Cameco

Beaverlodge Project Annual Report

Year 25 – Transition Phase
January 1, 2010 to June 30, 2011

Prepared for:
Canadian Nuclear Safety Commission
Compliance Report for License: WFOL-W5-2120.0/2012
&
Saskatchewan Ministry of Environment
Compliance Report: Beaverlodge Surface Lease

Prepared and Submitted by:
Cameco Corporation

September 2011

BEAVERLODGE PROJECT
Annual Report – Year 25 – Transition Phase
January 1, 2010 to June 30, 2011

BEAVERLODGE PROJECT

BEAVERLODGE PROJECT

Beaverlodge Project Annual Report

Year 25 – Transition Phase
January 1, 2010 to June 30, 2011

Prepared for:
Canadian Nuclear Safety Commission
Compliance Report for Licence: WFOL-W5-2120.0/2012
&
Saskatchewan Ministry of Environment
Compliance Report: Beaverlodge Surface Lease

Prepared and Submitted by:
Cameco Corporation

September 2011

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1

INTRODUCTION

1.0 INTRODUCTION

This report, 2010-2011 *Beaverlodge Mine-Mill Decommissioning Transition Phase Monitoring Annual Report*, is submitted in compliance with Canadian Nuclear Safety Commission (CNSC) Waste Facility Operating Licence WFOL-W5-2120.0/2012 issued to Cameco Corporation (Cameco) for the decommissioned Beaverlodge mine and mill site.

The report is also submitted in compliance with the Saskatchewan Beaverlodge Surface Lease Agreement dated December 24, 2006.

The report describes observations on the decommissioned Beaverlodge site covering the period between January 1, 2010 and June 30, 2011. In the 2008 annual report Cameco provided data based on a calendar year (January 2008 to December 2008). In November 2009 the CNSC granted Cameco a licence expiring on November 30, 2012. In that licence the CNSC Commission requested that Cameco and the CNSC staff provides an annual update of activities during the fourth quarter of each year.

To facilitate the preparation of the documentation required for this update meeting it was agreed the Annual Report would include information on environmental conditions, site activities and project status for an 18 month period (January through June of the following year). Cameco will continue providing an 18-month summary report until the expiry of the current CNSC licence. Following 2012 it is anticipated that subsequent annual reports will return to a 12-month summary, with the intention that the summary be based on a calendar year.

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 June 2011 are provided along with an overview of anticipated activities planned for latter half of 2011.

SECTION 2

GENERAL INFORMATION

2.0 GENERAL INFORMATION

2.1 Organizational Information

2.1.1 CNSC Licence/Provincial Surface Lease

The CNSC Waste Facility Operating Licence WFOL-W5-2120.0/2012 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 June 30, 2011 are as follows:

Officers

Chief Executive Officer	- G.W. Grandey*
President	- T. Gitzel*
Senior Vice-President & Chief Operating Officer	- B. Steane
Senior Vice-President, Marketing and Business Development	- G. B. Assie
Senior Vice-President and Chief Financial Officer	- O.K. Goheen
Senior Vice-President, Corporate Services	- G. Issac
Senior Vice-President, Governance, Law and Corporate Secretary	- G.M.S. Chad

*As of July 1, 2011, G. W. Grandey retired from his position as Chief Executive Officer on Cameco's Board of Directors. T. Gitzel took over as Chief Executive Officer from G. W. Grandey.

Board of Directors

V.J. Zaleschuk	N.A. McMillan
D. Camus	J.F. Colvin
J.H. Clappison	J.R. Curtiss
N.E. Hopkins	D.H.F. Deranger
O. Hushovd	J.K. Gowans
A.A McLellan	G.W. Grandey*

*T. Gitzel replaced G. W. Grandey on the Board of Directors as of July 1, 2011.

2.2 CNSC Licence

On February 18, 2009 a public hearing was held in Ottawa, Ontario for the renewal of the waste management license for the decommissioned Beaverlodge mining and milling facility. The Commission decided to adjourn the hearing until November 2009 so that a plan, providing details and milestones on the long-term activities for the proposed three year license period, was available for consideration.

At the February 2009 hearing the Commission granted exemption from further CNSC licensing of five minor former Eldorado Beaverlodge properties. This action allowed the properties to be released by Saskatchewan Ministry of Environment (SkMOE) from further Decommissioning and Reclamation and to be transferred to the province of Saskatchewan's Institutional Control (IC) program. The Saskatchewan Ministry of Energy and Resources (SkMER) is now the responsible authority for the administration of the five properties in the IC Program as described in the provincial Reclaimed Industrial Sites Act.

Following the November 2009 hearing, the Commission granted Cameco a Waste Facility Operating License for the former Beaverlodge Mine and Mill site. The renewed license WFOL-W5-2120.0/2012 is valid from December 1, 2009 to November 30, 2012.

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 2.4.1).

Uranium bearing minerals were first discovered in the Beaverlodge area of northern Saskatchewan in 1934. Since there was little demand for uranium at that time, further prospecting and development in the region was delayed for almost ten 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. In 1947 a prospecting incline was developed to explore the Ace ore body and the Dubyna claims were staked.

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 head frame. The following year the foundations were laid for a 450 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 small 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-1970's, some twenty-two 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 initiated site decommissioning. The decommissioning and reclamation work was completed in 1985. 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.

2.5 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 managed by Saskatchewan Research Council (SRC) and are currently in the process of being decommissioned.

Previous experience has shown that 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

DECOMMISSIONED AND RECLAIMED AREAS ACTIVITIES

3.0 DECOMMISSIONED AND RECLAIMED AREAS ACTIVITIES

The performance of the decommissioned and reclaimed area of the Beaverlodge site is assessed by routinely 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 assess 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 JRG

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 (SkMOE).

Five meetings were held with the JRG during the 2010-2011 reporting period, with the primary purpose of the meetings to discuss the Beaverlodge workplan and to allow for comment on activities and submissions. A summary of the meetings is presented below.

February 23, 2010: JRG meeting (Saskatoon, Saskatchewan)

Discussions during the February 2010 JRG meeting involved the schedule and workplan for activities to be undertaken in 2010. Updates on the development of the Quantitative Site Model (QSM) and conclusions from the flowing borehole program carried out in 2009 were provided, as well as discussion on the release strategy for the smaller properties. In addition, a presentation was made, followed by discussion with the JRG, regarding the proposed white sucker program for the spring of 2010.

A review of the work plan and schedule for 2010 was conducted, which included recent activities and regulatory approvals received. In particular, items receiving regulatory approval included the Martin Lake adit rehabilitation work and the proposed use of Bolger Pit for the burial of loose debris. The Gantt chart was reviewed with personnel present, in order to determine if the proposed activities were adequate and if the timelines were achievable.

The progress of several studies was discussed including a macrophyte program, the Ace Creek sediment program, and the Minewater reservoir baseline program. Discussions were also held regarding the Uranium City Country Foods Assessment.

July 26, 2010: JRG meeting (Saskatoon, Saskatchewan)

The 2010 work plan and timing of items for the CNSC update meeting in December 2010 was discussed. A revised water sampling program was discussed, which included the addition of water sampling station AC-6A**,** the cessation of sampling of station AN-4, the streamlining of the analyzed parameters, as well as a review of the water station sampling frequencies. In addition, the rehabilitation of the Fay Maintenance Shop area was reported as completed in July 2010.

A brief overview on the Beaverlodge Risk Matrix was presented, including the methodology used to develop it. The Gantt chart, containing the 3yr workplan, was reviewed to ensure proposed activities are adequate and timelines are being met and remain achievable.

The field work for several of the 2010 activities were reported as completed. These included the White Sucker Spawning Study, the flowing boreholes inspection, the 3 year outlet structure inspection, Year 1 of the Country Foods Study and the geotechnical inspection and stability assessment of the pit walls and waste rock piles.

Reports in the final stages of completion were discussed and included the CanNorth Minewater Reservoir Aquatic Investigation, Ace Bay Sediment Characterization and the Macrophyte report.

October 1, 2010: JRG meeting (Saskatoon, Saskatchewan)

An update on the status of projects leading up to the November update meeting with the Commission was provided. Dates for the CMD and presentation submissions to the Commission were confirmed.

It was agreed that the current surface lease boundaries described in the 2006 provincial surface lease agreement are representative and will continue to be used. The screening level Beaverlodge Risk Matrix was completed and sent to the JRG.

The development of Cameco's Commission Member Document (CMD) and Public Engagement Document (PEG) was discussed. These are to be provided as part of the Public Information Program. A PEG specific to Beaverlodge was reported as being under development and will be provided to the JRG once completed.

SENES completed the information gap analysis of the QSM development program. Year 1 of the Country Foods study was discussed.

Several "small sites" underwent clean up in 2010 which would facilitate the assessment for release to IC. The draft report for the pit wall and slope stability assessments was in preparation following the completion of the field work. No immediate public safety concerns with either the pit wall or slope stability were identified.

January 31, 2011: JRG Meeting (Saskatoon, Saskatchewan)

In attendance at the January Beaverlodge Project Meeting were representatives from Cameco, SkMOE, CNSC, DFO, and EC. The objectives of the meeting were to discuss the status of the 2010 project reports, discuss the 2011 workplan, and to plan the upcoming 2011 JRG inspection of Beaverlodge.

Upcoming 2011 activities were to include sampling of the residual spilled tailings along the Ace Creek Watershed, the characterization of Pistol and Beatrice Lakes, Year 2 of the Country Foods Study, the continued management of the flowing boreholes, and a follow up to the Ace Lake watershed assessment.

The 2011 annual JRG inspection was planned and was to include assessment of the "small sites" that have high potential to progress to IC. The 2011 JRG inspection was planned to include the additional inspection of the two Martin Lake adits, Bolger Pit, Fay Shaft, Dorrclone area, Fookes and Marie outlet structures and deltas.

May 10, 2011: JRG Meeting (Saskatoon, Saskatchewan)

This meeting was held to establish the plan for the upcoming June 6th to 10th JRG inspection of the Beaverlodge properties. Representatives from Cameco, SkMOE, CNSC, and EC were involved in the meeting.

A day by day plan for the JRG inspection was outlined. Areas to be visited include the Fay shaft service building, the plugged borehole area, the wasterock sampling locations, the Martin Lake adit, the Verna shaft cap, and Bolger Pit. In addition, a geotechnical inspection is scheduled to be performed by Cameco and the JRG on the Fookes Delta and the outlet structures located at Fookes and Marie reservoirs. The Ace Creek and Fulton Creek watershed structures were planned to be thoroughly inspected over the course of several days.

3.1.1 Additional Meetings

July 13, 2010: CanNorth Country Foods Year 1 (Uranium City, Saskatchewan)

In July of 2010 representatives from CanNorth presented the details of the Country Foods program to residents of Uranium City. A total of 22 adults (plus their children) were in attendance. Residents were informed of the purpose of the study, and were asked to identify potential harvested foods.

Details of the interview process were explained to the community, followed by CanNorth representatives responding to any questions and concerns regarding the program. In addition, a list of country foods consumed in the area was developed with the residents in attendance.

November 3, 2010: CNSC Public Commission Meeting (Ottawa, Ontario)

The Beaverlodge management plan and progress was presented. This included the 2010 studies with a focus on the Country Foods Study, inspection results and other follow up activities. These activities included the Dorrclone area clean up, the repairing of the drill holes in the shaft caps, the installation of water-level loggers in numerous areas around the properties, the rehabilitation of the Fay shaft area, the packed borehole monitoring and the Martin Lake adit rehabilitation (closure and monitoring).

A summary of the public engagement meetings and their locations were listed. These included the Beaverlodge public meeting (May 31, 2010, Uranium City), the Country Foods Study meeting (July 2010, Uranium City), the Athabasca Working Group meeting (October 15, 2010, Stony Rapids), and the Environmental Quality Committee meeting (November 2010, Uranium City). The MN-S Memorandum of Understanding was signed on September 27, 2010 and was discussed.

An overview of the path forward steps was provided with a general timeline: from information assessment (up to 2011), to risk management (2011-2012) to the application to release properties to IC (2012).

July 27-28, 2010: Beaverlodge Project and CNSC Lakeview QSM Modeling Meeting (CNSC offices, Ottawa, Ontario)

A meeting was held with the CNSC and SkMOE to discuss the development of the Beaverlodge QSM with respect to the LAKEVIEW model. A brief overview of Beaverlodge and its associated properties was provided as background to the development of the LAKEVIEW model. The Lakeview model has been shown to satisfactorily simulate water quality at Fookes Reservoir, Marie Reservoir and Greer Lake.

The IC program was discussed with respect to chemical, radiological, and biological criteria for release and to discuss which properties are close to being released.

May 5, 2011: QSM Update (CNSC offices, Ottawa, Ontario)

The objectives of the meeting were to review the progress made in the development of the QSM. Attendees were representatives from Cameco, Canada Eldor Inc (CEI), SENES and the CNSC. In addition, a representative from SkMOE called into the meeting.

A Beaverlodge site overview on the environmental components and interactions was provided focusing on the Ace Creek and Fulton Creek watersheds. The key drainage areas to Beaverlodge and the load contribution of each sub-watershed to the overall system was graphically displayed and discussed. Cameco reported adding water sampling stations to the outlet of Beaverlodge Lake and Martin Lake, as well as Crackingstone River and Crackingstone Bay of Lake Athabasca in order to increase understanding of the watershed system.

The following 2011 activities and field work were discussed: sampling of waste rock and tailings porewater, the addition of a water sampling station (AC-6A) in the Verna Creek watershed area, the plugging of the flowing boreholes in Lower Ace Creek, and the investigation of the flowing boreholes at Dubyna.

3.2 Regulatory Inspections

The performance of the decommissioned and reclaimed areas at Beaverlodge, described in this section, is determined by routine and non-routine visual inspections 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 ensuring the requirements of the license are being met.

3.2.1 2010 Inspection

Representatives from the CNSC, the SkMOE and Cameco Corporation performed a Type II joint inspection of the Beaverlodge properties from May 31 to June 3, 2010. As with previous inspections, the main objective was to follow up on action items and recommendations from the previous inspection, and to observe other areas of interest with respect to further source controls.

Areas visited during the 2010 inspection included: Fay Waste Rock Storage Area, Hab Mine – flow pathways, Dubyna Mine Site, AC-8, Martin Lake Adit (Beaverlodge Lake Side), 12 Zone Pit, Bolger Pit – Waste disposal trench, Fay flowing boreholes, Fookes Delta and Outlet Structure, Verna Shaft area, TL-7, Minewater Reservoir, and the Fay Mine – Shaft area.

3.2.2 2011 Inspection

Representatives from the CNSC, the SkMOE, DFO, EC, CanEldor, and Cameco Corporation performed a Type II joint inspection of the Beaverlodge properties from June 6th to June 10th, 2011.

The main objective of the inspection was to follow up on action items and recommendations from the previous inspection, and to observe other areas of potential interest with respect to further source controls. An additional objective was the inspection of a sand flow occurrence at Fookes Delta. This was deemed to be a one-time occurrence that would not threaten the functionality of the ditch.

Several recommendations from previous inspections were noted as complete in the 2011 inspection. These included the rehabilitation of the Dorrclone and Fay shaft area, the sealing of the Hab mine area boreholes, and the removal of unused equipment and debris in the Fay shaft area and from the water stations TL-7 and AC-8.

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 occurs annually 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 the Fookes Delta. In addition, the checklist requires photographically documenting 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.

Both the Marie and the Fookes outlet structures were dry due to the low levels of precipitation. The integrity of both of the outlet structures was maintained. There was no evidence of erosion and no concerns were noted. Grout-intruded rip-rap remained in place at both structures and is performing as designed. Photographic evidence was collected at both structures.

The Fookes delta was inspected for any evidence of tailings boils, tailings exposure, erosion of the cover, or any sand wash into the lake. No tailings boils were found however, settling features were noted on the cover near the shore of the tailings management area. These settling features did not result in the exposure of tailings and are not an immediate concern.

This was the first year the geotechnical checklist was used to complete the inspection. The geotechnical inspection took place during the June 2011 JRG inspection with the results and photographic record included in Appendix D.

3.3 Public Meetings

Two public meetings were held during the 2010-2011 reporting period, with the intent of providing an overview to the residents of Uranium City regarding the completed activities, an update on the current condition of the Beaverlodge properties, as well as the outlook for future planned activities.

May 31, 2010: Public Meeting (Uranium City, Saskatchewan)

In May of 2010, the spring public meeting was held at the Ben McIntyre School in Uranium City. Representatives from Cameco, as well as CNSC, SkMOE and the community attended a presentation made by Cameco, which was followed by a question and answer period.

The history and background of the region were presented to attendees, followed by an update on the activities conducted in 2009, results from the 2009 water sampling program, and planned activities for 2010.

It was noted during the meeting that five properties had been transferred into the provincial IC program, with long term funding in place to ensure funds are available for monitoring and unforeseen events. A number of studies completed in 2009 were discussed, including the Minewater Reservoir Aquatic Investigation, borehole plugging, Hab hydrology assessment, development of the management framework, and the LiDAR aerial survey.

Results from the 2009 water sampling program were presented, focusing on several stations in the Beaverlodge region including AC-8, AC-14, and TL-9.

Included in this presentation were slides detailing the activities for the Martin Lake adit rehabilitation, development of the ArcGIS database, White Sucker Spawning Study, the site wide flowing borehole investigation, the geotechnical assessment of several properties, and the Country Foods Study.

At the conclusion of the meeting Cameco requested feedback from Uranium City residents regarding effective communication methods, in an effort to ensure that Cameco is communicating in the best way possible with residents. Options presented to improve the communication included e-mails, newsletters or posters.

June 6, 2011: Public Meeting (Uranium City, Saskatchewan)

The 2011 Public Meeting was held at Ben McIntyre School in Uranium City. Attendees included Uranium City residents, and representatives from the AWG, EQC, Cameco, SkMOE, CNSC, DFO, EC, CEI, Can North and the Northern Saskatchewan Population Health Unit. The purpose was to discuss the 2010 and 2011 Beaverlodge related activities and also provide an update on the Country Food Study.

Cameco Corporation presented on the history of the Beaverlodge properties and its management plan. The 2010 activities presented were the Minewater Aquatic Investigation, the Macrophyte Study, the Ace Bay Contamination Delineation study, the geotechnical assessment, the White Sucker Spawning Study and the Ace Lake hydrology study.

Water quality data was presented graphically for the Fulton Creek outlet (Station TL-9) and the outlet of Ace Creek (Station AC-14). The parameters discussed included 226-radium, uranium, TDS (total dissolved solids), and selenium. The applicable COO (close out objectives) and SSWQO (Saskatchewan Surface Water Quality Objectives) were provided along with the water quality graphs.

An overview of the activities to be conducted in 2011 was presented. These included Year 2 of the Country Foods Study, the continual development of the QSM, and the planned permanent sealing of the boreholes inspected in 2010. Additional 2011 activities include an Ace lake hydrology follow-up study, the characterization of Pistol Lake and Beatrice Lake, the assessment of waste rock and of tailings spills, and the investigation of the Dubyna boreholes.

CanNorth followed with their presentation on the results of the Country Food Year 1 study. Year 2 of the Country Food Study was discussed and is planned to include the analysis of country food items associated with the Beaverlodge properties. CanNorth requested assistance from the Uranium City locals in providing samples and locations for the collection of country food items to be studied.

At the end of the presentation, in follow-up to the discussion from the previous public meeting Cameco representatives called on the attendees for their input on how to improve communications between Cameco and the Uranium City residents. Cameco proposed sending a quarterly “Beaverlodge Bulletin” via email to those interested in being updated on the activities related to Beaverlodge and a sign-up sheet was circulated.

3.4 EQC

The Northern Saskatchewan Environmental Quality Committee (EQC) is made up of representatives from designated northern municipal and First Nation communities. The committee enables northerners to learn about uranium mining activities and to see first-hand the environmental protection measures being employed, and the socio-economic benefits being gained. Activities involving the EQC are outlined below.

December 10, 2010: EQC Update Meeting (Uranium City, Saskatchewan)

The 2010 EQC update meeting was held in Ben McIntyre School in Uranium City. In attendance were representatives from Cameco and CanNorth as well as members from the EQC. After a brief overview of the Beaverlodge properties history, Cameco provided an update of 2010 activities and presented the Beaverlodge path forward. The path forward is based on the Beaverlodge management plan which systematically assesses the Beaverlodge properties for any potential risks and possible remedial options.

To supplement the management plan, the Beaverlodge Risk Matrix and its development process was presented. The matrix is used to evaluate Beaverlodge areas in order of risk based on the likelihood and the consequence of the risk in order to better concentrate efforts. Seven sites were assessed by the Beaverlodge Risk Matrix: Hab, Dubyna, Verna/Bolger, Fulton Creek, Lower Ace Creek, Ace Bay, and Fulton Bay.

An update on the revised water sampling program and the Country Foods study was provided. Current maintenance activities discussed included packed borehole monitoring, Martin Lake adit rehabilitation, Dorrclone area clean up and Fay shaft area rehabilitation.

This was followed by an update by CanNorth on Year 1 of the Country Food Studies. The meeting concluded with a site tour of the Beaverlodge properties.

3.5 AWG Meeting

The Athabasca Working Group (AWG) is a group established in 1993 as a liaison between the Athabasca communities and the uranium mining industry. The group typically discusses environmental protection, training and employment, and business opportunities in the Athabasca Basin. The group includes representatives from Athabasca Basin communities as well as Cameco and Areva.

The AWG coordinates an independent environmental monitoring program near the communities of the Athabasca Basin. The group samples water, air, sediments, and tissue from animals that are traditionally harvested by northerners. Funding for the program is provided by Cameco and Areva while testing and analysis is performed by independent consultants. The monitoring program began in 2000 and has been running continuously since then. At Beaverlodge, no environmental areas of concern have been identified and no measurable environmental impact from uranium exploration or mining has been found.

October 6, 2010: AWG Meeting (Stony Rapids, Saskatchewan)

The meeting served to update the AWG on the Beaverlodge transition to IC program. In attendance were members of the AWG and Cameco representatives. The Beaverlodge management framework was preceded by a review of the Beaverlodge history and monitoring programs. The Beaverlodge operational and decommissioning history was covered noting the environmental expectations of that time.

The presentation discussed the transition phase monitoring program and the focus on water quality assessments. It was noted that 18 water sampling stations are in use. More frequent sampling or additional stations may be implemented as needed. Uranium, selenium and 226-radium concentrations were presented graphically for water systems between Beaverlodge Lake and Crackingstone Bay (Lake Athabasca). Information was provided on the Beaverlodge properties Management Framework, a systematic assessment of the Beaverlodge properties to identify risks and implement remedial options as needed with an end goal of transferring the Beaverlodge properties to IC.

3.6 2010-11 Activities

April 2010*: *Installation of Signage at the Beaverlodge Properties

Warning signs were installed throughout the Beaverlodge properties to identify the site and its associated potential risks. Signs are intended to increase public safety and awareness around Beaverlodge sites.

May 2010: Martin Lake Adit Rehabilitation

During a Cameco inspection conducted on October 10, 2008 a small opening was noted in the backfill of Martin Lake adit (Beaverlodge Lake side). The adit was inspected again the following year on May 21/22, 2009. The opening had not increased in size and was not judged to be an immediate health and safety concern; however, Cameco committed to properly closing the adit. On November 26, 2009 a submission was made to the agencies outlining the plan for rehabilitating the adit.

Upon receiving approval from the regulators to proceed with the rehabilitation, a local contractor was hired to complete the work. A local contractor was hired to permanently close the adit. Construction activities included re-opening the adit, trimming the brow and sides in order to remove unstable material, and backfilling the adit to a sufficient depth to ensure stability. This work was completed in May 2010 and inspected by the JRG during the June 2010 inspection.

In June of 2010, Cameco representatives conducted a gamma survey in order to assess the existing gamma levels near the adit. The survey was conducted on a 2 m grid over the area surrounding the adit, as the terrain allowed. The average gamma reading over the entire survey area was 0.79 μSv/hr.

The final report was submitted to the regulators on September 27, 2010.

July 2010: Fay shaft area rehabilitation

In follow-up to a concern expressed by a Uranium City resident during the May 31, 2010 public meeting, Cameco and the JRG conducted an inspection of the former Fay mine services building area. This inspection identified depressions in the cover material applied to the foundation of the decommissioned building that housed the Fay shaft hoists.

Although the risk was considered low, Cameco engaged a local contractor to assess the condition of the site and undertake further rehabilitation work. The work was completed in July 2010. A report detailing the rehabilitation activities was submitted to the JRG on September 17, 2010.

August 2010: Dorrclone Area Clean-up

The Dorrclone plant, located within the main mine and mill facilities, was used to separate tailings. The area was decommissioned in 1985; however, not all materials were removed. Rehabilitation of the Dorrclone area, which included a remnant tailings line and other minor infrastructure, was planned for the fall of 2010. Cameco employed a local contractor to collect and move waste from this area to the approved Bolger Pit waste disposal location. The clean-up was completed in August 2010.

September 2010: Closure of Drill Holes in Hab Mine Cap

Two-inch diameter holes were drilled in the vent raise and shaft caps at Hab mine in 2009 in an effort to collect water from the underground workings. Due to a potential risk that freeze-thaw action may cause damage to the caps in the future, these holes were filled with concrete and sealed in September 2010.

September 2010: Memorandum of Understanding

On September 27, 2010, Cameco and AREVA Resources Canada entered into a memorandum of understanding (MOU) with the four Métis Nation–Saskatchewan (MN-S) regions in northern Saskatchewan. This took place after a series of discussions between MN-S representatives and Cameco personnel. In the MOU, the parties commit to a process of collaboration to ensure that northern Saskatchewan Métis are in the best position possible to take advantage of opportunities arising from Cameco’s projects and activities.

Another important function of the MOU is to enable the MN-S to be provided with opportunities to voice relevant concerns about the potential for applicable industry projects and activities to impact the exercise of Métis rights. Subsequent to the signing of the MOU, this working group held an initial meeting on October 8, 2010 in Saskatoon to begin implementation of this new arrangement.

February 2011: Approval of Revised Water Sampling Program

On March 15, 2010 Cameco submitted to the CNSC and SkMOE a proposed water sampling program for review and comment. Upon receiving regulatory feedback and incorporating the comments, the revised water sampling program was subsequently approved by the SkMOE on February 25, 2011 and by the CNSC on March 24, 2011.

The water sampling program was revised to reflect more recent trends and streamline analysis. The previous Beaverlodge surface water sampling program had been designed for the initial stages of post-decommissioning monitoring and thus, was not reflective of the historical data and established water quality trends.

Development of the revised water sampling program (WSP) for the Beaverlodge properties began with an assessment of historical data associated with Beaverlodge water sampling stations. A comprehensive list of parameters of concern was identified to evaluate water quality trends at sampling stations. The last 15 years of data (1995 to 2010) were assessed to eliminate the period of elevated contaminant concentrations immediately following decommissioning. This conservative approach to the trend analysis is more representative of the post decommissioning trends of the Beaverlodge properties.

The revisions to water sampling included the addition of the water stations AC-6A, BL-5, CS-1, CS-2, and ML-1, the addition of sampling for selenium at AC-8 and AC-14, along with the cessation of sampling of AN-4. BL-5 was added to provide a point of reference to compare upstream Beaverlodge Lake water quality with downstream Martin Lake water quality.

Station AN-4 was removed from the sampling program as the addition of sampling stations BL-5 (outlet of Beaverlodge Lake) and ML-1 (outlet of Martin Lake) made AN-4 obsolete.

Station AC-6A is located at the outlet of Verna Lake and measures water quality that has been affected by Bolger Pit and Verna shaft development.

Station ML-1 is located at the outlet of Martin Lake; adding this station will provide greater insight into the water quality downstream of Beaverlodge Lake. To address local concerns regarding downstream water quality monitoring, stations were established along Crackingstone River (CS-1) and at the inlet of Crackingstone Bay in Lake Athabasca (CS-2). A change in sampling frequency may occur in 2012 for AC-6A, BL-3, BL-5, ML-1 pending results from 2011.

3.7 Bolger Pit Waste Disposal

During a regulatory inspection completed in 2006, a number of areas were identified by SkMOE where loose debris and materials left behind during decommissioning that required additional clean-up.

Prior to commencing additional clean-up activities, Cameco sought approval from SkMOE and the CNSC to use Bolger Pit as a disposal location for loose debris encountered during clean-up activities. SkMOE and CNSC approval was received in February 2010, and in the spring of 2010 a trench was excavated in the pit. To prevent unauthorized vehicle access to the disposal site, a berm was placed in the entrance to Bolger Pit with access only allowed via a locked gate.

Bolger Pit was used for the disposal of materials cleaned up from areas on the Beaverlodge properties. These materials were mainly associated with former mining and milling activities. During the decommissioning activities of the early 1980's, Bolger Pit was used by Eldorado Resources as a disposal area for similar materials. Once placed in the pit, these materials were subsequently buried with waste rock.

As Bolger Pit had been used previously for disposal of similar materials, a trench was dug with dimensions of approximately 26 m long x 15 m wide x 1.5 m deep to dispose of any additional materials encountered during the clean-up of remaining debris on the Beaverlodge properties. A lockable gate at the entrance to Bolger Pit was installed to control access to the area.

In 2010, local contractors placed approximately 96 m^3 of debris into Bolger pit. The debris was collected during the Dorrclone area clean-up activities and consisted mainly of wood and wire collected from the tailings line. There was no material added to Bolger Pit in the first 6 months of 2011.

3.8 Studies

May 2010: Packed Boreholes and Seep Monitoring Near the Former Eldorado Mill

In May 2009, exploration drill holes near the Ace-Fay Shaft and Mill complex known to be discharging groundwater were sealed with temporary packers by Golder Associates Ltd.

In the spring of 2010 Golder Associates Ltd. was retained to perform monitoring of the packed boreholes in the vicinity of the Ace-Fay Shaft and Mill Complex as well as discharge monitoring for streams flowing into and out of Ace Lake. During the spring investigation, two new seeps were identified downstream of the previously identified seeps and were marked in the field. Golder returned to document the seeps and boreholes in June, July, and September of 2010. No additional seeps or boreholes were found in the follow up investigations.

The final report for 2010 was submitted to the regulators in February 2011. Recommendations were made to permanently seal the boreholes and continue monitoring the area.

May 2010: Quantitative Site Model

Cameco initiated the development of a Quantitative Site Model (QSM) regarding the Beaverlodge properties in 2010. Cameco and SRK Consulting had previously developed a conceptual site model (CSM) in 2009. In 2010, SENES Consultants Limited was retained to develop a QSM which is to take the environmental interactions described in the CSM and incorporate numerical monitoring information, contaminant transport and pathways modeling. The objective is to develop a predictive tool for the recovery of Beaverlodge properties. Ultimately, the QSM will be used as a tool to support risk based decisions regarding additional remediation of historical contaminant sources at the properties, and for tracking the progress of environmental recovery.

The project is to be done in two phases with the first phase beginning in May 2010. For the first phase, SENES determined input requirements and reviewed historical data for use in the model. Phase 2, to be completed in 2011 consists of developing the actual model and delivering a report discussing the calibrated and validated model's results.

May 2010 CanNorth Country Food Study Year 1

The CanNorth Country Food Study was initiated in May 2010 as a two year study with a primary objective of determining whether there were any potential human health risks from the consumption of country foods gathered in the area by Uranium City residents.

The focus of the Year 1 study was to gather information regarding the type, location, and the quantity of country foods the residents of Uranium City typically gather and consume. During the survey 115 residents of Uranium City were interviewed, representing approximately 91% of the year round and seasonal community. The residents voluntarily provided a number of samples of wildlife and berries for analysis. The samples represent a good cross section of the types of foods consumed by locals and locations.

The country foods commonly harvested include moose, rabbit, spruce grouse, blueberries, raspberries, and Labrador tea although beaver, lynx, muskrat, porcupine, and bear were also reported to be consumed. Fish was primarily obtained from Lake Athabasca with lake trout, lake whitefish, and northern pike being the most commonly consumed. Hunting areas are normally accessed by roads and corridors such as the Bushell and Eldorado roads as well as power lines in the area, although some hunters may travel longer distances by water in the fall to hunt moose.

Year 1 of the CanNorth Country Food Study was completed in 2010 with the final report submitted to the regulators on Feb 22, 2011. Year 2 of the study continues through 2011.

May/June 2010: White Sucker Spawning Health and Chemistry Study

In the spring of 2010 CanNorth Environmental Services was contracted to perform a white sucker spawning study in the vicinity of the Beaverlodge site. The main objective of this study was to document the age-class structure and the sex-ratio of the spawning population of white sucker within Ace Creek. The concentrations of metals and radionuclides in lake trout and white sucker tissue were also investigated in order to assess the health of the white sucker spawning populations. Milliken Lake and the Charlot River on Lake Athabasca provided the reference areas.

The final report was submitted in February 2011.

May/June 2010: Geotechnical Assessment

SRK Consulting (Canada) Inc. was contracted to perform a geotechnical assessment of various Beaverlodge properties associated with the former mining/milling facilities. The objective of the assessment was to assist Cameco in understanding the potential residual risks associated with some of the properties and to determine the reasonableness of potential remedial options.

The geotechnical survey included a pit wall and waste rock stability assessment. Results from the pit wall and waste rock stability assessment were submitted to the CNSC and SkMOE in January 2011.

May/June 2010: Stream Flow Diversion Option Survey

In late May of 2010, SRK Consulting (Canada) Inc. performed an assessment of potential options for the diversions of surface flows at several former Eldorado properties in the Beaverlodge area. Field surveys were conducted from May 26th to June 4th, 2010, and included ground-truthing of several possible diversion options.

A draft report was submitted to Cameco in April 2011, due to consultant availability the final report is expected in October 2011.

May/June 2010: Site-Wide Flowing Borehole Assessment

In May of 2010 SRK Consulting (Canada) Inc. completed a flowing borehole investigation on the former Eldorado Beaverlodge properties. The intent of the investigation was to identify and record the location and condition of each borehole that exhibit the potential for artesian conditions in which groundwater associated with flooded underground workings could report to the surface.

As part of the investigation, a review of historical provincial exploration drill records was performed, as well as conducting field confirmation at each of the former Eldorado Beaverlodge properties for the presence/absence of exploration drill holes. Drill holes were characterized in terms of location, condition, and presence/absence of surface discharges. In addition, an identification system was developed with each borehole labeled in the field. The final report was submitted in February 2011.

May/June 2010: Three Year Inspection of Fookes and Marie Reservoir Outlet Channels and Fookes Lake Delta

SRK Consulting (Canada) Inc. carried out the three year site inspection of the outlet channels at Fookes and Marie Reservoir in May of 2010. The objective of the inspection was to evaluate the condition of the outlet channels and compare their actual versus predicted performance. In addition, the Fookes Lake tailings delta was inspected in order to assess the performance of the cover since 2007. The final report was provided to the JRG on October 18, 2010. A summary of the results of the inspection are presented in Section 4.7.

September 2010 Beaverlodge Risk Matrix

During the quarterly Joint Regulatory Group (JRG) meeting held on July 26, 2010, Cameco committed to providing the JRG with a copy of the Beaverlodge Risk Matrix (BRM) being developed by Cameco for the Beaverlodge properties by September 30, 2010. The BRM is a screening level assessment that provides a semi-quantitative analysis of the current nature of the risks associated with the decommissioned properties. It is a tool that allows for the prioritization of potential remedial options by using regulatory accepted methodologies to conduct risk assessments.

In addition, the BRM functions as an internal management tool serving to promote organizational knowledge transfer within Cameco. Supporting the management framework, the BRM ensures that the properties are systematically reviewed and that current risks have been evaluated prior to advancement into the provincial Institutional Control (IC) program.

The matrix was used to evaluate Beaverlodge areas in order of risk based on the likelihood and the consequence of the risk in order to better concentrate efforts. Seven sites were assessed by the Beaverlodge Risk Matrix: Hab, Dubyna, Verna/Bolger, Fulton Creek, Lower Ace Creek, Ace Bay, and Fulton Bay. The screening level risk assessment was submitted to the CNSC and the SkMOE on September 30, 2010.

February 2011: Ace Lake Watershed Hydrologic Assessment

In support of the approved management framework and to better understand the potential residual risk associated with the decommissioned properties upstream of Ace Lake, Golder Associates Ltd. was contracted to collect streamflow and water quality data from all known sources of surface flow into and out of Ace Lake.

The assessment found that the majority of the contaminant load to Ace Lake is through the upper Ace Creek watershed, which contains the former Dubyna mine site. Other less significant load contributions were measured from the Hab sub-watershed and Verna sub-watershed. The assessment showed that Ace Lake acts as a flow through system rather than as a sink or source of contaminants of concern such as uranium. Flow monitoring results showed that 2010 was an exceptionally dry year in northern Saskatchewan, which may have influenced flow regimes in the region.

Results from the assessment supported establishing a hydrometric monitoring station AC-14. The final report was submitted to the regulators on February 14, 2011.

SECTION 4

ENVIRONMENTAL MONITORING PROGRAMS

4.0 ENVIRONMENTAL MONITORING PROGRAMS

Cameco retains a local contractor (Urdel Ltd.) to conduct the required water quality and radon sampling throughout the year. 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 (ERL June 1982). 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).

Table 4.1.1 provides a summary of the water quality COOs as originally established by the AECB in 1982 (AECB 1982). In the interest of completeness, the table also provides a summary of the most recent *Saskatchewan Surface Water Quality Objective for the Protection of Aquatic Life* and *General Surface Water Quality Objectives* (Saskatchewan Environment, 2006), the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME, 2006), the *Saskatchewan Municipal Drinking Water Quality Objectives* (2002) and the *Guidelines for Canadian Drinking Water Quality* (Health Canada, 2007).

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}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). The estimated operational loadings are summarized in Table 4.1.2.

4.2 Transition Phase Monitoring

Over the history of the transition phase monitoring, the results of four separate monitoring programs have been evaluated to assess the performance of the closed-out site. These are water quality, ambient radon, air quality and gamma radiation surveys.

In 2010-2011 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. 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.

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

4.3 Water Quality

This section discusses summary results for water quality parameters of interest at 17 sampling stations from July 1982 to June 2011 where the data is available. A revised water sampling program was approved by the CNSC for implementation in 2011.

This section focuses on the four main parameters of concern: uranium, 226-radium, total dissolved solids (TDS), and selenium. The COOs were approved during decommissioning by the regulators of the day.

At Beaverlodge, selenium monitoring began at selected water stations in 1996. The SSWQO includes selenium as well as uranium; there are no guidelines under the SSWQO for radium or for TDS. Where applicable, comparisons are also made with the original water quality modeling predictions made in 1983 (SENES 1983) and the revised predictions made in 2003 (SENES 2003).

The tables presented in the following section break the results into a mean annual average for 2010, and a six month mean for 2011. Due to suspected error in sampling, the scheduled March 2011 water sample for AC-14, BL-3, BL-4, and ML-1 was re-sampled in April 2011. Re-sampling occurred in April since monthly samples are taken near the end of each month.

Water samples were unable to be collected in 2011 for the stations AC-6A, TL-3, TL-4, TL-6, and TL-9 due to a lack of flow. Sampling was discontinued in 2011 for AN-4 as per the revised water sampling program approved by the CNSC. The scheduled sampling of AN-3 in 2010 was unable to be completed due to a lack of water flow. The next upcoming scheduled sampling is in September 2011, thus there is no data for AN-3 available for the Jan 2010 to Jun 2011 reporting period.

The two watersheds affected by the historical Eldorado Mining activities are Ace Creek and Fulton Creek. Within the Ace Creek watershed the routine sampling stations (from upstream to downstream) include:

- **AN-5** - Pistol Creek below 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-8** - Ace Lake outlet to Ace Creek;
- **AC-14** - Ace Creek at the discharge into Beaverlodge Lake; and
- **AC-6A**- Verna Lake discharge to Ace 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; and
- **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;
- **CS-1** – Crackingstone River at Bridge;
- **CS-2** – Crackingstone Bay in Lake Athabasca; and
- **ML-1** – Outlet of Martin Lake.

As part of the revised water sampling program, stations BL-5, CS-1, CS-2, and ML-1 were added while sampling of station AN-4, located in Martin Lake, was discontinued as a component of the environmental monitoring program moving forward. Figure 4.3.1 provides an overview of the various stations at which water quality is monitored.

Figures 4.3.2 to 4.3.61 are graphical representations of the historical annual average concentrations of U, ^{226}Ra, Se and TDS at each station. 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.

Sections 4.3.1 to 4.3.2 cover the water quality results and trends at each of the water stations within each water shed. Trends are noted through visual interpretation of the graphs and include trends in the short term (less than 5 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.

Table 4.3.4 compares the mean concentrations over the 18 month period from January 2010 through June 2011 to the COOs. Operational and model predictions for the stations AC-14, TL-7, and BL-4 are presented in Table 4.3.5. Table 4.3.6 summarizes whether each station has met the COO or model predictions in the current reporting year.

Total environmental loadings of U, ^{226}Ra, TDS, and Se to Beaverlodge Lake in 2010-2011 have been calculated and are reported in Tables 4.4.1 and 4.4.2. Loadings calculations and comparisons with the U, ^{226}Ra, and TDS revised predicted loadings at the shutdown of the facility are presented in Table 4.4.3 and summarized in section 4.4.2.

Comparisons for Se loadings with the estimated operational loadings and predicted shutdown loadings are not possible since Se was not monitored until after decommissioning and reclamation. Hydrology is discussed in Section 4.4.2 and precipitation data for Uranium City is provided in Table 4.4.4.

The detailed results and the annual averages for the current reporting period, January 2010 to June 2011, are provided in Appendices A and B respectively.

4.3.1 Ace Creek Watershed

AN-5

Station AN-5 is located in Pistol Creek downstream of the decommissioned Hab satellite mine. It is one of the four stations identified in the Eldorado decommissioning documents (Eldorado 1982) at which COOs are applied. During the 2010-11 reporting period, concentrations of U and TDS met their respective COOs while ^{226}Ra did not. The average concentration in 2009 and 2010 for each constituent as well as the January 1, 2011 to June 30, 2011 concentration is shown below:

Parameter	Units	Annual Average 2009 n=4	Annual Average 2010 n=6	Jan to June 2011 Average n=1	Close Out Objective*
U	mg/L	0.11	0.18	0.16	0.25
^{226}Ra	Bq/L	0.76	1.14	0.58	0.11
TDS	mg/L	137	204	171	250
Se	mg/L	0.0002	0.0001	0.0001	-

**Se was not included in the original COOs*

Uranium (U) values have shown seasonal fluctuation which in turn affect the annual average and are currently below the COO. Overall, the long term trend for U at AN-5 has shown a decrease in concentrations post-decommissioning. More recently, the short term trend (ie. last 5 years) at this station has shown a further decrease, with the mean concentration of U in 2009 the lowest recorded at this station.

The long term trend for 226-Radium (^{226}Ra) has shown considerable fluctuation, with values increasing slightly post decommissioning. While 2010 showed the highest ^{226}Ra values concentrations since monitoring began, the Jan-June 2011 ^{226}Ra average is the lowest recorded since 1995.

As with U values, 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.

Selenium values at AN-5 have followed the short term trend, continuing to meet the Saskatchewan Surface Water Quality Objective (SSWQO) of 0.001 mg/L since 2001.

All parameters, except for ^{226}Ra, are meeting the COOs for the current reporting period (Table 4.3.6). A historical summary of U, ^{226}Ra, TDS and Se concentrations at AN-5 are presented in Figures 4.3.2 to 4.3.5.

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. It is one of the four stations identified in the Eldorado decommissioning document (Eldorado 1982) at which COOs are applied.

All parameters were at or below the established COOs for the 2010-11 reporting period at this station. The average concentration in 2009 and 2010 as well as the 2011 concentration is shown below:

Parameter	Units	Annual Average 2009 n= 6	Annual Average 2010 n= 5	Jan to June 2011 Average n=1	Close Out Objective*
U	mg/L	0.22	0.25	0.24	0.25
^{226}Ra	Bq/L	0.04	0.03	0.03	0.11
TDS	mg/L	150	158	143	250
Se	mg/L	0.0002	0.0001	0.0001	-

**Se was not included in the original COOs*

Uranium concentrations at DB-6 are currently below the COO and have shown a steadily decreasing trend in the long term, with U levels meeting the COO in 5 of the last 7 years. The mean uranium concentration for 2009 was the lowest recorded annual average at this station since decommissioning. The 2010 average and sample results from 2011 are consistent with the short term trend.

The long term trend for ^{226}Ra and TDS at DB-6 has been consistent, with annual averages for ^{226}Ra and TDS meeting the COOs since 1981 and 1983 respectively. Concentrations of these parameters recorded during the 2010-11 reporting period are consistent with the long term trend.

The short term trend for Se at DB-6 has remained consistent, meeting the SSWQO since 2004.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station DB-6 are presented in Figures 4.3.6 to 4.3.9.

AC-6A

AC-6A is located at the discharge of Verna Lake to Ace Lake. Water quality monitoring at this station began in May 2010; however, due to low flow 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. There is no data available prior to 2009 or for 2011.

The only available results, May 2010, are reported in the table below:

Parameter	Units	May 2010 n=1
U	mg/L	0.26
^{226}Ra	Bq/L	0.10
TDS	mg/L	199
Se	mg/L	0.0001

As station AC-6A was added to the water sampling program in 2010, there is not enough data to assess trends.

Consistent with other stations in this system, the Se concentration recorded in 2010 was below the SSWQO.

The data is presented graphically in Figures 4.3.18 to 4.3.21.

AC-8

Station AC-8 is located at the discharge of Ace Lake into Ace Creek. Ace Lake is the receiving environment for waters discharged from DB-6, AN-5 and AC-6A. Mean concentrations observed during 2009 and 2010, as well as the 2011 concentrations are detailed in the table below.

Parameter	Units	Annual Average 2009 n= 5	Annual Average 2010 n=4	Jan to June 2011 Average n=1
U	mg/L	0.01	0.02	0.02
^{226}Ra	Bq/L	0.01	0.02	0.01
TDS	mg/L	73	77	81
Se	mg/L	0.0001	0.0001	0.0002

Long-term trends for concentrations of U and TDS have remained relatively stable at this station since 1982. The long term trend for ^{226}Ra has shown a decrease in the annual concentrations at this station.

Selenium only recently became a part of the routine monitoring program at AC-8, in August of 2009. As a result, there are not enough data points to confidently discuss trends with respect to the long term. However, Se concentrations are below the SSWQO.

A historical summary of U, ^{226}Ra, TDS, and Se annual average concentrations for station AC-8 are presented in Figures 4.3.10 to 4.3.13.

AC-14

AC-14 is located in Ace Creek at the discharge into Beaverlodge Lake. It is one of the four stations identified in the Eldorado decommissioning document (Eldorado 1982) at which COOs are applied. The long term trend for annual average concentrations of U and TDS measured at this station have been consistent, with concentrations below the COOs since the decommissioning of the Beaverlodge mine/mill complex. Concentrations of ^{226}Ra remained above the COOs until 1990-91, however; the long term trend has shown concentrations near or below the objective since 1991.

During the 2010-2011 reporting period, U, ^{226}Ra, and TDS were below the COOs, while Se was below the SSWQO. Annual average concentrations for 2009 and 2010, and the 2011 reporting period are provided in the table below.

Parameter	Units	Annual Average 2009 n=13	Annual Average 2010 n=12	Jan to June 2011 Average n=6	Close Out Objective*
U	mg/L	0.02	0.03	0.03	0.25
^{226}Ra	Bq/L	0.03	0.05	0.07	0.11
TDS	mg/L	78	82	87	250
Se	mg/L	0.0002	0.0002	0.0001	-

**Se was not included in the original COOs*

Modeling conducted for Eldorado Nuclear Ltd. during the original decommissioning established estimated concentrations for three parameters (SENES 1983). During the 2010-2011 monitoring period the annual average U, ^{226}Ra and TDS concentrations at AC-14 were less than the concentrations predicted at shutdown.

Uranium concentrations remained steady for the 2010-2011 reporting year. The 2009 annual average for ^{226}Ra (0.03 Bq/L) was the lowest recorded value at this station since decommissioning was complete. The January to June 2011 ^{226}Ra and TDS have increased since 2009 but are still below the COO and SSWQO.

The long term trend for Se at AC-14 since the laboratory method detection limit changed in 2003 has shown an overall decrease in concentrations, with results below the SSWQO. The

January to June 2011 average Se concentrations were among the lowest recorded at this station (0.0001 mg/L).

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station AC-14 are presented in Figures 4.3.14 to 4.3.17.

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. 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 concentration from the 2009 sampling event is detailed in the table below.

Parameter	Units	Annual Average 2008 n=1	Annual Average 2009 n=1	SSWQO
U	mg/L	0.002	0.002	0.015
^{226}Ra	Bq/L	0.005	0.005	-
TDS	mg/L	94	89	-
Se	mg/L	0.0001	0.0001	0.001

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 currently the SSWQO. Selenium concentrations at AN-3 have been at or below detectable laboratory limits since routine analysis began in 2000.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station AN-3 are presented in Figures 4.3.22 to 4.3.25.

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. Water has not been flowing at TL-3 since May 2010, thus there is no data available for the latter part of 2010 or for early 2011.

All parameters have remained relatively stable since 2009. Mean concentrations from 2009 and 2010 are shown in the table below.

Parameter	Units	Annual Average 2009 n=12	Annual Average 2010 n=5
U	mg/L	0.39	0.34
^{226}Ra	Bq/L	1.20	1.07
TDS	mg/L	220	211
Se	mg/L	0.0043	0.0037

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 remained relatively consistent post-decommissioning.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-3 are presented in Figures 4.3.26 to 4.3.29.

TL-4

TL-4 is located within Fulton Creek drainage downstream of TL-3 and at the discharge of Marie Reservoir. Water has not been flowing at TL-4 since October 2010, thus there is no data available for the latter part of 2010 or for early 2011. Results from the 2009 and 2010 annual averages are detailed in the table below.

Parameter	Units	Annual Average 2009 n= 11	Annual Average 2010 n=8
U	mg/L	0.34	0.42
^{226}Ra	Bq/L	1.58	1.65
TDS	mg/L	227	290
Se	mg/L	0.0025	0.0031

Annual concentrations of U and TDS at TL-4 have shown a considerable decrease over the long term, while Se and ^{226}Ra have remained relatively consistent.

The 2010 annual average concentrations for U, ^{226}Ra, TDS, and Se are slightly elevated in comparison to 2009 levels; however, concentrations are consistent with the observed short term trend.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-4 are presented in Figures 4.3.30 to 4.3.33.

TL-6

TL-6 is located at the discharge of Minewater Reservoir which was used for tailings deposition in 1953 and settling of treated mine water in the last 10 years of Beaverlodge mill operations. This water station generally exhibits ephemeral flows. As a result, only one sample was able to be collected in 2010. No samples were able to be collected for 2011. Results from the 2009 and 2010 sampling periods are shown below.

Parameter	Units	Annual Average 2009 n=2	May 2010 n=1
U	mg/L	0.21	0.25
^{226}Ra	Bq/L	5.55	5.60
TDS	mg/L	526	529
Se	mg/L	0.0023	0.0022

The long term trend for U and TDS at TL-6 showed a sharp decrease in concentrations post-decommissioning. The long term trend for annual concentrations of ^{226}Ra has shown considerable fluctuation over the past fifteen years ranging from 1.3 Bq/L in 1996 to 5.6 Bq/L in 2010; however the general trend has been increasing.

During the same time period, concentrations of sulphate have been decreasing while barium has demonstrated a trend similar to that observed in ^{226}Ra. Cameco has concluded this is a result of dissolution of the barium-radium-sulphate precipitate that was generated during the active treatment of mine water with barium chloride during operations.

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 U, ^{226}Ra, TDS and Se annual average concentrations for station TL-6 are presented in Figures 4.3.34 to 4.3.37.

TL-7

TL-7 is located at the discharge of Meadow Fen. It is one of the four stations identified in the Eldorado decommissioning document (Eldorado 1982) at which COOs are applied. During the 2010-11 reporting period, none of the parameters met the numerical COOs established for this station, although recent U results have been approaching the COO. Results from the 2009, 2010, and 2011 monitoring period are shown below.

Parameter	Units	Annual Average 2009 n=11	Annual Average 2010 n=9	Jan to June 2011 Average n=3	Close Out Objective*
U	mg/L	0.33	0.27	0.26	0.25
^{226}Ra	Bq/L	1.27	1.62	0.92	0.11
TDS	mg/L	222	297	279	250
Se	mg/L	0.0024	0.0053	0.0053	-

**Se was not included in the original COOs*

The original predictions made in SENES 1983 indicated that U concentrations were expected to meet the COOs in the long-term (more than 200 years), while TDS and ^{226}Ra were not expected to meet COOs at any point in the foreseeable future.

As observed with stations TL-3, TL-4 and TL-6 mean annual U concentrations have shown a decreasing long term trend since 1990. While the mean concentration of U during the 2010 reporting period was 0.27 mg/L, almost half of all the U samples collected and analyzed during this period were below the COO.

While the annual average for ^{226}Ra has been increasing overall since 1984, the 2011 value was the lowest ^{226}Ra concentration since 2000. The short term trend for ^{226}Ra has shown fluctuations in concentration; however, the 2011 value is lower than recorded in the previous several years.

The long term trend for TDS at TL-7 has shown a decrease in concentrations, with the annual average meeting the COO from 2006 to 2009. Selenium concentrations at TL-7 followed the overall decreasing long trend observed since 1990 until 2009, and have since been stable with minor fluctuations. Over the short term, the concentrations of Se at TL-7 have remained relatively stable.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-7 are presented in Figures 4.3.38 to 4.3.41.

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 has not been any water flowing at TL-9 since May 2010; thus there is no data available for the latter part of 2010 or for 2011.

Mean concentrations from the 2009 and 2010 annual averages are detailed in the table below.

Parameter	Units	Annual Average 2009 n= 8	Annual Average 2010 n=4
U	mg/L	0.30	0.48
^{226}Ra	Bq/L	2.08	0.98
TDS	mg/L	221	308
Se	mg/L	0.0032	0.0048

The long term trend for U at TL-9 has shown a decrease in concentrations following decommissioning. Concentrations in the short term have been stable, with a slight increase observed in 2010 (0.48 mg/L) values in comparison to 2009 (0.30 mg/L).

^{226}Ra concentrations have seen an overall increasing trend since 1990 and displayed some fluctuation throughout the past twenty years; however, the 2010 annual average was the lowest since 2000. In particular, January and February 2010 showed the lowest ^{226}Ra levels since February 2000.

Concentrations of TDS have shown a decreasing trend in the long term. Annual average TDS concentration has been consistent in the short term, with a slight increase observed in 2010.

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

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station TL-9 are presented in Figures 4.3.42 to 4.3.45.

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). 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. Mean annual concentrations recorded during 2009, 2010 and the 2011 reporting period are shown below. Comparisons to the SSWQO are included as well.

Parameter	Units	Annual Average 2009 n=4	Annual Average 2010 n=4	Jan to June 2011 Average n=2	SSWQO
U	mg/L	0.15	0.15	0.14	0.015
^{226}Ra	Bq/L	0.05	0.05	0.03	-
TDS	mg/L	151	150	155	-
Se	mg/L	0.0031	0.03	0.0027	0.001

The long term trend for annual average concentrations of U, TDS and Se at BL-3 has remained relatively consistent from 1998 to June 2011. Concentrations of ^{226}Ra have averaged below the SSWQO values and trended downwards over the past 7 years, from a value of 0.1 Bq/L in 2003 to the most recent value of 0.03 Bq/L.

Concentrations of U and Se are both elevated in comparison to the SSWQO.

A historical summary of U, ^{226}Ra, TDS and Se annual average concentrations for station BL-3 are presented in Figures 4.3.46 to 4.3.49.

BL-4

Station BL-4 is located in the approximate center of the north end of Beaverlodge Lake. 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. Results from the 2009, 2010, and 2011 reporting periods are shown in the table below.

Parameter	Units	Annual Average 2009 n=4	Annual Average 2010 n=4	Jan to June 2011 Average n=1	SSWQO
U	mg/L	0.14	0.14	0.14	0.015
^{226}Ra	Bq/L	0.03	0.04	0.03	-
TDS	mg/L	142	147	142	-
Se	mg/L	0.0030	0.0027	0.0028	0.001

The long term trend for U and ^{226}Ra at BL-4 has shown an overall decreasing trend, while TDS has been relatively consistent. Se concentrations have fluctuated over the long term; however, the recent short term trend has remained stable.

Concentrations of U and Se do not meet SSWQO at BL-4.

Historical sampling results are presented in Figures 4.3.50 to 4.3.53.

AN-4

Station AN-4 is located on Martin Lake which receives water that flows out of Beaverlodge Lake and flows into Cinch Lake. In March of 2010, Se was added to the water sampling program at Beaverlodge, thus there is no Se data prior to that point. Sampling at AN-4 was discontinued in early 2011 as part of the CNSC approved revised water sampling program, as water quality monitoring stations were established at the outlet of Beaverlodge Lake and Martin Lake, rendering AN-4 obsolete. The results from 2009 and 2010 are presented below.

Parameter	Units	Annual Average 2009 n=1	Annual Average 2010 n=2	SSWQO
U	mg/L	0.06	0.05	0.015
^{226}Ra	Bq/L	0.01	0.01	-
TDS	mg/L	105	117	-
Se	mg/L	-	0.0008	0.001

The short term trend has seen concentrations of U at AN-4 decreasing over the past several years, with the March 2010 value of 0.015 mg/L being the lowest reported value since decommissioning. While both the long term and short term trends have shown decreases in concentration, U at AN-4 does not currently meet SSWQO.

The long term trend for annual average concentrations of ^{226}Ra, TDS and Se remain consistent. Routine Se monitoring was initiated in 2010, and sampling results at AN-4 indicate that Se meets SSWQO.

A historical summary for station AN-4 is presented in Figures 4.3.54 to 4.3.57.

BL-5

Station BL-5 is located at the Beaverlodge Lake outlet. It was implemented in the revised water sampling program in January 2011 in order to provide a point of reference to compare upstream Beaverlodge Lake water quality and downstream Martin Lake water quality. As a result, only 2011 data is available. The results are presented in the table below with the SSWQO for comparisons.

Parameter	Units	Jan to June 2011 Average n=2	SSWQO
U	mg/L	0.138	0.015
^{226}Ra	Bq/L	0.02	-
TDS	mg/L	128	-
Se	mg/L	0.0018	0.001

Both uranium and selenium exceed the SSWQO at BL-5. Discussion of trends is not yet appropriate since the only data available is for a portion of 2011. The data is presented graphically in Figures 4.3.58 to 4.3.61.

CS-1

Station CS-1 is located at the outlet of Martin Lake near the bridge in Crackingstone River. Its purpose is to monitor water quality downstream from Uranium City. This station was implemented in the water sampling program in January 2011 with the first sampling scheduled in September 2011. As a result, there is no data available for inclusion in the report.

CS-2

Station CS-2 is located at the inlet of Crackingstone Bay in Lake Athabasca. As with station CS-1, station CS-2 is newly implemented and therefore data is not yet available.

ML-1

Station ML-1 is located at the outlet of Martin Lake. Sampling of this station began in 2011, thus there is no data available prior to this. The 2011 reporting period average is included in the table below with the SSWQOs available for comparison.

Parameter	Units	Jan to June 2011 Average n=2	SSWQO
U	mg/L	0.065	0.015
^{226}Ra	Bq/L	0.01	-
TDS	mg/L	140	-
Se	mg/L	0.0021	0.001

For the 2011 reporting period of January to June 2011, both U and Se were above the SSWQO. Discussion of trends is not yet appropriate since the only data available is for a portion of 2011.

The data is presented graphically in Figures 4.3.62 to 4.3.65.

4.4 Hydrology

4.4.1 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) stream flow for the predicted shut down and reclamation scenarios (SENES 1983) were:

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

The revised (TAEM 1997) stream flow predictions were:

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

Table 4.1.2 summarizes the original (1983) loading calculations and compares them to the revised loadings, which were derived using the revised (1997) stream flow data.

4.4.2 Hydrological Data and Loading Calculations

Golder Associates Limited (Golder) 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, 2010 to June 30, 2011. The report can be found in Appendix C.

Environment Canada operates meteorological stations at Uranium City and Stony Rapids, Saskatchewan. Meteorological data collected at these locations was reviewed as an indicator of the climatic conditions in the Beaverlodge area from January 2010 to June 2011. The data collected at Uranium City is closer to the site however this station has in the past shown data gaps. The data from Stony Rapids was reviewed as this station typically has a complete data set for analysis.

Precipitation was well below average for the period of January 2010 to July 2011 for both Uranium City and Stony Rapids; several months for both stations fall below 30% of normal. This data is supported by field observations in 2010 and 2011. Northern Saskatchewan was dry in 2010 and little snow fell through the winter of 2011. As a result there are many streams in the Beaverlodge area that were identified as having little or no discharge. The water stations AC-

6A, TL-3, TL-4, TL-6, TL-9, and AN-3 were unable to be sampled in 2011 due to a lack of water flow.

Although precipitation was well below normal for winter 2010, discharge at AC-8 was above the historical mean for January – May 2010. The greatest 2010 flow occurred in May. While the spring peak occurred in May- as is typical, subsequent periods saw much lower flows than the historical mean. This trend continued into 2011 with the May spring flow being less than 30% of the historical mean for that month.

Flow through TL-7 was much lower in the 2010-2011 reporting period than the historical mean. February through April 2011 saw virtually no water flowing through TL-7. The 2010 and 2011 spring peak both occurred in May. Water flow in 2011 through TL-7 was only a small fraction of the monthly historical means, ranging from 0 to 3%.

The Uranium City and Stony Rapids precipitation data is included in Table 4.4.4. This table reports total monthly precipitation for January 2010 to June 20111 and compares it to the historical normal precipitation.

Loading Calculations

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

Tables 4.4.1 and 4.4.2 present a summary of the monthly loading calculations for U, ^{226}Ra and TDS at TL-7 and AC-14, respectively, as well as the annual loading calculations for Se.

As detailed previously, revised estimates were completed in 1997 using site specific flow information. Table 4.4.3 provides a comparison of the 2010-2011 loadings at each of the two stations and the site total, to the revised loadings predicted for various reclamation scenarios.

The annual mean discharges as reported in the Golder annual streamflow assessment of the stage and flow data for stream flow monitoring stations at TL-7 and AC-8 for the period from January 2010 to June 2011 are:

- AC-14 - 251 L/s
- TL-7 - 2.23L/s

A breakdown of the annual loadings at stations AC-14 and TL-7 is provided in Table 4.4.3. As shown in the table, the total annual loadings of U, ^{226}Ra and TDS at stations AC-14 and TL-7 were less than the revised operational loadings.

Loadings Summary

Table 4.4.3 provides a summary of the total 2010 and January to June 2011 loadings to Beaverlodge Lake, as well as those of AC-14 and TL-7. Figures 4.4.1 to 4.4.3 present the revised total loadings to Beaverlodge Lake during operations for comparison. As can be seen, the total actual loadings to Beaverlodge Lake are less than the revised operational loadings. As the second of the COOs states that "*annual radioactive and non-radioactive contaminant loadings to the environment would not be greater after close-out than those which occurred during operations*" a review of this data shows the COOs for total loadings of U, ^{226}Ra and TDS to Beaverlodge Lake have been met during the 2010 monitoring period.

4.5 Air Quality

Section 4.5 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.

4.5.1 Ambient Radon Monitoring

As part of the transitional phase ongoing 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 4.5.1 and are located in the following areas:

- Airport Beacon;
- Eldorado town site;
- Northwest of the Airport;
- Ace Creek;
- Fay Waste Rock;
- Fookes Delta;
- Marie Lake Delta;
- Donaldson Lake;
- Fredette Lake; and
- Uranium City.

At the cessation of mining in 1982, track-etch detectors were placed 1 m above the ground at 84 separate locations throughout the Beaverlodge area. The track-etch cups were exposed during two separate periods (May to September, 1982 and October to December, 1982) in order to ascertain the radon concentrations during operations.

Track-etch cups were set out at ten stations in the Beaverlodge area from Feb 05, 2010 to Jan 01 2011 to track radon for 2010. Track-etch cups were set out from Jan 18 2009 to Feb 05 2010 to track radon for 2009. Table 4.5.1 presents a summary of the radon monitoring conducted at the ten sites for the 2010-2011 monitoring period and compares it to the previous four 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.

As the second of the COOs states that *"annual radioactive and non-radioactive contaminant loadings to the environment would not be greater after close-out than those which occurred during operations*" it is clear from a review of this data that the COO for radon has been consistently met since operations ceased.

4.6 Piezometric Data Update

Piezometric data was collected at the nine pneumatic piezometers on the Fookes Delta from January 2009 to June 2010. Following a recommendation by SRK Consulting (Canada) Inc., the CNSC approved the halting of piezometric data collection in January 2011. Accordingly, piezometric updates will not be provided in future annual reports. In lieu of collecting piezometric data, annual inspections of the Fookes Delta cover are conducted and evaluated according to the Geotechnical Inspection Checklist. Details on the results of the 2011 Geotechnical Inspection are given in Section 3.2.2 and Appendix D.

Piezometers were installed at Fookes Delta in 1993 to track pore water pressures within the tailings and waste rock. In 1997, an engineered filter cover was installed over the tailings and waste rock to dissipate an observed increase in pressure that led to boil formation. The filter cover was designed to dissipate this increase in pressure and concurrently prevent the potential movement of tailings to the surface. Piezometric data was used to assess the performance of the cover which has been fulfilling its objectives to date.

The piezometric 2010 data trends had conformed to trends observed as far back as 1997 with higher piezometric levels occurring from late spring to early summer. As the trends have been consistent with previous years and the engineered cover was performing as expected (no boil formation), SRK concluded that incremental piezometric data would provide no additional useful information. It was recommended that the collection of piezometer data be discontinued after June 2010. The piezometers are to be left in place in the unlikely event that additional data is needed in the future. Piezometric data collection may be necessary in the future should the Fookes delta cover fail. This would be evidenced by the formation of boils.

4.7 Three Year Inspection of the Marie Reservoir Outlet structure and the Fookes Delta and Outlet Structure

On May 27, 2010 an inspection of the cover at the Fookes Reservoir tailings delta and the two outlet structures at Marie and Fookes Reservoirs were conducted by representatives of SRK consulting. Previous inspections of these facilities were undertaken by SRK in September 1998, September 2001, June 2004 and August 2007.

No new boils or significant erosion features were observed on the Fookes Reservoir tailings delta. In light of this and combined with the observation that piezometric levels had remained consistent in terms of annual and seasonal trends, piezometric data collection was discontinued for 2011.

The Fookes Reservoir delta cover performance has proven to be stable as evidenced by the lack of boil formation and consistent piezometric trends. Due to this stability and the stability of both of the Fookes and Marie outlet structures, the CNSC approved a request to reduce the frequency of third-party inspections of the Fookes delta and outlet structures at Fookes and Marie Reservoirs from every three years to every five years.

Annual inspections of the Fookes delta and the outlet structures for Marie and Fookes reservoirs are required to support this change and are performed according to the Geotechnical Inspection Checklist. A third party geotechnical inspection is required every five years or on the occasion of any new tailings formation or if there are any significant changes to the outlet structures. Results from the 2011 Geotechnical Inspection are detailed in Section 3.2.2 and Appendix D.

SECTION 5

2011 WORK PLAN

5.0 2011 WORK PLAN

As this report was prepared in June 2011, this section describes those tasks proposed for the remainder of the year. A detailed list of studies and activities conducted from January 1st, 2010 to June 30th, 2011 is presented in Section 3.0.

5.1 Regular Scheduled Monitoring

Representatives of Cameco continue to complete the established monitoring program associated with the various properties. A revised water sampling program (WSP) was approved in 2010 and implemented in 2011. The new WSP took into consideration the vast amount of data available for the Beaverlodge site, previously approved and implemented sampling programs, and the role of monitoring as a part of the transition phase. The revised program streamlined monitoring to better characterize water quality, reduced overall costs and maintained quality control. The water sampling stations AC-6A, BL-5, CS-1, CS-2, and ML-1 were added while sampling at AN-4 was discontinued for 2011.

5.2 JRG Inspections/Public Meetings/EQC/CNSC

The next scheduled quarterly JRG meeting is planned for September 2011.

An EQC meeting is scheduled for fall 2011 that will provide an activity update for the Beaverlodge sites. The EQC meeting is currently planned for September 27/28 with Uranium City residents welcome to attend.

The CNSC midterm update meeting is currently planned for Ottawa on November 3, 2011.

5.3 Studies

Cameco has initiated or proposed a number of studies in 2011 that are aimed at furthering our understanding of the impacts and interaction of the licensed properties with the environment. Studies initiated in 2010 that are continuing in 2011 include:

- *Ongoing QSM development*
- *Ace Lake Watershed Hydrologic Assessment*

For a description of the above activities, refer to Section 3.8.

Small Site Assessment

Cameco is working with the JRG to determine the property boundaries of numerous "small sites" associated with the large group of properties referred to as the Main Mine/Mill Facilities. These "small sites" are areas that potentially have limited environmental and/or health and safety risks and may be good candidates for release from decommissioning and reclamation, exemption from CNSC licensing and accepted into the provincial IC program.

5.3.1 New Studies

Country Foods Assessment-Year 2

A two year study is underway to better understand local wildlife utilization and potential implications to human health from traditional harvesting is currently underway. The information gathered will be used to further develop and validate current ecological and human health risk models for the region, while traditional food harvesting results will be shared with the residents of Uranium City.

Year 1 consisted of determining the type, quantity, and location of country foods consumed by residents in the vicinity of Uranium City. This was completed in 2010 by surveying approximately 115 residents of Uranium City, representing 91% of the population.

Year 2 will move into the collection and analysis of country foods obtained from the Beaverlodge properties. All country food samples will be analyzed for concentration of chemical and radiological constituents. The samples gathered in year 1 will be used to supplement the samples gathered in Year 2.

The results will indicate if any potential risks exist and these will be used to implement risk management studies if needed. CanNorth will report the final results of this study to the residents of Uranium City and the surroundings area. In addition, the country food study data will be provided to SENES for the company to complete a Uranium City Human Health Risk Assessment. The Year 2 report is expected in March 2012.

5.4 2011-12 Work Plan

During the 2011-12 reporting period a number of activities are planned for the Beaverlodge mine/mill area and associated properties. In support of the management framework established for the Beaverlodge properties, future works conducted on the licenced properties will support the management of human and environmental risks to acceptable levels, while demonstrating conditions on the properties are stable and/or improving.

Ultimately, the 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.

In addition to the studies described previously, several programs are currently proposed for the 2011-12 reporting period.

Pistol and Beatrice Lake Characterization

A study to characterize Pistol and Beatrice Lake for limnology (temperature, dissolved oxygen, specific conductance, pH, and Secchi disk depth) and water chemistry is planned for the fall of 2011. In addition, Pistol and Beatrice Lake will be analysed for sediment and porewater chemistry, and will be surveyed for benthic invertebrate community and biomass as well as for the fish community. The draft report is expected in the first quarter of 2012.

Permanently sealing flowing boreholes at base of main wasterock pile

A program is proposed for the fall of 2011 that will attempt to seal the flow from flowing boreholes located at the base of the main wasterock pile. A draft report detailing the efforts of the program is expected in the first quarter of 2012.

Dubyna Flowing Boreholes

In the fall of 2011, a program will be conducted to locate flowing boreholes in Dubyna Lake. Efforts will be made to seal off any flow from the boreholes. A draft report detailing the efforts of the program is expected in the first quarter of 2012.

Shaft Cap Protocol

Development of a shaft cap protocol will continue during the 2011-12 reporting period. It is expected that research will be conducted, and a summary of the existing national and international standards and methods of testing in-situ concrete caps will be prepared.

Hydrometric Gauging Structures.

In 2011, Golder Associates Ltd. will be installing hydrometric gauging stations at AC-6A, TL-6 and AC-14. Work will be completed in the latter half of 2011.

SECTION 6

REFERENCES

6.0 REFERENCES

Athabasca Working Group, 2010. "*Athabasca Working Group 2010 Annual Report*".

Athabasca Working Group, 2009. "*Athabasca Working Group 2009 Annual Report*".

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

Atomic Energy Control Board, Response to Beaverlodge Mine and Mill Satellite Mines Release Document Final Report (July 1999), December 13, 1999.

Canadian Council of Ministers of the Environment, 2006. *Canadian Water Quality Guidelines for the Protection of Aquatic Life, CCME.*

Canadian Nuclear Safety Commission, October 2007. *"Saskatchewan Uranium Mines and Mills Inspection Report (S07-0651) August 29 - 30, 2007".*

CanNorth Environmental & SENES Consultants, February 2008, "*Site Description and Phase I Human Health Risk Assessment of the Beaverlodge Study Area".*

Conor Pacific 1999, *Current Period Environmental Assessment, Beaverlodge Mine Site, 1999; Conor Pacific and SENES*, April 1999.

Conor *Pacific and SENES* 1999, *Beaverlodge Mine and Mill Satellite Mines Release Document, Conor Pacific and SENES,* July 1999.

CSMWG 2000. A Federal Approach to Contaminated Sites. Prepared by Dillon Consulting Limited on behalf of the Contaminated Sites Management Working Group (CSMWG). November 2000.

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

Eldorado Resources Ltd., August 1983, *"Plan for the Close-Out of the Beaverlodge Site". August 1993, Vol. 5.*

Environment Canada and Ontario Ministry of the Environment. 2008. Canada-Ontario Decision Making Framework for Assessment of Great Lakes Contaminated Sediment. March. Prepared on behalf of Environment Canada (EC) and the Ontario Ministry of the Environment (MOE) by Golder Associates Ltd. and the Sediment Task Group of the Canada-Ontario Agreement Respecting the Great Lakes Ecosystem.

Golder Associates Ltd., August 2010. "2009 Streamflow Assessment Near Beaverlodge Mine".

Health Canada. March 2007. *Guidelines for Canadian Drinking Water Quality*.
(KHS) EMG., 2001 *Beaverlodge Satellite Mine Release Summary Report – Eagle Area, K260, 11 Zone, 46 Zone (KHS EMG Ltd.),* Oct. 2001

MacLaren Plansearch, March 1983. *Decommissioning of the Beaverlodge Mine/Mill Operations and Reclamation of the Site; Volume 2b: Hydrologic Investigations of the Tailings and Ace Creek Drainage Basins.*

Saskatchewan Environment. 2002. *Saskatchewan Drinking Water Quality Standards and Objectives EPB207/2002.*

Saskatchewan Environment, 2006. Surface Water Quality Objectives (SSWQO), Interim Edition. Regina, Saskatchewan

Saskatchewan Ministry of Environment (SkMOE), 2008. Guidelines for Northern Mine Decommissioning and Reclamation.

SENES Consultants Ltd., April 1983. "*Report to Eldorado Resources Ltd., Radiological and Environmental Assessment of Close-Out Options".*

SENES Consultants Ltd., February 2003. "*Report on Beaverlodge Mine Site Environmental Effects Reassessment"*

SENES Consultants Ltd., March 2008. "*Significance Analysis of Environmental Risks in the Beaverlodge Lake watershed and Identification of Potential Remediation Options".*

SRK Consulting, February 2008a. "Beaverlodge Decommissioning – 2007 Construction Activities at the Fookes Lake Delta".

SRK Consulting, September 2008b. *Beaverlodge Decommissioning – Fookes Lake Tailings Delta, Review of Piezometer Data from January 2008 to December 2008.*

SRK Consulting, September 2008c. *Final Closure Report Beaverlodge Mines K260, 11 Zone, 46 Zone & Eagle Area,* September 2008.

SRK Consulting, August 2010. Fookes Lake Tailings Delta, Review of Piezometer Data from January 2009 to December 2009.

TAEM, January 1997. *Hydrology Study, Stream Flow Estimates for Selected Locations in Ace Creek and Fulton Creek Drainage Areas*.

USEPA. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final. EPA 540-R-97-006

USEPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. United States Environmental Protection Agency. EPA-540-R-05-012. December.

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	-	-	1.37 at pH 8.0:10°C 2.20 at pH 6.5:10°C	-	-
Arsenic	mg/L	0.01	0.005	0.005	0.025	0.01
Barium	mg/L	-		-	1	1
Cadmium	mg/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	$10^{\{.86[\log(hardness)]-3.2\}}$	0.005	0.005
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	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	1	1
Iron	mg/L	0.3	0.3	0.3	0.3	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	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	0.01	0.01
Mercury	mg/L	-	0.000026	0.000026	0.001	0.001
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	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	-	-
pH	-	6.5 – 9.5	-	6.5 – 9.0	6.5 – 9.0	6.5 – 8.5
Radium 226	Bq/L	0.11	-	-	-	-
Selenium	mg/L	-	0.001	0.001	0.01	0.01
Silver	mg/L	-	0.0001	0.0001	-	-
TDS	mg/L	250	-	-	1500	500
TSS	mg/L	BkGd + 10	-	-	-	-
Uranium	mg/L	0.25	0.015	-	0.02 (Amended 2002)	0.02
Zinc	mg/L	0.05	0.03	0.03	5	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, CCME, 2006
4 Saskatchewan Drinking Water Quality Standards and Objectives EPB207/2002, 2002.
5 Guidelines for Canadian Drinking Water Quality, Health Canada, 2007.

Table 4.1.2
Predicted Loadings to Beaverlodge Lake During Operations

Parameter		Total Loadings	
		1983 Estimate	Revised Estimate (1997)
Uranium	(kg/year)	12,000	16,000
Total Dissolved Solids	(kg/year)	5,000,000	6,230,000
^{226}Radium	(Bq/year)	1.74×10^8	27.3×10^8

Table 4.3.1
Annual Means for Uranium (µg/L)

Year	Station																															
	AC-14		AC-8		AN-3		AN-4		AN-5		BL-3		BL-4		DB-6		TL-3		TL-4		TL-6		TL-7		TL-9		ML-1		BL-5		AC-6A	
	Mean µg/L	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
1982	458.3	28	19.0	4	13.1	16	142.0	2	-	-	1290.4	5	174.8	4	1352.0	7	4236.5	40	3829.2	39	7039.2	25	4016.5	93	4044.5	32	-	-	-	-	-	-
1983	67.6	44	26.0	13	3.9	1	-	-	1060.7	9	-	-	209.0	1	1300.4	11	4278.8	26	3654.0	28	5523.1	13	3802.8	71	3090.0	5	-	-	-	-	-	-
1984	46.0	47	25.8	11	1.5	1	93.0	1	686.3	8	-	-	-	-	1077.3	11	3875.0	12	4171.1	19	3100.0	6	2973.9	46	2410.0	5	-	-	-	-	-	-
1985	35.0	34	25.6	5	1.6	2	56.0	1	811.7	3	-	-	210.0	2	975.0	4	3220.0	5	3027.8	9	5575.0	2	2495.2	20	2100.0	1	-	-	-	-	-	-
1986	34.1	9	20.5	2	0.8	1	56.0	1	780.5	2	-	-	178.0	1	790.0	2	2725.0	2	3083.3	6	5000.0	1	2473.8	8	2100.0	1	-	-	-	-	-	-
1987	60.1	7	28.0	2	0.5	1	120.0	1	655.0	2	-	-	215.0	1	1050.0	2	3225.0	2	3016.0	5	2250.0	2	2197.6	7	-	-	-	-	-	-	-	-
1988	37.4	10	25.0	2	2.1	1	70.0	1	722.0	3	-	-	157.0	1	245.0	3	1632.5	2	1726.8	6	3525.0	2	2807.8	9	-	-	-	-	-	-	-	-
1989	43.3	9	15.8	2	1.2	1	86.0	1	547.5	2	-	-	212.0	1	579.5	2	1725.0	2	2266.7	9	3190.0	1	2007.8	9	-	-	-	-	-	-	-	-
1990	55.0	9	14.9	4	114.0	1	188.0	1	209.7	3	-	-	174.0	1	441.7	3	1789.0	3	2051.1	7	1850.0	1	2105.9	9	1024.7	3	-	-	-	-	-	-
1991	25.2	9	22.5	2	1.3	1	52.0	1	476.0	2	-	-	201.0	1	446.5	2	2126.7	3	2081.7	6	1950.0	1	2044.3	7	1290.0	3	-	-	-	-	-	-
1992	22.6	7	18.5	2	1.0	1	76.0	1	217.0	2	-	-	177.0	1	328.5	2	1460.0	2	1445.0	6	2020.0	1	1433.3	7	1045.5	4	-	-	-	-	-	-
1993	34.2	6	26.0	2	1.9	1	93.0	1	287.5	2	-	-	182.0	1	711.5	2	1530.0	3	1605.0	6	1460.0	1	1489.7	6	1497.5	8	-	-	-	-	-	-
1994	50.2	9	18.0	3	2.0	1	82.0	1	135.0	3	-	-	181.0	1	477.7	3	1228.6	10	1267.3	9	969.0	1	992.2	10	1173.6	10	-	-	-	-	-	-
1995	28.6	8	14.5	2	4.0	1	71.0	1	155.5	2	-	-	158.0	1	287.5	2	1194.3	8	1218.6	8	1435.0	2	1194.8	9	1174.4	10	-	-	-	-	-	-
1996	29.4	10	15.0	1	0.7	1	74.0	1	212.0	2	-	-	173.0	1	349.5	2	1023.0	5	1197.3	6	612.0	1	1164.0	11	1252.5	8	-	-	-	-	-	-
1997	27.8	8	16.0	4	1.5	1	40.0	1	151.3	4	-	-	178.5	2	384.0	4	1023.1	9	1015.2	10	778.0	2	1340.1	11	964.3	11	-	-	-	-	-	-
1998	39.6	12	14.0	4	1.5	1	97.0	1	213.2	6	153.0	1	152.5	2	309.3	6	756.6	12	783.0	12	447.0	2	701.9	11	711.3	11	-	-	-	-	-	-
1999	62.8	12	15.8	4	1.5	1	84.0	1	325.5	6	167.5	2	151.5	2	412.2	6	787.4	11	750.0	12	748.0	1	667.9	13	606.8	12	-	-	-	-	-	-
2000	51.2	12	15.5	4	1.4	1	99.0	1	225.7	7	163.0	2	153.0	2	516.2	6	697.4	12	626.0	12	659.5	2	650.6	12	468.0	11	-	-	-	-	-	-
2001	36.9	12	20.8	4	4.5	1	87.0	1	323.8	6	170.5	2	167.0	2	436.0	6	614.6	12	629.1	12	580.0	1	612.3	12	588.9	12	-	-	-	-	-	-
2002	30.3	12	17.5	4	1.2	1	68.0	1	429.0	6	164.0	1	164.3	4	314.1	7	607.3	12	577.8	12	353.5	2	578.8	12	554.0	11	-	-	154.0	1	-	-
2003	29.6	11	16.5	4	1.8	1	82.0	1	388.3	6	179.5	2	162.0	2	287.5	4	608.8	12	550.9	12	385.0	2	545.0	12	707.0	11	-	-	-	-	-	-
2004	37.2	13	15.2	5	1.3	1	71.0	1	363.8	6	150.0	2	135.0	2	354.7	6	552.3	12	535.8	12	177.5	2	530.0	12	481.8	11	-	-	-	-	-	-
2005	38.8	14	14.0	4	1.6	1	83.0	1	349.2	5	160.0	4	166.7	3	243.8	5	501.7	12	463.3	12	320.0	2	581.8	11	398.5	13	-	-	-	-	-	-
2006	41.4	13	17.8	4	1.4	1	92.0	1	241.2	5	162.5	4	150.0	4	230.8	4	373.3	11	381.8	11	280.0	1	375.5	11	384.2	12	-	-	-	-	-	-
2007	40.7	12	16.0	4	1.5	1	75.0	1	277.0	6	146.0	4	142.0	4	307.4	5	408.8	12	382.4	12	No water	0	374.3	12	316.9	12	-	-	-	-	-	-
2008	27.6	12	18.3	4	2.0	1	75.0	1	294.5	6	146.5	4	140.5	4	280.0	4	423.3	12	324.3	12	273.0	1	313.8	12	311.9	10	-	-	-	-	-	-
2009	23.8	13	14.6	5	1.6	1	63.0	1	109.0	4	152.0	4	143.8	4	215.5	6	393.9	12	344.5	11	210.0	2	327.5	11	296.4	8	-	-	-	-	-	-
2010	32.1	12	15.3	4	No water	0	47.0	2	184.8	6	145.3	4	143.8	4	247.6	5	341.8	5	419.8	8	248.0	1	274.9	9	483.8	4	-	-	-	-	263.0	1
*2011	32.7	6	15.0	1	No water	0	Not sampled	-	162.0	1	138.5	2	144.0	1	239.0	1	No water	0	No water	0	No water	0	255.33	3	No water	0	65.0	2	138.0	2	No water	No water

January to June 2011 sampling only
Revised water sampling program implemented in 2011: CS-1, CS-2,ML-1,BL-5 added, AN-4 removed.
No data yet available for stations CS-1, CS-2.
AC-6A added to permanent water sampling program in 2010.

Table 4.3.2
Annual Means for Radium-226 (Bq/L)

	Station																															
	AC-14		AC-8		AN-3		AN-4		AN-5		BL-3		BL-4		DB-6		TL-3		TL-4		TL-6		TL-7		TL-9		ML-1		BL-5		AC-6A	
	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
Year	Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		(Bq/L)		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L		Bq/L	
1982	0.313	28	0.028	4	0.006	16	0.215	2	-	-	0.155	6	0.057	4	0.088	7	4.293	40	0.945	40	0.326	26	0.259	92	0.093	31	-	-	-	-	-	-
1983	0.141	43	0.022	13	0.040	1	-	-	0.358	9	-	-	0.080	1	0.059	11	1.502	26	0.762	28	13.315	13	0.204	74	0.134	5	-	-	-	-	-	-
1984	0.145	46	0.025	11	0.005	1	0.020	1	0.377	8	-	-	-	-	0.085	11	0.678	12	3.105	19	0.840	6	0.591	46	0.184	5	-	-	-	-	-	-
1985	0.148	34	0.022	5	0.005	2	0.010	1	0.433	3	-	-	0.070	2	0.063	4	0.800	5	1.228	9	1.450	2	0.694	20	0.300	1	-	-	-	-	-	-
1986	0.114	9	0.025	2	0.005	1	0.020	1	0.450	2	-	-	0.050	1	0.035	2	0.550	2	1.367	6	1.600	1	0.430	8	-	-	-	-	-	-	-	-
1987	0.133	7	0.035	2	0.005	1	0.010	1	0.475	2	-	-	0.040	1	0.055	2	0.625	2	1.180	5	1.225	2	0.686	7	-	-	-	-	-	-	-	-
1988	0.146	10	0.030	2	0.005	1	0.005	1	0.433	3	-	-	0.080	1	0.037	3	0.340	2	0.992	6	1.300	2	0.572	9	-	-	-	-	-	-	-	-
1989	0.137	9	0.025	2	0.005	1	0.005	1	0.475	2	-	-	0.030	1	0.040	2	0.450	2	1.222	9	1.800	1	0.668	9	-	-	-	-	-	-	-	-
1990	0.101	9	0.036	4	0.005	1	0.005	1	0.550	3	-	-	0.005	1	0.023	3	0.533	3	1.043	7	1.300	1	0.627	9	0.217	3	-	-	-	-	-	-
1991	0.062	9	0.020	2	0.005	1	0.005	1	0.475	2	-	-	0.040	1	0.035	2	0.650	3	1.258	6	1.300	1	0.876	7	1.067	3	-	-	-	-	-	-
1992	0.047	7	0.020	2	0.010	1	0.010	1	0.450	2	-	-	0.030	1	0.045	2	0.625	2	1.042	6	1.200	1	0.814	7	1.575	4	-	-	-	-	-	-
1993	0.070	6	0.090	2	0.010	1	0.020	1	0.455	2	-	-	0.030	1	0.055	2	0.683	3	1.258	6	1.200	1	1.033	6	1.250	8	-	-	-	-	-	-
1994	0.087	9	0.027	3	0.005	1	0.010	1	0.940	3	-	-	0.040	1	0.080	3	0.673	10	1.083	9	1.600	1	0.890	10	0.900	10	-	-	-	-	-	-
1995	0.069	8	0.020	2	0.005	1	0.010	1	0.525	2	-	-	0.040	1	0.045	2	0.688	8	1.375	8	1.500	2	1.094	9	1.185	10	-	-	-	-	-	-
1996	0.061	11	0.030	1	0.005	1	0.010	1	0.935	2	-	-	0.020	1	0.040	2	0.640	5	1.283	6	1.300	1	1.000	11	0.937	8	-	-	-	-	-	-
1997	0.060	8	0.025	4	0.008	1	0.009	1	0.595	4	-	-	0.035	2	0.048	4	0.659	9	1.137	10	1.950	2	1.259	11	0.955	11	-	-	-	-	-	-
1998	0.083	12	0.023	4	0.005	1	0.010	1	0.658	6	0.040	1	0.030	2	0.040	6	0.603	12	0.990	12	2.700	2	0.943	11	1.193	11	-	-	-	-	-	-
1999	0.089	12	0.020	4	0.005	1	0.010	1	0.787	6	0.050	2	0.035	2	0.048	6	0.795	11	1.065	12	3.900	1	0.931	13	1.203	12	-	-	-	-	-	-
2000	0.079	13	0.020	4	0.005	1	0.050	1	0.627	7	0.035	2	0.025	2	0.057	6	0.818	12	1.073	12	4.150	2	0.822	12	0.911	11	-	-	-	-	-	-
2001	0.056	12	0.015	4	0.005	1	0.005	1	0.672	6	0.045	2	0.030	2	0.043	6	0.840	12	1.013	12	5.300	1	0.978	12	1.399	12	-	-	-	-	-	-
2002	0.050	12	0.018	4	0.005	1	0.030	1	0.625	6	0.050	1	0.048	4	0.039	7	0.865	12	1.244	12	4.250	2	1.078	11	1.636	11	-	-	0.060	2	-	-
2003	0.055	11	0.018	4	0.005	1	0.006	1	0.972	6	0.100	2	0.025	2	0.033	4	0.918	12	1.273	12	4.950	2	1.225	12	1.636	11	-	-	-	-	-	-
2004	0.060	13	0.020	5	0.005	1	0.009	1	0.753	6	0.075	2	0.035	2	0.038	6	1.008	12	1.417	12	4.150	2	1.357	12	1.709	11	-	-	-	-	-	-
2005	0.061	14	0.020	4	0.005	1	0.005	1	0.626	5	0.060	4	0.037	3	0.042	5	1.040	12	1.390	12	5.200	2	1.088	11	1.885	13	-	-	-	-	-	-
2006	0.052	13	0.011	4	0.005	1	0.005	1	0.692	5	0.050	4	0.033	4	0.044	4	0.905	11	1.260	11	6.300	1	1.191	11	1.658	12	-	-	-	-	-	-
2007	0.052	12	0.014	4	0.005	1	0.008	1	0.695	6	0.033	4	0.033	4	0.040	5	1.107	12	1.332	12	No water	0	1.249	12	1.858	12	-	-	-	-	-	-
2008	0.048	12	0.014	4	0.005	1	0.006	1	1.015	6	0.052	4	0.025	4	0.037	4	1.122	12	1.433	12	6.200	1	1.719	12	1.860	10	-	-	-	-	-	-
2009	0.034	13	0.014	5	0.005	1	0.009	1	0.762	4	0.053	4	0.025	4	0.035	6	1.198	12	1.582	11	5.550	2	1.273	11	2.075	8	-	-	-	-	-	-
2010	0.046	12	0.015	4	0.010	2	-	-	1.142	6	0.048	4	0.035	4	0.030	5	1.070	5	1.650	8	5.600	1	1.621	9	0.980	4	-	-	-	-	0.100	1
*2011	0.068	6	0.010	1	No water	0	Not sampled	-	0.580	1	0.025	2	0.030	1	0.030	1	No water	0	No water	0	No water	0	0.920	3	No water	0	0.013	2	0.022	2	No water	No water

**January to June 2011 sampling only*
Revised water sampling program implemented in 2011: CS-1, CS-2,ML-1,BL-5 added, AN-4 removed.
No data yet available for stations CS-1, CS-2.
AC-6A added to permanent water sampling program in 2010.

Table 4.3.3
Annual Means for TDS (mg/L)

Year	Station																															
	AC-14		AC-8		AN-3		AN-4		AN-5		BL-3		BL-4		DB-6		TL-3		TL-4		TL-6		TL-7		TL-9		ML-1		BL-5		AC-6A	
	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
1982	-	-	-	-	115	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	438	3	-	-	-	-	-	-	-	-
1983	85	25	79	6	104	1	-	-	303	6	-	-	-	-	219	7	964	4	880	13	4287	3	966	25	985	5	-	-	-	-	-	-
1984	89	47	80	11	110	1	138	1	233	8	188	1	202	1	203	10	858	12	970	19	3687	6	1594	46	951	5	-	-	-	-	-	-
1985	77	34	66	5	113	2	94	1	222	3	-	-	143	2	180	4	709	5	734	9	2475	2	1053	20	574	1	-	-	-	-	-	-
1986	80	9	65	2	94	1	103	1	216	2	-	-	180	1	160	2	632	2	792	6	3180	1	1315	8	-	-	-	-	-	-	-	-
1987	80	7	72	2	84	1	113	1	203	2	-	-	158	1	186	2	715	2	730	5	2630	2	904	7	-	-	-	-	-	-	-	-
1988	76	10	82	2	102	1	109	1	243	3	-	-	170	1	151	3	398	2	667	6	2295	2	1023	9	-	-	-	-	-	-	-	-
1989	77	9	72	2	96	1	126	1	208	2	-	-	160	1	129	2	437	2	696	8	1060	1	654	8	-	-	-	-	-	-	-	-
1990	84	5	74	2	68	1	112	1	173	2	-	-	132	1	125	2	210	1	627	4	1060	1	789	6	525	3	-	-	-	-	-	-
1991	137	9	72	2	83	1	116	1	151	2	-	-	11	1	187	2	567	3	567	6	1290	1	556	7	469	3	-	-	-	-	-	-
1992	77	7	85	2	90	1	120	1	169	2	-	-	152	1	141	2	409	2	458	6	1200	1	475	7	443	4	-	-	-	-	-	-
1993	74	9	76	2	93	1	115	1	178	2	-	-	142	1	148	2	434	3	475	6	872	1	513	9	530	8	-	-	-	-	-	-
1994	77	7	73	2	83	1	118	1	135	2	-	-	152	1	120	2	376	8	398	6	478	1	368	7	459	10	-	-	-	-	-	-
1995	78	7	74	2	77	1	118	1	107	2	-	-	146	1	113	2	352	7	390	7	732	2	402	8	421	10	-	-	-	-	-	-
1996	66	11	73	2	82	1	115	1	193	2	-	-	146	1	147	2	310	5	373	6	272	1	459	10	394	8	-	-	-	-	-	-
1997	66	8	69	4	92	1	127	1	133	4	-	-	166	2	136	4	307	9	338	10	329	2	343	11	371	11	-	-	-	-	-	-
1998	82	12	71	4	82	1	229	1	167	6	288	1	143	2	139	6	295	12	314	12	631	2	316	10	323	11	-	-	-	-	-	-
1999	84	12	70	4	94	1	148	1	179	6	163	2	153	2	153	6	304	11	303	12	626	1	306	13	302	12	-	-	-	-	-	-
2000	73	12	75	4	63	1	99	1	179	7	122	2	124	2	173	6	300	12	298	12	741	2	325	12	306	11	-	-	-	-	-	-
2001	79	12	72	4	58	1	93	1	191	6	146	2	147	2	167	6	281	12	290	12	660	1	303	12	288	12	-	-	-	-	-	-
2002	69	12	74	4	81	1	108	1	191	6	137	1	182	4	130	7	247	12	262	12	419	2	245	11	257	11	-	-	135	2	-	-
2003	77	11	72	4	88	1	119	1	187	6	157	2	145	2	134	4	247	12	258	12	506	2	265	12	353	11	-	-	-	-	-	-
2004	71	13	71	5	82	1	112	1	180	6	145	2	135	2	144	6	233	12	248	12	318	2	284	12	241	11	-	-	-	-	-	-
2005	84	12	72	4	98	1	129	1	180	6	152	4	180	3	148	5	248	12	237	12	566	2	300	11	234	11	-	-	-	-	-	-
2006	79	11	71	4	92	1	127	1	163	5	144	4	138	4	131	4	198	11	213	11	506	1	228	11	218	10	-	-	-	-	-	-
2007	85	12	80	4	84	1	104	1	190	6	147	4	139	4	153	5	226	12	229	12	No water	0	242	12	226	12	-	-	-	-	-	-
2008	72	12	64	4	94	1	119	1	185	6	150	4	143	4	153	4	228	12	226	12	516	1	250	12	212	10	-	-	-	-	-	-
2009	73	13	73	5	89	1	105	1	137	5	151	4	142	4	150	6	220	12	227	11	526	2	222	11	221	8	-	-	-	-	-	-
2010	82	12	77	4	No water	0	117	2	204	6	150	3	147	4	158	5	211	5	290	8	529	1	297	9	308	4	-	-	-	-	199	1
***2011**	87	6	81	1	No water	0	Not sampled	-	171	1	155	1	142	1	143	1	No water	0	No water	0	No water	0	279	3	No water	0	140	2	128	2	No water	No water

**January to June 2011 sampling only*
Revised water sampling program implemented in 2011: CS-1, CS-2,ML-1,BL-5 added, AN-4 removed.
No data yet available for stations CS-1, CS-2.
AC-6A added to permanent water sampling program in 2010.

Table 4.3.4
Jan 2010-June 2011 18 Month Average 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	0.4	0.1	1.4	1.1	**10**
Barium	(mg/L)	0.025	0.171	0.047	0.354	0.563	**1**
Copper	(mg/L)	0.001	0.001	0.001	0.001	0.001	**0.02**
Iron	(mg/L)	0.076	0.497	0.014	0.171	0.020	**0.3**
Nickel	(mg/L)	0.00019	0.00051	0.00018	0.00063	0.00048	**0.05**
Lead	(mg/L)	0.0007	0.0003	0.0001	0.0004	0.0003	**0.025**
Radium 226	(Bq/L)	0.053	1.061	0.030	1.446	0.980	**0.11**
TDS	(mg/L)	83.94	199.57	155.17	292.67	308.00	**250**
TSS	(mg/L)	2.389	2.000	1.000	1.417	1.250	**Background + 10**
Uranium	(µg/L)	32.3	181.6	246.2	270.0	483.8	**250**
Zinc	(mg/L)	0.001	0.003	0.002	0.001	0.001	**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.
* There was no water flow in 2011 for TL-9, thus this value is based only 2010 values

Table 4.3.5
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

Table 4.3.6
Transition Phase Monitoring – Year 25 (Jan 2010-Jun 2011)

	AC14	*AN5*	*DB6*	*TL-7*	*AC14*	*TL-7*	*BL4*	*AC14*	*TL-7*	*BL4*	*AC14*	*TL-7*	*BL4*
	Close Out Objective Concentration				*Model Concentration Predicted at Shutdown v. Actual Results*			*Predicted Concentrations For Minimum Reclamation v. Actual Results*			*Predicted Concentration for Maximum Reclamation v. Actual Results*		
Parameter	Met	Met	Met	Met	Met	Met	Met	Met	Met	Met	Met	Met	Met
Arsenic	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Barium	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Copper	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Iron	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Nickel	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Lead	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Radium-226	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**
TDS	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**
TSS	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-
Uranium	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**N**
Zinc	**Y**	**Y**	**Y**	**Y**	-	-	-	-	-	-	-	-	-

Y – Yes **N** – No

Table 4.4.1
January 2010- June 2011 Monthly Loading Calculations at TL-7

Month	Days in Month	Average Flows (L/s)	Uranium (mg/L)	U Loadings (Kg/month)	226Ra (Bq/L)	226Ra Loadings (Bq/month) x 107	TDS (mg/L)	TDS Loadings (kg/month) x 104	Se (mg/L)	Se Loadings (Kg/year)	Comments
2010											
January	31	4.1	0.494	5.42	2.2	2.42	291	0.32	0.0039	-	
February	28	3.4	0.471	3.87	1.4	1.15	278	0.23	0.0031	-	
March	31	2.6	0.384	2.67	0.69	0.48	328	0.23	0.0019	-	
April	30	4.6	0.175	2.09	1.1	1.31	144	0.17	0.0017	-	
May	31	16.7	0.226	10.11	1.6	7.16	218	0.98	0.0032	-	
June	30	6.6	0.16	2.74	2.3	3.93	238	0.41	0.0032	-	
July	31	0.2	-	-	-	-	-	-	-	-	no water
August	31	0.1	0.155	0.05	2	0.06	421	0.01	0.0170	-	
September	30	0.2	0.186	0.08	1.2075	0.05	393	0.02	0.0071	-	
October	31	0.4	0.219	0.23	2.1	0.23	363	0.04	0.0070	-	
November	30	0.2	-	-	-	-	-	-	-	-	no water
December	31	0.3	-	-	-	-	-	-	-	-	no water
Annual Average 2010		3.3	0.274		1.62		297		0.0053		
Total Loadings				2.73E+01		1.68E+08		2.40E+04			
2011											
January	31	0.2	-	0.00	-	0.00	-	0.00	-	-	no water
February	28	0.0	-	0.00	--	0.00	-	0.00	-	-	no water
March	31	0.0	-	0.00		0.00	-	0.00	-	-	no water
April	30	0.0	0.198	0.00	0.48	0.00	174	0.00	0.0054	-	
May	31	0.3	0.338	0.29	0.88	0.08	318	0.03	0.0058	-	
June	30	0.2	0.233	0.13	1.333	0.07	346	0.02	0.0047	-	
Jan to Jun 2011 Average		0.1	0.256		0.90		279		0.0053		
Total Loadings				4.19E-01		1.49E+06		4.64E+02			
Jan 2010-Jun 2011 Annual Average		2.23	0.270		1.44		293		0.0053		
Total Jan 2010 to Jun 2011 Loadings				27.69		16.94		2.45		0.38	

Table 4.4.2
January 2010- June 2011 Monthly Loading Calculations at AC-14

Month	Days in Month	Average Flows (L/s)	Uranium (mg/L)	U Loadings (Kg/month)	^{226}Ra (Bq/L)	^{226}Ra Loadings (Bq/month) x 10^7	TDS (mg/L)	TDS Loadings (kg/month) x 10^4	Se (mg/L)	Se Loadings (Kg/year)
2010										
January	31	341	0.019	17.35	0.02	1.83	77	7.03	0.0001	-
February	28	280	0.016	10.84	0.03	2.03	86	5.83	0.0001	-
March	31	217	0.016	9.30	0.03	1.74	92	5.35	0.0001	-
April	30	309	0.023	18.42	0.03	2.40	62	4.97	0.0001	-
May	31	744	0.022	43.84	0.04	7.97	86	17.14	0.0001	-
June	30	430	0.021	23.41	0.04	4.46	74	8.25	0.0001	-
July	31	238	0.023	14.65	0.05	3.18	78	4.97	0.0002	-
August	31	105	0.083	23.34	0.15	4.22	93	2.62	0.0010	-
September	30	167	0.059	25.47	0.05	2.16	96	4.14	0.0004	-
October	31	199	0.046	24.52	0.02	1.07	82	4.37	0.0003	-
November	30	178	0.031	14.31	0.04	1.85	89	4.11	0.0001	-
December	31	181	0.026	12.61	0.05	2.43	72	3.49	0.0001	-
Annual Average (2010)		282	0.032		0.05		82		0.0003	
Total Loadings				2.38E+02		3.53E+08		7.23E+05		
2011										
January	31	173	0.019	8.82	0.06	2.78	94	4.36	0.0001	-
February	28		0.02	6.78	0.08	2.71	84	2.85	0.0001	-
March	31	113	0.027	8.18	0.05	1.51	85	2.57	0.0001	-
April	30	92	0.057	13.58	0.09	2.06	97	2.31	0.0005	-
May	31	299	0.032	25.67	0.07	5.61	75	6.02	0.0001	-
June	30	319	0.026	21.51	0.07	5.79	87	7.20	0.0001	-
Jan to June 2011 Average		189	0.030		0.07		87		0.0001	
Total Loadings				8.45E+01		2.05E+08		2.53E+05		
Jan 2010-Jun 2011 Average		**251.43**	**0.031**		**0.05**		**84**		**0.0002**	
Total Loadings				**3.23E+02**		**5.58E+08**		**9.76E+05**		**1.73E+00**

Table 4.4.3
Comparison of Revised Predicted Loadings to Actual Jan 2010- June 2011 Loadings

Scenario	Parameter	AC14			TL7			Site Total Loadings
		Average Flows (L/s)	Average Concentration	Loadings	Average Flows (L/s)	Average Concentration	Loadings	
Revised Predictions								
During Operations	U (mg/L)	215	0.65	4.41E+03	89.4	4.1	1.16E+04	1.60E+04
	Ra226 (Bq/L)	215	0.22	1.49E+09	89.4	0.44	1.24E+09	2.73E+09
	TDS (mg/L)	215	174	1.18E+06	89.4	1793	5.06E+06	6.23E+06
At Shutdown (Predicted)	U (mg/L)	426	0.035	4.70E+02	16	3.16	1.59E+03	2.06E+03
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.53	2.67E+08	1.07E+09
	TDS (mg/L)	426	129	1.73E+06	16	1130	5.70E+05	2.30E+06
Minimum Reclamation (Long Term Predicted)	U (mg/L)	426	0.035	4.70E+02	16	0.1	5.05E+01	5.21E+02
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.38	1.92E+08	9.98E+08
	TDS (mg/L)	426	129	1.73E+06	16	389	1.96E+05	1.93E+06
Max. Reclamation (Long Term Predicted)	U (mg/L)	426	0.03	4.03E+02	16	0.1	5.05E+01	4.53E+02
	Ra226 (Bq/L)	426	0.06	8.06E+08	16	0.27	1.36E+08	9.42E+08
	TDS (mg/L)	426	125	1.68E+06	16	414	2.09E+05	1.89E+06

Table 4.4.3 (Continued)
Comparison of Revised Predicted Loadings to Actual Jan 2010 to June 2011 Loadings

Scenario	Parameter	AC14			TL7			Site Total Loadings
		Average Flows (L/s)	Average Concentration	Actual Loadings	Average Flows (L/s)	Average Concentration	Actual Loadings	
Actual Loadings (85 – 86)	U (mg/L)	481	0.045	6.60E+02	18.7	2.18	1.22E+03	1.88E+03
	Ra226 (Bq/L)	481	0.168	2.40E+09	18.7	0.52	5.00E+08	2.90E+09
	TDS (mg/L)	481	87	1.20E+06	18.7	1435	3.00E+05	1.50E+06
Actual Loadings (86 – 87)	U (mg/L)	587	0.05	8.86E+02	45	2.68	2.65E+03	3.54E+03
	Ra226 (Bq/L)	587	0.099	1.70E+09	45	0.65	6.70E+08	2.37E+09
	TDS (mg/L)	587	84	1.60E+06	45	754	6.00E+05	2.20E+06
Actual Loadings (87 – 88)	U (mg/L)	262	0.066	3.80E+02	11.7	2.34	2.47E+02	6.27E+02
	Ra226 (Bq/L)	262	0.168	1.00E+09	11.7	0.49	6.30E+07	1.06E+09
	TDS (mg/L)	262	87	5.00E+05	11.7	915	9.00E+04	5.90E+05
Actual Loadings (88 – 89)	U (mg/L)	650	0.03	5.94E+02	22.2	2.36	1.27E+03	1.86E+03
	Ra226 (Bq/L)	650	0.128	2.70E+09	22.2	0.75	5.10E+08	3.21E+09
	TDS (mg/L)	650	73	1.50E+06	22.2	620	3.30E+05	1.83E+06
Actual Loadings (89 – 90)	U (mg/L)	314	0.063	4.63E+02	18.9	1.91	6.02E+02	1.07E+03
	Ra226 (Bq/L)	314	0.129	1.20E+09	18.9	0.58	2.60E+08	1.46E+09
	TDS (mg/L)	314	83	8.20E+05	18.9	728	2.50E+05	1.07E+06
Actual Loadings (90 – 91)	U (mg/L)	592	0.035	5.66E+02	22	1.94	1.35E+03	1.91E+03
	Ra226 (Bq/L)	592	0.073	1.05E+09	22	0.666	4.63E+08	1.51E+09
	TDS (mg/L)	592	81	1.44E+06	22	86	4.76E+05	1.92E+06
Actual Loadings (91 – 92)	U (mg/L)	784	0.045	8.59E+02	-	1.57	-	-
	Ra226 (Bq/L)	784	0.06	1.43E+09	-	0.81	-	-
	TDS (mg/L)	784	79	2.11E+06	-	444	-	-
Actual Loadings (92 – 93)	U (mg/L)	634	0.029	6.16E+02	38	1.57	1.94E+03	2.56E+03
	Ra226 (Bq/L)	634	0.06	1.18E+09	38	1.09	1.31E+09	2.49E+09
	TDS (mg/L)	634	77	1.55E+06	38	504	6.30E+05	2.18E+06
Actual Loadings (93 – 94)	U (mg/L)	840	0.035	8.75E+02	-	1.28	1.19E+04	1.28E+04
	Ra226 (Bq/L)	840	0.07	2.00E+09	-	0.95	9.74E+08	2.98E+09
	TDS (mg/L)	840	80	2.08E+06	-	457	6.30E+05	2.71E+06
Actual Loadings (94 – 95)	U (mg/L)	432	0.048	5.10E+02	35	1.02	1.79E+03	2296
	Ra226 (Bq/L)	432	0.089	1.25E+09	35	0.95	7.48E+08	2.00E+09
	TDS (mg/L)	432	77	1.05E+06	35	416	2.60E+05	1.31E+06

Table 4.4.3 (Continued)
Comparison of Revised Predicted Loadings to Actual Jan 2010 to June 2011 Loadings

Scenario	Parameter	AC14			TL7			Site Total Loadings
		Average Flows (L/s)	Average Concentration	Actual Loadings	Average Flows (L/s)	Average Concentration	Actual Loadings	
Actual Loadings (95 – 96)	U (mg/L)	529	0.027	4.79E+02	30	1.13	1.07E+03	1.55E+03
	Ra226 (Bq/L)	529	0.059	1.05E+09	30	1.02	9.14E+08	1.96E+09
	TDS (mg/L)	529	76	1.24E+06	30	462	4.40E+05	1.68E+06
Actual Loadings (96 – 97)	U (mg/L)	540	0.022	3.75E+02	17.5	0.99	5.04E+02	8.79E+02
	Ra226 (Bq/L)	540	0.059	9.80E+08	17.5	1.06	5.62E+08	1.54E+09
	TDS (mg/L)	540	57	9.80E+05	17.5	369	2.00E+05	1.18E+06
Actual Loadings (97 – 98)	U (mg/L)	1314	0.028	1.18E+03	10	0.788	2.92E+02	1.47E+03
	Ra226 (Bq/L)	1314	0.067	2.74E+09	10	0.926	2.85E+08	3.03E+09
	TDS (mg/L)	1314	76	3.00E+06	10	319	1.00E+05	3.10E+06
Actual Loadings (98 – 99)	U (mg/L)	302	0.059	4.79E+02	9.3	0.718	1.92E+02	6.71E+02
	Ra226 (Bq/L)	302	0.085	8.32E+08	9.3	0.98	2.83E+08	1.12E+09
	TDS (mg/L)	302	84	7.30E+05	9.3	316	9.00E+04	8.20E+05
Actual Loadings (99 – 00)	U (mg/L)	207	0.059	3.67E+02	5.7	0.648	1.10E+02	4.77E+02
	Ra226 (Bq/L)	207	0.099	6.50E+08	5.7	0.819	1.50E+08	8.00E+08
	TDS (mg/L)	207	77	5.08E+05	5.7	322	5.57E+04	5.64E+05
Actual Loadings (00 – 01)	U (mg/L)	586.3	0.039	7.00E+02	27.3	0.658	5.45E+02	1.25E+03
	Ra226 (Bq/L)	586.3	0.052	8.90E+08	27.3	0.95	8.25E+08	1.72E+09
	TDS (mg/L)	586.3	76.08	1.40E+06	27.3	309	2.60E+05	1.66E+06
Actual Loadings (01 – 02)	U (mg/L)	598.8	0.034	6.01E+02	13.2	0.588	1.75E+02	7.76E+02
	Ra226 (Bq/L)	598.8	0.056	1.10E+09	13.2	0.93	3.40E+08	1.44E+09
	TDS (mg/L)	598.8	77	1.40E+06	13.2	278	9.00E+04	1.49E+06
Actual Loadings (02 – 03)	U (mg/L)	913	0.029	8.27E+02	34	0.567	4.93E+02	1.32E+03
	Ra226 (Bq/L)	913	0.05	1.34E+09	34	1.24	1.22E+09	2.56E+09
	TDS (mg/L)	913	78.5	2.10E+06	34	278	2.52E+05	2.35E+06
Actual Loadings (03 – 04)	U (mg/L)	504	0.035	5.02E+02	19.5	0.515	2.91E+02	7.93E+02
	Ra226 (Bq/L)	504	0.053	7.55E+08	19.5	1.27	7.70E+08	1.53E+09
	TDS (mg/L)	504	71.25	1.14E+06	19.5	253	1.60E+05	1.30E+06
Actual Loadings (04 – 05)	U (mg/L)	362	0.035	3.41E+02	11.3	0.606	1.56E+02	4.97E+02
	Ra226 (Bq/L)	362	0.0696	6.80E+08	11.3	1.233	4.36E+08	1.12E+09
	TDS (mg/L)	362	76.39	8.45E+05	11.3	335	9.61E+04	9.41E+05

Table 4.4.3 (Continued)
Comparison of Revised Predicted Loadings to Actual Jan 2010 to June 2011 Loadings

Scenario	Parameter	AC14			TL7			Site Total Loadings
		Average Flows (L/s)	Average Concentration	Actual Loadings	Average Flows (L/s)	Average Concentration	Actual Loadings	
Actual Loadings (05 – 06)	U	655	0.04	7.79E+02	26.1	0.428	3.31E+02	1.11E+03
	Ra226	655	0.048	1.08E+09	26.1	1.112	9.71E+08	2.05E+09
	TDS	655	76.7	1.54E+06	26.1	226	1.83E+05	1.72E+06
Actual Loadings (06 – 07)	U	290.6	0.045	3.69E+02	9.99	0.371	1.07E+02	4.76E+02
	Ra226	290.6	0.06	5.14E+08	9.99	1.27	4.40E+08	9.54E+08
	TDS	290.6	83	7.33E+05	9.99	243.9	7.38E+04	8.07E+05
Actual Loadings (07 – 08)	U	562.30	0.03	5.62E+02	18.91	0.36	2.06E+02	7.68E+02
	Ra226	562.30	0.05	8.60E+09	18.91	1.46	9.25E+08	1.79E+09
	TDS	562.30	81.50	1.45E+06	18.91	242.58	1.45E+05	1.60E+06
Actual Loadings (2008)	U	522.49	0.03	4.43E+02	18.91	0.31	1.83E+02	6.26E+02
	Ra226	522.49	0.05	7.78E+08	18.91	1.72	9.73E+08	1.75E+09
	TDS	522.49	71.58	1.16E+06	18.91	249.58	1.46E+05	1.31E+06
Actual Loadings (2009)	U	544	0.024	4.02E+02	11.5	0.328	9.29E+01	4.94E+02
	Ra226	544	0.03	4.86E+08	11.5	1.27	4.40E+08	9.26E+08
	TDS	544	73	1.31E+06	11.5	222	7.19E +04	1.38E+06
Actual Loadings (2010)	U	282	0.032	2.38E+02	3.3	0.274	2.73E+01	2.65E+02
	Ra226	282	0.05	3.53E+08	3.3	1.62	1.68E+08	5.21E+08
	TDS	282	82	7.23E+05	3.3	297	2.40E+04	7.47E+05
Actual Loadings (Jan-Jun 2011**)	U	189	0.030	8.45E+01	0.1	0.256	4.19E-01	8.49E+01
	Ra226	189	0.07	2.05E+08	0.1	0.90	1.49E+06	2.06E+08
	TDS	189	87	2.53E+05	0.1	279	4.64E+02	2.54E+05

**Note: Loading values in this table were calculated using monthly flow volumes, not the annual averages that are presented in this table.*

Units:
U [=] mg/L, Ra226 [=] Bq/L, TDS [=] mg/L
Loadings U [=] Kg/month, Loadings Ra226 [=] Bq/month, Loadings TDS [=] Kg/month

Table 4.4.4
Precipitation Data for Uranium City Jan 2010 to June 2011

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
2010	January	11.9	19/3	61.7	30/31	19.8	18.1	109/4	31/31
	February	2.4	15.5	15.5	28/28	1.1	13.3	8.3	28/28
	March	0.3	17.8	1.7	31/31	15.8*	18.2	86.8	30/31
	April	6.2*	16.9	36.7	29/30	8.2*	18	45.6	29/30
	May	8.2*	17.5	46.9	28/31	15.3*	26.3	58.2	30/31
	June	26.5	31.3	84.7	30/30	15.9	44.4	35.8	30/30
	July	19.5	47.1	41.4	31/31	34.8	56.3	61.8	31/31
	August	54.6	42.4	128.8	31/31	74.3	63.9	116.3	31/31
	September	25.8*	33.7	76.6	29/30	29.8*	48.4	61.6	29/30
	October	22.8	29.1	78.4	31/31	21.8	30.1	72.4	31/31
	November	4	28	14.3	30/30	4.1*	27.6	14.9	27/30
	December	6.8	23.6	28.8	31/31	8.2*	18.7	43.9	29/31
2010 Total		189	322.2	58.7	359/365	249.1	383.3	65	356/365
2011	January	7.6	19.3	39.4	31/31	2.4*	18.1	13.3	17/31
	February	4.3	15.5	27.7	28/28	1.9*	13.3	14.3	22/28
	March	3.6*	17.8	20.2	30/31	2.6*	18.2	14.3	26/31
	April	1.4	16.9	8.3	30/30	0.0*	18	0	28/30
	May	2.1*	17.5	12	30/31	2.8*	26.3	10.6	30/31
	June	5.6	31.3	17.9	30/30	11.6	44.4	26.1	30/30
Jan to Jun Total		24.6	118.3	20.8	191/181	21.3	138.3	15.4	168/181

Note: Precipitation data is provided by Environment Canada (2011)
([a]) Normals for the climate station at Uranium City are average monthly values from 1953 to 1986 and 1998 to 2009
([b]) Normals for the climate station at Stony Rapids are average monthly values from 1960 to 1982 and 1968 to 2009
* = Incomplete data set

Table 4.5.1
Radon Track Etch Cup Summary

	Annual Average pCi/L					
Location	1982	2006	2007	2008	2009	2010
Airport Beacon	1.4	0.4	0.3	0.5	0.5	0.3
Eldorado Townsite	3.7	0.7	0.4	0.7	0.7	0.5
Northwest of Airport	2.4	0.4	0.2	0.3	0.4	0.3
Ace Creek	10.7	6.3	4.9	6.7	5.3	5.4
Fay Waste Rock	5.1	1.4	1.1	1.2	1.2	0.9
Fookes Delta	5.1	3.1	1.8	3.0	2.9	2.0
Marie Lake	5.1	2.5	2.5	2.7	2.5	5.8
Donaldson Lake	5.1	0.3	0.2	0.7	0.6	0.2
Fredette Lake	5.1	0.4	0.2	0.3	0.8	1.2
Uranium City	5.1	0.2	0.2	0.3	1.2	0.3

FIGURES

FIGURES

Figure 2.4.1
Beaverlodge Location Map

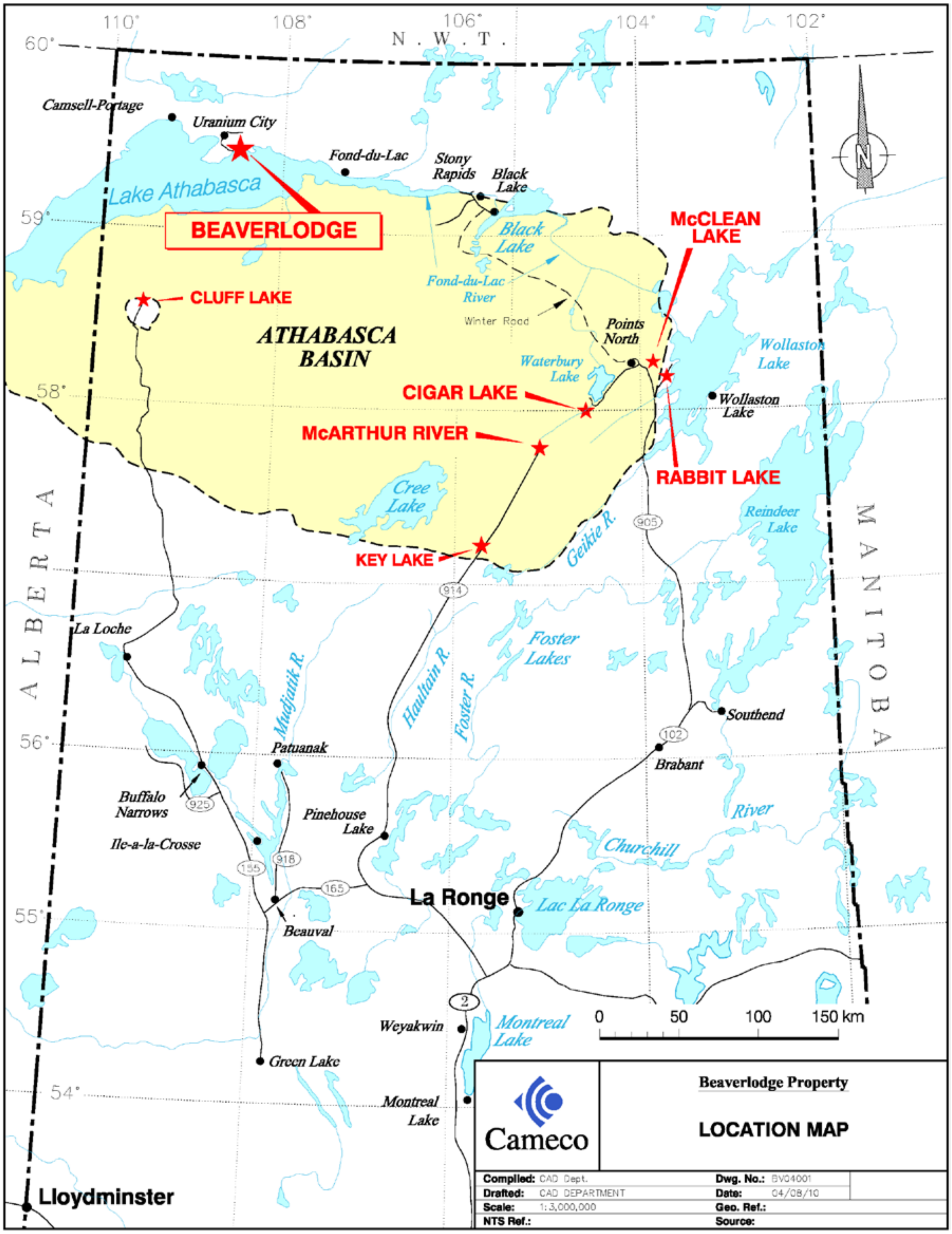


Figure 4.3.1
Aquatic Sampling Station Locations

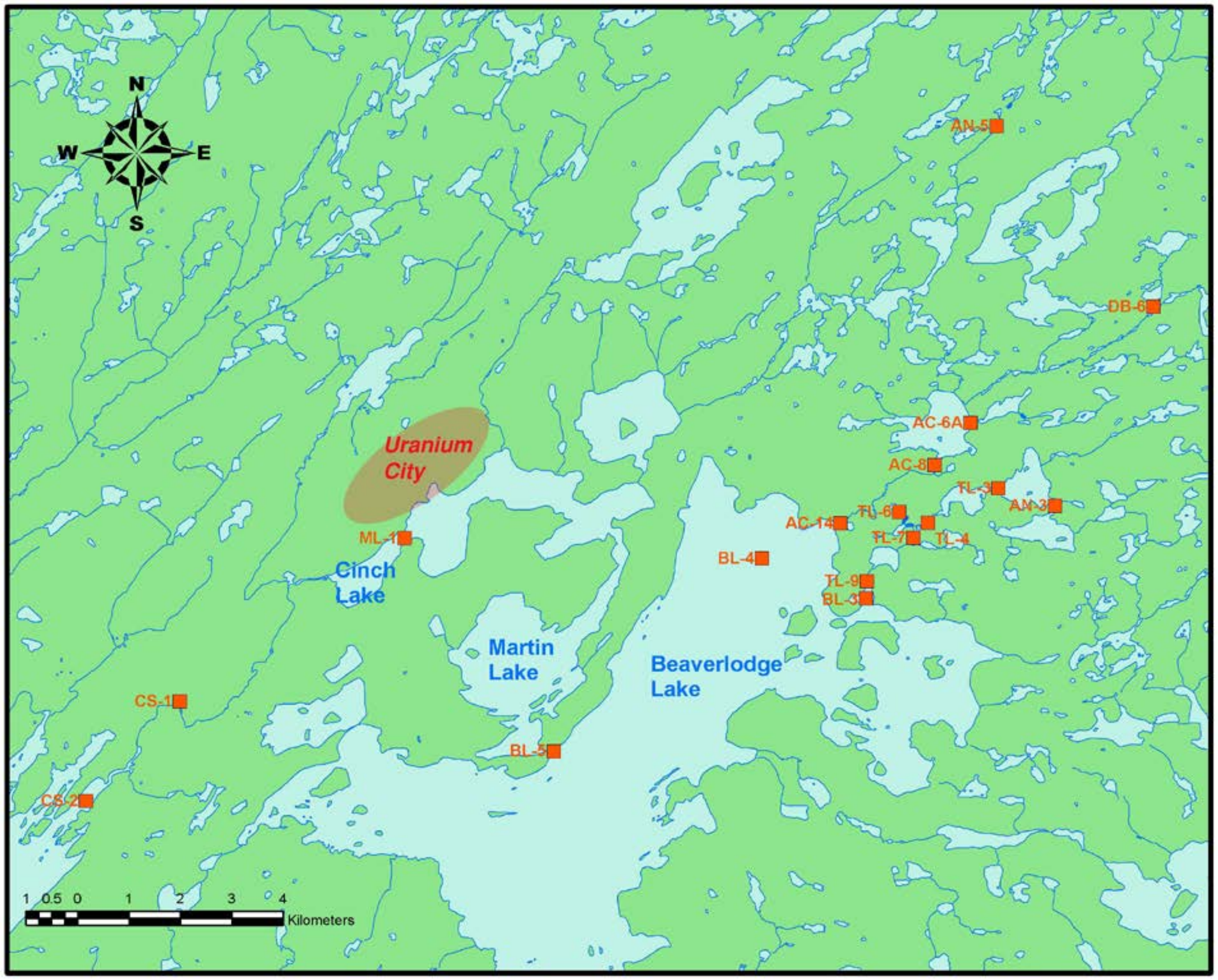


Figure 4.3.2 AN-5 - Pistol Creek below Hab Site

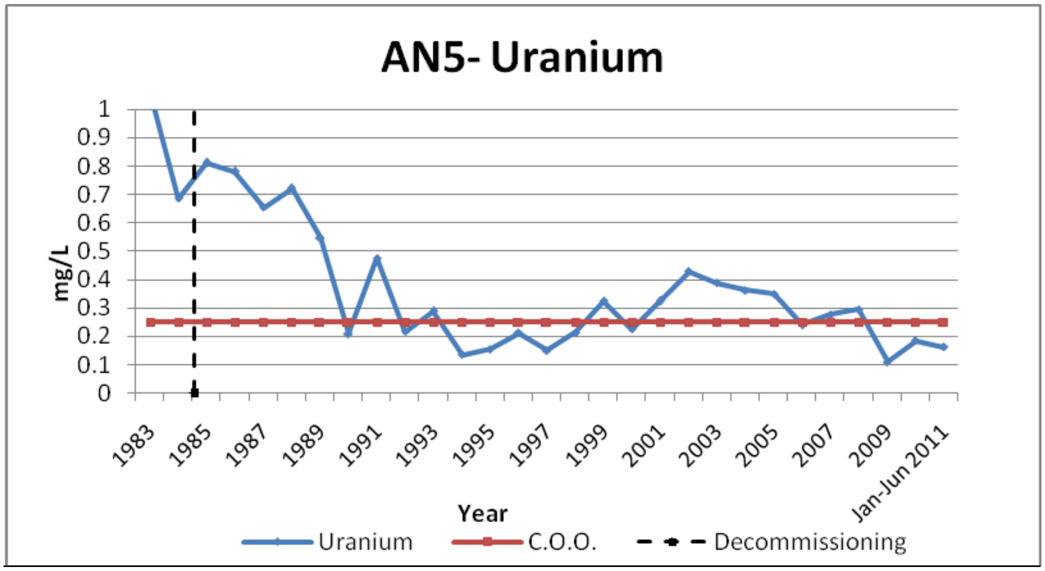


Figure 4.3.3 AN-5 - Pistol Creek below Hab Site

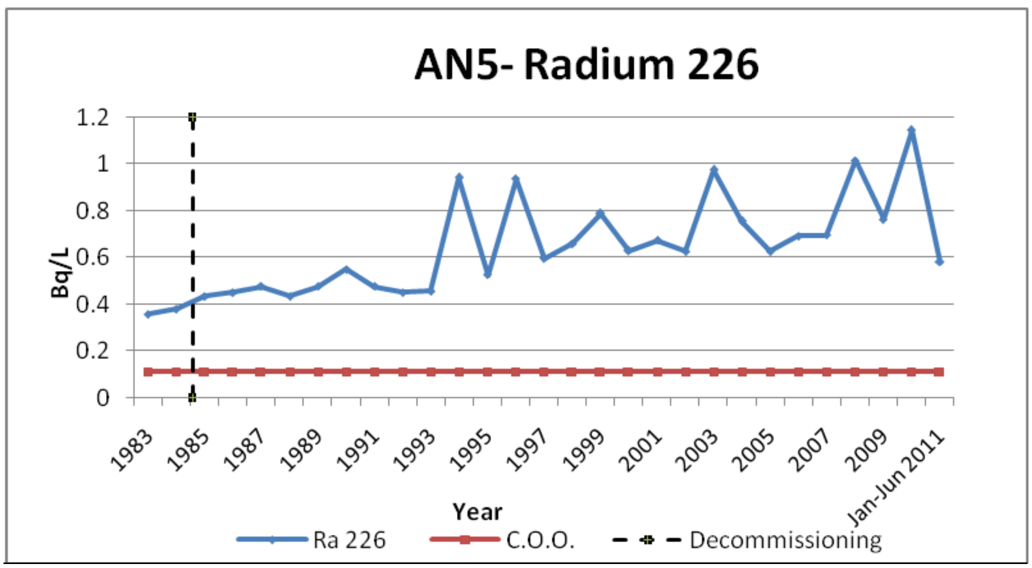


Figure 4.3.4 AN-5 - Pistol Creek below Hab Site

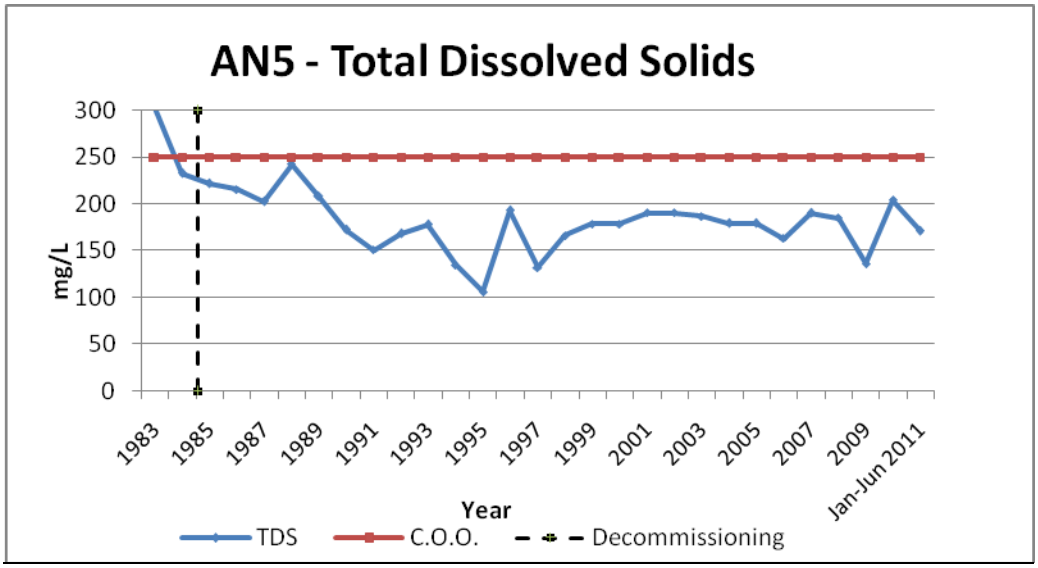
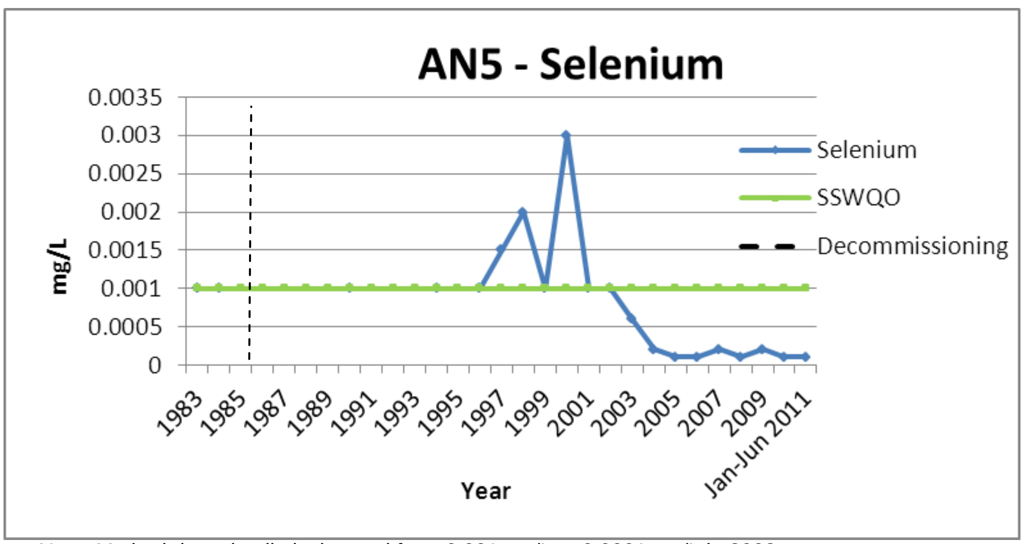


Figure 4.3.5 AN-5 - Pistol Creek below Hab Site



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

Figure 4.3.6 DB-6 - Dubyna Creek

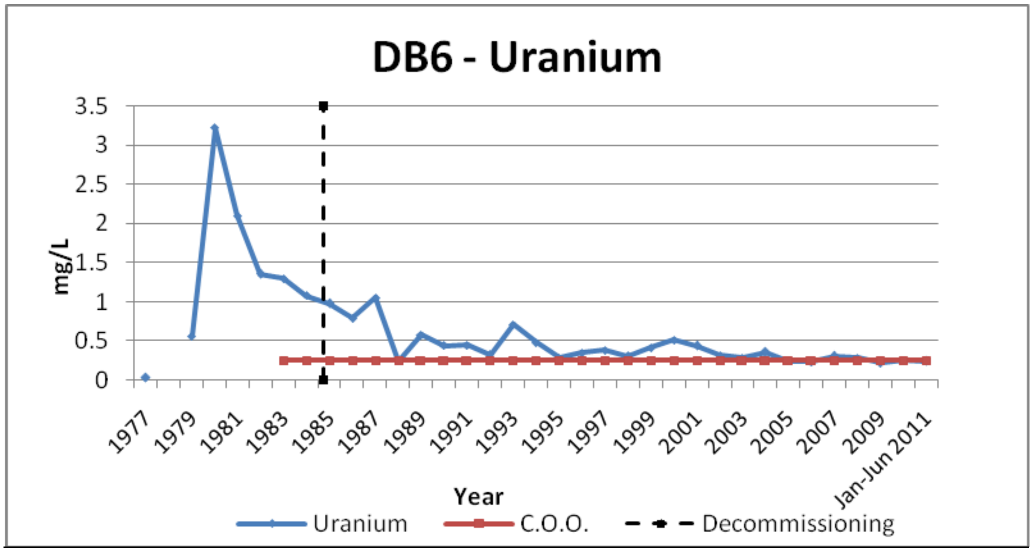


Figure 4.3.7 DB-6 - Dubyna Creek

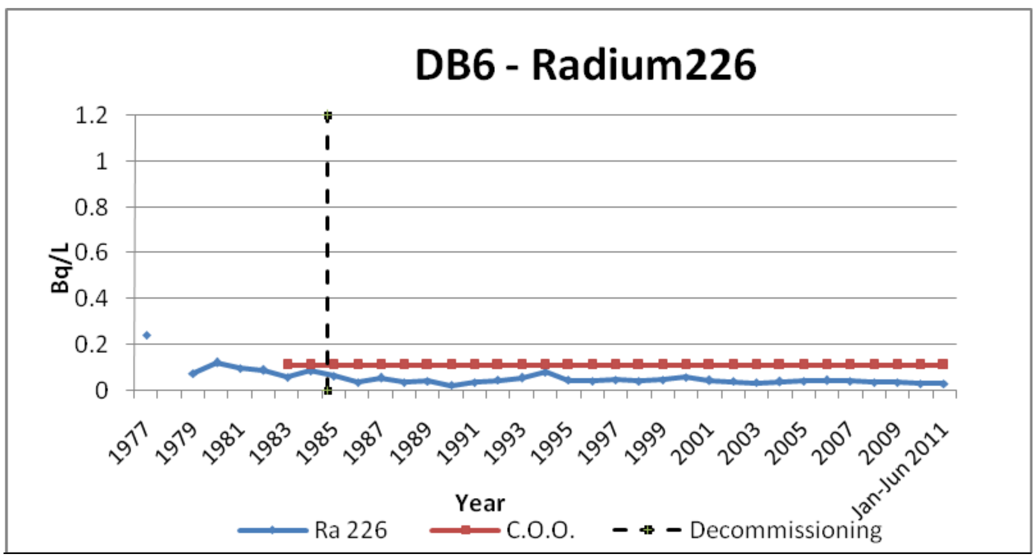


Figure 4.3.8 DB-6 - Dubyna Creek

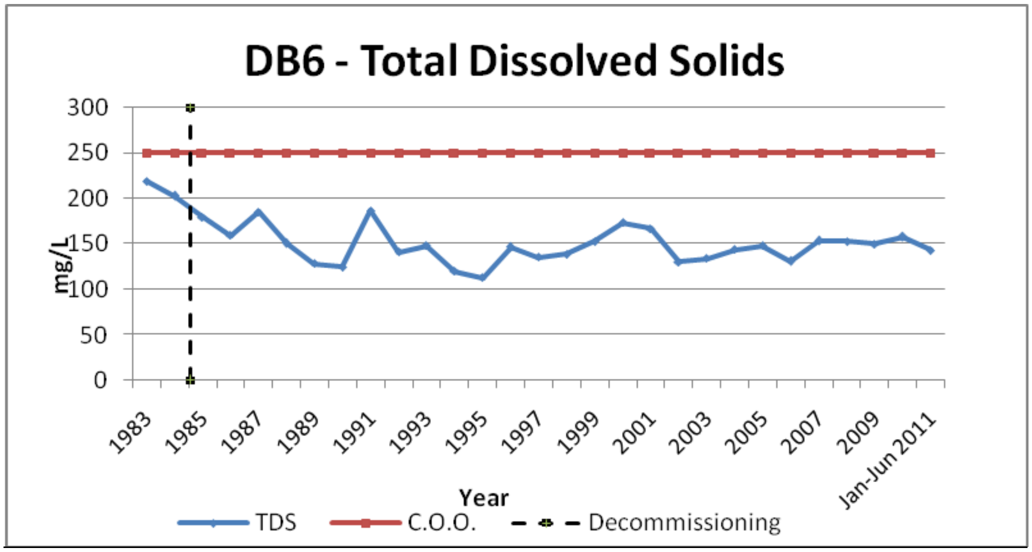
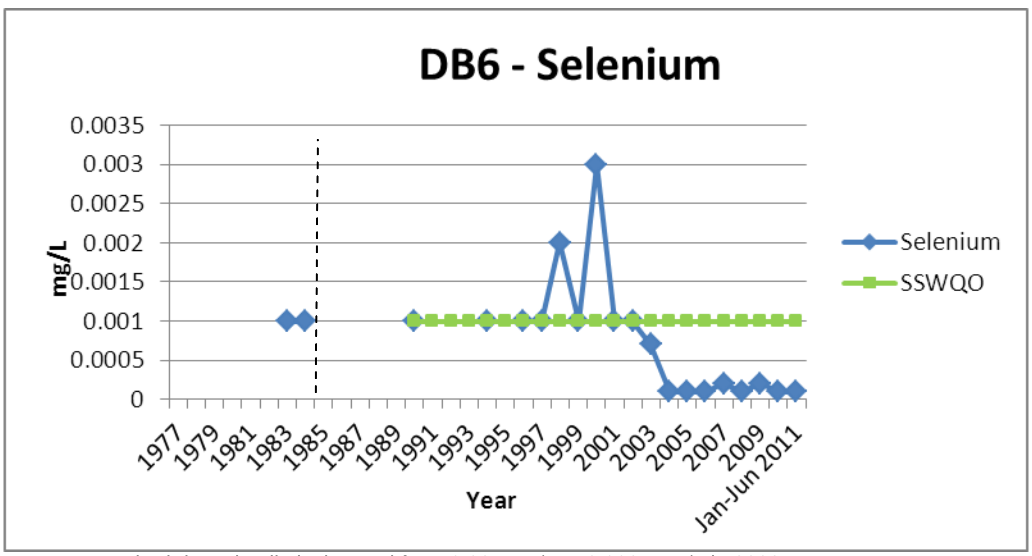


Figure 4.3.9 DB-6 - Dubyna Creek



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

Figure 4.3.10 AC-8 - Ace Lake Outlet to Ace Creek

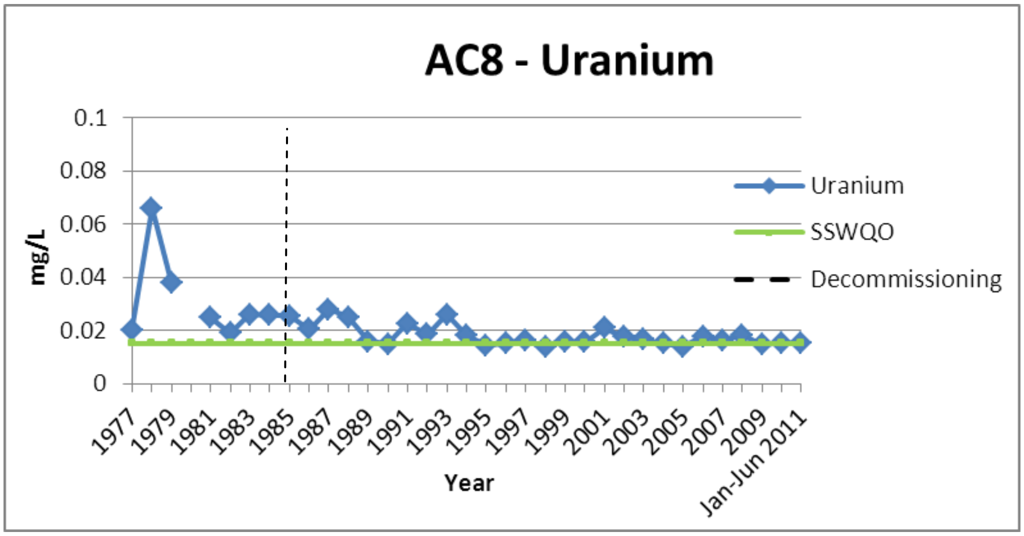


Figure 4.3.11 AC-8 - Ace Lake Outlet to Ace Creek

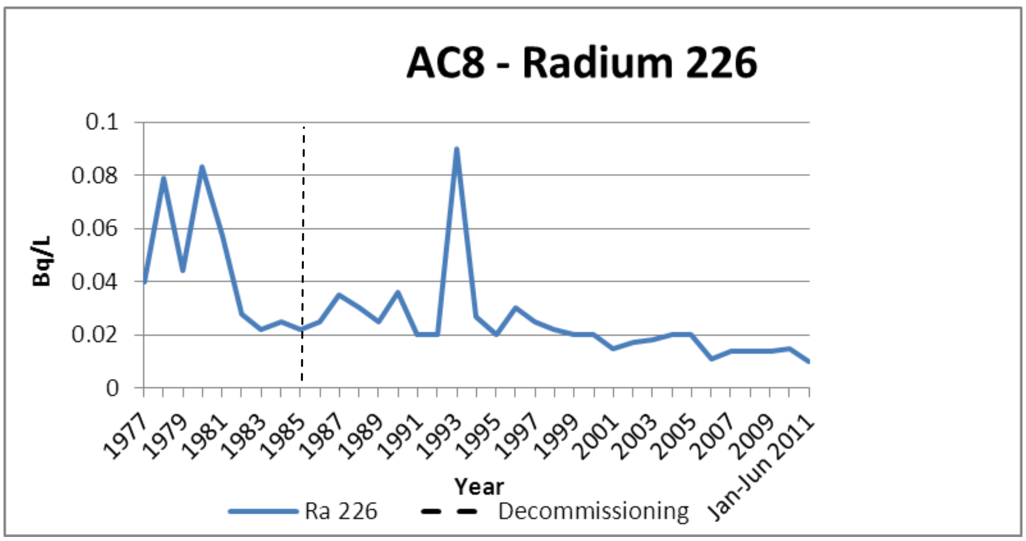


Figure 4.3.12 AC-8 - Ace Lake Outlet to Ace Creek

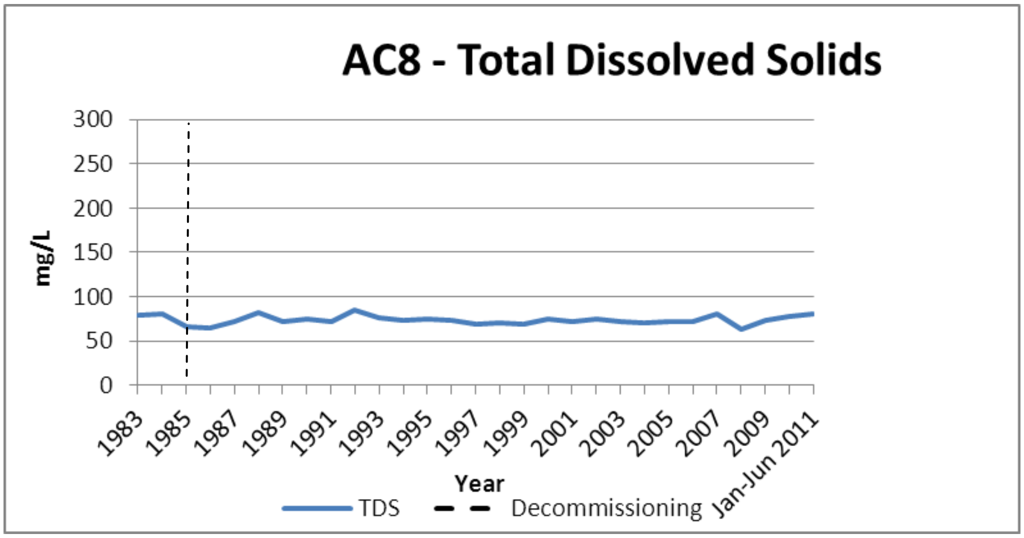
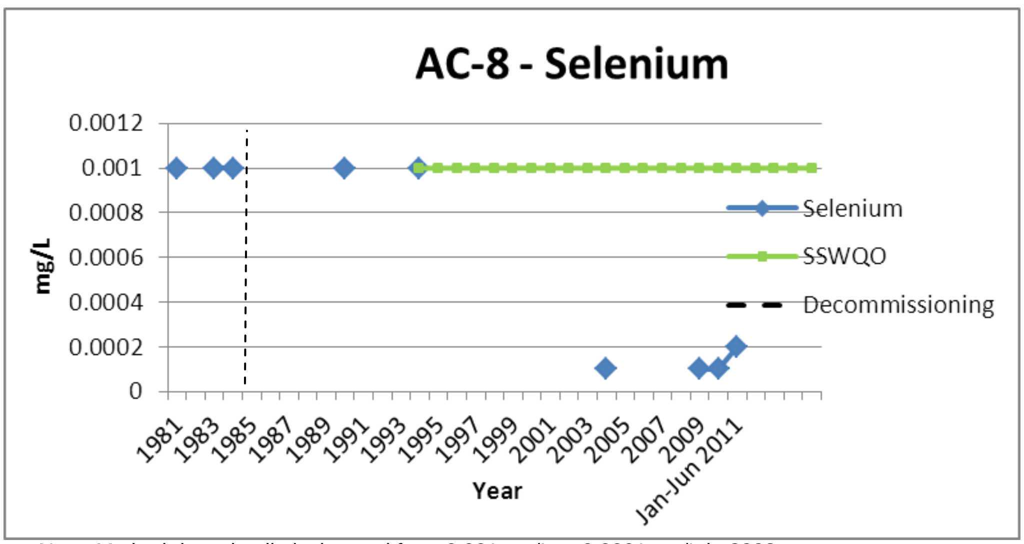


Figure 4.3.13 AC-8 - Ace Lake Outlet to Ace Creek



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

Figure 4.3.14 AC-14 - Ace Creek

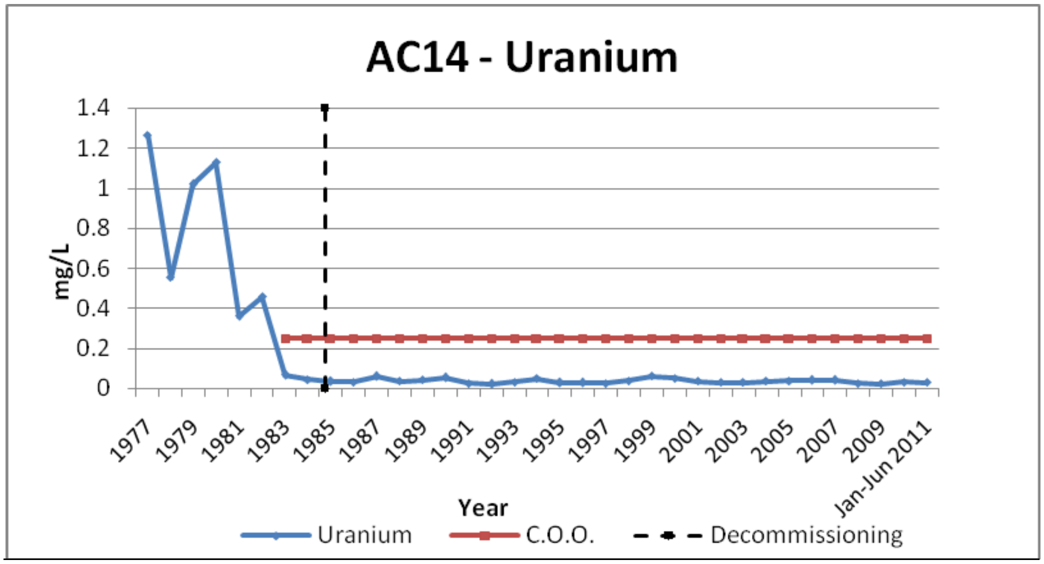


Figure 4.3.15 AC-14 - Ace Creek

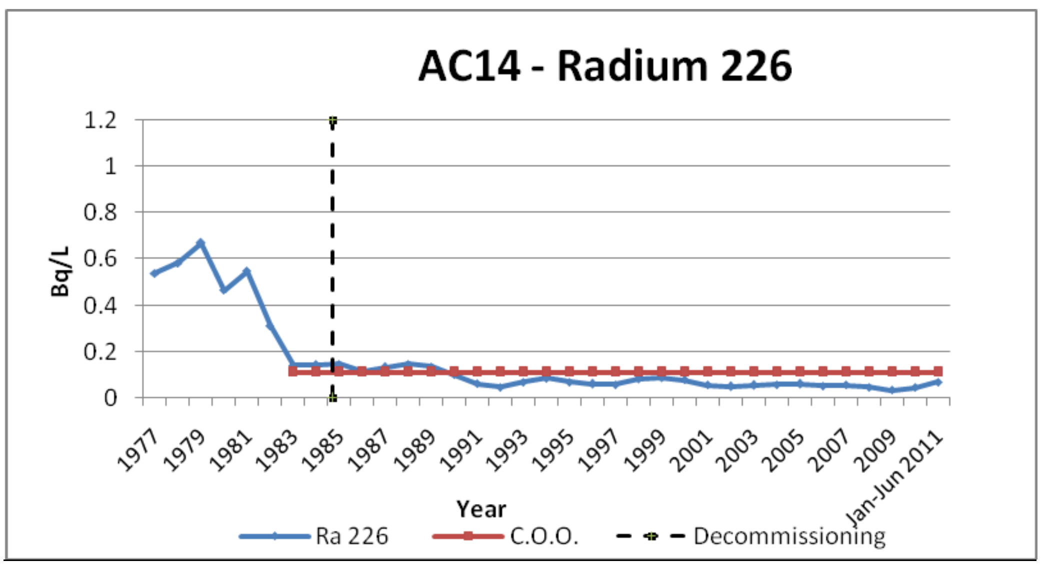


Figure 4.3.16 AC-14 - Ace Creek

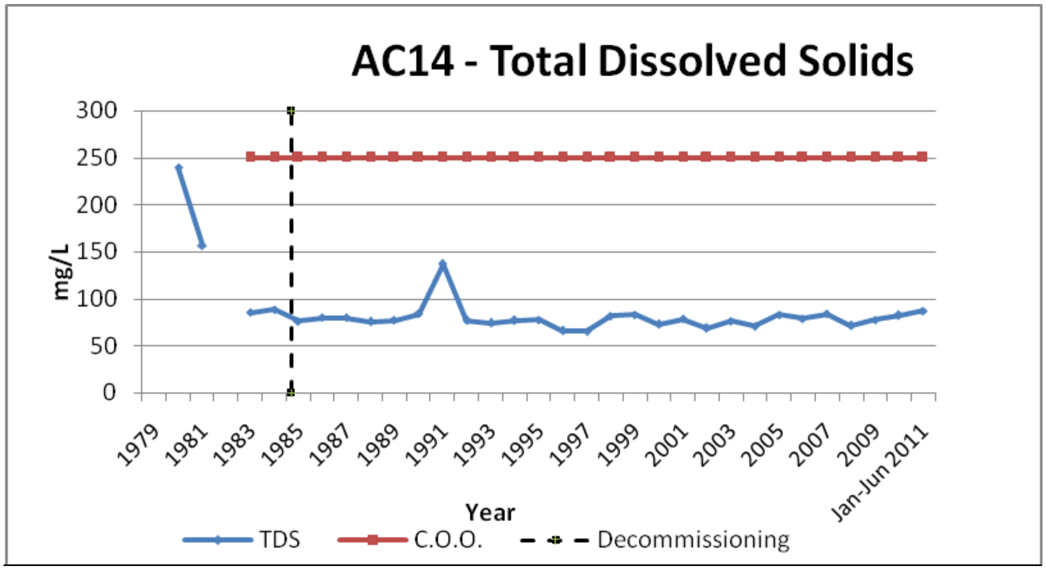
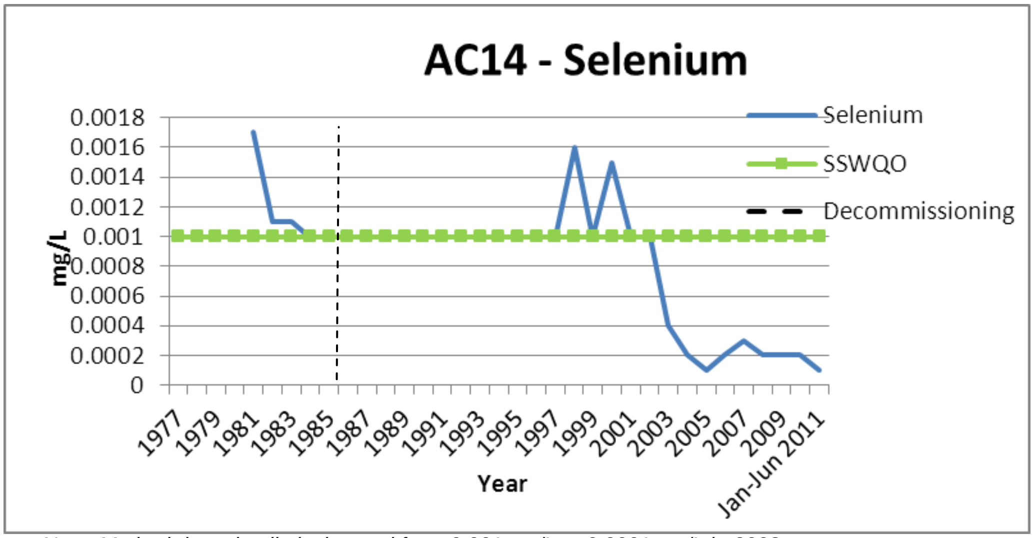


Figure 4.3.17 AC-14 - Ace Creek



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

Figure 4.3.18 AC-6A- Verna Lake Discharge to Ace Lake

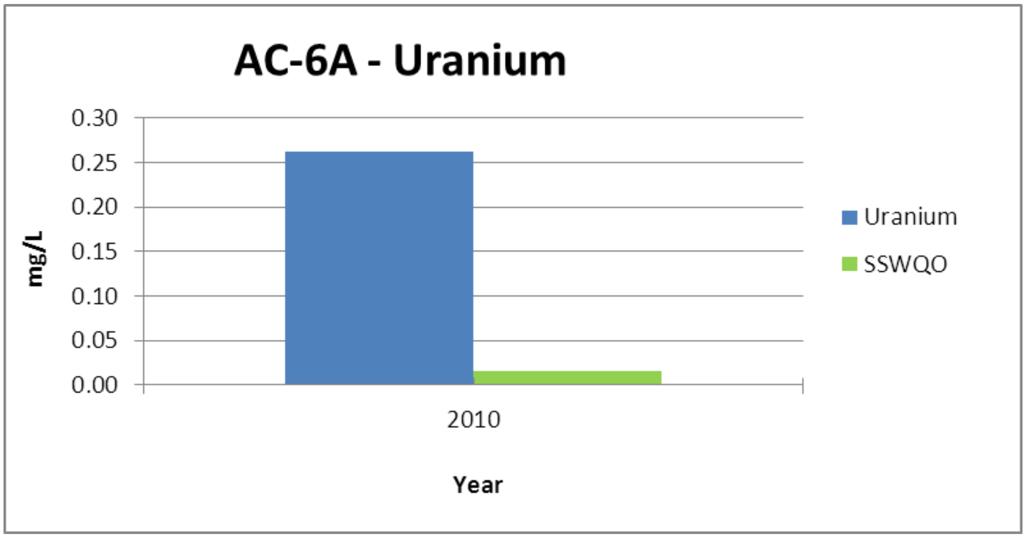


Figure 4.3.19 AC-6A- Verna Lake Discharge to Ace Lake

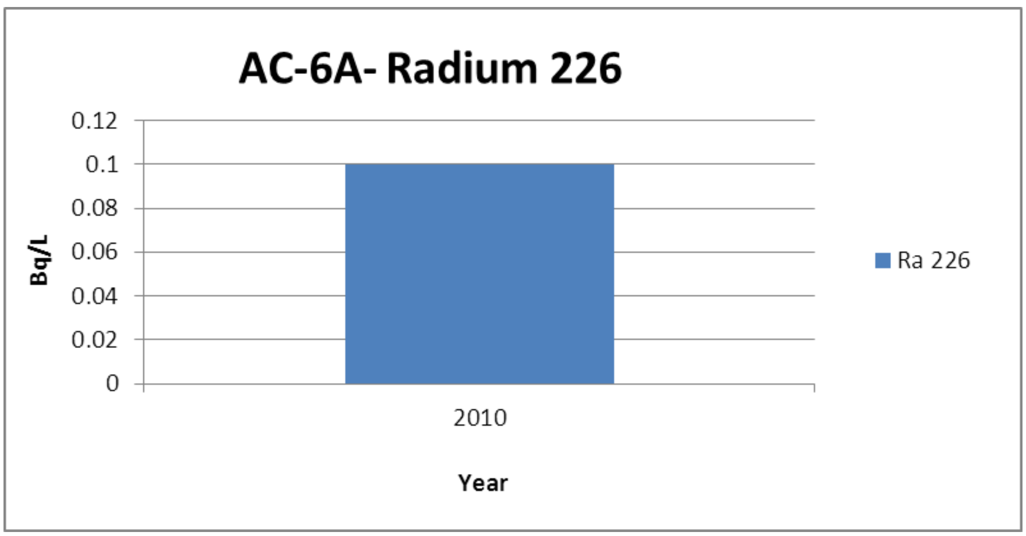


Figure 4.3.20 AC-6A- Verna Lake Discharge to Ace Lake

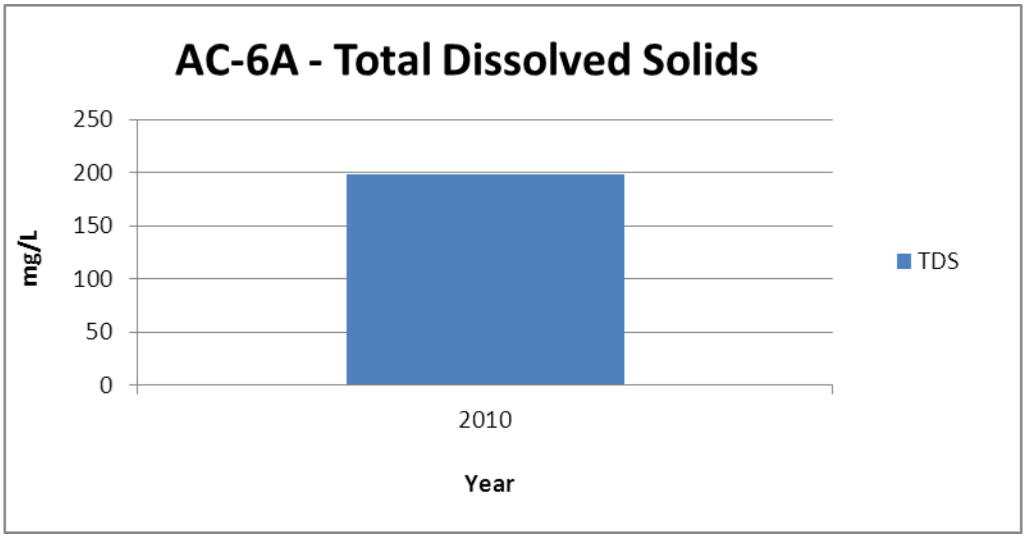


Figure 4.3.21 AC-6A- Verna Lake Discharge to Ace Lake

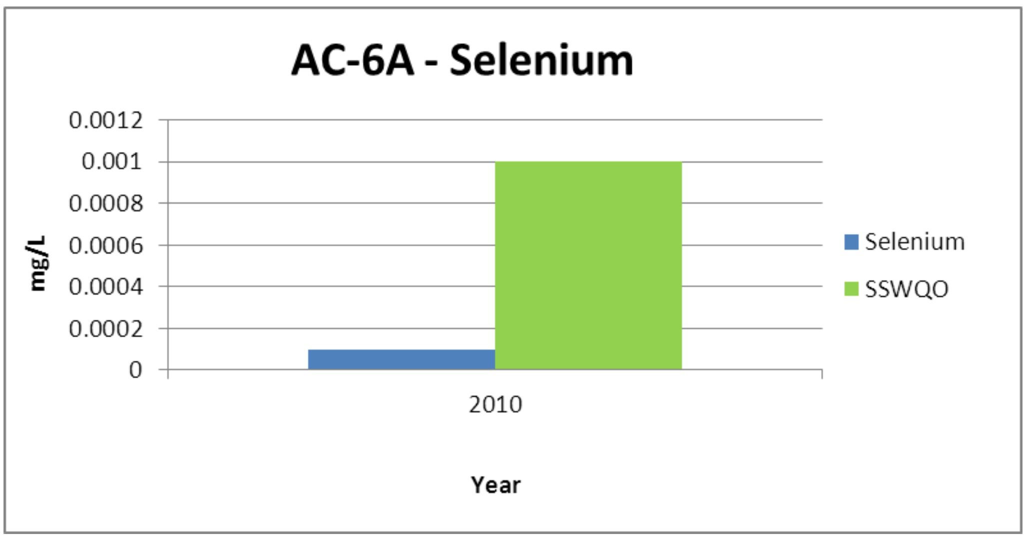
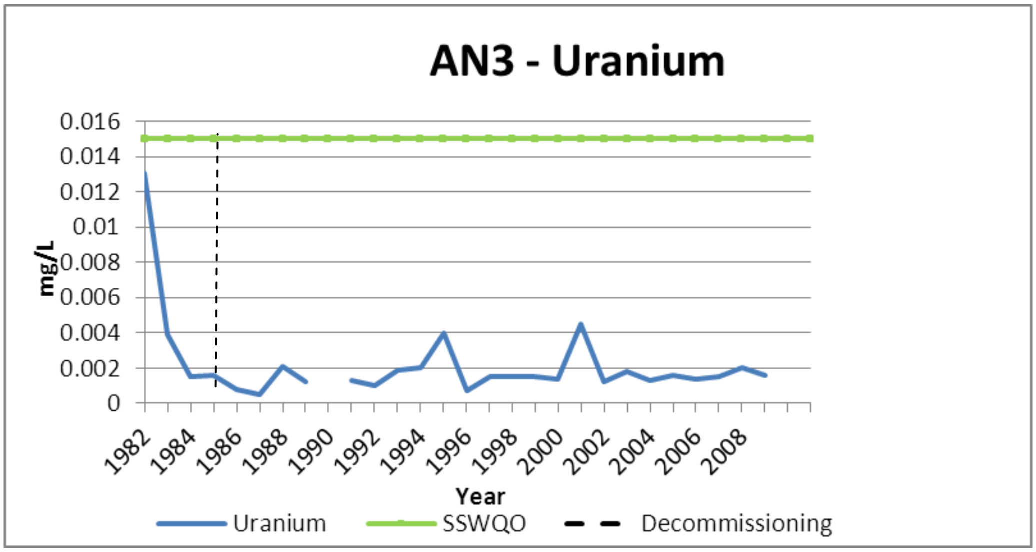
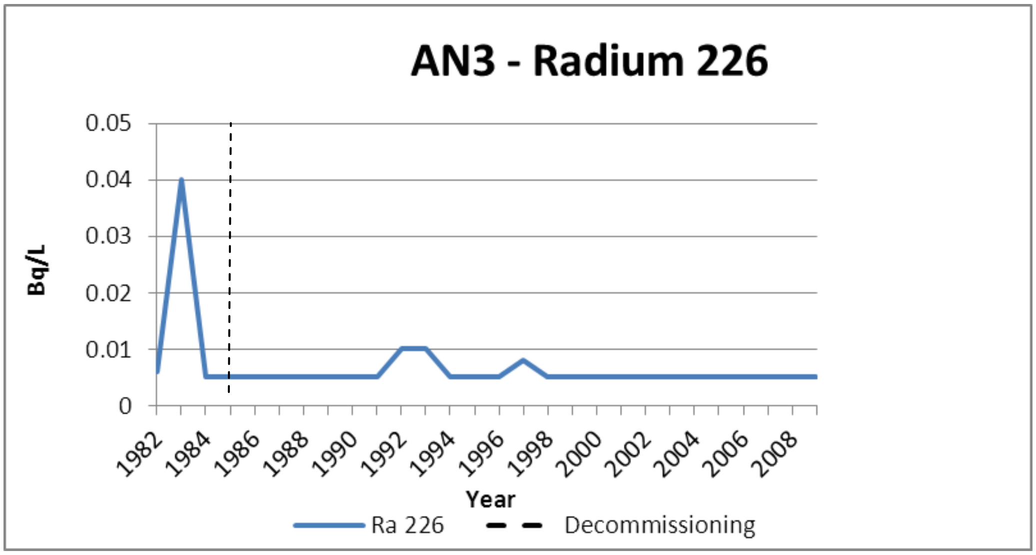


Figure 4.3.22 AN-3 - Fulton Lake (upstream of TL Stations)



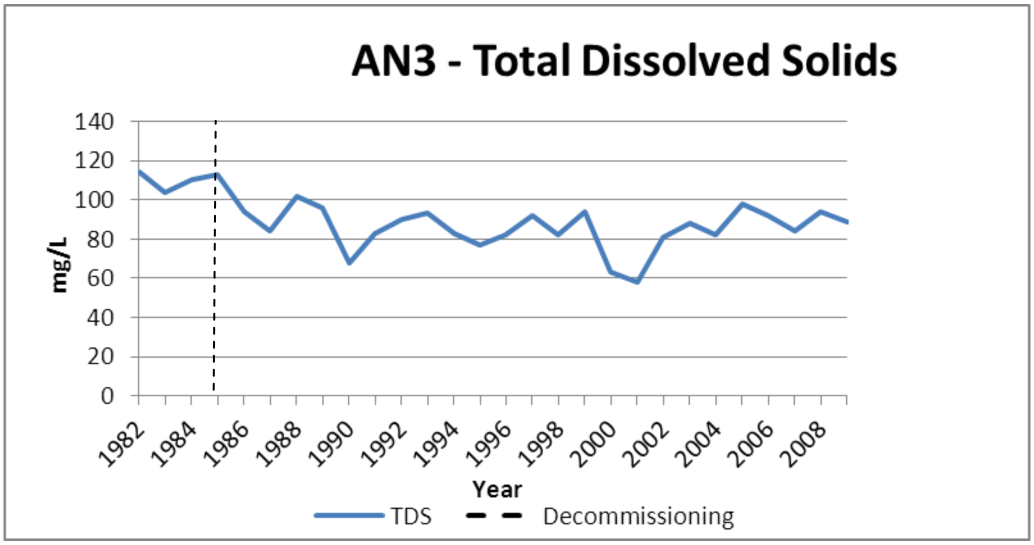
**The 2010 scheduled sampling was not completed due to a lack of water flow*
***Sampling not scheduled for early 2011*

Figure 4.3.23 AN-3 - Fulton Lake (upstream of TL Stations)



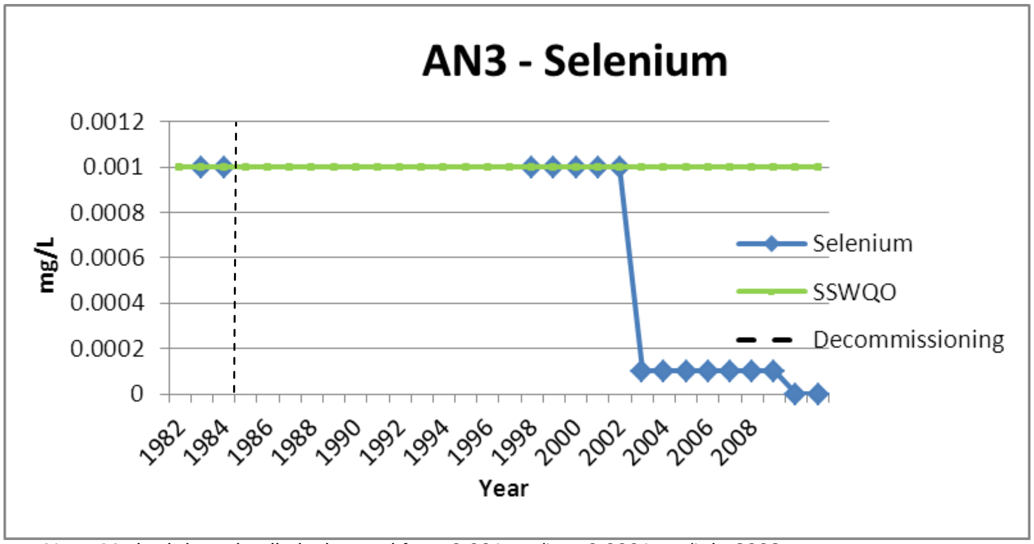
**The 2010 scheduled sampling was not completed due to a lack of water flow*
***Sampling not scheduled for early 2011*

Figure 4.3.24 AN-3 - Fulton Lake (upstream of TL Stations)



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

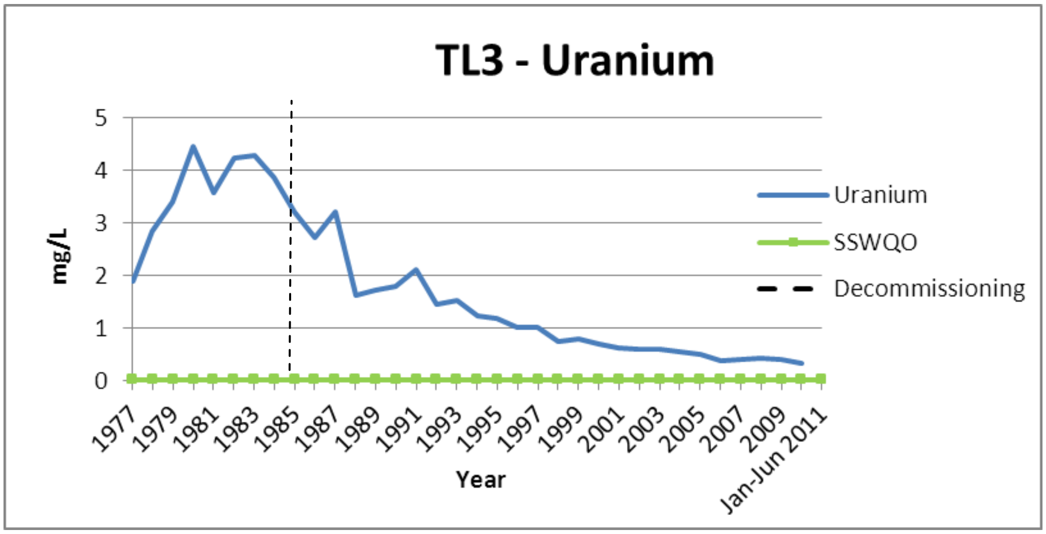
Figure 4.3.25 AN-3 - Fulton Lake (upstream of TL Stations)



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

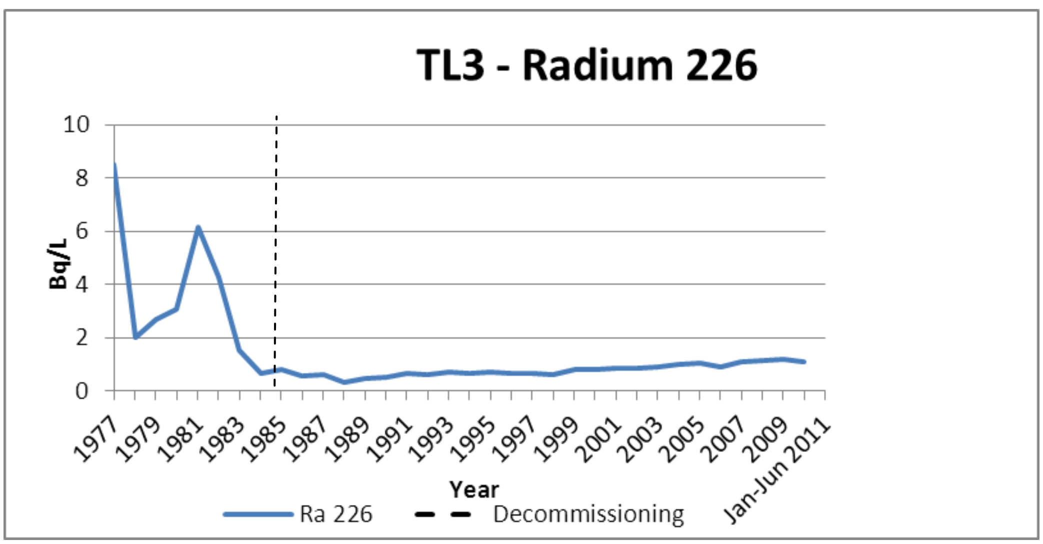
**The 2010 scheduled sampling was not completed due to a lack of water flow*
***Sampling not scheduled for early 2011*

Figure 4.3.26 TL-3 - Fookes Reservoir Discharge



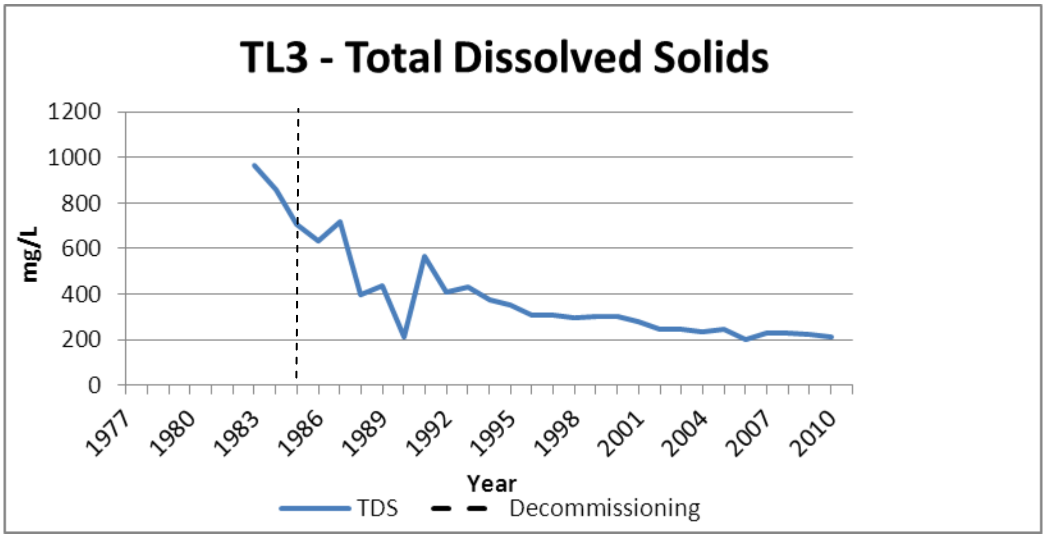
**No data available for 2011 due to a lack of water flow*

Figure 4.3.27 TL-3 - Fookes Reservoir Discharge



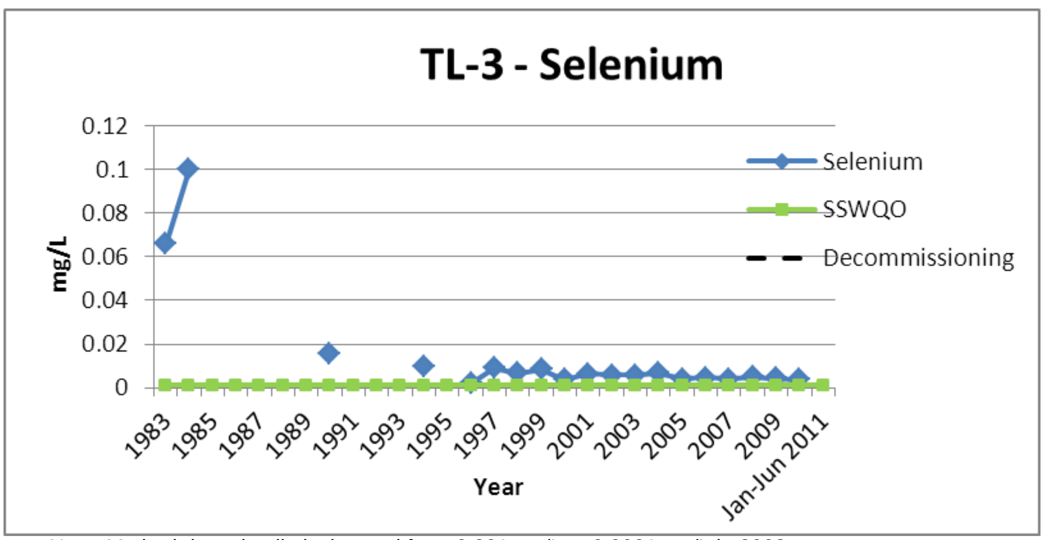
**No data available for 2011 due to a lack of water flow*

Figure 4.3.28 TL-3 - Fookes Reservoir Discharge



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

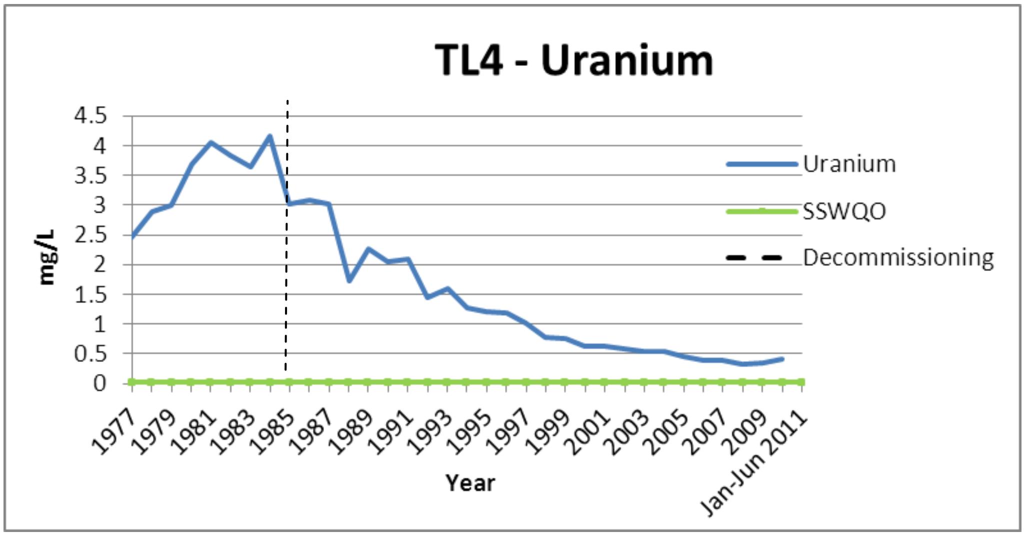
Figure 4.3.29 TL-3 - Fookes Reservoir Discharge



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

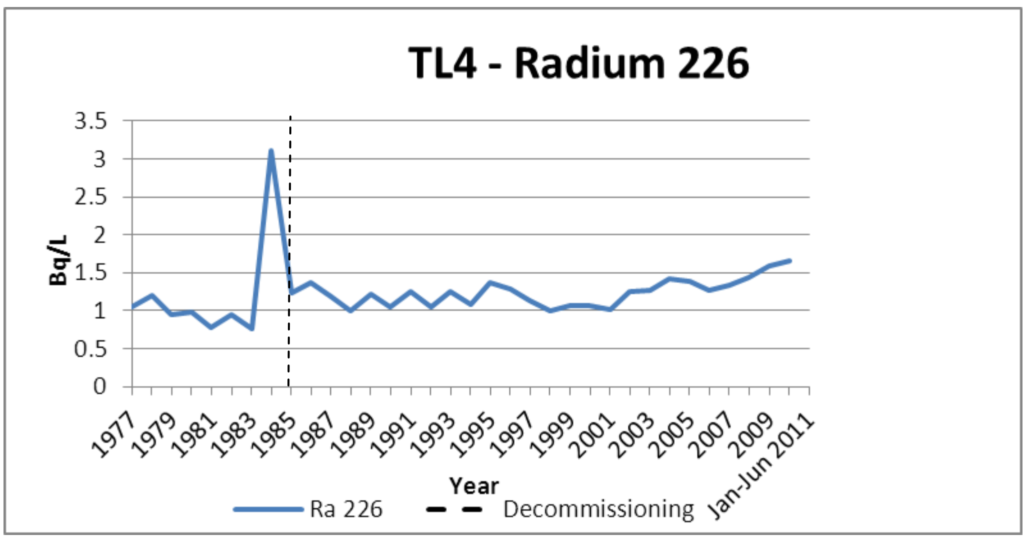
**No data available for 2011 due to a lack of water flow*

Figure 4.3.30 TL-4 - Marie Reservoir Discharge



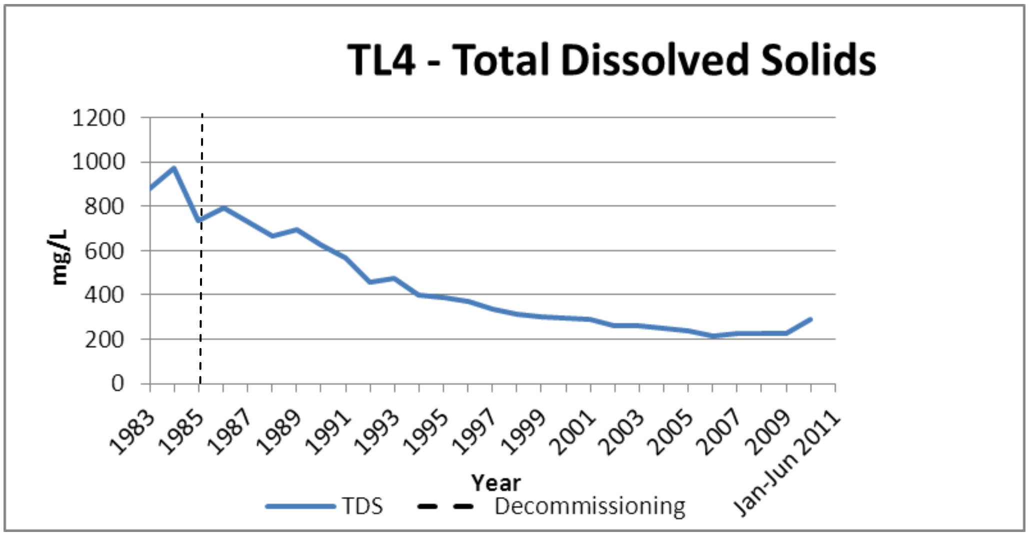
**No data available for 2011 due to a lack of water flow*

Figure 4.3.31 TL-4 - Marie Reservoir Discharge



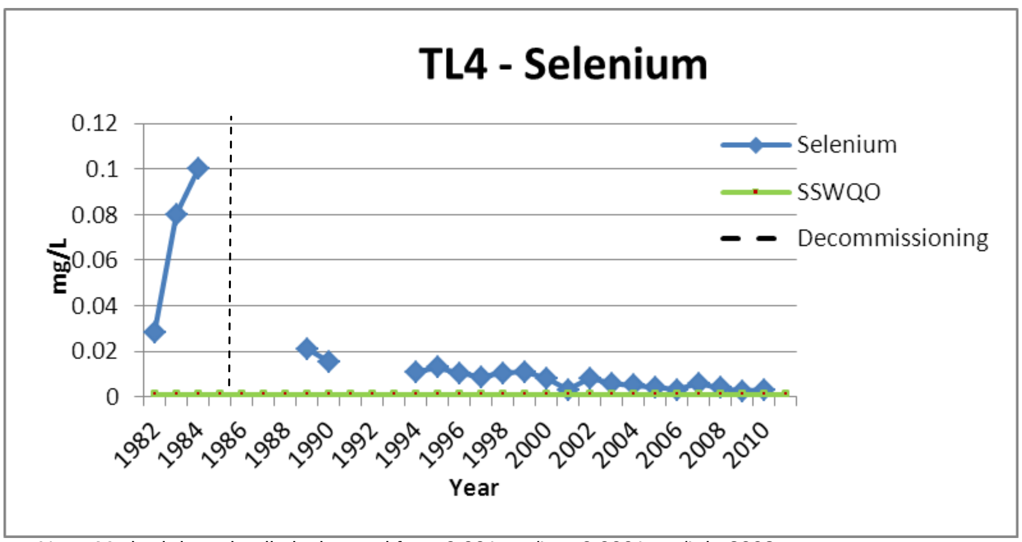
**No data available for 2011 due to a lack of water flow*

Figure 4.3.32 TL-4 - Marie Reservoir Discharge



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

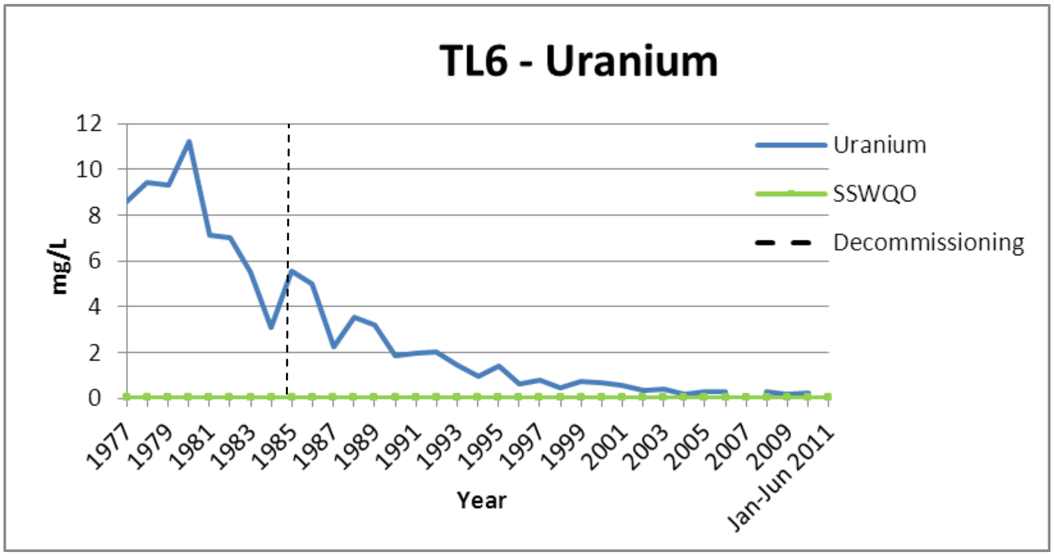
Figure 4.3.33 TL-4 - Marie Reservoir Discharge



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

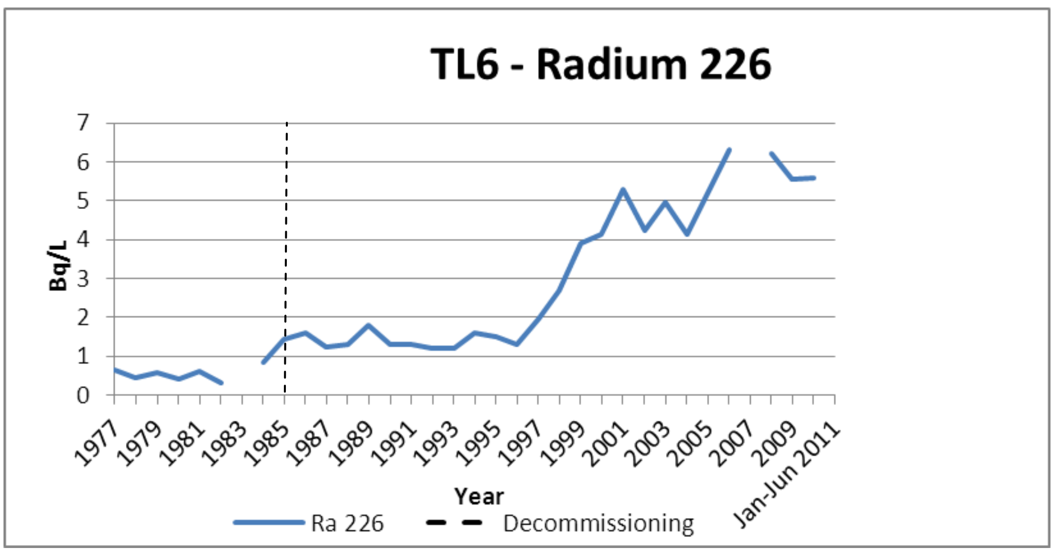
**No data available for 2011 due to a lack of water flow*

Figure 4.3.34 TL-6 - Minewater Reservoir Discharge



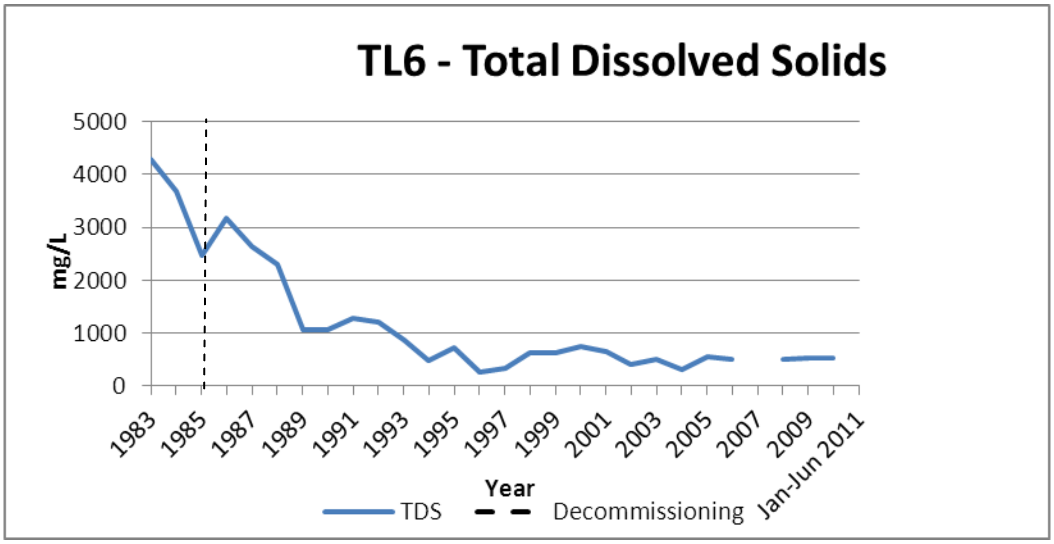
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.35 TL-6 - Minewater Reservoir Discharge



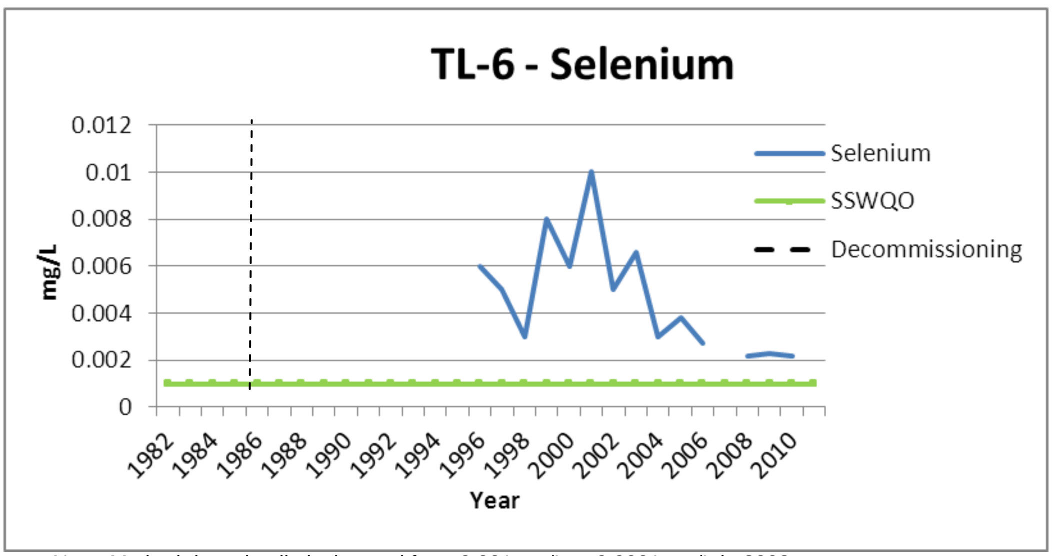
**No data available for 2007 and 2011 due to a lack of water flow*

Figure 4.3.36 TL-6 - Minewater Reservoir Discharge



**No data available for2007 and 2011 due to a lack of water flow*

Figure 4.3.37 TL-6 - Minewater Reservoir Discharge



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

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

Figure 4.3.38 TL-7 - Meadow Lake Discharge

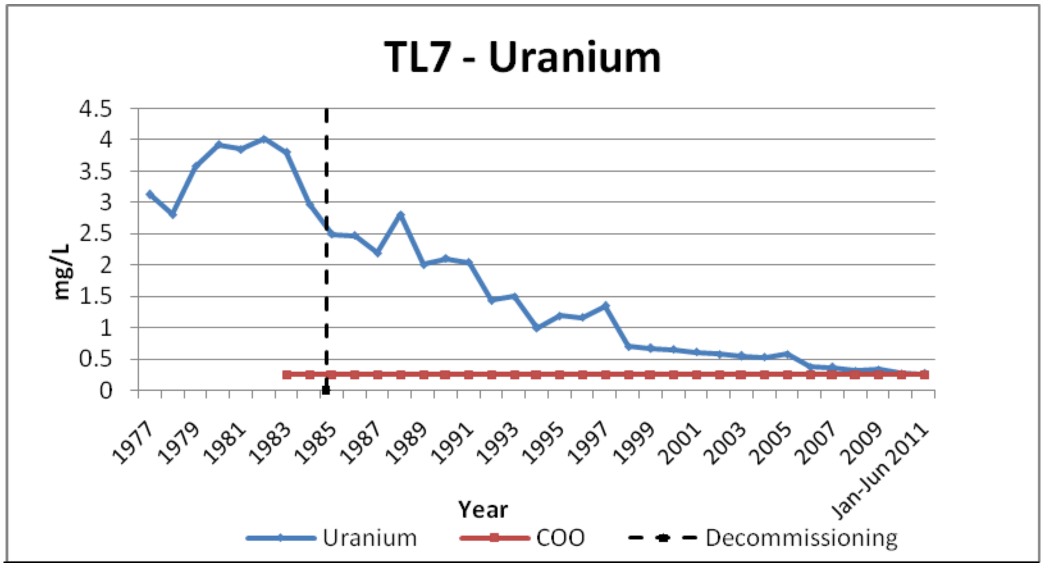


Figure 4.3.39 TL-7 - Meadow Lake Discharge

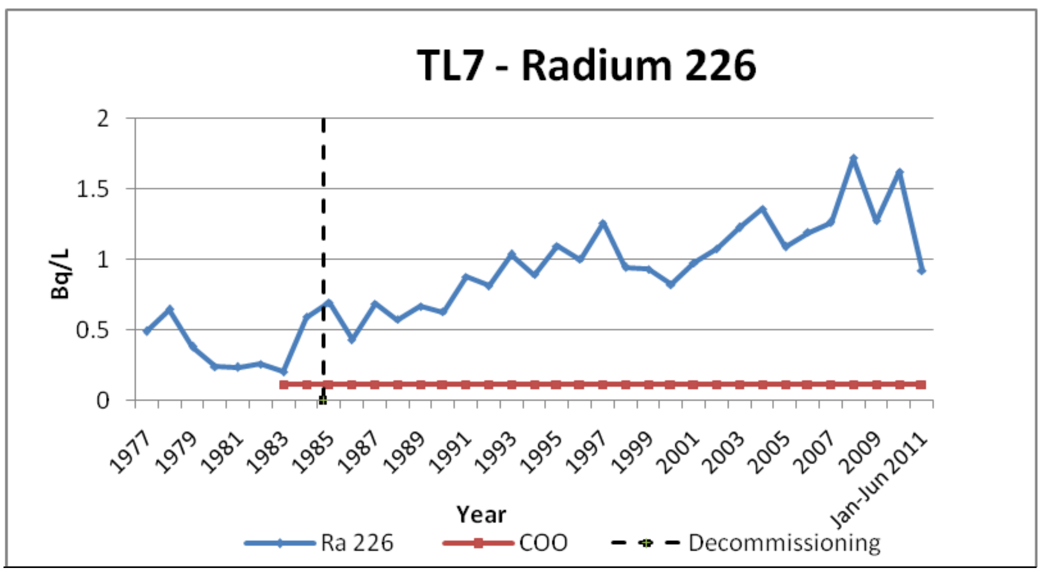


Figure 4.3.40 TL-7 - Meadow Lake Discharge

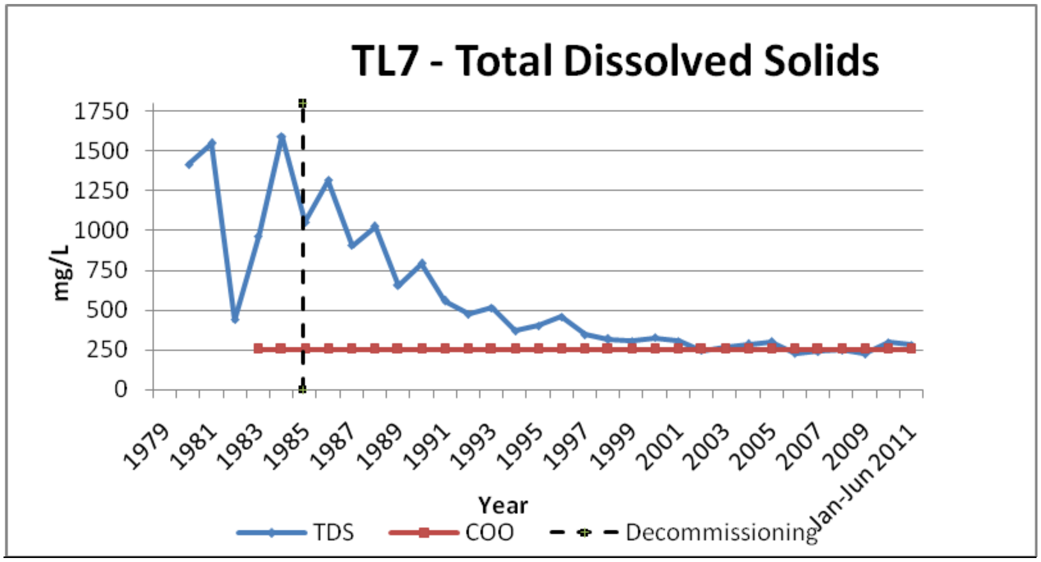
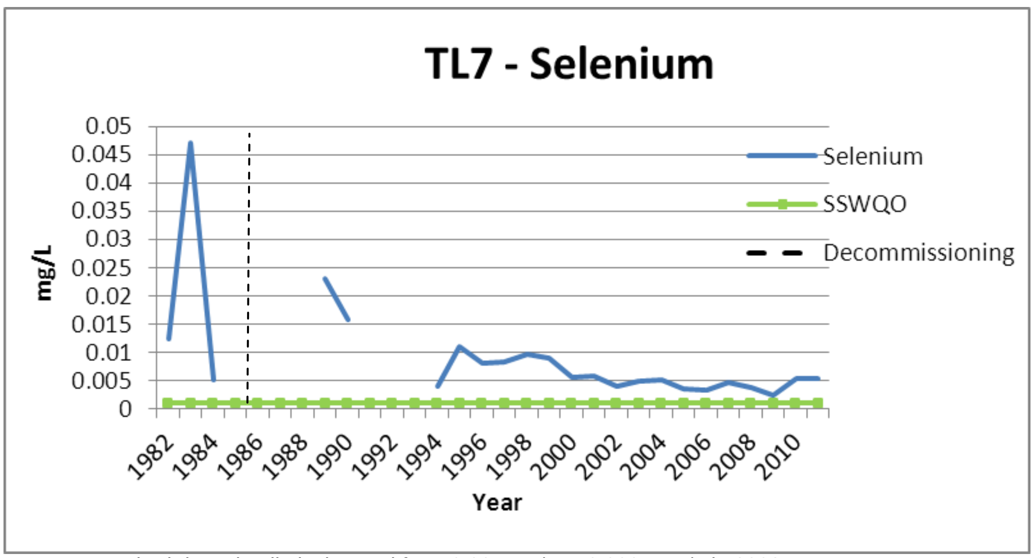


Figure 4.3.41 TL-7 - Meadow Lake Discharge



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

Figure 4.3.42 TL-9 - Fulton Creek Below Greer Lake

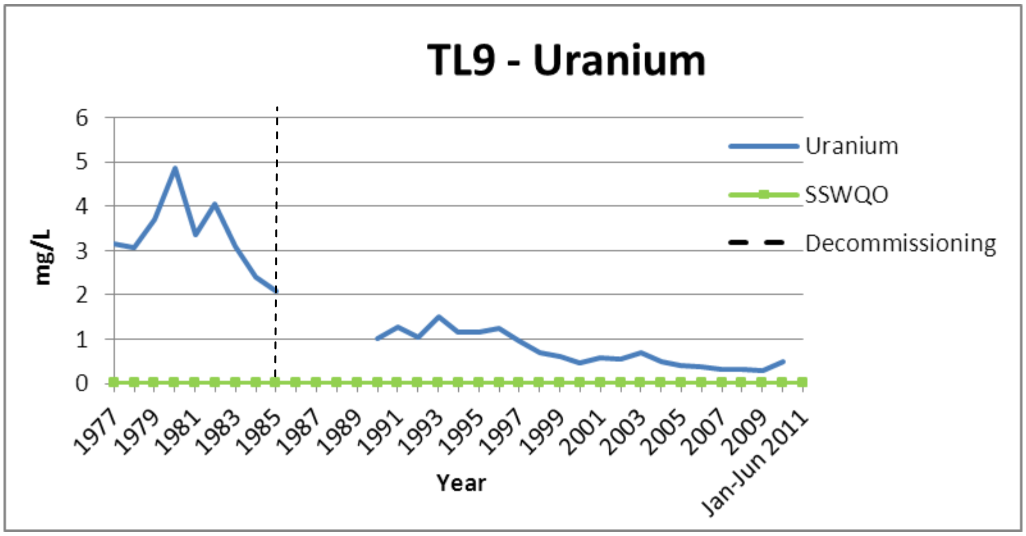


Figure 4.3.43 TL-9 - Fulton Creek Below Greer Lake

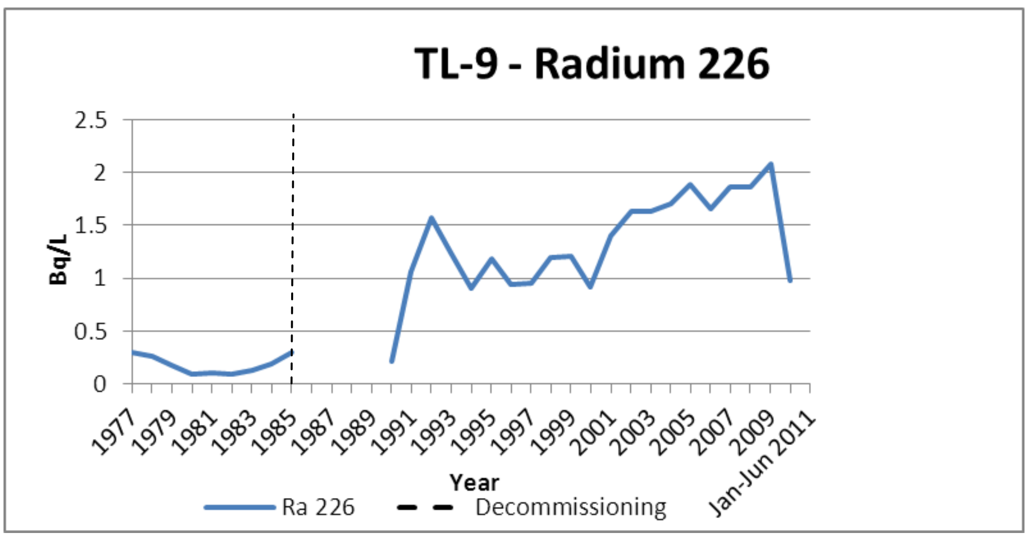


Figure 4.3.44 TL-9 - Fulton Creek Below Greer Lake

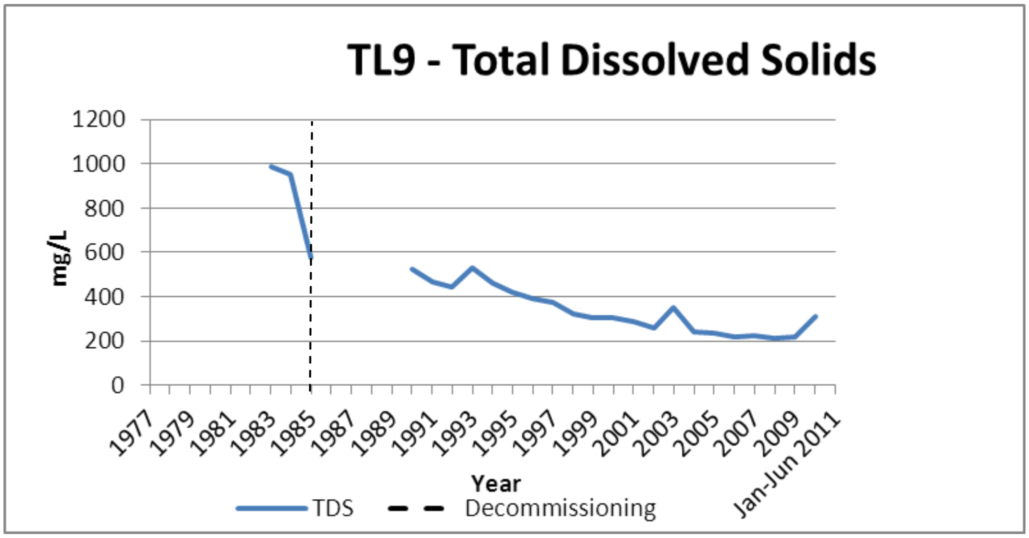
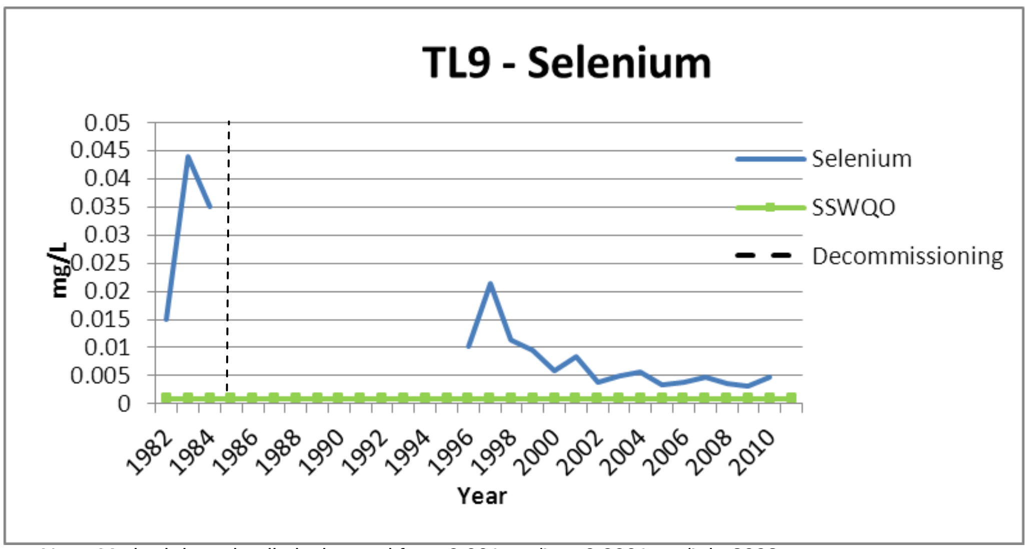


Figure 4.3.45 TL-9 - Fulton Creek Below Greer Lake



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

Figure 4.3.46 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

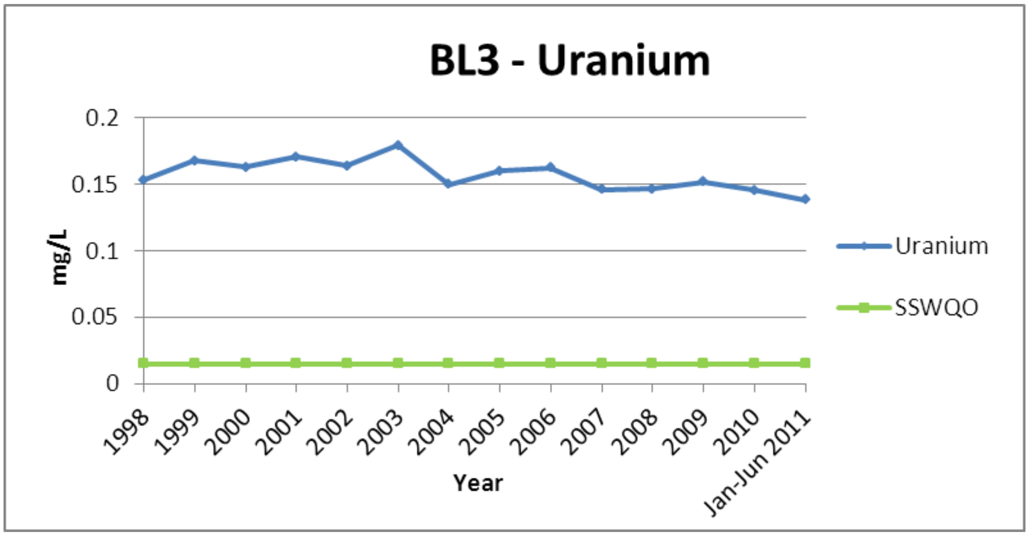


Figure 4.3.47 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

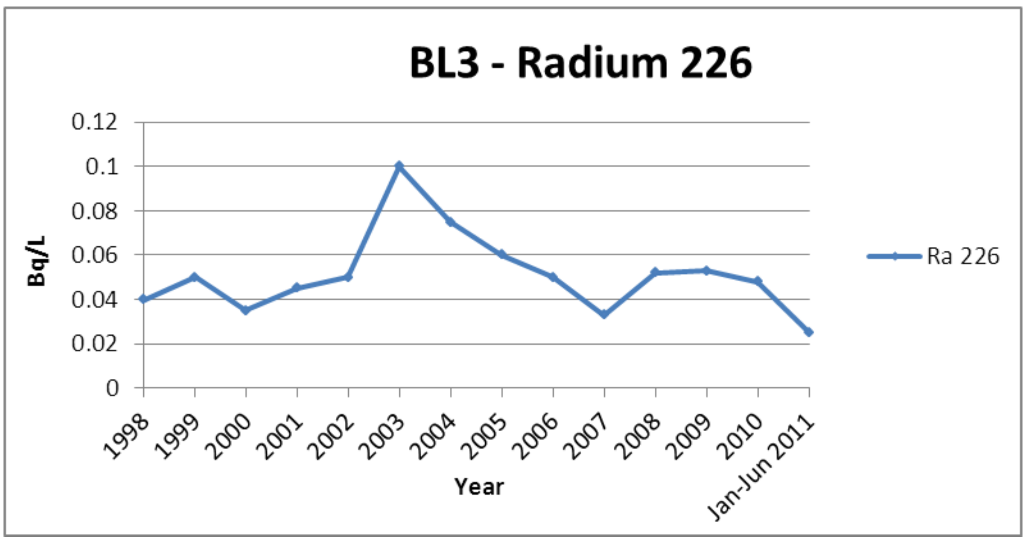


Figure 4.3.48 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge

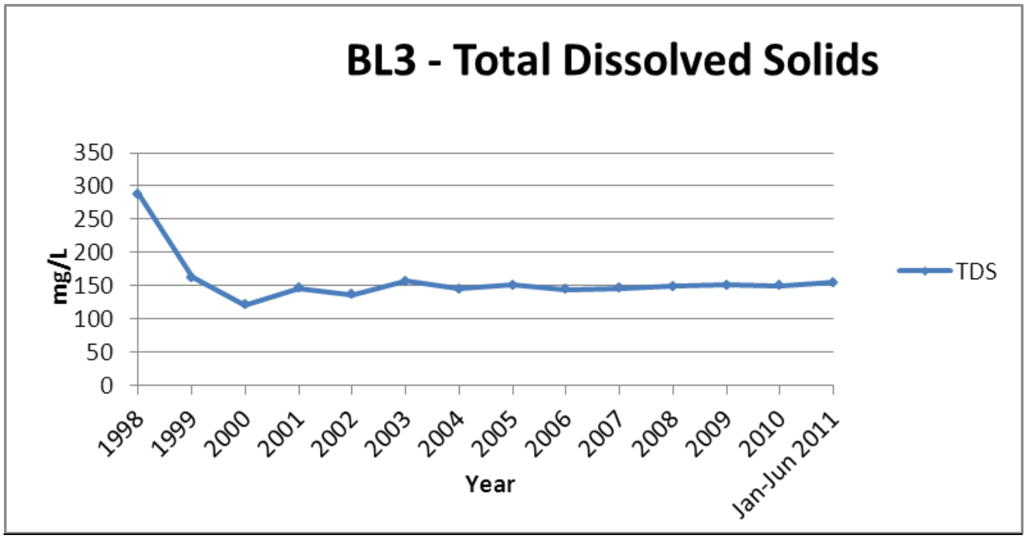
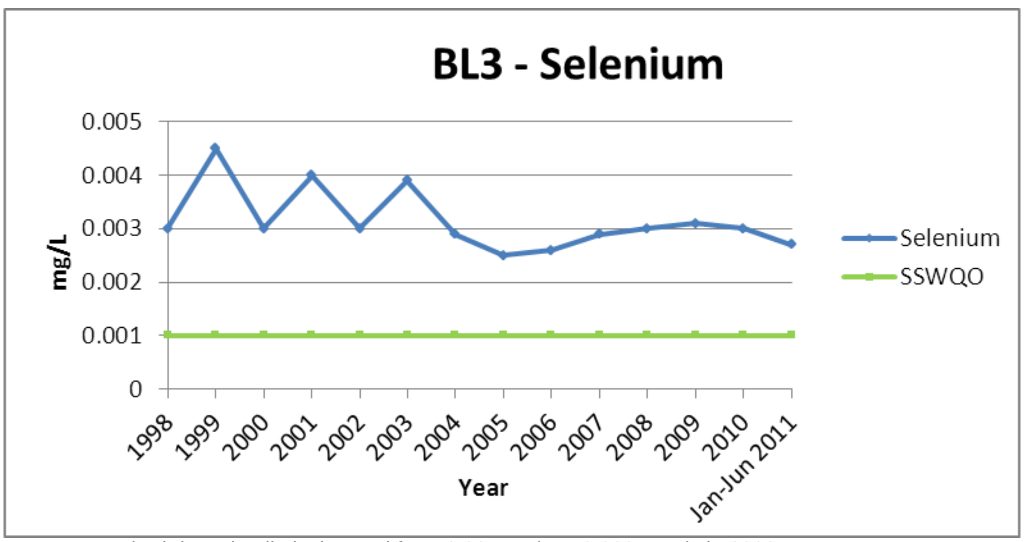


Figure 4.3.49 BL-3 - Beaverlodge Lake Opposite Fulton Creek Discharge



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

Figure 4.3.50 BL-4 - Beaverlodge Lake Centre

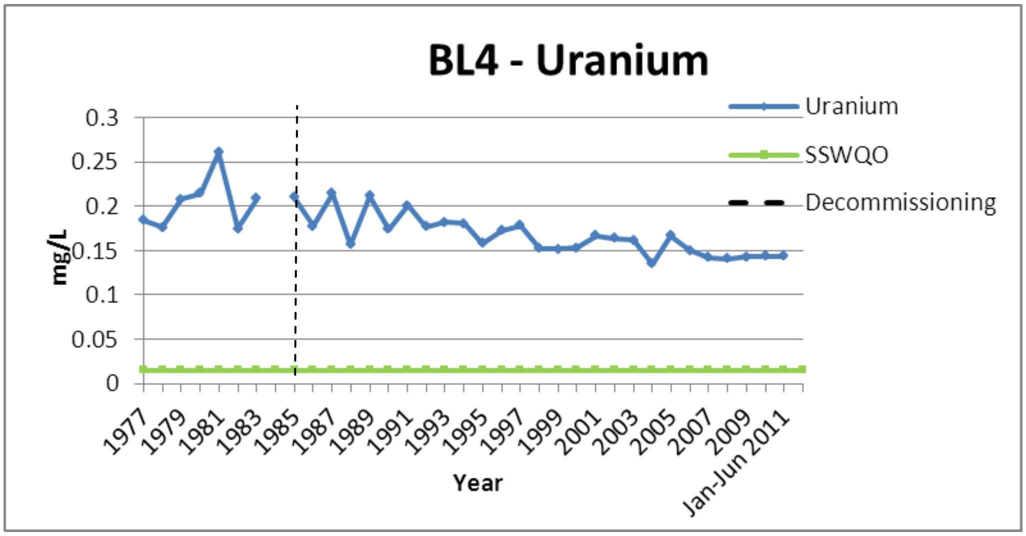


Figure 4.3.51 BL-4 - Beaverlodge Lake Centre

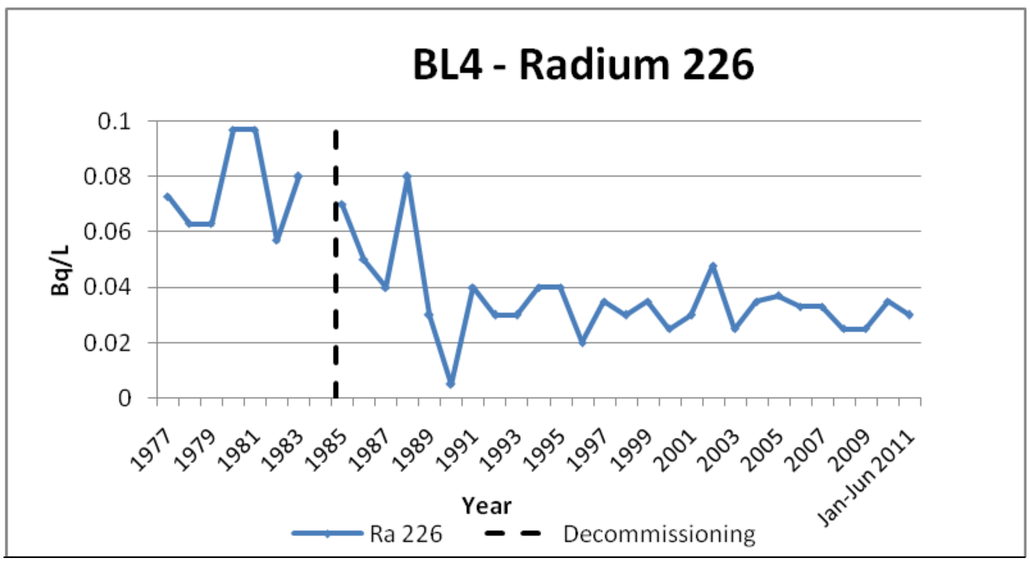


Figure 4.3.52 BL-4 - Beaverlodge Lake Centre

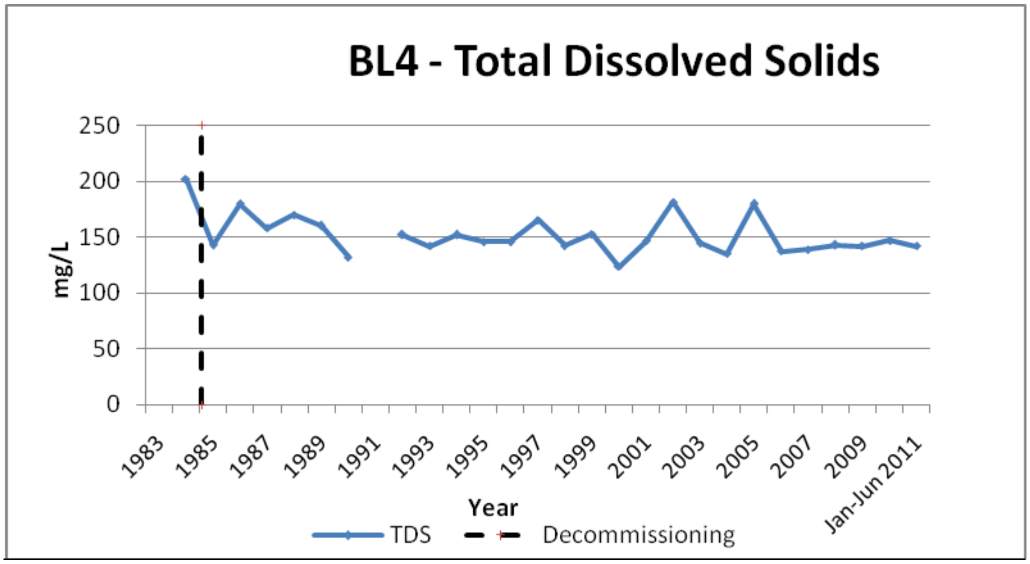
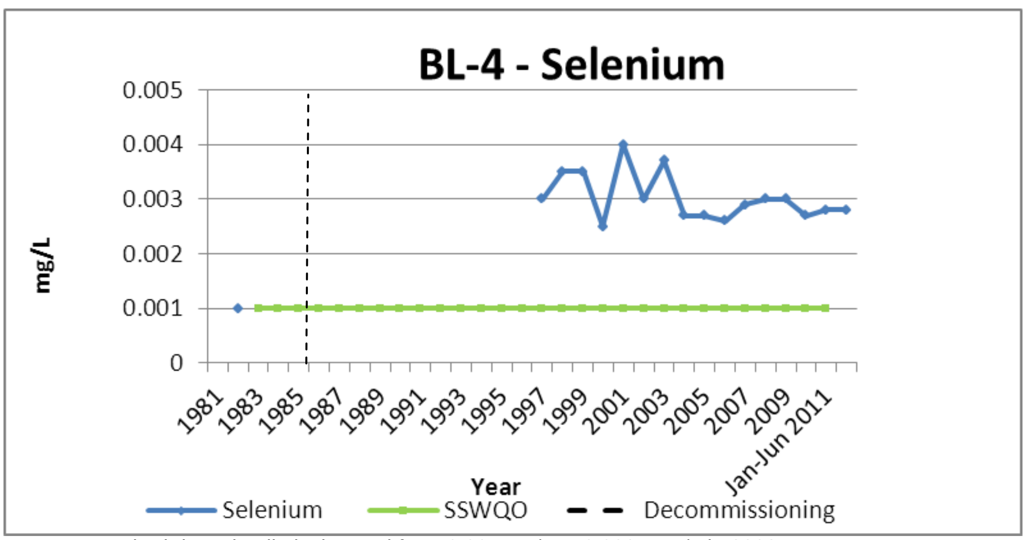
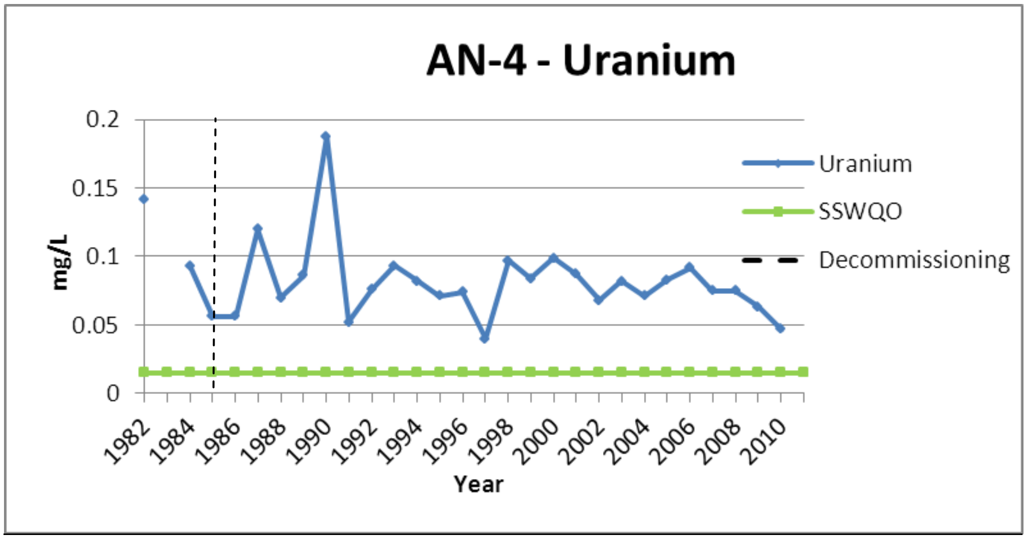


Figure 4.3.53 BL-4 - Beaverlodge Lake Centre



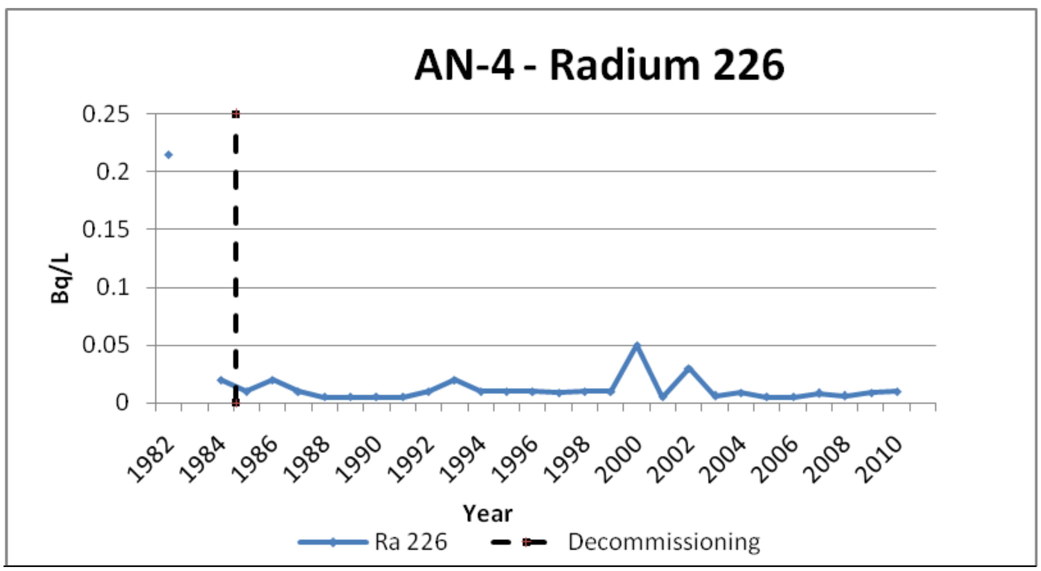
Note: Method detection limit changed from 0.001 mg/L to 0.0001 mg/L in 2003

Figure 4.3.54 AN-4 - Martin Lake



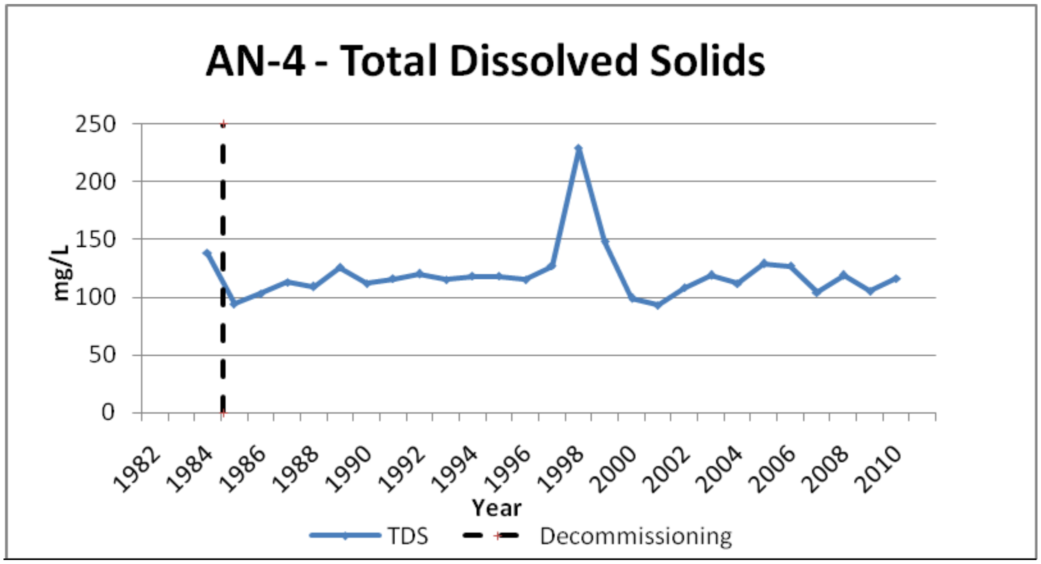
As of 2011, AN-4 was discontinued from the regular sampling program.

Figure 4.3.55 AN-4 - Martin Lake



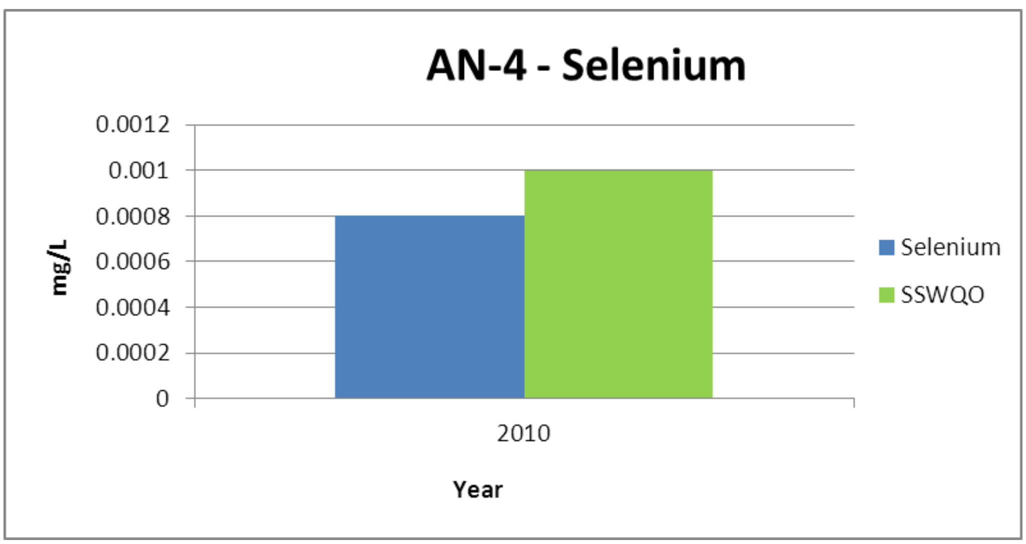
As of 2011, AN-4 was discontinued from the regular sampling program.

Figure 4.3.56 AN-4 - Martin Lake



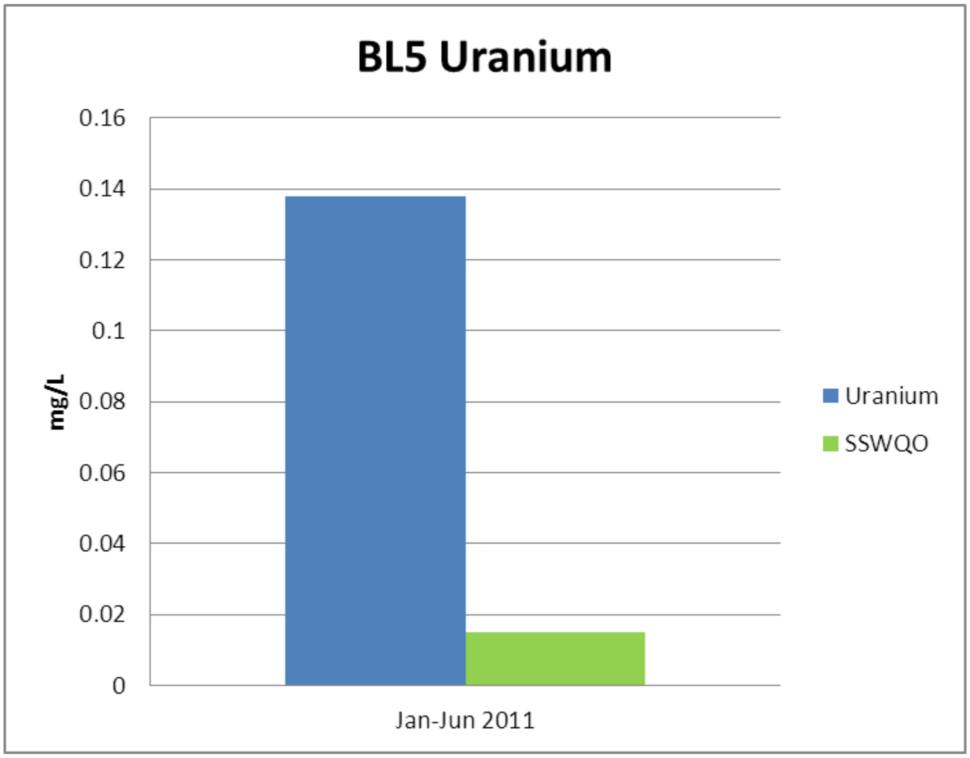
As of 2011, AN-4 was discontinued from the regular sampling program.

Figure 4.3.57 AN-4- Martin Lake



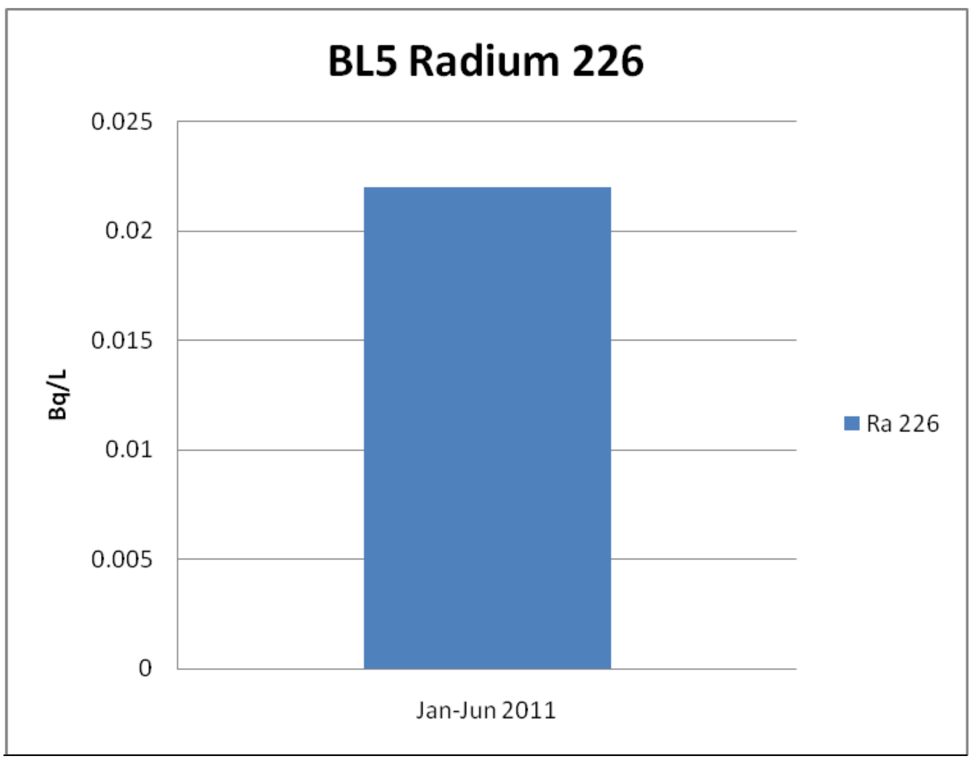
As of 2011, AN-4 was discontinued from the regular sampling program.
Se was added to the AN-4 regular sampling in 2010.

Figure 4.3.58 BL5-Beaverlodge Lake Outlet



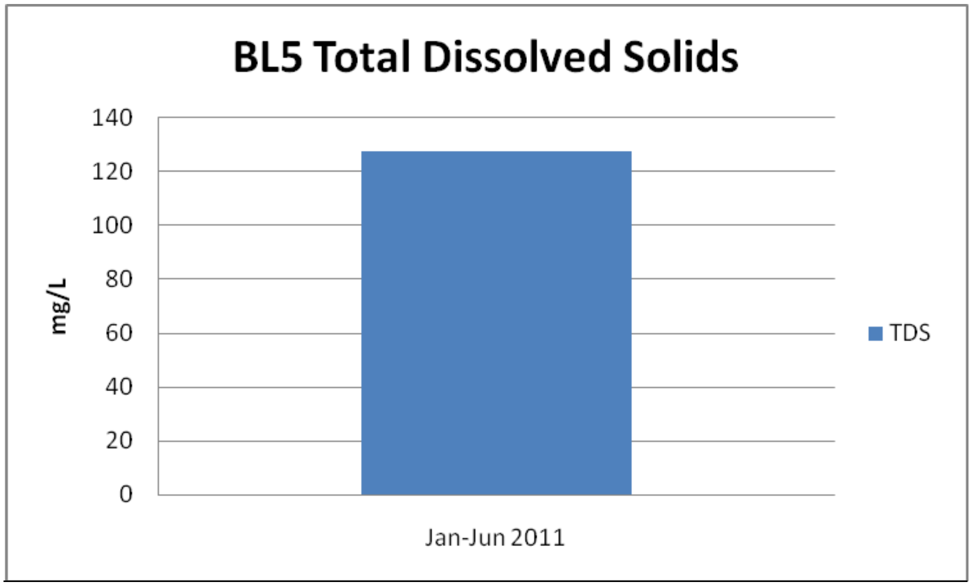
** Station implemented in water sampling program in 2011*

Figure 4.3.59 BL5-Beaverlodge Lake Outlet



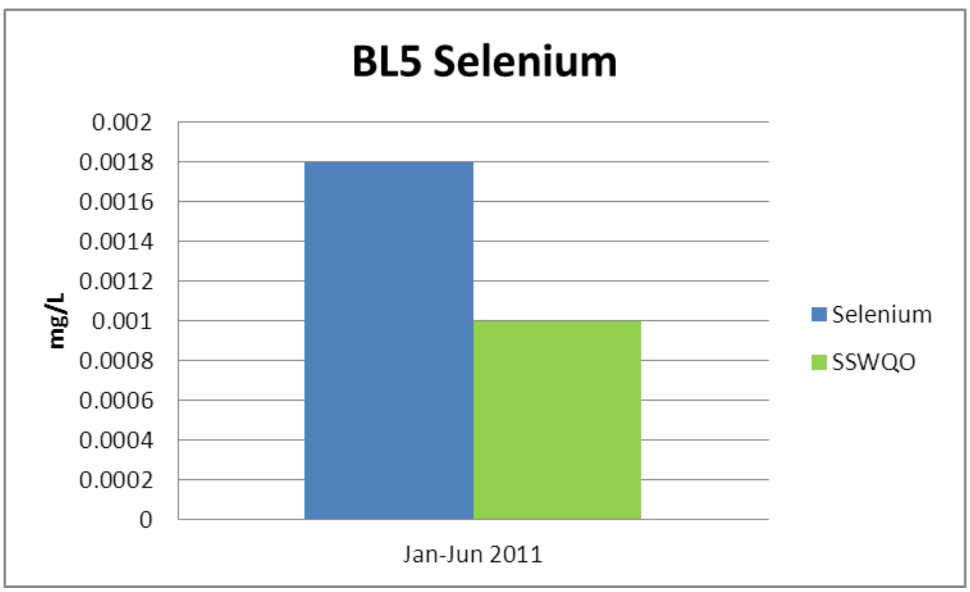
** Station implemented in water sampling program in 2011*

Figure 4.3.60 BL5-Beaverlodge Lake Outlet



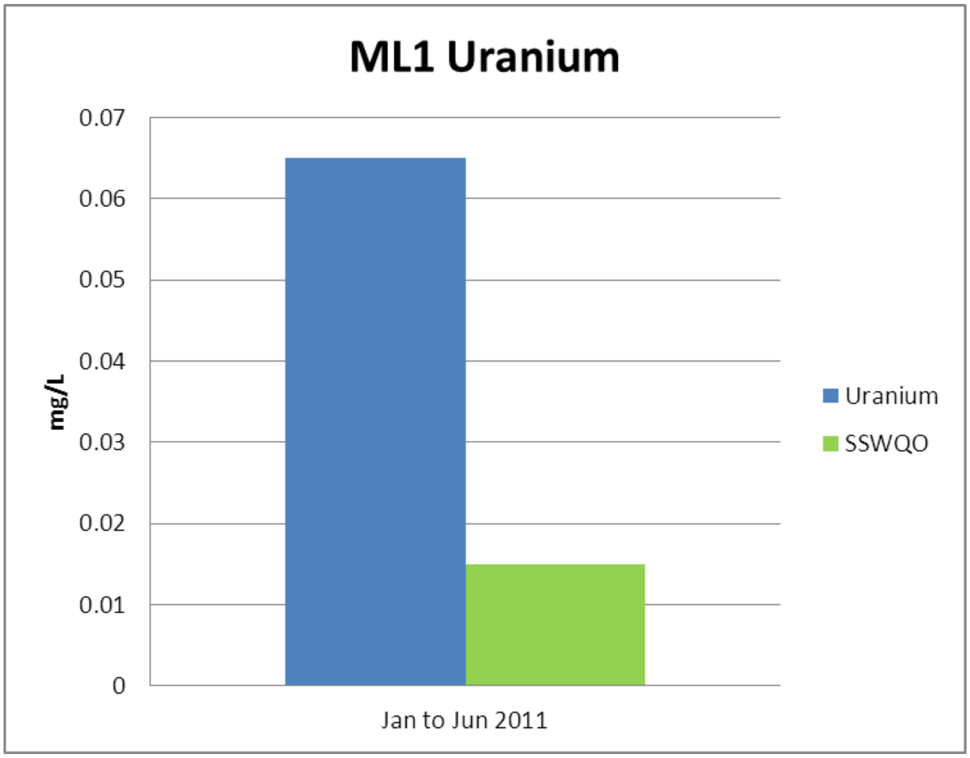
** Station implemented in water sampling program in 2011*

Figure 4.3.61 BL5-Beaverlodge Lake Outlet



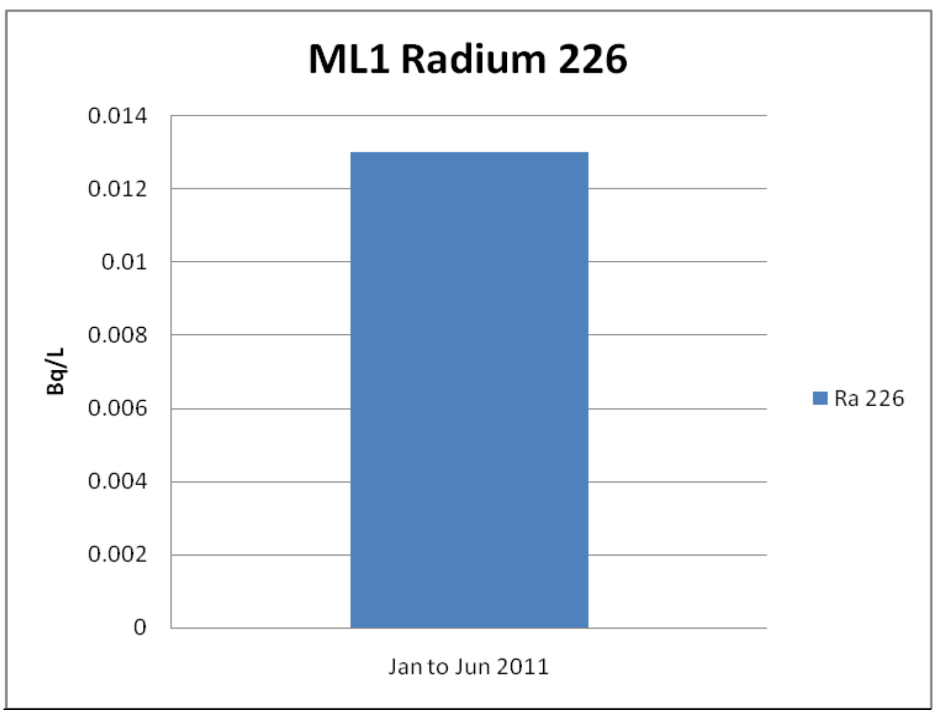
** Station implemented in water sampling program in 2011*

Figure 4.3.62 ML-1-Outlet of Martin Lake



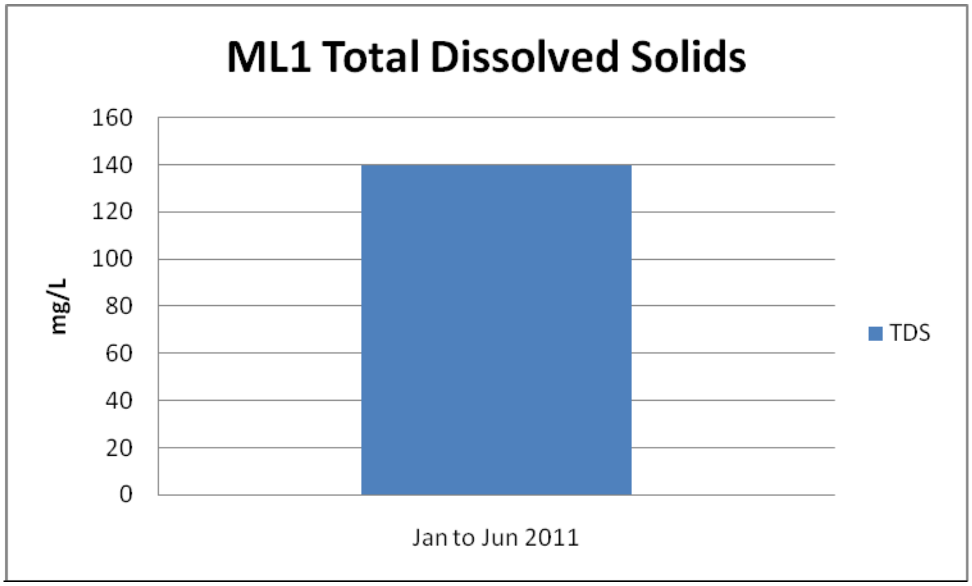
** Station implemented in water sampling program in 2011*

Figure 4.3.63 ML-1-Outlet of Martin Lake



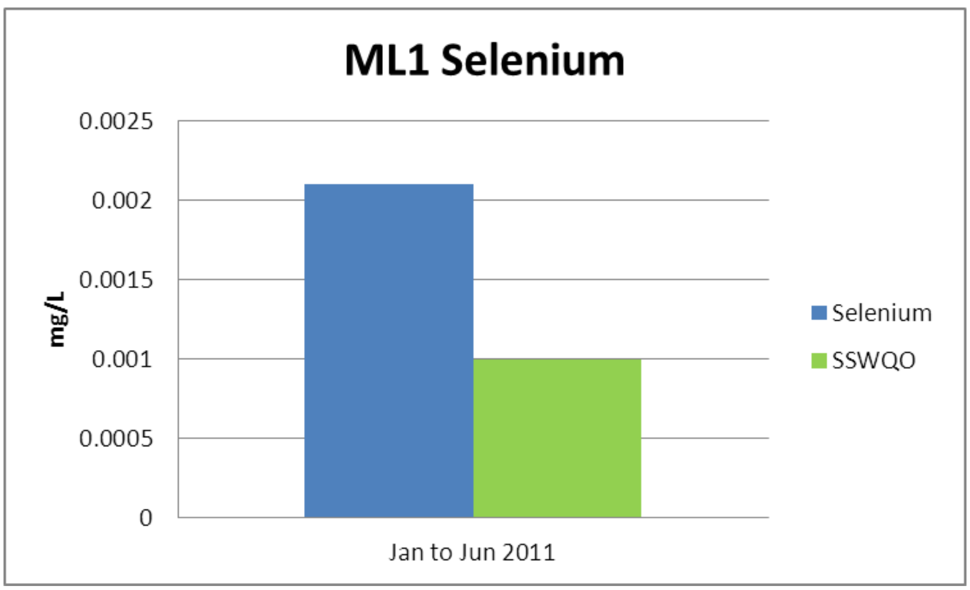
** Station implemented in water sampling program in 2011*

Figure 4.3.64 ML-1-Outlet of Martin Lake



** Station implemented in water sampling program in 2011*

Figure 4.3.65 ML-1-Outlet of Martin Lake



** Station implemented in water sampling program in 2011*

Figure 4.4.1 – Total Uranium Loadings to Beaverlodge Lake

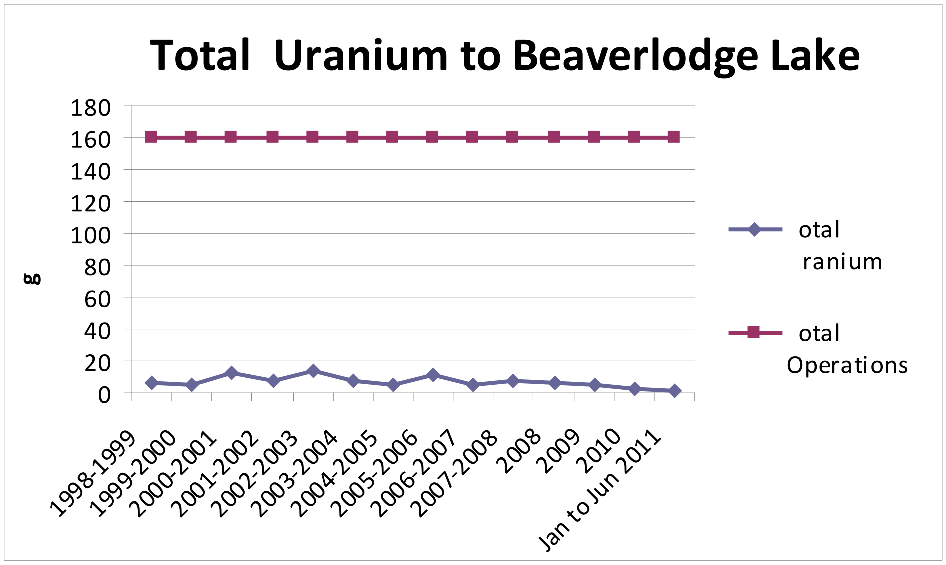


Figure 4.4.2 – Total Radium 226 Loadings to Beaverlodge Lake

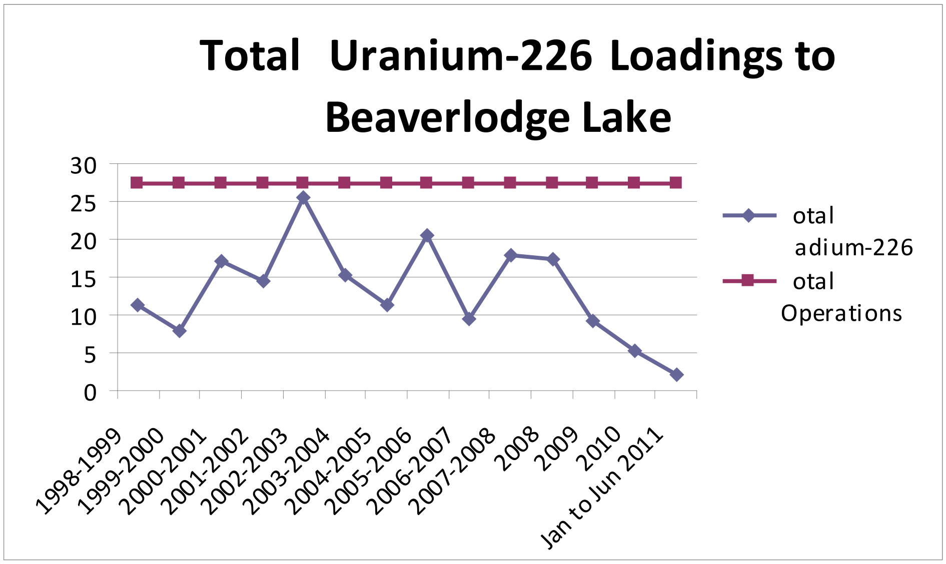


Figure 4.4.3 – Total Dissolved Solids Loadings to Beaverlodge Lake

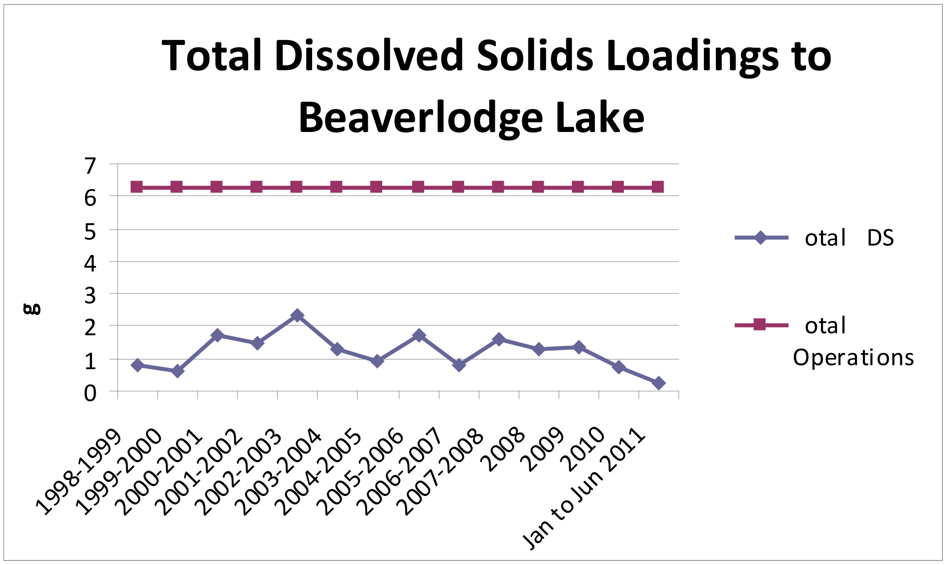


Figure 4.5.1 - Air Sampling Locations

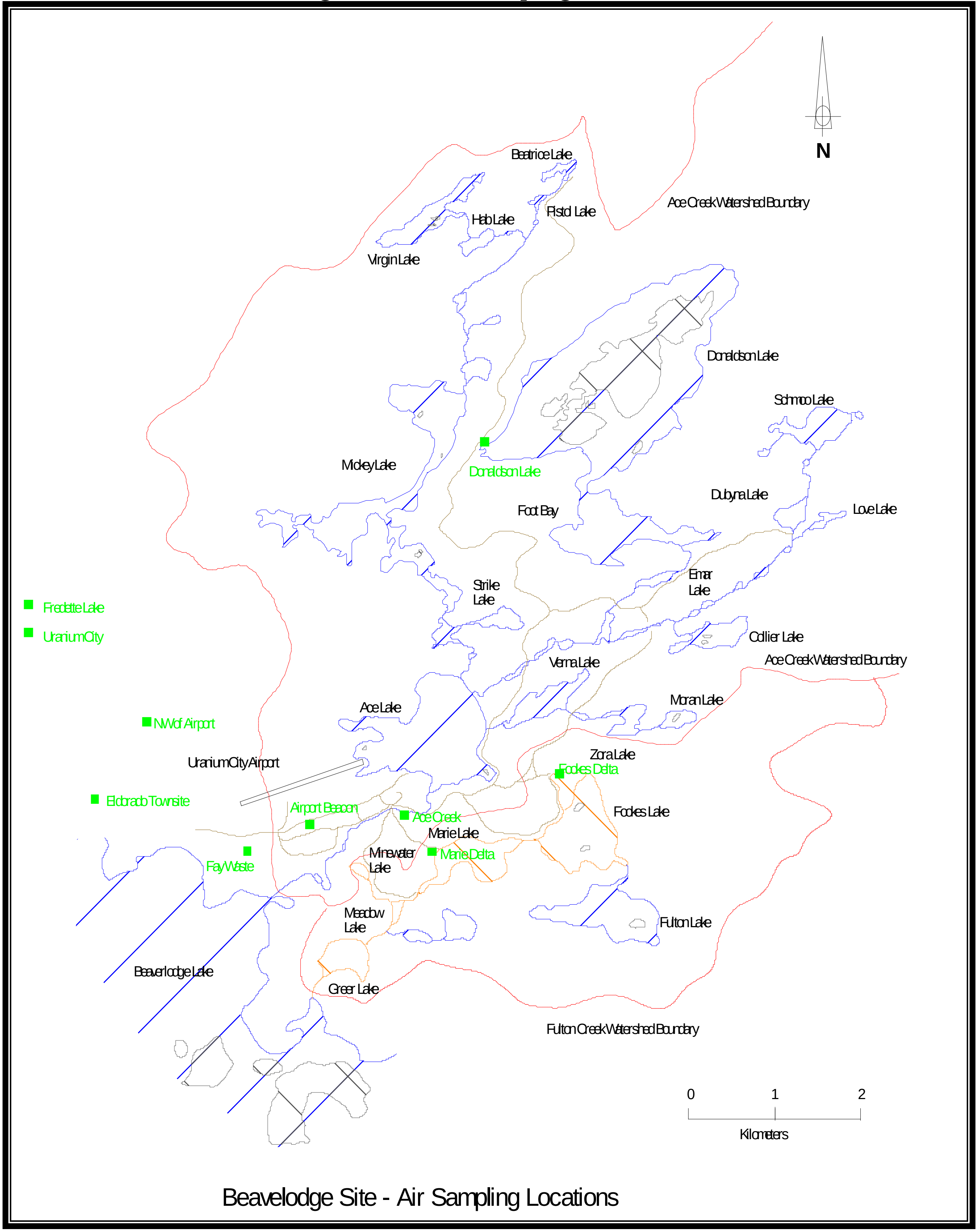
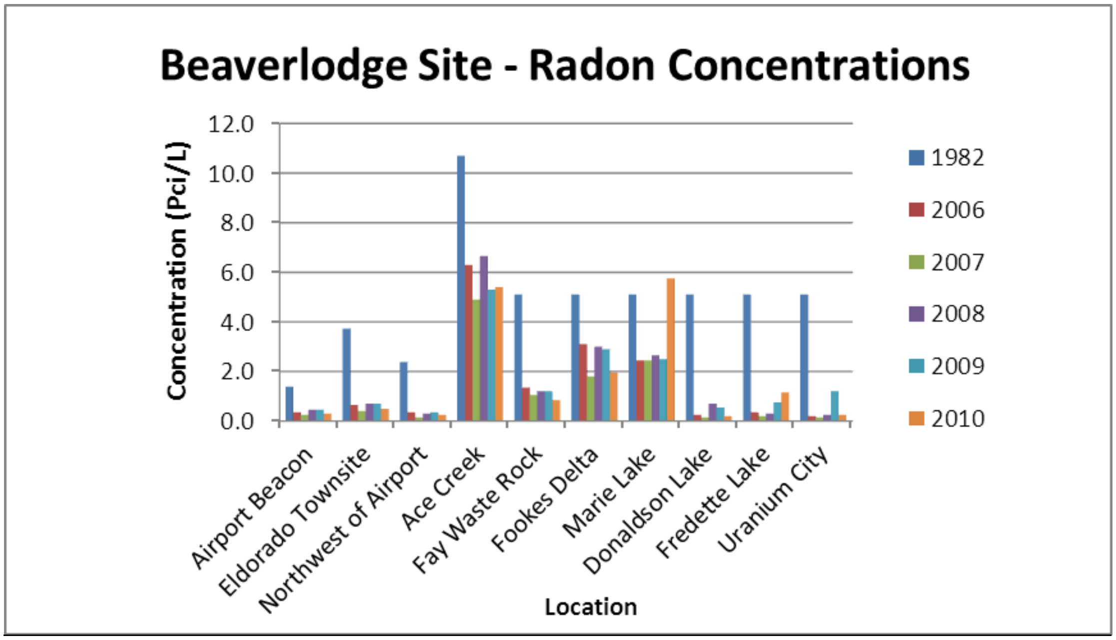


Figure 4.5.2
Radon Summary (2007 – 2010 versus 1982)



APPENDICES

APPENDICES

APPENDIX A

DETAILED WATER QUALITY RESULTS

Station: AC-14

	2010-Jan	2010-Feb	2010-Mar	2010-Apr	2010-May	2010-Jun	2010-Jul	2010-Aug	2010-Sep	2010-Oct	2010-Nov	2010-Dec	2011-Jan	2011-Feb	2011-Mar	2011-Apr	2011-May	2011-Jun
Alk-T (mg/L)	50.0	49.0	51.0	44.0	46.0	47.0	48.0	51.0	48.0	48.0	51.0	56.0	54.0	53.0	54.0	60.0	48.0	51.0
As (µg/L)	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.5	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Ba (mg/L)	0.024	0.023	0.025	0.020	0.022	0.022	0.023	0.028	0.026	0.022	0.025	0.025	0.026	0.026	0.025	0.027	0.025	0.028
C-(org) (mg/L)			8.000			7.600			7.200			7.200			8.200			7.800
Ca (mg/L)	17.0	17.0	17.0	14.0	15.0	16.0	16.0	20.0	18.0	17.0	17.0	17.0	18.0	18.0	18.0	20.0	17.0	17.0
Cl (mg/L)	1.10	1.20	1.10	1.10	1.20	1.40	1.40	2.70	2.20	1.60	1.30	1.30	1.20	2.00	1.50	3.70	1.30	2.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.0	<1.0	<1.0
Cond-L (µS/cm)	117	118	121	103	110	112	118	151	132	122	123	122	129	126	128	192	115	122
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.002	0.001	0.001	0.001	0.001	0.001	0.005	0.001	0.002	0.001	0.000
Fe (mg/L)	0.047	0.054	0.056	0.038	0.043	0.100	0.140	0.310	0.084	0.058	0.046	0.042	0.040	0.052	0.027	0.069	0.046	0.120
Hardness (mg/L)	56	56	56	46	50	53	53	65	59	56	56	56	59	60	59	66	56	56
HCO3 (mg/L)	61.0	60.0	62.0	54.0	56.0	57.0	59.0	62.0	58.0	58.0	62.0	68.0	66.0	65.0	66.0	66.0	58.0	62.0
K (mg/L)	0.7	0.9	0.5	0.7	0.6	0.6	0.7	0.8	0.8	0.8	0.5	0.9	0.9	0.9	0.7	0.9	0.7	0.8
Mg (mg/L)	3.4	3.4	3.4	2.8	3.0	3.1	3.1	3.6	3.4	3.3	3.3	3.4	3.5	3.6	3.5	3.8	3.2	3.3
Mo (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Na (mg/L)	1.6	1.8	1.9	1.6	1.7	1.8	1.9	3.8	2.8	2.4	1.7	1.9	1.8	1.9	1.7	3.5	1.9	2.0
Ni (mg/L)	0.00020	0.00020	0.00010	0.00010	0.00010	0.00020	0.00010	0.00040	0.00020	0.00010	<0.00010	0.00020	0.00020	0.00040	0.00020	0.00030	0.00020	0.00020
NO3 (mg/L)	0.71	0.35	0.26	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.04	<0.04	0.09	0.18	0.20	<0.04	<0.04	0.71
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			<0.01			<0.01			<0.01			<0.01			<0.01			<0.01
Pb (mg/L)	0.0002	0.0002	0.0001	0.0002	0.0004	0.0002	0.0003	0.0062	0.0004	0.0002	0.0003	0.0004	0.0004	0.0014	0.0002	0.0008	0.0004	0.0003
Pb210 (Bq/L)			<0.02			<0.02			0.01			0.05			<0.02			<0.02
pH-L (pH Unit)	7.71	7.67	7.82	7.59	7.79	7.84	7.86	7.63	7.52	7.67	7.66	7.85	7.67	7.46	7.75	8.54	7.70	7.77
Po210 (Bq/L)			0.006			0.010			0.015			0.010			0.010			0.008
Ra226 (Bq/L)	0.020	0.030	0.030	0.030	0.040	0.040	0.050	0.150	0.050	0.020	0.040	0.050	0.060	0.080	0.050	0.080	0.070	0.070
Se (mg/L)	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0010	0.0004	0.0003	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0005	<0.0001	<0.0001
SO4 (mg/L)	7.6	7.2	7.2	6.7	7.2	7.2	7.3	17.0	12.0	10.0	8.2	8.0	8.0	7.7	7.4	15.0	8.0	7.6
Sum of Ions (mg/L)	93	92	93	81	85	87	89	110	97	93	94	101	99	99	99	117	90	95
TDS (mg/L)	77.00	86.00	92.00	62.00	86.00	74.00	78.00	93.00	96.00	82.00	89.00	72.00	94.00	84.00	85.00	99.00	75.00	87.00
TSS (mg/L)	<1.000	<1.000	1.000	1.000	<1.000	<1.000	<1.000	6.000	1.000	<1.000	19.000	<1.000	<1.000	1.000	2.000	<1.000	2.000	1.000
U (µg/L)	19.0	16.0	16.0	23.0	22.0	21.0	23.0	83.0	59.0	46.0	31.0	26.0	19.0	20.0	27.0	72.0	32.0	26.0
Zn (mg/L)	0.001	0.002	0.001	<0.001	0.001	0.001	<0.001	0.004	<0.001	<0.001	<0.001	0.001	<0.001	0.006	<0.001	0.004	0.001	<0.001

Station: AC-8

	2010-Mar	2010-Jun	2010-Sep	2010-Dec	2011-Mar
Alk-T (mg/L)	51.0	46.0	46.0	56.0	54.0
As (µg/L)	0.2	0.1	0.1	0.3	0.2
Ba (mg/L)	0.024	0.020	0.023	0.089	0.025
C-(org) (mg/L)	8.100		7.000		
Ca (mg/L)	17.0	15.0	15.0	17.0	18.0
Cl (mg/L)	1.10	1.00	1.00	1.00	1.30
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	120	108	110	119	126
Cu (mg/L)	0.001	0.000	0.000	0.001	0.001
Fe (mg/L)	0.059	0.013	0.017	1.060	0.036
Hardness (mg/L)	56	50	50	56	59
HCO3 (mg/L)	62.0	56.0	56.0	68.0	66.0
K (mg/L)	0.8	0.7	0.7	0.8	0.7
Mg (mg/L)	3.4	3.0	3.1	3.3	3.5
Mo (mg/L)	0.001	0.001	0.001	0.001	0.001
Na (mg/L)	1.8	1.4	1.5	1.7	1.5
Ni (mg/L)	0.00020	0.00010	0.00010	0.00020	0.00010
NO3 (mg/L)	0.22	<0.04	<0.04	<0.04	0.13
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)	<0.01		<0.01		
Pb (mg/L)	<0.0001	<0.0001	<0.0001	0.0003	<0.0001
Pb210 (Bq/L)	<0.02		<0.02		
pH-L (pH Unit)	7.67	7.78	7.48	7.84	7.60
Po210 (Bq/L)	0.005		0.009		
Ra226 (Bq/L)	0.020	0.008	0.020	0.010	0.010
Se (mg/L)	0.0001	<0.0001	0.0001	<0.0001	0.0002
SO4 (mg/L)	6.7	6.3	6.2	7.4	6.9
Sum of Ions (mg/L)	93	83	84	99	98
TDS (mg/L)	88.00	71.00	76.00	73.00	81.00
TSS (mg/L)	1.000	<1.000	1.000	<1.000	<1.000
U (µg/L)	12.0	14.0	16.0	19.0	15.0
Zn (mg/L)	0.002	<0.001	<0.001	0.002	<0.001

Station: AN-4

	2010-Mar	2010-Sep
Alk-T (mg/L)	64.0	61.0
As (µg/L)	0.2	0.2
Ba (mg/L)	0.046	0.045
C-(org) (mg/L)	11.000	5.500
Ca (mg/L)	21.0	19.0
Cl (mg/L)	3.10	10.00
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	154	191
Cu (mg/L)	0.001	0.001
Fe (mg/L)	0.028	0.020
Hardness (mg/L)	69	65
HCO3 (mg/L)	78.0	74.0
K (mg/L)	1.1	1.0
Mg (mg/L)	4.1	4.3
Mo (mg/L)	0.001	0.002
Na (mg/L)	4.5	12.0
Ni (mg/L)	0.00020	0.00010
NO3 (mg/L)	0.09	<0.04
OH (mg/L)	<1.0	<1.0
P-(TP) (mg/L)	0.03	<0.01
Pb (mg/L)	0.0003	<0.0001
Pb210 (Bq/L)	<0.02	<0.02
pH-L (pH Unit)	7.93	7.65
Po210 (Bq/L)	<0.005	<0.005
Ra226 (Bq/L)	0.010	0.010
Se (mg/L)	0.0004	0.0012
SO4 (mg/L)	7.9	20.0
Sum of Ions (mg/L)	120	140
TDS (mg/L)	113.00	120.00
TSS (mg/L)	2.000	1.000
U (µg/L)	15.0	79.0
Zn (mg/L)	0.004	0.002

Station: AN-5

	2010-Jan	2010-Mar	2010-May	2010-Jul	2010-Sep	2010-Nov	2011-May
Alk-T (mg/L)	175.0	208.0	95.0	125.0	112.0	157.0	105.0
As (µg/L)	0.7	0.6	0.3	0.6	0.3	0.3	0.3
Ba (mg/L)	0.220	0.250	0.110	0.180	0.140	0.170	0.130
C-(org) (mg/L)		13.000			11.000		
Ca (mg/L)	51.0	58.0	30.0	35.0	35.0	49.0	33.0
Cl (mg/L)	2.00	3.00	1.00	1.00	1.10	2.00	0.80
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	365	423	222	256	257	355	235
Cu (mg/L)	0.001	0.000	0.002	0.001	0.002	0.001	0.001
Fe (mg/L)	1.470	1.090	0.082	0.310	0.140	0.250	0.140
Hardness (mg/L)	177	202	104	121	123	172	115
HCO3 (mg/L)	214.0	254.0	116.0	153.0	137.0	192.0	128.0
K (mg/L)	2.3	2.7	1.4	1.6	1.8	2.0	1.5
Mg (mg/L)	12.0	14.0	7.2	8.2	8.6	12.0	8.0
Mo (mg/L)	0.001	0.001	0.004	0.001	0.003	0.005	0.004
Na (mg/L)	6.9	8.5	4.0	4.7	5.0	6.7	4.5
Ni (mg/L)	0.00070	0.00060	0.00050	0.00040	0.00050	0.00040	0.00050
NO3 (mg/L)	<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
P-(TP) (mg/L)		0.04			<0.01		
Pb (mg/L)	0.0002	<0.0001	0.0012	<0.0001	0.0002	<0.0001	<0.0001
Pb210 (Bq/L)		0.10			<0.02		
pH-L (pH Unit)	7.43	7.49	7.79	7.73	7.44	7.74	7.54
Po210 (Bq/L)		0.060			0.010		
Ra226 (Bq/L)	1.900	1.900	0.530	1.100	0.630	0.790	0.580
Se (mg/L)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
SO4 (mg/L)	18.0	17.0	18.0	7.9	18.0	30.0	17.0
Sum of Ions (mg/L)	306	357	178	211	206	294	193
TDS (mg/L)	230.00	279.00	155.00	163.00	173.00	226.00	171.00
TSS (mg/L)	6.000	3.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	212.0	191.0	146.0	29.0	121.0	410.0	162.0
Zn (mg/L)	0.002	0.001	0.003	0.002	0.010	0.002	0.003

Station: BL-3

	2010-Mar	2010-Jun	2010-Sep	2010-Dec	2011-Mar	2011-Jun
Alk-T (mg/L)	75.0	67.0		76.0	74.0	
As (µg/L)	1.1	0.2	0.3	0.3	0.3	0.2
Ba (mg/L)	0.052	0.033	0.035	0.036	0.037	0.035
C-(org) (mg/L)	4.500	2.700	3.200	3.800		
Ca (mg/L)	23.0	21.0		22.0	23.0	21.0
Cl (mg/L)	14.00	13.00		14.00	14.00	12.00
CO3 (mg/L)	<1.0	<1.0		<1.0	<1.0	<1.0
Cond-L (µS/cm)	263	242		252	257	
Cu (mg/L)	0.002	0.001	0.002	0.002	0.002	0.001
Fe (mg/L)	0.011	0.004	0.009	0.002	0.005	0.005
Hardness (mg/L)	81	74		77	80	74
HCO3 (mg/L)	92.0	82.0		93.0	90.0	
K (mg/L)	1.2	1.0		1.3	1.1	1.1
Mg (mg/L)	5.7	5.3		5.5	5.5	5.2
Mo (mg/L)	0.004	0.003	0.004	0.004	0.003	0.004
Na (mg/L)	20.0	19.0		21.0	20.0	19.0
Ni (mg/L)	0.00290	0.00190	0.00430	0.00410	0.00160	0.00120
NO3 (mg/L)	<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)	0.02	<0.01	<0.01	<0.01		
Pb (mg/L)	0.0003	0.0001	0.0001	0.0003	<0.0001	0.0002
Pb210 (Bq/L)	<0.02	<0.02	<0.00	<0.02		
pH-L (pH Unit)	7.98	7.93		8.02	7.90	
Po210 (Bq/L)	<0.005	<0.005	0.002	<0.005		
Ra226 (Bq/L)	0.070	0.030	0.040	0.050	0.030	0.020
Se (mg/L)	0.0032	0.0027	0.0030	0.0029	0.0028	0.0027
SO4 (mg/L)	34.0	32.0		35.0	34.0	32.0
Sum of Ions (mg/L)	190	173		192	188	163
TDS (mg/L)	160.00	147.00		144.00	155.00	
TSS (mg/L)	1.000	<1.000		<1.000	<1.000	
U (µg/L)	151.0	135.0	144.0	151.0	134.0	143.0
Zn (mg/L)	0.005	0.006	0.005	0.004	0.005	0.002

Station: BL-4

	2010-Mar	2010-Jun	2010-Sep	2010-Dec	2011-Mar
Alk-T (mg/L)	71.0	67.0	65.0	75.0	69.0
As (µg/L)	0.3	0.2	0.3	0.3	0.3
Ba (mg/L)	0.037	0.032	0.035	0.034	0.034
C-(org) (mg/L)	3.400	3.200	3.100	3.500	3.600
Ca (mg/L)	22.0	21.0	21.0	21.0	22.0
Cl (mg/L)	14.00	13.00	14.00	15.00	14.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	256	240	244	245	249
Cu (mg/L)	0.001	0.001	0.001	0.002	0.001
Fe (mg/L)	0.013	0.004	0.150	0.003	0.002
Hardness (mg/L)	77	74	74	74	77
HCO3 (mg/L)	87.0	82.0	79.0	92.0	84.0
K (mg/L)	1.1	1.1	1.1	1.3	1.1
Mg (mg/L)	5.4	5.3	5.2	5.3	5.3
Mo (mg/L)	0.004	0.003	0.004	0.004	0.005
Na (mg/L)	20.0	19.0	19.0	20.0	20.0
Ni (mg/L)	0.00100	0.00170	0.00210	0.00210	0.00140
NO3 (mg/L)	0.09	<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)	0.02	<0.01	<0.01	<0.01	<0.01
Pb (mg/L)	0.0002	<0.0001	<0.0001	0.0002	<0.0001
Pb210 (Bq/L)	0.04	<0.02	<0.02	<0.02	0.03
pH-L (pH Unit)	8.08	7.94	7.74	8.02	7.88
Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005
Ra226 (Bq/L)	0.040	0.040	0.020	0.040	0.030
Se (mg/L)	0.0027	0.0026	0.0029	0.0028	0.0028
SO4 (mg/L)	34.0	32.0	32.0	34.0	32.0
Sum of Ions (mg/L)	184	173	171	189	178
TDS (mg/L)	158.00	146.00	147.00	137.00	142.00
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	151.0	133.0	144.0	147.0	144.0
Zn (mg/L)	0.007	0.004	0.003	0.008	0.001

Station: BL-5

	2011-Mar	2011-Jun
Alk-T (mg/L)	68.0	65.0
As (µg/L)	0.2	0.2
Ba (mg/L)	0.046	0.035
Ca (mg/L)	21.0	21.0
Cl (mg/L)	7.40	13.00
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	196	242
Cu (mg/L)	0.002	0.000
Fe (mg/L)	0.011	0.013
Hardness (mg/L)	71	74
HCO3 (mg/L)	83.0	79.0
K (mg/L)	1.1	1.1
Mg (mg/L)	4.6	5.2
Mo (mg/L)	0.002	0.004
Na (mg/L)	10.0	19.0
Ni (mg/L)	0.00010	0.00020
NO3 (mg/L)	0.26	2.90
OH (mg/L)	<1.0	<1.0
Pb (mg/L)	<0.0001	<0.0001
pH-L (pH Unit)	7.69	7.72
Ra226 (Bq/L)	<0.005	0.040
Se (mg/L)	0.0009	0.0027
SO4 (mg/L)	17.0	31.0
Sum of Ions (mg/L)	144	169
TDS (mg/L)	111.00	144.00
TSS (mg/L)	2.000	4.000
U (µg/L)		138.0
Zn (mg/L)	0.001	<0.001

Station: DB-6

	2010-Jan	2010-May	2010-Jul	2010-Sep	2010-Nov	2011-May
Alk-T (mg/L)	92.0	80.0	85.0	84.0	94.0	79.0
As (µg/L)	0.2	0.1	0.2	0.1	0.1	0.2
Ba (mg/L)	0.049	0.039	0.044	0.048	0.054	0.045
C-(org) (mg/L)				8.700		
Ca (mg/L)	39.0	33.0	36.0	36.0	41.0	33.0
Cl (mg/L)	0.70	0.60	0.70	0.70	0.60	0.60
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	244	210	226	233	249	208
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001
Fe (mg/L)	0.015	0.007	0.029	0.015	0.010	0.007
Hardness (mg/L)	122	104	113	113	129	104
HCO3 (mg/L)	112.0	98.0	104.0	102.0	115.0	96.0
K (mg/L)	0.8	0.8	0.8	0.8	2.0	0.8
Mg (mg/L)	6.1	5.2	5.6	5.7	6.5	5.2
Mo (mg/L)	0.002	0.002	0.002	0.002	0.002	0.002
Na (mg/L)	1.9	2.0	2.1	2.2	2.7	1.9
Ni (mg/L)	0.00020	0.00020	0.00020	0.00020	0.00010	0.00020
NO3 (mg/L)	0.53	0.09	<0.04	<0.04	0.09	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)				0.02		
Pb (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pb210 (Bq/L)				<0.02		
pH-L (pH Unit)	7.73	7.80	7.95	7.73	7.78	7.77
Po210 (Bq/L)				0.007		
Ra226 (Bq/L)	0.030	0.030	0.030	0.030	0.030	0.030
Se (mg/L)	<0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001
SO4 (mg/L)	29.0	26.0	27.0	29.0	31.0	26.0
Sum of Ions (mg/L)	190	166	176	176	199	164
TDS (mg/L)	162.00	154.00	144.00	162.00	166.00	143.00
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	261.0	208.0	213.0	272.0	284.0	239.0
Zn (mg/L)	0.001	<0.001	0.001	0.001	0.005	<0.001

Station: TL-3

	2010-Jan	2010-Feb	2010-Mar	2010-Apr	2010-May
Alk-T (mg/L)	139.0	141.0	148.0	86.0	131.0
As (µg/L)	1.0	1.0	1.0	0.7	1.0
Ba (mg/L)	0.037	0.036	0.039	0.023	0.033
C-(org) (mg/L)			9.500		
Ca (mg/L)	30.0	31.0	31.0	17.0	26.0
Cl (mg/L)	4.00	4.00	4.00	2.20	4.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	354	364	375	233	344
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001
Fe (mg/L)	0.005	0.004	0.004	0.008	0.010
Hardness (mg/L)	99	102	102	55	85
HCO3 (mg/L)	170.0	172.0	181.0	105.0	160.0
K (mg/L)	1.4	1.4	1.4	0.8	1.2
Mg (mg/L)	5.9	6.1	6.1	3.1	4.9
Mo (mg/L)	0.016	0.016	0.016	0.011	0.016
Na (mg/L)	37.0	38.0	40.0	27.0	41.0
Ni (mg/L)	0.00030	0.00030	0.00030	0.00020	0.00030
NO3 (mg/L)	0.13	0.18	0.09	<0.04	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			0.03		
Pb (mg/L)	0.0003	0.0002	0.0003	0.0004	0.0008
Pb210 (Bq/L)			0.07		
pH-L (pH Unit)	8.03	7.99	8.21	7.94	8.22
Po210 (Bq/L)			0.040		
Ra226 (Bq/L)	1.200	1.000	1.200	0.750	1.200
Se (mg/L)	0.0039	0.0040	0.0043	0.0025	0.0039
SO4 (mg/L)	38.0	41.0	42.0	27.0	43.0
Sum of Ions (mg/L)	286	294	306	182	280
TDS (mg/L)	216.00	232.00	247.00	137.00	221.00
TSS (mg/L)	<1.000	<1.000	1.000	1.000	<1.000
U (µg/L)	353.0	359.0	386.0	246.0	365.0
Zn (mg/L)	0.001	<0.001	0.002	<0.001	<0.001

Station: TL-4

	2010-Jan	2010-Feb	2010-Mar	2010-Apr	2010-May	2010-Aug	2010-Sep	2010-Oct
Alk-T (mg/L)	151.0	155.0	161.0	110.0	131.0	155.0	151.0	159.0
As (µg/L)	1.9	1.7	1.8	1.1	1.3	2.4	1.0	1.5
Ba (mg/L)	0.076	0.074	0.079	0.062	0.073	0.140	0.250	0.110
C-(org) (mg/L)			10.000				7.600	
Ca (mg/L)	25.0	27.0	27.0	20.0	22.0	37.0	93.0	58.0
Cl (mg/L)	5.00	4.00	4.00	2.60	4.00	5.00	6.00	7.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	383	395	403	272	328	454	759	566
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.005	0.001	0.001
Fe (mg/L)	0.015	0.010	0.017	0.042	0.062	0.240	0.089	2.010
Hardness (mg/L)	86	91	92	66	75	121	277	180
HCO3 (mg/L)	184.0	189.0	196.0	134.0	160.0	189.0	184.0	194.0
K (mg/L)	1.4	1.6	1.6	1.0	1.2	1.4	1.8	1.9
Mg (mg/L)	5.7	5.8	6.0	3.9	4.9	7.0	11.0	8.7
Mo (mg/L)	0.015	0.014	0.015	0.011	0.012	0.007	0.006	0.004
Na (mg/L)	47.0	50.0	50.0	32.0	42.0	48.0	58.0	49.0
Ni (mg/L)	0.00070	0.00060	0.00070	0.00040	0.00050	0.00140	0.00070	0.00510
NO3 (mg/L)	<0.04	<0.04	0.04	<0.04	0.09	<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)			0.03				<0.01	
Pb (mg/L)	0.0008	0.0005	0.0004	0.0004	0.0003	0.0005	0.0002	0.0002
Pb210 (Bq/L)			0.20				0.26	
pH-L (pH Unit)	8.09	7.77	8.16	7.96	8.05	7.70	7.11	7.45
Po210 (Bq/L)			0.080				0.030	
Ra226 (Bq/L)	1.800	1.700	1.800	1.500	1.500	2.300	1.300	1.300
Se (mg/L)	0.0031	0.0028	0.0033	0.0022	0.0024	0.0056	0.0026	0.0030
SO4 (mg/L)	43.0	44.0	44.0	27.0	36.0	71.0	230.0	130.0
Sum of Ions (mg/L)	311	321	329	221	270	358	584	449
TDS (mg/L)	236.00	249.00	265.00	168.00	219.00	288.00	520.00	372.00
TSS (mg/L)	<1.000	<1.000	1.000	<1.000	1.000	<1.000	5.000	5.000
U (µg/L)	409.0	397.0	410.0	266.0	299.0	189.0	308.0	1080.0
Zn (mg/L)	0.001	<0.001	0.001	<0.001	<0.001	0.010	0.002	0.007

Station: TL-6

	2010-May
Alk-T (mg/L)	306.0
As (µg/L)	1.2
Ba (mg/L)	1.160
Ca (mg/L)	46.0
Cl (mg/L)	54.00
CO3 (mg/L)	<1.0
Cond-L (µS/cm)	791
Cu (mg/L)	0.000
Fe (mg/L)	0.710
Hardness (mg/L)	160
HCO3 (mg/L)	373.0
K (mg/L)	3.1
Mg (mg/L)	11.0
Mo (mg/L)	0.002
Na (mg/L)	118.0
Ni (mg/L)	0.00030
NO3 (mg/L)	0.04
OH (mg/L)	<1.0
Pb (mg/L)	0.0001
pH-L (pH Unit)	7.94
Ra226 (Bq/L)	5.600
Se (mg/L)	0.0022
SO4 (mg/L)	41.0
Sum of Ions (mg/L)	646
TDS (mg/L)	529.00
TSS (mg/L)	2.000
U (µg/L)	248.0
Zn (mg/L)	0.001

Station: TL-7

	2010-Jan	2010-Feb	2010-Mar	2010-Apr	2010-May	2010-Jun	2010-Aug	2010-Sep	2010-Oct	2011-Apr	2011-May	2011-Jun
Alk-T (mg/	183.0	172.0	208.0	93.0	130.0	152.0	128.0	143.0	145.0	105.0	150.0	185.0
As (µg/L)	2.3	1.7	1.0	1.5	1.5	1.5	1.3	0.8	0.6	2.0	1.0	1.2
Ba (mg/L)	0.095	0.100	0.810	0.200	0.320	0.640	0.210	0.440	0.360	0.130	0.380	0.560
C-(org) (mg/L)			12.000			9.500		7.500				12.000
Ca (mg/L)	30.0	29.0	37.0	18.0	23.0	27.0	62.0	55.0	51.0	25.0	43.0	45.0
Cl (mg/L)	6.00	5.00	7.00	3.60	5.00	7.00	12.00	11.00	10.00	4.30	11.00	10.00
CO3 (mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS	463	437	502	226	324	366	640	588	542	275	477	521
Cu (mg/L)	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Fe (mg/L)	0.013	0.120	0.800	0.290	0.130	0.100	0.059	0.048	0.031	0.230	0.110	0.120
Hardness	103	99	125	60	79	92	204	178	168	84	146	150
HCO3 (mg	223.0	210.0	254.0	113.0	159.0	185.0	156.0	174.0	177.0	128.0	183.0	226.0
K (mg/L)	2.1	1.7	2.0	0.8	1.2	0.7	1.6	1.9	1.6	6.0	1.9	1.9
Mg (mg/L)	6.9	6.5	8.0	3.7	5.2	6.0	12.0	10.0	9.9	5.3	9.4	9.3
Mo (mg/L)	0.019	0.017	0.011	0.007	0.011	0.007	0.010	0.007	0.007	0.006	0.012	0.009
Na (mg/L)	64.0	61.0	66.0	23.0	38.0	45.0	54.0	50.0	49.0	23.0	45.0	58.0
Ni (mg/L)	0.00090	0.00070	0.00080	0.00040	0.00050	0.00060	0.00070	0.00060	0.00050	0.00060	0.00060	0.00070
NO3 (mg/L	0.09	<0.04	<0.04	<0.04	0.13	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.66
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			0.03			<0.01		<0.01				0.01
Pb (mg/L)	0.0007	0.0005	0.0006	0.0007	0.0005	0.0002	0.0001	0.0004	0.0002	0.0004	0.0004	0.0001
Pb210 (Bq/L)			0.17			<0.02		0.03				<0.02
pH-L (pH U	8.14	7.50	7.92	7.81	7.87	8.22	7.84	7.73	7.77	8.09	7.88	8.13
Po210 (Bq/L)			0.030			0.020		0.010				0.020
Ra226 (Bq	2.200	1.400	0.690	1.100	1.600	2.300	2.000	1.200	2.100	0.480	0.880	1.400
Se (mg/L)	0.0039	0.0031	0.0019	0.0017	0.0032	0.0032	0.0170	0.0071	0.0070	0.0054	0.0058	0.0047
SO4 (mg/L	53.0	49.0	50.0	17.0	31.0	32.0	180.0	140.0	120.0	36.0	84.0	90.0
Sum of Ior	385	362	424	179	263	303	478	442	418	228	377	440
TDS (mg/L	291.00	278.00	328.00	144.00	218.00	238.00	421.00	393.00	363.00	174.00	318.00	346.00
TSS (mg/L	<1.000	<1.000	4.000	1.000	1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	3.000
U (µg/L)	494.0	471.0	384.0	175.0	226.0	160.0	155.0	190.0	219.0	198.0	338.0	230.0
Zn (mg/L)	0.001	<0.001	0.005	0.001	<0.001	0.001	0.005	0.001	0.001	0.002	0.001	0.001

Station: TL-9

	2010-Jan	2010-Feb	2010-Mar	2010-May
Alk-T (mg/	197.0	208.0	195.0	146.0
As (µg/L)	1.0	0.7	1.6	1.2
Ba (mg/L)	0.280	0.180	0.940	0.850
C-(org) (mg/L)			14.000	
Ca (mg/L)	33.0	34.0	35.0	28.0
Cl (mg/L)	10.00	12.00	8.00	7.00
CO3 (mg/L	<1.0	<1.0	<1.0	<1.0
Cond-L (µ!	488	533	477	359
Cu (mg/L)	0.001	0.001	0.001	0.001
Fe (mg/L)	0.014	0.024	0.031	0.011
Hardness	128	142	121	95
HCO3 (mg	240.0	254.0	238.0	178.0
K (mg/L)	2.1	3.8	1.9	1.5
Mg (mg/L)	11.0	14.0	8.1	6.2
Mo (mg/L)	0.011	0.008	0.014	0.010
Na (mg/L)	60.0	65.0	63.0	41.0
Ni (mg/L)	0.00050	0.00050	0.00060	0.00030
NO3 (mg/L	<0.04	<0.04	0.13	0.31
OH (mg/L)	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)			0.03	
Pb (mg/L)	0.0002	0.0001	0.0003	0.0004
Pb210 (Bq/L)			0.06	
pH-L (pH U	7.88	7.98	8.12	8.18
Po210 (Bq/L)			0.020	
Ra226 (Bq	0.480	0.480	2.300	0.660
Se (mg/L)	0.0063	0.0056	0.0032	0.0040
SO4 (mg/L	49.0	56.0	46.0	33.0
Sum of Ior	405	439	400	295
TDS (mg/L	308.00	369.00	312.00	243.00
TSS (mg/L	<1.000	<1.000	2.000	<1.000
U (µg/L)	557.0	603.0	469.0	306.0
Zn (mg/L)	0.001	0.001	0.001	0.001

Station: AC-6A

	2010-May
Alk-T (mg/	97.0
As (µg/L)	0.2
Ba (mg/L)	0.022
Ca (mg/L)	43.0
Cl (mg/L)	0.40
CO3 (mg/L	<1.0
Cond-L (µ!	298
Cu (mg/L)	0.001
Fe (mg/L)	0.021
Hardness	143
HCO3 (mg	118.0
K (mg/L)	0.9
Mg (mg/L)	8.8
Mo (mg/L)	0.001
Na (mg/L)	2.4
Ni (mg/L)	<0.00010
NO3 (mg/L	0.04
OH (mg/L)	<1.0
Pb (mg/L)	<0.0001
pH-L (pH U	7.77
Ra226 (Bq	0.100
Se (mg/L)	<0.0001
SO4 (mg/L	51.0
Sum of Ior	225
TDS (mg/L	199.00
TSS (mg/L	<1.000
U (µg/L)	263.0
Zn (mg/L)	0.001

Station: ML-1

	2011-Mar	2011-Jun
Alk-T (mg/	75.0	63.0
As (µg/L)	0.3	0.2
Ba (mg/L)	0.037	0.042
C-(org) (m	3.400	5.000
Ca (mg/L)	23.0	19.0
Cl (mg/L)	16.00	8.20
CO3 (mg/L	<1.0	<1.0
Cond-L (µ	270	187
Cu (mg/L)	0.000	0.000
Fe (mg/L)	0.001	0.011
Hardness	81	65
HCO3 (mg	92.0	77.0
K (mg/L)	1.1	1.1
Mg (mg/L)	5.7	4.3
Mo (mg/L)	0.005	0.002
Na (mg/L)	21.0	12.0
Ni (mg/L)	0.00020	0.00010
NO3 (mg/L	<0.04	0.66
OH (mg/L)	<1.0	<1.0
P-(TP) (mg	<0.01	<0.01
Pb (mg/L)	<0.0001	<0.0001
Pb210 (Bq	<0.02	<0.02
pH-L (pH U	7.93	8.01
Po210 (Bq	<0.005	<0.005
Ra226 (Bq	0.020	<0.005
Se (mg/L)	0.0031	0.0011
SO4 (mg/L	36.0	18.0
Sum of Ior	195	140
TDS (mg/L	161.00	119.00
TSS (mg/L	<1.000	1.000
U (µg/L)	58.0	72.0
Zn (mg/L)	<0.001	<0.001

APPENDIX B

ANNUAL SUMMARY STATISTICS

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: AC-14 - Ace Creek discharge to Beaverlodge Lake

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**126**	18	19
pH-L (pH Unit)	**7.75**	18	0.23
TSS (mg/L)	**2.389**	18	4.313
Major Ions			
Alk-T (mg/L)	**50.5**	18	3.9
Ca (mg/L)	**17.2**	18	1.5
Cl (mg/L)	**1.63**	18	0.68
CO3 (mg/L)	**1.2**	18	0.7
Hardness (mg/L)	**57**	18	5
HCO3 (mg/L)	**61.1**	18	4.0
K (mg/L)	**0.7**	18	0.1
Mg (mg/L)	**3.3**	18	0.2
Na (mg/L)	**2.1**	18	0.6
OH (mg/L)	**1.0**	18	0.0
SO4 (mg/L)	**8.8**	18	2.9
Sum of Ions (mg/L)	**95**	18	9
TDS (mg/L)	**83.94**	18	9.56
Metals			
As (µg/L)	**0.2**	18	0.1
Ba (mg/L)	**0.025**	18	0.002
Cu (mg/L)	**0.001**	18	0.001
Fe (mg/L)	**0.076**	18	0.066
Mo (mg/L)	**0.001**	18	0.000
Ni (mg/L)	**0.00019**	18	0.00009
Pb (mg/L)	**0.0007**	18	0.0014
Se (mg/L)	**0.0002**	18	0.0002
Zn (mg/L)	**0.001**	18	0.002
Nutrients			
NH3-N (mg/L)	**0.06**	5	0.03
NO3 (mg/L)	**0.16**	18	0.22
P-(TP) (mg/L)	**0.01**	6	0.00
Radionuclides			
Pb210 (Bq/L)	**0.02**	6	0.01
Po210 (Bq/L)	**0.010**	6	0.003
Ra226 (Bq/L)	**0.053**	18	0.030
U (µg/L)	**32.3**	18	19.7
Organics			
C-(org) (mg/L)	**7.667**	6	0.413

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: AC-6A - Verna Lake discharge to Ace Lake

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**298**	1	
pH-L (pH Unit)	**7.77**	1	
TSS (mg/L)	**1.000**	1	
Major Ions			
Alk-T (mg/L)	**97.0**	1	
Ca (mg/L)	**43.0**	1	
Cl (mg/L)	**0.40**	1	
CO3 (mg/L)	**1.0**	1	
Hardness (mg/L)	**143**	1	
HCO3 (mg/L)	**118.0**	1	
K (mg/L)	**0.9**	1	
Mg (mg/L)	**8.8**	1	
Na (mg/L)	**2.4**	1	
OH (mg/L)	**1.0**	1	
SO4 (mg/L)	**51.0**	1	
Sum of Ions (mg/L)	**225**	1	
TDS (mg/L)	**199.00**	1	
Metals			
As (µg/L)	**0.2**	1	
Ba (mg/L)	**0.022**	1	
Cu (mg/L)	**0.001**	1	
Fe (mg/L)	**0.021**	1	
Mo (mg/L)	**0.001**	1	
Ni (mg/L)	**0.00010**	1	
Pb (mg/L)	**0.0001**	1	
Se (mg/L)	**0.0001**	1	
Zn (mg/L)	**0.001**	1	
Nutrients			
NO3 (mg/L)	**0.04**	1	
Radionuclides			
Ra226 (Bq/L)	**0.100**	1	
U (µg/L)	**263.0**	1	

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: AC-8 - Ace Lake discharge at weir

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**117**	5	7
pH-L (pH Unit)	**7.67**	5	0.14
TSS (mg/L)	**1.000**	5	0.000
Major Ions			
Alk-T (mg/L)	**50.6**	5	4.6
Ca (mg/L)	**16.4**	5	1.3
Cl (mg/L)	**1.08**	5	0.13
CO3 (mg/L)	**1.0**	5	0.0
Hardness (mg/L)	**54**	5	4
HCO3 (mg/L)	**61.6**	5	5.5
K (mg/L)	**0.7**	5	0.1
Mg (mg/L)	**3.3**	5	0.2
Na (mg/L)	**1.6**	5	0.2
OH (mg/L)	**1.0**	5	0.0
SO4 (mg/L)	**6.7**	5	0.5
Sum of Ions (mg/L)	**91**	5	8
TDS (mg/L)	**77.80**	5	6.83
Metals			
As (µg/L)	**0.2**	5	0.1
Ba (mg/L)	**0.036**	5	0.030
Cu (mg/L)	**0.001**	5	0.000
Fe (mg/L)	**0.237**	5	0.460
Mo (mg/L)	**0.001**	5	0.000
Ni (mg/L)	**0.00014**	5	0.00005
Pb (mg/L)	**0.0001**	5	0.0001
Se (mg/L)	**0.0001**	5	0.0000
Zn (mg/L)	**0.001**	5	0.001
Nutrients			
NH3-N (mg/L)	**0.06**	1	
NO3 (mg/L)	**0.09**	5	0.08
P-(TP) (mg/L)	**0.01**	2	0.00
Radionuclides			
Pb210 (Bq/L)	**0.02**	2	0.00
Po210 (Bq/L)	**0.007**	2	0.003
Ra226 (Bq/L)	**0.014**	5	0.006
U (µg/L)	**15.2**	5	2.6
Organics			
C-(org) (mg/L)	**7.550**	2	0.778

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: AN-4 - Martin Lake - along north shore , mid lake

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**173**	2	26
pH-L (pH Unit)	**7.79**	2	0.20
TSS (mg/L)	**1.500**	2	0.707
Major Ions			
Alk-T (mg/L)	**62.5**	2	2.1
Ca (mg/L)	**20.0**	2	1.4
Cl (mg/L)	**6.55**	2	4.88
CO3 (mg/L)	**1.0**	2	0.0
Hardness (mg/L)	**67**	2	3
HCO3 (mg/L)	**76.0**	2	2.8
K (mg/L)	**1.1**	2	0.1
Mg (mg/L)	**4.2**	2	0.1
Na (mg/L)	**8.3**	2	5.3
OH (mg/L)	**1.0**	2	0.0
SO4 (mg/L)	**13.9**	2	8.6
Sum of Ions (mg/L)	**130**	2	14
TDS (mg/L)	**116.50**	2	4.95
Metals			
As (µg/L)	**0.2**	2	0.0
Ba (mg/L)	**0.045**	2	0.001
Cu (mg/L)	**0.001**	2	0.001
Fe (mg/L)	**0.024**	2	0.006
Mo (mg/L)	**0.001**	2	0.001
Ni (mg/L)	**0.00015**	2	0.00007
Pb (mg/L)	**0.0002**	2	0.0001
Se (mg/L)	**0.0008**	2	0.0006
Zn (mg/L)	**0.003**	2	0.002
Nutrients			
NH3-N (mg/L)	**0.07**	1	
NO3 (mg/L)	**0.07**	2	0.04
P-(TP) (mg/L)	**0.02**	2	0.01
Radionuclides			
Pb210 (Bq/L)	**0.02**	2	0.00
Po210 (Bq/L)	**0.005**	2	0.000
Ra226 (Bq/L)	**0.010**	2	0.000
U (µg/L)	**47.0**	2	45.3
Organics			
C-(org) (mg/L)	**8.250**	2	3.889

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: AN-5 - Hab Site - upstream of confluence of hab and pistol creeks

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**302**	7	78
pH-L (pH Unit)	**7.59**	7	0.15
TSS (mg/L)	**2.000**	7	1.915
Major Ions			
Alk-T (mg/L)	**139.6**	7	41.6
Ca (mg/L)	**41.6**	7	10.9
Cl (mg/L)	**1.56**	7	0.80
CO3 (mg/L)	**1.0**	7	0.0
Hardness (mg/L)	**145**	7	38
HCO3 (mg/L)	**170.6**	7	50.9
K (mg/L)	**1.9**	7	0.5
Mg (mg/L)	**10.0**	7	2.6
Na (mg/L)	**5.8**	7	1.6
OH (mg/L)	**1.0**	7	0.0
SO4 (mg/L)	**18.0**	7	6.4
Sum of Ions (mg/L)	**249**	7	69
TDS (mg/L)	**199.57**	7	46.15
Metals			
As (µg/L)	**0.4**	7	0.2
Ba (mg/L)	**0.171**	7	0.050
Cu (mg/L)	**0.001**	7	0.001
Fe (mg/L)	**0.497**	7	0.551
Mo (mg/L)	**0.003**	7	0.002
Ni (mg/L)	**0.00051**	7	0.00011
Pb (mg/L)	**0.0003**	7	0.0004
Se (mg/L)	**0.0001**	7	0.0000
Zn (mg/L)	**0.003**	7	0.003
Nutrients			
NH3-N (mg/L)	**0.06**	1	
NO3 (mg/L)	**0.04**	7	0.00
P-(TP) (mg/L)	**0.03**	2	0.02
Radionuclides			
Pb210 (Bq/L)	**0.06**	2	0.06
Po210 (Bq/L)	**0.035**	2	0.035
Ra226 (Bq/L)	**1.061**	7	0.603
U (µg/L)	**181.6**	7	116.8
Organics			
C-(org) (mg/L)	**12.000**	2	1.414

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: BL-3 - Beaverlodge Lake - 100m out from TL-9

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**254**	4	9
pH-L (pH Unit)	**7.96**	4	0.05
TSS (mg/L)	**1.000**	4	0.000
Major Ions			
Alk-T (mg/L)	**73.0**	4	4.1
Ca (mg/L)	**22.0**	5	1.0
Cl (mg/L)	**13.40**	5	0.89
CO3 (mg/L)	**1.0**	5	0.0
Hardness (mg/L)	**77**	5	3
HCO3 (mg/L)	**89.3**	4	5.0
K (mg/L)	**1.1**	5	0.1
Mg (mg/L)	**5.4**	5	0.2
Na (mg/L)	**19.8**	5	0.8
OH (mg/L)	**1.0**	5	0.0
SO4 (mg/L)	**33.4**	5	1.3
Sum of Ions (mg/L)	**181**	5	13
TDS (mg/L)	**151.50**	4	7.33
Metals			
As (µg/L)	**0.4**	6	0.3
Ba (mg/L)	**0.038**	6	0.007
Cu (mg/L)	**0.002**	6	0.000
Fe (mg/L)	**0.006**	6	0.003
Mo (mg/L)	**0.004**	6	0.000
Ni (mg/L)	**0.00267**	6	0.00132
Pb (mg/L)	**0.0002**	6	0.0001
Se (mg/L)	**0.0029**	6	0.0002
Zn (mg/L)	**0.005**	6	0.001
Nutrients			
NH3-N (mg/L)	**0.22**	3	0.28
NO3 (mg/L)	**0.04**	4	0.00
P-(TP) (mg/L)	**0.01**	4	0.00
Radionuclides			
Pb210 (Bq/L)	**0.02**	4	0.01
Po210 (Bq/L)	**0.004**	4	0.002
Ra226 (Bq/L)	**0.040**	6	0.018
U (µg/L)	**143.0**	6	7.4
Organics			
C-(org) (mg/L)	**3.550**	4	0.777

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: BL-4 - Beaverlodge Lake - middle - composite of top, middle, bottom

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**247**	5	6
pH-L (pH Unit)	**7.93**	5	0.13
TSS (mg/L)	**1.000**	5	0.000
Major Ions			
Alk-T (mg/L)	**69.4**	5	3.8
Ca (mg/L)	**21.4**	5	0.5
Cl (mg/L)	**14.00**	5	0.71
CO3 (mg/L)	**1.0**	5	0.0
Hardness (mg/L)	**75**	5	2
HCO3 (mg/L)	**84.8**	5	5.0
K (mg/L)	**1.1**	5	0.1
Mg (mg/L)	**5.3**	5	0.1
Na (mg/L)	**19.6**	5	0.5
OH (mg/L)	**1.0**	5	0.0
SO4 (mg/L)	**32.8**	5	1.1
Sum of Ions (mg/L)	**179**	5	8
TDS (mg/L)	**146.00**	5	7.78
Metals			
As (µg/L)	**0.3**	5	0.0
Ba (mg/L)	**0.034**	5	0.002
Cu (mg/L)	**0.001**	5	0.000
Fe (mg/L)	**0.034**	5	0.065
Mo (mg/L)	**0.004**	5	0.001
Ni (mg/L)	**0.00166**	5	0.00047
Pb (mg/L)	**0.0001**	5	0.0001
Se (mg/L)	**0.0028**	5	0.0001
Zn (mg/L)	**0.005**	5	0.003
Nutrients			
NH3-N (mg/L)	**0.06**	4	0.02
NO3 (mg/L)	**0.05**	5	0.02
P-(TP) (mg/L)	**0.01**	5	0.00
Radionuclides			
Pb210 (Bq/L)	**0.03**	5	0.01
Po210 (Bq/L)	**0.005**	5	0.000
Ra226 (Bq/L)	**0.034**	5	0.009
U (µg/L)	**143.8**	5	6.7
Organics			
C-(org) (mg/L)	**3.360**	5	0.207

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: BL-5 - Beaverlodge Outlet

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**219**	2	33
pH-L (pH Unit)	**7.71**	2	0.02
TSS (mg/L)	**3.000**	2	1.414
Major Ions			
Alk-T (mg/L)	**66.5**	2	2.1
Ca (mg/L)	**21.0**	2	0.0
Cl (mg/L)	**10.20**	2	3.96
CO3 (mg/L)	**1.0**	2	0.0
Hardness (mg/L)	**73**	2	2
HCO3 (mg/L)	**81.0**	2	2.8
K (mg/L)	**1.1**	2	0.0
Mg (mg/L)	**4.9**	2	0.4
Na (mg/L)	**14.5**	2	6.4
OH (mg/L)	**1.0**	2	0.0
SO4 (mg/L)	**24.0**	2	9.9
Sum of Ions (mg/L)	**157**	2	18
TDS (mg/L)	**127.50**	2	23.33
Metals			
As (µg/L)	**0.2**	2	0.0
Ba (mg/L)	**0.041**	2	0.008
Cu (mg/L)	**0.001**	2	0.001
Fe (mg/L)	**0.012**	2	0.001
Mo (mg/L)	**0.003**	2	0.001
Ni (mg/L)	**0.00015**	2	0.00007
Pb (mg/L)	**0.0001**	2	0.0000
Se (mg/L)	**0.0018**	2	0.0013
Zn (mg/L)	**0.001**	2	0.001
Nutrients			
NO3 (mg/L)	**1.58**	2	1.87
Radionuclides			
Ra226 (Bq/L)	**0.022**	2	0.025
U (µg/L)	**138.0**	1	

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: DB-6 - Dubyna Lake discharge at culvert

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**228**	6	17
pH-L (pH Unit)	**7.79**	6	0.08
TSS (mg/L)	**1.000**	6	0.000
Major Ions			
Alk-T (mg/L)	**85.7**	6	6.2
Ca (mg/L)	**36.3**	6	3.2
Cl (mg/L)	**0.65**	6	0.05
CO3 (mg/L)	**1.0**	6	0.0
Hardness (mg/L)	**114**	6	10
HCO3 (mg/L)	**104.5**	6	7.6
K (mg/L)	**1.0**	6	0.5
Mg (mg/L)	**5.7**	6	0.5
Na (mg/L)	**2.1**	6	0.3
OH (mg/L)	**1.0**	6	0.0
SO4 (mg/L)	**28.0**	6	2.0
Sum of Ions (mg/L)	**179**	6	14
TDS (mg/L)	**155.17**	6	9.85
Metals			
As (µg/L)	**0.1**	6	0.1
Ba (mg/L)	**0.046**	6	0.005
Cu (mg/L)	**0.001**	6	0.000
Fe (mg/L)	**0.014**	6	0.008
Mo (mg/L)	**0.002**	6	0.000
Ni (mg/L)	**0.00018**	6	0.00004
Pb (mg/L)	**0.0001**	6	0.0000
Se (mg/L)	**0.0001**	6	0.0001
Zn (mg/L)	**0.002**	6	0.002
Nutrients			
NH3-N (mg/L)	**0.05**	1	
NO3 (mg/L)	**0.14**	6	0.19
P-(TP) (mg/L)	**0.02**	1	
Radionuclides			
Pb210 (Bq/L)	**0.02**	1	
Po210 (Bq/L)	**0.007**	1	
Ra226 (Bq/L)	**0.030**	6	0.000
U (µg/L)	**246.2**	6	31.4
Organics			
C-(org) (mg/L)	**8.700**	1	

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: ML-1 - Martin Lake outlet (North basin)

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**229**	2	59
pH-L (pH Unit)	**7.97**	2	0.06
TSS (mg/L)	**1.000**	2	0.000
Major Ions			
Alk-T (mg/L)	**69.0**	2	8.5
Ca (mg/L)	**21.0**	2	2.8
Cl (mg/L)	**12.10**	2	5.52
CO3 (mg/L)	**1.0**	2	0.0
Hardness (mg/L)	**73**	2	11
HCO3 (mg/L)	**84.5**	2	10.6
K (mg/L)	**1.1**	2	0.0
Mg (mg/L)	**5.0**	2	1.0
Na (mg/L)	**16.5**	2	6.4
OH (mg/L)	**1.0**	2	0.0
SO4 (mg/L)	**27.0**	2	12.7
Sum of Ions (mg/L)	**168**	2	39
TDS (mg/L)	**140.00**	2	29.70
Metals			
As (µg/L)	**0.3**	2	0.1
Ba (mg/L)	**0.040**	2	0.004
Cu (mg/L)	**0.000**	2	0.000
Fe (mg/L)	**0.006**	2	0.007
Mo (mg/L)	**0.004**	2	0.002
Ni (mg/L)	**0.00015**	2	0.00007
Pb (mg/L)	**0.0001**	2	0.0000
Se (mg/L)	**0.0021**	2	0.0014
Zn (mg/L)	**0.001**	2	0.000
Nutrients			
NH3-N (mg/L)	**0.07**	2	0.06
NO3 (mg/L)	**0.35**	2	0.44
P-(TP) (mg/L)	**0.01**	2	0.00
Radionuclides			
Pb210 (Bq/L)	**0.02**	2	0.00
Po210 (Bq/L)	**0.005**	2	0.000
Ra226 (Bq/L)	**0.013**	2	0.011
U (µg/L)	**65.0**	2	9.9
Organics			
C-(org) (mg/L)	**4.200**	2	1.131

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: TL-3 - Fookes Lake discharge

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**334**	5	58
pH-L (pH Unit)	**8.08**	5	0.13
TSS (mg/L)	**1.000**	5	0.000
Major Ions			
Alk-T (mg/L)	**129.0**	5	24.8
Ca (mg/L)	**27.0**	5	6.0
Cl (mg/L)	**3.64**	5	0.80
CO3 (mg/L)	**1.0**	5	0.0
Hardness (mg/L)	**89**	5	20
HCO3 (mg/L)	**157.6**	5	30.3
K (mg/L)	**1.2**	5	0.3
Mg (mg/L)	**5.2**	5	1.3
Na (mg/L)	**36.6**	5	5.6
OH (mg/L)	**1.0**	5	0.0
SO4 (mg/L)	**38.2**	5	6.5
Sum of Ions (mg/L)	**270**	5	50
TDS (mg/L)	**210.60**	5	42.83
Metals			
As (µg/L)	**0.9**	5	0.1
Ba (mg/L)	**0.034**	5	0.006
Cu (mg/L)	**0.001**	5	0.000
Fe (mg/L)	**0.006**	5	0.003
Mo (mg/L)	**0.015**	5	0.002
Ni (mg/L)	**0.00028**	5	0.00004
Pb (mg/L)	**0.0004**	5	0.0002
Se (mg/L)	**0.0037**	5	0.0007
Zn (mg/L)	**0.001**	5	0.001
Nutrients			
NH3-N (mg/L)		0	
NO3 (mg/L)	**0.10**	5	0.06
P-(TP) (mg/L)	**0.03**	1	
Radionuclides			
Pb210 (Bq/L)	**0.07**	1	
Po210 (Bq/L)	**0.040**	1	
Ra226 (Bq/L)	**1.070**	5	0.199
U (µg/L)	**341.8**	5	55.0
Organics			
C-(org) (mg/L)	**9.500**	1	

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: TL-4 - marie lake outflow

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**445**	8	154
pH-L (pH Unit)	**7.79**	8	0.36
TSS (mg/L)	**2.000**	8	1.852
Major Ions			
Alk-T (mg/L)	**146.6**	8	17.4
Ca (mg/L)	**38.6**	8	25.1
Cl (mg/L)	**4.70**	8	1.36
CO3 (mg/L)	**1.0**	8	0.0
Hardness (mg/L)	**124**	8	72
HCO3 (mg/L)	**178.8**	8	21.2
K (mg/L)	**1.5**	8	0.3
Mg (mg/L)	**6.6**	8	2.3
Na (mg/L)	**47.0**	8	7.5
OH (mg/L)	**1.0**	8	0.0
SO4 (mg/L)	**78.1**	8	69.4
Sum of Ions (mg/L)	**355**	8	114
TDS (mg/L)	**289.63**	8	110.05
Metals			
As (µg/L)	**1.6**	8	0.5
Ba (mg/L)	**0.108**	8	0.063
Cu (mg/L)	**0.001**	8	0.001
Fe (mg/L)	**0.311**	8	0.691
Mo (mg/L)	**0.011**	8	0.004
Ni (mg/L)	**0.00126**	8	0.00158
Pb (mg/L)	**0.0004**	8	0.0002
Se (mg/L)	**0.0031**	8	0.0011
Zn (mg/L)	**0.003**	8	0.004
Nutrients			
NH3-N (mg/L)	**0.05**	1	
NO3 (mg/L)	**0.05**	8	0.02
P-(TP) (mg/L)	**0.02**	2	0.01
Radionuclides			
Pb210 (Bq/L)	**0.23**	2	0.04
Po210 (Bq/L)	**0.055**	2	0.035
Ra226 (Bq/L)	**1.650**	8	0.330
U (µg/L)	**419.8**	8	277.9
Organics			
C-(org) (mg/L)	**8.800**	2	1.697

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: TL-6 - Minewater Lake discharge

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**791**	1	
pH-L (pH Unit)	**7.94**	1	
TSS (mg/L)	**2.000**	1	
Major Ions			
Alk-T (mg/L)	**306.0**	1	
Ca (mg/L)	**46.0**	1	
Cl (mg/L)	**54.00**	1	
CO3 (mg/L)	**1.0**	1	
Hardness (mg/L)	**160**	1	
HCO3 (mg/L)	**373.0**	1	
K (mg/L)	**3.1**	1	
Mg (mg/L)	**11.0**	1	
Na (mg/L)	**118.0**	1	
OH (mg/L)	**1.0**	1	
SO4 (mg/L)	**41.0**	1	
Sum of Ions (mg/L)	**646**	1	
TDS (mg/L)	**529.00**	1	
Metals			
As (µg/L)	**1.2**	1	
Ba (mg/L)	**1.160**	1	
Cu (mg/L)	**0.000**	1	
Fe (mg/L)	**0.710**	1	
Mo (mg/L)	**0.002**	1	
Ni (mg/L)	**0.00030**	1	
Pb (mg/L)	**0.0001**	1	
Se (mg/L)	**0.0022**	1	
Zn (mg/L)	**0.001**	1	
Nutrients			
NH3-N (mg/L)		0	
NO3 (mg/L)	**0.04**	1	
P-(TP) (mg/L)		0	
Radionuclides			
Pb210 (Bq/L)		0	
Po210 (Bq/L)		0	
Ra226 (Bq/L)	**5.600**	1	
U (µg/L)	**248.0**	1	
Organics			
C-(org) (mg/L)		0	

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: TL-7 - Meadow Lake discharge at weir

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**447**	12	127
pH-L (pH Unit)	**7.91**	12	0.21
TSS (mg/L)	**1.417**	12	0.996
Major Ions			
Alk-T (mg/L)	**149.5**	12	33.6
Ca (mg/L)	**37.1**	12	14.0
Cl (mg/L)	**7.66**	12	2.98
CO3 (mg/L)	**1.0**	12	0.0
Hardness (mg/L)	**124**	12	45
HCO3 (mg/L)	**182.3**	12	41.1
K (mg/L)	**2.0**	12	1.4
Mg (mg/L)	**7.7**	12	2.5
Na (mg/L)	**48.0**	12	14.3
OH (mg/L)	**1.0**	12	0.0
SO4 (mg/L)	**73.5**	12	50.5
Sum of Ions (mg/L)	**358**	12	94
TDS (mg/L)	**292.67**	12	85.91
Metals			
As (µg/L)	**1.4**	12	0.5
Ba (mg/L)	**0.354**	12	0.227
Cu (mg/L)	**0.001**	12	0.001
Fe (mg/L)	**0.171**	12	0.213
Mo (mg/L)	**0.010**	12	0.004
Ni (mg/L)	**0.00063**	12	0.00014
Pb (mg/L)	**0.0004**	12	0.0002
Se (mg/L)	**0.0053**	12	0.0041
Zn (mg/L)	**0.001**	12	0.002
Nutrients			
NH3-N (mg/L)	**0.02**	3	0.02
NO3 (mg/L)	**0.10**	12	0.18
P-(TP) (mg/L)	**0.02**	4	0.01
Radionuclides			
Pb210 (Bq/L)	**0.06**	4	0.07
Po210 (Bq/L)	**0.020**	4	0.008
Ra226 (Bq/L)	**1.446**	12	0.608
U (µg/L)	**270.0**	12	120.7
Organics			
C-(org) (mg/L)	**10.250**	4	2.179

Routine Summary Statistics Report for Beaverlodge Environment

From January 1, 2010 To June 30, 2011

Station: TL-9 - Greer Lake discharge at Beaverlodge Lake

	January 1, 2010 To June 30, 2011 Statistics		
	Average	Count	Std Dev
Physical Properties			
Cond-L (µS/cm)	**464**	4	74
pH-L (pH Unit)	**8.04**	4	0.14
TSS (mg/L)	**1.250**	4	0.500
Major Ions			
Alk-T (mg/L)	**186.5**	4	27.6
Ca (mg/L)	**32.5**	4	3.1
Cl (mg/L)	**9.25**	4	2.22
CO3 (mg/L)	**1.0**	4	0.0
Hardness (mg/L)	**122**	4	20
HCO3 (mg/L)	**227.5**	4	33.8
K (mg/L)	**2.3**	4	1.0
Mg (mg/L)	**9.8**	4	3.4
Na (mg/L)	**57.3**	4	11.0
OH (mg/L)	**1.0**	4	0.0
SO4 (mg/L)	**46.0**	4	9.6
Sum of Ions (mg/L)	**385**	4	62
TDS (mg/L)	**308.00**	4	51.52
Metals			
As (µg/L)	**1.1**	4	0.4
Ba (mg/L)	**0.563**	4	0.388
Cu (mg/L)	**0.001**	4	0.000
Fe (mg/L)	**0.020**	4	0.009
Mo (mg/L)	**0.011**	4	0.003
Ni (mg/L)	**0.00047**	4	0.00013
Pb (mg/L)	**0.0003**	4	0.0001
Se (mg/L)	**0.0048**	4	0.0014
Zn (mg/L)	**0.001**	4	0.000
Nutrients			
NH3-N (mg/L)		0	
NO3 (mg/L)	**0.13**	4	0.13
P-(TP) (mg/L)	**0.03**	1	
Radionuclides			
Pb210 (Bq/L)	**0.06**	1	
Po210 (Bq/L)	**0.020**	1	
Ra226 (Bq/L)	**0.980**	4	0.884
U (µg/L)	**483.8**	4	130.9
Organics			
C-(org) (mg/L)	**14.000**	1	

APPENDIX C

STREAMFLOW ASSESSMENT NEAR BEAVERLODGE MINE FOR 2010 AND 2011

August 9, 2011 Project No. 11-1362-0049

Mr. Mike Webster, Reclamation Coordinator, Compliance and Licensing
Cameco Corporation
2121 - 11th Street West
Saskatoon, Saskatchewan
S7M 1J3

STREAMFLOW ASSESSMENT NEAR BEAVERLODGE MINE FOR 2010 AND 2011

Dear Mr. Webster:

Golder Associates Ltd. (Golder) is pleased to present the following assessment of streamflow for Ace Creek (AC-8) and Fulton Creek (TL-7). As per the work plan submitted to Cameco Corporation (Cameco) on April 21, 2011 this document presents daily and monthly flow data for AC-8 and TL-7 up to the end of June 2011 as well as climate conditions at Uranium City and Stony Rapids.

Streamflow Monitoring

Streamflow or hydrometric monitoring at AC-8 includes continuous stage (water level) recording, staff gauge readings and measurements of discharge. The relationship between measured discharge and stage readings from the staff gauge are used to develop a relationship between the two which can then be used to estimate discharge from the continuous stage sensors. At TL-7 a continuous stage recorder and staff gauge are installed however measurements of discharge are performed infrequently due to the presence of a v-notch weir. A v-notch weir provides a relationship between discharge and stage height (or head) however damage to the weir was observed in 2010. The v-notch weir has not been repaired but Cameco's intent is to repair the weir or replace the weir with an alternate structure. The loss of measurable discharge from the weir is anticipated to be negligible and the calculation of discharge based on the continuous recorder is still reliable though additional damage may compromise the continued use of this data.

The stage recorders used at both sites are Solinst Leveloggers. The Levelogger at AC-8 remains in the stream year round while the logger at TL-7 is removed each fall to prevent damage due to ice conditions. The Levelogger at AC-8 was replaced with a newer model in the fall of 2010; similarly, a newer model was installed at TL-7.

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

Climatic Conditions

Environment Canada operates meteorological stations at Uranium City and Stony Rapids, Saskatchewan. Meteorological data collected at these locations was reviewed as an indicator of the climatic conditions in the Beaverlodge area from January 2010 to June 2011. The data collected at Uranium City is closer to the site however this station has in the past had problems which have resulted in data gaps. The data from Stony Rapids is included as this station typically has a complete data set for analysis. Table 1 provides mean and annual precipitation totals for Uranium City and Stony Rapids during the indicated time period.

Table 1: Precipitation Records for Uranium City and Stony Rapids

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
2010	January	11.9*	19.3	61.7	30/31	19.8	18.1	109.4	31/31
	February	2.4	15.5	15.5	28/28	1.1	13.3	8.3	28/28
	March	0.3	17.8	1.7	31/31	15.8*	18.2	86.8	30/31
	April	6.2*	16.9	36.7	29/30	8.2*	18.0	45.6	29/30
	May	8.2*	17.5	46.9	28/31	15.3*	26.3	58.2	30/31
	June	26.5	31.3	84.7	30/30	15.9	44.4	35.8	30/30
	July	19.5	47.1	41.4	31/31	34.8	56.3	61.8	31/31
	August	54.6	42.4	128.8	31/31	74.3	63.9	116.3	31/31
	September	25.8*	33.7	76.6	29/30	29.8*	48.4	61.6	29/30
	October	22.8	29.1	78.4	31/31	21.8	30.1	72.4	31/31
	November	4.0	28.0	14.3	30/30	4.1*	27.6	14.9	27/30
	December	6.8	23.6	28.8	31/31	8.2*	18.7	43.9	29/31
Total		189.0	322.2	58.7	359/365	249.1	383.3	65.0	356/365
2011	January	7.6	19.3	39.4	31/31	2.4*	18.1	13.3	17/31
	February	4.3	15.5	27.7	28/28	1.9*	13.3	14.3	22/28
	March	3.6*	17.8	20.2	30/31	2.6*	18.2	14.3	26/31
	April	1.4	16.9	8.3	30/30	0.0*	18.0	0.0	28/30
	May	2.1*	17.5	12.0	30/31	2.8*	26.3	10.6	30/31
	June	5.6	31.3	17.9	30/30	11.6	44.4	26.1	30/30
Total		24.6	118.3	20.8	191/181	21.3	138.3	15.4	168/181

Notes: Precipitation data is provided by Environment Canada (2011)
[(a)] Normals for the climate station at Uranium City are average monthly values from 1953 to 1986 and 1998 to 2009
[(b)] Normals for the climate station at Stony Rapids are average monthly values from 1960 to 1982 and 1968 to 2009
* = Incomplete data set

As presented in Table 1, precipitation is well below average for the period of January 2010 to July 2011 for both Uranium City and Stony Rapids; several months for both stations fall below 30% of normal. This data is supported by observations made during field visits in 2010 and 2011. Northern Saskatchewan was dry in 2010 and little snow fell through the winter of 2011. As a result there are many streams in the Beaverlodge area that were identified as having little or no discharge.

Data from Water Survey of Canada (WSC) (2011) for three hydrometric stations located south of Lake Athabasca indicate that discharge during the summer of 2010 was among the lowest on record and that flows were generally low of the mean through the end of 2010. The three hydrometric stations are the Douglas River located southwest of Uranium City, the MacFarlane River located southeast of Uranium city and the Fond-du-Lac River flowing into the east end of Lake Athabasca. Data for 2011 is not yet available from WSC.

Ace Creek – Station AC-8

The continuous stage recorded at AC-8 provided a complete data set over the period of January 1, 2010 to June 30, 2011. Stage data were recorded at 30 minute intervals, calculated to discharge based on the individual stage measurements and averaged to provide the daily average discharge. The stage-discharge relationship is presented in Figure 1 and combines eight measurements of discharge and stage with a single estimated zero flow value derived from the geometry of the structure. The equation describing the stage-discharge relationship is presented in Figure 1. The hydrograph of daily average data from January 1, 2010 to June 30, 2011 is presented as Figure 2. Tables 2 and 3 provide the daily average discharge and monthly average discharge at AC-8. Figure 3 presents the monthly average discharge from January, 2010 to June 2011 and compares that data to previously reported historical monthly values (Golder 2010).

Figure 1: Ace Creek (AC-8) Stage-Discharge Relationship

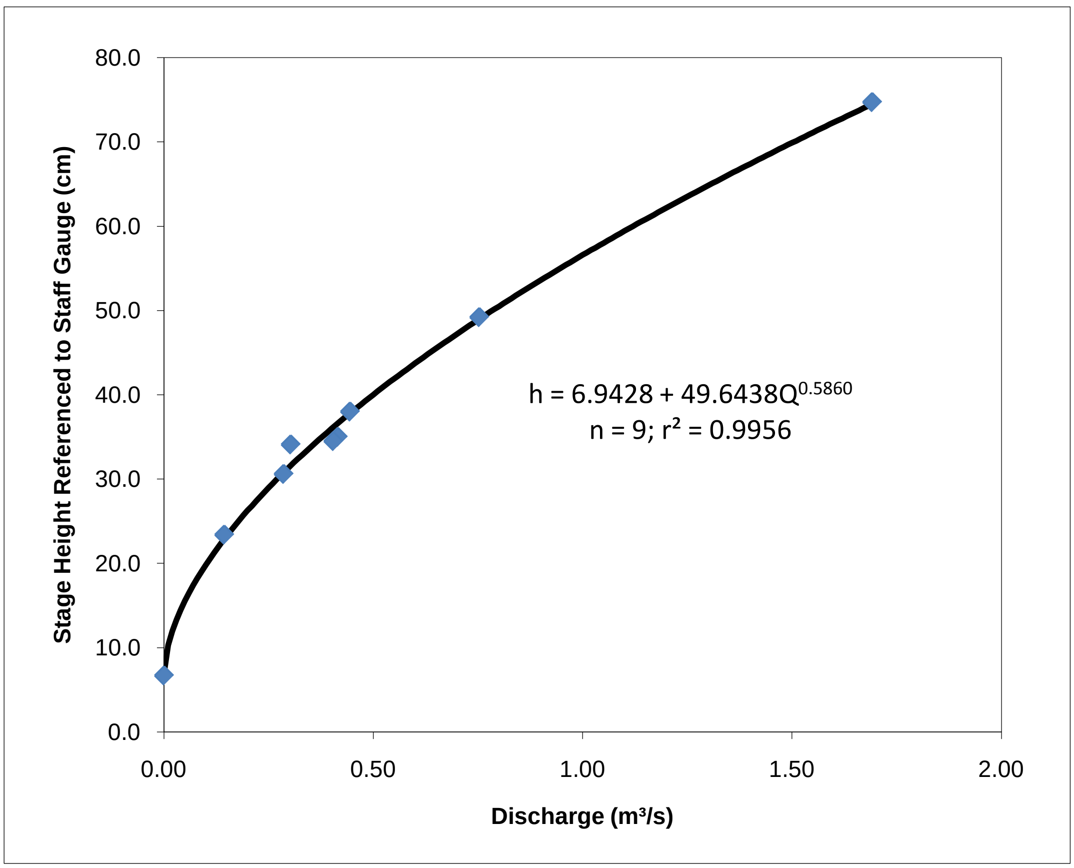


Figure 2: Ace Creek (AC-8) Daily Average Discharge and Instantaneous Discharge Measurements

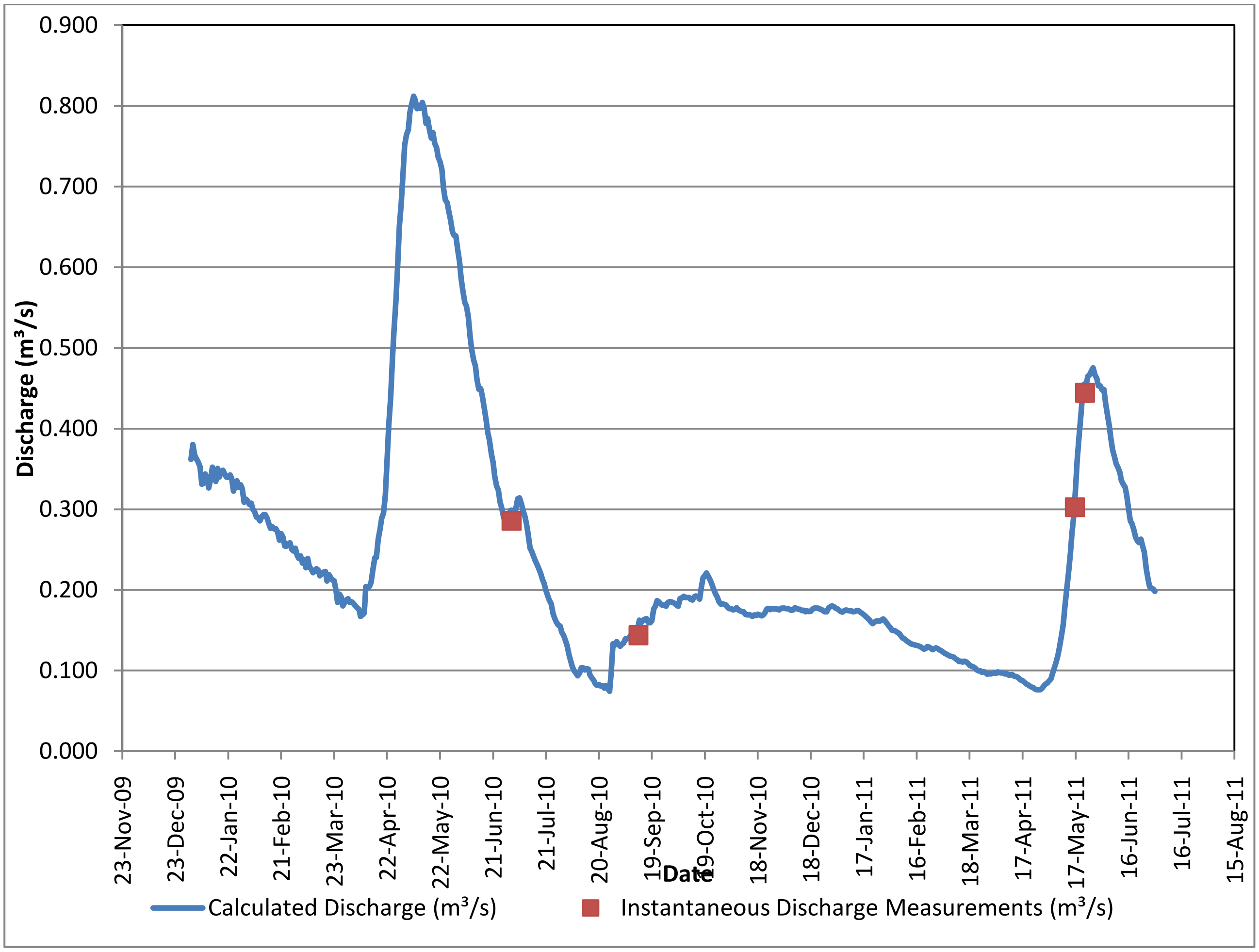


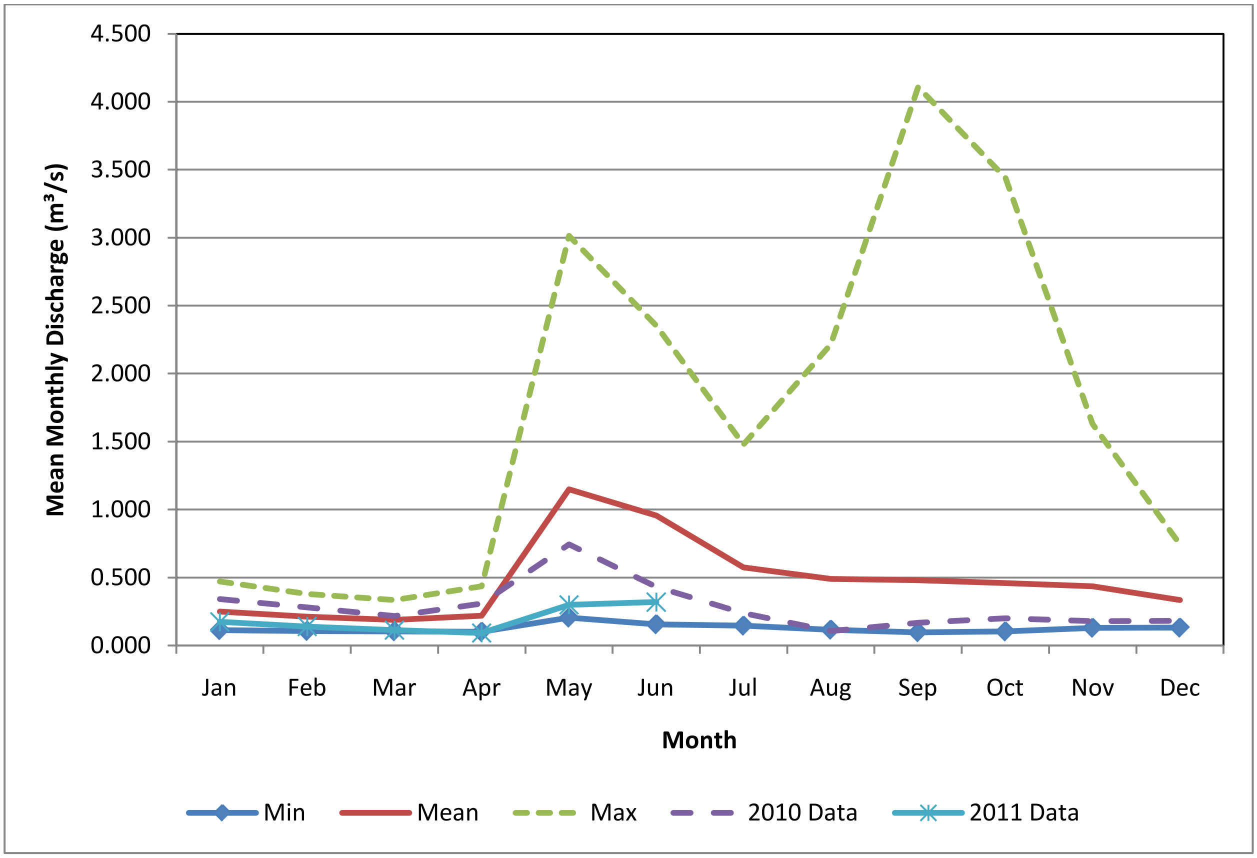
Table 2: Daily Average Discharge (m³/s) for Ace Creek (AC-8) from January 1, 2010 to June 30, 2011

Day	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11
1	0.362	0.312	0.252	0.184	0.717	0.622	0.305	0.142	0.135	0.190	0.183	0.182	0.183	0.158	0.130	0.101	0.088	0.455
2	0.380	0.311	0.243	0.185	0.751	0.606	0.305	0.136	0.137	0.188	0.182	0.183	0.182	0.155	0.129	0.101	0.091	0.456
3	0.367	0.306	0.239	0.183	0.764	0.586	0.296	0.125	0.138	0.186	0.182	0.183	0.180	0.155	0.127	0.102	0.093	0.440
4	0.362	0.307	0.242	0.180	0.770	0.569	0.307	0.116	0.144	0.185	0.180	0.182	0.178	0.154	0.126	0.102	0.101	0.425
5	0.359	0.300	0.233	0.178	0.792	0.556	0.320	0.109	0.144	0.195	0.181	0.182	0.178	0.152	0.125	0.101	0.107	0.411
6	0.353	0.297	0.237	0.176	0.803	0.552	0.320	0.104	0.145	0.195	0.183	0.181	0.179	0.151	0.123	0.101	0.115	0.395
7	0.331	0.290	0.228	0.167	0.812	0.539	0.313	0.101	0.148	0.198	0.180	0.180	0.180	0.148	0.122	0.100	0.124	0.380
8	0.332	0.290	0.239	0.169	0.807	0.514	0.305	0.097	0.150	0.196	0.179	0.180	0.180	0.145	0.122	0.100	0.134	0.372
9	0.344	0.286	0.229	0.171	0.796	0.498	0.298	0.101	0.148	0.196	0.178	0.183	0.179	0.144	0.121	0.098	0.147	0.364
10	0.338	0.291	0.226	0.204	0.797	0.485	0.287	0.108	0.152	0.196	0.178	0.182	0.179	0.142	0.119	0.098	0.162	0.358
11	0.326	0.293	0.221	0.202	0.797	0.478	0.275	0.108	0.158	0.193	0.175	0.181	0.178	0.140	0.117	0.099	0.184	0.353
12	0.337	0.293	0.223	0.205	0.804	0.461	0.258	0.105	0.168	0.193	0.174	0.181	0.179	0.139	0.116	0.097	0.206	0.342
13	0.352	0.289	0.226	0.209	0.797	0.449	0.253	0.106	0.164	0.197	0.174	0.179	0.179	0.137	0.116	0.097	0.227	0.337
14	0.340	0.282	0.225	0.226	0.778	0.449	0.248	0.106	0.167	0.198	0.174	0.180	0.180	0.137	0.115	0.096	0.251	0.334
15	0.334	0.277	0.217	0.240	0.784	0.441	0.242	0.098	0.169	0.197	0.172	0.178	0.177	0.136	0.116	0.094	0.277	0.325
16	0.351	0.278	0.220	0.240	0.770	0.427	0.237	0.095	0.169	0.194	0.174	0.179	0.176	0.136	0.115	0.092	0.299	0.307
17	0.340	0.275	0.222	0.263	0.760	0.412	0.232	0.092	0.164	0.208	0.173	0.178	0.174	0.135	0.113	0.091	0.336	0.292
18	0.346	0.276	0.223	0.275	0.767	0.394	0.226	0.087	0.164	0.221	0.175	0.179	0.172	0.134	0.111	0.089	0.370	0.288
19	0.348	0.272	0.211	0.289	0.753	0.386	0.218	0.086	0.167	0.223	0.174	0.181	0.170	0.133	0.110	0.088	0.398	0.281
20	0.344	0.262	0.219	0.295	0.748	0.369	0.214	0.086	0.181	0.227	0.173	0.183	0.168	0.131	0.109	0.086	0.425	0.271
21	0.340	0.270	0.215	0.318	0.736	0.358	0.205	0.085	0.185	0.222	0.173	0.182	0.165	0.132	0.107	0.085	0.449	0.266
22	0.339	0.266	0.212	0.357	0.731	0.341	0.198	0.085	0.192	0.218	0.176	0.183	0.163	0.134	0.105	0.084	0.463	0.264
23	0.343	0.255	0.211	0.405	0.721	0.329	0.192	0.082	0.190	0.213	0.181	0.181	0.165	0.133	0.104	0.083	0.462	0.269
24	0.338	0.254	0.199	0.438	0.698	0.323	0.188	0.085	0.188	0.206	0.182	0.181	0.166	0.132	0.104	0.081	0.473	0.260
25	0.322	0.258	0.185	0.488	0.683	0.309	0.175	0.081	0.186	0.201	0.181	0.179	0.167	0.131	0.102	0.080	0.475	0.253
26	0.331	0.258	0.195	0.523	0.680	0.301	0.169	0.078	0.186	0.196	0.182	0.178	0.166	0.132	0.103	0.080	0.479	0.232
27	0.335	0.250	0.191	0.559	0.669	0.289	0.165	0.101	0.185	0.191	0.181	0.178	0.167	0.133	0.101	0.080	0.483	0.219
28	0.327	0.248	0.180	0.606	0.658	0.292	0.161	0.138	0.189	0.188	0.181	0.183	0.169	0.132	0.100	0.082	0.474	0.210
29	0.330		0.184	0.650	0.644	0.284	0.160	0.136	0.191	0.188	0.181	0.184	0.167		0.100	0.084	0.470	0.207
30	0.325		0.188	0.679	0.640	0.291	0.152	0.141	0.191	0.187	0.180	0.185	0.164		0.100	0.087	0.461	0.206
31	0.309		0.189		0.639		0.148	0.138		0.187		0.184	0.161		0.101		0.460	
Mean	**0.341**	**0.280**	**0.217**	**0.309**	**0.744**	**0.430**	**0.238**	**0.105**	**0.167**	**0.199**	**0.178**	**0.181**	**0.173**	**0.140**	**0.113**	**0.092**	**0.299**	**0.319**

Table 3: Monthly and Annual Mean Discharges (m³/s) for Ace Creek (AC-8)

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	0.617
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	0.324
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	0.369
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	0.443
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	0.508
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	0.375
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	0.522
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							
Mean	**0.247**	**0.209**	**0.187**	**0.215**	**1.122**	**0.937**	**0.564**	**0.477**	**0.470**	**0.452**	**0.426**	**0.328**	**0.472**

Figure 3: Ace Creek (AC-8) Mean Monthly Discharge



Fulton Creek – Station TL-7

Stream discharge at Fulton Creek is monitored in conjunction with a v-notch weir. Though the weir is damaged an estimate of discharge is provided based on the hydraulic relationship between weir head and discharge (Equation [1]; Smith, 1995). The estimated discharge provided in the following tables and figures can be considered lower than the actual discharge at the station and it would be difficult to estimate to the magnitude of the deviation from the actual discharge. The deviation at the station is a function of the damage to the weir as observed in the photograph presented as Figure 4. As observed in Figure 4 the majority of the flow still passes through the v-notch however there is a portion of flow which passes below the v-notch and that portion is unquantifiable. The cause of the damage is believed to be pressure from ice. For purposes of analysis it may be assumed that the unquantifiable portion of discharge at TL-7 is negligible.

$$Q = 1.37 \cdot h^{2.5} \qquad [1]$$

Figure 4: Photograph of Damaged V-notch Weir at Fulton Creek (TL-7)

The continuous stage recorder installed at TL-7 was believed to be damaged as it remained installed through the winter of 2009 to 2010 (Golder 2010). Upon inspection of the data record portions of the data appear to remain usable for this assessment. The stage recorder was removed in September of 2010 and re-installed in May 2011. The discharge record at TL-7 is a function of the available stage recorder data as well as an empirical relationship to discharge at AC-8 (Equations [3] and [4]; Golder 2010). Equation [3] is used when discharge at AC-8 (Q_{AC-8}) is greater than 0.396 m³/s and Equation [4] is used when discharge at AC-8 (Q_{AC-8} is lower than 0.396 m³/s. In this assessment Equation [4] is not used as the discharge at AC-8 was never greater than 0.335 m³/s when the datalogger at TL-7 was not recording.

[3] $$Q_{TL-7} = 0.034\, Q_{AC-8} - 0.0086$$

[4] $$Q_{TL-7} = 0.0076\, Q_{AC-8}$$

Flow through TL-7 is known to occur throughout the winter with glaciations of ice building up at the v-notch. Communications with Cameco and Dean Classen (Uranium City Contracting) indicated that there was little to no glaciation in the system through the winter of 2010 to 2011 and it is expected that there was likely no flow during some periods during the winter due to the extremely dry preceding summer and fall. A best estimate of discharge using [3] is incorporated in this assessment to identify the ‘no flow’ period at TL-7. This period is believed to begin approximately February 9, 2011 with discharge less than 0.5 L/s occurring from October 24, 2010 to February 9. A portion of the record also indicates that the stage height dropped below the invert of the weir at various intervals between July 16, 2010 and September 6, 2010 with occasional periods of flow which are believed to be associated with precipitation events. The wooden boards that comprise the structure around the v-notch have been known to leak and as such there may have been discharge during the period July 16 to September 6 however it is unquantifiable when below the invert of the v-notch. It may be assumed that any discharge associated with stage heights below the invert is negligible and as such is assigned a magnitude of zero.

Figures 5 and 6 present the daily hydrograph and monthly average historic values at TL-7. Tables 4 and 5 present the numerical data associated with Figures 5 and 6. Discharges at TL-7 are well below historical flows with several months setting new minimum monthly averages (Table 5).

Figure 5: Fulton Creek (TL-7) Daily Average Discharge

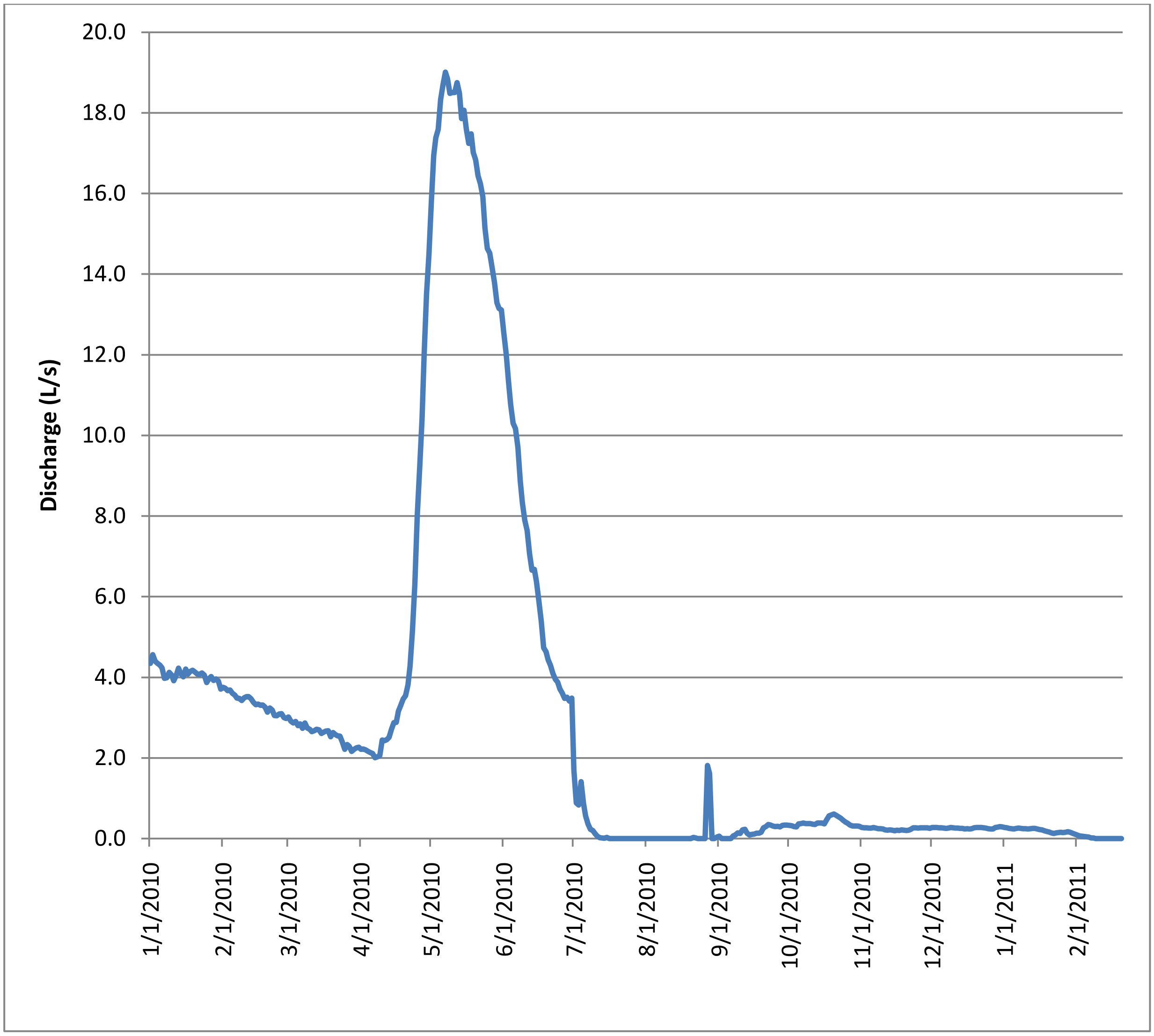


Figure 6: Fulton Creek (TL-7) Mean Monthly Discharge

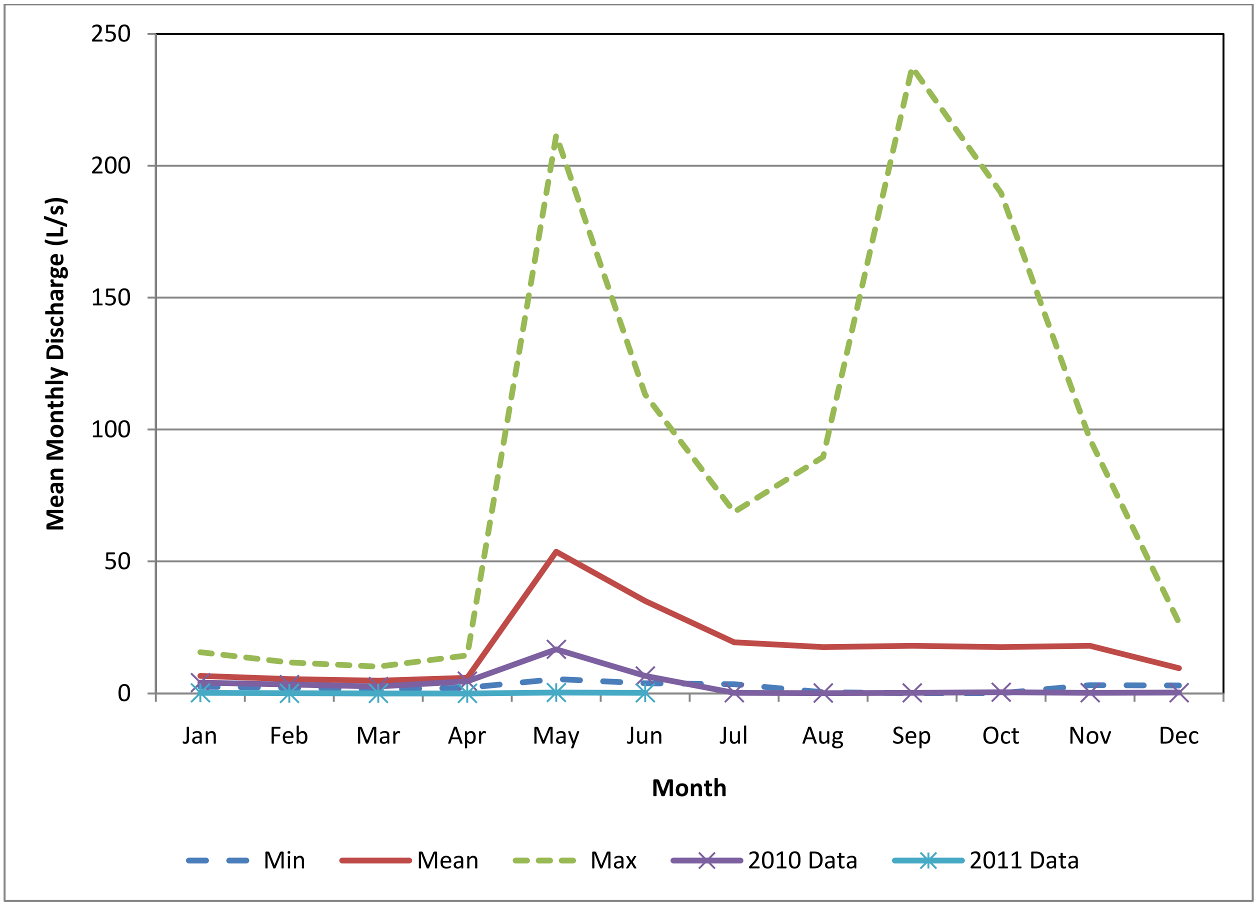


Table 4: Daily Average Discharge (L/s) for Fulton Creek (TL-7) from January 1, 2010 to June 30, 2011

Day	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11
1	4.34	3.75	3.02	2.21	15.78	12.54	1.70	0.00	0.06	0.33	0.28	0.27	0.28	0.09	0.00	0.00	0.00	0.41
2	4.56	3.73	2.92	2.22	16.94	12.02	0.89	0.00	0.00	0.32	0.27	0.28	0.27	0.07	0.00	0.00	0.00	0.43
3	4.40	3.67	2.87	2.20	17.38	11.32	0.83	0.00	0.00	0.30	0.27	0.28	0.26	0.06	0.00	0.00	0.00	0.33
4	4.34	3.69	2.91	2.16	17.59	10.76	1.41	0.00	0.00	0.29	0.26	0.27	0.24	0.06	0.00	0.00	0.00	0.31
5	4.30	3.60	2.80	2.14	18.32	10.30	0.88	0.00	0.00	0.37	0.26	0.27	0.24	0.05	0.00	0.00	0.00	0.32
6	4.24	3.56	2.85	2.11	18.69	10.17	0.57	0.00	0.00	0.37	0.28	0.26	0.25	0.04	0.00	0.00	0.00	0.31
7	3.97	3.48	2.73	2.00	19.01	9.71	0.37	0.00	0.07	0.39	0.26	0.25	0.26	0.02	0.00	0.00	0.00	0.32
8	3.99	3.48	2.87	2.03	18.84	8.86	0.23	0.00	0.09	0.37	0.25	0.26	0.25	0.02	0.00	0.00	0.00	0.34
9	4.13	3.43	2.74	2.06	18.48	8.33	0.20	0.00	0.14	0.37	0.24	0.28	0.25	0.00	0.00	0.00	0.00	0.23
10	4.06	3.49	2.71	2.45	18.51	7.90	0.12	0.00	0.13	0.37	0.24	0.27	0.25	0.00	0.00	0.00	0.00	0.24
11	3.92	3.52	2.66	2.43	18.50	7.64	0.06	0.00	0.22	0.36	0.22	0.26	0.24	0.00	0.00	0.00	0.00	0.40
12	4.04	3.52	2.67	2.45	18.75	7.06	0.03	0.00	0.23	0.35	0.21	0.26	0.24	0.00	0.00	0.00	0.00	0.28
13	4.22	3.47	2.71	2.51	18.48	6.66	0.01	0.00	0.13	0.38	0.21	0.25	0.25	0.00	0.00	0.00	0.00	0.21
14	4.08	3.38	2.69	2.71	17.86	6.68	0.01	0.00	0.09	0.39	0.21	0.25	0.25	0.00	0.00	0.00	0.05	0.19
15	4.01	3.32	2.61	2.88	18.06	6.38	0.03	0.00	0.11	0.38	0.19	0.24	0.24	0.00	0.00	0.00	0.23	0.21
16	4.21	3.34	2.64	2.88	17.59	5.90	0.00	0.00	0.11	0.36	0.21	0.25	0.22	0.00	0.00	0.00	0.40	0.14
17	4.08	3.31	2.67	3.16	17.24	5.40	0.00	0.00	0.14	0.47	0.21	0.24	0.21	0.00	0.00	0.00	0.65	0.15
18	4.15	3.31	2.67	3.30	17.48	4.73	0.00	0.00	0.13	0.56	0.21	0.24	0.20	0.00	0.00	0.00	0.58	0.15
19	4.18	3.26	2.53	3.47	17.02	4.63	0.00	0.00	0.16	0.59	0.21	0.27	0.18	0.00	0.00	0.00	0.68	0.15
20	4.13	3.14	2.63	3.54	16.83	4.43	0.00	0.00	0.27	0.61	0.20	0.28	0.17	0.00	0.00	0.00	0.67	0.11
21	4.08	3.24	2.58	3.81	16.44	4.30	0.00	0.03	0.30	0.58	0.21	0.27	0.14	0.00	0.00	0.00	0.74	0.12
22	4.07	3.19	2.55	4.28	16.24	4.09	0.00	0.02	0.35	0.54	0.23	0.28	0.13	0.00	0.00	0.00	0.75	0.26
23	4.11	3.05	2.54	5.16	15.92	3.95	0.00	0.00	0.33	0.51	0.27	0.27	0.14	0.00	0.00	0.00	0.74	0.28
24	4.06	3.05	2.39	6.31	15.14	3.88	0.00	0.00	0.31	0.46	0.27	0.26	0.15	0.00	0.00	0.00	0.69	0.18
25	3.87	3.09	2.21	8.00	14.63	3.71	0.00	0.00	0.30	0.41	0.26	0.25	0.15	0.00	0.00	0.00	0.67	0.14
26	3.97	3.10	2.34	9.17	14.52	3.61	0.00	0.00	0.30	0.38	0.27	0.24	0.15	0.00	0.00	0.00	0.58	0.03
27	4.02	3.01	2.29	10.40	14.16	3.47	0.00	1.81	0.29	0.34	0.27	0.24	0.16	0.00	0.00	0.00	0.52	0.03
28	3.93	2.98	2.16	12.00	13.79	3.51	0.00	1.61	0.33	0.31	0.27	0.28	0.17	0.00	0.00	0.00	0.50	0.02
29	3.96		2.21	13.51	13.29	3.41	0.00	0.00	0.34	0.32	0.27	0.29	0.16		0.00	0.00	0.53	0.09
30	3.91		2.25	14.48	13.15	3.49	0.00	0.00	0.34	0.31	0.26	0.30	0.13		0.00	0.00	0.45	0.07
31	3.71		2.27		13.11		0.00	0.04		0.31		0.29	0.11		0.00		0.44	
Mean	**4.10**	**3.36**	**2.60**	**4.60**	**16.70**	**6.63**	**0.24**	**0.11**	**0.18**	**0.40**	**0.24**	**0.26**	**0.20**	**0.01**	**0.00**	**0.00**	**0.32**	**0.21**

Table 5: Monthly and Annual Mean Discharges (L/s) for Fulton Creek (TL-7)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1980	3.7	3.7	3.6	6.1	5.4	3.8	3.5	3.5	3.5	4.1	3.7	3.5	4.0
1981	3.5	3.5	3.5	4.4	12.4	4.6	4.7	5.0	5.1	4.9	5.2	4.9	5.1
1982	4.3	4.2	4.5	5.1	20.1	15.1	8.0	4.8	3.5	3.9	3.8	4.1	6.8
1983	4.5	4.1	3.7	6.4	27.9	20.0	13.2	10.1	7.0	6.1	5.5	5.1	9.5
1984	4.9	5.0	5.5	13.5	16.8	26.7	29.7	19.5	12.6	20.3	29.7	26.7	17.6
1985	15.6	11.7	10.1	12.7	145.2	59.8	19.0	10.0	7.2	5.8	4.4	4.3	25.5
1986	4.6	4.8	4.8	5.9	15.1	18.7	21.6	17.4	8.9	6.4	5.3	5.0	9.9
1987	5.0	5.5	6.0	5.9	82.8	24.9	10.1	0.4	0.1	0.0	3.2	3.3	12.3
1988	3.9	2.6	2.4	2.2	18.0	33.6	37.6	24.2	9.5	4.7	5.3	5.0	12.4
1989	4.5	4.5	3.8	4.0	98.9	64.6	11.3	4.2	2.6	2.8	3.8	4.3	17.4
1990	5.2	4.7	4.4	2.4	20.1	28.8	9.5	4.5	3.5	3.7	7.0	10.0	8.7
1991	7.4	5.9	5.5	14.4	99.3	94.2	29.9	12.5	12.4	13.9	15.2	12.5	26.9
1992	9.5	7.1	5.8	6.9	113.3	39.6	32.4	16.7	22.7	73.0	70.8	18.9	34.7
1993	8.9	6.0	4.7	5.0	33.9	17.5	10.9	41.3	21.0	9.3	11.9	12.6	15.3
1994	8.0	6.1	5.4	4.8	211.5	53.0	6.9	3.2	2.3	3.0	3.1	3.1	25.9
1995	2.6	2.4	2.3	3.0	82.2	67.2	68.7	62.1	40.7	17.1	11.7	9.7	30.8
1996	7.1	4.9	3.8	3.5	16.0	16.8	35.0	29.2	10.3	8.3	8.5	7.4	12.6
1997	6.3	5.3	4.2	4.3	20.7	38.5	53.0	89.6	237.3	189.7	74.0	21.8	62.1
1998	11.4	8.4	6.8	8.0	52.2	13.0	21.6	12.9	7.4	5.6	5.6	5.3	13.2
1999	4.3	4.0	4.1	3.8	15.7	21.4	13.0	5.8	5.4	4.0	3.8	4.2	7.5
2000	4.2	3.3	3.0	3.2	9.1	9.0	7.6	8.2	8.9	48.0	96.2	8.9	17.5
2001	6.7	5.6	5.3	6.2	81.7	44.3	9.3	11.0	4.1	1.6	14.9	11.2	16.8
2002	10.7	6.0	4.5	4.9	55.9	24.4	12.1	63.2	44.6	5.6	19.3	14.1	22.1
2003	8.3	6.8	5.3	4.6	110.5	113.2	51.8	29.6	24.7	24.7	13.0	10.4	33.6
2004	7.1	7.0	8.8	5.7	5.5	45.6	7.6	2.6	1.8	1.3	4.5	4.2	8.5
2005	3.5	4.1	3.7	5.0	48.1	43.8	18.4	13.9	14.4	14.7	26.3	19.6	17.9
2006	13.4	9.0	5.7	13.3	115.4	45.9	12.4	7.3	6.2	6.2	6.0	5.3	20.5
2007	5.2	4.5	4.1	5.1	36.4	21.2	5.2	1.7	3.0	18.7	38.0	22.6	13.5
2008	15.2	10.4	8.6	7.1	48.9	47.4	11.2	9.5	7.5	17.3	27.2	16.6	18.9
2009	2.9	2.2	1.5	2.1	27.7	20.4	42.2	14.6	6.9	6.1	6.1	5.5	11.5
2010	4.1	3.4	2.6	4.6	16.7	6.6	0.2	0.1	0.2	0.4	0.2	0.3	3.3
2011	0.2	0.0	0.0	0.0	0.3	0.2							
Mean	**6.5**	**5.2**	**4.6**	**5.8**	**52.0**	**33.9**	**19.9**	**17.4**	**17.6**	**17.1**	**17.2**	**9.4**	**18.0**

Golder appreciates the opportunity to assist Cameco with this project. We trust that this report meets your needs at this time. Should you have any questions or comments please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Prepared By

Tyrel Lloyd, P.Eng.
Water Resources Engineer

Reviewed by

Brent Topp, P.Geo.
Associate, Senior Hydrologist

TL/BT/pls/cjf

n:\active\2011\1362\11-1362-0049 beaverlodge 2011 - uranium city, sk\report\report 1\11-1362-0049 - ltr rpt - 11 08 04 - 2010 streamflow assessment near beaverlodge mine.docx

References

Environment Canada. 2011. National Climate Data and Information Archive. Website. http://www.climate.weatheroffice.gc.ca/Welcome_e.html. Last accessed July 19, 2011.

Golder Associates Ltd. (Golder). 2010. Streamflow Assessment near Beaverlodge Mine. Letter Report. Saskatoon, Saskatchewan.

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

Water Survey of Canada (WSC). 2011. Archived Hydrometric Data. Website. http://www.wsc.ec.gc.ca/applications/H2O/index-eng.cfm. Last accessed July 20, 2011.

APPENDIX D

GEOTECHNICAL INSPECTION RESULTS FOR 2011

Table of Contents

1.0 INTRODUCTION

In June 2011 Cameco and the Joint Regulatory Group (JRG), consisting of the Canadian Nuclear Safety Commission (CNSC), Saskatchewan Ministry of Environment (SkMOE), Environment Canada (EC), and the Department of Fisheries and Oceans (DFO), 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 area was 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 3 years to 5 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 SkMOE.

This is the first year that Cameco and the JRG performed the inspection of the Fookes tailings delta and the outlet structures at Marie and Fookes Reservoirs. This report summarizes the observations and recommendations made during the June 7, 2011 inspection of these areas.

2.0 SRK RECOMMENDATIONS

The 2010 SRK report included recommendations to reduce the frequency of third party inspections of the Fookes tailings delta and the two outlet spillways at Fookes and Marie Reservoirs.

With respect to the outlet spillway structures SRK Consulting made the following recommendation:

“Both spillways are performing as designed, and will continue to do so for the foreseeable future, despite additional cracking and grout degradation that will occur with time. In view of these conclusions, it is reasonable to assume that conditions at the outlet spillways are adequate for final close out. In this context, SRK is of the opinion that formal, documented inspections by Cameco and/or regulators should be done annually for the next five years. The specific elements that would be evaluated during these inspections would include the following:

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

If, within that five year period, changes to the outlet structures and/or adjacent rip-rap structures occur to an extent that is deemed significant by regulators, then it may make sense for another inspection by a geotechnical engineer. Regardless, at the end of the 5-year period, a qualified geotechnical engineer should inspect the condition of the outlet structures, assess their performance and determine an appropriate inspection schedule following that inspection." (*SRK 2010*)

With respect to the Fookes Delta SRK Consulting made the following recommendation:

"SRK is of the opinion that formal, documented inspections by Cameco and/or regulators should be done annually for the next five years. The specific elements that would be evaluated during these inspections would include the following:

- The potential presence of new tailings boils or tailings exposures due to frost action, etc.;
- 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.

If, within that five year period, new boils or cover degradation occurs to an extent that is deemed significant by regulators, then it may make sense for another inspection by a geotechnical engineer. Regardless, at the end of the 5-year period, a qualified geotechnical engineer should inspect the condition of the cover, assess its performance and determine an appropriate inspection schedule following that inspection." (*SRK 2010*)

3.0 OUTLET STRUCTURE INSPECTIONS (FOOKES & MARIE RESERVOIR OUTLETS)

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*)

3.1 General Observations

Water levels in the area were extremely low during the inspection despite the inspection occurring in early June (shortly after freshet). Stagnant water at the bottom of both outlet structures provided evidence that water had not flowed through the outlet structures for some time as seen in Photo 2. The areas upstream of the outlet structures were significantly lower than the flow point of the structures as well, meaning that significant hydraulic recharge must occur before water will flow in these spillway channels as seen in Photo 4. Flow measurements and observations made at water sampling Station TL-7 (outlet of the tailings management area) indicate that flow in the Fulton Creek drainage was virtually non-existent through the fall and winter of 2010/11.

Uranium City area has been in a pattern of below normal precipitation for a number of years resulting in abnormally low flows in the Fulton Creek drainage area.

3.2 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

3.3 Marie Reservoir Outlet Structure Checklist

3.3.1 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 during the June 7 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) continue to displace due to ice-jacking.

The photographic record supports the observations made by SRK Consulting and the spillway continues to perform as designed. Photos 1 and 2 are taken from the same spot on the spillway labelled “mark”.

Photo 1 – Marie Reservoir Spillway looking upstream (no flow in spillway)

Photo 2 – Marie Reservoir Spillway looking downstream to stagnant stilling basin

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

Photo 4 – Marie Reservoir at outlet (note: water significantly below flow point to spillway)

3.3.2 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

Given the extremely low water levels and observations made during the June 7, 2011 inspection there was no evidence that overtopping of the rip-rap occurred since the May 2010 inspection.

3.4 Fookes Reservoir Outlet Structure Checklist

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

Photos 5 and 6, taken during the June 7 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 supports the observations made by SRK Consulting and the spillway continues to perform as designed.

Photo 5 – Fookes Reservoir Spillway looking upstream (no flow in spillway)

Photo 6 – Fookes Reservoir Spillway looking upstream from stilling basin

3.4.2 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

Given the extremely low water levels and observations made during the June 7, 2011 inspection there was no evidence that overtopping of the rip-rap has occurred since the May 2010 inspection.

4.0 TAILINGS DELTA

4.1 General Observations

As discussed in the previous section water levels in Fookes Reservoir were significantly lower than previous years. Generally the cover was in good condition showing no areas of excessive erosion. Vegetation is well established in numerous areas; however is more concentrated within 50 m of the Fookes Reservoir shoreline, and the engineered drainage structures. Photos 7 and 8 show the vegetation growth on the cover.

Photo 7 – Vegetation on Fookes Delta (looking SE)

Photo 8 – Vegetation on Fookes Delta (looking SW)

4.2 Inspection Checklist

- New tailing boils or tailings exposure due to frost action?
- 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
- Erosion protection devices performing as expected on former north access road?
  - waterbars (chevrons)
  - diversion ditches
  - erosion of cover adjacent to the former access road
- Earthen berms in place to limit access to the delta?

4.2.1 New tailing boils or tailings exposure due to frost action?

No new tailings boils were noted on the cover. Despite the low regional water table, the waste rock cover along the shoreline of Fookes Reservoir was intact, preventing tailings from being exposed. Photo 9 shows the shoreline of Fookes Reservoir with the waste rock cover in place.

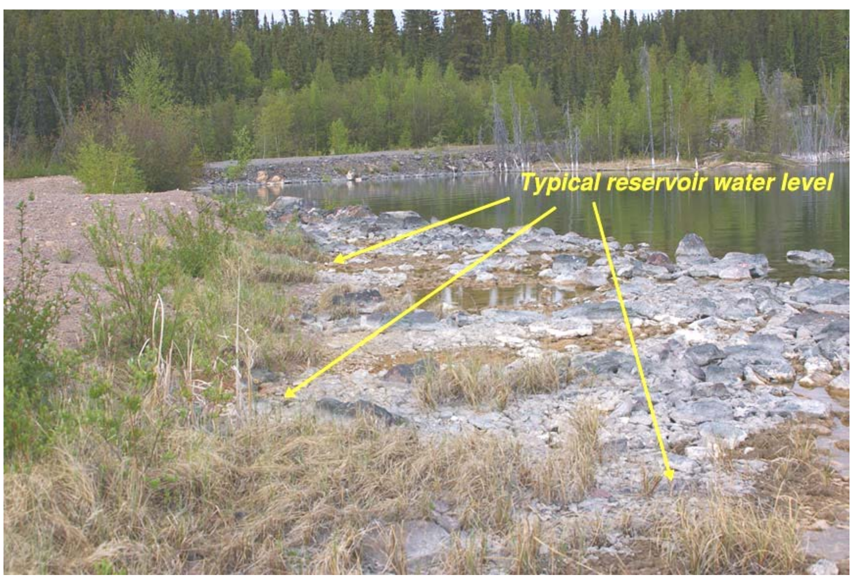


Photo 9 – Fookes Reservoir shoreline

4.2.2 Significant erosion of the cover material?

In general the sand cover was in good condition and showed no signs of excessive erosion. Small fractures were noted in 3 areas of the sand cover. The fractures appear to be settling features as a result of the low regional water table. Photographic record was captured (Photos 11 to 14), along with GPS coordinates, to allow for follow-up monitoring during future inspections. As was noted in the 2010 inspection report, sand has flowed along the base of the tributary ditch that has a rock fill base, but this appears to be a “one off” occurrence that will not threaten the functionality of the ditch in the medium term. In the longer term, as vegetation continues to establish itself, the risk to ditch functionality will diminish further. Photo 11 shows the extent of the sand along the base of the tributary ditch. GPS coordinates were also captured to facilitate follow-up inspection of this feature. A satellite photo showing the relative locations of the features discussed above was generated using Google Earth and is provided for reference as Photo 10.

Photo 10 – Relative position of features observed on Fookes Delta

Photo 11 – Sand flow feature in trench lined with waste rock

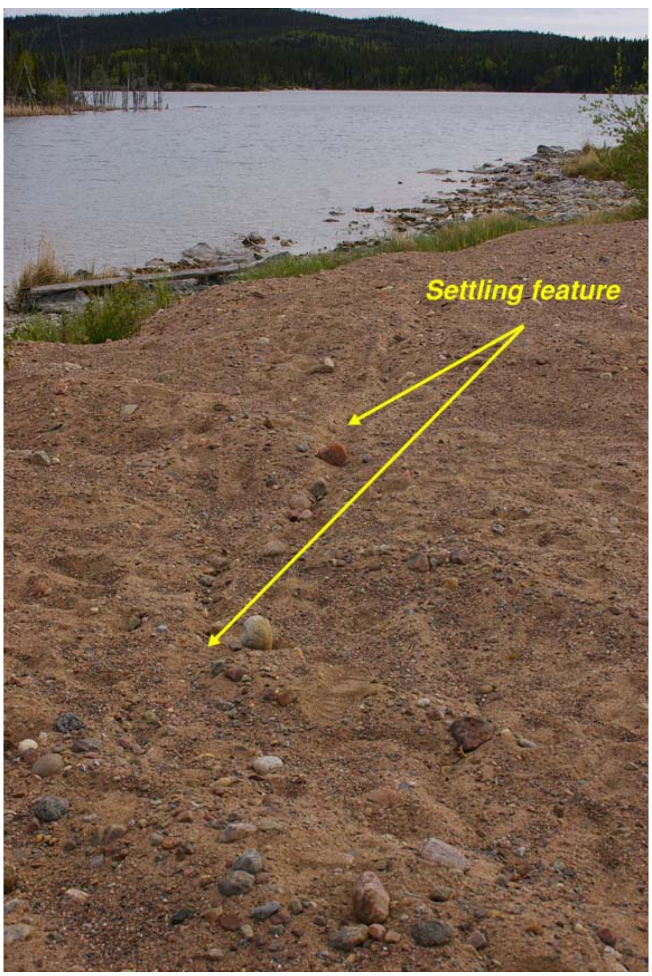


Photo 12 – Settling feature of sand cover on Fookes Delta
(location corresponds with "Settling on Delta #1" of Photo10)

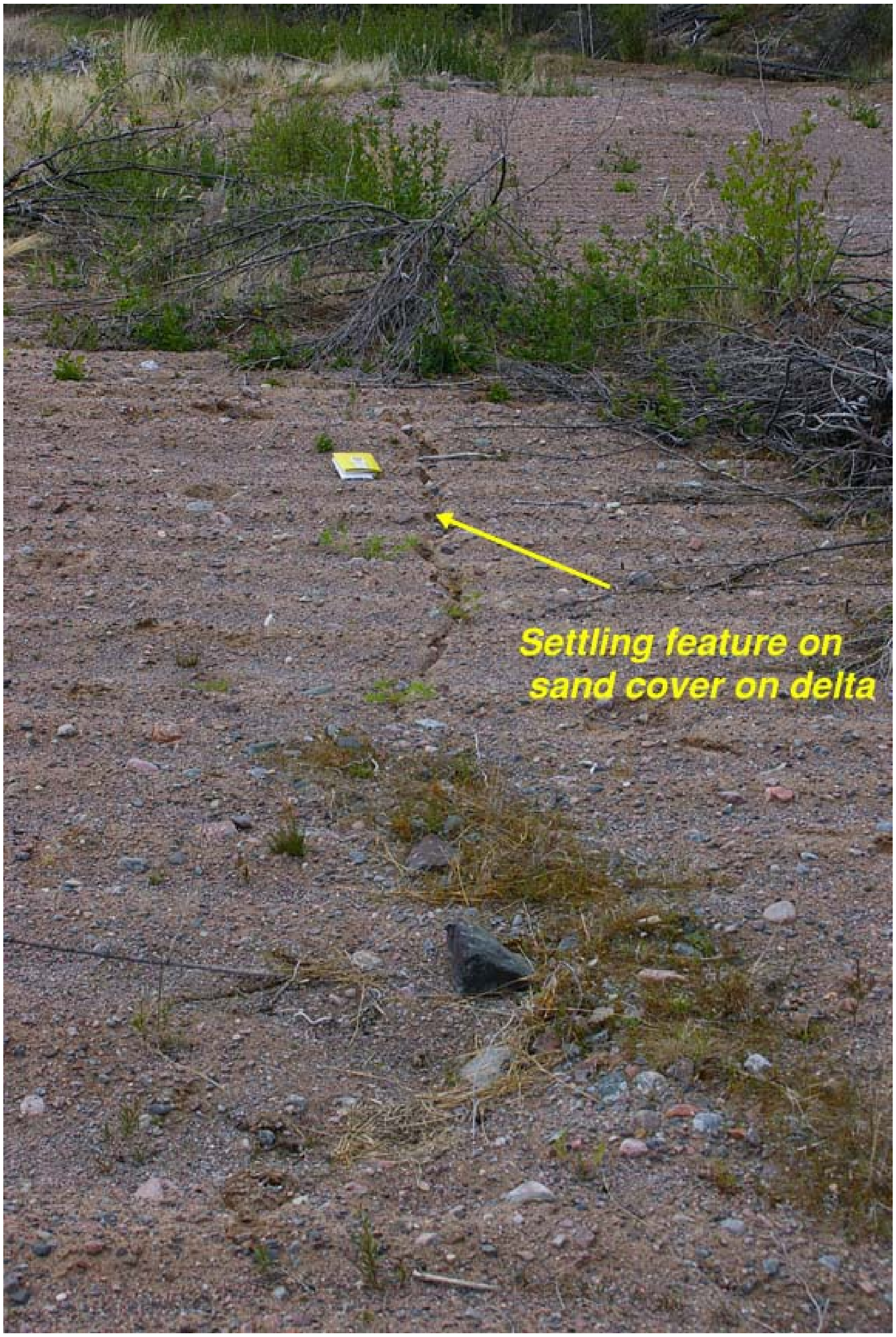


Photo 13 – Settling feature in sand cover at Fookes Delta
(location corresponds with "Settling on Delta #2" of Photo10)

Photo 14 – Close-up of settling feature from previous photo

4.2.3 Erosion protection devices 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 15). In addition to the chevrons, run-out structures were installed to carry away excessive water during extreme run-off events. These run-out structures are also in good shape with minimal eroded material (Photo 16).

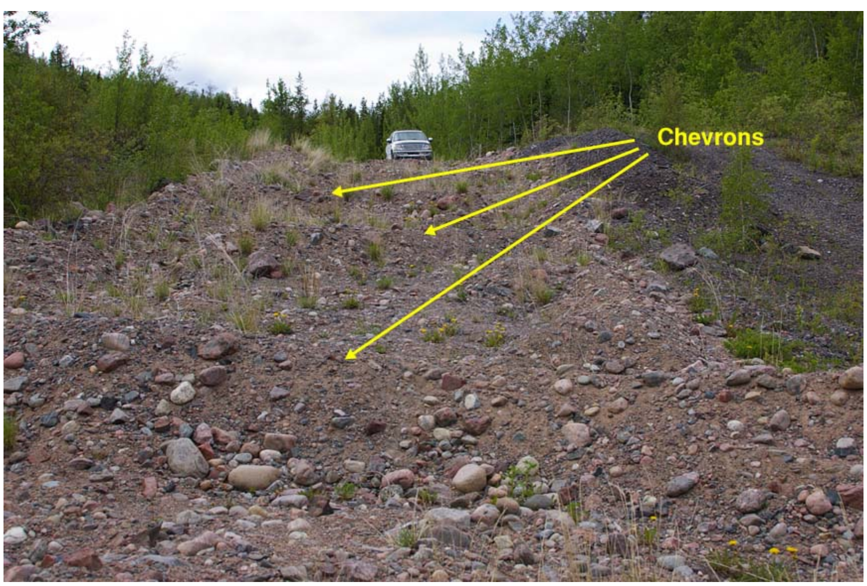


Photo 15 – Chevrons in place on north access point to Fookes Delta

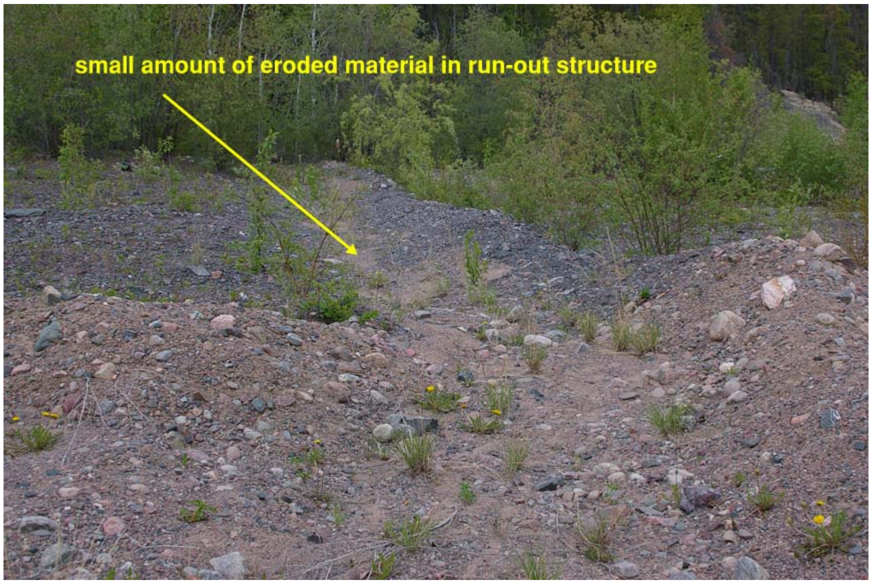


Photo 16 – Run-out structure along north access road

4.2.4 Earthen berms in place to limit access to the delta?

The earthen berms at the north and east access points to the delta are in place. The east access point remains impassable to trucks. At the north access point the potential exists for truck to by-pass the earthen berm however the road access is also filled with chevrons, as discussed previously, making access at this point difficult.

Fresh tire tracks were noted on the Fookes Delta during the inspection (Photo 17). Investigation determined that vehicles were accessing the delta via the west access road from Marie Reservoir.

Photo 17 – tire tracks in sand cover on Fookes Delta

Following the inspection Cameco hired a local contractor to place fill material across the road to prevent further access. This work was completed in July 2011 and will be inspected during the 2012 annual JRG inspection. The tire tracks did not result in significant deterioration of the cover and with the added measures to ensure traffic on the delta is limited this type of event should not occur in the future.

5.0 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.

Station: AN-5

	2010-Jan	2010-Mar	2010-May	2010-Jul	2010-Sep	2010-Nov	2011-May
Alk-T (mg/L)	175.0	208.0	95.0	125.0	112.0	157.0	105.0
As (µg/L)	0.7	0.6	0.3	0.6	0.3	0.3	0.3
Ba (mg/L)	0.220	0.250	0.110	0.180	0.140	0.170	0.130
C-(org) (mg/L)		13.000			11.000		
Ca (mg/L)	51.0	58.0	30.0	35.0	35.0	49.0	33.0
Cl (mg/L)	2.00	3.00	1.00	1.00	1.10	2.00	0.80
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	365	423	222	256	257	355	235
Cu (mg/L)	0.001	0.000	0.002	0.001	0.002	0.001	0.001
Fe (mg/L)	1.470	1.090	0.082	0.310	0.140	0.250	0.140
Hardness (mg/L)	177	202	104	121	123	172	115
HCO3 (mg/L)	214.0	254.0	116.0	153.0	137.0	192.0	128.0
K (mg/L)	2.3	2.7	1.4	1.6	1.8	2.0	1.5
Mg (mg/L)	12.0	14.0	7.2	8.2	8.6	12.0	8.0
Mo (mg/L)	0.001	0.001	0.004	0.001	0.003	0.005	0.004
Na (mg/L)	6.9	8.5	4.0	4.7	5.0	6.7	4.5
Ni (mg/L)	0.00070	0.00060	0.00050	0.00040	0.00050	0.00040	0.00050
NO3 (mg/L)	<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
P-(TP) (mg/L)		0.04			<0.01		
Pb (mg/L)	0.0002	<0.0001	0.0012	<0.0001	0.0002	<0.0001	<0.0001
Pb210 (Bq/L)		0.10			<0.02		
pH-L (pH Unit)	7.43	7.49	7.79	7.73	7.44	7.74	7.54
Po210 (Bq/L)		0.060			0.010		
Ra226 (Bq/L)	1.900	1.900	0.530	1.100	0.630	0.790	0.580
Se (mg/L)	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
SO4 (mg/L)	18.0	17.0	18.0	7.9	18.0	30.0	17.0
Sum of Ions (mg/L)	306	357	178	211	206	294	193
TDS (mg/L)	230.00	279.00	155.00	163.00	173.00	226.00	171.00
TSS (mg/L)	6.000	3.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	212.0	191.0	146.0	29.0	121.0	410.0	162.0
Zn (mg/L)	0.002	0.001	0.003	0.002	0.010	0.002	0.003

Station: BL-3

	2010-Mar	2010-Jun	2010-Sep	2010-Dec	2011-Mar	2011-Jun
Alk-T (mg/L)	75.0	67.0		76.0	74.0	
As (µg/L)	1.1	0.2	0.3	0.3	0.3	0.2
Ba (mg/L)	0.052	0.033	0.035	0.036	0.037	0.035
C-(org) (mg/L)	4.500	2.700	3.200	3.800		
Ca (mg/L)	23.0	21.0		22.0	23.0	21.0
Cl (mg/L)	14.00	13.00		14.00	14.00	12.00
CO3 (mg/L)	<1.0	<1.0		<1.0	<1.0	<1.0
Cond-L (µS/cm)	263	242		252	257	
Cu (mg/L)	0.002	0.001	0.002	0.002	0.002	0.001
Fe (mg/L)	0.011	0.004	0.009	0.002	0.005	0.005
Hardness (mg/L)	81	74		77	80	74
HCO3 (mg/L)	92.0	82.0		93.0	90.0	
K (mg/L)	1.2	1.0		1.3	1.1	1.1
Mg (mg/L)	5.7	5.3		5.5	5.5	5.2
Mo (mg/L)	0.004	0.003	0.004	0.004	0.003	0.004
Na (mg/L)	20.0	19.0		21.0	20.0	19.0
Ni (mg/L)	0.00290	0.00190	0.00430	0.00410	0.00160	0.00120
NO3 (mg/L)	<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)	0.02	<0.01	<0.01	<0.01		
Pb (mg/L)	0.0003	0.0001	0.0001	0.0003	<0.0001	0.0002
Pb210 (Bq/L)	<0.02	<0.02	<0.00	<0.02		
pH-L (pH Unit)	7.98	7.93		8.02	7.90	
Po210 (Bq/L)	<0.005	<0.005	0.002	<0.005		
Ra226 (Bq/L)	0.070	0.030	0.040	0.050	0.030	0.020
Se (mg/L)	0.0032	0.0027	0.0030	0.0029	0.0028	0.0027
SO4 (mg/L)	34.0	32.0		35.0	34.0	32.0
Sum of Ions (mg/L)	190	173		192	188	163
TDS (mg/L)	160.00	147.00		144.00	155.00	
TSS (mg/L)	1.000	<1.000		<1.000	<1.000	
U (µg/L)	151.0	135.0	144.0	151.0	134.0	143.0
Zn (mg/L)	0.005	0.006	0.005	0.004	0.005	0.002

Station: BL-4

	2010-Mar	2010-Jun	2010-Sep	2010-Dec	2011-Mar
Alk-T (mg/L)	71.0	67.0	65.0	75.0	69.0
As (µg/L)	0.3	0.2	0.3	0.3	0.3
Ba (mg/L)	0.037	0.032	0.035	0.034	0.034
C-(org) (mg/L)	3.400	3.200	3.100	3.500	3.600
Ca (mg/L)	22.0	21.0	21.0	21.0	22.0
Cl (mg/L)	14.00	13.00	14.00	15.00	14.00
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	256	240	244	245	249
Cu (mg/L)	0.001	0.001	0.001	0.002	0.001
Fe (mg/L)	0.013	0.004	0.150	0.003	0.002
Hardness (mg/L)	77	74	74	74	77
HCO3 (mg/L)	87.0	82.0	79.0	92.0	84.0
K (mg/L)	1.1	1.1	1.1	1.3	1.1
Mg (mg/L)	5.4	5.3	5.2	5.3	5.3
Mo (mg/L)	0.004	0.003	0.004	0.004	0.005
Na (mg/L)	20.0	19.0	19.0	20.0	20.0
Ni (mg/L)	0.00100	0.00170	0.00210	0.00210	0.00140
NO3 (mg/L)	0.09	<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)	0.02	<0.01	<0.01	<0.01	<0.01
Pb (mg/L)	0.0002	<0.0001	<0.0001	0.0002	<0.0001
Pb210 (Bq/L)	0.04	<0.02	<0.02	<0.02	0.03
pH-L (pH Unit)	8.08	7.94	7.74	8.02	7.88
Po210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005
Ra226 (Bq/L)	0.040	0.040	0.020	0.040	0.030
Se (mg/L)	0.0027	0.0026	0.0029	0.0028	0.0028
SO4 (mg/L)	34.0	32.0	32.0	34.0	32.0
Sum of Ions (mg/L)	184	173	171	189	178
TDS (mg/L)	158.00	146.00	147.00	137.00	142.00
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	151.0	133.0	144.0	147.0	144.0
Zn (mg/L)	0.007	0.004	0.003	0.008	0.001

Station: BL-5

	2011-Mar	2011-Jun
Alk-T (mg/L)	68.0	65.0
As (µg/L)	0.2	0.2
Ba (mg/L)	0.046	0.035
Ca (mg/L)	21.0	21.0
Cl (mg/L)	7.40	13.00
CO3 (mg/L)	<1.0	<1.0
Cond-L (µS/cm)	196	242
Cu (mg/L)	0.002	0.000
Fe (mg/L)	0.011	0.013
Hardness (mg/L)	71	74
HCO3 (mg/L)	83.0	79.0
K (mg/L)	1.1	1.1
Mg (mg/L)	4.6	5.2
Mo (mg/L)	0.002	0.004
Na (mg/L)	10.0	19.0
Ni (mg/L)	0.00010	0.00020
NO3 (mg/L)	0.26	2.90
OH (mg/L)	<1.0	<1.0
Pb (mg/L)	<0.0001	<0.0001
pH-L (pH Unit)	7.69	7.72
Ra226 (Bq/L)	<0.005	0.040
Se (mg/L)	0.0009	0.0027
SO4 (mg/L)	17.0	31.0
Sum of Ions (mg/L)	144	169
TDS (mg/L)	111.00	144.00
TSS (mg/L)	2.000	4.000
U (µg/L)		138.0
Zn (mg/L)	0.001	<0.001

Station: DB-6

	2010-Jan	2010-May	2010-Jul	2010-Sep	2010-Nov	2011-May
Alk-T (mg/L)	92.0	80.0	85.0	84.0	94.0	79.0
As (µg/L)	0.2	0.1	0.2	0.1	0.1	0.2
Ba (mg/L)	0.049	0.039	0.044	0.048	0.054	0.045
C-(org) (mg/L)				8.700		
Ca (mg/L)	39.0	33.0	36.0	36.0	41.0	33.0
Cl (mg/L)	0.70	0.60	0.70	0.70	0.60	0.60
CO3 (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cond-L (µS/cm)	244	210	226	233	249	208
Cu (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001
Fe (mg/L)	0.015	0.007	0.029	0.015	0.010	0.007
Hardness (mg/L)	122	104	113	113	129	104
HCO3 (mg/L)	112.0	98.0	104.0	102.0	115.0	96.0
K (mg/L)	0.8	0.8	0.8	0.8	2.0	0.8
Mg (mg/L)	6.1	5.2	5.6	5.7	6.5	5.2
Mo (mg/L)	0.002	0.002	0.002	0.002	0.002	0.002
Na (mg/L)	1.9	2.0	2.1	2.2	2.7	1.9
Ni (mg/L)	0.00020	0.00020	0.00020	0.00020	0.00010	0.00020
NO3 (mg/L)	0.53	0.09	<0.04	<0.04	0.09	<0.04
OH (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
P-(TP) (mg/L)				0.02		
Pb (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pb210 (Bq/L)				<0.02		
pH-L (pH Unit)	7.73	7.80	7.95	7.73	7.78	7.77
Po210 (Bq/L)				0.007		
Ra226 (Bq/L)	0.030	0.030	0.030	0.030	0.030	0.030
Se (mg/L)	<0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001
SO4 (mg/L)	29.0	26.0	27.0	29.0	31.0	26.0
Sum of Ions (mg/L)	190	166	176	176	199	164
TDS (mg/L)	162.00	154.00	144.00	162.00	166.00	143.00
TSS (mg/L)	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
U (µg/L)	261.0	208.0	213.0	272.0	284.0	239.0
Zn (mg/L)	0.001	<0.001	0.001	0.001	0.005	<0.001