

**Quinsam Coal
Corporation – Q2 (July –
September 2022)**
For Effluent Permit PE: 7008
Environmental Department

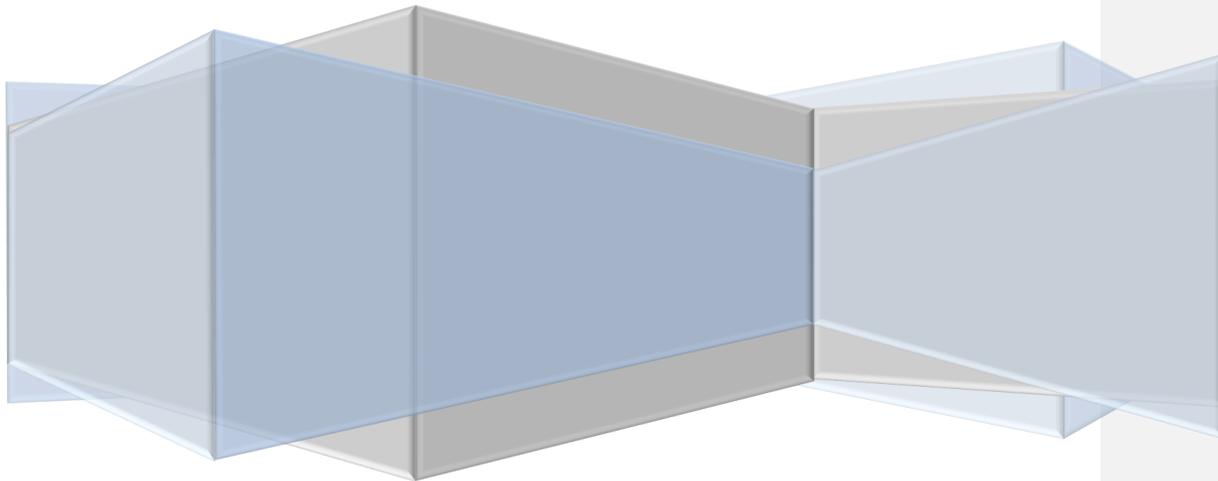


TABLE OF CONTENTS

Table of Contents.....1

Introduction2

North Water Management System (NWMS):.....43

South Water Management System (SWMS):54

7-South (7SSD) Water Management:76

Quarterly Monitoring:.....76

Non-Compliance Events:.....87

Receiving Environment Water Quality:87

 Precipitation.....87

 Lakes.....98

 Chlorophyll “a” and Phytoplankton Abundance.....1140

 Species Composition1342

 Streams and Rivers1342

Groundwater2322

Passive Treatment System (PTS).....2827

Quality Assurance Quality Control.....3029

Conclusion:.....3029

Figure 1: 5-South Flooded Mine Water Level4

Figure 2: Settling Pond #4 Discharge Rates5

Figure 3: Settling Pond #1 Discharge Rates7

Figure 4: Dissolved Copper Concentrations Compared to Acute and Chronic WQG's9

Figure 5: Average Dissolved Sulphate - Long Lake.....10

Figure 6: Average Dissolved Sulphate – Middle Quinsam Lake11

Figure 7: Summer Chlorophyll “a”12

Figure 8: Summer Phytoplankton Abundance12

Figure 9: Summer Phytoplankton and Zooplankton Abundance12

Figure 10: Total Arsenic in Quinsam River Compared to Acute-WQG (0.005 mg/L).....15

Figure 11: Total Iron in Quinsam River Compared to Acute-WQG (1.00 mg/L)16

Figure 12: Dissolved Iron in Quinsam River Compared to Acute-WQG (0.35 mg/L).....17

Figure 13: Total Manganese in Quinsam River Compared to Acute and Chronic -WQG’s (0.871 mg/L and 0.737 mg/L)18

Figure 14: 5 in 30 Average and Weekly Dissolved Sulphate in Quinsam River Compared to Chronic -WQG’s (128 mg/L)19

Figure 15: Concentrations of Iron - LLE.....20

Figure 16: Concentrations of Dissolved Sulphate - LLE.....21

Figure 17: Dissolved Sulphate at Long Lake Seeps22

Figure 18: Cross Section in North-South Direction Near Seepage Areas by QU11-09 and QU11-0524

Figure 19: 2 North Flooded Mine Void Compared to Seepage Rates Near QU1109 and QU1105.....25

Figure 20: Dissolved Arsenic, Sulphate and Chloride at Shallow Groundwater and Seepage Areas27

Figure 21: Water Level versus Long Lake Seep Flow.....28

Figure 22: Average Dissolved Sulphate and Average Sulphate Reduction29

▲ **Appendix I – Tables**

Tables 1-40

▲ **Appendix II - Biota**

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

INTRODUCTION

During Quarter 2 (July 1st through September 30th) Quinsam Mine maintained the environmental obligations for permits PE: 7008 held with the Ministry of Environment and Climate Change Strategy and the Mines Act permit C-172. The mine continues to be operated in a “*care and maintenance*” mode with The Bowra Group Inc. as the Receiver.

For Quarter 2 (Q2), most environmental monitoring was completed as per stipulations found within the effluent permit PE:7008.

There were three permit non-compliance events to report this quarter. An unauthorized discharge continues from Long Lake Seeps. Equipment malfunction resulted in missing flow monitoring data during summer low flow on the Iron River and depth profiling for pH on Long and Middle Quinsam lakes for one week in summer.

Concentrations for most parameters of interest were not elevated above British Columbia Water Quality Guideline’s for Protection of Freshwater Aquatic Life (WQG) in the receiving environment during the quarter. Those parameters that were trending above Guidelines include dissolved copper, iron and sulphate and total arsenic and iron. Dissolved copper was trending above WQG’s in lakes associated with summer stratification. Parameters remained below WQG’s for the Quinsam River except upstream of mine influence where dissolved copper was elevated above the chronic guideline.

Summer averages for hypolimnetic dissolved oxygen and total phosphorous in Long and Middle Quinsam Lakes were compared to Provisional Water Quality Objectives (WQO) for Middle Quinsam Lake sub-basin. Long Lake displayed slightly elevated average total phosphorus at depth during summer and slightly anoxic conditions in the hypolimnetic zone.

. Averaged dissolved sulphate at the LLE Monitoring Station (the last collection point for the south mine area before water enters Long Lake near the outlet) was above the Chronic WQG of 128 mg/L during summer.

Seepage from the 2-South mine at Long Lake Seep (LLS) displayed iron concentrations above the WQG’s of (0.35 mg/L and 1.00 mg/L, for dissolved and total, respectively). Groundwater sourced potential seepage areas in the 2-North Mine area entering the Quinsam river downstream of Middle Quinsam Lake Outlet referred to as S and S2, displayed elevated results above the WQG’s for arsenic and sulphate with S2 also displaying elevated iron.

Groundwater wells, underground sumps, and dewatering wells throughout the 2 and 3-North, 2 and 3-South, 4-South, 5-South and 7-South mine areas were monitored. There are certain parameters that continually trend above Standards. These include arsenic, chloride, and sulphide as H₂S. Selenium is also observed periodically in the ex-situ deep groundwater of QU11-05 D downgradient of the 2-North Mine, River Barrier Pillar, and 5-South mine.

NORTH WATER MANAGEMENT SYSTEM (NWMS):

Stage pumping / dewatering continued from 7-South Area 5 (7SA5) into 1-Mains 7-South (1M7S) sump, where it then pumps into the flooded 5-South mine with no further pumping occurring. Previously, the 5-South mine water (5SMW) was pumped into 3-Mains, 2-North underground mine (3M2N) until the pump failed in January 2022 and was not replaced. The 5SMW levels are monitored (Figure 1) to ensure water remains below the portal, 290 meters above sea level (masl).

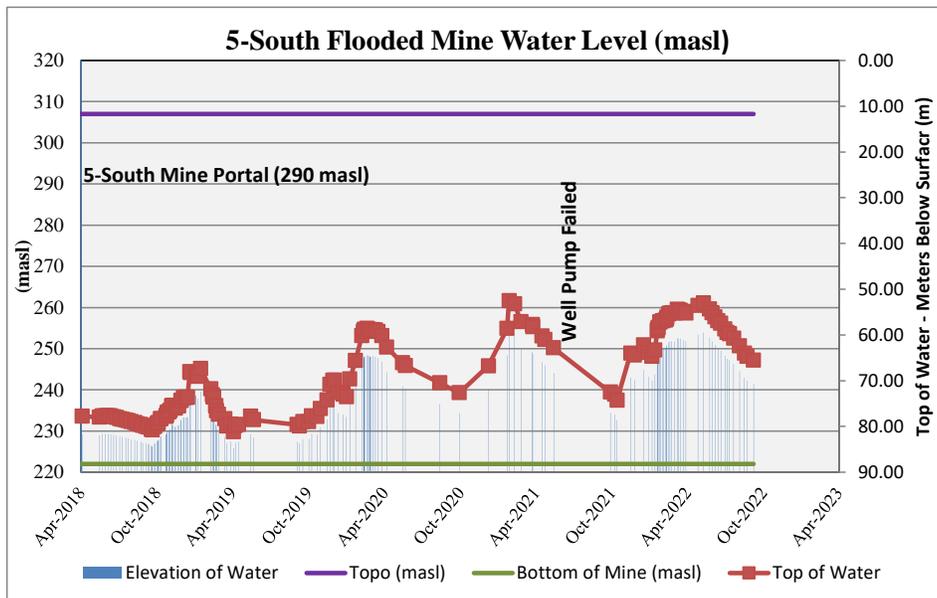


Figure 1: 5-South Flooded Mine Water Level

Underground 2-North mine water is pumped to surface and discharged into Brinco brook this combined water is released from the authorized discharge location, Settling Pond 4. Pumping systems include the following:

- 3-Mains 2-North (3M2N), dewatering 3-Mains area of 2-North mine
- 2-North Portal Sump (2NPS) collects seepage water from the tailings dam and underground 2-North mine
- 1-Mains, 2-North (1M2N) dewatering 1-Mains area of 2-North mine
- 5-Mains 2-North (5M#2) dewatering 5-Mains area of 2-North mine.

These pumps discharge into either Brinco brook or by opening gate valves located at the end of the lines, water can be directed into the 2-North pit pond, (WP). Water is used to supply sufficient water cover over the Potentially Acid Generating, Course Coal Refuse (PAG-CCR) stored in WP. During Q2 the gate valves were opened halfway directing water into both WP and Brinco brook.

Settling Pond 4 (WD / SP4) is the authorized discharge location for the North water management system (NWMS), where permit limits are applied to water quality and quantity. Discharge occurred 92 out of 92 days (Figure 2), with cumulative quarterly total calculated as 652,406 m³ compared to Q1 where 970,099 m³ was discharged. All water quality remained below effluent permit limits at SP4.

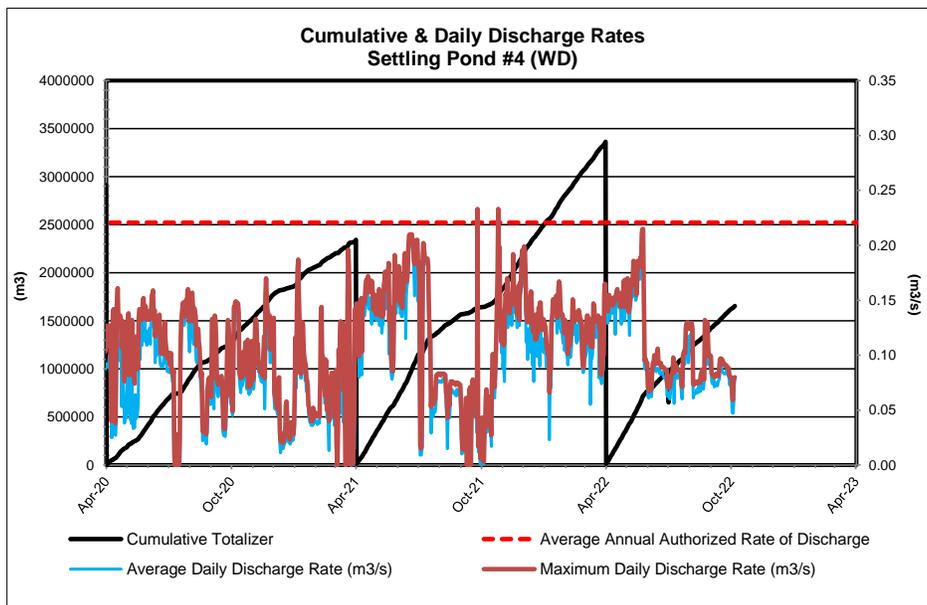


Figure 2: Settling Pond #4 Discharge Rates

SOUTH WATER MANAGEMENT SYSTEM (SWMS):

The SWMS is managed by directing discharge water from the Passive Treatment System (PTS) into the 2-South and 3-South pits. This conserves a water cover over stored PAG-CCR in the pits during the dry season and maintains mine water within the authorized works. The 2-South underground pump discharges 2-South mine water into the PTS. Water has been pumped at an average of 8.2 L/s from the 2-South flooded mine void (INF) with 5.0 L/s entering the PTS cells and 3.2 L/s (untreated) into the 2-South pit. The PTS includes two cells, the Biochemical reactor (BCREFF) and the Sulphide Polishing Cell (SPCEFF). Treated water flows passively through each cell

(BCREFF into SPCEFF) and is gravity feed from the SPCEFF into 2-South pit, entering at 2-South Inflow (2SI). At this location there is a V-notch weir coupled with a pressure transducer and a staff gauge (hydrometric station), where continuous inflow is monitored.

The 3-South pit maintains a water cover over the PAG-CCR via seepage and overflow from the 2-South pit as well as precipitation. Combined water (seepage and water cover overflow) from 2-South pit enters a channel and flow into the 3-South pit. Continuous discharge of the combined water is measured at location 2-South Culvert (2SC) into 3-South Pit. Here there is an H-flume and a flow meter measuring continuous outflow from 2-South pit and inflow to 3-South pit. Water pumped from 3-South pit is pumped to Settling Pond #1 (SPD / SP1). During summer, a gate valve can be opened at a junction on the 3-South pipeline located on the 2-South highwall. From here the 3-South water can be directed either into the 2-South pit or to SPD. When water pumped from 3-South pit is directed into 2-South pit this maintains a closed loop circuit and aids in maintaining a water cover over the 2-South Pit. As a result, SPD will stop discharging reducing the load from mine contact water on the receiving environment. The valve directing water from 3-South to 2-South was not opened this quarter. This was a result of increasing pumping rates from 4.5 L/s to 8.2 L/s at the 2-South underground mine pump (INF) in efforts to reduce underground mine water levels below the elevation of the Long Lake Seeps.

Pumped water from 3-South pit was directed to SPD with continuous discharge occurring throughout the quarter. At 3-South pit pond water levels were increased from 1.00 m to 1.50 m for the summer months due to evaporation.

SPD is the authorized discharge location for the SWMS where permit limits are applied to characteristics of the discharge quality and quantity. Discharge occurred for 91 out of 91 days (Figure 3). With a cumulative quarterly total of 64,636 m³ compared to Q1 where 230,982 m³ was discharged. All water quality remained below effluent permit limits at Settling Pond #1.

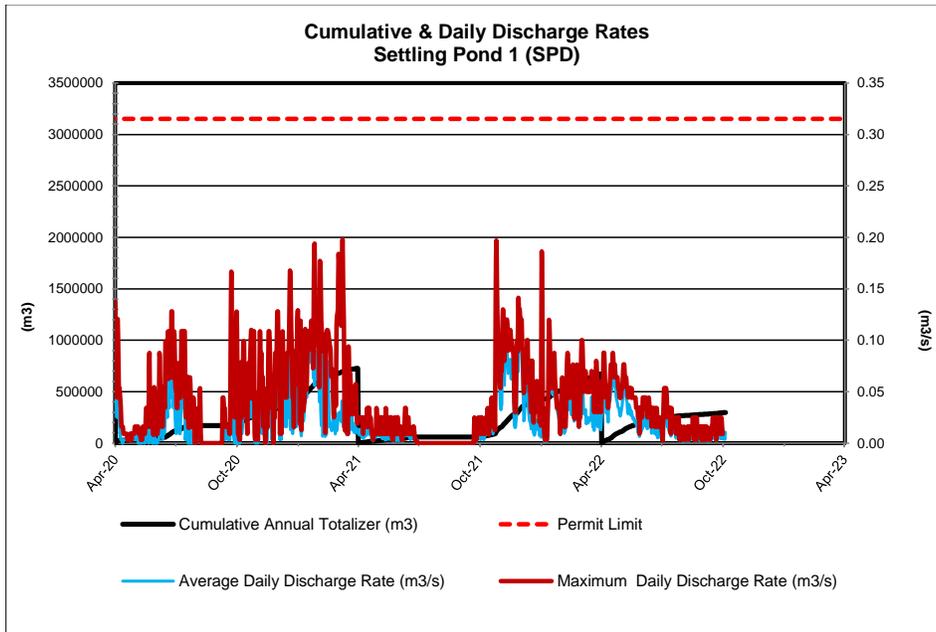


Figure 3: Settling Pond #1 Discharge Rates

7-SOUTH (7SSD) WATER MANAGEMENT:

Discharge did not occur during Q2 at 7SSD. Sedimentation pond outflow is controlled by pumping water accumulated in the pre-settling pond to the 7-South Portal Sump. This procedure reduces discharge, decreasing the overall parameter loading and the potential for adverse aquatic impact in the receiving environment as the biological availability for parameters of concern is much lower than under constant discharge conditions.

A quarterly sample was obtained from the ponded water (7SSD) and a monthly sample was collected from Stream 1, 7S for July with August and September having no flow. This quarter, parameters of interest remained within the specified limits of the BC Water Quality Guidelines Freshwater Aquatic Life during all sampling events at 7S. The water quality results corresponding to these samples are available in Appendix I.

QUARTERLY MONITORING:

Summer 2022 receiving environment monitoring program for both lakes and river/stream stations was completed. Quarterly monitoring was performed for groundwater quality, effluent and within (in-situ) mine releases. Most environmental sampling and obligations pertaining to permit PE-7008 were completed with results are available in Appendix I.

The environmental department also conducted routine inspections and completed any required maintenance of the water management structures.

NON-COMPLIANCE EVENTS:

Permit non-compliances occurred for the following:

- E297232 - Iron River (IR8) missing flow monitoring is required during the summer low sampling period. A new pressure Transducer was installed but failed to monitor continuously. This has since been corrected.
- E206619 and E206618 – Long and Middle Quinsam Lakes – Missing pH for all depths except 1 metre, 4 metre, 9 metre, and 1 metre from bottom. The pH probe was being replaced.
- E292131 - Long Lake Seeps unauthorized discharge occurred for 68 out of 98 days.

RECEIVING ENVIRONMENT WATER QUALITY:

Water quality in the receiving environment (lakes and rivers) is compared to British Columbia Water Quality Guideline's - Freshwater Aquatic Life (WQG). Summer averages for hypolimnetic dissolved oxygen and total phosphorous in Long and Middle Quinsam Lakes are compared to Provisional Water Quality Objective's (WQO) for Middle Quinsam Lake Sub-Basin.

The receiving environment monitoring program followed the five samples in thirty days schedule with sampling events spanning July 18th through August 15th. This monitoring period is meant to capture the rivers summer low flow and lakes stratification period.

Preamble – Water Hardness

For the purposes of this report, the WQG for hardness dependent parameters has been derived using site background values (i.e., monitoring location upstream of mine influence (WA) hardness ~30mg/L). Quinsam Coal has adopted this approach for the Iron River to provide a conservative comparison of receiving environment water quality.

PRECIPITATION

The amount of precipitation accumulated this quarter was 66.50 mm, lower than Q2 last year (140 mm). Precipitation in Q2 occurred mostly in July (57.80 mm). This is displayed in Appendix I, Table 30.

LAKES

The summer lake monitoring program included Long Lake (LLM) and Middle Quinsam Lake (MQL). Appendix 1, Table 3 provides a summary of parameters observed trending above WQG’s. Appendix I, Tables 36 through 38 display results compared to Guidelines. Dissolved copper was the only parameter above WQG’s. Summer average total phosphorus (0.015 mg/L) and dissolved oxygen (> 3 mg/L) were outside of the range for WQO of 0.007 mg/L and 3 mg/L respectively, in Long Lake at depth. Dissolved oxygen resulted in >3 mg/L for one week out of five in summer at depths below 17 metre’s.

Dissolved copper (Cu) was calculated from site specific parameters and generated from the Biotic Ligand Model (BLM). The BLM is a series of linked equations that predicts the toxicity of dissolved Cu under specific water chemistry conditions. As a result, the acute short-term and chronic long-term WQG’s vary between sites (Figure 4). Dissolved Cu was not elevated above acute WQG’s at any receiving environment locations. Average dissolved Cu was observed above the chronic WQG’s upstream of mine influence in the Quinsam River at WA (0.00053 mg/L). At depth’s 9 metre (0.00038 mg/L) and 1 meter from bottom (0.00037 mg/L) in Long Lake and at 4 meters (0.00047 mg/L) in Middle Quinsam Lake. Appendix 1, Table 3 displays the results above the WQG’s.

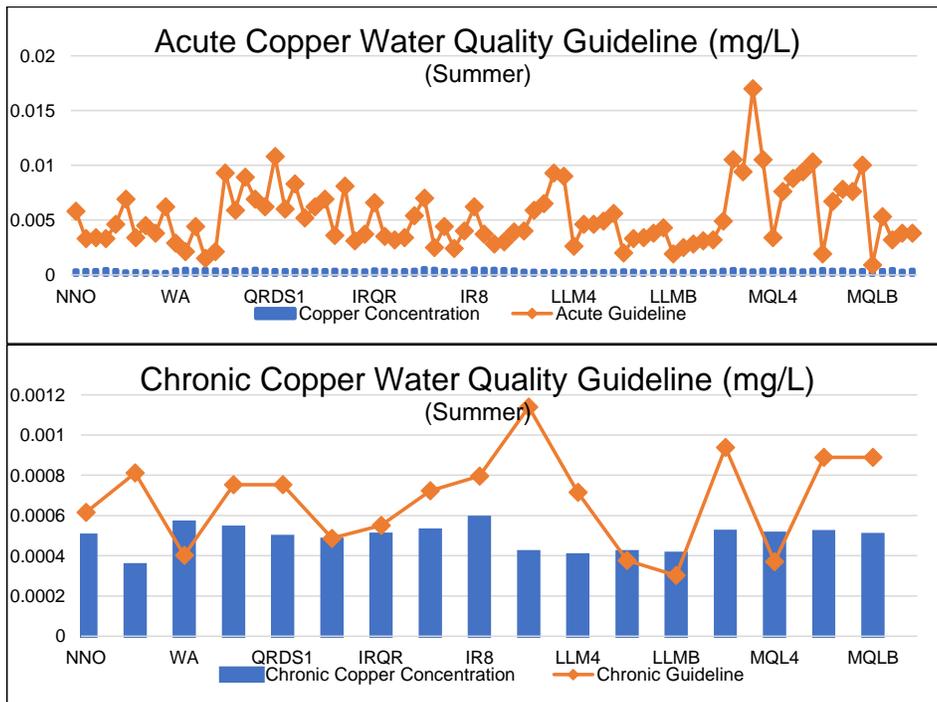


Figure 4: Dissolved Copper Concentrations Compared to Acute and Chronic WQG's

Noteworthy observations resulting from the lake monitoring program include:

- Average sulphate concentrations were measured below the water quality guideline (128 mg/L) in all lakes
- Average sulphate concentrations resulted in 112 mg/L at 9 m and 92.4 mg/L at 1 metre from bottom (1MB), in Long Lake
- Average sulphate in Middle Quinsam lake remained well below chronic WQG levels throughout the lake, averaging 30 mg/L to 34 mg/L from surface to bottom depths.
- Summer average WQO for total phosphorous (0.007 mg/L) was elevated in the 1 metre from bottom (1MB) sample in Long lake. Hypolimnetic dissolved oxygen (3 mg/L minimum during June, July, and August) fell below 3 mg/L in the hypolimnion zone (17 m to 21 m depths) on 1 out of 5 weeks of sampling.

The below figures (5 and 6) display the averaged sulphate from five weeks of monitoring for the lakes compared to the chronic WQG (128 mg/L) using a background hardness of 30 mg/L. All lakes were below the WQG during summer monitoring.

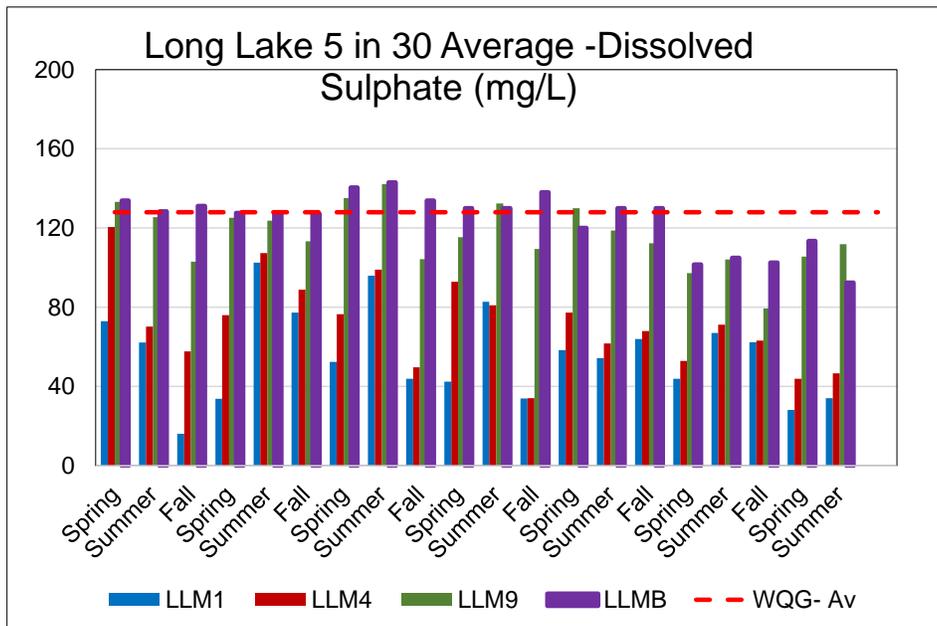


Figure 5: Average Dissolved Sulphate - Long Lake

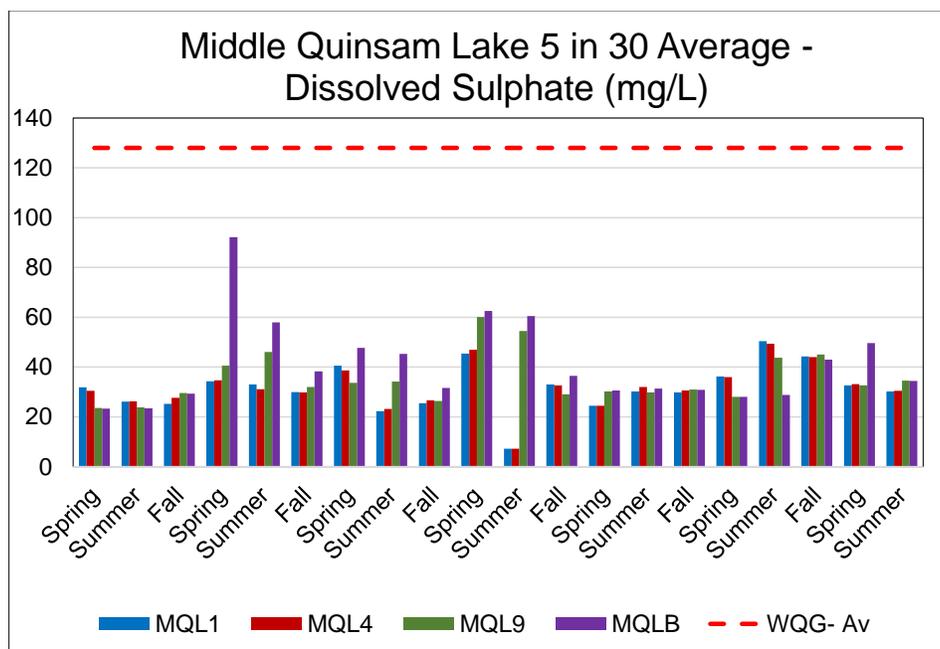


Figure 6: Average Dissolved Sulphate – Middle Quinsam Lake

CHLOROPHYLL “A” , PHYTOPLANKTON AND ZOOPLANKTON ABUNDANCE

Refer to Appendix II for the full data sets and reports.

Chlorophyll “a” concentrations provide an indication of overall phytoplankton biomass at any given time and provide a basis for comparing primary production among lakes. Summer results for Chlorophyll “a” and phytoplankton abundance is shown in Figures 7 and 8 collected on both Long and Middle Quinsam Lake’s. Chlorophyll “a” was higher in both Long and Middle Quinsam Lake (0.86 ug/L and 0.94 ug/L) compared to previous years (0.63 ug/L and 0.5 ug/L), respectively.

Total abundance in the July samples is shown in Figure 8, along with historical data for summer months. Total abundance for July ranged from 1,300 cells/mL to 1,400 cells/mL for Long and Middle Quinsam Lakes, respectively. These numbers are in the range reported historically.

The July 2022 samples for phytoplankton composition and abundance were similar to summer results in recent years. Zooplankton abundance for Middle Quinsam Lake in Summer 2022 were higher than those collected in Summer 2021 (3318 compared to 1714) with Long Lake having lower results in Summer 2022 compared to 2021 (1281 compared to 2017) (Figure 9).

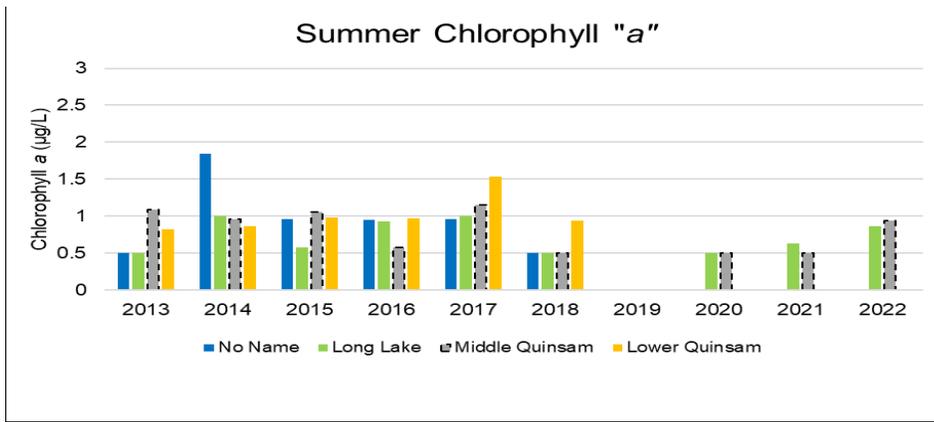


Figure 7: Summer Chlorophyll "a"

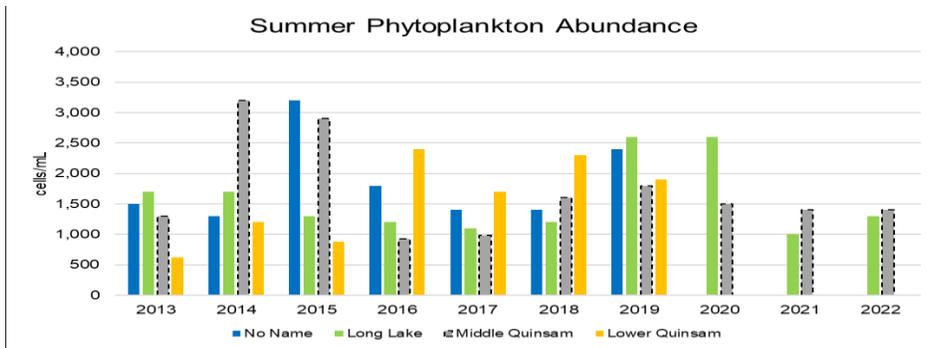


Figure 8: Summer Phytoplankton Abundance

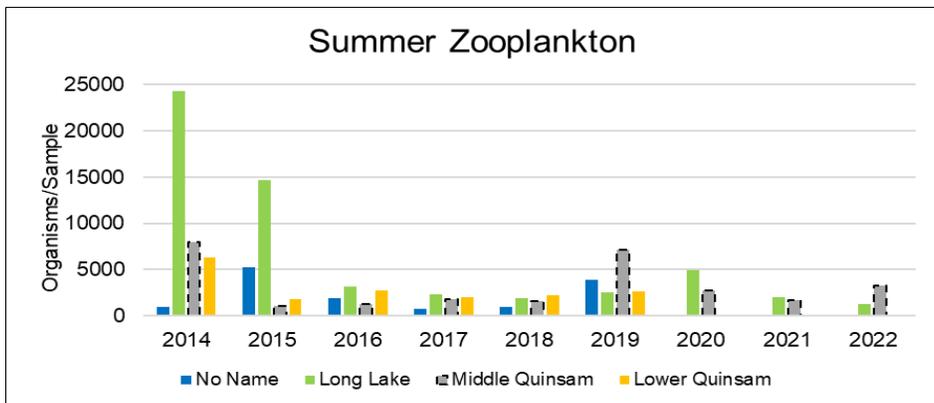


Figure 9: Summer Phytoplankton and Zooplankton Abundance

SPECIES COMPOSITION

The most abundant phytoplankton in Long and Middle Quinsam lakes were the very small (less than or equal to 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 the green alga *Dictyosphaerium pulchellum* (predominant in Middle Quinsam Lake and common in Long Lake), the *chrysophyte* *Ochromonas* spp. (predominant in Long Lake and common in Middle Quinsam Lake) and *Rhodomonas minuta* (common in both lakes).

For zooplankton both lakes had Cladocera as the most abundant organism followed by Calanoida.

Variations in total abundance when comparing lake phytoplankton abundance may be related to the month sampled and phytoplankton blooms. 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 are 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.

STREAMS AND RIVERS

The five samples in thirty days receiving environment program at river and stream sites commenced July 18th and concluded August 15th. Appendix I, Table 40 display water quality results from this program compared to WQG's for the Middle Quinsam Lake Sub-basin and Iron River.

Monitoring stations captured within the Middle Quinsam Lake sub-basin and Quinsam river include:

- Quinsam River at Argonaut Bridge (WA) - Upstream of all mine influence at,
- Middle Quinsam Lake Outlet (WB) - Receives all mine authorized discharge waters from SPD and WD
- Quinsam River Downstream (QRDS) – Temporary location on Quinsam River capturing mine discharge water from QU11-09 and seepage area (S) (Upstream of site QRDS1)
- Quinsam River Downstream Site 1 (QRDS1) - Downstream of mine influence from seepage areas and underground sub-aqueously tailings (1-Mains 2-North) and coarse refuse (River Barrier Pillar and 2-Mains 7-South)
- No Name Lake Outlet (NNO), upstream of mine influence in the South mine area. Predicted to capture seepage from the 2-South Pit (seepage has not been observed).
- Long Lake Outlet (LLO) - Downstream of influence from the South mine area
- 7-South Quinsam River (7SQR) - Downstream of all mine influence except 242 Adit
- Quinsam River downstream of the confluence with Iron River (IRQR) - Downstream of all mine influence including reclaimed 242 Adit.

Refer to Appendix 1, Table 3 for a summary of WQG observations.

Noteworthy observations resulting from the river/stream monitoring program include:

- Average dissolved Cu result of 0.00053 mg/L was above the chronic -WQG of 0.0004 mg/L on the Quinsam River upstream of mine influence at site WA.
- Average and maximum copper concentrations for the Quinsam River downstream of mine influence and Iron River were not above the chronic and acute WQG's.
- Total arsenic was above the acute WQG of 0.005 mg/L in the Iron River (IR8) during 3 out of 5 weeks of sampling
- All other parameters were below the acute and chronic WQG's for rivers and streams during the spring monitoring.

Figures 10 through 14 below, display trends for parameters of interest for total arsenic, total and dissolved iron, total manganese, and dissolved sulphate on the Quinsam River since 2017. All results have remained below WQG's. Marginal increases were observed in 2021 and Summer low flow periods related to seepage areas on the Quinsam River. The main indication of mine influence on water quality is observed with dissolved sulphate and incremental increases observed downstream compared to the Middle Quinsam Lake Outlet (WB) (Figure 14). The upstream location (WA) provides the baseline for dissolved sulphate concentrations prior to mine influence. Certain parameters of interest (arsenic, iron and sulphate) are closely monitored, and results graphed to ensure results are not trending above WQG's. Increases in these parameters of interest could indicate potential seepage pathways. As such they are important environmental monitoring points year-round. Quinsam has introduced weekly monitoring for dissolved sulphate and monthly monitoring to include total and dissolved metals. Underground flooded mine void water elevations are also closely monitored, as discussed in the Groundwater section.

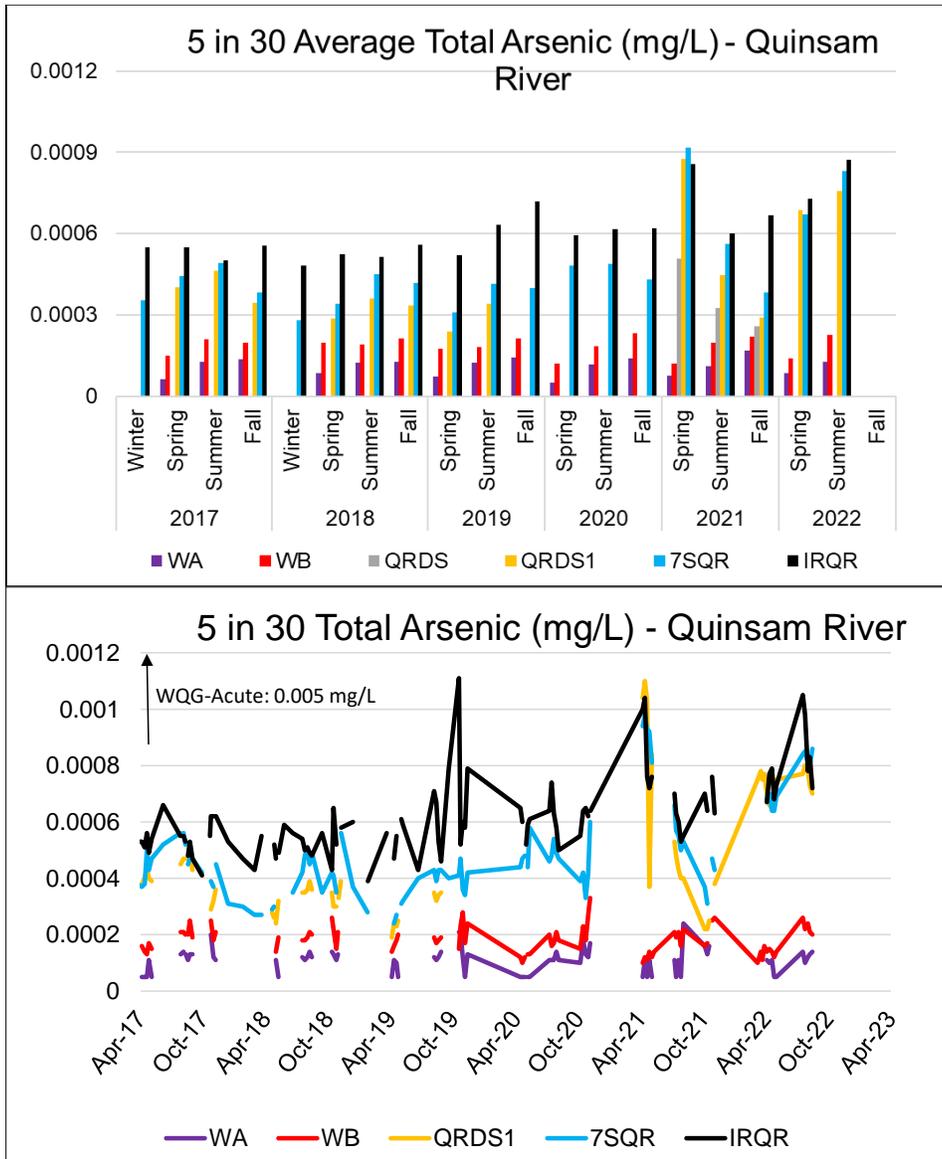


Figure 10: Total Arsenic in Quinsam River Compared to Acute-WQG (0.005 mg/L)

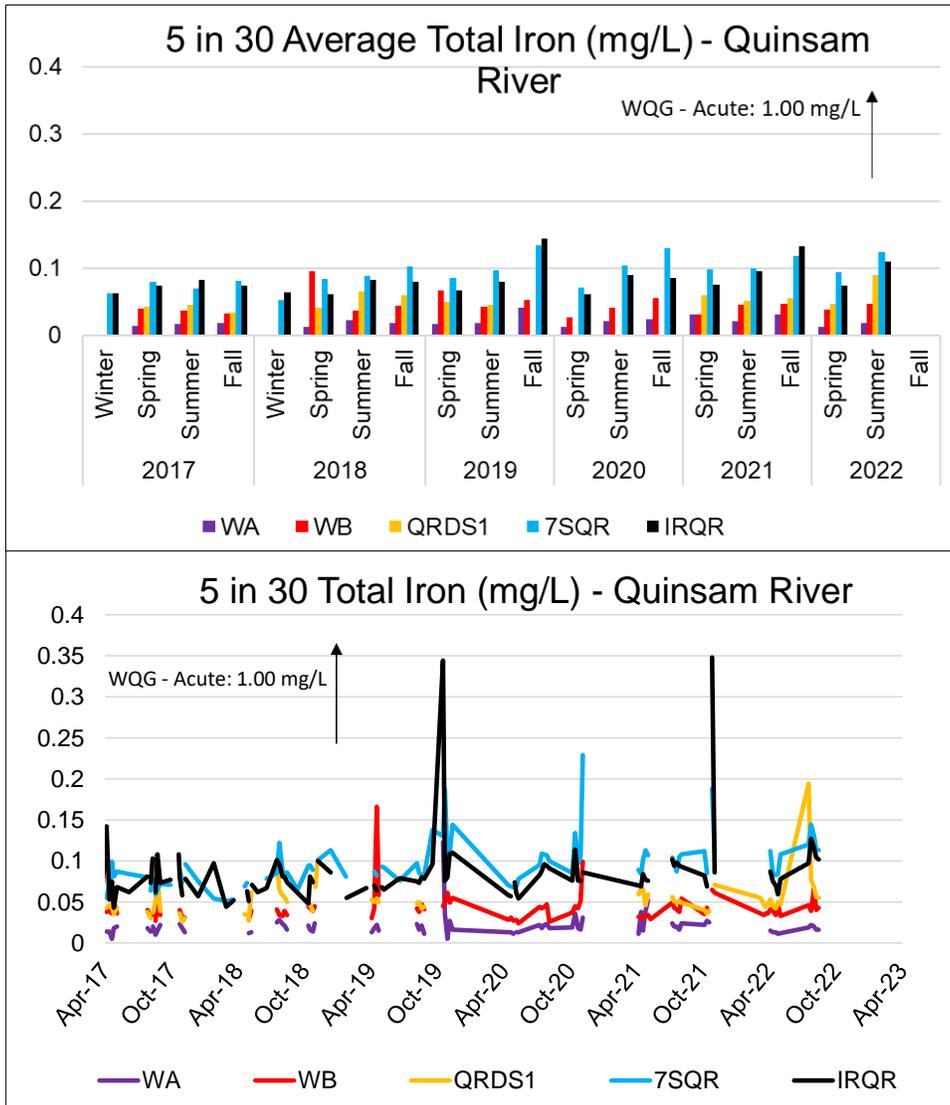


Figure 11: Total Iron in Quinsam River Compared to Acute-WQG (1.00 mg/L)

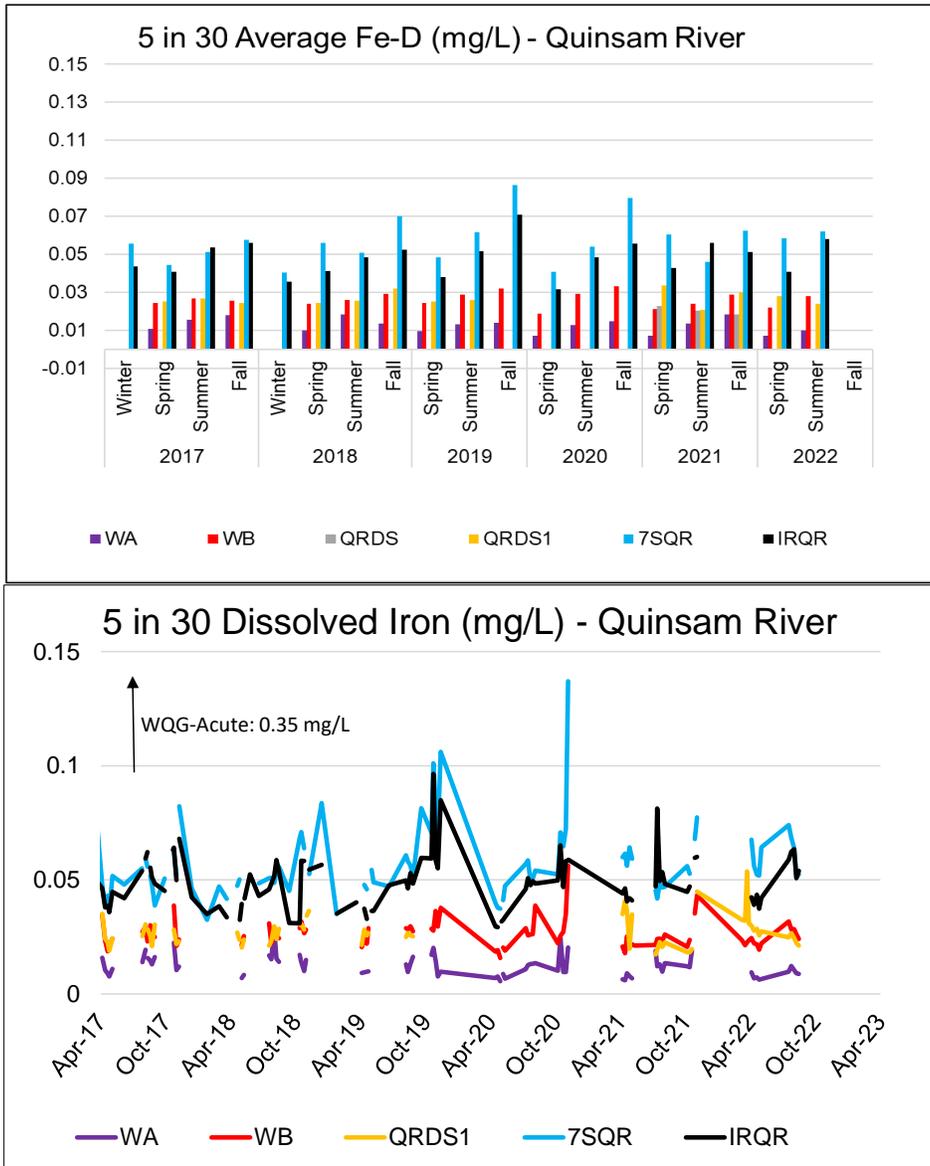


Figure 12: Dissolved Iron in Quinsam River Compared to Acute-WQG (0.35 mg/L)

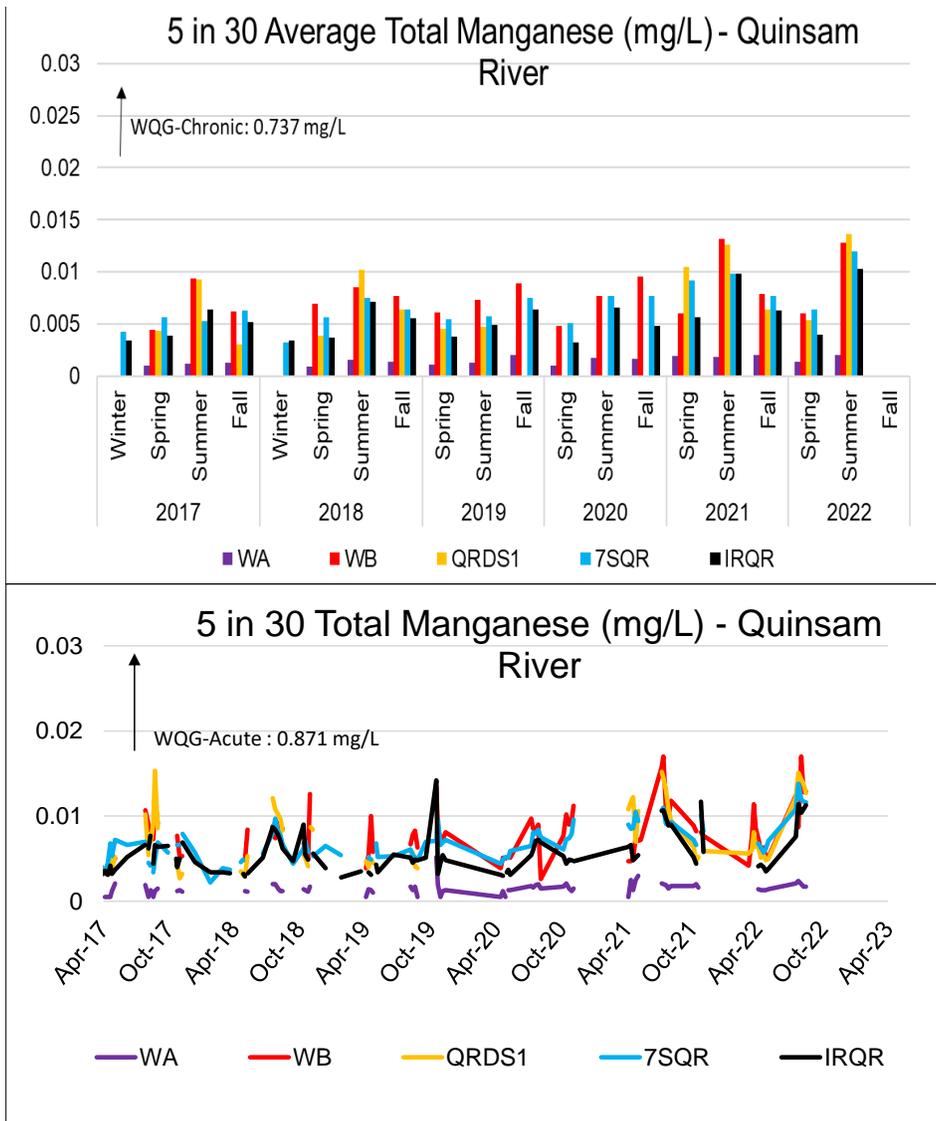


Figure 13: Total Manganese in Quinsam River Compared to Acute and Chronic -WQG's (0.871 mg/L and 0.737 mg/L)

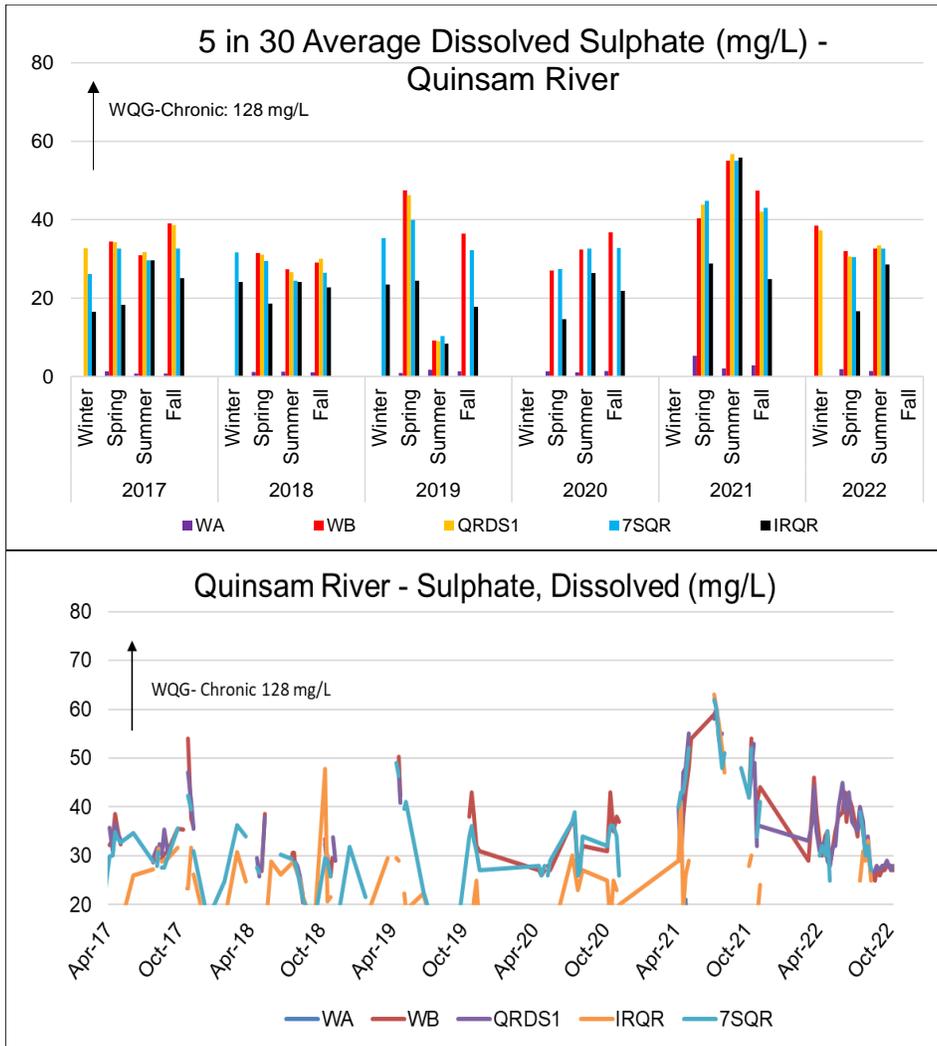


Figure 14: 5 in 30 Average and Weekly Dissolved Sulphate in Quinsam River Compared to Chronic -WQG's (128 mg/L)

While site LLE is considered the initial dilution zone (for water quality evaluation purposes) it is important to note that this location is a wetland and represents the uppermost extent of an initial dilution zone for the South water management system discharge into Long Lake. During summer, this site has limited inflow and anoxic conditions occur within the wetland. Concentrations of iron

increase as a result of low dissolved oxygen with concentrations of dissolved sulphate increasing with decreased flow rates. Figures 15 and 16 display the concentrations of these parameters historically compared to discharge rates at the culvert.

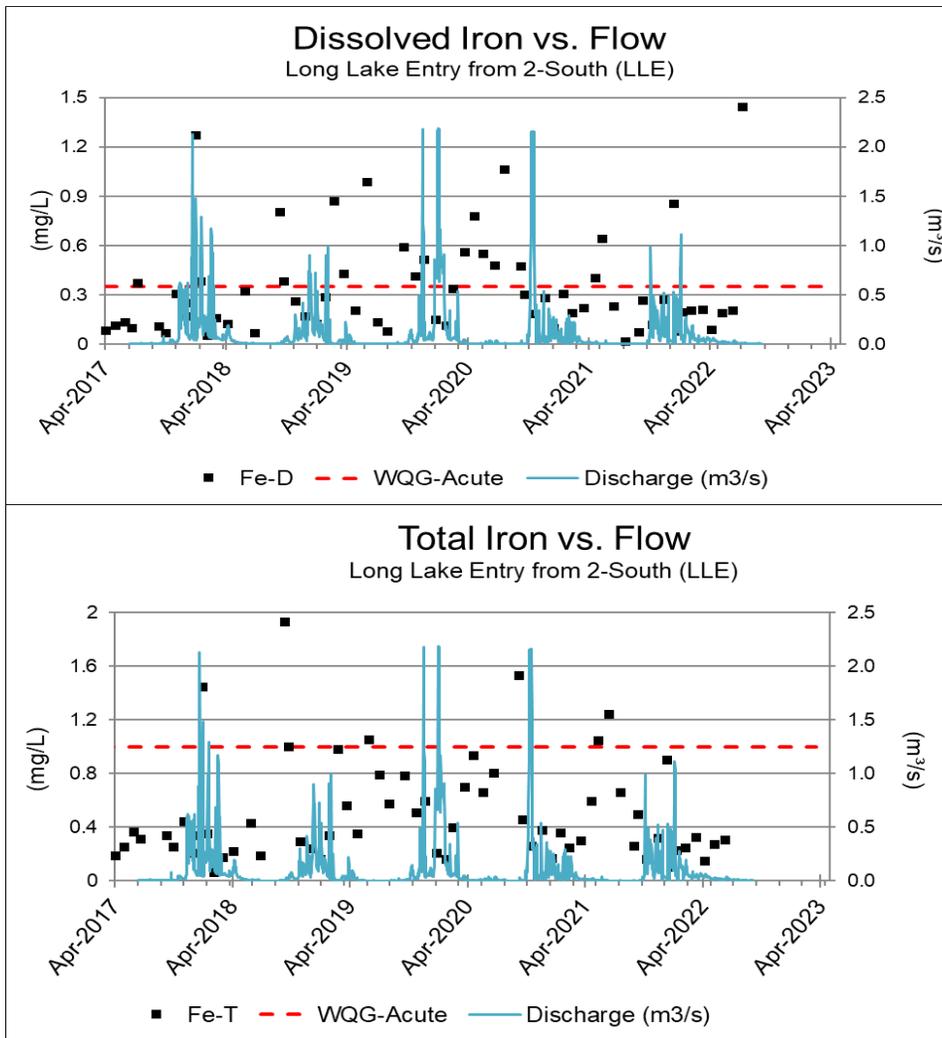


Figure 15: Concentrations of Iron - LLE

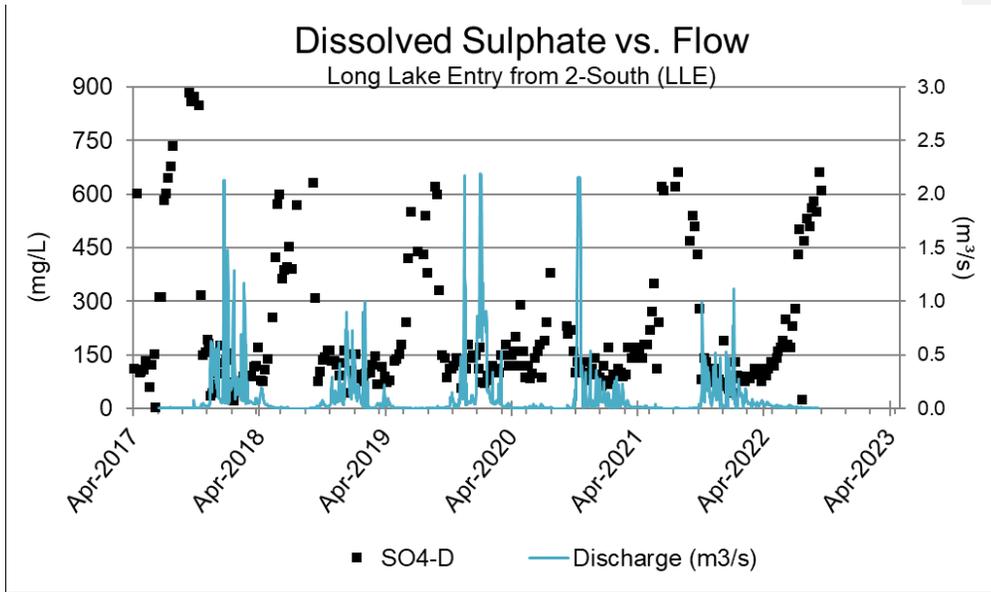


Figure 16: Concentrations of Dissolved Sulphate - LLE

Noteworthy observations resulting from LLE wetland monitoring locations:

- LLE displays elevated concentrations of dissolved sulphate compared to the WQG
- Rolling averages for weekly sulphate samples were above chronic-WQG of 128 mg/L for 9 rolling averages. Sulphate is collected weekly, and every 5 weeks is averaged.
- Peak sulphate concentrations at LLE are observed with decreased flow rates.
- LLE displayed elevated total and dissolved iron above acute-WQG's of 1.0 mg/L, 0.35 mg/L, respectively for 2 out of 3 monthly samples.

The Long Lake Seeps are not considered receiving environment sites but WQG's are used for comparison purposes only.

Noteworthy observations resulting from the Long Lake Seeps and LLE wetland monitoring locations:

- Long Lake Seep (LLS) displayed elevated total iron for 1 out of 3 monthly results and 3 out of 3 monthly results for dissolved iron above acute-WQG's of 1.0 mg/L, 0.35 mg/L, respectively.

- The larger seep (LLSM) results in lower concentrations of all parameters with water results remaining below acute-WQG's.
- Average monthly dissolved sulphate at LLSM remained comparable for the same time period as last year (November to September). Average results were 445 mg/L compared 394 mg/L. With the smaller seep, LLS averaging similar results for the November to September period 570 mg/L to 607 mg/L, respectively (Figure 17).

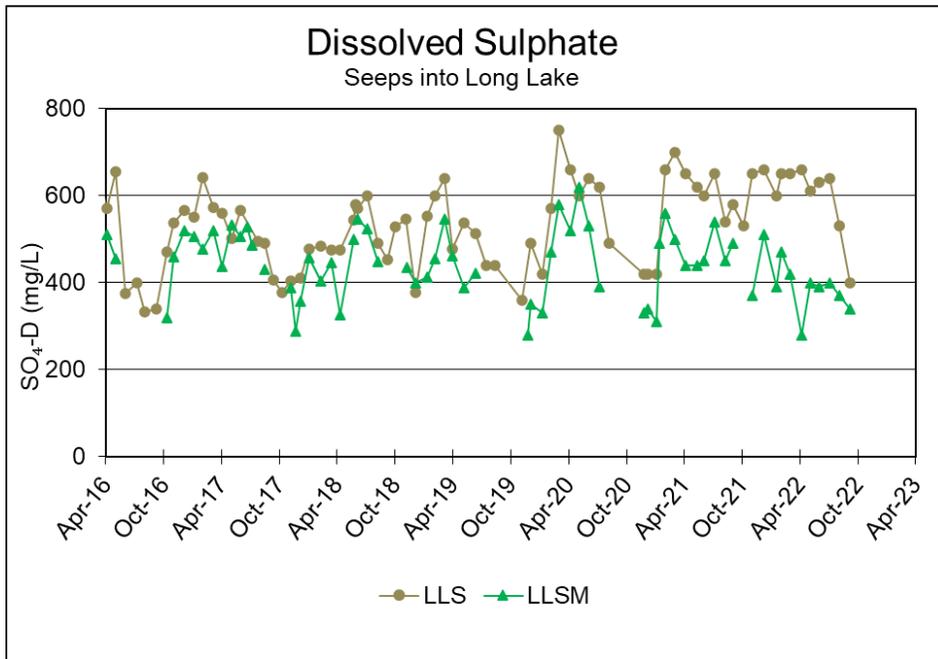


Figure 17: Dissolved Sulphate at Long Lake Seeps

GROUNDWATER

Groundwater wells are categorized as either ‘in-situ’ or ‘ex-situ;’ the definition 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 formation groundwater and indicates seepage from the flooded mine voids towards the receiving environment. This also includes wells up-gradient of workings and formation/ baseline 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), describing water quality standards for freshwater 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.

Appendix 1, Tables 31 through 32 provide a description of wells and results of the flooded mine void and groundwater chemistry.

Exceedances of the CSR-AW in ex-situ groundwater were observed for dissolved concentrations of arsenic, selenium, and sulphide as H₂S as displayed in Appendix 1, Table 4. Arsenic is naturally elevated in the groundwater and is associated with perched water tables interacting with the Dunsmuir sandstone and coal seams. This has been observed in baseline groundwater monitoring.

Groundwater areas elevated in CSR-AW dissolved arsenic (0.05 mg/L) includes the 2 and 3 North areas at both deep (D) and shallow (S) groundwater QU08-21 (S and D), QU10-10 (S), the River Barrier Pillar at QU11-09 (S), 7-South at QU08-13 (A and B), and the 4-South area at QU10-09 (S and D). The groundwater that the wells QU11-05 (S and D) and QU11-09 (M) intersect did not contain elevated arsenic.

The potential seepage areas S and S2A located next to the Quinsam river within the vicinity of groundwater wells QU11-09 and QU11-05, continue to be monitored for water quality and quantity. Water chemistry from the seepage sites at S, S2A and S2US from 2021 to present is compared to groundwater chemistry collected from QU11-09S and QU11-05S. Sampling site S is located near QU11-09 and S2 at the river in the vicinity of QU11-05. S2US was the source of the seepage area coming out of the bank at near QU11-05.

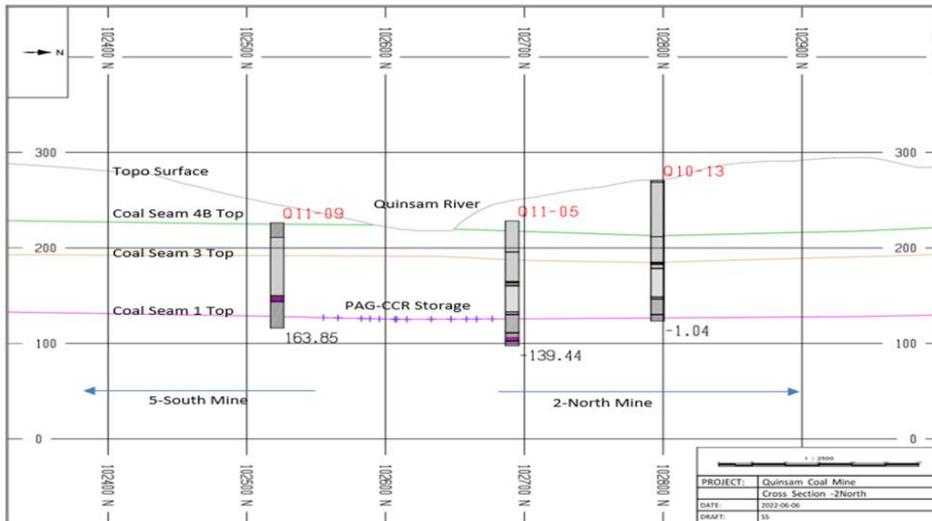


Figure 18: Cross Section in North-South Direction Near Seepage Areas by QU11-09 and QU11-05

Figure 18 above displays a cross section in North-South direction near the seepage areas S at QU11-09 and S2 at QU11-05. The numbers at the bottom of each borehole are the distance offset from the cross-section line. Positive (negative) sign indicate borehole locates in the north (south) of the cross-section line. The PAG-CCR storage area (blue cross) is projected on the coal seam 1 top surface, where the coal was mined at 2-North. Non-arrowed polylines represent different surfaces.

A relationship between flow rates at the seeps and water elevations in the 2-North flooded mine voids continues to be evaluated. In November 2021, a cap was placed on the well QU11-09 to prevent discharge to surface when the underground mine void filled with water. Pressure transducers were placed in the groundwater wells (shallow and deep) to measure the water levels compared to the 2-North flooded mine void water levels. In June, the cap was removed, and the data downloaded from the pressure transducer.

Figure 19 displays groundwater elevations compared to observations of seepage areas since March 2021 when groundwater well QU11-09 was discharging to surface. The groundwater for both shallow and deep water-tables follow a similar trend compared to 2-North mine water levels measured at dewatering well, 1-Mains well pump (1M2N). As displayed in Figure 19, groundwater in wells (QU11-09 M and S and QU11-05 D) increases to approximately 227 meters above sea level (masl) December through April corresponding to the 2-North, 1-Mains well pump water elevation. Flows from the seepage area near QU11-05, named S2US corresponds directly with the 1-Mains well pump water elevation but seepage from S2A and near QU11-09 seepage (S) could be combined mine related and natural groundwater influences.

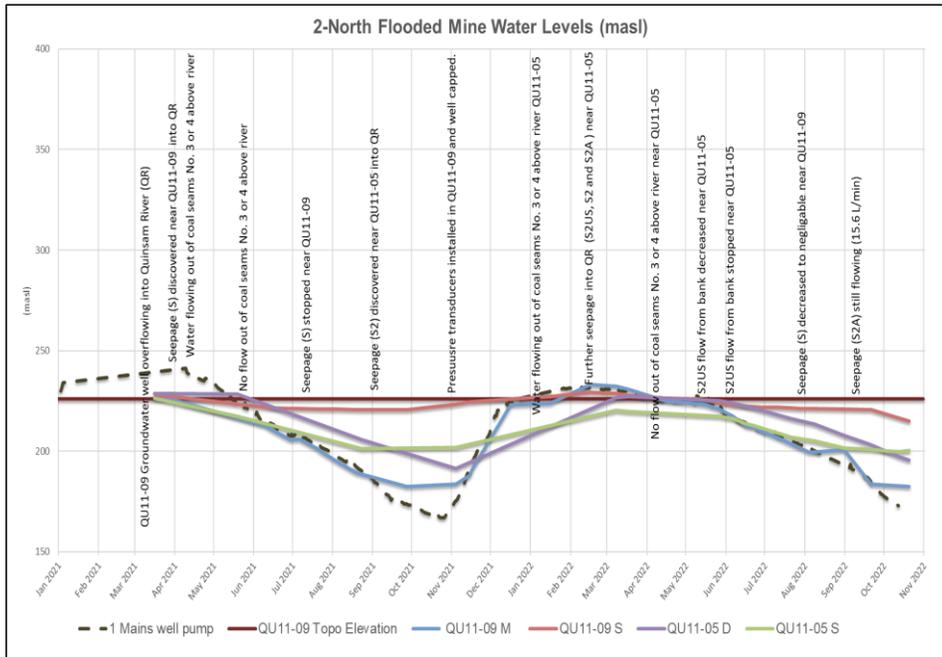


Figure 19: 2 North Flooded Mine Void Compared to Seepage Rates Near QU1109 and QU1105

At seepage location S near QU11-09 it is still unclear if shallow groundwater interacting with underlying coal seams is the source of elevated arsenic and sulphate in the discharge water or if this seepage is from migrating groundwater from the River Barrier Pillar. At the S2US near QU11-05 location, the trend seems to be related to the water elevations in the 2-North Mine. Observations made indicated that when water levels declined in the mine pool the seepage stopped percolating out of the bank at S2US at an elevation of 213 masl but a flow path to the river continued at lower elevations (S2A). This may also be groundwater interacting with the high sulphur coal seams. Further investigation with a hydrogeologist is warranted.

Seasonal trends are displayed as water levels increase and decrease related to groundwater influxes. Dewatering through pumping at 5M2N and 1M2N is an integral part of the water management plan with the objective being to maintain water levels below elevations of known subsidence zones where potential seepage may occur (210 - 270 meters above sea level (masl)). In 2021 and 2022 seepage areas were observed at elevations between 210 masl to 228 masl.

Water quality collected from the flow paths display elevated concentrations of arsenic and sulphate with iron elevated at the S2 sites. Elevated concentrations of arsenic and sulphate in these areas could be related to natural conditions where groundwater is interacting with the Dunsmuir sandstone and coal seams containing arsenic and sulfides. Seepage from shallow groundwater flowing to surface in these areas continued at S until the end of August and at S2A seepage

continued throughout the quarter. Appendix I, Tables 3, 33 and 34 present the water quality and quantity from the seepage areas. Figure 20 below displays the concentrations of dissolved arsenic, sulphate and chloride compared to the shallow groundwater in the area. Similar trends are noted for these parameters. The flow rates were measured at the entrance where the seepage flows into the Quinsam River.

In order to capture any impacts on the Quinsam River as a result of the seepage in these areas the weekly sulphate monitoring has been implemented upstream at Middle Quinsam lake outlet (WB) and downstream of the seepage areas on the Quinsam river at QRDS1. All parameters remained in low concentrations (below WQG's) on the Quinsam river (Figure 9 through 13 above), indicating sufficient mixing and dilution in the Quinsam river. Weekly monitoring will continue throughout the year.

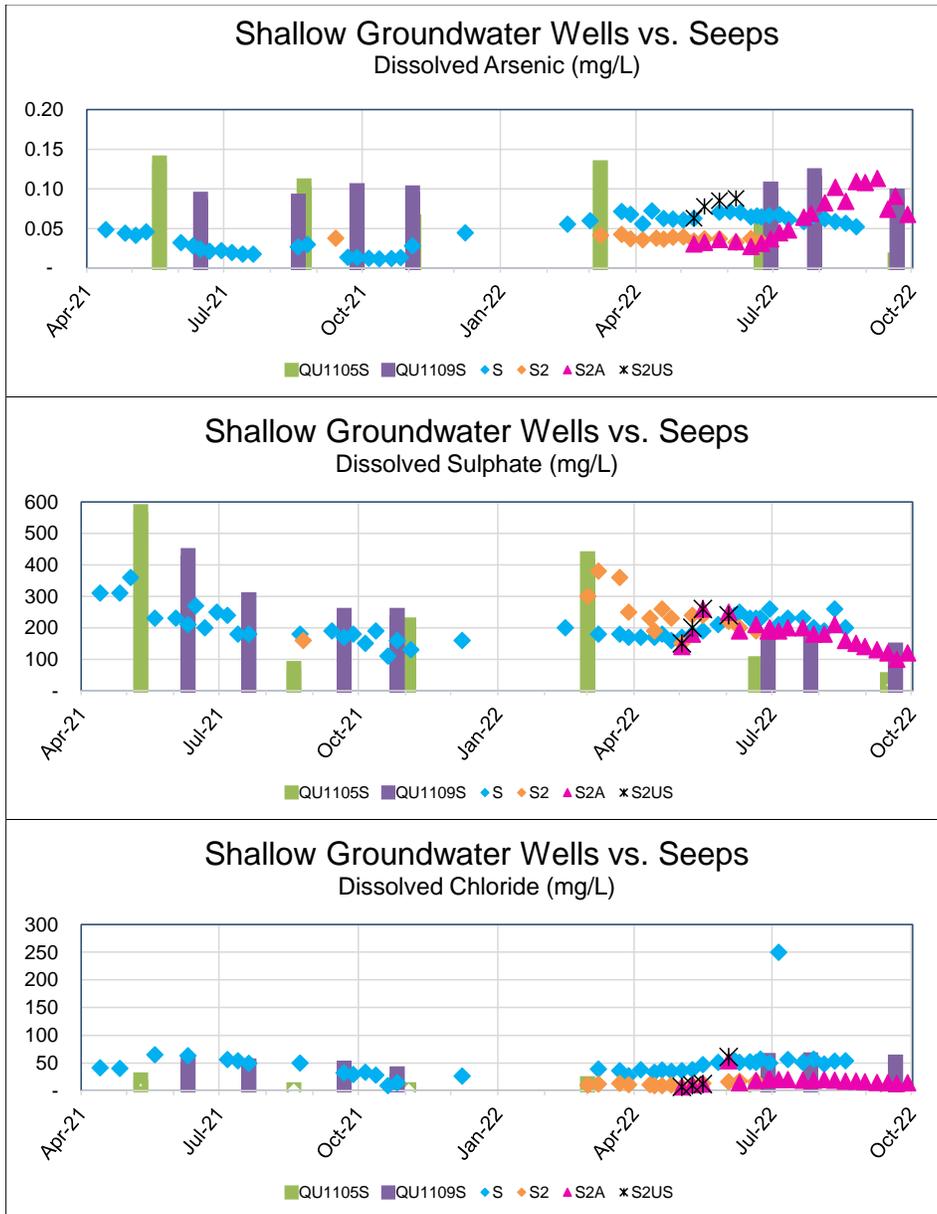


Figure 20: Dissolved Arsenic, Sulphate and Chloride at Shallow Groundwater and Seepage Areas

PASSIVE TREATMENT SYSTEM (PTS)

The PTS was operating throughout the quarter. The treatment system was operating at an average of 8.2 L/s, for 91 days in Q2 totaling 64,472 m³ of pumped mine-water. The mine water level was measured at 15.7 m above the pump in April and decreased to 4.0 m at the end of September. The seep stops flowing when the water level reaches an approximate elevation of 301.5 masl for LLS and 303.5 masl for LLSM measured at MW004. Groundwater levels in MW003 and MW005 also relate to the seep flow as displayed in Figure 21 below.

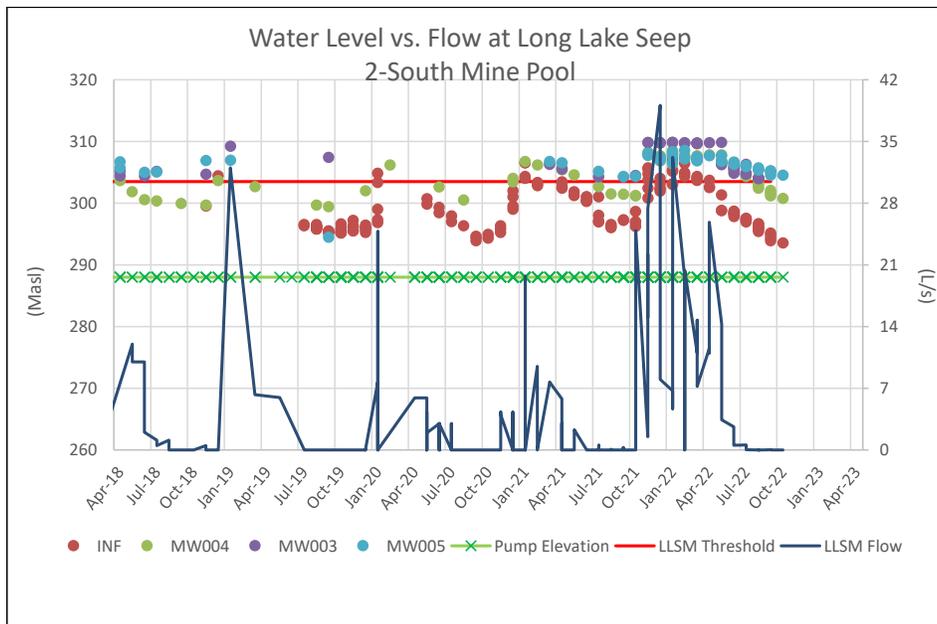


Figure 21: Water Level versus Long Lake Seep Flow

Figure 22 shows average concentrations of dissolved sulphate have been entering the system from 2-South flooded mine void measured at INF resulting in 571 mg/L, average sulphate at the BCR was 477.5 mg/L and leaving the system at SPCEFF resulting in 407.5 mg/L. Reduction in average sulphate throughout the PTS (INF to SPCEFF) was 164 mg/L. The station 2-South Inflow (2SI), receives discharge from the PTS, had an average sulphate concentration of 522 mg/L and SP1 averaged 500 mg/L during Q2. Overall, a quarterly average sulphate reduction of 72 mg/L was attained between INF and SPD (Figure 22). The original reduction goal for the PTS, was to reduce sulphate concentrations to 300 mg/L.

Increased pumping rates may have reduced the PTS’s capability to reduce sulphate. In April, the system flow rates were increase from 4.5 L/s to 8.2 L/s with 5.0 L/s of discharge directed into the PTS and 3.2 L/s directed straight into 2-South pit. The objective being to pump down the mine pool faster to stop the seep discharge for a longer period. In Q2 warmer ambient temperatures increase microbial metabolic activity within the BCR and SPC and a slightly higher reduction efficiency in sulphate was experienced between INF and SPC (164 mg/L compared to Q1, 124 mg/L). Low reduction efficiency may indicate that the substrates need to be changed in the BCR.

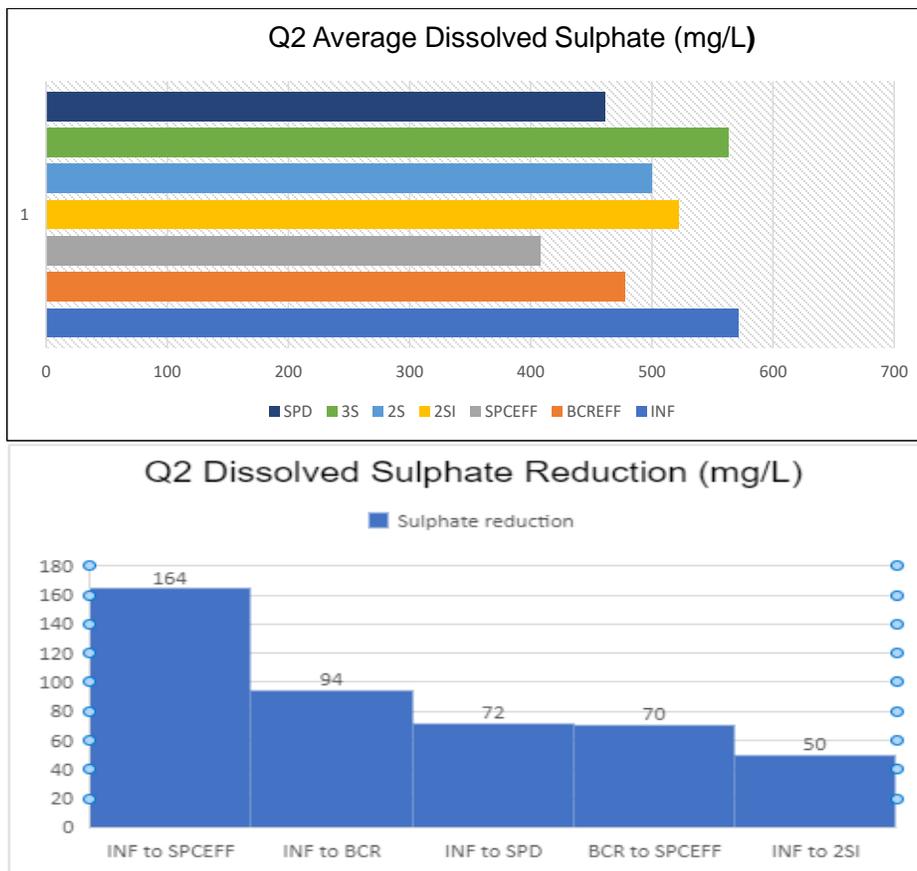


Figure 22: Average Dissolved Sulphate and Average Sulphate Reduction

The PTS is effective at reducing sulphate in mine water, with discharge assisting to maintain a water cover over the PAG-CCR in the 2-South pit during summer and reducing discharge at the Seep into Long Lake during low flow periods. This is accomplished by decreasing the elevation

of the 2-South flooded mine void below the elevation of the seep. The period of “no flow” at the Middle Seep into Long Lake (LLSM) has been observed to be extended by pumping down the mine pool.

Further monitoring of the PTS will continue and includes the 2-South and 3-South systems and groundwater wells QU11-11 (INF) and MW004. Relationships between mine pool water elevations and seep flow rates continue to be developed with observations noted every quarter.

QUALITY ASSURANCE QUALITY CONTROL

All replicate sampling was performed in compliance with the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition*.

As per these guidelines and in accordance with the Quinsam Coal Quality Assurance/Quality Control (QA/QC) program, one field replicate sample was collected per sampling event. Relative Percent Difference, RPD values were calculated in accordance with the B.C. field sampling manual.

CONCLUSION:

Quinsam Coal is dedicated to reducing the environmental impacts of mining on the receiving environment. Overall, there were no permit limit exceedances and few parameters outside the provincial Water Quality Guidelines in the receiving environment this quarter. This exemplifies that the environmental management practices employed by the mine are effective at reducing impacts to the surrounding environment. In closing, we trust the information presented in this report satisfies the conditions under Effluent Permit PE-7008. Please contact the Environmental Department if you have any questions or comments.