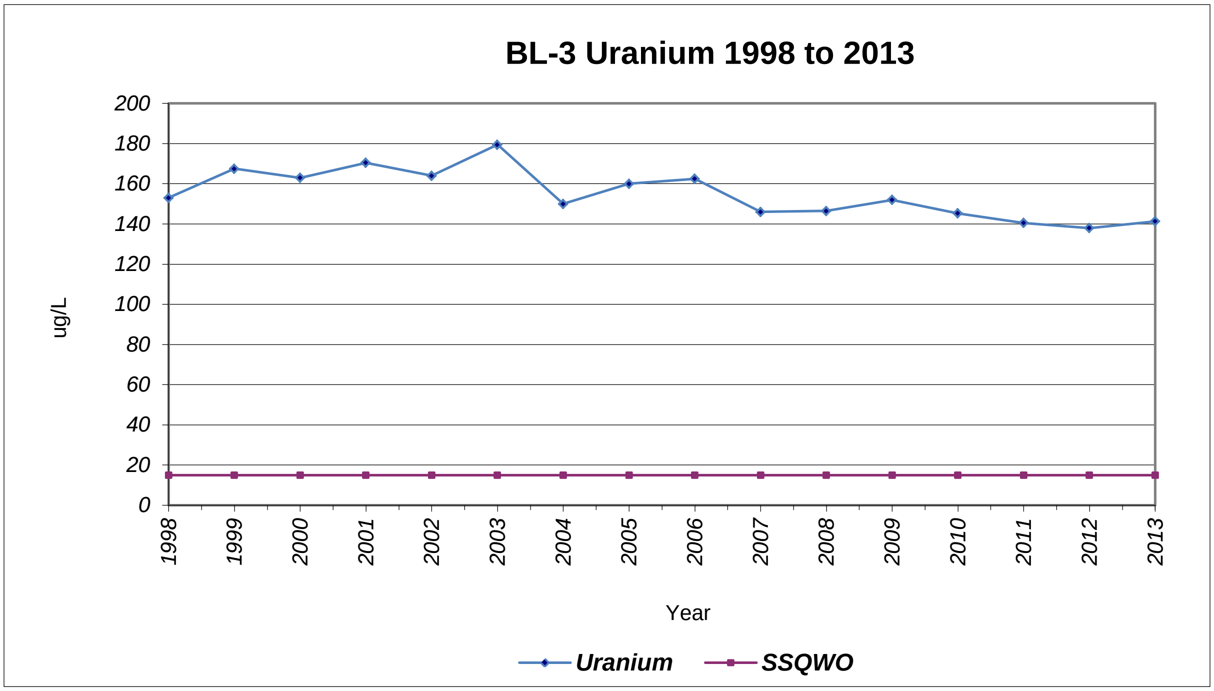


Figure 4.3.3-2 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

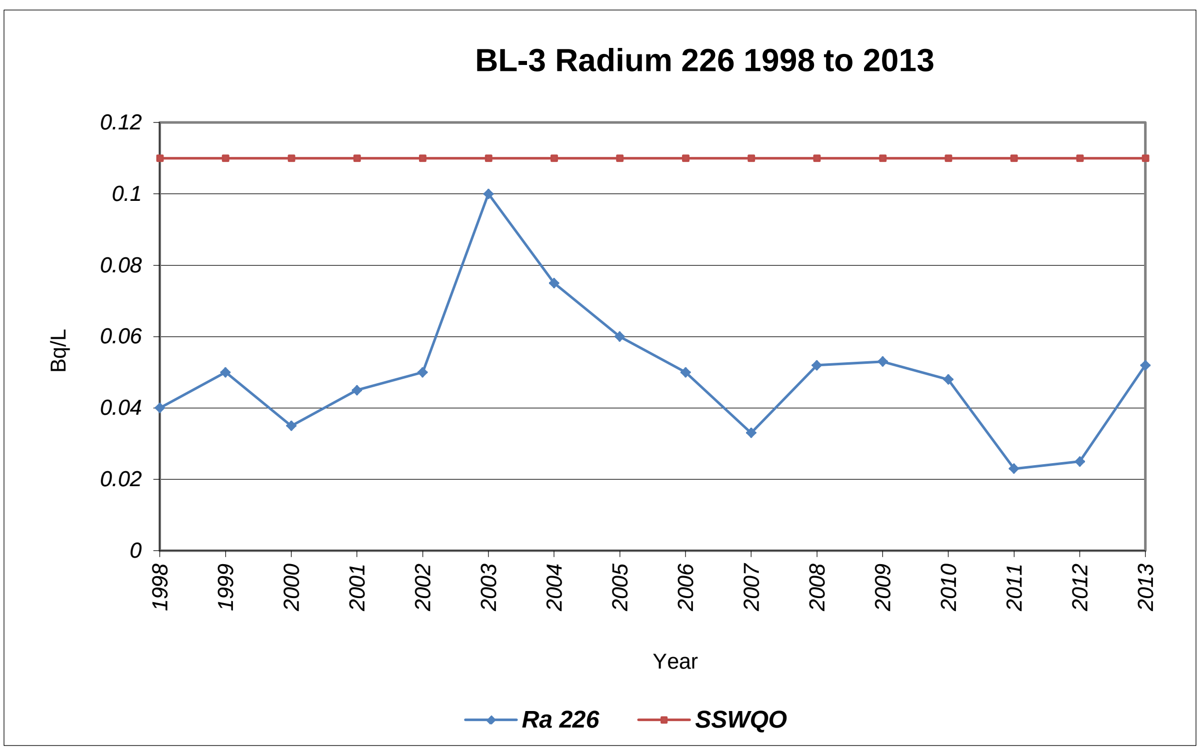


Figure 4.3.3-3 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

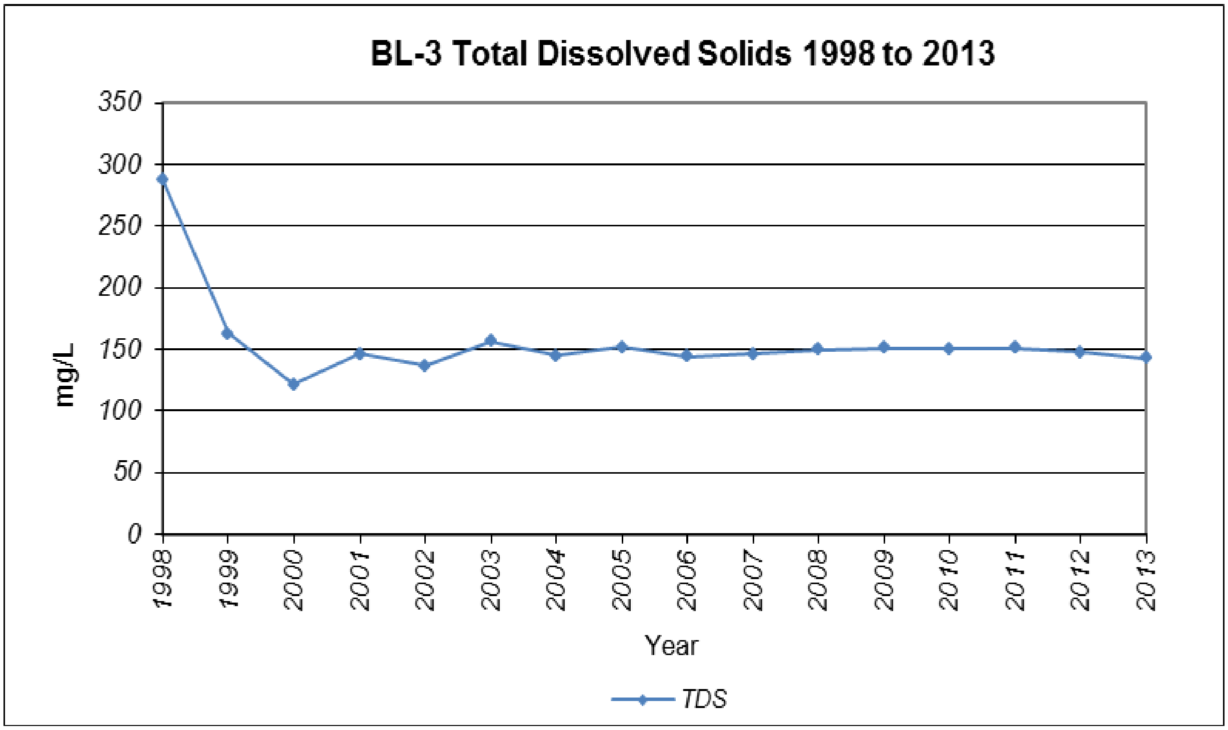
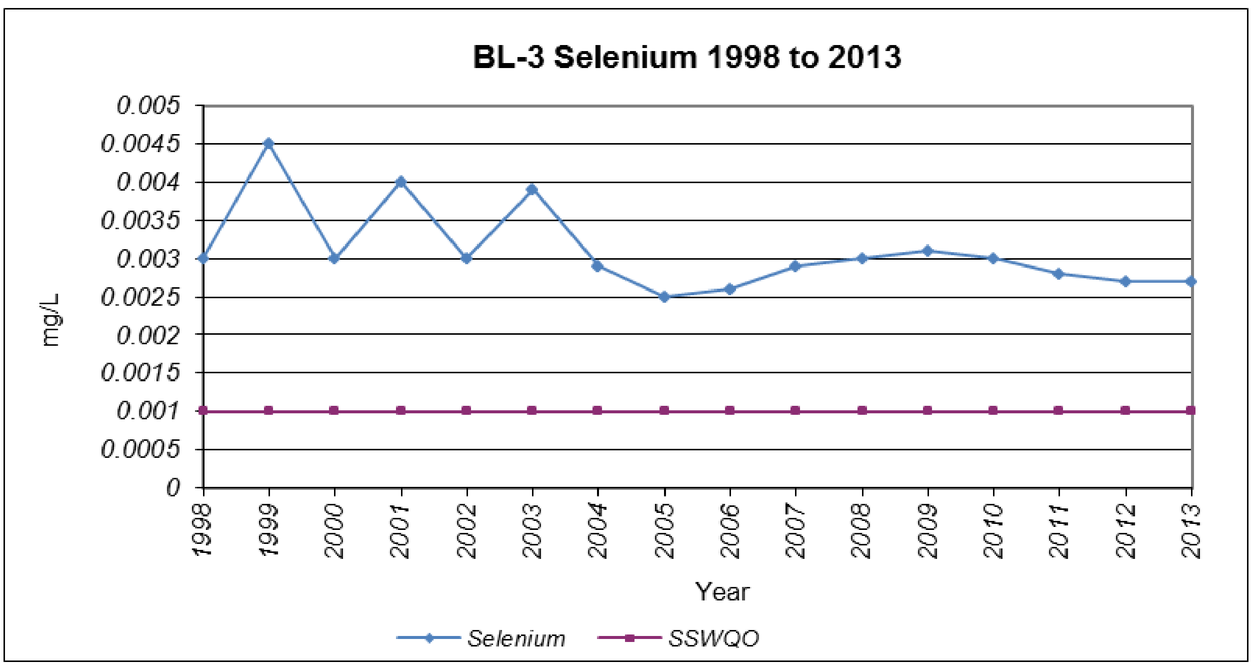


Figure 4.3.3-4 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



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

Figure 4.3.3-5 BL-3 Comparison to Predicted Recovery

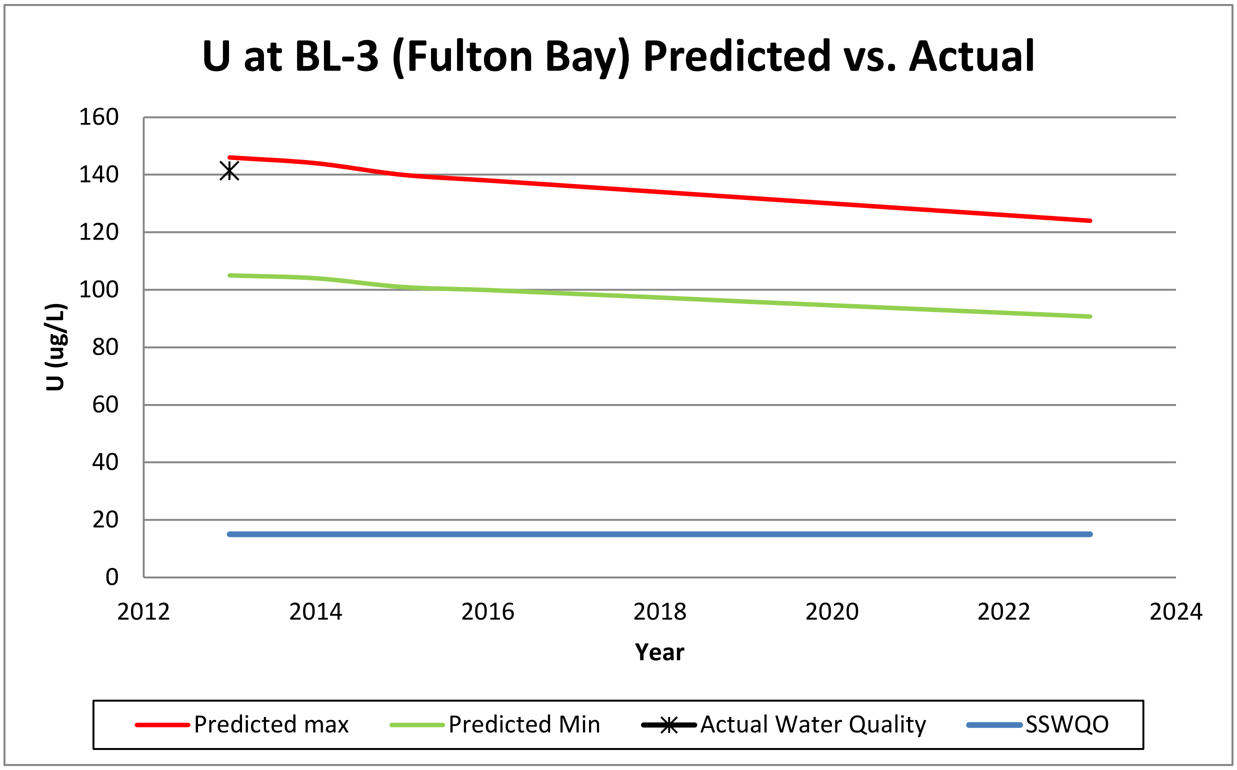


Figure 4.3.3-6 BL-3 Comparison to Predicted Recovery

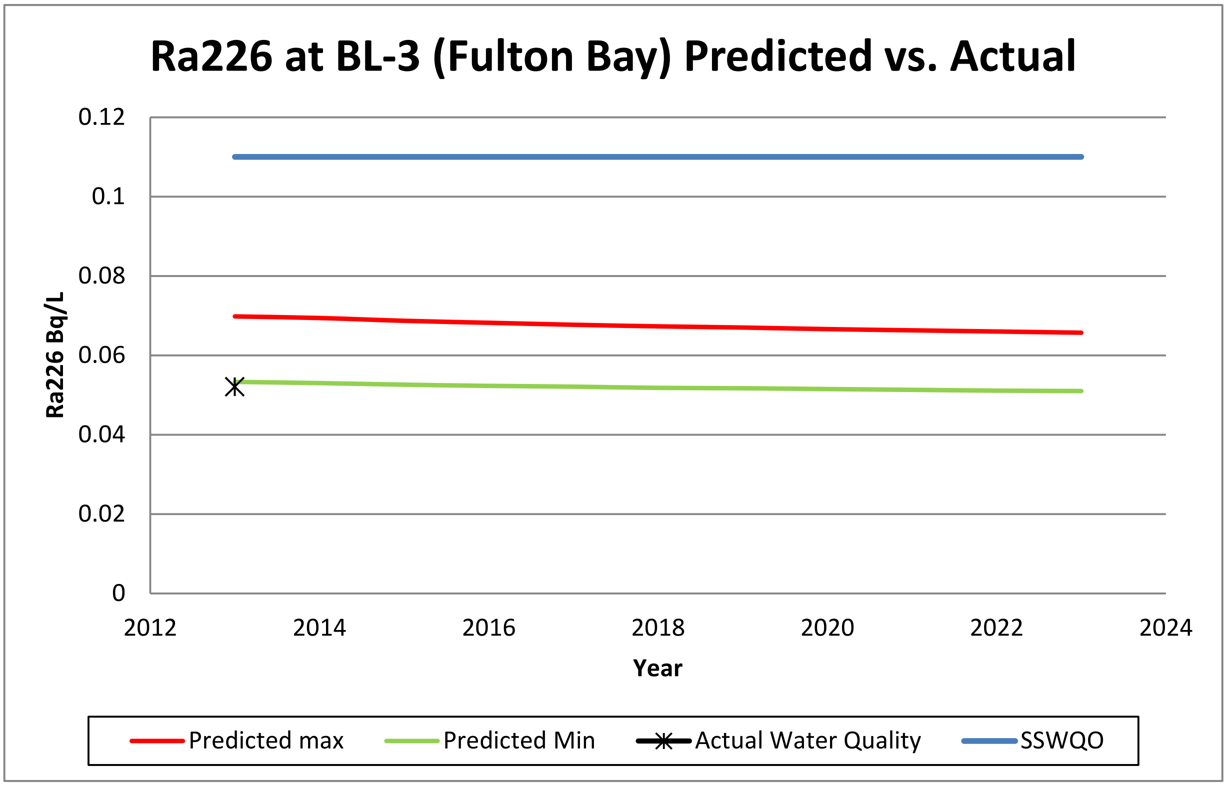


Figure 4.3.3-7 BL-3 Comparison to Predicted Recovery

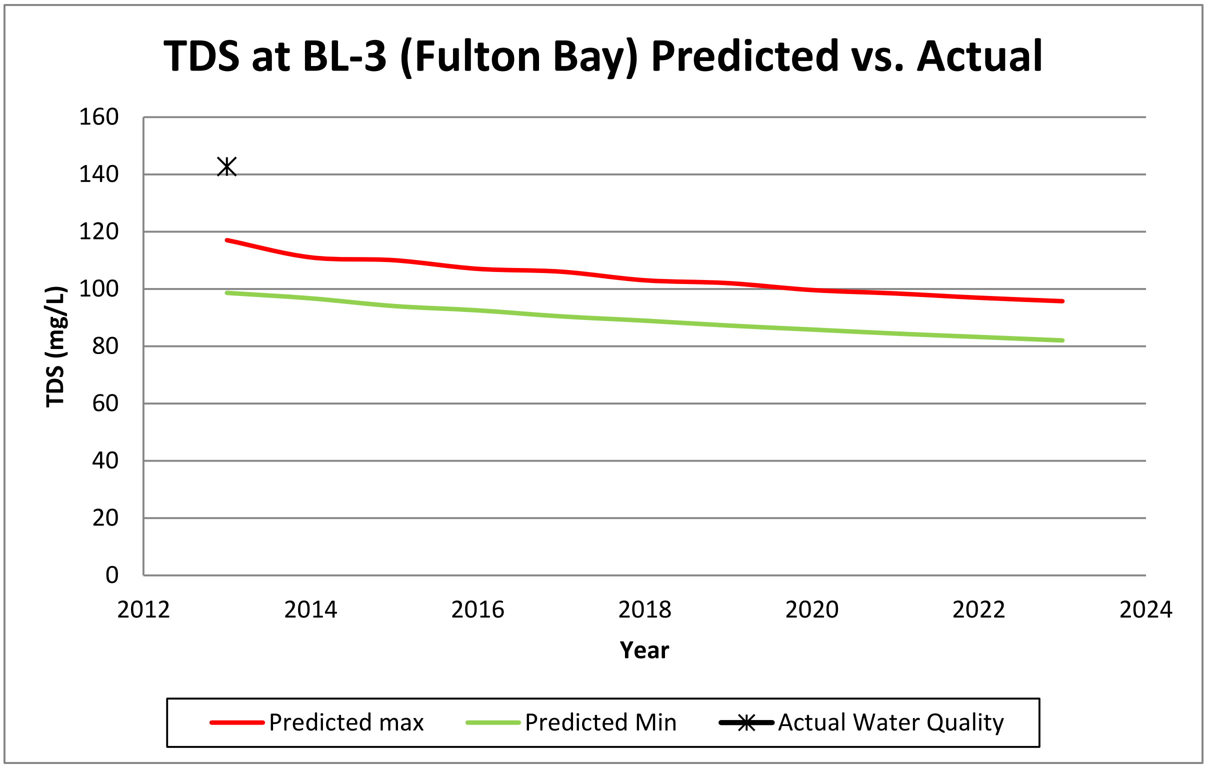


Figure 4.3.3-8 BL-3 Comparison to Predicted Recovery

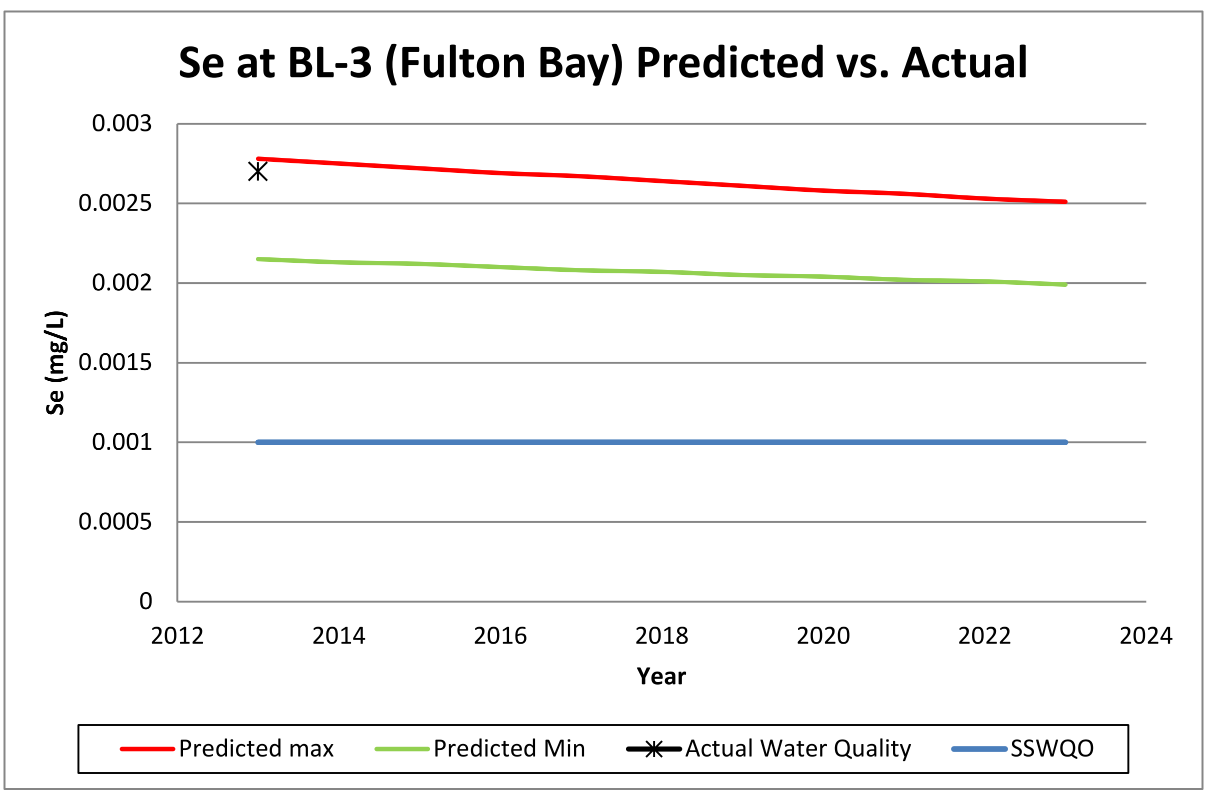


Figure 4.3.3-9 BL-4 Beaverlodge Lake Centre

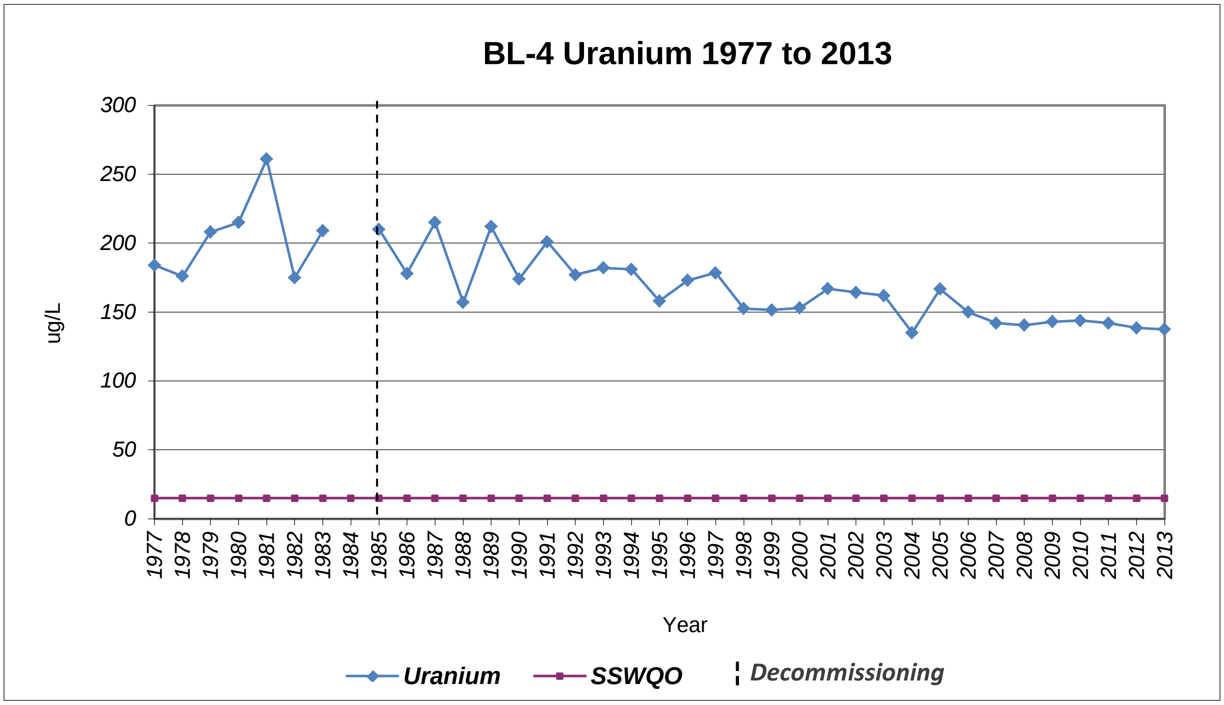


Figure 4.3.3-10 BL-4 Beaverlodge Lake Centre

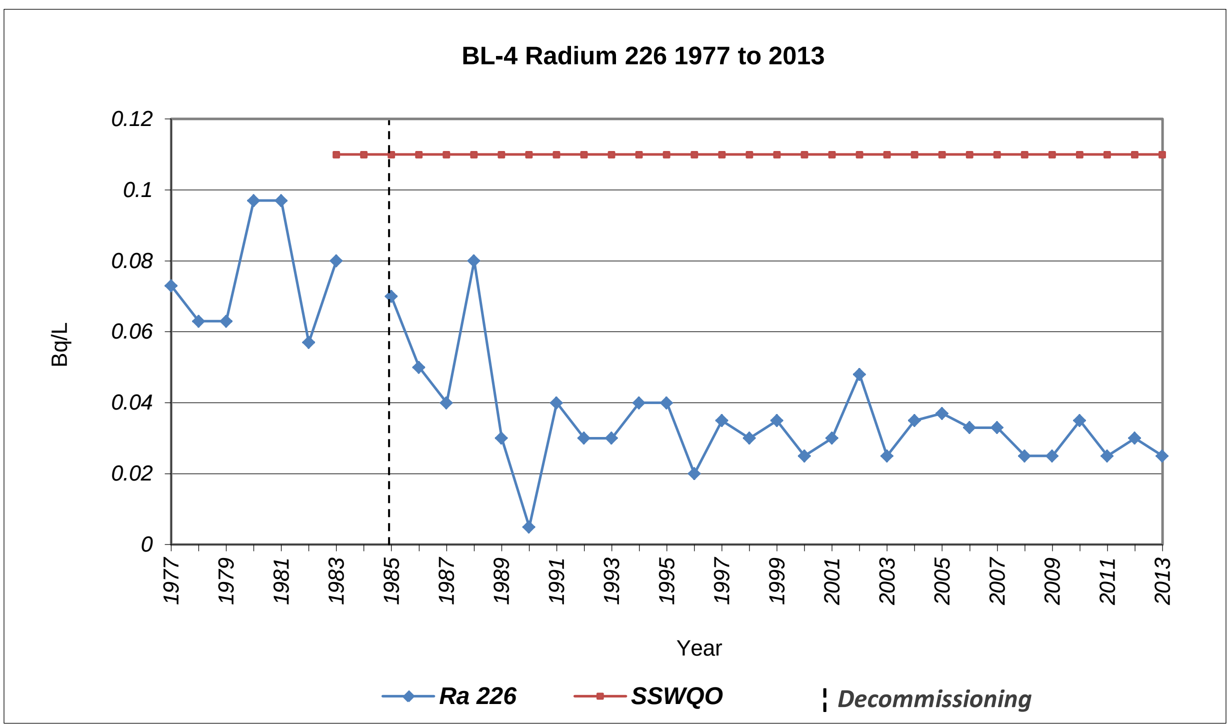


Figure 4.3.3-11 BL-4 Beaverlodge Lake Centre

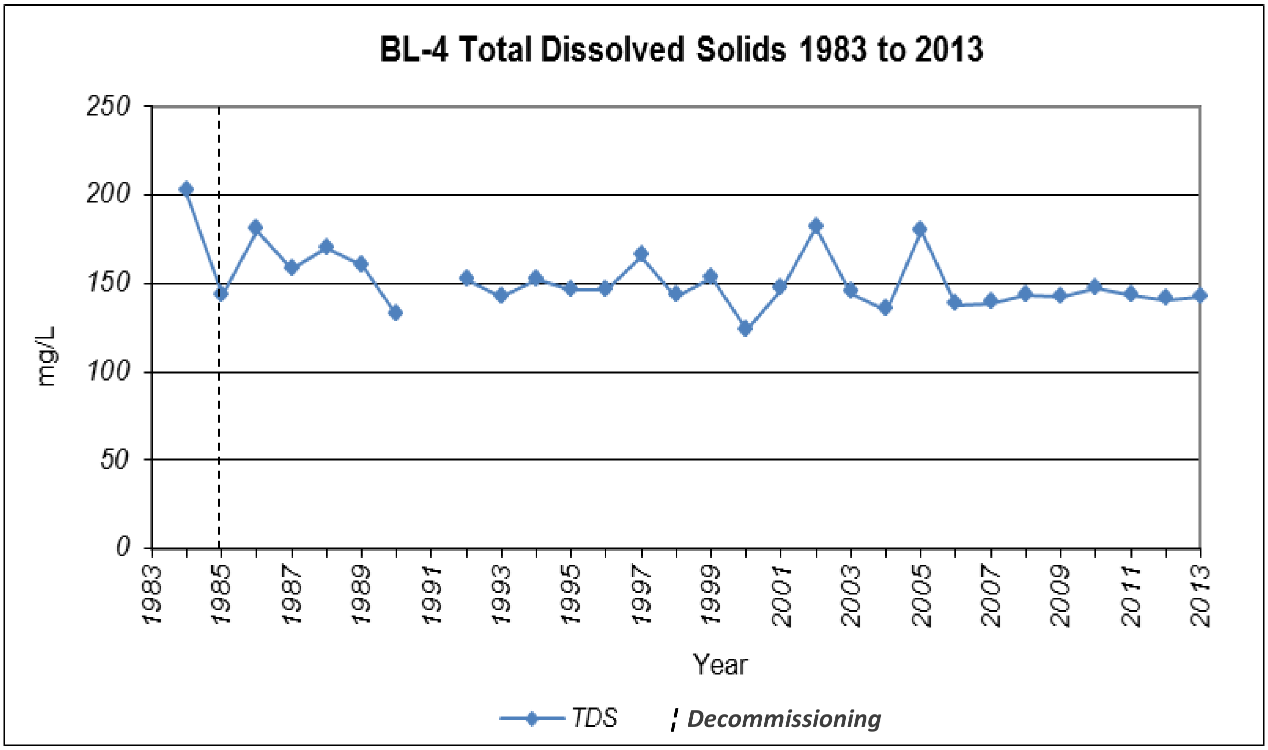
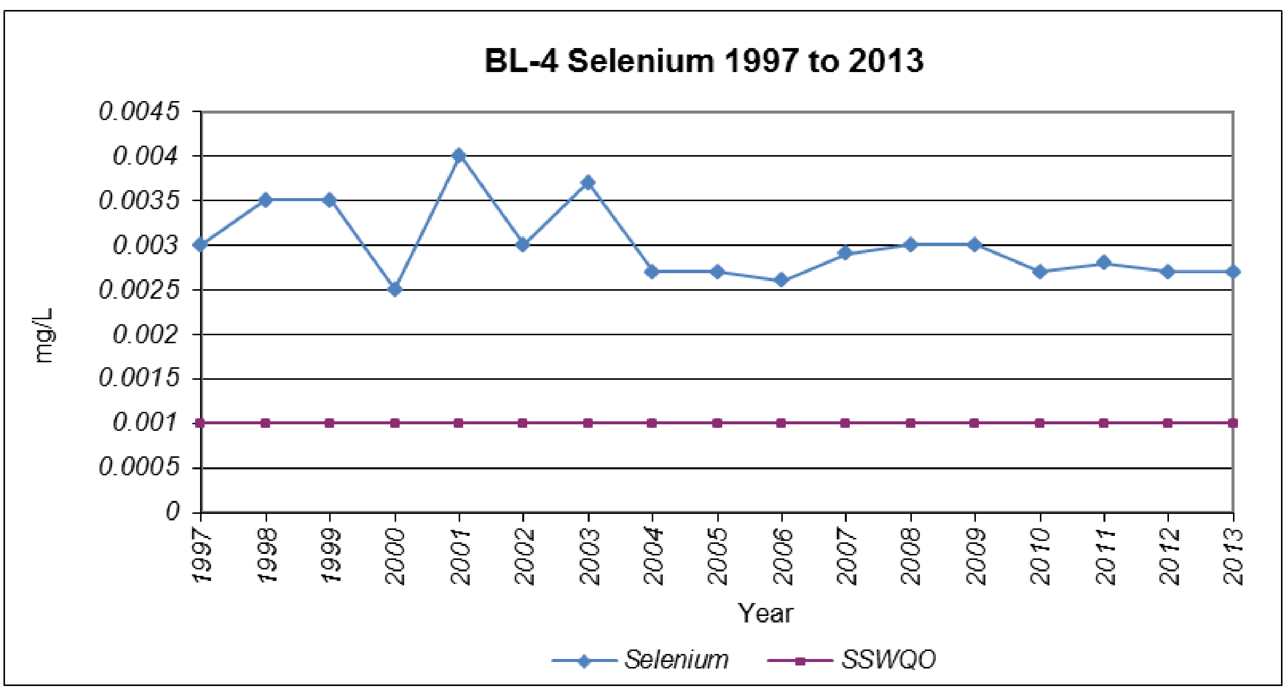


Figure 4.3.3-12 BL-4 Beaverlodge Lake Centre



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

Figure 4.3.3-13 BL-4 Comparison to Predicted Recovery

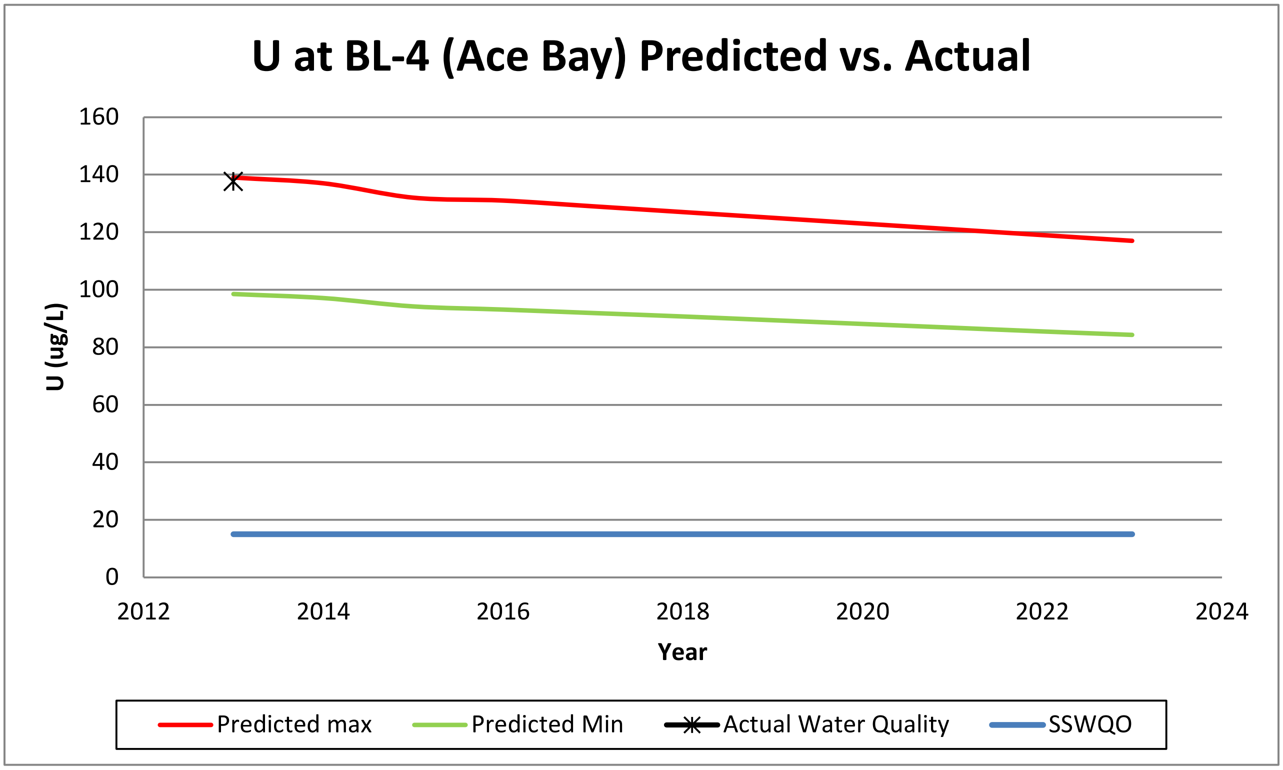


Figure 4.3.3-14 BL-4 Comparison to Predicted Recovery

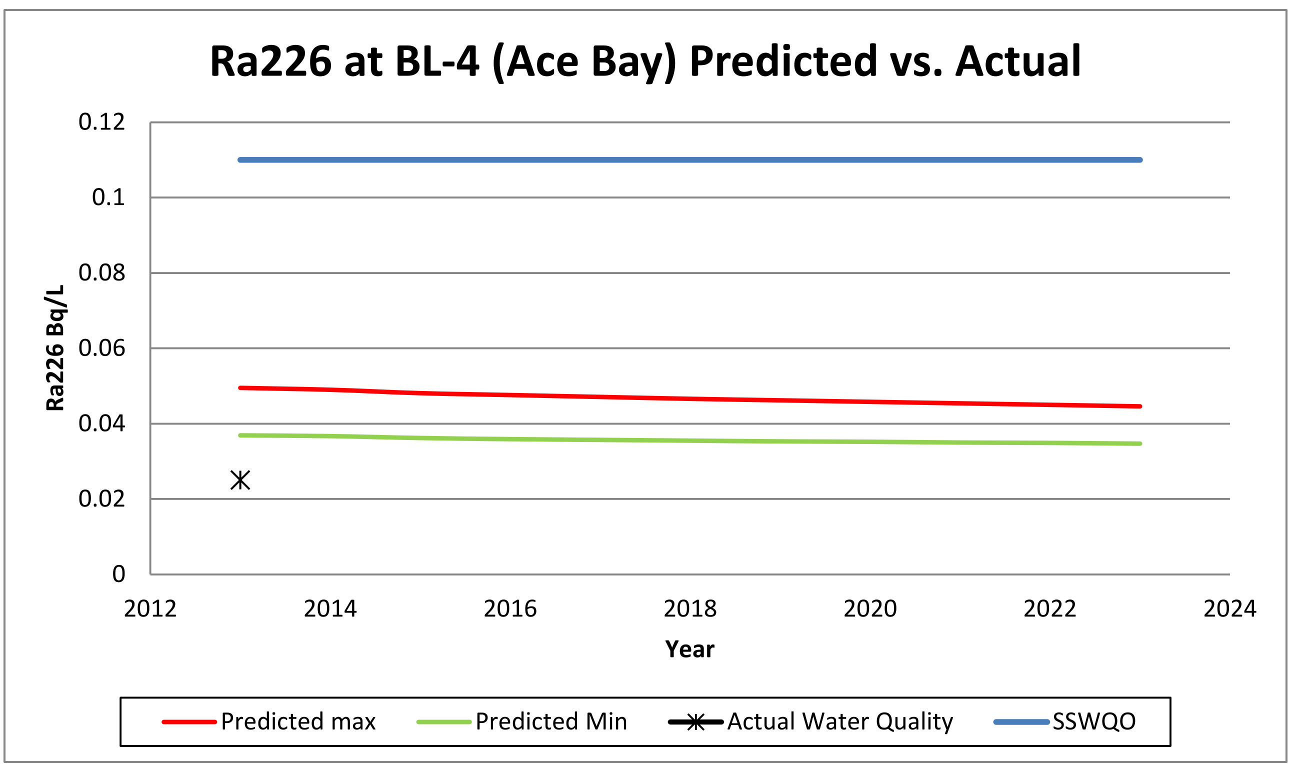


Figure 4.3.3-15 BL-4 Comparison to Predicted Recovery

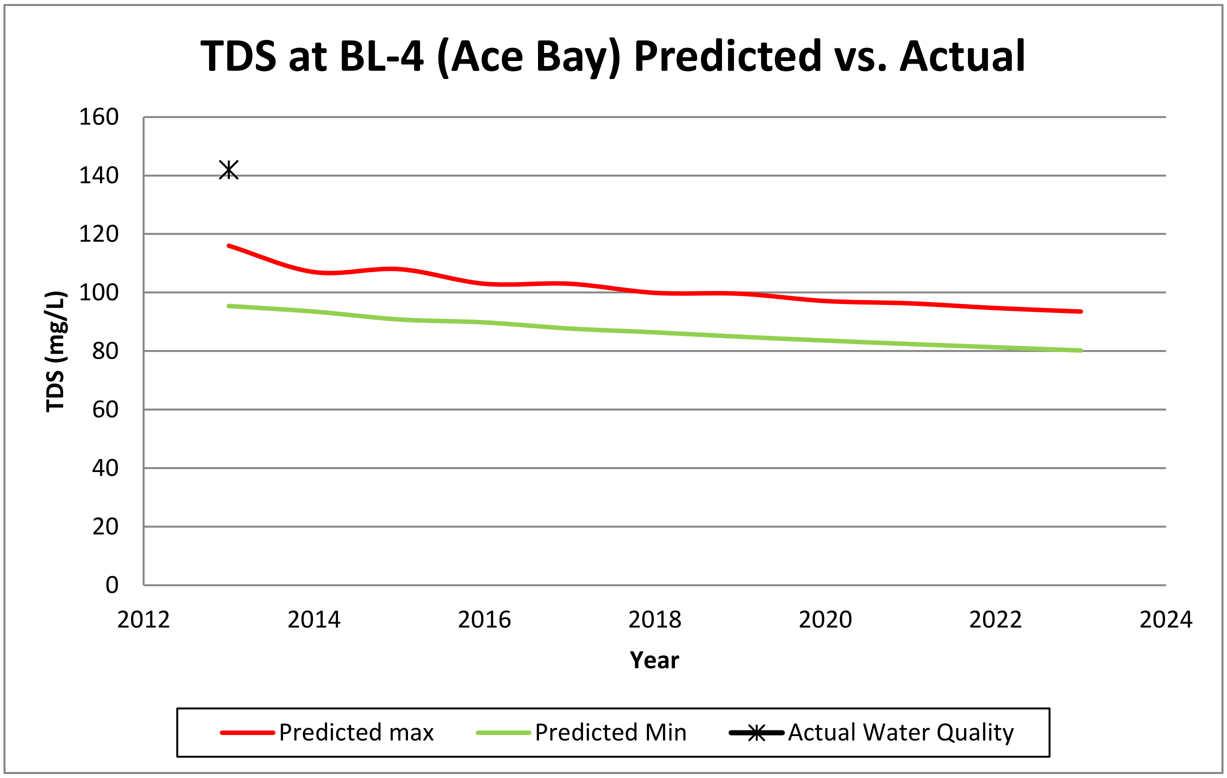


Figure 4.3.3-16 BL-4 Comparison to Predicted Recovery

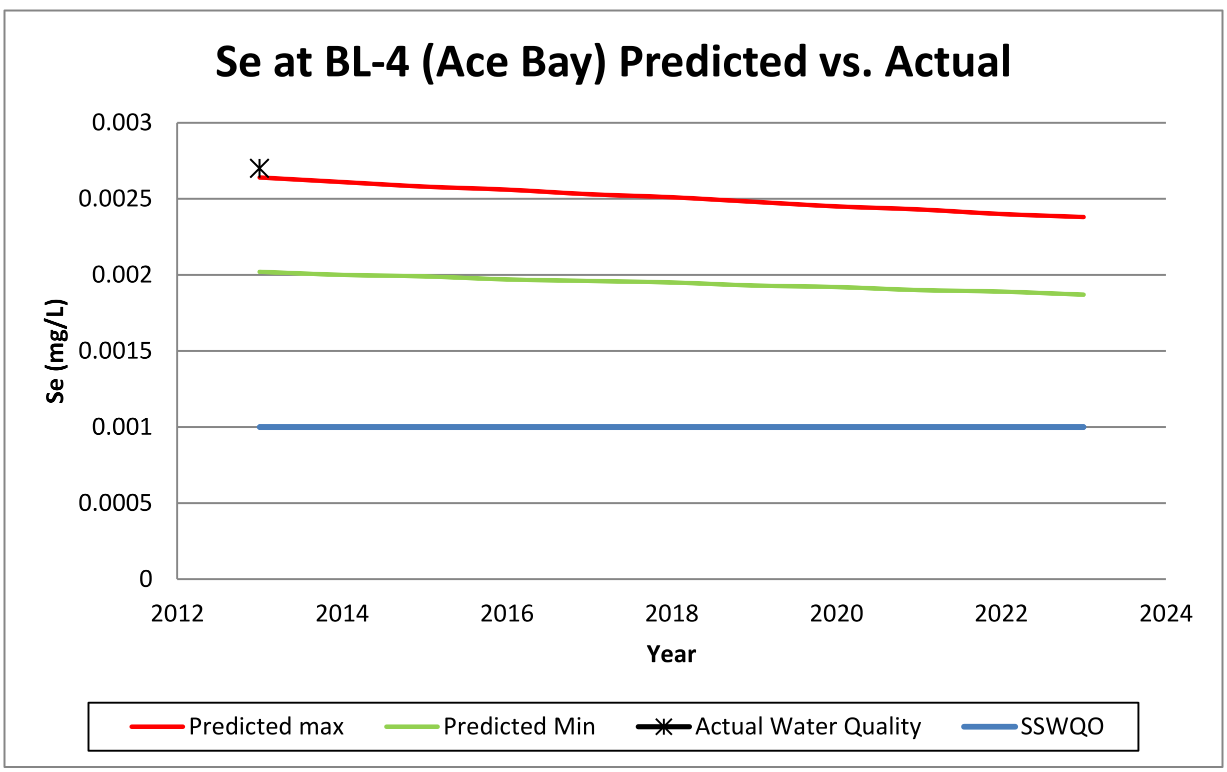
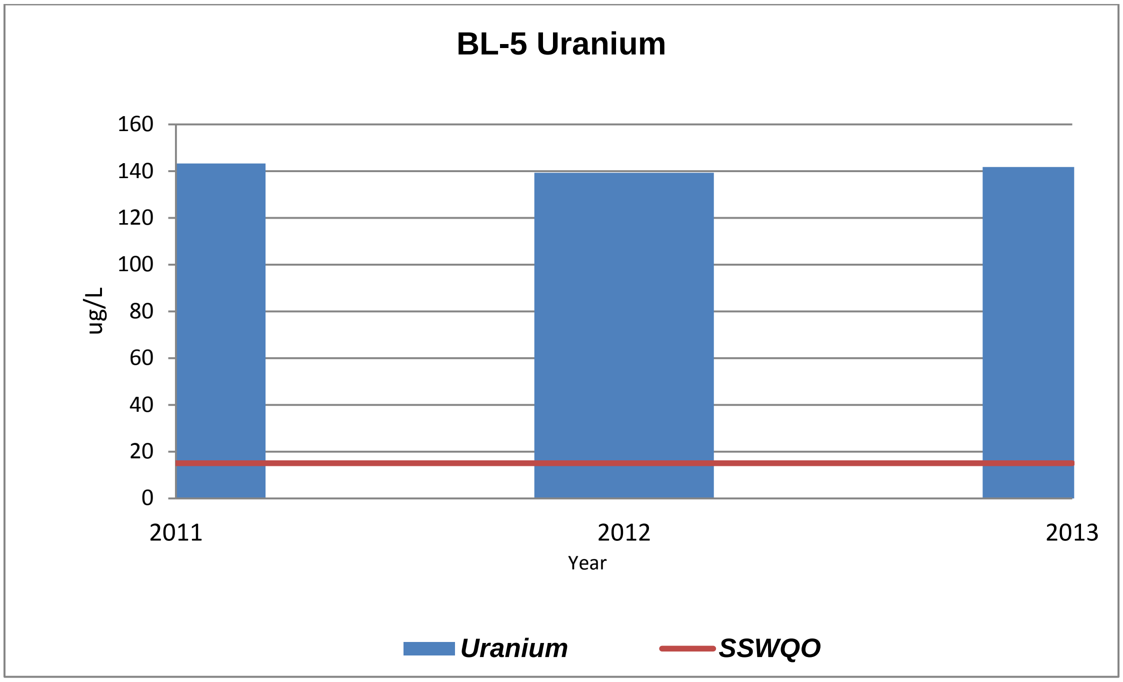
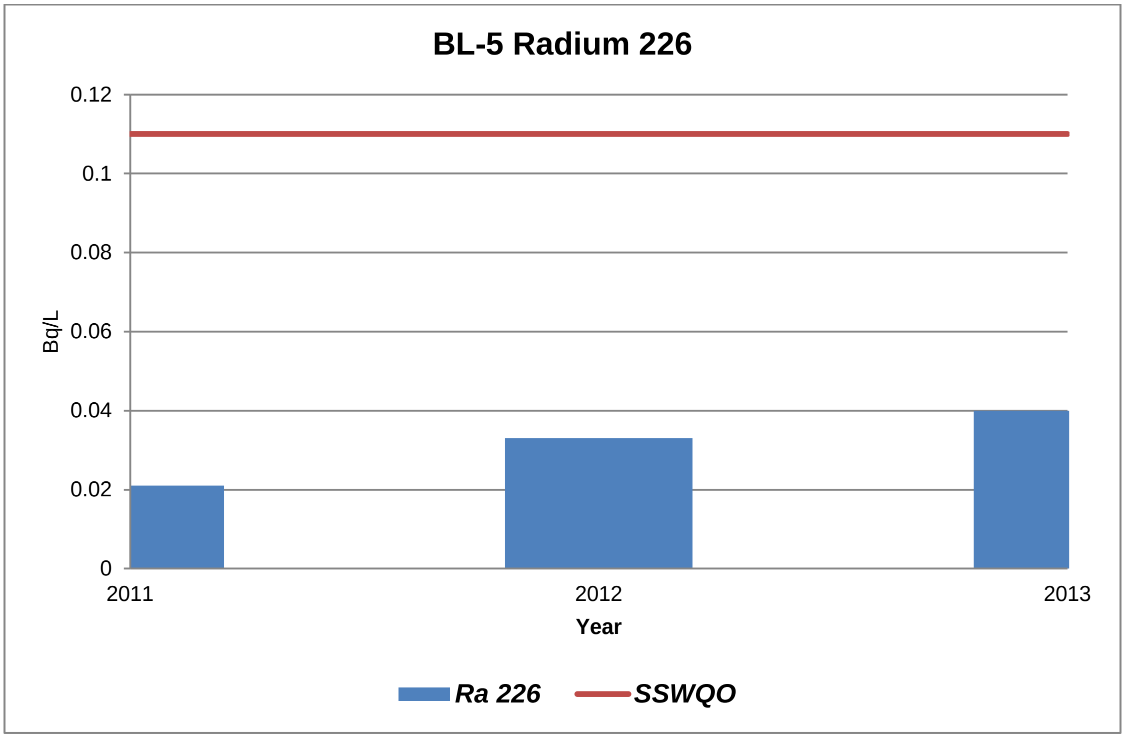


Figure 4.3.3-17 BL-5 Beaverlodge Lake Outlet



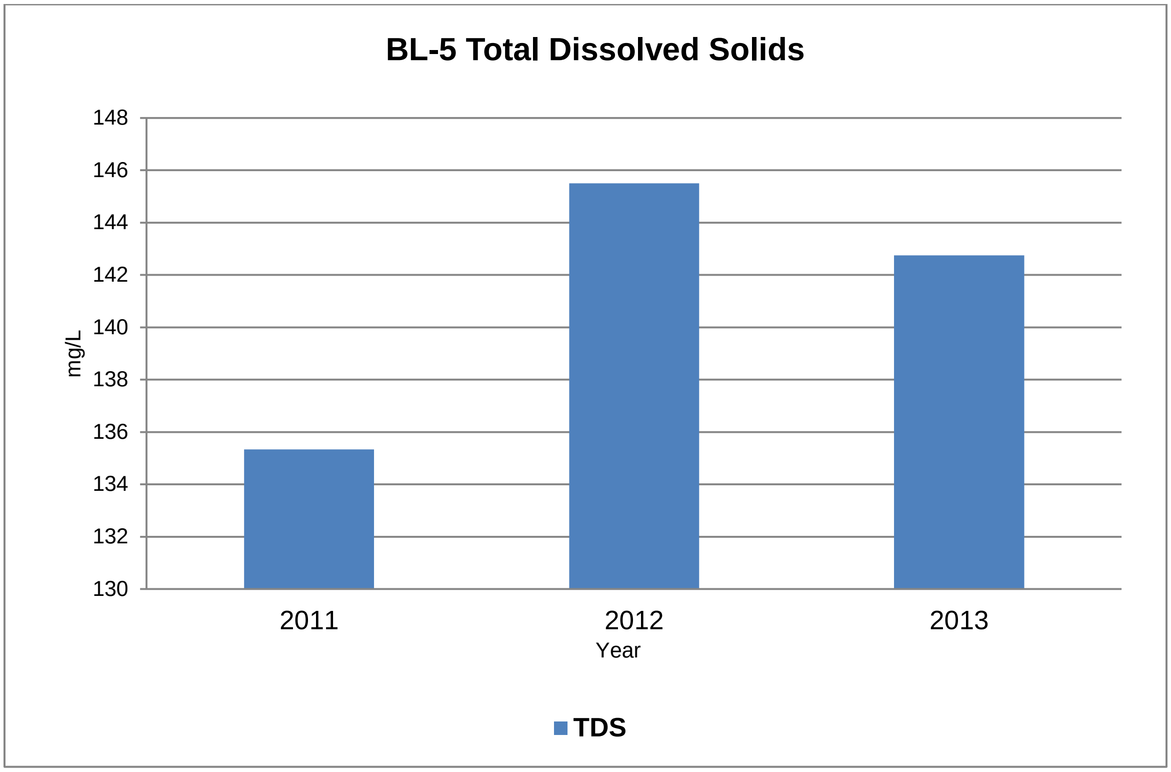
** Station implemented in water sampling program in 2011*

Figure 4.3.3-18 BL-5 Beaverlodge Lake Outlet



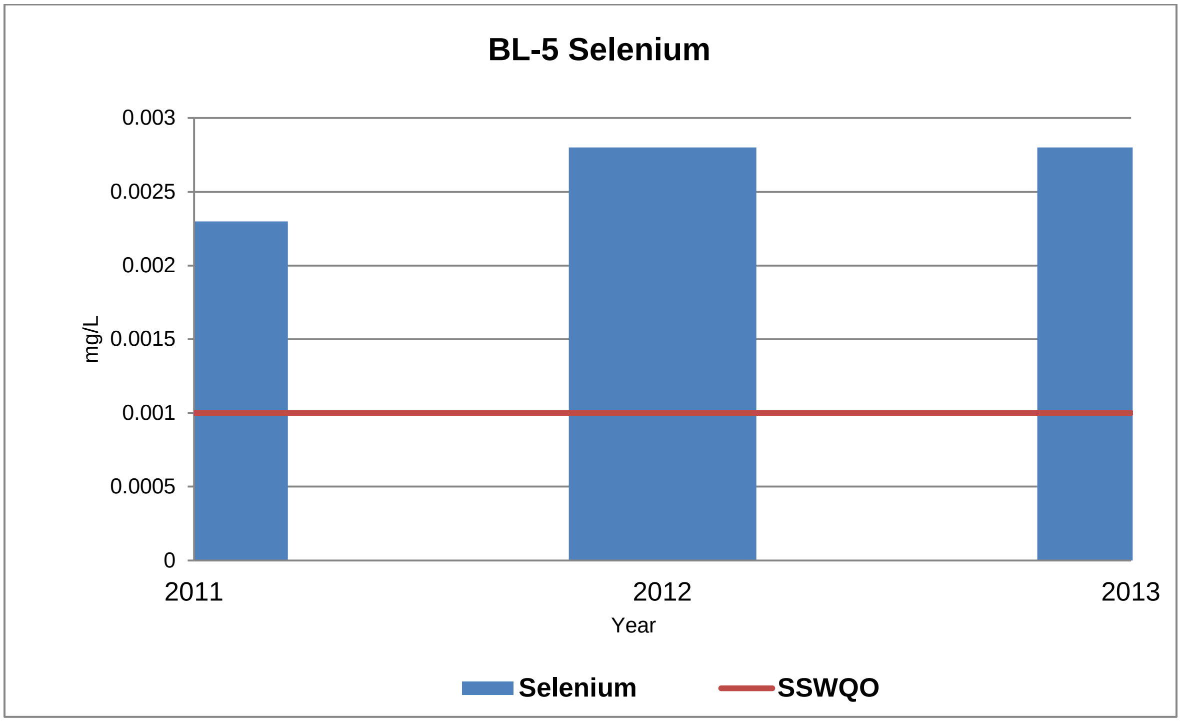
** Station implemented in water sampling program in 2011*

Figure 4.3.3-19 BL-5 Beaverlodge Lake Outlet



** Station implemented in water sampling program in 2011*

Figure 4.3.3-20 BL-5 Beaverlodge Lake Outlet



** Station implemented in water sampling program in 2011*

Figure 4.3.3-21 BL-5 Comparison to Predicted Recovery

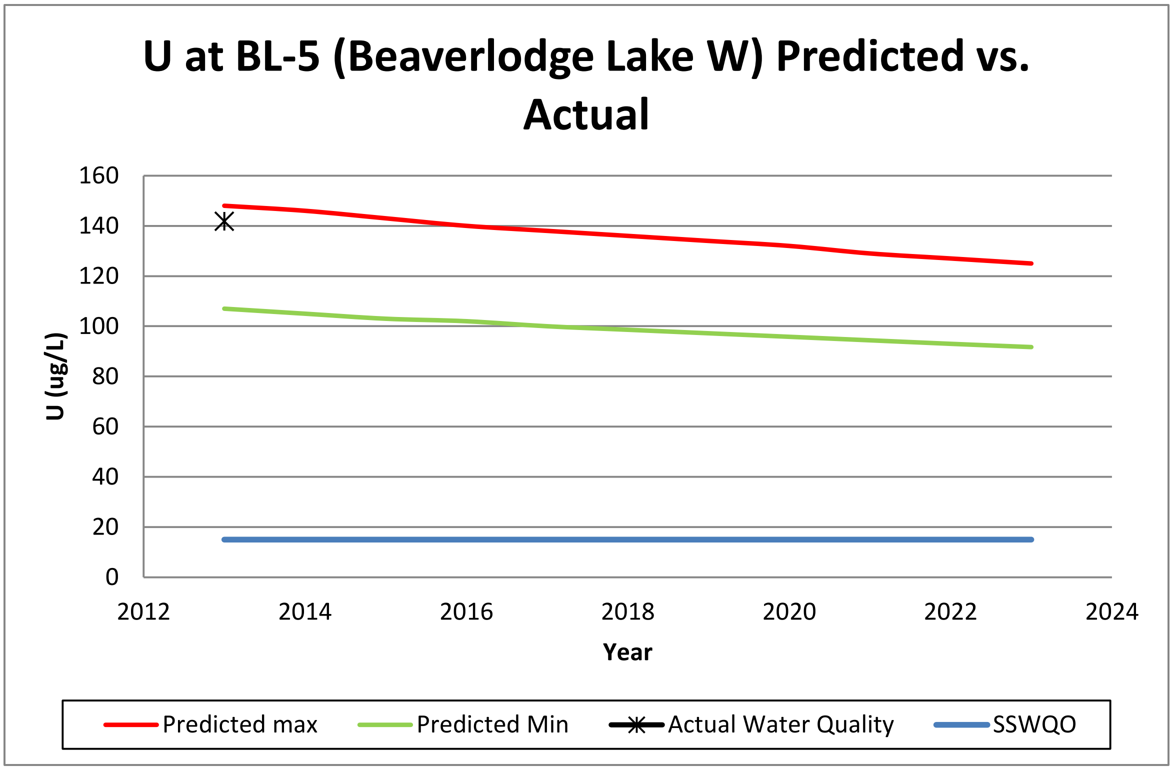


Figure 4.3.3-22 BL-5 Comparison to Predicted Recovery

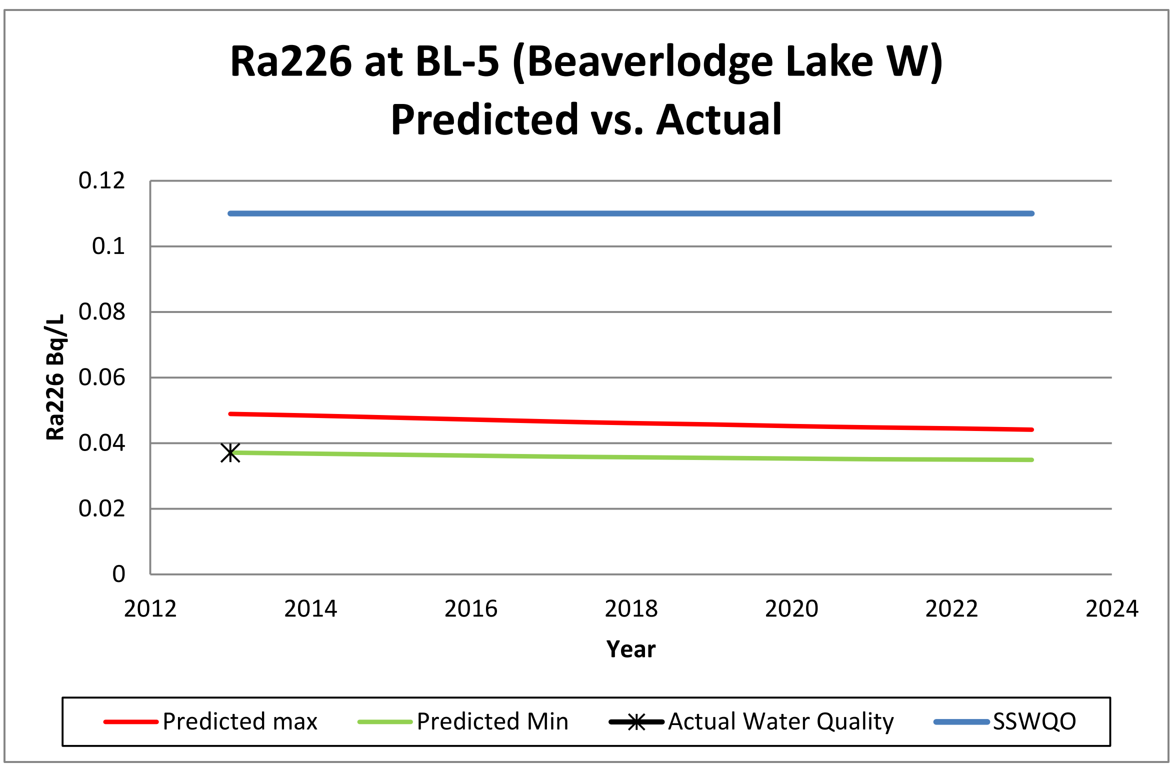


Figure 4.3.3-23 BL-5 Comparison to Predicted Recovery

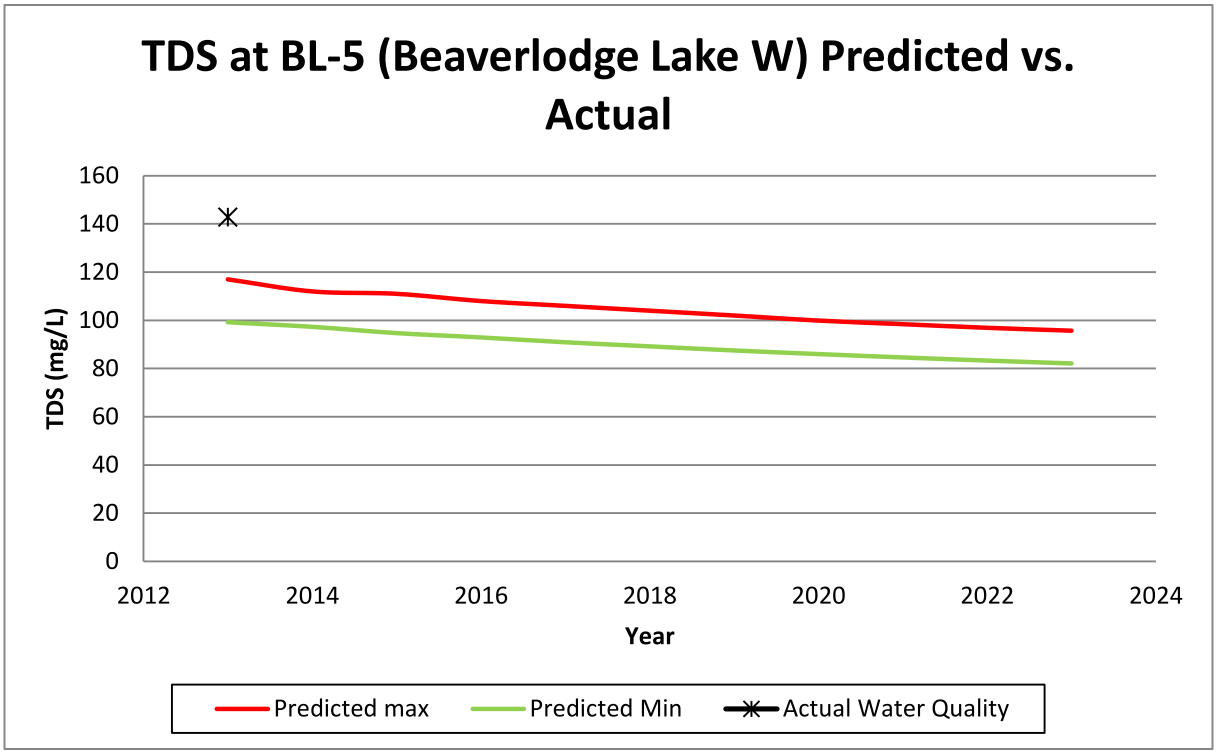


Figure 4.3.3-24 BL-5 Comparison to Predicted Recovery

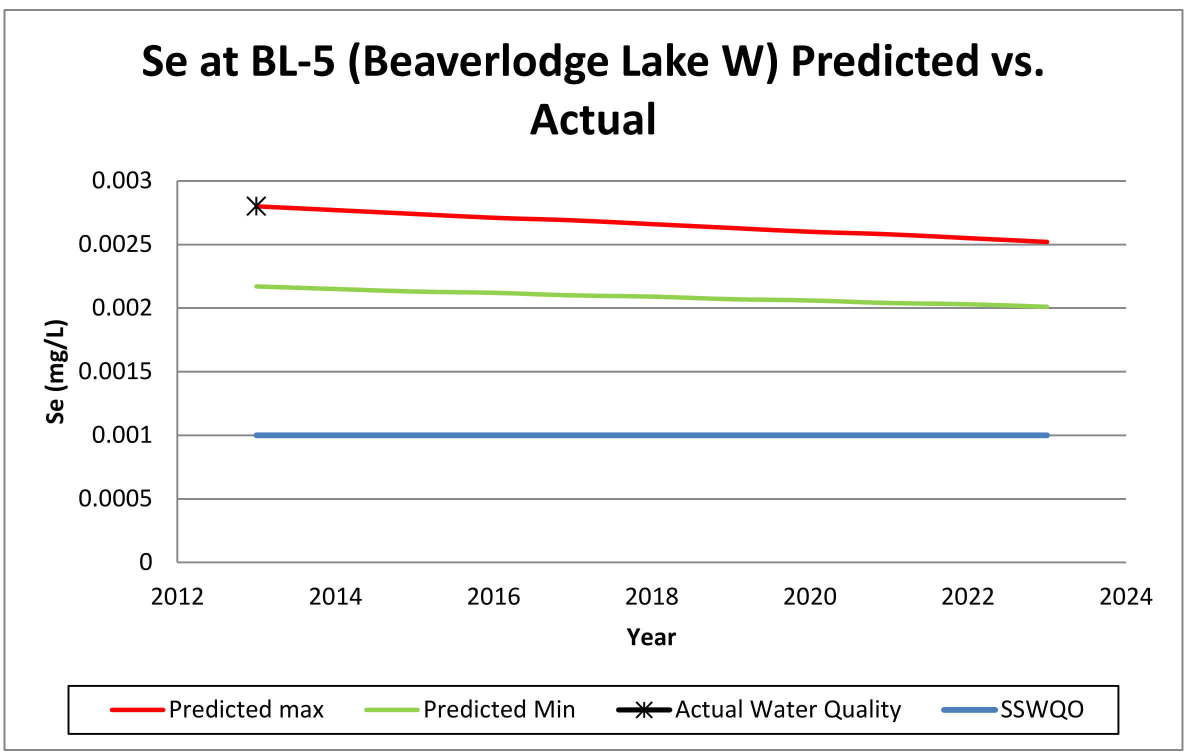
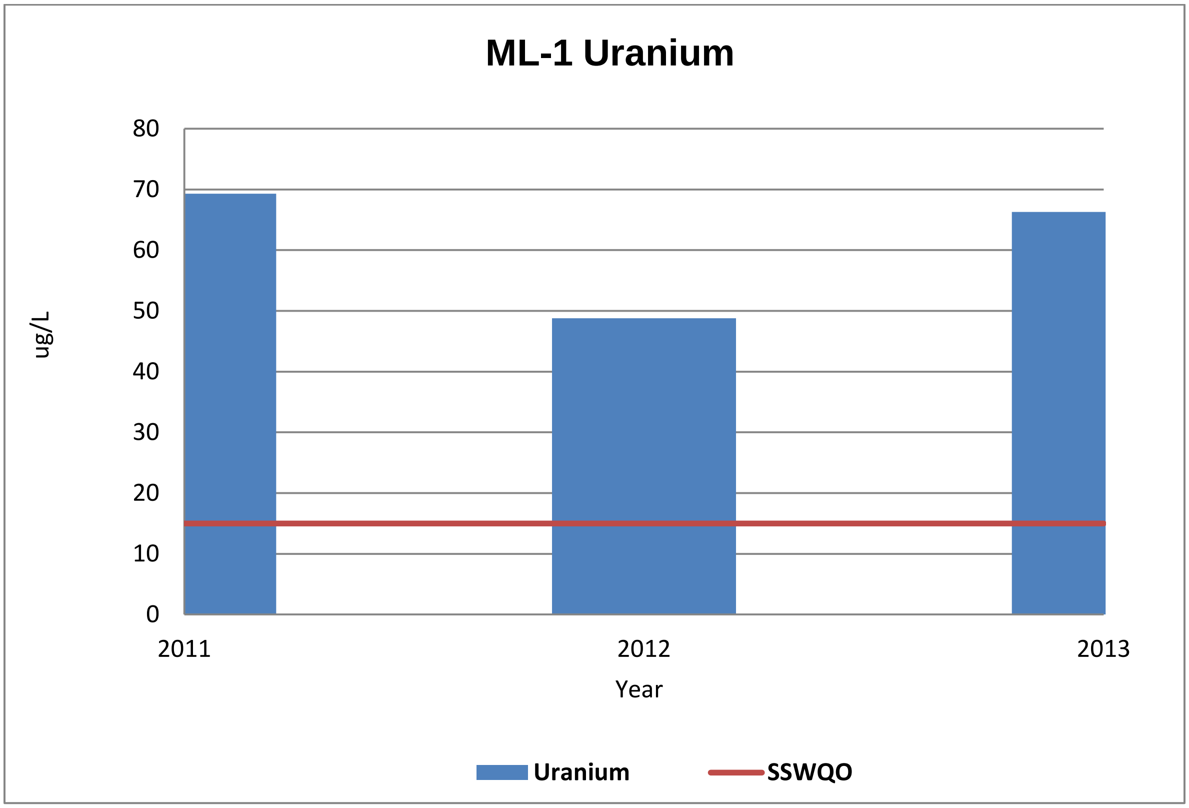
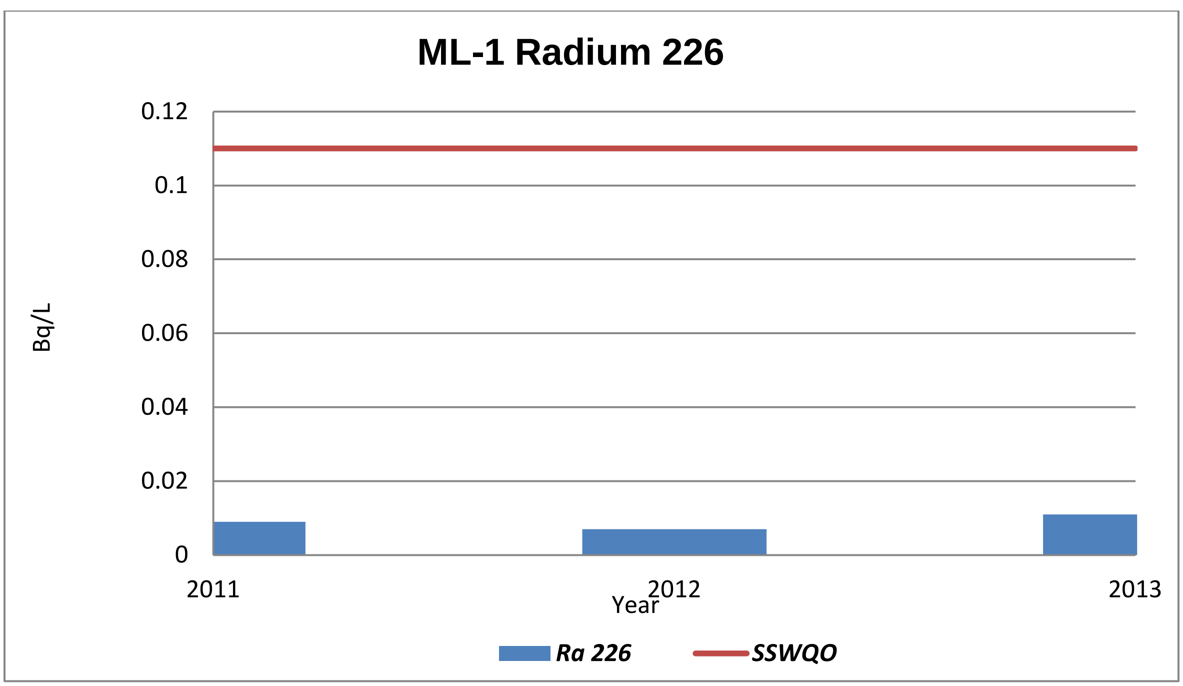


Figure 4.3.3-25 ML-1 Outlet of Martin Lake



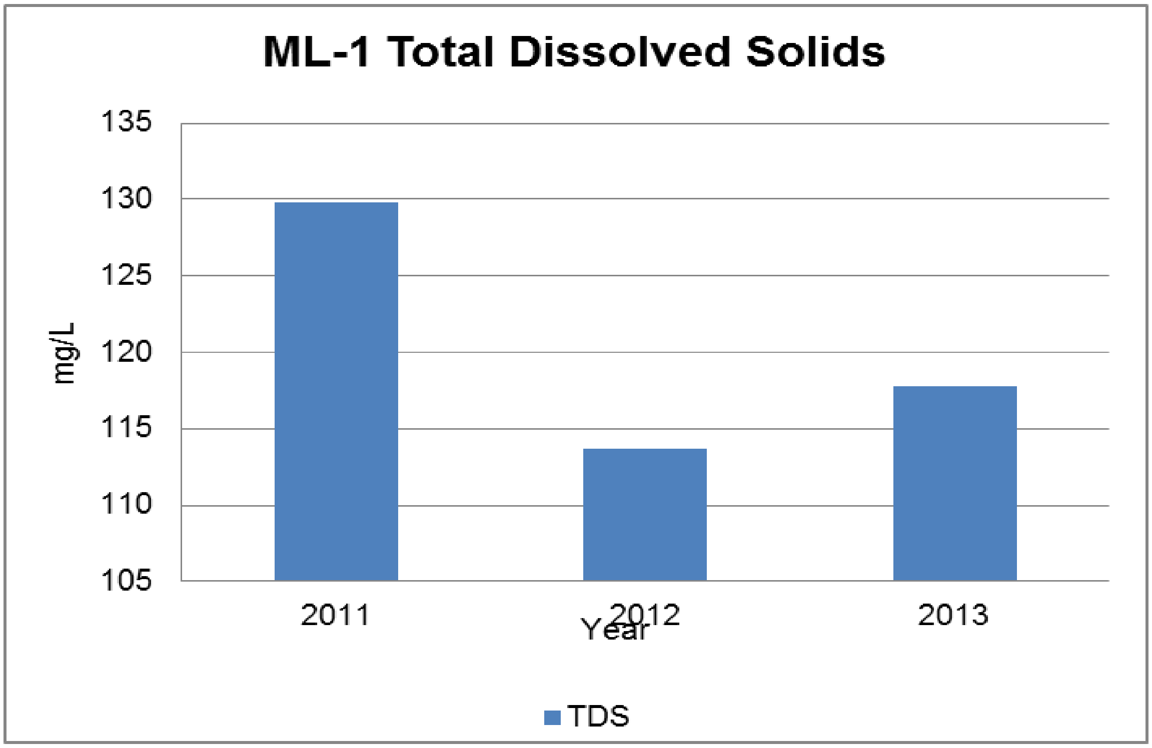
**Station implemented in water sampling program in 2011*

Figure 4.3.3-26 ML-1 Outlet of Martin Lake



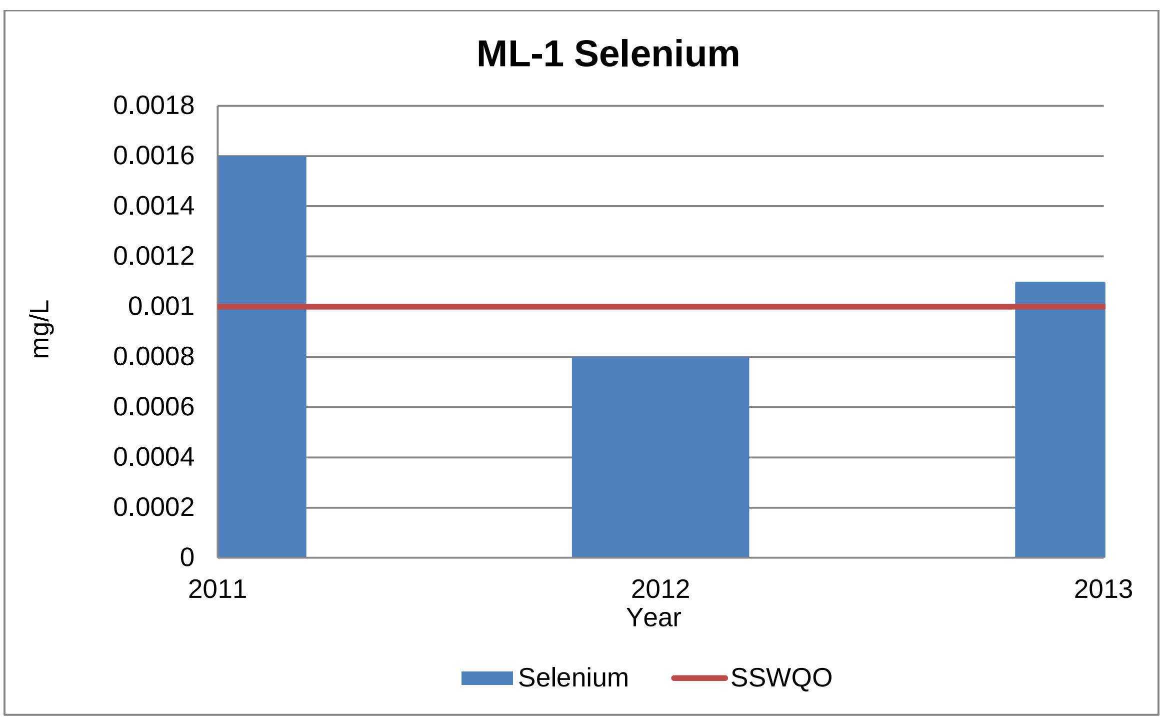
**Station implemented in water sampling program in 2011*

Figure 4.3.3-27 ML-1 Outlet of Martin Lake



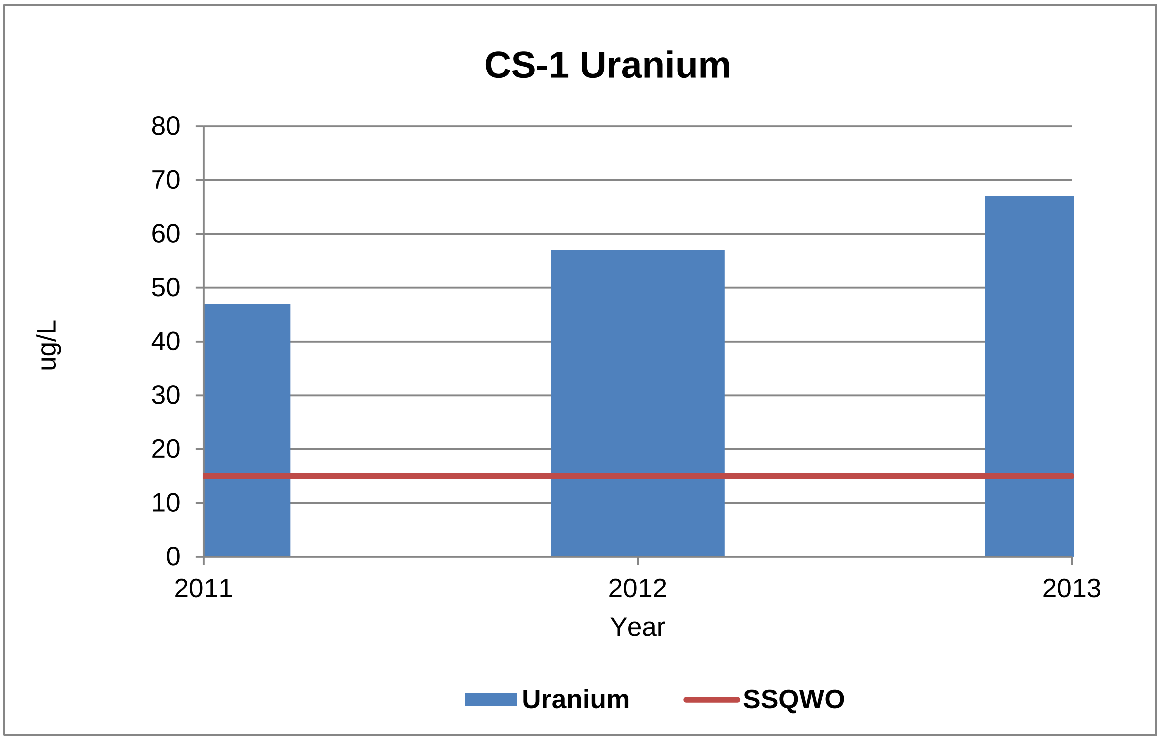
**Station implemented in water sampling program in 2011*

Figure 4.3.3-28 ML-1 Outlet of Martin Lake



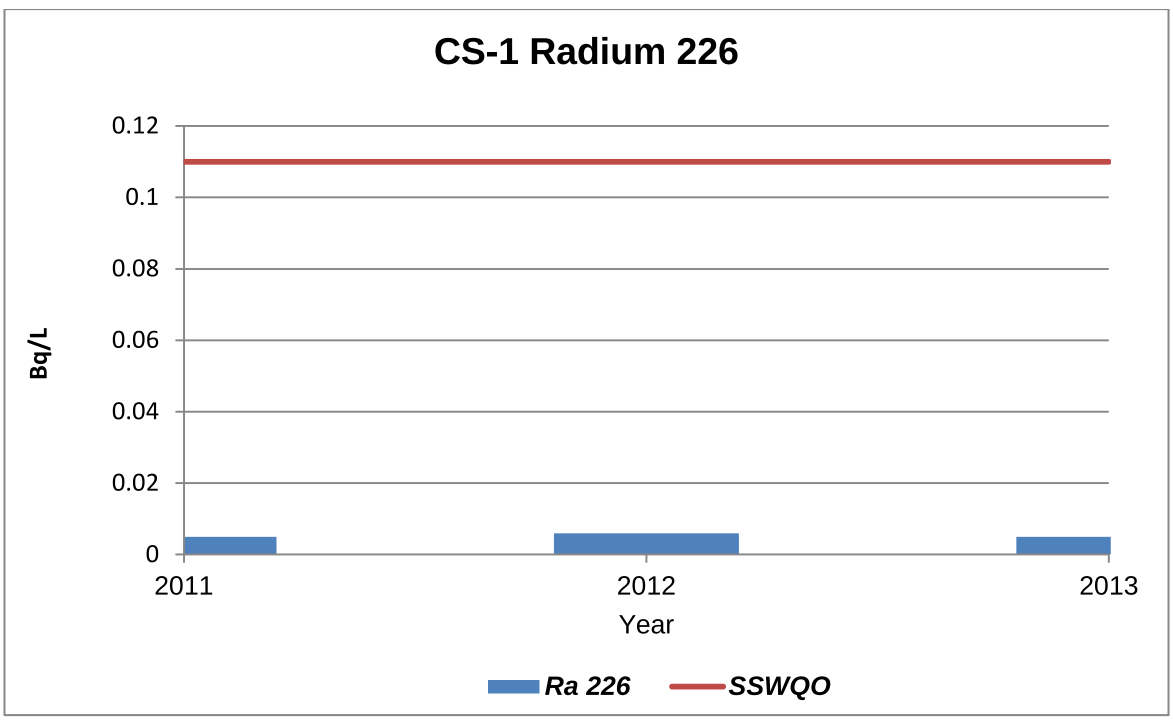
**Station implemented in water sampling program in 2011*

Figure 4.3.3-29 CS-1 Crackingstone Bay



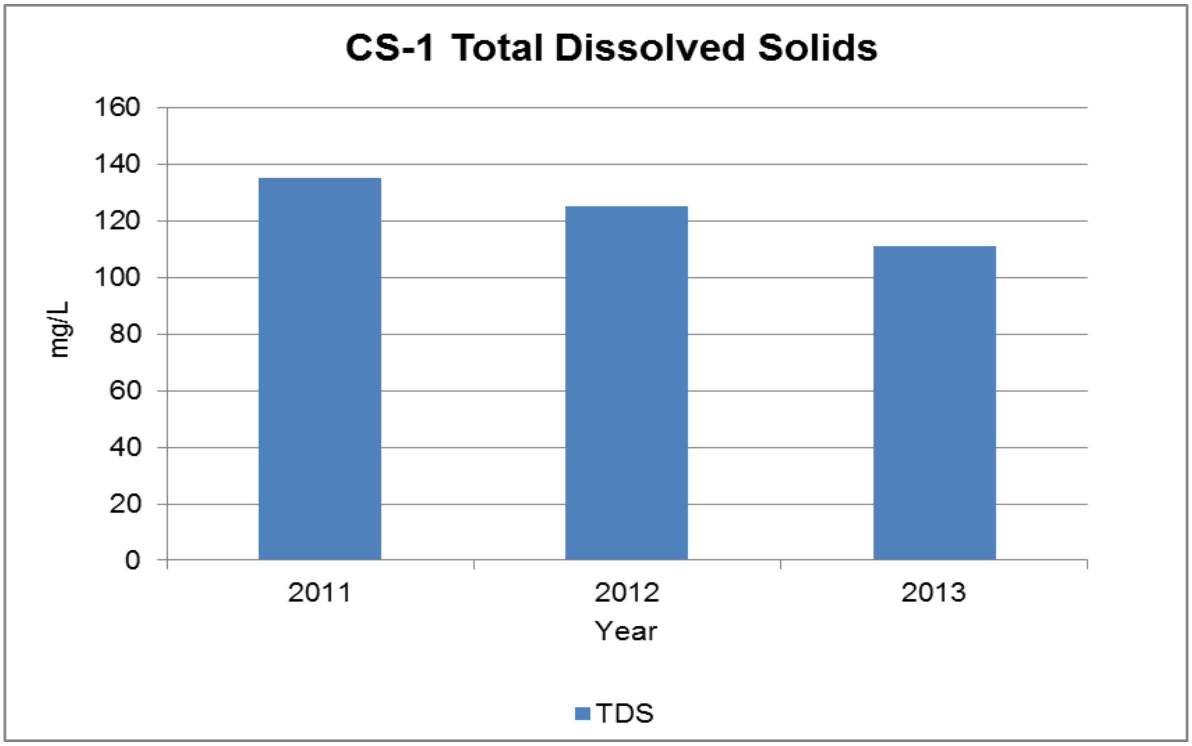
**Station implemented in water sampling program in 2011*

Figure 4.3.3-30 CS-1 Crackingstone Bay



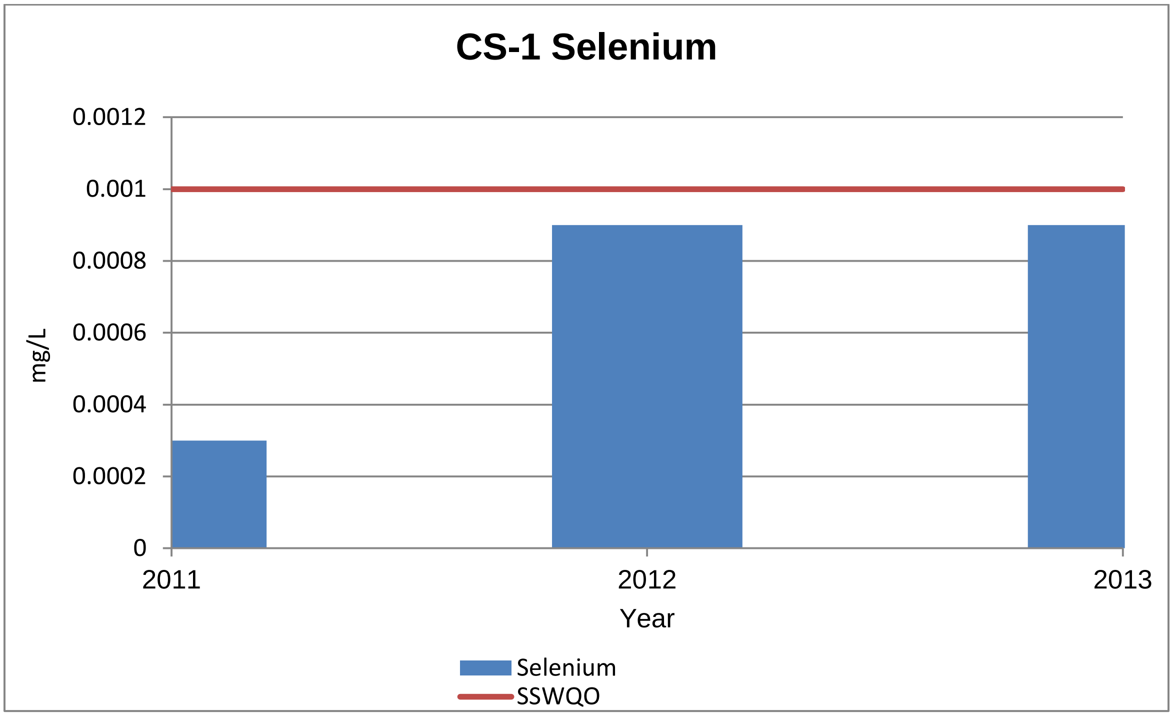
**Station implemented in water sampling program in 2011*

Figure 4.3.3-31 CS-1 Crackingstone Bay



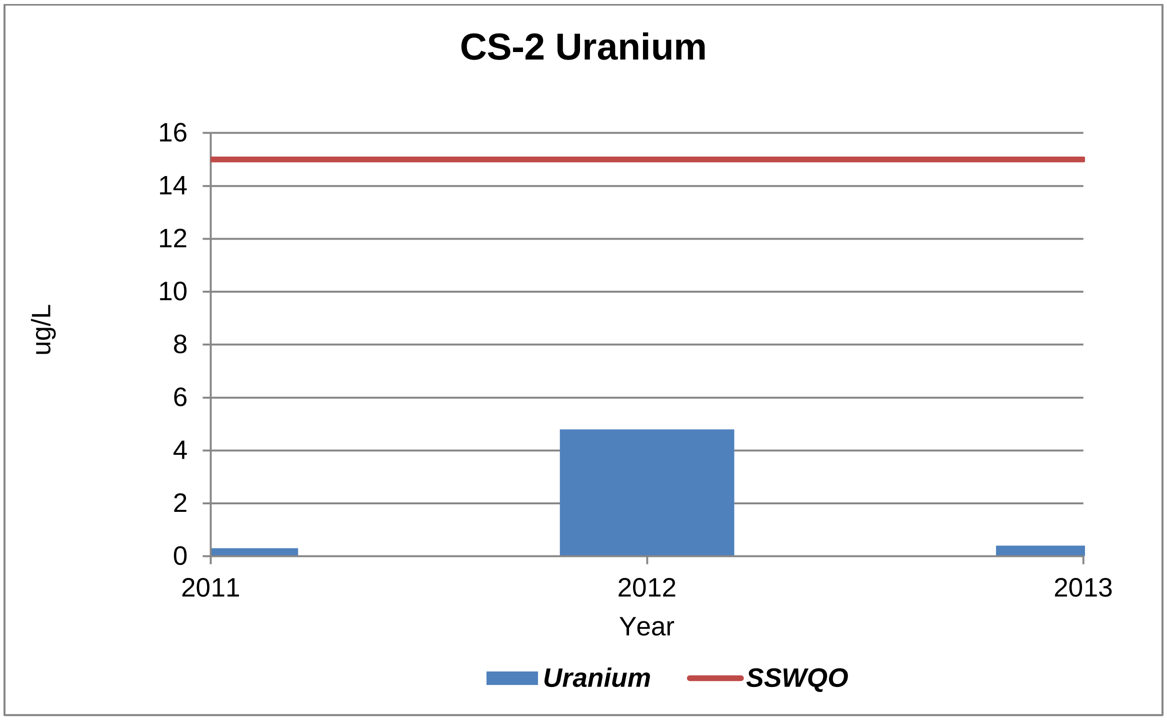
**Station implemented in water sampling program in 2011*

Figure 4.3.3-32 CS-1 Crackingstone Bay



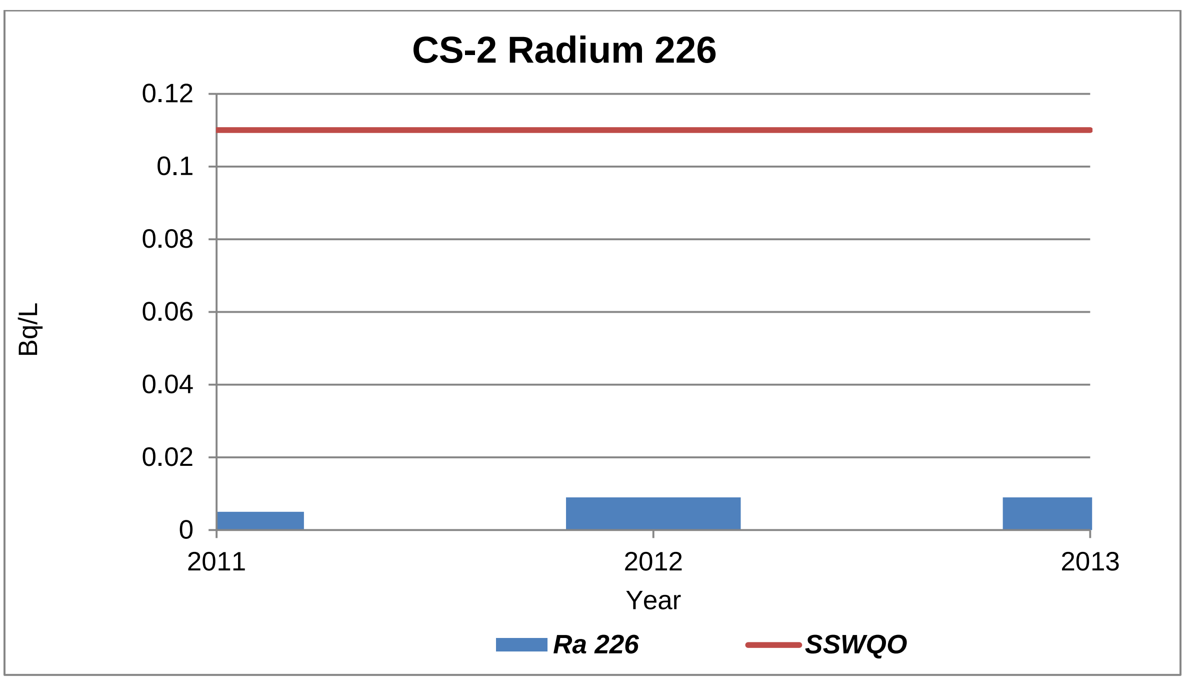
**Station implemented in water sampling program in 2011*

Figure 4.3.3-33 CS-2 Crackingstone Bay



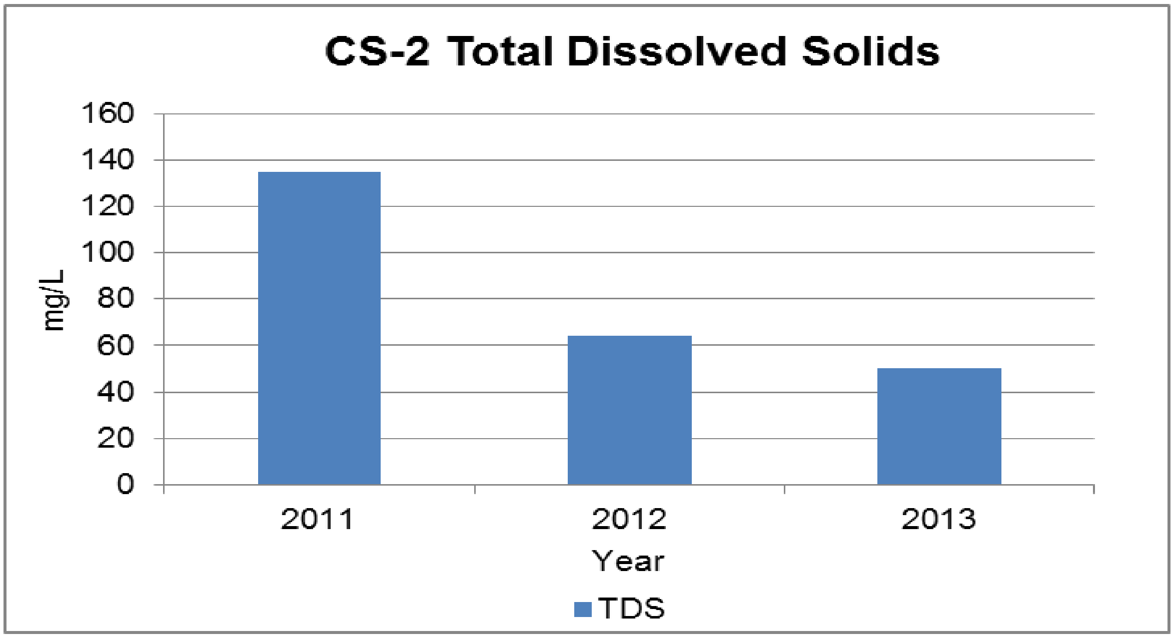
**Station implemented in water sampling program in 2011*

Figure 4.3.3-34 CS-2 Crackingstone Bay



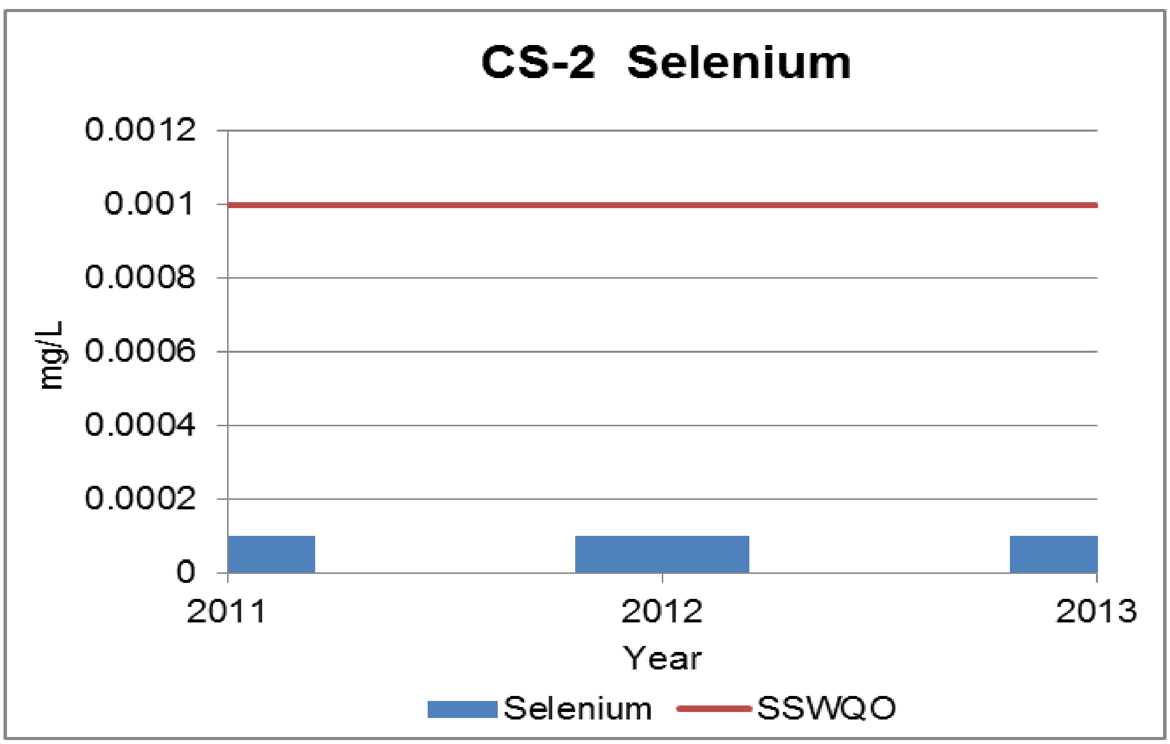
**Station implemented in water sampling program in 2011*

Figure 4.3.3-35 CS-2 Crackingstone Bay



**Station implemented in water sampling program in 2011*

Figure 4.3.3-36 CS-2 Crackingstone Bay



**Station implemented in water sampling program in 2011*

Figure 4.4
ZOR-1 and ZOR-2 sampling locations

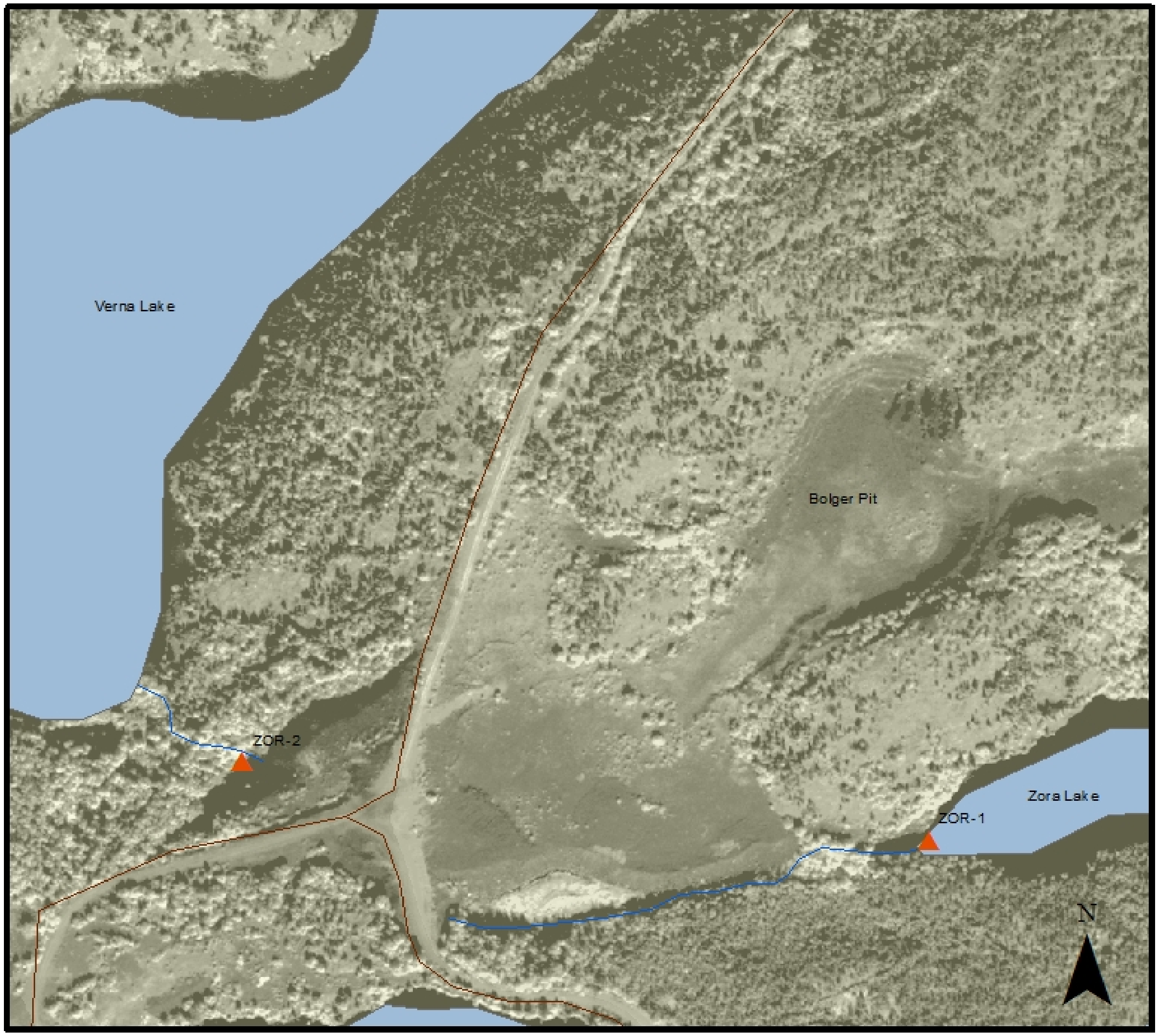
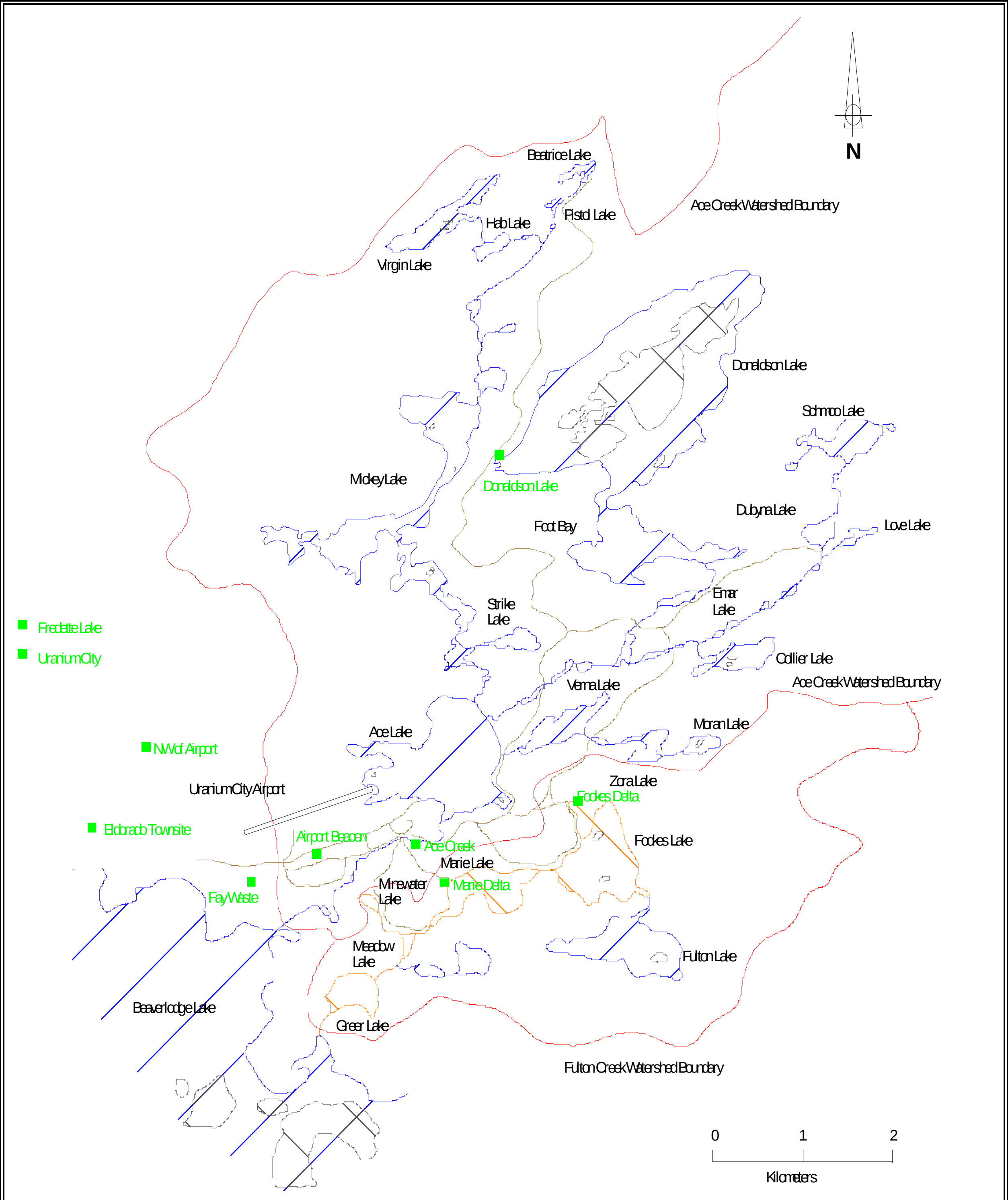
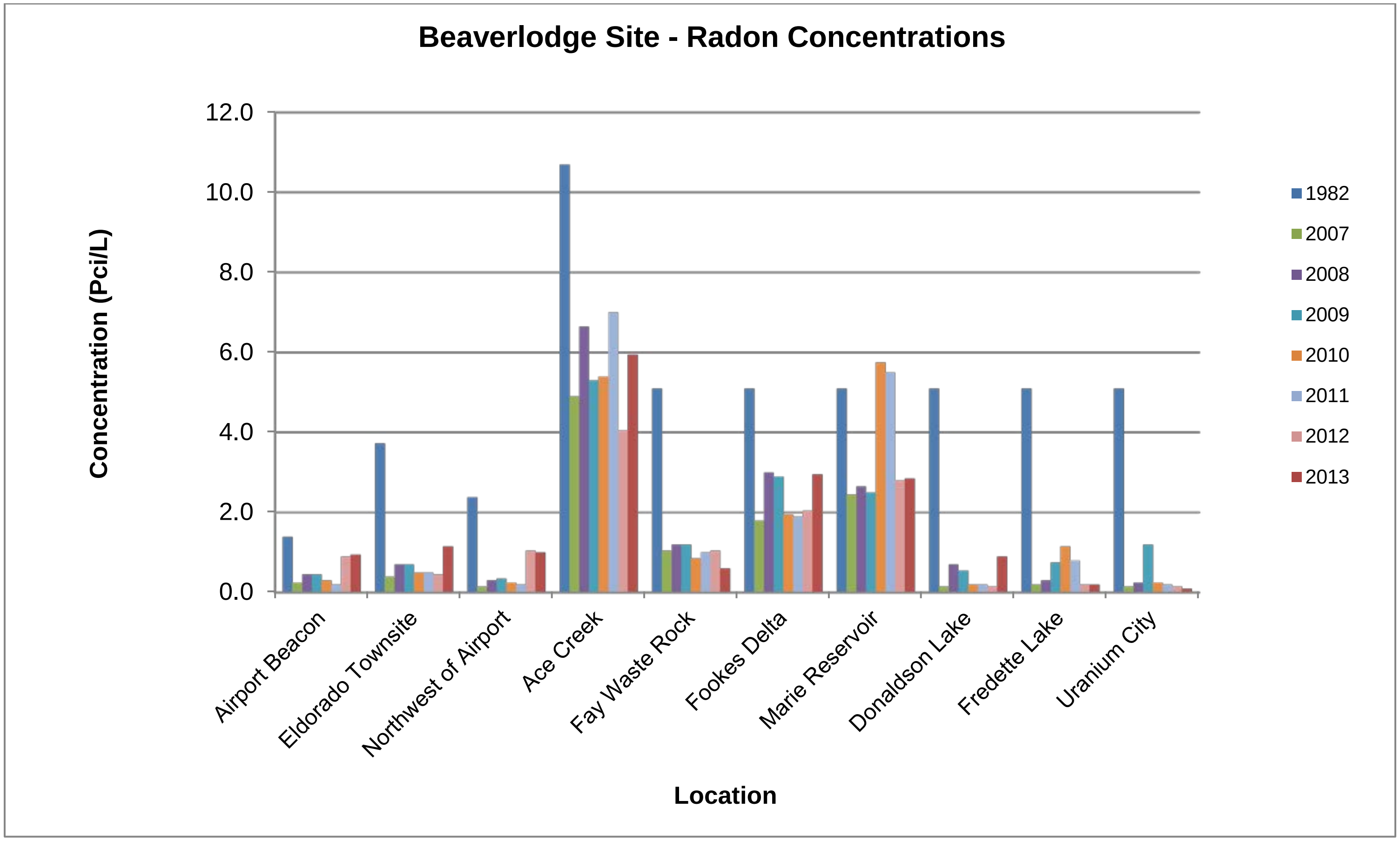


Figure 4.7.1-1 - Air Sampling Locations



Beavelodge Site - Air Sampling Locations

Figure 4.7.1-2
Radon Summary (2007 – 2013 versus 1982)



APPENDIX A

APPENDIX A

Station: AN-5

Parameter	2013-01-22	2013-03-22	2013-05-28	2013-07-30	2013-09-22	2013-11-23
Alk-T (mg/L)	144		50	90	103	142
As (µg/L)	0.4		0.4	0.4	0.2	0.3
Ba (mg/L)	0.17		0.079	0.12	0.12	0.14
Ca (mg/L)	45		19	28	30	46
Cl (mg/L)	1.3		0.4	0.5	0.7	1.1
CO3 (mg/L)	<1.0		<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	314		131	200	213	301
Cu (mg/L)	0.0011		0.0022	0.0003	0.0006	0.0005
Fe (mg/L)	0.53		0.15	0.26	0.1	0.19
Hardness (mg/L)	153		65	97	105	156
HCO3 (mg/L)	176		61	110	126	173
K (mg/L)	1.8		1	1.1	1.6	2.2
Mg (mg/L)	10		4.2	6.6	7.3	10
Mo (mg/L)	0.0028		0.0046	0.0019	0.002	0.0034
Na (mg/L)	5.4		2	3.1	3.8	5.7
NH3-N (mg/L)					0.04	
Ni (mg/L)	0.0008		0.0006	0.0004	0.0004	0.0004
NO3 (mg/L)	<0.04		<0.04	<0.04	<0.04	0.09
OH (mg/L)	<1.0		<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)					<0.01	
Pb (mg/L)	0.0002		0.0004	0.0001	0.0013	0.0001
pH-L (pH Unit)	7.66		7.58	7.54	7.57	7.62
Po210 (Bq/L)					0.01	
Ra226 (Bq/L)	1.4		0.41	0.81	0.62	1.4
Se (mg/L)	0.0001		<0.0001	<0.0001	<0.0001	<0.0001
SO4 (mg/L)	21		13	11	13	24
Sum of Ions (mg/L)	260		101	160	182	262
TDS (mg/L)	204		102	121	129	191
TSS (mg/L)	7		<1.000	2	<1.000	4
U (µg/L)	274		36	30	52	351
Zn (mg/L)	0.001		0.006	0.001	0.002	0.001

Station: DB-6

Parameter	2013-01-22	2013-03-22	2013-05-28	2013-07-30	2013-09-22	2013-11-23
Alk-T (mg/L)	97		71	100	92	102
As (µg/L)	0.2		0.1	0.1	0.1	0.2
Ba (mg/L)	0.052		0.041	0.042	0.05	0.055
Ca (mg/L)	41		30	34	37	39
Cl (mg/L)	0.8		0.5	0.5	0.6	0.7
CO3 (mg/L)	<1.0		<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	252		191	214	228	253
Cu (mg/L)	0.0006		0.0008	0.0006	0.0009	0.0006
Fe (mg/L)	0.014		0.016	0.018	0.022	0.013
Hardness (mg/L)	127		93	106	115	121
HCO3 (mg/L)	118		87	122	112	124
K (mg/L)	0.8		1	0.9	1	1.3
Mg (mg/L)	6.1		4.5	5.2	5.6	5.8
Mo (mg/L)	0.0021		0.0018	0.0021	0.0022	0.0022
Na (mg/L)	2.2		1.7	1.9	2.1	2.4
NH3-N (mg/L)					0.1	
Ni (mg/L)	0.0003		0.0002	0.0002	0.0003	0.0002
NO3 (mg/L)	0.22		<0.04	<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		<0.0001	<0.0001	0.0008	<0.0001
pH-L (pH Unit)	7.74		7.74	7.73	7.74	7.71
Po210 (Bq/L)					0.007	
Ra226 (Bq/L)	0.04		0.03	0.03	0.06	0.06
Se (mg/L)	0.0001		0.0001	0.0001	0.0001	0.0001
SO4 (mg/L)	28		20	23	27	28
Sum of Ions (mg/L)	197		145	188	185	201
TDS (mg/L)	165		137	136	152	169
TSS (mg/L)	<1.000		<1.000	2	<1.000	<1.000
U (µg/L)	194		130	161	202	234
Zn (mg/L)	<0.001		<0.001	0.001	0.001	<0.001

Station: AC-6A

Parameter	2013-06-23	2013-07-30	2013-08-26	2013-09-22
Alk-T (mg/L)	96			
As (µg/L)	0.2			
Ba (mg/L)	0.022			
Ca (mg/L)	42			
Cl (mg/L)	0.4			
CO3 (mg/L)	<1.0			
Cond-L (µS/cm)	275			
Cu (mg/L)	0.001			
Fe (mg/L)	0.028			
Hardness (mg/L)	140			
HCO3 (mg/L)	117			
K (mg/L)	0.9			
Mg (mg/L)	8.7			
Mo (mg/L)	0.001			
Na (mg/L)	2.3			
NH3-N (mg/L)				
Ni (mg/L)	0.0001			
NO3 (mg/L)	<0.04			
OH (mg/L)	<1.0			
P-(TP) (mg/L)				
Pb (mg/L)	<0.0001			
pH-L (pH Unit)	7.51			
Po210 (Bq/L)				
Ra226 (Bq/L)	0.14			
Se (mg/L)	0.0001			
SO4 (mg/L)	48			
Sum of Ions (mg/L)	219			
TDS (mg/L)	175			
TSS (mg/L)	<1.000			
U (µg/L)	201			
Zn (mg/L)	0.001			

Station: AC-8

Parameter	2013-03-22	2013-09-22
Alk-T (mg/L)	55	49
As (µg/L)	0.1	0.2
Ba (mg/L)	0.024	0.024
Ca (mg/L)	19	16
Cl (mg/L)	1	0.9
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	122	109
Cu (mg/L)	<0.0002	0.0007
Fe (mg/L)	0.045	0.029
Hardness (mg/L)	62	53
HCO3 (mg/L)	67	60
K (mg/L)	0.9	0.9
Mg (mg/L)	3.7	3.2
Mo (mg/L)	0.001	0.001
Na (mg/L)	1.7	1.5
NH3-N (mg/L)		0.06
Ni (mg/L)	0.0001	0.0002
NO3 (mg/L)	0.31	<0.04
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)		<0.01
Pb (mg/L)	<0.0001	0.0008
pH-L (pH Unit)	7.6	7.49
Po210 (Bq/L)		<0.005
Ra226 (Bq/L)	0.02	0.02
Se (mg/L)	<0.0001	<0.0001
SO4 (mg/L)	7.2	6.4
Sum of Ions (mg/L)	101	89
TDS (mg/L)	78	70
TSS (mg/L)	<1.000	<1.000
U (µg/L)	12	11
Zn (mg/L)	<0.001	0.002

Station: AC-14

Parameter	2013-01-22	2013-03-03	2013-03-22	2013-04-22	2013-05-28	2013-06-23	2013-07-30	2013-08-26	2013-09-22	2013-10-19	2013-11-23	2013-12-18*
Alk-T (mg/L)	56	57	57	56	47	46	49	50	52	52		55
As (µg/L)	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.2		0.2
Ba (mg/L)	0.027	0.025	0.025	0.025	0.021	0.024	0.022	0.024	0.026	0.024		0.026
Ca (mg/L)	19	18	18	18	15	16	17	17	18	18		18
Cl (mg/L)	1.3	1.2	1.1	1.5	0.8	1	1.1	1.2	1.6	1.6		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
Cond-L (µS/cm)	138	128	157	131	102	101	118	120	130	129		128
Cu (mg/L)	0.0004	0.0004	0.0007	<0.0002	0.0004	0.0005	0.0003	0.0006	0.001	0.0007		0.0007
Fe (mg/L)	0.057	0.046	0.046	0.033	0.057	0.078	0.098	0.11	0.077	0.058		0.056
Hardness (mg/L)	63	59	59	59	50	52	56	56	58	59		60
HCO3 (mg/L)	68	70	70	68	57	56	60	61	63	63		67
K (mg/L)	0.8	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.9	0.9		0.9
Mg (mg/L)	3.8	3.5	3.5	3.4	3	3	3.3	3.3	3.3	3.4		3.7
Mo (mg/L)	0.0011	0.0011	0.001	0.0009	0.0009	0.0009	0.0011	0.001	0.0011	0.0009		0.001
Na (mg/L)	1.9	1.8	1.8	2	1.5	1.6	1.8	2.1	2.6	2.5		1.8
NH3-N (mg/L)			0.04			0.08			0.12			0.08
Ni (mg/L)	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002		0.0002
NO3 (mg/L)	0.2	0.26	0.26	0.26	<0.04	<0.04	<0.04	<0.04	0.22	<0.04		0.22
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)	0.0003	0.0002	0.0003	0.0001	0.0004	0.0002	0.0002	0.0016	0.0018	0.0004		0.0002
pH-L (pH Unit)	7.54	7.72	7.8	7.58	7.66	7.48	7.54	7.58	7.53	7.54		7.74
Po210 (Bq/L)			<0.005			0.01			0.01			0.007
Ra226 (Bq/L)	0.04	0.04	0.04	0.05	0.04	0.06	0.08	0.09	0.07	0.07		0.03
Se (mg/L)	0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	0.0001	0.0002		0.0001
SO4 (mg/L)	8.4	7.5	7.3	8.2	6.6	6.7	7.6	8.2	12	11		7.7
Sum of Ions (mg/L)	103	103	103	102	85	85	92	94	102	100		101
TDS (mg/L)	93	75	85	99	76	69	72	86	84	88		83
TSS (mg/L)	<1.000	<1.000	<1.000	1	2	<1.000	1	2	<1.000	1		<1.00
U (µg/L)	20	21	17	15	18	19	24	28	49	49		20
Zn (mg/L)	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.001		0.002

* December sample was resampled in January due to original sample being taken in wrong location

Station: AN-3

Parameter	**2013-09-22**
Alk-T (mg/L)	72
As (µg/L)	0.1
Ba (mg/L)	0.017
Ca (mg/L)	21
Cl (mg/L)	0.6
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	145
Cu (mg/L)	0.0007
Fe (mg/L)	0.016
Hardness (mg/L)	72
HCO3 (mg/L)	88
K (mg/L)	0.9
Mg (mg/L)	4.9
Mo (mg/L)	0.0017
Na (mg/L)	2
NH3-N (mg/L)	0.05
Ni (mg/L)	0.0003
NO3 (mg/L)	<0.04
OH (mg/L)	<1.0
P-(TP) (mg/L)	<0.01
Pb (mg/L)	0.0009
pH-L (pH Unit)	7.68
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	<0.0001
SO4 (mg/L)	4.4
Sum of Ions (mg/L)	122
TDS (mg/L)	90
TSS (mg/L)	<1.000
U (µg/L)	1.6
Zn (mg/L)	0.001

Station: TL-3

Parameter	2013-03-22	2013-06-23	2013-09-22	2013-12-18
Alk-T (mg/L)	154	125	134	158
As (µg/L)	1.2	0.8	1	1.1
Ba (mg/L)	0.04	0.032	0.035	0.04
Ca (mg/L)	30	25	26	30
Cl (mg/L)	4	3	4	4
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	380	310	328	366
Cu (mg/L)	0.0011	0.001	0.0014	0.0016
Fe (mg/L)	0.003	0.008	0.022	0.009
Hardness (mg/L)	99	83	87	99
HCO3 (mg/L)	188	152	163	193
K (mg/L)	1.5	1.2	1.3	1.4
Mg (mg/L)	5.8	5	5.3	6
Mo (mg/L)	0.018	0.015	0.017	0.018
Na (mg/L)	45	36	39	43
NH3-N (mg/L)			0.04	
Ni (mg/L)	0.0004	0.0002	0.0004	0.0004
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)	0.0002	0.0002	0.0015	0.0005
pH-L (pH Unit)	8.16	7.94	8.06	8.2
Po210 (Bq/L)			0.04	
Ra226 (Bq/L)	1.4	1.2	1.3	1.3
Se (mg/L)	0.0046	0.0036	0.0036	0.0043
SO4 (mg/L)	44	35	40	43
Sum of Ions (mg/L)	318	257	279	320
TDS (mg/L)	236	192	210	228
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000
U (µg/L)	411	319	358	400
Zn (mg/L)	0.001	<0.001	0.002	0.001

Station: TL-4

Parameter	2013-03-22	2013-06-23	2013-09-22	2013-12-18
Alk-T (mg/L)	164	123	132	154
As (µg/L)	1.8	1.3	1.5	1.7
Ba (mg/L)	0.088	0.072	0.072	0.085
Ca (mg/L)	24	20	18	23
Cl (mg/L)	4	3	4	4
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	384	291	311	350
Cu (mg/L)	0.0003	0.0008	0.0009	0.0006
Fe (mg/L)	0.018	0.038	0.06	0.015
Hardness (mg/L)	85	70	67	82
HCO3 (mg/L)	200	150	161	188
K (mg/L)	1.7	1.3	1.4	1.6
Mg (mg/L)	6.1	4.9	5.4	5.9
Mo (mg/L)	0.011	0.0092	0.011	0.011
Na (mg/L)	51	38	43	48
NH3-N (mg/L)			0.12	
Ni (mg/L)	0.0006	0.0005	0.0006	0.0006
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)	0.0004	0.0002	0.0012	0.0005
pH-L (pH Unit)	8.03	8.03	7.98	8.2
Po210 (Bq/L)			0.02	
Ra226 (Bq/L)	2.2	1.6	1.7	2.2
Se (mg/L)	0.0023	0.002	0.0016	0.002
SO4 (mg/L)	37	28	32	34
Sum of Ions (mg/L)	324	245	265	304
TDS (mg/L)	242	183	208	222
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000
U (µg/L)	329	242	284	310
Zn (mg/L)	<0.001	<0.001	0.002	<0.001

Station: TL-6

Parameter	2013-05-28	2013-07-30	2013-09-22
Alk-T (mg/L)	288		
As (µg/L)	3		
Ba (mg/L)	1.26		
Ca (mg/L)	55		
Cl (mg/L)	47		
CO3 (mg/L)	<1.0		
Cond-L (µS/cm)	790		
Cu (mg/L)	0.0006		
Fe (mg/L)	1.79		
Hardness (mg/L)	186		
HCO3 (mg/L)	351		
K (mg/L)	2.8		
Mg (mg/L)	12		
Mo (mg/L)	0.0016		
Na (mg/L)	108		
NH3-N (mg/L)	0.12		
Ni (mg/L)	0.0005		
NO3 (mg/L)	<0.04		
OH (mg/L)	<1.0		
P-(TP) (mg/L)	0.01		
Pb (mg/L)	0.0002		
pH-L (pH Unit)	7.87		
Po210 (Bq/L)	0.05		
Ra226 (Bq/L)	7.9		
Se (mg/L)	0.0025		
SO4 (mg/L)	62		
Sum of Ions (mg/L)	638		
TDS (mg/L)	532		
TSS (mg/L)	2		
U (µg/L)	225		
Zn (mg/L)	0.001		

Station: TL-7

Parameter	2013-01-22	2013-03-03	2013-03-22	2013-04-22	2013-05-28	2013-06-23	2013-07-30	2013-08-26	2013-09-22	2013-10-19	2013-11-23	2013-12-18
Alk-T (mg/L)					124	128	127	135	139	139	153	161
As (µg/L)					1.6	1.7	1.4	1.4	1.2	1.2	1.5	1.6
Ba (mg/L)					0.16	0.18	0.25	0.4	0.3	0.26	0.14	0.13
Ca (mg/L)					23	21	19	20	20	21	23	24
Cl (mg/L)					5	5	4	4	5	7	4	4
CO3 (mg/L)					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)					314	305	311	316	322	332	357	365
Cu (mg/L)					0.0007	0.0007	0.0003	0.0004	0.0008	0.0004	0.0006	0.001
Fe (mg/L)					0.073	0.082	0.062	0.09	0.05	0.03	0.02	0.043
Hardness (mg/L)					79	73	70	72	73	76	83	86
HCO3 (mg/L)					151	156	155	165	170	170	187	196
K (mg/L)					1.4	1.2	1.2	1.3	1.4	1.6	1.7	1.6
Mg (mg/L)					5.3	5.1	5.4	5.4	5.7	5.8	6.2	6.4
Mo (mg/L)					0.0098	0.0092	0.0094	0.0077	0.0097	0.0097	0.011	0.011
Na (mg/L)					37	39	41	42	43	44	48	49
NH3-N (mg/L)						0.06			0.07			0.04
Ni (mg/L)					0.0006	0.0005	0.0005	0.0005	0.0006	0.0005	0.0006	0.0006
NO3 (mg/L)					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04
OH (mg/L)					<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)					0.0003	0.0002	0.0001	0.0012	0.001	0.0003	0.0005	0.0006
pH-L (pH Unit)					7.94	7.73	7.86	7.9	7.88	7.81	7.92	8.03
Po210 (Bq/L)						0.04			0.009			0.05
Ra226 (Bq/L)					1.7	1.4	1.5	1.7	1.6	1.4	1.4	1.7
Se (mg/L)					0.0025	0.0022	0.0016	0.0014	0.0016	0.0019	0.0021	0.002
SO4 (mg/L)					26	27	29	27	31	32	34	37
Sum of Ions (mg/L)					249	254	255	265	276	281	304	318
TDS (mg/L)					202	198	187	209	215	214	227	240
TSS (mg/L)					<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)					241	198	222	174	247	307	322	317
Zn (mg/L)					0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001

Station: TL-9

Parameter	2013-01-22	2013-03-03	2013-03-22	2013-04-22	2013-05-28	2013-06-23	2013-07-30	2013-08-26	2013-09-22	2013-10-19	2013-11-23	2013-12-18
Alk-T (mg/L)	175	179		171	123	144	141	145	150	155		178
As (µg/L)	1.9	1.5		1.6	1.5	2	1.9	2.4	1.9	1.9		2
Ba (mg/L)	1.18	0.82		0.64	0.73	1.01	1.06	1.17	1.46	1.49		1.33
Ca (mg/L)	28	29		28	24	27	24	24	25	27		30
Cl (mg/L)	9	7		7	5	7	7	7	7	7		6
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)	423	437		410	305	327	334	339	342	349		394
Cu (mg/L)	0.0007	0.0009		0.0004	0.0008	0.0008	0.0004	0.0006	0.0021	0.0005		0.0017
Fe (mg/L)	0.027	0.021		0.013	0.039	0.07	0.071	0.073	0.1	0.057		0.072
Hardness (mg/L)	103	104		99	83	93	86	88	91	95		106
HCO3 (mg/L)	214	218		209	150	176	172	177	183	189		217
K (mg/L)	1.8	1.9		1.8	1.5	1.6	1.5	1.5	1.5	1.6		1.8
Mg (mg/L)	8	7.7		7.2	5.6	6.2	6.4	6.8	7	6.7		7.6
Mo (mg/L)	0.016	0.015		0.014	0.0098	0.01	0.01	0.0098	0.013	0.014		0.015
Na (mg/L)	51	59		51	33	37	39	40	40	41		48
NH3-N (mg/L)						0.05			0.12			0.19
Ni (mg/L)	0.0005	0.0006		0.0005	0.0005	0.0004	0.0004	0.0005	0.0006	0.0004		0.0005
NO3 (mg/L)	0.09	0.13		0.09	0.2	0.22	0.31	0.75	<0.04	0.31		0.26
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)	0.0003	0.0003		0.0002	0.0006	0.0008	0.0005	0.0013	0.002	0.0005		0.0011
pH-L (pH Unit)	7.95	7.95		8.03	8	7.92	8.06	7.96	7.99	7.98		8.17
Po210 (Bq/L)						0.06			0.04			0.03
Ra226 (Bq/L)	2.9	2.3		1.9	2.3	3	3.1	3	4	3.7		3.2
Se (mg/L)	0.0038	0.0035		0.0035	0.0026	0.0024	0.002	0.0019	0.0022	0.0026		0.003
SO4 (mg/L)	38	39		38	24	25	26	25	28	28		35
Sum of Ions (mg/L)	350	362		342	243	280	276	282	292	301		346
TDS (mg/L)	268	284		270	189	212	209	224	228	229		260
TSS (mg/L)	<1.000	<1.000		<1.000	<1.000	<1.000	2	1	2	2		2
U (µg/L)	439	448		174	218	220	191	174	265	357		406
Zn (mg/L)	0.001	0.001		<0.001	0.001	<0.001	0.001	0.002	0.005	0.002		0.002

Station: BL-3

Parameter	2013-03-22	2013-06-23	2013-09-22	2013-12-18
Alk-T (mg/L)	76	68	70	78
As (µg/L)	0.3	0.3	0.3	0.3
Ba (mg/L)	0.048	0.045	0.038	0.041
Ca (mg/L)	24	21	21	23
Cl (mg/L)	12	12	13	14
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	255	234	237	257
Cu (mg/L)	0.0006	0.0041	0.0014	0.0046
Fe (mg/L)	0.007	0.017	0.013	0.007
Hardness (mg/L)	84	74	74	81
HCO3 (mg/L)	93	83	85	95
K (mg/L)	1.3	1.2	1.2	1.3
Mg (mg/L)	5.8	5.2	5.2	5.8
Mo (mg/L)	0.0038	0.0036	0.0038	0.0041
Na (mg/L)	20	19	19	21
NH3-N (mg/L)			0.08	
Ni (mg/L)	0.0006	0.0047	0.003	0.014
NO3 (mg/L)	<0.04	<0.04	<0.04	0.06
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01	
Pb (mg/L)	<0.0001	0.0004	0.0008	0.0003
pH-L (pH Unit)	7.91	7.62	7.69	7.97
Po210 (Bq/L)			<0.005	
Ra226 (Bq/L)	0.04	0.08	0.05	0.04
Se (mg/L)	0.0027	0.0026	0.0026	0.0029
SO4 (mg/L)	34	30	32	34
Sum of Ions (mg/L)	190	171	176	194
TDS (mg/L)	151	134	136	150
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000
U (µg/L)	143	130	136	156
Zn (mg/L)	0.003	0.006	0.002	0.004

Station: BL-4

Parameter	2013-03-22	2013-09-22
Alk-T (mg/L)	72	70
As (µg/L)	0.2	0.2
Ba (mg/L)	0.035	0.034
Ca (mg/L)	22	21
Cl (mg/L)	13	13
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	246	236
Cu (mg/L)	0.0022	0.0015
Fe (mg/L)	0.014	0.015
Hardness (mg/L)	78	74
HCO3 (mg/L)	88	85
K (mg/L)	1.3	1.2
Mg (mg/L)	5.6	5.2
Mo (mg/L)	0.0035	0.0037
Na (mg/L)	20	19
NH3-N (mg/L)	0.13	0.03
Ni (mg/L)	0.0022	0.0027
NO3 (mg/L)	<0.04	<0.04
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)	<0.01	<0.01
Pb (mg/L)	0.0001	0.0009
pH-L (pH Unit)	7.92	7.66
Po210 (Bq/L)	<0.005	<0.005
Ra226 (Bq/L)	0.03	0.02
Se (mg/L)	0.0028	0.0026
SO4 (mg/L)	34	32
Sum of Ions (mg/L)	184	176
TDS (mg/L)	149	135
TSS (mg/L)	<1.000	<1.000
U (µg/L)	141	134
Zn (mg/L)	0.007	0.003

Station: BL-5

Parameter	2013-03-22	2013-06-23	2013-09-22	2014-01-21*
Alk-T (mg/L)	75	65	69	75
As (µg/L)	0.3	0.2	0.2	0.3
Ba (mg/L)	0.036	0.032	0.034	0.038
Ca (mg/L)	23	20	21	23
Cl (mg/L)	14	12	13	14
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	259	228	236	271
Cu (mg/L)	0.0002	0.0003	0.0006	0.0003
Fe (mg/L)	0.001	0.002	0.016	0.002
Hardness (mg/L)	81	71	74	81
HCO3 (mg/L)	92	79	84	92
K (mg/L)	1.3	1.2	1.2	1.3
Mg (mg/L)	5.7	5.1	5.4	5.8
Mo (mg/L)	0.0039	0.0034	0.0038	0.004
Na (mg/L)	21	18	19	21
NH3-N (mg/L)			0.09	
Ni (mg/L)	0.0002	0.0002	0.0002	0.0002
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)	<0.0001	<0.0001	0.0011	<0.0001
pH-L (pH Unit)	8.01	7.65	7.7	7.83
Po210 (Bq/L)			<0.005	
Ra226 (Bq/L)	0.04	0.04	0.04	0.03
Se (mg/L)	0.0029	0.0026	0.0025	0.0031
SO4 (mg/L)	34	30	32	35
Sum of Ions (mg/L)	191	165	176	192
TDS (mg/L)	153	132	133	153
TSS (mg/L)	<1.000	<1.000	<1.000	<1.0
U (µg/L)	147	127	136	157
Zn (mg/L)	0.001	<0.001	0.001	<0.001

* December's sample was resampled in January 2014 due to human error

Station: ML-1

Parameter	2013-03-22	2013-06-23	2013-09-22	2013-12-18
Alk-T (mg/L)	67	57	70	76
As (µg/L)	0.2	0.2	0.2	0.2
Ba (mg/L)	0.043	0.038	0.043	0.051
Ca (mg/L)	20	18	19	23
Cl (mg/L)	8	6.6	8.4	9
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	185	156	193	216
Cu (mg/L)	0.0042	0.0004	0.0007	0.0005
Fe (mg/L)	0.012	0.01	0.018	0.006
Hardness (mg/L)	68	60	66	79
HCO3 (mg/L)	82	70	85	93
K (mg/L)	1.2	1	1.1	1.3
Mg (mg/L)	4.5	3.8	4.6	5.2
Mo (mg/L)	0.0019	0.0017	0.0023	0.0022
Na (mg/L)	11	9.3	12	14
NH3-N (mg/L)	0.09	0.06	0.04	0.04
Ni (mg/L)	0.0007	<0.00010	0.0002	0.0001
NO3 (mg/L)	0.13	<0.04	<0.04	0.09
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)	0.001	<0.0001	0.0012	<0.0001
pH-L (pH Unit)	7.73	7.58	7.67	7.87
Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005
Ra226 (Bq/L)	<0.005	0.007	0.01	0.02
Se (mg/L)	0.001	0.0008	0.0012	0.0013
SO4 (mg/L)	17	15	20	22
Sum of Ions (mg/L)	144	124	150	168
TDS (mg/L)	121	97	118	135
TSS (mg/L)	1	<1.000	<1.000	<1.000
U (µg/L)	61	52	75	77
Zn (mg/L)	0.006	<0.001	0.002	<0.001

Station: CS-1

Parameter	2013-09-22
Alk-T (mg/L)	66
As (µg/L)	0.2
Ba (mg/L)	0.045
Ca (mg/L)	20
Cl (mg/L)	7.9
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	186
Cu (mg/L)	0.0006
Fe (mg/L)	0.086
Hardness (mg/L)	70
HCO3 (mg/L)	80
K (mg/L)	1.1
Mg (mg/L)	4.8
Mo (mg/L)	0.0021
Na (mg/L)	11
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)	0.0011
pH-L (pH Unit)	7.68
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	<0.005
Se (mg/L)	0.0009
SO4 (mg/L)	17
Sum of Ions (mg/L)	142
TDS (mg/L)	111
TSS (mg/L)	4
U (µg/L)	67
Zn (mg/L)	0.001

Station: CS-2

Parameter	**2013-10-19**
Alk-T (mg/L)	29
As (µg/L)	0.2
Ba (mg/L)	0.012
Ca (mg/L)	7.5
Cl (mg/L)	3.4
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	74
Cu (mg/L)	0.0002
Fe (mg/L)	0.009
Hardness (mg/L)	28
HCO3 (mg/L)	35
K (mg/L)	0.9
Mg (mg/L)	2.3
Mo (mg/L)	0.0002
Na (mg/L)	2.8
NH3-N (mg/L)	<0.01
Ni (mg/L)	0.0003
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)	7.37
Po210 (Bq/L)	<0.005
Ra226 (Bq/L)	0.009
Se (mg/L)	<0.0001
SO4 (mg/L)	3.9
Sum of Ions (mg/L)	56
TDS (mg/L)	50
TSS (mg/L)	<1.000
U (µg/L)	0.4
Zn (mg/L)	<0.001

Station: ZOR-01

Parameter	2013-08-01	2013-09-01	2013-10-23	2013-11-23	2013-12-18
Alk-T (mg/L)	91	100	104	111	112
As (µg/L)	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.02	0.023	0.022	0.024	0.025
Ca (mg/L)	30	32	34	35	36
Cl (mg/L)	0.2	0.2	0.3	0.2	0.3
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	208	221	230	244	241
Cu (mg/L)	0.0015	0.0014	0.0007	0.0002	0.0012
Fe (mg/L)	0.012	0.02	0.006	0.007	0.007
Hardness (mg/L)	107	113	120	123	127
HCO3 (mg/L)	111	122	127	135	137
K (mg/L)	0.8	0.9	0.8	1	1
Mg (mg/L)	7.8	8.1	8.5	8.6	9
Mo (mg/L)	0.0008	0.001	0.0009	0.0008	0.0008
Na (mg/L)	1.7	1.8	1.8	2	2
NH3-N (mg/L)	0.04				0.02
Ni (mg/L)	0.0003	0.0003	0.0002	0.0001	0.0002
NO3 (mg/L)	<0.04	<0.04	<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	<0.01	<0.01	<0.01	<0.01
Pb (mg/L)	0.0009	0.0019	0.0002	<0.0001	0.0002
pH-L (pH Unit)	7.96	7.84	8.07	7.76	7.94
Po210 (Bq/L)	0.005	<0.005			0.008
Ra226 (Bq/L)	0.04	0.02	0.03	0.03	0.02
Se (mg/L)	0.0001	0.0001	0.0001	0.0001	0.0001
SO4 (mg/L)	18	19	20	20	21
Sum of Ions (mg/L)	170	184	192	202	206
TDS (mg/L)	136	147	144	150	151
TSS (mg/L)	1	<1.000	1	<1.000	1
U (µg/L)	16	18	18	20	19
Zn (mg/L)	0.009	0.003	0.002	<0.001	0.002

Station: ZOR-02

Parameter	2013-08-01	2013-09-01	2013-10-23	2013-11-23	2013-12-18
Alk-T (mg/L)	106	116	134	121	135
As (µg/L)	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.022	0.027	0.031	0.02	0.023
Ca (mg/L)	58	68	81	48	52
Cl (mg/L)	<1.00	<1.00	<1.00	1	1
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	352	418	484	319	335
Cu (mg/L)	0.003	0.0033	0.0026	0.0026	0.0054
Fe (mg/L)	0.029	0.029	0.027	0.014	0.012
Hardness (mg/L)	186	219	255	160	175
HCO3 (mg/L)	129	142	163	148	165
K (mg/L)	0.9	1	1	0.9	1.1
Mg (mg/L)	10	12	13	9.8	11
Mo (mg/L)	0.0012	0.0015	0.0014	0.0011	0.0012
Na (mg/L)	2	2.4	2.8	2.2	2.6
NH3-N (mg/L)	0.04				0.03
Ni (mg/L)	0.0003	0.0004	0.0003	0.0003	0.0005
NO3 (mg/L)	0.97	<0.04	2.3	0.58	0.71
OH (mg/L)	<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)	0.0012	0.0012	<0.0001	0.0001	0.0002
pH-L (pH Unit)	7.87	7.83	8.08	7.83	7.96
Po210 (Bq/L)	0.06	0.04			0.08
Ra226 (Bq/L)	0.44	0.36	0.4	0.31	0.33
Se (mg/L)	0.0004	0.0005	0.0007	0.0003	0.0004
SO4 (mg/L)	75	100	120	48	48
Sum of Ions (mg/L)	276	325	383	258	281
TDS (mg/L)	246	283	323	197	216
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	627	792	990	387	328
Zn (mg/L)	0.001	0.001	<0.001	<0.001	0.007

APPENDIX B

APPENDIX B

Report on

2013 Hydrometric Monitoring near Beaverlodge Mine

Project No. 2711-14004-0
Cameco Corporation | Michael Webster | (306) 956-6200
February 7, 2014

McElhanney Consulting Services Ltd.
www.mcelhanney.com

Tyrel Lloyd, Project Manager
(306) 649-0740 | tlloyd@mcelhanney.com

Table of Contents

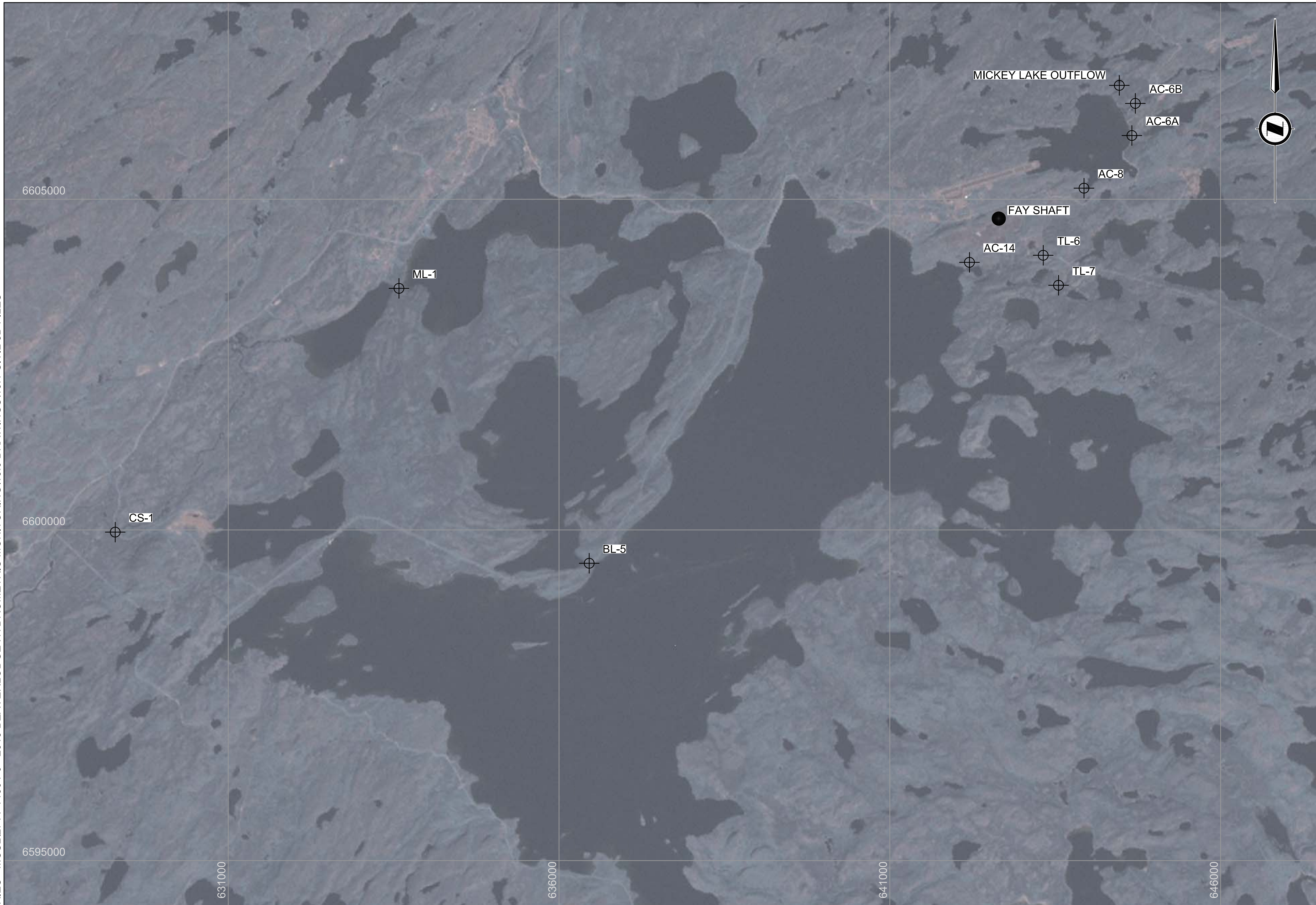
1 INTRODUCTION

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 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 on behalf of the Government of Canada. (SRK Consulting, 2009)

Monitoring activities have continued since the closure of the site and include routine sampling and/or measurement of local parameters including water quality and water quantity. Cameco has retained McElhanney Consulting Services Ltd. (McElhanney) to perform annual hydrological monitoring in areas associated with the former mine and mill activities and downstream. The scope of work provided 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;
- ML-1 – Martin Lake Outflow;
- TL-6 – Minewater Reservoir Outflow; and,
- TL-7 – Downstream of the Tailings Management Area.

One additional station included in the 2013 reporting is a datalogger deployed in the Fay Shaft. All monitoring stations assessed in this report are presented on Figure 1.



NOTES:
1. NAD83 UTM ZONE 12.
2. LANDSAT 7 IMAGERY.

LEGEND

HYDROMETRIC MONITORING LOCATION

FAY SHAFT LOCATION

0m 500 1000 1500 2000m

CLIENT:

Cameco

McElhanney

McElhanney Consulting Services Ltd.

300, 402 21st EAST
SASKATOON, SK, CANADA, S7K 0C3
PH 306 649 0740
www.mcelhanney.com

DRAWN: TAH	CAMECO BEAVERLODGE HYDROMETRIC MONITORING
CHECKED: JG	HYDROMETRIC MONITORING LOCATIONS
REVIEWED: TJL	
SCALE: H: V: AS SHOWN	

MCSL PROJECT NUMBER 2711-14004-0

DATE 22/01/2014

FIGURE NO. 01

REVISION 0

L:\PROJ_2013\2711 SERIES - MCSL\2711-14004-0 - 2013 BEAVERLODGE HYDROMETRIC MONITORING\10.0 DRAWINGS\10.1 CIVIL 3D FILES

2 METHODS

Two field programs were undertaken to complete this project. The first program ran from May 14 to 17, 2013 and the second from October 11 to 13, 2013; the station at the outlet of Beaverlodge Lake (BL-5) was measured on July 21, 2013 when McElhanney happened to be in the area in addition to the measurements taken during the field programs. At each location, 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 the 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 to 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 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 (2013b).

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.

3 CLIMATIC CONDITIONS

Environment Canada operates meteorological stations at Uranium City and at Stony Rapids, Saskatchewan. Meteorological data from these sites provide an indication of climatic conditions through the hydrological monitoring period. The station near Uranium City is automated and has been subject to problems in the past resulting in meteorological data gaps. Stony Rapids station in the past few years has become somewhat less reliable as well, but combined these weather stations usually provide sufficient record of recent precipitation at the Beaverlodge area. Table 1 provides mean and annual total precipitation (rain and snow) totals for Uranium City and Stony Rapids as well as the number of recorded days of data with respect to the number of possible days of record (Environment Canada 2013). Normal annual totals for precipitation are provided as presented by Golder Associates Ltd. (2011).

As indicated in Table 1, annual precipitation totals in 2013 appear to be below normal for both Uranium City and Stony Rapids; however, there are gaps in the data available which makes both records incomplete. Though Table 1 indicates that a majority of the year has been collected for both Uranium City and Stony Rapids, McElhanney is aware that both stations have had problems in the past including data which is reported as 'no precipitation' when there, in fact, was a major storm. Such an event occurred in July of 2013 which should have registered with the climate station but no data is available to indicate the event.

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
2013	January	0.5*	19.3	2.6	15/31	0.8*	18.1	4.4	23/31
	February	5*	15.5	32.3	28/29	0.5	13.3	3.8	28/28
	March	6.3	17.8	35.4	31/31	1.0*	18.2	5.5	29/31
	April	28	16.9	165.7	30/30	8.4*	18	46.7	26/30
	May	7.7*	17.5	44.0	30/31	11.2	26.3	42.6	31/31
	June	36.8*	31.3	117.6	29/30	22.0	44.4	49.5	30/30
	July	7.7*	47.1	16.3	29/31	18.9*	56.3	33.6	28/31
	August	13.7*	42.4	30.9	29/31	45.2*	63.9	70.7	30/31
	September	18*	33.7	53.4	28/30	34.8*	48.4	71.9	25/30
	October	26.9*	29.1	92.4	28/31	17.3	30.1	57.5	31/31
	November	16.5	28	58.9	30/30	0.0*	27.6	0.0	29/30
	December	15.8*	23.6	66.9	28/31	0.7	18.7	3.7	31/31
		182.3	322.2	56.6	335/365	160.8	383.3	42.0	341/365

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. This report references previous discharge measurements reported by McElhanney (2013a and 2013b). Monitoring periods reported in this section may differ from station to station dependent on whether a data logger was installed through the winter. In some cases, records have been extended either forwards, backwards or both to create records for stations from January 1 to December 31, 2013. The only data logger with a record extending beyond October 2013 to December 31, 2013 is AC-8; all hydrographs at other stations reported to the end of December 31, 2013 are synthesized from AC-8. Discharge values are typically reported to the fourth decimal place throughout this report for easy comparison between stations as well as high and low flows.

4.1 AC-6A – VERNA LAKE TO ACE LAKE

A v-notch weir installed at AC-6A is used to monitor discharge via hydraulic relationships. The weir was installed in August 2011 and mounted to the existing culvert through the road around the perimeter of Ace Lake. During the spring program the v-notch was filled with ice and flow was discharging over the road (Photo 1); thus no measurement was recorded and the Levelogger could not be installed. During the fall program the creek bed was dry (Photo 2). The Levelogger was installed on May 20, 2013 by Uranium City Contracting but no discharge was reported. 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 15, 2013

Photo 2: AC-6A - October 12, 2013

Table 2: AC-6A Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m³/s)
Weir Invert	0.273	0.0000
07-May-12 14:54	0.307	0.0005
08-May-12 08:06	0.315	0.0008
09-May-12 18:16	0.317	0.0008
12-Oct-13 11:47	No Water	No Flow

Figure 2: AC-6A Rating Curve

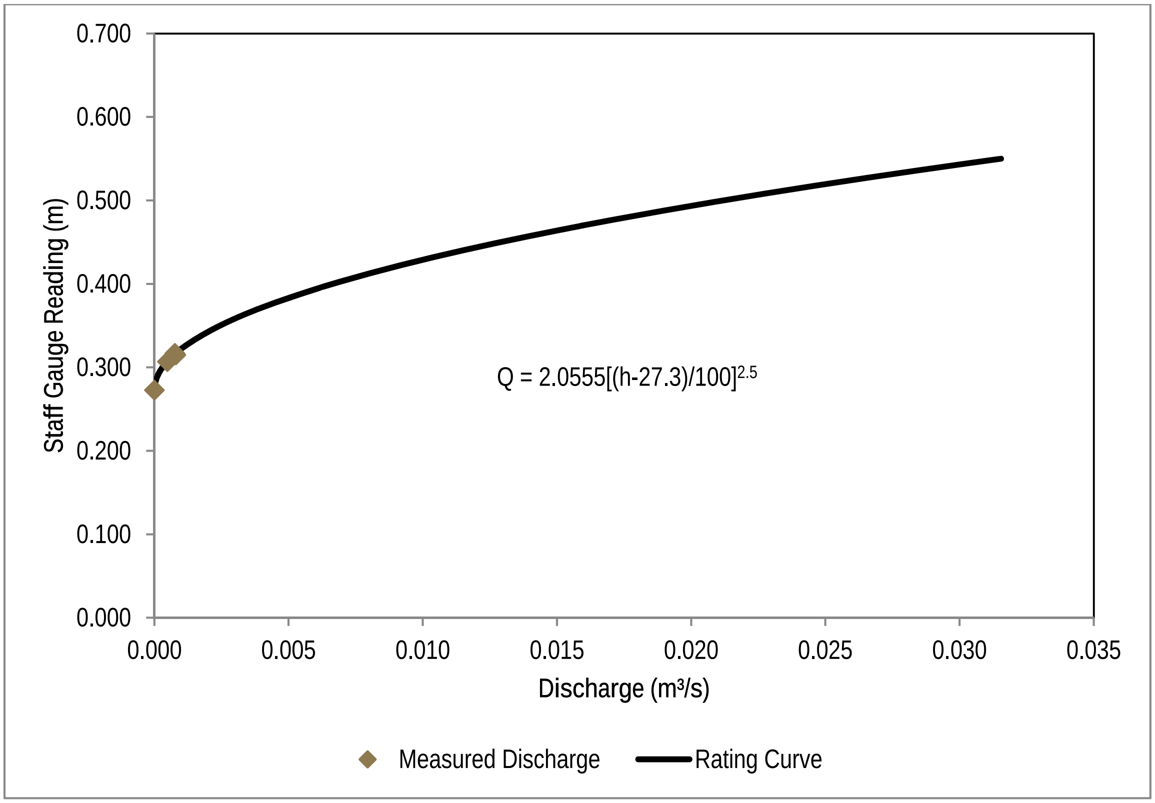


Figure 3: AC-6A 2013 Hydrograph

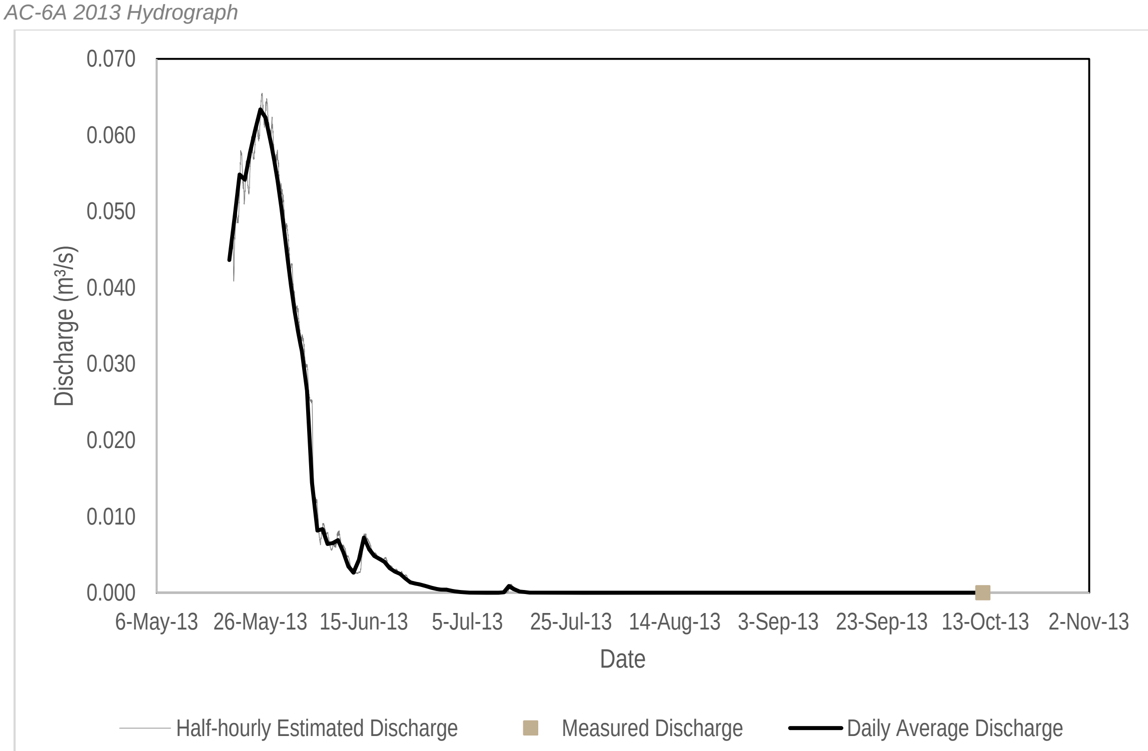


Table 3: AC-6A 2013 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.0399	0.0004	0.0000	0.0000	0.0000
2		0.0354	0.0003	0.0000	0.0000	0.0000
3		0.0317	0.0002	0.0000	0.0000	0.0000
4		0.0265	0.0001	0.0000	0.0000	0.0000
5		0.0144	0.0000	0.0000	0.0000	0.0000
6		0.0082	0.0000	0.0000	0.0000	0.0000
7		0.0083	0.0000	0.0000	0.0000	0.0000
8		0.0064	0.0000	0.0000	0.0000	0.0000
9		0.0065	0.0000	0.0000	0.0000	0.0000
10		0.0069	0.0000	0.0000	0.0000	0.0000
11		0.0054	0.0000	0.0000	0.0000	0.0000
12		0.0035	0.0001	0.0000	0.0000	0.0000
13		0.0026	0.0009	0.0000	0.0000	
14		0.0043	0.0005	0.0000	0.0000	
15		0.0072	0.0002	0.0000	0.0000	
16		0.0057	0.0001	0.0000	0.0000	
17		0.0048	0.0000	0.0000	0.0000	
18		0.0045	0.0000	0.0000	0.0000	
19		0.0040	0.0000	0.0000	0.0000	
20	0.0436	0.0032	0.0000	0.0000	0.0000	
21	0.0491	0.0028	0.0000	0.0000	0.0000	
22	0.0548	0.0025	0.0000	0.0000	0.0000	
23	0.0542	0.0019	0.0000	0.0000	0.0000	
24	0.0577	0.0014	0.0000	0.0000	0.0000	
25	0.0606	0.0012	0.0000	0.0000	0.0000	
26	0.0634	0.0011	0.0000	0.0000	0.0000	
27	0.0623	0.0009	0.0000	0.0000	0.0000	
28	0.0592	0.0007	0.0000	0.0000	0.0000	
29	0.0555	0.0005	0.0000	0.0000	0.0000	
30	0.0507	0.0004	0.0000	0.0000	0.0000	
31	0.0454		0.0000	0.0000		

4.2 AC-6B – ACE CREEK TO ACE LAKE

The gauging station located on Ace Creek at AC-6B is located immediately upstream of a bridge crossing (Photo 3). Two measurements of discharge during the spring freshet were recorded during the spring program on May 15 and 16, 2013 (Table 4) and provide additional high flow data for the rating curve (Figure 4). The data logger installed at this location registered peaks in the winter which McElhanney believes are a result of snow encroachment on the channel and not of an increase in discharge; this data has been corrected with data from AC-8. Hydrograph data (Figure 5 and Table 5) at AC-6B is in part synthesized from the record at AC-8 (prior to the spring program and following the fall program).

Photo 3: AC-6B - October 12, 2013

Table 4: AC-6B Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
27-Apr-10	98.907	0.7724
1-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
5-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

Figure 4: AC-6B Rating Curve

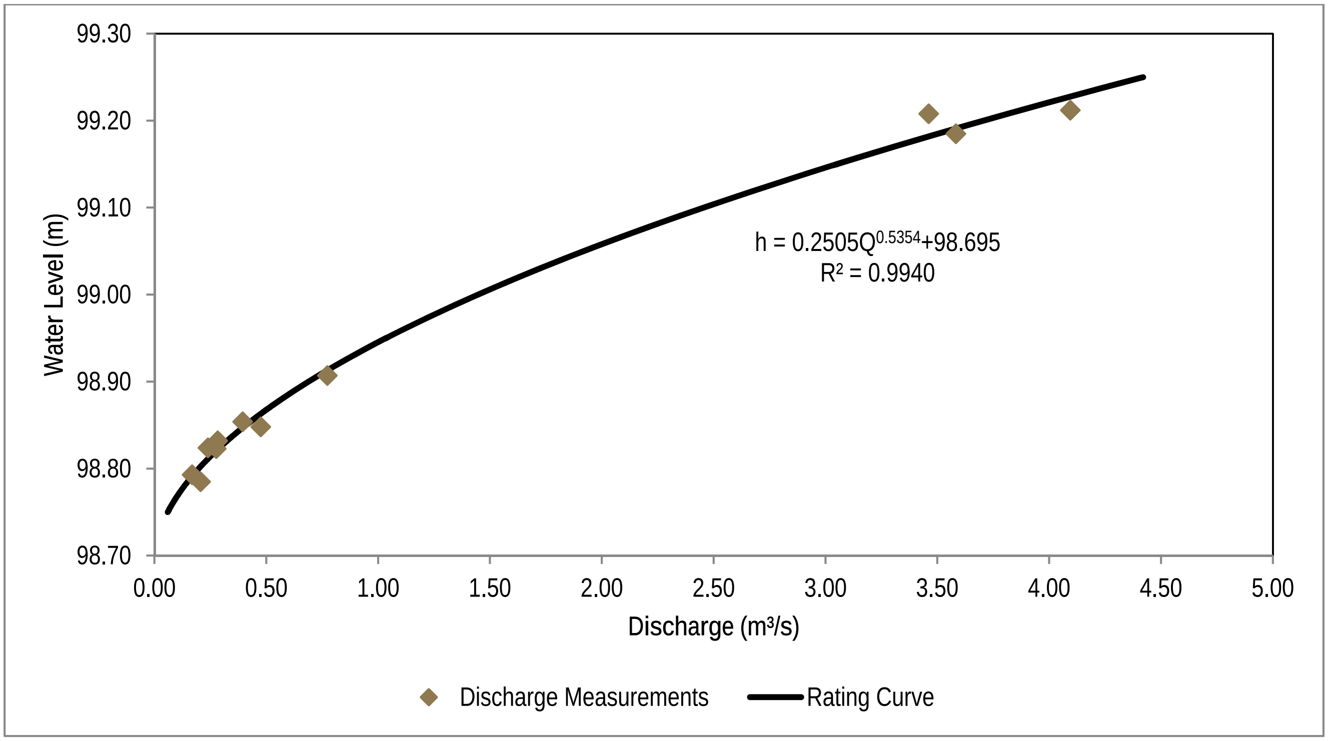


Figure 5: AC-6B 2013 Hydrograph

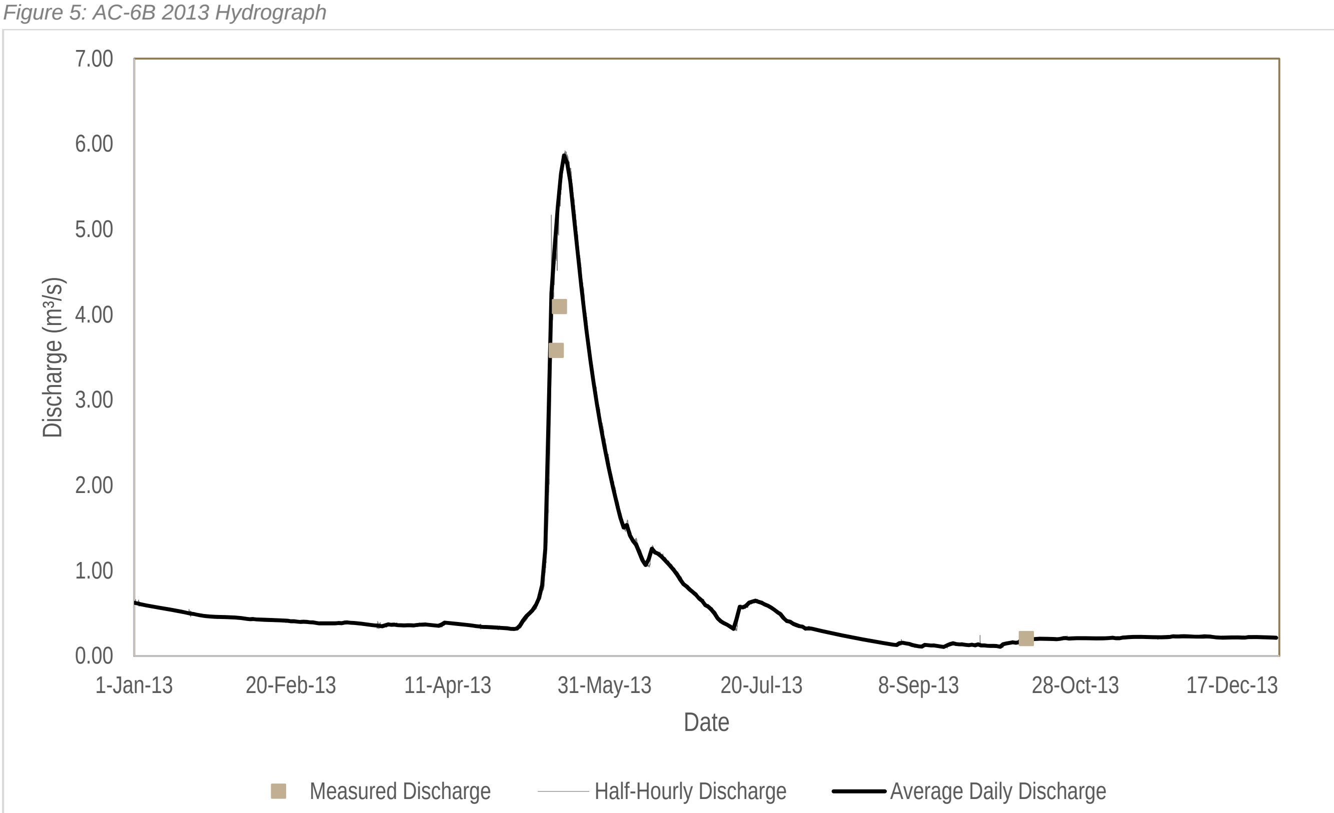


Table 5: AC-6B 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.6247	0.4520	0.3829	0.3642	0.3189	2.2616	0.6467	0.3506	0.1302	0.1185	0.2085	0.2298
2	0.6162	0.4506	0.3817	0.3685	0.3165	2.0746	0.5975	0.3449	0.1523	0.1179	0.2074	0.2298
3	0.6075	0.4493	0.3823	0.3675	0.3234	1.9136	0.5773	0.3203	0.1548	0.1166	0.2066	0.2299
4	0.6000	0.4459	0.3832	0.3689	0.3609	1.7564	0.5446	0.3268	0.1476	0.1093	0.2071	0.2286
5	0.5920	0.4408	0.3835	0.3659	0.4174	1.6151	0.4991	0.3206	0.1425	0.1397	0.2071	0.2259
6	0.5850	0.4359	0.3824	0.3618	0.4665	1.5060	0.4408	0.3121	0.1294	0.1490	0.2069	0.2250
7	0.5777	0.4304	0.3864	0.3580	0.5030	1.5344	0.4061	0.3036	0.1212	0.1540	0.2075	0.2287
8	0.5725	0.4327	0.3843	0.3543	0.5389	1.4133	0.3848	0.2953	0.1150	0.1619	0.2117	0.2312
9	0.5669	0.4294	0.3912	0.3692	0.5967	1.3504	0.3681	0.2871	0.1115	0.1561	0.2138	0.2289
10	0.5598	0.4270	0.3938	0.3921	0.6775	1.3034	0.3439	0.2790	0.1321	0.1614	0.2084	0.2262
11	0.5551	0.4263	0.3907	0.3891	0.8283	1.2137	0.3195	0.2710	0.1285	0.2013	0.2088	0.2229
12	0.5487	0.4242	0.3883	0.3848	1.2580	1.1241	0.4329	0.2631	0.1243	0.1938	0.2163	0.2189
13	0.5417	0.4221	0.3850	0.3796	2.6357	1.0661	0.5777	0.2553	0.1242	0.1909	0.2177	0.2159
14	0.5365	0.4208	0.3811	0.3761	4.2518	1.1347	0.5709	0.2476	0.1182	0.1949	0.2198	0.2142
15	0.5271	0.4193	0.3770	0.3723	4.7587	1.2588	0.5887	0.2400	0.1121	0.1981	0.2223	0.2155
16	0.5181	0.4181	0.3718	0.3693	5.2653	1.2132	0.6255	0.2325	0.1072	0.2013	0.2246	0.2153
17	0.5107	0.4172	0.3669	0.3662	5.6543	1.1979	0.6374	0.2252	0.1238	0.2035	0.2245	0.2169
18	0.5047	0.4144	0.3622	0.3597	5.8650	1.1677	0.6485	0.2179	0.1386	0.2024	0.2238	0.2176
19	0.4974	0.4122	0.3588	0.3563	5.7698	1.1306	0.6365	0.2108	0.1504	0.2004	0.2233	0.2174
20	0.4931	0.4075	0.3552	0.3508	5.5606	1.0919	0.6251	0.2038	0.1405	0.1989	0.2211	0.2161
21	0.4857	0.4075	0.3482	0.3476	5.2217	1.0502	0.6037	0.1969	0.1373	0.1996	0.2202	0.2149
22	0.4775	0.4032	0.3598	0.3418	4.8513	1.0054	0.5893	0.1901	0.1376	0.1968	0.2188	0.2214
23	0.4730	0.3998	0.3715	0.3392	4.5139	0.9579	0.5685	0.1834	0.1307	0.2011	0.2189	0.2220
24	0.4681	0.4021	0.3666	0.3379	4.1780	0.9003	0.5441	0.1768	0.1283	0.2077	0.2210	0.2220
25	0.4630	0.3991	0.3677	0.3370	3.8563	0.8453	0.5163	0.1703	0.1333	0.2096	0.2203	0.2217
26	0.4587	0.3963	0.3617	0.3330	3.5507	0.8176	0.4894	0.1640	0.1259	0.2053	0.2222	0.2208
27	0.4568	0.3934	0.3609	0.3326	3.2863	0.7827	0.4445	0.1577	0.1362	0.2063	0.2239	0.2200
28	0.4575	0.3878	0.3590	0.3306	3.0548	0.7498	0.4114	0.1516	0.1242	0.2076	0.2303	0.2180
29	0.4572		0.3599	0.3271	2.8339	0.7193	0.4033	0.1456	0.1233	0.2086	0.2297	0.2167
30	0.4565		0.3595	0.3250	2.6457	0.6763	0.3792	0.1397	0.1209	0.2086	0.2298	0.2157
31	0.4556		0.3582		2.4445		0.3640	0.1339		0.2079		0.2145

4.3 MICKEY LAKE OUTFLOW

Monitoring of discharge from Mickey Lake occurs in a channel located downstream of a beaver pond and approximately 100 m upstream of Ace Lake. The reach between Mickey Lake and Ace Lake has been reviewed in the field on several locations and the current monitoring station is the best available cross-section. The quality of data at this station is subject to the integrity of the upstream beaver dam; presently, this location yields acceptable data. Though a side channel does take flow during high discharge periods McElhanney did not identify any abnormalities with the data during 2013 and the flow data appears to be accurate and follow the expected rating curves. The gauging station is shown in

Photo 4. Station summary data are provided in Table 6 while the rating curve is presented on Figure 6. The hydrograph and daily average discharge data presented as Figure 7 and Table 7: Mickey Lake Outflow 2013 Daily Average Discharge (m^3/s), respectively.

Photo 4: Mickey Lake Outflow - October 12, 2013

Table 6: Mickey Lake Outflow Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
27-Apr-10	99.528	0.0597
01-Jul-10	99.458	0.0110
17-Sep-10 14:20	99.367	0.0003
18-May-11 11:35	99.523	0.0703
05-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

Figure 6: Mickey Lake Outflow Rating Curve

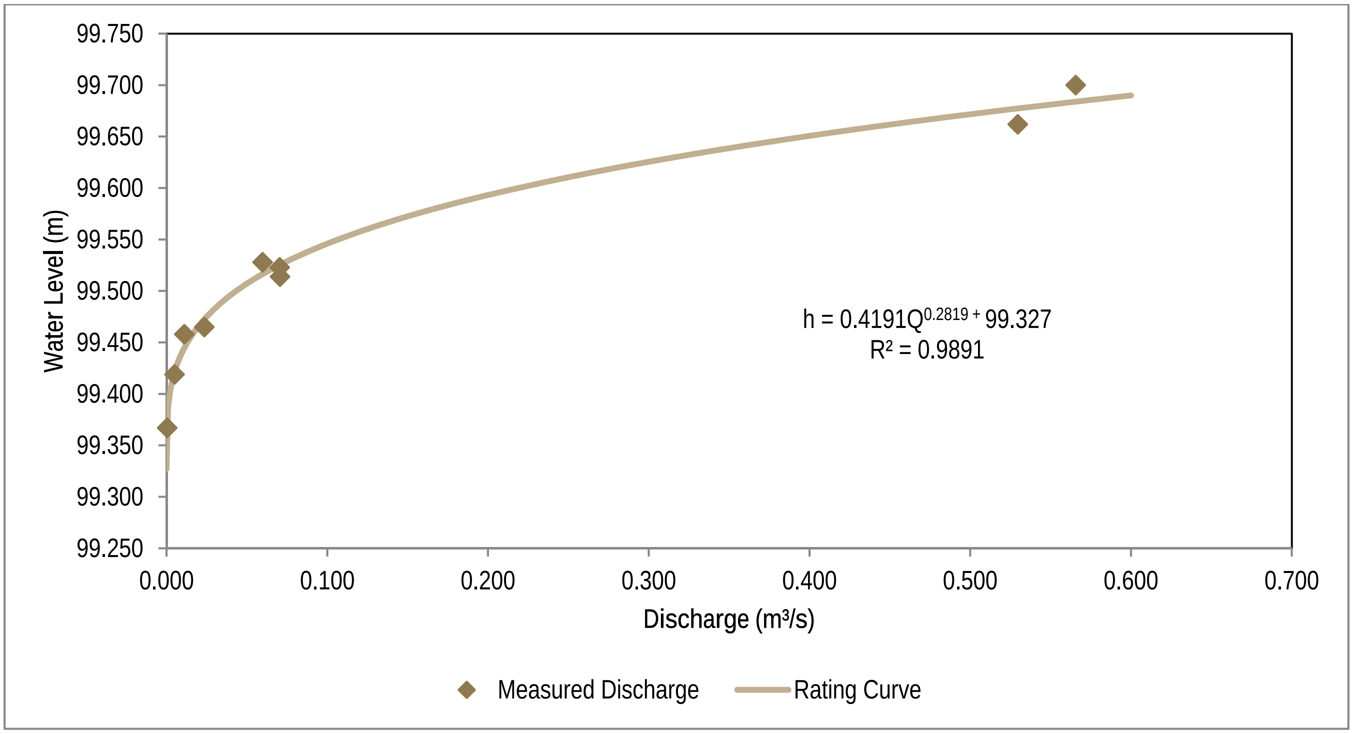


Figure 7: Mickey Lake Outflow 2013 Hydrograph

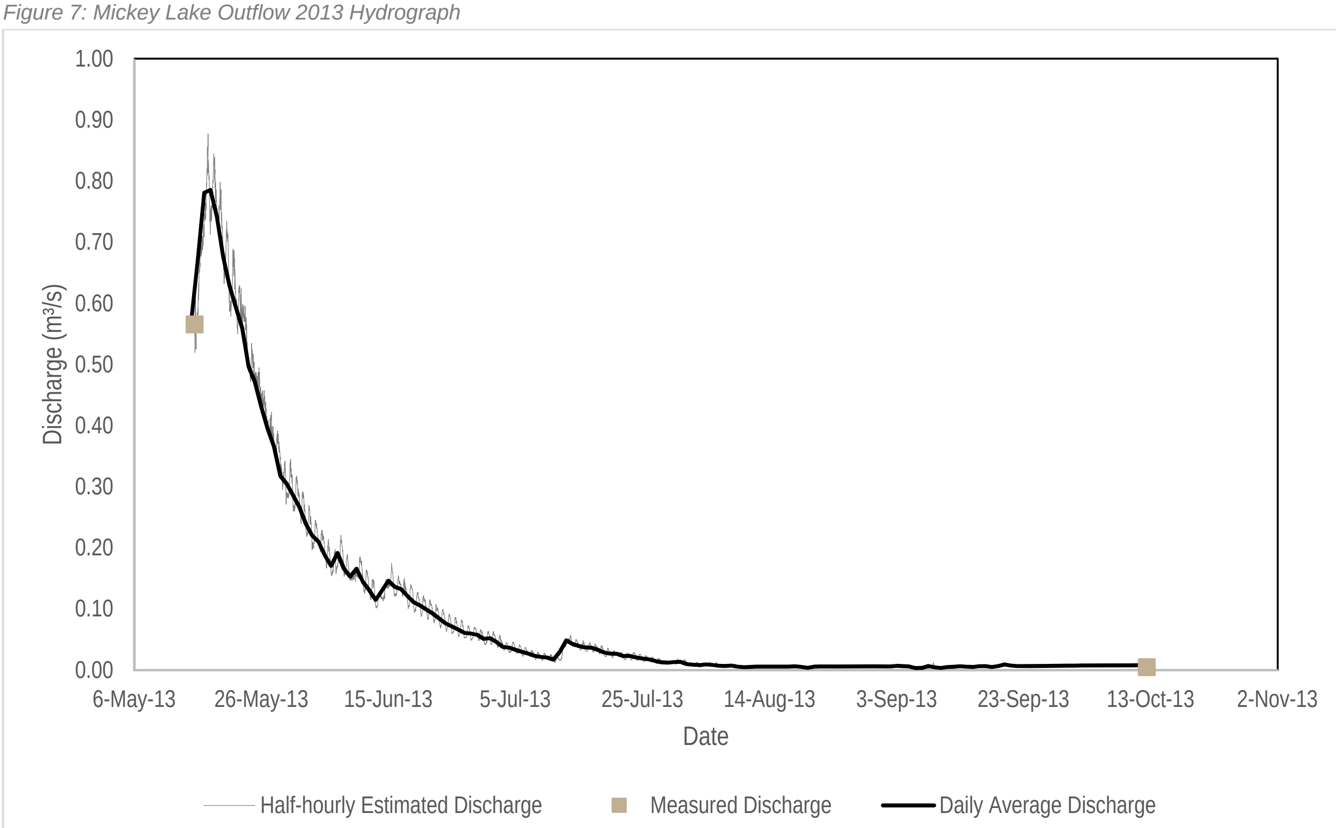


Table 7: Mickey Lake Outflow 2013 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.2663	0.0521	0.0098	0.0058	0.0072
2		0.2390	0.0462	0.0085	0.0057	0.0075
3		0.2203	0.0381	0.0082	0.0067	0.0078
4		0.2101	0.0368	0.0092	0.0064	0.0075
5		0.1874	0.0333	0.0083	0.0057	0.0071
6		0.1704	0.0298	0.0070	0.0031	0.0073
7		0.1914	0.0271	0.0065	0.0035	0.0076
8		0.1657	0.0234	0.0072	0.0066	0.0079
9		0.1528	0.0216	0.0056	0.0044	0.0073
10		0.1656	0.0206	0.0049	0.0034	0.0076
11		0.1440	0.0171	0.0049	0.0049	0.0078
12		0.1308	0.0299	0.0056	0.0052	0.0080
13		0.1147	0.0484	0.0055	0.0064	
14		0.1303	0.0428	0.0054	0.0054	
15	0.5731	0.1462	0.0393	0.0054	0.0050	
16	0.6710	0.1363	0.0371	0.0055	0.0063	
17	0.7806	0.1322	0.0365	0.0054	0.0064	
18	0.7851	0.1210	0.0331	0.0060	0.0050	
19	0.7420	0.1110	0.0284	0.0053	0.0065	
20	0.6752	0.1055	0.0267	0.0037	0.0091	
21	0.6285	0.0988	0.0264	0.0057	0.0074	
22	0.5933	0.0923	0.0228	0.0057	0.0066	
23	0.5587	0.0842	0.0229	0.0058	0.0065	
24	0.4970	0.0764	0.0207	0.0058	0.0064	
25	0.4711	0.0715	0.0188	0.0058	0.0065	
26	0.4299	0.0664	0.0176	0.0059	0.0063	
27	0.3949	0.0607	0.0150	0.0059	0.0065	
28	0.3656	0.0598	0.0125	0.0058	0.0070	
29	0.3174	0.0576	0.0122	0.0058	0.0073	
30	0.3046	0.0510	0.0131	0.0059	0.0071	
31	0.2859		0.0134	0.0060		

4.4 AC-8 – ACE LAKE OUTFLOW

The outflow from Ace Lake (*Photo 5*) has been monitored regularly since closure of the mine. Work began to update the rating curve in 2005 (Table 8 and Figure 8). The staff gauge and data logger are installed at the concrete piers upstream of the weir; in 2012 and 2013 the piers were observed to be in poor condition. McElhanney understands that Cameco is planning on re-locating the staff gauge and logger housing in 2014. With that in mind, McElhanney began surveying aspects of the station beginning in the fall of 2013 including the establishment of local temporary benchmarks. The hydrograph data is presented graphically on Figure 9 and the daily average discharge data are presented in Table 9. Historic monthly average discharge is reported for AC-8 and the updated data are presented in Table 10. A new sensor mount was installed in the fall of 2013 at AC-8.

Photo 5: AC-8 - May 16, 2013

Table 8: AC-8 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/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
01-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
03-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

Figure 8: AC-8 Rating Curve

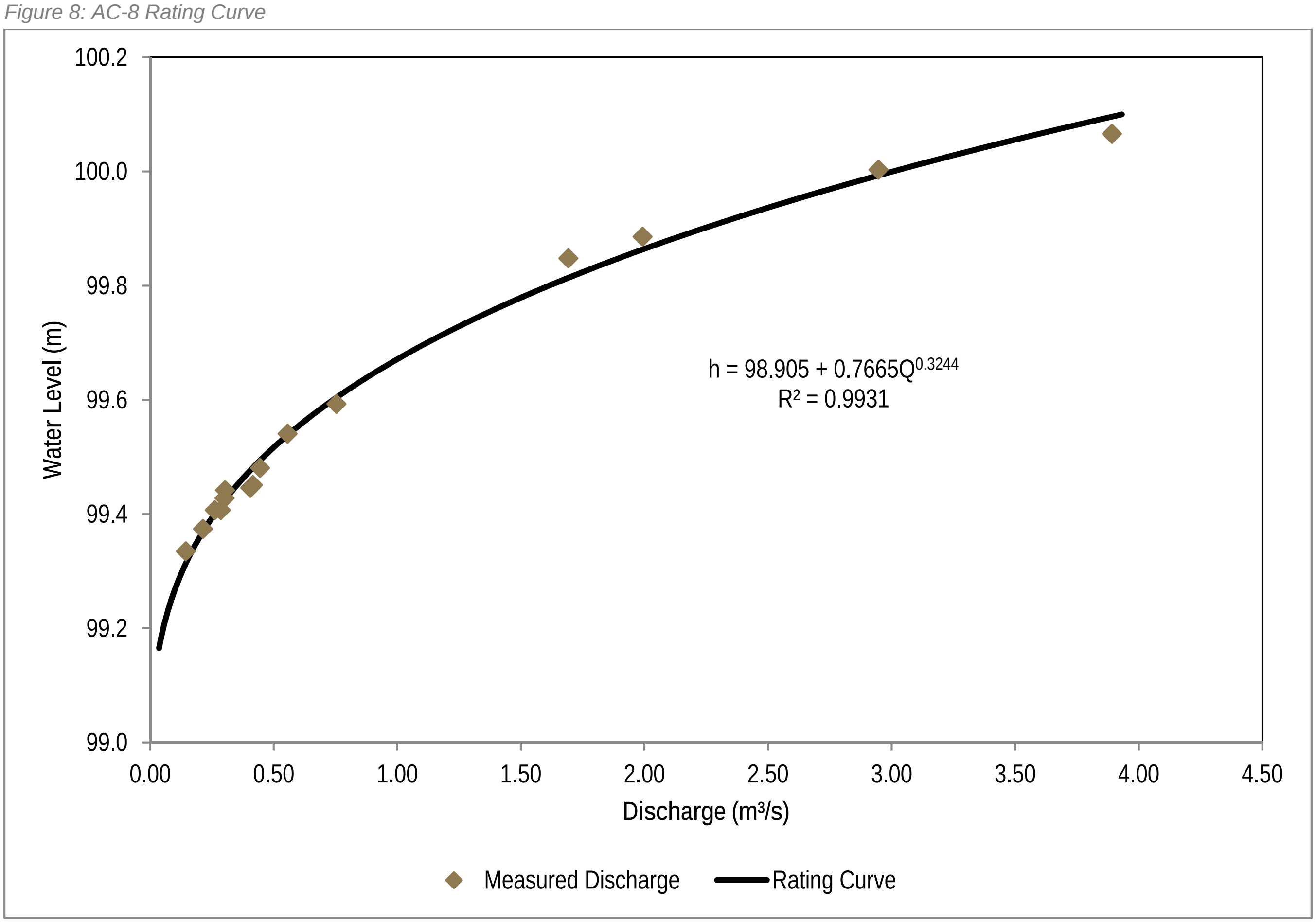


Figure 9: AC-8 2013 Hydrograph

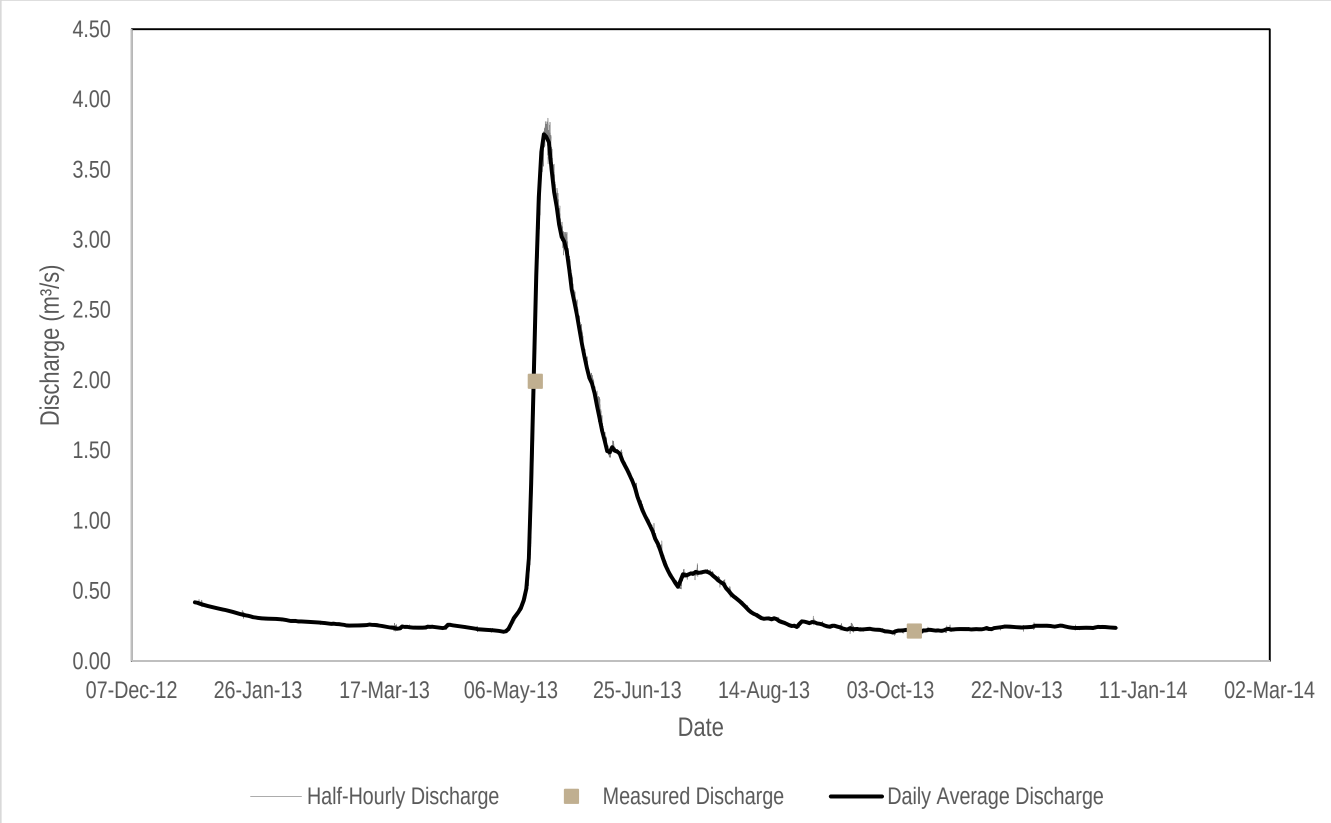


Table 9: AC-8 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.4184	0.3018	0.2575	0.2374	0.2155	2.4696	0.9236	0.4781	0.2707	0.2108	0.2275	0.2506
2	0.4153	0.2993	0.2540	0.2384	0.2120	2.3638	0.8707	0.4609	0.2781	0.2097	0.2276	0.2514
3	0.4085	0.2985	0.2522	0.2443	0.2091	2.2586	0.8365	0.4463	0.2760	0.2079	0.2272	0.2512
4	0.4030	0.2972	0.2531	0.2430	0.2121	2.1720	0.7887	0.4319	0.2678	0.2034	0.2255	0.2513
5	0.3981	0.2954	0.2528	0.2439	0.2294	2.0876	0.7363	0.4188	0.2658	0.2128	0.2260	0.2503
6	0.3932	0.2923	0.2538	0.2426	0.2650	2.0152	0.6855	0.3998	0.2614	0.2170	0.2272	0.2479
7	0.3877	0.2893	0.2531	0.2401	0.3032	1.9760	0.6454	0.3799	0.2536	0.2173	0.2258	0.2453
8	0.3833	0.2856	0.2547	0.2372	0.3269	1.9079	0.6114	0.3612	0.2480	0.2185	0.2263	0.2489
9	0.3792	0.2857	0.2549	0.2356	0.3506	1.8174	0.5833	0.3474	0.2441	0.2212	0.2296	0.2524
10	0.3761	0.2851	0.2570	0.2391	0.3830	1.7308	0.5560	0.3369	0.2506	0.2217	0.2350	0.2509
11	0.3715	0.2819	0.2608	0.2576	0.4318	1.6398	0.5289	0.3288	0.2509	0.2236	0.2287	0.2479
12	0.3678	0.2820	0.2585	0.2582	0.5128	1.5711	0.5710	0.3167	0.2459	0.2201	0.2267	0.2448
13	0.3640	0.2811	0.2572	0.2551	0.7306	1.4955	0.6180	0.3060	0.2404	0.2126	0.2355	0.2402
14	0.3591	0.2794	0.2553	0.2518	1.2594	1.4880	0.6105	0.3013	0.2326	0.2094	0.2376	0.2362
15	0.3559	0.2785	0.2528	0.2492	2.0062	1.5225	0.6162	0.3035	0.2289	0.2109	0.2394	0.2351
16	0.3504	0.2781	0.2499	0.2468	2.7472	1.4987	0.6241	0.3031	0.2245	0.2165	0.2421	0.2353
17	0.3440	0.2763	0.2469	0.2450	3.3046	1.4916	0.6211	0.2981	0.2343	0.2185	0.2457	0.2350
18	0.3387	0.2759	0.2435	0.2425	3.6263	1.4764	0.6346	0.3048	0.2275	0.2224	0.2451	0.2366
19	0.3346	0.2750	0.2403	0.2389	3.7516	1.4293	0.6280	0.2985	0.2277	0.2217	0.2448	0.2377
20	0.3300	0.2725	0.2387	0.2364	3.7324	1.3939	0.6309	0.2857	0.2280	0.2198	0.2445	0.2377
21	0.3272	0.2704	0.2350	0.2328	3.6929	1.3595	0.6353	0.2788	0.2247	0.2174	0.2419	0.2362
22	0.3225	0.2697	0.2311	0.2307	3.5003	1.3200	0.6390	0.2725	0.2247	0.2179	0.2411	0.2354
23	0.3179	0.2675	0.2331	0.2265	3.3395	1.2805	0.6333	0.2643	0.2271	0.2159	0.2397	0.2399
24	0.3126	0.2645	0.2468	0.2250	3.2366	1.2347	0.6225	0.2562	0.2282	0.2177	0.2390	0.2428
25	0.3104	0.2658	0.2430	0.2233	3.1094	1.1708	0.6057	0.2500	0.2291	0.2265	0.2406	0.2425
26	0.3072	0.2643	0.2427	0.2230	3.0221	1.1221	0.5917	0.2521	0.2262	0.2293	0.2410	0.2425
27	0.3039	0.2626	0.2404	0.2220	2.9877	1.0724	0.5741	0.2437	0.2238	0.2240	0.2426	0.2416
28	0.3023	0.2607	0.2385	0.2191	2.9182	1.0331	0.5606	0.2648	0.2225	0.2254	0.2434	0.2407
29	0.3024		0.2380	0.2191	2.7868	0.9973	0.5492	0.2830	0.2211	0.2275	0.2510	0.2386
30	0.3024		0.2378	0.2169	2.6447	0.9619	0.5190	0.2807	0.2167	0.2270	0.2512	0.2373
31	0.3020		0.2378		2.5608		0.5011	0.2762		0.2281		0.2360

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

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	0.151	0.150	0.149	0.221	0.204	0.156	0.145	0.145	0.145	0.163	0.151	0.146	0.161
1981	0.146	0.145	0.145	0.169	0.392	0.178	0.182	0.192	0.194	0.190	0.198	0.188	0.193
1982	0.169	0.167	0.176	0.196	0.577	0.459	0.279	0.185	0.146	0.157	0.154	0.162	0.236
1983	0.177	0.164	0.151	0.223	0.750	0.574	0.414	0.334	0.251	0.226	0.206	0.194	0.305
1984	0.189	0.192	0.208	0.413	0.501	0.723	0.789	0.564	0.399	0.571	0.790	0.725	0.505
1985	0.471	0.378	0.335	0.395	2.768	1.366	0.551	0.332	0.256	0.215	0.174	0.169	0.618
1986	0.181	0.186	0.185	0.218	0.462	0.541	0.608	0.544	0.343	0.233	0.201	0.193	0.325
1987	0.191	0.208	0.221	0.219	1.988	0.685	0.260	0.116	0.102	0.103	0.135	0.138	0.364
1988	0.154	0.114	0.108	0.100	0.361	0.817	1.120	0.819	0.254	0.181	0.202	0.191	0.368
1989	0.178	0.176	0.156	0.160	1.912	1.427	0.361	0.166	0.115	0.120	0.154	0.172	0.425
1990	0.197	0.183	0.169	0.108	0.556	0.764	0.317	0.175	0.145	0.151	0.250	0.333	0.279
1991	0.262	0.219	0.207	0.436	2.038	1.962	0.788	0.395	0.393	0.431	0.464	0.398	0.666
1992	0.319	0.254	0.215	0.247	2.634	1.386	0.663	0.489	0.408	1.223	0.985	0.508	0.778
1993	0.302	0.221	0.183	0.190	0.862	0.513	0.356	1.006	0.594	0.314	0.382	0.400	0.444
1994	0.277	0.225	0.205	0.186	3.014	1.459	0.339	0.117	0.097	0.105	0.130	0.131	0.524
1995	0.113	0.106	0.104	0.129	1.698	1.401	0.900	0.493	1.002	0.511	0.378	0.325	0.597
1996	0.252	0.190	0.155	0.146	0.272	0.524	1.408	0.499	0.341	0.286	0.293	0.262	0.386
1997	0.229	0.202	0.167	0.171	0.593	0.970	1.251	1.897	4.109	3.439	1.629	0.617	1.273
1998	0.369	0.291	0.246	0.279	1.236	0.410	0.614	0.404	0.260	0.208	0.208	0.199	0.394
1999	0.169	0.160	0.165	0.156	0.467	0.608	0.408	0.216	0.203	0.161	0.153	0.166	0.253
2000	0.166	0.136	0.129	0.136	0.307	0.305	0.267	0.274	0.674	0.824	1.211	0.744	0.431
2001	0.365	0.298	0.236	0.203	1.176	0.763	0.457	0.360	0.355	0.597	0.457	0.365	0.469
2002	0.350	0.220	0.176	0.189	1.304	2.353	0.516	2.216	1.102	0.688	0.561	0.437	0.843
2003	0.288	0.246	0.201	0.179	2.240	2.284	0.668	0.522	0.458	0.422	0.410	0.345	0.689
2004	0.253	0.250	0.301	0.214	0.206	1.996	0.455	0.219	0.169	0.170	0.176	0.166	0.381
2005	0.143	0.164	0.150	0.191	1.158	1.077	0.549	0.443	0.456	0.464	0.728	0.579	0.509
2006	0.433	0.321	0.229	0.397	2.280	0.978	0.365	0.240	0.226	0.228	0.220	0.200	0.510
2007	0.199	0.171	0.156	0.175	0.734	0.573	0.370	0.321	0.477	0.483	0.874	0.635	0.431
2008	0.463	0.343	0.294	0.252	1.110	1.125	0.361	0.318	0.265	0.509	0.735	0.495	0.523
2009	0.242	0.180	0.124	0.175	1.066	0.852	1.478	0.681	0.454	0.432	0.431	0.414	0.544
2010	0.341	0.280	0.217	0.309	0.744	0.430	0.238	0.105	0.167	0.199	0.178	0.181	0.282
2011	0.173	0.140	0.113	0.092	0.299	0.319	0.207	0.240	0.358	0.250	0.224	0.241	0.221
2012	0.259	0.221	0.215	0.248	2.467	1.114	0.699	0.560	0.666	0.517	0.621	0.535	0.677
2013	0.351	0.280	0.247	0.237	1.891	1.579	0.637	0.324	0.240	0.218	0.237	0.243	0.540
Mean	0.251	0.211	0.189	0.216	1.184	0.961	0.559	0.468	0.465	0.441	0.421	0.329	0.475

4.5 AC-14 – ACE CREEK UPSTREAM OF BEAVERLODGE LAKE

A second discharge monitoring station on Ace Creek, approximately 2 km downstream of Ace Lake and approximately 0.25 km upstream of Beaverlodge Lake, is used to create a record for comparison of discharge and water quality between the outflow from Ace Lake and the inflow to Beaverlodge Lakes. The station has been monitored since 2005 but only since 2011 have a water level measurement and data logger been incorporated at the station. The monitoring data and rating curve are presented as Table 11 and Figure 10, respectively. The hydrograph for AC-14 is shown in Figure 11 while the daily average discharge data is presented in Table 12.

The hydrograph at AC-14 indicates a high flow event in August 2013. Through communication with Uranium City Contracting, McElhanney has learned that a beaver dam was breached on August 1, 2013 which obstructed Ace Creek near the access road to the airport and the sudden rise and fall in discharge as shown in the hydrograph are the response to the flood wave. The hydrograph response is quite rapid beginning at 0.330 m^3/s at 4:30 pm on August 1, 2013 and peaking at 3.040 m^3/s at 6:00 pm. The hydrograph returns to 0.335 m^3/s at 7:30 am on August 2, 2013.

Photo 6: AC-14 - October 12, 2013

Table 11: AC-14 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
16-Aug-05	Not Measured	0.3561
24-Jan-06	Not Measured	0.5261
25-May-06	Not Measured	1.4651
22-May-09	Not Measured	1.4820
27-Sep-09 11:00	Not Measured	0.4276
27-Sep-09 11:30	Not Measured	0.4644
30-Apr-10	Not Measured	0.7067
01-Jul-10	Not Measured	0.2985
13-Sep-10 16:05	Not Measured	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
05-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

Figure 10: AC-14 Rating Curve

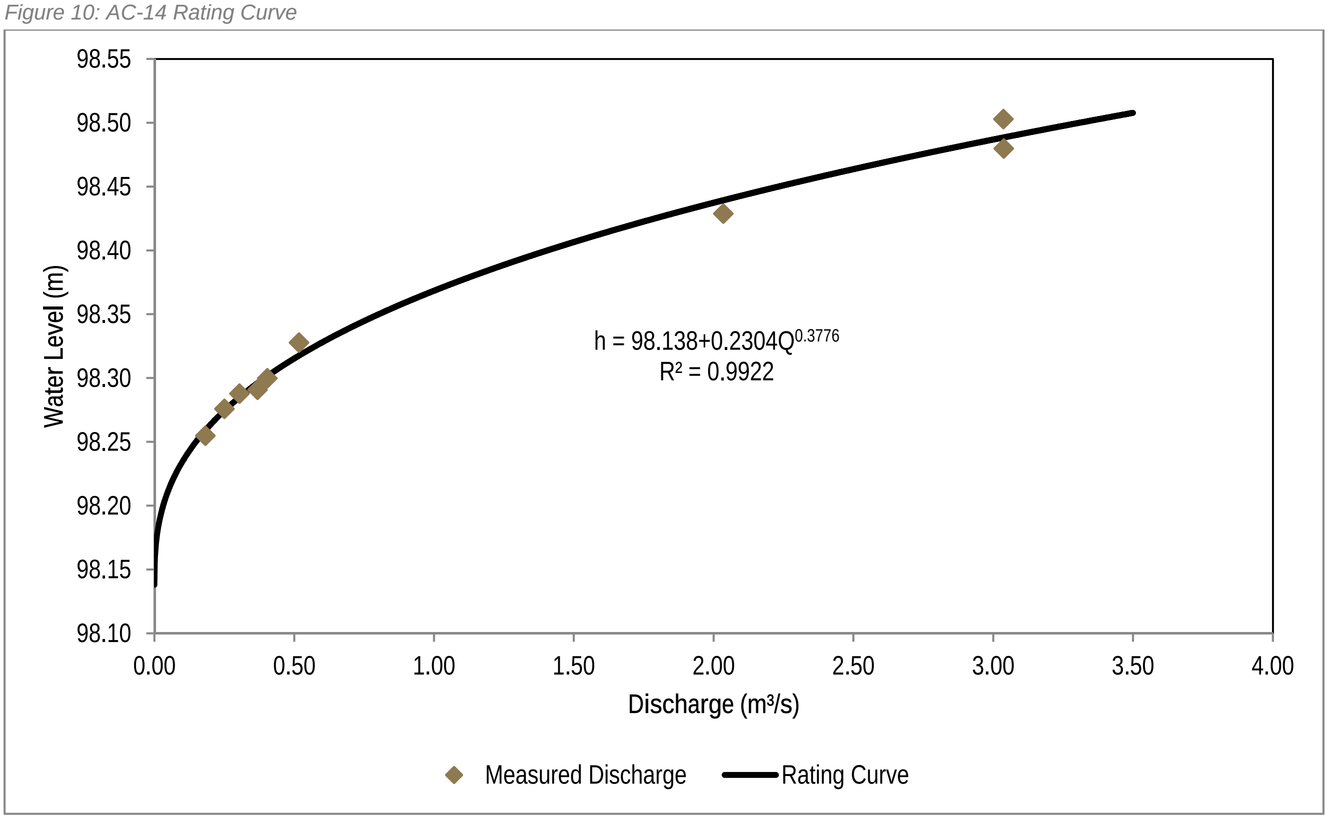


Figure 11: AC-14 2013 Hydrograph

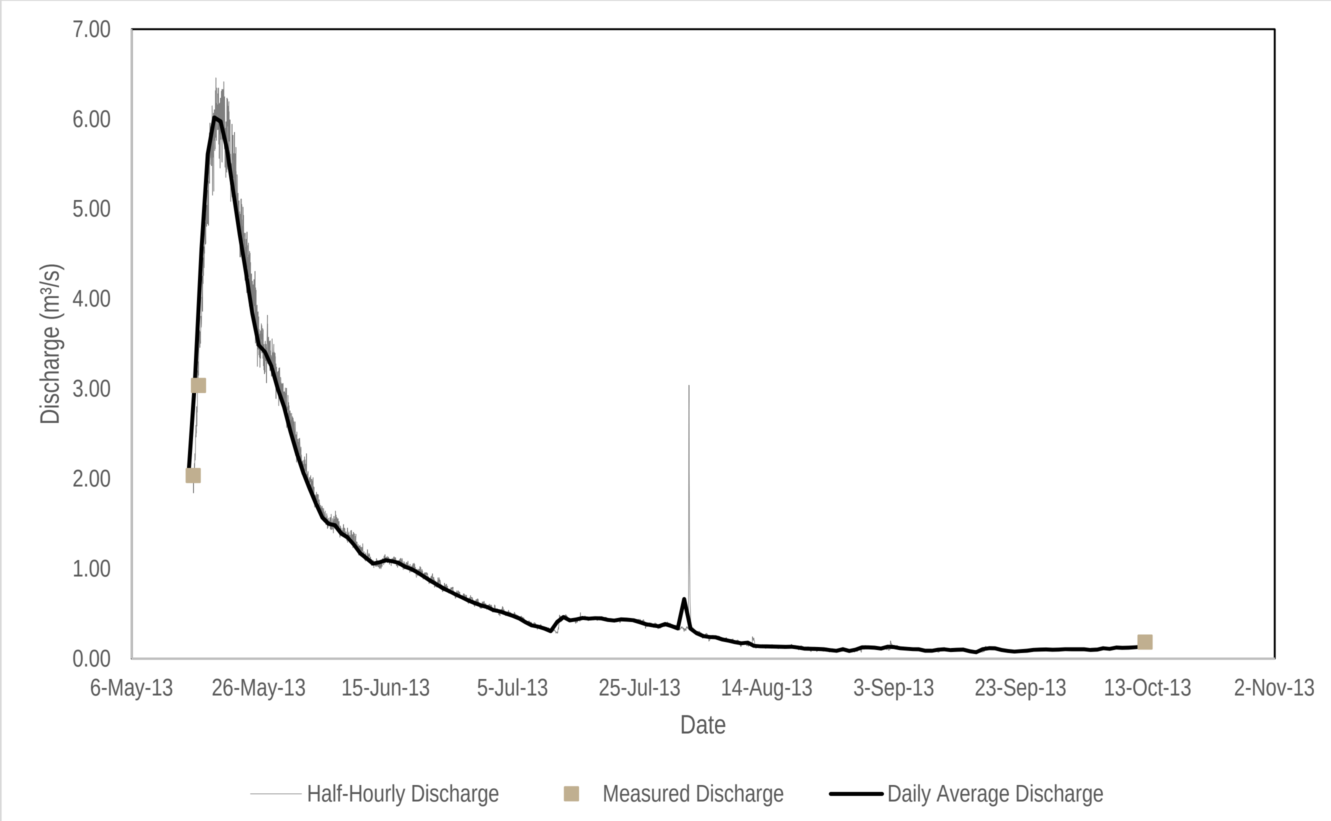


Table 12: AC-14 2013 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		2.2841	0.5718	0.6621	0.1123	0.1024
2		2.0722	0.5391	0.3313	0.1306	0.1025
3		1.8978	0.5246	0.2798	0.1283	0.1027
4		1.7293	0.4991	0.2500	0.1147	0.0957
5		1.5704	0.4756	0.2391	0.1097	0.0984
6		1.4988	0.4474	0.2355	0.1047	0.1148
7		1.4826	0.4053	0.2137	0.1020	0.1085
8		1.3917	0.3698	0.1979	0.0865	0.1220
9		1.3475	0.3554	0.1824	0.0859	0.1178
10		1.2667	0.3335	0.1692	0.0990	0.1200
11		1.1700	0.3053	0.1773	0.1019	0.1255
12		1.1145	0.4074	0.1418	0.0935	0.1310
13		1.0562	0.4612	0.1365	0.0968	
14		1.0707	0.4246	0.1339	0.0991	
15	2.0769	1.0931	0.4348	0.1336	0.0810	
16	3.1297	1.0823	0.4507	0.1315	0.0707	
17	4.5591	1.0648	0.4435	0.1299	0.1050	
18	5.6113	1.0230	0.4493	0.1302	0.1141	
19	6.0171	0.9967	0.4453	0.1218	0.1126	
20	5.9739	0.9580	0.4306	0.1104	0.0960	
21	5.6700	0.9145	0.4225	0.1084	0.0855	
22	5.1920	0.8664	0.4362	0.1060	0.0768	
23	4.7163	0.8267	0.4321	0.1023	0.0837	
24	4.2958	0.7826	0.4260	0.0945	0.0872	
25	3.8354	0.7510	0.4046	0.0872	0.0967	
26	3.4866	0.7154	0.3810	0.1040	0.0990	
27	3.4113	0.6816	0.3701	0.0853	0.1015	
28	3.2517	0.6474	0.3581	0.0995	0.0973	
29	3.0014	0.6175	0.3839	0.1244	0.0992	
30	2.7961	0.5911	0.3623	0.1244	0.1046	
31	2.5271		0.3362	0.1205		

4.6 TL-6 – MINEWATER RESERVOIR

The blasted channel at the outlet of Minewater Reservoir directs runoff towards the Fulton Creek drainage. The v-notch weir installed in the blasted channel is the monitoring location known as TL-6 (Photo 7). Stage and discharge data collected at the v-notch weir are presented in Table 13. The rating curve for TL-6 is shown in Figure 12; the rating curve in TL-6 has not captured a high flow measurement. The hydrograph for TL-6 is presented as Figure 13 while the daily average discharge data is presented in Table 14.

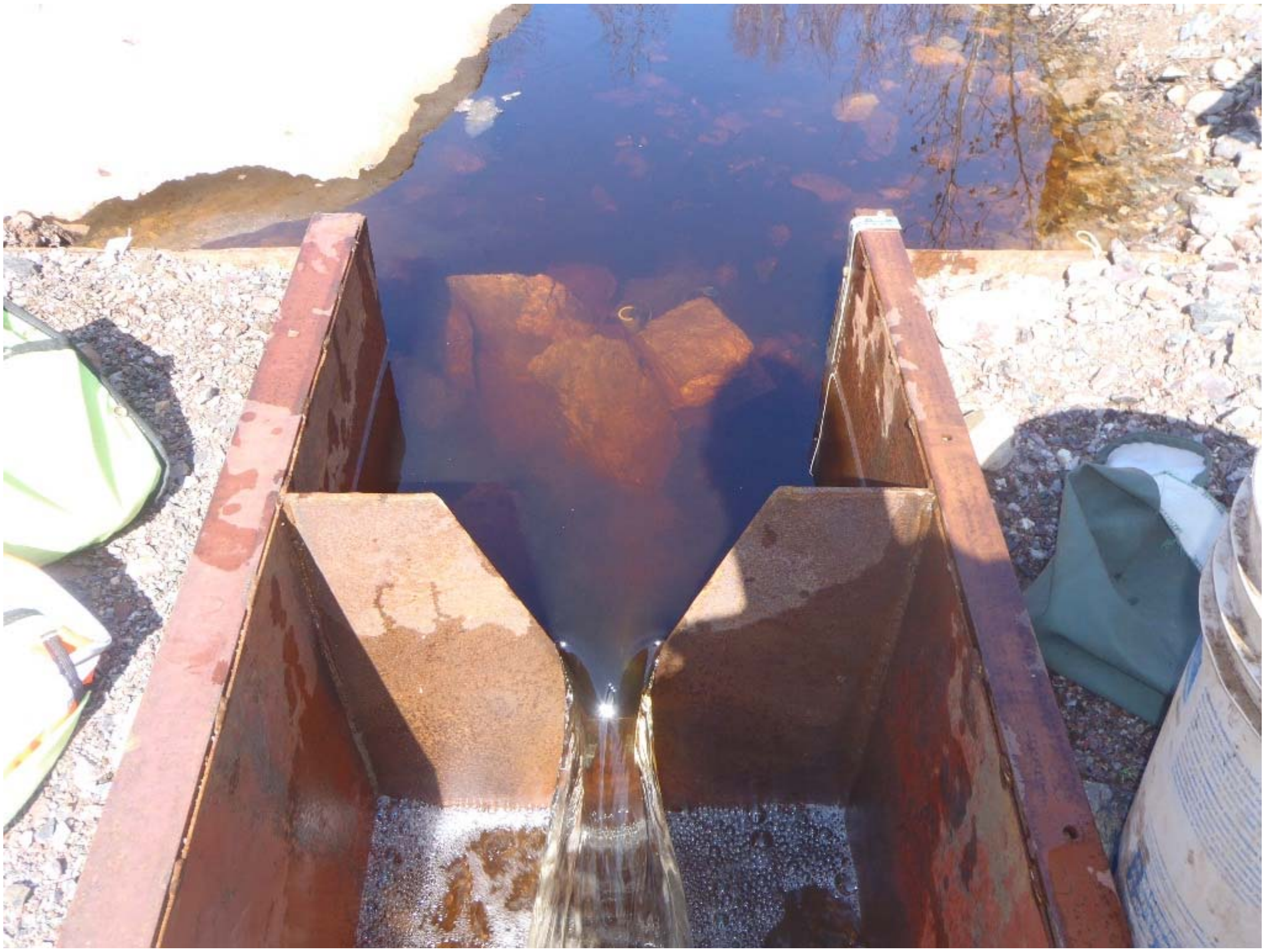


Photo 7: TL-6 - May 16, 2013

Table 13: TL-6 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
Weir Invert	0.260	0.0000
07-May-12 15:30	0.363	0.0023
09-May-12 19:08	0.358	0.0019
27-Sep-12 18:00	0.299	0.0002
12-May-13 18:00	0.420	0.0078
16-May-13 10:30	0.410	0.0072
12-Oct-13 17:03	0.281	0.0001

Figure 12: TL-6 Rating Curve

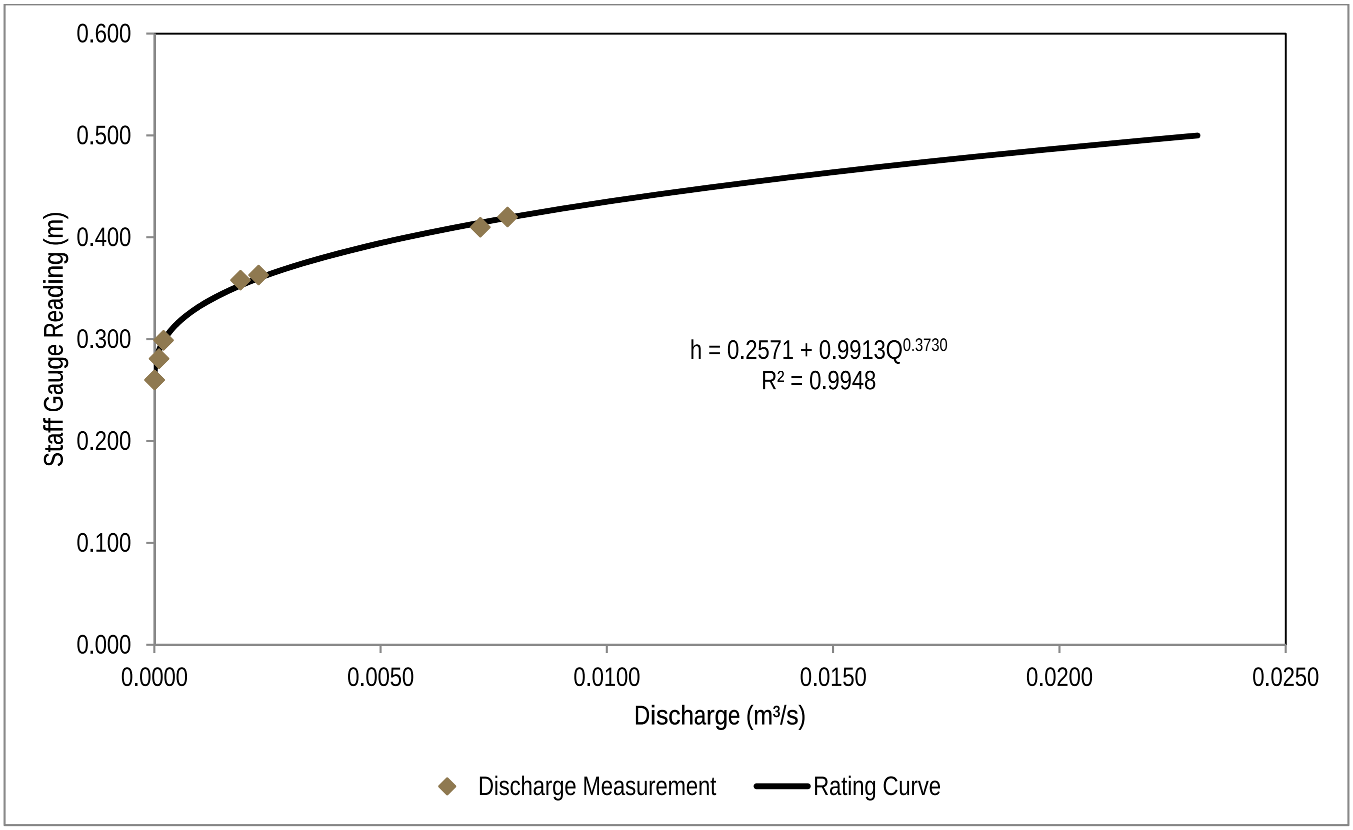


Figure 13: TL-6 2013 Hydrograph

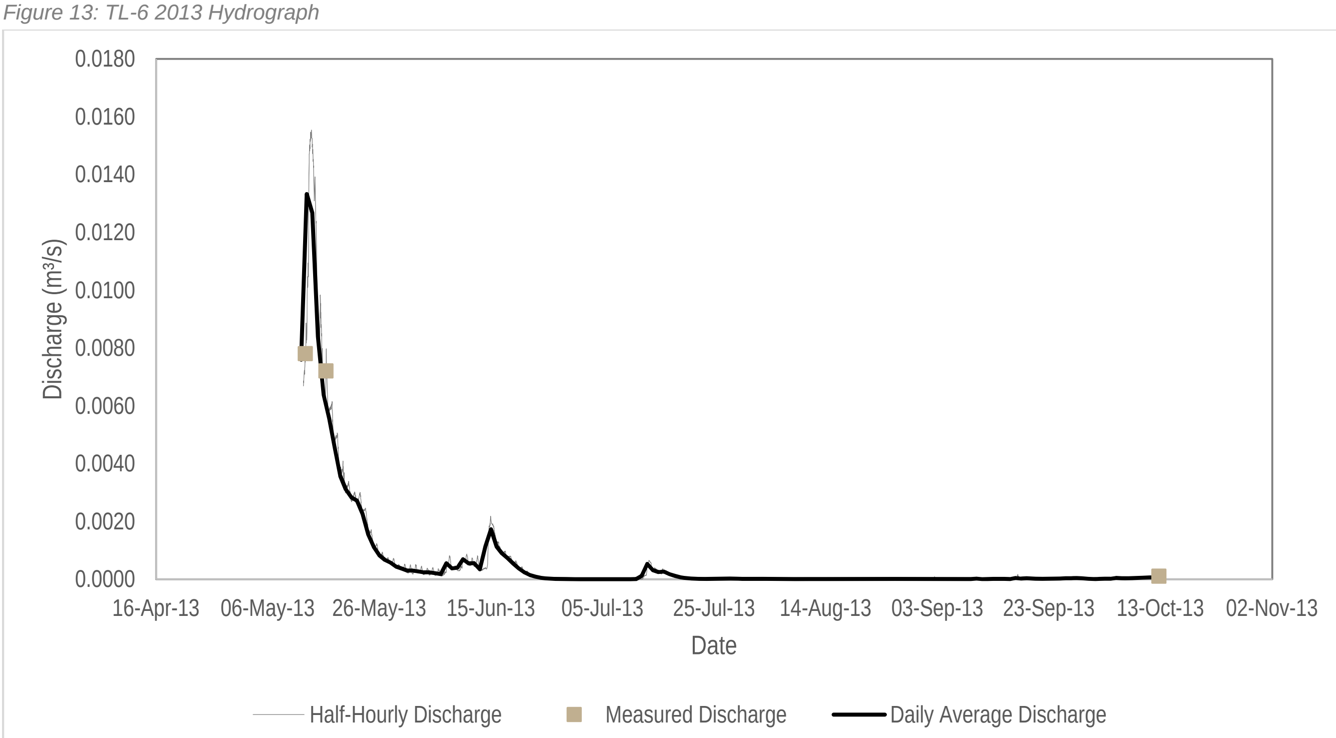


Table 14: TL-6 2013 Daily Average Discharge (m³/s)

Day	May	Jun	Jul	Aug	Sep	Oct
1		0.0003	0.0000	0.0000	0.0000	0.0000
2		0.0003	0.0000	0.0000	0.0000	0.0000
3		0.0002	0.0000	0.0000	0.0000	0.0000
4		0.0002	0.0000	0.0000	0.0000	0.0000
5		0.0002	0.0000	0.0000	0.0000	0.0000
6		0.0002	0.0000	0.0000	0.0000	0.0000
7		0.0006	0.0000	0.0000	0.0000	0.0000
8		0.0004	0.0000	0.0000	0.0000	0.0000
9		0.0004	0.0000	0.0000	0.0000	0.0000
10		0.0007	0.0000	0.0000	0.0000	0.0001
11		0.0005	0.0000	0.0000	0.0000	0.0001
12	0.0076	0.0006	0.0001	0.0000	0.0000	0.0001
13	0.0133	0.0003	0.0005	0.0000	0.0000	
14	0.0127	0.0011	0.0003	0.0000	0.0000	
15	0.0084	0.0017	0.0002	0.0000	0.0000	
16	0.0064	0.0011	0.0003	0.0000	0.0000	
17	0.0056	0.0009	0.0002	0.0000	0.0000	
18	0.0046	0.0007	0.0001	0.0000	0.0000	
19	0.0036	0.0005	0.0001	0.0000	0.0000	
20	0.0031	0.0004	0.0000	0.0000	0.0000	
21	0.0028	0.0002	0.0000	0.0000	0.0000	
22	0.0027	0.0001	0.0000	0.0000	0.0000	
23	0.0023	0.0001	0.0000	0.0000	0.0000	
24	0.0015	0.0001	0.0000	0.0000	0.0000	
25	0.0011	0.0000	0.0000	0.0000	0.0000	
26	0.0008	0.0000	0.0000	0.0000	0.0000	
27	0.0007	0.0000	0.0000	0.0000	0.0000	
28	0.0006	0.0000	0.0000	0.0000	0.0000	
29	0.0004	0.0000	0.0000	0.0000	0.0000	
30	0.0004	0.0000	0.0000	0.0000	0.0000	
31	0.0003		0.0000	0.0000		

4.7 TL-7 – TAILINGS CREEK AT MEADOW DAM

Similar to AC-8, TL-7 has been monitored since closure of the mine. The station is a v-notch weir inset into a large concrete dam. The station is known to have discharge through the winter of most years and is typically subject to glaciation as ice is frequently observed within the v-notch and plugging the weir. Due to the potential for damage, the stage sensor is removed every fall and re-installed every spring. Discharge is calculated from stage data collected by the sensor using the typical form for a 90° v-notch weir (Smith, 1995):

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

When the sensor is not installed in the weir an estimate of discharge is provided through equations referenced to the station at AC-8. Measurements of discharge were performed by McElhanney in spring 2013 prior to the thawing of the ice mass blocking the v-notch weir (Table 15). Those measurements were performed slightly downstream of the v-notch in a channel bounded by bedrock on each bank; the measurements yielded the highest discharge measurements in recent years but do not fit well with the equations used in prior reporting (McElhanney, 2013a). Based on the more recent measurements of discharge at TL-7 an equation was developed to relate AC-8 discharge to TL-7. The equation is considered valid from May to December of 2013 and the older equation sets are relied upon for data prior to May. The new equation used for estimating discharge from May to December 2013 is:

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

The hydrograph for TL-7 is presented as Figure 14 while the daily average discharges are provided in Table 16. Monthly average discharges for TL-7 are presented in Table 17.

Table 15: TL-7 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m³/s)
Weir Invert	0.000	0.000
21-May-11	0.005	0.0012
3-Oct-11	0.003	0.0002
07-May-12 16:30	0.096	Not Measured
09-May-12 19:30	0.090	Not Measured
27-Sep-12 17:30	0.115	0.0082
12-May-13 09:15	Not Measured Due to Ice	0.0815
16-May-13 11:50	Not Measured Due to Ice	0.1328
13-Oct-13 14:54	0.142	0.0109

Figure 14: TL-7 2013 Hydrograph

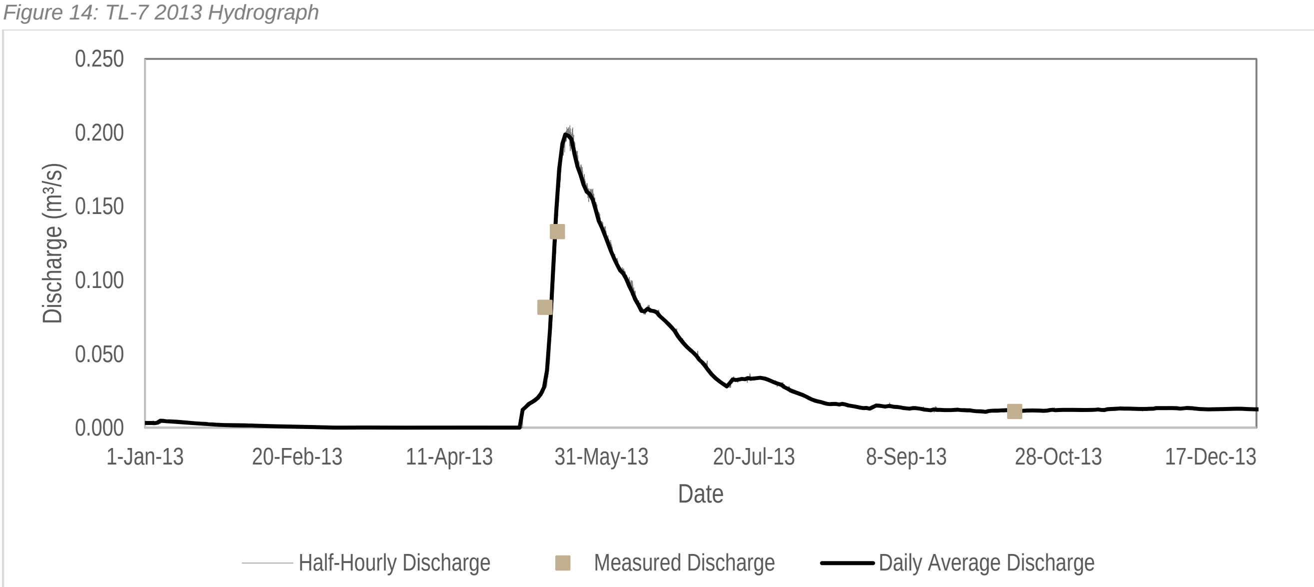


Table 16: TL-7 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0032	0.0017	0.0002	0.0000	0.0000	0.1309	0.0490	0.0253	0.0143	0.0112	0.0121	0.0133
2	0.0032	0.0016	0.0000	0.0000	0.0000	0.1253	0.0461	0.0244	0.0147	0.0111	0.0121	0.0133
3	0.0032	0.0015	0.0000	0.0000	0.0000	0.1197	0.0443	0.0237	0.0146	0.0110	0.0120	0.0133
4	0.0031	0.0015	0.0000	0.0000	0.0000	0.1151	0.0418	0.0229	0.0142	0.0108	0.0120	0.0133
5	0.0034	0.0014	0.0000	0.0000	0.0122	0.1106	0.0390	0.0222	0.0141	0.0113	0.0120	0.0133
6	0.0047	0.0013	0.0000	0.0000	0.0140	0.1068	0.0363	0.0212	0.0139	0.0115	0.0120	0.0131
7	0.0046	0.0012	0.0000	0.0000	0.0161	0.1047	0.0342	0.0201	0.0134	0.0115	0.0120	0.0130
8	0.0044	0.0011	0.0001	0.0000	0.0173	0.1011	0.0324	0.0191	0.0131	0.0116	0.0120	0.0132
9	0.0043	0.0011	0.0001	0.0000	0.0186	0.0963	0.0309	0.0184	0.0129	0.0117	0.0122	0.0134
10	0.0042	0.0011	0.0002	0.0000	0.0203	0.0917	0.0295	0.0179	0.0133	0.0117	0.0125	0.0133
11	0.0040	0.0010	0.0003	0.0002	0.0229	0.0869	0.0280	0.0174	0.0133	0.0118	0.0121	0.0131
12	0.0039	0.0010	0.0002	0.0002	0.0272	0.0833	0.0303	0.0168	0.0130	0.0117	0.0120	0.0130
13	0.0038	0.0010	0.0001	0.0001	0.0387	0.0793	0.0328	0.0162	0.0127	0.0113	0.0125	0.0127
14	0.0036	0.0009	0.0001	0.0000	0.0667	0.0789	0.0324	0.0160	0.0123	0.0111	0.0126	0.0125
15	0.0035	0.0009	0.0000	0.0000	0.1063	0.0807	0.0327	0.0161	0.0121	0.0112	0.0127	0.0125
16	0.0033	0.0009	0.0000	0.0000	0.1456	0.0794	0.0331	0.0161	0.0119	0.0115	0.0128	0.0125
17	0.0031	0.0008	0.0000	0.0000	0.1751	0.0791	0.0329	0.0158	0.0124	0.0116	0.0130	0.0125
18	0.0029	0.0008	0.0000	0.0000	0.1922	0.0782	0.0336	0.0162	0.0121	0.0118	0.0130	0.0125
19	0.0028	0.0008	0.0000	0.0000	0.1988	0.0758	0.0333	0.0158	0.0121	0.0117	0.0130	0.0126
20	0.0026	0.0007	0.0000	0.0000	0.1978	0.0739	0.0334	0.0151	0.0121	0.0116	0.0130	0.0126
21	0.0025	0.0006	0.0000	0.0000	0.1957	0.0721	0.0337	0.0148	0.0119	0.0115	0.0128	0.0125
22	0.0024	0.0006	0.0000	0.0000	0.1855	0.0700	0.0339	0.0144	0.0119	0.0115	0.0128	0.0125
23	0.0022	0.0005	0.0000	0.0000	0.1770	0.0679	0.0336	0.0140	0.0120	0.0114	0.0127	0.0127
24	0.0020	0.0004	0.0000	0.0000	0.1715	0.0654	0.0330	0.0136	0.0121	0.0115	0.0127	0.0129
25	0.0020	0.0004	0.0000	0.0000	0.1648	0.0621	0.0321	0.0132	0.0121	0.0120	0.0128	0.0129
26	0.0018	0.0004	0.0000	0.0000	0.1602	0.0595	0.0314	0.0134	0.0120	0.0122	0.0128	0.0129
27	0.0017	0.0003	0.0000	0.0000	0.1583	0.0568	0.0304	0.0129	0.0119	0.0119	0.0129	0.0128
28	0.0017	0.0003	0.0000	0.0000	0.1547	0.0548	0.0297	0.0140	0.0118	0.0119	0.0129	0.0128
29	0.0017		0.0000	0.0000	0.1477	0.0529	0.0291	0.0150	0.0117	0.0121	0.0133	0.0126
30	0.0017		0.0000	0.0000	0.1402	0.0510	0.0275	0.0149	0.0115	0.0120	0.0133	0.0126
31	0.0017		0.0000		0.1357		0.0266	0.0146		0.0121		0.0125

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
Mean	0.0062	0.0049	0.0044	0.0054	0.0520	0.0346	0.0195	0.0165	0.0167	0.0161	0.0162	0.0090	0.0168

4.8 BL-5 – BEAVERLODGE LAKE OUTFLOW

The outflow from Beaverlodge Lake is known as station BL-5 (Photo 8). This station has previously been known to be impacted by beaver activity at the outlet. The channel at the outlet of Beaverlodge Lake splits into two channels and debris jams are present on both channels. A rating curve has been developed comprised of three points with stage-discharge data presented in Table 18 and the plotted rating curve in Figure 15. The points used in the rating curve are comprised of the three most recent measurements and are believed to be the most representative of the outflow of Beaverlodge Lake at this time; there is some potential that the channel at the outflow or the debris jams have changed thus requiring reassessment of the rating curve. The hydrograph and daily average discharge data are presented in Figure 16 and Table 19, respectively.

Photo 8: BL-5 - October 13, 2013

Table 18: BL-5 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m³/s)
15-Sep-10 16:40	99.589	0.7815
18-May-11 09:00	99.507	0.3176
04-Oct-11 12:51	99.448	0.0958
04-Jun-12 18:45	99.640	0.7122
28-Sep-12 12:25*	99.540	0.9270
21-Jul-13 17:30*	99.586	1.5600
13-Oct-13 12:00*	99.401	0.2946

* denotes points used in the Rating Curve presented in Figure 15.

Figure 15: BL-5 Rating Curve

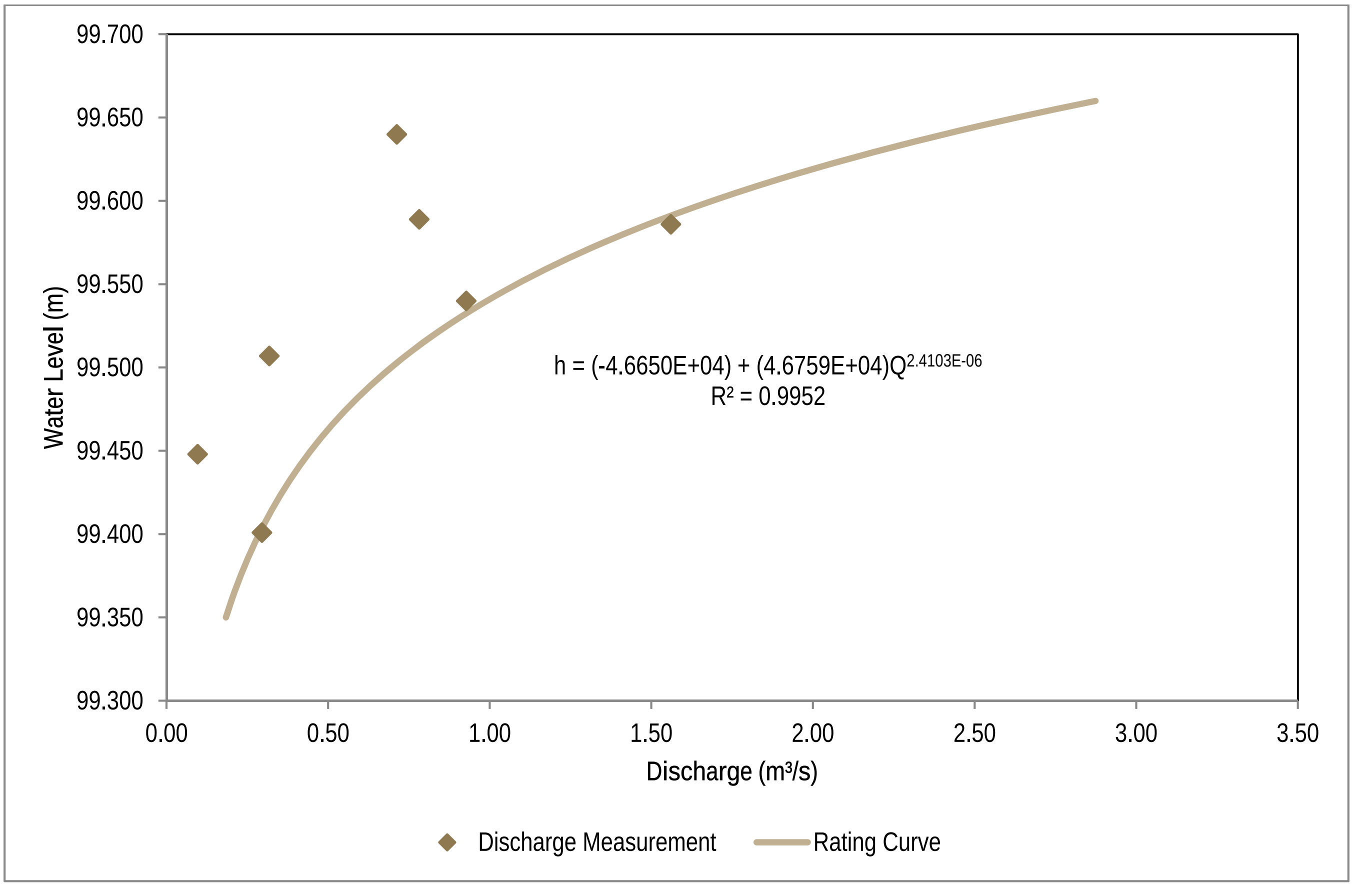


Figure 16: BL-5 2013 Hydrograph

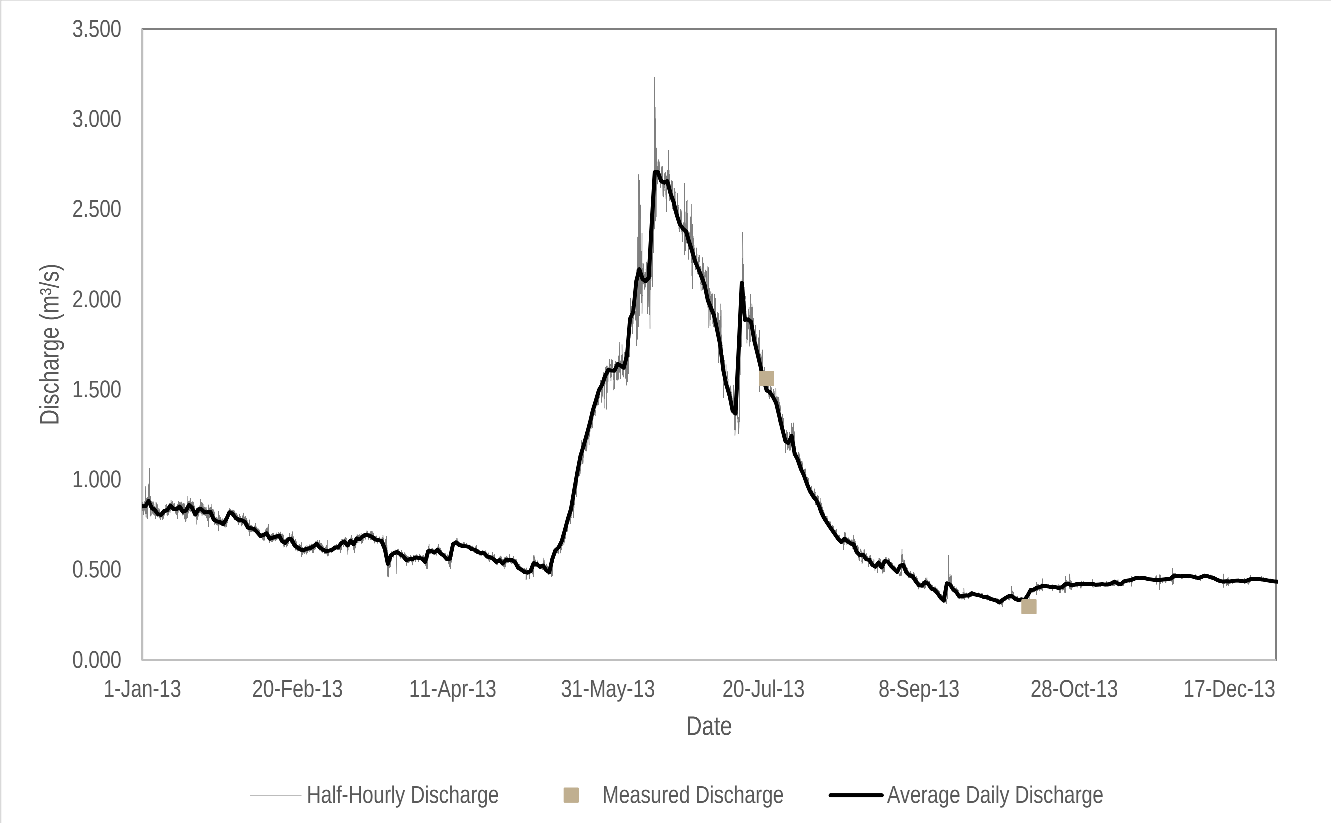


Table 19: BL-5 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.8513	0.7771	0.6039	0.5627	0.5423	1.6051	2.0806	1.0603	0.4873	0.3384	0.4209	0.4637
2	0.8536	0.7744	0.6056	0.5425	0.5108	1.6045	1.9996	1.0229	0.5233	0.3343	0.4210	0.4652
3	0.8820	0.7667	0.6103	0.6027	0.5011	1.6419	1.9552	0.9744	0.5270	0.3291	0.4203	0.4647
4	0.8431	0.7337	0.6239	0.6030	0.4875	1.6316	1.9148	0.9355	0.4850	0.3179	0.4172	0.4649
5	0.8318	0.7297	0.6239	0.5959	0.4839	1.6212	1.8322	0.9065	0.4692	0.3332	0.4181	0.4631
6	0.8083	0.7263	0.6479	0.6112	0.4931	1.6897	1.7489	0.8858	0.4634	0.3448	0.4203	0.4586
7	0.8045	0.7072	0.6577	0.5905	0.5364	1.8926	1.6064	0.8488	0.4370	0.3540	0.4177	0.4539
8	0.8263	0.6872	0.6343	0.5788	0.5315	1.9313	1.5260	0.8035	0.4133	0.3531	0.4187	0.4604
9	0.8308	0.6937	0.6608	0.5589	0.5163	2.1007	1.4710	0.7740	0.4120	0.3394	0.4247	0.4670
10	0.8561	0.7021	0.6410	0.5617	0.5228	2.1672	1.3824	0.7465	0.4314	0.3326	0.4347	0.4642
11	0.8377	0.6720	0.6742	0.6421	0.4978	2.1139	1.3666	0.7223	0.4209	0.3363	0.4231	0.4586
12	0.8377	0.6782	0.6698	0.6523	0.4860	2.1004	1.7301	0.6977	0.3960	0.3335	0.4193	0.4529
13	0.8511	0.6839	0.6858	0.6374	0.5624	2.1191	2.0918	0.6711	0.3892	0.3571	0.4356	0.4444
14	0.8222	0.6889	0.6946	0.6327	0.6087	2.4180	1.8869	0.6544	0.3699	0.3873	0.4395	0.4370
15	0.8289	0.6584	0.6891	0.6311	0.6248	2.7058	1.8895	0.6724	0.3458	0.3902	0.4428	0.4348
16	0.8594	0.6489	0.6818	0.6283	0.6584	2.7050	1.8752	0.6585	0.3291	0.4005	0.4479	0.4353
17	0.8439	0.6695	0.6681	0.6145	0.7202	2.6569	1.7687	0.6471	0.4246	0.4043	0.4545	0.4347
18	0.8061	0.6686	0.6648	0.6116	0.7832	2.6467	1.7007	0.6417	0.4173	0.4115	0.4535	0.4378
19	0.8349	0.6342	0.6600	0.5977	0.8370	2.6562	1.6308	0.5992	0.3920	0.4101	0.4528	0.4397
20	0.8360	0.6232	0.6178	0.5932	0.9414	2.5877	1.5526	0.5813	0.3781	0.4066	0.4524	0.4398
21	0.8176	0.6107	0.5326	0.5919	1.0384	2.5416	1.4952	0.5850	0.3510	0.4021	0.4476	0.4370
22	0.8200	0.6102	0.5804	0.5729	1.1309	2.4725	1.4849	0.5577	0.3543	0.4031	0.4460	0.4354
23	0.8201	0.6164	0.5927	0.5690	1.1851	2.4173	1.4597	0.5558	0.3577	0.3994	0.4434	0.4438
24	0.7778	0.6202	0.5977	0.5593	1.2454	2.3933	1.4260	0.5280	0.3562	0.4028	0.4421	0.4491
25	0.7682	0.6291	0.5864	0.5437	1.3093	2.3775	1.3556	0.5171	0.3694	0.4190	0.4451	0.4486
26	0.7650	0.6445	0.5751	0.5537	1.3824	2.3198	1.2839	0.5405	0.3633	0.4243	0.4459	0.4486
27	0.7532	0.6253	0.5547	0.5337	1.4394	2.2685	1.2144	0.5126	0.3600	0.4143	0.4488	0.4470
28	0.7806	0.6129	0.5588	0.5544	1.4969	2.2066	1.2042	0.5484	0.3552	0.4169	0.4502	0.4454
29	0.8190		0.5598	0.5532	1.5264	2.1706	1.2433	0.5453	0.3472	0.4208	0.4644	0.4415
30	0.8118		0.5683	0.5533	1.5763	2.1254	1.1437	0.5215	0.3476	0.4199	0.4648	0.4390
31	0.7878		0.5661		1.6082		1.1116	0.5044		0.4220		0.4366

4.9 ML-1 – MARTIN LAKE OUTFLOW

The outflow from Martin Lake, known as ML-1, is a combination of the Fredette Lake and Beaverlodge Lake drainage systems. The station is located at the outlet of Martin Lake which is immediately upstream of Cinch Lake. Cinch Lake is known to be impacted by beaver activity and the proximity of Cinch Lake to Martin Lake likely impacts the water level in Martin Lake via a backwater effect. Discharge for ML-1 is calculated through a relationship to CS-1. Measured stage and discharge data for ML-1 are presented in Table 20. A correlation between measured discharges from ML-1 and CS-1 (reported below) is presented as Figure 17 and is used to transform data from CS-1 to ML-1 which is presented in the hydrograph depicted in Figure 18. A stage data logger is not installed at ML-1. Daily average discharge data for ML-1 is presented in Table 21.

Table 20: ML-1 Stage and Discharge Measurements

Measurement Date & Time	Water Level (m)	Discharge (m^3/s)
18-Sep-10 14:40	98.981	1.0215
17-May-11 06:17	98.893	0.5153
04-Oct-11	99.158	0.0000
09-May-12 08:09	99.329	1.6468
28-Sep-12 09:22	99.140	2.1758
15-May-13 10:20	99.144	1.6176
13-Oct-13 10:20	98.913	0.6149

Figure 17: ML-1 Correlation to CS-1

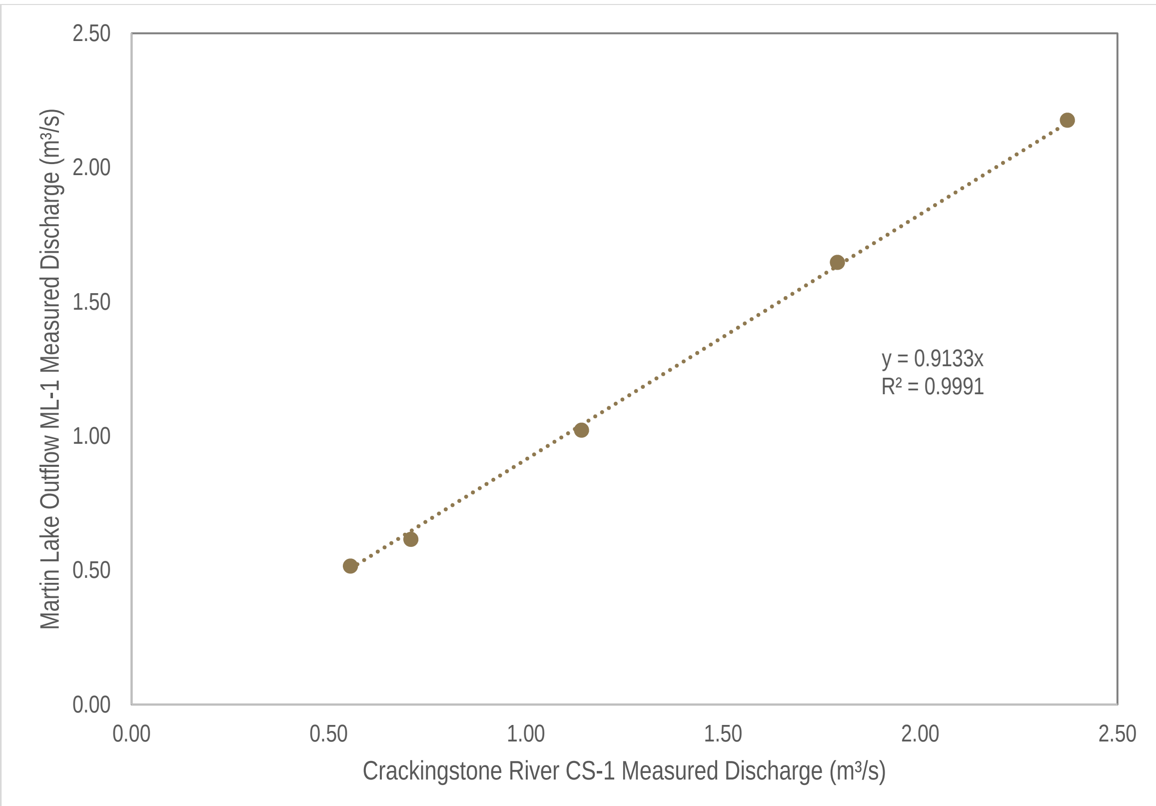


Figure 18: ML-1 2013 Hydrograph

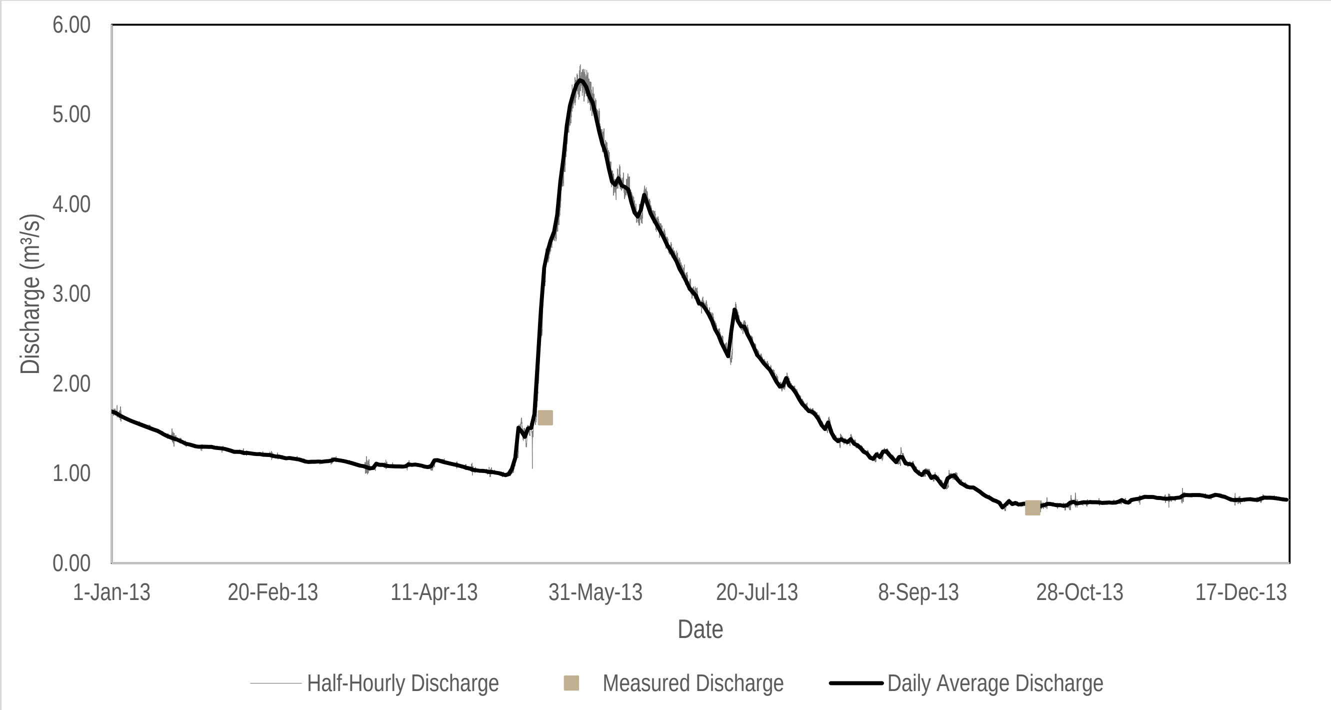


Table 21: ML-1 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.6877	1.2937	1.1442	1.0761	1.0023	4.8148	2.9837	1.8945	1.1258	0.7051	0.6776	0.7556
2	1.6773	1.2852	1.1323	1.0797	0.9902	4.6759	2.8943	1.8280	1.1828	0.6919	0.6777	0.7583
3	1.6543	1.2827	1.1263	1.0994	0.9805	4.5783	2.8853	1.7728	1.1812	0.6743	0.6764	0.7575
4	1.6360	1.2783	1.1291	1.0952	0.9906	4.3966	2.8288	1.7342	1.1114	0.6202	0.6707	0.7578
5	1.6193	1.2724	1.1283	1.0981	1.0491	4.2507	2.7708	1.6942	1.1046	0.6535	0.6723	0.7545
6	1.6026	1.2617	1.1317	1.0938	1.1696	4.2141	2.6991	1.6893	1.0984	0.6895	0.6764	0.7463
7	1.5843	1.2516	1.1294	1.0854	1.5090	4.2883	2.6036	1.6547	1.0343	0.6573	0.6717	0.7377
8	1.5692	1.2391	1.1346	1.0754	1.4664	4.2079	2.5411	1.6024	1.0038	0.6710	0.6734	0.7497
9	1.5554	1.2395	1.1353	1.0700	1.4076	4.1920	2.4526	1.5358	0.9834	0.6531	0.6844	0.7617
10	1.5450	1.2374	1.1423	1.0820	1.5005	4.1650	2.3756	1.4944	1.0234	0.6578	0.7027	0.7566
11	1.5292	1.2266	1.1552	1.1444	1.5070	4.0211	2.3056	1.5669	1.0102	0.6641	0.6815	0.7463
12	1.5168	1.2270	1.1476	1.1464	1.6690	3.9063	2.5880	1.4565	0.9496	0.6523	0.6746	0.7359
13	1.5039	1.2238	1.1433	1.1362	2.2293	3.8625	2.8246	1.3910	0.9680	0.6271	0.7044	0.7204
14	1.4876	1.2182	1.1367	1.1247	2.8125	3.9404	2.7007	1.3584	0.9315	0.6162	0.7114	0.7068
15	1.4766	1.2152	1.1282	1.1159	3.2917	4.1018	2.6397	1.3805	0.8817	0.6214	0.7175	0.7030
16	1.4580	1.2136	1.1184	1.1080	3.4649	3.9978	2.6345	1.3603	0.8452	0.6402	0.7268	0.7038
17	1.4366	1.2078	1.1082	1.1018	3.5916	3.8930	2.5501	1.3500	0.9441	0.6472	0.7389	0.7028
18	1.4187	1.2062	1.0968	1.0935	3.6844	3.8253	2.4820	1.3824	0.9661	0.6603	0.7370	0.7083
19	1.4046	1.2034	1.0858	1.0813	3.8804	3.7631	2.4015	1.3329	0.9789	0.6577	0.7358	0.7119
20	1.3892	1.1947	1.0808	1.0729	4.2563	3.6977	2.3204	1.3122	0.9353	0.6513	0.7350	0.7120
21	1.3796	1.1877	1.0680	1.0608	4.5215	3.6311	2.2786	1.2831	0.8941	0.6432	0.7262	0.7068
22	1.3639	1.1854	1.0550	1.0536	4.8752	3.5492	2.2265	1.2409	0.8738	0.6450	0.7233	0.7040
23	1.3481	1.1778	1.0617	1.0394	5.0982	3.4937	2.1902	1.2238	0.8512	0.6382	0.7186	0.7193
24	1.3303	1.1678	1.1080	1.0342	5.2312	3.4268	2.1510	1.1746	0.8444	0.6444	0.7162	0.7290
25	1.3229	1.1723	1.0951	1.0285	5.3304	3.3648	2.0864	1.1632	0.8416	0.6740	0.7216	0.7282
26	1.3120	1.1670	1.0941	1.0276	5.3807	3.2769	2.0198	1.2122	0.8183	0.6836	0.7232	0.7282
27	1.3010	1.1614	1.0863	1.0241	5.3668	3.2141	1.9672	1.1812	0.7946	0.6655	0.7284	0.7251
28	1.2956	1.1550	1.0800	1.0143	5.3109	3.1397	1.9768	1.2435	0.7667	0.6702	0.7310	0.7222
29	1.2958		1.0782	1.0144	5.1977	3.0622	2.0618	1.2481	0.7431	0.6773	0.7570	0.7151
30	1.2960		1.0776	1.0068	5.1310	3.0207	1.9762	1.2043	0.7273	0.6756	0.7577	0.7105
31	1.2946		1.0776		4.9782		1.9445	1.1655		0.6795		0.7061

4.10 CS-1 – CRACKINGSTONE RIVER

The Crackingstone River is monitored immediately downstream of a bridge crossing. The installation has a staff gauge mounted to the right wing wall of the bridge. Stage and discharge data for CS-1 are presented in Table 22 while the rating curve is shown in Figure 19. The hydrograph and daily discharge data are presented in Figure 20 and Table 23, respectively. The winter stage data at CS-1 prior to May 2013 appears to be impacted by ice; as such, the data is corrected with data from AC-8 on a unit area basis and manually adjusted to fit the trend of the hydrograph.

Photo 9: CS-1 - May 16, 2013

Table 22: 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
03-Oct-11	-0.040	0.0340
08-May-12 17:31	0.340	1.7901
27-Sep-12 14:53	0.418	2.3729
16-May-13 09:00	0.550	3.9647
16-May-13 16:50	0.560	Not Measured
12-Oct-13 18:00	0.150	0.7082

Figure 19: CS-1 Rating Curve

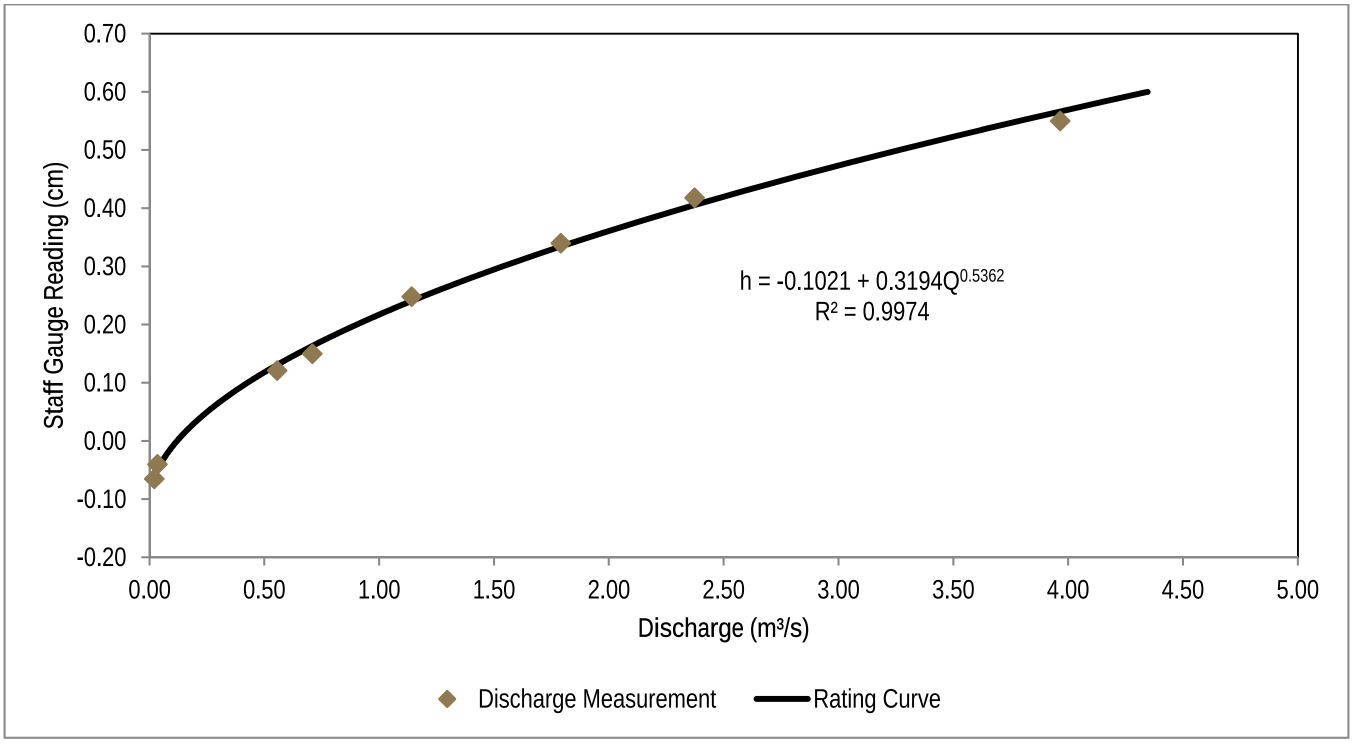


Figure 20: CS-1 2013 Hydrograph

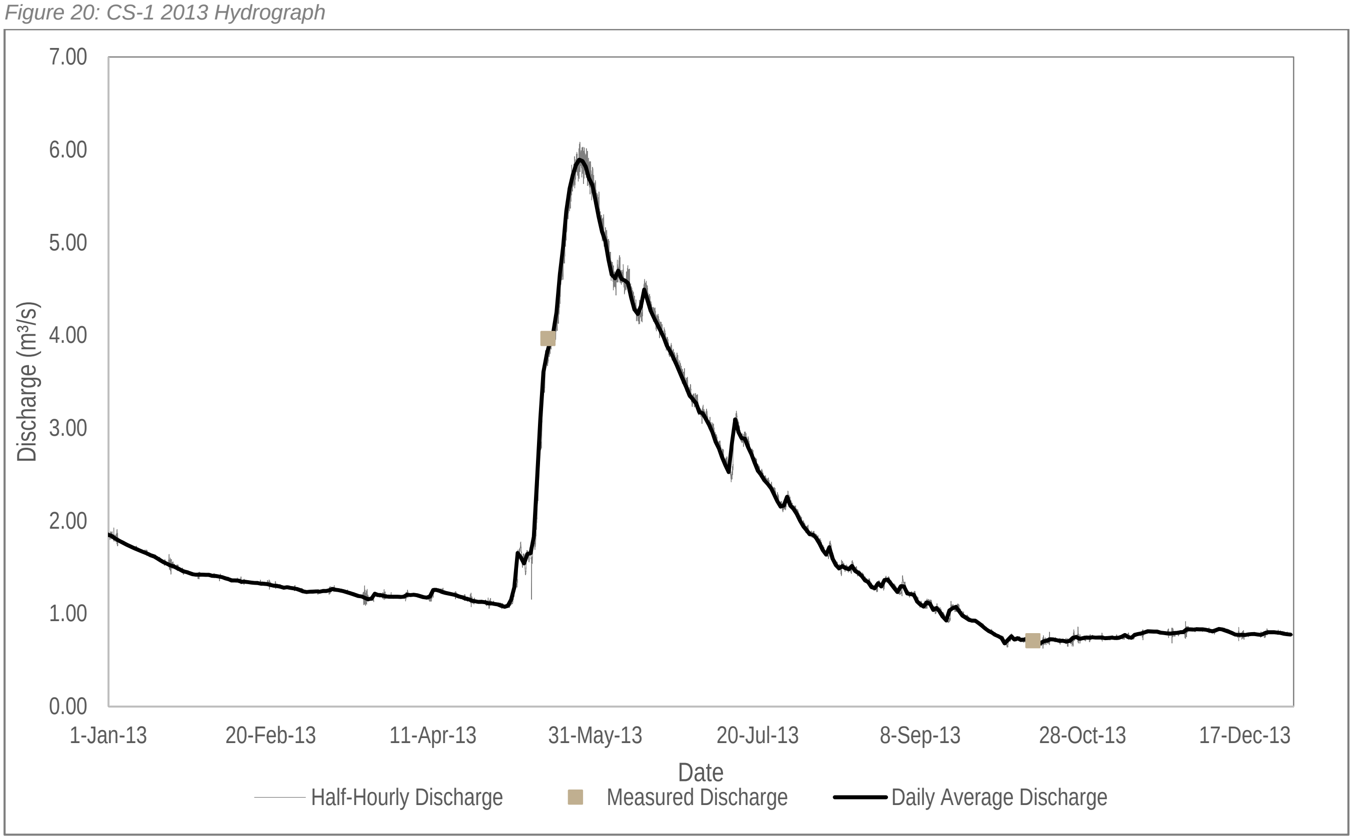


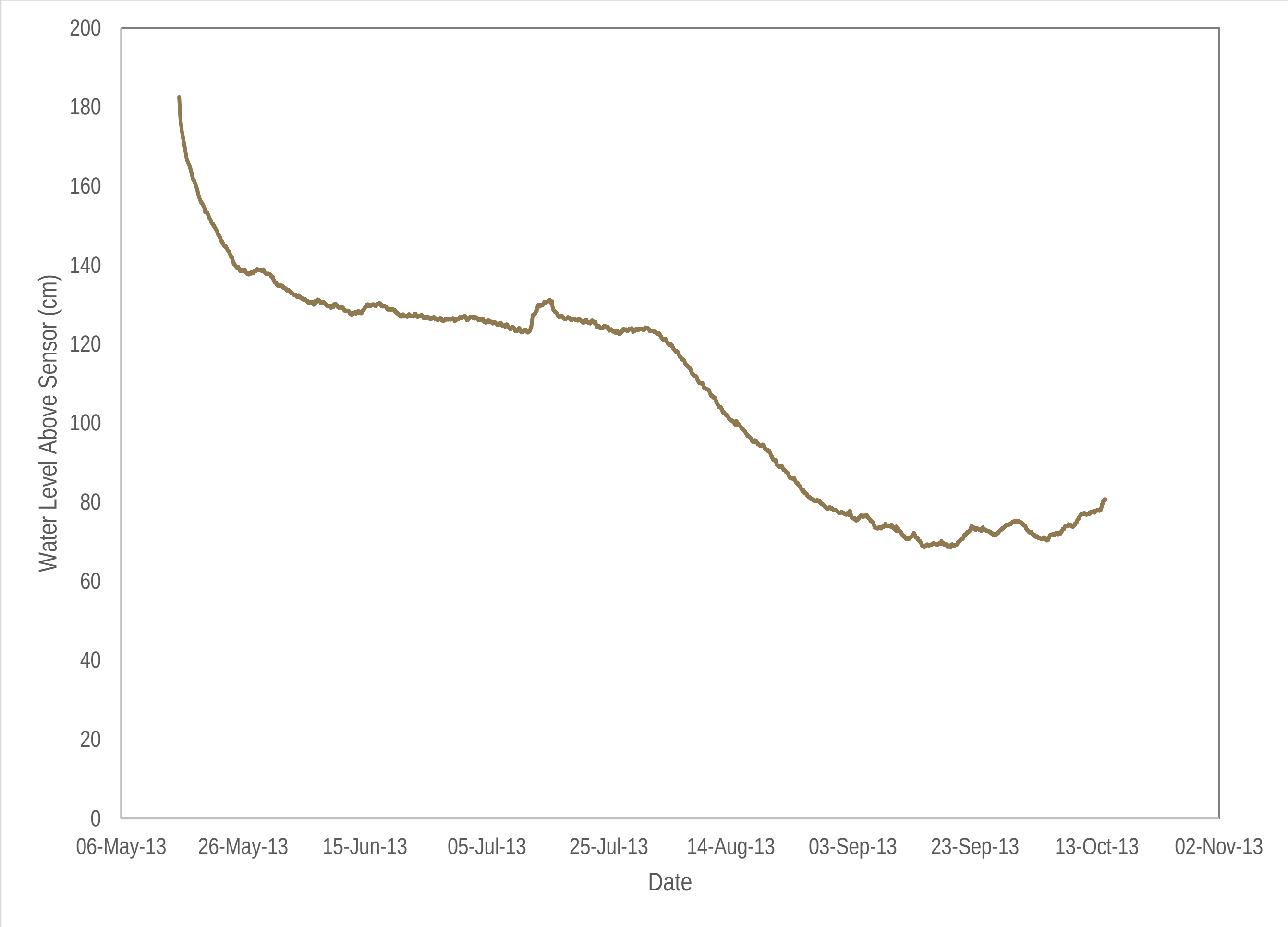
Table 23: CS-1 2013 Daily Average Discharge (m³/s)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.8479	1.4166	1.2529	1.1783	1.0974	5.2719	3.2670	2.0744	1.2327	0.7720	0.7419	0.8274
2	1.8365	1.4073	1.2398	1.1822	1.0842	5.1198	3.1691	2.0015	1.2951	0.7575	0.7420	0.8303
3	1.8113	1.4045	1.2332	1.2038	1.0736	5.0129	3.1592	1.9411	1.2934	0.7383	0.7406	0.8294
4	1.7913	1.3997	1.2363	1.1992	1.0847	4.8140	3.0974	1.8988	1.2170	0.6791	0.7344	0.8297
5	1.7730	1.3932	1.2354	1.2024	1.1487	4.6542	3.0338	1.8550	1.2095	0.7155	0.7361	0.8261
6	1.7547	1.3815	1.2391	1.1976	1.2806	4.6142	2.9553	1.8497	1.2026	0.7550	0.7406	0.8171
7	1.7347	1.3704	1.2367	1.1884	1.6522	4.6954	2.8508	1.8118	1.1325	0.7197	0.7355	0.8077
8	1.7182	1.3568	1.2423	1.1775	1.6056	4.6073	2.7823	1.7546	1.0991	0.7347	0.7374	0.8209
9	1.7031	1.3571	1.2430	1.1716	1.5412	4.5899	2.6854	1.6816	1.0767	0.7151	0.7494	0.8340
10	1.6917	1.3549	1.2508	1.1847	1.6430	4.5604	2.6011	1.6363	1.1206	0.7202	0.7694	0.8284
11	1.6744	1.3430	1.2649	1.2531	1.6501	4.4028	2.5244	1.7156	1.1061	0.7272	0.7462	0.8171
12	1.6608	1.3434	1.2565	1.2552	1.8274	4.2771	2.8337	1.5948	1.0397	0.7142	0.7387	0.8058
13	1.6467	1.3400	1.2518	1.2441	2.4410	4.2292	3.0928	1.5231	1.0599	0.6866	0.7713	0.7888
14	1.6288	1.3338	1.2446	1.2315	3.0794	4.3145	2.9571	1.4874	1.0199	0.6746	0.7790	0.7739
15	1.6168	1.3306	1.2353	1.2219	3.6042	4.4912	2.8903	1.5116	0.9654	0.6804	0.7856	0.7697
16	1.5964	1.3288	1.2246	1.2132	3.7938	4.3773	2.8846	1.4895	0.9254	0.7009	0.7957	0.7706
17	1.5729	1.3225	1.2134	1.2064	3.9326	4.2626	2.7922	1.4782	1.0337	0.7086	0.8091	0.7695
18	1.5534	1.3207	1.2009	1.1973	4.0342	4.1884	2.7177	1.5137	1.0578	0.7230	0.8070	0.7755
19	1.5380	1.3177	1.1889	1.1840	4.2488	4.1203	2.6295	1.4594	1.0719	0.7202	0.8057	0.7795
20	1.5211	1.3081	1.1834	1.1747	4.6604	4.0487	2.5406	1.4368	1.0241	0.7131	0.8047	0.7796
21	1.5106	1.3004	1.1693	1.1615	4.9507	3.9758	2.4949	1.4049	0.9789	0.7043	0.7951	0.7739
22	1.4934	1.2979	1.1552	1.1537	5.3380	3.8861	2.4379	1.3588	0.9567	0.7062	0.7919	0.7709
23	1.4761	1.2896	1.1625	1.1380	5.5822	3.8254	2.3981	1.3399	0.9320	0.6988	0.7869	0.7876
24	1.4566	1.2786	1.2132	1.1323	5.7278	3.7521	2.3552	1.2862	0.9246	0.7055	0.7842	0.7982
25	1.4485	1.2836	1.1991	1.1261	5.8364	3.6842	2.2845	1.2736	0.9215	0.7380	0.7901	0.7973
26	1.4365	1.2778	1.1980	1.1251	5.8915	3.5880	2.2115	1.3273	0.8959	0.7485	0.7918	0.7973
27	1.4245	1.2716	1.1895	1.1214	5.8763	3.5193	2.1539	1.2933	0.8700	0.7286	0.7975	0.7939
28	1.4186	1.2646	1.1825	1.1106	5.8151	3.4378	2.1645	1.3615	0.8395	0.7339	0.8004	0.7908
29	1.4189		1.1806	1.1107	5.6912	3.3529	2.2575	1.3666	0.8136	0.7416	0.8288	0.7830
30	1.4190		1.1799	1.1024	5.6181	3.3074	2.1638	1.3186	0.7964	0.7398	0.8296	0.7779
31	1.4175		1.1799		5.4508		2.1291	1.2762		0.7440		0.7732

4.11 FAY SHAFT

The Fay Shaft is equipped with a stage data logger suspended from the cap over the shaft. The data logger was installed in May 2013. Water depth measurement equipment was not available during either monitoring program so the water level is reported relative to the data logger. Figure 21 presents the recorded water level in the Fay Shaft as water level above the sensor.

Figure 21: Fay Shaft 2013 Recorded Water Level



5 SUMMARY AND RECOMMENDATIONS

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

Climate records for Uranium City indicate that some precipitation records may be missing in the data set. This is a common occurrence for this climate station.

Stream discharge measurements recorded high flow values at similar peaks to those observed in 2012 by McElhanney.

McElhanney suggests the following recommendations for future monitoring:

- A new mounting system must be installed for the staff gauge at AC-8;
- Measurements of discharge at TL-7 should be continued to improve the prediction of TL-7 flows from another station; and,

- Water depth measurements should be recorded at the Fay Shaft.

6 CLOSURE

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

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APPENDIX C

APPENDIX C

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1.0 INTRODUCTION

In July 2013 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 2013 inspection of the Fookes tailings delta and the outlet structures at Marie and Fookes reservoirs represent the third year of internal inspections, with a formal inspection, by a qualified engineer scheduled for 2015.

With respect to the outlet spillway structures the specific elements evaluated 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 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 17 - 18, 2013 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 in general appeared to be higher than in past years. This observation is supported by the hydrology assessment, which shows the flow from the tailings management area during the period of inspection was approximately 3X higher than during the 2012 regulatory inspection.

The channels appeared to be stable and all flow was contained within the rip-rapped channel.

As the inspection occurred later in the year than previous inspection substantially more vegetation growth is present, making it difficult to compare photographic records from previous years.

2.2 Inspection Checklist

- 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 18, 2013 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

There is no evidence that water has overtopped the rip-rap in this area. Photographic evidence comparing the 2012 inspection to the 2013 inspection show the loose stones on the frost-heaved block of grout intruded rip-rap in Figure 3 have not moved from year to year and the birch tree in the channel is in the same location as during the 2012 inspection.

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 July17, 2012 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

Of note, when photos taken during the 2012 inspection are compared to the 2013 inspection photos, the debris in the channel of the spillway is in exactly the same position. As a result Cameco has concluded that no overtopping of the rip-rap has occurred and that no erosion of the channel has occurred.

3.0 TAILINGS DELTA

3.1 General Observations

After a period of drought which saw water levels in Fookes Reservoir drop in 2011, water levels have returned to a normal level for the past two years. 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, although historic tire tracks on the delta remain. Although vegetation on the delta remains sparse over much of the area it is well established within 50 m of the Fookes Reservoir shoreline, and the engineered drainage structures. Photos 7 and 8 show the vegetation growth on the cover near the shoreline.

Photo 6 – Vegetation on the Fookes delta (looking SE)

Photo 7 – Vegetation on the Fookes delta (looking south)

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

No new tailings boils were noted on the cover.

3.2.2 Check for evidence of significant erosion of the cover material

In general the sand cover was in good condition and showed no signs of excessive erosion. As mentioned previously Fookes Reservoir water levels have been normal for the past two years after a period of drought in 2010 and 2011. Photo 8 shows 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 2012 or 2013, 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.

A drainage trench is located along the east side of the Fookes delta to channel surface water runoff during heavy precipitation events and spring freshet. It was noted in previous inspections that sand has flowed along the base of the drainage trench that has a rock-fill base. 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. There were no new sand flows identified in the drainage trench during the 2013 inspection. Photo 9 shows the vegetation growth in and around the drainage trench.

Photo 9 – Vegetation growth in the drainage trench on the Fookes delta (along the tree-line looking SW)

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

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

During the 2011 inspection it was noted that vehicles were accessing the Fookes delta via the west access road from Marie Reservoir. Following the 2011 inspection an additional earthen berm was placed on the west access road to prevent vehicles from entering the Fookes delta area. This berm was inspected during the 2012 inspection and found to be in good condition with no evidence that vehicles are by-passing the berm.

At the north access point the potential exists for truck to by-pass the earthen berm; however the road access is filled with chevrons, as discussed previously, making access at this point difficult. There was no evidence of fresh vehicle tracks in this area.

During the 2012 inspection it was discovered that the east access berm had been compromised and vehicles had gained access to the delta from this point. Following the inspection in 2012 the east berm was repaired and reinforced. This berm was inspected as part of the 2013 regulatory inspection and found to be in good condition, with no evidence that people had gained vehicular access to the delta. Photo 12 shows the repaired berm located on the east side of the Fookes Delta.

Photo 12 – East berm (looking west) repaired to prevent vehicular traffic

3.3 References

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

Cameco Corporation

2013 Borehole Remediation Activities Report

Prepared by Jacqui Spence
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February 11, 2014

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1.0 Introduction

Uranium bearing minerals were first discovered in the Beaverlodge Lake area of northern Saskatchewan in 1934. Between 1944 and 1948 Eldorado Mining and Refining Ltd. (Eldorado) conducted several exploration activities in the areas surrounding Beaverlodge Lake. These activities led to the discovery of several ore bodies in the area. During the operation phase of the Beaverlodge mine/mill, further exploration drilling and mine development to the northeast of Beaverlodge was a main focus. Production took place in the area from 1952 to the eventual ceasing of mine activities on June 25th, 1982 and the discontinuation of milling processes in August 1982. At this point Eldorado began decommissioning work and by 1985, decommissioning and reclamation work was completed and thus initiated the transition phase monitoring which continues today.

Monitoring activities and investigations continue to ensure properties and surrounding areas are not only stable environments but physically safe for inhabitants of the region. As well, Cameco strives for the eventual return of all Beaverlodge properties to Institutional Control (IC) program administered by the Government of Saskatchewan.

2.0 Background

With the future intentions to transfer the Beaverlodge properties into the provincial institutional control (IC) program, Cameco explored various remedial options in the development of the Beaverlodge Path Forward report. Several remedial options were identified and evaluated on a risk based approach, in which those properties posing higher risks to the local environmental and human receptors would take precedence in the selection of remedial options to mitigate those risks identified. Viability of each option was considered with respect to the expected magnitude of environmental improvement and the cost of implementation. The results of extensive consultation with regulatory agencies and stakeholders were also considered when assessing the remedial options that were presented in the Path Forward report.

One of the selected remedial options was the plugging of flowing and non-flowing boreholes identified on the Beaverlodge properties in order to eliminate to the maximum extent possible the potential for water to flow from underground mine workings to the surface.

2.1 Flowing Borehole Remediation

Details of the flowing borehole monitoring and reconnaissance efforts over the 2008-2012 period are provided in the *2009 Flowing Borehole and Seep Investigation* (Golder 2010c), the *2010 Flowing Borehole and Seep Investigation* (Golder 2011c), the *2011 Flowing Borehole and Seep Investigation* (Golder 2011e) and the *Flowing Drill Hole Investigation Beaverlodge Properties* (SRK 2011).

In 2011 and 2012 a program was implemented to plug 15 boreholes observed to exhibit, or have potential to exhibit, flow of groundwater associated with flooded underground mine workings under artesian conditions; nine located in an area north of Lower Ace Creek which drains to Beaverlodge Lake and six situated in and near the southwest shoreline of Dubyna Lake (SENES, 2013).

Specific details from the 2011 and 2012 borehole remediation programs can be found in the *Beaverlodge Borehole Decommissioning* (MDH 2011) and *Second Phase Field Program: Beaverlodge Borehole Decommissioning* (MDH 2012) reports.

After the 2012 field work, MDH (2012) concluded that all flowing borehole locations could be considered adequately remediated, as no flow was observed at the surface once remediation activities were completed. Recommendations were made to conduct annual visual inspections of the remediated boreholes for up to five years to ensure that remediated boreholes remain adequately plugged.

2.2 Non Flowing Borehole Remediation

SRK Consulting's (SRK) 2011report provided the coordinates and conditions for exploration boreholes located on and near the boundaries of the Beaverlodge properties. This report was the product of an extensive search of provincial government records and ground- truthing which took place the preceding year on the relevant properties identified in the Surface Lease Agreement issued by the Province of Saskatchewan.

The non-flowing boreholes identified in the SRK report were dispersed amongst several of the Beaverlodge properties. Although it was not the original intention to seal the non-flowing boreholes, it was identified by stakeholders as a potential concern and therefore added to the Path Forward for Beaverlodge for remediation. 14 of the boreholes were situated on the “Ace MC” property, within 250 m of the southwest shoreline of Ace Lake, as seen in Figure 4.1. The SRK report identified 26 boreholes in the Dubyna area; six of which were remediated in previous borehole closure activities by MDH in 2011 and 2012. The remainder were distributed between two locations, the first in “EMAR 1” in which the flowing boreholes were located within 200m southwest of the shoreline of Dubyna Lake, identified in Figure 4.2–1; and the others were located south of the far east end of Donaldson Lake, as seen in Figure 4.2–2 . 28 boreholes were identified in the Hab area of the “MSL 217” property; three in which are clustered just north of Pistol Lake, two were east of the waste rock pile between Pistol Lake and Beatrice Lake, four west of Beatrice Lake, as shown in Figure 4.3–1; and 11 north of Beatrice Lake, as seen in Figure 4.3–2. Six of the boreholes identified in the SRK report were recently drilled by a uranium exploration company adjacent to the Hab property and are not the responsibility of Cameco. Two holes were identified on the shore of Up Lake in the “Ace 8” property of the Verna/Bolger area (Figure 4.4). One borehole was identified in the SRK report at the Martin Adit area in the “MSL 7” property near the northwest shoreline of Beaverlodge Lake, as seen in Figure 4.5.

In the fall of 2013, Cameco contracted Uranium City Contractors (UCC), who had conducted the flowing borehole remediation activities, to seal the remaining non-flowing boreholes listed in SRK’s Flowing Drill Hole Investigation: Beaverlodge Properties (SRK, 2011). This report presents the results of the reclamation activities completed on these boreholes.

3.0 Methodology

3.1 Borehole Remediation

Field work was conducted on the Beaverlodge properties in the fall of 2013 by UCC. Upon site investigation, during remediation of identified boreholes, UCC found a number of additional non-flowing boreholes at several of the properties that were not identified in the 2011 drilling records search. These included AC 02 at “Ace MC”; DB 26 and DB 27 at Dubyna; and 8 in the Hab area (Hab 29 through 36).

The proposed methodology for remediation was to install a plug at the 30m level or until the end of the hole was reached, then filling the hole with a grout mixture comprised of approximate 96% to 4% cement/bentonite (by weight). A skid mounted grouting system was used to grout the boreholes. The grouting system consists of a piston pump, a 13 HP Honda gas powered engine, a 60 gallon steel drum, a 38 gallon pumping hopper, one 25 ft x 1.25 inch suction hose, and one 25 ft x 1 inch discharge hose connected to a 152 ft x 1 inch flexible PVC hose. Two 1,000 L water tanks were used for mixing grout and cleaning the grouting system after each use.

In cases where obstruction of the hole was encountered at less than 30 m, the entire borehole was filled to the point of the obstruction.

4.0 Results

The following section discusses the project as completed.

4.1 Ace MC Boreholes

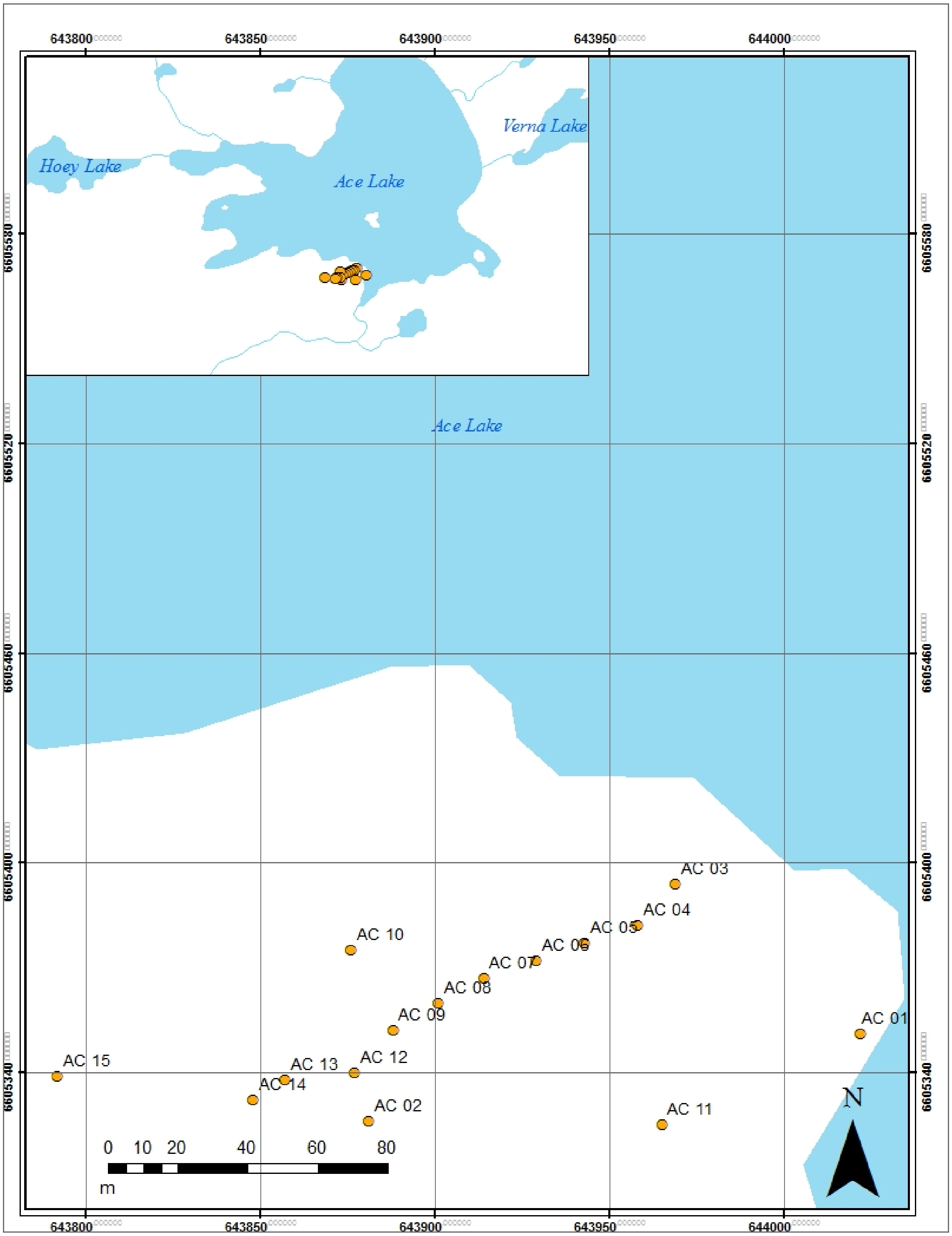
Table 4.1 summarizes the results of the remediation activities for 15 boreholes located southwest of Ace Lake.

Table 4.1 Location and remediation summary of Ace MC boreholes

Location Name	WGS 84 Coordinates		Status	Remediated
	Latitude	Longitude		
AC 01	59.561592	-108.4511606	Non-flowing	2013
AC 02	59.561416	-108.4536700	Non-flowing	2013
AC 03	59.561996	-108.4520683	Non-flowing	2013
AC 04	59.561892	-108.4522709	Non-flowing	2013
AC 05	59.561852	-108.4525395	Non-flowing	2013
AC 06	59.561812	-108.4527903	Non-flowing	2013
AC 07	59.561773	-108.4530589	Non-flowing	2013
AC 08	59.56714	-108.4532934	Non-flowing	2013
AC 09	59.561647	-108.4535286	Non-flowing	2013
AC 10	59.561857	-108.4537252	Non-flowing	2013
AC 11	59.561378	-108.4521858	Non-flowing	2013
AC 12	59.561543	-108.4537312	Non-flowing	2013
AC 13	59.561532	-108.4540861	Non-flowing	2013
AC 14	59.561481	-108.4542493	Non-flowing	2013
AC 15	59.561563	-108.4552345	Non-flowing	2013

All of the Ace MC non-flowing boreholes were successfully remediated as planned during the 2013 borehole remediation activities. Figure 4.1 presents the relative geographic location of the remediated Ace MC boreholes.

Figure 4.1 Geographic Locations of Ace MC boreholes



4.2 Dubyna Boreholes

Table 4.2 summarizes the results of the remediation activities for 22 non-flowing boreholes and the six previously remediated flowing boreholes at the Dubyna site.

Table 4.2 Location and remediation summary of Dubyna site boreholes

Location Name	WGS 84 Coordinates		Status	Remediated
	Latitude	Longitude		
DB 01	59.587090	-108.3775301	Non-flowing	could not be located/ not remediated
DB 02	59.587699	-108.3783331	Flowing	2011
DB 03	59.587829	-108.3785179	Flowing	2012
DB 04	59.587829	-108.3785356	Non-flowing	2013
DB 05	59.5869	-108.3774563	Non-flowing	2013
DB 06	59.587094	-108.377707	Non-flowing	could not be located/ not remediated
DB 07	59.58669	-108.3777208	Non-flowing	2013
DB 08	59.586883	-108.3779360	Non-flowing	2013
DB 09	59.587966	-108.3786136	Non-flowing	2011
DB 10	59.587544	-108.3800106	Non-flowing	2013
DB 11	59.587345	-108.3803982	Non-flowing	2013
DB 12	59.587354	-108.3803798	Non-flowing	2013
DB 13	59.587133	-108.3801312	Non-flowing	2013
DB 13A	59.587478	-108.3798386	Non-flowing	2013
DB 14	59.586857	-108.3797983	Flowing	2011
DB 15	59.58676	-108.3803374	Non-flowing	2013
DB 16	59.587778	-108.3786636	Flowing	2012
DB 17	59.585538	-108.3910977	Non-flowing	2013
DB 18	59.585507	-108.3913482	Non-flowing	2013
DB 19	59.585552	-108.3913801	Non-flowing	2013
DB 20	59.585544	-108.3914338	Non-flowing	2013
DB 21	59.585527	-108.3914706	Non-flowing	2013
DB 22	59.5856	-108.3915358	Non-flowing	2013
DB 23	59.585529	-108.3915944	Non-flowing	2013
DB 24	59.585747	-108.3903551	Non-flowing	2013
DB 25	59.588079	-108.3784276	Flowing	2011
DB 26	59.585901	-108.3899357	Non-flowing	2013
DB 27	59.585809	-108.3898542	Non-flowing	2013

All boreholes identified in the 2011 SRK report were successfully remediated between the 2011 to 2013 borehole reclamation activities at the Dubyna site, with the exception of DB-01 and DB-06. Both boreholes are in an area that is not expected to see flowing conditions, therefore the risk posed by leaving them is minimal. While performing reclamation activities UCC located two additional boreholes not identified in the SRK report. The boreholes did not appear to have any signs of past flowing characteristics, and were located approximately 30 m north east of DB-24 and south of south east shoreline of Donaldson Lake. Upon receiving authorization from Cameco, UCC successfully remediated these boreholes, DB-26 and DB-27.

Figure 4.2–1 and Figure 4.2–2 present the relative geographic location of all boreholes in the Dubyna area. The holes that have been remediated are identified in orange and the holes that were not able to be located are identified in purple.

Figure 4.2 – 1 Geographic Locations of Dubyna Lake boreholes

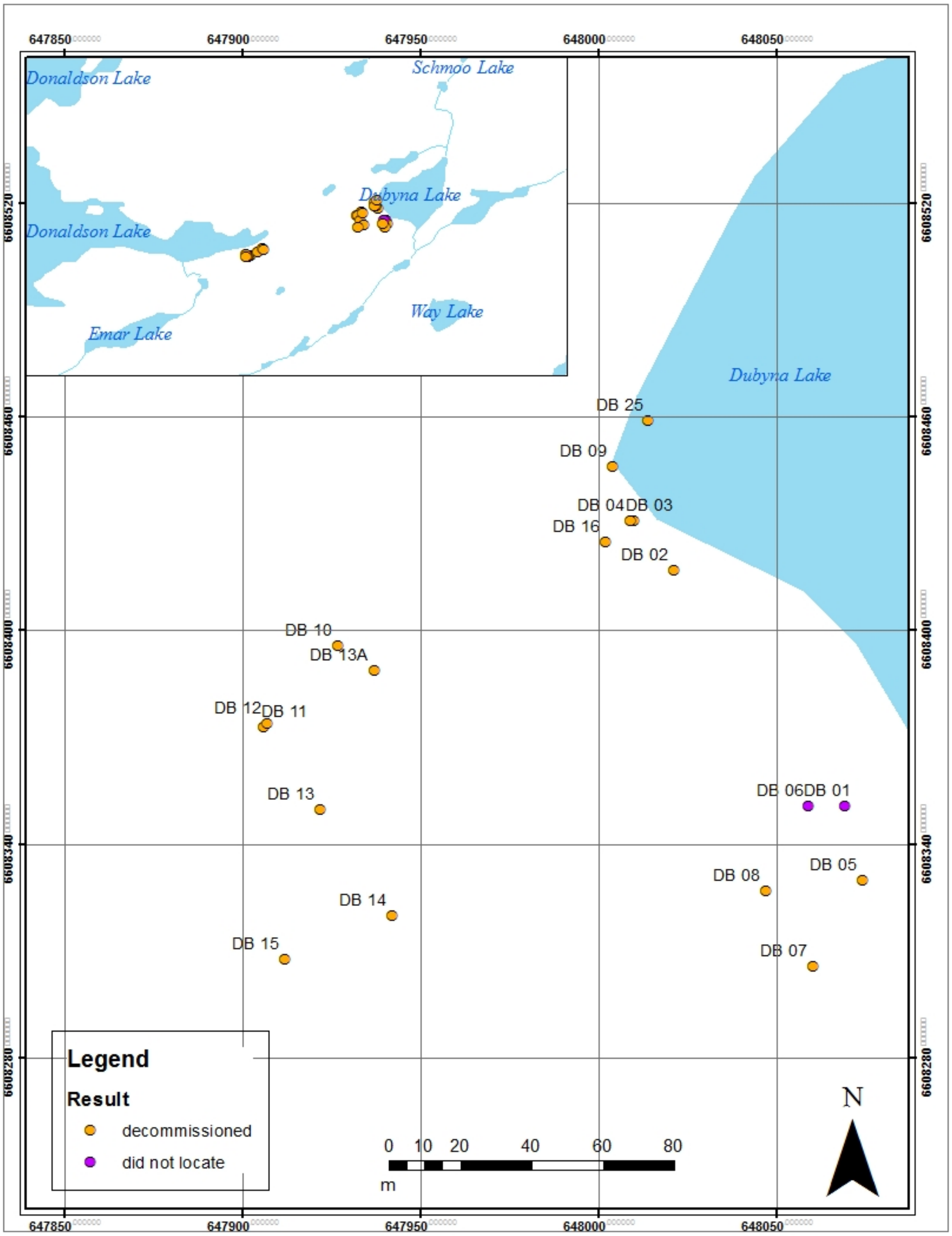
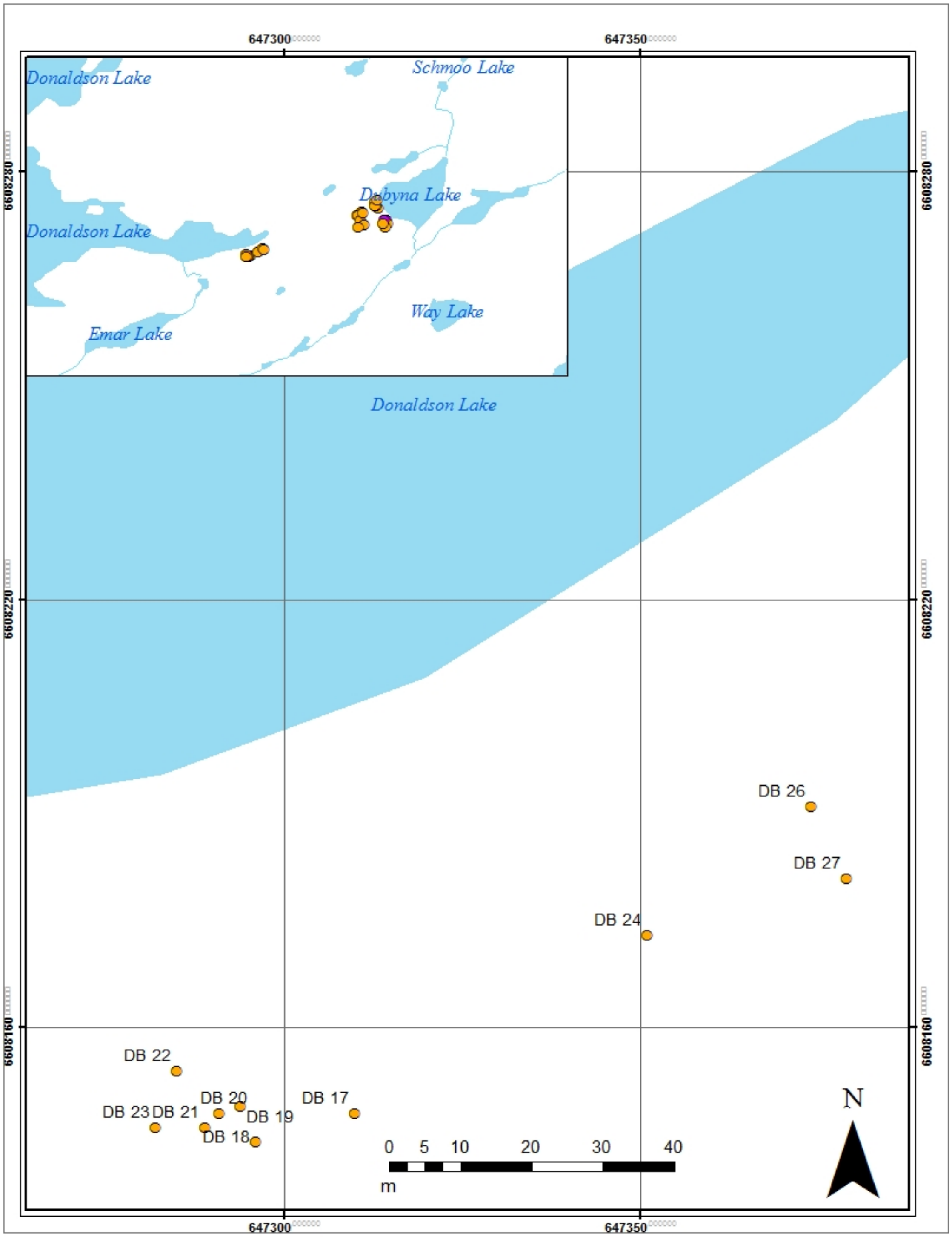


Figure 4.2 – 2 Geographic Locations of Donaldson Lake boreholes



4.3 Hab Site Boreholes

Table 4.3 summarizes the results of the remediation activities for 30 non-flowing boreholes, in addition there were 6 boreholes found near the Hab site property were determined to be exploration drill holes drilled prior to 2011.

Table 4.3 Location and remediation summary of Hab site boreholes

Location Name	WGS 84 Coordinates		Status	Remediated
	Latitude	Longitude		
HAB 01	59.625663	-108.4197695	Non-Flowing	2013
HAB 02	59.62574	-108.4195331	Non-Flowing	2013
HAB 03	59.625792	-108.4190146	Non-Flowing	2013
HAB 04	59.625829	-108.4190296	Non-Flowing	2013
HAB 05	59.625959	-108.4188244	Non-Flowing	2013
HAB 06	59.626041	-108.419776	Non-Flowing	2013
HAB 07	59.627351	-108.4201366	Non-Flowing	2013
HAB 08	59.627294	-108.4204425	Non-Flowing	2013
HAB 09	59.627299	-108.4207082	Non-Flowing	2013
HAB 10	59.627277	-108.4209582	Non-Flowing	2013
HAB 11	59.627301	-108.4212402	Non-Flowing	2013
HAB 12	59.62347	-108.4197072	Non-Flowing	2013
HAB 13	59.622591	-108.4211404	Non-Flowing	2013
HAB 14	59.622239	-108.4256189	Non-Flowing	2013
HAB 15	59.622004	-108.4260448	Non-Flowing	2013
HAB 16	59.622492	-108.425706	Non-Flowing	2013
HAB 17	59.623761	-108.4249171	Non-Flowing	2013
HAB 18	59.62385	-108.4243959	Non-Flowing	2013
HAB 19	59.62385	-108.4243959	Non-Flowing	2013
HAB 20*	59.623875	-108.4247665	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 21*	59.62358	-108.4252857	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 22*	59.623673	-108.4254559	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 23	59.623667	-108.4256337	Non-Flowing	2013
HAB 24*	59.623349	-108.4263498	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 25*	59.623273	-108.4256816	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 26*	59.623839	-108.4256738	Non-Flowing	Recent exploration drill hole/ not remediated
HAB 27	59.6239	-108.4255627	Non-Flowing	2013
HAB 28	59.62412	-108.4248719	Non-Flowing	2013
HAB 29	59.622523	-108.4258987	Non-Flowing	2013
HAB 30	59.622331	-108.425736	Non-Flowing	2013
HAB 31	59.622289	-108.4258811	Non-Flowing	2013

HAB 32	59.622289	-108.4258811	Non-Flowing	2013
HAB 33	59.622335	-108.4259485	Non-Flowing	2013
HAB 34	59.623824	-108.4258168	Non-Flowing	2013
HAB 35	59.623703	-108.4260921	Non-Flowing	2013
HAB 36	59.62355	-108.4265295	Non-Flowing	2013

*Note: “new” exploration drilling locations

All Eldorado related boreholes identified in the 2011 SRK report were remediated successfully during the 2013 borehole remediation activities at the Hab site. Furthermore, UCC located eight additional boreholes in the area that were also sealed (Hab 29 – Hab 36), as per direction provided by Cameco. It was noted that the additional boreholes did not appear to have any signs of past flowing characteristics. Hab 20, Hab 21, Hab 22, Hab 24, Hab 25, and Hab 26 were identified by SRK to be new exploration drill holes that were drilled prior to the 2011 investigation. The exploration boreholes were not sealed as they are not the responsibility of Cameco and may provide future use to the responsible party.

Figure 4.3–1 and Figure 4.3–2 present the relative geographic location of all remediated boreholes and the new exploration drill holes at the Hab site north of Pistol Lake and west of Beatrice Lake, and those north and south of Beatrice Lake respectively.

Figure 4.3 – 1 Geographic Locations of Pistol Lake area boreholes

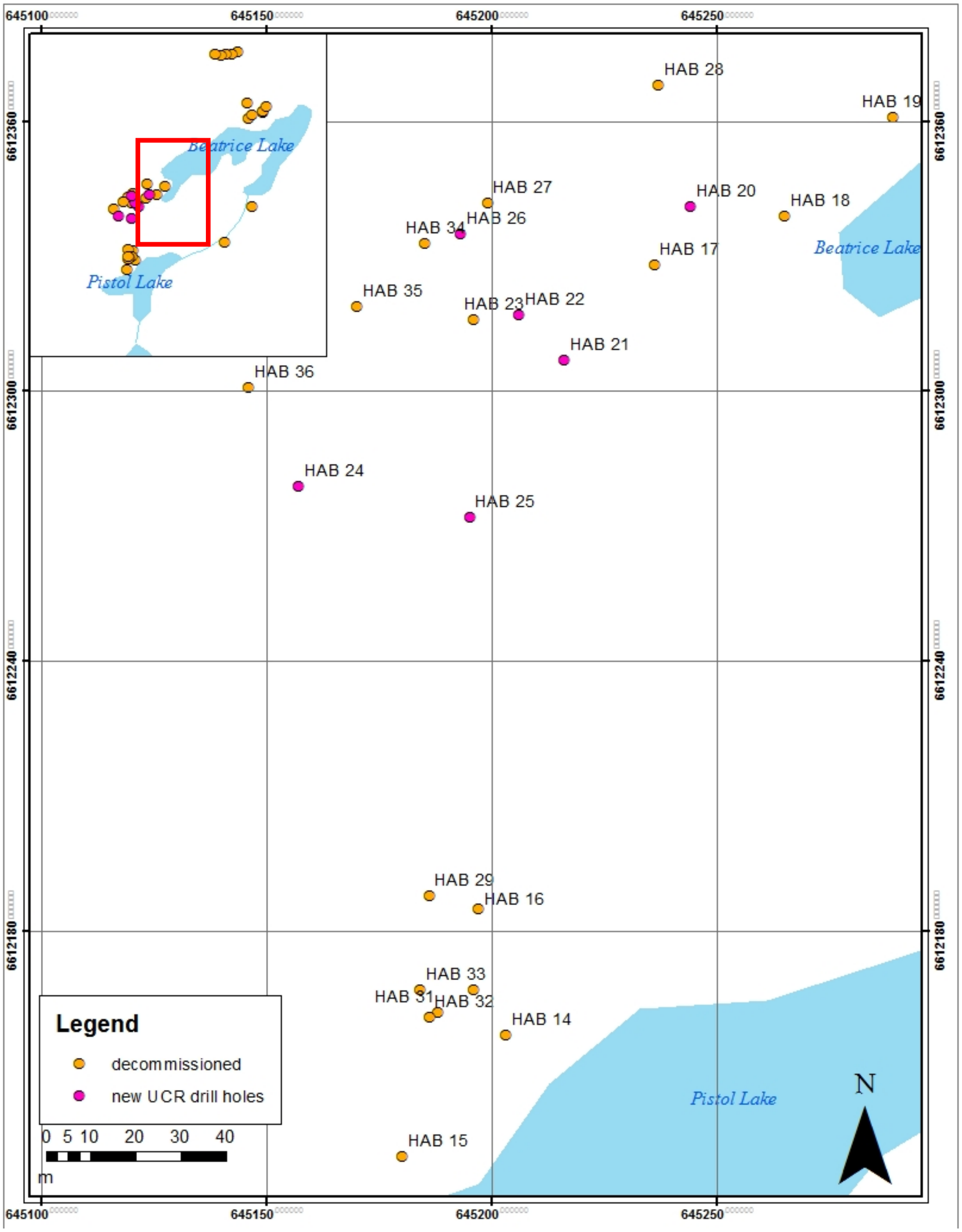
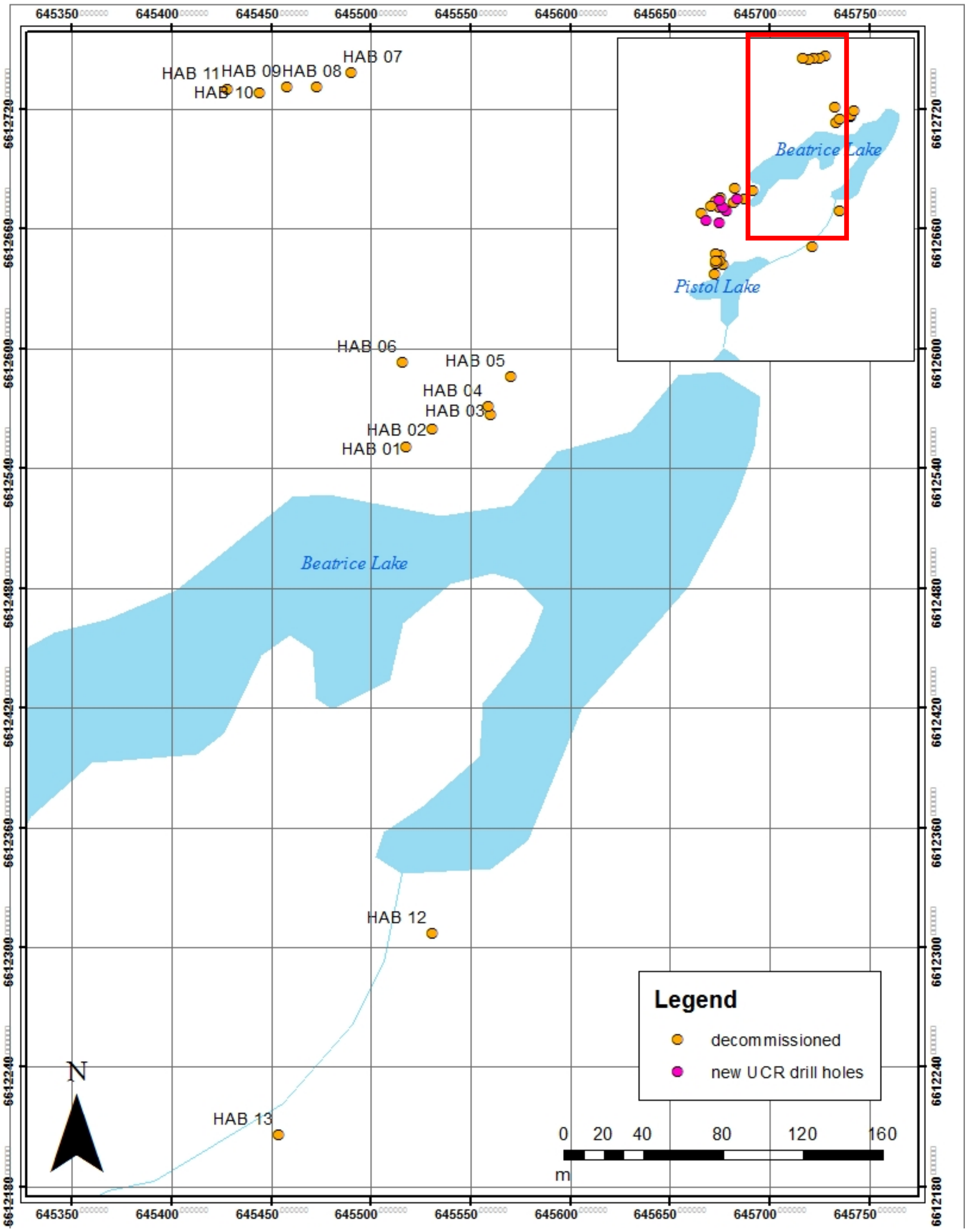


Figure 4.3 – 2 Geographic Locations of Beatrice Lake area boreholes



4.4 Verna/ Bolger area Boreholes

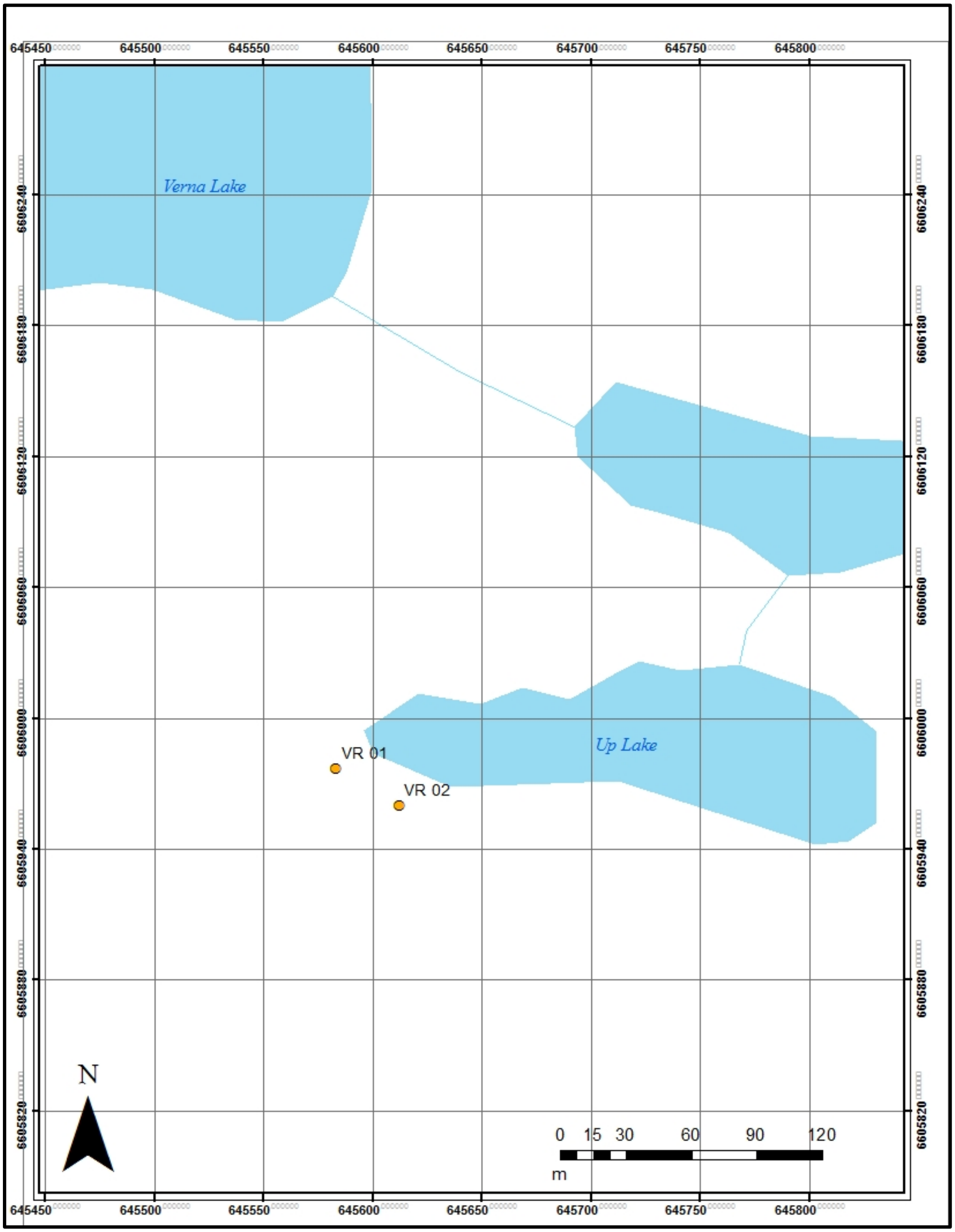
Table 4.4 summarizes the results of the remediation activities for two non-flowing boreholes located near the southwest shoreline of Up Lake in the Verna/ Bolger area of the Beaverlodge properties.

Table 4.4 Location and remediation summary of Verna/ Bolger boreholes

Location Name	WGS 84 Coordinates		Status	Remediated
	Latitude	Longitude		
VR 01	59.566667	-108.4231376	Non-Flowing	2013
VR 02	59.566505	-108.4226365	Non-Flowing	2013

Both of the Verna/ Bolger boreholes were successfully remediated as planned in the 2013 remediation activities. Figure 4.4 presents the relative geographic location of the boreholes near Up Lake.

Figure 4.4 Geographic Locations of Verna/ Bolger boreholes



4.5 Martin Lake Adit Boreholes

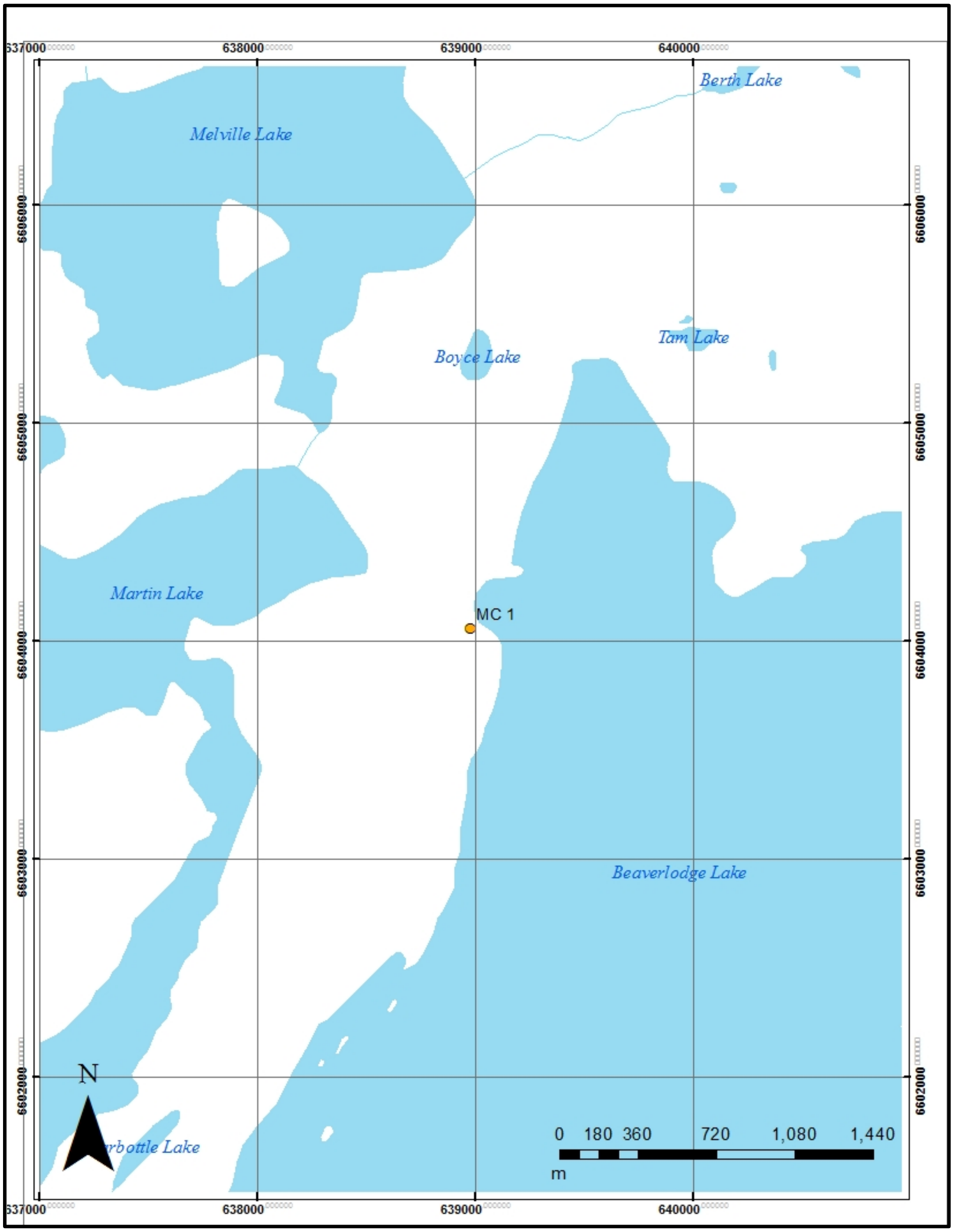
Table 4.5 summarizes the results of the remediation activities for the non-flowing borehole located near the northwest shoreline of Beaverlodge Lake in the Martin Lake Adit area of the Beaverlodge properties.

Table 4.5 Location and remediation summary of Martin Lake Adit borehole

Location Name	WGS 84 Coordinates		Status	Remediated
	Easting	Northing		
MC 1	59.55168	-108.5411597	Non-Flowing	2013

The borehole located in the Martin Lake adit area of the Beaverlodge properties was successfully remediated as planned during the 2013 borehole remediation activities. Figure 4.5 presents the relative geographic location of the borehole near the northwest shoreline of Beaverlodge Lake.

Figure 4.5 Geographic Location of the Martin Lake adit borehole



5.0 Summary

The borehole reclamation activities that took place in 2013 resulted in the successful reclamation and tagging of 59 identified non-flowing boreholes on the Beaverlodge properties with reference to the 2011 SRK borehole investigation. Two boreholes, which had previously been identified in the Dubyna area, could not be located at the time of remediation activities. The two boreholes are in an area that is not expected to see flowing conditions, and therefore the risk posed by leaving them is minimal. However, if during final preparatory activities, additional boreholes are identified they will be tagged and sealed. The six exploration drill holes identified by SRK in the Hab area will remain unplugged as they are not the responsibility of Cameco and plugging them may hinder the future use of them by the exploration companies. The additional boreholes identified by UCC: AC-02, DB-26, DB-27, and Hab 29 – 36 were all successfully plugged using the same strategy as that utilized to plug the flowing boreholes in 2011 and 2012. The final total of all plugged boreholes as a result of the reclamation activities in 2013 was 68.

6.0 References

Golder Associates (Golder) 2011e. *Result of Packed Borehole and Seep Monitoring Near the Former Eldorado Mill.* (2011 Flowing Borehole and Seep Investigation). Technical Memorandum. December 22.

Golder Associates (Golder) 2010c. *Results of the Investigation into the Remediation of Flowing Boreholes Near the Ace/Fay Shaft and Mill Complex at the Decommissioned Beaverlodge Mine* (2009 Flowing Borehole and Seep Investigation). February 8.

Golder Associates (Golder) 2011c. *Results of Packed Borehole and Seep Monitoring Near the Former Eldorado Mill (2010 Flowing Borehole and Seep Investigation).* January 28.

MDH Engineered Solutions Corp., 2011. Beaverlodge Borehole Decommissioning. Reference Number 2923-190011. November.

MDH Engineered Solutions Corp., 2012. Second Phase Field Program: Beaverlodge Borehole Decommissioning. Reference Number 3220-190011. August

SRK Consulting. 2011. Flowing Drill Hole Investigation – Beaverlodge Properties. Reference Number 46C008.031. February.

SENES Consultants. 2013. Beaverlodge Mine Site Status of the Environment 2008-2012. Reference Number 350737-001. December.

APPENDIX A

Permits

Government of Saskatchewan

Ministry of Environment
P.O. Box 3003
PRINCE ALBERT, SK
S6V 6G1
Tel: 306-953-3669
Fax: 306-953-2502
george.bihun@gov.sk.ca

August 28, 2013

PERMIT CONDITIONS FOR URANIUM CITY CONTRACTING'S BEAVERLODGE MINE SITE DRILL HOLE RECLAMATION PROJECT FOR CAMECO AQUATIC HABITAT PROTECTION PERMIT AND FOREST PRODUCT PERMIT #00451

Under authority of The Environmental Management Protection Act (EMPA) 2002, Section 36(1) The Water Regulations, 2002, Sections 8 and 9, The Forest Resources Management Act and The Provincial Lands Act and Regulations, permission is hereby granted to Uranium City Contracting to construct access trails into abandoned drill holes on the Beaverlodge mine property to seal the open drill holes and reclaim the sites.

The proponent is to contact either Brendon Smith or Stephen Dow at Stony Rapids, Saskatchewan, Ministry of Environment office 306-439-2062 or fax a notice to 306-439-2036 or email Brendon.Smith@gov.sk.ca or Stephen.Dow@gov.sk.ca prior to work commencing and immediately upon completion.

This permit is issued subject to and restricted to the following conditions:

1) All contractors working on this project must be given a copy of this permit to ensure all conditions are met.

2) This permit does not replace or super cede any approvals, licenses or authorizations, which may be required from municipal, provincial or federal legislation. The permit holder will maintain in force all such approvals, licenses or authorizations that may be required.

3) Prior to entry of equipment on forested Crown land, all equipment must be washed and clear of any non-indigenous plants or seeds.

4) All refuse is to be removed to a licensed landfill site with the exception of hazardous waste, which must be handled according to the appropriate Regulations. Refuse must not be buried or burned on site. Proponent must first have obtained the designated landfill owners permission (and pay any associated tipping fees) before hauling waste to that location.

5) The proponent must ensure that upon abandonment of any site (camp, helicopter pad, drill pad, etc,) all man made items are removed and disposed of properly. This includes but is not limited to flagging tape, nails and dimensional lumber. Haul out what you hauled in.

6) All structures (drill pipe racks, benches, drill supports, etc.) must be dismantled and any man made material (nails, wire, rope, etc.) must be removed and disposed of properly. All non-man made material is to be spread evenly over the site.

7) Upon completion of sealing drill holes, all associated project materials including petroleum products shall be cleaned up and removed from the site.

8) All spoiled materials resulting from construction activities must be placed in a location where it will not be subject to erosion into any water body or watercourse.

9) The Proponent must ensure that all drill muds and additives used for sealing drill holes will not have an adverse effect on the environment. *"Adverse effect"* as defined in section 2(a) of the *Environmental Management and Protection Act, 2002.*

10) All activities are to occur during dry or frozen ground conditions. During overly wet conditions, work must be stopped for any activity that could potentially cause undue rutting of the ground surface (other than permanent roadways). Rutting is defined as an area 5 meters in length and greater than 15 cm in depth.

11) Within bogs, muskegs or possible wet areas, the ground must be frozen enough to support equipment. If frozen ground conditions do not exist, alternate **approved** methods must be used to prohibit rutting of the ground surface (i.e. timber matting, planks, etc.).

12) No debris is to be deposited in any water body or watercourse or on the ice of any frozen water body or watercourse. Any debris accidentally deposited is to be removed immediately.

13) All trails within 30 meters of any water body or water course will be hand cut and the approach to any water body or water course will be doglegged. Maximum width of trails within 30 meters of any water body or water course is 4.5 meters. Existing access points must be used whenever possible.

14) When accessing work sites, woody species and top soils are to be stripped off the site and piled separately for later site reclamation. Where possible, stripping shall be limited to the area where the drill hole is located. Alternative methods of leveling equipment on site for sealing drill holes should be considered in lieu of soil stripping (i.e. snow/ice fill, hydraulic jacks, blocking, etc.).

15) When constructing any new roads or trails the proponent must ensure that they are constructed by windrowing all material to one side. The windrow area must first be constructed by flattening all material in the intended windrow area. Do not push any material into standing timber or damage any standing timber. After the project is complete these areas must be closed off by rolling back 100% of the material onto the road or trail.

16) If any existing trails are modified or widened they must be restored to their original width during reclamation.

17) Any new roads or trails can only be constructed to a maximum width of 5 meters (excluding the windrow area) unless otherwise approved. This also includes the modification of any existing roads or trails.

18) Once work is complete sites/roadways must be re-contoured, topsoil is to be re-spread, and woody species are to be rolled back and spread on the sites/roadways/drill fluid sumps. The site will be allowed to naturally regenerate. If supplemental planting is required, approval for seeding and/or tree planting is required prior to completing any reclamation work. Contact Dale Kristoff at 953-2484.

19) Where the access trail crosses existing trails, those trails are not to be blocked.

20) Any existing road closures that were opened to conduct this program must be closed in the same manner at program's conclusion unless previously authorized by Saskatchewan Ministry of Environment. The road closure may remain open only when there is active reclamation activities behind the closure, unless otherwise approved by Saskatchewan Ministry of Environment.

21) Weather permitting; all reclamation work is to be completed within 30 days of completion of this project.

22) Wherever possible, existing roads and trails shall be used to access sites and water withdrawal sites to limit unnecessary clearing of additional vegetation and prevent soil compaction.

23) Until re-vegetation is sufficient to control sediment erosion, the proponent shall ensure that effective sediment and erosion control measures are in place and that they are functioning properly and are maintained and/or upgraded as required to prevent sediment from entering the water body or water course.

24) All stationary fuel tanks, pumps, motors and hydraulic lines must have secondary containment, (E.g. If a pump is used to pump water, the pump and it's fuel supply must be placed in a container that is capable of holding 110% of the pump fuels and oils).

25) A spill kit must be on site during operations and all members of the drill crew must be properly trained in the operation of the spill kits.

26) **All** spills of hazardous substances or waste dangerous goods are to be reported to Dale Kristoff, Ministry of Environment at 953-2484 (for the amounts below the thresholds identified in the *Environmental Spill Control Regulations* reporting may be in table form in the Closure Report). All spills meeting or exceeding the quantities specified in the

27) *Environmental Spill Control Regulations* must be reported and handled according to the regulations.

28) All fuels, oils, lubricants and other petroleum-based products must be stored on or in secondary containment. If the storage system consists of a single storage tank the secondary containment must be capable of holding at least 110% of the storage tanks volume. If the storage system consists of more than one storage tank, the secondary containment must be capable of holding 100% of the largest storage tank and 10% of the aggregate capacity of all other storage tanks.

29) All fuels, oils, lubricants and other petroleum-based products must be stored at least 100 meters from any water body or watercourse.

30) All Hazardous Substances and Waste Dangerous Goods (HWSDG) such as used oils, used oil containers; fuel filters and HAZMAT padding must also be stored on or in secondary containment until proper disposal occurs. Spill kits and or spill/drip trays must be utilized on site whenever these products are stored or utilized.

31) The cleaning, fueling and servicing of equipment shall be conducted at least 100 meters from any water body or watercourse and in an area from which spills or wash water will not enter a water body or watercourse. Absorbent matting or drip trays must be used where accidental spills may occur during fueling. Contaminated material must be removed from the site for proper disposal immediately after cleanup has been completed.

32) Equipment operating near any watercourse shall be properly maintained, in sound mechanical condition and free of any fuel, oil, hydraulic fluid or coolant leaks.

33) Any program requiring water for drilling (except water from municipal or private sources) requires approval from the Saskatchewan Watershed Authority, Saskatchewan Environment and Fisheries and Oceans Canada.

34) Forest operations are to be conducted as per the *Forest Resources Management Act* and the *Forest Resources Management Regulations* unless otherwise stated.

35) Within 30 days of the date these permits expire or completion of this project, the proponent must complete and submit a Closure Report along with the completed Forest Product Permit. The outline for a Closure report can be found in the Saskatchewan Mineral Exploration Guidelines.

36) No material is to be pushed into standing timber. All leaning trees are to be removed from standing timber. All trees not salvaged are to be utilized in the reclamation of access trails, drill pads and any other disturbances.

37) No burning is permitted within the Provincial Forest or within 4.5 km of the Provincial Forest unless otherwise approved by Saskatchewan Ministry of Environment.

38) When working, from April 1 to October 31, within the Provincial Forest or within 4.5 km of the Provincial Forest, the drill crew must have fire-fighting equipment on hand, as list below. All fire-fighting equipment must be in good working order, readily available and the water packs must be full of water.

Tools	Up to 5 people	6 to 10 people	11-20 people
Axes	1	1	2
Pulaski tool (axe/grub hoe combination)	2	4	8
Pails	2	4	8
Shovels	2	4	8
Water Packs & Pumps	1	2	4

39) When working, from April 1 to October 31, within the Provincial Forest the proponent must complete and submit a Summer Exploration Camp Location form and contact the local Fire Base when working in their area. A copy of the camp location form and a map of the Fire Base locations and contact numbers is located within Best Management Practice 006 of the Mineral Exploration Guidelines of Saskatchewan.

40) Felling and yarding of trees shall be away from any water body. Trees are not to be yarded across any watercourse. No cut brush or trees may be left in or on any water body during this project.

41) The bank or boundary of any water body or watercourse disturbed by construction activities will be recontoured to the natural slope and will be stabilized immediately to prevent erosion by revegetation or other means (eg. using clean riprap and/or erosion control blankets).

42) During periods of heavy or persistent rainfall, work that could result in sediment eroding into the water body or watercourse shall be stopped. During the shutdown period measures to minimize the erosion must be implemented.

43) Operations must cease during spring break or at times when reclamation activities become detrimental to the environment.

44) All mitigation measures shall be implemented to the satisfaction of Saskatchewan Ministry of Environment.

45) Saskatchewan Ministry of Environment must be notified of any changes to this project and must approve these changes prior to their implementation.

This permit expires March 31, 2014

George Bihun
Environmental Project Officer

Government of Saskatchewan
Ministry of Environment

01/2013

Forest Product Permit

0045 I

Pursuant to the Forest Resource Management Act and Regulation permission is granted to the Permittee for: (check one)

☐ Timber ☐ Haying ☐ Grazing ☐ Special Products ☐ Oil & Gas Exploration ☑ Mineral Exploration (Reclamation Activities) ☐ Right of Way ☐ Science Projects

Effective Date: 27 | 08 | 13 (dd mm yy)
Expiry Date: 31 | 03 | 14 (dd mm yy)

Method of Payment
☐ monthly returns by permittee
☐ monthly returns by other (list)
☐ equal installments ($/due date)
1st ____ / application date
2nd ____
3rd ____ / 90 days after first remittance

Company or Individual Name: Uranium City Contracting (Last) | (First)
Date of Birth: __ | __ | __ (dd mm yy) Drivers License ______ or SHSC# ______
Address: Box 34
City: Uranium City Prov.: SK Postal Code: S0J-2W0 Telephone #: 498 2761 / 306
Operator Name: Lewandowski (Last) Kevin (First)
Inspecting Officer Name: Kristoff (Last) Dale (First)

Application date: 27 | 08 | 13 (dd mm yy)
Received by (please print): Dale Kristoff
Operating Office Name: ~~Dale Kristoff~~ George Bihun #808
Fire Year ______
Fire Name ______

*U - forest products must be used for own non-commercial use *S - authorizes permittee to offer for sale, sell, exchange, barter, deal, solicit or trade the forest products legally obtained with this permit

*U/S	Zone	Easting	Northing	Quantity	Unit	Species	Product Class	Salvage Type	Land Type	Crown Dues Rate	Dues Total	Fund Code	Management Fee Rate	Fee Total
General locations within the Beaverlodge Surface Lease														
Destruction of forest material necessary to do mine reclamation														
and clean up activities. Including sealing boreholes														
[illegible]														

Dues Subtotal No Fee **Fees Subtotal** —

(Commercial permit fee $50.00 Own Use permit fee $10.00) + 50.00 Permit Fee

GST Registrant # ______ or + 2.50 GST

Less: Credit from Permit # ______ - — Credit Total

Permittee Signature (Individual/Company representative): X

If representative please print name ______

Approved by: [signature]

Total Paid = 52.50

This license is subject to the Forest Resources Management Act and Regulations, officer's instructions and terms and conditions as stated in the following attachments:

☐ Operating Plan ☐ Scaling Plan ☐ Payment Schedule ☐ Range Management Plan ☐ Agreement Letter ☐ Access Letter (Ag & Food) ☐ Special Products Ledger ☑ Conditions

Permittee

APPENDIX E

APPENDIX E

Duplicate Sample QC Report

Filtered by Start Date: 2013-05-28; Finish Date: 2013-05-28; Stations: Blind-1,AC-14; Relationship Type: Duplicate;

Parent Field #: W-AC-14-20130528 18: Station: AC-14 - Ace Creek discharge to Beaverlodge Lake
Lab Sample: <4201044> Assigned: SRC Lab

Child Field #: W-Blind-1-20130528 18: Station: Blind-1 - Blind duplicate sample taken at station AC-14
Lab Sample: <4201348> 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	Primary	ICP-MS	0.00		**0.0**
Al	0.018 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.018 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Alk-T	47 mg/L	Primary	Acid Titr.			Alk-T	mg/L	Primary	Acid Titr.	1.00	3.00	
As	0.2 µg/L	Primary	ICP-MS	0.10	0.10	As	0.2 µg/L	Primary	ICP-MS	0.10	0.10	**0.0**
B	0.01 mg/L	Primary	ICP-MS	0.01		B	<0.01 mg/L	Primary	ICP-MS	0.01	0.01	**0.0**
Ba	0.021 mg/L	Primary	ICP-MS	0.00		Ba	0.022 mg/L	Primary	ICP-MS	0.00		**4.8**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
Ca	15 mg/L	Primary	ICP-IRS			Ca	mg/L	Primary	ICP-IRS	0.10	1.00	
Cd	0.00003 mg/L	Primary	ICP-MS	0.00	0.00	Cd	0.00002 mg/L	Primary	ICP-MS	0.00	0.00	**33.3**
Cl	0.8 mg/L	Primary	IC			Cl	mg/L	Primary	IC	0.10	0.10	
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.			CO3	mg/L	Primary	Acid Titr.	1.00		
Cond-L	102 µS/cm	Primary	SRC			Cond-L	µS/cm	Primary	SRC	1.00	7.00	
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**
Cu	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
F	0.14 mg/L	Primary	Electrode			F	mg/L	Primary	Electrode	0.01	0.03	
Fe	0.057 mg/L	Primary	ICP-MS	0.00	0.01	Fe	0.061 mg/L	Primary	ICP-MS	0.00	0.01	**7.0**
Hardness	50 mg/L	Primary	Calculate			Hardness	mg/L	Primary	Calculate	1.00	6.00	
HCO3	57 mg/L	Primary	Acid Titr.			HCO3	mg/L	Primary	Acid Titr.	1.00	7.00	
K	0.8 mg/L	Primary	ICP-IRS			K	mg/L	Primary	ICP-IRS	0.10	0.30	
Mg	3.0 mg/L	Primary	ICP-IRS			Mg	mg/L	Primary	ICP-IRS	0.10	0.60	
Mn	0.0094 mg/L	Primary	ICP-MS	0.00	0.00	Mn	0.0098 mg/L	Primary	ICP-MS	0.00	0.00	**4.3**
Mo	0.0009 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0009 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Na	1.5 mg/L	Primary	ICP-IRS			Na	mg/L	Primary	ICP-IRS	0.10	0.40	
Ni	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	Ni	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
NO3	<0.04 mg/L	Primary	SRC			NO3	mg/L	Primary	Calculate	0.04		
OH	<1 mg/L	Primary	Acid Titr.			OH	mg/L	Primary	Acid Titr.	1.00		
Pb	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	Pb	0.0005 mg/L	Primary	ICP-MS	0.00	0.00	**25.0**
pH-L	7.66 ph Units	Primary	SRC			pH-L	pH Unit	Primary	SRC	0.07	0.10	
Ra226	0.04 Bq/L	Primary	Alpha Spec	0.01	0.02	Ra226	0.04 Bq/L	Primary	Alpha Spec	0.01	0.02	**0.0**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
Se	0.0001 mg/L	Primary	ICP-MS	0.00		Se	<0.0001 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
SO4	6.6 mg/L	Primary	ICP-IRS			SO4	mg/L	Primary	ICP-IRS	0.20	1.00	
Sr	0.045 mg/L	Primary	ICP-MS	0.00	0.00	Sr	0.045 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Sum of Ions	85 mg/L	Primary	Calculate			Sum of Ions	mg/L	Primary	Calculate	1.00	8.00	
TDS	76 mg/L	Primary	Gravimetric			TDS	mg/L	Primary	Gravimetric	5.00	20.00	
Ti	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	Ti	0.0006 mg/L	Primary	ICP-MS	0.00	0.00	**50.0**

Duplicate Sample QC Report

Filtered by Start Date: 2013-05-28; Finish Date: 2013-05-28; Stations: Blind-1,AC-14; Relationship Type: Duplicate;

Lab Sample: <4201044> Assigned: SRC Lab | Lab Sample: <4201348> Assigned: SRC Lab

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
TSS	2 mg/L	Primary	Gravimetric			TSS	mg/L	Primary	Gravimetric	1.00	1.00	
U	18 µg/L	Primary	ICP-MS	0.10	0.70	U	18 µg/L	Primary	ICP-MS	0.10	0.70	**0.0**
V	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**

Lab Sample: W-AC-14-20130528 18: Assigned: BL Env. | Lab Sample: W-Blind-1-20130528 18: Assigned: BL Env.

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Cond-F	111.6 µS/cm	Primary	N/A			Cond-F	111.6 µS/cm	Primary	N/A			**0.0**
Temp. (w)	15.9 °C	Primary	Gravimetric			Temp. (w)	15.9 °C	Primary	N/A			**0.0**

QC Report By Lab

Filtered by Start Date: 2013-06-23; Finish Date: 2013-06-23; Stations: TL-7,TL-9;

Field Number	Type - Class	Status	Sampled On	Station
W-TL-7-20130623 00:	Water - Surf.	Completed	2013-06-23 00:00	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	0.05 Bq/L		SRC LAB	0.02	0.03	Beta Method	Lab Posted	Normal	ESSUMMER	2013-07-04 09:55	<4201656>
Duplicate #1	<0.10 Bq/L	**100.0**	Becquerel			Becq Pb210	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201657>

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	0.04 Bq/L		SRC LAB	0.005	0.020	Alpha Spec	Lab Posted	Normal	ESSUMMER	2013-07-04 09:03	<4201656>
Duplicate #1	0.050 Bq/L	**25.0**	Becquerel			Po-210	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201657>

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	0.41 Bq/L		SRC LAB	0.005	0.080	Alpha Spec	Lab Posted	Normal	ESSUMMER	2013-07-03 16:25	<4201656>
Duplicate #1	1.51 Bq/L	**268.3**	Becquerel			Ra-226	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201657>

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	198 µg/L		SRC LAB	0.1	2.0	ICP-MS	Lab Posted	Normal	ESSUMMER	2013-06-28 08:39	<4201656>
Duplicate #1	210 µg/L	**6.1**	Becquerel			U-UVF	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201657>

Field Number	Type - Class	Status	Sampled On	Station
W-TL-9-20130623 00:	Water - Surf.	Completed	2013-06-23 00:00	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	0.14 Bq/L		SRC LAB	0.02	0.07	Beta Method	Lab Posted	Normal	ESSUMMER	2013-07-04 09:55	<4201786>
Duplicate #1	0.12 Bq/L	**14.3**	Becquerel			Becq Pb210	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201787>

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	Lab Posted	Normal	ESSUMMER	2013-07-04 09:03	<4201786>
Duplicate #1	0.110 Bq/L	**83.3**	Becquerel			Po-210	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201787>

Ra226

QC Report By Lab

Filtered by Start Date: 2013-06-23; Finish Date: 2013-06-23; Stations: TL-7,TL-9;

Field Number	Type - Class	Status	Sampled On	Station
W-TL-9-20130623 00:	Water - Surf.	Completed	2013-06-23 00:00	TL-9 - Greer Lake discharge at Beaverlodge Lake

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	0.74 Bq/L		SRC LAB	0.005	0.100	Alpha Spec	Lab Posted	Normal	ESSUMMER	2013-07-05 08:33	<4201786>
Duplicate #1	3.00 Bq/L	**305.4**	Becquerel			Ra-226	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201787>

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	220 µg/L		SRC LAB	0.1	2.0	ICP-MS	Lab Posted	Normal	ESSUMMER	2013-06-28 08:39	<4201786>
Duplicate #1	230 µg/L	**4.5**	Becquerel			U-UVF	Lab Posted	Normal	ESSUMMER	2013-08-16 00:00	<4201787>

Duplicate Sample QC Report

Filtered by Start Date: 2013-06-01; Finish Date: 2013-06-30; Stations: TL-9,TL-7; Relationship Type: Duplicate;

Parent Field #:	W-TL-7-20130623 00:	Station:	TL-7 - Meadow Lake discharge at weir	Child Field #:	W-Blind-6-20130623 00:	Station:	Blind-6 - Blind duplicate sample collected from TL-7
Lab Sample:	<4201656>	Assigned:	SRC Lab	Lab Sample:	<4201866>	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	Primary	ICP-MS	0.00		**0.0**
Al	0.0040 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.0051 mg/L	Primary	ICP-MS	0.00	0.00	**27.5**
Alk-Phenol	<1 mg/L	Primary	SRC	1.00		Alk-Phenol	<1 mg/L	Primary	SRC	1.00		**0.0**
Alk-T	128 mg/L	Primary	Acid Titr.	1.00	5.00	Alk-T	129 mg/L	Primary	Acid Titr.	1.00	5.00	**0.8**
As	1.7 µg/L	Primary	ICP-MS	0.10	0.20	As	1.7 µg/L	Primary	ICP-MS	0.10	0.20	**0.0**
B	0.02 mg/L	Primary	ICP-MS	0.01	0.01	B	0.02 mg/L	Primary	ICP-MS	0.01	0.01	**0.0**
Ba	0.18 mg/L	Primary	ICP-MS	0.00		Ba	0.19 mg/L	Primary	ICP-MS	0.00		**5.6**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
C-(org)	10 mg/L	Primary	Non-Disp.Infrared	0.20	1.00	C-(org)	9.9 mg/L	Primary	Non-Disp.Infrared	0.20	1.00	**1.0**
Ca	21 mg/L	Primary	ICP-IRS	0.10	1.00	Ca	21 mg/L	Primary	ICP-IRS	0.10	1.00	**0.0**
Cd	<0.00001 mg/L	Primary	ICP-MS	0.00	0.00	Cd	0.00001 mg/L	Primary	ICP-MS	0.00		**0.0**
Cl	5 mg/L	Primary	Color	1.00	1.00	Cl	5 mg/L	Primary	Color	1.00	1.00	**0.0**
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.	1.00		CO3	<1 mg/L	Primary	Acid Titr.	1.00		**0.0**
Cond-L	305 µS/cm	Primary	SRC	1.00	10.00	Cond-L	302 µS/cm	Primary	SRC	1.00	10.00	**1.0**
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**
Cu	0.0007 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0007 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
F	0.41 mg/L	Primary	Electrode	0.01	0.06	F	0.40 mg/L	Primary	Electrode	0.01	0.06	**2.4**
Fe	0.082 mg/L	Primary	ICP-MS	0.00	0.01	Fe	0.084 mg/L	Primary	ICP-MS	0.00	0.01	**2.4**
Hardness	73 mg/L	Primary	Calculate	1.00	8.00	Hardness	74 mg/L	Primary	Calculate	1.00	8.00	**1.4**
HCO3	156 mg/L	Primary	Acid Titr.	1.00	10.00	HCO3	157 mg/L	Primary	Acid Titr.	1.00	10.00	**0.6**
K	1.2 mg/L	Primary	ICP-IRS	0.10	0.30	K	1.2 mg/L	Primary	ICP-IRS	0.10	0.30	**0.0**
Mg	5.1 mg/L	Primary	ICP-IRS	0.10	0.80	Mg	5.2 mg/L	Primary	ICP-IRS	0.10	0.80	**2.0**
Mn	0.0046 mg/L	Primary	ICP-MS	0.00	0.00	Mn	0.0048 mg/L	Primary	ICP-MS	0.00	0.00	**4.3**
Mo	0.0092 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0089 mg/L	Primary	ICP-MS	0.00	0.00	**3.3**
Na	39 mg/L	Primary	ICP-IRS	0.10	2.00	Na	40 mg/L	Primary	ICP-IRS	0.10	2.00	**2.6**
NH3-N	0.06 mg/L	Primary	Color	0.01	0.03	NH3-N	0.06 mg/L	Primary	Color	0.01	0.03	**0.0**
Ni	0.0005 mg/L	Primary	ICP-MS	0.00	0.00	Ni	0.0006 mg/L	Primary	ICP-MS	0.00	0.00	**20.0**
NO3	<0.04 mg/L	Primary	SRC	0.04		NO3	<0.04 mg/L	Primary	SRC	0.04		**0.0**
OH	<1 mg/L	Primary	Acid Titr.	1.00		OH	<1 mg/L	Primary	Acid Titr.	1.00		**0.0**
P-(TP)	<0.01 mg/L	Primary	ICP-IRS	0.01		P-(TP)	<0.01 mg/L	Primary	ICP-IRS	0.01		**0.0**
Pb	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	Pb	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Pb210	0.05 Bq/L	Primary	Beta Method	0.02	0.02	Pb210	0.03 Bq/L	Primary	Beta Method	0.02	0.03	**40.0**
pH-L	7.73 ph Units	Primary	SRC	0.07	0.10	pH-L	7.77 ph Units	Primary	SRC	0.07	0.10	**0.5**
Po210	0.04 Bq/L	Primary	Alpha Spec	0.01	0.02	Po210	0.04 Bq/L	Primary	Alpha Spec	0.01	0.02	**0.0**
Ra226	1.4 Bq/L	Primary	Alpha Spec	0.01	0.20	Ra226	1.6 Bq/L	Primary	Alpha Spec	0.02	0.30	**14.3**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
Se	0.0022 mg/L	Primary	ICP-MS	0.00	0.00	Se	0.0022 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**

Duplicate Sample QC Report

Filtered by Start Date: 2013-06-01; Finish Date: 2013-06-30; Stations: TL-9,TL-7; Relationship Type: Duplicate;

Lab Sample: <4201656> Assigned: SRC Lab | Lab Sample: <4201866> Assigned: SRC Lab

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
SO4	27 mg/L	Primary	ICP-IRS	0.20	2.00	SO4	28 mg/L	Primary	ICP-IRS	0.20	2.00	**3.7**
Sr	0.12 mg/L	Primary	ICP-MS	0.00	0.01	Sr	0.12 mg/L	Primary	ICP-MS	0.00	0.01	**0.0**
Sum of Ions	254 mg/L	Primary	Calculate	1.00	10.00	Sum of Ions	258 mg/L	Primary	Calculate	1.00	10.00	**1.6**
TDS	198 mg/L	Primary	Gravimetric	5.00	30.00	TDS	196 mg/L	Primary	Gravimetric	5.00	30.00	**1.0**
Ti	0.0003 mg/L	Primary	ICP-MS	0.00	0.00	Ti	0.0002 mg/L	Primary	ICP-MS	0.00	0.00	**33.3**
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
TSS	<1 mg/L	Primary	Gravimetric	1.00		TSS	<1 mg/L	Primary	Gravimetric	1.00		**0.0**
U	198 µg/L	Primary	ICP-MS	0.10	2.00	U	202 µg/L	Primary	ICP-MS	0.10	2.00	**2.0**
V	0.0021 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0021 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**

Lab Sample: <4201657> Assigned: Becquerel Lab | Lab Sample: <4201866> Assigned: SRC Lab

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Pb210	<0.10 Bq/L	Duplicate #1	Becq Pb210	0.02	0.02	Pb210	0.03 Bq/L	Primary	Beta Method			**70.0**
Po210	0.050 Bq/L	Duplicate #1	Po-210	0.01	0.02	Po210	0.04 Bq/L	Primary	Alpha Spec			**20.0**
Ra226	1.51 Bq/L	Duplicate #1	Ra-226	0.01	0.20	Ra226	1.6 Bq/L	Primary	Alpha Spec			**6.0**
U	210 µg/L	Duplicate #1	U-UVF	0.10	2.00	U	202 µg/L	Primary	ICP-MS			**3.8**

Lab Sample: W-TL-7-20130623 00: Assigned: BL Env. | Lab Sample: W-Blind-6-20130623 00: Assigned: BL Env.

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Cond-F	274 µS/cm	Primary	N/A			Cond-F	274 µS/cm	Primary	N/A			**0.0**
Temp. (w)	23.5 °C	Primary	Gravimetric			Temp. (w)	23.5 °C	Primary	Gravimetric			**0.0**

Parent Field #: W-TL-9-20130623 00: Station: TL-9 - Greer Lake discharge at Beaverlodge Lake | Child Field #: W-Blind-4-20130623 00: Station: Blind-4 - Blind duplicate sample collected from TL-9

Lab Sample: <4201786> Assigned: SRC Lab | Lab Sample: <4201376> 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	Primary	ICP-MS	0.00		**0.0**
Al	0.012 mg/L	Primary	ICP-MS	0.00	0.00	Al	0.014 mg/L	Primary	ICP-MS	0.00	0.00	**16.7**
Alk-Phenol	<1 mg/L	Primary	SRC	1.00		Alk-Phenol	<1 mg/L	Primary	SRC	1.00		**0.0**
Alk-T	144 mg/L	Primary	Acid Titr.	1.00	5.00	Alk-T	144 mg/L	Primary	Acid Titr.	1.00	5.00	**0.0**
As	2.0 µg/L	Primary	ICP-MS	0.10	0.20	As	2.0 µg/L	Primary	ICP-MS	0.10	0.20	**0.0**
B	0.02 mg/L	Primary	ICP-MS	0.01	0.01	B	0.02 mg/L	Primary	ICP-MS	0.01	0.01	**0.0**
Ba	1.01 mg/L	Primary	ICP-MS	0.00		Ba	1.0 mg/L	Primary	ICP-MS	0.00		**1.0**
Be	<0.0001 mg/L	Primary	ICP-MS	0.00		Be	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**

Duplicate Sample QC Report

Filtered by Start Date: 2013-06-01; Finish Date: 2013-06-30; Stations: TL-9,TL-7; Relationship Type: Duplicate;

Lab Sample: <4201786>		Assigned: SRC Lab				Lab Sample: <4201376>		Assigned: SRC Lab				
Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
C-(org)	12 mg/L	Primary	Non-Disp.Infra red	0.20	1.00	C-(org)	12 mg/L	Primary	Non-Disp.Infra red	0.20	1.00	**0.0**
Ca	27 mg/L	Primary	ICP-IRS	0.10	2.00	Ca	27 mg/L	Primary	ICP-IRS	0.10	2.00	**0.0**
Cd	<0.00001 mg/L	Primary	ICP-MS	0.00	0.00	Cd	0.00001 mg/L	Primary	ICP-MS	0.00		**0.0**
Cl	7 mg/L	Primary	Color	1.00	1.00	Cl	7 mg/L	Primary	Color	1.00	1.00	**0.0**
Co	<0.0001 mg/L	Primary	ICP-MS	0.00		Co	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
CO3	<1 mg/L	Primary	Acid Titr.	1.00		CO3	<1 mg/L	Primary	Acid Titr.	1.00		**0.0**
Cond-L	327 µS/cm	Primary	SRC	1.00	10.00	Cond-L	326 µS/cm	Primary	SRC	1.00	10.00	**0.3**
Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		Cr	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**
Cu	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	Cu	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
F	0.39 mg/L	Primary	Electrode	0.01	0.06	F	0.39 mg/L	Primary	Electrode	0.01	0.06	**0.0**
Fe	0.070 mg/L	Primary	ICP-MS	0.00	0.01	Fe	0.070 mg/L	Primary	ICP-MS	0.00	0.01	**0.0**
Hardness	93 mg/L	Primary	Calculate	1.00	8.00	Hardness	93 mg/L	Primary	Calculate	1.00	8.00	**0.0**
HCO3	176 mg/L	Primary	Acid Titr.	1.00	10.00	HCO3	176 mg/L	Primary	Acid Titr.	1.00	10.00	**0.0**
K	1.6 mg/L	Primary	ICP-IRS	0.10	0.40	K	1.6 mg/L	Primary	ICP-IRS	0.10	0.40	**0.0**
Mg	6.2 mg/L	Primary	ICP-IRS	0.10	0.80	Mg	6.3 mg/L	Primary	ICP-IRS	0.10	0.80	**1.6**
Mn	0.031 mg/L	Primary	ICP-MS	0.00	0.00	Mn	0.031 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Mo	0.010 mg/L	Primary	ICP-MS	0.00	0.00	Mo	0.0099 mg/L	Primary	ICP-MS	0.00	0.00	**1.0**
Na	37 mg/L	Primary	ICP-IRS	0.10	2.00	Na	37 mg/L	Primary	ICP-IRS	0.10	2.00	**0.0**
NH3-N	0.05 mg/L	Primary	Color	0.01	0.03	NH3-N	0.05 mg/L	Primary	Color	0.01	0.03	**0.0**
Ni	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	Ni	0.0004 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
NO3	0.22 mg/L	Primary	SRC	0.04	0.09	NO3	0.22 mg/L	Primary	SRC	0.04	0.09	**0.0**
OH	<1 mg/L	Primary	Acid Titr.	1.00		OH	<1 mg/L	Primary	Acid Titr.	1.00		**0.0**
P-(TP)	0.01 mg/L	Primary	ICP-IRS	0.01	0.01	P-(TP)	0.01 mg/L	Primary	ICP-IRS	0.01	0.01	**0.0**
Pb	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	Pb	0.0008 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Pb210	0.14 Bq/L	Primary	Beta Method	0.02	0.04	Pb210	0.07 Bq/L	Primary	Beta Method	0.02	0.07	**50.0**
pH-L	7.92 ph Units	Primary	SRC	0.07	0.10	pH-L	7.93 ph Units	Primary	SRC	0.07	0.10	**0.1**
Po210	0.06 Bq/L	Primary	Alpha Spec	0.01	0.02	Po210	0.06 Bq/L	Primary	Alpha Spec	0.01	0.02	**0.0**
Ra226	3.0 Bq/L	Primary	Alpha Spec	0.01	0.30	Ra226	3.4 Bq/L	Primary	Alpha Spec	0.02	0.50	**13.3**
Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		Sb	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
Se	0.0024 mg/L	Primary	ICP-MS	0.00	0.00	Se	0.0025 mg/L	Primary	ICP-MS	0.00	0.00	**4.2**
Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		Sn	<0.0001 mg/L	Primary	ICP-MS	0.00		**0.0**
SO4	25 mg/L	Primary	ICP-IRS	0.20	2.00	SO4	26 mg/L	Primary	ICP-IRS	0.20	2.00	**4.0**
Sr	0.17 mg/L	Primary	ICP-MS	0.00	0.01	Sr	0.17 mg/L	Primary	ICP-MS	0.00	0.01	**0.0**
Sum of Ions	280 mg/L	Primary	Calculate	1.00	10.00	Sum of Ions	281 mg/L	Primary	Calculate	1.00	10.00	**0.4**
TDS	212 mg/L	Primary	Gravimetric	5.00	30.00	TDS	214 mg/L	Primary	Gravimetric	5.00	30.00	**0.9**
Ti	0.0003 mg/L	Primary	ICP-MS	0.00	0.00	Ti	0.0003 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		Tl	<0.0002 mg/L	Primary	ICP-MS	0.00		**0.0**
TSS	<1 mg/L	Primary	Gravimetric	1.00		TSS	<1 mg/L	Primary	Gravimetric	1.00		**0.0**
U	220 µg/L	Primary	ICP-MS	0.10	2.00	U	219 µg/L	Primary	ICP-MS	0.10	2.00	**0.5**

Duplicate Sample QC Report

Filtered by Start Date: 2013-06-01; Finish Date: 2013-06-30; Stations: TL-9,TL-7; Relationship Type: Duplicate;

Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	Parameter	Value	Meas QC Type	Method	Entered DL	Entered Uncert	% Diff
Lab Sample: <4201786>		Assigned: SRC Lab				Lab Sample: <4201376>		Assigned: SRC Lab				
V	0.0028 mg/L	Primary	ICP-MS	0.00	0.00	V	0.0028 mg/L	Primary	ICP-MS	0.00	0.00	**0.0**
Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		Zn	<0.0005 mg/L	Primary	ICP-MS	0.00		**0.0**
Lab Sample: <4201787>		Assigned: Becquerel Lab				Lab Sample: <4201376>		Assigned: SRC Lab				
Pb210	0.12 Bq/L	Duplicate #1	Becq Pb210	0.02	0.04	Pb210	0.07 Bq/L	Primary	Beta Method			**41.7**
Po210	0.110 Bq/L	Duplicate #1	Po-210	0.01	0.02	Po210	0.06 Bq/L	Primary	Alpha Spec			**45.5**
Ra226	3.00 Bq/L	Duplicate #1	Ra-226	0.01	0.30	Ra226	3.4 Bq/L	Primary	Alpha Spec			**13.3**
U	230 µg/L	Duplicate #1	U-UVF	0.10	2.00	U	219 µg/L	Primary	ICP-MS			**4.8**
Lab Sample: W-TL-9-20130623 00:		Assigned: BL Env.				Lab Sample: W-Blind-4-20130623 00:		Assigned: BL Env.				
Cond-F	115.4 µS/cm	Primary	N/A			Cond-F	365 µS/cm	Primary	N/A			**216.3**
Temp. (w)	22.5 °C	Primary	Gravimetric			Temp. (w)	22.7 °C	Primary	Gravimetric			**0.9**