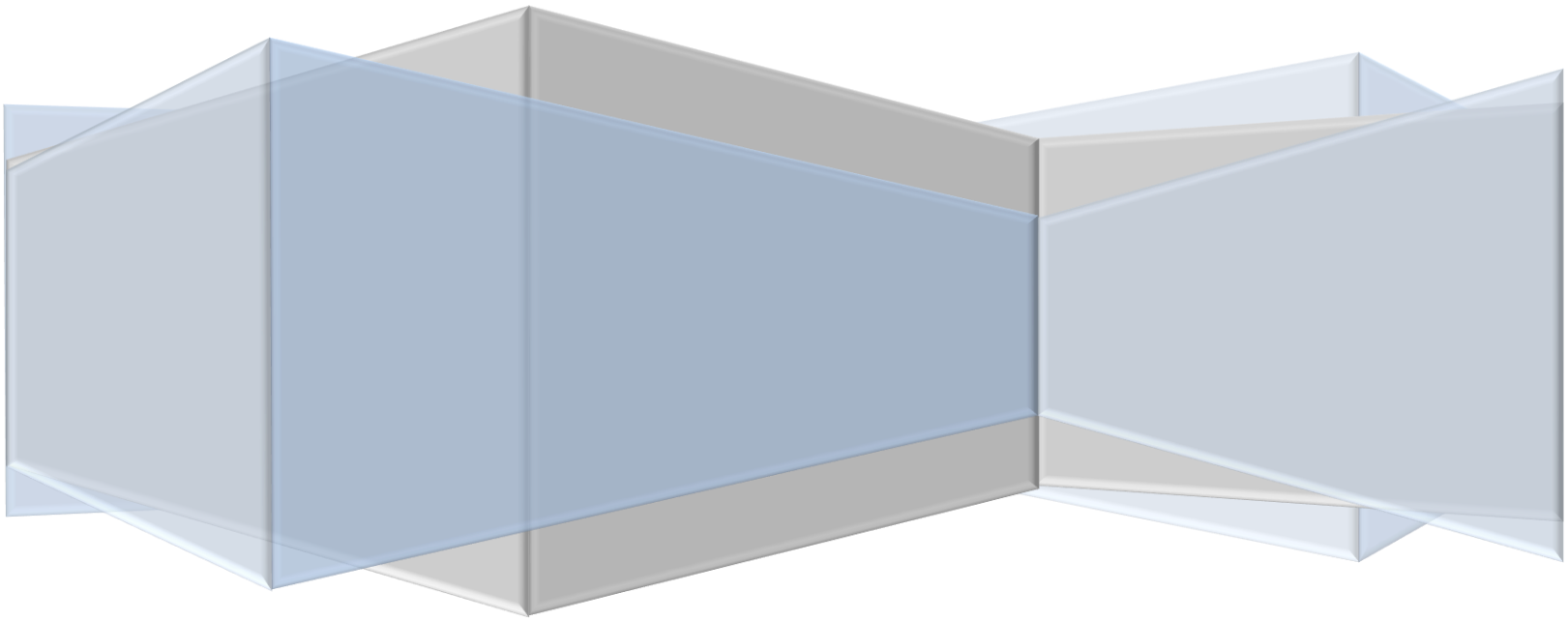
Quinsam Coal Corporations Quarterly Report (April-June 2021)

For Effluent Permit PE: 7008

Environmental Department



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INTRODUCTION

During Q1 (April 1st through June 30th, 2021) 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 did not pump into 3-Mains, 2-North Mine Pool (3M2N) this quarter. All water pumped from 7-South mine has remained in the 5-South Mine pool since late March.

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). In February 2020, the 5M#2 dewatering pump failed and on November 30, 2020, the 1M2N dewatering pump failed as reported previously. The 3M2N pumping network was used as the backup system for dewatering the mine pool until the pumps could be replaced. Consequently, the 2-North mine pool water elevation water level rose to 243.7 meters above sea level (MASL) by March 22, 2021. The water was being managed through the 3M2N pumping system.

The well pumps 5M#2 and 1M2N were replaced on March 25 and April 6, 2021, respectively. When operating 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.

During Q1 the gate valves were opened directing all water from 1M2N into the 2-North Pond (WP) to supply sufficient water cover over the Potentially Acid Generating, Course Coal Refuse (PAG-CCR). This

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. This quarter all water quality remained within permit limits. Discharge occurred 91 out of 91 days. Water quantity for Q1 discharged at SP4 was calculated as 1,141,517 m^3 compared to 2020 Q1 where 697,334 m^3 was discharged. All water quality remained below effluent permit limits at Settling Pond #4.

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 pump discharges the mine water into the treatment system. Water has been pumped at 4.5 L/s from the 2-South mine pool (INF) into the treatment system cells, Biochemical reactor (BCREFF) where it flows passively, to the Sulphide Polishing Cell (SPCEFF). PTS discharge water passively flows through each cell (BCREFF into SPCEFF) and is gravity feed to the 2S 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 contained 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). 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 Settling Pond #1 (SP1/SPD).

SP1 is the authorized discharge location for the South water management system where permit limits are applied to water quality and quantity. This quarter all water quality remained within permit limits. Discharge occurred for 88 out of 91 days. With a cumulative quarterly total of 59, 452 m^3 compared to last year Q1 where 119,698 m^3 was discharged. All water quality remained below effluent permit limits at Settling Pond #1.

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 the results are available in Appendix I.

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 Stream 1, 7S are available in Appendix I.

QUARTERLY MONITORING:

During the 1st Quarter (Q1) (Spring 2021), the 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 5 in 30 sampling period, apart from pH, dissolved copper, iron, and sulphate. Most of the exceedances of WQG were observed with dissolved copper. Quinsam is using a conservative approach for copper. Only those sites outside of the Middle Quinsam lake sub basin are compared to dissolved copper. Those sites include, No Name and Lower Quinsam lake's No Name lake Outlet, Quinsam river downstream of 7-South mine (7SQR and IRQR) and Iron river.

In addition to the aforementioned monitoring, the Quinsam Environmental Department sampled groundwater wells, underground sumps and dewatering wells throughout the 2-3 North, 2-3 South 4-South, 5-South and 7-South mine areas. Ex-situ groundwater is compared to the British Columbia Contaminated Site Regulation (CSR) (BC reg.375/96. O.C. 1480/96), Schedule 6, Aquatic life (CSR-AW). 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 QU1105D in the River Barrier Pillar of the 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 occurred from the 2-North mine pool during Q4 2021 and continued to seep until May 13, 2021. Seepage from shallow groundwater flowing on surface in the area continued throughout the quarter. The shallow groundwater was elevated in conductivity, arsenic, boron, copper and sulphate. Appendix I, Tables 4 and 42 present the data from the seepage water. Water quality and quantity was measured periodically from (March 19 through July 5) Table 1, below. The flow rate was measured at the entrance where the seepage flows into the Quinsam River.

Table 1:Water Quantity from Seepage into Quinsam River

Date	Flow rate (L/s)	Date	Flow rate (L/s)
March 19	1	May 20	0.50
March 30	0.16	May 25	0.37
April 7	0.08	May 31	0.30
April 21	0.013	Jun 7	0.20
March 19	1.00	Jun 10	0.18
March 30	0.16	Jun 14	0.14
April 7	0.08	Jun 21	0.11
Apr 21	1.11	Jul 5	0.07

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 area on two locations on the Quinsam river (QRDS and QRDS1). Results are available in Appendix I, Table 37 pages 58 and 60. All parameters remained in low concentrations (below WQG's) on the Quinsam river at QRDS and QRDS1. Indicating limited impact on water quality in the Quinsam river as a result of the seepage area.

RECEIVING ENVIRONMENT WATER QUALITY:

The receiving environment monitoring program followed the 5 samples in 30 days schedule with sampling events spanning April 6th through May 3rd. 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 appropriate 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 105 mm, higher than Q1 last year (90 mm). Precipitation in Q1 occurred mostly in May (41.40 mm). This is displayed in Appendix I, Table 31.

LAKES

The spring lake monitoring program included No Name Lake (NNL), Long Lake (LLM), Middle Quinsam Lake (MQL) and Lower Quinsam Lake (LQL). Appendix I, Tables 32 through 35 displays the depth profiling and field results with Appendix I, Table 37 (pages 39 through 55) displaying the water quality results compared to guidelines. Table 2 below, provides a summary of those parameters that were observed to be above the WQG's and WQO's for Spring monitoring in the lakes.

Table 2: Summary of Water Quality Guideline Observation for Lakes

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS 2020-2021						
EMS ID & Site Name	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E217018 - No Name Lake (NNL) 2-13 metres	pH	6.5	6.13 - 6.49	Spring 5 in 30	Min	(21/65) depths profiled during spring (2 out of 5 weeks)
NNL- 1m, 4m and 9m and 1 metre from Bottom (1MB)	Cu-D	0.0003	0.00034 (1M), 0.00034 (4M), 0.00044 (9M), 0.00034 (1MB)	Spring 5 in 30	A	Average of spring, 5 in 30 results for depths 1M, 4M, 9M and 1MB
E292118- Lower Quinsam Lake (LQL) 1M, 4M, 9M and 1MB	Cu-D	0.0003	0.00048 (1M), 0.00049 (4M), 0.00046 (9M) and 0.00047 (1MB)	Spring 5 in 30	A	Average of spring, 5 in 30 results for depths 1M, 4M, 9M and 1MB
E206619 - Long Lake Middle (LLM) (20m-21m depths)	pH	<6.5	6.45 to 6.46	Spring 5 in 30	Min	(2/105) depths profiled during spring (1 out of 5 weeks)
Min = Minimum Water Quality Guideline (WQG) M = Maximum WQG /WQO, A = Average WQG /WQO						
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.						

Noteworthy observations resulting from the lake monitoring program include:

- Average sulphate concentrations were measured at or below the water quality guideline (130 mg/L) in all lakes.
- Average sulphate concentrations resulted in 97 mg/L at 9 m and 102 mg/L from the 1 metre from bottom (1MB), on Long Lake during spring sampling.
- Sulphate in Middle Quinsam lake remained well below average guideline levels throughout the lake, averaging 36 mg/L on surface (1m and 4m) to 28 mg/L at depth (9m and 1MB).
- No Name lake experience acidic conditions where pH fell below the minimum guideline of 6.5 and Long lake experienced lower pH at 2 depths on bottom.
- Dissolved copper was just above the chronic guideline of 0.003 mg/L in No Name and Lower Quinsam Lakes at all depths during spring. These guidelines provide a conservative comparison.

STREAMS AND RIVERS

The 5 samples in 30 days receiving environment program at river and stream sites commenced April 6th and concluded May 3rd. Appendix I, Table 37 (pages 56 through 63) display water quality results from this program compared to water quality guidelines and objectives 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 (QRDS)
- 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).

Monitoring stations on the Iron River include:

- Iron River Upstream of future 7-South Area 5 development (IR6), and
- Iron River above the confluence with Quinsam River (IR8).

While monitoring location 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 are provided in this table for comparison purposes only.

Table 3: Summary of Guideline Observations for Rivers / Streams, Seeps (LLS, LLSM) and wetland (LLE)

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS 2020-2021						
EMS ID & Site Name	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E217017 - No Name Lake Outlet (NNO)	Cu-D	0.0003	0.00037	Spring 5 in 30	A	5 in 30 Average
E292113 -7 South Quinsam River (7SQR)	Cu-D	0.0003	0.00043	Spring 5 in 30	A	5 in 30 Average
E299256 - Downstream of the confluence of the Iron River and Quinsam River (IRQR)	Cu-D	0.0003	0.00051	Spring 5 in 30	A	5 in 30 Average
E292130 - South end water entering Long Lake (LLE)	Fe-D	0.35	0.402 and 0.641	May and June	M	(2/3) Monthly sampling events
	Fe-T	1.00	1.04	June	M	(1/3) Monthly sampling events
	SO4	128	152 to 318	Rolling averages	A	(11/14) rolling averages < 128mg/L
E292131- Smaller seep into Long Lake (LLS)	Fe-T	1.00	2.09, 1.66 and 1.72	April though June	M	(3/3) Monthly sampling events
	Fe-D	0.35	2.06, 1.60 and 1.78	April though June	M	(3/3) Monthly sampling events
E292131- Long Lake Seep Middle (LLSM)	Fe-D	0.35	0.481, 0.562 and 0.706	April though June	M	(3/3) Monthly sampling events
Seepage from shallow groundwater	As-T	0.005	0.0245 to 0.0519	April though June	M	(9/9) Weekly samples
	Cu-D	0.0003	0.000376	Spring 5 in 30	A	Average of 9 weeks
	SO4	128	228 to 302	April though June	A	(5/9) rolling averages < 128mg/L
	B-D	1.2	1.79	April though June	A	Average of 9 weeks
***SO4 at LLE was calculated using a rolling average.**						
Min = Minimum Water Quality Guideline (WQG) M = Maximum WQG /WQO, A = Average WQG /WQO						
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.						

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

- Dissolved copper was above the chronic -WQG (0.003 mg/L) for the averaged results at river / stream sites (NNO, 7SQR and IRQR). These guidelines provide a conservative comparison.

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

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

- Long Lake Seeps (LLS and LLSM) display elevated iron with the smaller seep having a higher frequency of elevated results.
- LLE displays elevated concentrations of the iron.

- Rolling averages for weekly sulphate samples were above chronic-WQG of 130 mg/L for 11 out of 14 weeks using a rolling average.
- 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 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), describing water quality standards for freshwater Aquatic Life (AL). 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.

Through Q1, 19 ex-situ groundwater wells, 13 in-situ sites were monitored. Appendix 1, Tables 39 through 41 (pages 65 through 62) provide a description of wells and results of the mine pool / groundwater chemistry.

Exceedances of the CSR-AL in ex-situ groundwater were observed for dissolved concentrations of arsenic, chloride, fluoride and sulphide as H_2S as displayed in Table 4 below. Arsenic is naturally elevated in the groundwater and is associated with perched water tables interacting with the Dunsmuir sandstone. This has been observed in baseline groundwater monitoring.

Table 4: Summary of Parameters above CSR-AL in Ex-Situ Groundwater

Parameter	Sites above the CSR-AL	CSR-AL	Results
As-D	QU08-13 (A and B), QU08-21G (S and D), QU10-09 (S and D), QU10-10 (S), QU11-05 (S), QU11-09 (S), QU10-08 (D) and QU10-09 (S and D)	0.05	0.0832 to 0.458
Sulphide as H2S	QU08-13 (A and B), QU08-21G (D), QU11-05 (S & D), QU11-09 (S), QU10-09 (D), QU10-08 (D), QU10-10 (S), QU10-11 (D)	0.02	0.0489 to 24.2
Cl-D	QU10-10 (D)	1500	3200 to 3400
F-D	QU10-08 (D)	2 to 3	2.3

PASSIVE TREATMENT SYSTEM (PTS)

The PTS was operating throughout the quarter with some power failure interruptions experienced. The treatment system was operating at approximately 4.5 L/s, which equates to 388,800 L/day for 91 days in Q1 totaling 35,380,800 L of pumped mine water. The mine pool water level was measured at 15.4 m above the pump in April and decreased to 12 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 meters above sea level (mASL) for LLS and 303.5 mASL for LLSM measured at QU11-11.

Average concentrations of dissolved sulphate have been entering the system from the 2-South mine pool measured at INF resulting in 666 mg/L and leaving the system at SPCEFF resulting in 465 mg/L. This has led to a reduction in average sulphate concentrations of 201 mg/L. The station 2-South Inflow (2SI), receives discharge from the PTS, had an average sulphate concentration of 454 mg/L and SP1 averaged 358 mg/L during Q1.

Overall, a quarterly average sulphate reduction of 308 mg/L was attained between INF and SPD. The original reduction goal has been achieved for the PTS, which was to reduce sulphate concentrations to 300 mg/L. This is a result of warmer ambient temperatures increasing microbial metabolic activity within the BCR.

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*.

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 environment. Overall, there were no permit limit exceedances and few provincial water quality guideline observations on site and in the receiving environment this quarter. This exemplifies that the environmental management practices employed by the environmental department are effective in 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 Quinsam Coal Environmental Department if you have any questions or comments.