Quinsam Coal
Annual Water Quality Monitoring Report 2017-2018

PREPARED BY: QUINSAM COAL CORPORATION

June, 2018

GLOSSARY & ACRONYMS

B.C. British Columbia

CALA Calibration

CCR Coarse Coal Reject

COPC Contaminants of Potential Concern

DL Detection Limit

DO Dissolved Oxygen

ENV Ministry of Environment and Climate Change Strategy

EMS Environmental Monitoring Station

EMPR Ministry of Energy, Mines and Petroleum Resources

EPT Ephemeroptera, Plecoptera, and Trichoptera

Ha Hectares

Hp Horsepower

IDZ Initial Dilution Zone

km Kilometer

LLE Long Lake Entry

LLSPTS Long Lake Seep Passive Treatment System

Masl Metres above sea level

MDL Mean Detection Limit

MOE Ministry of Environment

PAG Potentially Acid Generating

PAH Polyromantic Hydrocarbons

PEP Provincial Emergency Program

PNC Permit Non-compliance

QA/QC Quality Assurance/Quality Control

QCC Quinsam Coal Corporation

RPD Relative Percent Difference

TDS Total Dissolved Solids

TSS Total Suspended Solids

VIO Vancouver Island Objective for Phosphorus in Streams

WQG British Columbia Water Quality Guidelines for Protection of Aquatic Life

WQO Water Quality Objectives for Middle Quinsam Lake Sub-Basin

Table of Contents

Glossary & Acronyms ii

Executive Summary ix

1.0 Introduction 1

2.0 Water Management Systems and Monitoring Locations 5

2.1 Mine Related Discharge 6

2.1.1 The North Water Management System 6

2.1.2 The South Water Management System 10

2.1.3 7-South Water Management System 13

2.2 Receiving Environment Sites 16

2.2.1 River, Stream & Lake Monitoring Sites 16

2.2.2 Groundwater Monitoring Sites 18

2.3 Additional Monitoring Programs 19

2.3.1 Baseline Monitoring Programs 19

2.3.2 Sediment and Benthic Monitoring Program on the Quinsam Watershed for Effluent Permit PE:7008 20

2.3.3 Long Lake Seep Passive Treatment System & Loading Assessment (LLSPTS) 22

2.4 Maintenance & Reclamation Activities 22

3.0 Chemical Reagents and Waste Storage 23

4.0 Incidents - Permit Limit Exceedances & Permit Non-Compliances 23

5.0 Materials and Methods: Environmental Monitoring Program 25

5.1 Water Quality Analysis 25

5.2 Environmental Monitoring Equipment 26

5.3 Quality Assurance/Quality Control 27

6.0 Hydrology 31

6.1 North Water Management System 31

6.1.1 Authorized Discharge Rates at Settling Pond #4 (WD) E207409 31
6.2 South Water Management System 32
6.2.1 Authorized discharge Rates at Settling Pond #1 (SPD) E218582.....32
6.2.2 South Water Management System Entrance into Long Lake (LLE) E292130 34
6.2.3 Seep Monitoring Sites, Long Lake Seep (LLSM) – E292131.....34
6.3 7-South Mining Operation Decant (7SSD) - E292069 35
6.4 Receiving Environment 38
7.0 Water Quality: In-Mine Mine Releases & Water Management Systems.....38
7.1 North Water Monitoring Sites 40
7.1.1 Settling Pond #4 (WD) EMS #E207409.....40
7.1.2 General Parameters.....40
7.1.3 Culvert into Middle Quinsam Lake (WC) EMS #E207411.....42
7.2 South Water Monitoring Sites 42
7.2.1 Settling Pond #1 (SPD) EMS #E218582 and Biocell Downstream (BDS).....43
7.2.2 Long Lake Entrance (LLE) EMS #E2922130 45
7.2.3 Long Lake Seep.....48
7.3 7-South Water Monitoring Sites 49
7.3.1 7-South Settling Pond (7SSD) EMS #E292069.....50
7.4 Middle Point Facility 53
7.5 Bioassays 53
8.0 Water Quality in the Receiving Environment.....54
8.1 Lakes.....56
8.1.1 Seasonal Trends.....57
8.2 River and Stream Sites 67
8.2.1 Middle Quinsam Lake Inflow (WA) EMS #0126402 and Outflow (WB) EMS #0900504 68

8.2.2 No Name Outlet (NNO) EMS # E217017 and Long Lake Outlet (LLO) EMS # E21941269

8.2.3 Stream 1 – (7S) EMS # E292109 and Lower Wetland Outlet (LWO) EMS #E29211269

8.2.4 Quinsam River Downstream Site 1 (QRDS1) EMS # E286930 & 7-South Quinsam River (7SQR) EMS # E292113 71

8.2.5 Iron River 71

9.0 Biota Monitoring in the Receiving Environment 73

9.1 Phytoplankton 73

9.1.1 Methods 73

9.1.2 Results 74

9.2 Zooplankton 81

9.2.1 Methods 81

9.2.2 Results 82

Conclusion 85

10.0 Closing 87

List of Tables within Report

Table 1: Description of Monitoring Sites: In-Mine Releases & Initial Dilution Zones 6

Table 2 : Receiving Water (Stream and Lake) Monitoring Sites 16

Table 3: Groundwater Wells and Underground Sumps Monitored in 2017-2018 19

Table 4: Sediment and Benthic Monitoring Sites 21

Table 6: List of Monitoring Stations, Parameters and Statistics 39

Table 7: Permit Limits Applied to Settling Pond #4 40

Table 8: Permit Limits Applied to SPD and BDS 43

Table 9: Approved 30-day Average Water Quality Guideline for Sulphate to Protect Aquatic Life 46

Table 10: Permit Limits Applied to 7SSD EMS #E292069 50

Table 11: Water Quality Prediction Model-Best and Worst-Case Scenarios Compared to Measured Concentrations at 7SSD 52

Table 12: Water Quality Prediction Model-Best and Worst Case Scenarios Compared to Measured Concentrations at 7S 52

Table 13: Water Quality Guidelines and Objectives Applied to Receiving Environment Stations 55

Table 14: Summary of Water Quality Guideline Observations at Lake Monitoring Sites 57

Table 15: Summary of Water Quality Guideline Exceedances in the Streams and Rivers 67

Table 16: Chlorophyll a Concentrations, 1 m Depth, Quinsam Lakes System, 2017 74

Table 17: Phytoplankton Abundance, Quinsam Lake System, 2017 77

Table 18: Phytoplankton Taxon Richness, Quinsam Lake System, 2017 79

Table 19: Predominant and Common Larger Phytoplankton Taxa, Quinsam Lakes System, 2017 80

Table 20: Zooplankton Abundance, Quinsam Lake System, 2017 (vertical tow, 0 to 10 m) 82

Table 21: Zooplankton Taxon Richness, Quinsam Lake System, 2017 (vertical tow, 0 to 10 m) 84

List of Figures within Report

Figure 1: Water Movement and Flow Path in the North Management System 9

Figure 2: Water Movement & Flow Path in the South Water Management System 12

Figure 3: Water Movement and Flow Path at the 7-South Operation 15

Figure 4: Settling Pond #4 Maximum Daily and Cumulative Discharge, 2017/2018 31

Figure 5: Settling Pond #1 Maximum Daily and Cumulative Discharge, 2017/2018 33

Figure 6: Groundwater and Mine Pool Water Elevations vs. Long Lake Seep Flow, 2013 through 2018 35

Figure 7: Monitoring Site 7S Stage Discharge Curve 36

Figure 8: 7SSD Discharge, 2017/2018.....37

Figure 9: Total Phosphorus at LLE and Long Lake May through September 2011- 2017.....47

Figure 10: Chlorophyll a (µg/L) at 1 m Depth, Quinsam Lakes System, 2013 – 2017.....76

Figure 11: Total Phytoplankton Abundance, 1 m Depth, Quinsam Lakes System, 2013 – 201778

Figure 12: Total Zooplankton Abundance (0 to 10 m Vertical Tows), Quinsam Lakes System, 2014 to 2017 (no samples analyzed in Spring 2017) 83

Figure 13: Zooplankton Abundance by Group, Quinsam Lakes System, 2017 (no samples analyzed in Spring 2017) 85

List of Appendices

APPENDIX I – Tables of all monitoring locations and parameters required under PE-7008

APPENDIX II – Graphs of Key Monitoring Locations and Parameters of interest

APPENDIX III – Bioassay Results - Settling Pond #4, BDS, 7SSD, LLSM and 3SDS

APPENDIX IV –Biota Monitoring Analytical Results for Lakes

APPENDIX V – MoE Compliance Review Record & ETRC Agency and Stakeholder Tracking Table

APPENDIX VI – Long Lake Seepage Treatment – Supplemental Evaluation

APPENDIX VII – Exceedances / Spill Reports for 2017-2018

APPENDIX VIII – Annual Status Form 2017-2018

APPENDIX IX – Annual Groundwater Monitoring Report 2017-2018

APPENDIX X – Site Map

EXECUTIVE SUMMARY

In accordance with Effluent Permit PE-7008 issued under the *Environmental Management Act*, Quinsam Coal Corporation (QCC) operates water management systems designed to mitigate effects of mining activities on the Middle Quinsam Sub-Basin and Iron River watershed(s). This effluent permit provides the framework for the comprehensive monitoring program along with allowable levels of Parameters of Interest (POI) within water released from the permitted management systems. In addition to surface water quality monitoring within management systems and receiving environments, local groundwater and biological monitoring was conducted at numerous stations for a more comprehensive understanding of effects within the mine footprint.

Quinsam Coal was held in "care-and-maintenance" mode until June 17th, 2017 when ERP Compliant Fuels, currently one of the largest producers of metallurgical coal in North America, purchased Quinsam Coal Corporation. The change in ownership did not result in immediate production of coal as the initial focus was on rehabilitation and set-up of the 2-North and 7-South mines. Recommencement of mining activity at Quinsam included key activities:

- Rehabilitation (scaling the roof and ribs and re-installing ground support) of the 2-North belt road and re-installing the conveyor structure and

- Re-installing the conveyor structure into 7-South Areas 2, 3 and 4

Coal production commenced from the 2-North mine on September 28th, 2017 and mining commencing in the 7-South mine on December 18, 2018.

The main objective of this report is to inform governing bodies and stakeholders on the effectiveness of the management systems and compliance with the effluent permit for the 2017-2018 monitoring year including:

- Description of mine-site operations and their respective environmental management systems
- Report on environmental performance along with compliance with the Effluent Permit PE-7008
- Provide updates on surface, groundwater and receiving environment water including biological integrity

- Provide insight and recommendations for future monitoring and best environmental practices

Mine discharges released from permitted locations were within allowable levels for the majority of samples obtained this monitoring period. A permit limit exceedance observed for dissolved iron (0.5 mg/L) occurred at Settling Pond #1 EMS # E218582 on January 8th, 2018 resulting in 0.614 mg/L. The dissolved iron exceedance was thought to be attributed to high inflows of water causing turbidity due to the mixing of bottom, iron rich sediment, spill report # DGI-173540.

An unauthorized discharge occurred in January 2018 at the 3-South Pit in to the No Name Lake connector stream. The spill occurred during a heavy rain event in January as large amounts of water entering the pit spilled caused overflow of the designed spillway channel that is currently awaiting permitting. This overflow occurred intermittently for 24 hours and was mitigated with an additional pump directing water to Settling Pond #1. Spill report No. DGI-173610.

The permissible annual average rate of discharge at Setting Pond #4 (0.008 m^3/s) was exceeded with an average discharge rate of 0.1326m^3/s. Discharge rates are currently being investigated with possible future permitting considered authorizing larger volumes of water through this structure.

Spill reports can be found in Appendix VII including description of the spill, follow up and mitigative techniques.

Numerous water quality guideline (WQG) exceedances across the receiving environment were observed this monitoring year. Majority of the exceedances were anomalous and inconsistent, not thought to be attributed to any point source discharges from the mine.

Sulphate concentrations at depth in Long Lake have continued to be a focal point for receiving environment water quality as elevated levels have persisted throughout past monitoring. In 2017, levels declined slightly when compared to previous monitoring years with average concentrations remaining at WQG's of 128 mg/L. In Middle Quinsam Lake sulphate increased at 1mb during spring with average concentrations resulting in 92 mg/L. Concentrations declined during summer and fall to 58 mg/L and 34 mg/L, respectively.

Hypolimnetic dissolved oxygen occurred in the hypolimnion zone during summer and fall at Long and Lower Quinsam Lakes coinciding with elevated concentrations of total manganese in Long Lake at 1mb during fall and total and dissolved iron in Lower Quinsam Lake at 1mb, during summer.

The required spring 2017 zooplankton samples were not collected at any of the lakes (NNL, LLM, MQL and LQL) due to an Environmental department error.

The Long Lake Seep Passive Treatment System has been effective at reducing sulphate concentrations from mine pool water however; it has been difficult to determine whether this system has a positive effect with respect to sulphate concentrations within Long Lake and seep discharge. In January 2018, the treatment system pump failed, and the treatment system has not been operating since January as a result. The pump is currently scheduled for repair in July 2018. Lorax was contracted to produce a report on the effectiveness of the Treatment System on Long Lake sulphate concentrations and the relationship with seep flow. The report "*Long Lake Seepage Treatment System - Supplemental Evaluation*" was submitted to both the ENV and EMPR in June 2018 and is available in Appendix VI. This report replaces the required annual evaluation and loading assessment for Long Lake.

Groundwater monitoring is important for the understanding of cumulative mine inputs into undisturbed areas and receiving environments. Arsenic iron, manganese and sulphate are key parameters to monitor as they directly related to coal mining operations at Quinsam Coal. Currently, no inputs are known to have significant detrimental effects on receiving environments, but future monitoring will be an effective means to identify and determine changes. The comprehensive report is available in Appendix IX.

1.0 INTRODUCTION

The Quinsam Mine is located in the Quinsam River Watershed, approximately 28 kilometers (km) by road southwest of Campbell River. The land reserved by the Quinsam mining operation consists of approximately 283 hectares (ha) and is owned and operated by Quinsam Coal Corporation (QCC). Active mining operations were suspended in mid-January 2016 due to ongoing poor market conditions and a decreased demand for thermal coal. The mine had transitioned into a "Care and Maintenance" program shortly after focusing on maintenance, asset protection and reclamation, specifically the 242 area and the 1 – 4 and 7-South areas. The mine obtained new ownership in June 2017 with the prospect of restarting mine operations. In September 2017, coal production occurred from 2-North mining area with coal production occurring in mid-December from the 7-South mine.

The Quinsam Mine produces High Volatile "A" Bituminous thermal coal. Coal is processed at an onsite preparation plant, transported by B-train highway trucks to the Middle Point Barge Terminal north of Campbell River. Coal is then shipped via barge, to local customers and to Texada Island where it is then loaded onto a ship and sent to local companies or exported abroad.

Due to the mine's location, adjacent to Middle Quinsam Lake, the Quinsam River, No Name Lake, and Long Lake, which drain into Lower Quinsam Lake, the operational permits issued by the Ministry of Environment (MOE) and Climate Change Strategy (ENV) as well as the Ministry of Energy, Mines and Petroleum Resources (EMPR) established stringent effluent quality standards. Accordingly, QCC has maintained an environmental management system defined by the requirements of Effluent Permit PE-7008 and defined in the C-172 Mines Act permit. The mine has collaborated with regulators and stakeholders on key management aspects to minimize mine related effects in the receiving environment.

Sulphate concentrations in surface waters of the receiving environment (e.g. Long Lake) continued to be a focus for the QCC monitoring program. Although PE-7008 lists only one sulphate limit for effluent (500 mg/L at 7SSD), sulphate is routinely monitored at designated sites on the mine site and in the receiving environment. Quinsam continues to assess sources of sulphate and management options to mitigate concentrations in mine related discharge(s).

On-Site Water Quality and Activities

The North, South, and 7-South water management systems represent the cumulative mine related discharges to the Quinsam watershed. As such, strategic operation of management structures is designed for discharge waters to meet permit requirements and be of suitable quality for discharge into the receiving environment. Permit limits for parameters of interest have been established and are closely monitored to ensure environmental protection.

Bioassays

Rainbow Trout 96-hour bioassays were performed on water collected from Settling Ponds #1 (at BDS) and Settling Pond #4 and 7SSD. Each of these tests passed with 100% survival rates.

Receiving Water Quality

Water quality attainment in the Middle Quinsam Sub-Basin remains a key management objective at QCC. Comparison to provincial WQGs and Middle Quinsam Sub-Basin water quality objectives (WQOs) is used to evaluate receiving water quality, aquatic health, and overall operational performance.

Monitoring sulphate concentrations continues to act as an essential practice to evaluate mine impacts as it is a key parameter traced back to coal mining. Sulphate concentrations are compared to an average WQG of 128 mg/L, are calculated using a background hardness of 30 mg/L for the Middle Quinsam Sub-Basin. Sulphate results averaged over five weekly samples collected over 30 days (5 in 30) were compared to the WQO. Other parameters of interest for the receiving environment are total arsenic, copper, iron, manganese, and zinc and dissolved iron and aluminum. Elevated dissolved aluminum and total copper, and zinc concentrations are associated with high rainfall events (elevated TSS) and may not be associated with mine related discharges; however, elevated concentrations are considered in the context of aquatic effects. Monitoring at sites upstream of mine influences (e.g., IR1 in the Iron River) indicates naturally elevated concentrations of dissolved aluminum during high flow events. These metals and other parameters that are higher than WQGs or WQOs are discussed below. Total phosphorous concentrations are compared to the Vancouver Island Objective (VIO) for streams (a maximum of 0.01 mg/L and average of 0.005 mg/L) at one wetland Long Lake Entry (LLE).

Groundwater Quality

QCC maintains a comprehensive groundwater monitoring program to characterize water quality associated with mining development. There is a total of 35 groundwater wells including underground sumps located in-situ (disturbance footprint) and ex-situ (outside of mine workings) that are monitored. In the absence of groundwater well samples, underground sump samples are used for comparison. Results for ex-situ wells are compared to Contaminated Sites Regulations Standards for Protection of Aquatic Life (CSR-AW) and those for in-situ wells and sumps are compared to source terms derived for particular mining areas. Groundwater quality is influenced by bedrock chemistry, an example being the presence of realgar (arsenic sulphide) in the Dunsmuir Sandstone overlying the No. 4 coal zone, resulting in dissolved arsenic in the south area groundwater being naturally higher than the CSR-AW. Parameters of interest for groundwater are those with concentrations higher than the CSR-AW: arsenic, chloride, fluoride, sulphide as (H_2S) and sulphate. Overall, in-situ groundwater at Quinsam Coal is generally within the water quality prediction scenarios and ex-situ groundwater typically trends below most CSR-AW guidelines. The two exceptions to the aforementioned is groundwater influenced by host geological formations (e.g. Dunsmuir Member sandstones, Cumberland Member No.1 Coal seam and mudstones) with naturally elevated concentrations of parameters of interest and by weathering processes (i.e. mine wall oxidation and flushing) of disturbed materials within the mine footprint.

Receiving Water Sediment and Biota

QCC conducted a comprehensive biological monitoring program in 2016, as stipulated in Section 4.2.4 and 4.2.7 of the effluent permit. The August through October program involved sediment and benthic invertebrate monitoring at 23 locations in the watershed (at five lakes, one wetland, and three locations on the Quinsam River). In the four lakes exposed to mine influences, samples were collected at inlets, deep sites, seeps, and outlets.

Sediment results were compared to generic Canadian Council of Ministers of Environment (CCME) Interim Sediment Quality Guidelines (ISQG) and Probable Effect Levels (PEL) and to site-specific sediment quality objectives (SQOs) developed for Long Lake that reflect the naturally elevated background levels of some metals. The SQOs were derived from studies completed prior to mining influence in Long Lake (pre-1987). Where background levels are lower than ISQG's, the ISQGs are used for comparison. Primary parameters of interest for sediment are arsenic, iron, manganese and total polycyclic aromatic hydrocarbons (PAH), identified based on concentrations, relative

toxicity, and findings in previous reports. Most of the elevated concentrations are related to geology (host rock formations), although mining has contributed inputs. The next round of sediment sampling is scheduled for 2020-2021.

Water quality in the Middle Quinsam Sub-Basin and Iron River largely meets WQGs and WQOs and is considered a healthy aquatic ecosystem. Throughout the monitoring period, Quinsam has demonstrated that mine water management system(s) and procedure(s) are an effective tool in reducing parameters of interest loading in the receiving environment.

Benthic invertebrate samples from lakes and the wetland were analyzed for community metrics (density, taxon richness, diversity, evenness, major taxonomic groups), and for ecologically relevant and statistically significant differences among sites. Quinsam River sites were sampled and analyzed using the Canadian Aquatic Biomonitoring Network (CABIN) method.

Phytoplankton and zooplankton samples collected once per sampling event on all four lakes as a routine requirement of PE-7008s. Samples were analyzed for count, identification and species abundance.

Long Lake Seep Passive Treatment System-

The Long Lake Seep Passive Treatment System (LLST) consists of a series of treatment cells designed to receive mine-water pumped from the 2-South underground workings to reduce Parameters of Interest (POI) concentrations including dissolved sulphate and iron. This system was initiated as part of a remediation plan to limit localized mine-water seepage on the south-side of Long Lake as a result of subsidence caused by mining within close proximity and establishing an evident hydrologic connection.

The Long Lake Passive Treatment System (LLTS) continues to demonstrate reduction in sulphate concentrations throughout the system. Higher reduction is observed during warmer conditions, with reduction efficiencies of upwards of 300 mg/L. The addition of molasses (carbon source) has shown some capability to increase performance within the system.

2.0 WATER MANAGEMENT SYSTEMS AND MONITORING LOCATIONS

Settling ponds, sumps and ditches have been constructed to manage and treat mine contact water to help mitigate any negative effects on the receiving environment. Water management at the Quinsam Mine is divided into three discrete areas: North, South, and 7-South. Appendix XI, Site Map, displays underground mine locations, groundwater wells and surface monitoring sites. Table 1 below describes the within-mine releases monitoring sites and associated initial dilution zones.

Table 1: Description of Monitoring Sites: In-Mine Releases & Initial Dilution Zones

EMS ID #	Monitoring Sites	Station Code	*Type of Water (MW, FW,GW or IDZ)
North Coal Mining Operation			
E207409	**Settling Pond #4 Decant**	**WD**	**Discharge (MW)**
E207411	Culvert, at Middle Quinsam Lake Road	WC	MW & FW
E283433	2-North Portal Sump (Adit Sump)	2NPS	MW
E207412	2-North Pit Sump CCR Cover	WP	PAG-CCR Water Cover - MW
E292126	South Dyke Sump	SDS	MW
South Coal Mine			
E218582	**Settling Pond #1 Decant**	**SPD**	**Discharge (MW)**
E217014	Culvert, Downstream End at Access Road	SPC	MW & FW
E217015	South Pit Main Sump Water	3S	PAG-CCR Water Cover (MW & FW)
E292127	2-South Pit In Pit Water Cover (2-South Standpipe)	2S	PAG-CCR Water Cover (MW & FW)
E292128	1977 Bulk Sample Pit	3S77	MW & FW
E292129	Culvert Downstream of 4 South Access Road	4S-Lo	**MW & FW**
7-South Mining Operation			
E292069	**7-South Surface Decant**	**7SSD**	**Discharge (MW & FW)**
E292110	7-South Adit Sump	7SPS	MW
Seep Monitoring Sites			
E292131	Long Lake Seeps	LLS & LLSM	MW
	Small seep near the plant (PDS) & groundwater surface near road entering MQL (PDSR)	PDS & PDSR	GW & MW
Long Lake Seep Passive Treatment System			
N/A	Groundwater well (2-South Mine Pool) Influent to the treatment system	QU11-11 (INF-EFF)	MW
N/A	Bio Cell Reactor	BCR-EFF	MW
N/A	Sulphide Polishing Cell	SPC-EFF	MW
N/A	Aeration Lagoon	AL-EFF	MW
N/A	Settling Pond Effluent	SP-EFF	**Discharge MW**
Authorization to Bypass the Works			
N/A	Sampling location 35 m downstream of discharge from the treatment system (SP-EFF) and Settling Pond #1. Discharge is compared to SPD permit limits.	BDS	**Discharge MW**
Initial Dilution Zone (IDZ) Monitoring Sites			
E292130	Long Lake Entrance (South end water entering Long Lake)	LLE	IDZ
E292109	Road Crossing Bridge on Stream 1 above the Lower Wetland (Downstream of 7SSD). The site name is Stream 1, 7S.	7S	IDZ

*** MW= Mine Water, FW= Freshwater, GW =Groundwater IDZ = Intial Dilution Zone**

2.1 MINE RELATED DISCHARGE

2.1.1 *THE NORTH WATER MANAGEMENT SYSTEM*

The north water management system is designed to collect mine related runoff from the north disturbed surface areas and pumped water from the 2-North underground mine operations. This system includes catchment sumps and ditches, pipelines, a subaqueous storage facility for

potentially acid generating (PAG) coarse coal reject (CCR) and Settling Pond # 4 (WD) EMS #E207409.

The 2-North subaqueous PAG-CCR facility (WP) EMS #E207412 contains waste rock from 5-South Mine coal processing and is stored with at least 1.50 m of water cover to inhibit acid generation from the stowed material. This water cover is sourced from underground pumps and maintained by QCC personnel.

Based on hydrogeology of the area and mine workings depth, the 2-North mine must be dewatered to allow operations underground. A series of underground pumps move water to surface as needed. The underground dewater wells 1 and 5 Mains are both equipped with 2 X 200 horsepower (HP) surface pumps capable of pumping approximately 1500 gallons per minute collectively. Additional systems are installed to dewater portions of the mine that are hosting operations and are used intermittently as required.

Settling Pond # 4 collects gravity fed water from Brinco Brook, which includes disturbed surface runoff, tailings dam seepage, and underground water collected at 2-North Portal Sump (2NPS) EMS #E283433. The underground dewatering wells 1 and 5 Mains discharge directly into Brinco Brook and mix with the water from 2NPS. Settling Pond # 4 acts as the final collection point before discharge into a meadow/biomass system where it flows into a culvert at Middle Quinsam Lake road sampling location (WC) EMS #E207411, prior to entering another extensive wetland that flows into the inlet of Middle Quinsam Lake.

Settling Pond #4 encompasses approximately 2.4 ha of marshland with an average depth of 1.5 m and a storage capacity of approximately 30,000 m^3. It has been designed to receive a 1 in 10 year flood event and has an emergency spillway to prevent structure failure during extreme flood events. Water from Settling Pond #4 is pumped to the wash plant for use in coal processing. Used wash plant water is pumped to the tailings dam at the pump site CPP collection ditch, where it filters through the north side of the tailings dam to 2NPS. Water in the 2NPS is used for underground equipment, dust suppression, and emergency firefighting. Excess water in the 2NPS sump is pumped with a 65 HP pump through a 12-inch pipe along the 2-North high wall then discharged into Brinco Brook. South Dyke Sump (SDS) EMS #E292126 collects seepage water from the south side of the tailings dam and pumps it back to the tailings dam (the seepage does not report to the Quinsam River or Middle Quinsam Lake from this location).

In December 2017, the 5-South mine water and the SDS was redirected into a borehole where water will discharge into 3-Mains, 2-North. Now all water from 5-South (includes 7-South water) and SDS will enter 2-North mine and be received at Settling Pond #4.

Below the wash plant is a natural drainage where groundwater surfaces and flows towards Middle Quinsam Lake. There are two surface monitoring locations here and two nested (deep and shallow) groundwater wells. The plant ditch seep (PDS) is groundwater that surfaces and flows intermittently through the year; drying up in the summer. The water surfaces at the Plant Ditch Seep at the Road (PDSR) prior to entering Middle Quinsam Lake near the inlet end. These sites are monitored monthly when there is flow at surface. Deep and shallow nested groundwater wells MW00-1 (S and D) and MW00-6 (S and D) represent the groundwater below the collection ditch and processing plant. These wells were installed to monitor seepage from the plant site collection ditch. Historically, the plant site collection ditch was used to transport fine tailings from the processing of coal to WP, which was used as a fine tailings settling pond, with excess water pumped into Brinco Brook and gravity feed into Settling Pond # 4.

Figure 1 provides a flow chart describing the flow paths of water in the 2-North Water Management System.

NORTH WATER MANAGEMENT SYSTEM: WATER MOVEMENT

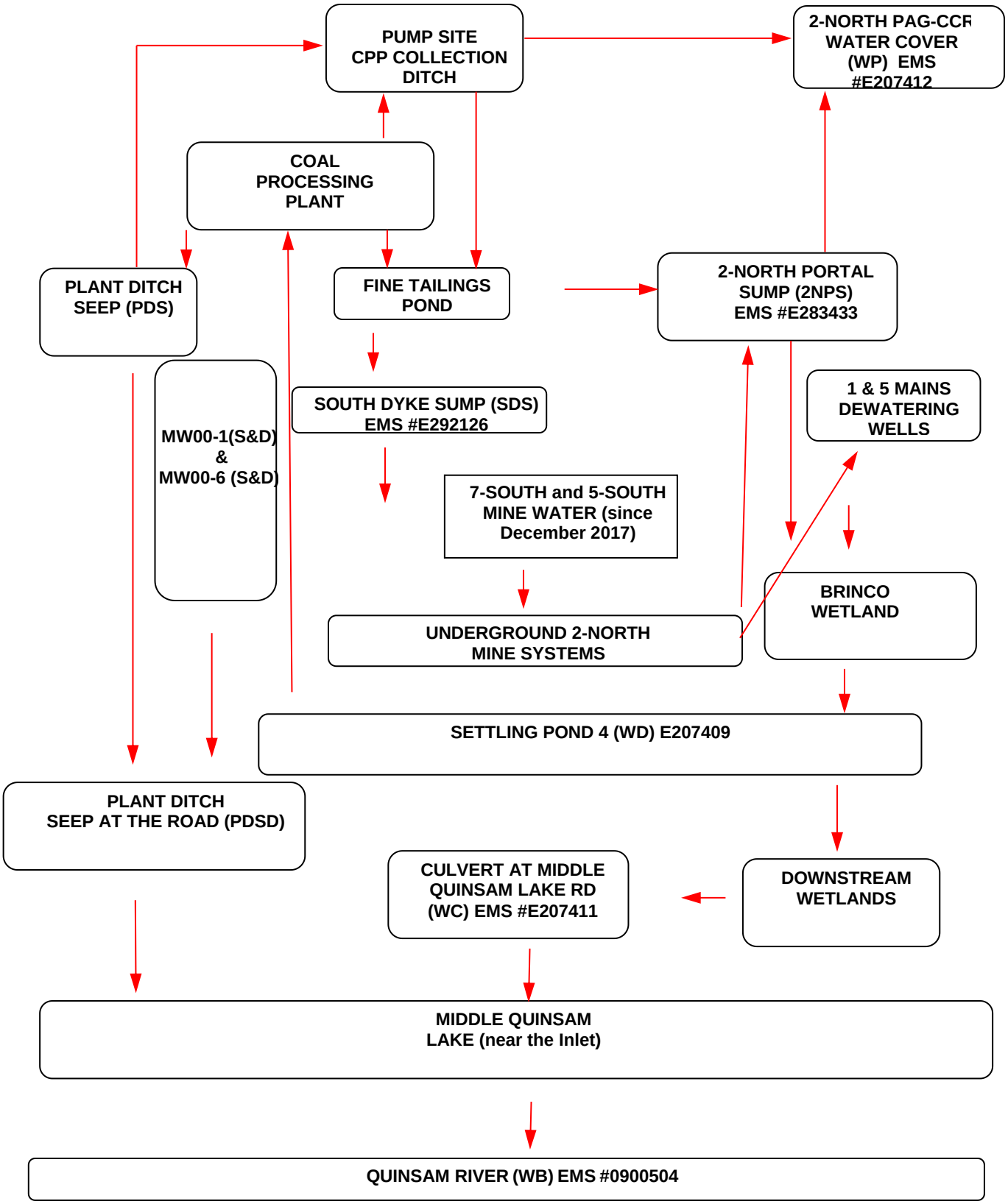


Figure 1: Water Movement and Flow Path in the North Management System

2.1.2 *The South Water Management System*

The South Water Management System is designed to collect mine related runoff from the south disturbed surface areas and manage water in the 2-South (2S) EMS #E292127 and 3-South (3S) EMS #E217015 PAG-CCR containment pits, Long Lake Seep Passive Treatment System (LLTS), and previously (prior to December 2017) 5-South mine workings.

The two long-term PAG-CCR pits (2-South and 3-South) have been completed as part of the south water management system. Construction of the 2-South PAG-CCR pit was completed in 2014. It includes a clay-bentonite liner to retain water within the pit and a water cover fed by a series of ditches and pipes that collect local catchment water. Surface personnel control valves to direct fresh non-mine impacted water into the PAG-CCR facility or to No Name Lake. A minimum of 1.50 m water cover is required in the 2-South PAG CCR and excess water from the 2-South PAG-CCR pit overflows a spillway (built in 2015) into a large channel that leads to the 3-South PAG-CCR storage pit. This water is used to provide 1 m deep water cover over 3-South. Excess water in 3-South is pumped via an 88 HP pump capable of pumping 500 gallons per minute directly into the roadside collection ditch that flows into Settling Pond #1.

Settling Pond #1 (SPD) EMS #E218582 is the compliance point for permitted discharges before water enters Long Lake. Settling Pond #1 encompasses 1.8 ha of wetland with an average depth of 1.5 m. An emergency overflow ditch built into the impoundment dam is located on the north end of the pond. A siphon pipeline has been installed from Settling Pond #1 to the 3-South Pond to provide an emergency source of water to maintain the 1 m cover over the 3-South PAG-CCR pond. In 2015, a pumping system was installed in the 5-South workings with discharge into Settling Pond #1 to reduce water levels over the 8-Mains plugs that separate the 5-South and 2-North mines. Water from the 5-South Mine was pumped periodically to Settling Pond #1 and in December 2017 was redirected to the 2-North mine pool at 3-Mains.

The LLTS is designed to inhibit flow at the Long Lake seep by lowering the 2-South mine-pool through pumping from monitoring well QU11-11, where it is treated on surface. There are four ponds (BCR-EFF, SPC-EFF, AL-EFF & SP-EFF) where water goes through processing. Effluent from this system (SP-EFF) is combined with Settling Pond #1 discharge, then flows 100 m to the location Biocell Downstream (BDS). This effluent channel leads into a series of meadow/biomass systems and combines with the surface and subsurface groundwater.

The 3-South 1977 bulk sample pit (3S77) EMS #E292128 is located upstream of the 4-South Pad and collects groundwater filtering in from the wetland through which Settling Pond #1 flows. The bulk sample pit has a surface discharge that filters into the groundwater and through the connector ditch above the reclaimed 4-South pad area. The 4-South ditch monitoring location (4S-Lo) EMS #E292129 is a culvert downstream of 4-South Access Road and west of 4S coal pad; it collects runoff from the reclaimed 4S-pad, groundwater seepage, and surface runoff from the haul road. The monitoring location SPC, EMS #E217014, located downstream of the 4-South pad and 4S-Lo, (does not interact with effluent from 4-South water); captures Settling Pond #1 water downstream of the wetland. The final collection point (EMS #E292130) is at the downstream end of the Long Lake Entrance (LLE) wetland and discharges approximately 50 m upstream of Long Lake. This site is considered the initial dilution zone (IDZ) for Long Lake.

Figure 2 provides a flow chart describing the flow paths of water in the South Water Management System.

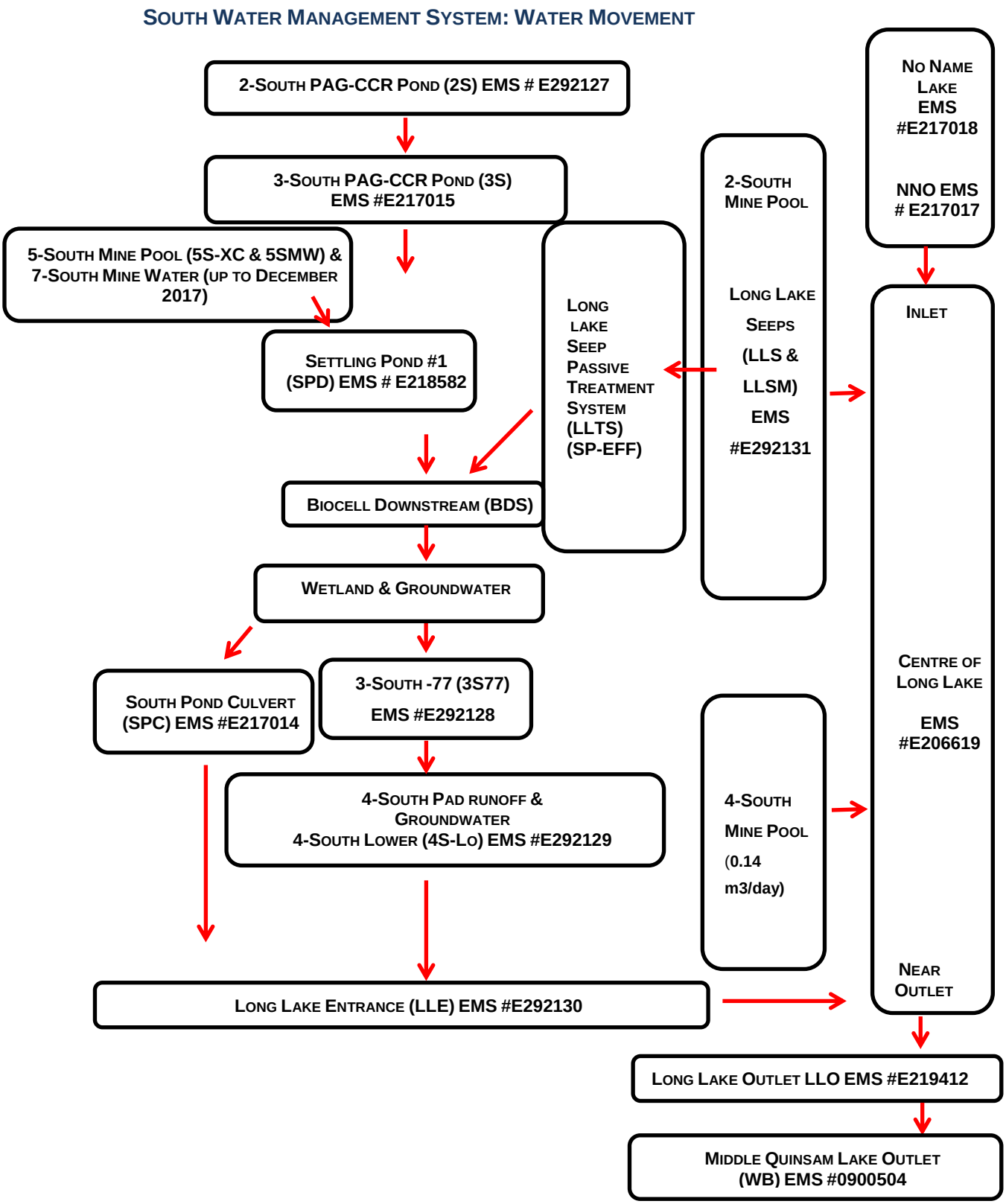


Figure 2: Water Movement & Flow Path in the South Water Management System

2.1.3 7-South Water Management System

The 7-South Water Management System includes the 7-South Surface Decant Settling Pond (7SSD) EMS #E292069, 7-South-Adit Sump (7SPS) EMS #E292110, 7-South Containment Pond (7SCP), and receiving environment sites downstream at Stream 1 (7S) EMS #E292109, which flows into the Lower Wetland and monitoring location Lower Wetland Outlet (LWO) EMS #E292112 at the confluence of the Quinsam River. This system is designed to manage excess water from the 7-South catchment area and mitigate environmental impacts from disturbed surface locations affected by mining and underground activity. Water is collected and stored in three main ponds in the 7-South Mine catchment area: 7SPS, 7SCP, and 7SSD.

7SPS contains water that is collected from dewatering processes during mining activity while most of surface water from the coal storage pad is directed into the adit sump. Water is pumped from active mining areas and stored adjacent to the portal entrance to use for dust suppression on mining equipment and for the fire suppression system. Water levels at 7SPS are set up on an automated float system, when water levels rise beyond a desired storage capacity, excess water is pumped underground into the 5-South Mine.

7SCP collects surface runoff from the 7-South surface disturbance area, local groundwater, and infiltration water from the coal pad. This pond allows suspended solids in surface water to settle before the water enters 7SSD. When this pond reaches a certain capacity, it discharges through a culvert into 7SSD. In 2015, the 7SCP was enlarged to accommodate more water. Additional pumps were placed at 7SSD and 7SCP to decrease 7SSD discharge and assist with water management. The revised system pumps water from 7SSD and 7SCP to 7SPS. The pump at 7SCP runs on an automated float system where water levels are kept below the overflow channel into 7SSD. During high precipitation events, a secondary pump can be activated to assist in pumping water to 7SPS. This pump can also be relocated to 7SSD where accumulated water can be diverted into 7SCP. This system does not eliminate discharge from 7SSD but helps reduce the amount discharged as 7SSD still must discharge during times of heavy precipitation.

7SSD is the permitted discharge location and main water collection pond for the 7-South Mine area, with a cumulative catchment of 3.14 ha. 7SSD is a settling pond that receives water from groundwater infiltrated from the surrounding hillsides and the coal storage pad. This water is monitored for quality and quantity during discharge events. Water is discharged from the pond via a 2-inch discharge line equipped with a valve to allow environmental personal to set the discharge

rate based on flow rates measured at the downstream site 7S in Stream 1. An 8:1 ratio (7S:7SSD) was calculated from previous water quality data and modelling conservatively to protect the Stream 1 receiving environment. Water quality downstream in Stream 1 meets applicable guidelines with dilution ratios greater than 8:1.

Discharge from 7SSD forms the headwaters of Stream 1, monitoring location 7S is located on Stream 1 below the confluence with Stream 2 and, for the purposes of the effluent permit, is compared to British Columbia water quality guidelines (WQGs) for protection of aquatic life to evaluate potential effects on aquatic receptors at this location.

Figure 3 provides a flow chart describing the flow paths of water in the 7-South Water Management System.

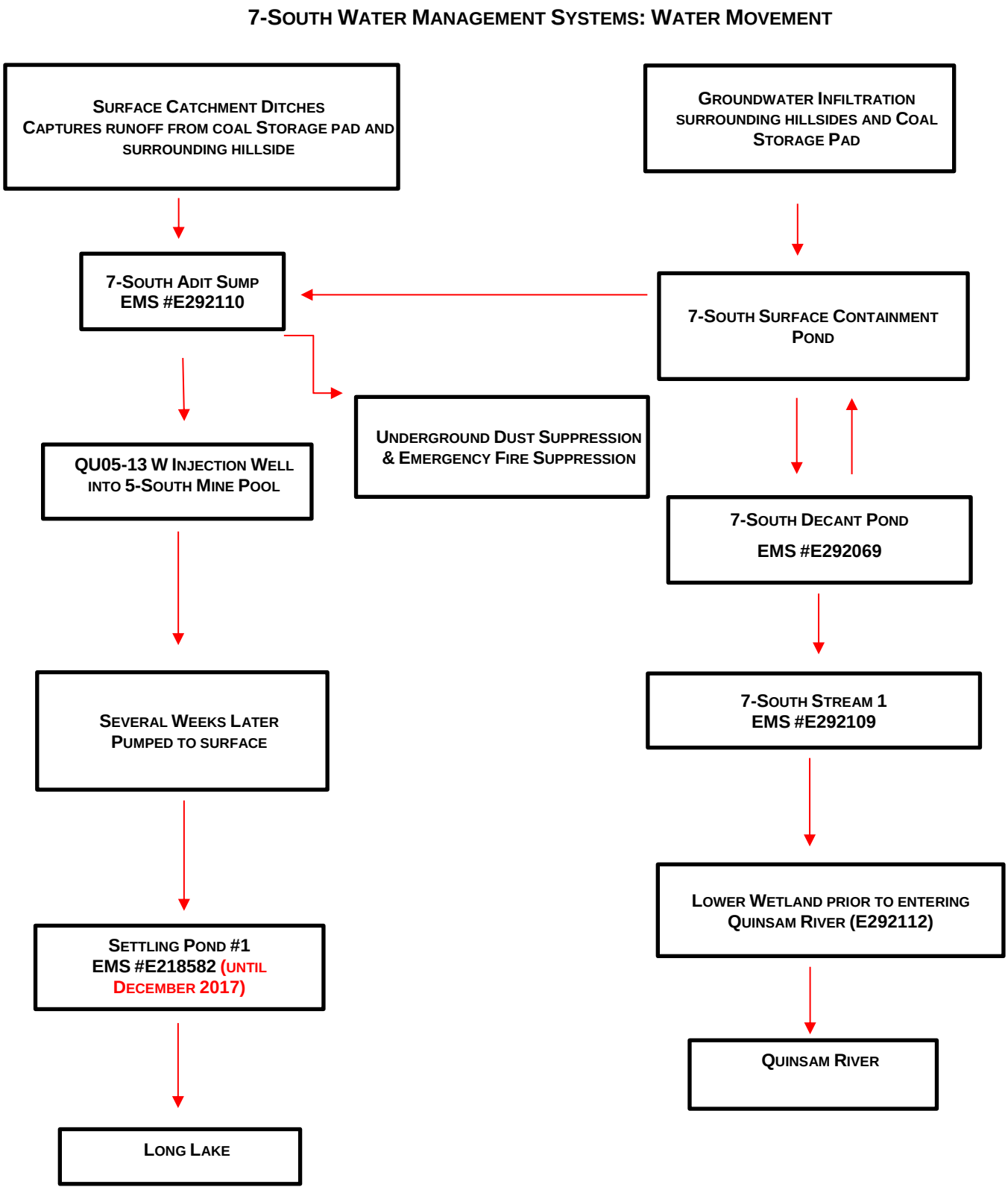


Figure 3: Water Movement and Flow Path at the 7-South Operation

2.2 RECEIVING ENVIRONMENT SITES

2.2.1 *RIVER, STREAM & LAKE MONITORING SITES*

Effluent Permit PE-7008 Section 4.2.3 identifies river, stream, and lake monitoring sites that represent the receiving environment for various mine related discharge(s). Most of these sites are monitored on a 5 in 30 sampling frequency (five events in 30 days) during the spring, summer and fall seasons. Table 2 lists the receiving water monitoring sites.

Table 2 : Receiving Water (Stream and Lake) Monitoring Sites

Streams	Lakes
North Mining Operation	
Quinsam River at Argonaut Road (WA) (EMS # 0126402) Outflow from Middle Quinsam Lake (WB) (EMS # 0900504)	Middle Quinsam Lake Centre (EMS # 206618)
South Mining Operation	
Long Lake Outlet (LLO) (EMS # E219412) No Name Lake Outlet (NNO) (EMS # E217017)	Long Lake at Centre (LLM) (EMS #E206619) No Name Lake (NNL) (EMS # E217018)
7-South Mining Operation (Areas 1 to 4)	
Quinsam River upstream of 7 South Mining Operation (QRDS1) (EMS # E286930) Quinsam River downstream of 7 South Mining Operation (7SQR) (EMS # E292113) Lower Wetland Outlet at the confluence of Quinsam River (LWO) (EMS # E292112)	Lower Quinsam Lake (LQL) (EMS #E292118)
7-South Area 5 Mining Operation	
Iron River upstream of mining operations (IR1) (EMS #E297230) Iron River upstream of 7SA5 (IR6) (EMS # E297231) Iron River downstream of 7SA5 and 242 inputs (IR8) (EMS # E297232) Quinsam River downstream of confluence with Iron River (IRQR) (EMS # E299256)	Lower Quinsam Lake (LQL) (EMS # E292118)

River and Stream Sites in the Quinsam River Sub-Basin

- Quinsam River at Argonaut Road (WA) EMS #0126402 – Located upstream of all mine related discharges; represents background (baseline) conditions for water quality comparisons.
- Outflow from Middle Quinsam Lake (WB) EMS #0900504 – Located at the outflow of Middle Quinsam lake; represents combined discharge from North and South water management systems.
- No Name Lake Outlet (NNO) EMS #E217017 – Located at the outflow of No Name Lake; not presently influenced by surface mine related discharge in the South. The groundwater influence from 2-South Pit to No Name Lake near the outlet site was estimated as 5 m^3/day or 10% of the seepage rate from 2-South Pit.
- Long Lake Outlet (LLO) EMS #E219412 – Located at the outflow to Long Lake; captures all South mine related inputs on surface and a percentage of groundwater (i.e. LLE and Long Lake Seep).
- Quinsam River Downstream Site 1 (QRDS1) EMS #E286930 – This site is located downstream of Middle Quinsam Lake Outflow (WB), the North Mining Operation and upstream of the 7-South Mining Operation; captures changes in water quality before the 7-South Mine and groundwater inputs related to mining.
- Lower Wetland Outlet at the confluence of the Quinsam River (LWO) EMS #E292112 – This site is located downstream of Stream 1 (7S); represents final surface discharge quality prior to combining with the Quinsam River.
- 7-South Quinsam River (7SQR) EMS #E292113 – Quinsam River downstream of QRDS1, LWO, and 7-South Mining Operation; captures incremental changes in water quality that may be attributed to 7-South PAG-CCR storage and flooded mine pool.

Iron River – Proposed 7-South Area 5 (7SA5) Mining Operation

- Iron River Upstream of Mining Operation (IR1) EMS #E297230 – Located upstream of any mine related activity; represents baseline conditions.
- Iron River Upstream of 7SA5 (IR6) EMS #E297231 – Located upstream of any mine related activity (currently); reflects baseline conditions in an area of different geologic formation(s) and baseline water quality influences than IR1 (mainly arsenic concentrations).

- Iron River downstream of 7SA5 and 242 inputs (IR8) EMS #E297232 – Downstream monitoring site on the Iron River; will be used to monitor potential influence of 7-South Area 5 (if developed).
- Quinsam River downstream of the confluence with the Iron River (IRQR) EMS #E299256 – Located downstream of all current and planned (7-South, Area 5) activities; represents the cumulative mine related discharge.

Lake Monitoring Sites

- No Name Lake (NNL) EMS #E217018– Located within the South mine development area.
- Long Lake (LLM) EMS #E206619 – Located within the South mine development area and receives water from No Name Lake, 2-South flooded mine pool as groundwater and surface water (Long Lake Seep). The outlet end receives seepage from 4-South flooded mine pool, estimated at 0.14 m^3/day and south water management discharge (LLE).
- Middle Quinsam Lake (MQL) EMS #E206618 – Located adjacent to the North mine development area and receives all discharge from the North water management system and upstream (non-mine related) inputs. Long Lake flows into Middle Quinsam Lake at the south end near the outlet (WB) via a small tributary stream (LLO).
- Lower Quinsam Lake (LQL) EMS #E292118 – Located well below mine related discharge(s); reflects the combined influences of Quinsam River and Iron River water quality.

2.2.2 *Groundwater Monitoring Sites*

Numerous groundwater observation wells in the vicinity of pits 2N, 1S, 2S, 3S, 4S, Block 242, and 7S are monitored. The site, location, frequency, and geological details of these wells are listed the *2017-2018 Annual Groundwater Monitoring Report* in Appendix B. As an alternative to the 2N, 1S, 2S, 3S, 4S and 7S wells, QCC established monitoring sites at underground sumps. During 2017-2018, QCC monitored 35 locations for groundwater. The *"2017-2018 Annual Groundwater Report"* located in Appendix IX outlines sampling methods and analytical results of the monitoring program for groundwater wells and underground sumps. The table below lists groundwater wells monitored during this period.

Table 3: Groundwater Wells and Underground Sumps Monitored in 2017-2018

Area	In-Situ Sumps	In-Situ Wells	Ex-Situ Wells	
2-North Ground Water Monitoring	6M2N	1M2N 5M#2 QU10-13 D	QU08-21G S QU10-10 S QU10-11 S	QU08-21G D QU10-10 D QU10-11 D
River Barrier Pillar		QU11-09 M	QU11-05 S QU11-09 S	QU11-05 D
2-North Plant Monitoring Wells			MW00-1 S MW00-6 S	MW00-1 D MW00-6 D
7-South Groundwater Monitoring	1M7S	QU14-10	QU08-10 D QU08-13 B	QU08-13 A
7-South Area 5, 242 Portal Area		242MW		
4-South Monitoring Wells		QU11-01	QU10-09 S	QU10-08 D QU10-09 D
2/3 South Monitoring Wells		QU11-11 MW00-4	MW00-2 MW12-24	MW12-23

2.3 ADDITIONAL MONITORING PROGRAMS

QCC conducts a diverse environmental monitoring program governed largely by the effluent permit PE: 7008. There are also additional baseline water quality monitoring programs, and in 2016, a sediment and benthic invertebrate monitoring program was conducted with the next program scheduled for 2020.

2.3.1 *BASELINE MONITORING PROGRAMS*

Quinsam conducts additional monitoring to support permit amendment efforts and to provide additional insight into water quality trends and observations. Although this information is not specifically included in this report, the data may be used in future submissions to ENV. As part of

the 7-South Area 5 permit application, monitoring in the Iron River continues to be performed. The Iron River sediment and benthic monitoring program will commence in August / September of 2018.

Baseline monitoring and characterizing of water quality for future permitting of the 3-South pit continues. An engineered outlet channel was constructed, which will act as a permanent overflow channel connecting the 3-South sub-aqueous PAG-CCR disposal pond to the drainage channel connecting No Name Lake to Long Lake. Monitoring locations include the 2-South Inflow (2SI), 2-South pit near the outflow (2S), 2-South Channel (2SC), and 3-South Pit (3S). Receiving environment monitoring sites are No Name Lake Outlet (NNO) and three locations on the No Name Lake connector channel. The three sites on the connector channel include:

- downstream of the 3S outlet channel (3SDS)
- a tributary to the connector channel (3SDST)
- 100 m downstream of the tributary and the connector channel (3SDS3)

The sites have been monitored on the 5 in 30 schedules during spring, summer, and fall, and more recently on a monthly basis. Water quality monitoring was completed in 2017. Baseline sediment and benthic sampling will be performed in 2018 on the No Name Lake connector stream to supplement permitting for discharge.

2.3.2 *Sediment and Benthic Monitoring Program on the Quinsam Watershed for Effluent Permit PE:7008*

QCC conducted sediment and benthic monitoring in August through October 2016 to meet condition 4.2.7 (iii) of the amended Permit PE-7008 (dated September 22, 2014). This monitoring program was designed to supplement existing water quality data by evaluating sediment chemistry and benthic biota in waterbodies that receive mine impacted discharges and reference sites with similar characteristics. The *2016-2017 Annual Water Quality Monitoring Report* contains the findings of the program. The program included five lakes, one wetland, and one river system for a total of 23 sites. The table below lists the waterbody type, waterbody name and site outlined in the study.

Table 4: Sediment and Benthic Monitoring Sites

Waterbody Type	Waterbody Name	Site
Lakes	No Name Lake (NNL)	No Name Lake Inlet, NNLI (EMS # E224246) No Name Lake Deep, NNLD (EMS # E217018) No Name Lake Near Seep (EMS # E292114) No Name Lake Outlet (EMS # E217017)
	Middle Quinsam Lake (MQL)	Middle Quinsam Lake Inlet (EMS # E206901) Middle Quinsam Lake Deep (EMS # E292115) Middle Quinsam Lake Near Seep (EMS # E292116) Middle Quinsam Lake Outlet (EMS # 0900504)
	Lower Quinsam Lake (LQL)	Lower Quinsam Lake Inlet (EMS # E292117) Lower Quinsam Lake Deep 1 (EMS # E29118) Lower Quinsam Lake Deep 2 (EMS # E292119) Lower Quinsam Lake Outlet (EMS # E292120)
	Long Lake (LL)	Long Lake Inlet (EMS # E292121) Long Lake Deep (EMS # E292122) Long Lake Near Seep (EMS # E292123) Long Lake Outlet (EMS # E219412)
	Gooseneck Lake (GNL)	Middle Gooseneck Lake (EMS # 1132502)
Wetland	Lower Wetland	Lower Wetland Inlet (EMS # E292124) Lower Wetland Middle (EMS # E292125) Lower Wetland Outlet (EMS # E292112)
Quinsam River	At Argonaut Road (WA)	(EMS # 0126402)
	Upstream of 7 South Mining Operation (QRDS1)	(EMS # E286930)
	Downstream of 7 South Mining Operation (7SQR)	(EMS # E292113)

2.3.3 *Long Lake Seep Passive Treatment System & Loading Assessment (LLSPTS)*

Refer to Appendix VI for the most recent report on the Long Lake Treatment System provided by Lorax Environmental entitled "*Long Lake Seepage Treatment System - Supplemental Evaluation May 22nd, 2018*" submitted to ENV and EMPR.

In January 2018 the pump in the 2-South mine pool and influent for the Treatment system failed. The treatment system has not been operating since that time. This pump is scheduled for replacement in July 2018.

All four quarterly reports were submitted during 2017-2018 for the LLSPTS. The report submitted by Lorax acts as the Annual Loading Assessment for 2017-2018.

2.4 Maintenance & Reclamation Activities

To ensure proper functioning of site wide water management systems, haul roads, roadside ditches, catchment ditches, ponds, culverts, pumps and water lines are maintained on a routine basis. Regular maintenance activities include removal of debris from culverts, replacement of silt fences and straw bales, and removal of sediment build-up from catchment ditches and ponds. Pumps and water lines are inspected daily and maintained as part of the surface inspection.

Major maintenance of treatment works has not occurred this year. The main changes in the water management system include the new drill hole into the 5-South Mine that was directed into the 2-North Mine in 3-Mains. Composite samplers have been maintained according to the schedule detailed in the *Draft Environmental Procedures Manual*.

The following reclamation and reclamation-related work was completed in 2017 (see the *Annual Reclamation Report for 2017, Mines Act Permit Number C-172* for further details):

- The high walls near the 2-South, 3-South and 7-South areas were re-contoured and re-sloped with till and cover soil.
- The 3-South east dyke construction initiated in 2016 including high wall and north dump area were completed in 2017 this included re-contouring and hydroseeded with a recipe of Coastal Native Bunchgrass, Coastal Reclamation Mixture, and 18-18-18 fertilizer. Reforestation is scheduled for spring 2018.
- Re-sloping, re-contouring and hydroseeding occurred on the south and east highwalls of 2-South was completed. Hydroseed of the area included Coastal Native Bunchgrass with an 11-33-11 fertilizer.
- The 2-North coal pad and containment ditch were excavated and the coal from the pad was reprocessed through the coal preparation plant, approximately 1000 tonnes was reprocessed.

- Coal pad and the coal pad containment ditch areas were re-contoured with stockpile till.
- The 2-North fines located on the coal pad and excavated from the South dam were relocated back to the South dam.
- The 7-South mine portal was backfilled with a boulder till, the highwall re-sloped with till and cover soil, the portal was later excavated as mining was re-initiated. South-west side of portal was recontoured.
- The infrastructure (pipelines, pumping system and electrical lines) were removed from the 5-South Mine in June and the portal entry was backfilled with 15 m of coarse rock from the rock quarry and 3 metres of till from the 3-South Stockpile.
- 24 hectares, encompassing the main roads from 2-North to 7-South and out to 2-South were included in the road-side spraying program and a number of till stockpiles were treated with a herbicide (targeting Scotch Broom), in accordance with the Quinsam Coal Invasive Plant Management Program.

Previous reclamation work performed around the 2, 3, 4 and 7-South areas are expected to substantially improve water quality in the receiving environment by decreasing exposure of weathering waste rock dumps and highwalls

.

3.0 Chemical Reagents and Waste Storage

Waste oil and solvents are stored in sealed containers or tidy tanks at secure locations and removed from site for recycling by Terrapure Nanaimo (RS15365). In 2017, 3,815 liters of waste oil was collected and recycled.

Scrap metal at the mine site is collected in designated containers and recycled.

4.0 Incidents - Permit Limit Exceedances & Permit Non-Compliances

This section provides a summary of permit limit exceedances (P) and permit non-compliances (PNC) specific to missed samples, parameter analysis, and missing flow data. Appendix 1, Table 2 summarizes permit limit exceedances and non-compliances for 2017/2018. Appendix VII provides the spill reports. All spill and excursion reports were submitted to the Environmental Compliance website at: environmentalcompliance@gov.bc.ca.

There were two events that resulted in reportable spills. These reportable spills were related to mine discharge during the 2017-2018 period:

- *Settling Pond #1, EMS # E218582 experienced elevated dissolved iron (0.614 mg/L) above permit limits (0.5 mg/L) on January 8, 2018; the spill report number is DGI – 173540*

- *Water normally pumped to Settling Pond #1 contained in the 3-South pit overflowed down the designed overflow channel during an extreme storm event causing an unauthorized discharge intermittently for a 24-hour period on January 29th, 2018 spill report number is DGI-173610.*

Permit Non-compliance (PNC) occurred at certain locations when parameters where missed, or samples were not collected due to weather conditions. These include:

- *Settling Pond #1, EMS # E218582 - missing 3 TSS samples due to frozen conditions where the composite sampler line froze during December 22nd, 23rd and January 1st.*
- *Settling Pond #4, EMS # E207409 - missing 3 TSS samples due to frozen conditions where the composite sampler line froze during December 24th and January 1st and 2nd.*
- *Settling Pond #4, EMS # E207409 average annual rate of discharge was exceeded by 0.052 m^3/s.*
- *Stream 1 (7S) EMS # E292109 and Lower Wetland Outlet (LWO) EMS # E292112 - Missing Metals (T) & (D), Alkalinity, Acidity, TSS, sulphate & dissolved organic carbon. Laboratory error. QCC collected the sample and sent it to the laboratory. Samples were not analyzed and was disposed occurring on October 24th, 2017.*
- *South end water entering Long Lake (LLE) EMS # E292130, Stream 1 (7S) EMS # E292109, Culvert, at Middle Quinsam Lake Road (WC) EMS # E207411. Samples were collected but chain of custody did not specify phosphorous total (LLE), Dissolved Organic Carbon (7S) and dissolved sulphate (WC). This was a QCC error occurring on March 7th, 2017, November 17, 2017 and January 5, 2018. Further care is taken when submitting the chain of custody reports.*
- *2-South E292127 continuous inflow data for 2017-2018. Level logger installed at the hydrometric station at 2S inflow channel drifted resulting in incorrect data. This has been resolved with a new level logger.*
- *E217018 (NNL), E206619 (LLM), E206618 (MQL) and E292118 (LQL)* - Spring *Zooplankton samples were not collected. Environmental department error. Schedule and QA / QC has been implemented.*

5.0 MATERIALS AND METHODS: ENVIRONMENTAL MONITORING PROGRAM

All water samples were collected in accordance with methods described in "*The British Columbia Field Sampling Manual for Continuous Monitoring of Air- Emissions, Water, Soil, Sediment, and Biological Samples*" (MOE 2013)[1]. This includes following of specified field protocols: use of field duplicates, split samples, and method blanks and checking for transcription errors.

Maxxam Analytics (Burnaby B.C.), a Canadian Association for Laboratory Accreditation (CALA) designated laboratory, conducted the analysis of surface, groundwater, and sediment samples. Phytoplankton samples were analyzed by Stantec Consulting Ltd. (Burnaby B.C.). Zooplankton samples were analyzed by Fraser Environmental (Surrey, B.C.).

5.1 WATER QUALITY ANALYSIS

PE-7008 identifies the parameters to be analyzed in effluent. Each site has specific requirements for parameters to be analyzed. The following parameters are generally monitored at each station:

- Total suspended solids (TSS) (mg/L)
- Total dissolved solids (TDS) (mg/L)
- pH-Field (standard units)
- Conductivity-Field (uS/cm)
- Alkalinity (mg/L as $CaCO_3$)
- Hardness (mg/L as $CaCO_3$)
- Sulphate (mg/L)
- Ammonia as nitrogen (mg/L)
- Nitrate/nitrite combined as nitrogen (mg/L)
- Dissolved Organic Carbon (mg/L)
- Total phosphorus and dissolved phosphate (mg/L)
- Total and dissolved metals (mg/L)
- Oil and grease (for sites SPD and WD only) (mg/L)
- Rainbow trout bioassays (for sites SPD, WD and 7SSD only)

[1] MOE. 2013. "The British Columbia Field Sampling Manual for Continuous Monitoring of Air- Emissions, Water, Soil, Sediment, and Biological Samples". Available at: http://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/field_sample_man2013.pdf

- 7 Day *Ceriodaphinia dubia* chronic toxicity test (at site 7S only)

The following parameters are specific to lake sampling:

- Dissolved oxygen (mg/L)
- Dissolved oxygen (Percent saturation)
- Temperature (Celsius)
- Oxidation reduction potential
- Biological
    - Phytoplankton (chlorophyll “a” and phaeopigment)
    - Phytoplankton (counts and identification to species)
    - Zooplankton (counts and identification to species)

All surface and groundwater samples were filtered through a 0.45 µm filter and most were preserved on site except for a few samples where preservation did not occur. Maxxam analyzed dissolved and total metals samples using the CCME/BC WQG analytical package to provide suitable detection limits for comparison with guidelines and as per ENV requirements. This included use of conventional and Inductively Coupled Plasma Mass Spectrometry (ICPMS) equipment.

5.2 ENVIRONMENTAL MONITORING EQUIPMENT

The following equipment was used to conduct the surface monitoring program at Quinsam Coal:

- ISCO 4210 flow meters equipped with a paper chart plotter and datalogger, which are connected to a sonic depth sensor to measure water height above decant (Settling Pond #1) and an ISCO signature flow meter with an ultrasonic sensor (Settling Pond #4). Both instruments use water height to determine discharge by using provided weir/orifice equations. Continuous monitoring is achieved using a datalogger and downloaded using a computer with Flowlink software.
- A Sitrans F M MAG 8000 CT electromagnetic flow meter to record discharge at 7SSD.
- ISCO 12-volt automatic samplers programmed to collect daily composite samples for analysis of TSS deployed at all permitted discharge locations.
- A YSI Exo 1 multiparameter sonde and YSI Pro-Plus, to obtain physical water quality parameters, and calibrated prior to each sampling event following manufacturer specifications for maintenance and handling.

- Two handheld sondes (Eutech PC Tester 35), for routine monitoring of pH and conductivity.
- Levelogger pressure transducers, used to obtain continuous water level measurements at Long Lake Outlet, Middle Quinsam Lake Outlet and the Iron River, with data used to create daily hydrographs.
- A 4 litre Beta sampler, to collect lake water samples; the sampler is constructed with materials to minimize interference cross contamination of metals and the 4 litre volume provides sufficient water for all required analyses in one deployment per depth.
- A Campbell Scientific weather site, to record temperature, precipitation, wind, humidity, solar intensity, and snow accumulation data (installed next to the 2-South pit in August 2015, became operational in October 2015).
- An Eckman grab sampler, for collection of sediment and benthic invertebrate samples.

Although this list is not exhaustive, it provides an overview of the equipment used for environmental monitoring. Groundwater monitoring equipment is listed in Appendix IX, Section 3 of the Groundwater Report.

5.3 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) sampling followed protocols described in MOE (2013, 2016). QA/QC practices were integrated into the water sampling program to maintain the integrity, consistency, and reproducibility of sampling techniques and results of environmental monitoring. Various samples, including field blanks, trip blanks, equipment blanks, and replicates, are used to evaluate methods and identify potential issues related to sampling techniques and equipment. Each sample type serves a specific purpose:

- Field Blanks – Samples of laboratory-grade, reverse osmosis, deionized water deposited into sample containers in the same location in which a field sample is collected. These samples are carried and treated in the same manner as a field sample to assess any potential cross-contamination that may occur due to sampler technique.
- Trip Blanks – Samples of laboratory-grade, reverse osmosis, deionized water deposited into sample containers in a laboratory setting are transported into field locations with samplers to determine if any cross-contamination occurs due to the handling or storage of sample bottles.
- Equipment Blanks – Samples of laboratory-grade, reverse osmosis, deionized water placed into a piece of equipment at a sampling station to identify potential cross-contamination

associated with equipment (e.g., Beta sampler), sampling procedures, or general cleanliness.

- Replicates – Samples collected at the same location and time by the same sampler using the same techniques and equipment. Replicates samples are used to assess precision for each analyte analyzed. Observed variance between replicates identifies uncertainty in sampling, environmental heterogeneity, and laboratory analysis.

Field replicate samples are collected during every sampling event, accounting for approximately 10% of analyses requested from the laboratory. One sampling event may span two or more days. The primary sampling events are:

- Weekly, monthly, and quarterly sampling for all permitted monitoring locations
- 5 in 30-day programs, three times per year for receiving environment sampling for lakes, rivers and streams

Monthly sampling at Long Lake Treatment System ponds, with a replicate collected Relative Percent Difference (RPD) values were calculated for the analytical results from the sample and its respective replicate. In accordance with the British Columbia Field-Sampling Manual, the calculation was applied as stated below:

$$RPD = Absolute \frac{(Sample\ Concentration - Replicate\ Concentration)}{\left(\frac{Sample\ Concentration + Replicate\ Concentration}{2}\right)}\ x\ 100\%$$

RPD calculations were only practical for results where concentrations were found at or greater than five times the reported detection limit (RDL) as there is considerable uncertainty at low levels. In addition, mathematical calculations for RPD appear exaggerated with low values where absolute differences may be relatively low. It is expected to see variation between a sample and its respective field replicate for a number of reasons. Some considerations include: inconsistent sample stream at sampling locations; heterogeneity of water at sampling location; the possibility of minor contaminations; laboratory sample preparation and accuracy of analytical instrument to name a few. Taking these possibilities into consideration, RPD values less than 20% are deemed “acceptable” and indicate proper sampling methodology with representative results. It has been acknowledged that RPD values greater than 20% indicate a potential problem with sampling integrity whereas values greater than 50% indicate a definite problem.

RPD calculations with values greater than 20% and 50% are presented in Appendix I, Table 64.

During the 2017/2018 monitoring year, 72 replicate surface water samples were collected. Of the 3720 analyzed parameters in these samples, 83 (1.6%) had an RPD greater than 20% while 23 of the 83 (0.6% of total) had an RPD greater than 50%. Duplicate analyses for total copper, dissolved copper, and total aluminum accounted for the most frequent instances of RPD greater than 20%, followed by arsenic, sulphate, iron and manganese. Overall there does not seem to be a parameter displaying enough RPD magnitude to identify a serious problem needing immediate attention. QCC will continue to adhere to sampling practices identified in MOE (2013) and promote best practices at all locations.

The DQO for field blank samples was that concentrations should not be significantly greater nor occur more frequently than for laboratory method blanks (MOE 2013). Results greater than two times the laboratory MDL were identified and investigated to determine potential contamination.

Field blank, trip blank, and equipment blank results of laboratory grade deionized water were within the acceptable range for samples analyzed in 2017/2018 (Appendix I, Table 42). Nine blank samples were analyzed for sulphate and metals; all results met the DQO, indicating acceptable field sample collection and handling.

Results of the 2017/2018 QA/QC review indicate confidence in the ability of QCC to collect and analyze samples that meet required accuracy and precision requirements. Internal performance audits will continue, and any identified deficiencies will be investigated to adjust sampling protocol. All employees will be kept up to date with sampling procedures and provided with any training and equipment necessary.

A variance analyses to identify outliers is performed prior to uploading analytical data into the database. Any results outside 95% confidence intervals (within 4 standard deviations) of previous results are investigated, and if needed Maxxam is contacted and the results are rerun, and a new report issued that include a review of Maxxam's internal investigation.

Maxxam Analytics laboratory performs internal QA/QC on all sample sets that are analyzed. This is included in the laboratory report provided from Maxxam and reviewed by QCC. The internal QA/QC performed by Maxxam Analytics meets laboratory standards. Maxxam Analytics internal QA/QC involves the following procedures with every sample set analyzed:

- Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
- Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
- Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

6.0 HYDROLOGY

6.1 NORTH WATER MANAGEMENT SYSTEM

6.1.1 *AUTHORIZED DISCHARGE RATES AT SETTLING POND #4 (WD) E207409*

Maximum authorized rates of discharge at WD are 0.32m^3/s (instantaneous) and 0.08m^3/s (annual average) or 2,522,880 m^3 over a period of 365 days. Maximum discharge rates were below 0.32m^3/s throughout the entire monitoring period and peaked in April 2017 and February 2018 during heavy precipitation events. Cumulative discharge was calculated as 4,173,914 m^3, equivalent to an annual average discharge rate of 0.1326 m^3/s; higher than the authorized average (0.08 m^3/s or 2,522,880 m^3). Figure 4 displays maximum daily discharge and cumulative discharge compared to permit limits.

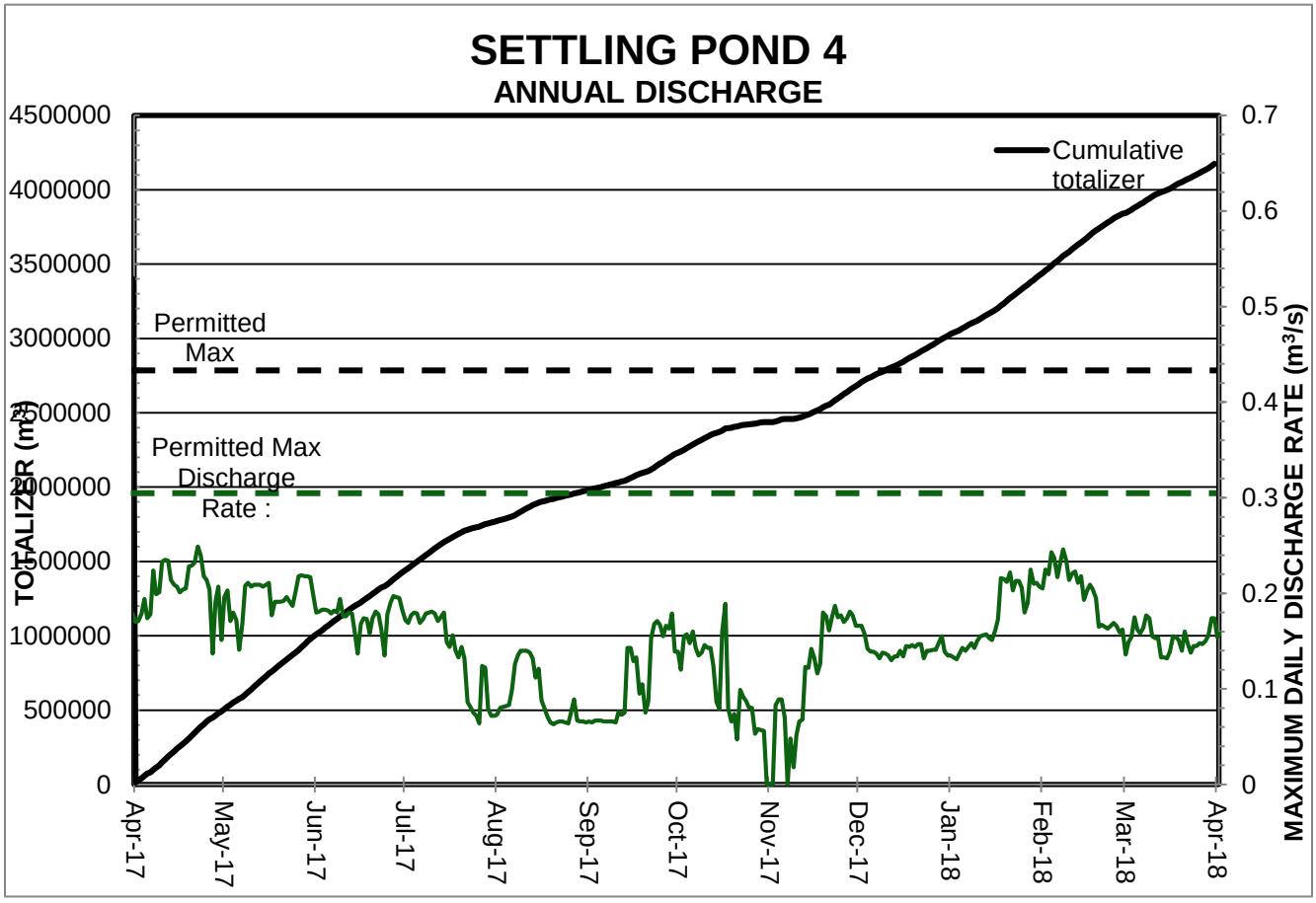


Figure 4: Settling Pond #4 Maximum Daily and Cumulative Discharge, 2017/2018

The annual average flow rate exceeded the maximum permissible value due to elevated discharge rates at WD during spring, fall, and winter coinciding with increased (seasonal) precipitation events and continuous pumping to maintain water levels underground in 2-North mine in preparation for mining.

Coal processing water is pumped from Settling Pond #4, reducing the discharge rates significantly when this occurs. Discharge rates are related to coal processing, dewatering from underground 2-North mine and precipitation. In the absence of coal processing the discharge rates should increase as this water is not being removed from the pond. Coal processing commenced in October 2017.

The rate of discharge at Settling Pond #4 is under investigation with Quinsam Environmental Department and Lorax Environmental Services. The outlet end of the discharge pipe is pointing upwards and is partially submerged causing a head pressure differential on the outlet end. These conditions cause inaccurate readings and Quinsam is currently taking corrective action to properly quantify flow rates.

The decant riser and discharge pipe was cleaned out by Roto Rotter to remove any buildup in the pipe. The next steps are to ensure the downstream end of the discharge pipe is clear and confirm the water exiting the system corresponds to the flow meter. The quantity of water discharging was anticipated to increase due to continuous pumping rates throughout the year. However further investigation is warranted to verify actual discharge rates.

A summary of discharges from Settling Pond # 4 is displayed in Appendix I, Tables (28-29).

6.2 SOUTH WATER MANAGEMENT SYSTEM

6.2.1 *AUTHORIZED DISCHARGE RATES AT SETTLING POND #1 (SPD) E218582*

Maximum authorized rates of discharge at SPD are 0.46m^3/s (instantaneous) and 0.10m^3/s (annual average) or 3,153,600m^3 over a period of 365 days. Both annual maximum flow (0.339m^3/s) and annual average flow (0.0243m^3/s) were well below the permitted rates. Figure 5 displays maximum daily discharge and cumulative discharge compared to permit limits.

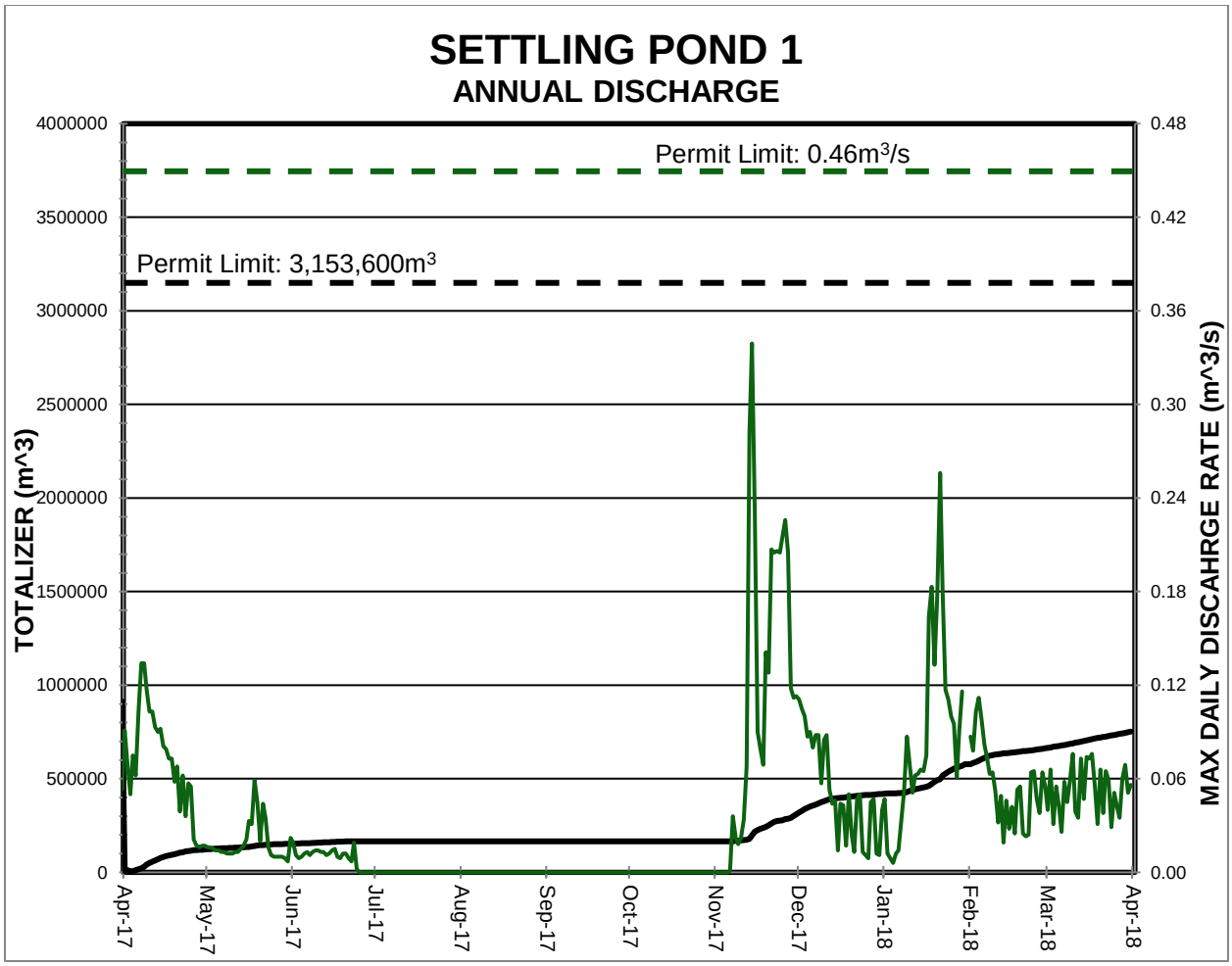


Figure 5: Settling Pond #1 Maximum Daily and Cumulative Discharge, 2017/2018

Zero discharge occurred from June 25th through November 5th, 2017. Daily discharge peaked at SPD several times during November and January coinciding with heavy precipitation resulting in increased surface runoff and pumping from the 3-South pit and 5-South underground (up until December 14th, 2017). Since December 2017, 5-South mine water has not discharged into Settling Pond #1 but was rerouted into the 3 Mains area of the 2-North mine pool on the south east side of the tailings dam.

A summary of SPD discharge is displayed in Appendix I, Tables (30-31).

6.2.2 *South Water Management System Entrance into Long Lake (LLE) E292130*

Flow monitoring is required weekly at LLE, which discharges near the outlet of Long Lake. Discharge at LLE represents the combined flow from the South water management system (SPD and SPEFF) along with groundwater from the 4-South coal pad area and non-mine related surface water from the upstream wetland and drainage features. As such, this site provides cumulative flow data representing all permitted discharges from the South water management system prior to entering Long Lake near the outlet.

Flow at LLE is well correlated with precipitation events and, historically, experiences a seasonal dry period during summer. However, since commencement of the Long Lake Seep treatment system, a base flow (corresponding with treatment system discharge of 4 L/s) is often present.

Appendix II, Graph 66 displays discharge versus precipitation at LLE.

6.2.3 *Seep Monitoring Sites, Long Lake Seep (LLSM) – E292131*

Manual flow measurements are obtained weekly at the LLSM weir. The flow information is available in Appendix II, Graph 65. The flow recorded at Long Lake Seep indicates a dependency on mine pool (void) water levels as depicted in Figure 6. Mine pool water levels correlate with seasonal precipitation, with highest levels observed in January 2018. As mine pool levels decrease below a certain elevation in late spring, flow at the seep decreases substantially and temporarily stops. In 2017, discharge from the seep stopped for four months (August 10 through November 7th). It is determined that seep flow is most closely related to water level at the monitoring well MW004 and the threshold level for seep flow is approximately 303.5 - 304 mASL. This trend will continue to be monitored and verified in the future. During November 2017 when the mine experience extreme rainfall events the seep flow was sustainably impacted by surface flow not related to seep flow. A water fall was coming down the ravine and the entire area was a river. The weir structure was buried by sediment and debris and had to be dug out after the water levels subsided. This is displayed on the figure below as LLSM flows exceeded 70 L/s. In March another rain event washed more sediment behind the weir structure which again had to be dug out. An H-fume with a flow meter will be installed in the 2018-2019 monitoring year to provide a highly accurate and continuous dataset for flow at the seeps.

In January of 2018, the pump at QU11-11 leading into the 2/3 South mine pool failed causing the Treatment to stop working until it could be repaired. This pump has not been operating since January but will be replaced in summer of 2018.

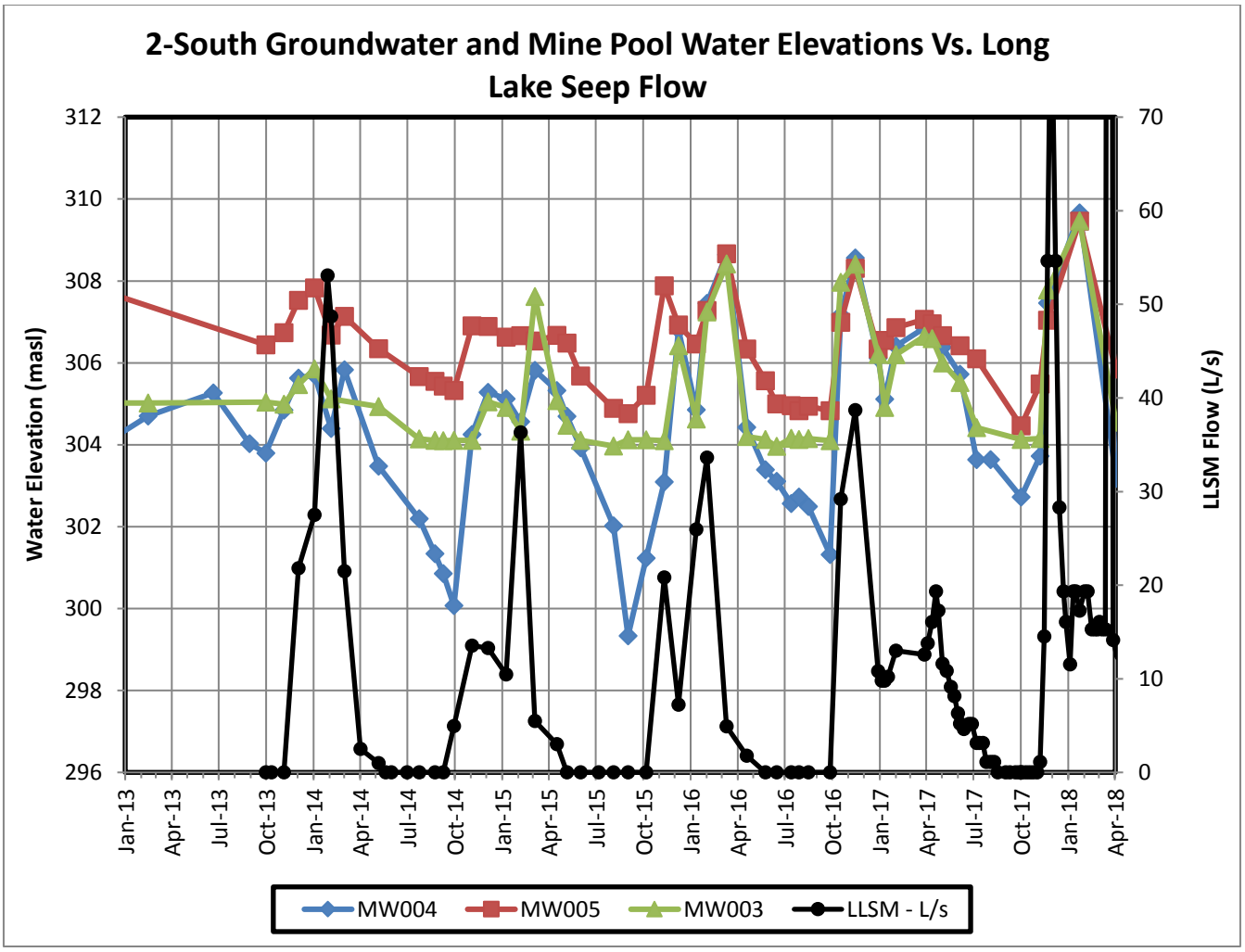


Figure 6: Groundwater and Mine Pool Water Elevations vs. Long Lake Seep Flow, 2013 through 2018

6.3 7-South Mining Operation Decant (7SSD) - E292069

The maximum authorized discharge from settling pond 7SSD is 0.005m^3/s (5 L/s). However, discharge is dependent on assimilative capacity of Stream 1 (7S) and, therefore, dynamic in nature. To facilitate determination of the appropriate discharge level at 7SSD, a flow rating curve was developed for monitoring site 7S (Figure 7) to allow instantaneous flow levels at 7S to be measured by reading the installed staff gauge.

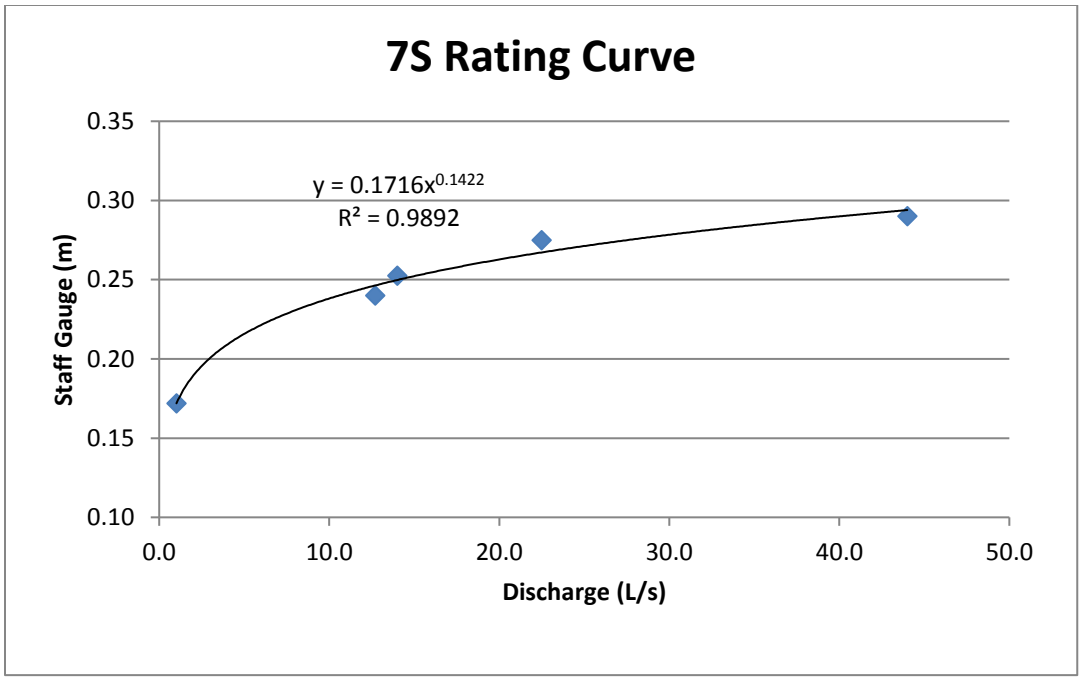


Figure 7: Monitoring Site 7S Stage Discharge Curve

Initially, an 8:1 dilution ratio was identified to maintain desirable water quality in the receiving environment, monitored at downstream site Stream 1 (7S). However, throughout the 7-South operational period, a lower dilution ratio has been shown to allow WQG's to be met in the receiving environment (site 7S). The dynamics of this system are still being monitored and measured; as a longer-term dataset is developed, the information will be evaluated to optimize discharge rates, while continuing to protect aquatic life.

In 2015, modifications were made to minimize discharge from 7SSD. The containment pond (7SCP) that delivers water into 7SSD was enlarged to accommodate more water. Additional pumps were placed at 7SSD and 7SCP to decrease 7SSD discharge and assist environmental personnel in water management. The revised system pumps water from 7SSD and 7SCP to 7SPS. The pump at 7SCP runs on an automated float system where water levels are kept below the overflow channel into 7SSD. During high precipitation events, a secondary pump can be activated to assist in pumping water to 7SPS. This pump can also be relocated to 7SSD, where any accumulated water can be diverted into 7SCP. This system does not eliminate all discharge from 7SSD but substantially reduces discharge frequency and aids in management during times of heavy precipitation.

Figure 8 shows 7SSD discharge rates and local precipitation. Discharge rates were substantially reduced during the 2017-2018 monitoring period compared to previous years. Discharge occurred over a 24-hour period for 2 days on January 18th and 19th, 2018 totaling 432 m^3 with an average discharge rate of 2.5 L/s. Discharge at 7SSD is exclusively influenced by groundwater inputs and precipitation. Appendix I, Table 32, displays cumulative flow measured at 7SSD for 2017/2018.

Maximum discharge rates did not exceed the maximum permitted discharge (5 L/s) and a dilution ratio of >8:1 was maintained at all times. Discharging occurred at 7SSD for one 24-hour period on January 18th through 19th during the year, following procedures recommended in the 7-South Technical Assessment Report[2]. An 8:1 dilution ratio was attained at all times during this 24-hour period of discharge, this is expressed in Appendix II, Graph 68.

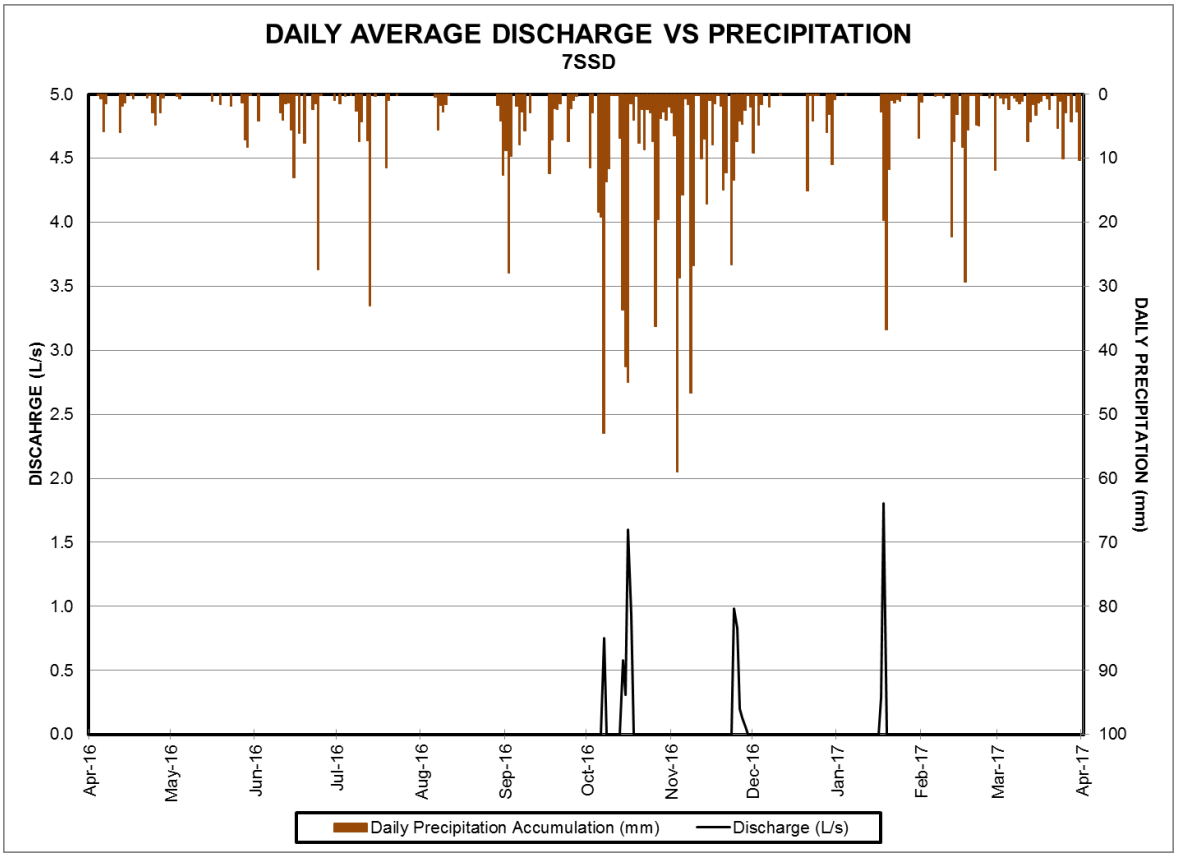


Figure 8: 7SSD Discharge, 2017/2018

[2] 7-South Technical Assessment Report 2014

6.4 RECEIVING ENVIRONMENT

Hydrometric stations in the receiving environment monitor hydrological conditions at key locations affected by QCC operations. Stage discharge curves for these stations have been developed using various methods (e.g. staff gauge, pressure transducer, manual measurements) and are periodically updated to ensure that the full range of flow is captured. The information is used to evaluate water quality and, in turn, determine assimilative capacity of the receiving environment with respect to mine related discharge. Moreover, flow is well correlated with lake flushing and turnover events, which directly influence concentrations of certain parameters (e.g. sulphate).

Flow data for WA is obtained from the Environment Canada monitoring station "Quinsam River at the Argonaut Bridge"; the data is currently subject to revision and has not been approved. The flow for WA is controlled upstream by the BC Hydro diversion dam to Gooseneck Lake; therefore, the volume of water diverted for hydro generating purposes influences flows at WA and WB. Accordingly, water levels at these two stations are not as closely correlated with precipitation as they are for other receiving environment stations.

Flow monitoring stations on the Iron River, Stream 1, and Long Lake system(s) are directly influenced by precipitation and the hydrographs typically show a pronounced peak following a precipitation event. This increase generally represents additional dilution and, therefore, assimilative capacity (for most parameters) in the receiving environment.

Appendix II, Graphs (63, 64, 67, 69 and 70) display flows compared to water level measurements and precipitation for the receiving environment hydrometric stations (WA, WB, LLO, 7S and IR8).

7.0 WATER QUALITY: IN-MINE MINE RELEASES & WATER MANAGEMENT SYSTEMS

This section presents results of the 2017/2018 water quality monitoring program for the North, South, and 7-South in-mine releases and water management systems for the major monitoring locations (e.g. settling ponds, discharges) and parameters of interest, to provide context for evaluating receiving environment water quality. The data for all in-mine release water quality monitoring stations are presented in Appendix I, Tables (4 - 27 and 35- 37) with tables (19 and 23) representing the initial dilution zones for the south mine area (LLE) and 7S-South Mine area (7S). Weekly field pH and conductivity results are presented in Appendix I, Tables (38 to 40).

Appendix I, Tables (44 - 78) provide a six year statistical summary (year over year, minimum, maximum, average, median, geometric mean, count, count < detection limit (DL), standard

deviation, first quartile, third quartile and standard error) for 27 parameters measured in the Settling Ponds, applicable receiving environment monitoring stations, and ex-situ groundwater wells. Monitoring years 2012-13 to 2017-18 are presented, where data is available. Table 5 below lists the monitoring stations, parameters, and statistics included in this evaluation.

For a summary of permit limit exceedances please refer to Appendix I, Table 2 and Appendix VIII to review the Annual Status Form prepared for PE-7008.

Table 5: List of Monitoring Stations, Parameters and Statistics

Monitoring Stations		
WA	LLS	
WD	LLSM	QU0813A
MW001D	MW002	QU0813B
MW001S	QU1009D	QU0821GD
MW006D	QU1009S	QU0821GS
MW006S	SPD	QU1010D
WC	LLE	QU1010S
MQL1	LLM1	QU1011D
MQLB	LLMB	QU1011S
NNL1	LLO	QU1105S
NNLB	WB	QU1109S
NNO	7SSD	7SQR
Parameters		
Arsenic (As-T)	Iron (Fe-T)	Lead (Pb-T)
Arsenic (As-D)	Iron (Fe-D)	Lead (Pb-D)
Aluminum (Al-T)	Manganese (Mn-T)	Sulphate (SO4-D)
Aluminum (Al-D)	Manganese (Mn-D)	Zinc (Zn-T)
Alkalinity (Alk-T)	Mercury (Hg-T)	Zinc (Zn-D)
Cadmium (Cd-T)	Mercury (Hg-D)	Phosphorous (P-T)
Cadmium (Cd-D)	Hardness (Hard-T)	Phosphorous (P-D)
Copper (Cu-T)	Nickel (Ni-T)	Nitrate & Nitrite combined (N-NO2,3)
Copper (Cu-D)	Nickel (Ni-D)	Ammonia Nitrate (N-NH3)
Statistics		
Count	Geometric Mean	1st Quartile
Minimum	Count <DL	Median
Maximum	Standard Deviation	3rd Quartile

7.1 NORTH WATER MONITORING SITES

The two primary monitoring locations in the North water management system are located at Settling Pond #4, sedimentation pond decant (WD) EMS #E207409 and the final discharge point above Middle Quinsam Lake (WC) EMS #E207411. A discussion for these two sites is presented below. Results for WD and WC including additional monitoring locations in the North mine area are provided in Appendix I, Tables (4, 7, 37 and 38).

7.1.1 *SETTLING POND #4 (WD) EMS #E207409*

Results for the 2017/2018 monitoring program demonstrated that water quality for all permitted parameters were within the permit limits listed in Table 6. Appendix I, Tables (4, 25, 35 and 38) provide water quality results for Settling Pond #4.

Table 6: Permit Limits Applied to Settling Pond #4

Parameters	Limit	Unit
Total Suspended Solids (daily composite)	25	mg/L
Total Suspended Solids (hourly composite)	35	mg/L
pH	6.0-8.5	mg/L
Ammonia (as N)	1.0	mg/L
Phosphorus (as P)	0.03	mg/L
Oil and Grease (total)	10	mg/L
Aluminum, dissolved	0.5	mg/L
Copper, dissolved	0.02	mg/L
Iron, dissolved	0.3	mg/L
Lead, dissolved	0.05	mg/L
Zinc, dissolved	0.1	mg/L
Rainbow Trout Bioassay (*Oncorhynchus mykiss*)	No mortalities at 100% effluent concentration after 96 hour	96LC50

7.1.2 *GENERAL PARAMETERS*

pH

In 2017/2018, field pH values displayed little variance, ranging from 7.30 to 8.20 and averaging 7.90. Starting in April 2013, field measurements (instead of lab) were used for improved accuracy and reliability. Consequently, a slight decline in reported pH was observed compared to historic results as depicted in Appendix II, Graph 3. Weekly field pH results are provided in Appendix I, Table 38.

Total Suspended Solids (TSS)

TSS exceedances did not occur in 2017/2018. The mitigation plan for future TSS exceedances is includes the use of a silt curtain that will be placed in Brinco brook to aid in reducing flow and increase retention time in the wetland. Observations with respect to precipitation, dewatering system operations, pond turbidity in Brinco brook and WD, concentrations of TSS and metals will continue to refine best practices and minimize TSS concentrations in WD. TSS was below detection limits <4.0 mg/L for most of the monitoring period with peak concentrations reaching 21 mg/L occurring on December 22, 2017 most likely attributed to freezing conditions at the site.

Hardness and Dissolved Sulphate

Both hardness and sulphate concentrations at WD have displayed marked decreased since 1996; see Graphs 1 and 2 in Appendix II. During 2017/2018, dissolved hardness ranged from 213 mg/L to 434 mg/L (averaging 318 mg/L), while sulphate ranged from 229 mg/L to 822 mg/L (averaging 507 mg/L). Average monthly sulphate concentrations peaked during spring and summer 2017, when discharge rates were lowest signaling minimal mine water dilution and potential evapo-concentration.

As observed in previous years, sulphate concentrations follow a seasonal pattern, with lower concentrations during late winter and early spring and higher concentrations during summer and early fall. Sulphate continues to be the primary parameter of interest from mine related discharges, as it's a common and traceable parameter associated with coal mining.

7.1.2.1 *Dissolved Metals*

Since commencement of underground mining in 1992, dissolved aluminum, copper, iron, manganese, and arsenic concentrations have remained well below permit limits, with minor, irregular fluctuations noted. Both dissolved lead and dissolved zinc were below detection limits. Zinc was slightly above detection limits during one event. In 2017/2018, concentrations measured in samples filtered in the field were typically below detection limits and were well below permit limits. Seasonal trends for parameters of interest were as follows (Appendix II, Graphs 5 through 8):

- Dissolved iron remained below permit limits throughout the monitoring year falling below detection limits of <0.025 mg/L on three occasions.
- Dissolved aluminum displayed peak concentrations in February, with a maximum of 0.0174 mg/L; well below the permit limit of 0.5 mg/L

- Both total and dissolved manganese remained in moderate concentrations throughout the year. As there are no permit limits for manganese, concentrations were compared to the WQG of 0.8 mg/L, all results were below the WQG.
- Total iron concentrations have shown an increasing trend since 2006, with concentration variations relating to fluctuating 2-North mine pool water elevations. Concentrations ranged from 0.166 mg/L to 1.17 mg/L, averaging 0.502 mg/L, with peak concentrations occurring in August. The relationship between the mine pool water elevation and elevated total iron concentrations at Settling Pond #4 is believed to be directly related to water flushing the oxidized mine walls and releasing iron into the water column.

7.1.3 *Culvert into Middle Quinsam Lake (WC) EMS #E207411*

Monitoring station WC represents the cumulative surface water discharge from WD prior to entering Middle Quinsam Lake. Concentrations for parameters of interest are typically slightly lower at WC than at WD, likely attributed to the attenuation that occurs along the WD-WC flow path that includes an expansive wetland. The exception observed is sulphate concentration during summer when discharge and dilution are lowest, and evapo-concentration is thought to occur. During 2017/2018, sulphate ranged from 381 mg/L to 737 mg/L, averaging 493 mg/L at WC. Metal concentrations are attenuated in the wetland, likely due to uptake by vegetation. This was particularly evident for total iron during times of elevated TSS and iron at WD. All concentrations of metals remained below permit limits and WQG's at this site except for sulphate. This site is not compared to permit limits or water quality guidelines but is now only for comparison purposes. The wetland also provides additional settling and filtration for TSS, which was below the DL (4 mg/L), even when TSS was elevated at WD discharge historically (Appendix II, Graph 4). The results demonstrate the wetland is functioning to reduce TSS before the discharge enters Middle Quinsam Lake. It is important to remember that after passing WC, the discharge water enters another large wetland before entering the inlet of Middle Quinsam Lake approximately 350 m downstream of WC.

7.2 South Water Monitoring Sites

The primary monitoring locations in the South water management system are stations that directly influence water quality in Long Lake: Settling Pond #1 decant (SPD) EMS #E218582, Biocell Downstream (BDS), Long Lake Entrance (LLE) EMS #E292130, and Long Lake Seeps (LLS & LLSM) EMS #E292131. The BDS station is an additional location established under the '*Authorization to Bypass the Works*' and is intended to capture the combined discharge of the Long Lake Seep Passive Treatment System Effluent (SPEFF) and SPD. Accordingly, permit limits for

SPD have been applied to this site. Please refer to the Long Lake Seep Passive Treatment System and Annual Loading Assessment found in Appendix VI for a full report on loading into Long Lake. This includes point source loading at sites SPD, SPEFF and the Seeps and quantified contributions of dissolved arsenic, iron, sulphate and manganese. The greatest point source contributor of sulphate into Long Lake was SPD with the Seeps contributing the second greatest overall load.

In early January 2018 the pump in the 2-South Mine pool that is used to pump water into the treatment system stopped working. The treatment system has not been operating since this has occurred. A new pump has been ordered and is scheduled for replacement in July 2018. The treatment system will discharge into 2-South pit flowing to 3-South pit where it will be pumped to Settling Pond #1. This eliminates the requirement for an '*Authorization to Bypass the Works'* request letter and brings the treatment system discharge into the authorized works.
Results for the additional monitoring locations in the South mine area (e.g. SPC) are provided in Appendix I, Tables (11 through 21, 35 through 37 and 39).

7.2.1 *Settling Pond #1 (SPD) EMS #E218582 and Biocell Downstream (BDS)*

These two sites represent the cumulative mine related discharge from the South water management system and are discussed together for ease of comparison. Permit limits applied to SPD and BDS are shown in Table 7. All parameters were below permit limits at SPD and BDS in 2017/2018 except dissolved iron exceeded permit limit of 0.5 mg/L at SPD.

Table 7: Permit Limits Applied to SPD and BDS

Parameters	Limit	Unit
Total Suspended Solids (daily composite)	25	mg/L
Total Suspended Solids (hourly composite)	35	mg/L
pH	6.0-8.5	mg/L
Ammonia (as N)	1.0	mg/L
Phosphorus (as P)	0.03	mg/L
Oil and Grease (total)	10	mg/L
Aluminum, dissolved	0.5	mg/L
Copper, dissolved	0.02	mg/L
Iron, dissolved	0.5	mg/L
Lead, dissolved	0.05	mg/L
Zinc, dissolved	0.2	mg/L
Rainbow Trout Bioassay (*Oncorhynchus mykiss*)	mortalities at 100% effluent concentration after 96 hour	96LC50

Appendix I, Tables (11, 26 and 35) contain results for SPD water quality while Tables (13, 35 and 39) contain results for BDS. Appendix II, Graphs (9 through 14) display the parameters of interest for SPD.

7.2.1.1 *General Parameters*

pH

All pH readings were within the permit limits at both sites in 2017/2018. Weekly field conductivity and pH are displayed in Appendix I, Table 39. Average field pH was 7.70 at SPD and 7.68 at BDS. Appendix II, Graph 11 displays pH throughout the year peak values occur when there is no discharge from the settling pond and decline through fall and winter as discharge commences, corresponding to pumping from 3-South pit and 5-South underground.

Nutrients

Ammonia and dissolved phosphorus remained below the permit criteria of 0.03 mg/L at BDS and SPD.

Total Suspended Solids (TSS)

Grab and composite samples for TSS analysis were collected, depending on discharge rates and sampling criteria. TSS ranged from <4.0 mg/L to 9.30 mg/L in 2017/2018 with no permit limit exceedances for SPD or BDS. Most results were less than the detection limit of 4.0 mg/L. Appendix II, Graph 12 displays the last six years of data for SPD.

Hardness and Dissolved Sulphate

Prior to 2015, the 2 and 3-South pits were the main contributors of sulphate to Settling Pond #1 before dewatering of the 5-South commenced in 2015. As retreat mining was completed in 5-South mine, the workings were isolated from the 2-North mine workings via an engineered bulk head that does not allow in-situ water to interact. Dewatering occurs to maintain water level in the underground workings and alleviate the pressure on the concrete bulk heads that are installed separating 2-North from 5-South. The 5-South mine water was transported via pipeline to Settling Pond #1 via a pumping system triggered by increases in water elevation in the 5-South Mine. As water management is crucial in the 5-South mine pool, excess water was pumped into Settling Pond #1, resulting in increased sulphate concentrations there. In mid-December 2017 a new drill hole was installed in between 14 cross cut and 15 cross cut on A1 road in the 5-South mine pool.

With this new installation geographically the 2-North mine pool was closer would aid in further dilution of the 5-South mine water. The 5-South mine pool consists of the combination of 7-South portal water and 5-South water. This water is pumped into 2-North, 3 Mains and then eventually discharged into Brinco Brook.

Sulphate concentrations in Settling Pond #1 (and BDS) have varied, depending on pumping rates from 5-South underground and 3-South Pit during times of heavy precipitation. Sulphate at SPD ranged from 95 mg/L to 367 mg//L and averaged 210 mg/L and at BDS ranged from 60 mg/L to 456 mg//L and averaged 273 mg/L. Concentrations were highest from July through September (low dilution) and lowest during winter (higher flow and high dilution) as shown in Appendix II, Graph 10. Sulphate concentrations will continue to be closely monitored in the future.

Typically, there is zero flow at SPD from late spring to early fall as there is minimal pumping from PAG-CCR storage facilities and 5-South. There was no discharge from SPD from June 25th through November 5th, 2018. Appendix I, Table 35, displays weekly sulphate results at BDS, SPD, and SPEFF.

7.2.1.2 *Dissolved Metals*

Dissolved aluminum, copper, lead, and zinc concentrations at SPD and BDS were below their permit limits during 2017/2018. Dissolved iron exceeded the permit limit of 0.5 mg/L on January 8, 2018. Resulting in 0.68mg/L. The dissolved iron exceedance was thought to be attributed to high inflows of water causing turbidity due to the mixing of bottom, iron rich sediment that had been oxidizing during the dry period from July through November when the pond was extremely low due to drought conditions on site. A spill report was submitted and can be found in Appendix VII, Spill Report No. DGI-173540.

7.2.2 *Long Lake Entrance (LLE) EMS #E2922130*

LLE is the most downstream monitoring station in the South Water Management System and represents cumulative mine water discharge into Long Lake (excluding the seeps). This station is located at the outflow of a culvert discharging from a wetland, and effluent flows through an approximately 50 m long channel before entering Long Lake. LLE is not defined as a receiving environment station but rather constitutes the upstream segment of a mixing zone defined as the IDZ in the permit. For observation purposes, results for LLE are compared to WQGs to assess overall water management system performance and influence on Long Lake.

Sulphate and dissolved iron are two main parameters of interest at LLE; both frequently exceeding WQG as displayed in Appendix II, Graphs 22 and 23. In 2017/2018, sulphate ranged from 4.10 mg/L to 906 mg/L (averaging 276 mg/L) with peak concentrations observed in late summer early fall during the low flow period. Sulphate concentrations exceeded the WQG of 128 mg/L for 20 of 42 weekly samples when applying a five-week rolling average. The sulphate WQG varies with hardness (see Table 8) and QCC follows a conservative approach defined in the WQG assuming a background hardness of 30 mg/L (very soft water, measured at WA) to derive a sulphate WQG of 128 mg/L. If the sulphate guideline for very hard water (hardness between 181 mg/L and 250 mg/L) found at LLE was applied, the sulphate WQG would be 429 mg/L resulting in exceedances for only 7 out of 42 weeks. If the average hardness in Long Lake 1 m from surface (82 mg/L) was applied, the WQG would be 309 mg/L resulting in exceedances for 9 of 42 weeks. These comparisons demonstrate the conservative approach incorporated into the WQG for protection of aquatic life. It should also be noted that during the summer low flow period LLE discharge may not be flowing into the lake before it is evaporated. The discharge is extremely low during summer and early fall. This is displayed in Appendix II, Graph 66.

Table 8: Approved 30-day Average Water Quality Guideline for Sulphate to Protect Aquatic Life

Water hardness* (mg/L)	Sulphate water quality guideline (mg/L)
Very Soft (0-30)	128
Soft to moderately soft (31-75)	218
Moderately soft/hard to hard (76-180)	309
Very hard (181-250)	429
>250	Need to determine based on site water

Both total (1.00mg/L) and dissolved (0.35 g/L) iron exceeded the WQG maximum in 2 of 11 monthly sampling events resulting in 2.17 mg/L and 0.37 mg/L respectively for July and 1.44 mg/L and 1.27 mg/L for January. This was mostly likely related to low flow with anoxic conditions occurring in the wetland and high flow conditions causing the mixing of iron-rich bottom waters of the wetland into surface water discharged at LLE. The high flows may have inhibited the typical redox reactions and iron precipitation processes that reduce dissolved iron to particulate iron.

The Vancouver Island Objective (VIO) for streams defines a maximum suitable concentration for total phosphorous of 0.01 mg/L and an average concentration of 0.005 mg/L applied from May through September. Exceedances occurred for one of the five samples in June resulting in 0.0306 mg/L. The 5-month average was not calculated due to only 4 months being sampled. As previously

stated, LLE is not considered a stream and the VIO is used for general comparison. Nutrients are monitored at LLE to assess loading from the treatment system for potential adverse effects on Long Lake and the downstream receiving environment. The elevated concentrations are most likely attributed to natural biotic processes including assimilation by vegetation, plankton, periphyton, and microorganisms. In wetlands, macrophytes play a significant role in uptake, assimilation and storage of phosphorous. Macrophytes absorb phosphorous directly from the water column and release it shortly after upon vegetation decomposition (R. Reddy, R. H. Kadlec, E. Flaig & P. M. Gale.1999)[3]. Elevated total phosphorus concentrations have been measured since before the treatment system was installed as displayed in the figure below. The measured concentrations are unlikely to result in eutrophication downstream given the low discharge rates from LLE during summer and the absence of a measurable increase in phosphorus in Long Lake where LLE enters the lake.

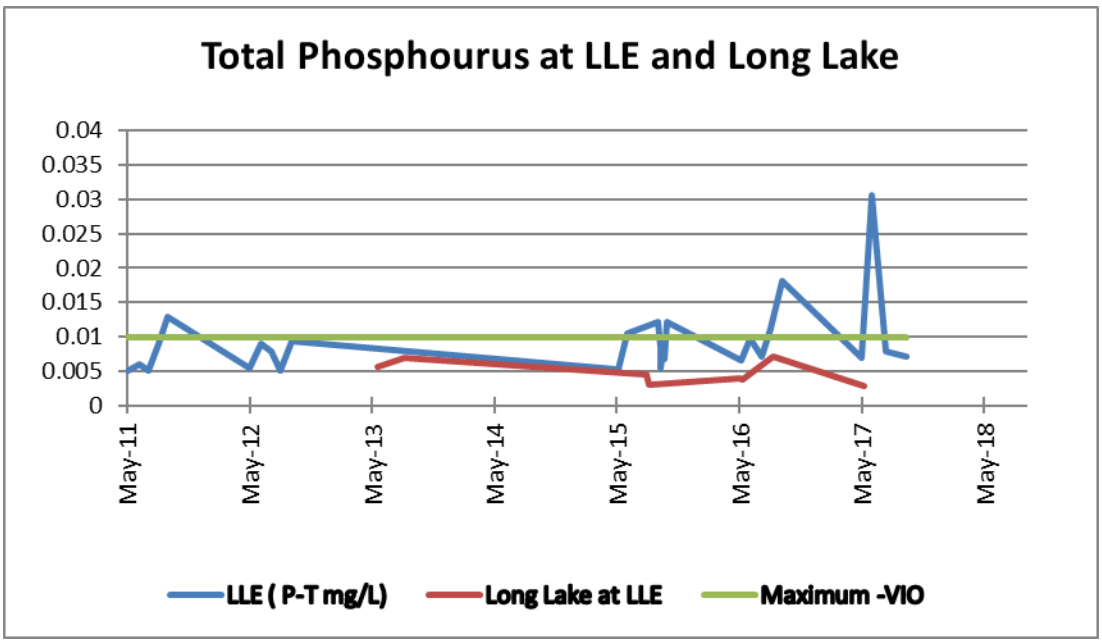


Figure 9: Total Phosphorus at LLE and Long Lake May through September 2011- 2017

Sulphate, iron, and TSS concentrations are influenced by precipitation events and source loading from the multiple disturbance areas within the South mining area. As sulphate and iron are continually found in high concentrations throughout routine monitoring. As a result, Lorax was

[3]R. Reddy, R. H. Kadlec, E. Flaig & P. M. Gale .1999. Phosphorus Retention in Streams and Wetlands: A Review, Critical Reviews in Environmental Science and Technology, 29:1, 83-146K

contracted to perform a loading assessment for LLE to investigate the potential influence from the 4-South portal pad area. This was followed up with further water quality monitoring at LLE during times of low flow and additional studies. Lorax submitted a study in February 2017 entitled "*LLE Wetland Survey and Iron Discharge Study."* Quinsam submitted a report in April 2017 entitled "4-South Loading - LLE Water Quality Summary Report (Including Historical Reports)". These studies provide a greater understanding of elevated iron and sulphate concentrations within the LLE wetland.

Lorax (2017) concluded:

> "*The study results indicated that iron introduced into the LLE wetland via 4S-Lo is particulate Fe3+, which is stored within the wetland. Under typical conditions, the particulate Fe3+ settles in the wetland pond and cycles between the wetland substrate and the base of the oxic surface water layer. Water discharging from the wetland and sampled at LLE on August 29th, 2016 had a low concentration of Fe-T, and iron was less than detection limit in all the filtered samples. These data indicate that iron being discharged to Long Lake is present as particulate iron, which has a relatively low bioavailability. Therefore, potential effects from mine-related inputs of iron to Long Lake should be assessed for the Fe-T fraction."*

Water quality has improved following the reclamation work performed on the 4-South Pad as well as the new culvert (at a slightly higher elevation) installation at LLE. Total and dissolved iron has continued to exceed guidelines as the wetland experiences anoxic conditions during summer and fall flush causes turbidity during high flows stirring up the bottom waters.

Appendix I, Tables (19, 36 and 39) provide the full set of data collected at LLE. A statistical summary of the past six years is available in Appendix I, Tables 44 through 78. Appendix II, Graph (66) displays discharge versus precipitation at LLE.

7.2.3 *Long Lake Seep*

The seep into Long Lake is a bedrock groundwater seep delivering water from the 2-3 South mine pool. This seep is monitored for water quality and quantity to assess overall loading into Long Lake. Long Lake seep water chemistry is influenced by groundwater levels in the 2 and 3-South mining area(s) and is subject to seasonal 'flushing' events due to local precipitation and infiltration.

Two seep sites are monitored on a continuous basis – LLS is the smaller seep and LLSM is the middle seep. LLSM is considered the primary seep, as flows at this site are typically much higher (and variable) than LLS; as such, the hydrology monitoring station is located on this seep.

Overall, water chemistry at both seeps remained consistent with that observed during previous reporting periods. A similar pattern of high flow during winter and no flow through summer and early fall was observed in 2017; however, the dry period (late August through early November) did not extend as in 2017(June through October 23) but was like the four-month dry period reported for previously. This was a direct result of the amount of precipitation received at the mine site during 2017-2018. The middle seep ceases to flow when the mine pool water level falls below the elevation of approximately 303.5-304 meters above sea level (MASL) (measured at MW00-4).

Sulphate concentrations at the middle seep (LLSM) are normally elevated with higher concentrations during winter and lower concentrations through spring but remained consistent throughout the 2017-2018 monitoring year. Concentrations at the smaller seep (LLS) are elevated during winter and spring and decrease slightly during summer and early fall. Although results are available for LLS, the cumulative flow at this site was negligible. The increase in sulphate concentrations observed during winter is thought to be attributed to oxidation (and leaching) of the mine void walls as displayed in Appendix II, Graph 24.

Other parameters of interest include arsenic, iron, and total manganese. This year there was one arsenic exceedance at the middle seep (0.00624 mg/L) and several exceedances for both total and dissolved iron at both seeps. Since the initiation of field filtering and preserving dissolved metal samples, dissolved iron has displayed an increase in concentrations. Mine water high in iron concentrations has the highest observed effect from the transition of laboratory filtering compared to field filtering. This is explained in detail in Section 5.3 of this report.

Metals display the same seasonal trend as sulphate, with peak concentrations in the winter and low flow summer months. Appendix II, Graphs 25 - 26 displays the concentrations of dissolved arsenic and total manganese since 2011. Concentrations of dissolved arsenic have decreased slightly since 2011, typically remaining below 0.004 mg/L, peak concentrations were observed above 0.004 mg/L in July and August at LLS. Total manganese has remained below the WQG of 0.8 mg/L since 2011.

During 2017/2018, monthly water quality samples were collected from the seeps with results included in Appendix I, Tables 20-21 and 39.

7.3 7-South Water Monitoring Sites

The 7-South water management system is comprised of several structures (Section 2.3) to manage local water in and around the disturbed area, with the most substantial structure being the 7-South

settling pond (7SSD). This structure represents the point of discharge for 7-South operations and is regulated under PE-7008. Table 9 outlines the applicable permit limits at 7SSD for each controlled parameter.

Table 9: Permit Limits Applied to 7SSD EMS #E292069

Parameters	Limit	Unit
Total Suspended Solids (daily composite)	25	mg/L
Total Suspended Solids (hourly composite)	35	mg/L
pH	6.0-8.0	mg/L
Sulphate	500	mg/L
Aluminum dissolved	0.1	mg/L
Cadmium dissolved	0.000045	mg/L
Copper dissolved	0.014	mg/L
Iron dissolved	0.35	mg/L
Selenium dissolved	0.016	mg/L
Rainbow Trout Bioassay (*Oncorhynchus mykiss*)	No mortalities at 100% effluent concentration after 96 hour	-

7.3.1 *7-South Settling Pond (7SSD) EMS #E292069*

Discharged occurred at 7SSD for 2 days this monitoring year. The water released was rain water and water from the coal pad.

The following discussion highlights parameters of interest at 7SSD EMS #E292069 with respect to discharge water quality and potential influence in the Lower Wetland and Quinsam River receiving environment. A discussion of settling pond performance and validation of actual effluent water quality compared to the water quality prediction model developed for the 7-South water management plan by Lorax follows.

Complete water chemistry datasets can be found in Appendix I, Tables (22 & 27). Appendix II, Graphs (15 through 21) display the parameters of interest for 7SSD compared to 7S.

7.3.1.1 *General Parameters*

pH

In 2017/2018, pH was generally within the permit limit range (6.0 – 8.0), with weekly measurements ranging from 7.4 to 8.3 (average of 7.82).

Weekly pH and conductivity values for 7SSD are displayed in Appendix I, Table 38.

Total Suspended Solids (TSS)

The TSS ranged from <4.0 mg/L to 6.5.0 mg/L, with an average of 4.34 mg/L. There were no events where TSS was elevated above the permit limit of 25 mg/L. Improved water management strategies such as revegetation of the surrounding banks and area as well as reduced discharge due to pumping systems have aided greatly in reducing TSS and overall discharge quantities.

Dissolved Sulphate

Concentrations of sulphate have decreased substantially since initiation of the management systems as improved practices have been applied. These concentrations have continued to decline into 2018 as improved pumping systems limit the amount of mine impacted water entering the pond. Much of the water entering the settling pond is direct rain water and has proven to limit the quantities discharged substantially. These results and observations reflect the effectiveness of improved management measures employed at the 7-South operational footprint to mitigate overall sulphate loading on the downstream system.

7.3.1.2 *Dissolved Metals*

There were no permit limit exceedances for any metals at 7SSD. The settling pond only discharged for a 24-hour period between January 18th and 19th, 2018. Appendix I, Tables 22 and 32 display the data and discharge quantities, respectively for 7SSD. Tables 9 and 10 display the predicted (expected case and worst case) water quality compared to measured concentrations for parameters of interest at 7SSD and 7S, respectively. The only parameter at worst case was arsenic. The pond was not discharging at the time of collection and 13 out of 14 samples collected were from the ponded water that was not discharging.

Table 10: Water Quality Prediction Model-Best and Worst-Case Scenarios Compared to Measured Concentrations at 7SSD

7SSD WQ (2017-18 Averages)				
Parameter	**Expected Case (mg/L)**	**Worst Case (mg/L)**	**Average (mg/L)**	**Result**
Fluoride	0.122-0.134	0.150-0.161	N/A	
Sulphate	56-71	139.3-180.5	19.26	**Below Expected**
Aluminum	0.040-0.041	0.110-0.113	0.005	**Below Expected**
Arsenic	0.001	0.002	0.002	**At Worst Case**
Boron	0.069-0.082	0.152-0.186	0.03	**Below Expected**
Cadmium	0.000012-0.00013	0.000037-0.000040	0.0000036	**Below Expected**
Cobalt	0.00015-0.00017	0.00161-0.00211	0.0001	**Below Expected**
Copper	0.004	0.006	0.001	**Below Expected**
Iron	0.034	0.130-0.133	0.001	**Below Expected**
Manganese	0.016-0.017	0.054-0.066	0.036	**Between Expected and Worse**
Nickel	0.001	0.003-0.004	0.0005	**Below Expected**
Selenium	0.00193-0.00194	0.00612-0.00632	0.00057	**Below Expected**
Zinc	0.003	0.006	0.00250	**Below Expected**

***When calculating averages, 0.5 of the method detection limit values were used.**

Table 11: Water Quality Prediction Model-Best and Worst Case Scenarios Compared to Measured Concentrations at 7S

7S WQ (2016-17 Averages)				
Parameter	**Expected Case (mg/L)**	**Worst Case (mg/L)**	**Average (mg/L)**	**Result**
Fluoride	N/A	N/A	N/A	
Sulphate	6.49-7.80	15.4-17.8	3.07	**Below Expected**
Aluminum	0.043	0.055-0.056	0.032	**Below Expected**
Arsenic	0.0002	0.0003	0.000062	**Below Expected**
Boron	0.052-0.063	0.061-0.063	0.025	**Below Expected**
Cadmium	0.000010	0.000013	0.000003	**Below Expected**
Cobalt	0.00046-0.00047	0.00062-0.00065	0.0001	**Below Expected**
Copper	0.001	0.001	0.00038	**Below Expected**
Iron	0.020-0.021	0.030-0.031	0.0075	**Below Expected**
Manganese	0.0026-0.003	0.007	0.0005	**Below Expected**
Nickel	0.001	0.001	0.0005	**Below Expected**
Selenium	0.00028-0.00030	0.00070-0.00075	0.00005	**Below Expected**
Zinc	0.005	0.005	0.0025	**Below Expected**

***When calculating averages, 0.5 of the method detection limit values were used.**

All other measured concentrations of sulphate, aluminum, boron, cadmium, cobalt, copper, iron, nickel, selenium and zinc were below the expected case predictions. Measured concentrations of manganese were above the expected predictions but below the worst-case predictions at 7SSD.

All annual average water quality concentrations measured for the parameters modeled at 7S were all below the expected case predictions as should be expected due to the limited discharge from the settling pond. This indicates that during 2017-18 monitoring year, measured water quality has improved from previous years, due to the adopted management practices over the past few years.

7.4 MIDDLE POINT FACILITY

All water samples collected in 2017/2018 had TSS, pH, and oil and grease concentrations below the permit limits at the Middle Point Facility. Results are presented in Appendix I, Table 79.

7.5 BIOASSAYS

An LC50 (median lethal concentration) is the concentration of material (in this case, effluent) in water that is estimated to be lethal to 50% of the test organisms. The LC_{50} and its 95% confidence limits are usually derived by statistical analysis of percent mortalities in several test concentrations, after a fixed period of exposure. The duration of exposure must be specified (e.g., 96-h LC50).

PE-7008 indicates that rainbow trout (*Oncorhynchus mykiss*) LC_{50} bioassays are required once per year (fall flush) at BDS for Settling Pond #1, EMS# E218582 and at Settling Pond #4, EMS# E207409. The bioassays are performed using 100% (non-diluted) discharge water to assess the potential survival of rainbow trout over a period of 96-hours. A successful test sees no mortalities throughout the 96-hour period. Discharge was collected from BDS and Settling Pond #4 on November 9, 2017 and on October 26, 2017, respectively.

The permit requires a 96-hour LC_{50} test on rainbow trout to be completed using 7SSD EMS# E292069 effluent water and, concurrently, a 7-day *Ceriodaphnia dubia* test from water obtained from 7S, EMS# E292109. This is required twice per year; once during the spring freshet and once during the fall flush, when discharging is occurring from 7SSD. The discharge from 7SSD pond was minimal (2 days) in 2017/2018 and low discharge quantities resulted in omitting the spring freshet sample. The fall flush sample was collected on January 19, 2018 at 7SSD and concurrently at 7S.

The sample collected from 7S for the *Ceriodaphnia dubia* was not valid as it did not meet one of the test criteria (i.e. average control reproduction was <15 neonates). The test organism's food the

toxicity laboratories received from the supplier negatively impacted the health of the *Ceriodaphnia dubia.* Other laboratories reported similar results where this incidence occurred. The mortalities were spotty, and the health criteria was suspect. The results of the test were not released to Quinsam due to the test not being validated by the laboratory. Due to limited discharge occurring at 7SSD (over a two-day period) the sample was not collected again. The impact for the water quality released over the 2 days would have been negligible as the water released meet permit limits and Water Quality Guidelines and exceeded the 8:1 dilution ratio required at 7S.

On July 6, 2017 a 48-hour *Daphnia Magna* single concentration at 100% pass or fail test was performed on effluent collected from the Long Lake Middle Seep. This was performed in to assess the seep waters toxicity on sensitive aquatic receptors.

On January 22, 2018 a rainbow trout LC_{50} bioassay was performed on effluent collected from the site 3SDS on the Name Lake Connector stream to assess water quality downstream of the 3-South discharge channel while an unauthorized discharge was occurring.

All rainbow trout bioassays and the *Cedriodaphnia dubia / Daphnia Magna* bioassays had 100% survival (Appendix III). This indicated that mine related discharges at BDS, Settling Pond 4, 7SSD, LLSM and discharge from 3S were compliant, with no acute toxicity in the effluent discharged.

8.0 WATER QUALITY IN THE RECEIVING ENVIRONMENT

Preamble – Water Hardness

For this report, hardness dependent WQGs were derived using background levels of hardness (i.e., WA and IR1 monitoring location, ~30 mg/L) to provide a conservative assessment of receiving environment water quality. Guidelines and objectives do not have legal status but are designed to provide resource managers with direction and comparison for protection of receiving environments with aquatic life.

Guidelines and Objectives: Receiving environment water quality is compared to the British Columbia Ambient WQG for Protection of Aquatic Life for most parameters. The exceptions are hypolimnetic DO (using a WQO based on a site-specific conditions), total cobalt and total lead

(using more recently established site-specific Water Quality Objectives (WQO)[4]), and total phosphorus in streams (using the Vancouver Island objective[5]). Table 12 lists the WQG, WQO and VIO used to screen receiving water quality.

Table 12: Water Quality Guidelines and Objectives Applied to Receiving Environment Stations

Parameter	Lakes (mg/L)		Streams (mg/L)	
	Maximum	5 in 30-day Avg	Maximum	5 in 30-day Avg
Phosphorus - total	0.007 summer avg - Long Lake		0.01	0.005**
	0.006 summer avg - Middle Quinsam L		(May-September)	
Turbidity	n/a	n/a	5.0 NTU	1.0 NTU
Non-filterable residue or TSS	25	5	n/a	n/a
Hypolimnetic DO	3 mg/L minimum during June-August		n/a	n/a
pH	6.5 – 9	n/a	6.5 – 9	n/a
Aluminum (dissolved)	0.1	0.05	0.1	0.05
Arsenic (total)	0.005	n/a	0.005	n/a
*Cadmium (dissolved)	0.00017	0.000088	0.00017	0.000088
Cobalt (total)	0.05	0.004	0.05	0.004
Copper (total)	0.007	0.002	0.007	0.002
Iron (total)	1.0	n/a	1.0	n/a
Iron (dissolved)	0.35	n/a	0.35	n/a
Lead (total)	0.005	0.003	0.005	0.003
Manganese (total)	0.8	0.7	0.8	0.7
Mercury (total)	0.0001	n/a	0.0001	n/a
Nickel (total)	0.025	n/a	0.025	n/a
Silver (total)	0.0001	n/a	0.0001	n/a
Zinc (total)	0.03	n/a	0.03	n/a
*Sulphate dissolved	n/a	128	n/a	128

* Values represent Middle Quinsam sub-basin water quality using WA hardness.

** Average based on monthly samples from May to Sept

[4] Campbell River Area Middle Quinsam Lake Sub-Basin Water Quality Assessment and Objectives. Ministry of Environment. 1989

[5] Guidance Document for Phosphorous Management in Vancouver Island Streams. Ministry of Environment. 2012

Water quality at locations outside of the Middle Quinsam Lake Sub-basin, such as the Iron River and 7-South (7S and LWO), are compared exclusively to the WQG.

8.1 LAKES

The monitoring program for the Middle Quinsam Lake Sub-basin employed a 5 in 30 sampling approach at No Name Lake (NNL), Long Lake (LLM), Middle Quinsam Lake (MQL), and Lower Quinsam Lake (LQL). There are four depths monitored at each lake:

- 1 metre below surface (1 m)
- 4 metres below surface (4 m)
- 9 metres below surface (9 m)
- 1 metre above bottom (1 mb)

Monitoring occurred during three separate periods:

- Spring – April / May 2017
- Summer – August / September 2017
- Fall – October / November 2017

Table 13 below summarizes those parameters above WQG and WQO observed in the lakes for 2017/2018. A summary table is also provided in Appendix I, Table 3 and Tables (44 through 78) provide a statistical summary for parameters of interest with Tables (80 through 83), displaying the depth profiles and field results, and Tables (84 through 131) displaying the water chemistry results compared to WQG and WQO. Appendix II, Graphs (27 through 52) illustrate parameter trends at each lake.

Table 13: Summary of Water Quality Guideline Observations at Lake Monitoring Sites

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS							
EMS ID & Site Name	Site Code & Depth	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E217018 - No Name Lake (NNL)	NNL 8-12 metres	pH	6.5	6.34 - 6.49	April 27 and May 4	Min	(8/60) Depths profiled during spring
	NNL 9-11.5 metres			6.34-6.48	Aug. 10 & 29		(6/57) Depths profiled during summer
	NNL 9-12.5 metres			6.20-6.47	Oct. 19, 25 & Nov. 2		(10/61) Depths profiled during fall
	NNL 1 metre	Zn-T	0.03	0.0307	Nov. 16	M	(1/5) Weekly samples collected in fall
			0.0075	0.00814	Fall 5 in 30	A	Fall 5 in 30
	NNL 4 metre	Cu-T	0.002	0.00202	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.0083	May 4th	M	(1/5) Weekly samples collected in spring
E206619 - Long Lake Middle (LLM)	LLM 13-19.0 metres	Hypolimnetic DO	3 mg/L minimum June through August	0.44 to 2.85	Summer 5 in 30	Min	(32/35) Depths profiled below 13 m (hypolimnion zone)
	LLM 1 metre	Cu-T	0.002	0.0022	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.00899	April 27th	M	(1/5) Weekly samples collected in spring
	LLM 1mb	Cu-T	0.002	0.01	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.0655	May 4th	M	(1/5) Weekly samples collected in spring
		Mn-T	0.8	1.23 to 1.63	Fall 5 in 30	M	Fall 5 in 30
		Mn-T	0.7	1.40	Fall 5 in 30	A	Fall 5 in 30
E292118 - Lower Quinsam Lake (LQL)	LQL (10-15.8 metres)	Hypolimnetic DO	3 mg/L minimum June through August	0.00 to 2.92	Summer 5 in 30	Min	(25/34) Depths profiled below 10 m (hypolimnion zone)
	LQL 1MB	Fe-T	1	1.15	Sep. 15	M	(1/5) Weekly samples in summer
	LQL 1mb	Fe-D	0.35	0.420 - 0.632	Summer 5 in 30	M	Summer 5 in 30

Min = Minimum Water Quality Guidline (WQG) M= Maximum WQG, A= Average WQG

For all Middle Quinsam Lake Sub-basin and Iron River results background hardness of 30 mg/L was used to calculate those parameters that are hardness dependent.

***SO4 at LLE was calculated using a rolling average.**

8.1.1 *Seasonal Trends*

Spring and fall sampling is timed to cover lake turnover, when water circulates freely in the water column and nutrients become more available for phytoplankton growth (Wetzel 2001)[6]. Water is most dense at 4ºC, and during winter, the surface water (epilimnion) is typically colder than 4ºC and the deeper water (hypolimnion) is at about 4ºC (displaying inverse stratification). Spring

[6]Wetzel, R.G. 2001. Limnology, Third Edition. Academic Press, San Diego CA.

turnover occurs when the surface water warms to 4ºC and begins to mix with the deeper water. The lake circulates freely throughout the water column for several days (Wetzel 2001). Through the spring and summer, surface temperatures increase, establishing a thermocline (region of rapid temperature change), with warmer water above and cooler water below. Temperatures cool in late summer, and eventually the thermal stratification breaks down, leading to fall overturn and to mixing of the water column. As surface waters continue to cool, a colder layer overlies the dense bottom water (4ºC) and inverse stratification persists from late fall to spring. During periods with distinct stratification, it has been observed that water chemistry often displays variable concentrations throughout the water column. During overturn, nutrients associated with decomposition of organic matter that has sunk to the bottom are brought into surface waters, where they are available for phytoplankton growth. The timing and duration of spring and fall turnover depend on the size and depth of the lake.

8.1.1.1 *Spring*

The spring sampling program is scheduled to capture the lake turnover that typically occurs in conjunction with warmer temperatures, snowmelt, and increased precipitation. Spring sampling spanned from April 11 through May 10, 2017 during this monitoring year. The sampling regime commenced during the spring turnover event with warming ambient temperatures of greater than 4 ºC. From April 1st through to May 10th 137.50 mm of precipitation was received.

Stratification gradually developed during the five weeks of sampling as temperatures warmed from 6 ºC to above 12ºC in the upper water column.

Noteworthy observations resulting from the spring lake monitoring program include the following:

- Sulphate was below or at the WQG (128 mg/L) in NNL, MQL LLM, LQL at all depths, with the maximum measured in LLM (128 mg/Lat LLM 1mb and 125 mg/L at LLM9)
- Average sulphate concentrations increased at MQL 1mb to 92 mg/L during spring 5 in 30
- No Name Lake continued to experience low pH values at depth
- Total copper was elevated above the average WQG (0.002 mg/L) at NNL4, LLM1 and LLMB and above the maximum WQG (0.007 mg/L) during 1 of the 5 weekly sampling events at the corresponding depths.

The only parameters of interest that were higher than WQGs during spring sampling were copper (shallow waters NNL4, LLM1 and deep water LLM) and pH (deep water at NNL).

8.1.1.2 *Summer*

The summer sampling program is scheduled to capture the period of low flow and lake stratification. The summer program ran from August 10th through September 15th. The summer program represents the lake's seasonal thermal stratification and a time when deeper lakes naturally develop anoxia in deeper waters. Results from this sampling period represent low dilution conditions when the lakes display minimum assimilative capacity and mine related surface discharges and groundwater infiltration have the greatest influence.

During the summer sampling program, there were high ambient temperatures and low precipitation (52.30 mm of accumulated precipitation for June through mid-September), with 22.50 mm in June, 17.20 mm in July, 5.80 mm in August and 6.80 mm till mid-September. Summer 2017 was a drier season compared to summer 2016 (150 mm for June through mid-September).

Noteworthy observations resulting from the summer monitoring program include the following:

- Sulphate was below the WQG (128 mg/L) in NNL, MQL LLM, LQL at all depths, with the maximum (128 mg/L) measured at LLM 1mb and LLM9 (125 mg/L)LLM 1mb had lower average Mn-T concentrations in summer 2017 (0.176 mg/L) than in summer 2016 (0.467 mg/L), and concentrations were below the WQG average (0.7 mg/L) in summer 2017 and 2016 (above the WQG in previous years)
- NNL had lower pH (below 6.5 WQG) at depth than in surface waters
- Hypolimnetic DO was below the site-specific WQG (3 mg/L) in LLM and LQL in the hypolimnion zone (0 to 2.92 mg/L)
- Total iron was elevated above the WQG on 1 occasion at 1mb in LQL and dissolved iron was elevated during all weeks of sampling at 1mb in LQL.

8.1.1.3 *Fall*

The fall sampling program is scheduled to capture the period of elevated precipitation following the summer dry season, representing fall overturn and a 'fall flushing' event that is correlated with elevated surface water metal concentrations resulting from localized weathering and mobilization. The lakes turn over in the fall as the water temperatures decrease and high inflows return. In 2017, the fall monitoring program was initiated on October 19th and ran through November 17th during a time of light precipitation (205.90 mm from October 1st through November 17th). This was notably lower than fall 2016, when 596 mm of accumulated precipitation was received from October 1st through November 17th.

Noteworthy observations resulting from the fall monitoring program include the following:

- Water quality parameters at most lakes remained below WQGs and WQOs; exceedances occurred at LLM, NNL and LQL
- All lakes except LLM had higher hypolimnetic DO levels compared to fall of previous years, resulting in decreased concentrations of iron at the sediment water interface in LQL at 1mb depth
- In LLM, total manganese concentrations at 1mb were elevated above the maximum WQG (0.8 mg/L) in all five weeks and exceeded the average WQG (0.7 mg/L)
- Sulphate concentrations were below the WQG (128 mg/L) in NNL, MQL, LQL and LLM at all depths; LLM 1mb was just below the WQG (128 mg/L) with an average of 127 mg/L and LLM1 and LLM4 had lower average sulphate concentrations than during summer, indicating the surface waters were mixing with deeper waters
- In LQL 1mb, dissolved iron concentrations were lower than during summer as dissolved oxygen increased in the hypolimnion zone. Dissolved iron was at the WQG (0.35 mg/L) on one occasion during fall
- NNL experienced lower pH at depth, below the minimum WQG (6.5)
- NNL1 experienced elevated total zinc above both maximum (0.03 mg/L) and average (0.0075 mg/L) WQGs

8.1.1.4 *General Parameters*

pH

Lakes that are deeper and thermally stratified normally have pH that ranges from alkaline on the surface (epilimnion) to slightly acidic at bottom depths (hypolimnion). This trend is typically more pronounced during summer, when the lake is stratified, and surface temperatures are elevated.

During 2017, NNL had several occurrences where pH fell below the WQG minimum of 6.5. For the depth profiles, this included 8 of 60 measurements in spring, 6 of 57 measurements in summer, and 10 of 61 measurements in fall.

Factors that may contribute to acidic conditions observed through the water column of NNL include:

- Natural conditions – the western end of the sub-basin is surrounded by a vast wetland; organic wetland soils tend to be acidic

- Limited turnover – temperature gradients are relatively small during spring and NNL is shallow (~12-13 m) compared to Long Lake (20 m) and Lower Quinsam Lake (16-18 m)
- Anthropogenic sources – i.e., mining and logging in the area

NNL has a shallow basin (12-13 m) and a large drainage area. Since monitoring began in 2012, slightly acidic conditions have been recorded throughout the water column during spring, summer and fall sampling events, with most of the readings below the WQG of 6.5. Baseline water quality sampling performed by MoE 1983 and 1984 also indicated pH less than 6.5 at depth. Monitoring will continue at NNL and and No Name Lake Outlet, with trends for pH evaluated.

The sampling location on No Name Lake is considered to be outside of mine related discharge, and low pH values are not believed to be associated with mining activities. No direct surface mine discharge locations to No Name Lake have been identified and the low pH is understood to be naturally occurring.

For all other lakes, pH remained circumneutral and within WQG's 6.5 to 9.0.

Middle Quinsam Lake is generally neutral to slightly basic throughout the spring, summer, and fall and this trend continued for 2017 (all samples above the WQG minimum). Both WA and WC, which enter Middle Quinsam Lake, exhibit neutral pH.

HARDNESS

The WQG for sulphate and several metals varies with hardness. Water is defined as very soft if hardness ranges from 0 - 30 mg/L and soft to moderately soft at 31- 75 mg/L. No Name Lake is considered to have very soft water (average concentration < 15 mg/L). Lower Quinsam Lake is characterized as very soft to moderately soft (average concentration of 20 mg/L to 35 mg/L in 2017). Since summer of 2014, Middle Quinsam Lake has had soft to moderately soft water throughout the water column. In 2017 there was an increase observed at depth in spring and summer (average of 85 mg/L in spring and 60.5 mg/L in summer at 1mb); all other depths had similar concentrations throughout the water column in all three sampling periods; Appendix II, Graph 39. Long Lake generally has moderate to hard water (higher hardness in deep water), but the range varies with season and depth. Concentrations were highest in summer at surface depths (average 122 mg/L). The deeper waters of Long Lake were less variable, with spring and fall averages of 132 mg/L and a summer average of 137 mg/L at 1mb.

In No Name and Lower Quinsam Lake, hardness was slightly higher at surface during summer than during fall and spring, indicating flushing and dilution from rain and/or runoff after the summer. During summer, hardness was higher at surface than at depth in No Name and Lower Quinsam lakes, in contrast to Long Lake, and Middle Quinsam Lake, which had higher hardness at depth than at surface. This could be an indication of groundwater infiltration to Long Lake or the greater depth of Long Lake (19-20 m), which would have lower flushing in the hypolimnion zone.

SULPHATE

As noted in Section 7.2.2 and Table 7, the sulphate WQG is hardness dependent, but for QCC, it is set at 128 mg/L (applying a background hardness of 30 mg/L from monitoring station WA, upstream of mine influences).

Sulphate concentrations were lower than the WQG of 128 mg/L in No Name, Middle Quinsam, and Lower Quinsam lakes at all depths and in Long Lake at 1 m, 4 m and 9 m depths during the three sampling periods. In Long Lake, results for 1mb were at or just below guidelines during all seasons (127.6 mg/L, 127.8 mg/L and 127.2 mg/L, respectively for spring, summer and fall average concentrations). If the sulphate WQG was derived using average hardness measured in Long Lake at 1m depth during spring (44 mg/L), summer (122 mg/L) and fall (81 mg/L), the average sulphate guideline would range from 218 mg/L to 309 mg/L during these seasons. Recognizing that hardness and sulphate concentrations in Long Lake reflect the influence of mining discharges, and not baseline conditions, a higher hardness-defined WQG would still be protective of aquatic life, given the protective mechanism provided by hardness (MOE 2013)[7].

Sulphate concentrations increased with depth in LLM, MQL, and NNL and appeared to be correlated with thermal stratification. In LQL, concentrations decreased with depth.

In 2017, sulphate concentrations in Long Lake were greatest during summer at depth 1mb. Higher concentrations during summer were associated with contributions from the seeps that flowed until mid-August, at a time of limited to no surface discharge from Settling Pond #1. The greatest

[7] Ministry of Environment. 2013. Ambient water quality guidelines for sulphate. Technical Appendix Update. Available at:http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/bc_moe_wqg_sulphate.pd

fluctuation was observed between spring, summer and fall at 1 m (average of 34 mg/L in spring, 103 mg/L in summer to 71 mg/L in fall). In deep water (9 m), the average concentrations were the same in spring and summer (125 mg/L) and were lower in fall (85.5 mg/L). At 1mb average sulphate concentrations were relatively constant: 127.6 mg/L in spring, 127.8 mg/L in summer and 127.2 mg/L in fall. This vertical pattern through the seasons suggests that the deeper water (15 to 20 m depth) does not fully flush.

In Middle Quinsam Lake, the fall 2014 monitoring indicated a decrease in sulphate concentrations at 1 mb from above 128 mg/L to below 20 mg/L after a flushing event. Sulphate concentrations had remained below 52 mg/L from fall 2014 until spring 2017, when an increase was observed at depth. In 2017, the average sulphate concentrations remained similar from surface to 9 m during all three seasons (ranging from 30 to 35 mg/L). The 1mb displayed the greatest variability, highest in spring (averaging 92 mg/L) and declining by fall (to 34 mg/L). Concentrations were similar throughout the entire water column in fall.

No Name Lake and Lower Quinsam lakes continued to have sulphate concentrations well below the WQG in 2017. In Lower Quinsam Lake, peak concentrations were reported during summer at 4 m (average of 27 mg/L) and suggested some influence of mining related discharges. The range of average concentrations in Lower Quinsam Lake remained similar during spring and fall throughout the water column, with a greater range observed between surface and 1mb in summer, indicating stratification. Once again, the sulphate concentrations were lowest at depth in Lower Quinsam Lake. In No Name Lake, the average sulphate concentration was below 5 mg/L for all three monitoring periods.

HYPOLIMNETIC DISSOLVED OXYGEN

The hypolimnetic dissolved oxygen (DO) Water Quality Objective of 3 mg/L minimum in June through August was developed for the Water Quality Objectives for Middle Quinsam Lake Sub-basin (MQL and LL); however, Quinsam also applies this objective to NNL and LQL. The hypolimnion is the dense, cold bottom layer below the thermocline in a thermally stratified lake. Typically, the hypolimnion is the coldest layer in summer and the warmest layer during winter. Anoxic conditions may develop naturally in deep waters over the summer due to the lack of circulation with upper, oxic water during stratification and the consumption of DO by microorganisms that decompose organic matter and by chemical reactions. The reducing environment can cause lake sediments to release iron, manganese, sulfide, and arsenic, all of which could have potential toxicological effects on aquatic receptors.

In 2017, hypolimnetic DO in Long Lake was below 3 mg/L during the summer sampling period, and low DO continued into November. Long Lake has a deep basin (20 m) and experiences anoxic conditions during summer and fall, associated with elevated manganese.

Lower Quinsam Lake exhibited anoxic conditions in the hypolimnion during the summer, with increased DO observed in the fall sampling event. In Lower Quinsam Lake, water at 10 to 16 m had DO below 3 mg/L for all five weeks of sampling during summer; this lake has a deep basin (17 m) and typically experiences low DO at depth when stratification is pronounced.

8.1.1.5 *Total and Dissolved Metals*

Concentrations of most metals at the four lake monitoring stations were low and below WQGs throughout the spring, summer, and fall sampling periods. Concentrations of dissolved cadmium, total and dissolved iron, total manganese and total zinc were higher than WQGs in some lakes, as discussed below.

Iron and Dissolved Oxygen

Total and dissolved iron (Fe-T and Fe-D) concentrations in the four lakes have displayed similar trends since 2013: low concentrations near surface throughout the year; low concentrations at all depths during spring; and increased concentrations at depth during anoxic conditions during summer and fall. Iron concentrations were well below WQGs for No Name, Long, and Middle Quinsam Lakes (all depths) and at Lower Quinsam Lake (all depths except 1mb).

Lower Quinsam Lake (at 1mb) had elevated Fe-T on one occasion during summer and elevated Fe-D on all five occasions during summer and one occasion during the fall. Fe-D ranged from 0.420 mg/L to 0.632 mg/L during summer. This is one of the deepest lakes sampled (17 m depth), and the elevated iron concentrations are directly related to anoxic conditions and associated increase in iron solubility at the sediment/water interface. Appendix II, Graphs (51 and 52) display the inverse relationship between low DO and elevated iron concentrations: when DO decreases below 3 mg/L, iron concentrations increase.

Manganese and Dissolved Oxygen

An inverse relationship between manganese (Mn-T) and DO is observed in Long Lake. Mn-T concentrations are highest when DO falls below 3 mg/L. In 2017, Mn-T concentrations remained low during spring and summer and increased in fall at 1mb to above the average and maximum WQGs (0.7 mg/L and 0.8 mg/L, respectively). Total Mn concentrations in Long Lake have been

greatest at 1mb depth since 2006. Appendix II, Graphs (37 and 38) display the maximum and 5 in 30 average concentrations of total manganese at Long Lake, respectively.

A similar trend of elevated Mn-T with low DO was identified for Lower Quinsam Lake at 1mb during the summer monitoring period. However, concentrations did not exceed the WQG maximum or average during 2017, Appendix II, Graphs (49 and 50) depict these trends.

The Ambient Water Quality Guidelines for Manganese[8] state:

> "*Mn is only slightly to moderately toxic to aquatic organisms in excessive amounts. It is present in almost all organisms and often ameliorates the hazard posed by other metals. Hence jurisdictions in the international arena have not disseminated Mn guidelines to protect freshwater and marine life. Mn availability and, hence its toxicity in the aquatic environment, can be influenced by many factors including water hardness."*

In deeper lakes, stratification may result in anoxic conditions in the hypolimnion and the dissolution of the iron and manganese from sediment. Casey (2009)[9] noted:

> "*Iron and manganese are commonly found in groundwater and some surface water such as lakes that have a significant groundwater input. The existence of Fe and or Mn in groundwater generally infers prior anaerobic conditions with the result that the water is likely to be devoid of oxygen and may also have a high carbon dioxide (CO_2) concentration. As well as being associated with groundwater input the existence of Fe and Mn in some deep lakes and reservoirs may be due to stratification, resulting in the development of anaerobic conditions in the bottom water zone and the dissolution of the iron and manganese from floor deposits*."

Long Lake has historically been characterized as having very low DO at depth, with levels in September to October below 4 mg/L at depths greater than 15 m (Kangasniemi,1989)[10]. Nordin

---

[8] Ministry of Environment.2013. Ambient Water Quality Guidelines for Manganese

9 Casey,T.J. 2009. Iron and Manganese in Water Occurrence, Drinking Water Standards and Treatment Options through the Aquavarra Research LMT Water Engineering Papers. Paper 3..

[10] Kangasniemi, B.J.1989.Campbell River Area Middle Quinsam Lake Sub-Basin Water Quality Assessment and Objectives. Ministry of Environment, Lands and Parks. Summary.

(2006)[11] reported that Long Lake stratifies into hyperlimnion and hypolimnion sections in April and May and remains stratified until October through November. Appendix II Graph 34 displays the inverse relationship between historical DO vs Mn-T reported at 1 mb since 2005 that occurs during late summer and fall when DO levels decline to below 3 mg/L.

SLR (2015)[12] suggested these findings have potential implications for the means by which sediments and Contaminants of Potential Concern (COPC) are distributed in Long Lake. They suggested that the deepest portion of the lake has the greatest potential to accumulate and retain COPCs whose mobility in aquatic systems is affected by oxygen availability in overlying waters and sediments.

It is conceivable that manganese has a greater loading rate from the parent rock and substrate materials, with mobility accelerated by anoxic conditions at depth (SLR, 2015); The regional geology of Long Lake is divided in half with the Nanaimo group in the southern half and the Island Plutonic Suite (IPS) in the northern half (SLR, 2015); this could have implications for different loading of arsenic and possibly manganese and other metals from parent material (SLR, 2015).

The Mn-T concentrations in deep waters of the lakes do not appear to be mine related, as concentrations at most discharge locations remains low; however, the WQG exceedances are of concerns for assessing potential effects in the receiving environment and trends will continue to be monitored in subsequent years.

Arsenic

Arsenic has become a parameter of interest in the Quinsam watershed, particularly for Long Lake; however, this parameter is not observed to be elevated in the receiving waters. In the 2017 monitoring programs, arsenic concentrations were well below the WQG (0.005 mg/L), in the four lakes monitored. Arsenic concentrations in sediment were elevated above guidelines in Long Lake, No Name Lake, and Lower Quinsam Lake as presented in the *2016-17 Annual Water Quality Monitoring Report* and in ex-situ groundwater throughout the site due to the host rock geology (See

[11] Nordin, R.N.2006.An Evaluation of the sediment quality and invertebrate benthic communities of Long and Middle Quinsam Lakes with regards to local coal mining activity.

[12]SLR.2015. Sediment Quality, Toxicity, and Bioavailability Review with Background Assessment Based on Current Knowledge of Sediment Dynamics and interpretation or Pre and Post Mining Sediment Concentrations and Distribution.

Appendix IX). The water quality data confirm that arsenic found in the sediment is not transported into the water column, even during times of anoxic conditions.

Copper and Zinc

Total copper was elevated above average and maximum WQGs (0.002 mg/L and 0.008 mg/L, respectively) in NNL at 4m and LLM at 1m and 1mb depths during spring. Total zinc was found elevated above maximum and average WQGs (0.03 mg/L and 0.0075 mg/L, respectively) in NNL at 1m during fall. Both parameters are thought to be attributed to increased runoff during spring and fall. Maximum guidelines were exceeded on one occasion, in all events, increasing results above average guidelines. For both parameters exceedances were minimal, less that two times the WQGs.

8.2 River and Stream Sites

The table below summarizes those river and stream sites that were observed to have parameters in excess of the WQGs. This table is also available in Appendix I, Table 3.

Table 14: Summary of Water Quality Guideline Exceedances in the Streams and Rivers

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS							
EMS ID & Site Name	Site Code & Depth	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E286930 - Quinsam River Downstream Site 1 (QRDS1)	QRDS1	Zn-T	0.0075	0.0142	Summer 5 in 30	A	Summer 5 in 30
			0.033	0.05	Aug. 17	M	(1/5) Weekly samples collected in summer
E292112 - Lower Wetland Outlet (LWO)	LWO	pH	6.5	5.7 to 5.8	Fall 5 in 30	Min	(3/5) Weekly samples collected in fall
		Cu-T	0.002	0.00216	Fall 5 in 30	A	Average of 4 samples collected in fall
		Al-D	0.05	0.13250	Fall 5 in 30	A	Average of 4 samples collected in fall
			0.1	0.1760, 0.1740 & 0.1270	Oct. 30 & Nov. 7th & 17th	M	(3/4) Weekly samples collected in fall
E297230 - Quinsam River Upstream of Mining Operations (IR1)	IR1	Al-D	0.05	0.06	Spring 5 in 30	A	Spring 5 in 30
			0.05	0.0521	Fall 5 in 30	A	Fall 5 in 30
			0.1	0.103	Oct.18	M	(1/5) Weekly samples collected in fall
		Zn-T	0.0075	0.0120	Summer 5 in 30	A	Summer 5 in 30
			0.033	0.04	Aug. 17	M	(1/5) Weekly samples collected in summer
E297231 - Iron River Upstream of 7SA5 (IR6)	IR6	Al-D	0.05	0.075	Spring 5 in 30	A	Spring 5 in 30
				0.0528	Fall 5 in 30	A	Fall 5 in 30
			0.1	0.105	Oct. 18	M	(1/5) Weekly samples collected in fall
		Cu-T	0.002	0.0022	Spring 5 in 30	A	Spring 5 in 30
			0.007	0.0080	Apr. 12	M	(1/5) Weekly samples collected in spring
		As-T	0.005	0.00672 - 0.0110	Aug. through Sep 27	M	(6/7) Samples collected in summer
				0.00740	Oct.12	M	(1/5) Samples collected in fall
E297232 - Iron River Downstream of 7SA5 (IR8)	IR8	As-T	0.005	0.00743 - 0.0172	Jul 25, Aug. 4 & 9 Sep. 27	M	(4/7) Samples collected in summer
				0.016	Oct.12	M	(1/5) Weekly samples collected in fall
		Al-D	0.05	0.066	Spring 5 in 30	A	Spring 5 in 30

Min = Minimum Water Quality Guidline (WQG) M= Maximum WQG, A= Average WQG

For all Middle Quinsam Lake Sub-basin and Iron River results background hardness of 30 mg/L was used to calculate those parameters that are hardness dependent.

***SO4 at LLE was calculated using a rolling average.**

8.2.1 *Middle Quinsam Lake Inflow (WA) EMS #0126402 and Outflow (WB) EMS #0900504*

Comparing Middle Quinsam Lake's inlet (WA) EMS # 0126402 and outlet (WB) EMS #0900504 offers an opportunity to assess potential mine-related effects on Middle Quinsam Lake water quality. Furthermore, water quality results from WA are considered "baseline" for the Middle Quinsam sub-basin receiving environment stations as the site is situated upstream of any mine related discharge. Data obtained from WB (outlet of Middle Quinsam Lake) provides information on lake water quality after the addition of discharges from the South water management system, shallow and deep groundwater, Long Lake Outlet (LLO), mine related discharge from Settling Pond #4, and other anthropogenic sources (e.g., logging). Summary statistics for the last six years are provided in Appendix I, Tables (44 and 78) with Tables (132 through 136) presenting water quality data for WA and WB with comparison to WQOs and WQGs. Appendix II, Graph (63) displays Middle Quinsam Lake daily inflow obtained at the WA hydrometric station and Graph (64) compares discharge at WB with precipitation. Appendix II, Graphs (53 through 59) display the parameters of interest or those found elevated above WQGs (dissolved sulphate, aluminum, total arsenic and zinc) in the Quinsam Sub-basin.

TSS results at WA and WB remained below detection limits (<4.0 mg/L) throughout all sampling events, as reported in previous years, and are expected to continue at low concentrations. Samples for WB are collected below the Coal Main road crossing on the Quinsam River and the low TSS results reflect the efforts made in reducing sediment and erosion at this location.

The pH values were similar at WA and WB. During 2017/2018, pH at WA and WB was weakly alkaline and within the WQG range of 6.5-9.0; pH values averaged 7.67 at WA and 7.85 at WB.

Conductivity at WB reflected the mine influences (elevated conductivity and sulphate are considered signatures of mine influence). For example, average conductivity values in 2017/2018 were 48 µs/cm at WA and 170 µs/cm at WB. Average sulphate concentrations were 0.96 mg/L at WA and 34.6 mg/L at WB, below the WQG at both stations (Appendix II, Graph 55). Like sulphate, annual average hardness concentrations display a moderate increase from WA to WB with average concentrations of 19.8 mg/L and 38.2 mg/L, respectively.

Dissolved metals displaying a substantial increase in annual average concentrations between WA and WB include both iron (0.00147 mg/L at WA to 0.0256 mg/L at WB) and manganese (0.00057 mg/L at WA to 0.0024 mg/L at WB) 2017/2018, likely attributed to mine related discharge. All total and dissolved metals remained below WQGs, and concentrations were similar to previous years.

8.2.2 *No Name Outlet (NNO) EMS # E217017 and Long Lake Outlet (LLO) EMS # E219412*

Flow from No Name Lake (NNO) enters the west end of Long Lake and exits Long Lake at the site known as LLO. LLO discharges to Middle Quinsam Lake upstream of Middle Quinsam Lake outlet (WB). Water quality monitoring at NNO and LLO provides information on changes in water chemistry in both Long Lake and the channel connecting the two lakes. The sampling location on No Name Lake is considered to be outside of direct mine discharge but could be influenced by groundwater. Therefore, changes in water chemistry between NNO and LLO represent the incremental mine loading into Long Lake from various inputs, including shallow and deep groundwater (e.g. emanating from 2S/3S), Long Lake Seep discharge, mine related discharge from the South water management system, and other anthropogenic sources (e.g., logging).

As shown in Appendix I, Tables (132 through 1342), average TSS concentrations for LLO and NNO remained ≤ 4 mg/L during the three monitoring periods in 2017/2018. Both NNO and LLO exhibited similar pH, averaging 7.47 at NNO and 7.62 at LLO, with no WQG exceedances.

Conductivity, sulphate and hardness levels increase between NNO and LLO, reflecting mine related influence on Long Lake. Annual average conductivity was 41 µs/cm at NNO and 275 µs/cm at LLO. Annual average sulphate was 1.2 mg/L at NNO and 57 mg/L at LLO. Sulphate concentrations at LLO were higher during spring than summer and fall sampling periods, with no values higher than the WQG. Sulphate concentrations at LLO are cyclic, highest during summer and decreasing during fall and winter along with higher flow rates and increased dilution, Appendix II, Graph (54). Sulphate is monitored weekly at LLO to assess water quality exiting Long Lake. Appendix I, Table (36) displays rolling average values for sulphate, which provide the most appropriate concentration to compare to the WQG. Like sulphate, water hardness increases from NNO (average of 14 mg/L) to LLO (average of 64.7 mg/L).

Average concentrations of metals observed in NNO and LLO remained low, with many below laboratory DLs. All total and dissolved metals were below their WQGs.

Water quality data for sites LLO and NNO are presented in Appendix I, Tables (137 to 142) with comparison to WQOs and WQGs. Appendix II, Graph (67) compares discharge with precipitation at LLO.

8.2.3 *Stream 1 – (7S) EMS # E292109 and Lower Wetland Outlet (LWO) EMS #E292112*

The headwaters of Stream 1 are formed by the discharge of 7SSD, which combines with Stream 2 above sampling location 7S. Downstream of site 7S, Stream 1 enters the Lower Wetland then flows into the Quinsam River. Given the aquatic values (fish habitat) in the Quinsam River, the 7S station has been defined as the initial dilution zone for 7-South discharge water. This receiving environment site is used to evaluate the influence of 7-South operations on aquatic receptors. The Lower Wetland Outlet (LWO) station was established to monitor the cumulative water quality in Stream 1, and to understand overall contributions to the Quinsam River. The Lower Wetland Outlet station has not been representative of water quality from 7SSD nor from 7S.

There was discharge from 7SSD for a total of 24 hours over 2 days in 2017/2018 and 12 days in 2016/2017, indicating the limited amount of loading from the 7-South mine discharge to the Lower Wetland.

The average sulphate level of 3.07 mg/L at 7S was well below the WQG (128 mg/L), which was a direct result of diligent control of releases from the 7SSD sedimentation pond (to maintain an 8:1 dilution ratio) and water management measures employed at 7-South operations. In 2017/2018, all total and dissolved metals were below WQGs and WQOs at 7S.

Downstream site LWO had low pH (below 6.5) for 3 out 5 weekly samples during fall and concentrations of dissolved aluminum and total copper above WQGs (copper above the average WQG of 0.002 mg/L and aluminum above the maximum WQG of 0.1 mg/L and average WQG of 0.05 mg/L). These results are consistent with baseline measurements collected by Golder Associates[13] in June 2011, which showed WQG exceedances for iron (3.79 mg/L Fe-T and 2.52 mg/L for Fe-D) and aluminum (0.101 mg/L Al-D). Elevated metals concentrations such as iron, aluminum and copper at this station are attributed to natural causes associated with anoxic conditions in wetlands during summer and fall. LWO is normally dry during the summer, low flow period. Elevated metals concentrations were localized to the wetland (beaver dam area) and downstream of 7S; concentrations were low at 7S throughout the monitoring periods. All other parameters were below WQGs; results for 7S are displayed in Appendix I, Tables (23 and 24) and Appendix II, Graphs (15, 17 through 21). Results for LWO are displayed in Appendix I, Tables (146 to 148).

[13] Golder Associates. Quinsam 7-South Effluent Technical Assessment Report. 2011

8.2.4 *Quinsam River Downstream Site 1 (QRDS1) EMS # E286930 & 7-South Quinsam River (7SQR) EMS # E292113*

QRDS1 is located approximately 2 km downstream from the Middle Quinsam Lake outlet (sampling site WB) and upstream of any inputs associated with 7-South operations. QRDS1 was established to monitor groundwater inputs from the underground disposal of 7-South tailings into the 2-North mine and the underground sub-aqueously stored PAG-CCR material from processing of 5-South coal stored in the river barrier pillar. 7SQR is the 7-South Quinsam River monitoring station on the Quinsam River approximately 4 km downstream of QRDS1. 7SQR water quality is used to evaluate the influence of 7-South mine related discharge to the Quinsam River downstream of the LWO, and groundwater inputs to the Quinsam River from sub-aqueously stored PAG-CCR in the 7-South mine.

The incremental loading associated with discharge from 7-South operation was observed to be negligible in 2017/2018. General parameter concentrations were similar for both sites.

Sulphate concentrations were similar for the two sites and were well below the WQG (128 mg/L). The annual average sulphate concentration was 35 mg/L at QRDS1 and 31.5 mg/L at 7SQR. Both stations were sampled during the three 5 in 30 sampling periods and 7SQR was also sampled monthly.

Total and dissolved metal concentrations were similar at both stations. The exception was for total zinc concentrations at QRDS1, which were higher than the maximum and average WQGs. The maximum WQG of 0.033 mg/L was exceeded during one sampling event in summer (0.05 mg/L), resulting in an exceedance of the average WQG of 0.0075 mg/L (0.0142 mg/L).

Appendix I, Tables (143 - 145) and Appendix II, Graphs (55 - 59) display relevant parameters of interest for these sites.

8.2.5 *Iron River*

The Iron River Baseline Summary Report was submitted to the MOE on March 31, 2016. The report reviewed the monitoring data at all sites in the Iron River, summarizing trends and parametres found to be naturally elevated due to the watershed geology and contact with the Benson/Dunsmuir members of the Comox Formation.

As part of the 7-South Area 5 permit application, baseline water quality data were collected at ten stations on the Iron River to gain an understanding of existing water quality and local influences. Additionally, six tributaries were monitored to identify incremental loading.

One year of monthly baseline samples was obtained at all sites to maximize interpretation of seasonal variations and trending on the Iron River. Post-baseline monitoring in 2017/2018 continues to consist of 5 in 30 and monthly sampling at three stations on the Iron River (IR1, IR6 and IR8) and one station on the Quinsam River, downstream of the confluence of the Iron River (IRQR).

Most general parameters (e.g., TSS, sulphate) had low concentrations at the four stations and remained well below WQGs. Hardness showed seasonal variability, with lower levels in spring and fall (higher flow) than in summer (low flow). Due to the varying hardness levels at IR1 (upstream of mining operations) a conservative approach was taken when calculating hardness-dependent WQGs (using a hardness of 30 mg/L).

Dissolved aluminum and total arsenic are the two primary parameters displaying a trend related to flows in the Iron River. Al-D concentrations were higher than the WQG during multiple sampling events at all three stations (IR1, IR6 and IR8) during spring and during one weekly sample in fall at IR1. As-T concentrations were higher than WQGs during summer low flow at IR6 and IR8 and were higher at IR6 compared to IR8. Elevated arsenic concentrations were also observed into the first week of fall sampling at both locations, as displayed in Appendix II, Graph 62.

An inverse relationship between As-T and Al-D has been identified: Al-D is elevated during periods of higher flow while As-T is elevated at times of low flow (Appendix II, Graphs 60 to 61). In 2017-2018, for example, As-T exceeded the WQG at IR6 and IR8 in most of the samples collected during the summer while Al-D was above the WQG during spring and fall.

Concentrations above maximum and average WQGs were reported for Zn-T at IR1 during summer and for Cu-T at IR8 during fall. In both cases, one of the five results were above the maximum WQG, resulting in the average being above the average WQG. All other parameters of interest were below WQGs at IR1, IR6, and IR8 and there were no parameters above WQGs observed at 7SQR or IRQR. Therefore, mixing of the Quinsam and Iron rivers continues to provide sufficient dilution to maintain water quality.

Appendix I, Tables (153 - 168) and Appendix II, Graphs (60 to 61) display relevant data for all Iron River sites graphed against flow.

9.0 BIOTA MONITORING IN THE RECEIVING ENVIRONMENT

Phytoplankton and zooplankton are monitored every year at one station in each of No Name, Long, Middle Quinsam, and Lower Quinsam lakes. The sampling sites are shown in Appendix X, Figure 1. This section of the report describes sampling objectives, methods, QA/QC, and results for phytoplankton and zooplankton.

9.1 PHYTOPLANKTON

Phytoplankton are photosynthetic microorganisms that live in lakes at depths to where adequate sunlight can penetrate. They are the main primary producers in lakes, converting sunlight, CO_2, and water into organic matter, and are the foundation for the aquatic food web (Wetzel 2001). Phytoplankton includes algae and cyanobacteria, both of which contain at least one form of chlorophyll (chlorophyll *a*), the major photosynthetic pigment. They are sensitive to changes in water quality (Wetzel 2001). Many lakes have a spring and fall phytoplankton bloom (peak growth period) following the seasonal "overturns" or mixing of the water column, which redistribute nutrients through the water column.

Phytoplankton are monitored annually at one station each in No Name, Long, Middle Quinsam, and Lower Quinsam lakes, in the deepest area of the lakes, where routine water quality monitoring is conducted. Since 2013, phytoplankton samples have been collected at the four lakes once each during the spring, summer and fall 5 in 30-day water sampling periods defined in amended Permit PE 7008. From the 1990s to 2012, Permit PE 7008 required sampling at 1, 4, and 9 m depth in April through September at Long Lake and Middle Quinsam Lake, with No Name Lake added in 2012 and Lower Quinsam Lake added in 2013.

9.1.1 *METHODS*

9.1.1.1 *Field Methods*

In 2017, samples were collected from 1 m depth using a 4 L Beta sampler. Chlorophyll *a* samples were collected as 1 L raw water samples, shipped to Maxxam Analytics (Burnaby B.C.) and laboratory filtered for analysis. A 250 mL sample was preserved with Lugol's in the field and analyzed for community composition, i.e., counts and identification to lowest practical level (Stantec Consulting Ltd., Burnaby B.C.). Field replicates were collected for QA/QC in September and October 2017.

9.1.1.2 *Laboratory Methods*

Organisms were identified to lowest practical level (species where possible) using an inverted microscope. A 27 mL volume of lake water was settled in a chamber. Counts were made at 100X, 400X, and 1000X magnifications, to record the size range of phytoplankton.

9.1.2 *RESULTS*

9.1.2.1 *Chlorophyll a*

Chlorophyll *a* concentrations provide an indication of overall phytoplankton biomass at any given time and provide a basis for comparing primary production among lakes. Table 15 provides data for samples collected from 1 m depth in 2017. Concentrations ranged from 0.48 µg/L (spring sample from Middle Quinsam Lake) to 1.55 µg/L (Lower Quinsam Lake, fall sample) in 2017.

Table 15: Chlorophyll a Concentrations, 1 m Depth, Quinsam Lakes System, 2017

Lake	Chlorophyll *a* (µg/L)		
	Spring[1]	Summer	Fall
No Name	0.72	0.96	1.16
Long	1.24	1.00	1.28
Middle Quinsam	0.48	1.15	0.93
Lower Quinsam	0.55	1.53	1.55

Note: Spring samples were an average of two sets as samples were collected on two separate dates during Spring.

Chlorophyll *a* concentration varied among lakes and over the three sampling periods. No Name, Middle Quinsam and Lower Quinsam all had peak concentrations in summer and fall, Long Lake had peak concentrations in spring and fall. Seasonal trends were as follows in 2017:

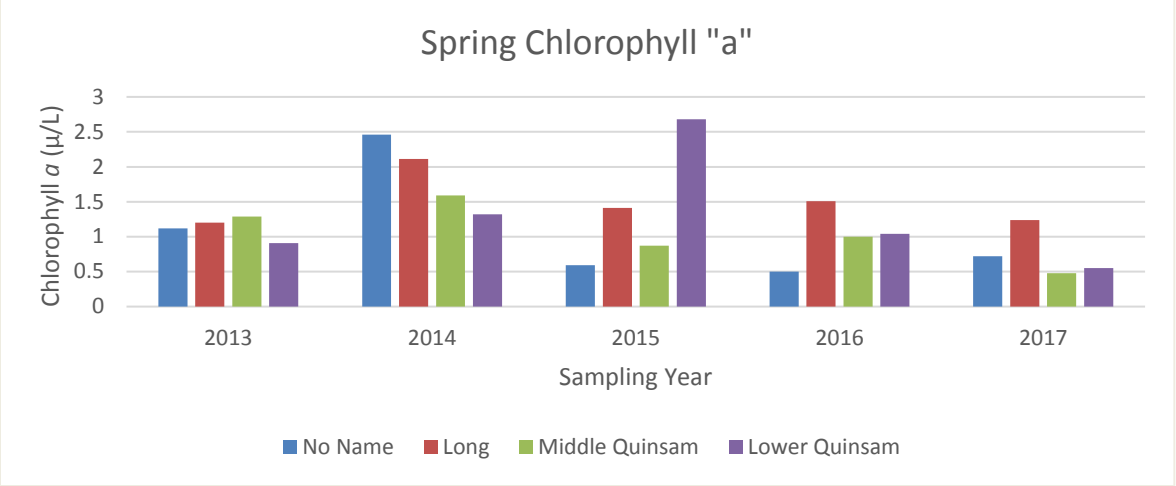
- In spring, concentrations were lowest in Middle Quinsam and Lower Quinsam lakes intermediate in No Name Lake, and highest in Long Lake
- In summer, concentrations were similar in No Name, Long, and Middle Quinsam lakes (0.96 to 1.15 µg/L), and highest in Lower Quinsam Lake (1.53 µg/L).
- In fall, concentrations were lowest in Middle Quinsam Lake (0.93 µg/L) and highest in Lower Quinsam Lake (1.55 µg/L). No Name and Long lakes had intermediate results.

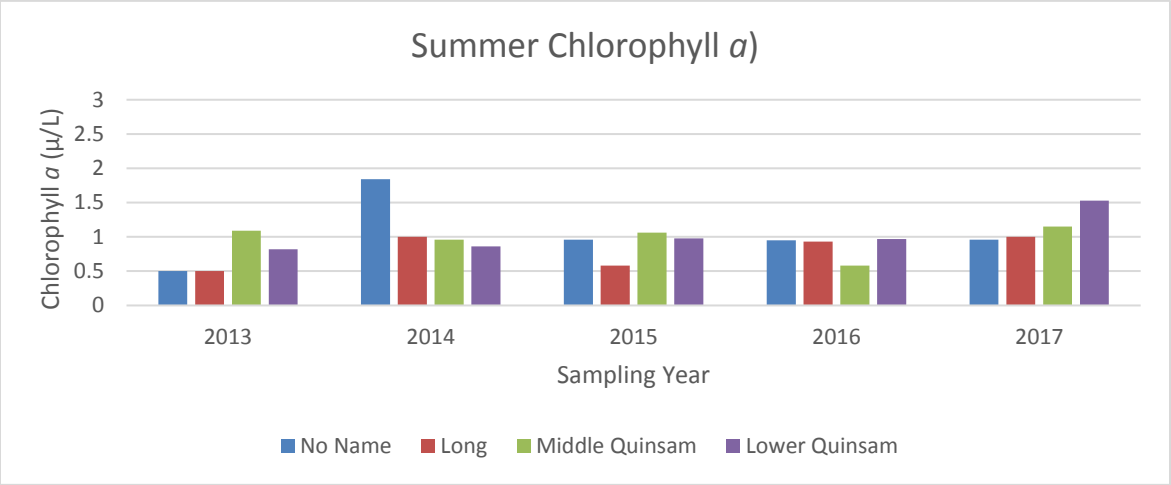
The chlorophyll *a* concentrations reported for these lakes reflect oligotrophic conditions (mean of 1.7 µg/L, maximum of 4.5 µg/L), and low total phosphorous concentrations (mean of 8 µg/L,

maximum of 18 µg/L), according to the trophic classification system for lakes developed by Vollenweider and Kerekes (1982; cited in Environment Canada 2004)[14]. Permit PE 7008 does not require nutrient analysis for the lakes, and nitrate, and ammonia data were not available to confirm this trophic classification.

Appendix IV and Figure 10 provide data for 2013 through 2017. Chlorophyll *a* results for 2017 were within the range reported from 2013 to 2016 (0.48 to 2.68 µg/L).

[14] Vollenweider, R. and J. Kerekes. 1982. Eutrophication of Waters. Monitoring Assessment and Control. Organization for Economic Co-operation and Development (OECD) Paris. 156 pp. cited in Environment Canada 2004. Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems. Report No. 1-8. http://publications.gc.ca/collections/Collection/En1-34-8-2004E.pdf





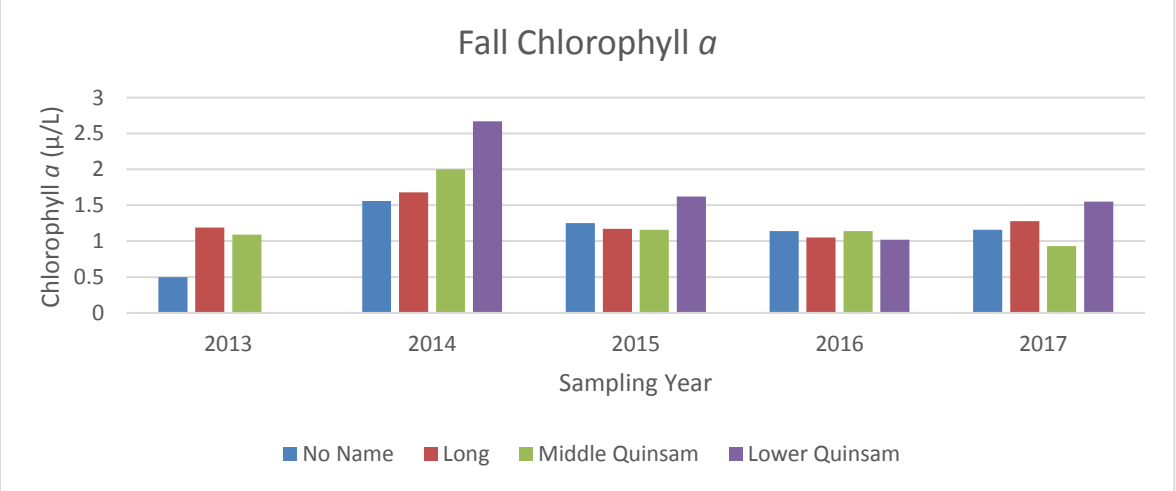


Figure 10: Chlorophyll a (µg/L) at 1 m Depth, Quinsam Lakes System, 2013 – 2017

9.1.2.2 *Phytoplankton Communities*

Phytoplankton taxonomy reports are included in Appendix IV and results are summarized here. Duplicate samples collected for No Name Lake in September and October showed good agreement for the paired samples (within 20% of duplicate samples).

Abundance is summarized in Table 16 as total and by size fraction (identified at 1000X, 400X, and 100X magnifications). Total abundance ranged from 860 to 2,700 cells/mL in 2017. The smallest size fraction (less than 5 µm in size) comprised 58 to 90%of the total abundance.

Table 16: Phytoplankton Abundance, Quinsam Lake System, 2017

Lake	Month	Abundance (cells/mL) at 1 m depth			
		Total	< 5 µm (1,000 X)	5 to 25 µm (400 X)	> 25 µm (100 X)
Long	May	2,700	2,400	340	16.2
Middle Quinsam		1,900	1,500	370	15.4
No Name		1,300	1,000	320	7.9
Lower Quinsam		1,700	1,300	390	1.2
Long	Sept.	1,100	940	200	1.5
Middle Quinsam		980	760	220	0.9
No Name		1,400	860	480	29.8
No Name Replicate		1,500	1,000	450	28.1
Lower Quinsam		1,700	990	600	86.6
Long	Oct.	2,000	1,800	190	0.4
Middle Quinsam		860	770	80	7.5
No Name		1,600	1,370	260	1.0
No Name Replicate		1,800	1,400	390	4.2
Lower Quinsam		1,300	770	530	14.8

In 2017, abundance was greatest in spring (Long and Middle Quinsam lakes) and summer (No Name and Lower Quinsam lakes) and lowest in fall at Middle Quinsam Lake (860 cells/mL). The highest abundance was recorded in spring and fall at Long Lake (2,700 cells/mL and 2000 cells/mL). Peak abundance and chlorophyll *a* concentrations did not always coincide, likely related to changes in size of abundant taxa over the sampling periods.

Variation in total abundance among lakes and through the three seasonal sampling periods for 2013 through 2017 is shown in Figure 11. As noted for chlorophyll *a*, high variability among seasons, years, and lakes between 2013 and 2018 was likely related to variation in timing of spring

and fall overturn and nutrient concentrations. Phytoplankton abundance data for 2017 were consistent with those of previous years.

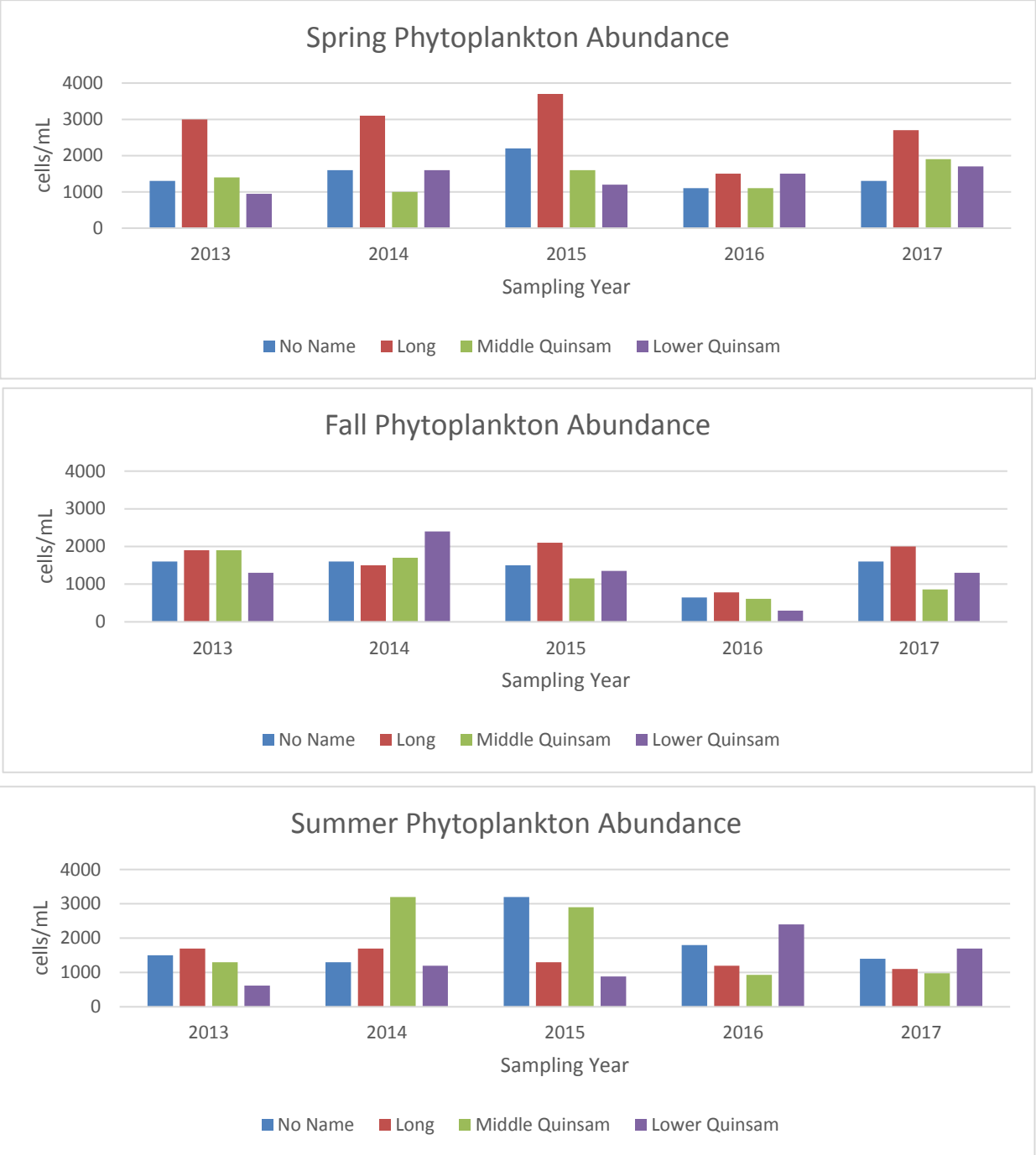


Figure 11: Total Phytoplankton Abundance, 1 m Depth, Quinsam Lakes System, 2013 – 2017

Taxon richness (at genus or species level) ranged from 18 (Lower Quinsam Lake, spring) to 30 (No Name Lake and Middle Quinsam Lake, summer) in 2017, as shown in Table 17. Richness was

highest in either September (Middle Quinsam and No Name lakes) or October (Long and Lower Quinsam lakes) and lowest in May.

Table 17: Phytoplankton Taxon Richness, Quinsam Lake System, 2017

Lake	Taxon Richness (Species level)		
	Spring (May)	Summer (September)	Fall (November)
No Name	22	30 [a]	27 [a]
Long	20	21	23
Middle Quinsam	21	30	22
Lower Quinsam	18	27	29

NOTE:
[a] Mean of duplicate samples

Very small (<5 µm) chrysoflagellates (*Ochromonas* spp. and *Chromulina* spp.) were the most abundant phytoplankton in samples from all lakes and all dates in 2017, as has been noted since monitoring began in the 1990s (Appendix IV-2). Although these ultra-nanoplankton were very abundant numerically, they contributed little to algal biomass. Small chrysoflagellates are numerically dominant in many lakes. The predominant and common larger phytoplankton taxa are listed in Table 18 and include:

- Chrysophyta (golden algae; *Ochromonas*, *Dinobryon, unidentified flagellate*)
- Cryptophyta (red-brown algae; *Cryptomonas*, *Rhodomonas*)
- Bacillariophyceae (diatoms; *Melosira italica*, *Cyclotella*)
- Chlorophyceae (green algae; Nephrocytium, Gloeocystis)

Table 18: Predominant and Common Larger Phytoplankton Taxa, Quinsam Lakes System, 2017

Season	Lake	Predominant	Common
Spring (May)	No Name	*Ochromonas* spp.	*Rhodomonas minuta,* *Cryptomonas* spp.
	Long	*Ochromonas* spp.	*Rhodomonas minuta*
	Middle Quinsam	*Ochromonas* spp.	*Rhodomonas minuta* *Dinobryon* spp.
	Lower Quinsam	*Ochromonas* spp.	*Rhodomonas minuta* *Cryptomonas spp.*
Summer (September)	No Name	*Rhodomonas minuta*	*Ochromonas* spp unidentified chrysoflagellate *Dinobryon bavaricum*
	Long	*Ochromonas* spp.	*Rhodomonas minuta*
	Middle Quinsam	*Ochromonas* spp.	*Rhodomonas minuta*
	Lower Quinsam	*Ochromonas* spp. *Melosira italica* *Rhodomonas minuta* *Gloeocystis* sp.	*Asterionella formosa*
Fall (October)	No Name	*Ochromonas* spp. *Melosira italica*	*Rhodomonas minuta* *Nephrocytium* sp.
	Long	*Ochromonas* spp..	*Rhodomonas minuta* *Cyclotella* sp. *Nephrocytium* sp.
	Middle Quinsam	*Ochromonas* spp.	*Rhodomonas minuta* *Cryptomonas* spp. *Nephrocytium* sp.
	Lower Quinsam	*Melosira italica*	*Ochromonas* spp. *Rhodomonas minuta* *Cryptomonas* spp. *Asterionella formosa*

9.2 ZOOPLANKTON

Zooplankton form the second trophic level in the water column of lakes (secondary producers), grazing on phytoplankton, consuming organic matter, and providing a food source for juvenile fish (Wetzel 2001). Abundance and composition of the zooplankton community vary among lakes due to variation in water chemistry, lake characteristics, and grazing pressures from fish (Wetzel 2001[15]).

Zooplankton are monitored in the Quinsam mine receiving environment three times per year at one station in each of No Name, Long, Middle Quinsam, and Lower Quinsam lakes. Since 2014, zooplankton samples have been collected once in the spring, summer, and fall during the 5 in 30 water quality sampling periods.

The 2017 spring zooplankton samples were not included in this analysis. The spring samples were collected and sent to the laboratory but were misplaced in transportation.

9.2.1 METHODS

9.2.1.1 *Field Methods*

Zooplankton were collected from No Name, Long, Middle Quinsam, and Lower Quinsam lakes three times in 2017 (once during each 5 in 30 day period). Samples were collected using a Wisconsin Plankton Sampler (63 µm net) in a 10 m vertical tow, with one sample collected per lake. Samples were preserved with ethanol and sent to Fraser Environmental Services (Surrey B.C.) for taxonomic analyses.

9.2.1.2 *Laboratory Methods*

Organisms were counted and identified to lowest practical level.

[15] Wetzel R. 2001. Limnology: Lake and River Ecosystems 150 pp

9.2.2 *RESULTS*

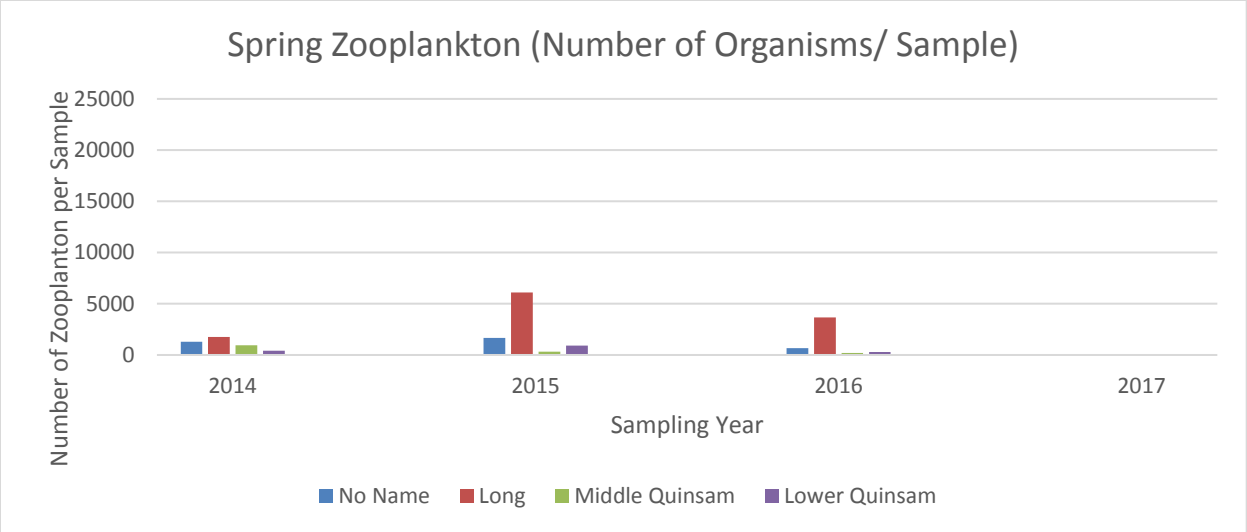
Detailed zooplankton taxonomic composition results are provided in Appendix IV and summarized below.

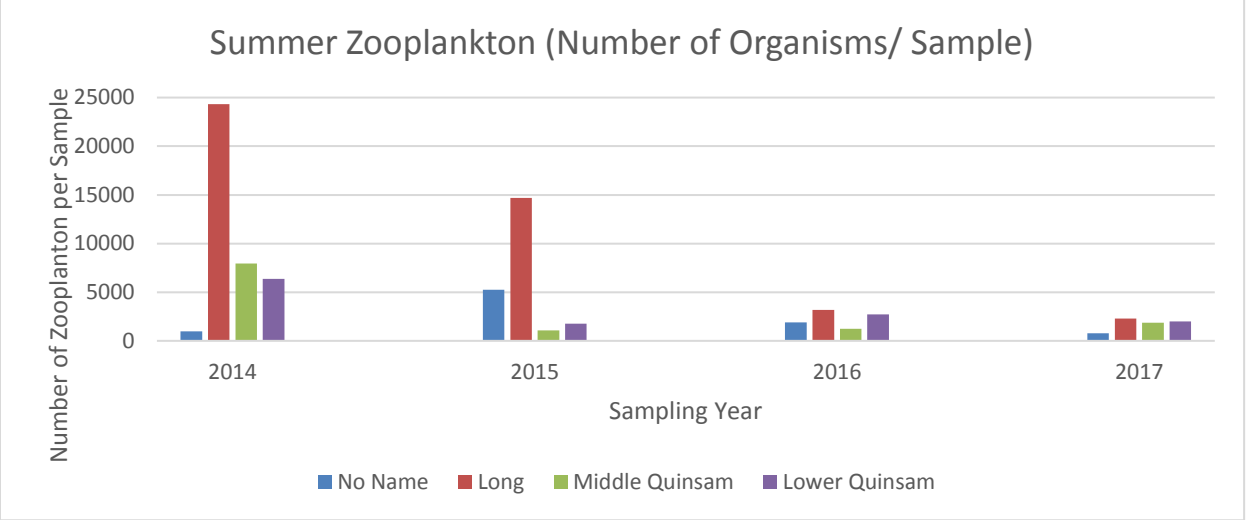
Zooplankton abundance in samples collected in 2017 is listed in Table 19. Abundance ranged from 766 organisms/sample (No Name Lake, September) to 3592 organisms/sample (Long Lake, October). No Name Lake had the lowest abundance among the four lakes, in both September and October. In Middle Quinsam and Lower Quinsam lakes, maximum abundance was reported in the summer and in Long Lake, the maximum occurred in October. Abundance was higher in Long Lake and lower in No Name Lake compared to the other lakes.

Table 19: Zooplankton Abundance, Quinsam Lake System, 2017 (vertical tow, 0 to 10 m)

Lake	Month	Abundance (organisms/sample)			
		Total	Copepoda	Cladocera	Rotifera
No Name	Spring (May)	N/A	N/A	N/A	N/A
Long		N/A	N/A	N/A	N/A
Middle Quinsam		N/A	N/A	N/A	N/A
Lower Quinsam		N/A	N/A	N/A	N/A
No Name	Summer (September)	766	263	750	225
Long		2293	341	14	1228
Middle Quinsam		1849	371	1,009	1209
Lower Quinsam		1996	751	72	438
No Name	Fall (October)	792	37	399	319
Long		3592	303	108	2878
Middle Quinsam		1506	100	84	1222
Lower Quinsam		803	135	329	204

Seasonal and spatial trends are shown in Figure 12 for samples collected in 2014, 2015, 2016 and 2017. There has been high variability among lakes, seasons, and years. In general, abundance is highest for the summer samples, following peaks in levels of phytoplankton and organic matter; however, there are exceptions, including low abundance in No Name Lake in summer 2014 and peak abundance in Lower Quinsam Lake in fall 2015. The 2016 and 2017 abundance were lower than in 2014 and 2015 for No Name and Long Lakes during summer and fall and may be related to variations in months sampled.





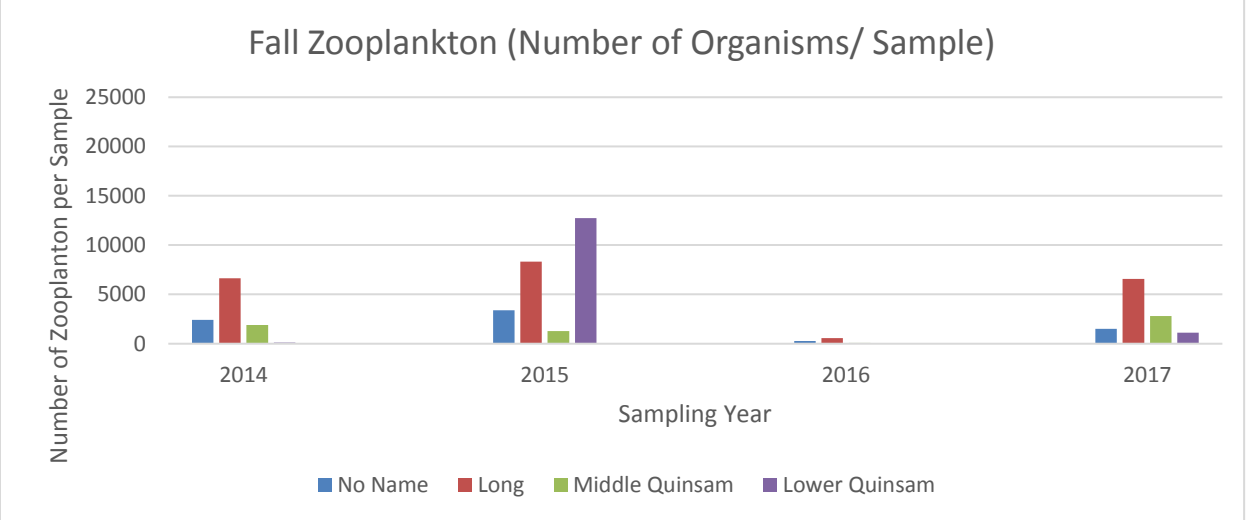


Figure 12: Total Zooplankton Abundance (0 to 10 m Vertical Tows), Quinsam Lakes System, 2014 to 2017
(no samples analyzed in Spring 2017)

Taxon richness was calculated at the genus level, omitting unidentified and benthic organisms. In 2017, taxon richness ranged from 10 to 14, and was slightly higher in summer than in fall in No Name and Long lakes (Table 20). Taxon richness tended to be highest at Long and Middle Quinsam lakes. The proportion of juveniles in the samples ranged from 10 to 29% during summer to 2 to 7% during fall, with highest proportions occurring in Lower Quinsam Lake in both seasons.

Table 20: Zooplankton Taxon Richness, Quinsam Lake System, 2017 (vertical tow, 0 to 10 m)

Characteristic	Lake	Spring (May)	Summer (September)	Fall (October)
Number of Genera	No Name	N/A	13	11
	Long	N/A	14	12
	Middle Quinsam	N/A	12	13
	Lower Quinsam	N/A	10	11
% Juvenile Copepoda and Cladocera in samples	No Name	N/A	14%	2%
	Long	N/A	10%	4%
	Middle Quinsam	N/A	14%	2%
	Lower Quinsam	N/A	29%	7%

Zooplankton communities consisted of the larger copepods and cladocerans and the smaller rotifers in 2017 (Figure 13). Composition varied among lakes and seasons:

- No Name Lake – Cladocerans were predominant (over 50% abundance) on all two dates, with rotifers common in September and October, and Copepoda common in September only; peak abundance occurred in September.
- Long Lake – Rotifers were predominant (over 80%) in both September and October. Copepoda were common in September and October (approximately 10%), and Cladocerans were common in October (approximately 5%); peak abundance was in October.
- Middle Quinsam Lake – Rotifers were predominant in September and October (approximately 40% in September and 80% in October). Cladocerans were predominant in September (approximately 40%). Copepoda were common in (approximately 20% in September and 7% in October). Peak zooplankton abundance was in September.
- Lower Quinsam Lake – Rotifers and copepods (45 to 50% each) were predominant in September. Cladocerans (approximately 50%) were predominant in October and rotifers and copepods were common (20% to 25% each). Peak zooplankton abundance was in September.

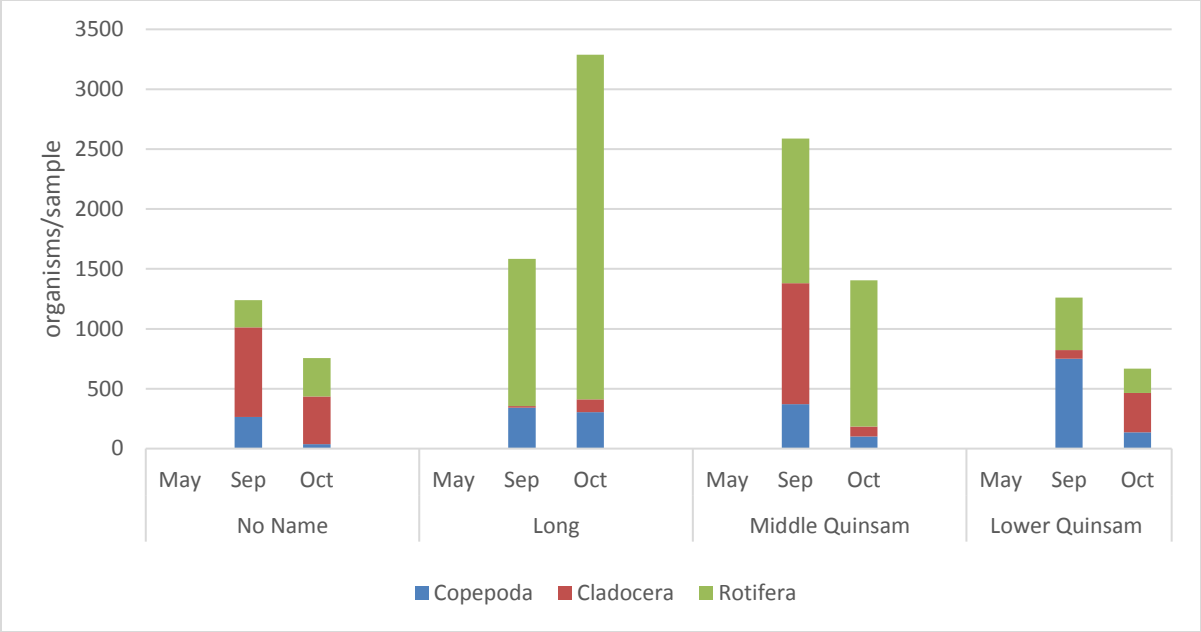


Figure 13: Zooplankton Abundance by Group, Quinsam Lakes System, 2017
(no samples analyzed in Spring 2017)

Differences in taxonomic composition are related to seasonal conditions, including food supply (phytoplankton and organic matter) and grazing pressures from fish. The larger copepods and cladocerans provide preferred food sources for fish. All four lakes are known to be fish bearing (e.g., salmon and trout species), but there is not enough information about fish populations to estimate grazing pressures on zooplankton.

Conclusion

Water in lakes of the Quinsam River watershed near Quinsam Mine and in the Quinsam River itself is of good quality, meeting WQGs and WQOs on most sampling dates. Sulphate remains slightly higher than the WQG in deep water (9 m and 1 mb) of Long Lake. Sulphate concentrations increased in Middle Quinsam Lake at 1mb compared to 2016 and 2015 sampling period during spring. The average spring 5 in 30 results (92 mg/L) remained below WQG of 128 mg/L and continued to decline during summer and fall sampling.

Low DO levels in deep waters are common during summer and early fall in in Long and Lower Quinsam lakes, which can result in mobilization of iron and manganese. Concentrations of these metals in deep water were lower in 2016 and 2017 than in earlier years. No Name, Long, Middle Quinsam, and Lower Quinsam lakes support phytoplankton communities typical of oligotrophic conditions and distinct zooplankton communities in each lake that provide typical prey for fish.

There were no indications of adverse effects of mine discharges on the plankton communities of lakes (density, taxonomic richness, composition).

While levels of iron and manganese are low in discharges from the mine, they can be elevated along with arsenic in groundwater seeps entering Long Lake (Golder 2011, Cullen 2011, SLR 2015). However, seep monitoring conducted since 2011 has shown a notable decline in concentrations of these metals (except for iron) and groundwater monitoring indicates naturally elevated concentrations in wells established in the Dunsmuir rock formation. The presence of anoxic or suboxic conditions in deep lake waters during the summer and early fall (which develop naturally in Long and Middle Quinsam lakes) leads to conditions where metals that are sensitive to changes in the redox environment can be mobilized and enter the deep waters. The amount of mobilization varies from year to year: In 2017, there were WQG exceedances for total manganese in Long Lake and for iron in Lower Quinsam Lake. However, in earlier years, the concentrations of iron and manganese were higher in both Long and Lower Quinsam Lakes. Results from the 2016 Sediment and Benthic study and earlier studies, summarized in SLR (2015) cannot conclusively identify a mine-related source for these metals in Long Lake, aside from possible localized sources from seeps, and there are naturally elevated levels observed in other lakes in the watershed.

Follow-up to the recommendations from 2016 monitoring program are also applicable to 2018-2019 monitoring program:

1. Recommendation: Analysis of nutrients (ammonia, nitrate / nitrite and phosphorous) for the lake water monitoring program, to support evaluation of the oligotrophic status of the lakes and to provide background data should changes in arsenic loadings to the lakes occur in the future (potential relationship between arsenic mobilization in sediment/water interface, DO levels in deep water, and increase in trophic status and organic matter loading to sediments).

   Follow-up: QCC has added nutrient sampling to lakes during Spring 2018 monitoring year.
2. Recommendation: Consider additional monitoring of seep areas in Long Lake to assess success of mitigation measures implemented in recent years. Further characterize habitat and sediment water quality conditions at the No Name and Middle Quinsam Seeps.

   Follow-up: QCC will need to preform further sediment sampling at Long Lake Seep for the effluent permit amendment currently being prepared. Habitat characterization and sediment quality status will be assessed in the future round of sediment and benthic sampling at No Name Lake and Middle Quinsam Lake.

10.0 CLOSING

Water quality in the Middle Quinsam Sub-Basin remained consistent with previous years and is considered to be in good condition with little appreciable impacts associated with coal mining. The majority of parameters of concern were below Provincial guideline and objective levels indicating minimal health risk to sensitive aquatic receptors. For example, sulphate concentrations were recorded below its respective guideline during all sampling events in three out of four lakes sampled; this trend signifies water management features and controls at the mine site are effective.

This year, Quinsam experienced one permit limit exceedance for dissolved iron at Settling Pond #1 mostly attributed to a combination of anoxic conditions during summer in the settling pond with high flows during fall and winter. The pond levels were low until late fall when discharge commenced. Quinsam was diligent in monitoring the downstream receiving environment and the results demonstrated that the risk to aquatic receptors was minimal.

Parameters of interest and those displaying slightly elevated concentrations in the lakes include total and dissolved iron (LQL 1mb) & total manganese (LLM 1mb) both of which are associated with anoxic concentrations at depth. The relationship between low DO and elevated manganese in Long Lake 1mb and Lower Quinsam Lake 1mb has been demonstrated in Appendix II, Graph (34, 51 and 52). This pattern of elevated manganese and iron at depth in these lakes has become more evident since the initiation of the 5 in 30 monitoring in 2013. Previously, there were occasional exceedances occurring during monthly sampling over summer and fall and all events were associated with low DO.

Total zinc and copper were slightly above guidelines as a result of the spring and fall flush in No Name and Long Lake (copper only).

Quinsam anticipates that the efforts invested into the reclamation projects will continue to contribute to improved water quality in Long Lake. This will be determined over the next few years as vegetation starts to become established within the area and concentrations of parameter loading start to decline.

Once again depth profiling has resulted in low pH conditions exceeding lower water quality guidelines of 6.5 observed in No Name Lake during all seasons and Long Lake during fall. However, there is little concern as the slightly acidic conditions are likely naturally occurring.

The Iron River was added to the receiving environment monitoring program during the 2014/2015 monitoring period as a result of the 7-South Area 5 mine approval. This development will commence in summer 2018 with the initiation of blasting scheduled through the Long Lake fault

zone. This system experiences naturally elevated concentrations (above water quality guidelines) of aluminum and arsenic; aluminum is present throughout the system (i.e. from IR1 through IR8) whereas arsenic is primarily detected below the sandstone unit of the Dunsmuir member contact represented by monitoring location IR6. These parameters have continued to be observed throughout 2017-18 monitoring in this system with less frequent exceedances of arsenic during low flow sampling. The main intention is to develop water quality objectives reflective of baseline conditions.

Quinsam Coal will continue to focus on site wide water management with a target of mitigating parameter of interest concentrations in the receiving environment. To date, Quinsam has demonstrated that the existing mine related controls and features implemented have been effective at reducing concentrations of certain parameters (e.g. sulphate). This trend is expected to persist and will be highlighted by future monitoring programs.

In closing, Quinsam trusts the information herein addresses the environmental responsibilities and provisions applicable to effluent permit PE: 7008.

This report has been reviewed by an appropriate qualified professional as signed below. Should you have any questions or concerns please contact the undersigned at Quinsam Coal Environmental Department 250-286-3224 Ext 225.

Kathleen Russell, B.Sc. Environmental Coordinator - Quinsam Coal Corporation

Kathleen Russell

Josh Fry - Quality Control Coordinator- Quinsam Coal Corporation

Josh Fry

Receiving Environment Biological Portion Reviewed By:

Karen Munro, M.Sc., R.P. Bio. Principal, Senior Aquatic Scientist – Stantec

Karen Munro

Appendix I

Appendix I
List of Tables

Table 1	Description of Effluent, In-Mine Releases & Receiving Environment Monitoring Sites
Table 2	Summary of Permit Limit Exceedances & Permit Non-Compliances (April 1st, 2017 through March 31st, 2018)
Table 3	Summary of Water Quality Guideline Observations at Receiving Monitoring Locations
	North Mine - Weekly / Monthly In-Mine Releases Surface Water Quality Monitoring
Table 4	Settling Pond #4 Permitted Decant for the North Mining Operation (WD)
Table 5	2-North Pit Sump CCR Water Cover (WP)
Table 6	2-North Portal Sump Effluent (2NPS)
Table 7	Culvert, at Middle Quinsam Lake Road (WC)
Table 8	South Dyke Sump (SDS)
	Seep Monitoring North Mine Operation
Table 9	Seep Near Plant (PDS)
Table 10	Groundwater / Surface Water from 2N Area at Road (PDSR)
	South Mine - Weekly / Monthly In-Mine Releases Surface Water Quality Monitoring
Table 11	Settling Pond # 1 - Permitted Decant for South Mining Operation (SPD)
Table 12	Long Lake Seep Passive Treatment System (LLSTS) Settling Pond Effluent (SPEFF)
Table 13	LLSTS and Settling Pond #1 Combined Discharge, Biocell Downstream (BDS)
Table 14	2 South Pit in Pit Water Cover - CCR Water Cover (2S)
Table 15	3 South Pit- South Pit Main Sump Water - CCR Water Cover (3S)
Table 16	3 South 77 Adit Pit- Exploration pit from 1977 (3S77)
Table 17	4 South Lower- Culvert Downstream of Access Road (4S-LO)
Table 18	South Pit Culvert- Culvert, downstream of Settling Pond #1 discharge (SPC)
	Initial Zone of Dilution for South Mining Operation
Table 19	Long Lake Entrance - Last wetland prior to entering Long Lake near the outlet - IDZ (LLE)
	Seep Monitoring South Mine Operation
Table 20	Seep into Long Lake (LLS)
Table 21	Middle Seep into Long Lake (LLSM)
	7-South Mining Area
Table 22	7 South Surface Decant - Permitted discharge location for the 7-South Mining Operation (7SSD)
	Initial Zone of Dilution for 7-South Mining Operation
Table 23	Stream 1 - Downstream of the 7SSD discharge, prior to entering the Lower Wetland Outlet (IDZ) (7S)
Table 24	Stream 1 - Average Water Quality Compared to (5 in 30) Average Water Quality Guidelines (IDZ) (7S)
	Total Suspended Solid Results From Settling Ponds
Table 25	Settling Pond # 4 - Daily Total Suspended Solid Results (WD)
Table 26	Settling Pond # 1 - Total Suspended Solid Results (SPD)
Table 27	7-South Surface Decant - Total Suspended Solid Results (7SSD)
	Discharge from Settling Ponds - Water Quantity & 7S Dilution Ratio
Table 28	Discharge from Settling Pond # 4 (April - September, 2016)
Table 29	Discharge from Settling Pond # 4 (October 2016 - March, 2017)

Appendix I
List of Tables

Table 30	Discharge from Settling Pond # 1 (April 1st, 2016 - March 31st, 2017)
Table 31	Discharge from Settling Pond # 1 (October 2016 - March, 2017)
Table 32	Discharge from 7-South Surface Decant (April 1st, 2016 - March 31st, 2017)
Table 33	Dilution Ratio: 7S vs 7SSD Discharge (April-October 2016)
Table 34	Dilution Ratio: 7S vs 7SSD Discharge (November 2016 -March 2017)
	Weekly Sulphate Results & Rolling Averages
Table 35	Weekly Sulphate Results at WD, SPD, SPEFF & BDS
Table 36	Weekly Sulphate Results & Rolling Averages at LLE & LLO
Table 37	Biweekly and Weekly TSS Results From WC, SPC, SPEFF and BDS
	Weekly Field Conductivity (us/cm) & pH Measurements
Table 38	Field Conductivity (us/cm) & pH (North Mine Area & 7-South)
Table 39	Field Conductivity (us/cm) & pH (South Mine Area)
Table 40	Field Conductivity (us/cm) & pH (Rivers & Wetland)
	Quality Control Quality Assurance For Water Quality
Table 41	Relative Percent Difference Values Greater Than 20%
Table 42	Sample Blanks
	Precipitation Results (mm)
Table 43	Daily Precipitation (mm)
	6 Year 2012-2018 Summary Statistics
Table 44	2012-2013 Statistics
Table 45	2012-2013 Statistics
Table 46	2012-2013 Statistics
Table 47	2012-2013 Statistics
Table 48	2012-2013 Statistics
Table 49	2013-2014 Statistics
Table 50	2013-2014 Statistics
Table 51	2013-2014 Statistics
Table 52	2013-2014 Statistics
Table 53	2013-2014 Statistics
Table 54	2013-2014 Statistics
Table 55	2014-2015 Statistics
Table 56	2014-2015 Statistics
Table 57	2014-2015 Statistics
Table 58	2014-2015 Statistics
Table 59	2014-2015 Statistics
Table 60	2014-2015 Statistics
Table 61	2015-2016 Statistics
Table 62	2015-2016 Statistics

Appendix I
List of Tables

Table 63	2015-2016 Statistics
Table 64	2015-2016 Statistics
Table 65	2015-2016 Statistics
Table 66	2015-2016 Statistics
Table 67	2016-2017 Statistics
Table 68	2016-2017 Statistics
Table 69	2016-2017 Statistics
Table 70	2016-2017 Statistics
Table 71	2016-2017 Statistics
Table 72	2016-2017 Statistics
Table 73	2017-2018 Statistics
Table 74	2017-2018 Statistics
Table 75	2017-2018 Statistics
Table 76	2017-2018 Statistics
Table 77	2017-2018 Statistics
Table 78	2017-2018 Statistics
	Middle Point Barge Loading Facility
Table 79	Middle Point Barge Loading Facility
	Physical Water Quality from Lakes-Depth Profiling
Table 80	No Name Lake Depth Profiling (NNL)
Table 81	Long Lake Depth Profiling (LLM)
Table 82	Middle Quinsam Lake Depth Profiling (MQL)
Table 83	Lower Quinsam Lake Depth Profiling (LQL)
	Receiving Environment - Lakes -5 in 30 Water Quality Monitoring
Table 84	No Name Lake 1 Metre Depth - Spring (NNL1)
Table 85	No Name Lake 1 Metre Depth - Summer (NNL1)
Table 86	No Name Lake 1 Metre Depth - Fall (NNL1)
Table 87	No Name Lake 4 Metre Depth - Spring (NNL4)
Table 88	No Name Lake 4 Metre Depth - Summer (NNL4)
Table 89	No Name Lake 4 Metre Depth - Fall (NNL4)
Table 90	No Name Lake 9 Metre Depth - Spring (NNL9)
Table 91	No Name Lake 9 Metre Depth - Summer (NNL9)
Table 92	No Name Lake 9 Metre Depth - Fall (NNL9)
Table 93	No Name Lake 1 Metre from Bottom Depth - Spring (NNLB)
Table 94	No Name Lake 1 Metre from Bottom Depth - Summer (NNLB)
Table 95	No Name Lake 1 Metre from Bottom Depth - Fall (NNLB)
Table 96	Long Lake 1 Metre Depth - Spring (LLM1)
Table 97	Long Lake 1 Metre Depth - Summer (LLM1)

Appendix I
List of Tables

Table 98	Long Lake 1 Metre Depth - Fall (LLM1)
Table 99	Long Lake 4 Metre Depth - Spring (LLM4)
Table 100	Long Lake 4 Metre Depth - Summer (LLM4)
Table 101	Long Lake 4 Metre Depth - Fall (LLM4)
Table 102	Long Lake 9 Metre Depth - Spring (LLM9)
Table 103	Long Lake 9 Metre Depth - Summer(LLM9)
Table 104	Long Lake 9 Metre Depth - Fall (LLM9)
Table 105	Long Lake 1 Metre from Bottom Depth - Spring (LLMB)
Table 106	Long Lake 1 Metre from Bottom Depth - Summer (LLMB)
Table 107	Long Lake 1 Metre from Bottom Depth - Fall (LLMB)
Table 108	Middle Quinsam Lake 1 Metre Depth - Spring (MQL1)
Table 109	Middle Quinsam Lake 1 Metre Depth - Summer (MQL1)
Table 110	Middle Quinsam Lake 1 Metre Depth - Fall (MQL1)
Table 111	Middle Quinsam Lake 4 Metre Depth - Spring (MQL4)
Table 112	Middle Quinsam Lake 4 Metre Depth - Summer (MQL4)
Table 113	Middle Quinsam Lake 4 Metre Depth - Fall (MQL4)
Table 114	Middle Quinsam Lake 9 Metre Depth - Spring (MQL9)
Table 115	Middle Quinsam Lake 9 Metre Depth - Summer (MQL9)
Table 116	Middle Quinsam Lake 9 Metre Depth - Fall (MQL9)
Table 117	Middle Quinsam Lake 1 Metre from Bottom Depth - Spring (MQLB)
Table 118	Middle Quinsam Lake 1 Metre from Bottom Depth - Summer (MQLB)
Table 119	Middle Quinsam Lake 1 Metre from Bottom Depth - Fall (MQLB)
Table 120	Lower Quinsam Lake 1 Metre Depth - Spring (LQL1)
Table 121	Lower Quinsam Lake 1 Metre Depth - Summer (LQL1)
Table 122	Lower Quinsam Lake 1 Metre Depth - Fall (LQL1)
Table 123	Lower Quinsam Lake 4 Metre Depth - Spring (LQL4)
Table 124	Lower Quinsam Lake 4 Metre Depth - Summer (LQL4)
Table 125	Lower Quinsam Lake 4 Metre Depth - Fall (LQL4)
Table 126	Lower Quinsam Lake 9 Metre Depth - Spring (LQL9)
Table 127	Lower Quinsam Lake 9 Metre Depth - Summer (LQL9)
Table 128	Lower Quinsam Lake 9 Metre Depth - Fall (LQL9)
Table 129	Lower Quinsam Lake 1 Metre from Bottom Depth - Spring (LQLB)
Table 130	Lower Quinsam Lake 1 Metre from Bottom Depth - Summer (LQLB)
Table 131	Lower Quinsam Lake 1 Metre from Bottom Depth - Fall (LQLB)
	Receiving Environment - Rivers -5 in 30 Water Quality Monitoring
Table 132	Middle Quinsam Lake Inlet-Spring (WA)
Table 133	Middle Quinsam Lake Inlet - Summer (WA)
Table 133	Middle Quinsam Lake Inlet - Fall (WA)

Appendix I
List of Tables

Table 134	Middle Quinsam Lake Outlet - Spring (WB)
Table 135	Middle Quinsam Lake Outlet - Summer (WB)
Table 136	Middle Quinsam Lake Outlet -Fall (WB)
Table 137	Long Lake Outlet - Spring (LLO)
Table 138	Long Lake Outlet - Summer (LLO)
Table 139	Long Lake Outlet - Fall (LLO)
Table 140	No Name Lake Outlet - Spring (NNO)
Table 141	No Name Lake Outlet - Summer (NNO)
Table 142	No Name Lake Outlet - Fall (NNO)
	Receiving Environment - Rivers -5 in 30 & Monthly Water Quality Monitoring
Table 143	Quinsam River Upstream of 7 South Mining Operation - Spring (QRDS1)
Table 144	Quinsam River Upstream of 7 South Mining Operation - Summer (QRDS1)
Table 145	Quinsam River Upstream of 7 South Mining Operation - Fall (QRDS1)
Table 146	Lower Wetland Outlet at the Confluence of the Quinsam River- Spring (LWO)
Table 147	Lower Wetland Outlet at the Confluence of the Quinsam River- Summer (LWO)
Table 148	Lower Wetland Outlet at the Confluence of the Quinsam River- Fall (LWO)
Table 149	Quinsam River Downstream of 7 South Mine Operation - Spring (7SQR)
Table 150	Quinsam River Downstream of 7 South Mine Operation - Summer (7SQR)
Table 151	Quinsam River Downstream of 7 South Mine Operation - Fall (7SQR)
Table 152	7-South Quinsam River - Winter (7SQR)
Table 153	Iron River Upstream of Mining Operations -Spring (IR1)
Table 154	Iron River Upstream of Mining Operations - Summer (IR1)
Table 155	Iron River Upstream of Mining Operations - Fall (IR1)
Table 156	Iron River Upstream of Mining Operations -Winter (IR1)
Table 157	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine - Spring (IR6)
Table 158	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine - Summer (IR6)
Table 159	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine -Fall (IR6)
Table 160	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine - Winter (IR6)
Table 161	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine - Spring (IR8)
Table 162	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine - Summer (IR8)
Table 163	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine - Fall (IR8)
Table 164	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine - Winter (IR8)
Table 165	Quinsam River Downstream of the Confluence with Iron River - Spring (IRQR)
Table 166	Quinsam River Downstream of the Confluence with Iron River - Summer (IRQR)
Table 167	Quinsam River Downstream of the Confluence with Iron River - Fall (IRQR)
Table 168	Quinsam River Downstream of the Confluence with Iron River -Winter (IRQR)
	Continuous flow data - 2 South
Table 169	2 South Pit in Pit Water Cover (2S) Continuous Outflow

Table 1
2017-2018 Annual Report

Description of Effluent, In-Mine Releases & Receiving Environment Monitoring Sites			
EMS ID #	**Monitoring Sites**	**Abbreviation (Station Code)**	***Type of Water (MW, FW or GW)**
	North Coal Mining Operation		
E207409	Settling Pond #4 Decant	WD	**Discharge (MW)**
E207411	Culvert, at Middle Quinsam Lake Road	WC	MW & FW
E283433	2-North Portal Sump (Adit Sump)	2NPS	MW
E207412	2-North Pit Sump CCR Cover	WP	PAG-CCR Water Cover - MW
E292126	South Dyke Sump	SDS	MW
	South Coal Mine		
E218582	Settling Pond #1 Decant	SPD	**Discharge (MW)**
E217014	Culvert, Downstream End at Access Road	SPC	MW & FW
E217015	South Pit Main Sump Water	3S	PAG-CCR Water Cover (MW & FW)
E292127	2-South Pit In Pit Water Cover (2-South Standpipe)	2S	PAG-CCR Water Cover (MW & FW)
E292128	1977 Bulk Sample Pit	3S77	MW & FW
E292129	Culvert Downstream of 4 South Access Road	4S-Lo	**MW & FW**
	7-South Mining Operation		
E292069	7-South Surface Decant	7SSD	**Discharge (MW & FW)**
E292110	7-South Adit Sump	7SPS	MW
	Seep Monitoring Sites		
E292131	Long Lake Seeps	LLS & LLSM	MW
	Small seep near the plant (PDS) & groundwater surface near road entering MQL (PDSR)	PDS & PDSR	GW & MW
	Receiving Environment Monitoring Sites - Initial Zone of Dilution (IDZ)		
Initial Dilution Zone (IDZ) Monitoring Sites			
E292130	Long Lake Entrance (South end water entering Long Lake)	LLE	IDZ
E292109	Road Crossing Bridge on Stream 1 above the Lower Wetland (Downstream of 7SSD).The site name is Stream 1, 7S.	7S	IDZ
	Receiving Water (Streams & Lakes Monitoring Sites) 5 in 30 Monitoring Locations		
North Coal Mining Operation			
E0126402	Quinsam River at Argonaut Road	WA	FW
E206618	Middle Quinsam Lake Centre	MQL (1, 4, 9 & 1m from Bottom)	FW
E0900504	Outflow from Middle Quinsam Lake	WB	FW
South Coal Mine			
E217018	No Name Lake	NNL (1, 4, 9 & 1m from Bottom)	FW
E217017	No Name Lake Outlet	NNO	FW
E206619	Long Lake at Centre	LLM (1, 4, 9 & 1m from Bottom)	FW
E219412	Long Lake Outlet	LLO	FW
7-South Mining Operation (Areas 1 to 4)			
E286930	Quinsam River Upstream of 7-South Mining Operation	QRDS1	FW
E292113	Quinsam River Downstream of 7-South Mining Operation	7SQR	FW
E292112	Lower Wetland Outlet at the confluence of the Quinsam River	LWO	FW
E292118	Lower Quinsam Lake Centre	LQL (1, 4, 9 & 1m from Bottom)	FW
7-South (Proposed) Area 5 Mining Operation			
E297230	Iron River upstream of mining operations	IR1	FW
E297231	Iron River upstream of 7SA5	IR6	FW
E297232	Iron River downstream of 7SA5 and 242 inputs	IR8	FW
E299256	Quinsam River downstream of confluence with Iron River	IRQR	FW
E292118	Lower Quinsam Lake Centre	LQL (1, 4, 9 & 1m from Bottom)	FW
Block 242 Mining Operation (Reclaimed / Not Monitored)			
E225798	Iron River upstream of the 242 influence	Not Monitored	FW
E225808	Iron River downstream of the 242 influence	Not Monitored	FW
N/A	Old portal sump used for collection of water from underground	Reclaimed	FW / GW
Middle Point Barge Loading Facility PE: 17181			
E17181	Middle Point	MP	Surface runoff
Long Lake Seep Passive Treatment System			
N/A	Groundwater well (2-South Mine Pool) influent to the treatment system	QU11-11 (INF-EFF)	MW
N/A	Bio Cell Reactor	BCR-EFF	MW
N/A	Sulphide Polishing Cell	SPC-EFF	MW
N/A	Aeration Lagoon	AL-EFF	MW
N/A	Settling Pond Effluent	SP-EFF	**Discharge MW**
Authorization to Bypass the Works			
N/A	Sampling location 35 m downstream of discharge from the treatment system (SP-EFF) and Settling Pond #1. Discharge is compared to SPD permit limits.	BDS	**Discharge MW**
*** MW= Mine Water, FW= Freshwater, GW =Groundwater IDZ = Intial Dilution Zone**			

Table 2
2017-2018 Annual Report

SUMMARY OF PERMIT LIMIT EXCEEDANCES & PERMIT NON-COMPLIANCES (April 1st, 2017 through March 31st, 2018)

EMS ID & Site Name	Permit Limit Exceedance (P) or Non-Compliance (PNC)	Parameter Exceeded / Other	Result (mg/L)	Requirement	Date	Non-Compliance Reason	Number of events or period for PNC, P or spill event.
E218582-Settling Pond #1 (SPD)	P	Fe-D	0.614	0.5	Jan. 8th	The dissolved iron exceedance was thought to be attributed to high inflows of water causing turbidity due to the mixing of bottom, iron rich sediment.	(1/12) monthly samples. Spill Report No. DGI-173540
	PNC	TSS	Missing Daily Composite TSS	Daily Composite	Dec 22nd - 23rd and Jan. 1st	3 samples. Frozen conditions resulted in samples not being collected. Composite sampler line froze.	Missing (3/134) required daily composite TSS samples.
E207409-Settling Pond #4 (WD)	PNC	TSS	Missing Daily Composite TSS	Daily Composite	Dec. 24th, Jan. 1st and 2nd	3 samples. Frozen conditions resulted in samples not being collected. Composite sampler line froze.	Missing (3/356) required daily composite TSS samples.
	Used to calculate fees	Annual Average Authorized Rate of Discharge	Annual Average Rate of Discharge was 0.1326m^3/s	Authorized Annual Average Rate of Discharge 0.08 m^3/s	April 1, 2017 through March 31, 2018	Quinsam is investigating the discharge rate by verifying rate of discharge against staff gauge reading, salt dilution tests and clearing any obstructions in the discharge pipe. The rate of discharge is used for permit fee calculation purposes.	Average authorized rate of discharge was exceeded by 0.052 $m^{3/}$s.
E217015-3 South Pit (3-S)	PNC	Unauthorized Discharge	No parameters exceeded the Water Quality Guidelines Downstream.	QCC is required to have a permit to discharge into the No Name Lake connector stream.	24 hr period between (Jan. 21st and 22nd)	Unauthorized discharge occurred from 3S pit into No Name Lake connector channel. Spill occurred when 3-South when water level rose above the dam and overflowed down the designed discharge channel that is not currently permitted. Spill report No. DGI-173610.	Intermittently for a 24 Hour period.
E292109 - Stream 1 (7S)	PNC	DOC	No Result	Monthly	Nov. 17	Parameter was not checked off on chain of custody sheet submitted to the labortory.	1 required parameter.
		Metals (T) & (D), Alkalinity, Acidity, TSS, SO4-D & DOC	No Results	Required month	Oct.24	QCC collected the sample and sent it to the laboratory. Sample was not analyzed and was disposed of. Laboratory error.	(1/12) required monthly samples.
E292112- Lower Wetland Outlet (LWO)	PNC	Metals (T) & (D), Alkalinity, Acidity, TSS & SO4-D	No Results	Required 5 weekly samples in 30 days during spring, summer and fall	Oct.24	QCC collected the sample and sent it to the laboratory. Sample was not analyzed and was disposed of. Laboratory error.	(1/5) weekly samples in fall.
E292130- South end water entering Long Lake (LLE)	PNC	P-T	No Results	Required monthly	Mar. 7th	Sample was collected but chain of custody did not specify P-T. QCC error.	(1/12) monthly samples.
E207411- Culvert, at Middle Quinsam Lake Road (WC)	PNC	SO_4	No Results	Required monthly	Jan. 5	Sample was collected but chain of custody did not specify SO_4. QCC error.	1/12 monthly samples.
E217018 (NNL), E206619 (LLM), E206618 (MQL) and E292118 (LQL)	PNC	Zooplankton	No Results	Required once during each 5 in 30 sampling event spring, summer and fall	Spring 2017	QCC error	1 spring sample was missed at all lakes (NNL, LL, MQL and LQL)
E292127- 2 South Pit in Pit Water Cover (CCR Water Cover) (2S)	PNC	Continuous inflow data	No Results	Continuous	2017-2018	Level logger installed at the hydrometric station at 2S inflow channel drifted resulting in incorrect data.	365 days - a new level logger has been installed.

Table 3
2017-2018 Annual Report

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS

EMS ID & Site Name	Site Code & Depth	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E217018 - No Name Lake (NNL)	NNL 8-12 metres	pH	6.5	6.34 - 6.49	April 27 and May 4	Min	(8/60) Depths profiled during spring
	NNL 9-11.5 metres			6.34-6.48	Aug. 10 & 29		(6/57) Depths profiled during summer
	NNL 9-12.5 metres			6.20-6.47	Oct. 19, 25 & Nov. 2		(10/61) Depths profiled during fall
	NNL 1 metre	Zn-T	0.03	0.0307	Nov. 16	M	(1/5) Weekly samples collected in fall
			0.0075	0.00814	Fall 5 in 30	A	Fall 5 in 30
	NNL 4 metre	Cu-T	0.002	0.00202	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.0083	May 4th	M	(1/5) Weekly samples collected in spring
E206619 - Long Lake Middle (LLM)	LLM 13-19.0 metres	Hypolimnetic DO	3 mg/L minimum June through August	0.44 to 2.85	Summer 5 in 30	Min	(32/35) Depths profiled below 13 m (hypolimnion zone)
	LLM 1 metre	Cu-T	0.002	0.0022	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.00899	April 27th	M	(1/5) Weekly samples collected in spring
	LLM 1mb	Cu-T	0.002	0.01	Spring 5 in 30	A	Spring 5 in 30
		Cu-T	0.007	0.0655	May 4th	M	(1/5) Weekly samples collected in spring
		Mn-T	0.8	1.23 to 1.63	Fall 5 in 30	M	Fall 5 in 30
		Mn-T	0.7	1.40	Fall 5 in 30	A	Fall 5 in 30
E292118 - Lower Quinsam Lake (LQL)	LQL (10-15.8 metres)	Hypolimnetic DO	3 mg/L minimum June through August	0.00 to 2.92	Summer 5 in 30	Min	(25/34) Depths profiled below 10 m (hypolimnion zone)
	LQL 1MB	Fe-T	1	1.15	Sep. 15	M	(1/5) Weekly samples in summer
	LQL 1mb	Fe-D	0.35	0.420 - 0.632	Summer 5 in 30	M	Summer 5 in 30
E292130 - Long Lake Entry (LLE) -Last wetland South Water Management flows into prior to entering Long Lake. Considered an initial dilution zone (IDZ)	LLE	SO4-D*	128	130 -906	Apr. 1 -Mar. 31	A	(20/42) Rolling averages
		Fe-D	0.35	0.37 & 1.27, 0.38	Jul. 11 & Jan. 3	M	(2/12) Monthy samples. Low flow in summer causes redox conditions in wetland. High flows in winter stir up the bottom of the wetland causing iron rich bottom waters to be disturbed.
		Fe-T	1	2.17 & 1.44	Jul. 11 & Jan. 3	M	
E292131- Long Lake Seeps	LLS	As-T	0.005	0.0052	Jun. 1	M	Monthly sample
		Fe-D	0.35	1.93, 1.50, 1.48 & 0.352	Jun. 1, Jul. 25 & Aug.14 & Sep. 12	M	(4/12) Monthly samples
		Fe-T	1	1.39, 2.06, 1.06 & 1.47	Apr. 3, Jun. 1, Jul. 25 & Aug. 14	M	(4/12) Monthly samples
	LLSM	As-T	0.005	0.006	July 6, 2018	M	(1/10) Monthly samples
		Fe-D	0.35	0.608, 1.11, 1.10 & 0.355	May 1, Jun. 1, Jul. 6 & Aug.14	M	(4/10) Monthly samples
		Fe-T	1	1.230 &1.430	Jun 1st & 21st	M	(2/10) Monthly samples
E286930 - Quinsam River Downstream Site 1 (QRDS1)	QRDS1	Zn-T	0.0075	0.0142	Summer 5 in 30	A	Summer 5 in 30
			0.033	0.05	Aug. 17	M	(1/5) Weekly samples collected in summer
E292112 - Lower Wetland Outlet (LWO)	LWO	pH	6.5	5.7 to 5.8	Fall 5 in 30	Min	(3/5) Weekly samples collected in fall
		Cu-T	0.002	0.00216	Fall 5 in 30	A	Average of 4 samples collected in fall
		Al-D	0.05	0.13250	Fall 5 in 30	A	Average of 4 samples collected in fall
			0.1	0.1760, 0.1740 & 0.1270	Oct. 30 & Nov. 7th & 17th	M	(3/4) Weekly samples collected in fall
E297230 - Quinsam River Upstream of Mining Operations (IR1)	IR1	Al-D	0.05	0.06	Spring 5 in 30	A	Spring 5 in 30
			0.05	0.0521	Fall 5 in 30	A	Fall 5 in 30
			0.1	0.103	Oct.18	M	(1/5) Weekly samples collected in fall
		Zn-T	0.0075	0.0120	Summer 5 in 30	A	Summer 5 in 30
			0.033	0.04	Aug. 17	M	(1/5) Weekly samples collected in summer
E297231 - Iron River Upstream of 7SA5 (IR6)	IR6	Al-D	0.05	0.075	Spring 5 in 30	A	Spring 5 in 30
				0.0528	Fall 5 in 30	A	Fall 5 in 30
			0.1	0.105	Oct. 18	M	(1/5) Weekly samples collected in fall
		Cu-T	0.002	0.0022	Spring 5 in 30	A	Spring 5 in 30
			0.007	0.0080	Apr. 12	M	(1/5) Weekly samples collected in spring
		As-T	0.005	0.00672 - 0.0110	Aug. through Sep 27	M	(6/7) Samples collected in summer
				0.00740	Oct.12	M	(1/5) Samples collected in fall
E297232 - Iron River Downstream of 7SA5 (IR8)	IR8	As-T	0.005	0.00743 - 0.0172	Jul 25, Aug. 4 & 9 Sep. 27	M	(4/7) Samples collected in summer
				0.016	Oct.12	M	(1/5) Weekly samples collected in fall
		Al-D	0.05	0.066	Spring 5 in 30	A	Spring 5 in 30

Min = Minimum Water Quality Guidline (WQG) M= Maximum WQG, A= Average WQG

For all Middle Quinsam Lake Sub-basin and Iron River results background hardness of 30 mg/L was used to calculate those parameters that are hardness dependent.

***SO4 at LLE was calculated using a rolling average.**

Table 4
2017-2018 Annual Report

EMS ID		E207409												
Site Description		Settling Pond #4		Permitted Decant for the North Mining Operation										
Site Name		WD												
Date		03/Apr/2017	02/May/2017	01/Jun/2017	11/Jul/2017	14/Aug/2017	12/Sep/2017	05/Oct/2017	06/Nov/2017	04/Dec/2017	03/Jan/2018	05/Feb/2018	15/Mar/2018	Permit Limit
Parameter	Unit													North
SO4-D	mg/L	519	519	475	499	751	696	366	408	418	539	498	546	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	25
Alk-T	mg/L	367	331	343	342	397	399	450	453	321	342	328	333	-
Acidity 8.3	mg/L	7.49	4.78	<0.50	3.81	3.0	<1.0	<1.0	<1.0	1.6	<1.0	13.3	2.1	-
Al-T	mg/L	0.0172		0.0244	0.0128	<0.015		<0.015		0.0250		0.140	0.0138	-
As-T	mg/L	0.00140		0.00141	0.00305	0.00231		0.00293		0.00290		0.00226	0.00244	-
Ba-T	mg/L	0.0195		0.0183	0.0233	0.0240		0.0172		0.0171		0.0200	0.0231	-
B-T	mg/L	0.818		0.813	0.932	1.05		0.98		0.643		0.695	0.813	-
Cd-T	mg/L	0.000018		0.000068	0.000011	<0.000050		<0.000050		<0.000010		0.000032	0.000022	-
Ca-T	mg/L	119		110	94.4	154		74.8		83.9		112	108	-
Cr-T	mg/L	<0.0010		<0.0010	<0.0010	<0.0050		<0.0050		<0.0010		<0.0010	<0.0010	-
Co-T	mg/L	0.00333		0.00090	<0.00020	<0.0010		<0.0010		0.00061		0.00531	0.00041	-
Cu-T	mg/L	0.00131		0.00089	0.00064	<0.0025		<0.0025		0.00061		0.00386	0.00075	-
Hard-T	mg/L	356		320	281	451		222		252		338	319	-
Fe-T	mg/L	0.240		0.166	0.655	1.17		0.473		0.318		0.563	0.430	-
Pb-T	mg/L	<0.00020		<0.00020	<0.00020	<0.0010		<0.0010		<0.00020		<0.00020	<0.00020	-
Mg-T	mg/L	14.4		11.0	10.9	16.3		8.50		10.2		14.0	11.7	-
Mn-T	mg/L	0.175		0.0538	0.0457	0.105		0.0376		0.109		0.191	0.134	-
Hg-T	mg/L	<0.0000020		<0.0000020	<0.0000020	<0.0000020		<0.0000020		<0.0000020		<0.0000020	<0.0000020	-
Mo-T	mg/L	<0.0010		<0.0010	<0.0010	<0.0050		<0.0050		<0.0010		<0.0010	<0.0010	-
Ni-T	mg/L	0.0081		0.0034	<0.0010	<0.0050		<0.0050		0.0016		0.0117	0.0017	-
K-T	mg/L	3.29		2.62	3.61	5.18		3.29		2.52		3.35	3.71	-
S-T	mg/L	212		162	208	278		134		137		197	197	-
Se-T	mg/L	<0.00010		0.00015	<0.00010	<0.00050		<0.00050		<0.00010		<0.00010	<0.00010	-
Si-T	mg/L	2.79		2.50	2.52	2.52		2.34		3.38		3.32	2.94	-
Ag-T	mg/L	<0.000020		<0.000020	<0.000020	<0.00010		<0.00010		<0.000020		<0.000020	<0.000020	-
Na-T	mg/L	277		229	302	371		330		203		257	268	-
Sr-T	mg/L	0.931		0.788	0.869	1.33		0.729		0.792		0.923	1.04	-
Zn-T	mg/L	<0.0050		<0.0050	<0.0050	<0.025		<0.025		<0.0050		0.0071	<0.0050	-
Al-D	mg/L	0.0055		0.0099	0.0096	<0.015		<0.015		0.0092		0.0174	<0.015	0.5
As-D	mg/L	0.00101		0.00111	0.00155	0.00097		0.00165		0.00226		0.00121	0.00190	-
Ba-D	mg/L	0.0196		0.0179	0.0246	0.0225		0.0166		0.0190		0.0173	0.0230	-
B-D	mg/L	0.892		0.807	0.973	0.96		0.92		0.734		0.662	0.91	-
Be-D	mg/L	<0.00010		<0.00010	<0.00010	<0.00050		<0.00050		<0.00010		<0.00010	<0.00050	-
Cd-D	mg/L	0.0000170		<0.0000050	0.0000080	<0.000025		<0.000025		0.0000050		0.0000271	<0.000025	-
Ca-D	mg/L	126		101	103	145		72.1		96.6000000		99.5	111	-
Cr-D	mg/L	<0.0010		<0.0010	<0.0010	<0.0050		<0.0050		<0.0010		<0.0010	<0.0050	-
Co-D	mg/L	0.00305		0.00073	<0.00020	<0.0010		<0.0010		0.00045		0.00439	<0.0010	-
Cu-D	mg/L	0.00088		0.00053	0.00077	<0.0010		<0.0010		0.00041		0.00082	<0.0010	0.02
Hard-D	mg/L	373		301	303	434		213		287		301	334	-
Fe-D	mg/L	0.0073		0.0111	0.0519	<0.025		<0.025		0.0081		0.0072	<0.025	0.3
Pb-D	mg/L	<0.00020		<0.00020	<0.00020	<0.0010		<0.0010		<0.00020		<0.00020	<0.0010	0.05
Mg-D	mg/L	13.9		11.8	11.4	17.5		8.05		11.2		12.9	13.5	-
Mn-D	mg/L	0.167		0.0432	0.0314	0.0767		0.0337		0.1060		0.167	0.133	-
Hg-D	mg/L	<0.0000020		<0.0000020	<0.0000020	<0.0000020		<0.0000020		<0.0000020		<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010		<0.0010	<0.0010	<0.0050		<0.0050		<0.0010		<0.0010	<0.0050	-
Ni-D	mg/L	0.0075		0.0033	<0.0010	<0.0050		<0.0050		0.0015		0.0099	<0.0050	-
K-D	mg/L	3.30		2.92	4.08	5.16		3.17		2.87		2.78	3.72	-
S-D	mg/L	212		171	204	275		131		164		166	209	-
Se-D	mg/L	<0.00010		<0.00010	<0.00010	<0.00050		<0.00050		0.00011		<0.00010	<0.00050	-
Si-D	mg/L	3.08		1.90	2.62	2.48		2.21		3.09		3.25	2.92	-
Na-D	mg/L	269		256	326	373		315		226		230	286	-
Sr-D	mg/L	0.919		0.761	0.928	1.36		0.730		0.930		0.986	1.00	-
Zn-D	mg/L	<0.0050		<0.0050	<0.0050	<0.025		<0.025		<0.0050		0.0059	<0.025	0.1
O&G	mg/L	<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		10

Table 5
2017-2018 Annual Report

EMS ID		E207412											
Site Description		2-North Pit Sump (WP) CCR Water Cover											
Site Name		WP											
Date		03/Apr/2017	02/May/2017	01/Jun/2017	11/Jul/2017	14/Aug/2017	12/Sep/2017	05/Oct/2017	06/Nov/2017	05/Dec/2017	16/Jan/2018	06/Feb/2018	15/Mar/2018
Parameter	Unit												
SO4-D	mg/L	324	341		440	586	575	453	478	566	151	500	589
TSS	mg/L	<4.0	131		28.0	<4.0	<4.0	4.5	<4.0	<4.0	<4.0	<4.0	<4.0
Alk-T	mg/L	337	287		309	372	314	477	308	301	55.8	205	230
Acidity 8.3	mg/L	1.15	1.24		<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.3
Al-T	mg/L	0.0409	1.13		0.0849	0.045	<0.015	0.0420	0.0370	0.0393	0.0113	0.0445	0.0551
As-T	mg/L	0.00255	0.00509		0.00430	0.00164	0.00136	0.00323	0.00141	0.00058	0.00011	0.00039	0.00084
Ba-T	mg/L	0.0193	0.0244		0.0261	0.0222	0.0181	0.0175	0.0172	0.0183	0.0056	0.0183	0.0206
B-T	mg/L	0.788	0.689		1.02	0.95	1.07	0.95	0.738	0.751	0.128	0.468	0.623
Cd-T	mg/L	<0.000010	0.000021		<0.000010	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	0.000016	<0.000010
Ca-T	mg/L	94.2	77.1		72.3	71.7	53.4	48.4	79.1	114	45.7	154	144
Cr-T	mg/L	<0.0010	0.0029		<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	0.00159	0.00422		0.00127	<0.0010	<0.0010	<0.0010	0.00023	0.00111	0.00028	0.00263	0.00185
Cu-T	mg/L	0.00068	0.0129		0.00274	<0.0025	<0.0025	<0.0025	0.00056	0.00082	<0.00050	0.00113	0.00068
Hard-T	mg/L	283	248		224	224	177	158	242	349	140	470	433
Fe-T	mg/L	0.127	2.68		0.738	0.240	0.137	0.393	0.095	0.210	0.039	0.111	0.077
Pb-T	mg/L	<0.00020	0.00039		0.00058	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	11.6	13.6		10.5	11.0	10.6	9.00	10.9	15.8	6.38	20.8	17.8
Mn-T	mg/L	0.0533	0.0818		0.116	0.0286	0.0078	0.0211	0.0280	0.0804	0.0283	0.148	0.105
Hg-T	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010		<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	0.0082	0.0092		0.0025	<0.0050	<0.0050	<0.0050	0.0011	0.0030	0.0010	0.0056	0.0047
K-T	mg/L	2.54	2.28		4.09	4.48	4.57	3.83	3.20	2.90	0.724	2.60	2.96
S-T	mg/L	130	123		168	214	236	171	167	210	53.2	203	212
Se-T	mg/L	<0.00010	0.00012	Water level too low to obtain a sample. Decreasing water level for final reclamation of pit during closure period.	<0.00010	<0.00050	<0.00050	<0.00050	0.00017	0.00026	0.00013	0.00036	0.00022
Si-T	mg/L	3.05	3.79		3.03	2.72	2.71	2.26	2.03	2.53	0.60	2.53	2.91
Ag-T	mg/L	<0.000020	<0.000020		<0.000020	<0.00010	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	221	198		314	354	351	374	273	248	32.4	159	196
Sr-T	mg/L	0.621	0.621		0.772	0.886	0.910	0.762	0.969	1.07	0.273	1.02	1.14
Zn-T	mg/L	<0.0050	0.0125		<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0062	0.0110		0.0065	<0.015	<0.015	<0.015	<0.015	0.0180	0.0058	0.0151	0.018
As-D	mg/L	0.00207	0.00099		0.00258	0.00130	0.00105	0.00191	0.00107	<0.00050	<0.00010	0.00025	0.00076
Ba-D	mg/L	0.0185	0.0183		0.0222	0.0215	0.0188	0.0177	0.0173	0.0169	0.0057	0.0167	0.0208
B-D	mg/L	0.766	0.682		0.990	0.96	1.01	1.00	0.819	0.73	0.135	0.437	0.74
Be-D	mg/L	<0.00010	<0.00010		<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050
Cd-D	mg/L	<0.0000050	<0.0000050		<0.0000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	0.0000061	0.0000185	<0.000025
Ca-D	mg/L	82.5	63.6		68.6	73.0	50.0	48.3	79.9	114	55.4	138	152
Cr-D	mg/L	<0.0010	<0.0010		<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0050
Co-D	mg/L	0.00136	<0.00020		0.00090	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.00030	0.00247	0.0019
Cu-D	mg/L	0.00067	0.00061		0.00181	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	0.00091	<0.0010
Hard-D	mg/L	252	212		213	230	172	156	245	353	168	417	469
Fe-D	mg/L	0.0088	0.0056		0.0350	0.034	0.064	0.0560	<0.025	<0.025	<0.0050	0.0053	<0.025
Pb-D	mg/L	<0.00020	<0.00020		<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.0010
Mg-D	mg/L	11.0	12.8		10.1	11.5	11.4	8.57	11.1	16.7	7.26	17.8	21.4
Mn-D	mg/L	0.0443	<0.0010		0.0795	0.0165	<0.0050	0.0088	0.0365	0.0832	0.0296	0.135	0.113
Hg-D	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010		<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0050
Ni-D	mg/L	0.0075	0.0027		0.0021	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0010	0.0055	0.0054
K-D	mg/L	2.47	2.30		3.99	4.55	4.72	3.66	3.22	2.83	0.715	2.10	3.15
S-D	mg/L	129	130		164	217	229	171	170	205	59.4	175	232
Se-D	mg/L	<0.00010	<0.00010		0.00016	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00015	0.00031	<0.00050
Si-D	mg/L	2.73	2.11		2.86	2.78	2.37	2.25	2.41	2.36	0.72	2.30	2.82
Na-D	mg/L	211	195		294	361	382	355	283	244	34.7	143	204
Sr-D	mg/L	0.611	0.633		0.732	0.936	0.899	0.742	0.833	1.04	0.317	1.07	1.11
Zn-D	mg/L	<0.0050	<0.0050		<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.025

Table 6
2017-2018 Annual Report

EMS ID		E283433											
Site Description		2-North Portal Sump Effluent											
Site Name		2NPS											
Date		3-Apr-17	2-May-17	1-Jun-17	11-Jul-17	14-Aug-17	12-Sep-17	5-Oct-17	6-Nov-17	5-Dec-17	3-Jan-18	6-Feb-18	15-Mar-18
Parameter	Unit												
SO4-D	mg/L	958	891	834	792	801	816	829	870	924	907	922	981
Alk-T	mg/L	281	313	251	243	305	274	335	281	322	299	279	257
Acidity83	mg/L	10.7	10.6	0.59	4.70	5.00	5.2	2.2	3.2	3.7	2.6	13.8	8.5
Al-T	mg/L	0.0230	0.0190	0.0660	0.0198	0.015	0.036	0.0570	0.0920	0.0760	0.023	0.812	0.103
As-T	mg/L	0.00079	0.00095	0.00048	0.00123	0.00125	0.00108	0.00136	0.00255	0.00072	0.00060	0.00181	0.00104
Ba-T	mg/L	0.0118	0.0131	0.0165	0.0133	0.0133	0.0136	0.0131	0.0147	0.0129	0.0118	0.0164	0.0126
B-T	mg/L	0.821	0.769	0.770	0.872	0.86	0.90	0.88	0.90	0.93	0.88	0.74	0.79
Cd-T	mg/L	0.000052	0.000017	0.000046	0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Ca-T	mg/L	292	246	218	247	221	203	217	231	248	246	269	268
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Co-T	mg/L	0.00136	0.00228	0.00618	0.00076	<0.0010	<0.0010	<0.0010	0.0013	0.0020	0.0013	0.0037	0.0018
Cu-T	mg/L	<0.00050	<0.00050	0.00252	<0.00050	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0052	<0.0025
Hard-T	mg/L	856	733	639	733	650	605	651	686	729	730	801	787
Fe-T	mg/L	0.209	0.276	0.233	0.375	0.418	0.245	0.447	1.03	0.231	0.190	1.17	0.354
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Mg-T	mg/L	31.1	28.7	23.0	28.0	24.2	23.7	26.7	26.6	27.0	28.3	31.1	28.9
Mn-T	mg/L	0.365	0.329	0.254	0.271	0.237	0.225	0.2500	0.4030	0.3520	0.353	0.364	0.330
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ni-T	mg/L	0.0030	0.0040	0.0119	0.0022	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0074	<0.0050
K-T	mg/L	3.91	3.68	3.47	3.75	3.46	3.62	3.41	3.65	3.91	3.84	4.16	3.94
S-T	mg/L	375	317	294	315	274	299	279	286	308	323	357	358
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Si-T	mg/L	3.50	3.14	3.22	3.25	2.96	2.98	2.82	2.94	3.14	3.11	4.23	3.51
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Na-T	mg/L	220	230	220	216	214	209	243	238	218	236	210	204
Sr-T	mg/L	1.89	1.70	1.61	1.65	1.58	1.64	1.61	1.68	1.91	1.70	1.83	1.83
Zn-T	mg/L	<0.0050	<0.0050	0.0090	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Al-D	mg/L	0.0163	0.0091	0.0382	0.0059	<0.015	<0.015	<0.015	<0.015	0.0170	<0.015	0.0190	<0.015
As-D	mg/L	0.00061	0.00070	0.00034	0.00090	0.00072	0.00074	0.00091	0.00090	<0.00050	0.00051	0.00053	0.00079
Ba-D	mg/L	0.0115	0.0128	0.0169	0.0137	0.0124	0.0133	0.0130	0.0147	0.0127	0.0118	0.0134	0.0133
B-D	mg/L	0.811	0.757	0.771	0.863	0.87	0.94	0.89	1.07	0.90	0.78	0.615	0.85
Be-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050
Cd-D	mg/L	0.0000540	0.0000060	0.0000200	<0.0000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	0.0000165	<0.000025
Ca-D	mg/L	288	234	214	248	220	224	218	236	247	247	268	272
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050
Co-D	mg/L	0.00134	0.00193	0.00613	0.00067	<0.0010	<0.0010	<0.0010	0.0011	0.0019	0.0012	0.00272	0.0016
Cu-D	mg/L	0.00033	0.00023	0.00120	0.00022	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00040	<0.0010
Hard-D	mg/L	847	693	635	732	650	668	656	698	729	731	788	807
Fe-D	mg/L	0.0085	0.0097	0.0052	0.0231	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.0149	<0.025
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.0010
Mg-D	mg/L	30.9	26.5	24.4	27.2	24.5	26.4	27.0	26.5	27.4	27.6	28.7	31.1
Mn-D	mg/L	0.358	0.295	0.259	0.256	0.272	0.233	0.2610	0.3960	0.3530	0.344	0.331	0.314
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050
Ni-D	mg/L	0.0028	0.0037	0.0116	0.0018	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0057	<0.0050
K-D	mg/L	4.01	3.98	3.67	3.98	3.24	3.60	3.46	3.80	3.95	3.86	3.60	3.86
S-D	mg/L	366	300	303	327	282	288	283	304	322	315	313	365
Se-D	mg/L	<0.00010	<0.00010	0.00012	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00016	<0.00050
Si-D	mg/L	3.46	3.10	2.91	3.27	3.06	3.03	2.81	3.21	3.07	3.08	3.18	3.22
Na-D	mg/L	215	224	238	219	215	232	248	233	219	230	201	214
Sr-D	mg/L	1.90	1.89	1.42	1.69	1.85	1.60	1.60	1.73	1.82	1.68	2.12	1.83
Zn-D	mg/L	<0.0050	<0.0050	0.0057	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.0058	<0.025

Table 7
2017-2018 Annual Report

EMS ID		E207411											
Site Description		Culvert at Middle Quinsam Lake Road											
Site Name		WC											
Date		3-Apr-17	2-May-17	1-Jun-17	11-Jul-17	14-Aug-17	12-Sep-17	5-Oct-17	6-Nov-17	11-Dec-17	5-Jan-18-M	5-Feb-18	6-Mar-18
Parameter	Unit												
SO4-D	mg/L	439	481	459	490	737	672	381	419	462	PNC	387	494
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Al-T	mg/L	0.0125	-	0.0132	0.0110	<0.015	-	<0.015	-	0.0077	-	0.0662	0.0193
As-T	mg/L	0.00047	-	0.00057	0.00075	0.00058	-	0.00071	-	0.00127	-	0.00106	0.00095
Ba-T	mg/L	0.0160	-	0.0174	0.0189	0.0246	-	0.0131	-	0.0178	-	0.0149	0.0200
B-T	mg/L	0.751	-	0.802	0.998	1.03	-	0.92	-	0.804	-	0.550	0.809
Cd-T	mg/L	<0.000010	-	0.000079	<0.000010	<0.000050	-	<0.000050	-	<0.000010	-	0.000081	<0.000010
Ca-T	mg/L	106	-	104	77.7	126	-	64.5	-	89.1	-	85.5	112
Cr-T	mg/L	<0.0010	-	<0.0010	<0.0010	<0.0050	-	<0.0050	-	<0.0010	-	<0.0010	<0.0010
Co-T	mg/L	0.00022	-	<0.00020	<0.00020	<0.0010	-	<0.0010	-	<0.00020	-	0.00119	<0.00020
Cu-T	mg/L	0.00059	-	0.00121	<0.00050	<0.0025	-	<0.0025	-	<0.00050	-	0.00149	0.00070
Hard-T	mg/L	316	-	310	238	379	-	198	-	268	-	260	332
Fe-T	mg/L	0.060	-	0.034	0.075	0.073	-	0.057	-	0.067	-	0.181	0.115
Pb-T	mg/L	<0.00020	-	<0.00020	<0.00020	<0.0010	-	<0.0010	-	<0.00020	-	<0.00020	<0.00020
Mg-T	mg/L	12.7	-	12.4	10.7	15.4	-	8.95	-	10.9	-	11.4	12.4
Mn-T	mg/L	0.0165	-	0.0132	0.0121	0.0221	-	0.0096	-	0.0103	-	0.0543	0.0272
Hg-T	mg/L	<0.0000020	-	<0.0000020	<0.0000020	0.0000023	-	<0.0000020	-	<0.0000020	-	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	-	<0.0010	<0.0010	<0.0050	-	<0.0050	-	<0.0010	-	<0.0010	<0.0010
Ni-T	mg/L	0.0028	-	0.0013	0.0010	<0.0050	-	<0.0050	-	<0.0010	-	0.0058	0.0019
K-T	mg/L	2.82	-	2.65	3.49	4.86	-	3.24	-	3.03	-	2.69	3.43
S-T	mg/L	177	-	177	189	270	-	136	-	161	-	154	191
Se-T	mg/L	<0.00010	-	<0.00010	<0.00010	<0.00050	-	<0.00050	-	<0.00010	-	0.00015	<0.00010
Si-T	mg/L	2.96	-	2.13	2.86	3.18	-	2.39	-	2.84	-	3.20	3.05
Ag-T	mg/L	<0.000020	-	<0.000020	<0.000020	<0.00010	-	<0.00010	-	<0.000020	-	<0.000020	<0.000020
Na-T	mg/L	241	-	229	287	358	-	328	-	242	-	203	263
Sr-T	mg/L	0.812	-	0.857	0.806	1.26	-	0.722	-	0.899	-	0.696	0.995
Zn-T	mg/L	<0.0050	-	<0.0050	<0.0050	<0.025	-	<0.025	-	<0.0050	-	<0.0050	<0.0050
Al-D	mg/L	0.0093	-	0.0066	0.0085	<0.015	-	<0.015	-	0.0061	-	0.0272	0.0175
As-D	mg/L	0.00039	-	0.00045	0.00063	0.00057	-	0.00060	-	0.00121	-	0.00061	0.00074
Ba-D	mg/L	0.0155	-	0.0161	0.0210	0.0241	-	0.0126	-	0.0182	-	0.0137	0.0189
B-D	mg/L	0.760	-	0.811	0.981	0.96	-	0.92	-	0.809	-	0.544	0.77
Be-D	mg/L	<0.00010	-	<0.00010	<0.00010	<0.00050	-	<0.00050	-	<0.00010	-	<0.00010	<0.00020
Cd-D	mg/L	<0.0000050	-	<0.0000050	<0.0000050	<0.000025	-	<0.000025	-	<0.0000050	-	0.0000071	<0.000010
Ca-D	mg/L	105	-	81.2	80.9	125	-	61.9	-	97.2	-	81.1	107
Cr-D	mg/L	<0.0010	-	<0.0010	<0.0010	<0.0050	-	<0.0050	-	<0.0010	-	<0.0010	<0.0020
Co-D	mg/L	<0.00020	-	<0.00020	<0.00020	<0.0010	-	<0.0010	-	<0.00020	-	0.00092	<0.00040
Cu-D	mg/L	0.00045	-	0.00055	0.00053	<0.0010	-	<0.0010	-	0.00141	-	0.00049	0.00044
Hard-D	mg/L	312	-	255	246	380	-	190	-	290	-	246	323
Fe-D	mg/L	0.0087	-	0.0204	0.0297	<0.025	-	<0.025	-	0.0069	-	0.0077	<0.010
Pb-D	mg/L	<0.00020	-	<0.00020	<0.00020	<0.0010	-	<0.0010	-	<0.00020	-	<0.00020	<0.00040
Mg-D	mg/L	12.0	-	12.6	10.6	16.7	-	8.66	-	11.5	-	10.6	13.4
Mn-D	mg/L	0.0153	-	<0.0010	0.0104	0.0239	-	0.0097	-	0.0099	-	0.0472	0.0269
Hg-D	mg/L	<0.0000020	-	<0.0000020	<0.0000020	<0.0000020	-	<0.0000020	-	<0.0000020	-	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	-	<0.0010	<0.0010	<0.0050	-	<0.0050	-	<0.0010	-	<0.0010	<0.0020
Ni-D	mg/L	0.0026	-	0.0012	<0.0010	<0.0050	-	<0.0050	-	<0.0010	-	0.0052	<0.0020
K-D	mg/L	2.75	-	2.77	3.85	5.13	-	3.12	-	3.14	-	2.34	3.46
S-D	mg/L	178	-	162	189	273	-	144	-	165	-	136	190
Se-D	mg/L	<0.00010	-	<0.00010	<0.00010	<0.00050	-	<0.00050	-	<0.00010	-	<0.00010	<0.00020
Si-D	mg/L	2.92	-	1.93	2.92	3.20	-	2.44	-	2.79	-	3.15	2.82
Na-D	mg/L	224	-	229	304	368	-	313	-	260	-	190	265
Sr-D	mg/L	0.813	-	0.783	0.843	1.27	-	0.715	-	1.02	-	0.793	0.946
Zn-D	mg/L	<0.0050	-	<0.0050	<0.0050	<0.025	-	<0.025	-	<0.0050	-	<0.0050	<0.010

Table 8
2017-2018 Annual Report

EMS ID		E292126			
Site Description		h Dyke Sump - Collects seepage from tailings dam			
Site Name		SDS			
Date		3-Apr-17	July-Sept- 2017	14-Nov-17	7-Feb-18
Parameter	Unit				
SO4-D	mg/L	1080		276	1200
Alk-T	mg/L	214		49.4	211
Acidity 8.3	mg/L	11.4		<1.0	11.3
Al-T	mg/L	0.104		1.520	0.431
As-T	mg/L	0.00017		0.00155	<0.00050
Ba-T	mg/L	0.0188		0.0176	0.0184
B-T	mg/L	0.538		0.143	0.580
Cd-T	mg/L	0.000034		0.000044	0.000146
Ca-T	mg/L	330		100	368
Cr-T	mg/L	<0.0010		0.0042	<0.0050
Co-T	mg/L	0.00427		0.00367	0.0197
Cu-T	mg/L	0.00216		0.0141	0.0064
Hard-T	mg/L	1010		296	1130
Fe-T	mg/L	0.088		2.35	0.132
Pb-T	mg/L	<0.00020		0.00030	<0.0010
Mg-T	mg/L	44.3		11.1	50.8
Mn-T	mg/L	0.519		0.205	0.903
Hg-T	mg/L	<0.0000020		<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010		<0.0010	<0.0050
Ni-T	mg/L	0.0140		0.0082	0.0493
K-T	mg/L	3.35		2.41	3.91
S-T	mg/L	378		99.5	452
Se-T	mg/L	0.00024		0.00088	0.00059
Si-T	mg/L	2.68		3.49	4.50
Ag-T	mg/L	<0.000020		<0.000020	<0.00010
Na-T	mg/L	139		16.8	134
Sr-T	mg/L	1.83	Dry thoughout Q2	0.499	2.17
Zn-T	mg/L	0.0081		0.0133	0.038
Al-D	mg/L	0.0175		0.0160	0.0345
As-D	mg/L	0.00011		0.00017	0.00015
Ba-D	mg/L	0.0188		0.0138	0.0171
B-D	mg/L	0.528		0.153	0.499
Be-D	mg/L	<0.00010		<0.00010	<0.00010
Cd-D	mg/L	0.0000370		0.0000312	0.000127
Ca-D	mg/L	321		114	382
Cr-D	mg/L	<0.0010		<0.0010	<0.0010
Co-D	mg/L	0.00434		0.00160	0.0179
Cu-D	mg/L	0.00195		0.00223	0.00351
Hard-D	mg/L	992		335	1140
Fe-D	mg/L	0.0090		0.0118	<0.0050
Pb-D	mg/L	<0.00020		<0.00020	<0.00020
Mg-D	mg/L	46.2		11.9	45.9
Mn-D	mg/L	0.510		0.1890	0.882
Hg-D	mg/L	<0.0000020		<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010		<0.0010	<0.0010
Ni-D	mg/L	0.0143		0.0044	0.0431
K-D	mg/L	3.62		2.64	3.48
S-D	mg/L	400		106	396
Se-D	mg/L	0.00020		0.00086	0.00064
Si-D	mg/L	3.00		1.63	4.63
Na-D	mg/L	145		18.6	123
Sr-D	mg/L	1.82		0.518	2.43
Zn-D	mg/L	0.0083		0.0050	0.0295

Table 9
2017-2018 Annual Report

Site Description		Seep Near Plant		
Site Name		PDS		
Date		3-Apr-17	2-May-17	1-Jun-17
Parameter	Unit			
SO4-D	mg/L	994	1040	1120
Alk-T	mg/L	301	297	314
Acidity 8.3	mg/L	18.2	17.6	10.1
Al-T	mg/L	0.0039	0.0083	0.0062
As-T	mg/L	<0.00010	0.00011	<0.00010
Ba-T	mg/L	0.0161	0.0135	0.0151
B-T	mg/L	0.573	0.503	0.520
Cd-T	mg/L	<0.000010	<0.000010	0.000042
Ca-T	mg/L	402	394	452
Cr-T	mg/L	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	<0.00050	<0.00050	<0.00050
Hard-T	mg/L	1250	1240	1360
Fe-T	mg/L	0.240	0.184	0.091
Pb-T	mg/L	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	61.3	62.1	55.1
Mn-T	mg/L	0.193	0.159	0.153
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010	<0.0010
K-T	mg/L	3.14	2.96	2.24
S-T	mg/L	403	360	350
Se-T	mg/L	<0.00010	<0.00010	0.00011
Si-T	mg/L	4.61	3.86	4.04
Ag-T	mg/L	<0.000020	<0.000020	<0.000020
Na-T	mg/L	67.3	67.8	62.2
Sr-T	mg/L	2.54	2.42	2.63
Zn-T	mg/L	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0036	0.0080	<0.0030
As-D	mg/L	<0.00010	0.00012	<0.00010
Ba-D	mg/L	0.0154	0.0132	0.0162
B-D	mg/L	0.520	0.500	0.474
Be-D	mg/L	<0.00010	<0.00010	<0.00010
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050
Ca-D	mg/L	433	386	421
Cr-D	mg/L	<0.0010	<0.0010	<0.0010
Co-D	mg/L	<0.00020	<0.00020	<0.00020
Cu-D	mg/L	0.00020	0.00037	<0.00020
Hard-D	mg/L	1320	1190	1310
Fe-D	mg/L	0.0151	0.0174	0.0311
Pb-D	mg/L	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	58.2	55.7	62.0
Mn-D	mg/L	0.186	0.148	0.179
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010
Ni-D	mg/L	<0.0010	<0.0010	<0.0010
K-D	mg/L	3.13	2.90	2.51
S-D	mg/L	389	349	367
Se-D	mg/L	<0.00010	<0.00010	<0.00010
Si-D	mg/L	4.97	3.96	3.73
Na-D	mg/L	64.9	63.7	73.3
Sr-D	mg/L	2.46	2.58	2.68
Zn-D	mg/L	<0.0050	<0.0050	<0.0050

Table 10
2017-2018 Annual Report

Site Description		Groundwater / Surface Water from 2N Area at Road							
Site Name		PDSR							
Date		3-Apr-17	2-May-17	1-Jun-17	Jul-Nov 2017	4-Dec-17	3-Jan-18	5-Feb-18	6-Mar-18
Parameter	Unit								
SO4-D	mg/L	435	651	745		355	683	263	556
Alk-T	mg/L	142	186	209		121	188	97.1	149
Acidity 8.3	mg/L	3.26	4.70	0.50		<1.0	<1.0	1.5	<1.0
Al-T	mg/L	0.0101	0.0106	0.0130		0.0109	0.0068	0.0201	0.0130
As-T	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	0.00013
Ba-T	mg/L	0.0167	0.0244	0.0328		0.0142	0.0221	0.0100	0.0199
B-T	mg/L	0.194	0.281	0.432		0.190	0.203	0.142	0.188
Cd-T	mg/L	<0.000010	<0.000010	0.000020		<0.000010	<0.000010	<0.000010	<0.000010
Ca-T	mg/L	186	228	282		118	220	94.7	209
Cr-T	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Hard-T	mg/L	589	728	880		386	720	303	656
Fe-T	mg/L	<0.010	0.013	<0.010		<0.010	<0.010	0.018	0.013
Pb-T	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	30.6	38.8	42.8		21.8	41.4	16.2	32.3
Mn-T	mg/L	0.0023	0.0014	<0.0010		<0.0010	<0.0010	0.0032	0.0026
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
K-T	mg/L	1.67	2.04	2.21		1.20	1.50	1.03	1.55
S-T	mg/L	183	220	267		134	251	98.3	206
Se-T	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	4.25	3.86	3.76		3.20	3.21	3.18	3.53
Ag-T	mg/L	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	46.8	55.2	62.3		39.6	60.6	27.4	49.6
Sr-T	mg/L	0.968	1.30	1.81	Dry	0.793	1.36	0.536	1.20
Zn-T	mg/L	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0087	0.0118	0.0077		0.0078	<0.015	0.0096	0.0077
As-D	mg/L	<0.00010	0.00012	<0.00010		<0.00010	<0.00050	<0.00010	<0.00010
Ba-D	mg/L	0.0172	0.0239	0.0333		0.0147	0.0224	0.0097	0.0196
B-D	mg/L	0.205	0.285	0.414		0.182	<0.25	0.147	0.183
Be-D	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00050	<0.00010	<0.00010
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.000025	<0.0000050	<0.0000050
Ca-D	mg/L	181	215	278		118	229	92.3	189
Cr-D	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0050	<0.0010	<0.0010
Co-D	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.0010	<0.00020	<0.00020
Cu-D	mg/L	0.00026	0.00050	0.00027		0.00045	<0.0010	0.00040	0.00034
Hard-D	mg/L	574	675	879		383	752	295	608
Fe-D	mg/L	<0.0050	<0.0050	<0.0050		<0.0050	<0.025	<0.0050	<0.0050
Pb-D	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.0010	<0.00020	<0.00020
Mg-D	mg/L	29.5	33.3	44.7		21.2	43.9	15.7	32.7
Mn-D	mg/L	0.0016	0.0021	<0.0010		<0.0010	<0.0050	0.0011	0.0015
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0050	<0.0010	<0.0010
Ni-D	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0050	<0.0010	<0.0010
K-D	mg/L	1.72	2.07	2.36		1.17	1.54	0.946	1.52
S-D	mg/L	181	202	270		129	255	87.7	198
Se-D	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00050	<0.00010	<0.00010
Si-D	mg/L	4.12	3.68	3.75		3.08	3.09	3.34	3.30
Na-D	mg/L	45.7	50.8	66.7		38.7	64.2	26.1	49.4
Sr-D	mg/L	0.958	1.36	1.64		0.775	1.33	0.557	1.18
Zn-D	mg/L	<0.0050	<0.0050	<0.0050		<0.0050	<0.025	<0.0050	<0.0050

Table 11
2017-2018 Annual Report

EMS ID		E218582												
Site Description		Settling Pond # 1 - Permitted Decant for South Mining Operation												Permit
Site Name		SPD	(SPD was not discharging from June 25th through to November 5th)											Limit-South
Date		3-Apr-17	2-May-17	1-Jun-17	11-Jul-17	14-Aug-17	12-Sep-17	3-Oct-17	7-Nov-17	12-Dec-17	8-Jan-18	7-Feb-18	6-Mar-18	
Parameter	Unit													
SO4-D	mg/L	187	273	219	187	206	206	134	143	259	122	156	176	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	9.3	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	**25**
Alk-T	mg/L	127	130	91.8	94.4	108.0	115	110	81.8	275	63.2	42.2	51	-
Acidity 8.3	mg/L	2.06	1.7	<0.50	2.33	<1.0	<1.0	<1.0	<1.0	5.4	1.3	1.8	<1.0	-
Al-T	mg/L	0.0625	0.0169	0.0064	0.03	0.01		0.0045	0.0446	0.0401	0.0546	0.0752	0.0319	-
As-T	mg/L	0.0007	0.0004	0.0004	0.0014	0.0013		0.0010	0.0009	0.0027	0.00121	0.00037	0.00084	-
Ba-T	mg/L	0.0102	0.0127	0.0126	0.016	0.0171		0.0138	0.0109	0.0216	0.0085	0.0063	0.0089	-
B-T	mg/L	0.29900	0.252	0.19	0.229	0.264		0.274	0.178	0.79600	0.114	0.059	0.082	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	0.000032	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	0.000015	<0.000010	-
Ca-T	mg/L	54.5	109.000	97	92.2	84.6		82.4	56.4	53.3	44.6	62.1	67.4	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	-
Co-T	mg/L	0.00099	<0.00020	<0.00020	0.00035	0.00027		<0.00020	0.0	0.00176	0.00139	0.00026	0.00071	-
Cu-T	mg/L	0.0013	0.0008	0.0008	0.0010	0.0007		<0.00050	0.0008	0.0015	0.00219	0.00064	0.00063	-
Hard-T	mg/L	170.0	333.0	292.0	286.0	269.0		267.0	178.0	164.0	136.0	186.0	204.0	-
Fe-T	mg/L	1.73	0.22	0.09	0.42	0.27		0.15	0.33	2.25	0.87	0.17	0.48	-
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-T	mg/L	8.22	14.6	12.1	13.5	14		14.9	9.1	7.58	5.95	7.47	8.6	-
Mn-T	mg/L	0.0578	0.0142	0.0167	0.0775	0.0549		0.0145	0.0415	0.13	0.22	0.0236	0.091	-
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.0000026	<0.0000020	<0.0000020	-
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	0.0028	0.0011	<0.0010	0.0024	0.0013		<0.0010	0.0012	0.0031	0.0021	<0.0010	<0.0010	-
K-T	mg/L	1.93	1.87	1.15	1.65	1.91		1.89	1.38	3.68	0.89	0.57	0.71	-
S-T	mg/L	66.7	106.0	82.6	84.7	82.6		78.0	47.2	86.8	43.0	54.0	60.9	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	2.7	2.0	0.9	0.6	1.2		0.8	1.8	3.0	3.8	2.7	2.7	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-
Na-T	mg/L	63.4	44.7	23.2	26.8	29.2		32.8	19.0	154.0	16.7	5.4	8.5	-
Sr-T	mg/L	0.41	0.69	0.63	0.64	0.62		0.65	0.37	0.56	0.27	0.32	0.38	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-
Al-D	mg/L	0.0053	0.0071	0.0042	0.0053	0.0046		<0.0030	0.0105	0.0075	0.0367	0.0424	0.0107	**0.5**
As-D	mg/L	0.0002	0.0003	0.0005	0.0011	0.0013		0.0009	0.0008	0.0010	0.0010	0.0003	0.0004	-
Ba-D	mg/L	0.0088	0.0125	0.0122	0.0151	0.0170		0.0138	0.0107	0.0195	0.0088	0.0057	0.013	-
B-D	mg/L	0.306	0.268	0.192	0.225	0.244		0.272	0.208	0.711	0.122	0.058	0.136	-
Be-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	0.000005	0.0000100	0.0000213	<0.0000050	-
Ca-D	mg/L	55.2	104	91.8	88.9	98.9		82.9	54.8	58.8	46.5	51.3	136.0	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	0.00085	<0.00020	<0.00020	0.0002200	0.0002600		<0.00020	0.0002100	0.00167	0.00158	0.00025	0.00039	-
Cu-D	mg/L	0.0005	0.00055	0.00062	0.00072	0.00064		0.0003	0.00051	0.00044	0.00083	0.00058	0.00035	**0.02**
Hard-D	mg/L	168	317	282	278	307		267	173	180	142	159	409	-
Fe-D	mg/L	0.043	0.010	0.026	0.196	0.219		0.102	0.163	0.100	**0.614**	0.077	0.053	**0.5**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	**0.05**
Mg-D	mg/L	7.41	13.90	12.90	13.60	14.50		14.70	8.87	7.98	6.30	7.42	16.50	-
Mn-D	mg/L	0.0503	<0.0010	<0.0010	0.041	0.0471		0.0098	0.0367	0.13	0.241	0.0247	0.0594	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.0000021	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	0.002	<0.0010	<0.0010	0.0013	0.0012		<0.0010	0.0012	0.0028	0.0014	<0.0010	<0.0010	-
K-D	mg/L	1.81	1.87	1.23	1.58	1.95		1.85	1.29	3.91	0.94	0.54	1.18	-
S-D	mg/L	61	103	84	87	82		76	49	87	44	50	122	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-
Si-D	mg/L	2.23	1.93	0.87	0.59	1.35		0.9	1.88	2.77	3.59	2.72	2.19	-
Na-D	mg/L	59.3	43.7	24.5	26.7	30.6		33.3	18.5	165	18.3	5.47	12.7	-
Sr-D	mg/L	0.38	0.70	0.56	0.60	0.66		0.65	0.38	0.56	0.29	0.32	0.78	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-
O&G	mg/L	<5.0		<5.0			<5.0	<5.0		<5.0		<5.0		-

Metals analyses were obtained monthly instead of bi-monthly as results were applied to the loading assessment.

Table 12
2017-2018 Annual Report

Site Description		Long Lake Seep Passive Treatment System (LLSTS) Settling Pond Effluent											
Site Name		SPEFF	(All discharge water from the treatment system was directed into 2-South pit from May until September)										
Date		3-Apr-17	2-May-17	2-Jun-17	2-Jul-17	2-Aug-17	14-Sep-17	27-Sep-17	3-Oct-17	14-Nov-17	12-Dec-17	8-Jan-18	7-Feb-18	6-Mar-18
Parameter	Unit													
SO4-D	mg/L	359	331				402	393	414	283	369	383	255	334
TSS	mg/L	<4.0	<4.0				<4.0	4.5	<4.0	<4.0	<4.0	<4.0	7.3	<4.0
Alk-T	mg/L	247	236				220		241	133	238	197	105	153
Acidity 8.3	mg/L	<0.50	<0.50						2.60	<1.0	2.60	<1.0	3.8	<1.0
N-NH3	mg/L	0.029	0.0190				0.034	<0.020	<0.020	<0.020	<0.020	0.0880	<0.020	<0.020
NO2+NO3	mg/L	<2.0	<2.0				<0.020	<0.020	<2.0	<2.0	<2.0	<0.20	<0.20	<0.20
Al-T	mg/L	0.0043	0.0034				<0.015	0.006	<0.0030	0.0322	0.0031	0.0058	0.0419	0.0052
As-T	mg/L	0.00102	0.00133				0.00331	0.00141	0.00207	0.00066	0.0005	0.00035	0.00016	0.00027
Ba-T	mg/L	0.0205	0.011				0.0261	0.0271	0.0228	0.0197	0.0187	0.0178	0.0142	0.0138
B-T	mg/L	0.509	0.51				0.73	0.742	0.605	0.317	0.533	0.44	0.226	0.371
Cd-T	mg/L	<0.000010	<0.000010				<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000021	<0.000010
Ca-T	mg/L	137	131				130	147	140	117	131	147	92.7	120
Cr-T	mg/L	<0.0010	<0.0010				<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020				<0.0010	<0.00020	<0.00020	0.00021	<0.00020	0.00062	0.00200	<0.00020
Cu-T	mg/L	<0.00050	<0.00050				<0.0025	0.00097	<0.00050	0.00108	<0.00050	<0.00050	0.00071	<0.00050
Hard-T	mg/L	388	373				387	427	408	343	378	415	267	338
Fe-T	mg/L	0.032	0.022				0.092	0.022	0.078	0.043	0.413	0.426	0.145	0.059
P-T	mg/L	0.0097	0.0094				0.0143	0.0095	0.0133	0.0063	0.0166	0.0036	0.0048	0.0067
Pb-T	mg/L	<0.00020	<0.00020				<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	11	11.2				14.8	14.4	14.0	12.7	12.5	11.8	8.77	9.09
Mn-T	mg/L	0.0045	0.0042				0.0202	0.0022	0.0154	0.0238	0.0219	0.0636	0.136	0.0044
Hg-T	mg/L	<0.0000020	<0.0000020					<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010				<0.0050	<0.0010	<0.0010	<0.0010	0.0012	0.0015	<0.0010	0.0011
Ni-T	mg/L	<0.0010	<0.0010				<0.0050	<0.0010	<0.0010	0.0026	<0.0010	0.0019	0.0067	<0.0010
K-T	mg/L	3.06	2.94				3.35	3.09	2.51	1.78	1.91	1.68	1.21	1.39
S-T	mg/L	128	120				151	152	141	120	130	142	95.1	115
Se-T	mg/L	<0.00010	<0.00010				<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	2.41	2.89				2.67	3.36	3.32	5.39	3.81	3.4	3.35	2.47
Ag-T	mg/L	<0.000020	<0.000020		NF		<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	92	94.2				116	122	112	52.3	91	77.6	43.7	64.7
Sr-T	mg/L	1.41	1.35				1.65	1.75	1.8	1.12	1.55	1.46	0.834	1.16
Zn-T	mg/L	<0.0050	<0.0050				<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	<0.0030	<0.0030				<0.0030	0.0065	<0.0030	0.0189	0.0294	0.0036	0.0078	<0.0030
As-D	mg/L	0.0009	0.00131				0.00324	0.00167	0.00199	0.00063	0.00038	0.00024	0.00015	0.00022
Ba-D	mg/L	0.0202	0.0112				0.0269	0.0269	0.0226	0.0191	0.0195	0.017	0.0122	0.014
B-D	mg/L	0.517	0.539				0.62	0.64	0.641	0.307	0.489	0.459	0.294	0.347
Cd-D	mg/L	<0.0000050	<0.0000050				<0.0000050	<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Ca-D	mg/L	142	138				130	141	152	116	144	145	101	118
Cr-D	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	<0.00020	<0.00020				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00030	0.00026	<0.00020
Cu-D	mg/L	0.00056	0.00037				<0.00020	0.00098	<0.00020	0.00069	0.00032	0.00616	<0.00020	<0.00020
Hard-D	mg/L	402	387				379	406	439	341	408	410	288	340
Fe-D	mg/L	0.0104	0.0078				0.0639	0.0144	0.0524	0.0196	0.0318	0.0061	0.0122	0.0121
P-D	mg/L	0.0107	0.0104				0.0098		0.0137	0.0126	0.0043		0.0023	0.0031
Pb-D	mg/L	<0.00020	<0.00020				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	11.2	10.5				13.2	13.4	14.4	12.8	12	11.4	8.78	10.8
Mn-D	mg/L	0.0035	<0.0010				0.0151	<0.0010	0.0115	0.0239	0.02	0.0399	0.0263	0.0034
Hg-D	mg/L	<0.0000020	<0.0000020					<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0016	0.0010	0.0011
Ni-D	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	0.0029	<0.0010	<0.0010	0.0011	<0.0010
K-D	mg/L	2.86	3.06				3.21	3.11	2.64	1.59	1.98	1.74	1.24	1.52
S-D	mg/L	123	126				141	152	146	106	134	145	102	125
Se-D	mg/L	<0.00010	<0.00010				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	mg/L	2.06	3.04				2.69	3.34	3.4	4.97	3.63	2.94	2.43	2.49
Na-D	mg/L	89.9	90.4				113	114	119	53	89.1	77.3	59.4	76.8
Sr-D	mg/L	1.33	1.49				1.79	1.86	1.91	1.1	1.71	1.49	1.16	1.21
Zn-D	mg/L	<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Table 13
2017-2018 Annual Report

Site Description		LLSTS and Settling Pond #1 Combined Discharge (Biocell Downstream)											
Site Name		BDS	(SPD was not discharging from June 25th through to November 5th)										Permit
Date		3-Apr-17	2-May-17	2-Jun-17	2-Jul-17	2-Aug-17	27-Sep-17	3-Oct-17	15-Nov-17	12-Dec-17	8-Jan-18	7-Feb-18	6-Mar-18	Limit-South
Parameter	Unit												
SO4-D	mg/L	242	310				456	352	135	288	291	283	268	-
TSS	mg/L	5.3	<4.0				<4.0	<4.0	<4.0	6.5	<4.0	<4.0	<4.0	**25**
Alk-T	mg/L	162	182					199	52.6	282	123	74.3	73	-
Acidity 8.3	mg/L	1.84	0.79					5.1	1.00	<1.0	1	1.5	<1.0	-
N-NH3	mg/L	0.056	0.027				<0.020	<0.020	<0.020	0.15	0.033	<0.020	<0.020	**1**
NO2+NO3	mg/L	<2.0	<2.0				<0.020	<2.0	<0.020	<2.0	<0.20	0.8	<0.20	-
Al-T	mg/L	0.0576	0.0083				0.0035	<0.0030	0.153	0.0263	0.0286	0.0729	0.0268	-
As-T	mg/L	0.00073	0.00082				0.00044	0.00042	0.00063	0.00247	0.00093	0.0003	0.00061	-
Ba-T	mg/L	0.0132	0.0138				0.0313	0.0289	0.0094	0.0216	0.0155	0.0099	0.0110	-
B-T	mg/L	0.355	0.385				0.655	0.564	0.114	0.792	0.249	0.104	0.118	-
Cd-T	mg/L	<0.000010	<0.000010				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	78.8	115				160	151	49.1	63.5	104	113	106	-
Cr-T	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	0.00085	0.00020				<0.00020	<0.00020	0.00050	0.00146	0.00100	0.00027	0.00047	-
Cu-T	mg/L	0.00109	0.00062				0.00125	0.00105	0.00101	0.00135	0.00066	0.00066	<0.00050	-
Hard-T	mg/L	238	338				465	438	152	196	314	343	317	-
Fe-T	mg/L	1.49	0.152				0.034	0.02	0.275	2.060	0.512	0.131	0.315	-
P-T	mg/L	0.0055	0.0055				0.0103	0.0044	0.0062	0.0054	0.005	0.0055	0.0031	-
Pb-T	mg/L	<0.00020	<0.00020				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-T	mg/L	9.94	12.2				16.1	14.9	7.09	9.1	12.8	15.1	12.6	-
Mn-T	mg/L	0.0534	0.0299				0.0447	0.0491	0.077	0.11	0.156	0.0238	0.0646	-
Hg-T	mg/L	<0.0000020	0.0000036				<0.0000020	<0.0000020	0.0000022	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-
Mo-T	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	0.0021	<0.0010				0.0024	0.002	0.0010	0.0032	0.0014	<0.0010	<0.0010	-
K-T	mg/L	2.28	2.36				2.75	2.26	1.02	3.67	1.55	1.04	0.95	-
S-T	mg/L	87.9	111				167	154	41.3	96.1	97.5	110	90.3	-
Se-T	mg/L	<0.00010	<0.00010				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	-
Si-T	mg/L	2.46	2.33				3.94	3.48	3.26	2.93	3.13	2.54	2.55	-
Ag-T	mg/L	<0.000020	<0.000020		NF		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-
Na-T	mg/L	72.8	67.4				106	97.1	11.7	154	32.2	8.9	10.5	-
Sr-T	mg/L	0.656	0.981				1.34	1.47	0.316	0.621	0.666	0.626	0.573	-
Zn-T	mg/L	<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Al-D	mg/L	0.005	0.0041				<0.0030	<0.0030	0.0688	0.0056	0.0165	0.0358	0.0126	**0.5**
As-D	mg/L	0.00026	0.00067				0.00054	0.00044	0.00055	0.0009	0.00071	0.00023	0.00041	-
Ba-D	mg/L	0.0122	0.0139				0.032	0.0275	0.0094	0.0201	0.016	0.0089	0.0108	-
B-D	mg/L	0.371	0.4				0.528	0.562	0.114	0.726	0.266	0.11	0.119	-
Cd-D	mg/L	<0.0000050	<0.0000050				0.0000060	0.0000060	0.0000060	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Ca-D	mg/L	85	121				150	149	54.1	66.4	108	112	105	-
Cr-D	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	0.00073	<0.00020				<0.00020	<0.00020	0.00045	0.0013	0.00109	0.00029	0.00045	-
Cu-D	mg/L	0.00032	0.00046				0.00105	0.00088	0.00088	0.00036	0.00042	0.00045	0.00041	**0.02**
Hard-D	mg/L	251	353				439	434	166	203	324	337	316	-
Fe-D	mg/L	0.0254	0.0231				0.0213	0.0136	0.155	0.0655	0.224	0.0573	0.106	**0.5**
P-D	mg/L	0.0068	0.007					0.004	0.0156	0.0021		0.0024	<0.0020	**0.03**
Pb-D	mg/L	<0.00020	<0.00020				<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	**0.05**
Mg-D	mg/L	9.43	12.5				15.3	15.1	7.45	8.89	13.5	13.7	13.2	-
Mn-D	mg/L	0.049	0.017				0.041	0.046	0.078	0.109	0.163	0.031	0.066	-
Hg-D	mg/L	<0.0000020	<0.0000020				<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010				<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	0.0018	<0.0010				0.0022	0.002	<0.0010	0.0025	0.0013	<0.0010	<0.0010	-
K-D	mg/L	2.22	2.57				2.70	2.42	1.09	3.90	1.65	0.91	0.98	-
S-D	mg/L	85	115				168	158	41.3	97.7	104	97.3	89.3	-
Se-D	mg/L	<0.00010	<0.00010				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	-
Si-D	mg/L	2.19	2.43				4.03	3.08	3.13	2.62	3.14	2.76	2.53	-
Na-D	mg/L	71.4	67.9				99.1	102	11.8	161	34.7	8.49	10.9	-
Sr-D	mg/L	0.632	1.07				1.43	1.38	0.318	0.689	0.715	0.637	0.59	-
Zn-D	mg/L	<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.2**

Table 14
2017-2018 Annual Report

EMS ID		E292127											
Site Description		2 South Pit in Pit Water Cover (CCR Water Cover)											
Site Name		2S											
Date		3-Apr-17	2-May-17	6-Jun-17	11-Jul-17	14-Aug-17	12-Sep-17	10-Oct-17	6-Nov-17	13-Dec-17	4-Jan-18	6-Feb-18	6-Mar-18
Parameter	Unit												
SO4-D	mg/L	116	108	178	194	215	255	360	352	238	215	163	136
Alk-T	mg/L	37.4	43.9	75.5	49.4	75.7	80.0	127	117	94.7	84.2	76.6	60.9
Acidity83	mg/L	0.78	0.84	<0.50	1.39	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0
Al-T	mg/L	0.164	0.0924	0.0373	0.0418	0.0387	0.0321	0.0102	0.0273	0.0497	0.0344	0.0768	0.0163
As-T	mg/L	0.00017	0.00010	0.00044	0.00066	0.00095	0.00093	0.00176	0.00086	0.00102	0.00058	0.00093	0.00073
Ba-T	mg/L	0.0125	0.0132	0.018	0.0188	0.0263	0.0312	0.0367	0.0303	0.0157	0.0148	0.0135	0.0106
B-T	mg/L	<0.050	<0.050	0.11	0.142	0.196	0.245	0.273	0.212	0.155	0.116	0.089	0.081
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	0.000014
Ca-T	mg/L	49.8	49.7	79.3	74.5	86.6	98.4	148	144	87.8	88.3	71.7	64.7
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00023	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	0.00120	0.00084	0.0008	0.00125	0.00185	0.00181	0.00128	0.00081	0.00065	0.00098	0.00072	0.00059
Hard-T	mg/L	151	152	240	231	267	302	447	431	268	266	215	191
Fe-T	mg/L	0.130	0.087	0.028	0.027	0.046	0.023	0.041	0.039	0.041	0.037	0.101	0.020
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	6.48	6.82	10.1	11.0	12.2	13.6	18.6	17.4	11.8	11.0	8.81	7.17
Mn-T	mg/L	0.0070	0.0016	0.0036	0.0145	0.0172	0.0135	0.0753	0.0230	0.0561	0.0239	0.0354	0.0189
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-T	mg/L	0.418	0.445	1.03	1.18	1.61	1.91	1.95	1.71	1.24	1.12	0.892	0.766
S-T	mg/L	41.3	37.5	61.3	77.4	72.9	98.3	127	120	76.6	73.6	56.7	45.0
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	2.51	2.52	0.41	0.33	0.62	0.82	1.39	1.16	1.48	1.88	1.62	1.20
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	2.10	2.15	5.32	5.95	10.7	15.4	27.0	22.5	13.9	12.0	6.31	5.38
Sr-T	mg/L	0.201	0.204	0.416	0.436	0.539	0.614	0.901	0.858	0.495	0.431	0.363	0.307
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0058	0.0060	0.017	0.0291	0.0210	0.0115	0.0034	0.0042	0.0061	0.0049	0.0049	0.0050
As-D	mg/L	<0.00010	<0.00010	0.00039	0.00069	0.00098	0.00076	0.00168	0.00083	0.00060	0.00045	0.00074	0.00072
Ba-D	mg/L	0.0120	0.0130	0.0177	0.0198	0.0262	0.0310	0.0341	0.0306	0.0136	0.0144	0.0114	0.0122
B-D	mg/L	<0.050	<0.050	0.105	0.148	0.184	0.235	0.258	0.235	0.117	0.115	0.077	0.087
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	<0.0000050	0.0000058	0.0000080	<0.0000050	<0.0000050
Ca-D	mg/L	49.7	45.7	89.3	78.3	88.4	101	141	135	79.4	83.8	69.6	72.0
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-D	mg/L	0.00063	0.00060	0.00073	0.00114	0.00182	0.00159	0.00065	0.00074	0.00061	0.00078	0.00044	0.00047
Hard-D	mg/L	150	139	269	240	269	310	427	411	236	250	208	214
Fe-D	mg/L	0.0161	<0.0050	0.005	0.0107	0.0112	0.0059	0.0093	0.0055	0.0053	<0.0050	<0.0050	<0.0050
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	6.28	6.10	11.2	10.9	11.8	14.2	18.3	18.0	9.03	9.92	8.22	8.41
Mn-D	mg/L	0.0041	<0.0010	0.0017	0.0123	0.0146	0.0112	0.0666	0.0170	0.0338	0.0203	0.0294	0.0214
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-D	mg/L	0.445	0.436	1.16	1.25	1.43	1.89	1.95	1.74	0.930	0.994	0.765	0.882
S-D	mg/L	42.0	35.8	65.5	72.9	74.2	88.6	123	125	63.0	70.4	51.5	53.1
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	mg/L	2.55	2.34	0.38	0.32	0.56	0.76	1.33	1.15	1.51	2.02	1.78	1.35
Na-D	mg/L	2.04	2.12	6.13	6.20	10.8	16.3	26.9	23.9	9.97	10.2	6.08	6.47
Sr-D	mg/L	0.200	0.207	0.432	0.459	0.629	0.598	0.948	0.797	0.441	0.442	0.357	0.361
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Table 15
2017-2018 Annual Report

EMS ID		E217015											
Site Description		3 South Pit Main Water Sump (CCR Water Cover)											
Site Name		3S											
Date		3-Apr-17	18-May-17	6-Jun-17	11-Jul-17	14-Aug-17	12-Sep-17	5-Oct-17	6-Nov-17	13-Dec-17	4-Jan-18	6-Feb-18	6-Mar-18
Parameter	Unit												
SO4-D	mg/L	582	579	593	542	548	530	518	536	657	618	507	587
Alk-T	mg/L	174	170	170	160	158	152	152	73.6	191	179	133	165
Acidity 8.3	mg/L	3.17	1.9	0.56	<0.50	1.3	<1.0	<1.0	<1.0	2.7	1.6	2.1	<1.0
Al-T	mg/L	0.0217	0.0288	0.0479	0.0382	0.0086	<0.015	<0.015	0.0125	0.023	0.0067	0.0495	0.007
As-T	mg/L	0.0002	0.00034	0.00033	0.00044	0.00045	<0.00050	<0.00050	0.00026	<0.00050	0.00027	0.00027	0.0003
Ba-T	mg/L	0.0133	0.0178	0.0182	0.0181	0.0178	0.0178	0.0165	0.0177	0.0173	0.0161	0.0136	0.0145
B-T	mg/L	0.289	0.274	0.296	0.345	0.4	0.49	0.39	0.368	0.28	0.336	0.189	0.304
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000050	<0.000010	<0.000010	0.000014
Ca-T	mg/L	233	248	231	221	202	207	195	232	254	269	220	263
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	<0.00050	<0.00050	0.00053	0.00088	<0.00050	<0.0025	<0.0025	<0.00050	<0.0025	<0.00050	0.00065	<0.00050
Hard-T	mg/L	702	742	706	693	617	633	609	689	773	811	663	779
Fe-T	mg/L	0.052	0.074	0.085	0.068	0.045	<0.050	<0.050	0.022	<0.050	0.021	0.076	0.025
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	28.9	29.5	31.5	34	27.6	28.1	29.8	26.4	33.8	34.1	27.4	29.6
Mn-T	mg/L	0.0375	0.0202	0.0421	0.0521	0.021	<0.0050	0.0119	0.0142	0.018	0.0159	0.008	0.0153
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010
K-T	mg/L	1.94	2.33	2.4	2.72	2.72	2.77	2.63	2.47	2.34	2.78	1.88	2.27
S-T	mg/L	205	211	204	214	189	209	181	179	226	245	207	217
Se-T	mg/L	0.00023	0.00013	0.00011	<0.00010	<0.00010	<0.00050	<0.00050	0.00016	<0.00050	0.00018	0.00019	0.00015
Si-T	mg/L	1.83	1.98	1.3	0.64	0.58	<0.50	<0.50	1.56	2.05	2.2	1.61	1.98
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020
Na-T	mg/L	21.8	24.3	26.7	31.8	32.6	33.5	38.0	30.2	24.9	31.9	15.9	23.3
Sr-T	mg/L	1.27	1.31	1.33	1.36	1.42	1.34	1.29	1.5	1.53	1.53	1.2	1.49
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.025	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0084	0.0137	0.0144	0.0133	<0.015	<0.015	<0.015	0.0072	0.0063	0.0036	0.0075	0.0162
As-D	mg/L	0.00014	0.0002	0.00027	0.00051	<0.00050	<0.00050	<0.00050	0.00029	0.00028	0.00025	0.0002	0.00023
Ba-D	mg/L	0.0132	0.017	0.0181	0.0193	0.0171	0.0185	0.0168	0.0175	0.0188	0.0160	0.0136	0.0141
B-D	mg/L	0.264	0.283	0.269	0.384	0.43	0.41	0.42	0.377	0.321	0.335	0.202	0.3
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025	<0.000025	<0.000025	<0.0000050	<0.0000050	<0.0000050	0.0000058	0.000042
Ca-D	mg/L	234	243	256	243	201	206	174	202	285	238	210	237
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00040
Cu-D	mg/L	0.00031	0.00036	0.0005	0.00054	<0.0010	<0.0010	<0.0010	0.00037	0.00035	0.00034	0.00032	0.00079
Hard-D	mg/L	719	730	773	744	618	640	556	621	843	727	625	720
Fe-D	mg/L	0.0102	0.0157	0.0223	0.0332	<0.025	0.0270	<0.025	<0.0050	0.0069	0.0064	0.0051	0.013
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00040
Mg-D	mg/L	32.6	30.1	32.8	33.5	28.4	30.6	29.2	28.3	32.0	32	24.3	31.4
Mn-D	mg/L	0.0418	0.0011	0.0318	0.0474	0.0222	<0.0050	0.0051	0.0124	0.0169	0.0151	0.0061	0.0162
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
K-D	mg/L	2.18	2.13	2.74	2.93	2.48	2.87	2.58	2.59	2.44	2.69	1.56	2.32
S-D	mg/L	214	184	220	225	183	197	180	190	246	241	180	215
Se-D	mg/L	0.00016	0.00019	0.00013	<0.00010	<0.00050	<0.00050	<0.00050	0.00016	0.00023	0.00018	0.00018	<0.00020
Si-D	mg/L	2.09	2.17	1.35	0.71	0.61	<0.50	<0.50	1.63	2.1	2.31	1.53	1.91
Na-D	mg/L	25.3	23.6	29.3	32.9	32.9	36.9	37.1	32.8	23.7	30	14.1	24
Sr-D	mg/L	1.27	1.39	1.4	1.38	1.39	1.31	1.27	1.41	1.77	1.61	1.31	1.37
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.010

Table 16
2017-2018 Annual Report

EMS ID		E292128			
Site Description		3 South 77 Adit Pit- Exploration pit from 1977			
Site Name		3S77			
Date		3-Apr-17	11-Jul-17	12-Oct-17	4-Jan-18
Parameter	Unit				
SO4-D	mg/L	221	224	228	299
Alk-T	mg/L	119	154	172	154
Acidity 8.3	mg/L	1.55	<0.50	<1.0	<1.0
Al-T	mg/L	0.0039	<0.0030	0.0051	0.0044
As-T	mg/L	0.00054	0.0016	0.00308	0.00058
Ba-T	mg/L	0.0176	0.0238	0.0267	0.0276
B-T	mg/L	0.272	0.371	0.346	0.32
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Ca-T	mg/L	78.8	88	97.1	99.6
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	0.00068	0.00882	<0.00050	0.00068
Hard-T	mg/L	239	267	291	304
Fe-T	mg/L	<0.010	0.032	0.108	0.062
Pb-T	mg/L	<0.00020	0.00087	<0.00020	<0.00020
Mg-T	mg/L	10.2	11.4	11.6	13.4
Mn-T	mg/L	0.0015	0.0356	0.152	0.0049
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
K-T	mg/L	1.15	1.49	1.98	1.71
S-T	mg/L	78.3	86.1	81.4	118
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	2.38	3.36	5.07	2.35
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	48.7	50.7	53.7	86.2
Sr-T	mg/L	0.555	0.633	0.675	0.693
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.003	<0.0030	<0.0030	0.0043
As-D	mg/L	0.00055	0.00166	0.00314	0.00058
Ba-D	mg/L	0.0177	0.026	0.0265	0.0284
B-D	mg/L	0.245	0.372	0.363	0.349
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Ca-D	mg/L	70.2	89.9	102	94.5
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Cu-D	mg/L	0.00052	0.00025	<0.00020	0.00079
Hard-D	mg/L	216	272	306	288
Fe-D	mg/L	0.0058	0.0173	0.0296	0.0497
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	9.97	11.6	12.8	12.6
Mn-D	mg/L	0.0015	0.0297	0.15	0.0048
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
K-D	mg/L	1.25	1.66	2.08	1.72
S-D	mg/L	82.9	86.4	86.4	124
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	mg/L	2.31	3.42	5.13	2.48
Na-D	mg/L	47.9	55.1	60.1	82.6
Sr-D	mg/L	0.548	0.658	0.663	0.728
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050

Table 17
2017-2018 Annual Report

EMS ID		E292129								
Site Description		4 South Lower- Culvert Dowstream of Access Road								
Site Name		4S-LO								
Date		3-Apr-17	2-May-17	1-Jun-17	Jul through Nov 2017	15-Nov-17	4-Dec-17	4-Jan-18	7-Feb-18	7-Mar-18
Parameter	Unit									
SO4-D	mg/L	123	134	145		148	153	241	83.6	192
Alk-T	mg/L	48.5	56.6	66.4		37.3	41.4	60.8	36.8	42.1
Acidity83	mg/L	2.95	3.90	<0.50		<1.0	<1.0	<1.0	2.4	4.9
Al-T	mg/L	0.0150	0.0153	0.0127		0.2800	0.0664	0.0546	0.0174	0.0447
As-T	mg/L	0.00018	0.00022	0.00015		0.00017	0.00015	0.00023	0.00014	0.00015
Ba-T	mg/L	0.0109	0.0127	0.0144		0.0098	0.0116	0.0189	0.0061	0.0141
B-T	mg/L	0.088	0.102	0.137		0.126	0.103	0.113	0.085	0.106
Cd-T	mg/L	<0.000010	<0.000010	<0.000010		0.000028	0.000018	0.000012	<0.000010	0.000011
Ca-T	mg/L	44.8	47.8	61.1		46.3	45.2	69.8	28.5	68.0
Cr-T	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	0.00164	0.00232	0.00070		0.00191	0.00221	0.00154	<0.00020	0.00149
Cu-T	mg/L	<0.00050	<0.00050	<0.00050		0.00094	0.00062	0.00059	<0.00050	<0.00050
Hard-T	mg/L	134	146	181		140	137	212	86.6	204
Fe-T	mg/L	1.79	2.45	0.192		0.136	0.566	1.35	0.076	1.24
Pb-T	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	5.35	6.51	6.86		5.88	5.80	9.05	3.78	8.34
Mn-T	mg/L	0.823	1.14	0.589		0.186	0.576	0.722	0.0615	0.711
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-T	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	0.0012	0.0014	<0.0010		0.0037	0.0031	0.0015	<0.0010	0.0015
K-T	mg/L	0.511	0.646	0.746		0.519	0.474	0.708	0.352	0.566
S-T	mg/L	41.0	46.1	50.1		53.1	46.3	85.4	28.0	69.0
Se-T	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	3.25	3.61	3.60		3.47	3.25	3.31	2.69	3.23
Ag-T	mg/L	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	14.8	18.4	21.3	No Flow - Sample station was dry until November, 2018	19.7	17.5	50.2	13.2	19.2
Sr-T	mg/L	0.186	0.208	0.268		0.225	0.220	0.349	0.144	0.319
Zn-T	mg/L	<0.0050	<0.0050	<0.0050		0.0071	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0033	<0.0030	0.0034		0.1370	0.0480	0.0176	0.0126	0.0414
As-D	mg/L	0.00011	0.00013	0.00015		0.00017	0.00014	0.00014	0.00012	0.00014
Ba-D	mg/L	0.0107	0.0121	0.0140		0.0094	0.0118	0.0172	0.0057	0.0142
B-D	mg/L	0.087	0.108	0.131		0.123	0.097	0.109	0.083	0.113
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050		0.0000250	0.0000180	0.0000070	<0.0000050	0.0000070
Ca-D	mg/L	47.5	45.3	58.9		51.60	43.50	64.7	27.9	65.5
Cr-D	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	0.00142	0.00206	0.00069		0.00200	0.00220	0.00144	<0.00020	0.00144
Cu-D	mg/L	<0.00020	<0.00020	0.00025		0.00095	0.00055	0.00037	0.00065	0.00022
Hard-D	mg/L	140	137	176		155	132	198	85.7	199
Fe-D	mg/L	0.325	0.147	0.0477		0.1060	0.5630	1.13	0.0731	1.29
Pb-D	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	5.28	5.83	7.12		6.21	5.60	8.88	3.87	8.72
Mn-D	mg/L	0.807	1.08	0.565		0.1940	0.5750	0.767	0.0641	0.713
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Mo-D	mg/L	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-D	mg/L	0.0010	0.0013	<0.0010		0.0038	0.0032	0.0014	<0.0010	0.0014
K-D	mg/L	0.569	0.660	0.767		0.521	0.477	0.660	0.347	0.573
S-D	mg/L	44.0	44.2	52.7		51.8	46.9	81.3	27.2	67.9
Se-D	mg/L	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	mg/L	3.68	3.49	3.83		3.44	3.09	3.07	2.96	3.18
Na-D	mg/L	14.4	17.7	22.2		20.9	17.8	47.6	13.4	19.6
Sr-D	mg/L	0.183	0.226	0.249		0.243	0.228	0.315	0.152	0.322
Zn-D	mg/L	<0.0050	<0.0050	<0.0050		0.0059	0.0052	<0.0050	<0.0050	<0.0050

Table 18
2017-2018 Annual Report

EMS ID		E217014									
Site Description		South Pit Culvert- Culvert, downstream of Settling Pond #1 discharge									
Site Name		SPC									
Date		3-Apr-17	2-May-17	1-Jun-17	Jul through Oct 2017	17-Oct-17	15-Nov-17	13-Dec-17	18-Jan-18	7-Feb-18	7-Mar-18
Parameter	Unit										
SO4-D	mg/L	88.0	68.9	70.8		44.2	63.1	198	49.0	64.1	96.4
Alk-T	mg/L	53.8	49.6	69.8		33.9	28.0	105	24.0	23.0	25.4
Acidity 8.3	mg/L	<0.50	<0.50	<0.50		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Al-T	mg/L	0.0824		0.0741		0.1090	0.2100	0.0403	0.109	0.0594	0.0557
As-T	mg/L	0.00026		0.00084		0.00056	0.00053	0.00032	0.00020	0.00020	0.00024
Ba-T	mg/L	0.0063		0.0095		0.0058	0.0075	0.0126	0.0048	0.0063	0.0077
B-T	mg/L	0.121		0.148		0.061	0.078	0.215	<0.050	<0.050	0.054
Cd-T	mg/L	<0.000010		<0.000010		0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ca-T	mg/L	29.7		39.5		20.6	25.1	48.2	18.7	24.9	34.8
Cr-T	mg/L	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-T	mg/L	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-T	mg/L	0.00065		0.00073		0.00252	0.00085	0.00057	0.00064	0.00060	<0.00050
Hard-T	mg/L	90.2		118		63.5	77.4	149	57.7	76.8	105
Fe-T	mg/L	0.133		0.319		0.131	0.355	0.052	0.108	0.053	0.055
Pb-T	mg/L	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-T	mg/L	3.89		4.74		2.96	3.57	6.99	2.65	3.52	4.47
Mn-T	mg/L	0.0030		0.0108		0.0033	0.0160	<0.0010	0.0023	<0.0010	<0.0010
Hg-T	mg/L	<0.0000020		<0.0000020		0.0000083	0.0000035	<0.0000020	0.0000030	0.0000020	<0.0000020
Mo-T	mg/L	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-T	mg/L	<0.0010		0.0012		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-T	mg/L	0.766		0.681		0.634	0.653	1.25	0.371	0.374	0.444
S-T	mg/L	28.5		24.3		14.0	22.4	62.1	14.4	22.9	30.2
Se-T	mg/L	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-T	mg/L	2.48		4.07		2.76	3.29	2.90	2.76	2.78	3.23
Ag-T	mg/L	<0.000020		<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Na-T	mg/L	21.7		18.4	No Flow - Sample station was dry until October, 2018	7.86	7.72	59.8	5.30	4.42	6.97
Sr-T	mg/L	0.201		0.252		0.132	0.164	0.368	0.116	0.158	0.205
Zn-T	mg/L	<0.0050		<0.0050		0.0679	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Al-D	mg/L	0.0463		0.0366		0.0588	0.0828	0.0381	0.0713	0.0562	0.0542
As-D	mg/L	0.00020		0.00066		0.00046	0.00027	0.00037	0.00019	0.00022	0.00020
Ba-D	mg/L	0.0060		0.0090		0.0057	0.0066	0.0134	0.0047	0.0056	0.0075
B-D	mg/L	0.120		0.134		0.054	0.076	0.216	<0.050	<0.050	<0.050
Cd-D	mg/L	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	0.0000120	<0.0000050	<0.0000050
Ca-D	mg/L	31.2		34.0		21.0	27.1	53.5	18.5	25.1	34.2
Cr-D	mg/L	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-D	mg/L	0.00044		0.00055		0.00095	0.00068	0.00052	0.00077	0.00286	0.00053
Hard-D	mg/L	94.8		104		63.7	83.5	163	57.4	77.3	105
Fe-D	mg/L	0.0611		0.137		0.0660	0.1040	0.0456	0.0625	0.0424	0.137
Pb-D	mg/L	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L	4.12		4.76		2.72	3.83	7.06	2.71	3.56	4.78
Mn-D	mg/L	0.0016		0.0014		0.0017	0.0019	<0.0010	0.0010	<0.0010	<0.0010
Hg-D	mg/L	<0.0000020		<0.0000020		0.0000068	0.0000032	<0.0000020	0.0000090	0.0000026	<0.0000020
Mo-D	mg/L	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-D	mg/L	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-D	mg/L	0.853		0.679		0.635	0.637	1.26	0.403	0.362	0.405
S-D	mg/L	31.3		25.3		13.7	22.2	66.5	15.3	21.4	30.1
Se-D	mg/L	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	mg/L	2.87		3.85		2.65	3.15	3.01	2.58	2.98	3.19
Na-D	mg/L	21.8		18.5		7.51	8.20	61.4	5.47	4.60	7.29
Sr-D	mg/L	0.202		0.232		0.138	0.178	0.403	0.118	0.162	0.199
Zn-D	mg/L	<0.0050		<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0126

Table 19
2017-2018 Annual Report

EMS ID		E292130												
Site Description		Long Lake Entrance- Last wetland prior to entering Long Lake near the outlet - IDZ												
Site Name		LLE												WQG-Max
Date		3-Apr-17	2-May-17	1-Jun-17	11-Jul-17	1-Aug-17	12-Sep-17	3-Oct-17	6-Nov-17	4-Dec-17	3-Jan-18	7-Feb-18	7-Mar-18	
Parameter	Unit													
SO4-D	mg/L	110	109	153	644		882	906	192	98.7	155	65.9	90.4	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0		<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<16	25
Alk-T	mg/L	62.4	60.9	69.3	117		160	147	56.9	46.6	60.1	22.8	28.3	-
Acidity83	mg/L	0.79	1.58	<0.50	0.53		1.70	3.60	1.2	<1.0	<1.0	<1.0	<1.0	-
N-NH3	mg/L	0.023	<0.0050	0.013	0.0087		<0.020	0.2500	<0.020	0.027	0.037	<0.020	0.14	-
N-NO23	mg/L	<0.020	<0.020	<0.020	<0.20		<0.020	<0.020	0.121	0.022	0.154	<0.020	0.095	-
Al-T	mg/L	0.112	0.0632	0.0461	0.0253		0.0200	<0.015	0.0512	0.109	0.0635	0.0612	0.0723	-
As-T	mg/L	0.00118	0.00096	0.00099	0.00123		<0.00050	<0.00050	0.00143	0.00146	0.00137	0.00024	0.00156	0.005
Ba-T	mg/L	0.0118	0.0139	0.0229	0.0355		0.0459	0.0349	0.0272	0.0115	0.0182	0.009	0.0128	-
B-T	mg/L	0.131	0.133	0.186	0.403		0.560	0.53	0.15	0.084	0.12	<0.050	0.064	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010		<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	36.5	38.5	64.7	231		273	271	61.4	29.7	45.4	25	35.9	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010	<0.0010	0.00022	<0.00020	<0.00020	<0.00020	<0.00020	0.05
Cu-T	mg/L	<0.00050	0.00053	0.00058	<0.00050		<0.0025	<0.0025	0.00075	0.00095	0.00091	<0.00050	0.00058	0.007
Hard-T	mg/L	112	121	201	724		863	866	193	92.4	143	76.8	110	-
Fe-T	mg/L	0.183	0.252	0.362	2.17		0.338	0.247	0.439	0.205	1.44	0.059	0.172	1
P-T	mg/L	0.0036	0.0070	**0.0306**	0.0079		0.0071	0.0116	0.0090	0.0083	0.0060	0.0033	**PNC**	0.01*
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	5.0	5.99	9.65	35.7		43.9	46.2	9.75	4.45	7.18	3.52	4.93	-
Mn-T	mg/L	0.0107	0.0492	0.137	0.214		0.0282	0.0176	0.251	0.024	0.202	0.0109	0.0706	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.0000027	<0.0000020	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.91	0.8	0.873	1.86		2.54	2.58	0.861	0.641	0.898	0.403	0.522	-
S-T	mg/L	36.5	37.3	61.6	254		320	308	59.9	31.7	53.9	22.1	33.8	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010		<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	2.7	2.21	2.66	4.02	No Flow-Sample station was dry	5.27	4.17	4.24	3.25	3.68	2.73	3.25	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020		<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	24.7	24.4	25.2	57.7		73.9	80.7	22.9	20.9	37.5	4.62	8.47	-
Sr-T	mg/L	0.245	0.262	0.427	1.2		1.66	1.65	0.366	0.185	0.282	0.155	0.21	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050		<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.03
Al-D	mg/L	0.0319	0.0278	0.0115	0.0058		<0.015	<0.015	0.0293	0.0561	0.0377	0.0441	0.0421	0.1
As-D	mg/L	0.00092	0.00075	0.00087	0.00087		<0.00050	<0.00050	0.00114	0.00136	0.00103	0.00018	0.00128	-
Ba-D	mg/L	0.0119	0.0136	0.0217	0.0379		0.0432	0.0348	0.0272	0.0117	0.0173	0.0082	0.012	-
B-D	mg/L	0.135	0.126	0.166	0.417		0.51	0.51	0.175	0.088	0.122	<0.050	0.053	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000060	<0.0000050		<0.0000050	<0.0000050	0.0000060	0.000012	<0.0000050	<0.0000050	0.000011	0.000017
Ca-D	mg/L	38.2	37.8	59.4	222		267	267	61.3	28.5	42.4	29.3	37.7	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010	<0.0010	0.00021	<0.00020	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00052	0.00042	0.00044	0.00029		<0.0010	<0.0010	0.00071	0.00088	0.00063	0.00074	0.00081	-
Hard-D	mg/L	116	117	188	698		863	846	193	88.7	133	88.6	115	-
Fe-D	mg/L	0.080	0.113	0.133	0.37		0.107	0.065	0.306	0.166	1.27	0.0524	0.155	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020		<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	5.03	5.4	9.58	35.3		47.9	43.4	9.8	4.29	6.49	3.71	5.09	-
Mn-D	mg/L	0.0102	0.044	0.124	0.1980		0.0339	0.0171	0.281	0.0243	0.204	0.0113	0.0652	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.0000021	<0.0000020		0.0000042	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010		<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.926	0.801	0.888	2.03		2.69	2.71	0.902	0.674	0.789	0.406	0.576	-
S-D	mg/L	38.3	37.5	61.5	251		320	317	64.8	33.3	53.2	22.5	30.7	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010		<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-D	mg/L	2.81	2.08	2.67	3.78		4.81	5.06	4.52	3.04	3.59	2.97	3.33	-
Na-D	mg/L	25.1	22.9	25.3	61.0		82.5	72.5	22.7	21.3	33.9	4.85	8.7	-
Sr-D	mg/L	0.242	0.271	0.38	1.24		1.65	1.61	0.393	0.205	0.280	0.161	0.202	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050		<0.025	<0.025	<0.0050	0.006	<0.0050	<0.0050	<0.0050	-

* Vancouver Island Objective for P-T in streams applicable from May through September. This is applied for observation only as LLE is not a stream.

Table 20
2017-2018 Annual Report

EMS ID.		E292131												
Site Description		Seep into Long Lake												
Site Name		LLS												WQO-Max
Date		03-Apr-17	02-May-17	01-Jun-17	25-Jul-217	14-Aug-17	12-Sep-17	10-Oct-17	07-Nov-17	07-Dec-17	04-Jan-18	07-Feb-18	13-Mar-18	
Parameter	Unit													
SO4-D	mg/L	559	502	567	494	490	407	377	403	411	478	483	474	-
TSS	mg/L	<4.0	<4.0	6.5	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	25
Alk-T	mg/L	248	237	249	249	252	195	161	167	174	217	206	205	-
Acidity 8.3	mg/L	7.27	4.95	4.38	3.49	4.6	4.6	4.2	<1.0	1.8	<1.0	12.7	2.4	-
Al-T	mg/L	0.0034	0.0093	0.0063	<0.0030	<0.0030	<0.015	0.0030	0.0042	0.0112	<0.0030	0.0129	<0.0030	-
As-T	mg/L	0.00463	0.00311	0.00519	0.00349	0.00432	0.00155	0.00140	0.00076	0.00068	0.00100	0.00034	0.00098	0.005
Ba-T	mg/L	0.0194	0.0183	0.0192	0.0193	0.0188	0.0192	0.0208	0.0216	0.0198	0.0201	0.0200	0.0200	-
B-T	mg/L	0.675	0.563	0.592	0.586	0.563	0.48	0.354	0.335	0.429	0.480	0.499	0.498	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	237	192	212	197	187	156	141	148	158	177	189	185	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	0.00040	0.00032	0.00048	0.00053	0.00049	<0.0010	<0.00020	0.00027	0.00034	0.00034	0.00040	0.00044	0.11
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	0.00056	0.00058	0.00108	<0.00050	0.00052	<0.00050	0.0051
Hard-T	mg/L	677	553	608	563	533	448	405	428	455	512	546	525	-
Fe-T	mg/L	1.39	0.726	2.06	1.06	1.47	0.412	0.447	0.191	0.142	0.128	0.088	0.172	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	20.8	18.2	19.2	17.4	15.8	14.0	12.9	14.3	14.9	17.2	17.8	15.7	-
Mn-T	mg/L	0.342	0.178	0.351	0.307	0.295	0.171	0.0714	0.0789	0.0586	0.0866	0.0343	0.129	0.8
Hg-T	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	0.0012	0.0014	0.0014	0.0014	0.0010	<0.0050	<0.0010	0.0023	0.0021	0.0014	0.0020	0.0014	0.025
K-T	mg/L	2.66	2.33	2.34	2.25	2.29	2.25	2.01	2.16	2.28	2.51	2.50	2.10	-
S-T	mg/L	232	191	197	179	164	160	135	145	157	182	201	171	-
Se-T	mg/L	<0.00010	<0.00010	0.00018	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	3.67	2.93	3.28	2.50	2.64	2.98	2.80	2.27	2.77	2.56	2.90	2.78	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	111	97.6	105	96.5	97.9	78.3	76.8	73.4	84.3	103	95.6	84.7	-
Sr-T	mg/L	1.94	1.64	1.95	1.78	1.78	1.37	1.31	1.37	1.34	1.56	1.73	1.60	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.03
Al-D	mg/L	<0.0030	0.0090	0.0056	<0.0030	<0.015	<0.0030	<0.0030	0.0030	0.0044	<0.0030	0.0054	<0.0030	0.1
As-D	mg/L	0.00246	0.00170	0.00497	0.00408	0.00443	0.00118	0.00058	0.00080	0.00052	0.00099	0.00026	0.00058	-
Ba-D	mg/L	0.0189	0.0187	0.0192	0.0198	0.0191	0.0190	0.0200	0.0219	0.0192	0.0201	0.0180	0.0211	-
B-D	mg/L	0.631	0.536	0.622	0.562	0.57	0.448	0.364	0.400	0.404	0.500	0.477	0.495	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000077	<0.0000050	0.000017
Ca-D	mg/L	234	179	208	191	179	163	131	137	158	157	180	177	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	0.00039	0.00034	0.00050	0.00054	<0.0010	0.00029	<0.00020	0.00029	0.00033	0.00030	0.00036	0.00046	-
Cu-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	0.00023	0.00044	0.00040	0.00040	0.00036	0.00084	0.00032	-
Hard-D	mg/L	666	516	602	548	516	471	381	403	450	461	513	508	-
Fe-D	mg/L	0.0112	0.0146	1.93	1.5	1.48	0.352	<0.0050	0.1790	0.0451	0.0799	0.0157	0.0147	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	19.9	16.8	19.8	17.2	16.6	15.5	13.1	14.6	13.8	16.6	15.7	16.1	-
Mn-D	mg/L	0.332	0.176	0.360	0.310	0.332	0.176	0.0724	0.0809	0.0544	0.0861	0.0316	0.131	-
Hg-D	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	0.0012	0.0014	0.0015	0.0012	<0.0050	<0.0010	<0.0010	0.0023	0.0019	0.0013	0.0018	0.0015	-
K-D	mg/L	2.67	2.37	2.47	2.33	2.30	2.42	2.07	2.20	2.15	2.42	2.06	2.23	-
S-D	mg/L	229	179	201	183	174	158	136	148	150	194	168	182	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-D	mg/L	3.59	2.90	2.97	2.79	2.67	2.89	2.83	2.68	2.74	2.68	3.02	2.97	-
Na-D	mg/L	105	95.0	109	98.3	98.0	89.0	76.4	77.0	81.4	98.4	86.4	86.0	-
Sr-D	mg/L	1.96	1.77	2.01	1.84	1.77	1.36	1.34	1.27	1.29	1.61	1.85	1.75	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-

WQO are displayed for comparison purposes only.

Table 21
2017-2018 Annual Report

Site Description		Middle Seep into Long Lake										
Site Name		LLSM										WQO-Max
Date		03-Apr-2017	02-May-2017	01-Jun-2017	06-Jul-2017	14-Aug-2017	07-Nov-2017	07-Dec-2017	04-Jan-2018	07-Feb-2018	13-Mar-2018	
Parameter												
SO4-D	mg/L	438	532	505	485	430	389	356	458	404	445	-
TSS	mg/L	<4.0	<4.0	5.0		<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	25
Alk-T	mg/L	202	235	232	214	241	163	151	207	165	192	-
Acidity 8.3	mg/L	7.27	7.56	2.87	<0.50	<1.0	<1.0	<1.0	<1.0	4.0	<1.0	-
Al-T	mg/L	0.0555	0.0059	0.0072	0.0380	0.0046	0.0087	0.0936	0.0040	0.0348	0.0035	-
As-T	mg/L	0.00279	0.00296	0.00334	0.00624	0.00259	0.00045	0.00090	0.00087	0.00040	0.00045	0.005
Ba-T	mg/L	0.0186	0.0188	0.0184	0.0217	0.0189	0.0239	0.0186	0.0208	0.0189	0.0186	-
B-T	mg/L	0.516	0.586	0.542	0.533	0.519	0.308	0.367	0.450	0.373	0.464	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	176	200	190	182	168	149	134	173	156	165	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	0.00107	0.00038	0.00066	0.00114	0.00049	0.00024	0.00099	0.00035	0.00059	0.00032	0.11
Cu-T	mg/L	0.00050	<0.00050	<0.00050	0.00079	<0.00050	0.00092	0.00164	<0.00050	0.00072	<0.00050	0.0051
Hard-T	mg/L	511	579	549	530	481	428	387	499	451	473	-
Fe-T	mg/L	0.770	0.808	1.23	3.63	0.957	0.222	0.482	0.212	0.140	0.159	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	17.2	19.1	17.7	18.1	15.3	13.9	12.6	16.5	15.3	15.0	-
Mn-T	mg/L	0.202	0.183	0.266	0.350	0.257	0.0506	0.0611	0.0979	0.0376	0.0850	0.8
Hg-T	mg/L	<0.0000020	<0.0000020			<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	0.0028	0.0016	0.0018	0.0023	0.0011	0.0018	0.0029	0.0014	0.0021	0.0012	0.025
K-T	mg/L	2.37	2.45	2.16	2.51	2.32	2.06	2.14	2.46	2.07	1.99	-
S-T	mg/L	180	193	176	195	158	136	135	186	160	160	-
Se-T	mg/L	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	3.16	2.86	2.85	2.90	2.47	2.05	2.84	2.64	2.73	2.60	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	87.6	102	92.4	96.3	91.2	68.4	79.0	102	71.4	77.5	-
Sr-T	mg/L	1.53	1.73	1.77	1.62	1.65	1.36	1.0	1.47	1.35	1.51	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.03
Al-D	mg/L	0.0257	0.0033	0.0055	0.0066	<0.015	0.0063	0.0267	0.0033	0.0094	0.0072	0.1
As-D	mg/L	0.00175	0.00272	0.00304	0.00258	0.00208	0.00025	0.00045	0.00072	0.00027	0.00032	-
Ba-D	mg/L	0.0192	0.0189	0.0189	0.0194	0.0179	0.0241	0.0182	0.0208	0.0179	0.0199	-
B-D	mg/L	0.515	0.534	0.559	0.524	0.52	0.347	0.364	0.449	0.365	0.472	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025	<0.0000050	0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000017
Ca-D	mg/L	184	193	195	204	171	135	134	159	151	173	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	0.00105	0.00037	0.00063	0.00066	<0.0010	0.00026	0.00101	0.00030	0.00054	0.00035	-
Cu-D	mg/L	0.00062	<0.00020	<0.00020	<0.00020	<0.0010	0.00086	0.00145	0.00046	0.00060	0.00033	-
Hard-D	mg/L	530	552	560	584	487	396	389	460	438	496	-
Fe-D	mg/L	0.0139	0.608	1.11	1.10	0.355	0.0511	0.1130	0.0607	0.0253	0.0347	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	17.3	17.0	17.7	17.9	14.8	14.3	13.2	15.5	14.6	15.3	-
Mn-D	mg/L	0.200	0.173	0.277	0.294	0.279	0.0503	0.0623	0.0963	0.0369	0.0915	-
Hg-D	mg/L	<0.0000020	<0.0000020			<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000039	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	0.0027	0.0015	0.0017	0.0029	<0.0050	0.0020	0.0027	0.0012	0.0021	0.0013	-
K-D	mg/L	2.46	2.34	2.27	2.27	2.12	2.14	2.26	2.33	1.89	2.13	-
S-D	mg/L	185	182	174	176	158	143	136	184	146	176	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-D	mg/L	3.36	2.77	2.60	3.04	2.63	2.60	2.87	2.73	2.75	2.97	-
Na-D	mg/L	87.4	94.2	93.1	92.4	92.4	73.3	81.1	92.7	69.9	83.7	-
Sr-D	mg/L	1.53	1.92	1.77	1.72	1.75	1.26	0.969	1.52	1.53	1.68	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-

WQO are displayed for comparison purposes only.

Table 22
2017-2018 Annual Report

EMS ID			E292069												
Site Description			Settling Pond at 7S - Permitted discharge location for the 7-South Mining Operation												
Site Name			7SSD												Permit Limits
Date		3-Apr-17	2-May-17	5-Jun-17	25-Jul-17	14-Aug-17	12-Sep-17	11-Oct-17	14-Nov-17	4-Dec-17	4-Jan-18	18-Jan-18	6-Feb-18	12-Mar-18	7SSD
Parameter	Unit														
SO4-D	mg/L	7.97	9.6	17.1	26.9	33.3	50.4	34.6	16.2	13.7	13.2	14.3	6	9.3	500
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	5.5	4.8	<4.0	<4.0	<4.0	<4.0	6.5	<4.0	<4.0	25
Alk-T	mg/L	140	168	185	182	195	179	161	119	133	143	64.4	45.4	107	-
Acidity 8.3	mg/L	<0.50	<0.50	1.60	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-
Al-T	mg/L	0.102	0.014	0.028	0.024	0.037	0.041	0.049	0.145	0.036	0.024	0.460	0.201	0.060	-
As-T	mg/L	0.0010	0.0015	0.0023	0.0050	0.0052	0.0112	0.0060	0.0015	0.0009	0.0006	0.0009	0.0005	0.0009	-
Ba-T	mg/L	0.0065	0.0064	0.0077	0.0067	0.0068	0.011	0.0071	0.0057	0.0056	0.0079	0.0054	0.0036	0.0043	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Cd-T	mg/L	<0.000010	0.000019	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	37.8	42.9	48.4	43.3	41	46	40	33.3	35.4	39.6	22	13.2	30.7	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00035	<0.00020	<0.00020	-
Cu-T	mg/L	0.00082	0.00085	0.00117	0.00228	0.00271	0.00264	0.00253	0.00118	0.00064	0.00077	0.00208	0.00102	0.00098	-
Hard-T	mg/L	138	158	179	181	176	183	155	121	129	143	76	43.3	105	-
Fe-T	mg/L	0.112	0.056	0.176	0.088	0.148	0.494	0.169	0.175	0.042	0.026	0.592	0.201	0.067	-
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-T	mg/L	10.5	12.3	14	17.8	17.9	16.6	13.5	9.27	9.95	10.7	5.09	2.54	6.88	-
Mn-T	mg/L	0.0425	0.0467	0.117	0.0751	0.0685	0.174	0.0977	0.0366	0.0241	0.0084	0.0323	0.0208	0.0087	-
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
K-T	mg/L	0.32	0.39	0.692	1.12	1.13	1.58	0.883	0.489	0.369	0.572	0.379	0.212	0.337	-
S-T	mg/L	3	<3.0	5.4	9.7	10.5	17.9	9.9	6.1	3.8	4.1	5.2	<3.0	<3.0	-
Se-T	mg/L	<0.00010	<0.00010	0.00012	0.00010	0.0001	0.00011	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	3.88	4.86	5.86	7.74	8.06	5.66	3.84	3.58	4.05	4.47	3.28	1.95	2.81	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-
Na-T	mg/L	5.03	5.95	7.6	12.6	14.6	15.3	9.87	4.69	5.29	5.49	2.32	1.33	3.24	-
Sr-T	mg/L	0.133	0.155	0.192	0.223	0.215	0.251	0.185	0.132	0.143	0.139	0.0692	0.0444	0.102	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-
Al-D	mg/L	0.004	<0.0030	<0.0030	0.0051	0.0040	0.0057	0.0045	0.0053	0.0035	<0.0030	0.0092	0.0105	0.0073	0.1
As-D	mg/L	0.00086	0.00138	0.00221	0.0050	0.00534	0.00622	0.00365	0.0013	0.00093	0.00064	0.00048	0.00029	0.00072	-
Ba-D	mg/L	0.0061	0.0057	0.0075	0.0058	0.007	0.0087	0.0062	0.0046	0.0055	0.0077	0.004	0.0024	0.0046	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	0.058	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Cd-D	mg/L	<0.0000050	0.0000090	<0.0000050	<0.0000050	0.0000060	<0.0000050	0.0000050	<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000045
Ca-D	mg/L	38.3	40.9	49.4	41.4	44.4	45.3	42.5	34.5	35	37.1	22.5	13.4	32.7	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00068	0.00077	0.00108	0.0023	0.00251	0.00247	0.00266	0.00082	0.00061	0.00072	0.00049	0.00085	0.00068	0.014
DOC	mg/L	1.48	1.96	2.88	5.90	4.89	7.65	5.32	2.06	1.62	1.80	0.84	0.98	1.60	-
Hard-D	mg/L	138	149	184	181	187	182	172	124	126	138	76.3	43.7	111	-
Fe-D	mg/L	0.0054	0.0064	0.0722	0.0314	0.0431	0.0618	0.0475	0.0072	<0.0050	<0.0050	0.0087	0.011	0.0057	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	10.2	11.3	14.7	18.9	18.5	16.70	16	9.14	9.46	10.9	4.91	2.48	7.14	-
Mn-D	mg/L	0.0171	<0.0010	0.0981	0.0182	0.0444	0.135	0.0182	0.0076	0.0183	0.0074	0.0158	0.0181	0.0063	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.359	0.381	0.718	1.03	1.03	1.5	0.92	0.444	0.368	0.505	0.36	0.203	0.34	-
S-D	mg/L	<3.0	<3.0	5.8	9.9	10.9	14.3	11.2	5.7	3.9	4.8	6.0	<3.0	<3.0	-
Se-D	mg/L	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.016
Si-D	mg/L	4.07	4.81	5.85	7.94	8.55	5.14	4.18	3.47	3.93	4.32	2.57	1.86	2.99	-
Na-D	mg/L	4.99	5.7	8.13	12.8	15.3	16	11.6	4.6	5.24	5.83	2.33	1.43	3.55	-
Sr-D	mg/L	0.137	0.166	0.2	0.214	0.234	0.209	0.164	0.123	0.143	0.142	0.0714	0.0448	0.114	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-

Table 23
2017-2018 Annual Report

EMS ID		E292109									
Site Description		Stream 1 - Downstream of the 7SSD discharge, prior to entering the Lower Wetland Outlet									
Site Name		7S									
Date		3-Apr-17	2-May-17	5-Jun-17	17-Nov-17	4-Dec-17	3-Jan-18	18-Jan-18	6-Feb-18	12-Mar-18	WQG-Max
Parameter	Unit										
SO4-D	mg/L	2.7	3.52	2.41	2.5	3.5	3.40	2.3	4.1	3.2	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	25
Alk-T	mg/L	13.1	15.3	27.2	11.8	13.6	15.5	8.4	10.1	11.5	-
Acidity83	mg/L	<0.50	0.8	3.39	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-
Al-T	mg/L	0.0284	0.0212	0.0158	0.0381	0.034	0.0211	0.104	0.0386	0.0233	-
As-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	0.00014	<0.00010	<0.00010	0.005
Ba-T	mg/L	0.0013	0.0014	0.0021	0.0014	0.0012	0.0012	0.0014	0.0012	0.0011	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	3.94	4.72	6.87	4.15	3.82	4.65	3.35	3.25	3.74	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.11
Cu-T	mg/L	0.00060	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	0.0051
Hard-T	mg/L	13.5	16.4	23.6	14.1	13.4	15.9	11.4	11.4	13.1	-
Fe-T	mg/L	<0.010	<0.010	<0.010	<0.010	0.031	<0.010	0.047	<0.010	<0.010	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	0.897	1.11	1.56	0.902	0.931	1.04	0.736	0.807	0.903	-
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0000022	0.0000021	<0.0000020	0.0000028	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.089	0.13	0.115	0.131	0.101	0.086	0.117	0.107	0.089	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-T	mg/L	3.81	4.43	4.88	4.2	3.79	4.35	3.79	3.46	3.58	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	1.4	1.57	2.02	1.47	1.44	1.55	1.16	1.16	1.26	-
Sr-T	mg/L	0.0155	0.0175	0.0266	0.0165	0.017	0.0163	0.0125	0.0135	0.0146	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.03
Al-D	mg/L	0.0267	0.0216	0.0149	0.0396	0.0295	0.0215	0.0713	0.0375	0.0248	0.1
As-D	mg/L	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	-
Ba-D	mg/L	0.0013	0.0015	0.0021	0.0013	0.0012	0.0011	0.0012	0.0011	0.0011	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Cd-D	mg/L	<0.0000050	0.0000090	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000017
Ca-D	mg/L	4.28	4.67	6.58	4	3.66	4.54	3.41	3.3	4.01	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00031	0.00042	0.00023	0.0005	0.00044	0.00036	0.00052	0.00031	0.00033	-
DOC	mg/L	1.67	1.50	1.40	PNC	3.42	1.72	3.27	1.67	1.89	-
Hard-D	mg/L	14.5	16	22.9	13.7	12.7	15.6	11.7	11.3	13.8	-
Fe-D	mg/L	0.0067	<0.0050	<0.0050	0.0079	0.0094	<0.0050	0.0243	0.0092	<0.0050	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	0.93	1.06	1.57	0.91	0.872	1.04	0.78	0.755	0.921	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Hg-D	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.0000031	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.107	0.124	0.123	0.112	0.097	0.092	0.14	0.104	0.099	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Si-D	mg/L	4.64	4.24	4.97	4.27	3.66	4.16	3.89	3.73	3.81	-
Na-D	mg/L	1.51	1.63	1.99	1.44	1.43	1.48	1.21	1.22	1.36	-
Sr-D	mg/L	0.0152	0.018	0.0257	0.0163	0.0163	0.0168	0.0126	0.0135	0.0163	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-

Table 24
2017-2018 Annual Report

EMS ID		E292109									
Site Description		Stream 1 -Average Water Quality Copared to (5 in 30) Average Water Quality Guidelines									
Site Name		7S									
Date		3-Apr-17	2-May-17	5-Jun-17	17-Nov-17	4-Dec-17	3-Jan-18	18-Jan-18	6-Feb-18	12-Mar-18	WQG-Max
Parameter	Unit										
SO4-D	mg/L	2.7	3.52	2.41	2.5	3.5	3.40	2.3	4.1	3.2	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	25
As-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	0.00014	<0.00010	<0.00010	0.005
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.11
Cu-T	mg/L	0.00060	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	0.0051
Fe-T	mg/L	<0.010	<0.010	<0.010	<0.010	0.031	<0.010	0.047	<0.010	<0.010	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.005
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.8
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0001
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.03
Al-D	mg/L	0.0267	0.0216	0.0149	0.0396	0.0295	0.0215	0.0713	0.0375	0.0248	0.1
Cd-D	mg/L	<0.0000050	0.0000090	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000017
Hard-D	mg/L	14.5	16	22.9	13.7	12.7	15.6	11.7	11.3	13.8	-
Fe-D	mg/L	0.0067	<0.0050	<0.0050	0.0079	0.0094	<0.0050	0.0243	0.0092	<0.0050	0.35

Table 25
2017-2018 Annual Report

Daily Total Suspended Solid Results

EMS ID E207409

Site Description Settling Pond #4 (WD)

TSS Permit Limit: 25.0 mg/L

Date	April	May	June	July	August	September	October	November	December	January	February	March
1	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	-	<4.0	**PNC**	<4.0	<4.0
2	<4.0	<4.0	<4.0	<4.0	4.30	<4.0	<4.0	8.80	<4.0	**PNC**	<4.0	<4.0
3	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
4	<4.0	<4.0	<4.0	<4.0	4.50	<4.0	<4.0	4.30	<4.0	<4.0	<4.0	<4.0
5	<4.0	<4.0	<4.0	<4.0	4.00	<4.0	<4.0	4.30	<4.0	<4.0	<4.0	<4.0
6	<4.0	<4.0	<4.0	<4.0	4.30	<4.0	<4.0	<4.0	<4.0	<4.0	6.5	<4.0
7	4.0	<4.0	<4.0	<4.0	7.30	4.30	<4.0	<4.0	<4.0	4.0	<4.0	16
8	4.5	<4.0	<4.0	<4.0	<4.0	4.30	<4.0	<4.0	<4.0	<4.0	4.3	<4.0
9	5.5	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	5.3	<4.0
10	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	5.8	<4.0
11	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
12	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
13	<4.0	<4.0	<4.0	4.00	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	10.8	<4.0
14	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
15	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
16	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
17	<4.0	<4.0	<4.0	8.80	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
18	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	6.30	<4.0	<4.0	<4.0
19	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.80	7.00	<4.0	6.5	<4.0
20	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	16.30	<4.0	7.0	<4.0
21	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	5	<4.0	<4.0
22	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	21.00	5.5	<4.0	<4.0
23	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	6.50	5.5	<4.0	<4.0
24	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	**PNC**	4.5	<4.0	<4.0
25	<4.0	<4.0	<4.0	<4.0	4.00	<4.0	<4.0	<4.0	14.50	<4.0	<4.0	<4.0
26	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
27	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
28	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
29	<4.0	<4.0	4.00	<4.0	<4.0	<4.0	<4.0	<4.0	6.80	5.3		<4.0
30	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.30	7.50	<4.0		<4.0
31		<4.0		<4.0	<4.0		<4.7		8.30	<4.0		<4.0

Notes: TSS composite sample is required: monthly - no decant flow, weekly when max daily flow < 0.054m^3/s & daily when max daily flow > 0.054m^3/s

Values highlighted in **bold red** indicate a permit limit exceedance

PNC (Permit Non-Compliance) indicates a required TSS sample was not collected

A dash (-) indicates that a sample was not required

Table 26
2017-2018 Annual Report

Total Suspended Solid Results

EMS ID E218582

Site Description Settling Pond #1 (SPD)

TSS Permit Limit: 25.0 mg/L

Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L	Date	TSS mg/L
1-Apr-17	6.80	1-May-17	<4.0	6-Jun-17	4.30	3-Nov-17	<4.0	1-Dec-17	<4.0	1-Jan-18	**PNC**	1-Feb-18	<4.0	1-Mar-18	<4.0
2-Apr-17	6.00	2-May-17	<4.0	12-Jun-17	<4.0	4-Nov-17	<4.0	2-Dec-17	<4.0	3-Jan-18	<4.0	2-Feb-18	<4.0	2-Mar-18	<4.0
3-Apr-17	4.30	3-May-17	<4.0	19-Jun-17	<4.0	5-Nov-17	<4.0	3-Dec-17	<4.0	4-Jan-18	<4.0	3-Feb-18	<4.0	3-Mar-18	<4.0
4-Apr-17	4.80	4-May-17	<4.0	11-Jul-17	<4.0	6-Nov-17	<4.0	4-Dec-17	<4.0	5-Jan-18	6.50	4-Feb-18	<4.0	4-Mar-18	<4.0
5-Apr-17	6.50	5-May-17	<4.0	14-Aug-17	9.30	7-Nov-17	<4.0	5-Dec-17	<4.0	6-Jan-18	5.30	5-Feb-18	5.80	5-Mar-18	<4.0
6-Apr-17	5.30	6-May-17	<4.0	12-Sep-17	<4.0	8-Nov-17	<4.0	6-Dec-17	<4.0	7-Jan-18	<4.0	6-Feb-18	<4.0	6-Mar-18	<4.0
7-Apr-17	5.30	7-May-17	<4.0	3-Oct-17	<4.0	9-Nov-17	<4.0	7-Dec-17	<4.0	8-Jan-18	<4.0	7-Feb-18	<4.0	7-Mar-18	<16
8-Apr-17	6.50	8-May-17	<4.0			10-Nov-17	<4.0	8-Dec-17	<4.0	9-Jan-18	<4.0	8-Feb-18	<4.0	8-Mar-18	<4.0
9-Apr-17	6.80	9-May-17	<4.0			11-Nov-17	<4.0	9-Dec-17	4.00	10-Jan-18	<4.0	9-Feb-18	<4.0	9-Mar-18	<4.0
10-Apr-17	7.50	10-May-17	<4.0			12-Nov-17	<4.0	10-Dec-17	4.30	11-Jan-18	<4.0	10-Feb-18	<4.0	10-Mar-18	<4.0
11-Apr-17	6.50	11-May-17	<4.0			13-Nov-17	<4.0	11-Dec-17	4.30	12-Jan-18	<4.0	11-Feb-18	<4.0	11-Mar-18	<4.0
12-Apr-17	9.00	12-May-17	<4.0			14-Nov-17	4.50	12-Dec-17	4.80	13-Jan-18	<4.0	12-Feb-18	<4.0	12-Mar-18	<4.0
13-Apr-17	4.50	13-May-17	<4.0			15-Nov-17	<4.0	13-Dec-17	6.00	14-Jan-18	<4.0	13-Feb-18	<4.0	13-Mar-18	<4.0
14-Apr-17	4.00	14-May-17	<4.0			16-Nov-17	<4.0	14-Dec-17	<4.0	15-Jan-18	<4.0	14-Feb-18	<4.0	14-Mar-18	<4.0
15-Apr-17	8.00	15-May-17	<4.0			17-Nov-17	<4.0	15-Dec-17	<4.0	16-Jan-18	<4.0	15-Feb-18	<4.0	15-Mar-18	<4.0
16-Apr-17	4.80	16-May-17	<4.0			18-Nov-17	<4.0	16-Dec-17	<4.0	17-Jan-18	<4.0	16-Feb-18	<4.0	16-Mar-18	<4.0
17-Apr-17	5.00	17-May-17	<4.0			19-Nov-17	4.00	17-Dec-17	<4.0	18-Jan-18	<4.0	17-Feb-18	<4.0	17-Mar-18	<4.0
18-Apr-17	4.00	18-May-17	<4.0			20-Nov-17	4.50	18-Dec-17	4.00	19-Jan-18	<4.0	18-Feb-18	<4.0	18-Mar-18	<4.0
19-Apr-17	<4.0	19-May-17	<4.0			21-Nov-17	<4.0	19-Dec-17	4.00	20-Jan-18	<4.0	19-Feb-18	5.00	19-Mar-18	<4.0
20-Apr-17	4.50	20-May-17	<4.0			22-Nov-17	4.80	20-Dec-17	<4.0	21-Jan-18	5.50	20-Feb-18	<4.0	20-Mar-18	<4.0
21-Apr-17	<4.0	21-May-17	4.30			23-Nov-17	<4.0	21-Dec-17	<4.0	22-Jan-18	<4.0	21-Feb-18	<4.0	21-Mar-18	<4.0
22-Apr-17	<4.0	22-May-17	4.80			24-Nov-17	<4.0	22-Dec-17	**PNC**	23-Jan-18	<4.0	22-Feb-18	<4.0	23-Mar-18	<4.0
23-Apr-17	<4.0	23-May-17	<4.0			25-Nov-17	<4.0	23-Dec-17	**PNC**	24-Jan-18	<4.0	23-Feb-18	<4.0	24-Mar-18	<4.0
24-Apr-17	<4.0	24-May-17	<4.0			26-Nov-17	4.30	25-Dec-17	<8.0	25-Jan-18	<4.0	24-Feb-18	<4.0	25-Mar-18	4.30
25-Apr-17	<4.0	25-May-17	<4.0			27-Nov-17	<4.0	26-Dec-17	<4.0	26-Jan-18	<4.0	25-Feb-18	<4.0	26-Mar-18	<4.0
26-Apr-17	<4.0	26-May-17	<4.0			28-Nov-17	<4.0	27-Dec-17	4.00	27-Jan-18	<4.0	26-Feb-18	<4.0	27-Mar-18	<4.0
27-Apr-17	<4.0	27-May-17	<4.0			29-Nov-17	4.00	28-Dec-17	<4.0	28-Jan-18	<4.0	27-Feb-18	<4.0	28-Mar-18	<4.0
28-Apr-17	<4.0	28-May-17	<4.0			30-Nov-17	4.50	29-Dec-17	<4.0	29-Jan-18	<4.0	28-Feb-18	<4.0	29-Mar-18	<4.0
29-Apr-17	<4.0	29-May-17	<4.0					30-Dec-17	6.00	30-Jan-18	<4.0			30-Mar-18	<4.0
30-Apr-17	<4.0	30-May-17	<4.0							31-Jan-18	<4.0			31-Mar-18	<4.0
		31-May-17	<4.0												

Notes: TSS composite sample is required: monthly - no decant flow, weekly when max daily flow < 0.046m^3/s & daily when max daily flow > 0.046m^3/s

Values highlighted in **bold red** indicate a permit limit exceedance

PNC (Permit Non-Compliance) indicates a required TSS sample was not collected.

Table 27
2017-2018 Annual Report

Total Suspended Solid Results

EMS ID E292069

Site Description 7 South Surface Decant (7SSD)

TSS Permit Limit: 25.0 mg/L

Date	TSS mg/L
3-Apr-17	<4.0
2-May-17	<4.0
5-Jun-17	<4.0
25-Jul-17	<4.0
14-Aug-17	5.5
12-Sep-17	4.8
11-Oct-17	<4.0
14-Nov-17	<4.0
4-Dec-17	<4.0
4-Jan-18	<4.0
18-Jan-18	6.5
19-Jan-18	<4.0
6-Feb-18	<4.0
12-Mar-18	<4.0

Notes:

Values highlighted in **bold red** indicate a permit limit exceedance

PNC (Permit Non-Compliance) indicates a required TSS sample was not collected.

Table 28
2017-2018 Annual Report

EMS ID **E207409**

DISCHARGE FROM SETTLING POND # 4 (WD)

Date	April Max. (m3/s)	April Daily (m3/s)	May Max. (m3/s)	May Daily (m3/s)	June Max. (m3/s)	June Daily (m3/s)	July Max. (m3/s)	July Daily (m3/s)	August Max. (m3/s)	August Daily (m3/s)	September Max. (m3/s)	September Daily (m3/s)
1	**0.1700**	0.1619	**0.1960**	0.1658	**0.1800**	0.1683	**0.1720**	0.1666	**0.0730**	0.0616	**0.0660**	0.0572
2	**0.1710**	0.1626	**0.2030**	0.1903	**0.1810**	0.1665	**0.1690**	0.1608	**0.0800**	0.0686	**0.0650**	0.0555
3	**0.1790**	0.1635	**0.1710**	0.1639	**0.1830**	0.1751	**0.1770**	0.1731	**0.0810**	0.0716	**0.0670**	0.0551
4	**0.1940**	0.1853	**0.1800**	0.1706	**0.1830**	0.1787	**0.1800**	0.1763	**0.0820**	0.0674	**0.0670**	0.0542
5	**0.1740**	0.1673	**0.1720**	0.1506	**0.1820**	0.1694	**0.1790**	0.1667	**0.0830**	0.0634	**0.0670**	0.0587
6	**0.1780**	0.1030	**0.1410**	0.1307	**0.1790**	0.1728	**0.1690**	0.1604	**0.0980**	0.0830	**0.0660**	0.0586
7	**0.2240**	0.2041	**0.1680**	0.1445	**0.1820**	0.1794	**0.1730**	0.1658	**0.1260**	0.1028	**0.0660**	0.0621
8	**0.1990**	0.1622	**0.2080**	0.1890	**0.1800**	0.1701	**0.1790**	0.1752	**0.1350**	0.1299	**0.0660**	0.0594
9	**0.2010**	0.1888	**0.2110**	0.2027	**0.1940**	0.1722	**0.1800**	0.1778	**0.1400**	0.1330	**0.0660**	0.0630
10	**0.2330**	0.2224	**0.2070**	0.1988	**0.1760**	0.1669	**0.1810**	0.1772	**0.1400**	0.1351	**0.0650**	0.0606
11	**0.2350**	0.2313	**0.2090**	0.2074	**0.1760**	0.1724	**0.1790**	0.1703	**0.1400**	0.1353	**0.0760**	0.0657
12	**0.2340**	0.2144	**0.2090**	0.2071	**0.1800**	0.1763	**0.1710**	0.1615	**0.1380**	0.1286	**0.0730**	0.0582
13	**0.2140**	0.2050	**0.2090**	0.2063	**0.1790**	0.1702	**0.1750**	0.1616	**0.1320**	0.1105	**0.0750**	0.0548
14	**0.2090**	0.2032	**0.2070**	0.2026	**0.1590**	0.1480	**0.1800**	0.1631	**0.1120**	0.0941	**0.1430**	0.0929
15	**0.2070**	0.2025	**0.2090**	0.2057	**0.1370**	0.1305	**0.1490**	0.1289	**0.1210**	0.1045	**0.1430**	0.1320
16	**0.2010**	0.1946	**0.2110**	0.2035	**0.1680**	0.1486	**0.1440**	0.1218	**0.0880**	0.0731	**0.1290**	0.1000
17	**0.2040**	0.1948	**0.1770**	0.1687	**0.1740**	0.1703	**0.1560**	0.1445	**0.0790**	0.0634	**0.1330**	0.1205
18	**0.2050**	0.1858	**0.1910**	0.1866	**0.1730**	0.1678	**0.1400**	0.1190	**0.0710**	0.0605	**0.0950**	0.0861
19	**0.2280**	0.2166	**0.1910**	0.1876	**0.1580**	0.1536	**0.1330**	0.1243	**0.0650**	0.0539	**0.1050**	0.0886
20	**0.2290**	0.2234	**0.1910**	0.1848	**0.1740**	0.1619	**0.1440**	0.1310	**0.0630**	0.0550	**0.0750**	0.0654
21	**0.2320**	0.2263	**0.1920**	0.1868	**0.1810**	0.1771	**0.1320**	0.1176	**0.0650**	0.0568	**0.0870**	0.0653
22	**0.2490**	0.2436	**0.1960**	0.1880	**0.1780**	0.1699	**0.0860**	0.0817	**0.0660**	0.0553	**0.1530**	0.1324
23	**0.2400**	0.2216	**0.1910**	0.1761	**0.1620**	0.1426	**0.0810**	0.0716	**0.0660**	0.0600	**0.1680**	0.1587
24	**0.2180**	0.2064	**0.1870**	0.1708	**0.1350**	0.1055	**0.0750**	0.0627	**0.0650**	0.0580	**0.1710**	0.1602
25	**0.2140**	0.2079	**0.2010**	0.1763	**0.1780**	0.1601	**0.0720**	0.0582	**0.0640**	0.0490	**0.1670**	0.1387
26	**0.2040**	0.1872	**0.2180**	0.2107	**0.1900**	0.1832	**0.0640**	0.0557	**0.0760**	0.0502	**0.1550**	0.1391
27	**0.1370**	0.1090	**0.2190**	0.2137	**0.1970**	0.1889	**0.1240**	0.0773	**0.0890**	0.0779	**0.1660**	0.1558
28	**0.1910**	0.1712	**0.2180**	0.2151	**0.1960**	0.1903	**0.1220**	0.0971	**0.0670**	0.0544	**0.1630**	0.1503
29	**0.2070**	0.1838	**0.2180**	0.2160	**0.1950**	0.1884	**0.0790**	0.0657	**0.0660**	0.0553	**0.1790**	0.1611
30	**0.1510**	0.1417	**0.2170**	0.2080	0.1830	0.1759	**0.0720**	0.0632	**0.0660**	0.0601	**0.1390**	0.1356
31			**0.1970**	0.1903			**0.0720**	0.0607	**0.0650**	0.0545		
Monthly Max	0.2490		0.2190		0.1970		0.1810		0.1400		0.1085	
Monthly Avg		0.1897		0.1877		0.1667		0.1270		0.0783		0.0949

P = Permit Limit Exceedance

BOLD = Flow requires TSS composite sample (Max daily flow > 0.054m^3/s)

For Decant Flow > 0.054 m^3/s

Table 29
2017-2018 Annual Report

EMS ID **E207409**

DISCHARGE FROM SETTLING POND # 4 (WD)

Date	October Max. (m3/s)	October Daily (m3/s)	November Max. (m3/s)	November Daily (m3/s)	December Max. (m3/s)	December Daily (m3/s)	January Max. (m3/s)	January Daily (m3/s)	February Max. (m3/s)	February Daily (m3/s)	March Max. (m3/s)	March Daily (m3/s)
1	**0.1390**	0.1048	0.0000	0.0000	**0.1660**	0.1574	**0.1350**	0.1313	**0.2050**	0.1845	**0.1360**	0.0585
2	**0.1200**	0.0927	0.0000	0.0000	**0.1660**	0.1581	**0.1330**	0.1034	**0.2250**	0.1997	**0.1490**	0.1247
3	**0.1550**	0.1274	**0.0830**	0.0516	**0.1570**	0.1454	**0.1310**	0.1016	**0.2200**	0.1716	**0.1540**	0.1265
4	**0.1570**	0.1466	**0.0890**	0.0831	**0.1420**	0.1209	**0.1370**	0.1033	**0.2430**	0.1978	**0.1750**	0.1645
5	**0.1480**	0.1213	**0.0890**	0.0781	**0.1390**	0.1091	**0.1430**	0.1342	**0.2370**	0.1879	**0.1620**	0.1244
6	**0.1600**	0.1504	**0.0700**	0.0254	**0.1390**	0.1316	**0.1400**	0.1357	**0.2170**	0.1737	**0.1580**	0.1353
7	**0.1430**	0.1347	0.0000	0.0000	**0.1370**	0.1062	**0.1440**	0.1366	**0.2320**	0.1896	**0.1640**	0.1385
8	**0.1350**	0.1145	0.0480	0.0136	**0.1320**	0.0968	**0.1480**	0.1129	**0.2460**	0.1949	**0.1770**	0.1611
9	**0.1380**	0.1184	0.0180	0.0014	**0.1380**	0.0908	**0.1430**	0.1104	**0.2340**	0.1727	**0.1740**	0.1505
10	**0.1460**	0.1330	0.0520	0.0368	**0.1370**	0.1339	**0.1500**	0.0976	**0.2140**	0.1688	**0.1550**	0.1407
11	**0.1430**	0.1086	**0.0660**	0.0542	**0.1350**	0.0986	**0.1550**	0.1376	**0.2210**	0.2011	**0.1530**	0.1454
12	**0.1430**	0.1237	**0.0680**	0.0630	**0.1300**	0.0946	**0.1560**	0.1481	**0.2230**	0.1815	**0.1530**	0.1071
13	**0.1240**	0.0941	**0.1230**	0.1019	**0.1340**	0.1072	**0.1570**	0.1523	**0.2110**	0.1771	**0.1330**	0.0928
14	**0.0860**	0.0816	**0.1220**	0.0722	**0.1340**	0.1057	**0.1530**	0.1204	**0.2180**	0.1686	**0.1330**	0.0898
15	**0.0790**	0.0757	**0.1420**	0.1031	**0.1400**	0.1106	**0.1510**	0.1318	**0.1930**	0.1581	**0.1320**	0.0893
16	**0.1600**	0.1059	**0.1330**	0.1190	**0.1340**	0.1308	**0.1610**	0.1478	**0.2030**	0.1970	**0.1390**	0.1097
17	**0.1890**	0.1559	**0.1160**	0.0977	**0.1450**	0.1398	**0.1730**	0.1501	**0.2090**	0.2041	**0.1550**	0.1456
18	**0.0790**	0.0328	**0.1260**	0.1065	**0.1440**	0.1440	**0.2160**	0.1883	**0.2040**	0.1989	**0.1540**	0.1484
19	**0.0660**	0.0259	**0.1800**	0.1569	**0.1460**	0.1192	**0.2150**	0.1883	**0.1950**	0.1698	**0.1510**	0.1124
20	**0.0740**	0.0629	**0.1760**	0.1150	**0.1440**	0.1181	**0.2120**	0.1954	**0.1650**	0.1532	**0.1400**	0.1044
21	0.0470	0.0327	**0.1610**	0.0744	**0.1470**	0.1388	**0.2220**	0.2071	**0.1670**	0.1570	**0.1600**	0.1165
22	**0.0990**	0.0678	**0.1760**	0.1632	**0.1470**	0.1376	**0.2030**	0.1602	**0.1650**	0.1502	**0.1470**	0.1134
23	**0.0920**	0.0505	**0.1870**	0.1729	**0.1320**	0.1285	**0.2130**	0.1675	**0.1630**	0.1529	**0.1380**	0.1136
24	**0.0870**	0.0383	**0.1750**	0.1652	**0.1400**	0.1328	**0.2130**	0.1800	**0.1660**	0.1553	**0.1450**	0.1126
25	**0.0800**	0.0245	**0.1770**	0.1701	**0.1400**	0.1346	**0.2060**	0.1924	**0.1690**	0.1635	**0.1450**	0.1396
26	**0.0800**	0.0226	**0.1700**	0.1627	**0.1410**	0.1379	**0.1800**	0.1611	**0.1660**	0.1291	**0.1480**	0.1143
27	0.0530	0.0245	**0.1740**	0.1518	**0.1410**	0.1379	**0.1900**	0.1724	**0.1590**	0.1265	**0.1470**	0.1198
28	**0.0580**	0.0495	**0.1810**	0.1640	**0.1480**	0.1409	**0.2250**	0.1973	**0.1620**	0.1148	**0.1500**	0.1219
29	**0.0570**	0.0495	**0.1770**	0.1475	**0.1550**	0.1468	**0.2100**	0.1745			**0.1560**	0.1337
30	**0.0560**	0.0189	**0.1660**	0.1516	**0.1390**	0.1360	**0.2110**	0.1859			**0.1740**	0.1634
31	0.0000	0.0000			**0.1350**	0.1300	**0.2070**	0.1714			**0.1740**	0.1599
Monthly Max	0.1890		0.1870		0.1660		0.2250		0.2460		0.1770	
Monthly Avg		0.0803		0.0934		0.1265		0.1515		0.1714		0.1251

P = Permit Limit Exceedance

BOLD = Flow requires TSS composite sample (Max daily flow > 0.054m^3/s)

For Decant Flow > 0.054 m^3/s

Table 30
2017-2018 Annual Report

EMS ID	E218582											
DISCHARGE FROM SETTLING POND # 1 (SPD)												
Date	**April**	**April**	**May**	**May**	**June**	**June**	**July**	**July**	**August**	**August**	**September**	**September**
	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)
1	**0.0910**	0.0738	0.0160	0.0122	0.0190	0.0103	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
2	**0.0690**	0.0518	0.0160	0.0125	0.0110	0.0058	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
3	**0.0500**	0.0326	0.0150	0.0129	0.0090	0.0039	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
4	**0.0750**	0.0528	0.0140	0.0090	0.0100	0.0046	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
5	**0.0620**	0.0491	0.0140	0.0085	0.0120	0.0061	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
6	**0.1030**	0.0629	0.0130	0.0076	0.0130	0.0058	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
7	**0.1340**	0.1070	0.0130	0.0066	0.0110	0.0063	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
8	**0.1340**	0.1195	0.0120	0.0096	0.0130	0.0109	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
9	**0.1170**	0.1051	0.0120	0.0073	0.0140	0.0088	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
10	**0.1030**	0.0841	0.0120	0.0073	0.0140	0.0083	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
11	**0.1030**	0.0726	0.0130	0.0095	0.0130	0.0074	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
12	**0.0930**	0.0777	0.0130	0.0089	0.0130	0.0054	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
13	**0.0900**	0.0712	0.0150	0.0095	0.0110	0.0063	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
14	**0.0920**	0.0637	0.0170	0.0113	0.0120	0.0083	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
15	**0.0810**	0.0532	0.0210	0.0145	0.0140	0.0115	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
16	**0.0790**	0.0447	0.0330	0.0213	0.0150	0.0084	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
17	**0.0730**	0.0410	0.0310	0.0246	0.0100	0.0065	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
18	**0.0730**	0.0425	**0.0590**	0.0385	0.0090	0.0074	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
19	**0.0580**	0.0365	0.0450	0.0222	0.0120	0.0076	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
20	**0.0680**	0.0509	0.0200	0.0098	0.0120	0.0058	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
21	0.0390	0.0270	0.0440	0.0187	0.0090	0.0033	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
22	**0.0620**	0.0459	0.0350	0.0137	0.0070	0.0018	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
23	0.0360	0.0253	0.0160	0.0073	0.0190	0.0011	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
24	**0.0570**	0.0243	0.0110	0.0052	0.0020	0.0003	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
25	**0.0550**	0.0278	0.0100	0.0045	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
26	0.0210	0.0130	0.0100	0.0041	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
27	0.0170	0.0111	0.0100	0.0043	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
28	0.0160	0.0094	0.0100	0.0040	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
29	0.0170	0.0149	0.0090	0.0031	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
30	0.0170	0.0118	0.0070	0.0044	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
31			0.0220	0.0092			**NF**	**NF**	**NF**	**NF**		
Monthly Max	0.1340		0.0590		0.0190		0.0000		0.0000		0.0000	
Monthly Avg		0.05011		0.01105		0.00633		0.0000		0.00000		0.00000

PNC = Permit Non-compliance

Bold = TSS composite sample is required: **monthly** - no decant flow, **weekly** when max daily flow < 0.046m^3/s & **daily** when max daily flow > 0.046m^3/s

No Flow= NF

Table 31
2017-2018 Annual Report

EMS ID	E218582											
DISCHARGE FROM SETTLING POND # 1 (SPD)												
Date	**October**	**October**	**November**	**November**	**December**	**December**	**January**	**January**	**February**	**February**	**March**	**March**
	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)	Max. (m3/s)	Daily (m3/s)
1	**NF**	**NF**	**NF**	**NF**	**0.1110**	0.1057	**0.0470**	0.0196	**0.0870**	0.0711	0.0400	0.0216
2	**NF**	**NF**	**NF**	**NF**	**0.1050**	0.1016	0.0120	0.0093	**0.0780**	0.0594	**0.0660**	0.0458
3	**NF**	**NF**	**NF**	**NF**	**0.1000**	0.0884	0.0090	0.0044	**0.1030**	0.0794	0.0310	0.0174
4	**NF**	**NF**	**NF**	**NF**	**0.0870**	0.0665	0.0060	0.0001	**0.1120**	0.0969	**0.0550**	0.0335
5	**NF**	**NF**	**NF**	**NF**	**0.0900**	0.0704	0.0120	0.0037	**0.0980**	0.0849	0.0420	0.0287
6	**NF**	**NF**	0.0010	0.0000	**0.0800**	0.0559	0.0140	0.0109	**0.0820**	0.0679	0.0260	0.0237
7	**NF**	**NF**	0.0360	0.0236	**0.0880**	0.0724	0.0330	0.0205	**0.0740**	0.0610	**0.0580**	0.0376
8	**NF**	**NF**	0.0220	0.0144	**0.0880**	0.0782	**0.0520**	0.0380	**0.0630**	0.0408	0.0450	0.0349
9	**NF**	**NF**	0.0180	0.0164	**0.0570**	0.0538	**0.0870**	0.0725	**0.0640**	0.0330	**0.0590**	0.0294
10	**NF**	**NF**	0.0220	0.0168	**0.0850**	0.0616	**0.0690**	0.0486	**0.0520**	0.0310	**0.0760**	0.0502
11	**NF**	**NF**	0.0340	0.0245	**0.0880**	0.0608	**0.0510**	0.0417	0.0320	0.0163	0.0390	0.0271
12	**NF**	**NF**	**0.0680**	0.0440	**0.0530**	0.0381	**0.0620**	0.0383	**0.0490**	0.0253	0.0350	0.0245
13	**NF**	**NF**	**0.2820**	0.2166	0.0440	0.0205	**0.0630**	0.0413	0.0190	0.0142	**0.0730**	0.0539
14	**NF**	**NF**	**0.3390**	0.2466	0.0460	0.0222	**0.0660**	0.0498	0.0460	0.0181	**0.0470**	0.0328
15	**NF**	**NF**	**0.2310**	0.0859	0.0140	0.0098	**0.0650**	0.0366	0.0280	0.0146	**0.0740**	0.0332
16	**NF**	**NF**	**0.0900**	0.0810	0.0440	0.0167	**0.0750**	0.0582	0.0420	0.0223	**0.0730**	0.0347
17	**NF**	**NF**	**0.0790**	0.0549	0.0430	0.0246	**0.1640**	0.1043	0.0250	0.0165	**0.0760**	0.0476
18	**NF**	**NF**	**0.0690**	0.0561	0.0170	0.0170	**0.1830**	0.1472	**0.0530**	0.0217	**0.0560**	0.0305
19	**NF**	**NF**	**0.1410**	0.1046	**0.0500**	0.0358	**0.1330**	0.0958	**0.0550**	0.0267	0.0310	0.0202
20	**NF**	**NF**	**0.1280**	0.1075	0.0240	0.0133	**0.1790**	0.0648	0.0250	0.0173	**0.0660**	0.0447
21	**NF**	**NF**	**0.2070**	0.1121	0.0130	0.0107	**0.2560**	0.2157	0.0230	0.0171	0.0380	0.0286
22	**NF**	**NF**	**0.2050**	0.0446	**0.0470**	0.0208	**0.1790**	0.1284	0.0240	0.0122	**0.0650**	0.0353
23	**NF**	**NF**	**0.2060**	0.0201	**0.0500**	0.0302	**0.1170**	0.1128	**0.0640**	0.0270	**0.0590**	0.0353
24	**NF**	**NF**	**0.2050**	0.0306	0.0130	0.0052	**0.1110**	0.0961	**0.0650**	0.0301	0.0290	0.0197
25	**NF**	**NF**	**0.2150**	0.0693	0.0110	0.0084	**0.1000**	0.0948	**0.0470**	0.0223	**0.0510**	0.0348
26	**NF**	**NF**	**0.2260**	0.0292	0.0090	0.0066	**0.0950**	0.0698	0.0380	0.0191	0.0420	0.0342
27	**NF**	**NF**	**0.2050**	0.0491	0.0450	0.0159	**0.0610**	0.0448	**0.0640**	0.0317	0.0350	0.0276
28	**NF**	**NF**	**0.1180**	0.1120	**0.0470**	0.0233	**0.0910**	0.0664	**0.0550**	0.0337	**0.0600**	0.0290
29	**NF**	**NF**	**0.1120**	0.1064	0.0120	0.0052	**0.1160**	0.0974			**0.0690**	0.0503
30	**NF**	**NF**	**0.1130**	0.1091	0.0110	0.0076	**0.1160**	0.0974			**0.0510**	0.0317
31	**NF**	**NF**			0.0400	0.0126	**0.1160**	0.0974			**0.0560**	0.0425
Monthly Ma	0.000		0.339		0.111		0.2560		0.1120		0.0760	
Monthly Avg		0.000		0.071		0.037		0.06536		0.03611		0.03358

PNC = Permit Non-compliance

Bold = TSS composite sample is required: **monthly** - no decant flow, **weekly** when max daily flow < 0.046m^3/s & **daily** when max daily flow > 0.046m^3/s

No Flow= NF

Table 32
2017-2018 Annual Report

EMS ID E292069

DISCHARGE FROM 7-SOUTH SURFACE DECANT (7SSD)

Date	April	May	June	July	August	September	October	November	December	January	February	March
	Daily Average L/S											
1	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
2	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
3	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
4	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
5	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
6	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
7	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
8	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
9	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
10	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
11	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
12	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
13	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
14	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
15	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
16	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
17	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
18	NF	NF	NF	NF	NF	NF	NF	NF	NF	2.50	NF	NF
19	NF	NF	NF	NF	NF	NF	NF	NF	NF	2.50	NF	NF
20	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
21	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
22	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
23	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
24	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
25	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
26	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
27	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
28	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
29	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF		NF
30	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF		NF
31	NF	NF	NF	NF	NF		NF	NF	NF	NF		NF
Monthly Avg	0.000	0.000	0.000	0.000	0.000	0.000	#DIV/0!	#DIV/0!	0.000	0.160	0.000	0.000
Annual Avg										0.014		
Cummulative Daily Totalizer Value For Maximum Decant Flow (5.00 L/s)										432 m^3		

Table 33
2017-2018 Annual Report

Dilution Ratio: 7S vs 7SSD Discharge

	April			May			June - August			September			October		
Date	**7S Q (L/s)**	**7SSD Q (L/s)**	**Dilution**	**7S Q (L/s)**	**7SSD Q (L/s)**	**Dilution**	**7S Q (L/s)**	**7SSD Q (L/s)**	**Dilution**	**7S Q (L/s)**	**7SSD Q (L/s)**	**Dilution**	**7S Q (L/s)**	**7SSD Q (L/s)**	**Dilution**
1	5.088	NF	∞	1.046	NF	∞	0.255	NF	NF	NF	∞	NF	NF	∞	
2	4.210	NF	∞	0.969	NF	∞	0.212	NF	NF	NF	∞	NF	NF	∞	
3	3.698	NF	∞	1.095	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
4	4.066	NF	∞	1.335	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
5	7.251	NF	∞	0.903	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
6	18.918	NF	∞	0.803	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
7	20.468	NF	∞	0.864	NF	∞	NF	NF	NF	NF	∞	NF	NF		
8	13.998	NF	∞	0.895	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
9	6.174	NF	∞	0.931	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
10	4.976	NF	∞	0.876	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
11	4.536	NF	∞	0.836	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
12	3.948	NF	∞	0.931	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
13	6.107	NF	∞	1.028	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
14	4.295	NF	∞	1.047	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
15	3.390	NF	∞	1.253	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
16	3.433	NF	∞	1.459	NF	∞	NF	NF	NF	NF	∞	NF	NF	∞	
17	2.510	NF	∞	1.092	NF	∞	NF	NF	NF	NF	∞	0.215	NF	∞	
18	1.997	NF	∞	0.984	NF	∞	NF	NF	NF	NF	∞	2.962	NF	∞	
19	2.401	NF	∞	0.852	NF	∞	NF	NF	NF	NF	∞	1.619	NF	∞	
20	1.921	NF	∞	0.677	NF	∞	NF	NF	NF	NF	∞	0.834	NF	∞	
21	2.271	NF	∞	0.625	NF	∞	NF	NF	NF	NF	∞	1.448	NF	∞	
22	2.232	NF	∞	0.626	NF	∞	NF	NF	NF	NF	∞	1.152	NF	∞	
23	2.031	NF	∞	0.584	NF	∞	NF	NF	NF	NF	∞	1.770	NF	∞	
24	1.533	NF	∞	0.597	NF	∞	NF	NF	NF	NF	∞	2.377	NF	∞	
25	1.672	NF	∞	0.471	NF	∞	NF	NF	NF	NF	∞	1.300	NF	∞	
26	1.273	NF	∞	0.371	NF	∞	NF	NF	NF	NF	∞	0.913	NF	∞	
27	0.982	NF	∞	0.355	NF	∞	NF	NF	NF	NF	∞	1.035	NF	∞	
28	0.971	NF	∞	0.324	NF	∞	NF	NF	NF	NF	∞	0.833	NF	∞	
29	1.332	NF	∞	0.327	NF	∞	NF	NF	NF	NF	∞	0.353	NF	∞	
30	0.836	NF	∞	0.288	NF	∞	NF	NF	NF	NF	∞	0.302	NF	∞	
31	1.046	NF	∞	0.267	NF	∞	-	-	-	-	-	0.396	NF	∞	

Table 34
2017-2018 Annual Report

Dilution Ratio: 7S vs 7SSD Discharge

	November			December			January			February			March		
Date	7S Q (L/s)	7SSD Q (L/s)	Dilution	7S Q (L/s)	7SSD Q (L/s)	Dilution	7S Q (L/s)	7SSD Q (L/s)	Dilution	7S Q (L/s)	7SSD Q (L/s)	Dilution	7S Q (L/s)	7SSD Q (L/s)	Dilution
1	0.247	NF	∞	5.796	NF	∞	0.906	NF	∞	2.118	NF	∞	0.760	NF	∞
2	0.487	NF	∞	4.707	NF	∞	1.378	NF	∞	4.273	NF	∞	0.574	NF	∞
3	0.416	NF	∞	2.433	NF	∞	1.637	NF	∞	4.517	NF	∞	0.595	NF	∞
4	0.640	NF	∞	2.368	NF	∞	1.510	NF	∞	8.165	NF	∞	0.513	NF	∞
5	0.290	NF	∞	2.140	NF	∞	1.415	NF	∞	3.384	NF	∞	0.565	NF	∞
6	0.229	NF	∞	2.157	NF	∞	1.391	NF	∞	1.959	NF	∞	0.610	NF	∞
7	0.474	NF	∞	2.550	NF	∞	6.902	NF	∞	1.996	NF	∞	0.698	NF	∞
8	0.838	NF	∞	2.384	NF	∞	16.374	NF	∞	1.413	NF	∞	0.584	NF	∞
9	1.424	NF	∞	2.012	NF	∞	15.519	NF	∞	1.337	NF	∞	0.433	NF	∞
10	1.368	NF	∞	1.783	NF	∞	6.915	NF	∞	1.412	NF	∞	0.511	NF	∞
11	1.425	NF	∞	1.740	NF	∞	8.812	NF	∞	0.857	NF	∞	0.442	NF	∞
12	2.220	NF	∞	1.358	NF	∞	5.447	NF	∞	0.737	NF	∞	0.468	NF	∞
13	46.854	NF	∞	1.388	NF	∞	6.201	NF	∞	0.833	NF	∞	0.337	NF	∞
14	22.376	NF	∞	1.553	NF	∞	9.817	NF	∞	0.454	NF	∞	0.280	NF	∞
15	16.511	NF	∞	1.188	NF	∞	7.856	NF	∞	0.547	NF	∞	0.279	NF	∞
16	6.576	NF	∞	1.203	NF	∞	4.739	NF	∞	0.563	NF	∞	0.245	NF	∞
17	2.510	NF	∞	1.968	NF	∞	44.455	NF	∞	0.731	NF	∞	0.000	NF	∞
18	3.382	NF	∞	2.044	NF	∞	42.676	2.500	17.07	0.462	NF	∞	0.000	NF	∞
19	38.657	NF	∞	3.084	NF	∞	25.205	2.500	10.082	0.647	NF	∞	0.239	NF	∞
20	11.402	NF	∞	1.530	NF	∞	16.049	NF	∞	0.534	NF	∞	0.301	NF	∞
21	12.872	NF	∞	2.741	NF	∞	193.599	NF	∞	0.596	NF	∞	0.287	NF	∞
22	17.761	NF	∞	2.138	NF	∞	8.355	NF	∞	0.463	NF	∞	0.270	NF	∞
23	10.415	NF	∞	1.836	NF	∞	9.220	NF	∞	0.630	NF	∞	0.262	NF	∞
24	6.298	NF	∞	2.757	NF	∞	4.829	NF	∞	0.427	NF	∞	0.248	NF	∞
25	9.387	NF	∞	1.872	NF	∞	2.115	NF	∞	0.336	NF	∞	0.261	NF	∞
26	18.073	NF	∞	2.151	NF	∞	1.427	NF	∞	0.327	NF	∞	0.289	NF	∞
27	6.400	NF	∞	1.958	NF	∞	1.059	NF	∞	0.355	NF	∞	0.429	NF	∞
28	6.119	NF	∞	1.943	NF	∞	6.730	NF	∞	0.640	NF	∞	0.406	NF	∞
29	4.704	NF	∞	1.790	NF	∞	20.017	NF	∞	-	-	-	0.461	NF	∞
30	6.068	NF	∞	0.739	NF	∞	5.656	NF	∞	-	-	-	0.359	NF	∞
31	-	-	-	-	NF	∞	-	NF	∞	-	-	-	0.419	NF	∞

Table 35
2017-2018 Annual Report

Weekly / Monthly Sulphate Results

EMS ID:	E207409	E218582	Last Settling Pond from LLSTS	Downstream of confluence with SPEFF & SPD
Site Name	Settling Pond #4	Settling Pond #1		
Site Code	WD	SPD	SPEFF	BDS
Week of:				
3-Apr-2017	519	187	359	242
10-Apr-2017	489	191	337	198
17-Apr-2017	450	233	361	249
24-Apr-2017	481	247	352	281
1-May-2017	519	273	331	310
8-May-2017	484	271	333	287
15-May-2017	446	193	NA	196
22-May-2017	457	235	NA	NA
29-May-2017	475	219	NA	NA
5-Jun-2017	229	250	NA	NA
12-Jun-2017	391	233	NA	NA
19-Jun-2017	369	222	NA	NA
26-Jun-2017	394	203	NA	NA
3-Jul-2017	444	NF	NA	NA
10-Jul-2017	499	187	NA	NA
17-Jul-2017	544	NF	NA	NA
24-Jul-2017	749	NF	NA	NA
31-Jul-2017	782	NF	385	NA
7-Aug-2017	822	NF	NA	NA
14-Aug-2017	751	206	NA	NA
21-Aug-2017	724	NF	402	NA
28-Aug-2017	755	NF	410	NA
4-Sep-2017	726	NF	355	NA
11-Sep-2017	696	206	402	NA
18-Sep-2017	478	NF	391	NA
25-Sep-2017	386	NF	393	456
2-Oct-2017	366	134	414	NA
9-Oct-2017	373	NF	378	436
16-Oct-2017	260	NF	326	330
23-Oct-2017	360	NF	365	348
30-Oct-2017	573	NF	NA	370
6-Nov-2017	408	143	379	158
13-Nov-2017	378	136	283	135
20-Nov-2017	332	226	361	221
27-Nov-2017	434	258	357	261
4-Dec-2017	418	202	348	300
11-Dec-2017	458	259	369	288
18-Dec-2017	428	200	355	225
25-Dec-2017	533	240	447	378
1-Jan-2018	539	197	453	225
8-Jan-2018	498	122	383	291
15-Jan-2018	561	156	249	276
22-Jan-2018	594	135	370	144
29-Jan-2018	533	277	249	268
5-Feb-2018	498	156	255	283
12-Feb-2018	524	175	353	257
19-Feb-2018	545	207	342	345
26-Feb-2018	528	215	335	313
5-Mar-2018	561	176	334	268
12-Mar-2018	546	94.5	14.8	59.6
19-Mar-2018	506	294	355	264
26-Mar-2018	517	367	356	365
Annual Min	**229**	**95**	**15**	**60**
Annual Max	**822**	**367**	**453**	**456**
Annual Average	**507**	**210**	**343**	**273**
Count	**52**	**38**	**38**	**33**

NA = Not Applicable

NF= No Flow

Sampling at SPEFF and BDS are only required when SPD is discharging. ND indicates no discharge from SPD.

Table 36
2017-2018 Annual Report

Weekly Sulphate Results and Rolling Averages at LLE & LLO				
EMS ID	**E292130**		**E219412**	
Site Name	**Long Lake Entry of 2-South mine effluent near the outlet of Long Lake**		**Long Lake Outlet**	
Site Code	**LLE**		**LLO**	
Week of:		**Sulphate Rolling Average**		**Sulphate Rolling Average**
3-Apr-17	110	97	112.0	48
10-Apr-17	602	**201**	26.8	47
17-Apr-17	101	**197**	40.7	46
24-Apr-17	102	**199**	32.0	47
1-May-17	109	**205**	40.4	50
8-May-17	134	**210**	48.4	38
15-May-17	58.9	101	58.6	44
22-May-17	122	105	42.1	44
29-May-17	153	115	54.3	49
5-Jun-17	4.10	94	52.8	51
12-Jun-17	311	**130**	77.6	57
19-Jun-17	311	**180**	71.8	60
26-Jun-17	582	**272**	70.0	65
3-Jul-17	602	**362**	82.5	71
10-Jul-17	644	**490**	76.2	76
17-Jul-17	677	**563**	94.3	79
24-Jul-17	733	**648**	98.0	84
31-Jul-17	**NF**		94.5	89
7-Aug-17	**NF**		96.1	92
14-Aug-17	**NF**		97.4	96
21-Aug-17	**NF**		99.9	97
28-Aug-17	**NF**		102.0	98
4-Sep-17	**NF**		115.0	102
11-Sep-17	882		107.0	104
18-Sep-17	860		108.0	106
25-Sep-17	873		119.0	110
2-Oct-17	906		119.0	114
9-Oct-17	847	**874**	119.0	114
16-Oct-17	317	**761**	116.0	116
23-Oct-17	149	**618**	101.0	115
30-Oct-17	157	**475**	85.3	108
6-Nov-17	192	**332**	83.2	101
13-Nov-17	35.4	**170**	44.8	86
20-Nov-17	43.5	115	23.7	68
27-Nov-17	67.9	99	32.3	54
4-Dec-17	98.7	88	21.1	41
11-Dec-17	177	85	61.4	37
18-Dec-17	128	103	59.7	40
25-Dec-17	135	121	49.7	45
1-Jan-18	155	**139**	51.4	49
8-Jan-18	60.7	**131**	57.9	56
15-Jan-18	74.5	111	35.5	51
22-Jan-18	21.8	89	15.9	42
29-Jan-18	50	72	42.7	41
5-Feb-18	65.9	55	22.1	35
12-Feb-18	72.4	57	30.0	29
19-Feb-18	89.1	60	44.2	31
26-Feb-18	92.7	74	40.7	37
5-Mar-18	90.4	82	47.1	39
12-Mar-18	88.5	87	51.3	46
19-Mar-18	116	95	104.0	57
26-Mar-18	120	102	83.7	65
Annual Min	**4**	**55**	**16**	**29**
Annual Max	**906**	**874**	**119**	**116**
Annual Average	**276**	**229**	**68**	**67**
Count:	**46**		**52**	

Notes: WQG applies background hardness of 30 mg/L deriving a sulphate guideline of 128 mg/L. If the hardness concentrations from LLE were used the WQG applied would be 429 mg/L.

Table 37
2017-2018 Annual Report

Biweekly and Weekly TSS Results From WC, SPC, SPEFF and BDS

EMS ID	E207411	E217014		
Site Date	WC	SPC	SPEFF	BDS
3-Apr-17	<4.0	<4.0	<4.0	5.3
10-Apr-17	NA	NA	<4.0	4.3
17-Apr-17	<4.0	<4.0	<4.0	<4.0
24-Apr-17	NA	NA	<4.0	4.8
1-May-17	<4.0	<4.0	<4.0	<4.0
8-May-17	NA	NA	<4.0	<4.0
15-May-17	<4.0	<4.0	NA	<4.0
29-May-17	<4.0	4.5	NA	NA
12-Jun-17	<4.0	<4.0	NA	NA
26-Jun-17	<4.0	NA	NA	NA
10-Jul-17	<4.0	NA	NA	NA
17-Jul-17	<4.0	NA	NA	NA
24-Jul-17	NA	NA	NA	NA
31-Jul-17	<4.0	NA	NA	NA
7-Aug-17	NA	NA	NA	NA
14-Aug-17	<4.0	NA	NA	NA
21-Aug-17	NA	NA	<4.0	NA
28-Aug-17	<4.0	NA	NA	NA
4-Sep-17	NA	NA	<4.0	NA
11-Sep-17	<4.0	NA	<4.0	NA
18-Sep-17	NA	NA	<4.0	NA
25-Sep-17	<4.0	NA	4.5	<4.0
2-Oct-17	<4.0	NA	<4.0	<4.0
9-Oct-17	NA	NA	<4.0	<4.0
16-Oct-17	<4.0	<4.0	<4.0	<4.0
23-Oct-17	NA	NA	<4.0	<4.0
30-Oct-17	<4.0	NA	NA	<4.0
6-Nov-17	NA	NA	<4.0	<4.0
13-Nov-17	<4.0	<4.0	<4.0	<4.0
20-Nov-17	NA	NA	<4.0	<4.0
27-Nov-17	<4.0	<4.0	<4.0	<4.0
4-Dec-17	<4.0	<4.0	<4.0	<4.0
11-Dec-17	<4.0	<4.0	<4.0	6.5
18-Dec-17	NA	NA	<4.0	<4.0
25-Dec-17	<4.0	<4.0	5	<4.0
1-Jan-18	NA	NA	4.3	<4.0
8-Jan-18	<4.0	<4.0	<4.0	<4.0
15-Jan-18	NA	<4.0	<4.0	<4.0
22-Jan-18	<4.0	NA	8.5	<4.0
29-Jan-18	NA	<4.0	6	<4.0
5-Feb-18	<4.0	<4.0	7.3	<4.0
12-Feb-18	NA	NA	<4.0	<4.0
19-Feb-18	<4.0	<4.0	<4.0	<4.0
26-Feb-18	NA	NA	<4.0	<4.0
5-Mar-18	<4.0	<16	<4.0	<4.0
12-Mar-18	NA	NA	<4.0	<4.0
19-Mar-18	<4.0	<4.0	<4.0	<4.0
26-Mar-18	NA	NA	<4.0	<4.0

NA= Not Applicable. All sites are based on discharge from Settling Ponds. WC dependant on WD discharge & SPEFF, BDS & SPC dependant on SPD discharge.

Table 38
2017-2018 Annual Report

Field Conductivity (uS/cm) & pH (North Mine Area & 7-South)

EMS ID	E283433		E207409		E207412		E207411				E292069		E292109				GW and SW from 2N Area at Road		E292126	
Site Name	2-N-Portal Sump		Settling Pond #4		2 North Pit Sump		North Pit Culvert		7 South Portal Sump		Settling Pond at 7S		Stream 1 -7S		Seep Near Plant				South Dyke Sump	
Site Code	2NPS		WD		WP		WC		7SPS		7SSD		7S		PDS		PDSR		SDS	
	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH
April 2017	1836	7.7	1587	7.8	1464	8	1580	8	850	7.7	273	7.8	31	7.7	1790	7.70	1431	7.50	2060	8
	1908	7.7	1513	7.6	1597	8.1	1632	7.6											2012	7.9
	1964	7.8	1343	7.8	1860	8.2	1327	8	782	7.8									2268	7.46
	1987	7.8	1365	7.8	1229	8.1	1400	7.8											2220	7.8
May 2017	1908	7.7	1452	7.9	1512	8.2	1450	7.8	808	7.8	350	7.8	48	7.7	1849	7.4	1405	7.80	2390	8.1
	1873	7.7	1597	8.1	1482	7.9	1485	8.3	886	8.2									2067	8
	1896	7.7	1752	8.1	1531	7.9	1601	8.1	886	8.3									2071	7.6
	1852	7.4	1897	7.7	1500	7.9	1777	8.1											2070	7.4
June 2017	2045	7.5	1610	7.9	1603	8	1557	8.3	912	8	391	7.8	60	7.6	1911	7.4	1630	7.60	DRY	
	2000	7.6	1780	7.8	1747	7.9	1558	8.3	850	8.1							Dry			
	2160	7.7	1803	7.9	1342	8.2	1789	8.2			238	7.7								
	2031	7.7	1428	7.8	1492	8.1	1402	8			403	8								
	2021	7.8	1518	7.8	1624	7.9	1462	8.2												
July 2017	1995	7.6	1498	7.9	1785	8.1	1352	8.1	821	6.3			NF							
	2027	7.6	1904	8	1947	8	1818	8.2												
	1974	7.4	2011	8	1759	7.9	1963	8.2												
	2068	7.6	2240	7.7	1784	7.9	1890	8.2			403	8								
August 2017	2003	7.4	2006	7.8	1692	8	2002	7.9	795	6.1										
	2028	7.9	2030	7.9	1669	8.1	1952	8			427	7.9								
	2009	7.8	2068	8	1704	8	1986	8.1												
	2062	7.7	2094	8.1	1859	8.1	1868	8.2												
	2016	7.8	2016	8	1956	8.2	1984	8.2												
September 2017	2020	7.7	2096	7.9	1975	8	2016	8.1	812	6.00										
	2032	7.8	2001	7.8	2190	8.2	2009	8.1			770	7.9								
	2018	7.7	1673	7.86	1760	8.1	1624	8.04												
	2003	7.7	1700	8.1	1998	8.1	1676	8.3												
October 2017	1950	7.50	1704	8.10	1998	8.10	1583	8.40												
	1991	7.60	1657	8.10	1700	8.20	1608	8.40	1102	7.50	357	7.8							918	7.50
	1990	7.40	1303	8.20	1312	8.00	1398	8.50	1200	4.00									691	7.50
	1866	7.50	1400	8.10	1515	8.40	1237	8.20	1446	2.90									740	7.40
	2000	7.70	1760	8.10	1631	8.30	1317	8.20	1573	4.0			56	6.9					1444	7.10
November 2017	1944	7.60	1529	8.10	1647	8.30	1493	8.20	1526	3.30									2070	7.50
	1944	7.60	984	8.00	1666	8.20	1031	8.00	982	6.80									2220	7.20
	1913	7.40	1227	7.80	1680	7.90	740	7.60	691	3.60	284	8.3							2000	7.00
	1885	7.50	1420	7.70	1688	8.00	1200	7.80	648	4.50			37	7					2007	7.5
December 2017	2160	7.20	1410	7.91	1744	7.90	1473	8.10	732	6.2	289	7.4	84	7.2			976	7.9	2022	7.2
	2004	7.40	1572	8.10	1640	8.30	1558	8.30	1013	7.2									2047	7.1
	2002	7.50	1624	7.50	1696	8.10	1512	8.10	758	6.3									468	7.2
	2000	7.30	1665	8.20	1479	8.30	1693	8.00	1005	7.2									249	7.3
January 2018	2001	7.7	1758	8.2	1378	7.9	1726	8	629	6	261	7.5	79	8.8			1559	7.4	1258	6.9
	2004	7.7	1629	7.9	1396	7.8	1404	8.1	636	6.1									2032	7.5
	1900	7.5	1728	8	1445	8	1472	8.1	375	6.9	70	7.8	35	7.6					2023	7.6
	2003	7.4	1503	7.3	1478	7.8	1018	7.1	378	6.9									2002	7.5
February 2018	2016	7.5	1583	7.5	1456	7.6	1056	7.5	504	7.1	103	7.8	40	8.3					2021	7.5
	2100	7.4	1380	7.5	1501	7.9	1230	8.1	736	6.9							690	7.8	2008	7.7
	2000	7.4	1660	7.7	1428	8	1628	8	724	7									2230	8
	1996	7.5	1836	8.1	1609	7.9	1754	8	1241	6.7									2074	7.9
March 2018	2008	7.6	1800	8	1619	7.8	1562	8	897	7.2									1970	8.2
	2010	7.3	1703	7.9	1547	8.1	1602	8.3	707	7.5	225	7.8	42	6.7			1299	7.9	2025	8.1
	2000	7.3	1673	7.9	1451	8	1447	8	850	7.7									2052	8
	2015	7.6	1763	7.8	1479	8.20	1695	8.4	782	7.2									2037	8.00
	2013	7.8	1770	8.1	1570	8.00	1558	8.2	808	7.7									2050	8.00

Table 39
2017-2018 Annual Report

Field Conductivity (uS/cm) & pH (South Mine Area)

EMS ID	E292127		E217015				E218582						E292128		E292129		E217014		E292130		E292131		E292131	
Site Name	2 South Pit CCR Water Cover		3 South Pit CCR Water Cover		LLSTS Settling Pond Effluent		Settling Pond # 1		Biocell Downstream				3S77		4 South Lower		South Pit Culvert		Long Lake Entry		Seep into Long Lake		Long Lake Middle Seep	
Site Code	2S (2SS)		3S		SPEFF		SPD		BDS				3S77		4SLO		SPC		LLE		LLS		LLSM	
	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH
April 2017	298	7.9	1179	7.9	1095	8.4	532	7.2	733	8	684	7.6	402	7.7	483	8	327	7.7	1338	7.4	1234	7.6		
	302.2	7.42	1213	7.9	1052.8	8.05	609.6	7.75	759.4	7.8	701	7.8	373	7.6	303	7.9	340	7.6						
	348	7.55	1260	7.9	1052.8	8.05	609.6	7.75	759.4	7.8	682	7.8	380	7.4	290	7.8	342	7.8						
	316	7.6	1151	8	993	8.3	715	7.6	760	8.1	706	7.8	360	7.4	302	7.9	340	7.7						
May 2017	327	7.6	1252	7.8	1036	8.2	689	7.7	762	7.9	694	7.8	392	7.8	316	7.8	387	7.4	1382	7.4	1042	7.45		
	386	7.7	1256	7.9	914.2	8.11	671.3	8.03	775.5	8.07	747	7.7	403	7.7	354	7.8	432	7.6						
	355	7.6	1290	8	1064	8.2	779	7.9	907	8.1	813	7.4	452	7.2	413	7.8	238	7.1						
	286	7.5	1370	7.8	Redirected to 2S		684	7.8	NA	NA	857	7.4	487	7.1	160	7.6	428	7						
June 2017	317	7.7	1400	7.9	NF	NF	763	7.7	NA	NA	747	7.5	422	8	366	7.8	460	7	1460	7	1298	7.7		
	407	7.7	1500	8	NF	NF	662.3	7.78	NA	NA	795	7.7	464	7.6	273	7.9	565	7.5						
	515	7.9	1346	8.1	NF	NF	658	7.9	NA	NA	736	7.7	428	8	274	7.9	800	7.6						
	481	7.6	1308	8	NF	NF	584	7.9	NA	NA	774	7.6	480	7.6	262	7.8	808	7.3						
	481	7.6	1172	7.9	NF	NF	623	8	NA	NA	735	7.5	670	7.4	246	7.7	763	7.2						
July 2017	493	7.6	1256	8	NF	NF	638	8	NA	NA	728	7.6	670	7.4	272	7.9	692	7.4	1015	8.00	1406	7.70		
	520	7.7	1309	8	NF	NF	612	8.1	NA	NA	750	7.6	NF		Dry June 29 through Oct 17		740	7.50						
	514	8.4	1332	8.1	NF	NF	723	7.9	NA	NA	779	7.7					956	7.60						
	690	7.29	1410	7.9	NF	NF	1070	7.8	NA	NA	783	7.8					1393	7.80						
August 2017	486	7.8	1295	8	NF	NF	620	7.7	NA	NA	787	7.8					Dry from Aug through Sep 5							
	496	7.8	1260	7.8	NF	NF	622	7.8	NA	NA	804	7.7							1462	7.1	1296	7.75		
	523	7.8	1405	7.9	NF	NF	638	7.9	NA	NA	798	7.7												
	505	7.9	1483	7.9	NF	NF	759	8	NA	NA	840	7.6												
	542	8.03	1378	7.8	NF	NF	745	8.1	NA	NA	857	7.7												
September 2017	524	8	1483	7.9	982	8	798	8	NA	NA	1045	7.6									Dry			
	514	8.4	1145	8	1153	7.9	694	8.1	NA	NA	832	7.6					1352	7.5	1468	7.6				
	505	8.01	1127	7.89	1287	7.9	669	8.1	NA	NA	698	7.8					1326	7.78	1468	7.6				
	505	8.01	1213	8	1152	7.8	481.2	8	1276	7.5	715	7.8					1713	7.96						
October 2017	1110	7.40	1187	8.00	1262	8	625	8.40	1030	7.45	783	7.60					1701	7.8						
	938	7.80	1180	7.50	1175	7.96	661	7.80	1176	7.5	795	7.40					1619	7.4	1046	7.2				
	855	8.20	314	8.20	1214	8	631	8.30	1228	7.8	785	7.90			188	7.9	812	7.4						
	847	7.80	1073	8.00	1086	8.2	613	8.10	938	7.8	900	7.20			461	8.2	376	6.9						
	954	7.80	1240	7.80	1132	8	430	8.30	1016	7.9	980	7.70			399	7.5	404	7.9						
November 2017	855	7.50	1246	8.10	1121	8.1	436	7.40	990	8	1015	7.40			374	8.1	521	7.3	1082	7.4	1052	7.8		
	878	7.80	989	7.40	1121	8.1	404	7.60	493	7.7	989	7.40			326	7.7	123	7.6			751	7.2		
	665	7.40	1102	7.70	1146	7.8	624	7.50	482	7.5	491	7.40			374	8.1	149	7.7	980	7.4	825	7.3		
	638	7.90	1090	7.80	1116	7.8	618	7.80	661	7.6	615	7.10	369	7.30	207	7.5	231	7.6						
December 2017	663	7.30	1350	7.70	1069	8.2	674	7.40	798	7.5	630	7.00	371	7.30	276	7.8	321	7.9	1161	7	825	7.3		
	337	7.10	1448	8.00	1016	7.9	981	7.80	982	7.8	587	7.10	404	7.00	392	7.9	511	7.6						
	636	7.90	1419	8.00	1081	7.9	864	7.40	939	7.8	689	7.30	413	7.50	595	7.6	379	7.9						
	645	7.80	1440	8.10	1181	7.7	714	7.60	1012	7.9	576	7.30	400	7.20	363	8.1	385	7.8						
January 2018	525	7.5	1410	7.80	1238	7.8	514	6.9	679	7.10	928	7.7	382	7.10	363	8.1	432	7.3	1202	7.1	1232	7.8		
	106	7	140	7.00	1339	7.5	424	7.2	775	7.00	316	7.6	486	7.4	158	7.6	238	6.5						
	41	8.5	1162	7.90	1080	7.5	310	7.4	737	7.20	631	7	451	7.4	159	7.5	245	8.1						
	375	8.2	601	7.80	876	7.3	360	7.9	354	7.60	720	7.2	480	7.6	246	7	81	7.9						
February 2018	38	7.6	1235	7.90	929	7.10	687	7.2	661	7.10	687	7.7	524	7.8	287	7.6	158	7.5	1311	6.8	1107	7		
	484	7.90	1383	8.00	826	7.30	444	7.1	717	7.60	720	7.7	615	7.8	437	7.9	140	6.7						
	511	8.00	1375	7.90	894	7.50	460	7.4	635	7.80	725	7.7	345	6.6	452	7.9	241	7.4						
	498	7.90	1369	7.70	1003	8.00	591	6.6	904	7.70	780	7.2	421	7.5	261	7.1	272	7.7						
March 2018	421	7.60	1468	7.50	1052	7.30	465	7.3	716	7.30	796	7.4	420	7.4	297	7.7	264	7.7						
	482	8.30	1276	7.90	940	7.80	806	7.3	649	7.60	890	8.1	455	7.8	199	8	263	7.3	1244	7.8	1201	7.4		
	470	8.20	1234	7.80	927	8.00	353	6.8	970	7.60	833	7.9	481	6.8	442	7.7	264	7.3						
	514	8.50	1318	8.30	962	8.00	653	7.3	675	7.80	704	8.2	531	7.3	510	7.8	320	7.4						
	369	8	1330	8.10	1012	8.00	943	8	943	8.1	684	8.2	608	7.4	232	8.3	339	7.7	1464	7				

Table 40
2017-2018 Annual Report

Field Conductivity (uS/cm) & pH (Rivers & Wetland)

EMS ID	E297230		E297231		E297232		E0126402		E0900504		E217017		E219412		E292112		E286930		E292113		E299256	
Site Name	Iron River Upstream Site 1		Iron River Site 6		Iron River Site 8		Mid Quinsam Lake Inlet		Mid Quinsam Lake Outlet		No Name Lake Outlet		Long Lake Outlet		Lower Wetland Outlet (7S)		Quinsam River Downstream 1		7 South Quinsam River		Iron River & Quinsam River	
Site Code	IR1		IR6		IR8		WA		WB		NNO		LLO		LWO		QRDS1		7SQR		IRQR	
	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH	Cond	pH
April 2017	69	7.7	54	7.9	54	8	42	7.8	143	7.7	32	7.5	374	7.4	46	7.6	159	7.8	145	7.8	107	7.5
	65	7.8	60	8	60	8	50	7.9	161	7.6	38	7.6	249	7.5	48	7.7	154	7.7	158	7.9	109	8.1
	71	8	57	7.5	62	7.6	48	8.3	180	7.7	47	7.7	162	7.6	52	7.2	176	8.2	154	7.3	109	7.4
	68	7.6	64	7.8	63	7.8	51	7.8	185	7.6	37	7.3	142	7.7	94	6.7	184	7.76	156	7.5	130	7.6
May 2017	66	8	64	7.9	64	8	47	7.7	168	7.8	36	7.6	174	7.7	84	7.7	178	7.9	171	7.9	116	7.9
June 2017	66	7.9	64	8	66	7.9					49	7.5							171	7.7	167	7.9
July 2017																						
	140	8.1	142	8.1	150	8	53	7.7	176	8.3	55.8	7.85	318	7.7	NF	NF	170	8.1	150	7.7	162	7.8
August 2017	176	7.8	177	8.3	186	8.3	48	7.8	177	8	43	7.8	322	7.7	NF	NF	176	8	186	7.5	182	7.6
	176	8.2	182	8.1	182	8.1	52	7.8	181	8.1	NF	NF	281	7.8	NF	NF	180	8.1	190	7.6	193	7.5
	168	8	172	8	172	8	50	7.4	159	8	NF	NF	305	7.7	NF	NF	160	7.9	187	7.7	167	7.7
	161	8.1	164	7.2	164	7.2	46	7.6	139	8	NF	NF	298	7.7	NF	NF	141	8	141	7.7	141	7.7
	160	7.6	163	7.5	162	7.5	46	7.6	147	8	NF	NF	251	7.8			148	8	168	7.8	156	7.8
September 2017																						
	214	8.2	220	8.3	216	8.3													176	8.4	178	8.3
October 2017																						
	191	7.9	173	8	206	8	48	7.1	169	7.4			358	7.4			186	8	172	7.8	171	7.6
	73	7.4	71	8	73	7.8	49	7.5	186	8.1			358	7.6			200	7.9	172	7.8	136	7.6
	99	7.3	66	7.6	64	7.8	38	7.8	205	7.9	41	6.9	282	7.3			200	7.3	194	7.9	163	7.2
	99	7.3	87	7.3	87	7.6	48	7.6	168	7.3	38	7	256	7.8	98	*5.7*	230	7.3	206	7.3	163	7.2
November 2017	103	7.4	80	7.3	82	7.3	47	7.3	182	8.1	55	7.3	271	7.5	98	*5.7*			192	7.2	158	7.3
											38	7.2			88	*5.8*						
											37	7			49	6.6						
											41	7.8			74	6.5						
December 2017																						
	86	7.3	69	7.8	67	7.6					27	8							96	7.2	85	7.5
January 2018																						
	60	7.2	40	7.5	40	7.5													142	7.2	98	6.9
February 2018																						
	81	8	72	8	77	7.6													178	7.5	162	7.5
March 2018																						
	60	7.8	60	7.8	50	8.4													174	8.4	134	8.3

Table 41
2017-2018 Annual Report

Relative Percent Difference Values Greater Than 20 %

Station	Date	Parameter	Detection Limit	Result1	Result2	RPD	Detection Limit X5	Any R > 5XDL?
LLM4	23/08/2017	Na-D	0.05	13.5	21.6	46.15	0.25	Yes
MQL1	08/11/2017	Al-D	0.003	0.0166	0.0114	37.14	0.015	Yes
IR6	18/10/2017	Cu-D	0.0002	0.00148	0.00215	36.91	0.001	Yes
LLM4	20/04/2017	Fe-D	0.005	0.0388	0.0541	32.94	0.025	Yes
LLEZ2	04/05/2017	Mn-T	0.001	0.0097	0.007	32.34	0.005	Yes
LLM4	23/08/2017	K-D	0.05	0.454	0.626	31.85	0.25	Yes
LLEZ2	04/05/2017	Al-T	0.003	0.0362	0.0264	31.31	0.015	Yes
LLM1	11/04/2017	Al-D	0.003	0.0279	0.0204	31.06	0.015	Yes
NNL1	16/11/2017	Mn-T	0.001	0.0238	0.0178	28.85	0.005	Yes
LLM1	11/04/2017	Sr-D	0.001	0.0473	0.0354	28.78	0.005	Yes
LQL1	02/11/2017	Turb	0.1	0.83	1.09	27.08	0.5	Yes
LQL4	20/04/2017	Fe-T	0.01	0.077	0.101	26.97	0.05	Yes
LLM4	20/04/2017	Turb	0.1	0.71	0.55	25.40	0.5	Yes
QRDS1	24/04/2017	Al-T	0.003	0.0188	0.0242	25.12	0.015	Yes
LLM1	11/04/2017	Fe-T	0.01	0.095	0.074	24.85	0.05	Yes
MQL1	08/11/2017	Al-T	0.003	0.017	0.0134	23.68	0.015	Yes
QRDS1	24/04/2017	Sr-T	0.001	0.055	0.0697	23.58	0.005	Yes
NNL1	16/11/2017	Al-T	0.003	0.0755	0.0602	22.55	0.015	Yes
QRDS1	24/04/2017	K-T	0.05	0.272	0.341	22.51	0.25	Yes
LLM4	23/08/2017	Sr-D	0.001	0.266	0.332	22.07	0.005	Yes
NNL1	07/09/2017	Turb	0.1	0.51	0.41	21.74	0.5	Yes
SPD	11/07/2017	Fe-D	0.005	0.196	0.159	20.85	0.025	Yes
MW001D	07/12/2017	Cu-D	0.0002	0.00161	0.00131	20.55	0.001	Yes
IR6	18/10/2017	Mn-T	0.001	0.0054	0.0044	20.41	0.005	Yes

All values with an RPD > 20% and one or more results greater than 5 X DL

Relative Percent Difference Values Greater Than 50 %

Station	Date	Parameter	Detection Limit	Result1	Result2	RPD	Detection Limit X5	Any R > 5XDL?
LLM4	23/08/2017	Mn-D	0.001	0.0017	0.0468	185.98	0.005	Yes
MQL1	08/11/2017	Cu-D	0.0002	0.00854	0.00062	172.93	0.001	Yes
NNL1	16/11/2017	Cd-T	0.00001	0.000063	0.00001	145.21	0.00005	Yes
NNL1	16/11/2017	Zn-T	0.005	0.0307	0.005	143.98	0.025	Yes
IR1	25/07/2017	Cu-T	0.0005	0.00107	0.00528	132.60	0.0025	Yes
LLM1	10/08/2017	Al-D	0.003	0.0086	0.0415	131.34	0.015	Yes
WA	04/04/2017	Cu-T	0.0005	0.00098	0.00349	112.30	0.0025	Yes
NNL1	15/08/2017	Fe-D	0.005	0.0939	0.029	105.61	0.025	Yes
NNL4	29/08/2017	Turb	0.1	0.32	0.99	102.29	0.5	Yes
LLEZ2	04/05/2017	Cu-T	0.0005	0.00983	0.0285	97.42	0.0025	Yes
LLEZ2	04/05/2017	Cu-D	0.0002	0.00256	0.0009	95.95	0.001	Yes
LLM4	23/08/2017	Fe-D	0.005	0.0115	0.0291	86.70	0.025	Yes
LLM4	23/08/2017	As-D	0.0001	0.00054	0.00025	73.42	0.0005	Yes
WB	12/04/2017	Cu-D	0.0002	0.00144	0.00069	70.42	0.001	Yes
NNO	03/05/2017	SO4-D	0.5	1.62	2.85	55.03	2.5	Yes

All values with an RPD > 50% and one or more results greater than 5 X DL

Table 42
2017-2018 Annual Report

Sample Blanks

Stn1	Smpl1	Date1	Class1	Param.Code	Result1	LMDL1	RPD	DL x 5	Result > 5xDL?
TB	TB-2Nov17-B	02/11/2017	B	Acidity83	8.9	1	159.6	5	Yes
TB	TB-2Nov17-B	02/11/2017	B	Acidity45	5.3	1	136.5	5	Yes
TB	TB-19Oct17-B	19/10/2017	B	SO4-D	3.1	1	102.4	5	No
TB	TB-7Sep17-B	07/09/2017	B	Zn-D	0.0146	0.005	98.0	0.025	No
TB	TB-7Sep17-B	07/09/2017	B	Cd-D	0.000011	0.000005	75.0	0.000025	No
TB	TB-7Sep17-B	07/09/2017	B	K-D	0.105	0.05	71.0	0.25	No
TB	TB-9Nov17-B	09/11/2017	B	Turb	0.2	0.1	66.7	0.5	No
EB	EB-8Nov17-B	08/11/2017	B	Turb	0.18	0.1	57.1	0.5	No
TB	TB-7Sep17-B	07/09/2017	B	Na-D	0.089	0.05	56.1	0.25	No
TB	TB-7Sep17-B	07/09/2017	B	Cu-D	0.00034	0.0002	51.9	0.001	No
EB	EB-19Oct17-B	19/10/2017	B	Acidity83	1.7	1	51.9	5	No
TB	TB-19Oct17-B	19/10/2017	B	Bicarb	1.6	1	46.2	5	No
TB	TB-7Sep17-B	07/09/2017	B	Al-D	0.0048	0.003	46.2	0.015	No
TB	TB-7Sep17-B	07/09/2017	B	Al-T	0.0044	0.003	37.8	0.015	No
TB	TB-19Oct17-B	19/10/2017	B	Alk-T	1.3	1	26.1	5	No
TB	TB-25May17-B	25/05/2017	B	Bicarb	0.61	0.5	19.8	2.5	No
TB	TB-19Oct17-B	19/10/2017	B	Cu-D	0.00023	0.0002	14.0	0.001	No
TB	TB-19Oct17-B	19/10/2017	B	Cu-T	0.00052	0.0005	3.9	0.0025	No

Notes: Red indicates an RPD greater than 50 % greater, orange idicates an RPD greater than 20 % and blue indicates an RPD greater than 2 %

Table 43
2017-2018 Annual Report

Daily Precipitation (mm)

DATE	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
1	7.20	1.60	1.50	0.00	0.00	0.00	0.10	0.10	4.00	0.40	3.00	2.20
2	5.10	1.90	0.10	0.00	0.00	0.00	0.00	0.00	1.80	1.70	6.30	1.60
3	0.00	3.50	1.20	0.00	0.00	0.00	0.00	6.30	0.10	9.40	8.20	0.00
4	0.00	4.40	0.00	0.00	0.00	0.00	0.00	0.70	0.10	3.50	4.70	0.10
5	9.40	0.30	0.00	0.00	0.00	0.00	0.00	3.80	0.00	9.90	0.20	0.00
6	4.70	0.00	0.00	0.00	0.00	0.00	0.00	1.90	0.20	2.90	5.40	0.00
7	11.20	4.10	0.00	0.00	0.00	0.40	0.00	9.80	0.20	3.20	3.00	0.00
8	28.30	0.10	0.00	0.00	0.00	0.00	0.00	13.30	0.30	4.00	1.60	0.00
9	1.20	3.30	5.10	0.00	0.00	3.90	0.10	3.20	0.00	4.10	0.00	5.60
10	2.10	0.00	0.00	0.00	0.00	0.10	1.10	0.00	0.00	0.00	0.20	0.60
11	5.30	1.20	0.10	0.00	0.00	2.40	0.30	5.30	0.10	4.70	0.00	0.00
12	0.00	4.30	0.00	0.00	0.80	0.00	0.00	8.50	0.00	2.80	0.00	0.10
13	9.50	4.50	0.00	0.10	0.40	0.00	0.00	34.40	0.00	3.10	0.00	0.00
14	3.40	5.50	1.80	0.00	0.00	0.00	0.00	16.30	0.20	0.50	7.90	1.10
15	0.30	5.40	0.80	0.00	0.00	0.00	0.00	7.90	0.10	3.40	0.10	0.10
16	3.40	7.00	6.50	0.00	0.10	0.00	4.10	0.60	3.50	2.00	1.60	0.00
17	0.00	9.20	0.80	0.00	0.00	6.70	9.70	0.10	8.60	37.60	15.40	0.00
18	2.00	0.00	0.00	0.00	0.00	5.50	12.50	5.60	0.10	26.40	0.00	6.60
19	2.00	0.20	0.40	5.50	0.00	4.40	10.90	34.30	0.70	0.50	0.10	0.00
20	11.00	0.00	3.90	8.80	0.00	0.00	14.20	1.50	1.70	37.50	0.40	0.00
21	2.00	0.00	0.30	2.20	0.00	0.00	13.00	23.30	0.00	58.50	0.50	0.00
22	0.00	0.00	0.00	0.60	1.40	0.00	11.00	10.90	0.10	1.90	0.5	1.00
23	2.20	0.00	0.00	0.00	2.30	0.00	8.30	1.00	0.00	10.30	4	2.80
24	1.60	0.00	0.00	0.00	0.00	0.80	5.50	13.50	0.00	2.70	1.4	0.00
25	0.00	0.00	0.00	0.00	0.00	6.80	2.40	9.60	0.10	4.00	0.8	1.00
26	0.80	0.00	0.00	0.00	0.00	0.20	0.30	16.30	0.00	0.50	1	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.00	11.80	0	10.20
28	0.60	0.00	0.00	0.00	0.00	0.00	0.10	9.80	0.00	35.40	0.2	1.40
29	0.10	0.00	0.00	0.00	0.00	0.10	0.00	4.90	0.00	2.60		0.00
30	4.90	0.00	0.00	0.00	0.80	0.20	0.00	6.20	0.00	3.40		6.30
31		0.00		0.00	0.00		0.00		0.00	0.20		0.10
Monthly Total (mm)	**118.30**	**56.50**	**22.50**	**17.20**	**5.80**	**31.50**	**93.70**	**249.30**	**21.90**	**288.90**	**66.50**	**40.80**
2017-18 Annual Total (mm)		**1012.90**										

Table 44
2017-2018 Annual Report

2012-13 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E01264O2		Average	0.000091	0.000074	0.0275	0.0196	18.8	0.00000375	0.00000375	0.00089	0.00073	0.0246	0.0119	0.0016	0.00070	0.0020010	0.0020010	19.2	0.00073	0.00050	0.000100	0.000100	1.905	0.00250	0.00339	0.00250	0.00250	0.0121	0.00923
		Count	10	10	10	10	42	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	42	10	10	7	8	7	7
		Minimum	<0.00010	<0.00010	0.0186	0.0127	14.2	<0.0000050	<0.0000050	0.0006	0.00049	0.0153	0.0071	0.0010	<0.0010	<0.000010	<0.000010	15.4	<0.001	<0.0010	<0.0002	<0.00020	<0.50	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00012	0.00012	0.056	0.0386	22.7	<0.00001	<0.000010	0.00167	0.00142	0.039	0.0202	0.0022	0.0015	<0.010	<0.010	20.5	0.0028	<0.0010	<0.0002	<0.00020	23.1	<0.005	0.0114	<0.0050	<0.0050	0.025	0.023
	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Geometric Mean	0.000086	0.000068	0.0259	0.0187	18.6	0.00000354	0.00000354	0.00082	0.00070	0.0239	0.0111	0.0016	0.00064	0.0005617	0.0005617	19.1	0.00059	0.00050	0.000100	0.000100	1.253	0.00250	0.00291	0.00250	0.00250	0.0114	0.00749
		Count <DL	3	6	0	0	0	10	10	0	0	0	0	0	7	10	10	0	9	10	10	10	4	10	9	7	8	6	1
		Standard Deviation	0.000029	0.000031	0.0114	0.0073	2.0	0.00000132	0.00000132	0.00039	0.00026	0.0061	0.0047	0.0004	0.00035	0.0021071	0.0021071	1.5	0.00073	0.00000	0.000000	0.000000	3.432	4E-11	0.00281	0.00000	3E-11	0.0057	0.00684
		1st Quartile	0.000062	<0.00010	0.0202	0.0154	17.4	<0.0000050	<0.0000050	0.00063	0.00058	0.0216	0.0080	0.0015	<0.0010	<0.0020	<0.0020	19.0	<0.0010	<0.0010	<0.00020	<0.00020	1.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0059
		Median	0.0001	<0.00010	0.0232	0.0180	18.0	0.00000375	0.00000375	0.00070	0.00071	0.0246	0.0104	0.0016	<0.0010	<0.0020	<0.0020	19.5	<0.0010	<0.0010	<0.00020	<0.00020	1.325	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0067
		3rd Quartile	0.000111	0.000108	0.0295	0.0208	20.3	<0.00001	<0.000010	0.00092	0.00075	0.0258	0.0155	0.0019	0.00088	0.0040000	0.0040000	20.1	<0.001	<0.0010	<0.0002	<0.00020	1.725	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.01030
WD		Average	0.00220	0.00145	0.0703	0.00935	341	0.0000149	0.0000105	0.00135	0.00090	0.380	0.00984	0.0669	0.05858	0.0027513	0.0029242	382	0.0033	0.0033	0.000100	0.000100	635	0.00250	0.00250	0.00425	0.00250	0.0324	0.04035
E207409		Count	12	13	12	13	46	12	13	12	13	12	13	12	13	12	13	12	12	13	12	13	53	12	13	11	11	11	11
		Minimum	0.00056	0.00048	0.0147	<0.0030	282	<0.00001	<0.000010	0.00050	0.00035	0.179	<0.0050	0.0252	<0.0010	<0.000010	<0.000010	248	0.0014	0.0014	<0.0002	<0.00020	370	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00824	0.00446	0.222	0.0239	441	0.000044	0.000021	0.0039	0.00357	0.673	0.0240	0.097	0.0988	<0.010	<0.010	600	0.0062	0.0057	<0.0002	<0.00020	977	<0.005	<0.0050	0.0076	<0.0050	0.067	0.13
	Settling Pond #4	Geometric Mean	0.00162	0.00117	0.0511	0.00684	340	0.0000113	0.0000090	0.00117	0.00073	0.339	0.00798	0.0621	0.04057	0.0005946	0.0007004	369	0.0030	0.0030	0.000100	0.000100	623	0.00250	0.00250	0.00381	0.00250	0.0224	0.02416
		Count <DL	0	0	0	2	0	6	8	0	0	0	2	0	1	12	13	0	0	0	12	13	0	12	13	6	11	6	1
		Standard Deviation	0.00222	0.00118	0.0638	0.00736	29	0.0000124	0.0000059	0.00089	0.00083	0.186	0.00652	0.0242	0.02875	0.0023773	0.0023600	107	0.0017	0.0014	0.000000	0.000000	122	1E-10	1E-10	1E-10	0.00207	1E-10	0.0260	0.03831
		1st Quartile	0.00101	0.00078	0.0375	0.0044	325	<0.000010	<0.000010	0.00087	0.00053	0.224	0.0059	0.0480	0.0472	0.0007512	<0.0020	298	0.0019	0.0022	<0.00020	<0.00020	536	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.01270
		Median	0.00136	0.00095	0.0470	0.0066	338	0.0000118	0.000012	0.00105	0.00068	0.334	0.0074	0.0695	0.0572	0.0030000	<0.010	358	0.0030	0.0027	<0.00020	<0.00020	647	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.030
		3rd Quartile	0.00195	0.00126	0.0699	0.0119	358	0.0000178	0.000015	0.00141	0.00096	0.546	0.0125	0.0895	0.0831	<0.010	<0.010	444	0.0043	0.0041	<0.0002	<0.00020	696	<0.005	<0.0050	0.00615	<0.0050	0.0575	0.06300
		Average	0.0240	0.0183	19.54	0.0388	91.6	0.000206	0.0000075	0.07093	0.00364	18.95	0.0100	0.4310	0.000528	0.0000150	0.0000050	22.8	0.01469	0.000375	0.002564	0.0000375	33.4	0.0469	0.00125	0.374	0.135		0.0125
MW001D		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		1
		Minimum	0.0185	0.0175	1.47	0.0350	91.6	0.000017	<0.000010	0.00886	0.00331	1.60	<0.010	0.0321	0.00021	<0.000010	<0.000010	21.3	0.00158	<0.00050	0.000229	<0.000050	28.8	0.0062	<0.0020	0.128	0.125		0.0125
		Maximum	0.0294	0.0190	37.6	0.0426	91.6	0.000396	<0.000020	0.133	0.00397	36.3	<0.030	0.830	0.000846	<0.000050	<0.000010	24.3	0.0278	<0.0010	0.00490	<0.00010	38.1	0.0876	<0.0030	0.619	0.145		0.0125
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean	0.0233	0.0182	7.43	0.0386	91.6	0.000082	0.0000071	0.03433	0.00363	7.62	0.0087	0.1632	0.000421	0.0000112	0.0000050	22.8	0.00663	0.000354	0.001059	0.0000354	33.1	0.0233	0.00122	0.281	0.135		0.0125
		Count <DL	0	0	0	0	0	0	2	0	0	0	2	0	0	2	2	0	0	2	0	2	0	0	2	0	0		0
		Standard Deviation	0.0077	0.0011	25.55	0.0054	0.0	0.000268	0.0000035	0.08778	0.00047	24.54	0.0071	0.5642	0.000450	0.0000141	0.0000000	2.1	0.01854	0.000177	0.003303	0.0000177	6.6	0.0576	0.00035	0.347	0.014		0.0000
		1st Quartile	0.0212	0.0179	10.50	0.0369	91.6	0.000112	0.0000062	0.03990	0.00348	10.27	0.0075	0.2316	0.000369	0.0000100	<0.000010	22.0	0.00814	0.000312	0.001397	0.0000312	31.1	0.0266	0.00113	0.251	0.130		0.0125
		Median	0.0240	0.0183	19.54	0.0388	91.6	0.000206	0.0000075	0.07093	0.00364	18.95	0.0100	0.4310	0.000528	0.0000150	0.0000050	22.8	0.01469	0.000375	0.002564	0.0000375	33.4	0.0469	0.00125	0.374	0.135		0.0125
		3rd Quartile	0.0267	0.0186	28.57	0.0407	91.6	0.000301	0.0000088	0.10196	0.00380	27.62	0.0125	0.6305	0.000687	0.0000200	<0.000010	23.6	0.02124	0.000438	0.003732	0.0000438	35.8	0.0672	0.00138	0.496	0.140		0.0125
MW001S		Average	0.024	0.0183	19.54000	0.0388	91.6	0.000206	0.000008	0.07093	0.00364	18.9500	0.01	0.431	0.000528	0.0000150	0.0000050	22.8	0.01469	0.000375	0.002564	0.0000375	33.4	0.0469	0.00125	0.37400	0.13500		0.0125
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		1
		Minimum	0.0185	0.0175	1.47	0.035	91.6	0.000017	<0.000010	0.00886	0.00331	1.6	<0.010	0.0321	0.00021	<0.000010	<0.000010	21.3	0.00158	<0.00050	0.000229	<0.000050	28.8	0.0062	<0.0020	0.128	0.125		0.0125
		Maximum	0.0294	0.019	37.6	0.0426	91.6	0.000396	<0.000020	0.133	0.00397	36.3	<0.030	0.830	0.000846	<0.000050	<0.000010	24.3	0.0278	<0.0010	0.0049	<0.00010	38.1	0.0876	<0.0030	0.619	0.145		0.0125
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean	0.0233	0.01820	7.43	0.0386	91.6	0.000082	0.0000071	0.034330	0.00363	7.62	0.0087	0.1632	0.000421	0.0000112	0.0000050	22.8	0.00663	0.000354	0.001059	0.0000354	33.1	0.0233	0.00122	0.281	0.135		0.0125
		Count <DL	0	0	0	0	0	0	2	0	0	0	2	0	0	2	2	0	0	2	0	2	0	0	2	0	0		0
		Standard Deviation	0.0077	0.0011	25.55	0.0054	0	0.000268	0.0000035	0.08778	0.00047	24.54	0.0071	0.5642	0.00045	0.0000141	0.0000000	2.1	0.01854	0.000177	0.003303	0.0000177	6.6	0.0576	0.00035	0.347	0.01400		0.0000
		1st Quartile	0.0212	0.0179	10.5	0.0369	91.6	0.000112	0.0000062	0.0399	0.00348	10.2700	0.0075	0.2316	0.000369	0.00001	<0.000010	22	0.00814	0.000312	0.001397	0.0000312	31.1	0.0266	0.00113	0.25100	0.13000		0.0125
		Median	0.024	0.0183	19.54000	0.0388	91.6	0.000206	0.000008	0.07093	0.00364	18.9500	0.01	0.431	0.000528	0.000015	<0.000010	22.8	0.01469	0.000375	0.002564	0.0000375	33.4	0.0469	0.00125	0.37400	0.13500		0.0125
		3rd Quartile	0.0267	0.0186	28.57	0.0407	91.6	0.0003010	0.0000088	0.10196	0.0038	27.62	0.0125	0.63050	0.000687	0.0000200	<0.000010	23.6	0.021240	0.000438	0.003732	0.0000438	35.8	0.0672	0.00138	0.496	0.14		0.0125
MW006D		Average	0.0278	0.0276	0.1057	0.0174	87.2	0.0000120	0.0000050	0.00173	0.00078	0.094	0.0100	0.00360	0.000238	0.0000050	0.0000050	51.9	0.000250	0.000250	0.000079	0.0000250	16.8	0.0035	0.00100	0.156	0.142		0.0061
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		1
		Minimum	0.0273	0.0268	0.0484	0.0174	87.2	<0.000010	<0.000010	0.00151	0.00065	0.043	<0.010	0.00185	0.000138	<0.000010	<0.000010	47.4	<0.00050	<0.00050	0.000057	<0.000050	13.1	0.0033	<0.0010	0.147	0.131		0.0061
		Maximum	0.0282	0.0285	0.163	0.0175	87.2	0.000019	<0.000010	0.00195	0.00092	0.145	<0.030	0.00535	0.000338	<0.000010	<0.000010	56.4	<0.00050	<0.00050	0.000100	<0.000050	20.4	0.0037	<0.0030	0.164	0.153		0.0061
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean	0.0277	0.0276	0.0888	0.0174	87.2	0.0000097	0.0000050	0.00172	0.00077	0.079	0.0087	0.00315	0.000216	0.0000050	0.0000050	51.7	0.000250	0.000250	0.000075	0.0000250	16.3	0.0035	0.00087	0.155	0.142		0.0061
		Count <DL	0	0	0	0	0	1	2	0	0	0	2	0	0	2	2	0	2	2	0	2	0	0	2	0	0		0
		Standard Deviation	0.0006	0.0012	0.0810	0.0001	0.0	0.0000099	0.0000000	0.00031	0.00019	0.072	0.0071	0.00247	0.000141	0.0000000	0.0000000	6.4	0.000000	0.000000	0.000030	0.0000000	5.2	0.0003	0.00071	0.012	0.016		0.0000
		1st Quartile	0.0275	0.0272	0.0771	0.0174	87.2	0.0000085	<0.000010	0.00162	0.00072	0.068	0.0075	0.00272	0.000188	<0.000010	<0.000010	49.6	<0.00050	<0.00050	0.000068	<0.000050	14.9	0.0034	0.00075	0.151	0.136		0.0061
		Median	0.0278	0.0276	0.1057	0.0174	87.2	0.0000120	<0.000010	0.00173	0.00078	0.094	0.0100	0.00360	0.000238	<0.000010	<0.000010	51.9	<0.00050	<0.00050	0.000079	<0.000050	16.8	0.0035	0.00100	0.156	0.142		0.0061
		3rd Quartile	0.0280	0.0281	0.1344	0.0175	87.2	0.0000155	<0.000010	0.00184	0.00085	0.120	0.0125	0.00448	0.000288	<0.000010	<0.000010	54.2	<0.00050	<0.00050	0.000089	<0.000050	18.6	0.0036	0.00125	0.160	0.148		0.0061
MW006S		Average	0.00152	0.00136	0.0437	0.00220	261.0	0.000035	0.000032	0.00126	0.000705	0.048	0.0100	0.0828	0.0723	0.0000050	0.0000050	675.5	0.00168	0.00151	0.0000545	0.0001115	849.0	0.00225	0.00220	0.0490	0.0442		0.0161
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.00127	0.00121	0.0404	0.0014	261	0.000023	0.000018	0.00111	<0.0010	0.044	<0.010	0.0226	0.0176	<0.000010	<0.000010	656	0.00107	0.00093	<0.00010	<0.00010	842	<0.0030	0.0014	0.0458	0.0384		0.0063
		Maximum	0.00177	0.00150	0.0470	<0.0060	261	0.000047	0.000046	0.0014	0.00091	0.051	<0.030	0.143	0.127	<0.000010	<0.000010	695	0.0023	0.0021	0.000059	0.000173	856	<0.0060	<0.0060	0.0522	0.050		0.0260
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean	0.00150	0.00135	0.0436	0.00205	261.0	0.000033	0.000029	0.00125	0.000675	0.047	0.0087	0.0568	0.0473	0.0000050	0.0000050	675.2	0.00157	0.00140	0.0000543	0.0000930	849.0	0.00212	0.00205	0.0489	0.0438		0.0128
		Count <DL	0	0	0	1	0	0	0	0	1	0	2	0	0	2	2	0	0	1	1	0	2	1	0	0	0		0
		Standard Deviation	0.00035	0.00021	0.0047	0.00113	0.0	0.000017	0.0000020	0.00021	0.000290	0.005	0.0071	0.0851	0.0774	0.0000000	0.0000000	27.6	0.00087	0.00083	0.0000064	0.0000870	9.9	0.00106	0.00113	0.0045	0.0082		0.0139
		1st Quartile	0.00140	0.00128	0.0420	0.00180	261	0.000029	0.000025	0.00118	0.000602	0.046	0.0075	0.0527	0.0450	<0.000010	<0.000010	665.8	0.00138	0.00122	0.0000522	0.0000808	845.5	0.00188	0.00180	0.0474	0.0413		0.0112
		Median	0.00152	0.00136	0.0437	0.00220	261	0.000035	0.000032	0.00126	0.000705	0.048	0.0100	0.0828	0.0723	<0.000010	<0.000010	675.5	0.00168	0.00151	0.0000545	0.0001115	849.0	0.00225	0.00220	0.0490	0.0442		0.0161
		3rd Quartile	0.00165	0.00143	0.0454	0.00260	261	0.000041	0.000039	0.00133	0.000808	0.049	0.0125	0.1129	0.0996	<0.000010	<0.000010	685.2	0.00199	0.00181	0.0000568	0.0001423	852.5	0.00262	0.00260	0.0506	0.0471		0.0211
WC		Average	0.00107	0.00092	0.0221	0.0084	306	0.0000078	0.0000064	0.00063	0.000573	0.1218	0.02321	0.0249	0.0137	0.0030009	0.0030009	325	0.00129	0.00102	0.000100	0.000100	598	0.00250	0.00400	0.00385	0.00250	0.0590	0.140
E207411		Count	11	11	11	11	42	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	44	11	11	2	18	5	2
		Minimum	0.00031	0.00038	0.0073	0.0044	256	<0.00001	<0.000010	0.00034	<0.00020	0.0552	<0.0050	0.0127	0.0015	<0.000010	<0.000010	182	<0.0010	<0.0010	<0.0002	<0.00020	345	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.019
		Maximum	0.00249	0.00206	0.058	0.0142	405	0.000020	<0.000025	0.00104	0.00119	0.205	0.0896	0.0478	0.0346	<0.010	<0.010	439	0.0022	0.0019	<0.0002	<0.00020	817	<0.005	0.0190	0.0052	<0.0050	0.098	0.26
	2-North Pit Culvert discharge into Middle Quinsam Lake	Geometric Mean	0.00091	0.00081	0.0189	0.0078	305	0.0000068	0.0000059	0.00060	0.000503	0.1140	0.01537	0.0228	0.0102	0.0009181	0.0009181	316	0.00112	0.00088	0.000100	0.000100	585	0.00250	0.00301	0.00361	0.00250	0.0468	0.070
		Count <DL	0	0	0	0	0	9	11	0	1	0	1	0	0	11	11	0	3	5	11	11	0	11	10	1	18	1	0
		Standard Deviation	0.00067	0.00056	0.0141	0.0035	27	0.0000050	0.0000030	0.00021	0.000267	0.0453	0.02479	0.0115	0.0101	0.0023225	0.0023225	72	0.00066	0.00054	0.000000	0.000000	121	1E-10	0.00497	0.00191	3E-11	0.0328	0.170
		1st Quartile	0.00074	0.00060	0.0144	0.0058	290	<0.000010	<0.000010	0.00044	0.000480	0.0996	0.01020	0.0175	0.0067	<0.0020	<0.0020	284	0.00075	<0.0010	<0.00020	<0.00020	503	<0.0050	<0.0050	0.00318	<0.0050	0.047	0.079
		Median	0.0009	0.00068	0.0170	0.0070	299	<0.00001	<0.000010	0.00072	0.00052	0.106	0.0137	0.0203	0.0120	<0.010	<0.010	318	0.0011	0.0012	<0.00020	<0.00020	607	<0.0050	<0.0050	0.00385	<0.0050	0.068	0.140
		3rd Quartile	0.00106	0.00096	0.0266	0.0105	315	0.0000092	<0.000010	0.00074	0.000650	0.1510	0.02735	0.0298	0.0188	<0.010	<0.010	367	0.00180	0.0013	<0.0002	<0.00020	693	<0.005	<0.0050	0.00452	<0.0050	0.072	0.200
MQL1		Average	0.000142	0.0001290	0.0224	0.0173	28.0	0.0000575	0.00000458	0.000934	0.001375	0.0469	0.0226	0.0069	0.00430	0.00350035	0.00320020	27.5	0.000688	0.0004292	0.00008442	0.00010875	13.74	0.005723	0.005943	0.00447	0.00250	0.0120	0.02810
E206618		Count	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6
		Minimum	0.00010	<0.00010	0.0180	0.0119	23.5	<0.0000050	<0.0000050	0.000541	0.000512	0.0366	0.0140	0.0039	<0.0010	0.0000021	<0.0000020	22.5	<0.0010	0.000075	0.0000065	<0.0000050	6.34	0.00134	0.00066	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00018	0.00016	0.0357	0.0258	39.1	0.000017	0.000010	0.00211	0.00285	0.0551	0.0340	0.0118	0.0109	<0.010	<0.010	35.1	0.00163	<0.0010	<0.00020	0.00025	30.2	0.0120	0.0126	0.0117	<0.0050	0.022	0.048
	Middle Quinsam Lake 1 metre below surface	Geometric Mean	0.000139	0.0001203	0.0217	0.0168	27.5	0.0000434	0.00000397	0.000829	0.001071	0.0464	0.0216	0.0065	0.00300	0.00104637	0.00065975	27.2	0.000609	0.0003645	0.00006341	0.00006300	11.85	0.004271	0.004203	0.00364	0.00250	0.0114	0.01903
		Count <DL	0	1	0	0	0	5	5	0	0	0	0	0	1	5	5	0	5	5	5	5	0	2	1	4	6	5	1
		Standard Deviation	0.000029	0.0000431	0.0067	0.0048	5.8	0.00000565	0.00000292	0.000589	0.001077	0.0073	0.0075	0.0028	0.00359	0.00234458	0.00248966	4.5	0.000461	0.0001735	0.00003817	0.00007943	8.84	0.004404	0.004352	0.00369	0.00000	0.0049	0.01840
		1st Quartile	0.000125	0.0001175	0.0186	0.0146	24.3	<0.0000050	<0.0000050	0.000615	0.000610	0.0417	0.0173	0.0056	0.00230	0.00200000	<0.0020	24.7	<0.0010	<0.0010	<0.00020	<0.00020	7.86	<0.0050	0.003175	<0.0050	<0.0050	<0.020	0.01432
		Median	0.000145	0.0001470	0.0200	0.0164	26.1	0.00000375	0.00000375	0.000760	0.000835	0.0482	0.0216	0.0060	0.00390	<0.010	<0.010	27.1	<0.0010	<0.0010	<0.00020	<0.00020	11.40	0.004300	0.005400	<0.0050	<0.0050	<0.020	0.03550
		3rd Quartile	0.000158	0.0001585	0.0219	0.0185	28.4	<0.000010	<0.000010	0.000837	0.002222	0.0523	0.0270	0.0077	0.00460	<0.010	<0.010	28.9	<0.0010	<0.0010	<0.00020	<0.00020	15.18	0.008950	0.008225	0.00445	<0.0050	<0.020	0.03875
MQLB		Average	0.000127	0.0001202	0.0173	0.01324	45.4	0.00000375	0.00000375	0.00081	0.000498	0.0317	0.0100	0.0076	0.00443	0.00350017	0.00320020	53.0	0.0004635	0.0004292	0.00008847	0.00008375	54.5	0.002360	0.002153	0.00250	0.00250	0.0120	0.0310
E206618		Count	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6
		Minimum	0.00010	<0.00010	0.0093	0.0047	44.6	<0.0000050	<0.0000050	0.00047	0.00037	0.0190	0.0076	0.0022	<0.0010	<0.0000020	<0.0000020	49.8	0.000281	0.000075	0.0000308	<0.0000050	51.6	0.00166	0.00042	<0.0050	<0.0050	<0.020	0.0052
		Maximum	0.00017	0.00017	0.0353	0.0380	46.1	<0.000010	<0.000010	0.00156	0.00065	0.0395	0.0128	0.0198	0.0168	<0.010	<0.010	59.6	<0.0010	<0.0010	<0.00020	<0.00020	56.5	<0.0050	<0.0050	<0.0050	<0.0050	0.022	0.047
	Middle Quinsam Lake 1 metre from bottom	Geometric Mean	0.000125	0.0001128	0.0156	0.01024	45.4	0.00000354	0.00000354	0.00073	0.000490	0.0306	0.0098	0.0059	0.00208	0.00092466	0.00065975	52.9	0.0004542	0.0003645	0.00008218	0.00005407	54.5	0.002335	0.001857	0.00250	0.00250	0.0114	0.0247
		Count <DL	0	1	0	0	0	6	6	0	0	0	0	0	2	6	5	0	5	5	5	6	0	5	5	6	6	5	0
		Standard Deviation	0.000027	0.0000401	0.0095	0.01241	0.6	0.00000137	0.00000137	0.00043	0.000101	0.0085	0.0022	0.0064	0.00624	0.00234491	0.00248966	3.5	0.0000894	0.0001735	0.00002825	0.00003980	1.7	0.000343	0.000849

Table 45
2017-2018 Annual Report

2012-13 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EZ17018		Average	0.000419	0.000380	0.0200	0.0142	15.6	0.00001265	0.00000312	0.000520	0.000514	0.0827	0.0498	0.00617	0.00210	0.00375025	0.00375025	17.8	0.0003948	0.0003912	0.00008045	0.00007663	3.48	0.003452	0.002008	0.00402	0.00530	0.0177	0.060
		Count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Minimum	0.00039	0.00026	0.0113	0.0083	14.3	<0.0000050	<0.0000050	0.00039	0.00042	0.0637	0.0413	0.00507	0.00119	<0.0000020	<0.0000020	16.5	0.000079	0.000065	0.0000218	0.0000065	2.92	0.00101	0.00053	<0.0050	<0.0050	<0.020	0.014
		Maximum	0.00045	0.00044	0.0266	0.0175	16.6	0.0000351	<0.000010	0.00067	0.00077	0.0954	0.0577	0.0088	0.0036	<0.010	<0.010	19.0	<0.0010	<0.0010	<0.00020	<0.00020	3.97	0.0078	<0.0050	0.0086	0.0137	0.030	0.18
	No Name Lake 1 metre below surface	Geometric Mean	0.000418	0.000373	0.0190	0.0136	15.6	0.00000770	0.00000297	0.000506	0.000496	0.0818	0.0493	0.00600	0.00192	0.00059460	0.00059460	17.8	0.0003152	0.0003002	0.00006833	0.00005049	3.45	0.002649	0.001696	0.00340	0.00383	0.0158	0.034
		Count <DL	0	0	0	0	0	2	4	0	0	0	0	0	0	4	4	0	3	3	3	3	0	2	3	3	3	2	0
		Standard Deviation	0.000030	0.000082	0.0067	0.0040	1.0	0.00001513	0.00000125	0.000136	0.000171	0.0136	0.0086	0.00178	0.00105	0.00249950	0.00249950	1.1	0.0002105	0.0002175	0.00003910	0.00004675	0.43	0.002982	0.000985	0.00305	0.00560	0.0097	0.080
		1st Quartile	0.000395	0.000366	0.0166	0.0135	15.3	0.00000438	<0.0000050	0.000412	0.000424	0.0782	0.0430	0.00509	0.00150	0.00375025	0.00375025	17.2	0.0003948	0.0003912	0.00008045	0.00007663	3.35	0.002128	0.002008	<0.0050	<0.0050	<0.020	0.019
		Median	0.000419	0.000410	0.0210	0.0154	15.8	0.00000650	<0.0000050	0.000509	0.000432	0.0858	0.0502	0.00540	0.00180	<0.010	<0.010	17.9	<0.0010	<0.0010	<0.00020	<0.00020	3.50	<0.0050	<0.0050	<0.0050	<0.0050	0.0155	0.023
		3rd Quartile	0.000442	0.000425	0.0245	0.0161	16.1	0.00001478	0.00000312	0.000617	0.000522	0.0903	0.0570	0.00648	0.00240	<0.010	<0.010	18.5	<0.0010	<0.0010	<0.00020	<0.00020	3.63	0.003825	<0.0050	0.00402	0.00530	0.0232	0.064
NNL8		Average	0.000204	0.000163	0.0254	0.0190	13.2	0.00000498	0.00000312	0.000459	0.000446	0.125	0.0555	0.0536	0.0467	0.00375025	0.00375025	30.6	0.0003898	0.0003925	0.00007748	0.00007563	16.2	0.002052	0.002020	0.00250	0.00250	0.056	0.0249
EZ17018		Count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Minimum	0.00016	0.00013	0.0191	0.0148	11.4	<0.0000050	<0.0000050	0.000356	0.000306	0.100	0.0473	0.0429	0.0383	<0.0000020	<0.0000020	27.7	0.000059	0.000070	0.0000099	<0.0000050	13.7	0.00071	0.00058	<0.0050	<0.0050	0.039	0.0065
		Maximum	0.00024	0.00022	0.0327	0.0211	14.7	0.0000064	<0.000010	0.00062	0.00063	0.183	0.0688	0.0616	0.0523	<0.010	<0.010	32.0	<0.0010	<0.0010	<0.00020	<0.00020	17.6	<0.0050	<0.0050	<0.0050	<0.0050	0.069	0.060
	No Name Lake 1 metre from bottom	Geometric Mean	0.000201	0.000160	0.0249	0.0188	13.2	0.00000468	0.00000297	0.000449	0.000432	0.121	0.0548	0.0532	0.0464	0.00059460	0.00059460	30.5	0.0002930	0.0003058	0.00005609	0.00003976	16.1	0.001825	0.001735	0.00250	0.00250	0.055	0.0180
		Count <DL	0	0	0	0	0	2	4	0	0	0	0	0	0	4	4	0	3	3	3	4	0	3	3	4	4	0	0
		Standard Deviation	0.000036	0.000039	0.0056	0.0029	1.4	0.00000175	0.00000125	0.000115	0.000136	0.039	0.0102	0.0078	0.0062	0.00249950	0.00249950	2.0	0.0002205	0.0002150	0.00004505	0.00004875	1.7	0.000895	0.000960	0.00000	0.00000	0.013	0.0239
		1st Quartile	0.000183	0.000145	0.0229	0.0186	12.7	0.00000438	<0.0000050	0.000389	0.000376	0.102	0.0476	0.0518	0.0441	0.00375025	0.00375025	30.1	0.0003898	0.0003925	0.00007748	0.00007563	15.9	0.002052	0.002020	<0.0050	<0.0050	0.051	0.0136
		Median	0.000208	0.000151	0.0248	0.0200	13.4	0.00000550	<0.0000050	0.000430	0.000425	0.108	0.0530	0.0550	0.0481	<0.010	<0.010	31.2	<0.0010	<0.0010	<0.00020	<0.00020	16.8	<0.0050	<0.0050	<0.0050	<0.0050	0.057	0.0165
		3rd Quartile	0.000229	0.000169	0.0273	0.0205	14.0	0.00000610	0.00000312	0.000500	0.000495	0.130	0.0608	0.0569	0.0507	<0.010	<0.010	31.7	<0.0010	<0.0010	<0.00020	<0.00020	17.1	<0.0050	<0.0050	<0.0050	<0.0050	0.062	0.0278
NNO		Average	0.00035	0.00031	0.0502	0.0261	13.35	0.00001835	0.00000885	0.00065	0.00069	0.1286	0.0762	0.0161	0.0129	0.0026510	0.0024010	16.3	0.00056	0.00050	0.000100	0.000100	3.81	0.00366	0.00318	0.00311		0.0135	0.0142
EZ17017		Count	10	10	10	10	42	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	42	10	10	8		8	8
		Minimum	0.0002	0.00018	0.0139	0.0069	9.93	<0.0000050	<0.0000050	0.00039	0.00050	0.0523	0.0326	0.0041	0.0020	<0.000010	<0.000010	12.7	<0.001	<0.0010	<0.0002	<0.00020	0.80	<0.005	<0.0050	<0.0050		<0.020	0.0051
		Maximum	0.00044	0.00044	0.147	0.0507	17.3	0.000120	0.0000480	0.00111	0.00105	0.312	0.205	0.0912	0.0951	<0.010	<0.010	19.4	0.0011	<0.0010	<0.0002	<0.00020	6.61	0.0104	0.0093	0.0074		0.027	0.021
	No Name Lake Outlet	Geometric Mean	0.00034	0.00030	0.0367	0.0220	13.16	0.00000824	0.00000534	0.00062	0.00067	0.1077	0.0643	0.0089	0.0051	0.0007759	0.0006598	16.1	0.00054	0.00050	0.000100	0.000100	3.40	0.00316	0.00285	0.00286		0.0124	0.0123
		Count <DL	0	0	0	0	6	8	8	0	0	0	0	0	0	8	10	0	9	10	10	10	0	8	9	7		6	0
		Standard Deviation	0.00008	0.00008	0.0434	0.0146	2.25	0.00003594	0.00001386	0.00021	0.00018	0.0880	0.0548	0.0268	0.0289	0.0021564	0.0022694	2.5	0.00019	0.00000	0.000000	0.000000	1.51	0.00264	0.00215	0.00173		0.0067	0.0069
		1st Quartile	0.00030	0.00025	0.0188	0.0165	11.27	<0.000010	0.00000312	0.00052	0.00053	0.0778	0.0498	0.0053	0.0032	<0.0020	<0.0020	14.8	<0.0010	<0.0010	<0.00020	<0.00020	2.97	<0.0050	<0.0050	<0.0050		<0.020	0.0074
		Median	0.00036	0.00032	0.0334	0.0242	13.2	<0.000010	<0.000010	0.00060	0.00070	0.0882	0.0574	0.0067	0.0041	0.0022500	<0.0020	16.2	<0.0010	<0.0010	<0.00020	<0.00020	4.10	<0.005	<0.0050	<0.0050		<0.020	0.0170
		3rd Quartile	0.00041	0.00036	0.0731	0.0360	15.18	0.00001100	<0.000010	0.00076	0.00080	0.1502	0.0641	0.0084	0.0048	<0.010	<0.010	18.5	<0.001	<0.0010	<0.0002	<0.00020	4.59	<0.0050	<0.0050	<0.0050		0.0128	0.020
LL5		Average	0.00573	0.00302	0.0340	0.00667	220.9	0.00000880	0.00000910	0.000511	0.001017	1.728	0.49360	0.377	0.368	0.0024010	0.0024010	552	0.0024	0.0026	0.000100	0.000119	546	0.00295	0.00365				
EZ92131		Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10				
		Minimum	0.00171	0.00101	0.0047	<0.0030	163	<0.0000050	<0.0000050	<0.00020	<0.00020	0.726	<0.0050	0.203	0.211	<0.000010	<0.000010	484	0.0012	0.0010	<0.0002	<0.00020	410	<0.0050	<0.0050				
		Maximum	0.00894	0.00554	0.255	0.0244	242	0.00002	0.000022	0.0021	0.00505	3.02	1.67	0.544	0.541	<0.010	<0.010	633	0.007	0.0067	<0.0002	0.00029	660	0.007	0.0096				
	Small Seep into Long Lake	Geometric Mean	0.00513	0.00256	0.0119	0.00456	219.7	0.00000649	0.00000659	0.000347	0.000579	1.622	0.06304	0.361	0.348	0.0006598	0.0006598	550	0.0021	0.0023	0.000100	0.000111	539	0.00277	0.00317				
		Count <DL	0	0	0	3	0	7	7	2	1	0	3	0	0	10	10	0	0	0	10	9	0	9	8				
		Standard Deviation	0.00244	0.00165	0.0778	0.00681	22.2	0.00000687	0.00000735	0.000581	0.001464	0.615	0.66634	0.111	0.122	0.0022694	0.0022694	48	0.0017	0.0017	0.000000	0.000060	93	0.00142	0.00251				
		1st Quartile	0.00466	0.00141	0.0061	0.00215	221.2	0.00000312	0.00000312	0.000232	0.000378	1.540	0.00338	0.318	0.242	<0.0020	<0.0020	520	0.0016	0.0015	<0.00020	<0.00020	470	<0.0050	<0.0050				
		Median	0.00576	0.00321	0.0090	0.0050	224.5	<0.000010	<0.000010	0.000425	0.000470	1.745	0.12325	0.400	0.398	<0.0020	<0.0020	540	0.0020	0.0022	<0.00020	<0.00020	555	<0.0050	<0.0050				
		3rd Quartile	0.00728	0.00423	0.0125	0.00805	230.8	0.00001438	0.00001512	0.00047	0.000890	1.925	1.05400	0.442	0.457	<0.010	<0.010	587	0.0022	0.0032	<0.0002	<0.00020	630	<0.0050	<0.0050				
LL5M		Average	0.00330	0.00160	0.03229	0.00900	207	0.00000829	0.00000663	0.000768	0.00057	1.112	0.17700	0.2705	0.2701	0.0021675	0.0021675	489	0.0026	0.0025	0.000163	0.000238	465	0.00358	0.00337				
EZ92131		Count	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
		Minimum	0.00083	0.00050	<0.0030	<0.0030	134	<0.0000050	<0.0000050	<0.00020	0.00024	0.232	<0.0050	0.0900	0.0929	<0.000010	<0.000010	386	0.0013	0.0012	<0.0002	<0.00020	324	<0.0050	<0.0050				
		Maximum	0.00841	0.00260	0.211	0.0241	241	0.0000440	0.000020	0.0021	0.00120	1.92	0.663	0.389	0.400	<0.010	<0.010	565	0.005	0.0052	0.00086	0.00175	611	0.0093	0.0096				
	Long Lake Middle Seep	Geometric Mean	0.00264	0.00146	0.01151	0.00648	204	0.00000546	0.00000517	0.000507	0.00050	0.960	0.02743	0.2492	0.2498	0.0007071	0.0007071	487	0.0023	0.0023	0.000120	0.000127	459	0.00319	0.00300				
		Count <DL	0	0	1	2	0	9	10	2	0	0	3	0	0	12	12	0	0	0	11	11	0	9	10				
		Standard Deviation	0.00242	0.00064	0.05950	0.00756	29	0.00001157	0.00000542	0.000680	0.00030	0.568	0.26660	0.0989	0.0972	0.0021240	0.0021240	43	0.0013	0.0013	0.000219	0.000476	79	0.00217	0.00219				
		1st Quartile	0.00169	0.00129	0.00382	0.00418	201	0.00000438	<0.0000050	0.000338	0.00038	0.717	0.00670	0.2270	0.2160	<0.0020	<0.0020	475	0.0015	0.0016	<0.00020	<0.00020	436	<0.0050	<0.0050				
		Median	0.00254	0.00154	0.01085	0.00775	209	<0.000010	<0.000010	0.000475	0.00050	0.948	0.01040	0.2735	0.2710	<0.0020	<0.0020	492	0.0023	0.0022	<0.00020	<0.00020	470	<0.0050	<0.0050				
		3rd Quartile	0.00378	0.00209	0.02210	0.00962	222	<0.000010	0.00000675	0.001080	0.00066	1.517	0.31325	0.3570	0.3582	<0.010	<0.010	512	0.0033	0.0028	<0.00020	<0.00020	508	0.00318	<0.0050				
MW002		Average	0.00034	0.00024	0.00300	0.00233	223.5	0.0000100	0.0000100	0.00050	0.000400	0.684	0.658	2.80	2.77	0.0000050	0.0000050	1230	0.0042	0.0040	0.000050	0.000050	1230	0.00300	0.00233	0.00400	0.05890		
		Count	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
		Minimum	0.00025	0.00022	<0.0060	<0.0020	211	<0.000020	<0.000020	<0.0010	<0.00040	0.466	0.426	2.37	2.34	<0.000010	<0.000010	1170	0.0037	0.0034	<0.00010	<0.00010	1160	<0.0060	<0.0020	<0.0020	0.0017		
		Maximum	0.00044	0.00027	<0.0060	<0.0060	236	<0.000020	<0.000020	<0.0010	<0.0010	0.933	0.881	3.16	3.19	<0.000010	<0.000010	1280	0.0046	0.0044	<0.00010	<0.00010	1280	<0.0060	<0.0060	<0.020	<0.30		
	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Geometric Mean	0.00033	0.00024	0.00300	0.00208	223.2	0.0000100	0.0000100	0.00050	0.000368	0.657	0.631	2.78	2.75	0.0000050	0.0000050	1229	0.0042	0.0040	0.000050	0.000050	1228	0.00300	0.00208	0.00215	0.01854		
		Count <DL	0	0	3	3	0	3	3	3	3	0	0	0	0	3	2	0	0	0	3	3	0	3	3	3	2		
		Standard Deviation	0.00010	0.00003	0.00000	0.00115	17.7	0.0000000	0.0000000	0.00000	0.000173	0.235	0.228	0.40	0.43	0.0000000	0.0000000	55	0.0005	0.0005	0.0000000	0.0000000	62	0.00000	0.00115	0.00520	0.07975		
		1st Quartile	0.00029	0.00022	<0.0060	0.00200	217.2	<0.000020	<0.000020	<0.0010	0.000350	0.559	0.547	2.62	2.56	<0.000010	<0.000010	1205	0.0040	0.0038	<0.00010	<0.00010	1205	<0.0060	0.00200	<0.0020	0.01335		
		Median	0.00033	0.00023	<0.0060	<0.0060	223.5	<0.000020	<0.000020	<0.0010	<0.0010	0.652	0.668	2.87	2.78	<0.000010	<0.000010	1240	0.0042	0.0042	<0.00010	<0.00010	1250	<0.0060	<0.0060	<0.0020	<0.050		
		3rd Quartile	0.00038	0.00025	<0.0060	<0.0060	229.8	<0.000020	<0.000020	<0.0010	<0.0010	0.792	0.774	3.02	2.98	<0.000010	<0.000010	1260	0.0044	0.0043	<0.00010	<0.00010	1265	<0.0060	<0.0060	0.00550	0.08750		
QU1009D		Average	0.119	0.122	0.00370	0.00310		0.0000050	0.0000050	0.000250	0.000100	0.214	0.210	0.0246	0.0233	0.0000050	0.0000050	161.5	0.000250	0.000250	0.0000250	0.0000250	100.4	0.00150	0.00050	0.0084	0.0250		0.140
		Count	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		1
		Minimum	0.119	0.120	<0.0030	<0.0010		<0.000010	<0.000010	<0.00050	<0.00020	0.202	0.196	0.0214	0.0202	<0.000010	<0.000010	158	<0.00050	<0.00050	<0.0000050	<0.000050	96.9	<0.0030	<0.0010	0.0076	<0.050		0.140
		Maximum	0.119	0.123	0.0059	0.0057		<0.000010	<0.000010	<0.00050	<0.00020	0.225	0.223	0.0277	0.0264	<0.000010	<0.000010	165	<0.00050	<0.00050	<0.0000050	<0.000050	104	<0.0030	<0.0010	0.0091	<0.050		0.140
	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Geometric Mean	0.119	0.121	0.00297	0.00169		0.0000050	0.0000050	0.000250	0.000100	0.213	0.209	0.0243	0.0231	0.0000050	0.0000050	161.5	0.000250	0.000250	0.0000250	0.0000250	100.4	0.00150	0.00050	0.0083	0.0250		0.140
		Count <DL	0	0	1	1		2	2	2	2	0	0	0	0	2	2	0	2	2	2	2	0	2	2	0	2		0
		Standard Deviation	0.000	0.002	0.00311	0.00368		0.0000000	0.0000000	0.000000	0.000000	0.016	0.019	0.0045	0.0044	0.0000000	0.0000000	4.9	0.000000	0.000000	0.0000000	0.0000000	5.0	0.00000	0.00000	0.0011	0.0000		0.000
		1st Quartile	0.119	0.121	0.00260	0.00180		<0.000010	<0.000010	<0.00050	<0.00020	0.208	0.203	0.0230	0.0217	<0.000010	<0.000010	159.8	<0.00050	<0.00050	<0.0000050	<0.000050	98.7	<0.0030	<0.0010	0.0080	<0.050		0.140
		Median	0.119	0.122	0.00370	0.00310		<0.000010	<0.000010	<0.00050	<0.00020	0.214	0.210	0.0246	0.0233	<0.000010	<0.000010	161.5	<0.00050	<0.00050	<0.0000050	<0.000050	100.4	<0.0030	<0.0010	0.0084	<0.050		0.140
		3rd Quartile	0.119	0.122	0.00480	0.00440		<0.000010	<0.000010	<0.00050	<0.00020	0.219	0.216	0.0261	0.0248	<0.000010	<0.000010	163.2	<0.00050	<0.00050	<0.0000050	<0.000050	102.2	<0.0030	<0.0010	0.0087	<0.050		0.140
QU1009S		Average	0.0948	0.0938	0.134	0.00080		0.0000050	0.0000050	0.000250	0.000100	5.83	5.56	0.403	0.399	0.0000050	0.0000050	231.0	0.000415	0.000400	0.000076	0.0000250	103.0	0.00150	0.00050	0.0118	0.0250		0.0384
		Count	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.0845	0.0805	0.117	<0.0010		<0.000010	<0.000010	<0.00050	<0.00020	5.47	5.23	0.387	0.388	<0.000010	<0.000010	227	<0.00050	<0.00050	0.000066	<0.0000050	103	<0.0030	<0.0010	0.0117	<0.050		0.0349
		Maximum	0.105	0.107	0.152	0.0011		<0.000010	<0.000010	<0.00050	<0.00020	6.19	5.88	0.419	0.411	<0.000010	<0.000010	235	0.00058	0.00055	0.000087	<0.0000050	103	<0.0030	<0.0010	0.0120	<0.050		0.0420
	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Geometric Mean	0.0942	0.0928	0.133	0.00074		0.0000050	0.0000050	0.000250	0.000100	5.82	5.55	0.403	0.399	0.0000050	0.0000050	231.0	0.000381	0.000371	0.000076	0.0000250	103.0	0.00150	0.00050	0.0118	0.0250		0.0383
		Count <DL	0	0	0	1		2	2	2	2	0	0	0	0	2	2	0	1	1	0	2	0	2	2	0	2		0
		Standard Deviation	0.0145	0.0187	0.025	0.00042		0.0000000	0.0000000	0.000000	0.000000	0.51	0.46	0.023	0.016	0.0000000	0.0000000	5.7	0.000233	0.000212	0.000015	0.0000000	0.0	0.00000	0.00000	0.0002	0.0000		0.0050
		1st Quartile	0.0896	0.0871	0.126	0.00065		<0.000010	<0.000010	<0.00050	<0.00020	5.65	5.39	0.395	0.394	<0.000010	<0.000010	229.0	0.000332	0.000325	0.000071	<0.0000050	103	<0.0030	<0.0010	0.0118	<0.050		0.0367
		Median	0.0948	0.0938	0.134	0.00080		<0.000010	<0.000010	<0.00050	<0.00020	5.83	5.56	0.403	0.399	<0.000010	<0.000010	231.0	0.000415	0.000400	0.000076	<0.0000050	103	<0.0030	<0.0010	0.0118	<0.050		0.0384
		3rd Quartile	0.0999	0.1004	0.143	0.00095		<0.000010	<0.000010	<0.00050	<0.00020	6.01	5.72	0.411	0.405	<0.000010	<0.000010	233.0	0.000498	0.000475	0.000082	<0.0000050	103	<0.0030	<0.0010	0.0119	<0.050		0.0402

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 46
2017-2018 Annual Report

2012-13 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
SPD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E218582		Average	0.00097	0.00074	0.0628	0.02813	50.10	0.00006076	0.00002316	0.00082	0.00061	0.282	0.0975	0.0709	0.06640	0.0034712	0.0035561	132.8	0.00125	0.00116	0.000187	0.000100	134.16	0.01070	0.00829	0.00719	0.00325	0.0100	0.01751
		Count	17	19	17	19	51	17	19	17	19	17	19	17	19	17	18	17	17	19	17	19	58	17	19	12	10	12	12
		Minimum	0.00027	0.00019	0.0045	<0.0030	7.00	<0.000010	<0.0000050	0.00048	0.00025	0.158	0.0236	0.0179	<0.0010	<0.000010	<0.000010	14.1	<0.0010	<0.0010	<0.0002	<0.00020	1.23	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00186	0.00166	0.141	0.0677	83.0	0.000798	0.000230	0.00136	0.00099	0.507	0.331	0.300	0.264	<0.010	<0.010	307	0.0037	0.0033	0.00142	<0.00020	312	0.104	0.0960	0.0113	0.0072	<0.020	0.036
	Settling Pond # 1	Geometric Mean	0.00084	0.00061	0.0416	0.01577	39.14	0.00001319	0.00000937	0.00078	0.00057	0.261	0.0741	0.0511	0.03365	0.0015190	0.0016230	71.6	0.00100	0.00094	0.000124	0.000100	76.50	0.00427	0.00348	0.00656	0.00300	0.0100	0.01464
		Count <DL	0	0	0	3	0	7	10	0	0	0	0	0	1	17	18	0	7	9	15	19	0	12	16	2	8	12	1
		Standard Deviation	0.00050	0.00046	0.0457	0.02274	27.03	0.00019047	0.00005208	0.00026	0.00022	0.116	0.0857	0.0729	0.07468	0.0021530	0.0021196	114.0	0.00091	0.00085	0.000320	0.000000	94.59	0.02474	0.02147	0.00272	0.00164	2E-10	0.00939
		1st Quartile	0.0005	0.00035	0.0184	0.00575	14.75	<0.000010	<0.000010	0.00061	0.00044	0.184	0.0530	0.0299	0.02125	<0.002	<0.002	15.9	<0.0010	<0.0010	<0.00020	<0.00020	27.25	<0.0050	<0.0050	0.00615	<0.0050	<0.020	0.01135
		Median	0.00090	0.00065	0.0503	0.0246	60.3	0.0000090	<0.000010	0.00079	0.00061	0.260	0.0779	0.0403	0.0349	<0.010	<0.010	159	0.0011	0.0011	<0.00020	<0.00020	145.00	<0.005	<0.0050	0.00735	<0.0050	<0.020	0.01700
		3rd Quartile	0.00125	0.00102	0.0944	0.04275	70.25	0.000020	0.00001400	0.00101	0.00076	0.381	0.0910	0.0783	0.07495	<0.010	<0.010	217	0.0015	0.0014	<0.0002	<0.00020	206.75	0.0051	<0.0050	0.00860	<0.0050	<0.020	0.02150
LLE		Average	0.00133	0.00113	0.1063	0.03340	45.1	0.00000840	0.00000560	0.00083	0.00054	0.971	0.6467	0.1117	0.1080	0.0038052	0.0036910	203.8	0.00060	0.00058	0.000114	0.000100	249.9	0.00339	0.00250	0.00695	0.00372	0.0327	0.02420
E292130		Count	21	21	21	21	46	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	53	21	21	15	14	15	15
		Minimum	0.00077	0.00065	0.0035	<0.0030	15.6	<0.0000050	<0.0000050	0.00038	0.00031	0.174	0.0248	0.0218	0.0179	<0.000010	<0.000010	55.3	<0.001	<0.0010	<0.0002	<0.00020	41.0	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00226	0.00187	0.307	0.0584	93.1	0.0000350	0.000013	0.00204	0.00125	3.14	2.61	0.616	0.610	<0.050	<0.050	892	0.0015	0.0015	0.00040	<0.00020	1000	0.0091	<0.0050	0.0118	0.0057	0.071	0.0660
	Long Lake Entrance (LLE)	Geometric Mean	0.00127	0.00108	0.0770	0.02519	39.3	0.00000593	0.00000457	0.00076	0.00051	0.723	0.3590	0.0757	0.0706	0.0015116	0.0014028	142.0	0.00057	0.00055	0.000107	0.000100	159.6	0.00309	0.00250	0.00638	0.00346	0.0265	0.01871
		Count <DL	0	0	0	2	0	16	18	0	0	0	0	0	0	17	19	0	18	19	20	21	0	16	21	2	8	4	1
		Standard Deviation	0.00043	0.00035	0.0775	0.01570	25.3	0.00000893	0.00000386	0.00042	0.00021	0.783	0.6601	0.1312	0.1303	0.0052294	0.0052781	238.3	0.00027	0.00026	0.000065	0.0000000	274.6	0.00178	0.00000	0.00267	0.00147	0.0207	0.01615
		1st Quartile	0.00099	0.00085	0.0637	0.0275	27.4	<0.00001	<0.000005	0.00057	0.00043	0.417	0.200	0.0385	0.0321	<0.0020	<0.0020	99.4	<0.0010	<0.0010	<0.00020	<0.00020	93.3	<0.0050	<0.0050	0.00535	<0.0050	0.0170	0.01350
		Median	0.00123	0.00107	0.0796	0.0375	36.4	<0.0000010	<0.000010	0.00070	0.00051	0.677	0.330	0.0706	0.0680	0.0022	0.0020	111	<0.0010	<0.0010	<0.00020	<0.00020	118	<0.005	<0.0050	0.0066	<0.0050	0.030	0.022
		3rd Quartile	0.00154	0.00137	0.133	0.0448	57.8	0.0000060	<0.000010	0.00095	0.00058	1.28	1.01	0.120	0.123	<0.010	<0.010	156	<0.0010	<0.0010	<0.00020	<0.00020	268	<0.0050	<0.0050	0.00870	0.00518	0.0370	0.03100
LLM1		Average	0.00055	0.00056	0.0148	0.0113	32.9	0.00001650	0.00000417	0.00042	0.00050	0.0627	0.0418	0.0141	0.00908	0.00350017	0.00350017	71.1	0.00050	0.00050	0.000100	0.000100	60.8	0.00560	0.00250	0.00292	0.00250	0.0100	0.018
E206619		Count	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
		Minimum	0.00028	0.00035	0.0066	0.0049	22.3	<0.000010	<0.0000050	0.00030	0.00032	0.0333	0.0098	0.0063	<0.0010	<0.0000020	<0.0000020	45.8	<0.0010	<0.0010	<0.00020	<0.00020	34.4	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.011
		Maximum	0.00085	0.00069	0.0295	0.0199	43.8	0.000054	<0.000010	0.00065	0.00088	0.0868	0.0717	0.0230	0.0210	<0.010	<0.010	103	<0.0010	<0.0010	<0.00020	<0.00020	84.1	0.0211	<0.0050	0.0050	<0.0050	<0.020	0.029
	Long Lake Middle 1 metre below Surface	Geometric Mean	0.00052	0.00054	0.0129	0.0104	32.2	0.00001083	0.00000397	0.00040	0.00047	0.0595	0.0356	0.0126	0.00366	0.00092466	0.00092466	69.2	0.00050	0.00050	0.000100	0.000100	58.5	0.00357	0.00250	0.00281	0.00250	0.0100	0.017
		Count <DL	0	0	0	0	0	2	6	0	0	0	0	0	2	6	6	0	6	6	6	6	0	5	6	5	6	6	0
		Standard Deviation	0.00019	0.00013	0.0085	0.0050	7.7	0.00001910	0.00000129	0.00013	0.00021	0.0203	0.0212	0.0071	0.00976	0.00234491	0.00234491	18.3	0.00000	0.00000	0.000000	0.000000	17.6	0.00759	0.00000	0.00102	0.00000	0.0000	0.006
		1st Quartile	0.00048	0.00049	0.0082	0.0091	29.7	0.00000550	0.00000312	0.00034	0.00038	0.0497	0.0322	0.0086	0.00098	0.00200000	0.00200000	67.6	<0.0010	<0.0010	<0.00020	<0.00020	55.7	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.015
		Median	0.00054	0.00059	0.0142	0.0105	31.2	0.00000800	<0.000010	0.00040	0.00042	0.0705	0.0431	0.0126	0.00575	<0.010	<0.010	69.4	<0.0010	<0.0010	<0.00020	<0.00020	57.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.017
		3rd Quartile	0.00061	0.00066	0.0169	0.0127	37.7	0.00001650	<0.000010	0.00043	0.00055	0.0720	0.0515	0.0202	0.01802	<0.010	<0.010	71.5	<0.0010	<0.0010	<0.00020	<0.00020	72.1	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.019
LLMB		Average	0.00024	0.00022	0.0104	0.0058	53.0	0.00000800	0.00000567	0.00044	0.00034	0.0447	0.00870	0.2693	0.1793	0.00350017	0.00350017	142.2	0.00050	0.00050	0.000100	0.000100	136.2	0.00520	0.00250	0.00250	0.00250	0.081	0.0153
E206619		Count	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
		Minimum	0.00019	0.00019	0.0065	0.0031	52.3	<0.0000050	<0.0000050	0.00027	0.00027	0.0303	<0.0050	0.0632	0.0033	<0.0000020	<0.0000020	137	<0.0010	<0.0010	<0.00020	<0.00020	131	<0.0050	<0.0050	<0.0050	<0.0050	0.070	0.0080
		Maximum	0.00028	0.00025	0.0133	0.0085	53.9	0.000028	0.000014	0.00084	0.00040	0.0559	0.0172	1.14	1.02	<0.010	<0.010	147	<0.0010	<0.0010	<0.00020	<0.00020	142	0.0187	<0.0050	<0.0050	<0.0050	0.093	0.010
	Long Lake Middle 1 metre From Bottom	Geometric Mean	0.00024	0.00022	0.0102	0.0055	53.0	0.00000529	0.00000471	0.00041	0.00034	0.0436	0.00733	0.1355	0.0182	0.00092466	0.00092466	142.1	0.00050	0.00050	0.000100	0.000100	136.1	0.00350	0.00250	0.00250	0.00250	0.080	0.0140
		Count <DL	0	0	0	0	0	5	5	0	0	0	1	0	0	6	6	0	6	6	6	6	0	5	6	6	6	0	0
		Standard Deviation	0.00004	0.00002	0.0025	0.0017	0.6	0.00000987	0.00000426	0.00021	0.00005	0.0105	0.00528	0.4282	0.4120	0.00234491	0.00234491	3.5	0.00000	0.00000	0.000000	0.0000000	4.0	0.00661	0.00000	0.00000	0.00000	0.009	0.0078
		1st Quartile	0.00021	0.00020	0.0095	0.0054	52.7	0.00000312	0.00000312	0.00033	0.00032	0.0368	0.00578	0.0657	0.0051	0.00200000	0.00200000	141	<0.0010	<0.0010	<0.00020	<0.00020	133.5	<0.0050	<0.0050	<0.0050	<0.0050	0.074	0.0112
		Median	0.00025	0.00021	0.0104	0.0058	53.0	<0.0000010	<0.000010	0.00036	0.00036	0.0472	0.00730	0.0979	0.0094	<0.010	<0.010	141.5	<0.0010	<0.0010	<0.00020	<0.00020	136.0	<0.0050	<0.0050	<0.0050	<0.0050	0.078	0.0130
		3rd Quartile	0.00027	0.00023	0.0122	0.0061	53.4	<0.000010	<0.000010	0.00047	0.00037	0.0526	0.01130	0.1458	0.0248	<0.010	<0.010	144.2	<0.0010	<0.0010	<0.00020	<0.00020	138.5	<0.0050	<0.0050	<0.0050	<0.0050	0.088	0.0162
LLO		Average	0.00048	0.00045	0.0496	0.0184	28.5	0.00000389	0.00000500	0.00076	0.00062	0.1480	0.0716	0.0202	0.0118	0.0025567	0.0025567	68.4	0.00062	0.00050	0.000100	0.000100	48.3	0.00250	0.00250	0.00321	0.00250	0.0126	0.01657
E219412		Count	9	9	9	9	39	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	48	9	9	7	9	7	7
		Minimum	0.00030	0.00033	0.0109	0.0036	12.1	<0.0000050	<0.0000050	0.0004	0.00042	0.0467	0.0174	0.0066	0.0025	<0.000010	<0.000010	45.8	<0.001	<0.0010	<0.0002	<0.00020	13.2	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.00061	0.00059	0.137	0.0372	44.5	<0.00001	0.000015	0.00217	0.00097	0.353	0.220	0.0514	0.0242	<0.010	<0.010	98.1	0.0016	<0.0010	<0.0002	<0.00020	108	<0.005	<0.0050	0.0075	<0.0050	0.028	0.043
	Long Lake Outlet	Geometric Mean	0.00047	0.00044	0.0388	0.0152	27.1	0.00000367	0.00000415	0.00065	0.00059	0.1262	0.0583	0.0167	0.0091	0.0006300	0.0006300	66.5	0.00057	0.00050	0.000100	0.000100	43.2	0.00250	0.00250	0.00292	0.00250	0.0116	0.01269
		Count <DL	0	0	0	0	0	9	8	0	0	0	0	0	0	9	9	0	8	9	9	9	0	9	9	6	9	6	1
		Standard Deviation	0.00011	0.00010	0.0393	0.0110	8.7	0.00000132	0.00000395	0.00055	0.00018	0.0941	0.0579	0.0137	0.0081	0.0023498	0.0023498	17.4	0.00037	0.00000	0.000000	0.0000000	22.1	4E-11	4E-11	0.00189	4E-11	0.0068	0.01274
		1st Quartile	0.0004	0.00036	0.0256	0.0114	21.6	<0.0000050	<0.0000050	0.00046	0.00045	0.0904	0.0535	0.0116	0.0056	<0.0020	<0.0020	57.0	<0.0010	<0.0010	<0.00020	<0.00020	30.1	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.01125
		Median	0.00051	0.00044	0.036	0.0138	29.6	<0.000010	<0.000010	0.00059	0.00059	0.113	0.0553	0.0189	0.0119	<0.0020	<0.0020	68.3	<0.0010	<0.0010	<0.00020	<0.00020	46.2	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.014
		3rd Quartile	0.00058	0.00052	0.0493	0.0252	35.6	<0.00001	<0.000010	0.00079	0.00074	0.160	0.0648	0.0250	0.0183	<0.010	<0.010	76.1	<0.0010	<0.0010	<0.0002	<0.00020	59.6	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.01700
WB		Average	0.00018	0.000148	0.0220	0.0143	29.9	0.00000375	0.00000375	0.00064	0.00071	0.0495	0.0256	0.0069	0.0042	0.0024010	0.0024010	32.1	0.00050	0.00050	0.000100	0.000100	21.65	0.00250	0.00250	0.00250	0.00250	0.0100	0.0095
E0900504		Count	10	10	10	10	43	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	43	10	10	8	9	8	8
		Minimum	0.00013	<0.00010	0.0121	0.0072	22.2	<0.0000050	<0.0000050	0.0005	0.00045	0.0366	0.0171	0.0031	0.0018	<0.000010	<0.000010	24.0	<0.001	<0.0010	<0.0002	<0.00020	5.93	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.0059
		Maximum	0.00027	0.00020	0.0360	0.0203	44.2	<0.00001	<0.000010	0.00091	0.00121	0.0944	0.0350	0.0150	0.0107	<0.010	<0.010	49.6	<0.001	<0.0010	<0.0002	<0.00020	49.5	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.021
	Middle Quinsam Lake Outlet	Geometric Mean	0.00017	0.000140	0.0211	0.0137	29.3	0.00000354	0.00000354	0.00063	0.00068	0.0476	0.0250	0.0062	0.0036	0.0006598	0.0006598	31.4	0.00050	0.00050	0.000100	0.000100	18.65	0.00250	0.00250	0.00250	0.00250	0.0100	0.0087
		Count <DL	0	1	0	0	0	10	10	0	0	0	0	0	0	10	10	0	10	10	10	10	0	10	10	8	9	8	0
		Standard Deviation	0.00004	0.000042	0.0066	0.0040	6.1	0.00000132	0.00000132	0.00011	0.00022	0.0170	0.0058	0.0036	0.0029	0.0022694	0.0022694	7.4	0.00000	0.00000	0.000000	0.0000000	11.87	4E-11	4E-11	3E-11	4E-11	1E-10	0.0049
		1st Quartile	0.00015	0.000132	0.0175	0.0121	25.8	<0.0000050	<0.0000050	0.00057	0.00060	0.0399	0.0217	0.0041	0.0022	<0.0020	<0.0020	28.3	<0.0010	<0.0010	<0.00020	<0.00020	12.1	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0071
		Median	0.00016	0.000160	0.0226	0.0154	28.2	0.00000375	0.00000375	0.00062	0.00065	0.0442	0.0252	0.0068	0.0031	<0.0020	<0.0020	29.4	<0.0010	<0.0010	<0.00020	<0.00020	19.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0078
		3rd Quartile	0.0002	0.000170	0.0246	0.0166	32.8	<0.00001	<0.000010	0.00068	0.00081	0.0506	0.0301	0.0083	0.0054	<0.010	<0.010	35.7	<0.001	<0.0010	<0.0002	<0.00020	29.1	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.0088

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 47
2017-2018 Annual Report

2012-13 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
75SD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EZ92069	Settling Pond at 75- Discharge to Stream 1 -75	Average	0.00067	0.0004	0.841	0.0105	128.5	0.000035	0.00002579	0.00337	0.00075	1.094	0.0111	0.3773	0.3791	0.00267196	0.00242934	172	0.0018	0.00094	0.000226	0.0001	74	0.0069	0.0025				
		Count	7	7	7	7	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7				
		Minimum	0.00046	0.00030	0.263	0.0063	80.5	<0.000010	<0.0000050	0.00153	0.00061	0.330	<0.0050	0.0973	0.0790	<0.0000020	<0.0000020	146	0.0012	<0.0010	<0.00020	<0.00020	14.5	<0.0050	<0.0050				
		Maximum	0.00149	0.00066	2.95	0.0133	215	0.000077	0.000069	0.00724	0.00084	3.24	0.0453	0.782	0.772	<0.010	<0.010	218	0.0029	0.0016	0.00043	<0.00020	112	0.0198	<0.0050				
		Geometric Mean	0.00061	0.00039	0.574	0.0101	118.0	0.00002100	0.00001373	0.00304	0.00074	0.792	0.00669	0.3180	0.3146	0.00036784	0.00034225	170.6	0.0017	0.00084	0.000180	0.000100	59.2	0.00478	0.00250				
		Count <DL	0	0	0	0	0	2	3	0	0	0	2	0	0	5	6	0	0	3	4	7	0	4	7				
		Standard Deviation	0.00037	0.00012	0.963	0.0029	61.0	0.00002961	0.00002632	0.00183	0.00009	1.024	0.01524	0.2262	0.2230	0.00235636	0.00243885	24.3	0.0006	0.00047	0.000158	0.000000	40.0	0.00682	0.00000				
		1st Quartile	0.00046	0.00035	0.318	0.0085	85.4	0.00000650	<0.000010	0.00262	0.00069	0.362	0.00405	0.2635	0.2720	0.00050135	0.00050220	158.0	0.0014	<0.0010	<0.00020	<0.00020	48.2	<0.0050	<0.0050				
		Median	0.00052	0.00039	0.399	0.0111	90.5	0.000036	0.000011	0.00269	0.00076	0.991	0.0062	0.276	0.310	0.0027	<0.0020	160	0.0015	0.0010	<0.00020	<0.00020	87.0	<0.0050	<0.0050				
		3rd Quartile	0.00066	0.00039	0.820	0.0130	171	0.0000570	0.0000440	0.00344	0.00082	1.185	0.0078	0.4795	0.4745	<0.010	<0.010	182.0	0.0020	0.00125	0.000375	<0.00020	104	0.00925	<0.0050				
75	Stream 1-75 discharge to LWO	Average	0.000140	0.000118	0.1211	0.0457	15.5	0.00001112	0.00004733	0.00055	0.00050	0.1040	0.04022	0.00108	0.00093	0.00258498	0.00258458	15.5	0.00050	0.00050	0.000100	0.000100	1.610	0.00250	0.00250	0.00792	0.00313	0.0738	0.01598
EZ92109		Count	12	12	12	12	24	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	25	12	12	4	6	4	4
		Minimum	<0.00010	<0.00010	0.0236	0.0189	10.5	<0.0000050	<0.0000050	0.00027	0.00025	0.0078	<0.0050	<0.0010	<0.0010	0.0000024	<0.0000020	11.6	<0.001	<0.0010	<0.0002	<0.00020	<0.50	<0.005	<0.0050	<0.0050	<0.0050	<0.020	<0.0050
		Maximum	0.0006	0.00028	1.01	0.238	24.5	0.0000480	0.000517	0.0022	0.00155	1.03	0.390	0.006	0.0032	<0.010	<0.010	21.7	<0.001	<0.0010	<0.0002	<0.00020	7.80	<0.005	<0.0050	0.0210	0.0063	0.191	0.036
		Geometric Mean	0.000105	0.000101	0.0487	0.0324	15.0	0.00000784	0.00000666	0.00045	0.00043	0.0224	0.00992	0.00072	0.00068	0.00021996	0.00018457	15.2	0.00050	0.00050	0.000100	0.000100	1.104	0.00250	0.00250	0.00523	0.00292	0.0356	0.01065
		Count <DL	4	4	0	0	0	7	10	0	0	0	1	9	10	9	10	0	12	12	12	12	2	12	12	2	5	2	1
		Standard Deviation	0.000150	0.000070	0.2806	0.0613	4.1	0.00001244	0.00014791	0.00053	0.00036	0.2920	0.11033	0.00158	0.00099	0.00253726	0.00253770	3.2	0.00000	0.00000	0.000000	0.000000	1.863	1E-10	1E-10	0.00885	0.00155	0.0856	0.01462
		1st Quartile	<0.00010	<0.00010	0.0299	0.0224	12.5	<0.000010	<0.000010	0.00035	0.00030	0.0101	0.00602	<0.0010	<0.0010	0.00004470	0.00004425	13.2	<0.0010	<0.0010	<0.00020	<0.00020	0.73	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.00692
		Median	0.00011	0.000115	0.0343	0.0268	13.8	<0.000010	<0.000010	0.00040	0.00040	0.0138	0.00675	<0.0010	<0.0010	0.00300000	0.00300000	14.0	<0.0010	<0.0010	<0.00020	<0.00020	0.94	<0.0050	<0.0050	0.00410	<0.0050	0.0470	0.01270
		3rd Quartile	0.000142	0.000142	0.0445	0.0320	18.5	0.000013	<0.000010	0.00048	0.00048	0.0313	0.0087	0.00065	<0.0010	<0.010	<0.010	17.6	<0.001	<0.0010	<0.0002	<0.00020	1.37	<0.005	<0.0050	0.00952	<0.0050	0.1108	0.02175
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average	0.548	0.531	0.0454	0.0018	153.0	0.0000050	0.0000085	0.000490	0.000100	0.261	0.212	0.0692	0.0655	0.0000050	0.0000050	119.5	0.000250	0.000250	0.0000250	0.0000250	10.4	0.00260	0.00050	0.0310	0.0250		0.143
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		Minimum	0.540	0.525	0.0365	0.0014	153	<0.000010	<0.000010	<0.00050	<0.00020	0.247	0.198	0.0594	0.0560	<0.000010	<0.000010	116	<0.00050	<0.00050	<0.000050	<0.000050	10.2	<0.0030	<0.0010	0.0271	<0.050		0.135
		Maximum	0.555	0.537	0.0543	0.0022	153	<0.000010	0.000012	0.00073	<0.00020	0.275	0.226	0.0789	0.0750	<0.000010	<0.000010	123	<0.00050	<0.00050	<0.000050	<0.000050	10.6	0.0037	<0.0010	0.0348	<0.050		0.150
		Geometric Mean	0.547	0.531	0.0445	0.0018	153.0	0.0000050	0.0000077	0.000427	0.000100	0.261	0.212	0.0685	0.0648	0.0000050	0.0000050	119.4	0.000250	0.000250	0.0000250	0.0000250	10.4	0.00236	0.00050	0.0307	0.0250		0.142
		Count <DL	0	0	0	0	0	2	1	1	2	0	0	0	0	2	2	0	2	2	2	2	0	1	2	0	2		0
		Standard Deviation	0.011	0.008	0.0126	0.0006	0.0	0.0000000	0.0000049	0.000339	0.000000	0.020	0.020	0.0138	0.0134	0.0000000	0.0000000	4.9	0.000000	0.000000	0.0000000	0.0000000	0.3	0.00156	0.00000	0.0054	0.0000		0.011
		1st Quartile	0.544	0.528	0.0410	0.0016	153	<0.000010	0.0000068	0.000370	<0.00020	0.254	0.205	0.0643	0.0608	<0.000010	<0.000010	117.8	<0.00050	<0.00050	<0.000050	<0.000050	10.3	0.00205	<0.0010	0.0290	<0.050		0.139
		Median	0.548	0.531	0.0454	0.0018	153	<0.000010	0.0000085	0.000490	<0.00020	0.261	0.212	0.0692	0.0655	<0.000010	<0.000010	119.5	<0.00050	<0.00050	<0.000050	<0.000050	10.4	0.00260	<0.0010	0.0310	<0.050		0.143
		3rd Quartile	0.551	0.534	0.0498	0.0020	153	<0.000010	0.0000102	0.000610	<0.00020	0.268	0.219	0.0740	0.0702	<0.000010	<0.000010	121.2	<0.00050	<0.00050	<0.000050	<0.000050	10.5	0.00315	<0.0010	0.0329	<0.050		0.146
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average	0.512	0.509	1.01	0.0057		0.0000050	0.0000050	0.00328	0.000100	1.22	0.059	0.110	0.0896	0.0000050	0.0000050	73.2	0.00107	0.000250	0.000154	0.0000250	10.4	0.0035	0.00050	0.0578	0.0250		0.109
		Count	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.512	0.509	1.01	0.0057		<0.000010	<0.000010	0.00328	<0.00020	1.22	0.059	0.110	0.0896	<0.000010	<0.000010	73.2	0.00107	<0.00050	0.000154	<0.000050	10.4	0.0035	<0.0010	0.0578	<0.050		0.109
		Maximum	0.512	0.509	1.01	0.0057		<0.000010	<0.000010	0.00328	<0.00020	1.22	0.059	0.110	0.0896	<0.000010	<0.000010	73.2	0.00107	<0.00050	0.000154	<0.000050	10.4	0.0035	<0.0010	0.0578	<0.050		0.109
		Geometric Mean	0.512	0.509	1.01	0.0057		0.0000050	0.0000050	0.00328	0.000100	1.22	0.059	0.110	0.0896	0.0000050	0.0000050	73.2	0.00107	0.000250	0.000154	0.0000250	10.4	0.0035	0.00050	0.0578	0.0250		0.109
		Count <DL	0	0	0	0		1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	1		0
		Standard Deviation	0.000	0.000	0.00	0.0000		0.0000000	0.0000000	0.00000	0.000000	0.00	0.000	0.000	0.0000	0.0000000	0.0000000	0.0	0.00000	0.000000	0.000000	0.0000000	0.0	0.0000	0.00000	0.0000	0.0000		0.000
		1st Quartile	0.512	0.509	1.01	0.0057		<0.000010	<0.000010	0.00328	<0.00020	1.22	0.059	0.110	0.0896	<0.000010	<0.000010	73.2	0.00107	<0.00050	0.000154	<0.000050	10.4	0.0035	<0.0010	0.0578	<0.050		0.109
		Median	0.512	0.509	1.01	0.0057		<0.000010	<0.000010	0.00328	<0.00020	1.22	0.059	0.110	0.0896	<0.000010	<0.000010	73.2	0.00107	<0.00050	0.000154	<0.000050	10.4	0.0035	<0.0010	0.0578	<0.050		0.109
		3rd Quartile	0.512	0.509	1.01	0.0057		<0.000010	<0.000010	0.00328	<0.00020	1.22	0.059	0.110	0.0896	<0.000010	<0.000010	73.2	0.00107	<0.00050	0.000154	<0.000050	10.4	0.0035	<0.0010	0.0578	<0.050		0.109
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average	0.262	0.200	0.11300	0.00425	214.0	0.0000175	0.0000175	0.00180	0.000725	1.63	0.972	0.310	0.318	0.0000050	0.0000050	301	0.00088	0.00088	0.000235	0.000088	11.40	0.00525	0.00425	0.0516	0.0875		0.416
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		Minimum	0.245	0.198	<0.0060	<0.0020	214	<0.000020	<0.000020	<0.0010	<0.00040	1.49	0.863	0.222	0.242	<0.000010	<0.000010	248	<0.0010	<0.0010	<0.00010	<0.00010	<10	<0.0060	<0.0020	0.0339	<0.050		0.397
		Maximum	0.278	0.202	0.223	<0.015	214	<0.000050	<0.000050	0.0031	<0.0025	1.77	1.08	0.398	0.393	<0.000010	<0.000010	355	<0.0025	<0.0025	0.00042	<0.00025	17.8	<0.015	<0.015	0.0694	<0.30		0.436
		Geometric Mean	0.261	0.200	0.02587	0.00274	214.0	0.0000158	0.0000158	0.00124	0.000500	1.62	0.965	0.297	0.308	0.0000050	0.0000050	296	0.00079	0.00079	0.000145	0.000079	9.43	0.00474	0.00274	0.0485	0.0612		0.416
		Count <DL	0	0	1	2	0	2	2	1	2	0	0	0	0	2	2	0	2	2	1	2	1	2	2	0	2		0
		Standard Deviation	0.023	0.003	0.15556	0.00460	0.0	0.0000106	0.0000106	0.00184	0.000742	0.20	0.153	0.124	0.107	0.0000000	0.0000000	75	0.00053	0.00053	0.000262	0.000053	9.05	0.00318	0.00460	0.0251	0.0884		0.028
		1st Quartile	0.253	0.199	0.05800	0.00262	214	0.0000138	0.0000138	0.00115	0.000462	1.56	0.917	0.266	0.280	<0.000010	<0.000010	274	0.00069	0.00069	0.000142	0.000069	8.20	0.00412	0.00262	0.0428	0.0562		0.407
		Median	0.262	0.200	0.11300	0.00425	214	0.0000175	0.0000175	0.00180	0.000725	1.63	0.972	0.310	0.318	<0.000010	<0.000010	301	0.00088	0.00088	0.000235	0.000088	11.40	0.00525	0.00425	0.0516	0.0875		0.416
		3rd Quartile	0.270	0.201	0.16800	0.00588	214	0.0000213	0.0000213	0.00245	0.000988	1.70	1.026	0.354	0.355	<0.000010	<0.000010	328	0.00106	0.00106	0.000328	0.000106	14.60	0.00638	0.00588	0.0605	0.1188		0.426
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average	0.240	0.221	0.2709	0.0062	200.0	0.0000050	0.0000050	0.000725	0.000175	0.590	0.358	0.0949	0.0915	0.0000050	0.0000050	48.3	0.000250	0.000250	0.0001235	0.0000250	0.72	0.00340	0.00100	0.1018	0.0875		0.176
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		Minimum	0.214	0.211	0.0227	0.0054	200	<0.000010	<0.000010	<0.00050	<0.00020	0.588	0.341	0.0718	0.0700	<0.000010	<0.000010	47.8	<0.00050	<0.00050	<0.000050	<0.000050	0.60	<0.0030	<0.0010	0.0787	<0.050		0.173
		Maximum	0.267	0.231	0.519	0.0070	200	<0.000010	<0.000010	0.00120	<0.00050	0.592	0.375	0.118	0.113	<0.000010	<0.000010	48.8	<0.00050	<0.00050	0.000222	<0.000050	0.84	0.0053	<0.0030	0.125	<0.30		0.180
		Geometric Mean	0.239	0.221	0.1085	0.0061	200.0	0.0000050	0.0000050	0.000548	0.000158	0.590	0.358	0.0920	0.0889	0.0000050	0.0000050	48.3	0.000250	0.000250	0.0000745	0.0000250	0.71	0.00282	0.00087	0.0992	0.0612		0.176
		Count <DL	0	0	0	0	0	2	2	1	2	0	0	0	0	2	2	0	2	2	1	2	0	1	2	0	2		0
		Standard Deviation	0.037	0.014	0.3509	0.0011	0.0	0.0000000	0.0000000	0.000672	0.000106	0.003	0.024	0.0127	0.0304	0.0000000	0.0000000	0.7	0.000000	0.000000	0.0001393	0.0000000	0.17	0.00269	0.00071	0.0327	0.0884		0.005
		1st Quartile	0.227	0.216	0.1468	0.0058	200	<0.000010	<0.000010	0.000488	0.000138	0.589	0.350	0.0834	0.0808	<0.000010	<0.000010	48.0	<0.00050	<0.00050	0.0000742	<0.000050	0.66	0.00245	0.00075	0.0903	0.0562		0.175
		Median	0.240	0.221	0.2709	0.0062	200	<0.000010	<0.000010	0.000725	0.000175	0.590	0.358	0.0949	0.0915	<0.000010	<0.000010	48.3	<0.00050	<0.00050	0.0001235	<0.000050	0.72	0.00340	0.00100	0.1018	0.0875		0.176
		3rd Quartile	0.254	0.226	0.3949	0.0066	200	<0.000010	<0.000010	0.000962	0.000213	0.591	0.366	0.1064	0.1023	<0.000010	<0.000010	48.6	<0.00050	<0.00050	0.0001728	<0.000050	0.78	0.00435	0.00125	0.1134	0.1188		0.178

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 48
2017-2018 Annual Report

2012-13 Statistics Stn.Code EMS_ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
QU1010D			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Average	0.0227	0.0218	3.93	0.0150		0.000050	0.000050	0.0080	0.00250	13.0	10.9	1.10	1.06	0.0000050	0.0000050	1510.0	0.00250	0.00250	0.00162	0.000250	12.5	0.0150	0.0150	0.111	0.00050		0.783
		Count	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.0227	0.0218	3.93	<0.030		<0.00010	<0.00010	0.0080	<0.0050	13.0	10.9	1.10	1.06	<0.000010	<0.000010	1510	<0.0050	<0.0050	0.00162	<0.00050	<25	<0.030	<0.030	0.111	<0.0010		0.783
	Ex-situ 2-North deep groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Mudstone).	Maximum	0.0227	0.0218	3.93	<0.030		<0.00010	<0.00010	0.0080	<0.0050	13.0	10.9	1.10	1.06	<0.000010	<0.000010	1510	<0.0050	<0.0050	0.00162	<0.00050	<25	<0.030	<0.030	0.111	<0.0010		0.783
		Geometric Mean	0.0227	0.0218	3.93	0.0150		0.000050	0.000050	0.0080	0.00250	13.0	10.9	1.10	1.06	0.0000050	0.0000050	1510.0	0.00250	0.00250	0.00162	0.000250	12.5	0.0150	0.0150	0.111	0.00050		0.783
		Count <DL	0	0	0	1		1	1	0	1	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	1		0
		Standard Deviation	0.0000	0.0000	0.00	0.0000		0.000000	0.000000	0.0000	0.00000	0.0	0.0	0.00	0.00	0.0000000	0.0000000	0.0	0.00000	0.00000	0.00000	0.000000	0.0	0.0000	0.0000	0.000	0.00000		0.000
		1st Quartile	0.0227	0.0218	3.93	<0.030		<0.00010	<0.00010	0.0080	<0.0050	13.0	10.9	1.10	1.06	<0.000010	<0.000010	1510	<0.0050	<0.0050	0.00162	<0.00050	<25	<0.030	<0.030	0.111	<0.0010		0.783
		Median	0.0227	0.0218	3.93	<0.030		<0.00010	<0.00010	0.0080	<0.0050	13.0	10.9	1.10	1.06	<0.000010	<0.000010	1510	<0.0050	<0.0050	0.00162	<0.00050	<25	<0.030	<0.030	0.111	<0.0010		0.783
		3rd Quartile	0.0227	0.0218	3.93	<0.030		<0.00010	<0.00010	0.0080	<0.0050	13.0	10.9	1.10	1.06	<0.000010	<0.000010	1510	<0.0050	<0.0050	0.00162	<0.00050	<25	<0.030	<0.030	0.111	<0.0010		0.783
QU1010S		Average	0.134	0.134	1.164	0.00195	142.0	0.0000080	0.0000050	0.00296	0.000175	0.994	0.259	0.0776	0.0696	0.0000050	0.0000050	64.2	0.000410	0.000250	0.000563	0.0000250	14.4	0.00150	0.00100	0.0366	0.0875		0.191
		Count	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.131	0.132	0.728	<0.0030	142	<0.000010	<0.000010	0.00263	<0.00020	0.958	0.235	0.0532	0.0479	<0.000010	<0.000010	62.0	<0.00050	<0.00050	0.000440	<0.000050	13.8	<0.0030	<0.0010	0.0321	<0.050		0.190
	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Maximum	0.136	0.135	1.60	0.0024	142	0.000011	<0.000010	0.00328	<0.00050	1.03	0.284	0.102	0.0913	<0.000010	<0.000010	66.3	0.00057	<0.00050	0.000686	<0.000050	14.9	<0.0030	<0.0030	0.0410	<0.30		0.192
		Geometric Mean	0.133	0.133	1.079	0.00190	142.0	0.0000074	0.0000050	0.00294	0.000158	0.993	0.258	0.0737	0.0661	0.0000050	0.0000050	64.1	0.000377	0.000250	0.000549	0.0000250	14.3	0.00150	0.00087	0.0363	0.0612		0.191
		Count <DL	0	0	0	1	0	1	2	0	2	0	0	0	0	2	2	0	1	2	0	2	0	2	2	0	2		0
		Standard Deviation	0.004	0.002	0.617	0.00064	0.0	0.0000042	0.0000000	0.00046	0.000106	0.051	0.035	0.0345	0.0307	0.0000000	0.0000000	3.0	0.000226	0.000000	0.000174	0.0000000	0.8	0.00000	0.00071	0.0063	0.0884		0.001
		1st Quartile	0.132	0.133	0.946	0.00172	142	0.0000065	<0.000010	0.00279	0.000138	0.976	0.247	0.0654	0.0588	<0.000010	<0.000010	63.1	0.000330	<0.00050	0.000502	<0.000050	14.1	<0.0030	0.00075	0.0343	0.0562		0.190
		Median	0.134	0.134	1.164	0.00195	142	0.0000080	<0.000010	0.00296	0.000175	0.994	0.259	0.0776	0.0696	<0.000010	<0.000010	64.2	0.000410	<0.00050	0.000563	<0.000050	14.4	<0.0030	0.00100	0.0366	0.0875		0.191
		3rd Quartile	0.135	0.134	1.382	0.00217	142	0.0000095	<0.000010	0.00312	0.000213	1.012	0.272	0.0898	0.0805	<0.000010	<0.000010	65.2	0.000490	<0.00050	0.000624	<0.000050	14.6	<0.0030	0.00125	0.0388	0.1188		0.192
QU1011D		Average	0.00907	0.00458	39.8	0.0075		0.000165	0.0000250	0.0239	0.00125	16.4	3.37	0.715	0.526	0.0000250	0.0000050	305.0	0.0079	0.00125	0.0273	0.000125	5.0	0.054	0.0075	0.192	0.150		0.288
		Count	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.00907	0.00458	39.8	<0.015		0.000165	<0.000050	0.0239	<0.0025	16.4	3.37	0.715	0.526	<0.000050	<0.000010	305	0.0079	<0.0025	0.0273	<0.00025	<10	0.054	<0.015	0.192	<0.30		0.288
		Maximum	0.00907	0.00458	39.8	<0.015		0.000165	<0.000050	0.0239	<0.0025	16.4	3.37	0.715	0.526	<0.000050	<0.000010	305	0.0079	<0.0025	0.0273	<0.00025	<10	0.054	<0.015	0.192	<0.30		0.288
	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Geometric Mean	0.00907	0.00458	39.8	0.0075		0.000165	0.0000250	0.0239	0.00125	16.4	3.37	0.715	0.526	0.0000250	0.0000050	305.0	0.0079	0.00125	0.0273	0.000125	5.0	0.054	0.0075	0.192	0.150		0.288
		Count <DL	0	0	0	1		0	1	0	1	0	0	0	0	1	1	0	0	1	0	1	1	0	1	0	1		0
		Standard Deviation	0.00000	0.00000	0.0	0.0000		0.000000	0.0000000	0.0000	0.00000	0.0	0.00	0.000	0.000	0.0000000	0.0000000	0.0	0.0000	0.00000	0.0000	0.000000	0.0	0.000	0.0000	0.000	0.000		0.000
		1st Quartile	0.00907	0.00458	39.8	<0.015		0.000165	<0.000050	0.0239	<0.0025	16.4	3.37	0.715	0.526	<0.000050	<0.000010	305	0.0079	<0.0025	0.0273	<0.00025	<10	0.054	<0.015	0.192	<0.30		0.288
		Median	0.00907	0.00458	39.8	<0.015		0.000165	<0.000050	0.0239	<0.0025	16.4	3.37	0.715	0.526	<0.000050	<0.000010	305	0.0079	<0.0025	0.0273	<0.00025	<10	0.054	<0.015	0.192	<0.30		0.288
		3rd Quartile	0.00907	0.00458	39.8	<0.015		0.000165	<0.000050	0.0239	<0.0025	16.4	3.37	0.715	0.526	<0.000050	<0.000010	305	0.0079	<0.0025	0.0273	<0.00025	<10	0.054	<0.015	0.192	<0.30		0.288
QU1011S		Average	0.00268	0.00150	0.328	0.0089		0.0000050	0.0000050	0.001570	0.000175	0.561	0.176	0.0698	0.0646	0.0000050	0.0000050	69.5	0.00102	0.00076	0.0000605	0.0000250	5.52	0.00150	0.00100	0.0106	0.0875		0.0082
		Count	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.00179	0.00141	0.122	0.0028		<0.000010	<0.000010	<0.00050	<0.00020	0.320	0.166	0.0662	0.0587	<0.000010	<0.000010	67.8	0.00081	0.00072	<0.000050	<0.000050	4.71	<0.0030	<0.0010	0.0073	<0.050		0.0067
		Maximum	0.00356	0.00158	0.533	0.0150		<0.000010	<0.000010	0.00289	<0.00050	0.802	0.185	0.0735	0.0704	<0.000010	<0.000010	71.2	0.00124	0.00079	0.000096	<0.000050	6.32	<0.0030	<0.0030	0.0138	<0.30		0.0097
	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Geometric Mean	0.00252	0.00149	0.255	0.0065		0.0000050	0.0000050	0.000850	0.000158	0.507	0.175	0.0698	0.0643	0.0000050	0.0000050	69.5	0.00100	0.00075	0.0000490	0.0000250	5.46	0.00150	0.00087	0.0100	0.0612		0.0081
		Count <DL	0	0	0	0		2	2	1	2	0	0	0	0	2	2	0	0	0	1	2	0	2	2	0	2		0
		Standard Deviation	0.00125	0.00012	0.291	0.0086		0.0000000	0.0000000	0.001867	0.000106	0.341	0.013	0.0052	0.0083	0.0000000	0.0000000	2.4	0.00030	0.00005	0.0000502	0.0000000	1.14	0.00000	0.00071	0.0046	0.0884		0.0021
		1st Quartile	0.00223	0.00145	0.225	0.0058		<0.000010	<0.000010	0.000910	0.000138	0.440	0.171	0.0680	0.0616	<0.000010	<0.000010	68.6	0.00092	0.00074	0.0000428	<0.000050	5.11	<0.0030	0.00075	0.0089	0.0562		0.0074
		Median	0.00268	0.00150	0.328	0.0089		<0.000010	<0.000010	0.001570	0.000175	0.561	0.176	0.0698	0.0646	<0.000010	<0.000010	69.5	0.00102	0.00076	0.0000605	<0.000050	5.52	<0.0030	0.00100	0.0106	0.0875		0.0082
		3rd Quartile	0.00312	0.00154	0.430	0.0119		<0.000010	<0.000010	0.002230	0.000213	0.682	0.180	0.0717	0.0675	<0.000010	<0.000010	70.4	0.00113	0.00077	0.0000782	<0.000050	5.92	<0.0030	0.00125	0.0122	0.1188		0.0090
QU1105S		Average	0.0923	0.0914	0.347	0.00150		0.0000050	0.0000050	0.00057	0.000250	0.400	0.206	0.0472	0.0439	0.0000050	0.0000050	54.9	0.000250	0.000250	0.000183	0.0000250	49.8	0.00150	0.00150	0.0233	0.150		0.115
		Count	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.0923	0.0914	0.347	<0.0030		<0.000010	<0.000010	0.00057	<0.00050	0.400	0.206	0.0472	0.0439	<0.000010	<0.000010	54.9	<0.00050	<0.00050	0.000183	<0.000050	49.8	<0.0030	<0.0030	0.0233	<0.30		0.115
		Maximum	0.0923	0.0914	0.347	<0.0030		<0.000010	<0.000010	0.00057	<0.00050	0.400	0.206	0.0472	0.0439	<0.000010	<0.000010	54.9	<0.00050	<0.00050	0.000183	<0.000050	49.8	<0.0030	<0.0030	0.0233	<0.30		0.115
	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Geometric Mean	0.0923	0.0914	0.347	0.00150		0.0000050	0.0000050	0.00057	0.000250	0.400	0.206	0.0472	0.0439	0.0000050	0.0000050	54.9	0.000250	0.000250	0.000183	0.0000250	49.8	0.00150	0.00150	0.0233	0.150		0.115
		Count <DL	0	0	0	1		1	1	0	1	0	0	0	0	1	1	0	1	1	0	1	0	1	1	0	1		0
		Standard Deviation	0.0000	0.0000	0.000	0.00000		0.0000000	0.0000000	0.00000	0.000000	0.000	0.000	0.0000	0.0000	0.0000000	0.0000000	0.0	0.000000	0.000000	0.000000	0.0000000	0.0	0.00000	0.00000	0.0000	0.000		0.000
		1st Quartile	0.0923	0.0914	0.347	<0.0030		<0.000010	<0.000010	0.00057	<0.00050	0.400	0.206	0.0472	0.0439	<0.000010	<0.000010	54.9	<0.00050	<0.00050	0.000183	<0.000050	49.8	<0.0030	<0.0030	0.0233	<0.30		0.115
		Median	0.0923	0.0914	0.347	<0.0030		<0.000010	<0.000010	0.00057	<0.00050	0.400	0.206	0.0472	0.0439	<0.000010	<0.000010	54.9	<0.00050	<0.00050	0.000183	<0.000050	49.8	<0.0030	<0.0030	0.0233	<0.30		0.115
		3rd Quartile	0.0923	0.0914	0.347	<0.0030		<0.000010	<0.000010	0.00057	<0.00050	0.400	0.206	0.0472	0.0439	<0.000010	<0.000010	54.9	<0.00050	<0.00050	0.000183	<0.000050	49.8	<0.0030	<0.0030	0.0233	<0.30		0.115
QU1109S		Average	0.154	0.130	100.0	0.0075		0.000465	0.0000250	0.0465	0.00125	34.6	0.0150	1.05	0.00199	0.00022	0.0000050	2.08	0.0166	0.00125	0.109	0.000125	37.6	0.137	0.0075	0.181	0.150		0.113
		Count	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.154	0.130	100	<0.015		0.000465	<0.000050	0.0465	<0.0025	34.6	<0.030	1.05	0.00199	0.00022	<0.000010	2.08	0.0166	<0.0025	0.109	<0.00025	37.6	0.137	<0.015	0.181	<0.30		0.113
		Maximum	0.154	0.130	100	<0.015		0.000465	<0.000050	0.0465	<0.0025	34.6	<0.030	1.05	0.00199	0.00022	<0.000010	2.08	0.0166	<0.0025	0.109	<0.00025	37.6	0.137	<0.015	0.181	<0.30		0.113
	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Geometric Mean	0.154	0.130	100.0	0.0075		0.000465	0.0000250	0.0465	0.00125	34.6	0.0150	1.05	0.00199	0.00022	0.0000050	2.08	0.0166	0.00125	0.109	0.000125	37.6	0.137	0.0075	0.181	0.150		0.113
		Count <DL	0	0	0	1		0	1	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1		0
		Standard Deviation	0.000	0.000	0.0	0.0000		0.000000	0.0000000	0.0000	0.00000	0.0	0.0000	0.00	0.00000	0.00000	0.0000000	0.00	0.0000	0.00000	0.000	0.000000	0.0	0.000	0.0000	0.000	0.000		0.000
		1st Quartile	0.154	0.130	100	<0.015		0.000465	<0.000050	0.0465	<0.0025	34.6	<0.030	1.05	0.00199	0.00022	<0.000010	2.08	0.0166	<0.0025	0.109	<0.00025	37.6	0.137	<0.015	0.181	<0.30		0.113
		Median	0.154	0.130	100	<0.015		0.000465	<0.000050	0.0465	<0.0025	34.6	<0.030	1.05	0.00199	0.00022	<0.000010	2.08	0.0166	<0.0025	0.109	<0.00025	37.6	0.137	<0.015	0.181	<0.30		0.113
		3rd Quartile	0.154	0.130	100	<0.015		0.000465	<0.000050	0.0465	<0.0025	34.6	<0.030	1.05	0.00199	0.00022	<0.000010	2.08	0.0166	<0.0025	0.109	<0.00025	37.6	0.137	<0.015	0.181	<0.30		0.113
7SQR		Average	0.00023	0.00021	0.0602	0.0177	27.9	0.00000561	0.00000606	0.00079	0.00066	0.1404	0.0530	0.0073	0.0034	0.0030011	0.0030011	28.8	0.00050	0.00050	0.000100	0.000100	18.36	0.00341	0.00298	0.00250	0.00250	0.0158	0.0146
E292113		Count	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	9	9	8	9	8	8
		Minimum	0.00011	0.00017	0.0113	0.0052	23.4	<0.00000050	<0.000005	0.00060	0.00039	0.0701	0.0394	0.0049	0.0017	<0.000010	<0.000010	22.7	<0.001	<0.0010	<0.0002	<0.00020	9.07	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.0069
		Maximum	0.00030	0.00026	0.142	0.0489	32.9	0.000018	0.000014	0.00110	0.00085	0.282	0.0684	0.0115	0.0065	<0.010	<0.010	33.5	<0.001	<0.0010	<0.0002	<0.00020	29.5	0.0107	0.0068	<0.0050	<0.0050	0.031	0.026
	7-South Quinsam River downstream of 7-South Mining Operation	Geometric Mean	0.00023	0.00021	0.0439	0.0149	27.8	0.00000458	0.00000495	0.00077	0.00065	0.1248	0.0518	0.0070	0.0031	0.0007533	0.0007533	28.6	0.00050	0.00050	0.000100	0.000100	16.88	0.00294	0.00279	0.00250	0.00250	0.0141	0.0136
		Count <DL	0	0	0	0	0	8	7	0	0	0	0	0	0	9	9	0	9	9	9	9	0	8	8	8	9	5	0
		Standard Deviation	0.00006	0.00003	0.0493	0.0126	3.1	0.00000480	0.00000438	0.00019	0.00014	0.0731	0.0118	0.0020	0.0016	0.0023964	0.0023964	3.3	0.00000	0.00000	0.000000	0.000000	7.75	0.00273	0.00143	3E-11	4E-11	0.0084	0.0058
		1st Quartile	0.00021	0.00020	0.0254	0.0119	26.5	<0.00000050	<0.00000050	0.00063	0.00062	0.0771	0.0422	0.0057	0.0022	<0.0020	<0.0020	27.6	<0.0010	<0.0010	<0.00020	<0.00020	12.68	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0106
		Median	0.00023	0.00020	0.0397	0.0153	27.3	<0.000010	<0.000010	0.0007	0.00064	0.114	0.0519	0.007	0.0035	<0.010	<0.010	28.7	<0.0010	<0.0010	<0.00020	<0.00020	15.45	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.015
		3rd Quartile	0.00029	0.00023	0.0712	0.0164	30.5	<0.00001	<0.000010	0.00094	0.00072	0.183	0.0619	0.0081	0.0043	<0.010	<0.010	30.4	<0.001	<0.0010	<0.0002	<0.00020	25.70	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0162

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 49
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E0126402	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Average	0.000135	0.000111	0.0308	0.0159	20.1	0.0000047	0.000003	0.00169	0.00061	0.0331	0.01203	0.00242	0.00061	0.0005342	0.0005342	20.7	0.0005	0.00050	0.000100	0.000100	1.53	0.00378	0.0025				
		Count	15	15	15	15	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15				
		Minimum	<0.00010	<0.00010	0.0135	0.0097	15.9	<0.0000050	<0.0000050	0.00055	0.00048	0.0136	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	18.4	<0.0010	<0.0010	<0.00020	<0.00020	0.56	<0.0050	<0.0050				
		Maximum	0.00032	0.00024	0.0797	0.0368	21.6	0.000011	0.000005	0.0142	0.00104	0.0725	0.0321	0.0083	0.0016	<0.010	<0.010	23.7	<0.0010	<0.0010	<0.00020	<0.00020	5.65	0.0217	<0.0050				
		Geometric Mean	0.000117	0.000098	0.027	0.0151	20	0.00000408	0.00002287	0.00093	0.00059	0.0281	0.01011	0.00177	0.00057	0.00000754	0.00000749	20.7	0.0005	0.00050	0.000100	0.000100	1.33	0.00289	0.0025				
		Count <DL	4	5	0	0	0	12	13	0	0	0	1	3	13	14	14	0	15	15	15	15	0	14	15				
		Standard Deviation	0.000071	0.000054	0.0184	0.0063	1.8	0.00000277	0.00000104	0.00347	0.00015	0.0201	0.0074	0.00203	0.0003	0.00130164	0.00130164	1.5	0	0.00000	0.000000	0.000000	1.18	0.00496	4E-11				
		1st Quartile	0.00008	<0.00010	0.019	0.014	20.4	<0.0000050	<0.0000050	0.00066	0.0005	0.0155	0.0071	0.00105	<0.0010	<0.0000020	<0.0000020	19.8	<0.0010	<0.0010	<0.00020	<0.00020	1.12	<0.0050	<0.0050				
		Median	0.00015	0.00012	0.0226	0.0146	20.5	<0.000010	<0.0000050	0.00068	0.00056	0.03	0.0101	0.0019	<0.0010	<0.0000020	<0.0000020	20.5	<0.0010	<0.0010	<0.00020	<0.00020	1.25	<0.0050	<0.0050				
		3rd Quartile	0.00011	0.000108	0.0295	0.0208	20.3	<0.00001	<0.000010	0.00092	0.00075	0.0258	0.0155	0.0019	0.00088	0.0040000	0.0040000	20.1	<0.001	<0.0010	<0.0002	<0.00020	1.725	<0.005	<0.0050	<0.0050	<0.0050	<0.020	0.01030
WD	Settling Pond #4	Average	0.00316	0.00202	0.0369	0.00395	346.7	0.0000281	0.00001204	0.001	0.00054	0.394	0.01036	0.0575	0.04731	0.00055644	0.0005009	348	0.0016	0.00142	0.000114	0.000100	607	0.00250	0.00300	0.0053		0.01	0.0396
E207409		Count	10	10	10	10	12	10	10	10	10	10	10	10	10	9	10	10	10	10	10	10	54	10	10	1		1	1
		Minimum	0.00162	0.00125	0.0131	<0.0030	296	<0.000010	<0.0000050	0.00052	0.00028	0.152	<0.0050	0.0276	<0.0010	<0.0000020	<0.0000020	277	0.0012	<0.0010	<0.00020	<0.00020	325	<0.0050	<0.0050	0.0053		<0.020	0.0396
		Maximum	0.00474	0.00279	0.111	0.009	382	0.000071	0.000035	0.00177	0.00135	0.606	0.0220	0.126	0.113	<0.010	<0.010	601	0.0024	0.0023	0.00024	<0.00020	969	<0.0050	0.0075	0.0053		<0.020	0.0396
		Geometric Mean	0.00291	0.00195	0.0308	0.00332	345.6	0.00001823	0.0000099	0.00092	0.00047	0.345	0.00844	0.0512	0.03018	0.00000258	0.00000234	340	0.0016	0.0013	0.000109	0.000100	595	0.00250	0.00279	0.0053		0.01	0.0396
		Count <DL	0	0	0	3	0	4	3	0	0	0	1	0	1	9	10	0	0	1	9	10	0	10	9	0		1	0
		Standard Deviation	0.00126	0.00056	0.0282	0.0024	28.4	0.00002668	0.0000087	0.00042	0.00034	0.196	0.00686	0.0308	0.02997	0.00166633	0.0015808	91	0.0004	0.00053	0.0000044	0.0000000	121	4E-11	0.00158	0		0.0000	0
		1st Quartile	0.00186	0.00162	0.0211	0.00188	325.5	0.00001138	0.0000075	0.00065	0.00034	0.228	0.0057	0.0322	0.0298	<0.0000020	<0.0000020	307	0.0014	0.00105	<0.00020	<0.00020	536	<0.0050	<0.0050	0.0053		<0.020	0.03960
		Median	0.00324	0.00188	0.0274	0.0034	352	0.00001375	0.000011	0.00086	0.00038	0.409	0.007	0.055	0.04505	<0.0000020	<0.0000020	324	0.0014	0.0014	<0.00020	<0.00020	620	<0.0050	<0.0050	0.0053		<0.020	0.040
		3rd Quartile	0.00433	0.00256	0.0402	0.00518	369	0.000052	<0.000025	0.00125	0.00068	0.575	0.01428	0.0623	0.05425	<0.0000020	<0.0000020	347	0.002	0.00182	<0.00020	<0.00020	660	<0.0050	<0.0050	0.0053		<0.020	0.03960
MW001D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average	0.0189	0.0194	2.31	0.0335	94.8	0.000029	0.000005	0.0108	0.00308	2.46	0.0050	0.0564	0.000857	0.0000160	0.0000050	21.8	0.00247	0.00025	0.000464	0.000025	29.2	0.0075	0.0005	0.173	0.142		0.0112
		Count	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.0186	0.0192	1.54	0.0322	93.1	0.000022	<0.000010	0.008	0.00282	1.68	<0.010	0.0399	0.000541	<0.000010	<0.000010	21.5	0.00188	<0.00050	0.00037	<0.000050	29	0.0058	<0.0010	0.169	0.139		0.0094
		Maximum	0.0195	0.0197	2.69	0.0341	96.5	0.000032	<0.000010	0.0122	0.00321	2.85	<0.010	0.065	0.00149	0.000038	<0.000010	22.4	0.00277	<0.00050	0.00051	<0.000050	29.5	0.0083	<0.0010	0.18	0.147		0.0149
		Geometric Mean	0.0189	0.0194	2.23	0.0335	94.8	0.000028	0.000005	0.0106	0.00307	2.39	0.005	0.0551	0.000758	0.0000098	0.0000050	21.8	0.00243	0.00025	0.000459	0.000025	29.2	0.0074	0.0005	0.173	0.142		0.011
		Count <DL	0	0	0	0	0	0	3	0	0	0	3	0	0	2	3	0	0	3	0	3	0	0	3	0	0		0
		Standard Deviation	0.0005	0.0003	0.66	0.0011	2.4	0.000006	0	0.00242	0.00023	0.68	1E-10	0.0143	0.000548	0.0000191	0.0000000	0.5	0.00051	0	0.000081	0	0.3	0.0014	0	0.006	0.005		0.0032
		1st Quartile	0.0186	0.0192	2.12	0.0332	93.9	0.000027	<0.000010	0.01010	0.00302	2.26	<0.010	0.0523	0.000541	<0.000010	<0.000010	21.5	0.00232	<0.00050	0.00044	<0.000050	29	0.007	<0.0010	0.169	0.139		0.0094
		Median	0.0186	0.0192	2.69	0.0341	94.8	0.000032	<0.000010	0.0122	0.00321	2.85	<0.010	0.0647	0.000541	<0.000010	<0.000010	21.5	0.00277	<0.00050	0.000511	<0.000050	29	0.0083	<0.0010	0.169	0.139		0.0094
		3rd Quartile	0.019	0.0194	2.69	0.0341	95.6	0.000032	<0.000010	0.0122	0.00321	2.85	<0.010	0.0647	0.001015	0.0000215	<0.000010	22	0.00277	<0.00050	0.000511	<0.000050	29.2	0.0083	<0.0010	0.174	0.143		0.0122
MW001S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average	0.00025	0.00017	0.01330	0.0026	365.7	0.000069	0.000053	0.00067	0.00061	0.1940	0.184	1.121	1.078	0.0000050	0.0000050	1086.7	0.00099	0.00129	0.0000417	0.0000417	972	0.02093	0.00083	0.01553	0.02500		0.0234
		Count	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.00024	<0.00010	0.0078	0.0014	348	0.00006	0.000025	<0.0010	0.00032	0.167	0.027	0.662	0.413	<0.000010	<0.000010	1060	0.00098	0.00067	<0.000050	<0.000050	932	<0.0060	<0.0010	<0.0020	<0.050		0.0107
		Maximum	0.00025	0.00023	0.0244	0.0032	401	0.000086	0.000067	<0.0020	0.00075	0.248	0.262	1.350	1.41	<0.000010	<0.000010	1100	0.001	0.0016	<0.00010	<0.00010	992	0.0568	<0.0020	0.0446	<0.050		0.0297
		Geometric Mean	0.00025	0.00014	0.0114	0.0024	364.8	0.000068	0.000048	0.000630	0.00056	0.191	0.123	1.065	0.936	0.0000050	0.0000050	1086.5	0.00099	0.0012	0.0000397	0.0000397	971.6	0.008	0.00079	0.00355	0.025		0.0211
		Count <DL	0	1	0	0	0	0	0	3	0	0	0	0	0	3	3	0	0	0	3	3	0	2	3	2	3		0
		Standard Deviation	0.00001	0.000104	0.0096	0.001	30.6	0.000015	0.000024	0.00029	0.00025	0.047	0.136	0.397	0.576	0.0000000	0.0000000	23.1	0.00001	0.00054	0.0000144	0.0000144	34.6	0.03106	0.00029	0.02517	0.00000		0.0110
		1st Quartile	0.00024	0.00014	0.0078	0.0023	348	0.00006	0.000046	<0.0010	0.00054	0.1670	0.145	1.006	0.912	<0.000010	<0.000010	1080	0.00099	0.00114	0.0000375	0.0000375	962	<0.0060	0.00075	<0.0020	<0.050		0.0202
		Median	0.00025	0.00023	0.00780	0.0032	348	0.00006	0.000067	<0.0010	0.00075	0.1670	0.262	1.35	1.41	<0.000010	<0.000010	1100	0.001	0.0016	<0.00010	<0.00010	992	<0.0060	<0.0020	<0.0020	<0.050		0.0297
		3rd Quartile	0.00025	0.00023	0.01610	0.0032	374.5	0.000073	0.000067	0.00075	0.00075	0.2080	0.262	1.35	1.41	<0.000010	<0.000010	1100	0.001	0.0016	<0.00010	<0.00010	992	0.0299	<0.0020	0.02280	<0.050		0.0297
MW006D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average	0.0284	0.0282	0.0367	0.0176	82.8	0.0000050	0.0000050	0.0008	0.00063	0.022	0.0050	0.00205	0.00076	0.0000050	0.0000050	48	0.000250	0.000250	0.0000375	0.0000250	12.3	0.01305	0.00050	0.157	0.16		0.0161
		Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.0278	0.028	0.0233	0.0165	80.5	<0.000010	<0.000010	<0.0015	0.00061	<0.010	<0.010	0.00122	0.00072	<0.000010	<0.000010	47.5	<0.00050	<0.00050	<0.000050	<0.000050	12.2	<0.0030	<0.0010	0.156	0.157		0.016
		Maximum	0.0289	0.0283	0.0501	0.0187	85.2	<0.000010	<0.000010	0.00085	0.00066	0.039	<0.010	0.00288	0.000799	<0.000010	<0.000010	48.4	<0.00050	<0.00050	0.000050	<0.000050	12.4	0.0246	<0.0010	0.158	0.163		0.0161
		Geometric Mean	0.0283	0.0281	0.0342	0.0176	82.8	0.000005	0.0000050	0.000798	0.00063	0.014	0.005	0.00187	0.000758	0.0000050	0.0000050	47.9	0.000250	0.000250	0.0000354	0.0000250	12.3	0.00607	0.0005	0.157	0.16		0.016
		Count <DL	0	0	0	0	0	2	2	1	0	1	2	0	0	2	2	0	2	2	1	2	0	1	2	0	0		0
		Standard Deviation	0.0008	0.0002	0.0190	0.0016	3.3	0	0.0000000	0.000071	0.00004	0.024	0	0.00117	0.000056	0.0000000	0.0000000	0.6	0.000000	0.000000	0.000018	0.0000000	0.1	0.01633	0	0.001	0.004		0.0001
		1st Quartile	0.0281	0.0281	0.03	0.0171	81.7	<0.000010	<0.000010	0.000775	0.00062	0.0135	<0.010	0.00164	0.00074	<0.000010	<0.000010	47.7	<0.00050	<0.00050	0.0000312	<0.000050	12.2	0.00728	<0.0010	0.156	0.158		0.016
		Median	0.0284	0.0282	0.0367	0.0176	82.8	<0.000010	<0.000010	0.0008	0.00063	0.022	<0.010	0.00205	0.00076	<0.000010	<0.000010	48	<0.00050	<0.00050	0.0000375	<0.000050	12.3	0.01305	<0.0010	0.157	0.16		0.0161
		3rd Quartile	0.0286	0.0282	0.0434	0.0182	84	<0.000010	<0.000010	0.000825	0.00065	0.031	<0.010	0.00247	0.000779	<0.000010	<0.000010	48.2	<0.00050	<0.00050	0.0000438	<0.000050	12.4	0.01883	<0.0010	0.158	0.162		0.0161
MW006S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average	0.00142	0.00129	0.0435	0.00360	231.2	0.000032	0.000028	0.00159	0.00127	0.084	0.0072	0.0176	0.01052	0.0000050	0.0000050	552.8	0.00112	0.000578	0.0000438	0.0000438	741.2	0.00262	0.00103	0.0619	0.06		0.00535
		Count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		4
		Minimum	0.00138	0.00125	0.0138	0.003	228	0.000025	0.000022	<0.0015	0.00105	0.044	<0.010	0.0105	0.00591	<0.000010	<0.000010	518	0.00098	<0.0010	<0.000050	<0.000050	736	<0.0030	<0.0020	0.0593	0.056		<0.0050
		Maximum	0.00152	0.00134	0.0641	0.0046	237	0.000035	0.000033	0.002	0.00144	0.107	0.014	0.0359	0.0216	<0.000010	<0.000010	593	0.0012	0.00081	<0.00010	<0.00010	743	<0.0060	0.0011	0.0644	0.064		0.0139
		Geometric Mean	0.00142	0.00129	0.0378	0.0036	231.2	0.000032	0.000028	0.00148	0.00126	0.08	0.0065	0.0152	0.00907	0.0000050	0.0000050	552.1	0.00112	0.00056	0.000042	0.0000420	741.2	0.00252	0.00102	0.0619	0.06		0.00384
		Count <DL	0	0	0	0	0	0	0	1	0	0	3	0	0	4	4	0	0	3	4	4	0	4	3	0	0		3
		Standard Deviation	0.00007	0.00005	0.0212	0.0007	3.9	0.000005	0.000006	0.00059	0.000200	0.03	0.0045	0.0123	0.00742	0.0000000	0.0000000	30.8	0.0001	0.000155	0.0000125	0.0000125	3.5	0.00075	0.00005	0.0029	0.004		0.0057
		1st Quartile	0.00138	0.00125	0.0395	0.00340	229.5	0.000032	0.000024	0.00139	0.00112	0.071	<0.010	0.0116	0.0069	<0.000010	<0.000010	542	0.00107	<0.0010	0.0000438	0.0000438	741.2	0.00262	<0.0020	0.0595	0.056		<0.0050
		Median	0.00138	0.00128	0.0481	0.00350	230	0.000034	0.000029	0.0018	0.0013	0.094	<0.010	0.0119	0.00728	<0.000010	<0.000010	550	0.00115	<0.0010	<0.00010	<0.00010	743.0	<0.0060	<0.0020	0.0620	0.06		<0.0050
		3rd Quartile	0.00142	0.00132	0.0521	0.00380	231.8	0.000035	0.000033	0.002	0.00144	0.107	0.0072	0.0179	0.01086	<0.000010	<0.000010	560.8	0.0012	0.000578	<0.00010	<0.00010	743	<0.0060	0.00103	0.0644	0.063		0.00535
WC	2-North Pit Culvert discharge into Middle Quinsam Lake	Average	0.00134	0.00111	0.0163	0.0055	318.5	0.0000073	0.0000602	0.0005	0.00047	0.115	0.00999	0.0161	0.0048	0.0006266	0.0005706	306	0.00066	0.00058	0.000100	0.000100	547	0.00250	0.00250				
E207411		Count	9	9	9	9	2	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	19	9	9				
		Minimum	0.00075	0.00068	0.0073	0.0039	303	<0.000010	<0.000050	<0.00050	0.00024	0.0518	<0.0050	0.0096	<0.0010	<0.0000020	<0.0000020	247	<0.0010	<0.0010	<0.00020	<0.00020	323	<0.0050	<0.0050				
		Maximum	0.00176	0.00154	0.0279	0.0129	334	<0.000025	<0.000025	0.00077	0.00136	0.199	0.0141	0.0227	0.0091	<0.010	<0.010	388	0.0019	0.0012	<0.00020	<0.00020	690	<0.0050	<0.0050				
		Geometric Mean	0.0013	0.00108	0.0142	0.0051	318.1	0.0000067	0.00000504	0.00047	0.00041	0.1036	0.00892	0.0154	0.00335	0.00000412	0.00000341	303	0.00058	0.00055	0.000100	0.000100	539	0.00250	0.0025				
		Count <DL	0	0	0	0	0	8	7	1	0	0	1	0	2	7	8	0	8	8	9	9	0	9	9				
		Standard Deviation	0.00034	0.00027	0.0088	0.0029	21.9	0.0000035	0.0000039	0.000183	0.00035	0.0547	0.00415	0.0049	0.00299	0.0017671	0.0016661	50	0.00047	0.00023	0.0000000	0.0000000	94	4E-11	4E-11				
		1st Quartile	0.00111	0.00097	0.01	0.0042	310.8	<0.000010	<0.0000050	0.00036	0.000290	0.0818	0.00730	0.0122	0.004	<0.0000020	<0.0000020	264	<0.0010	<0.0010	<0.00020	<0.00020	484	<0.0050	<0.0050				
		Median	0.00131	0.00106	0.0104	0.0042	318.5	<0.000010	<0.000010	0.00056	0.00037	0.0879	0.0116	0.0152	0.0049	<0.0000020	<0.0000020	295	<0.0010	<0.0010	<0.00020	<0.00020	542	<0.0050	<0.0050				
		3rd Quartile	0.00167	0.00132	0.0258	0.005	326.2	0.000011	0.0000059	0.0006	0.000460	0.1530	0.014	0.0207	0.0057	0.00000373	0.0000025	322	<0.0010	<0.0010	<0.00020	<0.00020	618	<0.0050	<0.0050				
MQL1	Middle Quinsam Lake 1 metre below surface	Average	0.000163	0.0001600	0.0154	0.0101	31.6	0.00000333	0.0000025	0.00069	0.00048	0.0529	0.0206	0.0088	0.00169	0.0000013	0.00000141	32	0.00054	0.0005	0.0001	0.0001	20.2	0.0025	0.0025	0.00312		0.0155	
E206618		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		2	
		Minimum	<0.00010	0.00011	0.0101	0.0058	26.4	<0.0000050	<0.0000050	0.00045	0.00041	0.025	0.0102	0.0032	<0.0010	<0.0000020	<0.0000020	27	<0.0010	<0.0010	<0.00020	<0.00020	14.6	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00025	0.00023	0.0206	0.0142	41.9	<0.000010	<0.0000050	0.00211	0.00068	0.0819	0.0295	0.0155	0.006	0.0000043	0.0000029	38.3	0.0011	<0.0010	<0.00020	<0.00020	31.6	<0.0050	<0.0050	0.005		0.021	
		Geometric Mean	0.000149	0.00016	0.015	0.0098	31.3	0.00000315	0.0000025	0.00063	0.00048	0.0506	0.0196	0.008	0.00120	0.00000116	0.00000128	31.8	0.00053	0.0005	0.0001	0.00010000	19.7	0.0025	0.0025	0.00297		0.0145	
		Count <DL	2	0	0	0	0	15	15	0	0	0	0	0	6	13	11	0	14	15	15	15	0	15	15	3		1	
		Standard Deviation	0.000061	0.00003	0.0035	0.0025	4.5	0.00000122	1E-13	0.0004	0.00008	0.015	0.006	0.0035	0.00155	0.00000089	0.00000071	3.6	0.00015	0	0	0	4.7	4E-11	4E-11	0.00125		0.0078	
		1st Quartile	0.00014	0.00014	0.0124	0.0085	29.6	<0.0000050	<0.0000050	0.00055	0.000440	0.0434	0.0178	0.0068	<0.0010	<0.0000020	<0.0000020	28.8	<0.0010	<0.0010	<0.00020	<0.00020	15.6	<0.0050	<0.0050	<0.0050		0.0128	
		Median	0.00016	0.0001600	0.0152	0.0103	30.8	<0.0000050	<0.0000050	0.000600	0.00046	0.0568	0.0223	0.0089	0.00130	<0.0000020	<0.0000020	32.6	<0.0010	<0.0010	<0.00020	<0.00020	20.40	<0.0050	<0.0050	<0.0050		0.0155	
		3rd Quartile	0.00021	0.00019	0.018	0.0118	31.7	<0.000010	<0.0000050	0.00064	0.00048	0.0614	0.0243	0.0107	0.00210	<0.0000020	0.0000016	34.3	<0.0010	<0.0010	<0.00020	<0.00020	22.6	<0.0050	<0.0050	0.00312		0.0183	
MQL8	Middle Quinsam Lake 1 metre from bottom	Average	0.000122	0.000117	0.0075	0.00325	48.4	0.00000333	0.0000025	0.00052	0.00043	0.0387	0.0074	0.1248	0.1108	0.0000143	0.00000109	131.5	0.0005	0.0005	0.0001	0.0001	138.3	0.002500	0.0025	0.00250		0.0100	
E206618		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		2	
		Minimum	<0.00010	<0.00010	0.0037	<0.0030	31.7	<0.0000050	<0.0000050	0.00028	0.0003	0.0210	<0.0050	0.0069	0.0024	<0.0000020	<0.0000020	35.2	<0.0010	<0.0010	<0.00020	<0.00020	24	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00021	0.00017	0.0144	0.0074	54.9	<0.000010	<0.0000050	0.00071	0.00077	0.106	0.0266	0.707	0.622	0.0000037	0.0000024	216	<0.0010	<0.0010	<0.00020	<0.00020	258	<0.0050	<0.0050	<0.0050		<0.020	
		Geometric Mean	0.000112	0.000113	0.007	0.00269	47.9	0.00000315	0.0000025	0.00051	0.000420	0.0338	0.00599	0.0456	0.0345	0.00000125	0.00000106	124.2	0.0005	0.0005	0.0001	0.0001	126.6	0.0025	0.0025	0.00250		0.01	
		Count <DL	3	1	0	7	0	15	15	0	0	0	4	0	0	12	14	0	15	15	15	15	0	15	15	4		2	
		Standard Deviation	0.000046	0.000026	0.0032	0.00212	7	0.00000122	1E-13	0.00011	0.00011	0.0249	0.00584	0.2061	0.1877	0.00000096	0.00000036	39.2	0	0	0	0.00000000	49.7	4E-11	4E-11	0.00000		0	
		1st Quartile	0.00011	0.00011	0.0054	<0.0030	49.1	<0.0000050	<0.0000050	0.00047	0.00038	0.0242	0.0042	0.0185	0.013	<0.0000020	<0.0000020	122.5	<0.0010	<0.0010	<0.00020	<0.00020	126	<0.0050	<0.0050	<0.0050		<0.020	
		Median	0.00013	0.0001100	0.0064	0.003	50.4	<0.0000050	<0.0000050	0.00050	0.000420	0.0287	0.0066	0.031	0.0228	<0.0000020	<0.0000020	126.0	<0.0010	<0.0010	<0.00020	<0.00020	128	<0.0050	<0.0050	<0.0050		<0.020	
		3rd Quartile	0.00014	0.00013	0.0088	0.00415	51	<0.000010	<0.0000050	0.00060	0.00044	0.0352	0.00795	0.1118	0.0952	<0.0000020	<0.0000020	137	<0.0010	<0.0010	<0.00020	<0.00020	141.5	<0.0050	<0.0050	<0.0050		<0.020	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 50
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E217018		Average	0.00047	0.000420	0.0289	0.0205	15.2	0.000005	0.0000028	0.000760	0.00054	0.1304	0.0787	0.0065	0.00252	0.000001	0.00000108	17.8	0.00063	0.0005	0.0001	0.0001	1.65	0.0025	0.0025	0.0025		0.01	
		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		1	
		Minimum	0.00022	0.0002	0.0227	0.015	13.1	<0.0000050	<0.0000050	0.00042	0.00036	0.0561	0.0375	0.0039	<0.0010	<0.0000020	<0.0000020	13.7	<0.0010	<0.0010	<0.00020	<0.00020	0.75	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00068	0.00059	0.0362	0.0258	17.1	0.000022	0.000007	0.00133	0.0009	0.203	0.114	0.0118	0.0044	<0.0000020	0.0000022	20.8	0.0024	<0.0010	<0.00020	<0.00020	2.86	<0.0050	<0.0050	<0.0050		<0.020	
	No Name Lake 1 metre below surface	Geometric Mean	0.00044	0.0004	0.0286	0.0203	15.1	0.00000393	0.00000268	0.00071	0.00052	0.1188	0.0748	0.00610	0.00226	0.00000100	0.00000105	17.6	0.00056	0.0005	0.0001	0.0001	1.53	0.0025	0.0025	0.00250		0.01	
		Count <DL	0	0	0	0	0	13	14	0	0	0	0	0	1	15	14	0	14	15	15	15	0	15	15	4		1	
		Standard Deviation	0.000160	0.00012	0.0041	0.0032	1.7	0.00000499	0.00000116	0.00031	0.00017	0.0529	0.0244	0.0024	0.00104	0.00000000	0.00000031	2.5	0.00049	0	0.0000000000	0	0.62	4E-11	4E-11	0		0	
		1st Quartile	0.00038	0.00035	0.0263	0.0188	13.5	<0.0000050	<0.0000050	0.00055	0.00044	0.0784	0.0610	0.0046	0.00185	<0.0000020	<0.0000020	15	<0.0010	<0.0010	<0.00020	<0.00020	1.17	<0.0050	<0.0050	<0.0050		<0.020	
		Median	0.00044	0.000440	0.0279	0.0204	15.7	<0.0000050	<0.0000050	0.00064	0.00045	0.135	0.0813	0.00510	0.00230	<0.0000020	<0.0000020	19.1	<0.0010	<0.0010	<0.00020	<0.00020	1.72	<0.0050	<0.0050	<0.0050		<0.020	
		3rd Quartile	0.0006	0.00052	0.0318	0.0225	16.5	<0.000010	<0.0000050	0.00096	0.00062	0.1715	0.0933	0.0082	0.00335	<0.0000020	<0.0000020	19.5	<0.0010	<0.0010	<0.00020	<0.00020	2.04	<0.0050	<0.0050	<0.0050		<0.020	
NNLB		Average	0.00029	0.00022	0.034	0.0228	13	0.00000333	0.0000025	0.000733	0.00042	0.212	0.0804	0.0151	0.00491	0.000001	0.00000125	17.4	0.0005	0.0005	0.0001	0.0001	4.58	0.0025	0.002500	0.00393		0.056	
E217018		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		1	
		Minimum	0.00021	0.00016	0.0243	0.0165	11.9	<0.0000050	<0.0000050	<0.00020	0.00035	0.103	0.0504	0.005	<0.0010	<0.0000020	<0.0000020	15.1	<0.0010	<0.0010	<0.00020	<0.00020	0.78	<0.0050	<0.0050	<0.0050		0.056	
		Maximum	0.00045	0.00038	0.0455	0.0275	13.8	<0.000010	<0.0000050	0.00397	0.00052	0.32	0.129	0.032	0.0172	<0.0000020	0.0000037	20.8	<0.0010	<0.0010	<0.00020	<0.00020	6.71	<0.0050	<0.0050	0.0056		0.056	
	No Name Lake 1 metre from bottom	Geometric Mean	0.00028	0.000210	0.0336	0.0225	12.9	0.00000315	0.0000025	0.000537	0.00042	0.202	0.0783	0.0128	0.00299	0.00000100	0.00000114	17.3	0.0005000	0.0005	0.0001	0.0001	4.25	0.0025	0.0025	0.00366		0.056	
		Count <DL	0	0	0	0	0	15	15	1	0	0	0	0	2	15	13	0	15	15	15	15	0	15	15	2		0	
		Standard Deviation	0.00006	0.00006	0.0055	0.0037	0.8	0.00000122	1E-13	0.000907	0.00005	0.064	0.0196	0.0088	0.00508	0.00000000	0.00000073	1.4	0	0.0000000	0	0	1.28	4E-11	0.000000	0.00166		0	
		1st Quartile	0.00024	0.00018	0.0299	0.0198	12.2	<0.0000050	<0.0000050	0.000465	0.00038	0.173	0.0687	0.0078	0.0015	<0.0000020	<0.0000020	16.4	<0.0010	<0.0010	<0.00020	<0.00020	4.33	<0.0050	<0.0050	<0.0050		0.056	
		Median	0.00028	0.0002	0.035	0.0230	13.3	<0.0000050	<0.0000050	0.000520	0.00041	0.225	0.0765	0.0119	0.0034	<0.0000020	<0.0000020	17.2	<0.0010	<0.0010	<0.00020	<0.00020	4.59	<0.0050	<0.0050	0.0038		0.056	
		3rd Quartile	0.0003	0.00024	0.0368	0.0262	13.5	<0.000010	<0.0000050	0.000610	0.00044	0.250	0.0922	0.0198	0.00515	<0.0000020	<0.0000020	18.2	<0.0010	<0.0010	<0.00020	<0.00020	4.86	<0.0050	<0.0050	0.00522		0.056	
NNO		Average	0.0005	0.00043	0.0311	0.0212	15.5	0.00000663	0.000004	0.00068	0.00062	0.1269	0.0713	0.0073	0.00315	0.0002886	0.0001886	17	0.0005	0.00050	0.000100	0.000100	2.07	0.0025	0.0025	0.00445	0.0025	0.01	0.0146
E217017		Count	16	16	16	16	12	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	2	4	4
		Minimum	0.00019	0.0002	0.0153	0.0097	12.1	<0.0000050	<0.0000050	0.00032	0.00037	0.0592	0.0326	0.0043	<0.0010	<0.0000020	<0.0000020	13	<0.0010	<0.0010	<0.00020	<0.00020	0.97	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0066
		Maximum	0.00069	0.00062	0.0529	0.0352	20.1	0.000027	0.0000120	0.00123	0.00251	0.207	0.105	0.0133	0.0064	0.0026	<0.0020	21.3	<0.0010	<0.0010	<0.00020	<0.00020	5.84	<0.0050	<0.0050	0.0103	<0.0050	<0.020	0.031
	No Name Lake Outlet	Geometric Mean	0.00045	0.00040	0.0294	0.0199	15.3	0.00000446	0.00000332	0.00063	0.00053	0.1165	0.0657	0.0069	0.00243	0.00000429	0.00000404	16.8	0.0005	0.00050	0.000100	0.000100	1.81	0.0025	0.0025	0.00356	0.0025	0.01	0.0121
		Count <DL	0	0	0	0	0	13	14	0	0	0	0	0	3	15	16	0	16	16	16	16	0	16	16	3	2	4	0
		Standard Deviation	0.00019	0.00014	0.0108	0.0071	2.7	0.00000808	0.00000324	0.00028	0.00053	0.0507	0.027	0.0025	0.00186	0.00070369	0.00040259	2.5	0	0.00000	0.000000	0.000000	1.26	4E-11	4E-11	0.0039	0	0	0.0112
		1st Quartile	0.00027	0.00026	0.024	0.0179	12.9	<0.0000050	<0.0000050	0.00048	0.00042	0.0704	0.0403	0.0057	0.00188	<0.0000020	<0.0000020	14.4	<0.0010	<0.0010	<0.00020	<0.00020	1.27	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0081
		Median	0.00058	0.00048	0.0317	0.0226	16.5	0.00000375	<0.0000050	0.00055	0.00044	0.128	0.0756	0.0068	0.0032	<0.0000020	<0.0000020	17.6	<0.0010	<0.0010	<0.00020	<0.00020	1.62	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	0.0103
		3rd Quartile	0.00064	0.00051	0.0353	0.0247	17.2	<0.000010	0.00000312	0.0008	0.00051	0.1638	0.0942	0.0084	0.0038	0.000002	0.000002	18.2	<0.0010	<0.0010	<0.00020	<0.00020	2.46	<0.0050	<0.0050	0.00445	<0.0050	<0.020	0.017
LLS		Average	0.00847	0.00235	0.1228	0.0063	226.2	0.00000825	0.00000757	0.001468	0.000428	2.97	0.00573	0.451	0.413	0.0000017	0.0000017	564	0.00386	0.0037	0.000218	0.0001	544	0.00639	0.00407				
E292131		Count	12	12	12	12	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
		Minimum	0.00339	0.00132	<0.0030	<0.0030	178	<0.0000050	<0.0000050	<0.00020	<0.00020	1.74	<0.0050	0.337	0.299	<0.0000020	<0.0000020	437	<0.0010	0.0014	<0.00020	<0.00020	388	<0.0050	<0.0050				
		Maximum	0.0123	0.00349	0.772	0.0229	244	0.00002	0.000013	0.0085	0.00148	4.9	0.0204	0.763	0.568	<0.000010	<0.000010	661	0.0174	0.0162	0.00152	<0.00020	669	0.0226	0.0165				
	Small Seep into Long Lake	Geometric Mean	0.00797	0.00224	0.02115	0.00364	224.9	0.00000674	0.00000608	0.000508	0.0003	2.83	0.00407	0.44	0.408	0.00000131	0.00000131	560	0.00247	0.0026	0.000125	0.0001	537	0.00405	0.0032				
		Count <DL	0	0	1	6	0	9	8	2	3	0	8	0	0	12	12	0	1	0	11	12	0	9	10				
		Standard Deviation	0.00282	0.00073	0.25122	0.00748	24.6	0.00000542	0.00000459	0.002667	0.00041	0.99	0.00587	0.115	0.068	0.00000156	0.00000156	70	0.00482	0.0044	0.000410	0.000000	91	0.00752	0.00415				
		1st Quartile	0.00708	0.00173	0.007	<0.0030	229	<0.000010	<0.0000050	0.000248	0.000175	2.280	<0.0050	0.382	0.369	<0.0000020	<0.0000020	510	0.00158	0.0015	<0.00020	<0.00020	490	<0.0050	<0.0050				
		Median	0.00844	0.00243	0.0133	0.0025	238	<0.000010	0.0000075	0.00043	0.000305	2.74	<0.0050	0.435	0.412	<0.0000020	<0.0000020	577	0.0023	0.0021	<0.00020	<0.00020	566	<0.0050	<0.0050				
		3rd Quartile	0.01023	0.00281	0.03997	0.00722	239	<0.000025	<0.000025	0.000592	0.000455	3.52	0.00622	0.47	0.44	<0.0000020	<0.0000020	616	0.0027	0.0026	<0.00020	<0.00020	597	0.00462	<0.0050				
LLSM		Average	0.00218	0.00108	0.0745	0.01117	176.7	0.00000525	0.00000509	0.00201	0.00064	0.964	0.00398	0.1719	0.176	0.0000018	0.0000018	441	0.00285	0.00281	0.0001	0.0001	400	0.00396	0.00378				
E292131		Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10				
		Minimum	0.00032	0.00012	0.0048	<0.0030	140	<0.0000050	<0.0000050	0.00039	0.00026	0.173	<0.0050	0.0025	0.0012	<0.0000020	<0.0000020	375	<0.0010	<0.0010	<0.00020	<0.00020	274	<0.0050	<0.0050				
		Maximum	0.00436	0.00182	0.498	0.0269	216	0.0000150	0.000010	0.00887	0.00142	2.37	0.0107	0.281	0.282	<0.000010	<0.000010	545	0.0125	0.0131	<0.00020	<0.00020	561	0.0171	0.0153				
	Long Lake Middle Seep	Geometric Mean	0.00175	0.00088	0.023	0.00754	174.7	0.00000453	0.00000446	0.00111	0.00053	0.774	0.00329	0.1144	0.1079	0.00000138	0.00000138	438	0.00174	0.00165	0.000100	0.0001	393	0.00303	0.00300				
		Count <DL	0	0	0	1	0	9	5	0	0	0	8	0	0	10	10	0	3	3	10	10	0	9	9				
		Standard Deviation	0.00127	0.00055	0.15170	0.00955	27.5	0.00000362	0.00000274	0.002790	0.00043	0.618	0.00314	0.0926	0.096	0.0000017	0.0000017	51	0.00355	0.00376	0	0	79	0.00462	0.00405				
		1st Quartile	0.00106	0.00068	0.0088	0.00382	149.8	0.00000312	<0.0000050	0.00052	0.00034	0.516	<0.0050	0.1050	0.1010	<0.0000020	<0.0000020	397	0.00078	0.00068	<0.00020	<0.00020	365	<0.0050	<0.0050				
		Median	0.00233	0.00117	0.0136	0.0072	179	<0.000010	<0.000010	0.00094	0.00046	0.976	<0.0050	0.2035	0.2245	<0.0000020	<0.0000020	443	0.00215	0.00195	<0.00020	<0.00020	390	<0.0050	<0.0050				
		3rd Quartile	0.00299	0.00148	0.06660	0.01868	199.5	<0.000010	0.00000598	0.001220	0.00072	1.145	<0.0050	0.2328	0.2402	<0.0000020	<0.0000020	471	0.00247	0.00235	<0.00020	<0.00020	412	<0.0050	<0.0050				

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 51
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW002	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Average	0.00044	0.00038	0.00300	0.0015	229.7	0.0000100	0.0000100	0.00050	0.000200	1.54	1.52	2.97	2.9	0.0000050	0.0000050	1241	0.0036	0.0034	0.000050	0.000050	1228.3	0.00300	0.001	0.00400	0.02500		0.1038
		Count	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6		6
		Minimum	0.00034	0.00031	<0.0060	<0.0020	222	<0.000020	<0.000020	<0.0010	<0.00040	1.26	1.26	2.76	2.66	<0.000010	<0.000010	1190	0.0033	0.0031	<0.00010	<0.00010	1190	<0.0060	<0.0020	<0.0020	<0.050		0.0879
		Maximum	0.00061	0.00044	<0.0060	0.004	237	<0.000020	<0.000020	<0.0010	<0.00040	1.7	1.75	3.19	3.13	<0.000010	<0.000010	1320	0.0037	0.0035	<0.00010	<0.00010	1250	<0.0060	<0.0020	<0.020	<0.050		0.127
		Geometric Mean	0.00043	0.00037	0.00300	0.00126	229.6	0.0000100	0.0000100	0.00050	0.0002	1.52	1.51	2.97	2.9	0.0000050	0.0000050	1241	0.0036	0.0034	0.000050	0.000050	1228.2	0.00300	0.001	0.00215	0.025		0.103
		Count <DL	0	0	6	5	0	6	6	6	6	0	0	0	0	6	6	0	0	0	6	6	0	6	6	6	6		0
		Standard Deviation	0.00010	0.00005	0.00000	0.00122	6.3	0.0000000	0.0000000	0.00000	0	0.22	0.21	0.20	0.22	0.0000000	0.0000000	42	0.0002	0.0002	0.000000	0.000000	22.3	0.00000	0	0.00465	0.000000001		0.0146
		1st Quartile	0.00036	0.00033	<0.0060	<0.0020	224.2	<0.000020	<0.000020	<0.0010	<0.00040	1.36	1.35	2.8	2.7	<0.000010	<0.000010	1230	0.0034	0.0035	<0.00010	<0.00010	1222.5	<0.0060	<0.0020	<0.0020	<0.050		0.0924
		Median	0.00044	0.0004	<0.0060	<0.0020	232	<0.000020	<0.000020	<0.0010	<0.00040	1.66	1.62	2.97	2.92	<0.000010	<0.000010	1235	0.0037	0.0035	<0.00010	<0.00010	1230	<0.0060	<0.0020	<0.0020	<0.050		0.1065
		3rd Quartile	0.00047	0.0004	<0.0060	<0.0020	233	<0.000020	<0.000020	<0.0010	<0.00040	1.68	1.63	3.15	3.11	<0.000010	<0.000010	1240	0.0037	0.0035	<0.00010	<0.00010	1245	<0.0060	<0.0020	0.00775	<0.050		0.107
QU1009D	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average	0.123	0.121	0.00610	0.00050	191.3	0.0000050	0.0000050	0.000250	0.000100	0.188	0.179	0.0192	0.0189	0.0000050	0.0000050	155.7	0.000250	0.000250	0.0000250	0.0000250	97.7	0.00350	0.00050	0.0073	0.0250		0.146
		Count	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.122	0.118	0.0042	<0.0010	191	<0.000010	<0.000010	<0.00050	<0.00020	0.183	0.178	0.0191	0.0187	<0.000010	<0.000010	154	<0.00050	<0.00050	<0.000050	<0.000050	96.1	<0.0030	<0.0010	0.0072	<0.050		0.138
		Maximum	0.124	0.123	0.007	<0.0010	192	<0.000010	<0.000010	<0.00050	<0.00020	0.19	0.179	0.0195	0.0194	<0.000010	<0.000010	159	<0.00050	<0.00050	<0.000050	<0.000050	98.5	0.0075	<0.0010	0.0074	<0.050		0.163
		Geometric Mean	0.123	0.121	0.0059	0.0005	191.3	0.0000050	0.0000050	0.000250	0.000100	0.188	0.179	0.0192	0.0189	0.0000050	0.0000050	155.6	0.000250	0.000250	0.0000250	0.0000250	97.7	0.00256	0.00050	0.0073	0.0250		0.146
		Count <DL	0	0	0	3	0	3	3	3	3	0	0	0	0	3	3	0	3	3	3	3	0	2	3	0	3		0
		Standard Deviation	0.001	0.003	0.0016	0	0.6	0.0000000	0.0000000	0.000000	0.000000	0.004	0.001	0.0002	0.0004	0.0000000	0.0000000	2.9	0.000000	0.000000	0.0000000	0.0000000	1.4	0.00346	0.00000	0.0001	0.0000		0.014
		1st Quartile	0.123	0.12	0.00560	<0.0010	191	<0.000010	<0.000010	<0.00050	<0.00020	0.186	0.178	0.0191	0.0187	<0.000010	<0.000010	154	<0.00050	<0.00050	<0.000050	<0.000050	97.3	<0.0030	<0.0010	0.0072	<0.050		0.138
		Median	0.124	0.123	0.00700	<0.0010	191	<0.000010	<0.000010	<0.00050	<0.00020	0.19	0.179	0.0191	0.0187	<0.000010	<0.000010	154	<0.00050	<0.00050	<0.000050	<0.000050	98.5	<0.0030	<0.0010	0.0072	<0.050		0.138
		3rd Quartile	0.124	0.123	0.00700	<0.0010	191.5	<0.000010	<0.000010	<0.00050	<0.00020	0.19	0.179	0.0193	0.019	<0.000010	<0.000010	156.5	<0.00050	<0.00050	<0.000050	<0.000050	98.5	0.0045	<0.0010	0.0073	<0.050		0.151
QU1009S	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average	0.0812	0.0822	4.9	0.00420	145	0.0000350	0.0000050	0.002660	0.000100	7.87	6.21	0.443	0.439	0.0000050	0.0000050	241.5	0.00172	0.000405	0.004008	0.0000250	109.0	0.00865	0.00050	0.0444	0.0250		0.0424
		Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.0798	0.0821	0.171	0.0015	136	<0.000010	<0.000010	0.00083	<0.00020	6.28	5.7	0.438	0.421	<0.000010	<0.000010	228	0.00063	<0.00050	0.000177	<0.000050	104	<0.0030	<0.0010	0.0149	<0.050		0.0379
		Maximum	0.0827	0.0824	9.63	0.0068	154	0.000065	<0.000010	0.00448	<0.00020	9.46	6.72	0.448	0.457	<0.000010	<0.000010	255	0.0028	0.00056	0.00784	<0.000050	114	0.0158	<0.0010	0.0740	<0.050		0.0468
		Geometric Mean	0.0812	0.0822	1.283	0.0032	144.7	0.0000180	0.0000050	0.001930	0.000100	7.71	6.19	0.443	0.439	0.0000050	0.0000050	241.1	0.00133	0.000374	0.001178	0.0000250	108.9	0.00487	0.00050	0.0332	0.0250		0.0421
		Count <DL	0	0	0	0	0	1	2	0	2	0	0	0	0	2	2	0	0	1	0	2	0	1	2	0	2		0
		Standard Deviation	0.0021	0.0002	6.689	0.0037	12.7	0.0000424	0.0000000	0.002580	0.000000	2.25	0.72	0.007	0.025	0.0000000	0.0000000	19.1	0.00153	0.000219	0.005419	0.0000000	7.1	0.01011	0.00000	0.0418	0.0000		0.0063
		1st Quartile	0.0805	0.0822	2.536	0.0028	140.5	0.00002	<0.000010	0.00174	<0.00020	7.08	5.96	0.44	0.43	<0.000010	<0.000010	234.8	0.00117	0.000328	0.002093	<0.000050	106.5	0.00508	<0.0010	0.0297	<0.050		0.0401
		Median	0.0812	0.0822	4.901	0.00410	145	0.000035	<0.000010	0.00266	<0.00020	7.87	6.21	0.443	0.439	<0.000010	<0.000010	241.5	0.00172	0.000405	0.004008	<0.000050	109	0.00865	<0.0010	0.0445	<0.050		0.0424
		3rd Quartile	0.082	0.0823	7.265	0.0055	149.5	0.00005	<0.000010	0.00357	<0.00020	8.67	6.46	0.446	0.448	<0.000010	<0.000010	248.2	0.00226	0.000482	0.005924	<0.000050	111.5	0.01223	<0.0010	0.0592	<0.050		0.0446
SPD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E218582	Settling Pond # 1	Average	0.00122	0.00093	0.0457	0.01548	55.40	0.00002968	0.00001807	0.00105	0.00075	0.313	0.1289	0.0648	0.03768	0.00010119	0.00010162	268.8	0.00122	0.00102	0.0001	0.000105	215.7	0.00440	0.00316	0.0109	0.00569	0.0112	0.02054
		Count	20	20	20	20	19	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	51	20	20	18	8	16	19
		Minimum	0.00064	0.0005	0.0093	<0.0030	12.40	<0.0000050	<0.0000050	0.0005	0.00044	0.17	0.0186	0.0171	<0.0010	<0.000002	<0.000002	15.8	<0.0010	<0.0010	<0.00020	<0.00020	3.93	<0.0050	<0.0050	0.0059	<0.0050	<0.020	<0.0050
		Maximum	0.00201	0.00191	0.129	0.0785	92.8	0.000207	0.000108	0.00198	0.00191	1.03	0.731	0.210	0.211	<0.0020	<0.0020	433	0.002	0.002	<0.00020	<0.00040	364	0.0269	0.0132	0.0206	0.0097	0.029	0.037
		Geometric Mean	0.00116	0.00088	0.0344	0.0077	49.6	0.00001084	0.00000988	0.00098	0.00069	0.275	0.0797	0.0523	0.00671	0.0000023	0.0000028	210.1	0.00114	0.00092	0.0001	0.000104	155.54	0.0032	0.00281	0.0103	0.00493	0.0107	0.01811
		Count <DL	0	0	0	5	0	8	5	0	0	0	0	0	7	19	17	0	3	8	20	20	0	17	19	0	3	15	1
		Standard Deviation	0.00040	0.00035	0.0345	0.0204	21.7	0.0000575	0.00002474	0.00039	0.00038	0.207	0.1663	0.051	0.06167	0.0003074	0.00030724	119.5	0.00043	0.00044	0.000000	0.000022	102.4	0.00577	0.00243	0.004	0.00298	0.0048	0.00857
		1st Quartile	0.00093	0.00073	0.0159	0.00338	44.2	<0.00001	<0.000010	0.00078	0.0005	0.201	0.0466	0.0359	<0.0010	<0.0000020	<0.0000020	240	0.00108	<0.0010	<0.00020	<0.00020	172.5	<0.0050	<0.0050	0.008	<0.0050	<0.020	0.016
		Median	0.00106	0.00084	0.0389	0.00625	61.3	0.0000090	0.0000075	0.00096	0.00066	0.242	0.067	0.0494	0.0063	<0.0000020	<0.0000020	318	0.0012	0.00115	<0.00020	<0.00020	254.00	<0.0050	<0.0050	0.0096	0.0057	<0.020	0.02000
		3rd Quartile	0.0016	0.00108	0.0625	0.01495	65	0.000017	0.00002700	0.00126	0.00086	0.298	0.1105	0.0654	0.04272	<0.0000020	0.00000308	340	0.0014	0.00122	<0.00020	<0.00020	289	<0.0050	<0.0050	0.01400	0.00827	<0.020	0.02500
LLE	Long Lake Entrance (LLE)	Average	0.00213	0.00128	0.1824	0.02302	56.5	0.00000658	0.00000422	0.00132	0.000508	2.258	0.4591	0.2018	0.1868	0.00000234	0.0000021	179.9	0.00061	0.0005	0.000119	0.000100	156	0.00361	0.00250				
E292130		Count	12	12	12	12	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	53	12	12				
		Minimum	0.00119	0.00077	0.0322	<0.0030	37.6	<0.0000050	<0.0000050	0.00045	<0.00020	0.475	0.0255	0.0681	0.056	<0.0000020	<0.0000020	87.8	<0.0010	<0.0010	<0.00020	<0.00020	59.6	<0.0050	<0.0050				
		Maximum	0.0036	0.0026	0.755	0.0521	102	0.0000180	0.000009	0.00664	0.00087	8.27	0.996	0.661	0.692	<0.000010	<0.000010	422	0.0018	<0.0010	0.00033	<0.00020	399	0.0083	<0.0050				
		Geometric Mean	0.00201	0.0012	0.1165	0.01652	54.2	0.00000558	0.0000037	0.00093	0.000458	1.48	0.3346	0.1496	0.1302	0.00000199	0.00000166	159.7	0.00056	0.0005	0.00011	0.000100	138.2	0.00322	0.00250				
		Count <DL	0	0	0	1	0	8	9	0	1	0	0	0	0	6	9	0	11	12	11	12	0	9	12				
		Standard Deviation	0.0008	0.00055	0.2094	0.01583	18.6	0.00000452	0.00000239	0.00171	0.000195	2.452	0.2974	0.1848	0.196	0.00000142	0.00000159	104.4	0.00038	0	0.000066	0.000000	85.3	0.00207	0.00000				
		1st Quartile	0.00158	0.00091	0.0616	0.01365	44.2	<0.000010	<0.0000050	0.00064	0.000412	0.802	0.239	0.0828	0.075	<0.0000020	<0.0000020	116.5	<0.0010	<0.0010	<0.00020	<0.00020	98.9	<0.0050	<0.0050				
		Median	0.00194	0.00115	0.0986	0.0212	53.2	<0.000010	<0.0000050	0.00080	0.000515	1.165	0.444	0.1123	0.1006	0.00000215	<0.0000020	141.5	<0.0010	<0.0010	<0.00020	<0.00020	134	<0.0050	<0.0050				
		3rd Quartile	0.00276	0.00136	0.1955	0.02818	59.2	0.0000058	0.0000525	0.0011	0.000575	2.398	0.6842	0.241	0.191	0.00000252	0.00000278	182.8	<0.0010	<0.0010	<0.00020	<0.00020	172	0.0034	<0.0050				
LLM1	Long Lake Middle 1 metre below Surface	Average	0.00071	0.00064	0.0253	0.0109	30.4	0.00000359	0.0000025	0.00052	0.00039	0.1396	0.0603	0.0138	0.00548	0.00006378	0.00006365	65.1	0.00050	0.00050	0.000100	0.000100	45.4	0.00250	0.00250	0.00448		0.0160	
E206619		Count	16	16	16	16	7	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4		3	
		Minimum	0.00043	0.00043	0.0094	0.007	25.5	<0.0000050	<0.0000050	0.00032	0.00031	0.0951	0.0358	0.0047	<0.0010	<0.0000020	<0.0000020	47.5	<0.0010	<0.0010	<0.00020	<0.00020	32.3	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00107	0.00091	0.0529	0.0224	34.4	0.000005	<0.0000050	0.00068	0.00059	0.306	0.105	0.0237	0.0158	<0.0020	<0.0020	85.3	<0.0010	<0.0010	<0.00020	<0.00020	57.3	<0.0050	<0.0050	0.0079		0.028	
		Geometric Mean	0.00068	0.00062	0.0229	0.0104	30.1	0.00000339	0.0000025	0.00051	0.00039	0.1334	0.0577	0.0126	0.00219	0.0000018	0.00000174	64.1	0.00050	0.00050	0.000100	0.000100	44.8	0.0025	0.00250	0.00396		0.0141	
		Count <DL	0	0	0	0	0	15	16	0	0	0	0	0	7	14	14	0	16	16	16	16	0	16	16	2		2	
		Standard Deviation	0.00021	0.00017	0.0118	0.0038	4.2	0.00000128	1E-13	0.0001	0.00007	0.0509	0.0187	0.0054	0.00602	0.00024966	0.00024969	11.8	0.00000	0.00000	0.000000	0.000000	7.3	4E-11	0.00000	0.00257		0.0104	
		1st Quartile	0.00052	0.0005	0.0189	0.0081	26.2	<0.0000050	<0.0000050	0.00046	0.00035	0.1122	0.0504	0.0105	<0.0010	<0.0000020	<0.0000020	55.7	<0.0010	<0.0010	<0.00020	<0.00020	40.6	<0.0050	<0.0050	<0.0050		<0.020	
		Median	0.00066	0.00062	0.023	0.0105	32.8	<0.0000050	<0.0000050	0.00052	0.00038	0.1265	0.0586	0.0146	0.0013	<0.0000020	<0.0000020	68.3	<0.0010	<0.0010	<0.00020	<0.00020	46.2	<0.0050	<0.0050	0.00375		<0.020	
		3rd Quartile	0.0009	0.00084	0.0292	0.0118	33.8	<0.000010	<0.0000050	0.0006	0.00042	0.1415	0.0677	0.0174	0.01108	<0.0000020	<0.0000020	74.4	<0.0010	<0.0010	<0.00020	<0.00020	50	<0.0050	<0.0050	0.00572		0.019	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 52
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LLMB	Long Lake Middle 1 metre From Bottom	Average	0.00027	0.00022	0.0108	0.00388	54.1	0.00000494	0.00000334	0.00044	0.00035	0.0708	0.01002	1.444	1.1778	0.00006373	0.00006361	132.6	0.00050	0.00050	0.000100	0.000100	124.6	0.00250	0.00286	0.00358		0.093	
E206619		Count	16	16	16	16	7	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4		3	
		Minimum	0.00021	0.00016	0.0057	<0.0030	51	<0.0000050	<0.0000050	0.00035	0.00028	0.0309	<0.0050	0.211	0.0109	<0.0000020	<0.0000020	121	<0.0010	<0.0010	<0.00020	<0.00020	113	<0.0050	<0.0050	<0.0050		0.080	
		Maximum	0.00035	0.00033	0.0165	0.0081	56.4	0.000024	0.000008	0.00061	0.00045	0.123	0.0295	3.74	3.21	<0.0020	<0.0020	146	<0.0010	<0.0010	<0.00020	<0.00020	135	<0.0050	0.0083	0.0068		0.106	
		Geometric Mean	0.00027	0.00021	0.0102	0.0033	54.0	0.0000039	0.00000303	0.00043	0.00035	0.0643	0.00628	0.95	0.5827	0.00000177	0.00000171	132.4	0.00050	0.00050	0.000100	0.000100	124.4	0.00250	0.00269	0.00321		0.092	
		Count <DL	0	0	0	5	0	14	13	0	0	0	7	0	0	14	14	0	16	16	16	16	0	16	15	3		0	
		Standard Deviation	0.00005	0.00005	0.0035	0.00216	2.4	0.00000523	0.00000185	0.00008	0.00005	0.0309	0.01014	1.321	1.1531	0.00024967	0.0002497	7.3	0.00000	0.00000	0.000000	0.000000	5.5	4E-11	0.00145	0.00215		0.013	
		1st Quartile	0.00023	0.00019	0.0081	<0.0030	51.9	<0.0000050	<0.0000050	0.0004	0.00032	0.0437	<0.0050	0.544	0.42	<0.0000020	<0.0000020	127.8	<0.0010	<0.0010	<0.00020	<0.00020	120	<0.0050	<0.0050	<0.0050		0.086	
		Median	0.00024	0.00021	0.0096	0.0035	55.5	0.00000375	<0.0000050	0.00042	0.00034	0.0655	0.00580	0.786	0.5585	<0.0000020	<0.0000020	130	<0.0010	<0.0010	<0.00020	<0.00020	126.0	<0.0050	<0.0050	<0.0050		0.092	
		3rd Quartile	0.00032	0.00024	0.0144	0.00515	55.9	<0.000010	<0.0000050	0.00046	0.00039	0.0956	0.01395	2.618	2.225	<0.0000020	<0.0000020	137.5	<0.0010	<0.0010	<0.00020	<0.00020	128	<0.0050	<0.0050	0.00358		0.099	
LLO	Long Lake Outlet	Average	0.00069	0.00058	0.0313	0.0125	28.7	0.00000425	0.00000266	0.0006	0.00048	0.1551	0.0679	0.0196	0.00337	0.00012619	0.00018869	58.7	0.0005	0.00058	0.000100	0.000100	32.5	0.00266	0.00250				
E219412		Count	16	16	16	16	13	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	44	16	16				
		Minimum	0.00040	0.00035	0.0146	0.0064	24.2	<0.0000050	<0.0000050	0.00038	0.00034	0.0962	0.0201	0.0071	<0.0010	<0.0000020	<0.0000020	40.9	<0.0010	<0.0010	<0.00020	<0.00020	14.4	<0.0050	<0.0050				
		Maximum	0.00098	0.00072	0.0571	0.0306	34.9	0.000008	<0.000010	0.0009	0.00071	0.223	0.118	0.0419	0.0118	<0.0020	<0.0020	82	<0.0010	0.0017	<0.00020	<0.00020	63.6	0.0051	<0.0050				
		Geometric Mean	0.00067	0.00056	0.0298	0.0114	28.5	0.00000397	0.00000261	0.00058	0.00046	0.1488	0.0613	0.0172	0.00155	0.0000027	0.0000043	57.5	0.0005	0.00054	0.000100	0.000100	30.8	0.00261	0.00250				
		Count <DL	0	0	0	0	0	12	16	0	0	0	0	0	9	15	15	0	16	15	16	16	0	15	16				
		Standard Deviation	0.00018	0.00014	0.0102	0.0061	3.3	0.00000158	0.00000063	0.00014	0.00011	0.0451	0.0298	0.0103	0.00374	0.0003411	0.00040253	12.8	0	0.00030	0.000000	0.000000	10.7	0.00065	4E-11				
		1st Quartile	0.0005	0.00043	0.0283	0.008	26.5	<0.0000050	<0.0000050	0.00049	0.0004	0.118	0.0461	0.0123	<0.0010	<0.0000020	<0.0000020	50.2	<0.0010	<0.0010	<0.00020	<0.00020	24.3	<0.0050	<0.0050				
		Median	0.00075	0.0006	0.0298	0.0108	27.9	<0.000010	<0.0000050	0.00058	0.00044	0.145	0.0624	0.0185	<0.0010	<0.0000020	<0.0000020	54.2	<0.0010	<0.0010	<0.00020	<0.00020	30.5	<0.0050	<0.0050				
		3rd Quartile	0.00082	0.00071	0.033	0.0153	30	<0.000010	<0.0000050	0.00071	0.00053	0.201	0.0968	0.0218	0.0061	0.00000125	0.0000035	68.5	<0.0010	<0.0010	<0.00020	<0.00020	38.5	<0.0050	<0.0050				
WB	Middle Quinsam Lake Outlet	Average	0.00022	0.000189	0.0230	0.0119	34	0.00002447	0.00000419	0.0008	0.00053	0.0677	0.0242	0.0092	0.00163	0.0001886	0.0001887	34.7	0.00050	0.00050	0.000100	0.000100	23.9	0.00250	0.00250				
E0900504		Count	16	16	16	16	13	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16				
		Minimum	0.00011	<0.00010	0.0146	0.0065	26.7	<0.0000050	<0.0000050	0.00054	0.00039	0.0295	0.0107	0.0029	<0.0010	<0.0000020	<0.0000020	27.1	<0.0010	<0.0010	<0.00020	<0.00020	13.4	<0.0050	<0.0050				
		Maximum	0.00032	0.00029	0.0396	0.0154	43.2	0.000339	0.00002	0.00297	0.00088	0.151	0.0419	0.0217	0.0034	<0.0020	<0.0020	44.7	<0.0010	<0.0010	<0.00020	<0.00020	32.9	<0.0050	<0.0050				
		Geometric Mean	0.00021	0.000178	0.0222	0.0114	33.5	0.00000441	0.00000331	0.00071	0.00052	0.0611	0.0222	0.0078	0.00135	0.00000404	0.00000433	34.4	0.00050	0.00050	0.000100	0.000100	23.1	0.00250	0.00250				
		Count <DL	0	1	0	0	0	15	13	0	0	0	0	0	4	16	15	0	16	16	16	16	0	16	16				
		Standard Deviation	0.00006	0.000055	0.0069	0.0031	6.1	0.00008388	0.00000442	0.00059	0.00011	0.0322	0.0101	0.0049	0.00093	0.00040259	0.00040253	4.4	0.00000	0.00000	0.000000	0.000000	6.2	4E-11	4E-11				
		1st Quartile	0.00017	0.000165	0.0186	0.0099	27.9	<0.0000050	<0.0000050	0.00059	0.00047	0.0393	0.0145	0.0043	0.00088	<0.0000020	<0.0000020	31.6	<0.0010	<0.0010	<0.00020	<0.00020	19.8	<0.0050	<0.0050				
		Median	0.00024	0.000200	0.0218	0.0125	33.2	<0.0000050	<0.0000050	0.00064	0.0005	0.0665	0.0226	0.0102	0.00155	<0.0000020	<0.0000020	35	<0.0010	<0.0010	<0.00020	<0.00020	24.6	<0.0050	<0.0050				
		3rd Quartile	0.00026	0.000213	0.0243	0.0144	39.7	<0.000010	0.00000312	0.00075	0.00058	0.0806	0.0338	0.0113	0.00205	0.000002	0.0000035	37.5	<0.0010	<0.0010	<0.00020	<0.00020	29.0	<0.0050	<0.0050				
7SSD	Settling Pond at 7S- Discharge to Stream 1 -7S		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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E292069		Average	0.00101	0.00057	0.30748	0.0081789	104.7	0.00001585	0.00001166	0.00227	0.00108	0.802	0.01959	0.2565	0.22188	0.00027197	0.0004554	260	0.00242	0.002	0.00011	0.0001	169.8	0.00429	0.00304	0.0133			
		Count	48	48	48	48	37	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	1			
		Minimum	0.00033	0.00021	0.0124	0.000189	59.6	<0.0000050	<0.0000050	0.00061	0.00052	0.100	<0.0050	0.0064	<0.0010	<0.0000020	<0.0000020	149	<0.0010	<0.0010	<0.00020	<0.00020	60.8	<0.0050	<0.0050	0.0133			
		Maximum	0.00597	0.00196	2.75	0.0254	141	0.00013	0.000094	0.0105	0.0042	7.23	0.216	0.961	0.854	<0.010	0.0054	524	0.0379	0.0304	0.00043	<0.00020	493	0.0436	0.025	0.0133			
		Geometric Mean	0.00082	0.00049	0.13166	0.0061235	102.5	0.00001024	0.00000783	0.00185	0.00097	0.525	0.00956	0.1739	0.07806	0.00000245	0.00000269	249	0.00129	0.00108	0.000105	0.000100	154	0.00327	0.00267	0.0133			
		Count <DL	0	0	1	4	0	13	17	0	0	0	11	0	6	45	42	0	18	23	46	48	0	37	46	0			
		Standard Deviation	0.00093	0.00036	0.4961	0.0057673	21.0	0.00002037	0.00001386	0.00179	0.00066	1.088	0.036	0.1922	0.1983	0.00102573	0.00145401	83	0.00544	0.00439	0.000051	0.000000	82.6	0.00612	0.00327	0			
		1st Quartile	0.0006	0.00032	0.04965	0.00405	93.5	<0.00001	<0.0000050	0.00133	0.00079	0.26	0.00582	0.1028	0.0713	<0.0000020	<0.0000020	205.0	<0.0010	<0.0010	<0.00020	<0.00020	109.8	<0.0050	<0.0050	0.0133			
		Median	0.00076	0.0005	0.165	0.0061	105	0.000011	0.0000085	0.00159	0.00088	0.6	0.0087	0.2225	0.176	<0.0000020	<0.0000020	242	0.0013	0.0010	<0.00020	<0.00020	159.0	<0.0050	<0.0050	0.0133			
		3rd Quartile	0.00102	0.00071	0.281	0.0116	121	0.0000190	0.0000163	0.00268	0.0012	0.784	0.0149	0.3998	0.37125	<0.0000020	<0.0000020	278.0	0.0021	0.0022	<0.00020	<0.00020	196.5	<0.0050	<0.0050	0.0133			
7S	Stream 1-7S discharge to LWO	Average	0.000177	0.000076	0.0685	0.016	18.412	0.0000093	0.00000722	0.000546	0.00043	0.0522	0.00372	0.0023	0.0005	0.00018712	0.00025688	55.1	0.00053	0.00061	0.000100	0.000100	40.190	0.00273	0.00250	0.0025			0.0058
E292109		Count	43	43	43	43	36	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	2			1
		Minimum	<0.00010	<0.00010	0.0127	0.0049	<0.50	<0.0000050	<0.0000050	<0.00020	0.0002	<0.0050	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	16.9	<0.0010	<0.0010	<0.00020	<0.00020	4.3	<0.0050	<0.0050	<0.0050			0.0058
		Maximum	0.00181	0.00019	1.05	0.0396	31.1	0.0000630	0.000067	0.00222	0.00093	0.912	0.017	0.0327	<0.0010	<0.010	<0.010	106	0.0012	0.0054	<0.00020	<0.00020	102.00	0.0078	<0.0050	<0.0050			0.0058
		Geometric Mean	0.000117	0.000068	0.0322	0.0147	16.4	0.00000612	0.00000427	0.000459	0.0004	0.01784	0.00315	0.00089	0.0005	0.00000214	0.0000022	49.4	0.00052	0.00053	0.000100	0.000100	30.6	0.00263	0.00250	0.0025			0.0058
		Count <DL	13	29	0	0	1	28	28	7	0	2	35	28	43	41	42	0	41	42	43	43	0	41	43	2			0
		Standard Deviation	0.000281	0.000041	0.1737	0.0072	5.113	0.00001176	0.00001173	0.000377	0.00018	0.1513	0.00294	0.0059	0	0.00079424	0.00092147	23.9	0.00014	0.00075	0.000000	0.000000	25.39	0.00108	0	0			0
		1st Quartile	<0.00010	<0.0001	0.0205	0.0114	15.85	<0.000010	<0.000005	0.000305	0.00031	0.009	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	43	<0.0010	<0.0010	<0.00020	<0.00020	24.35	<0.0050	<0.0050	<0.0050			0.0058
		Median	0.00012	<0.00010	0.0257	0.0144	17.35	<0.000010	<0.0000050	0.00042	0.00037	0.016	<0.0050	<0.001	<0.0010	<0.0000020	<0.0000020	53.7	<0.0010	<0.0010	<0.00020	<0.00020	36.6	<0.0050	<0.0050	<0.0050			0.00580
		3rd Quartile	0.00015	0.000105	0.0354	0.0183	21.85	0.0000085	0.0000063	0.00066	0.00053	0.02965	<0.0050	0.00145	<0.0010	<0.0000020	<0.0000020	69.2	<0.0010	<0.0010	<0.00020	<0.00020	49.2	<0.0050	<0.0050	<0.0050			0.0058
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average	0.429	0.435	0.0289	0.0021	183.0	0.0000050	0.000005	0.000250	0.000100	0.265	0.216	0.0545	0.0537	0.0000050	0.0000050	114.3	0.000250	0.000250	0.0000783	0.0000250	12.9	0.00150	0.00050	0.0234	0.0250		0.145
		Count	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.428	0.424	0.0251	0.0014	181	<0.000010	<0.000010	<0.00050	<0.00020	0.23	0.195	0.0479	0.0462	<0.000010	<0.000010	113	<0.00050	<0.00050	<0.000050	<0.000050	12.5	<0.0030	<0.0010	0.0234	<0.050		0.144
		Maximum	0.431	0.44	0.0308	0.0025	187	<0.000010	<0.000010	<0.00050	<0.00020	0.336	0.257	0.0578	0.0574	<0.000010	<0.000010	117	<0.00050	<0.00050	0.000105	<0.000050	13.6	<0.0030	<0.0010	0.0235	<0.050		0.148
		Geometric Mean	0.429	0.435	0.0288	0.0021	183.0	0.0000050	0.000005	0.00025	0.000100	0.261	0.214	0.0543	0.0534	0.0000050	0.0000050	114.3	0.000250	0.000250	0.0000651	0.0000250	12.9	0.0015	0.00050	0.0234	0.0250		0.145
		Count <DL	0	0	0	0	0	3	3	3	3	0	0	0	0	3	3	0	3	3	1	3	0	3	3	0	3		0
		Standard Deviation	0.002	0.009	0.0033	0.0006	3.5	0.0000000	0	0	0.000000	0.061	0.036	0.0057	0.0065	0.0000000	0.0000000	2.3	0.000000	0.000000	0.0000462	0.0000000	0.6	0	0.00000	0.0001	0.0000		0.002
		1st Quartile	0.428	0.432	0.0280	0.002	181	<0.000010	<0.000010	<0.00050	<0.00020	0.23	0.195	0.0528	0.0518	<0.000010	<0.000010	113	<0.00050	<0.00050	0.000065	<0.000050	12.5	<0.0030	<0.0010	0.0234	<0.050		0.144
		Median	0.428	0.44	0.0308	0.0025	181	<0.000010	<0.000010	<0.00050	<0.00020	0.23	0.195	0.0578	0.0574	<0.000010	<0.000010	113	<0.00050	<0.00050	0.000105	<0.000050	12.5	<0.0030	<0.0010	0.0234	<0.050		0.144
		3rd Quartile	0.43	0.44	0.0308	0.0025	184	<0.000010	<0.000010	<0.00050	<0.00020	0.283	0.226	0.0578	0.0574	<0.000010	<0.000010	115	<0.00050	<0.00050	0.000105	<0.000050	13	<0.0030	<0.0010	0.0234	<0.050		0.146
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average	0.49	0.484	4.42	0.0054	140.5	0.0000290	0.0000083	0.01174	0.000167	5.8	0.072	0.187	0.0807	0.0000050	0.0000050	72.5	0.00508	0.000417	0.000514	0.0000417	10.4	0.0107	0.00083	0.2162	0.0250		0.0941
		Count	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.461	0.463	1.41	0.0052	137	0.000028	<0.000010	0.00302	<0.00020	1.86	0.068	0.123	0.0778	<0.000010	<0.000010	70.2	0.00145	<0.00050	0.000181	<0.000050	10.3	0.0047	<0.0010	0.0547	<0.050		0.0891
		Maximum	0.504	0.495	5.92	0.0055	144	0.00003	<0.000020	0.0161	<0.00040	7.77	0.074	0.219	0.0865	<0.000010	<0.000010	73.6	0.0069	<0.0010	0.00068	<0.00010	10.5	0.0137	<0.0020	0.297	<0.050		0.104
		Geometric Mean	0.489	0.484	3.67	0.0054	140.5	0.0000290	0.0000079	0.00922	0.000159	4.82	0.072	0.181	0.0806	0.0000050	0.0000050	72.4	0.0041	0.000397	0.000437	0.0000397	10.4	0.0096	0.00079	0.169	0.0250		0.0938
		Count <DL	0	0	0	0	0	0	3	0	3	0	0	0	0	3	3	0	0	3	0	3	0	0	3	0	3		0
		Standard Deviation	0.025	0.018	2.60	0.0002	4.9	0.0000010	0.0000029	0.00755	0.000058	3.41	0.003	0.055	0.0050	0.0000000	0.0000000	2.0	0.00315	0.000144	0.000288	0.0000144	0.1	0.0052	0.00029	0.1399	0.0000		0.009
		1st Quartile	0.483	0.479	3.66	0.0054	138.8	0.000028	0.0000075	0.00956	0.00015	4.81	0.071	0.171	0.0778	<0.000010	<0.000010	71.9	0.00418	0.000375	0.000431	0.0000375	10.4	0.0092	0.00075	0.1758	<0.050		0.0891
		Median	0.504	0.495	5.92	0.0055	140.5	0.000028	<0.000020	0.0161	<0.00040	7.77	0.074	0.219	0.0778	<0.000010	<0.000010	73.6	0.0069	<0.0010	0.00068	<0.00010	10.5	0.0137	<0.0020	0.297	<0.050		0.0891
		3rd Quartile	0.504	0.495	5.92	0.0055	142.2	0.000029	<0.000020	0.0161	<0.00040	7.77	0.074	0.219	0.0822	<0.000010	<0.000010	73.6	0.0069	<0.0010	0.00068	<0.00010	10.5	0.0137	<0.0020	0.297	<0.050		0.0966

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 53
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average	0.33	0.262	0.00590	0.0013	227.0	0.000005	0.000005	0.00025	0.0001	0.56	0.242	0.084	0.0788	0.0000050	0.0000050	115	0.00025	0.00025	0.00639	0.000025	5.80	0.0091	0.0005	0.0215	0.025		0.232
		Count	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.33	0.262	0.0059	0.0013	227	<0.000010	<0.000010	<0.00050	<0.00020	0.56	0.242	0.0838	0.0788	<0.000010	<0.000010	115	<0.00050	<0.00050	0.00639	<0.000050	5.8	0.0091	<0.0010	0.0215	<0.050		0.232
		Maximum	0.33	0.262	0.0059	0.0013	227	<0.000010	<0.000010	<0.00050	<0.00020	0.56	0.242	0.0838	0.0788	<0.000010	<0.000010	115	<0.00050	<0.00050	0.00639	<0.000050	5.8	0.0091	<0.0010	0.0215	<0.050		0.232
		Geometric Mean	0.33	0.262	0.0059	0.0013	227.0	0.000005	0.000005	0.00025	0.000100	0.56	0.242	0.0838	0.0788	0.0000050	0.0000050	115	0.00025	0.00025	0.00639	0.000025	5.8	0.0091	0.0005	0.0215	0.025		0.232
		Count <DL	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0	1	1	0	1	0	0	1	0	1		0
		Standard Deviation	0	0	0	0.00000	0.0	0	0	0	0	0.00	0	0	0	0.0000000	0.0000000	0	0	0	0	0	0	0	0	0.00000	0	0		0
		1st Quartile	0.33	0.262	0.00590	0.0013	227	<0.000010	<0.000010	<0.00050	<0.00020	0.56	0.242	0.0838	0.079	<0.000010	<0.000010	115	<0.00050	<0.00050	0.00639	<0.000050	5.80	0.0091	<0.0010	0.0215	<0.050		0.232
		Median	0.33	0.262	0.00590	0.0013	227	<0.000010	<0.000010	<0.00050	<0.00020	0.56	0.242	0.084	0.0788	<0.000010	<0.000010	115	<0.00050	<0.00050	0.00639	<0.000050	5.80	0.0091	<0.0010	0.0215	<0.050		0.232
		3rd Quartile	0.330	0.262	0.00590	0.0013	227	<0.000010	<0.000010	<0.00050	<0.00020	0.56	0.242	0.0838	0.0788	<0.000010	<0.000010	115	<0.00050	<0.00050	0.00639	<0.000050	5.80	0.0091	<0.0010	0.0215	<0.050		0.232
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average	0.270	0.225	0.0315	0.0039	218.0	0.0000050	0.0000050	0.00025	0.0001	1.030	0.434	0.141	0.132	0.0000050	0.0000050	50.4	0.000250	0.000250	0.00395	0.0000250	0.54	0.00150	0.00050	0.113	0.087		0.205
		Count	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
		Minimum	0.27	0.225	0.0315	0.0039	218	<0.000010	<0.000010	<0.00050	<0.00020	1.03	0.434	0.141	0.1320	<0.000010	<0.000010	50.4	<0.00050	<0.00050	0.00395	<0.000050	0.54	<0.0030	<0.0010	0.113	0.087		0.205
		Maximum	0.27	0.225	0.0315	0.0039	218	<0.000010	<0.000010	<0.00050	<0.00020	1.03	0.434	0.141	0.132	<0.000010	<0.000010	50.4	<0.00050	<0.00050	0.00395	<0.000050	0.54	<0.0030	<0.0010	0.113	0.087		0.205
		Geometric Mean	0.27	0.225	0.0315	0.0039	218.0	0.0000050	0.0000050	0.00025	0.0001	1.030	0.434	0.1410	0.132	0.0000050	0.0000050	50.4	0.000250	0.000250	0.00395	0.0000250	0.54	0.0015	0.0005	0.113	0.087		0.205
		Count <DL	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0	1	1	0	1	0	1	1	0	0		0
		Standard Deviation	0	0	0	0	0.0	0.0000000	0.0000000	0	0	0	0	0	0	0.0000000	0.0000000	0	0.000000	0.000000	0	0.0000000	0	0	0	0	0		0
		1st Quartile	0.27	0.225	0.0315	0.0039	218	<0.000010	<0.000010	<0.00050	<0.00020	1.03	0.434	0.141	0.132	<0.000010	<0.000010	50.4	<0.00050	<0.00050	0.00395	<0.000050	0.54	<0.0030	<0.0010	0.113	0.087		0.205
		Median	0.270	0.225	0.0315	0.0039	218	<0.000010	<0.000010	<0.00050	<0.00020	1.030	0.434	0.141	0.132	<0.000010	<0.000010	50.4	<0.00050	<0.00050	0.00395	<0.000050	0.54	<0.0030	<0.0010	0.113	0.087		0.205
		3rd Quartile	0.27	0.225	0.0315	0.0039	218	<0.000010	<0.000010	<0.00050	<0.00020	1.03	0.434	0.141	0.132	<0.000010	<0.000010	50.4	<0.00050	<0.00050	0.00395	<0.000050	0.54	<0.0030	<0.0010	0.113	0.087		0.205
QU1010D	Ex-situ 2-North deep groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Mudstone).	Average	ND - High levels of methane made well dangerous to sample																										
		Count																											
		Minimum																											
		Maximum																											
		Geometric Mean																											
		Count <DL																											
		Standard Deviation																											
		1st Quartile																											
		Median																											
		3rd Quartile																											
QU1010S	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Average	0.148	0.135	9.38	0.0036	143.0	0.0000820	0.0000075	0.0176	0.00015	7.08	0.286	0.169	0.0768	0.0000050	0.0000050	76.4	0.006100	0.000375	0.00468	0.0000375	15.4	0.02150	0.00110	0.1132	0.025		0.19
		Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.137	0.134	5.45	0.0036	137	0.000065	<0.000010	0.0087	<0.00020	4.59	0.281	0.15	0.0614	<0.000010	<0.000010	72.6	0.0037	<0.00050	0.002980	<0.000050	14.2	0.0137	<0.0020	0.0883	<0.050		0.173
		Maximum	0.159	0.136	13.30	0.0037	149	0.000099	<0.000020	0.0264	<0.00040	9.56	0.291	0.188	0.0921	<0.000010	<0.000010	80.1	0.0085	<0.0010	0.00638	<0.00010	16.6	0.0293	0.0012	0.1380	<0.050		0.208
		Geometric Mean	0.148	0.135	8.51	0.00360	142.9	0.00008	0.0000071	0.0152	0.000141	6.62	0.286	0.168	0.0752	0.0000050	0.0000050	76.3	0.00561	0.000354	0.00436	0.0000354	15.4	0.02000	0.0011	0.1104	0.025		0.19
		Count <DL	0	0	0	0	0	0	2	0	2	0	0	0	0	2	2	0	0	2	0	2	0	0	1	0	2		0
		Standard Deviation	0.016	0.001	5.55	0.0001	8.5	0.000024	0.0000035	0.0125	0.000071	3.51	0.007	0.027	0.0217	0.0000000	0.0000000	5.3	0.00339	0.000177	0.0024	0.0000177	1.7	0.01100	0.00014	0.0351	0		0.025
		1st Quartile	0.143	0.134	7.41	0.0036	140	0.000074	0.0000062	0.0131	0.000125	5.83	0.284	0.16	0.0691	<0.000010	<0.000010	74.5	0.004900	0.000312	0.00383	0.0000312	14.8	0.0176	0.00105	0.1007	<0.050		0.182
		Median	0.148	0.135	9.38	0.0036	143	0.0000820	0.0000075	0.0176	0.00015	7.08	0.286	0.169	0.0768	<0.000010	<0.000010	76.4	0.006100	0.000375	0.00468	0.0000375	15.4	0.0215	0.00110	0.1132	<0.050		0.19
		3rd Quartile	0.154	0.136	11.34	0.0037	146	0.00009	0.0000088	0.022	0.000175	8.32	0.288	0.178	0.0844	<0.000010	<0.000010	78.2	0.007300	0.000438	0.00553	0.0000438	16	0.0254	0.00115	0.1256	<0.050		0.199
QU1011D	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average	0.0317	0.00678	159.6	0.00417	360	0.000931	0.0000417	0.1267	0.00083	57.9	3.94	2.23	0.873	0.0000903	0.0000050	349.3	0.0381	0.00208	0.1609	0.000208	5.0	0.227	0.00417	11.192	0.045		0.419
		Count	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3
		Minimum	0.0159	0.00594	60.8	<0.0050	336	0.000353	<0.000050	0.05	<0.0010	22.8	3.66	1.19	0.645	<0.000050	<0.000010	336	0.0146	<0.0025	0.0568	<0.00025	<10	0.095	<0.0050	0.375	<0.050		0.31
		Maximum	0.0396	0.0072	209	<0.010	372	0.00122	<0.00010	0.165	<0.0020	75.5	4.08	2.75	0.987	0.000123	<0.000010	356	0.0499	<0.0050	0.213	<0.00050	<10	0.293	<0.010	16.6	0.085		0.473
		Geometric Mean	0.0292	0.00675	138.5	0.00397	359.6	0.000807	0.0000397	0.1108	0.00079	50.7	3.93	2.08	0.857	0.0000723	0.0000050	349.2	0.0331	0.00198	0.1371	0.000198	5.0	0.201	0.00397	4.693	0.038		0.411
		Count <DL	0	0	0	3	0	0	3	0	3	0	0	0	0	1	3	0	0	3	0	3	3	0	3	0	2		0
		Standard Deviation	0.01370	0.00073	85.6	0.0014	20.8	0.000501	0.0000144	0.0664	0.00029	30.4	0.24	0.900	0.197	0.0000566	0.0000000	11.5	0.0204	0.00072	0.0902	0.000072	0.0	0.114	0.0014	9.368	0.035		0.094
		1st Quartile	0.0278	0.00657	134.9	0.00375	354	0.000786	0.0000375	0.1075	0.00075	49.2	3.87	1.97	0.816	0.000074	<0.000010	346	0.0322	0.00188	0.1349	0.000188	<10	0.194	0.00375	8.488	<0.050		0.391
		Median	0.0396	0.0072	209	<0.010	372	0.00122	<0.00010	0.165	<0.0020	75.5	4.08	2.75	0.987	0.000123	<0.000010	356	0.0499	<0.0050	0.213	<0.00050	<10	0.293	<0.010	16.6	<0.050		0.473
		3rd Quartile	0.0396	0.0072	209	<0.010	372	0.00122	<0.00010	0.165	<0.0020	75.5	4.08	2.75	0.987	0.000123	<0.000010	356	0.0499	<0.0050	0.213	<0.00050	<10	0.293	<0.010	16.6	0.055		0.473
QU1011S	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average	ND - Statistical summary for monitoring year was outside of sampling date. Sample was collected March 2013.																										
		Count																											
		Minimum																											
		Maximum																											
		Geometric Mean																											
		Count <DL																											
		Standard Deviation																											
		1st Quartile																											
		Median																											
		3rd Quartile																											

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 54
2017-2018 Annual Report

2013 -14 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU1105S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average	0.0574	0.0499	0.0394	0.00210	107.5	0.0000050	0.0000050	0.00025	0.000395	0.513	0.473	0.1216	0.1135	0.0000050	0.0000050	84.2	0.000250	0.000250	0.0000385	0.0000250	62.2	0.00150	0.00050	0.0092	0.025		0.0751
		Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2
		Minimum	0.0332	0.0306	0.0257	0.0019	95	<0.000010	<0.000010	<0.00050	<0.00020	0.348	0.294	0.0621	0.051	<0.000010	<0.000010	54.4	<0.00050	<0.00050	<0.000050	<0.000050	33.1	<0.0030	<0.0010	0.0066	<0.050		0.0572
		Maximum	0.0815	0.0692	0.0532	0.0023	120	<0.000010	<0.000010	<0.00050	0.00069	0.678	0.652	0.181	0.176	<0.000010	<0.000010	114	<0.00050	<0.00050	0.000052	<0.000050	91.3	<0.0030	<0.0010	0.0118	<0.050		0.093
		Geometric Mean	0.052	0.046	0.037	0.00210	106.8	0.0000050	0.0000050	0.00025	0.000263	0.486	0.438	0.106	0.0947	0.0000050	0.0000050	78.8	0.000250	0.000250	0.0000361	0.0000250	55	0.00150	0.00050	0.0088	0.025		0.0729
		Count <DL	0	0	0	0	0	2	2	2	1	0	0	0	0	2	2	0	2	2	1	2	0	2	2	0	2		0
		Standard Deviation	0.0342	0.0273	0.019	0.00030	17.7	0.0000000	0.0000000	0.00000	0.000417	0.233	0.253	0.0841	0.0884	0.0000000	0.0000000	42.1	0.000000	0.000000	0.000019	0.0000000	41.2	0.00000	0.00000	0.0037	0.000		0.025
		1st Quartile	0.0453	0.0402	0.0326	0.002	101.2	<0.000010	<0.000010	<0.00050	0.000248	0.430	0.384	0.0918	0.0822	<0.000010	<0.000010	69.3	<0.00050	<0.00050	0.0000318	<0.000050	47.6	<0.0030	<0.0010	0.0079	<0.050		0.0662
		Median	0.0574	0.0499	0.0394	0.0021	107.5	<0.000010	<0.000010	<0.00050	0.000395	0.513	0.473	0.1216	0.1135	<0.000010	<0.000010	84.2	<0.00050	<0.00050	0.0000385	<0.000050	62.2	<0.0030	<0.0010	0.0092	<0.050		0.0751
		3rd Quartile	0.0694	0.0595	0.0463	0.0022	113.8	<0.000010	<0.000010	<0.00050	0.000542	0.596	0.562	0.1513	0.1448	<0.000010	<0.000010	99.1	<0.00050	<0.00050	0.0000452	<0.000050	76.8	<0.0030	<0.0010	0.0105	<0.050		0.084
QU1109S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average	0.157	0.137	56.0	0.30898	128	0.000335	0.0000160	0.0305	0.00046	24	0.1200	0.673	0.01093	0.0000624	0.0000050	11.23	0.0098	0.0008	0.0819	0.000369	25.3	0.0952	0.0016	0.727	0.062		0.199
		Count	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5
		Minimum	0.141	0.114	31.9	<0.0020	117	0.000147	<0.000020	0.0156	<0.00040	13.4	0.015	0.328	0.00788	<0.000010	<0.000010	8.33	0.0053	<0.0010	0.0391	<0.00010	11.2	0.0475	<0.0020	0.38	<0.050		0.123
		Maximum	0.175	0.149	101	1.47	136	0.000757	<0.000050	0.0609	0.0012	43.4	0.488	1.38	0.0148	0.00019	<0.000010	14.1	0.0183	<0.0025	0.189	0.00157	49	0.2	<0.0050	1.58	0.078		0.309
		Geometric Mean	0.157	0.136	51.1	0.01597	127.8	0.00028	0.0000144	0.0271	0.000344	22.2	0.0450	0.569	0.01069	0.0000338	0.0000050	11.01	0.0089	0.00072	0.0691	0.00012	22.5	0.0824	0.00144	0.621	0.057		0.189
		Count <DL	0	0	0	2	0	0	5	0	4	0	0	0	0	2	5	0	0	5	0	4	0	0	5	0	1		0
		Standard Deviation	0.012	0.014	28.0	0.6496	8.5	0.000247	0.0000082	0.0181	0.00043	11.4	0.2060	0.46	0.00257	0.00007	0.0000000	2.49	0.0052	0.00041	0.061	0.000672	14.3	0.062	0.0008	0.505	0.021		0.072
		1st Quartile	0.151	0.131	37.6	<0.0050	121	0.000176	<0.000020	0.0198	<0.00040	19.8	0.016	0.358	0.00985	<0.000050	<0.000010	9.04	0.0064	<0.0010	0.0473	<0.00010	18	0.0536	<0.0020	0.432	0.064		0.154
		Median	0.159	0.143	44.8	0.0042	132	0.000267	<0.000020	0.0235	<0.00040	20.7	0.031	0.417	0.0104	0.00003	<0.000010	11.7	0.0079	<0.0010	0.0643	<0.00010	22.3	0.0731	<0.0020	0.445	0.067		0.182
		3rd Quartile	0.159	0.146	64.5	0.0672	134	0.000328	<0.000050	0.0329	<0.0010	22.5	0.049	0.88	0.0117	0.000062	<0.000010	13	0.0112	<0.0025	0.07	<0.00025	26.1	0.102	<0.0050	0.8	0.074		0.227
7SQR		Average	0.00032	0.00025	0.0464	0.0121	33.9	0.00000676	0.00000505	0.00072	0.00055	0.1552	0.0510	0.0078	0.00221	0.00033432	0.0003343	34.9	0.00053	0.00050	0.000105	0.000100	24.2	0.0025	0.0025				
E292113		Count	21	21	21	21	17	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21				
		Minimum	0.00014	0.00013	0.0206	0.0057	25.6	<0.0000050	<0.0000050	0.00044	0.00044	0.0584	0.0217	0.0031	<0.0010	<0.0000020	<0.0000020	19.1	<0.0010	<0.0010	<0.00020	<0.00020	13.4	<0.0050	<0.0050				
		Maximum	0.00044	0.00034	0.103	0.029	42.9	0.00005	0.000026	0.00099	0.00092	0.265	0.0768	0.016	0.0041	<0.010	<0.010	43.5	0.0011	<0.0010	0.00021	<0.00020	41.2	<0.0050	<0.0050				
		Geometric Mean	0.0003	0.00024	0.0413	0.0114	33.5	0.00000457	0.00000354	0.00071	0.00054	0.1449	0.0476	0.0072	0.00176	0.00000308	0.00000312	34.3	0.00052	0.00050	0.000104	0.000100	23.4	0.0025	0.0025				
		Count <DL	0	0	0	0	0	16	16	0	0	0	0	0	5	20	19	0	20	21	20	21	0	21	21				
		Standard Deviation	0.0001	0.00006	0.024	0.0047	5.8	0.00001032	0.00000609	0.00013	0.00011	0.056	0.0177	0.0033	0.00124	0.00111024	0.00111025	5.9	0.00013	0.00000	0.000024	0.000000	6.6	0	0				
		1st Quartile	0.00028	0.00022	0.0276	0.0106	28.9	<0.0000050	<0.0000050	0.00063	0.00048	0.13	0.0324	0.0054	0.0013	<0.0000020	<0.0000020	32.3	<0.0010	<0.0010	<0.00020	<0.00020	20	<0.0050	<0.0050				
		Median	0.00034	0.00027	0.0362	0.0116	32.8	<0.000010	<0.0000050	0.00069	0.00053	0.147	0.0557	0.0071	0.0025	<0.0000020	<0.0000020	36.6	<0.0010	<0.0010	<0.00020	<0.00020	23	<0.0050	<0.0050				
		3rd Quartile	0.00038	0.00029	0.0565	0.0122	40.4	<0.000010	<0.0000050	0.0008	0.00059	0.195	0.0648	0.0096	0.0029	<0.0000020	<0.0000020	38.5	<0.0010	<0.0010	<0.00020	<0.00020	29.20	<0.0050	<0.0050				
LQL1	Lower Quinsam Lake 1 metre below surface	Average	0.00060	0.00052	0.0259	0.0165	32.3	0.00000517	0.00000283	0.00080	0.00062	0.1210	0.0638	0.0137	0.00609	0.00006862	0.00006787	33.7	0.00053	0.00050	0.000107	0.000100	16.10	0.00267	0.00250	0.00340		0.0100	
E292118		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		2	
		Minimum	0.00045	0.00043	0.0108	0.0066	27.1	<0.0000050	<0.0000050	0.00059	0.00040	0.0716	0.0287	0.0045	<0.0010	<0.0000020	<0.0000020	25.1	<0.0010	<0.0010	<0.00020	<0.00020	9.51	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00099	0.00061	0.0455	0.0311	39.5	0.0000100	0.0000050	0.00164	0.00119	0.262	0.153	0.0440	0.0277	<0.0020	<0.0020	39.2	<0.0020	<0.0010	<0.00040	<0.00020	23.9	<0.010	<0.0050	0.0061		<0.020	
		Geometric Mean	0.00059	0.00051	0.0230	0.0145	32.1	0.00000461	0.00000274	0.00077	0.00059	0.1094	0.0580	0.0099	0.00236	0.00000206	0.00000182	33.3	0.00052	0.00050	0.000105	0.000100	15.26	0.00262	0.00250	0.00312		0.0100	
		Count <DL	0	0	0	0	0	10	13	0	0	0	0	0	5	13	13	0	15	15	15	15	0	15	15	3		2	
		Standard Deviation	0.00013	0.00006	0.0123	0.0084	3.8	0.00000253	0.00000088	0.00029	0.00020	0.0624	0.0326	0.0128	0.00890	0.00025768	0.00025787	5.3	0.00013	0.00000	0.000026	0.000000	5.34	0.00065	4E-11	0.00180		0.0000	
		1st Quartile	0.00052	0.00048	0.0138	0.0097	30.1	<0.0000050	<0.0000050	0.00063	0.00049	0.0794	0.0436	0.0050	<0.0010	<0.0000020	<0.0000020	28.0	<0.0010	<0.0010	<0.00020	<0.00020	11.15	<0.0050	<0.0050	<0.0050		<0.020	
		Median	0.00060	0.00053	0.0240	0.0138	32.0	<0.000010	<0.0000050	0.00067	0.00056	0.0874	0.0515	0.0077	0.0022	<0.0000020	<0.0000020	36.1	<0.0010	<0.0010	<0.00020	<0.00020	15.9	<0.0050	<0.0050	<0.0050		<0.020	
		3rd Quartile	0.00063	0.00054	0.0357	0.0250	33.8	0.00000650	<0.0000050	0.00081	0.00066	0.1425	0.0710	0.0199	0.00665	<0.0000020	<0.0000020	38.2	<0.0010	<0.0010	<0.00020	<0.00020	22.15	<0.0050	<0.0050	0.00340		<0.020	
LQLB	LQLB 1 metre from Bottom	Average	0.00137	0.00053	0.0352	0.0127	32.9	0.00000860	0.00000566	0.00071	0.00051	1.603	0.1752	0.4051	0.20672	0.00006807	0.00006820	32.9	0.00053	0.00050	0.000133	0.000100	11.04	0.00267	0.00250	0.00460		0.0170	
E292118		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		2	
		Minimum	0.00048	0.00035	0.0174	0.0032	28.4	0.0000050	<0.0000050	0.00048	0.00036	0.125	0.0494	0.0111	<0.0010	<0.0000020	<0.0000020	27.8	<0.0010	<0.0010	<0.00020	<0.00020	7.43	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00376	0.00081	0.0814	0.0294	38.4	0.000015	0.0000120	0.00104	0.00072	6.30	0.544	1.06	0.934	<0.0020	<0.0020	39.4	<0.0020	<0.0010	0.00049	<0.00020	14.4	<0.010	<0.0050	0.0068		0.024	
		Geometric Mean	0.00105	0.00052	0.0322	0.0101	32.8	0.00000786	0.00000470	0.00069	0.00050	0.720	0.1373	0.1570	0.06234	0.00000182	0.00000207	32.7	0.00052	0.00050	0.000116	0.000100	10.84	0.00262	0.00250	0.00409		0.0155	
		Count <DL	0	0	0	0	0	3	7	0	0	0	0	0	1	14	12	0	15	15	14	15	0	15	15	2		1	
		Standard Deviation	0.00111	0.00014	0.0169	0.0084	3.8	0.00000374	0.00000346	0.00014	0.00011	1.969	0.1434	0.4252	0.26156	0.00025782	0.00025778	3.7	0.00013	0.00000	0.000102	0.000000	2.13	0.00065	4E-11	0.00243		0.0099	
		1st Quartile	0.00053	0.00044	0.0250	0.0052	29.9	0.0000050	<0.0000050	0.00064	0.00042	0.208	0.0824	0.0412	0.02060	<0.0000020	<0.0000020	29.8	<0.0010	<0.0010	<0.00020	<0.00020	9.50	<0.0050	<0.0050	<0.0050		0.0135	
		Median	0.00098	0.00048	0.0319	0.0113	32.2	0.0000080	0.0000060	0.00068	0.00051	0.833	0.135	0.181	0.0515	<0.0000020	<0.0000020	33.4	<0.0010	<0.0010	<0.00020	<0.00020	11.4	<0.0050	<0.0050	0.00455		0.0170	
		3rd Quartile	0.00167	0.00062	0.0378	0.0166	36.4	0.00001150	0.00000800	0.00072	0.00056	2.245	0.1800	0.7830	0.34850	<0.0000020	0.00000205	35.7	<0.0010	<0.0010	<0.00020	<0.00020	12.35	<0.0050	<0.0050	0.00665		0.0205	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 55
2017-2018 Annual Report

2014-15 Statistics Stn.Code / EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E0126402	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Average	0.000138	0.000146	0.0253	0.0177	21.6	0.0000074	0.0000034	0.000911	0.00079	0.024	0.01258	0.0015	0.00050	0.0000012	0.0000013	21.5	0.0005	0.00050	0.000100	0.000118	1.024	0.02818	0.00276				
		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15				
		Minimum	<0.00010	<0.00010	0.0142	0.009	14.3	<0.000005	<0.000005	<0.00050	0.0005	0.01	<0.0050	<0.0010	<0.0010	<0.000002	<0.000002	15.5	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050				
		Maximum	0.00031	0.00025	0.0816	0.0592	26	0.000042	0.000008	0.00366	0.00149	0.051	0.0338	0.0054	<0.0010	0.0000028	0.0000031	27.1	<0.0010	<0.0010	<0.00020	0.00037	2.2	0.384	0.0064				
		Geometric Mean	0.00012	0.000135	0.0221	0.0157	21.5	0.00000549	0.00000307	0.000759	0.00076	0.022	0.01015	0.00114	0.0005	0.00000113	0.00000116	21.3	0.0005	0.00050	0.000100	0.000109	0.832	0.00372	0.00266				
		Count <DL	4	2	0	0	0	12	12	1	0	0	2	6	15	13	13	0	15	15	15	14	3	13	14				
		Standard Deviation	0.00007	0.000052	0.0174	0.012	2.5	0.00000966	0.0000019	0.00079	0.00025	0.011	0.00824	0.00127	0	0.00000054	0.00000072	3.2	0	0.00000	0.000000	0.000070	0.602	0.09844	0.00101				
		1st Quartile	0.00008	0.000125	0.0158	0.0126	20.8	<0.000010	<0.000005	0.000625	0.00068	0.014	0.0079	<0.0010	<0.0010	<0.000002	<0.000002	20.3	<0.0010	<0.0010	<0.00020	<0.00020	0.585	<0.0050	<0.0050				
		Median	0.00015	0.00016	0.0188	0.0137	21.7	<0.00001	<0.000005	0.00072	0.00071	0.024	0.0109	0.0016	<0.0010	<0.000002	<0.000002	21.6	<0.0010	<0.0010	<0.00020	<0.00020	0.97	<0.0050	<0.0050				
		3rd Quartile	0.00017	0.00017	0.0262	0.0186	23	<0.00001	<0.000005	0.00081	0.00086	0.03	0.01465	0.0019	<0.0010	<0.0000020	<0.000002	23.2	<0.0010	<0.0010	<0.00020	<0.00020	1.27	<0.0050	<0.0050				
WD	Settling Pond #4	Average	0.00230	0.0016	0.0206	0.00502	343	0.0000085	0.00000688	0.000921	0.00077	0.305	0.01506	0.0562	0.04518	0.00000151	0.00000136	366	0.00117	0.00106	0.000100	0.000100	603	0.05163	0.00278	0.0057		0.01	0.034
E207409		Count	10	10	10	10	17	10	10	10	10	10	10	10	10	9	9	10	10	10	10	10	54	10	10	1		1	1
		Minimum	0.00105	0.00093	0.0063	<0.0030	214	<0.00001	<0.0000050	<0.00050	0.00027	0.053	<0.0050	0.0077	<0.0010	<0.000002	<0.000002	234	<0.0010	<0.0010	<0.00020	<0.00020	320	<0.0050	<0.0050	0.0057		<0.020	0.034
		Maximum	0.00532	0.00316	0.0469	0.0112	418	0.000023	0.0000154	0.00187	0.00135	0.996	0.0286	0.158	0.159	0.0000044	0.0000042	471	0.0024	0.0022	<0.00020	<0.00020	978	0.298	0.0053	0.0057		<0.020	0.034
		Geometric Mean	0.00197	0.00149	0.0164	0.00428	340	0.0000071	0.0000057	0.000749	0.00069	0.167	0.01252	0.035	0.01146	0.00000129	0.00000117	360	0.0010	0.0009	0.000100	0.000100	587	0.00698	0.00270	0.0057		0.01	0.034
		Count <DL	0	0	0	2	0	7	3	2	0	0	1	0	2	7	8	0	3	4	10	10	0	7	9	0		1	0
		Standard Deviation	0.00144	0.00068	0.0147	0.00281	47	0.0000062	0.00000421	0.000577	0.00036	0.364	0.00823	0.0576	0.06051	0.00000115	0.0000011	66	0.00059	0.00058	0.000000	0.000000	139	0.10515	0.00089	0		0.0000	0
		1st Quartile	0.00133	0.00107	0.0098	0.00385	323	<0.000010	0.0000032	0.000585	0.0005	0.069	0.0104	0.0177	0.00318	<0.0000020	<0.0000020	340	0.00065	<0.0010	<0.00020	<0.00020	524	<0.0050	<0.0050	0.0057		<0.020	0.03400
		Median	0.00167	0.00147	0.0157	0.00495	352	<0.000010	0.0000575	0.00075	0.0008	0.112	0.01515	0.0304	0.01935	<0.000002	<0.000002	380	0.0012	0.0011	<0.00020	<0.00020	596	<0.0050	<0.0050	0.0057		<0.020	0.034
		3rd Quartile	0.00324	0.00191	0.0294	0.0056	377	0.000011	0.0000962	0.00129	0.00102	0.416	0.01778	0.0739	0.059	<0.000002	<0.000002	400	0.00145	0.00127	<0.00020	<0.00020	684	0.00648	<0.0050	0.0057		<0.020	0.03400
MW001D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average		0.0192		0.0322	89.8		0.0000038		0.0026		0.0038		0.00134		0.0000048	21.8		0.00051		0.0000625	28.2		0.0015		0.154		
		Count		2		2	2		2		2		2		2		2	1		2		2	2		2		2		
		Minimum		0.0189		0.0301	86.8		<0.000005		0.00255		<0.0050		0.0011		0.0000045	21.8		<0.0010		<0.000050	27.9		<0.0010		0.151		
		Maximum		0.0195		0.0342	92.8		<0.000010		0.00266		<0.010		0.00158		<0.000010	21.8		0.00052		<0.00020	28.5		<0.0050		0.156		
		Geometric Mean		0.0192		0.0321	89.7		0.0000035		0.0026		0.00354		0.00132		0.0000047	21.8		0.00051		0.00005	28.2		0.00112		0.153		
		Count <DL		0		0	0		2		0		2		0		1	0		1		2	0		2		0		
		Standard Deviation		0.0004		0.0029	4.2		0.0000018		0.00008		0.00177		0.000340		0.0000004	0		0.000014		0.000053	0.4		0.00141		0.004		
		1st Quartile		0.019		0.0311	88.3		0.0000031		0.00258		0.00312		0.00122		0.00000463	21.8		0.000505		0.0000438	28		0.001		0.152		
		Median		0.0192		0.0322	89.8		0.0000038		0.0026		0.0038		0.00134		0.00000475	21.8		0.00051		0.0000625	28.2		0.0015		0.154		
		3rd Quartile		0.0194		0.0332	91.3		0.0000044		0.00263		0.00438		0.00146		0.00000488	21.8		0.000515		0.0000813	28.4		0.002		0.155		
MW001S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average	0.0001	0.000185	0.00500	0.001	337	0.000041	0.000088	0.00025	0.00044	0.2860	0.139	1.03	1.928	0.0000050	0.0000038	1100	0.00095	0.00166	0.000025	0.0000625	903	0.0015	0.00185	0.03870	0.01465		0.0306
		Count	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	2	1	2	1	2		1
		Minimum	0.0001	<0.00010	0.005	<0.0010	308	0.000041	0.000048	<0.00050	0.00038	0.286	0.101	1.03	0.966	<0.000010	0.0000026	1100	0.00095	0.00093	<0.000050	<0.000050	839	<0.0030	0.0012	0.0387	0.0043		0.0306
		Maximum	0.0001	0.00032	0.005	<0.0030	366	0.000041	0.000129	<0.00050	0.00049	0.286	0.177	1.030	2.89	<0.000010	<0.000010	1100	0.00095	0.0024	<0.000050	<0.00020	967	<0.0030	<0.0050	0.0387	<0.050		0.0306
		Geometric Mean	0.0001	0.00013	0.005	0.00087	335.7	0.000041	0.000079	0.000250	0.00043	0.286	0.134	1.03	1.671	0.0000050	0.0000036	1100	0.00095	0.00149	0.000025	0.0000500	900	0.0015	0.00173	0.0387	0.01037		0.0306
		Count <DL	0	1	0	2	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	2	0	1	1	0	1		0
		Standard Deviation	0	0.000191	0	0.00071	41	0	0.000057	0	0.00008	0	0.054	0	1.36	0.0000000	0.0000017	0	0	0.00104	0	0.0000530	90	0	0.00092	0	0.01464		0.0000
		1st Quartile	0.0001	0.000118	0.005	0.00075	322.5	0.000041	0.000068	<0.00050	0.00041	0.2860	0.12	1.03	1.447	<0.000010	0.0000032	1100	0.00095	0.0013	<0.000050	0.0000438	871	<0.0030	0.00152	0.03870	0.00948		0.0306
		Median	0.0001	0.000185	0.00500	0.001	337	0.000041	0.000088	<0.00050	0.00044	0.2860	0.139	1.03	1.928	<0.000010	0.0000038	1100	0.00095	0.00166	<0.000050	0.0000625	903	<0.0030	0.00185	0.03870	0.01465		0.0306
		3rd Quartile	0.0001	0.000252	0.00500	0.00125	351.5	0.000041	0.000109	<0.00050	0.00046	0.2860	0.158	1.03	2.409	<0.000010	0.0000044	1100	0.00095	0.00203	<0.000050	0.0000813	935	<0.0030	0.00217	0.03870	0.01983		0.0306
MW006D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average	0.0288	0.0296	0.0243	0.0186	85.9	0.0000050	0.0000105	0.00087	0.00069	0.005	0.0050	0.00077	0.000302	0.0000050	0.0000050	48.4	0.000250	0.000250	0.000097	0.0000250	12.4	0.0015	0.00125	0.159	0.172		0.0053
		Count	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	2	1	2	1	2		1
		Minimum	0.0288	0.0287	0.0243	0.0176	85	<0.000010	<0.000010	0.00087	0.00059	<0.010	<0.010	0.00077	0.000254	<0.000010	<0.000010	48.1	<0.00050	<0.00050	0.000097	<0.000050	12.1	<0.0030	<0.0010	0.159	0.171		0.0053
		Maximum	0.0288	0.0306	0.0243	0.0196	86.8	<0.000010	0.000016	0.00087	0.00079	<0.010	<0.010	0.00077	0.000349	<0.000010	<0.000010	48.7	<0.00050	<0.00050	0.000097	<0.000050	12.8	<0.0030	0.002	0.159	0.173		0.0053
		Geometric Mean	0.0288	0.0296	0.0243	0.0186	85.9	0.000005	0.0000089	0.00087	0.00068	0.005	0.005	0.00077	0.000298	0.0000050	0.0000050	48.4	0.000250	0.000250	0.000097	0.0000250	12.4	0.0015	0.001	0.159	0.172		0.0053
		Count <DL	0	0	0	0	0	1	1	0	0	1	2	0	0	1	2	0	1	2	0	2	0	1	1	0	0		0
		Standard Deviation	0	0.0013	0.0000	0.0014	1.3	0	0.0000078	0	0.00014	0	0	0	0.000067	0.0000000	0.0000000	0.4	0.000000	0.000000	0.000000	0.0000000	0.5	0	0.00106	0	0.001		0.0000
		1st Quartile	0.0288	0.0292	0.0243	0.0181	85.4	<0.000010	0.0000078	0.00087	0.00064	<0.010	<0.010	0.00077	0.000278	<0.000010	<0.000010	48.2	<0.00050	<0.00050	0.000097	<0.000050	12.3	<0.0030	0.00088	0.159	0.172		0.0053
		Median	0.0288	0.0296	0.0243	0.0186	85.9	<0.000010	0.0000105	0.00087	0.00069	<0.010	<0.010	0.00077	0.000302	<0.000010	<0.000010	48.4	<0.00050	<0.00050	0.000097	<0.000050	12.4	<0.0030	0.00125	0.159	0.172		0.0053
		3rd Quartile	0.0288	0.0301	0.0243	0.0191	86.4	<0.000010	0.0000132	0.00087	0.00074	<0.010	<0.010	0.00077	0.000325	<0.000010	<0.000010	48.6	<0.00050	<0.00050	0.000097	<0.000050	12.6	<0.0030	0.00163	0.159	0.172		0.0053
MW006S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average	0.00204	0.00197	0.0591	0.00180	232.0	0.00003	0.000022	0.00176	0.00093	0.11	0.0050	0.0927	0.019	0.0000050	0.0000050	529	0.00113	0.00076	0.000122	0.000025	827.0	0.0031	0.00090	0.1490	0.038		0.233
		Count	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	2	1	2	1	2		1
		Minimum	0.00204	0.00133	0.0591	0.0015	192	0.00003	0.000018	0.00176	0.00092	0.11	<0.010	0.0927	0.0173	<0.000010	<0.000010	477	0.00113	0.00075	0.000122	<0.000050	699	0.0031	<0.0010	0.149	<0.050		0.233
		Maximum	0.00204	0.00261	0.0591	0.0021	272	0.00003	0.000027	0.00176	0.00094	0.11	<0.010	0.0927	0.0207	<0.000010	<0.000010	581	0.00113	0.00076	0.000122	<0.000050	955	0.0031	0.0013	0.149	0.051		0.2330
		Geometric Mean	0.00204	0.00186	0.0591	0.0018	228.5	0.00003	0.000022	0.00176	0.00093	0.11	0.005	0.0927	0.0189	0.0000050	0.0000050	526	0.00113	0.00075	0.000122	0.0000250	817.0	0.0031	0.00081	0.149	0.0357		0.233
		Count <DL	0	0	0	0	0	0	0	0	0	0	2	0	0	1	2	0	0	0	1	2	0	0	1	0	1		0
		Standard Deviation	0	0.00091	0	0.0004	56.6	0	0.000006	0	0.000010	0	0	0	0.0024	0.0000000	0.0000000	73	0	0.00001	0	0.0000000	181	0	0.00057	0	0.0184		0
		1st Quartile	0.00204	0.00165	0.0591	0.00160	212	0.00003	0.00002	0.00176	0.00092	0.11	<0.010	0.0927	0.0182	<0.000010	<0.000010	503	0.00113	0.00075	0.000122	<0.000050	763	0.0031	0.00070	0.149	0.0315		0.233
		Median	0.00204	0.00197	0.0591	0.00180	232	0.00003	0.000022	0.00176	0.00093	0.11	<0.010	0.0927	0.019	<0.000010	<0.000010	529	0.00113	0.00076	0.000122	<0.000050	827.0	0.0031	0.00090	0.1490	0.038		0.233
		3rd Quartile	0.00204	0.00229	0.0591	0.00200	252	0.00003	0.000025	0.00176	0.00094	0.11	<0.010	0.0927	0.0198	<0.000010	<0.000010	555	0.00113	0.00076	0.000122	<0.000050	891	0.0031	0.00110	0.149	0.0445		0.233
WC	2-North Pit Culvert discharge into Middle Quinsam Lake	Average	0.00125	0.00114	0.2207	0.0076	335	0.0000047	0.0000025	0.000524	0.00059	0.087	0.0233	0.0104	0.00489	0.00000149	0.0000141	283	0.00081	0.0005	0.000100	0.000100	558	0.00392	0.00250				
E207411		Count	8	8	8	8	5	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	13	8	8				
		Minimum	0.00079	0.00074	0.0113	<0.0030	243	<0.000005	<0.000005	<0.00050	0.00028	0.034	0.0082	0.0037	<0.0010	<0.000002	<0.000002	203	<0.0010	<0.0010	<0.00020	<0.00020	376	<0.0050	<0.0050				
		Maximum	0.00185	0.00151	1.67	0.0126	379	<0.00001	<0.000005	0.0009	0.00088	0.231	0.0567	0.0206	0.0112	0.0000049	0.0000043	354	0.0017	<0.0010	<0.00020	<0.00020	755	0.0103	<0.0050				
		Geometric Mean	0.00122	0.00111	0.0245	0.00647	331	0.0000046	0.0000025	0.00046	0.00055	0.0700	0.0186	0.0094	0.00298	0.00000122	0.0000012	278	0.00072	0.0005	0.000100	0.000100	551	0.00334	0.0025				
		Count <DL	0	0	0	1	0	8	8	3	0	0	0	0	2	7	7	0	5	8	8	8	0	6	8				
		Standard Deviation	0.00033	0.00027	0.5856	0.00382	53	0.0000009	0.0000000	0.000267	0.00023	0.068	0.0174	0.005	0.00409	0.00000138	0.00000117	55	0.00047	0	0.000000	0.000000	92	0.00287	3E-11				
		1st Quartile	0.00107	0.00098	0.0113	0.00578	344	<0.000010	<0.000005	<0.00050	0.000390	0.048	0.01080	0.0082	0.002	<0.0000020	<0.0000020	249	<0.0010	<0.0010	<0.00020	<0.00020	543	<0.0050	<0.0050				
		Median	0.00118	0.0011	0.0131	0.0071	347	<0.000010	<0.0000050	0.000515	0.0006	0.058	0.0148	0.0087	0.0038	<0.000002	<0.000002	271	<0.0010	<0.0010	<0.00020	<0.00020	563	<0.0050	<0.0050				
		3rd Quartile	0.0014	0.00129	0.0176	0.0101	364	<0.00001	<0.000005	0.000698	0.000790	0.0990	0.0342	0.0125	0.00792	<0.000002	<0.000002	327	0.00108	<0.0010	<0.00020	<0.00020	600	0.0034	<0.0050				
MQL1	Middle Quinsam Lake 1 metre below surface	Average	0.00023	0.0001810	0.01932	0.0146	35.8	0.0000035	0.00000273	0.00073	0.00074	0.045	0.0195	0.0074	0.00237	0.00000115	0.00000131	34.9	0.0005	0.0005	0.0001	0.000107	26.16	0.00536	0.0025	0.0034		0.0100	
E206618		Count	15	15	15	15	3	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	0.00012	<0.00010	0.0070	0.0046	31.7	<0.0000050	<0.000005	<0.00050	0.00047	0.026	0.0051	0.0036	<0.0010	<0.0000020	<0.0000020	25.3	<0.0010	<0.0010	<0.00020	<0.00020	9.57	<0.0050	<0.0050	<0.0050		<0.020	
		Maximum	0.00051	0.0003	0.0718	0.0285	41.7	<0.00001	0.000006	0.00245	0.0012	0.097	0.0299	0.0193	0.0101	0.0000033	0.0000038	42.2	<0.0010	<0.0010	<0.00020	0.00021	41.8	0.0454	<0.0050	0.0051		<0.020	
		Geometric Mean	0.0002	0.000169	0.01648	0.0135	35.6	0.0000033	0.00000265	0.000632	0.00072	0.042	0.0181	0.0066	0.00139	0.00000108	0.00000117	34.5	0.0005	0.0005	0.0001	0.00010500	23.24	0.00303	0.0025	0.00321		0.01	
		Count <DL	0	1	1	0	0	15	14	2	0	0	0	0	7	14	13	0	15	15	15	14	0	14	15	1		1	
		Standard Deviation	0.00011	0.00006	0.0153	0.0057	5.2	0.00000127	0.0000009	0.000507	0.00019	0.018	0.0065	0.004	0.00265	0.00000059	0.00000084	5.1	0	0	0	0.000028	11.34	0.01108	4E-11	0.00147		0	
		1st Quartile	0.00014	0.00015	0.01245	0.0108	32.9	<0.000005	<0.000005	0.00057	0.000620	0.032	0.0154	0.0046	<0.0010	<0.000002	<0.000002	32	<0.0010	<0.0010	<0.00020	<0.00020	17.65	<0.0050	<0.0050	0.00255		<0.020	
		Median	0.00022	0.0001700	0.0148	0.0144	34.1	<0.000005	<0.000005	0.000620	0.00074	0.043	0.0206	0.0069	0.00180	<0.000002	<0.000002	36.5	<0.0010	<0.0010	<0.00020	<0.00020	28.60	<0.0050	<0.0050	0.0026		<0.020	
		3rd Quartile	0.00024	0.000225	0.01995	0.0176	37.9	<0.00001	<0.000005	0.00072	0.00086	0.052	0.0242	0.0084	0.00310	<0.000002	<0.0000020	38	<0.0010	<0.0010	<0.00020	<0.00020	32.55	<0.0050	<0.0050	0.00385		<0.020	
MQL8	Middle Quinsam Lake 1 metre from bottom	Average	0.000128	0.000151	0.0099	0.00773	42	0.00000517	0.0000025	0.000769	0.00062	0.047	0.0127	0.0745	0.05463	0.00000129	0.00000126	109.3	0.0005	0.0005	0.000124	0.0001	112.1	0.002500	0.0025	0.00293		0.0290	
E206618		Count	15	15	15	15	3	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	<0.00010	<0.00010	0.0035	<0.0030	30.5	<0.000005	<0.0000050	<0.00050	0.00041	0.0210	<0.0050	0.0056	<0.0010	<0.0000020	<0.0000020	25.4	<0.0010	<0.0010	<0.00020	<0.00020	10	<0.0050	<0.0050	<0.0050		0.029	
		Maximum	0.00019	0.00039	0.0252	0.0198	48.2	0.000025	<0.0000050	0.00524	0.00118	0.081	0.0316	0.234	0.219	0.0000034	0.0000032	192	<0.0010	<0.0010	0.00046	<0.00020	195	<0.0050	<0.0050	0.0036		0.029	
		Geometric Mean	0.00012	0.000137	0.0079	0.00571	41.1	0.00000403	0.0000025	0.000476	0.000600	0.044	0.00945	0.0338	0.01611	0.00000116	0.00000115	85.9	0.0005	0.0005	0.000111	0.0001	69.8	0.0025	0.0025	0.00290		0.029	
		Count <DL	2	1	0	2	0	14	15	7	0	0	3	0	2	13	13	0	15	15	14	15	0	15	15	1		0	
		Standard Deviation	0.00004	0.000076	0.0076	0.00624	9.9	0.00000563	1E-13	0.001255	0.00018	0.017	0.00949	0.0881	0.07345	0.00000076	0.00000069	62.9	0	0	0.000093	0.00000000	74.9	4E-11	4E-11	0.00059		0	
		1st Quartile	0.000115	0.00012	0.0046	0.00410	38.8	<0.000005	<0.000005	<0.00050	0.00048	0.032	0.0072	0.015	0.0047	<0.000002	<0.000002	34	<0.0010	<0.0010	<0.00020	<0.00020	21	<0.0050	<0.0050	0.0026		0.029	
		Median	0.00013	0.0001300	0.0064	0.0047	47.2	<0.000010	<0.000005	0.00051	0.000590	0.048	0.0098	0.024	0.0209	<0.000002	<0.000002	128.0	<0.0010	<0.0010	<0.00020	<0.00020	140	<0.0050	<0.0050	0.0027		0.029	
		3rd Quartile	0.00015	0.00016	0.0132	0.0112	47.7	<0.00001	<0.0000050	0.00068	0.00068	0.057	0.0188	0.1445	0.0804	<0.0000020	<0.0000020	164.5	<0.0010	<0.0010	<0.00020	<0.00020	179.5	<0.0050	<0.0050	0.00315		0.029	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 56
2017-2018 Annual Report

2014-15 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E217018	No Name Lake 1 metre below surface	Average	0.00032	0.000290	0.0321	0.0244	13.44	0.0000045	0.00000267	0.000850	0.00064	0.078	0.0389	0.0077	0.00355	0.00000113	0.00000145	15.7	0.00055	0.0005	0.0001	0.0001	1.657	0.00267	0.0025	0.00715		0.029	
		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		1	
		Minimum	0.0002	0.00017	0.0089	0.0057	9.89	<0.000005	<0.0000050	<0.00050	0.00033	0.04	0.0202	0.0041	<0.0010	<0.0000020	<0.0000020	12.8	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050	<0.0050		0.029	
		Maximum	0.00041	0.00038	0.0661	0.0581	17.5	<0.000010	0.000005	0.00322	0.00098	0.217	0.0923	0.0325	0.0269	0.0000029	0.000005	18.3	0.0013	<0.0010	<0.00020	<0.00020	3.01	0.0051	<0.0050	0.0185		0.029	
		Geometric Mean	0.00031	0.00028	0.0257	0.0197	13.14	0.00000435	0.00000262	0.00064	0.00061	0.071	0.0358	0.00650	0.00159	0.00000107	0.00000125	15.6	0.00053	0.0005	0.0001	0.0001	1.313	0.00262	0.0025	0.00504		0.029	
		Count <DL	0	0	0	0	0	15	14	4	0	0	0	0	6	14	12	0	14	15	15	15	2	14	15	1		0	
		Standard Deviation	0.000060	0.00007	0.0207	0.0169	3.2	0.00000104	0.00000065	0.000765	0.00017	0.044	0.0187	0.007	0.00664	0.00000049	0.00000109	2	0.00021	0	0.00000000	0	0.878	0.00067	4E-11	0.00761		0	
		1st Quartile	0.00028	0.00024	0.0126	0.0122	10.6	<0.00001	<0.000005	0.000375	0.00054	0.054	0.0278	0.0052	<0.0010	<0.000002	<0.000002	13.9	<0.0010	<0.0010	<0.00020	<0.00020	0.96	<0.0050	<0.0050	0.00295		0.029	
		Median	0.00033	0.000300	0.0282	0.0187	14.5	<0.000010	<0.000005	0.00061	0.00064	0.069	0.0327	0.00570	0.00160	<0.000002	<0.000002	15	<0.0010	<0.0010	<0.00020	<0.00020	1.94	<0.0050	<0.0050	0.0038		0.029	
		3rd Quartile	0.00036	0.00032	0.0468	0.0325	14.7	<0.00001	<0.000005	0.000995	0.00073	0.084	0.0448	0.0068	0.00315	<0.0000020	<0.000002	17.4	<0.0010	<0.0010	<0.00020	<0.00020	2.23	<0.0050	<0.0050	0.008		0.029	
NNLB	No Name Lake 1 metre from bottom	Average	0.00027	0.00022	0.0319	0.0226	14.3	0.00000433	0.0000025	0.00082	0.00063	0.151	0.069	0.0302	0.0204	0.00000138	0.000001	19.8	0.0005	0.0005	0.0001	0.0001	5.66	0.0025	0.002500	0.00425		0.057	
E217018		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4		1	
		Minimum	0.00022	0.00014	0.0208	0.0118	13.6	<0.000005	<0.0000050	<0.00050	0.00039	0.087	0.0376	0.0084	0.0027	<0.0000020	<0.0000020	13.8	<0.0010	<0.0010	<0.00020	<0.00020	0.61	<0.0050	<0.0050	<0.0050		0.057	
		Maximum	0.00034	0.0005	0.0635	0.0535	15.3	<0.000010	<0.0000050	0.00366	0.00096	0.265	0.106	0.0976	0.0836	0.0000055	<0.0000020	22.4	<0.0010	<0.0010	<0.00020	<0.00020	9.01	<0.0050	<0.0050	0.0057		0.057	
		Geometric Mean	0.00026	0.000210	0.0299	0.0208	14.3	0.00000416	0.0000025	0.000602	0.00061	0.143	0.0657	0.0231	0.0111	0.00000118	0.00000100	19.6	0.0005000	0.0005	0.0001	0.0001	4.41	0.0025	0.0025	0.00407		0.057	
		Count <DL	0	0	0	0	0	15	15	4	0	0	0	0	0	13	15	0	15	15	15	15	0	15	15	1		0	
		Standard Deviation	0.00003	0.00009	0.0134	0.0111	0.6	0.00000114	1E-13	0.000867	0.00017	0.054	0.0219	0.0272	0.0259	0.00000118	0.00000000	2.5	0	0.0000000	0	0	2.71	4E-11	0.000000	0.00133		0	
		1st Quartile	0.00024	0.00019	0.0238	0.0167	14	0.00000375	<0.000005	0.00038	0.00048	0.112	0.0524	0.0156	0.005	<0.000002	<0.000002	19	<0.0010	<0.0010	<0.00020	<0.00020	4.91	<0.0050	<0.0050	0.00377		0.057	
		Median	0.00026	0.0002	0.0268	0.0192	14.1	<0.000010	<0.0000050	0.000590	0.00063	0.147	0.0634	0.0191	0.0075	<0.000002	<0.0000020	20.7	<0.0010	<0.0010	<0.00020	<0.00020	6.73	<0.0050	<0.0050	0.0044		0.057	
		3rd Quartile	0.00028	0.00022	0.0307	0.023	14.5	<0.000010	<0.0000050	0.000770	0.00072	0.161	0.0862	0.024	0.0166	<0.000002	<0.0000020	21.4	<0.0010	<0.0010	<0.00020	<0.00020	7.25	<0.0050	<0.0050	0.00488		0.057	
NNO	No Name Lake Outlet	Average	0.00031	0.00029	0.0388	0.0257	13.64	0.0000048	0.00000341	0.000625	0.0007	0.085	0.0448	0.0097	0.00368	0.0000017	0.0000017	15.6	0.0005	0.00050	0.000107	0.000107	2.07	0.0193	0.0025	0.00456	0.0049	0.029	0.0117
E217017		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	8	8	8	8
		Minimum	0.00014	0.00017	0.0115	0.0075	9.85	<0.000005	<0.000005	<0.00050	0.00045	0.043	0.0179	0.0038	<0.0010	<0.000002	<0.000002	11.7	<0.0010	<0.0010	<0.00020	<0.00020	0.76	<0.0050	<0.0050	<0.0050	<0.0050	0.022	0.0061
		Maximum	0.00047	0.0005	0.08	0.0524	20.8	0.000010	0.0000078	0.00106	0.00129	0.214	0.0892	0.0286	0.0215	0.0000061	0.0000053	18.1	<0.0010	<0.0010	0.00021	0.00021	3.68	0.14	<0.0050	0.0071	0.0087	0.033	0.019
		Geometric Mean	0.00029	0.00028	0.031	0.0210	13.31	0.0000046	0.00000307	0.000553	0.00067	0.078	0.0408	0.008	0.00171	0.00000136	0.00000136	15.4	0.0005	0.00050	0.000105	0.000105	1.91	0.00423	0.0025	0.00426	0.00426	0.029	0.011
		Count <DL	0	0	0	0	0	14	12	4	0	0	0	0	7	12	12	0	15	15	14	14	0	13	15	2	4	0	0
		Standard Deviation	0.0001	0.00009	0.0254	0.0163	3.36	0.0000018	0.00000192	0.000291	0.00021	0.0410	0.0201	0.0069	0.00541	0.0000016	0.00000154	2.4	0	0.00000	0.000028	0.000028	0.8	0.04455	4E-11	0.00171	0.00264	0.004	0.0043
		1st Quartile	0.00023	0.0002	0.0161	0.0128	11.4	<0.000010	<0.0000050	0.000375	0.00058	0.062	0.0306	0.005	<0.0010	<0.000002	<0.000002	13.6	<0.0010	<0.0010	<0.00020	<0.00020	1.5	<0.0050	<0.0050	0.00295	<0.0050	0.026	0.0079
		Median	0.00034	0.0003	0.0325	0.0204	12.5	<0.000010	<0.000005	0.00063	0.00067	0.079	0.0379	0.0067	0.0024	<0.000002	<0.000002	16.9	<0.0010	<0.0010	<0.00020	<0.00020	2.17	<0.0050	<0.0050	0.005	0.00455	0.032	0.0120
		3rd Quartile	0.00038	0.00036	0.0633	0.0386	15.1	<0.00001	<0.000005	0.00085	0.00078	0.088	0.0588	0.0114	0.0041	<0.000002	<0.000002	17.5	<0.0010	<0.0010	<0.00020	<0.00020	2.52	<0.0050	<0.0050	0.00538	0.00692	0.032	0.014
LLS	Small Seep into Long Lake	Average	0.00319	0.00163	0.0194	0.01219	210	0.00000540	0.00000448	0.000535	0.000402	1.018	0.04735	0.341	0.3277	0.0000012	0.0000011	549	0.00324	0.00305	0.000100	0.0001	518	0.00445	0.0025				
E292131		Count	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11				
		Minimum	0.00036	0.00031	<0.0030	<0.0030	104	<0.000005	<0.0000050	<0.00050	<0.00020	0.128	<0.0050	0.109	0.0948	<0.000002	<0.000002	306	<0.0010	<0.0010	<0.00020	<0.00020	251	<0.0050	<0.0050				
		Maximum	0.00978	0.00335	0.0746	0.0827	256	0.000014	0.0000143	0.00138	0.00137	3.72	0.472	0.638	0.634	0.0000028	0.0000024	780	0.0067	0.0063	<0.00020	<0.00020	755	0.021	<0.0050				
		Geometric Mean	0.00213	0.00135	0.0097	0.00414	204	0.0000048	0.00000368	0.000413	0.000303	0.653	0.00642	0.296	0.2749	0.0000011	0.00000108	524	0.00235	0.00226	0.000100	0.0001	486	0.00325	0.0025				
		Count <DL	0	0	1	5	0	10	7	7	2	0	5	0	0	10	10	0	2	2	11	11	0	9	11				
		Standard Deviation	0.00288	0.00095	0.02404	0.02437	44	0.000003	0.00000363	0.000435	0.00036	1.053	0.14087	0.182	0.1889	0.00000054	0.00000042	169	0.00221	0.002	0.000000	0.000000	179	0.00556	1E-10				
		1st Quartile	0.00108	0.00092	0.00385	<0.0030	194	<0.000010	<0.000005	<0.00050	0.00021	0.355	<0.0050	0.196	0.186	<0.000002	<0.0000020	416	0.00135	0.00125	<0.00020	<0.00020	367	<0.0050	<0.0050				
		Median	0.00217	0.0013	0.0078	0.0032	220	<0.000010	<0.0000050	<0.00050	0.000310	0.474	0.0051	0.306	0.287	<0.000002	<0.000002	517	0.0026	0.0031	<0.00020	<0.00020	531	<0.0050	<0.0050				
		3rd Quartile	0.00511	0.00226	0.0272	0.00605	238	<0.000010	0.00000525	0.00076	0.000485	1.51	0.00675	0.501	0.489	<0.000002	<0.000002	716	0.0051	0.0045	<0.00020	<0.00020	675	<0.0050	<0.0050				
LLSM	Long Lake Middle Seep	Average	0.00106	0.00075	0.0156	0.01019	177.5	0.0000067	0.00000669	0.001799	0.00056	0.397	0.00954	0.1863	0.1822	0.00000149	0.000001	494	0.00359	0.00319	0.0001	0.0001	450	0.0029	0.0025				
E292131		Count	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9				
		Minimum	0.0002	0.00023	0.0045	<0.0030	96.3	<0.00001	<0.0000050	<0.00050	0.00032	0.104	<0.0050	0.0458	0.0434	<0.000002	<0.000002	336	<0.0010	<0.0010	<0.00020	<0.00020	275	<0.0050	<0.0050				
		Maximum	0.00226	0.00145	0.0541	0.0335	216	0.0000140	0.000018	0.0116	0.00096	0.853	0.0408	0.35	0.346	0.0000054	<0.000002	643	0.007	0.0061	<0.00020	<0.00020	566	0.0061	<0.0050				
		Geometric Mean	0.00083	0.00062	0.0103	0.00676	171.6	0.0000061	0.00000535	0.000693	0.00052	0.320	0.00576	0.153	0.1488	0.00000121	0.000001	481	0.0026	0.00236	0.000100	0.0001	436	0.00276	0.00250				
		Count <DL	0	0	0	1	0	7	3	3	0	0	4	0	0	8	9	0	2	2	9	9	0	8	9				
		Standard Deviation	0.00068	0.00045	0.01760	0.01059	44	0.0000034	0.00000503	0.003691	0.00024	0.25	0.01242	0.1127	0.1121	0.0000015	0.0000000	118	0.00234	0.00205	0	0	113	0.0012	4E-11				
		1st Quartile	0.00048	0.00035	0.0063	0.0039	157	<0.000010	<0.000005	<0.00050	0.00042	0.154	<0.0050	0.0832	0.0818	<0.0000020	<0.0000020	385	0.0024	0.002	<0.00020	<0.00020	368	<0.0050	<0.0050				
		Median	0.00101	0.00089	0.0076	0.0057	201	<0.00001	0.0000052	0.00064	0.00044	0.406	0.00630	0.165	0.1560	<0.000002	<0.000002	529	0.0034	0.0028	<0.00020	<0.00020	468	<0.0050	<0.0050				
		3rd Quartile	0.00137	0.00095	0.01100	0.0104	211	<0.000010	0.000008	0.000690	0.00061	0.488	0.007	0.2620	0.242	<0.000002	<0.000002	589	0.0057	0.0051	<0.00020	<0.00020	550	<0.0050	<0.0050				

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 57
2017-2018 Annual Report

2014-15 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW002	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Average	0.00085	0.00042	0.00300	0.0018	211.8	0.0000680	0.0000258	0.00050	0.000308	3.26	1.97	3.01	2.91	0.0000050	0.0000043	1220	0.0032	0.0032	0.000050	0.000062	1167	0.01020	0.00352	0.00100	0.01938		0.109
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4	1	4	3	1	4	1	4	4	1	4	1	4		1
		Minimum	0.00085	0.00034	<0.0060	<0.0020	194	0.000068	<0.000020	<0.0010	<0.00040	3.26	1.46	3.01	2.58	<0.000010	0.0000023	1200	0.0032	0.0029	<0.00010	<0.00010	1110	0.0102	<0.0020	<0.0020	0.0025		0.109
		Maximum	0.00085	0.00052	<0.0060	0.0042	225	0.000068	0.000073	<0.0010	0.00062	3.26	2.28	3.01	3.22	<0.000010	<0.000010	1240	0.0032	0.0036	<0.00010	<0.00020	1240	0.0102	0.0096	<0.0020	<0.050		0.109
		Geometric Mean	0.00085	0.00041	0.00300	0.00143	211.4	0.0000680	0.0000164	0.00050	0.000269	3.26	1.95	3.01	2.9	0.0000050	0.0000041	1219.9	0.0032	0.0032	0.000050	0.000059	1166	0.01020	0.00221	0.001	0.01406		0.109
		Count <DL	0	0	1	3	0	0	2	1	2	0	0	0	0	1	3	0	0	0	1	4	0	0	3	1	3		0
		Standard Deviation	0.00000	0.00008	0.00000	0.0016	12.9	0.0000000	0.0000315	0.00000	0.000208	0	0.36	0.00	0.26	0.0000000	0.0000014	20	0	0.0003	0.000000	0.000025	54	0.00000	0.00411	0.00000	0.01125		0
		1st Quartile	0.00085	0.00036	<0.0060	<0.0020	208.2	0.000068	<0.000020	<0.0010	<0.00040	3.26	1.91	3.01	2.81	<0.000010	0.00000432	1210	0.0032	0.003	<0.00010	<0.00010	1140	0.0102	<0.0020	<0.0020	0.01938		0.109
		Median	0.00085	0.00041	<0.0060	<0.0020	214	0.000068	<0.000020	<0.0010	0.000205	3.26	2.08	3.01	2.92	<0.000010	<0.000010	1220	0.0032	0.0031	<0.00010	<0.00010	1160	0.0102	0.00175	<0.0020	<0.050		0.109
		3rd Quartile	0.00085	0.00048	<0.0060	0.0018	217.5	0.000068	0.00002575	<0.0010	0.000312	3.26	2.14	3.01	3.01	<0.000010	<0.000010	1230	0.0032	0.0032	<0.00010	0.000062	1187	0.0102	0.00427	<0.0020	<0.050		0.109
QU1009D	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.132		0.00100	190		0.0000038		0.000245		0.190		0.0201		0.0000030	152		0.000375		0.0000625	85.4		0.00150		0.0180		
		Count		2		2	2		2		2		2		2		2	1		2		2	2		2		2		
		Minimum		0.131		<0.0010	187		<0.000005		<0.00020		0.178		0.0143		<0.000002	152		<0.00050		<0.000050	85		<0.0010		0.011		
		Maximum		0.133		<0.0030	193		<0.000010		0.00039		0.203		0.0259		<0.000010	152		<0.0010		<0.00020	85.9		<0.0050		<0.050		
		Geometric Mean		0.132		0.00087	190		0.0000035		0.000197		0.19		0.0192		0.0000022	152		0.000354		0.0000500	85.4		0.00112		0.0166		
		Count <DL		0		2	0		2		1		0		0		2	0		2		2	0		2		1		
		Standard Deviation		0.001		0.00071	4.2		0.0000018		0.000205		0.018		0.0082		0.0000028	0		0.000177		0.0000530	0.6		0.00141		0.0099		
		1st Quartile		0.132		0.00075	188.5		0.0000031		0.000173		0.184		0.0172		0.000002	152		0.000312		0.0000438	85.2		0.001		0.0145		
		Median		0.132		0.00100	190		0.0000038		0.000245		0.190		0.0201		0.000003	152		0.000375		0.0000625	85.4		0.0015		0.018		
		3rd Quartile		0.132		0.00125	191.5		0.0000044		0.000318		0.197		0.023		0.000004	152		0.000438		0.0000813	85.7		0.002		0.0215		
QU1009S	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.025		0.00110	71.6		0.0000050		0.000100		0.112		0.376		0.0000050	238.0		0.000250		0.0000250	93.3		0.00050		0.0250		
		Count		1		1	1		1		1		1		1		1	1		1		1	1		1		1		
		Minimum		0.025		0.0011	71.6		<0.000010		<0.00020		0.112		0.376		<0.000010	238		<0.00050		<0.000050	93.3		<0.0010		<0.050		
		Maximum		0.025		0.0011	71.6		<0.000010		<0.00020		0.112		0.376		<0.000010	238		<0.00050		<0.000050	93.3		<0.0010		<0.050		
		Geometric Mean		0.025		0.0011	71.6		0.0000050		0.000100		0.112		0.376		0.0000050	238.0		0.00025		0.0000250	93.3		0.00050		0.0250		
		Count <DL		0		0	0		1		1		0		0		1	0		1		1	0		1		1		
		Standard Deviation		0		0	0		0.0000000		0.000000		0		0		0.0000000	0		0		0.0000000	0.0		0.00000		0.0000		
		1st Quartile		0.025		0.0011	71.6		<0.000010		<0.00020		0.112		0.376		<0.000010	238.0		<0.00050		<0.000050	93.3		<0.0010		<0.050		
		Median		0.025		0.00110	71.6		<0.000010		<0.00020		0.112		0.376		<0.000010	238.0		<0.00050		<0.000050	93.3		<0.0010		<0.050		
		3rd Quartile		0.025		0.0011	71.6		<0.000010		<0.00020		0.112		0.376		<0.000010	238.0		<0.00050		<0.000050	93.3		<0.0010		<0.050		
SPD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E218582	Settling Pond # 1	Average	0.0012	0.00096	0.0444	0.01561	81.80	0.0000096	0.00000504	0.000932	0.00065	0.271	0.0598	0.0667	0.02794	0.00000184	0.00000118	391	0.0021	0.0022	0.0001	0.000100	325.5	0.00381	0.00319	0.0105	0.0072	0.2575	0.02361
		Count	12	12	12	12	16	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	44	12	12	8	3	8	8
		Minimum	0.00047	0.00031	0.005	<0.0030	29.40	<0.00001	<0.000005	<0.00050	0.00029	0.15	0.01	0.023	<0.0010	<0.000002	<0.000002	135	0.0012	0.0013	<0.00020	<0.00020	48.8	<0.0050	<0.0050	0.003	0.0053	<0.020	<0.0050
		Maximum	0.0024	0.00204	0.104	0.048	119.0	0.000039	0.000013	0.00185	0.00129	0.563	0.142	0.185	0.144	0.0000059	0.0000021	661	0.0045	0.0044	<0.00020	<0.00020	836	0.0146	0.0108	0.0191	0.0106	<2.0	0.0501
		Geometric Mean	0.00103	0.00081	0.0285	0.01121	78.6	0.0000074	0.00000426	0.000804	0.00059	0.252	0.0438	0.0542	0.00639	0.0000014	0.0000011	365	0.00200	0.002	0.0001	0.000100	289.40	0.00312	0.00282	0.0089	0.00680	0.0316	0.01737
		Count <DL	0	0	0	1	0	8	6	1	0	0	0	0	4	9	10	0	0	0	12	12	0	10	11	0	0	8	1
		Standard Deviation	0.00067	0.0006	0.0366	0.01299	20.9	0.0000098	0.00000319	0.000525	0.00031	0.118	0.0457	0.0495	0.04132	0.0000017	0.00000041	139.0	0.001	0.0011	0.000000	0.000000	149.4	0.00355	0.0024	0.0059	0.003	0.4583	0.01561
		1st Quartile	0.00061	0.00057	0.0111	0.00702	69.7	<0.000010	<0.0000050	0.000585	0.00045	0.192	0.0198	0.0331	<0.0010	<0.000002	<0.000002	332	0.0013	0.0015	<0.00020	<0.00020	267.8	<0.0050	<0.0050	0.0059	0.0055	<0.020	0.01665
		Median	0.00104	0.00072	0.034	0.0117	80.8	<0.00001	0.00000375	0.000715	0.0006	0.255	0.0505	0.0507	0.0122	<0.000002	<0.000002	368	0.002	0.0017	<0.00020	<0.00020	318.00	<0.0050	<0.0050	0.01	0.0057	<0.020	0.02185
		3rd Quartile	0.00166	0.00129	0.0739	0.02087	96.6	0.000010	0.00000700	0.001202	0.00072	0.305	0.0869	0.0734	0.04118	0.00000135	<0.000002	455	0.0026	0.0022	<0.00020	<0.00020	365.2	<0.0050	<0.0050	0.01280	0.0082	0.2575	0.03000
LLE	Long Lake Entrance (LLE)	Average	0.00098	0.000751	0.08278	0.01978	65.4	0.00000500	0.00000250	0.000643	0.00057	0.972	0.40385	0.1172	0.0958	0.00000186	0.0000011	297	0.00075	0.0005	0.000109	0.000100	282.8	0.00723	0.00250	0.0079		0.043	0.02730
E292130		Count	12	12	12	12	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	53	12	12	5		5	5
		Minimum	0.00061	<0.00010	<0.0030	<0.0030	30.1	<0.00001	<0.000005	<0.00050	0.00028	0.211	<0.0050	0.0278	<0.0010	<0.000002	<0.000002	124	<0.0010	<0.0010	<0.00020	<0.00020	27.8	<0.0050	<0.0050	0.0025		0.027	0.0086
		Maximum	0.0014	0.00137	0.246	0.0485	138	<0.00001	<0.000005	0.00122	0.00083	3.48	1.23	0.537	0.405	0.0000113	0.0000024	867	0.0017	<0.0010	0.00021	<0.00020	817	0.0506	<0.0050	0.015		0.052	0.0780
		Geometric Mean	0.00096	0.000616	0.0552	0.01145	58.8	0.000005	0.0000025	0.000529	0.00054	0.734	0.1927	0.0832	0.05037	0.00000122	0.00000108	239.0	0.00066	0.0005	0.000106	0.000100	220.7	0.0038	0.00250	0.0066		0.042	0.0197
		Count <DL	0	1	1	3	0	12	12	5	0	0	1	0	1	11	11	0	9	12	11	12	0	9	12	0		0	0
		Standard Deviation	0.00023	0.000338	0.06208	0.01633	33.2	1E-13	5E-14	0.000378	0.00018	0.881	0.35764	0.1373	0.10515	0.00000297	0.0000004	236	0.00046	0	0.000032	0.000000	213	0.01376	0.00000	0.0051		0.009	0.0287
		1st Quartile	0.00081	0.00059	0.05315	0.00728	42.1	<0.000010	<0.0000050	<0.00050	0.00043	0.551	0.149	0.0541	0.04748	<0.0000020	<0.0000020	150	<0.0010	<0.0010	<0.00020	<0.00020	133	<0.0050	<0.0050	0.0048		0.0430	0.01420
		Median	0.00096	0.000815	0.06955	0.0186	54.5	<0.000010	<0.000005	0.00071	0.0006	0.667	0.389	0.0795	0.0693	<0.000002	<0.000002	193	<0.0010	<0.0010	<0.00020	<0.00020	172	<0.0050	<0.0050	0.0061		0.045	0.0147
		3rd Quartile	0.00116	0.000962	0.09825	0.02582	83.7	<0.00001	<0.000005	0.00096	0.00069	1.048	0.4865	0.117	0.10445	<0.0000020	<0.0000020	308	0.00072	<0.0010	<0.00020	<0.00020	428	0.00345	<0.0050	0.01110		0.0460	0.02110
LLM1	Long Lake Middle 1 metre below Surface	Average	0.00051	0.00048	0.0295	0.0179	32.9	0.00000470	0.00000267	0.000593	0.00074	0.081	0.037	0.0197	0.01189	0.00000287	0.00000145	68.1	0.00059	0.00050	0.000100	0.000100	54.4	0.01853	0.00250	0.00377		0.0300	
E206619		Count	15	15	15	15	4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	0.00028	0.00031	0.0075	0.0049	23.9	<0.000005	<0.0000050	<0.00050	0.00031	0.029	0.0101	0.0054	<0.0010	<0.0000020	<0.0000020	29.4	<0.0010	<0.0010	<0.00020	<0.00020	17.5	<0.0050	<0.0050	<0.0050		0.03	
		Maximum	0.00071	0.0007	0.0659	0.0477	36.9	<0.000010	0.000005	0.0016	0.00161	0.133	0.0734	0.0605	0.0571	<0.000050	0.0000054	94.4	0.0019	<0.0010	<0.00020	<0.00020	88.1	0.237	<0.0050	0.0063		0.03	
		Geometric Mean	0.00049	0.00046	0.0226	0.0144	32.4	0.0000046	0.00000262	0.00051	0.00065	0.07	0.032	0.015	0.00385	0.00000143	0.00000121	65.2	0.00055	0.00050	0.000100	0.000100	50.4	0.00376	0.00250	0.0034		0.0300	
		Count <DL	0	0	0	0	0	15	14	5	0	0	0	0	6	13	13	0	14	15	15	15	0	12	15	1		0	
		Standard Deviation	0.00013	0.00013	0.0205	0.0125	6.1	0.00000090	0.00000065	0.000358	0.00041	0.04	0.0187	0.0154	0.01537	0.00000616	0.00000124	18.8	0.00036	0.00000	0.000000	0.000000	19.4	0.06045	0.00000	0.00219		0.0000	
		1st Quartile	0.00042	0.00036	0.0107	0.0094	31.8	<0.000010	<0.000005	<0.00050	0.00044	0.038	0.0207	0.007	<0.0010	<0.000002	<0.000002	53.2	<0.0010	<0.0010	<0.00020	<0.00020	36.7	<0.0050	<0.0050	<0.0050		0.03	
		Median	0.00047	0.00043	0.0288	0.0135	35.3	<0.000010	<0.0000050	0.00059	0.00065	0.102	0.04	0.0154	0.0075	<0.000002	<0.000002	72.7	<0.0010	<0.0010	<0.00020	<0.00020	63.9	<0.0050	<0.0050	0.0025		0.03	
		3rd Quartile	0.00062	0.00059	0.0389	0.0239	36.4	<0.000010	<0.0000050	0.0007	0.0008	0.1130	0.0482	0.0258	0.019	<0.000002	<0.000002	83.5	<0.0010	<0.0010	<0.00020	<0.00020	66.7	<0.0050	<0.0050	0.0044		0.03	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 58
2017-2018 Annual Report

2014-15 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LLMB	Long Lake Middle 1 metre From Bottom	Average	0.00028	0.00021	0.0118	0.00624	54.3	0.00000633	0.0000037	0.000463	0.00052	0.127	0.01330	2.483	2.186	0.00000142	0.00000165	127.7	0.00050	0.00050	0.000100	0.000100	116.5	0.00250	0.00250	0.00330		0.066	
E206619		Count	15	15	15	15	4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	0.0002	0.00011	0.0038	<0.0030	52.1	<0.000005	<0.0000050	<0.00050	0.00021	0.05	0.0053	0.921	0.59	<0.0000020	<0.0000020	121	<0.0010	<0.0010	<0.00020	<0.00020	109	<0.0050	<0.0050	0.0022		0.066	
		Maximum	0.00041	0.00034	0.0224	0.0094	57.8	0.000019	0.000016	0.001	0.00096	0.318	0.0218	5.58	5.49	0.0000036	0.0000067	135	<0.0010	<0.0010	<0.00020	<0.00020	131	<0.0050	<0.0050	0.0052		0.066	
		Geometric Mean	0.00028	0.0002	0.0103	0.0054	54.3	0.00000546	0.00000303	0.000401	0.00048	0.103	0.0119	2.052	1.748	0.00000125	0.00000131	127.7	0.00050	0.00050	0.000100	0.000100	116.4	0.00250	0.00250	0.00306		0.066	
		Count <DL	0	0	0	2	0	12	13	8	0	0	0	0	0	12	12	0	15	15	15	15	0	15	15	1		0	
		Standard Deviation	0.00005	0.00006	0.0057	0.00281	2.5	0.00000437	0.00000359	0.000263	0.00022	0.095	0.006	1.661	1.5490	0.00000093	0.00000158	4.4	0.00000	0.00000	0.000000	0.000000	5.1	4E-11	0.00000	0.00165		0	
		1st Quartile	0.00024	0.00017	0.0068	0.00385	52.9	<0.000010	<0.000005	<0.00050	0.00037	0.068	0.0066	1.29	1.13	<0.000002	<0.000002	124.5	<0.0010	<0.0010	<0.00020	<0.00020	113	<0.0050	<0.0050	0.00235		0.066	
		Median	0.00028	0.00019	0.0112	0.0076	53.7	<0.00001	<0.0000050	<0.00050	0.00045	0.081	0.01450	1.56	1.46	<0.000002	<0.000002	128	<0.0010	<0.0010	<0.00020	<0.00020	117.0	<0.0050	<0.0050	<0.0050		0.066	
		3rd Quartile	0.00032	0.00024	0.016	0.00835	55.1	<0.000010	<0.0000050	0.000625	0.00062	0.15	0.01870	4.02	3.545	<0.000002	<0.0000020	130.5	<0.0010	<0.0010	<0.00020	<0.00020	118	<0.0050	<0.0050	0.00385		0.066	
LLO	Long Lake Outlet	Average	0.00054	0.00046	0.0407	0.0151	31.8	0.0000067	0.00000546	0.000639	0.00068	0.0980	0.03234	0.0223	0.00493	0.00000212	0.00000147	72.5	0.0005	0.00050	0.000100	0.000100	55.5	0.00324	0.00250				
E219412		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	53	15	15				
		Minimum	0.00034	0.00031	0.0075	0.0034	17.5	<0.000005	<0.000005	<0.00050	0.00033	0.012	<0.0050	0.0048	<0.0010	<0.000002	<0.000002	39.7	<0.0010	<0.0010	<0.00020	<0.00020	15.3	<0.0050	<0.0050				
		Maximum	0.00093	0.00059	0.107	0.0382	41.2	0.000041	0.000039	0.00161	0.00119	0.291	0.065	0.122	0.0139	0.0000114	0.0000034	110	<0.0010	<0.0010	<0.00020	<0.00020	108	0.0092	<0.0050				
		Geometric Mean	0.00052	0.00045	0.0328	0.0117	30.9	0.0000048	0.0000034	0.000539	0.00064	0.077	0.02076	0.0158	0.00235	0.0000015	0.0000013	69.8	0.0005	0.00050	0.000100	0.000100	51.3	0.00292	0.00250				
		Count <DL	0	0	0	0	0	14	12	5	0	0	3	0	6	11	11	0	15	15	15	15	0	13	15				
		Standard Deviation	0.00015	0.00009	0.0268	0.0111	7.1	0.0000095	0.0000094	0.000377	0.00024	0.071	0.02217	0.0284	0.00477	0.00000275	0.00000083	20.3	0	0.00000	0.000000	0.000000	20.4	0.002	4E-11				
		1st Quartile	0.00044	0.00038	0.0204	0.0057	26.2	0.0000038	<0.000005	<0.00050	0.0005	0.05	0.01405	0.0112	<0.0010	<0.000002	<0.000002	55.6	<0.0010	<0.0010	<0.00020	<0.00020	38.5	<0.0050	<0.0050				
		Median	0.00054	0.00044	0.034	0.0131	35	<0.00001	<0.000005	0.00067	0.00062	0.09	0.033	0.0158	0.0045	<0.000002	<0.000002	73.7	<0.0010	<0.0010	<0.00020	<0.00020	55.4	<0.0050	<0.0050				
		3rd Quartile	0.00061	0.00052	0.0507	0.0168	36.8	<0.00001	<0.000005	0.000795	0.00082	0.106	0.0511	0.0204	0.0089	0.00000155	0.00000165	84.9	<0.0010	<0.0010	<0.00020	<0.00020	69.5	<0.0050	<0.0050				
WB	Middle Quinsam Lake Outlet	Average	0.00024	0.00024	0.0199	0.0131	34.8	0.0000052	0.0000035	0.000699	0.00093	0.048	0.0202	0.0075	0.00119	0.0000011	0.0000014	41.9	0.00050	0.00050	0.000100	0.000100	33.7	0.00250	0.00250				
E0900504		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15				
		Minimum	0.00015	0.00014	0.0111	0.0041	23.4	<0.000005	<0.000005	<0.00050	0.00052	0.024	0.0095	0.0034	<0.0010	<0.000002	<0.000002	29.4	<0.0010	<0.0010	<0.00020	<0.00020	11	<0.0050	<0.0050				
		Maximum	0.00043	0.00046	0.0336	0.0216	42.9	0.0000016	0.000015	0.00108	0.00448	0.083	0.0446	0.0156	0.0041	0.0000028	0.0000068	83.8	<0.0010	<0.0010	<0.00020	<0.00020	73	<0.0050	<0.0050				
		Geometric Mean	0.00023	0.000230	0.0189	0.0121	34.2	0.0000047	0.00000295	0.000666	0.00075	0.046	0.0190	0.0068	0.00089	0.00000107	0.00000114	40.6	0.00050	0.00050	0.000100	0.000100	30.5	0.00250	0.00250				
		Count <DL	0	0	0	0	0	14	13	1	0	0	0	0	9	14	14	0	15	15	15	15	0	15	15				
		Standard Deviation	0.00008	0.00008	0.0065	0.0051	6.3	0.0000032	0.00000325	0.000206	0.001	0.0140	0.0081	0.0034	0.00104	0.00000046	0.0000015	12.5	0.00000	0.00000	0.000000	0.000000	15	4E-11	4E-11				
		1st Quartile	0.00019	0.00018	0.0166	0.0104	33	<0.000010	<0.000005	0.00059	0.00056	0.039	0.0154	0.0046	<0.0010	<0.000002	<0.000002	36.3	<0.0010	<0.0010	<0.00020	<0.00020	27.8	<0.0050	<0.0050				
		Median	0.0002	0.000220	0.0178	0.0118	36.1	<0.000010	<0.000005	0.00067	0.00064	0.049	0.0183	0.0071	<0.0010	<0.000002	<0.000002	38.6	<0.0010	<0.0010	<0.00020	<0.00020	31.1	<0.0050	<0.0050				
		3rd Quartile	0.00026	0.000260	0.0243	0.0186	38.4	<0.00001	<0.000005	0.000785	0.00074	0.056	0.0228	0.0096	0.00185	<0.000002	<0.000002	42.5	<0.0010	<0.0010	<0.00020	<0.00020	40.8	<0.0050	<0.0050				
7SSD	Settling Pond at 7S- Discharge to Stream 1 -7S		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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E292069		Average	0.00132	0.00081	0.2149	0.00928	124.8	0.0000247	0.00001833	0.00164	0.00091	0.499	0.0683	0.3139	0.26288	0.00000164	0.00000118	225	0.00156	0.00051	0.000117	0.000106	117.4	0.01019	0.00269	0.0039	0.0025	0.261	0.0163
		Count	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	1	1	1	1
		Minimum	0.0004	0.00024	0.0057	<0.0030	56.2	<0.000005	<0.000005	0.00074	0.00042	0.065	<0.0050	0.041	<0.0010	<0.000002	<0.000002	126	<0.0010	<0.0010	<0.00020	<0.00020	17.3	<0.0050	<0.0050	0.0039	<0.0050	0.261	0.0163
		Maximum	0.00448	0.00364	2.89	0.0515	208	0.00058	0.000519	0.00608	0.00352	2.27	0.333	5.14	4.08	0.0000086	0.0000051	343	0.0317	0.001	0.00044	0.00037	219	0.0831	0.0069	0.0039	<0.0050	0.261	0.0163
		Geometric Mean	0.0011	0.00065	0.0799	0.00613	119.6	0.00000920	0.0000053	0.00137	0.00084	0.392	0.032	0.1731	0.1043	0.00000129	0.00000109	217	0.00075	0.00051	0.000109	0.000103	99.3	0.00536	0.00262	0.0039	0.0025	0.261	0.0163
		Count <DL	0	0	0	7	0	24	20	0	0	0	4	0	3	35	40	0	31	42	40	42	0	25	41	0	1	0	0
		Standard Deviation	0.00097	0.00066	0.4635	0.00972	35.2	0.0000874	0.00007844	0.00127	0.0005	0.401	0.07754	0.765	0.6110	0.00000165	0.00000076	60	0.00475	0.00008	0.000067	0.000041	56.5	0.01572	0.00088	0	0	0	0
		1st Quartile	0.00074	0.0004	0.032	0.00355	101	<0.000010	<0.0000050	0.00094	0.00064	0.348	0.0109	0.098	0.0637	<0.0000020	<0.0000020	180.0	<0.0010	<0.0010	<0.00020	<0.00020	74.8	<0.0050	<0.0050	0.0039	<0.0050	0.261	0.0163
		Median	0.00102	0.0006	0.0806	0.0058	125	<0.000010	0.000005	0.00115	0.00082	0.427	0.0433	0.174	0.136	<0.000002	<0.000002	224	<0.0010	<0.0010	<0.00020	<0.00020	123.0	<0.0050	<0.0050	0.0039	<0.0050	0.261	0.0163
		3rd Quartile	0.00148	0.0009	0.215	0.0095	145.5	0.0000130	0.0000080	0.00173	0.00098	0.565	0.09335	0.2825	0.256	<0.0000020	<0.000002	277.0	0.0011	<0.0010	<0.00020	<0.00020	161.5	0.01225	<0.0050	0.0039	<0.0050	0.261	0.0163
7S	Stream 1-7S discharge to LWO	Average	0.000125	0.000109	0.0253	0.0193	27.7	0.00000779	0.00000656	0.000756	0.00058	0.0128	0.00469	0.00078	0.0005	0.00000152	0.0000012	50.6	0.00078	0.00057	0.000100	0.000100	30.280	0.00994	0.00294	0.002	0.0025	0.044	0.0112
E292109		Count	39	39	39	39	36	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	36	39	39	1	1	1	1
		Minimum	<0.00010	<0.00010	0.0078	0.0078	16.1	<0.000005	<0.000005	<0.00050	0.00025	<0.010	<0.0050	<0.0010	<0.0010	<0.000002	<0.000002	21.9	<0.0010	<0.0010	<0.00020	<0.00020	5.08	<0.0050	<0.0050	0.002	<0.0050	0.044	0.0112
		Maximum	0.00046	0.00029	0.0715	0.0599	51.4	0.0000390	0.000035	0.0063	0.00157	0.116	0.020	0.0051	<0.0010	0.000018	0.0000057	116	0.0074	0.0025	<0.00020	<0.00020	88.50	0.165	0.0085	0.0020	<0.0050	0.044	0.0112
		Geometric Mean	0.000108	0.000096	0.0222	0.0173	26.4	0.00000612	0.00000445	0.000491	0.00054	0.0081	0.00371	0.00063	0.0005	0.00000112	0.00000108	45.1	0.00057	0.00053	0.000100	0.000100	23.57	0.00397	0.00277	0.002	0.0025	0.044	0.0112
		Count <DL	9	12	0	0	0	30	24	20	0	26	26	31	39	37	37	0	37	37	39	39	0	30	35	0	1	0	0
		Standard Deviation	0.000078	0.000057	0.0145	0.0101	9.3	0.0000073	0.00000726	0.001069	0.00025	0.0196	0.00413	0.00082	0	0.00000276	0.00000089	25.7	0.00126	0.00034	0.000000	0.000000	20.71	0.02694	0.00139	0	0	0	0
		1st Quartile	0.0001	<0.00010	0.0156	0.012	21.4	<0.000010	<0.000005	<0.00050	0.00044	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	31.2	<0.0010	<0.0010	<0.00020	<0.00020	14.48	<0.0050	<0.0050	0.002	<0.0050	0.044	0.0112
		Median	0.00011	0.00011	0.0216	0.0175	23.9	<0.000010	<0.000005	<0.00050	0.00050	<0.010	<0.0050	<0.0010	<0.0010	<0.000002	<0.000002	47.0	<0.0010	<0.0010	<0.00020	<0.00020	28.3	<0.0050	<0.0050	0.00200	<0.0050	0.0440	0.01120
		3rd Quartile	0.00013	0.000125	0.0312	0.0237	31.9	<0.000010	0.00000915	0.00086	0.00063	0.0115	0.0057	<0.0010	<0.0010	<0.000002	<0.000002	61.8	<0.0010	<0.0010	<0.00020	<0.00020	42.18	<0.0050	<0.0050	0.002	<0.0050	0.044	0.0112
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average	0.43	0.433	0.0322	0.00192	186.0	0.0000050	0.000005	0.000250	0.000200	0.224	0.189	0.0387	0.0471	0.0000050	0.0000050	115.8	0.000250	0.000312	0.0000250	0.0000812	14.8	0.00470	0.00100	0.0167	0.0250		0.156
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4	1	4	4	1	4	1	4	4	1	4	1	3		1
		Minimum	0.430	0.42	0.0322	0.0012	183	<0.000010	<0.000010	<0.00050	<0.00020	0.224	0.182	0.0387	0.0371	<0.000010	<0.000010	112	<0.00050	<0.00050	<0.000050	<0.000050	14	0.0047	<0.0010	0.0167	<0.050		0.156
		Maximum	0.43	0.45	0.0322	<0.0050	188	<0.000010	<0.000010	<0.00050	<0.0010	0.224	0.198	0.0387	0.0588	<0.000010	<0.000010	119	<0.00050	<0.0010	<0.000050	<0.00050	15.3	0.0047	<0.0050	0.0167	<0.050		0.156
		Geometric Mean	0.43	0.433	0.0322	0.00186	186.0	0.0000050	0.000005	0.00025	0.000150	0.224	0.189	0.0387	0.0465	0.0000050	0.0000050	115.7	0.000250	0.000297	0.0000250	0.0000445	14.8	0.0047	0.00075	0.0167	0.0250		0.156
		Count <DL	0	0	0	1	0	1	4	1	4	0	0	0	0	1	4	0	1	4	1	4	0	0	4	0	3		0
		Standard Deviation	0	0.015	0	0.00054	2.2	0.0000000	0	0	0.000200	0.000	0.008	0	0.0089	0.0000000	0.0000000	2.9	0.000000	0.000125	0.0000000	0.0001125	0.6	0	0.00100	0	0.0000		0
		1st Quartile	0.43	0.422	0.0322	0.00172	185.2	<0.000010	<0.000010	<0.00050	<0.00020	0.224	0.184	0.0387	0.0435	<0.000010	<0.000010	115	<0.00050	<0.00050	<0.000050	<0.000050	14.7	0.0047	<0.0010	0.0167	<0.050		0.156
		Median	0.43	0.432	0.0322	0.002	186.5	<0.000010	<0.000010	<0.00050	<0.00020	0.224	0.188	0.0387	0.0462	<0.000010	<0.000010	116	<0.00050	<0.00050	<0.000050	<0.000050	15	0.00470	<0.0010	0.0167	<0.050		0.156
		3rd Quartile	0.43	0.443	0.0322	0.0022	187.2	<0.000010	<0.000010	<0.00050	0.0002	0.224	0.194	0.0387	0.0499	<0.000010	<0.000010	116.8	<0.00050	0.000312	<0.000050	0.0000812	15.2	0.0047	0.001	0.0167	<0.050		0.156
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average	0.439	0.5	1.85	0.00432	110.5	0.0000240	0.0000050	0.00483	0.000200	2.77	0.077	0.143	0.0826	0.0000050	0.0000050	72.8	0.00219	0.000312	0.000238	0.0000812	9.73	0.0061	0.00183	0.117	0.0250		0.111
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4	1	4	4	1	4	1	4	4	1	4	1	3		1
		Minimum	0.439	0.446	1.85	<0.0050	48.1	0.000024	<0.000010	0.00483	<0.00020	2.77	0.068	0.143	0.0752	<0.000010	<0.000010	68.6	0.00219	<0.00050	0.000238	<0.000050	8.89	0.0061	<0.0010	0.117	<0.050		0.111
		Maximum	0.439	0.522	1.85	0.0059	138	0.000024	<0.000010	0.00483	<0.0010	2.77	0.084	0.143	0.0937	<0.000010	<0.000010	75.3	0.00219	<0.0010	0.000238	<0.00050	10.3	0.0061	0.0038	0.117	<0.050		0.111
		Geometric Mean	0.439	0.499	1.85	0.00412	102.1	0.0000240	0.0000050	0.00483	0.000150	2.77	0.077	0.143	0.0823	0.0000050	0.0000050	72.7	0.00219	0.000297	0.000238	0.0000445	9.72	0.0061	0.00124	0.117	0.0250		0.111
		Count <DL	0	0	0	1	0	0	4	0	4	0	0	0	0	1	4	0	0	4	0	4	0	0	3	0	3		0
		Standard Deviation	0.000	0.036	0.00	0.0015	42	0.0000000	0.0000000	0.00000	0.000200	0.00	0.007	0.000	0.0079	0.0000000	0.0000000	3.1	0.00000	0.000125	0.000000	0.0001125	0.6	0.0000	0.00162	0.0000	0.0000		0.000
		1st Quartile	0.439	0.494	1.85	0.00355	105.8	0.000024	<0.000010	0.00483	<0.00020	2.77	0.074	0.143	0.0784	<0.000010	<0.000010	71.2	0.00219	<0.00050	0.000238	<0.000050	9.53	0.0061	<0.0010	0.117	<0.050		0.111
		Median	0.439	0.516	1.85	0.00445	128	0.000024	<0.000010	0.00483	<0.00020	2.77	0.078	0.143	0.0808	<0.000010	<0.000010	73.6	0.00219	<0.00050	0.000238	<0.000050	9.87	0.0061	0.0015	0.117	<0.050		0.111
		3rd Quartile	0.439	0.521	1.85	0.00522	132.8	0.000024	<0.000010	0.00483	0.0002	2.77	0.082	0.143	0.085	<0.000010	<0.000010	75.1	0.00219	0.000312	0.000238	0.0000812	10.07	0.0061	0.00282	0.117	<0.050		0.111

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 59
2017-2018 Annual Report

2014-15 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average		0.173		0.0041	201.0		0.000005		0.0001		1.05		0.177		0.0000010			0.0005		0.0001	0.25		0.0025		0.0504		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.173		0.0041	201		0.000005		<0.00020		1.05		0.177		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0504		
		Maximum		0.173		0.0041	201		0.000005		<0.00020		1.05		0.177		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0504		
		Geometric Mean		0.173		0.0041	201.0		0.000005		0.000100		1.05		0.177		0.0000010			0.0005		0.0001	0.25		0.0025		0.0504		
		Count <DL		0		0	0		0		1		0		0		1			1		1	1		1		0		
		Standard Deviation		0		0.00000	0.0		0		0		0		0		0.0000000			0		0	0		0.00000		0		
		1st Quartile		0.173		0.0041	201		0.000005		<0.00020		1.05		0.177		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0504		
		Median		0.173		0.0041	201		0.000005		<0.00020		1.05		0.177		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0504		
		3rd Quartile		0.173		0.0041	201		0.000005		<0.00020		1.05		0.177		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0504		
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average	**(ND) Only the deep well was sampled on an annual basis.**																										
		Count																											
		Minimum																											
		Maximum																											
		Geometric Mean																											
		Count <DL																											
		Standard Deviation																											
		1st Quartile																											
		Median																											
		3rd Quartile																											
QU1010D	Ex-situ 2-North deep groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Mudstone).	Average	0.0225	0.0174	1.35	0.0049	100.3	0.000025	0.000025	0.0078	0.00050	11.0	12.3	1.03	0.745	0.0000050	0.0000050	1580.0	0.00125	0.00125	0.00096	0.000125	6.375	0.0075	0.0025	0.153	0.08500		0.659
		Count	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	2	1	2	1	2		1
		Minimum	0.0225	0.0166	1.35	<0.0050	98.6	<0.000050	<0.000050	0.0078	<0.0010	11.0	12.1	1.03	0.73	<0.000010	<0.000010	1560	<0.0025	<0.0025	0.00096	<0.00025	<0.50	<0.015	<0.0050	0.153	<0.10		0.659
		Maximum	0.0225	0.0181	1.35	0.0073	102	<0.000050	<0.000050	0.0078	<0.0010	11.0	12.5	1.03	0.76	<0.000010	<0.000010	1600	<0.0025	<0.0025	0.00096	<0.00025	<25	<0.015	<0.0050	0.153	0.12		0.659
		Geometric Mean	0.0225	0.0173	1.35	0.0043	100.3	0.000025	0.000025	0.0078	0.00050	11.0	12.3	1.03	0.745	0.0000050	0.0000050	1579.9	0.00125	0.00125	0.00096	0.000125	1.768	0.0075	0.0025	0.153	0.07700		0.659
		Count <DL	0	0	0	1	0	1	2	0	2	0	0	0	0	1	2	0	1	2	0	2	2	1	2	0	1		0
		Standard Deviation	0.0000	0.0011	0.00	0.0034	2.4	0.000000	0.000000	0.0000	0.00000	0.0	0.3	0.00	0.02	0.0000000	0.0000000	28.3	0.00000	0.00000	0.00000	0.000000	8.7	0.0000	0.0000	0.000	0.04900		0.000
		1st Quartile	0.0225	0.017	1.35	0.0037	99.4	<0.000050	<0.000050	0.0078	<0.0010	11.0	12.2	1.03	0.738	<0.000010	<0.000010	1570	<0.0025	<0.0025	0.00096	<0.00025	3.312	<0.015	<0.0050	0.153	0.068		0.659
		Median	0.0225	0.0174	1.35	0.0049	100.3	<0.000050	<0.000050	0.0078	<0.0010	11.0	12.3	1.03	0.745	<0.000010	<0.000010	1580	<0.0025	<0.0025	0.00096	<0.00025	6.375	<0.015	<0.0050	0.153	0.085		0.659
		3rd Quartile	0.0225	0.0177	1.35	0.0061	101.2	<0.000050	<0.000050	0.0078	<0.0010	11.0	12.4	1.03	0.752	<0.000010	<0.000010	1590	<0.0025	<0.0025	0.00096	<0.00025	9.438	<0.015	<0.0050	0.153	0.102		0.659
QU1010S	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Average	0.141	0.136	13.5	0.0018	151.0	0.0000780	0.0000050	0.0127	0.0001	6.22	0.254	0.113	0.0491	0.0000050	0.0000050	76.1	0.005170	0.000250	0.00459	0.0000250	15.2	0.02180	0.00085	0.107	0.025		0.204
		Count	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	2	1	2	1	2		1
		Minimum	0.141	0.133	13.5	0.0013	151	0.000078	<0.000010	0.0127	<0.00020	6.22	0.252	0.113	0.0478	<0.000010	<0.000010	74.9	0.00517	<0.00050	0.004590	<0.000050	14.9	0.0218	<0.0010	0.107	<0.050		0.204
		Maximum	0.141	0.138	13.50	0.0024	151	0.000078	<0.000010	0.0127	<0.00020	6.22	0.256	0.113	0.0504	<0.000010	<0.000010	77.2	0.00517	<0.00050	0.00459	<0.000050	15.6	0.0218	0.0012	0.1070	<0.050		0.204
		Geometric Mean	0.141	0.135	13.5	0.00180	151.0	0.000078	0.0000050	0.0127	0.0001	6.22	0.254	0.113	0.0491	0.0000050	0.0000050	76	0.00517	0.000250	0.00459	0.0000250	15.2	0.02180	0.00077	0.107	0.025		0.204
		Count <DL	0	0	0	0	0	0	2	0	2	0	0	0	0	1	2	0	0	2	0	2	0	0	1	0	2		0
		Standard Deviation	0	0.004	0	0.0008	0.0	0	0.0000000	0	0	0	0.003	0	0.0018	0.0000000	0.0000000	1.6	0	0.000000	0	0.0000000	0.5	0.00000	0.00049	0	0		0
		1st Quartile	0.141	0.134	13.5	0.0016	151	0.000078	<0.000010	0.0127	<0.00020	6.22	0.253	0.113	0.0484	<0.000010	<0.000010	75.5	0.005170	<0.00050	0.00459	<0.000050	15.1	0.0218	0.00068	0.107	<0.050		0.204
		Median	0.141	0.136	13.5	0.0018	151	0.0000780	<0.000010	0.0127	<0.00020	6.22	0.254	0.113	0.0491	<0.000010	<0.000010	76.1	0.005170	<0.00050	0.00459	<0.000050	15.2	0.0218	0.00085	0.107	<0.050		0.204
		3rd Quartile	0.141	0.137	13.5	0.0021	151	0.000078	<0.000010	0.0127	<0.00020	6.22	0.255	0.113	0.0498	<0.000010	<0.000010	76.6	0.005170	<0.00050	0.00459	<0.000050	15.4	0.0218	0.00102	0.107	<0.050		0.204
QU1011D	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average	**ND -** well was not sampled in between April 1, 2013 through March 31, 2014. Well was sampled in April 2014.																										
		Count																											
		Minimum																											
		Maximum																											
		Geometric Mean																											
		Count <DL																											
		Standard Deviation																											
		1st Quartile																											
		Median																											
		3rd Quartile																											
QU1011S	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.00140		0.0093	87.7		0.0000050		0.00026		0.226		0.0793		0.0000050	69.3		0.00052		0.0000250	4.09		0.00050		0.025		
		Count		1		1	1		1		1		1		1		1	1		1		1	1		1		1		
		Minimum		0.0014		0.0093	87.7		<0.000010		0.00026		0.226		0.0793		<0.000010	69.3		0.00052		<0.000050	4.09		<0.0010		<0.050		
		Maximum		0.0014		0.0093	87.7		<0.000010		0.00026		0.226		0.0793		<0.000010	69.3		0.00052		<0.000050	4.09		<0.0010		<0.050		
		Geometric Mean		0.0014		0.0093	87.7		0.0000050		0.00026		0.226		0.0793		0.0000050	69.3		0.00052		0.0000250	4.09		0.0005		0.025		
		Count <DL		0		0	0		1		0		0		0		1	0		0		1	0		1		1		
		Standard Deviation		0		0	0		0.0000000		0		0		0		0.0000000	0		0		0.0000000	0		0		0		
		1st Quartile		0.0014		0.0093	87.7		<0.000010		0.00026		0.226		0.0793		<0.000010	69.3		0.00052		<0.000050	4.09		<0.0010		<0.050		
		Median		0.00140		0.0093	87.7		<0.000010		0.00026		0.226		0.0793		<0.000010	69.3		0.00052		<0.000050	4.09		<0.0010		<0.050		
		3rd Quartile		0.0014		0.0093	87.7		<0.000010		0.00026		0.226		0.0793		<0.000010	69.3		0.00052		<0.000050	4.09		<0.0010		<0.050		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 60
2017-2018 Annual Report

2014-15 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU1105S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.0998		0.0030	164		0.0000050		0.000100		0.675		0.2049		0.0000050	103.6		0.000250		0.0000250	108.7		0.00705		0.025		
		Count		2		2	2		2		2		2		2		2	2		2		2	2		2		2		
		Minimum		0.0856		0.0028	102		<0.000010		<0.00020		0.15		0.0288		<0.000010	40.2		<0.00050		<0.000050	27.4		<0.0010		<0.050		
		Maximum		0.114		0.0031	227		<0.000010		<0.00020		1.2		0.381		<0.000010	167		<0.00050		<0.000050	190		0.0136		<0.050		
		Geometric Mean		0.0988		0.00290	152		0.0000050		0.000100		0.424		0.1048		0.0000050	81.9		0.000250		0.0000250	72.2		0.00261		0.025		
		Count <DL		0		0	0		2		2		0		0		2	0		2		2	0		1		2		
		Standard Deviation		0.0201		0.00020	88		0.0000000		0.000000		0.742		0.2490		0.0000000	89.7		0.000000		0.0000000	115.0		0.00926		0.000		
		1st Quartile		0.0927		0.0029	133		<0.000010		<0.00020		0.412		0.1168		<0.000010	71.9		<0.00050		<0.000050	68		0.00377		<0.050		
		Median		0.0998		0.003	164		<0.000010		<0.00020		0.675		0.2049		<0.000010	103.6		<0.00050		<0.000050	108.7		0.00705		<0.050		
		3rd Quartile		0.1069		0.003	195		<0.000010		<0.00020		0.938		0.293		<0.000010	135.3		<0.00050		<0.000050	149.4		0.01032		<0.050		
QU1109S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average	0.146	0.144	51.2	0.00318	208	0.000236	0.0000056	0.0234	0.000162	20.5	0.0630	0.455	0.00888	0.000005	0.0000043	8.37	0.008	0.000375	0.0602	0.00005	86.24	0.0787	0.00113	0.74	0.075		0.175
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4	1	4	3	1	4	1	4	4	1	4	1	4		1
		Minimum	0.146	0.122	51.2	<0.0030	134	0.000236	<0.000005	0.0234	<0.00020	20.5	0.013	0.455	0.00503	<0.000010	0.0000021	6.21	0.008	<0.00050	0.0602	<0.000050	9.38	0.0787	<0.0010	0.74	0.0286		0.175
		Maximum	0.146	0.157	51.2	0.0051	382	0.000236	<0.000020	0.0234	0.00025	20.5	0.199	0.455	0.0193	<0.000010	<0.000010	12.6	0.008	<0.0010	0.0602	<0.00020	284	0.0787	<0.0050	0.74	0.106		0.175
		Geometric Mean	0.146	0.143	51.2	0.0029	188	0.000236	0.0000050	0.0234	0.00015	20.5	0.0320	0.455	0.00741	0.000005	0.0000040	7.9	0.008	0.000354	0.0602	0.000042	36.08	0.0787	0.00089	0.74	0.066		0.175
		Count <DL	0	0	0	1	0	0	4	0	3	0	0	0	0	1	3	0	0	4	0	4	0	0	4	0	0		0
		Standard Deviation	0.000	0.015	0.0	0.0015	117	0.000000	0.0000031	0.0000	0.00008	0.0	0.0910	0.00	0.00696	0.00000	0.0000015	3.67	0.0000	0.00014	0.000	0.000035	132.1	0.000	0.0010	0.000	0.038		0.000
		1st Quartile	0.146	0.142	51.2	0.00255	137	0.000236	0.0000044	0.0234	<0.00020	20.5	0.016	0.455	0.00505	<0.000010	0.00000428	6.25	0.008	<0.00050	0.0602	<0.000050	17.64	0.0787	<0.0010	0.74	0.0522		0.175
		Median	0.146	0.148	51.2	0.00305	159	0.000236	<0.000010	0.0234	0.00015	20.5	0.02	0.455	0.0056	<0.000010	<0.000010	6.29	0.008	0.000375	0.0602	0.0000375	25.8	0.0787	0.00075	0.74	0.0825		0.175
		3rd Quartile	0.146	0.151	51.2	0.00368	229	0.000236	0.0000062	0.0234	0.000213	20.5	0.067	0.455	0.00943	<0.000010	<0.000010	9.44	0.008	<0.0010	0.0602	0.0000625	94.4	0.0787	0.00138	0.74	0.1052		0.175
7SQR	7-South Quinsam River downstream of 7-South Mining Operation	Average	0.00036	0.00031	0.0322	0.0148	34	0.00000763	0.00000588	0.000905	0.00075	0.103	0.0445	0.0058	0.00204	0.00000118	0.00000126	37.5	0.00050	0.00050	0.000100	0.000100	27.1	0.00708	0.00315	0.00720	0.00850	0.037	0.0086
E292113		Count	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	2	1	2	2
		Minimum	0.00021	0.00014	0.0111	0.0039	22.4	<0.000005	<0.000005	<0.00050	0.00032	0.053	0.0266	0.003	<0.0010	<0.000002	<0.000002	27.2	<0.0010	<0.0010	<0.00020	<0.00020	10.8	<0.0050	<0.0050	0.0056	0.0085	0.031	0.0069
		Maximum	0.00098	0.00048	0.062	0.0326	44.1	0.000034	0.0000351	0.00248	0.003	0.242	0.0801	0.0112	0.0086	0.0000053	0.0000043	54.6	<0.0010	<0.0010	<0.00020	<0.00020	43.5	0.0466	0.0135	0.0088	0.0085	0.042	0.0103
		Geometric Mean	0.00033	0.0003	0.0285	0.0129	33.5	0.00000583	0.0000037	0.000812	0.00067	0.098	0.0428	0.0056	0.00144	0.00000107	0.00000115	37.1	0.00050	0.00050	0.000100	0.000100	25	0.00387	0.0028	0.00700	0.00850	0.036	0.0084
		Count <DL	0	0	0	0	0	20	19	2	0	0	0	0	8	23	21	0	24	24	24	24	0	19	22	0	0	0	0
		Standard Deviation	0.00016	0.00008	0.0156	0.0075	6	0.00000795	0.00000812	0.000449	0.00051	0.038	0.0133	0.0018	0.00182	0.00000088	0.00000078	6	0.00000	0.00000	0.000000	0.000000	9.9	0.01108	0.00239	0.0023	0	0.008	0.0024
		1st Quartile	0.00026	0.00024	0.0184	0.0096	30.4	<0.000010	<0.000005	0.000695	0.00053	0.085	0.0361	0.0047	<0.0010	<0.000002	<0.000002	34.5	<0.0010	<0.0010	<0.00020	<0.00020	17.6	<0.0050	<0.0050	0.0064	0.0085	0.034	0.0078
		Median	0.00032	0.00031	0.0305	0.0123	34.8	<0.00001	<0.000005	0.000865	0.00063	0.098	0.0413	0.0054	0.00165	<0.0000020	<0.000002	38	<0.0010	<0.0010	<0.00020	<0.00020	27.8	<0.0050	<0.0050	0.0072	0.0085	0.037	0.0086
		3rd Quartile	0.0004	0.00037	0.0403	0.0204	38.1	<0.000010	<0.000005	0.000968	0.00074	0.11	0.0499	0.0064	0.00285	<0.000002	<0.000002	40.6	<0.0010	<0.0010	<0.00020	<0.00020	35.80	<0.0050	<0.0050	0.008	0.0085	0.039	0.0094
LQL1	Lower Quinsam Lake 1 metre below surface	Average	0.00080	0.00053	0.0407	0.0236	32.2	0.0000055	0.00000373	0.00082	0.00106	0.103	0.0455	0.0084	0.00262	0.00000157	0.00000169	33.6	0.00050	0.00050	0.000100	0.000100	16.33	0.02009	0.00250	0.00317		0.028	
E292118		Count	15	15	15	15	3	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	0.00046	0.00031	0.0096	0.0079	27.2	<0.000005	<0.000005	0.00053	0.00047	0.051	0.0152	0.0037	<0.0010	<0.0000020	<0.0000020	28.6	<0.0010	<0.0010	<0.00020	<0.00020	1.40	<0.0050	<0.0050	<0.0020		0.028	
		Maximum	0.00388	0.00079	0.139	0.0508	36.7	0.000022	0.0000060	0.00129	0.00485	0.223	0.0793	0.0210	0.0100	0.0000066	0.0000064	38.5	<0.0010	<0.0010	<0.00020	<0.00020	22.3	0.215	<0.0050	0.0060		0.028	
		Geometric Mean	0.00065	0.00051	0.0311	0.0207	32.0	0.0000046	0.00000344	0.00079	0.00087	0.094	0.0419	0.0072	0.00134	0.00000124	0.00000137	33.4	0.00050	0.00050	0.000100	0.000100	13.99	0.00435	0.00250	0.00247		0.028	
		Count <DL	0	0	0	0	0	14	9	0	0	0	0	0	8	13	11	0	15	15	15	15	0	12	15	2		0	
		Standard Deviation	0.00086	0.00014	0.0330	0.0120	4.8	0.0000047	0.00000158	0.00023	0.00106	0.047	0.0179	0.0053	0.00310	0.00000159	0.00000150	3.5	0.00000	0.00000	0.000000	0.000000	6.50	0.05531	4E-11	0.00257		0.000	
		1st Quartile	0.00049	0.00042	0.0152	0.0146	30.0	0.0000038	<0.000005	0.00066	0.00068	0.069	0.0375	0.0046	<0.0010	<0.000002	<0.000002	31.2	<0.0010	<0.0010	<0.00020	<0.00020	11.04	<0.0050	<0.0050	0.00175		0.028	
		Median	0.00056	0.00050	0.0360	0.0235	32.8	<0.000010	<0.000005	0.00079	0.00085	0.085	0.0441	0.0058	<0.0010	<0.000002	<0.000002	32.3	<0.0010	<0.0010	<0.00020	<0.00020	19.2	<0.0050	<0.0050	<0.0050		0.028	
		3rd Quartile	0.00070	0.00066	0.0509	0.0290	34.8	<0.00001	0.00000525	0.00092	0.00090	0.136	0.0522	0.0092	0.00415	<0.000002	0.00000160	37.0	<0.0010	<0.0010	<0.00020	<0.00020	21.30	<0.0050	<0.0050	0.00425		0.028	
LQLB	LQLB 1 metre from Bottom	Average	0.00088	0.00064	0.0420	0.0254	32.7	0.00000783	0.00000633	0.000649	0.00092	0.538	0.2397	0.1814	0.1597	0.00000115	0.00000149	32.2	0.00050	0.00050	0.000100	0.000100	15.49	0.00326	0.00409	0.00550		0.031	
E292118		Count	15	15	15	15	3	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3		1	
		Minimum	0.00045	0.00032	0.0170	0.0069	27.7	<0.000005	<0.000005	<0.00050	0.00045	0.081	0.0432	0.0057	0.0012	<0.0000020	<0.0000020	27.3	<0.0010	<0.0010	<0.00020	<0.00020	8.26	<0.0050	<0.0050	<0.0050		0.031	
		Maximum	0.00187	0.00104	0.151	0.0543	38.1	0.000016	0.0000140	0.00120	0.00276	2.23	0.669	0.635	0.496	0.0000021	0.0000066	35.9	<0.0010	<0.0010	<0.00020	<0.00020	20.1	0.0098	0.0223	0.0088		0.031	
		Geometric Mean	0.00077	0.00060	0.0347	0.0229	32.4	0.00000693	0.00000549	0.000605	0.00084	0.295	0.1469	0.0427	0.0269	0.00000110	0.00000121	32.1	0.00050	0.00050	0.000100	0.000100	14.78	0.00292	0.00309	0.00485		0.031	
		Count <DL	0	0	0	0	0	6	4	2	0	0	0	0	0	13	13	0	15	15	15	15	0	13	13	1		0	
		Standard Deviation	0.00048	0.00023	0.0334	0.0117	5.2	0.00000415	0.00000339	0.000231	0.00054	0.610	0.2260	0.2273	0.2003	0.00000039	0.00000149	2.4	0.00000	0.00000	0.000000	0.000000	4.45	0.00209	0.00515	0.00316		0.000	
		1st Quartile	0.00050	0.00044	0.0216	0.0176	30.0	<0.000010	0.00000375	0.000565	0.00063	0.118	0.0605	0.0079	0.0042	<0.000002	<0.000002	30.5	<0.0010	<0.0010	<0.00020	<0.00020	11.06	<0.0050	<0.0050	0.00385		0.031	
		Median	0.00053	0.00055	0.0357	0.0254	32.3	0.0000070	0.0000060	0.00066	0.00087	0.168	0.0857	0.0151	0.0101	<0.000002	<0.000002	33.0	<0.0010	<0.0010	<0.00020	<0.00020	17.3	<0.0050	<0.0050	0.0052		0.031	
		3rd Quartile	0.00130	0.00086	0.0456	0.0294	35.2	0.00000950	0.00000820	0.000715	0.00093	0.856	0.4585	0.3760	0.3670	<0.000002	<0.000002	34.2	<0.0010	<0.0010	<0.00020	<0.00020	19.2	<0.0050	<0.0050	0.00700		0.031	

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 61
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E0126402	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Average	0.00014	0.000153	0.025	0.0215	20	0.00000732	0.00001318	0.000889	0.00075	0.025	0.0143	0.00121	0.00059	0.0000011	0.0000010	21.7	0.0005	0.00050	0.000100	0.000100	1.071	0.00396	0.0025	0.00300		0.013	0.0079
		Count	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	4	4	4
		Minimum	<0.00010	<0.00010	0.0141	0.0122	16.9	<0.0000050	<0.0000050	<0.00050	0.00049	0.013	0.0094	<0.0010	<0.0010	<0.0000020	<0.0000020	18.5	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050	<0.0050		<0.020	0.0054
		Maximum	0.00029	0.00023	0.0373	0.0414	23.2	0.000033	0.000123	0.00199	0.00154	0.065	0.0234	0.0023	0.0018	0.0000022	<0.0000020	33.4	<0.0010	<0.0010	<0.00020	<0.00020	1.73	0.023	<0.0050	0.0045		0.022	0.0106
		Geometric Mean	0.000123	0.000138	0.0243	0.0204	19.9	0.00000586	0.00000429	0.000798	0.00070	0.023	0.0135	0.00107	0.00055	0.00000106	0.000001	21.5	0.0005	0.00050	0.000100	0.000100	0.991	0.00293	0.0025	0.00290		0.0122	0.0076
		Count <DL	3	2	0	0	0	11	11	1	0	0	0	4	13	13	14	0	14	14	14	14	1	13	14	3		3	0
		Standard Deviation	0.000067	0.000061	0.0061	0.0077	2.3	0.00000756	0.00003216	0.000434	0.0003	0.013	0.0053	0.00058	0.00035	0.00000032	0	3.6	0	0.00000	0.000000	0.000000	0.363	0.00548	1E-10	0.00100		0.006	0.0028
		1st Quartile	0.000102	0.000108	0.021	0.0168	17.9	<0.000010	<0.0000050	0.000655	0.00058	0.018	0.0100	0.00065	<0.0010	<0.0000020	<0.000002	19.8	<0.0010	<0.0010	<0.00020	<0.00020	0.835	<0.0050	<0.0050	<0.0050		<0.020	0.0056
		Median	0.00014	0.00016	0.0234	0.0196	20.8	<0.000010	<0.0000050	0.00077	0.00065	0.022	0.0117	0.00125	<0.0010	<0.0000020	<0.000002	21.2	<0.0010	<0.0010	<0.00020	<0.00020	1.175	<0.0050	<0.0050	<0.0050		<0.020	0.0078
		3rd Quartile	0.000175	0.0002	0.0302	0.0244	22	<0.000010	<0.0000050	0.00108	0.00072	0.028	0.019	0.00148	<0.0010	<0.0000020	<0.0000020	22	<0.0010	<0.0010	<0.00020	<0.00020	1.248	<0.0050	<0.0050	0.003		0.013	0.01020
WD		Average	0.00331	0.00195	0.0164	0.01384	376	0.000009	0.00000431	0.00072	0.00046	0.440	0.01146	0.047	0.03862	0.00000125	0.000001	312	0.00065	0.00071	0.000100	0.000100	526	0.01061	0.00250	0.0038		0.01	0.0306
E207409	Settling Pond #4	Count	8	8	8	8	12	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	52	8	8	1		1	1
		Minimum	0.00193	0.00118	0.0038	<0.0030	320	<0.000010	<0.0000050	<0.00050	<0.00020	0.203	<0.0050	0.0117	<0.0010	<0.0000020	<0.0000020	264	<0.0010	<0.0010	<0.00020	<0.00020	258	<0.0050	<0.0050	0.0038		<0.020	0.0306
		Maximum	0.00439	0.00259	0.0556	0.0682	434	0.000029	0.000012	0.00143	0.00162	0.651	0.0233	0.0838	0.0783	0.000003	<0.0000020	375	0.0011	0.0016	<0.00020	<0.00020	820	0.0674	<0.0050	0.0038		<0.020	0.0306
		Geometric Mean	0.00322	0.00189	0.0112	0.00733	375	0.000007	0.0000035	0.000609	0.000342	0.414	0.00959	0.0391	0.01506	0.00000115	0.000001	309	0.0006	0.0006	0.000100	0.000100	515	0.00377	0.00250	0.0038		0.01	0.0306
		Count <DL	0	0	0	1	0	6	6	2	1	0	1	0	2	7	8	0	6	6	8	8	0	7	8	0		1	0
		Standard Deviation	0.00074	0.00048	0.0176	0.02211	33	0.0000086	0.00000357	0.000421	0.000479	0.148	0.00666	0.0277	0.03026	0.00000071	0.0000000	43	0.00028	0.00042	0.000000	0.000000	106	0.02295	3E-11	0		0.0000	0
		1st Quartile	0.00308	0.0017	0.0068	0.00518	360	<0.000010	<0.0000050	0.000452	0.00026	0.333	0.0072	0.0268	0.0191	<0.0000020	<0.0000020	269	<0.0010	<0.0010	<0.00020	<0.00020	454	<0.0050	<0.0050	0.0038		<0.020	0.03060
		Median	0.0034	0.00208	0.0099	0.00625	374	<0.000010	<0.0000050	0.00065	0.000305	0.492	0.01075	0.0403	0.0355	<0.0000020	<0.0000020	311	<0.0010	<0.0010	<0.00020	<0.00020	515	<0.0050	<0.0050	0.0038		<0.020	0.031
		3rd Quartile	0.00364	0.00221	0.0152	0.0093	396	0.000007	0.00000375	0.000907	0.00043	0.516	0.01385	0.0691	0.0642	<0.0000020	<0.0000020	342	0.00065	0.00065	<0.00020	<0.00020	582	<0.0050	<0.0050	0.0038		<0.020	0.03060
MW001D		Average		0.0195		0.0314	91.6		0.0000775		0.00179		0.0058		0.0106		0.0000056			0.0005		0.0001	25.7		0.0025		0.178		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0186		0.0302	89.8		<0.0000050		0.00131		<0.0050		0.006		0.0000048			<0.0010		<0.00020	24.8		<0.0050		0.174		
		Maximum		0.0205		0.0326	93.4		0.000013		0.00227		0.0091		0.0153		0.0000064			<0.0010		<0.00020	26.6		<0.0050		0.182		
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean		0.0195		0.0314	91.6		0.0000057		0.00172		0.00477		0.0096		0.0000055			0.0005		0.0001	25.7		0.0025		0.178		
		Count <DL		0		0	0		1		0		1		0		0			2		2	0		2		0		
		Standard Deviation		0.0013		0.0017	2.5		0.00000742		0.00068		0.00467		0.006600		0.0000011			0		0	1.3		0		0.006		
		1st Quartile		0.0191		0.0308	90.7		0.00000512		0.00155		0.00415		0.0083		0.0000052			<0.0010		<0.00020	25.2		<0.0050		0.176		
		Median		0.0195		0.0314	91.6		0.00000775		0.00179		0.0058		0.0106		0.0000056			<0.0010		<0.00020	25.7		<0.0050		0.178		
		3rd Quartile		0.02		0.032	92.5		0.00001038		0.00203		0.00745		0.013		0.000006			<0.0010		<0.00020	26.2		<0.0050		0.180		
MW001S		Average		0.00024		0.0015	361		0.000093		0.00046		0.107		1.79		0.0000037			0.0022		0.0001000	884		0.0025		0.00280		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.00015		<0.0030	356		0.000076		0.00038		0.055		1.59		0.0000035			0.0017		<0.00020	790		<0.0050		0.0023		
		Maximum		0.00032		<0.0030	366		0.000109		0.00055		0.159		1.99		0.0000039			0.0027		<0.00020	979		<0.0050		0.0032		
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean		0.00022		0.0015	361		0.000091		0.00046		0.0935		1.78		0.0000037			0.0021		0.0001000	879		0.0025		0.0027		
		Count <DL		0		2	0		0		0		0		0		0			0		2	0		2		0		
		Standard Deviation		0.00012		0	7.1		0.0000233		0.00012		0.0735		0.28		0.0000003			0.0007		0.0000000	133		0		0.00060		
		1st Quartile		0.00019		<0.0030	358.5		0.0000842		0.00042		0.081		1.69		0.0000036			0.002		<0.00020	837		<0.0050		0.00250		
		Median		0.00024		<0.0030	361		0.000093		0.00046		0.107		1.79		0.0000037			0.0022		<0.00020	884		<0.0050		0.00280		
		3rd Quartile		0.00028		<0.0030	363.5		0.000101		0.00051		0.133		1.89		0.0000038			0.0024		<0.00020	931		<0.0050		0.00300		
MW006D		Average		0.0287		0.0326	81.3		0.0000043		0.00068		0.0034		0.0009		0.0000045			0.000500		0.0001000	11.8		0.00250		0.156		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.0278		0.022	77.7		<0.0000050		0.0005		<0.0050		<0.0010		0.0000036			<0.0010		<0.00020	11.1		<0.0050		0.147		
		Maximum		0.0292		0.0506	84.1		0.000008		0.00082		0.0051		0.0017		0.0000054			<0.0010		<0.00020	12.7		<0.0050		0.16		
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean		0.0287		0.0303	81.3		0.0000037		0.00067		0.00317		0.00075		0.0000044			0.000500		0.0001000	11.7		0.0025		0.156		
		Count <DL		0		0	0		2		0		2		2		0			3		3	0		3		0		
		Standard Deviation		0.0008		0.0157	3.3		0.0000032		0.00017		0.0015		0.00069		0.0000009			0.000000		0.0000000	0.8		4E-11		0.008		
		1st Quartile		0.0284		0.0236	80		<0.0000050		0.00062		<0.0050		<0.0010		0.000004			<0.0010		<0.00020	11.3		<0.0050		0.154		
		Median		0.029		0.0251	82.2		<0.0000050		0.00073		<0.0050		<0.0010		0.0000044			<0.0010		<0.00020	11.5		<0.0050		0.16		
		3rd Quartile		0.0291		0.0378	83.2		0.00000525		0.00078		0.0038		0.0011		0.0000049			<0.0010		<0.00020	12.1		<0.0050		0.16		
MW006S		Average		0.0018		0.01640	191.3		0.000021		0.00118		0.0142		0.0201		0.0000049			0.0007		0.0001	573.7		0.00250		0.0561		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.00157		0.0069	180		0.0000107		0.00078		0.0052		0.0122		<0.000002			<0.0010		<0.00020	559		<0.0050		0.0525		
		Maximum		0.00202		0.034	199		0.0000283		0.00141		0.0226		0.0302		0.0000071			0.0011		<0.00020	585		<0.0050		0.063		
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean		0.00179		0.0125	191.2		0.0000194		0.00114		0.0121		0.0188		0.0000036			0.00065		0.0001000	573.6		0.0025		0.0559		
		Count <DL		0		0	0		0		0		0		0		1			2		3	0		3		0		
		Standard Deviation		0.00023		0.0153	10.0		0.000009		0.000350		0.0087		0.0092		0.0000034			0.00035		0.0000000	13.3		4E-11		0.0059		
		1st Quartile		0.00168		0.00760	187.5		0.0000174		0.00107		0.01		0.0150		0.00000385			<0.0010		<0.00020	568		<0.0050		0.0528		
		Median		0.0018		0.00830	195		0.000024		0.00136		0.0149		0.0179		0.0000067			<0.0010		<0.00020	577.0		<0.0050		0.053		
		3rd Quartile		0.00191		0.02120	197		0.0000262		0.00138		0.0188		0.0241		0.0000069			0.0008		<0.00020	581		<0.0050		0.058		
WC		Average	0.00111	0.00102	0.0151	0.01532	307	0.0000056	0.0000294	0.001084	0.000328	0.085	0.0142	0.0072	0.00012	0.000001	0.0000115	263	0.0005	0.00059	0.000123	0.000100	504	0.00250	0.00250				
E207411	2-North Pit Culvert discharge into Middle Quinsam Lake	Count	8	8	8	8	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	12	8	8				
		Minimum	0.00039	0.00073	<0.0030	<0.0030	231	<0.000010	<0.0000050	<0.00050	<0.00020	0.045	0.0079	0.0037	<0.0010	<0.0000020	<0.0000020	163	<0.0010	<0.0010	<0.00020	<0.00020	348	<0.0050	<0.0050				
		Maximum	0.00155	0.00133	0.0283	0.059	365	0.000010	0.000006	0.00692	0.00074	0.125	0.0266	0.0123	0.0087	<0.0000020	0.0000022	329	<0.0010	0.0012	0.00028	<0.00020	670	<0.0050	<0.0050				
		Geometric Mean	0.00104	0.00101	0.01127	0.00942	304	0.0000055	0.00000279	0.00038	0.000253	0.0810	0.0128	0.0068	0.00414	0.000001	0.0000011	257	0.0005	0.00056	0.000114	0.000100	495	0.00250	0.0025				
		Count <DL	0	0	1	1	0	7	7	7	3	0	0	0	1	8	7	0	8	7	7	8	0	8	8				
		Standard Deviation	0.00033	0.00021	0.00993	0.01848	47	0.0000018	0.0000012	0.002358	0.000228	0.026	0.0073	0.0027	0.00238	0	0.00000042	57	0	0.00025	0.000064	0.000000	97	3E-11	3E-11				
		1st Quartile	0.00109	0.00084	0.00865	0.00628	287	<0.000010	<0.0000050	<0.00050	<0.00020	0.067	0.00840	0.0059	0.00423	<0.0000020	<0.0000020	229	<0.0010	<0.0010	<0.00020	<0.00020	443	<0.0050	<0.0050				
		Median	0.00114	0.00108	0.0116	0.0085	297	<0.000010	<0.0000050	<0.00050	0.000325	0.092	0.0113	0.0072	0.0057	<0.0000020	<0.0000020	266	<0.0010	<0.0010	<0.00020	<0.00020	488	<0.0050	<0.0050				
		3rd Quartile	0.00124	0.00114	0.02455	0.01435	343	<0.000010	<0.0000050	<0.00050	0.000452	0.0980	0.0183	0.0083	0.00605	<0.0000020	<0.0000020	306	<0.0010	<0.0010	<0.00020	<0.00020	562	<0.0050	<0.0050				
MQL1		Average	0.00027	0.0002200	0.0198	0.0161	40.3	0.0000066	0.00000273	0.00098	0.0006	0.135	0.0225	0.0104	0.00167	0.0000001	0.00000100	38.1	0.0005	0.0005	0.000159	0.0001	31.9	0.00363	0.0025	0.00335			
E206618		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00011	0.00011	0.0064	0.0078	31	<0.000010	<0.000005	0.00055	0.00043	0.029	0.0073	0.0034	<0.0010	<0.0000020	<0.000002	30.8	<0.0010	<0.0010	<0.00020	<0.00020	22.8	<0.0050	<0.0050	<0.0020			
		Maximum	0.00069	0.00034	0.0352	0.0216	49.4	0.000029	0.000006	0.00429	0.00086	1.48	0.0404	0.0283	0.0052	<0.0000020	<0.000002	59.3	<0.0010	<0.0010	0.00074	<0.00020	38.9	0.0169	<0.0050	0.007			
	Middle Quinsam Lake 1 metre below surface	Geometric Mean	0.00023	0.00021	0.018	0.0153	39.8	0.0000056	0.00000265	0.00082	0.00059	0.048	0.0206	0.0082	0.00113	0.000001	0.000001	37.6	0.0005	0.0005	0.000124	0.00010000	31.4	0.00297	0.0025	0.00236			
		Count <DL	0	0	0	0	0	14	14	0	0	0	0	0	7	15	15	0	15	15	13	15	0	13	15	2			
		Standard Deviation	0.00016	0.00008	0.0083	0.0047	7	0.0000062	0.0000009	0.00093	0.00014	0.372	0.0095	0.008	0.00162	0	0	6.9	0	0	0.000173	0	5.6	0.00373	4E-11	0.00291			
		1st Quartile	0.00016	0.00016	0.0138	0.012	36.9	<0.000010	<0.0000050	0.00062	0.000500	0.034	0.0158	0.0044	<0.0010	<0.0000020	<0.0000020	34.4	<0.0010	<0.0010	<0.00020	<0.00020	26.6	<0.0050	<0.0050	<0.0020			
		Median	0.0002	0.0002000	0.0204	0.0179	39.9	<0.000010	<0.000005	0.000660	0.00058	0.037	0.0218	0.0077	0.00100	<0.0000020	<0.0000020	36.8	<0.0010	<0.0010	<0.00020	<0.00020	34.10	<0.0050	<0.0050	0.0027			
		3rd Quartile	0.00035	0.00027	0.0254	0.0194	44.2	<0.000010	<0.000005	0.00086	0.00067	0.045	0.0282	0.0124	0.00205	<0.000002	<0.000002	40	<0.0010	<0.0010	<0.00020	<0.00020	35.9	<0.0050	<0.0050	0.00505			
MQLB		Average	0.0002	0.00019	0.01115	0.00678	40.8	0.004658	0.00003567	0.000527	0.00046	0.493	0.0813	0.429	0.3947	0.0000001	0.00000100	54.8	0.00057	0.0005	0.0001	0.0001	45.6	0.004450	0.0025	0.00390			
E206618		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00013	0.0001	<0.0030	<0.0030	36.1	<0.000010	<0.000005	<0.00050	0.00034	0.0590	0.01	0.0192	0.0028	<0.000002	<0.000002	37.1	<0.0010	<0.0010	<0.00020	<0.00020	31.6	<0.0050	<0.0050	0.0023			
		Maximum	0.00037	0.00041	0.0211	0.0106	47.3	0.0698	0.000484	0.00092	0.00068	2.75	0.534	1.58	1.5	<0.000002	<0.000002	63.2	0.0016	<0.0010	<0.00020	<0.00020	53.5	0.0317	<0.0050	0.0053			
	Middle Quinsam Lake 1 metre from bottom	Geometric Mean	0.00019	0.00018	0.00927	0.00559	40.7	0.0000094	0.0000043	0.000473	0.000450	0.192	0.0383	0.1332	0.0877	0.000001	0.000001	54.5	0.00054	0.0005	0.0001	0.0001	45.3	0.00296	0.0025	0.00380			
		Count <DL	0	0	1	3	0	14	12	5	0	0	0	0	0	15	15	0	14	15	15	15	0	14	15	0			
		Standard Deviation	0.00007	0.00008	0.00592	0.00336	4.1	0.018021	0.00012406	0.000238	0.0001	0.862	0.1342	0.6029	0.5804	0	0	6	0.00028	0	0	0.00000000	5.8	0.00754	4E-11	0.00130			
		1st Quartile	0.00015	0.00013	0.00595	0.00445	39.6	<0.000010	<0.0000050	<0.00050	0.00039	0.07	0.0142	0.028	0.0182	<0.0000020	<0.0000020	53.1	<0.0010	<0.0010	<0.00020	<0.00020	44	<0.0050	<0.0050	0.0033			
		Median	0.00019	0.0001600	0.0106	0.0078	40.4	<0.000010	<0.000005	0.00054	0.000420	0.118	0.0284	0.0796	0.0768	<0.0000020	<0.0000020	55.8	<0.0010	<0.0010	<0.00020	<0.00020	45.4	<0.0050	<0.0050	0.0041			
		3rd Quartile	0.00024	0.00021	0.016	0.00955	40.8	<0.000010	<0.0000050	0.00069	0.00048	0.31	0.0874	0.6370	0.572	<0.000002	<0.000002	56.7	<0.0010	<0.0010	<0.00020	<0.00020	48.7	<0.0050	<0.0050	0.0048			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 62
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E217018		Average	0.00029	0.000290	0.0245	0.0208	12.9	0.0000062	0.00000267	0.000339	0.00053	0.042	0.0303	0.004	0.00289	0.000001	0.000001	15	0.0005	0.0005	0.0001	0.0001	2.31	0.0142	0.00279	0.0068			
		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00019	0.00019	0.0059	0.006	11.4	<0.000010	<0.0000050	<0.00050	0.00023	0.023	0.0112	0.0024	<0.0010	<0.0000020	<0.0000020	11.2	<0.0010	<0.0010	<0.00020	<0.00020	1.32	<0.0050	<0.0050	0.0038			
		Maximum	0.00045	0.00036	0.0486	0.0343	14.6	0.000023	0.000005	0.00068	0.00091	0.078	0.0611	0.0095	0.0084	<0.0000020	<0.0000020	17.0	<0.0010	<0.0010	<0.00020	<0.00020	3.95	0.125	0.0068	0.0133			
	No Name Lake 1 metre below surface	Geometric Mean	0.00029	0.00028	0.0215	0.0186	12.8	0.00000550	0.00000262	0.000313	0.0005	0.04	0.0266	0.00360	0.00188	0.00000100	0.00000100	14.9	0.0005	0.0005	0.0001	0.0001	2.2	0.00462	0.00267	0.00600			
		Count <DL	0	0	0	0	0	14	14	11	0	0	0	0	5	15	15	0	15	15	15	15	0	11	14	0			
		Standard Deviation	0.000070	0.00005	0.0118	0.0090	1.5	0.0000046	0.00000065	0.000158	0.00019	0.014	0.0146	0.0019	0.00237	0.00000000	0.00000000	1.6	0	0	0.00000000	0	0.78	0.03242	0.00111	0.0044			
		1st Quartile	0.00023	0.00024	0.0136	0.0122	11.5	<0.000010	<0.000005	<0.00050	0.0004	0.03	0.0174	0.0028	<0.0010	<0.000002	<0.000002	13.8	<0.0010	<0.0010	<0.00020	<0.00020	1.72	<0.0050	<0.0050	0.0044			
		Median	0.00031	0.000310	0.0227	0.0218	12.8	<0.000010	<0.0000050	<0.00050	0.00054	0.044	0.0331	0.00320	0.00280	<0.0000020	<0.0000020	15	<0.0010	<0.0010	<0.00020	<0.00020	2.03	<0.0050	<0.0050	0.005			
		3rd Quartile	0.00034	0.00032	0.033	0.0274	14.1	<0.000010	<0.0000050	0.000375	0.00066	0.047	0.0390	0.0044	0.00415	<0.0000020	<0.0000020	16.4	<0.0010	<0.0010	<0.00020	<0.00020	2.52	0.0051	<0.0050	0.0074			
NNLB		Average	0.00025	0.00022	0.0335	0.0274	11.4	0.000005	0.0000025	0.000416	0.00055	0.184	0.1027	0.0303	0.0237	0.000001	0.000001	16.7	0.0005	0.0005	0.0001	0.0001	4.82	0.0025	0.002500	0.00420			
E217018		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00015	0.00016	0.0249	0.0202	10.2	<0.000010	<0.0000050	<0.00050	0.00029	0.092	0.0438	0.0061	0.0023	<0.0000020	<0.0000020	15.1	<0.0010	<0.0010	<0.00020	<0.00020	4.06	<0.0050	<0.0050	0.0024			
		Maximum	0.00035	0.00031	0.0434	0.0333	12.7	<0.000010	<0.0000050	0.00077	0.00139	0.416	0.197	0.094	0.0807	<0.0000020	<0.0000020	19.1	<0.0010	<0.0010	<0.00020	<0.00020	5.81	<0.0050	<0.0050	0.0067			
	No Name Lake 1 metre from bottom	Geometric Mean	0.00024	0.000210	0.0331	0.027	11.4	0.000005	0.0000025	0.000368	0.00051	0.164	0.0896	0.0161	0.0087	0.00000100	0.00000100	16.7	0.0005000	0.0005	0.0001	0.0001	4.8	0.0025	0.0025	0.00400			
		Count <DL	0	0	0	0	0	15	15	9	0	0	0	0	0	15	15	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00006	0.00004	0.0057	0.0044	1	1E-13	1E-13	0.000218	0.00026	0.099	0.0557	0.0345	0.031	0.00000000	0.00000000	1.1	0	0.0000000	0	0	0.46	4E-11	0.000000	0.00180			
		1st Quartile	0.00023	0.0002	0.0289	0.0243	10.6	<0.000010	<0.000005	<0.00050	0.00042	0.12	0.0516	0.0074	0.003	<0.000002	<0.000002	16	<0.0010	<0.0010	<0.00020	<0.00020	4.51	<0.0050	<0.0050	0.0032			
		Median	0.00025	0.00021	0.0345	0.0286	11.5	<0.000010	<0.0000050	<0.00050	0.00048	0.136	0.0844	0.0077	0.0036	<0.0000020	<0.0000020	16.4	<0.0010	<0.0010	<0.00020	<0.00020	4.84	<0.0050	<0.0050	0.0039			
		3rd Quartile	0.00026	0.00023	0.0377	0.031	12.1	<0.000010	<0.0000050	0.000640	0.0006	0.254	0.159	0.0596	0.0505	<0.0000020	<0.0000020	17.4	<0.0010	<0.0010	<0.00020	<0.00020	5.08	<0.0050	<0.0050	0.005			
NNO		Average	0.00026	0.00026	0.0358	0.0302	12.36	0.0000055	0.00000275	0.0007	0.00073	0.061	0.0386	0.006	0.00432	0.0000010	0.0000013	14.5	0.0005	0.00050	0.000100	0.000100	1.8	0.00324	0.0025	0.00274	0.0028	0.0122	0.009
E217017		Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	5	5	5	5
		Minimum	0.00021	0.00019	0.02	0.0167	9.55	<0.000005	<0.000005	<0.00050	0.00034	0.044	0.0223	0.0026	<0.0010	<0.000002	<0.000002	12.4	<0.0010	<0.0010	<0.00020	<0.00020	1.19	<0.0050	<0.0050	<0.0020	<0.0020	<0.020	0.0051
		Maximum	0.00031	0.00039	0.0501	0.0434	15.3	0.000015	0.0000050	0.00193	0.00262	0.101	0.0719	0.0151	0.0137	<0.000002	0.000004	17.1	<0.0010	<0.0010	<0.00020	<0.00020	2.69	0.0099	<0.0050	0.0039	0.0042	0.021	0.0154
	No Name Lake Outlet	Geometric Mean	0.00026	0.00025	0.0347	0.0295	12.25	0.00000486	0.00000268	0.000543	0.0006	0.059	0.0352	0.0048	0.0024	0.000001	0.00000115	14.5	0.0005	0.00050	0.000100	0.000100	1.72	0.00287	0.0025	0.0025	0.00253	0.0116	0.0082
		Count <DL	0	0	0	0	0	9	9	4	0	0	0	0	3	10	9	0	10	10	10	10	0	9	10	1	1	4	0
		Standard Deviation	0.00004	0.00006	0.0089	0.0068	1.77	0.0000035	0.00000079	0.000542	0.00067	0.0190	0.0181	0.0045	0.00448	0	0.00000095	1.5	0	0.00000	0.000000	0.000000	0.59	0.00234	4E-11	0.00107	0.0012	0.0049	0.0043
		1st Quartile	0.00024	0.0002	0.0304	0.0277	11.18	<0.000010	<0.0000050	<0.00050	0.00045	0.05	0.0234	0.0027	0.00078	<0.000002	<0.0000020	13.8	<0.0010	<0.0010	<0.00020	<0.00020	1.36	<0.0050	<0.0050	0.0027	0.0025	<0.020	0.0058
		Median	0.00027	0.00026	0.0357	0.03	12.05	<0.000010	<0.000005	0.00061	0.00050	0.054	0.0327	0.0042	0.003	<0.0000020	<0.000002	14.2	<0.0010	<0.0010	<0.00020	<0.00020	1.44	<0.0050	<0.0050	0.0029	0.0028	<0.020	0.0074
		3rd Quartile	0.00029	0.0003	0.0408	0.0320	13.23	<0.000010	<0.000005	0.000893	0.00067	0.06	0.0495	0.0073	0.00578	<0.000002	<0.0000020	15.7	<0.0010	<0.0010	<0.00020	<0.00020	2.26	<0.0050	<0.0050	0.0032	0.0035	<0.020	0.011
LLS		Average	0.00474	0.00196	0.0398	0.01257	228	0.00001200	0.00001014	0.000967	0.000681	1.777	0.00836	0.4052	0.394	0.0000010	0.0000010	604	0.0036	0.0034	0.000100	0.0001	533	0.00338	0.00309				
E292131		Count	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12				
		Minimum	0.00078	0.00037	<0.0030	<0.0030	159	<0.000010	<0.0000050	<0.00050	<0.00020	0.271	<0.0050	0.0966	0.0949	<0.0000020	<0.0000020	393	0.0015	0.0015	<0.00020	<0.00020	281	<0.0050	<0.0050				
		Maximum	0.0113	0.0038	0.226	0.0651	263	0.000072	0.0000693	0.00364	0.00324	5.48	0.0334	0.602	0.58	<0.0000020	<0.0000020	791	0.0121	0.0108	<0.00020	<0.00020	709	0.0104	0.0096				
	Small Seep into Long Lake	Geometric Mean	0.00388	0.00157	0.0114	0.00559	226	0.0000073	0.00000476	0.000642	0.000268	1.265	0.00604	0.3645	0.3528	0.000001	0.000001	591	0.003	0.0029	0.000100	0.0001	511	0.00299	0.0028				
		Count <DL	0	0	2	3	0	9	7	5	7	0	4	0	0	12	12	0	0	0	12	12	0	10	11				
		Standard Deviation	0.0028	0.00117	0.06927	0.02002	32	0.0000192	0.00001914	0.000985	0.001047	1.562	0.00852	0.1543	0.1562	0	0	126	0.0029	0.0025	0.000000	0.000000	148	0.00234	0.00205				
		1st Quartile	0.00285	0.00115	0.00532	0.00278	211	<0.000010	<0.0000050	<0.00050	<0.00020	0.777	<0.0050	0.357	0.2978	<0.0000020	<0.0000020	535	0.0022	0.002	<0.00020	<0.00020	405	<0.0050	<0.0050				
		Median	0.00468	0.0016	0.0083	0.0050	243	<0.000010	<0.000005	0.000755	<0.00020	1.21	0.0065	0.447	0.438	<0.0000020	<0.0000020	648	0.0024	0.0024	<0.00020	<0.00020	580	<0.0050	<0.0050				
		3rd Quartile	0.00559	0.00282	0.02655	0.00808	249	0.0000062	0.00000592	0.001132	0.000677	2.418	0.00902	0.5075	0.5108	<0.0000020	<0.0000020	694	0.0039	0.0039	<0.00020	<0.00020	660	<0.0050	<0.0050				
LLSM		Average	0.00137	0.00096	0.02277	0.01510	195.1	0.000005	0.00000434	0.000583	0.000446	0.445	0.00489	0.1838	0.1805	0.000001	0.00000151	509	0.0027	0.0026	0.0001	0.0001	459	0.0025	0.0025				
E292131		Count	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7				
		Minimum	0.00059	0.00036	<0.0030	0.004	173	<0.000010	<0.0000050	<0.00050	<0.00020	0.249	<0.0050	0.0722	0.0591	<0.0000020	<0.0000020	455	0.0018	0.0015	<0.00020	<0.00020	370	<0.0050	<0.0050				
		Maximum	0.00188	0.00140	0.0549	0.0396	228	<0.000010	0.000009	0.00141	0.00101	0.669	0.0123	0.285	0.298	<0.0000020	0.0000032	561	0.0044	0.0041	<0.00020	<0.00020	617	<0.0050	<0.0050				
	Long Lake Middle Seep	Geometric Mean	0.00127	0.00087	0.01168	0.011	194	0.000005	0.00000379	0.000451	0.00034	0.419	0.00402	0.1628	0.1557	0.000001	0.00000134	508	0.0026	0.0025	0.000100	0.0001	451	0.0025	0.00250				
		Count <DL	0	0	2	0	0	7	4	4	1	0	4	0	0	7	5	0	0	0	7	7	0	7	7				
		Standard Deviation	0.0005	0.00041	0.02073	0.0129	22.6	1E-13	0.00000256	0.000461	0.00036	0.158	0.00366	0.0901	0.0952	0.0000000	0.0000009	39	0.0008	0.0009	0	0	90	0	0				
		1st Quartile	0.001	0.00064	0.00705	0.0053	174	<0.000010	<0.0000050	<0.00050	0.00023	0.344	<0.0050	0.1177	0.1122	<0.0000020	<0.0000020	487	0.0023	0.0021	<0.00020	<0.00020	382	<0.0050	<0.0050				
		Median	0.00156	0.00117	0.0134	0.012	193	<0.000010	<0.000005	<0.00050	0.00024	0.445	<0.0050	0.154	0.1540	<0.0000020	<0.0000020	504	0.0026	0.0023	<0.00020	<0.00020	453	<0.0050	<0.0050				
		3rd Quartile	0.00176	0.00126	0.03775	0.0199	212	<0.000010	0.00000575	0.000835	0.000655	0.531	0.00595	0.2700	0.264	<0.0000020	0.0000017	537	0.0027	0.003	<0.00020	<0.00020	505	<0.0050	<0.0050				

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 63
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW002	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Average		0.0005		0.0032	200		0.0000074		0.000997		2.38		2.56		0.0000032			0.0026		0.000100	1195		0.0025		0.00330		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.00037		<0.0030	193		0.000005		<0.00020		2.06		2.29		0.0000024			0.0023		<0.00020	1150		<0.0050		0.0023		
		Maximum		0.00069		0.0059	210		0.000011		0.00369		2.77		2.69		0.0000037			0.0028		<0.00020	1220		<0.0050		0.0053		
		Geometric Mean		0.00049		0.00268	199.9		0.0000071		0.000246		2.36		2.55		0.0000031			0.0026		0.000100	1194.7		0.0025		0.0031		
		Count <DL		0		2	0		0		3		0		0		0			0		4	0		4		0		
		Standard Deviation		0.00014		0.00213	7.7		0.0000026		0.001795		0.3		0.18		0.0000006			0.0002		0.000000	31.1		0		0.0014		
		1st Quartile		0.0004		<0.0030	194.5		0.0000058		<0.00020		2.23		2.54		0.0000028			0.0026		<0.00020	1187.5		<0.0050		0.0024		
		Median		0.00047		0.0027	198.5		0.0000068		<0.00020		2.34		2.63		0.0000032			0.0028		<0.00020	1205		<0.0050		0.0028		
		3rd Quartile		0.00057		0.0044	204		0.0000084		0.000998		2.48		2.65		0.0000036			0.0028		<0.00020	1212.5		<0.0050		0.00380		
QU1009D	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.122		0.02190	185.5		0.0000025		0.000100		0.205		0.0164		0.0000010			0.000500		0.0001000	80.6		0.00250		0.0340		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.118		0.0046	185		<0.0000050		<0.00020		0.194		0.0147		<0.0000020			<0.0010		<0.00020	76.8		<0.0050		0.03		
		Maximum		0.125		0.0392	186		<0.0000050		<0.00020		0.216		0.018		<0.0000020			<0.0010		<0.00020	84.4		<0.0050		0.038		
		Geometric Mean		0.121		0.0134	185.5		0.0000025		0.000100		0.205		0.0163		0.0000010			0.000500		0.0001000	80.5		0.00250		0.0338		
		Count <DL		0		0	0		2		2		0		0		2			2		2	0		2		0		
		Standard Deviation		0.005		0.0245	0.7		0.0000000		0.000000		0.016		0.0023		0.0000000			0.000000		0.0000000	5.4		0.00000		0.0057		
		1st Quartile		0.12		0.01320	185.2		<0.0000050		<0.00020		0.2		0.0155		<0.0000020			<0.0010		<0.00020	78.7		<0.0050		0.032		
		Median		0.122		0.02190	185.5		<0.0000050		<0.00020		0.205		0.0164		<0.0000020			<0.0010		<0.00020	80.6		<0.0050		0.034		
		3rd Quartile		0.123		0.03060	185.8		<0.0000050		<0.00020		0.21		0.0172		<0.0000020			<0.0010		<0.00020	82.5		<0.0050		0.036		
QU1009S	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.0857		0.00150	134.5		0.0000025		0.000100		5.42		0.366		0.0000043			0.000500		0.0001000	111.9		0.00250		0.0335		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0787		<0.0030	129		<0.0000050		<0.00020		5.01		0.326		0.0000033			<0.0010		<0.00020	97.8		<0.0050		0.0333		
		Maximum		0.0927		<0.0030	140		<0.0000050		<0.00020		5.84		0.406		0.0000053			<0.0010		<0.00020	126		<0.0050		0.0338		
		Geometric Mean		0.0854		0.0015	134.4		0.0000025		0.000100		5.41		0.364		0.0000042			0.0005		0.0001000	111.0		0.00250		0.0335		
		Count <DL		0		2	0		2		2		0		0		0			2		2	0		2		0		
		Standard Deviation		0.0099		0	7.8		0.0000000		0.000000		0.59		0.057		0.0000014			0		0.0000000	19.9		0.00000		0.0004		
		1st Quartile		0.0822		<0.0030	131.8		<0.0000050		<0.00020		5.22		0.346		0.0000038			<0.0010		<0.00020	104.8		<0.0050		0.0334		
		Median		0.0857		<0.0030	134.5		<0.0000050		<0.00020		5.42		0.366		0.0000043			<0.0010		<0.00020	111.9		<0.0050		0.0335		
		3rd Quartile		0.0892		<0.0030	137.2		<0.0000050		<0.00020		5.63		0.386		0.0000048			<0.0010		<0.00020	119		<0.0050		0.0337		
SPD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E218582	Settling Pond # 1	Average	0.00159	0.00125	0.0362	0.0179	80.00	0.0000108	0.00000818	0.00117	0.00054	0.568	0.0871	0.1744	0.15571	0.0000001	0.0000001	448	0.0043	0.0042	0.0001	0.000108	337.4	0.00361	0.00394	0.0131		0.5050	0.0147
		Count	13	13	13	13	10	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	36	13	13	2		2	2
		Minimum	0.00034	0.00018	0.0077	0.0031	46.20	<0.000010	<0.0000050	0.00062	0.00028	0.092	0.0103	0.0219	<0.0020	<0.0000020	<0.0000020	305	0.001	<0.0020	<0.00020	<0.00020	41.9	<0.0050	<0.0050	0.0078		<0.020	0.0053
		Maximum	0.00414	0.00333	0.0893	0.0447	110.0	0.00003	0.000020	0.0041	0.00093	1.64	0.226	0.647	0.571	<0.0000020	<0.0000020	584	0.0105	0.0116	<0.00020	<0.00040	505	0.0083	0.0079	0.0184		<2.0	0.0241
		Geometric Mean	0.00124	0.00089	0.0267	0.0131	78.1	0.0000087	0.00000596	0.00098	0.00051	0.37	0.0605	0.1008	0.04528	0.0000010	0.0000010	440	0.00310	0.00309	0.0001	0.000105	299.50	0.0032	0.00353	0.012		0.1000	0.0113
		Count <DL	0	0	0	0	0	7	5	0	0	0	0	0	1	13	13	0	0	1	13	13	0	10	9	0		2	0
		Standard Deviation	0.00114	0.00102	0.0266	0.0147	17.3	0.0000081	0.00000664	0.00096	0.00018	0.519	0.0675	0.1942	0.19427	0.0000000	0	90.0	0.0035	0.00349	0.000000	0.000028	125.7	0.00214	0.00202	0.0075		0.7	0.0133
		1st Quartile	0.00068	0.00053	0.0114	0.0075	70.7	<0.000010	<0.0000050	0.00068	0.00042	0.161	0.0305	0.0383	0.0125	<0.0000020	<0.0000020	362	0.0017	0.0017	<0.00020	<0.00020	288.8	<0.0050	<0.0050	0.0104		0.2575	0.01
		Median	0.00130	0.00083	0.029	0.0111	80.2	<0.000010	0.0000054	0.00079	0.00049	0.267	0.0777	0.124	0.106	<0.0000020	<0.0000020	475	0.0021	0.0024	<0.00020	<0.00020	359.00	<0.0050	<0.0050	0.0131		0.505	0.01470
		3rd Quartile	0.00205	0.00203	0.0547	0.0242	89.4	0.000018	0.00001100	0.00104	0.00066	0.94	0.1150	0.157	0.161	<0.0000020	<0.0000020	502	0.0071	0.0058	<0.00020	<0.00020	426	<0.0050	0.0054	0.01580		0.7525	0.01940
LLE	Long Lake Entrance (LLE)	Average	0.00092	0.00072	0.0889	0.03440	55.9	0.00000700	0.00000361	0.001265	0.00079	0.418	0.1551	0.107	0.0912	0.000001	0.0000010	250	0.00082	0.00072	0.000115	0.000100	210.4	0.00353	0.00250	0.0092	0.0045	0.0392	0.01736
E292130		Count	11	11	11	11	11	11	11	11	11	11	11	11	11	10	11	11	11	11	11	11	41	11	11	19	1	12	12
		Minimum	0.00027	0.00025	0.0137	0.0044	39.2	<0.000010	<0.0000050	<0.00050	0.00022	0.268	0.0239	0.0171	0.0019	<0.0000020	<0.0000020	140	<0.0010	<0.0010	<0.00020	<0.00020	64.6	<0.0050	<0.0050	0.004	0.0045	<0.020	<0.0050
		Maximum	0.00197	0.00133	0.235	0.0803	82.1	0.0000270	0.0000062	0.00568	0.00343	0.753	0.406	0.26	0.258	<0.0000020	<0.0000020	416	0.0023	0.0019	0.00026	<0.00020	481	0.0109	<0.0050	0.0319	0.0045	0.11	0.0470
		Geometric Mean	0.00078	0.00064	0.0648	0.0226	54.2	0.0000058	0.00000334	0.000859	0.00053	0.403	0.1124	0.0766	0.0511	0.000001	0.000001	233.0	0.00066	0.00062	0.000109	0.000100	192.9	0.00307	0.00250	0.0079	0.0045	0.0263	0.0113
		Count <DL	0	0	0	0	0	10	7	2	0	0	0	0	0	10	11	0	9	9	10	11	0	9	11	0	0	5	2
		Standard Deviation	0.00055	0.00037	0.0655	0.02750	14.9	0.0000066	0.00000158	0.001516	0.00094	0.131	0.1212	0.0836	0.0821	0	0	101	0.00071	0.00049	0.000048	0.000000	91.5	0.0026	0.00000	0.0062	0	0.0351	0.01594
		1st Quartile	0.00051	0.00046	0.0385	0.008	46.1	<0.000010	<0.0000050	0.000665	0.00027	0.332	0.067	0.0377	0.031	<0.0000020	<0.0000020	184	<0.0010	<0.0010	<0.00020	<0.00020	145	<0.0050	<0.0050	0.0053	0.0045	<0.020	0.00575
		Median	0.00085	0.00064	0.0917	0.0345	49.2	<0.000010	<0.000005	0.00084	0.00042	0.411	0.105	0.0839	0.0785	<0.0000020	<0.0000020	215	<0.0010	<0.0010	<0.00020	<0.00020	189	<0.0050	<0.0050	0.0083	0.0045	0.028	0.01145
		3rd Quartile	0.00122	0.00094	0.114	0.049	64.2	<0.000010	0.000005	0.0012	0.00072	0.452	0.2205	0.173	0.129	<0.0000020	<0.0000020	314	<0.0010	<0.0010	<0.00020	<0.00020	235	<0.0050	<0.0050	0.01050	0.0045	0.0555	0.02232
LLM1	Long Lake Middle 1 metre below Surface	Average	0.00056	0.00052	0.0147	0.0102	33.3	0.00005470	0.0000025	0.000579	0.00040	0.037	0.015	0.0082	0.0012	0.000001	0.000001	94	0.00059	0.00050	0.000213	0.000100	81.1	0.00415	0.00250	0.00268			
E206619		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00037	0.00034	0.0064	0.0035	26	<0.000010	<0.0000050	<0.00050	0.00029	0.018	0.0057	0.0036	<0.0010	<0.0000020	<0.0000020	66	<0.0010	<0.0010	<0.00020	<0.00020	44.8	<0.0050	<0.0050	<0.0020			
		Maximum	0.00084	0.00094	0.0327	0.0175	39.5	0.000699	<0.0000050	0.00219	0.00054	0.08	0.0306	0.0193	0.0053	<0.0000020	<0.0000020	125	0.0019	<0.0010	0.00179	<0.00020	108	0.0128	<0.0050	0.0046			
		Geometric Mean	0.00054	0.0005	0.0131	0.0094	32.8	0.0000093	0.0000025	0.00039	0.00039	0.034	0.0132	0.0071	0.00083	0.000001	0.000001	91.6	0.00055	0.00050	0.000121	0.000100	78.2	0.00345	0.00250	0.00234			
		Count <DL	0	0	0	0	0	11	15	11	0	0	0	0	10	15	15	0	14	15	14	15	0	11	15	1			
		Standard Deviation	0.00015	0.00015	0.0076	0.0039	6.3	0.00017840	1E-13	0.000671	0.00009	0.019	0.0073	0.0049	0.00134	0	0	21.6	0.00036	0.00000	0.000436	0.000000	20.9	0.00313	0.00000	0.00148			
		1st Quartile	0.00044	0.00042	0.0096	0.0079	27.5	<0.000010	<0.0000050	<0.00050	0.00035	0.024	0.009	0.0048	<0.0010	<0.0000020	<0.0000020	73.4	<0.0010	<0.0010	<0.00020	<0.00020	59.6	<0.0050	<0.0050	0.00205			
		Median	0.00051	0.00048	0.0133	0.01	34.6	<0.000010	<0.0000050	<0.00050	0.00037	0.033	0.016	0.0069	<0.0010	<0.0000020	<0.0000020	90.5	<0.0010	<0.0010	<0.00020	<0.00020	88.3	<0.0050	<0.0050	0.00255			
		3rd Quartile	0.00064	0.00058	0.0176	0.0128	38.8	0.00001100	<0.0000050	0.000485	0.00048	0.0420	0.019	0.0086	0.00135	<0.0000020	<0.0000020	114	<0.0010	<0.0010	<0.00020	<0.00020	97.4	0.0045	<0.0050	0.00318			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 64
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LLMB	Long Lake Middle 1 metre From Bottom	Average	0.00032	0.00026	0.0126	0.00773	46.1	0.00000500	0.00000283	0.000432	0.00041	0.059	0.01377	2.345	2.141	0.000001	0.000001	124.2	0.00050	0.00050	0.000100	0.000109	107.8	0.00271	0.00250	0.00310			
E206619		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.00024	0.00021	0.0032	<0.0030	43.2	<0.000010	<0.0000050	<0.00050	0.00023	0.021	<0.0050	0.291	0.238	<0.0000020	<0.0000020	114	<0.0010	<0.0010	<0.00020	<0.00020	104	<0.0050	<0.0050	0.0025			
		Maximum	0.00044	0.00033	0.0211	0.0127	49.6	<0.000010	0.000005	0.00107	0.00064	0.116	0.0402	5.69	5.41	<0.0000020	<0.0000020	132	<0.0010	<0.0010	<0.00020	0.00023	115	0.0056	<0.0050	0.0034			
		Geometric Mean	0.00031	0.00026	0.0112	0.00615	46.1	0.000005	0.00000274	0.000364	0.0004	0.052	0.00974	1.35	1.206	0.000001	0.000001	124.1	0.00050	0.00050	0.000100	0.000106	107.8	0.00264	0.00250	0.00300			
		Count <DL	0	0	0	3	0	15	13	10	0	0	2	0	0	15	15	0	15	15	15	14	0	14	15	0			
		Standard Deviation	0.00006	0.00004	0.0056	0.00418	2.4	1E-13	0.00000088	0.00029	0.00013	0.031	0.01174	2.09	1.9470	0	0	5.1	0.00000	0.00000	0.000000	0.000034	3.4	0.0008	0.00000	0.00040			
		1st Quartile	0.00027	0.00024	0.0092	0.0049	44.8	<0.000010	<0.0000050	<0.00050	0.00033	0.034	0.0058	0.391	0.335	<0.0000020	<0.0000020	120	<0.0010	<0.0010	<0.00020	<0.00020	105	<0.0050	<0.0050	0.0029			
		Median	0.00032	0.00026	0.0114	0.0084	46.4	<0.000010	<0.000005	<0.00050	0.00038	0.053	0.00890	1.91	1.83	<0.0000020	<0.0000020	125	<0.0010	<0.0010	<0.00020	<0.00020	108.0	<0.0050	<0.0050	0.0032			
		3rd Quartile	0.00035	0.0003	0.0166	0.0115	46.6	<0.000010	<0.0000050	0.000585	0.00046	0.076	0.02410	4.165	3.615	<0.0000020	<0.0000020	128.5	<0.0010	<0.0010	<0.00020	<0.00020	109	<0.0050	<0.0050	0.0033			
LLO	Long Lake Outlet	Average	0.00044	0.0004	0.0179	0.0117	32.7	0.0000048	0.00000250	0.000735	0.00047	0.0429	0.01723	0.0094	0.00186	0.000001	0.000001	91.2	0.00321	0.00050	0.000212	0.000100	66.2	0.00405	0.00250	0.00506		0.088	0.00588
E219412		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	52	15	15	5		5	5
		Minimum	0.00035	0.00027	0.0039	0.0038	20.8	<0.000005	<0.0000050	<0.00050	0.00027	<0.010	<0.0050	0.0031	<0.0010	<0.0000020	<0.0000020	44.4	<0.0010	<0.0010	<0.00020	<0.00020	11.7	<0.0050	<0.0050	<0.0050		<0.020	<0.0050
		Maximum	0.00059	0.00049	0.0371	0.025	40.6	<0.000010	<0.0000050	0.00559	0.00129	0.099	0.039	0.0229	0.0056	<0.0000020	<0.0000020	123	0.0412	<0.0010	0.00178	<0.00020	113	0.0258	<0.0050	0.0098		0.295	0.009
		Geometric Mean	0.00044	0.00039	0.0145	0.0098	32.1	0.0000048	0.0000025	0.000407	0.00043	0.0314	0.01251	0.0078	0.00129	0.0000010	0.0000010	87.6	0.00067	0.00050	0.000121	0.000100	57.9	0.00292	0.00250	0.00442		0.0372	0.00504
		Count <DL	0	0	0	0	0	15	15	10	0	2	2	0	6	15	15	0	14	15	14	15	0	14	15	2		2	2
		Standard Deviation	0.00007	0.00007	0.011	0.0066	6.1	0.0000006	1E-13	0.001364	0.00025	0.0294	0.01226	0.0059	0.00165	0	0	24.9	0.01051	0.00000	0.000434	0.000000	29.2	0.00602	4E-11	0.00299		0.1217	0.00323
		1st Quartile	0.00038	0.00035	0.0084	0.0056	27.7	<0.000010	<0.000005	<0.00050	0.00034	0.0195	0.0064	0.0047	<0.0010	<0.0000020	<0.0000020	67.9	<0.0010	<0.0010	<0.00020	<0.00020	42.1	<0.0050	<0.0050	<0.0050		<0.020	<0.0050
		Median	0.00045	0.00041	0.0158	0.0125	35.2	<0.000010	<0.0000050	<0.00050	0.0004	0.034	0.0138	0.0091	0.0016	<0.0000020	<0.0000020	101	<0.0010	<0.0010	<0.00020	<0.00020	66.1	<0.0050	<0.0050	0.0051		0.024	0.0066
		3rd Quartile	0.00048	0.00046	0.0278	0.0168	37.7	<0.000010	<0.0000050	0.0006	0.00044	0.064	0.0292	0.0120	0.0022	<0.0000020	<0.0000020	112.5	<0.0010	<0.0010	<0.00020	<0.00020	90.8	<0.0050	<0.0050	0.0054		0.101	0.00880
WB	Middle Quinsam Lake Outlet	Average	0.00024	0.00022	0.0185	0.015	39	0.0000049	0.0000028	0.000687	0.00057	0.045	0.0196	0.0109	0.00107	0.0000010	0.0000010	40.9	0.00073	0.00050	0.000100	0.000100	34.6	0.00250	0.00250	0.00536		0.0100	0.00892
E0900504		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	5		5	5
		Minimum	0.00012	0.00013	0.0068	0.0072	26.4	<0.000005	<0.0000050	<0.00050	0.00046	0.03	0.0093	0.0027	<0.0010	<0.0000020	<0.0000020	27.5	<0.0010	<0.0010	<0.00020	<0.00020	18.3	<0.0050	<0.0050	<0.0050		<0.020	<0.0050
		Maximum	0.00044	0.00034	0.0257	0.0211	48	0.000006	0.000007	0.00169	0.00086	0.094	0.0392	0.0188	0.0059	<0.0000020	<0.0000020	62.2	0.0026	<0.0010	<0.00020	<0.00020	48.7	<0.0050	<0.0050	0.0102		<0.020	0.016
		Geometric Mean	0.00023	0.000210	0.0175	0.0143	38.3	0.00000483	0.00000268	0.000599	0.00056	0.042	0.0185	0.009	0.00073	0.000001	0.000001	39.8	0.00061	0.00050	0.000100	0.000100	33.5	0.00250	0.00250	0.00458		0.0100	0.00664
		Count <DL	0	0	0	0	0	14	14	3	0	0	0	0	11	15	15	0	13	15	15	15	0	15	15	2		5	2
		Standard Deviation	0.00009	0.00008	0.0058	0.0046	7.3	0.00000071	0.00000116	0.000379	0.0001	0.0180	0.0073	0.0057	0.00141	0	0	10	0.00062	0.00000	0.000000	0.000000	8.5	4E-11	4E-11	0.00332		0	0.00651
		1st Quartile	0.00018	0.00015	0.0144	0.0108	32.2	<0.000010	<0.000005	0.000535	0.00052	0.032	0.0154	0.0046	<0.0010	<0.000002	<0.000002	35.4	<0.0010	<0.0010	<0.00020	<0.00020	29.3	<0.0050	<0.0050	<0.0050		<0.020	<0.0050
		Median	0.00025	0.000230	0.0202	0.0157	40.9	<0.000010	<0.0000050	0.00062	0.00055	0.041	0.0179	0.0122	<0.0010	<0.0000020	<0.0000020	37	<0.0010	<0.0010	<0.00020	<0.00020	35.0	<0.0050	<0.0050	0.0044		<0.020	0.0086
		3rd Quartile	0.00029	0.000280	0.0234	0.019	46	<0.000010	<0.000005	0.00072	0.00058	0.045	0.0238	0.0152	0.0008	<0.0000020	<0.0000020	44	<0.0010	<0.0010	<0.00020	<0.00020	38.7	<0.0050	<0.0050	0.0072		<0.020	0.015
7SSD	Settling Pond at 7S- Discharge to Stream 1 -7S		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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E292069		Average	0.00265	0.00224	0.2187	0.0147	134.2	0.0000096	0.00000485	0.00181	0.00093	0.34	0.01843	0.0741	0.03816	0.00000109	0.00000116	172	0.00063	0.00071	0.00011	0.0001	35.3	0.00845	0.00308				
		Count	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20				
		Minimum	0.00067	0.00037	0.0088	<0.0030	50.1	<0.000005	<0.0000050	0.00087	0.00049	0.037	<0.0050	0.0109	<0.0010	<0.0000020	<0.0000020	60.2	<0.0010	<0.0010	<0.00020	<0.00020	10.5	<0.0050	<0.0050				
		Maximum	0.00952	0.00921	0.927	0.0508	208	0.000031	0.000021	0.00371	0.00202	1.16	0.0547	0.16	0.0962	0.0000028	0.0000042	298	0.0012	0.0046	0.00029	<0.00020	98.6	0.0912	0.0142				
		Geometric Mean	0.00198	0.00139	0.0953	0.00797	122.4	0.00000740	0.00000358	0.00167	0.00087	0.203	0.0117	0.0601	0.01342	0.00000105	0.00000107	157	0.00059	0.00056	0.000105	0.000100	29.2	0.00379	0.00273				
		Count <DL	0	0	0	5	0	13	15	0	0	0	3	0	4	19	19	0	16	19	19	20	0	16	19				
		Standard Deviation	0.00243	0.00252	0.2831	0.01484	51.4	0.0000082	0.0000051	0.00079	0.00038	0.366	0.01779	0.0428	0.0341	0.0000004	0.00000072	69.2	0.00026	0.00092	0.000042	0.000000	23.9	0.01987	0.00262				
		1st Quartile	0.00123	0.00066	0.032	0.00278	89	<0.000010	<0.0000050	0.0014	0.00071	0.109	0.00622	0.0369	0.0025	<0.0000020	<0.0000020	125.0	<0.0010	<0.0010	<0.00020	<0.00020	20	<0.0050	<0.0050				
		Median	0.00171	0.00117	0.0872	0.0083	153	<0.000010	<0.000005	0.0016	0.0008	0.162	0.0105	0.0844	0.040	<0.0000020	<0.0000020	177	<0.0010	<0.0010	<0.00020	<0.00020	25.6	<0.0050	<0.0050				
		3rd Quartile	0.00268	0.00241	0.276	0.0219	166.5	0.0000105	0.0000031	0.00186	0.00117	0.446	0.02672	0.0925	0.06542	<0.000002	<0.000002	204.8	<0.0010	<0.0010	<0.00020	<0.00020	41.8	<0.0050	<0.0050				
7S	Stream 1-7S discharge to LWO	Average	0.000108	0.000149	0.0474	0.0396	18.9	0.00000622	0.0000035	0.009704	0.00055	0.0235	0.00976	0.00057	0.0005	0.00000111	0.00000112	20.1	0.00050	0.00050	0.000100	0.000100	4.280	0.00250	0.00250				
E292109		Count	18	18	18	18	17	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	17	18	18				
		Minimum	<0.00010	<0.00010	0.0163	0.0129	11.4	<0.000005	<0.0000050	<0.00050	0.00027	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	13	<0.0010	<0.0010	<0.00020	<0.00020	2.19	<0.0050	<0.0050				
		Maximum	0.00022	0.00039	0.134	0.0948	38	0.0000320	0.000008	0.165	0.00197	0.09	0.032	0.0018	<0.0010	0.0000029	0.0000022	40.9	<0.0010	<0.0010	<0.00020	<0.00020	7.65	<0.0050	<0.0050				
		Geometric Mean	0.000098	0.000114	0.0372	0.032	17.7	0.00000513	0.00000314	0.000643	0.00046	0.0152	0.00647	0.00054	0.0005	0.00000106	0.00000109	19.2	0.00050	0.00050	0.000100	0.000100	4.08	0.00250	0.00250				
		Count <DL	5	7	0	0	0	17	14	8	0	6	7	17	18	17	16	0	18	18	18	18	0	18	18				
		Standard Deviation	0.000047	0.000110	0.0363	0.0273	7.4	0.00000648	0.00000196	0.038758	0.00042	0.0243	0.00953	0.00031	0	0.00000045	0.00000036	7	0.00000	0.00000	0.000000	0.000000	1.45	3E-11	3E-11				
		1st Quartile	0.000062	<0.00010	0.0187	0.0173	12.3	<0.000010	<0.0000050	<0.00050	0.00033	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	14.8	<0.0010	<0.0010	<0.00020	<0.00020	3.26	<0.0050	<0.0050				
		Median	0.00011	0.00012	0.0374	0.0337	16	<0.000010	<0.000005	0.00053	0.00038	0.015	0.0064	<0.0010	<0.0010	<0.0000020	<0.0000020	18.6	<0.0010	<0.0010	<0.00020	<0.00020	3.99	<0.0050	<0.0050				
		3rd Quartile	0.00013	0.000205	0.0604	0.0511	23.9	<0.000010	<0.0000050	0.000932	0.00055	0.0265	0.01078	<0.0010	<0.0010	<0.000002	<0.0000020	23.4	<0.0010	<0.0010	<0.00020	<0.00020	4.84	<0.0050	<0.0050				
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average		0.4		0.0099	171.5		0.0000025		0.000100		0.21		0.052		0.0000018			0.000500		0.0001000	18.4		0.00250		0.1750		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.393		0.0032	162		<0.0000050		<0.00020		0.176		0.0346		<0.0000020			<0.0010		<0.00020	14.5		<0.0050		0.137		
		Maximum		0.415		0.0251	179		<0.0000050		<0.00020		0.262		0.0739		0.0000041			<0.0010		<0.00020	24.3		<0.0050		0.216		
		Geometric Mean		0.4		0.0069	171.4		0.0000025		0.000100		0.208		0.0501		0.0000014			0.000500		0.0001000	18		0.00250		0.1720		
		Count <DL		0		0	0		4		4		0		0		3			4		4	0		4		0		
		Standard Deviation		0.01		0.0103	7.1		0		0.000000		0.037		0.0163		0.0000016			0.000000		0.0000000	4.7		0.00000		0.0330		
		1st Quartile		0.395		0.0038	168.8		<0.0000050		<0.00020		0.193		0.0446		<0.0000020			<0.0010		<0.00020	14.7		<0.0050		0.16		
		Median		0.396		0.0056	172.5		<0.0000050		<0.00020		0.202		0.0497		<0.000002			<0.0010		<0.00020	17.5		<0.0050		0.173		
		3rd Quartile		0.402		0.0116	175.2		<0.0000050		<0.00020		0.219		0.057		0.00000178			<0.0010		<0.00020	21.2		<0.0050		0.188		
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average		0.468		0.0332	120.2		0.0000034		0.000100		0.1124		0.0896		0.0000028			0.000500		0.0001000	9.19		0.00250		0.1920		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.455		0.0057	116		<0.0000050		<0.00020		0.084		0.0808		<0.0000020			<0.0010		<0.00020	8.72		<0.0050		0.155		
		Maximum		0.487		0.112	125		0.000006		<0.00020		0.156		0.107		0.0000069			<0.0010		<0.00020	9.44		<0.0050		0.208		
		Geometric Mean		0.467		0.0137	120.2		0.0000031		0.000100		0.1089		0.0891		0.0000020			0.000500		0.0001000	9.19		0.00250		0.1910		
		Count <DL		0		0	0		3		4		0		0		2			4		4	0		4		0		
		Standard Deviation		0.015		0.0526	4.4		0.0000018		0.000000		0.033		0.0119		0.0000028			0.000000		0.0000000	0.3		0.00000		0.0250		
		1st Quartile		0.457		0.0062	116.8		<0.0000050		<0.00020		0.088		0.0824		<0.000002			<0.0010		<0.00020	9.11		<0.0050		0.19		
		Median		0.464		0.0074	120		<0.000005		<0.00020		0.1047		0.0854		0.00000165			<0.0010		<0.00020	9.3		<0.0050		0.203		
		3rd Quartile		0.474		0.0344	123.5		0.00000338		<0.00020		0.129		0.0926		0.00000345			<0.0010		<0.00020	9.39		<0.0050		0.206		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 65
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average		0.161		0.0116	206.0		0.000006		0.000133		1.075		0.171		0.0000021			0.00067		0.000133	0.25		0.00333		0.049		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.116		0.0034	191		<0.000010		<0.00020		0.735		0.127		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0224		
		Maximum		0.222		0.0174	216		0.000007		<0.00040		1.41		0.194		0.0000032			<0.0020		<0.00040	<0.50		<0.010		0.0703		
		Geometric Mean		0.155		0.0094	205.7		0.00000594		0.000126		1.038		0.168		0.0000019			0.00063		0.000126	0.25		0.00315		0.0441		
		Count <DL		0		0	0		1		3		0		0		1			3		3	3		3		0		
		Standard Deviation		0.055		0.00730	13.2		0.000001		0.000058		0.338		0.038		0.0000011			0.00029		0.000058	0		0.00144		0.0244		
		1st Quartile		0.131		0.0087	201		0.0000055		<0.00020		0.908		0.159		0.0000016			<0.0010		<0.00020	<0.50		<0.0050		0.0383		
		Median		0.146		0.0141	211		0.000006		<0.00020		1.08		0.191		0.0000022			<0.0010		<0.00020	<0.50		<0.0050		0.0543		
		3rd Quartile		0.184		0.0158	213.5		0.0000065		0.00015		1.245		0.192		0.0000027			0.00075		0.00015	<0.50		0.00375		0.0623		
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average		0.274		0.009	196.5		0.0000034		0.0001		0.786		0.1498		0.0000024			0.000500		0.0001000	0.725		0.00685		0.205		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		3		
		Minimum		0.215		0.0044	190		<0.0000050		<0.00020		0.381		0.0831		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.127		
		Maximum		0.365		0.0177	201		0.000006		<0.00020		1.06		0.191		0.0000044			<0.0010		<0.00020	2.15		0.0199		0.249		
		Geometric Mean		0.267		0.0078	196.4		0.0000031		0.0001		0.726		0.1426		0.0000020			0.000500		0.0001000	0.428		0.0042		0.197		
		Count <DL		0		0	0		3		4		0		0		2			4		4	3		3		0		
		Standard Deviation		0.069		0.0059	5.4		0.0000018		0		0.326		0.0491		0.0000017			0.000000		0.0000000	0.95		0.0087		0.068		
		1st Quartile		0.223		0.006	193		<0.0000050		<0.00020		0.592		0.128		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.184		
		Median		0.257		0.007	197.5		<0.0000050		<0.00020		0.852		0.1625		0.00000215			<0.0010		<0.00020	<0.50		<0.0050		0.24		
		3rd Quartile		0.307		0.0099	201		0.00000338		<0.00020		1.045		0.1842		0.00000358			<0.0010		<0.00020	0.725		0.00685		0.244		
QU1010D	Ex-situ 2-North deep groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Mudstone).	Average		0.0148		0.0128	95.1		0.000006		0.00010		10.9		0.514		0.0000053			0.00050		0.000100	1.087		0.0025		0.07560		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.0143		0.0053	91.2		0.000005		<0.00020		10.1		0.51		0.0000039			<0.0010		<0.00020	<0.50		<0.0050		0.0688		
		Maximum		0.0151		0.0271	97.3		0.000007		<0.00020		11.3		0.517		0.0000061			<0.0010		<0.00020	<5.0		<0.0050		0.0814		
		Geometric Mean		0.0148		0.0095	95.1		0.000006		0.00010		10.9		0.514		0.0000052			0.00050		0.000100	0.683		0.0025		0.07550		
		Count <DL		0		0	0		0		3		0		0		0			3		3	2		3		0		
		Standard Deviation		0.0005		0.0124	3.4		0.000001		0.00000		0.7		0.00		0.0000012			0.00000		0.000000	1.2		0.0000		0.00640		
		1st Quartile		0.0147		0.0056	94		0.000006		<0.00020		10.6		0.512		0.000005			<0.0010		<0.00020	0.38		<0.0050		0.0728		
		Median		0.0151		0.0059	96.8		0.000007		<0.00020		11.2		0.514		0.000006			<0.0010		<0.00020	0.51		<0.0050		0.0767		
		3rd Quartile		0.0151		0.0165	97		0.000007		<0.00020		11.2		0.516		0.000006			<0.0010		<0.00020	1.505		<0.0050		0.0791		
QU1010S	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Average		0.122		0.01023	147.7		0.0000025		0.0001		0.278		0.0347		0.0000010			0.000500		0.0001000	16.6		0.00250		0.0532		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.121		<0.0030	144		<0.000005		<0.00020		0.217		0.0318		<0.000002			<0.0010		<0.00020	14.8		<0.0050		0.0516		
		Maximum		0.123		0.0225	152		<0.000005		<0.00020		0.339		0.0385		<0.000002			<0.0010		<0.00020	18		<0.0050		0.0545		
		Geometric Mean		0.122		0.00609	147.6		0.0000025		0.0001		0.273		0.0346		0.0000010			0.000500		0.0001000	16.5		0.0025		0.0532		
		Count <DL		0		1	0		3		3		0		0		3			3		3	0		3		0		
		Standard Deviation		0.001		0.01094	4.0		0.0000000		0		0.061		0.0035		0.0000000			0.000000		0.0000000	1.6		4E-11		0.0015		
		1st Quartile		0.122		0.0041	145.5		<0.0000050		<0.00020		0.248		0.0328		<0.0000020			<0.0010		<0.00020	15.9		<0.0050		0.0525		
		Median		0.123		0.0067	147		<0.0000050		<0.00020		0.278		0.0337		<0.0000020			<0.0010		<0.00020	17		<0.0050		0.0534		
		3rd Quartile		0.123		0.0146	149.5		<0.0000050		<0.00020		0.308		0.0361		<0.0000020			<0.0010		<0.00020	17.5		<0.0050		0.054		
QU1011D	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.0169		0.0143	205		0.0000025		0.00226		0.747		0.22		0.0000042			0.0005		0.0001	5.9		0.0025		0.030		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.0169		0.0143	205		<0.0000050		0.00226		0.747		0.22		0.0000042			<0.0010		<0.00020	5.89		<0.0050		0.0304		
		Maximum		0.0169		0.0143	205		<0.0000050		0.00226		0.747		0.22		0.0000042			<0.0010		<0.00020	5.89		<0.0050		0.0304		
		Geometric Mean		0.0169		0.0143	205		0.0000025		0.00226		0.747		0.22		0.0000042			0.0005		0.0001	5.9		0.0025		0.030		
		Count <DL		0		0	0		1		0		0		0		0			1		1	0		1		0		
		Standard Deviation		0.00000		0.0000	0		0.0000000		0.00000		0.00		0.000		0.0000000			0.00000		0.000000	0.0		0.0000		0.000		
		1st Quartile		0.0169		0.0143	205		<0.0000050		0.00226		0.747		0.22		0.0000042			<0.0010		<0.00020	5.89		<0.0050		0.0304		
		Median		0.0169		0.0143	205		<0.0000050		0.00226		0.747		0.22		0.0000042			<0.0010		<0.00020	5.89		<0.0050		0.0304		
		3rd Quartile		0.0169		0.0143	205		<0.0000050		0.00226		0.747		0.22		0.0000042			<0.0010		<0.00020	5.89		<0.0050		0.0304		
QU1011S	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.00223		0.0168	86		0.0000060		0.00041		0.227		0.0564		0.0000052			0.0005		0.0001000	4.26		0.00250		0.0073		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.00223		0.0168	86		0.000006		0.00041		0.227		0.0564		0.0000052			<0.0010		<0.00020	4.26		<0.0050		0.0073		
		Maximum		0.00223		0.0168	86		0.000006		0.00041		0.227		0.0564		0.0000052			<0.0010		<0.00020	4.26		<0.0050		0.0073		
		Geometric Mean		0.00223		0.0168	86		0.0000060		0.00041		0.227		0.0564		0.0000052			0.0005		0.0001000	4.26		0.0025		0.0073		
		Count <DL		0		0	0		0		0		0		0		0			1		1	0		1		0		
		Standard Deviation		0		0	0		0.0000000		0		0		0		0.0000000			0		0.0000000	0		0		0		
		1st Quartile		0.00223		0.0168	86		0.000006		0.00041		0.227		0.0564		0.0000052			<0.0010		<0.00020	4.26		<0.0050		0.0073		
		Median		0.00223		0.0168	86		0.000006		0.00041		0.227		0.0564		0.0000052			<0.0010		<0.00020	4.26		<0.0050		0.0073		
		3rd Quartile		0.00223		0.0168	86		0.000006		0.00041		0.227		0.0564		0.0000052			<0.0010		<0.00020	4.26		<0.0050		0.0073		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 66
2017-2018 Annual Report

2015-16 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU1105S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.0782		0.00920	229		0.0000025		0.000125		1.25		0.3147		0.0000044			0.000500		0.0001000	151.3		0.00250		0.031		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.0456		0.0032	126		<0.0000050		<0.00020		0.189		0.037		<0.0000020			<0.0010		<0.00020	55.3		<0.0050		0.0178		
		Maximum		0.0913		0.0243	335		<0.0000050		0.0002		2.64		0.736		0.0000063			<0.0010		<0.00020	303		<0.0050		0.0394		
		Geometric Mean		0.0753		0.00640	213		0.0000025		0.000119		0.707		0.1852		0.0000036			0.000500		0.0001000	123.4		0.00250		0.030		
		Count <DL		0		0	0		4		3		0		0		1			4		4	0		4		0		
		Standard Deviation		0.0219		0.01010	97		0.0000000		0.000050		1.221		0.3145		0.0000023			0.000000		0.0000000	110.5		0.00000		0.010		
		1st Quartile		0.0754		0.004	160		<0.0000050		<0.00020		0.244		0.097		0.0000037			<0.0010		<0.00020	78.2		<0.0050		0.0265		
		Median		0.0878		0.0046	229		<0.0000050		<0.00020		1.086		0.243		0.00000505			<0.0010		<0.00020	123.4		<0.0050		0.0332		
		3rd Quartile		0.0906		0.0098	298		<0.0000050		0.000125		2.092		0.4608		0.0000057			<0.0010		<0.00020	196.5		<0.0050		0.0375		
QU1109S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.108		0.0062	401		0.0000025		0.0001		0.1647		0.0156		0.0000020			0.0005		0.0001	284		0.0025		0.071		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.080		<0.0030	280		<0.0000050		<0.00020		0.0889		0.0087		<0.0000020			<0.0010		<0.00020	166		<0.0050		0.0445		
		Maximum		0.126		0.0165	516		<0.0000050		<0.00020		0.214		0.02		0.0000031			<0.0010		<0.00020	442		<0.0050		0.0906		
		Geometric Mean		0.107		0.00411	391		0.0000025		0.0001		0.1557		0.0149		0.0000017			0.0005		0.0001	266		0.0025		0.069		
		Count <DL		0		1	0		4		4		0		0		2			4		4	0		4		0		
		Standard Deviation		0.020		0.0069	97		0.0000000		0.00000		0.0580		0.00490		0.0000012			0.00000		0.000000	118.0		0.0000		0.019		
		1st Quartile		0.103		0.00285	359		<0.000005		<0.00020		0.1347		0.0142		<0.0000020			<0.0010		<0.00020	212		<0.0050		0.0669		
		Median		0.114		0.0034	404		<0.0000050		<0.00020		0.178		0.017		0.00000195			<0.0010		<0.00020	265		<0.0050		0.075		
		3rd Quartile		0.119		0.00675	445		<0.0000050		<0.00020		0.208		0.0183		0.00000295			<0.0010		<0.00020	337		<0.0050		0.0794		
7SQR	7-South Quinsam River downstream of 7-South Mining Operation	Average	0.00049	0.00044	0.0374	0.0201	38.8	0.00001321	0.00001043	0.00088	0.00082	0.11	0.0536	0.0072	0.00301	0.0000011	0.00000116	40.7	0.00074	0.00050	0.000100	0.000100	31	0.00277	0.0025	0.00780		0.0152	0.015
E292113		Count	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	5		5	5
		Minimum	0.00027	0.00023	0.0114	0.0095	24	<0.0000050	<0.0000050	0.00053	0.00045	0.051	0.0286	0.003	<0.0010	<0.0000020	<0.0000020	26.9	<0.0010	<0.0010	<0.00020	<0.00020	14	<0.0050	<0.0050	0.0053		<0.020	0.0069
		Maximum	0.00094	0.00067	0.156	0.0908	51.5	0.00018	0.000161	0.00194	0.004	0.215	0.0903	0.0129	0.0062	0.000003	0.0000043	67.2	0.0056	<0.0010	<0.00020	<0.00020	45.8	0.0081	<0.0050	0.0103		0.025	0.024
		Geometric Mean	0.00046	0.00042	0.0294	0.017	38	0.00000555	0.00000334	0.0008	0.0007	0.101	0.0506	0.0067	0.00243	0.00000105	0.00000107	39.8	0.00056	0.00050	0.000100	0.000100	29.9	0.00264	0.0025	0.00760		0.0139	0.0135
		Count <DL	0	0	0	0	0	19	18	0	0	0	0	0	3	20	20	0	20	21	21	21	0	20	21	0		3	0
		Standard Deviation	0.00017	0.00013	0.0353	0.0173	8.2	0.00003824	0.00003452	0.00044	0.00075	0.045	0.0184	0.0026	0.00162	0.00000044	0.00000072	9	0.00111	0.00000	0.000000	0.000000	7.9	0.00122	0	0.0019		0.0073	0.0075
		1st Quartile	0.00037	0.00035	0.0208	0.0125	32.7	<0.000010	<0.0000050	0.00061	0.00054	0.069	0.0398	0.0054	0.0017	<0.0000020	<0.0000020	35.1	<0.0010	<0.0010	<0.00020	<0.00020	25	<0.0050	<0.0050	0.0073		<0.020	0.01
		Median	0.00044	0.00040	0.025	0.0152	36.3	<0.000010	<0.0000050	0.00069	0.00061	0.113	0.0507	0.0072	0.0034	<0.0000020	<0.0000020	37.7	<0.0010	<0.0010	<0.00020	<0.00020	32.3	<0.0050	<0.0050	0.0074		<0.020	0.0123
		3rd Quartile	0.00058	0.00054	0.0393	0.0196	47.7	<0.000010	<0.0000050	0.00087	0.00085	0.129	0.0649	0.0085	0.0041	<0.0000020	<0.0000020	43.9	<0.0010	<0.0010	<0.00020	<0.00020	36.60	<0.0050	<0.0050	0.0088		0.021	0.022
LQL1	Lower Quinsam Lake 1 metre below surface	Average	0.00067	0.00061	0.0185	0.0142	35.9	0.0000057	0.00000363	0.000633	0.00055	0.080	0.0414	0.0135	0.00563	0.00000100	0.00000100	34.3	0.00050	0.00050	0.000100	0.000100	21.3	0.01197	0.00250	0.00330			
E292118		Count	15	15	15	15	9	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	7			
		Minimum	0.00046	0.00042	0.0079	0.0065	27.3	<0.000005	<0.000005	<0.00050	0.00040	0.025	0.0096	0.0029	<0.0010	<0.000002	<0.000002	24.1	<0.0010	<0.0010	<0.00020	<0.00020	15.6	<0.0050	<0.0050	<0.0020			
		Maximum	0.00114	0.00084	0.0344	0.0239	42.7	0.000018	0.0000080	0.00110	0.00077	0.222	0.132	0.0586	0.0361	<0.000002	<0.000002	40.6	<0.0010	<0.0010	<0.00020	<0.00020	24.0	0.124	<0.0050	0.0047			
		Geometric Mean	0.00065	0.00060	0.0161	0.0134	35.6	0.0000052	0.00000325	0.000578	0.00054	0.067	0.0322	0.0091	0.00156	0.00000100	0.00000100	34.0	0.00050	0.00050	0.000100	0.000100	21.1	0.00411	0.00250	0.00302			
		Count <DL	0	0	0	0	0	14	11	3	0	0	0	0	8	15	15	0	15	15	15	15	0	11	15	1			
		Standard Deviation	0.00018	0.00013	0.0101	0.0050	4.9	0.0000035	0.00000200	0.000251	0.00010	0.052	0.0313	0.0149	0.01007	0.00000000	0.00000000	4.3	0.00000	0.00000	0.000000	0.000000	2.6	0.03121	4E-11	0.00117			
		1st Quartile	0.00052	0.00048	0.0102	0.0116	34.4	<0.000010	<0.0000050	0.00058	0.00050	0.040	0.0168	0.0054	<0.0010	<0.0000020	<0.0000020	32.0	<0.0010	<0.0010	<0.00020	<0.00020	19.8	<0.0050	<0.0050	0.00300			
		Median	0.00069	0.00065	0.0131	0.0130	36.8	<0.000010	<0.0000050	0.00062	0.00055	0.068	0.0388	0.0062	<0.0010	<0.0000020	<0.0000020	35.4	<0.0010	<0.0010	<0.00020	<0.00020	22.2	<0.0050	<0.0050	0.0037			
		3rd Quartile	0.00075	0.00068	0.0280	0.0170	38.8	<0.000010	0.00000425	0.000760	0.00062	0.103	0.0479	0.0161	0.00460	<0.000002	<0.000002	36.6	<0.0010	<0.0010	<0.00020	<0.00020	23.4	0.00410	<0.0050	0.00385			
LQLB	LQLB 1 metre from Bottom	Average	0.00206	0.00097	0.0317	0.0181	34.1	0.0000089	0.00000605	0.00106	0.00070	1.184	0.2998	0.3515	0.2078	0.00000100	0.00000100	34.6	0.00050	0.00050	0.000100	0.000100	15.6	0.00431	0.00250	0.00587			
E292118		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	7			
		Minimum	0.00048	0.00041	0.0193	0.0074	25.4	<0.000005	<0.000005	0.00063	0.00040	0.074	0.0425	0.0059	0.0016	<0.000002	<0.000002	28.1	<0.0010	<0.0010	<0.00020	<0.00020	12.0	<0.0050	<0.0050	<0.0020			
		Maximum	0.00598	0.00141	0.0475	0.0377	37.4	0.000017	0.0000130	0.00342	0.00151	4.19	0.599	0.980	0.750	<0.000002	<0.000002	41.9	<0.0010	<0.0010	<0.00020	<0.00020	20.4	0.0203	<0.0050	0.0098			
		Geometric Mean	0.00162	0.00091	0.0307	0.0169	33.9	0.0000076	0.00000520	0.00094	0.00067	0.662	0.2212	0.1549	0.0894	0.00000100	0.00000100	34.4	0.00050	0.00050	0.000100	0.000100	15.5	0.00319	0.00250	0.00498			
		Count <DL	0	0	0	0	0	8	5	0	0	0	0	0	0	15	15	0	15	15	15	15	0	13	15	1			
		Standard Deviation	0.00152	0.00035	0.0084	0.0074	4.1	0.0000049	0.00000327	0.00070	0.00027	1.198	0.1944	0.3377	0.2188	0.00000000	0.00000000	4.1	0.00000	0.00000	0.000000	0.000000	2.2	0.00503	4E-11	0.00268			
		1st Quartile	0.00089	0.00062	0.0260	0.0132	33.6	<0.000010	<0.000005	0.00070	0.00056	0.260	0.0937	0.0446	0.0347	<0.0000020	<0.0000020	32.2	<0.0010	<0.0010	<0.00020	<0.00020	14.4	<0.0050	<0.0050	0.00510			
		Median	0.00154	0.00106	0.0314	0.0169	35.6	<0.000010	0.0000060	0.00081	0.00065	0.774	0.314	0.270	0.156	<0.0000020	<0.0000020	34.9	<0.0010	<0.0010	<0.00020	<0.00020	15.3	<0.0050	<0.0050	0.0063			
		3rd Quartile	0.00274	0.00124	0.0351	0.0200	36.9	0.0000135	0.0000080	0.00116	0.00076	1.860	0.4270	0.6080	0.3465	<0.000002	<0.000002	37.2	<0.0010	<0.0010	<0.00020	<0.00020	16.2	<0.0050	<0.0050	0.00690			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 67
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E0126402	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Average	0.000124	0.000151	0.0266	0.0212	21	0.0000056	0.00000272	0.000879	0.00068	0.021	0.01248	0.00146	0.00058	0.0000011	0.0000014	20.4	0.0005	0.00054	0.000118	0.000117	1.34	0.00250	0.0025				
		Count	16	16	16	16	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16				
		Minimum	<0.00010	<0.00010	0.0172	0.0142	17.2	<0.000010	<0.0000050	<0.00050	0.00035	0.01	<0.0050	<0.0010	<0.0010	<0.000002	<0.000002	18.4	<0.0010	<0.0010	<0.00020	<0.00020	0.97	<0.0050	<0.0050				
		Maximum	0.00029	0.00028	0.0536	0.0343	24.2	0.000014	0.000006	0.00356	0.0017	0.046	0.0238	0.0042	0.0018	0.0000032	0.0000031	22.2	<0.0010	0.0012	0.00039	0.00037	2.12	<0.0050	<0.0050				
		Geometric Mean	0.000113	0.000141	0.025	0.0207	20.9	0.0000053	0.00000264	0.000749	0.00064	0.019	0.0112	0.00122	0.00054	0.00000108	0.00000128	20.4	0.0005	0.00053	0.000109	0.000109	1.32	0.00250	0.0025				
		Count <DL	3	1	0	0	0	15	15	1	0	0	1	4	15	15	12	0	16	15	15	15	0	16	16				
		Standard Deviation	0.000058	0.000056	0.0111	0.0049	1.5	0.0000023	0.00000088	0.000734	0.00031	0.009	0.00538	0.00096	0.00032	0.00000055	0.00000079	1.3	0	0.00017	0.000072	0.000067	0.28	4E-11	4E-11				
		1st Quartile	0.000108	0.00012	0.0199	0.0174	20.2	<0.000010	<0.0000050	0.000658	0.00054	0.016	0.0093	0.00095	<0.0010	<0.0000020	<0.0000020	19.5	<0.0010	<0.0010	<0.00020	<0.00020	1.21	<0.0050	<0.0050				
		Median	0.00012	0.000145	0.0232	0.0218	21.0	<0.000010	<0.0000050	0.00071	0.00058	0.02	0.0124	0.00135	<0.0010	<0.0000020	<0.000002	20.3	<0.0010	<0.0010	<0.00020	<0.00020	1.3	<0.0050	<0.0050				
		3rd Quartile	0.000132	0.000155	0.0274	0.0236	21.8	<0.000010	<0.0000050	0.000772	0.0007	0.024	0.01498	0.00152	<0.0010	<0.0000020	0.0000014	21.4	<0.0010	<0.0010	<0.00020	<0.00020	1.44	<0.0050	<0.0050				
WD	Settling Pond #4	Average	0.00203	0.00108	0.0467	0.01319	366.5	0.0000282	0.00000775	0.00193	0.00059	0.637	0.0132	0.2017	0.09038	0.000001	0.000001	403	0.01831	0.00395	0.000100	0.000100	733	0.01471	0.00325				
E207409		Count	9	8	9	8	13	9	8	9	8	9	8	9	8	8	8	9	9	8	9	8	53	9	8				
		Minimum	0.00093	0.00032	0.0045	<0.0030	321	<0.000010	<0.0000050	0.00055	0.00024	0.215	0.0094	0.009	<0.0010	<0.0000020	<0.0000020	292	<0.0010	<0.0010	<0.00020	<0.00020	320	<0.0050	<0.0050				
		Maximum	0.00361	0.00181	0.178	0.0297	413	0.000115	0.000033	0.00369	0.00095	1.33	0.0180	0.551	0.362	<0.0000020	<0.0000020	664	0.0925	0.0263	<0.00020	<0.00020	1170	0.0507	0.0085				
		Geometric Mean	0.00182	0.00095	0.0236	0.00967	365.4	0.0000131	0.0000048	0.00147	0.00054	0.506	0.0129	0.1103	0.02302	0.000001	0.000001	390	0.0031	0.0011	0.000100	0.000100	703	0.00701	0.00291				
		Count <DL	0	0	0	1	0	5	4	0	0	0	0	0	1	8	8	0	3	5	9	8	0	5	7				
		Standard Deviation	0.00101	0.00053	0.0564	0.00952	28.7	0.0000383	0.00001045	0.00139	0.00023	0.438	0.003	0.1889	0.12317	0	0.0000000	118	0.03134	0.00904	0.000000	0.000000	211	0.01837	0.00212				
		1st Quartile	0.00133	0.00076	0.0064	0.00695	337	<0.000010	<0.0000050	0.00069	0.00044	0.279	0.0106	0.0893	0.00422	<0.0000020	<0.0000020	304	<0.0010	<0.0010	<0.00020	<0.00020	579	<0.0050	<0.0050				
		Median	0.00157	0.00103	0.0268	0.0102	375	<0.000010	0.00000375	0.00119	0.00056	0.42	0.0134	0.137	0.0403	<0.0000020	<0.0000020	389	0.0013	<0.0010	<0.00020	<0.00020	676	<0.0050	<0.0050				
		3rd Quartile	0.00248	0.00153	0.0521	0.01992	387	0.000038	0.000006	0.00332	0.00073	0.893	0.0152	0.366	0.1335	<0.0000020	<0.0000020	419	0.0267	0.00135	<0.00020	<0.00020	896	0.0168	<0.0050				
MW001D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average		0.0208		0.1134	87.8		0.00000425		0.00204		0.0968		0.0078		0.0000058			0.0005		0.0001	26.8		0.0025		0.168		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0193		0.0989	87.1		<0.0000050		0.00177		0.0746		0.0051		0.0000048			<0.0010		<0.00020	25.8		<0.0050		0.164		
		Maximum		0.0223		0.128	88.4		0.000006		0.0023		0.119		0.0106		0.0000067			<0.0010		<0.00020	27.9		<0.0050		0.172		
		Geometric Mean		0.0207		0.1125	87.7		0.00000387		0.00202		0.0942		0.0074		0.0000057			0.0005		0.0001	26.8		0.0025		0.168		
		Count <DL		0		0	0		1		0		0		0		0			2		2	0		2		0		
		Standard Deviation		0.0021		0.0206	0.9		0.00000247		0.00037		0.0314		0.003900		0.0000013			0		0	1.5		0		0.006		
		1st Quartile		0.0201		0.1062	87.4		0.00000338		0.0019		0.0857		0.0065		0.0000053			<0.0010		<0.00020	26.3		<0.0050		0.166		
		Median		0.0208		0.1134	87.8		0.00000425		0.00204		0.0968		0.0078		0.0000058			<0.0010		<0.00020	26.8		<0.0050		0.168		
		3rd Quartile		0.0216		0.1207	88.1		0.00000512		0.00217		0.1079		0.0092		0.0000062			<0.0010		<0.00020	27.4		<0.0050		0.170		
MW001S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average		0.00009		0.01045	355.5		0.000066		0.0001		0.057		1.316		0.0000043			0.002		0.0001000	810		0.0025		0.00330		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		<0.00010		<0.0030	348		0.0000291		<0.00020		0.0284		0.681		0.0000032			0.0012		<0.00020	644		<0.0050		0.003		
		Maximum		0.00013		0.0194	363		0.000103		<0.00020		0.0857		1.95		0.0000054			0.0027		<0.00020	977		<0.0050		0.0036		
		Geometric Mean		0.00008		0.00539	355.4		0.0000547		0.0001		0.0493		1.152		0.0000042			0.0018		0.0001000	793		0.0025		0.0033		
		Count <DL		1		1	0		0		2		0		0		0			0		2	0		2		0		
		Standard Deviation		0.000057		0.01266	10.6		0.0000523		0		0.0405		0.897		0.0000016			0.0011		0.0000000	235		0		0.00040		
		1st Quartile		0.00007		0.00597	351.8		0.0000476		<0.00020		0.0427		0.998		0.0000038			0.0016		<0.00020	727		<0.0050		0.00320		
		Median		0.00009		0.01045	355.5		0.000066		<0.00020		0.057		1.316		0.0000043			0.002		<0.00020	810		<0.0050		0.00330		
		3rd Quartile		0.00011		0.01492	359.2		0.000085		<0.00020		0.0714		1.633		0.0000048			0.0023		<0.00020	893		<0.0050		0.00340		
MW006D	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Average		0.0284		0.021	80.2		0.0000025		0.00088		0.0087		0.001		0.0000069			0.000500		0.0001000	11.8		0.00515		0.165		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0277		0.0194	78.1		<0.0000050		0.00064		<0.0050		<0.0010		0.0000059			<0.0010		<0.00020	11.6		<0.0050		0.165		
		Maximum		0.0291		0.0226	82.4		<0.0000050		0.00111		0.0148		0.0015		0.0000079			<0.0010		<0.00020	12		0.0078		0.165		
		Geometric Mean		0.0284		0.0209	80.2		0.0000025		0.00084		0.00608		0.00087		0.0000068			0.000500		0.0001000	11.8		0.00442		0.165		
		Count <DL		0		0	0		2		0		1		1		0			2		2	0		1		0		
		Standard Deviation		0.001		0.0023	3.0		0.0000000		0.00033		0.0087		0.00071		0.0000014			0.000000		0.0000000	0.3		0.00375		0		
		1st Quartile		0.028		0.0202	79.2		<0.0000050		0.00076		0.00558		0.00075		0.0000064			<0.0010		<0.00020	11.7		0.00382		0.165		
		Median		0.0284		0.021	80.2		<0.0000050		0.00088		0.0087		0.001		0.0000069			<0.0010		<0.00020	11.8		0.00515		0.165		
		3rd Quartile		0.0288		0.0218	81.3		<0.0000050		0.00099		0.01172		0.00125		0.0000074			<0.0010		<0.00020	11.9		0.00648		0.165		
MW006S	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Average		0.00164		0.00540	179.0		0.0000225		0.00082		0.0156		0.0501		0.0000058			0.0005		0.0001	606.5		0.00250		0.0556		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.00156		0.0041	172		0.000015		0.0008		0.0073		0.0451		0.0000053			<0.0010		<0.00020	606		<0.0050		0.0536		
		Maximum		0.00173		0.0067	186		0.00003		0.00084		0.0239		0.0551		0.0000064			<0.0010		<0.00020	607		<0.0050		0.058		
		Geometric Mean		0.00164		0.0052	178.9		0.0000212		0.00082		0.0132		0.0498		0.0000058			0.00050		0.0001000	606.5		0.0025		0.0556		
		Count <DL		0		0	0		0		0		0		0		0			2		2	0		2		0		
		Standard Deviation		0.00012		0.0018	9.9		0.0000011		0.000030		0.0117		0.0071		0.0000008			0		0.0000000	0.7		0		0.0028		
		1st Quartile		0.0016		0.00480	175.5		0.0000188		0.00081		0.0114		0.0476		0.0000056			<0.0010		<0.00020	606.2		<0.0050		0.0546		
		Median		0.00164		0.00540	179		0.0000225		0.00082		0.0156		0.0501		0.0000058			<0.0010		<0.00020	606.5		<0.0050		0.0556		
		3rd Quartile		0.00169		0.00600	182.5		0.0000262		0.00083		0.0198		0.0526		0.0000061			<0.0010		<0.00020	606.8		<0.0050		0.0566		
WC		Average	0.0008	0.00067	0.019	0.0112	315	0.000024	0.0000205	0.000751	0.000413	0.19	0.0214	0.1125	0.1117	0.000001	0.000001	391	0.01929	0.0191	0.000100	0.000100	691	0.01013	0.00884				
E207411	2-North Pit Culvert discharge into Middle Quinsam Lake	Count	7	7	7	7	2	7	7	7	7	7	7	7	7	6	6	7	7	7	7	7	12	7	7				
		Minimum	0.00054	0.00035	0.0063	0.0037	282	<0.000010	<0.0000050	<0.00050	<0.00020	0.039	0.0095	0.0075	0.0031	<0.0000020	<0.0000020	290	<0.0010	<0.0010	<0.00020	<0.00020	482	<0.0050	<0.0050				
		Maximum	0.00111	0.00096	0.0416	0.0179	348	0.000116	0.000096	0.00176	0.00075	0.451	0.0506	0.533	0.545	<0.0000020	<0.0000020	524	0.114	0.111	<0.00020	<0.00020	1080	0.0507	0.0438				
		Geometric Mean	0.00078	0.00064	0.0149	0.0098	313.3	0.00001	0.00000776	0.00055	0.000348	0.1480	0.0171	0.036	0.0251	0.000001	0.000001	381	0.00219	0.00218	0.000100	0.000100	664	0.00451	0.00422				
		Count <DL	0	0	0	0	0	5	3	3	1	0	0	0	0	6	6	0	4	4	7	7	0	5	5				
		Standard Deviation	0.00022	0.00019	0.0142	0.0055	46.7	0.0000414	0.0000344	0.000631	0.000231	0.143	0.0166	0.1928	0.1998	2E-14	2E-14	94	0.0422	0.04109	0.000000	0.000000	209	0.01799	0.01546				
		1st Quartile	0.00062	0.00058	0.0082	0.0068	298.5	<0.000010	<0.0000050	<0.00050	0.000270	0.107	0.01020	0.0132	0.006	<0.0000020	<0.0000020	314	<0.0010	<0.0010	<0.00020	<0.00020	535	<0.0050	<0.0050				
		Median	0.00084	0.00066	0.0136	0.0117	315	<0.000010	0.000006	0.00056	0.00035	0.132	0.0132	0.0213	0.0166	<0.0000020	<0.0000020	370	<0.0010	<0.0010	<0.00020	<0.00020	600	<0.0050	<0.0050				
		3rd Quartile	0.00095	0.00078	0.0274	0.0158	331.5	0.000016	0.000017	0.001095	0.000575	0.2470	0.028	0.0998	0.1026	<0.0000020	<0.0000020	463	0.00950	0.01035	<0.00020	<0.00020	853	0.0051	0.00405				
MQL1	Middle Quinsam Lake 1 metre below surface	Average	0.00019	0.0001600	0.0256	0.0194	32.6	0.000005	0.00000303	0.000703	0.00061	0.043	0.0187	0.0059	0.00153	0.00000134	0.00000112	34.3	0.00067	0.00065	0.0001	0.0001	27.64	0.0025	0.00276	0.0036			
E206618		Count	15	15	15	15	4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3			
		Minimum	0.00011	0.00011	0.0134	0.0113	29	<0.000010	<0.0000050	<0.00050	0.0004	0.028	0.0064	0.0039	<0.0010	<0.0000020	<0.0000020	22.8	<0.0010	<0.0010	<0.00020	<0.00020	7.66	<0.0050	<0.0050	0.0029			
		Maximum	0.0008	0.0002	0.0635	0.0323	37.1	<0.000010	0.000008	0.00114	0.00142	0.065	0.0309	0.0072	0.0051	0.0000042	0.0000028	39.5	0.0018	0.0017	<0.00020	<0.00020	38.7	<0.0050	0.0064	0.0042			
		Geometric Mean	0.00016	0.00016	0.0228	0.0186	32.5	0.000005	0.00000283	0.000663	0.00058	0.041	0.0175	0.0058	0.00094	0.00000118	0.00000107	34	0.00059	0.00059	0.0001	0.00010000	26.24	0.0025	0.00266	0.0035			
		Count <DL	0	0	0	0	0	15	13	1	0	0	0	0	10	13	14	0	13	13	15	15	0	15	14	0			
		Standard Deviation	0.00017	0.00003	0.0144	0.0061	3.4	1E-13	0.00000152	0.000239	0.00024	0.013	0.0066	0.0011	0.00168	0.00000093	0.00000046	4.2	0.00044	0.00041	0	0	7.44	4E-11	0.00101	0.0007			
		1st Quartile	0.00013	0.00014	0.0165	0.0152	30.9	<0.000010	<0.0000050	0.000565	0.000480	0.032	0.0148	0.0048	<0.0010	<0.0000020	<0.0000020	32.4	<0.0010	<0.0010	<0.00020	<0.00020	24.45	<0.0050	<0.0050	0.0032			
		Median	0.00015	0.0001700	0.0203	0.0175	32.2	<0.000010	<0.0000050	0.000680	0.00053	0.038	0.0176	0.0061	<0.0010	<0.0000020	<0.0000020	34.8	<0.0010	<0.0010	<0.00020	<0.00020	28.30	<0.0050	<0.0050	0.0036			
		3rd Quartile	0.00018	0.00018	0.031	0.0231	34	<0.000010	<0.0000050	0.00073	0.00064	0.052	0.0220	0.0068	0.00230	<0.0000020	<0.0000020	37.7	<0.0010	<0.0010	<0.00020	<0.00020	31.35	<0.0050	<0.0050	0.0039			
MQLB	Middle Quinsam Lake 1 metre from bottom	Average	0.000154	0.000133	0.0202	0.0164	34.6	0.000005	0.00000274	0.000559	0.00058	0.071	0.0238	0.033	0.02559	0.0000001	0.00000100	34.2	0.00068	0.00067	0.0001	0.0001	25.8	0.002500	0.0025	0.00430			
E206618		Count	15	15	15	15	4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3			
		Minimum	<0.00010	<0.00010	0.0076	0.0047	32.6	<0.000010	<0.0000050	<0.00050	0.00032	0.0160	0.0082	0.0017	<0.0010	<0.0000020	<0.0000020	28.6	<0.0010	<0.0010	<0.00020	<0.00020	17	<0.0050	<0.0050	0.0031			
		Maximum	0.00034	0.00017	0.043	0.0291	36	<0.000010	0.0000061	0.00079	0.00093	0.231	0.0498	0.159	0.131	<0.0000020	<0.0000020	39.7	0.0019	0.0018	<0.00020	<0.00020	40	<0.0050	<0.0050	0.0059			
		Geometric Mean	0.000142	0.000128	0.017	0.0144	34.5	0.000005	0.00000265	0.000534	0.000570	0.05	0.0209	0.0115	0.00414	0.000001	0.000001	34.1	0.0006	0.00059	0.0001	0.0001	25.2	0.0025	0.0025	0.00410			
		Count <DL	1	1	0	0	0	15	14	2	0	0	0	0	5	15	15	0	13	13	15	15	0	15	15	0			
		Standard Deviation	0.000065	0.000033	0.0123	0.0078	1.6	1E-13	0.00000093	0.00015	0.00014	0.07	0.0126	0.0484	0.04098	0	0	3	0.00048	0.00046	0	0.00000000	6.2	4E-11	4E-11	0.00150			
		1st Quartile	0.000115	0.00011	0.0102	0.00860	33.6	<0.000010	<0.0000050	0.000525	0.0005	0.029	0.0142	0.0042	<0.0010	<0.0000020	<0.0000020	32.4	<0.0010	<0.0010	<0.00020	<0.00020	23	<0.0050	<0.0050	0.0034			
		Median	0.00014	0.0001400	0.0166	0.0175	34.8	<0.000010	<0.0000050	0.00055	0.000580	0.038	0.0174	0.0066	0.0014	<0.0000020	<0.0000020	34.0	<0.0010	<0.0010	<0.00020	<0.00020	23.8	<0.0050	<0.0050	0.0038			
		3rd Quartile	0.000185	0.00016	0.0248	0.022	35.8	<0.000010	<0.0000050	0.00064	0.00065	0.076	0.0318	0.0506	0.04005	<0.0000020	<0.0000020	36.3	<0.0010	<0.0010	<0.00020	<0.00020	24.6	<0.0050	<0.0050	0.0048			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 68
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E217018		Average	0.00033	0.000350	0.0418	0.035	13.6	0.000005	0.0000025	0.000517	0.00073	0.086	0.0603	0.005	0.00291	0.00000128	0.00000119	13.9	0.0005	0.00066	0.0001	0.0001	1.025	0.0025	0.0025	0.0087			
		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3			
		Minimum	0.00018	0.00022	0.0221	0.017	11.3	<0.000010	<0.0000050	<0.00050	0.00037	0.035	0.0325	0.0032	<0.0010	<0.0000020	<0.0000020	9.96	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050	<0.0020			
		Maximum	0.00055	0.00053	0.0803	0.0603	16.8	<0.000010	<0.0000050	0.00112	0.00279	0.127	0.0817	0.0081	0.0053	0.000004	0.0000025	19.4	<0.0010	0.0029	<0.00020	<0.00020	1.95	<0.0050	<0.0050	0.0163			
	No Name Lake 1 metre below surface	Geometric Mean	0.00031	0.00033	0.0376	0.0327	13.4	0.00000500	0.0000025	0.000454	0.00063	0.08	0.058	0.00480	0.00248	0.00000116	0.00000112	13.64	0.0005	0.00056	0.0001	0.0001	0.849	0.0025	0.0025	0.00523			
		Count <DL	0	0	0	0	0	15	15	6	0	0	0	0	1	13	13	0	15	14	15	15	3	15	15	1			
		Standard Deviation	0.000130	0.00012	0.0208	0.0135	2.7	1E-13	1E-13	0.00027	0.00059	0.03	0.0162	0.0014	0.00148	0.00000081	0.00000049	2.87	0	0.00062	0.00000000	0	0.553	4E-11	4E-11	0.00765			
		1st Quartile	0.00024	0.00025	0.0256	0.0232	11.6	<0.000010	<0.0000050	<0.00050	0.00048	0.058	0.0501	0.0043	0.00195	<0.0000020	<0.0000020	11.95	<0.0010	<0.0010	<0.00020	<0.00020	0.755	<0.0050	<0.0050	0.0049			
		Median	0.00028	0.000310	0.0305	0.0317	12.2	<0.000010	<0.0000050	0.00056	0.00055	0.093	0.0635	0.00460	0.00310	<0.0000020	<0.0000020	12.3	<0.0010	<0.0010	<0.00020	<0.00020	0.97	<0.0050	<0.0050	0.0088			
		3rd Quartile	0.00046	0.00048	0.0639	0.0487	16.3	<0.000010	<0.0000050	0.00064	0.0007	0.107	0.0718	0.0055	0.00425	<0.0000020	<0.0000020	16.8	<0.0010	<0.0010	<0.00020	<0.00020	1.42	<0.0050	<0.0050	0.01255			
NNLB		Average	0.00025	0.00022	0.0478	0.0384	10.4	0.000005	0.0000025	0.000441	0.00049	0.136	0.0812	0.011	0.00672	0.00000107	0.00000109	12.6	0.0005	0.00068	0.0001	0.0001	2.62	0.0025	0.003070	0.00500			
E217018		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	3			
		Minimum	0.00017	0.00017	0.0338	0.0309	9.72	<0.000010	<0.0000050	<0.00050	0.00026	0.049	0.0303	0.0024	<0.0010	<0.0000020	<0.0000020	11	<0.0010	<0.0010	<0.00020	<0.00020	0.68	<0.0050	<0.0050	0.0027			
		Maximum	0.00037	0.00029	0.0756	0.0549	11.3	<0.000010	<0.0000050	0.00111	0.00091	0.255	0.168	0.0364	0.0291	0.0000021	0.0000023	14.5	<0.0010	0.0032	<0.00020	<0.00020	3.77	<0.0050	0.0111	0.0065			
		Geometric Mean	0.00024	0.000220	0.0466	0.0377	10.39	0.000005	0.0000025	0.000387	0.00046	0.119	0.0721	0.0079	0.00383	0.00000105	0.00000106	12.5	0.0005000	0.00057	0.0001	0.0001	2.36	0.0025	0.00276	0.00470			
	No Name Lake 1 metre from bottom	Count <DL	0	0	0	0	0	15	15	8	0	0	0	0	1	14	14	0	15	14	15	15	0	15	14	0			
		Standard Deviation	0.00006	0.00004	0.0118	0.0076	0.59	1E-13	1E-13	0.00025	0.00017	0.067	0.0401	0.0097	0.00756	0.00000028	0.00000034	1.1	0	0.0007000	0	0	0.99	4E-11	0.002220	0.00200			
		1st Quartile	0.0002	0.00019	0.0408	0.0327	10.1	<0.000010	<0.0000050	<0.00050	0.00037	0.065	0.0507	0.0036	0.00145	<0.0000020	<0.0000020	11.9	<0.0010	<0.0010	<0.00020	<0.00020	2.49	<0.0050	<0.0050	0.0043			
		Median	0.00023	0.0002	0.0438	0.0358	10.3	<0.000010	<0.0000050	<0.00050	0.00048	0.141	0.0830	0.0092	0.0059	<0.0000020	<0.0000020	12.4	<0.0010	<0.0010	<0.00020	<0.00020	2.78	<0.0050	<0.0050	0.0059			
		3rd Quartile	0.0003	0.00026	0.0528	0.0395	10.6	<0.000010	<0.0000050	0.000585	0.00054	0.181	0.0957	0.0138	0.0088	<0.0000020	<0.0000020	13.2	<0.0010	<0.0010	<0.00020	<0.00020	3.32	<0.0050	<0.0050	0.0062			
NNO		Average	0.00036	0.00034	0.0457	0.0352	13.16	0.0000077	0.00000283	0.000591	0.00054	0.091	0.0582	0.006	0.00256	0.0000024	0.0000013	14	0.0005	0.00050	0.000100	0.000100	1.2	0.0025	0.0025	0.0082	0.0097		
E217017		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	2	2		
		Minimum	0.00017	0.0002	0.0257	0.0192	9.74	<0.000010	<0.0000050	<0.00050	0.00021	0.03	0.0252	0.0031	<0.0010	<0.000002	<0.000002	10.3	<0.0010	<0.0010	<0.00020	<0.00020	0.58	<0.0050	<0.0050	0.0066	0.0084		
		Maximum	0.00061	0.00055	0.0766	0.0588	17.5	0.000046	0.0000050	0.00188	0.00094	0.152	0.084	0.0166	0.0051	0.0000074	0.0000033	18	<0.0010	<0.0010	<0.00020	<0.00020	2.06	<0.0050	<0.0050	0.0099	0.011		
		Geometric Mean	0.00033	0.00033	0.0423	0.0330	12.93	0.0000058	0.00000274	0.000484	0.00052	0.082	0.0546	0.0054	0.00203	0.00000169	0.00000117	13.8	0.0005	0.00050	0.000100	0.000100	1.11	0.0025	0.0025	0.0081	0.0096		
	No Name Lake Outlet	Count <DL	0	0	0	0	0	14	13	6	0	0	0	0	3	10	13	0	15	15	15	15	0	15	15	0	0		
		Standard Deviation	0.00015	0.00012	0.0189	0.0135	2.6	0.0000106	0.00000088	0.000434	0.00017	0.0390	0.0193	0.0033	0.00144	0.00000229	0.00000079	2.5	0	0.00000	0.000000	0.000000	0.5	4E-11	4E-11	0.0023	0.0018		
		1st Quartile	0.00022	0.00026	0.0309	0.0247	11.1	<0.000010	<0.0000050	<0.00050	0.00047	0.056	0.0434	0.0044	0.00165	<0.0000020	<0.0000020	12.1	<0.0010	<0.0010	<0.00020	<0.00020	0.88	<0.0050	<0.0050	0.0074	0.009		
		Median	0.00031	0.0003	0.0374	0.0307	12.5	<0.000010	<0.0000050	0.00056	0.00053	0.095	0.0624	0.0051	0.0026	<0.0000020	<0.0000020	12.7	<0.0010	<0.0010	<0.00020	<0.00020	1.05	<0.0050	<0.0050	0.0082	0.0097		
		3rd Quartile	0.00048	0.00044	0.0655	0.0454	15.5	<0.000010	<0.0000050	0.00066	0.00055	0.118	0.0728	0.0066	0.0033	0.00000315	<0.0000020	16.5	<0.0010	<0.0010	<0.00020	<0.00020	1.68	<0.0050	<0.0050	0.0091	0.0104		
LLS		Average	0.00376	0.0017	0.0081	0.0065	233.4	0.00000500	0.00000667	0.000273	0.000236	1.159	0.00598	0.288	0.286	0.0000011	0.0000010	556	0.0016	0.0015	0.000100	0.0001	500	0.00282	0.0025	0.0021			
E292131		Count	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	3			
		Minimum	0.00077	0.00055	<0.0030	<0.0030	201	<0.000010	<0.0000050	<0.00050	<0.00020	0.255	<0.0050	0.159	0.152	<0.0000020	<0.0000020	431	0.0011	0.0011	<0.00020	<0.00020	333	<0.0050	<0.0050	<0.0020			
		Maximum	0.00939	0.00292	0.0206	0.0128	256	<0.000010	0.000049	0.00053	0.00051	3.6	0.022	0.439	0.443	0.0000025	<0.0000020	744	0.0028	0.0025	<0.00020	<0.00020	656	0.0064	<0.0050	0.003			
		Geometric Mean	0.00292	0.00148	0.00551	0.00533	232.8	0.000005	0.00000345	0.000266	0.00019	0.857	0.00384	0.272	0.27	0.00000108	0.000001	548	0.0015	0.0015	0.000100	0.0001	488	0.0027	0.0025	0.0019			
	Small Seep into Long Lake	Count <DL	0	0	3	2	0	12	10	11	6	0	9	0	0	11	12	0	0	0	12	12	0	11	12	1			
		Standard Deviation	0.00257	0.00083	0.00669	0.00383	17	1E-13	0.00001337	0.000081	0.000158	0.968	0.00745	0.096	0.095	0.00000043	0	96	0.0005	0.0005	0.000000	0.000000	114	0.00113	1E-10	0.00101			
		1st Quartile	0.00176	0.00089	0.00285	0.00428	226	<0.000010	<0.0000050	<0.00050	<0.00020	0.492	<0.0050	0.22	0.222	<0.0000020	<0.0000020	458	0.0013	0.0013	<0.00020	<0.00020	393	<0.0050	<0.0050	0.00165			
		Median	0.00348	0.00172	0.0056	0.0054	231.5	<0.000010	<0.0000050	<0.00050	0.000170	0.91	<0.0050	0.300	0.289	<0.0000020	<0.0000020	574	0.0014	0.0013	<0.00020	<0.00020	543	<0.0050	<0.0050	0.0023			
		3rd Quartile	0.00537	0.00237	0.01478	0.0094	246.5	<0.000010	<0.0000050	<0.00050	0.000360	1.56	0.00328	0.359	0.354	<0.0000020	<0.0000020	612	0.0016	0.0016	<0.00020	<0.00020	571	<0.0050	<0.0050	0.00265			
LLSM		Average	0.00181	0.00122	0.02865	0.01710	212.9	0.000005	0.00000531	0.000483	0.000408	0.562	0.00579	0.1786	0.1749	0.000001	0.000001	525	0.0021	0.0021	0.0001	0.0001	470	0.0025	0.0025				
E292131		Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
		Minimum	0.00111	0.00048	<0.0030	0.004	163	<0.000010	<0.0000050	<0.00050	<0.00020	0.288	<0.0050	0.0842	0.0902	<0.0000020	<0.0000020	377	0.0016	0.0016	<0.00020	<0.00020	320	<0.0050	<0.0050				
		Maximum	0.00282	0.00178	0.107	0.0613	235	<0.000010	0.000017	0.00154	0.00081	0.758	0.0144	0.281	0.252	<0.0000020	<0.0000020	653	0.0035	0.0032	<0.00020	<0.00020	519	<0.0050	<0.0050				
		Geometric Mean	0.00172	0.00115	0.01314	0.0113	211.7	0.000005	0.00000401	0.000364	0.00035	0.532	0.00434	0.1671	0.164	0.000001	0.000001	518	0.002	0.0021	0.000100	0.0001	466	0.0025	0.00250				
	Long Lake Middle Seep	Count <DL	0	0	1	0	0	8	5	6	1	0	5	0	0	8	8	0	0	0	8	8	0	8	8				
		Standard Deviation	0.00061	0.00042	0.03627	0.0191	22.6	1E-13	0.00000512	0.000472	0.00022	0.182	0.00491	0.0661	0.0629	0.0000000	0.0000000	86	0.0006	0.0005	0	0	66	3E-11	3E-11				
		1st Quartile	0.00128	0.00107	0.00402	0.0052	209	<0.000010	<0.0000050	<0.00050	0.000235	0.414	<0.0050	0.1360	0.1272	<0.0000020	<0.0000020	473	0.0017	0.0018	<0.00020	<0.00020	459	<0.0050	<0.0050				
		Median	0.00176	0.0011	0.01645	0.0108	216.5	<0.000010	<0.0000050	<0.00050	0.00043	0.602	<0.0050	0.1775	0.1790	<0.0000020	<0.0000020	535	0.002	0.002	<0.00020	<0.00020	491	<0.0050	<0.0050				
		3rd Quartile	0.0022	0.00153	0.03158	0.0173	227	<0.000010	0.00000575	0.000392	0.000508	0.72	0.0086	0.2222	0.2275	<0.0000020	<0.0000020	580	0.0021	0.0022	<0.00020	<0.00020	512	<0.0050	<0.0050				

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 69
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW002	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Average		0.0006		0.00395	203.2		0.0000081		0.000100		2.68		2.53		0.0000031			0.0027		0.000100	1265		0.0025		0.00190		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.0004		<0.0030	187		<0.0000050		<0.00020		2.39		2.4		<0.0000020			0.0025		<0.00020	1210		<0.0050		<0.0020		
		Maximum		0.00082		0.0097	215		0.000012		<0.00020		3.07		2.68		0.0000051			0.0029		<0.00020	1320		<0.0050		0.0046		
		Geometric Mean		0.00058		0.00287	203		0.0000068		0.0001		2.67		2.53		0.0000027			0.0027		0.000100	1264		0.0025		0.00146		
		Count <DL		0		2	0		1		4		0		0		1			0		4	0		4		3		
		Standard Deviation		0.0002		0.00391	11.7		0.0000047		0		0.29		0.12		0.0000017			0.0002		0.000000	49		0		0.0018		
		1st Quartile		0.00046		<0.0030	200.5		0.00000512		<0.00020		2.51		2.48		0.0000025			0.0026		<0.00020	1232		<0.0050		<0.0020		
		Median		0.0006		0.0023	205.5		0.000009		<0.00020		2.62		2.51		0.00000315			0.0026		<0.00020	1265		<0.0050		<0.0020		
		3rd Quartile		0.00074		0.00475	208.2		0.000012		<0.00020		2.79		2.56		0.00000375			0.0028		<0.00020	1297		<0.0050		0.00190		
QU1009D	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.0988		0.00150	186		0.0000025		0.000100		0.544		0.131		0.0000028			0.000500		0.0001000	89.3		0.00250		0.0403		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.098		<0.0030	184		<0.0000050		<0.00020		0.346		0.115		<0.0000020			<0.0010		<0.00020	84.8		<0.0050		0.0338		
		Maximum		0.1		<0.0030	188		<0.0000050		<0.00020		0.741		0.147		0.0000045			<0.0010		<0.00020	93.8		<0.0050		0.0468		
		Geometric Mean		0.0988		0.0015	186		0.0000025		0.000100		0.506		0.13		0.0000021			0.000500		0.0001000	89.2		0.00250		0.0398		
		Count <DL		0		2	0		2		2		0		0		1			2		2	0		2		0		
		Standard Deviation		0.0016		0	2.8		0.0000000		0.000000		0.279		0.023		0.0000025			0.000000		0.0000000	6.4		0.00000		0.0092		
		1st Quartile		0.0983		<0.0030	185		<0.0000050		<0.00020		0.445		0.123		0.00000188			<0.0010		<0.00020	87		<0.0050		0.037		
		Median		0.0988		<0.0030	186		<0.0000050		<0.00020		0.544		0.131		0.00000275			<0.0010		<0.00020	89.3		<0.0050		0.0403		
		3rd Quartile		0.0994		<0.0030	187		<0.0000050		<0.00020		0.642		0.139		0.00000362			<0.0010		<0.00020	91.6		<0.0050		0.0436		
QU1009S	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.0868		0.00150	144.5		0.0000025		0.000100		5.4		0.38		0.0000046			0.000500		0.0001000	112.5		0.00250		0.0290		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0829		<0.0030	132		<0.0000050		<0.00020		5.07		0.354		0.0000033			<0.0010		<0.00020	109		<0.0050		0.0232		
		Maximum		0.0907		<0.0030	157		<0.0000050		<0.00020		5.72		0.405		0.0000058			<0.0010		<0.00020	116		<0.0050		0.0347		
		Geometric Mean		0.0867		0.0015	144		0.0000025		0.000100		5.39		0.379		0.0000044			0.0005		0.0001000	112.4		0.00250		0.0284		
		Count <DL		0		2	0		2		2		0		0		0			2		2	0		2		0		
		Standard Deviation		0.0055		0	17.7		0.0000000		0.000000		0.46		0.036		0.0000018			0		0.0000000	4.9		0.00000		0.0081		
		1st Quartile		0.0849		<0.0030	138.2		<0.0000050		<0.00020		5.23		0.367		0.0000039			<0.0010		<0.00020	110.8		<0.0050		0.0261		
		Median		0.0868		<0.0030	144.5		<0.0000050		<0.00020		5.4		0.38		0.0000046			<0.0010		<0.00020	112.5		<0.0050		0.029		
		3rd Quartile		0.0888		<0.0030	150.8		<0.0000050		<0.00020		5.56		0.392		0.0000052			<0.0010		<0.00020	114.2		<0.0050		0.0318		
SPD	Settling Pond # 1		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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E218582		Average	0.00093	0.00064	0.0597	0.01586	102.00	0.000005	0.00000438	0.001293	0.00076	0.893	0.0812	0.1021	0.09174	0.00000116	0.000001	318.3	0.00269	0.00255	0.0001	0.000100	282.6	0.00250	0.0025	0.0105	0.0073		
		Count	12	12	12	12	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	45	12	12	10	11		
		Minimum	0.0003	0.00023	0.0032	<0.0030	22.50	<0.000010	<0.0000050	<0.00050	0.00031	0.145	0.0102	0.0059	<0.0010	<0.0000020	<0.0000020	37.4	<0.0010	<0.0010	<0.00020	<0.00020	32.8	<0.0050	<0.0050	0.0053	0.0026		
		Maximum	0.00335	0.00273	0.254	0.0768	280.0	<0.000010	0.000015	0.00321	0.00153	2.85	0.138	0.544	0.56	0.0000029	<0.0000020	520	0.0067	0.0073	<0.00020	<0.00020	632	<0.0050	<0.0050	0.0218	0.0228		
		Geometric Mean	0.00075	0.00049	0.0284	0.00978	81	0.000005	0.00000357	0.001085	0.00071	0.501	0.0619	0.0541	0.0194	0.0000011	0.0000010	266.6	0.00189	0.00171	0.0001	0.000100	225.40	0.0025	0.0025	0.0095	0.00600		
		Count <DL	0	0	0	1	0	12	8	1	0	0	0	0	3	11	12	0	2	3	12	12	0	12	12	0	0		
		Standard Deviation	0.00080	0.00068	0.0715	0.02031	74.1	1E-13	0.00000371	0.000791	0.00031	0.969	0.0507	0.1468	0.15459	0.0000006	0	150.4	0.00226	0.00228	0.000000	0.000000	163.3	1E-10	1E-10	0.0053	0.0058		
		1st Quartile	0.00055	0.00032	0.0069	0.00538	48.8	<0.000010	<0.0000050	0.00091	0.00058	0.202	0.0331	0.0271	0.0044	<0.0000020	<0.0000020	183.5	0.001	0.00095	<0.00020	<0.00020	151	<0.0050	<0.0050	0.0071	0.004		
		Median	0.00074	0.0004	0.0386	0.0106	92	<0.000010	<0.0000050	0.00103	0.00074	0.298	0.0934	0.0607	0.04905	<0.0000020	<0.0000020	341.5	0.00165	0.0014	<0.00020	<0.00020	267.00	<0.0050	<0.0050	0.0088	0.0055		
		3rd Quartile	0.00099	0.00063	0.0866	0.01485	118.5	<0.000010	0.00000500	0.001655	0.00082	1.748	0.1260	0.0921	0.09335	<0.0000020	<0.0000020	440.5	0.0037	0.00342	<0.00020	<0.00020	441	<0.0050	<0.0050	0.01040	0.0087		
LLE	Long Lake Entrance (LLE)	Average	0.00085	0.00072	0.065	0.02323	71.9	0.00000500	0.00000282	0.000583	0.00046	0.327	0.165	0.0499	0.0472	0.00000135	0.0000014	268.8	0.00050	0.0005	0.0001	0.000100	229.6	0.0025	0.00250	0.0081	0.0084	0.0395	0.01663
E292130		Count	14	14	14	14	12	14	14	14	14	14	14	14	14	13	13	14	14	14	14	14	52	14	14	13	2	12	12
		Minimum	0.00055	0.00049	0.0071	<0.0030	38.1	<0.000010	<0.0000050	<0.00050	<0.00020	0.142	0.0306	0.0184	0.0024	<0.0000020	<0.0000020	95.8	<0.0010	<0.0010	<0.00020	<0.00020	81.3	<0.0050	<0.0050	0.004	0.0063	<0.020	<0.0050
		Maximum	0.00144	0.00119	0.192	0.0676	106	<0.000010	0.000007	0.00131	0.00072	0.812	0.595	0.107	0.119	0.0000028	0.0000058	610	<0.0010	<0.0010	<0.00020	<0.00020	566	<0.0050	<0.0050	0.0182	0.0106	0.105	0.0560
		Geometric Mean	0.00082	0.0007	0.0402	0.01441	68.8	0.000005	0.00000269	0.0005	0.000423	0.298	0.1246	0.0453	0.0355	0.00000123	0.00000114	219.9	0.0005	0.0005	0.0001	0.000100	198.6	0.0025	0.00250	0.0074	0.0082	0.0269	0.0109
		Count <DL	0	0	0	1	0	14	13	5	1	0	0	0	0	10	12	0	14	14	14	14	0	0	14	14	0	0	5	3
		Standard Deviation	0.00024	0.00019	0.0572	0.01985	21.2	1E-13	0.0000012	0.000328	0.000158	0.166	0.1477	0.0232	0.0299	0.00000067	0.00000133	179.1	0	0	0	0.000000	133.7	1E-10	0.00000	0.0038	0.003	0.0328	0.01515
		1st Quartile	0.00067	0.00056	0.0141	0.0062	58.8	<0.000010	<0.0000050	<0.00050	0.00038	0.24	0.093	0.035	0.0273	<0.0000020	<0.0000020	135.5	<0.0010	<0.0010	<0.00020	<0.00020	139.8	<0.0050	<0.0050	0.0062	0.0074	<0.020	0.00542
		Median	0.0008	0.00072	0.0601	0.02075	73.1	<0.000010	<0.0000050	0.00055	0.00047	0.302	0.119	0.0468	0.0496	<0.0000020	<0.0000020	197.5	<0.0010	<0.0010	<0.00020	<0.00020	183.5	<0.0050	<0.0050	0.007	0.0084	0.028	0.015
		3rd Quartile	0.00091	0.00076	0.0959	0.03645	87.4	<0.000010	<0.0000050	0.000742	0.000568	0.326	0.1755	0.060	0.0598	<0.0000020	<0.0000020	397.5	<0.0010	<0.0010	<0.00020	<0.00020	267.2	<0.0050	<0.0050	0.00970	0.0095	0.0652	0.02325
LLM1	Long Lake Middle 1 metre below Surface	Average	0.00047	0.00044	0.0324	0.0256	31.9	0.00000500	0.00000485	0.000433	0.00053	0.068	0.0407	0.0084	0.0027	0.00000108	0.00000126	63.1	0.00050	0.00050	0.000100	0.000100	50.43	0.00250	0.00250	0.0038			
E206619		Count	15	15	15	15	6	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	5		
		Minimum	0.00034	0.0003	0.0073	0.0066	13.4	<0.000010	<0.0000050	<0.00050	<0.00020	0.032	0.0193	0.0043	<0.0010	<0.000002	<0.000002	12.8	<0.0010	<0.0010	<0.00020	<0.00020	3.6	<0.0050	<0.0050	0.0027			
		Maximum	0.00071	0.00063	0.0775	0.0513	37.8	<0.000010	0.0000241	0.00132	0.001	0.127	0.0719	0.0204	0.0107	0.0000022	0.0000035	91.8	<0.0010	<0.0010	<0.00020	<0.00020	81.1	<0.0050	<0.0050	0.0057			
		Geometric Mean	0.00045	0.00043	0.0233	0.0206	30.2	0.000005	0.00000341	0.00037	0.0004469	0.062	0.0371	0.0076	0.0016	0.00000105	0.00000115	52.5	0.00050	0.00050	0.000100	0.000100	35.94	0.0025	0.00250	0.0037			
		Count <DL	0	0	0	0	0	15	12	9	1	0	0	0	6	14	13	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00012	0.00011	0.0265	0.0170	9.3	0.00000000	0.00000606	0.000295	0.000225	0.032	0.0185	0.0044	0.00288	0.00000031	0.00000072	29.7	0.00000	0.00000	0.000000	0.000000	27.88	4E-11	0.00000	0.0012			
		1st Quartile	0.00038	0.00036	0.0114	0.0124	33.2	<0.000010	<0.0000050	<0.00050	0.000385	0.044	0.0276	0.0052	<0.0010	<0.0000020	<0.0000020	39	<0.0010	<0.0010	<0.00020	<0.00020	30.85	<0.0050	<0.0050	0.003			
		Median	0.0004	0.0004	0.018	0.018	35.4	<0.000010	<0.0000050	<0.00050	0.0005	0.059	0.033	0.0077	0.002	<0.0000020	<0.000002	76.6	<0.0010	<0.0010	<0.00020	<0.00020	62.5	<0.0050	<0.0050	0.0033			
		3rd Quartile	0.0006	0.00055	0.0584	0.0445	36.8	<0.000010	<0.0000050	0.000565	0.000615	0.0940	0.0562	0.0088	0.0034	<0.0000020	<0.0000020	84.8	<0.0010	<0.0010	<0.00020	<0.00020	69.45	<0.0050	<0.0050	0.0043			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 70
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LLMB	Long Lake Middle 1 metre From Bottom	Average	0.00029	0.00024	0.0168	0.0119	48.8	0.00000500	0.00000411	0.00039	0.000419	0.052	0.01493	0.3531	0.1721	0.000001	0.000001	134	0.00050	0.00050	0.000100	0.000100		0.00250	0.00250	0.00360			
E206619		Count	15	15	15	15	6	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	5			
		Minimum	0.00017	0.00019	0.0095	0.0044	47.1	<0.000010	<0.0000050	<0.00050	<0.00020	0.026	<0.0050	0.0378	<0.0010	<0.000002	<0.000002	87.6	<0.0010	<0.0010	<0.00020	<0.00020	123	<0.0050	<0.0050	0.003			
		Maximum	0.00034	0.00029	0.0278	0.0236	50.3	<0.000010	0.0000186	0.00085	0.00091	0.075	0.0317	1.02	0.62	<0.000002	<0.000002	158	<0.0010	<0.0010	<0.00020	<0.00020	138	<0.0050	<0.0050	0.0047			
		Geometric Mean	0.00029	0.00024	0.016	0.0101	48.7	0.000005	0.00000314	0.000346	0.000385	0.05	0.01112	0.2128	0.03415	0.000001	0.000001	133	0.00050	0.00050	0.000100	0.000100	131.1	0.00250	0.00250	0.00360			
		Count <DL	0	0	0	0	0	15	13	10	1	0	2	0	3	15	15	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00004	0.00003	0.0057	0.0068	1.3	1E-13	0.00000451	0.000214	0.000172	0.013	0.0106	0.337	0.2069	0	0	15.4	0.00000	0.00000	0.000000	0.000000	3.4	4E-11	0.00000	0.00070			
		1st Quartile	0.00028	0.00022	0.013	0.0051	48	<0.000010	<0.0000050	<0.00050	0.00035	0.043	0.00605	0.0754	0.02275	<0.0000020	<0.0000020	131	<0.0010	<0.0010	<0.00020	<0.00020	130	<0.0050	<0.0050	0.0031			
		Median	0.00029	0.00024	0.0144	0.0107	48.4	<0.000010	<0.0000050	<0.00050	0.00041	0.05	0.01180	0.174	0.0506	<0.0000020	<0.0000020	134	<0.0010	<0.0010	<0.00020	<0.00020	132.0	<0.0050	<0.0050	0.0033			
		3rd Quartile	0.0003	0.00026	0.0201	0.0176	49.9	<0.000010	<0.0000050	0.00058	0.00046	0.06	0.02400	0.4845	0.361	<0.000002	<0.000002	143.5	<0.0010	<0.0010	<0.00020	<0.00020	132.5	<0.0050	<0.0050	0.004			
LLO	Long Lake Outlet	Average	0.00045	0.00043	0.0383	0.0241	29.1	0.0000056	0.00000250	0.000458	0.00051	0.0680	0.0397	0.0075	0.00198	0.00000149	0.00000165	64.7	0.0005	0.00050	0.000100	0.000100	57	0.00250	0.00250	0.00401	0.00530		
E219412		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	52	15	15	7	2		
		Minimum	0.00034	0.0003	0.0088	0.0046	15	<0.000010	<0.0000050	<0.00050	<0.00020	0.015	0.0116	0.0033	<0.0010	<0.000002	<0.000002	18.3	<0.0010	<0.0010	<0.00020	<0.00020	10.7	<0.0050	<0.0050	<0.0020	0.0027		
		Maximum	0.00057	0.00057	0.102	0.0568	38.6	0.000014	<0.0000050	0.001	0.00108	0.158	0.087	0.0152	0.0052	0.0000047	0.000006	91.1	<0.0010	<0.0010	<0.00020	<0.00020	101	<0.0050	<0.0050	0.007	0.0079		
		Geometric Mean	0.00044	0.00042	0.0258	0.0177	27.9	0.0000054	0.0000025	0.000399	0.000443	0.055	0.0323	0.0067	0.00146	0.0000013	0.0000014	58.2	0.0005	0.00050	0.000100	0.000100	49.8	0.00250	0.00250	0.00346	0.00460		
		Count <DL	0	0	0	0	0	14	15	8	1	0	0	0	5	12	11	0	15	15	15	15	0	15	15	1	0		
		Standard Deviation	0.00007	0.00007	0.0345	0.0185	7.9	0.0000023	1E-13	0.000255	0.000272	0.046	0.0264	0.0035	0.00142	0.00000113	0.00000141	24.6	0	0.00000	0.000000	0.000000	26.2	4E-11	4E-11	0.00202	0.0037		
		1st Quartile	0.00039	0.00038	0.0113	0.0086	25.1	<0.000010	<0.0000050	<0.00050	0.00037	0.036	0.0199	0.0048	<0.0010	<0.0000020	<0.0000020	48.6	<0.0010	<0.0010	<0.00020	<0.00020	32.6	<0.0050	<0.0050	0.0028	0.004		
		Median	0.00043	0.00041	0.0209	0.016	32.9	<0.000010	<0.0000050	<0.00050	0.00042	0.043	0.0285	0.0072	0.0017	<0.000002	<0.000002	76.9	<0.0010	<0.0010	<0.00020	<0.00020	62.5	<0.0050	<0.0050	0.0039	0.0053		
		3rd Quartile	0.0005	0.00047	0.0712	0.04	34.2	<0.000010	<0.0000050	0.000605	0.00056	0.110	0.0635	0.0100	0.00295	<0.0000020	0.0000015	80.1	<0.0010	<0.0010	<0.00020	<0.00020	77.5	<0.0050	<0.0050	0.0053	0.0066		
WB	Middle Quinsam Lake Outlet	Average	0.00021	0.00021	0.0265	0.0202	30.9	0.000005	0.00000323	0.000641	0.00066	0.049	0.0265	0.0072	0.00185	0.0000013	0.0000011	35.3	0.00050	0.00050	0.000100	0.000100	28.6	0.00250	0.00250	0.00320			
E0900504		Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	4			
		Minimum	0.0001	0.00014	0.0137	0.0129	22.3	<0.000010	<0.0000050	<0.00050	0.00045	0.023	0.0114	0.0038	<0.0010	<0.000002	<0.000002	27.6	<0.0010	<0.0010	<0.00020	<0.00020	17.7	<0.0050	<0.0050	0.0021			
		Maximum	0.00037	0.00025	0.0506	0.0385	35.7	<0.000010	0.00001	0.00135	0.00147	0.099	0.0568	0.0103	0.0071	0.0000048	0.0000022	44.7	<0.0010	<0.0010	<0.00020	<0.00020	40.4	<0.0050	<0.0050	0.005			
		Geometric Mean	0.0002	0.000210	0.0237	0.019	30.7	0.000005	0.00000291	0.000591	0.00062	0.045	0.0241	0.007	0.00122	0.00000111	0.00000105	35.1	0.00050	0.00050	0.000100	0.000100	27.9	0.00250	0.00250	0.00310			
		Count <DL	0	0	0	0	0	15	13	2	0	0	0	0	7	14	14	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00007	0.00004	0.0136	0.0078	3.8	1E-13	0.00000208	0.000267	0.00027	0.0230	0.013	0.0019	0.00182	0.00000098	0.00000031	4.3	0.00000	0.00000	0.000000	0.000000	6.3	4E-11	4E-11	0.0013			
		1st Quartile	0.00016	0.00018	0.0169	0.0152	30.4	<0.000010	<0.0000050	0.000535	0.00052	0.034	0.0174	0.0058	<0.0010	<0.0000020	<0.0000020	32.6	<0.0010	<0.0010	<0.00020	<0.00020	24.4	<0.0050	<0.0050	0.0025			
		Median	0.0002	0.000220	0.0182	0.0177	31.5	<0.000010	<0.0000050	0.00057	0.00054	0.044	0.0245	0.0075	0.0014	<0.0000020	<0.0000020	34.6	<0.0010	<0.0010	<0.00020	<0.00020	28.9	<0.0050	<0.0050	0.0029			
		3rd Quartile	0.00026	0.000240	0.0382	0.0227	33.5	<0.000010	<0.0000050	0.00073	0.00068	0.056	0.0286	0.0087	0.00285	<0.000002	<0.0000020	38.5	<0.0010	<0.0010	<0.00020	<0.00020	31.4	<0.0050	<0.0050	0.0036			
7SSD			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E292069	Settling Pond at 7S- Discharge to Stream 1 -7S	Average	0.00251	0.00204	0.1667	0.00909	141.8	0.0000064	0.00000368	0.00161	0.001	0.248	0.01791	0.0834	0.05288	0.00000119	0.000001	147	0.00059	0.0005	0.0001	0.0001	15.82	0.0025	0.0025				
		Count	17	17	17	17	17	17	17	17	17	17	17	17	17	16	17	17	17	17	17	17	17	17	17				
		Minimum	0.00063	0.00029	0.0228	<0.0030	50.7	<0.000010	<0.0000050	0.00055	0.00043	0.057	<0.0050	0.01	<0.0010	<0.0000020	<0.0000020	63.5	<0.0010	<0.0010	<0.00020	<0.00020	8.22	<0.0050	<0.0050				
		Maximum	0.0112	0.01	1.03	0.0298	219	0.000019	0.000009	0.00511	0.00347	1.37	0.085	0.479	0.423	0.0000029	<0.0000020	230	0.002	<0.0010	<0.00020	<0.00020	31	<0.0050	<0.0050				
		Geometric Mean	0.0016	0.00114	0.0823	0.00501	130.5	0.00000590	0.00000322	0.00128	0.00084	0.154	0.00975	0.0570	0.01442	0.00000112	0.000001	138.1	0.00054	0.0005	0.000100	0.000100	14.94	0.0025	0.00250				
		Count <DL	0	0	0	6	0	14	13	0	0	0	4	0	2	14	17	0	16	17	17	17	0	17	17				
		Standard Deviation	0.00284	0.00261	0.2564	0.01005	51.3	0.0000036	0.00000231	0.00127	0.00075	0.326	0.02177	0.1071	0.1006	0.00000054	0	49.7	0.00036	0	0	0.000000	5.7	4E-11	0.00000				
		1st Quartile	0.0007	0.0006	0.0443	<0.0030	114	<0.000010	<0.0000050	0.00077	0.0006	0.088	0.005	0.0382	0.0035	<0.0000020	<0.0000020	108.0	<0.0010	<0.0010	<0.00020	<0.00020	11.2	<0.0050	<0.0050				
		Median	0.0012	0.00073	0.0596	0.0046	154	<0.000010	<0.0000050	0.00105	0.00066	0.115	0.0073	0.054	0.024	<0.0000020	<0.0000020	155	<0.0010	<0.0010	<0.00020	<0.00020	15.7	<0.0050	<0.0050				
		3rd Quartile	0.00271	0.0023	0.194	0.0135	174	<0.000010	<0.0000050	0.00176	0.00114	0.293	0.0247	0.0784	0.0482	<0.0000020	<0.0000020	181.0	<0.0010	<0.0010	<0.00020	<0.00020	19.7	<0.0050	<0.0050				
7S	Stream 1-7S discharge to LWO	Average	0.000099	0.000086	0.0489	0.038	15.4	0.000005	0.00000329	0.000409	0.00039	0.0172	0.00975	0.0006	0.00054	0.00000109	0.00000146	16.5	0.00050	0.00050	0.000100	0.000100	2.990	0.00278	0.00250				
E292109		Count	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14				
		Minimum	<0.00010	<0.00010	0.0163	0.0177	10.3	<0.000010	<0.0000050	<0.00050	<0.00020	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	12.1	<0.0010	<0.0010	<0.00020	<0.00020	1.26	<0.0050	<0.0050				
		Maximum	0.00018	0.00023	0.13	0.0776	26.8	<0.000010	0.00001	0.00112	0.00062	0.075	0.037	0.0014	0.0011	0.0000022	0.0000046	24.3	<0.0010	<0.0010	<0.00020	<0.00020	4.37	0.0064	<0.0050				
		Geometric Mean	0.00009	0.000073	0.0403	0.034	14.9	0.000005	0.00000294	0.000355	0.000349	0.0104	0.00589	0.00057	0.00053	0.00000106	0.00000127	16.1	0.00050	0.00050	0.000100	0.000100	2.87	0.00267	0.00250				
		Count <DL	5	9	0	0	0	14	12	9	2	8	6	12	13	13	11	0	14	14	14	14	0	13	14				
		Standard Deviation	0.000042	0.000057	0.034	0.0195	4.2	1E-13	0.00000215	0.00026	0.000164	0.0206	0.01134	0.00027	0.00016	0.00000032	0.00000104	3.7	0.00000	0.00000	0.000000	0.000000	0.8	0.00104	1E-10				
		1st Quartile	<0.00010	<0.00010	0.0257	0.0234	13.3	<0.000010	<0.0000050	<0.00050	0.00032	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	13.8	<0.0010	<0.0010	<0.00020	<0.00020	2.48	<0.0050	<0.0050				
		Median	0.00011	<0.00010	0.0359	0.0326	14.3	<0.000010	<0.0000050	<0.00050	0.00041	<0.010	0.0051	<0.0010	<0.0010	<0.0000020	<0.0000020	15.5	<0.0010	<0.0010	<0.00020	<0.00020	2.98	<0.0050	<0.0050				
		3rd Quartile	0.000127	0.000108	0.0599	0.0465	16	<0.000010	<0.0000050	0.000568	0.000492	0.0172	0.01052	<0.0010	<0.0010	<0.0000020	<0.0000020	17.8	<0.0010	<0.0010	<0.00020	<0.00020	3.59	<0.0050	<0.0050				
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average	0.458	0.427	0.0178	0.00338	175.8	0.0000050	0.0000025	0.000250	0.000100	0.24	0.216	0.0492	0.0556		0.0000016		0.000500	0.000500	0.0001000	0.0001000	17.8	0.00250	0.00250		0.1480		
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4		4		1	4	1	4	4	1	4		4		
		Minimum	0.458	0.405	0.0178	<0.0030	169	<0.000010	<0.0000050	<0.00050	<0.00020	0.24	0.205	0.0492	0.0431		<0.0000020		<0.0010	<0.0010	<0.00020	<0.00020	17	<0.0050	<0.0050		0.0931		
		Maximum	0.458	0.447	0.0178	0.0057	180	<0.000010	<0.0000050	<0.00050	<0.00020	0.24	0.222	0.0492	0.0813		0.0000034		<0.0010	<0.0010	<0.00020	<0.00020	19.2	<0.0050	<0.0050		0.174		
		Geometric Mean	0.458	0.426	0.0178	0.0028	175.7	0.0000050	0.0000025	0.00025	0.000100	0.24	0.216	0.0492	0.0538		0.0000014		0.000500	0.000500	0.0001000	0.0001000	17.8	0.0025	0.00250		0.1437		
		Count <DL	0	0	0	2	0	1	4	1	4	0	0	0	0		3		1	4	1	4	0	1	4		0		
		Standard Deviation	0	0.017	0	0.0022	5.0	0.0000000	0	0	0.000000	0.000	0.008	0	0.0175		0.0000012		0.000000	0.000000	0.0000000	0.0000000	1	0	0.00000		0.0375		
		1st Quartile	0.458	0.42	0.0178	<0.0030	173.5	<0.000010	<0.0000050	<0.00050	<0.00020	0.24	0.213	0.0492	0.0452		<0.0000020		<0.0010	<0.0010	<0.00020	<0.00020	17.2	<0.0050	<0.0050		0.1395		
		Median	0.458	0.427	0.0178	0.00315	177	<0.000010	<0.0000050	<0.00050	<0.00020	0.24	0.218	0.0492	0.049		<0.0000020		<0.0010	<0.0010	<0.00020	<0.00020	17.4	<0.0050	<0.0050		0.1625		
		3rd Quartile	0.458	0.434	0.0178	0.0050	179.2	<0.000010	<0.0000050	<0.00050	<0.00020	0.24	0.221	0.0492	0.0594		0.0000016		<0.0010	<0.0010	<0.00020	<0.00020	18.1	<0.0050	<0.0050		0.171		
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average	0.519	0.497	0.248	0.0124	127.5	0.0000050	0.0000079	0.00086	0.000100	0.411	0.143	0.084	0.0832		0.0000056		0.0005	0.005000	0.0001	0.0001000	9.39	0.0025	0.00512		0.2370		
		Count	1	4	1	4	4	1	4	1	4	1	4	1	4		4		1	4	1	4	4	1	4		4		
		Minimum	0.519	0.469	0.248	0.0073	124	<0.000010	<0.0000050	0.00086	<0.00020	0.411	0.109	0.084	0.0749		0.0000021		<0.0010	<0.0010	<0.00020	<0.00020	9.05	<0.0050	<0.0050		0.213		
		Maximum	0.519	0.528	0.248	0.0201	131	<0.000010	0.000024	0.00086	<0.00020	0.411	0.228	0.084	0.0888		0.0000121		<0.0010	0.0185	<0.00020	<0.00020	9.62	<0.0050	0.013		0.299		
		Geometric Mean	0.519	0.496	0.248	0.0114	127.5	0.0000050	0.0000044	0.00086	0.000100	0.411	0.136	0.084	0.083		0.0000044		0.0005	0.001230	0.0001	0.0001000	9.39	0.0025	0.00378		0.2350		
		Count <DL	0	0	0	0	0	1	3	0	4	0	0	0	0		0		1	3	1	4	0	1	3		0		
		Standard Deviation	0.000	0.026	0.00	0.0059	3.1	0.0000000	0.0000108	0.00000	0.000000	0.00	0.057	0.000	0.0065		0.0000045		0.00000	0.009000	0.000000	0.0000000	0.3	0.0000	0.00525		0.0410		
		1st Quartile	0.519	0.479	0.248	0.0081	125.5	<0.000010	<0.0000050	0.00086	<0.00020	0.411	0.114	0.084	0.0794		0.0000028		<0.0010	<0.0010	<0.00020	<0.00020	9.28	<0.0050	<0.0050		0.215		
		Median	0.519	0.495	0.248	0.0111	127.5	<0.000010	<0.0000050	0.00086	<0.00020	0.411	0.118	0.084	0.0844		0.000004		<0.0010	<0.0010	<0.00020	<0.00020	9.44	<0.0050	<0.0050		0.218		
		3rd Quartile	0.519	0.513	0.248	0.0154	129.5	<0.000010	0.00000788	0.00086	<0.00020	0.411	0.147	0.084	0.0882		0.0000067		<0.0010	0.005	<0.00020	<0.00020	9.56	<0.0050	0.00512		0.24		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 71
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average		0.158		0.0056	213.0		0.0000052		0.00013		0.934		0.1111		0.0000027			0.0005		0.0001	0.35		0.0025		0.082		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.111		0.0036	197		<0.0000050		<0.00020		0.303		0.0535		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0579		
		Maximum		0.208		0.0084	220		0.0000133		0.00022		1.59		0.174		0.0000049			<0.0010		<0.00020	0.64		<0.0050		0.104		
		Geometric Mean		0.155		0.0053	212.8		0.0000038		0.000122		0.799		0.1023		0.0000021			0.0005		0.0001	0.316		0.0025		0.0794		
		Count <DL		0		0	0		3		3		0		0		2			4		4	3		4		0		
		Standard Deviation		0.04		0.00220	10.9		0.0000054		0.00006		0.529		0.0494		0.0000020			0		0	0.195		0.00000		0.0234		
		1st Quartile		0.143		0.004	210.5		<0.0000050		<0.00020		0.714		0.091		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0639		
		Median		0.158		0.0052	217.5		<0.0000050		<0.00020		0.922		0.1085		0.00000245			<0.0010		<0.00020	<0.50		<0.0050		0.083		
		3rd Quartile		0.174		0.0067	220		0.0000052		0.00013		1.142		0.1282		0.00000415			<0.0010		<0.00020	0.35		<0.0050		0.101		
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average		0.198		0.008	207.0		0.0000031		0.000125		0.546		0.0912		0.0000041			0.000620		0.0001250	0.512		0.00312		0.0899		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.153		0.0066	200		<0.0000050		<0.00020		0.314		0.0698		0.0000024			<0.0010		<0.00020	<0.50		<0.0050		0.0385		
		Maximum		0.218		0.0097	222		<0.000010		<0.00040		1.01		0.128		0.0000078			<0.0020		<0.00040	1.01		<0.010		0.154		
		Geometric Mean		0.196		0.0079	206.8		0.0000030		0.000119		0.483		0.0884		0.0000036			0.000590		0.0001190	0.43		0.00297		0.0793		
		Count <DL		0		0	0		4		4		0		0		0			4		4	2		4		0		
		Standard Deviation		0.03		0.0016	10.1		0.0000013		0.00005		0.327		0.027		0.0000025			0.000250		0.0000500	0.359		0.00125		0.0498		
		1st Quartile		0.194		0.0068	202.2		<0.0000050		<0.00020		0.316		0.0717		0.0000026			<0.0010		<0.00020	<0.50		<0.0050		0.0592		
		Median		0.21		0.0079	203		<0.0000050		<0.00020		0.43		0.0834		0.000003			<0.0010		<0.00020	0.395		<0.0050		0.0836		
		3rd Quartile		0.214		0.0092	207.8		0.00000312		0.000125		0.66		0.103		0.0000046			0.00062		0.000125	0.658		0.00312		0.1142		
QU1010D	Ex-situ 2-North deep groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Mudstone).																												
		Average		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			0.00100		0.000430	0.25		0.0050		0.06650		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			<0.0020		0.00043	<0.50		<0.010		0.0665		
		Maximum		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			<0.0020		0.00043	<0.50		<0.010		0.0665		
		Geometric Mean		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			0.00100		0.000430	0.25		0.0050		0.06650		
		Count <DL		0		0	0		0		0		0		0		0			1		0	1		1		0		
		Standard Deviation		0.0000		0.0000	0		0.000000		0.00000		0.0		0.00		0.0000000			0.00000		0.000000	0.0		0.0000		0.00000		
		1st Quartile		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			<0.0020		0.00043	<0.50		<0.010		0.0665		
		Median		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			<0.0020		0.00043	<0.50		<0.010		0.0665		
		3rd Quartile		0.0152		0.0129	92.3		0.000022		0.00085		10.2		0.433		0.0000023			<0.0020		0.00043	<0.50		<0.010		0.0665		
QU1010S	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Average		0.133		0.0188	151.0		0.0000025		0.0001		0.351		0.0531		0.0000054			0.000500		0.0001000	49.8		0.00250		0.0686		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.133		0.0188	151		<0.0000050		<0.00020		0.351		0.0531		0.0000054			<0.0010		<0.00020	49.8		<0.0050		0.0686		
		Maximum		0.133		0.0188	151		<0.0000050		<0.00020		0.351		0.0531		0.0000054			<0.0010		<0.00020	49.8		<0.0050		0.0686		
		Geometric Mean		0.133		0.01880	151.0		0.0000025		0.0001		0.351		0.0531		0.0000054			0.000500		0.0001000	49.8		0.0025		0.0686		
		Count <DL		0		0	0		1		1		0		0		0			1		1	0		1		0		
		Standard Deviation		0		0	0.0		0.0000000		0		0		0		0.0000000			0.000000		0.0000000	0		0		0		
		1st Quartile		0.133		0.0188	151		<0.0000050		<0.00020		0.351		0.0531		0.0000054			<0.0010		<0.00020	49.8		<0.0050		0.0686		
		Median		0.133		0.0188	151		<0.0000050		<0.00020		0.351		0.0531		0.0000054			<0.0010		<0.00020	49.8		<0.0050		0.0686		
		3rd Quartile		0.133		0.0188	151		<0.0000050		<0.00020		0.351		0.0531		0.0000054			<0.0010		<0.00020	49.8		<0.0050		0.0686		
QU1011D	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.00905		0.0215	360		0.0000025		0.0001		4.09		0.453		0.0000031			0.0005		0.0001	1.0		0.0025		0.076		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.00905		0.0215	360		<0.0000050		<0.00020		4.09		0.453		0.0000031			<0.0010		<0.00020	0.95		<0.0050		0.0764		
		Maximum		0.00905		0.0215	360		<0.0000050		<0.00020		4.09		0.453		0.0000031			<0.0010		<0.00020	0.95		<0.0050		0.0764		
		Geometric Mean		0.00905		0.0215	360		0.0000025		0.0001		4.09		0.453		0.0000031			0.0005		0.0001	1.0		0.0025		0.076		
		Count <DL		0		0	0		1		1		0		0		0			1		1	0		1		0		
		Standard Deviation		0.00000		0.0000	0		0.0000000		0.00000		0.00		0.000		0.0000000			0.00000		0.000000	0.0		0.0000		0.000		
		1st Quartile		0.00905		0.0215	360		<0.0000050		<0.00020		4.09		0.453		0.0000031			<0.0010		<0.00020	0.95		<0.0050		0.0764		
		Median		0.00905		0.0215	360		<0.0000050		<0.00020		4.09		0.453		0.0000031			<0.0010		<0.00020	0.95		<0.0050		0.0764		
		3rd Quartile		0.00905		0.0215	360		<0.0000050		<0.00020		4.09		0.453		0.0000031			<0.0010		<0.00020	0.95		<0.0050		0.0764		
QU1011S	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.00495		0.012	106.3		0.0000025		0.000175		0.265		0.0602		0.0000055			0.0005		0.0001000	5.84		0.00250		0.0125		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.00169		0.0056	59.6		<0.0000050		<0.00020		0.179		0.0488		0.0000048			<0.0010		<0.00020	3.94		<0.0050		0.0055		
		Maximum		0.0082		0.0183	153		<0.0000050		0.00025		0.352		0.0716		0.0000063			<0.0010		<0.00020	7.73		<0.0050		0.0195		
		Geometric Mean		0.00372		0.0101	95.5		0.0000025		0.000158		0.251		0.0591		0.0000055			0.0005		0.0001000	5.52		0.0025		0.0104		
		Count <DL		0		0	0		2		1		0		0		0			2		2	0		2		0		
		Standard Deviation		0.0046		0.009	66		0.0000000		0.000106		0.122		0.0161		0.0000011			0		0.0000000	2.68		0		0.0099		
		1st Quartile		0.00332		0.0088	83		<0.0000050		0.000138		0.222		0.0545		0.0000052			<0.0010		<0.00020	4.89		<0.0050		0.009		
		Median		0.00494		0.0119	106.3		<0.0000050		0.000175		0.265		0.0602		0.0000055			<0.0010		<0.00020	5.84		<0.0050		0.0125		
		3rd Quartile		0.00657		0.0151	129.6		<0.0000050		0.000213		0.309		0.0659		0.0000059			<0.0010		<0.00020	6.78		<0.0050		0.016		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 72
2017-2018 Annual Report

2016-17 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
QU1105S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.0716		0.00562	207.8		0.0000033		0.000178		1.395		0.176		0.0000049			0.000500		0.0001000	92.9		0.00250		0.030		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.0362		<0.0030	82.8		<0.0000050		<0.00020		0.358		0.0988		0.0000024			<0.0010		<0.00020	42.3		<0.0050		0.0126		
		Maximum		0.103		0.0083	329		0.0000055		0.00027		2.46		0.254		0.0000108			<0.0010		<0.00020	156		<0.0050		0.0479		
		Geometric Mean		0.065		0.00472	170.7		0.0000030		0.000160		1.038		0.1629		0.0000040			0.000500		0.0001000	80.4		0.00250		0.027		
		Count <DL		0		1	0		3		2		0		0		0			4		4	0		4		0		
		Standard Deviation		0.0344		0.00295	136.6		0.0000015		0.000090		1.063		0.0765		0.0000040			0.000000		0.0000000	54.7		0.00000		0.015		
		1st Quartile		0.0452		0.00465	93.1		<0.0000050		<0.00020		0.549		0.117		0.000003			<0.0010		<0.00020	49.8		<0.0050		0.0222		
		Median		0.0737		0.00635	209.8		<0.0000050		0.00017		1.382		0.1755		0.0000032			<0.0010		<0.00020	86.6		<0.0050		0.0298		
		3rd Quartile		0.1001		0.00732	324.5		0.00000325		0.000248		2.228		0.2345		0.0000051			<0.0010		<0.00020	129.8		<0.0050		0.0377		
QU1109S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.077		0.006	512		0.0000054		0.0001		0.2270		0.0217		0.0000015			0.0005		0.0001	477		0.0025		0.029		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.067		0.0045	458		<0.0000050		<0.00020		0.171		0.0193		<0.0000020			<0.0010		<0.00020	435		<0.0050		<0.0020		
		Maximum		0.095		0.0097	554		0.000014		<0.00020		0.292		0.0233		0.0000028			<0.0010		<0.00020	540		<0.0050		0.0469		
		Geometric Mean		0.076		0.0057	510.5		0.0000039		0.0001		0.2220		0.0216		0.0000013			0.0005		0.0001	475		0.0025		0.015		
		Count <DL		0		0	0		3		4		0		0		3			4		4	0		4		1		
		Standard Deviation		0.013		0.0025	45.1		0.0000058		0.00000		0.0560		0.00170		0.0000009			0.00000		0.000000	50.0		0.0000		0.020		
		1st Quartile		0.068		0.0046	483.5		<0.0000050		<0.00020		0.186		0.0213		<0.0000020			<0.0010		<0.00020	436		<0.0050		0.02635		
		Median		0.072		0.0048	518		<0.0000050		<0.00020		0.223		0.0221		<0.0000020			<0.0010		<0.00020	467		<0.0050		0.03485		
		3rd Quartile		0.082		0.0062	546.5		0.00000538		<0.00020		0.264		0.0225		0.00000145			<0.0010		<0.00020	508		<0.0050		0.0379		
7SQR	7-South Quinsam River downstream of 7-South Mining Operation	Average	0.0008	0.00058	0.0419	0.0212	32.2	0.0000053	0.00000332	0.000781	0.00061	0.109	0.0484	0.0075	0.00245	0.00000156	0.00000109	35.9	0.00050	0.00050	0.000100	0.000100	28.9	0.0025	0.0025	0.00610			
E292113		Count	22	22	22	22	21	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	4		
		Minimum	0.00021	0.0002	0.0136	0.009	22.9	<0.000010	<0.0000050	<0.00050	0.00042	0.045	0.0211	0.0028	<0.0010	<0.000002	<0.000002	24.9	<0.0010	<0.0010	<0.00020	<0.00020	12.5	<0.0050	<0.0050	0.0038			
		Maximum	0.00558	0.00244	0.203	0.0448	37.8	0.000012	0.000012	0.00213	0.00089	0.465	0.0804	0.0359	0.0056	0.0000046	0.000003	44.4	<0.0010	<0.0010	<0.00020	<0.00020	39.3	<0.0050	<0.0050	0.0117			
		Geometric Mean	0.0005	0.00045	0.0307	0.0186	32	0.0000052	0.00000293	0.000701	0.0006	0.093	0.0459	0.0064	0.00192	0.00000129	0.00000105	35.6	0.00050	0.00050	0.000100	0.000100	28.2	0.0025	0.0025	0.00540			
		Count <DL	0	0	0	0	0	21	19	1	0	0	0	0	5	18	21	0	22	22	22	22	0	22	22	0			
		Standard Deviation	0.0013	0.00056	0.0432	0.0111	3.8	0.00000150	0.00000236	0.000432	0.00014	0.088	0.0159	0.0066	0.00142	0.00000122	0.00000043	4.8	0.00000	0.00000	0.000000	0.000000	5.7	0	0	0.0038			
		1st Quartile	0.00037	0.00033	0.0171	0.0121	29.6	<0.000010	<0.0000050	0.000552	0.00051	0.065	0.0381	0.0048	0.00142	<0.0000020	<0.0000020	33.2	<0.0010	<0.0010	<0.00020	<0.00020	25.8	<0.0050	<0.0050	0.004			
		Median	0.00042	0.00036	0.0242	0.0164	33.3	<0.000010	<0.0000050	0.00062	0.00058	0.085	0.0462	0.006	0.0028	<0.000002	<0.0000020	37	<0.0010	<0.0010	<0.00020	<0.00020	30	<0.0050	<0.0050	0.0044			
		3rd Quartile	0.00048	0.00046	0.0519	0.0292	34.8	<0.000010	<0.0000050	0.0008	0.00066	0.117	0.0554	0.0078	0.0031	<0.0000020	<0.0000020	38.8	<0.0010	<0.0010	<0.00020	<0.00020	32.60	<0.0050	<0.0050	0.0066			
LQL1	Lower Quinsam Lake 1 metre below surface	Average	0.00054	0.00051	0.0723	0.0321	29.6	0.0000075	0.00000434	0.000851	0.00070	0.133	0.0468	0.0069	0.00186	0.00000116	0.00000129	31.8	0.00091	0.00050	0.000100	0.000100	17.5	0.00250	0.00250	0.0117			
E292118		Count	16	16	16	16	4	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	3		
		Minimum	0.00032	0.00026	0.0069	0.0071	25.2	<0.000010	<0.0000050	<0.00050	0.00036	0.033	0.0161	0.0035	<0.0010	<0.0000020	<0.0000020	25.0	<0.0010	<0.0010	<0.00020	<0.00020	10.5	<0.0050	<0.0050	0.0044			
		Maximum	0.00071	0.00081	0.374	0.0813	34.3	0.000025	0.0000150	0.00195	0.00128	0.587	0.0862	0.0203	0.0053	0.0000024	0.0000028	42.3	0.0070	<0.0010	<0.00020	<0.00020	23.3	<0.0050	<0.0050	0.0220			
		Geometric Mean	0.00053	0.00049	0.0337	0.0241	29.4	0.0000063	0.00000358	0.000711	0.00066	0.092	0.0431	0.0062	0.00117	0.00000111	0.00000119	31.4	0.00059	0.00050	0.000100	0.000100	16.9	0.00250	0.00250	0.0094			
		Count <DL	0	0	0	0	0	13	11	3	0	0	0	0	8	14	13	0	15	16	16	16	0	16	16	0			
		Standard Deviation	0.00011	0.00015	0.1009	0.0245	3.7	0.0000058	0.00000343	0.000512	0.00024	0.145	0.0188	0.0040	0.00184	0.00000043	0.00000062	5.3	0.00162	0.00000	0.000000	0.000000	4.4	4E-11	4E-11	0.0092			
		1st Quartile	0.00045	0.00043	0.0118	0.0113	28.1	<0.000010	<0.0000050	0.000565	0.00049	0.052	0.0384	0.0049	<0.0010	<0.0000020	<0.0000020	28.0	<0.0010	<0.0010	<0.00020	<0.00020	14.5	<0.0050	<0.0050	0.0066			
		Median	0.00052	0.00048	0.0276	0.0244	29.4	<0.000010	<0.0000050	0.000700	0.00065	0.070	0.0435	0.0056	0.00080	<0.0000020	<0.0000020	29.6	<0.0010	<0.0010	<0.00020	<0.00020	16.8	<0.0050	<0.0050	0.0087			
		3rd Quartile	0.00064	0.00063	0.0888	0.0457	30.9	<0.000010	0.0000060	0.000990	0.00085	0.144	0.0516	0.0082	0.0034	<0.0000020	<0.0000020	36.1	<0.0010	<0.0010	<0.00020	<0.00020	21.8	<0.0050	<0.0050	0.0154			
LQLB	LQLB 1 metre from Bottom	Average	0.00119	0.00066	0.0840	0.0331	29.0	0.0000110	0.00000612	0.00100	0.00072	0.684	0.1917	0.2085	0.1350	0.00000107	0.00000134	29.1	0.00050	0.00050	0.000100	0.000100	12.8	0.00321	0.00250	0.0131			
E292118		Count	16	16	16	16	4	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	3		
		Minimum	0.00038	0.00028	0.0259	0.0095	26.7	<0.000010	<0.0000050	0.00062	0.00042	0.102	0.0461	0.0072	0.0016	<0.0000020	<0.0000020	24.5	<0.0010	<0.0010	<0.00020	<0.00020	10.3	<0.0050	<0.0050	0.0042			
		Maximum	0.00271	0.00128	0.437	0.0813	33.6	0.000026	0.0000120	0.00211	0.00119	2.36	0.498	0.689	0.392	0.0000021	0.0000027	34.0	<0.0010	<0.0010	<0.00020	<0.00020	15.2	0.0139	<0.0050	0.0267			
		Geometric Mean	0.00096	0.00061	0.0518	0.0265	28.9	0.0000090	0.00000543	0.00092	0.00069	0.396	0.1405	0.0650	0.0369	0.00000105	0.00000124	29.0	0.00050	0.00050	0.000100	0.000100	12.7	0.00278	0.00250	0.0098			
		Count <DL	0	0	0	0	0	8	4	0	0	0	0	0	0	15	12	0	16	16	16	16	0	15	16	0			
		Standard Deviation	0.00081	0.00028	0.1115	0.0237	3.1	0.0000072	0.00000287	0.00045	0.00021	0.693	0.1533	0.2557	0.1599	0.00000027	0.00000063	3.0	0.00000	0.00000	0.000000	0.000000	1.4	0.00285	4E-11	0.0120			
		1st Quartile	0.00060	0.00050	0.0290	0.0168	27.4	<0.000010	0.00000438	0.00066	0.00058	0.150	0.0789	0.0173	0.0054	<0.0000020	<0.0000020	27.3	<0.0010	<0.0010	<0.00020	<0.00020	12.0	<0.0050	<0.0050	0.0062			
		Median	0.00073	0.00060	0.0332	0.0230	28.0	0.0000085	0.00000590	0.00083	0.00072	0.270	0.0985	0.0438	0.0350	<0.0000020	<0.000002	27.8	<0.0010	<0.0010	<0.00020	<0.00020	12.7	<0.0050	<0.0050	0.0083			
		3rd Quartile	0.00193	0.00078	0.0752	0.0478	29.6	0.0000138	0.00000810	0.00120	0.00083	1.168	0.3492	0.4218	0.3062	<0.0000020	0.00000127	32.0	<0.0010	<0.0010	<0.00020	<0.00020	13.6	<0.0050	<0.0050	0.0175			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 73
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
WA																													
E0126402		Average	0.00011	0.000099	0.0288	0.0228	20.9	0.000005	0.0000025	0.000687	0.00068	0.0161	0.0147	0.00114	0.00057	0.0000010	0.0000010	19.8	0.0005	0.00050	0.000100	0.000100	0.916	0.00250	0.0025				
		Count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16				
		Minimum	<0.00010	<0.00010	0.0174	0.0148	16.9	<0.000010	<0.0000050	<0.00050	0.00055	<0.010	0.0076	<0.0010	<0.0010	<0.0000020	<0.0000020	17	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050				
	Middle Quinsam Lake Inlet - Quinsam River at Argonaut Road upstream of mining operation.	Maximum	0.0002	0.00017	0.0885	0.0359	23.9	<0.000010	<0.0000050	0.00101	0.001	0.023	0.0308	0.0021	0.0011	<0.0000020	<0.0000020	22.1	<0.0010	<0.0010	<0.00020	<0.00020	1.43	<0.0050	<0.0050				
		Geometric Mean	0.000101	0.00009	0.0262	0.0222	20.8	0.000005	0.0000025	0.00066	0.00067	0.0153	0.0139	0.00101	0.00055	0.000001	0.000001	19.8	0.0005	0.00050	0.000100	0.000100	0.795	0.00250	0.0025				
		Count <DL	4	6	0	0	0	16	16	1	0	1	0	5	14	16	16	0	16	16	16	16	6	16	16				
		Standard Deviation	0.000041	0.000041	0.0171	0.0059	2.2	1E-14	4E-15	0.000182	0.00013	0.0046	0.0057	0.00051	0.00019	0	0	1.5	0	0.00000	0.000000	0.000000	0.424	4E-11	4E-11				
		1st Quartile	0.000095	<0.00010	0.0202	0.0186	20.2	<0.000010	<0.0000050	0.000625	0.00061	0.014	0.0109	<0.0010	<0.0010	<0.0000020	<0.0000020	18.8	<0.0010	<0.0010	<0.00020	<0.00020	<1.0	<0.0050	<0.0050				
		Median	0.00012	0.00011	0.0245	0.0221	21.2	<0.000010	<0.0000050	0.00066	0.00062	0.017	0.0138	0.0012	<0.0010	<0.0000020	<0.0000020	20	<0.0010	<0.0010	<0.00020	<0.00020	1.05	<0.0050	<0.0050				
		3rd Quartile	0.00013	0.00013	0.0293	0.0264	22.7	<0.000010	<0.0000050	0.000762	0.00072	0.0185	0.0159	0.00143	<0.0010	<0.0000020	<0.0000020	21.1	<0.0010	<0.0010	<0.00020	<0.00020	1.275	<0.0050	<0.0050				
WD		Average	0.00234	0.00146	0.03103	0.00926	369	0.0000257	0.00001214	0.00132	0.00061	0.502	0.01539	0.1064	0.0948	0.000001	0.000001	317	0.004	0.00378	0.000200	0.000250	506	0.00558	0.00668				
E207409		Count	8	8	8	8	15	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	52	8	8				
		Minimum	0.0014	0.00097	<0.015	0.0055	321	<0.000010	<0.0000050	0.00061	0.00041	0.166	0.0072	0.0376	0.0314	<0.0000020	<0.0000020	222	<0.0010	<0.0010	<0.00020	<0.00020	229	<0.0050	<0.0050				
		Maximum	0.00305	0.00226	0.14	0.0174	453	0.000068	0.0000271	0.00386	0.00088	1.17	0.0519	0.191	0.167	<0.0000020	<0.0000020	451	0.0117	0.0099	<0.0010	<0.0010	822	<0.025	<0.025				
	Settling Pond #4	Geometric Mean	0.00225	0.0014	0.01864	0.00878	366	0.0000204	0.0000099	0.001094	0.000592	0.427	0.01216	0.0911	0.0781	0.000001	0.000001	310	0.0027	0.0027	0.000150	0.000183	490	0.00426	0.00509				
		Count <DL	0	0	2	3	0	3	4	2	3	0	3	0	0	8	8	0	3	4	8	8	0	7	7				
		Standard Deviation	0.00065	0.00046	0.04453	0.00359	43	0.0000191	0.00000764	0.001065	0.000179	0.315	0.01494	0.0583	0.057	1E-14	0.0000000	70	0.00386	0.00322	0.000185	0.000207	130	0.00456	0.00496				
		1st Quartile	0.00205	0.00109	0.01148	<0.015	337	0.0000163	0.00000725	0.000723	<0.0010	0.298	0.0079	0.0518	0.0408	<0.0000020	<0.0000020	273	0.00167	0.00225	<0.00020	<0.00020	425	<0.0050	<0.0050				
		Median	0.00237	0.00138	0.0155	0.00835	350	0.0000235	<0.000025	0.00107	0.000515	0.452	0.0118	0.107	0.0914	<0.0000020	<0.0000020	319	<0.0050	<0.0050	<0.00020	<0.00020	498	<0.0050	0.0042				
		3rd Quartile	0.00291	0.00171	0.02455	0.00967	398	0.0000267	0.00001363	0.001265	0.000782	0.586	<0.025	0.1442	0.1415	<0.0000020	<0.0000020	342	0.00458	0.00435	0.0002	<0.0010	545	0.00845	<0.025				
MW001D		Average		0.0197		0.0355	92.4		0.00000375		0.00143		0.0080		0.0082		0.0000010			0.0005		0.0001	27.4		0.0025		0.173		
		Count		2		2	1		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0189		0.0319	92.4		<0.0000050		0.00124		<0.0050		0.0029		<0.0000020			<0.0010		<0.00020	26.6		<0.0050		0.172		
		Maximum		0.0205		0.0391	92.4		0.000005		0.00161		0.0135		0.0134		<0.0000020			<0.0010		<0.00020	28.2		<0.0050		0.175		
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean		0.0197		0.0353	92.4		0.00000354		0.00141		0.00581		0.0062		0.0000010			0.0005		0.0001	27.4		0.0025		0.173		
		Count <DL		0		0	0		1		0		1		0		2			2		2	0		2		0		
		Standard Deviation		0.0011		0.0051	0.0		0.00000177		0.00026		0.00778		0.007400		0.0000000			0		0	1.1		1E-11		0.002		
		1st Quartile		0.0193		0.0337	92.4		0.00000313		0.00133		0.00525		0.0055		<0.0000020			<0.0010		<0.00020	27		<0.0050		0.173		
		Median		0.0197		0.0355	92.4		0.00000375		0.00143		0.0080		0.0082		<0.0000020			<0.0010		<0.00020	27.4		<0.0050		0.173		
		3rd Quartile		0.0201		0.0373	92.4		0.00000438		0.00152		0.01075		0.0108		<0.0000020			<0.0010		<0.00020	27.8		<0.0050		0.174		
MW001S		Average		0.000215		0.0045	344		0.000100		0.000515		0.0605		2.53		0.0000010			0.0025		0.0003000	754		0.0075		0.00920		
		Count		2		2	1		2		2		2		2		2			2		2	1		2		2		
		Minimum		0.00018		<0.0030	344		0.000092		<0.0010		0.047		1.84		<0.0000020			<0.0050		<0.00020	754		<0.0050		0.0068		
		Maximum		<0.00050		<0.015	344		0.000107		0.00053		0.074		3.22		<0.0000020			0.0025		<0.0010	754		<0.025		0.0117		
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean		0.00021		0.00335	344		0.0000992		0.000515		0.059		2.4341		0.0000010			0.0025		0.0002240	754		0.00559		0.0089		
		Count <DL		1		2	0		0		1		0		0		2			1		2	0		2		0		
		Standard Deviation		0.000049		0.00424	0		0.0000106		0.000021		0.0191		0.9758		0.0000000			1E-11		0.0002830	0		0.00707		0.00350		
		1st Quartile		0.000198		0.003	344		0.0000957		0.000508		0.0537		2.185		<0.0000020			<0.0050		0.0002	754		0.005		0.00800		
		Median		0.000215		0.0045	344		0.000100		0.000515		0.0605		2.53		<0.0000020			<0.0050		0.0003	754		0.0075		0.00920		
		3rd Quartile		0.000233		0.006	344		0.000103		0.000522		0.0673		2.875		<0.0000020			<0.0050		0.0004	754		0.01		0.01050		
MW006D		Average		0.0299		0.0221	76.8		0.0000148		0.00294		0.0025		0.0016		0.0000010			0.000500		0.0001000	16.2		0.00400		0.164		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0296		0.0189	72.8		<0.0000050		0.00073		<0.0050		0.0014		<0.0000020			<0.0010		<0.00020	12.9		<0.0050		0.156		
		Maximum		0.0301		0.0254	80.9		0.000027		0.00516		<0.0050		0.0019		<0.0000020			<0.0010		<0.00020	19.5		0.0055		0.173		
	Ex-situ 2-North deep groundwater well below the coal wash plant (Till)	Geometric Mean		0.0298		0.0219	76.7		0.0000082		0.00194		0.0025		0.0016		0.0000010			0.000500		0.0001000	15.9		0.00371		0.164		
		Count <DL		0		0	0		1		0		2		0		2			2		2	0		1		0		
		Standard Deviation		0.0004		0.0046	5.7		0.0000173		0.00313		1E-11		0.0004		0.0000000			0.000000		0.0000000	4.7		0.00212		0.012		
		1st Quartile		0.0297		0.0205	74.8		0.00000862		0.00184		<0.0050		0.0015		<0.0000020			<0.0010		<0.00020	14.6		0.00325		0.16		
		Median		0.0299		0.0221	76.8		0.00001475		0.00294		<0.0050		0.0016		<0.0000020			<0.0010		<0.00020	16.2		0.00400		0.164		
		3rd Quartile		0.03		0.0238	78.9		0.00002087		0.00405		<0.0050		0.0018		<0.0000020			<0.0010		<0.00020	17.9		0.00475		0.169		
MW006S		Average		0.00153		0.00450	167.0		0.00006		0.00153		0.0050		0.0469		0.0000010			0.0005		0.0001	553.5		0.00250		0.0544		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.00151		0.0036	165		0.000027		0.0011		<0.0050		0.03		<0.0000020			<0.0010		<0.00020	533		<0.0050		0.0543		
		Maximum		0.00155		0.0054	169		0.000093		0.00197		0.0075		0.0639		<0.0000020			<0.0010		<0.00020	574		<0.0050		0.055		
	Ex-situ 2-North shallow groundwater well below the coal wash plant (Till)	Geometric Mean		0.00153		0.0044	167.0		0.0000501		0.00147		0.00433		0.0438		0.0000010			0.00050		0.0001000	553.1		0.0025		0.0544		
		Count <DL		0		0	0		0		0		1		0		2			2		2	0		2		0		
		Standard Deviation		0.00003		0.0013	2.8		0.000047		0.000620		0.00354		0.024		0.0000000			0		0.0000000	29		1E-11		0.0002		
		1st Quartile		0.00152		0.00400	166		0.0000435		0.00132		0.00375		0.0385		<0.0000020			<0.0010		<0.00020	543.2		<0.0050		0.0544		
		Median		0.00153		0.00450	167		0.00006		0.00153		0.0050		0.0469		<0.0000020			<0.0010		<0.00020	553.5		<0.0050		0.0544		
		3rd Quartile		0.00154		0.00500	168		0.0000765		0.00175		0.00625		0.0554		<0.0000020			<0.0010		<0.00020	563.8		<0.0050		0.0545		
WC		Average	0.0008	0.00065	0.01811	0.01128	381.5	0.0000288	0.0000589	0.000874	0.00609	0.083	0.01293	0.0207	0.01798	0.00000116	0.000001	287	0.00229	0.002	0.000200	0.000213	514	0.00500	0.00531				
E207411		Count	8	8	8	8	2	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	12	8	8				
		Minimum	0.00047	0.00039	<0.015	0.0061	353	<0.000010	<0.0000050	<0.00050	0.00044	0.034	<0.010	0.0096	<0.0010	<0.0000020	<0.0000020	198	<0.0010	<0.0010	<0.00020	<0.00020	381	<0.0050	<0.0050				
		Maximum	0.00127	0.00121	0.0662	0.0272	410	0.000081	<0.000025	0.00149	0.00141	0.181	0.0297	0.0543	0.0472	0.0000023	<0.0000020	379	0.0058	0.0052	<0.0010	<0.0010	757	<0.025	<0.025				
	2-North Pit Culvert discharge into Middle Quinsam Lake	Geometric Mean	0.00076	0.00062	0.01334	0.0098	380.4	0.000015	0.00000464	0.00072	0.000562	0.0740	0.01103	0.0174	0.01111	0.00000111	0.000001	282	0.00183	0.0015	0.000150	0.000163	501	0.00374	0.00408				
		Count <DL	0	0	2	2	0	6	7	4	2	0	3	0	1	7	8	0	3	5	8	8	0	8	8				
		Standard Deviation	0.00028	0.00025	0.01983	0.00738	40.3	0.0000328	0.0000044	0.000488	0.000326	0.046	0.0083	0.0149	0.0145	0.00000046	1E-14	57	0.00163	0.00157	0.000185	0.000181	131	0.00463	0.00452				
		1st Quartile	0.00058	0.00054	0.00765	0.00728	367.2	<0.000010	<0.0000050	0.000505	0.000480	0.059	0.00750	0.0117	0.00985	<0.0000020	<0.0000020	254	0.00122	0.00088	<0.00020	<0.00020	434	<0.0050	<0.0050				
		Median	0.00073	0.0006	0.0118	0.0080	381.5	0.000015	0.00000375	0.000955	<0.0010	0.07	0.0106	0.0149	0.0129	<0.0000020	<0.0000020	289	0.0022	0.00185	<0.00020	<0.00020	471	<0.0050	<0.0050				
		3rd Quartile	0.00098	0.00066	0.01473	0.01135	395.8	0.0000385	0.00000845	<0.0025	0.000535	0.0850	0.01448	0.0234	0.02465	<0.0000020	<0.0000020	320	0.00258	0.00252	0.0002	0.000275	538	0.005	0.00688				
MQL1		Average	0.00017	0.0001600	0.0185	0.0162	40.6	0.000005	0.00000273	0.0007	0.00111	0.036	0.0211	0.0054	0.00091	0.000001	0.00000100	35.5	0.0005	0.0005	0.0001	0.0001	32.2	0.00306	0.0025	0.0029			
E206618		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	6			
		Minimum	0.00011	0.0001	0.0103	0.0076	34.4	<0.000010	<0.0000050	0.00051	0.0004	0.025	0.0141	0.0014	<0.0010	<0.0000020	<0.0000020	31.9	<0.0010	<0.0010	<0.00020	<0.00020	23.3	<0.0050	<0.0050	<0.0020			
		Maximum	0.00021	0.00022	0.0255	0.024	45.7	<0.000010	0.000006	0.00098	0.00854	0.055	0.0318	0.0069	0.0035	<0.0000020	<0.0000020	39.8	<0.0010	<0.0010	<0.00020	<0.00020	36.9	0.0109	<0.0050	0.0042			
	Middle Quinsam Lake 1 metre below surface	Geometric Mean	0.00016	0.00015	0.0179	0.0155	40.5	0.000005	0.00000265	0.00068	0.00067	0.035	0.0203	0.0051	0.00073	0.000001	0.000001	35.4	0.0005	0.0005	0.0001	0.00010000	32	0.00276	0.0025	0.00264			
		Count <DL	0	0	0	0	0	15	14	0	0	0	0	0	10	14	14	0	15	15	15	15	0	14	15	1			
		Standard Deviation	0.00004	0.00003	0.0048	0.0047	3.7	0	0.0000009	0.00016	0.00206	0.008	0.0061	0.0015	0.00081	0	0	2.1	0	0	0	0	3.8	0.00217	1E-10	0.00116			
		1st Quartile	0.00013	0.00013	0.0153	0.0129	39.4	<0.000010	<0.0000050	0.00057	0.000500	0.03	0.0168	0.0044	<0.0010	<0.0000020	<0.0000020	34.2	<0.0010	<0.0010	<0.00020	<0.00020	31	<0.0050	<0.0050	0.0025			
		Median	0.00017	0.0001700	0.0170	0.0166	40.5	<0.000010	<0.0000050	0.000620	0.00054	0.035	0.0185	0.0058	<0.0010	<0.0000020	<0.0000020	35.3	<0.0010	<0.0010	<0.00020	<0.00020	32.20	<0.0050	<0.0050	0.0029			
		3rd Quartile	0.0002	0.00018	0.0228	0.0202	42.3	<0.000010	<0.0000050	0.0008	0.00061	0.037	0.0251	0.0063	0.00115	<0.0000020	<0.0000020	36.8	<0.0010	<0.0010	<0.00020	<0.00020	35.4	<0.0050	<0.0050	0.00375			
MQLB		Average	0.000117	0.0001	0.0123	0.0104	42.6	0.000005	0.00000267	0.000613	0.00052	0.047	0.0179	0.0176	0.01197	0.0000001	0.00000100	61.0	0.0005	0.00058	0.0001	0.0001	61.5	0.003650	0.0025	0.00323			
E206618		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	6			
		Minimum	<0.00010	<0.00010	0.0073	0.0046	38.3	<0.000010	<0.0000050	<0.00050	0.00038	0.0170	0.0079	0.0052	<0.0010	<0.0000020	<0.0000020	27.6	<0.0010	<0.0010	<0.00020	<0.00020	23.8	<0.0050	<0.0050	<0.0020			
		Maximum	0.00019	0.00016	0.0185	0.0162	45.5	<0.000010	0.000005	0.00147	0.00069	0.225	0.0347	0.0693	0.0637	<0.0000020	<0.0000020	116	<0.0010	0.0017	<0.00020	<0.00020	136	0.0197	<0.0050	0.0049			
	Middle Quinsam Lake 1 metre from bottom	Geometric Mean	0.000107	0.000091	0.0117	0.0098	42.5	0.000005	0.00000262	0.000549	0.000520	0.037	0.0163	0.0133	0.00581	0.000001	0.000001	56.6	0.0005	0.00054	0.0001	0.0001	55.2	0.00287	0.0025	0.00265			
		Count <DL	3	5	0	0	0	15	14	3	0	0	0	0	1	14	14	0	15	14	15	15	0	14	15	2			
		Standard Deviation	0.00005	0.000042	0.0041	0.0035	2.3	0	0.00000065	0.000306	0.00008	0.05	0.0083	0.0167	0.01655	0	0	23.9	0	0.00031	0	0.00000000	29.4	0.00444	1E-10	0.00179			
		1st Quartile	0.0001	<0.00010	0.0081	0.00730	41.5	<0.000010	<0.0000050	0.000515	0.00047	0.028	0.0127	0.0076	0.00235	<0.0000020	<0.0000020	45.5	<0.0010	<0.0010	<0.00020	<0.00020	44.9	<0.0050	<0.0050	0.00163			
		Median	0.00011	0.0001100	0.0133	0.0107	42.9	<0.000010	<0.0000050	0.00057	0.000520	0.038	0.0141	0.0119	0.0063	<0.0000020	<0.0000020	60.8	<0.0010	<0.0010	<0.00020	<0.00020	58.4	<0.0050	<0.0050	0.00395			
		3rd Quartile	0.00015	0.000125	0.0148	0.0127	44.1	<0.000010	<0.0000050	0.00069	0.00055	0.042	0.0229	0.0204	0.01425	<0.0000020	<0.0000020	72.1	<0.0010	<0.0010	<0.00020	<0.00020	72.7	<0.0050	<0.0050	0.00455			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 74
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
NNL1																													
E217018		Average	0.00027	0.000260	0.0294	0.0248	13.1	0.0000089	0.0000025	0.000561	0.00054	0.065	0.0418	0.00739	0.00437	0.00000109	0.000001	14.1	0.0005	0.0005	0.000126	0.0001	1.685	0.00438	0.0025	0.0051			
		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	6			
		Minimum	0.00016	0.00015	0.0096	0.0092	10.3	<0.000010	<0.0000050	<0.00050	0.00032	0.028	0.0222	<0.0010	<0.0010	<0.0000020	<0.0000020	10.9	<0.0010	<0.0010	<0.00020	<0.00020	<0.50	<0.0050	<0.0050	0.0044			
		Maximum	0.00036	0.00037	0.0755	0.0511	15.2	0.000063	<0.0000050	0.0021	0.0013	0.145	0.0939	0.0285	0.0252	0.0000023	<0.0000020	17.1	<0.0010	<0.0010	0.00049	<0.00020	3.2	0.0307	<0.0050	0.0073			
	No Name Lake 1 metre below surface	Geometric Mean	0.00026	0.00025	0.0239	0.0221	13	0.00000590	0.0000025	0.000418	0.00051	0.058	0.0363	0.00501	0.00185	0.00000106	0.00000100	14	0.0005	0.0005	0.000111	0.0001	1.453	0.00295	0.0025	0.00500			
		Count <DL	0	0	0	0	0	14	15	9	0	0	0	1	5	13	14	0	15	15	14	15	2	14	15	0			
		Standard Deviation	0.000070	0.00008	0.0188	0.0119	2.0	0.000015	0	0.000535	0.00024	0.035	0.0255	0.00788	0.00697	0.00000035	0.00000000	1.8	0	0	0.00010100	0	0.785	0.00728	1E-10	0.0011			
		1st Quartile	0.00019	0.00018	0.0113	0.0131	11.3	<0.000010	<0.0000050	<0.00050	0.00042	0.042	0.0251	0.0036	<0.0010	<0.0000020	<0.0000020	12.8	<0.0010	<0.0010	<0.00020	<0.00020	1.345	<0.0050	<0.0050	0.0045			
		Median	0.00027	0.000270	0.0300	0.0239	14.2	<0.000010	<0.0000050	<0.00050	0.00048	0.055	0.0272	0.00420	0.00180	<0.0000020	<0.0000020	14.5	<0.0010	<0.0010	<0.00020	<0.00020	1.68	<0.0050	<0.0050	0.0047			
		3rd Quartile	0.00032	0.00033	0.0386	0.0309	14.5	<0.000010	<0.0000050	0.00061	0.00063	0.076	0.0519	0.00675	0.00405	<0.0000020	<0.0000020	15.2	<0.0010	<0.0010	<0.00020	<0.00020	1.9	<0.0050	<0.0050	0.005			
NNLB		Average	0.00021	0.0002	0.0343	0.0285	11.8	0.000005	0.00000267	0.000859	0.0005	0.129	0.0855	0.0282	0.0243	0.00000109	0.00000126	15.5	0.0005	0.0005	0.0001	0.0001	4.08	0.0025	0.002500	0.00620			
E217018		Count	15	15	15	15	8	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	6			
		Minimum	0.00016	0.00015	0.0138	<0.0030	10.3	<0.000010	<0.0000050	<0.00050	0.00033	0.091	0.0507	0.0078	0.0026	<0.0000020	<0.0000020	12.6	<0.0010	<0.0010	<0.00020	<0.00020	1.7	<0.0050	<0.0050	0.0042			
		Maximum	0.00032	0.00029	0.06	0.0519	14	<0.000010	0.000005	0.00664	0.00134	0.233	0.156	0.0989	0.0984	0.0000022	0.0000034	18.3	<0.0010	<0.0010	<0.00020	<0.00020	5.13	<0.0050	<0.0050	0.0111			
	No Name Lake 1 metre from bottom	Geometric Mean	0.00021	0.000190	0.0328	0.02419	11.8	0.000005	0.00000262	0.00047	0.00046	0.124	0.0812	0.0193	0.0134	0.00000106	0.00000115	15.4	0.0005000	0.0005	0.0001	0.0001	3.93	0.0025	0.0025	0.00590			
		Count <DL	0	0	0	1	0	15	14	8	0	0	0	0	0	13	12	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00005	0.00004	0.0104	0.01076	1.4	0	0.00000065	0.001616	0.00025	0.043	0.0311	0.0306	0.0311	0.00000032	0.00000069	1.6	0	0.0000000	0	0	1	1E-10	0.000000	0.00250			
		1st Quartile	0.00018	0.00017	0.0297	0.0274	10.6	<0.000010	<0.0000050	<0.00050	0.00038	0.097	0.0653	0.0117	0.0076	<0.0000020	<0.0000020	14.5	<0.0010	<0.0010	<0.00020	<0.00020	3.58	<0.0050	<0.0050	0.0049			
		Median	0.0002	0.00018	0.0312	0.0284	11.6	<0.000010	<0.0000050	<0.00050	0.00042	0.125	0.0791	0.0137	0.0099	<0.0000020	<0.0000020	15.3	<0.0010	<0.0010	<0.00020	<0.00020	4.4	<0.0050	<0.0050	0.0054			
		3rd Quartile	0.00023	0.00022	0.0381	0.03055	13.0	<0.000010	<0.0000050	0.000705	0.00049	0.133	0.0864	0.0226	0.0189	<0.0000020	<0.0000020	16.8	<0.0010	<0.0010	<0.00020	<0.00020	4.84	<0.0050	<0.0050	0.0063			
NNO		Average	0.00025	0.00024	0.0544	0.037	11.23	0.0000073	0.00000363	0.000625	0.00056	0.092	0.0564	0.00992	0.00658	0.0000014	0.0000012	13.17	0.0005	0.00050	0.000100	0.000100	1.633	0.00288	0.0025	0.0058	0.00519	0.0349	0.01655
E217017		Count	15	16	15	16	15	15	16	15	16	15	16	15	16	15	15	15	15	16	15	16	15	15	16	14	14	14	14
		Minimum	0.00017	0.00016	0.015	0.0134	6.5	<0.000010	<0.0000050	<0.00050	0.00036	0.042	0.024	<0.0010	<0.0010	<0.0000020	<0.0000020	7.87	<0.0010	<0.0010	<0.00020	<0.00020	<1.0	<0.0050	<0.0050	0.0026	<0.0020	<0.020	0.0058
		Maximum	0.0004	0.00038	0.136	0.0664	16.6	0.000039	0.0000170	0.00111	0.00075	0.205	0.0901	0.0287	0.0231	0.0000028	0.0000027	16.7	<0.0010	<0.0010	<0.00020	<0.00020	2.7	0.0082	<0.0050	0.0136	0.015	0.075	0.042
	No Name Lake Outlet	Geometric Mean	0.00024	0.00023	0.0462	0.0340	10.95	0.0000057	0.00000298	0.000572	0.00055	0.084	0.0529	0.0069	0.00409	0.00000125	0.00000112	12.87	0.0005	0.00050	0.000100	0.000100	1.43	0.00271	0.0025	0.0053	0.00433	0.0263	0.01364
		Count <DL	0	0	0	0	0	14	14	3	0	0	0	1	1	11	13	0	15	16	15	16	3	14	16	0	1	5	7
		Standard Deviation	0.00007	0.00006	0.0352	0.015	2.58	0.0000088	0.00000367	0.000241	0.00013	0.0430	0.0203	0.00795	0.00665	0.00000063	0.00000051	2.8	0	0.00000	0.000000	0.000000	0.723	0.00147	4E-11	0.0028	0.00347	0.0249	0.01195
		1st Quartile	0.00020	0.00019	0.0341	0.0263	9.86	<0.000010	<0.0000050	0.00052	0.00044	0.063	0.0416	0.00415	0.00245	<0.0000020	<0.0000020	11.4	<0.0010	<0.0010	<0.00020	<0.00020	1.265	<0.0050	<0.0050	0.0043	0.00333	<0.020	<0.020
		Median	0.00025	0.00024	0.0432	0.0351	11.2	<0.000010	<0.0000050	0.00068	0.00055	0.081	0.0524	0.0069	0.00325	<0.0000020	<0.0000020	13.2	<0.0010	<0.0010	<0.00020	<0.00020	1.62	<0.0050	<0.0050	0.0052	0.0044	0.031	<0.020
		3rd Quartile	0.00027	0.00026	0.0625	0.0483	12.4	<0.000010	<0.0000050	0.000765	0.00068	0.119	0.0763	0.01385	0.01103	0.00000155	<0.0000020	15.6	<0.0010	<0.0010	<0.00020	<0.00020	2.08	<0.0050	<0.0050	0.0064	0.00577	0.0573	0.020
LLS		Average	0.00226	0.00163	0.0055	0.00332	213.3	0.00000670	0.00000377	0.000478	0.000324	0.69	0.30810	0.1757	0.1784	0.0000010	0.0000010	526	0.00155	0.00146	0.000133	0.000133	470	0.00333	0.00333	0.0031	0.0025	0.01	0.021
E292131		Count	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	12	12	12	12	12	12	12	12	3	2	1	1
		Minimum	0.00034	0.00026	<0.0030	<0.0030	161	<0.000010	<0.0000050	<0.00050	<0.00020	0.088	<0.0050	0.0343	0.0316	<0.0000020	<0.0000020	405	<0.0010	<0.0010	<0.00020	<0.00020	377	<0.0050	<0.0050	0.0026	0.0021	<0.020	0.021
		Maximum	0.00492	0.00443	0.0129	0.009	252	<0.000050	<0.000025	<0.0025	0.00084	2.05	1.5	0.357	0.358	<0.0000020	<0.0000020	677	<0.0050	<0.0050	<0.0010	<0.0010	567	<0.025	<0.025	0.0036	0.0029	<0.020	0.021
	Small Seep into Long Lake	Geometric Mean	0.00165	0.00117	0.00402	0.00257	210.7	0.0000057	0.00000314	0.000394	0.000256	0.421	0.04709	0.1367	0.1368	0.000001	0.000001	519	0.00144	0.00132	0.000114	0.000114	466	0.00286	0.00286	0.0031	0.0025	0.01	0.021
		Count <DL	0	0	5	8	0	12	11	8	5	0	2	0	0	11	11	0	2	3	12	12	0	12	12	0	0	1	0
		Standard Deviation	0.00171	0.00139	0.00415	0.00267	34	0.0000058	0.00000313	0.000349	0.00022	0.655	0.56137	0.1191	0.1226	0	0	85	0.00057	0.00061	0.000115	0.000115	60	0.00289	0.00289	0.0005	0.0006	0	0
		1st Quartile	0.00093	0.00058	<0.0030	<0.0030	189.8	<0.000010	<0.0000050	<0.00050	<0.00020	0.164	0.01375	0.077	0.0788	<0.0000020	<0.0000020	453	0.00135	0.0012	<0.00020	<0.00020	410	<0.0050	<0.0050	0.0029	0.0023	<0.020	0.021
		Median	0.00147	0.00109	0.0038	<0.0030	211.5	<0.000010	<0.0000050	<0.00050	0.000340	0.429	0.0304	0.150	0.1535	<0.0000020	<0.0000020	529	0.0014	0.0014	<0.00020	<0.00020	480	<0.0050	<0.0050	0.0031	0.0025	<0.020	0.021
		3rd Quartile	0.0037	0.00213	0.00847	0.00465	248.2	<0.000010	<0.0000050	0.000565	0.000410	1.143	0.22225	0.298	0.3155	<0.0000020	<0.0000020	555	0.00202	0.00183	<0.00020	<0.00020	496	<0.0050	<0.0050	0.0033	0.0027	<0.020	0.021
LLSM		Average	0.00226	0.00119	0.0658	0.01168	193.2	0.0000057	0.0000043	0.001088	0.000719	1.006	0.18570	0.1703	0.1634	0.000001	0.00000126	491	0.0024	0.00252	0.0001	0.000133	438	0.00312	0.0039	0.003	0.0029	0.01	0.018
E292131		Count	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	12	12	12	12	12	12	12	12	4	4	2	2
		Minimum	0.0004	0.00025	0.0035	<0.0030	80.4	<0.000010	<0.0000050	<0.00050	<0.00020	0.14	0.0073	0.0376	0.0369	<0.0000020	<0.0000020	304	0.0011	0.0012	<0.00020	<0.00020	288	<0.0050	<0.0050	0.0021	0.0021	<0.020	<0.020
		Maximum	0.00624	0.00258	0.527	0.03	241	0.0000130	<0.000025	0.00655	0.00319	3.63	1.1	0.35	0.296	<0.0000020	0.0000039	631	0.0079	0.008	<0.00020	<0.0010	532	0.0099	<0.025	0.0036	0.0035	<0.020	0.026
		Geometric Mean	0.00159	0.00089	0.0169	0.00847	186.2	0.0000054	0.00000344	0.000593	0.00043	0.627	0.0598	0.1342	0.1313	0.000001	0.00000113	482	0.0021	0.00218	0.000100	0.000114	432	0.0028	0.00319	0.0029	0.0028	0.01	0.0161
	Long Lake Middle Seep	Count <DL	0	0	0	2	0	11	10	5	4	0	0	0	0	11	10	0	0	1	12	12	0	11	11	0	0	2	1
		Standard Deviation	0.00173	0.00081	0.14790	0.0098	47	0.0000023	0.00000369	0.001769	0.00087	1.023	0.32000	0.1106	0.1005	0.0000000	0.0000009	94	0.0018	0.00182	0	0.000115	72	0.00214	0.00334	0.0007	0.0006	4E-11	0.0113
		1st Quartile	0.00077	0.00042	0.0056	0.00652	164.5	<0.000010	<0.0000050	<0.00050	0.000265	0.22	0.02210	0.0790	0.0842	<0.0000020	<0.0000020	445	0.0016	0.00162	<0.00020	<0.00020	400	<0.0050	<0.0050	0.0026	0.0027	<0.020	0.014
		Median	0.00269	0.00119	0.0081	<0.015	204.5	<0.000010	<0.0000050	0.000595	0.00048	0.789	0.04290	0.15	0.1430	<0.0000020	<0.0000020	490	0.0019	0.00205	<0.00020	<0.00020	441	<0.0050	<0.0050	0.0031	0.0029	<0.020	0.018
		3rd Quartile	0.00306	0.00174	0.04240	0.01348	232.8	<0.000010	0.00000313	0.000822	0.00068	1.238	0.1735	0.2662	0.2708	<0.0000020	<0.0000020	542	0.0024	0.0027	<0.00020	<0.00020	490	<0.0050	<0.0050	0.0034	0.0031	<0.020	0.022

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 75
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
MW002	Ex-situ 2-3 South shallow groundwater well beside 3-South Pit (1 Seam)	Average	0.00086	0.00098	0.00695	0.0105	229.5	0.0000150	0.0000106	0.00075	0.000445	2.64	2.92	1.77	1.77	0.0000010	0.0000010	1220	0.00225	0.0024	0.000300	0.000400	1282	0.00750	0.01		0.00277		
		Count	2	4	2	4	4	2	4	2	4	2	4	2	4	1	4	2	2	4	2	4	4	2	4		4		
		Minimum	0.00074	0.00066	0.0064	0.005	209	<0.000010	0.000005	<0.00050	0.00028	2.3	2.44	1.69	1.69	<0.0000020	<0.0000020	1170	0.002	0.002	<0.00020	<0.00020	1220	<0.0050	<0.0050		<0.0020		
		Maximum	0.00097	0.00122	<0.015	0.022	249	<0.000050	<0.000025	<0.0025	<0.0010	2.98	3.42	1.85	1.95	<0.0000020	<0.0000020	1270	<0.0050	<0.0050	<0.0010	<0.0010	1360	<0.025	<0.025		0.0038		
		Geometric Mean	0.00085	0.00096	0.00693	0.00887	228.7	0.0000112	0.0000099	0.00056	0.000433	2.62	2.8992	1.77	1.767	0.0000010	0.0000010	1218	0.00224	0.0024	0.000224	0.000334	1280	0.00559	0.00836		0.00247		
		Count <DL	0	0	1	2	0	2	3	2	3	0	0	0	0	1	4	0	1	3	2	4	0	2	4		1		
		Standard Deviation	0.00016	0.00025	0.00078	0.00776	21.4	0.0000141	0.0000038	0.00071	0.00011	0.48	0.4016	0.11	0.1208	0.0000000	0.0000000	70	0.00035	0.00025	0.000283	0.000200	73	0.00707	0.005		0.00126		
		1st Quartile	0.0008	0.00086	0.00668	0.00688	212	0.00001	0.00001063	0.0005	0.000445	2.47	2.7625	1.73	1.7125	<0.0000020	<0.0000020	1195	0.0021	0.00237	0.0002	0.0004	1220	0.005	0.01000		0.00235		
		Median	0.00086	0.00103	0.00695	<0.015	230	0.000015	<0.000025	0.00075	<0.0010	2.64	2.91	1.77	1.72	<0.0000020	<0.0000020	1220	0.00225	<0.0050	0.0003	<0.0010	1275	0.0075	<0.025		0.00315		
		3rd Quartile	0.00091	0.00116	0.00722	0.01112	247.5	0.00002	<0.000025	0.001	<0.0010	2.81	3.0675	1.81	1.7775	<0.0000020	<0.0000020	1245	0.00237	<0.0050	0.0004	<0.0010	1337	0.01	<0.025		0.00358		
QU1009D	Ex-situ 4-South deep groundwater well. Down gradient of 4-South Mine. Base of Dunsmuir Member. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.101		0.00250	185		0.0000063		0.000550		0.655		0.1165		0.0000010			0.000500		0.0001000	83.7		0.00250		0.0265		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.100		<0.0030	184		<0.0000050		0.00033		0.517		0.098		<0.0000020			<0.0010		<0.00020	79		<0.0050		0.0178		
		Maximum		0.102		0.0035	186		0.00001		0.00076		0.793		0.135		<0.0000020			<0.0010		<0.00020	88.4		<0.0050		0.0352		
		Geometric Mean		0.101		0.00229	185		0.0000050		0.000500		0.6403		0.115		0.0000010			0.000500		0.0001000	83.6		0.00250		0.0250		
		Count <DL		0		1	0		1		0		0		0		2			2		2	0		2		0		
		Standard Deviation		0.001		0.00141	1.4		0.0000053		0.000300		0.1952		0.0262		0.0000000			0.000000		0.0000000	6.6		0.00000		0.0123		
		1st Quartile		0.101		0.00200	184.5		0.00000438		0.00044		0.586		0.1073		<0.0000020			<0.0010		<0.00020	81.3		<0.0050		0.0221		
		Median		0.101		0.00250	185		0.00000625		0.00055		0.655		0.1165		<0.0000020			<0.0010		<0.00020	83.7		<0.0050		0.0265		
		3rd Quartile		0.101		0.00300	185.5		0.00000813		0.00065		0.724		0.1258		<0.0000020			<0.0010		<0.00020	86.1		<0.0050		0.0309		
QU1009S	Ex-situ 4-South shallow groundwater well. Fracture zone 10 m below till. Assesses vertical gradients & water quality down gradient of the 4-South Mine workings. Just outside of mine pool. (Below 3 Seam)	Average		0.0838		0.00150	137.5		0.0000025		0.000155		5.55		0.3955		0.0000010			0.000500		0.0001000	128.0		0.00250		0.0295		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0807		<0.0030	136		<0.0000050		<0.00020		5.37		0.389		<0.0000020			<0.0010		<0.00020	128		<0.0050		0.0283		
		Maximum		0.0869		<0.0030	139		<0.0000050		0.00021		5.73		0.402		<0.0000020			<0.0010		<0.00020	128		<0.0050		0.0307		
		Geometric Mean		0.0837		0.0015	137.5		0.0000025		0.000145		5.5471		0.3954		0.0000010			0.0005		0.0001000	128.0		0.00250		0.0295		
		Count <DL		0		2	0		2		1		0		0		2			2		2	0		2		0		
		Standard Deviation		0.0044		0	2.1		0.0000000		0.000078		0.2546		0.0092		0.0000000			0		0.0000000	0.0		0.00000		0.0017		
		1st Quartile		0.0822		<0.0030	136.8		<0.0000050		0.000128		5.46		0.3922		<0.0000020			<0.0010		<0.00020	128		<0.0050		0.0289		
		Median		0.0838		<0.0030	137.5		<0.0000050		0.000155		5.55		0.3955		<0.0000020			<0.0010		<0.00020	128		<0.0050		0.0295		
		3rd Quartile		0.0854		<0.0030	138.2		<0.0000050		0.000183		5.64		0.3988		<0.0000020			<0.0010		<0.00020	128		<0.0050		0.0301		
SPD																													
E218582	Settling Pond # 1	Average	0.00109	0.00072	0.0599	0.02083	103.30	0.0000076	0.00000538	0.000991	0.00058	0.638	0.1611	0.0668	0.05851	0.00000121	0.00000117	215	0.00136	0.00104	0.0001	0.000100	204.2	0.00250	0.0025	0.113	0.0053	0.3925	0.0396
		Count	14	14	14	14	16	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	40	14	14	12	11	8	8
		Minimum	0.00037	0.0002	0.0045	<0.0030	40.80	<0.000010	<0.0000050	<0.00050	0.0003	0.088	0.0104	0.0142	<0.0010	<0.0000020	<0.0000020	127	<0.0010	<0.0010	<0.00020	<0.00020	94.5	<0.0050	<0.0050	0.0037	0.0032	<0.020	<0.020
		Maximum	0.00282	0.00151	0.249	0.078	275.0	0.000032	0.000021	0.00219	0.00083	2.25	0.614	0.220	0.241	0.0000026	0.0000023	333	0.0031	0.0028	<0.00020	<0.00020	367	<0.0050	<0.0050	1.27	0.0098	<2.0	0.17
		Geometric Mean	0.00088	0.0006	0.0351	0.01169	91.9	0.0000062	0.00000409	0.000883	0.00056	0.411	0.1009	0.0494	0.02626	0.0000011	0.0000011	206	0.00109	0.00086	0.0001	0.000100	196.50	0.0025	0.0025	0.0113	0.00500	0.0750	0.0207
		Count <DL	0	0	0	1	0	12	8	1	0	0	0	0	2	12	12	0	5	7	14	14	0	14	14	0	0	8	5
		Standard Deviation	0.00079	0.00042	0.0641	0.0226	55.9	0.0000075	0.00000522	0.000484	0.00015	0.664	0.1674	0.0554	0.06226	0.0000005	0.00000044	64.0	0.00091	0.0007	0.000000	0.000000	55.9	1E-10	1E-10	0.3644	0.0021	0.504	0.0564
		1st Quartile	0.00049	0.00034	0.0206	0.0053	63.1	<0.000010	<0.0000050	0.000685	0.0005	0.233	0.0592	0.0281	0.0277	<0.0000020	<0.0000020	165	<0.0010	<0.0010	<0.00020	<0.00020	170.2	<0.0050	<0.0050	0.0065	0.0037	<0.020	<0.020
		Median	0.00089	0.00069	0.0423	0.009	101.2	<0.000010	<0.0000050	0.00079	0.0006	0.353	0.102	0.0563	0.04405	<0.0000020	<0.0000020	195	0.00115	0.0008	<0.00020	<0.00020	204.50	<0.0050	<0.0050	0.0076	0.0046	0.055	<0.020
		3rd Quartile	0.00128	0.00101	0.072	0.0363	121.8	<0.000010	0.00000500	0.001267	0.00064	0.772	0.1878	0.077	0.06368	<0.0000020	<0.0000020	268	0.00195	0.00127	<0.00020	<0.00020	236.2	<0.0050	<0.0050	0.01010	0.0059	<2.0	0.03930
LLE	Long Lake Entrance (LLE)	Average	0.000999	0.000814	0.06775	0.02976	72.2	0.00000790	0.00000429	0.000698	0.000586	0.49	0.2533	0.0871	0.0855	0.00000131	0.0000016	289.5	0.00079	0.00079	0.000157	0.000157	261.41	0.00393	0.00648	0.0094	0.0064	0.0502	0.04829
E292130		Count	14	14	14	14	13	14	14	14	14	14	14	14	14	12	12	14	14	14	14	14	48	14	14	10	5	11	11
		Minimum	0.00024	0.00018	<0.015	0.0039	22.8	<0.000010	<0.0000050	<0.00050	0.00029	0.059	0.0524	0.0107	0.0097	<0.0000020	<0.0000020	55.9	<0.0010	<0.0010	<0.00020	<0.00020	4.1	<0.0050	<0.0050	0.0033	0.0029	<0.020	<0.0050
		Maximum	0.00163	0.00136	0.203	0.0734	160	<0.000050	0.000012	<0.0025	0.00088	2.17	1.27	0.251	0.281	0.000003	0.0000042	866	<0.0050	<0.0050	<0.0010	<0.0010	906	<0.025	0.0347	0.0306	0.0093	0.154	0.2500
		Geometric Mean	0.000828	0.000681	0.0515	0.02138	60.4	0.0000063	0.00000352	0.000611	0.000559	0.325	0.1686	0.0501	0.0486	0.00000119	0.0000014	191.4	0.00063	0.00063	0.000126	0.000126	150.17	0.00315	0.00404	0.0077	0.006	0.0261	0.02019
		Count <DL	2	2	1	2	0	14	10	5	2	0	0	0	0	10	8	0	14	14	14	14	0	14	12	0	0	7	4
		Standard Deviation	0.000502	0.000408	0.05007	0.02087	44.3	0.0000073	0.00000331	0.000343	0.000179	0.583	0.3125	0.085	0.0871	0.00000072	0.00000103	296.9	0.00073	0.00073	0.000145	0.000145	281.27	0.00363	0.00889	0.0078	0.0024	0.0555	0.07722
		1st Quartile	0.000612	0.00045	0.03148	0.0085	46.6	<0.000010	<0.0000050	0.000543	0.000455	0.215	0.100	0.0192	0.0189	<0.0000020	<0.0000020	110.5	<0.0010	<0.0010	<0.00020	<0.00020	85	<0.0050	<0.0050	0.0063	0.0057	<0.020	<0.020
		Median	0.001085	0.00087	0.0622	0.0306	60.9	<0.000010	<0.0000050	0.00059	0.000565	0.323	0.144	0.0509	0.0492	<0.0000020	<0.0000020	142	<0.0010	<0.0010	<0.00020	<0.00020	125	<0.0050	<0.0050	0.0075	0.0071	<0.020	0.013
		3rd Quartile	0.001415	0.001112	0.08378	0.04108	84	<0.000010	0.00000513	0.00094	0.000732	0.359	0.2923	0.139	0.123	<0.0000020	0.00000212	315.8	<0.0010	<0.0010	<0.00020	<0.00020	312.5	<0.0050	0.00513	0.00880	0.0071	0.0975	0.03200
LLM1	Long Lake Middle 1 metre below Surface	Average	0.00044	0.00043	0.0202	0.0172	32.4	0.00000500	0.0000025	0.001167	0.00041	0.051	0.031	0.0068	0.00203	0.000001	0.000001	82.2	0.00050	0.00050	0.000100	0.000100	69.6	0.00250	0.00250	0.00319			
E206619		Count	15	15	15	15	10	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	7			
		Minimum	0.00024	0.00023	0.0065	0.0044	14.8	<0.000010	<0.0000050	<0.00050	0.00022	0.016	0.0088	0.0011	<0.0010	<0.0000020	<0.0000020	23.6	<0.0010	<0.0010	<0.00020	<0.00020	12.6	<0.0050	<0.0050	<0.0020			
		Maximum	0.00062	0.00061	0.0503	0.0449	47.8	<0.000010	<0.0000050	0.00899	0.0007	0.109	0.0774	0.0090	0.0066	<0.0000020	<0.0000020	133	<0.0010	<0.0010	<0.00020	<0.00020	117	<0.0050	<0.0050	0.0060			
		Geometric Mean	0.00042	0.00041	0.0161	0.014	30.3	0.000005	0.0000025	0.00055	0.00038	0.042	0.0251	0.0063	0.00154	0.000001	0.000001	71.3	0.00050	0.00050	0.000100	0.000100	57.7	0.0025	0.00250	0.00264			
		Count <DL	0	0	0	0	0	15	15	7	0	0	0	0	3	14	14	0	15	15	15	15	0	15	15	2			
		Standard Deviation	0.00013	0.00014	0.0137	0.0114	11.4	0.00000000	0	0.002248	0.00015	0.032	0.0218	0.002	0.00167	0	0	39.5	0.00000	0.00000	0.000000	0.000000	36.3	1E-10	0.00000	0.00186			
		1st Quartile	0.00033	0.0003	0.0083	0.0079	26.8	<0.000010	<0.0000050	<0.00050	0.0003	0.022	0.0146	0.0059	0.00115	<0.0000020	<0.0000020	48.4	<0.0010	<0.0010	<0.00020	<0.00020	38.8	<0.0050	<0.0050	0.00205			
		Median	0.00043	0.00043	0.017	0.0125	32.7	<0.000010	<0.0000050	0.00050	0.00037	0.039	0.0261	0.0073	0.0016	<0.0000020	<0.0000020	81.8	<0.0010	<0.0010	<0.00020	<0.00020	72.2	<0.0050	<0.0050	0.0031			
		3rd Quartile	0.00056	0.00057	0.0294	0.0247	40.1	<0.000010	<0.0000050	0.000785	0.0005	0.0720	0.036	0.0083	0.00225	<0.0000020	<0.0000020	122	<0.0010	<0.0010	<0.00020	<0.00020	103.5	<0.0050	<0.0050	0.00405			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 76
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
LLMB	Long Lake Middle 1 metre From Bottom	Average	0.00028	0.00023	0.0125	0.009	57.6	0.00000500	0.0000025	0.004655	0.00037	0.07	0.02570	0.5811	0.5005	0.000001	0.000001	133.7	0.00050	0.00050	0.000126	0.000100	127.5	0.00250	0.00250	0.00410			
E206619		Count	15	15	15	15	10	15	15	15	15	15	15	15	15	14	14	15	15	15	15	15	15	15	15	7			
		Minimum	0.0002	0.00017	0.0067	0.0043	55.8	<0.000010	<0.0000050	<0.00050	0.00026	0.013	0.0081	0.0014	0.0014	<0.0000020	<0.0000020	127	<0.0010	<0.0010	<0.00020	<0.00020	122	<0.0050	<0.0050	0.0023			
		Maximum	0.00036	0.0003	0.0216	0.0155	61.7	<0.000010	<0.0000050	0.0655	0.00055	0.156	0.0742	1.63	1.45	<0.0000020	<0.0000020	143	<0.0010	<0.0010	0.00034	<0.00020	134	<0.0050	<0.0050	0.0071			
		Geometric Mean	0.00028	0.00022	0.0114	0.0082	57.6	0.000005	0.0000025	0.000421	0.00036	0.061	0.0185	0.2585	0.1299	0.000001	0.000001	133.6	0.00050	0.00050	0.000115	0.000100	127.5	0.00250	0.00250	0.00380			
		Count <DL	0	0	0	0	0	15	15	11	0	0	0	0	0	14	14	0	15	15	13	15	0	15	15	0			
		Standard Deviation	0.00005	0.00004	0.0056	0.0042	1.9	0	0	0.016833	0.00008	0.037	0.022	0.6065	0.6002	0	0	4.3	0.00000	0.00000	0.000071	0.000000	3.0	1E-10	0.00000	0.00170			
		1st Quartile	0.00024	0.00020	0.0084	0.0056	56.3	<0.000010	<0.0000050	<0.00050	0.00032	0.048	0.0097	0.1435	0.0692	<0.0000020	<0.0000020	132	<0.0010	<0.0010	<0.00020	<0.00020	126	<0.0050	<0.0050	0.003			
		Median	0.00028	0.00022	0.0088	0.0073	57.1	<0.000010	<0.0000050	<0.00050	0.00034	0.054	0.01160	0.258	0.14	<0.0000020	<0.0000020	133	<0.0010	<0.0010	<0.00020	<0.00020	127.0	<0.0050	<0.0050	0.0034			
		3rd Quartile	0.00032	0.00026	0.0188	0.0136	58.7	<0.000010	<0.0000050	0.00038	0.00041	0.097	0.04810	1.26	1.17	<0.0000020	<0.0000020	135	<0.0010	<0.0010	<0.00020	<0.00020	129.5	<0.0050	<0.0050	0.0049			
LLO	Long Lake Outlet	Average	0.00051	0.0004	0.058	0.015	36.6	0.0000054	0.00000275	0.000523	0.00042	0.1270	0.0294	0.0332	0.0048	0.00000122	0.00000109	92.3	0.0005	0.00050	0.000100	0.000100	68.5	0.00250	0.00250	0.0078	0.00540	0.0503	0.00864
E219412		Count	18	18	18	18	19	18	18	18	18	18	18	18	18	18	17	18	18	18	18	18	52	18	18	9	7	8	8
		Minimum	0.00027	0.00023	0.0071	0.004	20.6	<0.000010	<0.0000050	<0.00050	0.00026	0.024	0.0061	0.0047	0.0015	<0.0000020	<0.0000020	37.2	<0.0010	<0.0010	<0.00020	<0.00020	15.9	<0.0050	<0.0050	0.0032	0.0033	<0.020	<0.0050
		Maximum	0.00139	0.0006	0.287	0.054	54.9	0.000012	0.000007	0.00144	0.00098	0.643	0.084	0.279	0.0138	0.0000034	0.0000026	134	<0.0010	<0.0010	<0.00020	<0.00020	119	<0.0050	<0.0050	0.0167	0.0112	0.134	0.015
		Geometric Mean	0.00047	0.00038	0.0294	0.0107	35.2	0.0000052	0.00000265	0.000427	0.00039	0.077	0.0229	0.0147	0.0041	0.0000011	0.0000011	84.7	0.0005	0.00050	0.000100	0.000100	60.6	0.00250	0.00250	0.0069	0.00500	0.0341	0.00729
		Count <DL	0	0	0	0	0	17	17	10	0	0	0	0	0	16	16	0	18	18	18	18	0	18	18	0	0	2	5
		Standard Deviation	0.00026	0.00010	0.0813	0.0136	9.8	0.0000016	0.00000106	0.000357	0.00019	0.161	0.0232	0.0664	0.0029	0.00000065	0.00000039	34.5	0	0.00000	0.000000	0.000000	31.3	3E-11	3E-11	0.0042	0.0027	0.0454	0.00439
		1st Quartile	0.00035	0.00031	0.0132	0.0054	28.8	<0.000010	<0.0000050	<0.00050	0.00031	0.037	0.0153	0.0075	0.0031	<0.0000020	<0.0000020	55.0	<0.0010	<0.0010	<0.00020	<0.00020	42.6	<0.0050	<0.0050	0.0047	0.004	0.0205	0.00595
		Median	0.00044	0.00043	0.0261	0.0094	39.6	<0.000010	<0.0000050	<0.00050	0.00035	0.075	0.0197	0.0103	0.0043	<0.0000020	<0.0000020	107	<0.0010	<0.0010	<0.00020	<0.00020	60.5	<0.0050	<0.0050	0.0066	0.0042	0.0305	<0.020
		3rd Quartile	0.00055	0.00045	0.0523	0.022	43.5	<0.000010	<0.0000050	0.000752	0.00041	0.129	0.036	0.0165	0.0057	<0.0000020	<0.0000020	118.2	<0.0010	<0.0010	<0.00020	<0.00020	97.6	<0.0050	<0.0050	0.0095	0.0057	0.0723	0.01050
WB	Middle Quinsam Lake Outlet	Average	0.00019	0.00018	0.0184	0.0159	41.2	0.000005	0.00000294	0.000564	0.00063	0.036	0.0256	0.0068	0.0024	0.0000012	0.0000010	38.2	0.00050	0.00050	0.000100	0.000100	34.3	0.00250	0.00250	0.00430	0.00350	0.0100	0.00886
E0900504		Count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	16	16	16	16	16	17	16	16	9	7	8	8
		Minimum	0.00013	0.00012	0.0096	0.0082	32.9	<0.000010	<0.0000050	<0.00050	0.00044	0.027	0.0187	0.0032	0.001	<0.0000020	<0.0000020	32.9	<0.0010	<0.0010	<0.00020	<0.00020	28.7	<0.0050	<0.0050	0.0031	0.0023	<0.020	<0.0050
		Maximum	0.00025	0.00022	0.0288	0.0228	45.2	<0.000010	0.000006	0.00094	0.00144	0.051	0.0387	0.0120	0.0056	0.000004	<0.0000020	61.2	<0.0010	<0.0010	<0.00020	<0.00020	54	<0.0050	<0.0050	0.0073	0.0049	<0.020	0.025
		Geometric Mean	0.00018	0.000180	0.0174	0.0151	41	0.000005	0.00000279	0.000539	0.00059	0.036	0.0252	0.0064	0.0022	0.00000109	0.000001	37.8	0.00050	0.00050	0.000100	0.000100	34	0.00250	0.00250	0.00420	0.00350	0.0100	0.0065
		Count <DL	0	0	0	0	0	16	14	2	0	0	0	0	0	15	15	0	16	16	16	16	0	16	16	0	0	8	5
		Standard Deviation	0.00003	0.00003	0.0062	0.0051	3.2	1E-14	0.0000012	0.00016	0.00027	0.0070	0.0053	0.0025	0.0011	0.00000075	0	6.8	0.00000	0.00000	0.000000	0.000000	5.8	4E-11	4E-11	0.0013	0.0009	1E-10	0.00748
		1st Quartile	0.00017	0.00015	0.012	0.0099	39.7	<0.000010	<0.0000050	0.000535	0.00050	0.032	0.0225	0.005	0.0018	<0.0000020	<0.0000020	34.6	<0.0010	<0.0010	<0.00020	<0.00020	30.8	<0.0050	<0.0050	0.0036	0.003	<0.020	<0.0050
		Median	0.00018	0.000190	0.0185	0.0172	41.8	<0.000010	<0.0000050	0.000555	0.00055	0.036	0.024	0.0063	0.0023	<0.0000020	<0.0000020	36.7	<0.0010	<0.0010	<0.00020	<0.00020	32.3	<0.0050	<0.0050	0.004	0.0037	<0.020	0.0087
		3rd Quartile	0.00021	0.000200	0.024	0.02	43	<0.000010	<0.0000050	0.000615	0.0006	0.039	0.0278	0.0085	0.0027	<0.0000020	<0.0000020	38.6	<0.0010	<0.0010	<0.00020	<0.00020	35.5	<0.0050	<0.0050	0.0044	0.004	<0.020	0.01025
7SSD																													
E292069	Settling Pond at 7S- Discharge to Stream 1 -7S	Average	0.00283	0.00223	0.0893	0.00465	143.3	0.0000065	0.00000357	0.00149	0.00127	0.18	0.02697	0.0621	0.03594	0.000001	0.000001	140.4	0.0005	0.0005	0.0001	0.0001	19.26	0.0025	0.0025	0.0232	0.0094	0.01	0.01
		Count	14	14	14	14	14	14	14	14	14	14	14	14	14	12	12	14	14	14	14	14	14	14	14	1	1	1	1
		Minimum	0.00047	0.00029	0.0136	<0.0030	45.4	<0.000010	<0.0000050	0.00064	0.00049	0.026	<0.0050	0.0084	<0.0010	<0.0000020	<0.0000020	43.3	<0.0010	<0.0010	<0.00020	<0.00020	6	<0.0050	<0.0050	0.0232	0.0094	<0.020	<0.020
		Maximum	0.0112	0.00622	0.46	0.0105	195	0.000019	0.000009	0.00271	0.00266	0.592	0.0722	0.174	0.135	<0.0000020	<0.0000020	183	<0.0010	<0.0010	<0.00020	<0.00020	50.4	<0.0050	<0.0050	0.0232	0.0094	<0.020	<0.020
		Geometric Mean	0.0018	0.00149	0.053	0.00382	133.7	0.00000590	0.00000322	0.00132	0.00106	0.128	0.01447	0.0440	0.01773	0.000001	0.000001	132	0.0005	0.0005	0.000100	0.000100	16.14	0.0025	0.00250	0.0232	0.0094	0.01	0.01
		Count <DL	0	0	0	4	0	12	10	0	0	0	2	0	1	12	12	0	14	14	14	14	0	14	14	0	0	1	1
		Standard Deviation	0.00304	0.002	0.1194	0.00285	46.1	0.0000041	0.00000198	0.00077	0.00082	0.165	0.02707	0.0489	0.0424	0	0	42.6	0	0	0	0.000000	12.6	1E-10	0.00000	0	0	0	0
		1st Quartile	0.00087	0.00076	0.0278	0.002	122.5	<0.000010	<0.0000050	0.00088	0.00069	0.072	0.00588	0.0261	0.0097	<0.0000020	<0.0000020	123.0	<0.0010	<0.0010	<0.00020	<0.00020	10.48	<0.0050	<0.0050	0.0232	0.0094	<0.020	<0.020
		Median	0.0015	0.00134	0.0391	0.00425	152	<0.000010	<0.0000050	0.00117	0.00084	0.159	0.00985	0.0446	0.018	<0.0000020	<0.0000020	149	<0.0010	<0.0010	<0.00020	<0.00020	15.3	<0.0050	<0.0050	0.0232	0.0094	<0.020	<0.020
		3rd Quartile	0.00431	0.00329	0.092	0.0056	181.2	<0.000010	0.0000044	0.00223	0.00199	0.176	0.0464	0.092	0.03787	<0.0000020	<0.0000020	178.2	<0.0010	<0.0010	<0.00020	<0.00020	24.45	<0.0050	<0.0050	0.0232	0.0094	<0.020	<0.020
7S	Stream 1-7S discharge to LWO	Average	0.000066	0.000062	0.0361	0.0319	14.1	0.000005	0.00000322	0.000366	0.00038	0.0126	0.0075	0.0005	0.0005	0.00000151	0.00000126	14.8	0.00050	0.00050	0.000100	0.000100	3.070	0.00250	0.00250				
E292109		Count	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	9	9	9	9	9	9	9	9				
		Minimum	<0.00010	<0.00010	0.0158	0.0149	8.4	<0.000010	<0.0000050	<0.00050	0.00023	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	11.4	<0.0010	<0.0010	<0.00020	<0.00020	2.3	<0.0050	<0.0050				
		Maximum	0.00014	0.00011	0.104	0.0713	27.2	<0.000010	0.000009	0.00067	0.00052	0.047	0.024	<0.0010	<0.0010	0.0000028	0.0000031	23.6	<0.0010	<0.0010	<0.00020	<0.00020	4.10	<0.0050	<0.0050				
		Geometric Mean	0.000061	0.000059	0.0307	0.029	13.3	0.000005	0.00000288	0.000334	0.00037	0.0079	0.00546	0.0005	0.0005	0.00000138	0.00000115	14.4	0.00050	0.00050	0.000100	0.000100	3.01	0.00250	0.00250				
		Count <DL	7	7	0	0	0	9	8	6	0	7	4	9	9	5	7	0	9	9	9	9	0	9	9				
		Standard Deviation	0.000032	0.000024	0.0267	0.0167	5.4	0	0.00000217	0.000177	0.0001	0.0155	0.00698	0	0	0.00000074	0.00000074	3.7	0.00000	0.00000	0.000000	0.000000	0.62	4E-11	4E-11				
		1st Quartile	<0.00010	<0.00010	0.0212	0.0216	11.5	<0.000010	<0.0000050	<0.00050	0.00031	<0.010	<0.0050	<0.0010	<0.0010	<0.0000020	<0.0000020	13.1	<0.0010	<0.0010	<0.00020	<0.00020	2.5	<0.0050	<0.0050				
		Median	<0.00010	<0.00010	0.0284	0.0267	13.1	<0.000010	<0.0000050	<0.00050	0.00036	<0.010	0.0067	<0.0010	<0.0010	<0.0000020	<0.0000020	13.5	<0.0010	<0.0010	<0.00020	<0.00020	3.2	<0.0050	<0.0050				
		3rd Quartile	<0.00010	<0.00010	0.0381	0.0375	15.3	<0.000010	<0.0000050	0.00052	0.00044	<0.010	0.0092	<0.0010	<0.0010	0.00000212	<0.0000020	15.9	<0.0010	<0.0010	<0.00020	<0.00020	3.5	<0.0050	<0.0050				
QU0813A	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (No. 4 Seam)	Average		0.408		0.00215	177.0		0.0000025		0.000100		0.2307		0.0538		0.0000010			0.000500		0.0001000	22.8		0.00250		0.1480		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.382		<0.0030	171		<0.0000050		<0.00020		0.216		0.0456		<0.0000020			<0.0010		<0.00020	15.2		<0.0050		0.12		
		Maximum		0.435		0.0041	181		<0.0000050		<0.00020		0.249		0.0637		<0.0000020			<0.0010		<0.00020	30.1		<0.0050		0.184		
		Geometric Mean		0.408		0.00193	177.0		0.0000025		0.000100		0.2304		0.0534		0.0000010			0.000500		0.0001000	21.6		0.00250		0.1460		
		Count <DL		0		3	0		4		4		0		0		4			4		4	0		4		0		
		Standard Deviation		0.024		0.0013	4.5		4E-15		0.000000		0.015		0.0082		0.0000000			0.000000		0.0000000	8.3		0.00000		0.0270		
		1st Quartile		0.391		<0.0030	174.8		<0.0000050		<0.00020		0.2213		0.048		<0.0000020			<0.0010		<0.00020	15.8		<0.0050		0.133		
		Median		0.408		<0.0030	178		<0.0000050		<0.00020		0.229		0.053		<0.0000020			<0.0010		<0.00020	22.9		<0.0050		0.144		
		3rd Quartile		0.425		0.0022	180.2		<0.0000050		<0.00020		0.2385		0.0588		<0.0000020			<0.0010		<0.00020	29.9		<0.0050		0.159		
QU0813B	Ex-situ 7-South groundwater well down gradient of the CCR backfill towards QR (Till & SST contact)	Average		0.506		0.0678	135.8		0.0000034		0.000100		0.2425		0.0871		0.0000010			0.000500		0.0001000	67.3		0.00250		0.1362		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.493		0.0035	126		<0.0000050		<0.00020		0.127		0.0615		<0.0000020			<0.0010		<0.00020	10.2		<0.0050		0.0486		
		Maximum		0.518		0.241	147		0.000006		<0.00020		0.524		0.143		<0.0000020			<0.0010		<0.00020	221		<0.0050		0.168		
		Geometric Mean		0.505		0.0174	135.5		0.0000031		0.000100		0.2027		0.0821		0.0000010			0.000500		0.0001000	28.7		0.00250		0.1217		
		Count <DL		0		0	0		3		4		0		0		4			4		4	0		4		0		
		Standard Deviation		0.014		0.1157	9.2		0.0000018		0.000000		0.188		0.0377		0.0000000			0.000000		0.0000000	102.7		0.00000		0.0584		
		1st Quartile		0.493		0.0046	129.8		<0.0000050		<0.00020		0.1457		0.0664		<0.0000020			<0.0010		<0.00020	11		<0.0050		0.1344		
		Median		0.506		0.0135	135		<0.0000050		<0.00020		0.1595		0.072		<0.0000020			<0.0010		<0.00020	19		<0.0050		0.164		
		3rd Quartile		0.518		0.0767	141		0.00000338		<0.00020		0.2563		0.0926		<0.0000020			<0.0010		<0.00020	75.3		<0.0050		0.1658		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 77
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
QU0821GD	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 4 Seam)	Average		0.132		0.0076	215.0		0.00001033		0.000367		1.334		0.1573		0.0000010			0.00183		0.000367	1.58		0.00917		0.1014		
		Count		3		3	3		3		3		3		3		3			3		3	3		3		3		
		Minimum		0.121		<0.015	210		0.000006		<0.00020		0.982		0.0799		<0.0000020			<0.0010		<0.00020	<1.0		<0.0050		0.0493		
		Maximum		0.147		0.0078	218		<0.000025		<0.0010		1.73		0.278		<0.0000020			<0.0050		<0.0010	2.3		<0.025		0.141		
		Geometric Mean		0.131		0.0076	215.0		0.00000979		0.000292		1.2989		0.1363		0.0000010			0.00146		0.000292	1.304		0.00731		0.0925		
		Count <DL		0		2	0		2		3		0		0		3			3		3	1		3		0		
		Standard Deviation		0.014		0.00017	4.4		0.00000375		0.000231		0.3759		0.1059		0.0000000			0.00115		0.000231	0.951		0.00577		0.0471		
		1st Quartile		0.124		<0.015	213.5		0.00000925		0.0003		1.136		0.097		<0.0000020			0.0015		0.0003	1.22		0.0075		0.0817		
		Median		0.127		<0.015	217		<0.000025		<0.0010		1.29		0.114		<0.0000020			<0.0050		<0.0010	1.93		<0.025		0.114		
		3rd Quartile		0.137		0.00765	217.5		<0.000025		<0.0010		1.51		0.196		<0.0000020			<0.0050		<0.0010	2.12		<0.025		0.1275		
QU0821GS	Ex-situ 2-North groundwater well down gradient of u/g tailings disposal, measures water quality & hydraulic gradients downstream of Forjan Fault (No. 1 Seam)	Average		0.195		0.00832	201.2		0.0000099		0.000443		0.3953		0.0839		0.0000010			0.001500		0.0003000	0.613		0.00750		0.101		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.178		0.006	194		<0.0000050		0.00033		0.286		0.0493		<0.0000020			<0.0010		<0.00020	<1.0		<0.0050		0.0029		
		Maximum		0.208		0.0123	209		<0.000025		<0.0010		0.555		0.15		<0.0000020			<0.0050		<0.0010	0.95		<0.025		0.155		
		Geometric Mean		0.194		0.00803	201.2		0.0000083		0.000436		0.3825		0.0754		0.0000010			0.001120		0.0002240	0.587		0.00559		0.051		
		Count <DL		0		2	0		3		2		0		0		4			4		4	3		4		0		
		Standard Deviation		0.016		0.00274	6.3		0.0000049		0.00008		0.1194		0.0469		0.0000000			0.001150		0.0002310	0.225		0.00577		0.0673		
		1st Quartile		0.183		0.00712	197.8		0.00000963		0.000412		0.315		0.0512		<0.0000020			<0.0010		<0.00020	<1.0		<0.0050		0.0877		
		Median		0.197		<0.015	201		0.00001225		0.00047		0.37		0.0681		<0.0000020			0.0015		0.0003	<1.0		0.00750		0.123		
		3rd Quartile		0.208		0.0087	204.5		<0.000025		<0.0010		0.45		0.1008		<0.0000020			<0.0050		<0.0010	0.613		<0.025		0.1363		
QU1010D																													
		Average		0.0141		0.0098	92.2		0.000014		0.00061		8.7		0.3745		0.0000010			0.00275		0.000550	0.375		0.0138		0.07380		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.0139		0.0045	91.3		<0.0000050		0.00021		7.95		0.332		<0.0000020			<0.0010		<0.00020	<0.50		<0.0050		0.0711		
		Maximum		0.0144		<0.030	93.2		<0.000050		<0.0020		9.45		0.417		<0.0000020			<0.010		<0.0020	<1.0		<0.050		0.0766		
		Geometric Mean		0.0141		0.0082	92.2		0.000008		0.00046		8.6676		0.3721		0.0000010			0.00158		0.000316	0.354		0.0079		0.07380		
		Count <DL		0		1	0		2		1		0		0		2			2		2	2		2		0		
		Standard Deviation		0.0004		0.0074	1.3		0.000016		0.00056		1.1		0.06		0.0000000			0.00318		0.000636	0.2		0.0159		0.00390		
		1st Quartile		0.014		0.00712	91.8		0.00000813		0.000407		8.325		0.3533		<0.0000020			0.00163		0.000325	0.312		0.00813		0.0725		
		Median		0.0141		0.00975	92.2		0.00001375		0.000605		8.7		0.3745		<0.0000020			0.00275		0.00055	0.375		0.01375		0.0738		
		3rd Quartile		0.0143		0.01237	92.7		0.00001937		0.000803		9.075		0.3957		<0.0000020			0.00387		0.000775	0.438		0.01937		0.0752		
QU1010S	Ex-situ 2-North shallow groundwater well. Down gradient of u/g tailings disposal, measures water quality & hydraulic head downstream of 2-North workings. (No. 1 Seam / Sandstone).	Average		0.113		0.0083	152.0		0.0000025		0.0001		0.2325		0.0407		0.0000010			0.000500		0.0005300	19.9		0.00250		0.0551		
		Count		2		2	2		2		2		2		2		2			2		2	2		2		2		
		Minimum		0.112		<0.0030	152		<0.0000050		<0.00020		0.221		0.0361		<0.0000020			<0.0010		<0.00020	19.6		<0.0050		0.0468		
		Maximum		0.113		0.0151	152		<0.0000050		<0.00020		0.244		0.0453		<0.0000020			<0.0010		0.00096	20.1		<0.0050		0.0634		
		Geometric Mean		0.112		0.00476	152.0		0.0000025		0.0001		0.2322		0.0404		0.0000010			0.000500		0.0003100	19.8		0.0025		0.0545		
		Count <DL		0		1	0		2		2		0		0		2			2		1	0		2		0		
		Standard Deviation		0.001		0.00962	0.0		0.0000000		0		0.0163		0.0065		0.0000000			0.000000		0.0006080	0.4		1E-11		0.0117		
		1st Quartile		0.112		0.0049	152		<0.0000050		<0.00020		0.2268		0.0384		<0.0000020			<0.0010		0.000315	19.7		<0.0050		0.051		
		Median		0.113		0.0083	152		<0.0000050		<0.00020		0.2325		0.0407		<0.0000020			<0.0010		0.00053	19.9		<0.0050		0.0551		
		3rd Quartile		0.113		0.0117	152		<0.0000050		<0.00020		0.2382		0.043		<0.0000020			<0.0010		0.000745	20		<0.0050		0.0592		
QU1011D	Ex-situ 2-North deep groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.0088		0.0075	305		0.0000125		0.0012		4.44		0.502		0.0000010			0.0025		0.0005	0.5		0.0125		0.160		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.0088		<0.015	305		<0.000025		0.0012		4.44		0.502		<0.0000020			<0.0050		<0.0010	<1.0		<0.025		0.16		
		Maximum		0.0088		<0.015	305		<0.000025		0.0012		4.44		0.502		<0.0000020			<0.0050		<0.0010	<1.0		<0.025		0.16		
		Geometric Mean		0.0088		0.0075	305		0.0000125		0.0012		4.44		0.502		0.0000010			0.0025		0.0005	0.5		0.0125		0.160		
		Count <DL		0		1	0		1		0		0		0		1			1		1	1		1		0		
		Standard Deviation		0.00000		0.0000	0		0.0000000		0.00000		0.00		0.000		0.0000000			0.00000		0.000000	0.0		0.0000		0.000		
		1st Quartile		0.0088		<0.015	305		<0.000025		0.0012		4.44		0.502		<0.0000020			<0.0050		<0.0010	<1.0		<0.025		0.16		
		Median		0.0088		<0.015	305		<0.000025		0.0012		4.44		0.502		<0.0000020			<0.0050		<0.0010	<1.0		<0.025		0.16		
		3rd Quartile		0.0088		<0.015	305		<0.000025		0.0012		4.44		0.502		<0.0000020			<0.0050		<0.0010	<1.0		<0.025		0.16		
QU1011S	Ex-situ 2-North shallow groundwater well. Measures water quality & hydraulic gradient in Forjian Fault (Fractured sandstone).	Average		0.00145		0.0042	68.7		0.0000025		0.00027		0.177		0.0334		0.0000010			0.0005		0.0001000	5.3		0.00250		0.0076		
		Count		1		1	1		1		1		1		1		1			1		1	1		1		1		
		Minimum		0.00145		0.0042	68.7		<0.0000050		0.00027		0.177		0.0334		<0.0000020			<0.0010		<0.00020	5.3		<0.0050		0.0076		
		Maximum		0.00145		0.0042	68.7		<0.0000050		0.00027		0.177		0.0334		<0.0000020			<0.0010		<0.00020	5.3		<0.0050		0.0076		
		Geometric Mean		0.00145		0.0042	68.7		0.0000025		0.00027		0.177		0.0334		0.0000010			0.0005		0.0001000	5.3		0.0025		0.0076		
		Count <DL		0		0	0		1		0		0		0		1			1		1	0		1		0		
		Standard Deviation		0		0	0		0.0000000		0		0		0		0.0000000			0		0.0000000	0		0		0		
		1st Quartile		0.00145		0.0042	68.7		<0.0000050		0.00027		0.177		0.0334		<0.0000020			<0.0010		<0.00020	5.3		<0.0050		0.0076		
		Median		0.00145		0.0042	68.7		<0.0000050		0.00027		0.177		0.0334		<0.0000020			<0.0010		<0.00020	5.3		<0.0050		0.0076		
		3rd Quartile		0.00145		0.0042	68.7		<0.0000050		0.00027		0.177		0.0334		<0.0000020			<0.0010		<0.00020	5.3		<0.0050		0.0076		

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 78
2017-2018 Annual Report

2017 -18 Statistics Stn.Code EMS. ID	Site Name & Description	Statistics	As-T	As-D	Al-T	Al-D	Alk-T	Cd-T	Cd-D	Cu-T	Cu-D	Fe-T	Fe-D	Mn-T	Mn-D	Hg-T	Hg-D	Hard-T	Ni-T	Ni-D	Pb-T	Pb-D	SO4-D	Zn-T	Zn-D	P-T	P-D	N-NO23	N-NH3
QU1105S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.0762		0.00437	252.4		0.0000041		0.000135		1.2705		0.1618		0.0000010			0.000500		0.0001000	108.8		0.00250		0.029		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.0487		<0.0030	89.8		<0.0000050		<0.00020		0.492		0.0751		<0.0000020			<0.0010		<0.00020	50.8		<0.0050		0.0189		
		Maximum		0.0957		0.008	442		0.000009		0.00024		1.55		0.24		<0.0000020			<0.0010		<0.00020	166		<0.0050		0.0396		
		Geometric Mean		0.0739		0.00372	217		0.0000034		0.000124		1.1521		0.1491		0.0000010			0.000500		0.0001000	98.9		0.00250		0.028		
		Count <DL		0		1	0		3		3		0		0		4			4		4	0		4		0		
		Standard Deviation		0.0204		0.00269	147.6		0.0000033		0.000070		0.519		0.0681		0.0000000			0.000000		0.0000000	51.2		0.00000		0.010		
		1st Quartile		0.0676		0.00323	174.7		<0.0000050		<0.00020		1.248		0.135		<0.0000020			<0.0010		<0.00020	76.1		<0.0050		0.0221		
		Median		0.0803		0.004	239		<0.0000050		<0.00020		1.52		0.166		<0.0000020			<0.0010		<0.00020	109.2		<0.0050		0.0289		
		3rd Quartile		0.089		0.00515	316.8		0.00000413		0.000135		1.5425		0.1927		<0.0000020			<0.0010		<0.00020	142		<0.0050		0.0358		
QU1109S	Ex-situ River Barrier Pillar (RBP) shallow groundwater well. Monitors water quality & gradients above the RBP & 2-North Mine. (Sandstone)	Average		0.111		0.00652	470		0.0000100		0.0004		0.3168		0.0429		0.0000010			0.002		0.0004	430.5		0.01		0.060		
		Count		4		4	4		4		4		4		4		4			4		4	4		4		4		
		Minimum		0.071		0.0036	436		<0.0000050		<0.00020		0.162		0.0221		<0.0000020			<0.0010		<0.00020	402		<0.0050		0.0401		
		Maximum		0.140		<0.015	538		<0.000025		<0.0010		0.402		0.0531		<0.0000020			<0.0050		<0.0010	458		<0.025		0.0748		
		Geometric Mean		0.107		0.00624	469		0.0000084		0.000334		0.2992		0.0406		0.0000010			0.00167		0.000334	430		0.00836		0.058		
		Count <DL		0		3	0		4		4		0		0		4			4		4	0		4		0		
		Standard Deviation		0.029		0.0020	45		0.0000050		0.00020		0.1076		0.01430		0.0000000			0.00100		0.000200	24.3		0.0050		0.015		
		1st Quartile		0.103		0.00652	447		0.00001		0.0004		0.2865		0.0394		<0.0000020			0.002		0.0004	416.2		0.01		0.0534		
		Median		0.116		<0.015	454		<0.000025		<0.0010		0.3515		0.0483		<0.0000020			<0.0050		<0.0010	431		<0.025		0.0619		
		3rd Quartile		0.124		<0.015	478		<0.000025		<0.0010		0.3818		0.0518		<0.0000020			<0.0050		<0.0010	445.2		<0.025		0.068		
7SQR	7-South Quinsam River downstream of 7-South Mining Operation	Average	0.00042	0.0004	0.0231	0.0183	39.5	0.000005	0.00000266	0.000671	0.00055	0.073	0.0496	0.0054	0.0044	0.000001	0.000001	37.2	0.00050	0.00050	0.000105	0.000100	31.5	0.00262	0.0025	0.00490	0.00530	0.0252	0.00732
E292113		Count	22	22	22	22	22	22	22	22	22	22	22	22	22	21	20	22	22	22	22	22	22	22	22	12	7	11	11
		Minimum	0.00027	0.00025	0.0102	0.0071	26.4	<0.000010	<0.0000050	<0.00050	0.00041	0.051	0.0324	0.0022	0.0015	<0.0000020	<0.0000020	28.7	<0.0010	<0.0010	<0.00020	<0.00020	17	<0.0050	<0.0050	0.0021	0.0033	<0.020	<0.0050
		Maximum	0.00056	0.00055	0.0529	0.0574	45.2	<0.000010	0.000006	0.00212	0.00099	0.099	0.0822	0.0079	0.0078	<0.0000020	<0.0000020	53.7	<0.0010	<0.0010	0.00021	<0.00020	42.3	0.0051	<0.0050	0.0174	0.0086	0.038	<0.020
		Geometric Mean	0.00041	0.00039	0.0207	0.0159	39.1	0.000005	0.0000026	0.000621	0.00054	0.072	0.0486	0.0051	0.0042	0.000001	0.000001	36.9	0.00050	0.00050	0.000103	0.000100	31.1	0.00258	0.0025	0.00420	0.00510	0.024	0.00633
		Count <DL	0	0	0	0	0	22	21	1	0	0	0	0	0	21	20	0	22	22	21	22	0	21	22	0	0	1	9
		Standard Deviation	0.00009	0.00009	0.0115	0.0115	5.2	0.00000000	0.00000075	0.00035	0.00014	0.014	0.0107	0.0015	0.0014	0	0	5	0.00000	0.00000	0.000023	0.000000	5.2	0.00055	0	0.004	0.0018	0.0075	0.00339
		1st Quartile	0.00037	0.00034	0.0143	0.0107	37	<0.000010	<0.0000050	0.000525	0.00048	0.064	0.0428	0.0043	0.0034	<0.0000020	<0.0000020	34.7	<0.0010	<0.0010	<0.00020	<0.00020	29	<0.0050	<0.0050	0.0036	0.0043	0.0215	0.00425
		Median	0.00043	0.00040	0.0215	0.0152	41.9	<0.000010	<0.0000050	0.00058	0.00052	0.074	0.048	0.0055	0.0045	<0.0000020	<0.0000020	37.2	<0.0010	<0.0010	<0.00020	<0.00020	31.9	<0.0050	<0.0050	0.004	0.0045	0.023	<0.020
		3rd Quartile	0.00047	0.00046	0.027	0.0214	42.9	<0.000010	<0.0000050	0.000702	0.00055	0.083	0.0542	0.0066	0.0053	<0.0000020	<0.0000020	38.9	<0.0010	<0.0010	<0.00020	<0.00020	34.40	<0.0050	<0.0050	0.0046	0.006	0.0305	<0.020
LQL1	Lower Quinsam Lake 1 metre below surface	Average	0.00061	0.00058	0.0329	0.0251	34.9	0.000005	0.0000038	0.00087	0.00069	0.104	0.0652	0.0128	0.00581	0.00000115	0.00000112	32.8	0.0005	0.00050	0.000100	0.000100	21.1	0.00250	0.00250	0.005			
E292118		Count	15	15	15	15	5	15	15	15	15	15	15	15	15	13	13	15	15	15	15	15	15	15	15	6			
		Minimum	0.00047	0.0004	0.0077	0.0079	24.2	<0.000010	<0.0000050	0.00052	0.00042	0.037	0.0242	0.0037	<0.0010	<0.0000020	<0.0000020	27.0	<0.0010	<0.0010	<0.00020	<0.00020	13.8	<0.0050	<0.0050	0.004			
		Maximum	0.00076	0.00068	0.0871	0.0603	43.3	<0.000010	0.0000090	0.0036	0.00167	0.219	0.136	0.0455	0.0291	0.0000029	0.0000026	39.8	<0.0010	<0.0010	<0.00020	<0.00020	27.1	<0.0050	<0.0050	0.0060			
		Geometric Mean	0.0006	0.00057	0.0264	0.0203	34.2	0.000005	0.00000339	0.00074	0.00065	0.088	0.055	0.0092	0.0026	0.00000109	0.00000108	32.5	0.0005	0.00050	0.000100	0.000100	20.5	0.00250	0.00250	0.0049			
		Count <DL	0	0	0	0	0	15	10	0	0	0	0	0	3	12	12	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.0001	0.0001	0.0213	0.0164	7.8	0	0.0000021	0.00077	0.0003	0.061	0.0392	0.0125	0.00811	0.00000053	0.00000044	4.3	0	0.00000	0.000000	0.000000	5.1	1E-10	1E-10	0.0008			
		1st Quartile	0.00051	0.00049	0.0147	0.0111	30.7	<0.000010	<0.0000050	0.00057	0.00054	0.05	0.0324	0.0056	0.0012	<0.0000020	<0.0000020	29.4	<0.0010	<0.0010	<0.00020	<0.00020	15.6	<0.0050	<0.0050	0.0045			
		Median	0.00066	0.00063	0.0309	0.0184	35.5	<0.000010	<0.0000050	0.000640	0.00063	0.086	0.0522	0.0067	0.00160	<0.0000020	<0.0000020	32	<0.0010	<0.0010	<0.00020	<0.00020	23.4	<0.0050	<0.0050	0.005			
		3rd Quartile	0.0007	0.00065	0.0452	0.0374	41	<0.000010	0.0000050	0.000810	0.0007	0.143	0.0899	0.0148	0.00685	<0.0000020	<0.0000020	36.3	<0.0010	<0.0010	<0.00020	<0.00020	25.4	<0.0050	<0.0050	0.0055			
LQLB	LQLB 1 metre from Bottom	Average	0.001	0.00073	0.0423	0.0303	31.7	0.0000074	0.00000626	0.00097	0.00068	0.44	0.2442	0.1377	0.1297	0.00000114	0.00000112	31.4	0.00050	0.00050	0.000100	0.000100	16.3	0.0025	0.00250	0.0067			
E292118		Count	15	15	15	15	4	15	15	15	15	15	15	15	15	13	13	15	15	15	15	15	15	15	15	6			
		Minimum	0.00048	0.00038	0.0241	0.0157	24.5	<0.000010	<0.0000050	0.0005	0.00056	0.086	0.0514	0.0044	0.0024	<0.0000020	<0.0000020	25.4	<0.0010	<0.0010	<0.00020	<0.00020	12.5	<0.0050	<0.0050	0.0049			
		Maximum	0.00204	0.00119	0.0876	0.0681	35.7	0.000014	0.0000130	0.00268	0.00097	1.15	0.632	0.438	0.43	0.0000028	0.0000026	37.5	<0.0010	<0.0010	<0.00020	<0.00020	24.5	<0.0050	<0.0050	0.0086			
		Geometric Mean	0.00086	0.00068	0.0395	0.0279	31.4	0.0000068	0.00000559	0.0009	0.00067	0.288	0.1668	0.0451	0.0318	0.00000108	0.00000108	31.2	0.00050	0.00050	0.000100	0.000100	15.8	0.0025	0.00250	0.0066			
		Count <DL	0	0	0	0	0	9	3	0	0	0	0	0	0	12	12	0	15	15	15	15	0	15	15	0			
		Standard Deviation	0.00056	0.00029	0.0179	0.0138	4.9	0.0000032	0.00000299	0.00051	0.00011	0.383	0.2063	0.1608	0.1597	0.0000005	0.00000044	3.6	0.00000	0.00000	0.000000	0.000000	4.2	1E-10	1E-10	0.0013			
		1st Quartile	0.00051	0.00050	0.0297	0.0205	31	<0.000010	0.000005	0.00073	0.00061	0.119	0.0809	0.0105	0.0069	<0.0000020	<0.0000020	29.2	<0.0010	<0.0010	<0.00020	<0.00020	12.9	<0.0050	<0.0050	0.0058			
		Median	0.00068	0.00062	0.0368	0.0258	33.3	<0.000010	0.00000520	0.00087	0.00065	0.209	0.125	0.028	0.0147	<0.0000020	<0.0000020	30.9	<0.0010	<0.0010	<0.00020	<0.00020	15.3	<0.0050	<0.0050	0.0071			
		3rd Quartile	0.00153	0.00099	0.0468	0.0378	34	0.00001	0.00000800	0.00091	0.0007	0.772	0.4275	0.2745	0.264	<0.0000020	<0.0000020	33.0	<0.0010	<0.0010	<0.00020	<0.00020	17.8	<0.0050	<0.0050	0.0072			

Notes:
Factor applied to less-than results when calculating statistics: 0.5
Factor applied to greater-than results when calculating statistics: 1.0

Table 79
2017-2018 Annual Report

Middle Point Barge Loading Facility

EMS ID: E17181 **Permit # 17181**

Stn.Code:	MP			
Site Name:	Middle Point Terminal			
Units	mg/L	mg/L	pH Units	Flow
Parameters:	O&G	TSS	pH-F	m3/h
Permit Limits:	10	50	6.5 - 8.5	
6-Apr-2017	<5.0	<4.0	7.80	2
12-Apr-2017	<5.0	<4.0	8.01	2
19-Apr-2017	<5.0	<4.0	8.01	2
24-Apr-2017	<5.0	<4.0	8.00	2
4-May-2017	<5.0	<4.0	8.01	2
9-May-2017	<5.0	<4.0	8.00	2
18-May-2017	<5.0	<4.0	8.00	2
25-May-2017	<5.0	<4.0	7.90	2
2-Jun-2017	<5.0	<4.0	8.00	2
6-Jun-2017	<5.0	<4.0	7.90	2
16-Jun-2017	<5.0	<4.0	8.01	2
23-Jun-2017	<5.0	<4.0	8.00	2
27-Jun-2017	<5.0	<4.0	8.00	2
5-Jul-2017	<5.0	<4.0	7.90	2
13-Jul-2017	<5.0	<4.0	8.00	2
19-Jul-2017	<5.0	<4.0	8.10	2
25-Jul-2017	<5.0	<4.0	8.10	2
3-Aug-2017	<5.0	<4.0	8.00	2
9-Aug-2017	<5.0	<4.0	8.00	2
17-Aug-2017	<5.0	<4.0	8.00	2
22-Aug-2017	<5.0	<4.0	7.90	2
29-Aug-2017	<5.0	<4.0	8.00	2
6-Sep-2017	<5.0	<4.0	8.06	2
12-Sep-2017	<5.0	<4.0	8.00	2
20-Sep-2017	<5.0	<4.0	8.03	2
26-Sep-2017	<5.0	<4.0	7.60	2
5-Oct-2017	<5.0	<4.0	7.80	2
12-Oct-2017	<5.0	<4.0	8.00	2
19-Oct-2017	<5.0	<4.0	7.80	2
25-Oct-2017	<5.0	4	8.00	2
31-Oct-2017	<5.0	<4.0	8.00	2
7-Nov-2017	<5.0	<4.0	7.90	2
14-Nov-2017	<5.0	<4.0	7.70	2
20-Nov-2017	<5.0	<4.0	7.50	2
30-Nov-2017	<5.0	<4.0	7.50	2
5-Dec-2017	<5.0	4.5	7.80	2
11-Dec-2017	<5.0	<4.0	8.00	2
19-Dec-2017	<5.0	<4.0	7.80	2
27-Dec-2017	<5.0	<4.0	7.90	2
2-Jan-2018	<5.0	<4.0	7.80	2
8-Jan-2018	<5.0	<4.0	8.00	2
15-Jan-2018	<5.0	<4.0	8.00	2
22-Jan-2018	<5.0	<4.0	7.80	2
29-Jan-2018	<5.0	4.3	7.90	2
5-Feb-2018	<5.0	<4.0	8.00	2
15-Feb-2018	<5.0	<4.0	8.00	2
19-Feb-2018	<5.0	<4.0	8.10	2
28-Feb-2018	<5.0	<4.0	7.80	2
5-Mar-2018	<5.0	<4.0	7.70	2
15-Mar-2018	<5.0	<4.0	8.00	2
19-Mar-2018	<5.0	<4.0	7.80	2
26-Mar-2018	<5.0	<4.0	7.90	2

Table 80
2017-2018 Annual Report

EMS ID: E217018
Site NAME: NO NAME LAKE (NNL)

NO NAME LAKE DEPTH PROFILING SPRING

Sample Date	11-Apr						20-Apr						27-Apr						04-May						10-May					
Parameter	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP
Sample Depth (m)	Celsius				mg/L		Celsius				mg/L		Celcius				mg/L		Celcius				mg/L		Celcius				mg/L	
1	6.11	7.11	29	89.0	11.04	228.0	8.42	7.00	32	96.9	11.37	226.0	10.15	6.96	31	97.3	10.93	234.3	10.87	7.11	32	97.9	10.82	151.6	12.40	7.25	32	98.0	10.47	174.4
2	6.09	7.06	29	88.7	11.02	228.4	8.19	6.89	32	96.6	11.39	226.2	10.08	6.92	31	97.2	10.95	235.0	10.66	7.02	32	97.3	10.81	156.0	11.57	7.20	32	97.2	10.59	175.1
3	5.93	6.98	29	88.1	11.00	229.8	7.95	6.85	32	94.9	11.33	230.5	9.98	6.86	31	97.0	10.96	236.1	10.48	6.94	32	96.4	10.76	159.0	10.92	7.13	32	95.8	10.58	176.6
4	5.74	6.94	30	86.5	10.84	230.4	7.39	6.77	33	93.1	11.20	232.4	9.44	6.78	31	95.1	10.86	237.9	9.59	6.88	33	94.0	10.73	163.2	10.10	7.06	32	94.2	10.61	178.1
5	5.67	6.88	30	86.8	10.89	231.8	6.34	6.72	34	87.9	10.78	235.1	8.01	6.69	32	92.0	10.89	240.8	8.78	6.80	33	92.0	10.69	167.9	8.69	7.00	33	89.7	10.47	181.6
6	5.62	6.82	30	85.9	10.80	232.5	6.28	6.68	35	86.8	10.72	236.7	6.63	6.62	33	86.6	10.58	243.0	7.13	6.73	35	86.1	10.43	173.1	7.05	6.92	35	84.1	10.20	185.1
7	5.59	6.81	30	85.9	10.80	233.1	6.02	6.62	36	84.5	10.50	239.4	6.02	6.59	36	81.8	10.17	244.7	6.35	6.65	36	81.4	10.04	175.9	6.36	6.80	37	78.2	9.64	187.6
8	5.54	6.77	30	85.3	10.74	233.6	5.90	6.61	36	83.5	10.45	240.9	5.76	*6.48*	37	78.9	9.89	249.4	6.01	6.60	38	79.3	9.87	178.5	6.06	6.71	38	77.0	9.57	188.9
9	5.47	6.74	31	84.7	10.69	234.7	5.59	6.55	38	81.4	10.23	241.9	5.63	*6.42*	38	78.2	9.83	251.3	5.89	6.55	38	78.1	9.74	180.5	5.78	6.66	39	74.8	9.36	188.4
10	5.38	6.70	32	83.6	10.53	235.2	5.50	6.53	40	79.9	10.08	243.5	5.57	*6.36*	38	77.5	9.75	252.1	5.81	6.52	39	77.1	9.64	181.8	5.68	6.60	41	73.1	9.16	190.5
11	5.20	6.65	33	81.3	10.32	236.6	5.45	6.51	40	79.1	9.98	244.3	5.44	*6.34*	39	76.5	9.64	251.7	5.70	*6.49*	40	76.2	9.55	183.0	5.63	6.55	42	72.4	9.09	190.3
12	5.01	6.61	36	78.0	9.96	238.2	5.35	6.50	42	77.8	9.84	245.2	5.33	*6.34*	43	74.8	9.46	251.9	5.65	*6.46*	40	75.5	9.50	183.9	5.57	6.52	43	71.8	9.04	190.7
																			5.58	*6.45*	40	75.4	9.49	183.4						
1m from Bottom (BS)	BS=12.00m						BS=11.90m						BS=12.00m						BS=12.40m						BS=12.0 m					

NO NAME LAKE DEPTH PROFILING SUMMER

Sample Date	10-Aug						15-Aug						23-Aug						29-Aug						07-Sep					
Parameter	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius				mg/L		Celcius				mg/L		Celcius				mg/L		Celcius				mg/L		Celcius				mg/L	
1	23.03	7.41	41	98.6	8.44	224.1	21.90	7.46	46	90.2	7.99	170.8	22.00	7.40	38	82.9	7.23	157.1	21.30	7.32	38	90.3	7.93	178.3	22.10	7.50	39	75.3	6.55	123.4
2	23.03	7.40	43	97.4	8.37	225.0	21.80	7.46	46	93.3	8.12	168.10	22.00	7.43	38	76.3	6.83	157.6	21.30	7.25	38	87.3	7.75	181.6	22.10	7.36	39	76.6	6.63	127.4
3	22.07	7.32	41	98.1	8.37	230.5	21.80	7.46	46	88.6	7.88	171.10	21.90	7.40	38	82.1	7.19	163.1	21.30	7.34	38	85.4	7.55	177.4	22.00	7.36	39	70.1	6.11	126.6
4	18.92	7.10	35	115.1	10.70	239.7	21.70	7.40	46	87.7	7.66	166.60	21.70	7.40	38	77.3	6.81	163.4	21.10	7.34	38	84.4	7.46	178.2	21.90	7.34	39	73.0	6.37	127.0
5	15.00	6.95	30	108.7	10.89	247.7	16.50	7.12	36	120.2	11.91	196.00	18.00	7.44	32	104.6	10.11	171.9	18.90	7.24	33	109.0	10.10	195.1	19.40	7.33	34	92.9	8.57	132.4
6	10.65	6.89	30	90.4	10.06	250.9	12.00	6.73	34	97.4	10.57	209.30	12.70	7.11	29	93.8	9.93	198.2	13.50	7.04	30	99.0	10.32	208.5	15.40	7.24	31	97.0	9.80	141.3
7	8.75	6.81	29	75.3	8.74	254.1	9.30	6.72	34	81.8	9.36	211.50	12.60	6.90	29	89.4	9.51	216.8	10.00	6.87	29	76.9	8.70	224.7	11.00	7.13	29	77.8	8.33	150.0
8	7.81	6.71	29	65.7	7.86	256.7	7.80	6.65	34	62.4	7.39	212.90	10.40	6.86	28	81.2	9.00	214.6	8.50	6.58	28	63.4	7.44	230.6	8.70	7.04	29	50.7	5.97	155.4
9	7.01	*6.42*	29	55.4	6.71	258.7	7.20	6.59	33	51.3	6.22	214.50	9.90	6.65	28	71.7	8.13	220.7	7.20	6.52	28	45.3	5.48	228.6	7.50	6.93	28	34.7	4.12	159.2
10	6.73	*6.38*	29	53.1	6.50	260.5	6.80	6.63	34	45.0	5.46	211.00	8.40	6.64	28	65.4	6.49	223.3	6.80	*6.48*	28	43.0	5.25	229.9	6.90	6.74	28	32.6	3.92	163.3
11	6.34	*6.34*	29	52.3	6.42	198.9	6.60	6.67	34	44.4	5.45	206.60	7.20	6.59	28	65.4	5.02	222.8	6.50	*6.48*	28	41.0	5.06	228.3	6.60	6.76	28	31.6	3.76	160.8
	6.44	*6.34*	29	51.6	6.32	196.2																								
1m from Bottom (BS)	BS=11.5m						BS=11.0m						BS=11.0m						BS=10.9m						BS=11.0m					

NO NAME LAKE DEPTH PROFILING FALL

Sample Date	19-Oct						25-Oct						02-Nov						08-Nov						16-Nov					
Parameter	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP	TEMP.	pH	COND. µS/cm	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius				mg/L		Celcius				mg/L		Celcius				mg/L		Celcius				mg/L		Celcius				mg/L	
1	11.03	6.91	32	87.7	9.66	225.1	9.86	7.03	30	87.0	9.83	265.6	8.21	7.22	27	82.4	9.69	239.1	6.33	7.00	27	76.2	9.38	187.70	5.50	6.91	29	67.3	8.74	321.6
2	11.02	7.00	32	87.7	9.66	266.8	9.71	6.94	29	83.9	9.52	269.1	8.26	7.09	27	81.4	9.58	238.5	6.31	6.85	26	75.2	9.28	191.40	5.50	6.89	30	64.9	8.04	325.0
3	11.02	7.00	37	87.6	9.65	284.6	9.57	6.88	28	84.3	9.61	273.2	8.25	7.03	27	81.4	9.58	238.3	6.30	6.78	26	74.7	9.23	194.00	5.50	6.97	30	63.1	7.89	337.7
4	10.98	6.97	37	87.4	9.65	296.5	9.44	6.82	28	83.5	9.55	278.2	8.24	6.97	27	81.1	9.54	238.2	6.30	6.75	26	74.6	9.21	195.90	5.50	6.92	30	63.0	7.54	339.2
5	10.06	6.94	35	84.4	9.34	311.2	9.34	6.77	27	83.1	9.52	278.0	8.25	6.85	26	81.0	9.53	241.0	6.26	6.70	26	74.5	9.20	198.30	5.50	6.89	30	63.2	7.35	340.1
6	10.43	6.84	35	84.3	9.45	321.7	9.20	6.70	28	78.7	9.04	281.7	8.24	6.83	26	80.9	9.53	242.6	6.30	6.65	26	74.30	9.19	200.70	5.50	6.91	29	63.1	7.23	340.3
7	10.09	6.77	35	83.1	9.36	330.8	9.02	6.69	27	80.7	9.33	283.3	8.23	6.83	27	80.8	9.18	243.0	6.29	6.63	26	74.3	9.18	204.70	5.50	6.90	29	63.0	7.18	344.2
8	9.74	6.70	33	82.5	9.39	338.9	8.86	6.65	26	80.2	9.30	285.4	8.19	6.75	27	78.3	9.10	245.0	6.29	6.59	26	74.2	9.17	208.10	5.50	6.90	29	62.5	7.02	350.2
9	9.20	6.57	34	71.2	8.25	351.1	8.56	*6.47*	28	65.1	7.64	291.0	8.06	6.60	27	66.2	7.80	248.1	6.28	6.55	26	74.2	9.17	212.50	5.40	6.90	29	62.2	7.51	352.0
10	7.75	*6.20*	34	38.0	4.54	359.0	7.69	*6.27*	30	38.8	4.60	296.0	7.69	*6.45*	28	50.2	5.93	250.6	6.27	6.52	26	74.2	9.17	214.80	5.40	6.90	29	63.9	7.75	355.7
11	7.75	*6.20*	34	38.0	4.54	359.0	7.30	*6.24*	30	34.6	4.17	296.5	7.56	*6.39*	29	43.8	5.05	252.2	6.26	6.52	26	74.3	9.20	216.50	5.40	6.90	29	63.4	7.21	359.5
12							6.96	*6.22*	29	33.5	4.06	300.1	7.37	*6.35*	30	36.2	4.25	253.3	6.21	6.53	26	75.9	9.41	219.7	5.40	6.89	29	63.0	7.15	362.2
							6.79	*6.22*	29	33.6	4.10	300.9													5.40	6.87	28	62.2	7.08	363.6
1m from Bottom (BS)	BS=11.0m						BS=12.5m						BS=12.0m						BS=12.0m						BS=12.8m					

WQG-Max: Max. 6.5 -9.0 Hypolimnetic DO minimum 3 mg/L June -August

Table 81
2017-2018 Annual Report

EMS ID: E206619
Site NAME: LONG LAKE (LLM)

LONG LAKE DEPTH PROFILING SPRING

Sample Date	11-Apr						20-Apr						27-Apr						04-May						10-May					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celsius		µS/cm		mg/L	mV	Celsius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	6.54	6.75	88	94.4	11.59	221.2	9.07	6.89	130	98.6	11.38	236.5	10.63	6.95	147	97.6	10.85	217.1	10.91	7.08	164	96.8	10.69	174.1	12.59	7.14	177	98.3	10.45	191.0
2	6.68	6.63	152	93.6	11.45	226.4	8.58	6.88	143	97.6	11.42	236.3	10.53	6.94	149	97.5	10.86	217.5	10.71	7.02	172	96.5	10.72	176.0	11.53	7.13	216	96.0	10.42	192.8
3	5.97	6.57	269	87.0	10.84	229.2	7.66	6.80	240	93.4	11.14	241.9	9.21	6.86	225	93.3	10.70	222.7	10.31	6.98	203	94.7	10.60	179.0	10.56	7.05	260	93.2	10.39	194.9
4	5.32	6.59	361	72.4	9.14	232.1	6.64	6.78	331	84.6	10.41	244.9	7.24	6.82	320	82.0	9.92	227.8	8.20	6.89	315	85.4	10.12	185.6	7.71	7.04	341	78.7	9.49	199.6
5	4.89	6.60	386	65.2	8.31	233.2	5.42	6.76	406	69.0	8.72	248.1	5.42	6.81	390	69.1	8.69	231.4	6.00	6.82	389	70.6	8.74	189.6	6.15	6.94	377	68.4	8.45	201.0
6	4.76	6.61	393	62.5	8.00	233.7	4.94	6.74	421	63.7	8.14	249.0	4.92	6.77	400	60.1	7.69	234.0	5.36	6.79	404	64.0	8.09	191.2	5.50	6.90	392	63.3	7.97	201.0
7	4.59	6.62	396	61.2	7.89	233.8	4.78	6.73	427	61.6	7.91	249.4	4.77	6.74	403	59.7	7.68	235.0	5.04	6.77	410	61.1	7.80	192.3	5.12	6.89	398	59.3	7.52	201.2
8	4.57	6.62	398	61.0	7.87	234.1	4.65	6.73	429	61.0	7.85	249.3	4.72	6.74	406	59.6	7.65	236.0	4.80	6.75	414	59.9	7.68	192.3	4.81	6.87	402	58.5	7.51	200.9
9	4.54	6.67	399	60.6	7.82	234.4	4.64	6.73	433	60.6	7.81	249.7	4.66	6.73	410	58.8	7.57	236.7	4.73	6.74	416	58.8	7.56	193.2	4.79	6.87	404	58.2	7.46	200.9
10	4.53	6.67	401	60.5	7.81	235.0	4.55	6.73	434	60.7	7.83	249.7	4.63	6.73	411	58.2	7.49	237.0	4.66	6.72	419	57.5	7.39	193.7	4.77	6.86	407	56.7	7.26	201.1
11	4.50	6.66	404	60.3	7.79	235.1	4.55	6.73	436	60.1	7.75	249.9	4.60	6.73	412	57.9	7.45	238.0	4.65	6.70	420	56.5	7.26	194.5	4.72	6.85	408	55.6	7.15	201.1
12	4.48	6.67	406	59.9	7.74	235.2	4.55	6.73	437	59.7	7.71	250.0	4.58	6.72	413	57.4	7.40	238.2	4.64	6.70	421	56.0	7.21	195.0	4.68	6.84	409	55.4	7.12	201.4
13	4.47	6.67	407	59.6	7.71	235.2	4.55	6.73	438	59.4	7.67	250.2	4.56	6.72	413	57.2	7.38	238.7	4.59	6.68	422	55.5	7.15	194.8	4.65	6.84	410	54.9	7.06	201.3
14	4.46	6.67	407	59.4	7.68	235.3	4.54	6.73	439	59.2	7.63	250.3	4.54	6.71	414	56.8	7.33	239.1	4.59	6.69	423	55.1	7.11	195.4	4.60	6.83	410	54.2	6.99	201.1
15	4.45	6.68	408	59.1	7.64	235.4	4.53	6.73	439	58.7	7.58	250.4	4.54	6.71	414	56.4	7.28	239.5	4.56	6.67	424	54.7	7.05	195.8	4.58	6.83	410	54.0	6.96	201.1
16	4.44	6.68	409	58.4	7.59	235.6	4.52	6.72	440	58.5	7.55	250.5	4.54	6.70	415	56.2	7.25	239.6	4.56	6.66	424	53.7	6.93	195.0	4.58	6.82	411	53.4	6.86	201.0
17	4.44	6.68	410	58.3	7.54	236.0	4.51	6.72	440	58.3	7.53	250.6	4.54	6.71	415	56.2	7.25	239.8	4.56	6.66	424	53.3	6.87	196.1	4.58	6.82	411	53.0	6.82	201.0
18	4.44	6.67	410	57.6	7.45	236.1	4.49	6.72	441	58.3	7.53	250.7	4.52	6.71	415	56.1	7.25	240.2	4.56	6.66	425	52.9	6.83	196.3	4.58	6.82	412	52.7	6.79	200.9
1m from Bottom (BS)	4.45	6.67	410	57.3	7.41	236.3	4.48	6.72	441	58.1	7.52	250.7	4.51	6.71	415	55.8	7.21	240.8	4.57	6.65	425	52.8	6.81	196.7	4.57	6.82	411	52.3	6.74	201.1
	BS=19.00m						BS=19.20m						BS=19.00m						BS=19.00m						BS=19.00 m					

LONG LAKE DEPTH PROFILING SUMMER

Sample Date	10-Aug						15-Aug						23-Aug						29-Aug						07-Sep					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	22.70	7.57	335..3	84.8	7.31	137.7	21.30	7.09	379	92.9	8.29	168.8	21.30	7.40	335	88.0	7.80	123.2	21.00	7.06	320	88.7	7.91	215.4	21.30	7.25	329	80.2	7.10	129.4
2	22.40	7.57	334	84.8	7.32	145.8	21.20	7.14	378	86.1	7.64	168.3	21.30	7.39	344	84.6	77.60	130.7	20.70	7.09	318	86.8	7.78	213.1	21.30	7.26	329	74.2	6.57	127.2
3	22.10	7.55	337	88.5	7.62	148.7	21.10	7.24	378	84.0	7.47	166.6	21.30	7.37	344	84.0	7.47	131.0	20.70	7.13	318	90.0	8.07	210.6	21.30	7.28	329	76.5	6.80	126.7
4	22.40	7.46	371	77.8	7.04	151.9	21.10	7.26	377	89.8	8.03	166.5	21.30	7.36	345	84.5	7.51	132.6	20.40	7.17	317	84.8	7.63	208.3	21.00	7.29	330	78.3	6.96	127.0
5	17.60	7.30	339	94.0	9.09	163.9	17.70	7.14	387	107.6	10.22	178.7	21.00	7.35	344	86.0	7.57	151.9	19.30	7.15	330	85.8	7.91	209.6	20.00	7.27	336	83.4	7.60	130.1
6	11.80	7.16	324	85.7	9.11	176.4	12.20	7.06	364	94.3	10.12	182.5	19.80	7.34	327	89.0	8.09	158.7	13.80	7.06	313	97.0	10.02	214.6	15.30	7.18	326	91.0	9.22	134.7
7	8.60	7.11	302	71.2	8.12	180.1	8.80	6.95	340	68.6	7.92	185.9	13.50	7.25	318	93.4	9.73	166.7	9.90	6.96	289	77.7	8.84	217.1	10.60	7.14	297	72.3	8.02	136.2
8	7.10	7.12	288	57.1	6.88	180.1	7.10	6.96	327	53.6	6.50	184.4	10.00	7.16	297	78.9	8.77	176.5	7.50	6.91	274	58.8	7.08	217.9	8.10	7.10	282	48.0	5.78	137.7
9	6.00	7.12	29	42.4	5.26	178.5	6.00	6.97	319	43.7	5.44	181.8	7.90	7.10	275	53.5	6.45	177.3	6.10	6.89	263	45.6	5.66	216.3	6.40	7.07	269	38.3	4.73	137.9
10	5.50	7.11	279	34.7	4.37	178.3	5.60	6.96	316	38.5	4.85	180.4	6.20	7.10	267	45.5	5.62	176.0	5.70	6.88	260	39.0	4.87	214.8	6.00	7.05	265	33.0	4.20	137.3
11	5.30	7.10	277	31.1	3.91	178.5	5.40	6.95	315	34.6	4.36	179.6	5.70	7.08	264	33.4	4.15	173.6	5.50	6.88	259	33.0	4.16	213.0	5.70	7.04	263	26.5	3.32	136.9
12	5.10	7.08	276	27.5	3.53	176.5	5.20	6.95	313	31.4	3.99	179.4	5.80	7.07	224	33.1	4.14	172.2	5.20	6.87	257	29.7	3.71	211.9	5.50	7.03	261	24.5	3.09	137.8
13	5.00	7.07	275	26.2	3.32	179.0	5.00	6.94	311	26.5	3.30	179.2	5.40	7.06	224	25.6	3.41	173.0	4.90	6.87	255	19.8	***2.50***	210.2	5.20	6.96	259	19.1	***2.41***	138.9
14	4.90	7.06	275	22.5	***2.85***	177.7	4.80	6.94	311	17.4	***2.23***	178.8	5.00	7.05	224	19.0	***2.34***	173.5	4.90	6.86	255	16.6	***2.13***	208.7	5.00	6.88	259	15.4	***1.96***	141.5
15	4.80	7.04	274	18.0	***2.34***	179.5	4.80	6.92	310	13.1	***1.69***	176.9	4.80	7.05	224	13.0	***1.65***	173.9	4.80	6.84	255	14.0	***1.83***	207.9	5.00	6.84	258	12.0	***1.55***	142.0
16	4.80	7.04	274	14.9	***1.91***	179.5	4.80	6.91	311	11.5	***1.45***	153.8	4.80	7.05	225	11.6	***1.49***	173.0	4.80	6.83	255	12.5	***1.61***	207.0	4.90	6.83	258	9.0	***1.12***	141.5
17	4.80	6.95	274	12.0	***1.54***	179.6	4.80	6.89	311	9.5	***1.19***	141.5	4.80	7.04	225	10.0	***1.25***	169.2	4.80	6.80	255	10.6	***1.35***	206.8	4.90	6.82	258	6.0	***0.76***	141.1
18	4.80	6.91	274	9.6	***1.22***	179.8	4.80	6.89	311	8.7	***1.11***	133.0	4.80	7.02	224	8.7	***1.14***	165.0	4.80	6.78	255	9.7	***1.26***	206.3	4.90	6.82	258	4.7	***0.60***	139.8
1m from Bottom (BS)	4.80	6.87	274	6.7	***0.84***	181.2	4.80	6.88	311	7.2	***1.00***	124.8	4.80	7.00	226	6.5	***0.95***	134.0	4.80	6.75	257	5.4	***0.69***	165.0	4.90	6.81	258	3.5	***0.44***	138.5
	BS=19.0m						BS=19.0m						BS=19.0m						BS=19.0m						BS=19.0m					

LONG LAKE DEPTH PROFILING FALL

Sample Date	19-Oct						25-Oct						02-Nov						08-Nov						16-Nov					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	10.96	7.55	302	88.1	9.71	347.0	10.28	7.45	212	89.6	10.05	308.4	8.57	7.35	192	86.3	10.08	270.8	6.36	7.18	168.7	84.8	10.42	232.8	5.2	7.33	58	81.6	10.38	345.7
2	10.95	7.56	304	88.0	9.70	347.0	10.18	7.45	220	89.6	9.99	308.7	8.58	7.37	191	86.0	10.04	270.6	6.43	7.23	175.8	84.1	10.35	230.8	5.50	7.19	99	80.8	10.22	347.3
3	10.95	7.56	302	87.9	9.69	305.2	10.16	7.45	221	88.3	9.92	309.1	8.57	7.39	191	86.1	10.05	270.4	6.50	7.28	176.6	83.9	10.31	229.8	6.00	7.33	163	75.4	9.44	350.7
4	10.95	7.56	305	87.9	9.69	348.4	10.13	7.44	220	87.9	9.88	309.5	8.58	7.39	192	85.9	10.02	270.8	6.51	7.30	177.9	83.8	10.29	229.4	6.30	7.36	196	72.6	8.95	350.9
5	10.94	7.55	306	87.8	9.69	348.8	10.12	7.44	220	88.0	9.90	309.8	8.58	7.40	193	85.7	0.80	269.5	6.52	7.30	177.9	83.8	10.28	229.7	6.30	7.45	197	74.0	9.06	350.8
6	10.93	7.55	304	87.8	9.68	349.4	10.13	7.44	225	87.8	9.87	310.1	8.57	7.40	194	85.7	10.01	269.1	6.59	7.31	182	83.6	10.24	230.3	6.30	7.50	199	74.3	9.10	351.6
7	10.92	7.55	304	87.7	9.67	349.9	10.12	7.43	231	86.7	9.74	311.1	8.57	7.41	93	85.8	0.00	268.8	6.60	7.32	181.9	83.5	10.24	230.8	6.30	7.49	206	73.3	9.01	352.5
8	10.87	7.46	305	85.0	9.59	351.2	9.83	7.18	268	77.9	8.80	315.8	8.61	7.34	209	82.3	9.55	269.5	6.61	7.32	182.6	83.4	10.22	231.2	6.30	7.49	212	70.4	8.72	353.4
9	9.10	7.01	317	60.1	6.90	362.6	7.86	6.86	281	47.8	5.65	321.8	7.67	7.20	276	47.5	5.75	274.8	6.64	7.29	188	82.7	10.07	235.3	6.30	7.45	223	69.7	8.50	356.3
10	6.75	6.88	293	43.1	5.26	367.0	6.59	6.82	272	39.3	4.80	323.3	6.52	6.99	272	42.3	5.17	275.3	6.65	6.94	267.7	39.4	4.79	241.7	6.40	7.20	295	31.3	3.80	359.5
11	6.21	6.79	291	36.7	4.53	369.0	6.13	6.80	266	37.3	4.61	324.2	6.23	6.96	269	38.0	4.70	275.9	6.41	6.91	269.5	35.6	4.39	242.2	6.30	7.12	314	22.6	2.77	360.5
12	5.92	6.77	290	33.5	4.18	370.3	5.87	6.79	265	33.1	4.12	325.0	5.84	6.93	269	34.9	4.32	276.1	5.72	6.88	265.1	30.7	3.84	242.9	5.80	7.09	312	16.5	2.03	360.9
13	5.70	6.76	289	31.6	3.95	371.4	5.69	6.78	263	31.0	3.87	325.3	5.74	6.92	264	30.7	3.85	276.5	5.51	6.87	263	27.5	3.47	243.2	5.60	7.06	310	14.2	1.75	360.9
14	5.45	6.75	286	28.6	3.59	372.2	5.56	6.77	262	28.1	3.54	325.0	5.54	6.90	264	28.2	3.50	277.1	5.38	6.86	262.1	25.0	3.15	243.6	5.40	7.06	361	10.5	1.30	360.2
15	5.34	6.73	285	20.0	2.51	371.7	5.36	6.76	261	24.8	3.13	326.1	5.33	6.88	263	24.4	3.07	273.1	5.33	6.85	261.2	19.6	2.47	243.8	5.20	7.04	308	1.3	0.14	358.7
16	5.13	6.71	284	12.3	1.56	370.4	5.24	6.74	260	18.8	2.38	326.8	5.22	6.87	262	19.2	2.32	278.6	5.17	6.83	261	13.3	1.69	244.9	5.20	7.03	308	0.0	0.00	358.0
17	5.10	6.72	284	11.5	1.46	369.4	5.12	6.74	260	11.3	1.41	327.5	5.15	6.84	262	14.8	1.87	279.5	5.13	6.83	261.4	10.4	1.30	245.3	5.10	7.05	309	0.0	0.00	356.0
18	5.08	6.72	284	9.9	1.26	368.9	5.08	6.75	261	8.0	1.01	327.8	5.13	6.84	263	11.9	1.50	280.0	5.12	6.83	262.2	8.6	1.06	245.4	5.10	7.05	309	0.0	0.00	354.8
19	5.07	6.73	284	8.5	1.08	366.3	5.08	6.76	261	7.6	0.96	327.6	5.12	6.85	263	6.9	1.20	280.3	5.11	6.84	262.6	6.6	0.82	245.1	5.10	7.07	310	0.0	0.00	353.3
							5.81	6.76	261	6.7	0.85	327.4													5.10	7.00	310	0.0	0.00	324.2
1m from Bottom (BS)	BS=19.0m						BS=19.3m						BS=19.0m						BS=19.0m						BS=20m					

WQG-Max pH Max. 6.5 -9.0 Hypolimnetic DO minimum 3 mg/L June -August

Table 82
2017-2018 Annual Report

EMS ID E206618

Site NAME: MIDDLE QUINSAM LAKE (MQL)

MIDDLE QUINSAM LAKE DEPTH PROFILING SPRING

Sample Date	11-Apr						20-Apr						27-Apr						04-May						10-May					
Parameter	TEMP.	pH		% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celsius		µS/cm		mg/L	mV	Celsius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	7.47	7.08	162	95.6	11.47	203.8	9.48	7.38	192	99.8	11.40	217.6	11.31	7.49	172	100.0	10.94	212.5	11.29	7.40	168	99.5	10.90	166.1	13.36	7.52	163	100.7	10.52	189.9
2	7.37	7.11	162	95.2	11.46	204.3	9.45	7.38	192	99.5	11.39	218.3	11.04	7.49	172	99.4	10.94	212.4	11.18	7.39	169	99.2	10.89	167.2	12.83	7.54	162	100.3	10.60	189.4
3	7.29	7.12	162	95.2	11.47	204.4	9.16	7.38	194	98.8	11.37	218.8	11.01	7.50	172	99.1	10.92	213.0	11.04	7.38	168	98.7	10.87	167.9	12.23	7.52	161	99.4	10.66	190.1
4	7.16	7.14	162	95.4	11.55	204.7	8.82	7.39	194	98.4	11.42	219.5	10.91	7.49	171	98.9	10.92	213.3	10.97	7.37	169	98.1	10.82	169.1	11.76	7.52	164	99.5	10.78	189.8
5	7.09	7.14	163	94.4	11.45	205.1	8.53	7.38	193	98.4	11.49	220.2	10.83	7.49	172	98.7	10.92	213.9	10.69	7.36	171	97.5	10.84	170.5	11.31	7.52	166	98.9	10.82	189.7
6	6.98	7.16	164	94.0	11.41	205.1	8.24	7.37	193	97.6	11.49	221.3	9.58	7.48	179	97.9	11.17	215.3	10.25	7.35	174	97.8	10.96	171.3	10.58	7.50	169	97.8	10.89	190.7
7	6.66	7.15	174	92.4	11.35	206.9	7.67	7.36	192	95.6	11.40	222.5	8.34	7.47	182	96.9	11.39	216.5	9.32	7.33	181	96.4	11.05	173.3	9.10	7.48	179	95.3	11.01	193.4
8	6.34	7.12	179	90.5	11.17	208.6	7.04	7.32	195	93.0	11.30	225.0	7.54	7.43	183	94.2	11.29	220.5	8.02	7.32	188	94.1	11.15	175.8	7.97	7.42	185	92.4	10.95	196.2
9	5.97	7.09	189	88.4	11.01	210.3	6.53	7.29	201	90.6	11.12	226.7	6.83	7.34	192	89.3	10.90	223.3	6.65	7.28	212	86.9	10.63	179.6	6.88	7.31	205	85.7	10.43	203.7
10	5.61	7.06	202	85.8	10.74	212.7	6.00	7.21	225	85.0	10.57	230.5	6.12	7.24	220	82.0	10.12	227.4	6.23	7.19	241	79.1	9.74	184.0	6.21	7.19	245	74.6	9.23	209.2
11	5.06	6.99	242	79.1	10.05	216.5	5.37	7.11	280	75.9	9.31	236.2	5.78	7.13	257	73.4	9.18	232.1	6.01	7.11	265	71.8	8.95	187.4	6.04	7.11	262	68.3	8.50	210.9
12	4.94	6.90	299	69.6	8.89	221.6	5.28	7.02	314	70.0	8.83	239.8	5.51	7.02	307	63.1	7.95	236.0	5.80	7.02	286	65.5	8.20	190.0	5.96	7.04	270	64.8	8.07	211.8
13	4.93	6.79	401	53.6	6.82	227.0	5.17	6.85	404	52.5	6.64	245.3	5.44	6.94	322	59.0	7.45	237.7	5.74	6.96	295	62.2	7.79	191.8	5.88	6.99	275	62.4	7.76	212.6
	5.01	6.67	467	41.8	5.28	230.4	5.17	6.76	427	455.0	5.78	247.0	5.42	6.88	336	54.9	6.93	239.1	5.72	6.89	298	60.3	7.56	192.9	5.88	6.95	276	60.6	7.56	212.8
1m from Bottom (BS)	BS=13.50m						BS=13.40m						BS=13.5m						BS=13.5m						BS=13.4m					

MIDDLE QUINSAM LAKE DEPTH PROFILING SUMMER

Sample Date	10-Aug						15-Aug						23-Aug						31-Aug						07-Sep					
Parameter	TEMP.	pH		% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	23.80	8.01	180	95.2	7.61	154.1	22.30	7.60	198	97.3	8.45	142.4	22.30	7.85	168	84.6	7.33	132.1	21.90	8.06	214	84.3	7.38	106.8	22.40	7.65	167	103.1	8.97	100.9
2	23.50	8.05	177	87.4	7.49	152.0	22.10	7.70	196	94.3	8.20	141.8	22.20	7.82	168	88.5	7.70	134.4	21.80	8.01	213	82.9	7.27	105.8	22.40	7.67	167	101.7	8.77	100.3
3	23.10	8.04	176	90.9	7.75	152.1	22.00	7.73	195	94.6	8.30	143.2	22.10	7.82	168	87.6	7.67	135.0	21.80	7.97	213	82.4	7.24	105.5	22.40	7.70	167	101.4	8.80	100.4
4	22.90	8.00	174	92.2	7.70	154.7	22.00	7.72	195	96.1	8.40	143.0	22.00	7.81	167	80.1	7.00	135.5	21.70	7.97	212	82.1	7.98	104.7	22.30	7.73	166	99.9	8.69	101.0
5	22.30	7.94	172	89.9	7.88	157.1	21.80	7.74	195	96.1	8.43	145.2	21.80	7.78	167	84.4	7.42	138.2	21.50	7.94	212	82.4	7.29	103.4	22.20	7.72	165	100.4	8.75	101.8
6	20.90	7.90	166	90.3	8.09	158.5	21.10	7.75	191	96.7	8.63	147.2	21.60	7.77	165	84.4	7.41	137.7	21.00	7.92	210	80.8	7.17	104.9	21.70	7.73	164	100.0	8.74	102.6
7	17.10	7.82	162	111.8	10.78	166.0	17.60	7.74	183	113.0	10.79	154.1	19.00	7.81	156	99.9	9.33	143.8	19.20	7.88	202	99.0	9.11	106.1	19.60	7.72	160	110.9	10.18	107.1
8	13.50	7.68	166	119.7	12.38	175.8	14.20	7.60	189	127.4	13.14	161.4	15.20	7.68	161	112.3	11.32	151.5	15.20	7.85	209	112.7	11.29	109.1	16.40	7.68	165	144.3	14.35	111.5
9	10.10	7.57	176	90.1	9.97	182.5	10.30	7.41	198	97.6	10.94	171.2	11.60	7.51	168	101.7	11.09	161.8	11.30	7.78	215	96.3	10.56	115.7	11.40	7.61	171	118.0	12.87	116.0
10	8.90	7.52	179	70.9	8.08	184.2	9.00	7.37	204	78.1	8.94	173.9	9.40	7.38	171	72.3	8.04	168.5	9.40	7.72	220	66.1	7.60	118.3	9.60	7.51	172	83.0	9.39	121.1
11	8.30	7.52	179	58.1	6.79	184.1	8.50	7.35	203	63.2	6.41	174.2	8.90	7.31	171	62.0	7.15	169.1	8.70	7.68	219	52.9	6.14	121.0	9.00	7.45	172	65.1	7.54	12.8
12	8.20	7.23	179	51.0	6.00	191.0	8.20	7.33	204	55.1	6.45	174.5	8.50	7.28	170	53.2	6.17	169.1	8.60	7.63	219	45.2	5.27	123.7	8.70	7.43	172	52.1	5.99	122.2
13	8.10	7.17	182	36.5	4.28	152.1													8.50	7.55	227	39.1	4.52	113.3	8.50	7.40	175	47.5	5.54	121.9
1m from Bottom (BS)	8.10	7.11	186	29.1	3.33	146.6	8.10	7.31	204	43.5	5.09	171.0	8.40	7.27	170	48.0	5.57	168.1	8.50	7.55	227	39.1	4.52	113.3	8.50	7.40	175	47.5	5.54	121.9
	BS=13.5m						BS=12.9m						BS=12.6m						BS=13.3m						BS=13.4m					

MIDDLE QUINSAM LAKE DEPTH PROFILING FALL

Sample Date	19-Oct						25-Oct						02-Nov						08-Nov						16-Nov					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	11.40	7.64	148	89.3	9.75	323.6	10.62	7.60	132	89.2	9.92	299.3	9.41	7.55	11	87.7	10.02	214.7	6.89	7.63	101	87.9	10.69	238.1	6.20	7.74	114	81.3	10.08	335.5
2	11.41	7.63	148	89.1	9.74	327.7	10.60	7.59	131	89.1	9.91	299.7	9.41	7.46	117	87.1	9.96	214.6	6.88	7.62	101	87.7	10.67	238.1	6.20	7.73	115	82.4	10.17	339.0
3	11.35	7.64	148	89.1	9.73	329.5	10.58	7.59	132	89.1	9.91	300.1	9.41	7.44	117	87.1	9.96	217.2	6.87	7.61	101	87.5	10.65	238.4	6.20	7.78	115	82.0	9.96	342.4
4	11.34	7.64	148	88.9	9.72	330.1	10.42	7.58	132	88.5	9.88	300.6	9.41	7.43	117	87.0	9.95	218.7	6.86	7.61	101	87.5	10.65	238.8	6.20	7.78	115	79.0	9.78	343.5
5	11.33	7.63	147	88.8	9.72	331.1	10.42	7.58	132	87.8	9.81	301.2	9.41	7.43	117	87.0	9.95	219.7	6.86	7.60	100	87.4	10.65	239.1	6.20	7.78	115	78.7	9.77	345.8
6	11.29	7.63	150	88.7	9.72	332.0	10.32	7.57	132	87.3	9.78	301.6	9.41	7.43	117	8.7	9.93	219.2	6.86	7.60	101	87.4	10.64	239.4	6.20	7.77	115	78.0	9.70	346.6
7	11.28	7.63	149	88.8	9.72	333.2	10.30	7.57	131	87.2	9.78	301.9	9.39	7.42	117	87.0	9.95	220.9	6.86	7.60	101	87.4	10.64	239.8	6.20	7.78	115	79.1	9.63	347.4
8	11.25	7.63	151	88.3	9.68	334.8	10.23	7.56	130	87.1	9.77	302.2	9.40	7.42	117	86.9	9.95	220.0	6.85	7.60	101	87.2	10.63	240.3	6.20	7.78	115	78.5	9.65	348.2
9	11.22	7.60	152	87.2	9.55	336.2	10.21	7.56	129	86.9	9.76	302.0	9.41	7.42	117	86.9	9.94	222.0	6.83	7.60	100	87.2	10.62	240.7	6.20	7.80	115	81.5	10.01	348.6
10	11.14	7.58	150	86.6	9.49	337.1	10.18	7.55	129	86.6	9.73	303.0	9.40	7.45	117	86.9	9.95	221.2	6.82	7.59	100	87.1	10.61	241.2	6.20	7.80	115	81.2	10.02	348.9
11	11.02	7.53	157	426.0	9.05	340.7	10.18	7.54	130	86.1	9.67	303.4	9.39	7.43	117	86.9	9.95	223.7	6.81	7.60	100	87.0	10.61	241.5	6.20	7.80	115	79.4	9.80	349.2
12	10.91	7.18	166	69.4	7.72	345.8	10.11	7.52	129	85.5	9.62	304.5	9.39	7.42	116	86.9	9.94	224.2	6.79	7.59	100	87.0	10.61	241.7	6.20	7.79	115	80.1	9.78	350.0
13	9.16	6.87	192	30.4	3.46	354.9	10.11	7.52	129	85.1	9.58	304.9	9.39	7.42	116	86.8	9.93	225.5	6.77	7.59	100	87.0	10.63	242.1	6.20	7.79	115	80.1	9.25	348.2
							10.09	7.49	129	84.8	9.54	306.1	9.36	7.41	116	86.5	9.92	226.2	6.73	7.59	99	86.8	10.61	242.5	6.20	7.79	115	80.0	9.09	347.5
1m from Bottom (BS)	BS=13.0m						BS=13.5m						BS=13.5m						BS=13.5m						BS=13.5m					

WQG-Max pH Max. 6.5 -9.0 Hypolimnetic DO minimum 3 mg/L June -August

Table 83
2017-2018 Annual Report

EMS ID E292118

Site NAME: LOWER QUINSAM LAKE (LQL)

LOWER QUINSAM LAKE DEPTH PROFILING SPRING

Sample Date	12-Apr						20-Apr						27-Apr						04-May						10-May					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celsius		µS/cm		mg/L	mV	Celsius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	6.72	6.97	87	97.3	11.89	214.8	7.01	7.38	105	97.0	11.54	217.2	9.63	7.53	100	98.0	11.16	197.8	9.85	7.11	107	97.6	11.06	180.5	11.75	7.44	104	98.8	10.69	181.9
2	6.68	6.96	88	97.1	11.88	224.8	7.75	7.33	105	96.9	11.54	217.9	9.54	7.47	100	97.7	11.15	199.0	9.58	7.06	109	97.0	11.05	182.9	10.47	7.35	104	96.9	10.80	184.2
3	6.47	6.94	90	97.1	11.94	234.2	7.72	7.30	104	96.9	11.55	218.8	9.49	7.46	100	97.8	11.17	198.6	9.39	7.03	108	96.2	11.01	187.4	9.90	7.31	104	95.7	10.82	184.9
4	6.39	6.94	90	97.3	11.99	241.0	7.71	7.28	104	96.5	11.52	219.1	8.94	7.40	102	95.5	11.12	200.7	9.30	7.01	107	96.1	11.02	195.3	9.70	7.29	104	95.0	10.80	185.4
5	6.33	6.94	90	96.8	11.95	246.3	7.68	7.27	104	97.1	11.59	219.2	8.64	7.37	102	95.5	11.13	201.0	9.20	7.00	108	95.5	11.01	198.3	9.48	7.28	102	95.0	10.86	185.3
6	6.29	6.94	91	97.3	12.02	251.1	7.65	7.26	104	96.5	11.52	219.3	8.60	7.34	102	95.2	11.11	201.6	9.01	6.98	109	94.8	10.96	200.6	9.31	7.26	103	94.1	10.80	185.6
7	6.29	6.93	91	97.2	12.01	254.6	7.59	7.24	104	96.2	11.51	219.7	8.57	7.33	102	95.3	11.14	202.8	8.93	7.00	108	95.5	11.05	201.9	9.25	7.25	103	93.5	10.74	185.9
8	6.29	6.94	91	97.2	12.01	257.5	7.51	7.23	104	96.1	11.52	220.2	8.48	7.30	102	95.3	11.15	203.5	8.80	7.00	107	95.0	11.01	203.8	8.94	7.24	102	93.4	10.80	186.6
9	6.28	6.92	91	97.3	12.03	259.7	7.41	7.21	104	95.9	11.52	220.5	8.33	7.30	101	95.1	11.17	203.3	8.79	6.98	107	94.6	10.99	205.3	8.86	7.22	101	91.9	10.66	187.4
10	6.23	6.92	90	97.2	12.03	261.9	7.38	7.20	104	95.9	11.53	220.7	8.17	7.28	101	94.9	11.18	204.0	8.74	6.98	107	94.4	10.98	206.7	8.74	7.20	101	92.4	10.74	187.6
11	6.13	6.93	87	97.2	12.05	264.4	7.35	7.19	105	95.8	11.52	221.0	8.11	7.26	99	94.9	11.21	204.7	8.65	6.97	107	94.1	10.97	207.5	8.65	7.20	101	91.5	10.69	188.5
12	6.12	6.93	88	97.1	12.05	266.6	7.35	7.19	105	95.8	11.52	221.2	8.08	7.23	98	95.0	11.23	205.5	8.55	6.97	107	94.0	10.96	208.0	8.37	7.18	100	90.4	10.61	188.9
13	6.11	6.92	89	97.1	12.05	268.2	7.08	7.18	105	95.0	11.49	221.9	7.95	7.23	98	94.6	11.22	206.0	8.32	6.96	104	92.5	10.91	210.4	8.17	7.16	100	88.8	10.46	190.1
14	6.07	6.91	89	96.8	12.03	270.2	7.06	7.17	105	94.7	11.48	222.3	7.62	7.22	97	94.0	11.23	206.5	8.13	6.95	103	92.1	10.85	211.0	8.05	7.13	100	87.2	10.31	190.6
15	6.03	6.92	88	96.6	12.02	271.2	7.02	7.15	104	94.5	11.49	222.5	7.50	7.21	97	93.8	11.24	207.4	8.02	6.95	103	91.7	10.81	211.6	8.01	7.09	100	86.0	10.18	192.2
1m from Bottom (BS)	5.99	6.92	88	96.4	12.01	273.1	6.90	7.15	104	94.5	11.49	222.9	7.48	7.19	96	93.7	11.23	207.7	7.99	6.95	103	91.7	10.80	212.0	7.89	7.07	100	84.5	10.04	192.7
	BS: 16.10m						BS: 16.10m						BS: 16.2m						BS: 16.0m						BS: 16.0m					

LOWER QUINSAM LAKE DEPTH PROFILING SUMMER

Sample Date	15-Aug						23-Aug						31-Aug						07-Sep						15-Sep					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius.		µS/cm	101.1	8.64	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	21.80	7.75	176	98.5	8.72	148.7	21.50	7.93	147	83.4	7.38	116.8	21.80	7.76	192	84.2	7.41	119.3	22.20	7.87	153	104.3	9.09	96.0	18.50	8.05	151	77.9	7.31	67.1
2	21.80	7.77	176	98.3	8.64	147.8	21.50	7.93	148	80.4	7.10	120.1	21.50	7.77	191	82.0	7.35	117.6	22.20	7.90	153	107.2	9.34	96.2	18.40	8.03	150	76.8	7.21	69.1
3	21.30	7.76	174	99.4	8.78	149.0	21.20	7.91	146	85.0	7.61	122.3	21.40	7.76	190	80.5	7.12	117.3	22.20	7.87	153	105.9	9.22	97.9	18.30	8.01	151	75.3	7.13	70.4
4	21.00	7.79	172	97.6	8.71	148.7	21.00	7.89	147	78.6	6.97	122.5	21.10	7.75	189	81.4	7.28	117.2	21.60	7.90	153	100.0	8.60	98.0	18.30	8.00	150	74.8	7.04	72.5
5	20.40	7.75	171	91.8	8.27	153.3	20.70	7.85	146	79.2	7.12	124.6	20.40	7.72	190	80.4	7.32	117.6	21.00	7.86	153	102.9	9.11	100.4	18.30	7.97	151	73.1	6.86	77.1
6	19.10	7.69	160	89.8	8.36	159.0	19.80	7.81	143	76.5	6.94	128.9	19.70	7.67	184	79.5	7.30	119.2	19.60	7.82	140	88.0	8.04	103.0	17.90	7.88	149	73.7	7.05	84.1
7	17.20	7.67	131	90.6	8.70	164.8	17.40	7.80	134	73.5	7.00	134.7	18.50	7.66	169	75.5	7.07	120.3	19.00	7.77	132	92.0	8.48	105.7	16.10	7.86	133	65.6	6.46	90.4
8	14.20	7.59	102	82.3	8.59	179.3	14.30	7.70	88	72.8	7.45	152.1	14.40	7.72	113	68.5	7.06	126.5	15.20	7.81	92	85.1	8.55	110.0	13.70	7.88	93	56.6	5.92	97.7
9	11.80	7.28	95	71.0	7.70	181.7	12.00	7.45	80	64.6	6.98	158.5	12..3	7.58	103	55.7	5.95	129.7	12.80	7.70	82	72.6	7.64	114.0	11.30	7.82	84	45.3	4.98	100.5
10	10.70	7.24	91	60.7	6.69	180.5	11.10	7.24	77	54.0	5.96	166.5	11.30	7.52	99	53.7	5.88	130.7	11.00	7.61	77	55.0	5.72	117.5	10.00	7.72	82	26.5	*2.92*	104.2
11	10.00	7.21	90	46.4	5.22	179.2	10.00	7.18	75	33.7	3.80	166.5	11.20	7.51	99	51.3	5.62	131.3	10.30	7.53	76	30.2	3.40	119.1	9.50	7.65	82	8.1	*0.87*	105.5
12	9.20	7.15	89	25.3	*2.91*	179.6	9.30	7.14	75	17.0	*1.90*	166.5	10.40	7.41	97	41.0	4.57	135.1	9.50	7.42	75	10.6	*1.22*	121.0	9.00	7.58	83	0.0	*0.00*	106.1
13	8.80	7.09	90	6.1	*0.70*	180.3	8.90	7.1	75	5.2	*0.60*	163.5	9.50	7.33	96	20.1	*2.30*	138.4	9.00	7.35	76	0.0	*0.00*	121.4	8.70	7.53	84	0.0	*0.00*	102.6
14	8.60	7.06	91	0.0	*0.00*	179.6	8.80	7.10	76	0.0	*0.00*	161.5	9.10	7.23	97	3.8	*0.43*	141.1	8.60	7.28	77	0.0	*0.00*	121.5	8.60	7.44	92	0.0	*0.00*	55.8
15	8.00	7.00	93	0.0	*0.00*	173.9	8.70	7.07	76	0.0	*0.00*	161.6	8.90	7.17	98	0.0	*0.00*	142.8	8.60	7.21	78	0.0	*0.00*	120.6	8.50	7.35	97	0.0	*0.00*	27.9
							8.70	7.04	77	0.0	*0.00*	158.6	8.80	7.14	98	0.0	*0.00*	143.2	8.60	7.18	79	0.0	*0.00*	110.7	8.50	7.35	97	0.0	*0.00*	14.1
1m from Bottom (BS)																														
	BS=16.0m						BS=16.0m						BS=16.0m						BS=15.80m						BS=16.40m					

LOWER QUINSAM LAKE DEPTH PROFILING FALL

Sample Date	19-Oct						25-Oct						02-Nov						09-Nov						17-Nov					
Parameter	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP	TEMP.	pH	COND.	% Sat.	D.O.	ORP
Sample Depth (m)	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV	Celcius		µS/cm		mg/L	mV
1	10.92	7.47	112	82.6	9.12	268.5	10.40	7.24	97	83.0	9.28	243.4	9.074	7.57	96	89.9	10.16	281.4	7.50	7.62	102	70.8	8.48	135.6	5.90	7.60	76	81.6	10.12	282.1
2	10.91	7.46	113	82.3	9.09	271.1	10.18	7.24	97	80.3	9.03	247.1	9.180	7.52	97	84.4	9.71	275.6	7.50	7.53	102	65.9	7.82	138.8	5.90	7.56	75	81.1	10.11	235.2
3	10.89	7.43	112	81.8	9.04	276.9	10.08	7.22	96	80.2	9.04	250.0	9.180	7.47	97	84.0	9.67	277.0	7.40	7.48	101	66.2	7.91	141.8	5.90	7.56	76	80.7	10.10	240.5
4	10.68	7.38	105	78.8	8.75	280.9	9.99	7.22	97	82.9	9.36	253.3	9.182	7.44	97	83.3	9.65	277.5	7.40	7.47	101	65.8	7.89	141.7	5.90	7.53	76	82.0	10.19	244.2
5	10.42	7.33	105	80.9	9.04	287.4	9.91	7.22	96	83.2	9.41	257.4	9.180	7.43	97	83.8	9.64	276.9	7.40	7.43	101	65.4	7.86	144.2	5.80	7.53	75	77.8	9.73	249.3
6	10.39	7.33	105	78.5	8.75	7.3	9.88	7.21	96	83.3	9.43	259.5	9.176	7.42	97	83.7	9.63	276.3	7.40	7.40	101	65.4	7.43	143.2	5.80	7.53	74	79.7	9.98	252.0
7	10.38	7.30	103	77.8	8.69	292.1	9.84	7.22	96	83.5	9.46	260.9	9.180	7.42	97	83.7	9.63	275.7	7.30	7.42	101	64.0	7.43	142.5	5.80	7.51	74	78.7	9.82	257.4
8	10.36	7.29	104	79.7	8.96	293.3	9.80	7.21	95	82.3	9.33	261.1	9.175	7.42	97	83.7	9.63	275.3	7.30	7.42	101	62.3	7.47	145.6	5.80	7.51	74	80.6	10.07	260.3
9	10.31	7.30	104	81.6	9.16	295.0	9.77	7.21	95	81.9	9.29	262.2	9.171	7.41	97	83.6	9.62	274.2	7.30	7.38	101	66.2	7.84	146.1	5.80	7.50	74	81.5	10.13	262.0
10	10.25	7.32	103	81.0	9.08	298.2	9.73	7.19	95	82.4	9.36	263.8	9.160	7.41	97	8.5	9.62	273.5	7.30	7.38	102	61.5	7.34	148.3	5.80	7.50	73	80.5	10.14	263.8
11	10.23	7.31	103	80.6	9.06	299.5	9.71	7.19	94	82.3	9.35	264.9	9.088	7.40	99	83.3	9.61	273.4	7.10	7.34	101	65.4	7.91	149.3	5.70	7.49	73	80.0	9.94	266.3
12	10.18	7.32	102	81.3	9.15	301.3	9.69	7.19	94	81.9	9.30	266.0	9.075	7.40	99	83.3	9.60	273.1	7.00	7.35	102	59.1	7.14	148.7	5.70	7.50	72	78.9	9.88	269.5
13	10.15	7.32	103	81.8	9.20	302.5	9.64	7.19	94	81.7	9.30	267.8	9.060	7.39	100	83.2	9.60	272.7	7.00	7.34	102	60.0	7.29	147.2	5.70	7.49	71	80.6	10.02	270.2
14	10.15	7.32	103	81.8	9.20	303.5	9.60	7.19	94	81.5	9.29	272.0	9.062	7.39	99	83.1	9.59	272.4	7.00	7.32	102	63.5	7.71	147.6	5.60	7.51	71	81.1	10.14	272.2
15	10.08	7.12	102	66.7	7.45	310.4	9.58	7.16	93	79.4	9.04	274.2	9.039	7.39	99	83.1	9.59	272.3	7.00	7.30	102	63.7	7.72	148.0	5.60	7.50	71	80.5	10.12	273.2
16	9.55	6.76	95	20.2	2.30	317.6	9.58	7.15	93	79.4	9.05	275.1	9.028	7.38	99	83.0	9.59	272.1	7.00	7.30	102	63.2	7.72	147.5	5.60	7.50	71	80.3	10.11	275.5
																									5.60	7.55	71	71.8	9.01	274.8
1m from Bottom (BS)																														
	BS= 16.0						BS= 16.0						BS= 16.0						BS= 15.5						BS= 16.5					

WQG-Max pH Max. 6.5 -9.0 Hypolimnetic DO minimum 3 mg/L June -August

Table 84
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre Depth							
Site Name	NNL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	1.68	1.29	1.5	1.65	1.78	1.58	**128**	-
Chloro-a	ug/L	0.91				0.52	0.72	-	-
Turb	NTU	0.45	0.49	0.42	0.29	0.27	0.38	-	-
Alk-T	mg/L	10.3		11.7			11	-	-
P-T	mg/L	0.0048					0.0048	-	-
Al-T	mg/L	0.0404	0.0362	0.0367	0.0325	0.0274	0.0346	-	-
As-T	mg/L	0.00017	0.00016	0.0002	0.00018	0.00018	0.00018	-	**0.005**
Ba-T	mg/L	0.0011	<0.0010	0.0011	0.0011	0.0011	0.00098	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	3.2	3.52	3.69	3.53	3.79	3.55	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	0.00097	<0.00050	<0.00050	0.00039	**0.002**	**0.007**
Hard-T	mg/L	10.9	11.7	12.6	12	13	12.00	-	-
Fe-T	mg/L	0.072	0.056	0.08	0.055	0.046	0.062	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.711	0.703	0.818	0.778	0.866	0.775	-	-
Mn-T	mg/L	0.007	0.0042	0.0054	0.0039	0.0031	0.0047	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.086	0.079	0.081	0.08	0.085	0.082	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	0.894	0.994	1.03	0.965	1.12	1.001	-	-
Sr-T	mg/L	0.0105	0.0108	0.011	0.0118	0.0119	0.0112	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.032	0.0298	0.0254	0.0239	0.0233	0.0269	**0.05**	**0.1**
As-D	mg/L	0.00016	0.00015	0.00016	0.00018	0.00018	0.00017	-	-
Ba-D	mg/L	0.001	0.0011	0.001	0.0011	0.001	0.001	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	3.41	3.25	3.67	3.76	3.73	3.56	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00066	0.00043	0.00067	0.0005	0.00033	0.00052	-	-
Hard-D	mg/L	11.6	11.2	12.3	12.7	12.9	12.1	-	-
Fe-D	mg/L	0.0571	0.0263	0.0266	0.0244	0.0302	0.0329	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	0.762	0.736	0.757	0.8	0.874	0.786	-	-
Mn-D	mg/L	0.0061	<0.0010	<0.0010	<0.0010	0.002	0.00192	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.09	0.051	0.087	0.084	0.083	0.079	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	0.99	0.986	0.968	1.07	1.11	1.03	-	-
Sr-D	mg/L	0.01	0.0109	0.0108	0.0114	0.0117	0.0110	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 85
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre Depth							
Site Name	NNL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	1.22	<0.50	1.8	<1.0	1.4	1.03	**128**	-
Chloro-a	ug/L					0.96	0.96	-	-
Turb	NTU	0.31	0.26	0.36	0.27	0.51	0.34	-	-
Alk-T	mg/L	14.5	14.4			14.5	14.5	-	-
P-T	mg/L	0.0044	0.0073			0.0051	0.0056	-	-
Al-T	mg/L	0.0096	0.011	0.0111	0.0102	0.0116	0.0107	-	-
As-T	mg/L	0.00033	0.00036	0.00031	0.00036	0.00035	0.00034	-	**0.005**
Ba-T	mg/L	0.0011	0.0013	0.0011	0.0011	0.0011	0.0011	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	4.85	5.1	4.52	4.42	4.19	4.62	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	0.00031	**0.002**	**0.007**
Hard-T	mg/L	16.4	17.1	15.6	15.1	14.4	15.70	-	-
Fe-T	mg/L	0.028	0.048	0.037	0.036	0.038	0.037	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.04	1.07	1.04	0.989	0.945	1.017	-	-
Mn-T	mg/L	<0.0010	0.004	0.0036	0.0035	0.0036	0.003	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.092	0.087	0.084	0.077	0.100	0.088	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.33	1.31	1.27	1.27	1.21	1.28	-	-
Sr-T	mg/L	0.015	0.0153	0.0142	0.0147	0.0142	0.0147	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0232	0.0128	0.0092	0.0119	0.0131	0.0140	**0.05**	**0.1**
As-D	mg/L	0.00032	0.00037	0.00035	0.00034	0.00034	0.00034	-	-
Ba-D	mg/L	0.0011	0.0037	0.0012	0.0021	0.0017	0.002	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	4.90	4.74	4.88	4.72	4.52	4.75	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00045	0.00044	0.00032	0.00048	0.00041	0.00042	-	-
Hard-D	mg/L	16.6	16.3	16.5	16.2	15.4	16.2	-	-
Fe-D	mg/L	0.0259	0.0939	0.0222	0.0272	0.0244	0.0387	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.06	1.09	1.05	1.07	0.991	1.052	-	-
Mn-D	mg/L	<0.0010	0.0012	<0.0010	0.0012	0.0018	0.00104	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.086	0.095	0.09	0.086	0.097	0.091	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.35	1.34	1.31	1.33	1.26	1.32	-	-
Sr-D	mg/L	0.0154	0.0147	0.0145	0.0142	0.0148	0.0147	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 86
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre Depth							
Site Name	NNL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	2.20	3.20	2.00	3.1	1.70	2	**128**	-
Chloro-a	ug/L	1.16					1.16	-	-
Turb	NTU	0.37	0.62	0.49	0.73	0.67	0.58	-	-
Alk-T	mg/L	15.2	14			10.3	13.2	-	-
P-T	mg/L	0.0045				0.0046	0.0046	-	-
Al-T	mg/L	0.0148	0.03	0.0448	0.0487	0.0755	0.0428	-	-
As-T	mg/L	0.00026	0.00026	0.00027	0.00032	0.00031	0.00028	-	**0.005**
Ba-T	mg/L	0.0013	0.0016	0.0015	0.0035	0.0019	0.002	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000063	0.0000166	-	-
Ca-T	mg/L	4.6	4.22	4.55	4.42	3.98	4.35	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	<0.00050	0.0006	0.00062	0.0021	0.00133	0.00098	**0.002**	**0.007**
Hard-T	mg/L	15.4	14.5	14.9	14.9	13.3	14.60	-	-
Fe-T	mg/L	0.058	0.049	0.086	0.139	0.145	0.095	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00049	0.00018	**0.003**	**0.005**
Mg-T	mg/L	0.94	0.966	0.866	0.935	0.823	0.906	-	-
Mn-T	mg/L	0.005	0.0065	0.0083	0.0285	0.0238	0.014	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000023	0.0000013	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.1	0.117	0.108	0.11	0.137	0.114	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.15	1.230	1.22	1.26	1.18	1.21	-	-
Sr-T	mg/L	0.0148	0.0148	0.0137	0.0157	0.0132	0.0144	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0307	0.0081	**0.0075**	**0.03**
Al-D	mg/L	0.0131	0.0257	0.0397	0.0379	0.0511	0.0335	**0.05**	**0.1**
As-D	mg/L	0.00029	0.00025	0.00029	0.00027	0.00025	0.00027	-	-
Ba-D	mg/L	0.0013	0.0014	0.0014	0.0014	0.0013	0.0014	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	4.54	4.3	4.43	4.55	4.22	4.41	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00037	0.00049	0.00061	0.0013	0.00068	0.00069	-	-
Hard-D	mg/L	15.7	14.5	15	15.3	14.2	14.9	-	-
Fe-D	mg/L	0.0238	0.03	0.0468	0.0854	0.0834	0.0539	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.05	0.924	0.948	0.953	0.895	0.954	-	-
Mn-D	mg/L	0.0018	0.0028	0.0053	0.0252	0.0156	0.0101	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.102	0.108	0.114	0.104	0.127	0.111	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.32	1.21	1.3	1.27	1.22	1.26	-	-
Sr-D	mg/L	0.016	0.0141	0.0145	0.0159	0.0133	0.0148	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 87
2017-2018 Annual Report

EMS ID	E217018								
		No Name Lake 4 Metre Depth							
Site Name	NNL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	1.34	1.41	1.86	2.07	2.31	2	**128**	-
Turb	NTU	0.42	0.4	0.38	0.42	0.32	0.39	-	-
Alk-T	mg/L	8.48		11.2			9.84	-	-
P-T	mg/L	0.0048					0.0048	-	-
Al-T	mg/L	0.0362	0.0358	0.0364	0.0291	0.0303	0.0336	-	-
As-T	mg/L	0.00019	0.00017	0.00021	0.00017	0.0002	0.00019	-	**0.005**
Ba-T	mg/L	0.0011	<0.0010	0.0011	0.0011	0.0011	0.00098	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	3.21	3.59	3.58	3.38	3.8	3.51	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00071	<0.00050	0.00059	**0.0083**	<0.00050	**0.00202**	**0.002**	**0.007**
Hard-T	mg/L	11	11.9	12.2	11.7	13	12.000	-	-
Fe-T	mg/L	0.069	0.054	0.084	0.053	0.065	0.065	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.714	0.721	0.797	0.788	0.857	0.775	-	-
Mn-T	mg/L	0.0071	0.0042	0.0053	0.003	0.0037	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0005**	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.087	0.087	0.078	0.083	0.084	**0.084**	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	**1.5**	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	**0.00005**	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	0.899	1.01	1.02	0.986	1.1	**1.003**	-	-
Sr-T	mg/L	0.0111	0.0114	0.0109	0.0118	0.0118	**0.0114**	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0297	0.0294	0.0249	0.0298	0.024	0.0276	**0.05**	**0.1**
As-D	mg/L	0.00017	0.00017	0.00017	0.00019	0.00019	0.00018	-	-
Ba-D	mg/L	0.001	0.0011	0.001	0.0011	0.0011	0.0011	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	3.28	3.28	3.7	3.84	3.83	3.59	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00065	0.00044	0.00055	0.00108	0.00044	0.00063	-	-
Hard-D	mg/L	11.3	11.3	12.4	13.1	13.1	12.2	-	-
Fe-D	mg/L	0.0523	0.0288	0.0329	0.0232	0.0314	0.0337	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	0.76	0.758	0.763	0.842	0.864	0.797	-	-
Mn-D	mg/L	0.0058	<0.0010	<0.0010	<0.0010	<0.0010	0.00156	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.088	0.052	0.088	0.086	0.08	0.079	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.01	0.989	0.989	1.08	1.11	1.04	-	-
Sr-D	mg/L	0.0101	0.0115	0.0108	0.0122	0.0116	0.0112	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 88
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 4 Metre Depth							
Site Name	NNL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	1.12	<0.50	2	1.20	1.9	1	**128**	-
Turb	NTU	0.46	0.31	0.26	0.32	0.28	0.33	-	-
Alk-T	mg/L	15.6	15.3			16.1	15.7	-	-
P-T	mg/L	0.0058	0.0039			0.0069	0.0055	-	-
Al-T	mg/L	0.0086	0.0112	0.0096	0.0103	0.0107	0.0101	-	-
As-T	mg/L	0.00033	0.00035	0.00037	0.00035	0.00033	0.00035	-	**0.005**
Ba-T	mg/L	0.0012	0.0013	0.0011	0.0016	0.0012	0.0013	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	4.66	4.98	4.83	4.82	4.39	4.74	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00053	<0.00050	<0.00050	<0.00050	0.00066	0.00039	**0.002**	**0.007**
Hard-T	mg/L	15.5	16.9	16.2	16.3	14.9	16.000	-	-
Fe-T	mg/L	0.024	0.047	0.04	0.034	0.036	0.036	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.948	1.09	0.994	1.02	0.95	1.000	-	-
Mn-T	mg/L	<0.0010	0.004	0.0036	0.0025	0.0038	0.003	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.094	0.092	0.088	0.079	0.099	0.09	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.2	1.35	1.26	1.29	1.21	1.26	-	-
Sr-T	mg/L	0.0143	0.0154	0.0148	0.0153	0.0143	0.0148	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0621	0.0094	0.0089	0.0086	0.0089	0.0196	**0.05**	**0.1**
As-D	mg/L	0.00031	0.00036	0.00036	0.00035	0.00035	0.00035	-	-
Ba-D	mg/L	0.0014	0.0013	0.0011	0.0011	0.0012	0.0012	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	5.11	5.17	4.99	4.3	4.42	4.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00049	0.00037	0.00034	0.00034	0.00036	0.00038	-	-
Hard-D	mg/L	17.2	17.3	16.7	14.8	15.1	16.2	-	-
Fe-D	mg/L	0.0216	0.03	0.0226	0.0212	0.021	0.0233	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.08	1.07	1.03	0.982	0.993	1.031	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.00064	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.101	0.086	0.088	0.079	0.094	0.09	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.36	1.37	1.3	1.25	1.26	1.31	-	-
Sr-D	mg/L	0.0163	0.0149	0.0147	0.0149	0.0146	0.0151	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 89
2017-2018 Annual Report

EMS ID	E217018								
		No Name Lake 4 Metre Depth							
Site Name	NNL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	2.7	2.3	1.90	2.8	1.8	2	**128**	-
Turb	NTU	0.38	0.58	0.52	0.83	0.93	0.65	-	-
Alk-T	mg/L	12.8	13			12.1	12.6	-	-
P-T	mg/L	0.0052				0.0049	0.005	-	-
Al-T	mg/L	0.0163	0.0445	0.15	0.046	0.06	0.0634	-	-
As-T	mg/L	0.00028	0.0003	0.00031	0.0003	0.00028	0.00029	-	**0.005**
Ba-T	mg/L	0.0012	0.0015	0.0017	0.0015	0.0015	0.0015	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	4.49	4.11	4.64	4.43	3.77	4.29	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	0.00067	0.00126	0.00071	0.0009	0.00076	**0.002**	**0.007**
Hard-T	mg/L	15.1	14.2	15.7	14.9	12.7	14.500	-	-
Fe-T	mg/L	0.049	0.066	0.088	0.138	0.125	0.093	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.937	0.947	0.994	0.942	0.809	0.926	-	-
Mn-T	mg/L	0.0051	0.0072	0.0097	0.0289	0.0182	0.014	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000023	0.0000013	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.109	0.115	0.11	0.107	0.131	0.114	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.17	1.26	1.3	1.28	1.12	1.23	-	-
Sr-T	mg/L	0.0144	0.0143	0.0145	0.0154	0.0130	0.0143	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0143	0.0412	0.0403	0.0399	0.051	0.0373	**0.05**	**0.1**
As-D	mg/L	0.00028	0.00026	0.00029	0.00028	0.00024	0.00027	-	-
Ba-D	mg/L	0.0013	0.0014	0.0014	0.0015	0.0013	0.0014	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	4.43	4.21	4.56	4.8	4.23	4.45	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00034	0.00059	0.00056	0.00061	0.00066	0.00055	-	-
Hard-D	mg/L	15.3	14.3	15.3	16.1	14.2	15	-	-
Fe-D	mg/L	0.0249	0.0454	0.0512	0.0919	0.0864	0.06	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.03	0.912	0.953	1	0.871	0.953	-	-
Mn-D	mg/L	0.0021	0.0036	0.0063	0.0252	0.0156	0.0106	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	0.0000012	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.103	0.114	0.115	0.106	0.125	0.113	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.32	1.24	1.26	1.28	1.22	1.26	-	-
Sr-D	mg/L	0.0155	0.0138	0.0147	0.0154	0.0134	0.0146	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 90
2017-2018 Annual Report

EMS ID	E217018								
		No Name Lake 9 Metre Depth							
Site Name	NNL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	1.72	3.29	4.27	3.91	4.13	3	**128**	-
Turb	NTU	0.37	0.39	0.5	0.62	0.49	0.47	-	-
Alk-T	mg/L	10.7		11.7			11.2	-	-
P-T	mg/L	0.0048					0.0048	-	-
Al-T	mg/L	0.0383	0.0376	0.0386	0.0348	0.0347	0.0368	-	-
As-T	mg/L	0.00017	0.00018	0.0002	0.00018	0.00018	0.00018	-	**0.005**
Ba-T	mg/L	0.0011	0.0012	0.0013	0.0013	0.0013	0.0012	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	3.37	4.03	4.44	4.05	4.24	4.03	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00067	<0.00050	<0.00050	0.00614	<0.00050	0.00151	**0.002**	**0.007**
Hard-T	mg/L	11.4	13.5	14.8	13.6	14.5	13.600	-	-
Fe-T	mg/L	0.08	0.087	0.113	0.078	0.094	0.090	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.732	0.822	0.911	0.851	0.949	0.853	-	-
Mn-T	mg/L	0.008	0.0096	0.013	0.0078	0.0094	0.010	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.087	0.1	0.095	0.091	0.092	0.093	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	0.923	1.09	1.06	1.05	1.16	1.057	-	-
Sr-T	mg/L	0.0112	0.0142	0.0149	0.0148	0.0158	0.0142	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0306	0.0308	0.0274	0.0335	0.0285	0.0302	**0.05**	**0.1**
As-D	mg/L	0.00017	0.00019	0.00017	0.00018	0.00018	0.00018	-	-
Ba-D	mg/L	0.001	0.0013	0.0014	0.0013	0.0012	0.0012	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	3.64	3.98	4.58	4.26	4.46	4.18	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00052	0.00042	0.0004	0.00049	0.00049	0.00046	-	-
Hard-D	mg/L	12.2	13.3	15	14.2	15.1	14	-	-
Fe-D	mg/L	0.0596	0.0483	0.0593	0.0494	0.0606	0.0554	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	0.763	0.823	0.875	0.866	0.962	0.858	-	-
Mn-D	mg/L	0.0064	0.0053	0.0020	0.0016	0.0042	0.0039	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.091	0.053	0.092	0.093	0.095	0.085	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.020	0.983	1.05	1.09	1.17	1.06	-	-
Sr-D	mg/L	0.0105	0.0146	0.0147	0.0148	0.016	0.0141	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 91
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 9 Metre Depth							
Site Name	NNL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	4.58	3.29	4.2	3.9	4.3	4	**128**	-
Turb	NTU	0.41	0.39	0.4	0.42	0.48	0.42	-	-
Alk-T	mg/L	10.4	11.4			12	11.3	-	-
P-T	mg/L	0.0054	0.0051			0.0079	0.0061	-	-
Al-T	mg/L	0.0368	0.0287	0.0323	0.0262	0.0334	0.0315	-	-
As-T	mg/L	0.00016	0.00017	0.00019	0.00018	0.00018	0.00018	-	**0.005**
Ba-T	mg/L	0.0015	0.0016	0.0017	0.0016	0.0016	0.0016	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	4.91	5.06	4.91	4.61	4.42	4.78	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	0.00032	**0.002**	**0.007**
Hard-T	mg/L	16.1	16.8	16.1	15.2	14.6	15.800	-	-
Fe-T	mg/L	0.068	0.084	0.079	0.076	0.091	0.080	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.942	1	0.933	0.893	0.853	0.924	-	-
Mn-T	mg/L	0.0066	0.0086	0.0086	0.0078	0.0115	0.009	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.100	0.102	0.101	0.089	0.108	0.1	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.11	1.19	1.07	1.080	1.03	1.1	-	-
Sr-T	mg/L	0.0175	0.0178	0.0168	0.0177	0.0169	0.0173	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0396	0.0317	0.0243	0.026	0.0257	0.0295	**0.05**	**0.1**
As-D	mg/L	0.00018	0.00017	0.00019	0.00018	0.00016	0.00018	-	-
Ba-D	mg/L	0.0016	0.0016	0.0016	0.0016	0.0017	0.0016	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	5.04	4.9	4.83	4.78	4.81	4.87	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00039	0.00037	0.00031	0.00035	0.00038	0.00036	-	-
Hard-D	mg/L	16.6	16.2	16.0	15.6	15.8	16	-	-
Fe-D	mg/L	0.0642	0.0528	0.051	0.0813	0.0635	0.0626	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	0.966	0.95	0.959	0.892	0.925	0.938	-	-
Mn-D	mg/L	0.0067	0.0048	0.0065	0.009	0.0079	0.007	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.096	0.1	0.103	0.089	0.109	0.099	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.18	1.13	1.150	1.1	1.12	1.14	-	-
Sr-D	mg/L	0.0185	0.0174	0.0169	0.0168	0.0172	0.0174	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 92
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 9 Metre Depth							
Site Name	NNL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	3	2	2.60	2.3	2.00	2	**128**	-
Turb	NTU	1.08	0.72	0.5	0.77	0.79	0.77	-	-
Alk-T	mg/L	12.2	12.3			11	11.8	-	-
P-T	mg/L	0.007				0.0044	0.0057	-	-
Al-T	mg/L	0.0508	0.0601	0.0483	0.0428	0.0562	0.0516	-	-
As-T	mg/L	0.00029	0.0003	0.00029	0.00031	0.00028	0.00029	-	**0.005**
Ba-T	mg/L	0.0015	0.0015	0.0015	0.0015	0.0014	0.0015	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	4.36	4.38	5.21	4.32	3.89	4.43	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.0007	0.00076	0.00071	0.00079	0.00066	0.00072	**0.002**	**0.007**
Hard-T	mg/L	14.7	14.9	17.1	14.6	13.0	14.900	-	-
Fe-T	mg/L	0.102	0.108	0.114	0.129	0.127	0.116	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.925	0.954	0.991	0.921	0.804	0.919	-	-
Mn-T	mg/L	0.0201	0.0169	0.0217	0.0285	0.0173	0.021	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000022	0.0000012	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.149	0.113	0.116	0.102	0.135	0.123	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.18	1.24	1.34	1.21	1.13	1.22	-	-
Sr-T	mg/L	0.0147	0.014	0.0157	0.0155	0.0123	0.0144	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0483	0.0543	0.0405	0.0386	0.052	0.0467	**0.05**	**0.1**
As-D	mg/L	0.00029	0.00027	0.00027	0.00027	0.00025	0.00027	-	-
Ba-D	mg/L	0.0016	0.0014	0.0015	0.0015	0.0013	0.0015	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	4.44	4.18	4.74	4.64	4.16	4.43	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.0006	0.00063	0.00057	0.0007	0.00093	0.00069	-	-
Hard-D	mg/L	15.4	14.2	15.9	15.6	13.9	15	-	-
Fe-D	mg/L	0.0777	0.0690	0.0666	0.0857	0.0817	0.0761	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.03	0.908	0.972	0.976	0.861	0.949	-	-
Mn-D	mg/L	0.0188	0.0131	0.0172	0.0246	0.0147	0.0177	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000021	0.0000012	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.15	0.112	0.116	0.104	0.124	0.121	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.31	1.23	1.3	1.29	1.21	1.27	-	-
Sr-D	mg/L	0.0157	0.0131	0.0151	0.0155	0.0131	0.0145	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	0.0169	<0.0050	0.0054	-	-

Table 93
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre From Bottom Depth							
Site Name	NNLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	3	4.2	5.13	4.62	4.99	4	**128**	-
Turb	NTU	0.35	0.44	0.52	0.65	0.42	0.48	-	-
Alk-T	mg/L	10.3		11.6			10.9	-	-
P-T	mg/L	0.0051					0.0051	-	-
Al-T	mg/L	0.0367	0.0361	0.0394	0.0358	0.0304	0.0357	-	-
As-T	mg/L	0.00019	0.00019	0.00022	0.00017	0.00019	0.00019	-	**0.005**
Ba-T	mg/L	0.0013	0.0012	0.0015	0.0014	0.0014	0.0014	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	3.75	4.49	5.07	4.29	4.87	4.49	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.050**
Cu-T	mg/L	0.00078	<0.00050	<0.00050	0.00664	<0.00050	0.00163	**0.0020**	**0.0070**
Hard-T	mg/L	12.6	14.7	16.7	14.3	16	14.9	-	-
Fe-T	mg/L	0.096	0.097	0.13	0.091	0.109	0.105	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000100	**0.003**	**0.005**
Mg-T	mg/L	0.79	0.842	0.985	0.877	0.925	0.884	-	-
Mn-T	mg/L	0.0118	0.0115	0.0171	0.0091	0.0132	0.0125	**0.70**	**0.80**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.09	0.084	0.096	0.094	0.096	0.092	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	0.941	1.1	1.12	1.02	1.09	1.05	-	-
Sr-T	mg/L	0.0129	0.0156	0.0176	0.0167	0.0178	0.0161	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	<0.0030	0.0305	0.0284	0.0292	0.0275	0.023	**0.05**	**0.1**
As-D	mg/L	0.00016	0.00019	0.00017	0.00017	0.00017	0.00017	-	-
Ba-D	mg/L	<0.0010	0.0014	0.0015	0.0014	0.0014	0.00124	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	3.56	4.22	5.11	4.6	5.13	4.52	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00052	0.00046	0.00038	0.00134	0.00042	0.00	-	-
Hard-D	mg/L	11.9	14.1	16.8	15.2	17	15	-	-
Fe-D	mg/L	0.0631	0.0571	0.0675	0.0606	0.075	0.0647	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	0.727	0.865	0.977	0.897	1.01	0.90	-	-
Mn-D	mg/L	0.0083	0.0071	0.0041	0.0026	0.0078	0.006	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	0.0000034	<0.0000020	<0.0000020	0.00000148	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.078	0.058	0.101	0.094	0.099	0.086	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00	-	-
Na-D	mg/L	0.892	1.03	1.12	1.1	1.17	1.06	-	-
Sr-D	mg/L	<0.0010	0.0151	0.0174	0.0159	0.018	0.01338	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 94
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre From Bottom Depth							
Site Name	NNLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	4.88	3.76	5	3.90	2.7	4	**128**	-
Turb	NTU	0.43	0.4	0.44	0.5	0.4	0.43	-	-
Alk-T	mg/L	10.7	11.6			14	12.1	-	-
P-T	mg/L	0.0057	0.0049			0.0111	0.0072	-	-
Al-T	mg/L	0.0261	0.031	0.0272	0.0296	0.0138	0.0255	-	-
As-T	mg/L	0.00016	0.00021	0.00018	0.0002	0.00016	0.00018	-	**0.005**
Ba-T	mg/L	0.0017	0.0017	0.0016	0.0016	<0.0010	0.00142	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	5.75	5.20	5.18	4.62	4.46	5.04	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.050**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	0.00080	<0.00050	0.00036	**0.0020**	**0.0070**
Hard-T	mg/L	18.3	17.2	16.8	15.3	14.3	16.400	-	-
Fe-T	mg/L	0.095	0.136	0.125	0.129	0.091	0.115	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.967	1.03	0.926	0.923	0.775	0.924	-	-
Mn-T	mg/L	0.0078	0.0133	0.0137	0.0185	0.0101	0.013	**0.70**	**0.80**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.109	0.109	0.104	0.096	0.103	0.104	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.16	1.21	1.07	1.1	0.964	1.101	-	-
Sr-T	mg/L	0.0183	0.0193	0.0177	0.0172	0.0069	0.0159	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0306	0.0285	0.028	0.0264	0.0154	0.0258	**0.05**	**0.1**
As-D	mg/L	0.00017	0.00016	0.00015	0.00018	0.00029	0.00019	-	-
Ba-D	mg/L	0.0016	0.0019	0.0017	0.0016	0.0014	0.0016	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	5.05	5	5.10	4.63	4.41	4.84	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00043	0.00034	0.00035	0.00037	0.00033	0.00036	-	-
Hard-D	mg/L	16.7	16.5	16.8	15.4	14.9	16.1	-	-
Fe-D	mg/L	0.0755	0.0834	0.086	0.0868	0.0507	0.0765	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.00	0.975	0.985	0.933	0.939	0.966	-	-
Mn-D	mg/L	0.0077	0.0099	0.0118	0.0149	0.0075	0.0104	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.111	0.102	0.108	0.094	0.097	0.102	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.21	1.14	1.17	1.14	1.16	1.16	-	-
Sr-D	mg/L	0.019	0.0189	0.0182	0.0183	0.0158	0.0180	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 95
2017-2018 Annual Report

EMS ID	E217018	No Name Lake 1 Metre From Bottom Depth							
Site Name	NNLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	4.40	4.70	4.80	3.40	1.70	3.8	**128**	-
Turb	NTU	0.61	0.61	0.58	0.66	0.75	0.64	-	-
Alk-T	mg/L	12.9	13.300			10.3	12.2	-	-
P-T	mg/L	0.0065				0.0042	0.0053	-	-
Al-T	mg/L	0.0403	0.0299	0.0312	0.0472	0.06	0.0417	-	-
As-T	mg/L	0.00022	0.0003	0.00024	0.00032	0.00028	0.00026	-	**0.005**
Ba-T	mg/L	0.002	0.002	0.002	0.002	0.001	0.0018	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	4.5	4.8	5.2	4.5	3.8	4.56	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.050**
Cu-T	mg/L	0.00060	<0.00050	0.00063	0.00080	0.00063	0.00058	**0.0020**	**0.0070**
Hard-T	mg/L	15	16	17	15	13	15.200	-	-
Fe-T	mg/L	0.14	0.22	0.23	0.13	0.12	0.168	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	0.95	0.96	0.93	0.96	0.80	0.918	-	-
Mn-T	mg/L	0.0594	0.0954	0.0989	0.0268	0.0171	0.060	**0.70**	**0.80**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000	0.0000012	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.124	0.103	0.107	0.108	0.129	0.114	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	1.14	1.11	1.10	1.32	1.14	1.16	-	-
Sr-T	mg/L	0.0173	0.0200	0.0195	0.0157	0.0129	0.0171	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0361	0.0273	0.0279	0.0385	0.0519	0.0363	**0.05**	**0.1**
As-D	mg/L	0.00024	0.0002	0.0002	0.00027	0.00025	0.00023	-	-
Ba-D	mg/L	0.004	0.002	0.002	0.001	0.001	0.002	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	4.8	5.0	5.3	4.6	4.1	4.75	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.0004	0.0004	0.0005	0.0006	0.0007	0.00051	-	-
Hard-D	mg/L	16.10	16.30	17.20	15.50	13.60	15.7	-	-
Fe-D	mg/L	0.111	0.156	0.150	0.081	0.079	0.1154	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.000	0.906	0.981	0.974	0.850	0.942	-	-
Mn-D	mg/L	0.060	0.088	0.098	0.023	0.014	0.0566	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000	0.0000012	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.123	0.098	0.110	0.102	0.120	0.111	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	1.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	1.22	1.12	1.16	1.29	1.18	1.19	-	-
Sr-D	mg/L	0.0179	0.0184	0.0198	0.0157	0.0127	0.0169	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 96
2017-2018 Annual Report

EMS ID	E206619	Long Lake Middle 1 Metre Depth							
Site Name	LLM1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	17.6	28.7	37.5	40.1	45.5	33.9	**128**	-
Chloro-a	ug/L	0.93				1.55	1.24	-	-
Turb	NTU	0.39	0.51	0.51	0.42	0.43	0.45	-	-
Alk-T	mg/L	15.7		26.0	29.1	31.5	25.6	-	-
P-T	mg/L	<0.0020				0.0031	0.0021	-	-
Al-T	mg/L	0.0324	0.0397	0.0335	0.0265	0.023	0.031	-	-
As-T	mg/L	0.00024	0.00029	0.00033	0.00032	0.00033	0.0003	-	**0.005**
Ba-T	mg/L	0.0024	0.003	0.0037	0.004	0.0043	0.0035	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	7.97	12.4	15.7	15.9	19.6	14.31	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00102	<0.00050	**0.00899**	0.00050	<0.00050	**0.00220**	**0.002**	**0.007**
Hard-T	mg/L	25.2	37.9	48	48.7	59.7	43.900	-	-
Fe-T	mg/L	0.095	0.076	0.102	0.061	0.068	0.080	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.29	1.7	2.16	2.21	2.61	1.990	-	-
Mn-T	mg/L	0.0057	0.0061	0.009	0.0075	0.0086	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.157	0.210	0.278	0.28	0.308	0.247	-	-
S-T	mg/L	5.7	8.8	13	14.3	15.5	11.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	3.38	5.95	7.7	7.56	8.96	6.71	-	-
Sr-T	mg/L	0.0481	0.0766	0.101	0.111	0.127	0.0927	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0279	0.0237	0.0211	0.0299	0.0257	0.0257	**0.05**	**0.1**
As-D	mg/L	0.00023	0.00028	0.00029	0.00031	0.0003	0.00028	-	-
Ba-D	mg/L	0.0023	0.0032	0.0038	0.0039	0.0046	0.0036	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	0.062	0.032	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	9.11	13.2	16.1	16.9	19.1	14.88	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00049	0.00035	0.0007	0.00027	0.00056	0.00047	-	-
Hard-D	mg/L	28.1	40	48.7	51	58.4	45.2	-	-
Fe-D	mg/L	0.0557	0.0307	0.0732	0.0275	0.0361	0.0446	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.29	1.72	2.05	2.14	2.59	1.96	-	-
Mn-D	mg/L	0.0044	0.0012	<0.0010	<0.0010	0.0016	0.00164	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.16	0.24	0.273	0.281	0.318	0.254	-	-
S-D	mg/L	5.7	10.1	13.1	13.5	16.6	11.8	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	3.59	6.39	7.26	7.92	8.87	6.81	-	-
Sr-D	mg/L	0.0473	0.0894	0.0987	0.116	0.126	0.0955	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 97
2017-2018 Annual Report

EMS ID	E206619	Long Lake Middle 1 Metre Depth						Water Quality Guidelines	
Site Name	LLM1	5 in 30 Weekly Samples							
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	96.1	102	105	107	107	103	**128**	-
Chloro-a	ug/L					1	1	-	-
Turb	NTU	0.2	0.24	0.2	0.22	0.31	0.23	-	-
Alk-T	mg/L	39.7	40.3			45.2	41.7	-	-
P-T	mg/L	<0.0020	0.0031			0.005	0.0030	**0.007**	-
Al-T	mg/L	0.0092	0.0074	0.0067	0.008	0.0085	0.008	-	-
As-T	mg/L	0.00062	0.00061	0.00054	0.00059	0.00061	0.00059	-	**0.005**
Ba-T	mg/L	0.0085	0.0087	0.0094	0.0087	0.0086	0.0088	-	-
B-T	mg/L	0.069	0.075	0.076	0.085	0.09	0.079	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	40.3	40.8	41.2	39.4	40.4	40.4	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00068	<0.00050	<0.00050	<0.00050	0.00089	0.00046	**0.002**	**0.007**
Hard-T	mg/L	122	123	123	118	122	121.600	-	-
Fe-T	mg/L	0.016	0.019	0.019	0.019	0.025	0.020	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.24	5.19	4.97	4.82	5.17	5.080	-	-
Mn-T	mg/L	0.0011	0.0058	0.0059	0.0063	0.0059	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.469	0.496	0.499	0.454	0.48	0.48	-	-
S-T	mg/L	35.7	38.0	40.4	35.9	33.6	36.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	13.6	14.1	13.3	13.7	14.4	13.8	-	-
Sr-T	mg/L	0.258	0.271	0.264	0.277	0.267	0.267	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0086	0.0072	0.0069	0.007	0.0106	0.0081	**0.05**	**0.1**
As-D	mg/L	0.00056	0.00059	0.00058	0.00058	0.00061	0.00058	-	-
Ba-D	mg/L	0.0082	0.0084	0.0083	0.0092	0.0090	0.0086	-	-
B-D	mg/L	0.066	0.076	0.082	0.086	0.084	0.079	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	39.8	38.9	38.8	37.3	39.1	38.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00037	0.00032	0.00023	0.00051	0.00028	0.00034	-	-
Hard-D	mg/L	120	119	118	114	119	118	-	-
Fe-D	mg/L	0.0088	0.017	0.0126	0.0143	0.0149	0.0135	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.01	5.25	5.04	4.95	5.1	5.07	-	-
Mn-D	mg/L	<0.0010	0.0012	0.0020	0.0018	0.0012	0.00134	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.467	0.48	0.441	0.447	0.493	0.466	-	-
S-D	mg/L	35.0	38.5	34.6	35.5	37.8	36.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	13.4	13.8	13.2	13.7	14.4	13.70	-	-
Sr-D	mg/L	0.253	0.257	0.267	0.262	0.276	0.2630	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 98
2017-2018 Annual Report

EMS ID	E206619	Long Lake Middle 1 Metre Depth							
Site Name	LLM1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	117.00	69.20	86.10	72.20	12.60	71.4	**128**	-
Chloro-a	ug/L	1.28					1.28	-	-
Turb	NTU	0.3	0.7	0.4	0.4	0.8	0.52	-	-
Alk-T	mg/L	47.8	33.9			14.8	32.2	-	-
P-T	mg/L	0.0031				0.006	0.0046	-	-
Al-T	mg/L	0.0065	0.0170	0.0166	0.0176	0.0503	0.0216	-	-
As-T	mg/L	0.00047	0.00046	0.00043	0.00036	0.00035	0.00041	-	**0.005**
Ba-T	mg/L	0.0081	0.0061	0.0068	0.0059	0.0024	0.0059	-	-
B-T	mg/L	0.088	0.058	0.069	0.061	<0.050	0.060	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	44.80	25.50	28.60	26.60	7.47	26.59	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	0.0026	0.00052	0.00055	0.00083	**0.002**	**0.007**
Hard-T	mg/L	133.0	78.4	88.4	81.8	23.6	81.000	-	-
Fe-T	mg/L	0.034	0.039	0.043	0.038	0.109	0.053	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.12	3.57	4.15	3.75	1.20	3.560	-	-
Mn-T	mg/L	0.0073	0.0074	0.0089	0.0080	0.0086	0.008	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.58	0.35	0.41	0.37	0.18	0.377	-	-
S-T	mg/L	39.9	23.4	27.9	24.4	4.1	23.9	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	0.000022	<0.000020	<0.000020	0.000012	-	**0.0001**
Na-T	mg/L	15.7	9.9	11.6	10.3	2.4	9.98	-	-
Sr-T	mg/L	0.28	0.18	0.20	0.18	0.04	0.1749	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0044	0.0155	0.0125	0.0123	0.0449	0.0179	**0.05**	**0.1**
As-D	mg/L	0.0005	0.0004	0.0004	0.0004	0.0003	0.00042	-	-
Ba-D	mg/L	0.00870	0.00580	0.00690	0.00590	0.00270	0.006	-	-
B-D	mg/L	0.096	0.065	0.069	0.06	<0.050	0.063	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	43.0	26.9	32.9	28.4	8.2	27.87	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00022	0.00039	0.00035	0.00041	0.00069	0.00041	-	-
Hard-D	mg/L	131	82	99	87	26	84.9	-	-
Fe-D	mg/L	0.012	0.026	0.036	0.023	0.077	0.0348	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.75	3.55	4.08	3.82	1.31	3.7	-	-
Mn-D	mg/L	0.0011	0.0025	0.0018	0.0035	0.0066	0.0031	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.558	0.351	0.399	0.392	0.165	0.373	-	-
S-D	mg/L	44.4	23.7	29.0	25.1	4.4	25.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	17.30	9.42	11.70	11.00	2.66	10.42	-	-
Sr-D	mg/L	0.315	0.170	0.203	0.182	0.038	0.1815	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 99
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 4 Metre Depth							
Site Name	LLM4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	94.6	85.6	87.4	40.6	72.1	76.1	**128**	-
Turb	NTU	1.15	0.71	0.61	0.49	0.45	0.68	-	-
Alk-T	mg/L	46.7		45.8	27.7	41.3	40.4	-	-
P-T	mg/L	0.0049				0.0033	0.0041	-	-
Al-T	mg/L	0.0496	0.0302	0.0299	0.027	0.0265	0.0326	-	-
As-T	mg/L	0.00036	0.00035	0.00037	0.00033	0.00034	0.00035	-	**0.005**
Ba-T	mg/L	0.0066	0.0056	0.0059	0.0038	0.0053	0.0054	-	-
B-T	mg/L	0.097	0.08	0.092	<0.050	0.072	0.07	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	33.5	31.1	32	15.8	27.8	28	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	0.00033	**0.002**	**0.007**
Hard-T	mg/L	100	92.6	95.8	49	84.1	84.3	-	-
Fe-T	mg/L	0.133	0.097	0.102	0.057	0.079	0.094	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	4	3.63	3.87	2.3	3.59	3.48	-	-
Mn-T	mg/L	0.0201	0.0164	0.0171	0.0078	0.0132	0.015	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.581	0.461	0.504	0.28	0.441	0.453	-	-
S-T	mg/L	31.5	26.7	29.4	14.6	24.8	25.4	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	17.7	15.9	16.4	7.57	14.3	14.37	-	-
Sr-T	mg/L	0.25	0.253	0.233	0.112	0.211	0.212	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0203	0.0212	0.0186	0.0184	0.0170	0.0191	**0.05**	**0.1**
As-D	mg/L	0.00031	0.00035	0.00032	0.0003	0.00033	0.00032	-	-
Ba-D	mg/L	0.006	0.0059	0.0058	0.0039	0.0055	0.0054	-	-
B-D	mg/L	0.088	0.088	0.085	<0.050	0.077	0.0726	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	32.7	33.4	33.2	17.5	27	28.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00	-	-
Cu-D	mg/L	0.00061	0.00042	0.00034	0.00032	0.00042	0.00042	-	-
Hard-D	mg/L	98.5	98.3	98.5	52.8	81.6	85.9	-	-
Fe-D	mg/L	0.0702	0.0388	0.0401	0.0287	0.0313	0.0418	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	4.09	3.62	3.77	2.18	3.42	3.42	-	-
Mn-D	mg/L	0.0161	0.012	0.0061	<0.0010	0.0032	0.00758	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.566	0.53	0.531	0.283	0.425	0.467	-	-
S-D	mg/L	32.4	29.4	30.5	14	24.5	26.20	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	17.5	16.7	16	8.0	13.5	14.34	-	-
Sr-D	mg/L	0.232	0.265	0.23	0.114	0.200	0.208	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 100
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 4 Metre Depth							
Site Name	LLM4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	117.0	99.3	104	109	106	107.1	**128**	-
Turb	NTU	0.49	0.23	0.27	0.20	0.28	0.29	-	-
Alk-T	mg/L	43.3	41.7			45.6	43.5	-	-
P-T	mg/L	0.0027	0.0042			0.0044	0.0038	**0.007**	-
Al-T	mg/L	0.0066	0.008	0.0076	0.008	0.0070	0.0074	-	-
As-T	mg/L	0.00051	0.00059	0.00058	0.00056	0.00055	0.00056	-	**0.005**
Ba-T	mg/L	0.0094	0.0087	0.0085	0.0092	0.0079	0.0087	-	-
B-T	mg/L	0.077	0.079	0.077	0.088	0.076	0.079	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	48.3	42.9	41.7	40.6	35.8	41.9	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00052	<0.00050	<0.00050	<0.00050	0.00053	0.00036	**0.002**	**0.007**
Hard-T	mg/L	145	128	125	122	109	125.800	-	-
Fe-T	mg/L	0.031	0.020	0.023	0.039	0.02	0.027	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.91	5.11	4.95	4.95	4.71	5.130	-	-
Mn-T	mg/L	0.0013	0.0059	0.0061	0.0079	0.0052	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.496	0.472	0.5	0.455	0.445	0.474	-	-
S-T	mg/L	43.1	36.7	39.2	36.1	34.7	38.0	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	14.8	13.7	13.1	13.9	12.5	13.6	-	-
Sr-T	mg/L	0.302	0.272	0.265	0.279	0.247	0.273	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0066	0.0077	0.0066	0.0066	0.0082	0.0071	**0.05**	**0.1**
As-D	mg/L	0.00051	0.0006	0.00054	0.00055	0.00061	0.00056	-	-
Ba-D	mg/L	0.0095	0.0085	0.0081	0.0084	0.0092	0.0087	-	-
B-D	mg/L	0.085	0.08	0.081	0.083	0.085	0.083	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	46.8	40.9	39.5	38.6	39.9	41.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00037	0.00029	<0.00020	0.00029	0.00031	0.000272	-	-
Hard-D	mg/L	142	123	120	117	120	124.4	-	-
Fe-D	mg/L	0.0171	0.0137	0.0115	0.0144	0.0157	0.0145	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	6.03	5.14	5.18	4.96	4.99	5.26	-	-
Mn-D	mg/L	0.0013	0.0010	0.0017	0.0013	<0.0010	0.00116	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.512	0.464	0.454	0.461	0.506	0.479	-	-
S-D	mg/L	43.1	38.2	36.3	36.8	37.6	38.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	15.2	13.7	13.5	14.4	14.7	14.30	-	-
Sr-D	mg/L	0.299	0.265	0.266	0.268	0.286	0.2770	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 101
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 4 Metre Depth							
Site Name	LLM4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	118.0	90.7	83.4	79.0	56.3	85.5	**128**	-
Turb	NTU	0.29	0.42	0.41	0.41	0.65	0.44	-	-
Alk-T	mg/L	46.3	39.5			27.6	37.8	-	-
P-T	mg/L	0.0035				0.0037	0.0036	-	-
Al-T	mg/L	0.0083	0.013	0.0171	0.0149	0.0273	0.0161	-	-
As-T	mg/L	0.00047	0.00046	0.00045	0.00041	0.00036	0.00043	-	**0.005**
Ba-T	mg/L	0.0088	0.0075	0.0067	0.0066	0.005	0.0069	-	-
B-T	mg/L	0.092	0.077	0.069	0.070	0.052	0.072	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	42.9	32.8	31.5	29.1	22.9	31.8	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	0.00054	0.00053	<0.00050	<0.00050	0.00036	**0.002**	**0.007**
Hard-T	mg/L	128	100	96	89	69	96.300	-	-
Fe-T	mg/L	0.031	0.036	0.047	0.059	0.068	0.048	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.12	4.50	4.07	4.07	2.82	4.120	-	-
Mn-T	mg/L	0.007	0.008	0.009	0.009	0.009	0.008	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.573	0.433	0.396	0.403	0.319	0.425	-	-
S-T	mg/L	40.9	31.5	27.3	27.7	19.6	29.4	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	15.6	12.8	11.7	11.8	7.9	11.96	-	-
Sr-T	mg/L	0.277	0.228	0.2	0.1990	0.138	0.208	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0048	0.0088	0.0102	0.0114	0.0208	0.0112	**0.05**	**0.1**
As-D	mg/L	0.00047	0.00041	0.00045	0.00039	0.00037	0.00042	-	-
Ba-D	mg/L	0.0088	0.0073	0.0066	0.0061	0.0049	0.0067	-	-
B-D	mg/L	0.096	0.084	0.068	0.065	0.052	0.073	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	42.9	33.40	31.1	29.50	24.3	32.2	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00025	0.00031	0.00033	0.00039	0.00043	0.00034	-	-
Hard-D	mg/L	132	102	95	90	74	98.6	-	-
Fe-D	mg/L	0.0129	0.016	0.019	0.018	0.036	0.0205	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.98	4.45	4.14	4.02	3.18	4.35	-	-
Mn-D	mg/L	0.001	<0.0010	0.0018	0.0026	0.0033	0.00184	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.564	0.424	0.419	0.412	0.327	0.429	-	-
S-D	mg/L	44.50	31.60	28.60	26.90	19.70	30.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	17.8	12.6	12.0	12.0	8.9	12.66	-	-
Sr-D	mg/L	0.309	0.220	0.200	0.196	0.154	0.2160	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 102
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 9 Metre Depth							
Site Name	LLM9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	126	127	124	128	121	125.2	**128**	-
Turb	NTU	0.36	0.41	0.42	0.62	0.4	0.44	-	-
Alk-T	mg/L	56.1		57.2	57.4	54.4	56.3	-	-
P-T	mg/L	0.0042				0.0038	0.004	-	-
Al-T	mg/L	0.0203	0.0189	0.0201	0.0178	0.0178	0.019	-	-
As-T	mg/L	0.00034	0.0003	0.00032	0.0003	0.00028	0.00031	-	**0.005**
Ba-T	mg/L	0.0077	0.0074	0.0077	0.0076	0.0076	0.0076	-	-
B-T	mg/L	0.119	0.115	0.121	0.112	0.119	0.12	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	44.4	43.4	44.5	41.9	46.7	44.2	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	0.00053	<0.00050	0.00053	<0.00050	<0.00050	0.00036	**0.002**	**0.007**
Hard-T	mg/L	132	129	134	125	139	131.8	-	-
Fe-T	mg/L	0.094	0.091	0.094	0.079	0.084	0.088	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.02	5.08	5.5	4.99	5.44	5.21	-	-
Mn-T	mg/L	0.050	0.0652	0.0778	0.0666	0.0612	0.064	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.68	0.616	0.686	0.676	0.678	0.667	-	-
S-T	mg/L	42.7	40	43.6	44.3	41.7	42.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	22.4	22.3	23.6	22.4	23.5	22.8	-	-
Sr-T	mg/L	0.338	0.362	0.341	0.341	0.338	0.344	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0157	0.0158	0.0142	0.0142	0.0152	0.0150	**0.05**	**0.1**
As-D	mg/L	0.00029	0.00028	0.00026	0.00027	0.00028	0.00028	-	-
Ba-D	mg/L	0.0071	0.008	0.008	0.0079	0.0092	0.008	-	-
B-D	mg/L	0.117	0.122	0.128	0.119	0.118	0.121	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	45.1	42.2	46.5	45.4	42.8	44.4	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00	-	-
Cu-D	mg/L	0.00057	0.00037	0.00035	0.00037	0.00046	0.00042	-	-
Hard-D	mg/L	134	127	138	135	128	132.4	-	-
Fe-D	mg/L	0.0723	0.0459	0.0479	0.0493	0.0481	0.0527	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	5.13	5.18	5.33	5.2	5.15	5.2	-	-
Mn-D	mg/L	0.0451	0.0639	0.0707	0.063	0.0582	0.0602	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.663	0.651	0.693	0.704	0.648	0.672	-	-
S-D	mg/L	42	43.6	46.6	45	40.6	43.60	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	23	22.6	22.4	23.9	22.8	22.90	-	-
Sr-D	mg/L	0.321	0.355	0.334	0.344	0.33	0.337	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 103
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 9 Metre Depth							
Site Name	LLM9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	123	123	125	124	129	124.8	**128**	-
Turb	NTU	0.28	0.31	0.27	0.24	0.27	0.27	-	-
Alk-T	mg/L	56.1	55			57.8	56.3	-	-
P-T	mg/L	0.0036	0.0049			0.0048	0.0044	**0.007**	-
Al-T	mg/L	0.0149	0.0113	0.011	0.0118	0.0104	0.0119	-	-
As-T	mg/L	0.00025	0.00025	0.00025	0.00024	0.00023	0.00024	-	**0.005**
Ba-T	mg/L	0.0088	0.0084	0.0082	0.0081	0.0075	0.0082	-	-
B-T	mg/L	0.122	0.116	0.120	0.124	0.12	0.120	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	48.3	48.7	46.8	44.1	40.9	45.8	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00025	**0.002**	**0.007**
Hard-T	mg/L	144	144	138	131	122	135.800	-	-
Fe-T	mg/L	0.046	0.047	0.044	0.041	0.04	0.044	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.57	5.39	5.14	4.98	4.92	5.200	-	-
Mn-T	mg/L	0.0501	0.0588	0.0561	0.0604	0.0578	0.057	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.71	0.718	0.709	0.661	0.626	0.685	-	-
S-T	mg/L	44.6	45.4	45.9	43	37.2	43.2	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	24	23.3	21.7	22.6	22	22.7	-	-
Sr-T	mg/L	0.348	0.365	0.338	0.349	0.313	0.343	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0114	0.0109	0.0065	0.0099	0.0111	0.0100	**0.05**	**0.1**
As-D	mg/L	0.00021	0.00025	0.00058	0.00021	0.00025	0.0003	-	-
Ba-D	mg/L	0.0080	0.0081	0.0082	0.0078	0.0082	0.0081	-	-
B-D	mg/L	0.116	0.118	0.082	0.119	0.115	0.110	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	47.4	45.8	39.1	43.5	42.8	43.7	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00046	0.00037	0.00023	0.00033	0.00044	0.00037	-	-
Hard-D	mg/L	142	136	119	129	127	130.6	-	-
Fe-D	mg/L	0.0306	0.0375	0.0114	0.0309	0.0303	0.0281	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.68	5.36	5.21	4.99	4.78	5.2	-	-
Mn-D	mg/L	0.05	0.0543	0.0017	0.0495	0.051	0.0414	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.716	0.712	0.452	0.633	0.644	0.631	-	-
S-D	mg/L	43.5	44.4	35.8	41.4	41.3	41.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	24.5	23.1	13.4	22.3	22.2	21.10	-	-
Sr-D	mg/L	0.346	0.345	0.266	0.339	0.348	0.3290	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 104
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 9 Metre Depth							
Site Name	LLM9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	139	125	120	84	83	110	**128**	-
Turb	NTU	0.63	0.62	0.35	0.45	1.20	0.65	-	-
Alk-T	mg/L	54.6	50.8			36.5	47.3	-	-
P-T	mg/L	0.0039				0.0041	0.004	-	-
Al-T	mg/L	0.0202	0.0172	0.0136	0.0146	0.0261	0.0183	-	-
As-T	mg/L	0.00029	0.00035	0.00038	0.00042	0.0004	0.00037	-	**0.005**
Ba-T	mg/L	0.0083	0.0092	0.0083	0.0067	0.007	0.0079	-	-
B-T	mg/L	0.114	0.118	0.099	0.075	0.064	0.094	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	46.7	42.8	43.6	31.6	30.8	39.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00055	0.00031	**0.002**	**0.007**
Hard-T	mg/L	138	130	131	96	93	117.500	-	-
Fe-T	mg/L	0.074	0.048	0.044	0.042	0.074	0.056	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.23	5.55	5.40	4.08	3.84	4.820	-	-
Mn-T	mg/L	0.032	0.018	0.013	0.010	0.015	0.018	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.702	0.609	0.560	0.418	0.439	0.546	-	-
S-T	mg/L	44.3	42	40.2	29.1	28.2	36.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	20.7	20.2	18.5	11.4	11.4	16.4	-	-
Sr-T	mg/L	0.328	0.320	0.295	0.204	0.203	0.27	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0187	0.0082	0.008	0.0104	0.0141	0.0119	**0.05**	**0.1**
As-D	mg/L	0.00032	0.00035	0.00035	0.00042	0.00038	0.00036	-	-
Ba-D	mg/L	0.0087	0.0090	0.0081	0.0065	0.0065	0.0078	-	-
B-D	mg/L	0.125	0.121	0.096	0.069	0.069	0.096	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	46.5	44.1	43.2	31.2	32.7	39.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00038	0.00033	0.00034	0.00040	0.0006	0.00041	-	-
Hard-D	mg/L	141	133	129	95	99.1	119.4	-	-
Fe-D	mg/L	0.0491	0.020	0.019	0.017	0.028	0.0267	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.99	5.47	5.19	4.16	4.24	5.01	-	-
Mn-D	mg/L	0.022	0.0096	0.0034	0.0025	0.0078	0.0091	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.71	0.609	0.564	0.43	0.442	0.551	-	-
S-D	mg/L	49.00	43.50	40.30	28.50	28.10	37.9	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	23.80	19.20	17.70	12.80	12.40	17.20	-	-
Sr-D	mg/L	0.363	0.3180	0.2850	0.2050	0.2190	0.2780	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 105
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 1 Metre From Bottom Depth							
Site Name	LLMB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	131	127	129	127	124	127.6	**128**	-
Turb	NTU	0.61	0.44	0.73	0.51	0.98	0.65	-	-
Alk-T	mg/L	57.1		57.1	57.1	56	56.8	-	-
P-T	mg/L	0.0044				0.0023	0.0034	-	-
Al-T	mg/L	0.0201	0.0182	0.0195	0.0216	0.0198	0.0198	-	-
As-T	mg/L	0.00036	0.00031	0.00034	0.00032	0.00033	0.00033	-	**0.005**
Ba-T	mg/L	0.009	0.0081	0.0082	0.0087	0.0089	0.0086	-	-
B-T	mg/L	0.124	0.117	0.126	0.117	0.137	0.12	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	45.5	44.5	44.5	42.3	44.9	44.3	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	0.0007	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	0.06550	0.00054	0.01336	**0.002**	**0.007**
Hard-T	mg/L	135	132	134	127	133	132.2	-	-
Fe-T	mg/L	0.113	0.091	0.103	0.156	0.109	0.114	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.00034	<0.00020	0.00015	**0.003**	**0.005**
Mg-T	mg/L	5.16	5.16	5.64	5.24	5.07	5.25	-	-
Mn-T	mg/L	0.273	0.138	0.134	0.163	0.149	0.171	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.715	0.615	0.671	0.69	0.674	0.673	-	-
S-T	mg/L	44.3	41	45.9	46.1	44.3	44.3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	23.4	22.4	24.3	23.2	22.7	23.2	-	-
Sr-T	mg/L	0.359	0.366	0.345	0.367	0.348	0.357	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0155	0.0146	0.0143	0.013	0.0143	0.0143	**0.05**	**0.1**
As-D	mg/L	0.0003	0.00027	0.00026	0.00027	0.00029	0.00028	-	-
Ba-D	mg/L	0.0086	0.0084	0.0083	0.0089	0.0086	0.0086	-	-
B-D	mg/L	0.127	0.124	0.126	0.128	0.128	0.127	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	45.1	43.2	47.3	46	46.1	45.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00	-	-
Cu-D	mg/L	0.00055	0.0004	0.00044	0.00035	0.00042	0.00043	-	-
Hard-D	mg/L	134	129	140	137	137	135.4	-	-
Fe-D	mg/L	0.0742	0.0473	0.0495	0.051	0.0489	0.0542	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	5.31	5.12	5.45	5.34	5.34	5.31	-	-
Mn-D	mg/L	0.248	0.138	0.125	0.147	0.14	0.16	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.677	0.635	0.705	0.698	0.678	0.679	-	-
S-D	mg/L	43.3	42.6	46.6	45.3	43.2	44.20	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	23.2	21.9	22.4	23.7	23.4	22.90	-	-
Sr-D	mg/L	0.337	0.353	0.343	0.358	0.351	0.348	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 106
2017-2018 Annual Report

EMS ID	E206619								
		Long Lake Middle 1 Metre From Bottom Depth							
Site Name	LLMB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	29-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit						-		
SO4-D	mg/L	134	122	126	130	127	127.8	**128**	-
Turb	NTU	1.8	4.28	0.93	2.13	1.65	2.16	-	-
Alk-T	mg/L	55.8	55.8			57.7	56.4	-	-
P-T	mg/L	0.0028	0.0055			0.0071	0.0051	**0.007**	-
Al-T	mg/L	0.0081	0.0086	0.0088	0.0131	0.0108	0.0099	-	-
As-T	mg/L	0.0002	0.00027	0.00028	0.00031	0.00026	0.00026	-	**0.005**
Ba-T	mg/L	0.0091	0.0105	0.0092	0.0099	0.0098	0.0097	-	-
B-T	mg/L	0.123	0.112	0.123	0.12	0.125	0.121	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	47.1	45.3	48.8	45.4	44.9	46.3	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	0.00030	**0.002**	**0.007**
Hard-T	mg/L	141	135	143	134	133	137.200	-	-
Fe-T	mg/L	0.013	0.054	0.047	0.064	0.042	0.044	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	5.72	5.21	5.17	5.01	5.06	5.230	-	-
Mn-T	mg/L	0.0014	0.288	0.101	0.231	0.258	0.176	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.732	0.703	0.742	0.647	0.684	0.702	-	-
S-T	mg/L	45.6	44.6	48.6	41.9	44.2	45.0	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	24.4	22.8	22.7	22.1	22.1	22.8	-	-
Sr-T	mg/L	0.358	0.348	0.352	0.365	0.34	0.353	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0069	0.0061	0.0067	0.0073	0.0074	0.0069	**0.05**	**0.1**
As-D	mg/L	0.00022	0.00021	0.00019	0.00019	0.00022	0.00021	-	-
Ba-D	mg/L	0.0092	0.009	0.0087	0.0088	0.0093	0.009	-	-
B-D	mg/L	0.12	0.121	0.125	0.119	0.126	0.122	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	46.3	46.2	44.5	44.9	43.9	45.2	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00048	0.00032	0.00026	0.00034	0.00036	0.00035	-	-
Hard-D	mg/L	138	139	132	133	131	134.6	-	-
Fe-D	mg/L	0.0094	0.0116	0.0089	0.0100	0.0106	0.0101	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.54	5.61	5.17	5.07	5.07	5.29	-	-
Mn-D	mg/L	0.0014	0.0303	0.0019	0.0175	0.108	0.0318	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.715	0.727	0.669	0.652	0.719	0.696	-	-
S-D	mg/L	44.6	46.4	43	41.6	44.3	44.0	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	24.5	24.9	23.3	22.7	24.1	23.90	-	-
Sr-D	mg/L	0.35	0.358	0.36	0.351	0.372	0.3580	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 107
2017-2018 Annual Report

EMS ID	E206619	Long Lake Middle 1 Metre From Bottom Depth							
Site Name	LLMB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Unit						-		
SO4-D	mg/L	128	127	125	130	126	127.2	**128**	-
Turb	NTU	1.66	1.68	1.62	1.67	1.37	1.60	-	-
Alk-T	mg/L	59.1	59.00			61.7	59.9	-	-
P-T	mg/L	0.0034				0.0033	0.0033	-	-
Al-T	mg/L	0.0068	0.0067	0.0087	0.0082	0.0088	0.0078	-	-
As-T	mg/L	0.00024	0.00025	0.00028	0.00024	0.00024	0.00025	-	**0.005**
Ba-T	mg/L	0.0136	0.0151	0.013	0.0128	0.013	0.0135	-	-
B-T	mg/L	0.114	0.124	0.123	0.129	0.119	0.122	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	44.6	42	44.2	46.2	43.7	44.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	0.00031	**0.002**	**0.007**
Hard-T	mg/L	132	127	133	136	130	131.600	-	-
Fe-T	mg/L	0.064	0.053	0.049	0.046	0.049	0.052	-	**1.0**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.00025	<0.00020	0.00013	**0.003**	**0.005**
Mg-T	mg/L	5.03	5.31	5.56	5.03	5.00	5.190	-	-
Mn-T	mg/L	**1.38**	**1.63**	**1.29**	**1.23**	**1.45**	**1.40**	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.7	0.664	0.684	0.651	0.699	0.68	-	-
S-T	mg/L	43.1	43.2	44.9	41.1	43.5	43.2	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	22.00	22.90	23.90	20.80	22.00	22.3	-	-
Sr-T	mg/L	0.332	0.351	0.352	0.3410	0.3	0.335	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0105	0.0043	0.0049	0.0051	0.0046	0.0059	**0.05**	**0.1**
As-D	mg/L	0.0002	0.00017	0.00022	0.0002	0.00021	0.0002	-	-
Ba-D	mg/L	0.0134	0.014	0.012	0.0116	0.0118	0.0126	-	-
B-D	mg/L	0.124	0.139	0.124	0.119	0.117	0.125	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	45.6	45.4	46.4	45.4	49.0	46.4	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00034	0.00029	0.00032	0.00033	0.00034	0.00032	-	-
Hard-D	mg/L	136	134	138	136	145	137.8	-	-
Fe-D	mg/L	0.0231	0.0092	0.0122	0.0081	0.0113	0.0128	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	5.46	5.08	5.37	5.45	5.46	5.36	-	-
Mn-D	mg/L	1.37	1.45	1.16	1.18	1.39	1.31	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.695	0.64	0.681	0.677	0.68	0.675	-	-
S-D	mg/L	45.70	41.40	44.70	43.80	43.00	43.7	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	23.6	21.6	23.2	23.9	23.5	23.20	-	-
Sr-D	mg/L	0.347	0.332	0.353	0.348	0.372	0.3500	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 108
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre Depth							
Site Name	MQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	34.7	36.9	36.7	32.2	31.1	34	**128**	-
Chloro-a	ug/L	<0.50				0.71	0.48	-	-
Turb	NTU	0.34	0.24	0.25	0.34	0.29	0.29	-	-
Alk-T	mg/L	34.4		39.9			37.1	-	-
P-T	mg/L	0.0033					0.0033	-	-
Al-T	mg/L	0.0225	0.0255	0.0245	0.0231	0.0208	0.0233	-	-
As-T	mg/L	0.00012	0.00011	0.00013	0.00012	0.00012	0.00012	-	**0.005**
Ba-T	mg/L	0.0023	0.0021	0.0023	0.0022	0.0020	0.0022	-	-
B-T	mg/L	<0.050	0.059	0.052	<0.050	<0.050	0.037	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	11.4	13.2	12.8	11.2	12.1	12.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00076	0.00051	0.00062	0.00093	0.00057	0.00068	**0.002**	**0.007**
Hard-T	mg/L	34.6	39.8	38.7	34.2	36.7	36.800	-	-
Fe-T	mg/L	0.035	0.029	0.039	0.032	0.035	0.034	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.5	1.64	1.65	1.52	1.58	1.580	-	-
Mn-T	mg/L	0.0058	0.0044	0.0044	0.0042	0.0041	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.237	0.256	0.257	0.254	0.247	0.25	-	-
S-T	mg/L	11.5	12.2	12.9	11.5	10.4	11.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	14.3	18.8	18.2	16.4	17.7	17.1	-	-
Sr-T	mg/L	0.0683	0.0711	0.0694	0.0681	0.0638	0.0681	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0206	0.0217	0.0198	0.0205	0.024	0.0213	**0.05**	**0.1**
As-D	mg/L	0.0001	0.00013	0.00011	0.00012	0.00012	0.00012	-	-
Ba-D	mg/L	0.0022	0.0024	0.0023	0.0022	0.0021	0.0022	-	-
B-D	mg/L	<0.050	0.062	0.055	0.050	0.051	0.049	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	11.9	12.9	13	12	11.8	12.3	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00054	0.00058	0.00061	0.00086	0.00103	0.00072	-	-
Hard-D	mg/L	36.3	38.9	38.9	36.2	36.2	37.3	-	-
Fe-D	mg/L	0.0237	0.0162	0.0169	0.0141	0.0145	0.0171	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.61	1.6	1.53	1.5	1.6	1.57	-	-
Mn-D	mg/L	0.0035	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.245	0.274	0.261	0.254	0.244	0.256	-	-
S-D	mg/L	11.8	13.3	13	11.1	10.9	12.0	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	16.2	18.7	16.9	16.8	17.4	17.20	-	-
Sr-D	mg/L	0.0668	0.0777	0.0678	0.0671	0.0668	0.0692	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 109
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre Depth							
Site Name	MQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	30.8	33	31.2	36.9	31.5	33	**128**	-
Chloro-a	ug/L					1.15	1.15	-	-
Turb	NTU	0.42	0.24	0.27	0.22	0.26	0.28	-	-
Alk-T	mg/L	40.1	40.9			41.3	40.8	-	-
P-T	mg/L	<0.0020	0.0025			0.0042	0.0026	**0.006**	-
Al-T	mg/L	0.0245	0.0166	0.0163	0.0151	0.0156	0.0176	-	-
As-T	mg/L	0.00021	0.00021	0.0002	0.0002	0.00021	0.00021	-	**0.005**
Ba-T	mg/L	0.0018	0.0019	0.0029	0.0019	0.0019	0.0021	-	-
B-T	mg/L	0.051	0.054	0.053	0.053	0.052	0.053	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	12.2	11.4	12.4	12.2	11.7	12	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00069	0.00058	0.00055	0.00085	0.00059	0.00065	**0.002**	**0.007**
Hard-T	mg/L	36.9	34.4	37	36.7	35.3	36.100	-	-
Fe-T	mg/L	0.025	0.035	0.035	0.033	0.03	0.032	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.54	1.46	1.47	1.51	1.5	1.500	-	-
Mn-T	mg/L	0.0014	0.0069	0.0069	0.0058	0.0063	0.006	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.281	0.275	0.306	0.262	0.271	0.279	-	-
S-T	mg/L	11.6	11.6	13	12.8	11.5	12.1	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	19.2	17.9	17.8	17.5	17.5	18	-	-
Sr-T	mg/L	0.0619	0.0645	0.0654	0.0636	0.0663	0.0643	-	-
Zn-T	mg/L	0.0109	<0.0050	<0.0050	<0.0050	<0.0050	0.0042	**0.0075**	**0.03**
Al-D	mg/L	0.0176	0.0162	0.0152	0.0139	0.0167	0.0159	**0.05**	**0.1**
As-D	mg/L	0.00018	0.00022	0.00019	0.00019	0.00018	0.00019	-	-
Ba-D	mg/L	0.0018	0.0022	0.0018	0.0019	0.0021	0.002	-	-
B-D	mg/L	<0.050	0.058	0.053	0.054	0.057	0.049	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	11.8	11.6	11.7	11.7	11.6	11.7	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00057	0.00045	0.00061	0.00049	0.00051	0.00053	-	-
Hard-D	mg/L	35.4	34.5	36	35.4	34.9	35.2	-	-
Fe-D	mg/L	0.0182	0.0318	0.0185	0.017	0.0193	0.021	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.46	1.37	1.64	1.48	1.45	1.48	-	-
Mn-D	mg/L	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.00062	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.268	0.273	0.292	0.263	0.279	0.275	-	-
S-D	mg/L	10.7	9.9	12.5	11.2	12.2	11.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	18.5	17.8	19.7	17	17.9	18.20	-	-
Sr-D	mg/L	0.0609	0.0612	0.0677	0.0674	0.0689	0.0652	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 110
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre Depth							
Site Name	MQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Units								
SO4-D	mg/L	32.50	36.00	29.70	26.90	23.30	29.7	**128**	-
Chloro-a	ug/L	0.93					0.93	-	-
Turb	NTU	0.23	0.33	0.31	0.33	0.41	0.32	-	-
Alk-T	mg/L	45.7	45.2			37.7	42.9	-	-
P-T	mg/L	0.0025				0.0039	0.0032	-	-
Al-T	mg/L	0.0103	0.0115	0.0193	0.0170	0.0148	0.0146	-	-
As-T	mg/L	0.00016	0.00015	0.00019	0.00017	0.00018	0.00017	-	**0.005**
Ba-T	mg/L	0.0021	0.0023	0.0024	0.003	0.0022	0.0024	-	-
B-T	mg/L	0.060	0.066	0.057	0.059	<0.050	0.053	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	11.7	11.1	10.9	11.3	10.5	11.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.0006	0.00055	0.00098	0.00098	0.00071	0.00076	**0.002**	**0.007**
Hard-T	mg/L	35.3	33.8	32.9	34.1	31.9	33.600	-	-
Fe-T	mg/L	0.03	0.031	0.043	0.055	0.046	0.041	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.46	1.47	1.39	1.42	1.36	1.420	-	-
Mn-T	mg/L	0.0059	0.0064	0.0058	0.0068	0.006	0.006	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.295	0.296	0.313	0.280	0.254	0.288	-	-
S-T	mg/L	11.5	11	9	9.1	8.4	9.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	20.2	20.20	18.3	15.8	15.3	18	-	-
Sr-T	mg/L	0.0638	0.0638	0.0569	0.0534	0.0504	0.0577	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0076	0.0100	0.011	0.0166	0.0118	0.0114	**0.05**	**0.1**
As-D	mg/L	0.00017	0.00015	0.00018	0.00017	0.00016	0.00017	-	-
Ba-D	mg/L	0.0021	0.0023	0.0022	0.0021	0.002	0.0021	-	-
B-D	mg/L	0.061	0.076	0.060	0.055	<0.050	0.055	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.000006	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	11.7	11.6	11.6	10.9	10.6	11.28	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.0004	0.00045	0.00052	0.00854	0.00051	0.00208	-	-
Hard-D	mg/L	36	35	35	33	32	34.1	-	-
Fe-D	mg/L	0.0166	0.0219	0.0266	0.0300	0.0310	0.0252	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.55	1.46	1.41	1.39	1.34	1.43	-	-
Mn-D	mg/L	<0.0010	0.0012	<0.0010	0.0014	0.0015	0.00102	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.307	0.301	0.287	0.280	0.250	0.285	-	-
S-D	mg/L	12.4	11.4	10.4	9.5	8.3	10.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	20.9	20.1	18.3	17.2	15.2	18.30	-	-
Sr-D	mg/L	0.0659	0.0617	0.0592	0.0541	0.0511	0.0584	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 111
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 4 Metre Depth							
Site Name	MQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	35.7	38.0	34.6	33.1	32.2	35	**128**	-
Turb	NTU	0.3	0.26	0.26	0.25	0.22	0.26	-	-
Alk-T	mg/L	35.8		41.3			38.5	-	-
P-T	mg/L	0.0039					0.0039	-	-
Al-T	mg/L	0.0226	0.0265	0.0241	0.02	0.0197	0.0226	-	-
As-T	mg/L	0.00011	0.00013	0.00013	<0.00010	0.00013	0.00011	-	**0.005**
Ba-T	mg/L	0.0023	0.0022	0.0023	0.002	0.002	0.0022	-	-
B-T	mg/L	<0.050	0.061	0.053	0.051	<0.050	0.043	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	11.2	12.8	12.8	10.6	12.3	11.9	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00062	<0.00050	0.00057	0.00051	0.00058	0.00051	**0.002**	**0.007**
Hard-T	mg/L	34.2	39	38.4	32.4	37.3	36.300	-	-
Fe-T	mg/L	0.031	0.026	0.04	0.025	0.036	0.032	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.52	1.71	1.6	1.42	1.62	1.570	-	-
Mn-T	mg/L	0.0057	0.0036	0.0044	0.0029	0.0042	0.004	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.236	0.266	0.254	0.226	0.245	0.245	-	-
S-T	mg/L	11.6	12.7	12.1	12.6	10.5	11.9	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	14.6	19.4	17.8	15.4	18.1	17.1	-	-
Sr-T	mg/L	0.0662	0.0758	0.0687	0.0616	0.0649	0.0674	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0207	0.0232	0.0205	0.019	0.0182	0.0203	**0.05**	**0.1**
As-D	mg/L	0.00012	0.00013	0.00013	0.00013	0.00012	0.00013	-	-
Ba-D	mg/L	0.0022	0.0023	0.0023	0.0022	0.002	0.0022	-	-
B-D	mg/L	<0.050	0.063	0.053	<0.050	0.051	0.043	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	12	12.8	13.2	12.7	11.8	12.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00075	0.00086	0.00059	0.00054	0.00077	0.0007	-	-
Hard-D	mg/L	36.5	38.8	39.5	37.8	35.8	37.7	-	-
Fe-D	mg/L	0.0237	0.0158	0.0172	0.0139	0.0222	0.0186	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.58	1.65	1.57	1.48	1.55	1.57	-	-
Mn-D	mg/L	0.0033	<0.0010	<0.0010	<0.0010	<0.0010	0.00106	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.23	0.273	0.273	0.255	0.237	0.254	-	-
S-D	mg/L	12.1	13.3	13.1	11.1	10.6	12.0	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	15.7	19.4	17.2	16.9	16.7	17.20	-	-
Sr-D	mg/L	0.0646	0.0746	0.0698	0.0661	0.0656	0.0681	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 112
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 4 Metre Depth							
Site Name	MQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	30.5	33.6	33.1	27.2	32.5	31	**128**	-
Turb	NTU	0.44	0.28	0.25	0.25	0.39	0.32	-	-
Alk-T	mg/L	42.2	39.4			41.1	40.9	-	-
P-T	mg/L	<0.0020	0.0023			0.003	0.0021	**0.006**	-
Al-T	mg/L	0.0174	0.0166	0.0161	0.018	0.0174	0.0171	-	-
As-T	mg/L	0.00019	0.00021	0.00021	<0.00050	0.00019	0.00021	-	**0.005**
Ba-T	mg/L	0.0018	0.0019	0.0019	<0.0050	0.0022	0.00206	-	-
B-T	mg/L	<0.050	0.053	0.055	<0.25	0.053	0.062	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	0.000009	-	-
Ca-T	mg/L	12.2	12.5	12.8	11.9	11.6	12.2	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	0.0009	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	0.00018	-	**0.05**
Cu-T	mg/L	0.00064	0.00056	0.00062	<0.0025	0.00152	0.00092	**0.002**	**0.007**
Hard-T	mg/L	36.8	37.5	38.1	36.0	35.4	36.800	-	-
Fe-T	mg/L	0.023	0.039	0.05	<0.050	0.031	0.034	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	0.00018	**0.003**	**0.005**
Mg-T	mg/L	1.54	1.52	1.46	1.53	1.56	1.520	-	-
Mn-T	mg/L	<0.0010	0.0069	0.0074	0.0058	0.0066	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	0.0009	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	0.0009	-	**0.025**
K-T	mg/L	0.283	0.28	0.299	0.26	0.276	0.28	-	-
S-T	mg/L	11.5	11	13.3	<15	12	11.1	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	0.00009	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.00010	<0.000020	0.000018	-	**0.0001**
Na-T	mg/L	18.7	18.5	17.4	18.4	18.1	18.2	-	-
Sr-T	mg/L	0.0629	0.0638	0.0668	0.0617	0.0662	0.0643	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	0.0045	**0.0075**	**0.03**
Al-D	mg/L	0.0171	0.0166	0.0155	0.0141	0.0167	0.0160	**0.05**	**0.1**
As-D	mg/L	0.00020	0.00019	0.00019	0.00019	0.00021	0.0002	-	-
Ba-D	mg/L	0.0019	0.0019	0.0018	0.0019	0.0022	0.0019	-	-
B-D	mg/L	<0.050	0.057	0.056	0.056	0.055	0.050	-	-
Cd-D	mg/L	0.0000440	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000011	**0.000088**	**0.00017**
Ca-D	mg/L	11.5	11.1	14.0	11.7	11.8	12	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00157	0.00058	0.00048	0.00056	0.00053	0.00074	-	-
Hard-D	mg/L	34.6	33.5	41.1	35.5	35.3	36	-	-
Fe-D	mg/L	0.0213	0.0256	0.0265	0.0194	0.0218	0.0229	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.44	1.37	1.51	1.49	1.44	1.45	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.263	0.249	0.267	0.275	0.284	0.268	-	-
S-D	mg/L	10.9	9.4	11.5	11.7	11.7	11.0	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	18.2	17.6	18.1	17.8	17.8	17.90	-	-
Sr-D	mg/L	0.0611	0.0613	0.065	0.0679	0.0691	0.0649	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 113
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 4 Metre Depth							
Site Name	MQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17		Average	Max
Parameter	Unit								
SO4-D	mg/L	32.10	33.30	31.10	27.00	23.20	29.3	**128**	-
Turb	NTU	0.220	0.260	0.290	0.350	0.360	0.30	-	-
Alk-T	mg/L	42.6	46.2			38.8	42.5	-	-
P-T	mg/L	0.0033				0.0054	0.0043	-	-
Al-T	mg/L	0.0090	0.0142	0.0141	0.0124	0.0175	0.0134	-	-
As-T	mg/L	0.00016	0.00015	0.0002	0.00022	0.00016	0.00018	-	**0.005**
Ba-T	mg/L	0.002	0.0026	0.0022	0.0024	0.0024	0.0023	-	-
B-T	mg/L	0.059	0.074	0.059	<0.050	<0.050	0.048	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	11.7	11.3	11.3	10.9	8.2	10.67	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00053	0.00056	0.00082	0.00062	0.0007	0.00065	**0.002**	**0.007**
Hard-T	mg/L	35.1	34.2	33.8	32.9	25.5	32.300	-	-
Fe-T	mg/L	0.034	0.035	0.046	0.042	0.052	0.042	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.41	1.45	1.33	1.39	1.24	1.360	-	-
Mn-T	mg/L	0.006	0.007	0.006	0.008	0.006	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.299	0.294	0.296	0.302	0.255	0.289	-	-
S-T	mg/L	11	11	10	9	8	9.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	18.6	19.6	17.7	15.6	14.1	17.1	-	-
Sr-T	mg/L	0.061	0.0616	0.0573	0.0534	0.0523	0.0571	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0095	0.0095	0.0109	0.0111	0.0121	0.0106	**0.05**	**0.1**
As-D	mg/L	0.00018	0.00016	0.00015	0.00016	0.00016	0.00016	-	-
Ba-D	mg/L	0.0021	0.0022	0.0022	0.002	0.0021	0.0021	-	-
B-D	mg/L	0.066	0.070	0.058	0.054	<0.050	0.055	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	11.6	11.2	10.9	10.5	9.9	10.83	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00041	0.00046	0.00060	0.00057	0.00051	0.00051	-	-
Hard-D	mg/L	35.5	33.9	32.9	31.9	30.2	32.9	-	-
Fe-D	mg/L	0.0166	0.0197	0.0266	0.0280	0.0309	0.0244	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.6	1.44	1.39	1.36	1.32	1.42	-	-
Mn-D	mg/L	<0.0010	0.0011	<0.0010	0.0012	0.0015	0.00096	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.309	0.297	0.274	0.272	0.262	0.283	-	-
S-D	mg/L	12.3	11.7	9.8	9.4	9.1	10.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	21.5	19.8	17.9	16.8	14.8	18.20	-	-
Sr-D	mg/L	0.067	0.062	0.059	0.054	0.051	0.0584	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 114
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 9 Metre Depth							
Site Name	MQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	41.8	40.9	42.6	39.7	37.8	41	**128**	-
Turb	NTU	0.25	0.25	0.32	0.27	0.27	0.27	-	-
Alk-T	mg/L	36.7		37.8			37.2	-	-
P-T	mg/L	0.0036					0.0036	-	-
Al-T	mg/L	0.024	0.0211	0.023	0.0219	0.0285	0.0237	-	-
As-T	mg/L	0.00013	0.00011	0.00012	0.00011	0.00011	0.00012	-	**0.005**
Ba-T	mg/L	0.0025	0.0023	0.0025	0.0025	0.0023	0.0024	-	-
B-T	mg/L	0.053	0.056	0.055	0.054	0.055	0.055	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	13.3	13.9	14.1	13	13.6	13.6	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00078	<0.00050	0.00058	0.00054	0.00056	0.00054	**0.002**	**0.007**
Hard-T	mg/L	40.8	42.7	43.1	39.8	41.8	41.6	-	-
Fe-T	mg/L	0.031	0.026	0.035	0.026	0.03	0.03	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.87	1.92	1.95	1.8	1.88	1.88	-	-
Mn-T	mg/L	0.01	0.0057	0.0069	0.005	0.0048	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.272	0.251	0.26	0.269	0.27	0.264	-	-
S-T	mg/L	14.5	13.5	15.2	14.2	13.8	14.2	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	17.1	18.2	18.8	17.3	19.7	18.2	-	-
Sr-T	mg/L	0.0794	0.0779	0.0772	0.0748	0.0731	0.0765	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.019	0.0209	0.0182	0.0169	0.016	0.0182	**0.05**	**0.1**
As-D	mg/L	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	-	-
Ba-D	mg/L	0.0024	0.0026	0.0025	0.0025	0.0024	0.0025	-	-
B-D	mg/L	0.055	0.059	0.053	0.052	0.052	0.054	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	14.2	14.4	14.8	13.6	13.6	14.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00131	0.00051	0.00077	0.00049	0.00046	0.00071	-	-
Hard-D	mg/L	43.1	43.4	44.7	41.3	41.6	42.8	-	-
Fe-D	mg/L	0.0238	0.0144	0.0152	0.0135	0.0143	0.0162	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	1.88	1.77	1.85	1.77	1.84	1.82	-	-
Mn-D	mg/L	0.0056	0.0027	0.0012	<0.0010	<0.0010	0.0021	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.269	0.257	0.275	0.27	0.276	0.269	-	-
S-D	mg/L	14.3	14.3	15.5	13.8	13.4	14.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0	-	-
Na-D	mg/L	18.2	17.9	18	18.4	18.9	18.3	-	-
Sr-D	mg/L	0.0748	0.0786	0.0755	0.0761	0.0745	0.0759	-	-
Zn-D	mg/L	<0.0050	<0.0050	0.0064	<0.0050	<0.0050	0.0033	-	-

Table 115
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 9 Metre Depth							
Site Name	MQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	42.9	48.6	45	47.6	48	46	**128**	-
Turb	NTU	0.32	0.25	0.44	0.37	0.34	0.34	-	-
Alk-T	mg/L	39.5	39.6			40.3	39.8	-	-
P-T	mg/L	<0.0020	0.0048			0.004	0.00327	**0.006**	-
Al-T	mg/L	0.0106	0.0085	0.0228	0.0092	0.0103	0.0123	-	-
As-T	mg/L	0.00015	0.00014	0.00015	0.00014	0.00013	0.00014	-	**0.005**
Ba-T	mg/L	0.0022	0.0028	0.0027	0.0026	0.0029	0.0026	-	-
B-T	mg/L	0.052	0.057	0.055	0.060	0.064	0.058	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	15.2	16.4	15.8	16.6	16.7	16.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.0009	0.0005	0.00051	0.00077	0.0006	0.00066	**0.002**	**0.007**
Hard-T	mg/L	45.6	50.4	48.4	50.1	51	49.100	-	-
Fe-T	mg/L	0.013	0.021	0.025	0.031	0.034	0.025	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.89	2.29	2.15	2.1	2.23	2.130	-	-
Mn-T	mg/L	<0.0010	0.0048	0.0067	0.0084	0.0076	0.006	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.244	0.239	0.258	0.214	0.263	0.244	-	-
S-T	mg/L	14.3	17.8	18.5	16	18.3	17.0	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	19	19.5	18.8	19.0	20.1	19.3	-	-
Sr-T	mg/L	0.0758	0.0859	0.0805	0.0801	0.0834	0.0811	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.01	0.0074	0.0066	0.0057	0.0084	0.0076	**0.05**	**0.1**
As-D	mg/L	0.00015	0.00015	0.00013	0.00014	0.00014	0.00014	-	-
Ba-D	mg/L	0.0023	0.0028	0.0027	0.0026	0.0027	0.0026	-	-
B-D	mg/L	0.051	0.059	0.059	0.058	0.06	0.057	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	14.3	15.4	15.7	13.8	14.9	14.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00049	0.00045	0.0004	0.00049	0.00047	0.00046	-	-
Hard-D	mg/L	43.6	47.2	48.4	42.7	45.6	45.5	-	-
Fe-D	mg/L	0.0111	0.0129	0.0081	0.0074	0.0074	0.0094	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.89	2.10	2.24	1.99	2.02	2.05	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.243	0.225	0.216	0.213	0.233	0.226	-	-
S-D	mg/L	14	17.1	15.8	15.3	16.4	15.7	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	18.9	19.2	19.3	18.6	19.4	19.10	-	-
Sr-D	mg/L	0.0742	0.0795	0.0816	0.0809	0.0864	0.0805	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 116
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 9 Metre Depth							
Site Name	MQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	32.60	32.00	29.30	26.60	23.70	28.8	**128**	-
Turb	NTU	0.260	0.320	0.310	0.300	0.330	0.30	-	-
Alk-T	mg/L	44.3	44.5			39.7	42.8	-	-
P-T	mg/L	0.0024				0.0032	0.0028	-	-
Al-T	mg/L	0.0121	0.0129	0.0130	0.0134	0.015	0.0133	-	-
As-T	mg/L	0.00017	0.00018	0.0002	0.00018	0.00017	0.00018	-	**0.005**
Ba-T	mg/L	0.002	0.0023	0.0022	0.0023	0.0022	0.0022	-	-
B-T	mg/L	0.058	0.065	0.058	<0.050	<0.050	0.046	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	11.8	10.6	11.3	10.8	10.3	11	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.0007	0.0007	0.00057	0.00057	0.00054	0.00062	**0.002**	**0.007**
Hard-T	mg/L	35.8	32.5	33.8	32.3	30.9	33.100	-	-
Fe-T	mg/L	0.043	0.034	0.043	0.045	0.047	0.042	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.54	1.49	1.36	1.27	1.27	1.390	-	-
Mn-T	mg/L	0.0056	0.0079	0.0064	0.0066	0.006	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.302	0.305	0.284	0.294	0.260	0.289	-	-
S-T	mg/L	11.3	11.1	10.4	9.7	8.7	10.2	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	18.9	20.6	17.8	15.4	14.6	17.5	-	-
Sr-T	mg/L	0.0608	0.0634	0.0571	0.0531	0.0524	0.0574	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0093	0.0098	0.0134	0.0118	0.0122	0.0113	**0.05**	**0.1**
As-D	mg/L	0.00016	0.00016	0.00017	0.00017	0.00015	0.00016	-	-
Ba-D	mg/L	0.0021	0.0022	0.0022	0.0021	0.0022	0.0022	-	-
B-D	mg/L	0.065	0.069	0.058	0.054	<0.050	0.054	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	11.80	10.40	11.80	10.80	10.90	11.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00042	0.0005	0.00054	0.00063	0.00051	0.00052	-	-
Hard-D	mg/L	35.9	32.3	35.1	32.6	32.8	33.7	-	-
Fe-D	mg/L	0.0172	0.020	0.031	0.029	0.033	0.0257	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.57	1.55	1.41	1.39	1.36	1.46	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	0.0013	0.0015	0.00086	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.307	0.328	0.293	0.275	0.250	0.291	-	-
S-D	mg/L	12.40	12.90	9.50	9.40	8.40	10.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	21.1	21.6	18.4	17.3	15.5	18.80	-	-
Sr-D	mg/L	0.066	0.063	0.060	0.054	0.051	0.0588	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 117
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre from Bottom Depth							
Site Name	MQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	136	98.3	72.8	80.9	72.6	92	**128**	-
Turb	NTU	0.42	0.3	0.32	0.29	0.27	0.32	-	-
Alk-T	mg/L	44.5		44			44.2	-	-
P-T	mg/L	0.0046					0.0046	-	-
Al-T	mg/L	0.013	0.0149	0.0185	0.014	0.0147	0.015	-	-
As-T	mg/L	0.0001	<0.00010	0.00012	0.00011	<0.00010	0.00009	-	**0.005**
Ba-T	mg/L	0.0072	0.0048	0.0042	0.0045	0.0041	0.005	-	-
B-T	mg/L	0.055	0.061	0.058	0.057	0.053	0.057	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	36.2	29.8	23.2	22.5	22.4	26.8	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00078	<0.00050	0.00058	0.00056	0.00052	0.00054	**0.002**	**0.007**
Hard-T	mg/L	116	93.5	73.3	72.1	72.1	85.4	-	-
Fe-T	mg/L	0.052	0.033	0.038	0.021	0.027	0.034	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	6.23	4.62	3.73	3.87	3.94	4.48	-	-
Mn-T	mg/L	0.0693	0.0376	0.023	0.0195	0.0163	0.033	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.335	0.313	0.298	0.316	0.317	0.316	-	-
S-T	mg/L	43.8	31.5	25.3	28.2	24.4	30.6	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	25.6	25.3	22.8	22.8	24.4	24.2	-	-
Sr-T	mg/L	0.16	0.13	0.108	0.113	0.107	0.124	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0098	0.0124	0.013	0.0116	0.0121	0.0118	**0.05**	**0.1**
As-D	mg/L	<0.00010	0.00011	<0.00010	0.00011	0.00011	0.000086	-	-
Ba-D	mg/L	0.0073	0.0052	0.0042	0.0047	0.0042	0.0051	-	-
B-D	mg/L	0.062	0.061	0.056	0.057	0.059	0.059	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	37	27.5	23.0	25.5	24.6	27.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00057	0.00064	0.00052	0.00054	0.00045	0.00054	-	-
Hard-D	mg/L	120	87.4	71.7	79.6	76.8	87.1	-	-
Fe-D	mg/L	0.0154	0.0117	0.0132	0.0141	0.0123	0.0133	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	6.8	4.58	3.47	3.88	3.76	4.5	-	-
Mn-D	mg/L	0.0637	0.0324	0.0151	0.0134	0.0081	0.0265	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.339	0.348	0.307	0.323	0.315	0.326	-	-
S-D	mg/L	45.3	31.9	26.7	28.0	25.7	31.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0	-	-
Na-D	mg/L	28.1	24	21.8	24	24.1	24.4	-	-
Sr-D	mg/L	0.159	0.133	0.106	0.115	0.111	0.125	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 118
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre from Bottom Depth							
Site Name	MQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		10-Aug-17	15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	57	58.4	57.4	59.1	59.6	58	**128**	-
Turb	NTU	0.48	0.31	0.32	0.44	0.37	0.38	-	-
Alk-T	mg/L	41.7	41.6			41.1	41.5	-	-
P-T	mg/L	<0.0020	0.0035			0.0049	0.00313	**0.006**	-
Al-T	mg/L	0.0089	0.0081	0.0077	0.0073	0.0081	0.008	-	-
As-T	mg/L	0.0001	0.00011	0.0001	0.00011	<0.00010	0.000094	-	**0.005**
Ba-T	mg/L	0.0037	0.0036	0.0037	0.0036	0.0042	0.0038	-	-
B-T	mg/L	0.052	0.056	0.059	0.057	0.06	0.057	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	20.7	19.6	19.8	18.4	18.8	19.5	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00063	<0.00050	<0.00050	0.00057	0.00093	0.00053	**0.002**	**0.007**
Hard-T	mg/L	64.4	60.8	61	57.4	58.8	60.500	-	-
Fe-T	mg/L	0.017	0.028	0.028	0.039	0.039	0.030	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	3.09	2.86	2.84	2.79	2.9	2.900	-	-
Mn-T	mg/L	0.0071	0.0098	0.0102	0.0119	0.0121	0.010	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.302	0.297	0.298	0.259	0.275	0.286	-	-
S-T	mg/L	21.5	20.9	22.3	20.4	20.5	21.1	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	22.6	21.8	20.6	20.5	21.5	21.4	-	-
Sr-T	mg/L	0.0951	0.0943	0.0915	0.092	0.0960	0.0938	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.008	0.0095	0.0066	0.0058	0.0066	0.0073	**0.05**	**0.1**
As-D	mg/L	<0.00010	<0.00010	0.0001	0.00011	<0.00010	0.000072	-	-
Ba-D	mg/L	0.0038	0.0036	0.0037	0.0037	0.0043	0.0038	-	-
B-D	mg/L	<0.050	0.061	0.061	0.06	0.061	0.054	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	19.5	18.6	18.3	18.2	18	18.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00056	0.0005	0.00045	0.00045	0.00051	0.00049	-	-
Hard-D	mg/L	61.2	58	57.5	56.6	56.4	57.9	-	-
Fe-D	mg/L	0.0154	0.0175	0.0114	0.0139	0.0131	0.0143	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	3.03	2.78	2.84	2.72	2.79	2.83	-	-
Mn-D	mg/L	0.0068	0.0063	0.0052	0.0046	0.0031	0.0052	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.289	0.296	0.265	0.271	0.283	0.281	-	-
S-D	mg/L	21	21.2	19.8	19.6	20.5	20.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	22.2	21.4	20.6	20.9	21.5	21.30	-	-
Sr-D	mg/L	0.0944	0.0891	0.0935	0.0943	0.1	0.0943	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 119
2017-2018 Annual Report

EMS ID	E206618								
Site Description		Middle Quinsam Lake 1 Metre from Bottom Depth							
Site Name	MQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		19-Oct-17	25-Oct-17	2-Nov-17	8-Nov-17	16-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	57.00	32.70	30.10	26.10	23.80	34	**128**	-
Turb	NTU	0.23	0.34	0.27	0.40	0.34	0.32	-	-
Alk-T	mg/L	44.0	45.5			38.3	42.6	-	-
P-T	mg/L	0.0044				<0.0020	0.0027	-	-
Al-T	mg/L	0.0073	0.0173	0.0182	0.0133	0.0137	0.014	-	-
As-T	mg/L	0.00011	0.00019	0.00019	0.00019	0.00018	0.00017	-	**0.005**
Ba-T	mg/L	0.0041	0.0024	0.0022	0.0021	0.0034	0.0028	-	-
B-T	mg/L	0.057	0.065	0.057	0.050	<0.050	0.051	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	18.8	10.9	11.0	10.9	8.9	12.11	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00059	0.00147	0.00075	0.00051	0.00055	0.00077	**0.002**	**0.007**
Hard-T	mg/L	59	34	33	32	28	37.100	-	-
Fe-T	mg/L	0.025	0.042	0.225	0.047	0.041	0.076	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	2.92	1.50	1.39	1.25	1.29	1.670	-	-
Mn-T	mg/L	0.021	0.008	0.006	0.006	0.005	0.009	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.3	0.307	0.279	0.275	0.247	0.282	-	-
S-T	mg/L	19.5	11.9	9.3	9.3	8.7	11.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	21.3	20.1	17.6	15.1	14.1	17.6	-	-
Sr-T	mg/L	0.0878	0.0621	0.0572	0.0531	0.0581	0.0637	-	-
Zn-T	mg/L	<0.0050	<0.0050	0.0197	<0.0050	<0.0050	0.0059	**0.0075**	**0.03**
Al-D	mg/L	0.0046	0.0162	0.0144	0.0107	0.0144	0.0121	**0.05**	**0.1**
As-D	mg/L	0.0001	0.00014	0.00016	0.00016	0.00015	0.00014	-	-
Ba-D	mg/L	0.0042	0.0022	0.0023	0.002	0.002	0.0025	-	-
B-D	mg/L	0.062	0.071	0.056	0.053	<0.050	0.053	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	18.6	11.4	11.4	10.6	10.9	12.58	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00038	0.00052	0.00069	0.00055	0.00053	0.00053	-	-
Hard-D	mg/L	59	34	34	32	33	38.5	-	-
Fe-D	mg/L	0.008	0.030	0.028	0.029	0.035	0.026	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	3.02	1.43	1.40	1.38	1.38	1.72	-	-
Mn-D	mg/L	0.02	<0.0010	0.00	0.00	0.00	0.00418	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	0.0007	-	-
K-D	mg/L	0.3	0.299	0.288	0.27	0.252	0.282	-	-
S-D	mg/L	21.2	11.4	10.3	9.3	8.7	12.2	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	22.6	19.6	17.8	16.9	15.5	18.50	-	-
Sr-D	mg/L	0.0959	0.0599	0.0580	0.0533	0.0520	0.0638	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 120
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre Depth							
Site Name	LQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		12-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	13.8	15.2	15.6	17.4	15.6	16	**128**	-
Chloro-a	ug/L	0.85				<0.50	0.55	-	-
Turb	NTU	0.81	0.68	0.56	0.46	0.43	0.59	-	-
Alk-T	mg/L	24.2					24.2	-	-
P-T	mg/L	0.0057					0.0057	-	-
Al-T	mg/L	0.0544	0.0472	0.0468	0.0436	0.0382	0.046	-	-
As-T	mg/L	0.00047	0.00049	0.0005	0.00047	0.00051	0.00049	-	**0.0050**
Ba-T	mg/L	0.0031	0.0029	0.0033	0.0034	0.0032	0.0032	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	8.86	9.39	10.1	9.43	10.1	9.58	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00078	0.00061	0.00064	0.00062	0.00058	0.00065	**0.002**	**0.007**
Hard-T	mg/L	27	28.6	30.2	28.3	30.3	28.900	-	-
Fe-T	mg/L	0.086	0.075	0.099	0.083	0.09	0.087	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.19	1.25	1.24	1.15	1.26	1.220	-	-
Mn-T	mg/L	0.0037	0.0049	0.0051	0.0058	0.0062	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.197	0.251	0.21	0.216	0.221	0.219	-	-
S-T	mg/L	5.5	6	5.7	5.6	5.3	5.6	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	6.25	7.63	7.31	7.6	8.05	7.36	-	-
Sr-T	mg/L	0.0417	0.05	0.0456	0.0475	0.0491	0.0468	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0392	0.0376	0.0371	0.0467	0.0319	0.0385	**0.05**	**0.1**
As-D	mg/L	0.0004	0.00045	0.00046	0.00049	0.00049	0.00046	-	-
Ba-D	mg/L	0.0031	0.0033	0.0031	0.0033	0.0032	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	8.59	8.9	9.89	10.30	10.3	9.6	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00066	0.00065	0.00065	0.00058	0.00063	0.00063	-	-
Hard-D	mg/L	26.1	27.1	29.5	30.7	31	28.9	-	-
Fe-D	mg/L	0.0501	0.0482	0.0522	0.0526	0.0673	0.0541	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.12	1.18	1.17	1.19	1.26	1.18	-	-
Mn-D	mg/L	0.0022	0.0038	0.0016	<0.0010	0.0014	0.0019	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.199	0.174	0.218	0.218	0.223	0.206	-	-
S-D	mg/L	4.6	5.4	5.5	5.7	5.8	5.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	5.76	6.44	7.06	7.84	8.27	7.07	-	-
Sr-D	mg/L	0.0403	0.0435	0.0462	0.0481	0.0469	0.0450	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 121
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre Depth							
Site Name	LQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	15-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	24.8	25.9	26.6	25.9	27.1	26	**128.0**	-
Chloro-a	ug/L				1.53		1.53	-	-
Turb	NTU	0.32	0.39	0.3	0.31	0.42	0.35	-	-
Alk-T	mg/L	41			43.3		42.1	-	-
P-T	mg/L	0.004			0.005	0.0050	0.0047	**0.006**	-
Al-T	mg/L	0.0107	0.0106	0.01	0.0336	0.0077	0.0145	-	-
As-T	mg/L	0.00066	0.00066	0.0007	0.0007	0.00063	0.00067	-	**0.0050**
Ba-T	mg/L	0.0038	0.0036	0.0035	0.0037	0.0037	0.0037	-	-
B-T	mg/L	0.053	0.059	0.061	0.065	<0.050	0.053	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	12.5	12.4	12.1	12	11.5	12.1	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.00052	0.00067	0.00054	0.00057	0.00054	0.00057	**0.002**	**0.007**
Hard-T	mg/L	37.3	37.4	36.4	36.2	34.9	36.400	-	-
Fe-T	mg/L	0.051	0.049	0.047	0.044	0.037	0.046	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.51	1.54	1.5	1.55	1.46	1.510	-	-
Mn-T	mg/L	0.0073	0.0068	0.0067	0.0066	0.0055	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.265	0.269	0.252	0.277	0.269	0.266	-	-
S-T	mg/L	9.3	9.3	8.8	8.9	9	9.1	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	14.8	15.2	14.4	15.9	14.5	15	-	-
Sr-T	mg/L	0.0611	0.0584	0.06	0.062	0.0604	0.0604	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0131	0.0088	0.0082	0.0109	0.0079	0.0098	**0.05**	**0.1**
As-D	mg/L	0.00063	0.00064	0.00068	0.00067	0.00066	0.00066	-	-
Ba-D	mg/L	0.0051	0.0035	0.0036	0.0037	0.0037	0.0039	-	-
B-D	mg/L	0.058	0.054	0.055	0.058	<0.050	0.050	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	11.4	11.9	12.1	11.7	11.9	11.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00052	0.00042	0.00047	0.00057	0.00047	0.00049	-	-
Hard-D	mg/L	34.2	36.1	36.3	35.1	36	35.5	-	-
Fe-D	mg/L	0.0364	0.0244	0.0242	0.0285	0.0275	0.0282	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.41	1.57	1.49	1.44	1.52	1.49	-	-
Mn-D	mg/L	0.0016	<0.0010	0.0010	<0.0010	0.0016	0.00104	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.26	0.257	0.281	0.271	0.27	0.268	-	-
S-D	mg/L	8.7	8.9	8.9	9.6	9	9.0	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	14.3	14.8	15.2	15.5	15	15.00	-	-
Sr-D	mg/L	0.058	0.0599	0.0581	0.0653	0.0613	0.0605	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 122
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre Depth							
Site Name	LQL1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		20-Oct-17	25-Oct-17	2-Nov-17	9-Nov-17	17-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	25.00	22.10	23.40	24.00	14.00	21.7	**128.0**	-
Chloro-a	ug/L	1.55					1.55	-	-
Turb	NTU	0.79	1.17	0.83	1.05	1.70	1.11	-	-
Alk-T	mg/L	30.7	35.500				33.1	-	-
P-T	mg/L	0.0043				0.006	0.0052	-	-
Al-T	mg/L	0.0188	0.0309	0.0289	0.0246	0.0871	0.0381	-	-
As-T	mg/L	0.0007	0.0008	0.0007	0.0007	0.0006	0.00068	-	**0.0050**
Ba-T	mg/L	0.0039	0.0046	0.0043	0.0045	0.0041	0.0043	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000050	-	-
Ca-T	mg/L	10.5	9.7	13.5	12	9.03	10.95	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.000	-	**0.05**
Cu-T	mg/L	0.0008	0.00088	0.00083	0.0036	0.00087	0.00140	**0.002**	**0.007**
Hard-T	mg/L	32	30.1	39.8	36.2	27.3	33.100	-	-
Fe-T	mg/L	0.132	0.204	0.219	0.185	0.153	0.179	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.42	1.42	1.49	1.50	1.15	1.400	-	-
Mn-T	mg/L	0.0307	0.0455	0.0282	0.0208	0.0088	0.027	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000029	0.0000014	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.271	0.292	0.305	0.295	0.29	0.291	-	-
S-T	mg/L	8.0	7.7	8.0	8.4	4.9	7.4	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	0.00006	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	13.1	11.5	11.4	12.1	5.9	10.79	-	-
Sr-T	mg/L	0.0545	0.0582	0.061	0.0613	0.0434	0.0557	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0113	0.0279	0.0184	0.0173	0.0603	0.0270	**0.05**	**0.1**
As-D	mg/L	0.00063	0.00063	0.00067	0.00061	0.00052	0.00061	-	-
Ba-D	mg/L	0.0036	0.0042	0.0039	0.004	0.0043	0.004	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	0.000005	0.0000070	0.0000050	0.0000060	0.0000090	0.000006	**0.000088**	**0.00017**
Ca-D	mg/L	11.4	11.6	13.6	12.6	9.2	11.682	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00167	0.00075	0.00063	0.00074	0.00097	0.00095	-	-
Hard-D	mg/L	33.9	34.7	40.4	37.9	27.9	35	-	-
Fe-D	mg/L	0.0817	0.130	0.136	0.121	0.098	0.1134	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.35	1.40	1.54	1.56	1.18	1.41	-	-
Mn-D	mg/L	0.0168	0.0291	0.0129	0.0088	0.0049	0.0145	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000026	0.0000013	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.288	0.287	0.292	0.3	0.289	0.291	-	-
S-D	mg/L	9.10	8.00	8.40	8.60	5.00	7.8	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	12.4	11.3	11.6	12.4	6.2	10.77	-	-
Sr-D	mg/L	0.0542	0.0544	0.0584	0.0586	0.0442	0.0540	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 123
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 4 Metre Depth							
Site Name	LQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		12-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	14.4	15	16.5	16.6	15.7	16	**128**	-
Turb	NTU	1.01	0.65	0.77	0.54	0.51	0.7	-	-
Alk-T	mg/L	24					24	-	-
P-T	mg/L	0.0055					0.0055	-	-
Al-T	mg/L	0.0555	0.0515	0.0488	0.0404	0.0399	0.0472	-	-
As-T	mg/L	0.00046	0.00045	0.00051	0.00051	0.00051	0.00049	-	**0.005**
Ba-T	mg/L	0.0033	0.0029	0.0032	0.0032	0.0033	0.0032	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	9.41	9.54	10.1	9.17	10.2	9.68	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	0.00156	0.00053	0.00099	0.00059	0.00059	0.00085	**0.002**	**0.007**
Hard-T	mg/L	28.5	28.3	30.3	27.6	30.8	29.1	-	-
Fe-T	mg/L	0.122	0.077	0.098	0.07	0.085	0.09	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.21	1.09	1.23	1.15	1.27	1.19	-	-
Mn-T	mg/L	0.0038	0.0042	0.0057	0.0047	0.0059	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.205	0.193	0.211	0.212	0.220	0.208	-	-
S-T	mg/L	5.6	4.4	5.9	6	5.2	5.4	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	6.45	6.67	7.53	7.47	8.1	7.24	-	-
Sr-T	mg/L	0.043	0.0446	0.0468	0.0448	0.0487	0.0456	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0404	0.0394	0.0375	0.0361	0.0374	0.0382	**0.05**	**0.1**
As-D	mg/L	0.00041	0.00048	0.0005	0.00049	0.00048	0.00047	-	-
Ba-D	mg/L	0.0031	0.0034	0.0031	0.0034	0.0032	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	10	9.4	10.2	10.6	10.1	10.06	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00089	0.00052	0.0005	0.00059	0.0006	0.00062	-	-
Hard-D	mg/L	29.7	28.2	30.2	31.4	30.4	30	-	-
Fe-D	mg/L	0.0553	0.0469	0.0546	0.056	0.0602	0.0546	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	1.14	1.16	1.17	1.18	1.28	1.19	-	-
Mn-D	mg/L	0.0023	0.0027	0.0021	0.0012	0.0020	0.0021	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.212	0.201	0.221	0.218	0.214	0.213	-	-
S-D	mg/L	5.1	4.6	5.9	5.5	5.5	5.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	6.13	6.91	7.18	7.88	8.1	7.3	-	-
Sr-D	mg/L	0.0423	0.0482	0.0467	0.0489	0.0489	0.047	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 124
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 4 Metre Depth							
Site Name	LQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	15-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	25	26.1	28.1	27.2	27.5	26.8	**128**	-
Turb	NTU	0.37	0.37	0.37	0.40	0.5	0.40	-	-
Alk-T	mg/L	41.5					41.5	-	-
P-T	mg/L	0.004			0.0036	0.0047	0.0041	-	-
Al-T	mg/L	0.0113	0.011	0.0102	0.0281	0.0074	0.0136	-	-
As-T	mg/L	0.00068	0.00065	0.00065	0.00065	0.0006	0.00065	-	**0.005**
Ba-T	mg/L	0.0037	0.0035	0.0036	0.0037	0.0036	0.0036	-	-
B-T	mg/L	0.052	0.058	0.058	0.06	0.055	0.057	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	13.5	11.4	13.8	11.8	11.5	12.4	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00084	0.00058	0.00053	0.00081	0.00054	0.00066	**0.002**	**0.007**
Hard-T	mg/L	40.2	34.8	40.8	35.7	34.8	37.300	-	-
Fe-T	mg/L	0.056	0.049	0.053	0.047	0.036	0.048	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.55	1.55	1.52	1.54	1.49	1.530	-	-
Mn-T	mg/L	0.0069	0.0077	0.0068	0.0069	0.0051	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.269	0.258	0.249	0.274	0.272	0.264	-	-
S-T	mg/L	9	8.7	8.6	9.2	9.1	8.9	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	14.9	15.2	14.6	15.9	14.5	15	-	-
Sr-T	mg/L	0.0596	0.0582	0.0602	0.0631	0.0603	0.0603	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0098	0.0088	0.0086	0.0091	0.0062	0.0085	**0.05**	**0.1**
As-D	mg/L	0.00061	0.00066	0.00069	0.00062	0.00063	0.00064	-	-
Ba-D	mg/L	0.0036	0.0035	0.0045	0.0037	0.0035	0.0038	-	-
B-D	mg/L	0.057	0.056	0.055	0.061	<0.050	0.051	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	12.8	11.7	12.1	11.4	11.3	11.9	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00044	0.00043	0.00049	0.00049	0.00043	0.00046	-	-
Hard-D	mg/L	37.9	36.2	36.5	34.5	34.2	35.9	-	-
Fe-D	mg/L	0.0401	0.0247	0.0269	0.025	0.0251	0.0284	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.44	1.67	1.52	1.49	1.47	1.52	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.262	0.282	0.273	0.282	0.273	0.274	-	-
S-D	mg/L	8.3	9.9	9.7	10	9	9.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	14.5	16.5	15.1	16.0	14.7	15.40	-	-
Sr-D	mg/L	0.0581	0.0649	0.0565	0.0663	0.0613	0.0614	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 125
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 4 Metre Depth							
Site Name	LQL4	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		20-Oct-17	25-Oct-17	2-Nov-17	9-Nov-17	17-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	23.00	22.30	23.30	24.50	14.00	21.4	**128**	-
Turb	NTU	1.20	1.09	0.86	1.01	1.54	1.14	-	-
Alk-T	mg/L	35	35				34.9	-	-
P-T	mg/L	0.0066				0.007	0.0066	-	-
Al-T	mg/L	0.0348	0.0318	0.0279	0.0246	0.0992	0.0437	-	-
As-T	mg/L	0.00074	0.00071	0.00072	0.00076	0.00056	0.0007	-	**0.005**
Ba-T	mg/L	0.004	0.0042	0.0043	0.0044	0.0042	0.0042	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	10.9	11.1	12.5	12	9.05	11.11	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00404	0.00081	0.00069	0.00077	0.00085	0.00143	**0.002**	**0.007**
Hard-T	mg/L	33	33.6	37.1	36.4	27.4	33.500	-	-
Fe-T	mg/L	0.221	0.196	0.204	0.168	0.157	0.189	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.38	1.42	1.40	1.56	1.15	1.380	-	-
Mn-T	mg/L	0.0490	0.0380	0.0271	0.0197	0.0087	0.029	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000029	0.0000014	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.283	0.294	0.292	0.302	0.284	0.291	-	-
S-T	mg/L	7.2	7.6	7.6	8.6	4.8	7.2	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	12	11.3	10.9	12.4	5.86	10.49	-	-
Sr-T	mg/L	0.0535	0.0568	0.0587	0.0611	0.0433	0.0547	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0213	0.0237	0.0178	0.0168	0.0598	0.0279	**0.05**	**0.1**
As-D	mg/L	0.00067	0.00062	0.0006	0.00059	0.00051	0.0006	-	-
Ba-D	mg/L	0.0038	0.0042	0.004	0.004	0.0044	0.0041	-	-
B-D	mg/L	<0.050	0.050	<0.050	<0.050	<0.050	0.030	-	-
Cd-D	mg/L	0.000007	0.0000050	<0.0000050	0.0000118	0.0000050	0.000006	**0.000088**	**0.00017**
Ca-D	mg/L	11.1	11.50	12.5	12.40	9.47	11.394	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00065	0.00063	0.00059	0.00078	0.00081	0.00069	-	-
Hard-D	mg/L	33.5	34.6	37	37.3	28.6	34.2	-	-
Fe-D	mg/L	0.124	0.123	0.122	0.118	0.096	0.1165	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.39	1.40	1.43	1.51	1.21	1.39	-	-
Mn-D	mg/L	0.0366	0.0206	0.0118	0.0082	0.0048	0.0164	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000025	0.0000013	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.315	0.274	0.268	0.289	0.303	0.29	-	-
S-D	mg/L	8.40	8.30	7.70	8.50	4.80	7.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	11.6	11.1	11.0	12.0	6.1	10.37	-	-
Sr-D	mg/L	0.0513	0.0541	0.0593	0.0590	0.0444	0.0536	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 126
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 9 Metre Depth							
Site Name	LQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		12-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	15.8	15.5	17.3	16.7	15.6	16	**128**	-
Turb	NTU	1	0.81	0.6	0.45	0.46	0.66	-	-
Alk-T	mg/L	25.5					25.5	-	-
P-T	mg/L	0.0044					0.0044	-	-
Al-T	mg/L	0.0691	0.0519	0.0521	0.0409	0.0434	0.0515	-	-
As-T	mg/L	0.00049	0.0005	0.00049	0.00049	0.00048	0.00049	-	**0.005**
Ba-T	mg/L	0.0034	0.0034	0.0033	0.0032	0.0032	0.0033	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	10.2	10.1	9.99	9.29	10.1	9.94	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	0.00082	0.00054	0.0007	0.00158	0.00065	0.00086	**0.002**	**0.007**
Hard-T	mg/L	30.5	30.2	30.1	28	30.3	29.8	-	-
Fe-T	mg/L	0.109	0.094	0.096	0.069	0.084	0.09	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.22	1.2	1.26	1.16	1.25	1.22	-	-
Mn-T	mg/L	0.0049	0.0052	0.0057	0.0048	0.0045	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.221	0.205	0.218	0.212	0.22	0.215	-	-
S-T	mg/L	5.7	5.2	5.6	6.1	5	5.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	6.68	6.91	7.47	7.42	7.89	7.27	-	-
Sr-T	mg/L	0.0452	0.0440	0.047	0.045	0.049	0.046	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0427	0.0401	0.0379	0.0352	0.0368	0.0385	**0.05**	**0.1**
As-D	mg/L	0.00042	0.00044	0.00049	0.00048	0.00047	0.00046	-	-
Ba-D	mg/L	0.0031	0.0032	0.0032	0.0033	0.0032	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000003	**0.000088**	**0.000170**
Ca-D	mg/L	8.83	8.51	10.2	10.3	10.4	9.65	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00134	0.00056	0.0006	0.00052	0.00058	0.00072	-	-
Hard-D	mg/L	26.8	26.1	30.1	30.5	31	28.9	-	-
Fe-D	mg/L	0.0491	0.0474	0.0548	0.0546	0.0595	0.0531	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	1.15	1.17	1.14	1.17	1.24	1.17	-	-
Mn-D	mg/L	0.0023	0.0034	0.0024	0.0019	0.0024	0.0025	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.215	0.17	0.223	0.213	0.218	0.208	-	-
S-D	mg/L	4.8	5.3	5.8	5.5	5.3	5.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	6.22	6.67	7.02	7.91	7.76	7.1	-	-
Sr-D	mg/L	0.0444	0.0449	0.0451	0.0483	0.0467	0.0459	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 127
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 9 Metre Depth							
Site Name	LQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	15-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	15	15.5	15.7	16.3	20.6	16.6	**128**	-
Turb	NTU	0.54	0.46	0.42	0.52	0.73	0.53	-	-
Alk-T	mg/L	30.1					30.1	-	-
P-T	mg/L	0.0047			0.0044	0.0047	0.0046	-	-
Al-T	mg/L	0.022	0.0213	0.0196	0.0167	0.0152	0.019	-	-
As-T	mg/L	0.00054	0.00053	0.00054	0.00056	0.00064	0.00056	-	**0.005**
Ba-T	mg/L	0.0036	0.0035	0.0035	0.0037	0.0038	0.0036	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	10.5	9.98	10.1	10	10.5	10.22	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.00077	0.00064	0.00064	0.00066	0.00064	0.00067	**0.002**	**0.007**
Hard-T	mg/L	31.4	30	30.3	30.1	31.5	30.700	-	-
Fe-T	mg/L	0.085	0.084	0.093	0.081	0.148	0.098	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.25	1.23	1.21	1.23	1.26	1.240	-	-
Mn-T	mg/L	0.0105	0.0117	0.0112	0.0106	0.0161	0.012	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.24	0.221	0.209	0.233	0.24	0.229	-	-
S-T	mg/L	5.7	5.6	5.2	5.3	7.1	5.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	7.78	8.0	7.79	8.63	10	8.43	-	-
Sr-T	mg/L	0.0486	0.045	0.0477	0.0497	0.0511	0.0484	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	0.0031	**0.0075**	**0.03**
Al-D	mg/L	0.0188	0.0176	0.0157	0.0176	0.0121	0.0164	**0.05**	**0.1**
As-D	mg/L	0.0005	0.00051	0.00058	0.00055	0.00061	0.00055	-	-
Ba-D	mg/L	0.0034	0.0033	0.0034	0.0052	0.0037	0.0038	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	0.0000050	<0.0000050	0.000003	**0.000088**	**0.00017**
Ca-D	mg/L	10.4	10.0	10.6	10.4	10.9	10.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00047	0.0005	0.00054	0.00057	0.00044	0.0005	-	-
Hard-D	mg/L	30.6	29.9	31.6	31	32.8	31.2	-	-
Fe-D	mg/L	0.0715	0.055	0.0604	0.0557	0.102	0.0689	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.14	1.21	1.21	1.22	1.33	1.22	-	-
Mn-D	mg/L	0.0036	0.0026	0.0016	0.0012	0.0109	0.004	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.218	0.217	0.237	0.233	0.246	0.23	-	-
S-D	mg/L	5.4	5.4	5.2	5.5	6.8	5.7	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	7.37	7.77	8.03	8.54	10.1	8.36	-	-
Sr-D	mg/L	0.046	0.0471	0.0445	0.053	0.0528	0.0487	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 128
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 9 Metre Depth							
Site Name	LQL9	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		20-Oct-17	25-Oct-17	2-Nov-17	9-Nov-17	17-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	22.30	21.90	25.60	24.50	13.90	21.6	**128**	-
Turb	NTU	1.3	1.0	0.8	0.9	1.5	1.07	-	-
Alk-T	mg/L	34.9	35.4				35.1	-	-
P-T	mg/L	0.0065				0.0061	0.0063	-	-
Al-T	mg/L	0.0426	0.0343	0.0291	0.0241	0.0893	0.0439	-	-
As-T	mg/L	0.00079	0.00068	0.00077	0.00074	0.00056	0.00071	-	**0.005**
Ba-T	mg/L	0.0042	0.0041	0.0042	0.0043	0.0041	0.0042	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.000006	-	-
Ca-T	mg/L	10.30	10.50	12.20	12.00	8.96	10.79	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	**0.05**
Cu-T	mg/L	0.0009	0.00083	0.00123	0.00079	0.00105	0.00096	**0.002**	**0.007**
Hard-T	mg/L	31.2	31.9	36.5	36.2	27.0	32.600	-	-
Fe-T	mg/L	0.233	0.198	0.2	0.176	0.2	0.201	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.33	1.37	1.46	1.51	1.13	1.360	-	-
Mn-T	mg/L	0.0506	0.039	0.0286	0.0193	0.0085	0.029	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000029	0.0000014	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.287	0.280	0.269	0.288	0.282	0.281	-	-
S-T	mg/L	7.70	7.10	7.80	8.20	4.90	7.1	-	-
Se-T	mg/L	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	0.00006	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	10.70	10.60	11.10	11.80	5.74	9.99	-	-
Sr-T	mg/L	0.0512	0.0535	0.0578	0.0595	0.0425	0.0529	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0281	0.0246	0.0177	0.0162	0.0623	0.0298	**0.05**	**0.1**
As-D	mg/L	0.00065	0.00058	0.00061	0.00067	0.0005	0.0006	-	-
Ba-D	mg/L	0.004	0.0041	0.0041	0.004	0.0039	0.004	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	0.000005	0.0000050	<0.0000050	0.0000054	0.0000060	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	11.2	11.3	11.5	12.1	9.4	11.096	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Cu-D	mg/L	0.00063	0.00065	0.00063	0.00075	0.00091	0.00071	-	-
Hard-D	mg/L	33.7	34.2	34.9	36.3	28.3	33.5	-	-
Fe-D	mg/L	0.144	0.125	0.117	0.119	0.094	0.1198	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.38	1.43	1.48	1.51	1.19	1.4	-	-
Mn-D	mg/L	0.0417	0.0189	0.0122	0.0097	0.0047	0.0174	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	0.0000021	<0.0000020	0.0000027	0.0000016	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.290	0.274	0.283	0.287	0.281	0.283	-	-
S-D	mg/L	7.9	8.4	7.6	9.0	4.8	7.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	10.50	11.20	11.50	11.80	5.92	10.18	-	-
Sr-D	mg/L	0.0521	0.0533	0.0586	0.0562	0.0436	0.0528	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 129
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre from Bottom							
Site Name	LQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		12-Apr-17	20-Apr-17	27-Apr-17	4-May-17	10-May-17	5x30 Average	Average	Max
Parameters	Units								
SO4-D	mg/L	14.7	15.3	15.6	15.9	15.3	15	**128**	-
Turb	NTU	1.12	0.67	0.61	0.57	0.63	0.72	-	-
Alk-T	mg/L	24.5					24.5	-	-
P-T	mg/L	0.0049					0.0049	-	-
Al-T	mg/L	0.0743	0.0483	0.0528	0.0438	0.0453	0.0529	-	-
As-T	mg/L	0.00049	0.00048	0.0005	0.00051	0.00053	0.0005	-	**0.005**
Ba-T	mg/L	0.0033	0.0035	0.0032	0.0035	0.0035	0.0034	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000005	-	-
Ca-T	mg/L	9.76	9.77	9.51	8.84	9.71	9.52	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	**0.05**
Cu-T	mg/L	0.00084	0.00050	0.00072	0.00127	0.00069	0.00080	**0.002**	**0.007**
Hard-T	mg/L	29.3	29.2	28.8	26.9	29.5	28.7	-	-
Fe-T	mg/L	0.108	0.086	0.102	0.103	0.13	0.106	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.2	1.15	1.22	1.18	1.28	1.21	-	-
Mn-T	mg/L	0.0055	0.0044	0.0058	0.0139	0.0196	0.010	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.219	0.212	0.208	0.216	0.213	0.214	-	-
S-T	mg/L	5.2	5.8	5.5	5.7	5.1	5.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00001	-	**0.0001**
Na-T	mg/L	6.44	6.58	6.65	6.92	7.68	6.85	-	-
Sr-T	mg/L	0.0423	0.0458	0.0453	0.046	0.0475	0.0454	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0438	0.0404	0.0393	0.0362	0.035	0.0389	**0.05**	**0.1**
As-D	mg/L	0.00038	0.00046	0.00043	0.0005	0.0005	0.00045	-	-
Ba-D	mg/L	0.0032	0.0034	0.0031	0.0034	0.0034	0.0033	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000051	<0.0000050	0.0000052	0.000004	**0.000088**	**0.000170**
Ca-D	mg/L	8.5	8.61	9.62	9.74	9.94	9.28	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Cu-D	mg/L	0.00071	0.00065	0.0006	0.00068	0.0006	0.00065	-	-
Hard-D	mg/L	25.8	26.3	28.8	29.1	30.0	28	-	-
Fe-D	mg/L	0.0514	0.0577	0.0532	0.077	0.0854	0.0648	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0001	-	-
Mg-D	mg/L	1.12	1.17	1.17	1.16	1.26	1.18	-	-
Mn-D	mg/L	0.0026	0.0033	0.0024	0.0097	0.0147	0.0065	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000001	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.207	0.173	0.216	0.212	0.226	0.207	-	-
S-D	mg/L	4.9	5.5	5.7	5.7	4.7	5.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	5.78	6.51	6.57	6.89	7.63	6.7	-	-
Sr-D	mg/L	0.0421	0.0446	0.0455	0.0464	0.049	0.0455	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 130
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre from Bottom							
Site Name	LQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		15-Aug-17	23-Aug-17	31-Aug-17	7-Sep-17	15-Sep-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	12.5	12.9	13.7	12.8	12.8	13	**128**	-
Turb	NTU	4.94	4.57	3.54	3.58	5.35	4.40	-	-
Alk-T	mg/L	33.2					33.2	-	-
P-T	mg/L	0.007			0.0071	0.0086	0.0076	-	-
Al-T	mg/L	0.0338	0.0332	0.0305	0.0289	0.0287	0.031	-	-
As-T	mg/L	0.00162	0.00172	0.00152	0.00154	0.00204	0.00169	-	**0.005**
Ba-T	mg/L	0.0072	0.0068	0.0062	0.0067	0.0093	0.0072	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	0.000011	0.000014	0.000010	0.000011	0.00001	0.000011	-	-
Ca-T	mg/L	11.2	11	10.4	10.1	10.7	10.7	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	0.00034	0.00027	0.00024	0.00026	0.00044	0.00031	-	**0.05**
Cu-T	mg/L	0.00087	0.00268	0.00075	0.00078	0.00093	0.00120	**0.002**	**0.007**
Hard-T	mg/L	33.4	32.7	31	30.5	31.8	31.900	-	-
Fe-T	mg/L	0.911	0.931	0.75	0.79	1.15	0.907	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.33	1.26	1.24	1.26	1.22	1.260	-	-
Mn-T	mg/L	0.378	0.333	0.258	0.291	0.438	0.340	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000010	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.263	0.385	0.237	0.243	0.252	0.276	-	-
S-T	mg/L	5.2	5.4	5.1	4.5	4.6	5.0	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	7.54	7.3	7.46	7.47	6.85	7.32	-	-
Sr-T	mg/L	0.0512	0.0485	0.0497	0.0485	0.0513	0.0498	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0204	0.0226	0.0197	0.0262	0.0207	0.0219	**0.05**	**0.1**
As-D	mg/L	0.00093	0.00106	0.00099	0.00119	0.00118	0.00107	-	-
Ba-D	mg/L	0.0068	0.0067	0.0060	0.0072	0.0083	0.007	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	0.0000100	0.0000090	0.0000070	0.0000130	0.000009	0.0000096	**0.000088**	**0.00017**
Ca-D	mg/L	10.6	10.7	10.3	10.2	10.9	10.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	0.00031	0.00026	0.00021	0.00022	0.00042	0.00028	-	-
Cu-D	mg/L	0.00063	0.00065	0.00056	0.00076	0.00062	0.00064	-	-
Hard-D	mg/L	31.7	31.7	30.7	30.4	32.4	31.4	-	-
Fe-D	mg/L	0.435	0.479	0.42	0.541	0.632	0.501	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.26	1.25	1.22	1.19	1.25	1.23	-	-
Mn-D	mg/L	0.358	0.334	0.246	0.282	0.43	0.33	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020			0.0000010	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.236	0.238	0.251	0.254	0.25	0.246	-	-
S-D	mg/L	5	4.7	5.2	4.8	4.7	4.9	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	7.52	7.26	7.37	7.31	7.14	7.32	-	-
Sr-D	mg/L	0.0489	0.0499	0.0451	0.0526	0.0516	0.0496	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 131
2017-2018 Annual Report

EMS ID	E292118								
Site Description		Lower Quinsam Lake 1 Metre from Bottom							
Site Name	LQLB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		20-Oct-17	25-Oct-17	2-Nov-17	9-Nov-17	17-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	19.60	21.90	23.90	24.50	12.80	20.5	**128**	-
Turb	NTU	2.8	1.3	0.9	0.7	1.4	1.41	-	-
Alk-T	mg/L	35.7	33.4				34.5	-	-
P-T	mg/L	0.0072				0.0054	0.0063	-	-
Al-T	mg/L	0.0368	0.0382	0.0277	0.0241	0.0876	0.0429	-	-
As-T	mg/L	0.0013	0.00084	0.00068	0.00066	0.0005	0.0008	-	**0.005**
Ba-T	mg/L	0.0056	0.0046	0.0043	0.0043	0.0038	0.0045	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-T	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.000006	-	-
Ca-T	mg/L	10.3	12.6	12.6	12.0	8.4	11.18	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-T	mg/L	0.00027	<0.00020	<0.00020	<0.00020	<0.00020	0.00013	-	**0.05**
Cu-T	mg/L	0.00089	0.00088	0.00067	0.00121	0.00089	0.00091	**0.002**	**0.007**
Hard-T	mg/L	30.9	37.5	37.5	36.1	25.4	33.500	-	-
Fe-T	mg/L	0.71	0.30	0.21	0.17	0.14	0.307	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	**0.003**	**0.005**
Mg-T	mg/L	1.29	1.44	1.45	1.48	1.07	1.350	-	-
Mn-T	mg/L	0.212	0.053	0.028	0.019	0.007	0.064	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000028	0.0000014	-	**0.00010**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	**0.025**
K-T	mg/L	0.263	0.296	0.282	0.284	0.256	0.276	-	-
S-T	mg/L	6	8.2	7.8	8.3	4.4	6.9	-	-
Se-T	mg/L	0.00011	0.00011	<0.00010	<0.00010	<0.00010	0.00007	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000010	-	**0.0001**
Na-T	mg/L	9.70	11.10	11.10	11.80	5.06	9.75	-	-
Sr-T	mg/L	0.0501	0.0576	0.0599	0.0596	0.0402	0.0535	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	**0.0075**	**0.03**
Al-D	mg/L	0.0222	0.0258	0.0178	0.0157	0.0681	0.0299	**0.05**	**0.1**
As-D	mg/L	0.00099	0.00062	0.00062	0.00059	0.00051	0.00067	-	-
Ba-D	mg/L	0.0054	0.0042	0.004	0.0039	0.004	0.0043	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.025	-	-
Cd-D	mg/L	0.000007	0.0000050	0.0000050	0.0000051	0.0000060	0.000006	**0.000088**	**0.00017**
Ca-D	mg/L	10.9	11.20	12.6	12.20	9.33	11.25	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Co-D	mg/L	0.00027	<0.00020	<0.00020	<0.00020	<0.00020	0.00013	-	-
Cu-D	mg/L	0.00062	0.00067	0.00059	0.00083	0.00097	0.00074	-	-
Hard-D	mg/L	32.5	33.8	37.6	36.9	28.3	33.8	-	-
Fe-D	mg/L	0.347	0.153	0.125	0.114	0.092	0.1663	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00010	-	-
Mg-D	mg/L	1.30	1.39	1.50	1.56	1.21	1.39	-	-
Mn-D	mg/L	0.2080	0.0281	0.0133	0.0092	0.0047	0.0527	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000026	0.0000013	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0005	-	-
K-D	mg/L	0.293	0.266	0.278	0.289	0.285	0.282	-	-
S-D	mg/L	7.3	7.6	8.4	8.5	4.7	7.3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00005	-	-
Na-D	mg/L	9.43	10.50	11.80	12.40	5.77	9.98	-	-
Sr-D	mg/L	0.0518	0.0536	0.0603	0.0592	0.0429	0.0536	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0025	-	-

Table 132
2017-2018 Annual Report

EMS ID	E0126402								
Site Description		Middle Quinsam Lake Inlet							
Site Name	WA	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	1.16	1.43	1.27	1.29	1.41	1.3	**128**	-
Alk-T	mg/L	20.1	17.5	20.3	16.9	20.9	19.1	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0293	0.0885	0.0256	0.0294	0.0362	0.0418	-	-
As-T	mg/L	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	0.0001	-	**0.005**
Ba-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	5.71	6.19	6.45	6.51	6.38	6.25	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00098	0.00088	<0.00050	0.00063	0.00069	0.00074	**0.002**	**0.007**
Hard-T	mg/L	17	18.3	18.5	19.1	18.9	18.4	-	-
Fe-T	mg/L	0.014	0.014	<0.010	0.018	0.02	0.015	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.663	0.679	0.573	0.680	0.711	0.661	-	-
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	0.0012	0.0021	0.001	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.083	0.075	0.064	0.081	0.073	0.075	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	0.613	0.662	0.544	0.649	1.58	0.81	-	-
Sr-T	mg/L	0.0108	0.0111	0.0111	0.0108	0.0130	0.0114	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0301	0.0275	0.0305	0.026	0.0237	0.0276	**0.05**	**0.1**
As-D	mg/L	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	0.0001	-	-
Ba-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.000170**
Ca-D	mg/L	6.42	5.97	6.3	6.14	6.64	6.29	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.001	0.00088	0.00069	0.0006	0.00061	0.00076	-	-
Hard-D	mg/L	18.9	17.8	18.4	18	19.6	18.5	-	-
Fe-D	mg/L	0.0159	0.0105	0.0089	0.0076	0.011	0.0108	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.692	0.705	0.641	0.649	0.736	0.685	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.087	0.079	0.074	0.065	0.072	0.075	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	0.703	0.686	0.613	0.591	0.643	0.6	-	-
Sr-D	mg/L	0.0106	0.0105	0.0111	0.0103	0.0113	0.0108	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 133
2017-2018 Annual Report

EMS ID	E0126402								
Site Description		Middle Quinsam Lake Inlet							
Site Name	WA	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Aug-17	10-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	1.1	1.15	<0.50	<0.50	<1.0	1	**128**	-
Alk-T	mg/L	22.8	21.9	23.2	22.6	23.9	22.9	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0282	0.0234	0.0203	0.0211	0.0207	0.0227	-	-
As-T	mg/L	0.00014	0.00013	0.00011	0.00013	0.00013	0.00013	-	**0.005**
Ba-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	6.63	7.45	6.79	7.13	7.59	7.12	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00052	0.00059	0.00066	0.00064	0.00063	0.00061	**0.002**	**0.007**
Hard-T	mg/L	19.7	21.7	20.1	21	22.1	20.9	-	-
Fe-T	mg/L	0.014	0.02	0.01	0.015	0.022	0.016	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.754	0.761	0.756	0.788	0.754	0.763	-	-
Mn-T	mg/L	<0.0010	0.0013	<0.0010	0.0012	0.0015	0.001	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.054	0.077	0.057	0.081	0.064	0.067	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	0.593	0.622	0.614	0.641	0.635	0.621	-	-
Sr-T	mg/L	0.011	0.0117	0.0104	0.0115	0.0116	0.0112	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0224	0.0227	0.0218	0.0195	0.0202	0.0213	**0.05**	**0.1**
As-D	mg/L	0.00011	0.00013	0.00013	0.00011	0.00013	0.00012	-	-
Ba-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	7.88	7.56	7.42	7.38	6.64	7.38	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00062	0.00056	0.00085	0.00076	0.00063	0.00068	-	-
Hard-D	mg/L	22.9	22.4	21.9	21.6	19.7	21.7	-	-
Fe-D	mg/L	0.0193	0.0157	0.0145	0.0130	0.0161	0.0157	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.771	0.856	0.811	0.757	0.767	0.792	-	-
Mn-D	mg/L	<0.0010	<0.0010	0.0011	<0.0010	0.0010	0.001	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.065	0.071	0.099	0.094	0.075	0.081	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	0.636	0.68	0.636	0.609	0.664	0.6	-	-
Sr-D	mg/L	0.0115	0.0121	0.0119	0.0112	0.0117	0.0117	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 134
2017-2018 Annual Report

EMS ID	E0126402								
Site Description		Middle Quinsam Lake Inlet							
Site Name	WA	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Oct-17	16-Oct-17	23-Oct-17	30-Oct-17	6-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	1	<1.0	<1.0	<1.0	1	1	**128**	-
Alk-T	mg/L	22.8	22.2	17.1	20.6	20.3	20.6	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0174	0.0198	0.0381	0.0197	0.0179	0.0226	-	-
As-T	mg/L	0.00012	0.00013	0.0002	0.00012	0.00011	0.00014	-	**0.005**
Ba-T	mg/L	<0.0010	<0.0010	0.0017	0.0010	<0.0010	0.0011	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	7.22	7.13	5.97	6.76	6.78	6.77	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00101	0.00061	0.00083	0.00068	0.00066	0.00076	**0.002**	**0.007**
Hard-T	mg/L	21.7	21.2	18	20	20.1	20.2	-	-
Fe-T	mg/L	0.016	0.018	0.023	0.018	0.013	0.018	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.891	0.825	0.749	0.76	0.770	0.799	-	-
Mn-T	mg/L	0.0014	0.0015	0.0012	0.0013	0.0011	0.001	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.072	0.078	0.102	0.073	0.072	0.079	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	0.732	0.67	0.913	0.721	0.684	0.744	-	-
Sr-T	mg/L	0.0119	0.0118	0.0117	0.012	0.0117	0.0118	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.017	0.0148	0.0359	0.0178	0.0165	0.0204	**0.05**	**0.1**
As-D	mg/L	0.00014	<0.00010	0.00017	0.00012	0.00013	0.00013	-	-
Ba-D	mg/L	<0.0010	<0.0010	0.0016	0.0010	<0.0010	0.0011	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	7.31	6.86	5.66	6.27	7.1	6.64	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.0007	0.00062	0.00061	0.00059	0.00062	0.00063	-	-
Hard-D	mg/L	21.9	20.4	16.9	18.8	20.7	19.7	-	-
Fe-D	mg/L	0.0308	0.0138	0.0224	0.0105	0.012	0.0179	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.89	0.801	0.673	0.76	0.728	0.77	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.078	0.075	0.099	0.08	0.066	0.08	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	0.739	0.653	0.774	0.694	0.655	0.7	-	-
Sr-D	mg/L	0.0122	0.0113	0.011	0.0117	0.0114	0.0115	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 135
2017-2018 Annual Report

EMS ID	E0900504								
Site Description		Middle Quinsam Lake Outlet						Water Quality Guidelines	
Site Name	WB	5 in 30 Weekly Samples							
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	32.2	33.5	38.5	35.5	32.3	34	**128**	-
Alk-T	mg/L	32.9	36	40.4	39	39.4	37.5	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0243	0.0237	0.0288	0.0244	0.0245	0.0251	-	-
As-T	mg/L	0.00016	0.00014	0.00013	0.00017	0.00015	0.00015	-	**0.005**
Ba-T	mg/L	0.0024	0.0025	0.0023	0.0026	0.0025	0.0025	-	-
B-T	mg/L	<0.050	<0.050	0.057	0.054	0.054	0.053	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	11.4	12.4	13	13.7	12.9	12.70	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00066	0.00094	<0.00050	0.00055	0.00055	0.00064	**0.002**	**0.007**
Hard-T	mg/L	34.8	37.5	38.5	41	39	38.2	-	-
Fe-T	mg/L	0.038	0.039	0.036	0.051	0.036	0.04	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.54	1.59	1.48	1.62	1.64	1.57	-	-
Mn-T	mg/L	0.0032	0.0043	0.005	0.0048	0.005	0.005	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.235	0.256	0.23	0.255	0.258	0.247	-	-
S-T	mg/L	10.4	11.9	13.1	14.3	11.7	12.3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	11	14.6	17.6	15.2	15.9	14.9	-	-
Sr-T	mg/L	0.0684	0.07	0.0709	0.0779	0.0735	0.0721	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0228	0.0206	0.0211	0.0202	0.0189	0.0207	**0.05**	**0.1**
As-D	mg/L	0.00015	0.00012	0.00014	0.00016	0.00015	0.00014	-	-
Ba-D	mg/L	0.0025	0.0024	0.0024	0.0025	0.0025	0.0025	-	-
B-D	mg/L	<0.050	0.052	0.062	0.052	0.054	0.054	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.000170**
Ca-D	mg/L	13.5	12.4	13.4	12.9	13	13	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.0011	0.00144	0.00062	0.00044	0.00046	0.00081	-	-
Hard-D	mg/L	40.6	37.5	40	39	39.2	39.3	-	-
Fe-D	mg/L	0.0346	0.0232	0.0187	0.0209	0.0242	0.0243	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.65	1.59	1.57	1.66	1.65	1.62	-	-
Mn-D	mg/L	0.0016	0.0010	0.002	0.0018	0.0010	0.0015	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.245	0.26	0.25	0.245	0.255	0.251	-	-
S-D	mg/L	11.2	11.9	13.7	11.6	12.7	12.2	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	12.4	14.8	17.7	15.8	16	15.3	-	-
Sr-D	mg/L	0.0737	0.0660	0.0758	0.0721	0.0757	0.0727	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 136
2017-2018 Annual Report

EMS ID	E0900504								
Site Description		Middle Quinsam Lake Outlet							
Site Name	WB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	30.4	31.6	29.3	30.4	30.8	31	**128**	-
Alk-T	mg/L	41.9	41.7	43.1	41.8	42.2	42.1	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.019	0.0179	0.0163	0.0239	0.0168	0.0188	-	-
As-T	mg/L	0.00021	0.00020	0.0002	0.00025	0.00019	0.00021	-	**0.005**
Ba-T	mg/L	0.0018	0.0018	0.0018	0.0019	0.0019	0.0018	-	-
B-T	mg/L	0.055	0.059	0.052	0.054	0.055	0.055	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	11.1	11.6	10.9	11.5	11.3	11.30	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00052	0.0006	0.0006	0.00067	0.00052	0.00058	**0.002**	**0.007**
Hard-T	mg/L	33.6	35	32.9	34.8	34.2	34.1	-	-
Fe-T	mg/L	0.032	0.036	0.027	0.05	0.034	0.036	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.44	1.46	1.38	1.5	1.46	1.45	-	-
Mn-T	mg/L	0.009	0.0083	0.0073	0.012	0.0091	0.009	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.246	0.276	0.25	0.298	0.267	0.267	-	-
S-T	mg/L	10.1	11.6	9.9	11.5	11.4	10.9	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	18.1	17.9	18	18.3	18.3	18.1	-	-
Sr-T	mg/L	0.0576	0.0601	0.0569	0.0656	0.065	0.061	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0198	0.02	0.0155	0.0172	0.0159	0.0177	**0.05**	**0.1**
As-D	mg/L	0.00019	0.00021	0.00019	0.00019	0.0002	0.0002	-	-
Ba-D	mg/L	0.0019	0.0019	0.0021	0.0019	0.0019	0.0019	-	-
B-D	mg/L	0.060	0.052	0.058	0.056	0.054	0.056	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	0.0000060	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	11.9	12.3	12	12.1	11.5	12	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00059	0.00056	0.0005	0.00057	0.0005	0.00054	-	-
Hard-D	mg/L	36	37.1	35.7	36.1	34.6	35.9	-	-
Fe-D	mg/L	0.0295	0.0230	0.0301	0.0262	0.0249	0.0267	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.50	1.55	1.41	1.46	1.45	1.47	-	-
Mn-D	mg/L	0.0023	0.0024	0.0036	0.0026	0.0031	0.0028	-	-
Hg-D	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.283	0.28	0.284	0.287	0.263	0.279	-	-
S-D	mg/L	12	11.4	11.3	12.9	11.1	11.7	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	18.9	19.2	17.4	17.8	17.7	18.2	-	-
Sr-D	mg/L	0.0602	0.0649	0.062	0.0624	0.0637	0.0626	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 137
2017-2018 Annual Report

EMS ID	E0900504								
Site Description		Middle Quinsam Lake Outlet							
Site Name	WB	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Oct-17	16-Oct-17	23-Oct-17	30-Oct-17	6-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	35.3	32.2	54	37.6	35.9	39.0	**128**	-
Alk-T	mg/L	42.8	45.1	45.2	44.1	39.8	43.4	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0096	0.0122	0.0106	0.0108	0.0115	0.0109	-	-
As-T	mg/L	0.00018	0.00017	0.00025	0.00018	0.00021	0.0002	-	**0.005**
Ba-T	mg/L	0.0022	0.0023	0.0042	0.0028	0.003	0.0029	-	-
B-T	mg/L	0.065	0.061	0.068	0.056	0.062	0.062	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	12.6	11.9	20.2	11.9	14.2	14.20	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00054	<0.00050	0.00054	0.00068	0.00060	0.00057	**0.002**	**0.007**
Hard-T	mg/L	38.5	36.4	61.2	37	43.5	43.3	-	-
Fe-T	mg/L	0.028	0.032	0.04	0.031	0.031	0.032	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.72	1.61	2.60	1.73	1.94	1.92	-	-
Mn-T	mg/L	0.006	0.0066	0.0077	0.0052	0.0053	0.006	**0.7**	**0.8**
Hg-T	mg/L	0.000004	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000024	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.32	0.333	0.369	0.31	0.31	0.328	-	-
S-T	mg/L	12.5	12.6	19.3	11.6	14	14	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	21.0	21.1	18.5	19.3	18	19.6	-	-
Sr-T	mg/L	0.069	0.0674	0.126	0.0782	0.084	0.0849	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0096	0.0087	0.0082	0.0093	0.01	0.0092	**0.05**	**0.1**
As-D	mg/L	0.0002	0.00015	0.00022	0.0002	0.0002	0.00019	-	-
Ba-D	mg/L	0.0022	0.0023	0.0044	0.0028	0.0029	0.0029	-	-
B-D	mg/L	0.063	0.057	0.065	0.061	0.062	0.062	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000060	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	12.8	11.4	19.2	12.6	14.4	14.08	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.0005	0.00051	0.00067	0.00045	0.00055	0.00054	-	-
Hard-D	mg/L	39	34.7	57.9	38.5	43.1	42.6	-	-
Fe-D	mg/L	0.0209	0.0234	0.0387	0.0211	0.0238	0.0256	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.72	1.53	2.43	1.7	1.75	1.83	-	-
Mn-D	mg/L	0.0015	0.0031	0.0056	0.0023	0.0024	0.003	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.319	0.313	0.414	0.306	0.287	0.328	-	-
S-D	mg/L	12.9	11.5	18.1	12.7	12.5	13.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	21.2	19.9	17.2	18.6	16.60	18.7	-	-
Sr-D	mg/L	0.0693	0.0653	0.112	0.0763	0.0786	0.0803	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 138
2017-2018 Annual Report

EMS ID	E219412								
Site Description		Long Lake Outlet						Water Quality Guidelines	
Site Name	LLO	5 in 30 Weekly Samples							
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	112	26.8	40.7	32.0	40.4	50	**128**	-
Alk-T	mg/L	54.9	23.4	29.9	23.6	29.4	32.2	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	5.5	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0221	0.0316	0.287	0.03	0.0339	0.0809	-	-
As-T	mg/L	0.00034	0.00027	0.00041	0.00033	0.00035	0.00034	-	**0.005**
Ba-T	mg/L	0.0079	0.0032	0.005	0.0035	0.0042	0.0048	-	-
B-T	mg/L	0.111	<0.050	<0.050	<0.050	<0.050	0.062	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	37.3	12.1	15.6	14.9	16.8	19.30	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00064	0.00090	0.00144	<0.00050	<0.00050	0.00080	**0.002**	**0.007**
Hard-T	mg/L	112	37.2	48.3	45.1	51.6	58.8	-	-
Fe-T	mg/L	0.095	0.069	0.391	0.085	0.087	0.145	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	4.63	1.71	2.24	1.9	2.32	2.56	-	-
Mn-T	mg/L	0.0168	0.0047	0.0158	0.0067	0.0122	0.011	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.646	0.235	0.290	0.258	0.297	0.345	-	-
S-T	mg/L	37.1	9.5	11.1	12	14.2	16.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	20.5	5.79	8.91	7.2	8.39	10.15	-	-
Sr-T	mg/L	0.292	0.0741	0.0957	0.091	0.116	0.1338	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0196	0.0254	0.0245	0.0228	0.0180	0.0221	**0.05**	**0.1**
As-D	mg/L	0.00031	0.00023	0.00031	0.00026	0.00032	0.00029	-	-
Ba-D	mg/L	0.0079	0.0029	0.0046	0.0033	0.0041	0.0046	-	-
B-D	mg/L	0.126	<0.050	0.059	<0.050	<0.050	0.067	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.000170**
Ca-D	mg/L	43.9	11.7	16.8	12.9	17.6	20.6	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00098	0.00066	0.00041	0.00040	0.00033	0.00056	-	-
Hard-D	mg/L	130.0	36.1	51.6	40	53.8	62.3	-	-
Fe-D	mg/L	0.0844	0.0425	0.0365	0.0267	0.0344	0.0449	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	4.98	1.68	2.35	1.89	2.39	2.66	-	-
Mn-D	mg/L	0.0138	0.0016	0.0056	0.002	0.0022	0.005	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.697	0.236	0.298	0.229	0.311	0.354	-	-
S-D	mg/L	39.2	9.3	14	9.9	14.8	17.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	22.7	5.7	9.19	6.55	8.62	10.6	-	-
Sr-D	mg/L	0.298	0.0727	0.110	0.0881	0.12	0.1378	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 139
2017-2018 Annual Report

EMS ID	E219412								
Site Description		Long Lake Outlet							
Site Name	LLO	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	94.5	96.1	97.4	99.9	102	98	**128**	-
Alk-T	mg/L	41.4	41.5	43.8	43.1	45.4	43	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	1.50	1.20	1.10	-	-
TSS	mg/L	<4.0	<4.0	6.5	<4.0	<4.0	5	**5**	**25**
Al-T	mg/L	0.0137	0.0088	0.102	0.0542	0.245	0.0847	-	-
As-T	mg/L	0.00055	0.00055	0.00086	0.00067	0.00139	0.0008	-	**0.005**
Ba-T	mg/L	0.0083	0.0084	0.0098	0.0099	0.0137	0.0100	-	-
B-T	mg/L	0.071	0.078	0.078	0.078	0.082	0.077	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	0.000010	-	-
Ca-T	mg/L	35	38.5	40.3	39.2	37.6	38.10	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00044	0.00025	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	0.00065	0.00070	0.00101	0.00067	**0.002**	**0.007**
Hard-T	mg/L	106	116	122	119	115	115.6	-	-
Fe-T	mg/L	0.042	0.032	0.279	0.147	0.643	0.229	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	4.53	4.83	5.16	5.08	5.17	4.95	-	-
Mn-T	mg/L	0.0123	0.0111	0.112	0.0498	0.279	0.093	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.412	0.498	0.469	0.545	0.499	0.485	-	-
S-T	mg/L	31.5	34.7	34.9	35.4	35.5	34.4	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	12.7	12.9	13.3	13.5	13.9	13.3	-	-
Sr-T	mg/L	0.234	0.239	0.243	0.26	0.265	0.248	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0058	0.0055	0.0049	0.0047	0.0041	0.0050	**0.05**	**0.1**
As-D	mg/L	0.00058	0.0006	0.00047	0.00045	0.00041	0.0005	-	-
Ba-D	mg/L	0.0084	0.0088	0.0083	0.0093	0.0094	0.0088	-	-
B-D	mg/L	0.079	0.072	0.079	0.079	0.078	0.077	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	41.5	41.8	39.3	41.7	37.8	40.4	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00034	0.00028	0.00039	0.00032	0.00035	0.00034	-	-
Hard-D	mg/L	124	125	118	124	115.0	121.2	-	-
Fe-D	mg/L	0.0224	0.0139	0.010	0.009	0.0061	0.0123	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	4.99	5.09	4.83	4.89	4.98	4.96	-	-
Mn-D	mg/L	0.0073	0.0066	0.0044	0.0032	0.0043	0.0052	-	-
Hg-D	mg/L	<0.0000020	<0.0000020		<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.492	0.484	0.462	0.493	0.463	0.479	-	-
S-D	mg/L	38.4	36.1	37.5	38.1	34.7	37	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	13.2	13.5	12.6	13	13.5	13.2	-	-
Sr-D	mg/L	0.246	0.259	0.247	0.251	0.263	0.253	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 140
2017-2018 Annual Report

EMS ID	E219412								
Site Description		Long Lake Outlet							
Site Name	LLO	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Oct-17	16-Oct-17	23-Oct-17	30-Oct-17	6-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	119	116	101	85.3	83.2	100.9	**128**	-
Alk-T	mg/L	47.3	47.5	39.6	37.8	25.8	39.6	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0071	0.0089	0.0111	0.0133	0.0136	0.0108	-	-
As-T	mg/L	0.00044	0.00049	0.00046	0.00044	0.00043	0.00045	-	**0.005**
Ba-T	mg/L	0.0085	0.009	0.0080	0.0066	0.007	0.0078	-	-
B-T	mg/L	0.102	0.098	0.078	0.068	0.075	0.084	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	43.9	43.7	40.1	30.7	32.5	38.20	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	**0.002**	**0.007**
Hard-T	mg/L	134	133	119	93.3	99	115.7	-	-
Fe-T	mg/L	0.024	0.024	0.039	0.037	0.035	0.032	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	5.95	5.82	4.65	4.03	4.32	4.95	-	-
Mn-T	mg/L	0.0071	0.0078	0.008	0.0074	0.0095	0.008	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.566	0.613	0.505	0.4	0.412	0.499	-	-
S-T	mg/L	41.6	43.7	35.8	28.7	28.8	35.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	18.3	17.5	13.9	11.6	12.4	14.7	-	-
Sr-T	mg/L	0.295	0.311	0.248	0.202	0.212	0.254	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.004	0.0054	0.0085	0.0104	0.0103	0.0077	**0.05**	**0.1**
As-D	mg/L	0.00042	0.00043	0.00045	0.00043	0.00043	0.00043	-	-
Ba-D	mg/L	0.0087	0.0085	0.0074	0.0068	0.0067	0.0076	-	-
B-D	mg/L	0.103	0.085	0.076	0.069	0.071	0.081	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	44.7	38.5	36	30	32.3	36.3	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00030	0.00031	0.00031	0.00035	0.00034	0.00032	-	-
Hard-D	mg/L	136	119	108	91.1	97.1	110.2	-	-
Fe-D	mg/L	0.0147	0.0174	0.0195	0.019	0.0173	0.0176	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	6.03	5.44	4.34	3.94	4.02	4.75	-	-
Mn-D	mg/L	0.0040	0.0054	0.0015	0.003	0.0034	0.0035	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.56	0.538	0.478	0.399	0.398	0.475	-	-
S-D	mg/L	43.9	38.6	35.2	28.7	28.7	35	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	18.7	15.8	12.6	11.8	12	14.2	-	-
Sr-D	mg/L	0.301	0.289	0.229	0.215	0.205	0.248	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 141
2017-2018 Annual Report

EMS ID	E217017								
Site Description		No Name Lake Outlet						Water Quality Guidelines	
Site Name	NNO	5 in 30 Weekly Samples							
Date		6-Apr-17	12-Apr-17	20-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	2.06	1.94	1.13	1.62	1.62	2	**128**	-
Alk-T	mg/L	12.3	9.7	11.4	10.3	11.4	11.02	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0367	0.0304	0.129	0.0374	0.0338	0.0535	-	-
As-T	mg/L	0.00019	0.00017	0.00026	0.00018	0.00018	0.0002	-	**0.005**
Ba-T	mg/L	0.0011	0.0011	0.0017	0.0011	0.0011	0.0012	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	3.26	3.46	4.17	3.5	3.38	3.55	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00111	0.00052	0.00062	<0.00050	<0.00050	0.00065	**0.002**	**0.007**
Hard-T	mg/L	11.2	11.9	14.8	11.6	11.7	12.2	-	-
Fe-T	mg/L	0.067	0.042	0.205	0.081	0.052	0.089	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.736	0.779	1.07	0.687	0.805	0.815	-	-
Mn-T	mg/L	0.0043	<0.0010	0.0199	0.0064	0.004	0.007	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.097	0.089	0.101	0.083	0.085	0.091	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	0.98	0.98	2.08	0.92	1.08	1.207	-	-
Sr-T	mg/L	0.0109	0.0111	0.0157	0.0101	0.0112	0.0118	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0351	0.0295	0.0462	0.0277	0.0249	0.0327	**0.05**	**0.1**
As-D	mg/L	0.0002	0.00016	0.00022	0.00017	0.00019	0.00019	-	-
Ba-D	mg/L	0.0012	0.001	0.0012	<0.0010	0.0011	0.0011	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.000170**
Ca-D	mg/L	3.94	3.48	3.48	3.28	3.83	3.6	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00075	0.00061	0.0006	0.00036	0.00042	0.00055	-	-
Hard-D	mg/L	13.2	11.7	11.9	11	13.1	12.2	-	-
Fe-D	mg/L	0.0618	0.0411	0.0836	0.024	0.029	0.0479	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.808	0.734	0.773	0.691	0.849	0.771	-	-
Mn-D	mg/L	0.0033	0.0015	0.002	<0.0010	0.0015	0.0019	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.11	0.085	0.084	0.073	0.088	0.088	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	1.08	0.976	0.972	0.988	1.1	1.0	-	-
Sr-D	mg/L	0.0113	0.011	0.0118	0.0101	0.0114	0.0111	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 142
2017-2018 Annual Report

EMS ID	E217017		No Name Lake Outlet		Water Quality Guidelines	
Site Description			5 in 30 Weekly Samples			
Site Name	NNO			5x30 Average	Average	Max
Date		4-Aug-17				
Parameter	Unit					
SO4-D	mg/L	1.4			128	-
Alk-T	mg/L	16.6			-	-
Acidity 8.3	mg/L	<1.0			-	-
TSS	mg/L	<4.0			5	25
Al-T	mg/L	0.015			-	-
As-T	mg/L	0.00038			-	0.005
Ba-T	mg/L	0.0011			-	-
B-T	mg/L	<0.050			-	-
Cd-T	mg/L	<0.000010			-	-
Ca-T	mg/L	4.98			-	-
Cr-T	mg/L	<0.0010			-	-
Co-T	mg/L	<0.00020			-	0.05
Cu-T	mg/L	<0.00050			0.002	0.007
Hard-T	mg/L	16.7			-	-
Fe-T	mg/L	0.059			-	1
Pb-T	mg/L	<0.00020			0.003	0.005
Mg-T	mg/L	1.03			-	-
Mn-T	mg/L	0.01			0.7	0.8
Hg-T	mg/L	<0.0000020			-	0.0001
Mo-T	mg/L	<0.0010			-	-
Ni-T	mg/L	<0.0010			-	0.025
K-T	mg/L	0.126			-	-
S-T	mg/L	<3.0			-	-
Se-T	mg/L	<0.00010			-	-
Ag-T	mg/L	<0.000020			-	0.0001
Na-T	mg/L	1.34	No Flow		-	-
Sr-T	mg/L	0.0142			-	-
Zn-T	mg/L	0.0082			0.0075	0.03
Al-D	mg/L	0.0134			0.05	0.1
As-D	mg/L	0.00038			-	-
Ba-D	mg/L	0.0011			-	-
B-D	mg/L	<0.050			-	-
Cd-D	mg/L	<0.0000050			0.000088	0.00017
Ca-D	mg/L	5.03			-	-
Cr-D	mg/L	<0.0010			-	-
Co-D	mg/L	<0.00020			-	-
Cu-D	mg/L	0.00043			-	-
Hard-D	mg/L	16.9			-	-
Fe-D	mg/L	0.0483			-	0.35
Pb-D	mg/L	<0.00020			-	-
Mg-D	mg/L	1.04			-	-
Mn-D	mg/L	0.0159			-	-
Hg-D	mg/L	<0.0000020			-	-
Mo-D	mg/L	<0.0010			-	-
Ni-D	mg/L	<0.0010			-	-
K-D	mg/L	0.117			-	-
S-D	mg/L	<3.0			-	-
Se-D	mg/L	<0.00010			-	-
Na-D	mg/L	1.39			-	-
Sr-D	mg/L	0.0142			-	-
Zn-D	mg/L	<0.0050			-	-

Table 143
2017-2018 Annual Report

EMS ID	E217017								
Site Description		No Name Lake Outlet							
Site Name	NNO	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		24-Oct-17	1-Nov-17	7-Nov-17	17-Nov-17	21-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	2.5	2.5	2.7	1.8	2.1	2.3	**128**	-
Alk-T	mg/L	13.9	12.5	11.2	11.0	10	11.7	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0344	0.0471	0.0432	0.0606	0.0746	0.052	-	-
As-T	mg/L	0.00027	0.00028	0.00029	0.00026	0.00025	0.00027	-	**0.005**
Ba-T	mg/L	0.0014	0.0014	0.0015	0.0014	0.0013	0.0014	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	4.65	4.93	4.61	3.93	4.31	4.49	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00069	0.00076	0.00068	0.0008	0.00073	0.00073	**0.002**	**0.007**
Hard-T	mg/L	15.7	16.4	15.5	13.2	14.4	15	-	-
Fe-T	mg/L	0.072	0.083	0.125	0.121	0.118	0.104	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.982	0.995	0.961	0.825	0.875	0.928	-	-
Mn-T	mg/L	0.0069	0.0082	0.0287	0.0145	0.0132	0.014	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0000023	<0.0000020	0.0000021	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.135	0.119	0.122	0.138	0.135	0.13	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	1.25	1.32	1.25	1.18	1.190	1.24	-	-
Sr-T	mg/L	0.015	0.0152	0.0153	0.0132	0.0135	0.0144	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0256	0.0373	0.0351	0.0499	0.0552	0.0406	**0.05**	**0.1**
As-D	mg/L	0.00025	0.00027	0.00027	0.00026	0.00024	0.00026	-	-
Ba-D	mg/L	0.0012	0.0013	0.0015	0.0013	0.0017	0.0014	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	4.53	4.37	4.63	4.08	4.07	4.34	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00042	0.00055	0.00073	0.00068	0.00069	0.00061	-	-
Hard-D	mg/L	15.1	14.9	15.4	13.6	13.7	14.5	-	-
Fe-D	mg/L	0.0418	0.0463	0.0759	0.0839	0.0774	0.0651	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.928	0.962	0.94	0.829	0.85	0.902	-	-
Mn-D	mg/L	0.0032	0.0046	0.0231	0.0126	0.0105	0.0108	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.117	0.115	0.122	0.12	0.132	0.121	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	1.14	1.26	1.25	1.19	1.17	1.2	-	-
Sr-D	mg/L	0.0145	0.0143	0.0152	0.0126	0.0130	0.0139	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 144
2017-2018 Annual Report

EMS ID	E286930								
Site Description		Quinsam River Upstream of 7 South Mining Operation							
Site Name	QRDS1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	35.8	31.0	36.6	34.7	33.2	34	**128**	-
Alk-T	mg/L	36.9	34.7	37.9	41.5	42.3	38.7	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0259	0.0285	0.0356	0.0188	0.0335	0.0285	-	-
As-T	mg/L	0.00038	0.0004	0.00044	0.0004	0.00039	0.0004	-	**0.005**
Ba-T	mg/L	0.003	0.003	0.0030	0.0021	0.0029	0.0028	-	-
B-T	mg/L	0.054	0.051	0.059	0.050	0.058	0.054	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	12.5	12	13	10.1	12.2	12.00	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00058	0.00117	0.00053	0.00052	0.00077	0.00071	**0.002**	**0.007**
Hard-T	mg/L	38.5	36.7	38.7	31.8	37	36.5	-	-
Fe-T	mg/L	0.043	0.046	0.044	0.035	0.043	0.042	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.75	1.65	1.53	1.61	1.6	1.63	-	-
Mn-T	mg/L	0.0039	0.0034	0.0055	0.0039	0.0052	0.004	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.278	0.269	0.248	0.272	0.301	0.274	-	-
S-T	mg/L	12.1	10.9	12.3	12.6	11.3	11.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	13.5	13.3	16.3	16.5	16.6	15.2	-	-
Sr-T	mg/L	0.0791	0.07	0.0731	0.055	0.0708	0.0696	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0236	0.0218	0.0225	0.0207	0.0187	0.0215	**0.05**	**0.1**
As-D	mg/L	0.00039	0.00036	0.00043	0.00038	0.00038	0.00039	-	-
Ba-D	mg/L	0.0033	0.0029	0.0031	0.0028	0.0028	0.003	-	-
B-D	mg/L	0.058	<0.050	0.067	0.055	0.056	0.057	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000060	0.0000070	<0.0000050	0.000006	**0.000088**	**0.000170**
Ca-D	mg/L	15.1	11.6	13.5	12.4	13	13.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00091	0.00084	0.00054	0.00052	0.00052	0.00067	-	-
Hard-D	mg/L	45.5	35.8	40.6	37.5	39.5	39.8	-	-
Fe-D	mg/L	0.0351	0.0241	0.0227	0.019	0.0244	0.0251	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.92	1.65	1.68	1.59	1.69	1.71	-	-
Mn-D	mg/L	0.0023	<0.0010	0.0018	0.0011	0.0018	0.0016	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.303	0.266	0.277	0.269	0.315	0.286	-	-
S-D	mg/L	14.1	11.2	13.7	11.4	12.6	12.6	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	15.8	13.4	17.7	16.7	17.3	16.2	-	-
Sr-D	mg/L	0.0875	0.0666	0.0764	0.0704	0.0742	0.075	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 145
2017-2018 Annual Report

EMS ID	E286930								
Site Description		Quinsam River Upstream of 7 South Mining Operation							
Site Name	QRDS1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Aug-17	10-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	31.6	32.4	30.3	35.3	31.2	32	**128**	-
Alk-T	mg/L	47	42.3	44.8	42.9	44.1	44.2	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	4.8	<4.0	4	**5**	**25**
Al-T	mg/L	0.0178	0.0238	0.0255	0.0438	0.019	0.026	-	-
As-T	mg/L	0.00047	0.00047	0.00047	0.00048	0.00043	0.00046	-	**0.005**
Ba-T	mg/L	0.0025	0.004	0.0029	0.0029	0.0028	0.0030	-	-
B-T	mg/L	0.059	0.064	0.064	0.061	0.060	0.062	-	-
Cd-T	mg/L	<0.000010	0.000013	0.000016	<0.000010	<0.000010	0.000012	-	-
Ca-T	mg/L	11.1	12	13	12.3	11.4	12.00	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00051	0.00076	0.00195	0.00088	0.00074	0.00097	**0.002**	**0.007**
Hard-T	mg/L	33.8	36.4	39.1	37.2	34.9	36.3	-	-
Fe-T	mg/L	0.03	0.037	0.05	0.081	0.039	0.047	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.48	1.53	1.59	1.56	1.57	1.55	-	-
Mn-T	mg/L	0.0054	0.007	0.0092	0.0153	0.0086	0.009	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.269	0.323	0.766	0.337	0.295	0.398	-	-
S-T	mg/L	10.5	11.3	12.4	11.5	11.7	11.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	19.3	19.3	20.1	19.4	18.9	19.4	-	-
Sr-T	mg/L	0.061	0.0631	0.0674	0.0667	0.0657	0.0648	-	-
Zn-T	mg/L	<0.005	<0.005	0.0451	0.0110	<0.005	0.0142	**0.0075**	**0.03**
Al-D	mg/L	0.0181	0.0267	0.0146	0.0136	0.0179	0.0182	**0.05**	**0.1**
As-D	mg/L	0.0005	0.00048	0.00043	0.00038	0.00038	0.00043	-	-
Ba-D	mg/L	0.0025	0.0043	0.0026	0.0025	0.0027	0.0029	-	-
B-D	mg/L	0.064	0.057	0.057	0.056	0.057	0.058	-	-
Cd-D	mg/L	<0.0000050	0.0000230	<0.0000050	<0.0000050	<0.0000050	0.000009	**0.000088**	**0.00017**
Ca-D	mg/L	12.6	12.5	11.7	12.2	11.7	12.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00061	0.00077	0.00054	0.00048	0.00063	0.00061	-	-
Hard-D	mg/L	37.7	37.4	35.5	36.6	35.6	36.6	-	-
Fe-D	mg/L	0.0305	0.0283	0.0253	0.0209	0.0304	0.0271	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.52	1.52	1.52	1.48	1.55	1.52	-	-
Mn-D	mg/L	0.0025	0.0029	0.0024	0.0021	0.0024	0.0025	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.309	0.33	0.317	0.307	0.31	0.315	-	-
S-D	mg/L	12	11.7	12.2	13.2	11.5	12.1	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	19.6	19.8	18.6	18.3	18.7	19.0	-	-
Sr-D	mg/L	0.0615	0.0663	0.0679	0.0673	0.0652	0.0656	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 146
2017-2018 Annual Report

EMS ID	E286930								
Site Description		Quinsam River Upstream of 7 South Mining Operation							
Site Name	QRDS1	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		11-Oct-17	16-Oct-17	23-Oct-17	30-Oct-17	6-Nov-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	35.6	33.5	47	41.3	35.6	38.6	**128**	-
Alk-T	mg/L	44.4	45.5	44.2	42	41.3	43.5	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0091	0.0106	0.0125	0.0092	0.0098	0.0102	-	-
As-T	mg/L	0.00034	0.00042	0.00029	0.00032	0.00036	0.00035	-	**0.005**
Ba-T	mg/L	0.0024	0.0025	0.0039	0.0033	0.0031	0.0030	-	-
B-T	mg/L	0.063	0.065	0.068	0.061	0.062	0.064	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	12.5	12.2	17.6	13.1	13.70	13.80	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	**0.05**
Cu-T	mg/L	0.00175	0.0007	0.00069	0.00057	0.00068	0.00088	**0.002**	**0.007**
Hard-T	mg/L	38.1	37.2	53.4	40.7	42.1	42.3	-	-
Fe-T	mg/L	0.022	0.055	0.036	0.026	0.03	0.034	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	1.66	1.64	2.31	1.91	1.91	1.89	-	-
Mn-T	mg/L	0.0022	0.0029	0.0044	0.0027	0.0032	0.003	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.38	0.392	0.395	0.345	0.315	0.365	-	-
S-T	mg/L	12.9	12.7	16.2	13.6	12.8	13.6	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	21	21.5	19.4	19.4	18.2	19.9	-	-
Sr-T	mg/L	0.0674	0.0672	0.101	0.0867	0.0776	0.08	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0076	0.0071	0.0094	0.0078	0.0079	0.0080	**0.05**	**0.1**
As-D	mg/L	0.00035	0.00031	0.00029	0.00032	0.00033	0.00032	-	-
Ba-D	mg/L	0.0025	0.0025	0.0035	0.0032	0.0029	0.0029	-	-
B-D	mg/L	0.066	0.054	0.065	0.064	0.065	0.063	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.00017**
Ca-D	mg/L	12.8	10.30	16.5	13.7	13.6	13.4	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L	0.00066	0.00137	0.00047	0.00056	0.00053	0.00072	-	-
Hard-D	mg/L	39	31.9	50.1	41.8	41.1	40.8	-	-
Fe-D	mg/L	0.0159	0.0316	0.0282	0.0219	0.0230	0.0241	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	1.74	1.54	2.14	1.82	1.73	1.79	-	-
Mn-D	mg/L	0.0017	0.0026	0.0028	0.002	0.0021	0.0022	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.338	0.337	0.356	0.308	0.293	0.326	-	-
S-D	mg/L	13.5	12.2	16.1	13.9	12	13.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L	21.8	20.2	16.6	17.9	17.1	18.7	-	-
Sr-D	mg/L	0.0692	0.0656	0.097	0.0838	0.0778	0.0787	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 147
2017-2018 Annual Report

EMS ID	E292112								
Site Description		Lower Wetland Outlet at the Confluence of the Quinsam River							
Site Name	LWO	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5x30 Average	Average	Max
Parameter	Unit								
SO4-D	mg/L	1.61	1.20	1.88	1.97	<0.50	1	**128**	-
Alk-T	mg/L	20.8	17	34.9	42.9	25.8	28.3	-	-
Acidity 8.3	mg/L	<0.50	<0.50	2.15	3.0	3.34	1.89	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L	0.0771	0.0781	0.012	0.0094	0.117	0.0587	-	-
As-T	mg/L	0.00025	0.00026	0.0003	0.00052	0.00047	0.00036	-	**0.005**
Ba-T	mg/L	0.0016	0.0016	<0.0010	<0.0010	0.0059	0.0022	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	4.89	5.39	10.1	14	6.96	8.27	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00027	0.00021	-	**0.05**
Cu-T	mg/L	0.00112	0.00137	<0.00050	<0.00050	0.00099	0.00090	**0.002**	**0.007**
Hard-T	mg/L	16	17.4	30.9	42.9	22.6	26	-	-
Fe-T	mg/L	0.277	0.241	<0.010	0.022	0.519	0.214	-	**1**
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L	0.914	0.957	1.38	1.95	1.26	1.292	-	-
Mn-T	mg/L	0.0115	0.011	<0.0010	0.0025	0.0322	0.012	**0.7**	**0.8**
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	**0.0001**
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L	0.079	0.094	<0.050	<0.050	0.093	0.073	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	0.0001	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L	1.53	1.81	1.63	1.95	1.77	1.74	-	-
Sr-T	mg/L	0.0196	0.0208	0.0285	0.0339	0.04	0.0286	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L	0.0595	0.0517	0.0102	0.0069	0.0818	0.0420	**0.05**	**0.1**
As-D	mg/L	0.00022	0.00023	0.00033	0.00047	0.00039	0.00033	-	-
Ba-D	mg/L	0.0014	0.0014	<0.0010	<0.0010	0.0018	0.0013	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050	0.000005	**0.000088**	**0.000170**
Ca-D	mg/L	5.14	5.14	11.1	11.9	7.42	8.14	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00021	0.0002	-	-
Cu-D	mg/L	0.00109	0.00092	0.00041	0.0004	0.00076	0.00072	-	-
Hard-D	mg/L	16.6	16.8	34.2	37.3	23.4	25.7	-	-
Fe-D	mg/L	0.184	0.124	<0.0050	0.0098	0.288	0.1222	-	**0.35**
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L	0.906	0.954	1.57	1.87	1.18	1.296	-	-
Mn-D	mg/L	0.0099	0.0017	<0.0010	0.002	0.0286	0.0086	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L	0.078	0.094	<0.050	<0.050	0.071	0.069	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	0.0001	-	-
Na-D	mg/L	1.62	1.88	1.78	1.75	1.68	1.7	-	-
Sr-D	mg/L	0.0197	0.0208	0.0307	0.0301	0.0248	0.0252	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 148
2017-2018 Annual Report

EMS ID	E292112	Lower Wetland Outlet at the Confluence of the Quinsam River		Water Quality Guidelines	
Site Description		5 in 30 Weekly Samples			
Site Name	LWO				
Date			5x30 Average	Average	Max
Parameter	Unit				
SO4-D	mg/L			128	-
Alk-T	mg/L			-	-
Acidity 8.3	mg/L			-	-
TSS	mg/L			5	25
Al-T	mg/L			-	-
As-T	mg/L			-	0.005
Ba-T	mg/L			-	-
B-T	mg/L			-	-
Cd-T	mg/L			-	-
Ca-T	mg/L			-	-
Cr-T	mg/L			-	-
Co-T	mg/L			-	0.05
Cu-T	mg/L			0.002	0.007
Hard-T	mg/L			-	-
Fe-T	mg/L			-	1
Pb-T	mg/L			0.003	0.005
Mg-T	mg/L			-	-
Mn-T	mg/L			0.7	0.8
Hg-T	mg/L			-	0.0001
Mo-T	mg/L			-	-
Ni-T	mg/L			-	0.025
K-T	mg/L			-	-
S-T	mg/L			-	-
Se-T	mg/L			-	-
Ag-T	mg/L			-	0.0001
Na-T	mg/L	Dry, No Flow		-	-
Sr-T	mg/L			-	-
Zn-T	mg/L			0.0075	0.03
Al-D	mg/L			0.05	0.1
As-D	mg/L			-	-
Ba-D	mg/L			-	-
B-D	mg/L			-	-
Cd-D	mg/L			0.000088	0.00017
Ca-D	mg/L			-	-
Cr-D	mg/L			-	-
Co-D	mg/L			-	-
Cu-D	mg/L			-	-
Hard-D	mg/L			-	-
Fe-D	mg/L			-	0.35
Pb-D	mg/L			-	-
Mg-D	mg/L			-	-
Mn-D	mg/L			-	-
Hg-D	mg/L			-	-
Mo-D	mg/L			-	-
Ni-D	mg/L			-	-
K-D	mg/L			-	-
S-D	mg/L			-	-
Se-D	mg/L			-	-
Na-D	mg/L			-	-
Sr-D	mg/L			-	-
Zn-D	mg/L			-	-

Table 149
2017-2018 Annual Report

EMS ID	E292112								
Site Description		Lower Wetland Outlet at the Confluence of the Quinsam River							
Site Name	LWO	5 in 30 Weekly Samples						Water Quality Guidelines	
Date		24-Oct-17	30-Oct-17	7-Nov-17	17-Nov-17	21-Nov-17	Average	Average	Max
Parameter	Unit								
SO4-D	mg/L		17.90	14.60	4.70	8.10	11.3	**128**	-
Alk-T	mg/L		13.4	15.9	9.4	20.9	14.9	-	-
Acidity 8.3	mg/L		2.50	1.10	<1.0	<1.0	1.40	-	-
TSS	mg/L		<4.0	<4.0	<4.0	<4.0	4	**5**	**25**
Al-T	mg/L		0.201	0.167	0.138	0.0714	0.1444	-	-
As-T	mg/L		0.00053	0.00052	0.0002	0.00024	0.00037	-	**0.005**
Ba-T	mg/L		0.0026	0.0025	0.0017	0.0013	0.0020	-	-
B-T	mg/L		<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L		8.82	9.64	4.82	7.22	7.62	-	-
Cr-T	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L		0.00025	<0.00020	<0.00020	<0.00020	0.00021	-	**0.05**
Cu-T	mg/L		0.00318	0.00267	0.00167	0.00112	**0.00216**	**0.002**	**0.007**
Hard-T	mg/L		28.2	30.3	15.6	22.8	24.2	-	-
Fe-T	mg/L		0.309	0.321	0.135	0.053	0.205	-	**1**
Pb-T	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00020	**0.003**	**0.005**
Mg-T	mg/L		1.49	1.5	0.872	1.15	1.253	-	-
Mn-T	mg/L		0.0281	0.0204	0.0043	0.0013	0.014	**0.7**	**0.8**
Hg-T	mg/L		0.0000031	0.0000031	0.0000035	0.0000022	0.000003	-	**0.0001**
Mo-T	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-T	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	**0.025**
K-T	mg/L		<0.050	<0.050	0.099	0.161	0.09	-	-
S-T	mg/L		5.7	5.1	<3.0	<3.0	4.2	-	-
Se-T	mg/L		0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Ag-T	mg/L	PNC- sample was collected, sent to laboratory but not analyzed.	<0.000020	<0.000020	<0.000020	<0.000020	0.00002	-	**0.0001**
Na-T	mg/L		1.86	1.88	2.1	3.65	2.37	-	-
Sr-T	mg/L		0.0354	0.0312	0.0184	0.0252	0.0275	-	-
Zn-T	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.0050	**0.0075**	**0.03**
Al-D	mg/L		**0.176**	**0.174**	**0.127**	0.0531	**0.1325**	**0.05**	**0.1**
As-D	mg/L		0.00046	0.00046	0.0002	0.00023	0.00034	-	-
Ba-D	mg/L		0.0029	0.0023	0.0015	0.0014	0.002	-	-
B-D	mg/L		<0.050	<0.050	<0.050	<0.050	0.05	-	-
Cd-D	mg/L		0.0000060	0.0000070	<0.0000050	<0.0000050	0.000006	**0.000088**	**0.00017**
Ca-D	mg/L		9.36	9.24	4.71	6.63	7.485	-	-
Cr-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Co-D	mg/L		0.00022	<0.00020	<0.00020	<0.00020	0.0002	-	-
Cu-D	mg/L		0.00282	0.00260	0.00163	0.00096	0.002	-	-
Hard-D	mg/L		29.7	28.7	15.2	21.1	23.7	-	-
Fe-D	mg/L		0.288	0.279	0.11	0.0425	0.1799	-	**0.35**
Pb-D	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	-
Mg-D	mg/L		1.54	1.38	0.834	1.11	1.216	-	-
Mn-D	mg/L		0.0253	0.0188	0.0037	0.001	0.0122	-	-
Hg-D	mg/L		0.0000026	<0.0000020	0.0000028	0.0000024	0.0000025	-	-
Mo-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
Ni-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.001	-	-
K-D	mg/L		<0.050	<0.050	0.081	0.154	0.084	-	-
S-D	mg/L		5.3	4.8	<3.0	<3.0	4	-	-
Se-D	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.0001	-	-
Na-D	mg/L		1.93	1.83	2	3.51	2.3	-	-
Sr-D	mg/L		0.0336	0.0317	0.0175	0.0238	0.0267	-	-
Zn-D	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.005	-	-

Table 149
2017-2018 Annual Report

EMS ID	E292113	Quinsam River Downstream of 7 South Mine Operation								
Site Description		5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Site Name	7SQR									
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5-Jun-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	29.8	30	34.8	33.6	32.8	34.6	32.2	128	-
Alk-T	mg/L	33.2	35	36.2	39.5	40.9	42.3	37	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.027	0.0325	0.0474	0.0268	0.0347	0.0206	0.0337	-	-
As-T	mg/L	0.00037	0.00038	0.00050	0.00043	0.00047	0.00052	0.00043	-	0.005
Ba-T	mg/L	0.0027	0.0029	0.0029	0.0031	0.0031	0.0032	0.0029	-	-
B-T	mg/L	<0.050	<0.050	0.055	0.058	0.056	0.068	0.054	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	10.3	12	12.5	12.9	12	13.4	11.90	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.05
Cu-T	mg/L	0.00212	0.00058	0.00051	0.00054	0.00056	0.0005	0.0009	0.002	0.007
Hard-T	mg/L	31.7	37	37.1	39	36.9	40.2	36	-	-
Fe-T	mg/L	0.055	0.074	0.099	0.081	0.087	0.084	0.079	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.43	1.71	1.41	1.63	1.7	1.65	1.58	-	-
Mn-T	mg/L	0.0035	0.0044	0.0068	0.0053	0.0072	0.0066	0.0054	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.224	0.264	0.223	0.279	0.27	0.245	0.252	-	-
S-T	mg/L	9.7	10.8	10.6	13.3	11.1	10.8	11.1	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	11.1	13.7	15.4	16	16.8	17.5	14.6	-	-
Sr-T	mg/L	0.0625	0.068	0.0705	0.0731	0.0687	0.0731	0.0686	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.024	0.0247	0.0233	0.0207	0.0188	0.0122	0.0223	0.05	0.1
As-D	mg/L	0.00037	0.00036	0.00046	0.00041	0.00043	0.00046	0.00041	-	-
Ba-D	mg/L	0.0028	0.0028	0.0031	0.0029	0.003	0.0032	0.0029	-	-
B-D	mg/L	0.051	<0.050	0.061	0.053	0.054	0.061	0.054	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	0.000088	0.00017
Ca-D	mg/L	11.9	11.3	13	12.3	13.8	12.5	12.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00066	0.00099	0.00052	0.00042	0.00048	0.00046	0.00061	-	-
Hard-D	mg/L	36.3	34.8	39	37.5	41.4	38	37.8	-	-
Fe-D	mg/L	0.0475	0.0389	0.0431	0.0364	0.0517	0.048	0.0435	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.58	1.58	1.59	1.64	1.66	1.64	1.61	-	-
Mn-D	mg/L	0.0029	0.0022	0.0041	0.0031	0.0033	0.0044	0.0031	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.244	0.249	0.266	0.254	0.271	0.233	0.257	-	-
S-D	mg/L	11.2	10.0	12.7	11.3	12.2	10.1	11.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Na-D	mg/L	13.6	12.7	16	16	16.7	16.5	15.00	-	-
Sr-D	mg/L	0.0708	0.0655	0.0746	0.0697	0.0723	0.0672	0.0706	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 150
2017-2018 Annual Report

EMS ID	E292113		Quinsam River Downstream of 7 South Mine Operation							Water Quality Guidelines	
Site Description			5 in 30 Weekly Samples					Monthly			
Site Name	7SQR	Monthly									
Date		25-Jul-17	4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	27-Sep-17	5x30 Average	Average	Max
Parameter	Unit										
SO4-D	mg/L	28.8	27.9	30.8	27.5	27.6	29.5	35.5	28.7	128	-
Alk-T	mg/L	45.2	42.2	42.4	43.5	40.2	43.6	43.1	42.4	-	-
Acidity 8.3	mg/L	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0202	0.0157	0.014	0.0118	0.0153	0.0157	0.0124	0.0145	-	-
As-T	mg/L	0.00056	0.00056	0.00052	0.00045	0.00047	0.00047	0.00042	0.00049	-	0.005
Ba-T	mg/L	0.003	0.0028	0.0027	0.0026	0.0027	0.0027	0.0029	0.0027	-	-
B-T	mg/L	0.069	0.061	0.062	0.057	0.059	0.061	0.055	0.060	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	11.3	12.4	11.1	11	11.4	11.5	12.9	11.50	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.05
Cu-T	mg/L	0.00057	<0.00050	0.00064	0.00083	0.00073	0.00051	0.00063	0.0006	0.002	0.007
Hard-T	mg/L	34.6	37.3	34.1	33.3	35	35	38.5	35	-	-
Fe-T	mg/L	0.08	0.064	0.078	0.059	0.065	0.072	0.071	0.068	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00021	0.00020	0.003	0.005
Mg-T	mg/L	1.55	1.51	1.54	1.41	1.55	1.52	1.53	1.51	-	-
Mn-T	mg/L	0.0070	0.0045	0.0042	0.0034	0.0049	0.0069	0.0057	0.0048	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.258	0.279	0.271	0.25	0.291	0.276	0.319	0.273	-	-
S-T	mg/L	10.6	10.6	11.1	9.6	11.5	11.2	10.6	10.8	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	19.4	17.8	18.4	17.9	17.6	17.8	16.9	17.9	-	-
Sr-T	mg/L	0.0601	0.0593	0.0604	0.0578	0.064	0.066	0.0687	0.0615	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	0.0050	0.0075	0.033
Al-D	mg/L	0.0125	0.0154	0.0574	0.0107	0.0109	0.0101	0.0078	0.0209	0.05	0.1
As-D	mg/L	0.00051	0.00055	0.00053	0.00046	0.00048	0.00041	0.00039	0.00049	-	-
Ba-D	mg/L	0.0029	0.003	0.0029	0.0027	0.0027	0.0028	0.0027	0.0028	-	-
B-D	mg/L	0.062	0.066	0.057	0.060	0.060	0.059	0.053	0.060	-	-
Cd-D	mg/L	<0.0000050	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	0.000088	0.00017
Ca-D	mg/L	12	12	12.6	12.3	12.3	11.2	11.8	12.1	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00054	0.00078	0.00048	0.00041	0.00053	0.00051	0.00042	0.00054	-	-
Hard-D	mg/L	36.1	36.5	38.1	36.9	36.8	33.8	35.8	36.4	-	-
Fe-D	mg/L	0.0550	0.0592	0.0557	0.0517	0.0481	0.0388	0.0506	0.0507	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.49	1.56	1.62	1.48	1.47	1.43	1.51	1.51	-	-
Mn-D	mg/L	0.0051	0.0053	0.0053	0.0055	0.0054	0.0045	0.0045	0.0052	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.286	0.321	0.288	0.276	0.327	0.264	0.307	0.295	-	-
S-D	mg/L	12.3	11.8	10.6	11.2	10.6	9.9	12.2	10.8	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Na-D	mg/L	19	18.4	19.1	17.3	17	16.4	17.1	17.600	-	-
Sr-D	mg/L	0.062	0.0608	0.0655	0.0629	0.0614	0.0614	0.0627	0.0624	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 151
2017-2018 Annual Report

EMS ID	E292113	Quinsam River Downstream of 7 South Mine Operation								
Site Description		5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Site Name	7SQR									
Date		12-Oct-17	18-Oct-17	23-Oct-17	30-Oct-17	7-Nov-17	12-Dec-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	33.4	32.8	42.3	39.4	31	17	35.8	128	-
Alk-T	mg/L	44.2	41.6	43.3	42.2	42.3	27.1	42.7	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0102	0.0223	0.0233	0.0123	0.011	0.0342	0.0158	-	-
As-T	mg/L	0.0004	0.00037	0.00039	0.00037	0.00045	0.00031	0.0004	-	0.005
Ba-T	mg/L	0.0028	0.0032	0.0041	0.0034	0.0029	0.0021	0.0033	-	-
B-T	mg/L	0.067	0.067	0.062	0.059	0.054	<0.050	0.062	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	12.6	12.1	17.9	13.5	12.5	10.2	13.70	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.05
Cu-T	mg/L	0.00058	0.00051	0.00055	0.00072	0.00052	0.00065	0.0006	0.002	0.007
Hard-T	mg/L	39.0	37.7	53.7	41.8	37.5	30.5	42	-	-
Fe-T	mg/L	0.064	0.086	0.089	0.074	0.096	0.075	0.082	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.85	1.8	2.17	1.93	1.53	1.22	1.86	-	-
Mn-T	mg/L	0.0048	0.0064	0.0066	0.0066	0.0079	0.0057	0.0065	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.332	0.348	0.373	0.311	0.275	0.157	0.328	-	-
S-T	mg/L	12.2	12.5	15	12.6	10.2	5.4	12.5	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	21.7	20	17.2	18.5	15.9	6.34	18.7	-	-
Sr-T	mg/L	0.0673	0.0711	0.0987	0.0854	0.0681	0.0441	0.0781	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.0071	0.0116	0.0149	0.0106	0.0099	0.0215	0.0108	0.05	0.1
As-D	mg/L	0.00037	0.00031	0.00034	0.00035	0.00042	0.00028	0.00036	-	-
Ba-D	mg/L	0.0029	0.0031	0.0037	0.0035	0.003	0.0023	0.0032	-	-
B-D	mg/L	0.070	0.056	0.062	0.065	0.064	<0.050	0.063	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	0.000088	0.00017
Ca-D	mg/L	12.7	12.2	16.1	13.1	12.5	10	13.3	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00052	0.00052	0.00049	0.00045	0.00052	0.00071	0.0005	-	-
Hard-D	mg/L	38.9	37.3	48.6	40.2	38.1	30.3	40.6	-	-
Fe-D	mg/L	0.0427	0.0605	0.0619	0.052	0.0822	0.0462	0.0599	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.71	1.69	2.06	1.83	1.68	1.27	1.79	-	-
Mn-D	mg/L	0.0041	0.0055	0.0052	0.0059	0.0078	0.0049	0.0057	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.346	0.315	0.351	0.301	0.286	0.17	0.320	-	-
S-D	mg/L	13.2	11.2	14.3	12.4	10.7	5.6	12.4	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Na-D	mg/L	21.4	19.2	15.7	17.1	16.7	6.43	18.000	-	-
Sr-D	mg/L	0.0703	0.0696	0.0902	0.0786	0.0701	0.0459	0.0758	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 152
2017-2018 Annual Report

EMS ID	E292113	Quinsam River Downstream of 7 South Mine Operation			Water Quality Guidelines
Site Description		Monthly Samples			
Site Name	7SQR				
Date		24-Jan-18	27-Feb-18	20-Mar-18	Max
Parameter	Unit				
SO4-D	mg/L	24.8	36.3	33.9	-
Alk-T	mg/L	26.4	39.2	35.9	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	-
TSS	mg/L	<4.0	<4.0	<4.0	25
Al-T	mg/L	0.0529	0.0247	0.0223	-
As-T	mg/L	0.0003	0.00027	0.00027	0.005
Ba-T	mg/L	0.0025	0.0027	0.0028	-
B-T	mg/L	<0.050	0.054	0.055	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	9.15	12.4	13.9	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	0.05
Cu-T	mg/L	0.00091	0.00072	0.00064	0.007
Hard-T	mg/L	28.7	37.6	41.8	-
Fe-T	mg/L	0.054	0.051	0.053	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	1.41	1.58	1.75	-
Mn-T	mg/L	0.0022	0.0039	0.0037	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.212	0.254	0.28	-
S-T	mg/L	8.4	12.1	12	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	10.4	16	15	-
Sr-T	mg/L	0.0489	0.0737	0.0781	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.033
Al-D	mg/L	0.0398	0.0211	0.0175	0.1
As-D	mg/L	0.00028	0.00028	0.00025	-
Ba-D	mg/L	0.0024	0.0027	0.0027	-
B-D	mg/L	<0.050	0.055	<0.050	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	0.00017
Ca-D	mg/L	9.95	14.1	13.2	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00065	0.00055	0.00054	-
Hard-D	mg/L	30	42.2	39.6	-
Fe-D	mg/L	0.0324	0.0471	0.0417	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	1.26	1.71	1.6	-
Mn-D	mg/L	0.0015	0.0038	0.0033	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.208	0.291	0.248	-
S-D	mg/L	8.6	12.8	11.5	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	-
Na-D	mg/L	9.61	17.2	14.1	-
Sr-D	mg/L	0.0488	0.0778	0.0789	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	-

Table 153
2017-2018 Annual Report

EMS ID	E297230	Iron River Upstream of Mining Operations							Water Quality Guidelines	
Site Description		5 in 30 Weekly Samples								
Site Name	IR1									
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5-Jun-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	3.97	2.93	2.39	1.71	0.78	1.62	2.36	128	-
Alk-T	mg/L	30.2	28.1	31.4	27.1	28.9	30.8	29.1	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	8.95	<0.50	<0.50	2.19	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0489	0.062	0.112	0.064	0.0732	0.0469	0.072	-	-
As-T	mg/L	0.00033	0.00035	0.00033	0.00028	0.00028	0.00031	0.00031	-	0.005
Ba-T	mg/L	0.0022	0.0022	0.0022	0.0019	0.002	0.0021	0.0021	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	0.000024	0.000016	0.000027	0.000021	0.000024	0.000019	0.000022	-	-
Ca-T	mg/L	9.86	10.8	11.5	8.57	9.7	10.5	10.09	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00184	0.00076	0.00074	0.00060	0.00064	0.00071	0.0009	0.002	0.0070
Hard-T	mg/L	27	29.4	31.1	23.4	26.5	28.8	28	-	-
Fe-T	mg/L	0.012	0.014	0.075	0.019	0.024	0.011	0.029	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.005
Mg-T	mg/L	0.575	0.585	0.569	0.481	0.548	0.635	0.552	-	-
Mn-T	mg/L	<0.0010	<0.0010	0.0022	<0.0010	<0.0010	<0.0010	0.0012	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0000027	<0.0000020	<0.0000020	0.0000021	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.199	0.174	0.152	0.147	0.167	0.157	0.168	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-T	mg/L	0.00021	0.00021	0.00021	0.00015	0.00015	0.00018	0.00019	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	0.828	0.832	0.739	0.617	0.662	0.671	0.736	-	-
Sr-T	mg/L	0.0362	0.0372	0.036	0.0292	0.0304	0.0319	0.0338	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.008	0.03
Al-D	mg/L	0.0447	0.0489	0.0659	0.0631	0.0711	0.0446	0.059	0.05	0.1
As-D	mg/L	0.00036	0.00032	0.00036	0.00028	0.00029	0.00033	0.00032	-	-
Ba-D	mg/L	0.0023	0.0022	0.0021	0.0019	0.002	0.0021	0.0021	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	0.0000230	0.0000138	0.0000220	0.000021	0.0000247	0.000017	0.000021	0.00008	0.00017
Ca-D	mg/L	11.9	10.4	11.5	9.91	10.4	10.2	10.82	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00064	0.00069	0.00056	0.00057	0.00071	0.00065	0.00063	-	-
Hard-D	mg/L	32.3	28.3	30.9	26.9	28.4	28	29.4	-	-
Fe-D	mg/L	0.0136	0.0093	0.013	0.0134	0.0177	0.0097	0.0134	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	0.615	0.576	0.517	0.524	0.583	0.646	0.563	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000021	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.217	0.17	0.153	0.148	0.184	0.174	0.174	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-D	mg/L	0.00021	0.0002	0.00019	0.00015	0.00014	0.00017	0.00018	-	-
Na-D	mg/L	0.919	0.812	0.675	0.646	0.698	0.734	0.750	-	-
Sr-D	mg/L	0.0397	0.0373	0.0369	0.0312	0.0321	0.0317	0.0354	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 154
2017-2018 Annual Report

EMS ID	E297230		Iron River Upstream of Mining Operations							Water Quality Guidelines	
Site Description			5 in 30 Weekly Samples					Monthly			
Site Name	IR1	Monthly									
Date		25-Jul-17	4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	27-Sep-17	5x30 Average	Average	Max
Parameter	Unit										
SO4-D	mg/L	7.87	9.4	11	12.1	12.4	14.2	21.3	11.8	128	-
Alk-T	mg/L	60.7	68.9	71.2	75.7	75.9	79.9	77.1	74.3	-	-
Acidity 8.3	mg/L	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	-	-
Al-T	mg/L	0.0226	0.0254	0.0245	0.0206	0.0257	0.0198	0.0144	0.0232	-	-
As-T	mg/L	0.00055	0.00062	0.00061	0.00048	0.00056	0.00052	0.00048	0.00056	-	0.005
Ba-T	mg/L	0.0043	0.0052	0.005	0.0057	0.007	0.0061	0.0064	0.0058	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	0.000014	0.000012	0.000014	0.000017	0.000015	0.000014	0.00001	0.000014	-	-
Ca-T	mg/L	23.5	30.3	29.9	29.3	30.7	30.5	32.3	30.10	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00107	0.00058	0.00214	0.00092	0.00065	<0.00050	0.00074	0.0010	0.002	0.007
Hard-T	mg/L	63.2	81.4	80.2	78.9	82.9	82.6	86.7	81	-	-
Fe-T	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.1	1.38	1.36	1.43	1.51	1.57	1.48	1.45	-	-
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	0.0010	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.238	0.333	0.309	0.406	0.421	0.321	0.323	0.358	-	-
S-T	mg/L	<3.0	3.5	3.3	3.9	4.4	4.8	7.3	4.0	-	-
Se-T	mg/L	0.00039	0.00035	0.00029	0.00023	0.00025	0.0002	0.00055	0.00026	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	1.35	1.82	1.96	2.18	2.25	2.23	2.33	2.09	-	-
Sr-T	mg/L	0.0748	0.0869	0.0886	0.0903	0.0986	0.102	0.105	0.0933	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.0400	<0.0050	<0.0050	<0.0050	0.0120	0.0075	0.03
Al-D	mg/L	0.0236	0.0251	0.0255	0.0198	0.0220	0.0203	0.015	0.0225	0.05	0.1
As-D	mg/L	0.00055	0.00064	0.00062	0.00051	0.00058	0.00052	0.00054	0.00057	-	-
Ba-D	mg/L	0.0043	0.0052	0.0058	0.0061	0.0060	0.0062	0.0062	0.0059	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	0.0000110	0.000011	0.0000140	0.0000140	0.0000140	0.000013	0.0000120	0.000013	0.00008	0.00017
Ca-D	mg/L	24	30.8	30.3	31.2	31.7	29.9	31.7	30.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00057	0.00057	0.00052	0.00054	0.00049	0.00054	0.00042	0.00053	-	-
Hard-D	mg/L	64.9	82.7	81.8	84.2	85.3	81.1	85.5	83	-	-
Fe-D	mg/L	<0.0050	0.0233	<0.0050	<0.0050	0.0116	<0.0050	0.0084	0.01	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.200	1.38	1.46	1.54	1.46	1.54	1.57	1.48	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000021	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.268	0.324	0.34	0.344	0.37	0.327	0.323	0.341	-	-
S-D	mg/L	<3.0	4	3.8	4.6	4.9	4.9	7.9	4.4	-	-
Se-D	mg/L	0.00042	0.00035	0.00031	0.00025	0.00023	0.00019	0.00057	0.00027	-	-
Na-D	mg/L	1.45	1.83	2.01	2.13	2.08	2.27	2.58	2.060	-	-
Sr-D	mg/L	0.0732	0.0839	0.0945	0.1	0.0995	0.102	0.11	0.096	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 155
2017-2018 Annual Report

EMS ID	E297230	Iron River Upstream of Mining Operations								
Site Description		5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Site Name	IR1									
Date		12-Oct-17	18-Oct-17	23-Oct-17	30-Oct-17	7-Nov-17	12-Dec-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	19.6	4.4	3.6	5.6	6.6	4.7	8.0	128	-
Alk-T	mg/L	76.0	20.7	27.6	37.3	46.5	36.1	41.6	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0101	0.162	0.0783	0.0333	0.0217	0.0357	0.0611	-	-
As-T	mg/L	0.00041	0.00039	0.00041	0.00048	0.00052	0.00047	0.00044	-	0.005
Ba-T	mg/L	0.0054	0.0029	0.0023	0.0028	0.0028	0.0025	0.0032	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	0.000011	0.000045	0.000021	0.000017	0.000013	0.000015	0.000021	-	-
Ca-T	mg/L	32	9.63	10.5	13.3	17.5	14.4	16.59	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00087	0.00171	0.00099	0.00076	<0.00050	0.00052	0.0010	0.002	0.007
Hard-T	mg/L	87.1	27.3	29.2	36.8	47.5	38.8	46	-	-
Fe-T	mg/L	<0.010	0.144	0.043	0.013	<0.010	0.013	0.044	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.730	0.799	0.7	0.858	0.903	0.689	0.998	-	-
Mn-T	mg/L	<0.0010	0.0077	0.0014	<0.0010	0.0012	<0.0010	0.0025	0.7	0.8
Hg-T	mg/L	<0.0000020	0.0000046	0.0000022	<0.0000020	<0.0000020	<0.0000020	0.0000026	-	0.0001
Mo-T	mg/L	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.279	0.272	0.204	0.171	0.166	0.152	0.218	-	-
S-T	mg/L	6.7	<3.0	<3.0	<3.0	<3.0	<3.0	3.7	-	-
Se-T	mg/L	0.00065	0.00026	0.00027	0.00047	0.00054	0.00038	0.00044	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	2.62	1.03	0.867	1.06	1.11	0.879	1.337	-	-
Sr-T	mg/L	0.105	0.0298	0.0328	0.0498	0.0603	0.049	0.0555	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.011	0.103	0.0882	0.0352	0.0233	0.0342	0.0521	0.05	0.1
As-D	mg/L	0.00042	0.00027	0.00033	0.00047	0.00047	0.00052	0.00039	-	-
Ba-D	mg/L	0.0056	0.0026	0.0023	0.0027	0.0029	0.0027	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	0.0000110	0.0000210	0.000018	0.0000170	0.0000150	0.0000130	0.000016	0.00008	0.00017
Ca-D	mg/L	34.0	8.53	10.2	14.1	17.5	14.8	16.866	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00045	0.00126	0.00079	0.00058	0.00061	0.00062	0.00074	-	-
Hard-D	mg/L	92.3	24.4	28.2	38.5	47.6	39.9	46.2	-	-
Fe-D	mg/L	0.0166	0.0514	0.0295	0.0114	0.0067	0.0101	0.0231	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.79	0.761	0.647	0.834	0.956	0.696	0.998	-	-
Mn-D	mg/L	<0.0010	0.0028	0.001	<0.0010	0.0011	<0.0010	0.0014	-	-
Hg-D	mg/L	<0.0000020	0.0000041	0.0000026	<0.0000020	<0.0000020	<0.0000020	0.0000025	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.291	0.225	0.182	0.174	0.169	0.151	0.208	-	-
S-D	mg/L	7.2	<3.0	<3.0	<3.0	<3.0	<3.0	3.8	-	-
Se-D	mg/L	0.00067	0.00022	0.00021	0.00039	0.00056	0.00036	0.00041	-	-
Na-D	mg/L	2.72	0.959	0.784	1.03	1.130	0.886	1.325	-	-
Sr-D	mg/L	0.104	0.0305	0.0311	0.0476	0.0575	0.0512	0.0541	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 156
2017-2018 Annual Report

EMS ID	E297230	Iron River Upstream of Mining Operations			Water Quality Guidelines
Site Description		Monthly Samples			
Site Name	IR1				
Date		24-Jan-18	27-Feb-18	20-Mar-18	Max
Parameter	Unit				
SO4-D	mg/L	2.6	4.6	3.7	-
Alk-T	mg/L	22.1	35.9	21.8	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	-
TSS	mg/L	<4.0	<4.0	<4.0	25
Al-T	mg/L	0.0543	0.0268	0.0443	-
As-T	mg/L	0.00028	0.00046	0.00036	0.005
Ba-T	mg/L	0.0018	0.0023	0.0021	5
B-T	mg/L	<0.050	<0.050	<0.050	-
Cd-T	mg/L	0.000012	0.000014	0.000012	-
Ca-T	mg/L	8.98	12.9	9.2	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	0.11
Cu-T	mg/L	0.00053	0.0005	0.0009	0.007
Hard-T	mg/L	24.6	35.2	25.7	-
Fe-T	mg/L	0.016	<0.010	0.014	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.004
Mg-T	mg/L	0.535	0.708	0.649	-
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.00001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	2
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.125	0.145	0.157	-
S-T	mg/L	<3.0	<3.0	<3.0	-
Se-T	mg/L	0.00022	0.00037	0.0002	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	0.776	0.893	0.951	-
Sr-T	mg/L	0.0278	0.0449	0.0315	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.033
Al-D	mg/L	0.0802	0.0258	0.0421	0.1
As-D	mg/L	0.00029	0.00045	0.00033	-
Ba-D	mg/L	0.002	0.0025	0.0019	-
B-D	mg/L	<0.050	<0.050	<0.050	-
Cd-D	mg/L	0.0000230	0.000013	0.000011	0.00017
Ca-D	mg/L	9.5	14.8	8.77	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00047	0.00043	0.00042	-
Hard-D	mg/L	25.9	39.7	24.2	-
Fe-D	mg/L	0.0143	0.0074	0.0093	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	0.546	0.699	0.553	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.178	0.144	0.126	-
S-D	mg/L	<3.0	<3.0	<3.0	-
Se-D	mg/L	0.00017	0.00037	0.00019	-
Na-D	mg/L	0.818	0.903	0.847	-
Sr-D	mg/L	0.0316	0.0469	0.0315	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	-

Table 157
2017-2018 Annual Report

EMS ID	E297231	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine					Monthly		Water Quality Guidelines	
Site Description		5 in 30 Weekly Samples								
Site Name	IR6									
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5-Jun-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	2.46	1.44	1.49	1.78	0.91	2.06	1.62	128	-
Alk-T	mg/L	24.4	22.3	26.1	24.5	24.3	28.9	24.3	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0639	0.0823	0.0981	0.0966	0.0921	0.0475	0.0866	-	-
As-T	mg/L	0.00055	0.00054	0.0006	0.00047	0.00045	0.0009	0.00052	-	0.005
Ba-T	mg/L	0.0032	0.0033	0.0036	0.0031	0.003	0.0036	0.0032	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	0.000013	0.000011	0.000017	0.000016	0.000013	0.000013	-	-
Ca-T	mg/L	7.69	8.6	8.73	9.74	8.65	9.7	8.68	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00069	0.0080	0.00068	0.00070	0.00072	0.00072	0.0022	0.002	0.0070
Hard-T	mg/L	21.8	24.4	24.1	26.9	24.3	27.3	24	-	-
Fe-T	mg/L	0.027	0.047	0.041	0.044	0.052	0.018	0.042	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.005
Mg-T	mg/L	0.639	0.701	0.562	0.619	0.653	0.746	0.635	-	-
Mn-T	mg/L	<0.0010	<0.0010	0.0012	<0.0010	0.0013	<0.0010	0.0011	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0000029	<0.0000020	<0.0000020	0.0000022	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.173	0.676	0.165	0.197	0.197	0.193	0.282	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-T	mg/L	0.00015	0.00016	0.00013	0.00015	0.00012	0.00014	0.00014	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	0.927	2.35	0.752	0.794	0.854	0.92	1.135	-	-
Sr-T	mg/L	0.0293	0.0280	0.0299	0.029	0.029	0.0316	0.0290	-	-
Zn-T	mg/L	<0.0050	0.0072	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	0.0075	0.03
Al-D	mg/L	0.0696	0.0676	0.0819	0.0792	0.0759	0.0429	0.0748	0.05	0.1
As-D	mg/L	0.00053	0.00051	0.00059	0.00039	0.00043	0.00085	0.00049	-	-
Ba-D	mg/L	0.0034	0.0034	0.0036	0.0028	0.003	0.0036	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	0.0000100	0.0000096	0.0000180	0.000015	0.0000165	0.000009	0.000014	0.000080	0.000170
Ca-D	mg/L	8.96	7.76	9.15	8.18	8.99	9.16	8.61	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00095	0.00075	0.00075	0.00063	0.00062	0.00068	0.00074	-	-
Hard-D	mg/L	25.2	22	25.4	22.7	25.2	25.9	24.1	-	-
Fe-D	mg/L	0.0266	0.0248	0.0242	0.0249	0.0275	0.0118	0.0256	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	0.676	0.643	0.629	0.552	0.657	0.731	0.631	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	0.0000023	0.0000028	0.0000020	<0.0000020	0.0000022	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.187	0.19	0.173	0.162	0.192	0.193	0.181	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-D	mg/L	0.00015	0.00014	0.00015	0.00012	0.00012	0.00013	0.00014	-	-
Na-D	mg/L	0.956	0.923	0.785	0.708	0.784	0.918	0.831	-	-
Sr-D	mg/L	0.0321	0.0288	0.0318	0.0267	0.0295	0.0306	0.0298	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 158
2017-2018 Annual Report

EMS ID	E297231		Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine							Water Quality Guidelines	
Site Description			5 in 30 Weekly Samples					Monthly			
Site Name	IR6	Monthly									
Date		25-Jul-17	4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	27-Sep-17	5x30 Average	Average	Max
Parameter	Unit										
SO4-D	mg/L	8.02	9.5	11.3	11.9	12.7	13.9	19.2	11.9	128	-
Alk-T	mg/L	60.1	68.5	68.6	73.8	73.1	79.5	77.2	72.7	-	-
Acidity 8.3	mg/L	<0.50	<1.0	<1.0	<1.0	2.10	<1.0	<1.0	1.20	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.021	0.0203	0.0198	0.0184	0.0179	0.0152	0.0109	0.0183	-	-
As-T	mg/L	0.00364	0.0067	0.0079	0.0092	0.0106	0.0110	0.0084	0.00907	-	0.005
Ba-T	mg/L	0.0095	0.0116	0.0125	0.0147	0.0144	0.0156	0.0159	0.0138	-	-
B-T	mg/L	<0.050	<0.050	<0.050	0.056	0.062	0.066	0.062	0.057	-	-
Cd-T	mg/L	0.00001	<0.000010	<0.000010	0.000011	0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	21.5	26.3	27.1	25.1	28.4	28.3	31.5	27.00	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00064	0.00059	0.00055	0.00076	0.00054	0.00113	0.00061	0.0007	0.002	0.0070
Hard-T	mg/L	60.5	74.3	76.7	72.6	81.2	81.5	88.6	77	-	-
Fe-T	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.64	2.09	2.19	2.39	2.51	2.63	2.39	2.36	-	-
Mn-T	mg/L	0.0012	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0015	0.0010	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.311	0.412	0.409	0.543	0.443	0.448	0.481	0.451	-	-
S-T	mg/L	<3.0	4.2	3.1	3.6	4.2	4.8	6.3	4.0	-	-
Se-T	mg/L	0.00028	0.00018	0.00014	0.00014	0.00017	0.00015	0.00023	0.00016	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	2.2	2.94	3.36	3.87	3.95	4.25	4.11	3.67	-	-
Sr-T	mg/L	0.0732	0.0861	0.0894	0.0881	0.0997	0.102	0.107	0.0931	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.03
Al-D	mg/L	0.0196	0.0201	0.0232	0.0164	0.0154	0.0138	0.0118	0.0178	0.05	0.1
As-D	mg/L	0.00362	0.0074	0.00832	0.0103	0.0105	0.0107	0.00838	0.00944	-	-
Ba-D	mg/L	0.0088	0.0117	0.0128	0.0148	0.0145	0.0153	0.0151	0.0138	-	-
B-D	mg/L	<0.050	<0.050	<0.050	0.053	0.058	0.064	0.069	0.055	-	-
Cd-D	mg/L	0.0000060	0.000008	0.0000080	0.0000080	0.0000090	0.0000090	0.000008	0.000008	0.000080	0.00017
Ca-D	mg/L	23.4	28.6	27.9	28.4	29.7	27.8	31.6	28.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00053	0.00092	0.00049	0.00054	0.00047	0.00057	0.00044	0.0006	-	-
Hard-D	mg/L	65.2	79.6	78.8	80.9	84.3	80.2	89	80.8	-	-
Fe-D	mg/L	0.0097	0.0068	<0.0050	0.0085	<0.0050	<0.0050	<0.0050	0.0061	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.65	2.01	2.23	2.4	2.46	2.59	2.45	2.34	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.315	0.401	0.420	0.456	0.462	0.442	0.444	0.436	-	-
S-D	mg/L	<3.0	3.1	3.4	4.2	4.9	4.6	6.9	4.0	-	-
Se-D	mg/L	0.00029	0.00019	0.00018	0.00016	0.00016	0.00015	0.00017	0.00017	-	-
Na-D	mg/L	2.15	2.99	3.43	3.69	3.7	4.1	4.17	3.580	-	-
Sr-D	mg/L	0.0726	0.0868	0.0926	0.1020	0.0981	0.101	0.108	0.0961	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 159
2017-2018 Annual Report

EMS ID	E297231									
Site Description		Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine								
Site Name	IR6	5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Date		12-Oct-17	18-Oct-17	23-Oct-17	30-Oct-17	7-Nov-17	12-Dec-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	20.8	6.7	3.3	5.6	6.6	4.5	8.6	128	-
Alk-T	mg/L	74.4	21	23.5	32.5	39.4	29.7	38.2	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0093	0.132	0.0966	0.0449	0.0272	0.0521	0.062	-	-
As-T	mg/L	0.0074	0.0011	0.00053	0.00096	0.0013	0.00092	0.00226	-	0.005
Ba-T	mg/L	0.0132	0.0056	0.0040	0.0049	0.0052	0.0041	0.0066	-	-
B-T	mg/L	0.068	<0.050	<0.050	<0.050	<0.050	<0.050	0.054	-	-
Cd-T	mg/L	<0.000010	0.000034	0.000016	0.000011	0.000011	0.000012	0.000016	-	-
Ca-T	mg/L	30.3	9.3	8.68	11.2	14.7	10.8	14.84	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.0008	0.00168	0.00107	0.00094	0.00068	0.00122	0.0010	0.0020	0.0070
Hard-T	mg/L	86.5	27	24.8	31.8	41.2	30.2	42	-	-
Fe-T	mg/L	<0.010	0.137	0.075	0.025	0.016	0.026	0.053	-	1.00
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	2.66	0.929	0.761	0.939	1.1	0.790	1.278	-	-
Mn-T	mg/L	<0.0010	0.0054	0.0017	<0.0010	0.0018	0.0010	0.0022	0.7	0.8
Hg-T	mg/L	<0.0000020	0.0000047	0.0000024	<0.0000020	<0.0000020	<0.0000020	0.0000026	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.380	0.283	0.228	0.213	0.214	0.209	0.264	-	-
S-T	mg/L	6.6	<3.0	<3.0	<3.0	<3.0	<3.0	3.7	-	-
Se-T	mg/L	0.00027	0.0002	0.00018	0.00032	0.0004	0.00027	0.00027	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	4.83	1.19	0.989	1.27	1.43	1.09	1.942	-	-
Sr-T	mg/L	0.104	0.0302	0.0295	0.0448	0.0488	0.0401	0.0515	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.009	0.1050	0.0854	0.0382	0.0266	0.0463	0.0528	0.05	0.1
As-D	mg/L	0.00760	0.00073	0.00052	0.00091	0.00141	0.00098	0.00223	-	-
Ba-D	mg/L	0.0137	0.0056	0.0042	0.0047	0.0051	0.0045	0.0067	-	-
B-D	mg/L	0.070	<0.050	<0.050	<0.050	<0.050	<0.050	0.054	-	-
Cd-D	mg/L	0.0000060	0.0000160	0.000014	0.0000110	0.0000100	0.0000097	0.000011	0.00008	0.00016
Ca-D	mg/L	32	8.87	9.25	13.2	14.9	11.5	15.644	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00045	0.00148	0.00093	0.00072	0.00058	0.00062	0.00083	-	-
Hard-D	mg/L	90.6	26	26	36.9	41.7	32	44.2	-	-
Fe-D	mg/L	<0.0050	0.0916	0.0637	0.0241	0.0129	0.018	0.0395	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	2.6	0.942	0.713	0.962	1.08	0.814	1.259	-	-
Mn-D	mg/L	<0.0010	0.0031	0.0014	<0.0010	0.0016	<0.0010	0.0016	-	-
Hg-D	mg/L	<0.0000020	0.0000048	0.0000032	<0.0000020	<0.0000020	<0.0000020	0.0000028	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.399	0.259	0.222	0.209	0.204	0.175	0.259	-	-
S-D	mg/L	7.4	<3.0	<3.0	<3.0	<3.0	<3.0	3.9	-	-
Se-D	mg/L	0.00029	0.00019	0.00021	0.00027	0.00046	0.0003	0.00028	-	-
Na-D	mg/L	4.78	1.18	0.924	1.26	1.46	1.07	1.921	-	-
Sr-D	mg/L	0.111	0.0327	0.029	0.0419	0.0496	0.0418	0.0528	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 160
2017-2018 Annual Report

EMS ID	E297231	Iron River Upstream of Proposed 7SA5 & Upstream of Reclaimed 242 Mine			Water Quality Guidelines
Site Description		Monthly Samples			
Site Name	IR6				
Date		24-Jan-18	27-Feb-18	20-Mar-18	Max
Parameter	Unit				
SO4-D	mg/L	<1.0	4.3	3	-
Alk-T	mg/L	12.3	28.6	16.2	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	-
TSS	mg/L	<4.0	<4.0	<4.0	25
Al-T	mg/L	0.112	0.0401	0.0645	-
As-T	mg/L	0.00056	0.00132	0.00072	0.005
Ba-T	mg/L	0.0039	0.004	0.0033	5
B-T	mg/L	<0.050	<0.050	<0.050	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	5.85	9.61	6.66	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	0.11
Cu-T	mg/L	0.00079	0.0008	0.00063	0.007
Hard-T	mg/L	17.1	27.2	19.3	-
Fe-T	mg/L	0.077	0.013	0.028	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.004
Mg-T	mg/L	0.607	0.784	0.656	-
Mn-T	mg/L	0.0018	<0.0010	<0.0010	0.8
Hg-T	mg/L	0.0000023	<0.0000020	0.0000022	0.00001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	2
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.170	0.152	0.165	-
S-T	mg/L	<3.0	<3.0	<3.0	-
Se-T	mg/L	0.00013	0.00024	0.00013	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	0.964	1.04	1.02	-
Sr-T	mg/L	0.0229	0.0358	0.0249	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.033
Al-D	mg/L	0.0996	0.0351	0.0626	0.1
As-D	mg/L	0.00051	0.00141	0.00071	-
Ba-D	mg/L	0.0038	0.0043	0.0033	-
B-D	mg/L	<0.050	<0.050	<0.050	-
Cd-D	mg/L	0.0000080	0.000007	0.000009	0.000017
Ca-D	mg/L	6.2	11.2	6.85	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00083	0.00058	0.00059	-
Hard-D	mg/L	17.8	31.2	19.7	-
Fe-D	mg/L	0.0325	0.0139	0.0222	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	0.57	0.811	0.634	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	-
Hg-D	mg/L	0.0000031	<0.0000020	0.0000023	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.178	0.166	0.153	-
S-D	mg/L	<3.0	<3.0	<3.0	-
Se-D	mg/L	0.00013	0.00028	0.00017	-
Na-D	mg/L	0.866	1.13	0.968	-
Sr-D	mg/L	0.0224	0.0375	0.0254	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	-

Table 161
2017-2018 Annual Report

EMS ID	E297232	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine							Water Quality Guidelines	
Site Description		5 in 30 Weekly Samples					Monthly			
Site Name	IR8									
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5-Jun-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	3.10	1.43	2.01	0.90	0.94	1.97	1.68	128	-
Alk-T	mg/L	23.7	23.5	26.2	24.6	28	28.0	25.2	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0569	0.0714	0.0993	0.0767	0.0667	0.0391	0.0742	-	-
As-T	mg/L	0.00079	0.00069	0.0007	0.00057	0.00065	0.00116	0.00068	-	0.005
Ba-T	mg/L	0.0034	0.0033	0.0037	0.0033	0.0038	0.0044	0.0035	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	0.000018	0.000012	0.000013	0.000012	0.000013	-	-
Ca-T	mg/L	7.4	8.2	8.68	8.34	8.91	10.2	8.31	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00202	0.00081	0.00077	0.00069	0.00072	0.00101	0.0010	0.0020	0.0070
Hard-T	mg/L	21.2	23.5	24.2	23.4	25.3	29.5	24	-	-
Fe-T	mg/L	0.023	0.033	0.077	0.042	0.034	0.044	0.042	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	0.005
Mg-T	mg/L	0.663	0.728	0.608	0.615	0.732	1	0.669	-	-
Mn-T	mg/L	<0.0010	<0.0010	0.0024	<0.0010	<0.0010	0.0018	0.0013	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	0.0000023	0.0000028	<0.0000020	<0.0000020	0.0000022	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.161	0.181	0.195	0.17	0.194	0.226	0.18	-	-
S-T	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-T	mg/L	0.00015	0.00012	0.00013	0.00013	0.00014	0.00013	0.00013	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	0.91	1.05	0.874	0.807	0.914	1.31	0.911	-	-
Sr-T	mg/L	0.0271	0.0266	0.0296	0.0269	0.0306	0.034	0.0282	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.03
Al-D	mg/L	0.0644	0.0598	0.0728	0.0696	0.0629	0.0322	0.0659	0.05	0.1
As-D	mg/L	0.00079	0.00067	0.00069	0.00056	0.00064	0.00109	0.00067	-	-
Ba-D	mg/L	0.0036	0.0034	0.0036	0.0031	0.0036	0.0044	0.0035	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	0.0000080	0.0000072	0.0000180	0.0000110	0.0000127	0.0000090	0.000011	0.000080	0.000170
Ca-D	mg/L	8.53	7.6	9.24	8.05	9.03	10.3	8.49	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00077	0.00113	0.00078	0.00067	0.00064	0.00084	0.0008	-	-
Hard-D	mg/L	24.3	21.8	25.8	22.6	25.6	29.5	24	-	-
Fe-D	mg/L	0.0254	0.0236	0.0267	0.0255	0.0275	0.0282	0.0257	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	0.727	0.692	0.658	0.606	0.753	0.933	0.687	-	-
Mn-D	mg/L	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0012	0.0010	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	0.0000023	0.0000027	0.0000020	<0.0000020	0.0000022	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.187	0.176	0.209	0.154	0.202	0.227	0.186	-	-
S-D	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	-	-
Se-D	mg/L	0.00014	0.00013	0.00014	0.00012	0.00013	0.00014	0.00013	-	-
Na-D	mg/L	1.07	1.01	0.983	0.815	0.919	1.26	0.959	-	-
Sr-D	mg/L	0.0303	0.0271	0.0317	0.0267	0.0316	0.0347	0.0295	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 162
2017-2018 Annual Report

EMS ID	E297232		Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine							Water Quality Guidelines	
Site Description			5 in 30 Weekly Samples								
Site Name	IR8	Monthly									
Date		25-Jul-17	4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	27-Sep-17	5x30 Average	Average	Max
Parameter	Unit										
SO4-D	mg/L	8.31	9.7	11.4	4.92	4.38	4.8	18.6	7.04	128	-
Alk-T	mg/L	61.9	70.3	72.7	53.4	54.7	55.1	80.7	61.2	-	-
Acidity 8.3	mg/L	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	-	-
Al-T	mg/L	0.0198	0.0184	0.0198	0.0212	0.0114	0.0093	0.0104	0.016	-	-
As-T	mg/L	0.00743	0.0126	0.0119	0.00062	0.00061	0.00069	0.0172	0.00528	-	0.005
Ba-T	mg/L	0.0103	0.0123	0.0121	0.0115	0.0106	0.0103	0.0162	0.0114	-	-
B-T	mg/L	<0.050	0.064	0.072	<0.050	<0.050	<0.050	0.089	0.057	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	0.000016	0.000014	0.000011	<0.000010	0.000012	-	-
Ca-T	mg/L	23	30.3	28.5	20.5	19.1	18.2	30.9	23.30	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00074	0.00073	0.00064	0.00073	0.00062	0.0005	0.00064	0.0006	0.002	0.0070
Hard-T	mg/L	64.9	84.6	80.3	58.8	55.5	53.9	87.8	67	-	-
Fe-T	mg/L	<0.010	0.018	<0.010	0.027	0.042	0.018	<0.010	0.023	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.8	2.13	2.25	1.83	1.87	2.04	2.59	2.02	-	-
Mn-T	mg/L	<0.0010	<0.0010	<0.0010	0.0045	0.0010	0.0026	<0.0010	0.0020	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.326	0.421	0.444	0.443	0.395	0.331	0.463	0.407	-	-
S-T	mg/L	<3.0	3.3	3.8	<3.0	<3.0	<3.0	6.7	3.2	-	-
Se-T	mg/L	0.00025	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.00011	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	3	4.54	5.31	2.59	2.57	2.57	5.65	3.52	-	-
Sr-T	mg/L	0.0756	0.0894	0.0943	0.0695	0.0679	0.0663	0.112	0.0775	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.03
Al-D	mg/L	0.0184	0.0195	0.0342	0.008	0.0076	0.0073	0.0112	0.0153	0.05	0.1
As-D	mg/L	0.00729	0.0129	0.012	0.00065	0.00054	0.00062	0.0172	0.00534	-	-
Ba-D	mg/L	0.0098	0.0121	0.013	0.0114	0.0105	0.0106	0.016	0.0115	-	-
B-D	mg/L	<0.050	0.065	0.064	<0.050	<0.050	<0.050	0.095	0.056	-	-
Cd-D	mg/L	0.0000070	0.000007	0.0000070	0.0000130	0.0000120	0.00001	0.000008	0.000010	0.000080	0.00017
Ca-D	mg/L	24.1	28.3	28.0	19.6	19.7	18.3	31.2	22.8	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00067	0.00075	0.00131	0.00057	0.00042	0.00046	0.00059	0.0007	-	-
Hard-D	mg/L	67.4	80	79.5	56.4	56.5	53.4	89.7	65.2	-	-
Fe-D	mg/L	0.0087	0.0122	<0.0050	0.0058	0.0067	0.0092	0.0069	0.0078	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.76	2.25	2.29	1.8	1.77	1.85	2.85	1.99	-	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	0.0019	<0.0010	0.0015	<0.0010	0.0013	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.373	0.448	0.442	0.461	0.406	0.318	0.485	0.415	-	-
S-D	mg/L	3.0	4.3	3.9	<3.0	<3.0	<3.0	7.2	3.4	-	-
Se-D	mg/L	0.00028	0.00019	0.00016	<0.00010	<0.00010	<0.00010	0.00016	0.00013	-	-
Na-D	mg/L	2.87	4.72	5.36	2.48	2.39	2.37	6.43	3.460	-	-
Sr-D	mg/L	0.0749	0.0863	0.0941	0.07	0.0659	0.0643	0.114	0.0761	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 163
2017-2018 Annual Report

EMS ID	E297232									
Site Description		›n River Downstream of Proposed 7SA5 & Reclaimed 242 Mi								
Site Name	IR8	5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Date		12-Oct-17	18-Oct-17	23-Oct-17	30-Oct-17	7-Nov-17	12-Dec-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	20.5	5.2	2.80	7.90	6.5	3.9	8.6	128	-
Alk-T	mg/L	78.1	23.4	24.2	33.7	41.6	29	40.2	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0078	0.123	0.0984	0.041	0.0265	0.0433	0.0593	-	-
As-T	mg/L	0.0162	0.00112	0.00081	0.00172	0.00246	0.0015	0.00446	-	0.005
Ba-T	mg/L	0.0142	0.0054	0.0044	0.0053	0.0056	0.004	0.0070	-	-
B-T	mg/L	0.086	<0.050	<0.050	<0.050	<0.050	<0.050	0.057	-	-
Cd-T	mg/L	<0.000010	0.000035	0.000016	<0.000010	<0.000010	0.000015	0.000016	-	-
Ca-T	mg/L	31	10.1	8.97	11.7	14.7	10.1	15.29	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	0.004	0.11
Cu-T	mg/L	0.00069	0.0050	0.00118	0.00092	0.00065	0.0006	0.0017	0.002	0.0070
Hard-T	mg/L	89.4	29	25.9	33.2	41.4	28.7	44	-	-
Fe-T	mg/L	<0.010	0.135	0.073	0.027	0.014	0.02	0.052	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	2.94	0.934	0.837	1	1.12	0.823	1.366	-	-
Mn-T	mg/L	<0.0010	0.0046	0.0017	0.0011	0.0017	<0.0010	0.0020	0.7	0.8
Hg-T	mg/L	<0.0000020	0.0000058	0.0000025	<0.0000020	<0.0000020	<0.0000020	0.0000029	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.436	0.283	0.237	0.215	0.21	0.148	0.276	-	-
S-T	mg/L	6.8	<3.0	<3.0	<3.0	<3.0	<3.0	3.8	-	-
Se-T	mg/L	0.0002	0.00022	0.00017	0.0003	0.00038	0.00024	0.00025	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	0.00005	0.0001
Na-T	mg/L	6.71	1.24	1.11	1.42	1.63	1.2	2.42	-	-
Sr-T	mg/L	0.11	0.0318	0.0316	0.0443	0.0511	0.0376	0.0538	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.0075	0.096	0.0798	0.0363	0.0239	0.0398	0.0487	0.05	0.1
As-D	mg/L	0.017	0.00091	0.0007	0.00157	0.00251	0.00158	0.00454	-	-
Ba-D	mg/L	0.0145	0.005	0.0041	0.0053	0.0057	0.0043	0.0069	-	-
B-D	mg/L	0.088	<0.050	<0.050	<0.050	<0.050	<0.050	0.058	-	-
Cd-D	mg/L	0.0000070	0.0000150	0.000012	0.0000090	0.0000100	0.0000072	0.000011	0.00008	0.00017
Ca-D	mg/L	31.9	8.43	8.86	12	15	10.8	15.238	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00052	0.00155	0.00096	0.00075	0.00067	0.00062	0.00089	-	-
Hard-D	mg/L	92.4	25.0	25.3	34	42.2	30.5	43.8	-	-
Fe-D	mg/L	0.0077	0.071	0.0857	0.0205	0.0132	0.0147	0.0396	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	3.09	0.951	0.759	0.982	1.17	0.861	1.39	-	-
Mn-D	mg/L	<0.0010	0.0028	0.0015	<0.0010	0.0015	<0.0010	0.0016	-	-
Hg-D	mg/L	<0.0000020	0.000004	0.0000032	<0.0000020	<0.0000020	<0.0000020	0.0000026	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.441	0.256	0.215	0.209	0.212	0.157	0.267	-	-
S-D	mg/L	7.5	<3.0	<3.0	<3.0	<3.0	<3.0	3.9	-	-
Se-D	mg/L	0.0002	0.00023	0.00015	0.00027	0.00038	0.00023	0.00025	-	-
Na-D	mg/L	6.58	1.24	0.989	1.39	1.68	1.21	2.376	-	-
Sr-D	mg/L	0.109	0.0338	0.0286	0.0432	0.049	0.0387	0.0527	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 164
2017-2018 Annual Report

EMS ID	E297232	Iron River Downstream of Proposed 7SA5 & Reclaimed 242 Mine			Water Quality Guidelines
Site Description		Monthly Samples			
Site Name	IR8				
Date		24-Jan-18	27-Feb-18	20-Mar-18	Max
Parameter	Unit				
SO4-D	mg/L	<1.0	3.7	2.80	-
Alk-T	mg/L	13.9	29	16.4	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	-
TSS	mg/L	<4.0	<4.0	<4.0	25
Al-T	mg/L	0.102	0.0374	0.0605	-
As-T	mg/L	0.0007	0.00262	0.00111	0.005
Ba-T	mg/L	0.0035	0.0045	0.0035	5
B-T	mg/L	<0.050	<0.050	<0.050	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	5.66	9.55	6.87	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	0.11
Cu-T	mg/L	0.00082	0.0007	0.00089	0.007
Hard-T	mg/L	16.7	27.3	19.9	-
Fe-T	mg/L	0.06	0.014	0.03	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.004
Mg-T	mg/L	0.629	0.825	0.666	-
Mn-T	mg/L	0.0016	<0.0010	<0.0010	0.8
Hg-T	mg/L	0.0000024	<0.0000020	0.0000021	0.00001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	2
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.156	0.156	0.155	-
S-T	mg/L	<3.0	<3.0	<3.0	-
Se-T	mg/L	0.00011	0.00026	0.00016	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	0.936	1.24	1.06	-
Sr-T	mg/L	0.021	0.0355	0.0242	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.033
Al-D	mg/L	0.0852	0.0333	0.0563	0.1
As-D	mg/L	0.00064	0.00234	0.00114	-
Ba-D	mg/L	0.0035	0.005	0.0035	-
B-D	mg/L	<0.050	<0.050	<0.050	-
Cd-D	mg/L	0.0000060	0.000006	0.000010	0.00017
Ca-D	mg/L	6.01	10.8	6.98	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00064	0.00061	0.0006	-
Hard-D	mg/L	17.4	30.6	20.2	-
Fe-D	mg/L	0.0296	0.0127	0.0226	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	0.58	0.857	0.677	-
Mn-D	mg/L	<0.0010	<0.0010	<0.0010	-
Hg-D	mg/L	0.0000032	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.160	0.166	0.144	-
S-D	mg/L	<3.0	<3.0	<3.0	-
Se-D	mg/L	0.0001	0.00026	0.00013	-
Na-D	mg/L	0.889	1.23	1.04	-
Sr-D	mg/L	0.021	0.0372	0.0258	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	-

Table 165
2017-2018 Annual Report

EMS ID	E299256									
Site Description		Quinsam River Downstream of the Confluence with Iron River								
Site Name	IRQR	5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Date		4-Apr-17	12-Apr-17	19-Apr-17	24-Apr-17	3-May-17	5-Jun-17	5x30 Average	Average	Max
Parameter										
SO4-D	mg/L	17.1	17.5	16.8	16.1	15.9	26	16.7	128	-
Alk-T	mg/L	29.5	28.7	30	31.9	33	39.8	30.6	-	-
Acidity 8.3	mg/L	<0.50	<0.50	<0.50	2.05	<0.50	<0.50	0.81	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0387	0.0454	0.0623	0.0551	0.0498	0.0242	0.0503	-	-
As-T	mg/L	0.00053	0.00051	0.00056	0.00049	0.00054	0.00066	0.00053	-	0.005
Ba-T	mg/L	0.0032	0.0031	0.0032	0.0032	0.0034	0.0035	0.0032	-	-
B-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.058	0.050	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	9.25	10.0	10.2	6.53	10.3	11.8	9.26	-	-
Cr-T	mg/L	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	0.05
Cu-T	mg/L	0.00216	0.0009	0.00056	0.0007	0.00069	0.00059	0.0010	0.0020	0.0070
Hard-T	mg/L	27.9	30	29.4	20.7	30.5	35.6	28	-	-
Fe-T	mg/L	0.142	0.053	0.075	0.043	0.068	0.062	0.076	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.15	1.22	0.94	1.08	1.15	1.47	1.108	-	-
Mn-T	mg/L	0.0036	0.0031	0.0042	0.0032	0.0037	0.0052	0.0036	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.204	0.223	0.188	0.21	0.222	0.232	0.209	-	-
S-T	mg/L	5.8	6.1	5.2	5.5	5.3	8.2	5.6	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	6.81	7.40	6.82	7.36	7.92	13.1	7.26	-	-
Sr-T	mg/L	0.047	0.0493	0.0459	0.0454	0.0475	0.0614	0.0470	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.03
Al-D	mg/L	0.0383	0.0399	0.0503	0.0475	0.0415	0.0179	0.0435	0.05	0.1
As-D	mg/L	0.00055	0.00049	0.00056	0.00048	0.00054	0.00065	0.00052	-	-
Ba-D	mg/L	0.0033	0.0031	0.0034	0.003	0.0034	0.0036	0.0032	-	-
B-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.0000060	0.000006	0.0000070	<0.0000050	0.000006	0.000073	0.000132
Ca-D	mg/L	10.9	9.6	11.1	9.88	11.1	11.7	10.52	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.0023	0.00124	0.00059	0.00054	0.00079	0.00061	0.00109	-	-
Hard-D	mg/L	32.3	29	32.1	28.9	32.5	35.6	31	-	-
Fe-D	mg/L	0.0462	0.0379	0.0386	0.0358	0.0448	0.0419	0.0407	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.25	1.21	1.08	1.04	1.19	1.58	1.15	-	-
Mn-D	mg/L	0.0023	0.002	0.0031	0.0023	0.0027	0.0041	0.0025	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.232	0.221	0.214	0.2	0.227	0.245	0.219	-	-
S-D	mg/L	6.4	6.3	6.3	4.9	5.8	8.3	5.9	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Na-D	mg/L	7.68	7.47	7.69	7.26	8.17	13.5	7.650	-	-
Sr-D	mg/L	0.0519	0.0492	0.0516	0.0458	0.051	0.0602	0.0499	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 166
2017-2018 Annual Report

EMS ID	E299256		Quinsam River Downstream of the Confluence with Iron River								
Site Description			5 in 30 Weekly Samples							Water Quality Guidelines	
Site Name	IRQR	Monthly						Monthly			
Date		25-Jul-17	4-Aug-17	9-Aug-17	17-Aug-17	22-Aug-17	30-Aug-17	27-Sep-17	5x30 Average	Average	Max
Parameter	Unit										
SO4-D	mg/L	27.2	29.5	31.5	28.8	29.2	29.4	31.7	29.7	128	-
Alk-T	mg/L	44.2	45	44.1	42.7	43.2	44	41.1	43.8	-	-
Acidity 8.3	mg/L	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	-	-
Al-T	mg/L	0.0187	0.0162	0.0197	0.0149	0.0161	0.0231	0.0119	0.018	-	-
As-T	mg/L	0.00055	0.00055	0.00053	0.00048	0.00053	0.00047	0.00041	0.00051	-	0.005
Ba-T	mg/L	0.0033	0.0031	0.0027	0.0028	0.0029	0.0032	0.0031	0.0029	-	-
B-T	mg/L	0.064	0.059	0.061	0.060	0.065	0.058	0.052	0.061	-	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	-	-
Ca-T	mg/L	11.7	11.4	12.5	11.4	12	12	12.5	11.90	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	0.05
Cu-T	mg/L	0.00082	<0.00050	0.00053	0.00053	0.00055	0.00063	0.00073	0.0006	0.002	0.007
Hard-T	mg/L	35.4	34.6	37.5	34.8	36.6	36.7	37.5	36	-	-
Fe-T	mg/L	0.081	0.073	0.103	0.062	0.108	0.073	0.077	0.084	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.53	1.48	1.52	1.53	1.58	1.62	1.5	1.55	-	-
Mn-T	mg/L	0.0066	0.0062	0.0077	0.0044	0.0066	0.0064	0.0065	0.0063	0.7	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.258	0.261	0.277	0.256	0.299	0.296	0.327	0.278	-	-
S-T	mg/L	9.8	9.9	10.3	10.3	12.3	10.5	11.8	10.7	-	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	17.90	18.2	18.8	19	18.4	17.5	16.5	18.4	-	-
Sr-T	mg/L	0.0581	0.0601	0.062	0.0588	0.0662	0.0645	0.0666	0.0623	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.03
Al-D	mg/L	0.0125	0.0141	0.0143	0.0129	0.0115	0.0113	0.0091	0.0128	0.05	0.1
As-D	mg/L	0.00051	0.00055	0.00053	0.00048	0.00047	0.00045	0.00043	0.0005	-	-
Ba-D	mg/L	0.0031	0.0031	0.0030	0.003	0.0029	0.0032	0.0032	0.0030	-	-
B-D	mg/L	0.061	0.065	0.058	0.057	0.059	0.055	0.061	0.059	-	-
Cd-D	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	0.00017	0.00043
Ca-D	mg/L	12.4	12.7	13.9	11.8	12.6	11.7	11.9	12.5	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00052	0.00051	0.00068	0.00057	0.00043	0.0008	0.00045	0.0006	-	-
Hard-D	mg/L	37.3	38.3	41.4	35.7	37.6	35.6	36.4	37.7	-	-
Fe-D	mg/L	0.0539	0.0593	0.0621	0.0553	0.0511	0.0483	0.0452	0.0552	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.57	1.56	1.61	1.52	1.48	1.54	1.61	1.54	-	-
Mn-D	mg/L	0.0050	0.0059	0.0053	0.0057	0.0055	0.0053	0.0053	0.0055	-	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000002	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.295	0.31	0.299	0.295	0.31	0.292	0.314	0.301	-	-
S-D	mg/L	9.9	10.7	11.4	12.3	12.6	10.3	12.4	11.5	-	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	-	-
Na-D	mg/L	18.2	19.1	19.9	18.4	17.6	16.9	17.8	18.400	-	-
Sr-D	mg/L	0.0603	0.0608	0.0658	0.0682	0.0652	0.0631	0.0682	0.0646	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 167
2017-2018 Annual Report

EMS ID	E299256	Quinsam River Downstream of the Confluence with Iron River								
Site Description		5 in 30 Weekly Samples					Monthly		Water Quality Guidelines	
Site Name	IRQR									
Date		12-Oct-17	20-Oct-17	23-Oct-17	30-Oct-17	7-Nov-17	12-Dec-17	5x30 Average	Average	Max
Parameter	Unit									
SO4-D	mg/L	32.6	23.4	23.4	31.7	26.1	13.5	27.40	128	-
Alk-T	mg/L	45.1	28.6	32.7	37.8	38.2	28.8	36.5	-	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.00	-	-
TSS	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	5	25
Al-T	mg/L	0.0092	0.0961	0.0623	0.0175	0.0144	0.0325	0.0399	-	-
As-T	mg/L	0.0004	0.00055	0.00062	0.00062	0.00062	0.00053	0.00056	-	0.005
Ba-T	mg/L	0.0032	0.0041	0.0042	0.0041	0.0038	0.0029	0.0039	-	-
B-T	mg/L	0.065	<0.050	<0.050	<0.050	0.053	<0.050	0.054	-	-
Cd-T	mg/L	<0.000010	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	-	-
Ca-T	mg/L	13.2	11.8	11.9	13	13.2	10.2	12.60	-	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0002	-	0.05
Cu-T	mg/L	<0.00050	0.00132	0.00091	0.00064	0.00103	0.00067	0.0009	0.0020	0.0070
Hard-T	mg/L	39.9	35.4	35.6	39.1	39.7	30.1	38	-	-
Fe-T	mg/L	0.063	0.108	0.08	0.058	0.078	0.057	0.077	-	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	0.003	0.005
Mg-T	mg/L	1.68	1.45	1.4	1.61	1.65	1.14	1.56	-	-
Mn-T	mg/L	0.0055	0.005	0.004	0.0050	0.0069	0.0046	0.0053	0.7	0.8
Hg-T	mg/L	<0.0000020	0.0000025	0.0000023	<0.0000020	<0.0000020	<0.0000020	0.0000022	-	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	0.025
K-T	mg/L	0.331	0.3	0.282	0.271	0.273	0.161	0.291	-	-
S-T	mg/L	11.6	7.2	6.7	8.5	8.7	4.7	8.5	-	-
Se-T	mg/L	<0.00010	0.00012	0.00013	0.00011	0.00011	<0.00010	0.00011	-	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000020	-	0.0001
Na-T	mg/L	19	7.47	8.28	12.8	13.8	4.82	12.27	-	-
Sr-T	mg/L	0.0682	0.0563	0.0575	0.0745	0.065	0.0419	0.0643	-	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	0.0075	0.033
Al-D	mg/L	0.0063	0.0689	0.0486	0.0151	0.0129	0.0254	0.0304	0.05	0.1
As-D	mg/L	0.00038	0.00056	0.00058	0.00059	0.00066	0.00055	0.00055	-	-
Ba-D	mg/L	0.0035	0.0043	0.0045	0.0041	0.0038	0.0032	0.0040	-	-
B-D	mg/L	0.067	<0.050	<0.050	<0.050	0.055	<0.050	0.054	-	-
Cd-D	mg/L	<0.0000050	0.0000090	0.000008	<0.0000050	<0.0000050	<0.0000050	0.000006	0.000088	0.00017
Ca-D	mg/L	13.3	12.1	12	14.3	12.9	11.0	12.92	-	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Cu-D	mg/L	0.00045	0.00102	0.001	0.00053	0.00057	0.00069	0.00071	-	-
Hard-D	mg/L	40.9	36.4	35.8	42.4	38.6	32.4	38.8	-	-
Fe-D	mg/L	0.0489	0.0632	0.0641	0.0499	0.068	0.0423	0.0588	-	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	-	-
Mg-D	mg/L	1.86	1.48	1.4	1.63	1.56	1.19	1.59	-	-
Mn-D	mg/L	0.0058	0.0038	0.0035	0.0049	0.0065	0.0048	0.0049	-	-
Hg-D	mg/L	<0.0000020	0.000004	0.0000023	<0.0000020	<0.0000020	<0.0000020	0.0000025	-	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	-	-
K-D	mg/L	0.353	0.321	0.278	0.279	0.255	0.173	0.297	-	-
S-D	mg/L	12.4	8.2	7.7	9.2	8.3	4.3	9.2	-	-
Se-D	mg/L	<0.00010	0.00010	0.00011	0.00011	0.00010	0.00011	0.00010	-	-
Na-D	mg/L	20.9	7.25	7.81	12.4	12.8	4.98	12.230	-	-
Sr-D	mg/L	0.0693	0.0576	0.0572	0.0682	0.0642	0.0453	0.0633	-	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	-	-

Table 168
2017-2018 Annual Report

EMS ID	E299256	Quinsam River Downstream of the Confluence with Iron River			Water Quality Guidelines
Site Description		Monthly Samples			
Site Name	IRQR				
Date		24-Jan-18	27-Feb-18	20-Mar-18	Max
Parameter	Unit				
SO4-D	mg/L	16.8	30.8	24.7	-
Alk-T	mg/L	22.9	38.3	30.4	-
Acidity 8.3	mg/L	<1.0	<1.0	<1.0	-
TSS	mg/L	<4.0	<4.0	<4.0	25
Al-T	mg/L	0.0896	0.0253	0.0376	-
As-T	mg/L	0.00047	0.00043	0.00055	0.005
Ba-T	mg/L	0.0031	0.0029	0.0033	-
B-T	mg/L	<0.050	<0.050	<0.050	-
Cd-T	mg/L	<0.000010	<0.000010	<0.000010	-
Ca-T	mg/L	8.3	11.7	11.7	-
Cr-T	mg/L	<0.0010	<0.0010	<0.0010	-
Co-T	mg/L	<0.00020	<0.00020	<0.00020	0.05
Cu-T	mg/L	0.00091	0.00067	0.00066	0.0070
Hard-T	mg/L	25.5	35.6	35.1	-
Fe-T	mg/L	0.097	0.044	0.052	1
Pb-T	mg/L	<0.00020	<0.00020	<0.00020	0.005
Mg-T	mg/L	1.16	1.53	1.42	-
Mn-T	mg/L	0.0034	0.0034	0.0033	0.8
Hg-T	mg/L	<0.0000020	<0.0000020	<0.0000020	0.0001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-T	mg/L	<0.0010	<0.0010	<0.0010	0.025
K-T	mg/L	0.206	0.276	0.239	-
S-T	mg/L	5.9	10.9	8	-
Se-T	mg/L	<0.00010	<0.00010	<0.00010	-
Ag-T	mg/L	<0.000020	<0.000020	<0.000020	0.0001
Na-T	mg/L	7.44	14.3	10.50	-
Sr-T	mg/L	0.0422	0.068	0.0609	-
Zn-T	mg/L	<0.0050	<0.0050	<0.0050	0.033
Al-D	mg/L	0.0559	0.0211	0.0268	0.1
As-D	mg/L	0.00034	0.00045	0.00046	-
Ba-D	mg/L	0.003	0.0032	0.0032	-
B-D	mg/L	<0.050	0.051	<0.050	-
Cd-D	mg/L	<0.0000050	<0.0000050	0.000006	0.00017
Ca-D	mg/L	8.8	13.1	10.9	-
Cr-D	mg/L	<0.0010	<0.0010	<0.0010	-
Co-D	mg/L	<0.00020	<0.00020	<0.00020	-
Cu-D	mg/L	0.00066	0.00064	0.00071	-
Hard-D	mg/L	26.5	39	32.4	-
Fe-D	mg/L	0.0350	0.0384	0.0336	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	-
Mg-D	mg/L	1.1	1.54	1.27	-
Mn-D	mg/L	0.0016	0.003	0.003	-
Hg-D	mg/L	<0.0000020	<0.0000020	<0.0000020	-
Mo-D	mg/L	<0.0010	<0.0010	<0.0010	-
Ni-D	mg/L	<0.0010	<0.0010	<0.0010	-
K-D	mg/L	0.22	0.266	0.209	-
S-D	mg/L	6.5	11.6	6.7	-
Se-D	mg/L	<0.00010	<0.00010	<0.00010	-
Na-D	mg/L	6.95	13.4	8.54	-
Sr-D	mg/L	0.0404	0.0698	0.0567	-
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	-

Table 169
2017-2018 Annual Report

EMS ID	E292127																									
Site Description:	2 South Pit in Pit Water Cover (CCR Water Cover) Continuos Discharge Outflow																									
Site Name	2S																									
Date	April		May		June		July		August		September		October		November		December		Janaury		February		March			
	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)	WL	Q (L/s)
1	0.197849999	22.7	0.1505735	12.6	0.12433634	8.4	0.11733064	7.4	0.12433634	8.4	0.11758818	7.5	0.11309815	6.9	0.11474749	7.1	0.14555064	11.7	0.24920246	37.8	0.14251431	11.2	0.27541627	47.3		
2	0.189340542	20.6	0.15069898	12.6	0.12544591	8.5	0.14013218	10.8	0.12544591	8.5	0.11757843	7.5	0.11385177	7.0	0.11396156	7.0	0.14449202	11.5	0.23064488	31.8	0.14299827	11.3	0.2691371	44.9		
3	0.18002933	18.4	0.1510239	12.6	0.12394802	8.3	0.13797538	10.4	0.12394802	8.3	0.11755773	7.5	0.11377019	7.0	0.11539509	7.2	0.14814361	12.1	0.21256264	26.5	0.14481949	11.6	0.2395177	34.6		
4	0.183835911	19.3	0.14650867	11.8	0.12412236	8.4	0.13572083	10.1	0.12412236	8.4	0.11935162	7.7	0.11300094	6.9	0.11437089	7.0	0.14158224	11.0	0.19648069	22.3	0.15572871	13.5	0.2191925	28.4		
5	0.194672788	21.9	0.14572175	11.7	0.12374988	8.3	0.13637189	10.2	0.12374988	8.3	0.11904727	7.7	0.11244938	6.8	0.11447001	7.1	0.14426921	11.5	0.18596729	19.8	0.12901741	9.1	0.21839648	28.2		
6	0.207828775	25.3	0.14671676	11.9	0.12320221	8.2	0.13491925	9.9	0.12320221	8.2	0.11859026	7.6	0.11383632	7.0	0.12057486	7.9	0.13989705	10.7	0.17914847	18.3	0.14304044	11.3	0.22438074	29.9		
7	0.241835623	35.4	0.14216972	11.1	0.12442591	8.4	0.13383796	9.8	0.12442591	8.4	0.117492	7.4	0.11485502	7.1	0.11836468	7.6	0.1401834	10.8	0.17296286	16.9	0.15255505	12.9	0.27781654	48.3		
8	0.27055094	45.5	0.14600612	11.8	0.1234135	8.3	0.13543524	10.0	0.1234135	8.3	0.11745619	7.4	0.11875195	7.6	0.11596255	7.2	0.1426079	11.2	0.16727281	15.7	0.16159561	14.6	0.25620184	40.2		
9	0.231151807	32.0	0.14336148	11.3	0.12275742	8.2	0.13945922	10.7	0.12275742	8.2	0.11692824	7.4	0.11425006	7.0	0.1190452	7.7	0.14295284	11.2	0.1640183	15.1	0.18277865	19.1	0.23232696	32.3		
10	0.214089577	27.0	0.14230971	11.1	0.12485653	8.5	0.13640949	10.2	0.12485653	8.5	0.1167979	7.4	0.11918693	7.7	0.12006128	7.8	0.14446768	11.5	0.16106995	14.5	0.18235971	19.0	0.21838161	28.2		
11	0.197608555	22.6	0.14383378	11.4	0.12318309	8.2	0.13332886	9.7	0.12318309	8.2	0.11692364	7.4	0.11825732	7.6	0.11884348	7.6	0.14230721	11.1	0.1600742	14.3	0.18918206	20.6	0.19862814	22.9		
12	0.192543492	21.4	0.14304279	11.3	0.12573966	8.6	0.13255211	9.6	0.12573966	8.6	0.11974911	7.7	0.11947299	7.7	0.12356806	8.3	0.14712754	12.0	0.15735861	13.8	0.20026832	23.3	0.19477728	21.9		
13	0.211150207	26.2	0.14352639	11.3	0.12595672	8.6	0.13058831	9.3	0.12595672	8.6	0.11767454	7.5	0.1149035	7.1	0.12134037	8.0	0.1509019	12.6	0.15544411	13.4	0.20218489	23.8	0.18325271	19.2		
14	0.190711446	20.9	0.14465334	11.5	0.12300231	8.2	0.13307061	9.7	0.12300231	8.2	0.11748025	7.4	0.1142471	7.0	0.12520494	8.5	0.20007435	23.2	0.15395571	13.2	0.20419621	24.3	0.17564808	17.5		
15	0.184173092	19.4	0.14771287	12.1	0.12301255	8.2	0.1347492	9.9	0.12301255	8.2	0.11573114	7.2	0.1135367	6.9	0.12218539	8.1	0.21564516	27.4	0.1527013	12.9	0.21087669	26.1	0.17004189	16.3		
16	0.17693383	17.8	0.15661586	13.7	0.12228364	8.1	0.13598218	10.1	0.12228364	8.1	0.11545594	7.2	0.11540507	7.2	0.13370757	9.8	0.27056676	45.5	0.152166	12.8	0.23098168	31.9	0.16916512	16.1		
17	0.174771878	17.3	0.18780628	20.2	0.12042172	7.8	0.13213628	9.5	0.12042172	7.8	0.11563028	7.2	0.11486175	7.1	0.15052496	12.5	0.26692417	44.1	0.15374988	13.1	0.31512707	64.3	0.16180898	14.6		
18	0.168142098	15.9	0.1992908	23.0	0.1205664	7.9	0.13346249	9.7	0.1205664	7.9	0.11780251	7.5	0.12169963	8.0	0.15891438	14.1	0.23209523	32.3	0.15245532	12.9	0.41997006	124.6	0.16122173	14.5		
19	0.177340776	17.9	0.18844656	20.4	0.12335238	8.2	0.13527222	10.0	0.12335238	8.2	0.11611608	7.3	0.1219289	8.0	0.14819701	12.1	0.21057026	26.0	0.15436311	13.2	0.49365566	181.8	0.15733625	13.8		
20	0.177237476	17.8	0.17426698	17.2	0.12484758	8.5	0.13353512	9.7	0.12484758	8.5	0.11565148	7.2	0.11963306	7.7	0.14188785	11.1	0.32380158	68.4	0.15121789	12.7	0.50203516	189.2	0.15831367	14.0		
21	0.171070789	16.5	0.16390205	15.1	0.12682612	8.7	0.12769042	8.9	0.12682612	8.7	0.11569923	7.2	0.11541936	7.2	0.1437542	11.4	0.31943987	66.3	0.15029587	12.5	0.57397042	259.4	0.15281302	13.0		
22	0.168224914	15.9	0.15569816	13.5	0.12663538	8.7	0.12900146	9.1	0.12663538	8.7	0.11635597	7.3	0.11410129	7.0	0.14794242	12.1	0.29437928	55.1	0.14988749	12.4	0.59181138	278.9	0.15190693	12.8		
23	0.164439663	15.2	0.15149875	12.7	0.12061482	7.9	0.12685816	8.7	0.12061482	7.9	0.1200232	7.8	0.11580082	7.2	0.15061522	12.6	0.31130955	62.5	0.14888079	12.3	0.41935455	124.2	0.14973414	12.4		
24	0.15998168	14.3	0.14788444	12.1	0.1201856	7.8	0.12572991	8.6	0.1201856	7.8	0.11724279	7.4	0.11499802	7.1	0.14894928	12.3	0.30092663	57.9	0.14981388	12.4	0.26567071	43.7	0.15120892	12.7		
25	0.161911124	14.7	0.14307261	11.3	0.11876441	7.6	0.12577049	8.6	0.11876441	7.6	0.11489212	7.1	0.11484117	7.1	0.14806785	12.1	0.26920143	45.0	0.14947648	12.4	0.23487974	33.1	0.14487106	11.6		
26	0.155921584	13.5	0.14132202	11.0	0.1205798	7.9	0.12547465	8.5	0.1205798	7.9	0.11512208	7.1	0.1209196	7.9	0.14697979	11.9	0.2819662	49.9	0.14801317	12.1	0.21096316	26.1	0.1494268	12.4		
27	0.155329393	13.4	0.14001716	10.8	0.11934116	7.7	0.12539843	8.5	0.11934116	7.7	0.11361667	6.9	0.11643093	7.3	0.14658307	11.9	0.32933941	71.1	0.14781787	12.1	0.20603214	24.8	0.14688366	11.9		
28	0.152137102	12.8	0.13885345	10.6	0.11864492	7.6	0.12570313	8.6	0.11864492	7.6	0.11352001	6.9	0.11419066	7.0	0.14626822	11.8	0.28732941	52.1	0.14811766	12.1	0.22210452	29.3	0.1449625	11.6		
29	0.155889524	13.5	0.13831437	10.5	0.12029709	7.8	0.12519069	8.5	0.12029709	7.8	0.11450301	7.1	0.11440648	7.0	0.14723792	12.0	0.27020802	45.4	0.14812076	12.1			0.14396259	11.4		
30	0.152002271	12.8	0.14102343	10.9	0.11826639	7.6	0.12429465	8.4	0.11826639	7.6	0.11868765	7.6	0.11878863	7.6	0.14517111	11.6	0.24841732	37.5	0.14585847	11.7			0.14560194	11.7		
31			0.1425596	11.2			0.12428897	8.4	0.11733064	7.4			0.11913339	7.7			0.2562127	40.2	0.14200472	11.1			0.14864858	12.2		
WL= Water Level			Q= Quantity																							

Appendix II

Appendix II
List of Graphs

Graph 1	Hardness Settling Pond 4
Graph 2	Average Monthly Dissolved Sulphate Settling Pond 4
Graph 3	Weekly pH Settling Pond 4
Graph 4	Total Suspended Solids Settling Pond 4 & WC
Graph 5	Dissolved Iron Settling Pond 4
Graph 6	Dissolved Aluminum Settling Pond 4
Graph 7	Total Managanese Settling Pond 4
Graph 8	Total Iron Settling Pond 4 vs QU10-13 D
Graph 9	Hardness Settling Pond 1
Graph 10	Average Monthly Dissolved Sulphate Settling Pond 1
Graph 11	Weekly Field pH Settling Pond 1
Graph 12	Total Suspended Solids Settling Pond 1
Graph 13	Dissolved Iron Settling Pond 1
Graph 14	Total Manganese Settling Pond 1
Graph 15	Dissolved Sulphate 7SSD vs 7S
Graph 16	Total Suspended Solids 7SSD
Graph 17	Dissolved Aluminum 7SSD vs 7S
Graph 18	Total Arsenic 7SSD vs. 7S
Graph 19	Dissolved and Total Copper 7SSD vs. 7S
Graph 20	Dissolved Iron 7SSD vs 7S
Graph 21	Total Manganese 7SSD vs. 7S
Graph 22	Dissolved Sulphate vs Discharge LLE
Graph 23	Dissolved Iron vs Discharge LLE
Graph 24	Dissolved Sulphate Seeps Into Long Lake
Graph 25	Dissolved Arsenic Seeps Into Long Lake
Graph 26	Total Manganese Seeps Into Long Lake
Graph 27	5 in 30 Hardness No Name Lake
Graph 28	5 in 30 pH No Name Lake
Graph 29	5 in 30 Average Dissolved Sulphate No Name Lake
Graph 30	5 in 30 Dissolved Iron No Name Lake
Graph 31	5 in 30 Total Iron No Name Lake
Graph 32	5 in 30 Hardness Long Lake
Graph 33	5 in 30 pH Long Lake
Graph 34	Historic Dissolved Oxygen vs Total Manganese Long Lake 1 Metre from bottom 2005-2018
Graph 35	Historic Dissolved Sulphate Long Lake

Appendix II
List of Graphs

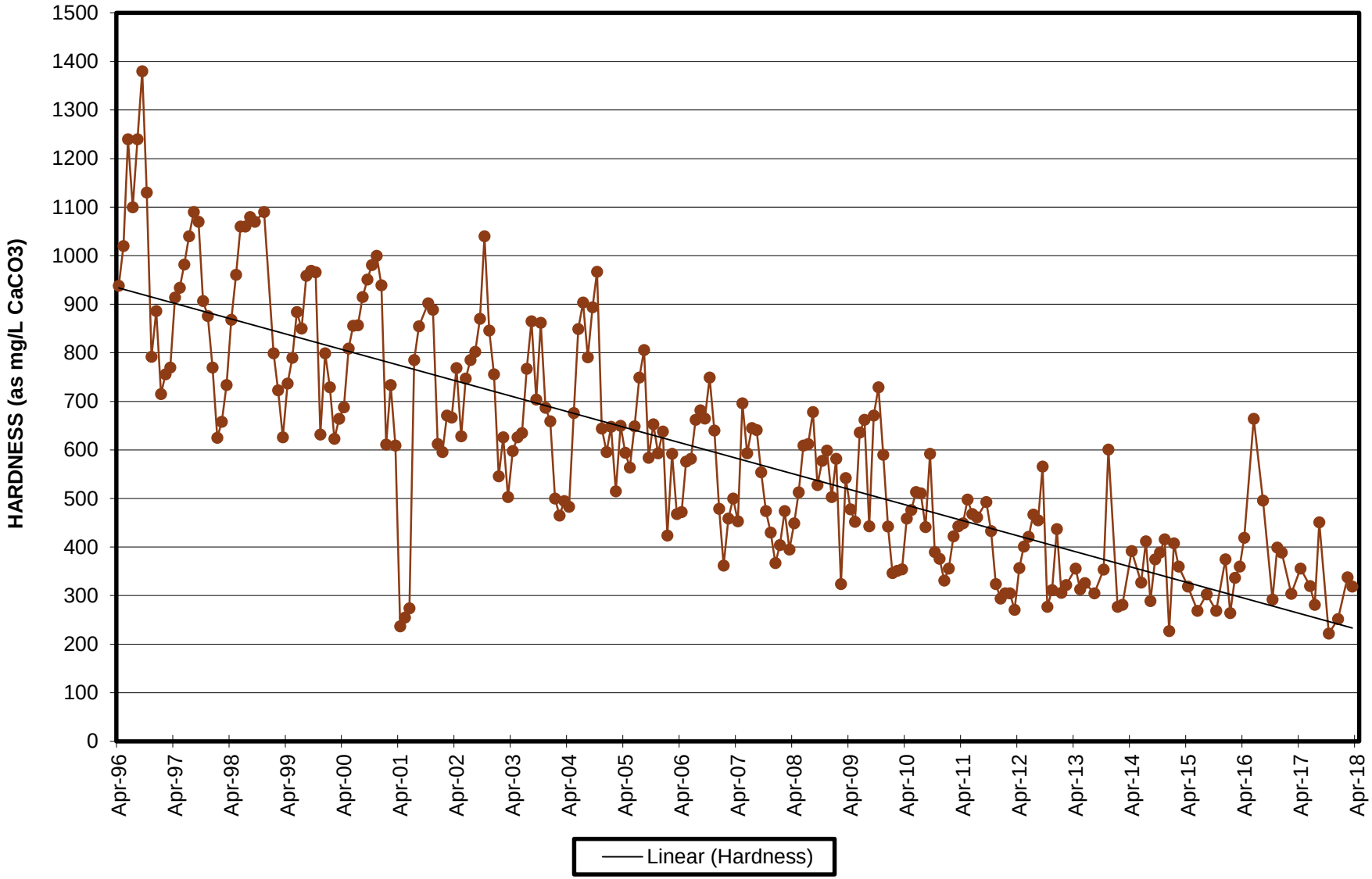
Graph 36	5 in 30 Average Dissolved Sulphate Long Lake
Graph 37	5 in 30 Total Manganese Long Lake
Graph 38	5 in 30 Average Total Manganese Long Lake
Graph 39	5 in 30 Hardness Middle Quinsam Lake
Graph 40	5 in 30 pH Middle Quinsam Lake
Graph 41	5 in 30 Average Dissolved Sulphate Middle Quinsam Lake
Graph 42	5 in 30 Total Manganese Middle Quinsam Lake
Graph 43	5 in 30 Average Total Manganese Middle Quinsam Lake
Graph 44	5 in 30 Total Arsenic Middle Quinsam Lake
Graph 45	5 in 30 Total Iron Middle Quinsam Lake
Graph 46	5 in 30 Hardness Lower Quinsam Lake
Graph 47	5 in 30 pH Lower Quinsam Lake
Graph 48	5 in 30 Average Dissolved Sulphate Lower Quinsam Lake
Graph 49	5 in 30 Total Manganese Lower Quinsam Lake
Graph 50	5 in 30 Average Total Manganese Lower Quinsam Lake
Graph 51	5 in 30 Dissolved Iron vs Dissolved Oxgen Lower Quinsam Lake 1mb
Graph 52	5 in 30 Total Iron vs Dissolved Oxgen Lower Quinsam Lake 1mb
Graph 53	5 in 30 Average Dissolved Sulphate Quinsam Sub Basin: Rivers and Streams
Graph 54	Dissolved Sulphate Quinsam Sub Basin: Rivers and Streams (NNO to LLO)
Graph 55	Dissolved Sulphate Quinsam Sub Basin: Rivers (WA, WB to 7SQR)
Graph 56	5 in 30 Average Dissolved Aluminum Quinsam Sub Basin: Rivers and Streams
Graph 57	5 in 30 Dissolved Aluminum Quinsam Sub Basin: Rivers and Streams
Graph 58	Total Arsenic Quinsam Sub Basin: Rivers and Streams
Graph 59	Total Zinc Quinsam Sub Basin: Rivers and Streams
Graph 60	Dissolved Aluminum vs. Flow Iron River
Graph 61	5 in 30 Average Dissolved Aluminum vs. Flow Iron River
Graph 62	Total Arsenic vs. Flow Iron River
Graph 63	Flow vs. Precipitation WA
Graph 64	Flow vs. Precipitation WB
Graph 65	Discharge LLSM
Graph 66	Discharge vs. Precipitation LLE
Graph 67	Flow vs. Precipitation LLO
Graph 68	Discharge vs. Precipitation 7SSD
Graph 69	Flow vs. Precipitation 7S Stream 1
Graph 70	Flow vs. Precipitation IR8

GRAPH 1

HARDNESS

SETTLING POND 4

QUINSAM COAL

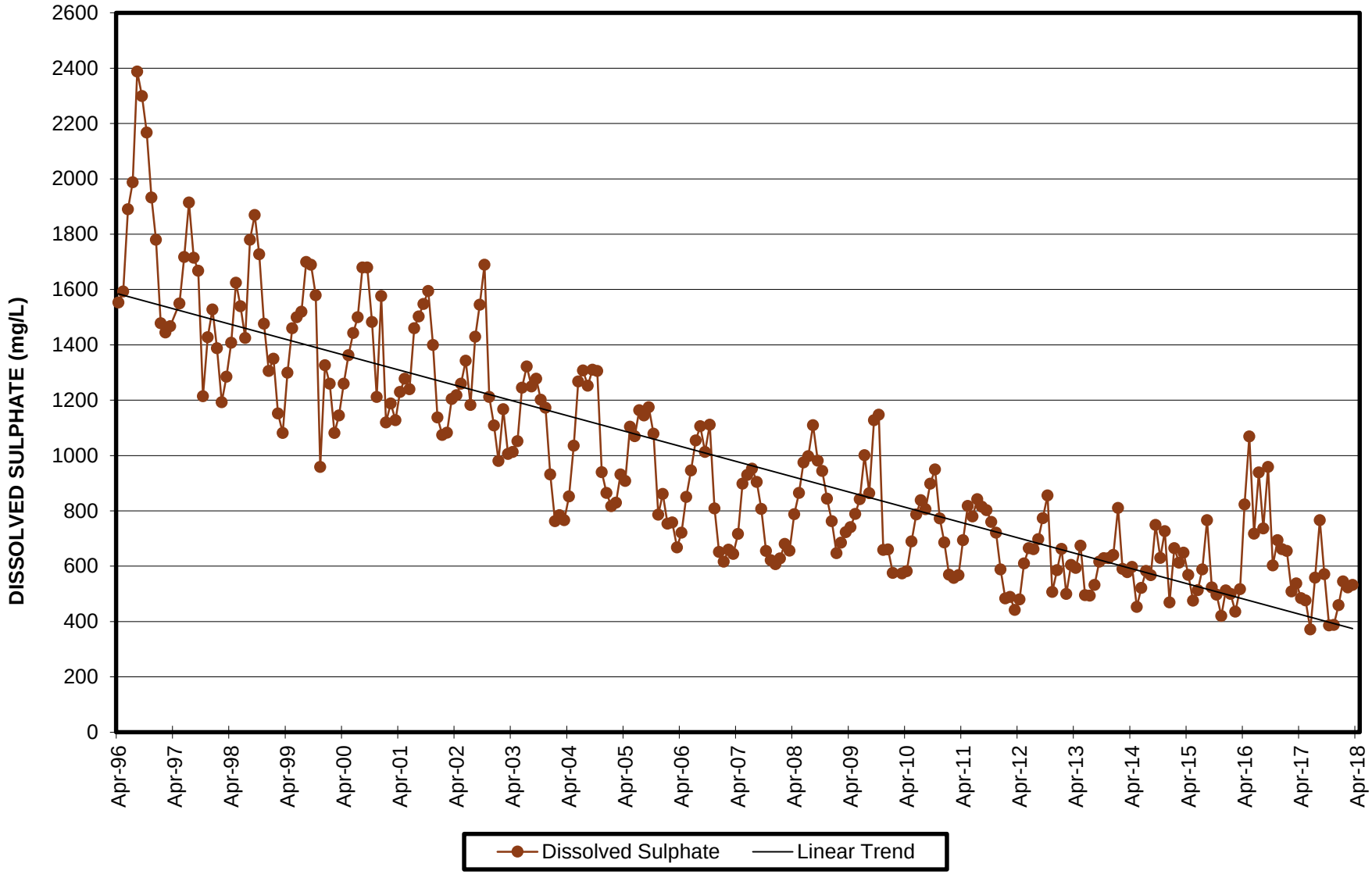


GRAPH 2

AVERAGE MONTHLY DISSOLVED SULPHATE

SETTLING POND 4

QUINSAM COAL

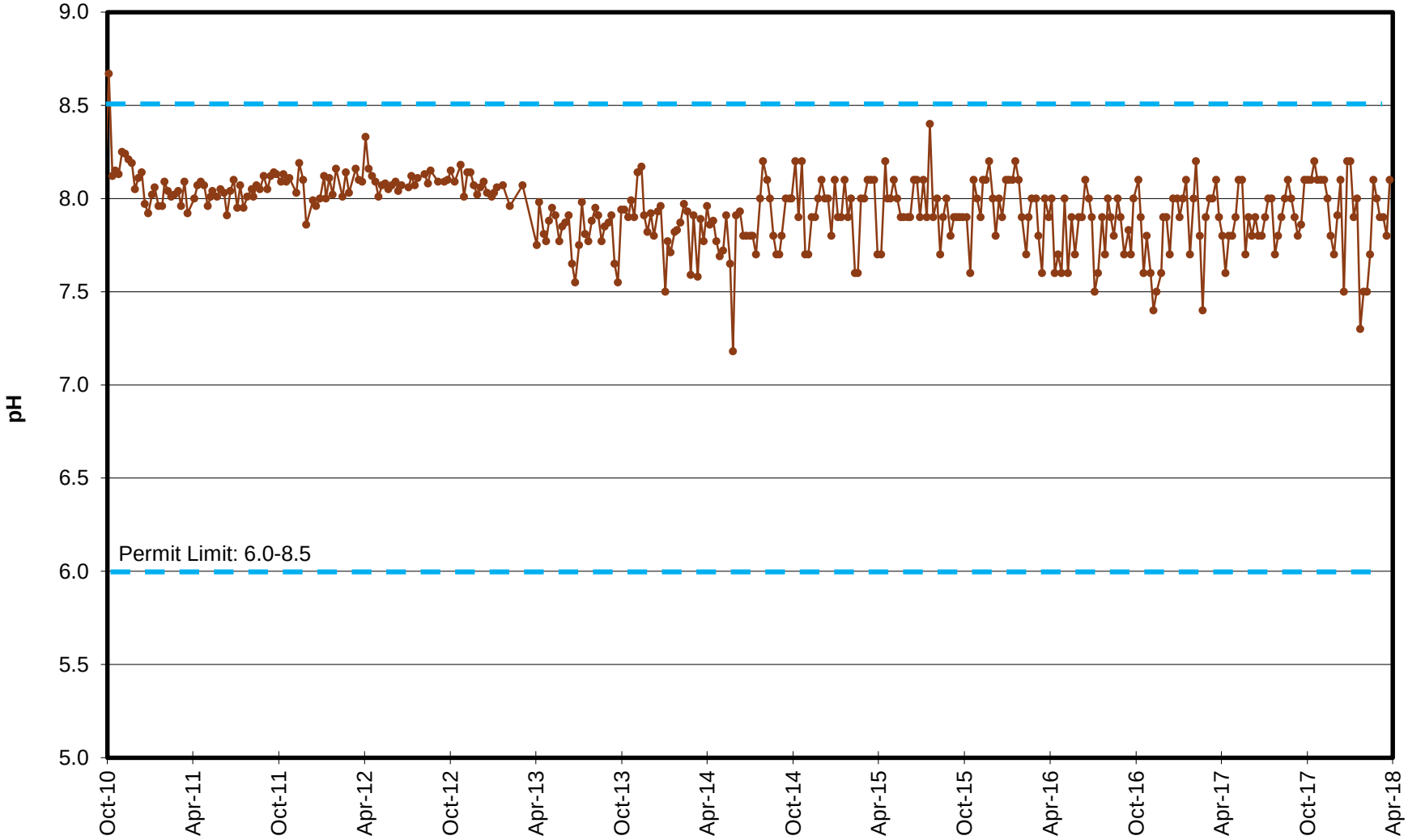


GRAPH 3

WEEKLY pH

SETTLING POND 4

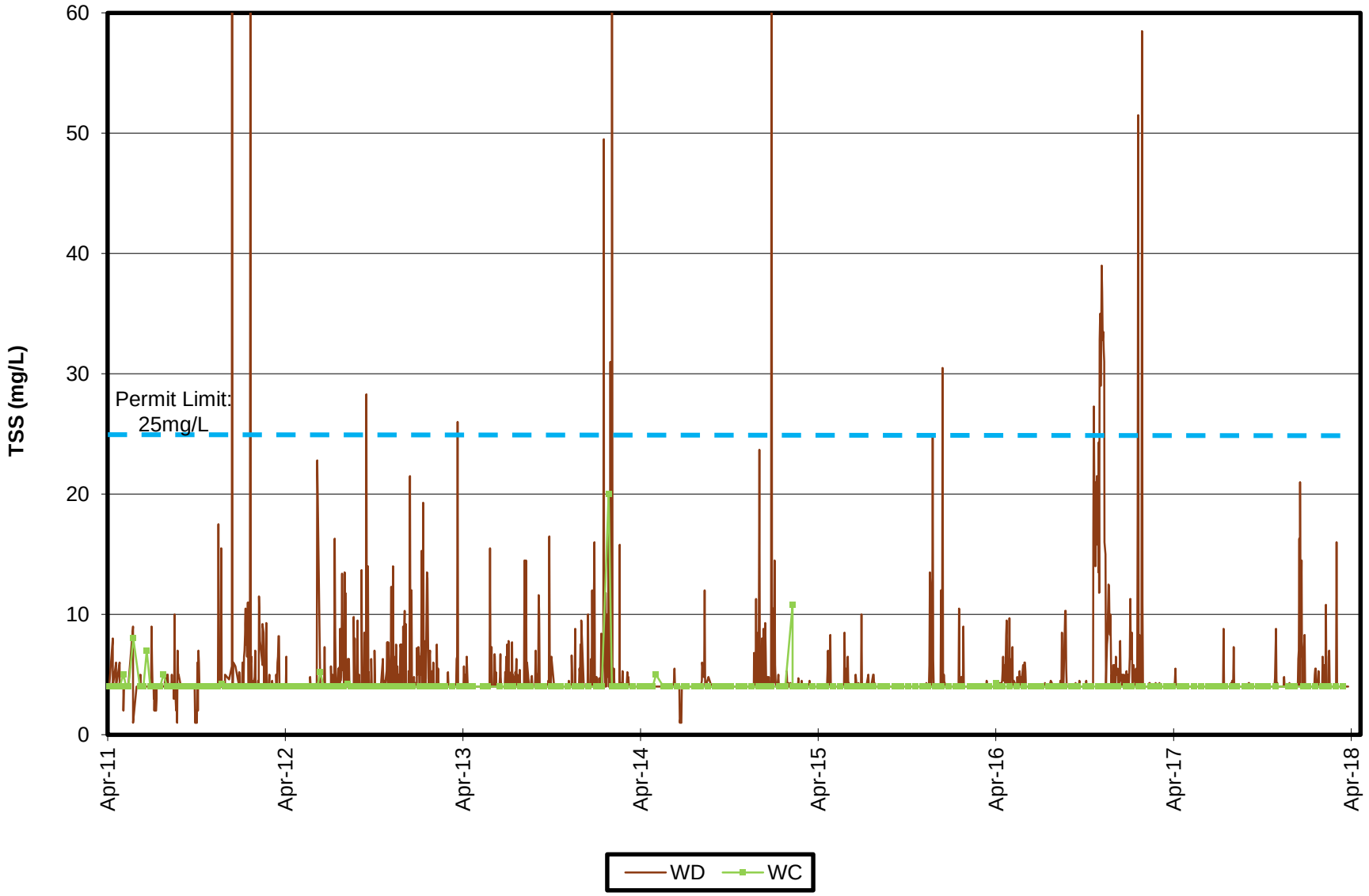
QUINSAM COAL



GRAPH 4

TOTAL SUSPENDED SOLIDS

SETTLING POND 4 & WC

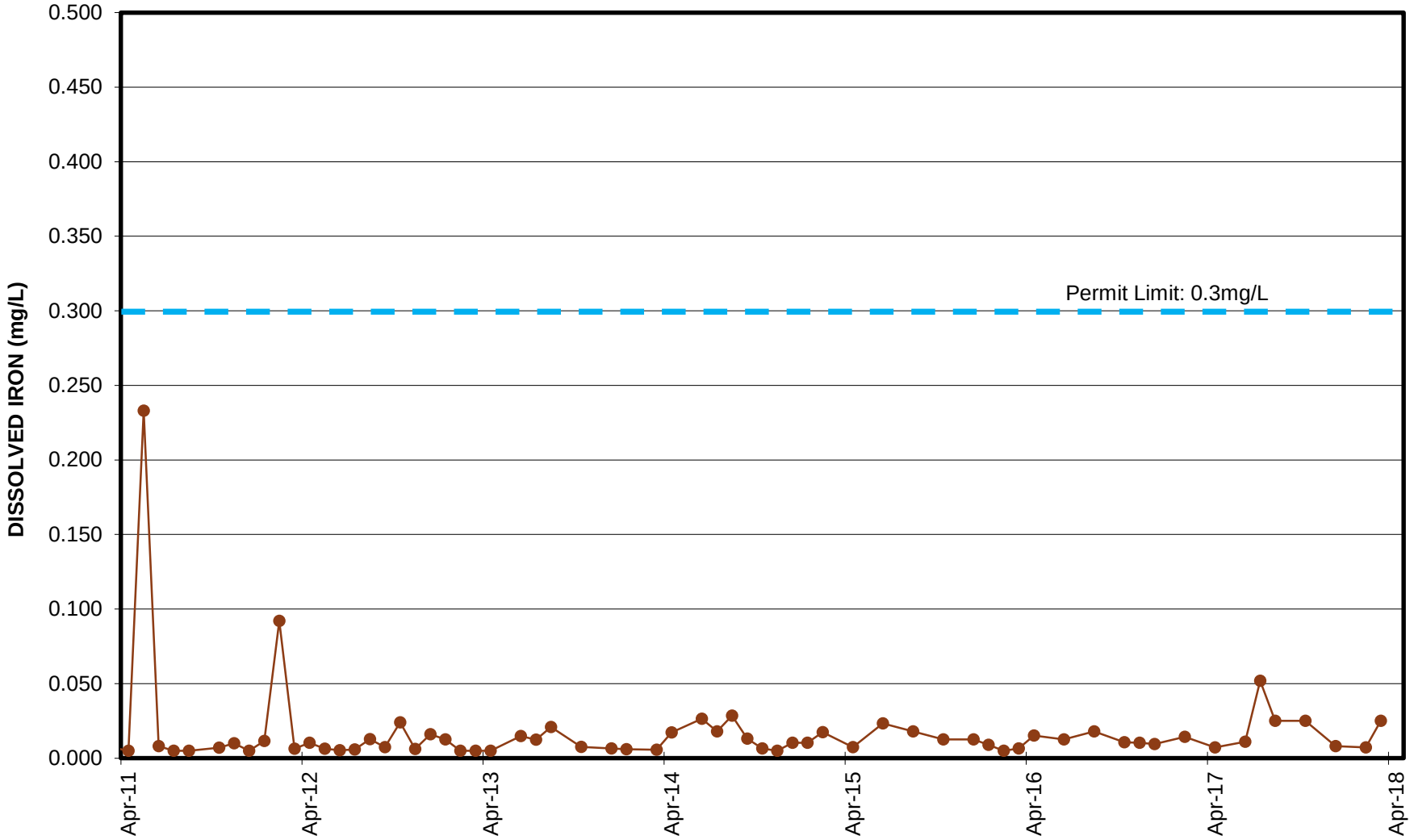


GRAPH 5

DISSOLVED IRON

SETTLING POND 4

QUINSAM COAL

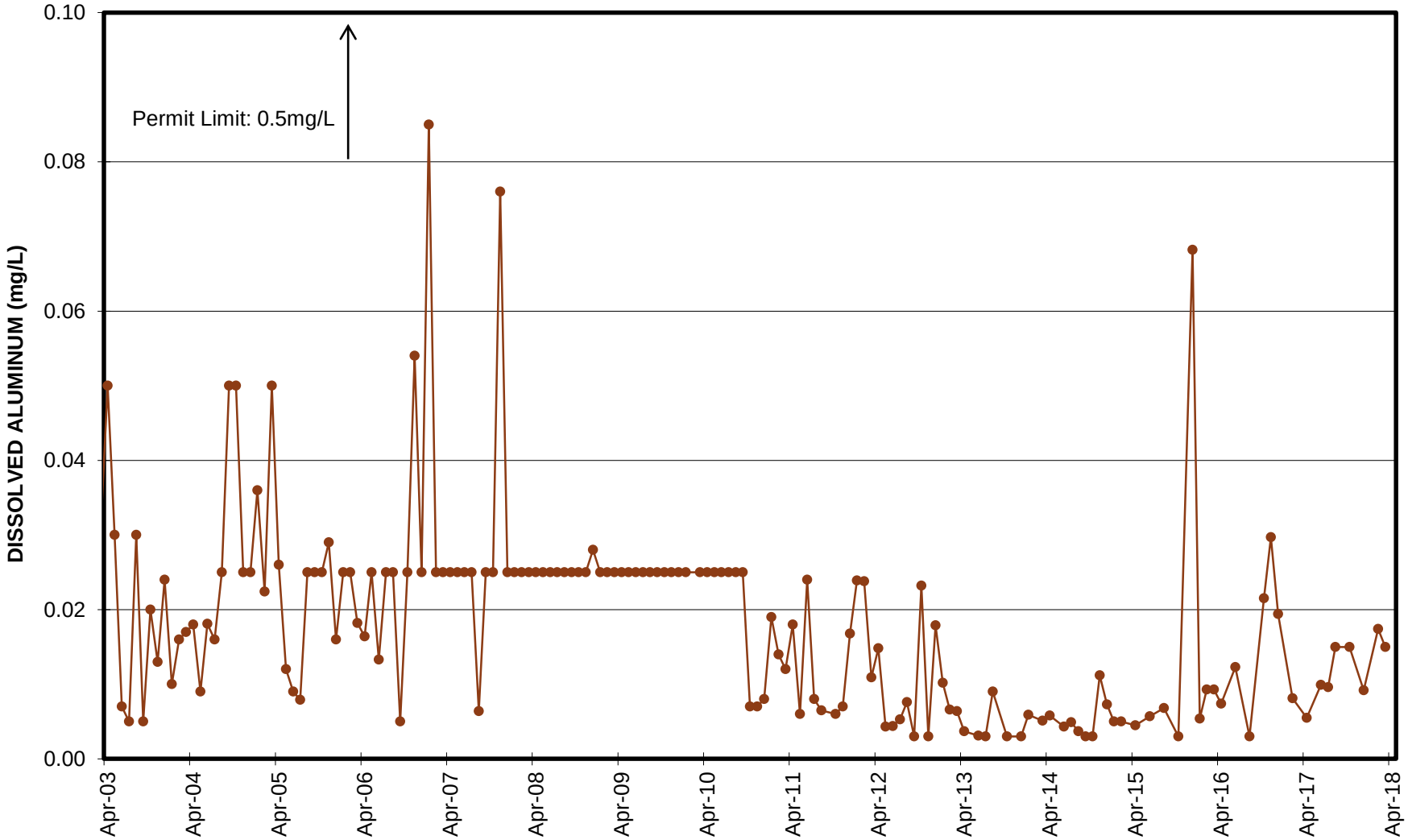


GRAPH 6

DISSOLVED ALUMINUM

SETTLING POND 4

QUINSAM COAL

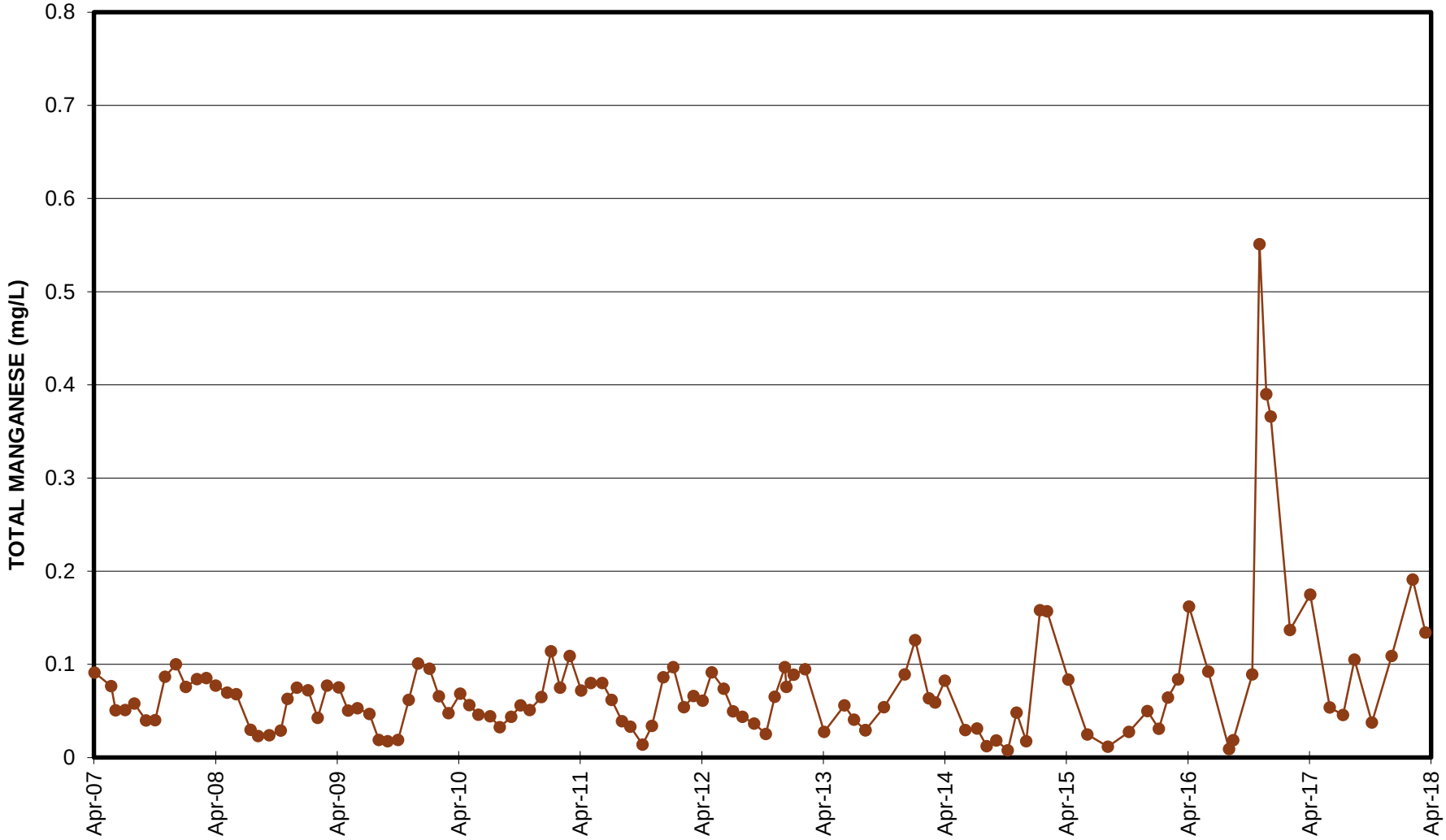


GRAPH 7

TOTAL MANGANESE

SETTLING POND 4

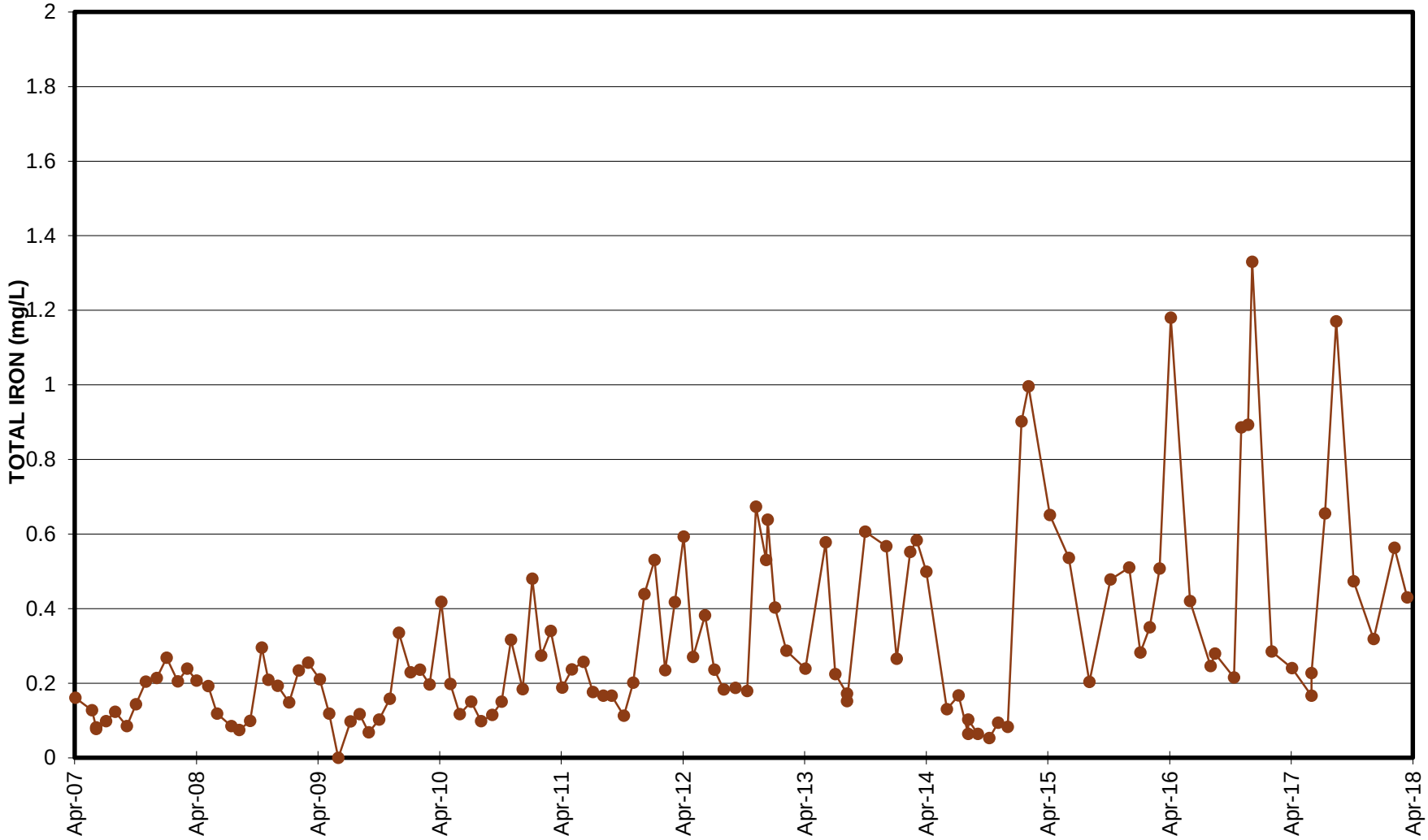
QUINSAM COAL



GRAPH 8

TOTAL IRON

SETTLING POND 4

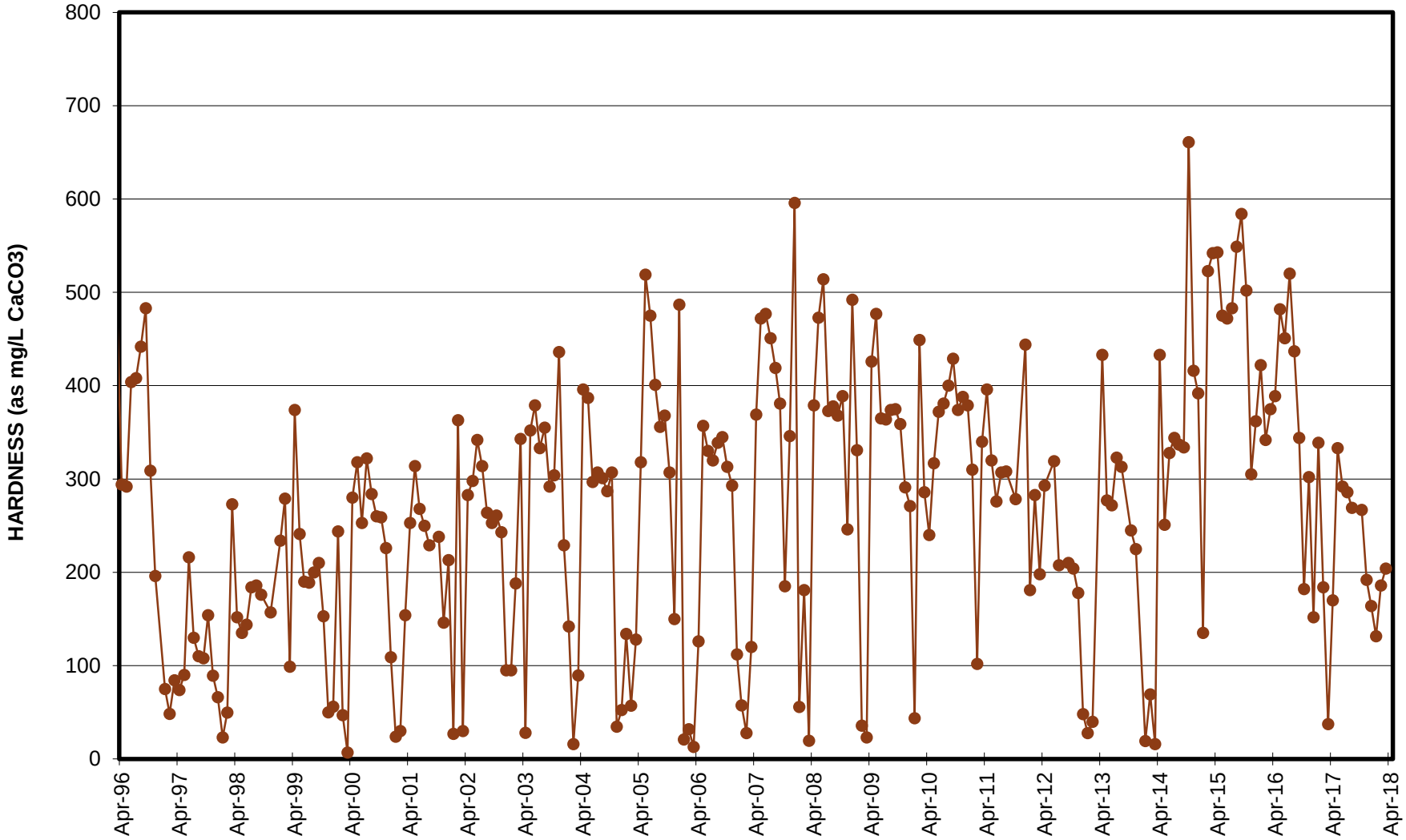


GRAPH 9

HARDNESS

SETTLING POND 1

QUINSAM COAL

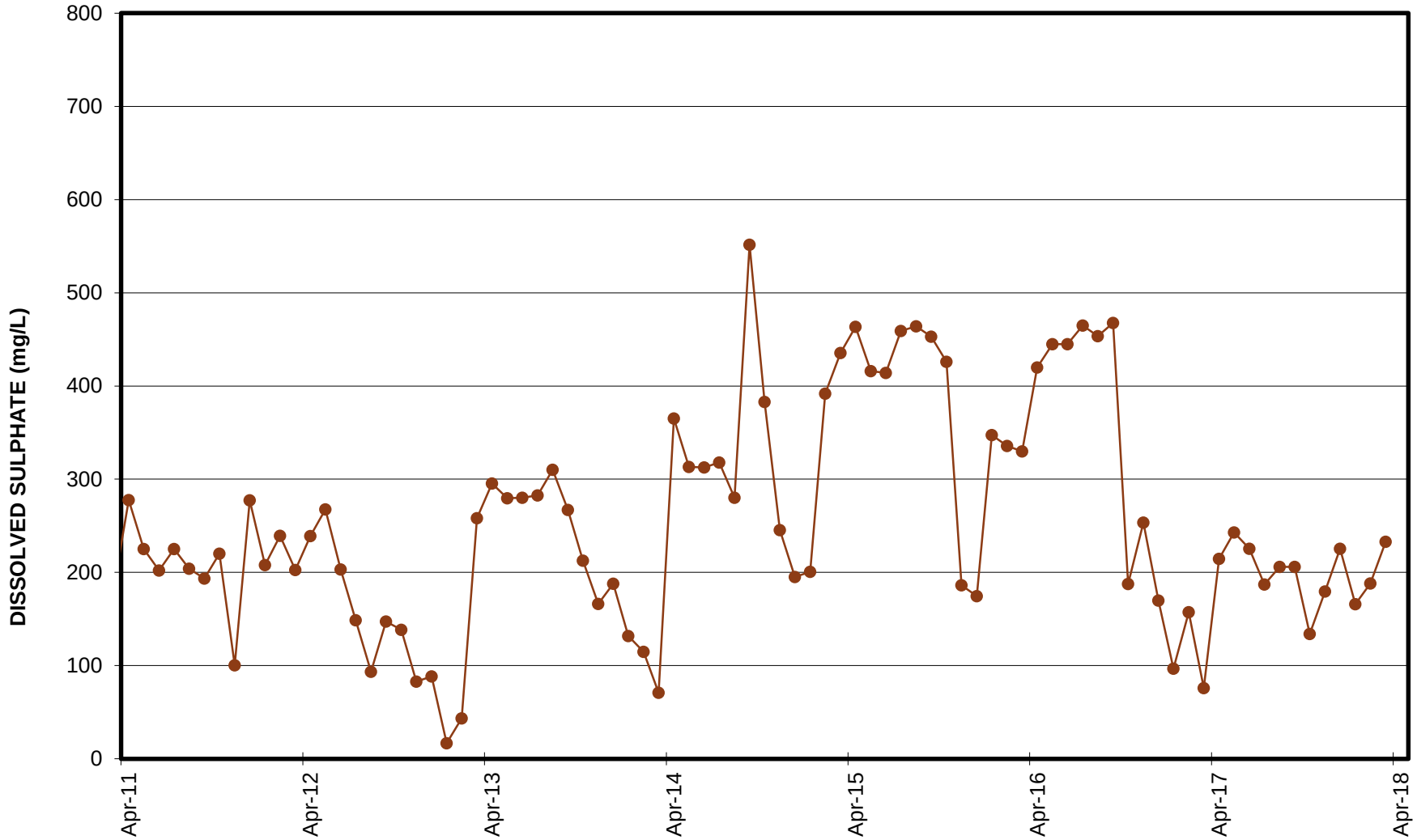


GRAPH 10

AVERAGE MONTHLY DISSOLVED SULPHATE

SETTLING POND 1

QUINSAM COAL

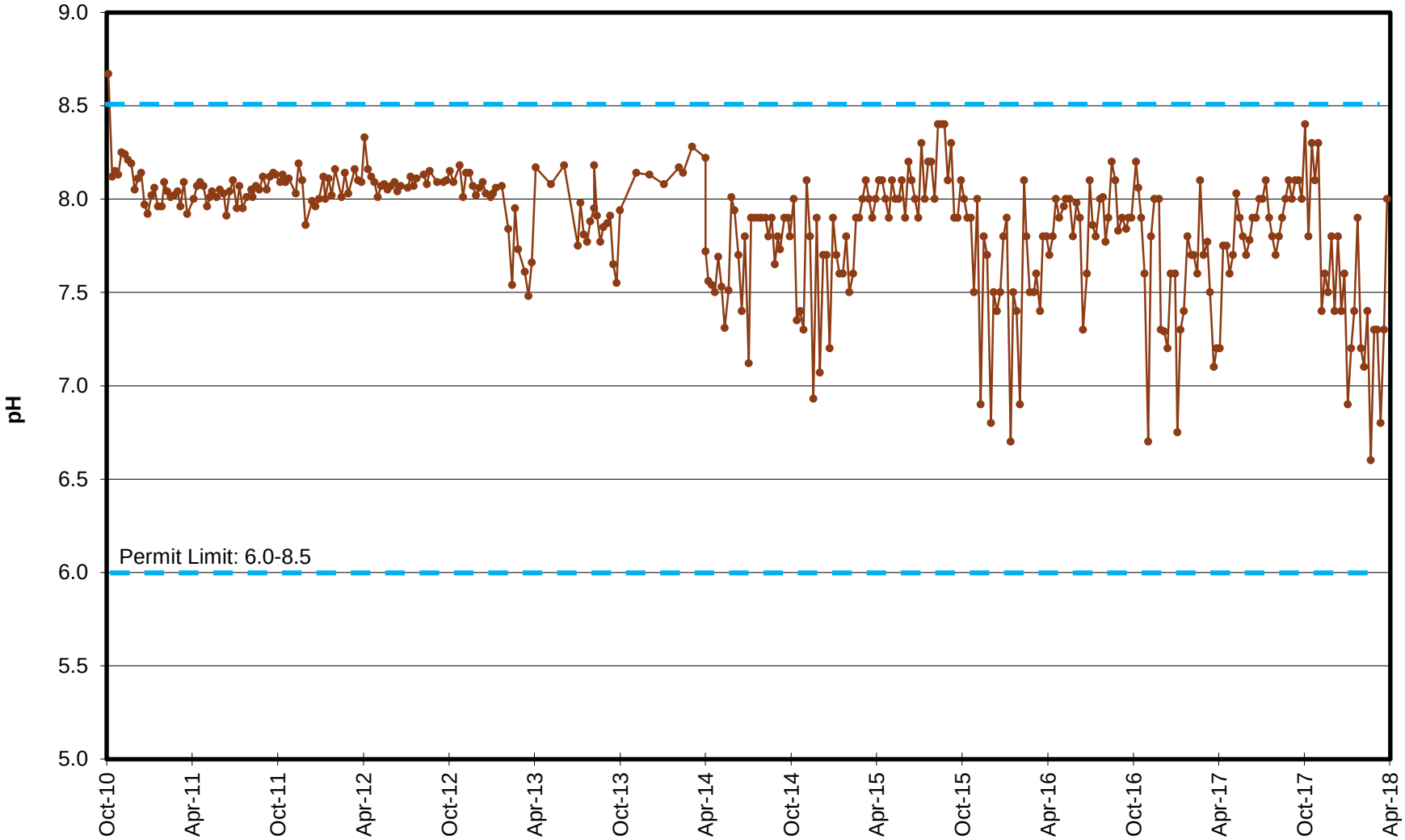


GRAPH 11

WEEKLY FIELD pH

SETTLING POND 1

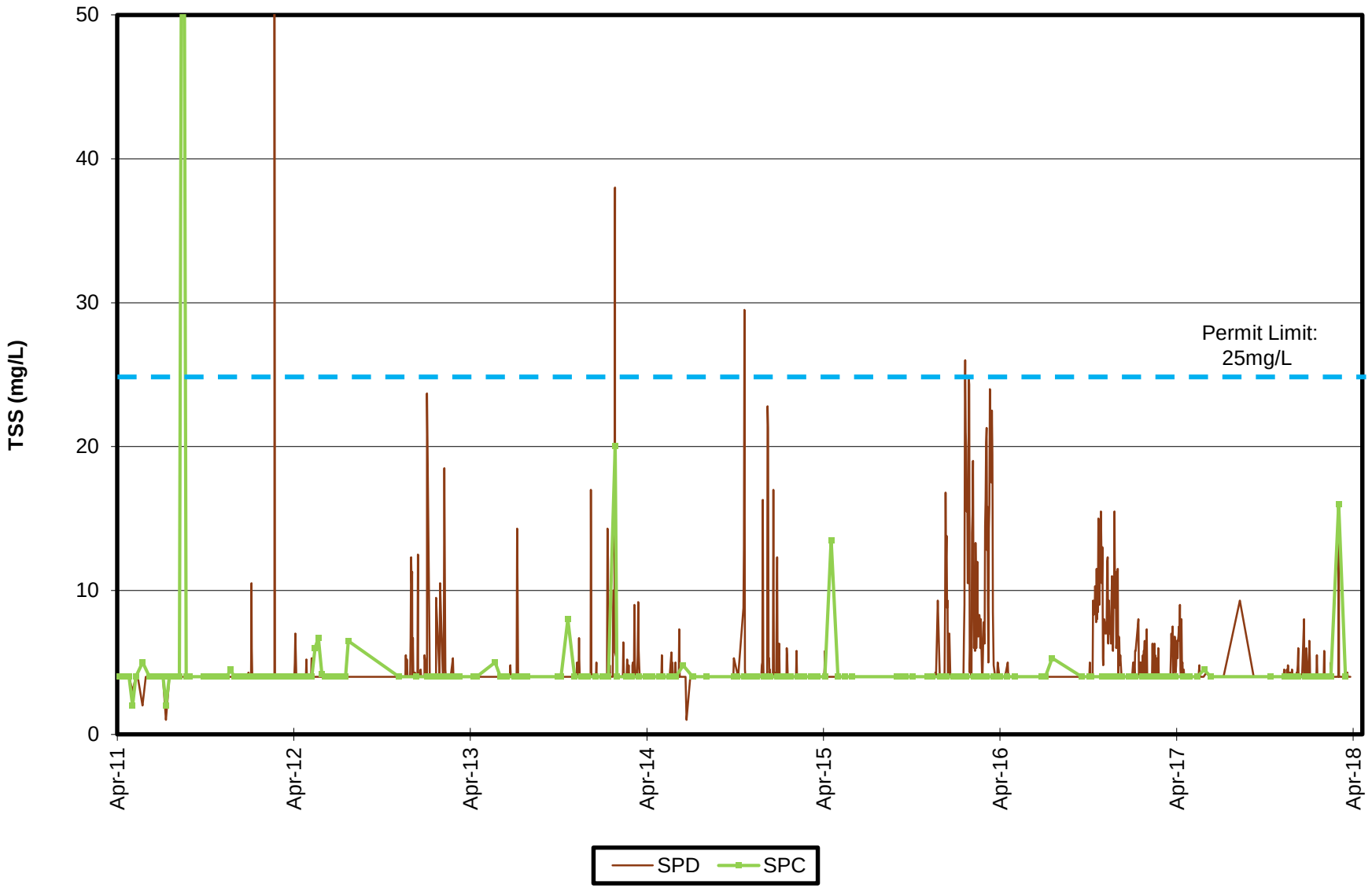
QUINSAM COAL



GRAPH 12

TOTAL SUSPENDED SOLIDS

SETTLING POND 1

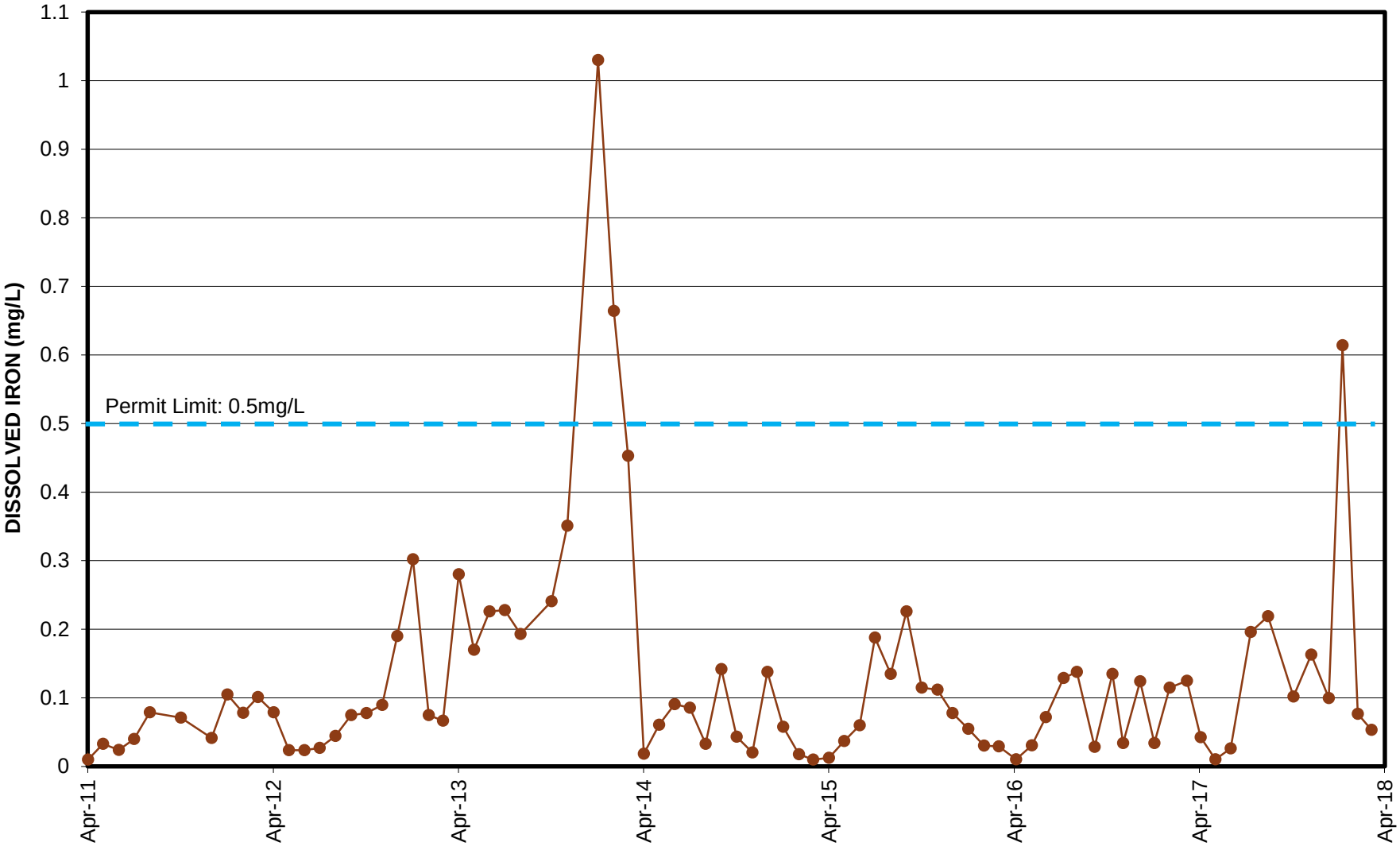


GRAPH 13

DISSOLVED IRON

SETTLING POND 1

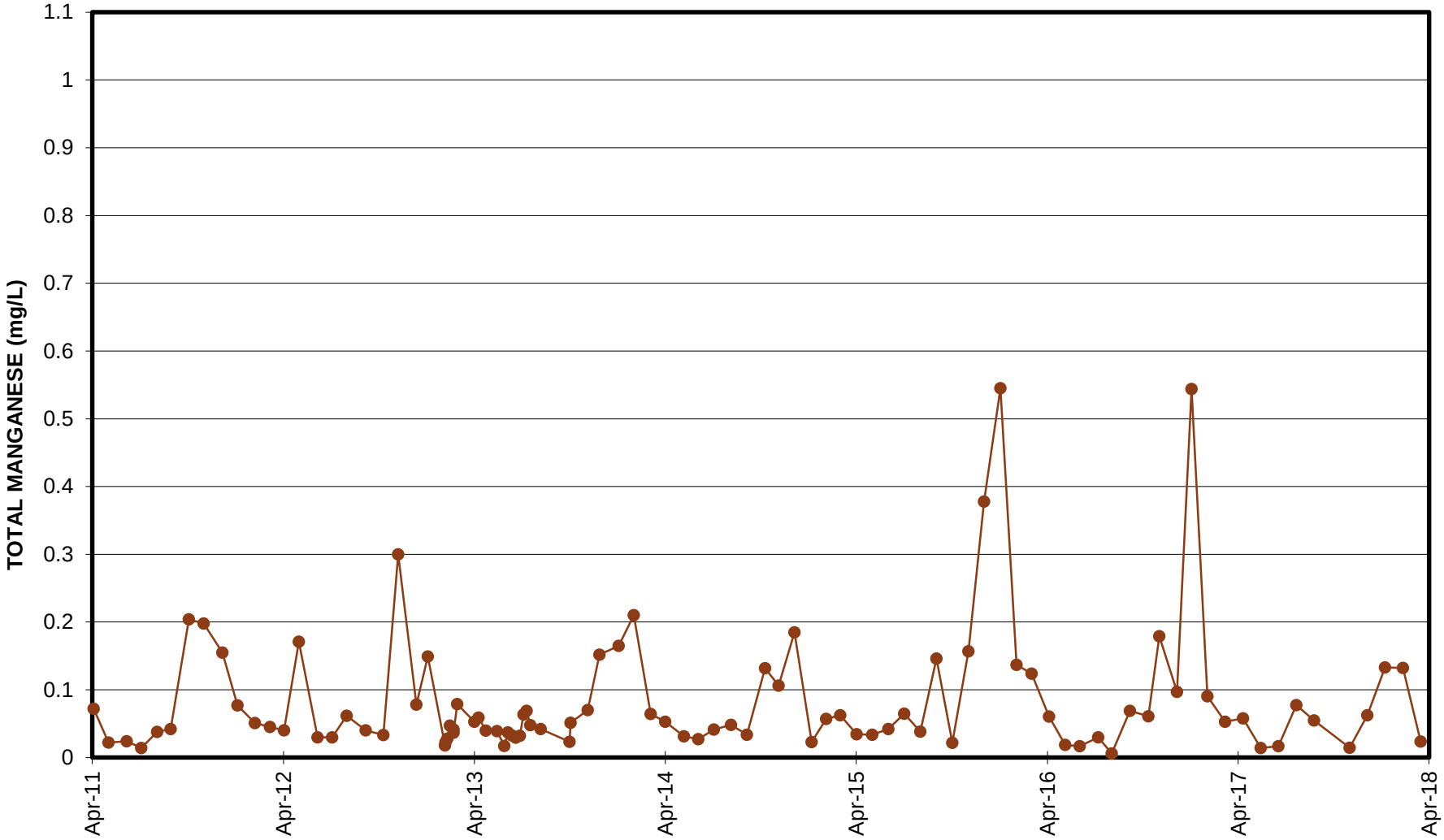
QUINSAM COAL



GRAPH 14

TOTAL MANGANESE

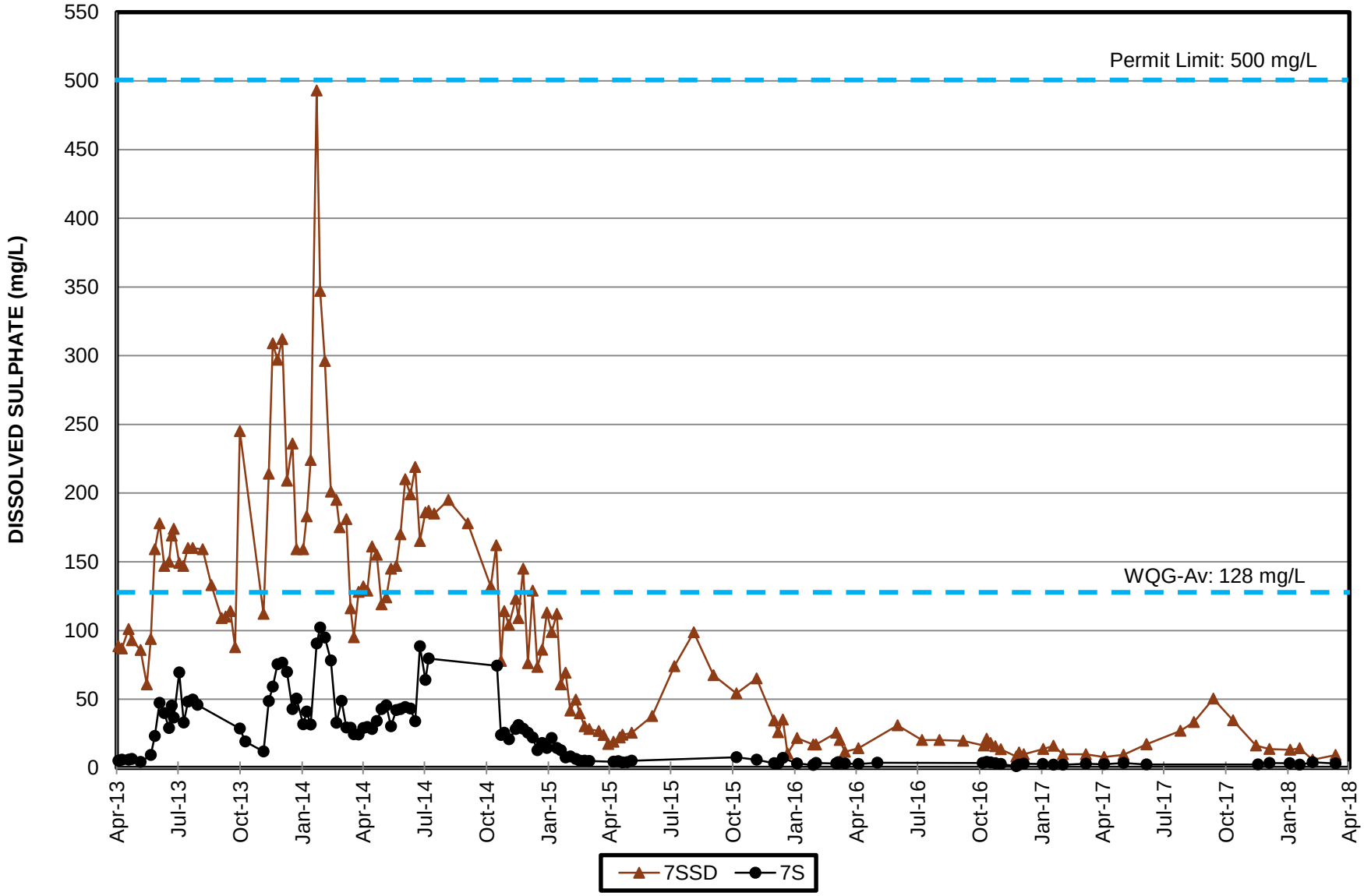
SETTLING POND 1



GRAPH 15

DISSOLVED SULPHATE

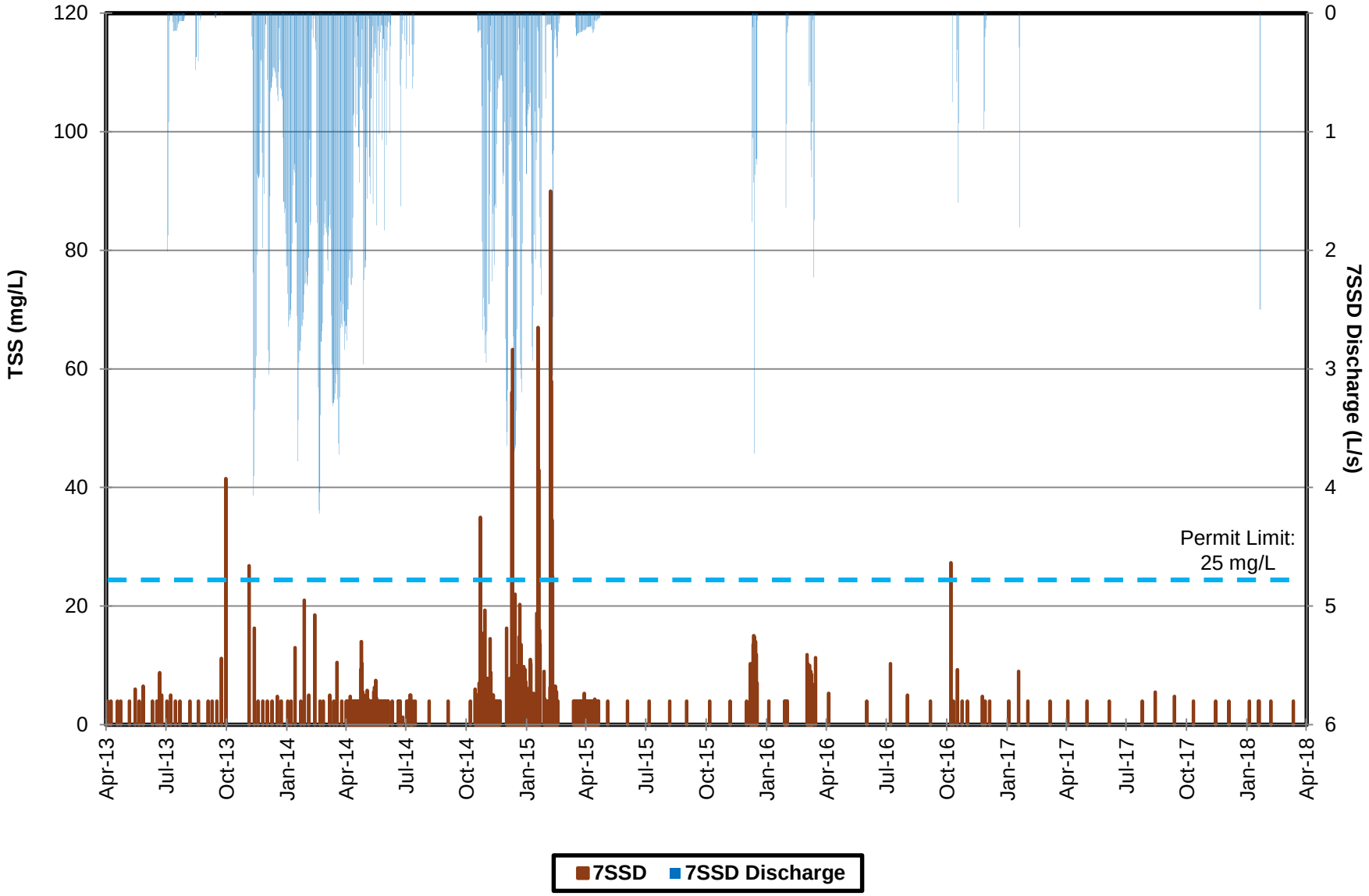
7SSD vs 7S



GRAPH 16

TOTAL SUSPENDED SOLIDS

7SSD

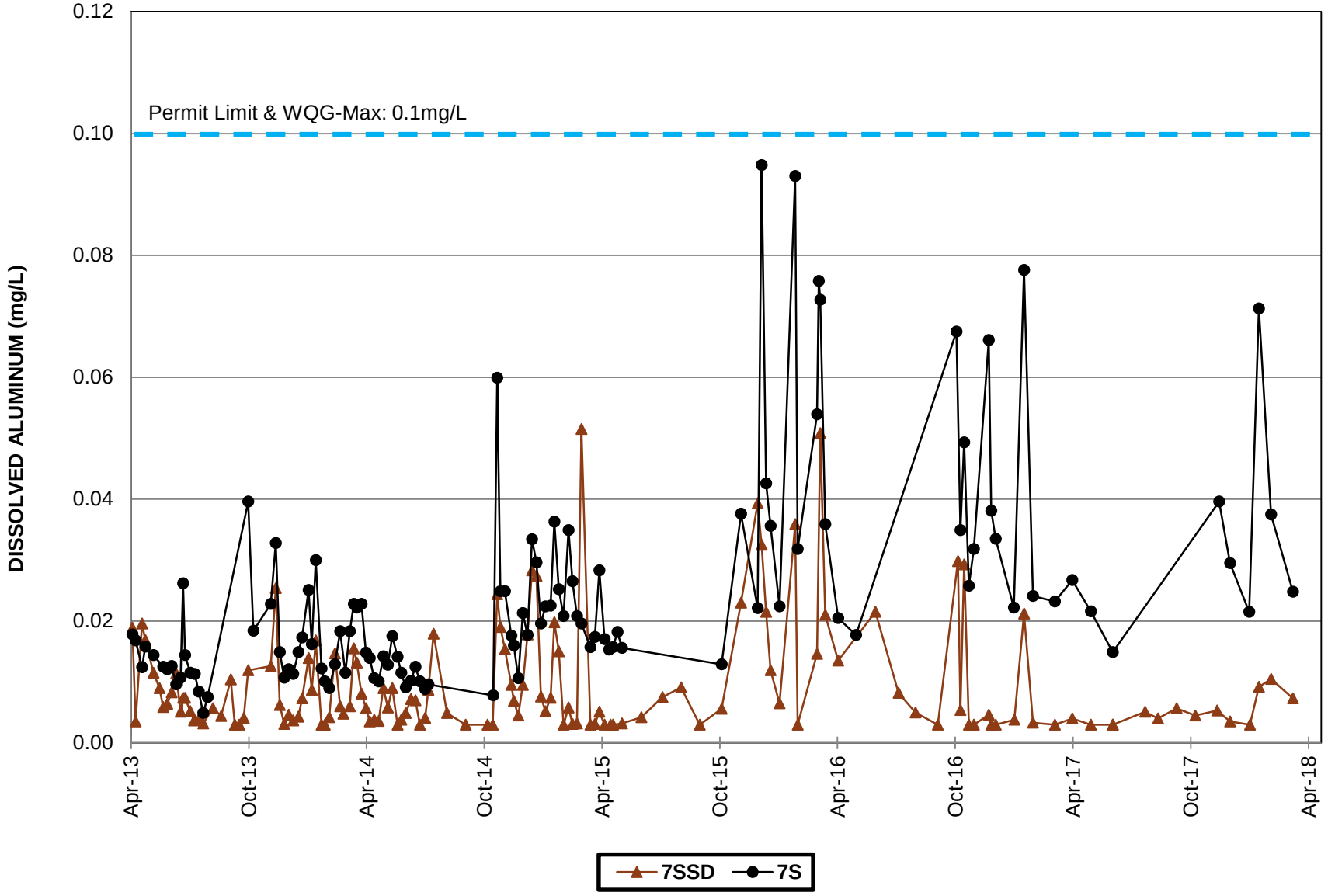


GRAPH 17

DISSOLVED ALUMINUM

7SSD vs 7S

QUINSAM COAL

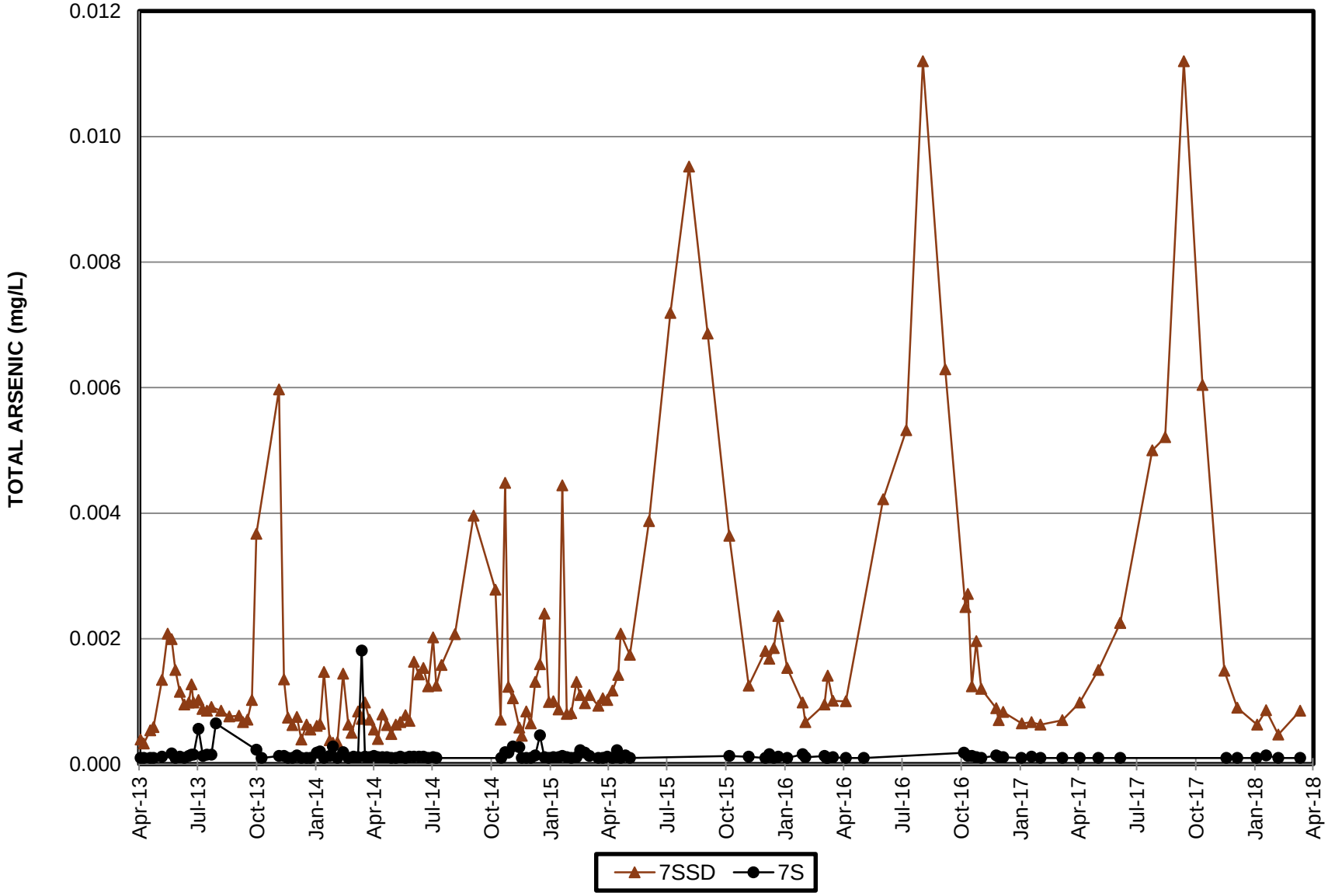


GRAPH 18

TOTAL ARSENIC

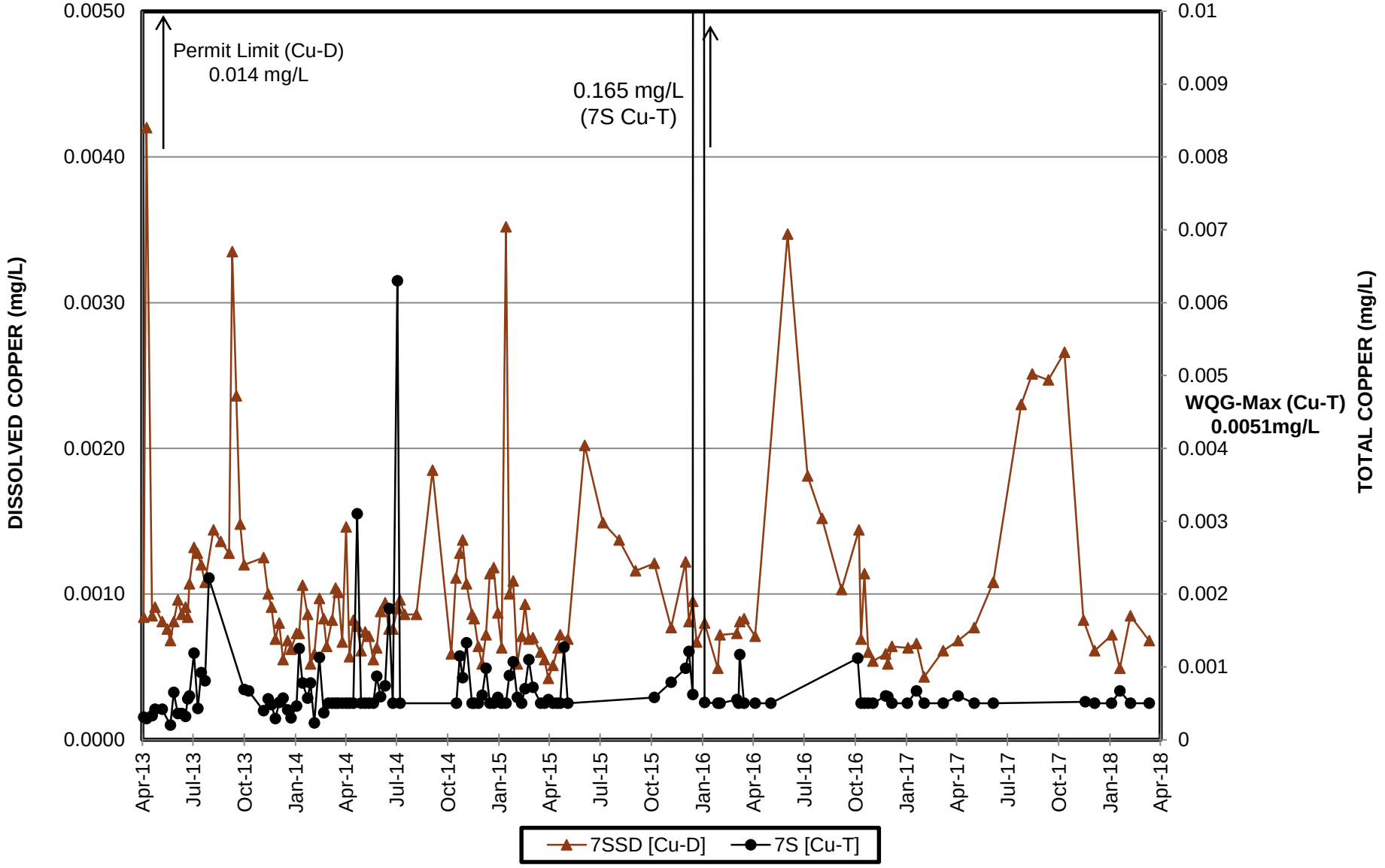
7SSD vs 7S

QUINSAM COAL



QUINSAM COAL

GRAPH 19
DISSOLVED AND TOTAL COPPER
7SSD vs 7S

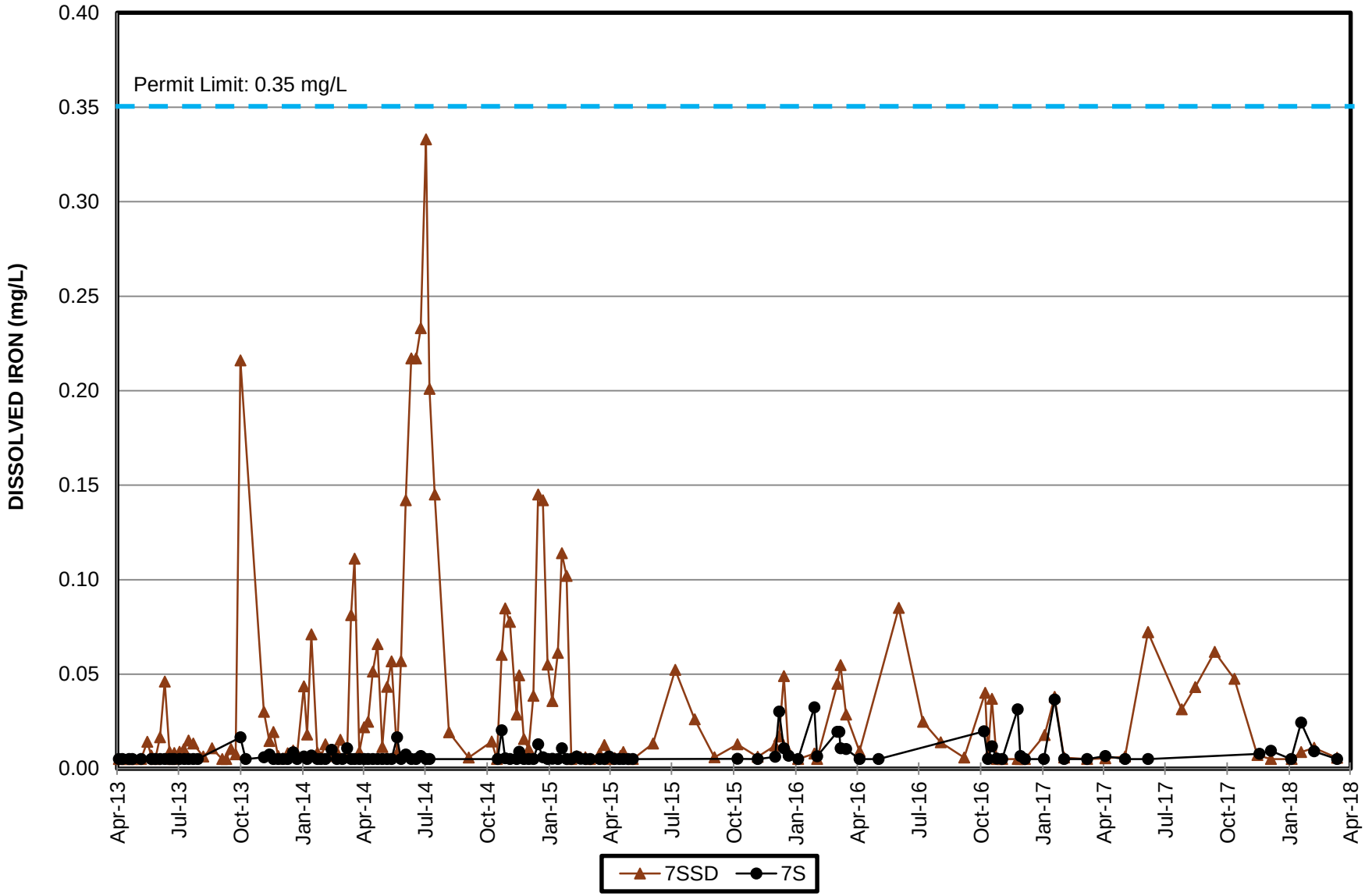


GRAPH 20

DISSOLVED IRON

7SSD vs 7S

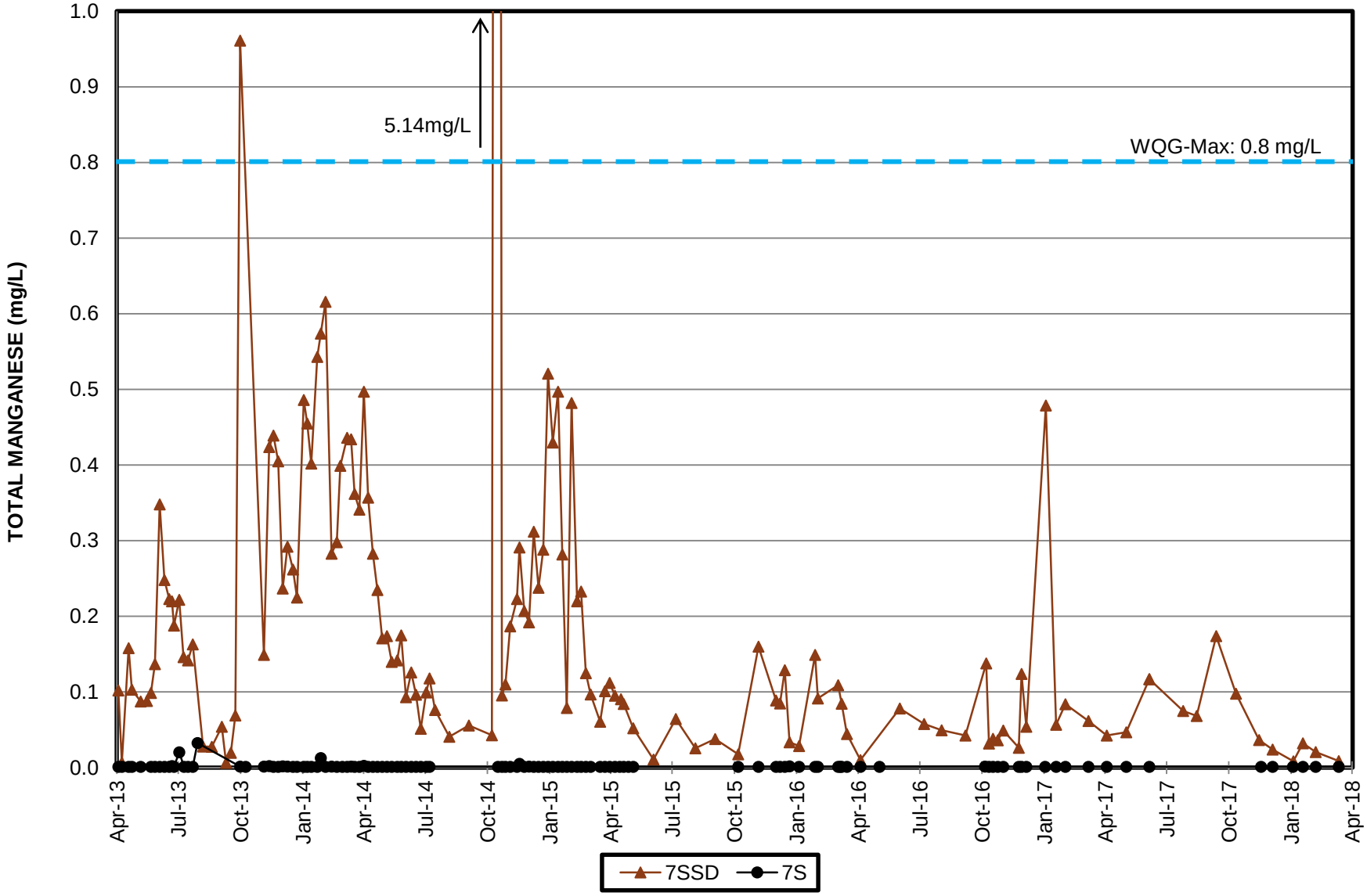
QUINSAM COAL



GRAPH 21

TOTAL MANGANESE

7SSD vs 7S

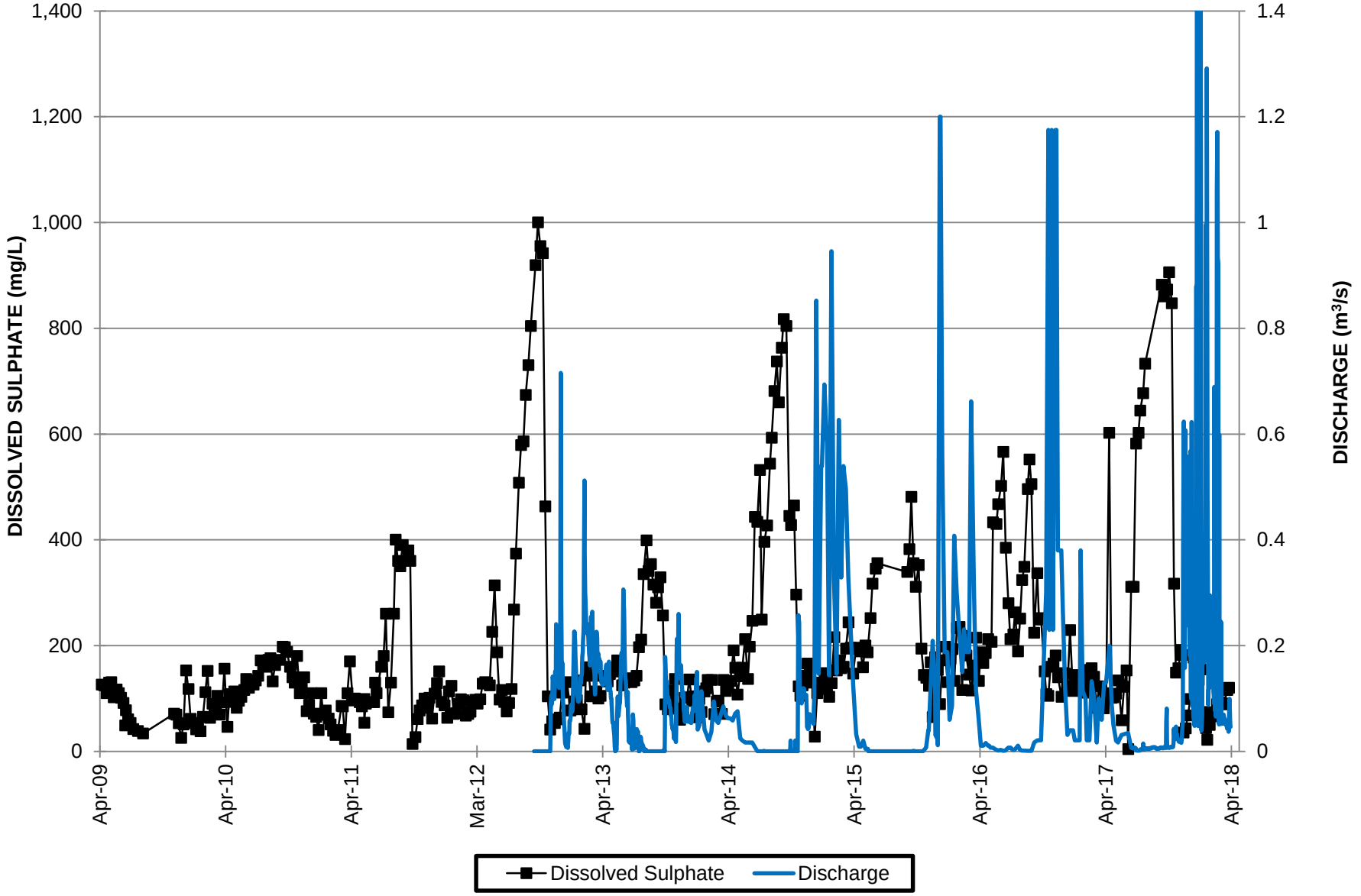


GRAPH 22

DISSOLVED SULPHATE VS DISCHARGE

LLE

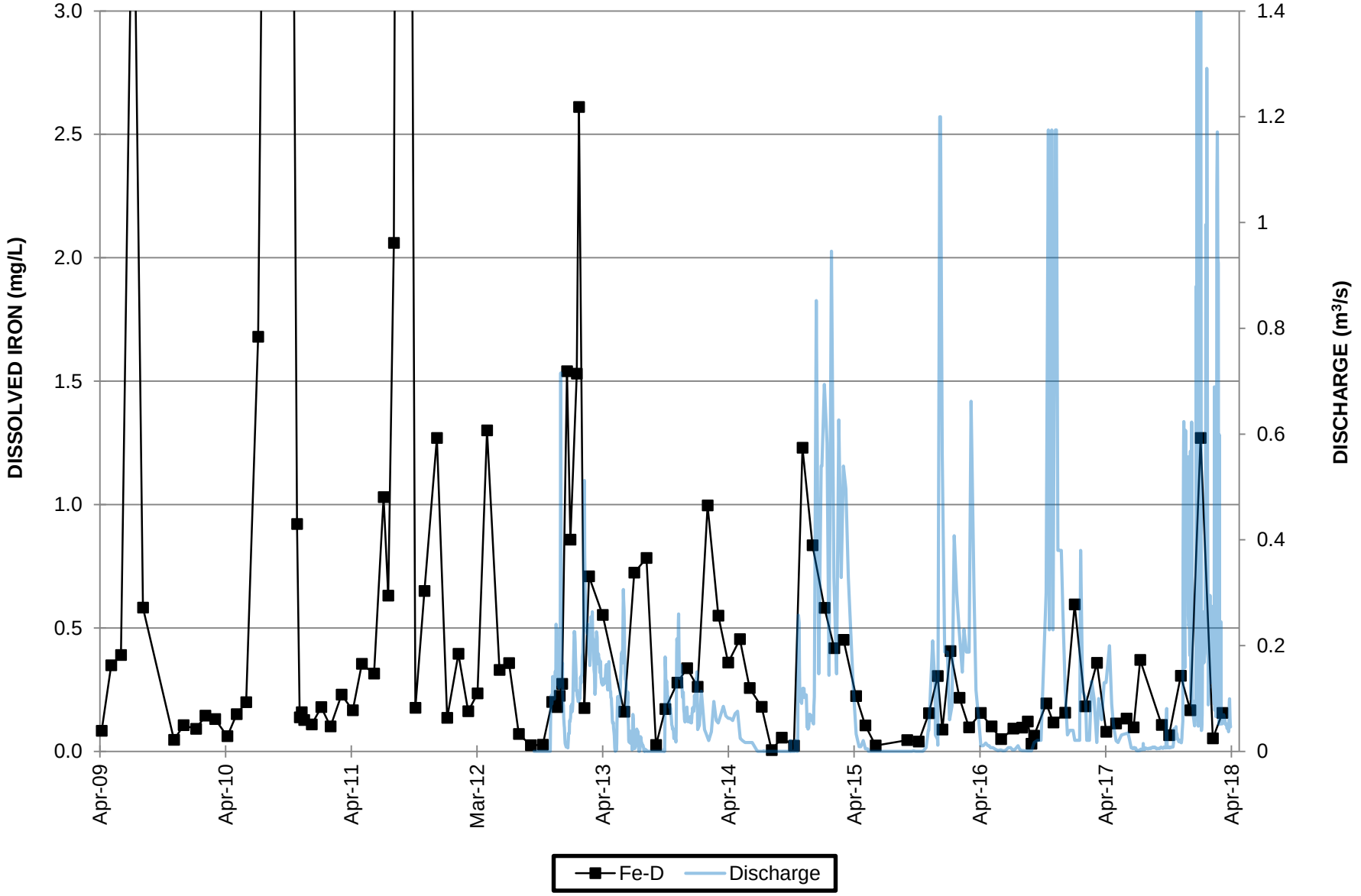
QUINSAM COAL



GRAPH 23

DISSOLVED IRON VS DISCHARGE

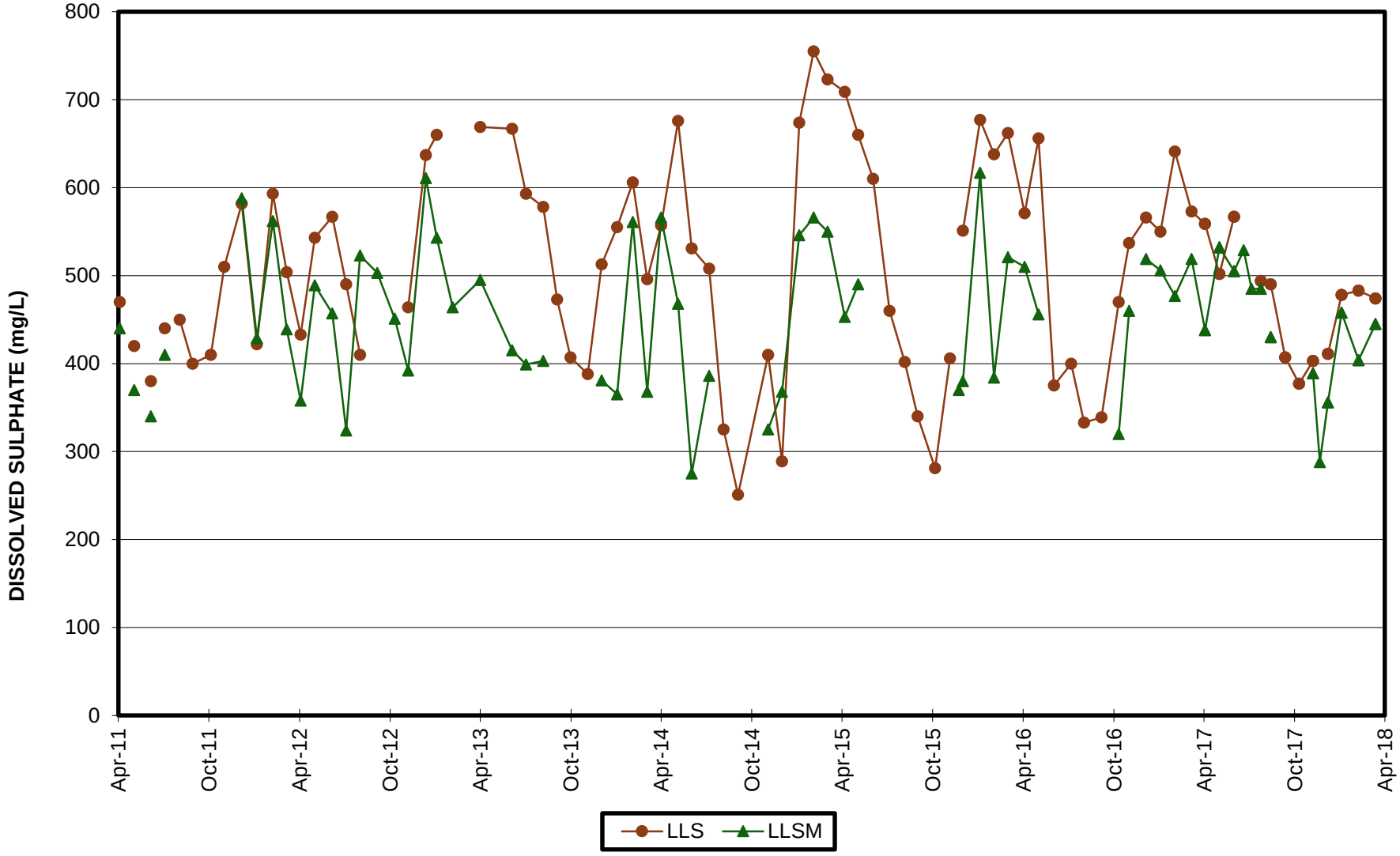
LLE



GRAPH 24

DISSOLVED SULPHATE

SEEPS INTO LONG LAKE

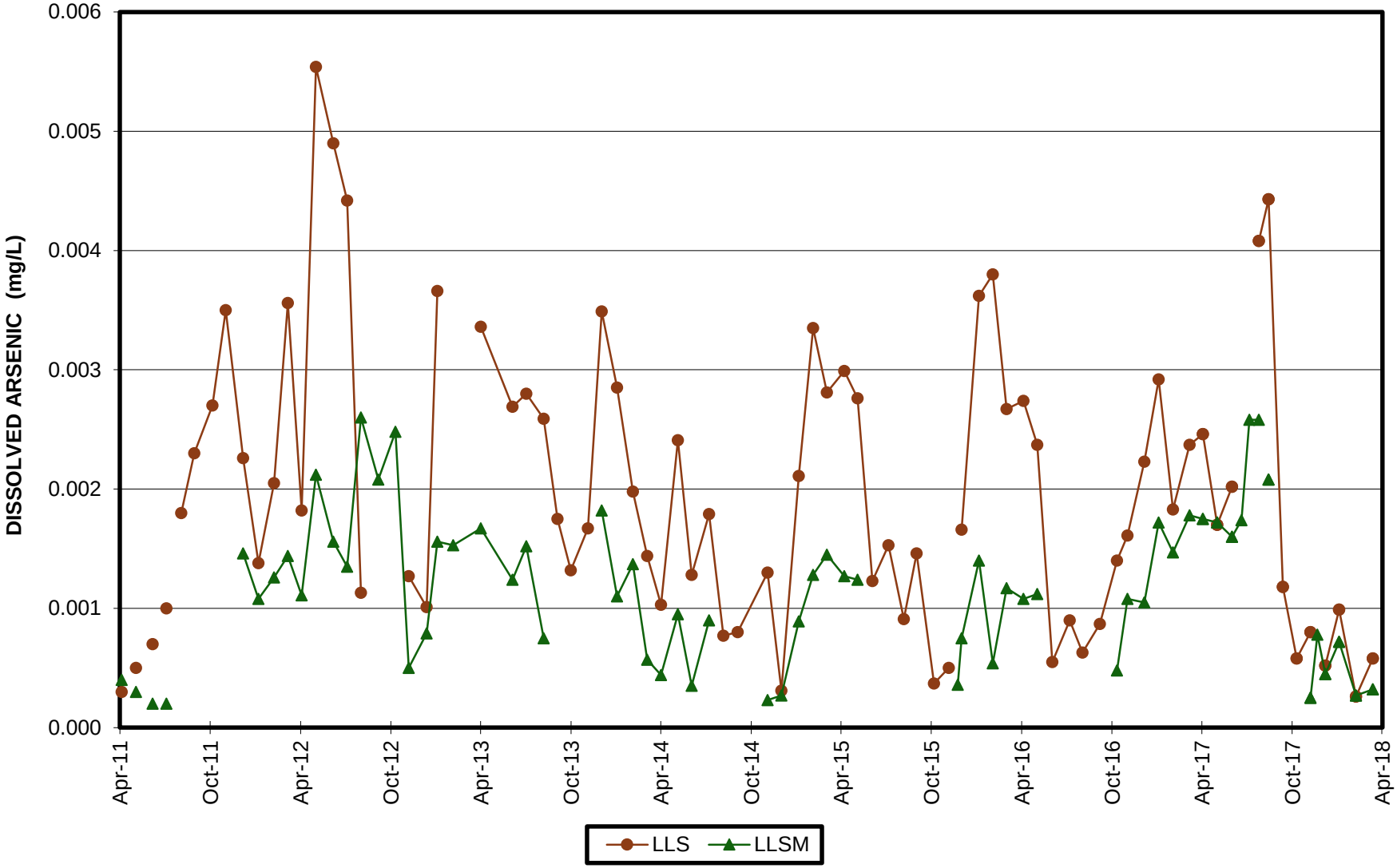


GRAPH 25

DISSOLVED ARSENIC

SEEPS INTO LONG LAKE

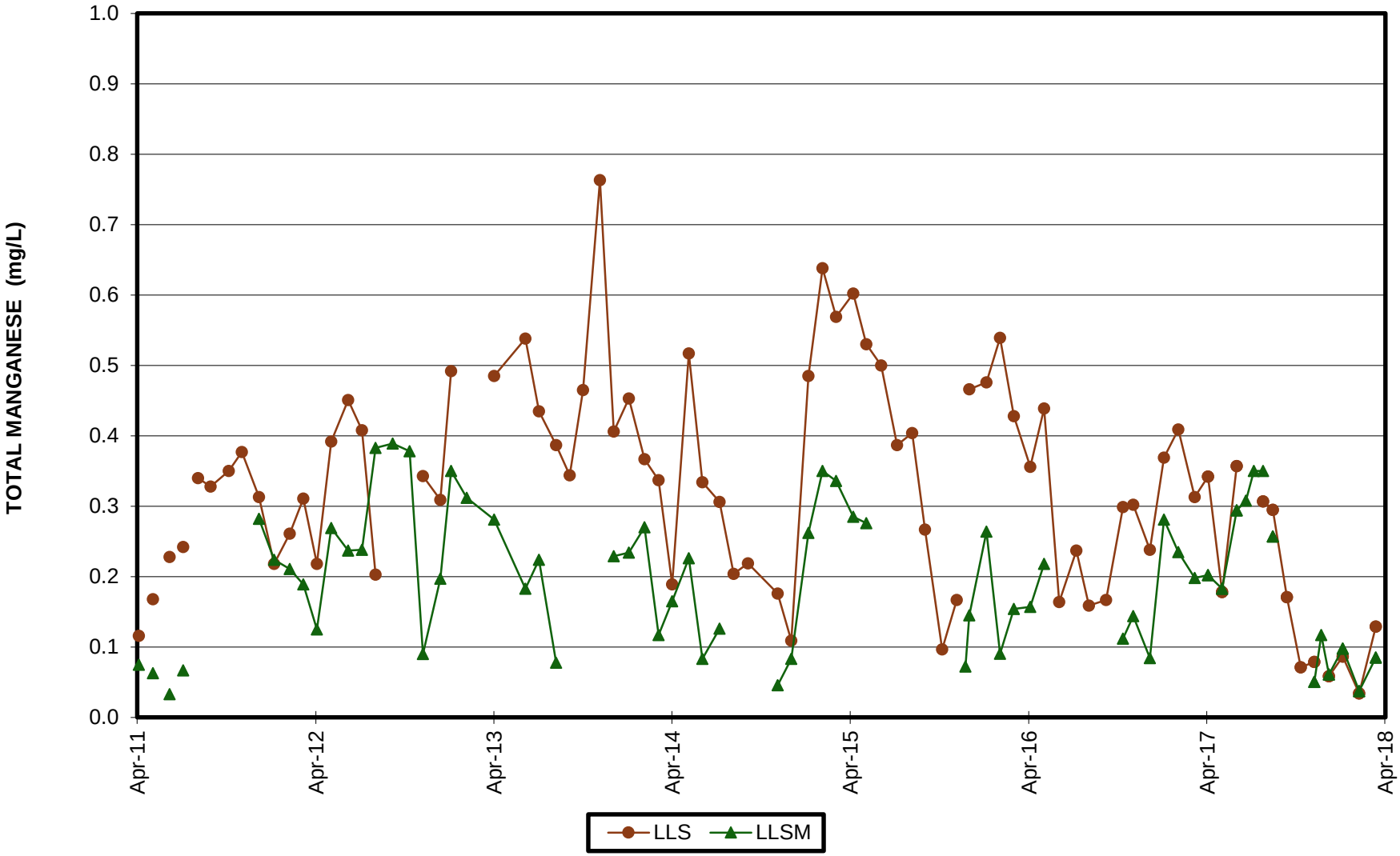
QUINSAM COAL



GRAPH 26

TOTAL MANGANESE

SEEPS INTO LONG LAKE

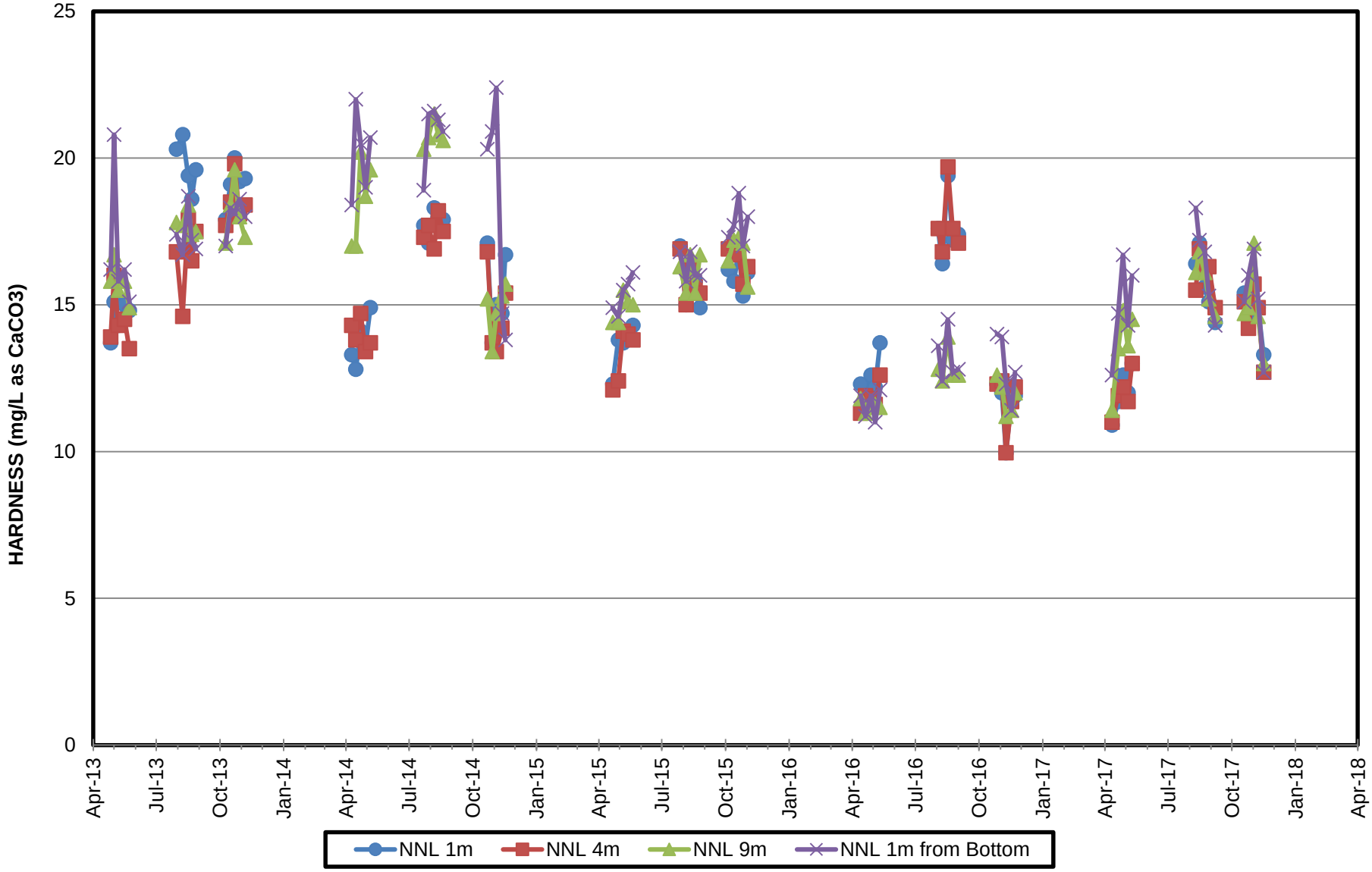


GRAPH 27

5 in 30 HARDNESS

NO NAME LAKE

QUINSAM COAL

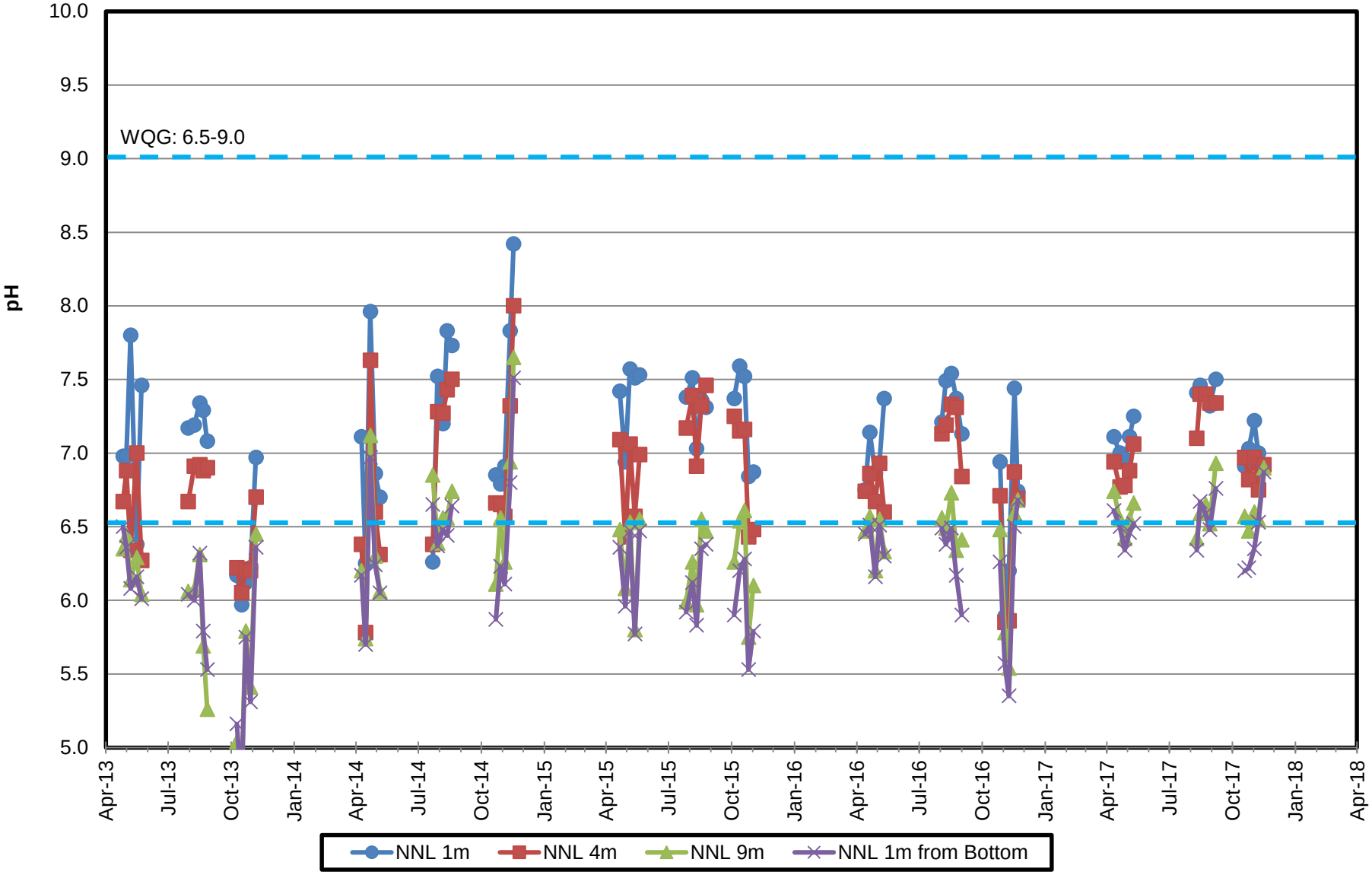


GRAPH 28

5 in 30 PH

NO NAME LAKE

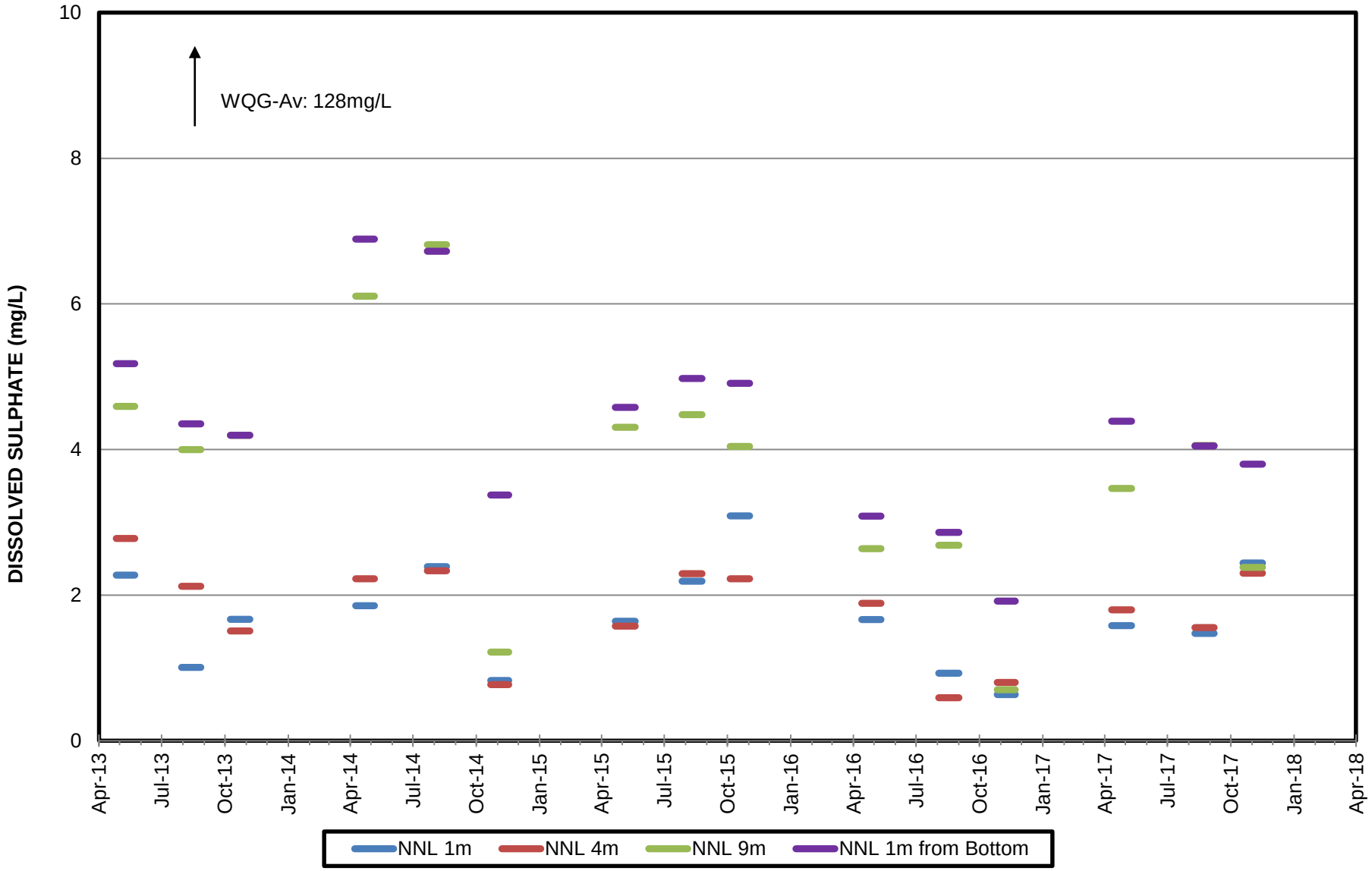
QUINSAM COAL



GRAPH 29

5 in 30 AVERAGE DISSOLVED SULPHATE

NO NAME LAKE

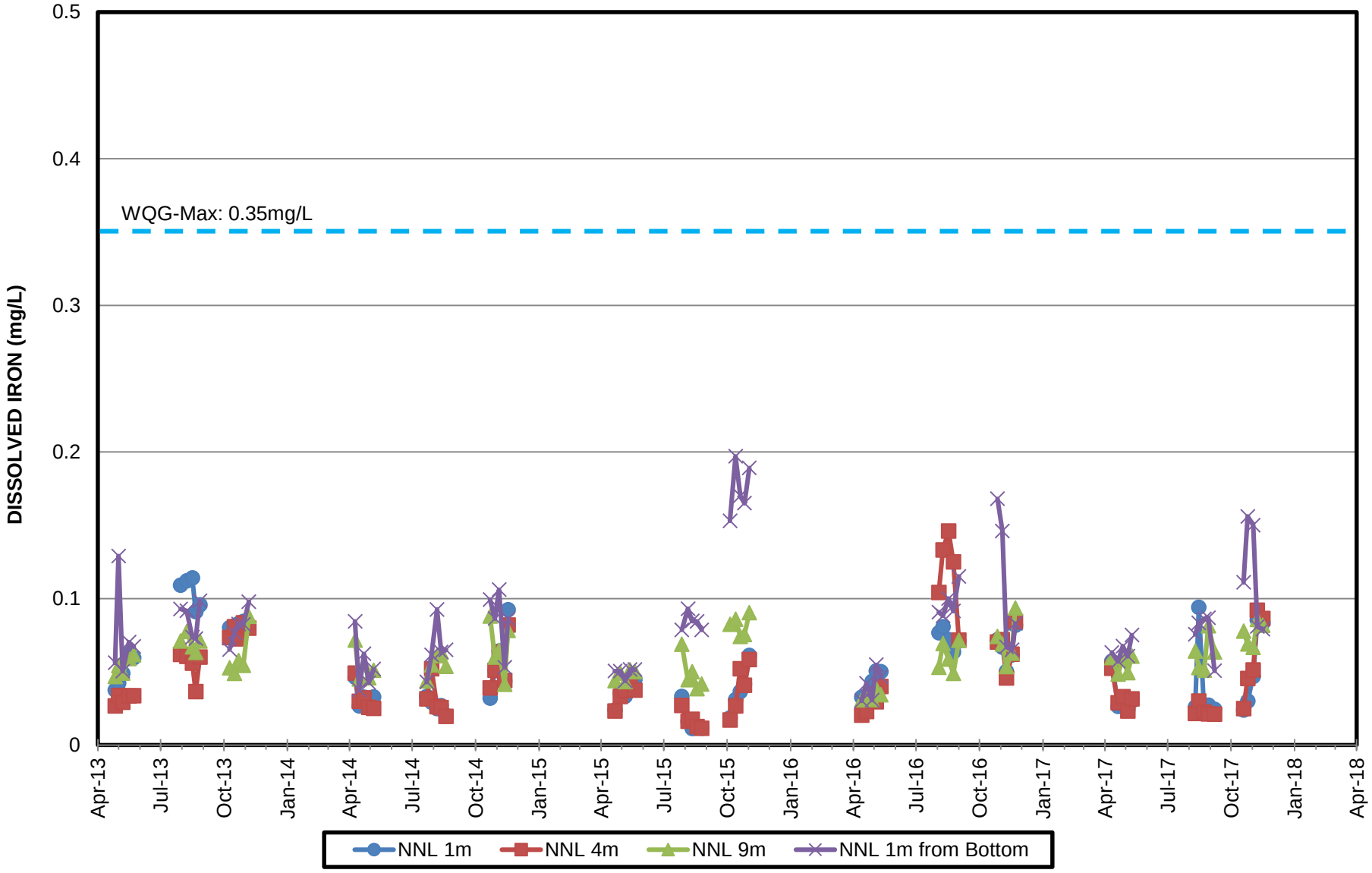


GRAPH 30

5 in 30 DISSOLVED IRON

NO NAME LAKE

QUINSAM COAL

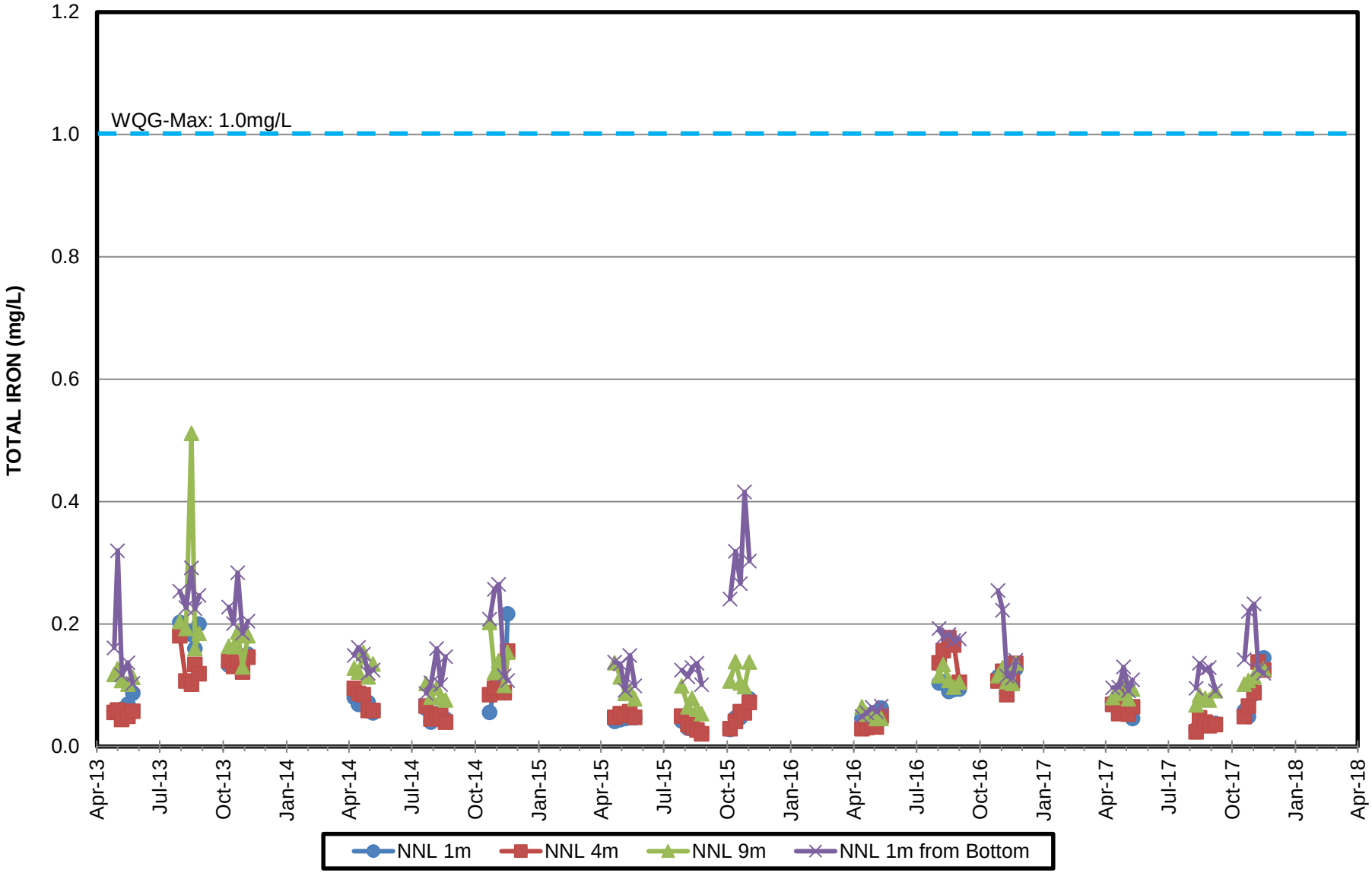


GRAPH 31

5 in 30 TOTAL IRON

NO NAME LAKE

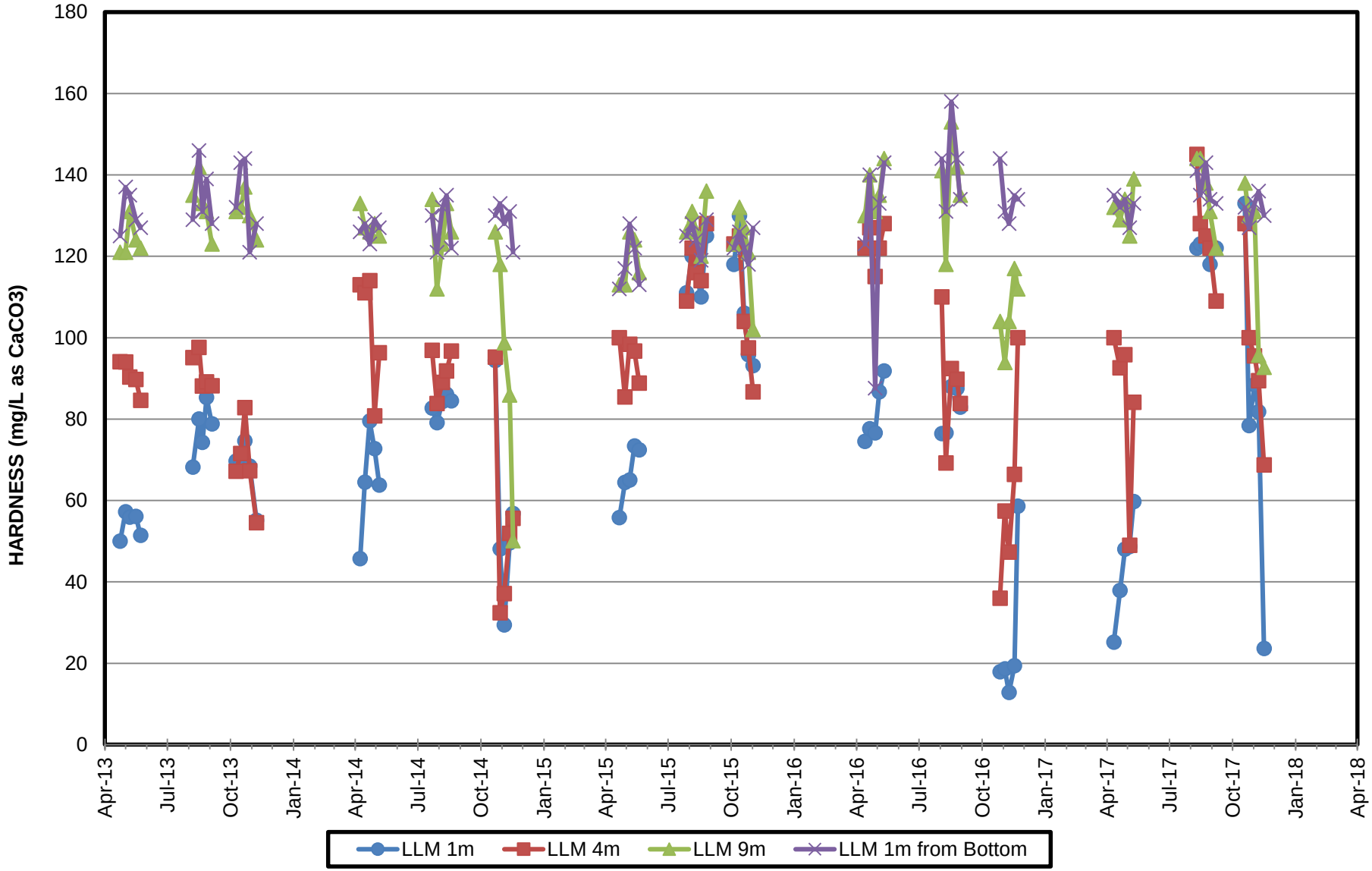
QUINSAM COAL



GRAPH 32

5 in 30 HARDNESS

LONG LAKE

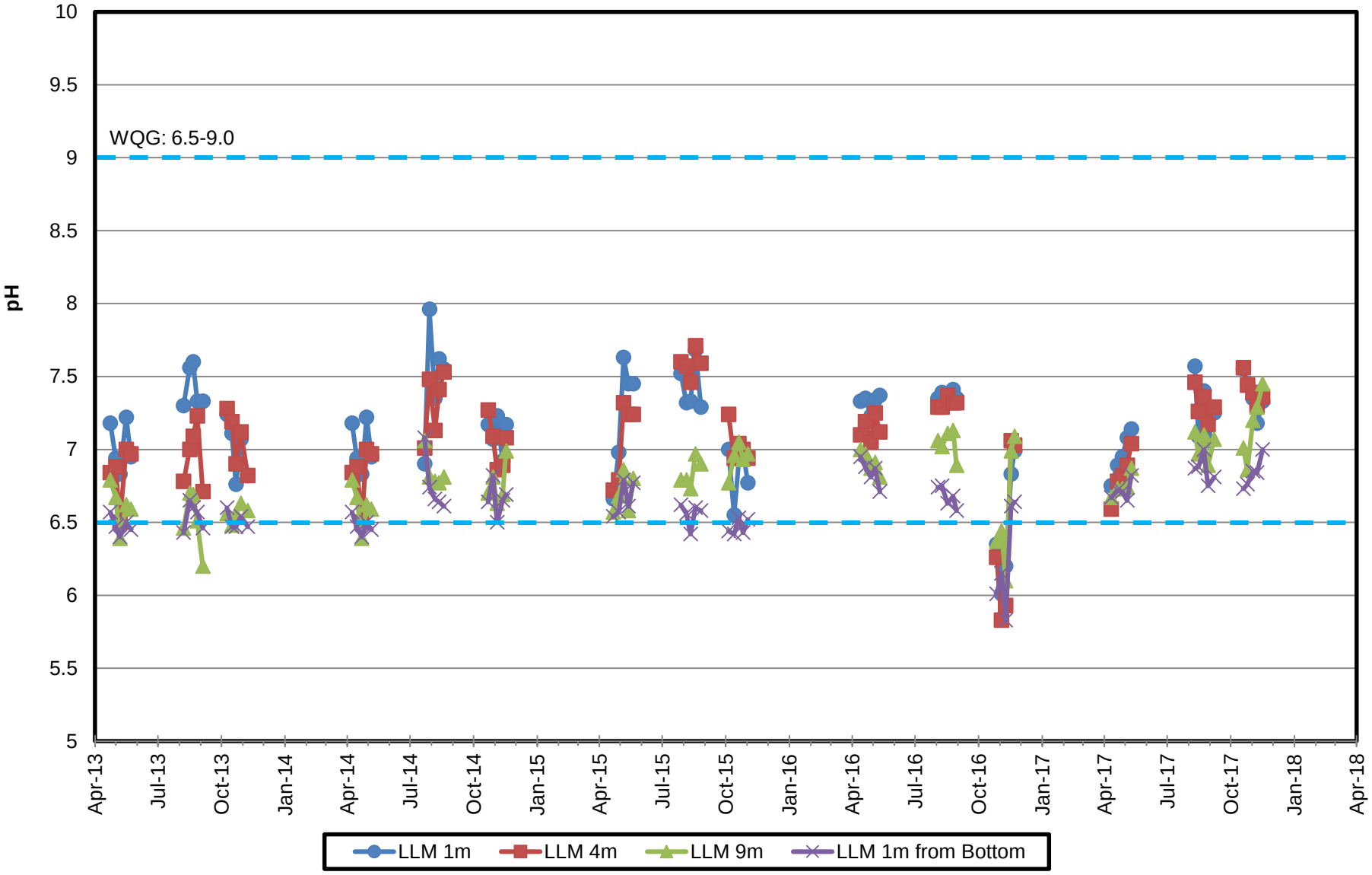


GRAPH 33

5 in 30 PH

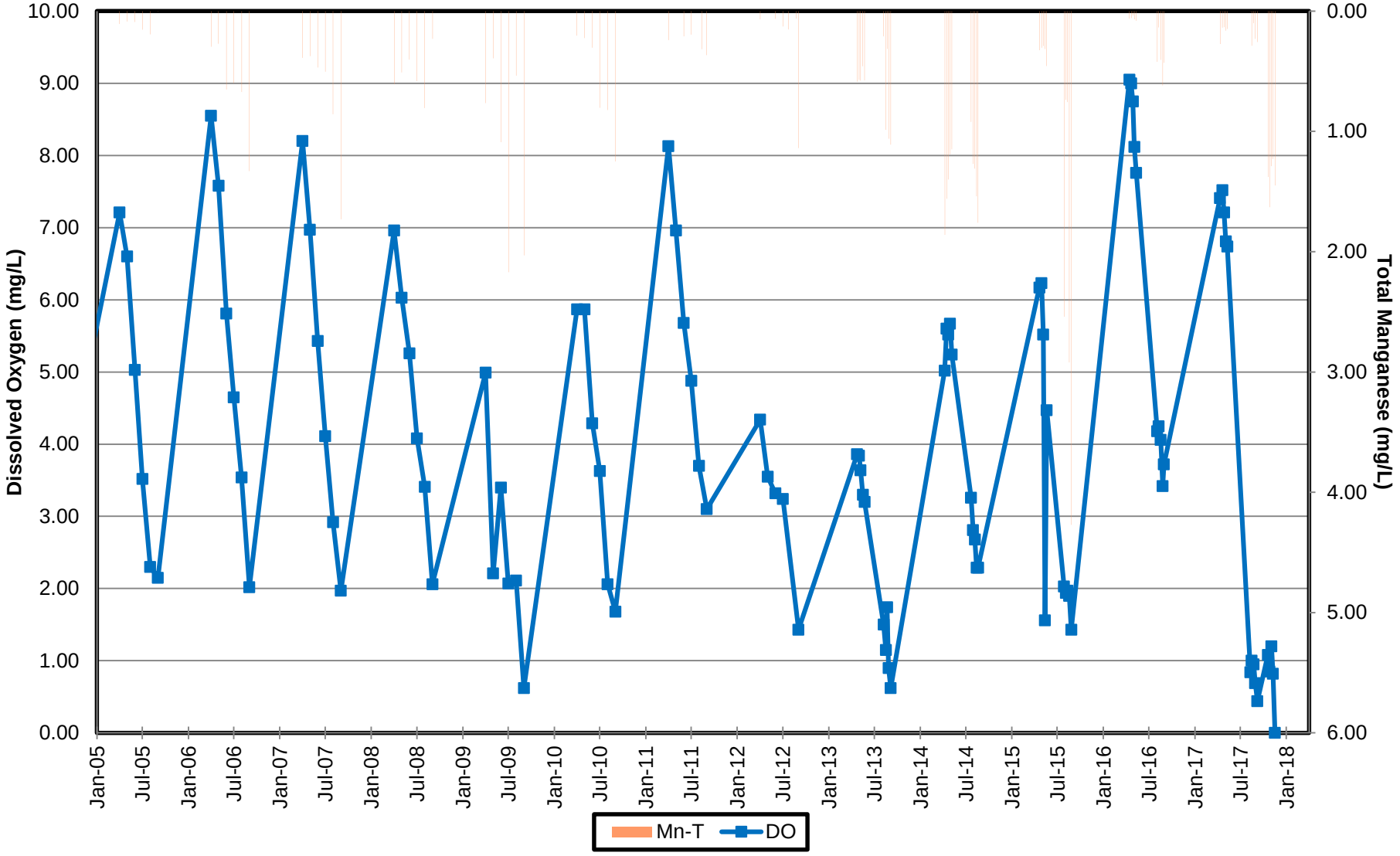
LONG LAKE

QUINSAM COAL



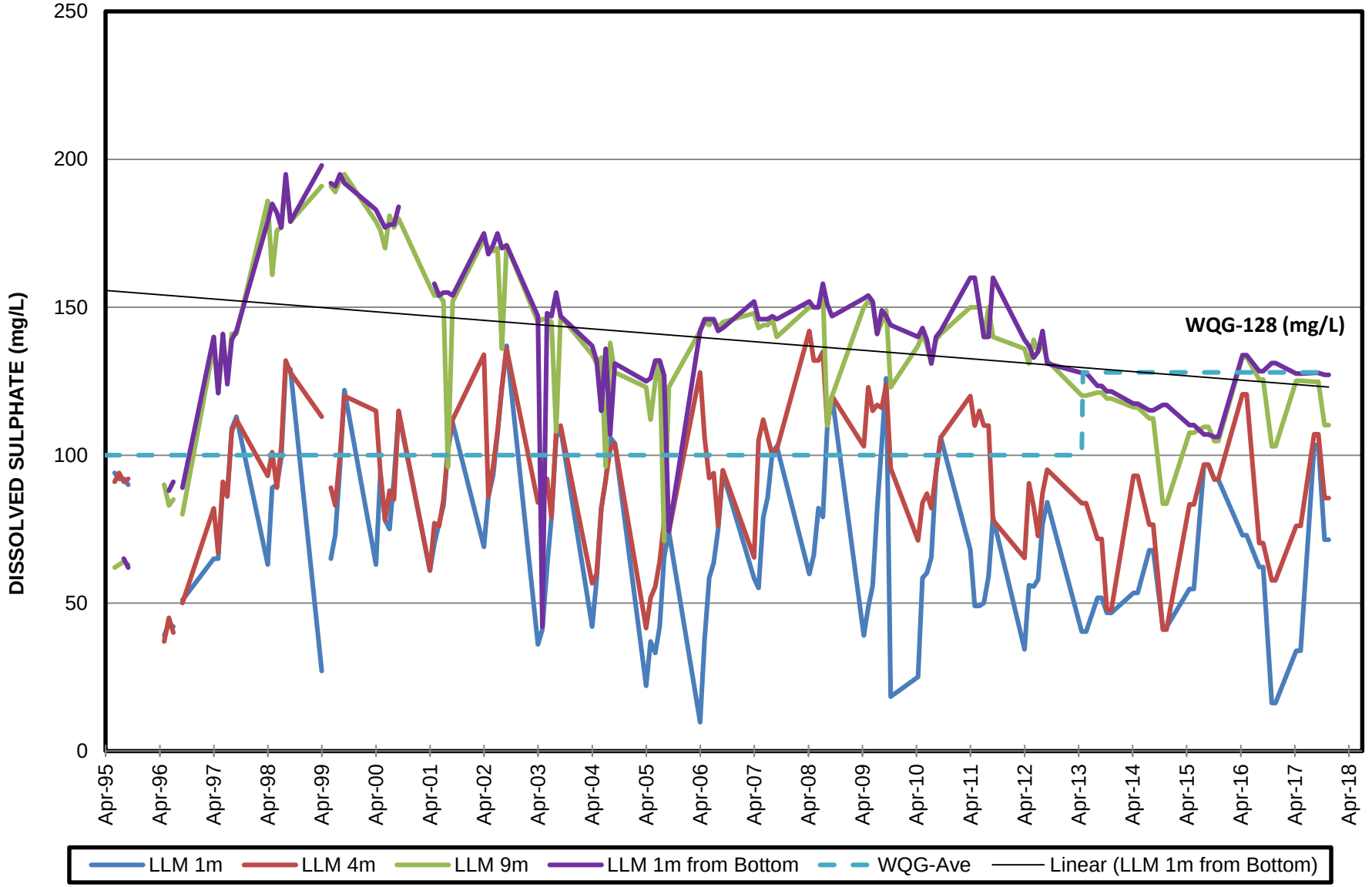
Graph 34

Historic Dissolved Oxygen vs Total Manganese
Long Lake 1 Metre From Bottom
2005-2018

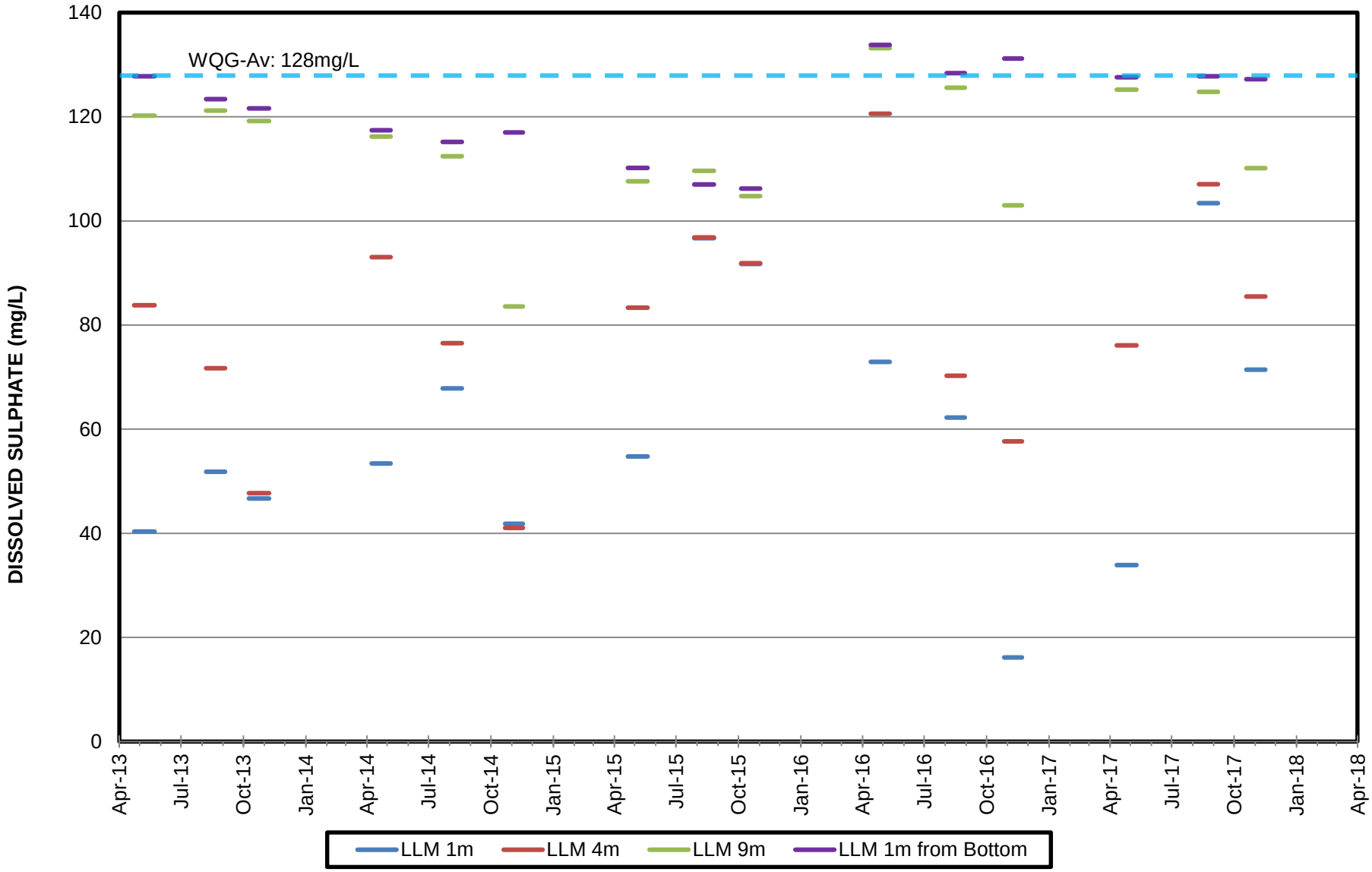


Graph 35
HISTORIC DISSOLVED SULPHATE
LONG LAKE

QUINSAM COAL



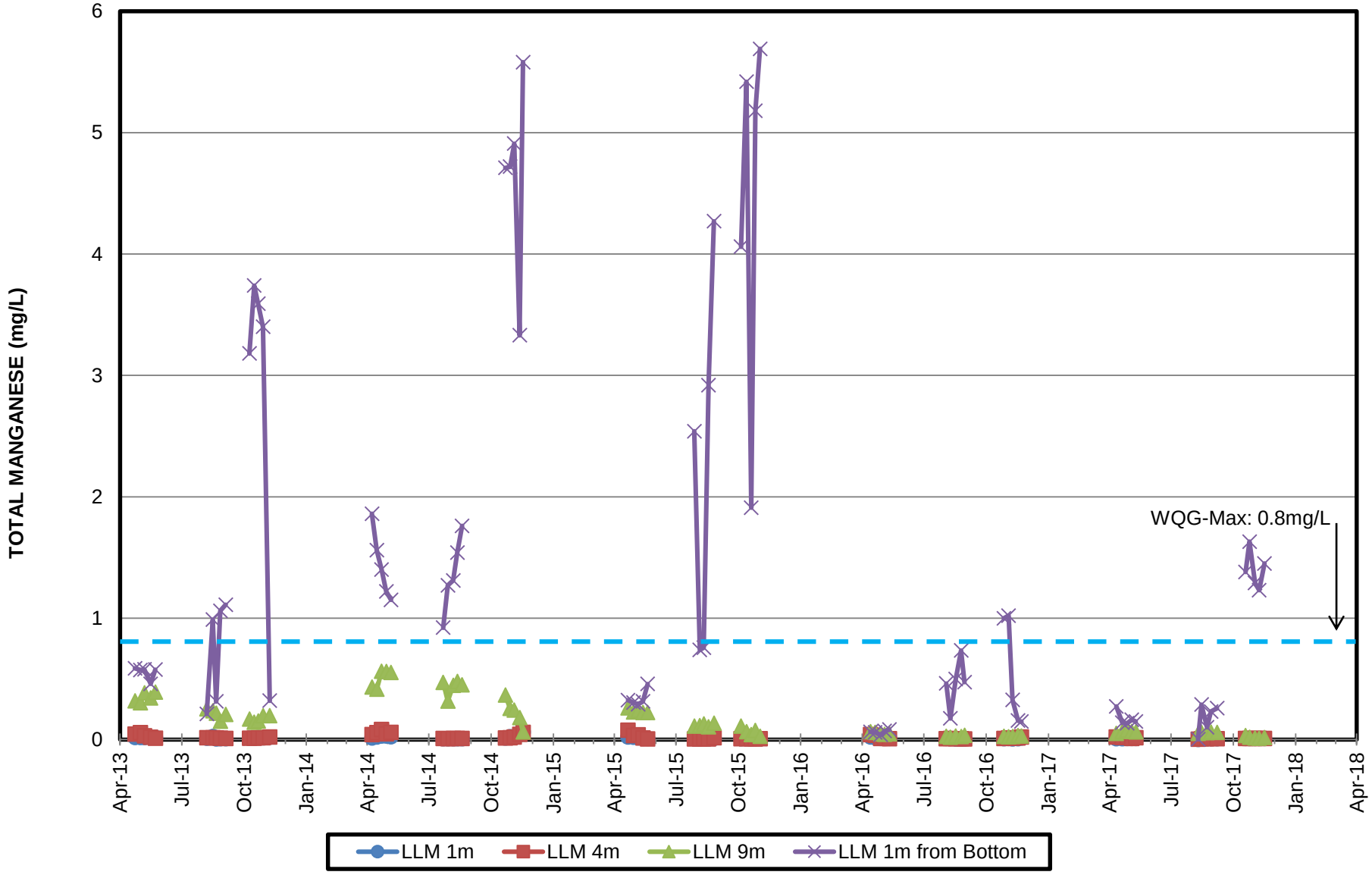
Graph 36
5 in 30 AVERAGE DISSOLVED SULPHATE
LONG LAKE



GRAPH 37

5 in 30 TOTAL MANGANESE

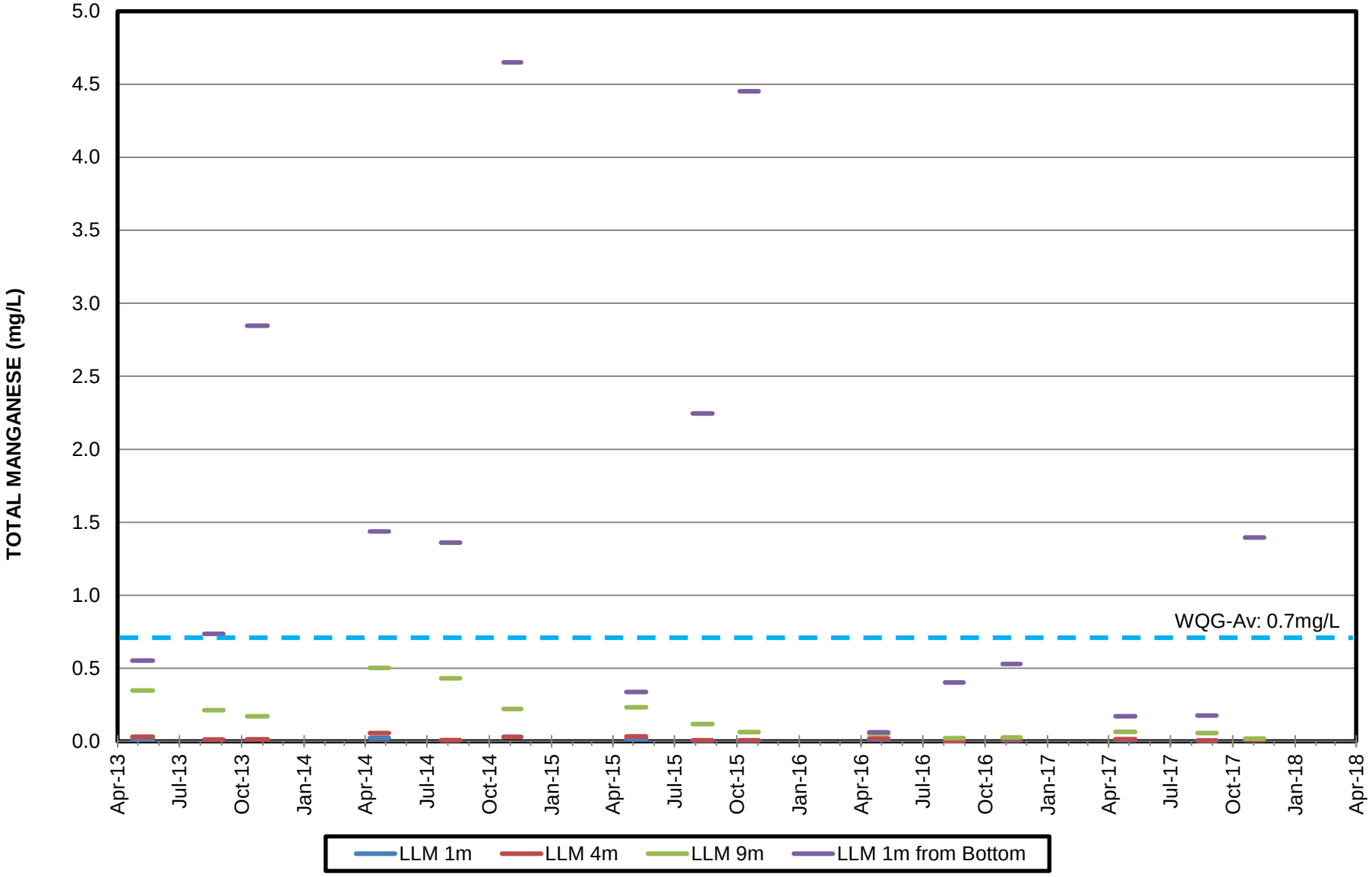
LONG LAKE



GRAPH 38

5 in 30 AVERAGE TOTAL MANGANESE

LONG LAKE

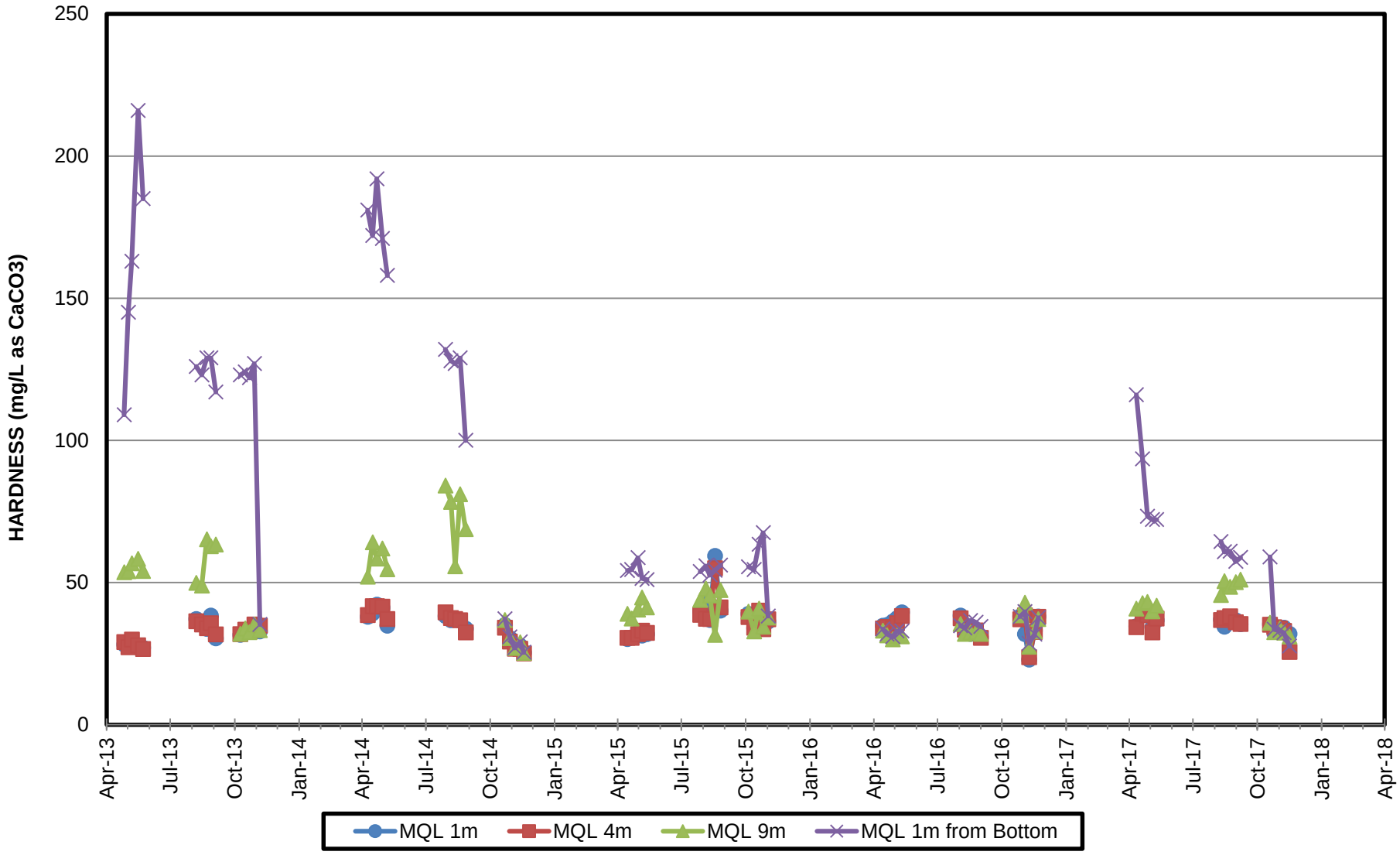


GRAPH 39

5 in 30 HARDNESS

MIDDLE QUINSAM LAKE

QUINSAM COAL

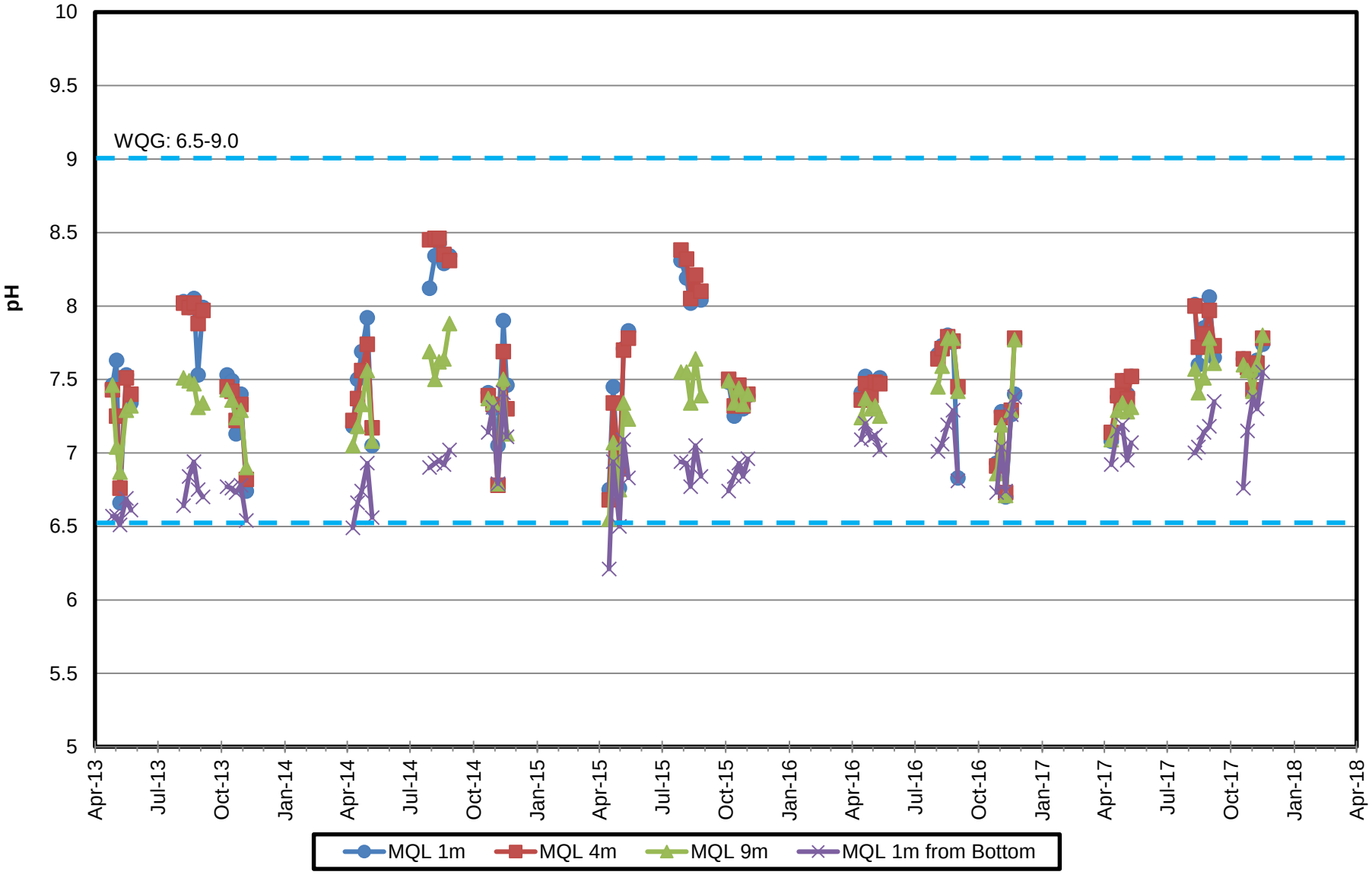


GRAPH 40

5 in 30 PH

MIDDLE QUINSAM LAKE

QUINSAM COAL

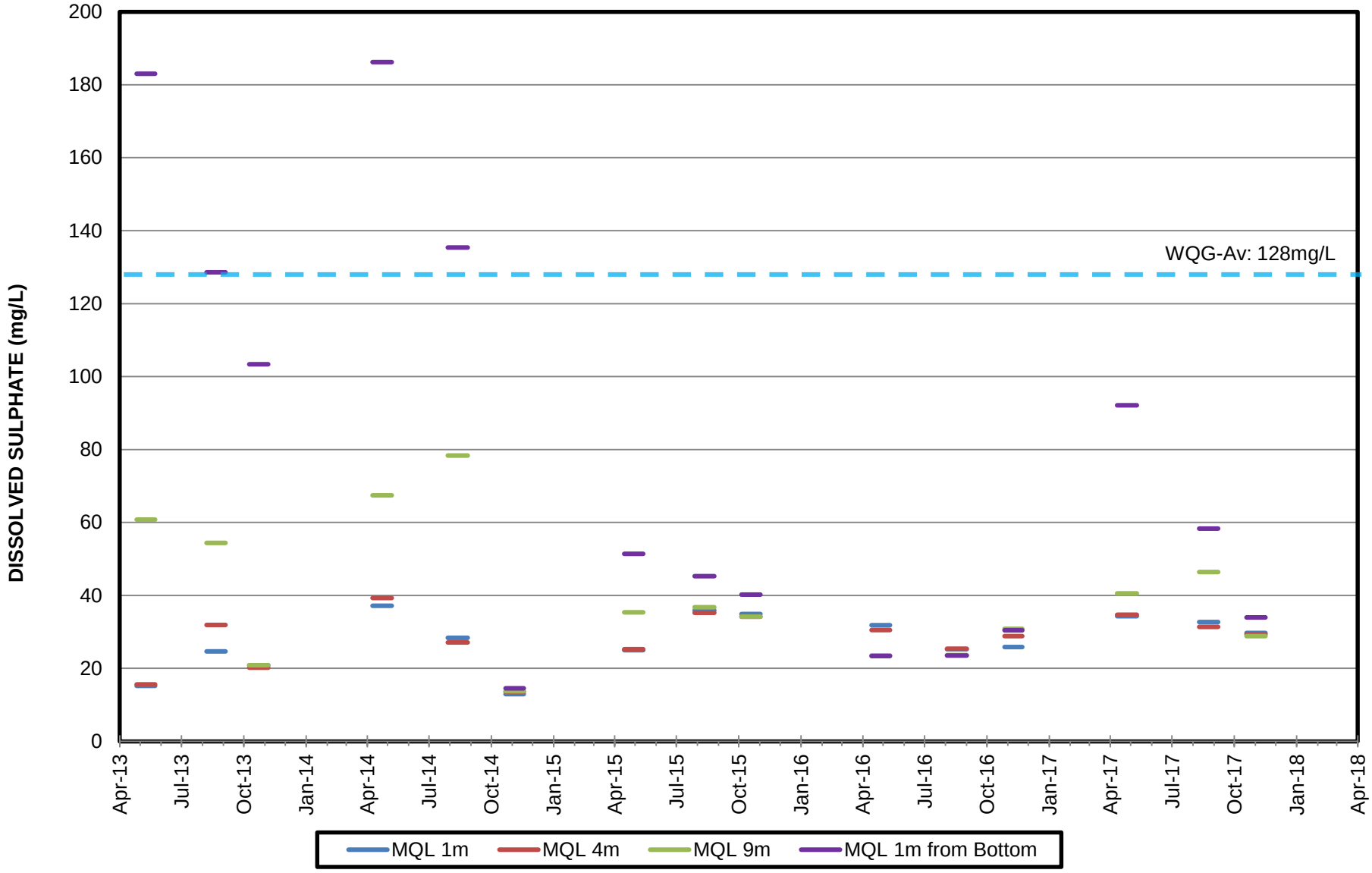


GRAPH 41

5 in 30 AVERAGE DISSOLVED SULPHATE

MIDDLE QUINSAM LAKE

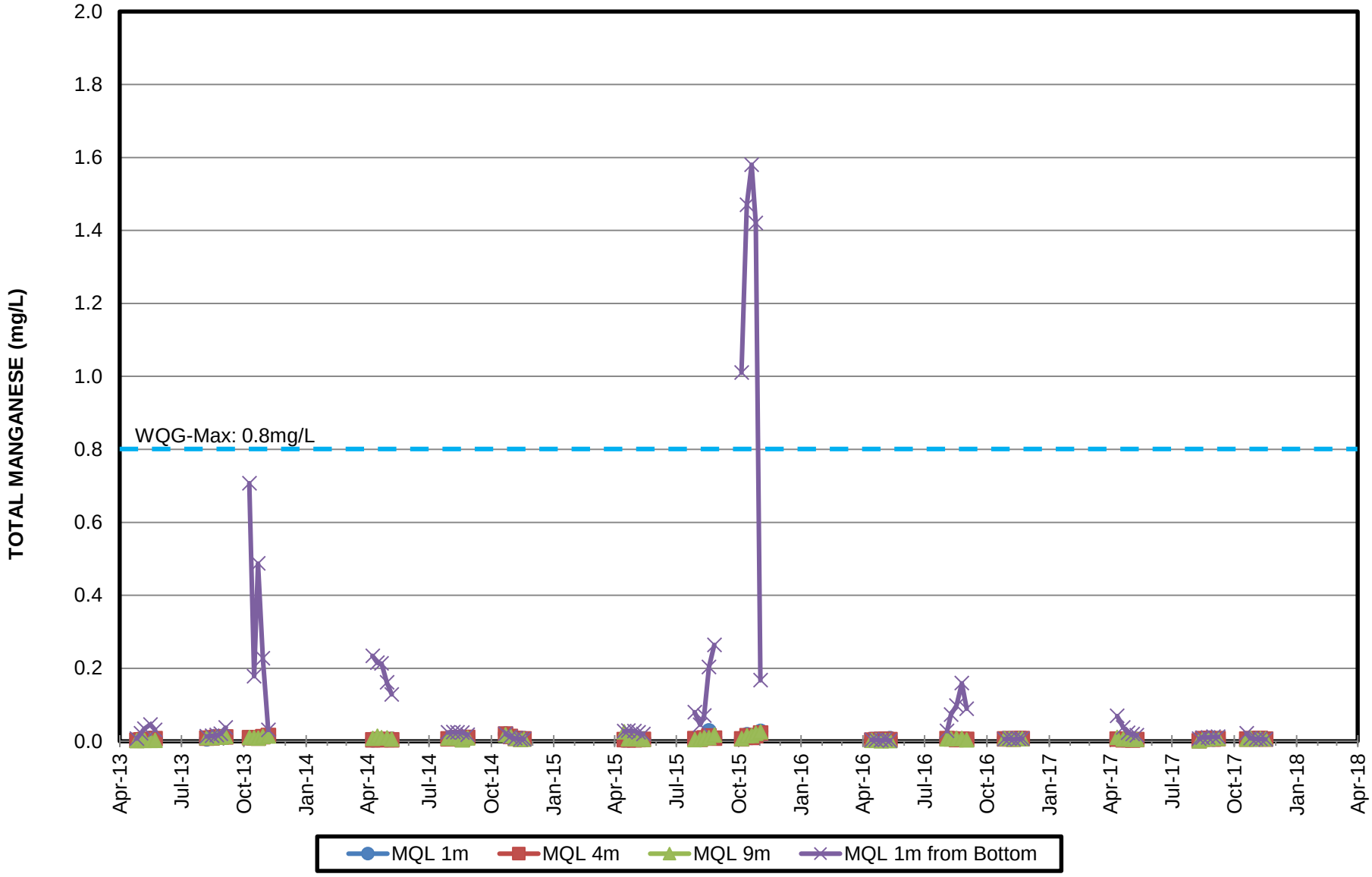
QUINSAM COAL



GRAPH 42

5 in 30 TOTAL MANGANESE

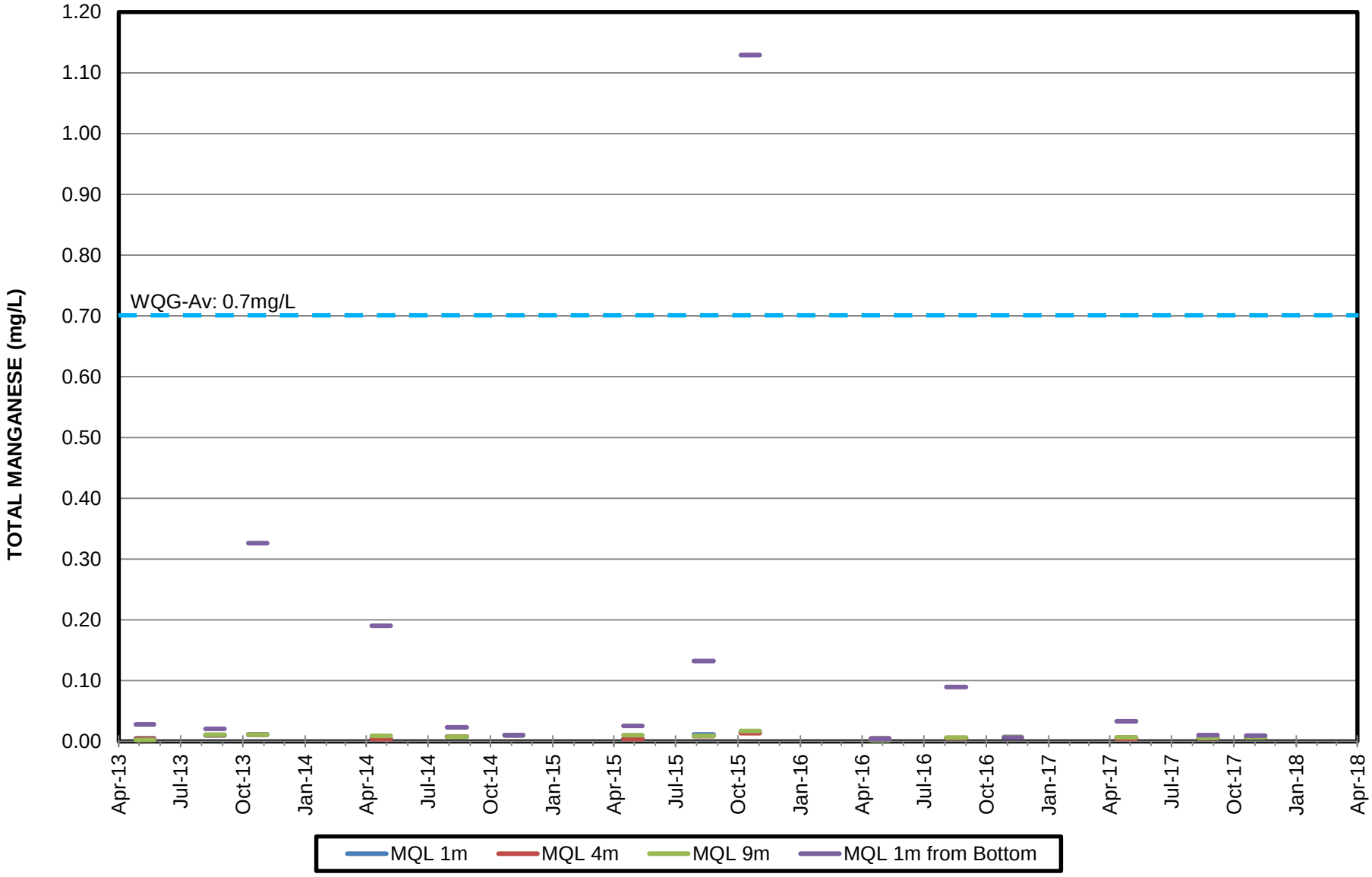
MIDDLE QUINSAM LAKE



GRAPH 43

5 in 30 AVERAGE TOTAL MANGANESE

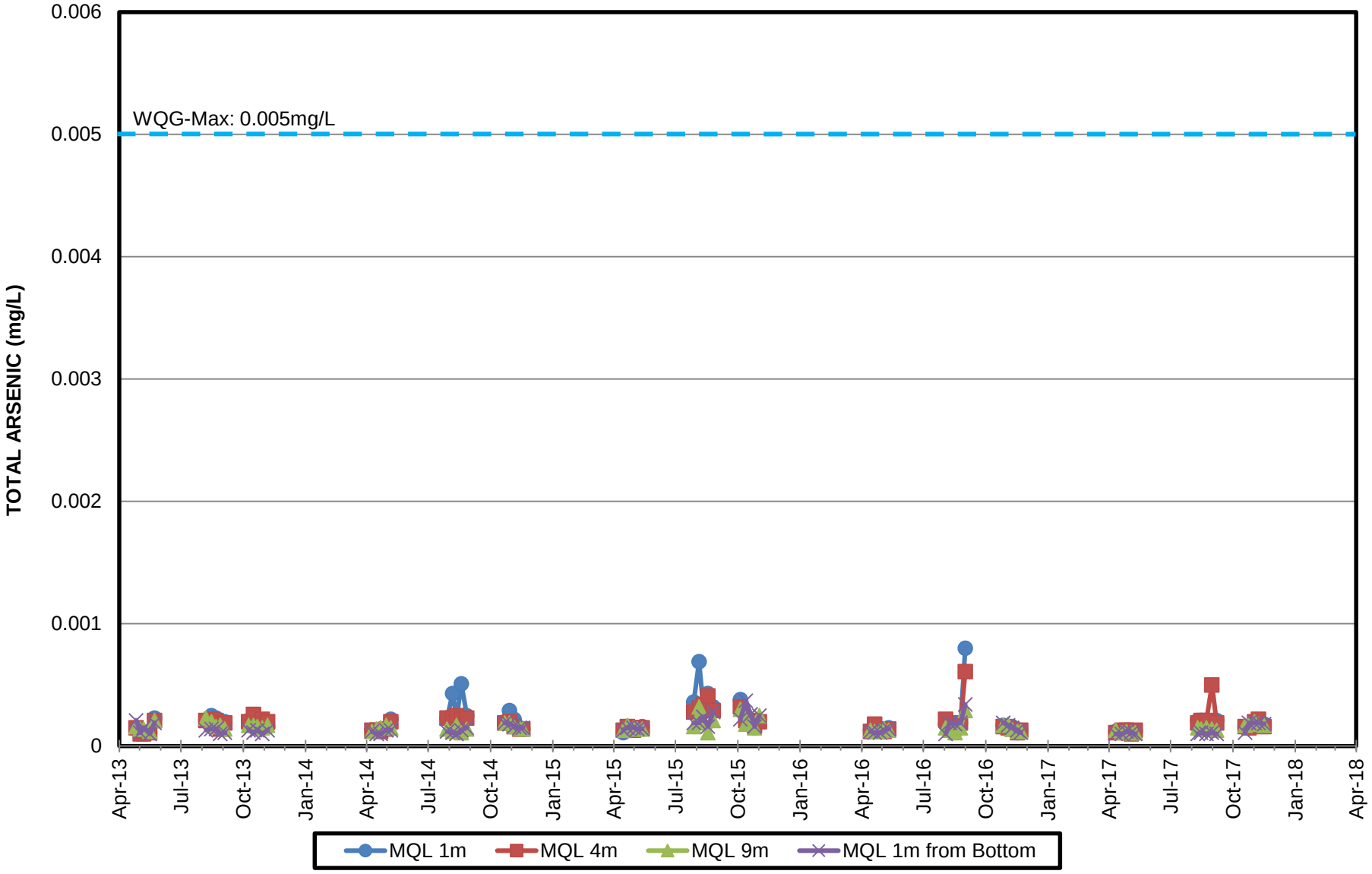
MIDDLE QUINSAM LAKE



GRAPH 44

5 in 30 TOTAL ARSENIC

MIDDLE QUINSAM LAKE

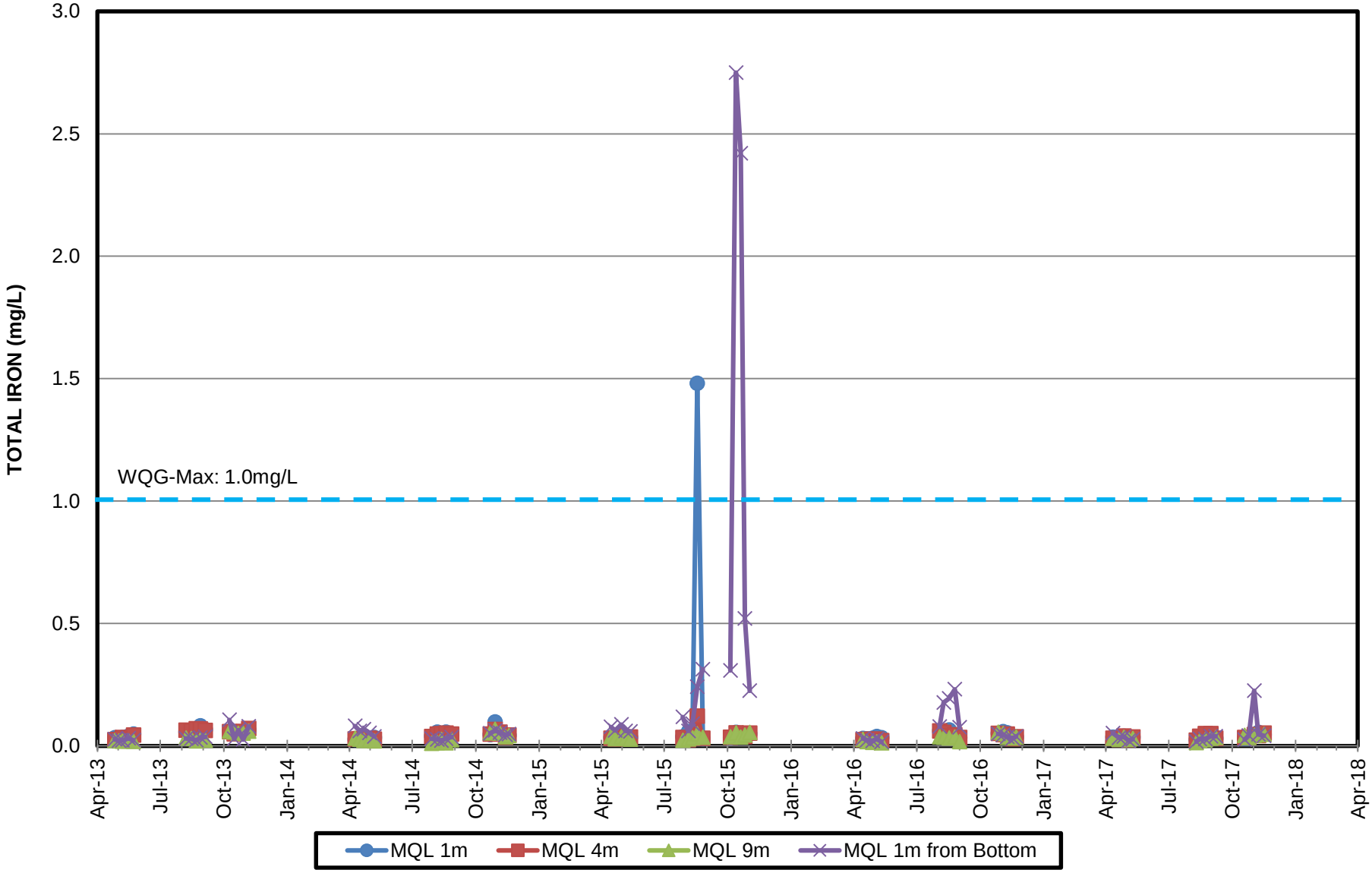


GRAPH 45

5 in 30 TOTAL IRON

MIDDLE QUINSAM LAKE

QUINSAM COAL

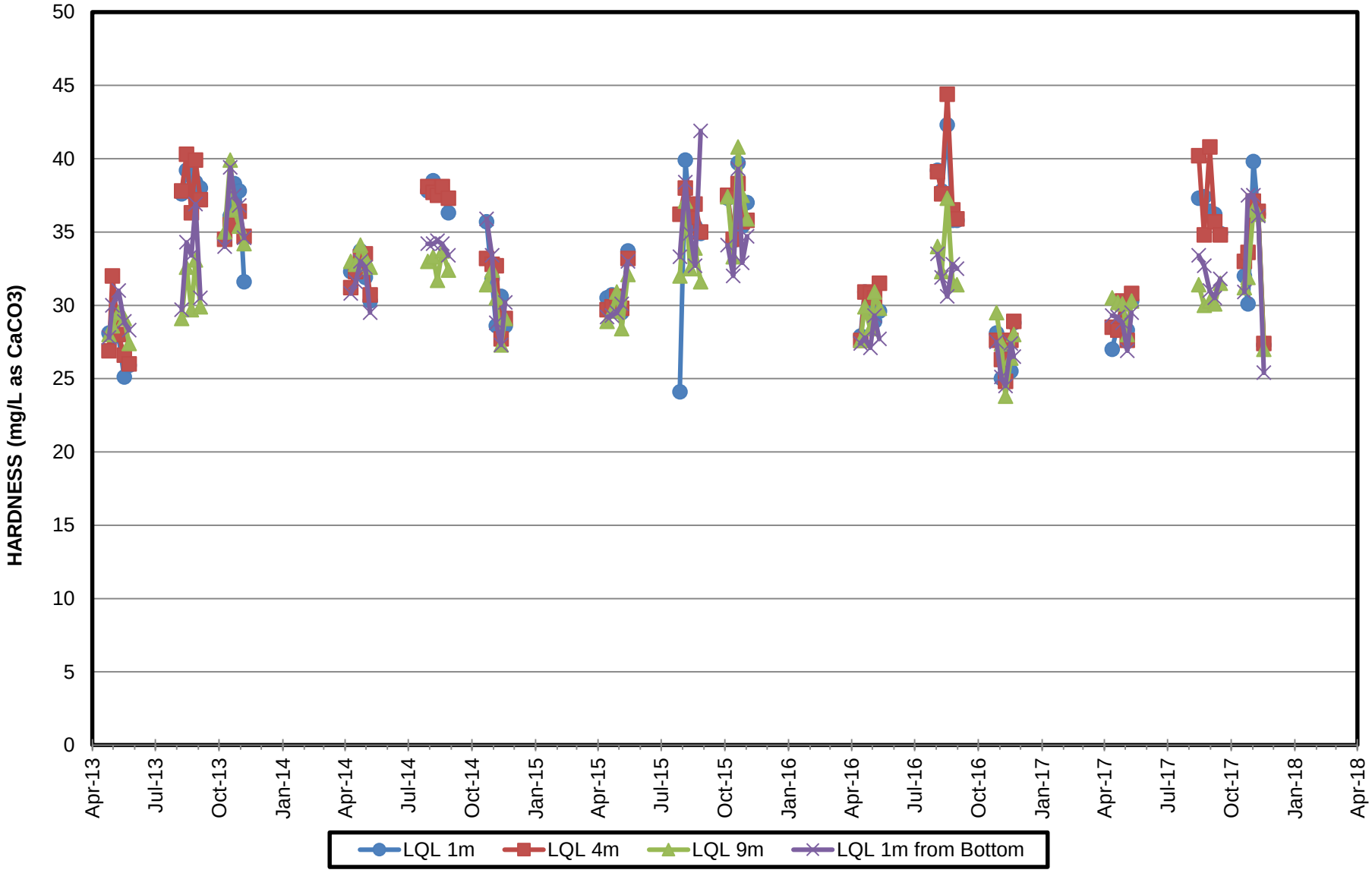


GRAPH 46

5 in 30 HARDNESS

LOWER QUINSAM LAKE

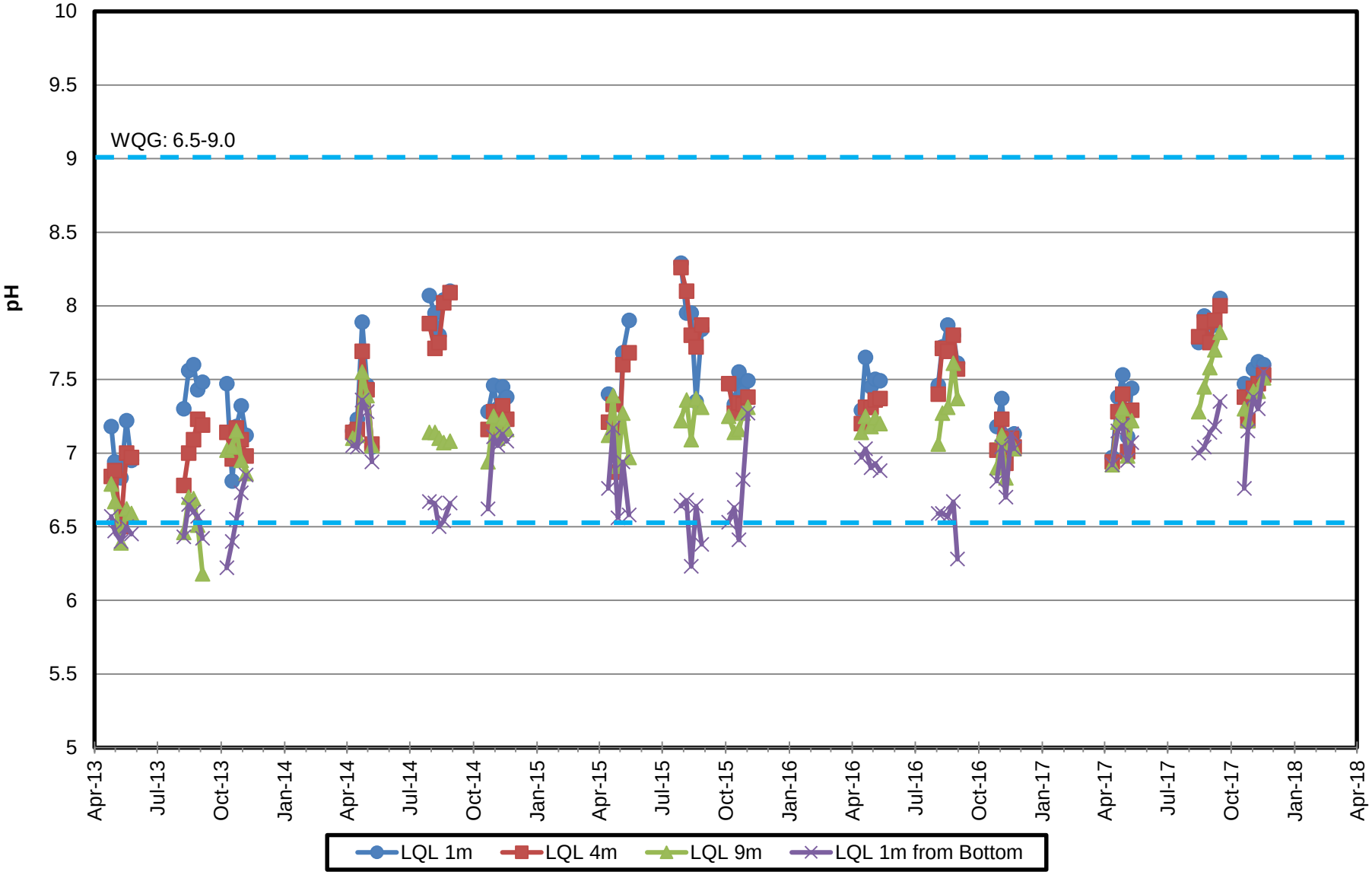
QUINSAM COAL



GRAPH 47

5 in 30 PH

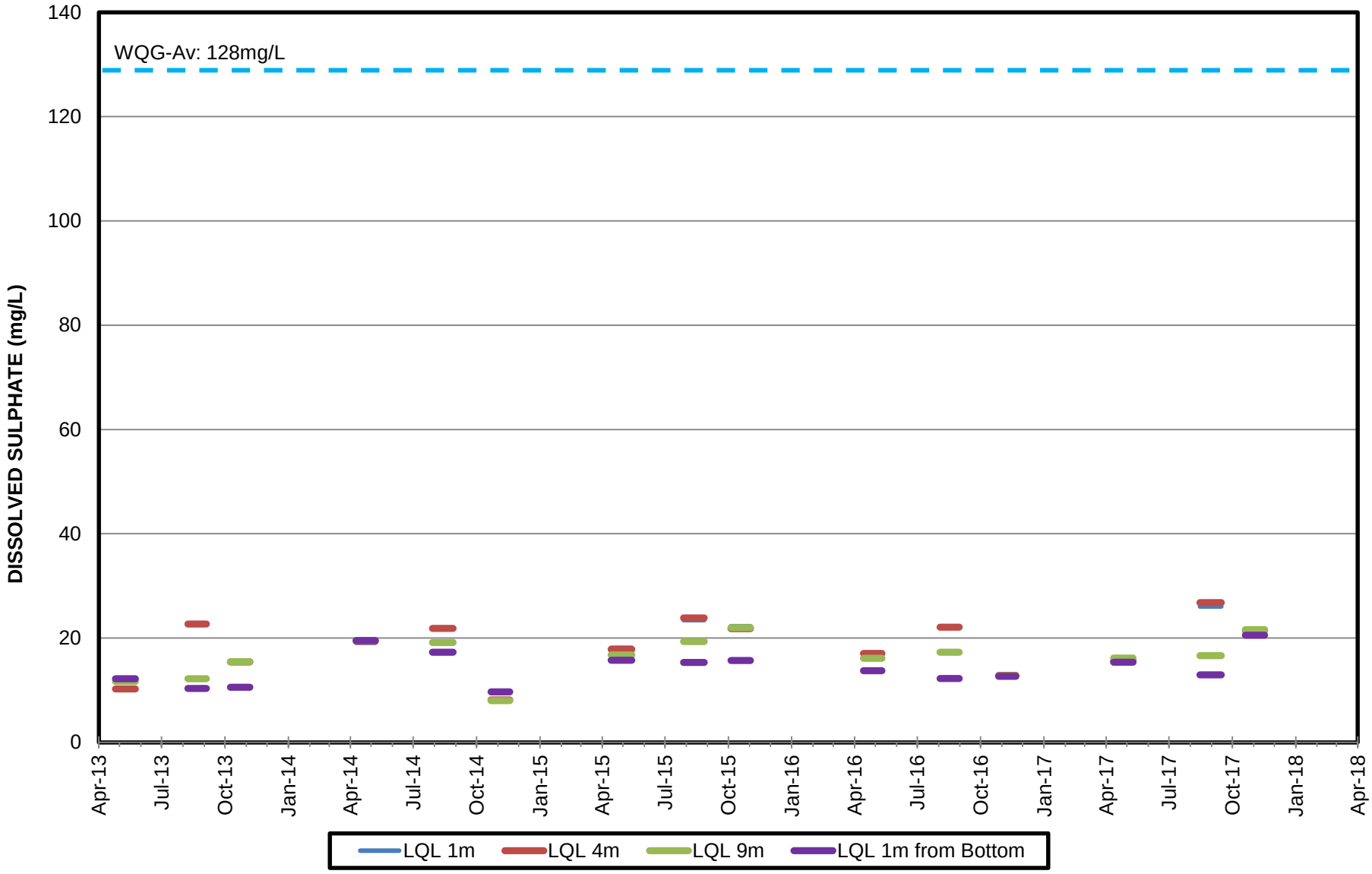
LOWER QUINSAM LAKE



Graph 48

5 in 30 AVERAGE DISSOLVED SULPHATE

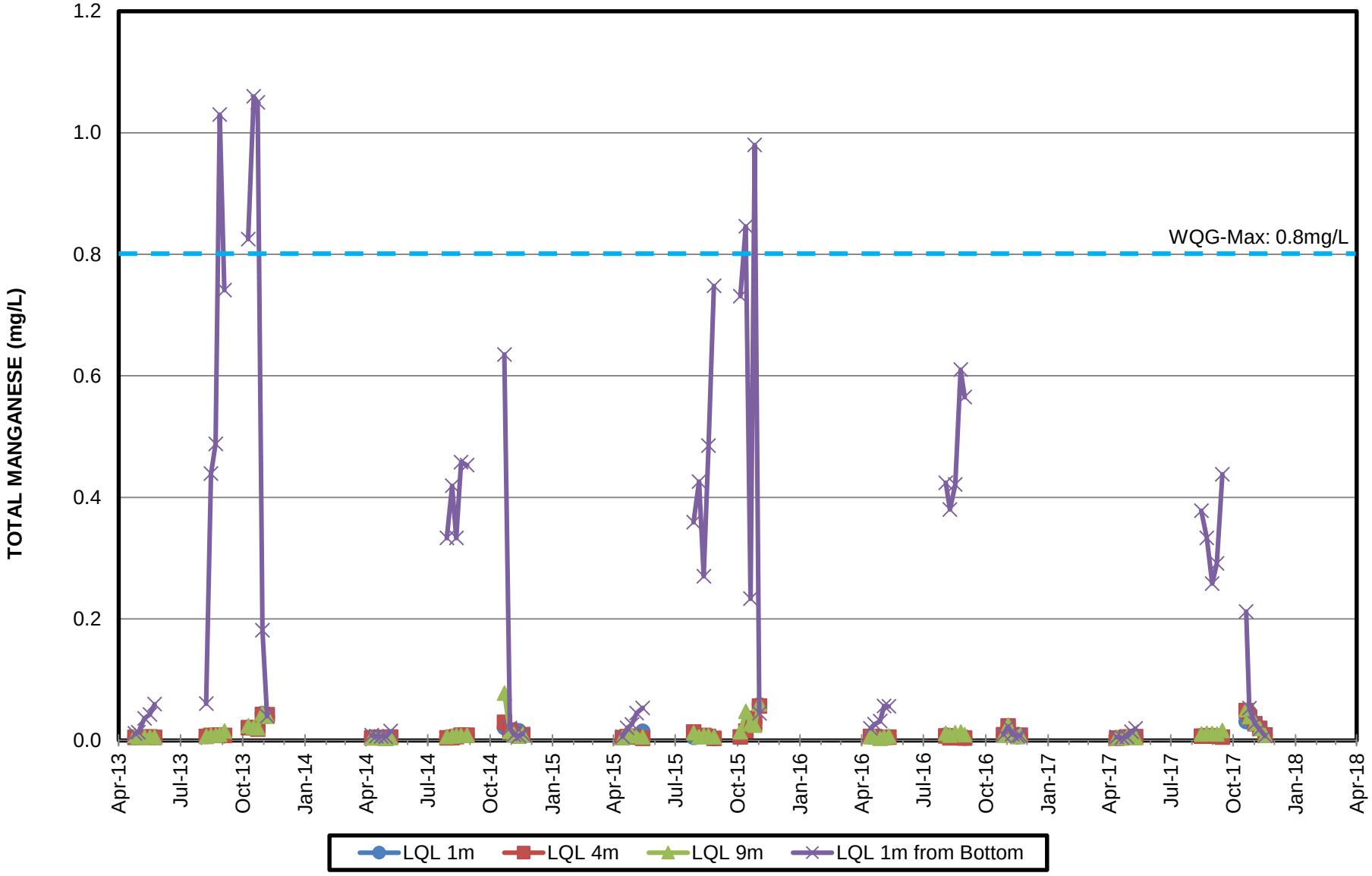
LOWER QUINSAM LAKE



GRAPH 49

5 in 30 TOTAL MANGANESE

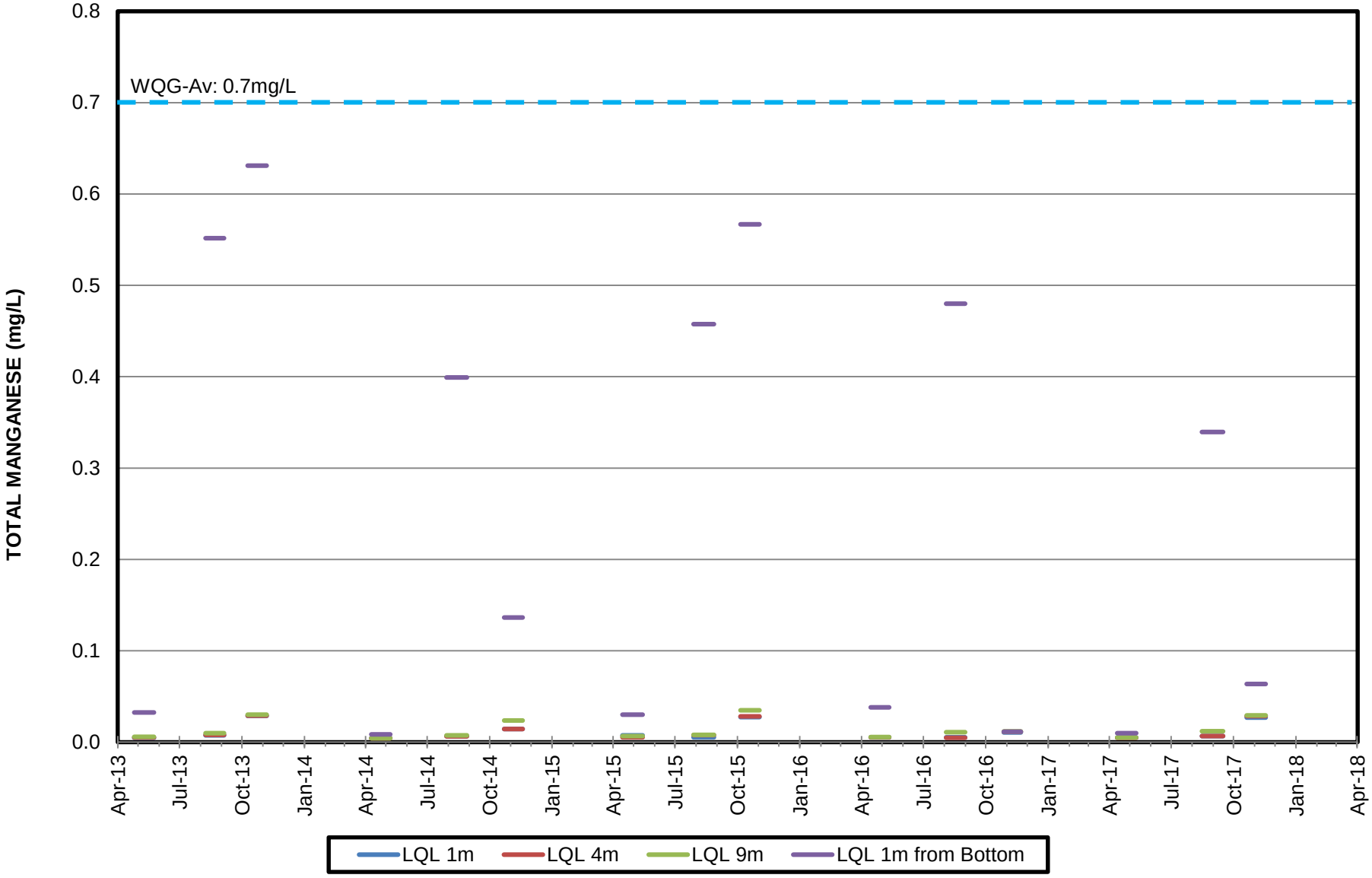
LOWER QUINSAM LAKE



GRAPH 50

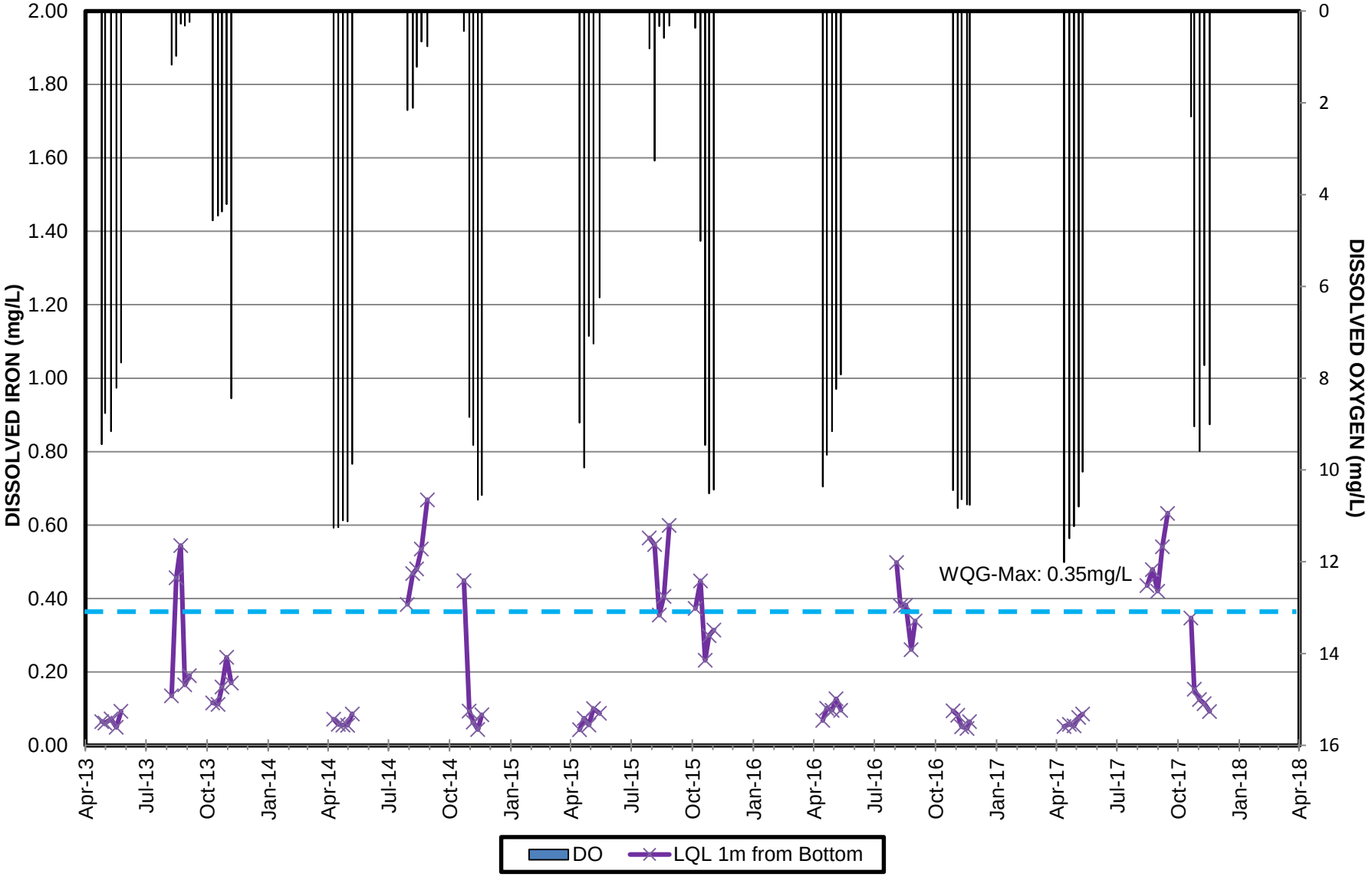
5 in 30 AVERAGE TOTAL MANGANESE

LOWER QUINSAM LAKE



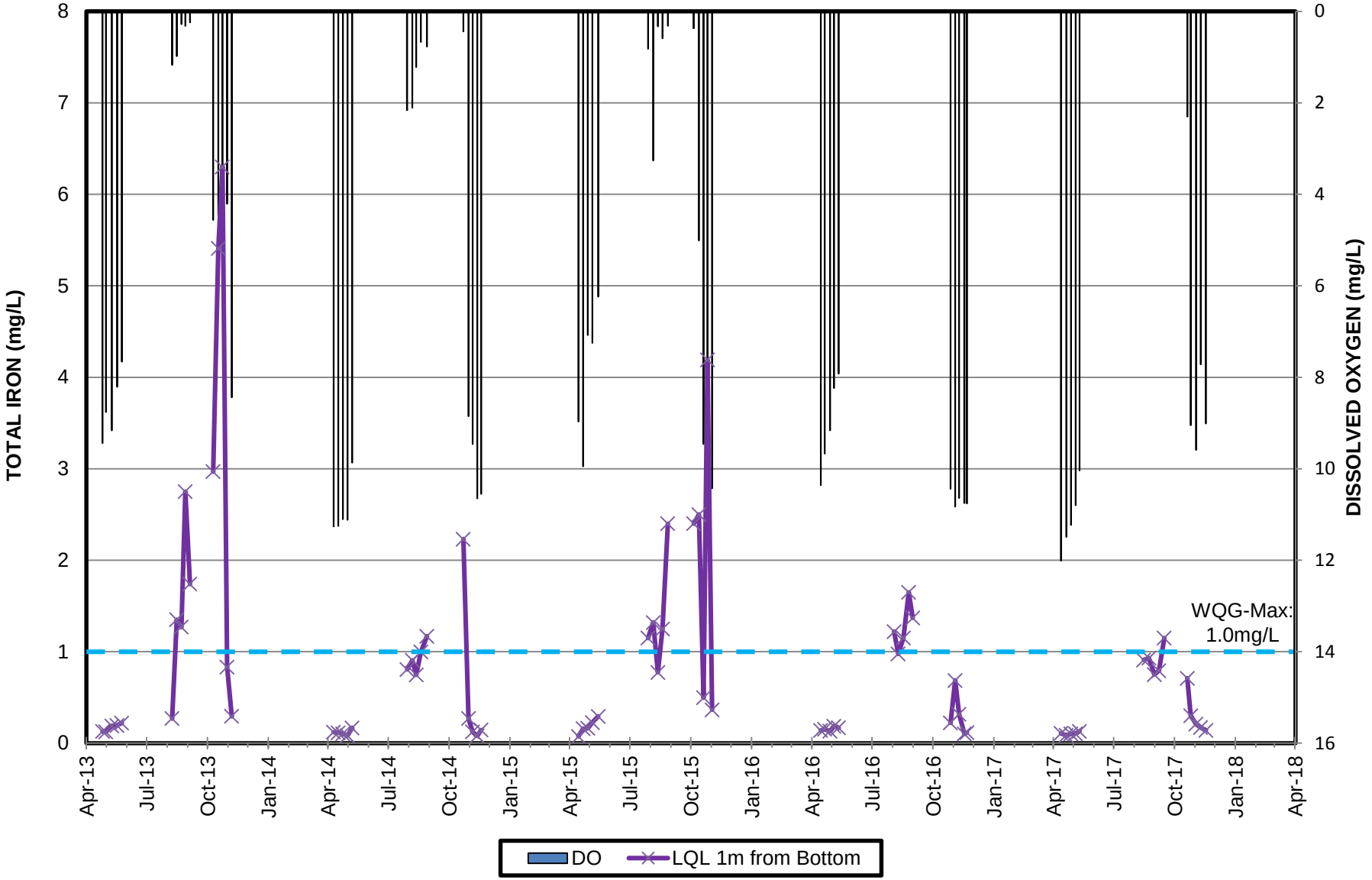
Graph 51
5 in 30 DISSOLVED IRON VS DISSOLVED OXYGEN
LOWER QUINSAM LAKE 1mb

QUINSAM COAL

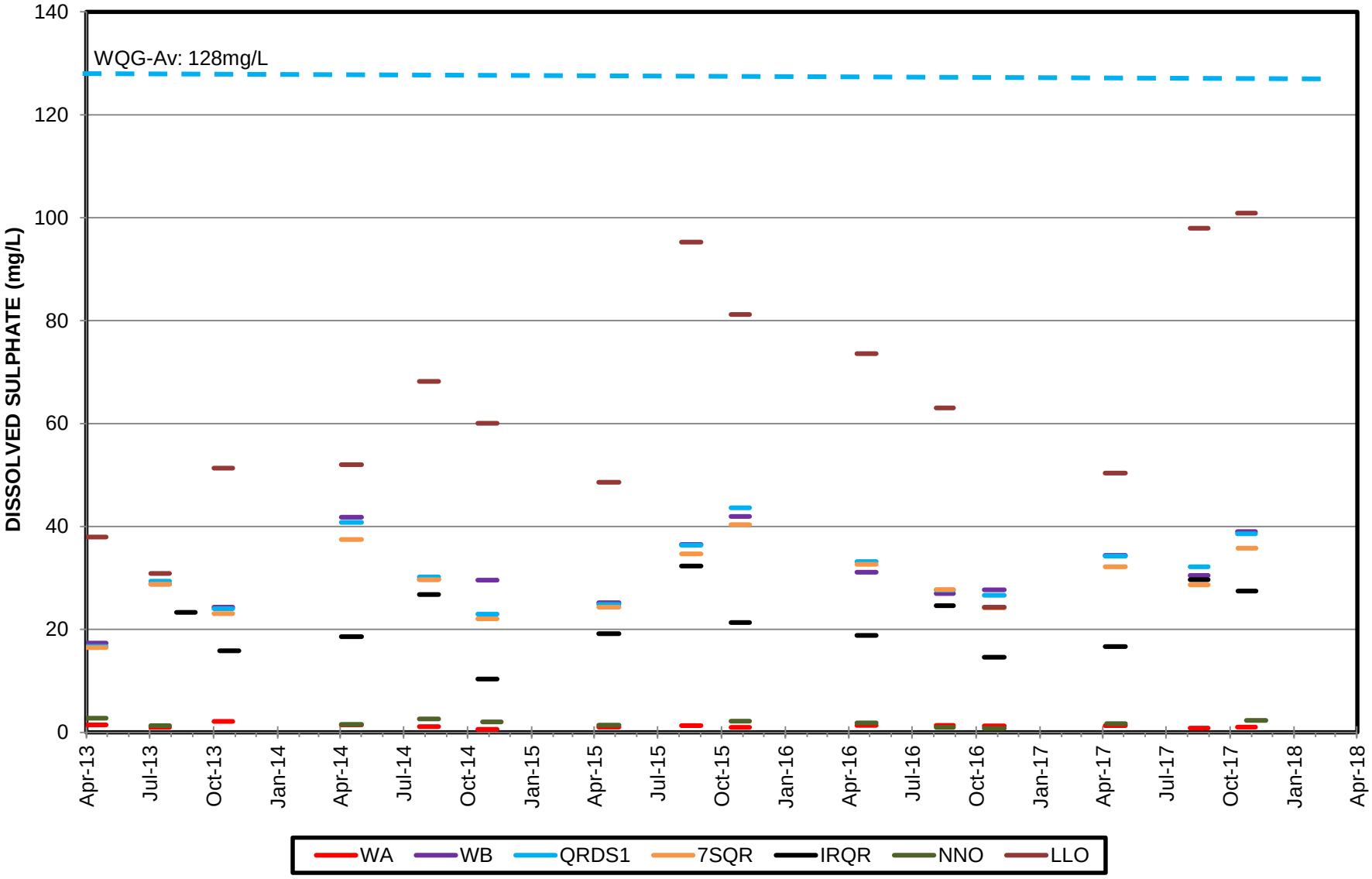


Graph 52
5 in 30 TOTAL IRON VS DISSOLVED OXYGEN
LOWER QUINSAM LAKE 1mb

QUINSAM COAL



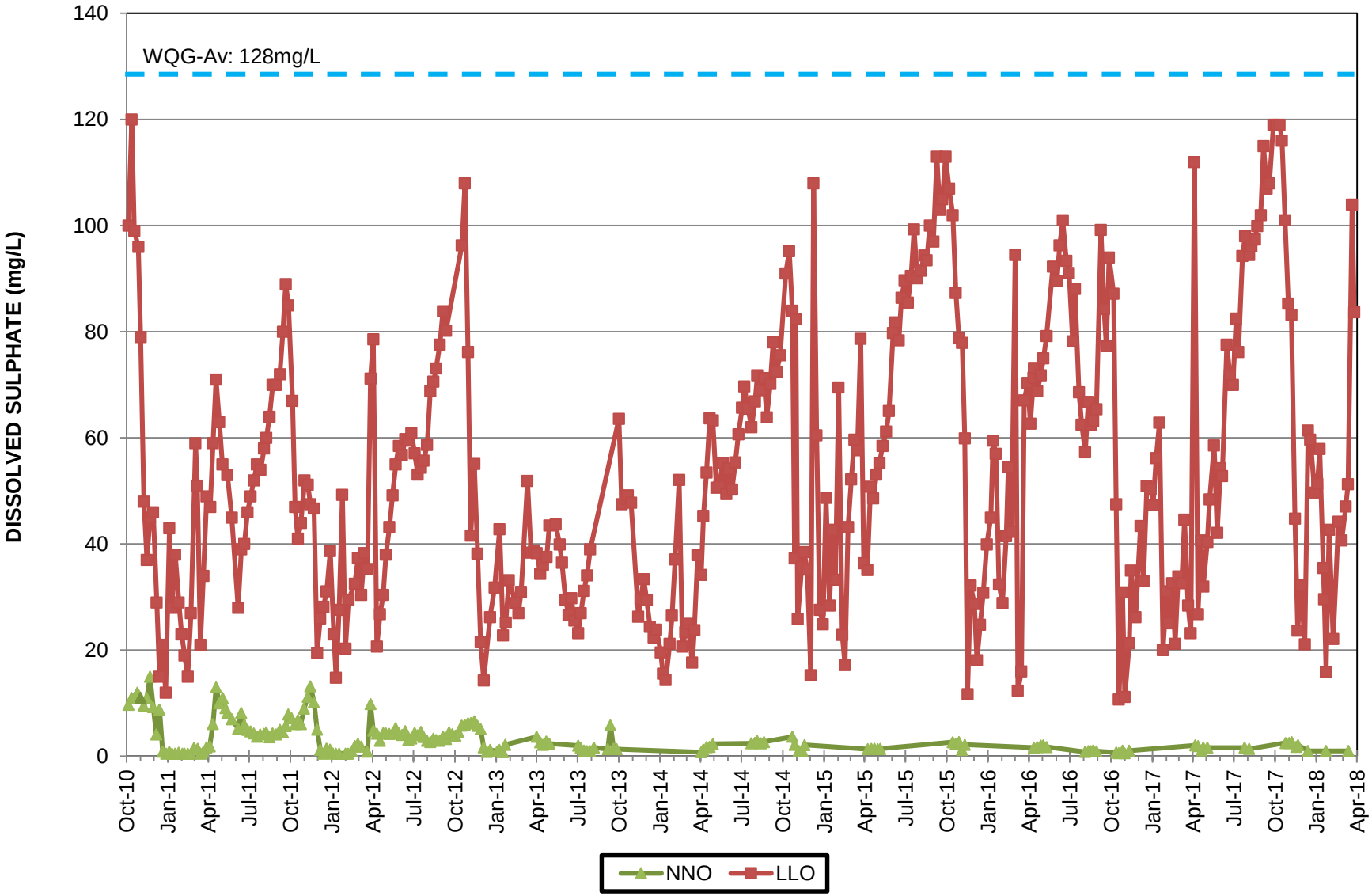
GRAPH 53
5 IN 30 AVERAGE DISSOLVED SULPHATE
QUINSAM SUB BASIN: RIVERS AND STREAMS



GRAPH 54

DISSOLVED SULPHATE

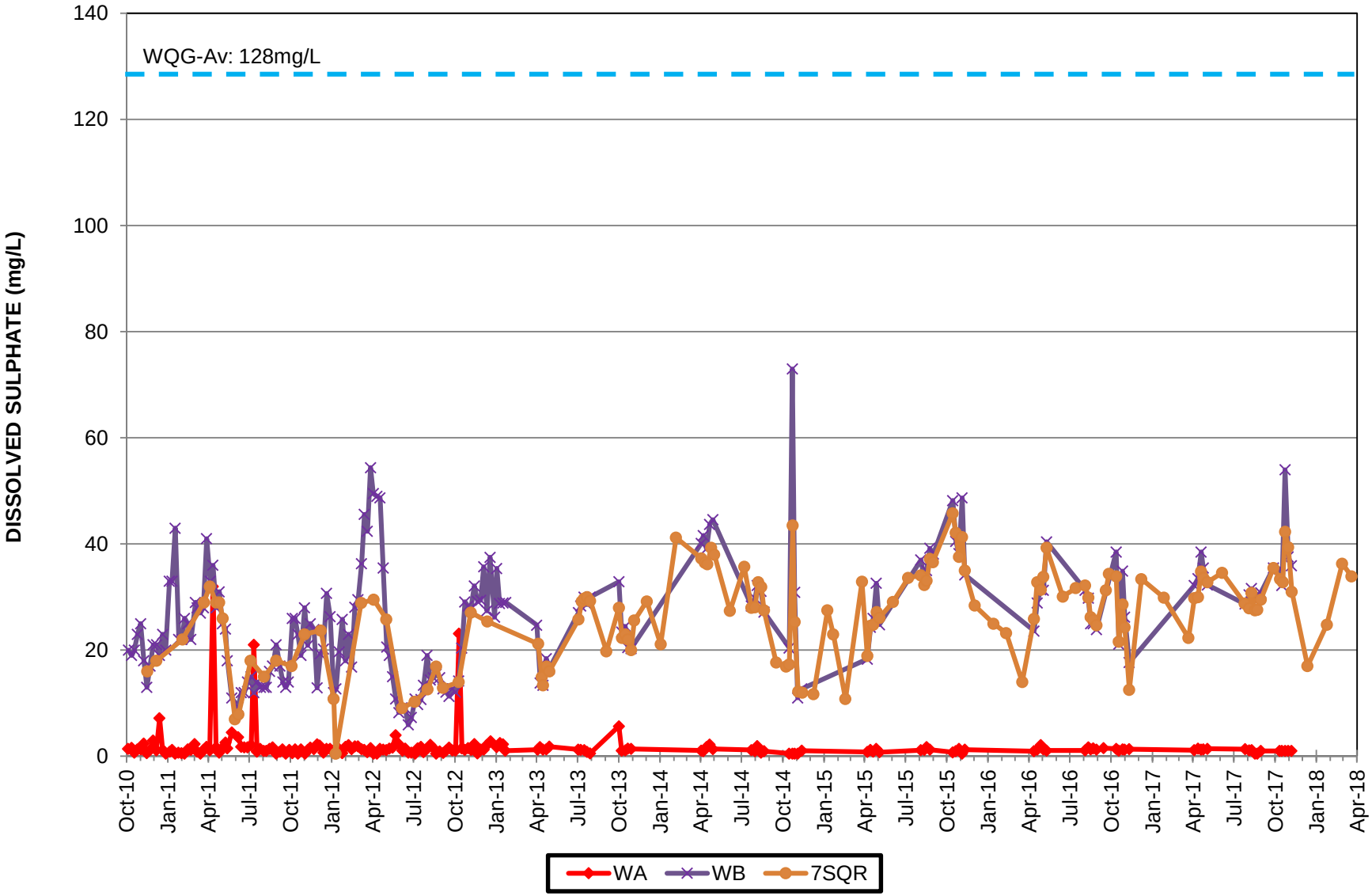
QUINSAM SUB BASIN: RIVERS AND STREAMS



GRAPH 55

DISSOLVED SULPHATE

QUINSAM SUB BASIN: RIVERS AND STREAMS

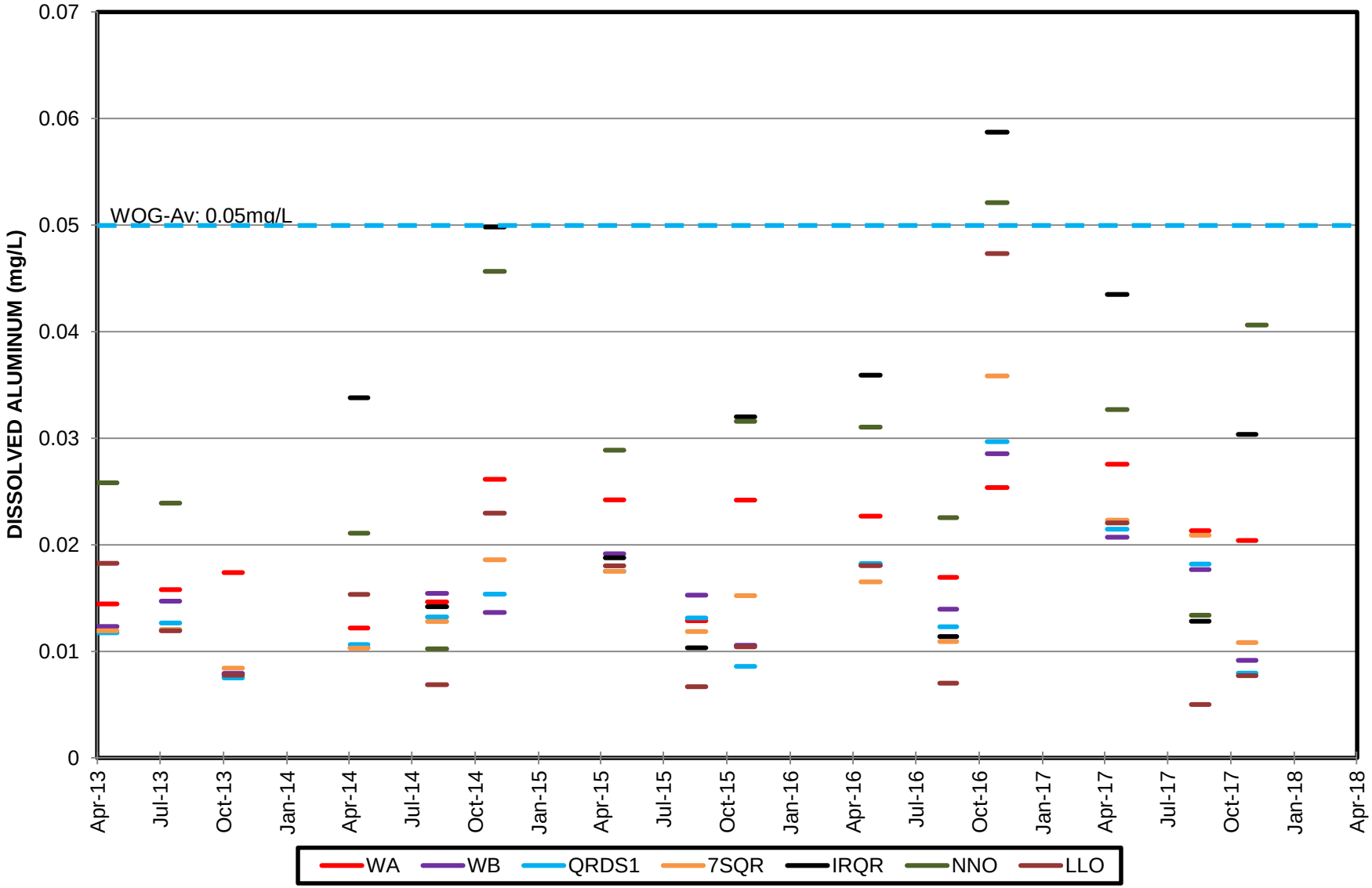


GRAPH 56

5 IN 30 AVERAGE DISSOLVED ALUMINUM

QUINSAM SUB BASIN: RIVERS AND STREAMS

QUINSAM COAL

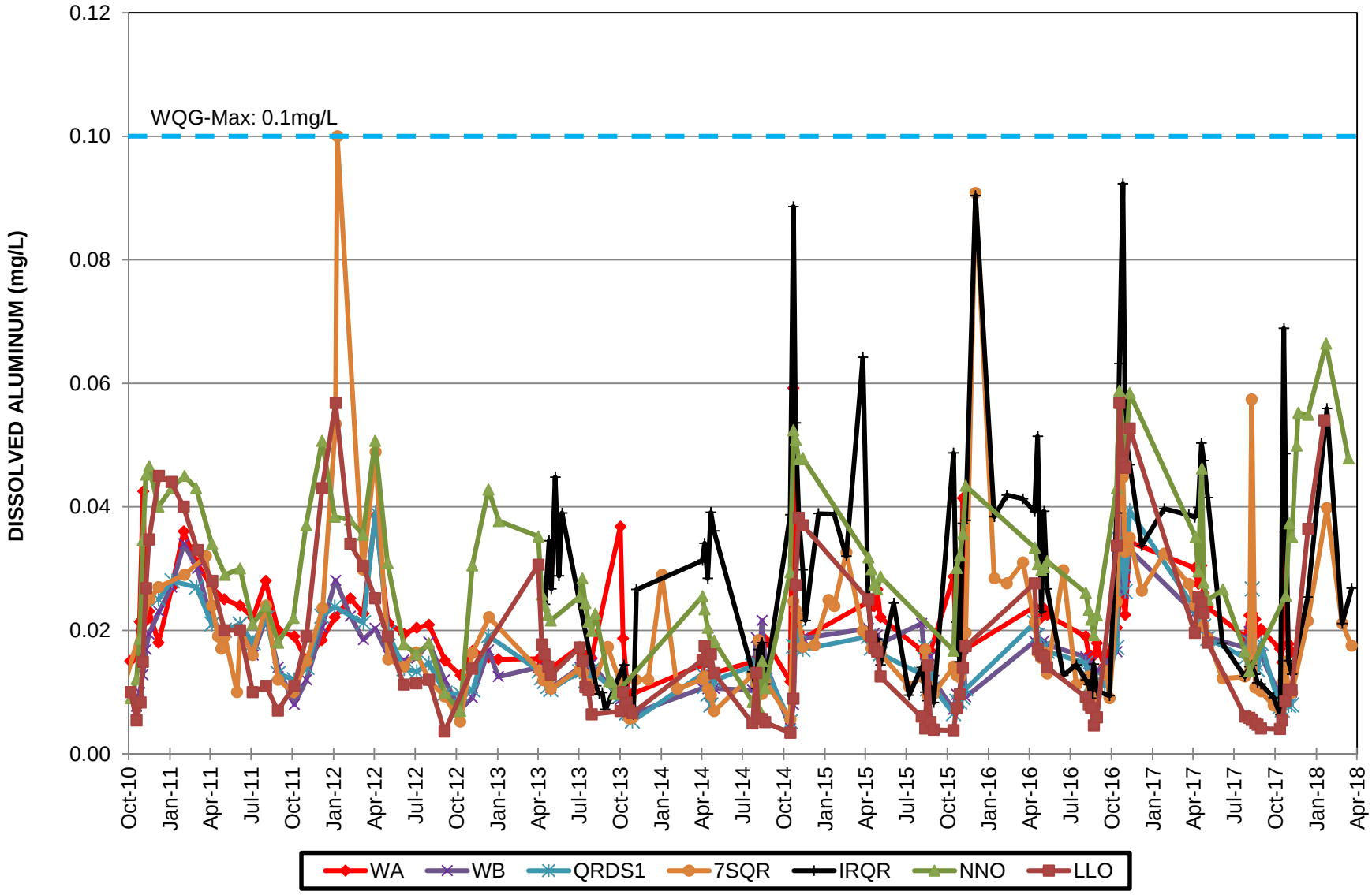


GRAPH 57

DISSOLVED ALUMINUM

QUINSAM SUB BASIN: RIVERS AND STREAMS

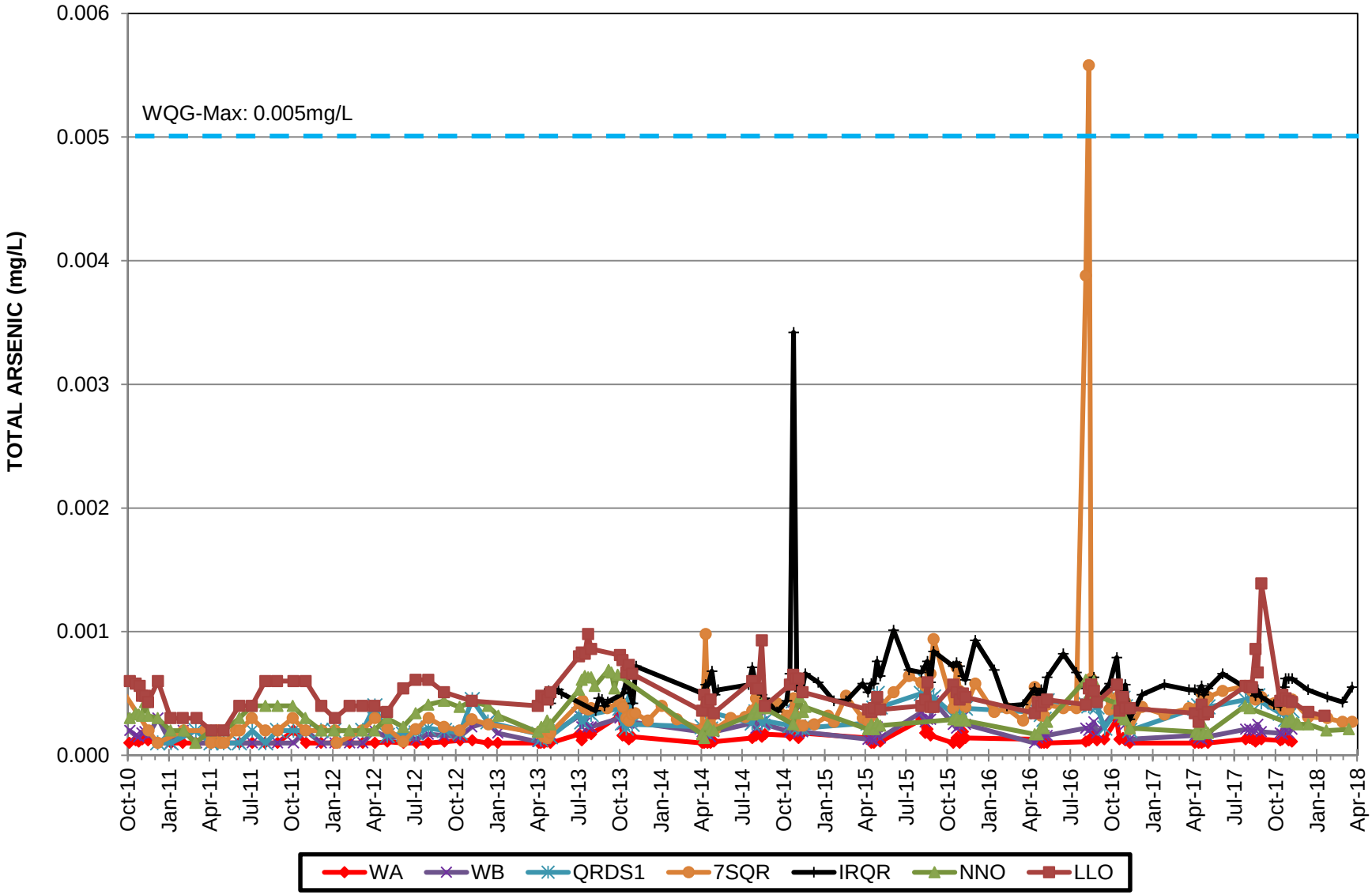
QUINSAM COAL



GRAPH 58

TOTAL ARSENIC

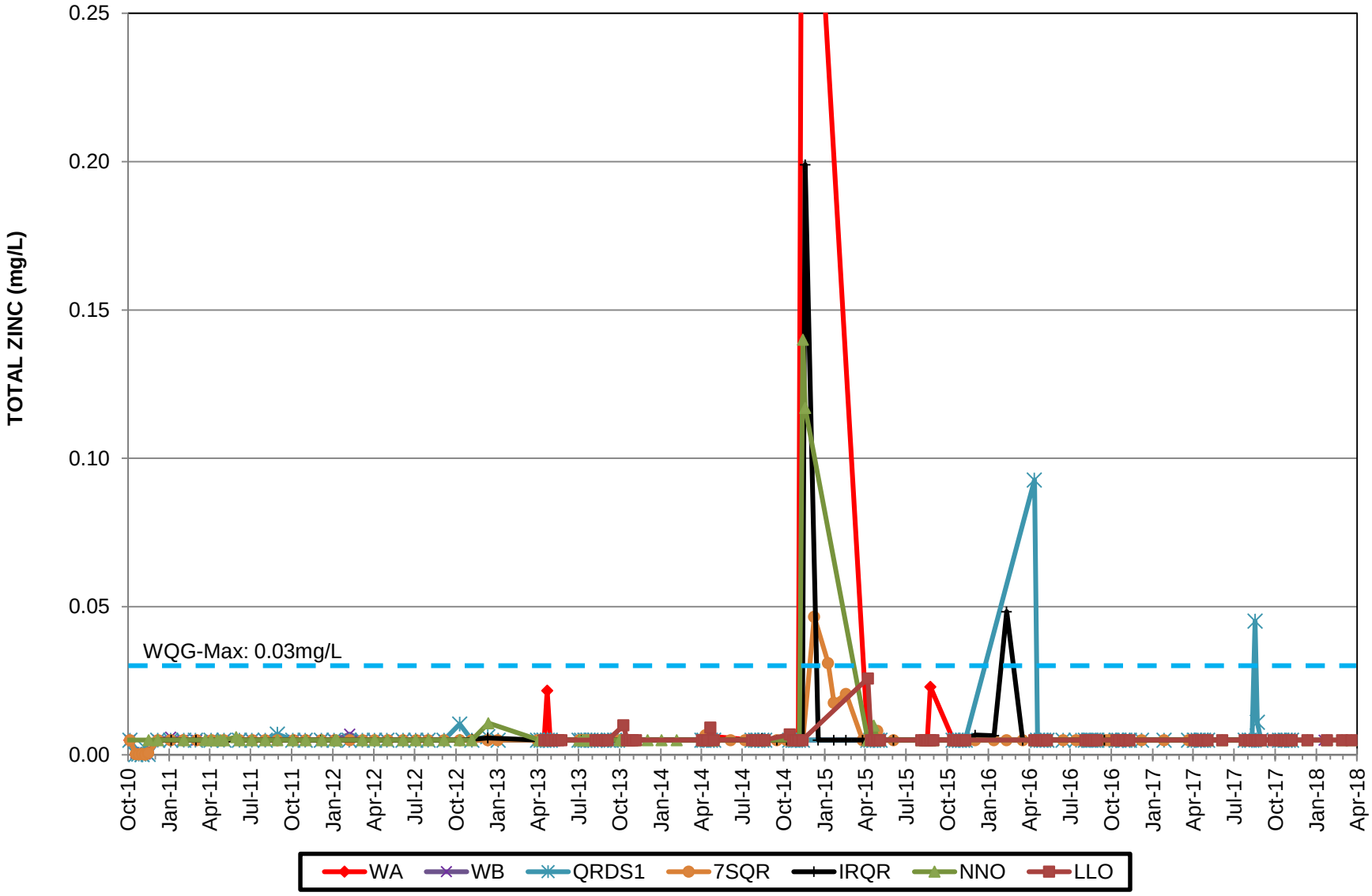
QUINSAM SUB BASIN: RIVERS AND STREAMS



GRAPH 59

TOTAL ZINC

QUINSAM SUB BASIN: RIVERS AND STREAMS

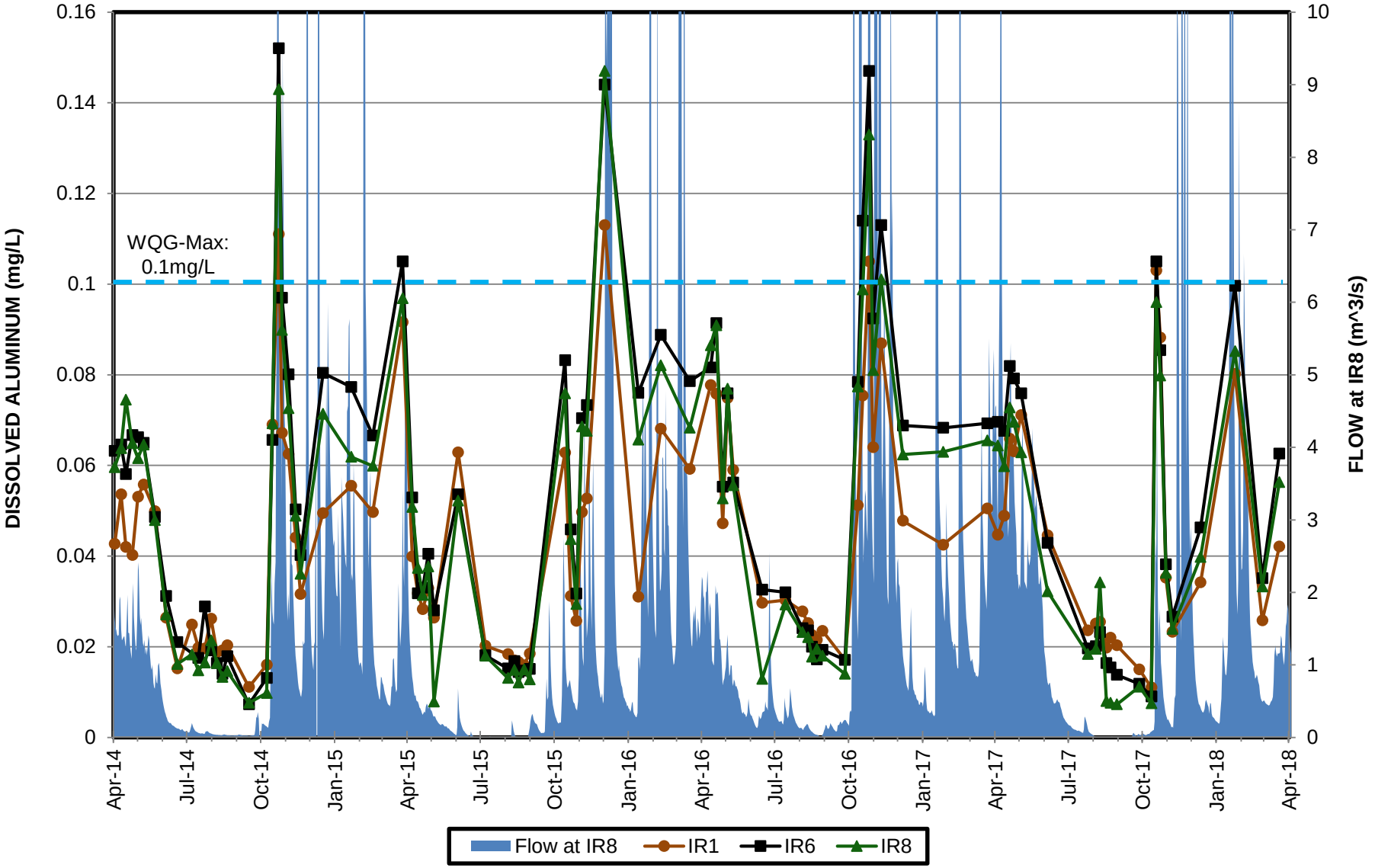


GRAPH 60

DISSOLVED ALUMINUM vs Flow

IRON RIVER

QUINSAM COAL

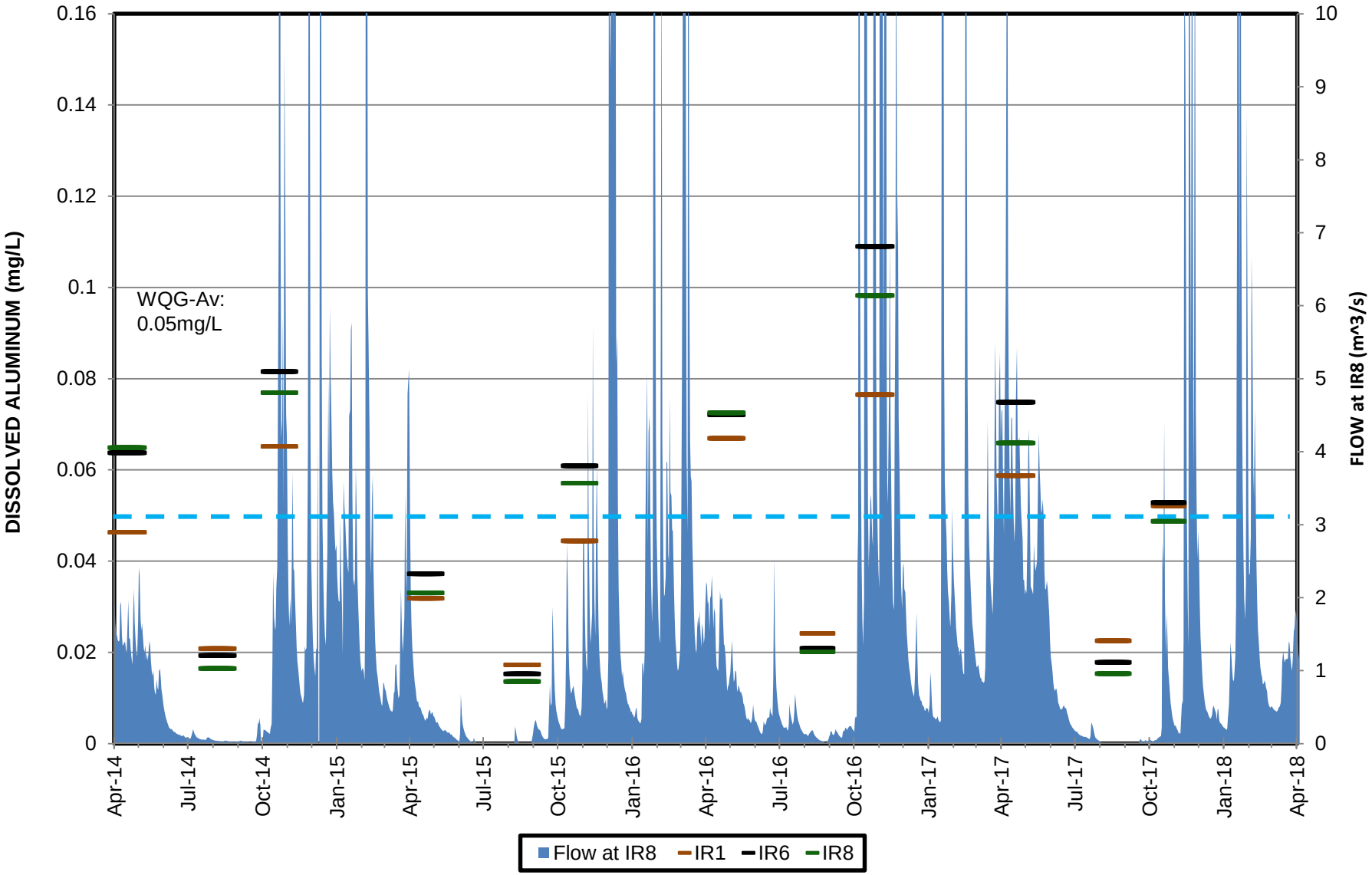


GRAPH 61

5 in 30 AVERAGE DISSOLVED ALUMINUM vs Flow

IRON RIVER

QUINSAM COAL

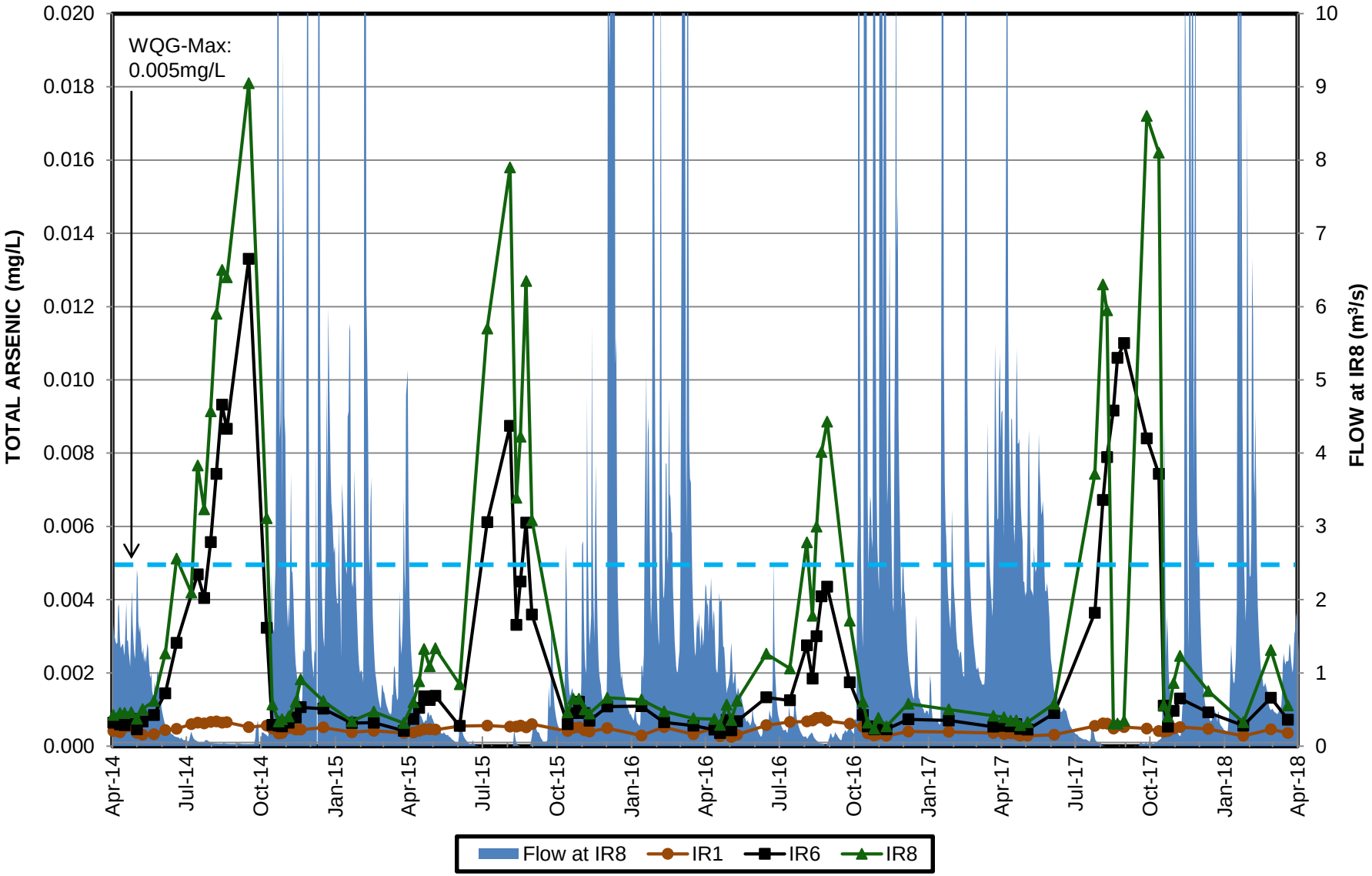


GRAPH 62

TOTAL ARSENIC vs FLOW

IRON RIVER

QUINSAM COAL

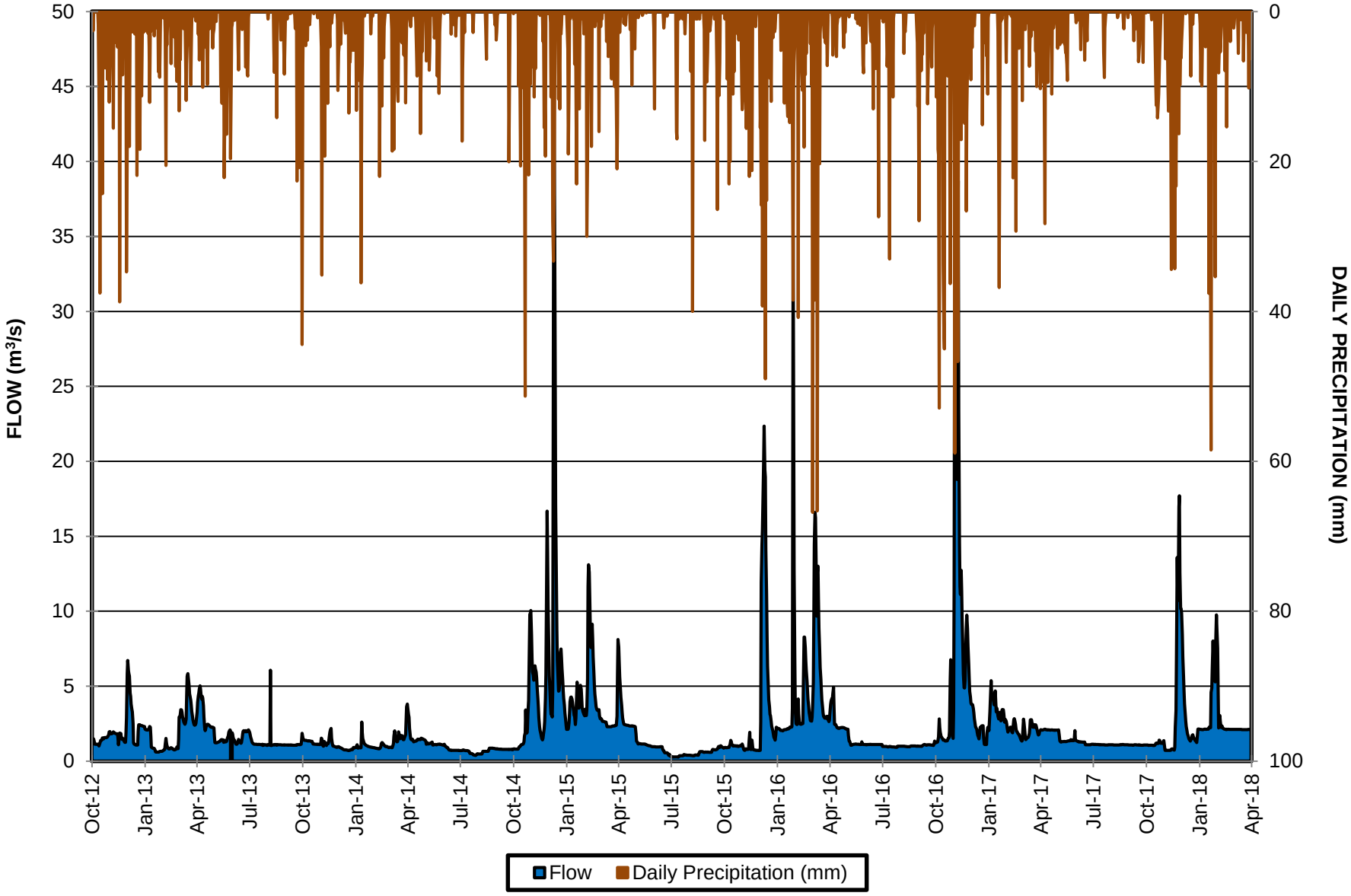


GRAPH 63

FLOW vs PRECIPITATION

WA

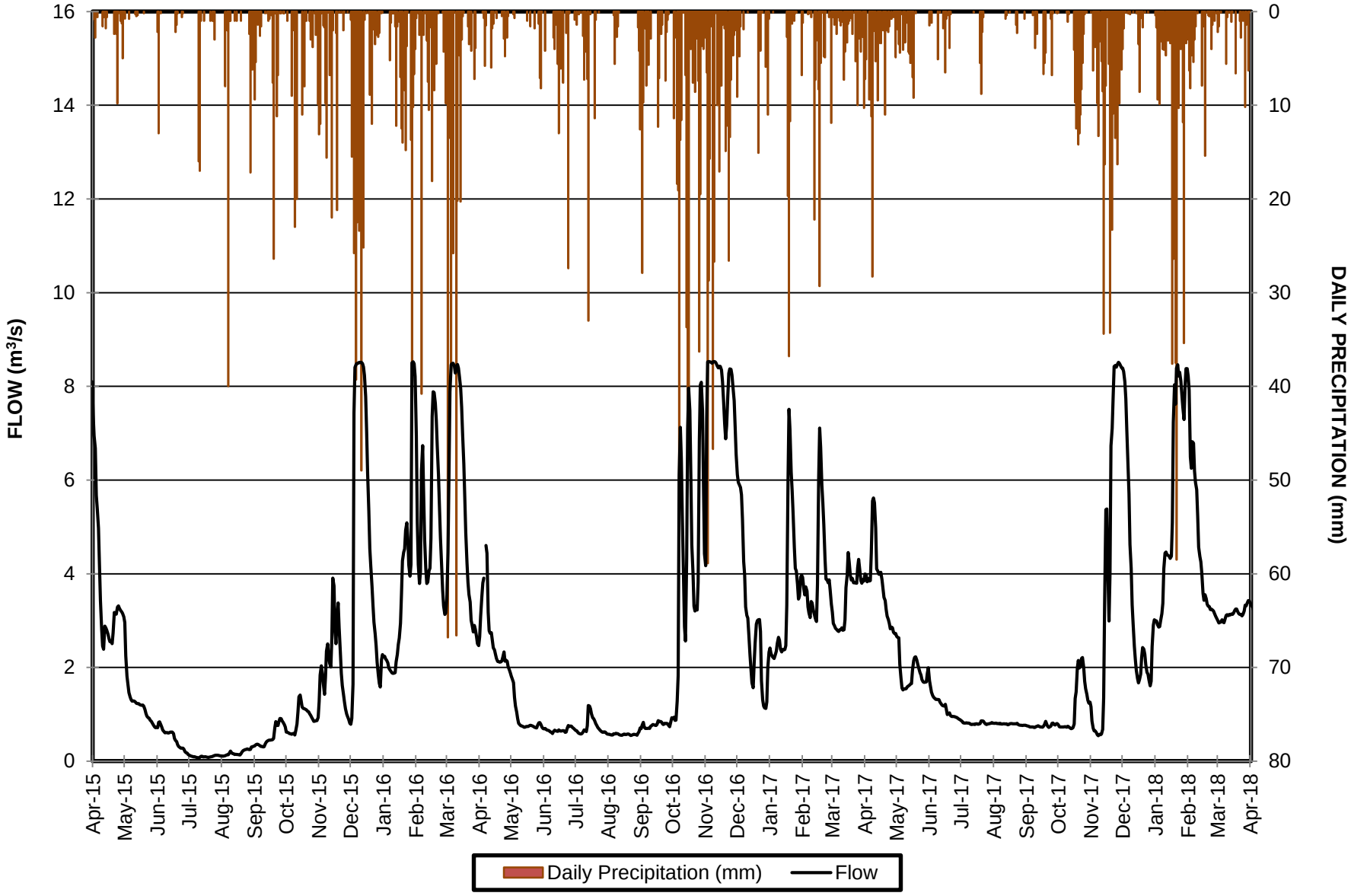
QUINSAM COAL



GRAPH 64

FLOW vs PRECIPITATION

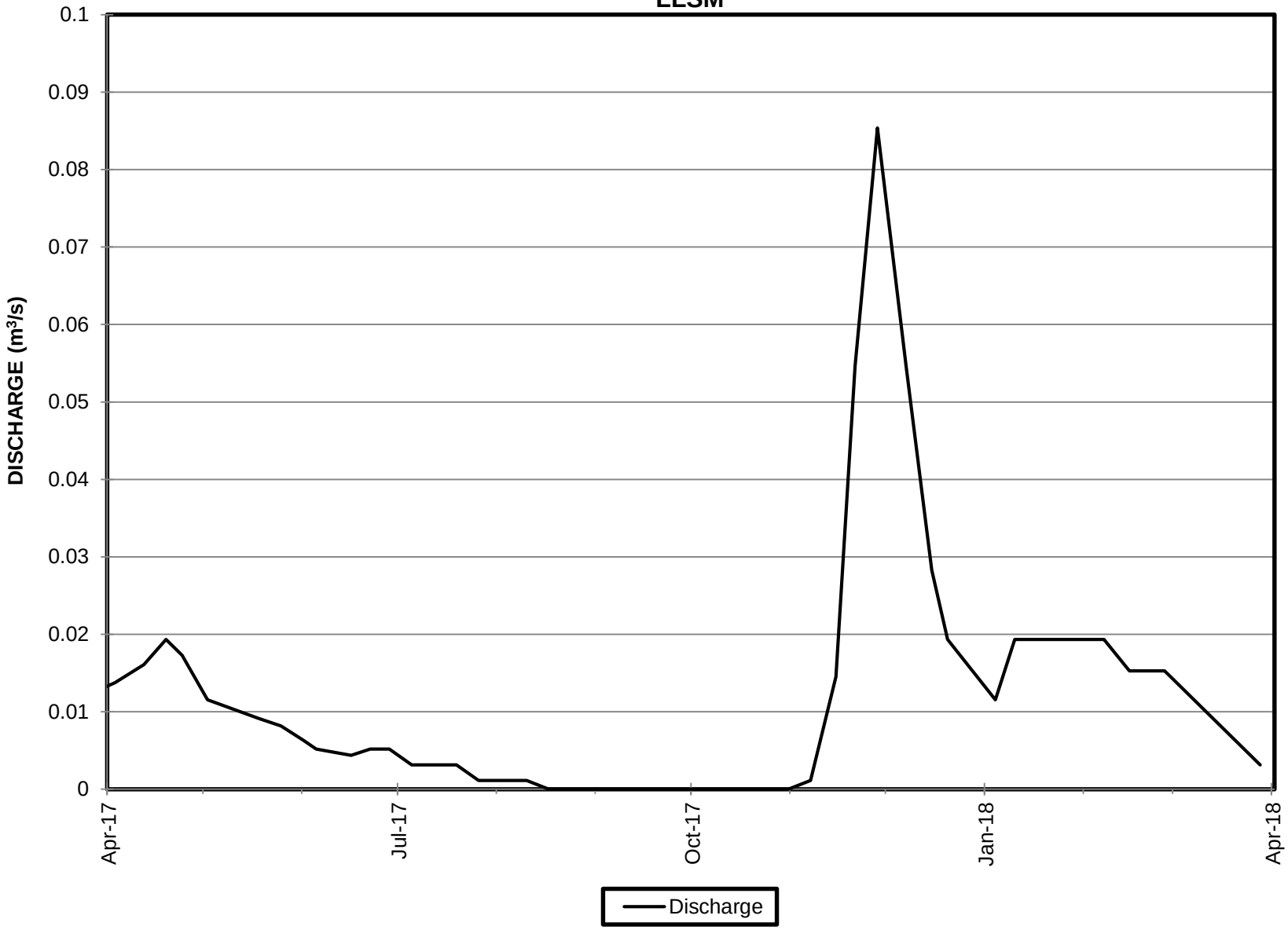
WB



GRAPH 65

DISCHARGE

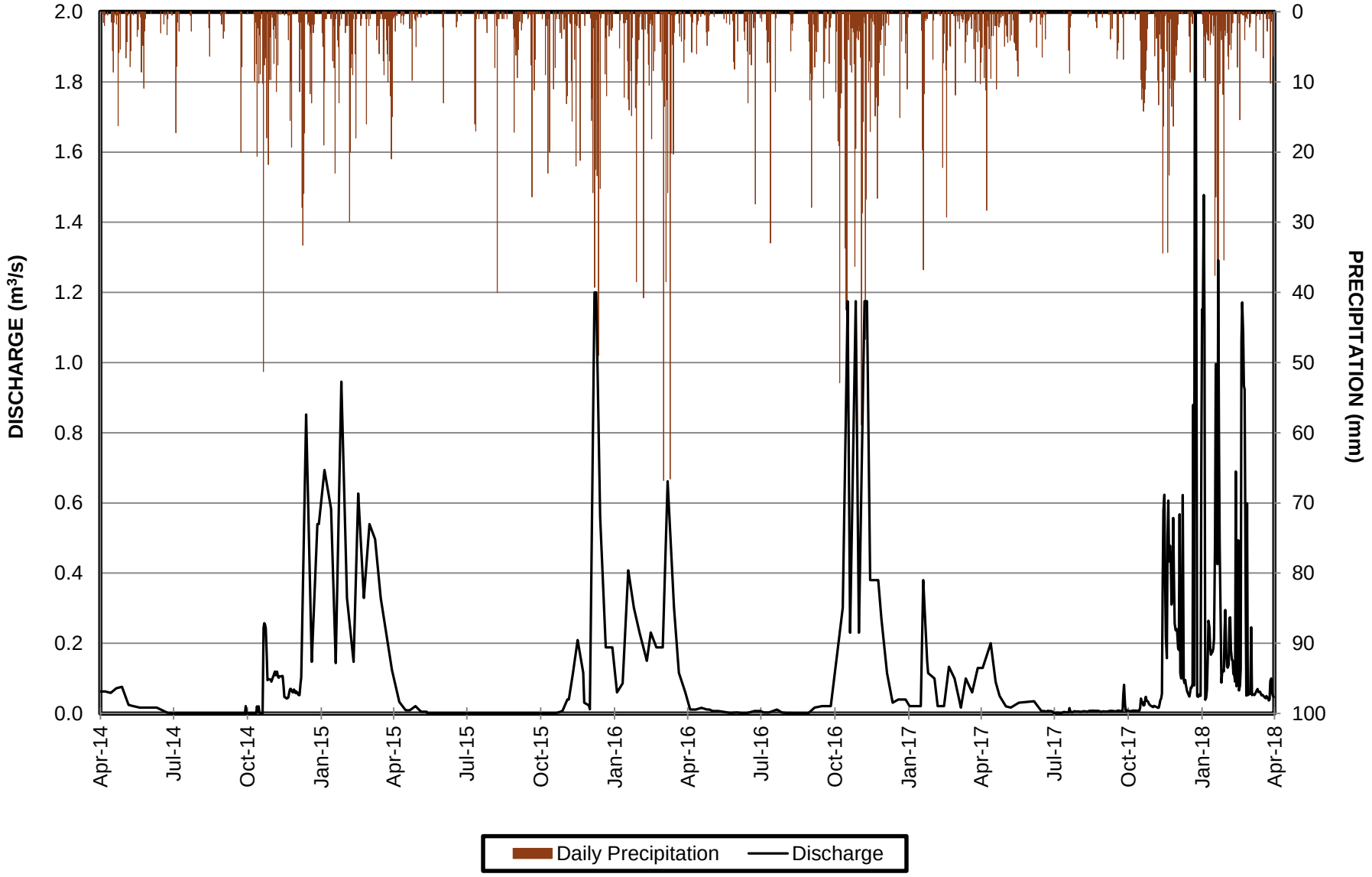
LLSM



GRAPH 66

DISCHARGE vs PRECIPITATION

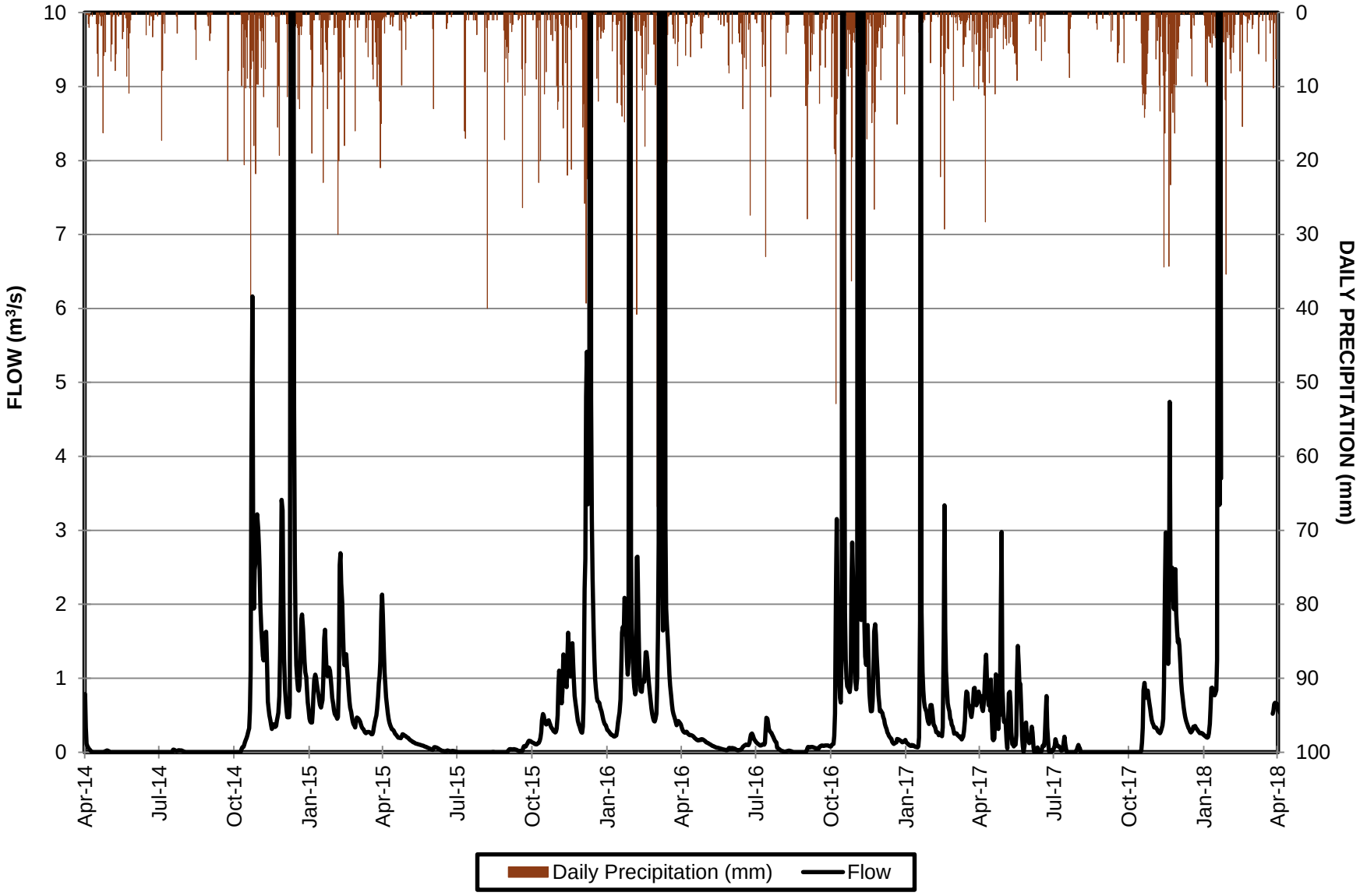
LLE



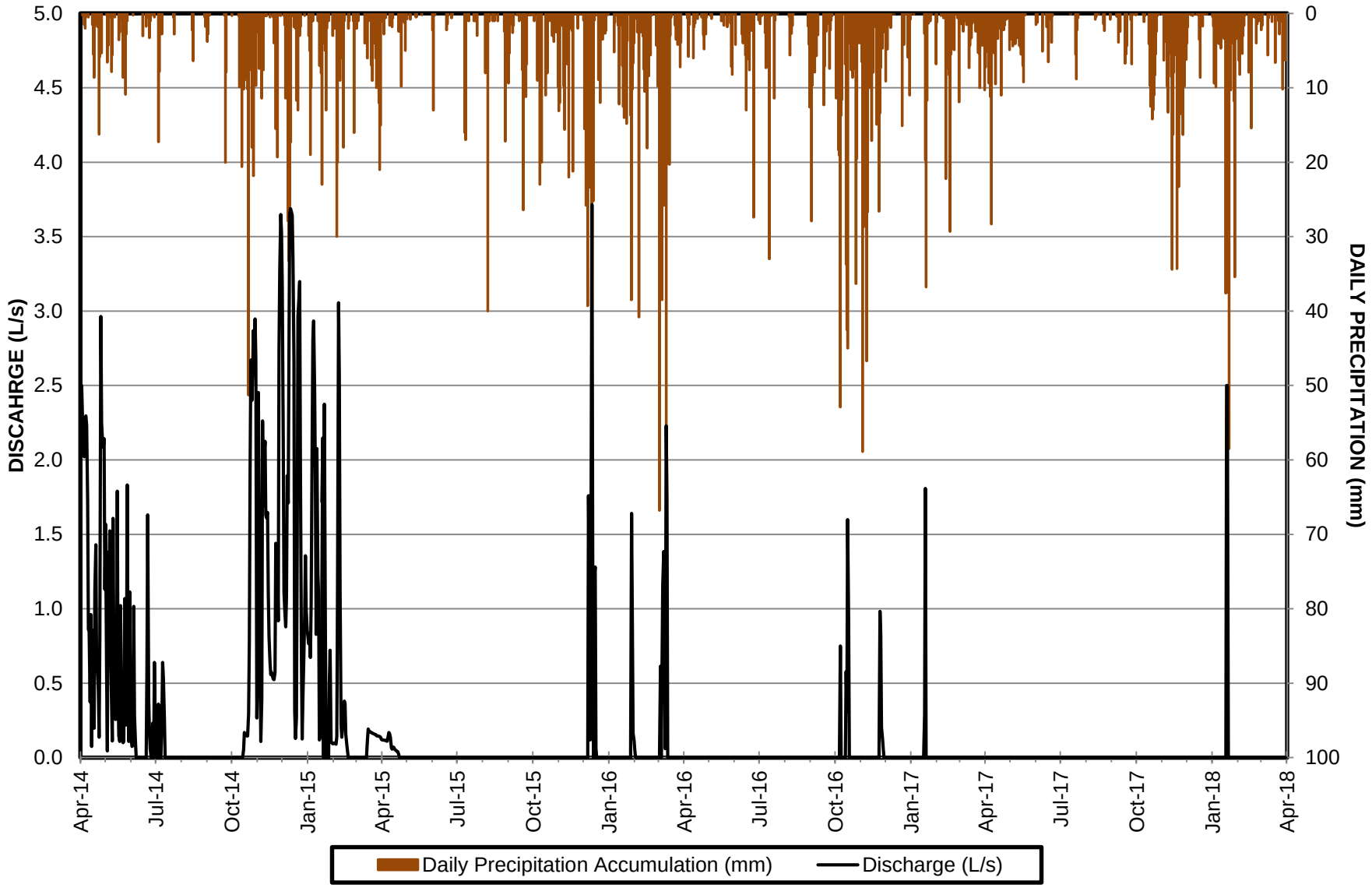
GRAPH 67

FLOW vs PRECIPITATION

LLO



Graph 68
DAILY AVERAGE DISCHARGE VS PRECIPITATION
7SSD

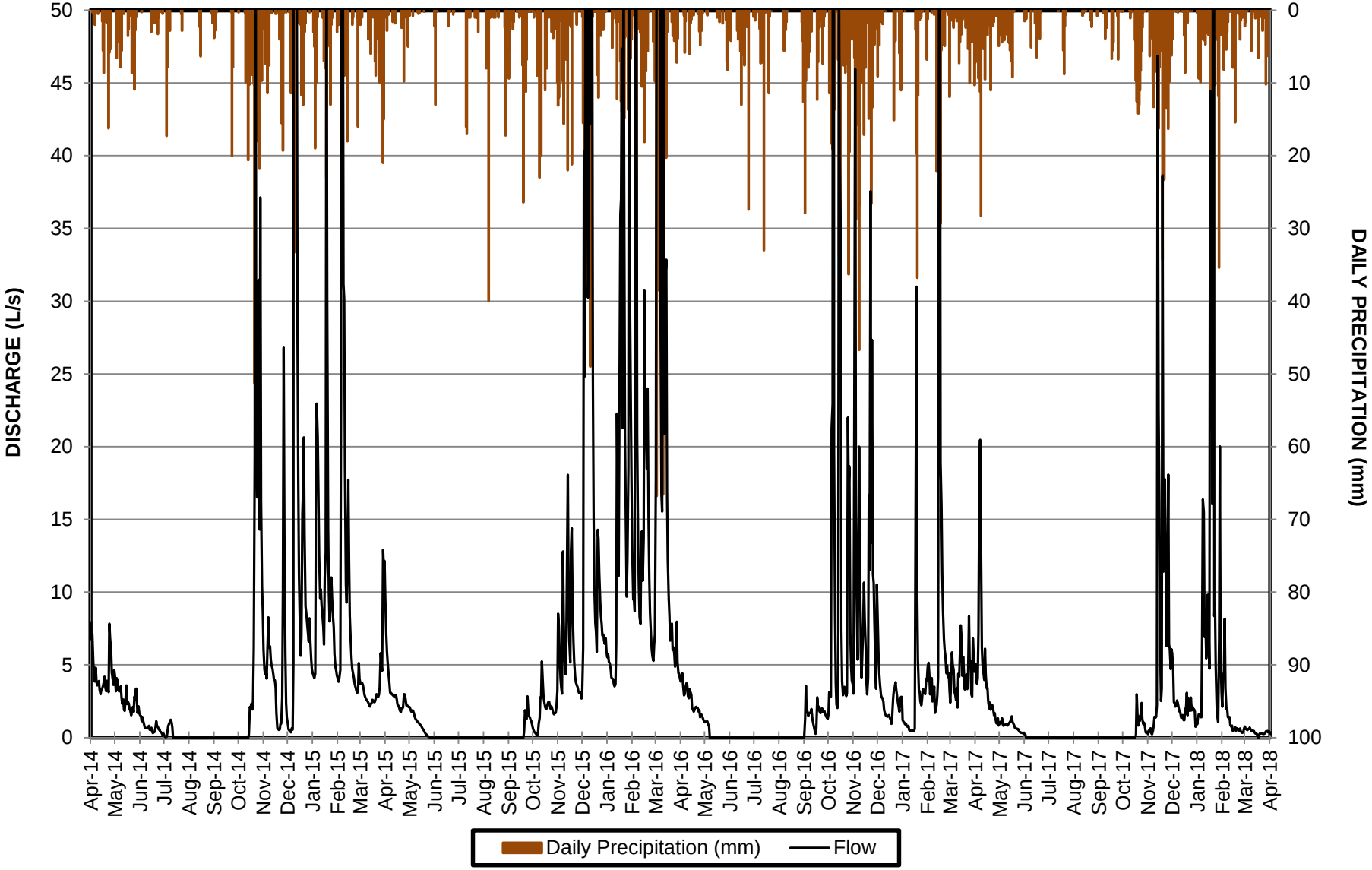


GRAPH 69

DAILY DISCHARGE vs PRECIPITATION

7S STREAM 1

QUINSAM COAL

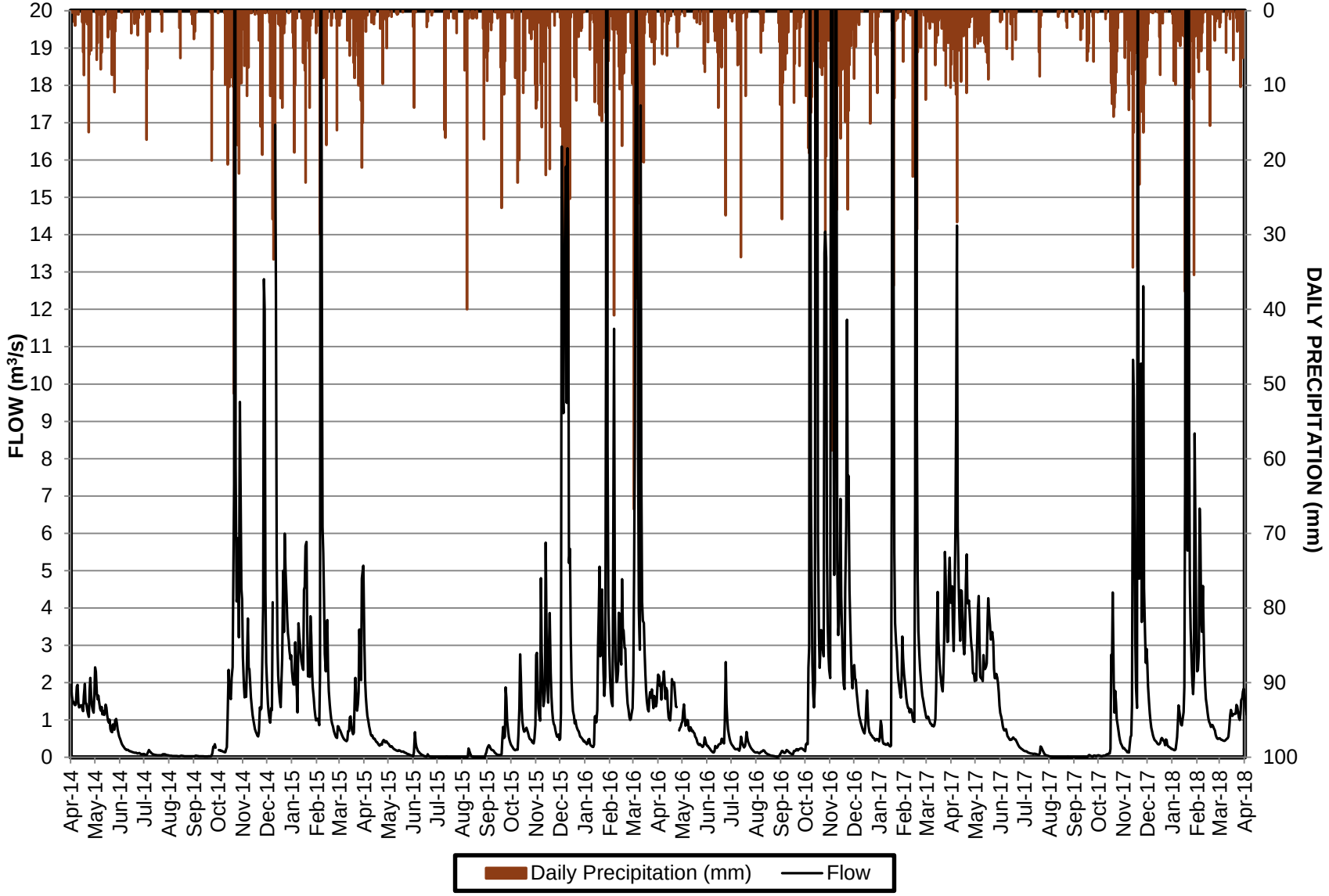


GRAPH 70

FLOW VS PRECIPITATION

IR8

QUINSAM COAL



Appendix III

Acute Toxicity Test Results

Sample SI4924-WD,
collected October 26, 2017

Final Report

November 7, 2017

Submitted to: **Maxxam Analytics**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
SI4924-WD	26-Oct-17 at N/A	27-Oct-17 at 1405h	27-Oct-17 at 1630h	9.0°C

N/A = Not available.

TESTS

- Rainbow trout 96-h single concentration screening test

RESULTS

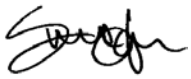
Toxicity test results

Sample ID	Percent survival in 100% (v/v) sample
SI4924-WD	100

QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	160.4 (112.2 – 357.2) µg/L Zn[1]
Reference toxicant historical mean (2 SD range)	99.9 (55.7 – 179.1) µg/L Zn
Reference toxicant CV	34%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1] Test date: October 27, 2017, CL = Confidence Limits, LC = Lethal Concentration, SD = Standard Deviation, CV = Coefficient of Variation



Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) single concentration test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥15 cm
Test concentrations	100% (undiluted) sample, plus laboratory control
Test replicates	3 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Test endpoints	Survival
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Zinc (added as $ZnSO_4$)

APPENDIX B – Toxicity test data

Rainbow Trout Summary Sheet

Client: Maxxam

Start Date/Time: October 27, 2017 @ 1630h

Work Order No.: 171266

Test Species: *Oncorhynchus mykiss*

Test Validity Criteria:
≥ 90% control survival
WQ Ranges:
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Information:

Sample ID: S14924-WD
Sample Date: October 26, 2017
Date Received: October 27, 2017
Sample Volume: 20 x 1L
Other: -

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 11
Alkalinity (mg/L $CaCO_3$): 12

Test Organism Information:

Batch No.: 101317
Source: Aqua Farms
No. Fish/Volume (L): 10/10
Loading Density (g/L): 0.28
Mean Length ± SD (mm): 35 ± 1 Range: 33 - 37
Mean Weight ± SD (g): 0.28 ± 0.02 Range: 0.25 - 0.31

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZn93
Stock Solution ID: 171Zn04
Date Initiated: October 27, 2017
96-h LC50 (95% CL): 160.4 (112.2 - 357.2) mg/L Zn

Reference Toxicant Mean and Historical Range: 99.9 (55.7 - 179.1) mg/L Zn
Reference Toxicant CV (%): 34

Test Results: 100% survival at 96h in the 100% (v/v) unfiltered sample.

Reviewed by: [signature]

Date reviewed: Nov 6, 2017

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: Maxxam
Sample I.D. SI4924-WD
W.O. # 171266
RBT Batch #: 101317
Date Collected/Time: 26Oct17 @ not available
Date Setup/Time: 27Oct17 @ 1630h
CER #: 2
Sample Setup By: RE

Thermometer: Ce/2
D.O. meter/probe: 2 / D2
Cond./Salinity meter/probe: 2 / CP2
pH meter/probe: 2 / P2

Number Fish/Volume: 10 / 10L
7-d % Mortality: 0.1%
Total Pre-aeration Time (mins): 30
Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.0		14.0
D.O. (mg/L)	9.5		9.6
pH	8.0		8.2
Cond. (µS/cm)	1669		1671
Salinity (ppt)	0.8		0.8

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
(% v/v)	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.6	9.9	9.9	9.3	9.6	7.1	7.2	7.1	7.2	7.3	37	44
100%				10	10	10	10	14.0	15.0	15.0	15.0	15.0	9.6	9.9	9.8	9.2	9.5	8.2	8.4	8.4	8.7	8.5	1671	1512
Initials				RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE	RE

Sample Description/Comments: Clear, light yellow liquid, no odour, no particulates

Fish Description at 96 h: All fish appear normal Number of Stressed Fish at 96 h: 0

Other Observations: light yellow precipitate formed at bottom of tank

Reviewed by: [signature] Date Reviewed: Nov 6, 2017

APPENDIX C – Chain-of-custody form

Maxxam
A Bureau Veritas Group Company

Sent To: Nautilus Environmental - Burnaby
8664 Commerce Court
Burnaby, BC, V5A 4N7
Tel: (604) 420-8773

CHAIN OF CUSTODY RECORD FOR SUBCONTRACTED WORK

COC # B795560-VNAU-01-01

wo# 171266

REPORT INFORMATION	
Company:	Maxxam
Address:	4606 Canada Way, Burnaby, British Columbia, V5G 1K5
Contact Name:	Veronica De Guzman
Email:	VDeGuzman@maxxam.ca, customerservicebc@maxxamanalytics.com
Phone:	
Maxxam Project #:	B795560

#	SAMPLE ID	MATRIX	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	SAMPLER INITIALS	# CONT.	ANALYSIS REQUESTED: Rainbow Trout 96 hr @ 100% Sublet	ADDITIONAL SAMPLE INFORMATION
1	SI4924-WD	WATER	2017/10/26			20	X	(P: 01)
2						XIL		
3								
4								
5								
6								
7								
8								
9								
10								

REGULATORY CRITERIA

SPECIAL INSTRUCTIONS

Please inform Maxxam immediately if you are not accredited for the requested test(s).
Please return a copy of this form with the report.

TURNAROUND TIME

☐ Rush Required

2017/11/06
Date Required

Please inform us if rush charges will be incurred.

COOLER ID:	YES	NO	Temp: (°C)	1	2	3
Custody Seal Present						
Custody Seal Intact						
Cooling Media Present						

COOLER ID:	YES	NO	Temp: (°C)	1	2	3
Custody Seal Present						
Custody Seal Intact						
Cooling Media Present						

COOLER ID:	YES	NO	Temp: (°C)	1	2	3
Custody Seal Present						
Custody Seal Intact						
Cooling Media Present				9.0		

RELINQUISHED BY: (SIGN & PRINT)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (SIGN & PRINT)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
1. KEVIN CHAN	~~2017/10/27~~ 2017/10/27	15:00	1. Nautilus	Oct 27/17	14:05
2.	2017/10/27		2. NY- Nan Yamamoto		

END OF REPORT

Maxxam
A Bureau Veritas Group Company

RESULTS OF RAINBOW TROUT SINGLE CONCENTRATION-100%

Success Through Science®

Client : 9239 QUINSAM COAL CORPORATION, Campbell River Job Number: B7A0592

Client Project Name & Number: BDS BDS BIOASSAY

Test Result:

96 hrs Mortality % 0 Statistical Method: Visual

Sample Name : BDS

Description:	yellow, clear			Sample Number:	SL6306-01
Sample Collected:	Nov 09, 2017 04:00 PM	Sampling Method :	Regular	Site Collection:	N/A
Sample Collected By:	Kathleen Russell	Volume Received:	20 x 1LP	Temp.Upon Arrival: 4 °C	Storage: 2-6°C
Sample Received:	Nov 10, 2017 12:04 PM	pH:	7.6	Dissolved Oxygen:	11.0 mg/L
Analysis Start :	Nov 10, 2017 04:30 PM	Temperature :	15 °C	Sample Conductance:	522 µS/cm

Concentration	Temperature (°C)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	pH	pH	Conductivity (uS/cm)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)
% vol/vol	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	96 hrs	96 hrs
0	15	15	10.2	9.8	7.3	7.4	39	0	0	0
100	15	15	10.2	9.7	7.8	8.4	521	0	0	0

Comments : All fish appeared and behaved normally during the test.

Culture/Control/Dilution Water Burnaby Municipal Dechlorinated Water

Hardness: 20 mg/L $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,100 (% vol/vol)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	>15 cm
Total # of Organisms Used :	20	Pre-aeration Time :	120 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	18 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.4 g/L	Photoperiod :	16:8 (light: dark)		

Test Organism : Rainbow Trout *(Oncorhynchus mykiss)* Source : Aqua Farm

Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.7 ± 0.3 g	Length (Mean) +- SD :	4.35 ± 0.57 cm
Culture Water Renewal :	≥ 1L/min/kg fish	Weight (Range) :	0.4 ± 1.3 g	Length (Range) :	3.50 – 5.20 cm
Culture Photoperiod :	16:8 (light: dark)			% Mortality within 7 days :	0%
Feeding rate and frequency :	daily: 1-5% biomass of trout.			Acclimation Time:	>14 days

Reference chemical: Zinc Test Date: Oct 15, 2017

Test Endpoint 96 hrs LC50 (95% confidence interval) : 0.08 (0.06, 0.10)mg/L Statistical Method : Untrimmed Spearman-Kärber

Historical Mean LC50 (warning limits) : 0.14 (0.08, 0.26) mg/L Concentration : 0,0.04,0.08,0.16,0.32,0.64 mg/L

Test Method Maxxam's BBY2SOP-00004 is based on the latest versions of EPS 1/RM/9, EPS 1/RM/13, and EPS 1/RM/50.

Method Deviations : None.

Note: The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Analyst : Gurjit Matharu

Verified By : Kimberly Tamaki, Scientist, Ecotoxicology Date: Nov 21, 2017 10:26 AM

Maxxam
A Bureau Veritas Group Company

RESULTS OF RAINBOW TROUT SINGLE CONCENTRATION-100%

Success Through Science®

Client : 9239 QUINSAM COAL CORPORATION, Campbell River Job Number: B805390

Client Project Name & Number: 7S & 7SSD 7A BIOASSAY

Test Result:

96 hrs Mortality % 0 Statistical Method: Visual

Sample Name : 7SSD

Description:	light brown			Sample Number:	SV8334-01
Sample Collected:	Jan 19, 2018 04:00 PM	Sampling Method :	Regular	Site Collection:	N/A
Sample Collected By:	Kathleen Russell	Volume Received:	20 x 1LP	Temp.Upon Arrival: 3 °C	Storage: 2-6°C
Sample Received:	Jan 23, 2018 11:04 AM	pH:	7.5	Dissolved Oxygen:	11.0 mg/L
Analysis Start :	Jan 24, 2018 02:08 PM	Temperature :	15 °C	Sample Conductance:	158 µS/cm

Concentration	Temperature (°C)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	pH	pH	Conductivity (uS/cm)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)
% vol/vol	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	96 hrs	96 hrs
0	15	15	10.1	9.9	7.5	7.5	41	0	0	0
100	15	15	10.4	9.9	7.8	8.1	158	0	0	0

Comments : All fish appeared and behaved normally during the test.

Culture/Control/Dilution Water Burnaby Municipal Dechlorinated Water

Hardness: 17 mg/L $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,100 (% vol/vol)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	>15 cm
Total # of Organisms Used :	20	Pre-aeration Time :	120 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	15 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16:8 (light: dark)		

Test Organism : Rainbow Trout *(Oncorhynchus mykiss)* Source : Aqua Farm

Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.80 ± 0.53 cm
Culture Water Renewal :	≥ 1L/min/kg fish	Weight (Range) :	0.2 – 0.6 g	Length (Range) :	2.70 – 4.40 cm
Culture Photoperiod :	16:8 (light: dark)			% Mortality within 7 days :	0%
Feeding rate and frequency :	daily: 1-5% biomass of trout.			Acclimation Time:	>14 days

Reference chemical: Zinc Test Date: Jan 11, 2018

Test Endpoint 96 hrs LC50 (95% confidence interval) : 0.06 (<0.04, 0.09)mg/L Statistical Method : Probit

Historical Mean LC50 (warning limits) : 0.13 (0.06, 0.26) mg/L Concentration : 0,0.04,0.08,0.16,0.32,0.64 mg/L

Test Method Maxxam's BBY2SOP-00004 is based on the latest versions of EPS 1/RM/9, EPS 1/RM/13, and EPS 1/RM/50.

Method Deviations : None.

Note: The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Analyst : Michael Brassil

Verified By : Kimberly Tamaki, Scientist, Ecotoxicology Date: Feb 01, 2018 04:07 PM

Maxxam
A Bureau Veritas Group Company

RESULTS OF RAINBOW TROUT SINGLE CONCENTRATION-100%

Success Through Science®

Client : 9239 QUINSAM COAL CORPORATION, Campbell River Job Number: B805391

Client Project Name & Number: 7S & 7SSD 7S BIOASSAY

Test Result:

96 hrs Mortality % 0 Statistical Method: Visual

Sample Name : 3SDS

Description: light brown Sample Number: SV8350-01

Sample Collected: Jan 22, 2018 04:00 PM Sampling Method : Regular Site Collection: N/A

Sample Collected By: Kathleen Russell Volume Received: 20 x 1LP Temp.Upon Arrival: 3 °C Storage: 2-6°C

Sample Received: Jan 23, 2018 11:04 AM pH: 6.8 Dissolved Oxygen: 10.9 mg/L

Analysis Start : Jan 24, 2018 02:08 PM Temperature : 15 °C Sample Conductance: 31 µS/cm

Concentration	Temperature (°C)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	pH	pH	Conductivity (uS/cm)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)
% vol/vol	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	96 hrs	96 hrs
0	15	15	10.1	10.0	7.5	7.6	41	0	0	0
100	15	15	10.4	10.0	7.1	7.5	31	0	0	0

Comments : All fish appeared and behaved normally during the test.

Culture/Control/Dilution Water Burnaby Municipal Dechlorinated Water

Hardness: 17 mg/L $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,100 (% vol/vol)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	>15 cm
Total # of Organisms Used :	20	Pre-aeration Time :	120 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	15 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16:8 (light: dark)		

Test Organism : Rainbow Trout *(Oncorhynchus mykiss)* Source : Aqua Farm

Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.76 ± 0.24 cm
Culture Water Renewal :	≥ 1L/min/kg fish	Weight (Range) :	0.3 – 0.6 g	Length (Range) :	3.40 – 4.10 cm
Culture Photoperiod :	16:8 (light: dark)			% Mortality within 7 days :	0%
Feeding rate and frequency :	daily: 1-5% biomass of trout.			Acclimation Time:	>14 days

Reference chemical: Zinc Test Date: Jan 11, 2018

Test Endpoint 96 hrs LC50 (95% confidence interval) : 0.06 (<0.04, 0.09)mg/L Statistical Method : Probit

Historical Mean LC50 (warning limits) : 0.13 (0.06, 0.26) mg/L Concentration : 0,0.04,0.08,0.16,0.32,0.64 mg/L

Test Method Maxxam's BBY2SOP-00004 is based on the latest versions of EPS 1/RM/9, EPS 1/RM/13, and EPS 1/RM/50.

Method Deviations : None.

Note: The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Analyst : Michael Brassil

Verified By : Kimberly Tamaki, Scientist, Ecotoxicology Date: Feb 01, 2018 04:05 PM

Maxxam
A Bureau Veritas Group Company

RESULTS OF RAINBOW TROUT SINGLE CONCENTRATION-100%

Success Through Science®

Client : 9239 QUINSAM COAL CORPORATION, Campbell River Job Number: B749884

Client Project Name & Number: LONG LAKE MIDDLE SEEP LONG LAKE SEEP

Test Result:

96 hrs Mortality % 0 Statistical Method: Visual

Sample Name : LLSM

Description: light yellow Sample Number: RI4869-01

Sample Collected: Jun 19, 2017 04:00 PM Sampling Method : Grab Site Collection: N/A

Sample Collected By: Kathleen Russell Volume Received: 2 x 20CB Temp.Upon Arrival: 3 °C Storage: 2-6°C

Sample Received: Jun 21, 2017 01:05 PM pH: 7.6 Dissolved Oxygen: 10.3 mg/L

Analysis Start : Jun 22, 2017 03:05 PM Temperature : 15 °C Sample Conductance: 1110 µS/cm

Concentration	Temperature (°C)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	pH	pH	Conductivity (uS/cm)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)
% vol/vol	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	Initial	96 hrs	96 hrs	96 hrs
0	15	15	10.2	10.0	7.7	7.3	44	0	0	0
100	15	15	10.2	9.6	7.6	8.0	1109	0	0	0

Comments : All fish appeared and behaved normally during the test.
The LC50 for reference toxicant test was outside of 2SD but within 3SD of the previous mean. The test is valid as it otherwise performed normally, and has been added to the control chart.

Culture/Control/Dilution Water Burnaby Municipal Dechlorinated Water

Hardness: 23 mg/L $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,100 (% vol/vol)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	>15 cm
Total # of Organisms Used :	20	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	18 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.4 g/L	Photoperiod :	16:8 (light: dark)		

Test Organism : Rainbow Trout *(Oncorhynchus mykiss)* Source : Aqua Farm

Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.7 ± 0.1 g	Length (Mean) +- SD :	4.50 ± 0.19 cm
Culture Water Renewal :	≥ 1L/min/kg fish	Weight (Range) :	0.6 ± 0.9 g	Length (Range) :	4.10 – 4.80 cm
Culture Photoperiod :	16:8 (light: dark)			% Mortality within 7 days :	0%
Feeding rate and frequency :	daily: 1-5% biomass of trout.			Acclimation Time:	>14 days

Reference chemical: Zinc Test Date: Jun 15, 2017

Test Endpoint 96 hrs LC50 (95% confidence interval) : 0.21 (0.15, 0.29)mg/L Statistical Method : Probit

Historical Mean LC50 (warning limits) : 0.10 (0.05, 0.20) mg/L Concentration : 0,0.04,0.08,0.16,0.32,0.64 mg/L

Test Method Maxxam's BBY2SOP-00004 is based on the latest versions of EPS 1/RM/9, EPS 1/RM/13, and EPS 1/RM/50.

Method Deviations : None.

Note: The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Analyst : Sheida Rostama

Verified By : Kimberly Tamaki, Scientist, Ecotoxicology Date: Jun 28, 2017 04:48 PM

Maxxam
A Bureau Veritas Group Company

RESULTS OF *DAPHNIA MAGNA* SINGLE CONCENTRATION-100%

Success Through Science®

Client : 9239 QUINSAM COAL CORPORATION, Campbell River | Job Number: B755898

Client Project Name & Number: LONG LAKE MIDDLE SEEP LONG LAKE SEEP | Sample Number: RL8209-01

Test Result:

48 hrs Mortality % 0 Statistical Method: Visual

Mean percent mortality: Sample 0 Control 0

Sample Name : LLSM

Description:	clear			Sample Prior to Analysis:	
Sample Collected:	Jul 06, 2017 04:00 PM	Sampling Method :	Grab	pH:	7.5
Sample Collected By:	Kathleen Russell	Site Collection: N/A		Temperature :	20 °C
Sample Received:	Jul 07, 2017 11:57 AM	Volume Received:	3 x 1LP	Dissolved Oxygen:	10.1 mg/L
Analysis Start :	Jul 10, 2017 01:17 PM	Temp.Upon Arrival:	3 °C	Sample Conductance:	1353 µS/cm
End :	Jul 12, 2017 02:15 PM	Storage:	2-6°C	Hardness:	540 mg $CaCO_3$/L

Concentration	Temperature (°C)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	pH	pH	Conductivity (uS/cm)	Mortality (#)	Mortality (%)	Immobility (#)
% vol/vol	Initial	48 hrs	Initial	48 hrs	Initial	48 hrs	Initial	48 hrs	48 hrs	48 hrs
0	20	20	9.0	8.9	8.2	8.3	358	0	0	0
0	20	20	9.0	8.9	8.2	8.2	358	0	0	0
0	20	20	9.0	8.9	8.2	8.2	358	0	0	0
100	20	20	9.0	8.9	7.9	8.2	1338	0	0	0
100	20	20	9.0	8.8	7.9	8.2	1338	0	0	0
100	20	20	9.0	8.9	7.9	8.2	1338	0	0	0

Comments : All neonates appeared and behaved normally during the test.

Culture/Control/Dilution Water: Reconstituted Water-Moderately Hard

Hardness: 104 mg/L $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,0,0,100,100,100 (% vol/vol)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	25-50 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	No
Test Volume :	185 mL	Vessel Volume :	200 mL	Test pH Adjusted:	No
Loading Density :	18.5 mL/Daphnia	Photoperiod :	16:8 (light: dark)		

Test Organism : *Daphnia magna* Source : Aquatic Biosystems

Age at Test Initiation :	<24 hrs	Average Brood Size :	31.0
Culture Photoperiod :	16:8 (light: dark)	% Mortality within 7 days :	3.5
Culture Temperature :	20 ± 2 °C	Time To First Brood :	7 Days
Culture Diet	2.5ml algae + 2.5 ml YCT; Sun. 1.25 ml algae + 1.25ml YCT.		

Reference chemical: Zinc Test Date: Jul 04, 2017

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.45 (0.17, 0.65)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	0.41 (0.19, 0.90) mg/L	Concentration :	0,0.05,0.1,0.5,1,5,10 mg/L

Test Method Maxxam's BBY2SOP-00007 is based on the latest version of EPS 1/RM/14.

Method Deviations: None.

Note: The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Analyst : Navpreet Shergill

KTamaki

Verified By : Kimberly Tamaki, Scientist, Ecotoxicology Date: Jul 20, 2017 02:49 PM

Appendix IV

Stantec Consulting Ltd.
500-4730 Kingsway, Burnaby BC V5H 0C6

August 21, 2017
File: 123210406

Attention: Morgan Melnychuk
Maxxam Analytics Laboratory
4606 Canada Way
Burnaby, BC V5G 1K5

Dear Morgan,

Reference: Quinsam Lakes Phytoplankton, May 2017
(Sample Reference RA8511-05, RA8446-05, RA8504-05, RA8471-05)
(Job Numbers B736060, B736065, B736072, B736075)

INTRODUCTION

Quinsam Coal Ltd. collects water samples from the Quinsam Lakes system during the growing season. Permit requirements were amended for 2014 to include surface water sampling (1.0 m depth) three times a year (spring, late summer, fall overturn). Four lakes are now sampled: Long, Middle Quinsam, No Name, and Lower Quinsam lakes. From 1994 through 2012, the requirement was for sampling at 1, 4 and 9 m in April through September for Long Lake and Middle Quinsam Lake, with No Name Lake added to the program in June 2012 and Lower Quinsam Lake added in 2013. The 2013 program was similar to that for 2014, but with collection of samples at 0.5 m as well as 1 m depth. This long-term record is included in Appendix A.

Samples are submitted to Stantec Consulting Ltd. for phytoplankton taxonomic analysis, as part of ongoing monitoring requirements of the Ministry of Environment. Some months, an additional sample is taken as a field replicate for quality assurance/quality control (QA/QC). This brief report provides information about samples collected in April 2016.

METHODS

Sub-samples (27 mL) of preserved lake water were settled and examined at 100 X, 400 X and 1,000 X magnifications using a Zeiss inverted microscope. Counting effort is defined as at least 100 organisms of the predominant species at 400 X, up to 200 fields at 1,000 X and a half or whole sub-sample at 100 X.

RESULTS

Abundance

Abundance data for 1993 to 2016 are summarized in Appendix A and detailed taxonomic results for May 2017 are presented in Appendix B.

Reference: Quinsam Lakes Phytoplankton, May 2017
(Sample Reference RA8511-05, RA8446-05, RA8504-05, RA8471-05)
(Job Numbers B736060, B736065, B736072, B736075)

Total abundance in the May 2017 samples is shown in Table 1. Total abundance was 2,700 cells/mL for Long Lake, 1,900 cells/mL for Middle Quinsam Lake, 1,300 cells/mL for No Name Lake, and 1,700 cells/mL for Lower Quinsam Lake.

Table 1 Phytoplankton Abundance (cells/mL) in Quinsam Lake System, May 2017

Lake	Month	Abundance (cells/mL) at 1 m depth			
		Total	< 5 µm (1,000 X)	5 to 25 µm (400 X)	> 25 µm (100 X)
Long	May	2,700	2,400	340	16.2
Middle Quinsam	May	1,900	1,500	370	15.4
No Name	May	1,300	1,000	320	7.9
Lower Quinsam	May	1,700	1,300	390	1.2

Species Composition

Species composition data for May 2017 are contained in Appendix B. The most abundant phytoplankton in all four lakes were the very small (≤ 5 µm) chrysoflagellates (*Ochromonas* spp. and *Chromulina* spp.). Although these ultra-nanoplankton species were very abundant numerically, they usually contribute little to algal biomass.

The most abundant of the larger algae were as follows:

- In Long Lake, larger *Ochromonas* spp. were predominant and the cryptophyte *Rhodomonas minuta* and diatom *Synedra radians* were common.
- In Middle Quinsam Lake, larger *Ochromonas* spp. were predominant and *Rhodomonas minuta* and the chrysophyte *Dinobryon bavaricum* were common.
- In No Name Lake, *Rhodomonas minuta and Ochromonas* spp. were predominant and *Rhodomonas minuta* and *Cryptomonas* spp. were common.
- In Lower Quinsam Lake, larger *Ochromonas* spp. were predominant and *Rhodomonas minuta* and *Cryptomonas* spp. were common.

Reference: Quinsam Lakes Phytoplankton, May 2017
(Sample Reference RA8511-05, RA8446-05, RA8504-05, RA8471-05)
(Job Numbers B736060, B736065, B736072, B736075)

CLOSURE

We trust this information meets your present requirements. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,

STANTEC CONSULTING LTD.

Karen Munro, M.Sc. R.P. Bio.
Principal
Phone: (604-678-3085
Fax: (604) 436-3752
Karen.Munro@stantec.com

Appendix A Historical Abundance Data: Quinsam Lakes System, 1993–2016
Appendix B Species Composition Data: May 2017

cd v:\1231\active\em\123110406\report\2017 quinsam\may\let_20170821_quinsam_lakes_fin.docx

APPENDIX A

Historical Abundance Data: Quinsam Lakes System, 1993–2016

Table A1-1 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1993 and 1994

Date	Sampling Site	Total Abundance	< 5mm (1,000X)	5 to 25 mm (400X)	> 25 mm (100X)
1993 October	LLM1	2,300	1,800	530	
	LLM3	3,000	2,400	550	
	LLMB	610	420	190	
1994 May	LL1R	10,000	8,800	1,200	
	LL3R	5,000	3,800	1,200	
	LL9R	4,000	3,200	800	
1994 June	LL0	1,400	1,200	250	
	LL1	1,000	790	220	
	LL4	1,500	1,200	320	
	LL9	2,500	1,900	580	
	LLB	830	440	390	
1994 July	LL1	2,100	1,900	180	
	LL4	1900	1700	250	
	LL9	1,500	1,100	400	
1994 August	LL1	1,700	1,400	290	
	LL4	1,000	850	200	
	LL9	900	780	150	
1994 September	LL1	900	620	250	
	LL4	2,300	2,000	260	
	LL9	2,100	1,700	350	

Table A1-2 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1995

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
1995 April	LL1	3,100	2,700	340	
	LL4	3,300	2,900	350	
	LL9	1,300	1,100	280	
1995 May	LL1	5,400	4,900	570	
	LL4	4,800	4,100	700	
	LL9	1,500	1,000	500	
1995 June	LL1	2,100	1,800	300	
	LL4	2,600	2,100	500	
	LL9	7,400	6,600	850	
1995 July	LL1	2,000	1,700	300	
	LL4	1,900	1,650	350	
	LL9	1,500	1,200	300	
1995 August	LL1	1,100	960	180	
	LL4	1,300	1,100	240	
	LL9	1,900	1,700	210	
1995 September	LL1	2,900	2,800	170	
	LL4	3,400	3,100	330	
	LL9	1,900	1,600	280	

Table A1-3 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1996

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
1996 April	LL1	4,600	4,200	340	
	LL4	6,000	5,600	380	
	LL9	1,100	960	160	
1996 May	LL1	2,200	1,600	600	31
	LL4	2,200	1,700	540	16
	LL9	1,700	1,400	290	26
1996 June	LL1	2,100	1,600	440	4
	LL4	1,600	1,300	340	2
	LL9	1,600	1,100	500	9
1996 July	LL1	2,400	2,300	140	1
	LL4	3,200	3,000	200	3
	LL9	No sample			
1996 August	LL1	2,100	1,900	160	1
	LL4	2,200	1,800	390	37
	LL9	1,700	1,500	200	10
1996 September	LL1	1,900	1,600	230	82
	LL4	2,200	1,800	300	145
	LL9	2,100	1,800	220	38
1996 April	MQ1	No sample			
	MQ4	No sample			
	MQ9	No sample			
1996 May	MQ1	2,000	1,700	230	11
	MQ4	1,100	930	180	7
	MQ9	2,200	1,800	430	1
1996 June	MQ1	2,700	2,500	150	3
	MQ4	2,600	2,400	210	7
	MQ9	1,200	1,000	190	1
1996 July	MQ1	2,400	2,100	335	24
	MQ4	1,900	1,400	380	130
	MQ9	1,200	860	320	29
1996 August	MQ1	2,800	2,500	280	17
	MQ4	1,800	1,500	310	18
	MQ9	2,300	1,900	390	21
1996 September	MQ1	1,700	1,300	270	5
	MQ4	900	560	350	0.6
	MQ9	1,200	1,100	190	0.7

Table A1-4 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1997

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
1997 early May	LL1	3,200	2,800	340	12
	LL4	4,300	4,000	300	32
	LL9	1,700	1,600	140	5
1997 late May[1]	LL1	3,000	2,600	370	61
	LL4	4,900	4,200	620	100
	LL9	4,700	4,000	730	44
1997 June[2]	LL1	1,500	1,100	340	2
	LL4	1,200	1,000	240	1
	LL9	3,900	2,700	1,200	50
1997 July	LL1	2,400	2,300	110	0
	LL4	1,700	1,500	170	0.1
	LL9	480	390	80	2
1997 August	LL1	1,900	1,700	230	0.2
	LL4	880	740	140	0.6
	LL9	1,000	870	93	1.4
1997 September	LL1	1,000	870	140	0.6
	LL4	2,000	1,800	270	0.3
	LL9	700	490	210	0.8
1997 early May	MQ1	1,700	1,400	270	2
	MQ4	1,600	1,400	240	2
	MQ9	2,500	2,300	240	2
1997 late May	MQ1	1,200	1,000	150	0.4
	MQ4	1,600	1,300	280	1
	MQ9	1,200	1,000	190	0.2
1997 June	MQ1	1,900	1,700	140	1
	MQ4	2,500	2,400	130	1
	MQ9	1,400	1,200	200	1
1997 July	MQ1	2,400	2,300	130	0.3
	MQ4	1,500	1,400	110	0.1
	MQ9	890	640	260	0.6
1997 August	MQ1	2,100	1,900	220	0.8
	MQ4	1,500	1,300	190	1.4
	MQ9	1,000	760	240	1.6
1997 September	MQ1	800	640	170	1.3
	MQ4	900	620	280	6.4
	MQ9	650	370	280	1.5

NOTES:

1. recalculated counting *Synedra radians* at 400X rather tha

2. recalculated counting *Synedra radians* at 400X rather than 100X & *Cyclotella glomerata* at 1000X rather than 400X

Table A1-5 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1998

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
1998 April	LL1	2,800	2,600	210	12
	LL4	4,100	3,700	390	12
	LL9	1,600	1,100	500	10
1998 May[1]	LL1	2,000	1,500	430	76
	LL4	1,600	1,100	480	85
	LL9	2,100	1,500	630	20
1998 June	LL1	5,700	5,600	140	0.3
	LL4	7,100	6,900	210	0.3
	LL9	3,300	1,700	1,600	4
1998 July	LL1	1,200	1,100	130	10
	LL4	740	560	170	8
	LL9	760	130	630	5
1998 August	LL1	1,900	1,700	190	2
	LL4	2,200	2,000	230	2
	LL9	1,900	1,600	220	5
1998 September	LL1	5,000	4,900	130	2
	LL4	3,500	3,300	150	2
	LL9	2,200	2,000	220	5
1998 April	MQ1	2,200	1,900	250	3
	MQ4	1,900	1,600	260	3
	MQ9	3,100	2,700	460	2
1998 May	MQ1	2,500	2,300	210	1
	MQ4	2,600	2,400	180	2
	MQ9	2,100	1,700	480	0.4
1998 June	MQ1	1,900	1,700	180	1
	MQ4	1,600	1,400	200	1
	MQ9	1,300	1,000	310	0.4
1998 July	MQ1	1,500	1,400	120	19
	MQ4	1,800	1,600	150	35
	MQ9	1,300	1,100	190	25
1998 August	MQ1	1,900	1,700	250	12
	MQ4	1,300	950	350	10
	MQ9	1,400	890	490	12
1998 September	MQ1	2,000	1,800	200	11
	MQ4	2,700	2,500	220	7
	MQ9	2,100	1,900	230	10

NOTE:

1. recalculated for counting *Synedra radians* at 400X rather than 100X

Table A1-6 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 1999

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
1999 April	LL1	3,800	3,500	310	9
	LL4	6,800	6,200	560	17
	LL9	3,000	2,600	410	10
1999 May	LL1	No sample			
	LL4	No sample			
	LL9	No sample			
1999 early July	LL1	1,100	910	150	2
	LL4	1,400	1,200	150	1
	LL9	1,300	1,200	100	1
1999 late July	LL1	1,100	870	200	1
	LL4	2,000	1,800	280	1
	LL9	1,000	860	130	1
1999 August	LL1	2,700	2,500	180	2
	LL4	2,800	2,600	170	6
	LL9	3,000	2,800	170	4
1999 September	LL1	3,700	3,500	230	12
	LL4	5,000	4,700	290	17
	LL9	4,000	3,700	290	3
1999 April	MQ1	2,300	1,600	220	430
	MQ4	2,200	1,800	200	230
	MQ9	2,700	1,900	600	190
1999 May	MQ1	No sample			
	MQ4	No sample			
	MQ9	No sample			
1999 early July	MQ1	790	700	90	0.4
	MQ4	770	620	150	0.5
	MQ9	1,100	1,000	130	0.3
1999 late July	MQ1	2,700	2,600	110	0.2
	MQ4	2,100	1,900	220	0.8
	MQ9	620	420	190	0.3
1999 August	MQ1	2,100	2,000	140	6
	MQ4	1,100	980	110	4
	MQ9	1,100	1,000	120	9
1999 September	MQ1	1,300	1,100	190	14
	MQ4	1,500	1,300	190	9
	MQ9	760	540	210	10

Table A1-7 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2000

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2000 April	LL1	2,100	1,600	450	33
	LL4	2,500	1,800	700	68
	LL9	1,300	590	740	6.8
2000 May	LL1	3,300	2,800	530	17
	LL4	3,000	2,600	320	15
	LL9	2,000	1,500	490	15
2000 June	LL1	2,900	2,500	390	9.1
	LL4	2,900	2,400	400	19
	LL9	6,400	5,700	730	19
2000 July	LL1	1,600	1,400	130	2.1
	LL4	1,400	1,200	250	1.6
	LL9	1,200	990	250	3.6
2000 August	LL1	1,800	1,600	170	12
	LL4	1,100	940	190	8.2
	LL9	1,500	1,400	130	1.9
2000 September	LL1	2,200	1,900	360	11
	LL4	2,000	1,800	200	9.2
	LL9	1,300	1,100	200	7.2
2000 April	MQ1	1,800	1,300	450	5.9
	MQ4	1,700	1,300	420	1.6
	MQ9	1,500	1,200	280	1.7
2000 May	MQ1	1,800	1,500	290	3
	MQ4	1,600	1,300	290	4.4
	MQ9	1,900	1,600	270	7.6
2000 June	MQ1	2,100	1,900	250	1.4
	MQ4	2,400	2,200	200	2.1
	MQ9	1,800	1,500	380	1.1
2000 July	MQ1	1,300	1,100	210	7.4
	MQ4	2,100	1,800	250	9.6
	MQ9	2,100	1,300	800	22
2000 August	MQ1	1,500	1,200	290	5.8
	MQ4	2,200	1,900	310	7.2
	MQ9	2,400	1,900	500	7.5
2000 September	MQ1	1,800	1,600	200	14
	MQ4	2,100	1,900	250	14
	MQ9	2,000	1,700	220	28

Table A1-8 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2001

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2001 April	LL1	3,300	2,600	670	19
	LL4	4,400	3,900	830	13
	LL9	1,400	860	490	5
2001 May	LL1	7,700	6,200	1,100	310
	LL4	11,000	10,000	980	100
	LL9	4,600	3,600	670	22
2001 June	LL1	7,800	6,600	1,000	170
	LL4	6,800	5,100	1,500	210
	LL9	3,000	2,400	680	25
2001 July	LL1	3,300	3,100	170	1
	LL4	3,200	3,000	180	1
	LL9	1,600	1,400	160	2
2001 August	LL1	1,300	1,100	180	1
	LL4	1,700	1,500	200	2
	LL9	720	540	170	1
2001 September	LL1	8,200	8,000	270	13
	LL4	8,800	8,600	260	13
	LL9	4,800	4,600	190	1
2001 April	MQ1	3,600	3,200	400	10
	MQ4	3,500	3,200	310	11
	MQ9	5,700	4,900	830	24
2001 May	MQ1	1,900	1,500	360	17
	MQ4	1,800	1,400	370	14
	MQ9	3,800	3,200	600	13
2001 June	MQ1	2,200	1,900	240	2
	MQ4	3,700	3,400	310	2
	MQ9	4,000	3,600	390	4
2001 July	MQ1	2,500	2,300	230	8
	MQ4	2,700	2,400	260	6
	MQ9	1,500	1,200	240	8
2001 August	MQ1	1,800	1,600	190	17
	MQ4	1,900	1,700	180	15
	MQ9	1,800	1,600	160	16
2001 September	MQ1	1,900	1,700	180	24
	MQ4	3,200	2,900	230	37
	MQ9	1,800	1,600	190	43

Table A1-9 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2002

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2002 April	LL1	5,600	5,100	460	57
	LL4	5,600	5,100	490	40
	LL9	1,300	1,100	220	12
2002 May	LL1	2,600	1,900	710	29
	LL4	2,700	2,000	690	41
	LL9	1,800	1,300	460	37
2002 June	LL1	5,800	5,300	340	140
	LL4	9,200	8,600	450	96
	LL9	3,700	3,000	620	27
2002 July	LL1	2,900	2,700	180	0.3
	LL4	2,400	2,200	160	0.6
	LL9	3,900	3,300	560	41.2
2002 August	LL1	2,900	2,800	140	7.2
	LL4	2,300	2,200	150	3.2
	LL9	1,500	1,400	130	0.6
2002 September	LL1	3,900	3,700	220	27
	LL4	3,500	3,200	260	31
	LL9	2,500	2,300	210	2.2
2002 April	MQ1	2,000	1,700	360	8.2
	MQ4	1,900	1,600	300	3.6
	MQ9	1,500	1,200	260	4
2002 May	MQ1	1,400	1,100	270	1.1
	MQ4	1,400	1,200	230	1.7
	MQ9	1,400	1,100	330	1.4
2002 June	MQ1	1,000	940	110	1
	MQ4	800	680	120	0.3
	MQ9	60	50	7	0
2002 July	MQ1	1,700	1,300	330	50
	MQ4	1,500	1,100	360	34
	MQ9	940	700	240	5.5
2002 August[1]	MQ1	1,400	1,200	140	42
	MQ4	1,200	940	180	76
	MQ9	2,600	200	300	275
2002 September	MQ1	1,400	1,200	160	33
	MQ4	2,100	1,900	220	28
	MQ9	1,100	920	160	28

NOTE:

1. recalculated for counting *Cyclotella bodanica* at 400X rather than 100X

Table A1-10 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2003

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2003 April	LL1	4,800	4,200	560	36
	LL4	3,600	2,900	640	8.6
	LL9	640	450	190	6.9
2003 May	LL1	4,200	3,500	620	25
	LL4	4,600	3,800	800	23
	LL9	1,400	1,100	280	16
2003 June	LL1	2,300	1,600	630	37
	LL4	6,800	6,100	600	43
	LL9	4,500	3,800	680	42
2003 July	LL1	1,600	1,400	240	1
	LL4	2,400	2,100	270	0.5
	LL9	2,900	2,700	250	9.8
2003 August	LL1	2,000	1,800	240	0.8
	LL4	2,200	1,900	250	0.5
	LL9	1,900	1,600	260	0.6
2003 September	LL1	2,600	2,400	290	0.2
	LL4	3,700	3,400	340	1.8
	LL9	1,900	1,600	250	1.9
2003 April	MQ1	3,500	2,900	570	28
	MQ4	3,000	2,400	510	17
	MQ9	2,000	1,600	310	17
2003 May	MQ1	2,900	2,400	350	99
	MQ4	3,000	2,400	480	43
	MQ9	3,000	2,500	560	16
2003 June	MQ1	1,300	1,100	180	6
	MQ4	1,900	1,500	420	21
	MQ9	3,000	2,700	350	16
2003 July	MQ1	2,700	2,600	170	0.5
	MQ4	2,000	1,600	380	1.5
	MQ9	1,400	1,100	240	79
2003 August	MQ1	1,300	1,000	280	43
	MQ4	1,500	1,200	240	44
	MQ9	3,500	2,500	620	338
2003 September	MQ1	2,100	1,900	260	6.5
	MQ4	2,300	2,000	290	23
	MQ9	Not available			

Table A1-11 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2004

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2004 April	LL1	5,300	4,100	1,200	20
	LL4	3,500	2,600	860	13
	LL9	3,300	2,600	730	9.1
2004 May	LL1	8,000	7,100	860	34
	LL4	6,600	5,300	1,200	36
	LL9	2,800	2,000	770	22
2004 June	LL1	2,900	2,600	270	3.1
	LL4	2,900	2,600	310	5
	LL9	4,900	4,100	730	39
2004 July	LL1	1,600	1,300	280	2.7
	LL4	1,200	1,100	170	2.2
	LL9	1,700	1,400	270	1
2004 August	LL1	1,300	960	350	18
	LL4	1,400	1,000	300	38
	LL9	1,700	1,600	110	27
2004 September	LL1	3,800	3,400	370	27
	LL4	4,300	3,900	350	25
	LL4 - duplicate	3,100	2,800	320	19
	LL9	3,000	2,700	280	12
2004 April	MQ1	1,500	1,120	400	2.2
	MQ4	1,400	1,030	370	5.2
	MQ9	1,500	1,200	340	4.2
2004 May	MQ1	2,300	2,000	310	2.4
	MQ4	1,500	1,200	300	3.6
	MQ9	2,600	2,100	470	2.4
2004 June	MQ1	1,900	1,700	190	34
	MQ4	3,000	2,700	250	48
	MQ9	2,200	1,900	210	123
2004 July[1]	MQ1	1,200	960	260	6.2
	MQ4	1,700	1,400	260	9.9
	MQ9	1,300	840	340	82
2004 August[2]	MQ1	2,900	2,600	260	53
	MQ4	3,800	3,500	250	51
	MQ4 - duplicate	2,500	2,200	210	53
	MQ9	3,900	3,600	260	44
2004 September	MQ1	2,300	1,700	550	25
	MQ4	2,100	1,600	420	26
	MQ9	2,500	2,000	520	19

NOTES:

1. MQ9 recalculated for counting *Cyclotella bodanica* at 400X rather than 100X
2. MQ1, MQ4, MQ9 recalculated for counting *Elakatothrix gelatinosa* colonies at 400X rather than 100X

Table A1-12 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2005

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2005 April	LL1	2,700	2,100	550	24
	LL4	3,500	2,800	610	29
	LL9	670	460	200	8.5
2005 May	LL1	7,200	6,600	670	55
	LL4	5,700	4,900	850	20
	LL9	1,300	850	440	20
2005 June	LL1	2,700	2,400	300	2.4*
	LL4	2,800	2,500	330	8.3*
	LL9	990	850	130	8.9
2005 July	LL1	1,200	800	400	44*
	LL4	1,700	1,200	460	33*
	LL9	692	540	150	3.5*
2005 August	LL1	1,400	1,100	290	26
	LL4	1,100	810	220	64
	LL9	2,400	1,900	360	73
2005 September	LL1	1,400	1,100	170	170
	LL4	2,300	1,900	220	170
	LL9	1,800	1,200	590	31*
2005 April	MQ1	1,400	1,100	370	8.8
	MQ4	1,900	1,500	400	3.6
	MQ9	1,700	1,300	400	6.6
2005 May	MQ1	1,300	1,000	300	3.4
	MQ4	1,500	1,200	330	3.2
	MQ9	1,300	1,000	340	3.7
2005 June	MQ1	1,700	1,600	150	4.6
	MQ4	1,000	710	270	2.1
	MQ9	1,100	900	200	1.1
2005 July[1]	MQ1	1,100	860	220	14.6
	MQ4	1,100	920	200	11.2
	MQ9	1,400	700	170	489
2005 August[2]	MQ1	1,100	950	170	0.5
	MQ4	1,900	1,600	250	7.1
	MQ9	2,100	1,700	330	89*
2005 September	MQ1	870	710	140	10.7
	MQ4	1,200	1,100	170	20.2
	MQ9	1,400	1,100	180	146

NOTE:

* = Cyclotella bodanica counted at 400X rather than 100X

Table A1-13 **Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2006**

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 mm (100X)
2006 April	LL1	1,800	1,100	610	1.9*
	LL4	3,200	2,700	520	14.7
	LL9	690	550	135	2.2
2006 May	LL1	2,600	2,000	620	19.7
	LL4	4,900	4,200	640	12.9
	LL9	540	380	160	4.8
2006 June	LL1	860	610	200	39.5
	LL4	2,000	1,800	190	22.2
	LL4 (rep)	1,100	940	190	23.2
	LL9	1,700	1,400	220	17.7
2006 July	LL1	1,300	1,100	160	54.8
	LL4	2,700	2,200	370	165
	LL9	1,700	1,300	350	19.1
2006 August	LL1	2,700	2,500	200	14.3
	LL4	2,600	2,300	220	34.6
	LL9	2,800	2,300	470	23.8
2006 September	LL1	3,800	3,600	160	0.4
	LL4	1,300	1,200	120	2
	LL9	1,800	1,700	130	3.6
2006 April	MQ1	2,200	16,00	240	9.4
	MQ4	2,400	1,900	550	8.6
	MQ9	1,600	1,400	180	8.2
2006 May	MQ1	1,700	1,500	240	10.8
	MQ4	1,700	1,400	320	7.4
	MQ4 (rep)	2,100	1,800	310	11.8
	MQ9	1,900	1,600	280	4.1
2006 June	MQ1	1,900	1,800	130	0.9
	MQ4	1,400	1,200	200	4.4
	MQ9	950	840	110	0.6
2006 July	MQ1	1,100	870	220	42.8
	MQ4	2,000	1,700	260	16.6
	MQ9	2,300	2,100	180	18.8*
2006 August	MQ1	1,500	1,200	280	6.5
	MQ4	2,100	1,800	290	13.3
	MQ9	1,300	880	400	17.0*
2006 September	MQ1	2,500	2,300	200	1.9
	MQ4	2,100	1,800	260	11.8
	MQ9	3,400	2,400	970	1.8*

NOTE:
* *Cyclotella bodanica* (diatom) counted at 400X rather than 100X

Table A1-14 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2007

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)
2007 April	LL1	3,100	2,800	240
	LL4	3,000	2,200	620
	LL9	1,200	910	240
2007 May	LL1	2,600	2,000	540
	LL4	3,300	2,600	670
	LL9	1,300	890	430
2007 June	LL1	2,100	1,600	420
	LL4	2,500	2,000	520
	LL9	1,100	750	300
2007 July	LL1	2,300	2,000	240
	LL4	2,400	2,100	270
	LL9	3,100	3,000	180
2007 August	LL1	1,100	900	240
	LL4	2,300	2,100	150
	LL4 (rep)	2,600	2,400	150
	LL9	570	480	90
2007 September	LL1	2,500	2,200	280
	LL4	1,700	1,400	240
	LL9	420	350	68
2007 April	MQ1	1,700	1,500	230
	MQ4	1,900	1,602	300
	MQ9	1,100	900	200
2007 May	MQ1	1,500	1,300	250
	MQ4	1,800	1,500	320
	MQ9	2,600	2,300	310
2007 June	MQ1	1,500	1,200	300
	MQ4	1,800	1,600	200
	MQ9	1,500	1,200	290
2007 July	MQ1	1,500	1,100	220
	MQ4	1,900	1,500	440*
	MQ9	1,000	860	150
	MQ9 (rep)	1,600	1,400	150
2007 August	MQ1	2,300	2,100	200
	MQ4	1,100	970	160
	MQ9	710	590	120
2007 September	MQ1	1,400	1,100	270
	MQ4	1,500	1,200	290
	MQ9	1,000	690	300

Table A1-15 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2008

Date	Sampling Site	Total Abundance	< 5mm (1000X)	5 to 25 mm (400X)	> 25 µm (100X)
2008 April	LL1	2,500	2,070	360	30
	LL4	3,100	2,500	540	50
	LL9	1,300	1,030	240	20
2008 May	LL1	3,100	2,840	220	20
	LL4	5,300	4,820	430	25
	LL9	1,300	1,030	260	20
2008 June	LL1	1,000	880	110	1
	LL4	960	730	220	8
	LL9 (rep)	1,500	1,060	380*	16*
	LL9	1,200	780	380*	7*
2008 July	LL1	1,000	970	80	1
	LL4	1,400	1,300	110	17
	LL9	2,000	1,500	370	110
2008 August	LL1	1,100	1,000	50	1
	LL4	1,400	1,300	50	11
	LL9	1,100	1,060	40	9
2008 September	LL1	2,100	1,730	420**	2**
	LL4	2,300	1,780	490**	3**
	LL9	2,900	2,250	690**	6**
2008 April	MQ1	2,100	1,850	200	1
	MQ4	1,700	1,530	200	3
	MQ9	2,800	2410	400	4
2008 May	MQ1	1,000	870	130	1
	MQ4	1,700	1460	230	2
	MQ9	1,200	1,000	180	2
2008 June	MQ1	840	700	140	0.4
	MQ4	1,300	1,040	240	1
	MQ9	870	580	280	0.5
2008 July	MQ1	620	520	90	8
	MQ4	500	370	130	8
	MQ9	870	680	180	0.5
	MQ9 (rep)	1,000	760	260	9
2008 August	MQ1	750	660	100	1
	MQ4	980	860	110	6
	MQ9	1,300	990	290	5
2008 September	MQ1	1,500	1,310	160	14
	MQ4	1,100	980	150	3
	MQ9	2,800	2,680	130	10

NOTES:
* *Synedra radians* (diatom) counted at 400X rather than 100X, due to high numbers
** *Asterionella formosa* (diatom) counted at 400X rather than 100X, due to high numbers

Table A1-16 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2009

Date	Sampling Site	Total Abundance	< 5 µm (1000X)	5 to 25 µm (400X)	> 25 µm (100X)
2009 April	LL1	780	480	300	6
	LL4	1,600	1,220	340	4
	LL9	90	60	30	1
2009 May	LL1	6,000	5,150	820	19
	LL4	4,900	4,100	760	10
	LL9	430	290	140	5
2009 June	LL1	1,700	1,370	370	5
	LL4	1,400	1,030	360	12
	LL9	680	340	330	6
2009 July	LL1	2,100	1,900	270	3
	LL4	2,700	2,400	330	4
	LL9	700	340	350	4
2009 August	LL1	3,100	2,900	170	3
	LL4	2,400	2,200	190	15
	LL9	1,700	1,300	370	10
2009 September	LL1	3,700	3,500	220	5
	LL4	2,300	2,100	180	3
	LL9	1,100	950	170	1
2009 April	MQ1	1,400	1,130	250	33
	MQ4	1,300	1,170	160	12
	MQ9	2,300	2,730	520	13
2009 May	MQ1	1,700	1,440	260	3
	MQ4	2,100	1,750	340	5
	MQ9	3,800	3,060	720	18
2009 June	MQ1	1,500	1,360	160	0.1
	MQ4	1,100	990	150	0.2
	MQ9	1,100	940	200	0.8
2009 July	MQ1	1,000	790	190	4
	MQ4	1,300	1,100	220	8
	MQ9	1,200	940	240	5
2009 August	MQ1	610	450	160	0.3
	MQ4	1,300	1,170	170	3
	MQ9	1,600	1,200	390	0.4
2009 September	MQ1	830	670	160	5
	MQ4	1,200	970	170	6
	MQ9	1,400	1,200	240	1

Table A1-17 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2010

Date	Sampling Site	Total Abundance	< 5 µm (1,000X)	5 to 25 µm (400X)	> 25 µm (100X)
2010 April	LL1	630	490	140	1.6
	LL4	1,900	1,500	390	3
	LL9	170	100	70	0.4
2010 May	LL1	1,200	940	270	13.4
	LL4	4,500	3,800	650	17
	LL9	530	390	140	0.9
2010 June	LL1	2,400	1,900	500	5.2
	LL4	3,600	3,000	610	11
	LL9	1,500	1,100	400	10.6
2010 July	LL1	2,100	1,900	170	8.7
	LL1 (rep)	1,900	1,700	180	5
	LL4	3,000	2,800	250	2
	LL9	1,900	1,700	210*	0
2010 August	LL1	1,200	990	180	1.5
	LL4	1,600	1,400	190	1
	LL4 (rep)	1,600	1,400	180	2
	LL9	1,800	1,600	170	0
2010 September	LL1	2,100	1,800	260	15.1
	LL4	4,400	4,200	200	5
	LL9	1,200	1,100	130	0.4
2010 April	MQ1	1,700	1,600	100	0.4
	MQ4	1,200	1,100	120	1
	MQ9	800	710	90	2.4
2010 May	MQ1	1,100	990	120	0.9
	MQ4	1,100	960	150	1
	MQ9	1,600	1,330	240	2.9
2010 June	MQ1	2,000	1,700	270	0.9
	MQ4	1,400	1,100	240	1
	MQ9	1,000	850	200	1.1
2010 July	MQ1	1,800	1,500	250	8.7
	MQ1 (rep)	1,400	1,300	170	6
	MQ4	1,500	1,300	180	10
	MQ9	1,600	1,400	180	4
2010 August	MQ1	1,400	1,200	140	7.2
	MQ4	1,000	870	160	5
	MQ4 (rep)	1,100	900	150	5
	MQ9	1,200	1,000	150	8
2010 September	MQ1	1,300	1,000	260	1.3
	MQ4	1,300	1,040	220	3
	MQ9	1,100	900	190	1.7

Table A1-18 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2011

Date	Sampling Site	Total Abundance	< 5 µm (1,000X)	5 to 25 µm (400X)	> 25 µm (100X)
2011 April	LL1	1,700	1,400	220	52
	LL4	3,900	3,260	540	80
	LL9	2,200	1,820	340	9
2011 May	LL1	3,600	2,880	720	6
	LL1 (rep)	3,500	2,790	690	6
	LL4	4,900	4,160	700	6
	LL9	1,300	900	350	5
2011 June	LL1	2,100	1,750	330	36
	LL4	2,300	2,050	290	3
	LL9	1,500	1,060	450	4
2011 July	LL1	1,400	1,150	270	3
	LL4	1,800	1,440	350	1
	LL4 (rep)	1,900	1,600	300	0.1
	LL9	1,900	1,550	320	2
2011 August	LL1	2,900	2,500	360	15
	LL4	1,800	1,400	320	27
	LL9	1,500	1,200	280	0.9
2011 September	LL1	1,300	940	380	2.2
	LL4	1,800	1,500	380	0.4
	LL9	960	770	190	0.3
2011 April	MQ1	1,600	1,370	270	7
	MQ4	1,400	1,160	270	6
	MQ9	1,900	1,400	490	3
2011 May	MQ1	1,200	1,050	190	2
	MQ1 (rep)	1,200	1,040	170	3
	MQ4	1,800	1,370	410	4
	MQ9	1,600	670	920	4
2011 June	MQ1	2,000	1,840	150	1
	MQ4	1,500	1,300	200	1
	MQ9	1,700	1,200	520	10
2011 July	MQ1	2,200	2,100	110	0.4
	MQ4	1,600	1,330	230	3
	MQ9	1,000	770	200	1
	MQ9(rep)	1,100	860	200	1
2011 August	MQ1	1,400	1,200	210	4
	MQ4	3,300	3,000	280	0.6
	MQ9	1,200	1,000	200	0.1
2011 September	MQ1	2,300	2,100	190	17.2
	MQ4	2,600	2,400	190	0.2
	MQ9	1,600	1,400	240	9.6

Table A1-19 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2012

Date	Sampling Site	Total Abundance	< 5 µm (1,000X)	5 to 25 µm (400X)	> 25 µm (100X)
2012 April	LL1	2,300	1,980	330	5
	LL4	3,200	2,570	590	6
	LL9	1,000	800	190	6
2012 May	LL1	3,000	2,470	470	15
	LL4	2,200	1,640	600	7
	LL9	2,300	2,050	280	7
2012 June	LL1	1,400	1,080	310	3
	LL4	1,700	1,400	320	2
	LL9	980	810	170	2
	LL9 (rep)	1,200	1,020	140	1
2012 July	LL1	1,600	1,390	170	3
	LL4	Sample lost in transit (broken bottle)			
	LL9	880	730	150	2
2012 August	LL1	970	740	210	19
	LL1 (rep)	940	760	170	14
	LL4	1,300	990	250	35
	LL9	380	250	130	0.5
2012 September	LL1	Sample unpreserved – no analysis done			
	LL4	2,800	2,350	480	1
	LL9	Sample unpreserved – no analysis done			
2012 April	MQ1	2,200	2,010	200	3
	MQ4	1,700	1,440	220	3
	MQ9	1,600	1,420	180	5
2012 May	MQ1	1,100	990	140	1
	MQ4	830	680	140	0
	MQ9	1,200	1,000	150	0.2
2012 June	MQ1	2,100	1,920	170	0.4
	MQ4	890	740	150	0.3
	MQ9	1,100	910	200	0.4
	MQ9 (rep)	1,100	920	200	0.5
2012 July	MQ1	1,300	1,210	100	0.4
	MQ4	1,100	1,010	90	10
	MQ9	740	640	100	1
2012 August	MQ1	1,030	860	180	0.8
	MQ1 (rep)	920	720	200	0.2
	MQ4	810	660	140	10
	MQ9	430	340	90	1.6
2012 September	MQ1	900	730	170	0.5
	MQ4	760	650	115	2
	MQ9	580	430	160	0.5
2012 June	NNL1	1,600	1,240	320	0.5
	NNL4	1,000	670	370	0.2
	NNL9	840	700	140	1
	NNL9 (rep)	880	730	160	0.8
2012 July	NNL1	1,300	1,000	260	1.2
	NNL4	1,700	1,390	310	1
	NNL9	820	540	280	0.2
2012 August	NNL1	810	660	150	1.6
	NNL1 (rep)	790	590	200	1
	NNL4	1,800	1,350	440	0.8
	NNL9	730	530	195	0.04
2012 September	NNL1	1,530	1,170	360	1.2
	NNL4	1,260	970	290	2
	NNL9	1,740	1530	220	0.2

Table A1-20 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2013

Sampling Site	Date	Depth	Total Abundance	< 5 µm (1,000X)	5 to 25 µm (400X)	> 25 µm (100X)
Long Lake	April 2013	0.5 m	2,300	1,750	530	10
		1 m	3,000	2,470	570	15
	August 2013	0.5 m	1,300	880	455	2
		1.0 m	1,700	1,170	470	15
	October 2013	0.5 m	1,500	1,150	340	12
		1.0 m	1,900	1440	400	14
Middle Quinsam Lake	April 2013	0.5 m	1,350	1,080	270	2
		1.0 m	1,400	1,150	250	2
	August 2013	0.5 m	1,300	1,045	235	7
		1.0 m	1,300	1,010	325	6
		1.0 m (rep)	1,200	990	230	9
	October 2013	0.5 m	1,800	1,440	350	2
		1.0 m	1,900	1,570	290	2
		1.0 m (rep)	1,600	1,310	300	3
No Name Lake	April 2013	0.5 m	1,300	900	370	45
		1.0 m	1,600	1,150	380	36
	August 2013	0.5 m	1,200	880	440	5
		1.0 m	1,500	1,060	455	6
		1.0 m (rep)	1,700	1,315	470	8
	October 2013	0.5 m	1,800	1,310	460	1
		1.0 m	1,600	1,060	540	1
Lower Quinsam Lake	April 2013	0.5 m	1,800	1,420	406	2
		1 m	950	700	245	2
	August 2013	0.5 m	960	810	150	2
		1.0 m	620	460	160	3
	October 2013	0.5 m	1,300	1,040	200	12
		1.0 m	1,300	1,060	230	4

Table A1-21 **Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2014**

Sampling Site	Date	Depth	Total Abundance	< 5 µm (1,000X)	5 to 25 µm (400X)	> 25 µm (100X)
Long Lake	April 2014	1 m	3100	2665	330	86.6
	July 2014	1 m	1700	1170	490	0.9
	October 2014	1 m	1500	1200	290	18.6
Middle Quinsam Lake	April 2014	1 m	1000	840	155	11.4
		1 m replicate	590	480	100	11.7
	July 2014	1 m	3200	2950	240	0.5
	October 2014	1 m	1700	1400	310	3.2
No Name Lake	April 2014	1 m	1600	1260	290	83
	July 2014	1 m	1300	970	310	2.5
		1 m replicate	1200	830	250	3.1
	October 2014	1 m	1600	1400	200	1.7
		1 m replicate	1500	1200	230	2.2
Lower Quinsam Lake	April 2014	1 m	1600	1400	225	7.6
	July 2014	1 m	1200	1010	210	1.8
	October 2014	1 m	2400	2000	350	66

Table A1-22 Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2015

Lake	Month	Depth (m)	Total Abundance	< 5 µm (1000X)	5 to 25 µm (400X)	> 25 µm (100X)
Long	April	1	3700	3300	400	15
	July	1	1300	1030	260	6.6
	October	1	2100	1800	230	14.6
Middle Quinsam	April	1	1600	1300	300	2.4
	July	1	2900	1060	1850	2.8
	October	1	1150	920	230	0.3
No Name	April	1	1200	870	350	1.1
	July	1	880	610	260	6.6
	October	1	1350	1000	300	4.3
	October replicate	1	1200	920	280	4.5
Lower Quinsam	April	1	2200	1800	350	28
	April replicate	1	2300	1800	520	18
	July	1	3200	580	2630	3.3
	October	1	1500	1100	330	71

Table A-23 **Phytoplankton Abundance (cells/mL) in the Quinsam Lakes System, 2016**

Lake	Month	Abundance (cells/mL) at 1 m depth			
		Total	< 5 µm (1,000 X)	5 to 25 µm (400 X)	> 25 µm (100 X)
Long	April	1,500	1,300	240	5.5
Middle Quinsam		1,100	882	240	2.8
No Name		1,100	864	240	1.8
No Name (replicate)		970	792	180	1.8
Lower Quinsam		1,500	1,200	260	5.4
Long	August	1,200	990	140	22
Middle Quinsam		930	810	116	1.5
No Name		1,800	1,200	500	42
No Name (replicate)		1,900	1,280	595	46
Lower Quinsam		2,400	1,850	578	1.4
Long	November	780	640	140	0.5
Middle Quinsam		610	520	90	3
No Name		650	600	50	0.4
Lower Quinsam		300	250	50	0

APPENDIX B

Species Composition Data: May 2017

Quinsam Lake Phytoplankton - 10 May 2017
Long Lake 1 m (RA8446-05, Job B736060
27 ml sample settled

Total Cells Counted	**536**
Total Cells Per mL	**2,700**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	64	1152
Ochromonas/Chromulina spp. (4-5 um)	43	774
Ochromonas/Chromulina spp. (6-7 um)	10	180
Chrysochromulina parva	4	72
Pseudokephyrion sp.	12	216
TOTAL	**133**	**2,394**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Ochromonas spp. (8-10 um)	165	281
Ochromonas spp. (12-15 um)	3	5
BACILLARIOPHYCEAE		
Melosira italica (filaments)	1	2
CHLOROPHYCEAE		
Gloeocystis sp. (cells + cols)	2	3
DINOPHYCEAE		
Gymnodinium sp.	2	3
Peridinium sp.	1	2
CRYPTOPHYCEAE		
Cryptomonas spp.	7	12
Rhodomonas minuta	19	32
TOTAL	**200**	**340**
100X magnification - half sample		
BACILLARIOPHYCEAE		
Asterionella formosa (2 cols, 2 cells)	2	0.2
Eunotia sp. (long)	2	0.2
Synedra radians	152	12.2
Synedra ulna	37	3.0
Tabellaria fenestrata (2 cols, 8 cells)	8	0.6
CHLOROPHYCEAE		
Botryococcus braunii (colonies)	1	0.1
DINOPHYCEAE		
Gymnodinium helveticum	1	0.1
TOTAL	**203**	**16.2**

Quinsam Lake Phytoplankton - 10 May 2017
Middle Quinsam Lake 1 m (RA8504-05, Job B736072
27 ml sample settled

Total Cells Counted **492**
Total Cells Per mL **1,900**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	38	684
Ochromonas/Chromulina spp. (4-5 um)	31	558
Ochromonas/Chromulina spp. (6-7 um)	8	144
Pseduokephyrion sp.	6	108
Chrysochromulina parva	1	18
TOTAL	**84**	**1512**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	13	22
Mallomonas spp.	1	2
Ochromonas spp. (8-10 um)	168	286
Ochromonas spp. (12-15 um)	4	7
BACILLARIOPHYCEAE		
Cyclotella ocellata/stelligera	2	3
Melosira italica (filaments)	1	2
Rhizosolenia longiseta	8	14
CHLOROPHYCEAE		
Gloeocystis sp. (cells+cols)	2	3
CRYPTOPHYCEAE		
Cryptomonas spp.	2	3
Rhodomonas minuta	13	22
CYANOPHYCEAE		
Dactylococcopsis aciciularis (cols)	2	3
TOTAL	**216**	**367**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon bavaricum (14 cols, 126 cells)	126	10.1
Dinobryon sociate (3 cols, 13 cells)	13	1.0
BACILLARIOPHYCEAE		
Asterionella formosa (2 cols, 5 cells)	5	0.4
Synedra radians	47	3.8
Synedra ulna	1	0.1
TOTAL	**192**	**15.4**

Quinsam Lake Phytoplankton - 10 May 2017
No Name Lake 1 m (RA8471-05, Job B736065)
27 ml sample settled

Total Cells Counted	**342**
Total Cells Per mL	**1,300**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	23	414
Ochromonas/Chromulina spp. (4-5 um)	25	450
Ochromonas/Chromulina spp. (6-7 um)	4	72
Chrysochromulina parva	1	18
Pseudokephyrion sp.	3	54
TOTAL	**56**	**1,008**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	3	5
Dinobryon cysts	2	3
Mallomonas sp.	2	3
Ochromonas spp. (8-10 um)	109	185
BACILLARIOPHYCEAE		
Cyclotella glomerata (cells + colonies)	2	3
Melosira italica (cells + fils)	3	5
CHLOROPHYCEAE		
Gloeocystis sp. (cells + cols)	2	3
DiNOPHYCEAE		
Peridinium sp.	1	2
CRYPTOPHYCEAE		
Cryptomonas spp.	29	49
Rhodomonas minuta	22	37
CYANOPHYCEAE		
Dactylococcopsis acicularis (cols)	11	19
Merismopedia sp. (cols)	1	2
TOTAL	**187**	**318**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon bavaricum (1 col, 16 cell)	16	1.3
Dinobryon sociale (2 cols, 10 cells)	10	0.8
BACILLARIOPHYCEAE		
Synedra radians	53	4.2
Synedra ulna	16	1.3
Tabellaria fenestrata (1 cols, 4 cells)	4	0.3
TOTAL	**99**	**7.9**

Quinsam Lake Phytoplankton - 10 May 2017
Lower Quinsam Lake 1 m (RA8511-05, Job B736075)
27 ml sample settled

Total Cells Counted	**319**
Total Cells Per mL	**1,700**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	26	468
Ochromonas/Chromulina spp. (4-5 um)	28	504
Ochromonas/Chromulina spp. (6-7 um)	13	234
Pseudokephyrion sp.	6	108
TOTAL	**73**	**1,314**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	1	2
Dinobryon cyst	1	2
Ochromonas spp. (8-10 um)	145	247
Ochromonas spp. (12-15 um)	4	7
BACILLARIOPHYCEAE		
Cyclotella ocellata/stelligera	1	2
Melosira italica (fil)	1	2
CHLOROPHYCEAE		
Tetraedron minimum	3	5
DINOPHYCEAE		
Gymnodinium sp.	7	12
Peridinium sp.	3	5
CRYPTOPHYCEAE		
Cryptomonas spp.	24	41
Rhodomonas minuta	41	70
TOTAL	**231**	**393**
100X magnification - half sample		
BACILLARIOPHYCEAE		
Synedra radians	10	0.8
Synedra ulna	3	0.2
CYANOPHYCEAE		
Oscillatoria sp. (200-300 um filaments)	2	0.2
TOTAL	**15**	**1.2**

Stantec Consulting Ltd.
500-4730 Kingsway, Burnaby BC V5H 0C6

October 17, 2017
File: 123210406

Attention: Morgan Melnychuk
Maxxam Analytics Laboratory
4606 Canada Way
Burnaby, BC V5G 1K5

Dear Morgan,

Reference: Quinsam Lakes Phytoplankton, September 2017
(Sample Reference RX6697-03, RX6711-03, RX6688-04, RX6692-03, RX6706-03)
(Job Numbers B777159, B777162, B777165, B777167)

INTRODUCTION

Quinsam Coal Ltd. collects water samples from the Quinsam Lakes system during the growing season. Permit requirements were amended for 2014 to include surface water sampling (1.0 m depth) three times a year (spring, late summer, fall overturn). Four lakes are now sampled: Long, Middle Quinsam, No Name, and Lower Quinsam lakes. From 1994 through 2012, the requirement was for sampling at 1, 4 and 9 m in April through September for Long Lake and Middle Quinsam Lake, with No Name Lake added to the program in June 2012 and Lower Quinsam Lake added in 2013. The 2013 program was similar to that for 2014 and subsequent years, but with collection of samples at 0.5 m as well as 1 m depth. This long-term record is included in Appendix A.

Samples are submitted to Stantec Consulting Ltd. for phytoplankton taxonomic analysis, as part of ongoing monitoring requirements of the Ministry of Environment. Some months, an additional sample is taken as a field replicate for quality assurance/quality control (QA/QC). This brief report provides information about samples collected in September 2017.

METHODS

Sub-samples (27 mL) of preserved lake water were settled and examined at 100 X, 400 X and 1,000 X magnifications using a Zeiss inverted microscope. Counting effort is defined as at least 100 organisms of the predominant species at 400 X, up to 200 fields at 1,000 X and a half or whole sub-sample at 100 X.

RESULTS

Abundance

Abundance data for 1993 to 2016 are summarized in Appendix A and detailed taxonomic results for September 2017 are presented in Appendix B.

Reference: Quinsam Lakes Phytoplankton, September 2017
(Sample Reference RX6697-03, RX6711-03, RX6688-04, RX6692-03, RX6706-03)
(Job Numbers B777159, B777162, B777165, B777167)

Total abundance in the September 2017 samples is shown in Table 1. Total abundance was 1,100 cells/mL for Long Lake, 980 cells/mL for Middle Quinsam Lake, 1,400 cells/mL for No Name Lake, 1,500 cells/mL for No Name Lake replicate, and 1,700 cells/mL for Lower Quinsam Lake.

Table 1 Phytoplankton Abundance (cells/mL) in Quinsam Lake System, September 2017

Lake	Month	Abundance (cells/mL) at 1 m depth			
		Total	< 5 µm (1,000 X)	5 to 25 µm (400 X)	> 25 µm (100 X)
Long	May	2,700	2,400	340	16.2
Middle Quinsam		1,900	1,500	370	15.4
No Name		1,300	1,000	320	7.9
Lower Quinsam		1,700	1,300	390	1.2
Long	Sept.	1,100	940	200	1.5
Middle Quinsam		980	760	220	0.9
No Name		1,400	860	480	29.8
No Name Replicate		1,500	1,000	450	28.1
Lower Quinsam		1,700	990	600	86.6

Species Composition

Species composition data for September 2017 are contained in Appendix B. The most abundant phytoplankton in all four lakes were the very small (≤ 5 µm) chrysoflagellates (*Ochromonas* spp. and *Chromulina* spp.). Although these ultra-nanoplankton species were very abundant numerically, they usually contribute little to algal biomass.

The most abundant of the larger algae were as follows:

- In Long Lake, larger *Ochromonas* spp. were predominant and the cryptophyte *Rhodomonas minuta* was common.
- In Middle Quinsam Lake, larger *Ochromonas* spp. were predominant and the cryptophyte *Rhodomonas minuta* and small chlorophyte *Oocystis* sp. were common.
- In No Name Lake and its replicate, larger *Ochromonas* spp. and an unidentified chrysoflagellate were predominant and *Rhodomonas minuta* and the colonial chrysophyte *Dinobryon bavaricum* were common.

Reference: Quinsam Lakes Phytoplankton, September 2017
(Sample Reference RX6697-03, RX6711-03, RX6688-04, RX6692-03, RX6706-03)
(Job Numbers B777159, B777162, B777165, B777167)

- In Lower Quinsam Lake, larger *Ochromonas* spp., the diatoms *Asterionella formosa* and *Melosira italica*, the chlorophyte *Gloeocystis sp*., and *Rhodomonas minuta* were predominant.

Comparison of Replicate Samples

Two replicates were collected from 1 m depth in No Name Lake. Percent difference in the duplicate samples was calculated. A difference of up to 10% can be expected for a total cell count of 400 organisms, for repeat sampling from the same bottle; higher percent difference can be expected when separate grabs are used for the replicates, as was done here.

For No Name Lake, species composition and abundance in the two samples were similar. Total abundance was 1,400 cells/mL in one sample and 1,500 cells/mL in the other; this difference of ± 7% indicates good inter-sample reproducibility. Species composition was also similar in the two samples.

CLOSURE

We trust this information meets your present requirements. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,

STANTEC CONSULTING LTD.

Barrie Tuite, M.Sc., R.P. Bio.
Aquatic Scientist
Phone: (604) 328-5312
Fax: (604) 436-3752
Barrie. Tuite@stantec.com

Karen Munro, M.Sc. R.P. Bio.
Principal
Phone: (604) 678-3085
Fax: (604) 436-3752
Karen.Munro@stantec.com

Appendix A Historical Abundance Data: Quinsam Lakes System, 1993–2016
Appendix B Species Composition Data: September 2017

kb \\cd1183-f05\workgroup\1231\active\em\123110406\report\2017 quinsam\sept\let_20171017_quinsam_lakes_fin.docx

APPENDIX B

Species Composition Data: September 2017

Quinsam Lake Phytoplankton - 7 September 2017
Long Lake 1 m (RX6697-03, Job B777162)
27 ml sample settled

Total Cells Counted	**324**
Total Cells Per mL	**1,100**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	28	504
Ochromonas/Chromulina spp. (4-5 um)	13	234
Ochromonas/Chromulina spp. (6-7 um)	4	72
Chrysochromulina parva	4	72
Pseudokephyrion sp.	3	54
TOTAL	**52**	**936**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	1	1
Ochromonas spp. (8-10 um)	119	101
Ochromonas spp. (12-15 um)	1	1
BACILLARIOPHYCEAE		
Melosira italica (filaments)	5	4
CHLOROPHYCEAE		
Crucigenia sp. (cols)	6	5
Dictosphaerium pulchellum (cols.)	7	6
Nephrocytium sp. (cells)	10	9
Scenedesmus sp. (cols)	4	3
Tetraedron sp.	1	1
DINOPHYCEAE		
Gymnodinium sp.	1	1
Peridinium sp.	1	1
CRYPTOPHYCEAE		
Cryptomonas spp.	20	17
Rhodomonas minuta	46	39
CYANOPHYCEAEA		
Aphanothece sp. (cols)	2	2
Chroococcus sp. (cols)	4	3
Dactylococcopsis acicularis (cells + cols)	6	5
TOTAL	**234**	**199**
100X magnification - whole sample		
BACILLARIOPHYCEAE		
Navicula sp.	1	0.04
Rhopalodia gibba	1	0.04
Synedra radians	3	0.1
Synedra ulna	3	0.1
CHLOROPHYCEAE		
Botryococcus braunii (colonies)	2	0.1
Elakatothrix gelatinosa (cols)	1	0.04
Staurastrum sp.	2	0.1
DINOPHYCEAE		
Ceratium hirudinella	25	1.0
TOTAL	**38**	**1.5**

Quinsam Lake Phytoplankton - 7 September 2017
Middle Quinsam Lake 1 m (RX6711-03, Job B777167)
27 ml sample settled

Total Cells Counted	**329**
Total Cells Per mL	**980**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	21	378
Ochromonas/Chromulina spp. (4-5 um)	8	144
Ochromonas/Chromulina spp. (6-7 um)	3	54
Pseduokephyrion sp.	2	36
Chrysochromulina parva	1	18
CHLOROPHYCEAE		
Oocystis sp. (5X3 um)	7	126
TOTAL	**42**	**756**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	4	3
Mallomonas spp.	20	17
Ochromonas spp. (8-10 um)	106	90
BACILLARIOPHYCEAE		
Navicula sp.	1	1
CHLOROPHYCEAE		
Cosmarium sp.	1	1
Dictosphaerium pulchellum (cols.)	6	5
Gloeocystis sp. (cells+cols)	5	4
Nephrocytium sp. (cells)	31	26
Scenedesmus sp. (cols)	3	3
Tetradedron sp.	1	1
DINOPHYCEAE		
Gymnodinium sp.	1	1
CRYPTOPHYCEAE		
Cryptomonas spp.	16	14
Rhodomonas minuta	60	51
CYANOPHYCEAE		
Aphanothece sp. (cols)	2	2
Chroococcus sp. (cols)	2	2
Dactylococcopsis aciciularis (cols)	4	3
Rhabdoderma sp. (cols)	1	1
TOTAL	**264**	**224**
100X magnification - whole sample		
CHRYSOPHYCEAE		
Dinobryon cylindricum (2 cols, 6 cells)	6	0.2
BACILLARIOPHYCEAE		
Synedra radians	1	0.04
CHLOROPHYCEAE		
Elakatothrix gelatinosa (cols)	7	0.3
Mougeotia sp. (1 fil, 6 cells)	6	0.2
Quadrigula chodati (cols)	1	0.04
CYANOPHYCEAE		
Anabaena flos-aquae (1 fil, 8 cells)	1	0.04
Coelosphaerium kuetzingiana (cols)	1	0.04
TOTAL	**23**	**0.9**

Quinsam Lake Phytoplankton - 7 September 2017
No Name Lake 1 m (RX6688-04, Job B777159)
27 ml sample settled

Total Cells Counted	**702**
Total Cells Per mL	**1,400**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	26	468
Ochromonas/Chromulina spp. (4-5 um)	14	252
Ochromonas/Chromulina spp. (6-7 um)	3	54
Chrysochromulina parva	1	18
Pseudokephyrion sp.	4	72
TOTAL	**48**	**864**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	1	2
Ochromonas spp. (8-10 um)	65	111
unidentified flagellate (8x4 um)	76	129
BACILLARIOPHYCEAE		
Cyclotella ocellata/stelligera	1	2
Melosira italica (cells + fils)	8	14
Rhizosolenia logiseta	3	5
CHLOROPHYCEAE		
Crucigenia sp.	2	3
Gloeocystis sp. (cells + cols)	1	2
Oocystis sp. (cols + cells)	2	3
Nephrocytium sp. (cells)	4	7
DiNOPHYCEAE		
Gymnodinium sp.	1	2
CRYPTOPHYCEAE		
Cryptomonas spp.	10	17
Rhodomonas minuta	100	170
CYANOPHYCEAE		
Chroococcus cf. prescottii (cols)	2	3
Dactylococcopsis acicularis (cols)	2	3
Aphanothece sp. (cols)	1	2
Merismopedia sp. (cols)	2	3
TOTAL	**281**	**478**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon bavaricum (170 col, 285 cell)	285	22.8
Dinobryon cylindricum (7 cols, 44 cells)	44	3.5
BACILLARIOPHYCEAE		
Asterionella formosa (1 col, 4 cells)	4	0.3
Synedra radians	3	0.2
CHLOROPHYCEAE		
Botryococcus braunii (cols)	2	0.2
CYANOPHYCEAE		
Anabaena flos-aquae (fil)	13	1.0
Coelosphaerium kuetzingiana (cols)	3	0.2
Rhabdoderma sp. (cols)	19	1.5
TOTAL	**373**	**29.8**

Quinsam Lake Phytoplankton - 7 September 2017
No Name Lake 1 m Rep (RX6692-03, Job B777159)
27 ml sample settled

Total Cells Counted	**674**
Total Cells Per mL	**1,500**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	32	576
Ochromonas/Chromulina spp. (4-5 um)	14	252
Ochromonas/Chromulina spp. (6-7 um)	4	72
Chrysochromulina parva	5	90
Pseudokephyrion sp.	1	18
TOTAL	**56**	**1,008**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Ochromonas spp. (8-10 um)	74	126
unidentified flagellate (8x4 um)	72	122
BACILLARIOPHYCEAE		
Melosira italica (cells + fils)	5	9
CHLOROPHYCEAE		
Crucigenia sp.	1	2
Gloeocystis sp. (cells + cols)	2	3
Oocystis sp. (cols + cells)	4	7
Nephrocytium sp. (cells)	5	9
DiNOPHYCEAE		
Gymnodinium sp.	1	2
Peridinium sp.	1	2
CRYPTOPHYCEAE		
Cryptomonas spp.	8	14
Rhodomonas minuta	87	148
CYANOPHYCEAE		
Chroococcus cf. prescottii (cols)	4	7
Dactylococcopsis acicularis (cols)	1	2
Aphanothece sp. (cols)	1	2
Merismopedia sp. (cols)	1	2
TOTAL	**267**	**454**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon bavaricum (143 col, 266 cell)	266	21.3
Dinobryon cylindricum (7 cols, 32 cells)	32	2.6
BACILLARIOPHYCEAE		
Asterionella formosa (2 col, 12 cells)	12	1.0
Synedra radians	1	0.1
CHLOROPHYCEAE		
Botryococcus braunii (cols)	2	0.2
Quadrigula chodati (cols)	1	0.1
CYANOPHYCEAE		
Anabaena flos-aquae (fil)	8	0.6
Coelosphaerium kuetzingiana (cols)	1	0.1
Rhabdoderma sp. (cols)	28	2.2
TOTAL	**351**	**28.1**

Quinsam Lake Phytoplankton - 7 September 2017
Lower Quinsam Lake 1 m (RX6706-03, Job B777165)
27 ml sample settled

Total Cells Counted	**1,844**
Total Cells Per mL	**1,700**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	39	702
Ochromonas/Chromulina spp. (4-5 um)	14	252
Ochromonas/Chromulina spp. (6-7 um)	2	36
TOTAL	**55**	**990**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	54	46
Dinobryon sp. (cyst)	3	3
Mallomonas sp.	12	10
Ochromonas spp. (8-10 um)	122	104
BACILLARIOPHYCEAE		
Cyclotella ocellata/stelligera	4	3
Melosira italica (fil) (small)	125	106
CHLOROPHYCEAE		
Gloeocystis sp. (cols)	138	117
Nephrocytium sp. (cells)	24	20
Oocystis sp. (cols)	8	7
Scenedesmus sp. (cols)	34	29
DINOPHYCEAE		
Gymnodinium sp.	1	1
CRYPTOPHYCEAE		
Cryptomonas spp.	39	33
Rhodomonas minuta	130	111
CYANOPHYCEAE		
Chroococcus sp. (cols)	4	3
Dactylococcopsis acicularis (cols)	6	5
Rhabdoderma sp. (cols)	2	2
TOTAL	**706**	**600**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon sociale (2 cols, 4 cells)	4	0.3
BACILLARIOPHYCEAE		
Asterionella formosa (138 cols, 1060 cells)	1060	84.8
Synedra radians	4	0.3
Synedra ulna	1	0.1
Tabellaria fenestrata (1 col, 6 cells)	6	0.5
CHOROPHYCEAE		
Elakatothrix gelatinosa (cols)	1	0.1
Mougeotia sp. (2 fils, 6 cells)	6	0.5
CYANOPHYCEAE		
Anabaena flos-aquae (fils)	1	0.1
TOTAL	**1083**	**86.6**

Stantec Consulting Ltd.
500-4730 Kingsway, Burnaby BC V5H 0C6

November 27, 2017
File: 123210406

Attention: Morgan Melnychuk
Maxxam Analytics Laboratory
4606 Canada Way
Burnaby, BC V5G 1K5

Dear Morgan,

Reference: Quinsam Lakes Phytoplankton, October 2017
(Sample Reference SG8643-06, SG8602-06, SG8629-06, SH0553-06)
(Job Numbers B792856, B792847, B792854, B793094)

INTRODUCTION

Quinsam Coal Ltd. collects water samples from the Quinsam Lakes system during the growing season. Permit requirements were amended for 2014 to include surface water sampling (1.0 m depth) three times a year (spring, late summer, fall overturn). Four lakes are now sampled: Long, Middle Quinsam, No Name, and Lower Quinsam lakes. From 1994 through 2012, the requirement was for sampling at 1, 4 and 9 m in April through September for Long Lake and Middle Quinsam Lake, with No Name Lake added to the program in June 2012 and Lower Quinsam Lake added in 2013. The 2013 program was similar to that for 2014 and subsequent years, but with collection of samples at 0.5 m as well as 1 m depth. This long-term record is included in Appendix A.

Samples are submitted to Stantec Consulting Ltd. for phytoplankton taxonomic analysis, as part of ongoing monitoring requirements of the Ministry of Environment. Some months, an additional sample is taken as a field replicate for quality assurance/quality control (QA/QC). This brief report provides information about samples collected in October 2017.

METHODS

Sub-samples (27 mL) of preserved lake water were settled and examined at 100 X, 400 X and 1,000 X magnifications using a Zeiss inverted microscope. Counting effort is defined as at least 100 organisms of the predominant species at 400 X, up to 200 fields at 1,000 X and a half or whole sub-sample at 100 X.

Reference: Quinsam Lakes Phytoplankton, October 2017
(Sample Reference SG8643-06, SG8602-06, SG8629-06, SH0553-06)
(Job Numbers B792856, B792847, B792854, B793094)

RESULTS

Abundance

Abundance data for 1993 to 2016 are summarized in Appendix A and detailed taxonomic results for October 2017 are presented in Appendix B.

Total abundance in the October 2017 samples is shown in Table 1. Total abundance was 2,000 cells/mL for Long Lake, 860 cells/mL for Middle Quinsam Lake, 1,600 cells/mL for No Name Lake, 1,800 cells/mL for No Name Lake replicate, and 1,300 cells/mL for Lower Quinsam Lake.

Table 1 Phytoplankton Abundance (cells/mL) in Quinsam Lake System, September 2017

Lake	Month	Abundance (cells/mL) at 1 m depth			
		Total	< 5 µm (1,000 X)	5 to 25 µm (400 X)	> 25 µm (100 X)
Long	May	2,700	2,400	340	16.2
Middle Quinsam		1,900	1,500	370	15.4
No Name		1,300	1,000	320	7.9
Lower Quinsam		1,700	1,300	390	1.2
Long	Sept.	1,100	940	200	1.5
Middle Quinsam		980	760	220	0.9
No Name		1,400	860	480	29.8
No Name Replicate		1,500	1,000	450	28.1
Lower Quinsam		1,700	990	600	86.6
Long	Oct.	2,000	1,800	190	0.4
Middle Quinsam		860	770	80	7.5
No Name		1,600	1,370	260	1.0
No Name Replicate		1,800	1,400	390	4.2
Lower Quinsam		1,300	770	530	14.8

Reference: Quinsam Lakes Phytoplankton, October 2017
(Sample Reference SG8643-06, SG8602-06, SG8629-06, SH0553-06)
(Job Numbers B792856, B792847, B792854, B793094)

Species Composition

Species composition data for October 2017 are contained in Appendix B. The most abundant phytoplankton in all four lakes were the very small (≤ 5 µm) chrysoflagellates (*Ochromonas* spp. and *Chromulina* spp.). Although these ultra-nanoplankton species were very abundant numerically, they usually contribute little to algal biomass.

The most abundant of the larger algae were as follows:

- In Long Lake, larger *Ochromonas* spp. were predominant and the cryptophyte *Rhodomonas minuta*, diatom *Cyclotella* sp. and green alga *Nephrocytium* sp. were common.
- In Middle Quinsam Lake, larger *Ochromonas* spp. were predominant and the cryptophytes *Rhodomonas minuta* and *Cryptomonas* spp. and diatom *Asterionella formosa* were common.
- In No Name Lake and its replicate, larger *Ochromonas* spp. and the diatom *Melosira italica* were predominant and *Rhodomonas minuta* was common.
- In Lower Quinsam Lake, *Melosira italica* was predominant, and larger *Ochromonas* spp., *Rhodomonas minuta* and *Asterionella formosa* were common.

Comparison of Replicate Samples

Two replicates were collected from 1 m depth in No Name Lake. Percent difference in the duplicate samples was calculated. A difference of up to 10% can be expected for a total cell count of 400 organisms, for repeat sampling from the same bottle; higher percent difference can be expected when separate grabs are used for the replicates, as was done here.

For No Name Lake, species composition and abundance in the two samples were similar. Total abundance was 1,600 cells/mL in one sample and 1,800 cells/mL in the other; this difference of ± 11% indicates reasonable inter-sample reproducibility.

Reference: Quinsam Lakes Phytoplankton, October 2017
(Sample Reference SG8643-06, SG8602-06, SG8629-06, SH0553-06)
(Job Numbers B792856, B792847, B792854, B793094)

CLOSURE

We trust this information meets your present requirements. Should you have any questions or require additional information, please contact the undersigned.

Respectfully,

STANTEC CONSULTING LTD.

Barrie Tuite, M.Sc., R.P. Bio.
Aquatic Scientist
Phone: (604) 328-5312
Fax: (604) 436-3752
Barrie. Tuite@stantec.com

Karen Munro, M.Sc. R.P. Bio.
Principal
Phone: (604) 678-3085
Fax: (604) 436-3752
Karen.Munro@stantec.com

Appendix A Historical Abundance Data: Quinsam Lakes System, 1993–2016
Appendix B Species Composition Data: October 2017

tt v:\1231\active\em\123110406\report\2017 quinsam\oct\let_quinsam_lakes_phytoplankton_20171127.docx

APPENDIX B
SPECIES COMPOSITION DATA: OCTOBER 2017

Quinsam Lake Phytoplankton - 19 October 2017
Long Lake 1 m (SG8643-06, Job B792856
27 ml sample settled

Total Cells Counted	**324**
Total Cells Per mL	**2,000**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	22	396
Ochromonas/Chromulina spp. (4-5 um)	59	1062
Ochromonas/Chromulina spp. (6-7 um)	8	144
Chrysochromulina parva	6	108
Pseudokephyrion sp.	3	54
TOTAL	**98**	**1,764**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Diceras chodatii	1	1
Ochromonas spp. (8-10 um)	109	93
BACILLARIOPHYCEAE		0
Cyclotella cf. ocellata/stelliger	25	21
Melosira italica (filaments)	3	3
CHLOROPHYCEAE		
Crucigenia sp. (cols)	6	5
Gloeocystis sp. (cells + cols)	2	2
Nephrocytium sp. (cells)	26	22
Oocystis sp. (cells+cols)	1	1
Scenedesmus sp. (cols)	1	1
Tetraedron sp.	12	10
DINOPHYCEAE		
Peridinium sp.	1	1
CRYPTOPHYCEAE		
Cryptomonas spp.	10	9
Rhodomonas minuta	27	23
CYANOPHYCEAEA		
Dactylococcopsis acicularis (cells + cols)	2	2
TOTAL	**226**	**192**
100X magnification - whole sample		
BACILLARIOPHYCEAE		
Synedra radians	2	0.1
Synedra ulna	2	0.1
CHLOROPHYCEAE		
Botryococcus braunii (colonies)	2	0.1
Elakatothrix gelatinosa (cols)	4	0.16
TOTAL	**10**	**0.4**

Quinsam Lake Phytoplankton - 19 October 2017
Middle Quinsam Lake 1 m (SG8602-06, Job B792847)
27 ml sample settled

Total Cells Counted **419**
Total Cells Per mL **860**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	24	432
Ochromonas/Chromulina spp. (4-5 um)	16	288
Ochromonas/Chromulina spp. (6-7 um)	2	36
Pseduokephyrion sp.	1	18
TOTAL	**43**	**774**
400X magnification - 4 strips		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	3	1
Dinobryon sp. (cysts)	1	0.4
Mallomonas spp.	6	3
Ochromonas spp. (8-10 um)	103	44
BACILLARIOPHYCEAE		
Cyclotella glomerata (cells + cols)	1	0.4
Cyclotella cf. ocellata/stelliger	1	0.4
CHLOROPHYCEAE		
Gloeocystis sp. (cells+cols)	4	2
DINOPHYCEAE		
Gymnodinium sp.	4	2
Peridinium sp.	1	0.4
CRYPTOPHYCEAE		
Cryptomonas spp.	27	11
Rhodomonas minuta	36	15
CYANOPHYCEAE		
Dactylococcopsis aciciularis (cols)	1	0.4
TOTAL	**188**	**80**
100X magnification - whole sample		
CHRYSOPHYCEAE		
Chrysostephanosphaerella (2 col, 32 cells)	32	1.3
Dinobryon cylindricum (1 cols, 4 cells)	4	0.2
BACILLARIOPHYCEAE		
Asterionella formosa (18 cols, 147 cells)	147	5.9
Synedra radians	2	0.1
Synedra acus	1	0.04
CHLOROPHYCEAE		
Botryococcus braunii (cols)	2	0.1
TOTAL	**188**	**7.5**

Quinsam Lake Phytoplankton - 19 October 2017
No Name Lake 1 m (SG8629-06, Job B792854)
27 ml sample settled

Total Cells Counted	**399**
Total Cells Per mL	**1,600**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	44	792
Ochromonas/Chromulina spp. (4-5 um)	24	432
Ochromonas/Chromulina spp. (6-7 um)	8	144
TOTAL	**76**	**1,368**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Diceras chodatii	2	2
Mallomonas spp.	3	3
Ochromonas spp. (8-10 um)	95	81
BACILLARIOPHYCEAE		
Melosira italica (cells + fils)	87	74
CHLOROPHYCEAE		
Crucigenia sp.	2	2
Dictyosphaerium sp. (cols)	1	1
Gloeocystis sp. (cells + cols)	4	3
Oocystis sp. (cols + cells)	6	5
Nephrocytium sp. (cells)	20	17
Scenedesmus sp. (cols)	1	1
CRYPTOPHYCEAE		
Cryptomonas spp.	20	17
Rhodomonas minuta	47	40
CYANOPHYCEAE		
Chroococcus cf. prescottii (cols)	9	8
Dactylococcopsis acicularis (cols)	7	6
Merismopedia sp.	6	5
TOTAL	**310**	**264**
100X magnification - half sample		
CHLOROPHYCEAE		
Botryococcus braunii (cols)	3	0.2
Quadrigula sp. (cols)	2	0.2
CYANOPHYCEAE		
Anabaena flos-aquae (fil)	5	0.4
Coelosphaerium kuetzingiana (cols)	1	0.1
Rhabdoderma sp. (cols)	2	0.2
TOTAL	**13**	**1.0**

Quinsam Lake Phytoplankton - 19 October 2017
No Name Lake 1 m Rep (SG8629-06, Job B792854)
27 ml sample settled

Total Cells Counted	**584**
Total Cells Per mL	**1,800**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	42	756
Ochromonas/Chromulina spp. (4-5 um)	29	522
Ochromonas/Chromulina spp. (6-7 um)	5	90
Chrysochromulina parva	2	36
TOTAL	**78**	**1,404**
400X magnification - 2 strips		
CHRYSOPHYCEAE		
Dinobryon sp. (cells)	2	2
Mallomonas sp.	6	5
Ochromonas spp. (8-10 um)	119	101
Ochromonas spp. (12-16 um)	7	6
unidentified chrysophyte cyst	6	5
BACILLARIOPHYCEAE		
Melosira italica (cells + fils)	96	82
CHLOROPHYCEAE		0
Crucigenia sp.	15	13
Dictyosphaerium sp. (cols)	7	6
Gloeocystis sp. (cells + cols)	4	3
Oocystis sp. (cols + cells)	7	6
Nephrocytium sp. (cells)	27	23
DiNOPHYCEAE		
Gymnodinium sp.	2	2
CRYPTOPHYCEAE		
Cryptomonas spp.	39	33
Rhodomonas minuta	93	79
EUGLENOPHYCEAE		
Trachelmonas sp.	2	2
CYANOPHYCEAE		
Chroococcus cf. prescottii (cols)	4	3
Dactylococcopsis acicularis (cols)	11	9
Aphanothece sp. (cols)		
Merismopedia sp. (cols)	6	5
TOTAL	**453**	**385**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon bavaricum (1 col, 2 cells)	2	0.2
BACILLARIOPHYCEAE		
Asterionella formosa (1 col, 8 cells)	8	0.6
Synedra ulna	1	0.1
Synedra radians	2	0.2
CHLOROPHYCEAE		
Botryococcus braunii (cols)	4	0.3
Quadrigula chodati (cols)	2	0.2
CYANOPHYCEAE		
Anabaena flos-aquae (fil)	6	0.5
Chroococcus cf. prescottii (cols)	20	1.6
Rhabdoderma sp. (cols)	8	0.6
TOTAL	**53**	**4.2**

Quinsam Lake Phytoplankton - 19 October 2017
Lower Quinsam Lake 1 m (SH0553-06, Job B793094)
27 ml sample settled

Total Cells Counted	**547**
Total Cells Per mL	**1,300**

	Number Counted	Cells per mL
1000X magnification - 50 fields		
CHRYSOPHYCEAE		
Ochromonas/Chromulina spp. (2-3 um)	21	378
Ochromonas/Chromulina spp. (4-5 um)	19	342
Ochromonas/Chromulina spp. (6-7 um)	3	54
Pseduokephyrion sp.	2	36
TOTAL	**45**	**774**
400X magnification - 1 strip		
CHRYSOPHYCEAE		
Dinobryon sp. (cyst)	3	5
Mallomonas sp.	3	5
Ochromonas spp. (12-15 um)	5	9
Ochromonas spp. (8-10 um)	75	128
BACILLARIOPHYCEAE		
Melosira italica (fil) (small)	143	243
CHLOROPHYCEAE		
Crucigenia sp. (cols)	3	5
Gloeocystis sp. (cols)	4	7
Nephrocytium sp. (cells)	2	3
Oocystis sp. (cols)	2	3
Scenedesmus sp. (cols)	4	7
DINOPHYCEAE		
Gymnodinium sp.	2	3
EUGLENOPHYCEAE		
Trachelomonas sp.	1	2
CRYPTOPHYCEAE		
Cryptomonas spp.	24	41
Rhodomonas minuta	35	60
CYANOPHYCEAE		
Chroococcus sp. (cols)	1	2
Dactylococcopsis acicularis (cols)	2	3
TOTAL	**309**	**525**
100X magnification - half sample		
CHRYSOPHYCEAE		
Dinobryon cylindricum (4 cols, 8 cells)	8	0.6
Dinobryon sociale (3 cols, 9 cells)	9	0.7
BACILLARIOPHYCEAE		
Asterionella formosa (60 cols, 153 cells)	153	12.2
Diatoma tenue (1 col, 3 cells)	3	0.2
Synedra radians	13	1.0
Synedra ulna	3	0.2
Tabellaria fenestrata (1 col, 1 cell)	1	0.1
CHOROPHYCEAE		
Mougeotia sp. (1 fil, 2 cells)	2	0.2
CYANOPHYCEAE		
Coelosphaerium sp. (cols)	1	0.1
TOTAL	**193**	**15.4**

Quinsam Lakes - taxa and abundance of zooplankton samples 2017

Prepared by FRASER ENVIRONMENTAL SERVICES										
Prepared for Quinsam Coal Corporation										
Highway 28Km 18 Argonaut Rd.										
5800 Argonaut Road										
Campbell River, B.C., V9W 5C5										
taxa and abundance of zooplankton samples										
level of id. : lowest/lowest										
		Summer				**Fall**				
Site Name		NNL	LLM	MQL	LQL	NNL - M	LLM	MQL	LQL1-19-Oct17-M	NNL - R
FES Sample Number		**170180**	**170181**	**170182**	**170179**	**170205**	**170208**	**170207**	**170224**	**170206**
Sampling Date(s)		Sept. 7, 2017	Sept. 7, 2017	Sept. 7, 2017	Sept. 7, 2017	Oct. 19, 2017	Oct. 19, 2017	Oct. 19, 2017	Oct. 19, 2017	Oct. 19, 2017
units = total organisms/sample										
	stage									
Sub-class : Copepoda										
Order : Cyclopoida										
Cryptocyclops bicolor	adult						14	12	23	
Diacyclops thomasi	adult	8		6	7	8		3		2
Ectocyclops phaleratus	adult	5	24	20	44		28	17		
Microcyclops varicans	adult						43			
UID	copepodid		31	17	47		39	18	23	
Order : Calanoida										
Family : Diaptomidae										
Hesperodiaptomus kenai	adult					5				2
Skistodiaptomus oregonens	adult	146	97	92	131	16	96	39	73	32
UID	copepodid	13	3	40	150		5	3	13	2
UID Calanoida / Cyclopoida	nauplii	91	186	196	372	8	78	8	3	12
Order : Cladocera										
Bosmina longirostris	adult	31	62	32	22	26	49	18	138	22
Daphnia longiremis	adult								73	
Ceriodaphnia dubia	adult		38							2
Daphnia rosea	adult	107	421	147	628	42	41	47	89	34
Daphnia sp.	juvenile	3	17	12	15	10	15		5	
Daphnia sp.	ephippium								3	
Diaphanosoma brachyurum	adult	13	166	78	135	13		16	21	7
Ephippium	resting		7							
Holopedium gibberum	adult	55	3			308	3			163
Polyphemus pediculus	adult	60	3					3		
Scapholeberis sp.	adult	3								
Phylum : Rotifera										
Asplanchna sp.			28				31			
Conochilus sp.		81		1,010	113	277		18		131
Kellicottia longispina		123	621	81	193	26	427	127	3	24
Keratella cochlearis		3	576	46	99	8	2,404	450	175	
Keratella quadrata			3	3				3		
Polyarthra sp.				43			8	624	26	
UID		18		26	33	8	8			2
Benthic										
Group : Hydracarina										
Order : Diptera										
Chaoborus sp.	larvae	3	7		7					
Group : Hydracarina	larvae	3				1				2
TOTAL		**766**	**2,293**	**1,849**	**1,996**	**755**	**3,289**	**1,406**	**668**	**435**
UID = unidentified due to lack of size and/or missing morphological characters.										

Appendix V

Report Date:October 04, 2017 File:15827

Report Number:067261

QUINSAM COAL CORPORATION

Attn: Kathleen Russell
PO Box 5000
Campbell River BC V9W 8A3

Dear QUINSAM COAL CORPORATION

Re: Non-compliance Advisory Letter, Permit 15827, 5800 Argonaut Main, near Campbell River, BC, Refuse

On September 19, 2017, Ministry of Environment, Environmental Protection Division staff conducted an inspection of your facility, QUINSAM COAL CORPORATION located at 5800 Argonaut Main, near Campbell River, BC with authorization number 15827 under the *Environmental Management Act*. Ministry staff were accompanied on site by Kathleen Russell, Quinsam Coal Corporation.

Failure to comply with the terms and conditions set out in your authorization is an offence under the *Environmental Management Act* (EMA).

A person who fails to comply with a provision of EMA may be found guilty of an offence and could be liable, on summary conviction, to a penalty. For your reference, EMA and all related and pertinent British Columbia Laws can be found at http://www.bclaws.ca/.

It should also be noted that, as an alternative to prosecution of the offence mentioned above, the Ministry may initiate action to impose an administrative penalty against QUINSAM COAL CORPORATION. The *Administrative Penalties Regulation (EMA)* (B.C. Reg. 133/2014) (APR) was brought into force in 2014. The APR describes the prescribed provisions of the *EMA* as well as that of specified regulations under which administrative penalties can be assigned.

This Advisory, the alleged violations and the circumstances to which it refers will form part of the compliance history of QUINSAM COAL CORPORATION, and will be taken into account in the event of future non-compliance.

Please note that this authorization is considered to be out of compliance until such a time as it can be confirmed to meet the authorization requirements.

Inspection Details:

Requirement Description:	**AUTHORISED DISCHARGES** 1.1.1: This subsection applies to the discharge of refuse from a COAL MINING OPERATION. The site reference number for this discharge is E236777. The maximum authorised rate of discharge is 300 m3/a.
Details/Findings:	On September 19, 2017 BC Ministry of Environment and Climate Change Strategy ("Ministry") Environmental Protection Officer Darren Stewart performed a site inspection of Quinsam Coal Corporation ("Quinsam") located on Argonaut Main approximately 20km outside of Campbell River, BC. The purpose of this inspection was to evaluate compliance with Quinsam`s discharge authorizations with the Ministry. Ms. Russell informed Officer Stewart that the rate of discharge is not monitored or recorded therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	n/a

Ministry of Environment Compliance
Environmental Protection Division
Mailing Address:
2080-A
Labieux Rd
Nanaimo BC V9E 6J9
Telephone: 250 751 3100
Facsimile: 250 751 3103
Website: www.gov.bc.ca/env

Requirement Description:	**AUTHORISED DISCHARGES** 1.1.2: The components of the refuse which may be discharged are non--recyclable metal, wood waste, and miscellaneous waste including rubber (conveyor belt and hoses), plastic, typical maintenance shop refuse, and residue from the controlled open burning of wood waste, but excluding putrescible and special waste.
Details/Findings:	Mr. Russell confirmed with Officer Stewart that the components of the refuse which are discharged include only those types specified in this section and that putrescible and special waste are not discharged in the landfill. Officer Stewart observed no putrescible and special waste in the landfill during the site visit.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**AUTHORISED DISCHARGES** 1.1.3: The authorised works are a landfill operation as directed and related appurtenances approximately located as shown on attached Site Plan A.
Details/Findings:	Officer Stewart observed the authorised works including a landfill operation as directed and related appurtenances approximately located as shown on attached Site Plan A.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**AUTHORISED DISCHARGES** 1.1.5: The location of the facilities from which the discharge originates is Lot I of District Lots 98, 120, 148 and 149, Comox Land District, Plan VIP 64817.
Details/Findings:	Ms. Russel confirmed with Officer Stewart that the location of the facilities from which the discharge originates remains in the authorized location.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**AUTHORISED DISCHARGES** 1.2.1: This subsection applies to the discharge of air contaminants from the CONTROLLED OPEN BURNING OF WOOD WASTE. The site reference number for this discharge is E242587. The maximum authorised rate at which wood waste may be burned is 60m3/a.
Details/Findings:	Ms. Russell informed Officer Stewart that the rate of wood waste burning is not monitored or recorded therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	n/a
Requirement Description:	**AUTHORISED DISCHARGES** 1.2.2: The components of the wood waste which may be burned are broken pallets, packing crates and failed or reject shoring timbers, but excluding wood waste treated with wood preservatives or wood protection products registered under the Pest Control Products Act (Canada).
Details/Findings:	Officer Stewart observed a variety of wood waste components including broken pallets, packing crates, failed or reject shoring timbers and untreated lumber. No wood waste treated with wood preservatives or wood protection products registered under the Pest Control Products Act (Canada) were observed by Officer Stewart.
Compliance:	In
Actions to be taken:	n/a

Requirement Description:	**AUTHORISED DISCHARGES** 1.2.3: The authorised works are a controlled open burning operation as directed, approximately located as shown on attached Site Plan A.
Details/Findings:	Officer Stewart observed a controlled open burning operation as directed, approximately located as shown on attached Site Plan A.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Landfill Operation** 2.1: The permittee shall compact the refuse and apply suitable cover material once every 20 operating days and at least once per month. The metallic component of the refuse shall be segregated, placed in an area of the landfill separated from the wood waste and covered with suitable material once every 20 days and at least once every month. The Regional Waste Manager may vary the frequency of covering or issue specific operating instructions when circumstances affect normal operation.
Details/Findings:	Officer Stewart observed some metallic objects segregated from the landfill such as larger electrical devices (photo 1), however there was a metallic component of the refuse not segregated and was co-mingled in the main landfill along with some wood waste. Metal rebar was observed interspersed amongst the other refuse in the landfill, including wood waste (photo 3). Ms. Russel informed Officer Stewart that the landfill had last been covered approximately two weeks prior to the inspection. Before that, waste covering was deemed unnecessary due to the mines inactive "care and maintenance" status. No records were available that documented frequency of cover therefore compliance with this component of the requirement was not determined.
Compliance:	Out
Actions to be taken:	Please ensure that the metallic component of the refuse shall be segregated, placed in an area of the landfill separated from the wood waste and covered with suitable material once every 20 days and at least once every month.
Requirement Description:	**Waste Reduction and Alternate Disposal** 2.3: The ministry has developed a policy to reduce, recycle and reuse solid wastes. The permittee is encouraged to segregate for recycling and reuse, where possible, materials destined for disposal at this site.
Details/Findings:	Ms. Russell informed Officer Stewart that several materials are recycled by Quinsam through site policy including steels, metals, plastic buckets and non-industrial wastes such as paper and cans.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Special Waste** 2.4: The discharge of special waste as defined by the Waste Management Act Special Waste Regulation is prohibited.
Details/Findings:	Ms. Russell confirmed with Officer Stewart that no special wastes as defined by the Waste Management Act Special Waste Regulation are discharged. Officer Stewart observed no special wastes in the landfill during the site visit.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Putrescible Waste** 2.5: The discharge of putrescible waste is prohibited.
Details/Findings:	Ms. Russell confirmed with Officer Stewart that no putrescible wastes are discharged. Officer Stewart observed no putrescible wastes in the landfill during the site visit.

Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Operational Requirements For Controlled Open Burning** 2.6 a: Location of Burning Area. The burning operation shall be restricted to a site designated as a burning area by the Regional Waste Manager.
Details/Findings:	Officer Stewart observed a wood waste pile located in the site designated as a burning area which had yet to be burned. Previous burning operations were restricted to the designated site.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Operational Requirements For Controlled Open Burning** 2.6 b: Waste Segregation. Burnable wastes shall be segregated from non-combustible materials and only readily burnable wood waste originating from the mine operations shall be open-burned. No waste shall be burned which is unacceptable to the Regional Waste Manager.
Details/Findings:	Officer Stewart observed non-combustible materials not segregated from burnable wastes as shown by plastic sheets (photo 5) and a variety of metals (wire, rebar, sheet metal: photos 6 and 7) located within the pile of wood waste waiting to be burned.
Compliance:	Out
Actions to be taken:	Please remove all non-combustible materials from the readily burnable wood waste prior to open-burning of the pile. Plastics and metals are unacceptable waste to the Regional Waste Manager (now Director) and shall not be burned.
Requirement Description:	**Operational Requirements For Controlled Open Burning** 2.6 c: Frequency. The maximum burning frequency is 2 times per year. Each burn shall comprise one continuous period necessary to reduce the wood waste to ashes, but shall not exceed two days in duration.
Details/Findings:	Ms. Russell informed Officer Stewart that Quinsam burns 2 times per year or less and the burns do not exceed two days in duration. The waste burning is undertaken by site contractor Ben VanDyke and were described by Ms. Russell as one day burns. However, no records were available that showed dates/duration of burns therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	n/a
Requirement Description:	**Operational Requirements For Controlled Open Burning** 2.6 d: Timing. Burning shall take place only when an attendant is on duty and when conditions promote rapid combustion and dispersion of combustion products. No burning shall take place during periods of fire hazard or when burning is prohibited by other government agencies.
Details/Findings:	Ms. Russell informed Officer Stewart that burning only takes place when Ben Van Dyke (the attendant) is on duty and that definitely no burning takes place during periods of fire hazard or when burning is prohibited.
Compliance:	In
Actions to be taken:	n/a

Requirement Description:	**Operational Requirements For Controlled Open Burning** 2.6 e: Fire Control. Suitable approved devices shall be available for extinguishing fires to prevent them from spreading to surrounding areas. Such devices may include a pressurised water supply, chemical type fire extinguishers, or an earth stockpile. If an earth stockpile is contemplated for fire control, earth moving equipment shall be available at the site during burning. A fireguard shall be cleared and maintained free of combustible materials. Additional authorisations for open burning may be required by other government agencies. In particular, the approval holder shall ensure that the necessary approvals have been obtained from the Ministry of Forests.
Details/Findings:	Ms. Russell confirmed with Officer Stewart that burning attendant Ben Van Dyke brings a pressurized water truck on site when any burning occurs.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**Future Upgrading of Works** 2.7: The Regional Waste Manager may require future upgrading of the pollution control works to protect the environment.
Details/Findings:	Officer Stewart did not locate any records specifying that the Director has required future upgrading of the pollution control works to protect the environment therefore compliance with this requirement is not applicable at this time.
Compliance:	Not Applicable
Actions to be taken:	n/a

Compliance History:
July 06, 2016 = IR31440 and Advisory for non-combustible material in the burn pile.

In a response from Quinsam to the Ministry dated December 12, 2016 regarding the inspection report and Advisory from July 2016, Ms. Russell stated, "The development of record keeping and photos will be implemented to demonstrate frequency of burn periods enabling Permittee to demonstrate compliance". During the inspection conducted September 19, 2017, Ms. Russell confirmed that these actions had not yet been implemented.

Please be advised that this inspection report may be published on the provincial website within 7 days.

Please submit all annual/quarterly/monthly reports and data submissions to the Ministry's Routine Environmental Reporting Submission Mailbox at EnvAuthorizationsReporting@gov.bc.ca. More information about the reporting requirements may be found at http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-mailbox .

Below are attachments related to this inspection.

If you have any questions about this letter, please contact the undersigned.

Yours truly,

Darren Stewart

Environmental Protection Officer

cc:

Attachments:
1) IR67261 Photo Record PR-15827 Quinsam.pdf Photo Record

Deliver via:
Email: [X] **Fax:** [ ] **Mail:** [ ]
Registered Mail: [ ] **Hand Delivery:** [ ]

Ministry of Environment
Compliance
Environmental Protection Division
Mailing Address:
2080-A
Labieux Rd
Nanaimo BC V9E 6J9
Telephone: 250 751 3100
Facsimile: 250 751 3103
Website: www.gov.bc.ca/env

Ministry of Environment

Compliance
Environmental
Protection Division

Mailing Address:
2080-A
Labieux Rd
Nanaimo BC V9E 6J9

Telephone: 250 751 3100
Facsimile: 250 751 3103
Website: www.gov.bc.ca/env

DISCLAIMER:
Please note that sections of the permit, regulation or code of practice referenced in this inspection record are for guidance and are not the official version. Please refer to the original permit, regulation or code of practice.

To see the most up to date version of the regulations and codes of practices please visit
http://www.bclaws.ca

If you require a copy of the original permit, please contact the inspector noted on this inspection record or visit:
http://www2.gov.bc.ca/gov/topic.page?id=DF89089126D042FD96DF5D8C1D8B1E41&title=Publically%20Viewable%20Authorizations

It is also important to note that this inspection record does not necessarily reflect each requirement or condition of the authorization therefore compliance is noted only for the requirements or conditions listed in the inspection record.

Authorization: PR-15827	Client Name: Quinsam Coal Corporation
NRIS IR #: 67261	Site Inspection Photos Date: September 19, 2017

Photo 1 Segregated metals and electrical items at the entry of the landfill.	
Photo 2 Main area of the landfill that has been recently covered.	

Authorization: PR-15827	Client Name: Quinsam Coal Corporation
NRIS IR #: 67261	Site Inspection Photos Date: September 19, 2017

Photo 3 Main landfill including unsegregated metals (rebar).	
Photo 4. Large wood waste pile in the burn area.	

Authorization: PR-15827	Client Name: Quinsam Coal Corporation
NRIS IR #: 67261	Site Inspection Photos Date: September 19, 2017

Photo 5 Plastic sheets within the burn pile.	
Photo 6 Piece of red sheet metal within the burn pile.	

Authorization: PR-15827	Client Name: Quinsam Coal Corporation
NRIS IR #: 67261	Site Inspection Photos Date: September 19, 2017

Photo 7 Metal wire and rebar within the burn pile.	

Report Date:November 15, 2017 File:7008

Report Number:070993

QUINSAM COAL CORPORATION

Attn: Kathleen Russell
PO Box 5000
Campbell River, BC
V9W 5C5

Dear QUINSAM COAL CORPORATION

Re: Warning Letter, Permit, 7008

On September 19, 2017, Ministry of Environment, Environmental Protection Division staff conducted an inspection under *Environmental Management Act (EMA)*, 7008. The inspection determined that QUINSAM COAL CORPORATION is out of compliance with its Permit 7008, and the section(s) listed below. This Warning Letter lists the compliance verification information contained below.

Failure to comply with the requirements set out in your Permit is an offence under the *Environmental Management Act (EMA)*. Section 120(6) of *EMA* states as follows:

> *120(6) A person who, holding a permit or approval issued to the person under this Act to introduce waste into the environment, introduces waste into the environment without having complied with the requirements of the permit or approval commits an offence and is liable on conviction to a fine not exceeding $1 000 000 or imprisonment for not more than 6 months, or both.*

It should also be noted that, as an alternative to prosecution of the offence referenced above, the Ministry may initiate action to impose an administrative penalty against QUINSAM COAL CORPORATION. *The Administrative Penalties Regulation (EMA)* (B.C. Reg. 133/2014) (APR) was brought into force in 2014. The APR describes the prescribed provisions of the EMA as well as that of specified regulations under which administrative penalties can be assigned. Section 12(5) of the APR states as follows:

> *12(5) A person who fails to comply with a requirement of a permit or approval issued or given under the Act is liable to an administrative penalty not exceeding $40 000, unless the requirement the person failed to comply with is also a prescribed provision of the EMA or the regulations that is subject to a different maximum administrative penalty.*

If you fail to take the necessary actions to restore compliance, you may be subject to escalating enforcement action. This Warning Letter and the alleged violations and circumstances to which it refers, will form part of the compliance history of QUINSAM COAL CORPORATION and will be taken into account in the event of future violations.

Finally, I request that QUINSAM COAL CORPORATION immediately implement the necessary changes or modifications to correct the non-compliance(s) with the *Environmental Management Act*. Further, I request that QUINSAM COAL CORPORATION notify this office in writing by email or letter within 30 days of this letter, advising what corrective measures have been taken, and what else is being done, to prevent similar non-compliances in the future.

Inspection Details:

Requirement Description:	**1. AUTHORISED DISCHARGES, 1.1** 1.1.1: This subsection applies to the discharge of effluent from the NORTH COAL MINING OPERATION AND COAL PREPARATION PLANT as shown on attached Site Plan A. The site reference number for this discharge is E207409. 1.1.1 The maximum and average authorised rates of discharge are 0.32 m3/s and 0.08 m3/s respectively. The authorised discharge period is 365 d/a.

Ministry of Environment Compliance
Environmental Protection Division
Mailing Address:
2080-A
Labieux Rd
Nanaimo BC V9E 6J9
Telephone: 250 751 3100
Facsimile: 250 751 3103
Website: www.gov.bc.ca/env

Details/Findings:	BC Ministry of Environment and Climate Change Strategy ("Ministry") Environmental Protection Officer Darren Stewart performed an on-site inspection on September 19, 2017 of the Quinsam Coal Corporation ("Quinsam") coal mine located approximately 25 km southwest of Campbell River, BC. A data review of the 2016-2017 Annual Report (containing data April 1st, 2016 through March 31st, 2017) submitted by Quinsam on August 14, 2017 was also performed by Officer Stewart in addition to the site visit. The reported Annual Average Rate of Discharge was 0.1079 m3/s for the date range April 1, 2016 through March 31, 2017. Permitted flow rates are one of the parameters used for the calculation of permit fees by the Ministry. A reported annual exceedance of 878,959 m3 or 34.8% of the authorized rate means Quinsam is under-paying for its discharge of effluent. It should be noted that this annual flow rate exceedance was also a non-compliance noted in the previous inspection and Warning Letter issued to Quinsam dated February 18, 2016.
Compliance:	Out
Actions to be taken:	Amend this section of the permit to reflect an accurate discharge flow rate.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.1, 1.1.2** 1.1.2: This subsection applies to the discharge of effluent from the NORTH COAL MINING OPERATION AND COAL PREPARATION PLANT as shown on attached Site Plan A. The site reference number for this discharge is E207409. 1.1.2 The characteristics of the discharge shall not exceed: Parameters: Total Suspended Solids (daily composite), Limit: 25, Unit: mg/L; Total Suspended Solids (hourly composite), Limit: 35, Unit: mg/L; pH, Limit: 6.0 - 8.5, Unit: - ; Ammonia (as N) , Limit: 1.0, Unit: mg/L; Phosphorus (as P) (asterisk - see NOTE 1), Limit: 0.03, Unit: mg/L; NOTE 1: Dissolved; Oil and Grease (total), Limit: 5, Unit: mg/L; Aluminum (asterisk - see NOTE 1), Limit: 0.5, Unit: mg/L; NOTE 1: Dissolved; Copper (asterisk - see NOTE 1), Limit: 0.02, Unit: mg/L; NOTE 1: Dissolved; Iron (asterisk - see NOTE 1), Limit: 0.3, Unit: mg/L; NOTE 1: Dissolved; Lead (asterisk - see NOTE 1), Limit: 0.05, Unit: mg/L; NOTE 1: Dissolved; Zinc (asterisk - see NOTE 1), Limit: 0.1, Unit: mg/L; NOTE 1: Dissolved; Rainbow Trout Bioassay (Oncorhynchus mykiss), Limit: (double asterisk - see NOTE 2), Unit: - ; NOTE 2: No mortalities at 100 percent effluent concentration after 96 hours.
Details/Findings:	Total Suspended Solids was reported to have exceeded the permit limit requirements of this section for daily composite (25 mg/L) during 13 sample events on the following dates: October 23, 2016 - 27.3 mg/L November 4th thru November 13th, 2016 - 32.8, 35.0, 29.0, 32.8, 39.0, 36.8, 32.8, 33.5, 32.0, 31.0 mg/L respectively. January 22, 2017 - 51.5 mg/L January 30, 2017 - 58.5 mg/L
Compliance:	Out
Actions to be taken:	Take appropriate actions through utilization of best practices to maintain total suspended solids within the permitted limit specified in this section.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.1** 1.1.3: This subsection applies to the discharge of effluent from the NORTH COAL MINING OPERATION AND COAL PREPARATION PLANT as shown on attached Site Plan A. The site reference number for this discharge is E207409. 1.1.3 The authorised works are surface runoff collection and diversion ditches, plant-site runoff collection box, flocculation facilities, settling pond #4, 2 North pit sump, tailings storage facility, 2 North portal sump, surface and underground pumping facilities and related appurtenances approximately located as shown on attached Site Plan A.
Details/Findings:	Officer Stewart observed the authorized works on location as described in this section of the permit, except for flocculation facilities that were not present.
Compliance:	Out

Actions to be taken:	Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.1** 1.1.4: This subsection applies to the discharge of effluent from the NORTH COAL MINING OPERATION AND COAL PREPARATION PLANT as shown on attached Site Plan A. The site reference number for this discharge is E207409. 1.1.4 The authorised works must be complete and in operation on and from the date of this amended permit.
Details/Findings:	Officer Stewart observed no flocculation facilities present at Quinsam, as specified in the authorized works required under section 1.1.3., thus the authorized works are incomplete Ms. Russell confirmed with Officer Stewart that there are no flocculation facilities present.
Compliance:	Out
Actions to be taken:	As stated in permit section 3.1, in order to meet the levels specified for total suspended solids in Subsection 1.1, it may be necessary to use chemical flocculating agents. Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.2** 1.2.1: This subsection applies to the discharge of effluent from the SOUTH COAL MINING OPERATION as shown on attached Site Plan B. The site reference number for this discharge is E218582. 1.2.1 The maximum and average authorised rates of discharge are 0.46 m3/s and 0.10 m3/s respectively. The authorised discharge period is 365 d/a.
Details/Findings:	The rates of discharge for the South Coal Mining Operation included in the annual report were below the permitted maximum and average rates and reported in the 2016/2017 Annual Report as: annual maximum flow = 0.221 m3/s annual average flow = 0.0290 m3/s
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.2, 1.2.2** 1.2.2: This subsection applies to the discharge of effluent from the SOUTH COAL MINING OPERATION as shown on attached Site Plan B. The site reference number for this discharge is E218582. 1.2.2 The characteristics of the discharge shall not exceed: Parameters: Total Suspended Solids (daily composite), Limit: 25, Unit: mg/L; Total Suspended Solids (hourly composite), Limit: 35, Unit: mg/L ; pH, Limit: 6.0 - 8.5, Unit: - ; Ammonia (as N) , Limit: 1.0, Unit: mg/L; Phosphorus (as P) (asterisk - see NOTE 1), Limit: 0.03, Unit: mg/L; NOTE 1: Dissolved; Oil and Grease (total), Limit: less than DL (3 asterisk - See NOTE 3), Unit: mg/L; NOTE 3: less than Detection Limit; Aluminum (asterisk - see NOTE 1), Limit: 0.5, Unit: mg/L; NOTE 1: Dissolved; Copper (asterisk - see NOTE 1), Limit: 0.02, Unit: mg/L; NOTE 1: Dissolved; Iron (asterisk - see NOTE 1), Limit: 0.5, Unit: mg/L; NOTE 1: Dissolved; Lead (asterisk - see NOTE 1), Limit: 0.05, Unit: mg/L; NOTE 1: Dissolved; Zinc (asterisk - see NOTE 1), Limit: 0.2, Unit: mg/L; NOTE 1: Dissolved; Rainbow Trout Bioassay (Oncorhynchus mykiss), Limit: (double asterisk - see NOTE 2), Unit: - ; NOTE 2: No mortalities at 100 percent effluent concentration after 96 hours.
Details/Findings:	The characteristics of the discharge in this section were exceeded on the following date: Phosphorus (as P): April 4, 2016 - 0.0608 mg/L. The remaining discharge characteristics were reported as compliant for the remainder of the period covered the annual report.
Compliance:	Out
Actions to be taken:	n/a

Requirement Description:	**1. AUTHORISED DISCHARGES, 1.2** 1.2.3: This subsection applies to the discharge of effluent from the SOUTH COAL MINING OPERATION as shown on attached Site Plan B. The site reference number for this discharge is E218582. 1.2.3 The authorised works are surface runoff collection and diversion ditches, flocculation facilities, settling pond, 3 pit sumps (1S, 2S and 3S Pits), an adit sump (4S Adit), pumping facilities , and related appurtenances approximately located as shown on attached Site Plan B.
Details/Findings:	Officer Stewart observed the authorized works on location as described in this section of the permit, except for flocculation facilities that were not present. Ms. Russell also informed Officer Stewart that pit sump 1S has been filled in, reclaimed and no longer exists.
Compliance:	Out
Actions to be taken:	Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary. During the next permit amendment, request updating the works to remove pit sump 1S that no longer exists.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.2** 1.2.4: This subsection applies to the discharge of effluent from the SOUTH COAL MINING OPERATION as shown on attached Site Plan B. The site reference number for this discharge is E218582. 1.2.4 The authorised works must be complete and in operation on and from the date of this amended permit.
Details/Findings:	Officer Stewart observed no flocculation facilities present at Quinsam, as specified in the authorized works required under section 1.2.3., thus the authorized works are incomplete Ms. Russell confirmed with Officer Stewart that there are no flocculation facilities present.
Compliance:	Out
Actions to be taken:	As stated in permit section 3.1, in order to meet the levels specified for total suspended solids in Subsection 1.2, it may be necessary to use chemical flocculating agents. Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.3** 1.3.1: This subsection applies to the discharge of effluent from the BLOCK 242 COAL MINING OPERATION as shown on attached Site Plan C. The site reference number for this discharge is E225796. 1.3.1 Subject to Subsection 4.4.3 the maximum authorised rate of discharge is 0.0082 m3/s. The authorised discharge period is 365 d/a.
Details/Findings:	Ms. Russell informed Officer Stewart that there is no mine activity in this area and that flow rates are not being collected from this area. Officer Stewart observed the area referenced by this section to be fully overgrown and wooded with no discharge occurring related to mine activity.
Compliance:	Not Applicable
Actions to be taken:	If this area is deemed fully reclaimed and to remain inactive, then this section is suggested for removal from the permit during the next permit amendment upon approval from the Authorizations section.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.3** 1.3.3: This subsection applies to the discharge of effluent from the BLOCK 242 COAL MINING OPERATION as shown on attached Site Plan C. The site reference number for this discharge is E225796. 1.3.3 The authorised works are surface runoff collection and diversion ditches, flocculation facilities, two surface settling ponds (primary and secondary), pumping facilities and related appurtenances approximately located as shown on attached Site Plan C.
Details/Findings:	Officer Stewart observed the area surrounding the two surface settling ponds to be fully wooded with most of the above mentioned authorized works removed and the mine portal closed off and filled in. The only visible remnants of mine activity in this area are what used to be the settling ponds, which according to Ms. Russell, occasionally collect some rainwater. Officer Stewart observed precipitation collected in the ponds during the inspection.
Compliance:	Not Applicable

Actions to be taken:	Request an amendment to the permit to remove the subsection applicable to the BLOCK 242 authorized works, as these works are no longer applicable to this inactive section.
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.4** 1.4.1: This subsection applies to the discharge of effluent from the 7 SOUTH MINING OPERATION as shown on attached Site Plan D and E. The site reference number for this discharge is E292069. 1.4.1 The maximum authorized rate of discharge is 0.005 m3/s. The authorized discharge period is 365 d/a.
Details/Findings:	The Annual Report states, "discharge is dependent on assimilative capacity of Stream 1 (7S) and, therefore, dynamic in nature. To facilitate determination of the appropriate discharge level at 7SSD, a flow rating curve was developed for monitoring site 7S (Figure 7) to allow instantaneous flow levels at 7S to be measured by reading the installed staff gauge". All reported flow values were below the maximum authorized rate of discharge is 0.005 m3/s.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.4, 1.4.2** 1.4.2: This subsection applies to the discharge of effluent from the 7 SOUTH MINING OPERATION as shown on attached Site Plan D and E. The site reference number for this discharge is E292069. 1.4.2 The characteristics of the discharge shall not exceed: Parameter: Total Suspended Solids (daily composite), Limit: 25, Unit: mg/L; Total Suspended Solids (hourly composite), Limit: 35, Unit: mg/L; pH, Limit: 6.0 - 8.0, Unit: - ; Sulphate (asterisk - see NOTE 1) , Limit: 500, Unit: mg/L; NOTE 1: Dissolved; Aluminum (asterisk - see NOTE 1), Limit: 0.1, Unit: mg/L; NOTE 1: Dissolved; Cadmium (asterisk - see NOTE 1), Limit: 0.000045, Unit: mg/L; NOTE 1: Dissolved; Copper (asterisk - see NOTE 1), Limit: 0.014, Unit: mg/L; NOTE 1: Dissolved; Iron (asterisk - see NOTE 1), Limit: 0.35, Unit: mg/L; NOTE 1: Dissolved; Selenium (asterisk - see NOTE 1), Limit: 0.016, Unit: mg/L; NOTE 1: Dissolved; Rainbow Trout Bioassay (Oncorhynchus mykiss), Limit: (double asterisk - see NOTE 2), Unit: - ; NOTE 2: No mortalities at 100 percent effluent concentration after 96 hours.
Details/Findings:	The annual report documented 2 sample events where Total Suspended Solids (daily composite) exceeded the permit limit of 25 mg/L: October 7, 2016 = 27.3 mg/L October 16, 2016 = 35.0 mg/L The documented reason for the exceedances was described as a high surface erosion and low pond retention time occurring during extreme storm events.
Compliance:	Out
Actions to be taken:	n/a
Requirement Description:	**1. AUTHORISED DISCHARGES, 1.4** 1.4.3: This subsection applies to the discharge of effluent from the 7 SOUTH MINING OPERATION as shown on attached Site Plan D and E. The site reference number for this discharge is E292069. 1.4.3 The authorized works are surface runoff collection and diversion ditches, flocculation facilities, one surface settling pond, an adit sump (7S Adit), pumping facilities and related appurtenances approximately located as shown on attached Site Plan D.
Details/Findings:	Officer Stewart observed the authorized works on location as described in this section of the permit, except for flocculation facilities that were not present.
Compliance:	Out
Actions to be taken:	Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary.

Requirement Description:	**1. AUTHORISED DISCHARGES, 1.4** 1.4.4: This subsection applies to the discharge of effluent from the 7 SOUTH MINING OPERATION as shown on attached Site Plan D and E. The site reference number for this discharge is E292069. 1.4.4 The authorized works must be complete and in operation when the discharge commences.
Details/Findings:	Officer Stewart observed no flocculation facilities present at Quinsam, as specified in the authorized works required under section 1.4.3., thus the authorized works are incomplete Ms. Russell confirmed with Officer Stewart that there are no flocculation facilities present.
Compliance:	Out
Actions to be taken:	As stated in permit section 3.1, in order to meet the levels specified for total suspended solids in Subsection 1.4, it may be necessary to use chemical flocculating agents. Complete the authorized works as specified in the permit or request a permit amendment to remove said works, providing rationale as to why they are deemed unnecessary.
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.1 North Coal Mining and Coal Preparation Plant Operation (Settling Pond #4), 2.1.4 Wash Plant Effluent** 2.1.4: Wash plant effluent shall not be conveyed to the 2-North pit sump via the wash plant ditch. The Permittee shall keep records of the date, duration and estimated volume of any overflow of the wash plant effluent sump. Subject to review of this data, the Director may request changes to the works.
Details/Findings:	Ms. Russell informed Officer Stewart that washing of coal is not occurring at the facility therefore compliance with this section is not applicable.
Compliance:	Not Applicable
Actions to be taken:	If this is to remain a non-applicable part of the permit related to actual on site activity, then this section should be removed upon the next permit amendment.
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.1 North Coal Mining and Coal Preparation Plant Operation (Settling Pond #4), 2.1.5 Settling Pond Solids and Storage Volume** 2.1.5: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 2 300 m3. The removed solids shall be disposed of in a manner approved by the Director.
Details/Findings:	Ms. Russell informed Officer Stewart that the water depth has not been measured since 2009 and that the solids have never been removed from Settling Pond #4 therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	Measure the water depth below the pond decant to maintain a compliant minimum of 1.0 m. Removed settled solids as necessary as described in this section and dispose materials as approved by the Director.
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.1 North Coal Mining and Coal Preparation Plant Operation (Settling Pond #4), 2.1.6 Discharge Routing** 2.1.6: The discharge from the settling pond shall be conveyed to Middle Quinsam Lake in a manner acceptable to the Director.
Details/Findings:	Mr. Russell confirmed with Officer Stewart that the discharge from the settling pond is conveyed to Middle Quinsam Lake via the wetland area.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.2 South Coal Mining Operation (Settling Pond #1), 2.2.3 Settling Pond Solids and Storage Volume** 2.2.3: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 1400 m3. The removed solids shall be disposed of in a manner approved by the Director.

Details/Findings:	Ms. Russell informed Officer Stewart that the water depth has not been measured and that the current water storage volume of the pond is unknown therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	Measure the water depth below the pond decant to maintain a compliant minimum of 1.0 m. Removed settled solids as necessary as described in this section and dispose materials as approved by the Director.
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.3 Block 242 Coal Mining Operation, 2.3.1 Pumping Rate** 2.3.1: Subject to Subsection 4.4.3 the rate at which effluent may be pumped from the underground sump(s) to the primary settling pond and from the primary settling pond to the secondary settling pond shall not exceed 0.043 m3/s (up to a maximum of 400 m3/d) and 0.0082 m3/s respectively.
Details/Findings:	Officer Stewart observed a reclaimed/overgrown area that was described as the previous Block 242 coal mining operation, which ceased production many years prior. Ms. Russell informed Officer Stewart that there are no underground sump(s) and no pumping of effluent to the ponds. The remnants of the overgrown settling ponds now only collect precipitation therefore compliance with this requirement is not applicable.
Compliance:	Not Applicable
Actions to be taken:	Amend the permit to remove compliance points and authorized works referencing Block 242.
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.4 7 South Mining Operation Settling Pond, 2.4.2 Pumping Rate** 2.4.2: The Permittee shall keep records of the date, duration and estimated volume when water from the 7 South Adit Sump (7S-Sump) is pumped to the settling pond and submit the records to the Regional Waste Manager upon request.
Details/Findings:	Ms. Russell informed Officer Stewart that the pumping of water from the 7 South Adit Sump (7S-Sump) to the settling pond has never happened, therefore compliance with the requirement of keeping records for this activity is currently not applicable.
Compliance:	Not Applicable
Actions to be taken:	n/a
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.4 7 South Mining Operation Settling Pond, 2.4.4 Settling Pond Solids and Storage Volume** 2.4.4: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 340 m3. The removed solids shall be disposed of in a manner approved by the Director.
Details/Findings:	Officer Stewart observed low water levels in the settling pond during the inspection due to almost drought conditions throughout the summer. The pond was not discharging at the time of inspection and Officer Stewart was unable to determine the actual volume of water storage maintained in the settling pond, therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	n/a
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.4 7 South Mining Operation Settling Pond, 2.4.6 Settling Pond Discharge Dilution Rate** 2.4.6: The 7-South settling pond must not discharge unless a minimum flow is measured in Stream 1 (7S monitoring site). The minimum Stream 1 to discharge ratio shall be documented to the satisfaction of the Director in the Environmental Procedures Manual required in Section 3.2.

Details/Findings:	As stated in the Quinsam Annual Report, to facilitate determination of the appropriate discharge level at 7SSD, a flow rating curve was developed for monitoring site 7S to allow instantaneous flow levels at 7S to be measured by reading the installed staff gauge. The flow rating curve was included in the Annual Report on page 37 including the explanation thati nitially, an 8:1 dilution ratio was identified to maintain desirable water quality in the receiving environment, monitored at downstream site Stream 1 (7S). However, throughout the 7-South operational period, a lower dilution ratio has been shown to allow WQG's to be met in the receiving environment (site 7S). On page 39 of the Annual Report, a discharge summary stated that discharge occurred for 12 days over the year, totaling 731.274 m3. Maximum discharge rates did not exceed the maximum permitted discharge (5 L/s) and a dilution ratio of >8:1 was maintained at all times.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**2. SPECIFIC REQUIREMENTS, 2.4 7 South Mining Operation Settling Pond, 2.4.7 Settling Pond Discharge Effluent Quality Model Validation** 2.4.7: The Permittee shall report on the settling pond performance in the annual report. The purpose of the report is to validate the effluent water quality prediction model using actual flow and water quality data. The Director may amend the permit, if required, or request an amendment of the permit for environmental protection based on the report findings.
Details/Findings:	The Annual Report included information regarding the 7-South Settling Pond (7SSD) and was contained in section 7.3.1. of the report.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.1 Flocculation** 3.1: In order to meet the levels specified for total suspended solids in Subsections 1.1, 1.2, 1.3 and 1.4, it may be necessary to use chemical flocculating agents. The Permittee is required to carry out laboratory testing of the flocculants proposed for toxicity and effectiveness for removing suspended matter. The methodology and details of the testing program are subject to the approval of the Director. Based on the results of laboratory testing the Director may approve a flocculant for use under actual operating conditions. At least one alternate flocculant shall be tested and, if approved by the Director, an adequate supply shall be located within 6 hours travel time from the mine site.
Details/Findings:	Ms. Russell informed Officer Stewart that Quinsam does not currently use any chemical flocculating agents and Officer Stewart did not observe any flocculation facilities on site during the inspection. Officer Stewart was unable to ascertain if the Permittee carried out the required laboratory testing of the flocculants proposed or if a flocculant had been approved by the Director, therefore compliance with this requirement was not determined.
Compliance:	Not Determined
Actions to be taken:	

Requirement Description:	**3. GENERAL REQUIREMENTS, 3.2 Environmental Procedures Manual** 3.2: An Environmental Procedures Manual shall be maintained by the Permittee as a working document for use by supervisory personnel and a guide to field staff during various stages of the project. The manual should cover all aspects of onsite environmental management applicable to mine construction and operation including but not limited to, the following items: 1) Land clearing, topsoil stripping and road construction; 2) Construction of water diversion and water collection ditches; 3) Flocculation; 4) Macrophyte growth and harvesting in the ponds, drainage ditches and discharge channels; 5) Acid-base accounting and materials handling; 6) Reclamation activities; 7) Construction of waste dumps; 8) Contingency planning for effluent liming, lake aeration and forest fertilization. 9) Settling pond operation under various flow/discharge conditions for the Block 242 coal mining operation as detailed in the Block 242 Mine Water Management Quinsam Coal Mine, AGRA Earth and Environmental Limited, February 1997; 10) Underground pump operation during extreme rainfall events; 11) Settling pond operation for the 7-South mining operation, including details on the contingency measures. The Permittee shall review the Environmental Procedures Manual at least on an annual basis to determine if any changes are required and submit any revisions to the Director for approval. Annual reviews and submission of revisions are due on March 31 of each year.
Details/Findings:	The most recent submission of the Environmental Procedures Manual was sent to the Ministry on March 29, 2017 and included the applicable sections and information.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.6 Chemical Storage Contaminant Works** 3.6: Approved containment works shall be placed around the chemical storage areas to prevent spills to the environment. This includes, but is not necessarily limited to, storage areas for petroleum products and flocculating agents.
Details/Findings:	Officer Stewart addressed storage areas for petroleum products in a separate Inspection Report #068487 where the site was evaluated for compliance with the Hazardous Waste Regulation (HWR). The facility produces and stores waste oil in a manner deemed compliant with the HWR.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.7 Spill Reporting** 3.7: All spills to the environment (as defined in the Spill Reporting Regulation) shall be reported immediately in accordance with the Spill Reporting Regulation. Notification shall be via the Provincial Emergency Program at 1-800-663-3456.
Details/Findings:	Officer Stewart observed records on file with the Ministry where spills to the environment (as defined in the Spill Reporting Regulation) were reported immediately in accordance with the Spill Reporting Regulation.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.9 Maintenance of Works, Non-Compliances and Emergency Procedures** 3.9.1: The Permittee shall inspect the authorized works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents continuing effective operation of the authorized works, the Permittee shall take appropriate remedial action and immediately notify the Regional Waste Manager or a designated Officer.
Details/Findings:	Ms. Russell confirmed with Officer Stewart that the authorized works are inspected regularly and Officer Stewart observed the inspection sheets and field books used to document inspection records and maintenance activities.

Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.9 Maintenance of Works, Non-Compliances and Emergency Procedures, 3.9.2** 3.9.2: In the event of commissioning of the works, operational system modifications, equipment failure, operator error, spill, permit non-compliances or any other condition which may affect the quantity or quality of the discharge such that permit limits may be exceeded, the Permittee shall: take appropriate action to prevent or mitigate pollution, immediately notify the Provincial Emergency Program (PEP) 1-800-663-3456, as soon as possible, conduct sampling and analysis of discharges which may cause non-compliance with the characteristics of the discharge as specified in Section 1 of this permit and provide the results to the Regional Waste Manager or a designated Officer, as soon as practicable (but not later than 30-days after the Permittee became aware of the event), investigate the event and provide a report including results of sampling and analysis, permit non-compliance, corrections to the operational system, root cause of the event and decisions for corrective and preventive action.
Details/Findings:	Ms. Russell informed Officer Stewart of the facility response procedures in the event of equipment failure, operator error, spill, permit non-compliances or any other condition which may affect the quantity or quality of the discharge such that permit limits may be exceeded. Initial response/actions taken, monitoring conducted, mitigation measures taken, and sample results are provided in reports provided to the Ministry via the Environmental Compliance inbox within 30-days of the permittee becoming aware of the event, which were observed by Officer Stewart during the file review portion of this inspection. The Annual Report stated on page 24 that there were 15 reportable total suspended solid (TSS) exceedances and 1 dissolved phosphorous exceedance related to mine discharge during the 2016-2017 reporting period.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**3. GENERAL REQUIREMENTS, 3.10 Bypasses** 3.10: The Permittee shall ensure that no effluent is discharged without being processed through the authorised works unless prior written approval is received from the Director.
Details/Findings:	Officer Stewart confirmed that Quinsam has written approval received from the Director to bypass the authorized works defined in subsection 1.2.3 and specifically to continue discharging from the Long Lake Seep Treatment System (LLST) effluent into the outflow channel from Settling Pond 1 at a point approximately 35 m downstream of the authorized discharge point for Settling Pond 1. The bypass was most recently re-authorized in a letter from the Ministry dated August 25, 2017 which expires August 26, 2018. However, due to specific dated requirements in the bypass authorization regarding 3(b) Final Report on the Demonstration Module due by November 30, 2017 and 4. Expectation for Permit Amendment Application due December 31, 2017, full compliance with this bypass authorization was not determined.
Compliance:	Not Determined
Actions to be taken:	In addition to specific monitoring and reporting requirements, Quinsam must submit a final report on the demonstration module of the LLST, prepared by a Qualified Professional, to the Director by November 30, 2017 and expected to submit a preliminary application to add LLST and the Long Lake Seep discharge to permit PE-7008 by December 31, 2017.
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.2 Receiving Environment Monitoring Sites and Monitoring Requirements, 4.2.7 Sediment and Benthic Monitoring** 4.2.7: See Attached Document for Section 4.2.7

Details/Findings:	As stated in the Annual Report, Quinsam conducted the sediment and benthic monitoring in August through October 2016 to meet condition 4.2.7 (iii) of Permit PE-7008. Officer Stewart observed the program description located in Appendix VI starting on page 730 including details provided in Appendix 1, Table 1 (of that report) listing the sampling sites in the five lakes, one wetland, and one river system for a total of 23 sites.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.1 Composite Sampling** 4.3.1: The Permittee shall install suitable sampling facilities and obtain 24 hour composite samples of effluent for total suspended solids. Each daily composite sample shall consist of 8 samples taken at three hour intervals. Sampling shall be performed at frequencies specified in Subsections 4.1.1, 4.1.2., 4.1.3 and 4.1.4. The Permittee may also be required to collect hourly composite samples in order to verify compliance with the total suspended solids criteria of 35 mg/l specified in Subsections 1.1.2, 1.2.2, 1.3.2 and 1.4.2. Each hourly composite sample shall consist of 4 samples taken at 15 minute intervals. Proper care should be taken in sampling, storing, and transporting the samples to adequately control temperature and avoid contamination or breakage. The Permittee shall collect a grab sample instead of a composite sample when weather conditions result in freezing conditions, rendering collection of composite samples not feasible.
Details/Findings:	As detailed in the Annual Report, composite samples were not obtained on the following dates: Subsection 1.1.2: April 2 and 3, 2016 due to an equipment malfunction of the composite sampler. February 21 and 22, 2017 due to sampler error. Subsection 1.2.2: November 9, 2016 due to sample being spilled in transit to the laboratory. February 22, 2017 due to sampler error sample was not collected. Subsection 1.4.2: October 14 and 15, 2016 due to equipment malfunction. January 17, 2017 due to a cracked pipe from freezing conditions.
Compliance:	Out
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.2 Continuous Flow Recording** 4.3.2: The Permittee shall provide and maintain suitable flow measuring devices and maintain a continuous record of the rate at which the effluent is discharged from the settling ponds authorised in Subsections 1.1.3, 1.2.3, 1.4.3 and from the secondary settling pond authorised in Subsection 1.3.3.
Details/Findings:	As detailed in the 2016-2017 Annual Report, continuous flow records were missing for 1.1.3 (North Coal Mining Operations) for 29 days due to flow meter malfunctioning which re-set and erased the continuous flow data for the dates May 30th - June 6th and October 31st through November 20th, 2016. It should also be noted that there is no flow measuring device nor records kept for effluent rates of discharge from the secondary settling pond authorised in Subsection 1.3.3. due to the cessation of mine effluent discharge and removal of works at Block 242.
Compliance:	Out
Actions to be taken:	Mr. Russell informed Officer Stewart that a new ISCO signature flow meter with an ultra-sonic level sensor had already been purchased and installed in November 2016.

Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.3 Iron River Flow Monitoring** 4.3.3: The Permittee shall conduct a study to establish a flow calibration curve on the Iron River at a point selected by Environment Canada. The flow calibration curve shall be completed prior to the re-commencement of mining. Based on the results of this study and/or other information obtained in connection with this discharge the Director may increase the flow monitoring frequency in Iron River specified in Subsection 4.3.2 and/or limit the rate of discharge from the Block 242 mining operation during periods of low flow in Iron River.
Details/Findings:	Ms. Russell confirmed with Officer Stewart that the study and flow calibration curve referenced in this section of the permit was completed in 2012 and conducted by consultant Lorax Environmental Services.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.4 pH and Conductivity Monitoring** 4.3.4: All pH and conductivity probes used for field measurements shall be maintained according to manufacturer's requirements. Maintenance and calibration logs and instrument manuals shall be kept up to date and made available upon inspection. Any instance where pH results are deemed unreliable due to low conductance will be noted along with the corresponding conductance, and these results shall be included in quarterly and annual reports described in section 4.5.
Details/Findings:	Officer Stewart observed up to date calibration logs and instrument manuals for all pH and conductivity probes used for field measurements that were made available during the inspection
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.8 Precipitation Monitoring** 4.3.8: The Permittee shall maintain a suitable rain gauge at a location approved by the Director and measure and record the daily accumulated precipitation.
Details/Findings:	Quinsam maintains two suitable rain gauges, one located at the main office and the other at the 2 South Mine location. Ms. Russell informed Officer Stewart that the precipitation measurements are recorded from the 2 South Mine gauge due to its increased accuracy and reliability.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.3 Additional Monitoring Requirements, 4.3.9 Block 242 Monitoring** 4.3.9: Monitoring relating to the Block 242 Mining Operation required by Subsections 4.1.3 and 4.2.3 shall commence at the start of mine-influenced discharge from the Block 242 secondary settling pond.
Details/Findings:	There is currently no mine-influenced discharge from the Block 242 secondary settling pond therefore monitoring required by Subsections 4.1.3 and 4.2.3 is currently not applicable.
Compliance:	Not Applicable
Actions to be taken:	Should mine-influenced discharge from the Block 242 secondary settling pond ever start, monitoring detailed in Subsections 4.1.3 and 4.2.3 shall commence as required.

Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.5 Reporting** 4.5.1 (i): The Permittee shall submit the results of the monitoring program to the Director on a quarterly basis within thirty days following the previous quarter of monitoring. Based on these results, the monitoring program may be increased or decreased at the discretion of the Director. The format and content of the quarterly report is subject to the approval the Director. An annual review and interpretative report shall be prepared and submitted by the Permittee by June 30 of each year. The report will include, but is not necessarily limited to, the following items: 1) A summary of monitoring results for the previous twelve months. 2) Spills or other unusual events. 3) Changes in the environment resulting from mining activity. 4) Summary of completed, in progress activities or studies relevant to the permitted discharges, associated authorized works and the receiving environment relevant to the reporting period. 5) Projected activities for the coming year which may have an impact on the environment. The format and content of the annual report is subject to the approval of the Environmental Technical Review Committee and the Director. 4.5.1 Through the duration of mining in 7-South Area 5, quarterly and annual reports shall include a summary of: i. Quality and quantity of water pumped from the 7-South Area 5 development with potential to reach Settling Pond 4.
Details/Findings:	Officer Stewart observed the results of the monitoring program submitted to the Director on a quarterly basis within thirty days following the previous quarter of monitoring as required. Quarterly reports are titled using the proper naming conventions, include the required information and are submitted to the ENV Authorizations Reporting email inbox. The most recent 2016-2017 annual review and interpretative report was prepared and submitted by the Permittee on August 14, 2017, however an extension to the due date of June 30 was requested by Quinsam and approved by the Ministry. The Annual Report included all the required information listed in this section.
Compliance:	In
Actions to be taken:	n/a
Requirement Description:	**4. MONITORING AND REPORTING REQUIREMENTS, 4.5 Reporting** 4.5.1 (i): The Permittee shall submit the results of the monitoring program to the Director on a quarterly basis within thirty days following the previous quarter of monitoring. Based on these results, the monitoring program may be increased or decreased at the discretion of the Director. The format and content of the quarterly report is subject to the approval the Director. An annual review and interpretative report shall be prepared and submitted by the Permittee by June 30 of each year. The report will include, but is not necessarily limited to, the following items: 1) A summary of monitoring results for the previous twelve months. 2) Spills or other unusual events. 3) Changes in the environment resulting from mining activity. 4) Summary of completed, in progress activities or studies relevant to the permitted discharges, associated authorized works and the receiving environment relevant to the reporting period. 5) Projected activities for the coming year which may have an impact on the environment. The format and content of the annual report is subject to the approval of the Environmental Technical Review Committee and the Director. 4.5.1 Through the duration of mining in 7-South Area 5, quarterly and annual reports shall include a summary of: i. Quality and quantity of water pumped from the 7-South Area 5 development with potential to reach Settling Pond 4.
Details/Findings:	Ms. Russell informed Officer Stewart that mining in 7-South Area 5 has yet to start, therefore compliance with this requirement at the time of this report was not applicable.
Compliance:	Not Applicable
Actions to be taken:	Ms. Russell also confirmed with Officer Stewart that Quinsam has intent to start mining eventually in 7-South Area 5, at which time all requirements listed in permit parts 4.5.1.i. thru 4.5.1.iv. shall become applicable.

Compliance History:
February 18, 2016: IR20991 and Warning Letter for non-compliance with Permit 7008, namely sections 1.1.1, 1.1.2, 1.2.2, 1.4.2, 4.1 and additional permit requirements in the July 21, 2014 and August 26, 2014 Director's letters.

Please be advised that this inspection report may be published on the provincial website within 7 days.

Please submit all annual/quarterly/monthly reports and data submissions to the Ministry's Routine Environmental Reporting Submission Mailbox at EnvAuthorizationsReporting@gov.bc.ca. More information about the reporting requirements may be found at http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-mailbox.

Below are attachments related to this inspection.

If you have any questions about this letter, please contact the undersigned.

Yours truly,

Darren Stewart

Environmental Protection Officer

cc: Andrea Doll, ENV
Liz Archibald, ENV

Attachments:
1) IR 70093 Quinsam Photo Record Template.pdf Photo Record
2) 2015_06 PE-7008 28.pdf Permit Clause 4.2.7

Deliver via:
Email: X **Fax:** ☐ **Mail:** ☐
Registered Mail: X **Hand Delivery:** ☐

Ministry of Environment
Compliance
Environmental Protection Division
Mailing Address:
2080-A
Labieux Rd
Nanaimo BC V9E 6J9
Telephone: 250 751 3100
Facsimile: 250 751 3103
Website: www.gov.bc.ca/env

DISCLAIMER:
Please note that sections of the permit, regulation or code of practice referenced in this inspection record are for guidance and are not the official version. Please refer to the original permit, regulation or code of practice.

To see the most up to date version of the regulations and codes of practices please visit
http://www.bclaws.ca

If you require a copy of the original permit, please contact the inspector noted on this inspection record or visit:
http://www2.gov.bc.ca/gov/topic.page?id=DF89089126D042FD96DF5D8C1D8B1E41&title=Publically%20Viewable%20Authorizations

It is also important to note that this inspection record does not necessarily reflect each requirement or condition of the authorization therefore compliance is noted only for the requirements or conditions listed in the inspection record.

Authorization: 7008	Client Name: Quinsam Coal Corporation
NRIS IR #: 70093	Site Inspection Photos Date: September 19, 2017

Photo 1 Settling Pond #4 (WD)	
Photo 2 Discharge from Settling Pond #4 entering wetlands en route to Middle Quinsam Lake	

Authorization: 7008	Client Name: Quinsam Coal Corporation
NRIS IR #: 70093	Site Inspection Photos Date: September 19, 2017

Photo 3 Settling Pond #1 (SPD) in the South mine area.	
Photo 4. Currently no discharge due to low water levels resulting in a decant pipe above water.	

Authorization: 7008	Client Name: Quinsam Coal Corporation
NRIS IR #: 70093	Site Inspection Photos Date: September 19, 2017

Photo 5 First "settling pond" in the reclaimed Block 242 area. No active influent or effluent. Ponds passively collect precipitation.	
Photo 6 Second "settling pond" in the reclaimed Block 242 area. No active influent or effluent. Ponds passively collect precipitation.	

Authorization: 7008	Client Name: Quinsam Coal Corporation
NRIS IR #: 70093	Site Inspection Photos Date: September 19, 2017

Photo 7 7-South Mining Operation Decant (7SSD) pond currently not discharging due to low inflow.	
Photo 8 Minimum water depth and minimum water storage are not maintained due to lack of inflow.	

Document : IR 70093 Quinsam Photo Record Template.pdf
Document comment: Photo Record

4.2.7 Sediment and Benthic Monitoring Requirements

i) General requirements applicable to all sites defined under section 4.2.4

Parameters
LAKE WATER CHEMISTRY PROFILE
Temp, DO, specific conductivity, pH, ORP
WATER CHEMISTRY
Hardness, turbidity, sulphate (d), metals (t) and (d), polycyclic aromatic hydrocarbons Mid lake sites – grab samples at two depths: near bottom and surface of lake for all sites except for deep sites where an additional sample will be collected at 5 m below surface Stream sites, wetlands and lake inlet/outlets – grab samples just below surface
SEDIMENT CHEMISTRY
moisture, pH, particle size, total organic carbon (TOC), total metals, polycyclic aromatic hydrocarbons
BIOLOGICAL MONITORING
Benthic invertebrates at all stream monitoring sites listed in subsection 4.2.4, as per Canadian Aquatic Biomonitoring Network (CABIN) methodology
Benthic community taxonomy and count for all lake and wetland monitoring sites listed in subsection 4.2.4

ii) The monitoring program described in 4.2.7 may be conducted over two consecutive years, with upper and lower watershed sites sampled in respective years. Under this program, monitoring site WB (EMS # 0900504) shall serve as the lowest site in the upper watershed.

iii) Sediment and benthic monitoring cycles are required every 3 to 5 years. The first assessment will be completed in 2015-2016. Following the first monitoring cycle, the sediment and biological monitoring program will be revised based on the outcomes of previous years' assessments. The permittee will submit the results of the sediment and biological monitoring program along with recommendations for the subsequent monitoring cycle by an appropriately qualified professional. Recommendations will be reviewed and approved and/or modified by the director.

Date issued: December 23, 1987
Date amended: June 23, 2015
(most recent)

Luc Lachance, P.Eng.
for Director, *Environmental Management Act*

Document : 2015_06 PE-7008 28.pdf
Document comment: Permit Clause 4.2.7

Permit 7008 Environmental Technical Review Committee Action Item & Outcome Tracking Table

Items	Meeting Type (Agency, Stakeholder)	ETRC Member or Stakeholder Responsible	Type	Context	Description	Date of Advice	Target Completion Date	Description of Follow -up	Status
1	**Agency**	QCC	Action Item	Agenda Item 3.1 - An update to the terms of reference was completed last year.	Terms of reference will be included in future meeting invites.	November 23, 2017	October 1, 2018		0n-going
2	**Agency**	QCC	Action Item	Agenda Item 3.2 - Report Format Discussion around making the electronic version of the report easier to navigate.	Future Annual Reports will have separated appendixes. PDF version will include bookmarks and thumbnails.	November 23, 2017	June 30, 2018		0n-going
3	**Agency**	QCC	Action Item	Agenda Item 3.2 - Report distribution to agencies	Future hard copies and electronic copies of the Annual Report will be sent to City of Campbell River (CoCR) and EMPR. Electronic versions will be submitted to ENV.	November 23, 2017	June 30, 2018	Annual Report received from CoCR	0n-going
4	**Agency**	QCC	Action Item	Agenda Item 3.2 - Report distribution to library	Once reviewed by CoCR, QCC will deliver the Annual Report hard copy to the Vancouver Island Regional library.	November 23, 2017	Annually	Hard copy delivered 25-Apr-18	Closed
5	**Agency**	QCC	Action item	Agenda Item 3.3 - Public Notice The public notice was posted in the Campbell River Mirror on November 8th, 10th, 15th, & 17th	Tear sheet from newspaper will be sent to ENV.	November 23, 2017	November 27, 2017	Submitted Nov 27/17	Closed
6	**Agency**	QCC	Action Item	Agenda Item 4.1 - Tracking Table Updates Discussion around items that did not get closed from the 2016 tracking table.	Each year, include on-going action items from previous year for follow-up. Tracking table will be updated in Annual report and finalized at that year's ETRC meeting.	November 23, 2017	June 30, 2018		0n-going
7	**Agency**	QCC	Action Item	Agenda Item 4.2 - On-going issues Items carried over from 2016 tracking table	As per recent reclamation activities at 242: - Review historical and current water quality at 242 flooded portal and 242 Sump, present data at 2017 Stakeholder meeting and write up in an e-mail to ENV.	November 23, 2017	January 31, 2018	Data was presented at the Stakeholder meeting. A report was sent to ENV with tracking table.	Closed
8	**Agency**	QCC	Action Item	Agenda Items 4.2 and 6 - Iron River borehole update / items carried over from 2016 tracking table. An assessment of the Iron River borehole issue is underway by ENV Compliance.	ENV to keep the ETRC and CREC updated on progress on the Iron River borehole.	November 23, 2017	December 31, 2018		0n-going
9	**Agency**	QCC	Action Item	Agenda Item 7.2 - 4-South loading report summary. This report was submitted last year, QCC indicated they were considering following up with Lorax's recommendation to assess the colloidal Fe fraction at LLE, but were unsure if it was necessary.	Follow up on size fraction filtration techniques with Lorax and discuss with ENV at follow-up meeting.	November 23, 2017	December 31, 2017	Information was presented at Stakeholder meeting. Size fractioning of below 0.45 um was used to determine the bioavailability of dissolved iron less than 0.45 um. This was preformed in order to assess whether LLE samples that exceed BCWQGs for dissolved iron contain a significant proportion of Fe-D as colloidal Fe. All samples are now field filtered to 0.45 um, in order to avoid chemical transformations during transport to lab.	Closed
10	**Agency**	QCC	Action Item	Agenda Item 7.3 - Summary of benthic invertebrate and sediment program results and recommendations.	Iron River sediment sampling is to be conducted in 2018. QCC to submit potential sampling locations to ENV for discussion.	November 23, 2017	April 30, 2018	To be submitted.	0n-going
11	**Agency**	QCC	Action Item	Agenda Item 7.3 - Summary of benthic invertebrate and sediment program results and recommendations.	Recommendations for future monitoring will be included in the upcoming permit amendment application.	November 23, 2017	June 30st, 2018 (Did not complete)	Permit amendment application has been submitted. Draft version of recommendations from Stantec was submitted to QCC and is being reviewed. ENV will review the recommendations. Finalization will occur with minor permit amendment. Recommendations be included in 2017-18 Annual Report. (This has not been finalized and is not included in Annual Report).	0n-going
12	**Agency**	QCC	Recommendation	Agenda Item 7.3 - Summary of benthic invertebrate and sediment program results and recommendations.	Review when logging was performed within the vicinity of No Name Lake, provide a time line.	November 23, 2017	December 31st, 2017	Logging commenced within the vicinity of the lake during 2011 when comparing images using Google Earth.	0n-going

Permit 7008 Environmental Technical Review Committee Action Item & Outcome Tracking Table									
Items	Meeting Type (Agency, Stakeholder)	ETRC Member or Stakeholder Responsible	Type	Context	Description	Date of Advice	Target Completion Date	Description of Follow -up	Status
13	**Stakeholder**	QCC	Requests	Agenda Item 3.1 - Water Quality Summary. Elevated arsenic results were observed at 7SQR during summer low flow on two consecutive occasions. Stakeholders were concerned that arsenic concentrations were increasing on the Quinsam river since mining began. There was concern about the upstream Argonaut mine contaminating the Quinsam River influencing baseline results. QCC suggested graphing all arsenic data in the database to see if the trend for arsenic is increasing.	Arsenic concentrations on the Quinsam river remain in low concentrations. The upstream site (WA) near the inlet of Middle Quinsam Lake also remains low. Results of sediment samples were found in low concentrations as well. QCC to provide water quality for arsenic concentrations on the Quinsam River distribute to ETRC.	December 5th, 2017	April 24, 2018	Distributed with ETRC Tracking Table. Historical detection limits (2002) found in QCC's database were set above BCWQG. With the exception of the two elevated previous results from 2016 arsenic remains in low concentrations on the Quinsam River.	Closed
14	**Stakeholder**	ENV	Action Item	Agenda Item 4.2.1 - Iron River Borehole updates. A bore hole with elevated Arsenic was discover on the Iron River in This file was passed on to ENV Compliance who will be contacting Environment Canada (EC). Stakeholders question EC's role requesting mitigative actions be taken for the sump.	Compliance to contact Environment Canada with respect to the IRS1	December 5th, 2017			On-going
15	**Stakeholder**	ENV	Action Item	Agenda Item 4.2.2 4-South Loading Report Summary. A final report "4-South Loading-LLE Water Quality Summary Report (Including Historical Reports) - April 2017", QCC indicated they were considering following up with Lorax's recommendation to assess the colloidal Fe fraction at LLE if concentrations remain elevated.	Size fractioning of below 0.45 µm was used to determine the bioavailability of dissolved iron (Fe-D) less than 0.45 µm. This was preformed in order to assess whether LLE samples that exceed BCWQGs for Fe-D contain a significant proportion of Fe-D as colloidal Fe. All samples are now field filtered to 0.45 µm, in order to avoid chemical transformations during transport to lab.	December 5th, 2017		Wetlands are naturally elevated with metals especially during summer with low dissolved oxygen causing redox reactions at the sediment water interface.	Closed
16	**Stakeholder**	QCC	Requests	Agenda Item 4.2.3 - 242 portal data review and reclamation work performed to date. Reviewing historical to present water quality data.	Coal production from the 242 underground test mine began in September 1996 and ended in November of 1996. The 242 test site was recently reclaimed in 2016. An assessment of the historical to present water quality was presented and compared to BCWQG and contaminated sites regulations for protection of aquatic life (CSR-AW), where applicable.	December 5th, 2017	April 24, 2018	A summary report has been distributed with ETRC meeting minutes. Further sediment, groundwater and surface water sampling will be carried out to assess the results of reclamation activities and remove the monitoring requirements from the effluent permit.	Closed
17	**Stakeholder**	EMPR	Action Item	Agenda Item 5.0 - Effluent permit administration and compliance.	Mines Act permit requirements from the Area 5 permit amendment (C-172). All permit amendments pertaining to C-172 can be found on the EMPR website (https://mines.empr.gov.bc.ca/).	December 5th, 2017	December 5th, 2017	Link to the EMPR B.C. mining website (https://mines.empr.gov.bc.ca/)	Closed
18	**Stakeholder**	QCC	Action Item	Agenda Item 5.1 - Compliance with permit limits.	Follow-up with compliance ENV with a mitigation strategy for Total Suspended Solids (TSS) at Settling Pond # 4. TSS levels were in excess of permit limits during extreme storm events in 2016. A mitigation strategy was recommended.	December 5th, 2017	Report due May 2018	Response to compliance inspection was submitted with a mitigation strategy for TSS exceedances. This includes submitting a TSS management report and plans for installing a sediment curtain during 2018. The use of flock soaks will be evaluated if TSS levels increase (See attached Memo).	On-going

Quinsam Coal Mine
2017 Environmental Technical Review Committee Meeting

Date: November 23, 2017
Time: 9:30am – 2:30 pm
Location: MOE Office, 2080 Labieux Rd, Nanaimo
Also available via video conference using Lync (see invite)

Attendees	Initials	Position	Agency
Andrea Doll	AD	Senior Environmental Protection Officer, Mining Operations	Ministry of Environment and Climate Change Strategy (ENV), Nanaimo
Darren Stewart	DS	Environmental Protection Officer, Compliance Section	ENV, Nanaimo
Genevieve Huneault	GH	Community Resource Technologist, Compliance Section	ENV, Nanaimo
Karen Munroe	KM	Principal, Senior Aquatic Scientist	Stantec
Kathleen Russell	KR	Environmental Coordinator	Quinsam Coal Corporation (QCC)
Nicole Obee	NO	Environmental Impact Assessment Biologist	ENV, Victoria
Norm Johnson	NJ	Underground Mine Manager at Quinsam Coal	QCC
Paul Beddoes	PB	Senior Environmental Geoscientist, Mines and Mineral Resources Division	Ministry of Energy, Mines and Petroleum Resources (EMPR)
Terry Martin	TM	Environmental Specialist	City of Campbell River (CoCR)

Purpose: To review the Quinsam Coal Corporation's 2016/17 Annual Monitoring Report, provide updates on mine status and environmental matters, identify issues and agree on possible recommendations to be made to the Director of Environmental Protection, where warranted.

Agenda Items:

1. Meeting opening (ENV)
    - 1.1 Meeting objectives and introductions
    - 1.2 Review agenda

2. Overview of status and activities over the preceding year and plans for the coming year (QCC)
    - 2.1 Mine and ownership status
    - 2.2 Site activities over the past year and activities planned for the coming year
    - 2.3 Permitting update

3. ETRC administration
    - 3.1 Terms of reference (ENV)
    - 3.2 Data site update and Report Format (QCC)
    - 3.3 Public notice (ENV/QCC)
    - 3.4 Planning for stakeholder meeting (all)

4. Report out on actions taken as a result of the 2016 meetings (QCC)
    - 4.1 Tracking Table Updates
    - 4.2 On-going issues

5. Compliance with permit requirements (ENV)

6. Iron River borehole update (ENV)

7. Highlights from the Annual Monitoring Report (QCC)
    - 7.1 Lakes water quality summary
    - 7.2 4-South loading report summary
    - 7.3 Summary of arsenic data at Quinsam River and Iron River monitoring stations
    - 7.4 Summary of benthic invertebrate and sediment program results and recommendations

8. Any additional discussion topics (all)

9. Round table for minutes: action items, outcomes and positions (all)

Quinsam Coal Mine

2017 Stakeholder Environmental Technical Review Committee Meeting

Date: December 5, 2017; Time: 10:00 am – 3:00 pm

Location: Coast Discovery Inn, Vancouver Room

Purpose: To review the Quinsam Coal Corporation's 2016/17 Annual Monitoring Report, provide updates on mine status and environmental matters, identify issues and agree on possible recommendations to be made to the Director of Environmental Protection, where warranted.

Attendees	Initials	Position	Agency
Andrea Doll	AD	Senior Environmental Protection Officer, Mining Operations	Ministry of Environment and Climate Change Strategy (ENV), Nanaimo
Mark Love	ML	Section Head of North West and Vancouver Island Regions, Mining Operations	ENV, Smithers
Genevieve Huneault	GH	Community Resource Technologist, Compliance Section	ENV, Nanaimo
Nicole Obee	NO	Environmental Impact Assessment Biologist	ENV, Victoria
Paul Beddoes	PB	Senior Environmental Geoscientist, Mines and Mineral Resources Division	Ministry of Energy, Mines and Petroleum Resources (EMPR)
Karen Munroe	KM	Principal, Senior Aquatic Scientist	Stantec
Kathleen Russell	KR	Environmental Coordinator	Quinsam Coal Corporation (QCC)
Matt Ashley	MA	Mine Manager at Quinsam Coal	QCC
Terry Martin	TM	Environmental Specialist	City of Campbell River (CoCR)
Matt Rykers	MR	Water Quality Technician	City of Campbell River (CoCR)
Lynne Stone	LS	Representing Claire Trevena, MLA	Member Legislative Assembly (MLA)
Glenda Woodward	GW	Stakeholder	Campbell River Environmental Committee (CREC)
Leona Adams	LA	Stakeholder	CREC
Frank Jamieson	FJ	Stakeholder	CREC
John Lewis	JL	Stakeholder	CREC
Richard Hamilton	RH	Stakeholder	Greenways Land trust (GL)
Peter Schwarzhoff	PS	Stakeholder	GL
Leroy McFarlane	LM	Stakeholder	Oyster River Estuary

Lunch will be provided by QCC

Agenda Items:

10:00am

1.0 Meeting opening (ENV)
- **1.1** Meeting objectives and introductions
- **1.2** Review agenda

10:15

2.0 Overview of status and activities over the preceding year and plans for the coming year (QCC)
- **2.1** Mine and ownership status
- **2.2** Site activities over the past year and activities planned for the coming year

10:45

3.0 Highlights from the Annual Monitoring Report (QCC)
- **3.1** Water quality summary
- **3.2** Groundwater inputs and terminology
- **3.3** Summary of aquatic biota and sediment results and discussion

1:00 -1:30 break

4.0 Report out on actions taken as a result of the 2016 meetings
- **4.1** Tracking Table Updates (QCC)
- **4.2** On-going issues (QCC)
  - **4.2.1** Iron River borehole updates (ENV)
  - **4.2.2** 4-South loading report summary
  - **4.2.3** 242 portal data review

2:00

5.0 Effluent permit administration and compliance
- **5.1** Compliance with permit requirements (ENV)
- **5.2** Permitting update (ENV, QCC)

2:30

6.0 Round table for minutes: action items, outcomes and positions (all)

242 MINING AREA –WATER QUALITY ASSESSMENT FOLLOWING RECLAMATION

QUINSAM COAL

April 2018

Table of Contents

Operations/Water Management 2

Water Quality 3

Reclamation and Future Activities 7

Table 1: Groundwater Quality Results in 242 and Vicinity 5

Figure 1: 242 Water Management System 3
Figure 2: Settling Pond #1 - Dissolved Sulphate 4
Figure 3: Dissolved Aluminum versus Flow 7
Figure 4: Total Arsenic versus Flow 7
Figure 5: 242 exploration adit, prior to reclamation 8
Figure 6: 242 exploration adit, after reclamation 8

Appendix I

Water Quality Tables

Tables 1-7

Operations/Water Management

Mining commenced at 242 Mine in July 1996 and operations were suspended in November 1996, due to permit issuance delays. This area was developed as an underground room and pillar mining operation; accessing the number 4 coal seam reserves (4-Seam), approximately 5km southwest of the 2-North mining area. Although plans were made to return to this operation, it was not accessed again due to difficult mining conditions.

The 4-Seam is hosted in the Dunsmuir member and is confined between layers of sandstone. This sandstone is known to be arsenic bearing and is a common parameter of interest (POI) in this sedimentary stratum. In addition to arsenic, sulphate and iron are other POIs that are typically associated with coal seams.

There were numerous water management structures designed for this operation as dewatering of this mine (via underground sumps) was necessary to access the coal seam and maintain operations. The main POI for underground sump(s) was total suspended solids (TSS) as capacity of these sumps were very limited with highly variable inflows. Sump waters were brought to surface as needed via intermittent pumping systems to a primary settling pond (Settling Pond #1) later know as the 242 Portal Sump with a capacity of 2,300m^3. Excess waters from this primary pond were pumped with an automated pumping system to a secondary pond (Settling Pond #2) for further settling. Discharges from this secondary pond overflowed into a polishing pond and were released to the land via an intermittent creek bed that often seeped into the ground before reaching the Iron River. Figure 1 below displays the historic water management system when mining operations were active.

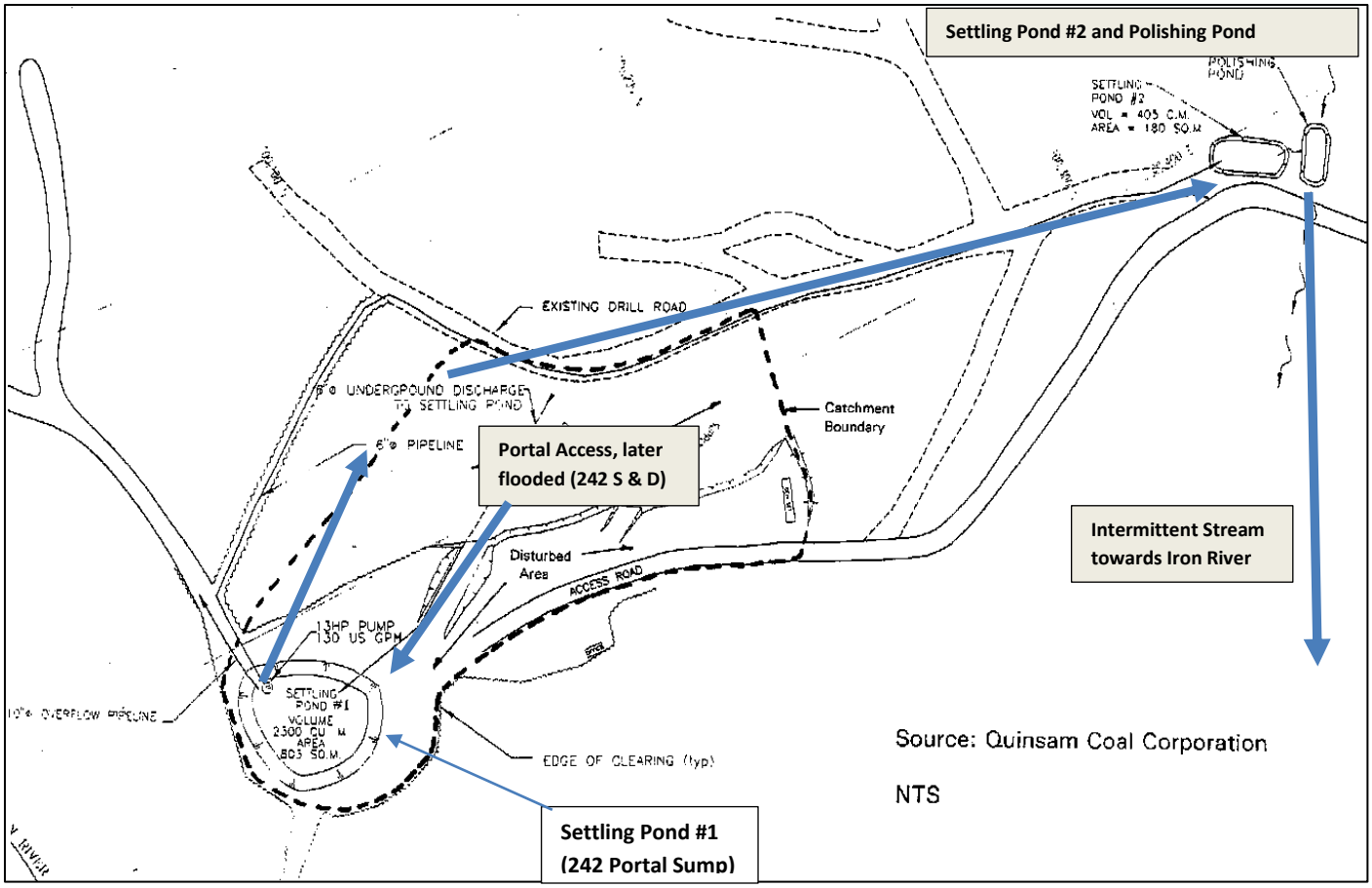


Figure 1: 242 Water Management System

Water Quality

Some historic water quality data has been recovered for the portal sump (interchangeable with Settling Pond #1), polishing pond and sites upstream and downstream of the discharge point into the Iron River sampled throughout mining operations in 1996. Historical data is quite limited due to the short duration of mining and sampling along with dated laboratory techniques where detection limits were set higher than present water quality guidelines; therefore, comparisons are not appropriate. Additional samples have been taken in recent years at various locations in and around 242 and have been used for comparison to historic data. While TSS was a main POI during operations, its relative short-term effects and residence times are not useful for evaluating any chronic impacts on the receiving environment. Sulphate has been a useful parameter to use as reference for mining impacts as it is often found in abundant concentrations and reliable laboratory detection limits with little change in analytical techniques over the years.

During operations, underground water was pumped into Settling Pond #1. There was a coal pad that remained after operations ceased with remanence of raw coal left on the pad. As displayed in Figure 2, sulphate concentrations in Settling Pond #1 have been found in notable concentrations but always below

current WQG. A sample taken in March 2017 exhibits a markedly lower concentration of sulphate when compared to past results. This is most likely due to the removal of the raw coal pad and reclamation work performed on site. Additional sampling will provide more clarity on the effects reclamation has had on Settling Pond #1.

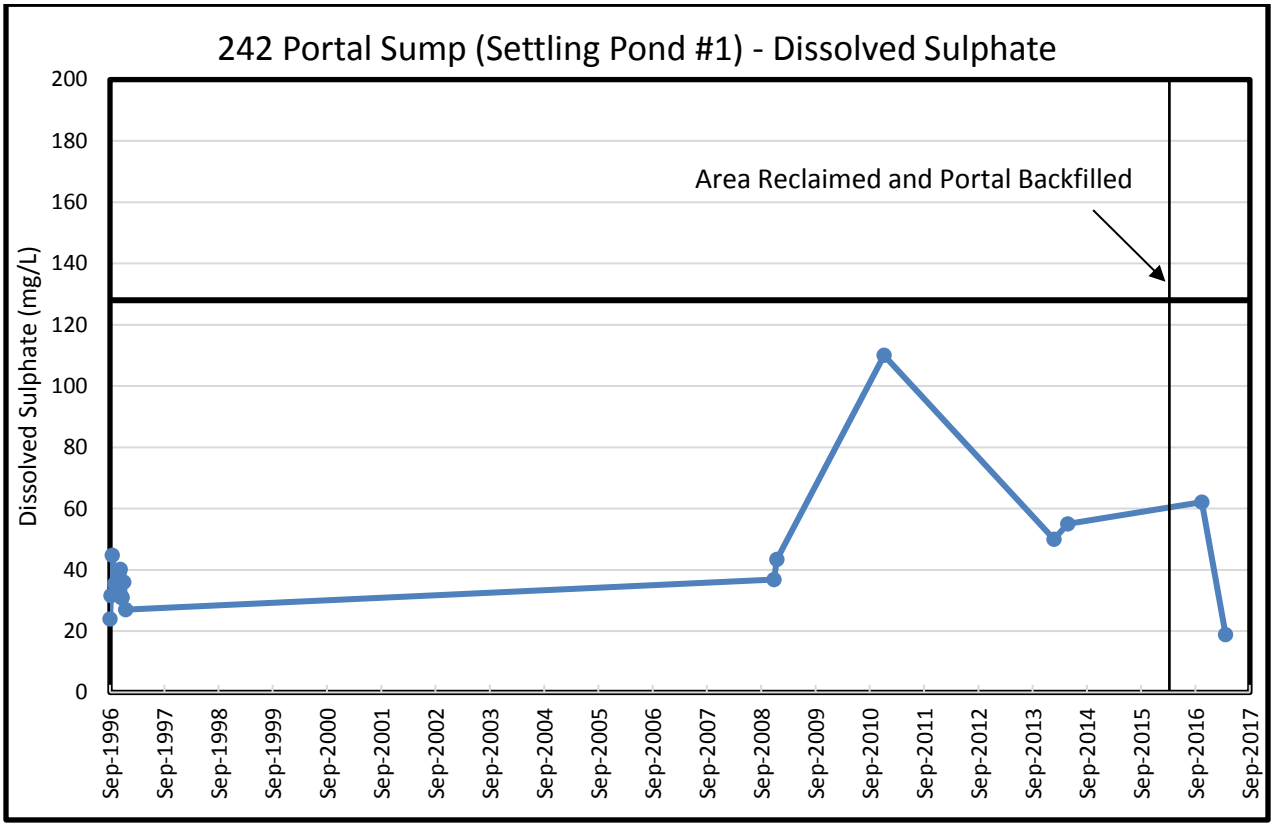


Figure 2: Settling Pond #1 - Dissolved Sulphate

Table 1: Groundwater Quality Results in 242 and Vicinity

Groundwater Quality Results						
All results displayed in mg/L		**As-D**	**As-T**	**Fe-D**	**Fe-T**	**SO4-D**
CSR Guideline		**0.05**				**1000**
242 Flooded Portal Deep Sample	29-Apr-14	0.00081	0.148	<0.0050	7.29	76.9
242 Flooded Portal Deep Sample	11-Aug-14	0.00245		<0.010		60.1
242 Flooded Portal Deep Sample	08-Oct-14	0.00242	0.0146	<0.0050	0.654	63.1
242 Flooded Portal Deep Sample	26-Nov-14	0.00077	0.00090	<0.0050	0.011	61.4
242 Flooded Portal Deep Sample	17-Dec-14	0.00076	0.00711	0.0123	0.393	61.2
242 Flooded Portal Deep Sample	26-Mar-15	0.00061	0.00206	<0.0050	0.167	58.8
242 Flooded Portal Deep Sample	23-Apr-15	0.00057		<0.0050		66.5
242 Flooded Portal Deep Sample	09-Jul-15	0.00192		<0.0050		70.4
242 Flooded Portal Deep Sample	13-Aug-15	0.00085		<0.0050		54.9
242 Flooded Portal Deep Sample	10-Sep-15	0.00081		<0.0050		56.8
242 Flooded Portal Deep Sample	29-Oct-15	0.00064		<0.0050		56.6
242 Flooded Portal Deep Sample	26-Nov-15	0.00062		<0.0050		53.4
242 Flooded Portal Deep Sample	22-Dec-15	0.00042		<0.0050		76.5
242 Flooded Portal Deep Sample	14-Jan-16	0.00035		<0.0050		68.1
242 Flooded Portal Deep Sample	02-Mar-16	0.00037		<0.0050		59.1
Drill hole into deepest portion of mine pool (242MW)	7-Feb-18	0.00065		1.46		67.7
Shallow Groundwater Well	19-Nov-12	0.0173	0.274	0.270	11.2	9.66
QU1136S	16-Jul-13					
QU1136S	27-Feb-13	0.0134	0.426	0.161	17.3	8.80
QU1136S	28-Feb-13					
QU1136S	27-Nov-13	0.0145	0.895	0.322	31.0	9.59
QU1136S	16-Sep-14	0.0125		0.326		11.3
QU1136S	25-Nov-14	0.00488		0.057		9.69
QU1136S	8-Feb-18	0.00933		0.0383		7.1
Deep Groundwater Well						
QU1136D	19-Nov-12	1.15	1.19	0.611	0.796	14.4
QU1136D	01-Mar-13	1.08	1.05	0.588	0.679	14.0
QU1136D	18-Sep-13	1.08	1.06	0.588	1.18	13.5
QU1136D	13-Dec-13	1.09	1.09	0.612	0.725	12.6
QU1136D	07-Feb-14	1.20	1.15	0.651	0.715	12.8
QU1136D	11-Aug-14	1.03		0.602		13.1
QU1136D	21-May-14	1.04	1.06	0.628	0.776	13.6
QU1136D	25-Nov-14	0.965		0.327		12.8
QU1136D	23-Mar-15	1.00		0.563		11.7
QU1136D	8-Feb-18	0.889		0.713		11.6

Upon review of sampling results from local surface and groundwater, it was determined that water quality remains in good standing in the area. Arsenic and sulphate concentrations in the receiving environment (Iron River) are key in evaluating any effects from mining disturbance due to mobilization and water transport. Due to its small footprint and mining strategy, there was very little impact on the local watershed (Iron River and groundwater) from operations at 242. Sampling in the Iron River will continue to play a vital role in evaluating any effects of past and upcoming (7-South Area 5) mining activities.

In late 2017 after the reclamation activities were completed a borehole was drilled into the deepest portion of the mine pool to continue assessing the 242-water quality. The results were returned favorable with almost all results found in low concentration including arsenic, resulting in 0.00065 mg/L. Sulphate was also found in moderate concentrations resulting in 67.7 mg/L. Dissolved iron was the only parameter that was elevated resulting in 1.46 mg/L. The sample was obtained from 1 foot above bottom and was expected to result in elevated parameters as heavy metals and sulphate will accumulate at depth. This drill hole will be monitored on a quarterly schedule in 2018.

The upper Iron river and lower Iron river were sampled historically from 1996 through present. Additional sample locations on the Iron river were added to the receiving environment monitoring program during 2014 resulting from the 7-South Area 5 mine permit approval. The 7 South Area 5 development was postponed until late 2018 when the demand for thermal coal increased. Monitoring results observed that the system experiences naturally elevated concentrations (above water quality guidelines) of dissolved aluminum and total arsenic; aluminum is present throughout the system (i.e. from IR1 through IR8) whereas arsenic is primarily detected below the sandstone unit of the Dunsmuir member contact, represented by monitoring location Iron River Site 6 (IR6). This area has naturally elevated arsenic due to the host rock formation of the Dunsmuir sandstone. The main intention of the monitoring program was to develop water quality objectives reflective of baseline conditions.

Dissolved aluminum and arsenic are two parameters identified as displaying an inverse relationship to each other based on flow. Dissolved aluminum is elevated during high flows and dissolved arsenic is elevated during low flows as displayed in figures 3 and 4 below. These parameters have continued to be observed throughout monitoring of the Iron River.

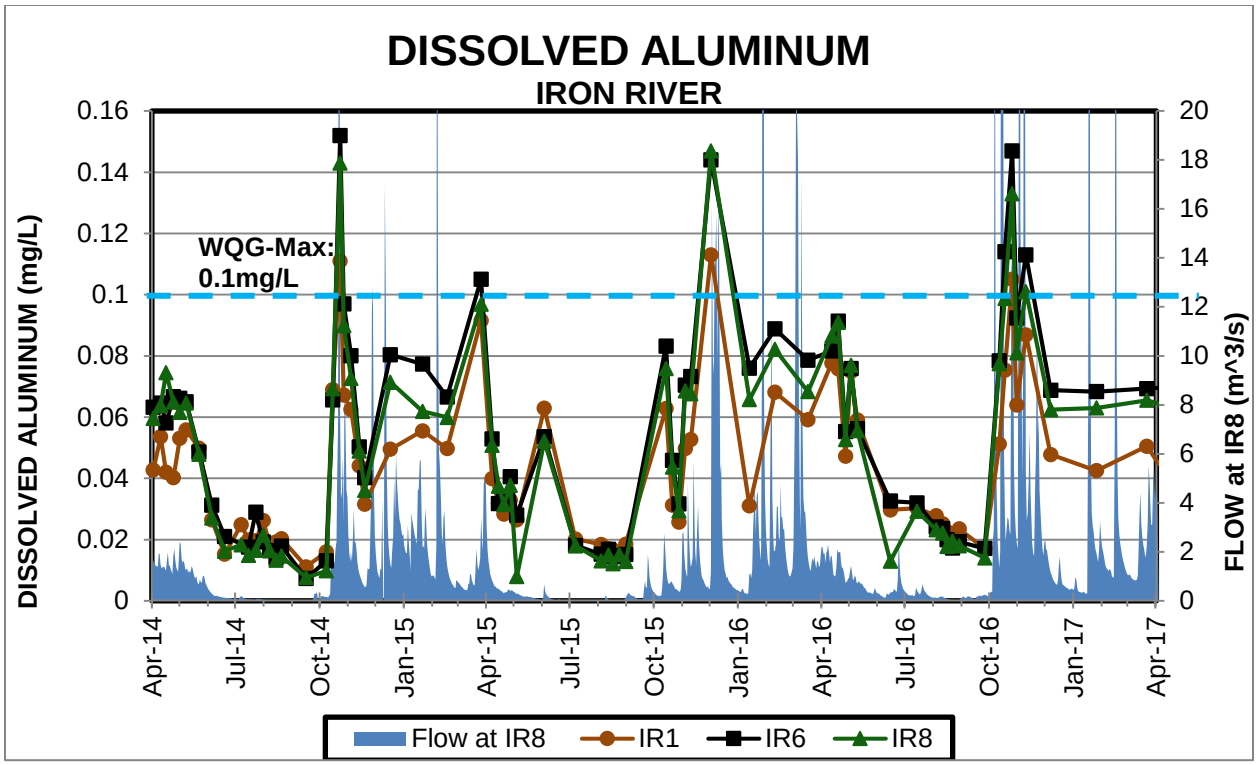


Figure 3: Dissolved Aluminum versus Flow

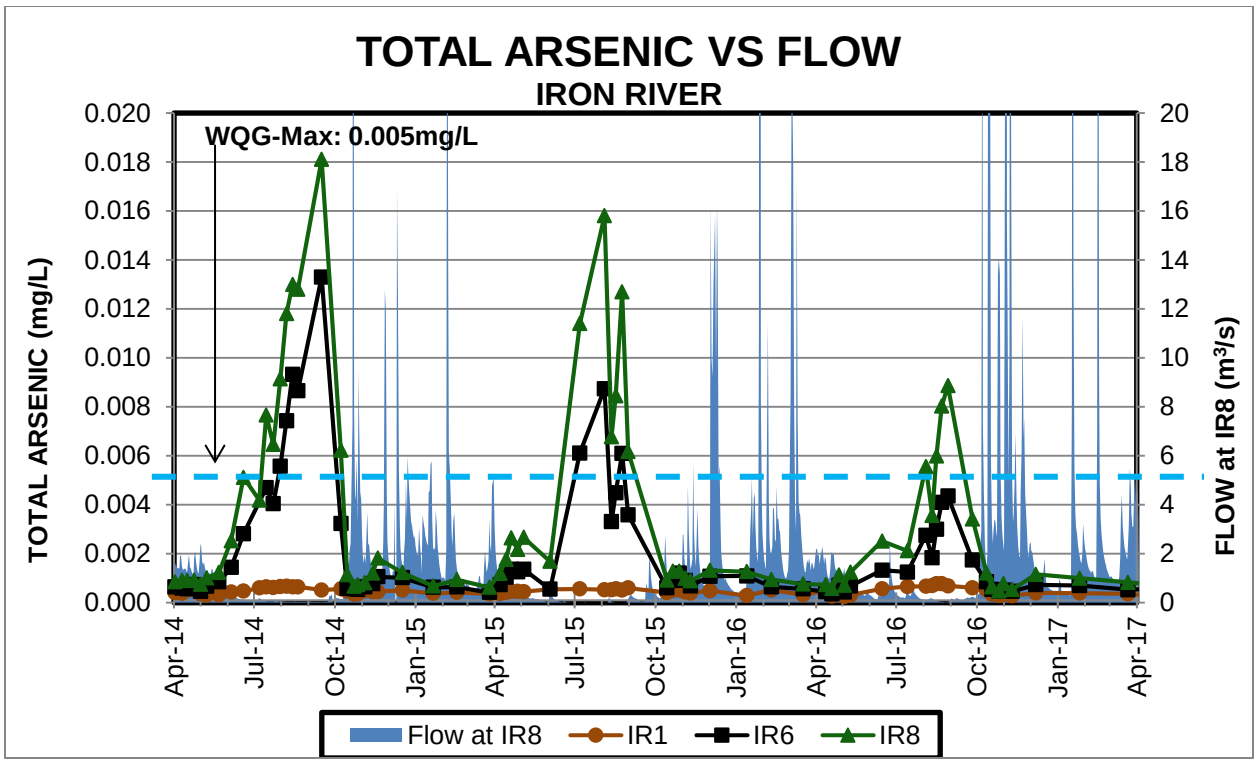


Figure 4: Total Arsenic versus Flow

Reclamation and Future Activities

During the spring of 2016, a boulder dense till (salvaged from the 7-South overburden dump) was recovered from the 2-South area and used to infill the portals. The high wall was resloped using till and other local stockpiled material, and then topsoiled using 3,500 m^3 of material from the 7-South topsoil stockpile. The 242 surface reclamation area (0.44 hectares) was seeded using Coastal Native Bunch grass seed at a rate of 15 kg/ha, and Coastal Native sodgrass seed at a rate of 20 kg/ha. Broadcasted with the grass seed was an 11-33-11 fertiliser at a rate of 250 kg/ha. A before and after photograph of the area is displayed below in figures 5 and 6, respectively.

Figure 5: 242 exploration adit, prior to reclamation

Figure 6: 242 exploration adit, after reclamation

Quinsam Coal intends to remove permit requirements in PE 7008 for Block 242 as access through the reclaimed portal and associated water management structures will not be used in future operations. Quinsam does intend to retrieve water samples in Spring 2018 at Settling Pond #1 to ascertain acceptable and consistent water quality. Sediment samples will be collected to compliment water quality results to understand any cumulative contamination at this site. These results will be included in the permit amendment application requesting to remove the 242 authorised works and discharge locations from the permit. Tree planting has occurred during April 2018 at rate of 1400 stems per hectare and a mixture of Red Alder and Douglas Fir. Once the area sustains vegetation for one year it is considered reclaimed. Periodic monitoring will occur at the site to assess the health of vegetation and monitor for invasive plants.

Tables 1 - 7 display the water quality results historically to present.

Quinsam trust this report meets the expectations of the Ministry for surface water quality. Further groundwater monitoring will be carried out with the commencement of mining in Area 5.

Sincerely,

Environmental Department

QUINSAM COAL

Quinsam Coal Corporation

Ph: (250) 286-3224 ext. 225

E-mail: kar@quinsam.com

Appendix I

Water Quality Tables

TABLE 1
242 Water Quality

242 Flooded Portal Deep Sample (242D)																
Date		29-Apr-14	11-Aug-14	08-Oct-14	26-Nov-14	17-Dec-14	26-Mar-15	23-Apr-15	09-Jul-15	13-Aug-15	10-Sep-15	29-Oct-15	26-Nov-15	22-Dec-15	14-Jan-16	02-Mar-16
Acidity45	mg/L			<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Acidity83	mg/L			<0.50		4.45	0.69	1.27	9.32	<0.50	2.44	<0.50	8.88	7.73	1.01	3.27
Alk-T	mg/L	61.6	89.6	89.0	88.0	65.9	44.7	70.4	73.0	82.1	84.8	89.3	90.9	65.4	61.5	68.7
Al-D	mg/L	<0.0030	0.0014	0.0039	<0.0030	0.0090	0.0162	<0.0030	0.0035	0.0047	<0.0030	<0.0030	<0.0030	0.0084	0.0043	0.0042
Al-T	mg/L	0.394		0.0411	<0.0030	0.0309	0.0438									
As-D	mg/L	0.00081	0.00245	0.00242	0.00077	0.00076	0.00061	0.00057	0.00192	0.00085	0.00081	0.00064	0.00062	0.00042	0.00035	0.00037
As-T	mg/L	0.148		0.0146	0.00090	0.00711	0.00206									
Ba-D	mg/L	0.0389	0.0649	0.0628	0.0597	0.0552	0.0538	0.0620	0.0513	0.0548	0.0546	0.0621	0.0595	0.0650	0.0559	0.0625
Ba-T	mg/L	0.0521		0.0650	0.0584	0.0648	0.0483									
B-D	mg/L	0.125	0.145	0.174	0.158	0.092	0.085	0.123	0.139	0.148	0.177	0.196	0.181	0.129	0.105	0.140
B-T	mg/L	0.117		0.173	0.161	0.122	0.075									
Ca-D	mg/L	47.8	47.1	43.0	45.6	42.6	35.0	43.4	43.1	42.1	46.2	45.0	44.6	43.8	40.5	40.9
Carb	mg/L	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ca-T	mg/L	44.9		42.4	48.5	50.0	35.7									
Cd-D	mg/L	0.0000065	<0.000010	<0.0000050	0.000005	0.0000110	0.0000120	0.0000126	0.0000080	0.0000070	<0.000005	<0.000005	0.0000050	0.0000150	0.0000110	0.0000110
Cd-T	mg/L	0.000030		<0.000010	0.000012	0.000014	0.000013									
Cl-D	mg/L							0.86	5.6	0.59	0.93	1.2	0.93	1.3	<0.50	0.90
Co-D	mg/L	<0.00050	0.00011	<0.00050	<0.00050	0.00068	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00121	0.00079	0.00051
Co-T	mg/L	0.00296		<0.00050	<0.00050	0.00073	0.00069									
Cr-D	mg/L	<0.0010	0.00023	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cr-T	mg/L	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010									
Cu-D	mg/L	<0.00020	0.00022	<0.00020	0.00023	0.00039	0.00025	<0.00020	0.00099	<0.00020	<0.00020	<0.00020	0.00022	0.00036	0.00026	0.00021
Cu-T	mg/L	0.00473		0.00072	<0.00050	<0.00050	0.00066									
DOC	mg/L		<0.50		2.06		<0.50	1.18	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	1.29	<0.50
F-D	mg/L							0.150	0.160	0.180	0.200	0.200	0.190	0.160	0.130	0.120
Fe-D	mg/L	<0.0050	<0.010	<0.0050	<0.0050	0.0123	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fe-T	mg/L	7.29		0.654	0.011	0.393	0.167									
Hard-D	mg/L	137		127	134	122	99.2	126	124	123	135	131	132	127	117	119
Hard-T	mg/L	129	138	127	142	143	102									
Hg-D	mg/L	<0.000002	<0.000010	<0.0000020	<0.0000020	<0.000002	<0.0000020	<0.0000020	<0.0000020	0.0000026	0.0000041	0.0000029	0.0000035	0.0000021	0.0000055	0.0000054
Hg-T	mg/L	<0.000002		<0.0000020	<0.0000020	<0.000002	<0.0000020									
K-D	mg/L	0.682	0.80	0.788	0.807	0.606	0.485	0.705	0.759	0.625	0.707	0.766	0.790	0.634	0.602	0.639
K-T	mg/L	0.635		0.758	0.841	0.648	0.468									
Li-D	mg/L	0.0115	0.0141	0.0158	0.0149	0.0090	0.0086	0.0120	0.0113	0.0119	0.0142	0.0153	0.0158	0.0114	0.0092	0.0106
Li-T	mg/L	0.0112		0.0160	0.0152	0.0112	0.0080									
Mg-D	mg/L	4.18	4.85	4.76	4.97	3.75	2.85	4.37	4.01	4.38	4.79	4.53	5.12	4.15	3.98	3.95
Mg-T	mg/L	3.97		5.17	5.19	4.46	3.00									
Mn-D	mg/L	0.0120	0.0225	0.0104	<0.0010	0.0698	0.0589	0.0446	0.0016	0.0068	0.0055	<0.0010	<0.0010	0.0884	0.0675	0.0519
Mn-T	mg/L	0.140		0.0313	<0.0010	0.0809	0.0567									
Na-D	mg/L	5.22	7.26	7.20	7.57	4.82	3.30	5.64	5.47	6.62	7.24	7.01	7.71	5.23	4.64	4.83
Na-T	mg/L	5.22		7.68	7.74	5.44	3.26									
N-D	mg/L							0.047	0.094	0.080	0.038	0.142	0.042	0.053	0.124	0.145
Ni-D	mg/L	<0.0010	0.00931	<0.0010	<0.0010	0.0018	0.0022	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0026	0.0022	0.0016
Ni-T	mg/L	0.0031		0.0017	<0.0010	0.0021	0.0022									
N-NH3	mg/L			0.012	0.039	<0.0050	<0.0050									
N-NO2	mg/L					<0.0050	<0.0050									
N-NO23	mg/L			<0.020	<0.020	<0.020	<0.020									
N-NO3	mg/L					<0.020	<0.020									
Pb-D	mg/L	<0.00020	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Pb-T	mg/L	0.00027		<0.00020	<0.00020	<0.00020	<0.00020									
P-D	mg/L		<0.050		<0.0050	0.0093	0.0095	0.0086	0.0020	0.0024	<0.0020	<0.0020	0.0025	0.0027	<0.0020	<0.0020
P-T	mg/L			0.0061		0.0073	0.0101									
pH-L	pH Unit	7.69	7.54													
S2-T	mg/L	0.0052	<0.0020	0.0051		0.0086	0.0058	0.0086	<0.0050	***0.0338***	0.0115	0.0072	<0.0050	0.0075	0.0104	0.0079
H2S	mg/L								<0.0050	0.036	0.012	0.0080		0.0080	0.011	0.0080
Sb-D	mg/L	<0.00050	0.00031	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Sb-T	mg/L	0.00062		<0.00050	<0.00050	<0.00050	<0.00050									
S-D	mg/L	29.0	20.5	18.6	21.6	20.9	21.3	22.7	22.2	18.2	19.9	20.3	18.8	24.2	23.0	22.9
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Se-T	mg/L	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010									
Si-D	mg/L	3.07	3.09	3.00	3.08	3.28	2.89	3.45	3.22	3.09	3.37	3.96	3.45	3.57	3.40	3.37
Si-T	mg/L	3.61		2.68	3.19	3.78	3.12									
SO4-D	mg/L	76.9	60.1	63.1	61.4	61.2	58.8	66.5	70.4	54.9	56.8	56.6	53.4	76.5	68.1	59.1
Sr-D	mg/L	0.119	0.152	0.155	0.149	0.0923	0.0765	0.111	0.114	0.134	0.139	0.148	0.159	0.120	0.0904	0.100
Sr-T	mg/L	0.116		0.161	0.147	0.113	0.0716									
S-T	mg/L	28.3		17.9	19.8	28.2	17.8									
Tl-D	mg/L	0.000071	0.000089	0.000072	0.000066	0.000129	0.000162	0.000100	0.000068	<0.000050	0.000057	0.000074	0.000064	0.000156	0.000142	0.000111
Tl-T	mg/L	0.000151		0.000092	0.000068	0.000162	0.000136									
TOC	mg/L					0.85	<0.50									
TSS	mg/L	15.3		<4.0		<4.0	<4.0				<4.0	<4.0	<4.0	<4.0	<4.0	5.3
Zn-D	mg/L	<0.0050	0.0047	<0.0050	<0.0050	0.0157	0.0139	0.0064	0.0071	0.0054	<0.0050	<0.0050	<0.0050	0.0104	0.0099	0.0474
Zn-T	mg/L	0.0243		<0.0050	<0.0050	0.0190	0.0178									

Bolded Red indictaes parameter is above CSR-AW for Dissolved Arsenic (0.05mg/L) and Sulphide (0.02 mg/L)

TABLE 2
242 Water Quality

242 Flooded Portal Shallow Sample (242S)					
Date		22-Jan-14	21-Jan-15	17-Feb-15	27-Jan-16
Acidity45	**mg/L**		<0.50	<0.50	<0.50
Acidity83	**mg/L**		1.80	3.84	<0.50
Alk-T	**mg/L**	69.1	40.3	59.2	54.2
Al-D	**mg/L**	<0.0030	0.0650	0.0053	0.0435
Al-T	**mg/L**	0.0461	0.191	0.0314	
As-D	**mg/L**	0.00078	0.00058	0.00038	0.00091
As-T	**mg/L**	0.0119	0.00307	0.00596	
Ba-D	**mg/L**	0.0597	0.0479	0.0610	0.0532
Ba-T	**mg/L**	0.0619	0.0495	0.0684	
B-D	**mg/L**	0.122	0.083	0.090	0.120
B-T	**mg/L**	0.137	0.073	0.105	
Ca-D	**mg/L**	40.3	29.5	39.7	36.9
Carb	**mg/L**	<0.50	<0.50	<0.50	<0.50
Ca-T	**mg/L**	41.0	31.2	38.6	
Cd-D	**mg/L**	0.000220	0.0000240	0.0000120	0.0000890
Cd-T	**mg/L**	0.0000140	0.000030	0.000013	
Cl-D	**mg/L**				<0.50
Co-D	**mg/L**	0.00069	0.00204	0.00071	0.00099
Co-T	**mg/L**	0.00065	0.00246	0.00072	
Cr-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010
Cr-T	**mg/L**	<0.0010	<0.0010	<0.0010	
Cu-D	**mg/L**	0.00266	0.00022	0.00025	0.00062
Cu-T	**mg/L**	0.00040	0.00080	0.00201	
DOC	**mg/L**				1.39
F-D	**mg/L**				0.078
Fe-D	**mg/L**	<0.0050	<0.0050	<0.0050	0.0061
Fe-T	**mg/L**	0.580	0.386	0.273	
Hard-D	**mg/L**	118	86.1	114	106
Hard-T	**mg/L**	118	91.4	113	
Hg-D	**mg/L**	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Hg-T	**mg/L**	<0.0000020	<0.0000020	<0.0000020	
K-D	**mg/L**	0.738	0.472	0.551	0.615
K-T	**mg/L**	0.618	0.471	0.568	
Li-D	**mg/L**	0.0118	0.0077	0.0096	0.0092
Li-T	**mg/L**	0.0109	0.0076	0.0096	
Mg-D	**mg/L**	4.22	3.04	3.52	3.42
Mg-T	**mg/L**	3.75	3.24	3.94	
Mn-D	**mg/L**	0.0720	0.0796	0.0766	0.0703
Mn-T	**mg/L**	0.0707	0.0877	0.0792	
Na-D	**mg/L**	5.61	3.31	3.77	3.95
Na-T	**mg/L**	5.29	3.71	4.34	
N-D	**mg/L**				0.051
Ni-D	**mg/L**	0.0019	0.0032	0.0020	0.0023
Ni-T	**mg/L**	0.0018	0.0040	0.0022	
N-NH3	**mg/L**	0.0058	0.0067	0.0057	
N-NO2	**mg/L**		<0.0050	<0.0050	
N-NO23	**mg/L**	0.022	<0.020	<0.020	
N-NO3	**mg/L**		<0.020	<0.020	
Pb-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.00020
Pb-T	**mg/L**	<0.00020	<0.00020	0.00026	
P-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.0020
P-T	**mg/L**	0.0065	0.0048	0.0026	
pH-L	**pH Units**	7.76			
S2-T	**mg/L**		<0.0050	0.0065	<0.0050
H2S	**mg/L**				
Sb-D	**mg/L**	<0.00050	<0.00050	<0.00050	<0.00050
Sb-T	**mg/L**	<0.00050	<0.00050	<0.00050	
S-D	**mg/L**	22.6	20.7	20.7	20.5
Se-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00010
Se-T	**mg/L**	<0.00010	<0.00010	<0.00010	
Si-D	**mg/L**	3.04	2.70	3.07	3.18
Si-T	**mg/L**	3.21	2.87	3.32	
SO4-D	**mg/L**	68.8	54.5	61.1	57.7
Sr-D	**mg/L**	0.112	0.0703	0.0879	0.0854
Sr-T	**mg/L**	0.118	0.0734	0.0875	
S-T	**mg/L**	22.0	21.4	22.9	
Tl-D	**mg/L**	0.000124	0.000218	0.000121	0.000136
Tl-T	**mg/L**	0.000120	0.000239	0.000131	
TOC	**mg/L**		<0.50	<0.50	
TSS	**mg/L**	<4.0	<4.0	<4.0	<4.0
Zn-D	**mg/L**	0.0093	0.0296	0.0100	0.407
Zn-T	**mg/L**	0.0103	0.0484	0.0110	

Bolded Red indictaes parameter is above CSR-AW for Dissolved Arsenic (0.05mg/L) and Sulphide (0.02 mg/L)

TABLE 3
242 Water Quality

		Settling Pond # 1 (242 Portal Sump)						
Date		25-Nov-08	15-Dec-08	06-Dec-10	22-Jan-14	25-Apr-14	12-Oct-16	22-Mar-17
Acidity45	**mg/L**			<0.5			<0.50	<0.50
Acidity83	**mg/L**			1.4			1.12	2.87
Alk-T	**mg/L**	77.8	73.8	43	22.3	61.7	11.1	5.60
Al-D	**mg/L**	0.0055	0.0054	0.053	0.0288	0.0091	0.0473	0.0070
Al-T	**mg/L**	0.0576	<0.20	0.024	0.0866	0.0421	0.116	0.0112
As-D	**mg/L**	<0.00050	<0.00050	0.0006	0.00174	0.00130	0.00282	0.00048
As-T	**mg/L**	***0.00562***	<0.20	0.0017	0.00223	***0.00590***	0.00399	0.00055
Ba-D	**mg/L**	0.063	0.067	0.067	0.0359	0.0688	0.0354	0.0126
Ba-T	**mg/L**	0.065	0.068	0.063	0.0334	0.0571	0.0363	0.0125
B-D	**mg/L**	0.11	0.12	0.11	0.083	0.117	0.063	<0.050
B-T	**mg/L**	0.11	0.12	0.10	0.059	0.096	0.070	<0.050
Ca-D	**mg/L**	35.3	36.1	48.3	21.5	36.7	21.8	8.87
Carb	**mg/L**			<0.5	<0.50	<0.50	<0.50	<0.50
Ca-T	**mg/L**	35.1	36.7	47.8	19.5	37.3	22.8	8.35
Cd-D	**mg/L**	0.000020	0.000028	0.00020	0.0000770	0.0000123	0.0000400	0.0000200
Cd-T	**mg/L**	0.000208	<0.010	0.00004	0.000089	0.000012	0.000042	0.000022
Cl-D	**mg/L**							
Co-D	**mg/L**	0.00071	0.00115	0.0029	0.00248	<0.00050	0.00077	0.00142
Co-T	**mg/L**	0.00072	<0.010	0.0030	0.00236	<0.00050	0.00139	0.00141
Cr-D	**mg/L**	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Cr-T	**mg/L**	<0.0010	<0.010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Cu-D	**mg/L**	<0.0010	0.0047	0.0010	0.00069	0.00069	0.00114	0.00024
Cu-T	**mg/L**	<0.0010	<0.010	0.0012	0.00125	0.00061	0.00154	<0.00050
DOC	**mg/L**							
F-D	**mg/L**							
Fe-D	**mg/L**	<0.030	<0.030	0.972	0.0140	0.0100	0.0229	0.0346
Fe-T	**mg/L**	0.498	0.395	1.15	0.264	0.364	0.100	0.093
Hard-D	**mg/L**			137	64.0	107	65.4	26.1
Hard-T	**mg/L**	104	107	135	57.4	108	68.1	24.5
Hg-D	**mg/L**	<0.000020	<0.000020	<0.00002	<0.0000020	<0.000002	<0.0000020	<0.0000020
Hg-T	**mg/L**	<0.000020		<0.00002	<0.0000020	<0.000002	0.0000029	<0.0000020
K-D	**mg/L**	<2.0	<2.0	0.63	0.547	0.563	0.540	0.232
K-T	**mg/L**	<2.0	<2.0	0.61	0.500	0.573	0.557	0.226
Li-D	**mg/L**	0.0106	0.0117	0.011	<0.0050	0.0098	<0.0050	<0.0020
Li-T	**mg/L**	0.0106	0.011	0.007	<0.0050	0.0101	<0.0050	<0.0020
Mg-D	**mg/L**	3.89	4.04	3.91	2.50	3.77	2.64	0.950
Mg-T	**mg/L**	3.92	3.97	3.79	2.09	3.74	2.73	0.882
Mn-D	**mg/L**	0.0431	0.0589	0.176	0.237	0.0435	0.123	0.151
Mn-T	**mg/L**	0.0427	0.0679	0.169	0.224	0.0492	0.162	0.153
Na-D	**mg/L**	5.7	5.9	4.05	2.79	4.53	2.32	0.763
Na-T	**mg/L**	5.8	5.9	4.18	2.51	4.73	2.32	0.727
N-D	**mg/L**							
Ni-D	**mg/L**	0.0022	0.0024	0.007	0.0022	0.0015	0.0019	<0.0010
Ni-T	**mg/L**	0.0019	<0.050	0.008	0.0031	0.0015	0.0021	<0.0010
N-NH3	**mg/L**	<0.0050		<0.05	0.018			
N-NO2	**mg/L**			<0.005				
N-NO23	**mg/L**	0.0119	0.0117	<0.02	0.165			
N-NO3	**mg/L**			<0.02				
Pb-D	**mg/L**	<0.00050	<0.00050	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Pb-T	**mg/L**	<0.00050	<0.050	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
P-D	**mg/L**				0.0108			
P-T	**mg/L**		<0.30		0.0111			
pH-L	**pH Units**	7.80	7.45	7.37	6.77	7.69		
S2-T	**mg/L**					0.0085		
H2S	**mg/L**							
Sb-D	**mg/L**	<0.00050	<0.00050	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Sb-T	**mg/L**	<0.00050	<0.20	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
S-D	**mg/L**			35	16.1	19.1	21.1	7.3
Se-D	**mg/L**	<0.0010	<0.0010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Se-T	**mg/L**	<0.0010	<0.20	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	**mg/L**			3.2	3.05	2.91	3.16	1.40
Si-T	**mg/L**		2.90	3.1	3.06	2.97	3.39	1.18
SO4-D	**mg/L**	36.8	43.4	110	50.0	55.0	62.1	18.9
Sr-D	**mg/L**			0.107	0.0624	0.0940	0.0585	0.0243
Sr-T	**mg/L**		0.103	0.099	0.0557	0.0920	0.0615	0.0234
S-T	**mg/L**			35	13.8	20.1	20.8	6.7
Tl-D	**mg/L**	<0.00020	<0.00020	0.00031	<0.000050	0.000092	<0.000050	<0.000010
Tl-T	**mg/L**	<0.00020	<0.20	0.00028	<0.000050	0.000122	<0.000050	<0.000010
TOC	**mg/L**							
TSS	**mg/L**	<3.0	<3.0		<4.0	<4.0	<4.0	<4.0
Zn-D	**mg/L**	0.0110	0.0138	0.024	0.0116	0.0102	0.0326	<0.0050
Zn-T	**mg/L**	0.0131	0.0147	0.026	0.0150	0.0146	0.0384	<0.0050

Bolded blue indicates exceedance of BCWQG for Arsenic -Total (0.005 mg/L)

TABLE 4
242 Water Quality

		242 Secondary Settling Pond Inflow (242 SSPI)	242 Secondary Settling Pond Outflow (242 SSPO)
Date		22-Jan-14	22-Jan-14
Acidity45	mg/L		
Acidity83	mg/L		
Alk-T	mg/L	8.76	8.48
Al-D	mg/L	0.0663	0.0441
Al-T	mg/L	0.154	0.177
As-D	mg/L	0.00015	<0.00010
As-T	mg/L	0.00022	0.00020
Ba-D	mg/L	0.0100	0.0062
Ba-T	mg/L	0.0107	0.0104
B-D	mg/L	<0.050	<0.050
B-T	mg/L	<0.050	<0.050
Ca-D	mg/L	2.95	1.80
Carb	mg/L	<0.50	<0.50
Ca-T	mg/L	3.05	2.76
Cd-D	mg/L	<0.0000050	<0.0000050
Cd-T	mg/L	<0.000010	<0.000010
Cl-D	mg/L		
Co-D	mg/L	<0.00050	<0.00050
Co-T	mg/L	<0.00050	<0.00050
Cr-D	mg/L	<0.0010	<0.0010
Cr-T	mg/L	<0.0010	<0.0010
Cu-D	mg/L	0.00053	0.00028
Cu-T	mg/L	0.00099	0.00096
DOC	mg/L		
F-D	mg/L		
Fe-D	mg/L	0.0677	0.0280
Fe-T	mg/L	0.183	0.139
Hard-D	mg/L	11.2	6.79
Hard-T	mg/L	11.4	10.1
Hg-D	mg/L	<0.0000020	<0.0000020
Hg-T	mg/L	<0.0000020	<0.0000020
K-D	mg/L	0.118	0.058
K-T	mg/L	0.091	0.099
Li-D	mg/L	<0.0050	<0.0050
Li-T	mg/L	<0.0050	<0.0050
Mg-D	mg/L	0.942	0.557
Mg-T	mg/L	0.927	0.789
Mn-D	mg/L	0.0642	0.0187
Mn-T	mg/L	0.0723	0.0340
Na-D	mg/L	0.935	0.616
Na-T	mg/L	0.931	0.841
N-D	mg/L		
Ni-D	mg/L	<0.0010	<0.0010
Ni-T	mg/L	<0.0010	<0.0010
N-NH3	mg/L	0.027	0.019
N-NO2	mg/L		
N-NO23	mg/L	0.098	0.084
N-NO3	mg/L		
Pb-D	mg/L	<0.00020	<0.00020
Pb-T	mg/L	<0.00020	<0.00020
P-D	mg/L	0.0142	0.0054
P-T	mg/L	0.0210	0.0093
pH-L	pH Units	6.87	7.02
S2-T	mg/L		
H2S	mg/L		
Sb-D	mg/L	<0.00050	<0.00050
Sb-T	mg/L	<0.00050	<0.00050
S-D	mg/L	<3.0	<3.0
Se-D	mg/L	<0.00010	<0.00010
Se-T	mg/L	<0.00010	<0.00010
Si-D	mg/L	3.17	2.19
Si-T	mg/L	3.26	3.48
SO4-D	mg/L	2.10	1.54
Sr-D	mg/L	0.0139	0.0084
Sr-T	mg/L	0.0146	0.0131
S-T	mg/L	<3.0	<3.0
Tl-D	mg/L	<0.000050	<0.000050
Tl-T	mg/L	<0.000050	<0.000050
TOC	mg/L		
TSS	mg/L	<4.0	<4.0
Zn-D	mg/L	<0.0050	<0.0050
Zn-T	mg/L	<0.0050	<0.0050

Bolded Red indictaes parameter is above CSR-AW for Dissoved Arsenic (0.05mg/L) and Sulphide (0.02 mg/L)

TABLE 5
242 WATER QUALITY

QU1136D		Deep Groundwater Well - Located between 242 and Iron River in the 4B Coal Seam and Sandstone									
Date		19-Nov-12	01-Mar-13	18-Sep-13	13-Dec-13	07-Feb-14	11-Aug-14	21-May-14	25-Nov-14	23-Mar-15	08-Feb-18
Acidity45	mg/L	<1.0	1.3	2.8	<1.0	2.0		2.2		<0.50	<1.0
Acidity83	mg/L									<0.50	<1.0
Ag-D	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000020	<0.00010
Ag-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010					
Al-D	mg/L	0.0038	0.0020	0.0025	0.0031	0.0033	0.0021	0.0026	0.0011	<0.0030	<0.015
Alk-T	mg/L		168	171	163	170	167	161	151	159	168
Al-T	mg/L	0.233	0.138	0.574	0.142	0.0571		0.201			
As-D	mg/L	***1.15***	***1.08***	***1.08***	***1.09***	***1.20***	***1.03***	***1.04***	***0.965***	***1.00***	***0.889***
As-T	mg/L	1.19	1.05	1.06	1.09	1.15		1.06			
Ba-D	mg/L	0.126	0.114	0.120	0.118	0.128	0.113	0.120	0.108	0.114	0.114
Ba-T	mg/L	0.125	0.112	0.121	0.117	0.122		0.121			
B-D	mg/L	0.574	0.592	0.577	0.587	0.579	0.632	0.589	0.587	0.725	0.63
B-T	mg/L	0.598	0.600	0.570	0.647	0.650		0.602			
Ca-D	mg/L	49.8	46.7	47.6	49.2	48.6	47.3	47.1	46.2	44.8	43.5
Ca-T	mg/L	50.6	47.0	47.4	50.3	49.6		46.9			
Cd-D	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.000025
Cd-T	mg/L	<0.000010	<0.000010	0.000028	<0.000010	<0.000010		0.000016			
Cl-D	mg/L	0.65	0.65	0.63	0.61	0.60		0.67		0.89	<1.0
Co-D	mg/L	0.00011	<0.00010	0.00015	0.00010	0.00010	<0.00010	0.00013	<0.00010	<0.00050	<0.0010
Cond	uS/cm	323	2270	314	320	1088		309	359	314	
Co-T	mg/L	0.00022	0.00013	0.00060	0.00018	0.00014		0.00030			
Cr-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0050
Cr-T	mg/L	0.00019	0.00016	0.00060	0.00014	<0.00010		0.00031			
Cu-D	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010
Cu-T	mg/L	0.00079	0.00057	0.00163	<0.00050	<0.00050		0.00078			
DOC	mg/L	<0.50	<0.50	<0.50	0.63	<0.50	<0.50	0.68	<0.50	0.53	<0.50
DO-F	mg/L		3.01								
F-D	mg/L	0.698	0.707	0.714	0.666	0.714		0.686		0.660	0.730
Fe-D	mg/L	0.611	0.588	0.588	0.612	0.651	0.602	0.628	0.327	0.563	0.713
Fe-T	mg/L	0.796	0.679	1.18	0.725	0.715		0.776			
Hardness	mg/L	163	154	155	161	158	156	155	151	151	146
Hg-D	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000020	<0.0000020
Hg-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010			
K-D	mg/L	0.95	0.91	0.86	0.95	0.87	0.89	1.00	0.88	0.879	1.00
K-T	mg/L	0.99	0.89	0.97	1.00	0.89		1.02			
Li-D	mg/L	0.0534	0.0502	0.0511	0.0502	0.0508	0.0531	0.0536	0.0508	0.0541	0.050
Li-T	mg/L	0.0512	0.0487	0.0505	0.0537	0.0548		0.0497			
Mg-D	mg/L	9.40	9.07	8.70	9.21	8.97	9.14	9.13	8.80	9.55	9.13
Mg-T	mg/L	9.74	9.10	8.96	9.54	9.07		9.16			
Mn-D	mg/L	0.128	0.115	0.128	0.108	0.117	0.0903	0.110	0.0791	0.0693	0.0663
Mn-T	mg/L	0.136	0.118	0.134	0.112	0.115		0.115			
Mo-D	mg/L	0.0162	0.0140	0.0111	0.00920	0.00893	0.00815	0.00889	0.00785	0.0068	<0.0050
Mo-T	mg/L	0.0168	0.0146	0.0103	0.0101	0.0103		0.00833			
Na-D	mg/L	10.3	10.8	11.0	11.1	12.1		10.9	11.9	12.4	12.6
Na-T	mg/L	10.7	10.7	10.8	11.6	12.0		11.0			
Ni-D	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0050
Ni-T	mg/L	<0.00050	<0.00050	0.00071	<0.00050	<0.00050		0.00110			
N-NH3	mg/L	0.133	0.128	0.0659	0.123	0.124		0.118			
N-NO2	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010			
N-NO3	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		0.0112			
N-T	mg/L	0.080	0.116	0.175	0.149	0.144		0.156			
Pb-D	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.0010
Pb-T	mg/L	0.000082	0.000067	0.000298	0.000059	0.000059		<0.00040			
P-D	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.0055	0.275
pH-L	pH Units	8.30	8.25	8.15	8.27	8.12	7.45	8.09	7.58	7.11	7.35
P-T(LL)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050			
S2-T	mg/L	0.0029	0.0043	<0.0020	***0.024***	0.0146	<0.0020	***0.046***	<0.020	***0.0313***	0.0068
Sb-D	mg/L	0.00027	0.00029	0.00018	0.00011	0.00014	0.00023	<0.00010	0.00028	<0.00050	<0.0025
Sb-T	mg/L	0.00040	0.00045	0.00053	0.00033	0.00028		0.00023			
S-D	mg/L	4.98	4.61	4.51	5.35	5.08	4.59	5.67	4.05	5.1	<15
Se-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00026	<0.00010	<0.00010	<0.00050
Se-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010			
Si-D	mg/L	4.57	4.39	4.56	4.63	4.78	4.60	4.82	4.76	5.44	4.71
Si-T	mg/L	5.34	4.77	5.86	5.04	5.02		5.24			
Sn-D	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0050	<0.025
Sn-T	mg/L	<0.00010	<0.00010	0.00034	0.00015	0.00013		0.00018			
SO4-D	mg/L	14.4	14.0	13.5	12.6	12.8	13.1	13.6	12.8	11.7	11.6
Sr-D	mg/L	0.388	0.400	0.402	0.361	0.377	0.414	0.387	0.391	0.417	0.418
Sr-T	mg/L	0.409	0.403	0.374	0.393	0.419		0.400			
S-T	mg/L	5.10	4.83	4.45	4.64	4.80		4.85			
TDS-L	mg/L	190	186	194	194	188		204			
Ti-D	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.025
Ti-T	mg/L	<0.010	<0.010	0.021	<0.010	<0.010		<0.010			
Tl-D	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050
Tl-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010			
TOC	mg/L	0.57	<0.50	1.09	0.98	0.89		1.10			
TSS	mg/L	4.7	3.8	8.9	8.4	<3.0		7.2			
Turb	NTU	8.86	7.65	18.6	8.31	7.05		9.30			26.6
U-D	mg/L	0.000122	0.000116	0.000121	0.000112	0.000094	0.000074	0.000100	0.000064	<0.00010	<0.00050
U-T	mg/L	0.000149	0.000136	0.000187	0.000161	0.000119		0.000124			
Zn-D	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	<0.0010	<0.0050	<0.025
Zn-T	mg/L	<0.0030	<0.0030	0.0044	0.0033	<0.0030		0.0055			

Bolded Red indictaes parameter is above CSR-AW for Dissolved Arsenic (0.05mg/L) and Sulphide (0.02 mg/L)

TABLE 6
242 WATER QUALITY

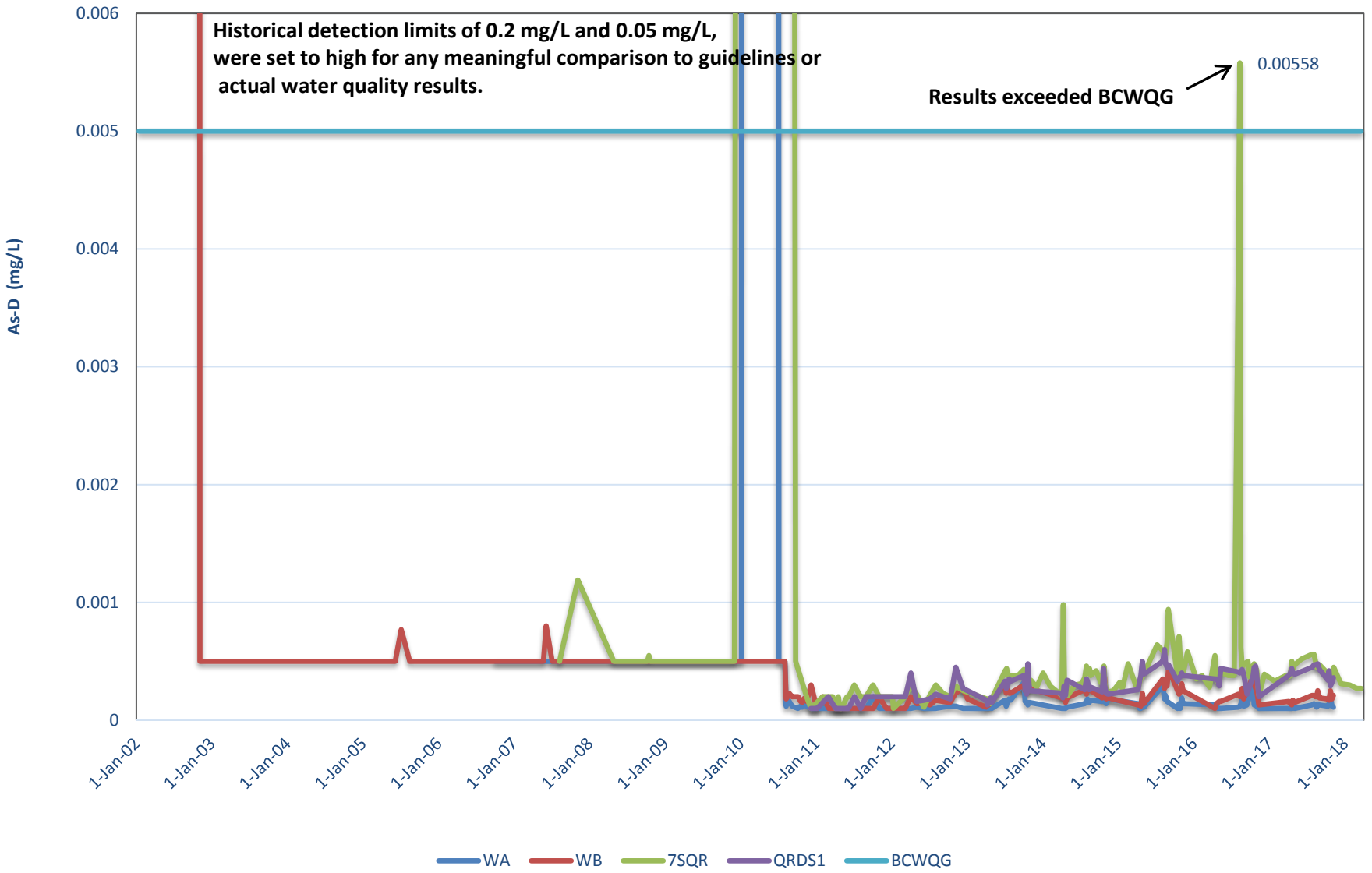
QU1136S		Shallow Groundwater Well - Located between 242 and Iron River in Sandstone						
Date		27-Feb-13	28-Feb-13	19-Nov-12	27-Nov-13	16-Sep-14	25-Nov-14	08-Feb-18
Acidity45	mg/L			5.0	3.0			<1.0
Acidity83	mg/L							1.1
Ag-D	mg/L	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000020
Ag-T	mg/L	0.000039		0.000022	0.000050			
Al-D	mg/L	0.0035		<0.0010	<0.0010	<0.0010	<0.0010	<0.0030
Alk-T	mg/L				85.9	105	98.2	71.8
Al-T	mg/L	6.55		3.47	8.76			
As-D	mg/L	0.0134		0.0173	0.0145	0.0125	0.00488	0.00933
As-T	mg/L	0.426		0.274	0.895			
Ba-D	mg/L	0.0983		0.107	0.108	0.113	0.103	0.0967
Ba-T	mg/L	0.147		0.141	0.239			
B-D	mg/L	0.011		0.013	0.012	0.022	0.013	<0.050
B-T	mg/L	0.017		0.020	0.021			
Ca-D	mg/L	27.9		33.0	33.0	39.6	34.2	25.2
Ca-T	mg/L	29.0		32.9	36.5			
Cd-D	mg/L	0.000047		0.000032	0.000021	0.000023	0.000017	0.0000230
Cd-T	mg/L	0.000316		0.000124	0.000323			
Cl-D	mg/L	0.53		0.53	0.68			<1.0
Co-D	mg/L	0.00124		0.00074	0.00139	0.00108	0.00049	0.00129
Cond	uS/cm		163	179	186	224	205	
Co-T	mg/L	0.00982		0.00504	0.0124			
Cr-D	mg/L	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.0010
Cr-T	mg/L	0.00589		0.00363	0.00652			
Cu-D	mg/L	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	0.00034
Cu-T	mg/L	0.0186		0.00882	0.0251			
DOC	mg/L			<0.50	<0.50	<0.50	<0.50	1.07
DO-F	mg/L		1.38					
F-D	mg/L	0.037		0.025	0.022			0.038
Fe-D	mg/L	0.161		0.270	0.322	0.326	0.057	0.0383
Fe-T	mg/L	17.3		11.2	31.0			
Hardness	mg/L	82.0		96.5	96.1	115	99.5	73.9
Hg-D	mg/L	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.0000020
Hg-T	mg/L	0.000057		0.000023	0.000027			
K-D	mg/L	0.19		0.21	0.20	0.20	0.20	0.197
K-T	mg/L	0.85		0.58	1.33			
Li-D	mg/L	0.00523		0.00462	0.00503	0.00511	0.00458	0.0042
Li-T	mg/L	0.0118		0.00790	0.0116			
Mg-D	mg/L	2.98		3.44	3.34	4.00	3.43	2.65
Mg-T	mg/L	4.20		3.81	5.43			
Mn-D	mg/L	0.186		0.102	0.192	0.140	0.0608	0.126
Mn-T	mg/L	0.369		0.176	0.430			
Mo-D	mg/L	0.000152		0.000166	0.000117	0.000106	0.000095	<0.0010
Mo-T	mg/L	0.000721		0.00100	0.000796			
Na-D	mg/L	1.07		1.33	1.33	1.40	1.15	1.00
Na-T	mg/L	1.14		1.32	1.38			
Ni-D	mg/L	0.00127		0.00102	0.00081	0.00090	0.00071	<0.0010
Ni-T	mg/L	0.0104		0.00679	0.0126			
N-NH3	mg/L			<0.0050	<0.0050			
N-NO2	mg/L	<0.0010		<0.0010	<0.0010			
N-NO3	mg/L	<0.0050		0.0144	0.0106			
N-T	mg/L	<0.050		<0.050	<0.10			
Pb-D	mg/L	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.00020
Pb-T	mg/L	0.00273		0.00131	0.00618			
P-D	mg/L	<0.050		<0.050	<0.050	<0.050	<0.050	0.0024
pH-L	pH Units		6.13	7.70	7.70	6.49	6.37	
P-T(LL)	mg/L	0.054		<0.050	0.102			
S2-T	mg/L	<0.0020		<0.0020	0.0031	<2.0	<0.020	<0.0050
Sb-D	mg/L	0.00224		0.00334	0.00153	0.00099	0.00141	0.00205
Sb-T	mg/L	0.0139		0.0119	0.0160			
S-D	mg/L	2.80		3.29	3.20	3.84	3.39	<3.0
Se-D	mg/L	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Se-T	mg/L	0.00011		<0.00010	0.00014			
Si-D	mg/L	2.77		2.87	2.90	2.92	2.81	3.12
Si-T	mg/L	15.7		8.53	24.6			
Sn-D	mg/L	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.0050
Sn-T	mg/L	0.00026		<0.00010	0.00030			
SO4-D	mg/L	8.80		9.66	9.59	11.3	9.69	7.1
Sr-D	mg/L	0.0304		0.0354	0.0360	0.0453	0.0406	0.0270
Sr-T	mg/L	0.0355		0.0404	0.0457			
S-T	mg/L	2.99		3.30	3.42			
TDS-L	mg/L			111	114			
Ti-D	mg/L	<0.010		<0.010	<0.010	<0.010	<0.010	<0.0050
Ti-T	mg/L	0.271		0.136	0.226			
Tl-D	mg/L	0.000012		0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tl-T	mg/L	0.000087		0.000051	0.000130			
TOC	mg/L	<0.50		1.58	3.50			
TSS	mg/L	226		97.3	442			
Turb	NTU	308		172	521			307
U-D	mg/L	0.000028		0.000032	0.000041	0.000043	0.000027	<0.00010
U-T	mg/L	0.000601		0.000342	0.00162			
Zn-D	mg/L	0.0049		0.0043	0.0025	0.0022	0.0017	<0.0050
Zn-T	mg/L	0.0323		0.0197	0.0474			

Bolded Red indictaes parameter is above CSR-AW for Arsenic (0.05mg/L) and Sulphide (0.02 mg/L)

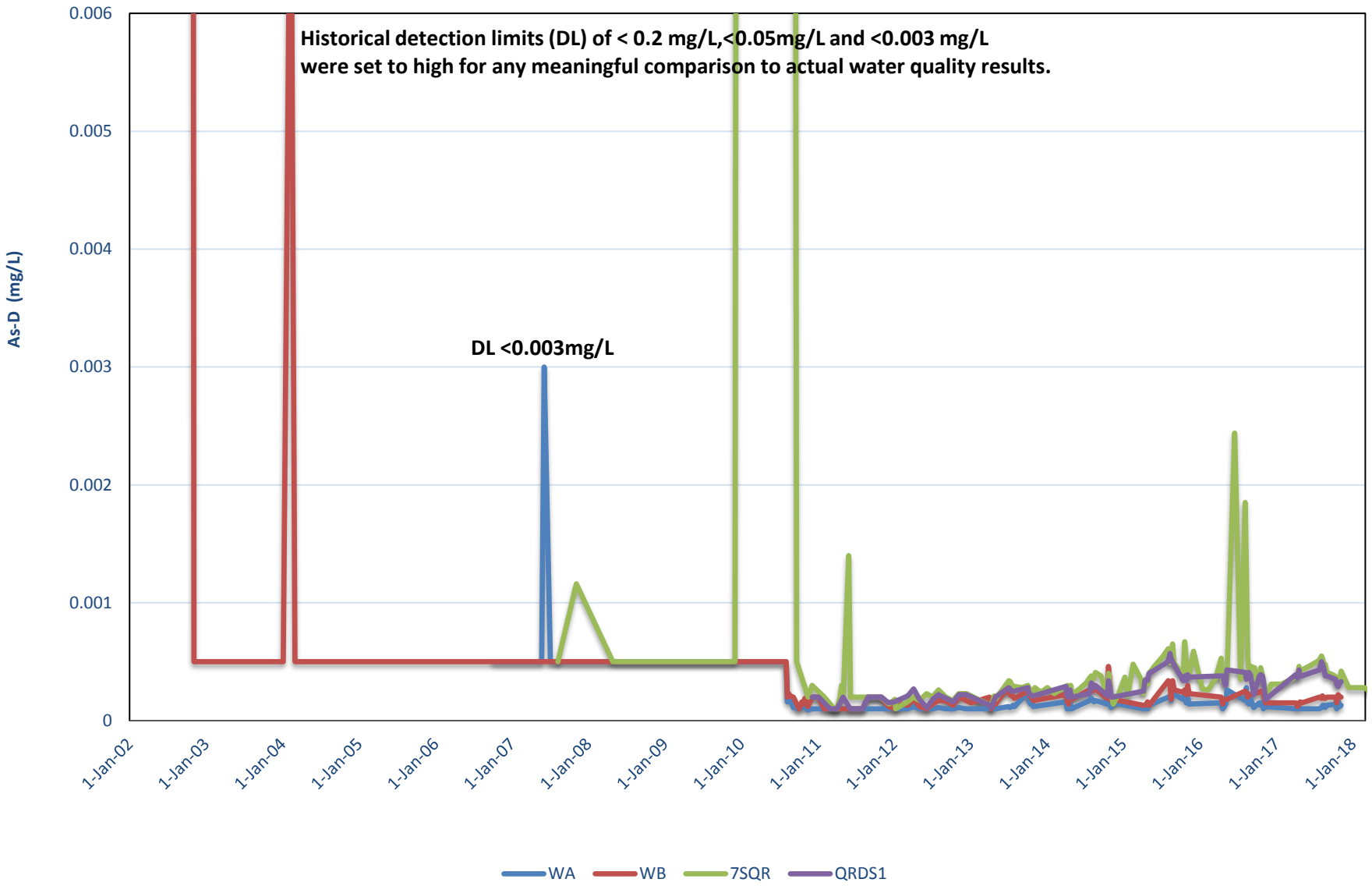
TABLE 7
242 WATER QUALITY

242MW	242 Borehole into Mine Pool	
Date		07-Feb-18
Acidity45	mg/L	<1.0
Acidity83	mg/L	19.3
Ag-D	mg/L	<0.000020
Ag-T	mg/L	
Al-D	mg/L	0.0255
Alk-T	mg/L	33.7
Al-T	mg/L	
As-D	mg/L	0.00065
As-T	mg/L	
Ba-D	mg/L	0.0376
Ba-T	mg/L	
B-D	mg/L	0.074
B-T	mg/L	
Ca-D	mg/L	35.8
Ca-T	mg/L	
Cd-D	mg/L	0.0000207
Cd-T	mg/L	
Cl-D	mg/L	<1.0
Co-D	mg/L	0.00254
Cond	uS/cm	
Co-T	mg/L	
Cr-D	mg/L	<0.0010
Cr-T	mg/L	
Cu-D	mg/L	0.00044
Cu-T	mg/L	
DOC	mg/L	<0.50
DO-F	mg/L	
F-D	mg/L	0.051
Fe-D	mg/L	1.46
Fe-T	mg/L	
Hardness	mg/L	98.9
Hg-D	mg/L	<0.0000020
Hg-T	mg/L	
K-D	mg/L	0.459
K-T	mg/L	
Li-D	mg/L	0.0050
Li-T	mg/L	
Mg-D	mg/L	2.31
Mg-T	mg/L	
Mn-D	mg/L	0.341
Mn-T	mg/L	
Mo-D	mg/L	<0.0010
Mo-T	mg/L	
Na-D	mg/L	2.32
Na-T	mg/L	
Ni-D	mg/L	0.0044
Ni-T	mg/L	
N-NH3	mg/L	
N-NO2	mg/L	
N-NO3	mg/L	
N-T	mg/L	
Pb-D	mg/L	<0.00020
Pb-T	mg/L	
P-D	mg/L	0.0022
pH-L	pH Units	6.54
P-T(LL)	mg/L	
S2-T	mg/L	0.0108
Sb-D	mg/L	<0.00050
Sb-T	mg/L	
S-D	mg/L	24.2
Se-D	mg/L	<0.00010
Se-T	mg/L	
Si-D	mg/L	4.06
Si-T	mg/L	
Sn-D	mg/L	<0.0050
Sn-T	mg/L	
SO4-D	mg/L	67.7
Sr-D	mg/L	0.0593
Sr-T	mg/L	
S-T	mg/L	
TDS-L	mg/L	
Ti-D	mg/L	<0.0050
Ti-T	mg/L	
Tl-D	mg/L	0.000251
Tl-T	mg/L	
TOC	mg/L	
TSS	mg/L	
Turb	NTU	2.88
U-D	mg/L	<0.00010
U-T	mg/L	
Zn-D	mg/L	0.0125
Zn-T	mg/L	

Historical Total Arsenic
Quinsam River



Historical Dissolved Arsenic
Quinsam River



Historical to Present Arsenic Concentrations on the Quinsam River

Quinsam River - Dissolved Arsenic (mg/L)

Date	As-D mg/L WA	As-D mg/L WB	As-D mg/L 7SQR	As-D mg/L QRDS1
14-Jan-02		0.2		
11-Feb-02		0.2		
11-Mar-02		0.2		
8-Apr-02		0.05		
6-May-02		0.05		
3-Jun-02		0.05		
1-Jul-02		0.05		
5-Aug-02		0.05		
2-Sep-02		0.05		
14-Oct-02		0.05		
4-Nov-02		0.0005		
2-Dec-02		0.0005		
6-Jan-03		0.0005		
3-Feb-03		0.0005		
10-Mar-03		0.0005		
14-Apr-03		0.0005		
5-May-03		0.0005		
2-Jun-03		0.0005		
7-Jul-03		0.0005		
18-Aug-03		0.0005		
1-Sep-03		0.0005		
1-Oct-03		0.0005		
3-Nov-03		0.0005		
3-Dec-03		0.0005		
5-Jan-04		0.0005		
9-Feb-04		0.008		
1-Mar-04		0.0005		
19-Apr-04		0.0005		
17-May-04		0.0005		
2-Jun-04		0.0005		
20-Jul-04		0.0005		
10-Aug-04		0.0005		
2-Sep-04		0.0005		
5-Oct-04		0.0005		
9-Nov-04		0.0005		
1-Dec-04		0.0005		
18-Jan-05		0.0005		
1-Feb-05		0.0005		
1-Mar-05		0.0005		

6-Apr-05		0.0005	
2-May-05		0.0005	
6-Jun-05		0.0005	
4-Jul-05		0.0005	
15-Aug-05		0.0005	
7-Sep-05		0.0005	
3-Oct-05		0.0005	
1-Nov-05		0.0005	
5-Dec-05		0.0005	
6-Jan-06		0.0005	
14-Feb-06		0.0005	
6-Mar-06		0.0005	
3-Apr-06		0.0005	
2-May-06		0.0005	
12-Jun-06		0.0005	
6-Jul-06		0.0005	
2-Aug-06		0.0005	
7-Sep-06		0.0005	
3-Oct-06	0.0005	0.0005	
1-Nov-06	0.0005	0.0005	
5-Dec-06	0.0005	0.0005	
2-Jan-07	0.0005	0.0005	
2-Jan-07	0.0005		
6-Feb-07	0.0005	0.0005	
6-Mar-07	0.0005	0.0005	
3-Apr-07	0.0005	0.0005	
23-May-07	0.0005	0.0005	
5-Jun-07	0.003	0.0005	
4-Jul-07	0.0005	0.0005	
1-Aug-07	0.0005	0.0005	
9-Aug-07			0.0005
5-Sep-07	0.0005	0.0005	
2-Oct-07	0.0005	0.0005	
1-Nov-07	0.0005	0.0005	
5-Nov-07			0.00116
4-Dec-07	0.0005	0.0005	
2-Jan-08		0.0005	
5-Feb-08	0.0005	0.0005	
4-Mar-08	0.0005	0.0005	
1-Apr-08	0.0005	0.0005	
27-Apr-08			0.0005
6-May-08	0.0005	0.0005	
2-Jun-08	0.0005	0.0005	
15-Jul-08	0.0005	0.0005	
7-Aug-08	0.0005	0.0005	
9-Sep-08	0.0005	0.0005	
29-Sep-08			0.0005

7-Oct-08			0.0005
14-Oct-08	0.0005	0.0005	0.0005
21-Oct-08			0.0005
28-Oct-08			0.0005
3-Nov-08	0.0005	0.0005	
1-Dec-08	0.0005		
2-Dec-08		0.0005	
4-Jan-09	0.0005	0.0005	
3-Feb-09	0.0005	0.0005	
2-Mar-09	0.0005		
3-Mar-09		0.0005	
24-Mar-09			0.0005
31-Mar-09			0.0005
6-Apr-09	0.0005	0.0005	
7-Apr-09			0.0005
13-Apr-09			0.0005
20-Apr-09			0.0005
4-May-09		0.0005	
5-May-09	0.0005		0.0005
1-Jun-09	0.0005	0.0005	
2-Jun-09			0.0005
6-Jul-09			0.0005
7-Jul-09		0.0005	
8-Jul-09	0.0005		
4-Aug-09	0.0005		
5-Aug-09		0.0005	0.0005
31-Aug-09		0.0005	
1-Sep-09	0.0005		0.0005
30-Sep-09			0.0005
1-Oct-09	0.0005	0.0005	
2-Nov-09		0.0005	
3-Nov-09	0.0005		
5-Nov-09			0.0005
30-Nov-09		0.0005	
1-Dec-09	0.0005		
2-Dec-09			0.0005
5-Jan-10	0.0005	0.0005	
1-Feb-10		0.0005	
2-Feb-10	0.0005		
2-Mar-10	0.0005	0.0005	
6-Apr-10		0.0005	
7-Apr-10	0.0005		
26-Apr-10			0.2
3-May-10	0.0005	0.0005	
31-May-10	0.0005	0.0005	
5-Jul-10	0.0005	0.0005	
3-Aug-10	0.0005	0.0005	

9-Aug-10	0.00016	0.0002		
16-Aug-10	0.00021	0.00023		
23-Aug-10		0.00021		
7-Sep-10	0.00011	0.0002		
23-Sep-10			0.0005	
4-Oct-10	0.0001			
5-Oct-10		0.0001		
18-Oct-10	0.00011	0.00016		
25-Oct-10	0.00014	0.00014		
1-Nov-10		0.00019		
2-Nov-10	0.00015			
8-Nov-10	0.0001	0.00018		
15-Nov-10	9.00E-05	0.00012		
16-Nov-10			0.0002	
6-Dec-10	0.0001		0.0003	0.0002
7-Dec-10		0.0002		
4-Jan-11		0.0002		
5-Jan-11	0.0001			0.0002
31-Jan-11	0.0001			
1-Feb-11		0.0001		
2-Feb-11			0.0002	
1-Mar-11	0.0001			0.0001
3-Mar-11		0.0001		
22-Mar-11			0.0001	
4-Apr-11	0.0001		0.0001	0.0001
5-Apr-11		0.0001		
18-Apr-11			0.0002	
25-Apr-11			0.0003	
2-May-11	0.0001	0.0001		0.0002
3-May-11			0.0002	
30-May-11			0.0014	
6-Jun-11	0.0001	0.0001		0.0001
7-Jun-11			0.0002	
4-Jul-11			0.0002	
5-Jul-11	0.0001	0.0001		0.0001
2-Aug-11	0.0001			
3-Aug-11		0.0001	0.0002	
4-Aug-11				0.0001
30-Aug-11	0.0001	0.0002	0.0002	0.0002
3-Oct-11			0.0002	
5-Oct-11	0.0001	0.0002		0.0002
1-Nov-11		0.0002	0.0002	
2-Nov-11	0.0001			0.0002
5-Dec-11	0.0001			0.00015
6-Dec-11		0.00012		
7-Dec-11			0.00014	
3-Jan-12	0.0001			0.00016

5-Jan-12		0.0001	0.00018	
9-Jan-12			0.0001	
7-Feb-12	0.0001	0.00014		
6-Mar-12			0.00016	
7-Mar-12	0.0001	0.00013		0.00021
2-Apr-12		0.00018		
3-Apr-12	0.00012		0.0002	0.00027
1-May-12	0.0001		0.00017	0.00018
2-May-12		0.00012		
5-Jun-12		0.0001	0.00023	
6-Jun-12	0.0001			0.00011
3-Jul-12			0.0002	
4-Jul-12	0.0001	0.00014		0.00018
31-Jul-12	0.00011	0.00017		0.00022
1-Aug-12			0.00026	
4-Sep-12		0.00017	0.0002	
5-Sep-12	0.0001			0.00019
9-Oct-12		0.00013	0.00017	
10-Oct-12	0.0001			0.00016
5-Nov-12		0.0002	0.00023	
6-Nov-12	0.00011			0.00022
11-Dec-12	0.0001	0.00017		0.00022
12-Dec-12			0.00023	
2-Jan-13	0.0001	0.00015		
1-Apr-13		0.0002		
3-Apr-13	0.0001			0.00013
4-Apr-13			0.00013	
8-Apr-13	0.0001			0.00011
9-Apr-13		0.0001		
12-Apr-13			0.00015	
15-Apr-13	0.0001	0.00012	0.00015	0.00014
22-Apr-13	0.0001	0.00015		0.00017
23-Apr-13			0.00021	
29-Apr-13	0.0001	0.00014	0.00018	0.0002
2-Jul-13	0.00012			0.00028
3-Jul-13		0.00029	0.00034	
8-Jul-13	0.00011	0.00022		0.00027
10-Jul-13			0.00033	
15-Jul-13		0.00021	0.00031	0.00025
15-Jul-13		0.00021	0.00031	0.00025
16-Jul-13	0.00012			
22-Jul-13	0.00013	0.00021	0.00029	0.00025
29-Jul-13	0.00012	0.00019	0.00029	0.00025
3-Sep-13			0.00028	
1-Oct-13	0.00024	0.00025	0.0003	0.00028
7-Oct-13	0.00016	0.00022		0.00023
8-Oct-13			0.00027	

15-Oct-13	0.00014	0.0002	0.00026	0.00022
21-Oct-13	0.00015	0.00019	0.00022	0.00021
28-Oct-13	0.00012	0.00017	0.00024	0.00021
4-Nov-13			0.00028	
2-Dec-13			0.00024	
2-Jan-14			0.00028	
5-Feb-14			0.00023	
2-Apr-14	0.00016	0.00022	0.00029	0.00029
7-Apr-14	0.0001	0.00017		0.00021
10-Apr-14			0.0003	
14-Apr-14	0.0001	0.00014		0.0002
16-Apr-14			0.00021	
21-Apr-14	0.00016	0.00021		0.00026
24-Apr-14			0.0003	
28-Apr-14	0.0001	0.00018		0.0002
1-May-14			0.00022	
5-Jun-14			0.00027	
7-Jul-14			0.00032	
23-Jul-14	0.00017	0.00026	0.00036	0.00023
31-Jul-14	0.00019	0.00026	0.00038	0.00032
5-Aug-14	0.00018	0.00025		0.00031
7-Aug-14			0.00035	
13-Aug-14	0.00016	0.00028		0.00028
14-Aug-14			0.00037	
20-Aug-14	0.00017	0.00027	0.00041	0.0003
16-Sep-14			0.00038	
8-Oct-14			0.00026	
15-Oct-14	0.00014	0.00019	0.00025	0.00021
22-Oct-14	0.00025	0.00046		0.00034
23-Oct-14			0.0004	
27-Oct-14	0.00015	0.00035	0.00032	0.0003
3-Nov-14	0.00011	0.00017		0.0002
4-Nov-14			0.00022	
12-Nov-14	0.00015	0.00018		0.0002
13-Nov-14			0.00014	
8-Dec-14			0.00022	
8-Jan-15			0.00037	
21-Jan-15			0.00021	
17-Feb-15			0.00048	
26-Mar-15			0.00035	
7-Apr-15	0.0001	0.00013	0.00023	0.00025
14-Apr-15	0.0001	0.00013	0.00031	0.00034
20-Apr-15	0.0001	0.00014	0.00035	0.00035
27-Apr-15	0.0001	0.00016		0.00034
28-Apr-15			0.00031	
4-May-15	0.00013	0.00013	0.0004	0.0004
3-Jun-15			0.00047	

7-Jul-15			0.00054	
4-Aug-15	0.0002	0.00034	0.00061	0.0005
12-Aug-15	0.00021	0.00031	0.00049	0.00057
17-Aug-15	0.00017	0.00018	0.00056	0.00053
24-Aug-15	0.00023	0.00034	0.00065	0.0005
31-Aug-15			0.00049	
1-Sep-15		0.00026		0.00047
14-Oct-15	0.00018	0.00024	0.00038	0.00034
21-Oct-15	0.00023	0.00026	0.00067	0.00038
28-Oct-15	0.00015	0.00022	0.0005	0.00034
4-Nov-15	0.0002	0.0003	0.00038	0.00039
10-Nov-15	0.00014	0.00023	0.00037	0.00037
2-Dec-15			0.00059	
13-Jan-16			0.00027	
10-Feb-16			0.00026	
17-Mar-16			0.00036	
12-Apr-16	0.00015	0.0002	0.00053	0.00038
19-Apr-16	0.0001	0.00014	0.00033	0.00038
27-Apr-16	0.00012	0.00018	0.00032	0.00032
3-May-16	0.00014	0.00018	0.0003	0.0003
10-May-16	0.00026	0.00018	0.00035	0.00043
15-Jun-16			0.00244	
14-Jul-16			0.00035	
4-Aug-16	0.00017	0.00025	0.00185	0.00041
11-Aug-16	0.00028	0.00024	0.00127	0.00035
16-Aug-16	0.00015	0.0002	0.00054	0.0004
22-Aug-16	0.00014	0.00022	0.00042	0.00041
29-Aug-16	0.00019	0.00022	0.00046	0.00039
14-Sep-16	0.00011			
15-Sep-16				0.00022
19-Sep-16			0.00045	
26-Sep-16			0.00035	
12-Oct-16	0.00015	0.00024	0.00036	0.00038
18-Oct-16	0.00013	0.00025	0.00045	0.00039
26-Oct-16	0.00015	0.00025	0.00039	0.00038
31-Oct-16	0.0001	0.00023	0.00034	0.00034
10-Nov-16	0.00012	0.00015	0.0002	0.00018
7-Dec-16			0.00031	
26-Jan-17			0.00031	
22-Mar-17			0.00036	
4-Apr-17	0.0001	0.00015	0.00037	0.00039
12-Apr-17	0.0001	0.00012	0.00036	0.00036
19-Apr-17	0.00011	0.00014	0.00046	0.00043
24-Apr-17	0.0001	0.00016	0.00041	0.00038
3-May-17	0.0001	0.00015	0.00043	0.00038
5-Jun-17			0.00046	
25-Jul-17			0.00051	

26-Jul-17	0.0001	0.0002		0.00043
4-Aug-17	0.00011	0.00019	0.00055	0.0005
9-Aug-17		0.00021	0.00053	
10-Aug-17	0.00013			0.00048
17-Aug-17	0.00013	0.00019	0.00046	0.00043
22-Aug-17	0.00011	0.00019	0.00048	0.00038
30-Aug-17	0.00013	0.0002	0.00041	0.00038
27-Sep-17			0.00039	
11-Oct-17	0.00014	0.0002		0.00035
12-Oct-17			0.00037	
16-Oct-17	0.0001	0.00015		0.00031
18-Oct-17			0.00031	
23-Oct-17	0.00017	0.00022	0.00034	0.00029
30-Oct-17	0.00012	0.0002	0.00035	0.00032
6-Nov-17	0.00013	0.0002		0.00033
7-Nov-17			0.00042	
12-Dec-17			0.00028	
24-Jan-18			0.00028	
27-Feb-18			0.00028	
20-Mar-18			0.00025	

Historical to Present Arsenic Concentrations on the Quinsam River

Date	As-T mg/L WA	As-T mg/L WB	As-T mg/L 7SQR	As-T mg/L QRDS1	As-T mg/L WQG-Max
14-Jan-02		0.2			0.005
11-Feb-02		0.2			0.005
11-Mar-02		0.2			0.005
8-Apr-02		0.05			0.005
6-May-02		0.2			0.005
3-Jun-02		0.2			0.005
1-Jul-02		0.2			0.005
5-Aug-02		0.2			0.005
2-Sep-02		0.2			0.005
14-Oct-02		0.2			0.005
4-Nov-02		0.0005			0.005
2-Dec-02		0.0005			0.005
6-Jan-03		0.0005			0.005
3-Feb-03		0.0005			0.005
10-Mar-03		0.0005			0.005
14-Apr-03		0.0005			0.005
5-May-03		0.0005			0.005
2-Jun-03		0.0005			0.005
7-Jul-03		0.0005			0.005
18-Aug-03		0.0005			0.005
1-Sep-03		0.0005			0.005
1-Oct-03		0.0005			0.005
3-Nov-03		0.0005			0.005
3-Dec-03		0.0005			0.005
5-Jan-04		0.0005			0.005
9-Feb-04		0.0005			0.005
1-Mar-04		0.0005			0.005
19-Apr-04		0.0005			0.005
########		0.0005			0.005
2-Jun-04		0.0005			0.005
20-Jul-04		0.0005			0.005
10-Aug-04		0.0005			0.005
2-Sep-04		0.0005			0.005
5-Oct-04		0.0005			0.005
9-Nov-04		0.0005			0.005
1-Dec-04		0.0005			0.005
18-Jan-05		0.0005			0.005
1-Feb-05		0.0005			0.005
1-Mar-05		0.0005			0.005
6-Apr-05		0.0005			0.005
2-May-05		0.0005			0.005
6-Jun-05		0.0005			0.005

4-Jul-05		0.00077		0.005
15-Aug-05		0.0005		0.005
7-Sep-05		0.0005		0.005
3-Oct-05		0.0005		0.005
1-Nov-05		0.0005		0.005
5-Dec-05		0.0005		0.005
6-Jan-06		0.0005		0.005
14-Feb-06		0.0005		0.005
6-Mar-06		0.0005		0.005
3-Apr-06		0.0005		0.005
2-May-06		0.0005		0.005
12-Jun-06		0.0005		0.005
6-Jul-06		0.0005		0.005
2-Aug-06		0.0005		0.005
7-Sep-06		0.0005		0.005
3-Oct-06	0.0005	0.0005		0.005
1-Nov-06	0.0005	0.0005		0.005
5-Dec-06	0.0005	0.0005		0.005
2-Jan-07	0.0005	0.0005		0.005
2-Jan-07	0.0005			0.005
6-Feb-07	0.0005	0.0005		0.005
6-Mar-07	0.0005	0.0005		0.005
3-Apr-07	0.0005	0.0005		0.005
########	0.0005	0.0005		0.005
5-Jun-07	0.0005	0.0008		0.005
4-Jul-07	0.0005	0.0005		0.005
1-Aug-07	0.0005	0.0005		0.005
9-Aug-07			0.0005	0.005
5-Sep-07	0.0005	0.0005		0.005
2-Oct-07	0.0005	0.0005		0.005
1-Nov-07	0.0005	0.0005		0.005
5-Nov-07			0.00119	0.005
4-Dec-07	0.0005	0.0005		0.005
2-Jan-08		0.0005		0.005
5-Feb-08	0.0005	0.0005		0.005
4-Mar-08	0.0005	0.0005		0.005
1-Apr-08	0.0005	0.0005		0.005
27-Apr-08			0.0005	0.005
6-May-08	0.0005	0.0005		0.005
2-Jun-08	0.0005	0.0005		0.005
15-Jul-08	0.0005	0.0005		0.005
7-Aug-08	0.0005	0.0005		0.005
9-Sep-08	0.0005	0.0005		0.005
29-Sep-08			0.0005	0.005
7-Oct-08			0.0005	0.005
14-Oct-08	0.0005	0.0005	0.00055	0.005
21-Oct-08			0.0005	0.005

28-Oct-08			0.0005	0.005
3-Nov-08	0.0005	0.0005		0.005
1-Dec-08	0.0005			0.005
2-Dec-08		0.0005		0.005
4-Jan-09	0.0005	0.0005		0.005
3-Feb-09	0.0005	0.0005		0.005
2-Mar-09	0.0005			0.005
3-Mar-09		0.0005		0.005
24-Mar-09			0.0005	0.005
31-Mar-09			0.0005	0.005
6-Apr-09	0.0005	0.0005		0.005
7-Apr-09			0.0005	0.005
13-Apr-09			0.0005	0.005
20-Apr-09			0.0005	0.005
4-May-09		0.0005		0.005
5-May-09	0.0005		0.0005	0.005
1-Jun-09	0.0005	0.0005		0.005
2-Jun-09			0.0005	0.005
6-Jul-09			0.0005	0.005
7-Jul-09		0.0005		0.005
8-Jul-09	0.0005			0.005
4-Aug-09	0.0005			0.005
5-Aug-09		0.0005	0.0005	0.005
31-Aug-09		0.0005		0.005
1-Sep-09	0.0005		0.0005	0.005
30-Sep-09			0.0005	0.005
1-Oct-09	0.0005	0.0005		0.005
2-Nov-09		0.0005		0.005
3-Nov-09	0.0005			0.005
5-Nov-09			0.0005	0.005
30-Nov-09		0.0005		0.005
1-Dec-09	0.0005			0.005
2-Dec-09			0.0005	0.005
5-Jan-10	0.0005	0.0005		0.005
1-Feb-10		0.0005		0.005
2-Feb-10	0.2			0.005
2-Mar-10	0.2	0.0005		0.005
6-Apr-10		0.0005		0.005
7-Apr-10	0.2			0.005
26-Apr-10			0.2	0.005
3-May-10	0.2	0.0005		0.005
########	0.2	0.0005		0.005
5-Jul-10	0.0005	0.0005		0.005
3-Aug-10	0.0005	0.0005		0.005
9-Aug-10	0.00012	0.00018		0.005
16-Aug-10	0.00018	0.0002		0.005
23-Aug-10		0.00023		0.005

7-Sep-10	0.00012	0.0002			0.005
23-Sep-10			0.0005		0.005
4-Oct-10	0.0001				0.005
5-Oct-10		0.0002			0.005
18-Oct-10	0.00012	0.00016			0.005
25-Oct-10	0.00011	0.00015			0.005
1-Nov-10		0.00018			0.005
2-Nov-10	0.00013				0.005
8-Nov-10	0.00018	0.00019			0.005
15-Nov-10	0.00012	0.00016			0.005
16-Nov-10			0.0002		0.005
6-Dec-10	0.0001		0.0001	0.0001	0.005
7-Dec-10		0.0003			0.005
4-Jan-11		0.0001			0.005
5-Jan-11	0.0001			0.0001	0.005
31-Jan-11	0.0001				0.005
1-Feb-11		0.0002			0.005
2-Feb-11			0.0002		0.005
1-Mar-11	0.0001			0.0002	0.005
3-Mar-11		0.0001			0.005
22-Mar-11			0.0002		0.005
4-Apr-11	0.0001		0.0001	0.0001	0.005
5-Apr-11		0.0001			0.005
18-Apr-11			0.0002		0.005
25-Apr-11			0.0001		0.005
2-May-11	0.0001	0.0001		0.0001	0.005
3-May-11			0.0001		0.005
########			0.0002		0.005
6-Jun-11	0.0001	0.0001		0.0001	0.005
7-Jun-11			0.0002		0.005
4-Jul-11			0.0003		0.005
5-Jul-11	0.0001	0.0001		0.0002	0.005
2-Aug-11	0.0001				0.005
3-Aug-11		0.0001	0.0002		0.005
4-Aug-11				0.0001	0.005
30-Aug-11	0.0001	0.0001	0.0002	0.0002	0.005
3-Oct-11			0.0003		0.005
5-Oct-11	0.0002	0.0001		0.0002	0.005
1-Nov-11		0.0002	0.0002		0.005
2-Nov-11	0.0001			0.0002	0.005
5-Dec-11	0.0001			0.0002	0.005
6-Dec-11		0.0001			0.005
7-Dec-11			0.0002		0.005
3-Jan-12	0.0001			0.0002	0.005
5-Jan-12		0.0001	0.0002		0.005
9-Jan-12			0.0001		0.005
7-Feb-12	0.0001	0.0001			0.005

6-Mar-12			0.0002		0.005
7-Mar-12	0.0001	0.0001		0.0002	0.005
2-Apr-12		0.0002			0.005
3-Apr-12	0.0001		0.0003	0.0004	0.005
1-May-12	0.00011		0.00022	0.00016	0.005
2-May-12		0.00014			0.005
5-Jun-12		0.00015	0.00011		0.005
6-Jun-12	0.0001			0.00017	0.005
3-Jul-12			0.00021		0.005
4-Jul-12	0.0001	0.00013		0.00018	0.005
31-Jul-12	0.0001	0.00017		0.00022	0.005
1-Aug-12			0.0003		0.005
4-Sep-12		0.00016	0.00023		0.005
5-Sep-12	0.00011			0.0002	0.005
9-Oct-12		0.00015	0.0002		0.005
10-Oct-12	0.00012			0.00018	0.005
5-Nov-12		0.00023	0.00029		0.005
6-Nov-12	0.00012			0.00045	0.005
11-Dec-12	0.0001	0.00027		0.00027	0.005
12-Dec-12			0.00025		0.005
2-Jan-13	0.0001	0.00018			0.005
1-Apr-13		0.00011			0.005
3-Apr-13	0.0001			0.00017	0.005
4-Apr-13			0.00018		0.005
8-Apr-13	0.0001			0.00013	0.005
9-Apr-13		0.00013			0.005
12-Apr-13			0.00018		0.005
15-Apr-13	0.0001	0.00013	0.00015	0.00017	0.005
22-Apr-13	0.00011	0.00016		0.00019	0.005
23-Apr-13			0.00014		0.005
29-Apr-13	0.0001	0.00017	0.00018	0.00015	0.005
2-Jul-13	0.00017			0.00033	0.005
3-Jul-13		0.00032	0.00042		0.005
8-Jul-13	0.00012	0.00023		0.00027	0.005
10-Jul-13			0.00044		0.005
15-Jul-13		0.00026	0.00038	0.00029	0.005
15-Jul-13		0.00026	0.00038	0.00029	0.005
16-Jul-13	0.00017				0.005
22-Jul-13	0.00018	0.00023	0.00037	0.00035	0.005
29-Jul-13	0.00017	0.00023	0.00038	0.00033	0.005
3-Sep-13			0.00038		0.005
1-Oct-13	0.00032	0.0003	0.00043	0.00038	0.005
7-Oct-13	0.00016	0.00025		0.00026	0.005
8-Oct-13			0.00039		0.005
15-Oct-13	0.00015	0.00026	0.0003	0.00022	0.005
21-Oct-13	0.00013	0.00026	0.00028	0.00048	0.005
28-Oct-13	0.00015	0.00027	0.00033	0.00025	0.005

4-Nov-13			0.00034		0.005
2-Dec-13			0.00028		0.005
2-Jan-14			0.0004		0.005
5-Feb-14			0.00029		0.005
2-Apr-14	0.0001	0.00019	0.00021	0.00023	0.005
7-Apr-14	0.0001	0.0002		0.00019	0.005
10-Apr-14			0.00098		0.005
14-Apr-14	0.0001	0.00018		0.00029	0.005
16-Apr-14			0.00025		0.005
21-Apr-14	0.0001	0.00015		0.00021	0.005
24-Apr-14			0.00032		0.005
28-Apr-14	0.00011	0.00019		0.00034	0.005
1-May-14			0.00021		0.005
5-Jun-14			0.0003		0.005
7-Jul-14			0.00031		0.005
23-Jul-14	0.00014	0.00026	0.00036	0.00026	0.005
31-Jul-14	0.00016	0.00022	0.00046	0.00035	0.005
5-Aug-14	0.00018	0.00029		0.00033	0.005
7-Aug-14			0.0004		0.005
13-Aug-14	0.00015	0.00027		0.00026	0.005
14-Aug-14			0.00044		0.005
20-Aug-14	0.00017	0.00025	0.00038	0.00028	0.005
16-Sep-14			0.00042		0.005
8-Oct-14			0.00032		0.005
15-Oct-14	0.00016	0.00019	0.00031	0.00024	0.005
22-Oct-14	0.00031	0.00043		0.00044	0.005
23-Oct-14			0.00046		0.005
27-Oct-14	0.00017	0.00035	0.00032	0.0003	0.005
3-Nov-14	0.00014	0.00018		0.00023	0.005
4-Nov-14			0.00024		0.005
12-Nov-14	0.00018	0.00019		0.00022	0.005
13-Nov-14			0.00024		0.005
8-Dec-14			0.00025		0.005
8-Jan-15			0.00032		0.005
21-Jan-15			0.00027		0.005
17-Feb-15			0.00048		0.005
26-Mar-15			0.0003		0.005
7-Apr-15	0.00014	0.00013	0.00027	0.00026	0.005
14-Apr-15	0.0001	0.00013	0.00032	0.00033	0.005
20-Apr-15	0.0001	0.00012	0.00036	0.00038	0.005
27-Apr-15	0.00015	0.00023		0.0005	0.005
28-Apr-15			0.00037		0.005
4-May-15	0.00011	0.00014	0.00039	0.00039	0.005
3-Jun-15			0.00051		0.005
7-Jul-15			0.00064		0.005
4-Aug-15	0.00029	0.00035	0.00059	0.0005	0.005
12-Aug-15	0.00018	0.00027	0.00056	0.0006	0.005

17-Aug-15	0.00021	0.00029	0.00056	0.00048	0.005
24-Aug-15	0.00016	0.00029	0.00066	0.00045	0.005
31-Aug-15			0.00094		0.005
1-Sep-15		0.00044		0.00047	0.005
14-Oct-15	0.0001	0.00025	0.00038	0.00033	0.005
21-Oct-15	0.00014	0.00022	0.00071	0.00036	0.005
28-Oct-15	0.0001	0.00024	0.00052	0.00037	0.005
4-Nov-15	0.00019	0.00031	0.00044	0.0004	0.005
10-Nov-15	0.00014	0.00025	0.00039	0.00038	0.005
2-Dec-15			0.00058		0.005
13-Jan-16			0.00035		0.005
10-Feb-16			0.00038		0.005
17-Mar-16			0.00028		0.005
12-Apr-16	0.00013	0.0001	0.00055	0.00035	0.005
19-Apr-16	0.00012	0.00014	0.00034	0.00035	0.005
27-Apr-16	0.0001	0.00015	0.00032	0.00033	0.005
3-May-16	0.0001	0.00016	0.00032	0.00029	0.005
########	0.0001	0.00016	0.00041	0.00044	0.005
15-Jun-16			0.00038		0.005
14-Jul-16			0.00038		0.005
4-Aug-16	0.00011	0.00022	0.00388	0.00041	0.005
11-Aug-16	0.00012	0.0002	0.00558	0.0004	0.005
16-Aug-16	0.00014	0.00022	0.00062	0.00041	0.005
22-Aug-16	0.00019	0.00027	0.00045	0.00043	0.005
29-Aug-16	0.00012	0.00018	0.00047	0.00039	0.005
14-Sep-16	0.00013				0.005
15-Sep-16				0.00022	0.005
19-Sep-16			0.0005		0.005
26-Sep-16			0.00037		0.005
12-Oct-16	0.00029	0.00037	0.00046	0.00037	0.005
18-Oct-16	0.00013	0.00031	0.00048	0.00045	0.005
26-Oct-16	0.00014	0.00027	0.00043	0.00046	0.005
31-Oct-16	0.00012	0.00025	0.00043	0.00039	0.005
10-Nov-16	0.0001	0.00013	0.00021	0.0002	0.005
7-Dec-16			0.00039		0.005
26-Jan-17			0.00033		0.005
22-Mar-17			0.00038		0.005
4-Apr-17	0.0001	0.00016	0.00037	0.00038	0.005
12-Apr-17	0.0001	0.00014	0.00038	0.0004	0.005
19-Apr-17	0.0001	0.00013	0.0005	0.00044	0.005
24-Apr-17	0.00011	0.00017	0.00043	0.0004	0.005
3-May-17	0.0001	0.00015	0.00047	0.00039	0.005
5-Jun-17			0.00052		0.005
25-Jul-17			0.00056		0.005
26-Jul-17	0.00013	0.00021		0.00045	0.005
4-Aug-17	0.00014	0.00021	0.00056	0.00047	0.005
9-Aug-17		0.0002	0.00052		0.005

10-Aug-17	0.00013			0.00047	0.005
17-Aug-17	0.00011	0.0002	0.00045	0.00047	0.005
22-Aug-17	0.00013	0.00025	0.00047	0.00048	0.005
30-Aug-17	0.00013	0.00019	0.00047	0.00043	0.005
27-Sep-17			0.00042		0.005
11-Oct-17	0.00012	0.00018		0.00034	0.005
12-Oct-17			0.0004		0.005
16-Oct-17	0.00013	0.00017		0.00042	0.005
18-Oct-17			0.00037		0.005
23-Oct-17	0.0002	0.00025	0.00039	0.00029	0.005
30-Oct-17	0.00012	0.00018	0.00037	0.00032	0.005
6-Nov-17	0.00011	0.00021		0.00036	0.005
7-Nov-17			0.00045		0.005
12-Dec-17			0.00031		0.005
24-Jan-18			0.0003		0.005
27-Feb-18			0.00027		0.005
20-Mar-18			0.00027		0.005

March 27th, 2018
Ministry of Environment and Climate Change Strategy
Environmental Protection Division
2080-A Labieux Rd
Nanaimo B.C., V9T 6J9
Phone: 250 751-3100

Dear Andrea Doll,

Quinsam Coal Corporation (QCC) is proposing to submit a mitigation plan to reduce the risk of Total Suspended Solids (TSS) occurring at the Settling Pond #4 discharge. The outline for this plan is detailed below.

Discharge from Settling Pond 4 (SP4):

With respect to the recent permit amendment application QCC proposes that additional evaluation of monitoring data and development of water management measures be undertaken to address the non-compliance issues associated with the SP4 discharge rather than preparing a Permit Amendment Application for discharge from this site.

On March 22nd, 2018 QCC and Lorax initiated an evaluation to confirm that the flow monitoring instrumentation is installed and calibrated correctly and examined the discharge rating curve for the SP4 water management structure. A salt dilution test was performed, and a staff gauge was installed in the settling pond. Further information will be required to confirm the quantity of water discharging from the decant riser is accurate. Data compilation will include a series of salt dilution tests performed under different flow conditions. A staff gauge will be installed in the downstream wetland for further reference. With this information, the need for additional water management measures will be evaluated to reduce flow to SP4, if necessary, to ensure that the average annual discharge rate is maintained at 0.08 m^3/d.

Total Suspended Solids at SP4 - A silt curtain will be installed during August 2018 when the water level is lowest in the wetland leading into SP4. QCC and Lorax will also prepare a TSS management plan that can be implemented during times when high levels of suspended solids are expected to be discharged from site. The below figure displays the TSS at Settling Pond 4 (WD) since 2011 as depicted in the figure TSS exceedances do not occur downstream at WC and the number of TSS exceedances are not a frequent occurrence at Settling Pond #4. The elevated TSS that occurred in 2016-17 were a result of extreme storm events occurring at the mine site. Since 2010 only 18 TSS results were greater than 25mg/L with 13 of them occurring in 2016-2017 monitoring year. There were no TSS exceedances in 2017-2018 monitoring year.

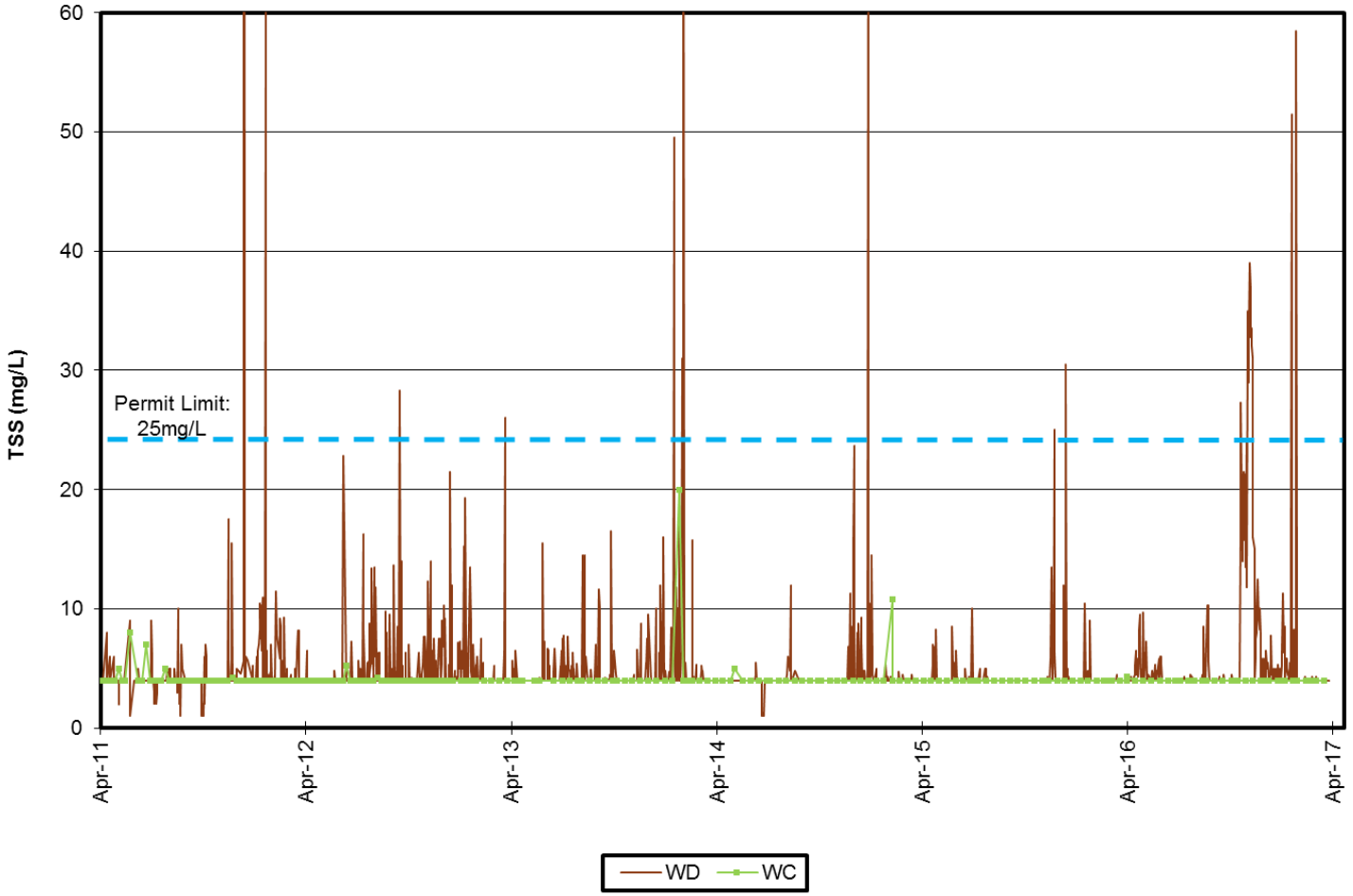
QCC intends on performing some “cleanup” activities upstream and will evaluate/audit entire north water management system during high precipitation events to determine the main sources of TSS introduced into SP4. Changes to the system/maintenance will be suggested after findings from these investigations. This may take another year of monitoring to initiate the upstream evaluation; however, best management practices will be in place prior to fall of 2018.

A TSS management plan will be submitted once the evaluation of the system has been completed and discharge rates have been confirmed.

Best Regards,

Kathleen Russell BSc.
Environmental Coordinator
QUINSAM COAL
Quinsam Coal Corporation
Ph: (250) 286-3224 ext. 225
E-mail: kar@quinsam.com

TOTAL SUSPENDED SOLIDS
SETTLING POND 4 & WC



Appendix VI

QUINSAM COAL

Long Lake Seepage Treatment - Supplemental Evaluation

Prepared for:
Quinsam Coal
P.O. Box 5000,
Campbell River, BC, V9W 8A3

Prepared by:
Lorax Environmental Services Ltd.
2289 Burrard St.
Vancouver, BC, V6J 3H9

Project No. A473-2

22 May 2018

LORAX ENVIRONMENTAL

Table of Contents

QUINSAM COAL

Table of Contents

TABLE OF CONTENTS ..... **i**

1. INTRODUCTION
1.1 PROJECT OVERVIEW 1-1

2. SITE MONITORING EVALUATION
2.1 HYDRO-CLIMATIC BACKGROUND 2-1
2.1.1 QUINSAM COAL CLIMATE STATION 2-1
2.1.2 REGIONAL CLIMATE STATIONS 2-2
2.1.3 AIR TEMPERATURE, PRECIPITATION AND EVAPORATION AT THE MINE SITE 2-2
2.1.4 PRECIPITATION CONTEXT FOR THE LLTS EVALUATION (2012-2017) 2-5
2.1.5 SITE STREAMFLOW AND DISCHARGE DATA 2-6
2.2 WATER QUALITY DATA EVALUATION 2-9
2.2.1 LLO 2-9
2.2.2 LLM 2-11
2.2.3 WATER QUALITY AND FLOW CORRELATION ANALYSIS 2-14
2.3 LAKE DYNAMICS OF LONG LAKE 2-15

3. GROUNDWATER INFLOWS TO LONG LAKE
3.1 PREVIOUS GROUNDWATER FLUX ESTIMATES 3-1
3.2 FLOW ESTIMATES FOR SEEPAGE BYPASSING LONG LAKE SEEP WEIRS 3-2
3.3 LONG LAKE SEEP AND 3-SOUTH UNDERGROUND CONDITIONS 3-5
3.3.1 LONG LAKE SEEP FLOWS AND 3 SOUTH UNDERGROUND GROUNDWATER LEVELS 3-5
3.3.2 LONG LAKE SEEP AND 3 SOUTH UNDERGROUND WATER QUALITY 3-9

4. LONG LAKE WATER AND LOAD BALANCE MODEL
4.1 WATER BALANCE MODEL 4-1
4.2 SULPHATE LOAD BALANCE MODEL 4-3
4.2.1 MONTHLY LOAD MODEL 4-3
4.2.2 PROPORTIONAL SULPHATE LOADING – LLST SYSTEM ACTIVE 4-4
4.2.3 PROPORTIONAL SULPHATE LOADING – NO TREATMENT SCENARIO 4-6
4.2.4 LONG LAKE MIXING REGIME 4-8

5. SUMMARY AND CONCLUSIONS

6. CLOSURE

REFERENCES **R-1**

LIST OF FIGURES

FIGURE 2-1 SURFACE WATER QUALITY AND HYDROLOGY MONITORING STATIONS 2-2

FIGURE 2-2 MONTHLY PATTERNS OF PRECIPITATION AT REGIONAL CLIMATE STATIONS (QRH, QIN, SCA AND CRA) AND THE QUINSAM COAL MINE (QCC). 2-3

FIGURE 2-3 COMPUTED AND DERIVED POTENTIAL EVAPORATION ESTIMATES FOR QUINSAM MINE 2-5

FIGURE 2-4 DRAINAGE AREAS REPORTING TO LONG LAKE 2-7

FIGURE 2-5 LONG LAKE OUTLET MONTHLY FLOW VOLUMES BY YEAR 2-8

FIGURE 2-6 SULPHATE CONCENTRATIONS AT THE OUTLET OF LONG LAKE (LLO). 2-10

FIGURE 2-7 SULPHATE CONCENTRATIONS FROM LONG LAKE PROFILE SAMPLES AT 1 M, 4 M, AND 9M DEPTHS AND 1 M FROM LAKE BOTTOM. 2-12

FIGURE 2-8 AVERAGE SULPHATE CONCENTRATIONS OF THE PREVIOUS FIVE WEEKLY SAMPLES IN LONG LAKE COMPARED TO BC WQG (CALCULATED USING AVERAGE HARDNESS FROM THE PREVIOUS FIVE WEEKLY SAMPLES). 2-13

FIGURE 2-9 COMPARISON OF LONG LAKE (LLM) SURFACE WATER AND LLO WATER TEMPERATURE SIGNATURES (2013-2017). 2-16

FIGURE 2-10 RELATIONSHIP BETWEEN DENSITY AND WATER TEMPERATURE (UPPER PANEL) AND CONCEPTUAL DIAGRAM ILLUSTRATING THE ANNUAL CYCLE OF THERMAL STRATIFICATION IN A DIMICTIC LAKE (AFTER CHOWDHURY *ET AL.*, 2013). 2-17

FIGURE 2-11 DISSOLVED OXYGEN PROFILES MEASURED AT LONG LAKE (LLM, 2013-2017). THE PANELS SHOW DISSOLVED OXYGEN-DEPTH PROFILES FOR AUGUST (UPPER) AND APRIL (LOWER). 2-18

FIGURE 3-1 3 SOUTH UNDERGROUND AND LONG LAKE SEEP 3-3

FIGURE 3-2 SIMULATED GROUNDWATER FLUXES AND MEASURED LLSM FLOWS. 3-4

FIGURE 3-3 LLSM WEIR PRIOR TO UPGRADES IN APRIL 2012. APPROXIMATE FLOW 20 L/S. 3-5

FIGURE 3-4 FLOW AT LONG LAKE SEEP (LLSM) AND WATER LEVELS IN 3-SOUTH UNDERGROUND MONITORING WELLS. 3-7

FIGURE 3-5 WATER QUALITY AT THE LONG LAKE SEEPS AND 3-SOUTH UNDERGROUND MONITORING WELLS. 3-10

FIGURE 3-6 FLOW AND WATER QUALITY AT LLS AND LLSM DURING LLST OPERATION. 3-11

FIGURE 3-7 WATER LEVELS AND WATER QUALITY AT MW-004 DURING LLST. 3-11

FIGURE 4-1 MONTHLY LAKE INFLOWS AND OUTFLOWS (INCLUDING EVAPORATION) FOR LONG LAKE 4-2

FIGURE 4-2 MODELED MONTHLY SULPHATE LOAD INPUTS TO LONG LAKE, AND MEASURED SULPHATE LOAD LOSSES AT THE LLO STATION. 4-4

FIGURE 4-3 MONTHLY PROPORTIONAL SULPHATE LOAD CONTRIBUTIONS TO LONG LAKE (WITH TREATMENT). AVERAGE MONTHLY SULPHATE LOADING (SUM OF ALL INPUTS) IS SHOWN BY THE BLACK LINE. 4-5

FIGURE 4-4 MONTHLY PROPORTIONAL SULPHATE LOAD CONTRIBUTIONS TO LONG LAKE (NO TREATMENT). AVERAGE MONTHLY SULPHATE LOADING (SUM OF ALL INPUTS) IS SHOWN BY THE BLACK LINE. 4-7

FIGURE 4-5 MODELED SULPHATE CONCENTRATIONS AT THE OUTLET OF LONG LAKE. 4-8

FIGURE 4-6 MODELED SULPHATE CONCENTRATIONS WITHIN THE UPPER 6 M OF THE LONG LAKE WATER COLUMN 4-9

LIST OF TABLES

TABLE 2-1 QUINSAM COAL CLIMATE STATION - SUMMARY OF MEASURED PARAMETERS AND INSTRUMENTATION 2-1

TABLE 2-2 REGIONAL CLIMATE STATIONS NEAR THE QUINSAM COAL MINE WITH EXTENSIVE PERIOD OF RECORD 2-2

TABLE 2-3 PERIOD OF RECORD AIR TEMPERATURE AND PRECIPITATION SUMMARIES - REGIONAL CLIMATE STATIONS 2-3

TABLE 2-4 MEASURED PRECIPITATION AT QUINSAM COAL MINE (2012-2017) 2-4

TABLE 2-5 SUMMARY OF POTENTIAL EVAPORATION ESTIMATES FOR QUINSAM MINE 2-5

TABLE 2-6 BASED ON PRECIPITATION DATA FROM QUINSAM HATCHERY (1976-2017) 2-6

TABLE 2-7 LONG LAKE AREA WATER QUALITY AND FLOW MONITORING STATIONS. LISTED IN ORDER FROM UPSTREAM TO DOWNSTREAM (LAKE OUTLET). 2-6

TABLE 2-8 PEARSON'S CORRELATION COEFFICIENTS (R^2 VALUE) BETWEEN KEY INPUTS TO THE LONG LAKE WATER QUALITY ANALYSIS. 2-14

TABLE 2-9 FIRST OCCURRENCES OF 4°C WATER TEMPERATURE AT LLO MONITORING (2012-2018). . 2-16

TABLE 3-1 LONG LAKE GROUNDWATER LOADS 3-1

TABLE 3-2 MEAN, 5TH AND 95TH PERCENTILE CONCENTRATIONS AT MW-004 AND LLS PRIOR TO AND DURING LLST OPERATION 3-12

TABLE 4-1 MONTHLY AVERAGE INFLOW VOLUMES FOR LONG LAKE (2012 TO 2017). ALL VALUES IN M^3. 4-2

TABLE 4-2 AVERAGE MONTHLY SULPHATE LOADS AND PREDICTED INCREASE 4-7

1. Introduction

QUINSAM COAL

1. Introduction

1.1 Project overview

The Long Lake Seep Treatment (LLST) system was constructed in response to a December 1, 2010 requirement by Ministry of Environment and Climate Change Strategy (ENV) to install and operate a mitigation system to collect and treat the flow of effluent entering Long Lake via the seep. Quinsam Coal Corporation (QCC) constructed a demonstration phase LLST system and operated it from September 2012 through December 2017 when the system ceased operation due to a pump failure. The system was operated at a standard influent flow rate of 4.0 L/s throughout the operating period with increased flow rates introduced briefly in August 2013, 2014 and 2015.

Operation of the LLST system was only one of the activities that QCC undertook in the 2-South and 3-South mine areas to reduce sulphate loading to Long Lake. In addition to the operation of the LLTS the following reclamation activities were completed in 2016 and 2017:

- Rock-fill berm in 2-South replaced with compacted till dyke,
- 2-South highwall was resloped and covered with backfill,
- 3-South highwall was resloped and covered with backfill, and
- North dump covered with topsoil.

ENV requested that QCC provide a final report on the demonstration phase and using the results of that report to formulate the plan for the long-term treatment system. An initial evaluation of the LLST system was completed in November 2017 (Gould, 2017). The Ministry of Environment and Climate Change Strategy (ENV) reviewed the November 2017 study and requested the following additional information:

1) Provide a comparison of the range of summer-fall sulphate data from the Long Lake outlet pre and post LLST system operation;
2) Provide Long Lake water quality data (such as monitoring station LLM-B) in the assessment of the effectiveness of LLST;
3) Provide an assessment of water levels in the mine to evaluate if sulphate concentrations at the seep during the operation of the LLST are lower in summer and early fall compared to concentrations prior to operation;

4) Provide all data graphed illustrating flows from the Long Lake Seep to evaluate how the LLST and the 2006 landslide may have change flow rate at the seepage face; and

5) Provide an updated water balance model.

The Ministry of Energy, Mines and Petroleum Resources (EMPR) also reviewed the Gould (2017) report and had the following comments:

6) Based on the information presented in the documents, EMPR does not agree that the LLST has demonstrated effectiveness in reducing seep flow or sulphate load at LLS.

7) Confirm QCC's understanding and evaluation of the effectiveness of the LLST system.

QCC has retained Lorax Environmental Services Ltd. (Lorax) to conduct a supplemental evaluation regarding the LLST system. The objective of this document is to provide the information requested by ENV and EMPR, which will allow the ministries to further evaluate the impact of the LLST on water quality in Long Lake. In addition, Lorax has prepared a sulphate loading model for the operating period of the LLST system to assess the variation of loading to the system.

2. Site Monitoring Evaluation

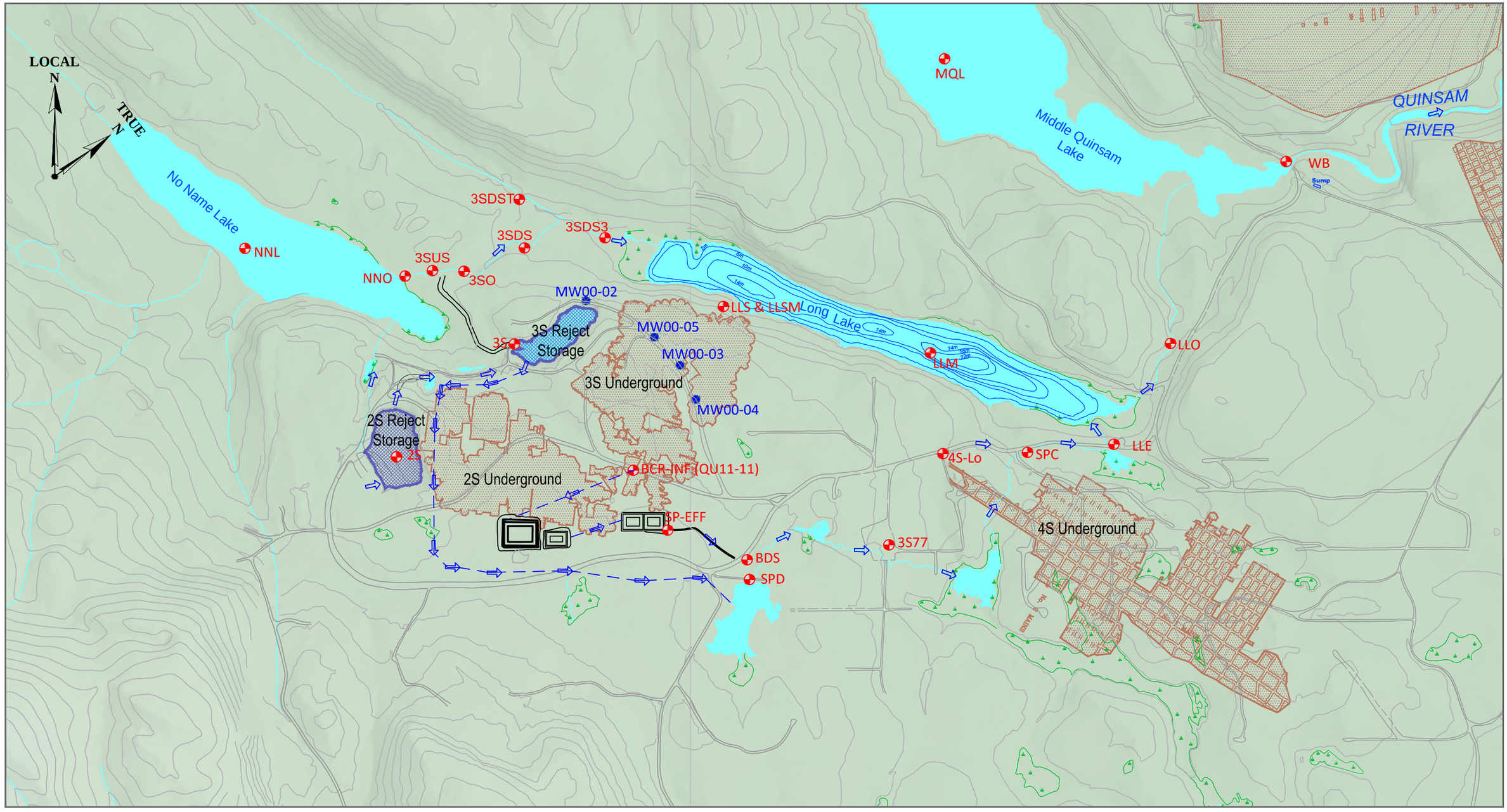
QUINSAM COAL

2. Site Monitoring Evaluation

Lorax has reviewed the regional and site climatic information as well as the extensive hydrologic, groundwater and water quality monitoring data collected by QCC on site to prepare the supplemental LLST system evaluation. The location of the site monitoring stations within and adjacent to Long Lake that were used in this study are illustrated in Figure 2-1.

Section 2.1 summarizes the hydro-climatic monitoring information for the Quinsam Coal Mine and baseline conditions described for water balance parameters including precipitation, air temperature and evaporation. Both site-specific and regional hydrometeorological data are identified and synthesized here, as these variables form the basis of the water balance and dynamics of Long Lake that are used for this LLST system and the 2 South / 3 South Permit Amendment Application.

Section 2.2 presents the sulphate concentrations measured within and at the outlet of Long Lake and discusses the implications of these results. Section 2.3 presents an overview of lake dynamics and evaluates how these processes could be responsible for the observed trends in Long Lake sulphate concentrations.



LEGEND

- Groundwater Well
- Surface Water Station
- Swamp/Marsh
- Lakes
- Pits
- Elevation(10m)
- Lake Bathymetry
- Road
- Rivers/Creeks
- Existing Mine Workings
- Long Lake Seep Treatment System
- Pumped Mine Flow
- Mine Contact Water Gravity Flow

DATE SAVED:	May 07, 2018
DRAWN BY:	AL
REVIEWED:	SJ
VERSION:	1

Projection: *Orthographic*
Coordinate System: *Quinsam Mine Local Grid*
Units: *Metres*

0 200 400 m

CLIENT: QUINSAM COAL

LORAX ENVIRONMENTAL

PROJECT: Long Lake Seep Treatment Evaluation

TITLE: Surface Water Quality and Hydrology Monitoring Stations

PROJECT #: A473-2

FIGURE: 2-1

P:\@Drafting\Quinsam\AutoCAD map\LongLakeSeepTreamtmentAssessment\SWQM_20180507_v2.dwg

2.1 Hydro-Climatic Background

2.1.1 Quinsam Coal Climate Station

A research grade Campbell Scientific climate station with a 10-m tower was installed at the Quinsam property in October 2015 to inform planning, engineering and environmental management studies undertaken at the project site. The weather station was installed adjacent the 2S 3S development area, which is situated roughly 2.5 km from the Quinsam office and roughly 15 km from Campbell River Airport. Table 2-1 summarizes climate sensors installed at the local climate station, which includes the following measured parameters: air temperature (daily average, minimum, maximum), precipitation, snow depth, relative humidity, wind speed and direction, solar radiation and barometric pressure. Prior to October 2015, climate measurements were recorded for a limited set of climate parameters (air temperature, rainfall) at a Davis weather station installed at the Quinsam office.

Table 2-1:
Quinsam Coal Climate Station - Summary of Measured Parameters and Instrumentation

Climate Parameter	Units
Average Daily Air Temperature	°C (2m)
Minimum Daily Air Temperature	°C (2m)
Maximum Daily Air Temperature	°C (2m)
Average Daily Relative Humidity	% (2m)
Minimum Daily Relative Humidity	% (2m)
Maximum Daily Relative Humidity	% (2m)
Average Daily Air Temperature	°C (10m)
Minimum Daily Air Temperature	°C (10m)
Maximum Daily Air Temperature	°C (10m)
Average Daily Pressure	(mBar)
Average Daily Wind Speed	m/s
Average Daily Wind Speed	km/h
Average Daily Wind Direction	degrees
Solar Intensity	MJ/m2
Snow Depth	m
Daily Precipitation	mm

2.1.2 Regional Climate Stations

The Quinsam Coal Mine benefits by being situated near many regional climate stations (Table 2-2). Several of these climate stations are situated close to (within 10-20 km) the property and show considerable record length (*e.g.*, >30 years) such as Strathcona Dam (SCA), Quinsam River Hatchery (QRH), Quinsam River at Argonaut Bridge (QIH) and Campbell River Airport (CRA).

Table 2-2:
Regional Climate Stations Near the Quinsam Coal Mine With Extensive Period of Record

Station Name	Station ID	Network	Latitude	Longitude	Elevation (m)	Start	End
Strathcona Dam	SCA	BCH	49.997	-125.584	227	1980	2016
Quinsam River Hatchery	QRH	EC	50.016	-125.304	46	1975	2018
Quinsam R. @ Argonaut Bridge	QIN	BCH	49.930	-125.500	280	1993	2017
Campbell River Airport	CRA	EC	49.951	-125.271	106	1965	2018

Notes: EC - Environment Canada; BCH - BC Hydro

2.1.3 Air Temperature, Precipitation and Evaporation at the Mine Site

Period of record air temperature and precipitation summaries are presented for QRH, QIN, SCA and CRA in Table 2-3. Annual precipitation varies between 1,200-1,600 mm for these stations, with months October through April comprising a wet season and months May through September being comparably drier (Figure 2-2). Mean annual temperatures range from 7.4-9.2 °C, with months July and August being warmest on average and months December and January being coolest typically.

Of the four regional climate stations, Quinsam Coal is situated closest (within 3.5 km) and at similar elevation (~300 m asl) to the QIN (Quinsam River at Argonaut Bridge. Accordingly, the air temperature signature and expected precipitation depths (*e.g.*, Figure 2-2, Table 2-3, Table 2-4) for the Quinsam Mine are most closely aligned to this nearby climate station. For the period 2012-2017, average annual precipitation for the mine site was measured to be approximately 1,100 mm (Table 2-4). A long-term estimate of annual precipitation for Quinsam Mine was derived by isolating scalars between measured data for site and regional stations for corresponding time period then applying to full record length per regional station. The long-term estimate of annual precipitation was slightly higher than the measured record (2012-2017) shows and is 1,150 mm.

Table 2-3:
Period of Record Air Temperature and Precipitation Summaries - Regional Climate Stations

Station	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
QRH	P (mm)	216	174	143	98	76	65	44	59	66	182	246	236	1,606
QRH	Air T (°C)	2.1	3.6	5.6	8.4	11.7	14.6	17.1	17.2	14.0	9.1	4.7	2.3	9.2
QIN	P (mm)	157	111	105	60	69	67	44	49	55	135	178	170	1,200
QIN	Air T (°C)	-0.4	1.3	3.6	6.5	10.1	12.9	15.8	15.8	12.5	7.3	2.8	0.1	7.4
SCA	P (mm)	192	139	125	69	61	62	40	48	63	152	221	198	1,370
SCA	Air T (°C)	1.4	2.8	4.9	7.8	11.6	14.3	16.9	17.0	13.8	8.8	4.3	1.9	8.8
CRA	P (mm)	199	159	136	84	67	61	40	49	59	153	231	215	1,452
CRA	Air T (°C)	1.3	3.0	4.8	7.7	11.2	14.2	16.9	16.9	13.4	8.3	4.2	1.7	8.6

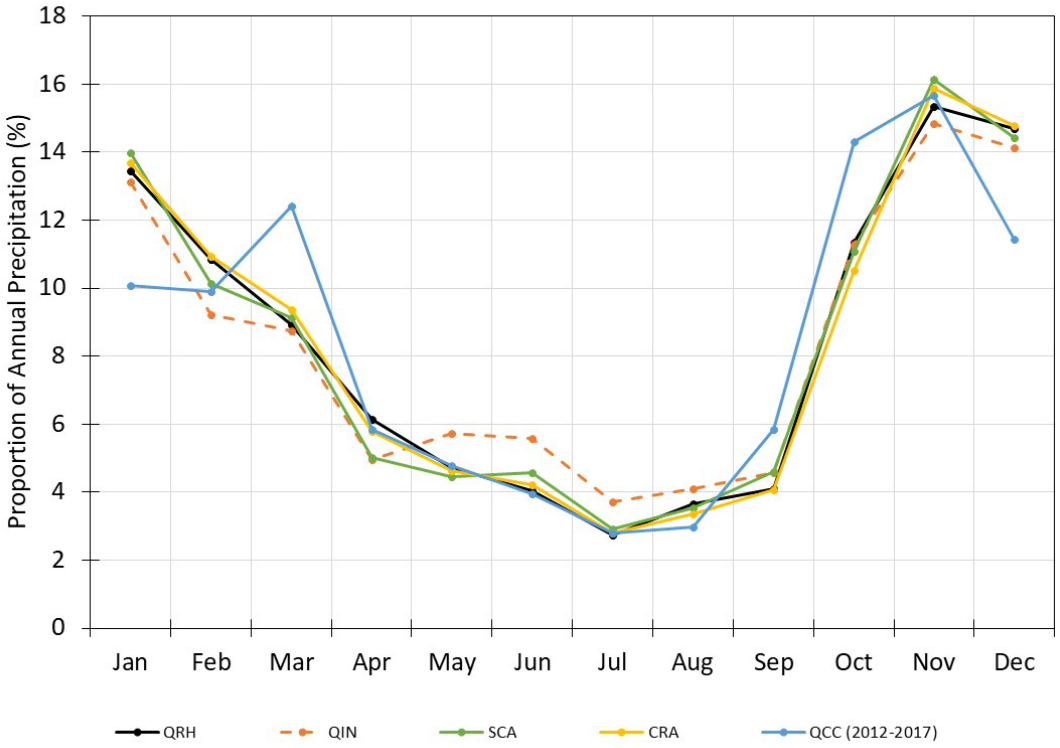


Figure 2-2: Monthly Patterns of Precipitation at Regional Climate Stations (QRH, QIN, SCA and CRA) and the Quinsam Coal Mine (QCC).

Table 2-4:
Measured Precipitation at Quinsam Coal Mine (2012-2017)

	Precipitation (mm)												
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2012	163	170	158	92	32	74	25	5	11	162	166	162	1,222
2013	65	75	80	66	141	56	0	57	133	28	104	93	898
2014	94	68	112	53	63	11	33	11	35	210	87	165	941
2015	109	126	113	33	3	20	41	89	77	98	113	264	1,085
2016	157	121	300	30	22	78	69	31	104	363	323	58	1,655
2017	82	101	68	118	57	23	17	6	32	94	249	22	868
Avg. (2012-2017)	112	110	138	65	53	44	31	33	65	159	174	127	1,111

Notes: Data for 2012 (Jan to Sept) infilled from Quinsam Hatchery and application of a data scalar (value = 0.69).

Potential evaporation rates were computed for the Quinsam Coal Mine using climate data for site (October 2015 to December 2017) and the Ref-ET calculator - a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record, a daily climate input file was prepared for Quinsam Mine, which included the following information: air temperature, relative humidity, incoming solar radiation, atmospheric pressure and wind speed data. Resulting outputs from Ref-ET for the mine site are presented in Table 2-5 and Figure 2-3 for two evaporation formulations (Priestley Taylor and Penman Monteith).

Overall, Ref-ET outputs indicate the following for potential evaporation at Quinsam Mine: 1) monthly evaporation rates are highest in the summer and range from 90-120 mm/month (May, Jun, Jul, Aug); 2) on an annual basis, roughly 70% annual evaporation (*i.e.*, 440-493 mm) is realized between May and September; and 3) annual evaporation is expected to be on the order of 600 mm at the mine site. As a validation of the evaporation estimates computed using climate data from the property, independent estimates of evaporation for the mine derived using the ClimateBC online data tool (http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/) are also presented in Table 2-5 and Figure 2-3.

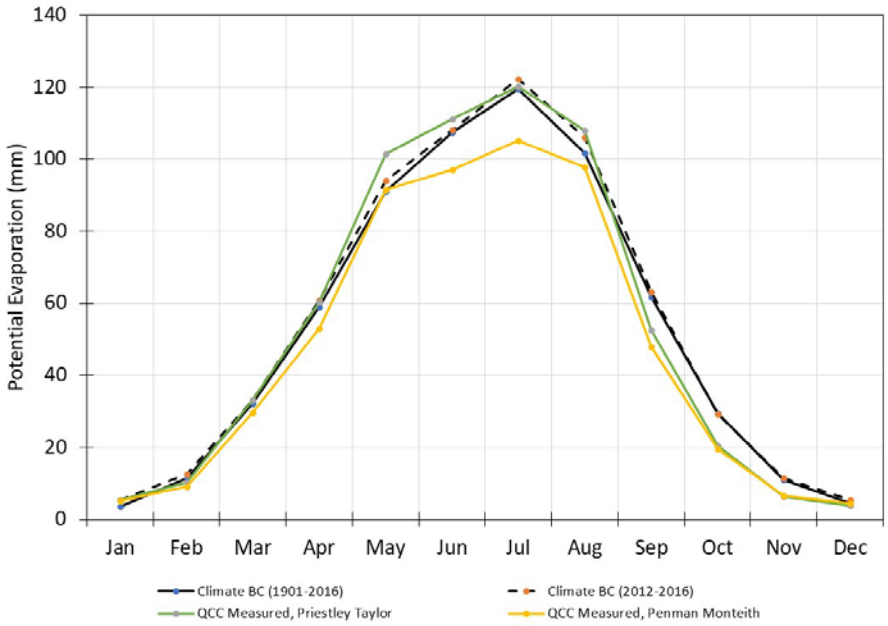


Figure 2-3: Computed and Derived Potential Evaporation Estimates for Quinsam Mine

Table 2-5:
Summary of Potential Evaporation Estimates for Quinsam Mine

	Potential Evaporation (mm)													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**	**May-Sep**
QCC Penman Monteith (2015-2017)	5	9	30	53	91	97	105	98	48	19	7	5	567	440
QCC Priestley Taylor (2015-2017)	5	10	33	60	102	111	120	108	53	20	6	4	633	493
ClimateBC (1901-2016)	4	11	32	59	91	107	120	102	62	30	11	5	633	482
ClimateBC (2012-2016)	5	13	33	61	94	108	122	106	63	29	11	5	652	494

2.1.4 Precipitation Context for the LLTS Evaluation (2012-2017)

In subsequent sections of the report, hydrometric, water quality and load balance model results are presented for the 2012-2017 time period. To provide a relative indication of the annual and seasonal hydrometeorology conditions for these six years, period of record precipitation data for the Quinsam Hatchery (QRH, 1976-2017) were assessed. Specifically, for each year of record annual and seasonal precipitation totals were assigned percentile values, with higher percentile values indicating wetter than normal conditions and vice versa. The results of this exercise are summarized in Table 2-6, with hydro-climate highlights for 2012-2017 including very wet conditions in 2012 and 2016 and very dry conditions in 2013 and 2017.

Table 2-6:
Based on precipitation data from Quinsam Hatchery (1976-2017)

Year	Annual (J-D)	Winter DJF	Spring MAM	Summer JJA	Autumn SON
2012	79	63	88	51	63
2013	5	37	21	63	9
2014	40	9	58	14	47
2015	33	56	19	53	12
2016	84	88	30	74	98
2017	12	5	84	9	42

Notes:
Annual and seasonal percentile values assigned per year for period 1976-2017
Blue values (percentile > 50) indicate wetter than average periods
Red values (percentile < 50) indicate drier than average periods

2.1.5 Site Streamflow and Discharge Data

QCC has implemented an extensive hydrologic monitoring network on the streams and water courses within and adjacent to the property. The key stations used in this study are listed in Table 2-7 and extent of the monitoring network surrounding Long Lake is illustrated in Figure 2-1. Drainage areas contributing to the flow from Long Lake include the area reporting to No Name Lake and the drainage reporting directly to the south end of Long Lake (Figure 2-4).

Table 2-7:
Long Lake area water quality and flow monitoring stations. Listed in order from upstream to downstream (lake outlet).

Station ID	Station Name	Parameters Monitored	Record Period	Drainage Area (km^2)
3SDS3	On NNO Downstream of where 3S Discharges	WQ[1]	Sept. 2013 – Dec. 2017	14.3
NNO	No Name Lake Outlet	WQ	Jan. 2013 – Dec. 2017	11.7
3SDST	3SDS Tributary (to NN Connector)	WQ	Sep. 2013 – Dec. 2017	2.57
NN_LL	Additional non-contact drainage to Long Lake	--[2]	NA	0.88
LLSM	Long Lake Seep (Main)	WQ, Flow	Feb. 2011 – Dec. 2017	NA
LLS	Long Lake Seep	WQ, Flow	Oct. 2006 – Dec. 2017	NA
LLM1	Long Lake Middle (1 m below surface)	WQ	Sep. 2006 – Dec. 2017	NA
LLM4	Long Lake Middle (4 m below surface)	WQ	Sep. 2006 – Dec. 2017	NA
LLM9	Long Lake Middle (9 m below surface)	WQ	Sep. 2006 – Dec. 2017	NA
LLMB	Long Lake Middle (bottom)	WQ	Sep. 2006 – Dec. 2017	NA
LLE	Long Lake Entry	WQ, Flow	Apr. 2012 – Dec. 2017	2.4
LLO	Long Lake Outlet	WQ, Flow	Oct. 2006 – Dec. 2017	18.2

Notes:
[1]WQ = water quality
[2]This drainage area captures the areas bordering the lake that are not included in the 3SDS3, LLS, LLSM or LLE stations. No measured data is available for these inputs.

94000 96000 98000 100000

104000 102000

LOCAL N

TRUE N

Settling Pond 4 (SP4)

Pit Sump

PLANT SITE

OFFICE

Office QUONSET

Firehall

FINE REFUSE IMPOUNDMENT

Middle Quinsam Lake

QUINSAM RIVER

Quinsam River below Middle Quinsam Lake

No Name Lake

No Name Lake Connector Channel

Long Lake Seep (LLS)

Long Lake Outlet (LLO)

Long Lake

Long Lake Culvert (LLE)

2SI

Settling Pond 1 (SP1)

94000 96000 98000 100000

LEGEND

- Surface Water Station
- Swamp/Marsh
- Lakes
- Pits
- Elevation(50m)
- Elevation(10m)
- Road
- Rivers/Creeks

DATE SAVED:	May 07, 2018
DRAWN BY:	AL
REVIEWED:	SJ
VERSION:	1

Projection: *Orthographic*
Coordinate System: *Quinsam Mine Local Grid*
Units: *Metres*

0 200 400 m

CLIENT: QUINSAM COAL

LORAX ENVIRONMENTAL

PROJECT: **Long Lake Seep Treatment Evaluation**

TITLE: Drainage areas Reporting to Long Lake

PROJECT #: A473-2

FIGURE: 2-4

P:\@Drafting\Quinsam\AutoCAD map\Surface WQ_Quinsam_Hydrostn_Catchmetns_20180507.dwg

In order to develop the water balance model discussed in Section 4, regional precipitation and streamflow data from the stations listed in Table 2-7 were used as a benchmark for the QA/QC of site precipitation and streamflow data, and to infill missing data from the site records where necessary. Precipitation data were sourced from the Quinsam Coal climate station record, except for the period of January to September 2012, which were missing and were infilled using the Quinsam River at Argonaut Bridge record (WSC 08HD021).

The flow record from LLO formed the most complete and reliable streamflow record that is representative of surface catchments, and thus it was scaled to represent flows at NNO, 3SDS3 and the remaining catchments reporting to Long Lake. Monthly flow volumes for the years of 2012 through 2017 from the LLO record are shown in Figure 2-5. The hydrograph is typical of coastal basins, with the majority of flows occurring between the months of October and April of each year in response to the large frontal systems that deliver intense precipitation from the Pacific Ocean. The winter high flow period is followed by a prolonged dry period from May to September, and snowfall at site elevations is limited, therefore the hydrograph does not display a strong spring freshet hydrograph signal.

Consistent with the precipitation data presented in Section 2.1.4, it is apparent from the LLO hydrograph records that 2013 represented an abnormally dry year when compared to the 2012-2017 average (56% of average flow), and 2016 an abnormally wet year (159% of average flow).

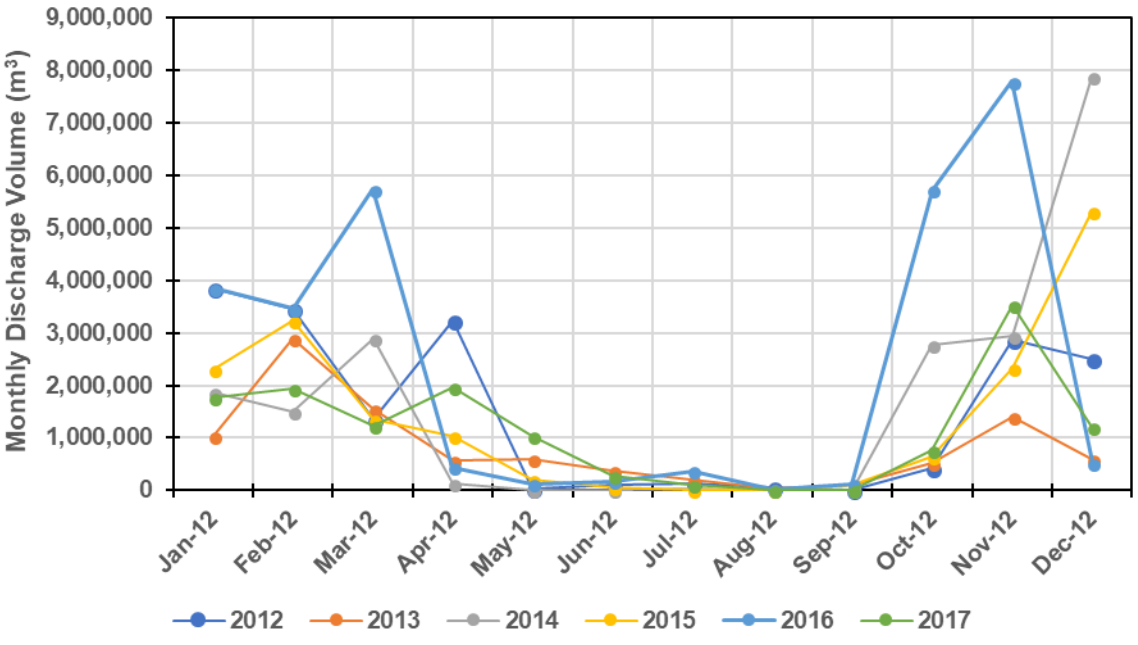


Figure 2-5: Long Lake Outlet monthly flow volumes by year

The LLO record is largely complete over the 2012 to 2017 period, with the exception of January to June 2012. LLO flow data were infilled for this period using surrogate months from the LLO record. Representative monthly flow volumes were chosen for this 6-month period using a relationship between monthly flow volumes at LLO and monthly precipitation. Snowpack at site is assumed to be ephemeral during the winter, with any accumulated snow melting within the same month. Monthly flows are driven largely by frontal rainfall events, thus the precipitation:streamflow relationship is assumed to hold throughout the winter. For example, precipitation in January 2012 most closely matched the amounts measured in January 2016, and therefore the LLO flow data from January 2016 was used as a surrogate for January 2012. In order to construct the water balance model using site data, flow records for the NNO, non-contact drainages reporting to the NNO Connector Channel and Long Lake, and the 3SDS3 station were scaled by drainage area from the LLO record.

2.2 Water Quality Data Evaluation

Water quality monitoring has been conducted at the outlet of Long Lake (station LLO) and near the deepest portion of the lake at monitoring station LLM. The location of the water quality sampling stations and mine facilities are presented in Figure 2-1 and listed in Table 2-7. Station LLM includes vertical profile samples collected at depths of 1 m, 4 m and 9 m below surface and 1 m off the bottom of the lake. LLM sample profiles collected during the operation of the LLST system are limited to 5 sampling events over 30 days (5-in-30) conducted once in early spring, late summer and autumn. No winter sampling was undertaken at LLM.

The discussion in this section presents sulphate concentrations in Long Lake during the treatment period, which is defined as September 1, 2012 through December 31, 2017. Sulphate concentrations during the treatment period are also compared to pre-treatment concentrations for the period of record available that extends from September 2006 through August 2012.

2.2.1 LLO

Sulphate concentrations at the Long Lake outlet display a consistent seasonal trend that is driven by the hydrologic cycle. Peak concentrations are typically observed in September and October prior to the initiation of the wet season and lowest concentrations are observed in December during peak flows (Figure 2-6). Deviations from this trend can be attributed to unusual climatic and hydrologic conditions. Notably, a peak concentration in October was absent in 2013, which was due to an abnormally dry autumn (Table 2-6).

Since the initiation of the LLST system, annual sulphate concentrations at the outlet of Long Lake have decreased compared to the pre-treatment period. Although sulphate concentrations during LLST operation largely remained within the range of concentrations observed prior to the initiation of treatment in September 2012 (Figure 2-6), the maximum concentrations in the summer-fall period did not exceed 121 mg/L, which was the pre-treatment 95th percentile concentration. Conversely there were several measurements recorded during the period of 2012 to 2017 below the pre-treatment 5th percentile concentration (20 mg/L).

Sulphate concentrations at LLO have remained below the long-term BC Water Quality guideline for the protection of aquatic life (WQG), as noted in Figure 2-6. The sulphate WQG was updated in April 2013 to reflect the more extensive set of studies available for sulphate toxicity. The sulphate WQG illustrated on Figure 2-6 was calculated from the average LLO hardness of five weekly consecutive samples, as per BC MOE (2018) which states that, "An averaging period approach is used for these WQGs. This approach allows concentrations of a substance to fluctuate above and below the guideline provided the long-term average is met over the specified averaging period (*i.e.* 5 samples in 30 days)". Although the displayed guideline is calculated from average hardness, the sulphate concentrations are plotted as individual data to demonstrate that sulphate does not exceed the specified sulphate guideline in the outlet stream, even for short periods of time. Likewise, it is notable that the pre-treatment 95th percentile concentration is also below the WQG.

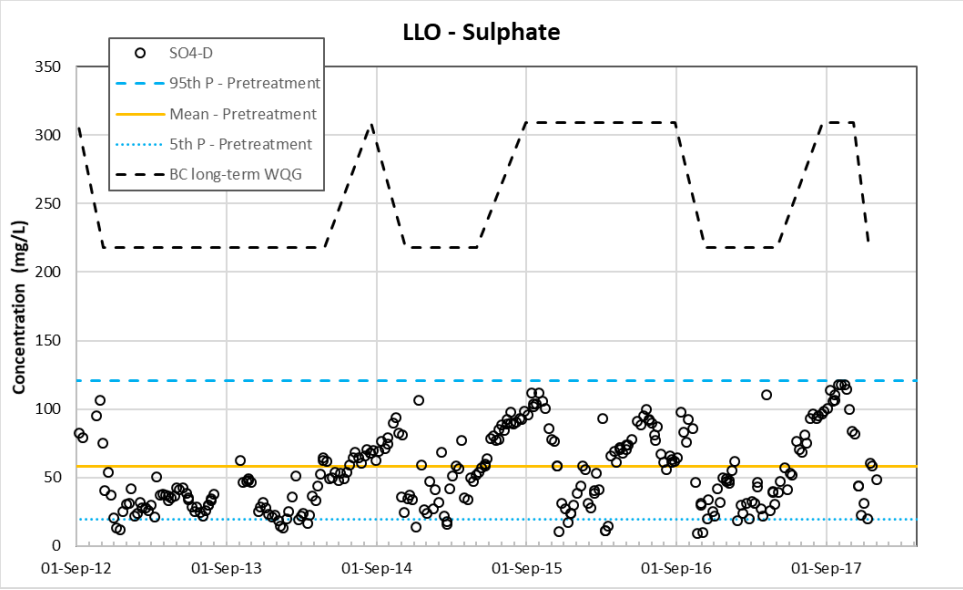


Figure 2-6: Sulphate concentrations at the outlet of Long Lake (LLO).

Notes: BC water quality guideline (WQG) calculated using mean LLO hardness of the previous five weekly samples. Where weekly hardness data were not available, the hardness value measured in monthly grab samples was used to calculate the WQG. Sulfate values reflect grab sample concentrations and have not been averaged.

2.2.2 LLM

Direct measurements of Long Lake water quality are obtained from profile sampling through the water column at station LLM. Samples were collected three times per year (spring, summer and autumn as 5-in-30 weekly samples) during the monitoring period. The results of individual samples collected during the operating period of the LLST system are provided in Figure 2-7 in relation to the range of concentrations measured during the pre-treatment period.

The data indicate that sulphate concentrations in the lake have generally decreased during the LLST operating period throughout the lake water column relative to those measured during the pre-treatment period (Figure 2-7). The monitoring data also indicate that sulphate concentrations typically increase with increasing depth in the lake. Similar to LLO, concentrations at the surface of the lake (LLM-1) have typically remained within the range of concentrations observed prior to treatment. However, the maximum concentration at LLM-1 during treatment did not exceed the pre-treatment 95th percentile concentration (120 mg/L) and there were several measurements below the 5th percentile concentration (34 mg/L). The downward shift in sulphate concentrations measured at the bottom of the lake at LLM-B is more pronounced, with all but one measured value during the treatment period remaining below the pre-treatment 5th percentile value (136 mg/L).

The seasonal trend in the LLM sulphate concentrations (Figure 2-7) is not as readily apparent as it was at LLO (Figure 2-6) and this seasonality appears to become less pronounced with increasing depth. At the lake surface, it is expected that if a full set of monthly samples were available from LLM, concentrations at the surface of Long Lake (LLM-1) would display a seasonal signature that is more similar to LLO. Wind-mixing at the lake surface is expected to contribute to a well-mixed and fairly uniform surface layer that, with direct connectivity to LLO, would yield similar to water quality at both LLM-1 and LLO. In contrast, seasonal trends in sulphate concentrations for LLO and LLM-B appear to be largely decoupled.

Because the LLM dataset does not capture water quality from mid-October through mid-April, it may omit annual concentration minima at all depths. It is during this period (peak winter flows) that sulfate concentrations in the lake surface would be diluted due to the influx of low-ionic meteoric waters and surface runoff. Annual sulfate minima could also occur at lower lake depths in conjunction with seasonal turnover, when low sulfate concentrations at the lake surface mix with higher sulfate concentrations at lower depths, further diluting sulfate concentrations. Such events are not fully captured in the current LLM dataset due to the restricted seasonal sampling schedule during 2012-2017 when data from November through mid-April were not collected.

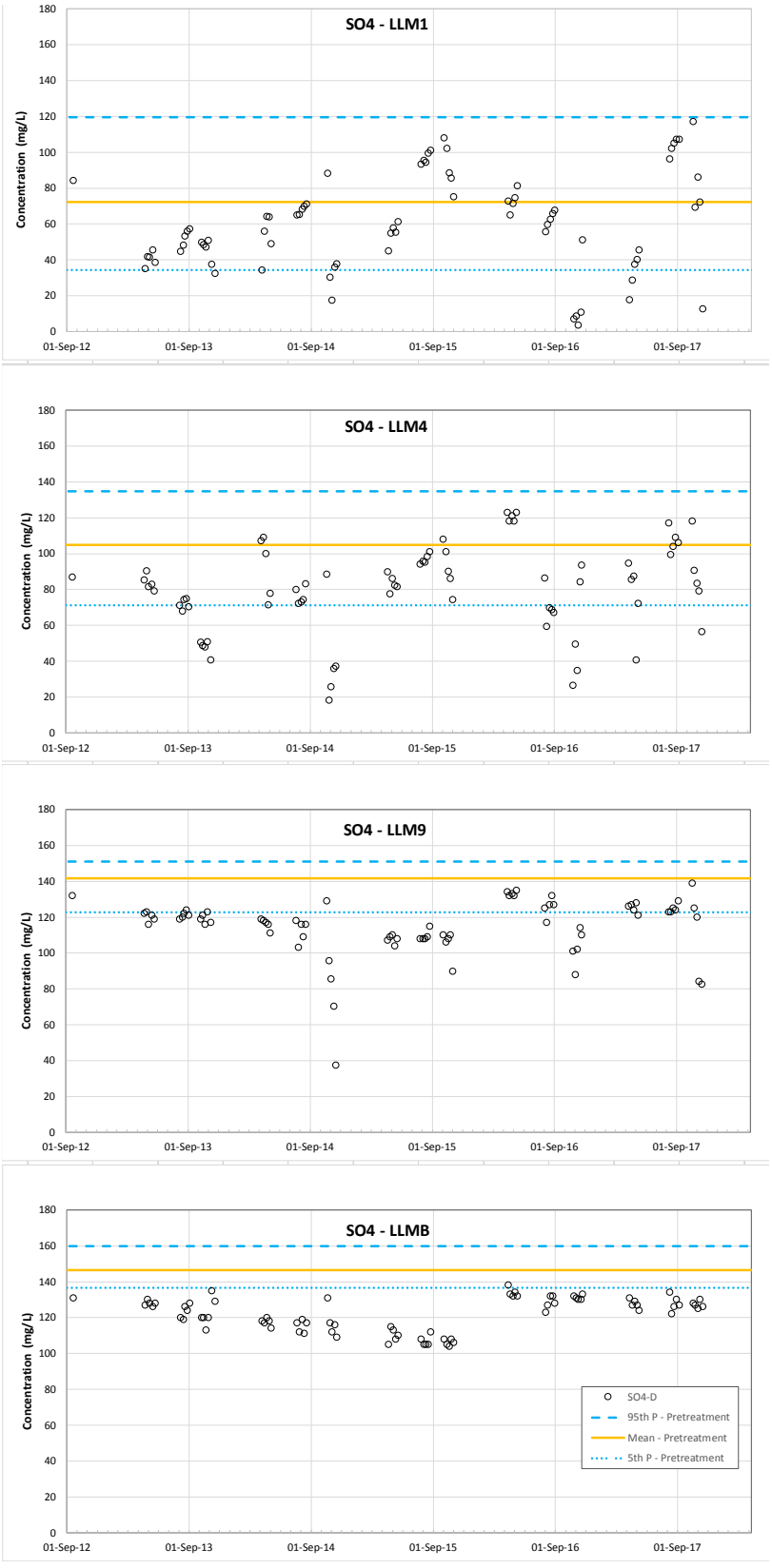


Figure 2-7: Sulphate Concentrations from Long Lake profile samples at 1 m, 4 m, and 9m depths and 1 m from lake bottom.

Based on the current dataset, the narrow range in sulphate concentrations at LLM-B and LLM-9 after mid-April through September suggest that the bottom waters may be isolated from the surface waters during this period with little or no mixing. Sulphate at LLM-B displayed a decreasing trend during the LLST operating period 2012 through 2015 from 135 mg/L to 105 mg/L. However, measured concentrations increased in 2016. As discussed above, however, annual concentration minima at these stations may not be captured in the current dataset. From 2014 onwards, there is evidence that some lake mixing occurred at depths down to LLM-9 during the month of November. In November 2014, for example, concentrations at LLM-9 decreased from the typical bottom water concentrations of 120 mg/L to those observed in surface waters < 40 mg/L. A similar trend was not observed at LLM-B, however. The implications of this observation and the processes responsible will be discussed further in Section 2.3 and Chapter 4.

Lake profile samples in the middle of Long Lake at station LLM indicate that sulphate concentrations have remained below the BC WQG (aquatic life) for sulphate (Figure 2-8). Figure 2-8 presents average sulphate concentrations for LLM stations calculated from five consecutive weekly sampling events. The sulphate WQG shown in that plot is calculated using average hardness from the previous five weekly samples collected from the surface of the lake (LLM-1) (as per BC MOE, 2018), which has the lowest hardness in the profile. This approach yields the most conservative (lowest) WQGs for sulphate, as water hardness is typically lowest at the lake surface. Only the average sulphate concentrations from the November 2016 sample set shows that the LLM-B water concentrations approach the BC WQG. However, this value falls well below the BC sulphate WQG when calculated using the ambient hardness measured for the same period at LLM-B (309 mg/L).

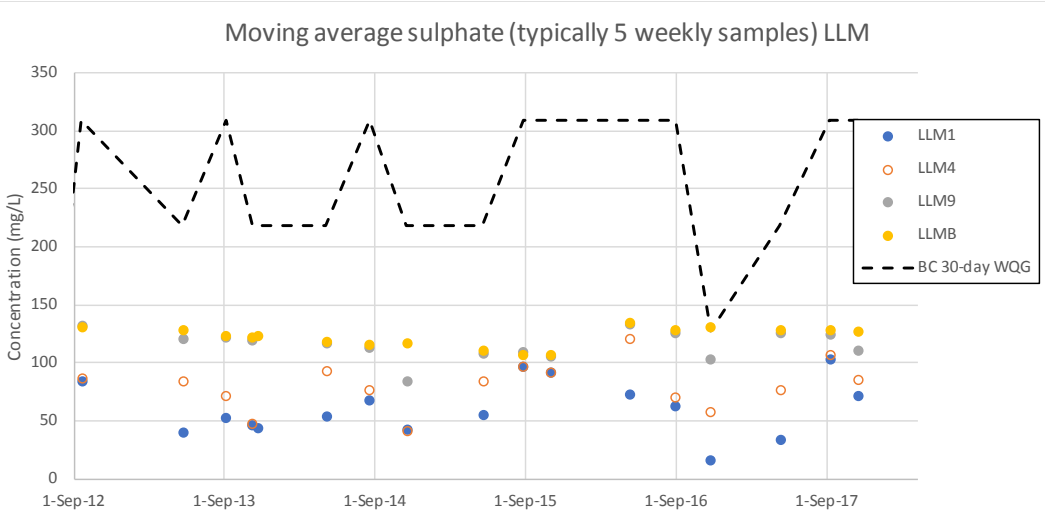


Figure 2-8: Average Sulphate Concentrations of the previous five weekly samples in Long Lake compared to BC WQG (calculated using average hardness from the previous five weekly samples).

2.2.3 Water Quality and Flow Correlation Analysis

An initial scoping exercise was conducted to determine the influence of various inputs on the Lake outflows and water quality at key monitoring locations. A correlation analysis was used to quantify the degree of common variability between the key parameters, which then allowed the water and load balance model results to be placed in context. The datasets included in this analysis spanned the period of January 2012 to December 2017, and include:

- Monthly precipitation (mm/month);
- Flow from the LLSM station (m^3/month);
- Flow from the LLE station (m^3/month);
- Flow from the LLO station (m^3/month);
- Sulphate concentrations measured at LLSM station (mg/L);
- Sulphate concentrations measured at LLMB station (mg/L);
- Sulphate concentrations measured at LLE station (mg/L), and;
- Sulphate concentrations measured at LLO station (mg/L).

As expected, precipitation is strongly correlated with measured flows at the LLE and LLO stations (R^2 = 0.76 to 0.82), with variation in LLSM flows moderately linked to variation in precipitation (R^2 = 0.45), due to the moderating effect of residence time within the groundwater system (Table 2-8). Sulphate concentrations at the key monitoring locations are negatively correlated with precipitation and flows at the LLE and LLO stations, indicating that higher sulphate concentrations in the lake are associated with lower precipitation during the summer months.

Table 2-8:
Pearson's correlation coefficients (R^2 value) between key inputs to the Long Lake water quality analysis.

	Precipitation	**LLSM_Flow**	**LLE_Flow**	**LLO_Flow**	**LLSM_SO_4**	**LLMB_SO_4**	**LLE_SO_4**	**LLO_SO_4**
Precipitation	--	--	--	--	--	--	--	--
LLSM_Flow	0.45	--	--	--	--	--	--	--
LLE_Flow	0.76	0.51	--	--	--	--	--	--
LLO_Flow	0.82	0.59	0.77	--	--	--	--	--
LLSM_SO_4	0.04	0.14	0.13	0.10	--	--	--	--
LLMB_SO_4	-0.01	0.14	0.07	0.03	0.09	--	--	--
LLE_SO_4	-0.39	-0.49	-0.36	-0.44	-0.41	0.16	--	--
LLO_SO_4	-0.35	-0.61	-0.47	-0.50	-0.49	-0.04	0.73	--

Sulphate concentrations in the lake bottom (LLMB) are poorly correlated with those at LLSM, LLE and LLO, which is likely an artefact of the low inter-month variability in the lake bottom concentrations.

The most interesting result gained from this analysis is that sulphate concentrations at LLO are most strongly linked to concentrations in the LLE inflows to the lake. Given that LLE is located very close to the lake outlet, and the predominant flow direction is from west to east through the lake (Figure 2-1), this indicates that despite the other sulphate loads reporting to the lake via the Long Lake seeps, the LLE discharges provide the main control on sulphate concentrations at LLO (Table 2-8). This finding will be explored further in the water and load balance model discussion (Section 4).

2.3 Lake Dynamics of Long Lake

In this section of the report, environmental data are presented to summarize lake dynamics (*i.e.*, evidence for thermal stratification, lake turnover and physical mixing) within Long Lake. An understanding of these processes is necessary to interpret load balance model results and key messages of this study.

Long Lake surface water temperatures (*i.e.*, the average of the upper 3 m at LLM) are compared to water temperature data collected below the lake at LLO monitoring station (Figure 2-9). In this figure, temperature data at LLM are spot measurements collected between April and November and cover the period 2013-2017. In contrast, water temperature data for LLO are high-resolution (hourly) data collected by a water level recorder and cover the same time period.

Figure 2-9 illustrates that water temperature data at LLO are robust proxies for surface water temperatures in Long Lake. During the summer (*e.g.*, Jun, Jul, Aug), the relationship between water temperature at LLM and LLO shows some differentiation, but this is not unexpected since the local water balance is very negative at this time of year and surface flows to- and from Long Lake are minor. For months with appreciable flow (*e.g.*, November through March), lake surface temperatures are equivalent to the LLO temperature signature. While there are no lake surface measurements for December through March, it is reasonable to expect strong similarity between LLM surface and LLO owing to the flow-through dynamics of Long Lake during winter.

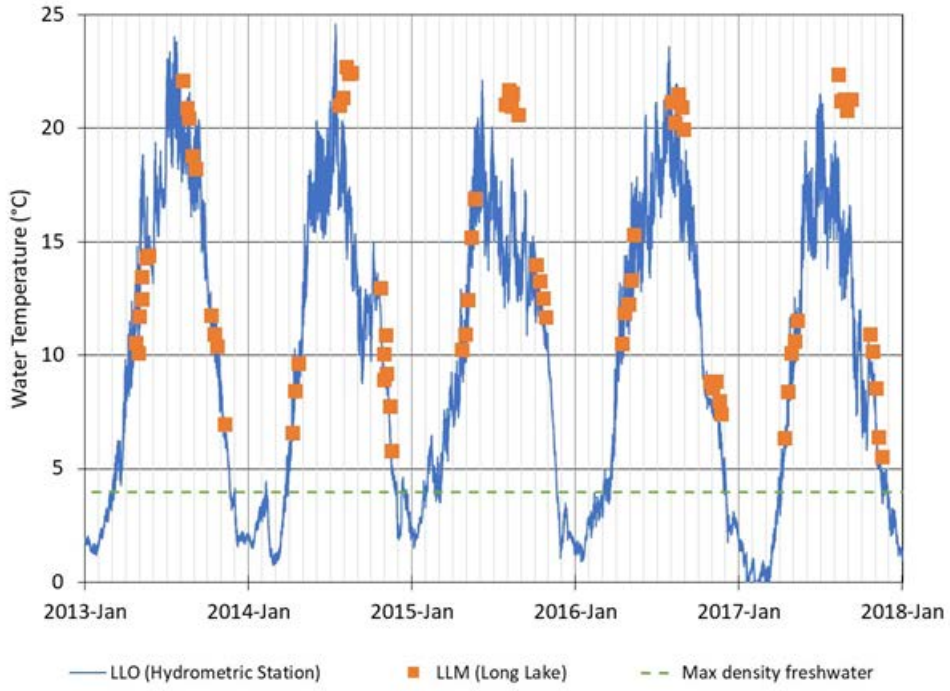


Figure 2-9: Comparison of Long Lake (LLM) surface water and LLO water temperature signatures (2013-2017).

Maximum density of fresh water occurs at approximately 4°C Figure 2-9, upper panel), and therefore, warming surface waters each spring (*e.g.*, from 2°C to 4 °C) or cooling surface waters in autumn/winter (*e.g.*, from 10 °C to 4 °C) will initiate conditions where higher density surface waters will mix episodically to depth in a lake. These concepts, which are typical traits of a dimictic lake are shown conceptually in Figure 2-10 (lower panel). Water temperature data for LLM and LLO (Figure 2-9) confirm the potential for at least two overturn events in Long Lake on an annual basis. The date of winter/spring turnover event shows variability from year to year (Table 2-9). However, turnover events late-November and during March appear the norm.

Table 2-9:
First occurrences of 4°C water temperature at LLO monitoring (2012-2018).

Autumn/Winter	Winter/Spring
November 27, 2012	March 5, 2013
November 21, 2013	March 25, 2014
November 26, 2014	January 27, 2015
November 21, 2015	March 4, 2016
December 3, 2016	April 5, 2017
November 16, 2017	March 16, 2018

Note: Dates above correspond to first occurrence of 4°C daily water temperature (at LLO) on either the autumn/winter cooling trend or winter/spring warming trend.

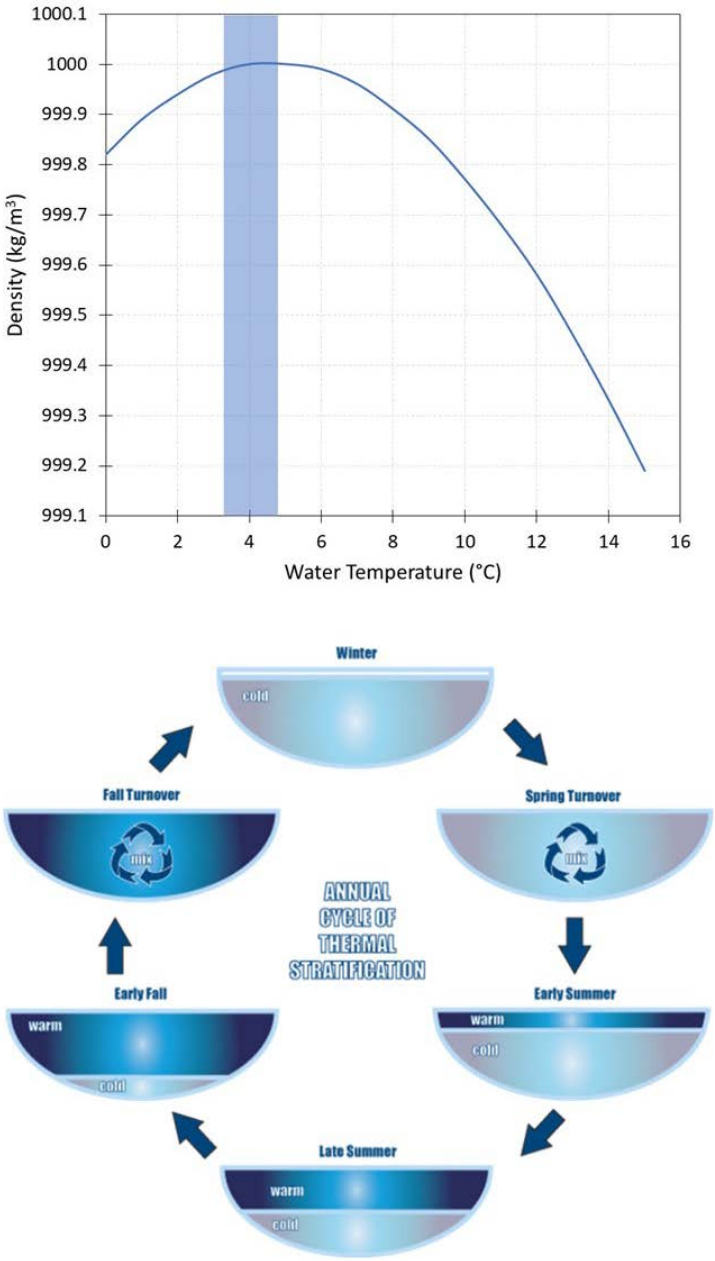


Figure 2-10: Relationship between density and water temperature (upper panel) and conceptual diagram illustrating the annual cycle of thermal stratification in a dimictic lake (after Chowdhury *et al.*, 2013).

There are other lines of evidence for seasonal turnover within Long Lake (Figure 2-11). Dissolved oxygen (DO) data for August (summer dry period) show concentrations range from 6-9 mg/L in the upper 8 m of the lake, with evidence of oxygen depletion at depth (*i.e.*, DO <3 m/L at depths below 16 m). In contrast, data for April show higher DO signatures at the lake surface (*i.e.*, 9-12 mg/L in the upper 4 m of the lake) and comparatively elevated DO concentration (6-9 mg/L) that extend to the bottom of the lake. Higher DO signatures in the April surface layer are assumed attributable to the

wetter/turbulent flow conditions that occur in winter and may entrain DO into the lake. The elevated DO concentrations that are observed at depth in April are assumed a function of density-water temperature turnover events that occur late-winter/spring.

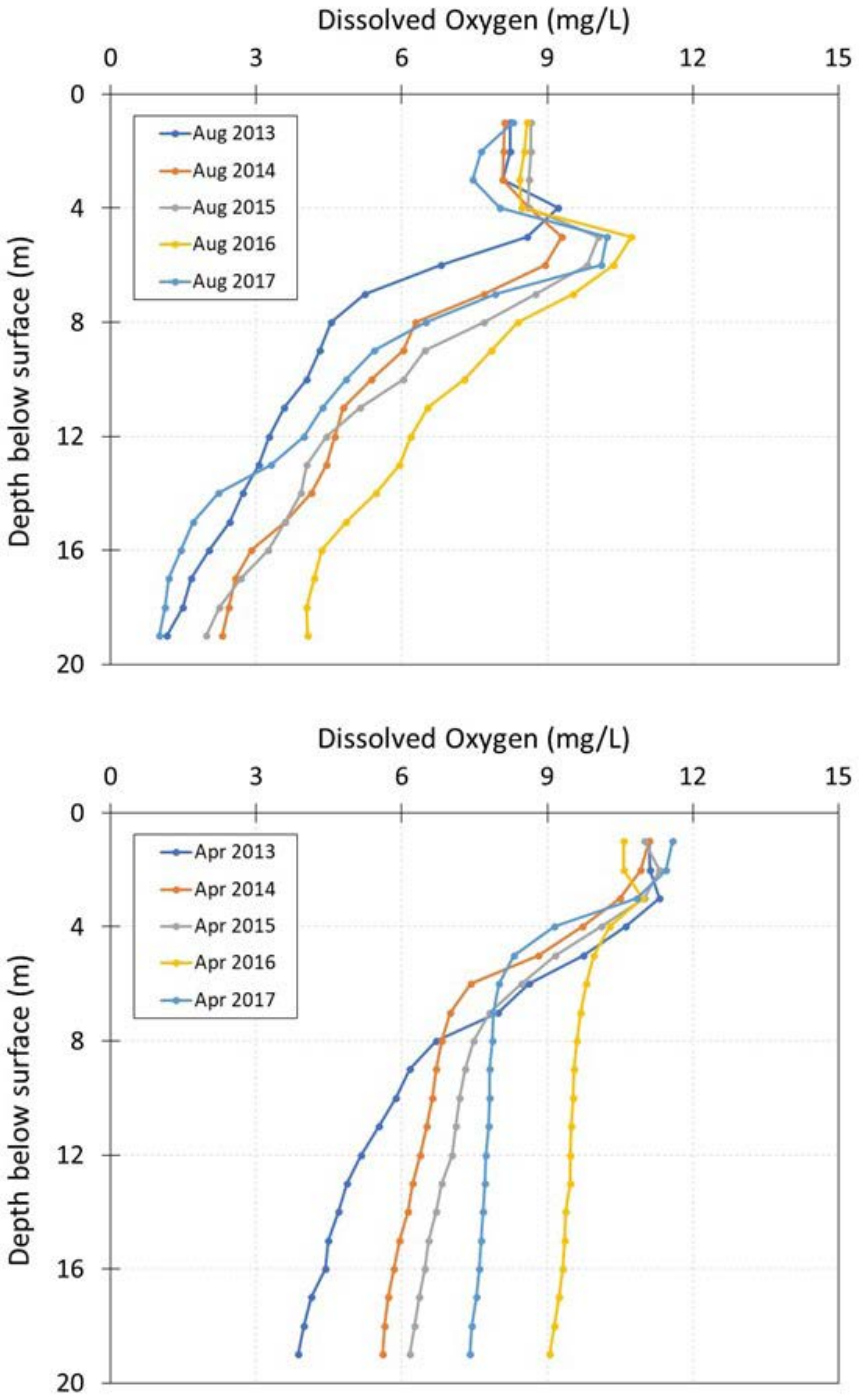


Figure 2-11: Dissolved oxygen profiles measured at Long Lake (LLM, 2013-2017). The panels show dissolved oxygen-depth profiles for August (upper) and April (lower).

3. Groundwater Inflows to Long Lake

QUINSAM COAL

3. Groundwater Inflows to Long Lake

3.1 Previous Groundwater Flux Estimates

Lorax prepared a groundwater loading assessment for Long Lake in 2012 (Lorax, 2012). Groundwater fluxes to Long Lake were computed for five different perimeter segments surrounding the lake. Hydraulic gradients were derived from then-current groundwater water levels measured at wells in the area of interest. The groundwater fluxes were computed based on a two-layer groundwater system consisting of shallow bedrock (0-20 m) and deeper bedrock (20-40 m), with each layer assigned a hydraulic conductivity (K) value derived from a site-wide database of bedrock hydraulic testing results. The only area where surficial materials were considered was at the northeast end of the 3 South Pit where a rock fill berm has been constructed to contain CCR backfill in the pit. Groundwater fluxes to this perimeter segment were derived using K values reflective of a rock fill berm. Upper and expected case groundwater fluxes were computed using different K values for the shallow bedrock (Table 3-1).

Table 3-1:
Long Lake Groundwater Loads

	Groundwater Flux (m^3/d)		**SO4 Source Terms**		**SO4 Loads (kg/d)**	
Perimeter Segment	Upper Case	Expected Case	Well Data Used	[SO_4] (mg/L)	Upper Case	Expected Case
Segment 1: North Shore Long Lake	161	44	MW11-09S/M	50	8.1	2.2
Segment 2: 3 South Pit Area	156	156	MW00-2	1170	182	182
Segment 3: 3 South Underground Mine[1]	6	2	MW00-5	1700	10.8	3.0
Segment 4: South Shore Long Lake[1]	49	13	MW11-07S/D, MW11-08S/D	127	6.2	1.7
Segment 5: 4 South Mine[1]	18	5	QU10-09S	128	2.3	0.6
				Total[1]	**209**	**189**

Notes:
1. There was a transcription error in the orginal Lorax (2012) report. Corrected loads for these segments are presented here.

To compute groundwater mass loads, a unique source term was applied to each perimeter segment. The source terms were derived from October 2010 – September 2011 water quality samples taken from monitoring wells situated adjacent to Long Lake (Table 3-1). Expected and upper-case groundwater loads were computed using the expected and upper case groundwater flow terms coupled with source concentrations consistent between the two scenarios. Computed groundwater sulphate loads for the expected and upper case are

provided in Table 3-1. The 3 South Pit contributes the highest loads via a groundwater pathway due to the assumed high permeability of the rockfill dam and downgradient surficial sediments. It is expected that sulphate loads to Long Lake from the 3 South Pit through Segment 2 (Table 3-2) will decrease in 2018 due to the replacement of the rock fill dam with a compacted till dyke that was completed in the summer of 2017.

Recent water levels collected from a subset of the wells indicate that current groundwater flow conditions are reasonably approximated by the 2012 assessment. The upper case groundwater fluxes and loads presented in Table 3-1 have been used to inform the updated Long Lake water and load balance model (Chapter 4).

3.2 Flow Estimates for Seepage Bypassing Long Lake Seep Weirs

The groundwater loads presented in Table 3-1 do not include loads contributed by the Long Lake Seep. In the 2012 assessment, loading from the Long Lake Seep was assessed separately from the groundwater analysis. An analysis has been undertaken to determine the magnitude of Long Lake Seep flow that may be bypassing the weirs and unaccounted for in the previous loading assessment.

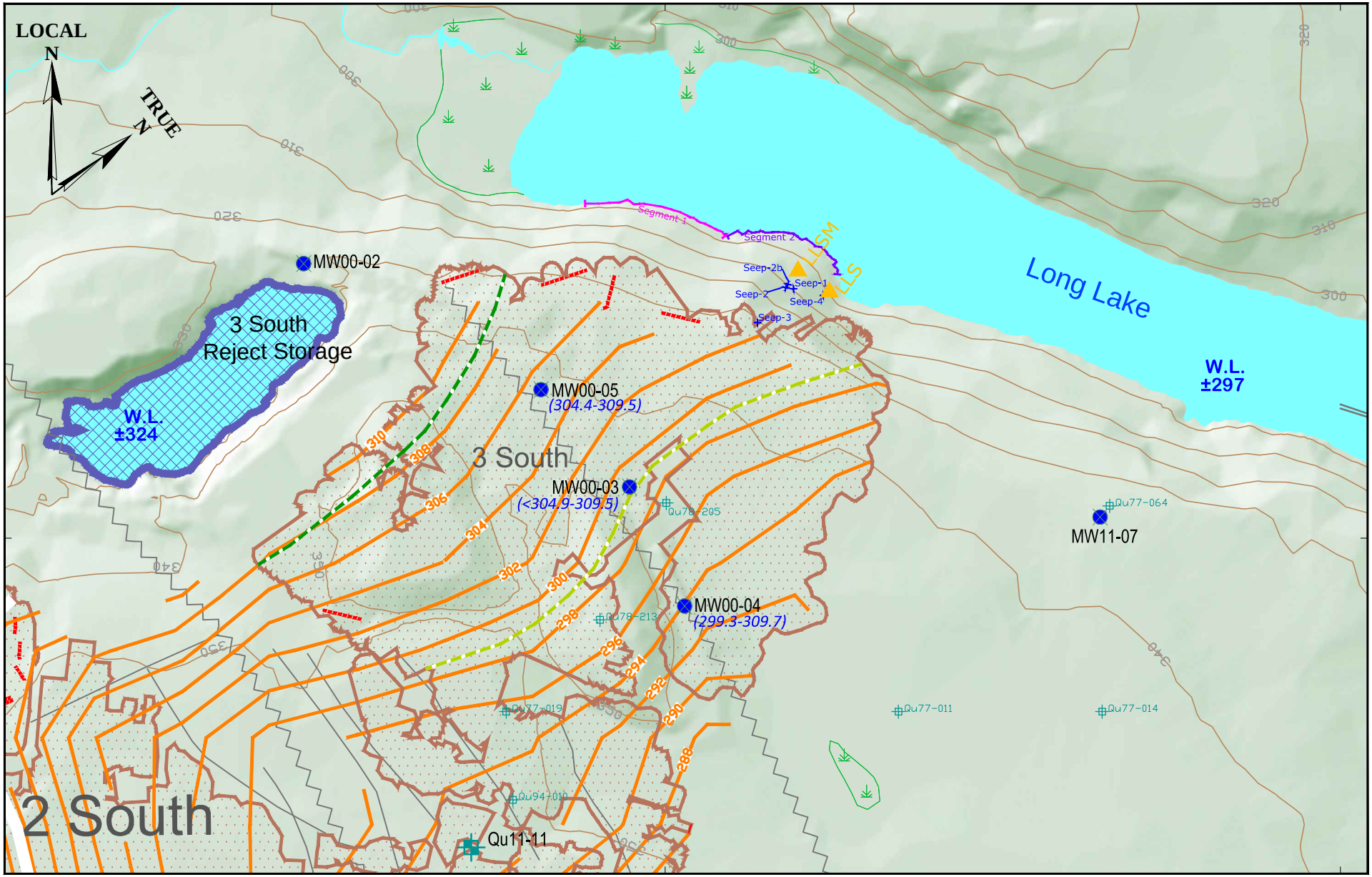
The groundwater flow analysis estimates the magnitude of flow potentially bypassing the weir measuring LLSM. The analysis computes Darcy fluxes from saturated 3-South gob towards Long Lake and compares it to measured fluxes at LLSM, noting that the secondary seep (LLS) is of much smaller magnitude (0.15 L/s versus 20-50 L/s at LLS, Figure 3-1). The Darcy flux is given by the following:

$$= \cdot \cdot$$

where Q is the groundwater flux (L/s), k is the hydraulic conductivity of intact bedrock between the 3-South gob and the lake, A is the cross-sectional area of flow (assumed to be the saturated thickness of GOB) and i is the hydraulic gradient between the gob and Long Lake. The Darcy flux was computed for two segments (Figure 3-1):

- Segment 1 where the GOB is at its closest proximity to the shore of the lake and the bedrock thickness the face of the GOB is less than 10 meters; and,
- Segment 2 where the GOB is farther back from the lake and bedrock thickness at the face of the GOB is on the order of 20 meters.

The thickness of ground cover at the face of the GOB determines the K value applied to the segment. For bedrock cover less than 10 meters (*i.e.* Segment 1), a K value of 1.5E-4 m/s was applied, while a slightly lower value (5E-5 m/s) was used for the second segment with thicker bedrock cover. These values are consistent with the some of the highest bedrock K values measured on site at shallow depths (Lorax,2012).



LEGEND

- Existing Mine Workings
- Pits
- Lakes
- Rivers/Creeks
- Elevation(10m)
- Fault
- Swamp/Marsh
- Weir
- Pumping Well
- Groundwater Well
- Boreholes
- Long Lake Seeps
- 327.2 Water Levels range (Jan. 2013-Apr. 2018)
- Mine Flooded Line (Max)
- Mine Flooded Line (Min)
- Top of 1 Seam Contours

DATE SAVED:	May 07, 2018
DRAWN BY:	AL
REVIEWED:	LF
VERSION:	1

Projection: Orthographic
Coordinate System: Quinsam Mine Local Grid
Units: Metres

1:4,000

0 50 100 Meters

CLIENT: QUINSAM COAL

LORAX ENVIRONMENTAL

PROJECT: **Long Lake Seep Treatment Evaluation**

TITLE: 3 South Underground and Long Lake Seep

PROJECT #: A473-2

FIGURE: 3-1

P:\@Drafting\Quinsam\AutoCAD map\LongLakeSeepTreamtmentAssessment\GWM_Map_20180507.dwg

The analysis was set up so that groundwater fluxes could be computed for the water level recorded in the GOB, which is measured at monitoring well MW-004. The cross-sectional area of saturated gob (*A*) and the hydraulic gradient (*i*) therefore change through time. The cross-sectional area of saturated gob considers the dip of the coal seam over these two segments (top of No. 1 seam contours are shown in Figure 3-1). The 3-South gob is located above the elevation of the lake over these two segments. The 3-South GOB extends from the base of the No. 1 seam, assumed to be 2.5 m thick, to ground surface.

The computed groundwater fluxes are shown in Figure 3-2. The hydraulic conductivity of bedrock was adjusted such that computed groundwater fluxes would be commensurate with peak LLSM flows. The analysis shows that, while coarse, the Darcy approximation for flows at LLSM is appropriate as it reproduces the flashiness of LLSM flows for water level changes in the gob. The analysis also shows that during baseflow periods, when LLSM flow drops to zero, there remains approximately 5 L/s of flow that may be bypassing the weirs. This bypass flow is expected to occur throughout the year, except during extremely dry periods (*i.e.* September of 2014 and 2015) when the water level in the 3-South gob drops to 300 m or lower. At this point, the gob is largely unsaturated over the segments considered and the Darcy flux essentially drops to zero. This 'uncaptured flow' term has been incorporated in to the water balance and water quality models, as described in Chapter 4.

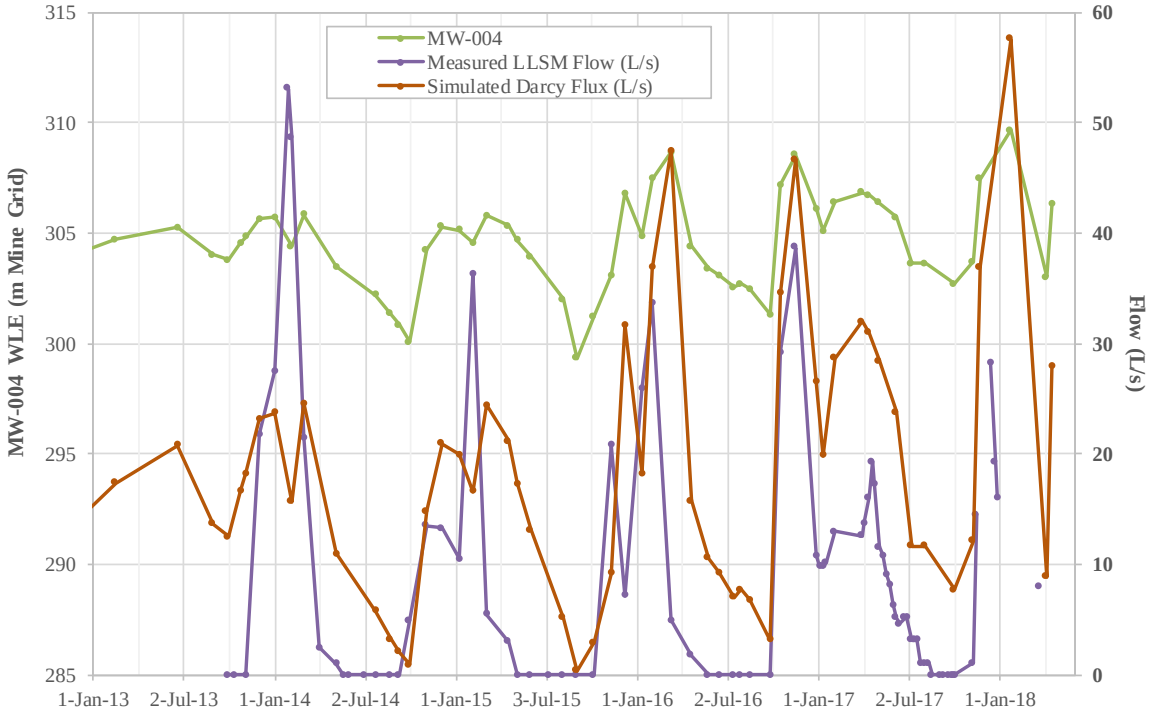


Figure 3-2: Simulated groundwater fluxes and measured LLSM flows.

3.3 Long Lake Seep and 3-South Underground Conditions

For this updated assessment, groundwater conditions in the 3 South gob and at the Long Lake seep are explored in more detail to determine if operation of the LLST system has influenced the quantity and quality of flow from Long Lake Seep and water quality/quantity in the 3 South gob.

3.3.1 Long Lake Seep Flows and 3 South Underground Groundwater Levels

A map of the 3 South Underground monitoring wells and the location of the Long Lake Seep relative to the underground workings is provided in Figure 3-1. Several visible seeps issue from the rock face flanking Long Lake, down gradient from the flooded 3-South underground. Drainage from several of these seeps coalesces and is measured at a single weir and reported as LLSM (Figure 3-3). The seeps feeding LLSM range in elevation from 300.6 m to 308.9 m. An additional seep (elevation 299.8 m) is measured adjacent to the LLSM weir and reported as LLS. Three monitoring wells are completed within the 3 South gob including MW-003, MW-004, and MW-005. Pumping well QU11-11 feeds 3-South underground mine water to the LLST system.

Figure 3-3: LLSM weir prior to upgrades in April 2012. Approximate flow 20 L/s.

Figure 3-4 shows time trends of LLSM flow and groundwater levels in the 3 South underground monitoring wells. Monthly precipitation data from site and the nearby BC Hydro station (Quinsam River at Argonaut Bridge) are shown for reference. Vertical reference lines show the approximate dates of a landslide event near the Long Lake Seep and initiation of the LLST system. When viewed in tandem with the water level data, flows at LLSM appears to stop when the water level in MW-004 drops below ~302.5 m. This also corresponds to the elevation of Seeps 1 and 2 which feed the LLSM weir (Figure 3-1). The estimated maximum and minimum flooded level of the 3-South underground workings, based on the water level record at MW-004, is shown as the dashed green line on Figure 3-1.

The water level hydrographs for MW00-3, MW00-4 and MW00-5 all show strong seasonal variability. The subsidence related fracture zone above the former mine has likely enhanced its connection to surface recharge. As indicated in earlier reports (Lorax, 2012; Golder 2010) a landslide in the area of the Long Lake Seep prompted changes in groundwater hydrographs reported by MW00-3, MW00-4 and MW00-5. The slide caused a depression of hydrograph maxima on the order of one to two meters. The slide also caused the water levels in these three wells to diverge with the hydrograph record at MW-003 becoming flashier. It is likely that the landslide enhanced drainage from the 3 South underground (Lorax, 2012).

Given the influence of the landslide on water levels, a comparison of the effects of the LLST system on water levels must consider data post dating January 2006. The comparison is conflated by variable climate and the frequency of water level measurements - water levels were measured in 3 to 6 months of the year between 2006 and 2012, while they were measured in 9 to 12 months of the year from 2014 onward.

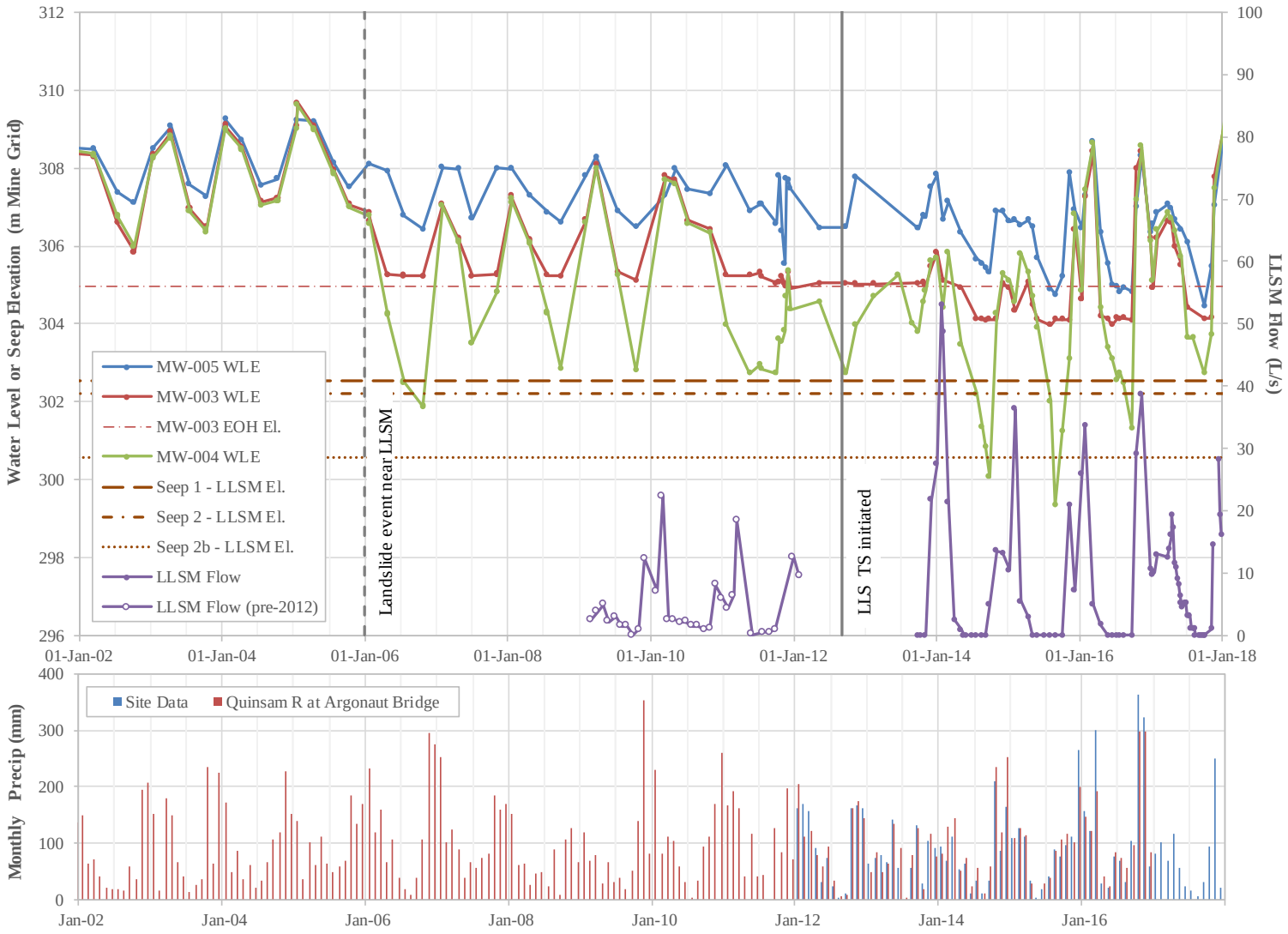


Figure 3-4: Flow at Long Lake Seep (LLSM) and water levels in 3-South underground monitoring wells.

Water level maxima measured at MW-004 are illustrated in Figure 3-4 along with precipitation. In years where water levels were more frequently measured (2013 onward), water level maxima typically occurred in March. Unfortunately, water levels were not measured in March in most years pre-dating the LLST system, except for 2009 and 2010. Thus, the true maximum water levels may be higher than the maximum measurement captured by the monitoring records for these years. The maxima measured in 2009 and 2010 years are 308.0 and 307.7 m, respectively. Water level maxima measured after inception of LLST system (2013-2015) range from 305.8 m to 306.9 m, or about 1 to 2 meters below pre-treatment minima. The antecedent precipitation conditions during this time are lower than average, particularly in 2013 (Table 2-6), which may be responsible for the lower mine pool maxima. Predictably, in the years when the mine void did not flood to 308 m, the mine pool drained to lower levels in 2014 and 2015. The following year (2016) was a very wet year (Table 2-6) and at which time the MW-004 maxima equalled or exceeded pre-treatment levels in 2016 and 2017. However, 2017 was an extremely dry year but a decrease in the minimum MW-004 water level was not noted in October 2017.

In years where water levels were more frequently measured (2013 onward), water level minimal typically occur in late September or early October. Water levels were also measured around this time of year in years prior to treatment, when data are more sparse. Therefore, it is assumed that water level minima measured in 2006, 2008, 2009, 2011 are likely representative of true hydrograph minima. The minimum water levels at MW-004 in these years range from 301.9 m to 302.9 m. Subsequent to the initiation of the LLST system water level minima in MW-004 were similar to pre-treatment levels in 2012 and higher in 2013. A notable decrease in minima can be noted in 2014 and 2015, which corresponds to the second and third consecutive years of below average rainfall (Table 2-6). Minimum water levels measured at this well from 2014 to 2016 range from 299.3 m to 301.3 m. The 2016 minimum (301.3 m) is more than half a meter lower than the 2008 minimum, despite having experienced a much wetter summer than 2008, although, again, the preceding three years experienced below average precipitation. Similar patterns are also observed in the MW-005 data. MW-003 data are more difficult to interpret since this well is shallower and often dry. Some of the more recent water levels measured at this well are thought to be false reads (*i.e.* water left in the end cap of the well) as the depth to water measurements exceed the well depth (horizontal red dashed line in Figure 3-4).

The results presented above are inconclusive given the variable precipitation trends noted above. Although 2014 and 2015 water levels in the 3 South gob were clearly lower than the pre-treatment time frame this may be directly related to climate variations.

The impact of the LLST system on flow rates at LLSM is difficult to establish (Figure 3-4). Prior to 2012, flows were derived from spot measurements of water height made directly

at the notch of the face plate. Continuous measurements of stage were not recorded prior to 2012, nor were validating discharge measurements (*e.g.*, bucket samples) to confirm agreement with the rating curve for the structure. In 2012, the LLSM hydrometric station was upgraded under oversight of a Lorax hydrologist. Upgrades included improved containment of the weir via sandbagging and installation of instrumentation (metric staff gauge, stilling well and water level recorder) upgradient of the weir faceplate. This allowed for continuous monitoring of flows and cross-checking with manual staff gauge and bucket measurements for rating curve re-development and validation. Measurements pre-dating 2012 are assumed to have underestimated flows due to the measurement method *(i.e.* height of water at the notch) and potential for flow bypassing the weir. For this reason, a detailed comparison of pre- and post-treatment LLSM seepage rates has not been undertaken.

3.3.2 Long Lake Seep and 3 South Underground Water Quality

Time trends of sulphate concentrations at the Long Lake Seep (LLS, LLSM) and the 3 South Underground (MW-003, MW-004, and MW-005) are provided in Figure 3-5. A continuous water quality record that allows comparison of sulphate concentrations prior to and during operation of the LLST system only exists for MW-004 and LLS. The smaller Long Lake seep (LLS) and MW-004 have been routinely sampled since 2006 (Table 2-7). The larger Long Lake Seep (LLSM) has been sampled since February 2011. Sampling of MW-003 and MW-005 was discontinued in 2012.

Figure 3-5 illustrates that sulphate concentrations are highest and most variable at MW-005 and lowest and least variable at MW-004. MW-003, LLS and LLSM report intermediate concentrations that are moderately variable. Referring to Figure 3-1, the magnitude and variability of sulphate concentrations within the 3 South gob appears correlated with the position of the sampling location along the dip of the coal seam and thus the position of the moving saturated front. MW-004, which screens gob that remains saturated year round, reports the lowest sulphate concentrations. MW-003, LLS and LLSM sample contact water from areas that are periodically unsaturated. Oxidation products can build up during unsaturated periods which are then flushed as the exposed surfaces are reflooded. Peak concentrations in the perennial seep (LLS) tend to occur during or shortly after peak flow events at LLSM and are often timed in the very late fall/early winter (December through February) (Figure 3-5), noting that peak water levels in the mine typically occur in March. Sulphate maxima measured at LLSM are not always measured during the same month as LLS but, seem to also occur during the late fall/early winter although 2014 and 2017 were exceptions.

Annual minimum concentrations at LLS and LLSM are not consistently measured during the same season and are therefore not synchronous with water level minima measured in

the mine at MW-004 (Figure 3-4). The timing of sulphate minima is also not consistent between the two stations, noting that minima at LLS are sometimes recorded when LLSM is not flowing (Figure 3-6).

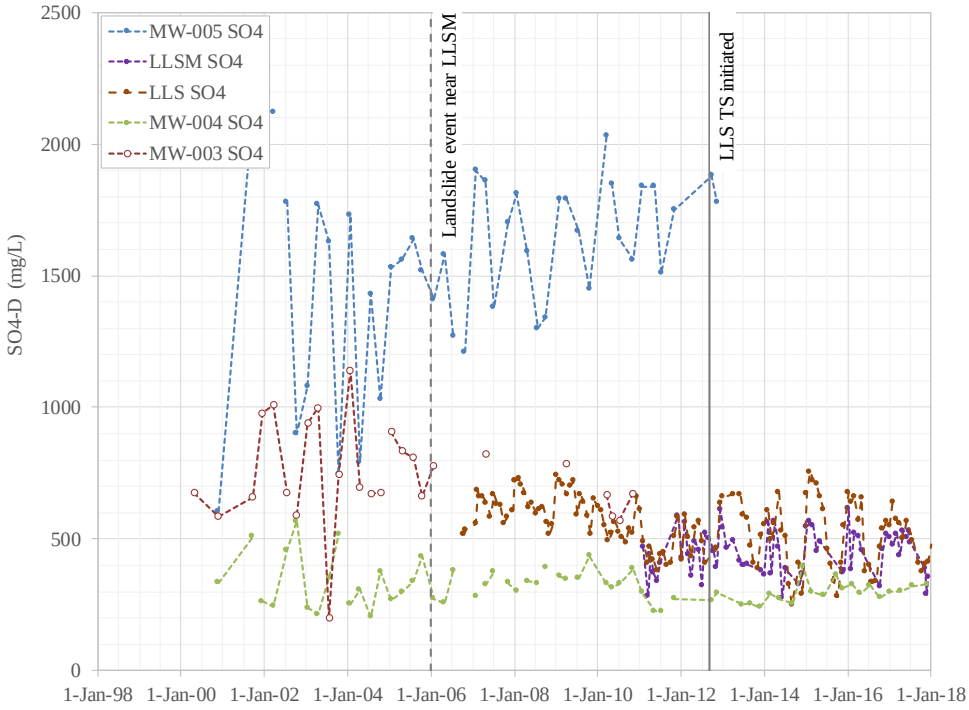


Figure 3-5: Water quality at the Long Lake seeps and 3-South underground monitoring wells.

Time trends of sulphate concentrations at LLS, LLSM and MW-004 post-dating inception of the LLST system are shown in Figure 3-6 and Figure 3-7. To illustrate trends, pre-treatment concentration statistics (mean, 5th percentile, 95th percentile) are shown as horizontal reference. Since LLSM was monitored for a shorter period prior to inception of treatment (Table 2-7), the statistics and discussion are based on data for LLS. Since inception of the LLST system, the water quality at LLS has improved with mean concentrations ~55 mg/L less than mean concentrations prior to treatment. Fifth percentile concentrations are have dropped by over 100 mg/L while 95th percentile concentrations are essentially similar to pre-treatment levels.

Mean sulphate concentrations at MW-004 are slightly lower (30 mg/L) since treatment began (Table 3-2). The reduction in 95th percentile concentrations at this well since onset of treatment is more pronounced (>120 m/L lower) and seasonal variations in concentrations are lower. Peak sulphate concentrations at this well do not appear correlated to the water level in the workings (Figure 3-7). Overall, the water quality data at LLS and MMW-004 indicate a modest improvement in 3 South water quality since inception of treatment.

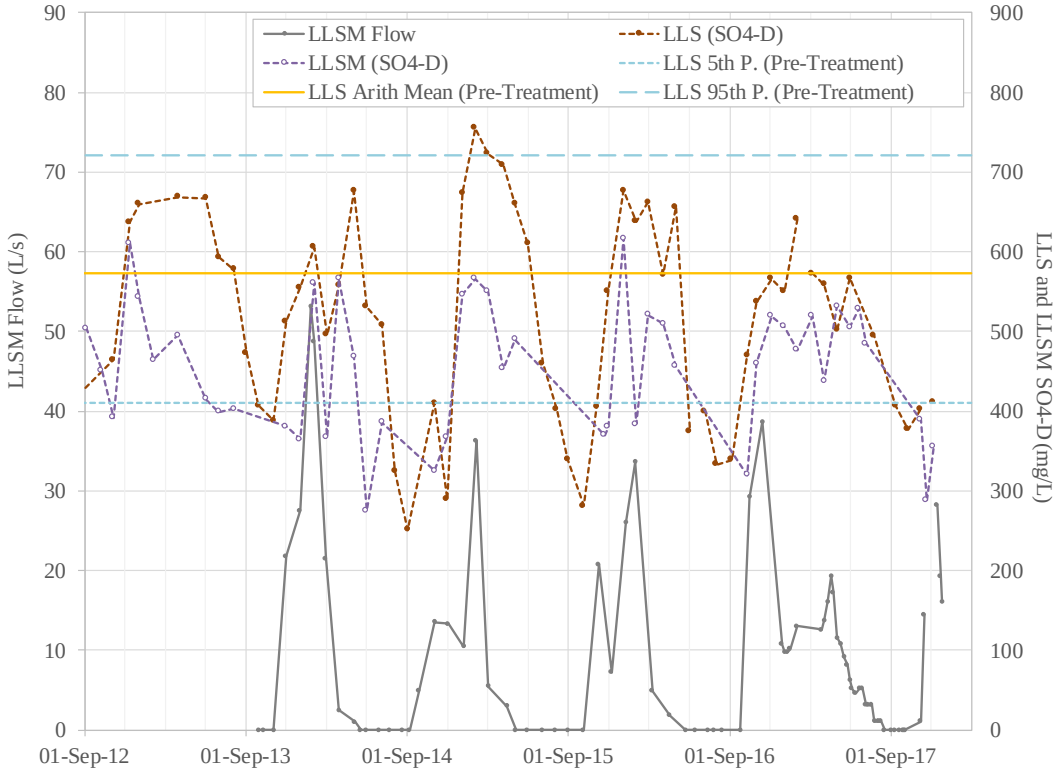


Figure 3-6: Flow and water quality at LLS and LLSM during LLST Operation.

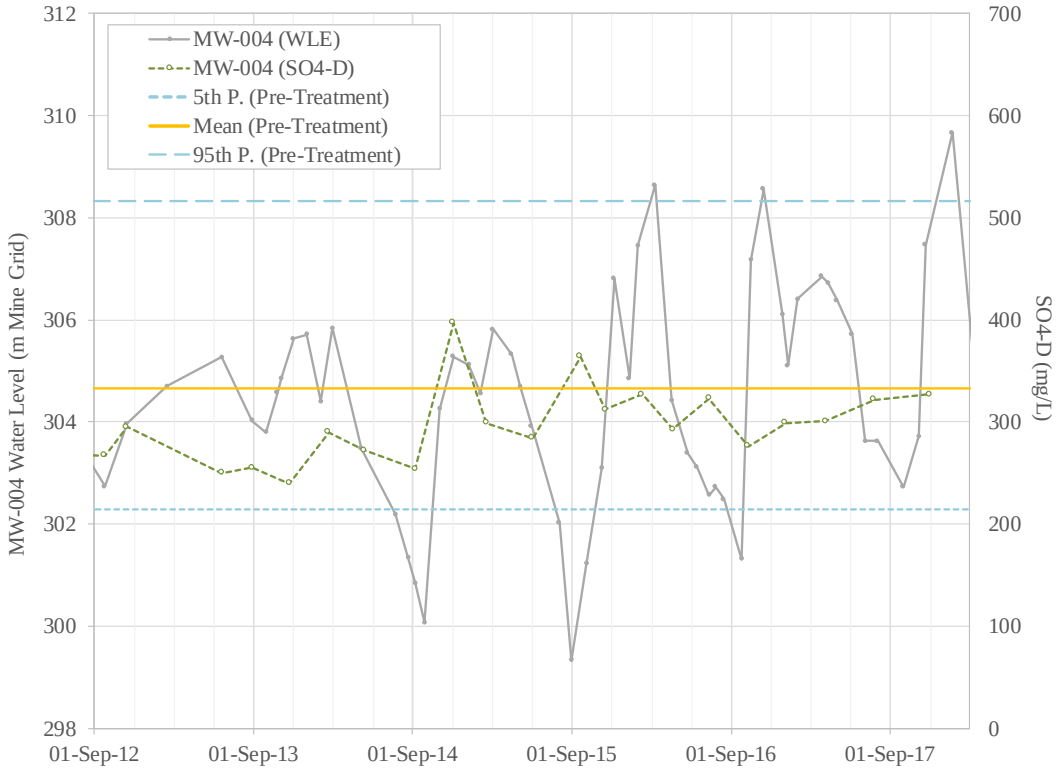


Figure 3-7: Water levels and water quality at MW-004 during LLST.

Table 3-2:
Mean, 5th and 95th percentile concentrations at MW-004 and LLS prior to and during LLST operation

Metric	MW-004		LLS	
	Pre-LLST	**During LLST**	**Pre-LLST**	**During LLST**
5% Percentile	215	241	410	288
Arith. Mean	333	297	573	518
Std. Deviation	82	37	92	126
95% Percentile	516	394	721	710
Count	41	21	70	57
Sample Dates	24-Nov-00 to 4-Nov-11	25-Sep-12 to 30-Nov-17	12-Oct-06 to 1-Aug-12	5-Sep-12 to 7-Dec-17

4. Long Lake Water and Load Balance Model

QUINSAM COAL

4. Long Lake Water and Load Balance Model

To further refine the understanding of the Long Lake system, and to quantify the dominant sulphate loading sources on a monthly basis, a water and load balance model was assembled in Microsoft Excel. The model includes monthly flows and sulphate concentrations as inputs for all stations listed in Table 2-7. In addition to the data sources listed in Table 2-7, the groundwater inflows and associated sulphate loads described in detail in Chapter 3 were also included.

4.1 Water Balance Model

Modeled lake inputs include the following:

- Precipitation on the surface of Long Lake;
- All runoff reporting to Long Lake from the No Name Lake watershed, as represented by the 3SDS3 node. Flow volumes were estimated by scaling the LLO data by watershed area;
- Groundwater system inflows to the lake, as described in Section 3.1;
- Seepage flows as measured at the LLS and LLSM weirs;
- Shallow gob seepage flows that bypass the Long Lake Seep weirs as described in Section 3.2; and
- Measured flows from the LLE station, including the effluent from the LLTS.

Lake outputs (losses from the water balance) are:

- Evaporation, as described in Section 2.1.3, and;
- Measured flows at the LLO station.

The water balance is well resolved, with the inflows and outflows from the lake balancing to within 1% on a monthly basis over the full model run (Jan. 2012 to Dec. 2017; Figure 4-1).

The monthly proportions of total lake inflow generated by each source are presented in Table 4-1. The majority of lake inflows report from the No Name Lake catchment and the downstream connector channel (76% of total inflows), and the additional surface runoff from the northern and southern edges of the lake that are not captured by other monitoring stations. The inflows generated from sub-surface flows through the deeper groundwater system, gob and LLSM+LLS only comprise 3% of total lake inputs on an annual basis.

Flows measured at the LLE station (which include the outflow from the Long Lake Treatment System) comprise 15% of the total lake inputs.

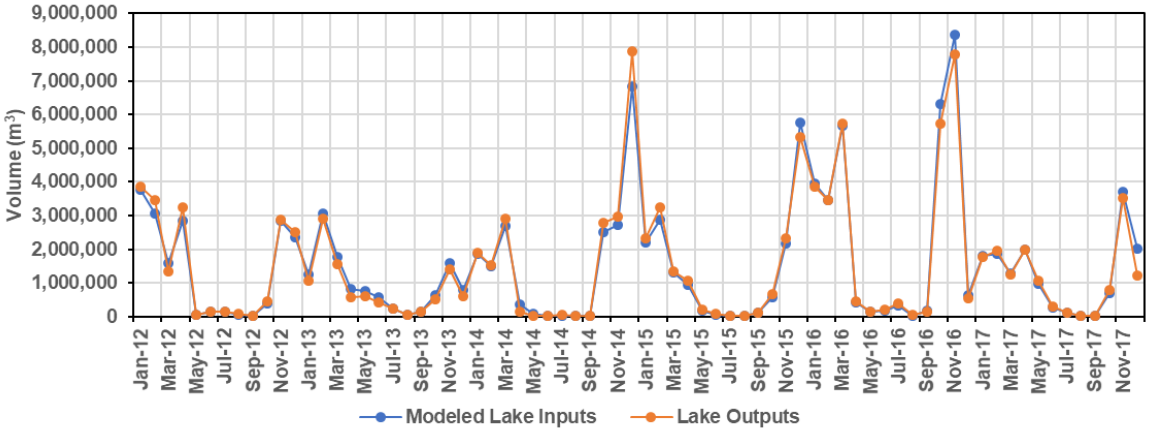


Figure 4-1: Monthly lake inflows and outflows (including evaporation) for Long Lake

Table 4-1:
Monthly average inflow volumes for Long Lake (2012 to 2017). All values in m^3.

Month	Precip	3SDS3	NC-LL	GW	Gob	LLWM+LLS	LLE	Total
Jan	15,641	1,916,220	118,730	6,836	13,392	49,506	367,969	2,488,293
Feb	13,212	2,151,437	133,304	6,395	12,240	44,632	282,368	2,643,588
Mar	17,434	1,837,945	113,880	6,836	13,392	43,256	369,039	2,401,782
Apr	8,329	960,165	59,492	6,616	12,960	34,085	162,188	1,243,834
May	7,550	259,230	16,062	6,836	13,392	11,115	61,756	375,942
Jun	6,179	131,798	8,166	6,616	12,960	6,005	45,927	217,651
Jul	4,245	108,681	6,734	6,836	13,392	4,419	12,906	157,213
Aug	4,385	16,688	1,034	6,836	13,392	1,295	3,576	47,206
Sep	8,523	47,343	2,933	6,616	8,640	389	17,286	91,730
Oct	19,390	1,417,563	87,833	6,836	13,392	7,098	317,058	1,869,170
Nov	22,868	2,720,492	168,563	6,616	12,960	52,661	593,859	3,578,018
Dec	16,777	2,350,324	145,627	6,836	13,392	64,237	484,951	3,082,144
Average	12,044	1,159,824	71,863	6,726	12,792	26,558	226,573	1,516,381
Average Annual Contribution	1%	76%	5%	0%	1%	2%	15%	100%

Volumetric calculations using the Long Lake bathymetry (Figure 2-1) indicate the total lake volume is 1,025,031 m^3 and volume below the 9 m depth comprises < 20% of the total lake. The total monthly flow inputs to Long Lake from October through April (Table 4-1)

exceeds the total lake volume, however, inflows for the remaining months are less than the lake volume. This indicates that only a portion of the lake volume is likely to be released during the period of May through September.

4.2 Sulphate Load Balance Model

The sulphate load balance model is built on the water balance model architecture, with total monthly sulphate loads calculated as the product of the average monthly concentration multiplied by the total monthly flow volume for each input and output listed in Section 4.1.

The load balance model is designed to be used to address three primary objectives that were developed to better understand the processes responsible for the sulphate concentration trends in Long Lake. The objectives of the loading model analysis and the section of the report where they are addressed are listed below.

1. Section 4.2.1 discusses the quantification of the monthly variability in sulphate loads reporting to and discharging from Long Lake;
2. Section 4.2.2 discusses the quantification of the relative proportion of the total load contributed by each source during the period of mine pool water treatment by the LLST system; and
3. Section 4.2.3 discusses the quantification of the degree of change in both total loads reporting to the lake, and the changes in proportions of total load contributed by each source if the treatment system were to be decommissioned.

4.2.1 Monthly Load Model

Relevant information on the sulphate data used as model inputs is provided below.

- All non-contact areas (including the No Name Lake outflows, as represented by station 3SDS3) show sulphate concentrations below method detection limits (0.005 mg/L). Concentrations for these flows are set to half-detect (0.0025 mg/L).
- The high-K groundwater inflows described in Section 3.1 were used in the load balance model, which results in an estimated 209 kg/day sulphate load reporting to the lake, as opposed to 190 kg/day for the low-K scenario.
- Sulphate concentrations in seepage water bypassing the weirs are estimated from LLS.
- Sulphate concentrations in the LLS seepage average 518 ± 123 mg/L;
- Sulphate concentrations in the LLSM seepage average 448 ± 77 mg/L;
- Sulphate concentrations in the LLE discharge average 245 ± 190 mg/L, and;

- Sulphate concentrations in the LLO lake discharge average 56 ± 24 mg/L;

Similar to the water balance model, the load balance model is also well resolved, with the average monthly sulphate load input (55,664 kg) and losses (58,082 kg) from the lake balancing to within 4% (Figure 4-2).

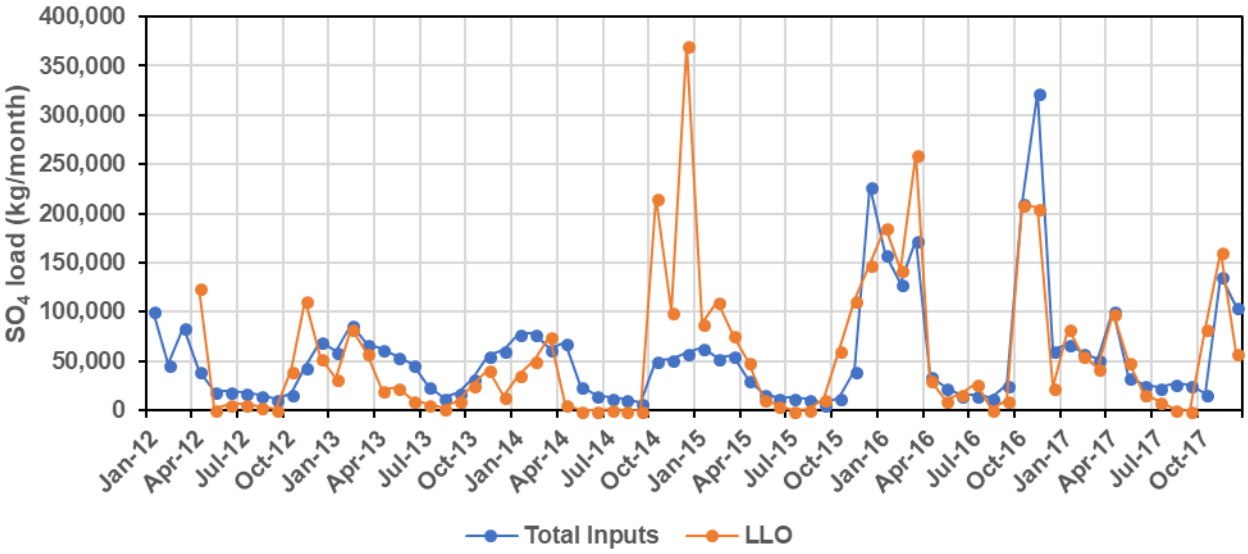


Figure 4-2: Modeled monthly sulphate load inputs to Long Lake, and measured sulphate load losses at the LLO station.

Three multi-month peaks in sulphate loadings to the lake are evident between November and March from 2014 to 2017 (Figure 4-2). Sulphate concentrations in the LLE discharge during these periods were within the normal range for these months, and thus these peaks are due to higher than average discharge (flow) at the LLE station, which ranged from 172% (Feb. 2016) to 467% (Oct. 2016) of the 6-year monthly average discharge.

4.2.2 Proportional Sulphate Loading – LLST System Active

The sulphate loads calculated within the model over the 2012 to 2017 period were reported as a percent of the total load, and these proportions were averaged by month for the treatment scenario (Figure 4-3). Monthly average total sulphate loads for the treatment scenario reporting to Long Lake vary from 108,717 kg/month in November to 15,996 kg/month in September (Figure 4-3). This intra-annual pattern is driven by the site hydro-climate regime, with peak flows occurring in October through March, and declining to annual minimums in July through September.

Under the treatment scenario, the No Name Catchment (3SDS3) and additional non-contact drainages reporting to Long Lake each contribute <1% of the total load, as sulphate concentrations are consistently below the method detection limit in these waters. The two

seeps (LLS and LLSM) account for 18% of the sulphate load in Long Lake on an annual basis, varying from 1% in September when the mine pool is drawn down to 35% in December (for LLSM) when the mine pool water level is high following the onset of winter precipitation events. The seepage flow through the gob that bypasses the LLSM and LLS weirs constitutes 20% of the total load annually, varying from 8% in November to 29% - 40% in May to August. The groundwater system not directly related to the Long Lake Seep contributes 23% of the total load annually, varying from lows of 8% (Dec. – Jan.) to a high of 52% in September (Figure 4-3).

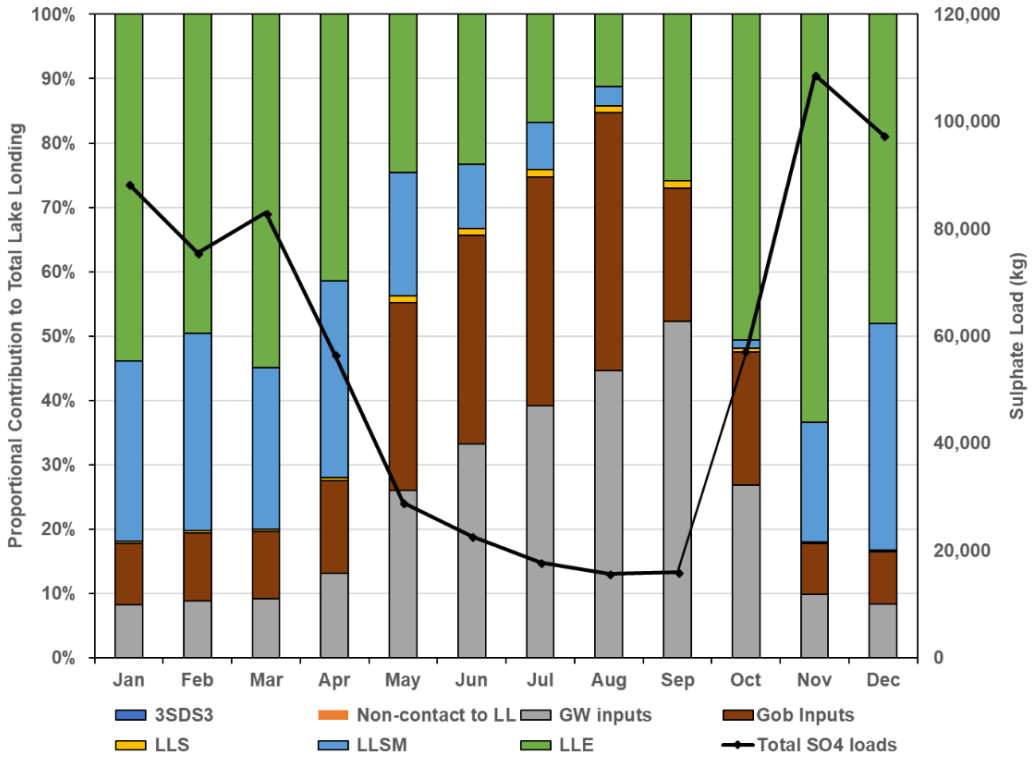


Figure 4-3: Monthly proportional sulphate load contributions to Long Lake (with treatment). Average monthly sulphate loading (sum of all inputs) is shown by the black line.

LLE comprises the largest source load reporting to the lake (39% annually), and sulphate concentrations at LLO are most strongly correlated to sulphate values at LLE (R^2 = 0.79; Table 2-8). Groundwater inflows to the lake constitute 23% of the load on an annual basis, however comprise a much higher proportion of total loading during the summer. From April to August, LLE's contribution to the load balance drops from 41% to 11% as surface flows decline in response to lower precipitation and summer dry conditions. The proportion of loading contributed by the groundwater system (exclusive of LLS and LLSM) increases over the same period from 13% to 45%. This is largely an artefact of dropping surface flow inputs, while the groundwater system flow rates remain relatively constant.

4.2.3 Proportional Sulphate Loading – No Treatment Scenario

The sulphate loads calculated within the model to simulate loading to the lake following the removal of the LLST system are presented as a percent of the total load (Figure 4-4). To calculate the potential impact of decommissioning the Long Lake Treatment System, several adjustments were made to the loading model. First, is was assumed that the current rate of pumping to treatment from the mine pool (constant at 4 L/s) was allowed to discharge to the lake via the existing seepage faces, with the average concentration of the LLS and LLSM waters. Next, the sulphate load remaining in the treated effluent (represented by monitoring data from the BCR-EFF station, at 4 L/s) was removed from the LLE discharges. LLE flows were assumed to remain unaltered from the 'with treatment' scenario, which is a conservative assumption, as it results in higher loads than if 4 L/s of flow were removed from the LLE discharge.

Following application of these assumptions, the revised simulation predicts that the removal of the LLST system will result in an increase of sulphate loads to the lake of 3% on an average annual basis. Under the no treatment scenario, monthly average total sulphate loads reporting to Long Lake vary from 109,884 kg/month in November to 18,324 kg/month in September (Figure 4-4).

The removal of treatment results in the redirected load contributing 13% of the total loads on an average annual basis, varying from 6% in November through March, to 28% in September, mirroring the intra-annual pattern in proportional load contributions noted for the LLS and LLSM seeps (Figure 4-4). The intra-annual pattern in proportional load contributions from each source remains the same under the no treatment scenario, but the magnitude of the contribution to the total load is reduced relative to the additional sulphate loads no longer being treated. Groundwater inputs not associated with the Long Lake Seep comprise 20% of the total loads, gob flows are 18%, the LLS and LLSM remain 18% of the total, and the LLE discharges see the largest reduction in proportional contributions, falling from 39% to 31% on an average annual basis (Figure 4-4).

In the event that the LLST system does not continue to operate, the average annual sulphate load to Long Lake is predicted to increase by 3% (Table 4-2) over the loads that were observed during the operating period through 2017. A monthly evaluation of the loading indicates that an increase of 14% - 19% would be observed during the summer months of July, August and September.

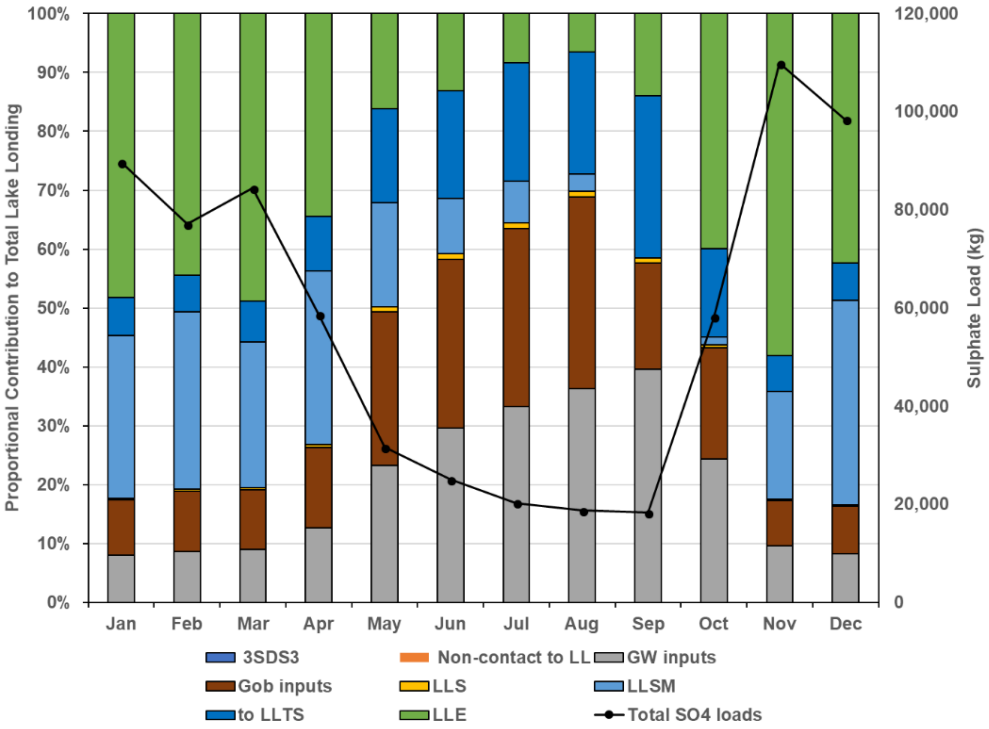


Figure 4-4: Monthly proportional sulphate load contributions to Long Lake (no treatment). Average monthly sulphate loading (sum of all inputs) is shown by the black line.

Table 4-2:
Average Monthly Sulphate Loads and Predicted Increase

	Treatment	No Treatment	Load Increase
	(kg SO_4)	(kg SO_4)	%
Jan	88,384	89,659	1%
Feb	75,509	77,088	2%
Mar	82,995	84,407	2%
Apr	56,662	58,631	3%
May	28,941	31,611	9%
Jun	22,708	25,050	10%
Jul	17,817	20,269	14%
Aug	15,749	18,726	19%
Sep	15,996	18,324	15%
Oct	56,992	58,190	2%
Nov	108,717	109,884	1%
Dec	97,499	98,407	1%
Total	**667,970**	**690,246**	**3%**

4.2.4 Long Lake Mixing Regime

The loading model is used to estimate sulphate concentrations at the outlet of Long Lake and these modeled concentrations are compared to the measured concentrations at LLO during the LLST system operating period. A comparison of the modeled versus the measured concentrations (Figure 4-5) provides insight into the lake processes that may influence the timing and release of sulphate from Long Lake. In this first simulation, all sulphate loads reporting to Long Lake are mixed with the total inflow volume to calculate a concentration on a monthly basis. This approach assumes that water volumes and loads report to the outlet on a monthly basis.

The predicted concentrations correspond closely with measured values October through April but the results from the model typically over estimate concentrations June through September (Figure 4-5). This result suggests that a portion of the sulphate load input into Long Lake during the spring and summer months does not report to the outlet but rather, is stored within the lake.

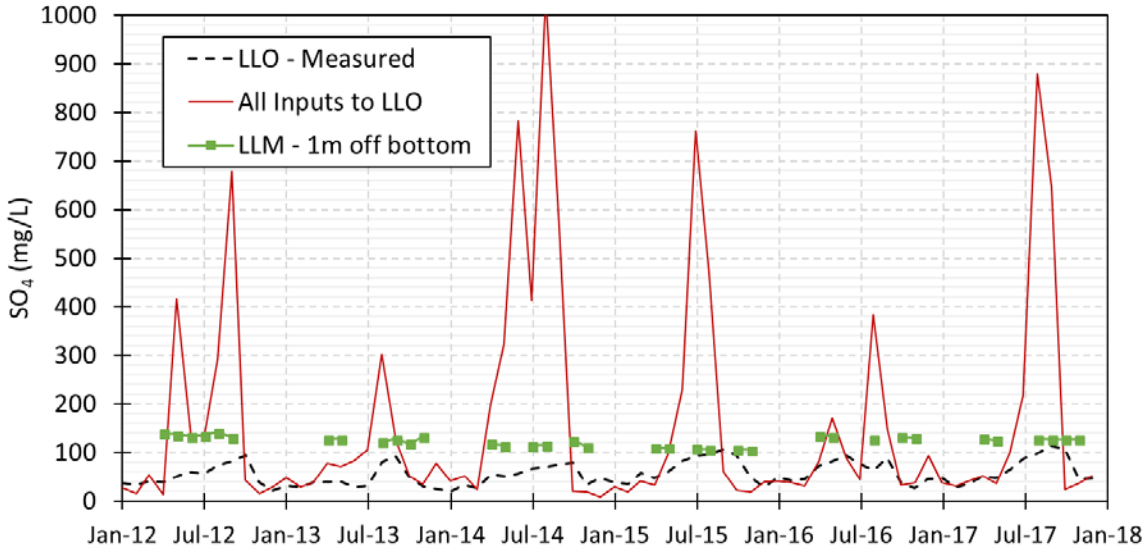


Figure 4-5: Modeled sulphate concentrations at the outlet of Long Lake.

A more detailed model of the lake system that simulates mass storage within the lake from month to month can account for the measured sulphate concentrations in the lake. A second simulation was conducted that incorporated the following components:

- The bottom of the lake is assumed to be isolated from the upper 6 m of the lake throughout the year;
- Loads introduced into the lake are allowed to fully mix with the water volume in the upper 6 m of the lake. A concentration is calculated from the combined monthly input and pre-existing loads; and

- A load is released from the lake outlet each month that corresponds to the monthly lake discharge with the calculated concentration in the upper 6 m.

The results of the second simulation match the measured values from the Long Lake Outlet (LLO) and the two upper lake profile measurements from depths of 1 m and 4 m (LLM1, LLM4) as illustrated in Figure 4-6. The good correlation between the simulation results and measured surface water sulphate concentrations suggest that although there may be variable mixing depths within the lake there may not be complete turnover of the lake each year. However, as stated previously, the extent of lake mixing during the winter months has not been fully established by the monitoring program.

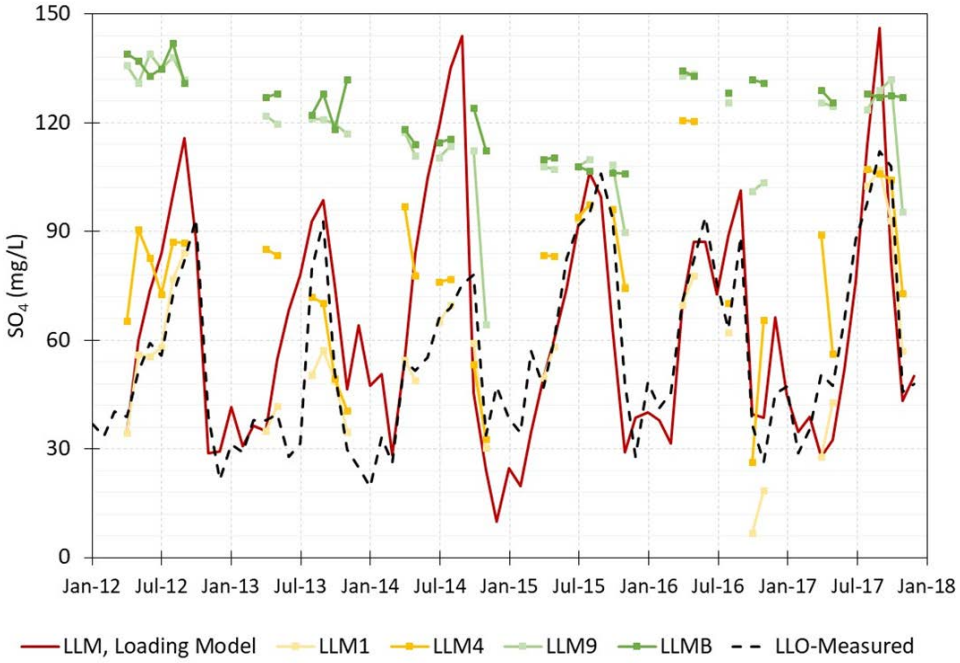


Figure 4-6: Modeled Sulphate Concentrations within the Upper 6 m of the Long Lake Water Column

The model simulations do not conclusively establish how lake bottom waters maintain concentrations on the order of 120 mg/L to 150 mg/L. If complete lake turnover occurs in December and dilutes bottom waters, higher sulphate concentrations are re-established again by April once the large precipitation events taper off in March. Two possible scenarios that may explain the water quality trends are outlined below.

Scenario 1 - Lake Turnover

Lake turnover occurs in December mixing surface waters and deep waters. During the winter months, dilute upstream water flows over the surface of the lake, with minimal mixing to depth, and then reports to the lake outlet with low concentrations. Mine

influenced waters reporting to the lake through LLE and groundwater flow pathways report to the lower portion of the lake and do not mix fully with the fast-flowing surface layer.

Scenario 2 - No Lake Turnover

The bottom of the lake remains isolated from surface waters throughout the year. During the winter months, dilute upstream water flows over the surface of the lake with minimal mixing to depth and reports to the lake outlet with low concentrations. Mine influenced waters reporting to the lake through LLE and groundwater reports to the upper portion of the lake and mixes fully with the fast-flowing surface layer. The current sulphate signature at LLM-B is a relict of pre-2006 sulphate loading to the lake. Gradual reduction of sulphate in the bottom water is a result of diffusional flux into the upper layers.

5. Summary and Conclusions

QUINSAM COAL

5. Summary and Conclusions

At the request of the Ministry of Environment and Climate Change Strategy, this supplemental evaluation of the Long Lake Seep treatment system was prepared as a companion to the November 2017 report issued on behalf of Quinsam Coal (Gould, 2017). The main findings of this supplemental evaluation and the implications regarding the evaluation of the LLST system are listed below.

Long Lake Hydrology

- The majority of inflows to Long Lake report from the No Name Lake catchment and the downstream connector channel (76% of total inflows). These catchments have limited to no mine influence and provide a large source of dilution to the Long Lake waters.
- During the operating period of the LLST system there were a series of unusual hydro-met conditions. Very wet conditions were realized in 2012 and 2016 and very dry conditions occurred in 2013 and 2017. Decreased lake concentrations tend to be associated with the wet years due to the greater contribution from upstream dilutionary sources, which needs to be accounted for when assessing the effect of the LLST system on sulphate concentrations in Long Lake.
- There is evidence that temperature driven density contrasts within Long Lake provide conditions suitable for lake turnover in late-November and again in March. Lake profile monitoring does not capture these turnovers due to the restricted seasonal sampling schedule during 2012-2017 when data from November through mid-April were not collected.

Long Lake Water Quality

- QCC has undertaken a number of reclamation and closure activities to reduce loading to Long Lake in addition to the operation of the LLST system.
- Since the initiation of the LLST system, annual sulphate concentrations at the outlet of Long Lake have decreased slightly compared to the pre-treatment period. The maximum concentrations in the summer-fall period remained below the pre-treatment 95^{th} percentile concentration. Conversely, there were several measurements recorded during the period of 2012 to 2017 below the pre-treatment 5^{th} percentile concentration (20 mg/L).
- Sulphate concentrations at the Long Lake outlet have remained below the long-term BC Water Quality guideline for the protection of aquatic life (WQG) calculated using ambient hardness levels both prior to treatment (2006 to September 2012) and during treatment (Sept 2012 to 2018).

- Sulphate concentrations at the outlet of Long Lake (LLO) are strongly correlated with concentrations in LLE inflow.
- Sulphate concentrations throughout the lake water column at LLM have decreased slightly during the LLST operating period relative to those measured during the pre-treatment period.
- Lake profile samples in the middle of Long Lake at station LLM indicate that sulphate concentrations have remained below the BC WQG (aquatic life) calculated from ambient hardness at all depths measured in the lake during treatment. Similarly, pre-treatment 95th percentile sulphate concentrations remained below the hardness-dependent BC WQG at LLM.
- Sulphate concentrations in the lake bottom (LLM-B) are poorly correlated with those at LLSM, LLE and LLO, which suggests that lake bottom water is not hydrologically connected with the sources LLSM and LLE or the lake outlet at LLO.

Long Lake Seep Water Levels and Sulphate Concentrations

- Variable water levels measured in the 3-South gob do not show a clear trend since the inception of the LLST system as evidenced in the monitoring well records at MW-004 and MW-005. Less frequent monitoring during the pre-treatment period and abnormal climatic conditions during the treatment period prevent definitive conclusions from being made from the 3-South water level data.
- A detailed comparison of flow rates during the pre-treatment period with those measured during treatment from the LLSM and LLS weirs is not possible. The LLSM hydrometric station underwent upgrades in 2012 which improved the accuracy of the flow records. Conversely, LLSM measurements pre-dating 2012 are not continuous and may underestimate flows due to the potential for flow bypassing the weir.
- The highest and most variable sulphate concentrations in the 3-South gob are measured updip (MW-005) while intermediate concentrations are measured at LLS and LLSM. MW-004, which is screened in a deeper, consistently saturated portion of the workings, reports the lowest and least variable sulphate concentrations. This suggests that water from both of these areas within the 3-South gob contribute to the flow and geochemical signature of Long Lake Seepage water.
- Annual maximum sulphate concentrations at the LLS monitoring station tend to occur in the very late fall/early winter (December through February). Sulphate maxima measured at LLSM are not always measured during the same month as LLS but, seem to also occur during the late fall/early winter although 2014 and 2017 were exceptions.

- Since inception of the LLST system, mean sulphate concentrations at the LLS weir have decreased by 55 mg/L, while 5th percentile concentrations have decreased by >100 mg/L. 95th percentile concentrations are largely unchanged since inception of treatment. Water quality has also improved at MW-004 since inception of treatment, with mean sulphate concentrations having dropped by >30 mg/L and 95th percentile concentrations having dropped by over 120 mg/L.
- An analysis of groundwater conditions in the immediate vicinity of the Long Lake seeps indicates that there could be approximately 5 L/s of flow bypassing the LLSM weir and contributing sulphate loading to Long Lake. This bypass flow is predicted to become negligible during extremely dry conditions when the water level in the gob drops below 300 m elevation.

Long Lake Sulphate Loading Model

- The average monthly sulphate load input (55,664 kg) and losses (58,082 kg) from Long Lake balance to within 4%.
- A cessation in the operation of the LLST system is predicted to produce a 3% increase to the average annual sulphate load to Long Lake. The greatest proportionate sulphate loading increase of 14% to 19% would occur during the summer months of July, August and September.
- Water quality modelling suggests that flow-through and storage within the upper 6 m of the lake could account for the observed sulphate concentrations in the lake surface and the outlet of Long Lake.

Although sulphate concentrations in Long Lake have gradually decreased since 2012 during the operation of the LLST system and implementation of closure and reclamation activities in the 2-South/3-South mine areas, operation of the LLST system may be an inefficient method for improving water quality at the bottom of the lake. The results of this supplemental evaluation regarding the efficacy of ongoing treatment indicates that the total flow through the lake has the potential to dilute and maintain sulphate concentrations well below the aquatic life guidelines throughout the year if the lake were allowed to fully mix each year. The volume of Long Lake below 9 m comprises < 20% of the total lake volume or approximately 204,000 m^3. If the bottom lake waters are continually isolated under the current conditions, the best management approach may be to encourage mixing of bottom waters with the surface layer and allow natural flow (in winter) to improve water quality throughout the lake. To establish the current state of lake dynamics and inform management options, it is recommended that the standard profile monitoring schedule in Long Lake at Station LLM be shifted to include monitoring in late October, December, February and April for at least one year rather than during the summer months.

6. Closure

QUINSAM COAL

6. Closure

We trust that this report meets your expectations. Please contact the undersigned with any questions or comments.

Sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

Bruce Mattson, M.Sc., P.Geo.
Senior Environmental Geoscientist

Colin Fraser, M.Sc., P.Geo.
Senior Hydrologist

Meghan Goertzen, M.Sc.
Environmental Toxicologist

Laura-Lee Findlater, B.Sc., P.Geo.
Project Hydrogeologist

Scott Jackson, M.Sc., P.Geo.
Hydrologist

References

QUINSAM COAL

References

British Columbia Ministry of Environment & Climate Change Strategy (BC MOE), 2018. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Summary Report. Water protection and Sustainability Branch. March 2018. Accessed at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf

Golder, 2010. 2009/2010 Annual Groundwater Monitoring Summary, 2 North, 2 South Areas, Quinsam Mine, BC. Report prepared for Quinsam Coal Corporation, June 14, 2010.

Gould, G. 2017. Long Lake Seep as an Authorized Discharge Point Long Lake Seep Treatment – Demonstration System Overview and Long-Term Plan. Report prepared on behalf of Quinsam Coal Corporation, November 30, 2017.

Lorax, 2012. Long Lake Groundwater Assessment – Quinsam Mine. Report prepared for Quinsam Coal Corporation, February 29, 2012.

Appendix VII

To: EnvironmentalNonCompliance@gov.bc.ca

Date: February 13, 2018

Subject: Permit non-compliance report for Settling Pond #1 (SPD), EMS # E218582 and authorization #07008.

Attention: *Quinsam Coal Corporation dissolved iron exceedance at Settling Pond #1, EMS #E218582. Non-compliance for 1 dissolved iron, monthly sample required from discharge #E218582 occurring on 2018-01-08. Provincial Emergency Program (PEP) was informed with a spill report generated* ***(DGI-173540).***

Date of Non-compliance: *2018-01-08 (24-hour period).*

Location of Non-compliance: [5800 Argonaut Main, Quinsam Coal Mine Site]

Nature of Non-compliance: The dissolved iron exceedance was thought to be attributed to high inflows of water causing turbidity due to the mixing of bottom, iron rich sediment. The pond water level had been extremely low for the summer exposing the bottom sediment in the pond. This would have oxidized any of the iron in the sediment which may have been released once water levels increased. The dissolved iron resulted in a concentration of 0.614 mg/L on January 8th, 2018 at SPD permit limit is 0.5 mg/L. The quantity of water released was 3283.2 m^3 for 24 hour duration. Figure 1 and Table 1 below, display the average discharge rate at the settling pond until January 24th, 2018. As depicted, discharge did not commence until November 6th, 2017 for this site, with peak flows displayed in November and late January. The discharge rates display an increasing trend on both sampling days (November 28th and January 8th) where elevated iron was observed. Pumping occurred from 3-South Pit continuously with periodic dewatering of the 5-South Mine pool occurring up until early December, when a new dewatering pump was installed in 5-South Mine Pool with this water redirected to 2-North Mine.

Initial Response/Actions Taken & Monitoring Conducted:

Upon receipt of results from the analytical laboratory PEP was notified and further sampling was initiated at key downstream locations those included: SPC, LLE and LLO. A rush metals analysis was requested for the January 18th samples from Setting Pond #1 and SPC, LLE and LLO along with a request to analyze for total and dissolved metals from composite samples

collected from SPD on January 9th through 11th, 2018. All results collected from SPD were below permit limits except the January 8th sample. Figure 2, below displays the concentrations of dissolved iron through the system. As depicted from the chart the sampling location immediately downstream of SPD referred to as BDS, did not display elevated iron concentrations on January 8th but elevated iron was observed at 4-South Lower and LLE during monthly sampling events. The increased flow rates with the initial flush indicates these sites may be experiencing the same type of oxidation and release of iron from the sediment with increased flow rates.

All results from SPD and downstream locations were below permit limits for SPD (0.5 mg/L) SPC, LLE and LLO on January 18th, 2018. The settling pond discharge flows through a serious of wetlands to the downstream monitoring station LLE and then continues through another small wetland prior to entering near the outlet of Long Lake. As displayed in the Google earth image Figure 4 below, the flow path from SPD to Long Lake is approximately 1.88 km.

Table 2 display's concentrations of iron at all sampling locations since October, 2017 and compares the results to permit limits applied to Settling Pond #1 and B.C. Water Quality Guidelines for the Protection of Aquatics Life applies only at LLE and LLO. The sampling location LLE displayed elevated concentrations of iron but this site is still 158 meters away from the lake where the receiving environment is met.

Future Action Items: Further observations with respect to dewatering system operation and metal concentrations, pond turbidity, climate & precipitation will be recorded and used to develop and employ best practices. At this time Quinsam is investigating the best solution to increase settling time in the pond and reduce the occurrences of iron exceedances that have occurred.

Quinsam Environmental Department makes every attempt to lower the risk to aquatic receptors in the receiving environment from mine water and will continue to employ best practices to ensure compliance in the future. If there are any further inquiries into these events please contact myself at the below contact information.

Contact information:

Kathleen Russell BSc.
Environmental Coordinator

Ph: (250) 286-3224 ext. 225
E-mail: kar@quinsam.com

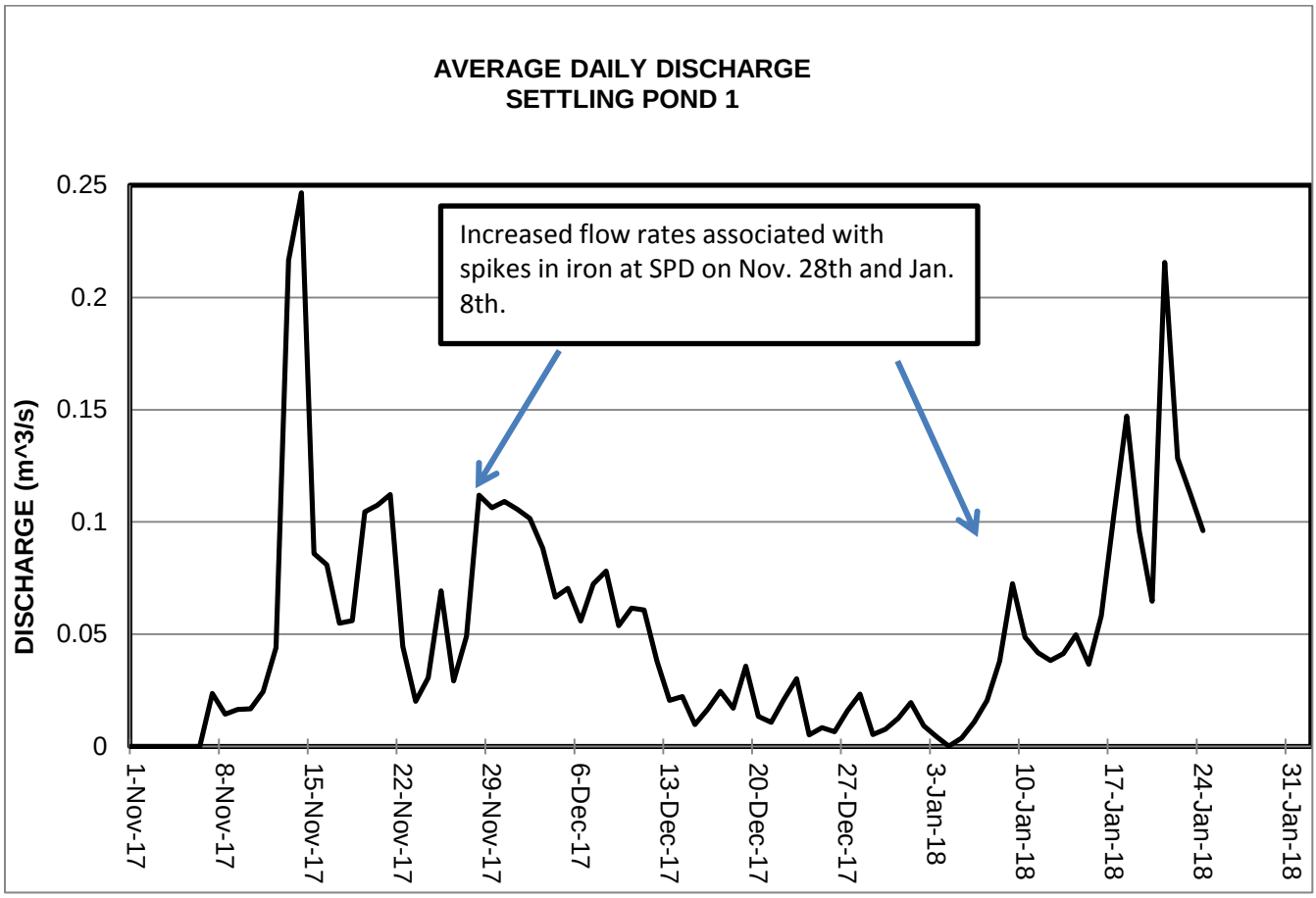


Figure 1: Average Daily Discharge from Settling Pond #1

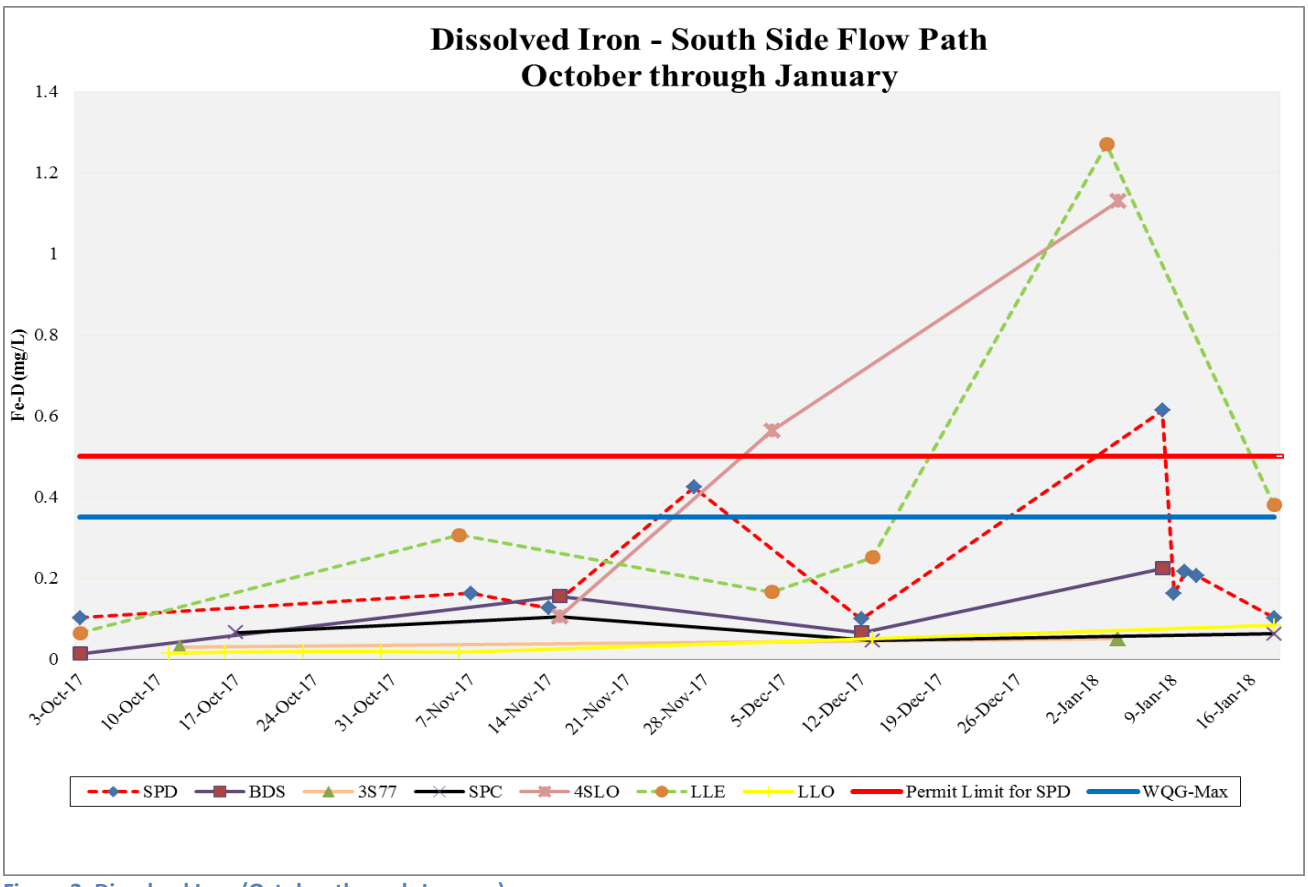


Figure 2: Dissolved Iron (October through January)

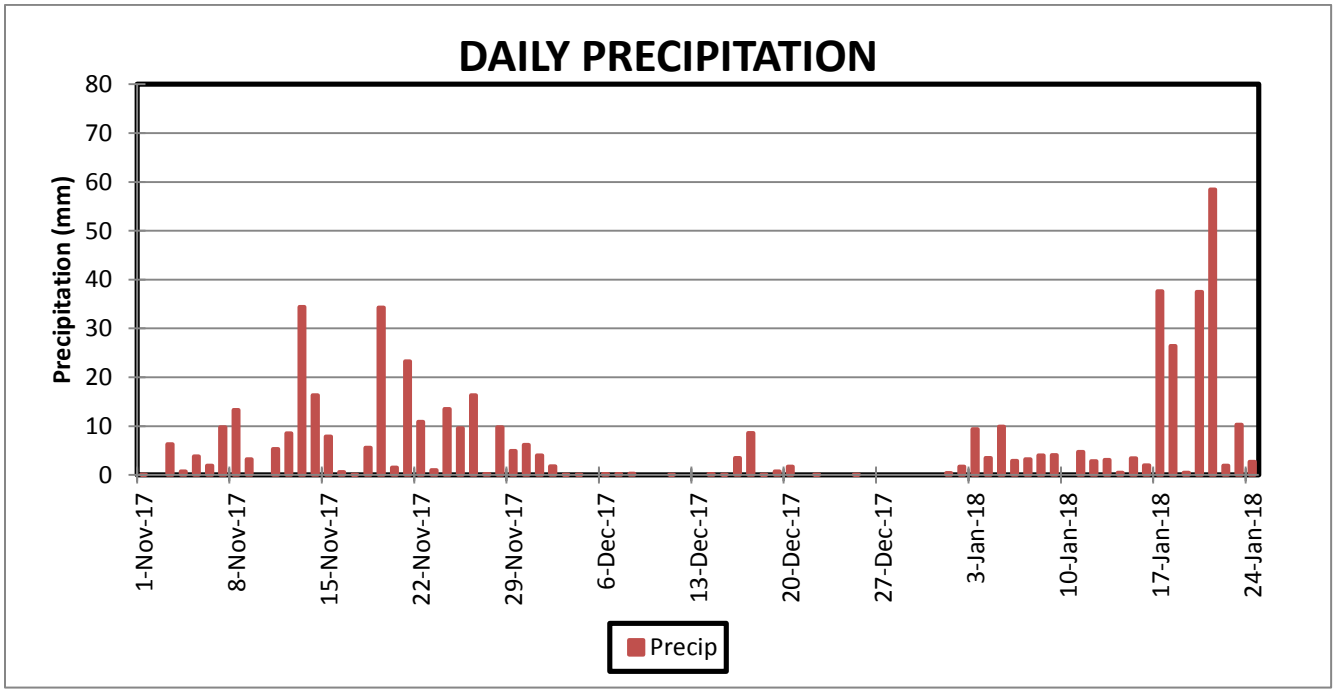


Figure 3: Daily Precipitation (mm)

Figure 4: South Water Management Flow Path from SPD to LLO

Table 1: Discharge Rate at Settling Pond # 1

Date	Min. Flow	Max. Flow	Average Daily Discharge (m^3/s)	Av Q * T	Cumulative Totalizer
1-Nov-17	0.0000	0.0000	0.0000	0.0000	
2-Nov-17	0.0000	0.0000	0.0000	0.0000	379603.0728
3-Nov-17	0.0000	0.0000	0.0000	0.0000	379603.0728
4-Nov-17	0.0000	0.0000	0.0000	0.0000	379603.0728
5-Nov-17	0.0000	0.0000	0.0000	0.0000	379603.0728
6-Nov-17	0.0000	0.0010	0.0000	0.9000	379603.0728
7-Nov-17	0.0010	0.0360	0.0236	2038.5000	379603.0728
8-Nov-17	0.0110	0.0220	0.0144	1242.9000	379602.1728
9-Nov-17	0.0130	0.0180	0.0164	1417.5000	377563.6728
10-Nov-17	0.0000	0.0220	0.0168	1447.2000	376320.7728
11-Nov-17	0.0180	0.0340	0.0245	2114.1000	374903.2728
12-Nov-17	0.0340	0.0680	0.0440	3805.2000	373456.0728
13-Nov-17	0.0000	0.2820	0.2166	18716.4000	371341.9728
14-Nov-17	0.0000	0.3390	0.2466	21308.4000	367536.7728
15-Nov-17	0.0000	0.2310	0.0859	7418.7000	348820.3728
16-Nov-17	0.0690	0.0900	0.0810	6995.7000	327511.9728
17-Nov-17	0.0370	0.0790	0.0549	4741.2000	320093.2728
18-Nov-17	0.0370	0.0690	0.0561	4846.5000	313097.5728
19-Nov-17	0.0490	0.1410	0.1046	9033.3000	308356.3728
20-Nov-17	0.0820	0.1280	0.1075	9286.2000	303509.8728
21-Nov-17	0.0000	0.2070	0.1121	9689.4000	294476.5728
22-Nov-17	0.0000	0.2050	0.0446	3853.8000	285190.3728
23-Nov-17	0.0000	0.2060	0.0201	1740.6000	275500.9728
24-Nov-17	0.0000	0.2050	0.0306	2646.1728	271647.1728
25-Nov-17	0.0000	0.2150	0.0693	5991.3000	269906.5728
26-Nov-17	0.0000	0.2260	0.0292	2526.3000	267260.4000
27-Nov-17	0.0000	0.2050	0.0491	4242.6000	261269.1000
28-Nov-17	0.1010	0.1180	0.1120	9675.0000	258742.8000
29-Nov-17	0.1020	0.1120	0.1064	9192.6000	254500.2000
30-Nov-17	0.1020	0.1130	0.1091	9425.7000	244825.2000
1-Dec-17	0.0950	0.1110	0.1057	9132.3000	235632.6000
2-Dec-17	0.0990	0.1050	0.1016	8774.1000	226206.9000
3-Dec-17	0.0680	0.1000	0.0884	7633.8000	217074.6000
4-Dec-17	0.0570	0.0870	0.0665	5749.2000	208300.5000
5-Dec-17	0.0510	0.0900	0.0704	6082.2000	200666.7000
6-Dec-17	0.0290	0.0800	0.0559	4831.2000	194917.5000
7-Dec-17	0.0380	0.0880	0.0724	6254.1000	188835.3000
8-Dec-17	0.0560	0.0880	0.0782	6753.6000	184004.1000
9-Dec-17	0.0520	0.0570	0.0538	4651.2000	177750.0000
10-Dec-17	0.0450	0.0850	0.0616	5326.2000	170996.4000
11-Dec-17	0.0360	0.0880	0.0608	5255.1000	166345.2000
12-Dec-17	0.0190	0.0530	0.0381	3288.6000	161019.0000
13-Dec-17	0.0080	0.0440	0.0205	1769.4000	155763.9000
14-Dec-17	0.0070	0.0460	0.0222	1919.7000	152475.3000
15-Dec-17	0.0030	0.0140	0.0098	849.6000	150705.9000
16-Dec-17	0.0070	0.0440	0.0167	1439.1000	148786.2000
17-Dec-17	0.0170	0.0430	0.0246	2127.6000	147936.6000
18-Dec-17	0.0170	0.0170	0.0170	1468.8000	146497.5000
19-Dec-17	0.0140	0.0500	0.0358	3089.7000	144369.9000
20-Dec-17	0.0010	0.0240	0.0133	1152.9000	142901.1000
21-Dec-17	0.0060	0.0130	0.0107	922.5000	139811.4000
22-Dec-17	0.0000	0.0470	0.0208	1796.4000	138658.5000
23-Dec-17	0.0110	0.0500	0.0302	2606.4000	137736.0000
24-Dec-17	0.0000	0.0130	0.0052	449.1000	135939.6000
25-Dec-17	0.0050	0.0110	0.0084	724.5000	133333.2000
26-Dec-17	0.0010	0.0090	0.0066	571.5000	132884.1000
27-Dec-17	0.0030	0.0450	0.0159	1369.8000	132159.6000
28-Dec-17	0.0000	0.0470	0.0233	2012.4000	131588.1000
29-Dec-17	0.0000	0.0120	0.0052	451.8000	130218.3000
30-Dec-17	0.0010	0.0110	0.0076	657.9000	128205.9000
31-Dec-17	0.0000	0.0400	0.0126	1086.3000	127754.1000
1-Jan-18	0.0000	0.0470	0.0196	1693.8000	127096.2000
2-Jan-18	0.0060	0.0120	0.0093	800.1000	126009.9000
3-Jan-18	0.0000	0.0090	0.0044	382.5000	124316.1000
4-Jan-18	0.0000	0.0060	0.0001	5.4000	123516.0000
5-Jan-18	0.0000	0.0120	0.0037	321.3000	123133.5000
6-Jan-18	0.0070	0.0140	0.0109	944.1000	123128.1000
7-Jan-18	0.0140	0.0330	0.0205	1771.2000	122806.8000
8-Jan-18	0.0320	0.0520	0.0380	3283.2000	121862.7000
9-Jan-18	0.0510	0.0870	0.0725	6263.1000	120091.5000
10-Jan-18	0.0150	0.0690	0.0486	4201.2000	116808.3000
11-Jan-18	0.0320	0.0510	0.0417	3603.6000	110545.2000
12-Jan-18	0.0240	0.0620	0.0383	3310.2000	106344.0000
13-Jan-18	0.0290	0.0630	0.0413	3570.3000	102740.4000
14-Jan-18	0.0290	0.0660	0.0498	4299.3000	99430.2000
15-Jan-18	0.0000	0.0650	0.0366	3162.6000	95859.9000
16-Jan-18	0.0000	0.0750	0.0582	5031.9000	91560.6000
17-Jan-18	0.0420	0.1640	0.1043	9008.1000	88398.0000
18-Jan-18	0.1260	0.1830	0.1472	12716.1000	83366.1000
19-Jan-18	0.0760	0.1330	0.0958	8276.4000	74358.0000
20-Jan-18	0.0000	0.1790	0.0648	5594.4000	61641.9000
21-Jan-18	0.1750	0.2560	0.2157	18632.7000	53365.5000
22-Jan-18	0.0880	0.1790	0.1284	11090.7000	47771.1000
23-Jan-18	0.1020	0.1170	0.1128	9743.4000	29138.4000
24-Jan-18	0.0520	0.1110	0.0961	8304.3000	18047.7000

Table 2: Concentrations of Iron October through January

DGIR-173540								
	EMS ID:	E218582		E292128	E217014	E292129	E292130	E219412
	Station Name:	Settling Pond #1	Biocell Downstream	1977 Adit Pit	South Pit Culvert	4 South Ditch	Long Lake Entry of LLE	Long Lake Outlet LLO
	Station Code:	SPD	BDS	3S77	SPC	4SLO	WQG	WQG
Fe-D	Date	Permit Limit 0.5 mg/L					*0.35 mg/L*	*0.35 mg/L*
	3-Oct-17	0.102	0.0136				0.0650	
	11-Oct-17							0.0147
	12-Oct-17			0.0296				
	16-Oct-17							0.0174
	17-Oct-17				0.0660			
	23-Oct-17							0.0195
	30-Oct-17							0.0190
	6-Nov-17						0.3060	0.0173
	7-Nov-17	0.163						
	14-Nov-17	0.126						
	15-Nov-17		0.1550		0.1040	0.1060		
	27-Nov-17	0.424						
	4-Dec-17					0.563	0.1660	
	12-Dec-17	0.0995	0.0655					
	13-Dec-17				0.0456		0.2510	0.0515
	3-Jan-18						*1.27*	
	4-Jan-18			0.0497		1.13		
	8-Jan-18	0.614	0.224					
	9-Jan-18	0.162						
	10-Jan-18	0.216						
	11-Jan-18	0.206						
	18-Jan-18	0.102			0.0625		*0.38*	0.0837
Average		0.22145	0.1145	0.0397	0.0695	0.5997	0.4063	0.0319
Minimum		0.0995	0.0136	0.0296	0.0456	0.1060	0.0650	0.0147
Maximum		0.614	0.224	0.0497	0.1040	1.13	1.27	0.0837
							WQG	WQG
Fe-T							*1*	*1*
	3-Oct-17	0.145	0.020				0.247	
	11-Oct-17							0.024
	12-Oct-17			0.108				
	16-Oct-17							0.024
	17-Oct-17				0.131			
	23-Oct-17							0.039
	30-Oct-17							0.037
	6-Nov-17						0.439	0.035
	7-Nov-17	0.328						
	14-Nov-17	0.282						
	15-Nov-17		0.275		0.355	0.136		
	27-Nov-17	1.3						
	4-Dec-17					0.566	0.205	
	12-Dec-17	2.25	2.06					
	13-Dec-17				0.052		0.336	0.080
	3-Jan-18						*1.44*	
	4-Jan-18			0.062		1.35		
	8-Jan-18	0.870	0.512					
	9-Jan-18	0.508						
	10-Jan-18	0.651						
	11-Jan-18	0.554						
	18-Jan-18	0.378			0.108		0.349	0.140
Average		0.7266	0.717	0.085	0.162	0.684	0.503	0.054
Minimum		0.145	0.020	0.062	0.052	0.136	0.205	0.024
Maximum		2.25	2.06	0.108	0.355	1.35	1.44	0.140

Unauthorized Discharge - Spill Report Number DGI: 173610

To: EnvironmentalNonCompliance@gov.bc.ca

Date: January 29th, 2018

Subject: Unauthorized Discharge Report for 3-South Pit EMS # E217015 and authorization #07008.

Attention: *Quinsam Coal Corporation experienced an Unauthorized Discharge from 3-South Pit EMS # E217015. Provincial Emergency Program (PEP) was informed with a spill report generated* ***(DGI-173610).***

Date of Non-compliance: *2018-01-21 to 2018-01-22 (24-hour period).*

Location of Non-compliance: [5800 Argonaut Main, Quinsam Coal Mine Site]

Nature of Non-compliance:

2 – 3 South Facilities

An unauthorized discharge from 3 South PAG-CCR Facility (3S) into No Name Lake connector channel occurred on January 22nd, 2018. This occurred following a serious of extreme rain events exceeded 5 year 24 hour and 10 year 72 hour events where the mine received 187.2 mm of precipitation from January 12th through 24th (Tables 1 & 2, Figures 1 & 2). The 3S Facility is designed for final reclamation with a constructed discharge channel that the water from 3-S Facility will overflow down during fall and winter heavy precipitation events; once authorized as a permitted discharge. Quinsam is in the process of permitting this as an authorized discharge channel for the overflow water from the 2-South and 3-South areas to enter No Name Lake connector channel which then flows into the inlet of Long Lake. However, until this permit is in place this is considered an un-authorized discharge or spill. Currently the water from 2S & 3S facilities is pumped from 3S to Settling pond 1 where it discharges at the outlet of Long Lake which flows into the Quinsam River.

Table 1: 24-Hour and 72- Hour Rainfall Return Periods for Quinsam Mine Site

Return Period (Years)	24-hour Rainfall Depth (mm)	72-hour Rainfall Depth (mm)
2	**44.2**	**69.6**
5	**55.1**	**87.1**
10	61.6	**96.8**
25	68.9	107
50	73.8	114
100	78.3	**120**
200	82.3	125
500	87.2	131
1000	90.5	134
PMP*	**260**	**386**
***Probable Maximum Precipitation=PMP**		
Golder Associates 2016		
Exceeding 2 Yr. 24 Hr		
Exceeding 5 Yr. 24 Hr		
Exceeding 2 Yr. 72 Hr		
Exceeding 5 Yr. 72 Hr		
Exceeding 10 Yr. 72 Hr		
Exceeding 100 Yr. 72 Hr		

Table2: January 12th through 24th Rainfall Events Compare to Return Periods for Quinsam Mine Site

Date	24 Hour Daily Precipitation (mm)	72-Hour Rainfall Depth (mm)
12-Jan-18	2.8	
13-Jan-18	3.1	
14-Jan-18	0.5	
15-Jan-18	3.4	
16-Jan-18	2	
17-Jan-18	37.6	
18-Jan-18	26.4	
19-Jan-18	0.5	
20-Jan-18	37.5	**97.9**
21-Jan-18	**58.5**	
22-Jan-18	1.9	
23-Jan-18	10.3	
24-Jan-18	2.7	
Total	**187.2**	
Event	**Exceeding 5 Yr. 24 Hr**	**Exceeding 10 Yr. 72 Hr**

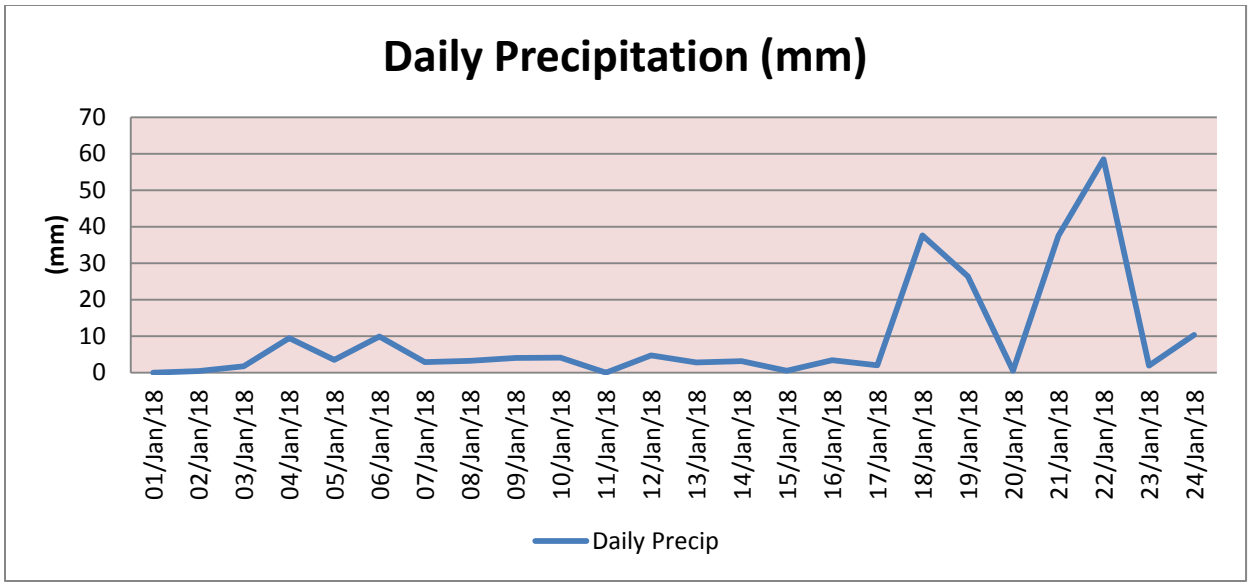


Figure 1: Daily Perception at Quinsam Mine Site

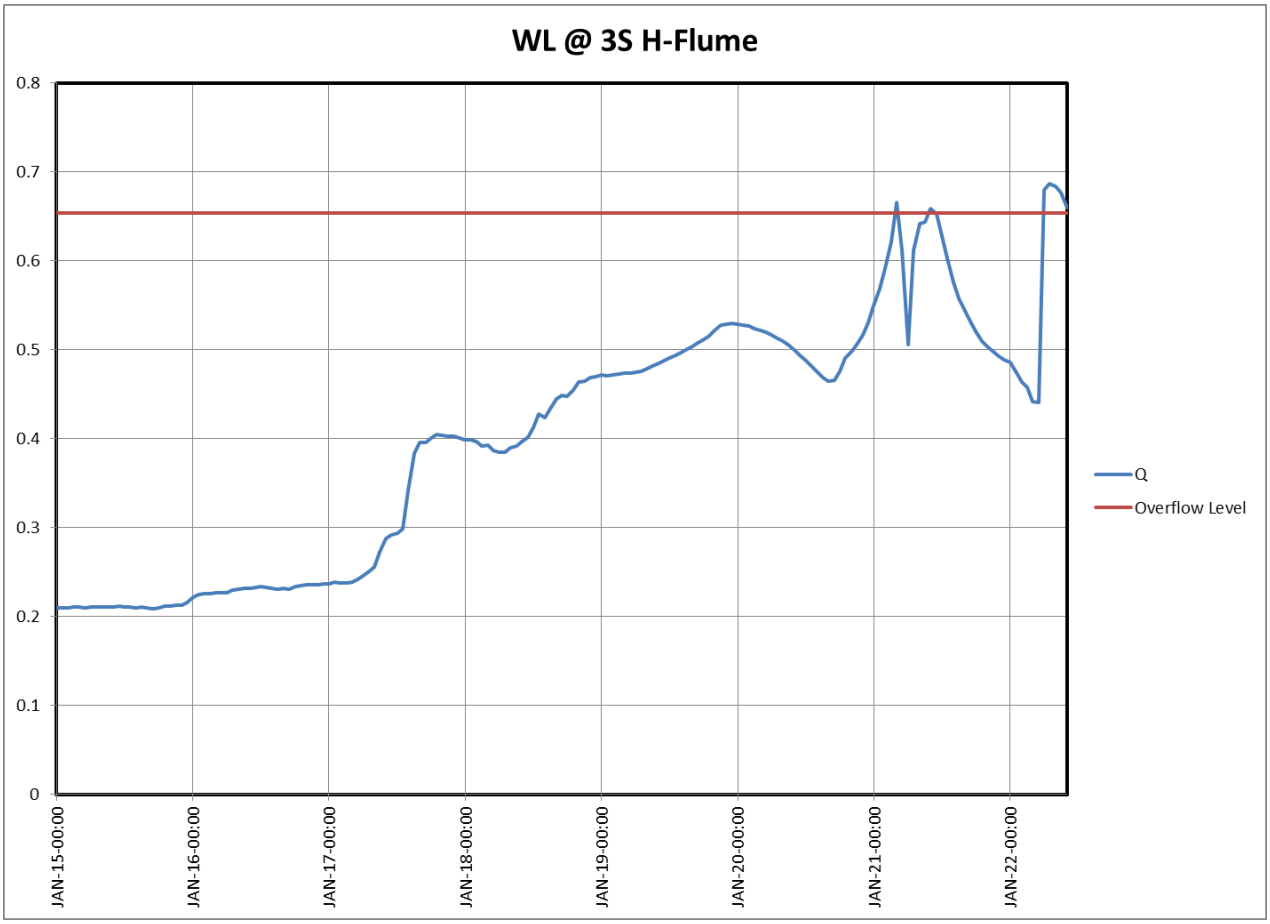


Figure 2: Water Level in 3-South Pit at inflow (flume) in relationship to the crest of the weir where discharge occurs (Red Line).

Background:

The South Water Management System is designed to collect mine related runoff from the south disturbed surface areas and manage water in the 2 and 3-South PAG-CCR facilities. Two long-term PAG-CCR facilities (2-South and 3-South) have been completed as part of the south water management system. The construction of the 2-South PAG-CCR containment pond included a clay-bentonite liner to retain water within the pit. Construction and storage of material carried on to completion in 2014 where water was diverted into the area. A series of ditches and pipes were installed to utilize local catchment as a source of water cover. Surface personnel control valves to direct fresh non-mine impacted water into the PAG-CCR facility or direct to No Name Lake. A minimum of 1.50 metre water cover is required in the 2-South PAG-CCR which is sourced from local catchment and precipitation. Excess water from the 2-South PAG-CCR Pond overflows into a large waterway that leads into the 3-South PAG-CCR storage facility. This spill way was constructed in 2015. Water received from 2-South is used to provide adequate water cover over 3-South (1 metre). Excess water in 3-South is pumped via an 88 Hp pump capable of pumping 500 gallons per minute directly into the road side collection ditch that flows into SPD.

Initial Response/Actions Taken & Monitoring Conducted:

As displayed in the site map found at the back of this report, water quality was obtained from three locations these include:

- NNO: No Name Lake connector stream to Long Lake, upstream of 3S discharge channel.
- 3S: Water cover in the 3S pit before it flows down the channel and
- 3SDS: 50 m downstream of the discharge channel from 3S on the NNO connector channel, 3 South Downstream.

Parameters include sulphate, total and dissolved metals and anions and cations and nutrients. Water quality results remained favorable with all parameters meeting permit limits and Acute British Columbia Approved Water Quality Guidelines for protection of Aquatic Life. Analytical results are included in Table 3 below and compared to permit limits and water quality guidelines. A rainbow trout toxicity test was also conducted at the 3SDS site. The results for this test will be submitted once the test is complete.

At the time of the unauthorized discharge the water level in the NNO connector stream was experiencing extremely high flow rates and the inflow of the 3S discharge was minimal compared to the flow rate in NNO. The pictures below display the flow rates in the 3-South pit over the crest of the weir during discharge and after and the flow rate in the river where the 3S discharge channel enters.

Corrective actions include developing an Operations and Maintenance Manual (OMM) for the South Water Management System in order to identify a trigger action plan that would initiate the rental of the diesel pump in order to maintain the water level during extreme storm events. Therefore discharge will not occur until a permit is obtained for this channel.

A table below lists Initial Response/Actions Taken & Monitoring Conducted.

Once again due diligence was carried out by the Quinsam Environmental Department to ensure that the risk to the aquatic receptors was minimal. If there are any further inquiries into these events please contact myself at the below contact information.

Contact information:
Kathleen Russell BSc.
Environmental Coordinator
Ph: (250) 286-3224 ext. 225
E-mail: kar@quinsam.com

Initial Response/Actions Taken & Monitoring Conducted:

Date	Staff Gauge	Inflow @ H-Flume (inches)	Estimated water level from crest of weir at discharge channel	Corrective Actions Taken	Precipitation (mm)
January 16th, 2018	0.95	0.233	2 metres	58 HP pump from 3-South pit to Settling Pond 1 (SP1) was running.	2
January 18th , 2018	0.98	0.450	5.5 feet below crest of weir.	Pump to SP1 was running.	26.4
January 19th , 2018	Underwater	0.545	Inches from crest of weir.	Rented another pump and tied it into a 4" pipeline to SP1. Rental store only had this pump available.	0.5
January 20th, 2018	Underwater	0.555	Inches from crest of weir.	Both pumps could not keep up. Waiting for the larger pump to arrive for mainland. Larger pump was capable of pumping 30 meter elevation difference over 1 km and connected to 4" pipeline to SP1.	37.5
January 21st, 2018	Underwater	4:00 am, >0.645	Overflow	Water started to spill over into designed discharge channel at 4:00 am. This channel is not authorized. Discharge rate was 5-10 L/s.	58.5
January 22nd, 2018	Underwater	6:00 am >0.645 10:00 am <0.654	Overflow Inches from crest of weir.	6:00am water spilling over crest of channel. Sampling was performed at 3S pit, No Name Lake connector Channel and downstream 50 m (3SDS). Provincial Emergency Program (PEP) was notified and a report was made. Toxicity samples were collected downstream at 3SDS. Discharge ceased at 10:00am according to flow data (See Chart).	1.9
January 23rd, 2018		9:30 am 0.456	5 feet below crest of weir.	Both pumps remain in operation. Water level continues to drop.	10.3
January 24th, 2018		10:00M 0.450	Water level continues to drop.	Both pumps remain in operation, water level continues to drop.	2.7

Table 3: Analytical data collected during unauthorized discharge

Station Description	EMS ID	E217017 No Name Lake Outlet	E217015 3 South Pit	3S downstream		
	Stn.Code	NNO	3S	3SDS		
Date		22-Jan-2018	22-Jan-2018	22-Jan-2018		
Parameter	Unit				PL-S (P)	WQG-Max (M)
SO4-D	mg/L	<1.0	318	1.9		
Alk-T	mg/L	6.5	95.8	6.7		
Acidity83	mg/L	<1.0	2.1	<1.0		
Al-T	mg/L	0.136	0.298	0.155		
As-T	mg/L	0.00020	0.00054	0.00024		0.005
Ba-T	mg/L	0.0011	0.0143	0.0012		5.0
Cd-T	mg/L	<0.000010	0.000015	<0.000010		
Ca-T	mg/L	2.27	146	2.94		
Cr-T	mg/L	<0.0010	<0.0010	<0.0010		
Co-T	mg/L	<0.00020	0.00043	<0.00020		0.11
Cu-T	mg/L	0.00083	0.00169	0.00075		0.007
Hard-T	mg/L	7.87	434	9.85		
Fe-T	mg/L	0.124	0.334	0.143		1.0
Pb-T	mg/L	<0.00020	<0.00020	<0.00020		0.004
Mg-T	mg/L	0.534	16.8	0.605		
Mn-T	mg/L	0.0051	0.0419	0.0064		0.8
Hg-T	mg/L	0.0000028	<0.0000020	0.0000028		0.00001
Mo-T	mg/L	<0.0010	<0.0010	<0.0010		2.0
Ni-T	mg/L	<0.0010	0.0013	<0.0010		0.025
K-T	mg/L	0.124	1.40	0.131		
S-T	mg/L	<3.0	122	<3.0		
Se-T	mg/L	<0.00010	0.00020	<0.00010		
Si-T	mg/L	3.23	2.39	3.28		
Ag-T	mg/L	<0.000020	<0.000020	<0.000020		0.0001
Na-T	mg/L	0.749	10.5	0.769		
Sr-T	mg/L	0.0060	0.725	0.0091		
Zn-T	mg/L	<0.0050	<0.0050	<0.0050		0.03
Al-D	mg/L	0.0664	0.0159	0.0697	0.5	0.1
As-D	mg/L	0.00018	0.00038	0.00018		
B-D	mg/L	<0.050	0.151	<0.050		
Cd-D	mg/L	<0.0000050	0.0000170	<0.0000050		0.000017
Ca-D	mg/L	2.18	148	2.76		
Cr-D	mg/L	<0.0010	<0.0010	<0.0010		
Co-D	mg/L	<0.00020	0.00028	<0.00020		
Cu-D	mg/L	0.00056	0.00079	0.00056	0.02	
Hard-D	mg/L	7.63	442	9.32		
Fe-D	mg/L	0.0405	0.0056	0.0407	0.5	0.35
Pb-D	mg/L	<0.00020	<0.00020	<0.00020	0.05	
Mg-D	mg/L	0.531	17.5	0.588		
Mn-D	mg/L	0.0026	0.0380	0.0029		
Hg-D	mg/L	0.0000027	<0.0000020	0.0000026		
Mo-D	mg/L	<0.0010	<0.0010	<0.0010		
Ni-D	mg/L	<0.0010	0.0012	<0.0010		
K-D	mg/L	0.105	1.40	0.124		
S-D	mg/L	<3.0	128	<3.0		
Se-D	mg/L	<0.00010	0.00017	<0.00010		
Si-D	mg/L	2.99	2.01	2.86		
Na-D	mg/L	0.750	11.5	0.825		
Sr-D	mg/L	0.0060	0.791	0.0094		
Zn-D	mg/L	<0.0050	<0.0050	<0.0050	0.2	

Figure 3: 3-South Pit water seeping over crest of weir into discharge channel

Figure 4: 3-South Pit water seeping over crest of weir into discharge channel

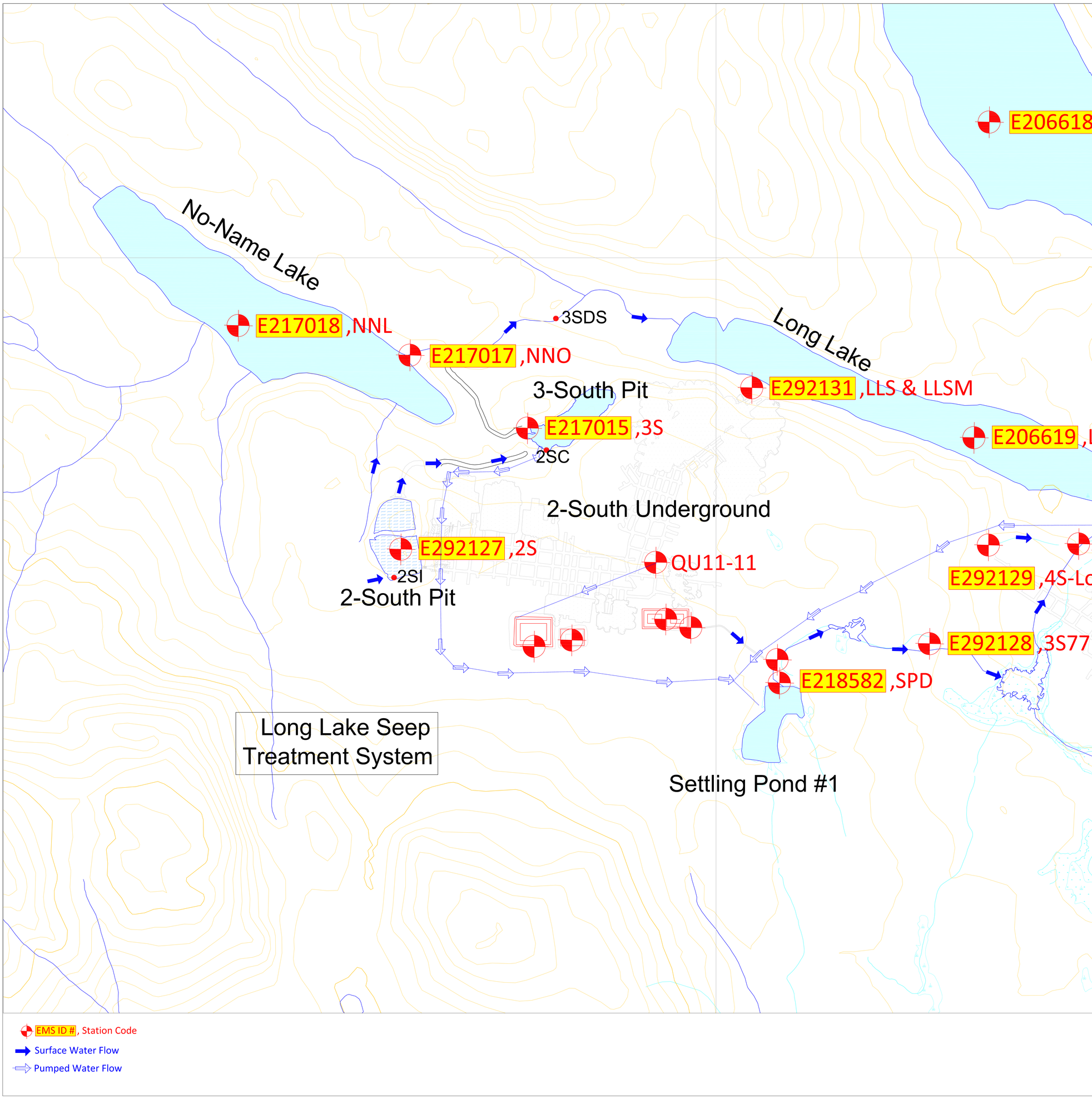
Figure 5: 3-South Pit water seeping over crest of weir into discharge channel

Figure 6: Confluence of the 3-South Discharge Channel and No Name Lake Connector Stream

Figure 7: Downstream of the confluence of 3-South discharge channel and No Name Lake connector stream (3SDS)

Figure 8: 3-South flow had stopped at 10:00 am.

Figure 9: 3-South flow had stopped at 10:00 am.


No-Name Lake
E217018 ,NNL
E217017 ,NNO
3SDS
3-South Pit
E217015 ,3S
2SC
2-South Underground
E292127 ,2S
2SI
2-South Pit
QU11-11
Long Lake
E292131 ,LLS & LLSM
E206619 ,L
E292129 ,4S-Lo
E292128 ,3S77
E218582 ,SPD
Long Lake Seep Treatment System
Settling Pond #1
EMS ID #, Station Code
Surface Water Flow
Pumped Water Flow

Appendix VIII

Annual Status Form

AUTHORIZATION NUMBER: 7008
AUTHORIZATION TYPE: Effluent, Permit
LEGAL AUTHORIZATION HOLDER NAME: Quinsam Coal Corporation

AUTHORIZED PERSON NAME: Kathleen Russell
AUTHORIZED PERSON SIGNATURE: Kathleen Russell
SIGNATURE DATE: June 30, 2018

I understand that it is an offense to mislead a government official, and I declare that all of the information presented is accurate and true.
I have been given the authority by the authorization holder to sign this form.

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
Section 1	AUTHORISED DISCHARGES		
Section 1.1	This subsection applies to the discharge of effluent from the NORTH COAL MINING OPERATION AND COAL PREPARATION PLANT. The site reference number for this discharge is E207409		
Section 1.1.1	The maximum and average authorized rates of discharge are 0.32 m^3/s and 0.08 m^3/s respectively. The authorized discharge period is 365 d/a. The maximum flow rate observed was 0.2490 m^3/s. The average annual flow rate was calculated as 0. 1326 m^3/s, above the average authorized discharge rate of 0.080 m^3/s.	No	The average rate of discharge was 0.1326 m3/s . Refer to the Annual Report, Section (6.1.1), page 31, Figure 4. This is for permit fee calculations only. Discharge rates are currently being investigated.
Section 1.1.2	The characteristics of the discharge shall not exceed the specified permit limits (See 1.1.2 of PE7008). All monitored parameters were in compliance.	Yes	Refer to the Annual Report, Appendix I, Tables 4 and 25
Section 1.1.5	The location of the facilities from which the discharge originates is Block 26, Block 120 and Block 148, Comox Land District.	Yes	N/A
Section 1.1.6	The location of the point of discharge is Block 120, Comox Land District.	Yes	N/A
Section 1.2	This subsection applies to the discharge of effluent from the SOUTH COAL MINING OPERATION. The site reference number for this discharge is E218582.		
Section 1.2.1	The maximum and average authorized rates of discharge are 0.46 m^3/s and 0.10 m^3/s, respectively. The authorized discharge period is 365 d/a. The maximum flow rate observed was 0.339 m^3/s. The average annual flow rate was calculated as 0.0243 m^3/s.	Yes	Refer to the Annual Report, Section (6.2), page 32, Figure 5.
Section 1.2.2	Discharge from the South Mining Operation shall not exceed the specified permit limits.	No	Fe-D exceeded permit limits during a high flow event on Jan. 8th, 2018. See Appendix VII.
Section 1.2.3	The authorized works are surface runoff collection and diversion ditches, flocculation facilities, settling pond, 3 pit sumps (1S, 2S and 3S Pits), an adit sump (4S Adit), pumping facilities, and related appurtenances approximately located.	ND	Permit amendment is underway to remove 1S , 4S audit sump & flocculation facilities as these do not exist.
Section 1.2.5	The location of the facilities from which the discharge originates is Block 98 and Block 149, Comox Land District.	Yes	N/A
Section 1.2.6	The location of the point of discharge is Block 149,Comox Land District.	Yes	N/A
Section 1.3-1.3.6	This subsection applies to the discharge of effluent from the BLOCK 242 COAL MINING OPERATION as shown on attached Site Plan C. The site reference number for this discharge is E225796.	ND	No discharge occurred from this site during 2017-2018. This site is non-operational and reclaimed. Permit amendment is underway to remove this site from the permit.
Section 1.4	This subsection applies to the discharge of effluent from the 7 SOUTH MINING OPERATION. The site reference number for this discharge is E292069.	Yes	N/A
Section 1.4.1	The maximum authorized rate of discharge is 0.005 m^3/s. The authorized discharge period is 365 d/a. Discharge occurred for 2 days over the year, totaling 432 m^3.	Yes	Refer to the Annual Report, Section (6.3), page 35.
Section 1.4.2	The characteristics of the discharge from the 7 South Mining Operation shall not exceed the specified permit limits.	Yes	Refer to the Annual Report, Section (7.3), pages 49 -53 .
Section 1.4.5	The location of the facilities and point of discharge is Block 120, Comox Land District, except part in plan 12164, 13574, 13641, VIP53617 and VIP64817.	Yes	N/A
Section 2	Specific Requirements		
Section 2.1	North Coal Mining and Coal Preparation Plant Operation (Settling Pond #4)		
Section 2.1.1	Rate of Discharge: The maximum flow of 0.32 m^3/s is the peak routed outflow from the settling pond resulting from the following inputs: a) The assumed response of the gravity fed catchment area defined in Subsection 2.1.3 up to a 1 in 10 year return period rainfall of 24 hour duration; and b) The maximum combined pumping rate from the 2-North portal sump, 2-North underground workings, and the tailings facility, as specified in Subsection 2.1.2. The Director may from time to time redefine the maximum outflow based upon actual on-site measurements.	Yes	N/A
Section 2.1.2	Pumping Rate: The combined rate at which effluent may be pumped from the 2-North portal sump, 2-North underground workings and the tailings facility to the settling pond shall not exceed 0.32 m^3/s unless authorization has been obtained from the Director. Pumping rates shall be decreased as necessary to accommodate flows as defined in Subsection 2.1.1 (a).	Yes	N/A
Section 2.1.3	Catchment Area: The gravity drained settling pond catchment area shall not exceed 4 hectares unless authorization has been obtained from the Director.	Yes	N/A
Section 2.1.4	Wash Plant Effluent: Wash plant effluent shall not be conveyed to the 2-North pit sump via the wash plant ditch. The Permittee shall keep records of the date, duration and estimated volume of any overflow from the wash plant effluent sump. Subject to review of this data, the Director may request changes to the works.	Yes	All fine tailing are directed to the tailings impoundment or underground 2-North Mine.
Section 2.1.5	Settling Pond Solids and Storage Volume: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 2,300 m^3. The removed solids shall be disposed of in a manner approved by the Director.	Yes	Settled solids have not accumulated to a point that requires them to be removed at this time.
Section 2.1.6	Discharge Routing: The discharge from the settling pond shall be conveyed to Middle Quinsam Lake in a manner acceptable to the Director.	Yes	N/A

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
Section 2.1.7	Effluent Characteristics (for Total Suspended Solids): The characteristics of the effluent with respect to total suspended solids shall be equivalent to or less than the levels specified in Subsection 1.1.2 for discharge rates of up to 0.32 m^3/s (or as may be redefined by the Director according to Subsection 2.1.1). Variances may be allowed by the Director for higher discharge rates. The Director may as well, in the future, establish a maximum level for total suspended solids during extreme storm events.	Yes	N/A
Section 2.2	South Coal Mining Operation (Settling Pond #1)		
Section 2.2.1	Rate of Discharge: The maximum flow of 0.46 m^3/s is the peak routed outflow from the settling pond resulting from an assumed response of the maximum equivalent catchment area as defined in Subsection 2.2.2 to a design I in 10 year return period rainfall of 24 hour duration. The Director may from time to time redefine the maximum routed outflow based upon actual on-site measurements.	Yes	N/A
Section 2.2.2	Catchment Area: The maximum equivalent settling pond catchment area shall not exceed 68.4 hectares as defined in the South Pit Water Management. Settling Pond 1, Quinsam Coal Project. Ker, Priestman and Associates Limited, March 1990 unless authorization has been obtained from the Director.	Yes	N/A
Section 2.2.3	Settling Pond Solids and Storage Volume: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 1400 m^3. The removed solids shall be disposed of in a manner approved by the Director.	Yes	Settled solids have not accumulated to a point that requires them to be removed at this time.
Section 2.2.4	Discharge Routing: The discharge from the settling pond shall be conveyed to Long Lake through the adjacent wetlands as specified in Figure I, South Pit Water Management. Settling Pond 1, Quinsam Coal Project, Ker, Priestman and Associates Limited, March 1990.	Yes	N/A
Section 2.2.5	Effluent Characteristics (for Total Suspended Solids): The characteristics of the effluent with respect to total suspended solids shall be equivalent to or less than the levels specified in Subsection 1.2.2 for discharge rates up to 0.46 m^3/s (or as may be redefined by the Director according to Section 2.2.1). Variances may be allowed by the Director for higher discharge rates. The Director may as well, in the future, establish a maximum level for total suspended solids during extreme storm events.	Yes	Refer to the Annual Report, Appendix I, Tables 11 and 26
Section 2.3 - 2.3.4	Block 242 Coal Mining Operation		This site is non-operational with reclamation underway.
Section 2.4	7-South Mining Operation Settling Pond		
Section 2.4.1	Rate of Discharge : The maximum flow of 0.005 m^3/s is the peak routed outflow from the settling pond resulting from an assumed response of the maximum equivalent catchment area as defined in subsection 2.4.3 to a design I in 10 year return period of 24 hour duration. Additional flow from the 7S adit sump pump must not cause the settling pond to overflow or exceed the maximum flow. The Director may from time to time redefine the maximum routed outflow based upon actual on-site measurements.	Yes	N/A
Section 2.4.2	Pumping Rate: The Permittee shall keep records of the date, duration and estimated volume when water from the 7 South Adit Sump (7S-Sump) is pumped to the settling pond and submit the records to the Regional Waste Manager upon request.	Yes	To date, no water has ever been routed from the 7S-Sump to 7SSD. Therefore no records exist.
Section 2.4.3	Catchment Area: The maximum settling pond catchment area shall not exceed 3.14 hectares as defined in the Surface Water Management Plan -7 South Development Quinsam Mine, Golder Associates, April 12, 2012 (Appendix B) unless authorization has been obtained from the Director.	Yes	N/A
Section 2.4.4	Settling Pond Solids and Storage Volume: Settled solids which have accumulated in the settling pond shall be removed as required to maintain a minimum water depth below the pond decant of 1.0 m and a minimum water storage volume of 340 m^3. The removed solids shall be disposed of in a manner approved by the Director.	ND	Settled solids have not accumulated to a point that requires them to be removed at this time. A minimum water cover of 1.0m is not sustained at all times as water management practices have changed to have minimal water discharged from the pond. Based on experience, it is difficult to maintain a 1.0m cover and discharge at appropriate levels. There has been far less TSS exceedances with the new practice.
Section 2.4.5	Discharge Routing: The discharge from the settling pond shall be conveyed to the Quinsam River via an ephemeral stream (Stream I) and a wetland (Lower Wetland) adjacent the Quinsam River in a manner acceptable to the Director.	Yes	Refer to the Annual Report, Appendix I, Tables 33-34
Section 2.4.6	Settling Pond Discharge Dilution Ratio: The 7-South settling pond must not discharge unless a minimum flow is measured in Stream 1 (7S monitoring site). The minimum Stream 1 to discharge ratio shall be documented to the satisfaction of the Director in the Environmental Procedures Manual required in Section 3.2.	Yes	Refer to the Annual Report, Appendix I, Tables 33 & 34.
Section 2.4.7	Settling Pond Discharge Effluent Quality Model Validation: The Permittee shall report on the settling pond performance in the annual report. The purpose of the report is to validate the effluent water quality prediction model using actual flow and water quality data. The Director may amend the permit, if required, or request an amendment of the permit for environmental protection based on the report findings.	Yes	Refer to the Annual Report , Appendix I, Tables 33 & 34.
Section 2.4.8	Contingency Measures: In the event of a 7-South settling pond discharge permit limit exceedance, the settling pond discharge valve must be closed immediately and the effluent must temporarily be diverted to the 5S mine or 7S mine underground workings, or to another area acceptable to the Director. Details of the contingency measures shall be documented in the Environmental Procedures Manual required under Section 3.2. Additionally, the Permittee shall follow Section 3.9 requirements.	Yes	The 7-South settling pond water is mostly directed to 7-S Sump via pumping. Refer to the Annual Report Section (7.3). Details of the contingency measures are documented in the Environmental Procedures Manual (EPM).
Section 2.4.9	Toxicity Failure Monitoring and Reporting Procedures	Yes	There have been no toxicity failures in the past. Toxicity samples were collected during the fall flush but were not collected during the spring due to zero discharge. See Appendix III.
Section 3.2	Environmental Procedures Manual (EPM)	Yes	The EPM was submitted on March 31, 2018 to the ENV compliance review website.
Section 3.3	Acid Generation Control	Yes	N/A
Section 3.4	Water Quality Objectives	Yes	N/A
Section 3.5	Nutrient Control	Yes	N/A

Authorized Person Initial:_____ Date:_____

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
Section 3.6	Chemical Storage Containment Works	Yes	N/A
Section 3.7	Spill Reporting	ND	See Annual Report (Appendix VII). Inflow data from the 3-South pit had to be downloaded prior to determining how long the spill had occurred.
Section 3.8	Additional Works	Yes	There is an authorization to bypass the works for the Long Lake Seep Passive Treatment System granted in August 2017.
Section 3.9 (3.9.1-3.9.2)	Maintenance of Works, Non-Compliances and Emergency Procedures	Yes	Refer to Annual Report, Appendix I (Table 2) and Appendix VII & EPM.
Section 3.10	Bypasses	No	There is an authorization to bypass the works for the Long Lake Seep Passive Treatment System granted in August 2017. A permit amendment is underway for the discharge from the Long Lake Seep. Effluent from the 3-South pit discharged down the designed outflow channel without a permit to discharge. See Appendix VII
Section 4.1.1	Effluent and In-Mine Release		
Section 4.1.1	North Coal Mining and Coal Preparation Plant Operation	Yes	
Section 4.1.1 i)	Decant WD (EMS # E207409) Missed 3/356 TSS samples. Composites were missed due to an 3 samples. Frozen conditions resulted in samples not being collected over the holidays. Composite sampler line froze.	No	Scheduled grab samples are taken during freezing conditions.
Section 4.1.1 ii)	Culvert, at Middle Quinsam Lake Road - WC (EMS # E207411)	No	Sulphate weekly sample was not analyzed at the lab on January 5. Collected but not specified for analyses on Chain of Custody.
Section 4.1.1 iii)	2-North Portal Sump Effluent - 2N-P-Sump (EMS # E283433).	Yes	N/A
Section 4.1.1 iv)	Additional Sites Monitoring Schedule : 2-North Pit Sump CCR Cover (WP) EMS # E207412, South Dyke Sump (SDS) EMS # E292126	Yes	N/A
Section 4.1.2	South Coal Mining Operation		
Section 4.1.2 (i)	Decant - SPD (EMS # E218582) Missing (3/134) required daily composite TSS samples. Frozen conditions resulted in samples not being collected. Composite sampler line froze.	No	Scheduled grab samples are taken during freezing conditions.
Section 4.1.2 (ii)	Culvert, Downstream End of Access Road - SPC (EMS # E217014)	Yes	N/A
Section 4.1.2 (iii)	South Pit Main Sump Water- 3S (EMS # E217015)	Yes	N/A
Section 4.1.2 (iv)	Additional Monitoring Sites Schedule: 2-South Pit In Pit Water Cover (2S) EMS # E292127, 1977 Bulk Pit Sample (3S77) EMS # E292128, Culvert Downstream of the 4 South Access Road (4S-Lo) EMS # E292129	No	Continuos inflow dto 2-South Pit was lost due to the instrument drifting and data recorded being incorrect. All required samples were collected from these sites. See Annual Report, Appendix I
Section 4.3	Block 242 Coal Mining Operation	Yes	NA - Area is non-operational and reclaimed.
Section 4.1.4	7 South Mining Operation		
Section 4.1.4 (i)	Decant - 7SSD (EMS # E292069)	Yes	Annual Report, Appendix I, Table 32
Section 4.1.4 (ii)	7-South Adit Sump EMS # E292110	Yes	NA - This pond is never pumped to 7S Settling Pond.
Section 4.2	Receiving Environment Monitoring Sites and Monitoring Requirements		
Section 4.2.1 (i)	Initial Dilution Zone Monitoring Sites - Long Lake Entrance- LLE (EMS # E292130) Missed one required monthly P-T sample.	No	Sample was collected but chain of custody did not specify P-T. QA/QC practices have been implemented prior to Chain of custody being sent out.
Section 4.2.1 (ii)	Road Crossing bridge on Stream I above the Lower Wetland -7S (EMS # E292109). Missed one monthly required DOC. Missed one monthly required sample set for all parameters (metals (T) & (D), alkalinity, acidity, TSS, SO4-D & DOC). Sample set was collected and submitted to the laboratory but lab failed to analyze the samples.	No	QA/QC practices have been implemented prior to Chain of custody being sent out.
Section 4.2.2	Seep Monitoring Sites		N/A
Section 4.2.2 (i)	Long Lake Seep- LLS (EMS # E292131)	Yes	Refer to the Annual Report, Appendix I, Tables 20 - 21
Section 4.2.3	Receiving Water (Stream and Lakes) Monitoring Sites. **7-South Mining Operation (Areas 1 to 4):** Quinsam River downstream of 7 South Mining Operation (7SQR) (EMS # E292113), **7-South Area 5 Mining Operation:** Stream- Iron River upstream of mining operations (IR1) (EMS #E297230), Iron River upstream of 7SA5 (IR6) (EMS # E297231), Iron River downstream of 7SA5 and 242 inputs (IR8) (EMS # E297232), Quinsam River downstream of confluence with Iron River (IRQR) (EMS # E299256).	Yes	Refer to the Annual Report, Appendix I, Tables 149 - 168
Section 4.2.4	Sediment and Benthic Monitoring Sites	NA	N/A
Section 4.2.4 (i)	7-South Area 5 sediment proposal	Yes	Proposing the sediment and benthic sites in August 2018
Section 4.2.5	Stream Monitoring Requirements		
Section 4.2.5 (i)	General Requirements Applicable to All Sites Defined Under Section 4.2.3 (E292112- Lower Wetland Outlet (LWO)) Missed a sample set during fall. Missed one weekly required sample set for all parameters (metals (T) & (D), alkalinity, acidity, TSS, SO4-D & DOC). Sample set was collected and submitted to the laboratory but laboratory failed to analyze the samples.	Yes & No	All samples except LWO were obtained in accordance to the permit. Refer to exceedance tables and subsequent text for detailed information.
Section 4.2.6	Lake Monitoring Requirements		
Section 4.2.6 (i)	General Requirements Applicable to All Sites Defined Under Section 4.2.3. Zooplankton samples were not collected during spring on all lakes.	No	All samples except zooplankton samples during spring were obtained in accordance with the permit. Refer to exceedance tables and subsequent text for detailed information.
Section 4.2.7	Sediment Benthic Monitoring Requirements	N/A	Scheduled for 2020
Section 4.2.7 (i)	General Requirements Applicable to All Sites Defined Under Section 4.2.4	N/A	N/A
Section 4.3	Additional Monitoring Requirements		
Section 4.3.1	Composite sampling	No	Equipment is established and routinely inspected. Refer to Non-compliance list for information on missed samples. Appendix I, Table 2. Composite sample tables, Appendix I, Tables 25-27.
Section 4.3.2	Continuous Flow Recording	Yes	Annual Report, Appendix I, Tables 28 - 32
Section 4.3.3	Iron River Flow Monitoring	Yes	Annual Report, Appendix II, Graph 70
Section 4.3.4	pH and Conductivity Monitoring	Yes	Annual Report, Appendix I , Tables 28 - 32
Section 4.3.5	Monitoring of Seeps	Yes	Annual Report Appendix I , Tables 9, 10 and 20, 21
Section 4.3.6	Groundwater Observation Wells	Yes	Groundwater results and discussion is integrated into the Annual Report. Please see Appendix IX.
Section 4.3.7	Monitoring of Drainage Ditches and Water Channels	Yes	Operations are checked daily by the environmental technician and shift bosses.
Section 4.3.8	Precipitation Monitoring	Yes	Annual Report, Appendix I , Table 43
Section 4.3.9	Block 242 Monitoring	Yes	Not operational, area has been reclaimed
Section 4.4	Monitoring Procedures	Yes	N/A
Section 4.4.1	Sampling and Analytical Procedures	Yes	N/A
Section 4.5	Reporting	Yes	N/A
Section 4.5.1	7 South Area 5 Reporting	Yes	Mining has not commenced in this area.

Authorized Person Initial:_____ Date:_____

Appendix IX

2017-2018 Annual Groundwater Monitoring Report

Pertaining to the Mines Act Permit C-172 & Effluent Permit PE: 7008

Submitted to: Ministry of Energy and Mines & Ministry of Environment

Prepared by:
Quinsam Coal Corporation
Technical Services Department

Table of Contents

1 Introduction 1
2 Groundwater Monitoring Regime 3
2.1 Hydrogeological Setting 4
2.1.1 Underground PAG-CCR Storage in the River Barrier Pillar 6
2.1.2 Down Gradient of Subaqueous Disposal of Fine Tailings in 2-North and 3-North 7
2.1.3 2-North Coal Processing Plant and Coal Pad 8
2.1.4 4-South Water Chemistry 8
2.1.5 2-South – 3-South Area 9
2.1.6 7-South Down Gradient of Subaqueous Disposal of PAG-CCR in 7-South 10
2.1.7 Baseline/Background 11
2.1.8 Mine Pools, Underground Sumps and Mine Water Pumped to Surface 11
3 Methods and Procedures for Monitoring Groundwater 11
3.1 Sampling Techniques 12
3.1.1 Inertial Lift Sampling 12
3.1.2 Peristaltic Sampling 13
3.1.3 Bladder Pumps 13
3.2 Parameters Monitored 13
3.3 Quality Assurance/Quality Control 15
3.3.1 Results of Field Replicates 15
4 Results and Discussion 18
4.1 References for Water Quality Data 18
4.2 Key Observations and Conclusions 20
4.2.1 North Mining Area 20
4.2.2 River Barrier Pillar Area 27
4.2.3 North Mining Area Plant Monitoring Wells 32
4.2.4 7-South 35
4.2.5 2/3 South Monitoring Wells 42
4.2.6 4-South Mine Area 46
4.2.7 242 Mine 52
5 Summary 53

List of Figures

Figure 1: General Stratigraphic Column - Quinsam Mine 6
Figure 2: In-Situ 2N Monitoring Wells - Dissolved Sulphate 23
Figure 3: Water Elevations at QU10-13 D 23
Figure 4: Ex Situ 2-North Monitoring Wells - Dissolved Arsenic 25
Figure 5: Ex-Situ 2N Monitoring Wells – Dissolved Sulphate 26
Figure 6: Ex-Situ 2N Monitoring Wells - Sulphide as H_2S 27
Figure 7: Ex-Situ River Barrier Pillar Monitoring Wells – Dissolved Sulphate vs. Water Elevation 30

Figure 8: Groundwater Transport in RBP and Vicinity 32
Figure 9: Plant Monitoring Wells – Dissolved Arsenic 34
Figure 10: Plant Monitoring Wells – Dissolved Sulphate 35
Figure 11: 7-South In-Situ Monitoring Wells - Dissolved Arsenic 37
Figure 12: 7-South In-Situ Monitoring Wells - Dissolved Iron 38
Figure 13: 7-South In-Situ Monitoring Wells - Dissolved Sulphate 38
Figure 14: 7-South Ex-Situ Monitoring Wells - Dissolved Sulphate 40
Figure 15: 7S Ex-Situ Monitoring Wells - Dissolved Arsenic 41
Figure 16: 7S Ex-Situ Monitoring Wells – Dissolved Iron 41
Figure 17: In-Situ 2S Monitoring Wells - Dissolved Sulphate 42
Figure 18: In-situ 2-South Monitoring Wells - Dissolved Iron 43
Figure 19: 2-South Groundwater and Mine Pool Water Elevations 43
Figure 20: Ex-Situ 2/3 South Monitoring Wells - Dissolved Sulphate 45
Figure 21: Ex-Situ 2/3 South Monitoring Wells – Dissolved Iron 46
Figure 22: 4-South Mine Pool Water Elevation at QU11-01 48
Figure 23: In-Situ 4-South Monitoring Wells - Dissolved Arsenic 48
Figure 24: In-Situ 4-South Monitoring Wells - Dissolved Iron 49
Figure 25: In-Situ 4-South Monitoring Wells - Dissolved Sulphate 50
Figure 26: Ex-Situ 4-South Monitoring Wells - Dissolved Arsenic 51
Figure 27: Ex-Situ 4S Monitoring Wells - Dissolved Sulphate 52

List of Tables

Table 1: Groundwater Wells & Sumps Monitored in 2017-2018 3
Table 2: Sulphate Water Quality Guideline (mg/L) - Based on Water Hardness (mg/L) Categories 14
Table 3: Replicates & Relative Percent Difference Greater than 20% 16
Table 4: CSR-AW Standards 19
Table 5: CSR-AW Exceedances in Ex-Situ Groundwater Wells 19
Table 6: Source Terms Comparison for 2/3 North Mine Void 21
Table 7: Source Terms Comparison for 2-North Mine Water with 7-South Tailings 22
Table 8: Source Terms Comparison for RBP with 7-South CCR and Averages 29
Table 9:Source Terms Comparison for 7-South with PAG-CCR 37
Table 10: Source Terms Comparison of Flooded 4-South Mine Void Mature Mine Pool 47

List of Appendices:

Appendix A: Site Map
Appendix B: Tables
Appendix C: Borehole Development Logs
Appendix D: Graphs

1 Introduction

Quinsam Coal Corporation, as part of the requirements under Mines Act Permit C-172 (administered by the Ministry of Energy and Mines) and Effluent Permit PE-7008 (administered by the Ministry of Environment), conducts a comprehensive groundwater monitoring program to characterize water quality associated with mining development. This edition covers a 12-month period and interprets the results from April 1, 2017 to March 31, 2018 to synchronize with the surface water monitoring report pertaining to the effluent permit.

Prior to 2012, the groundwater monitoring program was executed by external consultants. In 2012, in an effort to reduce costs and improve the logistics of the program, Quinsam Coal internalized the groundwater monitoring program. Methodology of sampling followed the procedures developed in the Lorax Hydrogeological Assessment and the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emissions, Water, Wastewater, Soil Sediment, and Biological Field Sampling 2013 Edition.* The groundwater program has been defined through work performed by Quinsam Coal and Lorax Environmental on the hydrogeology of the respective mining areas, which governs the sampling locations, methods and frequency with consideration of their relationship to mining.

As in previous reports, groundwater wells have been categorized as either ‘in-situ’ or ‘ex-situ’ based on their respective installation location. Definitions for each is as follows:

- *In-situ:* groundwater wells located within the mine workings (disturbance footprint) and therefore represent water accumulated within the mining void. In the absence of groundwater well samples, underground sump samples are used for comparison.
- *Ex-situ:* groundwater wells located outside the mine workings (disturbance footprint) which reflect water quality flowing from the mine void towards the receiving environment. This also includes baseline and background (up-gradient of workings) groundwater wells.

The groundwater wells outside the mine footprint (ex-situ) are compared to the British Columbia Contaminated Site Regulation (CSR) (BC reg.37/96. O.C. 1480/96), including the amendments (343/2008 January 1, 2009) describing water quality standards for fresh water Aquatic Life (AW). The aquatic life standard assumes that a minimum 1:10 dilution is available for groundwater discharged to a freshwater system; together, they are referred to as CSR-AW.

The parameters of interest (POI) captured under the CSR-AW and applied to Quinsam include: arsenic (As), cobalt (Co), copper (Cu), fluoride (F), iron (Fe), sulphate (SO_4), sulphide (as H_2S) and zinc (Zn). Section 4.1 compares sampling results performed during this program to the CSR-AW standards (by development area).

Derived from numerous studies, POI source terms have been developed by Lorax Environmental for various areas, including: geochemical characterization of the 4-South mine pool, laboratory kinetic testing conducted on the 7-South coarse coal reject, 7-South formation water and 2-North, 3-North and 5-South mine water and formation water samples collected from underground mine dewatering. It is important to consider water captured and stored within the mine workings (in-situ) to ascertain potential discharge (through existing water management structures) and seepage water quality. Accordingly, groundwater wells that are located within a mine void are sampled as part of the monitoring program with results being compared to source terms developed for each respective area.

2 Groundwater Monitoring Regime

Throughout the 2017-2018 monitoring period, Quinsam Coal monitored 35 groundwater sites within the vicinity of the mine footprint. These sites consisted of 24 ex-situ wells, 9 in-situ wells and 2 in-situ underground sumps as illustrated in Table 1 below.

Table 1: Groundwater Wells & Sumps Monitored in 2017-2018

Area	In-Situ Sumps	In-Situ Wells	Ex-Situ Wells	
2-North	6M2N	1M2N 5M#2 QU10-13 D	QU08-21G S QU10-10 S QU10-11 S	QU08-21G D QU10-10 D QU10-11 D
River Barrier Pillar		QU11-09 M	QU11-05 S QU11-09 S	QU11-05 D
2-North Plant			MW00-1 S MW00-6 S	MW00-1 D MW00-6 D
7-South	1M7S	QU14-10	QU08-13 A	QU08-13 B QU08-10 D
7-South Area 5 / 242		242MW	QU11-36S	QU11-36 D
4-South		QU11-01	QU10-09 S	QU10-08D QU10-09D
2/3 South		QU11-11 MW00-4	MW12-23 MW00-2	MW12-24

Appendix A, Site Plan, presents a map of the groundwater sampling sites with respect to underground workings and disturbed areas. Table 1 describes the groundwater well locations and monitoring frequency followed in 2017-18. The groundwater well monitoring frequency and wells listed in Table 1 are regularly evaluated and modified in order to best monitor groundwater and potential impacts from mining. The areas encompassed in this monitoring program include: 2-North, the River Barrier Pillar (RBP), 2-South, 3-South, 4-South, 7-South; and 7-South Area 5/242 area.

The monitoring wells have been selected as they relate to:

- hydrogeology of the area
- groundwater regime

- stratigraphy and geologic structure
- formation groundwater
- mine pool waters
- past and present mining conditions
- underground PAG–CCR storage
- fine tailings storage

Appendix B displays the groundwater quality results for the 2017-18 monitoring year. Completion logs for the well installations listed in Table 1 can be found in Appendix C, and a further discussion of these wells can be found in Mine Permit (C-172) Amendment: 7-South Development Volume 3: Appendix I through J and Volume 4: Appendix K. Lorax Environmental Services was retained by Quinsam Coal to perform a hydrogeological investigation in these areas. The wells are a combination of nested wells, single wells and boreholes. The nested wells include a deep well and a shallow well that are screened in zones of interest. The deeper wells are generally drilled into the lowest coal seam and the shallower wells represent other zones of interest which may include shallower coal seams, or areas of increased permeability (Lorax, 2011).

With a change of ownership and recommencement of mining at Quinsam Coal in 2017, plans have been made to enter 7-South Area 5. These plans have triggered the need to resume monitoring of groundwater in the area prior to mining to ensure baseline data has been collected. Monitoring of these wells will continue following mining operations to determine any impacts on in/ex-situ groundwater.

2.1 Hydrogeological Setting

Groundwater wells relating to mining voids or defined as ‘down gradient’ from mine development zones have been established to characterize water quality for each respective area. The water chemistry is compared to source terms for parameters of interest established through:

- Sulphur distribution in the proposed workings

- Solid phase and leaching characteristics of CCR and tailings from the 7-South areas and disposed in mined out workings
- Geochemical characterization of the hanging wall strata over the mine area
- Formation groundwater characteristics

The information pertaining to column leach testing and derivation of source terms can be found in the application for 7-South Development Mine Permit Amendment (C-172) Volume 3: Appendix J and Volume 4, Appendix K (Lorax [(1)], 2011).

Figure 1 below displays the stratigraphic column at the Quinsam mine.

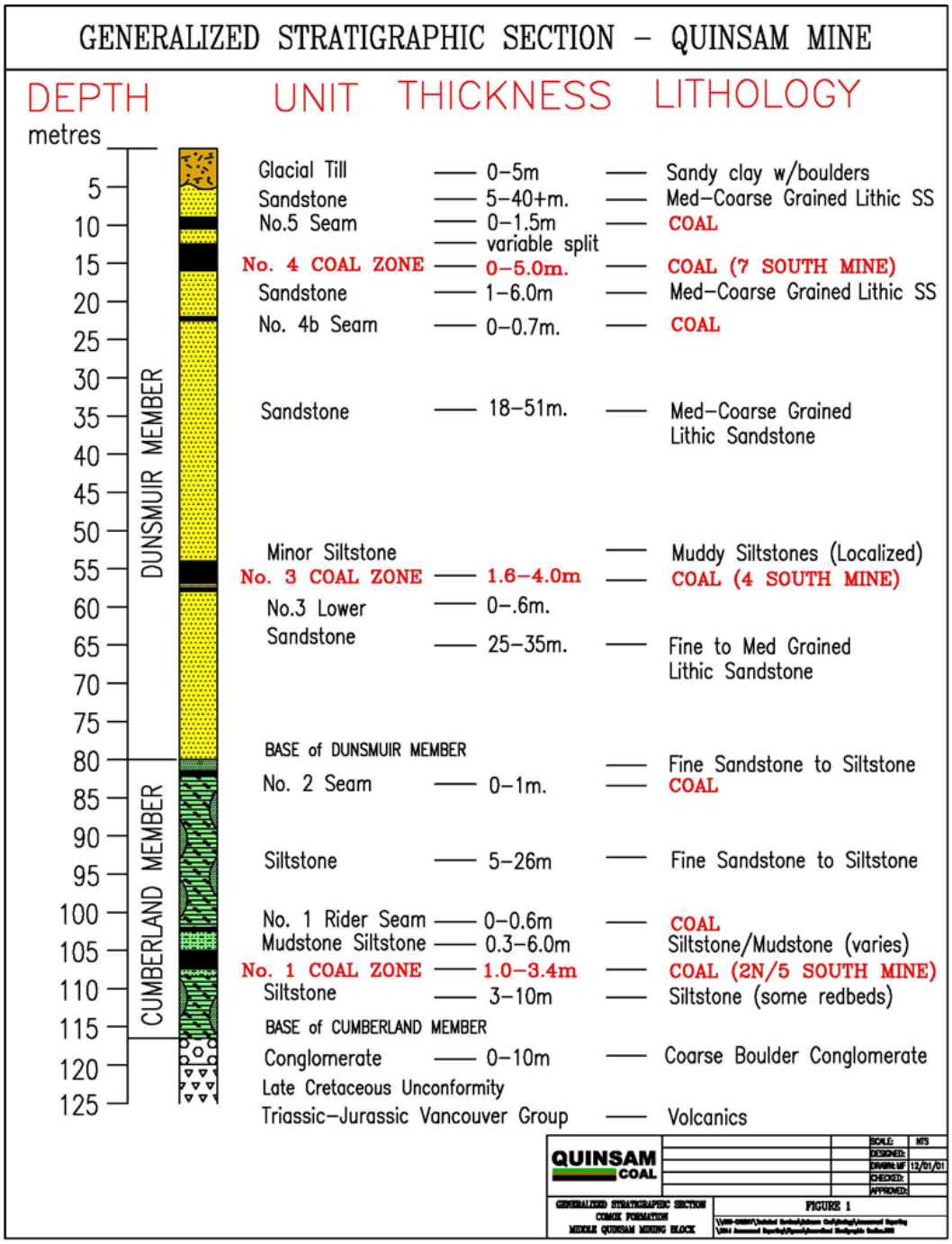


Figure 1: General Stratigraphic Column - Quinsam Mine

2.1.1 Underground PAG-CCR Storage in the River Barrier Pillar

Coarse coal reject (CCR) material produced from the processing of raw No. 1 seam coal is defined as potentially acid generating material (PAG) when the sulphur content exceeds 1.3 %. As

development of the 5-South mine progressed, inherent sulphur levels found in the #1 coal zone progressively increased above 1.3% sulphur. The run of mine coal processed through the Coal Preparation Plant and the resultant waste materials (fine tailings and CCR) were therefore classified as PAG. To mitigate potential metal leaching/acid rock drainage, Quinsam Coal established a sub-aqueous PAG-CCR disposal facility within the mine workings known as 87 Panel River Barrier Pillar (RBP). This disposal method was used as a pilot project for future PAG-CCR storage of material from the then proposed 7-South mine. Accordingly, groundwater monitoring at this facility has been a crucial part of Quinsam's past and current groundwater monitoring program. Wells used to monitor the seepage of groundwater are QU11-05 (S and D) and QU11-09 S while in-situ waters are monitored using well QU11-09 M.

2.1.2 Down Gradient of Subaqueous Disposal of Fine Tailings in 2-North and 3-North

The 2-North mine has been a subaqueous disposal site of fine tailings from processing of the 7-South coal since 2012. Fine tailings were pumped underground into 2-North 1 Mains until early 2015 when the line was relocated due to retreating underground operations. Pumping was redirected into the 5 Mains mining void of the 2-North mine. The wells installed in these areas initially supported a hydrogeological investigation performed by Lorax. The 2-North, 3-North and 5-South mine waters and formation waters have been defined as: mine water, #1 coal seam groundwater, and Dunsmuir sandstone groundwater. In these areas, the mine water is classified as circum-neutral with a distinct sulphate geochemical signature that can be used to trace the flow paths of mine water (Lorax [(1)], 2011).

Groundwater wells QU10-10 (S and D), and QU10-11 (D) have been installed down gradient of the 2-North subaqueous disposal areas and measure formation water quality and hydraulic head downstream of the 2-North mine workings. Quinsam originally drilled QU08-21G in the 2-North area as a geotechnical hole but was later converted into monitoring wells QU08-21G S and QU08-21G D. These wells were used to characterize water quality on the opposite side of the Forjan Fault in both the No. 1 coal zone (deep well) and the overlying Dunsmuir Sandstones in the No. 4 coal zone (shallow well). QU10-13 D measures the hydraulic head above the 2-North mine (1 Mains) and fine tailings disposal. QU10-11 S monitors groundwater in the overlying Dunsmuir sandstones

in a fracture zone. The in-situ waters in the 2-North mine pool are monitored at well locations 1Mains 2-North (1M2N), 5Mains #2 (5M#2) and QU10-13 D & the underground sump 6 Mains 2-North (6M2N) replaces the groundwater well QU11-03 as it was difficult to obtain a sample due to the depth of the well.

2.1.3 2-North Coal Processing Plant and Coal Pad

The coal processing plant is located east of Middle Quinsam Lake and lies at an elevation approximately 40 metres above the lake surface. Two nested groundwater wells MW00-6 (S and D) and MW00-1 (S and D) have been installed at the peripheries of a surface collection ditch to intercept groundwater and surface runoff from the coal processing plant and coal stockpile pad. The depth of the shallow wells MW00-1 S and MW00-6 S are 8.1 and 8.7 metres respectively, while the deeper wells MW00-1 D and MW00-6 D measure 29.8 and 18.0 metres respectively. These wells monitor groundwater quality at different depths in the glacial till overburden layered overtop of the bedrock.

2.1.4 4-South Water Chemistry

The 4-South mine is developed in the #3 coal zone. The #3 coal zone lies within the Dunsmuir Member of the Comox Formation. The Dunsmuir Member consists of thick-bedded medium to coarse grained arkosic sandstones containing localized silty interbeds. Lorax classified the groundwater in this area into two groups; formation groundwater with lower overall dissolved ion concentrations and mine pool water with higher dissolved ion levels. The mine pool water is elevated in sulphate and iron; this signature is used to assess the mine pool seepage rates and groundwater flow path.

Lorax's assessment of the area found that formation groundwater wells had water quality with a geochemical signature that suggested mine pool influence in the down gradient wells of the flooded 4–South Mine. In Volume 3, Appendix I, Section 4 of the 4-South Mine Groundwater Evaluation, Lorax concludes that "*The component of seepage from the shallow westernmost portion of the 4-South mine inferred to flow to Long Lake represent about 10% (0.14 m^3/day) of the 1.4 m^3/day, estimated to represent the total seepage from 4-South. All seepage is ultimately directed to the Quinsam River"* (Lorax [(2)], 2011).

The monitoring wells established in this area were situated to intercept any groundwater transport that may occur from the 4-South mine pool. These wells include QU10-09 (S and D), QU10-08 D and QU10-07 D (Lorax. 2011). This reporting year, QCC has monitored all of these wells except QU10-07 as it has displayed a minimal influence from the mine waters geochemical signature. QU10-08 is located up gradient of the 4-South mine and displays minimal influence from the 4-South mine pool.

The monitoring wells dedicated to monitoring in-situ water of the flooded workings are wells QU11-01 and QU78-161. QU11-01 is situated in the depillared area of the mine while QU78-161 is located in open mine workings east of a large fault. In past monitoring years, both of these wells were sampled due to their distance apart. It has been deemed that only one of these wells are necessary to determine mine-pool water chemistry as they have both exhibited similar characteristics when assessing historic data. Monitoring at QU78-161 has been ceased until further notice.

2.1.5 2-South – 3-South Area

The 2-South – 3-South area consists of naturally flooded mine workings, the 2-South subaqueous PAG-CCR storage pit, the 3-South subaqueous PAG-CCR storage pit and other surface disturbances. Wells established in this location are used to determine if parameters of interest are emanating from the mine workings or the PAG-CCR storage pits towards the receiving environment.

The 2-South open pit area was engineered to contain PAG-CCR material and included a sand-bentonite liner to minimize seepage and to retain water necessary for cover. Backfilling of PAG-CCR was completed in summer 2015 and water cover has been maintained since late 2015 (subaqueous disposal). It was projected that approximately $50m^3$ of water will seep from the facility daily with 10% of the water reporting to No Name Lake. The wells MW12-23 and MW12-24 are designed to intercept any water transporting from the 2-South PAG-CCR storage towards the lake. The 3-South open pit development has been backfilled with PAG-CCR and was flooded to provide a full water cover; similar to the requirements of 2-South. A Groundwater well named

MW00-2 was installed down gradient of this facility in shallow bedrock approximately 15 metres from the northeast corner to characterize seepage from 3-South. It is inferred that MW00-2 is hydraulically connected with the 3-South pit based on proximity and reported water quality (Golder Associates, 2006).

Groundwater wells MW00-4 and QU11-11 are used to monitor the 2-South mine pool and depillared areas. MW00-4 is located on the north-eastern margin of the 2-South mine in the depillared workings near Long Lake. QU11-11 is located at the deepest portion of the 2-South as it draws water from the underground mine pool for treatment in the Long Lake Seep Passive Treatment System (LLSTS). This well is monitored monthly to assess mine pool chemistry and to assess the performance of sulphate reduction through the LLSTS. Historically, MW00-3 and MW00-5 were also monitored in this location but are presently only used to monitor the water elevation in the mine pool. The underground workings in the 3-South pit area were developed and accessed by two portals located in the 2-South pit, with the 3-South Pit separated from the underground workings by intact bedrock. It is expected that the hydraulic connection between the flooded 3-South pit and the former 2-South underground workings are a result of bedrock fractures within the intact bedrock (Golder Associates. 2007).

2.1.6 7-South Down Gradient of Subaqueous Disposal of PAG-CCR in 7-South

The nested groundwater well QU08-13 (A & B) is situated topographically down gradient of the 7-South mine workings to intercept groundwater flow from the workings towards the Quinsam River. The well is located to monitor water quality and detect any seepage from the 7-South PAG-CCR underground disposal area in the 7-South mine at the stratigraphic level of the No. 4 coal zone (QU08-13 A) or as it rises through the stratigraphic column towards the Quinsam River (QU08-13 B). Source terms derived specifically for this development will be used as a comparison of water quality. Other groundwater wells within the 7-South area are used to monitor groundwater quality in relation to the seepage from the run of mine stockpile (QU08-10). At present, monitoring well QU14-10 is being used to measure water quality of the in-situ underground PAG-CCR subaqueous disposal. When the storage of PAG-CCR, drill holes QU08-07 and / or QU09-01 will be developed into monitoring wells to measure in-situ underground water quality within the PAG-CCR storage facility.

2.1.7 Baseline/Background

Groundwater monitoring wells within areas without mine related impact or up gradient of the perceived flow path are established to identify baseline/background information on water quality for modeling purposes and when comparing/identifying sites encountering mining influence. Two primary areas of focus for collecting baseline groundwater quality in the near future are 7-South Area 5 and the 4-South / 6-South areas. These areas were monitored in the past and additional monitoring may be required now that future mining operations are expected.

2.1.8 Mine Pools, Underground Sumps and Mine Water Pumped to Surface

A mine pool is a flooded mine void or previously mined out area which may or may not be backfilled with waste material. Mine pools often exhibit elevated concentrations of metals and sulphate associated with developed coal seams. Concentrations become increasingly elevated if mine pools have waste deposits present as constituents tend to dissolve and accumulate at depth. A chemical stratification occurs when there is limited mixing of the mine water and the heavily mineralized waters settle on the bottom of the water column while the lighter, less mineralized waters, concentrate in the upper portion.

In-situ mine pool monitoring locations include: 1M2N, 5M#2, and QU10-13 D in 2-North; QU11-09 M in the RBP; QU14-10 in 7-South; QU11-01 in 4-South; MW00-4 and QU11-11 in 2-South; and 242MW for the 242 mine. In addition to mine pool monitoring sites that are not accessible to monitoring personnel, underground sumps are used to characterize in-situ locations including: 1 Mains 7-South (1M7S) and 6 Mains 2-North (6M2N).

3 Methods and Procedures for Monitoring Groundwater

During groundwater sampling, water is directed through a flow cell connected to a water quality sonde to instantaneously measure parameters such as pH, conductivity, temperature, oxidation reduction potential and dissolved oxygen. These parameters are used to identify when intercepted groundwater entering the column is steady and representative of the targeted water based on the well design. Water samples are obtained for laboratory analysis when the appropriate volume of water has been purged, water levels have stabilized, and the physical parameters listed above

stabilize. Ultimately, the objective is to collect a sample that represents the ‘active’ groundwater in an area as opposed to stagnant water within a well.

3.1 Sampling Techniques

Generally, four methods/systems (dependent on groundwater setting) are employed for monitoring groundwater. These methods include:

- Inertial lift
- Peristaltic pumping
- Portable bladder pump
- Dedicated bladder pump

The most suitable sampling device is selected based on:

- Parameters being monitored
- Maximum efficiency
- Purging rate compared to well yield
- Well diameter
- Depth of well
- Sample collection point
- Ease of use of the sampling device

3.1.1 Inertial Lift Sampling

This method of sampling uses HDPE tubing fitted with an inert foot valve placed down the well casing at the desired depth. Oscillation of this tubing forces water up to surface while the foot valve prevents backflow on the downswing. This constant oscillation is achieved using a mechanical actuator known as a hydrolift. The hydrolift is attached to the tubing end on surface and cycles up and down to provide the motion needed to lift water. Flow rate is directly proportional to the speed of oscillation, well design and water level. Inertial lift sampling is appropriate in wells in which a high purge rate is required as flow rates can range from 0.5 to over 4 L/min.

3.1.2 Peristaltic Sampling

This method employs a peristaltic pump connected to tubing that is placed within the well casing at a desired depth. Peristalsis is a cyclic compression and decompression on the tubing to create a negative pressure point in which the water is drawn up the tubing. This method is employed at very shallow wells that can potentially have poor recharge rates.

3.1.3 Bladder Pumps

Bladder pumps are submerged to an appropriate level and operate by filling and discharging a bladder system inside a housing unit. Compressed gas (N_2) is supplied at surface and is pumped down the tubing to provide the compression and release of water within the bladder housing. Flow rate is controlled via timing cycles of recharge and discharge, air pressure and depth of water. Bladder pumps are used in deeper wells in which inertial lift and peristaltic pumping capabilities and efficiencies are not possible.

3.2 Parameters Monitored

The total metals suite was removed from the analytical requests in 2014 to eliminate the potential artifacts (associated with higher total suspended sediment) in sampling results. Since then, analytical results have included dissolved metals, total suspended solids (TSS), dissolved anions (i.e. bromide (Br^-), chloride (Cl^-), fluoride (F^-), sulphide (S^{2-}), sulphide as (H_2S), sulphate (SO_4), total dissolved nitrogen (TDN), dissolved organic carbon (DOC), total-alkalinity (Alk) and acidity. Furthermore, field measurements for pH, temperature, conductivity, oxidation reduction potential and dissolved oxygen continue to be part of the monitoring program.

Results for hydrogen sulphide are calculated using a gravimetric conversion factor (sulphide result multiplied by 1.063) as the laboratory only provides results as sulphide. This calculation is necessary to compare results to the CSR-AW standards as the standard is measured as H_2S (0.02 mg/L). In the past, sulphide results that were expressed as <MDL were calculated using the MDL value which was often 0.02 mg/L. For all previous results and results included in this reporting

year that were <MDL, a value of half the MDL was used for calculation. This may eliminate past issues of false positive bias when the gravimetric conversion factor is applied.

In 2013 the Ambient Water Quality Guideline for dissolved sulphate was updated from an acute guideline of 100 mg/L to a chronic guideline based on a 30-day average. The new guideline is relative to background water hardness concentrations. As a result, sulphate water quality guidelines for the protection of aquatic life were developed for different categories of water hardness as displayed in Table 2 below.

Table 2: Sulphate Water Quality Guideline (mg/L) - Based on Water Hardness (mg/L) Categories

Water Hardness* (mg/L)	Sulphate Guideline (mg/L)
Very Soft (0-30)	128
Soft to moderately soft (31-75)	218
Moderately soft/hard to hard (76-180)	309
Very hard (181-250)	429

*Water hardness categories adapted from the CCME.

** Toxicity tests on the early stage rainbow trout were only conducted up to a water hardness of 250 mg/L.

The BC Land Remediation Section develops the Contaminated Sites Regulations standards. As it is a regulation, standards do not change when a water quality guideline changes. As a result, the CSR-AW for sulphate was not updated when the BC Water Quality Guideline was revised. Currently, the CSR-AW standards are subject to revision, with the first step of the process being to review the policy (e.g. developing a CSR standard) and the second step applying the newly derived standard. These new guidelines derived from the Water Quality Guidelines are often a factor of the guideline (e.g. 10 times higher). The CSR-AW standard for dissolved sulphate of 1000 mg/L has been applied but this may change in the future.

Starting March 2015, in an effort to reduce costs, all water samples were analyzed by Maxxam Analytics in favour of ALS Environmental (ALS). While both labs provided analyses of water with similar detection limits, not all analysis methods were the same. Results have been consistent for all parameters except Sulphide as H_2S at low ranges.

3.3 Quality Assurance/Quality Control

Quality Assurance / Quality Control (QA/QC) for the Quinsam groundwater sampling program is conducted in accordance with *"The British Columbia Field Sampling Manual, For Continuous Monitoring and Collection of Air, Air-Emissions, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition"* (MOE, 2013). During this reporting period, 11 replicate samples were collected across 9 sites, totaling 701 measurement pairs. Sites where replicate samples were obtained included: MW00-1 D, MW00-2, QU08-13 A (x2), QU08-13 B, QU10-10 S, QU10-13 D, QU11-09 S, QU11-09 M, and QU14-10 (x2).

Relative Percent Difference (RPD) values were calculated for the analytical results from the sample and its respective replicate. In accordance with the British Columbia Field-Sampling Manual, the calculation was applied as stated below:

$$RPD = Absolute \frac{(Sample\ Concentration - Replicate\ Concentration)}{\left(\frac{Sample\ Concentration + Replicate\ Concentration}{2}\right)}\ x\ 100\%$$

RPD calculations were only practical for results where concentrations were found at or greater than five times the reported detection limit (RDL) as there is considerable uncertainty at low levels. In addition, mathematical calculations for RPD appear exaggerated with low values where absolute differences may be relatively low.

3.3.1 Results of Field Replicates

It is expected to see variation between a sample and its respective field replicate for a number of reasons. Some considerations include: inconsistent sample stream at sampling locations; heterogeneity of water at sampling location; the possibility of minor contaminations; laboratory sample preparation and accuracy of analytical instrument to name a few. Taking these possibilities into consideration, RPD values less than 20% are deemed "acceptable" and indicate proper sampling methodology with representative results. It has been acknowledged that RPD values greater than 20% indicate a potential problem with sampling integrity whereas values greater than 50% indicate a definite problem. When taking a groundwater replicate during a sampling event, approximately 60 parameters are analyzed from the same set of samples. It is common to have one or a select few of these parameters exceed an acceptable RPD threshold while the rest do not.

Concerns over sampling integrity or methodology are raised when numerous results have high RPD values within the same sample or if certain parameters have repeated failures throughout the year. The following table displays failures observed in this year's monitoring period.

Table 3: Replicates & Relative Percent Difference Greater than 20%

Station	Date	Parameter	Detection Limit	Detection Limit X5	Result1	Result2	RPD
1M2N	27/06/2017	Fe-D	0.005	0.0233	0.025	2.42	196.19
QU0813A	13/12/2017	Al-D	0.003	0.003	0.015	0.151	192.21
1M2N	27/06/2017	Cu-T	0.0005	0.0457	0.0025	0.0039	168.55
5M#2	27/06/2017	Fe-D	0.005	0.0491	0.025	0.405	156.75
1M2N	27/06/2017	Pb-T	0.0002	0.00222	0.001	0.00034	146.88
QU0813A	25/09/2017	S2-T	0.005	0.0592	0.025	0.332	139.47
QU0813A	25/09/2017	H2S	0.0053	0.063	0.0265	0.35	138.98
5M#2	27/06/2017	Zn-D	0.005	0.0126	0.025	0.0436	110.32
QU1109S	19/12/2017	Carb	1	6.5	5	2.8	79.57
QU1109S	19/12/2017	Alk-PP	1	5.5	5	2.4	78.48
1M2N	27/06/2017	As-D	0.0001	0.00425	0.0005	0.00875	69.23
QU1109S	19/12/2017	H2S	0.005	0.29	0.025	0.56	63.53
QU1109S	19/12/2017	S2-T	0.005	0.275	0.025	0.524	62.33
QU0813A	13/12/2017	S2-T	0.005	0.164	0.025	0.0866	61.77
QU0813A	13/12/2017	H2S	0.005	0.17	0.025	0.092	59.54
QU0813A	13/12/2017	N-D	0.02	0.359	0.1	0.213	51.05
QU0813A	13/12/2017	P-D	0.002	0.15	0.01	0.0918	48.14
QU1013D	06/12/2017	DOC	0.5	3.02	2.5	4.27	34.29
5M#2	27/06/2017	Si-T	0.1	2.57	0.5	3.63	34.19
QU1410	23/11/2017	Turb	0.1	2.84	0.5	2.1	29.96
QU1010S	23/06/2017	TSS	8	128	40	172	29.33
QU1410	23/11/2017	P-D	0.002	0.0131	0.01	0.0176	29.32
QU0813B	07/06/2017	P-D	0.002	0.0486	0.01	0.0639	27.20
5M#2	27/06/2017	Zn-T	0.005	0.0277	0.025	0.0364	27.15
5M#2	27/06/2017	Fe-T	0.01	0.384	0.05	0.499	26.05
5M#2	27/06/2017	As-D	0.0001	0.00942	0.0005	0.0122	25.72
QU0813B	07/06/2017	S2-T	0.005	0.0355	0.025	0.0279	23.97
QU1010S	23/06/2017	P-D	0.002	0.0468	0.01	0.0594	23.73
QU0813B	07/06/2017	H2S	0.005	0.038	0.025	0.03	23.53
QU1010S	23/06/2017	Alk-PP	0.5	2.48	2.5	3.13	23.17
QU1010S	23/06/2017	Carb	0.5	2.98	2.5	3.76	23.15
QU0813A	25/09/2017	N-D	0.02	0.263	0.1	0.209	22.88
5M#2	27/06/2017	B-T	0.05	0.797	0.25	0.989	21.50
MW001D	07/12/2017	Cu-D	0.0002	0.00161	0.001	0.00131	20.55

Within the 11 replicate samples and 701 measurement pairs analyzed, 34 pairs had an RPD greater than 20% (4.85% of total), and 16 had an RPD greater than 50% (2.28% of total). It is invalid to compare site-to-site replicates this monitoring period as there is not an even representation of replicates at each respective site. This has sparked the need for even representation across sampling locations to properly evaluate sampling methodology. During next year's monitoring regime, one replicate per site will be collected for even representation. This should minimize bias when analyzing quality control measures across sampling.

When assessing the parameters for replicate failures, it was noted that the parameters total sulphide and hydrogen sulphide lead with the amount of RPD exceedances this monitoring year. Sulphide replicate failures have been observed in other monitoring locations in past monitoring periods and prompted investigation. The expected reason for these parameters to see high variation between replicate and parent samples is in the reactive nature of sulphide when sampling. This parameter can change chemical state easily as it is sensitive to redox conditions in the sample matrix. For example, sulphide concentrations are higher is some anoxic waters typically found in deep groundwater. When brought to surface, this water can become oxygenated and influence speciation changes that affect the analytical results. To limit false readings, preservation of sulphide must occur immediately by placing preservative in sample bottle prior to the deposition of sample water.

Another quality control measure to be applied next monitoring period is increased attention to cleanliness of sampling equipment and tubing installed in groundwater wells. Tubing assemblies installed within the wells are re-used as it is unfeasible to replace tubing assemblies wells every sampling event. An in-depth review of the integrity of the assemblies will occur immediately to evaluate the need for replacement. For tubing assemblies not installed in the well (portable bladder pump and surface sampling tubing), increased cleaning and proper storage methods will be applied.

4 Results and Discussion

4.1 References for Water Quality Data

Geochemical source terms have been developed by Lorax as a conceptual model that represents the progression of mine pool geochemistry for all mine pool areas on the Quinsam Mine Site. This model is explained in detail in the 7-South Development Mine Permit Amendment Volume 3, Appendix I and Volume 4, Appendix K.

Geochemical source terms were developed for the anticipated mine plan in 2-North, 3-North and 5-South mine areas where 7-South tailings will be stored, as well as 2-/3-North, 4-South and 5-South flooded mine voids without PAG-CCR or fine tailings. Source terms provide an overview developed for each respective mine area compared to the measured water quality.

The source terms have been developed using a set of empirical data including the following:

- Water chemistry collected from underground mine dewatering and mine void,
- Kinetic saturated column leach tests performed on 7-South CCR and tailings,
- Sulphur distribution in the proposed workings.

Comparison of water quality data to source terms can be found in tables within each respective area in the discussion of results.

All water quality results for groundwater wells located between mine working(s) and the receiving environment have been compared to Contaminated Sites Regulations for Aquatic Life (CSR-AW). Numerical standards used for CSR-AW are described in Table 4 below. A groundwater map displaying the location of each well in relationship to the underground mine area can be found in Appendix A, Site plan. Appendix B displays the analytical water quality results for 2017-2018. Graphical representations for parameters of interest can be found throughout the report for each respective area of the mine. Additional graphs can be found in Appendix D of this report.

Table 4: CSR-AW Standards

Parameter	CSR-AW (mg/L)	Parameter	CSR-AW (mg/L)
Dissolved Sulphate	1000	Dissolved Lead	*
Dissolved Chloride	1500	Dissolved Mercury	0.001
Dissolved Fluoride	*	Dissolved Molybdenum	10
Dissolved Silver	*	Dissolved Nickel	*
Dissolved Arsenic	0.05	Dissolved Antimony	0.2
Dissolved Barium	10	Dissolved Selenium	0.01
Dissolved Boron	50	Dissolved Thallium	0.003
Dissolved Beryllium	0.053	Dissolved Titanium	1
Dissolved Cadmium	*	Dissolved Uranium	3
Dissolved Chromium	0.01	Dissolved Zinc	*
Dissolved Cobalt	0.04	Sulphide as H_2S	0.02
Dissolved Copper	*		
***Indicates the Standard is hardness dependent**			

Table 5 below displays a summary of exceedances noted during the 2017-18 sampling program at the ex-situ wells compared to the CSR-AW.

Table 5: CSR-AW Exceedances in Ex-Situ Groundwater Wells

Parameter	Sites with Failures	CSR-AW Guideline	Results Ranges
As-D	*QU08-21GS, QU08-21GD, QU10-10S, QU11-05S, QU11-09S, QU08-13A, QU08-13B, QU10-09S, QU10-09D, QU 10-08D*	0.005	0.0710 - 0.520
Cl-D	*QU10-10D*	1500	3100 - 3200
H_2S	*QU08-21GS, QU08-21GD, QU11-05S, QU11-05D, QU11-09S, MW-001S, QU08-13A, QU08-13B*	0.02	0.03-10
SO4-D	*MW-002*	1000	1220

4.2 Key Observations and Conclusions

4.2.1 North Mining Area

The North mining area represents the largest operation on the mine-site and has been the longest project at Quinsam Coal spanning nearly 30 years of mining. The North mining area is divided into 3 sections based on source terms: 2/3 North Mine Void, 2 North Mine Water with 7-South tailings, and North Mining Area Ex-Situ groundwater.

4.2.1.1 2/3 North Mine Void

Much of the mined out 2/3-North mine is allowed to naturally flood and mine pool water has been found to be circum-neutral with a unique sulphate geochemical characteristic. Water is found to be oxic to strongly reducing in various locations in the mine. The source terms as established by Lorax (2011) are displayed in Table 6, with comparison to the results from the sample taken from a sump in 6-Mains (6M2N). This area was chosen as it does not contain tailings storage and has no influence from tailings storage in other areas of the mine. Previous monitoring years used samples from a well named QU11-03 in the 3-North mine (10 Panel) to represent the 2/3-North mine void. Sampling at this well was discontinued as water samples were difficult to obtain and a local fault was thought to influence water in this area and give potentially unrepresentative results.

Three samples were obtained at 6M2N during this monitoring period with results averaged to compare to source terms. All parameters were below the expected value with many results well below. This is in contrast to the 2015 reported results where alkalinity, fluoride and boron were above expected values. Further monitoring on a frequent basis is required to accurately represent this location to ensure consistency and overall representation of this area.
Appendix B displays the in-situ raw data, while Table 6 below compares the expected and worst-case scenarios with the actual results.

Table 6: Source Terms Comparison for 2/3 North Mine Void

2N Mine Void - 6M2N				
Parameters	**Expected**	**Worst Case**	**Annual Average**	**Comparison to Source Terms**
Alkalinity (CaCO3)	450	-	448	Below Expected
Fluoride (F)	0.29	0.3	0.056	Below Expected
Sulphate (SO4)	278	1280	183.3	Below Expected
Dissolved Metals				
Aluminum (Al)	0.013	0.027	0.006	Below Expected
Arsenic (As)	0.036	0.04	0.00153	Below Expected
Boron (B)	1.1	1.2	0.842	Below Expected
Cadmium (Cd)	0.00002	0.00008	0.000005	Below Expected
Cobalt (Co)	0.001	0.0035	0.0005	Below Expected
Copper (Cu)	0.001	0.004	0.00048	Below Expected
Iron (Fe)	0.49	2.45	0.0189	Below Expected
Manganese (Mn)	0.36	0.95	0.0584	Below Expected
Nickel (Ni)	0.001	0.008	0.001	Below Expected
Selenium (Se)	0.0002	0.001	0.00011	Below Expected
Zinc (Zn)	0.006	0.007	0.0056	Below Expected

All units in mg/L

4.2.1.2 2-North Mine Water with 7-South Tailings

1 Mains 2-North (1M2N) is an area within the 2-North Mine that was mined, depillared and subsequently used as a sub-aqueous storage facility for fine tailings from the processing of 7-South coal. Prior to the injection of tailings into this area, this part of the naturally flooded workings was dewatered. The fine tailings were then pumped into the in-situ mine water, allowing for the tailings to settle out throughout 1 Mains until it was necessary to relocate the tailings line in early 2015 to accommodate underground operations. The 7-South fine tailings were then pumped into another area of the 2-North Mine, 5 Mains. For the purpose of this monitoring program, 1M2N has remained the sampling site for comparison to geochemical source terms and is expected to reflect those terms very closely. 1M2N was sampled four times during this reporting period.

The POI results from the four sampling events were averaged to an annual result, and are displayed in Table 7, below. As shown, the majority of the parameters average to below the expected values, with the exceptions of nickel and iron. Iron concentrations reported much higher than last year likely due to improved sampling technique and field filtering/preservation. Certain metals were

observed to be suspiciously low in past monitoring and field filtering/preservation was implemented to improve representation.

Table 7: Source Terms Comparison for 2-North Mine Water with 7-South Tailings

2N with 7S Tailings - 1M2N				
Parameters	**Expected**	**Worst Case**	**Annual Average**	**Comparison to Source Terms**
Alkalinity (CaCO3)	450	-	437	Below Expected
Fluoride (F)	1.1	1.2	0.170	Below Expected
Sulfate (SO4)	278	1280	450.7	Below Expected
Dissolved Metals				
Aluminum (Al)	0.013	0.027	0.010	Below Expected
Arsenic (As)	0.113	0.125	0.009	Below Expected
Boron (B)	1.1	1.2	1.1	At Expected
Cadmium (Cd)	0.00002	0.00008	0.000015	Below Expected
Cobalt (Co)	0.001	0.023	0.0006	Below Expected
Copper (Cu)	0.001	0.004	0.0007	Below Expected
Iron (Fe)	0.49	2.902	1.868	Above Expected
Manganese (Mn)	0.36	0.95	0.244	Below Expected
Nickel (Ni)	0.001	0.033	0.003	Above Expected
Selenium (Se)	0.0002	0.007	0.0003	Above Expected
Zinc (Zn)	0.006	0.019	0.016	Above Expected

All units are in mg/L

Sulphate decreased significantly compared to past monitoring years; likely due to the absence of 7-South coal processing and subsequent tailings injection. See Figure 2 for sulphate concentrations and Figure 3 for water elevations in the well QU10-13 D. Water elevations are a function of groundwater infiltration and dewatering efforts. Appendix B, Table 3 represents the 2017-18 in-situ raw data, Table 7 above displays the comparison of the 2017-18 results compared to those developed as the expected and worst-case scenarios.

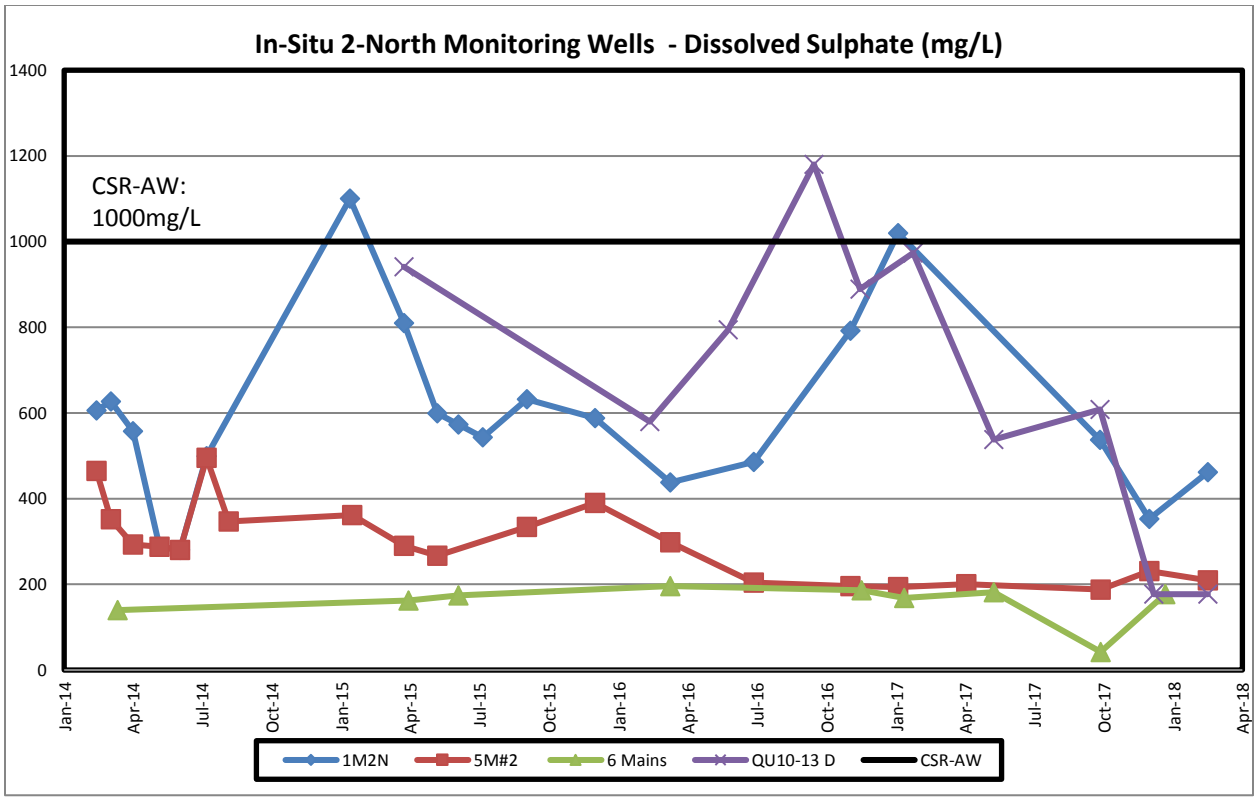


Figure 2: In-Situ 2N Monitoring Wells - Dissolved Sulphate

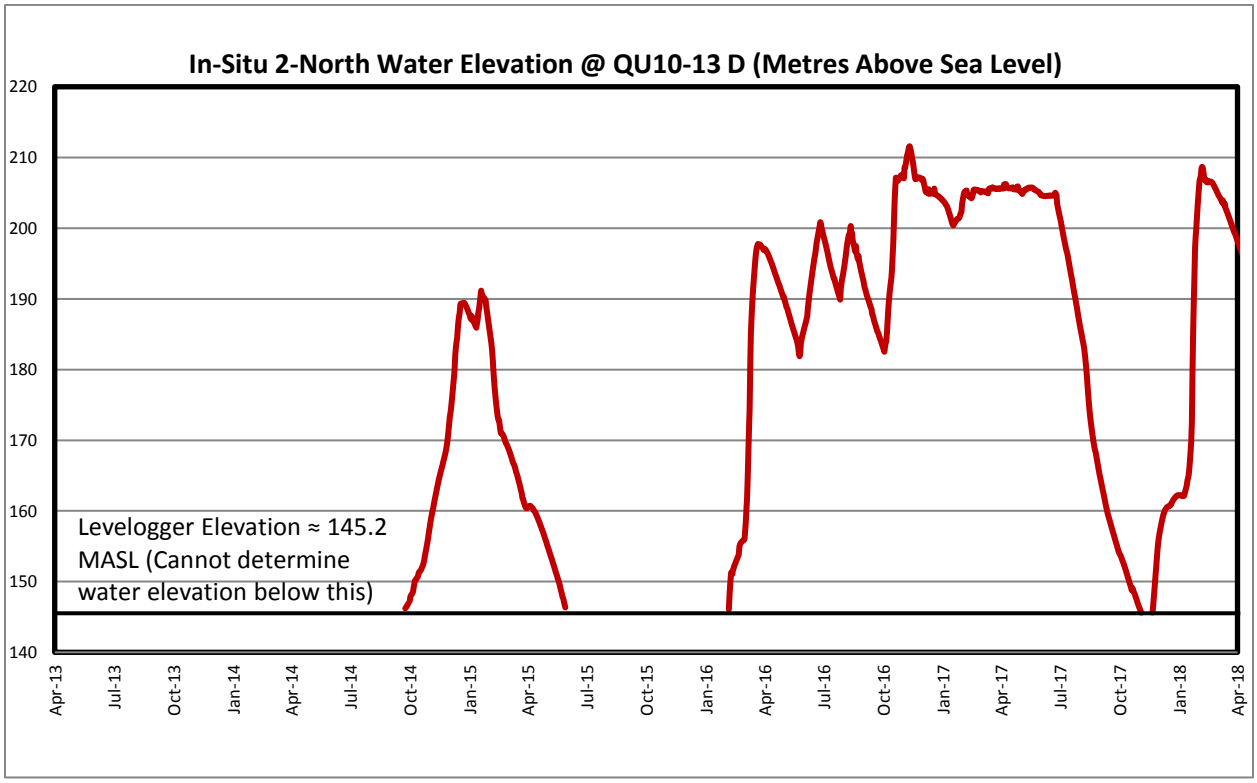


Figure 3: Water Elevations at QU10-13 D

4.2.1.3 North Mining Area Ex-Situ Groundwater

The parameters of interest in the In-situ 2-North mining area were previously identified by Lorax in the 2-North/3-North and 5-South groundwater evaluation and include: fluoride, sulphate, aluminum, arsenic, boron, cadmium, cobalt, copper, iron, manganese, nickel, selenium, and zinc (Lorax 2011). It is conceivable that these parameters may be found within Ex-Situ wells as water from the 2-North area transports outside the mine void.

Parameters that were observed to be trending high or displayed exceedances against the CSR-AW were graphed. The parameters included arsenic, sulphate, sulphide (as H_2S), iron, sodium and chloride. Appendix B and Figures 4 through 6 below, represent the water quality results for these areas.

Notable observations for this area include:

- Most parameters remained consistent with previous monitoring years with no major changes
- All POI were below the CSR-AW standards except dissolved arsenic, sulphide and chloride
- Dissolved arsenic concentrations exceeded the CSR-AW standard (0.05 mg/L) in all sampling events at QU10-10 S, Q08-21G (S and D)
- H_sS concentrations at QU08-21G (S and D) were found in excess of the CSR-AW standard (0.02 mg/L) in all sampling events
- Dissolved iron was found in highest concentration in the No. 1 coal seam (QU10-10 D) with a max concentration of 11.2 mg/L, consistent with previous years
- Chloride has been elevated well above the CSR-AW in all sampling events since 2014 at QU10-10 D and has shown moderate concentrations with fluctuations at QU08-21G D
- Sodium concentrations found within the Ex-Situ wells have shown similar profiles to that of chloride indicating the presence of salt
- An increased sulphate concentration was observed in the well QU10-10 S in fall 2016 did not persist through this monitoring period

Throughout the 2-North, 3-North, and RBP areas, wells located in the 'deep' Cumberland Member of the stratigraphic column, particularly #1 coal seam, have consistently reported low dissolved arsenic during all sampling events. Wells in 'shallower' Dunsmuir Member sandstones, particularly nested in the area of the #4 coal zone, reported arsenic values that were consistently elevated. The Dunsmuir sandstone member contains higher levels of arsenic and has been verified during drilling programs conducted by Quinsam Coal. These observations are consistent with the findings of Lorax (Lorax [(2)], 2011), who determined that elevated arsenic concentrations are found in formation waters of the Dunsmuir Formation including sandstone and the #3 and #4 coal zones. These results are in contrast of those found from formation waters of the #1 coal zone of the Cumberland Member. An exception to this observation is the monitoring well QU08-21G D. QU08-21G D is nested within the Cumberland Member on the Eastern side of the Forjan Fault, and while lower than those found in the Dunsmuir Member Sandstones and coal measures, all three sampling events during this reporting period exceeded the CSR-AW standards. Figure 4 displays arsenic concentrations in the 2-North area.

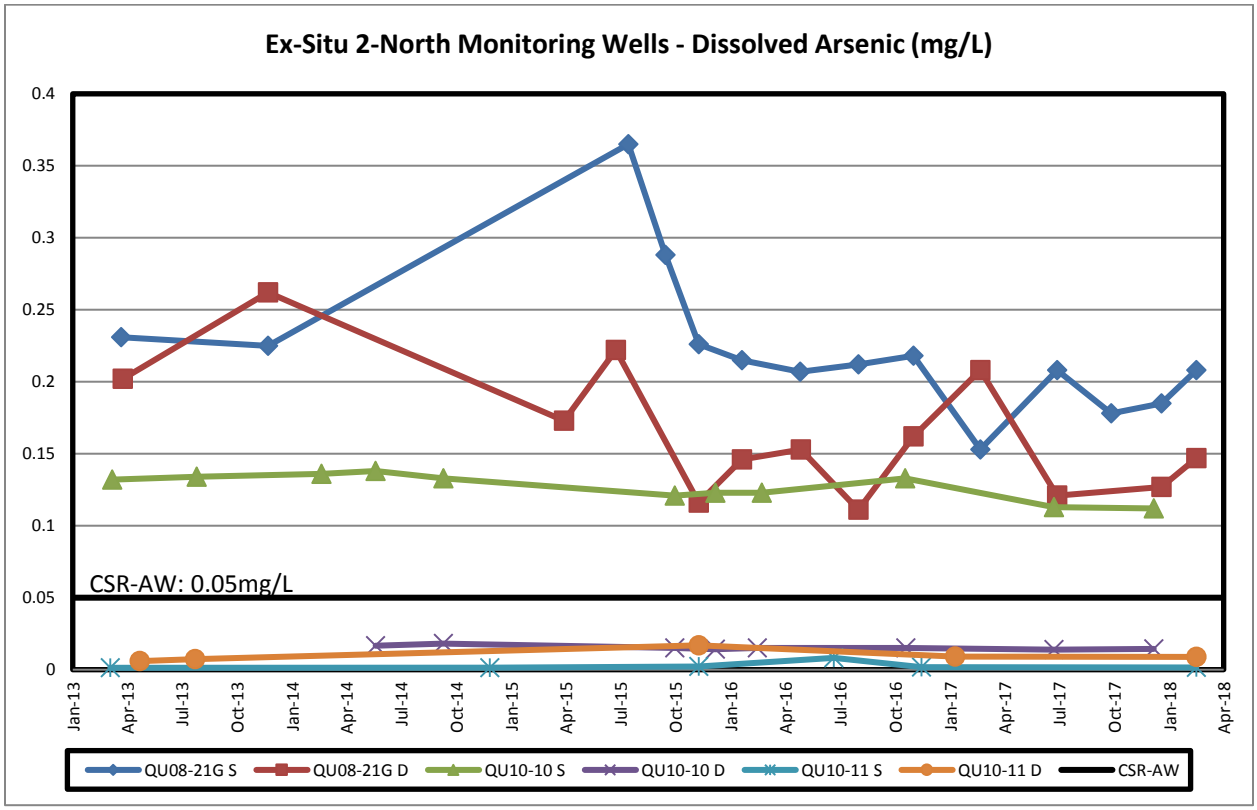


Figure 4: Ex Situ 2-North Monitoring Wells - Dissolved Arsenic

Concentrations of dissolved sulphate in the 2-North mine area outside of mine workings are low and frequently below detection levels (0.5 mg/L). A notably higher sulphate result was reported at the well QU 10-10S during heavy precipitation in October while water levels in the 2-North mine increased considerably. Additional sampling information has not shown a persisting trend with dissolved sulphate to date but will be monitored closely in the future with relation to water levels in the mine pool. There is little trending or concerns with sulphate for the remainder of the 2-north ex-situ wells

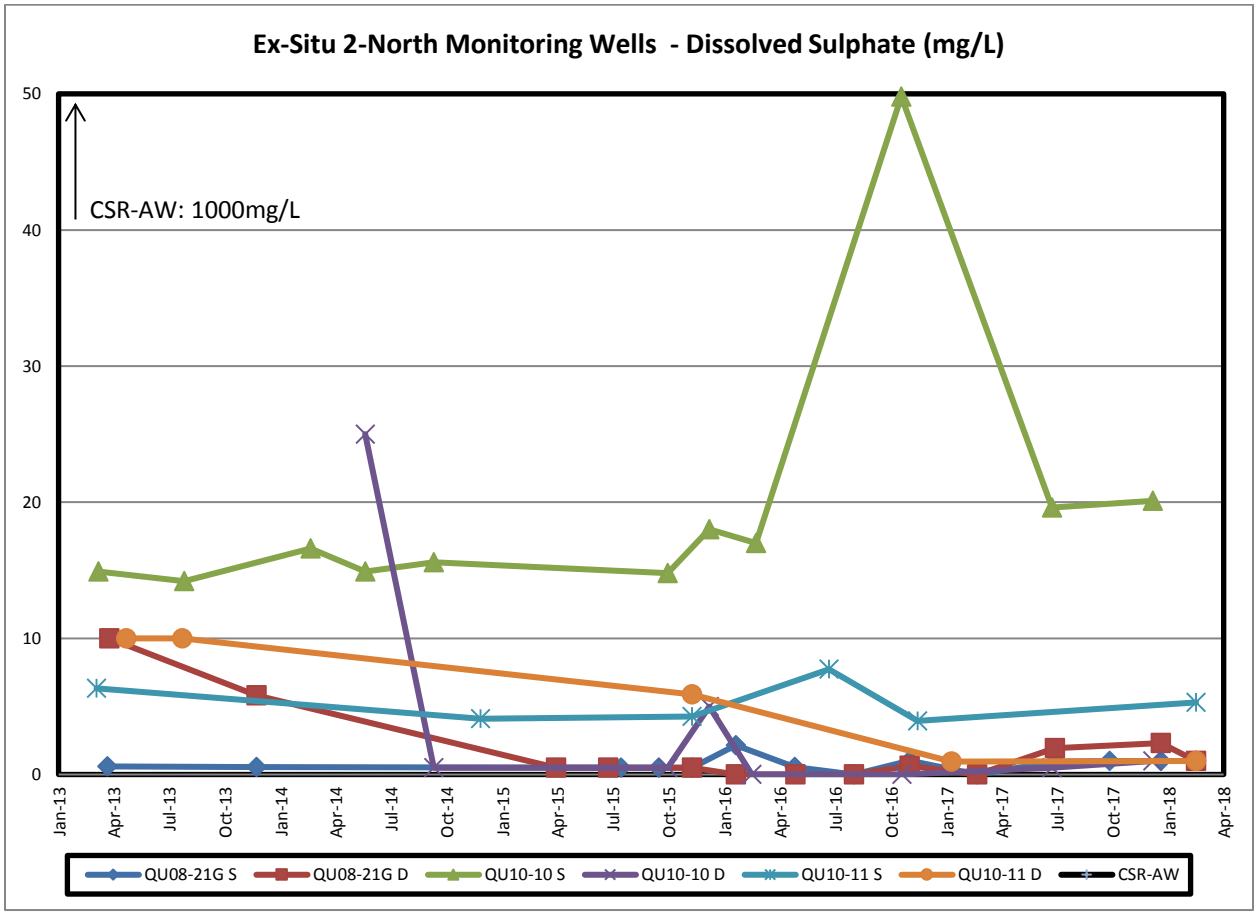


Figure 5: Ex-Situ 2N Monitoring Wells – Dissolved Sulphate

Sulphide has been found in elevated concentrations in many monitoring wells near the mine site. Sulphur is present in local geologic formations (particularly coal seams) and has been extensively documented by Quinsam Coal. As water interacts with sulphur bearing rock, leaching of the

sulphur occurs and it can take many different forms dissolved into the water. Sulphide (as H_2S) occurs in groundwater with low dissolved oxygen and negative redox potentials. In the presence of oxygen, sulphur typical takes the form of a much less toxic sulphate. Figure 6 displays sulphide concentrations found with Ex-Situ 2-North wells. Sulphide is present in elevated concentrations in wells QU08-21 G (D&S). These wells intercept groundwater from the #1 and #4 coal seams, respectively and have been found to have low dissolved oxygen and negative redox potentials.

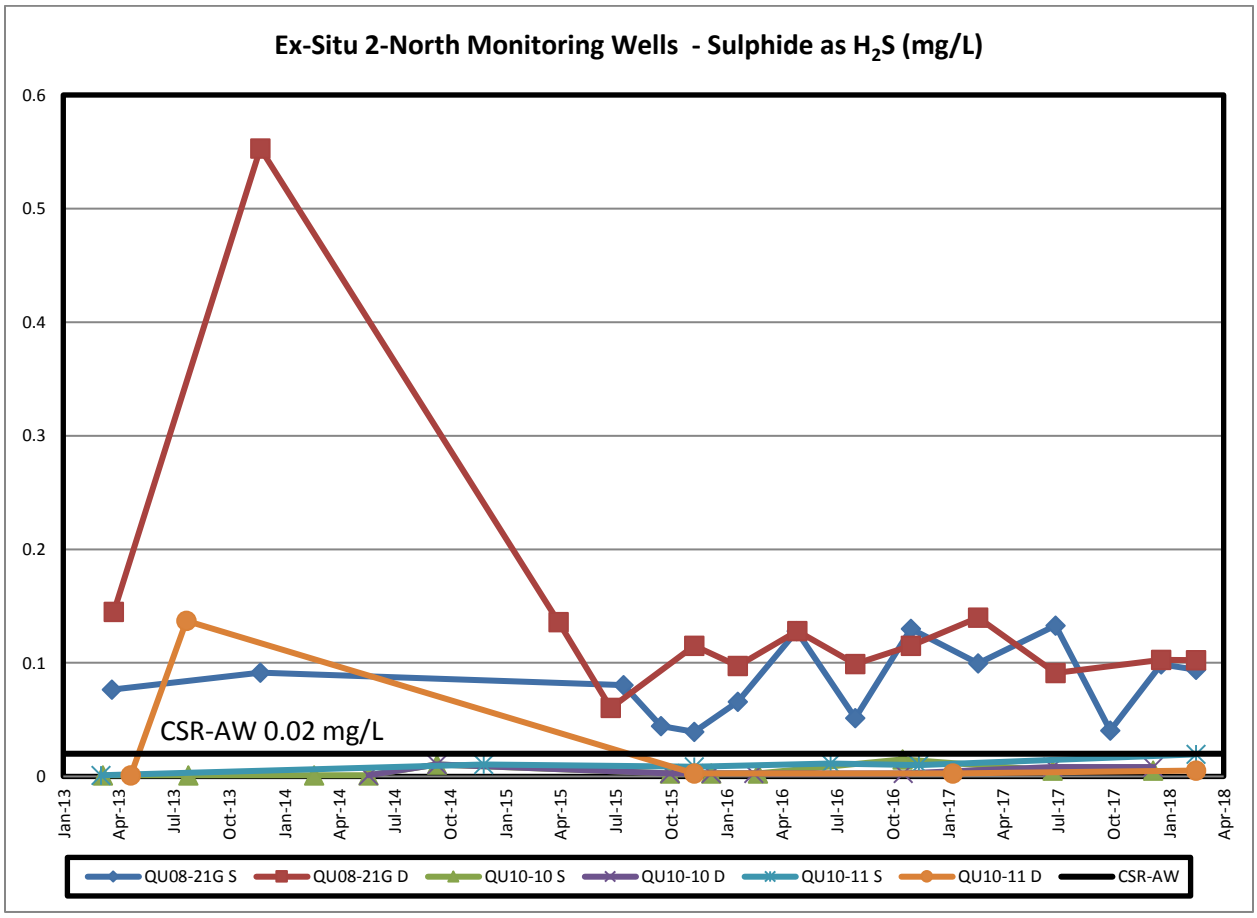


Figure 6: Ex-Situ 2N Monitoring Wells - Sulphide as H_2S

4.2.2 River Barrier Pillar Area

4.2.2.1 River Barrier Pillar with 5-South CCR

QU11-09 M represents water in the underground PAG-CCR disposal location at 87 Panel RBP. Disposing of PAG-CCR was completed in the RBP in September of 2012 with the PAG-CCR

elevation at 153.5 m. The water level in QU11-09 M increased since 2012 from 145 m to 180 - 210 m dependent on groundwater influx and dewatering efforts in 2-North. Groundwater elevations will continue to be monitored to better understand the dynamics within the RBP with respect to historic mining operations.

Source terms for the River Barrier Pillar (RBP) with PAG-CCR were originally developed using 7-South CCR quality data. As mining operations progressed, a storage area for the existing 5-South PAG-CCR was needed prior to mining 7-South. The RBP location was deemed suitable and excess 5-South PAG-CCR was backfilled in that location. In previous reports, the generated source terms (using 7-South PAG-CCR) were used for comparing and evaluating water quality results. As these source terms aren't necessarily applicable for water quality in this storage area, additional information including annual averages were used to help evaluate water quality.

As displayed in Table 8, source terms derived from 7-South PAG-CCR along with annual and cumulative averages have been calculated. Observations for each parameter in QU11-09 M are as follows:

- Alkalinity has shown a steady increase since initial flooding of the PAG-CCR
- Fluoride saw an increase after initial flooding in 2014 but has since declined
- Sulphate saw its highest concentrations during initial flooding and saw a steep decline in 2014 after water levels increased.
- Sulphate concentrations have since stabilized within a predictable range and seem to vary with water levels
- Boron remained relatively stable after initial flooding
- Cadmium has been observed in low levels throughout monitoring
- Cobalt saw an increase after initial flooding and has since declined
- Iron and manganese have stabilized and have started to decline in concentration

Table 8: Source Terms Comparison for RBP with 7-South CCR and Averages

Parameter	RBP w/ 7S CCR		QU1109-M w/ 5S CCR		
	Expected	Worst case	Annual Average		2013-2017/18 Average
Alkalinity	282		2013	380	459
			2014	405	
			2015	483	
			2016	512	
			2017/18	513	
Fluoride	0.71	1	2013	0.41	0.246
			2014	0.48	
			2015	0.12	
			2016	0.11	
			2017/18	0.11	
Sulphate	396	1990	2013	1600	1195
			2014	1044	
			2015	1180	
			2016	1233	
			2017/18	916	
Aluminum	0.02	0.05	2013	0.0020	0.0072
			2014	0.0067	
			2015	0.0091	
			2016	0.0056	
			2017/18	0.0125	
Arsenic	0.128	0.19	2013	0.0030	0.0046
			2014	0.0046	
			2015	0.0068	
			2016	0.0058	
			2017/18	0.0026	
Boron	0.71	1.88	2013	1.55	1.25
			2014	1.19	
			2015	1.25	
			2016	1.17	
			2017/18	1.07	
Cadmium	0.000017	0.000175	2013	0.000020	0.000018
			2014	0.000020	
			2015	0.000008	
			2016	0.000022	
			2017/18	0.000020	
Cobalt	0.005	0.148	2013	0.00542	0.00468
			2014	0.01485	
			2015	0.00180	
			2016	0.00051	
			2017/18	0.00080	
Copper	0.001	0.0001	2013	0.0004	0.00088
			2014	0.0007	
			2015	0.0023	
			2016	0.0002	
			2017/18	0.00080	
Iron	0.805	33.5	2013	8.2	14.2
			2014	12.3	
			2015	18.0	
			2016	18.7	
			2017/18	13.7	
Manganese	0.14	2.89	2013	0.327	0.385
			2014	0.434	
			2015	0.447	
			2016	0.419	
			2017/18	0.296	

4.2.2.2 RBP Ex-Situ Groundwater

Concentrations of dissolved sulphate measured in the ex-situ wells of the River Barrier Pillar area are low but are elevated enough to assist with analysis of the groundwater paths exiting from the in-situ mine waters (Figure 7). Storage of the PAG-CCR and subsequent flooding of the workings are thought to contribute to these elevated sulphate concentrations.

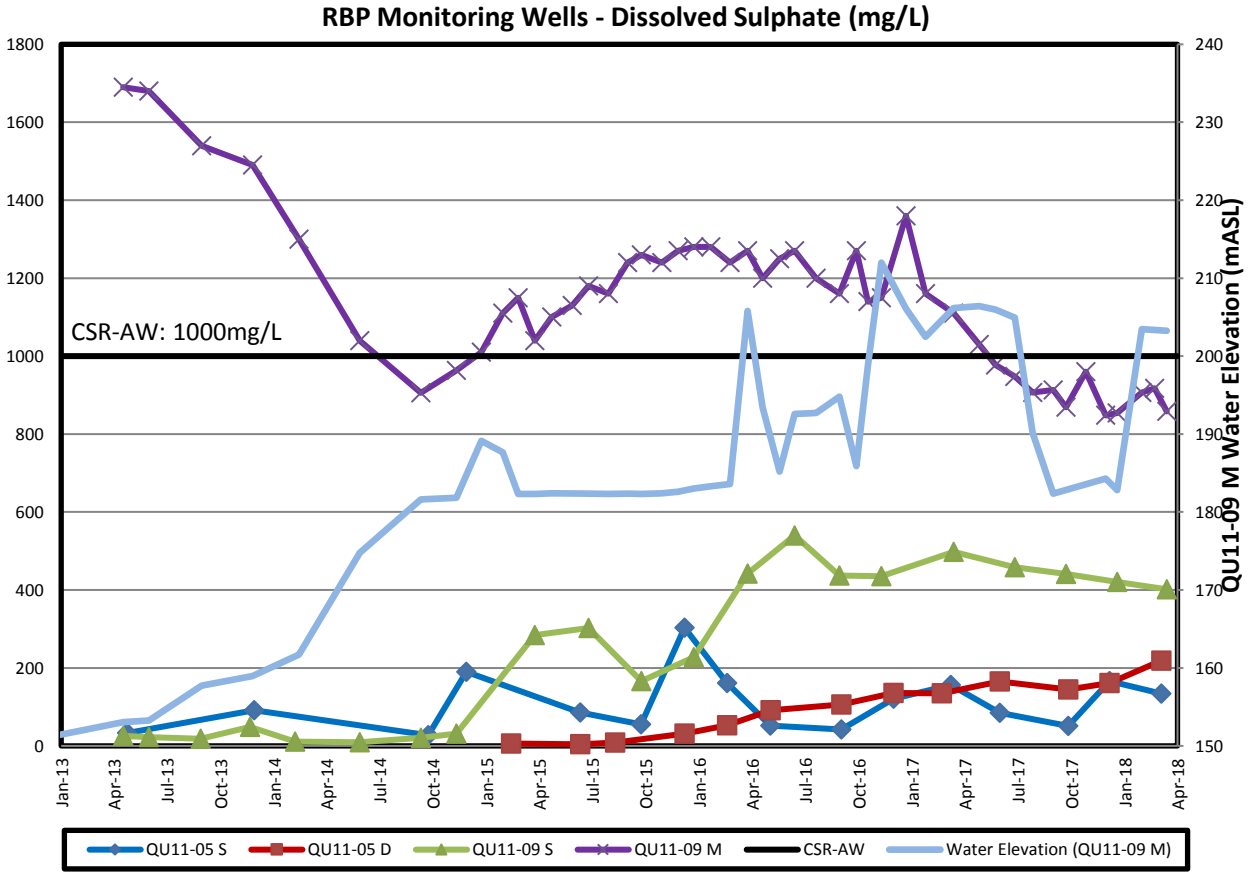


Figure 7: Ex-Situ River Barrier Pillar Monitoring Wells – Dissolved Sulphate vs. Water Elevation

QU11-05 D is nested down dip/gradient from the RBP PAG-CCR storage facility in the #1 coal seam and contains dissolved sulphate levels that have steadily increased from 6 mg/L in June 2015, to 219 mg/L in March 2018. These steadily increasing levels indicate water transport from either the RBP, 2 North workings, 5-South workings or a combination of all three. Another parameter that has shown a steep increase concurrent with sulphate from June 2015 to February 2017 is sulphide as H_2S. The high depth of this well along with low dissolved oxygen indicates a favourable location to have high sulphide concentrations.

QU11-05 S, nested stratigraphically above, but down gradient/dip from the RBP, report sulphate concentrations that are elevated compared to other 2-North wells. The increase in sulphate concentrations occur as autumn precipitation bring large quantities of water to the mine site and water levels underground rise. The fluctuations aren't completely proportionate to underground water levels in either the RBP or 2-North mine pool; however, they provide some evidence that there is hydraulic conductivity or migration of groundwater across the stratigraphy.

QU11-09 S is a well nested in the stratigraphy directly above the RBP in-situ monitoring well, QU1109-M. Prior to 2015, sulphate concentrations at this well have ranged from approximately 20-50 mg/L when water levels were low in the PAG-CCR storage area below. Since early 2015, sulphate concentrations have fluctuated but have generally increased at this location ranging from 166-540 mg/L. As displayed in Figure 7, sulphate concentrations at QU11-09 S appear to be directly correlated to groundwater elevations in the PAG-CCR storage area. This increase indicates migrating in-situ waters up vertically, likely via the natural hydraulic conductivity of the geology, as well as structural conduits (fault and joint planes) encountered during mining. Based on observations, these increases occur when groundwater elevation in the well below rise above 181-185 MASL, the elevation at which the lithology transitions into the sandstone that hosts QU11-09 S. It can also be inferred that water migrating to this well is sourced from above the 5-South mine. See Figure 8 for groundwater migration paths (Lorax, 2011).

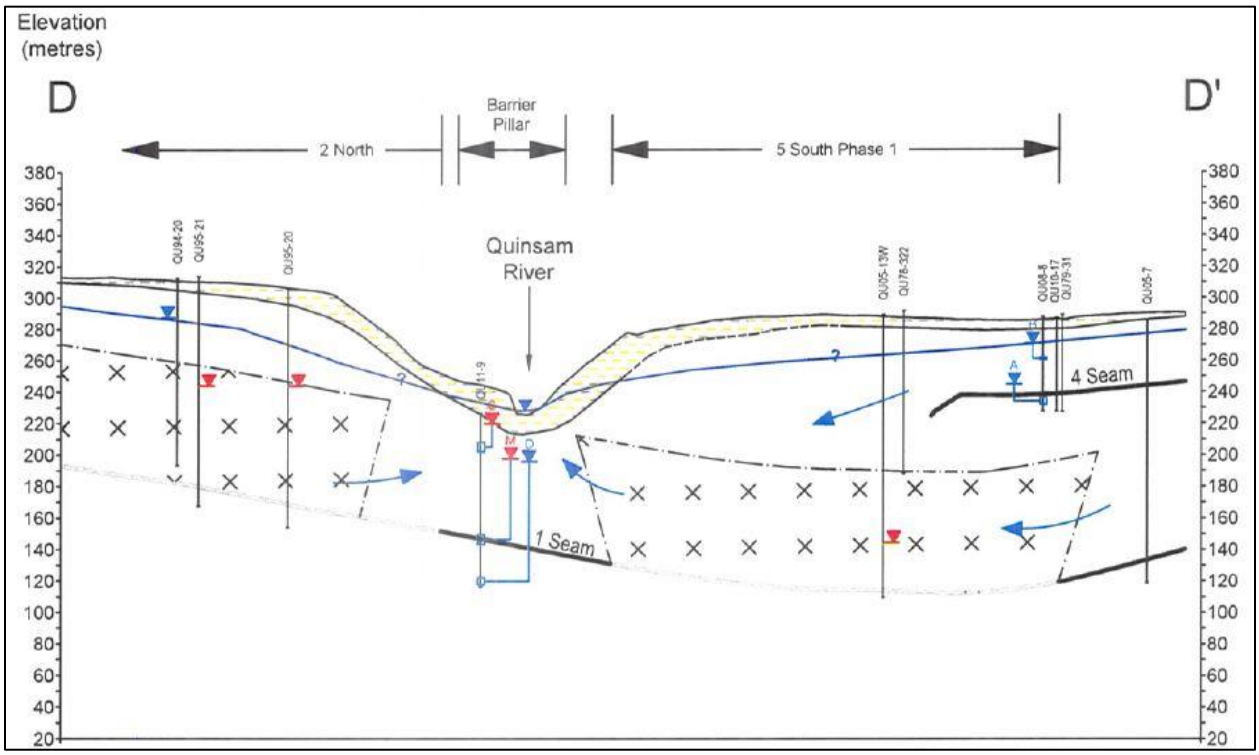


Figure 8: Groundwater Transport in RBP and Vicinity

Following the completion of the 8-Mains plugs (engineering control established to eliminate unnatural mixing of groundwater accumulated in the 5-South side of the mine, and the 2-North side of the mine) in February of 2014, the water levels in 5-South began to rise, increasing the hydraulic head pressure on the groundwater stored in 5-South and RBP. It is assumed that as the water level rose, the pressure on the groundwater flow path was increased, as shown by the increase of sulphate levels in QU11-09 S.

4.2.3 North Mining Area Plant Monitoring Wells

Two nested monitoring wells (MW00-6 and MW00-1) are in the peripheries of a catchment drainage ditch located below the coal processing plant (CPP) and the clean coal pad. Both wells contain a “shallow” and “deep” groundwater intercept nested at different depths of the overburden till layer as shown in Appendix C.

Noted in the well installation completion log for MW00-1 (D&S), the ‘Shallow’ well was nested in a layer of the till that contained a larger percentage of cobbles and coarse gravels compared to the finer grained gravelly sands and clay materials noted surrounding the ‘Deep’ well. This is important to note, as observations made in the shallow groundwater wells compared to the deep wells include more conductive water that is higher in alkalinity and exhibits elevated concentrations of dissolved sulphate. This leads to the assumption that the shallow wells are getting direct communication from the CPP and clean coal pad via the catchment drainage ditch while the deeper wells are isolated from that groundwater due to some other control, possibly based on grain size differences in the till. However, while the differences between the groundwater results from the shallow and deep wells are obvious, any difference between the host till of the shallow and deep well located at MW00-6 were not noted in the completion log and therefore cannot be easily explained by geologic control. MW00-1 D is nested significantly deeper in the till at 28 metres than MW00-6 D at 14 metres. Interestingly, MW00-6 is geographically closer (while only 15 metres) to the plant ditch and coal pad where iron and sulphate should be observed in higher concentrations.

Historically, MW00-1 S displayed slightly acidic conditions, with the pH falling just below 6.4 on most occasions, while MW00-6 S was generally neutral. The deeper wells are more alkaline with pH ranging from 8.3-9.5. MW00-1 S displayed the highest concentrations of dissolved sulphate, hardness, iron, manganese and other constituents. The deeper wells (MW00-1 D and MW00-6 D) have low concentrations of metals and sulphate with alkaline pH and low conductivity. Since January of 2013, regardless of the variation of precipitation throughout the year, the groundwater maintains its natural path through the clean coal pad and its surroundings, into the ditch, and through the till substrates.

Consistent with past years, dissolved arsenic (Figure 9), aluminum and zinc are found in greater concentrations in the deeper wells than the shallow wells but remain at moderate concentrations and below CSR-AW standards. The main concern and objective of these wells is to intercept plant stockpile water to trace effects the coal pad may have near Middle Quinsam Lake.

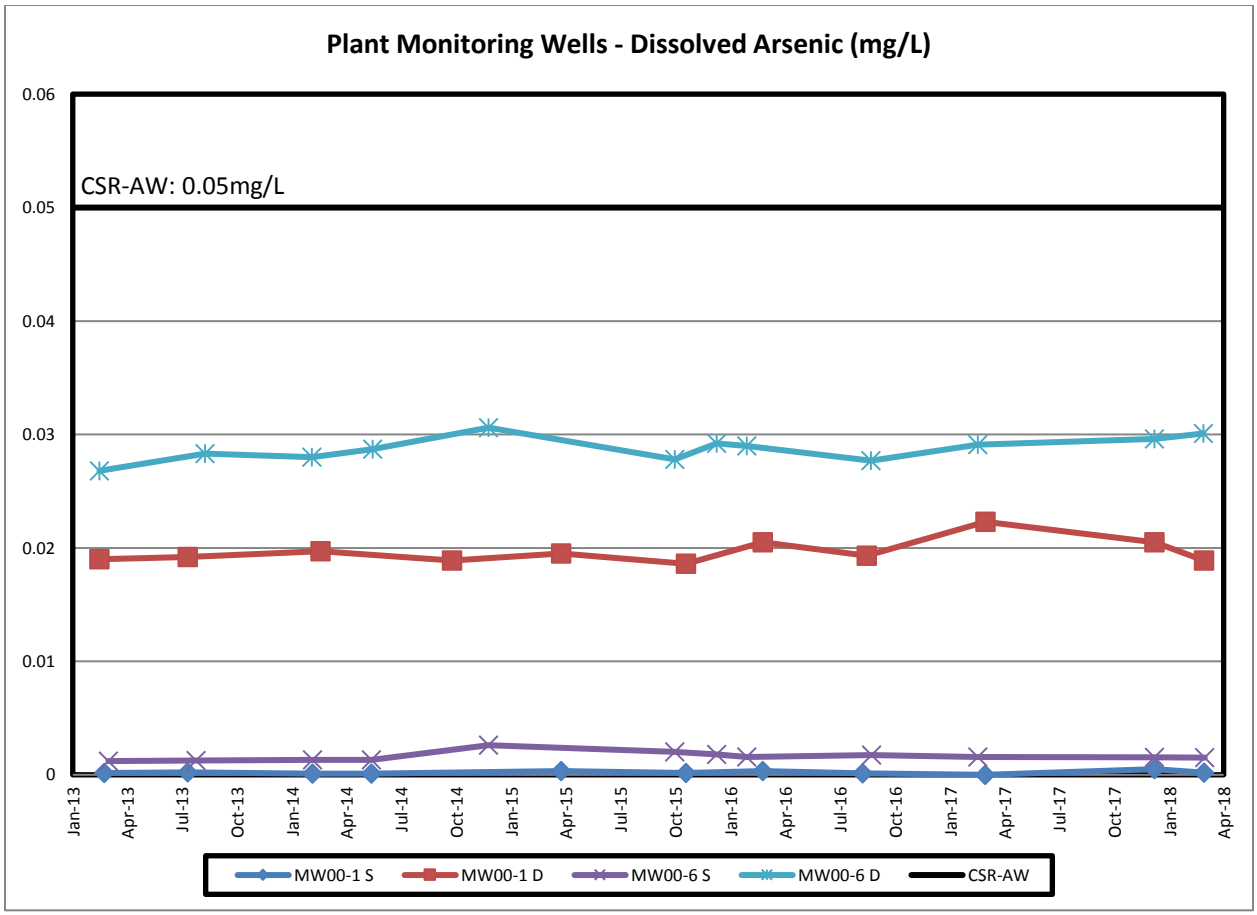


Figure 9: Plant Monitoring Wells – Dissolved Arsenic

Dissolved sulphate levels (Figure 10) in MW00-1 S exhibit a decreasing trend since mid-2013 with some apparent seasonal variation showing higher concentrations of sulphate throughout the drier season and lower concentrations through the rainy season. Dissolved sulphate concentrations at MW00-6 S have shown an obvious decrease over the last four years with little seasonal variation. This decrease indicates that the improved water management practices implemented have had positive effects on local groundwater as seepage from tailings have not been transported across the plant ditch into the 2N PAG-CCR storage facility.

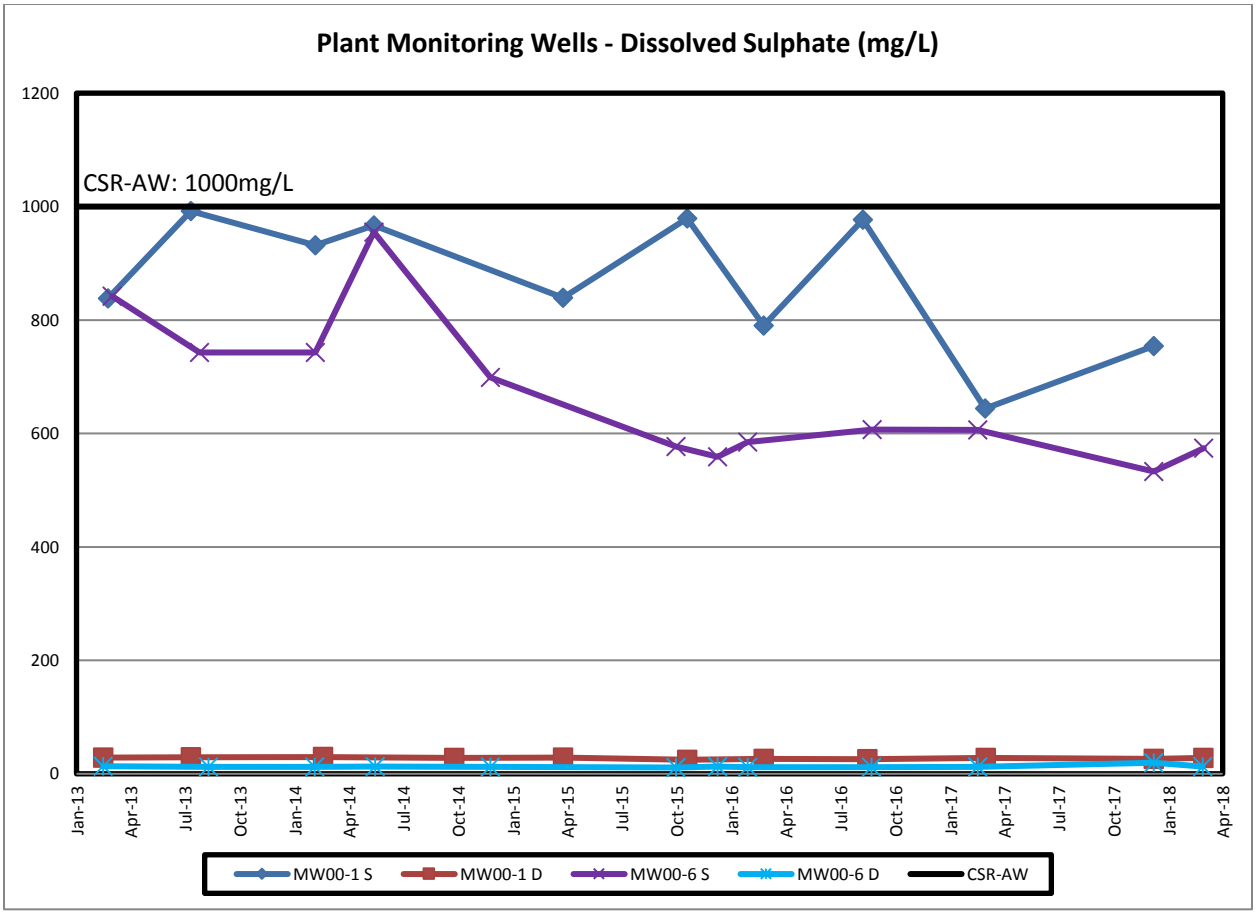


Figure 10: Plant Monitoring Wells – Dissolved Sulphate

The Quinsam Coal Environmental Department is currently assessing this area of groundwater monitoring, considering the possibility of eliminating one of these monitoring wells (due to similar parameter trends) and re-establishing a groundwater monitoring site closer to the southern drainage of the CPP and the clean coal pad.

4.2.4 7-South

4.2.4.1 7-South Mine with PAG-CCR

Area 2 of the 7-South mine is being used as a sub-aqueous PAG-CCR storage facility for waste material produced by the mechanical processing (crushing and floatation) of the 7-South raw coal product. Storage of this PAG-CCR commenced March 12, 2015 and has subsequently flooded due to natural groundwater infiltration. The in-situ flooded water in this area has been monitored using

well QU14-10, with 12 sampling events taking place during this monitoring period. The 7-South mine void water will continue to be monitored following completion of mining and subsequent subaqueous disposal of PAG-CCR.

Lorax predicted Source Term concentrations, which are provided in Mine Permit (C-172) Amendment; 7-South Development Volume 3 Appendix J. Lorax outlined three scenarios in which results would vary, which are, in summary:

> Scenario 1: Water quality based on the CCR that is being stored, having been given enough time on surface (greater than 2 years) to become acidic, prior to being flooded.
> Scenario 2: Water quality based on the CCR being stored less than 2 years since being produced, which would not be acidic.
> Scenario 3: Expected long term water quality concentrations following the complete dissolution of stored oxidation products and the influenced mine water being completely discharged from the mine, or re-stabilized as metal sulphides within the flooded workings.

Table 9 displays the Source Term expectations for Scenario 2 and 3 (omitting Scenario 1 as PAG-CCR was stored and flooded in less than the predicted two years for the PAG-CCR to become acidic), as well as the average results for the sampling events of 2017-18. Average concentrations calculated are then compared to scenario 2 as they are most applicable to what is expected at this point in time. It is noted that sulphate, arsenic, copper, iron, manganese and nickel have increased since monitoring began. As reported in past monitoring years, dissolved boron and sulphate exceed expected results while copper and aluminum have now exceeded expected results through this monitoring period. Although not a parameter of interest, the water in the flooded 7-South workings is very hard, higher than any other well on site. Hardness levels averaged 2085 mg/L, indicating a strong influence from calcium and magnesium carbonates, likely found interstitially in the sandstone that is a large constituent in the 7-South coarse coal reject.

Table 9: Source Terms Comparison for 7-South with PAG-CCR

Parameters	Scenario 2 (CCR not acidic) Expected Values	Scenario 3 (Long term chemistry)	2017/18 Average Results from Q14-10	Results obtained- compared to Scen. 2
Fluoride (F)	0.6	0.1	0.11	Below Expected
Sulphate (SO_4)	1260	22	1751	Above Expected
Aluminum (Al)	0.009	0.005	0.012	Above Expected
Arsenic (As)	0.19	0.099	0.073	Below Expected
Boron (B)	0.98	0.13	1.07	Above Expected
Cadmium (Cd)	0.0002	0.000012	0.00002	Below Expected
Cobalt (Co)	0.062	0.0003	0.0011	Below Expected
Copper (Cu)	0.001	0.0002	0.0011	Above Expected
Iron (Fe)	6.705	0.015	1.810	Below Expected
Manganese (Mn)	2.885	0.08	1.396	Below Expected
Nickel (Ni)	0.122	0.0009	0.0050	Below Expected
Selenium (Se)	0.004	0.0001	0.0004	Below Expected
Zinc (Zn)	0.088	0.004	0.020	Below Expected

All units are in mg/L

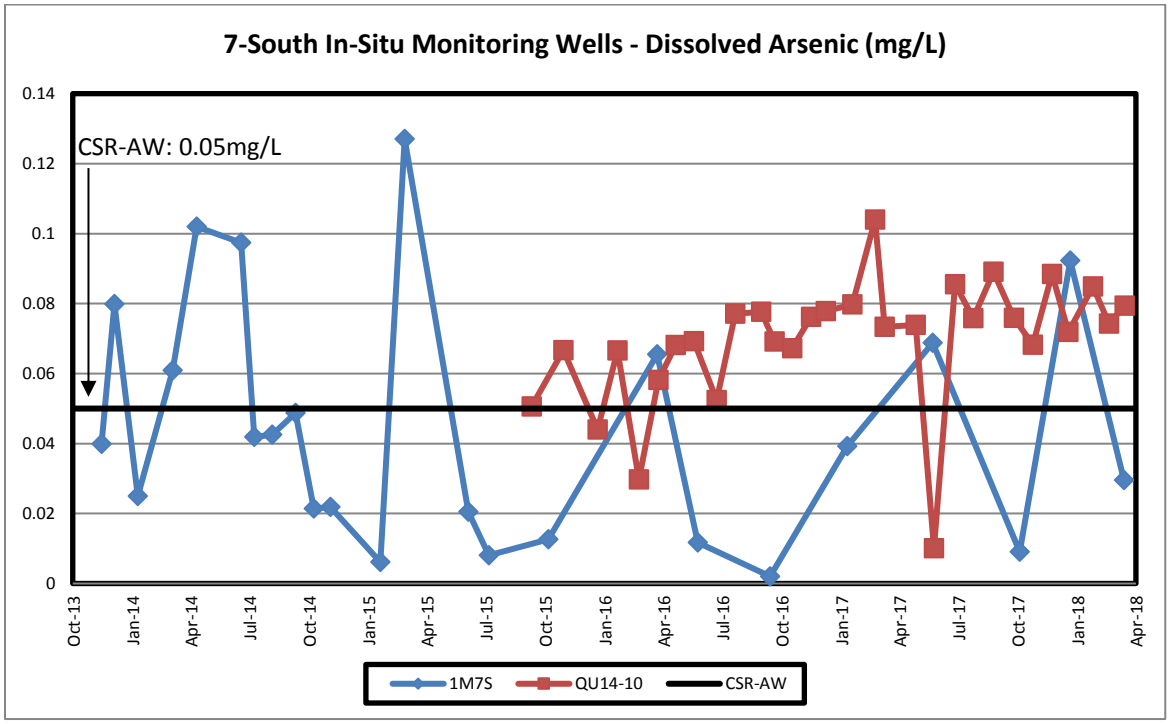


Figure 11: 7-South In-Situ Monitoring Wells - Dissolved Arsenic

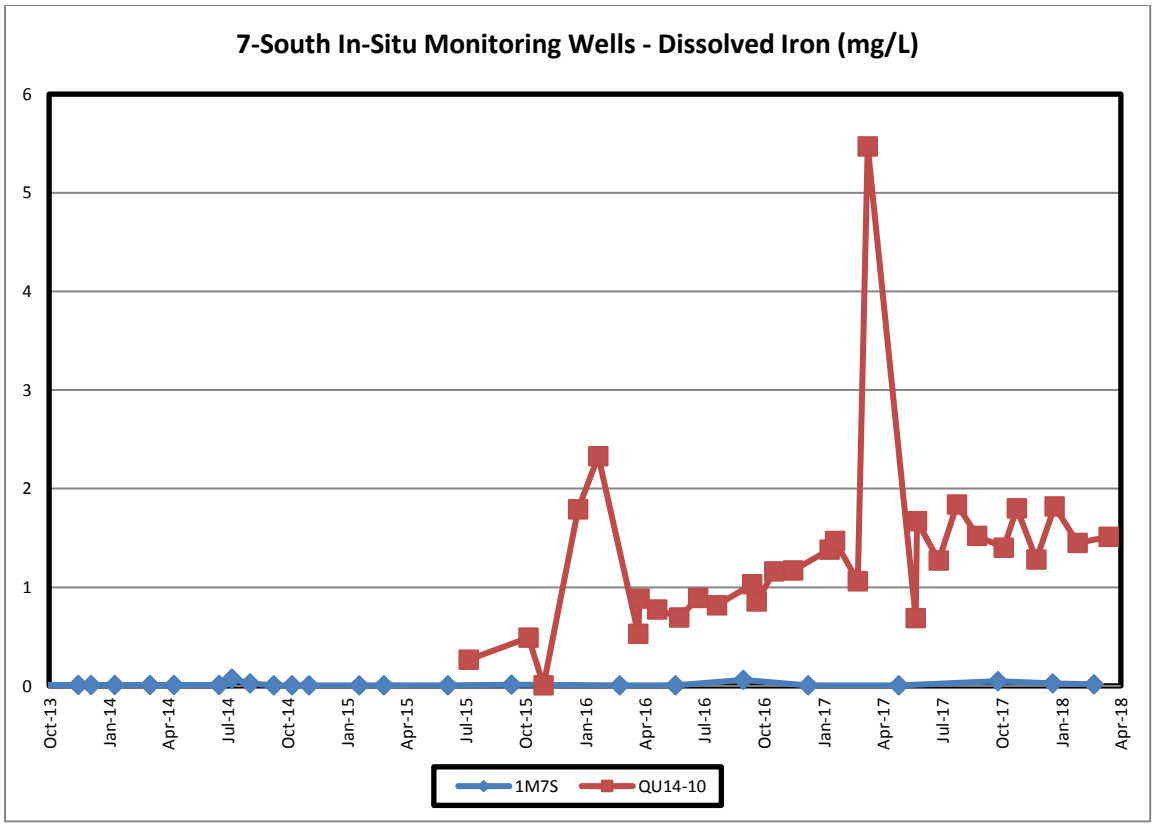


Figure 12: 7-South In-Situ Monitoring Wells - Dissolved Iron

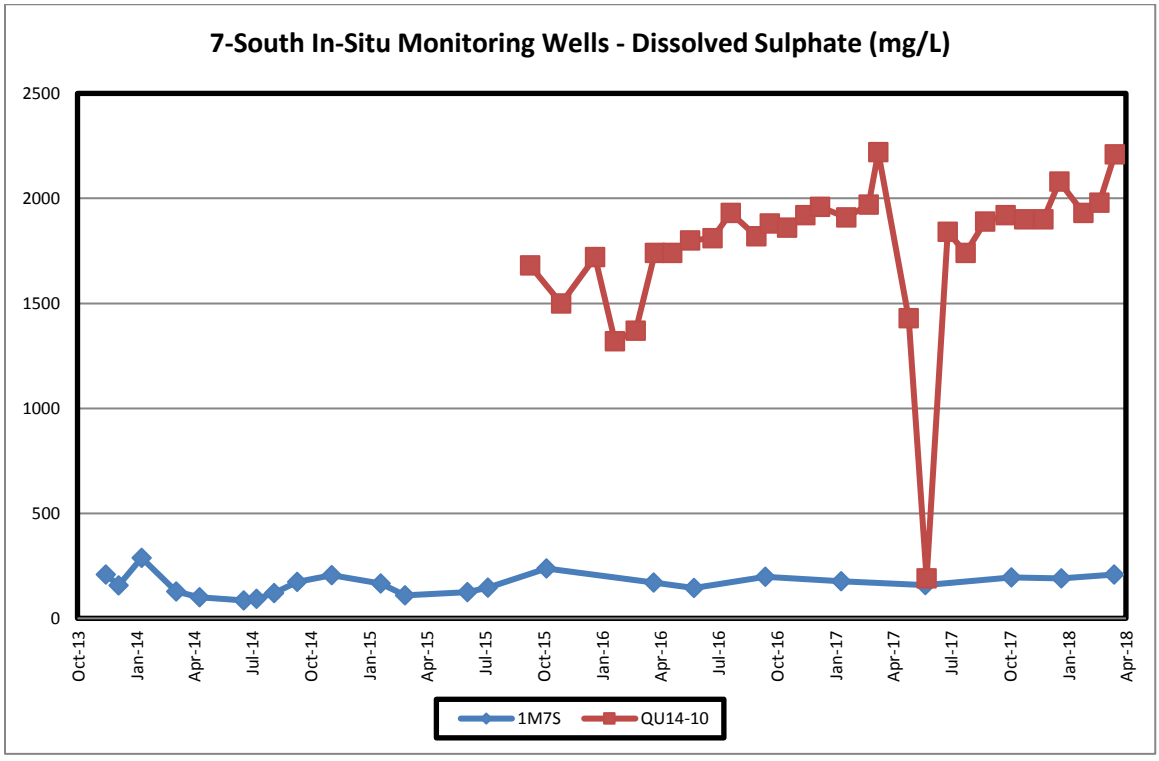


Figure 13: 7-South In-Situ Monitoring Wells - Dissolved Sulphate

4.2.4.2 7-South Underground Sump

Water chemistry in the 7-South mine pool was monitored via sump sampling in 1 Mains (1M7S). Samples from 1M7S exhibit low and consistent levels of dissolved sulphate and dissolved iron with average values of 188 mg/L and 0.02 mg/L respectively during this monitoring period. Dissolved arsenic, however, has shown fluctuations since monitoring has been established, with the higher concentrations observed throughout the winter, likely attributed to high groundwater infiltration through sandstone. These inconsistent arsenic values may be attributed to variable amounts of water either pumped into or out of this sump for mining purposes.

4.2.4.3 7-South Ex-Situ

The primary focus of the 7-South ex-situ groundwater monitoring is to evaluate water flowing from Area 2 (permanent PAG CCR storage location) towards the Quinsam River; monitoring wells QU08-13 A and B satisfy this consideration. In addition to monitoring seepages from Area 2, monitoring well QU08-10 is situated to monitor groundwater transport from permitted mining reserves in 7-South (areas 4 & 5) towards the Iron river. This well is located adjacent to the Area 4 development on the North side of the Long Lake fault and is nested in the #4 coal zone.

The No. 4 coal zone at 7-South is hosted within the Dunsmuir Member sandstones of the Comox Formation, which is naturally elevated in arsenic and fluoride. On average, the highest concentration of arsenic in the current Quinsam Coal monitoring regime is found in the 7-South area. The northern limit of the 7-South underground mine workings is limited by the location of a normal fault called the Overlook Fault, which displaces the #4 coal zone vertically by 14 metres. The Overlook Fault defines the groundwater flow path between the 7-South mine, and the monitoring wells QU08-13 A and B. Well QU08-13 A monitors groundwater traveling down-gradient from the 7-South workings within the #4 coal zone at 52 metres deep. QU08-13 B monitors groundwater higher up in the stratigraphic column at the glacial till overburden/sandstone contact at 26 metres deep, effectively monitoring groundwater that would be migrating up through the stratigraphy towards the Quinsam River. This groundwater is suspected to follow a different flow path at the down gradient northern extent of the 7-South mine than other groundwater in the

area (Lorax, 2011). Lorax has described this well as significantly sodium enriched with circum-neutral pH. The groundwater is anoxic with mild to moderate reducing conditions.

Starting March 2015 PAG-CCR from the processing of 7-South raw coal was transported from the Quinsam Coal Preparation Plant to the 7-South Disposal Bin, which delivers PAG-CCR directly onto the underground belt structure for transport into Area 2. Since that date, material has been backfilled, and allowed to naturally flood. The in-situ flooded water in this area has been monitored using well QU14-10, while the ex-situ groundwater has been monitored using QU08-13 A&B. Data acquired prior to March 2015 has provided information about baseline conditions and will be used for comparison when analyzing future monitoring.

The most notable and relevant observation made during this monitoring period was the low, stable sulphate concentrations throughout the year with a distinctive increase in dissolved iron and sulphate in February 2018. This increase was concurrent with advance mining in the northern extent of 3-Mains. With expansion of mining boundaries in this area, it is believed that mobilization of materials and "shrinkage" of the effective barrier between the mine and monitoring well has contributed to the increase in these parameters. Future monitoring will determine if these parameters persist at elevated levels or if they decrease post-mining activities.

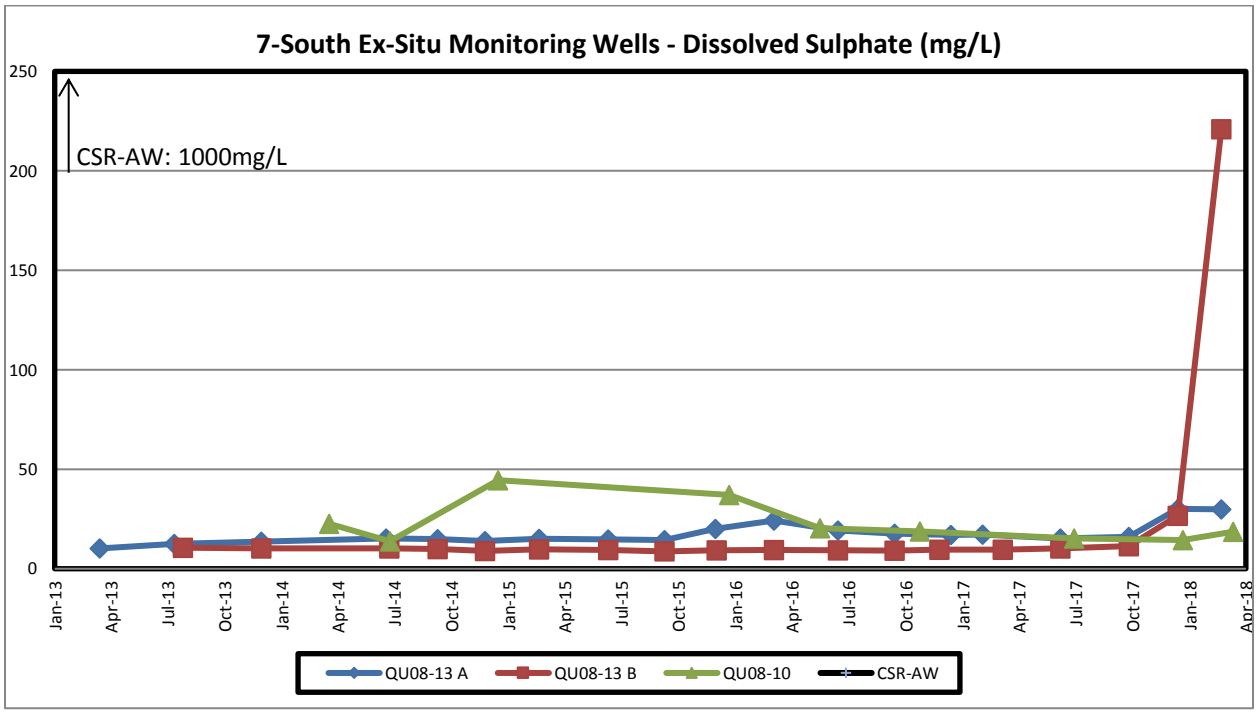


Figure 14: 7-South Ex-Situ Monitoring Wells - Dissolved Sulphate

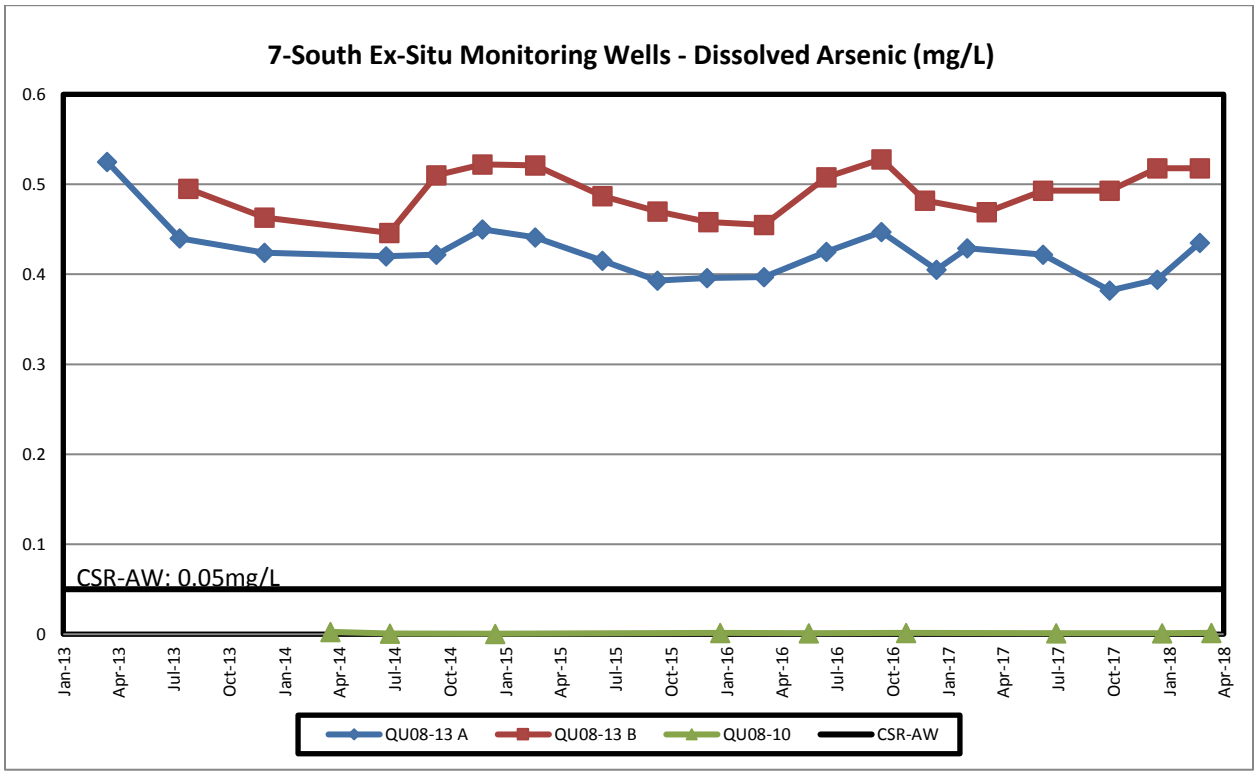


Figure 15: 7S Ex-Situ Monitoring Wells - Dissolved Arsenic

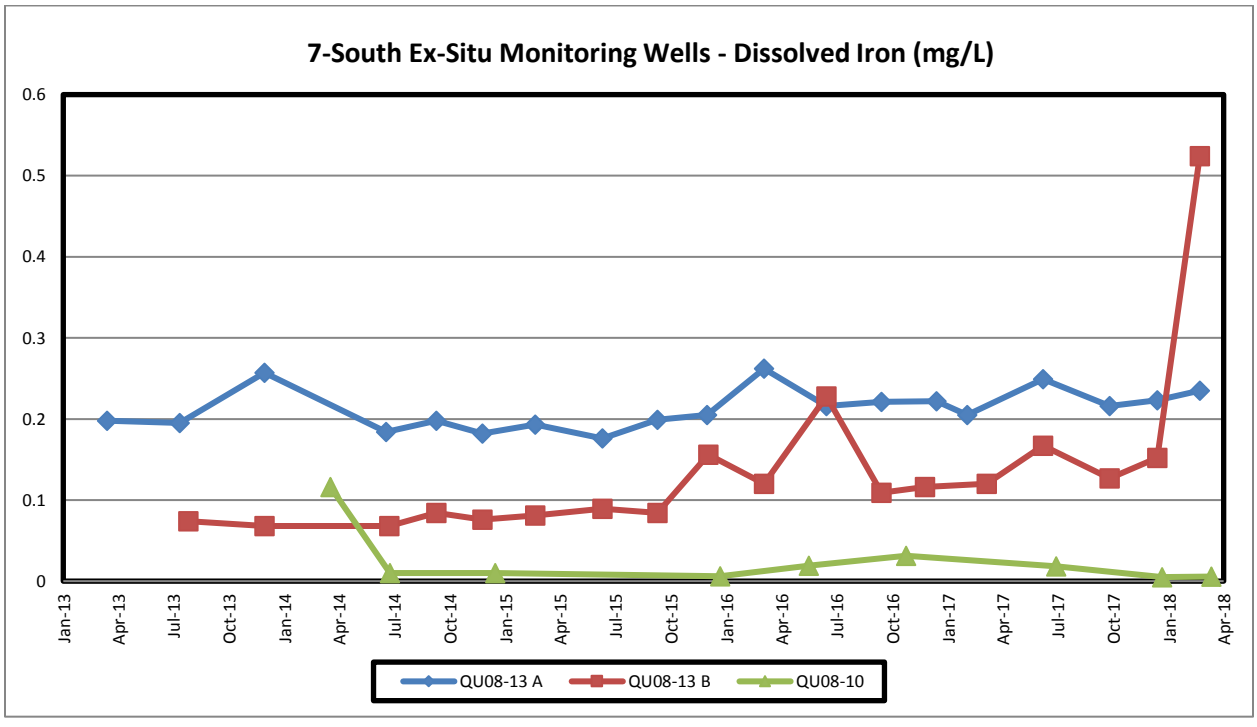


Figure 16: 7S Ex-Situ Monitoring Wells – Dissolved Iron

4.2.5 2/3 South Monitoring Wells

4.2.5.1 2/3 South Mine Pool

Monitoring wells MW00-4 and QU11-11 were established for monitoring the 2-South mine pool water quality while QU11-11 is also used for reference for the treatment system influent. 2-South mine pool water enters Long Lake via the Long Lake Seep and discharges are closely related to water levels monitored at MW00-4. These wells exhibit moderate concentrations of sulphate averaging 325 mg/L (MW00-4) and 506 mg/L (QU11-11) in this monitoring period. It is noted that both wells are relatively stable for sulphate concentrations although QU11-11 has declined since late 2016. Concentrations of dissolved metals are relatively low in these wells and exhibit neutral pH. Dissolved iron concentrations do show periodic spikes in well QU11-11 and are typically related to rising mine pool water elevations as flushing of the mine walls encourages a gradational increase in dissolved metals. The distinct increase of dissolved iron in mid-2017 at QU11-11 is a direct result of changing to field filtering and preservation on site.

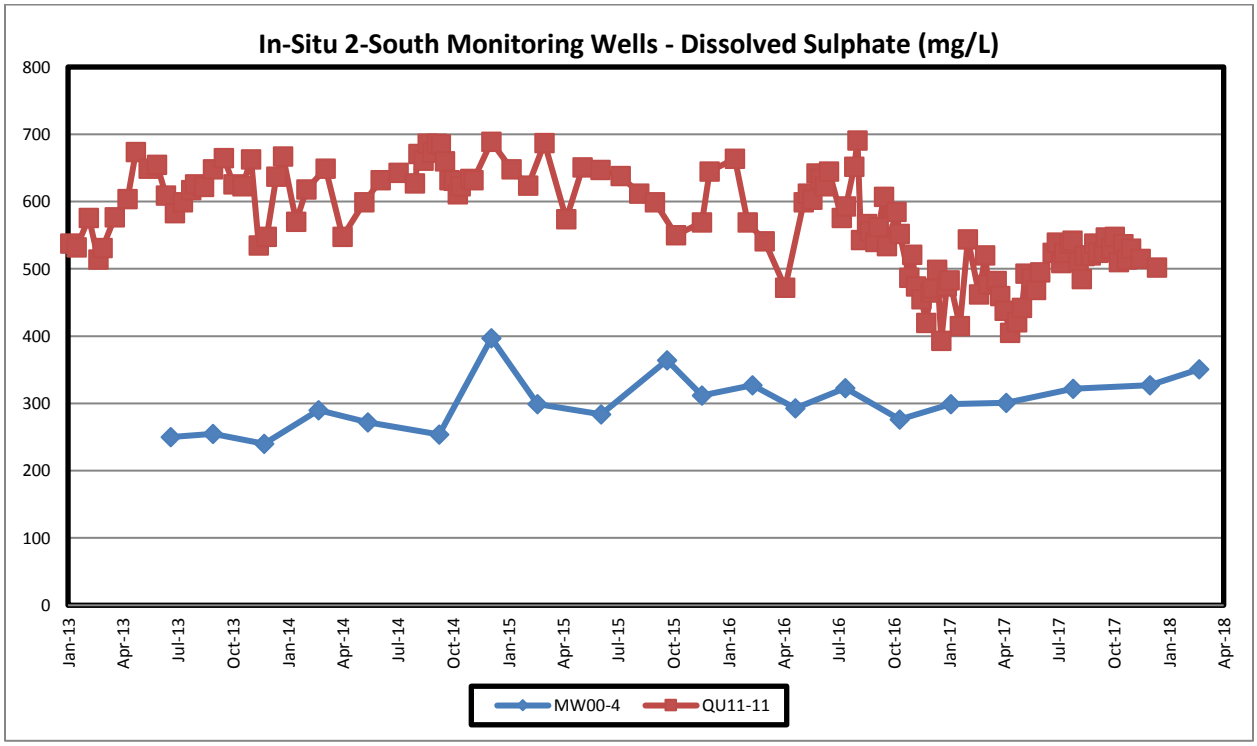


Figure 17: In-Situ 2S Monitoring Wells - Dissolved Sulphate

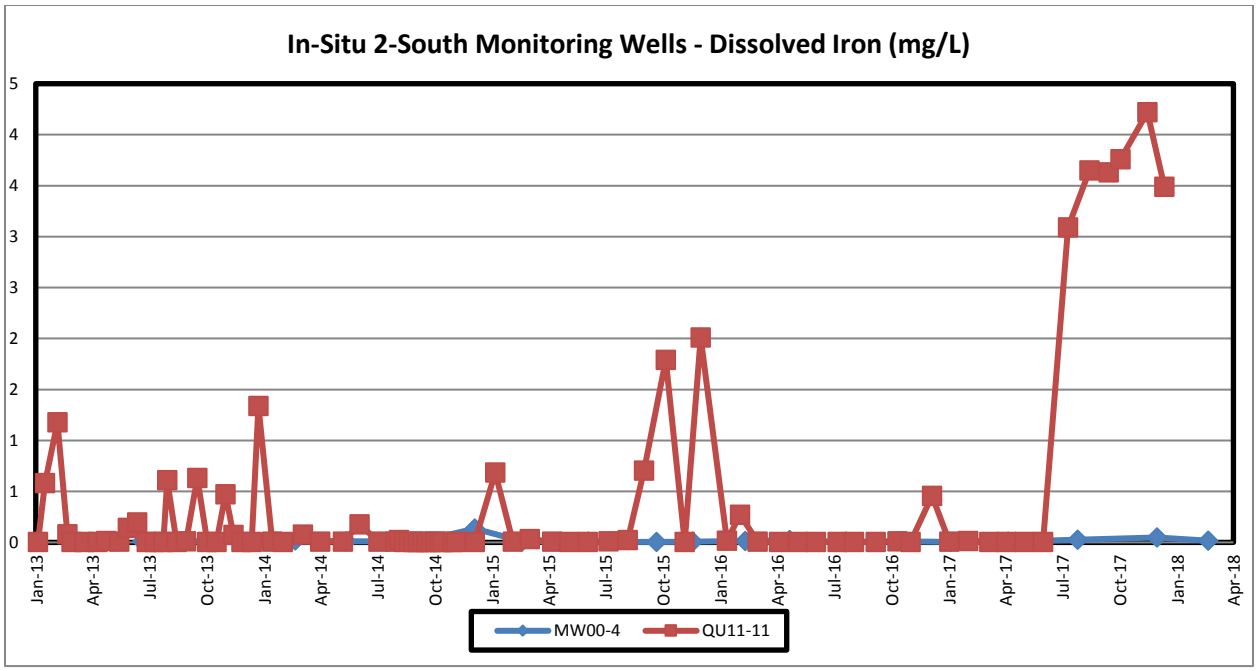


Figure 18: In-situ 2-South Monitoring Wells - Dissolved Iron

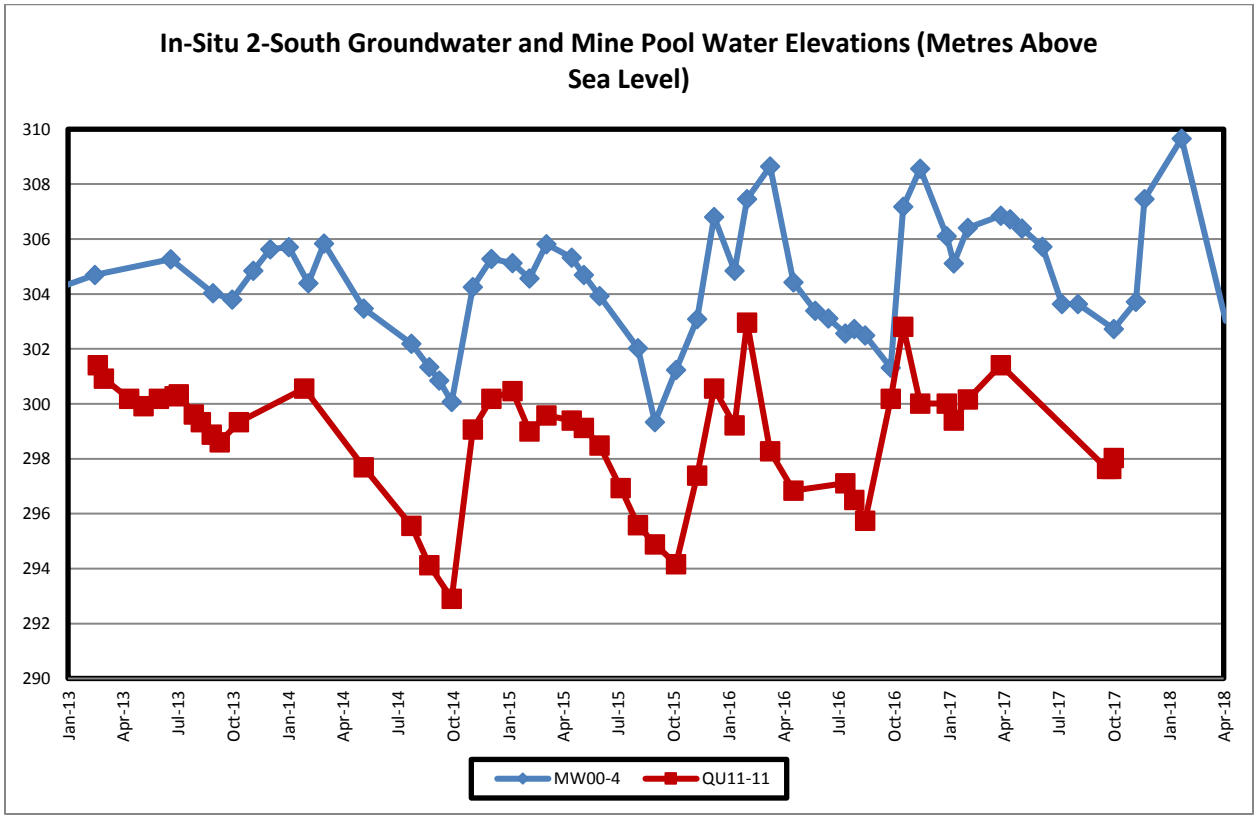


Figure 19: 2-South Groundwater and Mine Pool Water Elevations

4.2.5.2 2/3 South Ex-Situ Wells

Monitoring wells in the 2 and 3-South areas exhibit elevated concentrations of sulphate and some metals based on their proximity to the 2-South and 3-South PAG-CCR storage facilities and past surface disturbances; both open pit and underground mining activities. These wells include MW00-2 located next to the 3-South flooded PAG-CCR Storage Facility as well as MW12-23 and MW12-24 established as wells between the 2-South flooded PAG-CCR Storage Facility and No Name Lake. Dissolved iron, manganese and other dissolved materials are elevated at MW00-2 as it is situated about 5 metres from the 3-South PAG-CCR pond and intercepts the water that flows through the hydraulically conductive till.

While MW00-2 is located to monitor the drainage from the 3-South pit, MW12-23 and 24 are designed to intercept seepage from the reclaimed 1-South pit, the 1-South sump, and the 2-South pit. As evidenced by the dissolved sulphate levels found in these wells, the shallower well MW12-24, intercepts a perched water table, potentially attributed to the reclaimed 1-South pit up gradient, but independent of 2-South groundwater, whereas the deeper well MW12-23, intercepts 2-South seepage groundwater at an elevation approximately 3 metres below the surface water elevation in No Name Lake. Lorax suggests that No Name Lake is a 'losing' lake (i.e., recharging the aquifer at its downstream end). According to initial drill logs during the installation of these monitoring wells, the siltstone bedrock appears very tight in this area with no water bearing features intercepted.

Monitoring wells MW12-23 and MW12-24 (particularly MW12-23) have slow recharging rates, making proper sampling very difficult and often, not feasible. Sampling at MW12-23 occurs over two days; day one involves purging the well and day two involves a low flow sampling technique to obtain water that has formed over a 24-hour period using a portable bladder. While quarterly sampling is required, MW12-23 is often found to be dry, (especially during the summer) and sampling is not possible. Based on previous efforts and understanding of well recharge, there is now a high success rate of sample collection and a reliable dataset is developing. Moving forward, it will be important to monitor recharge rates and water levels to determine seepage rates from the 2-South PAG-CCR storage pond towards No Name Lake. Appendix B represents the monitoring data collected for 2017-2018.

Notable observations in this area include:

- Dissolved sulphate concentrations exceeded the CSR-AW guideline of 1000 mg/L at MW-002 in (5/5) sampling events, averaging 1274 mg/L, as shown in Figure 20. Year over year averages have been on the rise since 2014.
- Sulphate concentrations have continued to decline at MW12-23 throughout this monitoring period and have had no CSR-AW exceedances. It is noted that this decrease occurred following reclamation activities within the 1 and 2-South area (Figure 20)
- Sulphate concentrations in the shallower well MW12-24, are substantially lower than in MW12-23 indicating minimal influence from the 2-South PAG-CCR storage facility.

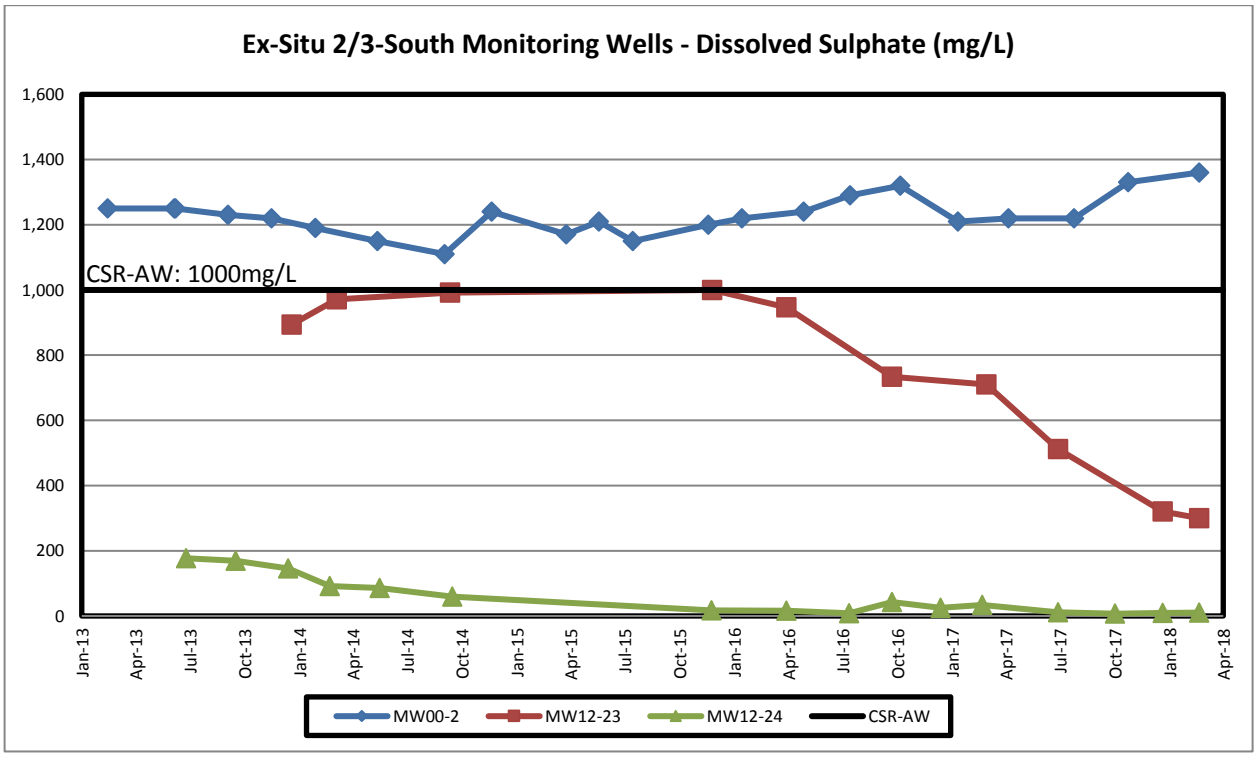


Figure 20: Ex-Situ 2/3 South Monitoring Wells - Dissolved Sulphate

- Conductivity was found to be very high in MW00-2 and MW12-23, and moderate in MW12-24, reflecting results of past years.
- Dissolved arsenic is found in stable, low concentrations in the 2-South ex-situ wells.
- Dissolved manganese is elevated in MW00-2 and MW12-23 indicating influence from PAG-CCR storage however levels are declining

- Dissolved iron concentrations are increasing at MW00-2 and have nearly tripled in the past four years (Figure 21). Its possible that the increase is a result of dissolution from the 2S PAG-CCR storage area and transport to 3S PAG CCR storage area.

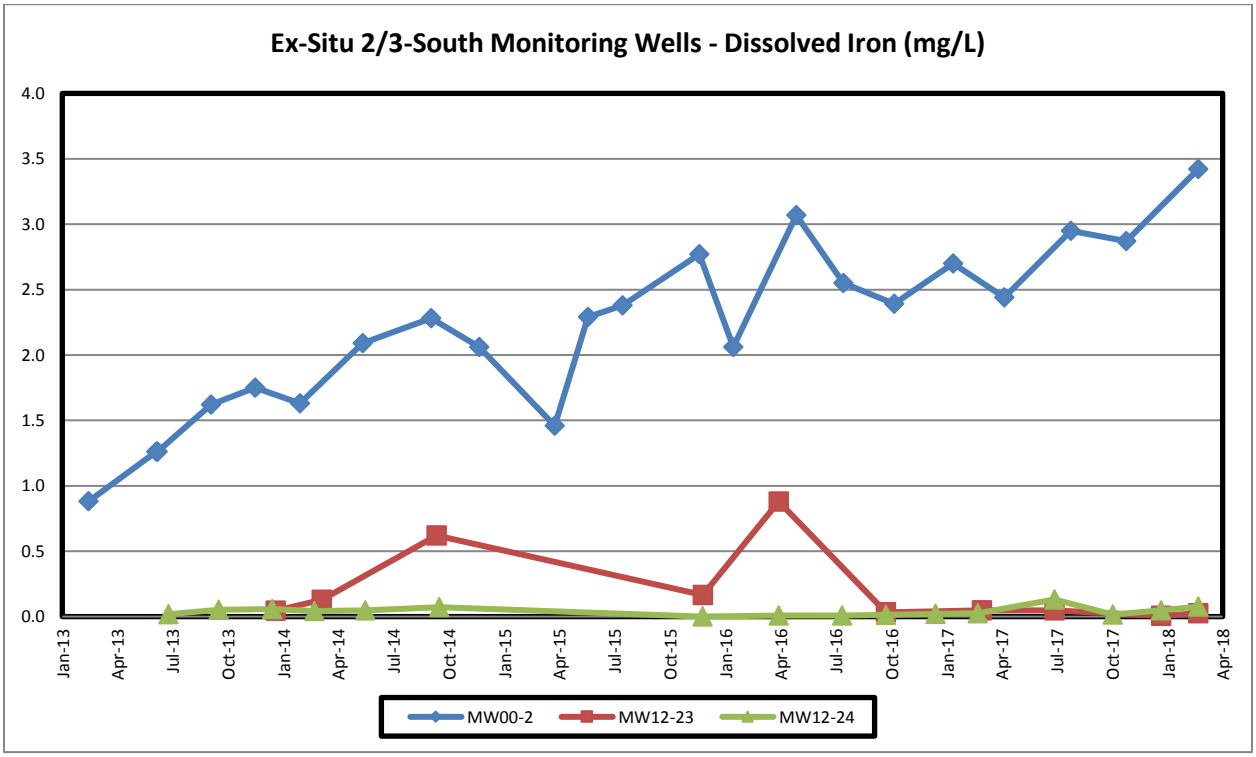


Figure 21: Ex-Situ 2/3 South Monitoring Wells – Dissolved Iron

4.2.6 4-South Mine Area

4.2.6.1 4-South Mine Pool

Predicted mature mine pool source terms were developed for the flooded 4-South mine and are quantified using maximum concentrations measured in QU78-161 and QU11-01. The 4-South mine pool chemistry indicates that the mine water has evolved into a mature state and can be used to estimate long term water chemistry. The mine water is expected to be anoxic and contain elevated sulphate, reduced iron and traces of dissolved sulphide, although eventually the mine waters are predicted to display higher pH, alkalinity and lower metal concentrations as iron and other metals are sequestered into sulphide minerals. The monitoring well 78-161 was dropped this monitoring period due to difficult access and chemical similarities to QU11-01. POI concentrations

seen this monitoring period are lower to previous monitoring years and continue to demonstrate a decline in iron, manganese and sulphate.

Table 10 below displays the comparison between predicted water quality to observed water quality during this monitoring period. The values used were the maximum values found for QU11-01 from the only sampling event completed in 2017-18. The only parameters that were above the predicted concentration levels were aluminum, arsenic, boron and selenium. It is noted that values used for aluminum and selenium were at laboratory detection limits and may be lower than the predicted maximum values expected.

Table 10: Source Terms Comparison of Flooded 4-South Mine Void Mature Mine Pool

Parameters	Predicted Max. Values	Maximum Values	Results obtained
Alkalinity (as $CaCO_3$)	450	82	Below Predicted
Aluminum (Al)	0.024	<0.030	At detection limits
Arsenic (As)	0.0924	0.156	Above Predicted
Boron (B)	0.637	1.15	Above Predicted
Cadmium (Cd)	0.000085	<0.000050	Below Predicted
Cobalt (Co)	0.063	<0.0020	Below Predicted
Copper (Cu)	0.0564	<0.0020	Below Predicted
Fluoride (F)	1	0.2	Below Predicted
Iron (Fe)	257	132	Below Predicted
Manganese (Mn)	5.97	2.48	Below Predicted
Selenium (Se)	0.0004	<0.0010	At detection limits
Sulfate (SO_4)	2060	1380	Below Predicted
Zinc (Zn)	0.0712	<0.050	Below Predicted

According to Lorax, chemical stratification is apparent in this mine pool as the heavily mineralized water remains on the bottom of the water column and the less mineralized water remains in the upper portion due to limited mixing of the water column. Lorax described the groundwater in this area as having an age affected signature of fluoride and arsenic, directly related to the increased residence time in the groundwater system.

The mine void is “flooded” and water levels in the mine pool show little change as there are no dewatering efforts or active operations in this mine. POI is generally quite stable due to the

maturity and flooded status of the mine and do not show major fluctuations. It is noted that some POI concentrations are trending downward (iron, manganese and sulphate) while arsenic has shown a steady increase since 2013 (Figures 23-25).

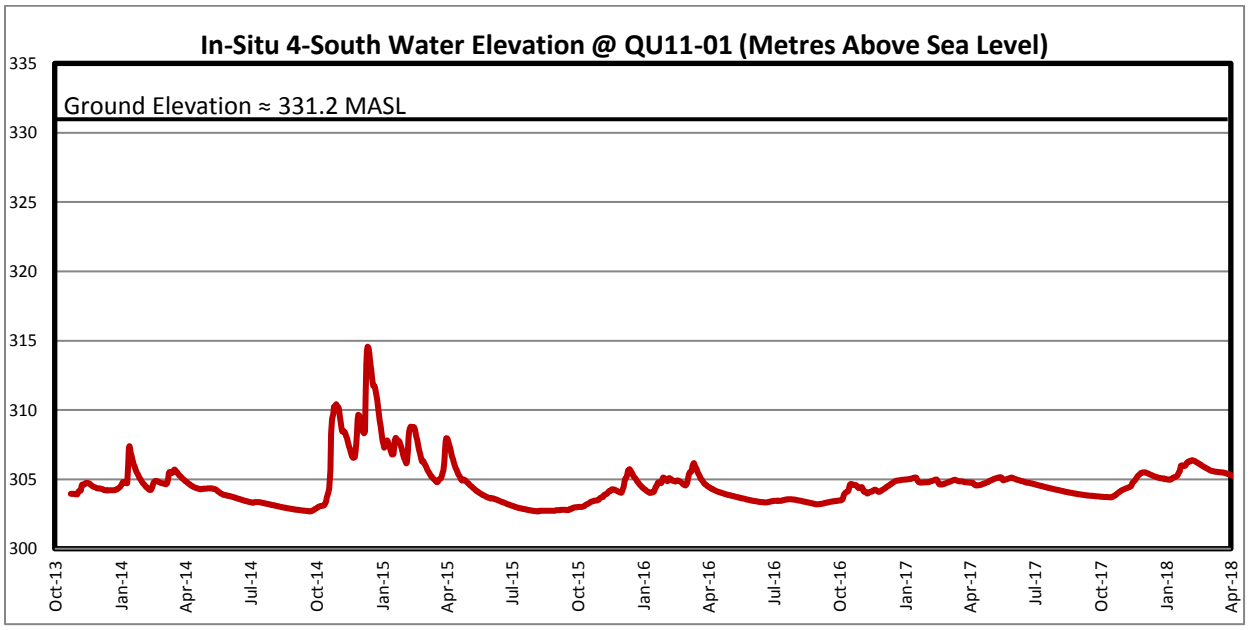


Figure 22: 4-South Mine Pool Water Elevation at QU11-01

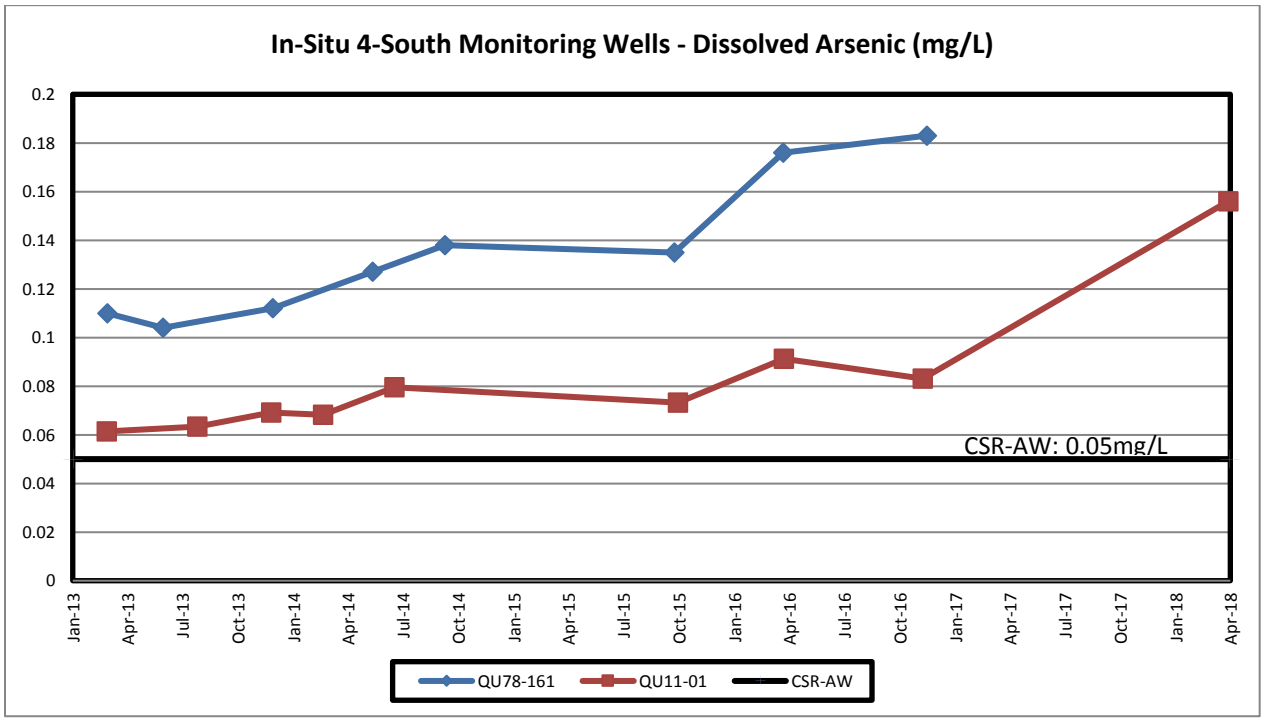


Figure 23: In-Situ 4-South Monitoring Wells - Dissolved Arsenic

The 4-South mine pool is dominated by iron reducing conditions with elevated concentrations of iron and sulphate. The chemical stratification is characterized by the high concentrations of iron and sulphate found at depth in the mine pool. While declining, he mine pool water quality has the highest concentration of dissolved iron on the mine site, having exhibiting concentrations greater than 200 mg/L at QU11-01.

Lorax observed that sulphate has an opposite trend to fluoride; sulphate is found in lowest concentrations in the formation water and highest in the mine pool. Sulphate concentrations are elevated and follow a similar profile to dissolved iron where concentrations have been generally decreasing since 2013.

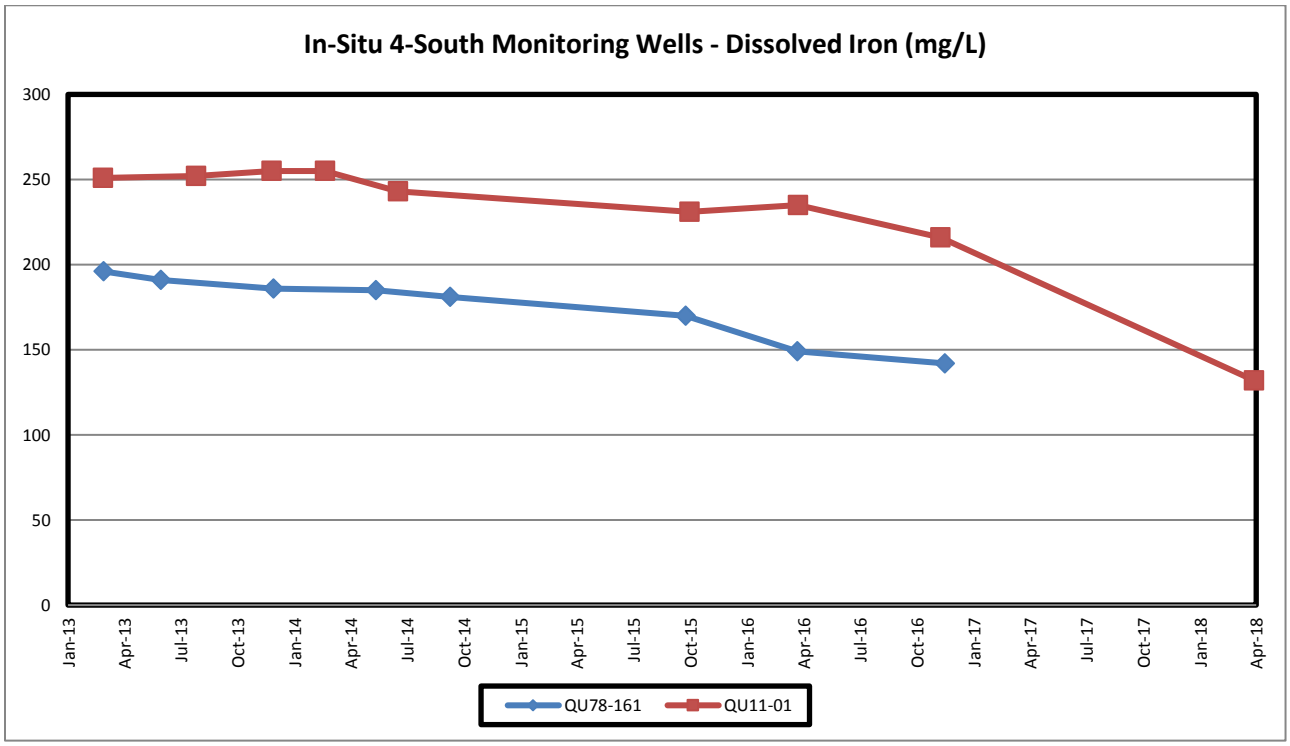


Figure 24: In-Situ 4-South Monitoring Wells - Dissolved Iron

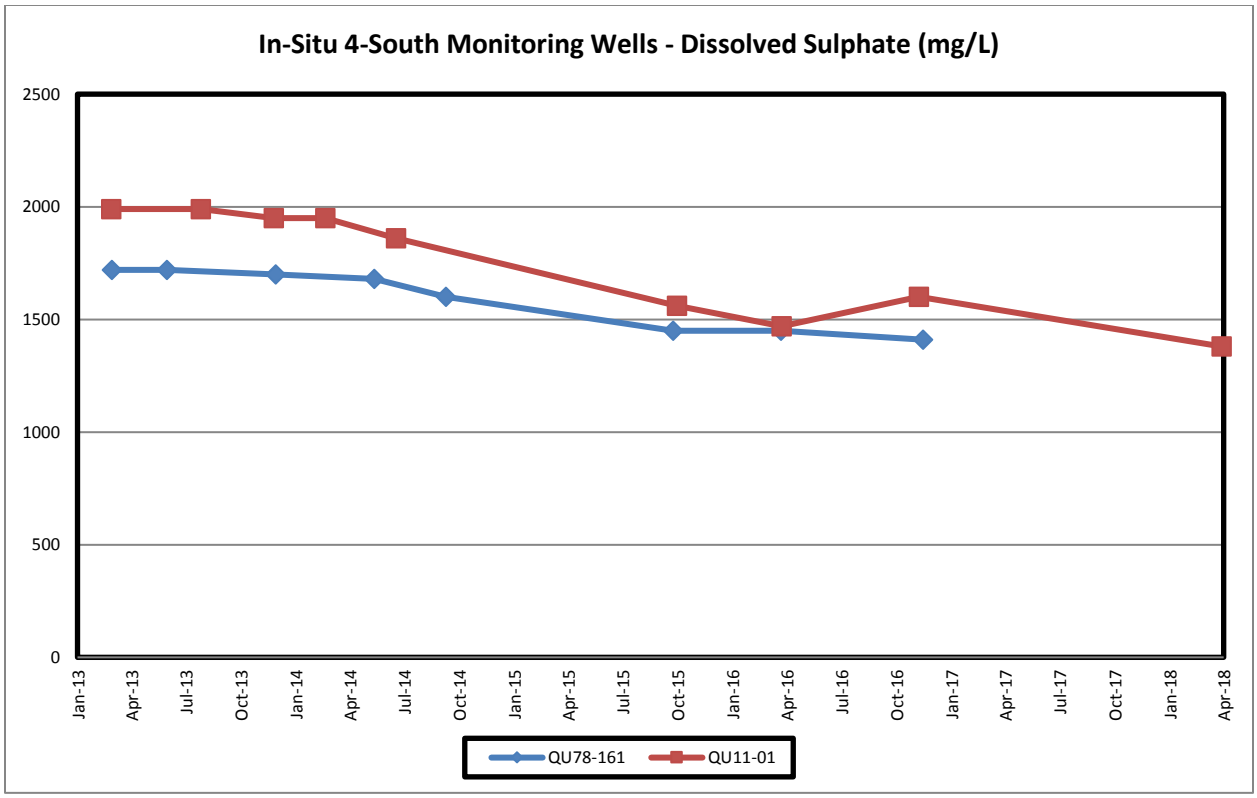


Figure 25: In-Situ 4-South Monitoring Wells - Dissolved Sulphate

4.2.6.2 4-South Ex-Situ Wells

Observations by Lorax of formation water down-gradient of the 4-South mine indicate mine and age-affected signatures suggesting a hydraulic connection between the 4-South mine pool and the down gradient monitoring wells. The hydraulic connection is most obvious at QU10-09 S, and less obvious at QU10-07 D. The strong mine signature in QU10-09 indicates that it is along the flow path of the juvenile mine waters discharging from the upper portion of the 4-South mine workings (Lorax, 2011).

Monitoring wells in this area are focused on four types of water quality:

- QU10-09 (S & D) ex-situ formation waters, outside of existing workings, assess vertical gradients and water quality adjacent to Long Lake
- QU10-07 D ex-situ formation waters; down gradient of existing workings next to the Long Lake Entrance wetland (LLE)

- QU10-08 D ex-situ up gradient of the existing workings; assess water quality immediately up gradient of existing workings

Generally, major ion concentrations highest in the mine pool waters and lowest in the formation groundwater. POI concentrations in and outside the 4-South mine pool are relatively stable, showing some minor trending.

Notable observations include:

- Dissolved arsenic concentrations were elevated above CSR-AW standards (0.05mg/L) at each well for all sampling events, reflecting historic results (Figure 26)

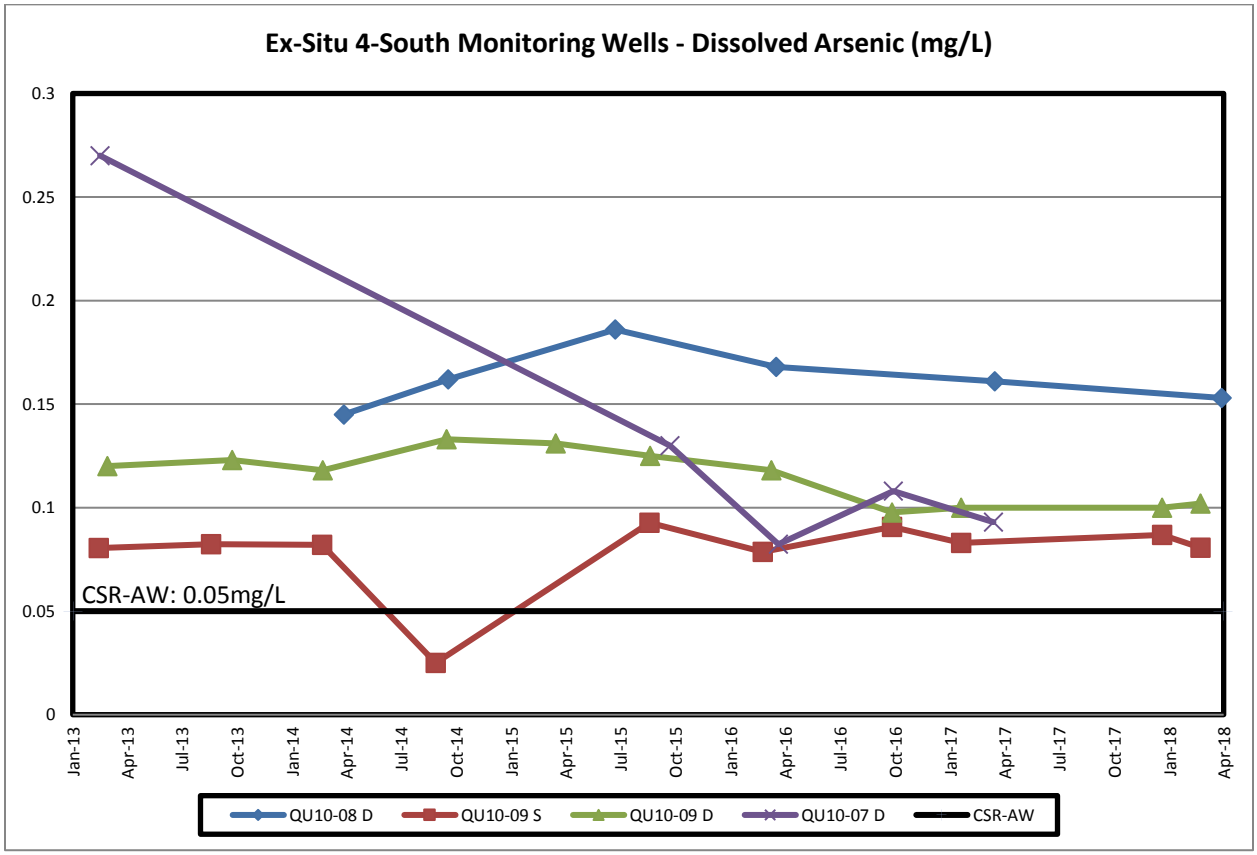


Figure 26: Ex-Situ 4-South Monitoring Wells - Dissolved Arsenic

- Dissolved iron was below 1.0 mg/L in all wells except in QU10-09 S, where results persisted between 5-6 mg/L
- Dissolved sulphate levels were generally low (as observed in the past), especially at QU10-07 D and QU10-08 D

- Dissolved sulphate levels were higher in QU10-09 S/D throughout the monitoring period

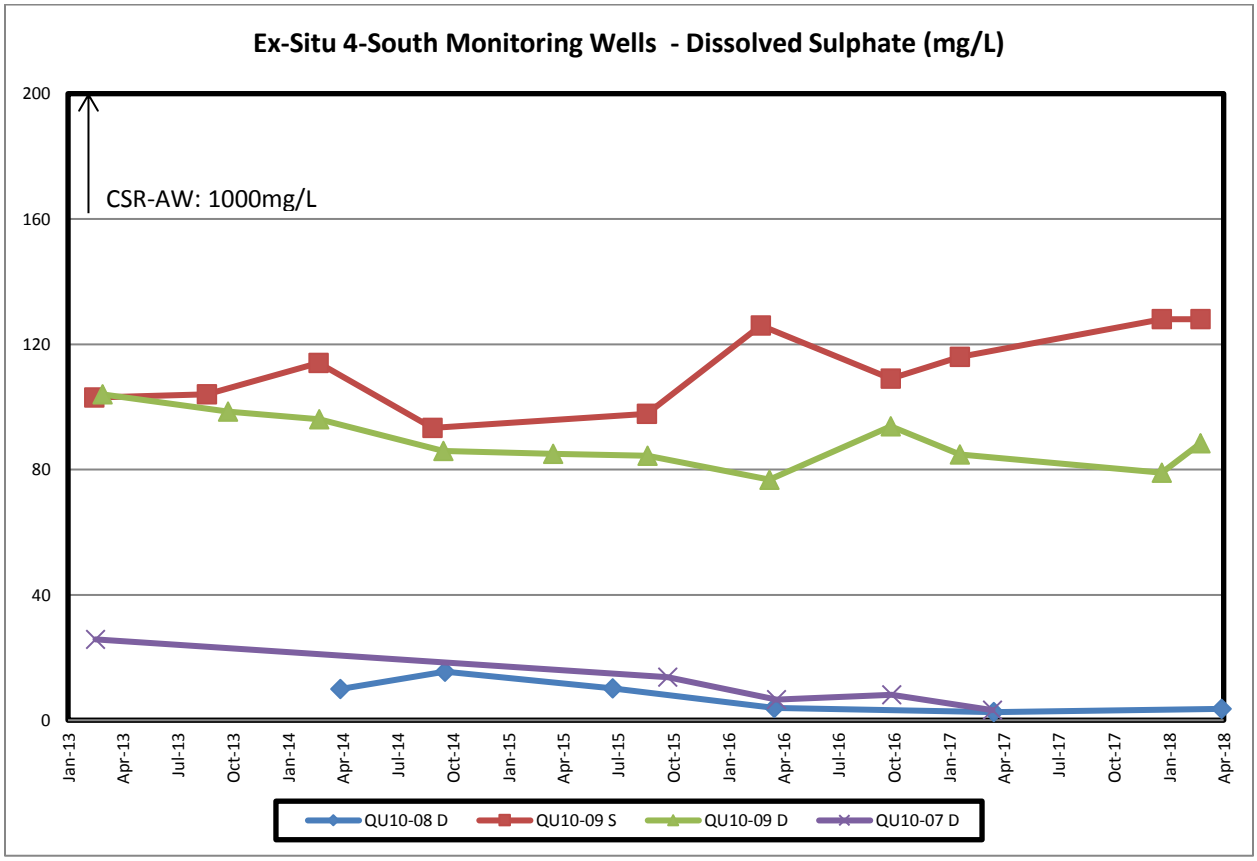


Figure 27: Ex-Situ 4S Monitoring Wells - Dissolved Sulphate

- Fluoride exceeded CSR-AW standards in well QU10-08 during the lone sampling event. This level was slightly less than previous years at 1.90 mg/L.

4.2.7 242 Mine

The 242 Portal site was reclaimed in Spring, 2016 with backfilling of the portal, permanent slope creation, topsoil cover and subsequent revegetation. A new sampling site (242MW) was created in 2017 with the drilling and installation of an additional groundwater well.

The pH of the flooded waters of the historic 242 mine has been consistently neutral, ranging from approximately 6.5-7.5. During this monitoring period, the water exhibited low concentrations of

alkalinity, sulphate and metals, consistent with past monitoring events since 2014. Consistent water quality is expected as the small amount of mining that occurred was prior to 1996, and the mine was flooded immediately, with no additional disturbances.

5 Summary

The groundwater monitoring program at Quinsam Coal has been established to capture the interaction between mine related surface and underground disturbance areas (contact water) with the receiving environment. The comprehensive nature of this program allows Quinsam to generate water quality predictions, strategically manage surplus water generated as a result of mining activities and create management plans with a focus on mitigating potential receiving environment impacts.

During the mine operations phase, the groundwater program provides critical information to ensure that plans and targets are being achieved. For example, in-situ wells provide the necessary information to validate water quality predictions (source terms) within a mining area. The program also provides opportunity to monitor water quality associated with three key operational waste management practices:

1) Subaqueous PAG-CCR disposal
2) Fine Tailings underground storage in 2 North mine void(s)
3) Backfilled and flooded underground PAG-CCR

The information attained from monitoring these unique and innovative disposal methods will inform future waste management plans and opportunities for Quinsam Coal.

Overall, in-situ groundwater at Quinsam Coal is generally within the water quality prediction scenarios and ex-situ groundwater typically trends below the CSR-AW standards. The two exceptions to the aforementioned is groundwater influenced by host geological formations (e.g. Dunsmuir Member sandstones, Cumberland Member No.1 Coal seam and mudstones) with

naturally elevated concentrations of parameters of interest and by weathering processes (i.e. mine wall oxidation and flushing) of disturbed materials within the mine footprint.

The long-term groundwater quality trend(s) demonstrate that deeper formation groundwater systems are not substantially influenced by contact water at most locations (i.e. 2-North/5-South and 7-South), as moderate concentrations of dissolved metals and low concentrations of sulphate are typical. In contrast, the underground mine voids, flooded open pit mining areas, and those areas used for subaqueous PAG-CCR and tailings stowage have, in some cases, elevated concentrations of certain parameters. Sulphate is the primary parameter of interest within these mining areas, due to the fact that sulphate has a distinctive geochemical signature and the contact water flow path can be tracked.

The groundwater program will continue to evolve as mining advances into new areas, or retreats from existing areas, and information on existing mine developments is evaluated. Furthermore, the program will be adapted to encompass the progression of our waste management strategy and any well or area specific trending.

References

1. Lorax Environmental and Enterprise Geoscience Services Ltd. (2011). Appendix I 4 South Mine Groundwater Evaluation. In *Mine Permit (C-172) Amendment Appendices I-J* (Vol. Volume 3, pp. 3-1, 4-1, 4-10, 4-11, 4-16, 5-1,6-1-7-12, 5-1). Burnaby, B.C.

2. Lorax Environmental and Enterprise Geoscience Services Ltd. (2011). Appendix I 4 South Mine Groundwater Evaluation. In *Mine Permit (C-172) Amendment Appendices K-N* (Vol. Volume 4, pp. 4-1, 4-12, 4-13, 4-13, 4-35, 5.3,6-47, 6-55). Burnaby, B.C.

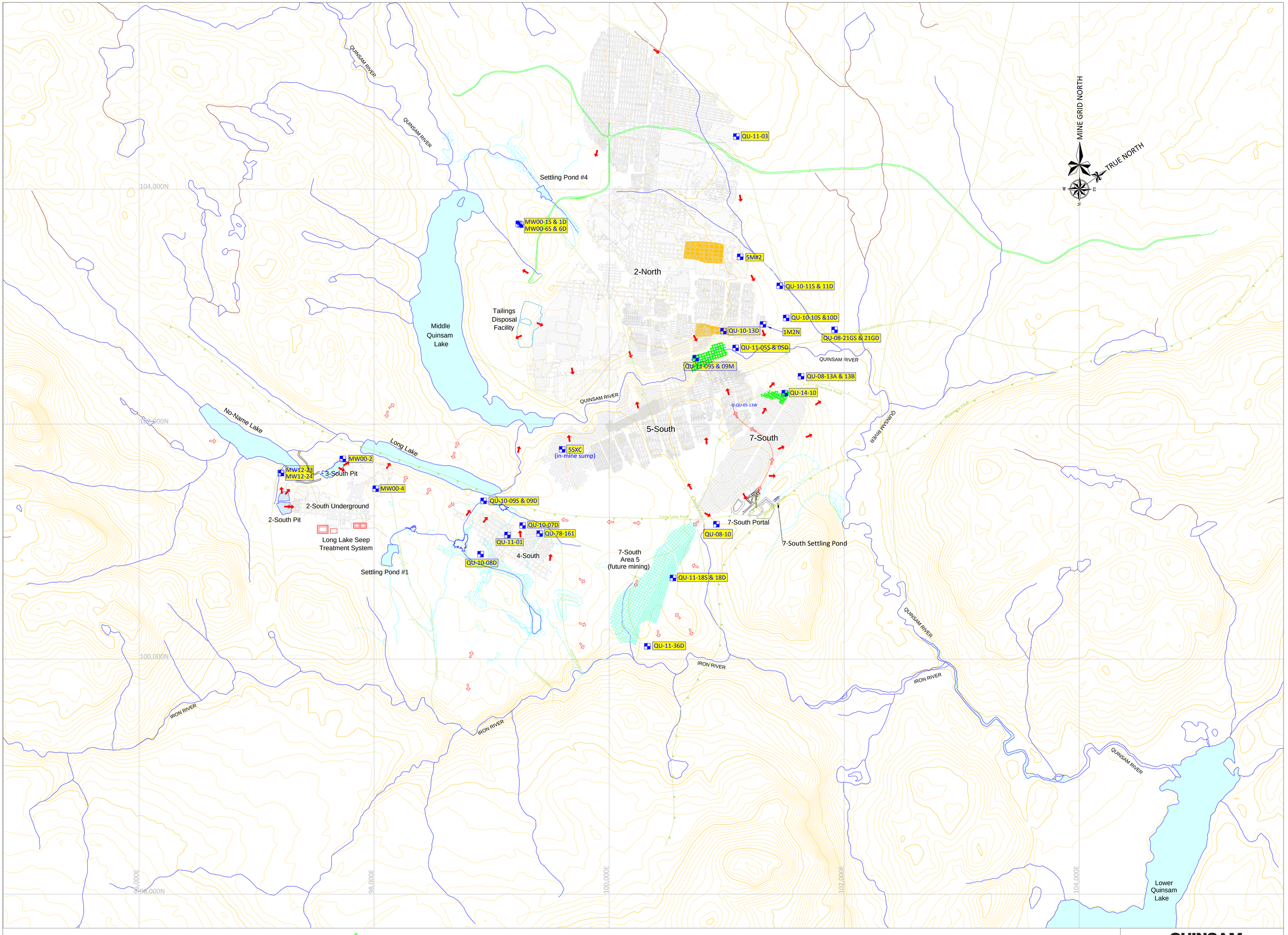
3. Lorax Environmental Ltd. (2013) *Quinsam Coal Corporation Groundwater Quality Sampling Guide, (*pp. 1-1 to 4-4). Burnaby, B.C.

4. Golder Associates Ltd. (2006) *Quarterly Groundwater Monitoring Assessment Fall (2006) Quinsam Mine*, (pp. 9-12). Victoria, B.C.

5. Ministry of Environment Province of British Columbia. (2013) *Ambient Water Quality Guidelines for Sulphate. Technical Appendix*. (pp. 7). Victoria, B.C.

6. Ministry of Environment (MOE). (2013) *The British Columbia Field Sampling Manual, For Continuous Monitoring and Collection of Air, Air-Emissions, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition".* Victoria, B.C.

Appendix A



- Groundwater Monitoring Well
- Groundwater Flow (mine impacted water)
- Groundwater Flow (non-mine impacted water)
- Pumping (mine impacted water to underground workings)
- Underground PAG-CCR Disposal
- Underground Tailings Disposal

QUINSAM COAL

2017 Annual Water Quality Report
Site Plan - Groundwater

Scale: 1:10,000 | Site Plan - Groundwater

C:\Environment - Reclamation\2017 Annual Report\Ground Water.dwg

Appendix B

2-3 North Monitoring Results

In-Situ

Site ID:		1M2N				5M#2					6M2N			QU10-13D			
Date:		27-Jun-17	26-Sep-17	30-Nov-17	15-Feb-18	3-Apr-17	27-Jun-17	27-Sep-17	30-Nov-17	15-Feb-18	9-May-17	27-Sep-17	21-Dec-17	9-May-17	26-Sep-17	6-Dec-17	15-Feb-18
Parameter:	**Units**																
SO4-D	**mg/L**		537	353	462	200		188	231	209	182	42.4	177	538	608	177	177
S2-T	**mg/L**	0.172	0.182	0.266	0.0937	0.0105	0.0248	0.132	0.0359	0.0252	0.0086		0.0109	0.122	0.0130	0.0216	0.0343
H2S	**mg/L**	0.183	0.193	0.283	0.0996	0.0112	0.0264	0.140	0.0382	0.0268	0.00914		0.0116	0.130	0.0138	0.0230	0.0365
Cond-F	**uS/cm**	1830	1784	1568		2445	2362	2000						1284.6	1276	1168	
pH-F	**pH Units**	8	7.9	7.2		7.7	7.8	8						6.92	7.33	7.47	
Alk-T	**mg/L**		514	415	382	459		524	477	452	407	126	408	477	518	601	541
Acidity83	**mg/L**		7.3	<1.0	<1.0	8.44		<1.0	<1.0	<1.0	1.39	1.7	1.6	9.66	3.6	<1.0	<1.0
N-D	**mg/L**	0.285	0.415	0.338	0.261	0.160	<0.20	0.478	0.352	0.108	0.242	0.209	0.191	0.394	0.337	0.259	0.130
DOC	**mg/L**	131	1.21	1.93	1.48	0.98	1.50	1.98	1.75	1.23	1.40	1.56	2.34		1.54	3.02	2.43
Hydrox	**mg/L**		<1.0	<1.0	<1.0	<0.50		<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	**mg/L**		628	506	441	560		612	556	514	484	154	498	582	632	733	616
Carb	**mg/L**		<1.0	<1.0	12.3	<0.50		13.9	12.9	18.1	6.11	<1.0	<1.0	<0.50	<1.0	<1.0	21.7
Cl-D	**mg/L**		46	28	14			14	15	7.9	2.1	2.7	4.5	47	57	140	130
F-D	**mg/L**		0.160	0.170	0.180			0.087	0.067	0.094	0.200	0.042	0.050	0.140	0.120	0.160	0.180
Br-D	**mg/L**		<0.10	0.056	<0.050			0.040	0.028	<0.050	0.029	<0.010	0.011	0.098	<0.10	0.276	0.251
P-D	**mg/L**	0.0068	0.0058	0.0077	0.0245	0.0033	0.0059	0.0082	0.0056	0.0045	0.0098	0.0371	<0.0020	0.0101	0.0082	0.0148	0.0080
TSS	**mg/L**	7.0				<4.0	<4.0				<4.0			<4.0			
Al-D	**mg/L**	0.0071	<0.015	0.0033	<0.015	<0.0030	0.0050	<0.015	<0.0030	<0.015	0.0035	<0.0030	<0.0030	0.0060	<0.015	<0.015	<0.015
Ag-D	**mg/L**	<0.000020	<0.00010	<0.000020	<0.00010	<0.000020	<0.000020	<0.00010	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010
As-D	**mg/L**	0.00425	0.00862	0.0140	0.00894	0.00511	0.00942	0.0132	0.00658	0.00346	0.00244	0.00134	0.00157	0.00531	0.00597	0.00452	0.00854
Ba-D	**mg/L**	0.0302	0.0233	0.0337	0.0321	0.0209	0.0261	0.0271	0.0279	0.0281	0.0264	0.0259	0.0504	0.0199	0.0323	0.0317	0.0358
B-D	**mg/L**	0.940	1.25	1.11	0.925	0.984	0.927	0.90	0.981	0.928	1.15	0.103	0.739	1.16	1.16	1.58	1.65
Be-D	**mg/L**	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050
Bi-D	**mg/L**	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050
Cd-D	**mg/L**	<0.0000050	<0.000025	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.000025	<0.0000050	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025	<0.000025	<0.000025
Ca-D	**mg/L**	85.6	95.3	66.3	84.5	34.9	39.6	41.1	46.8	42.4	22.1	33.0	53.6	62.3	96.0	38.0	43.6
Cr-D	**mg/L**	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050
Co-D	**mg/L**	<0.00020	<0.0010	<0.00020	<0.0010	<0.00020	<0.00020	<0.0010	0.00033	<0.0010	<0.00020	<0.00020	0.00088	0.00094	0.0013	0.0010	0.0012
Cu-D	**mg/L**	0.00033	<0.0010	0.00041	<0.0010	<0.00020	<0.00020	<0.0010	0.00089	<0.0010	0.00153	0.00174	0.00121	<0.00020	<0.0010	<0.0010	<0.0010
Fe-D	**mg/L**	0.0233	3.06	2.0600	2.33	0.0129	0.0491	0.370	0.3920	0.253	<0.0050	0.0124	0.0141	0.681	1.34	0.1980	2.36
Hard-D	**mg/L**	247	276	192	246	99.6	111	117	133	123	62.4	98.8	154	176	278	105	121
Pb-D	**mg/L**	<0.00020	<0.0010	<0.00020	<0.0010	<0.00020	<0.00020	<0.0010	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010
Mg-D	**mg/L**	8.00	9.18	6.47	8.58	2.99	2.85	3.39	3.91	4.12	1.74	4.00	4.92	4.92	9.35	2.55	2.84
Mn-D	**mg/L**	0.233	0.302	0.1890	0.252	0.0590	0.0525	0.0646	0.0815	0.0554	0.0587	0.0013	0.0398	0.222	0.466	0.2310	0.223
Hg-D	**mg/L**	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000039	0.0000116	<0.0000020	<0.0000020
Na-D	**mg/L**	285	381	261	327	262	241	269	224	272	270	31.3	219	357	474	341	389
Mo-D	**mg/L**	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	0.0017	<0.0010	<0.0010	0.0012	<0.0050	<0.0050	<0.0050
Ni-D	**mg/L**	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	0.0028	<0.0010	<0.0050	<0.0050	<0.0050
K-D	**mg/L**	4.63	4.48	3.92	4.57	2.25	2.45	2.48	2.54	2.58	1.49	1.05	2.13	3.92	4.81	3.05	3.36
S-D	**mg/L**	182	186	139	174	69.4	75.2	66	76.2	76	43.7	15.0	61.9	150	244	62	63
Sb-D	**mg/L**	<0.00050	<0.0025	<0.00050	<0.0025	<0.00050	<0.00050	<0.0025	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.0025	<0.0025
Se-D	**mg/L**	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	0.00039	0.00016	<0.00010	<0.00050	<0.00050	<0.00050
Si-D	**mg/L**	3.68	3.45	3.86	3.55	2.44	3.00	3.34	3.51	2.91	3.39	6.80	3.38	3.12	2.97	3.20	3.31
Sr-D	**mg/L**	0.847	0.950	0.668	0.845	0.351	0.376	0.416	0.469	0.466	0.225	0.189	0.688	0.615	1.05	0.391	0.415
Tl-D	**mg/L**	<0.000010	<0.000050	<0.000010	<0.000050	<0.000010	<0.000010	<0.000050	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050
Ti-D	**mg/L**	<0.0050	<0.025	<0.0050	<0.025	<0.0050	<0.0050	<0.025	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025
U-D	**mg/L**	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	0.00014	<0.00050	<0.00050	<0.00050
V-D	**mg/L**	<0.0050	<0.025	<0.0050	<0.025	<0.0050	<0.0050	<0.025	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025
Zn-D	**mg/L**	0.0084	<0.025	0.0066	<0.025	<0.0050	0.0126	<0.025	0.0377	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

2-3 North Monitoring Results

Ex-Situ

Site ID:		CSR-AW	QU08-21 GS	QU08-21 GD			QU10-10 S		QU10-10 D		QU10-11 S	QU10-11 D
Date:			15-Feb-18	28-Jun-17	19-Dec-17	15-Feb-18	23-Jun-17	6-Dec-17	23-Jun-17	6-Dec-17	15-Feb-18	15-Feb-18
Parameter:	Units											
SO4-D	mg/L	1000	<1.0	1.93	2.3	<1.0	19.6	20.1	<0.50	<1.0	5.3	<1.0
S2-T	mg/L		0.0884	0.0858	0.0967	0.0962	<0.0050	<0.0050	0.0079	0.0079	0.0183	<0.0050
H2S	mg/L	0.02	0.0940	0.0912	0.103	0.102	0.00266	0.00266	0.00840	0.00840	0.0195	0.00266
Cond-F	uS/cm		426.3			2619				7835.6	110.6	2204
pH-F	pH Units		8.23			7.72				7.17	7.13	7.4
Alk-T	mg/L		194	218	217	210	152	152	93.2	91.3	68.7	305
Acidity83	mg/L		<1.0	4.34	11.0	<1.0	0.53	<1.0	15.3	10.4	<1.0	3.0
N-D	mg/L		0.172	0.556	0.413	0.435	0.222	0.241	0.754	0.961	0.074	0.384
DOC	mg/L		1.32	<2.5	1.50	1.66	1.15	1.05	1.02	5.28	<0.50	5.20
Hydrox	mg/L		<1.0	<0.50	<1.0	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	mg/L		226	266	265	248	180	186	114	111	83.8	373
Carb	mg/L		5.2	<0.50	<1.0	4.0	2.98	<1.0	<0.50	<1.0	<1.0	<1.0
Cl-D	mg/L	1500	59	1200	1100	940	4.6	4.6	3100	3200	<1.0	730
F-D	mg/L	2	1.80	1.00	0.920	1.20	0.620	0.580	0.020	<0.020	0.063	0.220
Br-D	mg/L		0.101	1.71	1.74	1.52	<0.010	<0.010	4.52	5.13	<0.010	1.59
P-D	mg/L		0.116	0.0493	0.141	0.114	0.0468	0.0634	0.0711	0.0766	0.0076	0.160
TSS	mg/L						128		35.5			
Al-D	mg/L		0.0060	0.0078	<0.015	<0.015	<0.0030	0.0151	0.0045	<0.030	0.0042	<0.015
Ag-D	mg/L	*	<0.000020	<0.000020	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.00020	<0.000020	<0.00010
As-D	mg/L	0.05	0.208	0.121	0.127	0.147	0.113	0.112	0.0139	0.0144	0.00145	0.00880
Ba-D	mg/L	10	0.311	3.07	2.42	2.48	0.342	0.367	1.35	1.24	0.123	0.568
B-D	mg/L	50	2.10	3.60	3.18	4.19	0.603	0.708	0.356	0.54	0.095	1.76
Be-D	mg/L	0.053	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00050
Bi-D	mg/L		<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0050
Cd-D	mg/L	*	0.0000120	0.0000060	<0.000025	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.000050	<0.0000050	<0.000025
Ca-D	mg/L		14.6	135	104	110	24.6	26.1	612	596	19.4	93.3
Cr-D	mg/L	0.01	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0050
Co-D	mg/L	0.04	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	0.00050	<0.0020	<0.00020	<0.0010
Cu-D	mg/L	*	0.00044	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	0.00021	<0.0020	0.00027	0.0012
Fe-D	mg/L		0.286	1.29	1.7300	0.982	0.221	0.2440	9.45	7.9500	0.177	4.44
Hard-D	mg/L		52.2	413	318	344	84.1	89.3	1570	1530	68.1	271
Pb-D	mg/L	*	<0.00020	<0.00020	<0.0010	<0.0010	0.00096	<0.00020	<0.00020	<0.0020	<0.00020	<0.0010
Mg-D	mg/L		3.83	18.2	14.2	16.7	5.52	5.88	11.0	10.9	4.74	9.17
Mn-D	mg/L		0.0518	0.114	0.2780	0.0799	0.0361	0.0453	0.417	0.3320	0.0334	0.502
Hg-D	mg/L	0.001	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	mg/L		103	682	583	563	35.2	33.8	1260	1280	5.25	503
Mo-D	mg/L	10	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0050
Ni-D	mg/L	*	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.010	<0.0010	<0.0050
K-D	mg/L		3.99	11.5	8.93	10.4	3.27	3.33	7.24	7.47	1.03	6.74
S-D	mg/L		<3.0	<3.0	<15	<15	6.3	6.3	<3.0	<30	<3.0	<15
Sb-D	mg/L	0.2	<0.00050	<0.00050	<0.0025	<0.0025	<0.00050	<0.00050	<0.00050	<0.0050	<0.00050	<0.0025
Se-D	mg/L	0.01	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00050
Si-D	mg/L		3.76	4.46	4.42	4.71	4.36	4.73	3.72	3.8	3.42	6.57
Sr-D	mg/L		0.382	2.70	2.16	2.16	0.461	0.422	6.27	5.44	0.193	1.32
Tl-D	mg/L	0.003	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000050
Ti-D	mg/L	1	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.050	<0.0050	<0.025
U-D	mg/L		<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00050
V-D	mg/L		<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.050	<0.0050	<0.025
Zn-D	mg/L	1	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.050	<0.0050	<0.025

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

River Barrier Pillar Monitoring Results

In-Situ

Site ID:		QU11-09 M											
Date:		26-Apr-17	24-May-17	26-Jun-17	27-Jul-17	31-Aug-17	22-Sep-17	26-Oct-17	29-Nov-17	19-Dec-17	30-Jan-18	21-Feb-18	14-Mar-18
Parameter:	**Units**												
SO4-D	**mg/L**	1030	977	948	907	913	869	960	848	854	907	917	858
S2-T	**mg/L**	0.0527	0.0612	0.0447	0.0324	0.0442	0.0662	0.0214	0.0628	0.0173	0.0379	0.0890	0.0343
H2S	**mg/L**	0.0560	0.0651	0.0475	0.0344	0.0470	0.0704	0.0227	0.0668	0.0184	0.0403	0.0946	0.0365
Cond-F	**uS/cm**	3005	2115	2008	3251	2996	2158	2147	2198	2007	2092		2092
pH-F	**pH Units**	7.31	7.17	7.47	7.36	7.08	7.25	7.18	7.58	7.61	7.74		7.74
Alk-T	**mg/L**	514	501	476	477	518	532	554	577	577	386	512	536
Acidity83	**mg/L**	<0.50	8.80	9.60	9.00	<1.0	4.2	<2.0	<1.0	23.3	<1.0	<1.0	<1.0
N-D	**mg/L**	0.299	0.368	0.626	0.399	0.397	0.333	0.481	0.610	0.479	0.369	0.158	0.332
DOC	**mg/L**	0.75	1.14	0.96	1.2	1.5	0.84	1.94	1.76	1.34	0.94	0.95	0.73
Hydrox	**mg/L**	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bicarb	**mg/L**	602	611	559	570	616	650	676	691	704	470	625	635
Carb	**mg/L**	12.8	<0.50	10.8	5.92	7.8	<1.0	<1.0	6.2	<1.0	<1.0	<1.0	9.1
Cl-D	**mg/L**	65	69	63	65	67	70	71	66	66	68	69	67
F-D	**mg/L**	0.098	0.120	0.110	0.110	0.110	0.120	0.120	0.097	0.100	0.110	0.097	0.110
Br-D	**mg/L**	0.107	0.11	0.11	0.106	0.122	0.12	<0.10	0.139	0.136	0.138	0.34	0.32
P-D	**mg/L**	0.0048	0.0041	0.0040	0.0024	0.0047	0.0049	0.0050	0.0054	0.0045	0.0031	0.0050	0.0024
TSS	**mg/L**	33	29.5	38.8									
Al-D	**mg/L**	<0.0030	0.0061	0.0060	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Ag-D	**mg/L**	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
As-D	**mg/L**	0.00307	0.00379	0.00406	0.00354	0.00050	0.00268	0.00142	0.00258	0.00173	0.00238	0.00288	0.00238
Ba-D	**mg/L**	0.0142	0.0146	0.0149	0.0148	0.0156	0.0154	0.0178	0.0177	0.0159	0.0145	0.0143	0.0135
B-D	**mg/L**	1.10	1.09	0.940	1.06	0.95	1.04	1.21	1.21	1.12	0.98	1.03	1.16
Be-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bi-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cd-D	**mg/L**	0.0000071	<0.0000050	<0.0000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
Ca-D	**mg/L**	140	136	114	107	112	114	108	111	105	105	104	100
Cr-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Co-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cu-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Fe-D	**mg/L**	13.4	16.3	18.9	17.5	8.05	14.6	11.0000	12.0000	11.2000	13.6	15.5	12.4
Hard-D	**mg/L**	405	397	338	322	333	339	323	330	313	317	309	303
Pb-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Mg-D	**mg/L**	13.3	13.7	12.8	13.1	12.9	13.5	13.1	13.2	12.4	13.4	11.8	12.9
Mn-D	**mg/L**	0.280	0.297	0.347	0.343	0.288	0.287	0.2790	0.2750	0.2830	0.300	0.285	0.282
Hg-D	**mg/L**	0.0000057	<0.0000020	<0.0000020	0.0000113	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**	567	590	532	536	534	544	529	527	513	561	510	541
Mo-D	**mg/L**	0.0029	0.0025	0.0020	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ni-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
K-D	**mg/L**	6.29	6.29	5.85	6.47	6.45	6.67	5.86	6.26	6.02	6.15	6.12	6.41
S-D	**mg/L**	390	383	334	348	339	334	305	310	301	315	298	341
Sb-D	**mg/L**	<0.00050	<0.00050	<0.00050	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Se-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Si-D	**mg/L**	3.37	3.59	2.96	3.29	3.30	3.47	3.63	3.56	3.28	3.38	3.52	3.27
Sr-D	**mg/L**	1.47	1.36	1.26	1.25	1.30	1.36	1.36	1.41	1.32	1.28	1.14	1.14
Tl-D	**mg/L**	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Ti-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
U-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
V-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Zn-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

* Calculated parameters

River Barrier Pillar Monitoring Results

Ex-Situ

Site ID:		CSR-AW	QU11-05 S		QU11-05 D				QU11-09 S			
Date:			6-Dec-17	5-Mar-18	31-May-17	26-Sep-17	6-Dec-17	5-Mar-18	26-Jun-17	22-Sep-17	19-Dec-17	14-Mar-18
Parameter:	Units											
SO4-D	mg/L	1000	166	134	165	145	161	219	458	441	421	402
S2-T	mg/L		0.0647	0.0565	9.80	9.16	10.6	12.0	1.05	0.295	0.275	0.513
H2S	mg/L	0.02	0.0688	0.0601	10.4	9.74	11.3	12.8	1.12	0.314	0.292	0.545
Cond-F	uS/cm					3688	2826			1459	1285	1117
pH-F	pH Units					7.72	7.81			7.78	8.08	7.78
Alk-T	mg/L		442	275	273	309	361	287	538	451	458	436
Acidity83	mg/L		<1.0	<1.0	4.77	2.1	<1.0	3.6	<0.50	<1.0	2.0	<1.0
N-D	mg/L		0.196	0.207	0.490	683	0.457	0.460	0.563	0.478	0.422	0.417
DOC	mg/L		5.19	1.10	<0.50	4.21	10.7	2.03	1.09	1.20	0.59	0.75
Hydrox	mg/L		<1.0	<1.0	<0.50	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	mg/L		540	328	333	377	441	350	652	528	545	499
Carb	mg/L		<1.0	3.3	<0.50	<1.0	<1.0	<1.0	1.98	10.8	6.5	16.6
Cl-D	mg/L	1500	2.0	2.0	1400	1300	1400	1300	63	52	54	47
F-D	mg/L	2	0.3	0.290	0.032	0.029	0.038	0.290	0.650	0.470	0.470	0.500
Br-D	mg/L		<0.010	0.023	2.37	2.56	2.53	2.1	0.10	<0.10	0.103	0.16
P-D	mg/L		0.0232	0.0346	0.276	0.436	0.451	0.272	0.0401	0.0658	0.0579	0.0748
TSS	mg/L				4.8				<4.0			
Al-D	mg/L		0.0038	0.0042	0.0079	<0.015	0.0170	<0.015	0.0036	<0.015	<0.015	<0.015
Ag-D	mg/L	*	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.000020	<0.00010	<0.00010	<0.00010
As-D	mg/L	0.05	0.0739	0.0957	0.00715	0.0114	0.0111	0.0109	0.0710	0.118	0.113	0.140
Ba-D	mg/L	10	0.142	0.0857	0.362	0.165	0.339	0.280	0.0568	0.0623	0.0512	0.0557
B-D	mg/L	50	1.65	0.905	0.419	0.43	0.62	0.48	2.21	2.17	2.11	1.97
Be-D	mg/L	0.053	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00050	<0.00050
Bi-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050	<0.0050	<0.0050
Cd-D	mg/L	*	<0.0000050	<0.0000050	0.0000430	<0.000025	<0.000025	<0.000025	<0.0000050	<0.000025	<0.000025	<0.000025
Ca-D	mg/L		49.9	38.4	133	138	141	142	32.3	47.6	43.1	49.7
Cr-D	mg/L	0.01	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050	<0.0050	<0.0050
Co-D	mg/L	0.04	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.0010	<0.0010	<0.0010
Cu-D	mg/L	*	<0.00020	0.00024	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.0010	<0.0010	<0.0010
Fe-D	mg/L		1.5500	1.50	0.0493	<0.025	0.0360	0.032	0.162	0.402	0.3280	0.375
Hard-D	mg/L		165	129	353	362	370	375	115	174	155	179
Pb-D	mg/L	*	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.0010	<0.0010	<0.0010
Mg-D	mg/L		9.69	8.10	4.80	4.47	4.33	4.88	8.38	13.3	11.6	13.4
Mn-D	mg/L		0.2400	0.177	0.0806	0.104	0.1670	0.103	0.0221	0.0531	0.0451	0.0514
Hg-D	mg/L	0.001	<0.0000020	<0.0000020	<0.0000020	<0.000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	mg/L		185	121	878	853	799	873	450	358	340	333
Mo-D	mg/L	10	0.0015	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050	<0.0050	<0.0050
Ni-D	mg/L	*	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0050	<0.0050	<0.0050
K-D	mg/L		3.35	3.32	4.97	4.55	4.51	4.99	5.16	4.78	4.39	4.67
S-D	mg/L		58.7	45.9	90.2	1620	58	119	171	164	164	158
Sb-D	mg/L	0.2	<0.00050	<0.00050	<0.00050	<0.0025	<0.0025	<0.0025	<0.00050	<0.0025	<0.0025	<0.0025
Se-D	mg/L	0.01	<0.00010	<0.00010	0.00012	<0.00050	<0.00050	<0.00050	0.00012	<0.00050	<0.00050	<0.00050
Si-D	mg/L		3.06	3.10	3.97	4.41	4.85	4.35	4.74	6.22	6.30	6.72
Sr-D	mg/L		0.546	0.456	1.74	1.53	1.48	1.58	0.592	0.667	0.616	0.635
Tl-D	mg/L	0.003	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	<0.000050
Ti-D	mg/L	1	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.025	<0.025	<0.025
U-D	mg/L		0.00018	<0.00010	0.00017	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00050	<0.00050
V-D	mg/L		<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.025	<0.025	<0.025
Zn-D	mg/L	1	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.025	<0.025	<0.025

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

2-North Plant Monitoring Results

Ex-Situ

Site ID:		CSR-AW	MW-001 S		MW-001 D		MW-006 S		MW-006 D	
Date:			7-Dec-17	28-Feb-18	7-Dec-17	28-Feb-18	7-Dec-17	1-Mar-18	7-Dec-17	27-Feb-18
Parameter:	Units									
SO4-D	mg/L	1000	754		26.6	28.2	533	574	19.5	12.9
S2-T	mg/L		0.0087	0.0210	0.0104	0.0163	0.0064	0.0113	0.0149	0.0075
H2S	mg/L	0.02	0.00925	0.0223	0.0111	0.0173	0.00680	0.0120	0.0158	0.00797
Cond-F	uS/cm		1321	1194	181.9	137.1	1019	1113	134.5	137.9
pH-F	pH Units		6.66	6.68	9.26	9.12	7.95	7.89	8.99	8.79
Alk-T	mg/L		344		92.4		169	165	72.8	80.9
Acidity83	mg/L		20.4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
N-D	mg/L		0.467		0.363		0.375	0.262	0.745	
DOC	mg/L		2.91	2.65	3.09	3.96	2.53	1.90	2.18	0.88
Hydrox	mg/L		<1.0		<1.0		<1.0	<1.0	<1.0	<1.0
Bicarb	mg/L		419		113		207	201	88.8	98.7
Carb	mg/L		<1.0		<1.0		<1.0	<1.0	<1.0	<1.0
Cl-D	mg/L	1500	2.9		1.5	<1.0	5.6	4.3	<1.0	<1.0
F-D	mg/L	2	0.020		0.120	0.140	0.057	<0.20	0.100	0.110
Br-D	mg/L		<0.050		0.015	0.017	0.021	0.15	<0.010	<0.010
P-D	mg/L		0.0117	0.0068	0.172	0.175	0.0546	0.0543	0.173	0.156
TSS	mg/L									
Al-D	mg/L		<0.015	<0.0030	0.0319	0.0391	0.0036	0.0054	0.0189	0.0254
Ag-D	mg/L	*	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
As-D	mg/L	0.05	<0.00050	0.00018	0.0205	0.0189	0.00155	0.00151	0.0296	0.0301
Ba-D	mg/L	10	0.0158	0.0123	0.0036	0.0035	0.0353	0.0330	0.0096	0.0094
B-D	mg/L	50	0.38	0.385	0.071	0.074	0.185	0.176	<0.050	<0.050
Be-D	mg/L	0.053	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bi-D	mg/L		<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd-D	mg/L	*	0.000107	0.0000920	<0.0000050	0.0000050	0.0000270	0.0000930	<0.0000050	0.0000270
Ca-D	mg/L		281	220	8.52	7.63	158.0000000	149	19.1	16.4
Cr-D	mg/L	0.01	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	0.04	<0.0010	0.00040	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-D	mg/L	*	<0.0010	0.00053	0.00161	0.00124	0.00110	0.00197	0.00073	0.00516
Fe-D	mg/L		0.0740	0.0470	<0.0050	0.0135	<0.0050	0.0075	<0.0050	<0.0050
Hard-D	mg/L		914	719	21.7	19.7	452	431	49.9	43.2
Pb-D	mg/L	*	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L		51.6	41.4	0.101	0.152	14.2	14.5	0.535	0.512
Mn-D	mg/L		3.2200	1.84	0.0029	0.0134	0.0300	0.0639	0.0014	0.0019
Hg-D	mg/L	0.001	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	mg/L		96.2	80.7	45.8	40.0	147	152	20.9	19.0
Mo-D	mg/L	10	<0.0050	<0.0010	0.0109	0.0103	0.0301	0.0298	0.0033	0.0031
Ni-D	mg/L	*	<0.0050	0.0025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-D	mg/L		2.40	1.94	0.605	0.556	2.34	2.53	0.729	0.808
S-D	mg/L		276	199	9.0	8.8	200	212	3.3	3.6
Sb-D	mg/L	0.2	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Se-D	mg/L	0.01	<0.00050	<0.00010	<0.00010	<0.00010	0.00027	0.00026	<0.00010	<0.00010
Si-D	mg/L		8.64	8.53	2.63	2.40	4.82	4.82	3.86	3.39
Sr-D	mg/L		1.40	1.12	0.0301	0.0301	0.861	0.825	0.0799	0.0791
Tl-D	mg/L	0.003	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ti-D	mg/L	1	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
U-D	mg/L		0.00301	0.00257	0.00078	0.00071	0.00665	0.00650	0.00071	0.00069
V-D	mg/L		<0.025	<0.0050	0.0064	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zn-D	mg/L	1	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0055

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

7-South Monitoring Results

In-Situ

Site ID:		QU14-10												1M7S			
Date:		26-Apr-17	24-May-17	26-Jun-17	24-Jul-17	24-Aug-17	25-Sep-17	24-Oct-17	23-Nov-17	18-Dec-17	25-Jan-18	19-Feb-18	15-Mar-18	22-May-17	4-Oct-17	21-Dec-17	14-Mar-18
Parameter:	**Units**																
SO4-D	**mg/L**	1430	190	1840	1740	1890	1920	1900	1900	2080	1930	1980	2210	159	195	190	208
S2-T	**mg/L**	0.0380	0.0051	0.0155	0.0080	0.0071	0.0141	0.0109	0.0127	0.0111	0.0147	0.0150	0.0124	0.0071	0.0096	0.0117	0.0102
H2S	**mg/L**	0.0404	0.00542	0.0165	0.00850	0.00755	0.0150	0.0116	0.0135	0.0118	0.0156	0.0159	0.0132	0.00755	0.0102	0.0124	0.0108
Cond-F	**uS/cm**	1786	422.9	2469.2	3626	2670	2307	2577.3	2464	2514	2441	2403	2061		1663	683	676
pH-F	**pH Units**	6.8	7.1	6.76	6.66	6.57	6.73	6.75	6.87	6.9	6.93	6.81	6.8		8	8	7.8
Alk-T	**mg/L**	238	151	294	298	302	298	297	301	307	277	300	271	91.6	139	147	112
Acidity83	**mg/L**	0.85	2.08	22.7	31.3	14.0	20.6	22.3	10.9	54.4	14.6	25.6	7.4	<0.50	<1.0	<1.0	<1.0
N-D	**mg/L**	0.175	2.51	<0.20	0.221	0.258	0.246	0.348	0.201	0.2	0.209	0.162	0.361	0.097	0.262	0.632	0.174
DOC	**mg/L**	0.99	0.71	1.15	0.81	1.4	1.27	3.93	1.44	0.81	0.92	1.35	1.13	<0.50	1.56	1.97	0.80
Hydrox	**mg/L**	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	**mg/L**	290	184	358	363	368	363	363	367	374	338	366	331	112	169	180	136
Carb	**mg/L**	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Cl-D	**mg/L**	4.9	1.2	5.7	5.4	5.5	5.6	5.7	6.0	5.8	5.7	5.5	5.7	3.1	2.4	2.0	4.0
F-D	**mg/L**	0.200	0.220	0.170	0.180	0.180	0.190	0.170	0.2	0.170	0.170	0.160	0.160	0.290	0.420	0.5	0.310
Br-D	**mg/L**	<0.050	<0.010	<0.10	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	0.012	0.37	0.47	<0.010	<0.010	<0.010	0.046
P-D	**mg/L**	0.0259	0.0048	0.0147	0.0145	0.0147	0.0206	0.0130	0.0131	0.0152	0.0099	0.0239	0.0187	0.0196	0.0048	0.0119	0.0080
TSS	**mg/L**	15.5	23.8	<4.0										6.3			
Al-D	**mg/L**	<0.0030	<0.0030	0.0051	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.0030	0.0051	0.0033	<0.0030
Ag-D	**mg/L**	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020
As-D	**mg/L**	0.0739	0.0101	0.0855	0.0758	0.0891	0.0759	0.0682	0.0884	0.0719	0.0849	0.0743	0.0794	0.0688	0.00906	0.0923	0.0295
Ba-D	**mg/L**	0.0250	0.0660	0.0174	0.0170	0.0166	0.0162	0.0160	0.0183	0.0165	0.0182	0.0164	0.0174	0.0407	0.0741	0.0874	0.0509
B-D	**mg/L**	0.828	0.264	1.10	1.17	1.39	1.16	1.12	1.10	1.20	1.03	1.21	1.21	0.427	0.417	0.538	0.295
Be-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010
Bi-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd-D	**mg/L**	0.0000075	<0.0000050	<0.0000050	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.0000050	0.0000080	<0.0000050	0.0000100
Ca-D	**mg/L**	464	104	530	510	504	530	495	522	493	534	510	507	62.5	75.6000000	89.0	99.7
Cr-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	**mg/L**	0.00123	0.00037	0.00122	0.0015	0.0011	0.0013	0.0012	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.00056	0.00160	0.00073	0.00169
Cu-D	**mg/L**	<0.00020	<0.00020	0.00027	0.0022	<0.0010	0.0029	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	0.00024	0.00040	0.00033	0.00022
Fe-D	**mg/L**	5.47	0.688	1.67	1.27	1.84	1.52	1.4000	1.8000	1.2800	1.82	1.45	1.51	<0.0050	0.0468	0.0251	0.0157
Hard-D	**mg/L**	1620	375	2190	2190	2180	2260	2120	2130	2110	2170	2170	2170	229	274	315	323
Pb-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	**mg/L**	111	28.0	211	222	225	228	214	201	213	202	219	218	17.7	20.6	22.5	18.0
Mn-D	**mg/L**	1.18	0.194	1.71	1.52	1.58	1.59	1.4700	1.5500	1.4700	1.54	1.43	1.52	0.0213	0.0781	0.0405	0.135
Hg-D	**mg/L**	0.0000032	<0.0000020	<0.0000020	0.0000043	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**	44.8	10.7	56.6	56.7	61.2	60.0	55.5	56.0	55.4	57.5	54.8	58.7	16.7	16.3	17.5	12.0
Mo-D	**mg/L**	0.0011	<0.0010	0.0011	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0012	0.0011	0.0014	<0.0010
Ni-D	**mg/L**	0.0045	<0.0010	0.0057	0.0066	<0.0050	0.0065	0.0053	<0.0050	0.0055	<0.0050	<0.0050	<0.0050	0.0023	0.0046	0.0028	0.0044
K-D	**mg/L**	6.16	1.97	7.67	8.27	7.87	7.74	8.27	8.18	7.71	7.30	7.81	8.31	2.11	1.89	2.31	1.98
S-D	**mg/L**	538	86.3	735	761	747	724	720	745	694	693	708	758	60.1	67.8	69.6	88.4
Sb-D	**mg/L**	<0.00050	<0.00050	<0.00050	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.00050	0.00064	<0.00050	<0.00050
Se-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	**mg/L**	2.94	3.10	2.68	3.30	3.17	2.83	2.96	3.05	2.99	3.07	3.03	3.08	4.44	3.55	4.14	3.20
Sr-D	**mg/L**	3.24	0.804	5.05	4.59	4.50	5.07	4.45	4.7	4.66	4.75	4.44	4.82	0.523	0.729	0.900	0.670
Tl-D	**mg/L**	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	0.000029	0.000012	0.000033
Ti-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050
U-D	**mg/L**	0.00087	0.00018	0.00137	0.00131	0.00116	0.00130	0.00119	0.00120	0.00126	0.00125	0.00125	0.00126	<0.00010	<0.00010	<0.00010	<0.00010
V-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.0050	<0.0050
Zn-D	**mg/L**	<0.0050	<0.0050	0.0051	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.0050	0.0150

* Calculated parameters

7-South Monitoring Results

Ex-Situ

Site ID:		CSR-AW	QU08-10			QU08-13 A				QU08-13 B			
Date:			29-Jun-17	21-Dec-17	12-Mar-18	7-Jun-17	25-Sep-17	13-Dec-17	21-Feb-18	7-Jun-17	25-Sep-17	13-Dec-17	21-Feb-18
Parameter:	**Units**												
SO4-D	**mg/L**	**1000**	15.2	14.5	18.6	15.2	16.0	30.1	29.8	10.2	11.3	26.7	221
S2-T	**mg/L**		<0.0050	<0.0050	0.0053	0.0644	0.0592	0.164	0.180	0.0355	0.0223	0.0091	0.0122
H2S	**mg/L**	**0.02**	0.00266	0.00266	0.00563	0.0685	0.0629	0.174	0.191	0.0377	0.0237	0.00967	0.0130
Cond-F	**uS/cm**		266.4	2271	253.9		265	298.5	305.5		176	219.5	493.1
pH-F	**pH Units**		7.32	7.61	7.53		7.94	7.96	7.92		8.13	8.8	7.98
Alk-T	**mg/L**		160	175	154	176	180	181	171	147	126	131	139
Acidity83	**mg/L**		<0.50	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
N-D	**mg/L**		0.126	0.241	0.106	0.201	0.263	0.359	0.326	0.141	0.187	0.140	0.199
DOC	**mg/L**		0.65	1.98	0.67	0.95	1.03	2.23	0.99	0.99	1.08	0.82	0.91
Hydrox	**mg/L**		<0.50	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	**mg/L**		191	213	188	207	219	216	209	177	154	160	169
Carb	**mg/L**		2.04	<1.0	<1.0	3.53	<1.0	2.6	<1.0	0.74	<1.0	<1.0	<1.0
Cl-D	**mg/L**	**1500**	0.98	<1.0	<1.0	6.5	7.1	7.9	7.0	3.2	1.1	1.2	1.9
F-D	**mg/L**	**2**	0.680	0.590	0.640	0.710	0.740	0.730	0.710	0.500	0.410	0.400	0.350
Br-D	**mg/L**		<0.010	<0.010	<0.010	0.014	0.016	0.017	0.021	<0.010	<0.010	<0.010	0.050
P-D	**mg/L**		0.0261	0.0197	0.0192	0.184	0.137	0.150	0.120	0.0486	0.168	0.165	0.163
TSS	**mg/L**					<4.0				12.3			
Al-D	**mg/L**		0.0040	0.0031	0.0035	0.0041	<0.0030	<0.0030	<0.0030	0.0035	0.0050	0.2410	0.0219
Ag-D	**mg/L**	*	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
As-D	**mg/L**	**0.05**	0.00123	0.00128	0.00136	0.422	0.382	0.394	0.435	0.493	0.493	0.518	0.518
Ba-D	**mg/L**	**10**	0.0966	0.123	0.134	0.213	0.213	0.249	0.221	0.0587	0.0482	0.0537	0.148
B-D	**mg/L**	**50**	0.228	0.211	0.215	0.601	0.640	0.837	0.604	0.418	0.264	0.359	0.323
Be-D	**mg/L**	**0.053**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bi-D	**mg/L**		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd-D	**mg/L**	*	0.0000150	0.0000182	0.0000130	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000060
Ca-D	**mg/L**		47.3	55.2	49.7	32.7	31.9	33.2	36.5	29.4	27.9	29.7	86.2
Cr-D	**mg/L**	**0.01**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	**mg/L**	**0.04**	0.00037	0.00030	0.00076	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Cu-D	**mg/L**	*	0.00056	0.00079	0.00068	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Fe-D	**mg/L**		0.0181	<0.0050	0.0058	0.249	0.216	0.2230	0.235	0.167	0.127	0.1520	0.524
Hard-D	**mg/L**		157	181	165	116	111	116	126	94.5	89.1	95.8	277
Pb-D	**mg/L**	*	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	**mg/L**		9.41	10.4	9.91	8.28	7.70	8.00	8.36	5.10	4.71	5.26	15.0
Mn-D	**mg/L**		0.0724	0.0630	0.0844	0.0572	0.0637	0.0488	0.0456	0.0681	0.0615	0.0758	0.143
Hg-D	**mg/L**	**0.001**	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**		6.37	5.68	6.37	37.2	38.4	40.6	38.4	27.9	21.7	23.2	28.0
Mo-D	**mg/L**	**10**	0.0024	0.0014	0.0022	<0.0010	<0.0010	<0.0010	<0.0010	0.0018	0.0021	0.0024	0.0018
Ni-D	**mg/L**	*	0.0013	0.0014	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-D	**mg/L**		2.19	2.25	2.54	1.94	1.88	1.99	2.14	1.38	1.29	1.36	2.04
S-D	**mg/L**		5.1	4.9	6.7	3.9	6.0	9.5	10.5	3.2	4.3	7.6	68.6
Sb-D	**mg/L**	**0.2**	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Se-D	**mg/L**	**0.01**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	**mg/L**		3.45	3.76	4.01	3.97	3.75	3.51	3.92	4.35	4.43	3.84	4.67
Sr-D	**mg/L**		0.356	0.438	0.460	0.417	0.403	0.429	0.463	0.253	0.211	0.230	0.673
Tl-D	**mg/L**	**0.003**	0.000019	0.000018	0.000013	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ti-D	**mg/L**	**1**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
U-D	**mg/L**		0.00079	0.00062	0.00051	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
V-D	**mg/L**		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zn-D	**mg/L**	**1**	0.0591	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

4-South Monitoring Results

		In-Situ		Ex-Situ				
Site ID:		**QU11-01**	**CSR-AW**	**QU10-08 D**	**QU10-09 S**		**QU10-09 D**	
Date:		29-Mar-18		29-Mar-18	20-Dec-17	22-Feb-18	20-Dec-17	22-Feb-18
Parameter:	**Units**							
SO4-D	**mg/L**	1380	**1000**	3.6	128	128	79.0	88.4
S2-T	**mg/L**	0.0674		<0.0050	0.0325	0.0324	0.123	0.109
H2S	**mg/L**	0.0716	**0.02**	0.00266	0.0345	0.0344	0.131	0.116
Cond-F	**uS/cm**			347.5				
pH-F	**pH Units**			8.6				
Alk-T	**mg/L**	82.0		260	139	136	184	186
Acidity83	**mg/L**	105		<1.0	4.8	1.5	<1.0	<1.0
N-D	**mg/L**	0.274		0.156	0.253	0.397	0.20	11.4
DOC	**mg/L**	1.79		3.12	2.55	<0.50	2.35	2.99
Hydrox	**mg/L**	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0
Bicarb	**mg/L**	100		300	170	166	225	227
Carb	**mg/L**	<1.0		8.4	<1.0	<1.0	<1.0	<1.0
Cl-D	**mg/L**	3.8	**1500**	5.2	1.1	1.5	1.5	1.9
F-D	**mg/L**	0.200	**2**	1.90	0.056	0.057	0.240	0.220
Br-D	**mg/L**	0.31		<0.010	0.036	0.047	0.022	0.027
P-D	**mg/L**	0.0203		0.164	0.0283	0.0307	0.0352	0.0178
TSS	**mg/L**							
Al-D	**mg/L**	<0.030		0.135	<0.0030	<0.0030	<0.0030	0.0035
Ag-D	**mg/L**	<0.00020	*	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
As-D	**mg/L**	0.156	**0.05**	0.153	0.0869	0.0807	0.100	0.102
Ba-D	**mg/L**	0.014	**10**	0.0168	0.137	0.132	0.129	0.129
B-D	**mg/L**	1.15	**50**	1.80	0.058	0.054	0.471	0.495
Be-D	**mg/L**	<0.0010	**0.053**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bi-D	**mg/L**	<0.010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd-D	**mg/L**	<0.000050	*	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000100
Ca-D	**mg/L**	398		2.11	79.1	74.0	55.4	59.0
Cr-D	**mg/L**	<0.010	**0.01**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	**mg/L**	<0.0020	**0.04**	<0.00020	<0.00020	<0.00020	0.00025	<0.00020
Cu-D	**mg/L**	<0.0020	*	0.00037	0.00021	<0.00020	0.00033	0.00076
Fe-D	**mg/L**	132		0.115	5.3700	5.73	0.5170	0.793
Hard-D	**mg/L**	1170		6.11	246	234	185	199
Pb-D	**mg/L**	<0.0020	*	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	**mg/L**	43.0		0.204	11.8	11.8	11.4	12.5
Mn-D	**mg/L**	2.48		0.104	0.3890	0.402	0.1350	0.0980
Hg-D	**mg/L**	<0.0000020	**0.001**	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**	121		104	10.1	10.3	36.9	36.5
Mo-D	**mg/L**	<0.010	**10**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ni-D	**mg/L**	<0.010	*	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
K-D	**mg/L**	6.51		0.683	0.718	0.734	1.74	1.85
S-D	**mg/L**	487		3.0	43.2	41.9	29.4	28.6
Sb-D	**mg/L**	<0.0050	**0.2**	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Se-D	**mg/L**	<0.0010	**0.01**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Si-D	**mg/L**	5.7		6.38	8.92	8.77	9.30	10.1
Sr-D	**mg/L**	1.77		0.0548	0.324	0.265	1.07	0.990
Tl-D	**mg/L**	<0.00010	**0.003**	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ti-D	**mg/L**	<0.050	**1**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
U-D	**mg/L**	<0.0010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
V-D	**mg/L**	<0.050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zn-D	**mg/L**	<0.050	**1**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

2-3 South Monitoring Results

In-Situ

Site ID:		MW-004				QU11-11								
Date:		6-Apr-17	26-Jul-17	30-Nov-17	20-Feb-18	3-Apr-17	2-May-17	1-Jun-17	11-Jul-17	14-Aug-17	14-Sep-17	3-Oct-17	15-Nov-17	12-Dec-17
Parameter:	**Units**													
SO4-D	**mg/L**	301	322	327	351	438	442	495	524	519	525	548	515	502
S2-T	**mg/L**	<0.0050	<0.0050	0.0149	0.0124	0.0351	0.0297	0.0401	0.0166	0.0193	0.0399	0.0455	0.0507	0.0411
H2S	**mg/L**	0.00266	0.00266	0.0158	0.0132	0.0373	0.0316	0.0426	0.0176	0.0205	0.0424	0.0484	0.0539	0.0437
Cond-F	**uS/cm**	614.2		706	652									
pH-F	**pH Units**	6.88		7.11	7.02									
Alk-T	**mg/L**	129	172	107	93.6	241	254	258	261	274	275	281	268	244
Acidity83	**mg/L**	<0.50	5.51	3.5	4.3									14.3
N-D	**mg/L**	0.185	0.119	0.153	0.133									
DOC	**mg/L**	1.94	2.2	3.44	2.66									
Hydrox	**mg/L**	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<1.0
Bicarb	**mg/L**	157	210	131	114	295	310	314	319	334	335	343	326	298
Carb	**mg/L**	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<1.0
Cl-D	**mg/L**	0.65	0.65	1.7	<1.0									
F-D	**mg/L**	0.079	0.099	0.058	0.072									
Br-D	**mg/L**	0.014	<0.050	<0.010	0.091									
P-D	**mg/L**	0.0027	<0.0020	0.0223	0.0021	0.0028	0.0036	0.0028	0.0048	0.0031	0.0039	0.0041	<0.0020	0.0039
TSS	**mg/L**	<4.0												
Al-D	**mg/L**	0.0053	0.0051	0.0172	0.0074	<0.0030	<0.0030	<0.0030	0.0041	<0.015	<0.015	<0.0030	0.0059	0.0045
Ag-D	**mg/L**	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020
As-D	**mg/L**	0.00037	0.00031	0.00058	0.00034	0.00093	0.00087	0.00083	0.00349	0.00421	0.00436	0.00512	0.00421	0.00341
Ba-D	**mg/L**	0.0346	0.0423	0.0208	0.0228	0.0191	0.0218	0.0197	0.0230	0.0226	0.0224	0.0215	0.0205	0.0212
B-D	**mg/L**	0.228	0.286	0.298	0.168	0.644	0.562	0.602	0.680	0.66	0.67	0.650	0.658	0.744
Be-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010
Bi-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010
Cd-D	**mg/L**	0.0000050	0.0000060	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000090	<0.000025	<0.000025	<0.0000050	<0.0000050	<0.0000050
Ca-D	**mg/L**	121	138	119	134	178	174	192	212	209	198	211	198	181
Cr-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010
Co-D	**mg/L**	<0.00020	<0.00020	0.00037	0.00035	0.00036	0.00037	0.00033	0.00057	<0.0010	<0.0010	0.00048	0.00061	0.00117
Cu-D	**mg/L**	0.00100	0.00077	0.00120	0.00071	<0.00020	<0.00020	0.00024	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020
Fe-D	**mg/L**	0.0067	0.0252	0.0494	0.0178	<0.0050	<0.0050	<0.0050	3.09	3.65	3.63	3.7600	4.2200	3.4900
Hard-D	**mg/L**	363	409	355	402	494	485	539	589	581	550	586	551	506
Pb-D	**mg/L**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020
Mg-D	**mg/L**	14.5	15.8	14.2	16.5	12.1	12.0	14.3	14.5	14.4	13.7	14.3	13.8	12.7
Mn-D	**mg/L**	0.0087	0.0296	0.0287	0.0281	0.238	0.241	0.277	0.319	0.330	0.325	0.3190	0.3120	0.3350
Hg-D	**mg/L**	0.0000048	0.0000047	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020		<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**	44.5	53.1	48.5	34.6	93.0	98.5	104	108	113	108	113	104	111
Mo-D	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010
Ni-D	**mg/L**	<0.0010	<0.0010	0.0018	0.0021	<0.0010	<0.0010	<0.0010	0.0011	<0.0050	<0.0050	<0.0010	0.0012	0.0020
K-D	**mg/L**	1.78	2.03	1.77	1.59	1.51	1.67	1.71	1.81	1.93	1.83	1.80	1.80	1.69
S-D	**mg/L**	111	130	131	129	153	160	174	193	194	187	188	171	182
Sb-D	**mg/L**	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.0025	<0.00050	<0.00050	<0.00050
Se-D	**mg/L**	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010
Si-D	**mg/L**	3.49	3.01	3.77	3.38	2.68	3.23	2.89	3.41	3.45	3.21	2.89	3.58	3.51
Sr-D	**mg/L**	0.946	1.11	0.881	0.947	1.46	1.69	1.64	1.77	1.84	1.82	2.05	1.82	1.80
Tl-D	**mg/L**	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010
Ti-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050
U-D	**mg/L**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010
V-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.025	<0.0050	<0.0050	<0.0050
Zn-D	**mg/L**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0060	<0.025	<0.025	<0.0050	0.0059	0.0069

* Calculated parameters

2-3 South Monitoring Results

Ex-Situ

Site ID:		CSR-AW	MW-002				MW12-23			MW12-24			
Date:			6-Apr-17	25-Jul-17	24-Oct-17	20-Feb-18	28-Jun-17	21-Dec-17	20-Feb-18	28-Jun-17	2-Oct-17	21-Dec-17	20-Feb-18
Parameter:	Units												
SO4-D	mg/L	1000	1220	1220	1330	1360	512	320	300	10.9	6.9	8.9	9.8
S2-T	mg/L		0.0074	<0.0050	0.0078	0.0114	<0.0050	0.0054	0.0113	<0.0050	0.0095	0.0052	<0.0050
H2S	mg/L	0.02	0.00787	0.00266	0.00829	0.0121	0.00266	0.00574	0.0120	0.00266	0.0101	0.00553	0.00266
Cond-F	uS/cm				2067.4	1965		1239	1301		550	564	510
pH-F	pH Units				6.89	6.98		7.3	7.46		8.74	9.35	9.33
Alk-T	mg/L		209	213	247	249	537	642	575	379	377	422	358
Acidity83	mg/L		8.49	17.3	14.3	19.3	<0.50	<1.0	5.6	<0.50	<1.0	<1.0	<1.0
N-D	mg/L		0.227	0.170	0.230	<0.20		0.5300000	0.391	0.366	0.215	0.366	0.160
DOC	mg/L		1.25	0.61	2.02	302		8.54	6.88	2.6	1.77	4.52	3.00
Hydrox	mg/L		<0.50	<0.50	<1.0	<1.0	<0.50	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Bicarb	mg/L		255	260	301	303	655	755	696	436	433	475	376
Carb	mg/L		<0.50	<0.50	<1.0	<1.0	<0.50	14.1	2.8	12.7	13.6	19.3	29.7
Cl-D	mg/L	1500	2.4	1.8	2.3	2.3	22	14	14	4.9	5.0	4.8	4.7
F-D	mg/L	2	0.120	0.130	0.130	0.120	0.160	0.180	0.180	0.230	0.220	0.220	0.210
Br-D	mg/L		<0.10	<0.050	<0.050	0.31	0.10	0.062	0.11	0.031	0.031	0.032	0.017
P-D	mg/L		0.0028	0.0035	0.0038	<0.0020		0.0232	0.0205	0.0848	0.101	0.106	0.102
TSS	mg/L		12.5										
Al-D	mg/L		0.0050	0.022	<0.015	<0.015	0.0523	0.0041	<0.015	0.0516	0.0098	0.0385	0.0583
Ag-D	mg/L	*	<0.000020	<0.00010	<0.00010	<0.00010	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020
As-D	mg/L	0.05	0.00066	0.00092	0.00114	0.00122	0.00172	0.00138	0.00138	0.00289	0.00316	0.00328	0.00297
Ba-D	mg/L	10	0.0153	0.0148	0.0148	0.0158	0.0477	0.0303	0.0317	0.0268	0.0253	0.0248	0.0150
B-D	mg/L	50	0.533	0.50	0.61	0.67	0.553	0.489	0.50	0.527	0.510	0.465	0.423
Be-D	mg/L	0.053	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010
Bi-D	mg/L		<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd-D	mg/L	*	0.0000050	<0.000025	<0.000025	<0.000025	0.000120	0.0000598	0.000059	0.0000200	<0.0000050	0.0000056	0.0000050
Ca-D	mg/L		438	440	453	465	41.5	33.8	34.3	8.60	6.88	7.05	5.75
Cr-D	mg/L	0.01	<0.0010	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Co-D	mg/L	0.04	0.00430	0.0041	0.0037	0.0035	0.00332	<0.00020	<0.0010	0.00039	0.00027	<0.00020	<0.00020
Cu-D	mg/L	*	0.00028	<0.0010	<0.0010	<0.0010	0.00572	0.00394	0.0047	0.00516	0.00046	0.00120	0.00075
Fe-D	mg/L		2.44	2.95	2.8700	3.42	0.0472	0.0058	<0.025	0.131	0.0167	0.0465	0.0772
Hard-D	mg/L		1290	1300	1340	1380	110	88.6	89.7	23.0	18.3	18.8	15.3
Pb-D	mg/L	*	<0.00020	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020
Mg-D	mg/L		47.3	47.8	50.1	53.8	1.48	1.05	0.98	0.371	0.266	0.280	0.228
Mn-D	mg/L		1.95	1.72	1.7200	1.69	0.455	0.0066	<0.0050	0.127	0.1640	0.1610	0.0734
Hg-D	mg/L	0.001	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000030	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Na-D	mg/L		76.6	73.3	94.0	114	443	436	392	177	148	195	181
Mo-D	mg/L	10	<0.0010	<0.0050	<0.0050	<0.0050	0.0080	0.0081	0.0073	0.0066	0.0061	0.0082	0.0072
Ni-D	mg/L	*	0.0020	<0.0050	<0.0050	<0.0050	0.0183	0.0050	0.0054	0.0044	0.0025	0.0028	0.0019
K-D	mg/L		3.88	4.12	4.44	4.63	2.59	2.54	2.37	1.23	0.895	1.01	0.996
S-D	mg/L		427	462	459	478	202	122	106	5.2	<3.0	<3.0	3.3
Sb-D	mg/L	0.2	<0.00050	<0.0025	<0.0025	<0.0025	0.00152	0.00089	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050
Se-D	mg/L	0.01	<0.00010	<0.00050	<0.00050	<0.00050	0.00536	0.00302	0.00295	0.00026	<0.00010	0.00012	0.00012
Si-D	mg/L		3.33	3.54	3.47	3.40	3.71	3.25	3.61	2.92	2.74	2.43	2.70
Sr-D	mg/L		3.00	3.06	3.20	3.52	0.628	0.557	0.439	0.0988	0.0832	0.0958	0.0610
Tl-D	mg/L	0.003	<0.000010	<0.000050	<0.000050	<0.000050	0.000018	0.000036	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010
Ti-D	mg/L	1	<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050
U-D	mg/L		0.00037	<0.00050	<0.00050	<0.00050	0.0298	0.0422	0.0356	0.00263	0.00156	0.00205	0.00202
V-D	mg/L		<0.0050	<0.025	<0.025	<0.025	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050
Zn-D	mg/L	1	<0.0050	<0.025	<0.025	<0.025	0.0122	<0.0050	<0.025	0.0134	<0.0050	0.0059	<0.0050

* Calculated parameters

Highlighted Red indicates CSR-AW exceedance

242 Monitoring Results				
		In-Situ	Ex-Situ	
Site ID:		**242MW**	**QU1136D**	**QU1136S**
Date:		7-Feb-18	8-Feb-18	8-Feb-18
Parameter:	**Units**			
SO4-D	**mg/L**	67.7	11.6	7.1
S2-T	**mg/L**	0.0108	0.0068	<0.0050
H2S	**mg/L**	0.011	0.00723	0.00266
Cond-F	**uS/cm**		254.3	10.7
pH-F	**pH Units**		7.79	6.51
Alk-T	**mg/L**	33.7	168	71.8
Acidity83	**mg/L**	19.3	<1.0	1.1
N-D	**mg/L**	0.206	0.401	0.250
DOC	**mg/L**	<0.50	<0.50	1.07
Hydrox	**mg/L**	<1.0	<1.0	<1.0
Bicarb	**mg/L**	41.1	205	87.6
Carb	**mg/L**	<1.0	<1.0	<1.0
Cl-D	**mg/L**	<1.0	<1.0	<1.0
F-D	**mg/L**	0.051	0.730	0.038
Br-D	**mg/L**	<0.010	<0.010	<0.010
P-D	**mg/L**	0.0022	0.275	0.0024
TSS	**mg/L**			
Al-D	**mg/L**	0.0255	<0.015	<0.0030
Ag-D	**mg/L**	<0.000020	<0.00010	<0.000020
As-D	**mg/L**	0.00065	0.889	0.00933
Ba-D	**mg/L**	0.0376	0.114	0.0967
B-D	**mg/L**	0.074	0.63	<0.050
Be-D	**mg/L**	<0.00010	<0.00050	<0.00010
Bi-D	**mg/L**	<0.0010	<0.0050	<0.0010
Cd-D	**mg/L**	0.0000207	<0.000025	0.0000230
Ca-D	**mg/L**	35.8	43.5	25.2
Cr-D	**mg/L**	<0.0010	<0.0050	<0.0010
Co-D	**mg/L**	0.00254	<0.0010	0.00129
Cu-D	**mg/L**	0.00044	<0.0010	0.00034
Fe-D	**mg/L**	1.46	0.713	0.0383
Hard-D	**mg/L**	98.9	146	73.9
Pb-D	**mg/L**	<0.00020	<0.0010	<0.00020
Mg-D	**mg/L**	2.31	9.13	2.65
Mn-D	**mg/L**	0.341	0.0663	0.126
Hg-D	**mg/L**	<0.0000020	<0.0000020	<0.0000020
Na-D	**mg/L**	2.32	12.6	1.00
Mo-D	**mg/L**	<0.0010	<0.0050	<0.0010
Ni-D	**mg/L**	0.0044	<0.0050	<0.0010
K-D	**mg/L**	0.459	1.00	0.197
S-D	**mg/L**	24.2	<15	<3.0
Sb-D	**mg/L**	<0.00050	<0.0025	0.00205
Se-D	**mg/L**	<0.00010	<0.00050	<0.00010
Si-D	**mg/L**	4.06	4.71	3.12
Sr-D	**mg/L**	0.0593	0.418	0.0270
Tl-D	**mg/L**	0.000251	<0.000050	<0.000010
Ti-D	**mg/L**	<0.0050	<0.025	<0.0050
U-D	**mg/L**	<0.00010	<0.00050	<0.00010
V-D	**mg/L**	<0.0050	<0.025	<0.0050
Zn-D	**mg/L**	0.0125	<0.025	<0.0050
		0.0115		

Appendix C

Enterprise Geoscience Services Ltd.

Borehole Log of QU-78-161 (4 South)

Date Started	: 1978	Drilled By	: n/a
Date Completed	: 1978	Northing Coord.	: 101068.3
Hole Diameter	: 140 mm assumed	Easting Coord.	: 99409.0
Drilling Method	: n/a	Survey By	: n/a
Sampling Method	: n/a	Logged By	: n/a

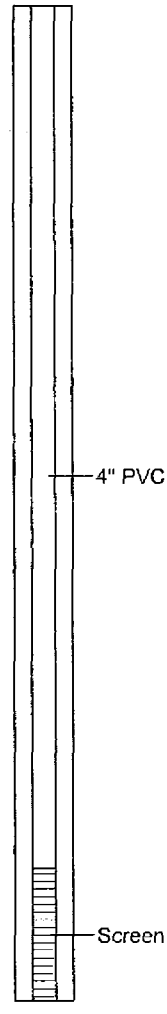
Water Levels

▼ QU-78-161: 305.14 m (12-Jan-2011)

▽

Well: QU-78-161
Elev. m: 318.5

Depth (m)	Elev. m 318.5	USCS	Graphic Symbol	Material Description
50	268.5	SP		
55	263.5	SS		
60	258.5	SM		
65	253.5	SS		
70	248.5			
75				



EOH @ 71.7 m

Notes:

Borehole terminated to drift at 86.4 m.

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\0901 0 Lorax\2010 Work\Borehole logs\QU-78-161.bor

PROJECT No : 002-1065

RECORD OF MONITORING WELL: MW00-1(D&S)

SHEET 1 OF 2

LOCATION: Washplant Ditch, Quinsam Mine

BORING DATE: April 17-18, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		0.00							Cement
		Loose, moist, brown SAND and GRAVEL, trace silt.			1	GRAB					Pea Gravel April 25, 2000 ▽
2				1.83	2	GRAB					Bentonite
4		Dense, dry to moist, grey, coarse GRAVEL and SAND with cobbles (granite), trace to some silt.			3	GRAB			○		Filter Sand
6					4	GRAB					Screen
				7.32	5	GRAB					
8		Dense, moist to dry, grey, gravelly SAND, trace silt, trace to some clay (TILL).			6	GRAB					
10				10.36	7	GRAB					
12					8	GRAB					
14											Pea Gravel
		Dense, moist, dark grey, silty SAND, trace to some gravel, trace clay (TILL).									
16					9	GRAB			○		April 25, 2000 ▽
18											
20				19.31							
		CONTINUED NEXT PAGE									

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: M.D.

CHECKED: J.A.F.

PROJECT No.: 002-1065

RECORD OF MONITORING WELL: MW00-1(D&S)

SHEET 2 OF 2

LOCATION: Washplant Ditch, Quinsam Mine

BORING DATE: April 17-18, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-4} 10^{-5} 10^{-6} 10^{-7})	WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20													
22		Dense, dry, grey, gravelly SAND and GRAVEL, trace to some silt (TILL). *(continued)*											Pea Gravel
24													Bentonite
25				24.38									
26		Dense, dry, gravelly SAND, some clay, trace silt (TILL)			10	GRAB							
28													Screen Filter Sand
30													Drill Cuttings
		End of MONITORING WELL.		30.48									
32													
34													
36													
38													
40													

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

DEPTH SCALE

1 : 100

Golder Associates

LOGGED: M.D

CHECKED: J.A.F.

PROJECT No.: 002-1066

RECORD OF MONITORING WELL: MW00-2

SHEET 1 OF 1

LOCATION: Washplant Ditch, Quinsam Mine

BORING DATE: April 17-18, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Dry, grey SAND and GRAVEL (shale rock fragments) (Rock Fill).		0.00							Cement
				1.52							Bentonite
2		SHALE (bedrock).									April 19, 2000 April 25, 2000 ▽
4		Coal and Shale		3.96	1	GRAB					Filter Sand
		SHALE		4.88	2	GRAB					
		Coal Seam		5.49	3	GRAB					Screen
6		SHALE		6.10							
		End of MONITORING WELL		6.31							
8											
10											
12											
14											
16											
18											
20											

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: M.D.

CHECKED: J.A.F.

BOREHOLE 002-1066.GPJ GLOR_CAN.GDT 2-7-02

PROJECT No.. 002-1065

RECORD OF MONITORING WELL: MW00-4

SHEET 1 OF 3

LOCATION: 3S Pit, Quinsam Coal Mine

BORING DATE: Nov. 20,22&23, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Loose, moist, grey and brown ROCK FILL, some sand and silt		0.00							Bentonite and Concrete
2											
4		Dense, moist, light brown, silty SAND some gravel (sub-angular). (Till).		3.35	1	CS					
6				5.79							
8					2	CS					
10											
12		Medium strong, grey SANDSTONE. - grades to lighter grey @ 15.24m - trace black coal @ 24.38m									
14											
16					3	CS					
18											
20					4	CS					
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: W.H.

CHECKED: J.A.F.

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

PROJECT No.: 002-1065

RECORD OF MONITORING WELL: MW00-4

SHEET 2 OF 3

LOCATION: 3S Pit, Quinsam Coal Mine

BORING DATE: Nov. 20,22&23, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20					4	CS					
22											
24											
26					5	CS					
28		Medium strong, grey SANDSTONE. - grades to lighter grey @ 15.24m - trace black coal @ 24.38m *(continued)*									
30											
32					6	CS					
34											
		VOID - likely old mine workings, broken and caved in bedrock.		34.14							
36				35.66							
38		SANDSTONE.									
40		*CONTINUED NEXT PAGE*									

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

DEPTH SCALE

1 : 100

Golder Associates

LOGGED: W.H.

CHECKED: J.A.F.

PROJECT No. 002-1065

RECORD OF MONITORING WELL: MW00-4

SHEET 3 OF 3

LOCATION: 3S Pit, Quinsam Coal Mine

BORING DATE: Nov. 20,22&23, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
40											
42		SANDSTONE. *(continued)*									Nov. 24/00 ▽
44		VOID - likely old mine workings, broken and caved in bedrock.		44.81							
46		SANDSTONE		45.72							50mm PVC Slotted Pipe
48		VOID - likely old mine workings, broken and caved in bedrock.		48.77							
50		End of MONITORING WELL.		49.68							
52											
54											
56											
58											
60											

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: W.H.
CHECKED: J.A.F.

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

PROJECT No. 002-1065

RECORD OF MONITORING WELL: MW00-6

SHEET 1 OF 1

LOCATION: 3S Pit, Quinsam Coal Mine

BORING DATE: Nov. 21-22, 2000

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — w — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		0.00							
2		Compact, moist, light brown TILL (FILL) (boulders, cobbles, sandy silt).			1	CS					Slough MW 6D Nov. 24/00 ▽
4					2	CS					Bentonite Seal Silica Sand
6				5.79	3	CS					MW 6S Nov. 24/00 ▽ 50mm Slotted PVC Pipe
8											
10											Bentonite Seal
12		Dense, moist to wet, dark grey, sandy SILT (Native), some gravel, cobbles and boulders. (TILL).									
14											
16											50mm Slotted PVC Pipe Silica Sand
18											Slough
20		End of MONITORING WELL.		18.59							

BOREHOLE 002-1065.GPJ GLDR_CAN.GDT 2-7-02

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: W.H.

CHECKED: J.A.F.

Lorax Environmental Services Ltd.
2289 Burrard Street
Vancouver, BC, Canada, V6J 3H9
Phone: +1 (604) 688-7173
Fax: +1 (604) 688-7175
www.lorax.ca

Borehole ID: QU08-10

Project #: 885-1
Project: Quinsam Coal Groundwater Monitoring
Client: Quinsam Coal/Hillsborough Resources
Location: 7 South

Northing: 5533856.79
Easting: 324464.06
Ground Elevation: 295.02m
Steel Casing: 6 inch

Depth	Symbol	Description	Depth/Elev.	Well	Observations
ft / m		Ground Surface			
0 – 20 / 0 – 6		Overburden/ Glacial Till	0.0	Pea Gravel 0.0m-3.0m; Cement Grout 3.0m-17.37m	
22 – 58 / 6.5 – 17.5		Sandstone	21.3	Bentonite Pellets 17.37m-18.29m	

Drilled By: Drillwell
Drill Method: Downhole Hammer
Geologists: M. Storey
Drill Date: March 10, 2008

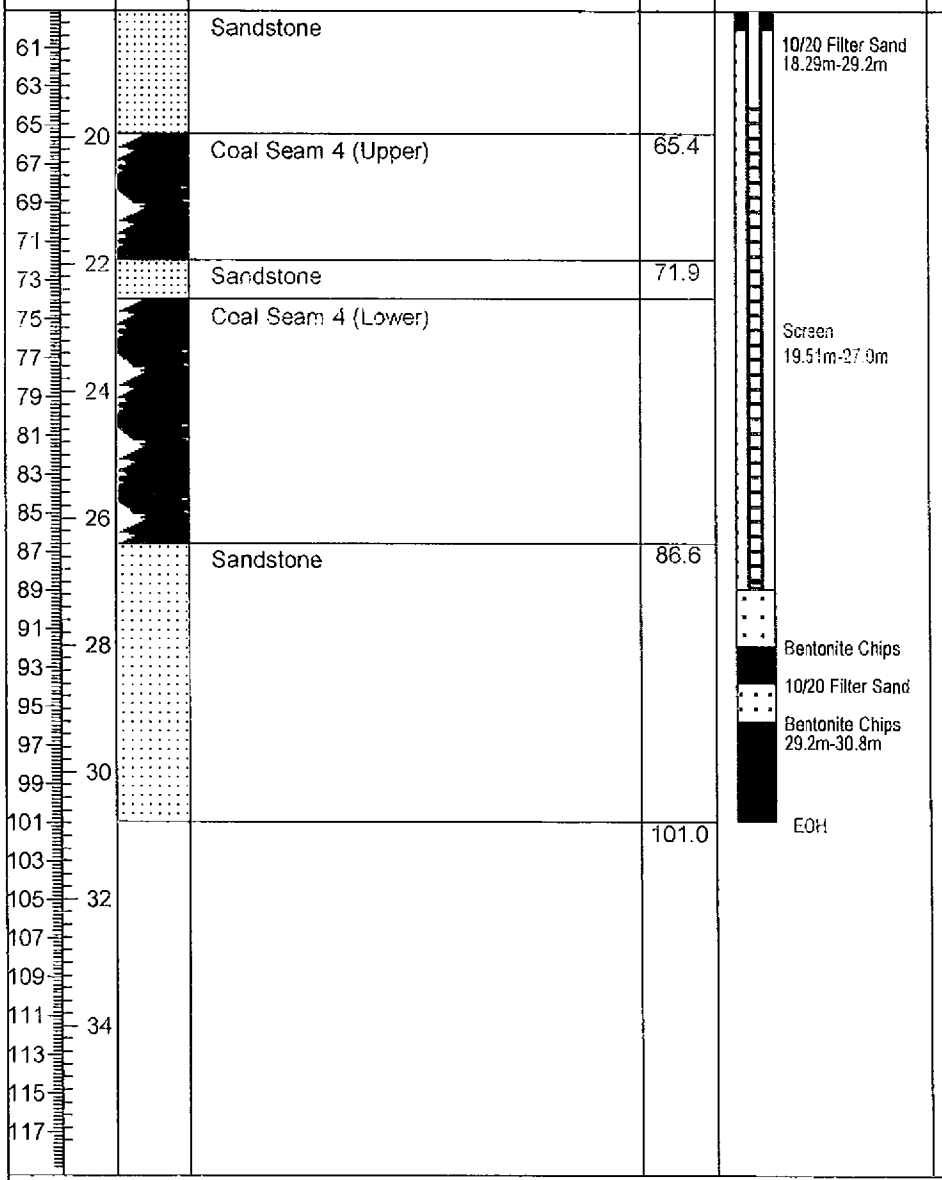
Hole Size: 7 in (0-6.5m), 6 in (6.5m-30.9m)
PVC Casing: 2 inch
Well Installation Date: April 20, 2010
Sheet: 1 of 2

Lorax Environmental Services Ltd.
2289 Burrard Street
Vancouver, BC, Canada, V6J 3H9
Phone: +1 (604) 688-7173
Fax: +1 (604) 688-7175
www.lorax.ca

Borehole ID: QU08-10

Project #: 885-1
Project: Quinsam Coal Groundwater Monitoring
Client: Quinsam Coal/Hillsborough Resources
Location: 7 South

Northing: 5533856.79
Easting: 324464.06
Ground Elevation: 295.02m
Steel Casing: 6 inch



Drilled By: Drillwell
Drill Method: Downhole Hammer
Geologists: M. Storey
Drill Date: March 10, 2008

Hole Size: 7 in (0-6.5m), 6 in (6.5m-30.9m)
PVC Casing: 2 inch
Well Installation Date: April 20, 2010
Sheet: 2 of 2

Lorax Environmental Services Ltd.
2289 Burrard Street
Vancouver, BC, Canada, V6J 3H9
Phone: +1 (604) 688-7173
Fax: +1 (604) 688-7175
www.lorax.ca

Borehole ID: P08-13

Project #: 885-1
Project: Quinsam Coal Groundwater Monitoring
Client: Quinsam Coal/ Hillsborough Resources
Location: 7 South

Northing: 5535188
Easting: 323887
Ground Elevation: 220.40m
Steel Casing: 6 inch

Depth (ft / m)	Symbol	Description	Depth/Elev.	Well A	Well B	Observations
0 / 0		Ground Surface				
0 – 66 / 0 – 20		Overburden Glacial Till			Pea Gravel 0-2.0m Cement Grout 2.0m-4.0m Pea Gravel 4.0m-6.9m Bentonite chips 6.9m-7.93m Pea Gravel 8.6m-13.72m Bentonite Pellets 13.72m-14.94m Pea Gravel 14.94m-21.03m	GW Elevation: 212.41m Well B (April 27, 2010) GW Elevation: 207.21m Well A (April 27, 2010)

Drilled By: Drillwell Enterprises
Drill Method: Downhole Hammer
Geologists: M. Storey
Drill Date: March 3, 2008

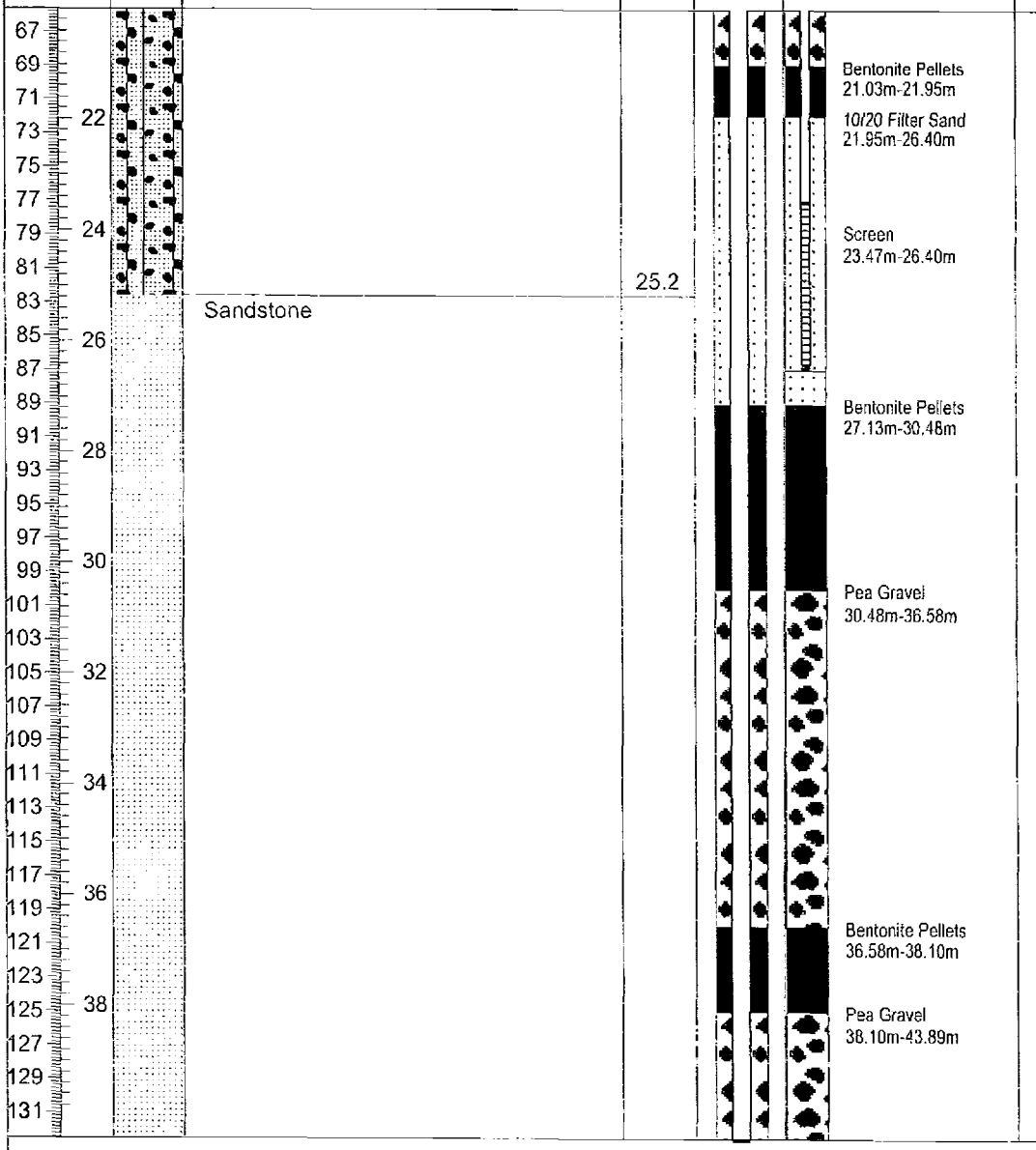
Hole Size: 7 in (0-25.5m), 5.5 in (25.5m-EOH)
PVC Casing: Well A: 2 inch,Well B: 1-1/4inch
Well Installation Date: April 20, 2010
Sheet: 1 of 3

Lorax Environmental Services Ltd.
2289 Burrard Street
Vancouver, BC, Canada, V6J 3H9
Phone: +1 (604) 688-7173
Fax: +1 (604) 688-7175
www.lorax.ca

Borehole ID: P08-13

Project #: 885-1
Project: Quinsam Coal Groundwater Monitoring
Client: Quinsam Coal/ Hillsborough Resources
Location: 7 South

Northing: 5535188
Easting: 323887
Ground Elevation: 220.40m
Steel Casing: 6 inch



Drilled By: Drillwell Enterprises
Drill Method: Downhole Hammer
Geologists: M. Storey
Drill Date: March 3, 2008

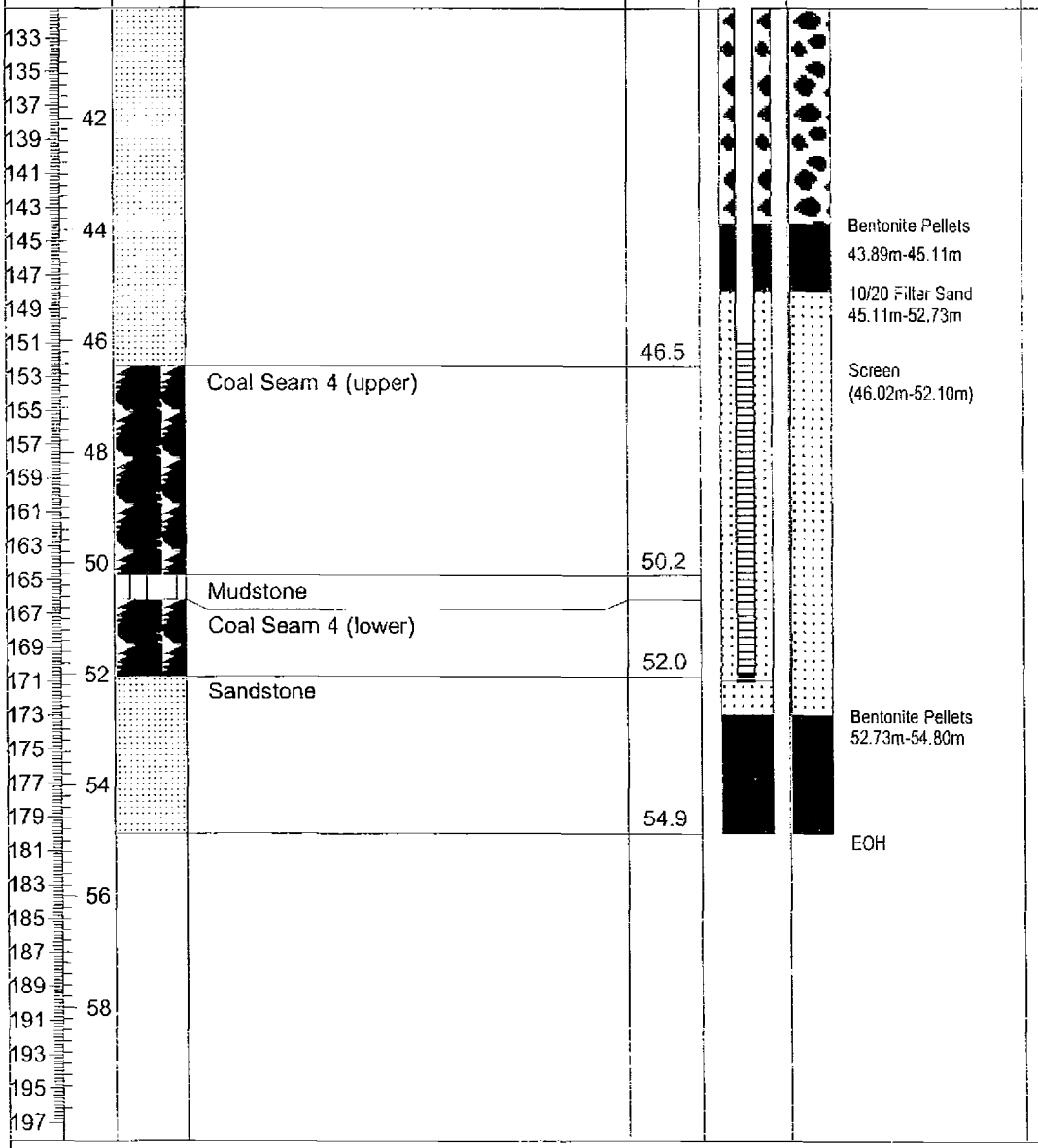
Hole Size: 7 in (0-25.5m), 5.5 in (25.5m-EOH)
PVC Casing: Well A: 2 inch,Well B: 1-1/4inch
Well Installation Date: April 20, 2010
Sheet: 2 of 3

Lorax Environmental Services Ltd.
2289 Burrard Street
Vancouver, BC, Canada, V6J 3H9
Phone: +1 (604) 688-7173
Fax: +1 (604) 688-7175
www.lorax.ca

Borehole ID: P08-13

Project #: 885-1
Project: Quinsam Coal Groundwater Monitoring
Client: Quinsam Coal/ Hillsborough Resources
Location: 7 South

Northing: 5535188
Easting: 323887
Ground Elevation: 220.40m
Steel Casing: 6 inch



Drilled By: Drillwell Enterprises
Drill Method: Downhole Hammer
Geologists: M. Storey
Drill Date: March 3, 2008

Hole Size: 7 in (0-25.5m), 5.5 in (25.5m-EOH)
PVC Casing: Well A: 2 inch,Well B: 1-1/4inch
Well Installation Date: April 20, 2010
Sheet: 3 of 3

Enterprise Geoscience Services Ltd.

Borehole Log of QU-08-21G

Date Started	: May 20, 2008	Drilled by	: Driliwell Enterprises
Date Completed	: May 21, 2008	Northing Coord.	: 102802
Hole Diameter	: 140 mm	Easting Coord.	: 101917
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Core	Logged By	: C.G. Cathyl-Bickford

Water Levels
- QU-08-21G-S 213.14 m (10-Nov-10)
- QU-08-21G-D 212.86 m (10-Nov-10)

Well1: QU-08-21G-S
Well2: QU-08-21G-D
Elev. m: 213.66

Depth (m)	Elev. m (213.66)	USCS	Graphic Symbol	Material Description
0	213			NOT CORED
5	208			
10	203			
15	198			
20	193			
25	188	SS / SL		SANDSTONE - light grey to dark brown, medium to coarse grained, non-calcareous COAL SEAM 6- dull to bright, with siltstone/mudstone lenses SILTSTONE & MUDSTONE interbeds - medium brown to black, carbonaceous
30	183			SANDSTONE - 26.7-34m: light to medium grey, medium to coarse grained, with conglomerate lenses.
35	178	SS		34-52m: light to dark grey, fine to coarse grained. Top of Dunsmuir 'E' Sandstone at 34m
40	173			
45	168			
50				

Pea gravel
Bentonite chips
Pea gravel
PVC 2"/Schedule 40
Bentonite chips
PVC 1.25"/Schedule 40
Pea gravel
Bentonite chips
Pea gravel
Bentonite chips
Pea gravel
Bentonite chips
Pea gravel

Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

05-19-201 ers\John Belfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-08-21G

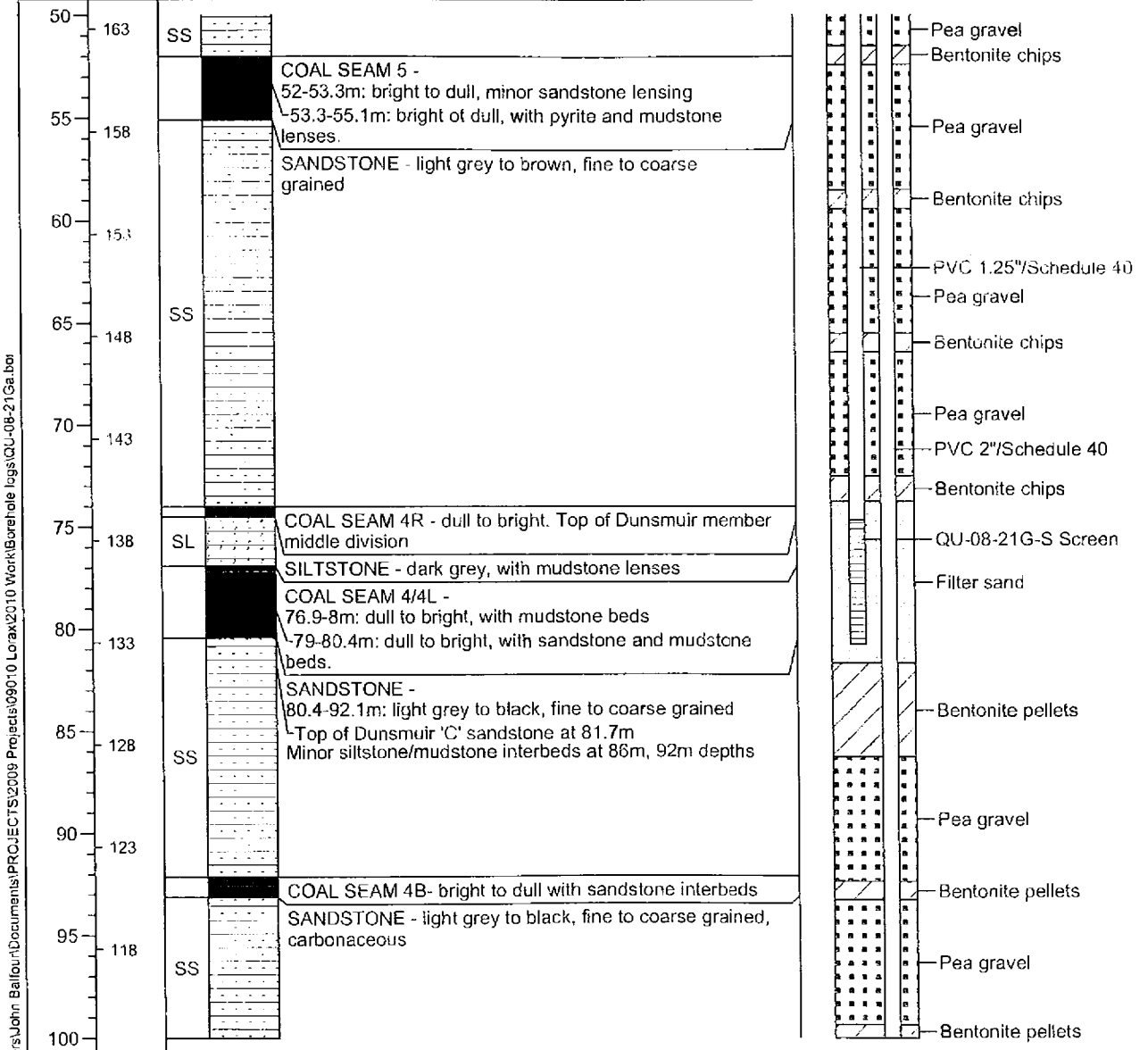
Enterprise Geoscience Services Ltd.

Borehole Log of QU-08-21G

Date Started	: May 20, 2008	Drilled by	: Drillwell Enterprises
Date Completed	: May 21, 2008	Northing Coord.	: 102802
Hole Diameter	: 140 mm	Easting Coord.	: 101917
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Core	Logged By	: C.G. Cathyl-Bickford

Water Levels
- QU-08-21G-S 213.14 m (10-Nov-10)
- QU-08-21G-D 212.86 m (10-Nov-10)

Well1: QU-08-21G-S
Well2: QU-08-21G-D
Elev. m: 213.66



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

05-19-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-08-21Ga.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-08-21G

Date Started	: May 20, 2008	Drilled by	: Drillwell Enterprises
Date Completed	: May 21, 2008	Northing Coord.	: 102802
Hole Diameter	: 140 mm	Easting Coord.	: 101917
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Core	Logged By	: C.G. Cathyl-Bickford

Water Levels
- QU-08-21G-S 213.14 m (10-Nov-10)
- QU-08-21G-D 212.86 m (10-Nov-10)

Well1: QU-08-21G-S
Well2: QU-08-21G-D
Elev. m: 213.66

Depth (m)	Elev. m 213.66	USCS	Material Description
100	113		SANDSTONE - light grey to black, fine to coarse grained, carbonaceous
105	108		
110	103	SS	
115	98		
120	93		
125	88	SL	COAL SEAM 3R - bright, with carbonaceous mudstone interbeds/at top of sequence.
		SL	SILTSTONE & MUDSTONE - dark brown to grey, interbedded
130	83	SL	COAL SEAM 3 - bright to dull, with mudstone lenses at top and bottom of sequence.
			SILTSTONE - medium to dark brown, with mudstone interbeds
135	78		COAL SEAM 3L - dull to bright, interlaminated with mudstone at top of sequence.
			SILTSTONE - 130-133m: dark brown, with dark brown mudstone beds, minor coal lenses at 131m and between 132.7 and 133m
140	73	SS	SANDSTONE - 133-154.6m: light to dark grey, fine to coarse grained, top of Dunsmuir 'A' sandstone at 133m.
145	68		147-149m: dark brown mudstone lenses
150			

Well1: Pea Gravel; Bentonite Pellets; Pea Gravel; Bentonite Pellets; Pea Gravel; Bentonite Pellets; Pea Gravel; PVC 2"/Schedule 40; Bentonite Pellets; Pea Gravel; Bentonite Pellets; Pea Gravel; Bentonite Pellets; Pea Gravel

Well2: Bentonite Pellets; Pea Gravel

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-19-2011 ...ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-08-21G

Enterprise Geoscience Services Ltd.

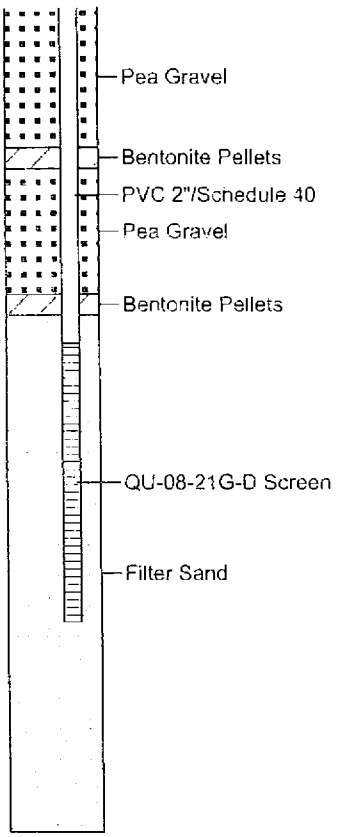
Borehole Log of QU-08-21G

Date Started	: May 20, 2008	Drilled by	: Drillwell Enterprises
Date Completed	: May 21, 2008	Northing Coord.	: 102802
Hole Diameter	: 140 mm	Easting Coord.	: 101917
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Core	Logged By	: C.G. Cathyl-Bickford

Water Levels
- QU-08-21G-S 213.14 m (10-Nov-10)
- QU-08-21G-D 212.86 m (10-Nov-10)

Well1: QU-08-21G-S
Well2: QU-08-21G-D
Elev. m: 213.66

Depth (m)	Elev. m 213.66	USCS	Material Description
150	63	SS	
155	58	MS	MUDSTONE - grey brown, with siltstone lenses, medium brown, carbonaceous
		SL	COAL SEAM 2 - bright to dull, dirty at base (155.0-156.1m)
160	53		SILTSTONE - 156-157.3m: dark grey, with dark brown mudstone interbeds
		SS	SANDSTONE, IRONSTONE and SILTSTONE interbeds - dark grey to brown. Possible fault at 157.3m
165	48		
170	43		
			COAL SEAM 1 - 171.6-172.7m: dull to bright, dirty, with mudstone lensese at top and bottom of sequence (Quinsam No. 1 coal bed)
175	38	MS	
		SL	
180	33	SL	MUDSTONE - 172.7-173.6m: medium brown with siltstone lense at top of sequence -floor of upper bench/top of main parting at 172.9m -interlaminated coal and mudstone between 173.4m and 173.6m -base of main parting at 173.5m
185	28		IRONSTONE, SILTSTONE and MUDSTONE - dark grey to brown
			SANDY SILT, COALY ROCK (Coal Seam 1L).
190	23		SILTSTONE, IRONSTONE, SANDSTONE and MUDSTONE interbeds - 176.9-177.8m: bright coal bands 176.9-184m: dark grey to dark brown conglomerate with sandstone bed at base, dark green, coarse grained
			EOH @ 185.8m
195	18		
200			



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

05-19-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-08-21Gb.bol

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-07

Date Started	: Sept 28, 2010	Drilled by	: Drillwell Enterpirses
Date Completed	: Sept 29, 2010	Northing Coord.	: 101137
Hole Diameter	: 150mm/85mm core	Easting Coord.	: 99263
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels

▼ QU-10-07-S 18.538m (11/19/2010)

▽ QU-10-07-D 14.805m (11/19/2010)

Well1: QU-10-07-S
Well2: QU-10-07-D
Elev. m: 317.61

Depth (m)	Elev. m 317.61	USCS	Graphic Symbol	Material Description
0	317			SANDY SILT (TILL) - red-brown, loose, moist.
				SANDSTONE -
				0.1-3.1m light grey, weathered, fine to medium grained.
				3.1-6.1m light grey, medium grained.
5	312			No water at 6.0m.
				6.1-9.1m medium grey, coarse-grained, moderately weathered with dark grey siltstone lens.
				9.1-12.2m medium grey, medium-coarse grained, fresh.
10	307	SS		No water at 12.2m.
				12.2-21.3m medium grey, fresh.
15	302			
20				

6" Steel Casing to 1.8m
Pea gravel
Bentonite chips
Pea gravel
Bentonite chips
PVC 1.5"/Schedule 40
PVC 1.5"/Schedule 40
Pea gravel
Bentonite chips
Pea gravel

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-07.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-07

Date Started	: Sept 28, 2010	Drilled by	: Drillwell Enterpirses
Date Completed	: Sept 29, 2010	Northing Coord.	: 101137
Hole Diameter	: 150mm/85mm core	Easting Coord.	: 99263
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-07-S 18.538m (11/19/2010)
- QU-10-07-D 14.805m (11/19/2010)

Well1: QU-10-07-S
Well2: QU-10-07-D
Elev. m: 317.61

Depth (m)	Elev. m 317.61	USCS	Material Description
20	297		No water at 21.3m. 21.3-24.4m light grey, fine-medium grained, moderately weathered.
			24.4-30.5m light grey, fine-medium grained, fresh.
25	292		
30	287	SS	30.5-36.6m very light grey, fine-grained, fresh, siltstone lens.
35	282		36.6-39.6m very light grey, fine-medium grained, moderately weathered.
			39.6-48.8m very light grey, fine-medium grained, fresh.
40			

Pea gravel
Bentonite chips
Pea gravel
PVC 1.5"/Schedule 40
PVC 1.5"/Schedule 40
Bentonite chips
Bentonite pellets
Filter sand
QU-10-07-S Screen

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-07.bor

Enterprise Geoscience Services Ltd.

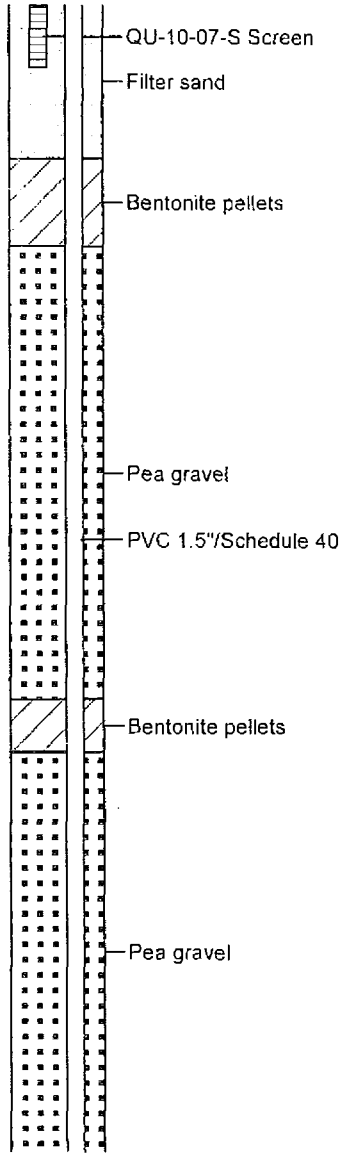
Borehole Log of QU-10-07

Date Started	: Sept 28, 2010	Drilled by	: Drillwell Enterpirses
Date Completed	: Sept 29, 2010	Northing Coord.	: 101137
Hole Diameter	: 150mm/85mm core	Easting Coord.	: 99263
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-07-S 18.538m (11/19/2010)
- QU-10-07-D 14.805m (11/19/2010)

Well1: QU-10-07-S
Well2: QU-10-07-D
Elev. m: 317.61

Depth (m)	Elev. m 317.61	USCS	Graphic Symbol	Material Description
40	277			
45	272			
50	267	SS		48.8-54.9m medium grey, fine to medium grained, fresh.
55	262			No water at 54.9m. 54.9-57.9m medium grey, fine to medium grained, moderately weathered.
60				57.9-61.0m fine grained, dark grey, fresh.



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\090010 Lorax\2010 Work\Borehole logs\QU-10-07.bor

Enterprise Geoscience Services Ltd.

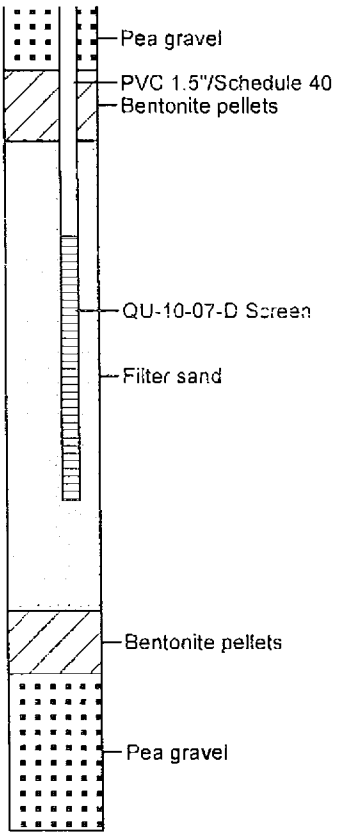
Borehole Log of QU-10-07

Date Started	: Sept 28, 2010	Drilled by	: Drillwell Enterpirses
Date Completed	: Sept 29, 2010	Northing Coord.	: 101137
Hole Diameter	: 150mm/85mm core	Easting Coord.	: 99263
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-07-S 18.538m (11/19/2010)
- QU-10-07-D 14.805m (11/19/2010)

Well1: QU-10-07-S
Well2: QU-10-07-D
Elev. m: 317.61

Depth (m)	Elev. m 317.61	USCS	Material Description
60	257	SS	61.0-64.9m medium-dark grey, fine-medium grained, fresh.
65	252		COAL - Rapid drill penetration. Water in coal seam ~0.5 US GPM.
		MS	COAL/MUDSTONE. Borehole cored from 67.7m to 74.4m (5.5inch diameter)
		SS	Heavily fractured 67.7-69.8m: (2.1m/ 0.6m rec'y). Lost remainder of core run to 69.8m.
			SANDSTONE, medium grey.
70	247	SL	SILTSTONE,
			69.8-70.4m fine grained, dark grey, fresh, heavily fractured 69.8-70.3m, then massive.
			69.8-71.3m: (1.52m/1.4m rec'y).
			heavily fractured 71.3-72.5m.
		SS	71.3-72.7m: (1.37m/1.2m rec'y).
			70.4-71.9m SILTSTONE/SANDSTONE, fine grained, dark grey, fresh.
			grey, SANDSTONE, light grey, medium-coarse grained, fresh. -72.5
75	242		minor fractures 72.5-73.9m.
			Heavily fractured 73.9-74.4m.
			72.7-74.4m: (1.7m/1.75m rec'y).
			Flow 0.75 GPM at 74.4m.
			EOH @ 74.4m
80			



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-07.bor

Enterprise Geoscience Services Ltd.

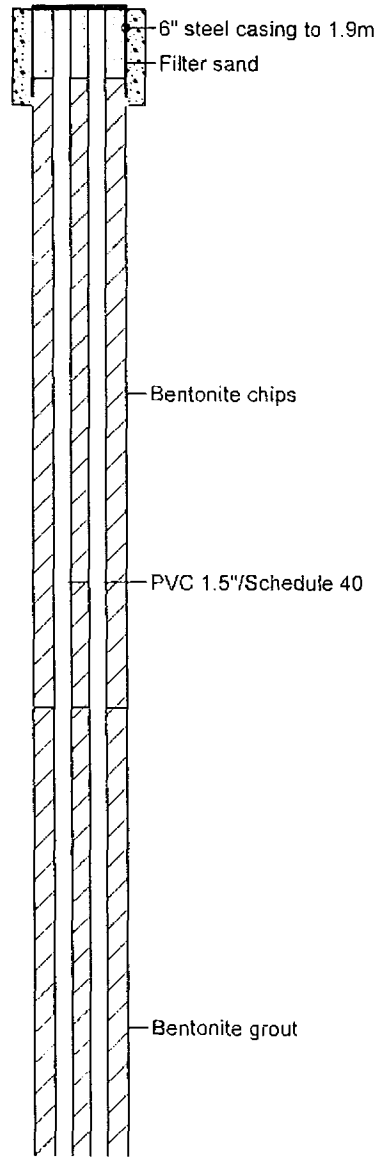
Borehole Log of QU-10-08

Date Started	: Sept 29, 2010	Drilling Company	: Drillwell Enterpirses
Date Completed	: Sept 30, 2010	Northing Coord.	: 100893
Hole Diameter	: 150 mm/85 mm core	Easting Coord.	: 98905
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-08-S: 307.50m (11/19/2010)
- QU-10-08-D: 306.54m (11/19/2010)

Well1: QU-10-08-S
Well2: QU-10-08-D
Elev. m: 339.17

Depth (m)	Elev. m 339.17	USCS	Graphic Symbol	Material Description
0	339			SANDSTONE -
				0-1.8m: green-grey, medium-coarse, fresh
				1.8-7.3m: medium-grey, fine grained, moderately weathered, non-carbonaceous
5	334			
				7.3-18.9m: dark grey, fine grained, fresh, non-carbonaceous
10	329	SS		
15	324			
				18.9-21.3m: dark grey, fine-grained, slightly weathered, non-carbonaceous
20	319			
				21.3-37.2m: medium: grey, fine-medium: grained, fresh, non-carbonaceous
25				



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-08.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-08

Date Started	: Sept 29, 2010	Drilling Company	: Drillwell Enterpirses
Date Completed	: Sept 30, 2010	Northing Coord.	: 100893
Hole Diameter	: 150 mm/85 mm core	Easting Coord.	: 98905
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels

▼ QU-10-08-S: 307.50m (11/19/2010)

▽ QU-10-08-D: 306.54m (11/19/2010)

Well1: QU-10-08-S
Well2: QU-10-08-D
Elev. m: 339.17

Depth (m)	Elev. m 339.17	USCS	Graphic Symbol	Material Description
25	314			
30	309			
35	304	SS		37.2-64.0m: light grey, coarse-grained, fresh, slightly carbonaceous. Hole dry at resumption of drilling next day (Sept 30/10)
40	299			
45	294			
50				

PVC 1.5"/Schedule 40

Bentonite grout

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-08.bor

Enterprise Geoscience Services Ltd.

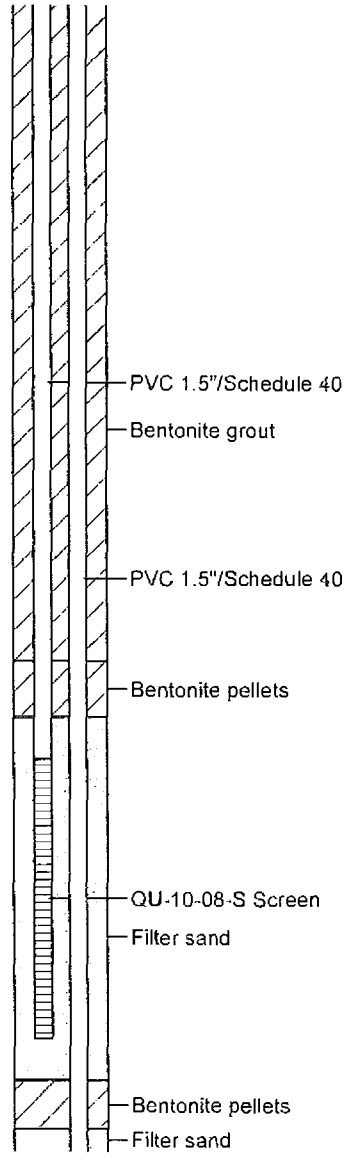
Borehole Log of QU-10-08

Date Started	: Sept 29, 2010	Drilling Company	: Drillwell Enterpirses
Date Completed	: Sept 30, 2010	Northing Coord	: 100893
Hole Diameter	: 150 mm/85 mm core	Easting Coord.	: 98905
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-08-S: 307.50m (11/19/2010)
- QU-10-08-D: 306.54m (11/19/2010)

Well1: QU-10-08-S
Well2: QU-10-08-D
Elev. m: 339.17

Depth (m)	Elev. m 339.17	USCS	Graphic Symbol	Material Description
50	289			
55	284			
60	279			
		SS		64.0-66.4m: light grey, coarse-grained, fresh, not carbonaceous
65	274			66.4-71.5m: medium: grey, coarse grained, fresh, non-carbonaceous
70	269			Dry hole at 71.3m. Borehole cored from 71.3m to EOH 71.5-73.6m: light grey, coarse grained, fresh, non-carbonaceous, moderately fractured. (2.13 m/2.06 rec'y) 73.6-75.7m: light grey, coarse grained, fresh, non-carbonaceous, massive fracture
75				



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-08.bor

Enterprise Geoscience Services Ltd.

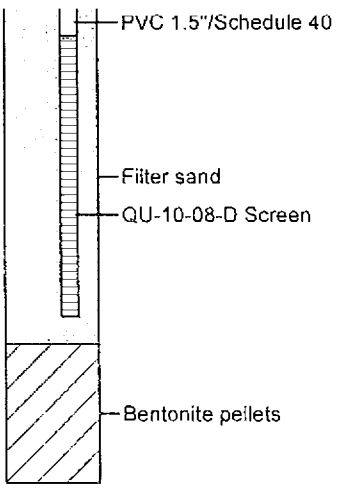
Borehole Log of QU-10-08

Date Started	: Sept 29, 2010	Drilling Company	: Drillwell Enterpirses
Date Completed	: Sept 30, 2010	Northing Coord.	: 100893
Hole Diameter	: 150 mm/85 mm core	Easting Coord.	: 98905
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-08-S: 307.50m (11/19/2010)
- QU-10-08-D: 306.54m (11/19/2010)

Well1: QU-10-08-S
Well2: QU-10-08-D
Elev. m: 339.17

Depth (m)	Elev. m 339.17	USCS	Material Description
75	264	SS	
		SL	SILTSTONE/COAL Interface
		MS	COAL SEAM 3- heavily fractured COAL SEAM 3 and MUDSTONE lenses - heavily fractured 76.4-79.1m: (2.74 m/2.74 rec'y)
80	259		COAL Seam 3 - minor pyrite, heavily fractured 79.1-81.1m: (1.98 m/0.71 rec'y)
		SS	SANDSTONE - 81.1-82.6m: (1.52 m/1.52 rec'y) 81.4-82.6m: dark grey, fine to medium: grained with thin coal stringers (1/8 to 1/2 inch), heavily fractured 82.6-82.9m: light grey, very coarse grained, fresh, minor fractures 82.6-84.1m: (1.52 m/1.42 rec'y) 82.9-85.3m: light-medium: grey, med-coarse grained, massive, fresh 84.1-85.6m: (1.52 m/1.52 rec'y)
85	254		EOH @ 85.3m
90	249		
95	244		
100			



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09013 Lorax\2010 Work\Borehole logs\QU-10-08.bor

Enterprise Geoscience Services Ltd.

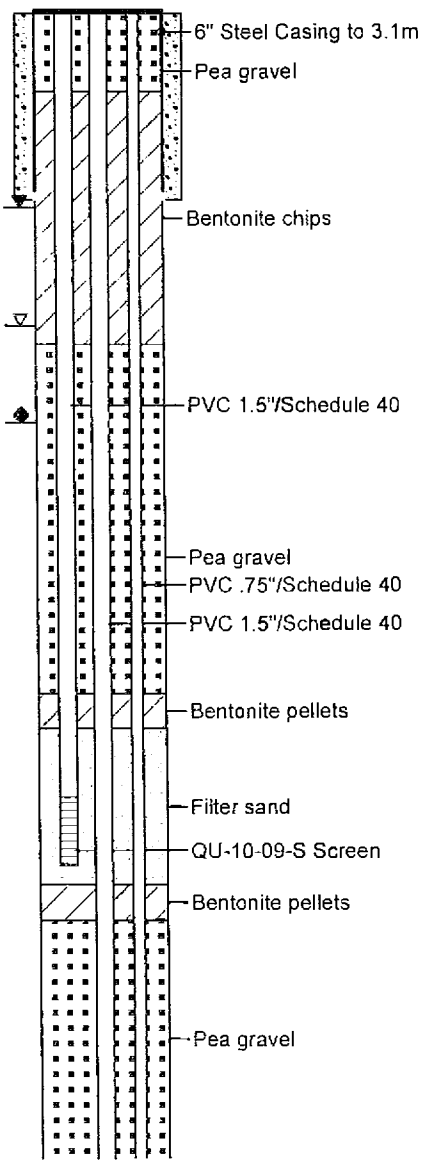
Borehole Log of QU-10-09

Date Started	: Oct 1, 2010	Drilled By	: Drillwell Enterprises
Date Completed	: Oct 5, 2010	Northing Coord.	: 101346
Hole Diameter	: 150 mm	Easting Coord.	: 98931
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-09-S: 300.91m
- QU-10-09-D: 298.84m
- QU-10-09-P: 291.48m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 304.31

Depth (m)	Elev. m 304.31	USCS	Material Description
0	304	f42	Sandy SILT (TILL) - with boulders, red-brown
5	299	ss	SANDSTONE - 3.05-6.1m: light to dark grey, medium grained, fresh, non-carbonaceous
			6.1-9.14m: light to dark grey, medium-coarse grained 8 thin coal stringers (3.18mm) between 6.55-6.71m in weathered siltstone lens quartz vein at 7.3m
			9.1-12.2m: light grey, coarse grained
10	294		iron-stained quartz vein fracture zones at 11.1-11.6m conglomerate inclusions between 11.7-11.9m 12.2-15.2m: light grey, coarse grained 15.2-18.3m: interval. conglomerate inclusions 13.3-14.0m and 14.5-14.8m weathered zone at 14.3m
15	289		18.3-22.6m: light grey, medium coarse grained
			conglomerate lense at 17.7m 22.6-23.5m: light grey, medium coarse grained
20			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-09.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-09

Date Started	: Oct 1, 2010	Drilled By	: Drillwell Enterprises
Date Completed	: Oct 5, 2010	Northing Coord.	: 101346
Hole Diameter	: 150 mm	Easting Coord.	: 98931
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-09-S: 300.91m
- QU-10-09-D: 298.84m
- QU-10-09-P: 291.48m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 304.31

Depth (m)	Elev. m 304.31	USCS	Material Description
20	284		conglomerate lense 20.3-20.4m
			23.5-27.4m: weathered
			27.4-29.6m: medium grey, fine-medium grained, with thin shale stingers
25	279		minor conglomerate inclusions @ 25.3m
			29.6-32m: light to medium grey, fine to medium grained
		SS	32-33.5m: medium grey, medium grained with disseminated shale stringers
30	274		33.5-38.1m: light to medium grey, medium-coarse grained, fractures 32-33.2m COAL seam (1" thick) at 32.2m
			38.1-39.3m: light to medium grey, weathered mudstone lense @ 112 to 112.5 ft, fractures from 117.5 to 124
35	269		flow 9 GPM at 37.8m
		MS	MUDSTONE - dark brown, multiple fractures
40		SS	SANDSTONE - 39.3-42.7m: light to medium grey, medium grained

Pea gravel
Bentonite pellets
PVC 1.5"/Schedule 40
Pea gravel
PVC .75"/Schedule 40
Bentonite pellets
QU-10-09-D Screen
Filter sand
Bentonite pellets

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-05-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-09.bor

Enterprise Geoscience Services Ltd.

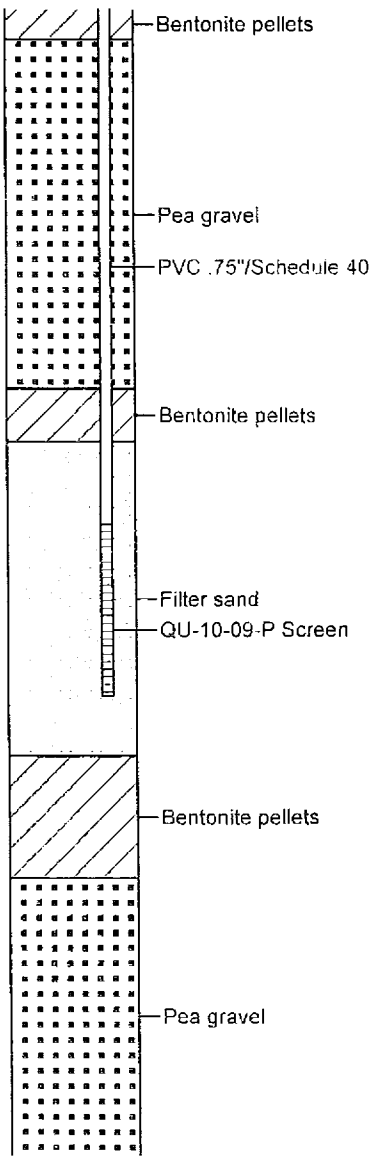
Borehole Log of QU-10-09

Date Started	: Oct 1, 2010	Drilled By	: Drillwell Enterprises
Date Completed	: Oct 5, 2010	Northing Coord.	: 101346
Hole Diameter	: 150 mm	Easting Coord.	: 98931
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-09-S: 300.91m
- QU-10-09-D: 298.84m
- QU-10-09-P: 291.48m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 304.31

Depth (m)	Elev. m 304.31	USCS	Material Description
40	264		fractured at 40.2m
			42.7-45.7m: light to medium grey, medium grained, heavily fractured, MUDSTONE bed (20 cm thick, dark brown)
			thin COAL stringer @43.1m
45	259	SS	45.7-49.2m: light grey, coarse grained, heavily fractured
			47.6-47.8m: mudstone bed (dark brown)
50	254		COAL SEAM 2, heavily fractured with mudstone and coal stringers at base
			flow 12 GPM at 49.4m
		MS	MUDSTONE - dark brown, heavily fractured, with coal stringers over 6" interval. Flow 16 GPM at 50.3m
55	249	SL	SILTSTONE - 54.9-57.3m: dark brown, heavily fractured. 6 inches of light grey unweathered SILTSTONE at base
			coal stringers at 55.2m. Thin coal stringers in weathered mudstone between 55.2-56.1m
		MS	MUDSTONE - dark brown, fractured on 15.24cm spacing, disseminated COAL stringers (1 ft interval) at base of 91.4m moderately fractured mudstone sequence, mudstone heavily fractured at base. Flow 28 GPM at 57.3m
60		SL	



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-09.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-09

Date Started	: Oct 1, 2010	Drilled By	: Drillwell Enterprises
Date Completed	: Oct 5, 2010	Northing Coord.	: 101346
Hole Diameter	: 150 mm	Easting Coord.	: 98931
Drilling Method	: Air Rotary with wireline coring	Survey By	: McElhanney
Sampling Method	: Grab sample/core log	Logged By	: O. Quinn

Water Levels
- QU-10-09-S: 300.91m
- QU-10-09-D: 298.84m
- QU-10-09-P: 291.48m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 304.31

Depth (m)	Elev. m 304.31	USCS	Material Description
60	244		SILTSTONE -
			59.7-61.6m: grey-brown, heavily fractured. Flow 24 GPM at 196m
			fractured 60.3-60.5m
			coal lenses (61.0-91.4cm) between 60.8-61.6m
			61.6-64.3m: light to dark brown
			moderately fractured between 61.7-62.6m with thin coal stringers in fracture zones
		SL	heavily fractured to base at 64.3m
65	239		64.3-68.6m: grey-brown
			moderately fractured between 64.3-65.4m
			heavily fractured 65.4-65.7m
			moderately fractured 65.7-66.3m
			highly fractured 66.3-66.5m
			moderately fractured 66.5-67.1m
70	234		EOH @ 68.6m. Flow 30 GPM at 68.6m.
75	229		
80			

Pea gravel
Bentonite pellets
Pea gravel

Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-09.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-10

Date Started	: Oct 6, 2010	Drilled by	: Drillwelt Enterprises
Date Completed	: Oct 7, 2010	Northing Coord.	: 102903
Hole Diameter	: 150 mm	Easting Coord.	: 101506
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

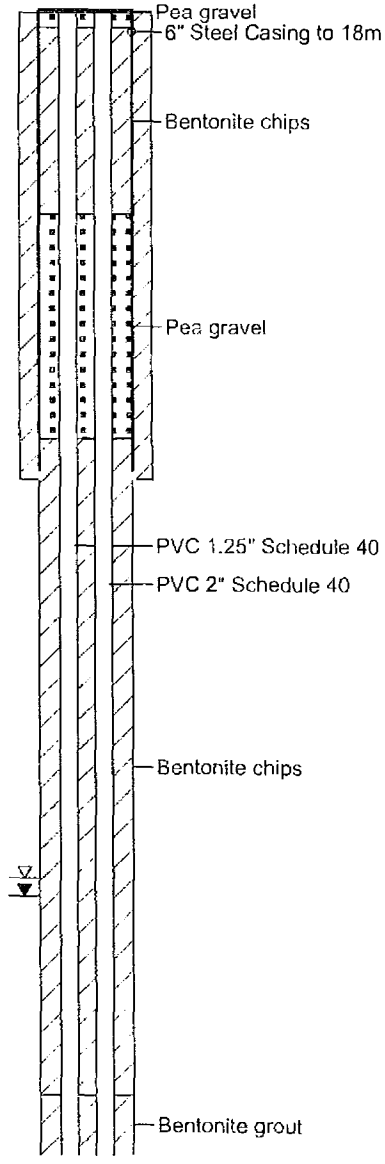
Water Levels

▼ QU-10-10-S: 210.55M (11/19, 2010)

▽ QU-10-10-D: 210.44M (11/18/2010)

Well1: QU-10-10-S
Well2: QU-10-10-D
Elev. m: 244.26

Depth (m)	Elev. m 244.26	USCS	Graphic Symbol	Material Description
0	244			Silty, sandy TILL - with boulders, red-brown
5	239			TILL - grey, with boulders
10	234			
15	229			
20	224	SS		SANDSTONE - 17.7-24.4m: light grey, fine-medium grained, slightly weathered, slightly carbonaceous to 21.3m
25	219			24.4-29.3m: medium grey, fined grained, fresh
30	214	SL		SILTSTONE - dark grey, fresh
35	209	SS		SANDSTONE - 31.1-34.8m: dark grey, fine grained, fresh; 34.8-38.1m: light grey, fine-medium grained, moderately weathered; flow 0.25 US GPM at 36.6m
40	204	SS		COAL SEAM 5 - shiny, with light grey/brown, coarse-grained sandstone; SANDSTONE - 38.4-42.7m: medium grey, fine-med grained, fresh; 42.7-57.9m: grey, medium-coarse grained, fresh; Flow 7.5 US GPM at 42.7m
45				



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-10a.p

Enterprise Geoscience Services Ltd.

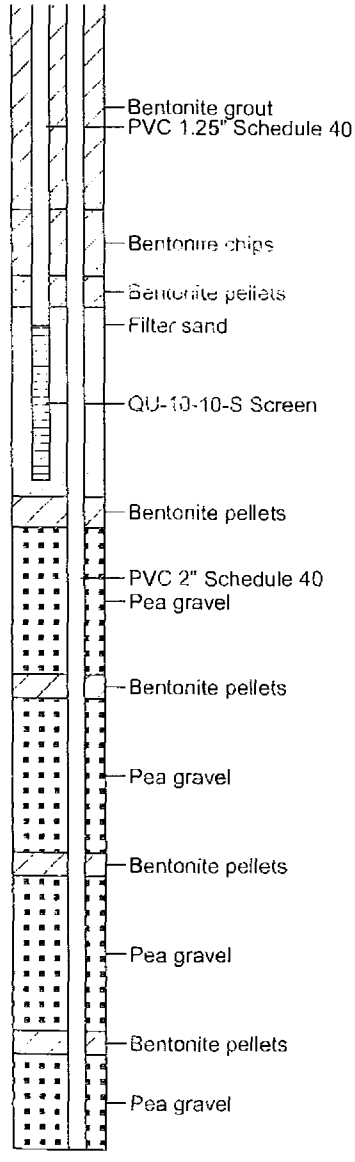
Borehole Log of QU-10-10

Date Started	: Oct 6, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 7, 2010	Northing Coord.	: 102903
Hole Diameter	: 150 mm	Easting Coord.	: 101506
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

Water Levels
- QU-10-10-S: 210.55M (11/19, 2010)
- QU-10-10-D: 210.44M (11/18/2010)

Well1: QU-10-10-S
Well2: QU-10-10-D
Elev. m: 244.26

Depth (m)	Elev. m 244.26	USCS	Material Description
45	199		
50	194	SS	Flow 10 US GPM at 48.8m
55	189		
			COAL (No. 4 Seam). Flow 10 US GPM at 57.91m
60	184	SS	SANDSTONE - 58.2-63.1m: grey, fine-medium grained, fresh
			63.1-80.8m: light grey, medium-coarse grained, fresh
65	179		Flow 10 US GPM at 67.1m
70	174		
75	169		
80	164	MS	MUDSTONE - dark brown, weathered
			COAL (No. 4 B) - shiny, interbedded with dark grey MUDSTONE
		MS	MUDSTONE - dark grey, fresh
85	159	SS	SANDSTONE - 84.73-105.77m: light grey, coarse grained, fresh
90			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-10a.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-10

Date Started	: Oct 6, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 7, 2010	Northing Coord.	: 102903
Hole Diameter	: 150 mm	Easting Coord.	: 101506
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

Water Levels
- QU-10-10-S: 210.55m (11/19, 2010)
- QU-10-10-D: 210.44m (11/18/2010)

Well1: QU-10-10-S
Well2: QU-10-10-D
Elev. m: 244.26

Depth (m)	Elev. m 244.26	USCS	Material Description	Well Construction
90	154	SS	SANDSTONE (cont'd)	Pea Gravel
				Bentonite pellets
95	149			Pea Gravel
100	144			Bentonite pellets
105	139			Pea Gravel
			COAL - shiny, interbedded with dark brown MUDSTONE	Bentonite pellets
		SL	SILTSTONE - dark brown, fresh	
110	134		COAL SEAM 3R - dull to shiny with light brown, weathered mudstone	PVC 2" Schedule 40
		SL	SILTSTONE - dark brown, fresh	Pea Gravel
				Bentontie pellets
115	129		COAL SEAM 3 - shiny	
		MS	MUDSTONE - dark brown, fresh	
		SS	SANDSTONE - 118.3-118.9m: light grey, coarse grained with dull COAL SEAM 3L.	Pea Gravel
120	124	MS	118.9-120.1m: light grey, fine-medium grained, fresh	Bentonite pellets
			MUDSTONE - dark brown, fresh	
125	119	SS	SANDSTONE - 121.9-132.9m: light grey, medium grained, fresh, with interbedded dark brown, fresh, carbonaceous MUDSTONE	Pea Gravel
			Flow 10 US GPM at 128.0m	Bentonite pellets
130	114		132.9-141.1m: light to medium grey, fine-coarse grained, fresh	Pea Gravel
135				Bentonite pellets

Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-10b

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-10

Date Started	: Oct 6, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 7, 2010	Northing Coord.	: 102903
Hole Diameter	: 150 mm	Easting Coord.	: 101506
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

Water Levels
- QU-10-10-S: 210.55m (11/19, 2010)
- QU-10-10-D: 210.44m (11/18/2010)

Well1: QU-10-10-S
Well2: QU-10-10-D
Elev. m: 244.26

Depth (m)	Elev. m 244.26	USCS	Material Description
135	109	SS	
140	104		Flow 12 US GPM at 140.2m
		MS	MUDSTONE - dark brown, fresh
145	99		COAL SEAM 2 - shiny, with dark brown, fresh MUDSTONE
		MS	MUDSTONE - 144.3-148.7m: medium brown, fresh 148.7-149.0m: COAL lens 148.7-150.3m: dark brown
150	94		150.3-156.7m: dark brown, with grey-green, fine-medium grained SILTSTONE, fresh
155	89		156.7-160.9m: dark brown, fresh Flow 12 US GPM at 158.5m
160	84		COAL SEAM 2L/1R - shiny, with light brown, fresh MUDSTONE
		MS	MUDSTONE - 162.5-165.4m: light brown, fresh
165	79		Flow 12 US GPM at 164.6m
		MS	COAL SEAM 1- shiny
			MUDSTONE - grey-brown, fresh
		MS	COAL SEAM 1 - shiny, with medium-brown, fresh, MUDSTONE
170	74	MS	MUDSTONE - dark brown-grey, fresh
			COAL - shiny, with medium-brown, fresh, MUDSTONE
			MUDSTONE - dark brown-grey, fresh
175	69		COAL SEAM 1L - shiny with medium-brown. fresh MUDSTONE
		SL	SILTSTONE - 173.1-177.7m: green-grey, fresh
180			EOH @ 179.83m (Flow 12 US GPM)

Bentonite pellets
Pea Gravel
Bentonite pellets
Pea Gravel
PVC 2" Schedule 40
Bentonite pellets
Pea Gravel
Bentonite pellets
Pea Gravel
Bentonite pellets
QU-10-10-D Screen
Sand Pack
Bentonite pellets
Pea Gravel.

Quinsam Coal
Assessment of Undergrounc Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-10b.bor

Enterprise Geoscience Services Ltd.

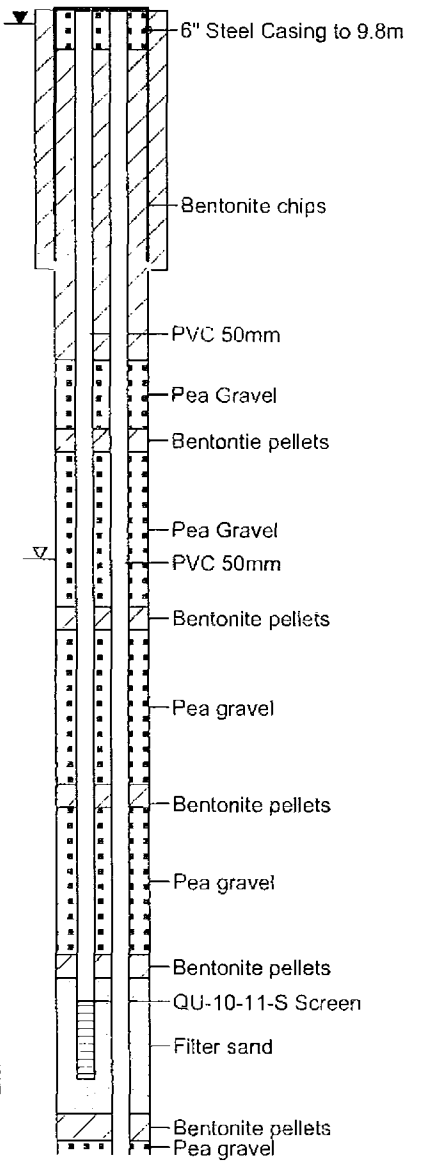
Borehole Log of QU-10-11

Date Started	: Oct 8, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 13, 2010	Northing Coord.	: 103177
Hole Diameter	: 150 mm	Easting Coord.	: 101451
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

Water Levels
- QU-10-11-S 248.939 m (21/01/2011)
- QU-10-11-D 227.892 m (08/02/2011)

Well1: QU-10-11-S
Well2: QU-10-11-D
Elev. m: 249.5

Depth (m)	Elev. m 249.5	USCS	Material Description
0	249	f42	sandy SILT TILL - with boulders 0-3.7m red brown 3.7-9.1m grey-brown
5	244		
10	239	ss	SANDSTONE - 9.1-17.4m light grey, coarse-grained, highly weathered
15	234		17.4-18.9m greenish grey, medium grained 18.9-25.9m light grey, medium grained
20	229		
25	224		25.9-34.4m light grey, medium grained, moderately weathered
30	219		Hole dry at 33.5m
35	214		34.1-45.7m light-medium grey, medium to coarse grained, fresh
40	209		flow at fracture (40.8m) 30 US GPM
45			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-19-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-11a.b

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-11

Date Started	: Oct 8, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 13, 2010	Northing Coord.	: 103177
Hole Diameter	: 150 mm	Easting Coord.	: 101451
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	: O. Quinn

Water Levels

QU-10-11-S 248.939 m (21/01/2011)

QU-10-11-D 227.892 m (08/02/2011)

Well1: QU-10-11-S
Well2: QU-10-11-D
Elev. m: 249.5

Depth (m)	Elev. m 249.5	USCS	Material Description
45	204	SS	45.7-47.5m dark grey, fine-medium grained, fresh, carbonaceous
			COAL SEAM - dirty
50	199		SANDSTONE - 47.8-71.3m grey to grey-brown, medium-coarse to medium grained, fresh flow 30 US GPM at 48.8m
55	194		flow 30 US GPM at 54.9m
60	189	SS	
65	184		flow 20 US GPM at 67.1m (water was flowing out of adjacent exploration hole, QU-05-10 during this measurement)
70	179		
		MS	COAL SEAM 4B- with SILTSTONE/MUDSTONE
			MUDSTONE - dark brown, fresh
			COAL (No. 4 B Seam) - with SILTSTONE/MUDSTONE
75	174		SANDSTONE - 72.85-86.26m grey brown to grey, medium to coarse grained, fresh
80	169		flow 15 US GPM at 79.25m
		SS	
85	164		86.26-91.44m dark brown, fine grained, fresh
90			

Pea gravel
Bentontie pellets
Pea gravel
Bentontie pellets
Pea gravel
Bentonite pellets
PVC 50mm
Pea Gravel
Benotnite pellets
Pea gravel
Benotnite pellets
Pea Gravel
Bentonite pellets
Pea gravel

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-19-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-11a.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-10-11

Date Started	: Oct 8, 2010	Drilled by	: Driliwell Enterprises
Date Completed	: Oct 13, 2010	Northing Coord.	: 103177
Hole Diameter	: 150 mm	Easting Coord.	: 101451
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sampie	Logged By	: O. Quinn

Water Levels
- QU-10-11-S 248.939 m (21/01/2011)
- QU-10-11-D 227.892 m (08/02/2011)

Well1: QU-10-11-S
Well2: QU-10-11-D
Elev. m: 249.5

Depth (m)	Elev. m 249.5	USCS	Material Description
90	159	SS	SANDSTONE (cont'd) - 91.44-94.49m dark grey, medium grained, fresh. flow 12 US GPM at 91.44m. (QU-10-05 flowing during measurement).
95	154	SS	COAL SEAM 3R - shiny, with dark brown, fresh MUDSTONE
			SANDSTONE - medium grey
		MS	MUDSTONE - 96.93-102.11m dark brown, fresh flow 30 US GPM at 97.54m (QU-10-05 flowing during measurement).
100	149		COAL SEAM 3L - shiny, with dark brown, fresh MUDSTONE
		MS	MUDSTONE - 103.02-106.07m dark brown, fresh flow 18 US GPM at 103.63m (QU-10-05 flowing during measurement).
105	144	SS	
		MS	SANDSTONE - light grey, fine-medium grained with dark brown mudstone
110	139		MUDSTONE - 108.21-109.73m dark brown, fresh, with minor COAL seams flow 30 US GPM at 109.73m (QU-10-05 flowing during measurement).
115	134		SANDSTONE - 109.73-115.21m grey, fine to medium grey, with dark brown MUDSTONE lenses 115.21-130.45m grey, fine to medium grained, fresh flow 12 US GPM at 115.82m (QU-10-05 flowing during measurement). COAL stringers at 118.87m and 121.62-121.92m flow 7 US GPM at 121.92m (QU-10-05 flowing during measurement).
120	129	SS	
125	124		flow 9 US GPM at 128.02m (QU-10-05 flowing during measurement).
130	119	SL	SILTSTONE - 130.45-132.89m dark brown, fresh flow 6 US GPM at 132.59m (QU-10-05 flowing during measurement).
		MS	MUDSTONE - dark brown
135			

Pea gravel
Bentonite pellets
Pea gravel
Bentonite pellets
Pea gravel
Bentonite pellets
PVC 2"/Schedule 40
Pea gravel
Bentonite pellets
Pea gravel
Bentonite pellets
Pea gravel
Bentonite pellets
Pea gravel
Bentonite pellets

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-19-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-11b.

Enterprise Geoscience Services Ltd

Borehole Log of QU-10-11

Date Started	: Oct 8, 2010	Drilled by	: Drillwell Enterprises
Date Completed	: Oct 13, 2010	Northing Coord.	: 103177
Hole Diameter	: 150 mm	Easting Coord.	: 101451
Drilling Method	: Air Rotary	Survey By	: McElhanney
Sampling Method	: Grab sample	Logged By	. O. Quinn

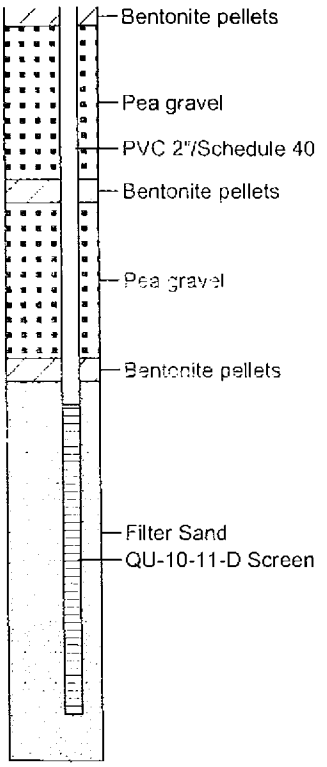
Water Levels

▼ QU-10-11-S 248.939 m (21/01/2011)

▽ QU-10-11-D 227.892 m (08/02/2011)

Well1: QU-10-11-S
Well2: QU-10-11-D
Elev. m: 249.5

Depth (m)	Elev. m 249.5	USCS	Material Description
135	114	MS	coal beds at 134.11, 136.25 and 138.07m
140	109	MS	COAL SEAM 2 - shiny, with MUDSTONE
			MUDSTONE - flow 4 US GPM at 140.21m (QU-10-05 flowing during measurement).
		MS	COAL SEAM 2- shiny, with MUDSTONE
145	104		MUDSTONE - fresh
			COAL SEAM 2L/1U
		MS	MUDSTONE - medium grey-brown, with shiny COAL stringers
150	99		flow 16 US GPM at 146.3m (QU-10-05 flowing during measurement).
			COAL SEAM 1 - shiny with MUDSTONE flow 4 US GPM at 152.4m (QU-10-05 flowing during measurement).
155	94	MS	MUDSTONE - light brown to green/grey
			COAL SEAM 1L - shiny with MUDSTONE
160	89	SS	SANDSTONE - greenish grey, fine-medium grained, fresh
			flow 11 GPM at 158.5m (QU-10-05 flowing during measurement).
		SH	SHALE - red-brown, fresh
165	84		EOH @ 164.59m, flow 11 GPM
170	79		
175	74		
180			



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

05-19-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-10-11b.bor

LOG FOR DRILLHOLE #: Qu10-13 **Page: 1 of 5**

Client: Hillsborough Resources
Project: 7S Permit
Drilling Method: Rotary
Drilling Contractor: DrillWell
Engineer: M Cullen, L Fletcher
Date Started: Nov 5, 2011

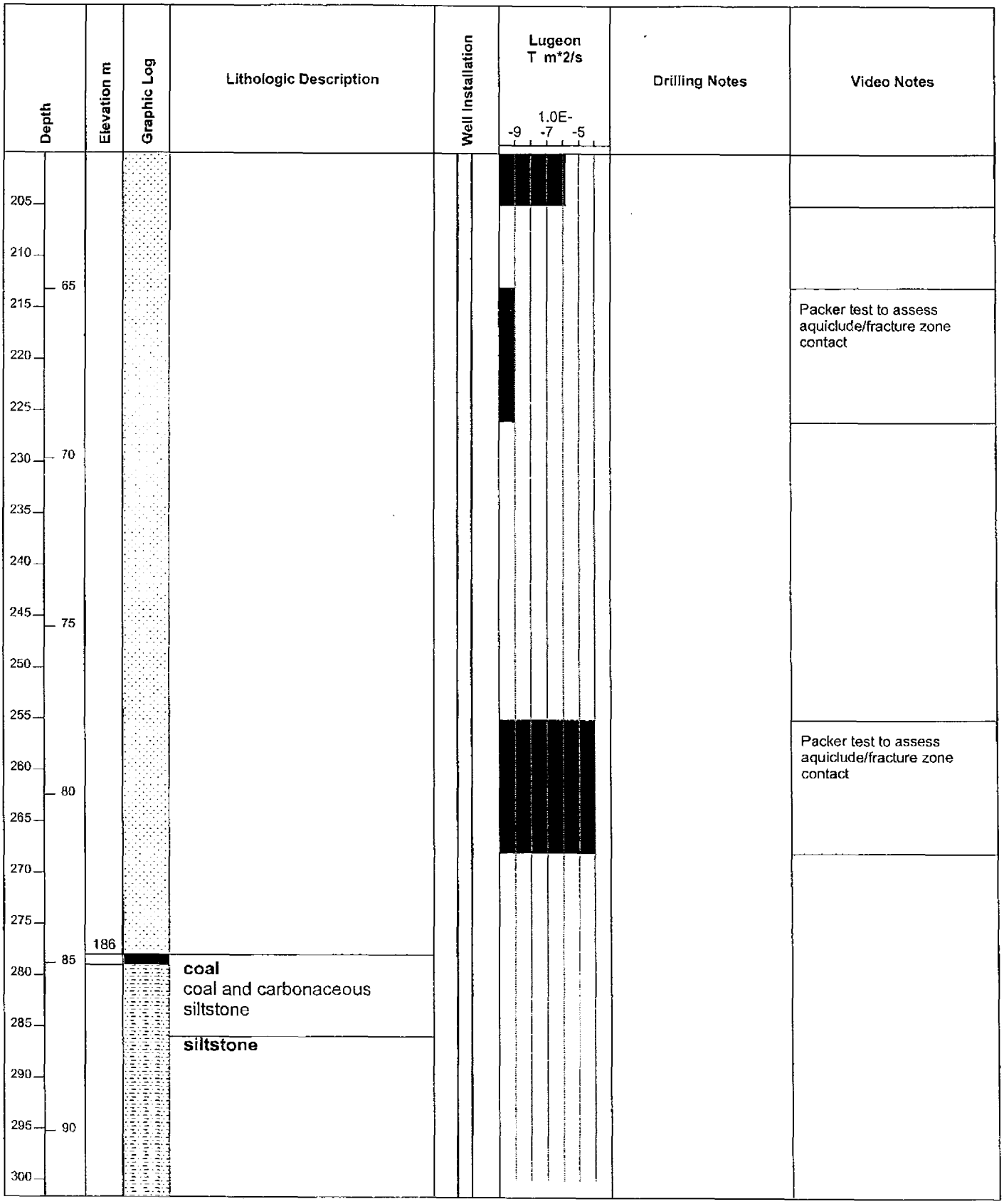
Co-ordinates:
Collar Elev.: 270.68
Dip/Dip direction: vert
Total Depth: 483
Casing Depth: 5
Hole dia:

Depth ft	Depth m	Elevation m	Graphic Log	Lithologic Description	Well Installation	Lugeon T m*2/s (1.0E-9 … 1.0E-5)	Drilling Notes	Video Notes
0	0	271		Ground Surface				
5		269		**overburden**				
				sedimentary sequence Dunsmuir Formation				horiz fractures: staining, pre-existing, possible open
100	30							, no fractures evident

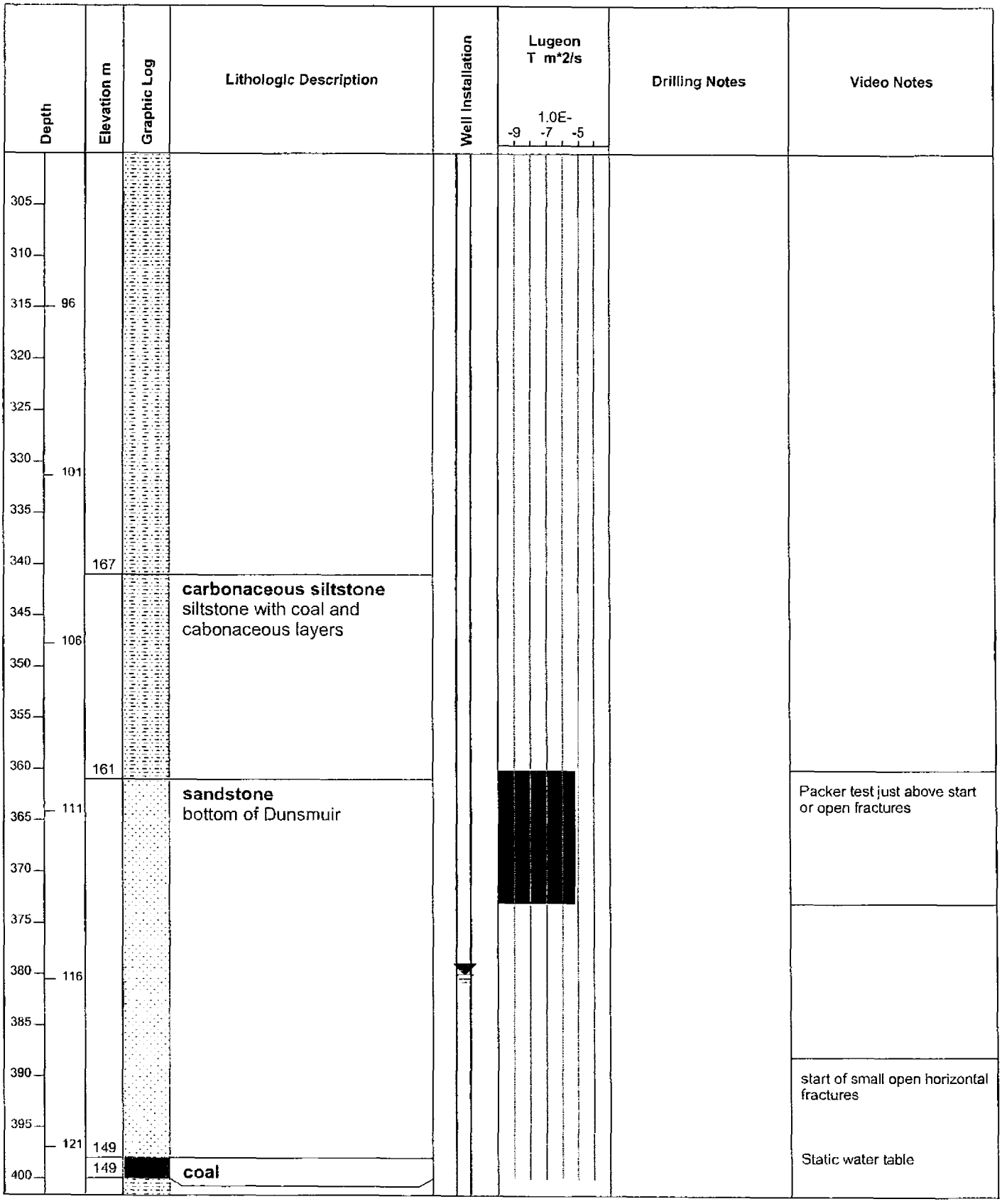
LOG FOR DRILLHOLE #: Qu10-13 **Page: 2 of 5**

Depth	Elevation m	Graphic Log	Lithologic Description	Well Installation	Lugeon T m^2/s (1.0E-9 to 1.0E-5)	Drilling Notes	Video Notes
105–200 (35, 40, 45, 50, 55, 60)							sections of rough drill hole wall from 120 to 234 ft Packer testing over sections of rough DH wall to test for aquiclude Packer testing over piezometer location and dilated zone small open fractures; possible new Packer testing over dilated zone

LOG FOR DRILLHOLE #: Qu10-13 **Page: 3 of 5**



LOG FOR DRILLHOLE #: Qu10-13 **Page: 4 of 5**



LOG FOR DRILLHOLE #: Qu10-13 **Page: 5 of 5**

Depth	Elevation m	Graphic Log	Lithologic Description	Well Installation	Lugeon T m*2/s (1.0E-9 -7 -5)	Drilling Notes	Video Notes
405			**siltstone** Cumberland Formation siltstone, sandy siltstone, occassional sandstone layers				start of larger open horizontal fractures
410							
	126						
415							start of broken rock (caved zone)
420							
425						Hole starts making water at ~1gpm	
430	131						
435							
440							
445							
	136						
450							
455							
460							
	141						
465						possible fracture	
470							
475							
480	146						
	124					water increases to ~12 gpm	
	123		**coal** #1 Rider Seam				
485						end of hole, hole collapsing	
490							
495	151						
500							

Enterprise Geoscience Services Ltd.

Borehole Log of QU-11-01 (4 South)

Date Started	: 4 Jan 2011	Drilled By	: Dirtiwell Enterprises
Date Completed	: 6 Jan 2011	Northing Coord.	: 101056.7
Hole Diameter	: 140 mm	Easting Coord.	: 99134.6
Drilling Method	: Air rotary with wireline coring	Survey By	: Quinsam
Sampling Method	: Core	Logged By	: N. Bazowski

Water Levels

▼ QU-11-01: 290 01 m (19-Feb-11)

▽

Well: QU-11-01
Elev. m: 316.368

Depth (m)	Elev. m 316.368	USCS	Graphic Symbol	Material Description	Remarks
65	251.37				
		SP			
70	246.37				
		SS			+ Shale traps at 73 m.
75	241.37				+ Shale traps at 76 m.
80	236.37	SM			
		SS			+ Hole intersects minedrift at 85.2 m.
85	231.37			EOH @ 85.2 m	
90					

4" PVC

Screen

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-01.bor

Enterprise Geoscience Services Ltd.

Borehole Log of QU-11-03 (2 North)

Date Started	: Jan 12, 2011	Drilled By	: Drillwell Enterprises
Date Completed	:	Northing Coord.	: n/a
Hole Diameter	: 150 mm / 140 mm core	Easting Coord.	: n/a
Drilling Method	: Air rotary with wireline coring	Survey By	:
Sampling Method	: Grab sample / Core	Logged By	: N. Bazowski

Water Levels
▼ QU-11-03: 42.21 m bTOC (18-Jan-2011)
▽

Well: QU-11-03
Elev. m: xxx

Depth (m)	Elev. m 304	USCS	Graphic Symbol	Material Description	Remarks
65	239				
		SP		From 0 - 69.34 m not logged SANDSTONE, zone of silty sandstone, from: 71.52 - 73.64 m and 74.18 - 75.44 m Conglomerate at base from: 81.58 - 81.75 m	+ Completion details to follow.
70	234				
75	229				
80	224	SS		SILTSTONE	
85	219	SM		SILTSTONE, Coaly siltstone and coal, Coal layers from: 86.48-86.54 m 86.66-87.57 m 87.67-87.98 m 89.71-90.08 m	
90					

4" PVC

Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-03.bo

Enterprise Geoscience Services Ltd

Borehole Log of QU-11-03 (2 North)

Date Started	: Jan 12, 2011	Drilled By	: Driilwell Enterprises
Date Completed	.	Northing Coord.	: n/a
Hole Diameter	: 150 mm / 140 mm core	Easting Coord.	: n/a
Drilling Method	: Air rotary with wireline coring	Survey By	:
Sampling Method	: Grab sample / Core	Logged By	: N. Bazowski

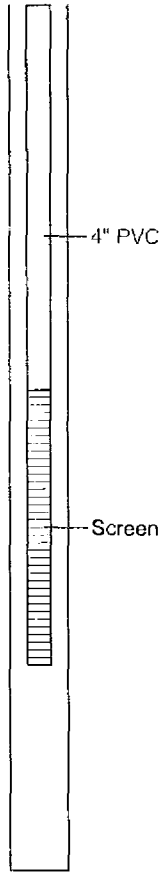
Water Levels

▼ QU-11-03: 42.21 m bTOC (18-Jan-2011)

▽

Well: QU-11-03
Elev. m: xxx

Depth (m)	Elev. m 304	USCS	Graphic Symbol	Material Description	Remarks
90	214	SM		SILTSTONE, Sandstone and Conglomerate	
95	209				
100	204	SS			
105	199				
110	194	CO		Coaly siltstone	+ Hole intersetcs mine void.
115				EOH @ 110.64 m	



Quinsam Coal
Assessment of Underground Disposal of Coarse Coal Refuse

Campbell River, B.C.

03-09-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-03.bor

Enterprise Geoscience Services Ltd

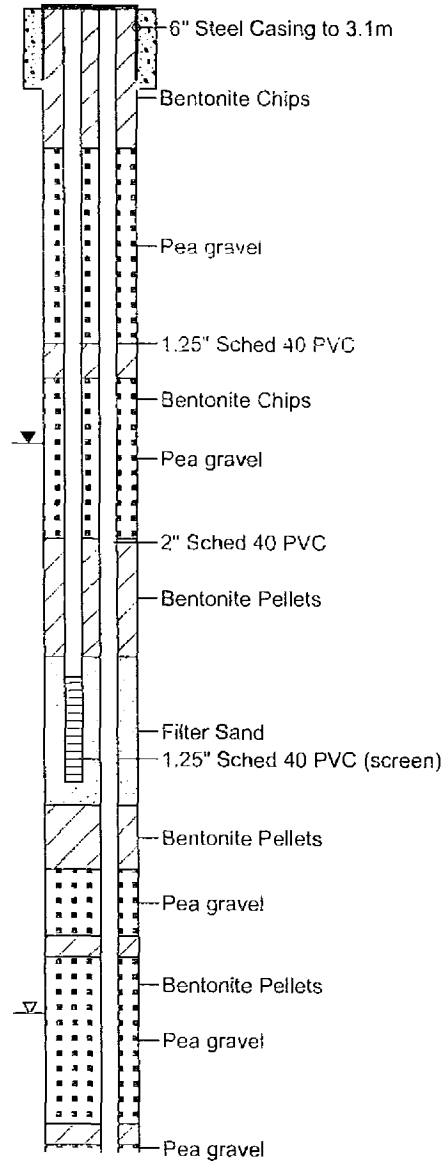
Borehole Log of QU-11-05

Date Started	: Feb 15, 2011	Drilled By	: Drillwell Enterprise
Date Completed	: Feb 18, 2011	Northing Coord.	: 102648.3
Hole Diameter	: 140 mm	Easting Coord.	: 101075.9
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Core	Logged By	: N. Bazowski

Water Levels
- QU-11-05-S: 19.00 m (8-Mar-11)
- QU-11-05-D: 43.95 m (8-Mar-11)

Well1: QU-11-05-S
Well2: QU-11-05-D
Elev. m: 228.39

Depth (m)	Elev. m 228.39	USCS	Material Description
0	228		NOT CORED
5	223	SW	SANDSTONE
10	218		10-10.06 m: Coaly Siltstone
			10.14-10.31m: Coaly Siltstone
15	213		10.31-10.57m: Siltstone
20	208		
25	203		23.55-23.72m: Conglomerate
			24.54-24.73m: Conglomerate
			24.9-24.97m: Conglomerate
30	198		25.47-25.55m: Conglomerate
		SW	30.45-30.51m: Coaly Siltstone (fractured)
			COAL
35	193		SANDSTONE
			COAL - 4B Coal Seam
			SANDSTONE
40	188	SW	32.75-33.04 m: Silty Coaly Sandstone
45	183		
50			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

Bentonite Pellets

05-05-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-05.b

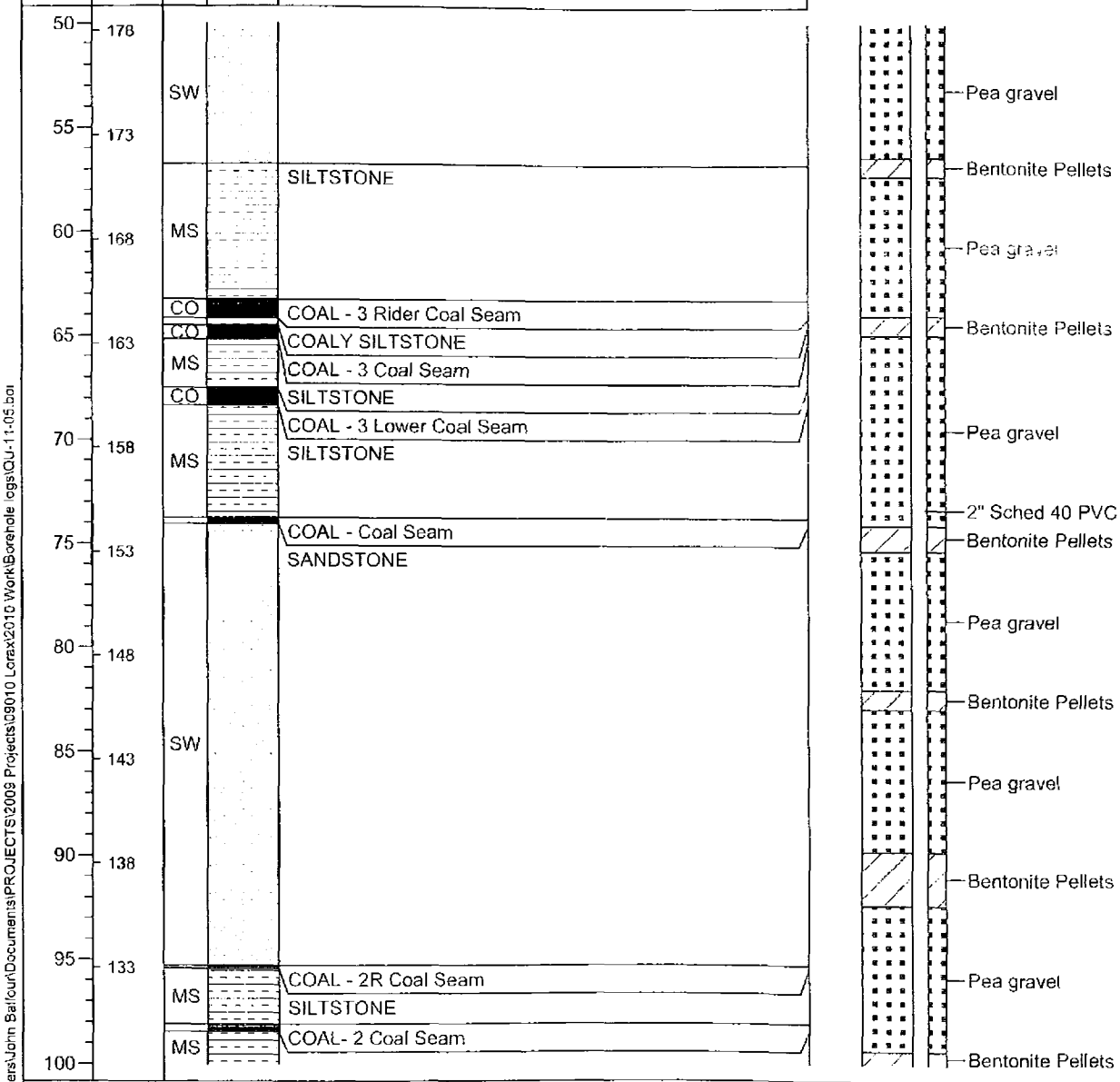
Enterprise Geoscience Services Ltd.

Borehole Log of QU-11-05

Date Started	: Feb 15, 2011	Drilled By	: Drillwell Enterprise
Date Completed	: Feb 18, 2011	Northing Coord.	: 102648.3
Hole Diameter	: 140 mm	Easting Coord.	: 101075.9
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Core	Logged By	: N. Bazowski

Water Levels
- QU-11-05-S: 19.00 m (8-Mar-11)
- QU-11-05-D: 43.95 m (8-Mar-11)

Well1: QU-11-05-S
Well2: QU-11-05-D
Elev. m: 228.39



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-05-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-05.bor

Enterprise Geoscience Services Ltd.

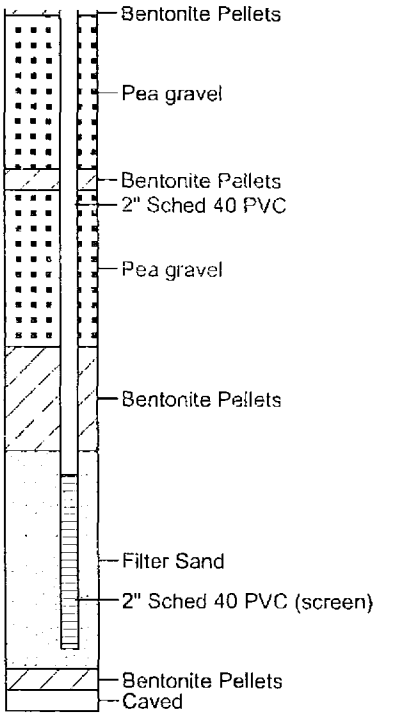
Borehole Log of QU-11-05

Date Started	: Feb 15, 2011	Drilled By	: Drillwell Enterprise
Date Completed	: Feb 18, 2011	Northing Coord.	: 102648.3
Hole Diameter	: 140 mm	Easting Coord.	: 101075.9
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Core	Logged By	: N. Bazowski

Water Levels
- QU-11-05-S: 19.00 m (8-Mar-11)
- QU-11-05-D: 43.95 m (8-Mar-11)

Well1: QU-11-05-S
Well2: QU-11-05-D
Elev. m: 228.39

Depth (m)	Elev. m 228.39	USCS	Material Description
100	128		
105	123	MS	
110	118		
115	113		
		CO	COAL- 1 Rider Coal Seam
120	108	MS	116.99-117.08m: Siltstone
			SILTSTONE
		CO	COAL- 1 Seam Upper Coal
125	103	CO	SILTSTONE
		CO	COAL- 1Seam Middle Coal
			125.21-127.27m: Siltstone
		MS	COAL - 1 Seam Lower Coal
130	98		125.35-125.49m: Coaly Siltstone
			125.56-125.81m: Coaly Siltstone
			SILTSTONE
135	93		127.75-127.86m: Coal
			EOH @ 130.76 M
140	88		
145	83		
150			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-05-201 ...ars\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-05.bo

Enterprise Geoscience Services Ltd

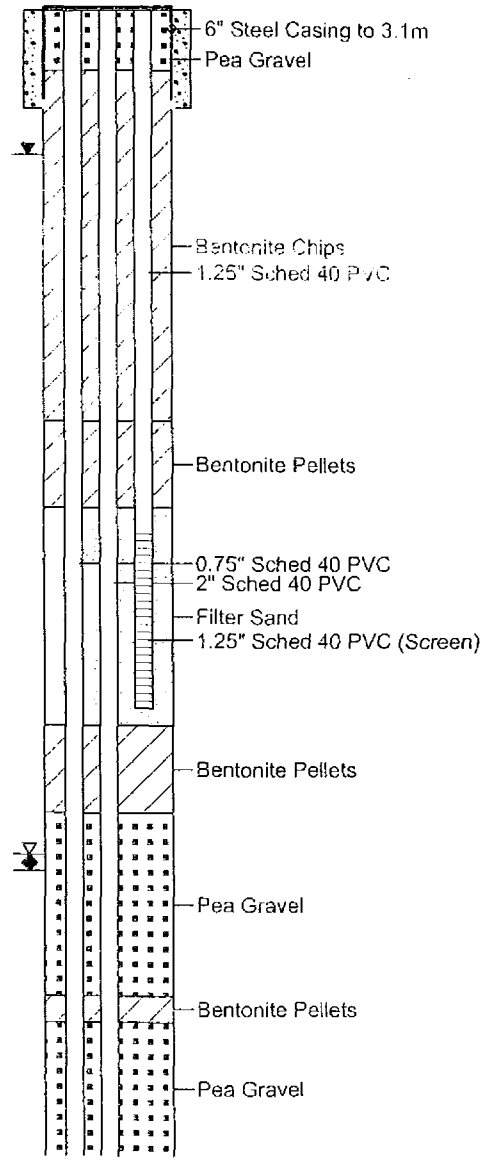
Borehole Log of QU-11-09

Date Started	:	Drilled By	: Driflwell Enterprise
Date Completed	: March 8, 2011	Northing Coord.	: 102561.8
Hole Diameter	: 152 mm / 140 mm	Easting Coord.	: 100736
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Grab sample and core	Logged By	: N. Bazowski

Water Levels
- QU-10-09-S: 5.05 m
- QU-10-09-D: 29.52 m
- QU-10-09-P: 30.08 m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 226.297

Depth (m)	Elev. m 226.297	USCS	Graphic Symbol	Material Description
0	226			OVERBURDEN
5	221			
10	216			
15	211	MS		SILTSTONE
				SANDSTONE
20	206			
25	201	SW		
30	196			
35	191			
40				



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B C

05-05-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-09.bor

Enterprise Geoscience Services Ltd

Borehole Log of QU-11-09

Date Started	:	Drilled By	: Drillwell Enterprise
Date Completed	: March 8, 2011	Northing Coord.	: 102561.8
Hole Diameter	: 152 mm / 140 mm	Easting Coord.	: 100736
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Grab sample and core	Logged By	: N. Bazowski

Water Levels
- QU-10-09-S: 5.05 m
- QU-10-09-D: 29.52 m
- QU-10-09-P: 30.08 m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 226.297

Depth (m)	Elev. m 226.297	USCS	Material Description
40	186	SW	
45	181	MS	SILTSTONE
50	176	SW	SANDSTONE
55	171		
60	166		
65	161		at 67.16 m coring starts
70	156		
75	151	MS	SILTSTONE
		CO	COAL - 1 RiderSeam
		MS	SILTSTONE
80		CO	COAL - 1 Seam Upper

Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
2" Sched 40 PVC
0.75" Sched 40 PVC
Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Filter Sand
2" Sched 40 PVC (Screen)

Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C.

05-05-201 ers\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-09.bo

Enterprise Geoscience Services Ltd.

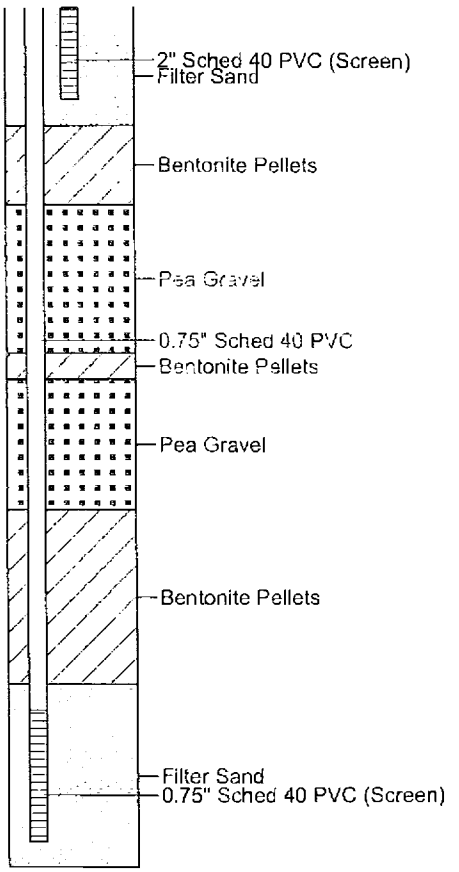
Borehole Log of QU-11-09

Date Started	:	Drilled By	: Drillwell Enterprise
Date Completed	: March 8, 2011	Northing Coord.	: 102561.8
Hole Diameter	: 152 mm / 140 mm	Easting Coord.	: 100736
Drilling Method	: Air rotary with wireline coring	Survey By	: QCC
Sampling Method	: Grab sample and core	Logged By	: N. Bazowski

Water Levels
- QU-10-09-S: 5.05 m
- QU-10-09-D: 29.52 m
- QU-10-09-P: 30.08 m

Well1: QU-10-09-S
Well2: QU-10-09-D
Well3: QU-10-09-P
Elev. m: 226.297

Depth (m)	Elev. m 226.297	USCS	Material Description
80	146	CO	
		MS	SILTSTONE
			COAL- 1 Seam Lower
			SILTSTONE
85	141		
		MS	
90	136		
95	131		
		GC	CONGLOGERATE 96.2-96.64 m: Very Coarse Grained Sandstone 97.08-967.45 m: Very Coarse Grained Sandstone
100	126	MS	SILTSTONE
		SW	SANDSTONE
105	121	GC	COGLOMERATE
110	116		EOH @ 110.19
115	111		
120			



Quinsam Coal
Assessment of Underground Disposal
of Coarse Coal Refuse

Campbell River, B.C

05-05-2011 C:\Users\John Balfour\Documents\PROJECTS\2009 Projects\09010 Lorax\2010 Work\Borehole logs\QU-11-09.bor

Borehole Log of QU11-18

HILLSBOROUGH Resources Limited

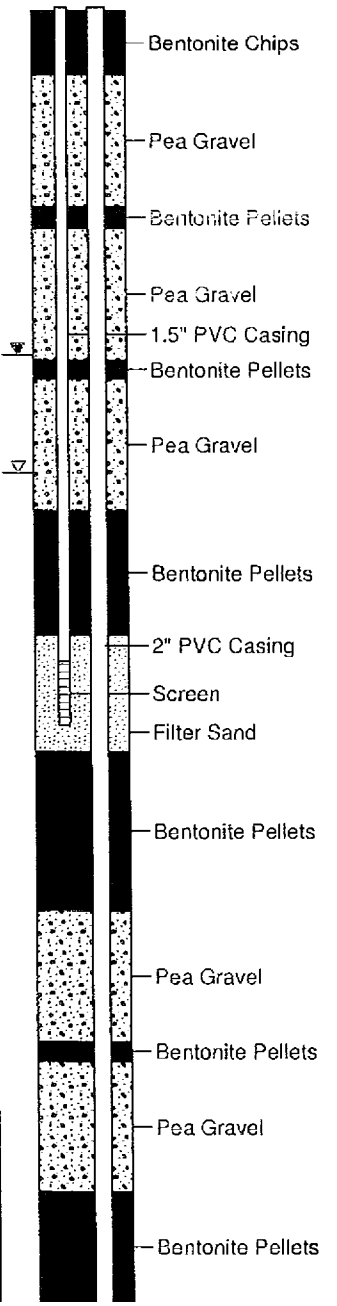
Quinsam Coal Corporation
Project #: J885-7

Date Drilled	: August 2011	Mine Grid Northing (m)	: 100690.81
Date Installed	: Dec 12, 2011	Mine Grid Easting (m)	: 100542.84
Hole Diameter	: 150 mm/ 85 mm core	Logged By	: N. Bazowski (QCC)
Drilling Method	: Air Rotary w/ wireline coring	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: M. Storey (Lorax)

Water Levels
- QU11-18S: 283.59 m (Mar 19, 2012)
- QU11-18D: 278.09 m (Mar 19, 2012)

Well1: MW11-18S PVC Stickup 0.16m
Well2: MW11-18D PVC Stickup 0.16m
Elev.: 299.71 m (ground surface)

Depth (m)	Elev. (m asl) 299.71	Cored Interval	GRAPHIC	DESCRIPTION
0	299			TILL (not logged)
5	294			
10	289			
15	284			
20	279			
25	274			
30	269			
35	264			Drilled with casing, not logged
				SANDSTONE, grey, fine to medium grained Fault zone 37.2-37.7 m with fractures infilled with rusty clays, little water flow inferred
40	259			Coal (4 Seam) with some calcite, few surfaces display powdery orange mineral (realgar) in minor amounts
				SILTSTONE
45	254			COAL (4L Seam), dirty dull to bright clean, pyrite noted in limited intervals
				SILTSTONE, medium grey
50	249			
				COAL (4B Seam)
55	244			SILTSTONE, medium grey
60				



08-20-2012 P:\J885 Hillsborough Resources\885-7 242 Mine\Borehole Logs\2011 DH and Instails\Instalation Logs\QU11-18.bc

Borehole Log of QU11-18

HILLSBOROUGH Resources Limited

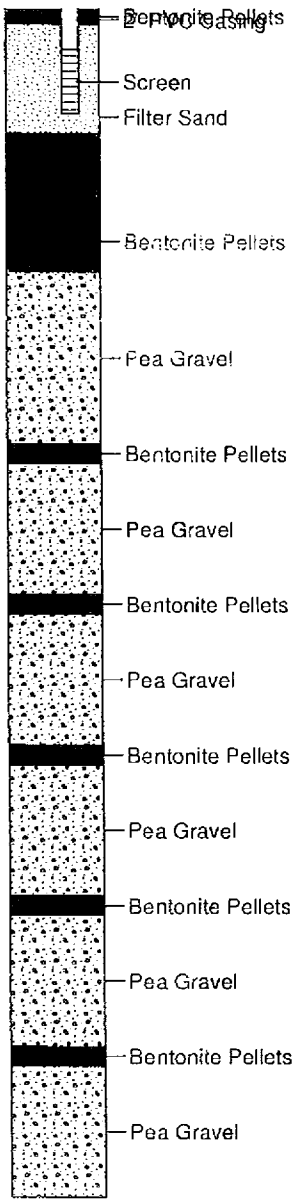
Quinsam Coal Corporation
Project #: J885-7

Date Drilled	: August 2011	Mine Grid Northing (m)	: 100690.81
Date Installed	: Dec 12, 2011	Mine Grid Easting (m)	: 100542.84
Hole Diameter	: 150 mm/ 85 mm core	Logged By	: N. Bazowski (QCC)
Drilling Method	: Air Rotary w/ wireline coring	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: M. Storey (Lorax)

Water Levels
- QU11-18S: 283.59 m (Mar 19, 2012)
- QU11-18D: 278.09 m (Mar 19, 2012)

Well1: MW11-18S PVC Stickup 0.16m
Well2: MW11-18D PVC Stickup 0.16m
Elev.: 299.71 m (ground surface)

Depth (m)	Elev. (m asl) 299.71	Cored Interval	GRAPHIC	DESCRIPTION
60	239			
				SANDSTONE, medium grey, fine grained, tight
65	234			SILSTONE, medium to dark grey, trace coal Airlift yield increased 12 GPM at 66.8 m
70	229			COAL (3 Zone)
75	224			Discrepancy between geophysical log and chip log
80	219			SILTSTONE, mostly grey interbedded with some brown, 5% calcite, 5% coal, fault zone
85	214			SILTSTONE, fractures noted 88-88.5 m and 94.3 m
90	209			
95	204			
100	199			SANDSTONE, greenish grey, fine to medium grained
				CONGLOMERATE
105	194			SILSTONE, with minor mudstone, some fractures
				BENSON CONGLOMERATE, both clast and matrix supported
110	189			SILSTONE, hematitic and dark green, 20 cm fault zone at 111.7 m
				CONGLOMERATE
115	184			EOH 115.2 m.
120				



08-20-2012 J885 Hillsborough Resources\885-7 242 Mine\Borehole Logs\2011 DH and Installs\Installation Logs\QU11-18.bc

Borehole Log of QU11-36D

HILLSBOROUGH Resources Limited

Quinsam Coal Corporation
Project #: J885-7

Date Drilled	: December 2011	Mine Grid Northing (m)	: 100111.42
Date Installed	: Dec 20, 2011	Mine Grid Easting (m)	: 100322.46
Hole Diameter	: 150 mm/ 85 mm core	Logged By	: N. Bazowski (QCC)
Drilling Method	: Air Rotary w/ wireline coring	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: M. Storey (Lorax)

Water Levels
▼ QU11-36D: Water level 260.86 m (Mar 19, 2012)
▽

Well: MW11-36D PVC Stickup 0.22 m
Elev.: 285.89 m (ground surface)

Depth (m)	Elev. (m asl) 285.89	Cored Interval	GRAPHIC	DESCRIPTION
0	285			TILL (not logged)
5	280			
10	275			BR (drilled)
15	270			
20	265			
				COAL (5 Seam)
25	260			BR
30	255			SANDSTONE, medium to coarse grained, fractured with oxidation surfaces throughout Possible fault at ~33.6 m
35	250			
40	245			
				SANDSTONE, fine to medium grained, with overlying pyritic SILSTONE (top 5 cm)
45				

Bentonite Chips
Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Pea Gravel
2" PVC Casing
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Pea Gravel
Bentonite Pellets
Pea Gravel

08-20-2012 P:\J885 Hillsborough Resources\885-7 242 Mine\Borehole Logs\2011 DH and Installs\Installation Logs\QU11-36D.ac

Borehole Log of QU11-36D

HILLSBOROUGH Resources Limited

Quinsam Coal Corporation
Project #: J885-7

Date Drilled	: December 2011	Mine Grid Northing (m)	: 100111.42
Date Installed	: Dec 20, 2011	Mine Grid Easting (m)	: 100322.46
Hole Diameter	: 150 mm/ 85 mm core	Logged By	: N. Bazowski (QCC)
Drilling Method	: Air Rotary w/ wireline coring	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: M. Storey (Lorax)

Water Levels
▼ QU11-36D: Water level 260.86 m (Mar 19, 2012)
▽

Well: MW11-36D PVC Stickup 0.22 m
Elev.: 285.89 m (ground surface)

Depth (m)	Elev. (m asl) 285.89	Cored Interval	GRAPHIC	DESCRIPTION
45	240			
50	235			SANDSTONE
				COAL (4L Seam)
55	230			BR (drilled)
60	225			COAL (4B Seam)
				BR (drilled)
65	220			
70	215			
75	210			
80	205			BENSON CONGLOMERATE
				EOH 80.0 m
85	200			
90				

Pea Gravel
Bentonite Pellets
Pea Gravel
2" PVC Casing
Bentonite Pellets
filter sand
Screen
Bentonite Pellets
Pea Gravel

08-20-2012 r:\J885 Hillsborough Resources\885-7 242 Mine\Borehole Logs\2011 DH and Installs\Installation Logs\QU11-36D.doc

LORAX ENVIRONMENTAL

Borehole Log of MW12-23

HILLSBOROUGH Resources Limited

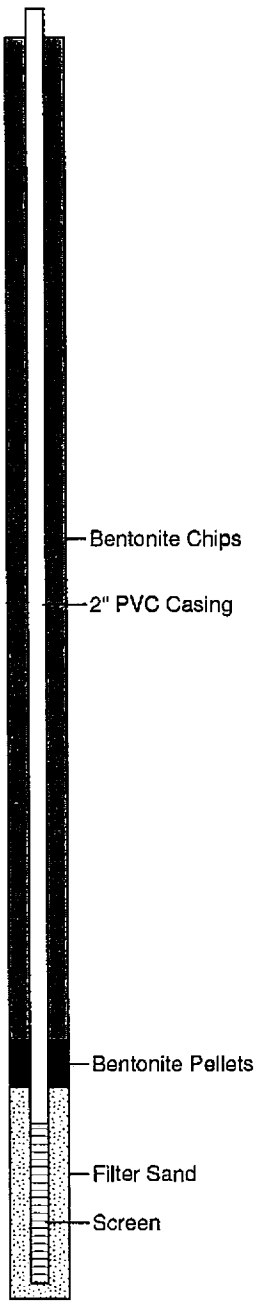
Quinsam Coal Corporation
Project #: A305-3

Date Drilled	: Oct 3, 2012	Mine Grid Northing (m)	: 101584.912
Date Installed	: Oct 4, 2012	Mine Grid Easting (m)	: 97205.970
Hole Diameter	: 150 mm	Logged By	: L.Findlater
Drilling Method	: Air rotary	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: L. Findlater

Water Levels
MW12-23: dry (Oct 23, 2012)

Well: MW12-23 PVC Stickup 0.55 m
Elev.: 334.299 m (ground surface).

Depth (m)	Elev. (m asl) 334.299	GRAPHIC	DESCRIPTION
0	334		FILL and OVERBURDEN (not logged)
			SILTSTONE, brownish grey, slightly weathered
			SILTSTONE, as above, fresh
5	329		SILTSTONE, dark grey, fresh
			SILTSTONE, medium grey with pink flecks, sandy
			SILTSTONE, medium grey, interbedded with light grey, fine SANDSTONE
			SILTSTONE, medium brownish grey
10	324		
			SILTSTONE, interbedded tan-grey, fine sandy and dark grey
			SILTSTONE, interbedded reddish brown and greenish grey fine sandy siltstone layers, greenish grey layer trending to silty fine sandstone
15	319		
20	314		Hole drilled with water; no noticeable fractures or water bearing zones encountered during drilling. Drilling dusty throughout.
25			EOH at 24.4 m



11-08-2012 P:\A305 (Quinsam Coal)\A305-3 Monitoring Well Installations\MW12-23.bor

LORAX ENVIRONMENTAL

Borehole Log of MW12-24

HILLSBOROUGH Resources Limited

Quinsam Coal Corporation
Project #: A305-3

Date Drilled	: Oct 3, 2012	Mine Grid Northing (m)	: 101583.676
Date Installed	: Oct 4, 2012	Mine Grid Easting (m)	: 97207.129
Hole Diameter	: 150 mm	Logged By	: L.Findlater
Drilling Method	: Air rotary	Surveyed By	: QCC
Drilling Company	: Drillwell Enterprises	Installed By	: L. Findlater

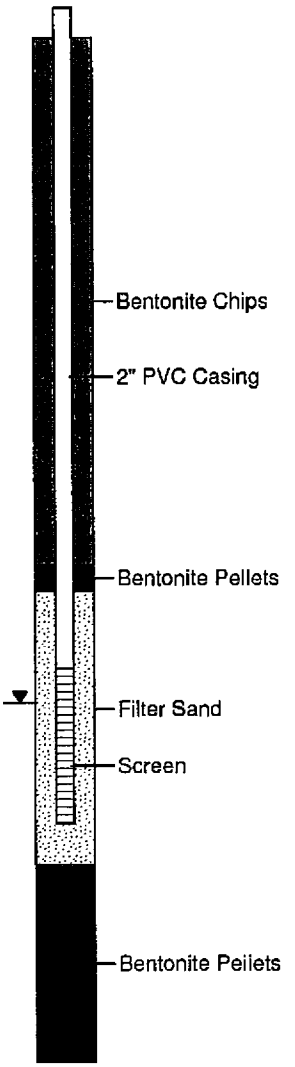
Water Levels

▼ MW12-24: 13.448 m bTOC (Oct 23, 2012).

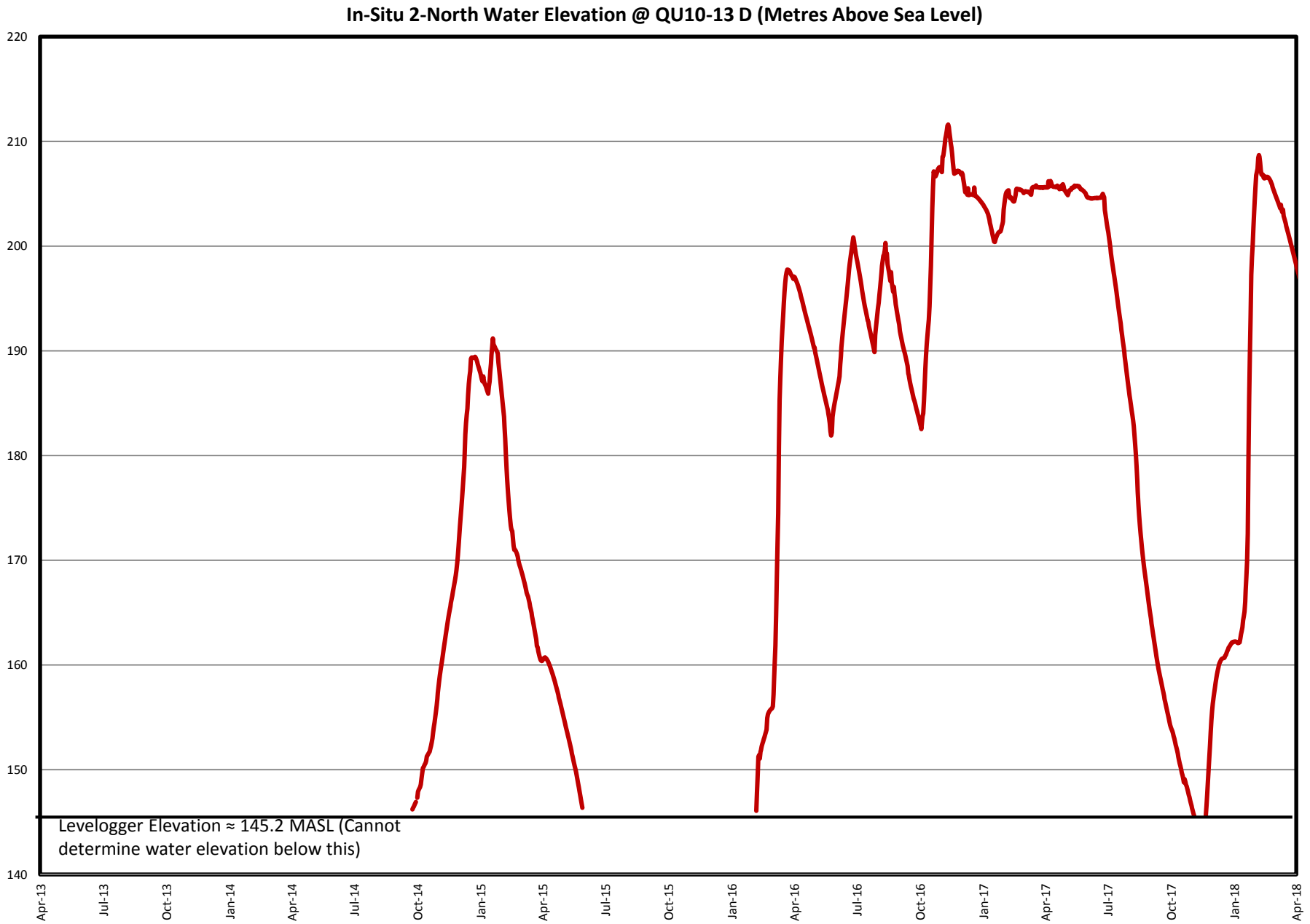
▽

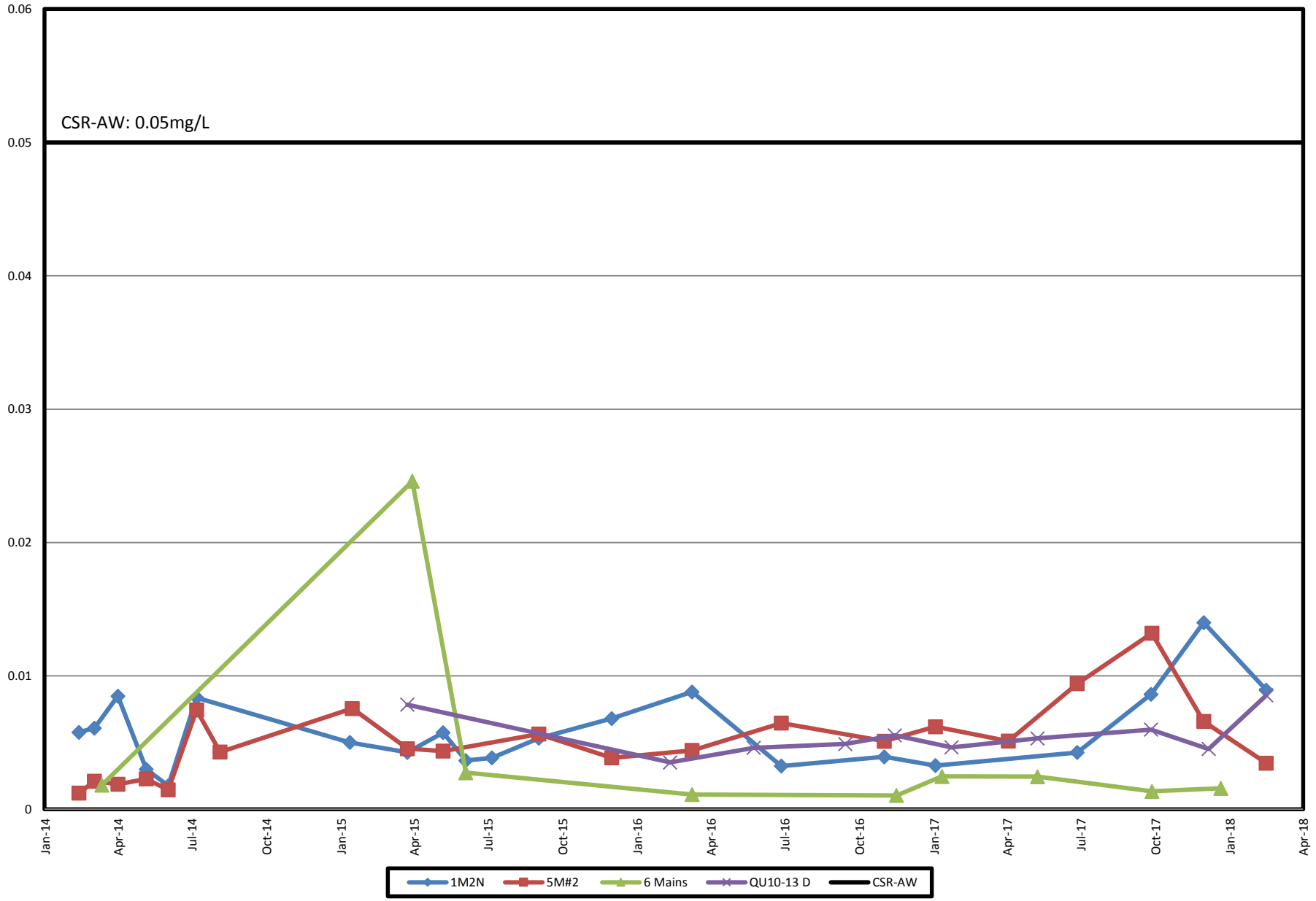
Well: MW12-24 PVC Stickup 0.58 m
Elev.: 334.354 m (ground surface).

Depth (m)	Elev. (m asl) 334.354	GRAPHIC	DESCRIPTION
0	334		FILL and OVERBURDEN (not logged)
			SILTSTONE, dark brown-grey, slightly weathered
5	329		SILTSTONE, dark grey, fresh
			SILTSTONE, light tan-grey, fine sandy
			SILTSTONE, as above, with pink flecks and trending towards silty fine sandstone
			SILTSTONE, grey
10	324		SILTSTONE, greenish grey, fine sandy
			SILTSTONE, interbedded reddish brown and greenish grey fine sandy siltstone layers, greenish grey layer somewhat trending to silty fine sandstone
15	319		Hole drilled with air only, dusty drilling throughout with no noticeable fractures. Some water dripping at collar at 60 ft rod change,however no water at end of discharge pipe
20	314		EOH at 19.8 m
25			

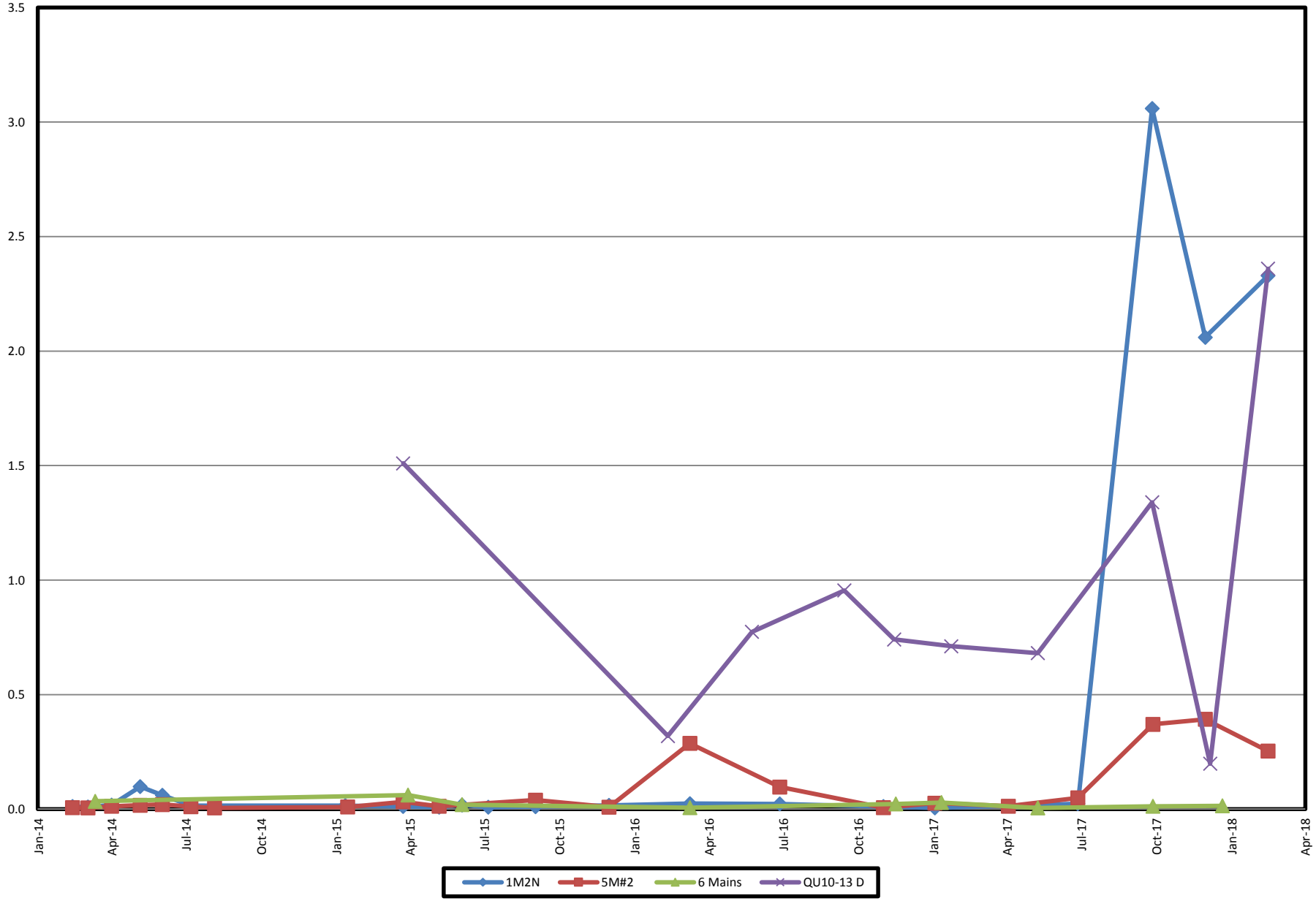


Appendix D

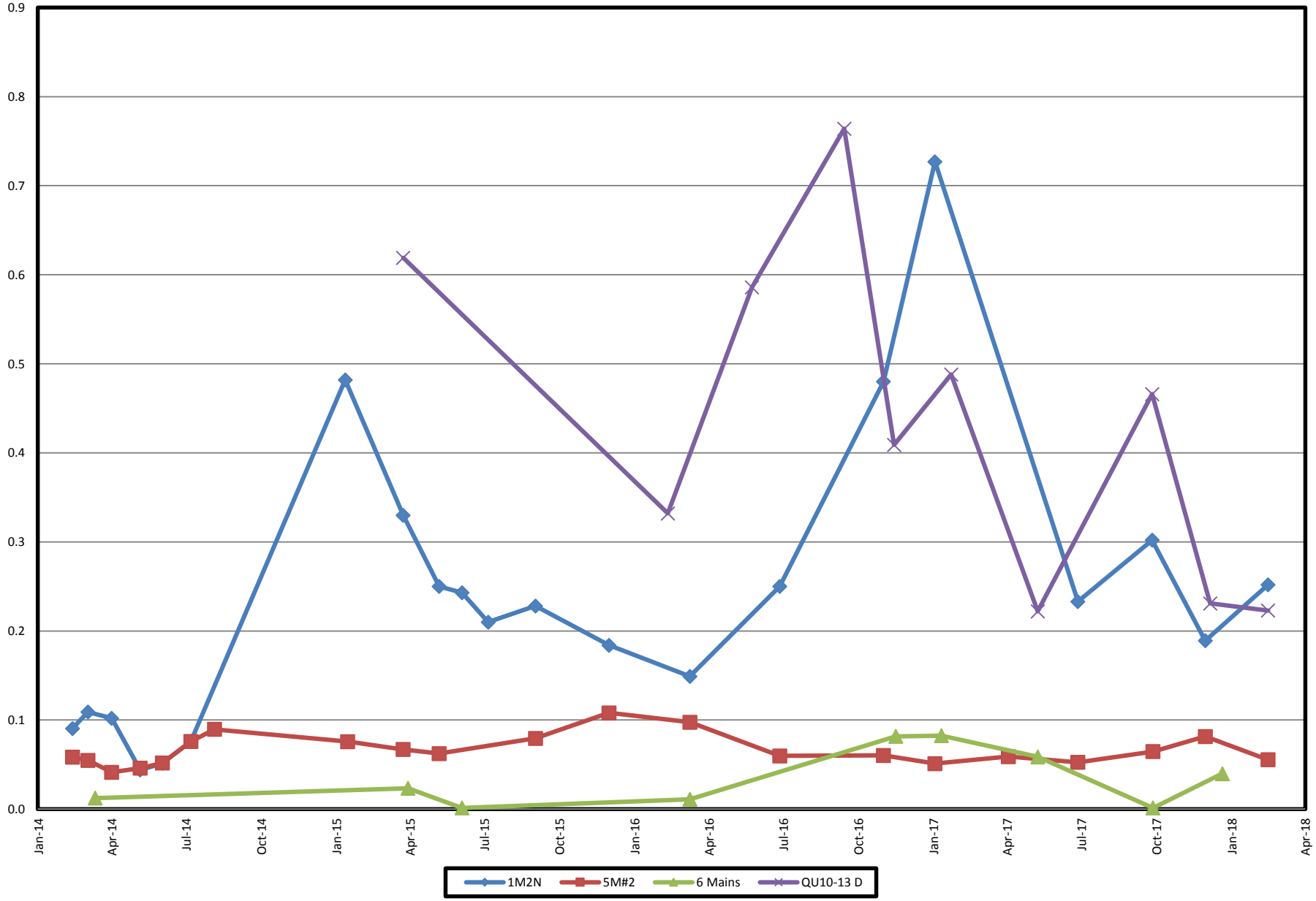

In-Situ 2-North Water Elevation @ QU10-13 D (Metres Above Sea Level)
220
210
200
190
180
170
160
150
140
Levelogger Elevation ≈ 145.2 MASL (Cannot determine water elevation below this)
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18

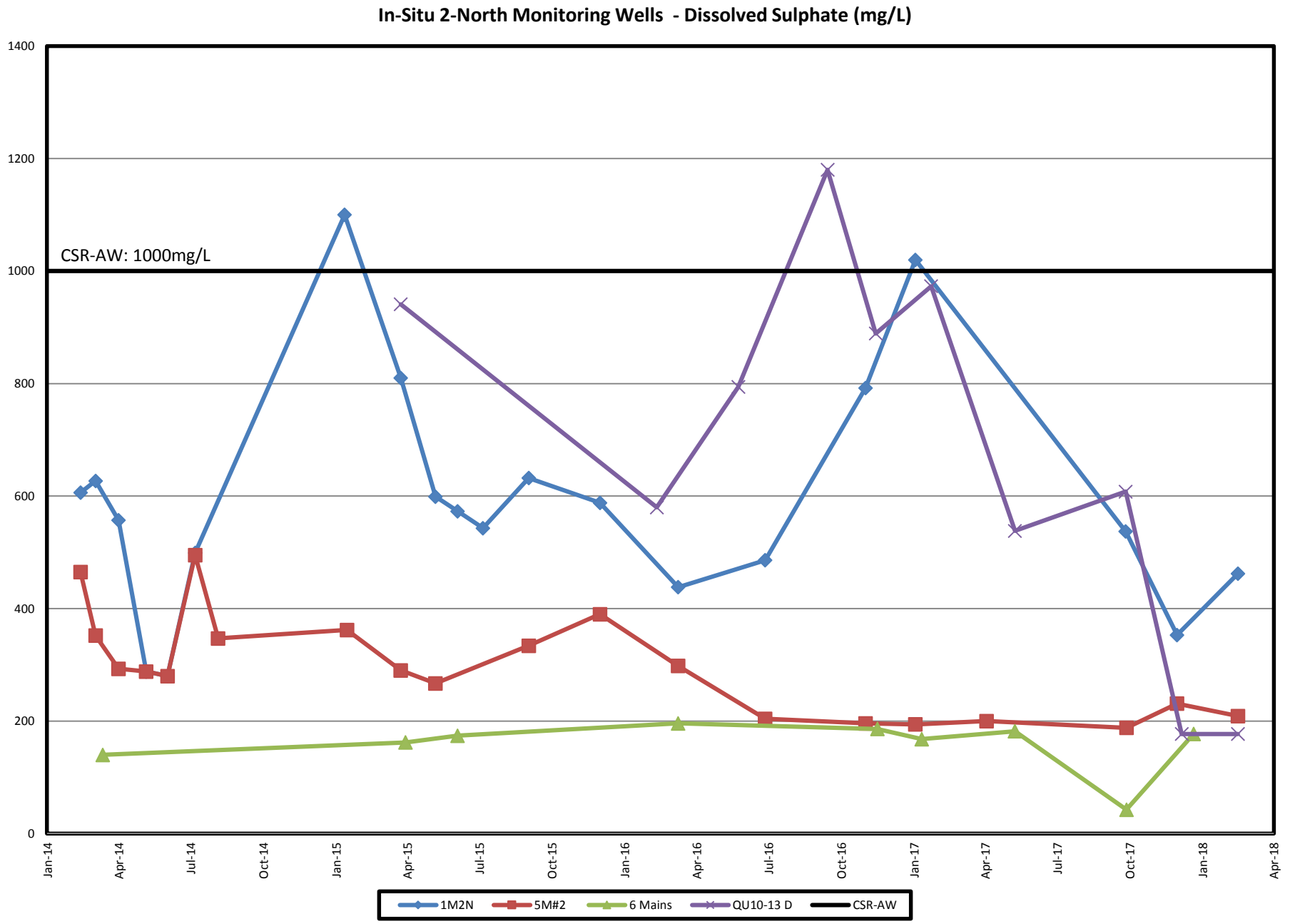

In-Situ 2-North Monitoring Wells - Dissolved Arsenic
CSR-AW: 0.05mg/L
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M2N
5M#2
6 Mains
QU10-13 D
CSR-AW

In-Situ 2-North Monitoring Wells - Dissolved Iron (mg/L)

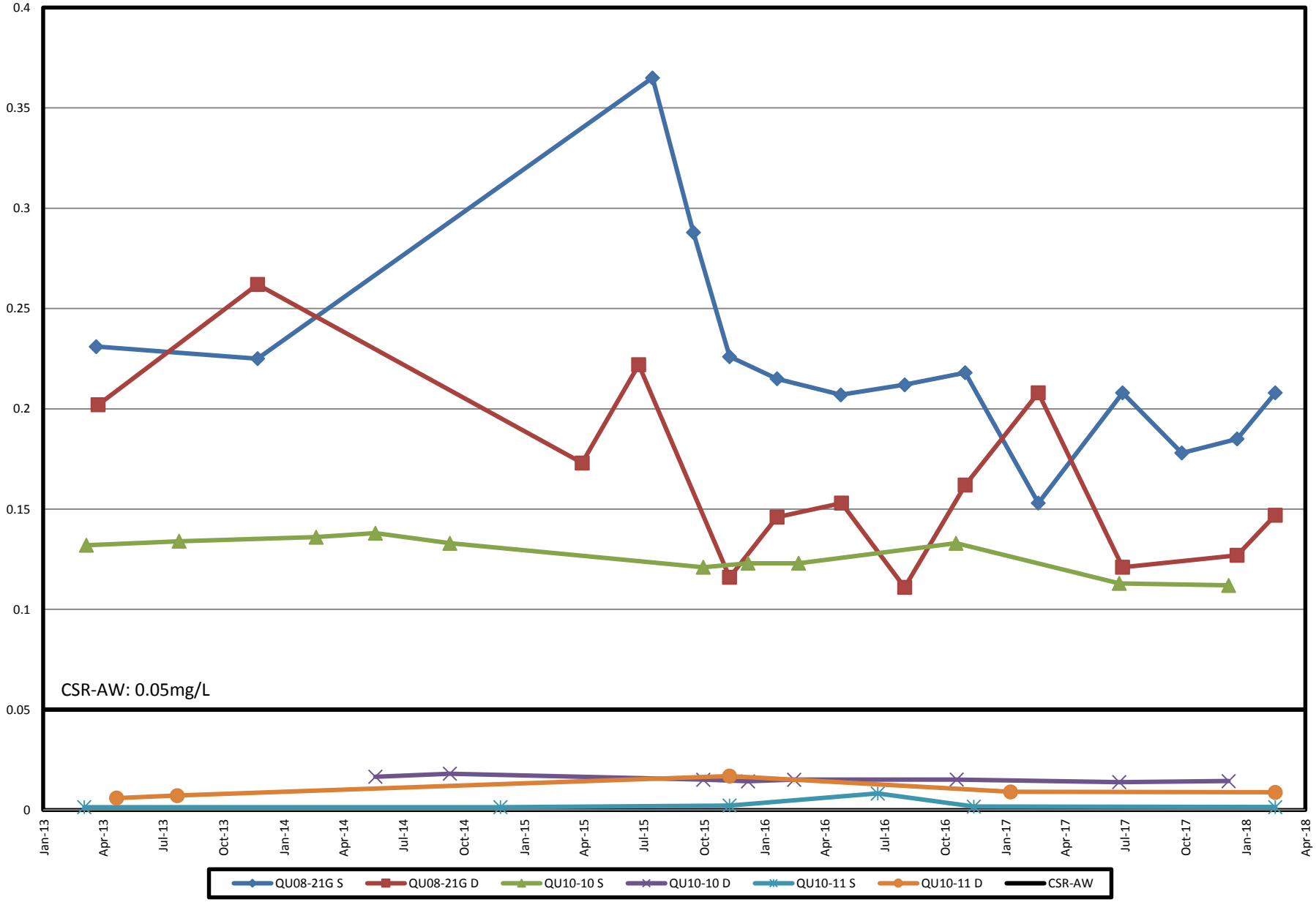


In-Situ 2-North Monitoring Wells - Dissolved Manganese (mg/L)

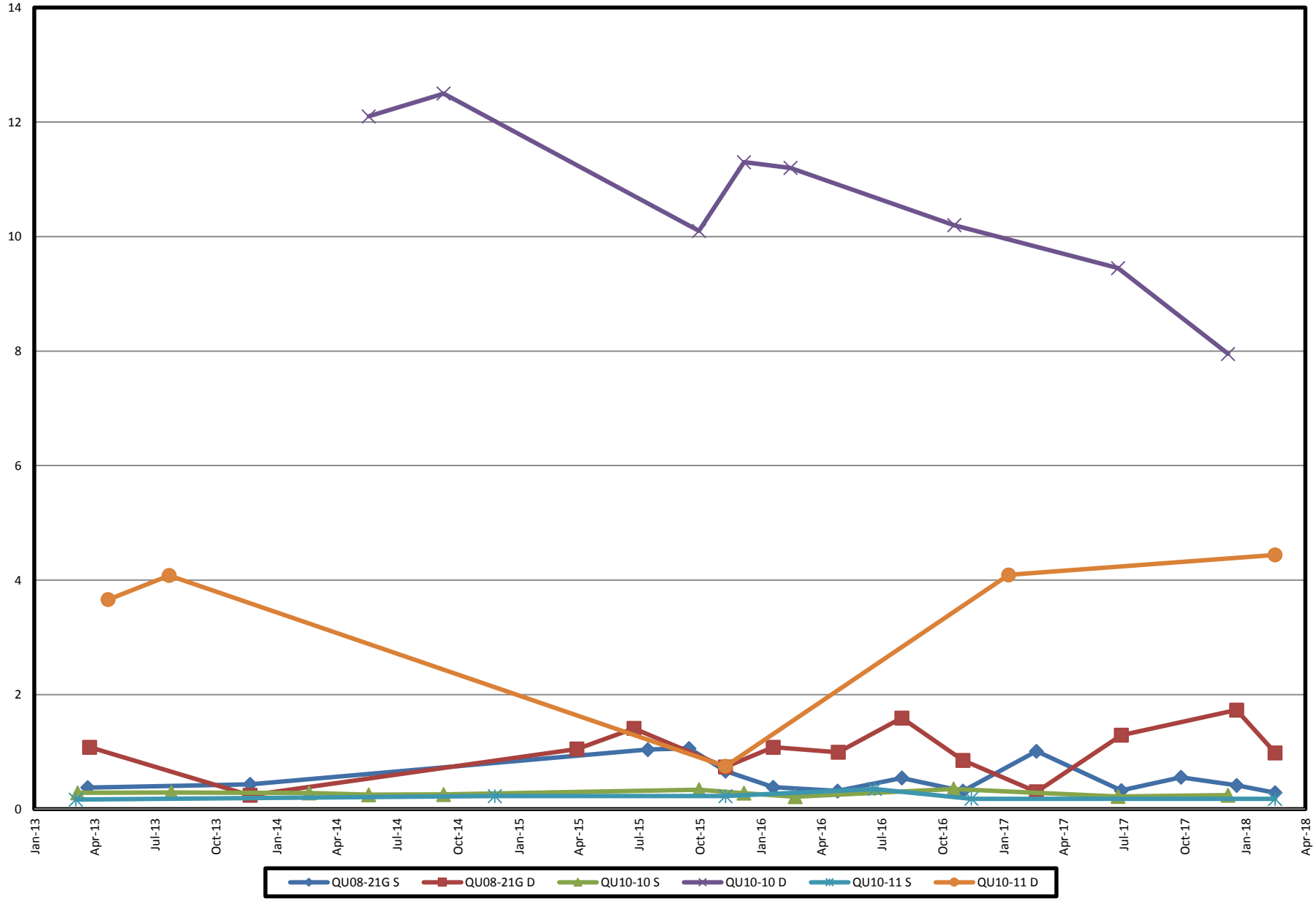



In-Situ 2-North Monitoring Wells - Dissolved Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
CSR-AW: 1000mg/L
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M2N
5M#2
6 Mains
QU10-13 D
CSR-AW

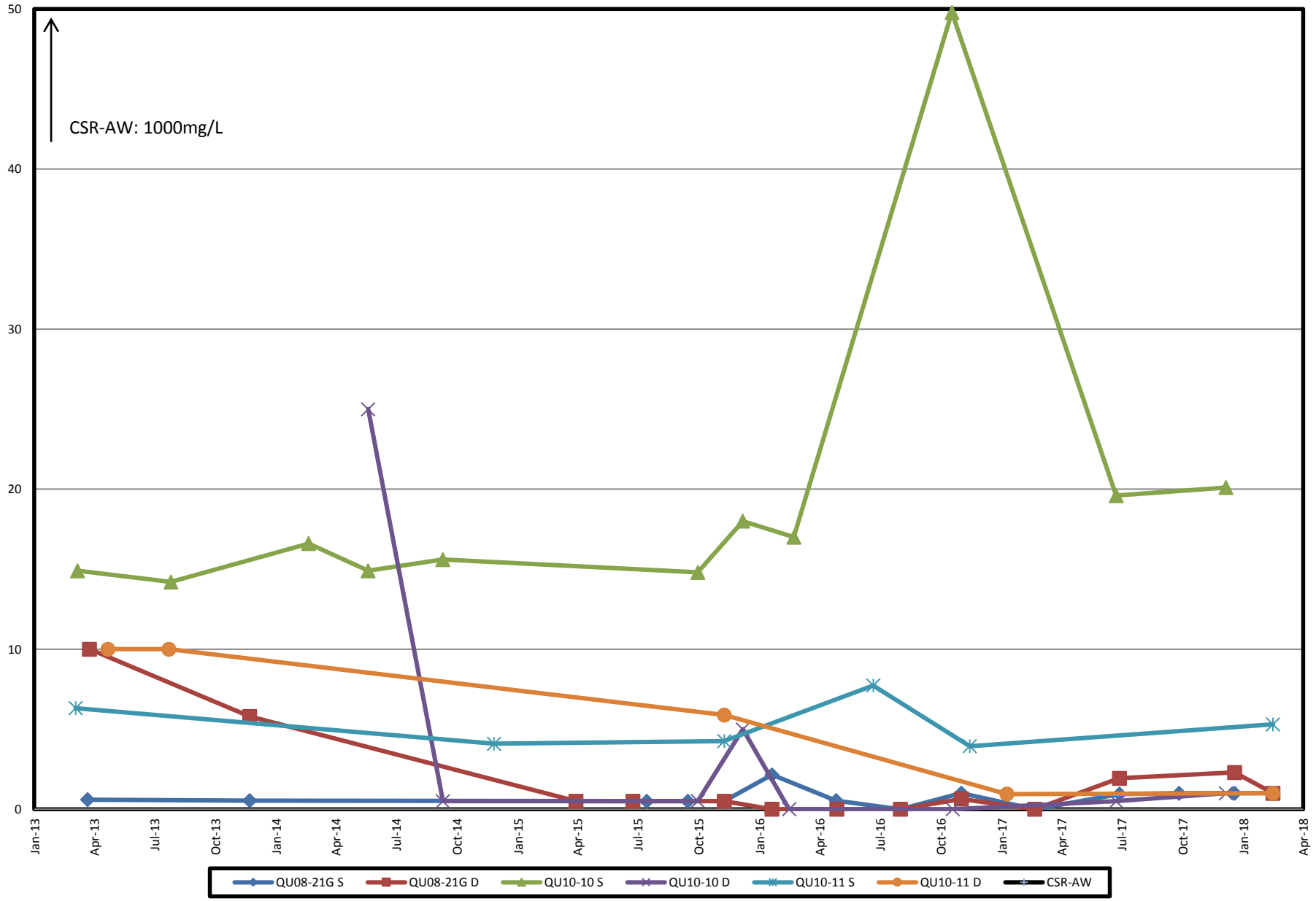
Ex-Situ 2-North Monitoring Wells - Dissolved Arsenic (mg/L)

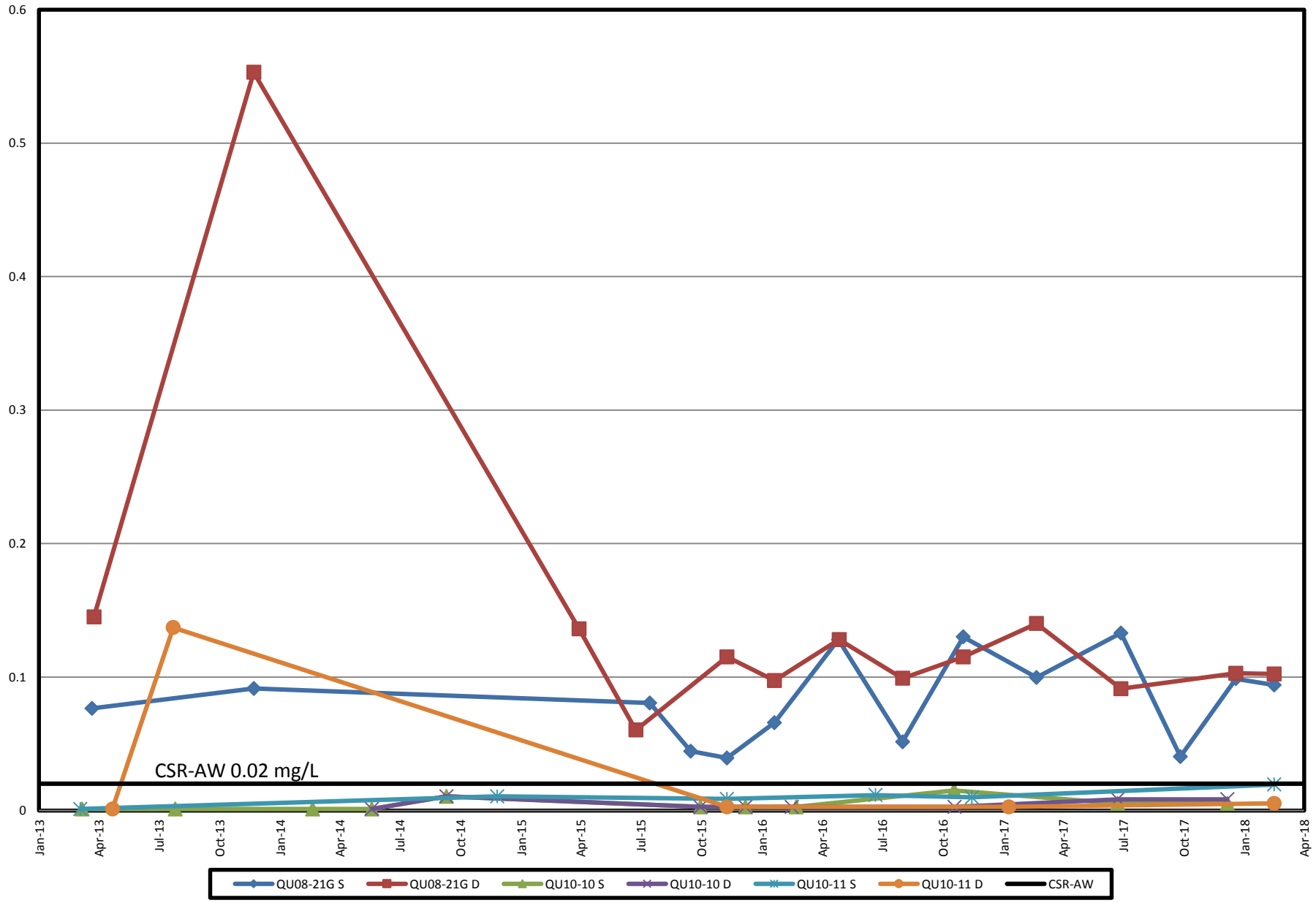


Ex-Situ 2-North Monitoring Wells - Dissolved Iron (mg/L)

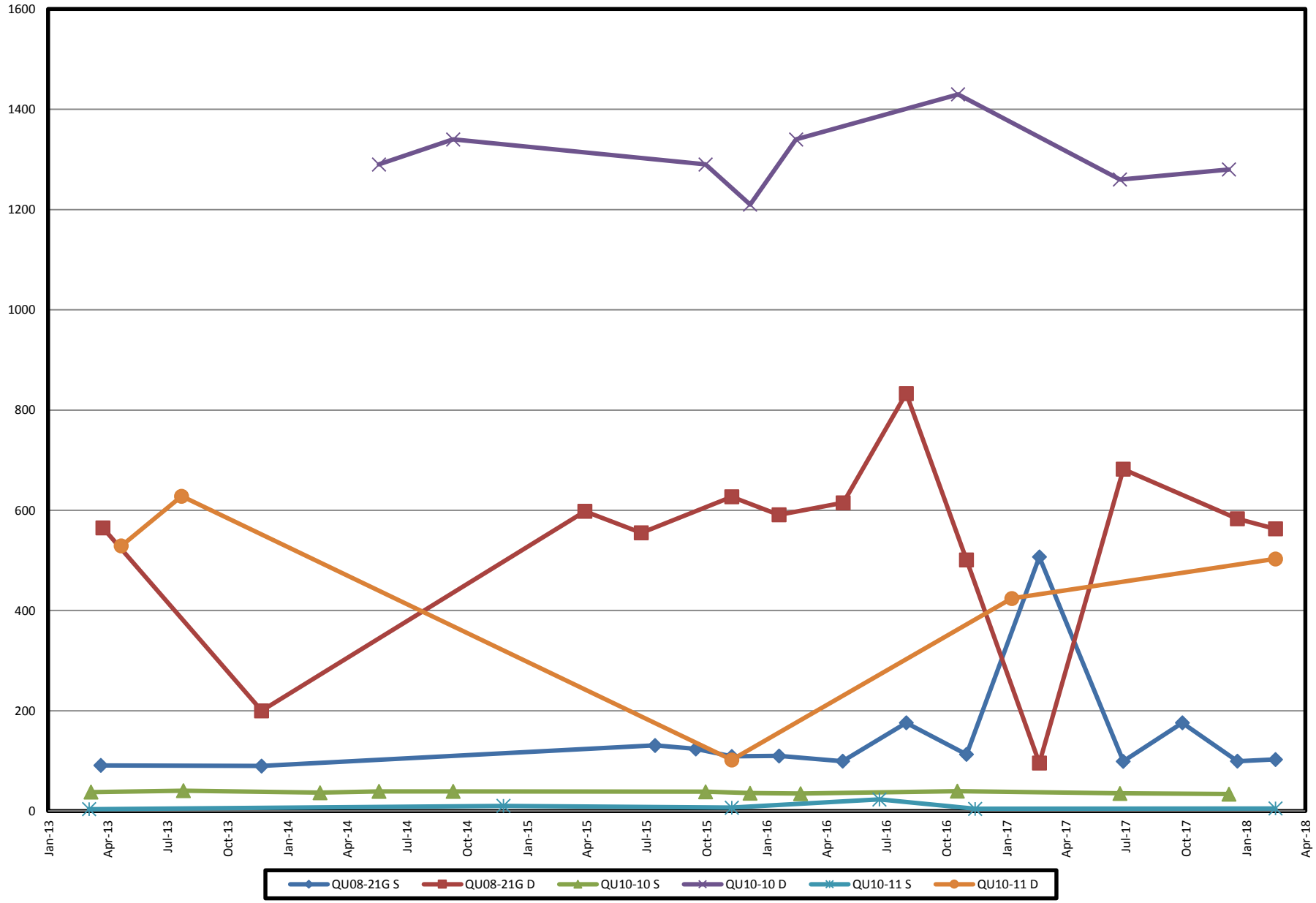


Ex-Situ 2-North Monitoring Wells - Dissolved Sulphate (mg/L)

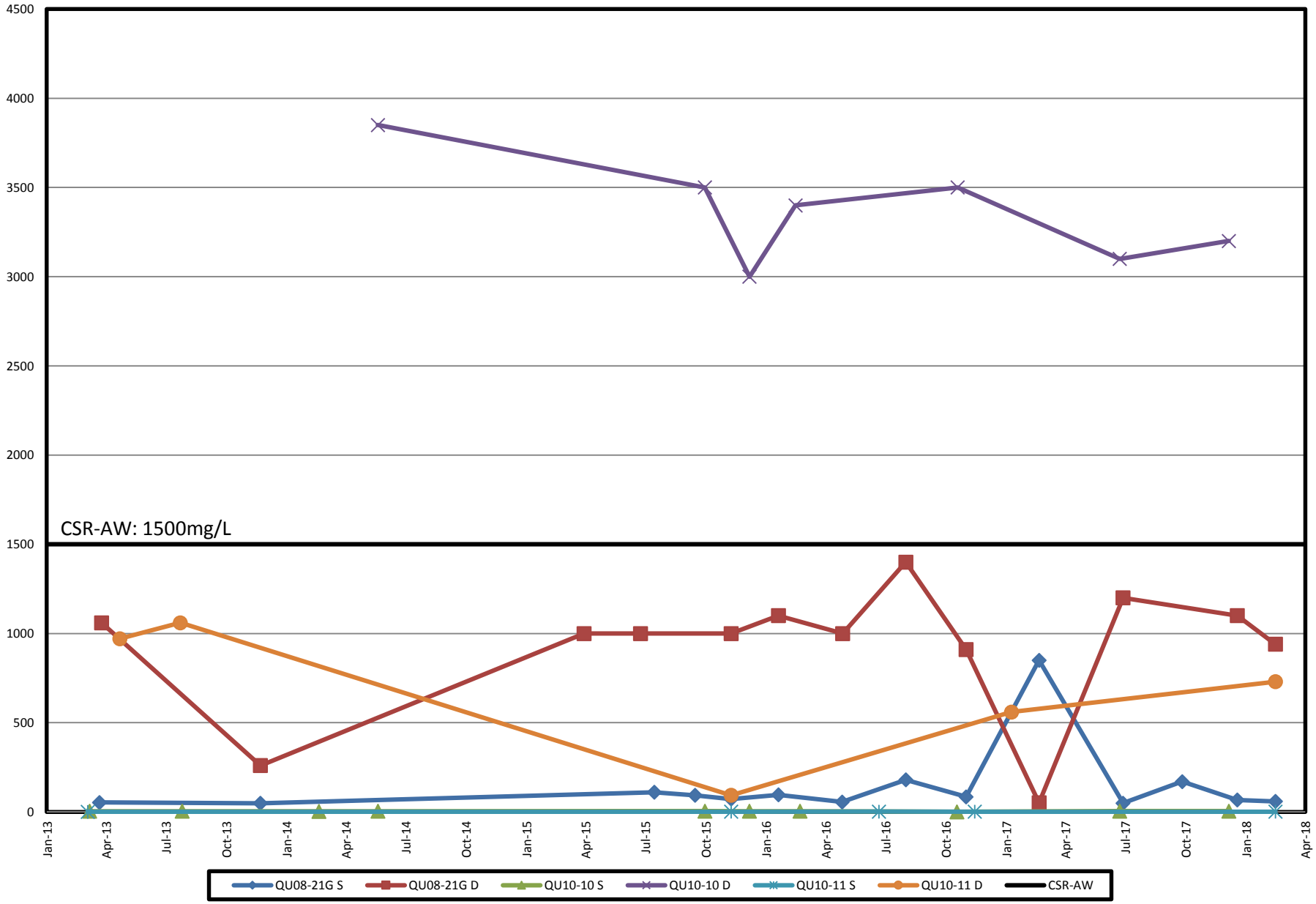



Ex-Situ 2-North Monitoring Wells - Sulphide as H_2S (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
CSR-AW 0.02 mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU08-21G S
QU08-21G D
QU10-10 S
QU10-10 D
QU10-11 S
QU10-11 D
CSR-AW

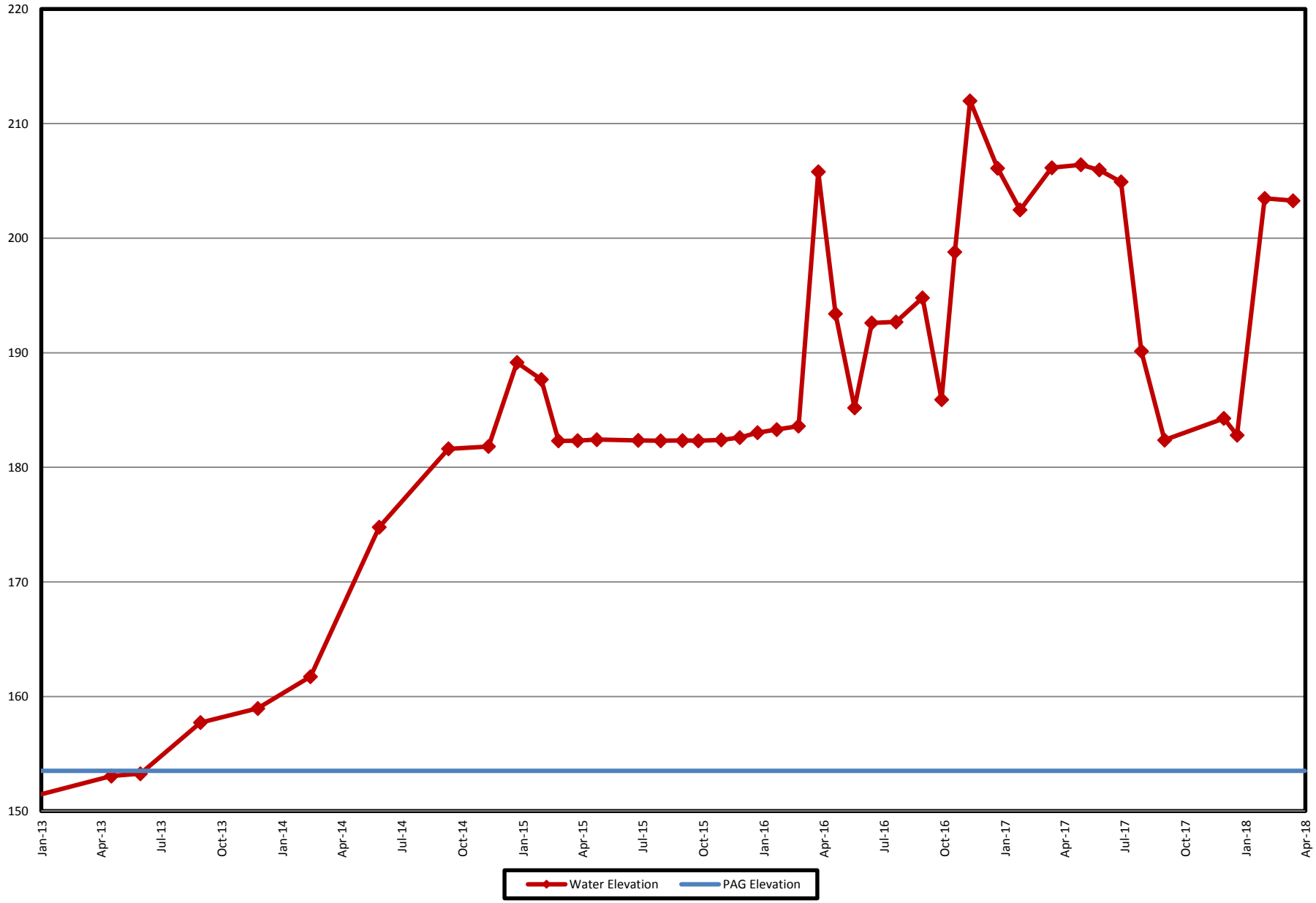
Ex-Situ 2-North Monitoring Wells - Dissolved Sodium (mg/L)

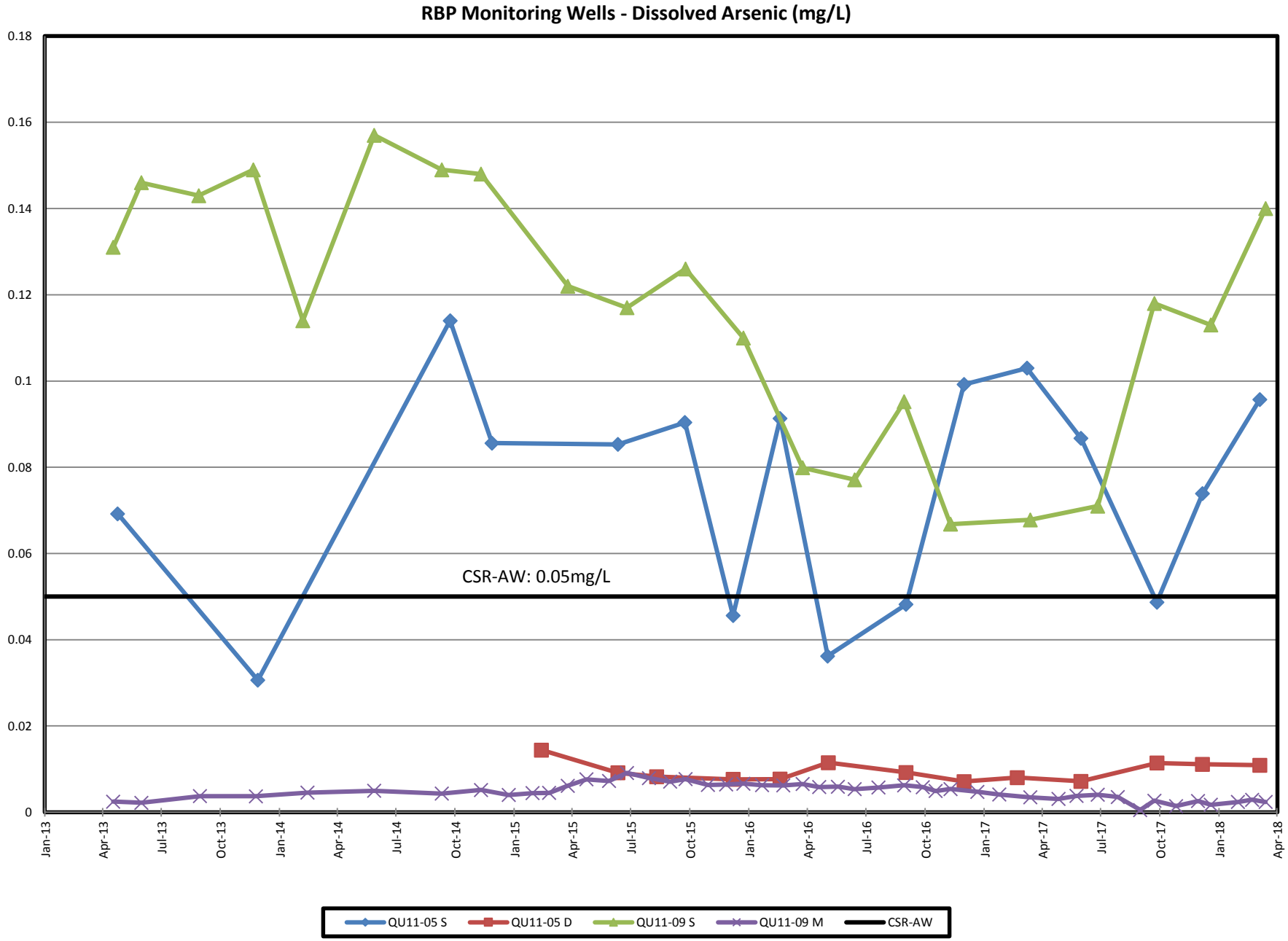


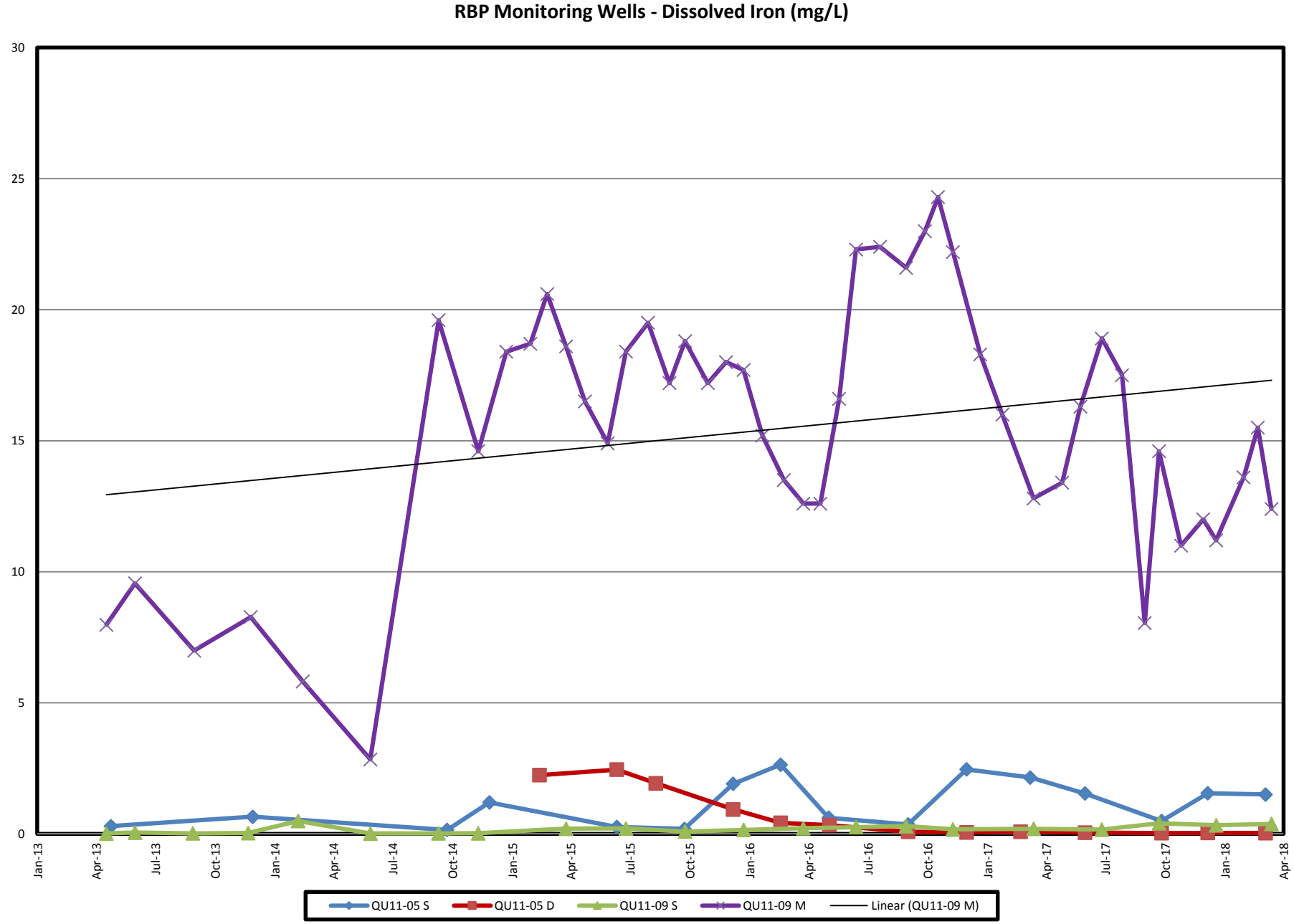
Ex-Situ 2-North Monitoring Wells - Dissolved Chloride (mg/L)

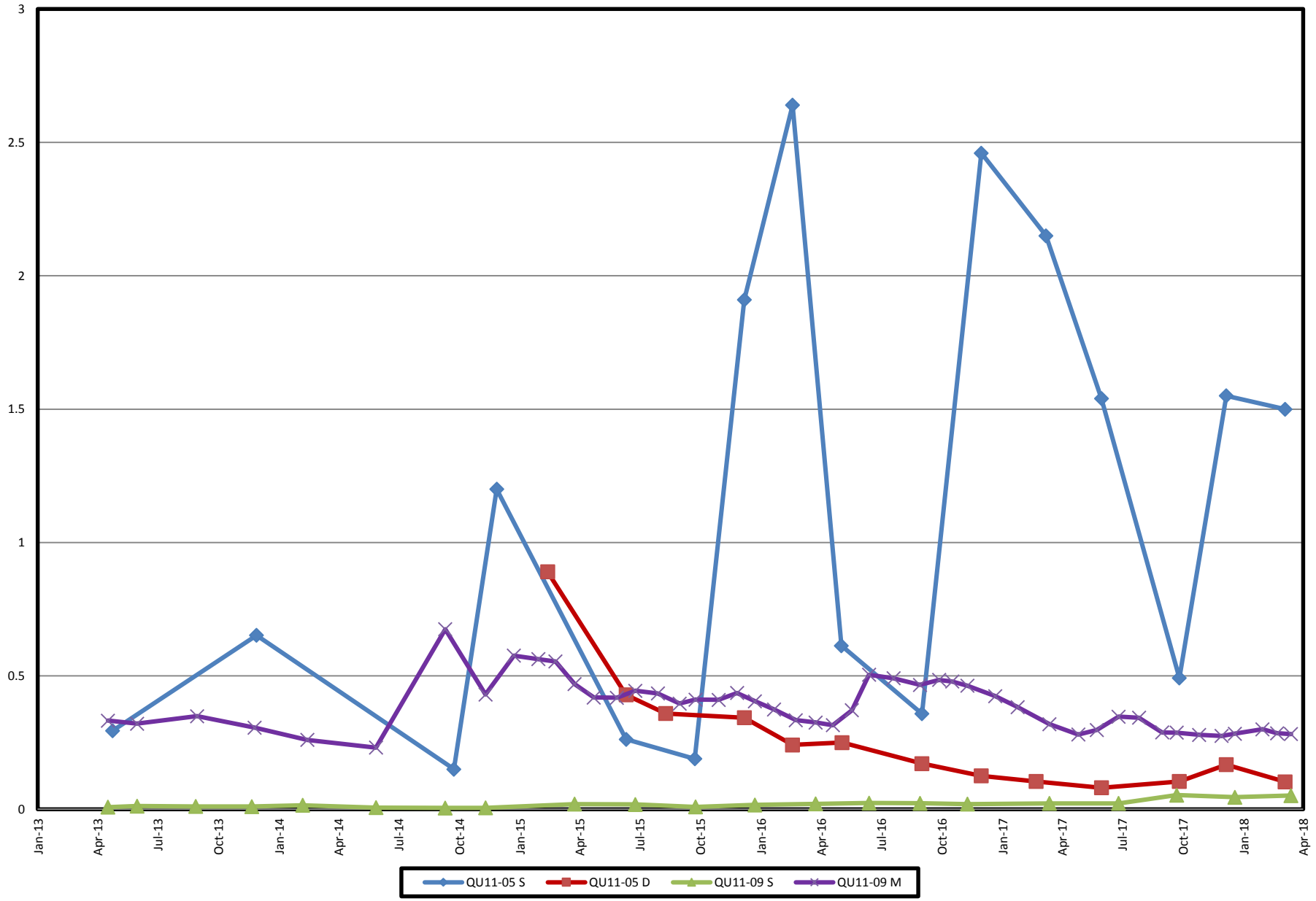


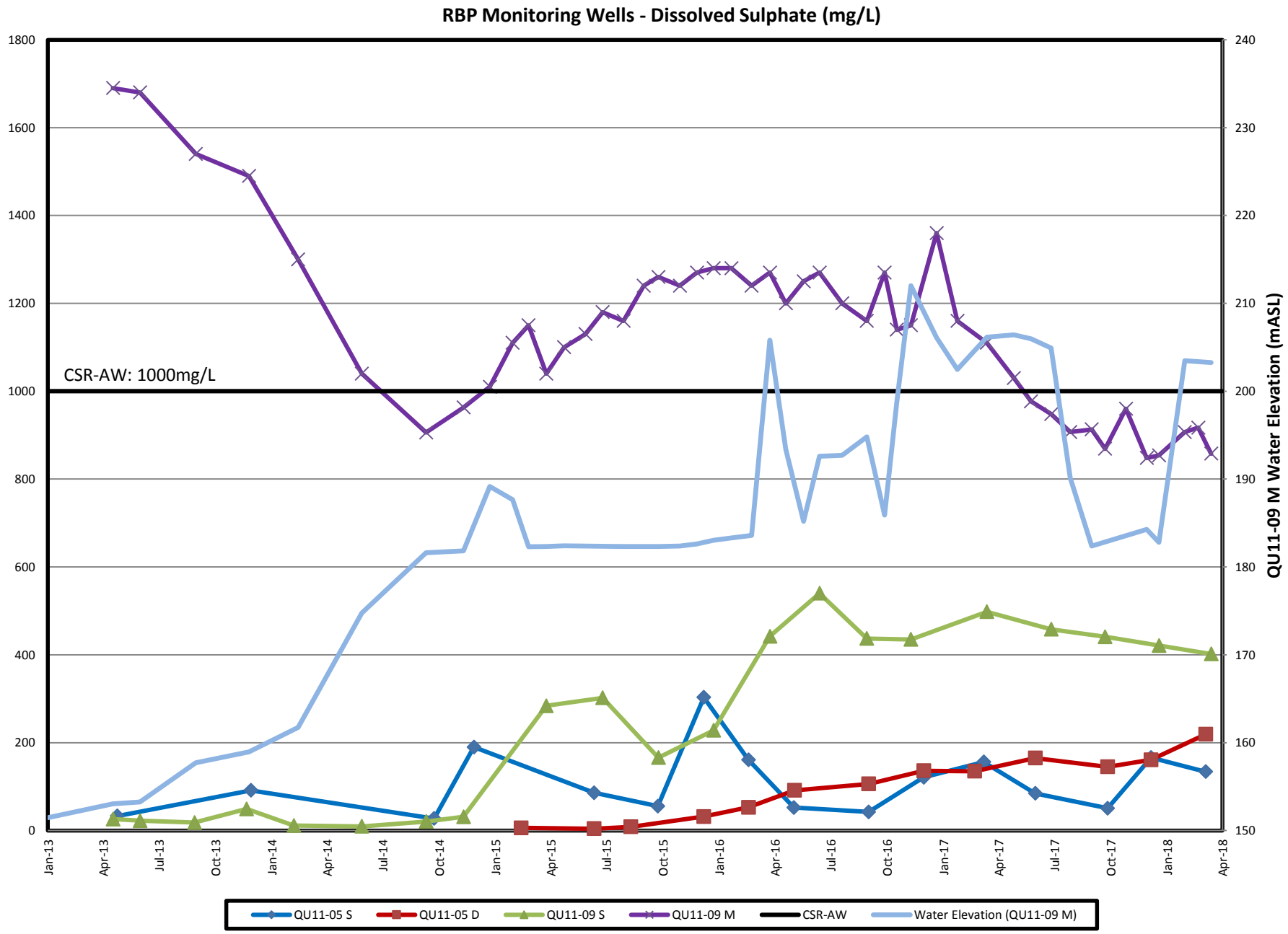
RBP Mine Pool Water Elevation @ QU11-09 M (Metres Above Sea Level)

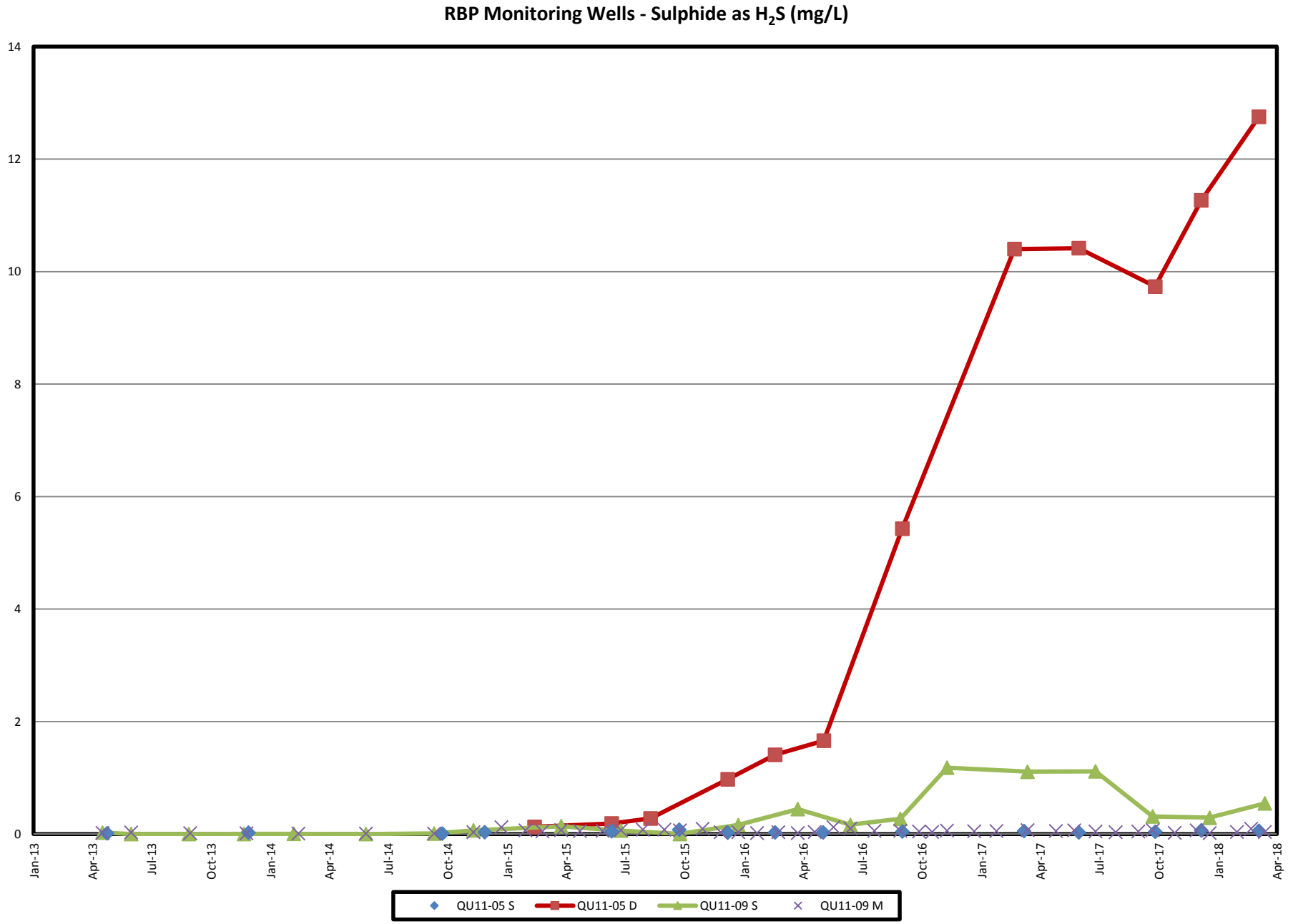


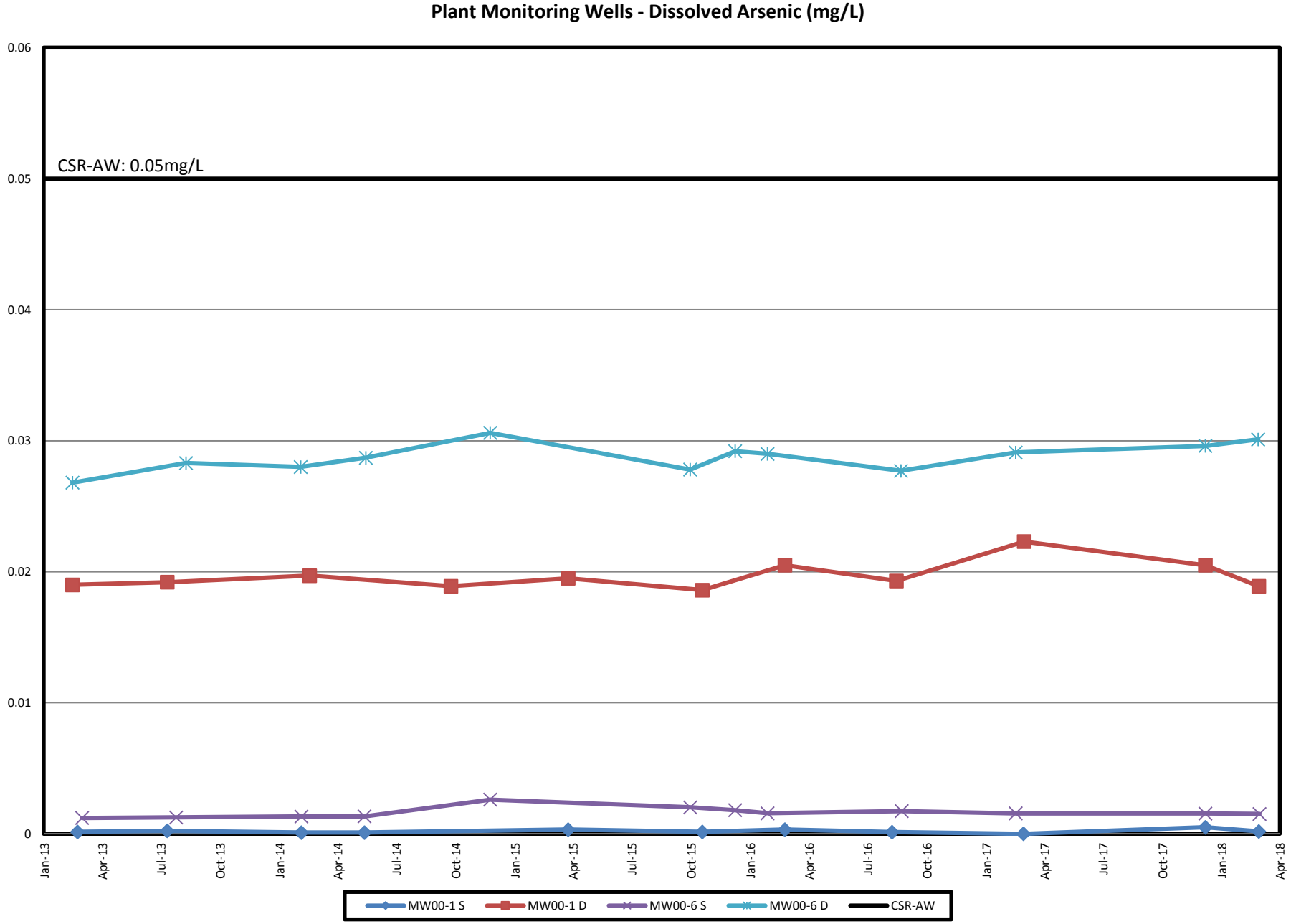

RBP Monitoring Wells - Dissolved Arsenic (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
CSR-AW: 0.05mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU11-05 S
QU11-05 D
QU11-09 S
QU11-09 M
CSR-AW

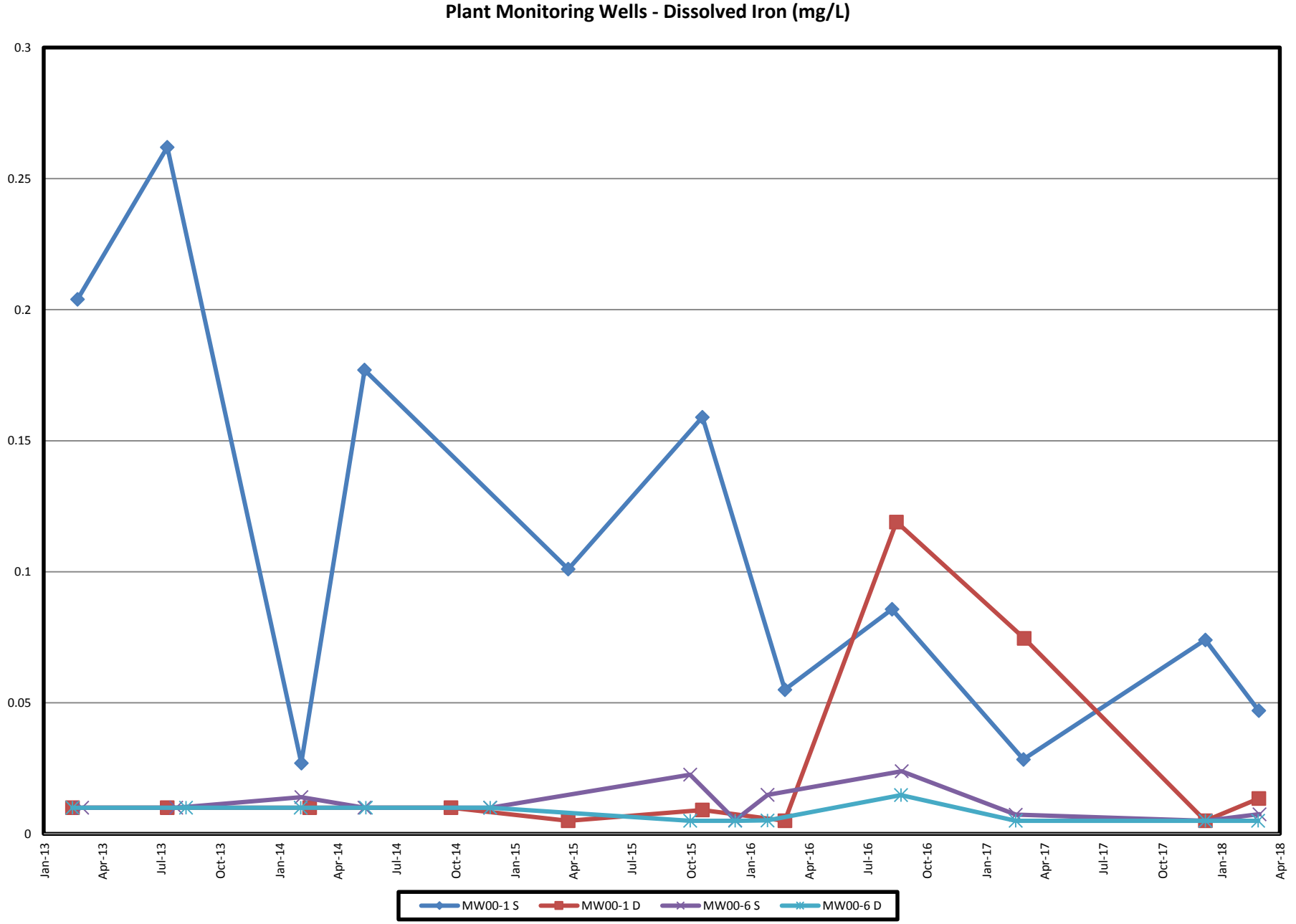

RBP Monitoring Wells - Dissolved Iron (mg/L)
30
25
20
15
10
5
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU11-05 S
QU11-05 D
QU11-09 S
QU11-09 M
Linear (QU11-09 M)


RBP Monitoring Wells - Dissolved Manganese (mg/L)
3
2.5
2
1.5
1
0.5
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU11-05 S
QU11-05 D
QU11-09 S
QU11-09 M

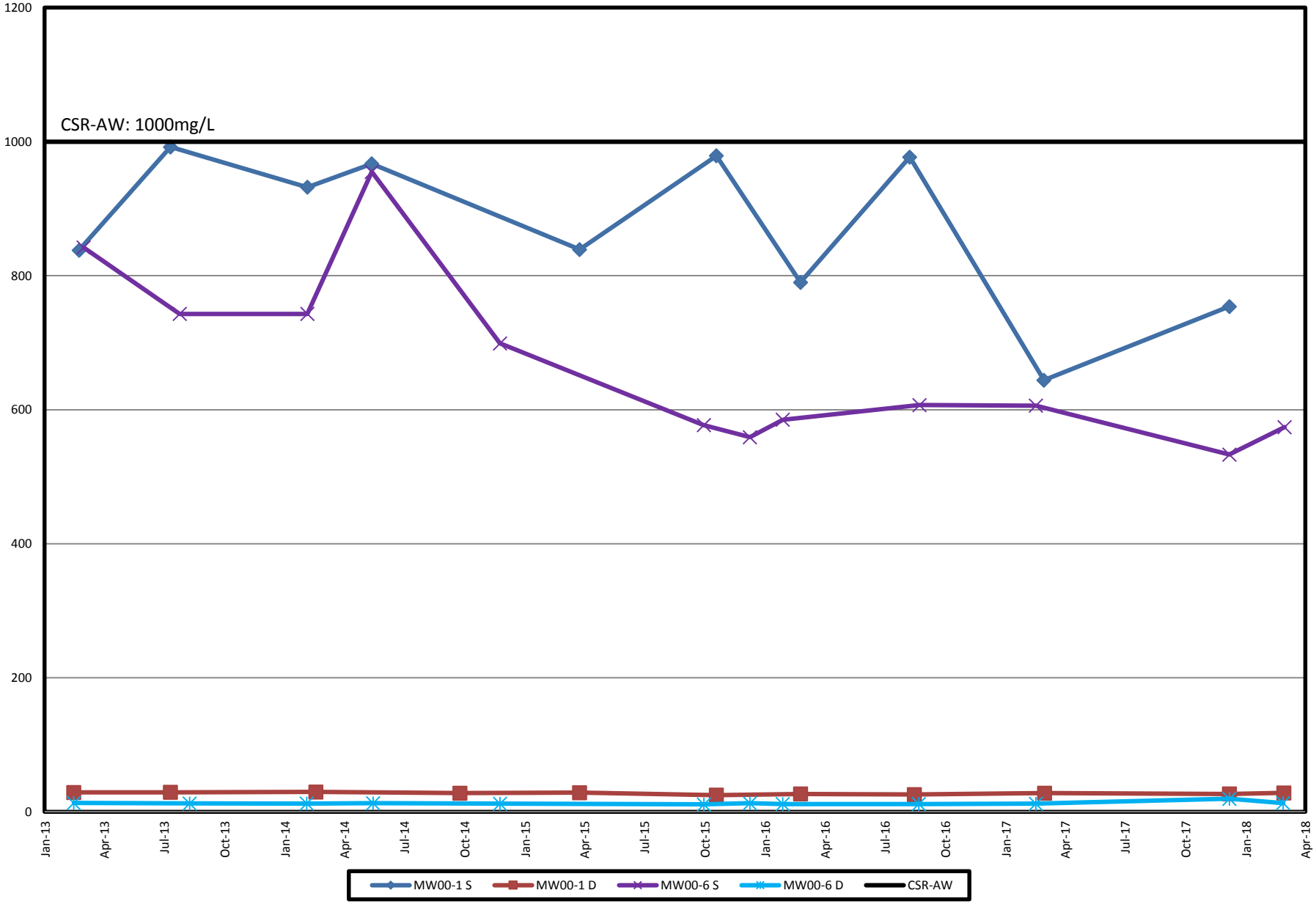

RBP Monitoring Wells - Dissolved Sulphate (mg/L)
CSR-AW: 1000mg/L
QU11-09 M Water Elevation (mASL)
1800
1600
1400
1200
1000
800
600
400
200
0
240
230
220
210
200
190
180
170
160
150
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU11-05 S
QU11-05 D
QU11-09 S
QU11-09 M
CSR-AW
Water Elevation (QU11-09 M)

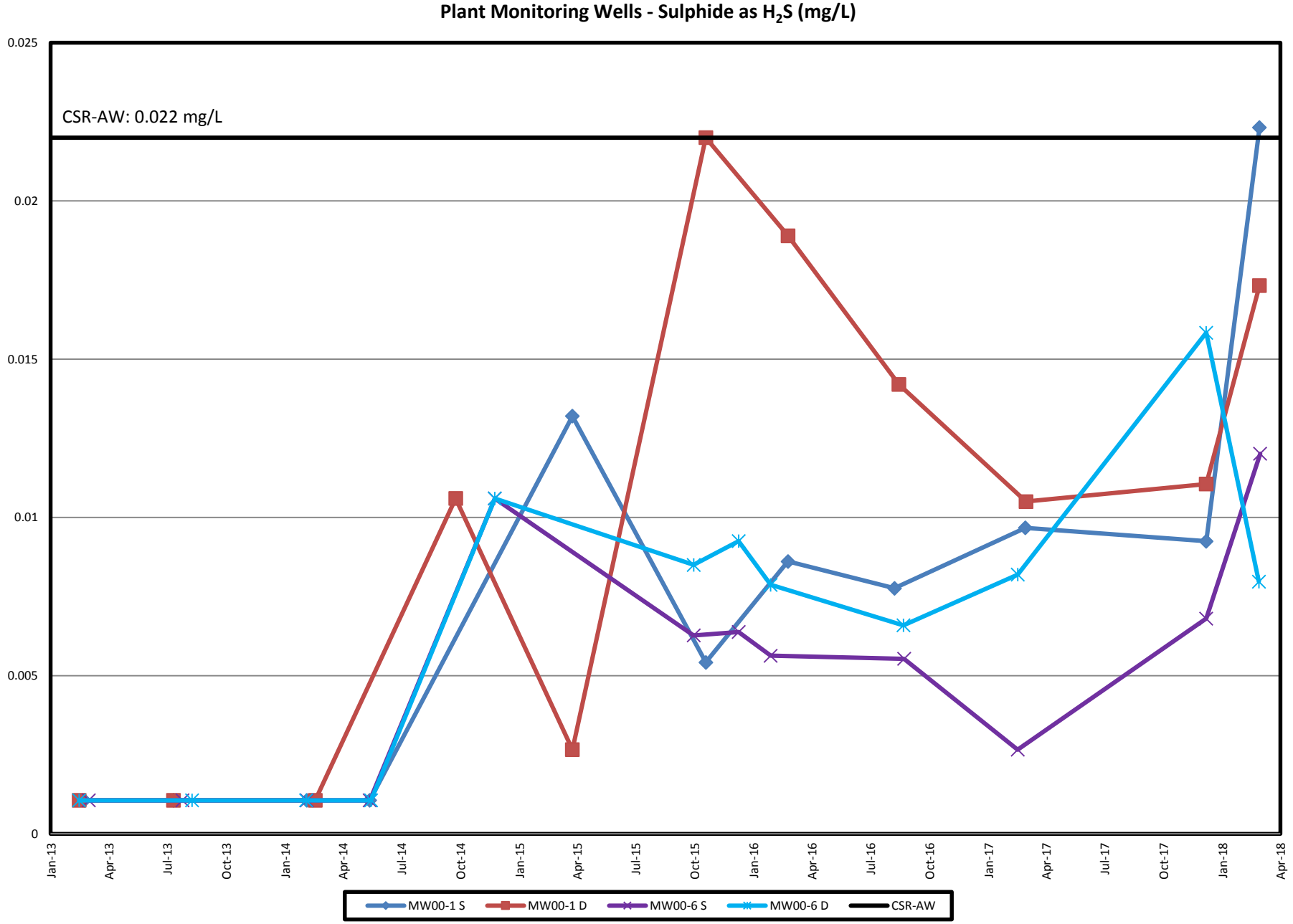

RBP Monitoring Wells - Sulphide as H_2S (mg/L)
14
12
10
8
6
4
2
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU11-05 S
QU11-05 D
QU11-09 S
QU11-09 M


Plant Monitoring Wells - Dissolved Arsenic (mg/L)
CSR-AW: 0.05mg/L
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-1 S
MW00-1 D
MW00-6 S
MW00-6 D
CSR-AW

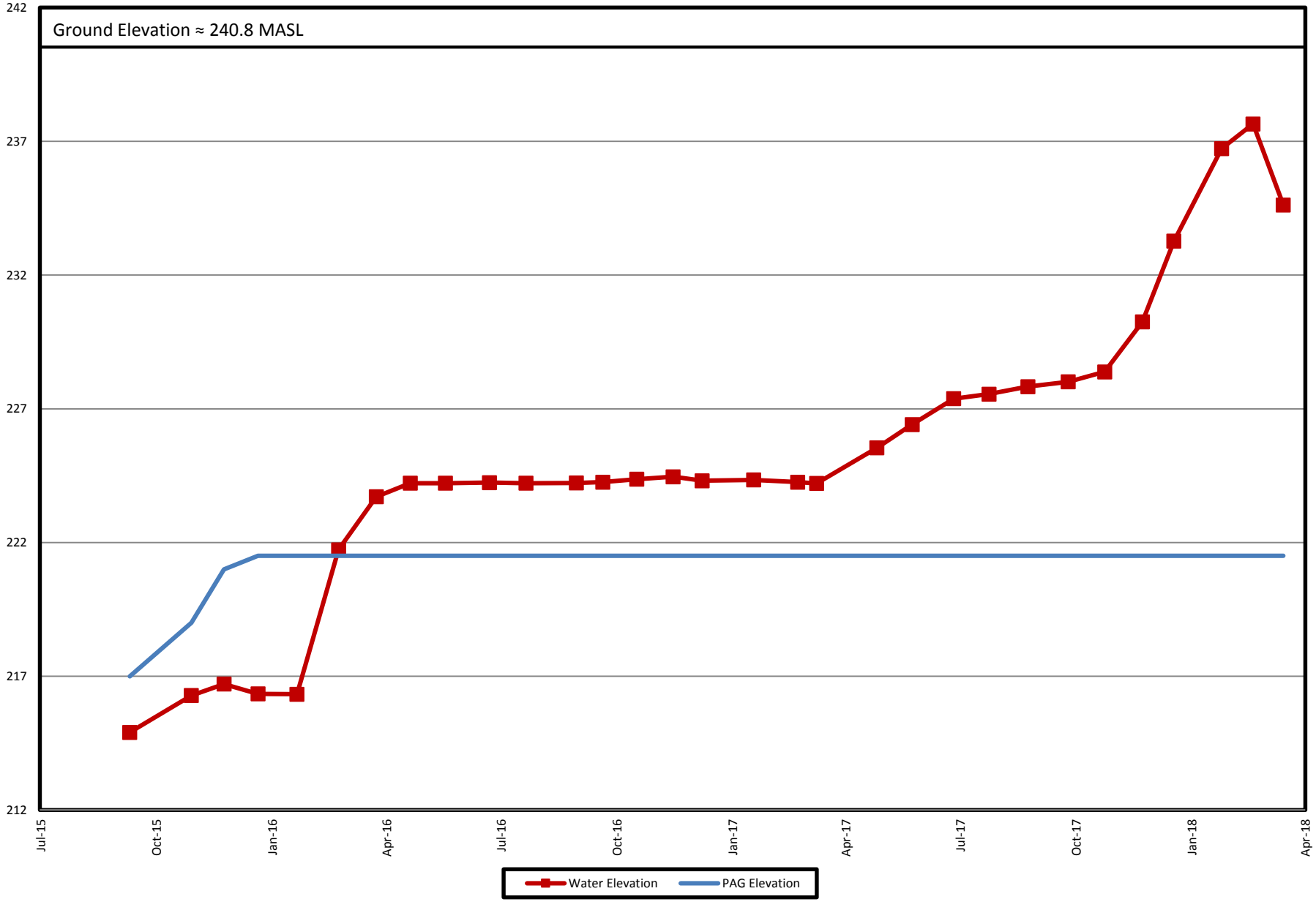

Plant Monitoring Wells - Dissolved Iron (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-1 S
MW00-1 D
MW00-6 S
MW00-6 D

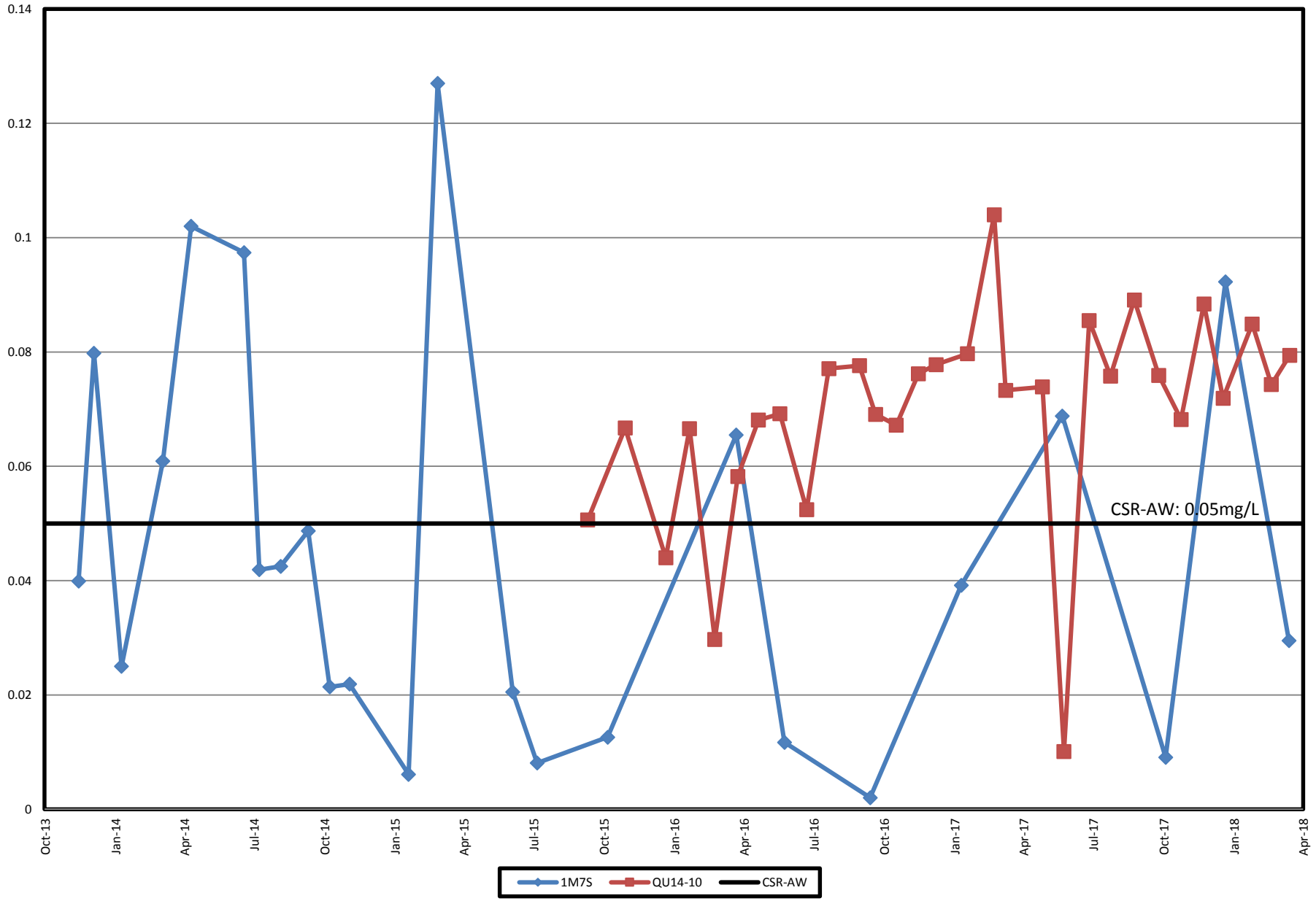
Plant Monitoring Wells - Dissolved Sulphate (mg/L)

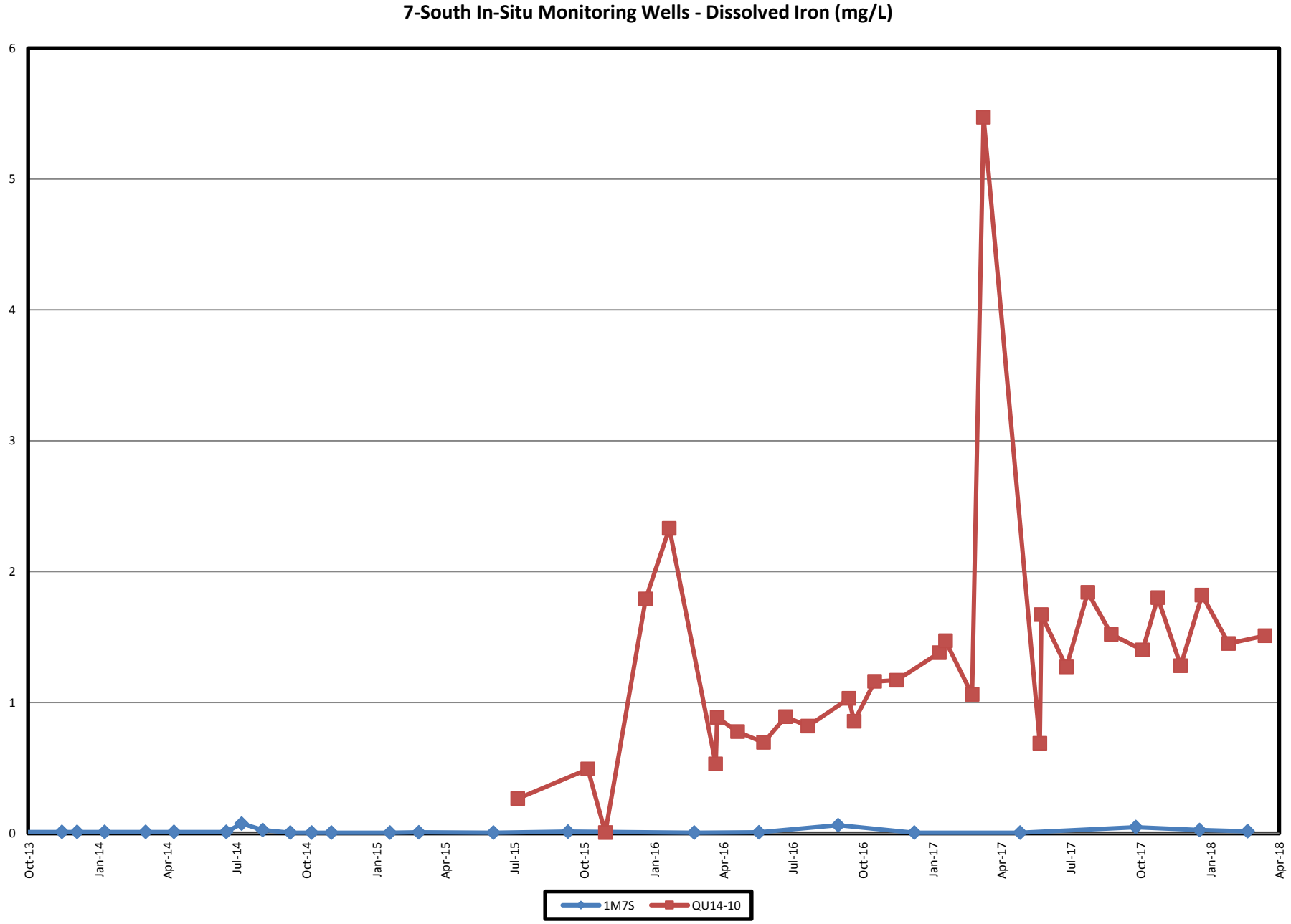


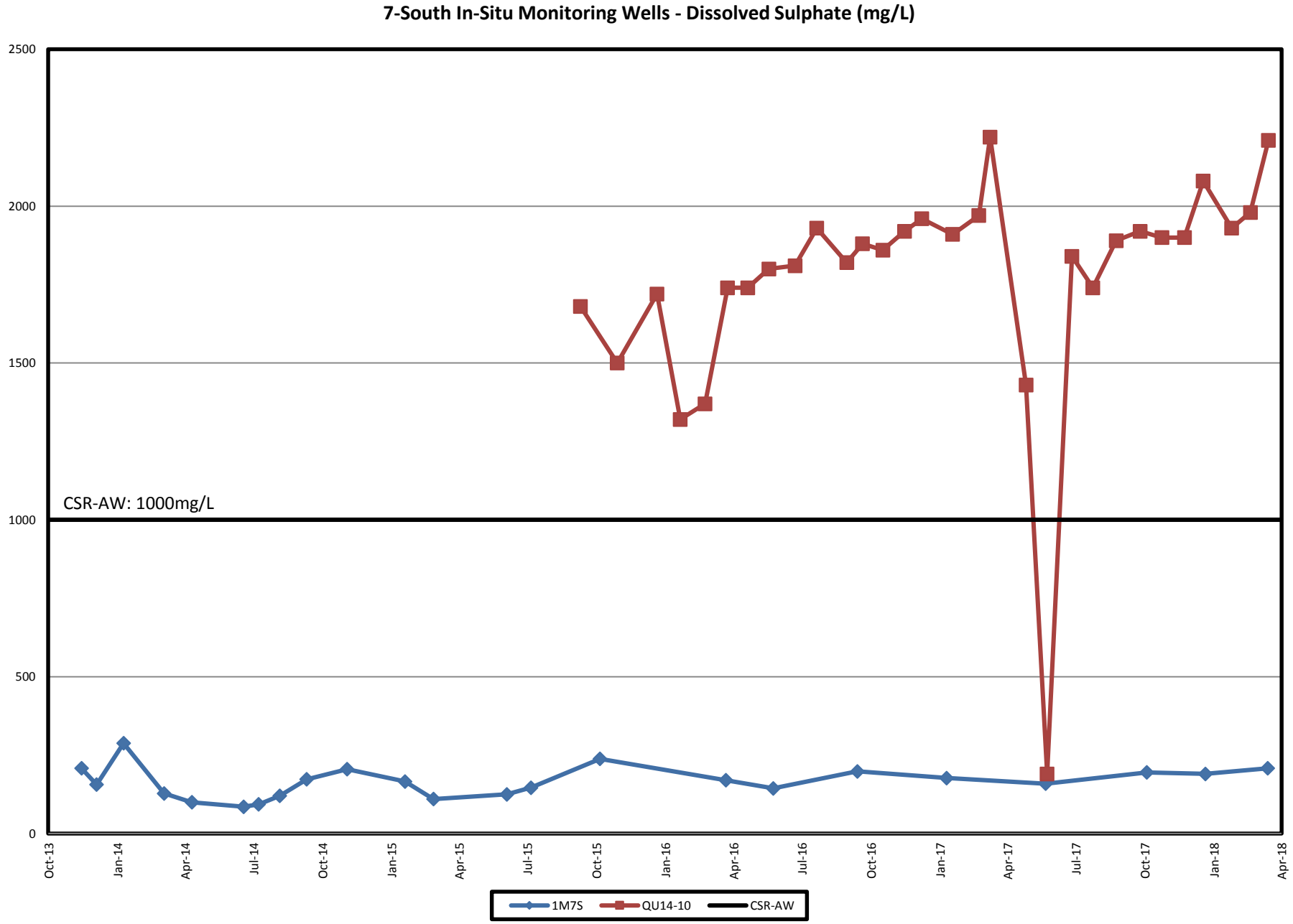

Plant Monitoring Wells - Sulphide as H_2S (mg/L)
CSR-AW: 0.022 mg/L
0.025
0.02
0.015
0.01
0.005
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-1 S
MW00-1 D
MW00-6 S
MW00-6 D
CSR-AW

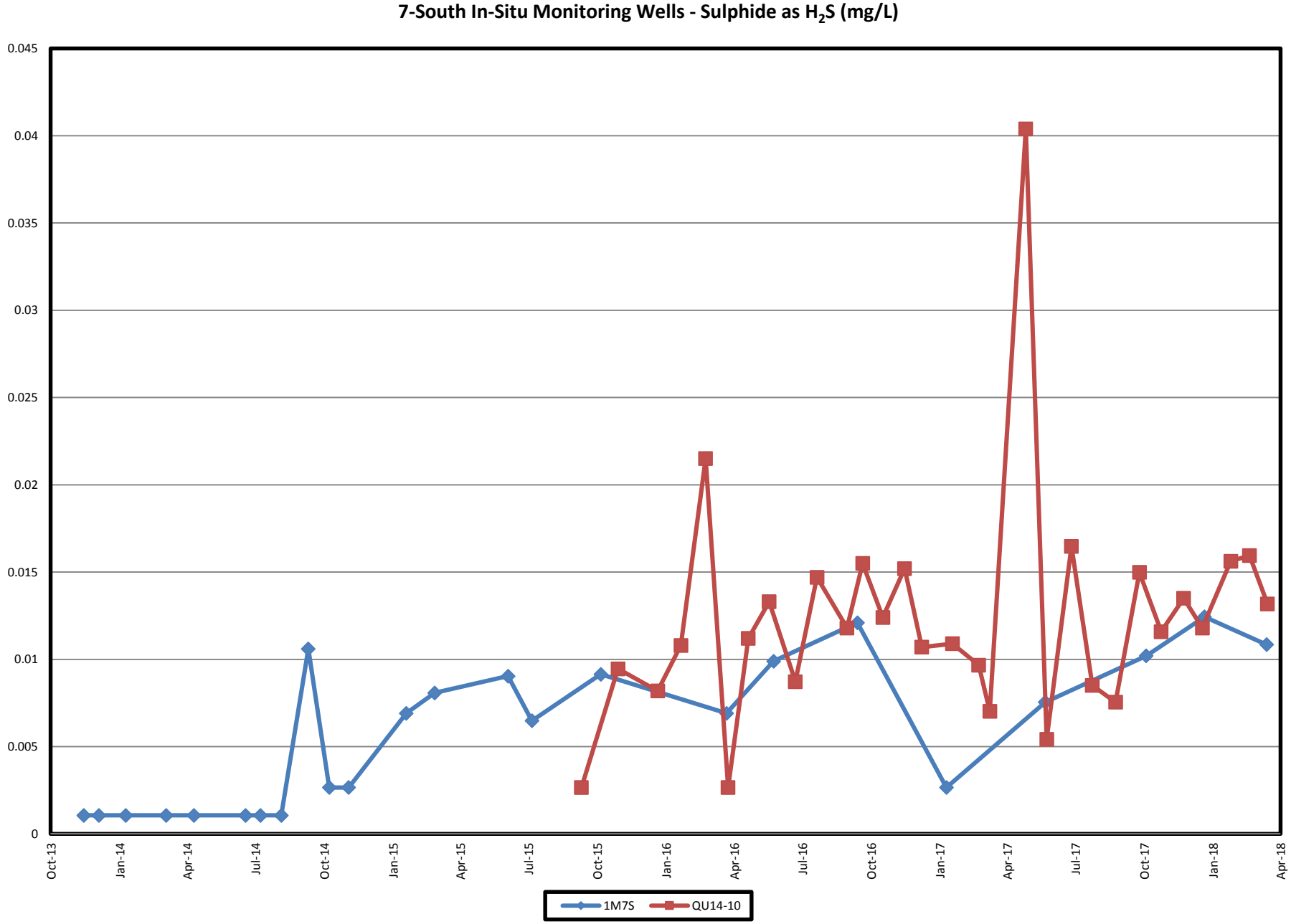
In-Situ 7-South PAG Elevation and Water Elevation @ QU14-10 (Metres Above Sea Level)

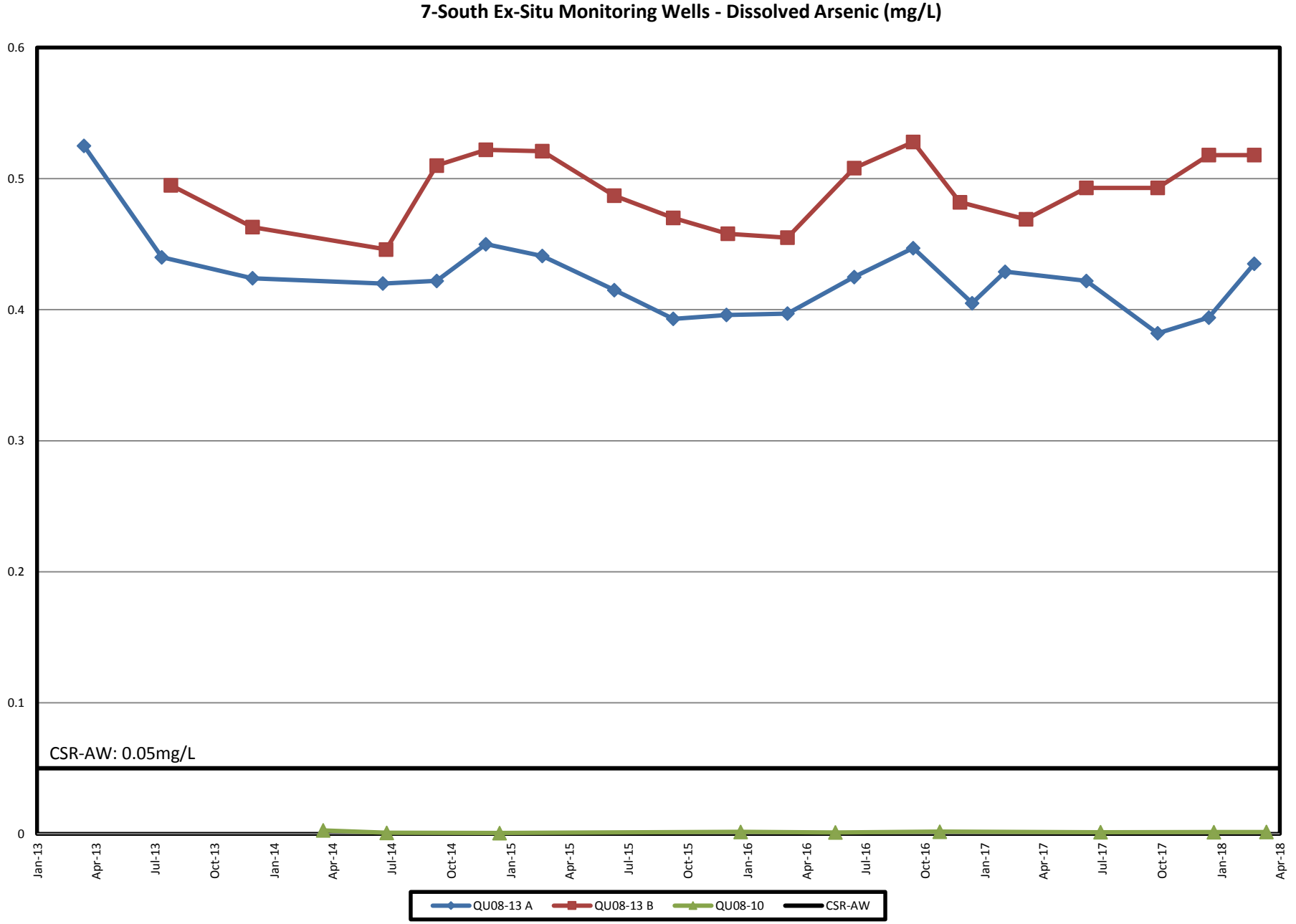


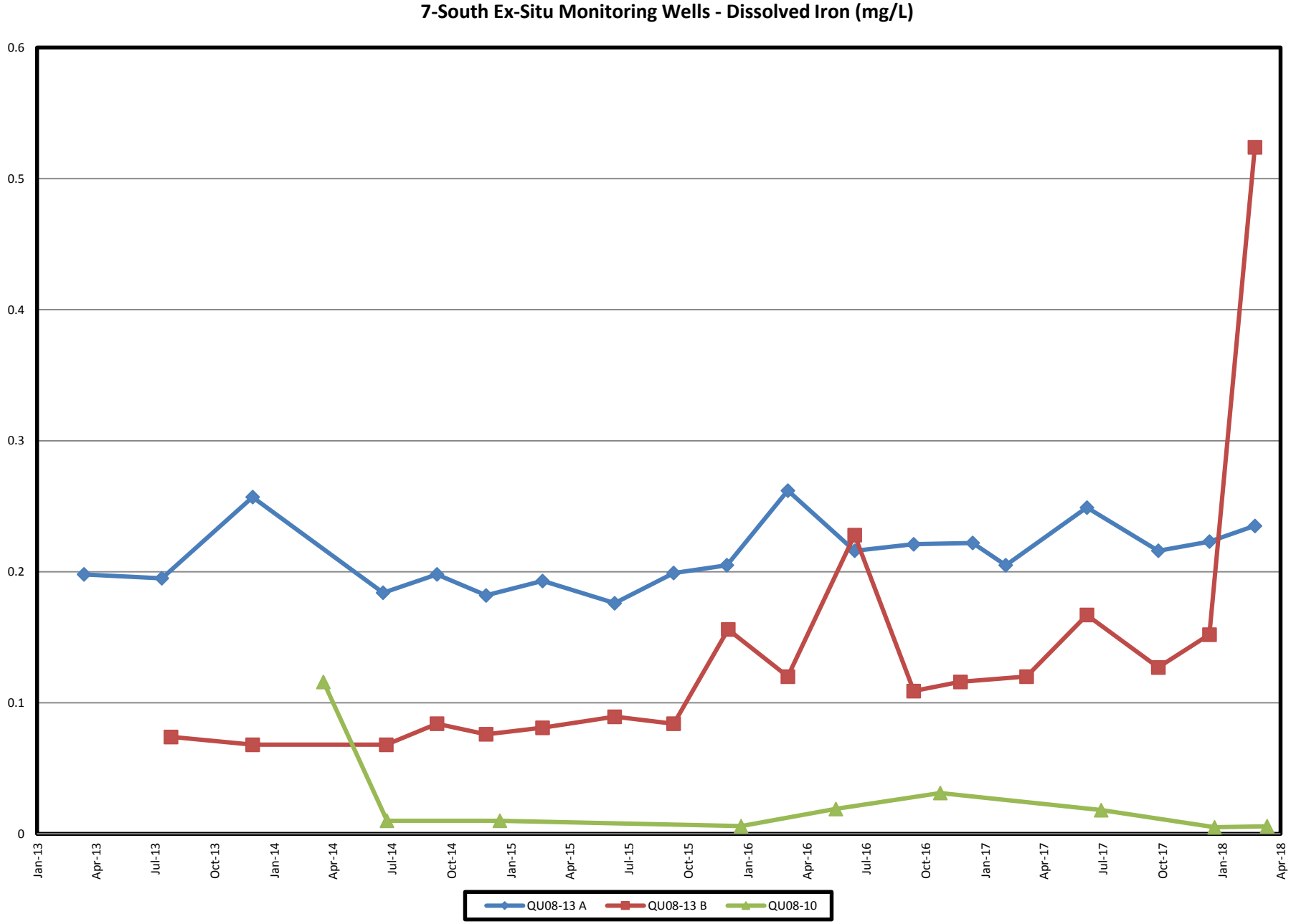

7-South In-Situ Monitoring Wells - Dissolved Arsenic (mg/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
CSR-AW: 0.05mg/L
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M7S
QU14-10
CSR-AW


7-South In-Situ Monitoring Wells - Dissolved Iron (mg/L)
6
5
4
3
2
1
0
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M7S
QU14-10

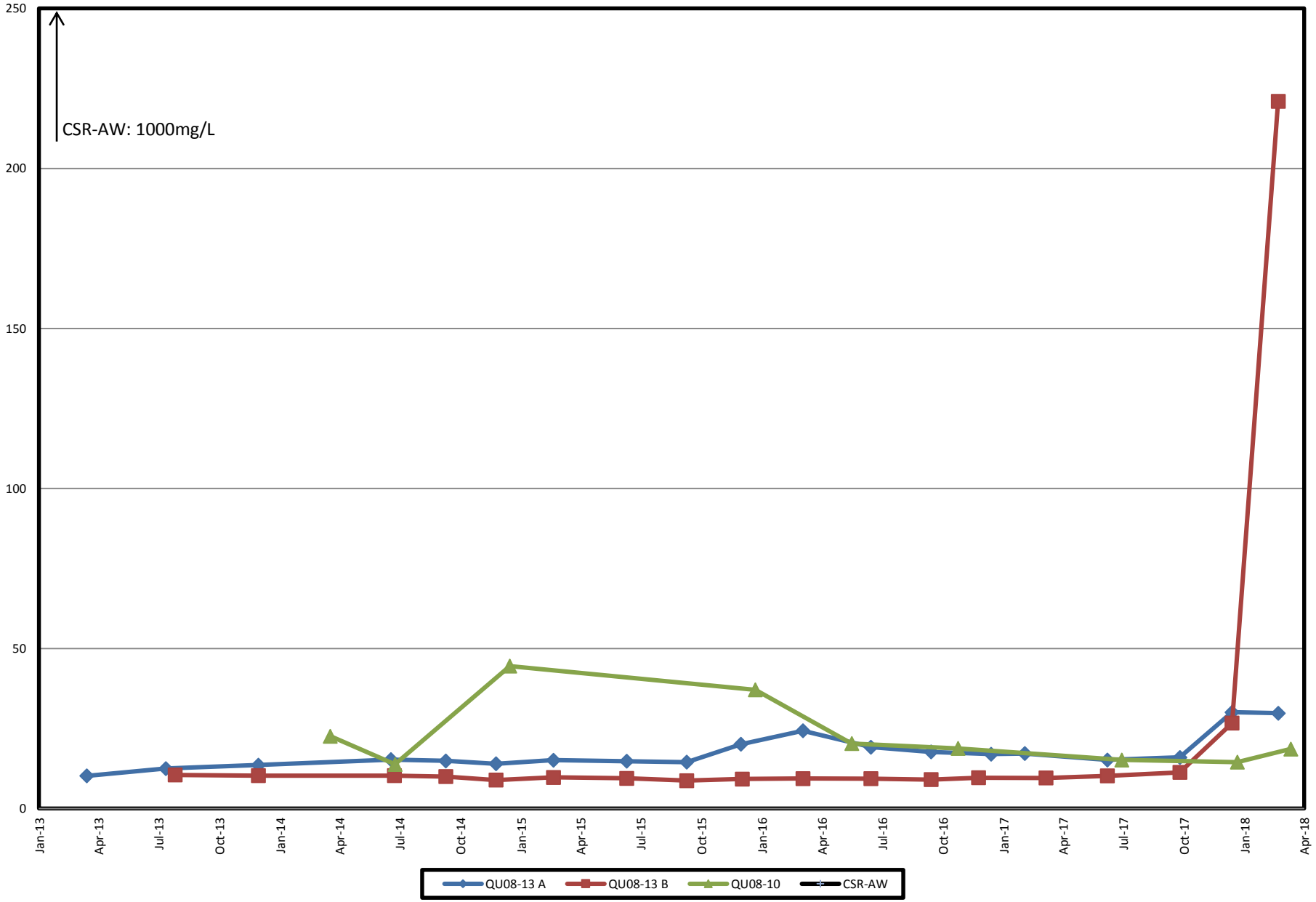

7-South In-Situ Monitoring Wells - Dissolved Sulphate (mg/L)
2500
2000
1500
1000
500
0
CSR-AW: 1000mg/L
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M7S
QU14-10
CSR-AW

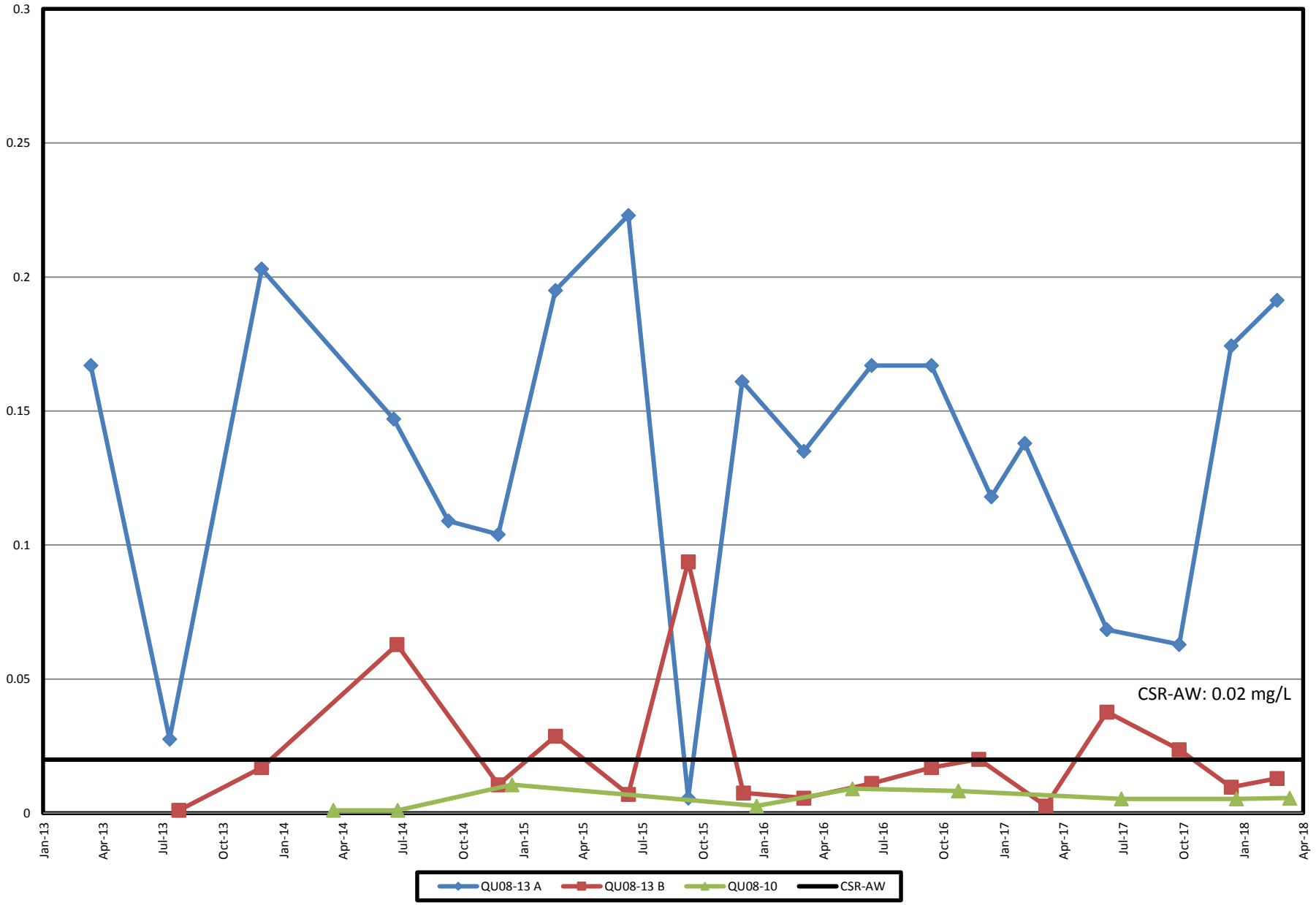

7-South In-Situ Monitoring Wells - Sulphide as H_2S (mg/L)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
1M7S
QU14-10


7-South Ex-Situ Monitoring Wells - Dissolved Arsenic (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
CSR-AW: 0.05mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU08-13 A
QU08-13 B
QU08-10
CSR-AW

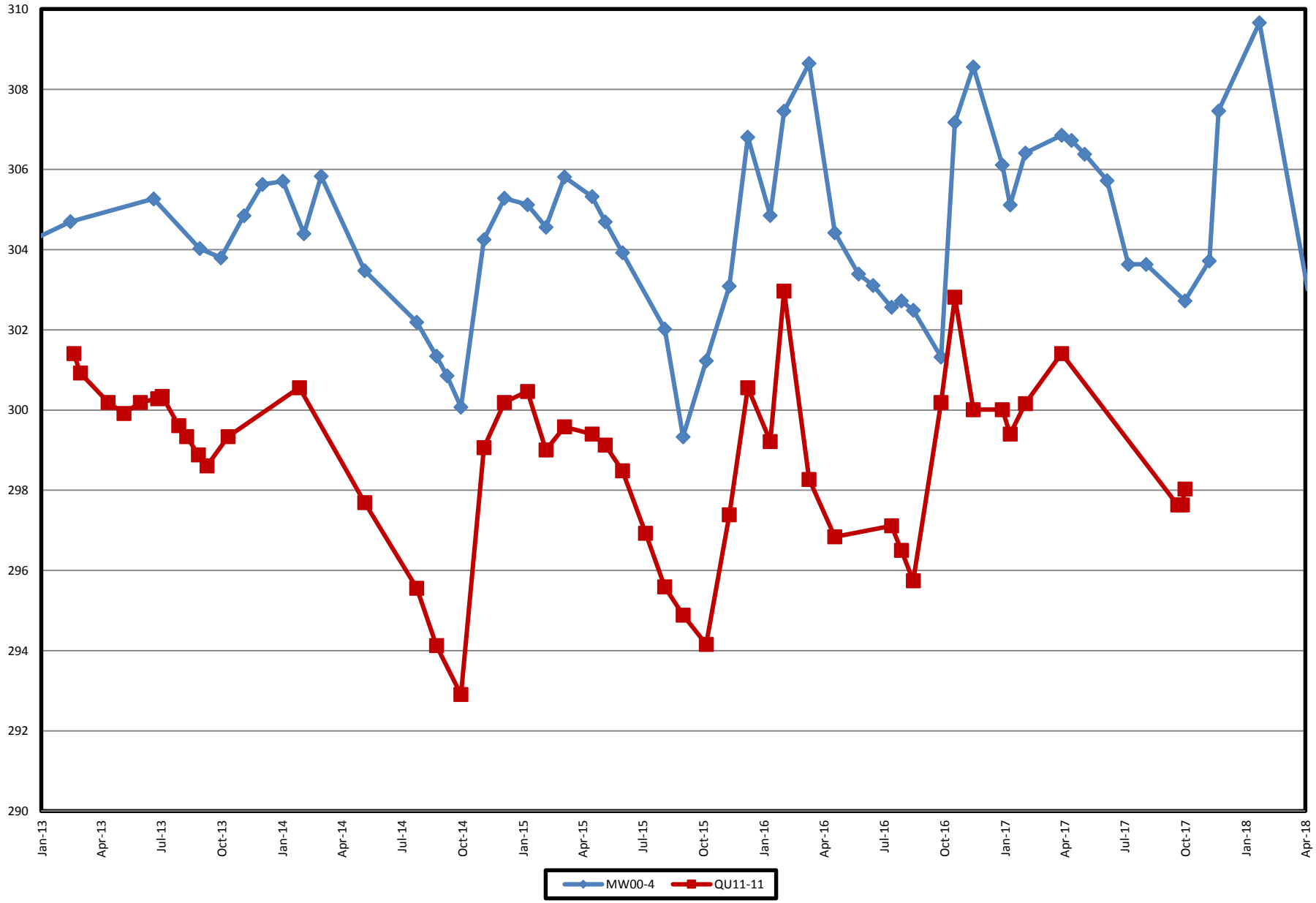

7-South Ex-Situ Monitoring Wells - Dissolved Iron (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU08-13 A
QU08-13 B
QU08-10

7-South Ex-Situ Monitoring Wells - Dissolved Sulphate (mg/L)

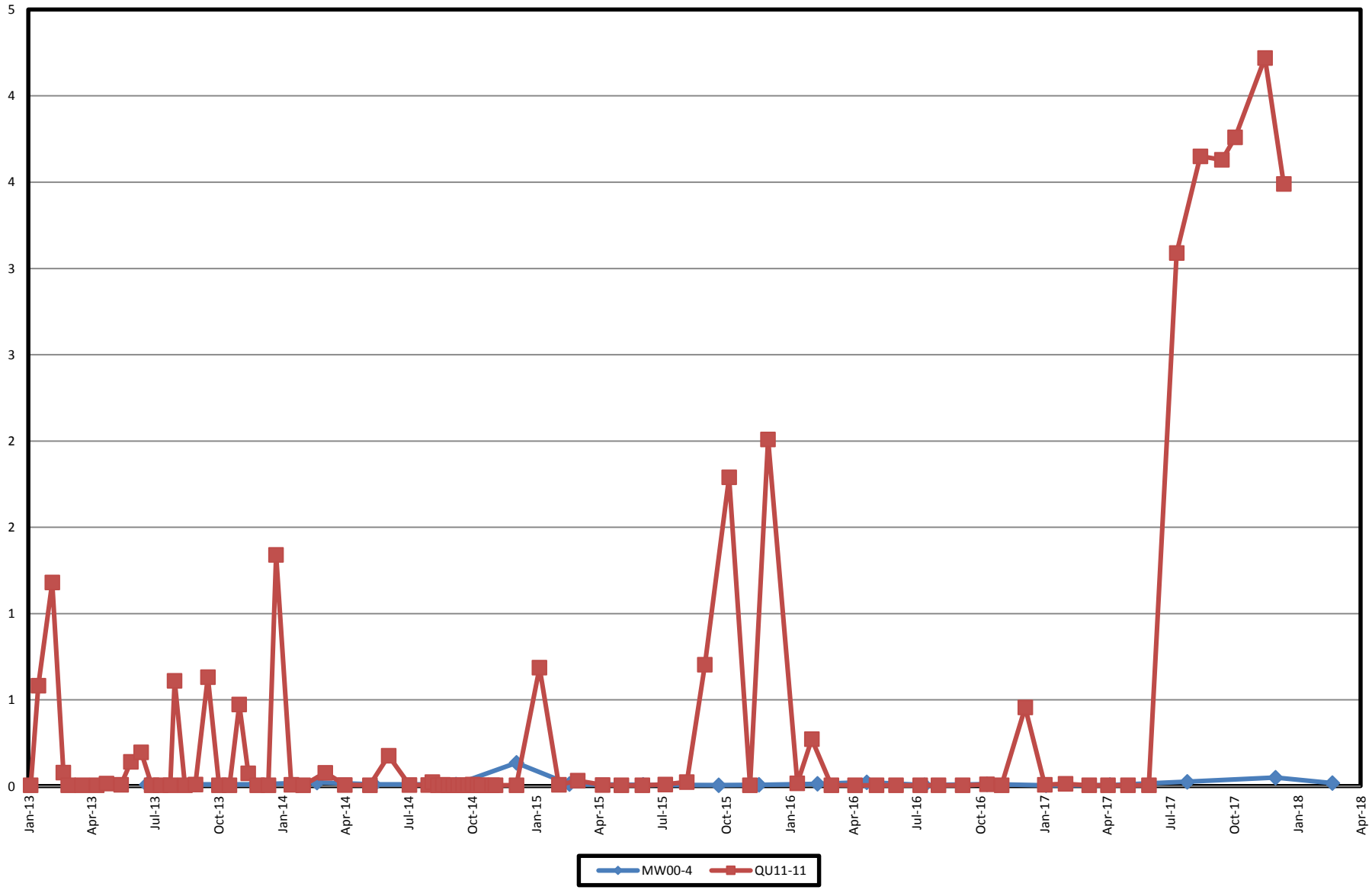



7-South Ex-Situ Monitoring Wells - Sulphide as H_2S (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
CSR-AW: 0.02 mg/L
QU08-13 A
QU08-13 B
QU08-10
CSR-AW

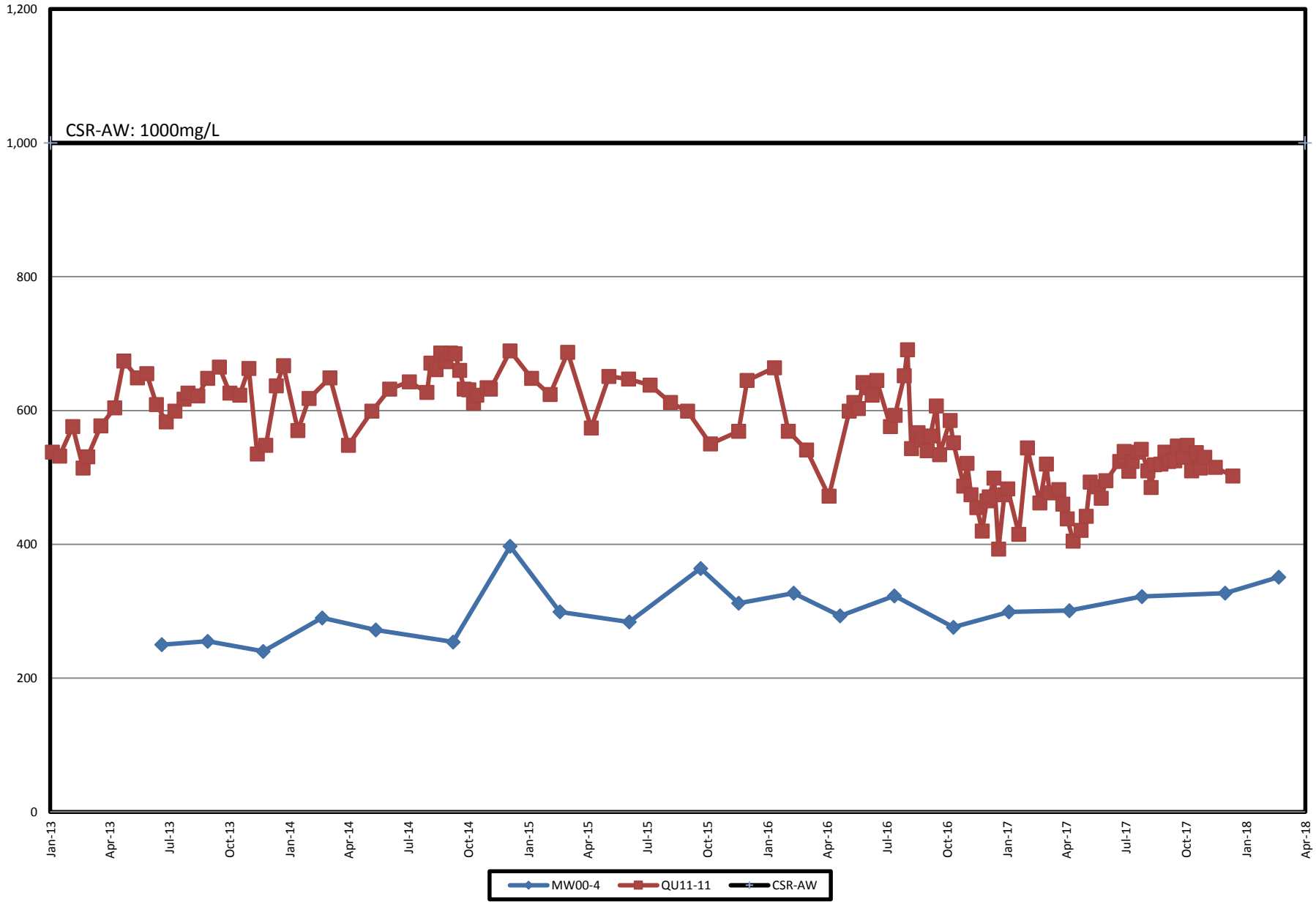
In-Situ 2-South Groundwater and Mine Pool Water Elevations (Metres Above Sea Level)

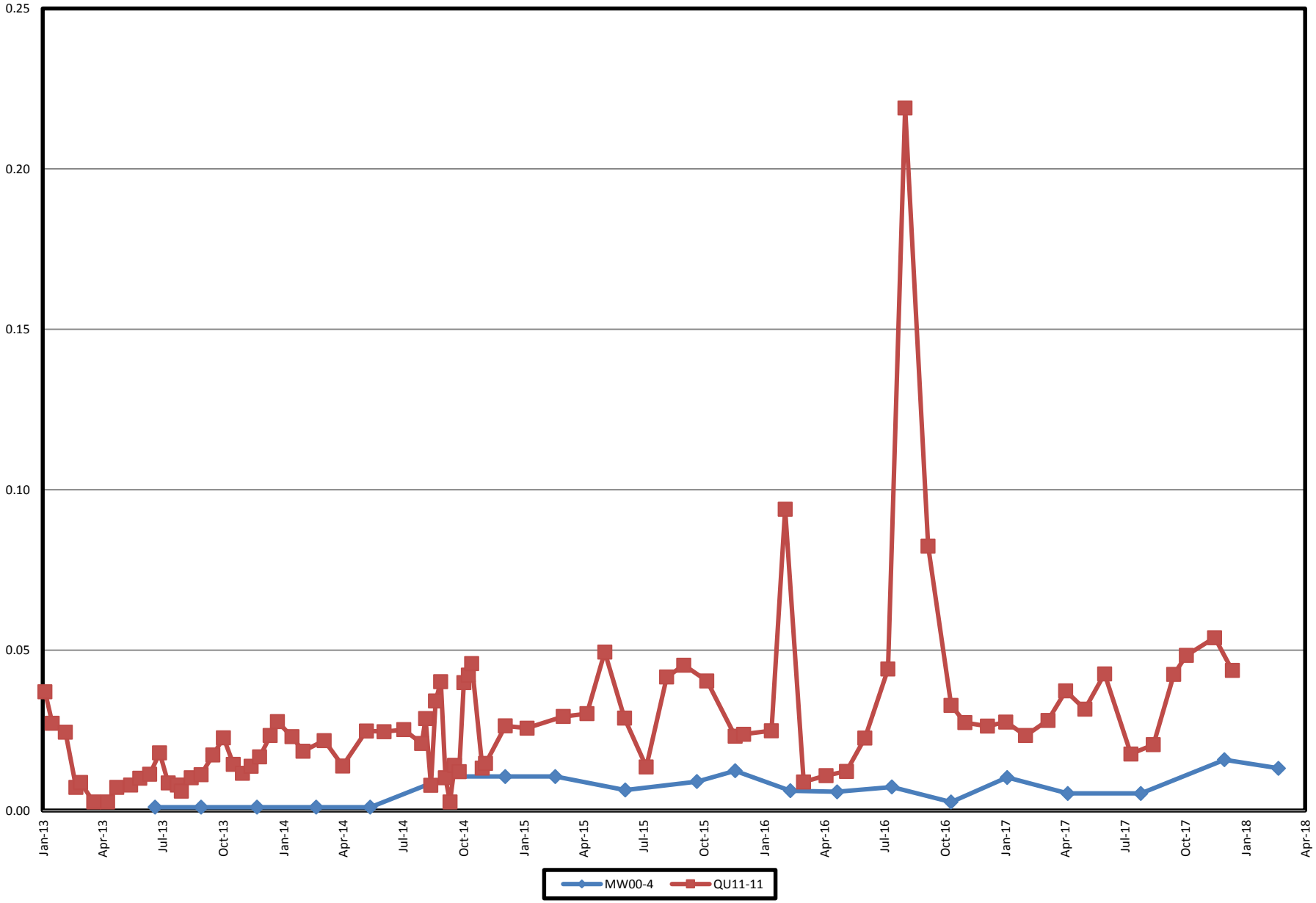


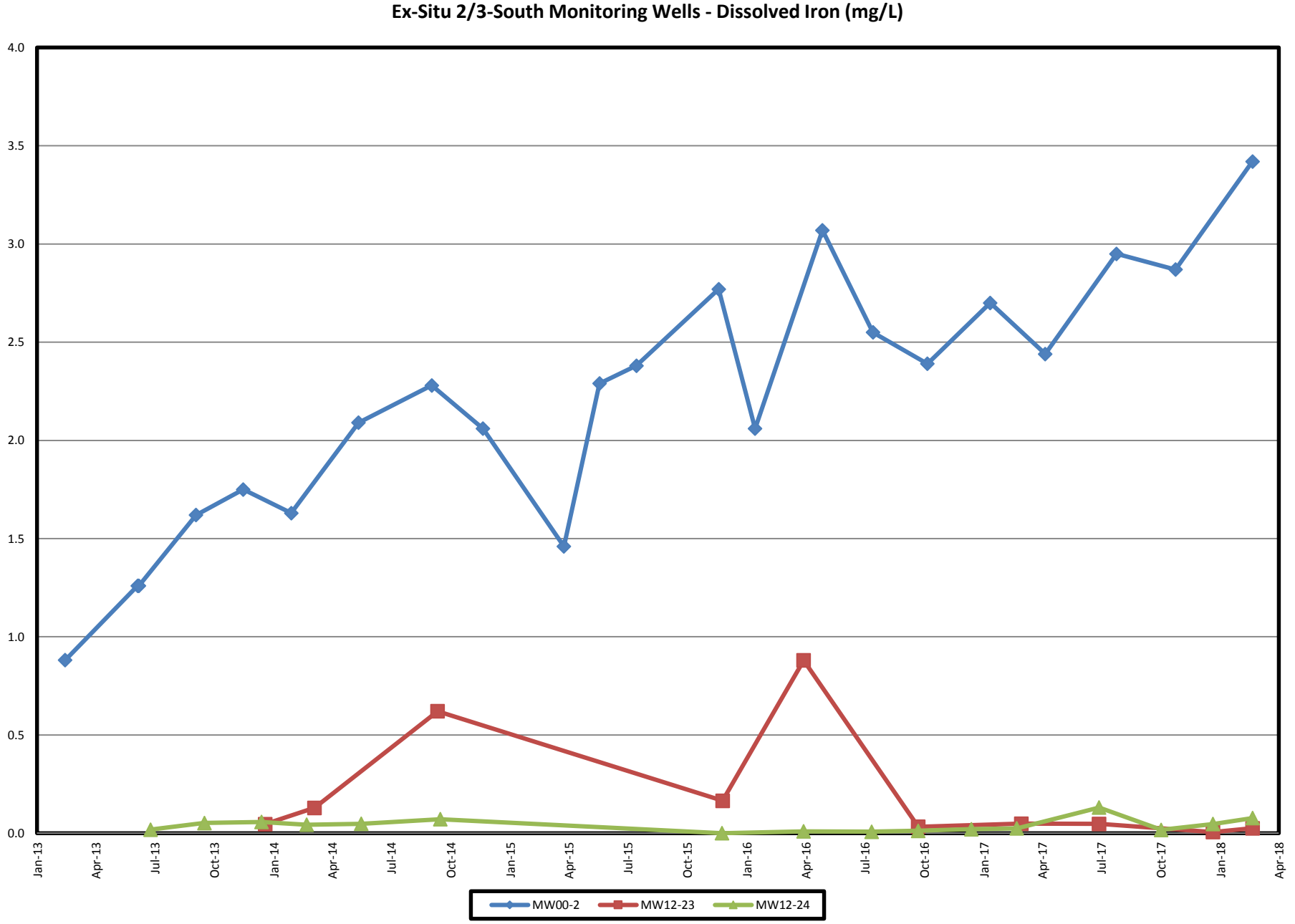
In-Situ 2-South Monitoring Wells - Dissolved Iron (mg/L)

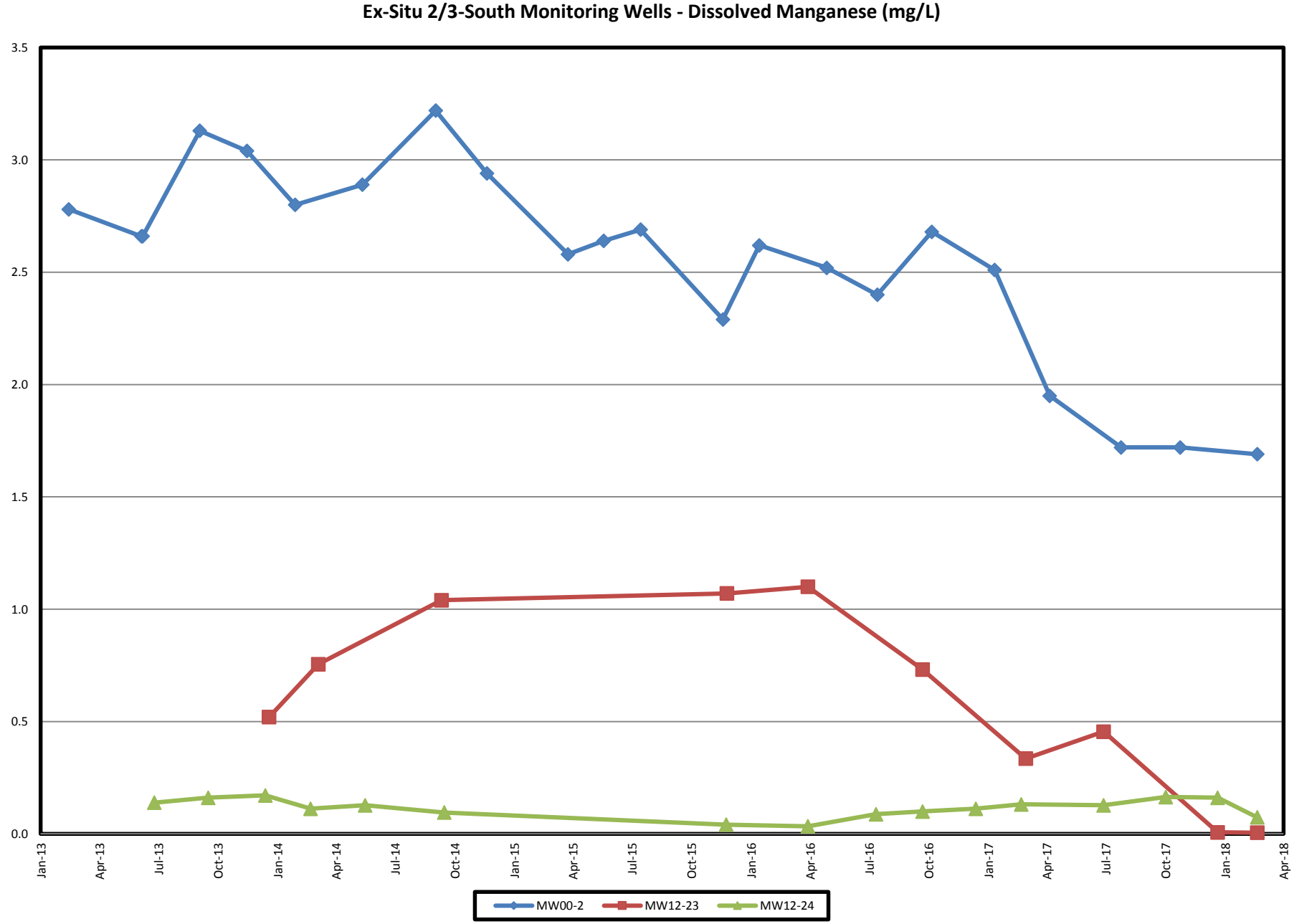


In-Situ 2-South Monitoring Wells - Dissolved Sulphate (mg/L)

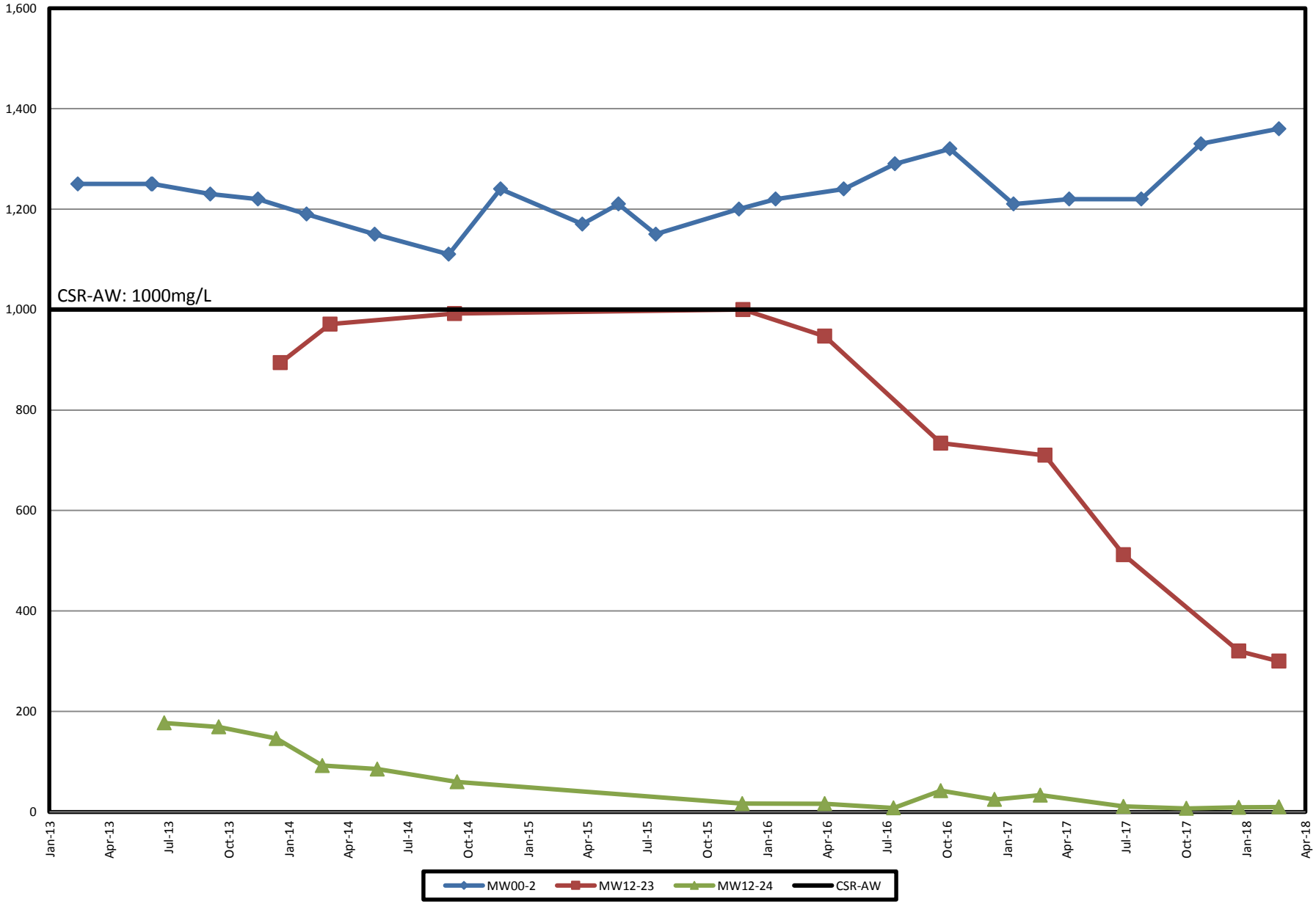


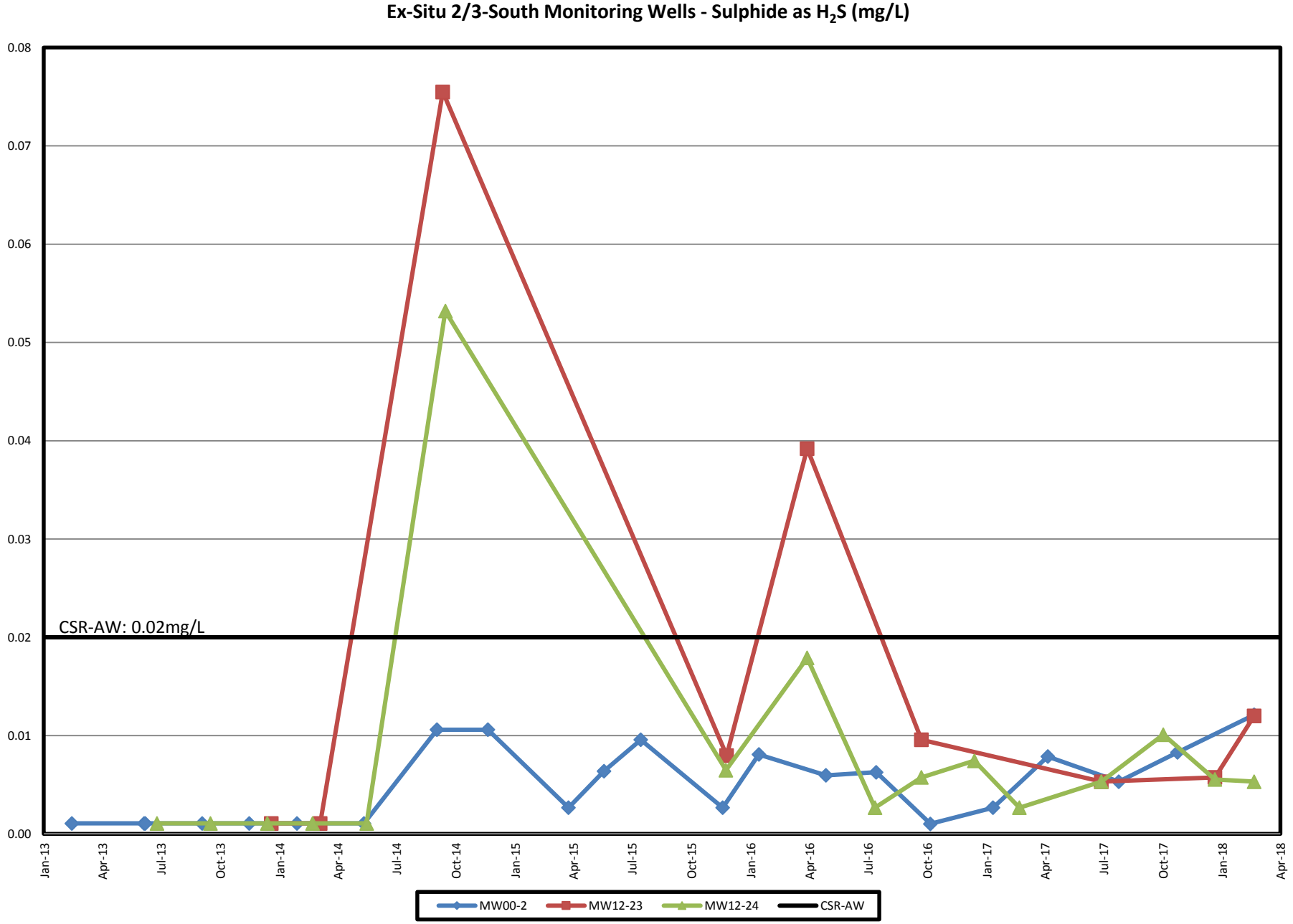

In-Situ 2-South Monitoring Wells - Sulphide as H_2S (mg/L)
0.25
0.20
0.15
0.10
0.05
0.00
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-4
QU11-11


Ex-Situ 2/3-South Monitoring Wells - Dissolved Iron (mg/L)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-2
MW12-23
MW12-24

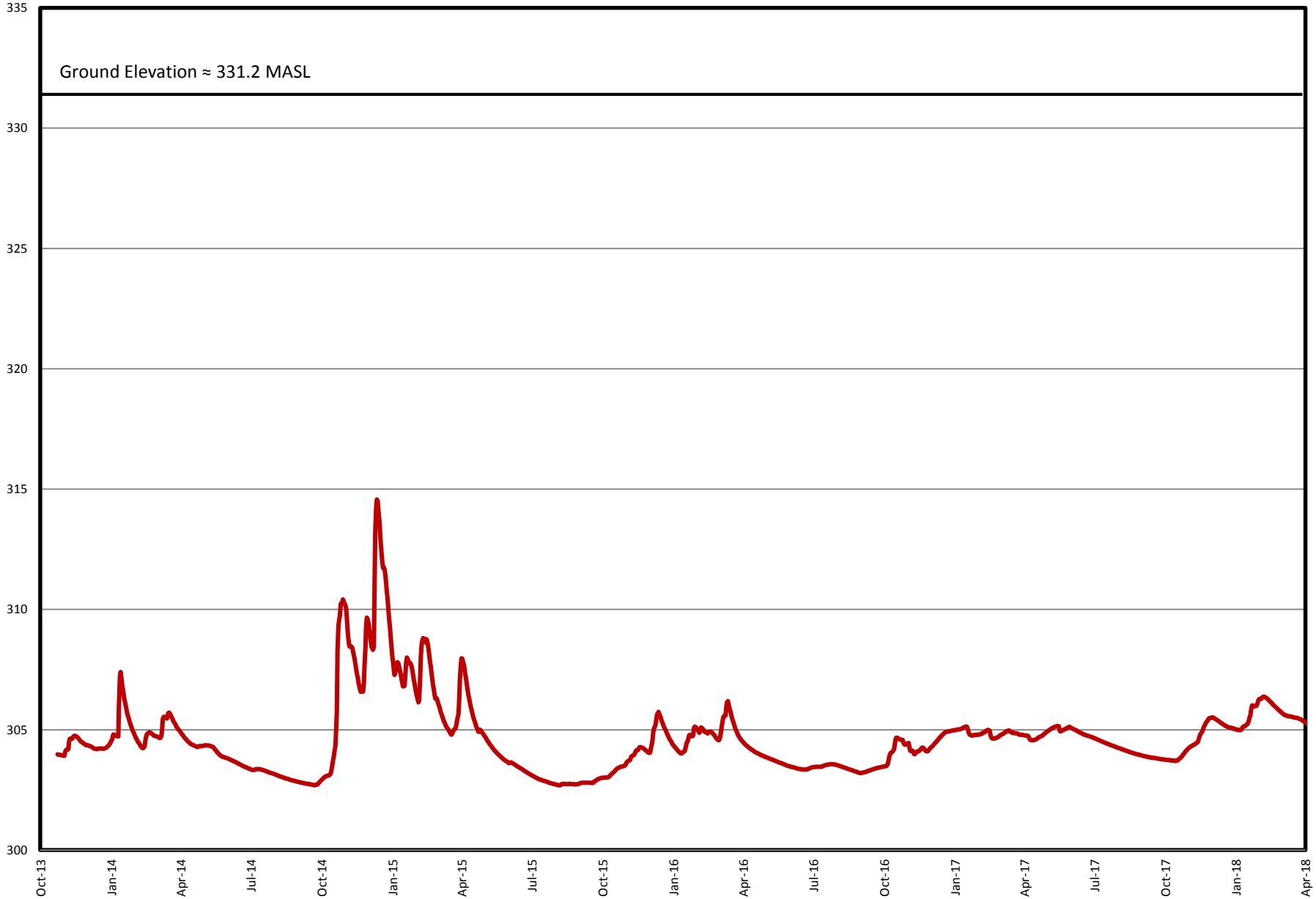

Ex-Situ 2/3-South Monitoring Wells - Dissolved Manganese (mg/L)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-2
MW12-23
MW12-24

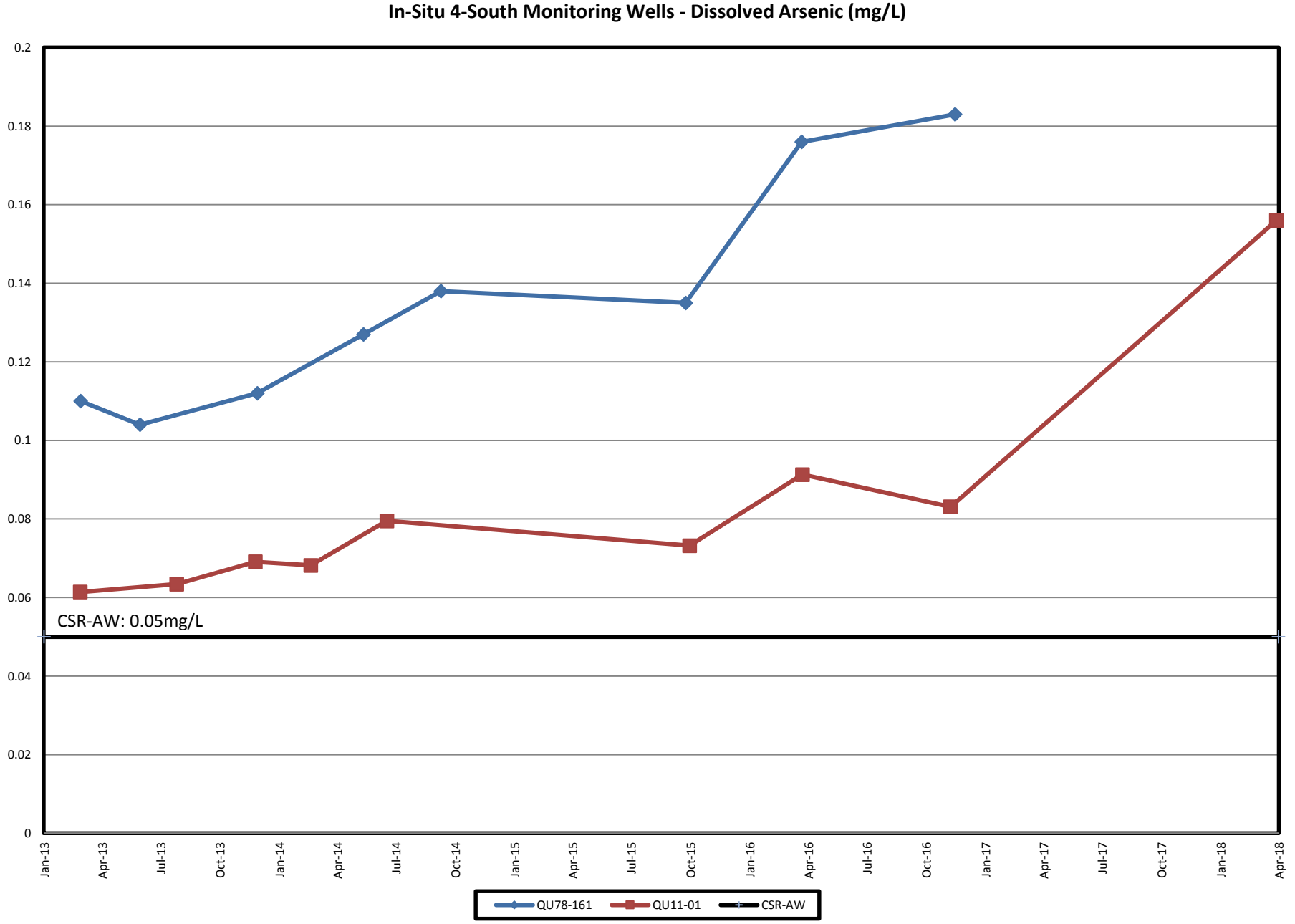
Ex-Situ 2/3-South Monitoring Wells - Dissolved Sulphate (mg/L)

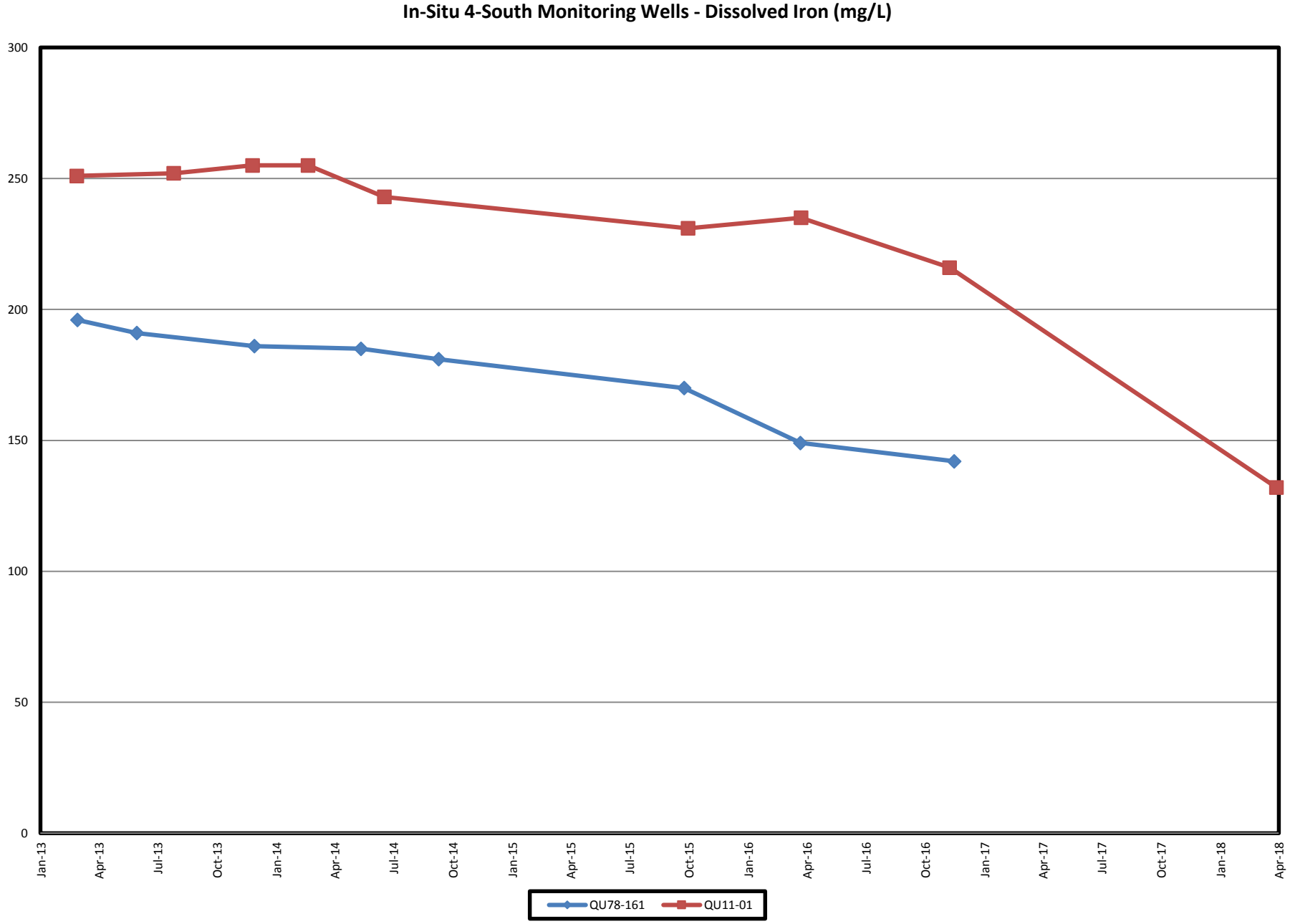


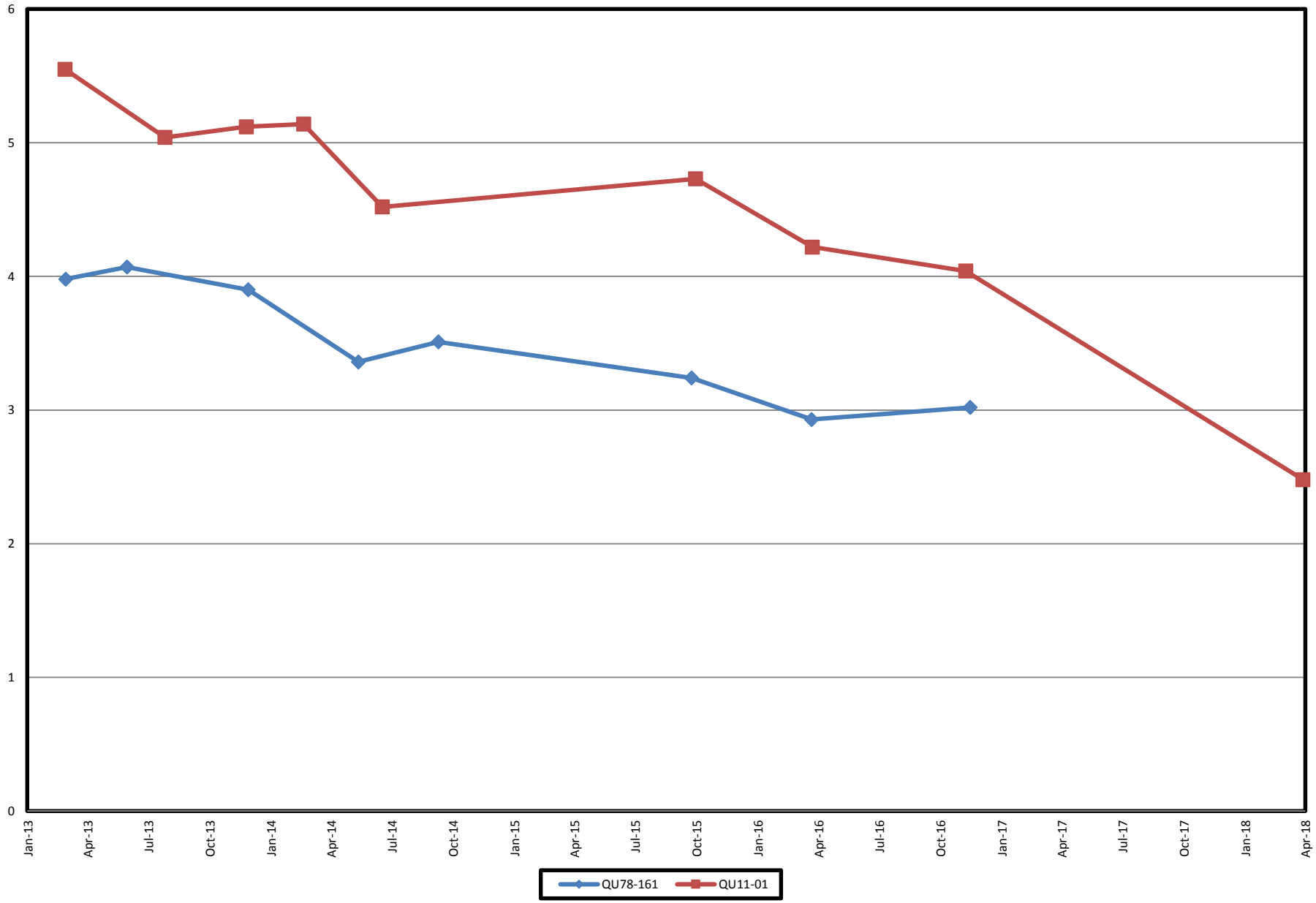

Ex-Situ 2/3-South Monitoring Wells - Sulphide as H_2S (mg/L)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
CSR-AW: 0.02mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
MW00-2
MW12-23
MW12-24
CSR-AW

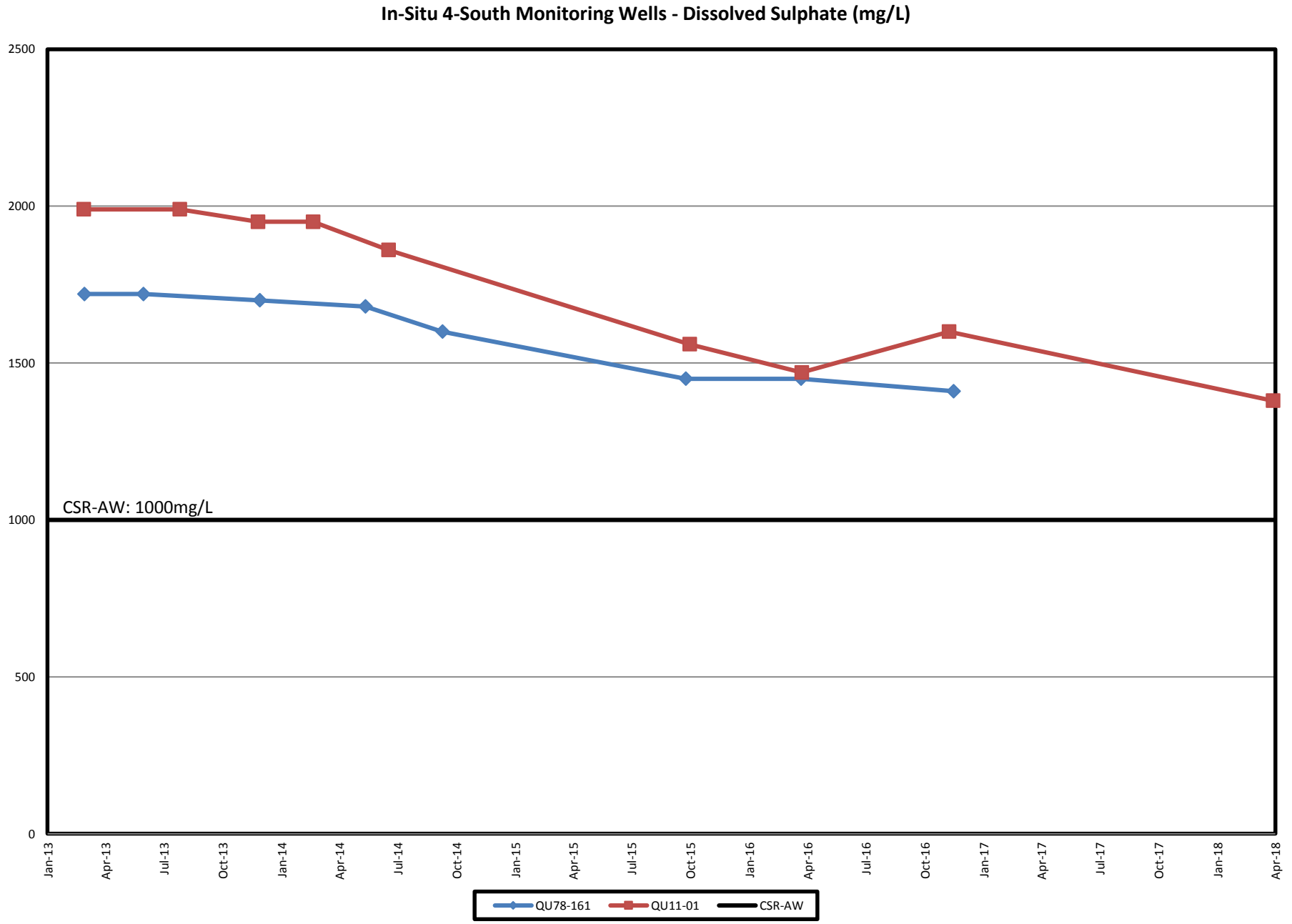
In-Situ 4-South Water Elevation @ QU11-01 (Metres Above Sea Level)

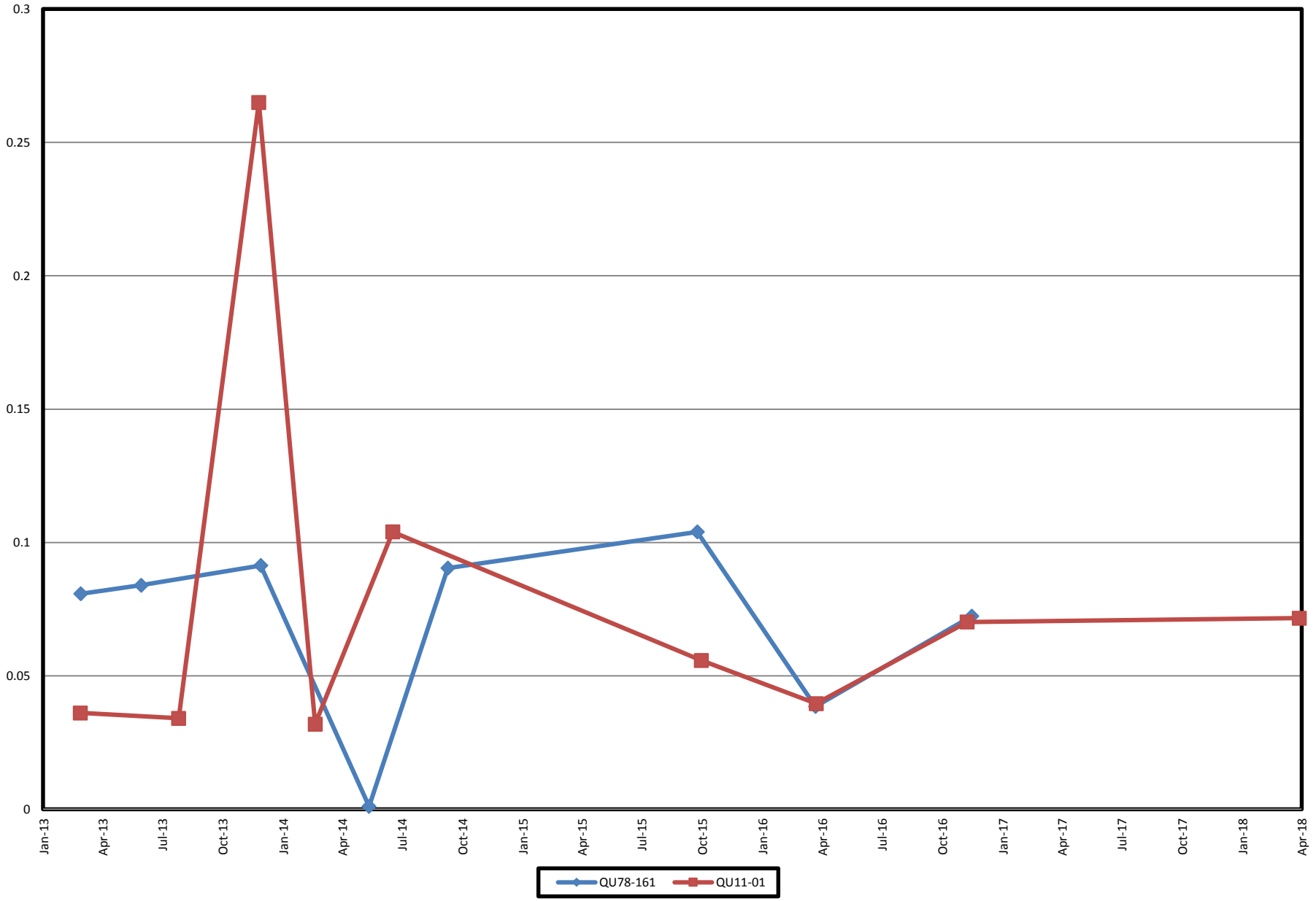



In-Situ 4-South Monitoring Wells - Dissolved Arsenic (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
CSR-AW: 0.05mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU78-161
QU11-01
CSR-AW

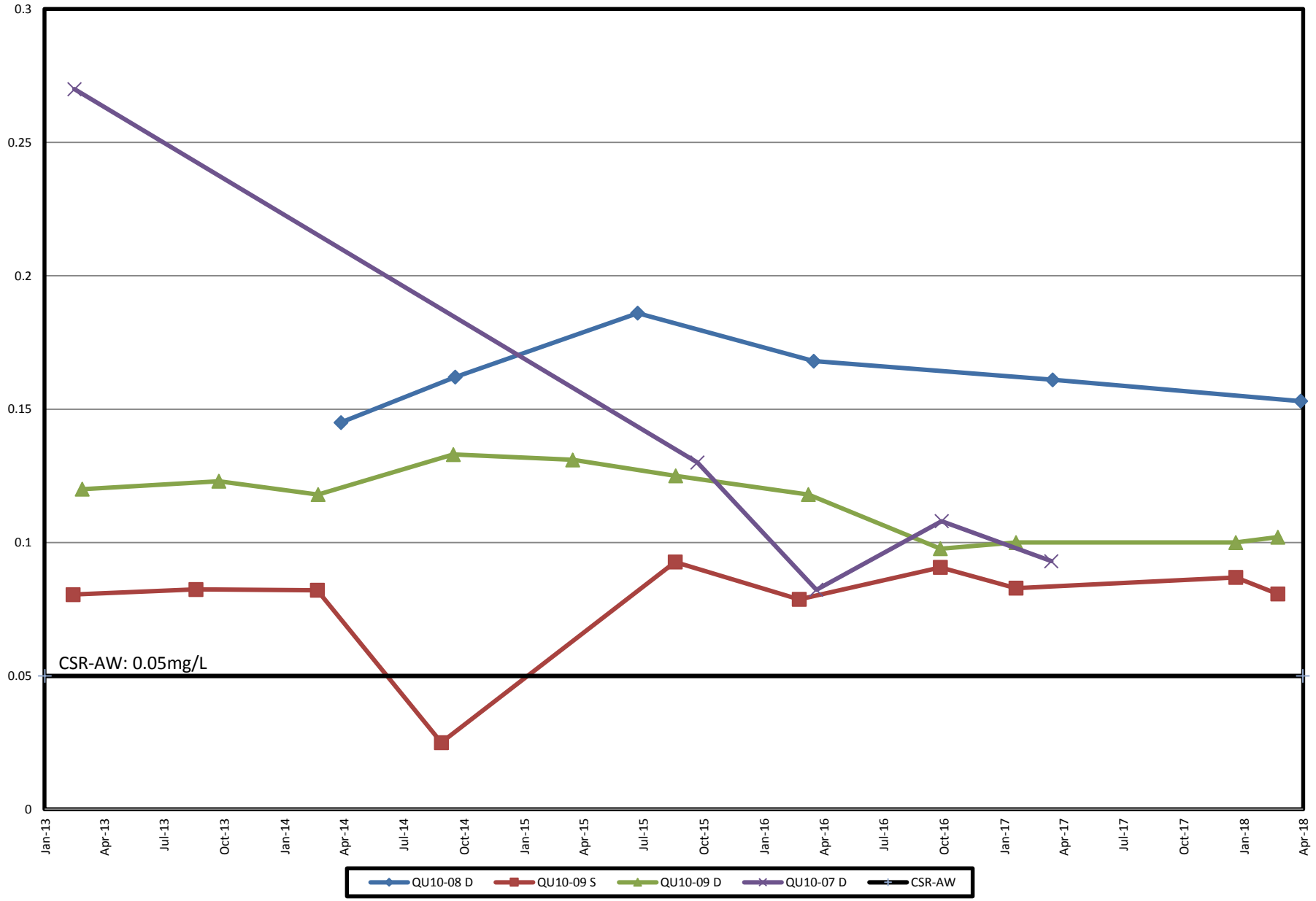

In-Situ 4-South Monitoring Wells - Dissolved Iron (mg/L)
300
250
200
150
100
50
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU78-161
QU11-01


In-Situ 4-South Monitoring Wells - Dissolved Manganese (mg/L)
6
5
4
3
2
1
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU78-161
QU11-01

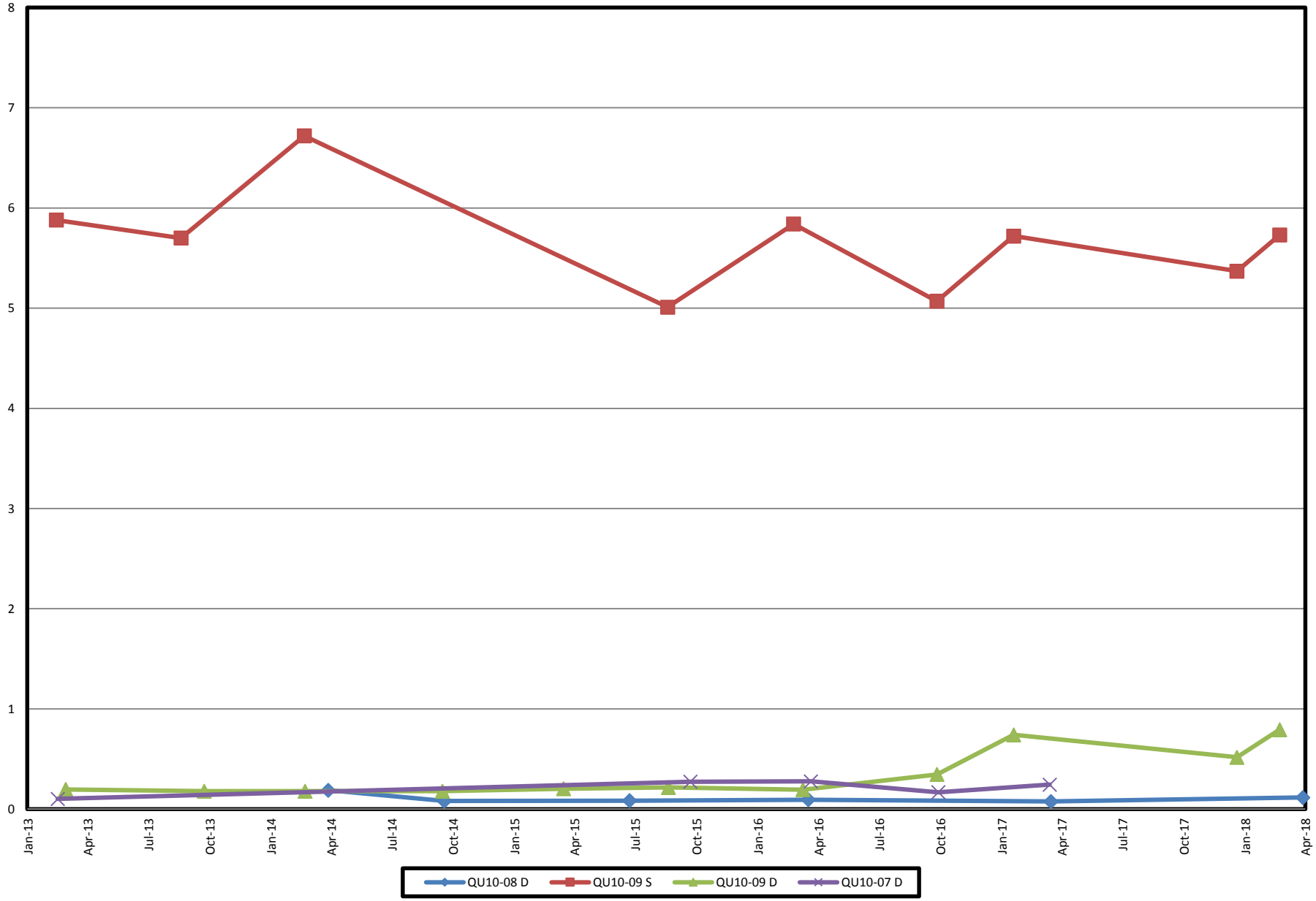

In-Situ 4-South Monitoring Wells - Dissolved Sulphate (mg/L)
2500
2000
1500
1000
500
0
CSR-AW: 1000mg/L
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU78-161
QU11-01
CSR-AW


In-Situ 4-South Monitoring Wells - Sulphide as H_2S (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
QU78-161
QU11-01

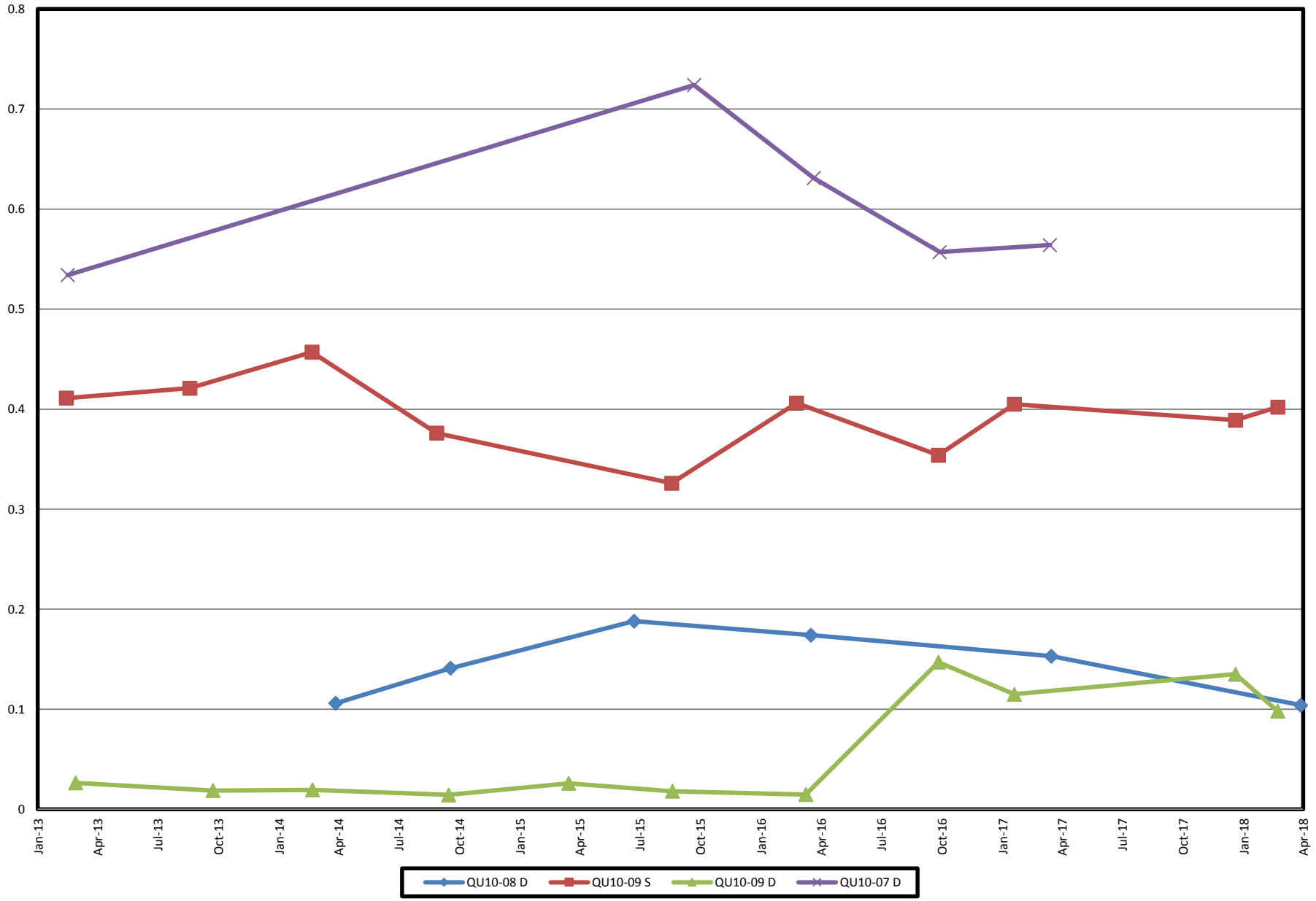
Ex-Situ 4-South Monitoring Wells - Dissolved Arsenic (mg/L)



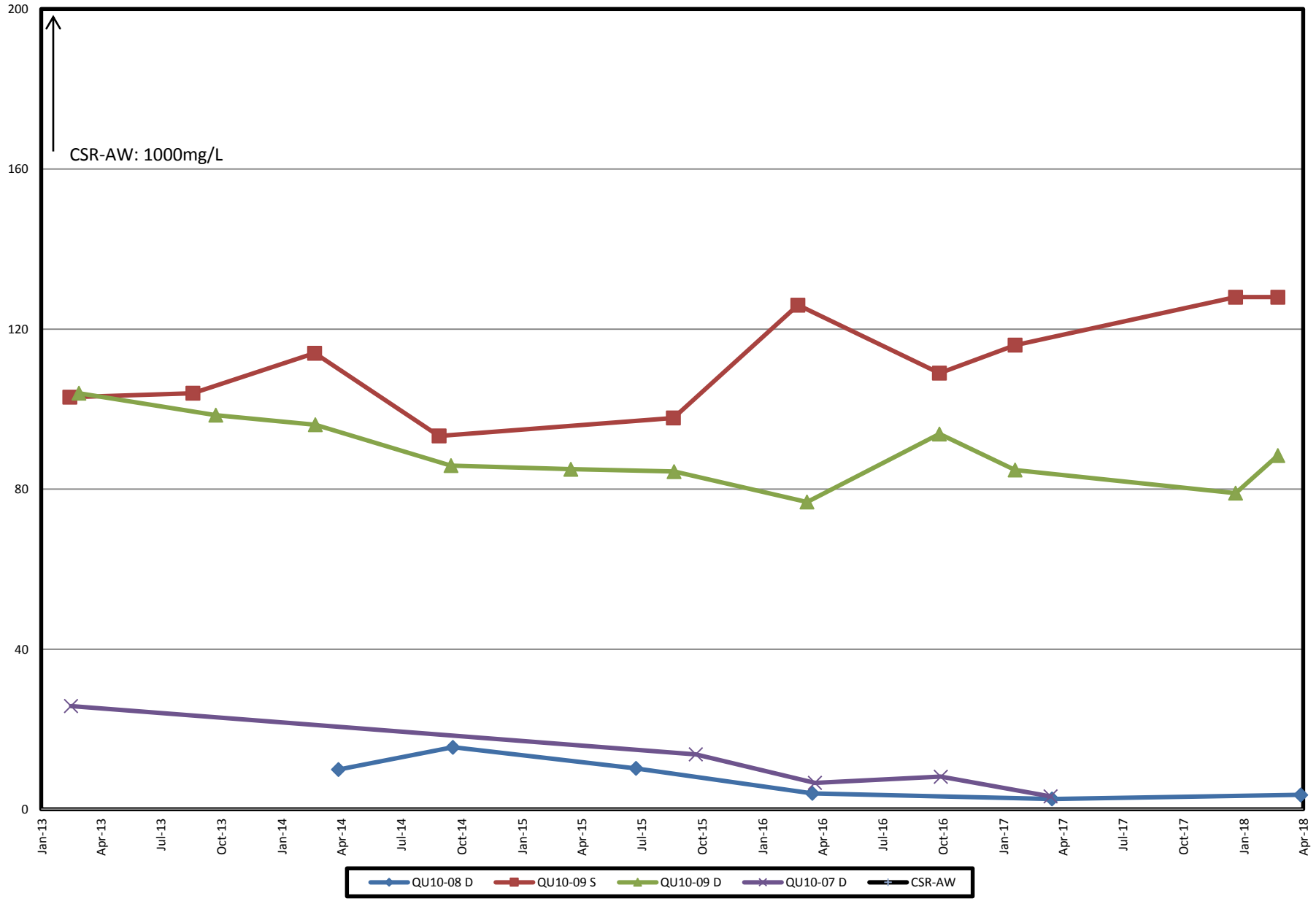
Ex-Situ 4-South Monitoring Wells - Dissolved Iron (mg/L)



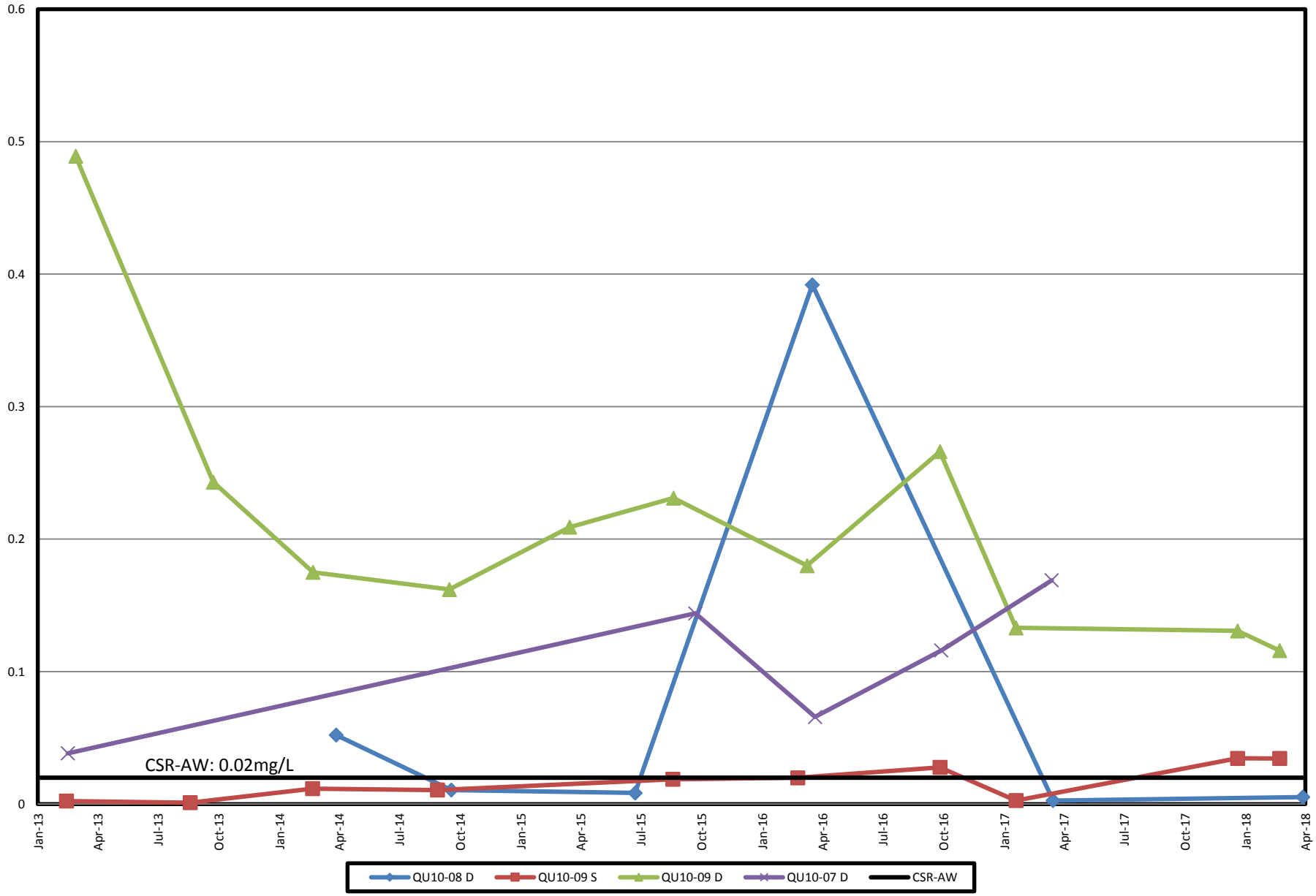
Ex-Situ 4-South Monitoring Wells - Dissolved Manganese (mg/L)



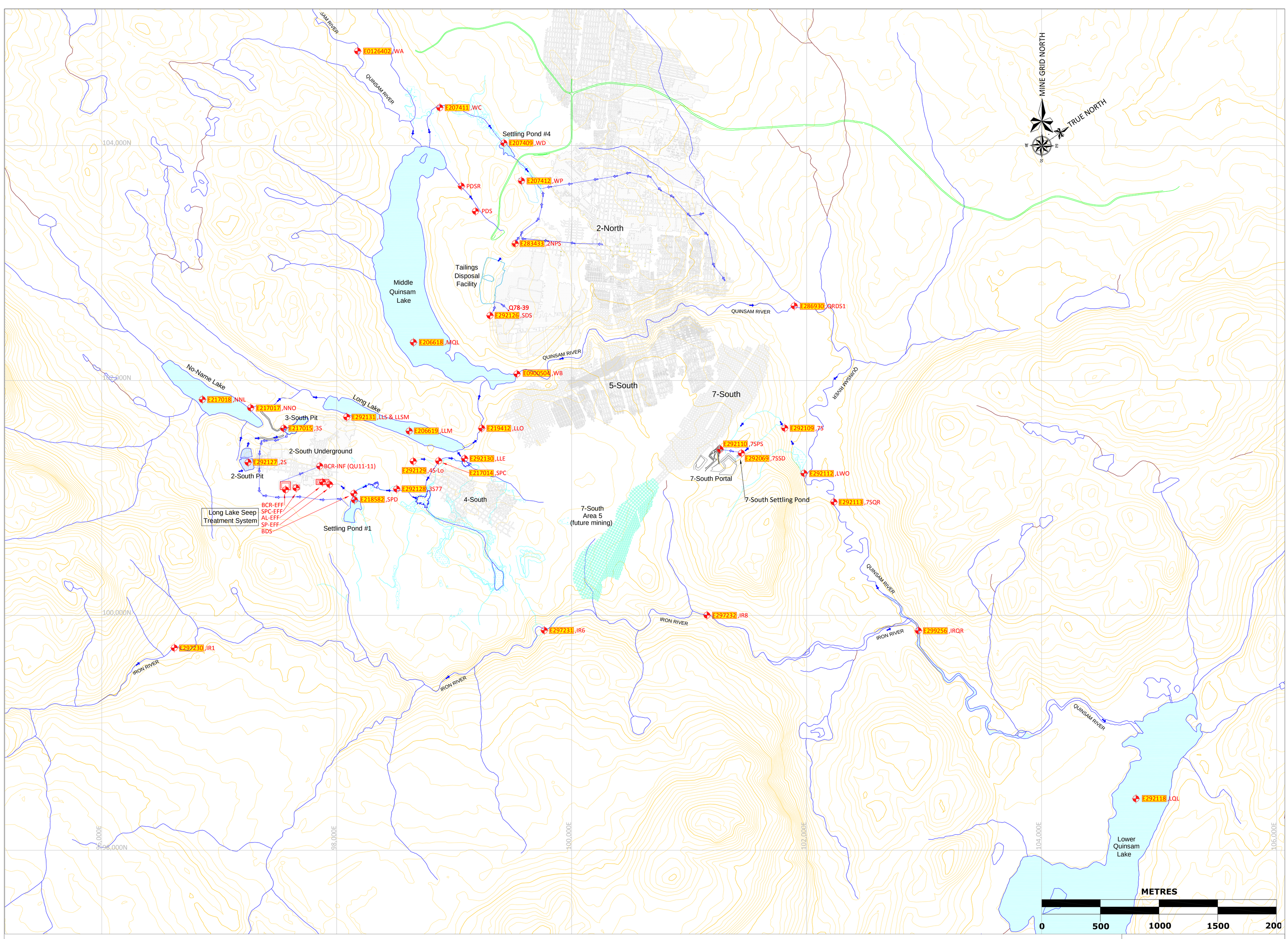
Ex-Situ 4-South Monitoring Wells - Dissolved Sulphate (mg/L)



Ex-Situ 4-South Monitoring Wells - Sulphide as H_2S (mg/L)



Appendix X



EMS ID #, Station Code

Surface Water Flow

Pumped Water Flow

2018 Annual Water Quality Report
Site Plan - Surface Water

Scale: 1:10,000	Site Plan - Surface Water

I:\DCC-CAMDC1\Environmental\Gary Gould Environment - Reclamation\2018 Annual Report\Updated-2018-Surface Water.dwg