Quinsam Coal Corporation Quarterly Report (April-June 2022)

For Effluent Permit PE: 7008

Environmental Department

TABLE OF CONTENTS

Appendix I – Tables

Tables 1-44

INTRODUCTION

During Quarter 1 (April 1st through June 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 1 (Q1), all environmental monitoring was completed as per stipulations in the effluent permit PE:7008. *The Annual Water Quality Monitoring Report* was submitted on June 30th.

NORTH END WATER MANAGEMENT SYSTEM:

Stage pumping / dewatering continued from 7-South Area 5 (7SA5) into 1-Mains 7-South (1M7S) sump, where it then pumps into the 5-South Mine (5SMW). The 5SMW has not pumped into 3-Mains, 2-North Mine Pool (3M2N) since it failed in January 2022. Flooded mine water levels are monitored to ensure levels remain below the portal of 290 meters above sea level (masl).

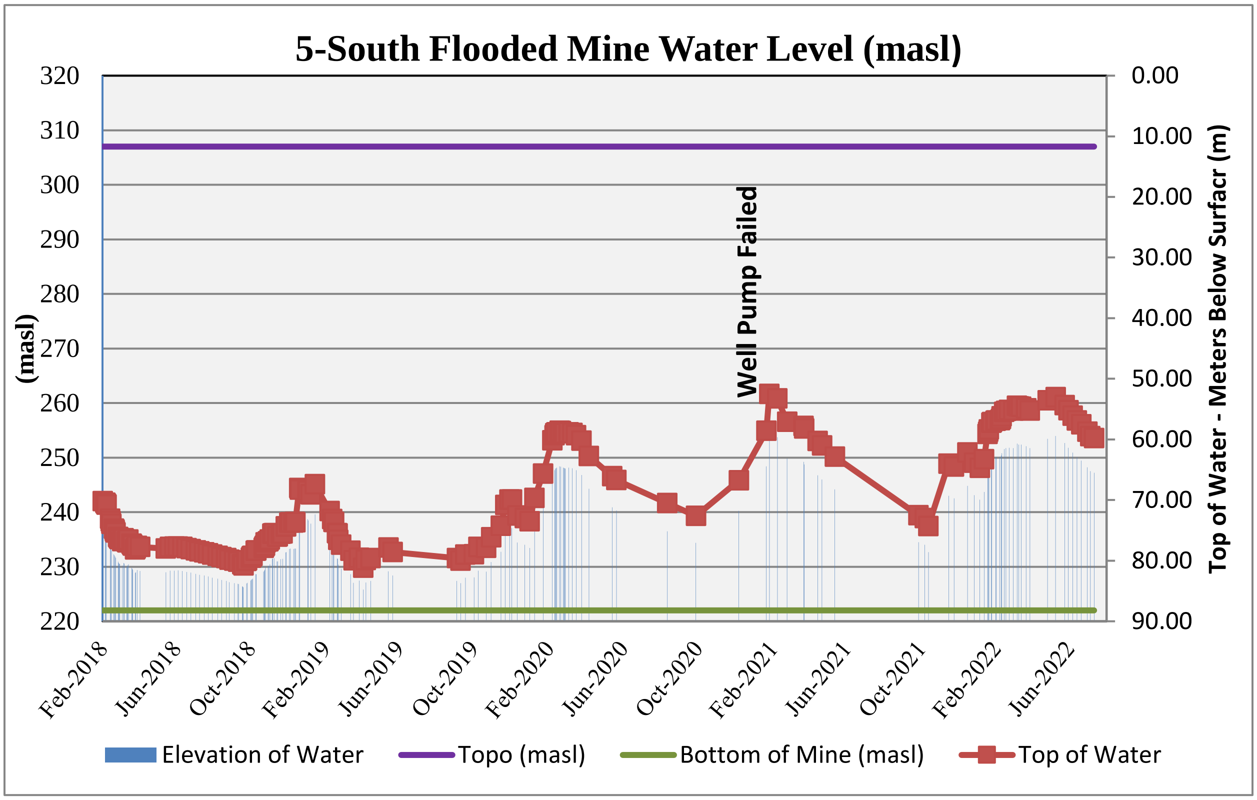


Figure 1: 5-South Flooded Mine Water Level

The 3M2N pump was operating to dewater the 2-North mine pool with discharge into Brinco brook. The 2-North Portal Sump (2NPS) collects seepage water from the tailings dam and underground 2-North mine. This water combined with 3M2N discharges into Brinco brook.

The other two major dewatering wells located in the 2-North mine pool include, 1-Mains, 2-North (1M2N) and 5-Mains 2-North (5M#2). These pumps discharge into either Brinco Brook or by opening gate valves located at the end of the lines, water can be directed into WP. Water is used to supply sufficient water cover over the Potentially Acid Generating, Course Coal Refuse (PAG-CCR) in WP. During Q1 the gate valves were opened halfway directing water into both 2-North Pond (WP) and Brinco Brook.

Settling Pond 4 (WD / SP4) is the authorized discharge location for the North water management system, where permit limits are applied to water quality and quantity. All water quality remained within permit limits. Discharge occurred 91 out of 91 days (Figure 2). Discharged at SP4 was calculated as 97, 0099 m^3 compared to 2021 Q1 where 114, 1603 m^3 was discharged. All water quality remained below effluent permit limits at SP4.

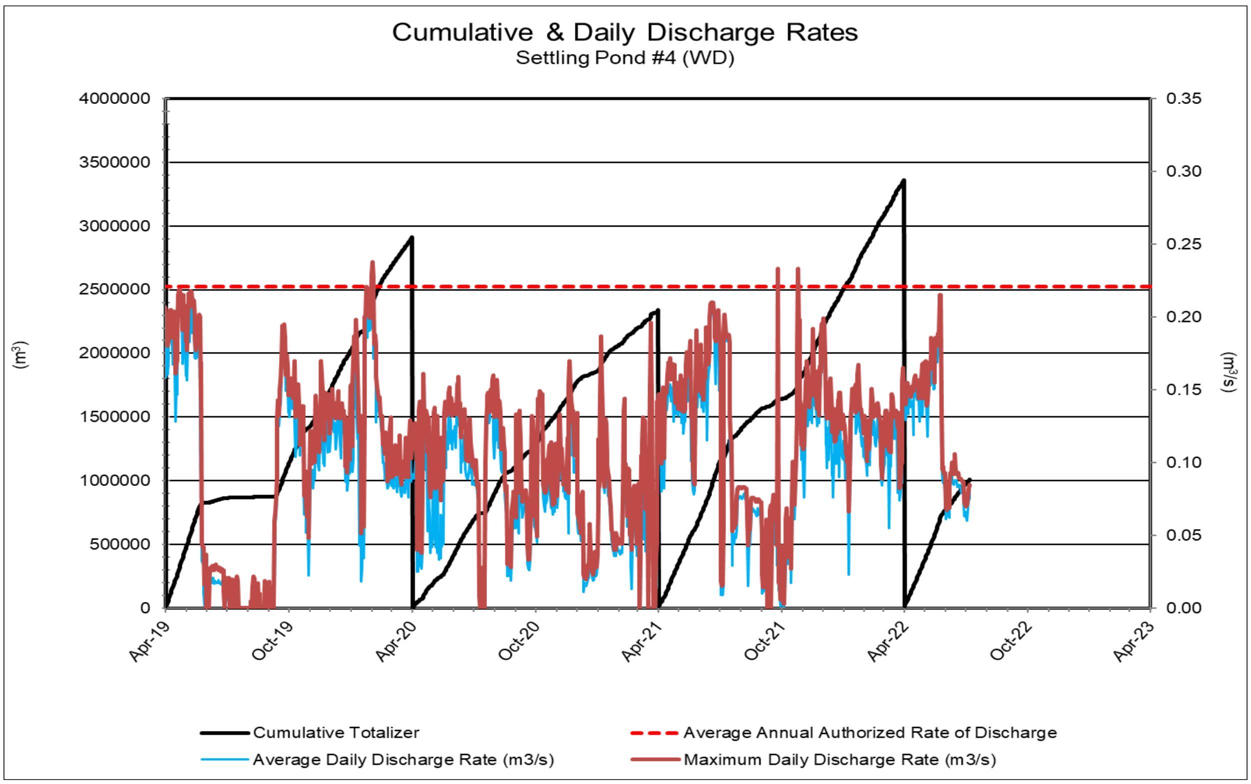


Figure 2: Settling Pond #4 Discharge Rates

SOUTH END WATER MANAGEMENT SYSTEM:

Water in the south end is managed by directing all water from the Passive Treatment System (PTS) into the 2-South and 3-South pits to maintain a water cover over the PAG-CCR during the dry season and maintain the 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 mine pool (INF) with 5.0 L/s into the treatment system 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 to the 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 from the 2-South pit, overflow from the water cover at 2-South pit and precipitation. This water flows down a channel from 2-South to 3-South. Continuous discharge 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 the 3-South pit is pumped to Settling Pond #1 during spring, fall and winter. During summer, a gate valve is opened at a junction on the 3S pipeline located on the 2-South highwall. From here the 3-South water can be directed either into the 2S pit or to Settling Pond #1 (SPD / SP1). When water pumped from 3S is directed into 2S 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 (normally during mid-May) reducing the load from mine contact water on the receiving environment. The valve directing water from 3S to 2S was not opened this quarter and all water has been directed to SP1.

SP1 is the authorized discharge location for the South water management system where permit limits are applied to water quality and quantity. Discharge occurred for 91 out of 91 days (Figure 3). With a cumulative quarterly total of 23, 0982 m^3 compared to last year Q1 where 59,452 m^3 was discharged. All water quality remained below effluent permit limits at Settling Pond #1.

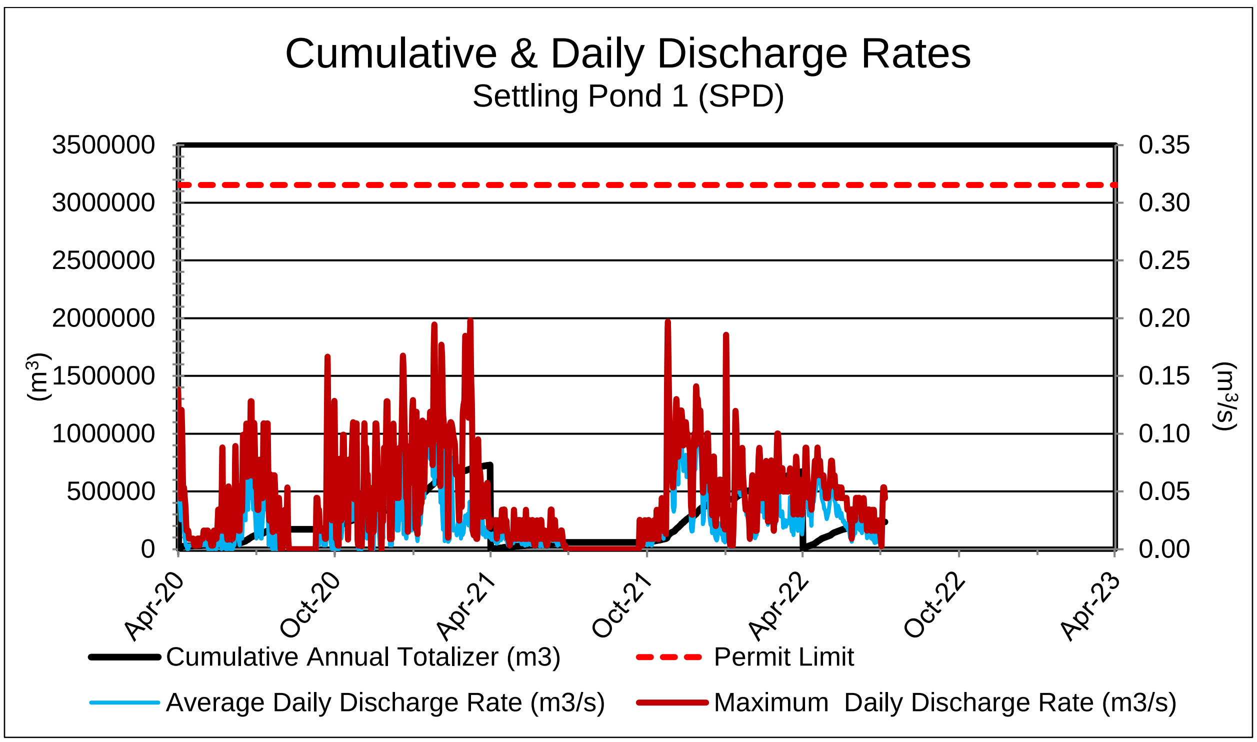


Figure 3: Settling Pond #1 Discharge Rates

7-SOUTH (7SSD) WATER MANAGEMENT:

Discharge did not occur during Q1 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 monthly samples collected from Stream 1, 7S. This quarter, parameters of interest remained within the specified limits of the Water Quality Guidelines (WQG) during all sampling events at 7S. The water quality results corresponding to these samples are available in Appendix I, Tables 22 and 24.

QUARTERLY MONITORING:

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

The reader should note that concentrations for most parameters of interest were not elevated above water quality guideline (WQG) levels in the receiving environment throughout the spring sampling period, apart from dissolved copper and pH. Dissolved copper was trending above WQG's in lakes associated with spring turnover.

Long Lake Entry at LLE displayed averaged sulphate above the Chronic WQG of 128 mg/L.

Seepage from the 2-South mine at Long Lake Seep (LLS) displayed arsenic and dissolved and total iron concentrations above the WQG's of (0.005 mg/L, 0.35 m/L and 1.00 mg/L, respectively). Groundwater sourced potential seepage areas entering the Quinsam river at 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 2-3 North, 2-3 South 4-South, 5-South and 7-South mine areas were monitored. There are certain parameters that continually result above the CSR-AW. These include arsenic, chloride and sulphide as H_2S. Selenium is also observed periodically in the ex-situ deep groundwater of QU11-05D downgradient of the 2-North Mine, River Barrier Pillar and 5-South mine.

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

Non-Compliance Events:

There were no new non-compliance events to report this quarter. An unauthorized discharge continues from the from the Long Lake Seeps until an application for a permit amendment is submitted.

Receiving Environment Water Quality:

The receiving environment monitoring program followed the five samples in thirty days schedule with sampling events spanning April 6th through May 10th. This monitoring period is meant to capture the "*spring freshet*".

Preamble – Water Hardness

For the purposes of this report, the water quality guideline(s) (WQG) for hardness dependent parameters has been derived using site background values (i.e., monitoring location 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 248 mm, higher than Q1 last year (105 mm). Precipitation in Q1 occurred mostly in April (132.60 mm). This is displayed in Appendix I, Table 30.

Lakes

The spring lake monitoring program included No Name Lake (NNL), Long Lake (LLM), Middle Quinsam Lake (MQL) and Lower Quinsam Lake (LQL). Appendix 1, Table 3 provides a summary of those parameters that were seen above WQG's for lake spring monitoring. Appendix I, Tables 36 through 40 display results compared to guidelines. Only dissolved copper and pH were elevated above the WQG's during spring. Average results for pH ranged from 6.12 to 6.32 at No Name Lake for all depths sampled. These averages are below the chronic minimum WQG of 6.5, consistent with historical results.

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 elevated above acute WQG's in No Name at all depths and Long Lake at 9 m. Average copper was observed above the chronic WQG's upstream of mine influence in No Name Lake also in Long, Middle Quinsam and Lower Quinsam Lake's. Results above the acute WQG's ranged from 0.00041 mg/L to 0.00197 mg/L. Averaged results compared to the Chronic WQG's ranged from 0.00041 mg/L to 0.00072 mg/L. Long Lake 9m displayed the highest results for both acute and chronic WQG's. Appendix 1, Table 3 displays the results above the WQG's.

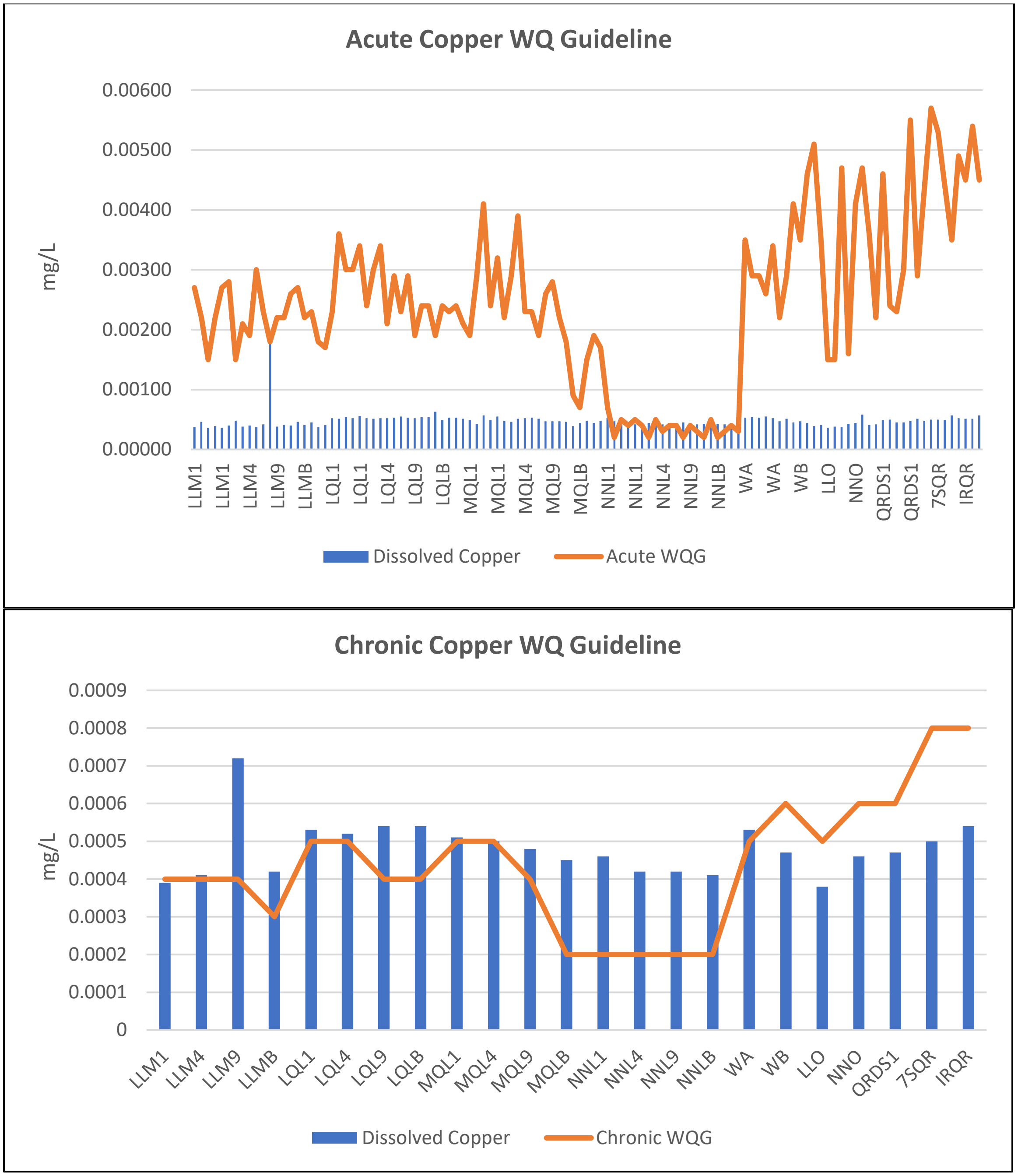


Figure 4: Dissolved Copper Concentrations Compared to Acute and Chronic WQG's

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

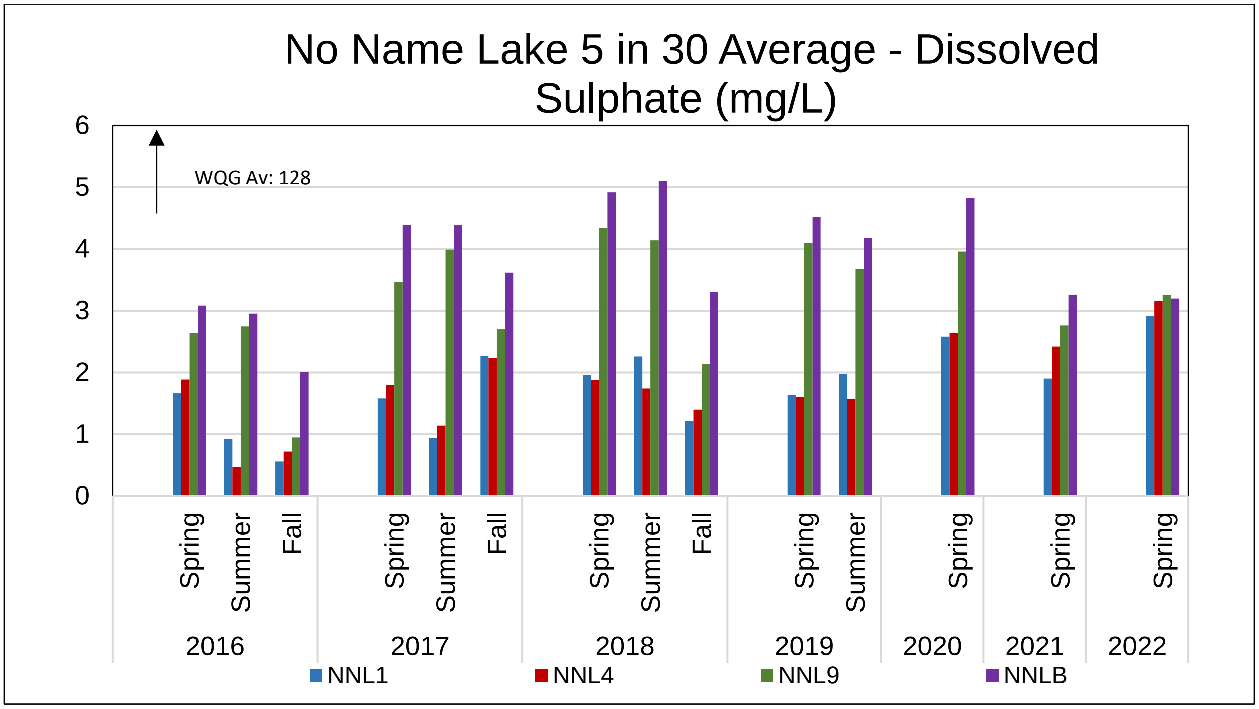
- Average sulphate concentrations resulted in 106 mg/L at 9 m and 113 mg/L at 1 metre from bottom (1MB), on Long Lake

- Sulphate in Middle Quinsam lake remained well below average guideline levels throughout the lake, averaging 33 mg/L at (1m, 4m and 9m) to 50 mg/L at depth 1MB.

- No Name Lake experience acidic conditions where average pH fell below the minimum guideline of 6.5 at all depths.

- Dissolved copper in No Name Lake was above the chronic WQG of 0.0002 mg/L and acute guideline on April 13th at all depths. The calculated WQG is below 0.0002 mg/L, however, 0.0002 mg/L is considered to be the lowest concentration routinely measured and therefore replaces the calculated HC5 value for this water chemistry.

The below figures (5 and 6) include 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 spring monitoring.



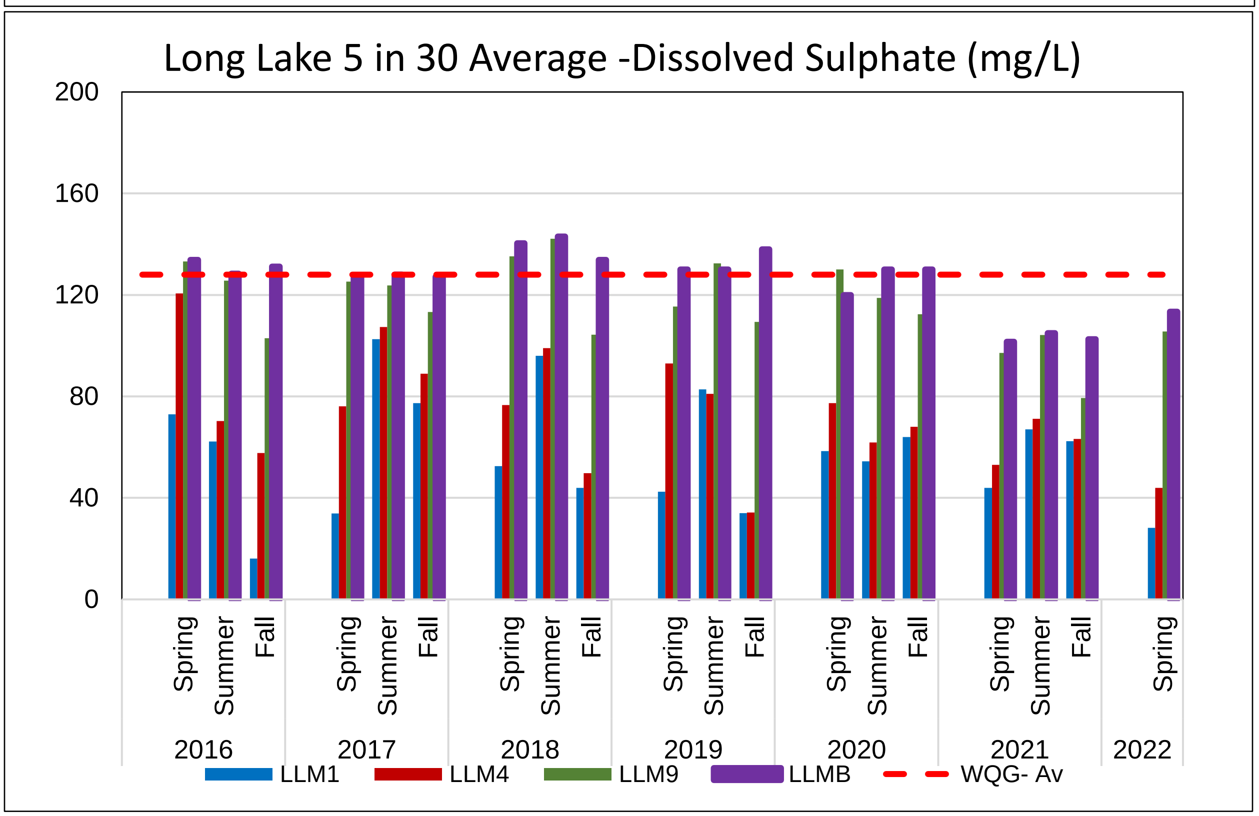
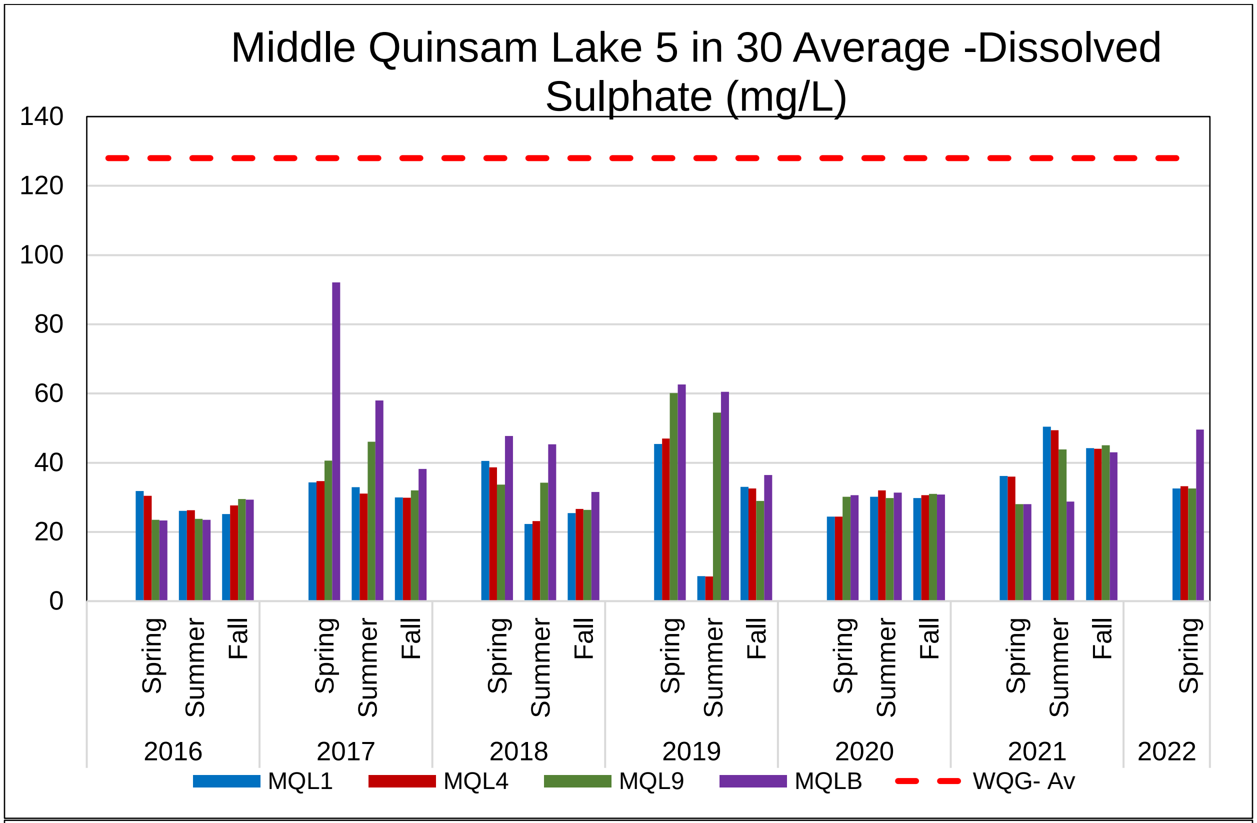


Figure 5: Average Dissolved Sulphate - No Name Lake and Long Lake



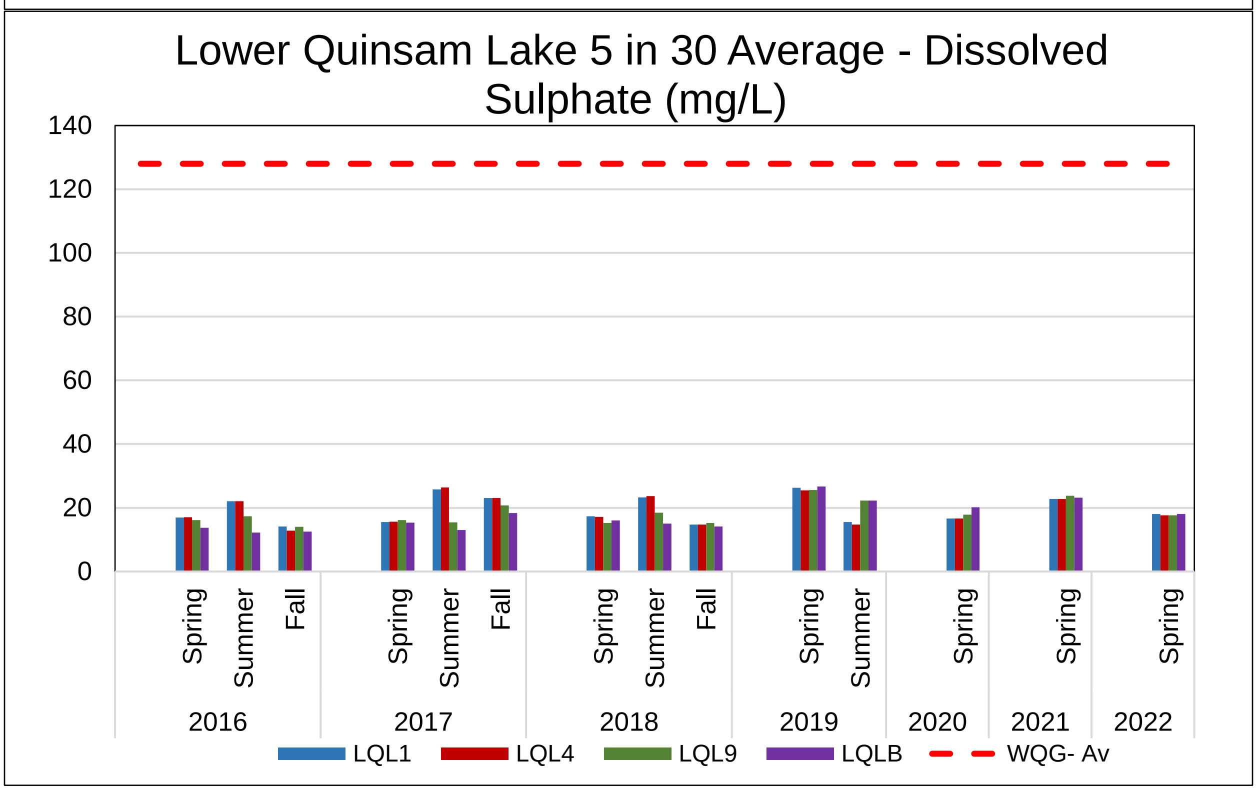


Figure 6: Average Dissolved Sulphate – Middle and Lower Quinsam Lakes

STREAMS AND RIVERS

The five samples in thirty days receiving environment program at river and stream sites commenced April 4th and concluded May 2nd. Appendix I, Table 41 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:

- Middle Quinsam Lake Inlet (WA),
- Middle Quinsam Lake Outlet (WB),
- Quinsam River Downstream Site 1 (QRDS1)
- No Name Lake Outlet (NNO),
- Long Lake Outlet (LLO),
- 7-South Quinsam River (7SQR),
- Quinsam River downstream of the confluence with Iron River (IRQR).

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 0.0005 mg/L on the Quinsam River upstream of mine influence at site WA.

- Average copper results for the Quinsam River downstream of mine influence and Iron River were not above the acute or chronic WQG's.

- All other parameters were below the acute and chronic WQG's for rivers and streams during the spring monitoring.

Figure 7 below displays trends for parameters of interest such as total arsenic, dissolved iron, and average dissolved sulphate on the Quinsam River since 2016. All results have remained below WQG levels. The main indication of the mine influence on water quality is observed with dissolved sulphate increasing downstream compared to the upstream location (WA).

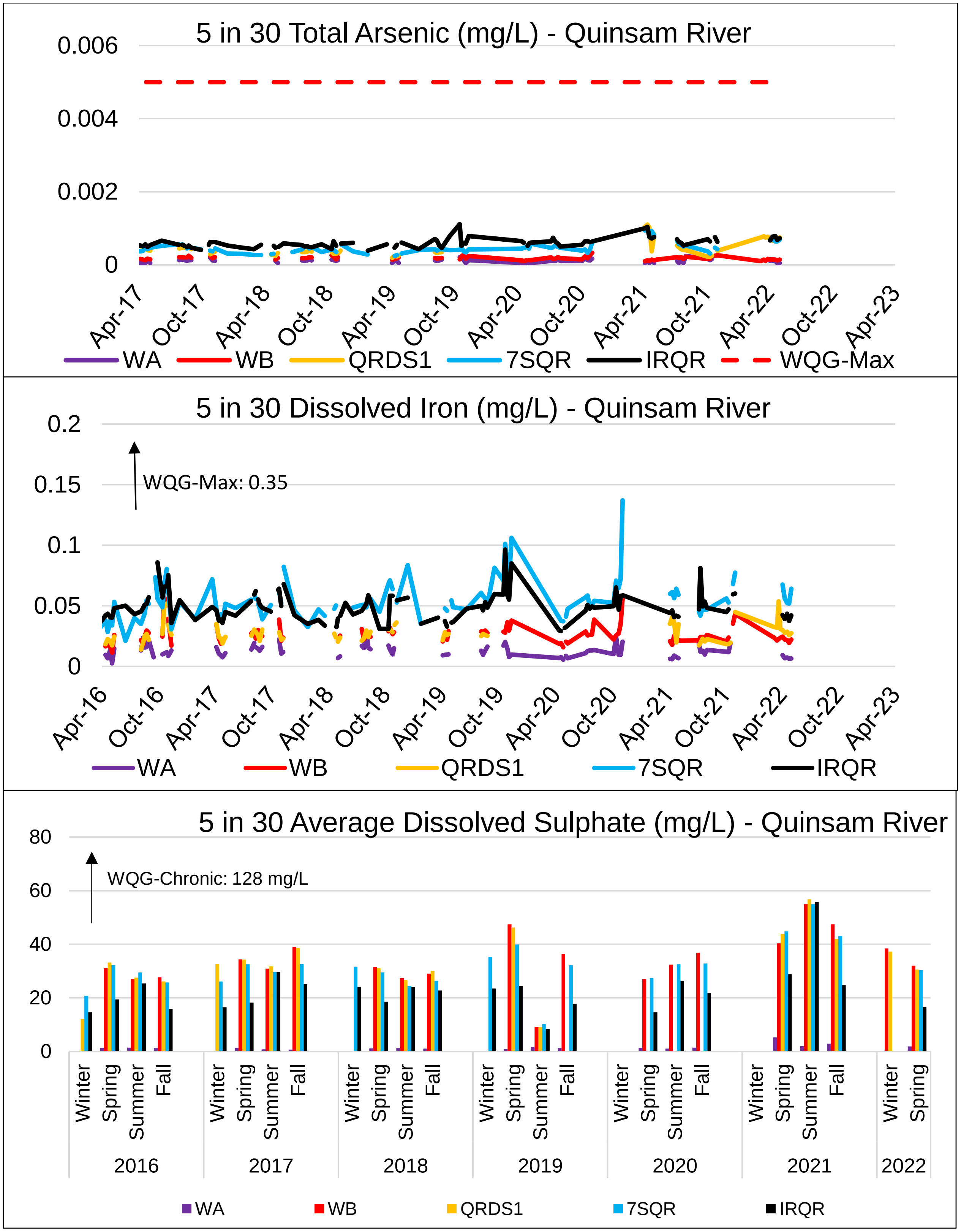


Figure 7: Total Arsenic, Dissolved Iron and Average Dissolved Sulphate - Quinsam River

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.

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 iron, both total and dissolved on all three-monthly sampling events and elevated arsenic on one sampling event above acute-WQG's of 1.0 mg/L, 0.35 mg/L and 0.005 mg/L, respectively.
- The larger seep (LLSM) did not have elevated iron.
- 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 4 out of 11 rolling averages.
- Peak sulphate concentrations at LLE are observed with decreased flow rates.

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 32 through 33 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, chloride, selenium and sulphide as H_2S 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 QU08-21 (GS and GD), QU11-05 (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 deep ground water at QU11-05 and QU11-09 did not contain elevated arsenic.

The potential seepage areas S and S2 located next to the Quinsam river near groundwater wells QU11-09 and QU11-05, continue to be monitored for water quality and quantity. Water chemistry from the seepage sites at S, S2 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.

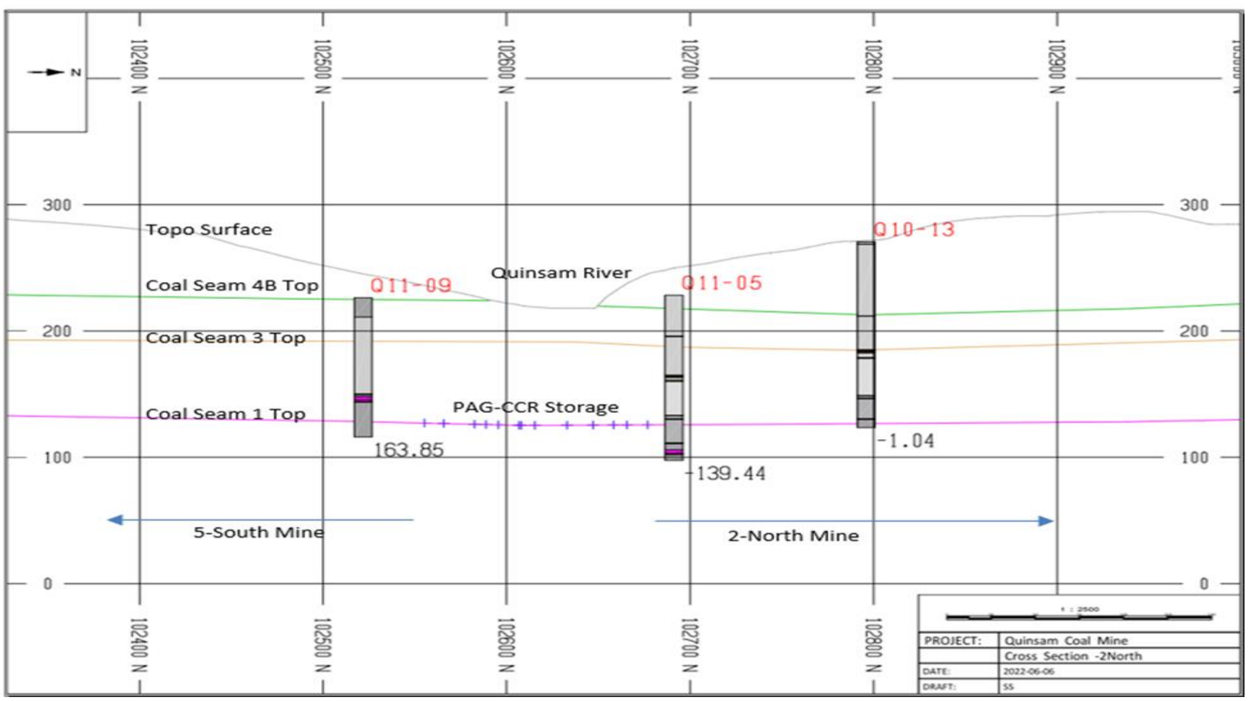


Figure 8: Cross Section in North-South Direction Near Seepage Areas by QU11-09 and QU11-05

Figure 8 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 (Figure 9). 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 taken off and the data was downloaded from the wells. As displayed in Figure 9 the groundwater water in both wells did reach surface elevation of 227 meters above sea level (masl) and follows the same trend as the 2-North mine water levels measured at both dewatering pumps 1M2N and 5M#2 (Figure 10).

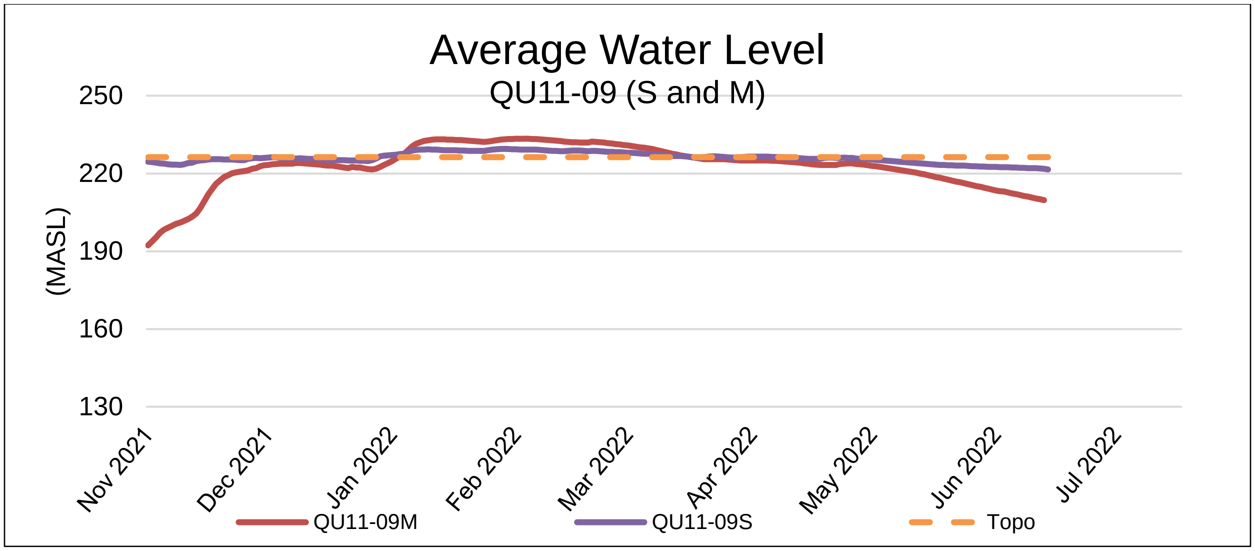


Figure 9: Shallow and Deep Groundwater Measured in QU1109 (S and M) Compared to Surface Elevation

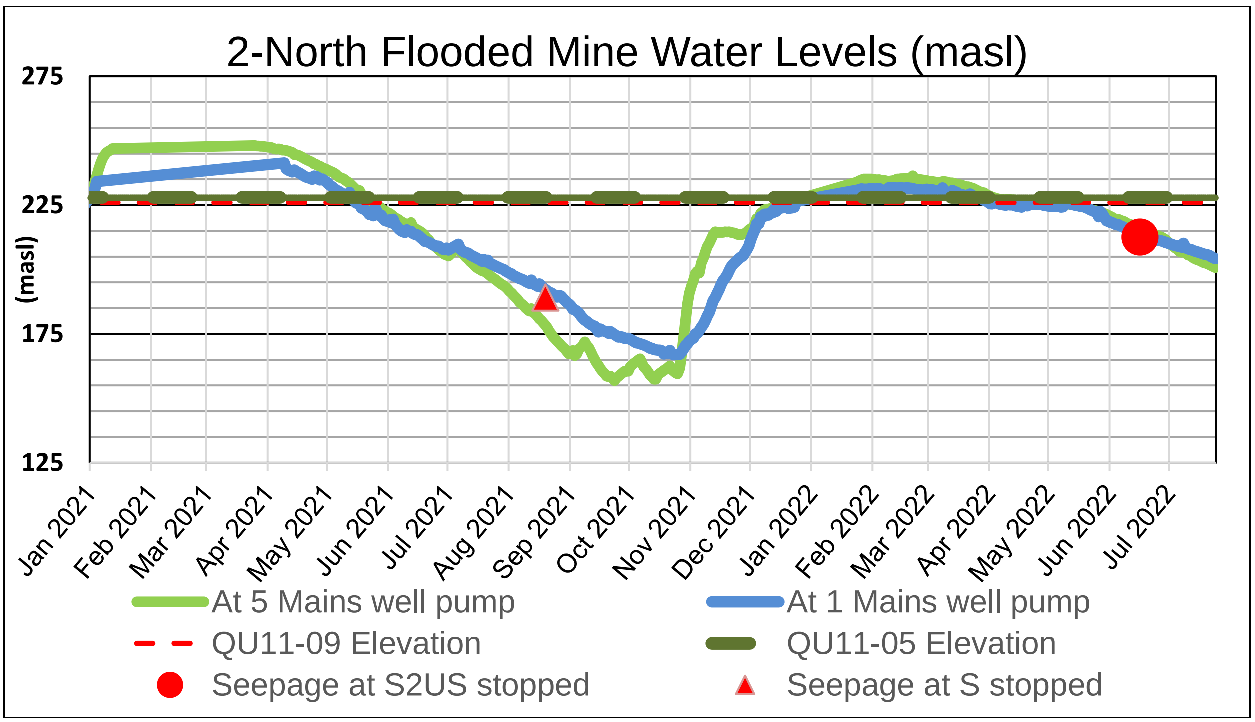


Figure 10: 2 North Flooded Mine Void Compared to Seepage Rates Near QU1109 and QU1105

Figure 10 displays the elevation of the groundwater when the seepages were observed to stop flowing from the ground at S and S2US. At seepage location S near QU11-09 it is still unclear if the shallow groundwater is impacting the seepage or water from the 2-North Mine. At the S2 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 (S2). Further investigation with a hydrogeologist is warranted.

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 throughout the quarter. Appendix I, Tables 3, 34 and 35 present the data from the seepage water. Figure 11 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. Water quality and quantity was measured periodically throughout the quarter, Appendix Table 1, below. The flow rates were measured at the entrance where the seepage flows into the Quinsam River.

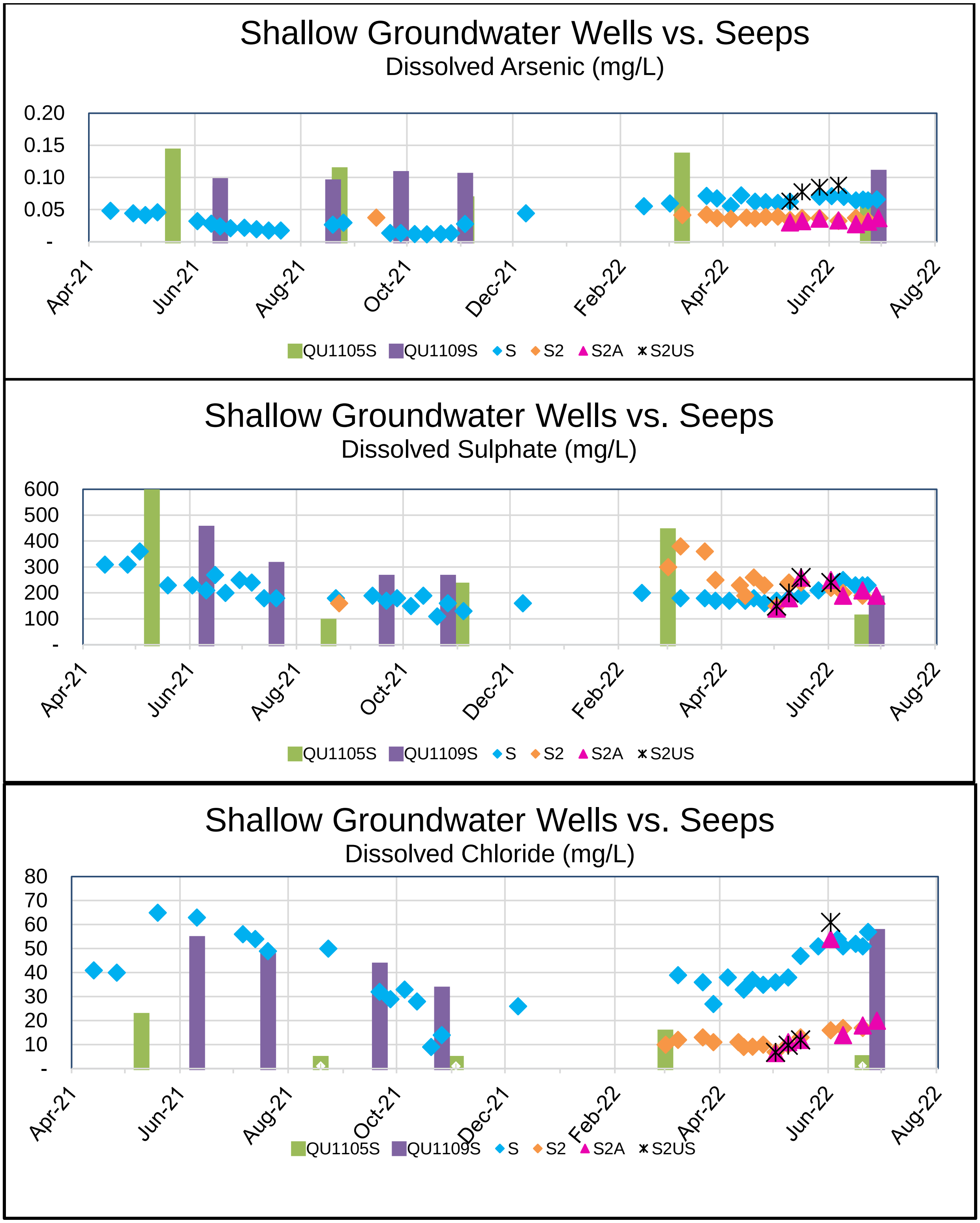


Figure 11: Dissolved Arsenic, Sulphate and Chloride at Shallow Groundwater and Seepage Areas

Table 1:Water Quantity from Seepage into Quinsam River

Weekly Flow		Weekly Flow		
Site	Potential Seepage (S)	Site	Potential Seepage (S2A and B)	
Flow (m³/s) Weeks	Estimate Flow	Flow (m³/s) Weeks	Estimate Flow S2A	S2B
05-Apr-22	0.0016	05-Apr-22		0.0050
11-Apr-22	0.00095	14-Apr-22		0.0040
19-Apr-22	0.00118	19-Apr-22		0.0045
25-Apr-22	0.00126	25-Apr-22		0.0040
02-May-22	0.0012	02-May-22		0.0035
09-May-22	0.0011	09-May-22	0.0057	0.0036
16-May-22	0.00084	16-May-22	0.0058	0.0032
26-May-22	0.0038	26-May-22	0.0046	0.0022
02-Jun-22	0.000345	09-Jun-22	0.0038	0.0007
09-Jun-22	0.0005	16-Jun-22	0.0022	0.0002
16-Jun-22	0.0003	23-Jun-22	0.0010	0.0001
20-Jun-22	0.0003	29-Jun-22	0.0005	Dry
23-Jun-22	0.0003			
28-Jun-22	0.0002			

In order to capture any impacts on the Quinsam River as a result of the seepage in this area the spring receiving environment monitoring included weekly sampling upstream at Middle Quinsam lake outlet (WB) and downstream of the seepage areas on the Quinsam river at QRDS1. Results are available in Appendix I, Table 41. All parameters remained in low concentrations (below WQG's) on the Quinsam river (Figure 7 above). Indicating sufficient mixing and dilution in the Quinsam river during winter and spring. Weekly monitoring will continue during low flow conditions.

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 Q1 totaling 64471.68 m^3 of pumped mine-water. The mine pool water level was measured at 15.7 m above the pump in April and decreased to 9.8 m at the end of June. The seep stops flowing when the water level reaches around 8 m above the pump an elevation level of about 301.5 masl for LLS and 303.5 masl for LLSM measured at QU11-11 (INF). Groundwater levels in MW003, MW004 and MW005 also relate to the seep flow as displayed in Figure 12 below.

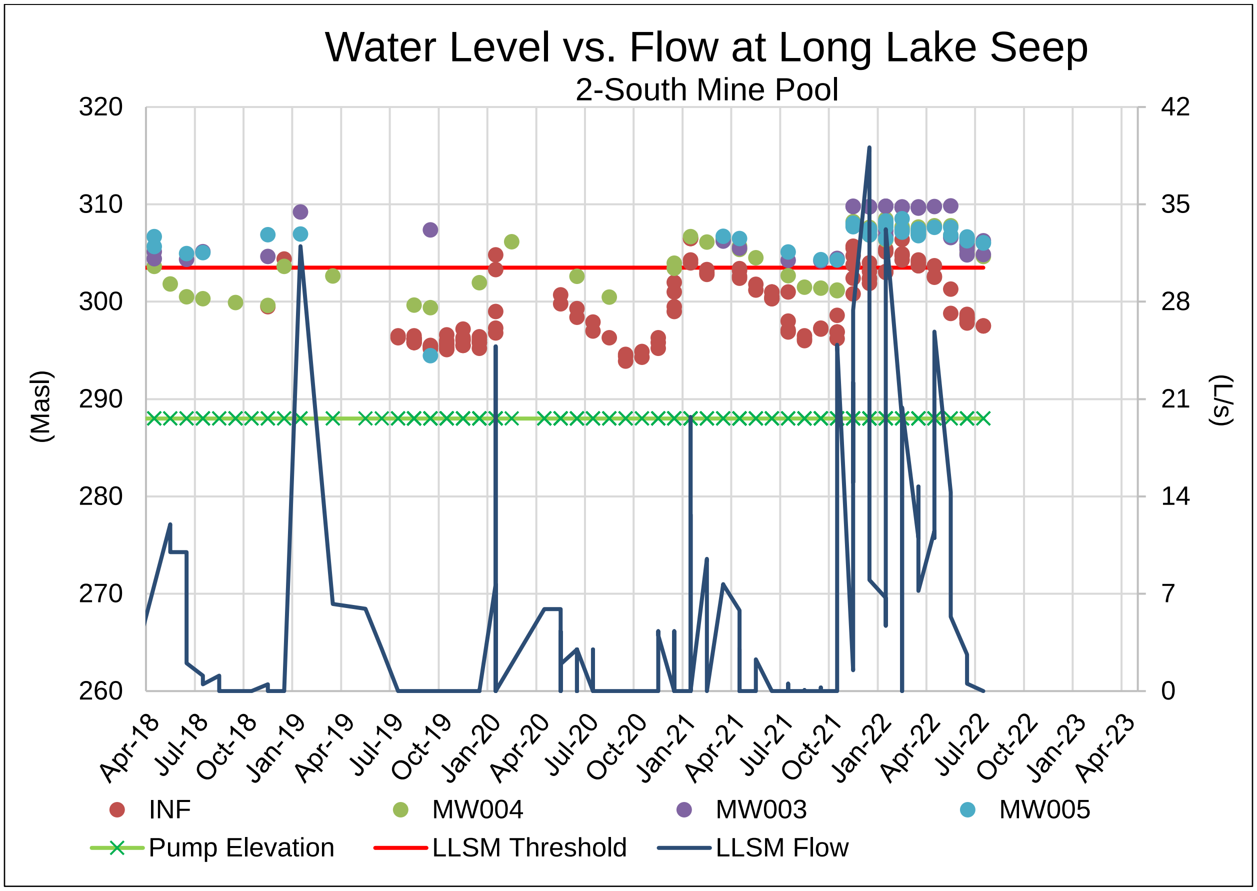
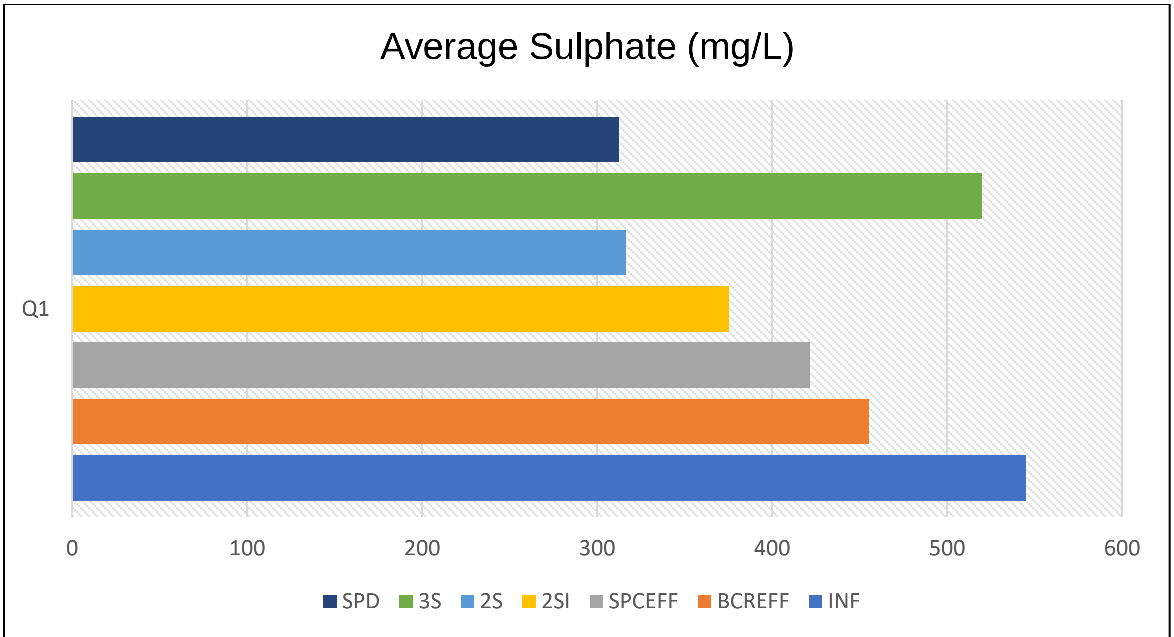


Figure 12: Water Level Versus Long Lake Seep Flow

Average concentrations of dissolved sulphate have been entering the system from the 2-South mine pool measured at INF resulting in 545 mg/L, average sulphate at the BCR was 455 mg/L and leaving the system at SPCEFF resulting in 422 mg/L. This has led to a reduction in average sulphate of 81 mg/L. The station 2-South Inflow (2SI), receives discharge from the PTS, had an average sulphate concentration of 120 mg/L and SP1 averaged 152 mg/L during Q1. Overall, a quarterly average sulphate reduction of 152 mg/L was attained between INF and SPD. The original reduction goal for the PTS, was to reduce sulphate concentrations to 300 mg/L. This was not achieved this quarter, but the results are still favorable (Figure 13).

Increased pumping rates may have reduced the treatment systems 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 it the warmer ambient temperatures will increase microbial metabolic activity within the BCR and SPC and a greater reduction in sulphate is expected.



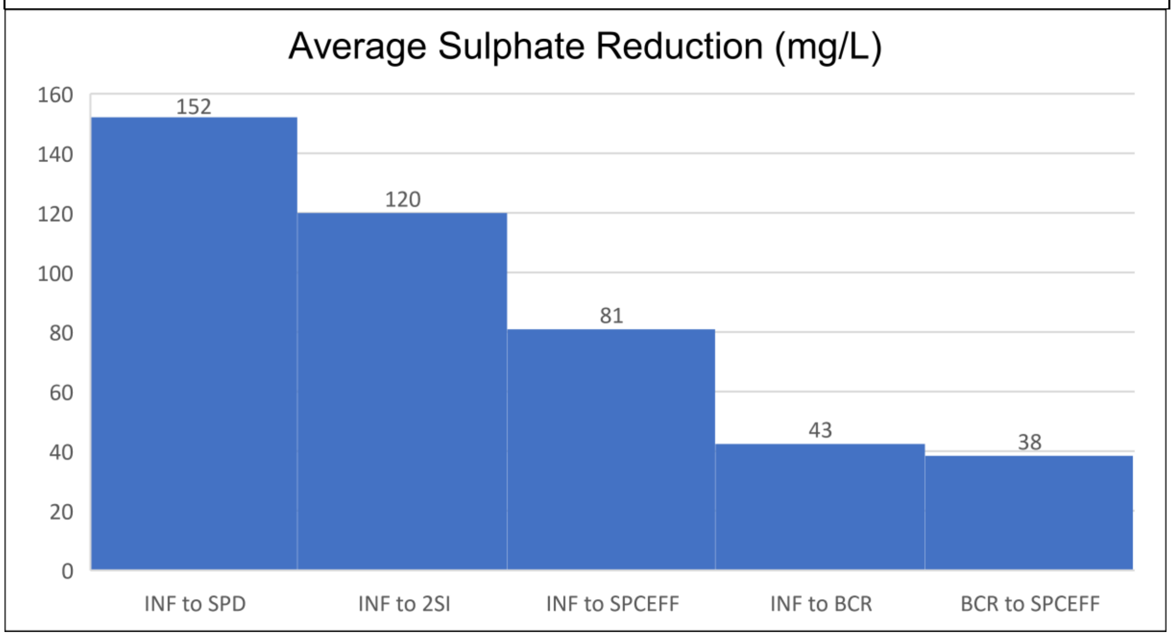


Figure 13: Average Sulphate and Average Sulphate Reduction

The PTS is effective at maintaining water cover over the PAG-CCR in the 2-South pit and reducing discharge at the Seep into Long Lake during low flow periods. This is accomplished by decreasing the elevation of the mine pool 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*. Appendix 1, Tables 42 to 44 display the duplicate, trip blanks and equipment blanks collected this quarter.

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 as a result 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.