

Appendix X

Sediment and Benthic Invertebrate Monitoring Program

APPENDIX X

2021-2022 ANNUAL WATER QUALITY MONITORING REPORT

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1.0 PROJECT LOCATION

Quinsam coal mine “the Site” is an underground coal mine located in the east-central area of Vancouver Island, 20 kilometers west of the City of Campbell River and about 200 kilometers north-west of Vancouver. Access to the mine from Campbell River is by BC Provincial Highway 28 (the Gold River Highway) and Ministry of Forests – Forest Service Road 9563 (the Argonaut Main).



Figure 1: Project Regional Location Map

The site is situated within the Quinsam Subbasin with mine effluent discharge entering from the South side into Long Lake and the North side into Middle Quinsam Lake. Both lakes drain into the Quinsam River. The Site is located along the north-eastern foothills of the Beaufort Range, which forms the backbone of Vancouver Island. This area is characterized by gently rolling lands incised by stream and river channels, the most prominent of which is the Quinsam River. The Quinsam River flows northward from Middle Quinsam Lake before making an abrupt eastward bend and flowing on towards Lower Quinsam Lake.

The water bodies included in the subbasin are Upper Quinsam, Middle Quinsam, Lower Quinsam, No Name, Long and Flume Lakes. Upper Quinsam Lake drains into Wokas Lake and the outlet of Wokas Lake forms the head waters of the Quinsam River. From there the Quinsam River flows approximately 5 km (past the Argonaut Bridge) into the inlet of Middle Quinsam Lake. Long Lake

enters the Quinsam River from the south near the outlet of Middle Quinsam Lake. The Quinsam River flows east roughly 10 km before entering Lower Quinsam Lake and then north 25 km before entering the Campbell River, 3 km from the estuary.

The Iron River is a major tributary to the Quinsam River and enters from the south approximately 5 km downstream of Middle Quinsam Lake and approximately 2.5 km from the inlet of Lower Quinsam Lake. Refer to Figure 2.

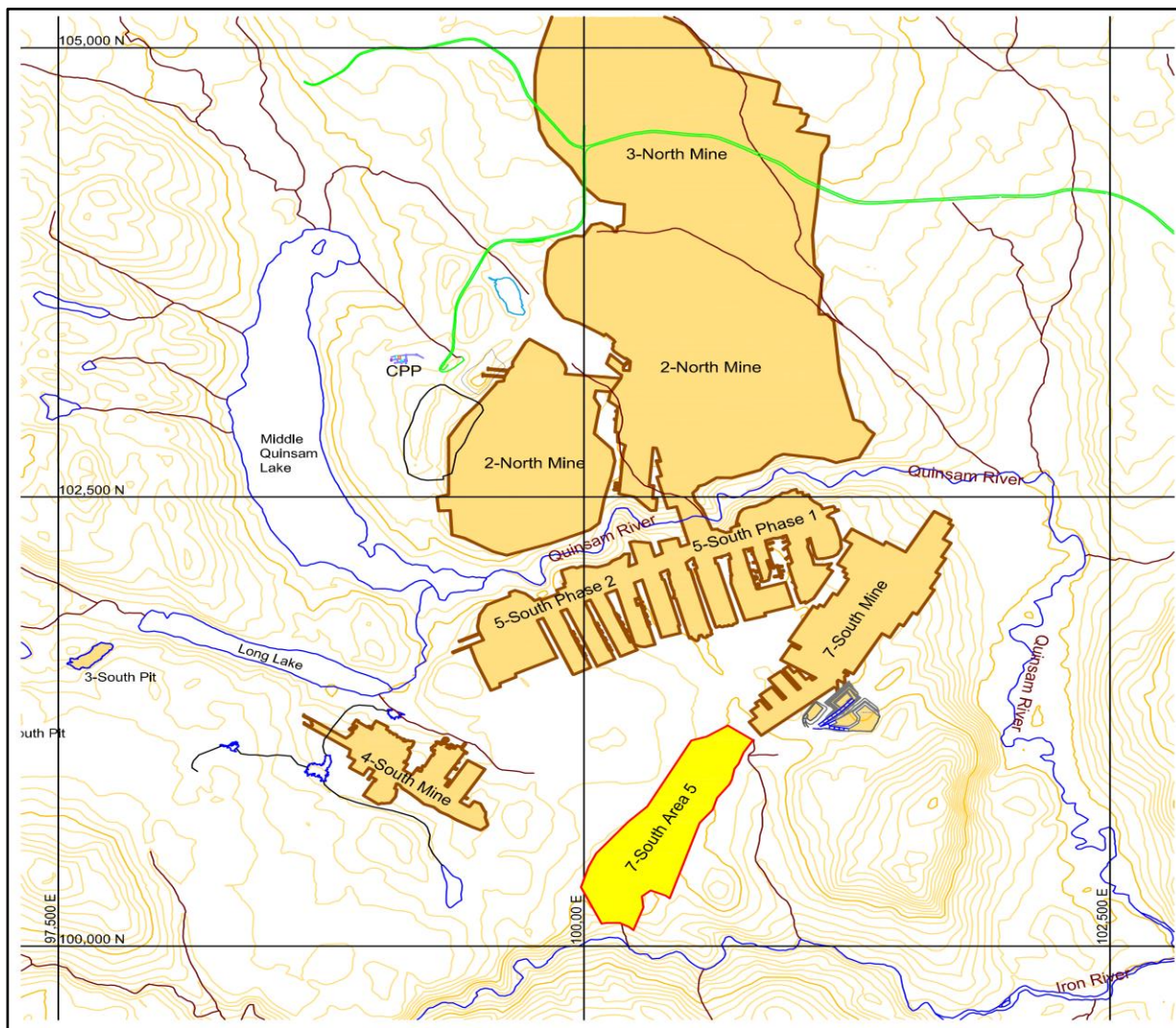


Figure 2: Project Area

1.1 STUDY OBJECTIVE

Baseline sampling was initiated in the Iron River prior to a new mine development in 2020. The Quinsam River receives mine influenced water. This study was initiated to evaluate the potential impacts from seepage areas and mine related discharge from surface and groundwater on sediment and benthic invertebrates in the Quinsam River.

1.1.1 *SEDIMENT AND BENTHIC INVERTEBRATE MONITORING*

Sediment and benthic invertebrate monitoring in the Quinsam River are required every three to five years to meet conditions of the amended Permit PE-7008 (dated June 23, 2015), with baseline monitoring required once (prior to mine development) on the Iron River. Studies were conducted in 2020 (Iron River) and 2021 (Quinsam River) to meet these permit conditions. Additional sediment sampling was conducted at a potential seep location to investigate probable inputs from mine-affected groundwater to the Quinsam River.

Baseline sediment and benthic invertebrate monitoring was conducted in September 2020 at two sampling locations on the Iron River to meet condition 4.2.7 (i) of the amended permit. This was timed to provide baseline data prior to operation of the then proposed mine 7-South Area 5 (which has since been suspended). Refer to Figure 2, where the yellow highlighted area represents 7-South Area 5 proposed mine.

In September 2021 sediment and benthic invertebrate sampling was performed at four locations on the Quinsam River to meet condition 4.2.7 (iii) of the amended permit. This monitoring program was designed to supplement sediment and benthic invertebrate data collected in 2016 and included water quality data. The 2021 program was conducted to evaluate conditions in the Quinsam River in areas that receive mine impacted discharges and compare results with reference locations with similar characteristics. In 2016 a full program was carried out as described in Appendix VI of the 2016-2017 Annual Water Quality Monitoring Report; the sampling locations in 2016 included five lakes, one wetland, and one river system (Quinsam River) for a total of 23 locations.

The 2021 program focused on conditions in the Quinsam River; it did not include lake and wetland sampling because of financial restraints with the mine in care and maintenance after bankruptcy. The 2021 program included a habitat assessment and collection of benthic organisms, water quality and sediment data following the procedures of the Canadian Aquatic Biomonitoring Network (CABIN). The CABIN is an aquatic biomonitoring program for assessing the health of freshwater ecosystems in Canada. Benthic macroinvertebrates are collected at a monitoring location and their counts are used as an indicator of the health of that water body.

Potential seepage areas near the Quinsam River have been observed and are referred to as S and S2. In 2021, water quality and quantity data were collected intermittently at both S and S2 locations to characterize the areas and potential changes in the Quinsam River. The areas are located downstream of Middle Quinsam Lake and upstream of 7 South Mining Operation. The first location

(S) was discovered after a groundwater well (QU11-09) discharged mine water into the Quinsam River located downstream of Middle Quinsam Lake and upstream of QRD-02. This occurred due to the flooded mine void water increasing to ground levels and pressurizing the aquifer. This situation initiated the sediment and benthic invertebrate monitoring program on the Quinsam River in 2021. The potential seepage area referred to as S continued to exist into 2021-2022. This location has water quality and quantity collected. The second location, potential seep location S2, was discovered while performing sediment and benthic invertebrate monitoring at QRD-02. Sediment was collected at S2 to investigate potential inputs from mine-affected groundwater to the Quinsam River. For further information on the potential seepage areas refer to Section 4.1 of the Annual Water Quality Monitoring Report (AWQMR).

1.2 STUDY DESIGN

The study was designed to assess sediment benthic community and sediment conditions upstream of mine related inputs at Argonaut Bridge on the Quinsam River (WA) and downstream of mine related discharge from mining operations (2-North, 2-South, 4-South and 5-South) at Quinsam River Downstream stations 2 and 3 (QRD-02 and QRD-03) and further downstream of mine related inputs from 7-South Mining Operation at 7-South Quinsam River (7SQR). Table 1 provides sampling station information and Figure 3 shows sampling locations within the watershed.

APPENDIX X – Sediment and Benthic Invertebrate Monitoring Report

Table 1: Sediment and Benthic Invertebrate Monitoring Locations

Watercourse	Station Code / EMS #	Station Name	Latitude Longitude	Rationale	Sediment	Benthic Invertebrates
Iron River	IRN-06 E297231	Iron River Upstream of 7SA5	49.91734 -125.44074	Upstream of any mine related activity; reflects baseline conditions in an area of different geologic formation(s) and baseline water quality (mainly arsenic concentrations).	Sept. 2020	Sept. 2020
	IRN-08 E297232	Iron River downstream of 7SA5 and 242 inputs	49.93082 -125.42052	Downstream monitoring location; monitors potential influence from discharge of the proposed 7-South Area 5 Mine development. This mine was never developed.	Sept. 2020	Sept. 2020
Quinsam River	WA E0126402	Quinsam River at Argonaut Road	49.930053 -125.510574	Upstream of mine-related discharges; represents background (baseline) conditions for water quality comparisons	Sept. 2016 Sept. 2021	Sept. 2016 Sept. 2021
	QRD-02 (QRDS1 in 2016 samples)	Quinsam River Upstream of 7 South Mining Operation QRD02	49.941349 -125.459947	Upstream of Potential Seepage Area S2, within the area of mine-related discharges.	Sept. 2016 Sept. 2021	Sept. 2016 Sept. 2021
	S2	Potential seepage area at QRD-02	49.941457 -125.460370	Located downstream of the benthic invertebrate sampling location at QRD-02. Sediment collected at stream entering river.	Sept. 2021	
	QRD-03	Quinsam River Upstream of 7 South Mining Operation QRD03	49.946280 -125.454801	Downstream of Potential Seepage Area S2	Sept. 2021	Sept. 2021
	7SQR E292113	Quinsam River Downstream of 7 South Mining Operation (7SQR)	49.939484 -125.416997	Downstream of inputs from 7-South mining activities and upstream of the Iron River confluence. Captures incremental changes in water quality that may be attributed to 7-South PAG-CCR storage and flooded mine pools. Represents the cumulative mine related discharge.	Sept. 2016 Sept. 2021	Sept. 2016 Sept. 2021
NOTE: QRD-02 and QRD-03 are located downstream of Middle Quinsam Lake Outflow (WB), in the North Mining Operation area and upstream of the 7-South Mining Operation. They capture changes in water quality upstream of the 7-South Mine and groundwater inputs related to mining, and Potential Seepage Areas S and S2. QRD-02 – sediment samples taken on left bank (DL) and right bank (DR) to investigate potential seepage from groundwater at S2.						

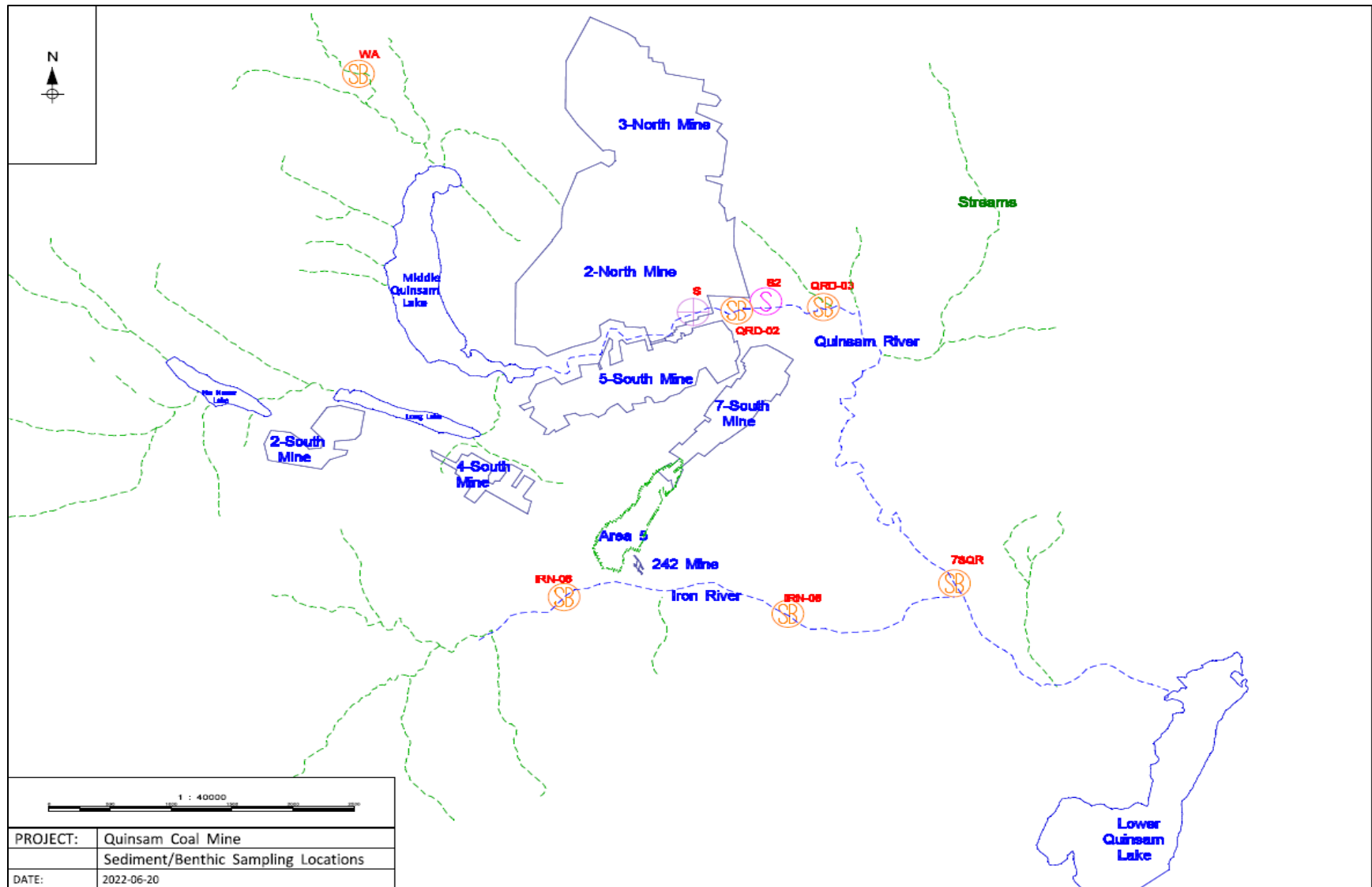


Figure 3: Sampling Station Locations in Quinsam Subbasin, 2020 and 2021 (red circles indicate sediment [S] or benthic invertebrate [B] samples collected; no samples collected at seep location S)

Baseline sediment and benthic invertebrate samples were collected on the Iron River at two locations (IRN-06 and IRN-08). Between locations IRN-06 and IRN-08, there was a small mine called the 242 Mine, that operated for approximately five months in 1996 (Figure 3). Mining at 242 Mine commenced in July 1996 and suspended in November 1996, due to permit issuance delays. The 242 Mine was developed as an underground room and pillar mining operation, accessing the No. 4 coal seam reserves (4-Seam), approximately 5 km 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 arsenic 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. The No. 4 coal seam was proposed to be accessed via 7-South Area 5 development, with access through the 7-South Mine. This received a permit, but the mine went bankrupt before the coal seam was mined.

2.0 SEDIMENT QUALITY IN THE RECEIVING ENVIRONMENT

Sediment samples were collected from two locations on the Iron River in September 2020 and four locations on the Quinsam River in September 2021 (Table 1 and Figure 3). Sediment was also collected from a potential seepage area (S2) in September 2021.

Sediment was analyzed for a variety of parameters. Parameters were chosen based on constituents commonly found in sediment near coal mines and POI from previous studies completed in this watershed. The analysis chosen were:

- Total Moisture
- Particle Size
- Paste pH
- Total Organic Carbon
- Total Sulphur
- Total Metals (<65 micron)
- Polycyclic Aromatic Hydrocarbons (PAHs)

Each location included five sets of sediment samples, except at QRD-02 (DL and DR) where an additional set was collected due to potential seepage from groundwater observed. Split samples were collected at IRN-08, WA and 7SQR (Table 2).

Table 2: 2020 and 2021 Sample Description

Location Name	Sediment Samples Sets	Water Chemistry Sample Sets	Biological Monitoring CABIN
Iron River			
IRN-06 (A, B, C, D, E)	5	1	1
IRN-08 (A, B, C, D, E) Plus a split	6	1	1
QA/QC			
Replicate		1	
Field Blank		1	
Trip Blank		1	
Field split	1		
Total	12	5	2
Quinsam River			
WA plus a spilt	5	1	1
QRD-02 *	6	1	1
S2**	1	1	
QRD-03	5	1	1
7SQR plus a spilt	6	1	1
QA/QC			
Replicate		1	
Field Blank		1	
Trip Blank		1	
Field split	2		
Total	25	8	4

*QRD-02DL and QRD-02DR were downstream of S2 on either side of the river.

**S2 was a potential seepage area discovered near QRD-02

2.1 METHODS

Sediment samples were collected using a spoon to remove fine sediment from around boulders and other slow flowing areas, within the surface 10 cm of sediment. Sediment was placed in labelled jars, placed in a cooler with ice packs, and shipped to Bureau Veritas in Burnaby under chain of custody for analysis. One to six replicate samples were collected at each station. For

QA/QC, split samples were taken at locations IRN-08, WA and 7SQR. Figures 2 and 3 illustrates the Quinsam Sub-basin where the samples were collected.

2.2 RESULTS

Appendix A-1 Tables 1-19 display the water chemistry samples associated with the sediment sampling program. Water quality is compared to the Acute B.C. Water Quality Guidelines - Freshwater Aquatic Life (WQG). Further analysis for water quality including trending and discussion of results is available in Section 9.2 of the AWQMR, Rivers and Stream Sites, where Appendix I displays water quality results and Appendix II displays graphs for POI in both the Iron and Quinsam Rivers.

Appendix A-2 Tables 1 - 36 display the results from the sediment monitoring program compared to the applicable guidelines. Appendix A-2 Tables 1 - 11 display results for Iron River (2020) and Appendix A-2 Tables 12 - 36 display results for Quinsam River (2021).

Sediment chemistry results were compared to the Canadian Council of Ministers of Environment (CCME) Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PEL). Appendix A-2 Tables 10 and 35 display the parameters above the applicable guidelines (ISQG and PEL) on the Iron River and Quinsam River, respectively.

Appendix A-3 displays graphical representation for those POI and concentrations above the ISQG and PEL, with historical data shown where available. POI include arsenic, copper, iron, Naphthalene, 2-Methylnaphthalene, Acenaphthene and Phenanthrene.

The ISQG and PEL are generic guidelines for several metals and PAHs (CCME 2017). “The ISQG reflects the concentration below which adverse biological effects are expected to occur rarely. The PEL defines the level above which adverse effects are expected to occur frequently.” (CCME 2001). These guidelines were used to assess sediment quality at the monitoring stations.

2.3 SEDIMENT QUALITY FOR IRON RIVER AND QUINSAM RIVER

2.3.1 IRN-06 -UPSTREAM IRON RIVER

IRN-06 was sampled for baseline reference conditions to evaluate sediment upstream of Mine 242 influence and 7-South Area 5. The sampling station was in an area of dense riparian vegetation near a logging road, below a cut block. The river was approximately 4.3 m wide, with a maximum depth of 1.4 m and a velocity of 0.11 m/s. Instream habitat was mainly riffles, straight runs and pools, with little depositional areas for sediment to accumulate.

The dominant substrate types were large cobbles with similar amounts of boulders and pebbles, minimal sandy/silty interstitial material, and a relatively low organic content. Sediment had an average moisture content of 17%, with 98% sand and small amounts of clay (2%), with less than detection limit of silt. Paste pH was 7.49.

Total PAHs in sediment were relatively low (0.576 mg/kg), with 2-methylnaphthalene exceeding the ISQG for two of the five samples (0.021 mg/kg average) and the spilt (0.032 mg/kg), and naphthalene occurring once above ISQG (0.038 mg/kg).

Arsenic was elevated in all samples, above both ISQG and PEL (range of 36.2 mg/kg to 118 mg/kg with an average of 68.47 mg/kg), this coincides with the sedimentary stratum in the location. Additional exceedances for this location were noted for cadmium, chromium, copper, and zinc (1.33 mg/kg, 55.4mg/kg, 69.0 mg/kg and 128.4 mg/kg, respectively). Zinc displayed levels less than ISQG for two replicates samples (Appendix A-2, Tables 1 - 11).

For water quality associated with the sediment sampling program, arsenic was close to the Acute-WQG (0.005 mg/L). All other parameters remained below the Acute-WQG's (Appendix A-1, Tables 1 - 9).

2.3.2 IRN-08 -DOWNSTREAM IRON RIVER

IRN-08 was sampled approximately 1.88 km downstream of potential influence from 242 Mine and the then proposed 7-South Area 5 mine to evaluate baseline conditions prior to development of 7-South Area 5 mine. Habitat characteristics differed from the upstream locations (IRN-06) with more dominant vegetation and canopy coverage. The river was approximately 6.1 m wide, with a maximum depth of 1.6 m and a velocity of 0.08 m/s. Instream habitat was riffles and pools, with few areas for sediment to accumulate.

The preeminent substrate types were smaller sized cobbles and pebbles, with traces of sandy/silty interstitial material, and organic content remained comparatively low. Sediment had an average moisture content of 19.8%, with 98% sand and small amounts of silt and clay. Paste pH was 7.39.

PAH concentrations for individual parameters were not higher than the ISQG, other than 2-methylnaphthalene, which had the only ISQG exceedance (ranged from 0.033 mg/kg to 0.059 mg/kg, averaging 0.029 mg/kg).

Arsenic was higher than ISQG and PEL (ranged between 61.4 mg/kg to 87.4 mg/kg and averaged 72.1 mg/kg) and slightly lower than concentrations upstream at IRN-06. Cadmium, chromium, and copper exceeded ISQG for every individual result (averages 1.42 mg/kg, 58.06 mg/kg and 83.80 mg/kg, respectively). While zinc had individual results (126 mg/kg, 127 mg/kg and 132 mg/kg) which were above the ISQG, the overall average remained just below the sediment guidelines. (Appendix A-2, Tables 1 - 11).

For water quality associated with the sediment sampling program, arsenic measured above the Acute-WQG (0.005 mg/L). All other parameters remained below the Acute-WQG's (Appendix 1-1, Tables 1-9). Refer to Section 9.2.5 in the AWQMR for further discussion on water quality.

2.3.3 WA - UPSTREAM OF MINE INFLUENCE ON QUINSAM RIVER

WA, located at the Argonaut Bridge, was sampled to evaluate sediment upstream of any mining discharges. This location served as a reference area for the sediment study, given its location upstream of mine influences, although habitat characteristics differed from those of downstream locations. The sampling station was in an area of dense riparian vegetation near a permanent logging road (Argonaut Main). The river was approximately 11 m wide, with a maximum depth of 1.0 m and a velocity of 0.41 m/s. There are considerable fluctuations in velocities and flow rates associated with seasonal rainfall events and water release at the BC Hydro diversion dam upstream. Instream habitat was mainly riffles and rapids, with few depositional areas for sediment to accumulate.

The dominant substrate types were small cobbles and pebbles, with sandy/silty interstitial material and a relatively low organic content. Sediment had an average moisture content of 15.9%, with 96% sand and small amounts of silt and clay. Paste pH was 6.81.

PAHs in sediment were below the DLs for individual parameters.

Both arsenic and copper exceeded ISQGs (average of 6.14 mg/kg and 51 mg/kg, respectively) but were below PELs (Appendix A-2, Tables 12 - 36). In 2016 and 2021 WA had the highest copper concentrations indicating a possible upstream contribution among river sites (Appendix A-3, Graph 2).

For water quality associated with the sediment sampling program all parameters measured below the Acute-WQG's (Appendix A-1, Tables 10 - 19). Refer to Section 9.2.1 in the AWQMR for discussion on water quality.

2.3.4 QRD-02 - DOWNSTREAM OF MINE INFLUENCE ON QUINSAM RIVER

QRD-02, approximately 2 km downstream of the outlet of Middle Quinsam Lake, was selected to monitor sediment chemistry downstream of the North and South water management systems. This section of the Quinsam River receives groundwater sourced from the River Barrier Pillar PAG storage area and the 2-North PAG-Tailings mine mine-affected waters. The station was near exploration roads in the 2-North mining area and had dense riparian vegetation with partial tree cover. The river was approximately 13 m wide, with a maximum depth of 0.5 m and a velocity of 0.40 m/s. This section of river contained small riffles, large boulders and, at the time of sampling, had few depositional areas for sediment to accumulate. The dominant rock types were small and large cobble, with coarse sand and silt interstitial material and a low organic content. Sediment had an average moisture content of 19.5% and contained 92% sand with small amounts of silt and clay. Paste pH was neutral at 7.37.

PAHs were measurable but low in concentration, with an average total PAH of 0.085 mg/kg. Some PAH compounds were above ISQG: 2-methylnaphthalene averaged 0.0257 mg/kg, while acenaphthene, naphthalene, and phenanthrene displayed individual exceedances (0.0074 mg/kg, 0.059 mg/kg and 0.052 mg/kg, respectively).

Arsenic averaged greater than ISQG and PEL (19.12 mg/kg), most elevated by the sampling location on the left bank (QRD-02DL 45.3 mg/kg), capturing where a potential seepage area was discovered (S2). The concentrations remained less than PEL at all other sampling locations throughout QRD-02 but were still above the ISQG (ranged from 10.6 mg/kg to 16.6 mg/kg) (Appendix A-2, Tables 12 - 36).

For water quality associated with the sediment sampling program, all parameters measured below the Acute-WQG's (Appendix A-1, Tables 10 - 19). Refer to Section 9.2.4 in the AWQMR for discussion on water quality.

2.3.5 QRD-03 - DOWNSTREAM OF MINE INFLUENCE ON QUINSAM RIVER

QRD-03, approximately 3 km downstream of the outlet of Middle Quinsam Lake, was selected to monitor sediment chemistry downstream of the North and South water management systems and potential seepage location S2. This section of the Quinsam River receives groundwater sourced from the River Barrier Pillar PAG storage area and other mine-affected waters. The station was near exploration roads in the 2-North mining area and also had dense riparian vegetation with partial tree cover.

The river was approximately 13 m wide, with a maximum depth of 1.0 m and a velocity of 0.73 m/s. This section of river contained small riffles, large boulders and, at the time of sampling, had few depositional areas for sediment to accumulate. The dominant rock types were small and large cobble, with coarse sand and silt interstitial material and a low organic content. Sediment had an average moisture content of 22.6% and contained 91% sand with small amounts of silt and clay. Paste pH was neutral at 7.24.

PAHs were measurable but low in concentration, with an average total PAH concentration of 0.039 mg/kg. Some individual PAH compounds were above DLs, 2-methylnaphthalene was the one parameter that occurred above the ISQG (0.023 mg/kg).

Arsenic concentrations exceeded the ISQG (averaged 12.8 mg/kg and ranged between 10.7 mg/kg and 15.7 mg/kg), which displayed a decrease from the sampling location upriver (QRD-02) (Appendix A-2, Tables 12 - 36).

For water quality associated with the sediment sampling program, all parameters measured below the Acute-WQG's (Appendix A-1, Tables 10 - 19). Refer to Section 9.2.4 in the AWQMR for discussion on water quality.

2.3.6 7SQR -DOWNSTREAM OF MINE INFLUENCE ON QUINSAM RIVER

7SQR is located just upstream of the Iron River-Quinsam River confluence, about 4 km downstream from QRD-03, and downstream of all mine related discharges, including 7-South. The riverbed was 17 m wide, about 0.8 m deep, contained a few pools and riffles, and had a velocity of 0.44 m/s. The station was partially tree covered, dominated by small shrubs, and contained some aquatic plants and periphyton. The riverbed contained many large boulders and had more abundant silty/sandy interstitial material, making sample collection easier than at upstream stations. The average moisture content was 31.1% and paste pH was 6.59. The samples were mainly composed of sand 89%, with similar concentrations of silt and organic matter to the upstream stations (QRD-02 and QRD-03).

Total PAH concentrations at 7SQ03 were 0.0279 mg/kg with none of the individual parameters higher than their ISQGs.

Arsenic concentrations were lower at 7SQR than at locations upstream (QRD-02 & QRD-03) but remained above ISQG (averaged 10.94 mg/kg while ranging from 6.32 mg/kg to 18.4 mg/kg). One individual sample was above arsenic PEL (18.4 mg/kg) and cadmium ISQG (0.654 mg/kg). Elevated cadmium concentrations have been reported intermittently in discharges from the 7-South mining area since 2012 (Appendix A-2, Tables 12 - 36). For water quality associated with the sediment sampling program, all parameters measured below the Acute-WQG's (Appendix A-1, Tables 10 - 19). Refer to Section 9.2.4 in the AWQMR for discussion on water quality.

2.3.6.1 Parameters of Interest (POI)

Iron does not have an associated ISQG or PEL; it is observed in highest concentrations at WA (35,383 mg/kg), upstream of mining discharge. Concentrations decrease with each sampling location downstream QRD-02, QRD-03 and 7SQR (29,466 mg/kg, 28,720 mg/kg and 18,585 mg/kg, respectively). It is uncertain if some elevated concentrations are due to surrounding anthropogenic sources or natural conditions. Refer to Appendix A-3, Graph 3.

2.3.7 SEDIMENT QUALITY AND ASSOCIATED WATER QUALITY RESULTS FOR SEEPAGE AREA

One sample from the top 10 cm of sediment was collected from a potential seepage area (S2) flow path. The seepage location had visible iron precipitate deposited on the flow path, suspected as mine influenced. This could also be related to the host rock lithology in the area and shallow groundwater.

Results of the sediment sample returned notably elevated arsenic (8290 kg/mg) compared to ISQG and PEL of 5.9 mg/kg and 17 mg/L. Concentrations of calcium (13600 mg/kg), iron (275000

mg/kg) and manganese (15000 mg/kg) were also elevated but there are no guidelines used for comparison. Table 3 below compares the relevant maximum values.

In groundwater containing iron, both iron and arsenic are found in their reduced form. When the groundwater containing elevated iron discharges to surface, it is oxidized and those redox reactive parameters such as iron change state. Iron in the +2-oxidation state is called the ferrous ion, while iron in the +3-oxidation state is called the ferric ion. Oxidized states of iron precipitated from the water into the sediment along the flow path. Arsenic concentrations in water are decreased via two primary mechanisms: adsorption and coprecipitation. First, soluble iron (Fe (II)) and As (III) are oxidized. Then As(V) adsorbs onto the iron hydroxide precipitates from the water. By the property of adsorption, arsenic can bind to the solid surface of iron. Arsenic absorption is strongly dependent on the higher concentrations of iron compared to arsenic concentrations and neutral pH conditions (Zhang et al. 2004). In the case of this flow path with observed elevated iron the concentrations of elevated arsenic are observed in the sediment through the mechanisms of absorption and coprecipitation.

Table 3: Potential Seepage Location (S2) Sediment Quality

<i>Sample ID</i>	<i>Parameter</i>	<i>Matrix</i>	<i>Criteria¹</i>	<i>Criteria²</i>	<i>Result</i>	<i>Units</i>
S2-13 SEP21-M	Fluoranthene	Sediment	0.111	2.355	0.011	mg/kg
S2-13 SEP21-M	Total Antimony (Sb)	Sediment			1.19	mg/kg
S2-13 SEP21-M	Total Arsenic (As)	Sediment	5.9	17	8290	mg/kg
S2-13 SEP21-M	Total Barium (Ba)	Sediment			1160	mg/kg
S2-13 SEP21-M	Total Calcium (Ca)	Sediment			13600	mg/kg
S2-13 SEP21-M	Total Cobalt (Co)	Sediment			25.2	mg/kg
S2-13 SEP21-M	Total Iron (Fe)	Sediment			275000	mg/kg
S2-13 SEP21-M	Total Manganese (Mn)	Sediment			15000	mg/kg
S2-13 SEP21-M	Total Phosphorus (P)	Sediment			625	mg/kg
S2-13 SEP21-M	Total Sodium (Na)	Sediment			908	mg/kg
S2-13 SEP21-M	Total Strontium (Sr)	Sediment			315	mg/kg
S2-13 SEP21-M	Total Thallium (Tl)	Sediment			0.096	mg/kg
S2-13 SEP21-M	Total Uranium (U)	Sediment			0.54	mg/kg
S2-13 SEP21-M	% silt by hydrometer	Sediment			25	%
S2-13 SEP21-M	Clay Content	Sediment			6.4	%
S2-13 SEP21-M	Moisture	Sediment			92	%
S2-13 SEP21-M	Benzo(b)fluoranthene	Sediment			<0.010	mg/kg
S2-13 SEP21-M	Total Boron (B)	Sediment			59.3	mg/kg
S2-13 SEP21-M	Total Organic Carbon (C)	Sediment			6.1	%
Legend						
Exceeds one Criteria	Result					
Exceeds two Criteria	Result					
DL > Criteria	Result					
Criteria 1	CCME Sediment Quality -FW					
Criteria 2	CCME Sediment Quality-PEL					

Water quality for the potential seepage location is summarized below and available in Appendix A-1. Water quality at S2 display elevated arsenic, iron and sulphate concentrations in the seep water. Table 4 displays the POI compared to Acute-WQG.

Table 4: Parameters of Interest in Potential Seepage Water compared to Acute-WQG

Description	Potential Seepage on QR near QU11-05		
	Location Name	S2	WQG -Acute September 13, 2021
pH		pH Units	6.00 to 9.00 6.90
Cond		uS/cm	387
SO4-D		mg/L	160
As-T		mg/L	0.005 0.0908
Fe-T		mg/L	1.00 1.85
Mn-T		mg/L	0.8706 0.498
As-D		mg/L	0.0375
Fe-D		mg/L	0.35 0.342
Mn-D		mg/L	0.387

Bold indicates result is above Acute-WQG

2.4 QUALITY CONTROL FOR SPLIT SAMPLES

There was a total of three split samples (at WA, 7SQR and IRN-06) with 188 parameters analyzed for split samples. Of the analyzed 188 parameters in these parent samples and their split samples, 8 (4.3%) had a relative percent difference (RPD) greater than 20% and one (0.5%) had an RPD greater than 50%

The parameters that were found with an RPD greater than 20% did not have a high enough magnitude or frequency of occurrence to identify an issue requiring attention. Monitoring location 7SQR-A showed four results (2-Methylnaphthalene, Low Molecular Weight PAH, Phenanthrene, Total PAH) greater than 20%. There were three parameters with RPD greater than 20% for IRN-06E (Naphthalene and Total Antimony) and WA-1 (Vanadium), and one parameter with an RPD greater than 50% at WA-1 (Sulphur) resulting in 108%. Appendix A - 4 displays RPD values for split samples.

3.0 BENTHIC INVERTEBRATES

Benthic invertebrates were sampled following CABIN protocols at two stations in the Iron River and four stations in the Quinsam River (Table 1). The sampling stations and rationale are described in Section 1.1 Study Objective and Section 1.2 Study Design and illustrated in Figure 3.

The two stations in the Iron River (IRN-06 and IRN-08) were sampled in 2020 (Table 1). These sites were sampled to assess baseline conditions, prior to potential mine influence from the proposed 7-South Area 5 mine area. Station IRN-06 is the upstream reference site. Between stations IRN-06 and IRN-08 are the historical 242 Mine, the permitted but undeveloped 7-South Area 5, and bedrock geology with elevated arsenic levels. The Iron River is a tributary to the Quinsam River with the confluence located just below site 7SQR on the Quinsam River.

The four stations in the Quinsam River (WA, QRD-02, QRD-03 and 7SQR) were sampled in 2021. Station WA is the upstream reference location upstream of Middle Quinsam Lake and represents background conditions. Stations QRD-02 and QRD-03 are downstream of potential effects from the North Mine Site and 7 South Mine Site. QRD-03 is also downstream of potential seepage areas (see sections 1.1.1 and 2.3.7). Station 7SQR represents the furthest downstream station on the Quinsam River where mine influence from 2N, 3N, 2S, 3S, 4S, 5S, River Barrier Pillar and 7-South is captured. It is just upstream of the confluence with the Iron River.

Stations WA, QRD-02 (called QRDS1 in the 2016 program), and 7SQR were also sampled in 2016 following CABIN protocols (Table 1 and Quinsam Coal Corporation 2017).

3.1 METHODS

3.1.1 *FIELD METHODS*

Benthic invertebrate samples and associated habitat characteristics were collected from the stations following Environment Canada's CABIN protocol (Environment Canada 2012). At each station, riffle habitat substrates were kicked for three minutes while traversing from bank to bank in a zigzag pattern, with flow carrying invertebrates into the kicknet (400 mesh size). Large and deeply embedded rocks were rubbed by hand to loosen organisms. The net was removed from the water, and the sample rinsed carefully into a container, taking care to remove organisms clinging to the net (using forceps). Samples were preserved with 10% buffered Formalin in a 1:3 ratio (Formalin: sample). Samples were labelled inside and outside with site code, sampling date, and number of jars (i.e., 1 of 3, 2 of 3, etc.). Sampling information (the person kicking, typical depth of kicked area, sampling time, number of jars required to contain the sample) was recorded on field sheets. Habitat data (channel morphology, canopy cover, substrate, water velocity, and canopy cover) were collected at each site following CABIN protocols.

3.1.2 *LABORATORY METHODS*

Samples were sent to Cordillera Consulting Inc. in Summerland, BC for taxonomic analysis (specimen enumeration and taxonomy analysis to the lowest practical level). Cordillera was responsible for sample reception, sorting, identification, and QA/QC (sorting and sub-sampling efficiency). The taxonomists met the CABIN certification requirements. The detailed Methods and QC Reports from Cordillera (2020 and 2021) are included in Appendix C. Samples were subsampled using a Marchant Box, with a minimum of 300 organisms counted and identified. Organisms were identified to genus or species where possible and following CABIN (McDermott et al 2014), SAFIT (2015), and PNAMP (2015) protocols for Standard Taxonomic Effort.

Sorting efficiency was assessed as 98% efficiency for the Iron River samples and 97% efficiency for the Quinsam River samples. Taxonomic error was assessed as 0.00% for both the Iron River

and Quinsam River samples. Both the sorting efficiency and taxonomic error rate were within the acceptable limits for CABIN Laboratory methods.

3.1.3 DATA ANALYSIS METHODS

Taxonomic data were analyzed using the Reference Condition Approach (RCA) and for community metrics using the CABIN data analysis tools. The data were analyzed using the Preliminary BC Coastal RCA Model (2010) (the Model). The model uses 89 reference (undisturbed) site samples from Vancouver Island and south Gwaii Haanas that were collected between 2001 and 2008. In the Model, reference site invertebrate communities are classified into one of three reference groups with similar family level composition. The Model was used to predict the ‘test site’ invertebrate communities at IRN-06, IRN-08, WA, QRD-02, QRD-03, and 7SQR to a reference group using the predictor variables average depth, bankfull width, number of National Parks, and percent alpine in the watershed. Ordination ellipses (90%, 99%, and 99.9%) were used to assess how similar or divergent the test site communities were from the reference condition as follows:

- Test sites that fall within the 90% ellipse are characterized as ‘similar to reference’
- Test sites that fall between the 90% and 99% ellipses are characterized ‘mildly divergent’
- Test sites falling between the 99% and 99.9% ellipses are characterized ‘divergent’
- Test sites falling outside of the 99.9% ellipse are characterized ‘highly divergent’

It has been found that 10% of reference sites fall outside of the 90% ellipse and as a result, a test site may also fall outside of the 90% ellipse and be characterized as mildly or divergent from the reference condition (Type I error).

A Vancouver Island Updated RCA Model (Somers et. al. 2021) has been developed using 125 reference site samples from Vancouver Island and data collected between 2001 and 2019. This model was not used for the Quinsam samples as several GIS-derived predictor variables (stream order, stream length, degree days, August precipitation, watershed maximum elevation, watershed minimum elevation, and percent volcanic bedrock) were not available at the time of reporting. Use of the Preliminary BC Coastal RCA Model is consistent with the data analysis used in the Quinsam Coal Annual Water Quality Monitoring Report 2016 – 2017 (Quinsam Coal Corporation 2017), allowing comparison with the 2016 dataset.

Data were also summarized for taxa richness, EPT taxa richness, Simpson’s Index of Diversity, and Pielou’s Evenness, using CABIN data assessment tools (Water: CABIN - Canada.ca). EPT taxa richness is the total number of taxa within the “pollution sensitive” orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). Taxa richness and EPT taxa richness will decrease with decreasing water quality (Weber, 1973).

3.2 RESULTS

3.2.1 HABITAT

Habitat variables are presented in Appendix B, and key habitat characteristics are summarized in Table 5. In situ water quality data collected at the time of sampling are listed in Table 6. General habitat characteristics are described in Section 2.3.

Iron River station IRN-06 is approximately 1.88 km upstream from IRN-08. It is at a higher elevation, has smaller bankfull and wetted widths, and higher water velocity than IRN-08. Cobble, pebble, and boulder substrates are dominant at both stations Table 5. Conductivity (157.5 and 156 $\mu\text{S}/\text{cm}$), pH (7.9 and 7.8), and dissolved oxygen (10.0 and 10.4 mg/L) levels were similar at the two stations (Table 5). Water temperature was one degree warmer at IRN6 (14.3°C) than at IRN 8 (13.3°C), which might be attributed to the time of day the sites were sampled.

In the Quinsam River, WA is the furthest upstream, QRD-02 and QRD-03 are intermediate, and 7SQR is the furthest downstream. Elevation decreased and bankfull width, wetted width, and depth increased from WA to 7SQR. Substrates were generally similar among the stations, with pebble substrates dominating, followed by cobble and gravel; there was a higher % cobble and lower % pebble at QRD-02 than at the other three sites (also photos in Appendix B-4 show the abundant boulders at QRD-02). Temperature, pH, and dissolved oxygen levels were similar at the four stations. Conductivity increased from WA (55.3 $\mu\text{S}/\text{cm}$) to QRD-02 (217.9 $\mu\text{S}/\text{cm}$), reflecting the natural changes between headwater and downstream areas, and also the influence of mine discharges, and decreased slightly by 7SQR to 202.7 $\mu\text{S}/\text{cm}$.

Table 5: Habitat Characteristics of Benthic Invertebrate River Stations, 2020 and 2021

Site	Date	Elevation (masl)	Bankfull Width (m)	Wetted Width (m)	Mean Velocity (m/s)	Mean Depth (m)	Substrate (% composition)			
							Boulder	Cobble	Gravel	Pebble
IRN-06	Sept 2020	256	16.5	4.27	0.106	0.14	28	47	1	24
IRN-08	Sept 2020	210	23.93	6.1	0.076	0.12	10	58	5	27
WA	Sept 2021	297	12.68	10.76	0.41	0.34	1	22	12	65
QRD-02	Sept 2021	216	16.12	13.2	0.395	0.34	0	40	11	49
QRD-03	Sept 2021	205	16.58	12.83	0.73	0.36	0	17	17	66
7SQR	Sept 2021	197	20.51	17.12	0.24	0.41	0	6	11	83

Table 6: In Situ Water Quality at Benthic Invertebrate River Stations, 2020 and 2021

Site	Date	Air Temperature (°C)	Water Temperature (°C)	pH	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)
IRN-06	Sept 2020	22	14.3	7.87	157.7	9.95
IRN-08	Sept 2020	18	13.3	7.78	156.2	10.38
WA	Sept 2021	19.2	17.4	7.26	55.3	9.37
QRD-02	Sept 2021	17.7	18.5	7.83	217.9	9.23
QRD-03	Sept 2021	13.5	17.2	7.66	205.9	9.25
7SQR	Sept 2021	9.1	15.4	7.30	202.7	9.18

3.2.2 BENTHIC INVERTEBRATE COMMUNITY

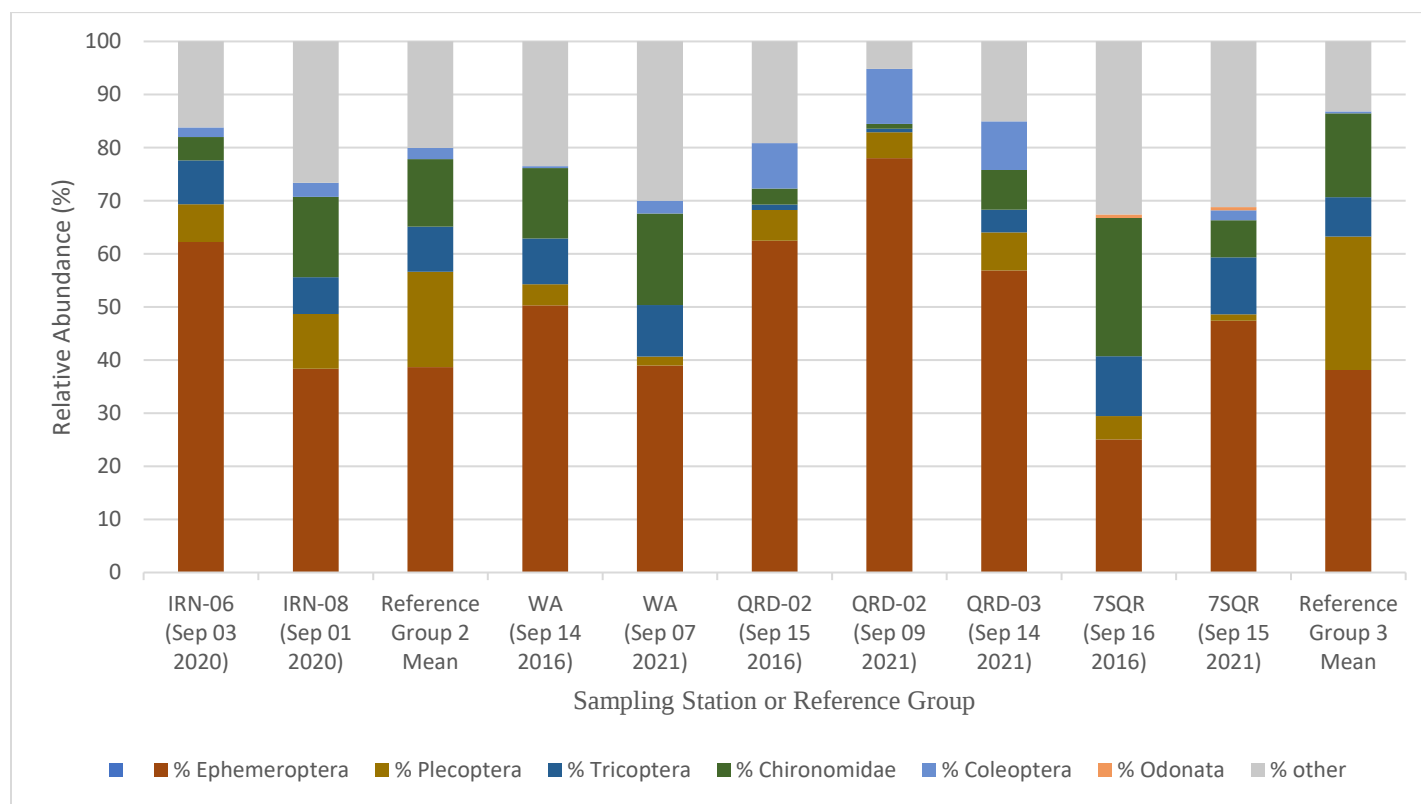
The benthic invertebrate community data were evaluated using the Preliminary Coastal BC RCA model (2010). Results are summarized in Table 7, with ordination figures and details included in Appendix B. Taxonomic results from the laboratory are provided in Appendix C. Table 8 presents a summary of community indices at the family level. Figure 4 provides an overview of community composition at the Iron River and Quinsam River stations, with results summarized below.

Table 7: Reference Condition Approach Site Assessments, 2016, 2020, and 2021

Site	Year	Reference Group	Vector 1 vs 2	Vector 1 vs 3	Vector 2 vs 3	Overall
IRN-06	2020	2	Similar to Reference	Similar to Reference	Similar to Reference	Similar to Reference
IRN-08	2020	2	Similar to Reference	Similar to Reference	Similar to Reference	Similar to Reference
WA	2016	3	Mildly Divergent	Similar to Reference	Mildly Divergent	Mildly Divergent
WA	2021	3	Divergent	Similar to Reference	Mildly Divergent	Divergent
QRD-02	2016	3	Similar to Reference	Mildly Divergent	Similar to Reference	Mildly Divergent
QRD-02	2021	3	Similar to Reference	Mildly Divergent	Divergent	Divergent
QRD-03	2021	3	Divergent	Similar to Reference	Mildly Divergent	Divergent
7SQR	2016	3	Similar to Reference	Mildly Divergent	Mildly Divergent	Mildly Divergent
7SQR	2021	3	Mildly Divergent	Similar to Reference	Mildly Divergent	Mildly Divergent

Table 8: Benthic Invertebrate Community Family-Level Indices, Iron and Quinsam Rivers, 2020 and 2021

Index	IRN6 (2020)	IRN8 (2020)	Reference Group 2 Average ($\pm$ Standard Deviation)	WA (2021)	QRD-02 (2021)	QRD-03 (2021)	7SQR (2021)	Reference Group 3 Average ($\pm$ Standard Deviation)
Total Abundance	1,372	3,864	1369 $\pm$ 852	2,100	1,844	3,913	2,260	1110 $\pm$ 880
Family Richness	21	26	20 $\pm$ 3	21	17	19	24	18 $\pm$ 3
EPT Richness	12	14	11 $\pm$ 2	7	10	8	9	11 $\pm$ 2
Simpson's Diversity	0.9	0.9	0.8 $\pm$ 0.1	0.8	0.5	0.8	0.8	0.8 $\pm$ 0.1
Pielou's Evenness	0.8	0.8	0.7 $\pm$ 0.1	0.8	0.4	0.7	0.7	0.7 $\pm$ 0.1
Notes: EPT: Ephemeroptera, plecoptera, trichoptera								

**Figure 4: Community Composition at the Iron River and Quinsam River Stations**

3.2.2.1 Iron River

The two stations on the Iron River were predicted with more than 90% probability to belong to Reference Group 2 and were assessed as being Similar to Reference Condition (Table 7).

Reference station IRN-06 was predicted to have a 91% probability of being in Reference Group 2 (Table 7). The dominant taxa were Ephemeroptera (62%) followed by Diptera plus non-insects (20.1%), Trichoptera (8%), and Plecoptera (7%). The dominant Ephemeroptera were Heptageniidae, Baetidae, and Ephemerellidae. The dominant Diptera were Chironomidae (4.4%), and non-insects were Arachnida (mites) (Appendix B-1).

Station IRN-08 was predicted to have a 97% probability of being in Reference Group 2 (Table 7). The dominant taxa were Diptera plus non-insects (42%) and Ephemeroptera (38%), followed by Plecoptera (10%). The dominant Diptera were Chironomidae (15%) and non-insects were Arachnida (mites). The dominant Ephemeroptera were Ephemerellidae, Heptageniidae, and Baetidae (Appendix B-2).

Invertebrate abundance, family richness, and Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness were higher at downstream IRN-08 than at upstream reference station IRN-06. Both stations had high Simpson's Diversity (0.9), with a value of 1.0 reflecting maximum diversity (Table 8), and similar Pielou's Evenness (0.8) with a value of 1.0 reflecting maximum evenness. EPT were predominant, with higher EPT abundance at IRN-06 (78%) than at IRN-08 (56%).

The benthic invertebrate communities at the Iron River stations were similar to the Preliminary Coastal BC RCA model Reference Group 2 reference condition (invertebrate communities at undisturbed sites), with 91% and 97% probability for IRN-06 and IRN-08, respectively. The Iron River communities were abundant, diverse, and dominated by EPT taxa (Figure 4). These results indicate good habitat quality (similar to reference condition) at both stations in the Iron River.

3.2.2.2 Quinsam River

The four stations on the Quinsam River were predicted with moderate (61% to 69%) probability to belong to Reference Group 3. and were not assessed as being Similar to Reference Condition (Table 7).

Reference station WA was predicted to have a 69% probability of being in Reference Group 3 and the benthic community was assessed as being Divergent from the Reference Condition (Table 7). WA differed from Reference Group 3 in having higher abundance (2,100 organisms/sample), lower percent EPT individuals (50%), higher percent of the EPT taxa as Baetidae (83%), and lower percent Plecoptera (4%) compared to Reference Group 3 (Table 8 and Figure 4). At WA, the dominant taxa were Ephemeroptera (39%), followed by Chironomidae (17%), and Trichoptera (10%) (Figure 5 and Appendix B-3). It is unclear why the invertebrate community was assessed as Divergent from Reference Group 3, as the station is the reference station in Quinsam River and upstream of mine influence. Measured water quality at this site did not exceed Acute-WQG during

the benthic invertebrate sampling period (Appendix A-1). Samples collected during spring, summer and fall 5-sample-in-30-day periods had higher dissolved copper concentrations at WA than at other sampling stations in the Quinsam River, and concentrations were marginally higher than the Chronic-WQG at WA (Section 9.2.1 AWQMR). Sediment analysis indicated copper levels to be above the ISQG (36.7 mg/kg) and arsenic levels up to 1.5 times higher than the ISQG (5.9 mg/kg) but both copper and arsenic remained lower than the PEL of 197 mg/kg and 17 mg/kg, respectively (Section 2.3.3, Appendix A-2). Concentrations of copper in sediment at WA were higher than at the downstream sites in both 2016 and 2021 (Appendix A-3, Graph 2).

Station QRD-02 was predicted to have a 61% probability of being in Reference Group 3 and the benthic community was assessed as being Divergent from the Reference Condition (Table 7). QRD-02 differed from Reference Group 3 in higher abundance (1,844 organisms/sample), higher percent EPT individuals (84%), higher percent of EPT taxa as Baetidae (91%), lower percent Trichoptera (1%), lower percent Plecoptera (5%), and higher percent Coleoptera (10%) than Reference Group 3 (Table 8 and Figure 4). At QRD-02 the dominant taxa were Ephemeroptera (78%) followed by Coleoptera (10%) and Plecoptera (5%). Chironomidae relative abundance was low at 1% (Figure 4 and Appendix B-4). The invertebrate community at QRD-02 differs from Reference Group 3 and other stations and may be indicative of mine influence. Measured water quality at this location did not exceed Acute-WQG during the benthic invertebrate sampling period (Appendix A-1). The sediment quality analysis indicated four PAH's higher than ISQG in some replicates and arsenic concentrations higher than the ISQG (5.9 mg/kg) in all samples, and the PEL (17 mg/kg) in one sample by 2.7 times (Section 2.3.4 and Appendix A-2).

Station QRD-03 was predicted to have a 67% probability of being in Reference Group 3 and the benthic community was also assessed as being Divergent from the Reference Condition (Table 3.2.3) (Table 7). QRD-03 differed from Reference Group 3 in higher abundance (3,913 organisms/sample), lower percent EPT individuals (59%), higher percent of EPT taxa as Baetidae (82%), lower percent Trichoptera (4%), lower percent Plecoptera (7%) and higher percent Coleoptera (9%) (Table 8 and Figure 4). At QRD-03 the dominant taxa were Ephemeroptera (57%), followed by Coleoptera (9%), Chironomidae (8%), and Plecoptera (7%) (Figure 4 and Appendix B-5). The invertebrate community at QRD-03 differs from Reference Group 3 but is more similar to communities at stations WA and 7SQR than at QRD-02. This suggests a lesser mine and seepage influence than at QRD-02. Measured water quality at this location did not exceed Acute-WQG during the benthic invertebrate survey (Appendix A-1). The sediment quality analysis indicated one PAH higher than its' ISQG in one replicate; arsenic concentrations were up to 2.6 times higher than the ISQG (5.9 mg/kg) in one sample (Section 2.3.5 and Appendix A-2).

Station 7SQR was predicted to have a 69% probability of being in Reference Group 3 and the benthic community was assessed as being Mildly Divergent from the Reference Condition (Table 7). 7SQR differed from Reference Group 3 in higher abundance (2,260 organisms/sample), higher percent EPT taxa as Baetidae (78%), lower percent Plecoptera (1%), and lower percent Chironomidae (7%) (Table 8 and Figure 4). At 7SQR, the dominant taxa were the Ephemeroptera (47%), followed by Trichoptera (11%) and Chironomidae (7%) (Figure 4 and Appendix B-6). The 7SQR community being assessed Mildly Divergent indicates it is more similar to the reference condition than the two upstream sites, and that mine influence appears to be localized. Measured water quality at this location did not exceed Acute-WQG during the benthic invertebrate survey (Appendix A-1). The sediment quality analysis indicated arsenic concentrations higher than the

ISQG (5.9 mg/kg) in all samples and the PEL (17 mg/kg) in one sample by 1.1 times (Section 2.3.6 and Appendix A-2).

Spatial trends for the Quinsam River stations were as follows (Table 8):

- Abundance (organisms/sample) was highest at site QRD-03 (3,913), intermediate at 7SQR (2,260) and WA (2,100), and lowest at QRD-02 (1,844).
- Family-level richness (number of families) was highest at 7SQR (24), intermediate at WA and QRD-03 (21 and 19), and lowest at QRD-02 (17).
- EPT richness (family level) was highest at QRD-02 (10) and lowest at WA (7).
- Simpson's Diversity Index was high, at 0.8 at WA, QRD-03 and 7SQR and lower at QRD-02 (0.5), with a value of 1.0 reflecting maximum diversity.
- Pielou's Evenness Index was highest at WA (0.8), similar at QRD-03 (0.7) and 7SQR (0.7), and lowest at QRD-02 (0.4), with a value of 1.0 reflecting maximum evenness.
- EPT were predominant, making up 50%, 84%, 68% and 59% of the taxa at WA, QRD-02, QRD-03, and 7SQR stations, respectively.

The benthic invertebrate communities at the Quinsam River reference (WA) and downstream monitoring stations differed from the Preliminary Coastal BC RCA model Reference Group 3 reference condition. The Quinsam River sites had higher total abundance and differing percent abundance for EPT groups, chironomids and Coleoptera than Reference Group 3. In general, the Quinsam River invertebrate communities were dominated by EPT organisms (50% at WA, 84% at QRD-02, 68% at QRD-03, and 59% at 7SQR) (Table 8). The EPT are associated with clean water (coarse substrates, well oxygenated, low organic enrichment), although there are exceptions (Barbour et al. 1999). The lower abundance, family richness, and diversity at QRD-02 than at WA suggests mine influence may be impairing the benthic invertebrate community at this site. However, the community at QRD-03 and 7SQR returns to background (WA) levels (or higher) for abundance, richness, diversity, and evenness.

3.2.2.3 Summary

For the two stations on the Iron River, the RCA model results and individual metrics (family richness, EPT richness, EPT predominance) indicate the river supports a variety of insect taxa that indicate good habitat conditions.

For the four stations on the Quinsam River, the RCA model results indicate the invertebrate communities differ from the Reference Condition for the assigned Reference Group 3. However, the communities are abundant, diverse, and dominated by EPT taxa. Potential influence of Quinsam Mine is detected in the invertebrate community metrics at QRD-02, but by station 7SQR, the community improves to better than conditions at station WA. The invertebrate community trend follows the sediment quality trend, with the most number and highest magnitude of

concentrations higher than the ISQG at QRD-02, followed by improved sediment quality by 7SQR. There were no measured concentrations higher than the Acute-WQG at the four benthic invertebrate monitoring stations from the water collected during sediment sampling (Appendix A-1). Refer to Section 9.2.4 of the AWQMR for a discussion on water quality and trends on the Quinsam river.

3.2.2.4 Comparison to Historical Data

In 2016, Quinsam River stations WA, QRD-02, and 7SQR were sampled following CABIN protocols. The sites were assessed using the Preliminary Coastal BC RCA model and were predicted to Reference Group 3. In 2016, the three sites were assessed as being mildly divergent from the Reference Condition (Table 7). Using this assessment, WA and QRD-02 were further from the Reference Condition in 2021 than in 2016 and 7SQR was similar. In general, the Quinsam River invertebrate communities were dominated in both 2016 and 2021 by EPT organisms; the percent Ephemeroptera remained the same or increased between 2016 and 2021, and percent Plecoptera, Trichoptera, and Chironomidae remained similar. The exception was a decrease in Chironomidae at 7SQR from 26% in 2016 to 7% in 2021.

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Appendix A-1
Table 1
Summary Sheet

Samples							Worksheets					
Site Description	EMS #	Sample ID	Sample Collection Date	Bureau Veritas Job ID	Bureau Veritas Sample ID	Water	PAHs - Water	Diss Metals - Water	Tot Metals - Water	Inorganic - Water	Others	Others
Iron River Upstream of Mine 242 Influence and 7-South Area 5 (IR6)	E297231	IR6-2SEP20-M	2020-09-02 12:00 AM	C063915	YJ9334			x	x	x		x
Replicate		IR6-2SEP20-R	2020-09-02 12:00 AM	C063915	YJ9335			x	x	x		x
Iron River Downstream of 242 Influence and 7-South Area 5 (IR8)	E297232	IR8-1SEP20-M	2020-09-01 12:00 AM	C063915	YJ9336			x	x	x		x
Lab Duplicate		IR8-1SEP20-M Lab-Dup	2020-09-01 12:00 AM	C063915	YJ9336					x		
Field Blank		FB-1SEP20-B	2020-09-01 12:00 AM	C063915	YJ9338			x	x	x		x
Trip Blank		TB-2SEP20-B	2020-09-02 12:00 AM	C063915	YJ9337			x	x	x		x

Appendix A-1
Table 2
Dissolved Metals - Water

Parameter	Criteria ¹	Units	RDL	Sample ID				
				Bureau Veritas Job ID / Sample ID				
				Sample Collection Date				
				Sample Collection Time				
				IR8-1SSEP20-M C063915 / YJ9336 2020-09-01	FB-1SEP20-B C063915 / YJ9338 2020-09-01	IR6-2SEP20-M C063915 / YJ9334 2020-09-02	IR6-2SEP20-R C063915 / YJ9335 2020-09-02	TB-2SEP20-B C063915 / YJ9337 2020-09-02
Dissolved Hardness (CaCO ₃)		mg/L	0.50	63.2	<0.50	65.7	66	<0.50
Dissolved Aluminum (Al)	0.1	mg/L	0.0030	0.0101	<0.0030	0.0131	0.013	<0.0030
Dissolved Antimony (Sb)		mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Arsenic (As)	0.005	mg/L	0.00010	0.00645	<0.00010	0.00408	0.00411	<0.00010
Dissolved Barium (Ba)		mg/L	0.0010	0.0101	<0.0010	0.01	0.0098	<0.0010
Dissolved Beryllium (Be)		mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Bismuth (Bi)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)		mg/L	0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Cadmium (Cd)	0.00141	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Calcium (Ca)		mg/L	0.050	22.4	<0.050	23.5	23.7	<0.050
Dissolved Chromium (Cr)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Cobalt (Co)	0.11	mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Copper (Cu)	0.0009	mg/L	0.00020	0.00056	<0.00020	0.00045	0.00045	<0.00020
Dissolved Iron (Fe)	0.35	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Lead (Pb)	0.003	mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Lithium (Li)		mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Dissolved Magnesium (Mg)		mg/L	0.050	1.76	<0.050	1.69	1.7	<0.050
Dissolved Manganese (Mn)	0.605	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Mercury (Hg)		mg/L	0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019
Dissolved Molybdenum (Mo)	2	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Nickel (Ni)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Potassium (K)		mg/L	0.050	0.266	<0.050	0.269	0.265	<0.050
Dissolved Selenium (Se)		mg/L	0.00010	0.00026	<0.00010	0.00033	0.00036	<0.00010
Dissolved Silicon (Si)		mg/L	0.10	2.47	<0.10	2.73	2.75	<0.10
Dissolved Silver (Ag)	0.00155	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Sodium (Na)		mg/L	0.050	2.86	<0.050	2.44	2.4	<0.050
Dissolved Strontium (Sr)		mg/L	0.0010	0.078	<0.0010	0.0816	0.0817	<0.0010
Dissolved Sulphur (S)		mg/L	3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Dissolved Thallium (Tl)		mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Tin (Sn)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Titanium (Ti)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Uranium (U)		mg/L	0.00010	<0.00010	<0.00010	0.0001	0.0001	<0.00010
Dissolved Vanadium (V)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Zinc (Zn)	0.187	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Zirconium (Zr)		mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX

Appendix A-1
Table 3
Total Metals - Water

Parameter	Criteria ¹	Units	RDL	Sample ID				
				Bureau Veritas Job ID / Sample ID				
				Sample Collection Date				
				Sample Collection Time				
				IR8-1SSEP20-M C063915 / YJ9336 2020-09-01	FB-1SEP20-B C063915 / YJ9338 2020-09-01	IR6-2SEP20-M C063915 / YJ9334 2020-09-02	IR6-2SEP20-R C063915 / YJ9335 2020-09-02	TB-2SEP20-B C063915 / YJ9337 2020-09-02
Total Hardness (CaCO ₃)		mg/L	0.50	67.6	<0.50	68	67.6	<0.50
Total Aluminum (Al)		mg/L	0.0030	0.0124	<0.0030	0.0206	0.0162	<0.0030
Total Antimony (Sb)		mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Arsenic (As)	0.005	mg/L	0.00010	0.00671	<0.00010	0.0043	0.00428	<0.00010
Total Barium (Ba)		mg/L	0.0010	0.0109	<0.0010	0.0105	0.0104	<0.0010
Total Beryllium (Be)		mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Bismuth (Bi)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Boron (B)		mg/L	0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Cadmium (Cd)		mg/L	0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010
Total Calcium (Ca)		mg/L	0.050	24	<0.050	24.3	24.1	<0.050
Total Chromium (Cr)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Cobalt (Co)	0.11	mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Total Copper (Cu)	0.003	mg/L	0.00050	0.00055	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron (Fe)	1	mg/L	0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Lead (Pb)	0.003	mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Total Lithium (Li)		mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Total Magnesium (Mg)		mg/L	0.050	1.88	<0.050	1.78	1.78	<0.050
Total Manganese (Mn)	0.605	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Mercury (Hg)		mg/L	0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019
Total Molybdenum (Mo)	2	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Nickel (Ni)		mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Potassium (K)		mg/L	0.050	0.284	<0.050	0.276	0.277	<0.050
Total Selenium (Se)		mg/L	0.00010	0.00026	<0.00010	0.00036	0.00034	<0.00010
Total Silicon (Si)		mg/L	0.10	2.85	<0.10	3.04	2.97	<0.10
Total Silver (Ag)	0.00155	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Sodium (Na)		mg/L	0.050	3.01	<0.050	2.39	2.39	<0.050
Total Strontium (Sr)		mg/L	0.0010	0.0819	<0.0010	0.0849	0.0838	<0.0010
Total Sulphur (S)		mg/L	3.0	<3.0	<3.0	<3.0	3.8	<3.0
Total Thallium (Tl)		mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Tin (Sn)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Titanium (Ti)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Uranium (U)		mg/L	0.00010	<0.00010	<0.00010	0.0001	0.0001	<0.00010
Total Vanadium (V)		mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Zinc (Zn)	0.187	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Zirconium (Zr)		mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX

Appendix A-1
Table 4
Inorganic - Water

Parameter	Criteria ¹	Units	RDL	Sample ID					
				Bureau Veritas Job ID / Sample ID					
				Sample Collection Date					
				Sample Collection Time					
				IR8-1SSEP20-M C063915 / YJ9336 2020-09-01	IR8-1SSEP20-M Lab-Dup C063915 / YJ9336 2020-09-01	FB-1SEP20-B C063915 / YJ9338 2020-09-01	IR6-2SEP20-M C063915 / YJ9334 2020-09-02	IR6-2SEP20-R C063915 / YJ9335 2020-09-02	TB-2SEP20-B C063915 / YJ9337 2020-09-02
Alkalinity (PP as CaCO ₃)		mg/L		-	-	-	-	-	-
Alkalinity (Total as CaCO ₃)		mg/L		-	-	-	-	-	-
Bicarbonate (HCO ₃)		mg/L		-	-	-	-	-	-
Carbonate (CO ₃)		mg/L		-	-	-	-	-	-
Hydroxide (OH)		mg/L		-	-	-	-	-	-
Acidity (pH 4.5)		mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acidity (pH 8.3)		mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromide (Br)		mg/L		-	-	-	-	-	-
Dissolved Chloride (Cl)	600	mg/L		-	-	-	-	-	-
Fluoride (F)		mg/L		-	-	-	-	-	-
Sulphate (SO ₄)		mg/L		-	-	-	-	-	-
Biochemical Oxygen Demand		mg/L		-	-	-	-	-	-
Total Ammonia (N)		mg/L		-	-	-	-	-	-
Dissolved Nitrogen (N)		mg/L		-	-	-	-	-	-
Nitrate plus Nitrite (N)		mg/L	0.020	<0.020	-	-	0.026	0.024	-
Dissolved Organic Carbon (C)		mg/L		-	-	-	-	-	-
Total Organic Carbon (C)		mg/L		-	-	-	-	-	-
Total Oil and grease		mg/L		-	-	-	-	-	-
Total Sulphide		mg/L		-	-	-	-	-	-
Sulphide (as H ₂ S)		mg/L		-	-	-	-	-	-
Total Sulphide (as H ₂ S)		mg/L		-	-	-	-	-	-
Dissolved Phosphorus (P)		mg/L		-	-	-	-	-	-
Total Phosphorus (P)		mg/L		-	-	-	-	-	-
Turbidity		NTU		-	-	-	-	-	-
Total Suspended Solids		mg/L		-	-	-	-	-	-

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX

Appendix A-1

Table 5

Others

Parameter	Criteria ¹	Units	RDL	Sample ID				
				Bureau Veritas Job ID / Sample ID				
				Sample Collection Date				
				Sample Collection Time				
				IR8-1SEP20-M C063915 / YJ9336 2020-09-01	FB-1SEP20-B C063915 / YJ9338 2020-09-01	IR6-2SEP20-M C063915 / YJ9334 2020-09-02	IR6-2SEP20-R C063915 / YJ9335 2020-09-02	TB-2SEP20-B C063915 / YJ9337 2020-09-02
Others								
Nitrite (N)	0.25	mg/L	0.0050	<0.0050	-	<0.0050	<0.0050	-
Nitrate (N)	32.8	mg/L	0.020	<0.020	-	0.026	0.024	-
Alkalinity (PP as CaCO3)		mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity (Total as CaCO3)		mg/L	1.0	63	<1.0	62	66	<1.0
Bicarbonate (HCO3)		mg/L	1.0	77	<1.0	76	81	<1.0
Carbonate (CO3)		mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hydroxide (OH)		mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (Cl)	600	mg/L	1.0	1.5	<1.0	<1.0	<1.0	<1.0
Sulphate (SO4)		mg/L	1.0	9.2	<1.0	8.7	8.6	<1.0
Total Suspended Solids		mg/L	1.0	<1.0	-	<1.0	<1.0	-
Filter and HNO3 Preservation		N/A		FIELD	FIELD	FIELD	FIELD	FIELD
Total Ammonia (N)	12.276	mg/L	0.015	<0.015	-	0.019	0.029	-
Total Phosphorus (P)		mg/L	0.0030	0.46	-	<0.0030	<0.0030	-
Dissolved Organic Carbon (C)		mg/L	0.50	1.4	-	1.4	1.3	-
Dissolved Phosphorus (P)		mg/L	0.0030	<0.0030	-	<0.0030	<0.0030	-

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX

Maximum Values Summary Table

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Hardness (CaCO3)	Water			66	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Dissolved Aluminum (Al)	Water	0.1		0.0131	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Antimony (Sb)	Water			<0.00050	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Arsenic (As)	Water	0.005		0.00645	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Barium (Ba)	Water			0.0101	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Beryllium (Be)	Water			<0.00010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Bismuth (Bi)	Water			<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Boron (B)	Water			<0.050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Cadmium (Cd)	Water	0.00141		<0.000010	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Calcium (Ca)	Water			23.7	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Chromium (Cr)	Water			<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Cobalt (Co)	Water	0.11		<0.00020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Copper (Cu)	Water	0.0009		0.00056	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Iron (Fe)	Water	0.35		<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Lead (Pb)	Water	0.003		<0.00020	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Lithium (Li)	Water			<0.0020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Magnesium (Mg)	Water			1.76	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Manganese (Mn)	Water	0.605		<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Mercury (Hg)	Water			<0.0000019	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Molybdenum (Mo)	Water	2		<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Nickel (Ni)	Water			<0.0010	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Dissolved Potassium (K)	Water			0.269	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Selenium (Se)	Water			0.00036	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Silicon (Si)	Water			2.75	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Silver (Ag)	Water	0.00155		<0.000020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Sodium (Na)	Water			2.86	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Strontium (Sr)	Water			0.0817	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Sulphur (S)	Water			<3.0	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Thallium (Tl)	Water			<0.000010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Tin (Sn)	Water			<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Titanium (Ti)	Water			<0.0050	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Dissolved Uranium (U)	Water			0.0001	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Vanadium (V)	Water			<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Zinc (Zn)	Water	0.187		<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Dissolved Zirconium (Zr)	Water			<0.00010	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Hardness (CaCO3)	Water			68	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Aluminum (Al)	Water			0.0206	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Antimony (Sb)	Water			<0.00050	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Arsenic (As)	Water	0.005		0.00671	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Barium (Ba)	Water			0.0109	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Beryllium (Be)	Water			<0.00010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Bismuth (Bi)	Water			<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Boron (B)	Water			<0.050	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Cadmium (Cd)	Water			0.000013	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Calcium (Ca)	Water			24.3	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Chromium (Cr)	Water			<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Cobalt (Co)	Water	0.11		<0.00020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Copper (Cu)	Water	0.003		0.00055	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Iron (Fe)	Water	1		<0.010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Lead (Pb)	Water	0.003		<0.00020	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Lithium (Li)	Water			<0.0020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Magnesium (Mg)	Water			1.88	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Manganese (Mn)	Water	0.605		<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Mercury (Hg)	Water			<0.0000019	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Molybdenum (Mo)	Water	2		<0.0010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Nickel (Ni)	Water			<0.0010	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Potassium (K)	Water			0.284	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Selenium (Se)	Water			0.00036	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Silicon (Si)	Water			3.04	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Silver (Ag)	Water	0.00155		<0.000020	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Sodium (Na)	Water			3.01	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Strontium (Sr)	Water			0.0849	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Total Sulphur (S)	Water			3.8	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Thallium (Tl)	Water			<0.000010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Tin (Sn)	Water			<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Titanium (Ti)	Water			<0.0050	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Uranium (U)	Water			0.0001	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Vanadium (V)	Water			<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Zinc (Zn)	Water	0.187		<0.0050	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Total Zirconium (Zr)	Water			<0.00010	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Acidity (pH 4.5)	Water			<1.0	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Acidity (pH 8.3)	Water			<1.0	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Nitrate plus Nitrite (N)	Water			0.026	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Nitrite (N)	Water	0.25		<0.0050	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Nitrate (N)	Water	32.8		0.026	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Alkalinity (PP as CaCO3)	Water			<1.0	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Alkalinity (Total as CaCO3)	Water			66	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Bicarbonate (HCO3)	Water			81	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Carbonate (CO3)	Water			<1.0	mg/L
TB-2SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9337	C063915	Hydroxide (OH)	Water			<1.0	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Chloride (Cl)	Water	600		1.5	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Sulphate (SO4)	Water			9.2	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Total Suspended Solids	Water			<1.0	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Total Ammonia (N)	Water	12.276		0.029	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Phosphorus (P)	Water			0.46	mg/L
IR8-1SSEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Organic Carbon (C)	Water			1.4	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Phosphorus (P)	Water			<0.0030	mg/L

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	

Table 7

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Hardness (CaCO3)	Water			<0.50	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Aluminum (Al)	Water	0.1		<0.0030	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Antimony (Sb)	Water			<0.00050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Arsenic (As)	Water	0.005		<0.00010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Barium (Ba)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Beryllium (Be)	Water			<0.00010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Bismuth (Bi)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Boron (B)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Cadmium (Cd)	Water	0.00141		<0.000010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Calcium (Ca)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Chromium (Cr)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Cobalt (Co)	Water	0.11		<0.00020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Copper (Cu)	Water	0.0009		<0.00020	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Iron (Fe)	Water	0.35		<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Lead (Pb)	Water	0.003		<0.00020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Lithium (Li)	Water			<0.0020	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Magnesium (Mg)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Manganese (Mn)	Water	0.605		<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Mercury (Hg)	Water			<0.000019	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Molybdenum (Mo)	Water	2		<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Nickel (Ni)	Water			<0.0010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Potassium (K)	Water			<0.050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Selenium (Se)	Water			<0.0010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Silicon (Si)	Water			<0.10	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Silver (Ag)	Water	0.00155		<0.000020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Sodium (Na)	Water			<0.050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Dissolved Strontium (Sr)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Sulphur (S)	Water			<3.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Thallium (Tl)	Water			<0.000010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Tin (Sn)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Titanium (Ti)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Uranium (U)	Water			<0.00010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Vanadium (V)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Zinc (Zn)	Water	0.187		<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Zirconium (Zr)	Water			<0.00010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Hardness (CaCO3)	Water			<0.50	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Aluminum (Al)	Water			<0.0030	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Antimony (Sb)	Water			<0.00050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Arsenic (As)	Water	0.005		<0.00010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Barium (Ba)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Beryllium (Be)	Water			<0.00010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Bismuth (Bi)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Boron (B)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Cadmium (Cd)	Water			<0.000010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Calcium (Ca)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Chromium (Cr)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Cobalt (Co)	Water	0.11		<0.00020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Copper (Cu)	Water	0.003		<0.00050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Iron (Fe)	Water	1		<0.010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Lead (Pb)	Water	0.003		<0.00020	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Lithium (Li)	Water			<0.0020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Magnesium (Mg)	Water			<0.050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Manganese (Mn)	Water	0.605		<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Mercury (Hg)	Water			<0.000019	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Molybdenum (Mo)	Water	2		<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Nickel (Ni)	Water			<0.0010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Potassium (K)	Water			<0.050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Selenium (Se)	Water			<0.00010	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Silicon (Si)	Water			<0.10	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Silver (Ag)	Water	0.00155		<0.000020	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Sodium (Na)	Water			<0.050	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Total Strontium (Sr)	Water			<0.0010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Sulphur (S)	Water			<3.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Thallium (Tl)	Water			<0.000010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Tin (Sn)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Titanium (Ti)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Uranium (U)	Water			<0.00010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Vanadium (V)	Water			<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Zinc (Zn)	Water	0.187		<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Zirconium (Zr)	Water			<0.00010	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Acidity (pH 4.5)	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Acidity (pH 8.3)	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Nitrate plus Nitrite (N)	Water			<0.020	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Nitrite (N)	Water	0.25		<0.0050	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Nitrate (N)	Water	32.8		<0.020	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Alkalinity (PP as CaCO3)	Water			<1.0	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Alkalinity (Total as CaCO3)	Water			<1.0	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Bicarbonate (HCO3)	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Carbonate (CO3)	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Hydroxide (OH)	Water			<1.0	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Chloride (Cl)	Water	600		<1.0	mg/L
FB-1SEP20-B	BASLINE IRON RIVER	IRON RIVER	YJ9338	C063915	Sulphate (SO4)	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Suspended Solids	Water			<1.0	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Total Ammonia (N)	Water	12.276		<0.015	mg/L
IR6-2SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9334	C063915	Total Phosphorus (P)	Water			<0.0030	mg/L
IR6-2SEP20-R	BASLINE IRON RIVER	IRON RIVER	YJ9335	C063915	Dissolved Organic Carbon (C)	Water			1.3	mg/L
IR8-1SEP20-M	BASLINE IRON RIVER	IRON RIVER	YJ9336	C063915	Dissolved Phosphorus (P)	Water			<0.0030	mg/L

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	

Appendix A-1
Table 8
Exceedance Summary Table Results

<i>Criteria Name</i>	<i>Sample ID</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Parameter</i>	<i>Criteria</i>	<i>Result</i>	<i>DL</i>	<i>Units</i>
BC Approved WQG -	IR8-1SSEP20-M	YJ9336	C063915	Dissolved Arsenic (As)	0.005	0.00645	0.0001	mg/L
BC Approved WQG -	IR8-1SSEP20-M	YJ9336	C063915	Total Arsenic (As)	0.005	0.00671	0.0001	mg/L

Appendix A-1
Table 9
Summary of Analysis Dates

<i>Sample ID</i>	<i>Project</i>	<i>Site</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Date Sampled</i>	<i>Date Range: Extracted</i>	<i>Date Range: Analyzed</i>
IR8-1SEP20-M	BASELINE IRON RIVER	IRON RIVER	YJ9336	C063915	2020/09/01	2020/09/08 - 2020/09/10	2020/09/04 - 2020/09/11
FB-1SEP20-B	BASELINE IRON RIVER	IRON RIVER	YJ9338	C063915	2020/09/01	2020/09/10 - 2020/09/11	2020/09/04 - 2020/09/11
IR6-2SEP20-M	BASELINE IRON RIVER	IRON RIVER	YJ9334	C063915	2020/09/02	2020/09/08 - 2020/09/10	2020/09/04 - 2020/09/11
IR6-2SEP20-R	BASELINE IRON RIVER	IRON RIVER	YJ9335	C063915	2020/09/02	2020/09/08 - 2020/09/10	2020/09/04 - 2020/09/11
TB-2SEP20-B	BASELINE IRON RIVER	IRON RIVER	YJ9337	C063915	2020/09/02	2020/09/10 - 2020/09/11	2020/09/04 - 2020/09/11

Appendix A-1
Table 10
Summary Sheet

Samples								Water	PAHs - Water	Diss Metals - Water	Tot Metals - Water	Inorganic - Water	Others	Others					
Location Name	Site Description	EMS #	Sample ID:	Sample Number	Sample Collection Date	Bureau Veritas Job ID	Bureau Veritas Sample ID												
QUINSAM RIVER UPSTREAM	Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)	O126402	WA	WA-7SEP21-M	2021-09-07 12:00 AM	C167191	AFO985								x	x	x	x	x
QA/QC	Field Replicate	O126402	WA	WA-7SEP21-R	2021-09-07 12:00 AM	C167191	AFO986								x	x	x	x	x
QA/QC	Trip Blank	N/A	TB	TB-7SEP21-B	2021-09-07 12:00 AM	C167191	AFO987									x	x		x
QA/QC	Lab Duplicate	N/A	TB	TB-7SEP21-B Lab-Dup	2021-09-07 12:00 AM	C167191	AFO987										x		
QA/QC	Field Blank	N/A	FB	FB-7SEP21-B	2021-09-07 12:00 AM	C167191	AFO988									x	x		x
QUINSAM RIVER DOWNSTREAM	Quinsam River Site 2 Upstream of 7-South Mining Operation and Downstream from Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	E286930	QRD02	QRD02-9SEP21-M	2021-09-09 12:00 AM	C167191	AFO989								x	x	x	x	x
	Lab Duplicate	N/A	QRD02	QRD02-9SEP21-M Lab-Dup	2021-09-09 12:00 AM	C167191	AFO989											x	x
POTENTIAL SEEPAGE	Potential Seepage at Site 2		S2	S2-13SEP21-M	2021-09-13 12:00 AM	C169566	AGE566									x	x	x	x
QUINSAM RIVER DOWNSTREAM	Quinsam River Site 3 Upstream of 7-South Mining Operation and Downstream from Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	N/A	QRD03	QRD03-14SEP21-M	2021-09-14 12:00 AM	C169566	AGE567								x	x	x	x	x
QUINSAM RIVER DOWNSTREAM	Quinsam River Downstream of 7-South Mining Operation and Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	E292113	75QR	75QR-15SEP21-M	2021-09-15 12:00 AM	C169566	AGE568								x	x	x	x	x
QA/QC	Lab Duplicate	N/A	75QR	75QR-15SEP21-M Lab-Dup	2021-09-15 12:00 AM	C169566	AGE568												x
QA/QC	Field Replicate	N/A	75QR	75QR-15SEP21-R	2021-09-15 12:00 AM	C169566	AGE569	x	x	x	x	x							

Appendix A-1
Table 11
PAHs - Water

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID					
					Bureau Veritas Job ID / Sample ID					
					Sample Collection Date					
					Sample Collection Time					
					WA-7SEP21-M C167191 / AFO985 2021-09-07	WA-7SEP21-R C167191 / AFO986 2021-09-07	QRD02-9SEP21-M C167191 / AFO989 2021-09-09	QRD03-14SEP21-M C169566 / AGE567 2021-09-14	75QR-15SEP21-M C169566 / AGE568 2021-09-15	75QR-15SEP21-R C169566 / AGE569 2021-09-15
Low Molecular Weight PAH's			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
High Molecular Weight PAH's			mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total PAH			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
2-Methylnaphthalene			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Acenaphthene		0.0058	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acenaphthylene			mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine		0.0044	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Anthracene		0.000012	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)anthracene		0.000018	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene		0.000015	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b&j)fluoranthene			mg/L	0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Benzo(g,h,i)perylene			mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Benzo(k)fluoranthene			mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Chrysene			mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dibenz(a,h)anthracene			mg/L	0.0000030	<0.0000030	<0.0000030	<0.0000030	<0.0000030	<0.0000030	<0.0000030
Fluoranthene		0.00004	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Fluorene		0.003	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Indeno(1,2,3-cd)pyrene			mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Naphthalene	0.001	0.0011	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Phenanthrene		0.0004	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Pyrene		0.000025	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Quinoline		0.0034	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Appendix A-1
Table 12
Dissolved Metals - Water

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID								
					Bureau Veritas Job ID / Sample ID								
					Sample Collection Date								
					Sample Collection Time								
					WA-7SEP21-M C167191 / AFO985 2021-09-07	WA-7SEP21-R C167191 / AFO986 2021-09-07	TB-7SEP21-B C167191 / AFO987 2021-09-07	FB-7SEP21-B C167191 / AFO988 2021-09-07	QRD02-9SEP21-M C167191 / AFO989 2021-09-09	S2-13SEP21-M C169566 / AGE566 2021-09-13	QRD03-14SEP21-M C169566 / AGE567 2021-09-14	75QR-15SEP21-M C169566 / AGE568 2021-09-15	75QR-15SEP21-R C169566 / AGE569 2021-09-15
Dissolved Hardness (CaCO3)			mg/L	0.50	22.1	23.1	<0.50	<0.50	45.9	103	43.3	44	42.7
Dissolved Aluminum (Al)	0.1		mg/L	0.0030	0.0134	0.0133	<0.0030	<0.0030	0.0092	0.0056	0.0085	0.0079	0.0078
Dissolved Antimony (Sb)			mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Arsenic (As)	0.005	0.005	mg/L	0.00010	0.00013	0.00013	<0.00010	<0.00010	0.00022	0.00031	0.0004	0.00039	0.00039
Dissolved Barium (Ba)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	0.0476	0.0021	0.0026	0.0026
Dissolved Beryllium (Be)			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Bismuth (Bi)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)		1.5	mg/L	0.050	<0.050	<0.050	<0.050	<0.050	0.072	0.618	0.076	0.074	0.076
Dissolved Cadmium (Cd)	0.00141		mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Calcium (Ca)			mg/L	0.050	7.44	7.75	<0.050	<0.050	15	31.3	14.2	14.4	13.9
Dissolved Chromium (Cr)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Cobalt (Co)	0.11		mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00026	<0.00020	<0.00020	<0.00020
Dissolved Copper (Cu)	0.0009		mg/L	0.00020	0.00048	0.00043	<0.00020	<0.00020	0.00037	<0.00020	0.0004	0.00038	0.00036
Dissolved Iron (Fe)	0.35	0.3	mg/L	0.0050	0.0208	0.0189	<0.0050	<0.0050	0.0179	0.342	0.0199	0.0517	0.0491
Dissolved Lead (Pb)	0.003		mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Lithium (Li)			mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0259	<0.0020	<0.0020	<0.0020
Dissolved Magnesium (Mg)			mg/L	0.050	0.854	0.909	<0.050	<0.050	2.04	6.06	1.91	1.96	1.92
Dissolved Manganese (Mn)	0.605		mg/L	0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0013	0.387	0.0013	0.0058	0.0056
Dissolved Mercury (Hg)		0.000026	mg/L	0.0000019	<0.0000019	<0.0000019	-	-	<0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019
Dissolved Molybdenum (Mo)	2	0.073	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Nickel (Ni)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Potassium (K)			mg/L	0.050	0.057	0.057	<0.050	<0.050	0.319	2.79	0.35	0.342	0.339
Dissolved Selenium (Se)		0.001	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Silicon (Si)			mg/L	0.10	1.95	2.14	<0.10	<0.10	2.05	3.76	1.99	2.14	2.1
Dissolved Silver (Ag)	0.00155	0.00025	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Sodium (Na)			mg/L	0.050	0.671	0.715	<0.050	<0.050	24.6	112	22.9	23.1	22.6
Dissolved Strontium (Sr)			mg/L	0.0010	0.0124	0.0115	<0.0010	<0.0010	0.0983	0.46	0.0973	0.0939	0.0946
Dissolved Sulphur (S)			mg/L	3.0	<3.0	<3.0	<3.0	<3.0	17	51.8	16.8	15.8	15.9
Dissolved Thallium (Tl)		0.0008	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Tin (Sn)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Titanium (Ti)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Uranium (U)		0.015	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Vanadium (V)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Zinc (Zn)	0.187	0.03	mg/L	0.0050	<0.0050	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Zirconium (Zr)			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Appendix A-1
Table 13
Total Metals - Water

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID									
					Bureau Veritas Job ID / Sample ID									
					Sample Collection Date									
					Sample Collection Time									
					WA-7SEP21-M C167191 / AFO985 2021-09-07	WA-7SEP21-R C167191 / AFO986 2021-09-07	TB-7SEP21-B C167191 / AFO987 2021-09-07	TB-7SEP21-B Lab-Dup C167191 / AFO987 2021-09-07	FB-7SEP21-B C167191 / AFO988 2021-09-07	QRD02-9SEP21-M C167191 / AFO989 2021-09-09	S2-13SEP21-M C169566 / AGE566 2021-09-13	QRD03-14SEP21-M C169566 / AGE567 2021-09-14	75QR-15SEP21-M C169566 / AGE568 2021-09-15	75QR-15SEP21-R C169566 / AGE569 2021-09-15
Total Hardness (CaCO3)			mg/L	0.50	22.1	23.2	<0.50	-	<0.50	46.7	106	43.1	43.4	44.4
Total Aluminum (Al)			mg/L	0.0030	0.0453	0.0171	0.0114	0.0116	<0.0030	0.016	0.0415	0.0119	0.0182	0.0209
Total Antimony (Sb)			mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Arsenic (As)	0.005	0.005	mg/L	0.00010	0.00013	0.00012	<0.00010	<0.00010	<0.00010	0.00023	0.0908	0.00035	0.00042	0.00044
Total Barium (Ba)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0022	0.0543	0.0022	0.0026	0.0027
Total Beryllium (Be)			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Bismuth (Bi)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Boron (B)		1.5	mg/L	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.08	0.614	0.073	0.075	0.079
Total Cadmium (Cd)			mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Calcium (Ca)			mg/L	0.050	7.39	7.79	<0.050	-	<0.050	15.3	32.5	14.2	14.3	14.5
Total Chromium (Cr)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Cobalt (Co)	0.11		mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00039	<0.00020	<0.00020	<0.00020
Total Copper (Cu)	0.003		mg/L	0.00050	0.00062	0.00054	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron (Fe)	1	0.3	mg/L	0.010	0.032	0.031	<0.010	<0.010	<0.010	0.044	1.85	0.046	0.09	0.093
Total Lead (Pb)	0.003		mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Total Lithium (Li)			mg/L	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0255	<0.0020	<0.0020	<0.0020
Total Magnesium (Mg)			mg/L	0.050	0.878	0.896	<0.050	-	<0.050	2.1	6.04	1.88	1.88	1.97
Total Manganese (Mn)	0.605		mg/L	0.0010	0.0021	0.0018	<0.0010	<0.0010	<0.0010	0.0087	0.498	0.0071	0.0076	0.008
Total Mercury (Hg)		0.000026	mg/L	0.0000019	<0.0000019	<0.0000019	-	-	-	<0.0000019	<0.0000019	<0.0000019	<0.0000019	<0.0000019
Total Molybdenum (Mo)	2	0.073	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Nickel (Ni)			mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Potassium (K)			mg/L	0.050	0.054	0.055	<0.050	-	<0.050	0.353	2.83	0.343	0.335	0.352
Total Selenium (Se)		0.001	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Silicon (Si)			mg/L	0.10	1.97	2.07	<0.10	<0.10	<0.10	2.07	3.91	2.03	2.21	2.24
Total Silver (Ag)	0.00155	0.00025	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Sodium (Na)			mg/L	0.050	0.707	0.703	<0.050	-	<0.050	25.9	112	22.2	22.3	23.2
Total Strontium (Sr)			mg/L	0.0010	0.012	0.0121	<0.0010	<0.0010	<0.0010	0.1	0.466	0.0963	0.0971	0.0967
Total Sulphur (S)			mg/L	3.0	<3.0	<3.0	<3.0	-	<3.0	17.4	52.4	16.1	15.6	16.4
Total Thallium (Tl)		0.0008	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Tin (Sn)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Titanium (Ti)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Uranium (U)		0.015	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Vanadium (V)			mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Zinc (Zn)	0.187	0.03	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Zirconium (Zr)			mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Appendix A-1
Table 14
Inorganic - Water

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID							
					Bureau Veritas Job ID / Sample ID							
					Sample Collection Date							
					Sample Collection Time							
					WA-7SEP21-M C167191 / AFO985 2021-09-07	WA-7SEP21-R C167191 / AFO986 2021-09-07	QRD02-9SEP21-M C167191 / AFO989 2021-09-09	QRD02-9SEP21-M Lab-Dup C167191 / AFO989 2021-09-09	S2-13SEP21-M C169566 / AGE566 2021-09-13	QRD03-14SEP21-M C169566 / AGE567 2021-09-14	75QR-15SEP21-M C169566 / AGE568 2021-09-15	75QR-15SEP21-R C169566 / AGE569 2021-09-15
Alkalinity (PP as CaCO3)			mg/L		-	-	-	-	-	-	-	-
Alkalinity (Total as CaCO3)			mg/L		-	-	-	-	-	-	-	-
Bicarbonate (HCO3)			mg/L		-	-	-	-	-	-	-	-
Carbonate (CO3)			mg/L		-	-	-	-	-	-	-	-
Hydroxide (OH)			mg/L		-	-	-	-	-	-	-	-
Acidity (pH 4.5)			mg/L		-	-	-	-	-	-	-	-
Acidity (pH 8.3)			mg/L		-	-	-	-	-	-	-	-
Bromide (Br)			mg/L		-	-	-	-	-	-	-	-
Dissolved Chloride (Cl)			mg/L		-	-	-	-	-	-	-	-
Fluoride (F)			mg/L		-	-	-	-	-	-	-	-
Sulphate (SO4)			mg/L		-	-	-	-	-	-	-	-
Biochemical Oxygen Demand			mg/L		-	-	-	-	-	-	-	-
Total Ammonia (N)			mg/L		-	-	-	-	-	-	-	-
Dissolved Nitrogen (N)			mg/L		-	-	-	-	-	-	-	-
Nitrate plus Nitrite (N)			mg/L	0.020	<0.020	<0.020	<0.020	<0.020	0.03	<0.020	<0.020	<0.020
Dissolved Organic Carbon (C)			mg/L		-	-	-	-	-	-	-	-
Total Organic Carbon (C)			mg/L		-	-	-	-	-	-	-	-
Total Oil and grease			mg/L		-	-	-	-	-	-	-	-
Total Sulphide			mg/L	0.0018	-	-	-	-	<0.0018	-	-	-
Sulphide (as H2S)			mg/L	0.0020	-	-	-	-	<0.0020	-	-	-
Total Sulphide (as H2S)			mg/L		-	-	-	-	-	-	-	-
Dissolved Phosphorus (P)			mg/L		-	-	-	-	-	-	-	-
Total Phosphorus (P)			mg/L		-	-	-	-	-	-	-	-
Turbidity			NTU		-	-	-	-	-	-	-	-
Total Suspended Solids			mg/L		-	-	-	-	-	-	-	-

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Appendix A-1
Table 15
Others

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID										
					Bureau Veritas Job ID / Sample ID										
					Sample Collection Date										
					Sample Collection Time										
					WA-7SEP21-M C167191 / AFO985 2021-09-07	WA-7SEP21-R C167191 / AFO986 2021-09-07	TB-7SEP21-B C167191 / AFO987 2021-09-07	FB-7SEP21-B C167191 / AFO988 2021-09-07	QRD02-9SEP21-M C167191 / AFO989 2021-09-09	QRD02-9SEP21-M Lab-Dup C167191 / AFO989 2021-09-09	S2-13SEP21-M C169566 / AGE566 2021-09-13	QRD03-14SEP21-M C169566 / AGE567 2021-09-14	7SQ03-15SEP21-M C169566 / AGE568 2021-09-15	7SQR-15SEP21-M Lab-Dup C169566 / AGE568 2021-09-15	7SQR-15SEP21-R C169566 / AGE569 2021-09-15
Others															
Sulphate (SO4)			mg/L	1.0	2.2	1.8	<1.0	<1.0	55	-	160	45	48	-	45
Turbidity			NTU	0.10	0.16	0.11	<0.10	<0.10	0.15	-	2.7	0.19	0.36	-	0.42
Filter and HNO3 Preservation			N/A		FIELD	FIELD	FIELD	FIELD	FIELD	-	FIELD	FIELD	FIELD	-	FIELD
Total Organic Carbon (C)			mg/L	0.50	1.3	1.4	-	-	1.8	-	1.6	1.6	1.5	1.6	1.7
Total Phosphorus (P)			mg/L	0.0030	<0.0030	<0.0030	-	-	<0.0030	-	0.0099	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Organic Carbon (C)			mg/L	0.50	1.4	1.4	-	-	1.5	1.6	0.96	1.5	1.4	-	0.55
Dissolved Phosphorus (P)			mg/L	0.0030	<0.0030	<0.0030	-	-	<0.0030	-	<0.0030	<0.0030	<0.0030	-	<0.0030
1-Methylnaphthalene			ug/L	0.050	<0.050	<0.050	-	-	<0.050	-	-	<0.050	<0.050	-	<0.050
Nitrite (N)	0.25	0.06	mg/L	0.0050	-	-	-	-	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050
Nitrate (N)	32.8		mg/L	0.020	-	-	-	-	-	-	0.03	<0.020	<0.020	-	<0.020

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Sample ID	Project	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Low Molecular Wei	Water			<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	High Molecular We	Water			<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total PAH	Water			<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	2-Methylnaphthale	Water			<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Acenaphthene	Water		0.0058	<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Acenaphthylene	Water			<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Acridine	Water		0.0044	<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Anthracene	Water		0.000012	<0.000010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Benzo(a)anthracen	Water		0.000018	<0.000010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Benzo(a)pyrene	Water		0.000015	<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Benzo(b&j)fluorant	Water			<0.000030	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Benzo(g,h,i)peryl	Water			<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Benzo(k)fluoranth	Water			<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Chrysene	Water			<0.000020	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dibenz(a,h)anthrac	Water			<0.000030	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Fluoranthene	Water		0.00004	<0.000020	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Fluorene	Water		0.003	<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Indeno(1,2,3-cd)py	Water			<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Naphthalene	Water	0.001	0.0011	<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Phenanthrene	Water		0.0004	<0.000050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Pyrene	Water		0.000025	<0.000020	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Quinoline	Water		0.0034	<0.000020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Hardness	Water			103	mg/L
WA-7SEP21-M	WATER WA QUINSAM I	AF0985	C167191	Dissolved Aluminum	Water	0.1		0.0134	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Antimon	Water			<0.00050	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Arsenic (	Water	0.005	0.005	0.0375	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Barium (I	Water			0.0476	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Beryllium	Water			<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Bismuth	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Boron (B	Water		1.5	0.618	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Cadmium	Water	0.00141		<0.000010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Calcium (	Water			31.3	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Chromium	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Cobalt (C	Water	0.11		0.00026	mg/L
WA-7SEP21-M	WATER WA QUINSAM I	AF0985	C167191	Dissolved Copper (I	Water	0.0009		0.00048	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Iron (Fe)	Water	0.35	0.3	0.342	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Lead (Pb	Water	0.003		<0.00020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Lithium (	Water			0.0259	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Magnesi	Water			6.06	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Mangan	Water	0.605		0.387	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Mercury	Water		0.000026	<0.0000019	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Molybde	Water	2	0.073	<0.0010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Nickel (N	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Potassium	Water			2.79	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Selenium	Water		0.001	<0.00010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Silicon (S	Water			3.76	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Silver (Ag	Water	0.00155	0.00025	<0.000020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Sodium (	Water			112	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Strontium	Water			0.46	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Dissolved Sulphur (	Water			51.8	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Thallium	Water		0.0008	<0.000010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Tin (Sn)	Water			<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Titanium	Water			<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Uranium	Water		0.015	<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Vanadium	Water			<0.0050	mg/L
WA-7SEP21-R	WATER WA QUINSAM I	AF0986	C167191	Dissolved Zinc (Zn)	Water	0.187	0.03	0.005	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Zirconium	Water			<0.00010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Hardness (Ca	Water			106	mg/L
WA-7SEP21-M	WATER WA QUINSAM I	AF0985	C167191	Total Aluminum (Al)	Water			0.0453	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Antimony (Sb	Water			<0.00050	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Arsenic (As)	Water	0.005	0.005	0.0908	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Barium (Ba)	Water			0.0543	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Beryllium (Be	Water			<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Bismuth (Bi)	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Boron (B)	Water		1.5	0.614	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Cadmium (Cd	Water			<0.000010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Calcium (Ca)	Water			32.5	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Chromium (C	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Cobalt (Co)	Water	0.11		0.00039	mg/L
WA-7SEP21-M	WATER WA QUINSAM I	AF0985	C167191	Total Copper (Cu)	Water	0.003		0.00062	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Iron (Fe)	Water	1	0.3	1.85	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Lead (Pb)	Water	0.003		<0.00020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Lithium (Li)	Water			0.0255	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Magnesium (I	Water			6.04	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Manganese (I	Water	0.605		0.498	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Mercury (Hg)	Water		0.000026	<0.0000019	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Molybdenum	Water	2	0.073	<0.0010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Nickel (Ni)	Water			<0.0010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Potassium (K)	Water			2.83	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Selenium (Se)	Water		0.001	<0.00010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Silicon (Si)	Water			3.91	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Silver (Ag)	Water	0.00155	0.00025	<0.000020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Sodium (Na)	Water			112	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Strontium (Sr	Water			0.466	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Sulphur (S)	Water			52.4	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Thallium (Tl)	Water		0.0008	<0.000010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Tin (Sn)	Water			<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Titanium (Ti)	Water			<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Uranium (U)	Water		0.015	<0.00010	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Vanadium (V)	Water			<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Zinc (Zn)	Water	0.187	0.03	<0.0050	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Total Zirconium (Zr	Water			<0.00010	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Nitrate plus Nitrite	Water			0.03	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Sulphide	Water			<0.0018	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Sulphide (as H2S)	Water			<0.0020	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Sulphate (SO4)	Water			160	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Turbidity	Water			2.7	NTU
QRD02-9SEP21-M	WATER WA QUINSAM I	AF0989	C167191	Total Organic Carbi	Water			1.8	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Total Phosphorus (	Water			0.0099	mg/L
QRD02-9SEP21-M Lab-Dup	WATER WA QUINSAM I	AF0989	C167191	Dissolved Organic (	Water			1.6	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Dissolved Phospho	Water			<0.0030	mg/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	1-Methylnaphthale	Water			<0.050	ug/L
75QR-15SEP21-R	QUINSAM RIVER	AGE569	C169566	Nitrite (N)	Water	0.25	0.06	<0.0050	mg/L
S2-13SEP21-M	QUINSAM RIVER	AGE566	C169566	Nitrate (N)	Water	32.8		0.03	mg/L

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Low Molecular Weight PAH's	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	High Molecular Weight PAH's	Water			<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total PAH	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	2-Methylnaphthalene	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Acenaphthene	Water		0.0058	<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Acenaphthylene	Water			<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Acridine	Water		0.0044	<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Anthracene	Water		0.000012	<0.000010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Benzo(a)anthracene	Water		0.000018	<0.000010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Benzo(a)pyrene	Water		0.000015	<0.0000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Benzo(b,k)fluoranthene	Water			<0.000030	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Benzo(g,h,i)perylene	Water			<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Benzo(k)fluoranthene	Water			<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Chrysene	Water			<0.000020	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dibenz(a,h)anthracene	Water			<0.0000030	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Fluoranthene	Water		0.00004	<0.000020	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Fluorene	Water		0.003	<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Indeno(1,2,3-cd)pyrene	Water			<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Naphthalene	Water	0.001	0.0011	<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Phenanthrene	Water		0.0004	<0.000050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Pyrene	Water		0.000025	<0.000020	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Quinoline	Water		0.0034	<0.000020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Hardness (CaCO3)	Water			<0.50	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Aluminum (Al)	Water	0.1		<0.0030	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Antimony (Sb)	Water			<0.000050	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Arsenic (As)	Water	0.005	0.005	<0.0010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Barium (Ba)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Beryllium (Be)	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Bismuth (Bi)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Boron (B)	Water		1.5	<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Cadmium (Cd)	Water	0.00141		<0.000010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Calcium (Ca)	Water			<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Chromium (Cr)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Cobalt (Co)	Water	0.11		<0.000020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Copper (Cu)	Water	0.0009		<0.00020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Iron (Fe)	Water	0.35	0.3	<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Lead (Pb)	Water	0.003		<0.00020	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Lithium (Li)	Water			<0.0020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Magnesium (Mg)	Water			<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Manganese (Mn)	Water	0.605		<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Mercury (Hg)	Water		0.000026	<0.0000019	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Molybdenum (Mo)	Water	2	0.073	<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Nickel (Ni)	Water			<0.0010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Potassium (K)	Water			<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Selenium (Se)	Water		0.001	<0.00010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Silicon (Si)	Water			<0.10	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Silver (Ag)	Water	0.00155	0.00025	<0.000020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Sodium (Na)	Water			<0.150	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Dissolved Strontium (Sr)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Sulphur (S)	Water			<3.0	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Thallium (Tl)	Water		0.0008	<0.000010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Tin (Sn)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Titanium (Ti)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Uranium (U)	Water		0.015	<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Vanadium (V)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Zinc (Zn)	Water	0.187	0.03	<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Zirconium (Zr)	Water			<0.0010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Hardness (CaCO3)	Water			<0.50	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0988	C167191	Total Aluminum (Al)	Water			<0.0030	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Antimony (Sb)	Water			<0.000050	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Arsenic (As)	Water	0.005	0.005	<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Barium (Ba)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Beryllium (Be)	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Bismuth (Bi)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Boron (B)	Water		1.5	<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Cadmium (Cd)	Water			<0.000010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Calcium (Ca)	Water			<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Chromium (Cr)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Cobalt (Co)	Water	0.11		<0.00020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Copper (Cu)	Water	0.003		<0.00050	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Iron (Fe)	Water	1	0.3	<0.010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Lead (Pb)	Water	0.003		<0.00020	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Lithium (Li)	Water			<0.0020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Magnesium (Mg)	Water			<0.150	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Manganese (Mn)	Water	0.605		<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Mercury (Hg)	Water		0.000026	<0.0000019	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Molybdenum (Mo)	Water	2	0.073	<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Nickel (Ni)	Water			<0.0010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Potassium (K)	Water			<0.150	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Selenium (Se)	Water		0.001	<0.00010	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Silicon (Si)	Water			<0.10	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Silver (Ag)	Water	0.00155	0.00025	<0.000020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Sodium (Na)	Water			<0.150	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Total Strontium (Sr)	Water			<0.0010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Sulphur (S)	Water			<3.0	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Thallium (Tl)	Water		0.0008	<0.000010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Tin (Sn)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Titanium (Ti)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Uranium (U)	Water		0.015	<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Vanadium (V)	Water			<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Zinc (Zn)	Water	0.187	0.03	<0.0050	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Zirconium (Zr)	Water			<0.00010	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Nitrate plus Nitrite (N)	Water			<0.020	mg/L
S2-13SEP21-M	QUINSAM RIVER		AGES66	C169566	Total Sulphide	Water			<0.0018	mg/L
S2-13SEP21-M	QUINSAM RIVER		AGES66	C169566	Sulphide (as H2S)	Water			<0.0020	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Sulphate (SO4)	Water			<1.0	mg/L
TB-7SEP21-B	WATER WA QUINSAM RIVER		AF0987	C167191	Turbidity	Water			<10	NTU
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Organic Carbon (C)	Water			1.3	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Total Phosphorus (P)	Water			<0.0030	mg/L
75QR-15SEP21-R	QUINSAM RIVER		AGES69	C169566	Dissolved Organic Carbon (C)	Water			0.55	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	Dissolved Phosphorus (P)	Water			<0.0030	mg/L
WA-7SEP21-M	WATER WA QUINSAM RIVER		AF0985	C167191	1-Methylnaphthalene	Water			<0.150	ug/L
S2-13SEP21-M	QUINSAM RIVER		AGES66	C169566	Nitrite (N)	Water	0.25	0.06	<0.0050	mg/L
QRD03-14SEP21-M	QUINSAM RIVER		AGES67	C169566	Nitrate (N)	Water	32.8		<0.020	mg/L

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	BC Approved WQG - MAX
Criteria 2	CCME Water Aquatic Life - FW

Appendix A-1
Table 18
Exceedance Summary Table

Results

<i>Criteria Name</i>	<i>Sample ID</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Parameter</i>	<i>Criteria</i>	<i>Result</i>	<i>DL</i>	<i>Units</i>
BC Approved WQG - MAX	S2-13SEP21-M	AGE566	C169566	Total Arsenic (As)	0.005	0.0908	0.0001	mg/L
BC Approved WQG - MAX	S2-13SEP21-M	AGE566	C169566	Total Iron (Fe)	1	1.85	0.01	mg/L
BC Approved WQG - MAX	S2-13SEP21-M	AGE566	C169566	Dissolved Arsenic (As)	0.005	0.0375	0.0001	mg/L
CCME Water Aquatic Life - FW	S2-13SEP21-M	AGE566	C169566	Total Arsenic (As)	0.005	0.0908	0.0001	mg/L
CCME Water Aquatic Life - FW	S2-13SEP21-M	AGE566	C169566	Total Iron (Fe)	0.3	1.85	0.01	mg/L
CCME Water Aquatic Life - FW	S2-13SEP21-M	AGE566	C169566	Dissolved Arsenic (As)	0.005	0.0375	0.0001	mg/L
CCME Water Aquatic Life - FW	S2-13SEP21-M	AGE566	C169566	Dissolved Iron (Fe)	0.3	0.342	0.005	mg/L

Appendix A-1

Table 19
Summary of Analysis Dates

<i>Sample ID</i>	<i>Project</i>	<i>Site</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Date Sampled</i>	<i>Date Range: Extracted</i>	<i>Date Range: Analyzed</i>
WA-7SEP21-M	QUINSAM RIVER UPSTREAM	WA	AFO985	C167191	2021/09/07	2021/09/13 - 2021/09/17	2021/09/11 - 2021/09/20
WA-7SEP21-R	QUINSAM RIVER UPSTREAM	WA	AFO986	C167191	2021/09/07	2021/09/13 - 2021/09/17	2021/09/11 - 2021/09/20
TB-7SEP21-B	QUINSAM RIVER UPSTREAM	TRIP BLANK	AFO987	C167191	2021/09/07	2021/09/13 - 2021/09/15	2021/09/11 - 2021/09/15
FB-7SEP21-B	QUINSAM RIVER UPSTREAM	FIELD BLANK	AFO988	C167191	2021/09/07	2021/09/13 - 2021/09/15	2021/09/11 - 2021/09/15
QRD02-9SEP21-M	QUINSAM RIVER DOWNSTREAM	QRD02	AFO989	C167191	2021/09/09	2021/09/13 - 2021/09/17	2021/09/11 - 2021/09/20
S2-13SEP21-M	POTENTIAL SEEPAGE	S2	AGE566	C169566	2021/09/13	2021/09/20 - 2021/09/22	2021/09/17 - 2021/09/23
QRD03-14SEP21-M	QUINSAM RIVER DOWNSTREAM	QRD03	AGE567	C169566	2021/09/14	2021/09/20 - 2021/09/23	2021/09/17 - 2021/09/24
7SQR-15SEP21-M	QUINSAM RIVER DOWNSTREAM	7SQR	AGE568	C169566	2021/09/15	2021/09/20 - 2021/09/23	2021/09/17 - 2021/09/24
7SQR-15SEP21-R	QUINSAM RIVER DOWNSTREAM	7SQR	AGE569	C169566	2021/09/15	2021/09/20 - 2021/09/23	2021/09/17 - 2021/09/24

Appendix A-2
Table 1
Summary Sheet

Samples						Worksheets					
Site Description	EMS #	Description	Sample Collection Date	Bureau Veritas Job ID	Bureau Veritas Sample ID	Soil	PAHs - Sed	Metals - Soil	Physical Parameters - Soil	Others	Others
Iron River Upstream of Mine 242 Influence and 7-South Area 5 (IR6)	E297231	IRN06A	2020-09-03 12:00 AM	C063900	YJ9250		x	x	x		x
		IRN06B	2020-09-03 12:00 AM	C063900	YJ9251		x	x	x		x
		IRN06C	2020-09-03 12:00 AM	C063900	YJ9252		x	x	x		x
		IRN06D	2020-09-03 12:00 AM	C063900	YJ9253		x	x	x		x
		IRN06E	2020-09-03 12:00 AM	C063900	YJ9254		x	x	x		x
		IRN06E Lab-Dup	2020-09-03 12:00 AM	C063900	YJ9254		x	x	x		
		IRN06E Lab-Dup 2	2020-09-03 12:00 AM	C063900	YJ9254		x				
		IRN06E-SPLIT	2020-09-03 12:00 AM	C063900	YJ9255		x	x	x		x
		IRN06A	2020-09-03 12:00 AM	C063900	YK1353			x			x
		IRN06B	2020-09-03 12:00 AM	C063900	YK1354			x			x
		IRN06C	2020-09-03 12:00 AM	C063900	YK1359			x			x
		IRN06D	2020-09-03 12:00 AM	C063900	YK1360			x			x
		IRN06E	2020-09-03 12:00 AM	C063900	YK1361			x			x
		IRN06E-SPLIT	2020-09-03 12:00 AM	C063900	YK1362			x			x
		IRN06E-SPLIT Lab-Dup	2020-09-03 12:00 AM	C063900	YK1362			x			x
		IRN08A	2020-09-02 12:00 AM	C063900	YJ9256		x	x	x		x
		IRN08B	2020-09-02 12:00 AM	C063900	YJ9257		x	x	x		x
Iron River Downstream of 242 Influence and 7-South Area 5 (IR8)	E297232	IRN08B Lab-Dup	2020-09-02 12:00 AM	C063900	YJ9257				x		x
		IRN08C	2020-09-02 12:00 AM	C063900	YJ9258		x	x	x		x
		IRN08D	2020-09-02 12:00 AM	C063900	YJ9259		x	x	x		x
		IRN08E	2020-09-02 12:00 AM	C063900	YJ9260		x	x	x		x
		IRN08A	2020-09-02 12:00 AM	C063900	YK1363			x			x
		IRN08B	2020-09-02 12:00 AM	C063900	YK1364			x			x
		IRN08B Lab-Dup	2020-09-02 12:00 AM	C063900	YK1364						x
		IRN08C	2020-09-02 12:00 AM	C063900	YK1365			x			x
		IRN08D	2020-09-02 12:00 AM	C063900	YK1366			x			x
		IRN08E	2020-09-02 12:00 AM	C063900	YK1367			x			x

Appendix A-2
Table 2
PAHs - Sediment_Soils

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID				
					Bureau Veritas Job ID / Sample ID				
					Sample Collection Date				
					Sample Collection Time				
					IRN08A	IRN08B	IRN08C	IRN08D	IRN08E
					C063900 / YJ9256	C063900 / YJ9257	C063900 / YJ9258	C063900 / YJ9259	C063900 / YJ9260
					2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02
Moisture			%	0.30	21	20	22	17	19
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010	0.073	0.12	0.063	0.036	0.028
High Molecular Weight PAH's			mg/kg	0.0010	0.0081	0.011	0.0085	<0.0010	0.0011
Total PAH			mg/kg	0.0010	0.081	0.13	0.072	0.036	0.03
2-Methylnaphthalene	0.201	0.0202	mg/kg	0.0010	0.033	0.059	0.027	0.017	0.012
Acenaphthene	0.0889	0.00671	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Acenaphthylene	0.128	0.00587	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.245	0.0469	mg/kg	0.0010	0.0013	0.0018	<0.0010	<0.0010	<0.0010
Benzo(a)anthracene	0.385	0.0317	mg/kg	0.0010	0.0017	0.0023	0.0015	<0.0010	<0.0010
Benzo(a)pyrene	0.782	0.0319	mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(g,h,i)perylene			mg/kg	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010	<0.0010	0.0011	0.001	<0.0010	<0.0010
Chrysene	0.862	0.0571	mg/kg	0.0010	0.0024	0.0034	0.0028	<0.0010	0.0011
Dibenz(a,h)anthracene	0.135	0.00622	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	2.355	0.111	mg/kg	0.0010	0.0019	0.0028	0.0021	<0.0010	<0.0010
Fluorene	0.144	0.0212	mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.391	0.0346	mg/kg	0.0010	0.02	0.033	0.022	0.012	0.009
Phenanthrene	0.515	0.0419	mg/kg	0.0010	0.019	0.028	0.015	0.0062	0.0069
Pyrene	0.875	0.053	mg/kg	0.0010	0.0022	0.003	0.0021	<0.0010	<0.0010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Appendix A-2
Table 3
PAHs - Sediment_Soils

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID							
					Bureau Veritas Job ID / Sample ID							
					Sample Collection Date							
					Sample Collection Time							
					IRN06A	IRN06B	IRN06C	IRN06D	IRN06E	IRN06E Lab-Dup	IRN06E Lab-Dup 2	IRN06E-SPLIT
					C063900 / YJ9250	C063900 / YJ9251	C063900 / YJ9252	C063900 / YJ9253	C063900 / YJ9254	C063900 / YJ9254	C063900 / YJ9254	C063900 / YJ9255
					2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03
Moisture			%	0.30	19	19	16	20	17	17	-	11
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010	0.088	0.036	0.017	0.048	0.071	-	-	0.077
High Molecular Weight PAH's			mg/kg	0.0010	0.0068	0.0041	<0.0010	0.0066	0.011	-	-	0.011
Total PAH			mg/kg	0.0010	0.095	0.04	0.017	0.054	0.082	-	-	0.088
2-Methylnaphthalene	0.201	0.0202	mg/kg	0.0010	0.036	0.015	0.0069	0.02	0.027	0.023	0.021	0.032
Acenaphthene	0.0889	0.00671	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Acenaphthylene	0.128	0.00587	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.245	0.0469	mg/kg	0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010
Benzo(a)anthracene	0.385	0.0317	mg/kg	0.0010	0.0014	<0.0010	<0.0010	0.0013	0.0022	0.0016	0.0018	0.0024
Benzo(a)pyrene	0.782	0.0319	mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(g,h,i)perylene			mg/kg	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Chrysene	0.862	0.0571	mg/kg	0.0010	0.0018	0.0016	<0.0010	0.0023	0.0035	0.0022	0.0029	0.0035
Dibenz(a,h)anthracene	0.135	0.00622	mg/kg	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	2.355	0.111	mg/kg	0.0010	0.002	0.0012	<0.0010	0.0016	0.0024	0.0022	0.002	0.0025
Fluorene	0.144	0.0212	mg/kg	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.391	0.0346	mg/kg	0.0010	0.038	0.01	0.0054	0.016	0.019	0.017	0.016	0.024
Phenanthrene	0.515	0.0419	mg/kg	0.0010	0.014	0.01	0.0049	0.011	0.024	0.016	0.016	0.021
Pyrene	0.875	0.053	mg/kg	0.0010	0.0016	0.0012	<0.0010	0.0015	0.0028	0.0019	0.002	0.0027

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Appendix A-2
Table 4
Metals - Soil

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID					Sample ID						
					Bureau Veritas Job ID / Sample ID					Bureau Veritas Job ID / Sample ID						
					Sample Collection Date					Sample Collection Date						
					IRN08A C063900 / YK1363 2020-09-02	IRN08B C063900 / YK1364 2020-09-02	IRN08C C063900 / YK1365 2020-09-02	IRN08D C063900 / YK1366 2020-09-02	IRN08E C063900 / YK1367 2020-09-02	IRN06A C063900 / YK1353 2020-09-03	IRN06B C063900 / YK1354 2020-09-03	IRN06C C063900 / YK1359 2020-09-03	IRN06D C063900 / YK1360 2020-09-03	IRN06E C063900 / YK1361 2020-09-03	IRN06E-SPLIT C063900 / YK1362 2020-09-03	IRN06E-SPLIT Lab-Dup C063900 / YK1362 2020-09-03
Moisture			%	0.30	-	-	-	-	-	-	-	-	-	-	-	-
Soluble (2:1) pH			pH		-	-	-	-	-	-	-	-	-	-	-	-
Total Aluminum (Al)			mg/kg	100	25600	24500	25000	23300	22600	23200	26000	25400	23800	23200	23700	23500
Total Antimony (Sb)			mg/kg	0.10	1.07	0.76	0.72	0.7	0.91	0.66	0.43	0.49	0.88	0.98	1.36	1.37
Total Arsenic (As)	17	5.9	mg/kg	0.20	87.4	68.9	71	61.4	72	48.6	38.2	36.2	71.7	98.1	118	122
Total Barium (Ba)			mg/kg	0.10	128	139	136	168	158	109	97.8	117	151	131	148	154
Total Beryllium (Be)			mg/kg	0.20	0.56	0.53	0.54	0.48	0.47	0.49	0.51	0.51	0.58	0.56	0.61	0.62
Total Bismuth (Bi)			mg/kg	0.10	0.12	0.14	0.12	0.14	0.13	0.11	<0.10	<0.10	<0.10	<0.10	0.11	0.12
Total Cadmium (Cd)	3.5	0.6	mg/kg	0.050	1.71	1.38	1.41	1.31	1.27	1.38	1.36	1.27	1.36	1.26	1.33	1.38
Total Calcium (Ca)			mg/kg	100	11500	10900	10800	12700	11400	10400	10700	11600	9590	9140	9330	9700
Total Chromium (Cr)	90	37.3	mg/kg	0.50	48.3	87.6	66.9	44.3	43.2	64	52	55.1	73.7	42.7	44.5	48.3
Total Cobalt (Co)			mg/kg	0.10	25.5	25	24.9	23.4	23.7	24.1	25.1	25.1	25.9	25.1	25.7	27.4
Total Copper (Cu)	197	35.7	mg/kg	0.50	84.6	82.5	78.6	87.4	85.9	71.5	71.4	79.1	67.8	59.9	63.9	66.1
Total Iron (Fe)			mg/kg	100	62600	62100	61300	63500	62000	63300	63600	64000	64700	60100	61900	65200
Total Lead (Pb)	91.3	35	mg/kg	0.10	5.29	5.43	5.51	4.43	4.34	6.97	4.52	6.49	7.66	5.09	5.44	5.69
Total Lithium (Li)			mg/kg	0.50	15.8	14.5	14.4	13.3	13.7	12.7	13.4	13.7	15.4	16.1	16.9	17.1
Total Magnesium (Mg)			mg/kg	100	7830	7890	7920	7860	7590	8770	10600	10600	7800	7140	6840	7170
Total Manganese (Mn)			mg/kg	0.20	1170	1160	1190	1100	1090	1110	1140	1120	1180	1130	1250	1340
Total Mercury (Hg)	0.486	0.17	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-
Total Molybdenum (Mo)			mg/kg	0.10	2.85	2.74	2.39	2.12	1.95	2.33	1.68	1.83	4.45	3.77	4.28	4.44
Total Nickel (Ni)			mg/kg	0.50	43	69.3	55.6	40	39.7	53.1	45.2	48.8	59.2	39.1	40.9	44
Total Phosphorus (P)			mg/kg	10	779	697	637	706	663	686	805	806	630	613	630	645
Total Potassium (K)			mg/kg	100	1010	1020	1060	897	877	921	899	894	1110	1100	1140	1120
Total Selenium (Se)			mg/kg	0.50	2.23	1.58	1.57	1.9	1.59	1.25	1.07	1.23	1.36	1.19	1.4	1.45
Total Silver (Ag)			mg/kg	0.050	0.1	0.09	0.076	0.084	0.08	0.087	0.07	0.09	0.083	0.071	0.076	0.075
Total Sodium (Na)			mg/kg	100	442	404	438	442	371	501	463	491	357	373	339	349
Total Strontium (Sr)			mg/kg	0.10	82.8	74.3	72.2	69.3	66.4	68.8	68.5	72.6	64.8	65	66.9	69.3
Total Thallium (Tl)			mg/kg	0.050	0.183	0.169	0.164	0.137	0.144	0.153	0.132	0.133	0.168	0.183	0.206	0.209
Total Tin (Sn)			mg/kg	0.10	0.67	0.55	0.53	0.5	0.49	2.53	1.37	0.56	0.69	0.68	0.58	0.56
Total Titanium (Ti)			mg/kg	1.0	775	703	730	879	845	700	910	1010	573	604	549	519
Total Uranium (U)			mg/kg	0.050	1.07	0.946	0.825	0.794	0.804	0.84	0.713	0.659	0.785	0.759	0.791	0.854
Total Vanadium (V)			mg/kg	1.0	155	144	145	147	142	144	148	148	151	145	149	155
Total Zinc (Zn)	315	123	mg/kg	1.0	132	126	127	111	116	139	127	133	124	119	122	128
Total Zirconium (Zr)			mg/kg	0.50	3.49	4.2	4.15	3.88	5.64	6.11	6.99	7.96	5.48	5.09	4.73	5.4

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Appendix A-2
Table 5
Physical Parameters - Soil

Parameter	Criteria ¹	Criteria ²	Units	RDL	Sample ID												
					Bureau Veritas Job ID / Sample ID												
					Sample Collection Date												
					Sample Collection Time												
					IRN08A C063900 / YJ9256 2020-09-02	IRN08B C063900 / YJ9257 2020-09-02	IRN08B Lab-Dup C063900 / YJ9257 2020-09-02	IRN08C C063900 / YJ9258 2020-09-02	IRN08D C063900 / YJ9259 2020-09-02	IRN08E C063900 / YJ9260 2020-09-02	IRN06A C063900 / YJ9250 2020-09-03	IRN06B C063900 / YJ9251 2020-09-03	IRN06C C063900 / YJ9252 2020-09-03	IRN06D C063900 / YJ9253 2020-09-03	IRN06E C063900 / YJ9254 2020-09-03	IRN06E Lab-Dup C063900 / YJ9254 2020-09-03	IRN06E-SPLIT C063900 / YJ9255 2020-09-03
% sand by hydrometer			%	2.0	96	98	98	98	98	98	97	97	99	99	99	-	96
% silt by hydrometer			%	2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0
Clay Content			%	2.0	<2.0	2	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	2.6
Moisture			%	0.30	21	20	-	22	17	19	19	19	16	20	17	17	11
Soluble (2:1) pH			pH		7.54	7.41		7.33	7.35	7.33	7.69	7.58	7.54	7.36	7.44	7.39	7.46

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Appendix A-2
Table 6
Others

Parameter	Criteria ²	Criteria ²	Units	RDL	Sample ID																											
					Bureau Veritas Job ID / Sample ID																											
					Sample Collection Date																											
					Sample Collection Time																											
					IRN08A	IRN08B	IRN08B Lab-Dup	IRN08C	IRN08D	IRN08E	IRN08A	IRN08B	IRN08B Lab-Dup	IRN08C	IRN08D	IRN08E	IRN06A	IRN06B	IRN06C	IRN06D	IRN06E	IRN06E-SPLIT	IRN06A	IRN06B	IRN06C	IRN06D	IRN06E	IRN06E-SPLIT	IRN06E-SPLIT Lab-Dup			
C063900 / YJ9256	C063900 / YJ9257	C063900 / YJ9257	C063900 / YJ9258	C063900 / YJ9259	C063900 / YJ9260	C063900 / YK1363	C063900 / YK1364	C063900 / YK1364	C063900 / YK1365	C063900 / YK1366	C063900 / YK1367	C063900 / YJ9250	C063900 / YJ9251	C063900 / YJ9252	C063900 / YJ9253	C063900 / YJ9254	C063900 / YJ9255	C063900 / YK1353	C063900 / YK1354	C063900 / YK1359	C063900 / YK1360	C063900 / YK1361	C063900 / YK1362	C063900 / YK1362								
2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-02	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03	2020-09-03								
Others																																
Total Sulphur (S)			%	0.06	0.08	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	-	-	-	-	<0.06	0.07	<0.06	<0.06	<0.06	<0.06	-	-	-	-	-	-	-			
Total Mercury (Hg)	0.486	0.17	mg/kg	0.01	-	-	-	-	-	-	0.018	0.022	-	0.018	0.016	0.016	-	-	-	-	-	0.018	0.011	0.012	0.019	0.016	0.016	-				
Total Boron (B)			mg/kg	1	-	-	-	-	-	-	14.5	14.8	-	13.9	13	10.9	-	-	-	-	-	12.1	11.7	10.9	15.9	16.6	17.5	16.5				
Total Tungsten (W)			mg/kg	0.5	-	-	-	-	-	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	-	-	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50				
Total Organic Carbon (C)			%	0.050 - 0.064	-	-	-	-	-	-	3.5	1.4	1.4	0.32	1.9	1.9	-	-	-	-	-	-	1.4	0.64	0.67	1.1	1.5	1.6	-			

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Appendix A-2
Table 7

Maximum Values Summary Table

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
IRN08C	BASELINE SEDIMENT IR IRON RIVER		YJ9258	C063900	Moisture	Sediment			22	%
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Index of Additive Cancer Risk(IARC)	Sediment			<0.10	N/A
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Low Molecular Weight PAH's	Sediment			0.12	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	High Molecular Weight PAH's	Sediment			0.011	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Total PAH	Sediment			0.13	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	2-Methylnaphthalene	Sediment	0.201	0.0202	0.059	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Acenaphthene	Sediment	0.0889	0.00671	<0.00050	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Acenaphthylene	Sediment	0.128	0.00587	<0.00050	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Anthracene	Sediment	0.245	0.0469	0.0018	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Benzo(a)anthracene	Sediment	0.385	0.0317	0.0024	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Benzo(a)pyrene	Sediment	0.782	0.0319	<0.0010	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Benzo(g,h,i)perylene	Sediment			<0.0020	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Benzo(k)fluoranthene	Sediment			<0.0010	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Benzo(b&j)fluoranthene	Sediment			0.0011	mg/kg
IRN06E	BASELINE SEDIMENT IR IRON RIVER		YJ9254	C063900	Chrysene	Sediment	0.862	0.0571	0.0035	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Dibenz(a,h)anthracene	Sediment	0.135	0.00622	<0.00050	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Fluoranthene	Sediment	2.355	0.111	0.0028	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Fluorene	Sediment	0.144	0.0212	<0.0010	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Indeno(1,2,3-cd)pyrene	Sediment			<0.0020	mg/kg
IRN06A	BASELINE SEDIMENT IR IRON RIVER		YJ9250	C063900	Naphthalene	Sediment	0.391	0.0346	0.038	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Phenanthrene	Sediment	0.515	0.0419	0.0028	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YJ9257	C063900	Pyrene	Sediment	0.875	0.053	0.003	mg/kg
IRN08C	BASELINE SEDIMENT IR IRON RIVER		YJ9258	C063900	Moisture	Sediment			22	%
IRN06A	BASELINE SEDIMENT IR IRON RIVER		YJ9250	C063900	Soluble (2:1) pH	Sediment			7.69	pH
IRN06B	BASELINE SEDIMENT IR IRON RIVER		YK1354	C063900	Total Aluminum (Al)	Sediment			26000	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Antimony (Sb)	Sediment			1.37	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Arsenic (As)	Sediment	17	5.9	122	mg/kg
IRN08D	BASELINE SEDIMENT IR IRON RIVER		YK1366	C063900	Total Barium (Ba)	Sediment			168	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Beryllium (Be)	Sediment			0.62	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YK1364	C063900	Total Bismuth (Bi)	Sediment			0.14	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Cadmium (Cd)	Sediment	3.5	0.6	1.71	mg/kg
IRN08D	BASELINE SEDIMENT IR IRON RIVER		YK1366	C063900	Total Calcium (Ca)	Sediment			12700	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YK1364	C063900	Total Chromium (Cr)	Sediment	90	37.3	87.6	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Cobalt (Co)	Sediment			27.4	mg/kg
IRN08D	BASELINE SEDIMENT IR IRON RIVER		YK1366	C063900	Total Copper (Cu)	Sediment	197	35.7	87.4	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Iron (Fe)	Sediment			65200	mg/kg
IRN06D	BASELINE SEDIMENT IR IRON RIVER		YK1360	C063900	Total Lead (Pb)	Sediment	91.3	35	7.66	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Lithium (Li)	Sediment			17.1	mg/kg
IRN06B	BASELINE SEDIMENT IR IRON RIVER		YK1354	C063900	Total Magnesium (Mg)	Sediment			10600	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Manganese (Mn)	Sediment			1340	mg/kg
IRN06D	BASELINE SEDIMENT IR IRON RIVER		YK1360	C063900	Total Molybdenum (Mo)	Sediment			4.45	mg/kg
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YK1364	C063900	Total Nickel (Ni)	Sediment			69.3	mg/kg
IRN06C	BASELINE SEDIMENT IR IRON RIVER		YK1359	C063900	Total Phosphorus (P)	Sediment			806	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Potassium (K)	Sediment			1140	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Selenium (Se)	Sediment			2.23	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Silver (Ag)	Sediment			0.1	mg/kg
IRN06A	BASELINE SEDIMENT IR IRON RIVER		YK1353	C063900	Total Sodium (Na)	Sediment			501	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Strontium (Sr)	Sediment			82.8	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Thallium (Tl)	Sediment			0.209	mg/kg
IRN06A	BASELINE SEDIMENT IR IRON RIVER		YK1353	C063900	Total Tin (Sn)	Sediment			2.53	mg/kg
IRN06C	BASELINE SEDIMENT IR IRON RIVER		YK1359	C063900	Total Titanium (Ti)	Sediment			1010	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Uranium (U)	Sediment			1.07	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Vanadium (V)	Sediment			155	mg/kg
IRN06A	BASELINE SEDIMENT IR IRON RIVER		YK1353	C063900	Total Zinc (Zn)	Sediment	315	123	139	mg/kg
IRN06C	BASELINE SEDIMENT IR IRON RIVER		YK1359	C063900	Total Zirconium (Zr)	Sediment			7.96	mg/kg
IRN06C	BASELINE SEDIMENT IR IRON RIVER		YJ9252	C063900	% sand by hydrometer	Sediment			99	%
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YJ9256	C063900	% silt by hydrometer	Sediment			2.4	%
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YJ9255	C063900	Clay Content	Sediment			2.6	%
IRN08C	BASELINE SEDIMENT IR IRON RIVER		YJ9258	C063900	Moisture	Sediment			22	%
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YJ9256	C063900	Total Sulphur (S)	Sediment			0.08	%
IRN08B	BASELINE SEDIMENT IR IRON RIVER		YK1364	C063900	Total Mercury (Hg)	Sediment	0.486	0.17	0.022	mg/kg
IRN06E-SPLIT	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Boron (B)	Sediment			17.5	mg/kg
IRN06E-SPLIT Lab-Dup	BASELINE SEDIMENT IR IRON RIVER		YK1362	C063900	Total Tungsten (W)	Sediment			<0.50	mg/kg
IRN08A	BASELINE SEDIMENT IR IRON RIVER		YK1363	C063900	Total Organic Carbon (C)	Sediment			3.5	%

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality-FW

Appendix A-2

Table 8

Minimum Values Summary Table

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
IRN06E-SPLIT	BASLINE SEDIMENT IRI IRON RIVER		YJ9255	C063900	Moisture	Sediment			11	%
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Index of Additive Cancer Risk(IARC)	Sediment			<0.10	N/A
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YJ9252	C063900	Low Molecular Weight PAH's	Sediment			0.017	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YJ9259	C063900	High Molecular Weight PAH's	Sediment			<0.0010	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YJ9252	C063900	Total PAH	Sediment			0.017	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YJ9252	C063900	2-Methylnaphthalene	Sediment	0.201	0.0202	0.0069	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Acenaphthene	Sediment	0.0889	0.00671	<0.00050	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Acenaphthylene	Sediment	0.128	0.00587	<0.00050	mg/kg
IRN08C	BASLINE SEDIMENT IRI IRON RIVER		YJ9258	C063900	Anthracene	Sediment	0.245	0.0469	<0.0010	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YJ9259	C063900	Benzo(a)anthracene	Sediment	0.385	0.0317	<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Benzo(a)pyrene	Sediment	0.782	0.0319	<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Benzo(g,h,i)perylene	Sediment			<0.0020	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Benzo(k)fluoranthene	Sediment			<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Benzo(b&j)fluoranthene	Sediment			<0.0010	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YJ9259	C063900	Chrysene	Sediment	0.862	0.0571	<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Dibenz(a,h)anthracene	Sediment	0.135	0.00622	<0.00050	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YJ9259	C063900	Fluoranthene	Sediment	2.355	0.111	<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Fluorene	Sediment	0.144	0.0212	<0.0010	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Indeno(1,2,3-cd)pyrene	Sediment			<0.0020	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YJ9252	C063900	Naphthalene	Sediment	0.391	0.0346	0.0054	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YJ9252	C063900	Phenanthrene	Sediment	0.515	0.0419	0.0049	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YJ9259	C063900	Pyrene	Sediment	0.875	0.053	<0.0010	mg/kg
IRN06E-SPLIT	BASLINE SEDIMENT IRI IRON RIVER		YJ9255	C063900	Moisture	Sediment			11	%
IRN08C	BASLINE SEDIMENT IRI IRON RIVER		YJ9258	C063900	Soluble (2:1) pH	Sediment			7.33	pH
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Aluminum (Al)	Sediment			22600	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Antimony (Sb)	Sediment			0.43	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YK1359	C063900	Total Arsenic (As)	Sediment	17	5.9	36.2	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Barium (Ba)	Sediment			97.8	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Beryllium (Be)	Sediment			0.47	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Bismuth (Bi)	Sediment			<0.10	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Cadmium (Cd)	Sediment	3.5	0.6	1.26	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Calcium (Ca)	Sediment			9140	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Chromium (Cr)	Sediment	90	37.3	42.7	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YK1366	C063900	Total Cobalt (Co)	Sediment			23.4	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Copper (Cu)	Sediment	197	35.7	59.9	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Iron (Fe)	Sediment			60100	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Lead (Pb)	Sediment	91.3	35	4.34	mg/kg
IRN06A	BASLINE SEDIMENT IRI IRON RIVER		YK1353	C063900	Total Lithium (Li)	Sediment			12.7	mg/kg
IRN06E-SPLIT	BASLINE SEDIMENT IRI IRON RIVER		YK1362	C063900	Total Magnesium (Mg)	Sediment			6840	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Manganese (Mn)	Sediment			1090	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Molybdenum (Mo)	Sediment			1.68	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Nickel (Ni)	Sediment			39.1	mg/kg
IRN06E	BASLINE SEDIMENT IRI IRON RIVER		YK1361	C063900	Total Phosphorus (P)	Sediment			613	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Potassium (K)	Sediment			877	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Selenium (Se)	Sediment			1.07	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Silver (Ag)	Sediment			0.07	mg/kg
IRN06E-SPLIT	BASLINE SEDIMENT IRI IRON RIVER		YK1362	C063900	Total Sodium (Na)	Sediment			339	mg/kg
IRN06D	BASLINE SEDIMENT IRI IRON RIVER		YK1360	C063900	Total Strontium (Sr)	Sediment			64.8	mg/kg
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Thallium (Tl)	Sediment			0.132	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Tin (Sn)	Sediment			0.49	mg/kg
IRN06E-SPLIT Lab-Dup	BASLINE SEDIMENT IRI IRON RIVER		YK1362	C063900	Total Titanium (Ti)	Sediment			519	mg/kg
IRN06C	BASLINE SEDIMENT IRI IRON RIVER		YK1359	C063900	Total Uranium (U)	Sediment			0.659	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Vanadium (V)	Sediment			142	mg/kg
IRN08D	BASLINE SEDIMENT IRI IRON RIVER		YK1366	C063900	Total Zinc (Zn)	Sediment	315	123	111	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YK1363	C063900	Total Zirconium (Zr)	Sediment			3.49	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	% sand by hydrometer	Sediment			96	%
IRN08B	BASLINE SEDIMENT IRI IRON RIVER		YJ9257	C063900	% silt by hydrometer	Sediment			<2.0	%
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YJ9256	C063900	Clay Content	Sediment			<2.0	%
IRN06E-SPLIT	BASLINE SEDIMENT IRI IRON RIVER		YJ9255	C063900	Moisture	Sediment			11	%
IRN08B	BASLINE SEDIMENT IRI IRON RIVER		YJ9257	C063900	Total Sulphur (S)	Sediment			<0.06	%
IRN06B	BASLINE SEDIMENT IRI IRON RIVER		YK1354	C063900	Total Mercury (Hg)	Sediment	0.486	0.17	0.011	mg/kg
IRN08E	BASLINE SEDIMENT IRI IRON RIVER		YK1367	C063900	Total Boron (B)	Sediment			10.9	mg/kg
IRN08A	BASLINE SEDIMENT IRI IRON RIVER		YK1363	C063900	Total Tungsten (W)	Sediment			<0.50	mg/kg
IRN08C	BASLINE SEDIMENT IRI IRON RIVER		YK1365	C063900	Total Organic Carbon (C)	Sediment			0.32	%

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality-PEL
Criteria 2	CCME Sediment Quality -FW

Exceedance Summary Table
Results

	<i>Criteria Name</i>	<i>Sample ID</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Parameter</i>	<i>Criteria</i>	<i>Result</i>	<i>DL</i>	<i>Units</i>
	CCME Sediment Quality-PEL	IRN06A	YK1353	C063900	Total Arsenic (As)	17	48.6	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06B	YK1354	C063900	Total Arsenic (As)	17	38.2	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06C	YK1359	C063900	Total Arsenic (As)	17	36.2	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06D	YK1360	C063900	Total Arsenic (As)	17	71.7	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06E	YK1361	C063900	Total Arsenic (As)	17	98.1	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06E-SPLIT	YK1362	C063900	Total Arsenic (As)	17	118	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Arsenic (As)	17	122	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN08A	YK1363	C063900	Total Arsenic (As)	17	87.4	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN08B	YK1364	C063900	Total Arsenic (As)	17	68.9	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN08C	YK1365	C063900	Total Arsenic (As)	17	71	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN08D	YK1366	C063900	Total Arsenic (As)	17	61.4	0.2	mg/kg
	CCME Sediment Quality-PEL	IRN08E	YK1367	C063900	Total Arsenic (As)	17	72	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06A	YJ9250	C063900	Naphthalene	0.0346	0.038	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06A	YJ9250	C063900	2-Methylnaphthalene	0.0202	0.036	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06E Lab-Dup 2	YJ9254	C063900	2-Methylnaphthalene	0.0202	0.021	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06E Lab-Dup	YJ9254	C063900	2-Methylnaphthalene	0.0202	0.023	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06E	YJ9254	C063900	2-Methylnaphthalene	0.0202	0.027	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT	YJ9255	C063900	2-Methylnaphthalene	0.0202	0.032	0.001	mg/kg
	CCME Sediment Quality -FW	IRN08A	YJ9256	C063900	2-Methylnaphthalene	0.0202	0.033	0.001	mg/kg
	CCME Sediment Quality -FW	IRN08B	YJ9257	C063900	2-Methylnaphthalene	0.0202	0.059	0.001	mg/kg
	CCME Sediment Quality -FW	IRN08C	YJ9258	C063900	2-Methylnaphthalene	0.0202	0.027	0.001	mg/kg
	CCME Sediment Quality -FW	IRN06A	YK1353	C063900	Total Arsenic (As)	5.9	48.6	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06A	YK1353	C063900	Total Cadmium (Cd)	0.6	1.38	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06A	YK1353	C063900	Total Chromium (Cr)	37.3	64	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06A	YK1353	C063900	Total Copper (Cu)	35.7	71.5	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06A	YK1353	C063900	Total Zinc (Zn)	123	139	1	mg/kg
	CCME Sediment Quality -FW	IRN06B	YK1354	C063900	Total Arsenic (As)	5.9	38.2	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06B	YK1354	C063900	Total Cadmium (Cd)	0.6	1.36	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06B	YK1354	C063900	Total Chromium (Cr)	37.3	52	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06B	YK1354	C063900	Total Copper (Cu)	35.7	71.4	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06B	YK1354	C063900	Total Zinc (Zn)	123	127	1	mg/kg
	CCME Sediment Quality -FW	IRN06C	YK1359	C063900	Total Arsenic (As)	5.9	36.2	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06C	YK1359	C063900	Total Cadmium (Cd)	0.6	1.36	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06C	YK1359	C063900	Total Chromium (Cr)	37.3	55.1	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06C	YK1359	C063900	Total Copper (Cu)	35.7	79.1	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06C	YK1359	C063900	Total Zinc (Zn)	123	133	1	mg/kg

Exceedance Summary Table
Results

	<i>Criteria Name</i>	<i>Sample ID</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Parameter</i>	<i>Criteria</i>	<i>Result</i>	<i>DL</i>	<i>Units</i>
	CCME Sediment Quality -FW	IRN06D	YK1360	C063900	Total Arsenic (As)	5.9	71.7	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06D	YK1360	C063900	Total Cadmium (Cd)	0.6	1.29	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06D	YK1360	C063900	Total Chromium (Cr)	37.3	73.7	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06D	YK1360	C063900	Total Copper (Cu)	35.7	67.8	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06D	YK1360	C063900	Total Zinc (Zn)	123	124	1	mg/kg
	CCME Sediment Quality -FW	IRN06E	YK1361	C063900	Total Arsenic (As)	5.9	98.1	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06E	YK1361	C063900	Total Cadmium (Cd)	0.6	1.26	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06E	YK1361	C063900	Total Chromium (Cr)	37.3	42.7	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E	YK1361	C063900	Total Copper (Cu)	35.7	59.9	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT	YK1362	C063900	Total Arsenic (As)	5.9	118	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Arsenic (As)	5.9	122	0.2	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT	YK1362	C063900	Total Cadmium (Cd)	0.6	1.33	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Cadmium (Cd)	0.6	1.38	0.05	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT	YK1362	C063900	Total Chromium (Cr)	37.3	44.5	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Chromium (Cr)	37.3	48.3	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT	YK1362	C063900	Total Copper (Cu)	35.7	63.9	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Copper (Cu)	35.7	66.1	0.5	mg/kg
	CCME Sediment Quality -FW	IRN06E-SPLIT Lab-Dup	YK1362	C063900	Total Zinc (Zn)	123	128	1	mg/kg
	CCME Sediment Quality -FW	IRN08A	YK1363	C063900	Total Arsenic (As)	5.9	87.4	0.2	mg/kg
	CCME Sediment Quality -FW	IRN08A	YK1363	C063900	Total Cadmium (Cd)	0.6	1.71	0.05	mg/kg
	CCME Sediment Quality -FW	IRN08A	YK1363	C063900	Total Chromium (Cr)	37.3	48.3	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08A	YK1363	C063900	Total Copper (Cu)	35.7	84.6	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08A	YK1363	C063900	Total Zinc (Zn)	123	132	1	mg/kg
	CCME Sediment Quality -FW	IRN08B	YK1364	C063900	Total Arsenic (As)	5.9	68.9	0.2	mg/kg
	CCME Sediment Quality -FW	IRN08B	YK1364	C063900	Total Cadmium (Cd)	0.6	1.38	0.05	mg/kg
	CCME Sediment Quality -FW	IRN08B	YK1364	C063900	Total Chromium (Cr)	37.3	87.6	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08B	YK1364	C063900	Total Copper (Cu)	35.7	82.5	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08B	YK1364	C063900	Total Zinc (Zn)	123	126	1	mg/kg
	CCME Sediment Quality -FW	IRN08C	YK1365	C063900	Total Arsenic (As)	5.9	71	0.2	mg/kg
	CCME Sediment Quality -FW	IRN08C	YK1365	C063900	Total Cadmium (Cd)	0.6	1.41	0.05	mg/kg
	CCME Sediment Quality -FW	IRN08C	YK1365	C063900	Total Chromium (Cr)	37.3	66.9	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08C	YK1365	C063900	Total Copper (Cu)	35.7	78.6	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08C	YK1365	C063900	Total Zinc (Zn)	123	127	1	mg/kg
	CCME Sediment Quality -FW	IRN08D	YK1366	C063900	Total Arsenic (As)	5.9	61.4	0.2	mg/kg
	CCME Sediment Quality -FW	IRN08D	YK1366	C063900	Total Cadmium (Cd)	0.6	1.31	0.05	mg/kg
	CCME Sediment Quality -FW	IRN08D	YK1366	C063900	Total Chromium (Cr)	37.3	44.3	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08D	YK1366	C063900	Total Copper (Cu)	35.7	87.4	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08E	YK1367	C063900	Total Arsenic (As)	5.9	72	0.2	mg/kg
	CCME Sediment Quality -FW	IRN08E	YK1367	C063900	Total Cadmium (Cd)	0.6	1.27	0.05	mg/kg
	CCME Sediment Quality -FW	IRN08E	YK1367	C063900	Total Chromium (Cr)	37.3	43.2	0.5	mg/kg
	CCME Sediment Quality -FW	IRN08E	YK1367	C063900	Total Copper (Cu)	35.7	85.9	0.5	mg/kg

Appendix A-2
Table 11
Summary of Analysis Dates

<i>Sample ID</i>	<i>Project</i>	<i>Site</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Date Sampled</i>	<i>Date Range: Extracted</i>	<i>Date Range: Analyzed</i>
IRN06A	BASLINE SEDIMENT IRON RIVER	IR6	YJ9250	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06B	BASLINE SEDIMENT IRON RIVER	IR6	YJ9251	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06C	BASLINE SEDIMENT IRON RIVER	IR6	YJ9252	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06D	BASLINE SEDIMENT IRON RIVER	IR6	YJ9253	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06E	BASLINE SEDIMENT IRON RIVER	IR6	YJ9254	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06E-SPLIT	BASLINE SEDIMENT IRON RIVER	IR6	YJ9255	C063900	2020/09/03	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN06A	BASLINE SEDIMENT IRON RIVER	IR6	YK1353	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN06B	BASLINE SEDIMENT IRON RIVER	IR6	YK1354	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN06C	BASLINE SEDIMENT IRON RIVER	IR6	YK1359	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN06D	BASLINE SEDIMENT IRON RIVER	IR6	YK1360	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN06E	BASLINE SEDIMENT IRON RIVER	IR6	YK1361	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN06E-SPLIT	BASLINE SEDIMENT IRON RIVER	IR6	YK1362	C063900	2020/09/03	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN08A	BASLINE SEDIMENT IRON RIVER	IR8	YJ9256	C063900	2020/09/02	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN08B	BASLINE SEDIMENT IRON RIVER	IR8	YJ9257	C063900	2020/09/02	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN08C	BASLINE SEDIMENT IRON RIVER	IR8	YJ9258	C063900	2020/09/02	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN08D	BASLINE SEDIMENT IRON RIVER	IR8	YJ9259	C063900	2020/09/02	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN08E	BASLINE SEDIMENT IRON RIVER	IR8	YJ9260	C063900	2020/09/02	2020/09/08 - 2021/02/17	2020/09/09 - 2021/02/19
IRN08A	BASLINE SEDIMENT IRON RIVER	IR8	YK1363	C063900	2020/09/02	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN08B	BASLINE SEDIMENT IRON RIVER	IR8	YK1364	C063900	2020/09/02	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN08C	BASLINE SEDIMENT IRON RIVER	IR8	YK1365	C063900	2020/09/02	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN08D	BASLINE SEDIMENT IRON RIVER	IR8	YK1366	C063900	2020/09/02	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19
IRN08E	BASLINE SEDIMENT IRON RIVER	IR8	YK1367	C063900	2020/09/02	2020/09/10 - 2021/02/17	2020/09/11 - 2021/02/19

Appendix A-2
Table 12
Summary Sheet

Samples						Worksheets				
Site Name	EMS #	Sample ID	Sample Collection Date	Bureau Veritas Job ID	Bureau Veritas Sample ID	Soil	PAHs - Sed	Metals - Soil	Physical Param	Others
Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)	O126402	WA1-SEP21-M	2021-09-07 12:00 AM	C167190	AFO979		x	x	x	
		WA1-SEP21-M Lab-Dup	2021-09-07 12:00 AM	C167190	AFO979	x	x	x	x	x
		WA2-SEP21-M	2021-09-07 12:00 AM	C167190	AFO980	x	x	x	x	x
		WA3-SEP21-M	2021-09-07 12:00 AM	C167190	AFO981	x	x	x	x	x
		WA3-SEP21-M Lab-Dup	2021-09-07 12:00 AM	C167190	AFO981				x	
		WA4-SEP21-M	2021-09-07 12:00 AM	C167190	AFO982	x	x	x	x	x
		WA4-SEP21-M Lab-Dup	2021-09-07 12:00 AM	C167190	AFO982			x		
		WA5-SEP21-M	2021-09-07 12:00 AM	C167190	AFO983	x	x	x	x	x
Possible Seepage at Site 2	N/A	S2-13 SEP21-M	2021-09-13 12:00 AM	C169603	AGE915	x	x	x	x	x
Quinsam River Site 2 Upstream of 7-South Mining Operation and Downstream from Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	E286930	QRD02A-13SEP21-M	2021-09-13 12:00 AM	C169603	AGE916	x	x	x	x	x
		QRD02B-13 SEP21-M	2021-09-13 12:00 AM	C169603	AGE917	x	x	x	x	x
		QRD02C-13SEP21-M	2021-09-13 12:00 AM	C169603	AGE918	x	x	x	x	x
		QRD02E-13 SEP21-M	2021-09-13 12:00 AM	C169603	AGE919	x	x	x	x	x
		QRD02DL-13 SEP21-M	2021-09-13 12:00 AM	C169603	AGE920	x	x	x	x	x
		QRD02DR-13 SEP21-M	2021-09-13 12:00 AM	C169603	AGE921	x	x	x	x	x
		QRD02DR-13 SEP21-M Lab-Dup	2021-09-13 12:00 AM	C169603	AGE921			x		
Quinsam River Site 3 Upstream of 7-South Mining Operation and Downstream from Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	N/A	QRD03A-14 SEP31-M	2021-09-14 12:00 AM	C169603	AGE922	x	x	x	x	x
		QRD03B-14 SEP31-M	2021-09-14 12:00 AM	C169603	AGE923	x	x	x	x	x
		QRD03B-14 SEP31-M Lab-Dup	2021-09-14 12:00 AM	C169603	AGE923				x	
		QRD03C-14 SEP31-M	2021-09-14 12:00 AM	C169603	AGE924	x	x	x	x	x
		QRD03D-14 SEP31-M	2021-09-14 12:00 AM	C169603	AGE925	x	x	x	x	x
		QRD03E-14 SEP21-M	2021-09-14 12:00 AM	C169603	AGE926	x	x	x	x	x
Quinsam River Downstream of 7-South Mining Operation and Influence of Mines (2S, 3S, 4S, 5S, RBP and 2N and 3N)	E292113	7SQ03A-15SEP21-M	2021-09-15 12:00 AM	C169603	AGE927	x	x	x	x	x
		7SQ03A-15SEP21-M Lab-Dup	2021-09-15 12:00 AM	C169603	AGE927	x	x	x	x	x
		7SQ03B-15SEP21-M	2021-09-15 12:00 AM	C169603	AGE928	x	x	x	x	x
		7SQ03C-15SEP21-M	2021-09-15 12:00 AM	C169603	AGE929	x	x	x	x	x
		7SQ03D-15SEP21-M	2021-09-15 12:00 AM	C169603	AGE930	x	x	x	x	x
		7SQ03E-15SEP21-M	2021-09-15 12:00 AM	C169603	AGE931	x	x	x	x	x
		7SQ03A-15SEP21-S	2021-09-15 12:00 AM	C169603	AGE932	x	x	x	x	x

Appendix A-2
Table 13
PAHs - Sediment_Soils

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)						
Parameter	Criteria ¹	Criteria ²	Units	RDL	WA1-SEP21-M C167190 / AFO979 2021-09-07	WA1-SEP21-M Lab-Dup C167190 / AFO979 2021-09-07	WA2-SEP21-M C167190 / AFO980 2021-09-07	WA3-SEP21-M C167190 / AFO981 2021-09-07	WA4-SEP21-M C167190 / AFO982 2021-09-07	WA5-SEP21-M C167190 / AFO983 2021-09-07	WA1-SEP21-S C167190 / AFO984 2021-09-07 Split Sample
Moisture			%	0.30	14	15	19	17	10	20	16
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
High Molecular Weight PAH's			mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total PAH			mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
2-Methylnaphthalene	0.0202	0.201	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Acenaphthene	0.00671	0.0889	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Acenaphthylene	0.00587	0.128	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.0469	0.245	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(a)anthracene	0.0317	0.385	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(a)pyrene	0.0319	0.782	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(g,h,i)perylene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chrysene	0.0571	0.862	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dibenz(a,h)anthracene	0.00622	0.135	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	0.111	2.355	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Fluorene	0.0212	0.144	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.0346	0.391	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phenanthrene	0.0419	0.515	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Pyrene	0.053	0.875	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 14
PAHs - Sediment_Soils

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Possible Seepage at Site 2
Parameter	Criteria ¹	Criteria ²	Units	RDL	S2-13 SEP21-M C169603 / AGE915 2021-09-13
Moisture			%	0.30	92
Index of Additive Cancer Risk(IARC)			N/A	0.10	0.14
Low Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.055
High Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.04
Total PAH			mg/kg	0.0010 - 0.010	0.095
2-Methylnaphthalene	0.0202	0.201	mg/kg	0.0010 - 0.010	0.013
Acenaphthene	0.00671	0.0889	mg/kg	0.00050 - 0.0050	<0.0050
Acenaphthylene	0.00587	0.128	mg/kg	0.00050 - 0.0050	<0.0050
Anthracene	0.0469	0.245	mg/kg	0.0010 - 0.010	<0.010
Benzo(a)anthracene	0.0317	0.385	mg/kg	0.0010 - 0.010	<0.010
Benzo(a)pyrene	0.0319	0.782	mg/kg	0.0010 - 0.010	0.016
Benzo(g,h,i)perylene			mg/kg	0.0020 - 0.020	<0.020
Benzo(k)fluoranthene			mg/kg	0.0010 - 0.010	<0.010
Benzo(b&j)fluoranthene			mg/kg	0.0010 - 0.010	<0.010
Chrysene	0.0571	0.862	mg/kg	0.0010 - 0.010	0.013
Dibenz(a,h)anthracene	0.00622	0.135	mg/kg	0.00050 - 0.0050	<0.0050
Fluoranthene	0.111	2.355	mg/kg	0.0010 - 0.010	0.011
Fluorene	0.0212	0.144	mg/kg	0.0010 - 0.010	<0.010
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020 - 0.020	<0.020
Naphthalene	0.0346	0.391	mg/kg	0.0010 - 0.010	0.012
Phenanthrene	0.0419	0.515	mg/kg	0.0010 - 0.010	0.03
Pyrene	0.053	0.875	mg/kg	0.0010 - 0.010	<0.010

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 15
PAHs - Sediment_Soils

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 2					
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD02A-13SEP21-M C169603 / AGE916 2021-09-13	QRD02B-13 SEP21-M C169603 / AGE917 2021-09-13	QRD02C-13SEP21-M C169603 / AGE918 2021-09-13	QRD02E-13 SEP21-M C169603 / AGE919 2021-09-13	QRD02DL-13 SEP21-M C169603 / AGE920 2021-09-13	QRD02DR-13 SEP21-M C169603 / AGE921 2021-09-13
Moisture			%	0.30	19	18	22	18	19	21
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.2	0.044	0.059	0.05	0.034	0.059
High Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.021	0.012	0.0081	0.0076	0.0073	0.0086
Total PAH			mg/kg	0.0010 - 0.010	0.22	0.057	0.067	0.058	0.041	0.067
2-Methylnaphthalene	0.0202	0.201	mg/kg	0.0010 - 0.010	0.076	0.011	0.021	0.018	0.0095	0.019
Acenaphthene	0.00671	0.0889	mg/kg	0.00050 - 0.0050	0.0074	0.0023	0.0021	0.0018	0.0017	0.0017
Acenaphthylene	0.00587	0.128	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.0469	0.245	mg/kg	0.0010 - 0.010	0.0051	0.0021	0.0015	0.0017	0.0011	0.0019
Benzo(a)anthracene	0.0317	0.385	mg/kg	0.0010 - 0.010	0.0038	0.0021	0.0017	0.0015	0.0016	0.0018
Benzo(a)pyrene	0.0319	0.782	mg/kg	0.0010 - 0.010	0.002	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(g,h,i)perylene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010 - 0.010	0.0024	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chrysene	0.0571	0.862	mg/kg	0.0010 - 0.010	0.0057	0.0036	0.0026	0.0026	0.0026	0.0028
Dibenz(a,h)anthracene	0.00622	0.135	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	0.111	2.355	mg/kg	0.0010 - 0.010	0.0048	0.0028	0.0019	0.0018	0.0016	0.0022
Fluorene	0.0212	0.144	mg/kg	0.0010 - 0.010	0.0024	0.0014	<0.0010	<0.0010	<0.0010	0.001
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.0346	0.391	mg/kg	0.0010 - 0.010	0.059	0.011	0.016	0.014	0.0078	0.017
Phenanthrene	0.0419	0.515	mg/kg	0.0010 - 0.010	0.052	0.016	0.018	0.015	0.013	0.018
Pyrene	0.053	0.875	mg/kg	0.0010 - 0.010	0.0042	0.0026	0.0019	0.0017	0.0015	0.0019

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 16
PAHs - Sediment_Soils

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 3				
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD03A-14 SEP31-M C169603 / AGE922 2021-09-14	QRD03B-14 SEP31-M C169603 / AGE923 2021-09-14	QRD03C-14 SEP31-M C169603 / AGE924 2021-09-14	QRD03D-14 SEP31-M C169603 / AGE925 2021-09-14	QRD03E-14 SEP21-M C169603 / AGE926 2021-09-14
Moisture			%	0.30	26	21	22	20	24
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.013	0.008	0.042	0.032	0.073
High Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.0023	<0.0010	0.0044	0.0059	0.015
Total PAH			mg/kg	0.0010 - 0.010	0.015	0.008	0.047	0.038	0.088
2-Methylnaphthalene	0.0202	0.201	mg/kg	0.0010 - 0.010	0.0032	0.0027	0.015	0.011	0.023
Acenaphthene	0.00671	0.0889	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	0.0009	0.001	0.0028
Acenaphthylene	0.00587	0.128	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.0469	0.245	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	0.0013	0.0011	0.0024
Benzo(a)anthracene	0.0317	0.385	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	0.0013	0.0026
Benzo(a)pyrene	0.0319	0.782	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015
Benzo(g,h,i)perylene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013
Chrysene	0.0571	0.862	mg/kg	0.0010 - 0.010	0.0012	<0.0010	0.0017	0.0019	0.0043
Dibenz(a,h)anthracene	0.00622	0.135	mg/kg	0.00050 - 0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	0.111	2.355	mg/kg	0.0010 - 0.010	0.0011	<0.0010	0.0014	0.0014	0.0033
Fluorene	0.0212	0.144	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020 - 0.020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.0346	0.391	mg/kg	0.0010 - 0.010	0.0028	0.0025	0.012	0.0065	0.021
Phenanthrene	0.0419	0.515	mg/kg	0.0010 - 0.010	0.0066	0.0028	0.013	0.012	0.025
Pyrene	0.053	0.875	mg/kg	0.0010 - 0.010	<0.0010	<0.0010	0.0013	0.0014	0.0028

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 17
PAHs - Sediment_Soils

Site Description					Quinsam River Downstream of 7-South Mine						
Sample ID											
Bureau Veritas Job ID / Sample ID											
Sample Collection Date											
Parameter	Criteria ¹	Criteria ²	Units	RDL	7SQ03A-15SEP21-M C169603 / AGE927 2021-09-15	7SQ03A-15SEP21-M Lab-Dup C169603 / AGE927 2021-09-15	7SQ03B-15SEP21-M C169603 / AGE928 2021-09-15	7SQ03C-15SEP21-M C169603 / AGE929 2021-09-15	7SQ03D-15SEP21-M C169603 / AGE930 2021-09-15	7SQ03E-15SEP21-M C169603 / AGE931 2021-09-15	7SQ03A-15SEP21-S C169603 / AGE932 2021-09-15 Split Sample
Moisture			%	0.30	35	35	32	29	22	22	43
Index of Additive Cancer Risk(IARC)			N/A	0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10
Low Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.029	-	0.023	0.022	0.0045	0.011	0.038
High Molecular Weight PAH's			mg/kg	0.0010 - 0.010	0.0089	-	0.0066	0.0071	0.001	0.0049	0.012
Total PAH			mg/kg	0.0010 - 0.010	0.038	-	0.03	0.029	0.0055	0.016	0.049
2-Methylnaphthalene	0.0202	0.201	mg/kg	0.0010 - 0.010	0.0091	-	0.0069	0.0071	0.0014	0.0036	0.012
Acenaphthene	0.00671	0.0889	mg/kg	0.00050 - 0.0050	0.0012	-	0.0012	<0.00050	<0.00050	<0.00050	0.0018
Acenaphthylene	0.00587	0.128	mg/kg	0.00050 - 0.0050	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Anthracene	0.0469	0.245	mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
Benzo(a)anthracene	0.0317	0.385	mg/kg	0.0010 - 0.010	0.0014	-	0.0012	0.0013	<0.0010	0.001	0.0018
Benzo(a)pyrene	0.0319	0.782	mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(g,h,i)perylene			mg/kg	0.0020 - 0.020	<0.0020	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Benzo(k)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Benzo(b&j)fluoranthene			mg/kg	0.0010 - 0.010	0.0014	-	<0.0010	0.0013	<0.0010	<0.0010	0.0018
Chrysene	0.0571	0.862	mg/kg	0.0010 - 0.010	0.0026	-	0.0019	0.0024	0.001	0.0014	0.0035
Dibenz(a,h)anthracene	0.00622	0.135	mg/kg	0.00050 - 0.0050	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Fluoranthene	0.111	2.355	mg/kg	0.0010 - 0.010	0.0028	-	0.0019	0.0017	<0.0010	0.0013	0.0037
Fluorene	0.0212	0.144	mg/kg	0.0010 - 0.010	0.0011	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0018
Indeno(1,2,3-cd)pyrene			mg/kg	0.0020 - 0.020	<0.0020	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Naphthalene	0.0346	0.391	mg/kg	0.0010 - 0.010	0.0068	-	0.0067	0.0055	<0.0010	0.0021	0.0071
Phenanthrene	0.0419	0.515	mg/kg	0.0010 - 0.010	0.01	-	0.0081	0.0091	0.0031	0.0053	0.014
Pyrene	0.053	0.875	mg/kg	0.0010 - 0.010	0.0022	-	0.0016	0.0017	<0.0010	0.0012	0.0025

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 18
Metals - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)							
Parameter	Criteria ¹	Criteria ²	Units	RDL	WA1-SEP21-M C167190 / AFO979 2021-09-07	WA1-SEP21-M Lab-Dup C167190 / AFO979 2021-09-07	WA2-SEP21-M C167190 / AFO980 2021-09-07	WA3-SEP21-M C167190 / AFO981 2021-09-07	WA4-SEP21-M C167190 / AFO982 2021-09-07	WA4-SEP21-M Lab-Dup C167190 / AFO982 2021-09-07	WA5-SEP21-M C167190 / AFO983 2021-09-07	WA1-SEP21-S C167190 / AFO984 2021-09-07 Split Sample
Moisture			%	0.3	14	15	19	17	10	-	20	16
Soluble (2:1) pH			pH		6.82	-	6.69	6.88	6.86	6.9	6.68	6.87
Total Aluminum (Al)			mg/kg	100	17500	-	19200	18900	18200	-	19600	18400
Total Antimony (Sb)			mg/kg	0.1	0.12	-	0.11	0.11	0.11	-	0.12	0.11
Total Arsenic (As)	5.9	17	mg/kg	0.2	5.89	-	6.33	6.05	5.64	-	6.81	6.11
Total Barium (Ba)			mg/kg	0.1	45.3	-	48	52.4	44.4	-	52.8	42.6
Total Beryllium (Be)			mg/kg	0.2	0.21	-	0.28	0.23	0.22	-	0.24	0.22
Total Bismuth (Bi)			mg/kg	0.1	<0.10	-	<0.10	<0.10	<0.10	-	<0.10	<0.10
Total Cadmium (Cd)	0.6	3.5	mg/kg	0.05	0.098	-	0.149	0.091	0.103	-	0.118	0.104
Total Calcium (Ca)			mg/kg	100	8940	-	8330	8650	9200	-	9480	9410
Total Chromium (Cr)	37.3	90	mg/kg	0.5	19.5	-	21.6	20.1	22.6	-	19.9	23
Total Cobalt (Co)			mg/kg	0.1	12.2	-	12.8	12.3	11.8	-	12.8	12.3
Total Copper (Cu)	35.7	197	mg/kg	0.5	45.8	-	55.1	53.6	50.3	-	50.8	49.2
Total Iron (Fe)			mg/kg	100	34500	-	35000	33900	33600	-	34700	40600
Total Lead (Pb)	35	91.3	mg/kg	0.1	2.51	-	2.72	2.63	2.59	-	2.73	2.97
Total Lithium (Li)			mg/kg	0.5	3.95	-	4.39	3.86	3.87	-	4.44	4.17
Total Magnesium (Mg)			mg/kg	100	8350	-	8630	8210	8030	-	9150	8380
Total Manganese (Mn)			mg/kg	0.2	494	-	503	501	505	-	526	526
Total Mercury (Hg)	0.17	0.486	mg/kg	0.05	<0.050	-	<0.050	<0.050	<0.050	-	<0.050	<0.050
Total Molybdenum (Mo)			mg/kg	0.1	0.33	-	0.43	0.41	0.42	-	0.45	0.43
Total Nickel (Ni)			mg/kg	0.5	18	-	18.8	17.4	16.8	-	19.5	17.7
Total Phosphorus (P)			mg/kg	10	296	-	321	284	314	-	302	309
Total Potassium (K)			mg/kg	100	243	-	252	252	263	-	315	273
Total Selenium (Se)			mg/kg	0.5	<0.50	-	<0.50	<0.50	<0.50	-	<0.50	<0.50
Total Silver (Ag)			mg/kg	0.05	<0.050	-	<0.050	<0.050	<0.050	-	<0.050	<0.050
Total Sodium (Na)			mg/kg	100	282	-	280	290	284	-	325	341
Total Strontium (Sr)			mg/kg	0.1	34.3	-	33.8	34.6	35.7	-	35.4	34.8
Total Thallium (Tl)			mg/kg	0.05	<0.050	-	<0.050	<0.050	<0.050	-	<0.050	<0.050
Total Tin (Sn)			mg/kg	0.1	0.37	-	0.35	0.35	0.4	-	0.39	0.42
Total Titanium (Ti)			mg/kg	1	1980	-	2070	2080	2090	-	2140	2180
Total Uranium (U)			mg/kg	0.05	0.255	-	0.353	0.288	0.297	-	0.281	0.279
Total Vanadium (V)			mg/kg	1	116	-	115	112	120	-	113	147
Total Zinc (Zn)	123	315	mg/kg	1	47.9	-	51.1	47.1	47.5	-	53.7	50.4
Total Zirconium (Zr)			mg/kg	0.5	9.28	-	11.3	10.7	9.62	-	9.89	9.42
Legend												
To Be Announced	TBA											
Exceeds one Criteria	Result											
Exceeds two Criteria	Result											
DL > Criteria	Result											
Criteria 1	CCME Sediment Quality -FW											
Criteria 2	CCME Sediment Quality-PEL											

Appendix A-2
Table 19
Metals - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Possible Seepage at Site 2
Parameter	Criteria ¹	Criteria ²	Units	RDL	S2-13 SEP21-M C169603 / AGE915 2021-09-13
Moisture			%	0.3	92
Soluble (2:1) pH			pH		7.84
Total Aluminum (Al)			mg/kg	100	5860
Total Antimony (Sb)			mg/kg	0.1	1.19
Total Arsenic (As)	5.9	17	mg/kg	0.2	8290
Total Barium (Ba)			mg/kg	0.1	1160
Total Beryllium (Be)			mg/kg	0.2	0.29
Total Bismuth (Bi)			mg/kg	0.1	<0.10
Total Cadmium (Cd)	0.6	3.5	mg/kg	0.05	0.258
Total Calcium (Ca)			mg/kg	100	13600
Total Chromium (Cr)	37.3	90	mg/kg	0.5	8.29
Total Cobalt (Co)			mg/kg	0.1	25.2
Total Copper (Cu)	35.7	197	mg/kg	0.5	20.7
Total Iron (Fe)			mg/kg	100	275000
Total Lead (Pb)	35	91.3	mg/kg	0.1	1.36
Total Lithium (Li)			mg/kg	0.5	6.9
Total Magnesium (Mg)			mg/kg	100	1200
Total Manganese (Mn)			mg/kg	0.2	15000
Total Mercury (Hg)	0.17	0.486	mg/kg	0.05	-
Total Molybdenum (Mo)			mg/kg	0.1	1.85
Total Nickel (Ni)			mg/kg	0.5	7.69
Total Phosphorus (P)			mg/kg	10	625
Total Potassium (K)			mg/kg	100	213
Total Selenium (Se)			mg/kg	0.5	0.69
Total Silver (Ag)			mg/kg	0.05	<0.050
Total Sodium (Na)			mg/kg	100	908
Total Strontium (Sr)			mg/kg	0.1	315
Total Thallium (Tl)			mg/kg	0.05	0.096
Total Tin (Sn)			mg/kg	0.1	0.36
Total Titanium (Ti)			mg/kg	1	193
Total Uranium (U)			mg/kg	0.05	0.54
Total Vanadium (V)			mg/kg	1	54.2
Total Zinc (Zn)	123	315	mg/kg	1	23.3
Total Zirconium (Zr)			mg/kg	0.5	1.64
Legend					
To Be Announced		TBA			
Exceeds one Criteria		Result			
Exceeds two Criteria		Result			
DL > Criteria		Result			
Criteria 1		CCME Sediment Quality -FW			
Criteria 2		CCME Sediment Quality-PEL			

Appendix A-2
Table 20
Metals - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 2						
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD02A-13SEP21-M C169603 / AGE916 2021-09-13	QRD02B-13 SEP21-M C169603 / AGE917 2021-09-13	QRD02C-13SEP21-M C169603 / AGE918 2021-09-13	QRD02E-13 SEP21-M C169603 / AGE919 2021-09-13	QRD02DL-13 SEP21-M C169603 / AGE920 2021-09-13	QRD02DR-13 SEP21-M C169603 / AGE921 2021-09-13	QRD02DR-13 SEP21-M Lab-Dup C169603 / AGE921 2021-09-13
Moisture			%	0.3	19	18	22	18	19	21	-
Soluble (2:1) pH			pH		7.32	7.31	7.25	7.41	7.5	7.42	7.4
Total Aluminum (Al)			mg/kg	100	11200	9340	8510	9070	9600	7530	-
Total Antimony (Sb)			mg/kg	0.1	0.16	0.24	0.15	0.12	0.12	0.17	-
Total Arsenic (As)	5.9	17	mg/kg	0.2	13.1	13.7	10.6	16.6	45.3	15.4	-
Total Barium (Ba)			mg/kg	0.1	25.8	18	18.3	29.6	38.3	18.8	-
Total Beryllium (Be)			mg/kg	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	-
Total Bismuth (Bi)			mg/kg	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Total Cadmium (Cd)	0.6	3.5	mg/kg	0.05	0.062	0.051	0.052	0.053	0.061	0.059	-
Total Calcium (Ca)			mg/kg	100	6080	5400	6160	6110	6480	5380	-
Total Chromium (Cr)	37.3	90	mg/kg	0.5	16	14.2	16.3	17.8	15.3	14.4	-
Total Cobalt (Co)			mg/kg	0.1	9.89	7.27	8.1	8.39	8.48	7.24	-
Total Copper (Cu)	35.7	197	mg/kg	0.5	28.4	20.4	20.2	20.3	18.3	16.5	-
Total Iron (Fe)			mg/kg	100	28600	24700	34500	32900	28500	27600	-
Total Lead (Pb)	35	91.3	mg/kg	0.1	1.35	1.16	1.07	1.13	1.14	1.11	-
Total Lithium (Li)			mg/kg	0.5	4.19	3.96	3.5	4	4.78	3.17	-
Total Magnesium (Mg)			mg/kg	100	4590	3660	3570	3790	4200	3040	-
Total Manganese (Mn)			mg/kg	0.2	354	290	325	364	798	340	-
Total Mercury (Hg)	0.17	0.486	mg/kg	0.05	-	-	-	-	-	-	-
Total Molybdenum (Mo)			mg/kg	0.1	0.52	0.43	0.36	0.31	0.34	0.33	-
Total Nickel (Ni)			mg/kg	0.5	15.9	11.9	12.4	12.9	12.6	11	-
Total Phosphorus (P)			mg/kg	10	200	206	219	227	187	248	-
Total Potassium (K)			mg/kg	100	191	168	198	210	157	204	-
Total Selenium (Se)			mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-
Total Silver (Ag)			mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Total Sodium (Na)			mg/kg	100	217	204	220	207	265	215	-
Total Strontium (Sr)			mg/kg	0.1	22	18.7	18.3	21	32	19.6	-
Total Thallium (Tl)			mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Total Tin (Sn)			mg/kg	0.1	0.28	0.24	0.26	0.26	0.22	0.23	-
Total Titanium (Ti)			mg/kg	1	1170	1070	1230	1220	1140	1010	-
Total Uranium (U)			mg/kg	0.05	0.215	0.173	0.157	0.168	0.151	0.21	-
Total Vanadium (V)			mg/kg	1	84.3	79.7	118	124	90.1	93.9	-
Total Zinc (Zn)	123	315	mg/kg	1	33.3	27.8	30.3	28.8	29.9	27.6	-
Total Zirconium (Zr)			mg/kg	0.5	5.7	4.9	6.19	6.25	5.63	4.78	-
Legend											
To Be Announced	TBA										
Exceeds one Criteria	Result										
Exceeds two Criteria	Result										
DL > Criteria	Result										
Criteria 1	CCME Sediment Quality -FW										
Criteria 2	CCME Sediment Quality-PEL										

Appendix A-2
Table 21
Metals - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 3				
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD03A-14 SEP31-M C169603 / AGE922 2021-09-14	QRD03B-14 SEP31-M C169603 / AGE923 2021-09-14	QRD03C-14 SEP31-M C169603 / AGE924 2021-09-14	QRD03D-14 SEP31-M C169603 / AGE925 2021-09-14	QRD03E-14 SEP21-M C169603 / AGE926 2021-09-14
Moisture			%	0.3	26	21	22	20	24
Soluble (2:1) pH			pH		7.28	7.31	7.3	7.23	6.94
Total Aluminum (Al)			mg/kg	100	11300	14400	11300	9190	8690
Total Antimony (Sb)			mg/kg	0.1	0.14	0.12	0.17	0.22	0.16
Total Arsenic (As)	5.9	17	mg/kg	0.2	10.8	10.7	13.4	15.7	13.4
Total Barium (Ba)			mg/kg	0.1	24.1	32.6	20.8	19.2	20
Total Beryllium (Be)			mg/kg	0.2	<0.20	0.21	<0.20	<0.20	<0.20
Total Bismuth (Bi)			mg/kg	0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Total Cadmium (Cd)	0.6	3.5	mg/kg	0.05	0.064	0.059	0.064	0.057	0.055
Total Calcium (Ca)			mg/kg	100	6170	6190	7260	6040	5700
Total Chromium (Cr)	37.3	90	mg/kg	0.5	19	23	17.8	16.1	15.8
Total Cobalt (Co)			mg/kg	0.1	8.81	9.93	9.23	8.68	8.68
Total Copper (Cu)	35.7	197	mg/kg	0.5	22.8	26.5	23.7	26.5	20.8
Total Iron (Fe)			mg/kg	100	28100	30100	29500	27900	28000
Total Lead (Pb)	35	91.3	mg/kg	0.1	1.32	1.33	1.3	1.24	1.17
Total Lithium (Li)			mg/kg	0.5	5.26	6.38	4.44	4.23	4
Total Magnesium (Mg)			mg/kg	100	3690	4320	4530	3550	3390
Total Manganese (Mn)			mg/kg	0.2	377	527	493	348	328
Total Mercury (Hg)	0.17	0.486	mg/kg	0.05	-	-	-	-	-
Total Molybdenum (Mo)			mg/kg	0.1	0.4	0.46	0.41	0.36	0.38
Total Nickel (Ni)			mg/kg	0.5	14.2	15.9	14.4	13.9	13.2
Total Phosphorus (P)			mg/kg	10	195	158	233	218	249
Total Potassium (K)			mg/kg	100	164	139	155	183	193
Total Selenium (Se)			mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50
Total Silver (Ag)			mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Total Sodium (Na)			mg/kg	100	200	159	220	197	191
Total Strontium (Sr)			mg/kg	0.1	22.9	24	24	19.6	19.1
Total Thallium (Tl)			mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Total Tin (Sn)			mg/kg	0.1	0.29	0.35	0.28	0.28	0.25
Total Titanium (Ti)			mg/kg	1	1210	1410	1320	1210	1060
Total Uranium (U)			mg/kg	0.05	0.207	0.251	0.202	0.176	0.168
Total Vanadium (V)			mg/kg	1	96.6	105	98.4	89.6	88
Total Zinc (Zn)	123	315	mg/kg	1	29.6	28.3	31.5	30.2	31.9
Total Zirconium (Zr)			mg/kg	0.5	5.2	7.4	5.85	6.03	6.1
Legend									
To Be Announced	TBA								
Exceeds one Criteria	Result								
Exceeds two Criteria	Result								
DL > Criteria	Result								
Criteria 1	CCME Sediment Quality -FW								
Criteria 2	CCME Sediment Quality-PEL								

Appendix A-2
Table 22
Metals - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Downstream of 7-South Mine						
Parameter	Criteria ¹	Criteria ²	Units	RDL	7SQ03A-15SEP21-M C169603 / AGE927 2021-09-15	7SQ03A-15SEP21-M Lab-Dup C169603 / AGE927 2021-09-15	7SQ03B-15SEP21-M C169603 / AGE928 2021-09-15	7SQ03C-15SEP21-M C169603 / AGE929 2021-09-15	7SQ03D-15SEP21-M C169603 / AGE930 2021-09-15	7SQ03E-15SEP21-M C169603 / AGE931 2021-09-15	7SQ03A-15SEP21-S C169603 / AGE932 2021-09-15 Split Sample
Moisture			%	0.3	35	35	32	29	22	22	43
Soluble (2:1) pH			pH		6.38	-	6.43	6.64	6.85	6.9	6.32
Total Aluminum (Al)			mg/kg	100	10900	10700	10500	14500	10500	13200	10700
Total Antimony (Sb)			mg/kg	0.1	0.12	0.12	<0.10	0.3	<0.10	0.12	0.14
Total Arsenic (As)	5.9	17	mg/kg	0.2	8.07	7.92	6.32	18.4	11.1	10.8	8.22
Total Barium (Ba)			mg/kg	0.1	25.5	26.4	21.9	42.7	17.8	24.5	28.2
Total Beryllium (Be)			mg/kg	0.2	<0.20	<0.20	<0.20	0.23	<0.20	<0.20	<0.20
Total Bismuth (Bi)			mg/kg	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Cadmium (Cd)	0.6	3.5	mg/kg	0.05	0.116	0.118	0.091	0.654	0.07	0.097	0.137
Total Calcium (Ca)			mg/kg	100	5900	5860	6230	7180	6530	6180	5770
Total Chromium (Cr)	37.3	90	mg/kg	0.5	15	14.8	13.6	22	12.6	18.4	15.7
Total Cobalt (Co)			mg/kg	0.1	6.95	7.13	6.59	10	6.78	7.35	7.09
Total Copper (Cu)	35.7	197	mg/kg	0.5	18.7	19	15.9	34.1	15.8	24.1	20.8
Total Iron (Fe)			mg/kg	100	17200	17100	15500	27200	16800	19000	17300
Total Lead (Pb)	35	91.3	mg/kg	0.1	1.41	1.4	1.27	3.12	1.04	1.5	1.7
Total Lithium (Li)			mg/kg	0.5	4.28	4.24	4.3	6.62	3.82	4.73	4.35
Total Magnesium (Mg)			mg/kg	100	3630	3640	3490	5240	4060	3740	3600
Total Manganese (Mn)			mg/kg	0.2	198	199	180	318	217	310	196
Total Mercury (Hg)	0.17	0.486	mg/kg	0.05	-	-	-	-	-	-	-
Total Molybdenum (Mo)			mg/kg	0.1	0.4	0.39	0.28	0.86	0.24	0.57	0.47
Total Nickel (Ni)			mg/kg	0.5	11.1	11.4	10.6	16.1	11.3	12.8	11.2
Total Phosphorus (P)			mg/kg	10	224	234	236	333	202	206	258
Total Potassium (K)			mg/kg	100	139	132	136	220	123	144	139
Total Selenium (Se)			mg/kg	0.5	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	<0.50
Total Silver (Ag)			mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Sodium (Na)			mg/kg	100	174	170	187	274	176	222	170
Total Strontium (Sr)			mg/kg	0.1	19.9	19.7	19.6	34.3	19.3	26.7	20.5
Total Thallium (Tl)			mg/kg	0.05	<0.050	<0.050	<0.050	0.084	<0.050	<0.050	<0.050
Total Tin (Sn)			mg/kg	0.1	0.29	0.28	0.3	0.38	0.25	0.34	0.3
Total Titanium (Ti)			mg/kg	1	1090	1080	1230	996	1340	1100	923
Total Uranium (U)			mg/kg	0.05	0.208	0.204	0.184	0.523	0.138	0.241	0.23
Total Vanadium (V)			mg/kg	1	63.3	62.7	60.4	87.8	61.5	74.2	63.4
Total Zinc (Zn)	123	315	mg/kg	1	28.1	29	25.9	44.2	25.3	26.8	30.4
Total Zirconium (Zr)			mg/kg	0.5	3.25	3.4	4.17	2.49	6.11	3.12	3.23
Legend To Be Announced TBA Exceeds one Criteria Result Exceeds two Criteria Result DL > Criteria Result Criteria 1 CCME Sediment Quality -FW Criteria 2 CCME Sediment Quality-PEL											

Appendix A-2
Table 23
Physical Parameters - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)							
Parameter	Criteria ¹	Criteria ²	Units	RDL	WA1-SEP21-M C167190 / AFO979 2021-09-07	WA1-SEP21-M Lab-Dup C167190 / AFO979 2021-09-07	WA2-SEP21-M C167190 / AFO980 2021-09-07	WA3-SEP21-M C167190 / AFO981 2021-09-07	WA3-SEP21-M Lab-Dup C167190 / AFO981 2021-09-07	WA4-SEP21-M C167190 / AFO982 2021-09-07	WA5-SEP21-M C167190 / AFO983 2021-09-07	WA1-SEP21-S C167190 / AFO984 2021-09-07 Sample Split
Total Sulphur (S)			%		-	-	-	-	-	-	-	-
% sand by hydrometer			%	2	95	-	95	95	95	95	97	97
% silt by hydrometer			%	2	3.3	-	3.9	2.9	3	4.4	<2.0	2.2
Clay Content			%	2	2.1	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Moisture			%	0.3	14	15	19	17	-	10	20	16

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 24
Physical Parameters - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Possible Seepage at Site 2
Parameter	Criteria ¹	Criteria ²	Units	RDL	
					S2-13 SEP21-M C169603 / AGE915 2021-09-13
Total Sulphur (S)			%		-
% sand by hydrometer			%	2	69
% silt by hydrometer			%	2	25
Clay Content			%	2	6.4
Moisture			%	0.3	92

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 25
Physical Parameters - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 2					
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD02A-13SEP21-M C169603 / AGE916 2021-09-13	QRD02B-13 SEP21-M C169603 / AGE917 2021-09-13	QRD02C-13SEP21-M C169603 / AGE918 2021-09-13	QRD02E-13 SEP21-M C169603 / AGE919 2021-09-13	QRD02DL-13 SEP21-M C169603 / AGE920 2021-09-13	QRD02DR-13 SEP21-M C169603 / AGE921 2021-09-13
Total Sulphur (S)			%		-	-	-	-	-	-
% sand by hydrometer			%	2	83	94	94	94	94	94
% silt by hydrometer			%	2	14	2.3	4	5.1	4	4.2
Clay Content			%	2	2.7	3.3	<2.0	<2.0	<2.0	<2.0
Moisture			%	0.3	19	18	22	18	19	21

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 26
Physical Parameters - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 3					
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD03A-14 SEP31-M C169603 / AGE922 2021-09-14	QRD03B-14 SEP31-M C169603 / AGE923 2021-09-14	QRD03B-14 SEP31-M Lab-Dup C169603 / AGE923 2021-09-14	QRD03C-14 SEP31-M C169603 / AGE924 2021-09-14	QRD03D-14 SEP31-M C169603 / AGE925 2021-09-14	QRD03E-14 SEP21-M C169603 / AGE926 2021-09-14
Total Sulphur (S)			%		-	-	-	-	-	-
% sand by hydrometer			%	2	90	86	86	94	95	95
% silt by hydrometer			%	2	9.4	13	13	5	4.8	5.2
Clay Content			%	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Moisture			%	0.3	26	21	-	22	20	24

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 27
Physical Parameters - Soil

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Downstream of 7-South Mine						
Parameter	Criteria ¹	Criteria ²	Units	RDL	7SQ03A-15SEP21-M C169603 / AGE927 2021-09-15	7SQ03A-15SEP21-M Lab-Dup C169603 / AGE927 2021-09-15	7SQ03B-15SEP21-M C169603 / AGE928 2021-09-15	7SQ03C-15SEP21-M C169603 / AGE929 2021-09-15	7SQ03D-15SEP21-M C169603 / AGE930 2021-09-15	7SQ03E-15SEP21-M C169603 / AGE931 2021-09-15	7SQ03A-15SEP21-S C169603 / AGE932 2021-09-15 Sample Split
Total Sulphur (S)			%		-	-	-	-	-	-	-
% sand by hydrometer			%	2	93	-	89	83	94	92	83
% silt by hydrometer			%	2	4.5	-	10	16	5.1	5.8	15
Clay Content			%	2	2.1	-	<2.0	<2.0	<2.0	<2.0	<2.0
Moisture			%	0.3	35	35	32	29	22	22	43

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 28
Others

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River at Argonaut Road (WA) (Upstream of Mine Influence)						
Parameter	Criteria ¹	Criteria ²	Units	RDL	WA1-SEP21-M C167190 / AFO979 2021-09-07	WA1-SEP21-M Lab-Dup C167190 / AFO979 2021-09-07	WA2-SEP21-M C167190 / AFO980 2021-09-07	WA3-SEP21-M C167190 / AFO981 2021-09-07	WA4-SEP21-M C167190 / AFO982 2021-09-07	WA5-SEP21-M C167190 / AFO983 2021-09-07	WA1-SEP21-S C167190 / AFO984 2021-09-07 Sample Split
Others											
Benzo(b)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Mercury (Hg)	0.17	0.486	mg/kg	0.010	0.023	-	0.026	0.023	0.046	0.039	0.02
Total Boron (B)			mg/kg	1.0	2.7	-	2.5	2.5	2.5	2.5	2.6
Total Tungsten (W)			mg/kg	0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon (C)			%	0.050	0.76	0.88	0.97	0.82	1.1	0.97	0.85
Total Sulphur (S)			%	0.06	0.2	0.14	0.12	0.1	0.08	<0.06	<0.06

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 29
Others

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Possible Seepage at Site 2
Parameter	Criteria ¹	Criteria ²	Units	RDL	S2-13 SEP21-M C169603 / AGE915 2021-09-13
Others					
Benzo(b)fluoranthene			mg/kg	0.0010 - 0.010	<0.010
Total Mercury (Hg)	0.17	0.486	mg/kg	0.010	0.047
Total Boron (B)			mg/kg	1.0	59.3
Total Tungsten (W)			mg/kg	0.50	<0.50
Total Organic Carbon (C)			%	0.050	6.1
Total Sulphur (S)			%	0.06	0.14

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 30
Others

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 2					
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD02A-13SEP21-M C169603 / AGE916 2021-09-13	QRD02B-13 SEP21-M C169603 / AGE917 2021-09-13	QRD02C-13SEP21-M C169603 / AGE918 2021-09-13	QRD02E-13 SEP21-M C169603 / AGE919 2021-09-13	QRD02DL-13 SEP21-M C169603 / AGE920 2021-09-13	QRD02DR-13 SEP21-M C169603 / AGE921 2021-09-13
Others										
Benzo(b)fluoranthene			mg/kg	0.0010 - 0.010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Mercury (Hg)	0.17	0.486	mg/kg	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Boron (B)			mg/kg	1.0	6.5	5.2	5.8	5.3	4.8	5.6
Total Tungsten (W)			mg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon (C)			%	0.050	0.81	0.62	0.41	0.49	0.59	0.56
Total Sulphur (S)			%	0.06	0.09	0.08	0.07	0.06	<0.06	0.06

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 31
Others

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Upstream of 7-South Mine Site 3				
Parameter	Criteria ¹	Criteria ²	Units	RDL	QRD03A-14 SEP31-M C169603 / AGE922 2021-09-14	QRD03B-14 SEP31-M C169603 / AGE923 2021-09-14	QRD03C-14 SEP31-M C169603 / AGE924 2021-09-14	QRD03D-14 SEP31-M C169603 / AGE925 2021-09-14	QRD03E-14 SEP21-M C169603 / AGE926 2021-09-14
Others									
Benzo(b)fluoranthene			mg/kg	0.0010 - 0.010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013
Total Mercury (Hg)	0.17	0.486	mg/kg	0.010	<0.010	0.012	<0.010	<0.010	<0.010
Total Boron (B)			mg/kg	1.0	4.5	3.5	4.5	4.6	5.4
Total Tungsten (W)			mg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon (C)			%	0.050	0.58	0.52	0.81	0.72	0.99
Total Sulphur (S)			%	0.06	<0.06	<0.06	<0.06	<0.06	<0.06

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 32
Others

Site Description Sample ID Bureau Veritas Job ID / Sample ID Sample Collection Date					Quinsam River Downstream of 7-South Mine						
Parameter	Criteria ¹	Criteria ²	Units	RDL	7SQ03A-15SEP21-M C169603 / AGE927 2021-09-15	7SQ03A-15SEP21-M Lab-Dup C169603 / AGE927 2021-09-15	7SQ03B-15SEP21-M C169603 / AGE928 2021-09-15	7SQ03C-15SEP21-M C169603 / AGE929 2021-09-15	7SQ03D-15SEP21-M C169603 / AGE930 2021-09-15	7SQ03E-15SEP21-M C169603 / AGE931 2021-09-15	7SQ03A-15SEP21-S C169603 / AGE932 2021-09-15 Sample Split
Others											
Benzo(b)fluoranthene			mg/kg	0.0010 - 0.010	0.0014	-	<0.0010	0.0013	<0.0010	<0.0010	0.0018
Total Mercury (Hg)	0.17	0.486	mg/kg	0.010	0.011	0.013	0.01	0.023	<0.010	0.02	0.016
Total Boron (B)			mg/kg	1.0	3.9	3.7	6.5	7.6	4.2	5.8	4.5
Total Tungsten (W)			mg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon (C)			%	0.050	1	-	1.1	1.4	0.33	0.57	0.9
Total Sulphur (S)			%	0.06	<0.06	-	0.07	<0.06	<0.06	<0.06	<0.06

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 33

Maxxam Values Summary Table

Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Moisture	Sediment			92	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Index of Additive Cancer Risk(IARC)	Sediment			0.14	N/A
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	Low Molecular Weight PAH's	Sediment			0.2	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	High Molecular Weight PAH's	Sediment			0.04	mg/kg
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	Total PAH	Sediment			0.22	mg/kg
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	2-Methylnaphthalene	Sediment	0.0202	0.201	0.076	mg/kg
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	Acenaphthene	Sediment	0.00671	0.0889	0.0074	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Acenaphthylene	Sediment	0.00587	0.128	<0.0050	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Anthracene	Sediment	0.0469	0.245	<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(a)anthracene	Sediment	0.0317	0.385	<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(a)pyrene	Sediment	0.0319	0.782	0.016	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(g,h,i)perylene	Sediment			<0.020	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(k)fluoranthene	Sediment			<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(b&l)fluoranthene	Sediment			<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Chrysene	Sediment	0.0571	0.862	0.013	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Dibenz(a,h)anthracene	Sediment	0.00622	0.135	<0.0050	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Fluoranthene	Sediment	0.111	2.355	0.011	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Fluorene	Sediment	0.0212	0.144	<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Indeno(1,2,3-cd)pyrene	Sediment			<0.020	mg/kg
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	Naphthalene	Sediment	0.0346	0.391	0.059	mg/kg
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER		AGE916	C169603	Phenanthrene	Sediment	0.0419	0.515	0.052	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Pyrene	Sediment	0.053	0.875	<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Moisture	Sediment			92	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Soluble (2:1) pH	Sediment			7.84	pH
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	Total Aluminum (Al)	Sediment			19600	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Antimony (Sb)	Sediment			1.19	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Arsenic (As)	Sediment	5.9	17	8290	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Barium (Ba)	Sediment			1160	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Beryllium (Be)	Sediment			0.29	mg/kg
75SQ03A-15SEP21-S	SEDIMENT QUINSAM RIVER		AGE932	C169603	Total Bismuth (Bi)	Sediment			<0.10	mg/kg
75SQ03C-15SEP21-M	SEDIMENT QUINSAM RIVER		AGE929	C169603	Total Cadmium (Cd)	Sediment	0.6	3.5	0.654	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Calcium (Ca)	Sediment			13600	mg/kg
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER		AF0984	C167190	Total Chromium (Cr)	Sediment	37.3	90	23	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Cobalt (Co)	Sediment			25.2	mg/kg
WA2-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0980	C167190	Total Copper (Cu)	Sediment	35.7	197	55.1	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Iron (Fe)	Sediment			275000	mg/kg
75SQ03C-15SEP21-M	SEDIMENT QUINSAM RIVER		AGE929	C169603	Total Lead (Pb)	Sediment	35	91.3	3.12	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Lithium (Li)	Sediment			6.9	mg/kg
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	Total Magnesium (Mg)	Sediment			9150	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Manganese (Mn)	Sediment			15000	mg/kg
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER		AF0984	C167190	Total Mercury (Hg)	Sediment	0.17	0.486	<0.050	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Molybdenum (Mo)	Sediment			1.85	mg/kg
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	Total Nickel (Ni)	Sediment			19.5	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Phosphorus (P)	Sediment			625	mg/kg
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	Total Potassium (K)	Sediment			315	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Selenium (Se)	Sediment			0.69	mg/kg
75SQ03A-15SEP21-S	SEDIMENT QUINSAM RIVER		AGE932	C169603	Total Silver (Ag)	Sediment			<0.050	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Sodium (Na)	Sediment			908	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Strontium (Sr)	Sediment			315	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Thallium (Tl)	Sediment			0.096	mg/kg
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER		AF0984	C167190	Total Tin (Sn)	Sediment			0.42	mg/kg
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER		AF0984	C167190	Total Titanium (Ti)	Sediment			2180	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Uranium (U)	Sediment			0.54	mg/kg
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER		AF0984	C167190	Total Vanadium (V)	Sediment			147	mg/kg
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	Total Zinc (Zn)	Sediment	123	315	53.7	mg/kg
WA2-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0980	C167190	Total Zirconium (Zr)	Sediment			11.3	mg/kg
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0983	C167190	% sand by hydrometer	Sediment			97	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	% silt by hydrometer	Sediment			25	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Clay Content	Sediment			6.4	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Moisture	Sediment			92	%
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Benzo(b)fluoranthene	Sediment			<0.010	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Mercury (Hg)	Sediment	0.17	0.486	0.047	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Boron (B)	Sediment			59.3	mg/kg
75SQ03A-15SEP21-S	SEDIMENT QUINSAM RIVER		AGE932	C169603	Total Tungsten (W)	Sediment			<0.50	mg/kg
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER		AGE915	C169603	Total Organic Carbon (C)	Sediment			6.1	%
WA1-SEP21-M	SEDIMENT WA QUINSAM RIVER		AF0979	C167190	Total Sulphur (S)	Sediment			0.2	%

Legend	
To Be Announced	TBA
Exceeds one Criteria	Result
Exceeds two Criteria	Result
DL > Criteria	Result
Criteria 1	CCME Sediment Quality -FW
Criteria 2	CCME Sediment Quality-PEL

Appendix A-2
Table 34

Minimum Values Summary Table

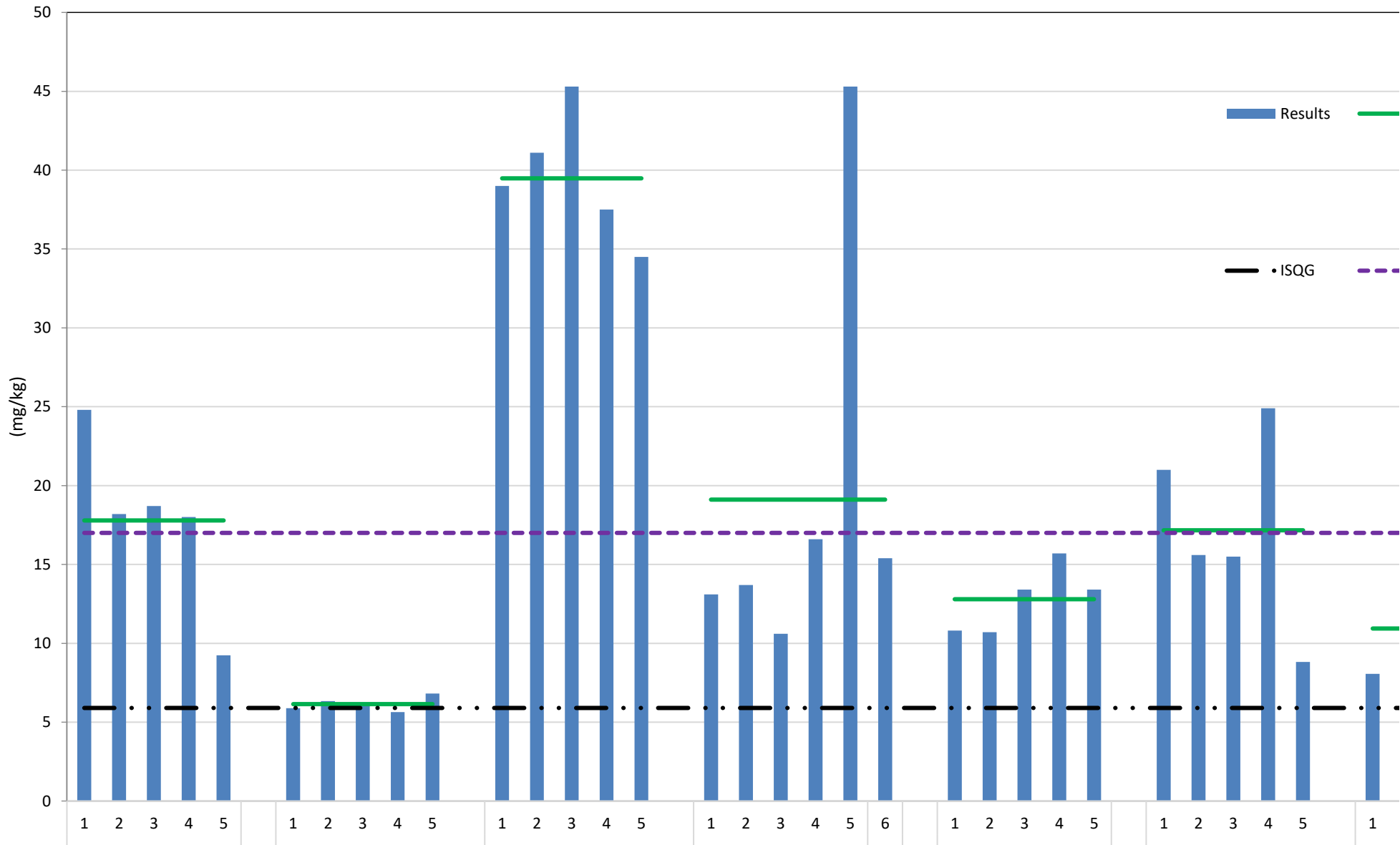
Sample ID	Project	Site	Bureau Veritas Sample ID	Bureau Veritas Job ID	Parameter	Matrix	Criteria ¹	Criteria ²	Result	Units
WA4-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO982	C167190	Moisture	Sediment			10	%
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Index of Additive Cancer Risk(IARC)	Sediment			<0.10	N/A
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Low Molecular Weight PAH's	Sediment			<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	High Molecular Weight PAH's	Sediment			<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total PAH	Sediment			<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	2-Methylnaphthalene	Sediment	0.0202	0.201	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Acenaphthene	Sediment	0.00671	0.0889	<0.00050	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Acenaphthylene	Sediment	0.00587	0.128	<0.00050	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Anthracene	Sediment	0.0469	0.245	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(a)anthracene	Sediment	0.0317	0.385	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(a)pyrene	Sediment	0.0319	0.782	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(g,h,i)perylene	Sediment			<0.0020	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(k)fluoranthene	Sediment			<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(b&j)fluoranthene	Sediment			<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Chrysene	Sediment	0.0571	0.862	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Dibenz(a,h)anthracene	Sediment	0.00622	0.135	<0.00050	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Fluoranthene	Sediment	0.111	2.355	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Fluorene	Sediment	0.0212	0.144	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Indeno(1,2,3-cd)pyrene	Sediment			<0.0020	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Naphthalene	Sediment	0.0346	0.391	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Phenanthrene	Sediment	0.0419	0.515	<0.0010	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Pyrene	Sediment	0.053	0.875	<0.0010	mg/kg
WA4-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO982	C167190	Moisture	Sediment			10	%
75Q03A-15SEP21-S		SEDIMENT QUINSAM RIVER	AGE932	C169603	Soluble (2:1) pH	Sediment			6.32	pH
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Aluminum (Al)	Sediment			5860	mg/kg
75Q03B-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE928	C169603	Total Antimony (Sb)	Sediment			<0.10	mg/kg
WA4-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO982	C167190	Total Arsenic (As)	Sediment	5.9	17	5.64	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Barium (Ba)	Sediment			17.8	mg/kg
QRD02A-13SEP21-M		SEDIMENT QUINSAM RIVER	AGE916	C169603	Total Beryllium (Be)	Sediment			<0.20	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Bismuth (Bi)	Sediment			<0.10	mg/kg
QRD02B-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE917	C169603	Total Cadmium (Cd)	Sediment	0.6	3.5	0.051	mg/kg
QRD02DR-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE921	C169603	Total Calcium (Ca)	Sediment			5380	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Chromium (Cr)	Sediment	37.3	90	8.29	mg/kg
75Q03B-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE928	C169603	Total Cobalt (Co)	Sediment			6.59	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Copper (Cu)	Sediment	35.7	197	15.8	mg/kg
75Q03B-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE928	C169603	Total Iron (Fe)	Sediment			15500	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Lead (Pb)	Sediment	35	91.3	1.04	mg/kg
QRD02DR-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE921	C169603	Total Lithium (Li)	Sediment			3.17	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Magnesium (Mg)	Sediment			1200	mg/kg
75Q03B-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE928	C169603	Total Manganese (Mn)	Sediment			180	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Mercury (Hg)	Sediment	0.17	0.486	<0.050	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Molybdenum (Mo)	Sediment			0.24	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Nickel (Ni)	Sediment			7.69	mg/kg
QRD03B-14 SEP31-M		SEDIMENT QUINSAM RIVER	AGE923	C169603	Total Phosphorus (P)	Sediment			158	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Potassium (K)	Sediment			123	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Selenium (Se)	Sediment			<0.50	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Silver (Ag)	Sediment			<0.050	mg/kg
QRD03B-14 SEP31-M		SEDIMENT QUINSAM RIVER	AGE923	C169603	Total Sodium (Na)	Sediment			159	mg/kg
QRD02C-13SEP21-M		SEDIMENT QUINSAM RIVER	AGE918	C169603	Total Strontium (Sr)	Sediment			18.3	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Thallium (Tl)	Sediment			<0.050	mg/kg
QRD02DL-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE920	C169603	Total Tin (Sn)	Sediment			0.22	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Titanium (Ti)	Sediment			193	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Uranium (U)	Sediment			0.138	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Vanadium (V)	Sediment			54.2	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Zinc (Zn)	Sediment	123	315	23.3	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	Total Zirconium (Zr)	Sediment			1.64	mg/kg
S2-13 SEP21-M		SEDIMENT QUINSAM RIVER	AGE915	C169603	% sand by hydrometer	Sediment			69	%
WA5-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO983	C167190	% silt by hydrometer	Sediment			<2.0	%
WA2-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO980	C167190	Clay Content	Sediment			<2.0	%
WA4-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO982	C167190	Moisture	Sediment			10	%
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Benzo(b)fluoranthene	Sediment			<0.0010	mg/kg
QRD02A-13SEP21-M		SEDIMENT QUINSAM RIVER	AGE916	C169603	Total Mercury (Hg)	Sediment	0.17	0.486	<0.010	mg/kg
WA2-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO980	C167190	Total Boron (B)	Sediment			2.5	mg/kg
WA1-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO979	C167190	Total Tungsten (W)	Sediment			<0.50	mg/kg
75Q03D-15SEP21-M		SEDIMENT QUINSAM RIVER	AGE930	C169603	Total Organic Carbon (C)	Sediment			0.33	%
WA5-SEP21-M		SEDIMENT WA QUINSAM RIVER	AFO983	C167190	Total Sulphur (S)	Sediment			<0.06	%
Legend										
To Be Announced		TBA								
Exceeds one Criteria		Result								
Exceeds two Criteria		Result								
DL > Criteria		Result								
Criteria 1		CCME Sediment Quality -FW								
Criteria 2		CCME Sediment Quality-PEL								

<i>Criteria Name</i>	<i>Sample ID</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Parameter</i>	<i>Criteria</i>	<i>Result</i>	<i>DL</i>	<i>Units</i>
CCME Sediment Quality -FW	WA1-SEP21-M	AFO979	C167190	Total Copper (Cu)	35.7	45.8	0.5	mg/kg
CCME Sediment Quality -FW	WA2-SEP21-M	AFO980	C167190	Total Arsenic (As)	5.9	6.33	0.2	mg/kg
CCME Sediment Quality -FW	WA2-SEP21-M	AFO980	C167190	Total Copper (Cu)	35.7	55.1	0.5	mg/kg
CCME Sediment Quality -FW	WA3-SEP21-M	AFO981	C167190	Total Arsenic (As)	5.9	6.05	0.2	mg/kg
CCME Sediment Quality -FW	WA3-SEP21-M	AFO981	C167190	Total Copper (Cu)	35.7	53.6	0.5	mg/kg
CCME Sediment Quality -FW	WA4-SEP21-M	AFO982	C167190	Total Copper (Cu)	35.7	50.3	0.5	mg/kg
CCME Sediment Quality -FW	WA5-SEP21-M	AFO983	C167190	Total Arsenic (As)	5.9	6.81	0.2	mg/kg
CCME Sediment Quality -FW	WA5-SEP21-M	AFO983	C167190	Total Copper (Cu)	35.7	50.8	0.5	mg/kg
CCME Sediment Quality -FW	WA1-SEP21-S	AFO984	C167190	Total Arsenic (As)	5.9	6.11	0.2	mg/kg
CCME Sediment Quality -FW	WA1-SEP21-S	AFO984	C167190	Total Copper (Cu)	35.7	49.2	0.5	mg/kg
CCME Sediment Quality -FW	S2-13 SEP21-M	AGE915	C169603	Total Arsenic (As)	5.9	8290	0.2	mg/kg
CCME Sediment Quality -FW	QRD02A-13SEP21-M	AGE916	C169603	Naphthalene	0.0346	0.059	0.001	mg/kg
CCME Sediment Quality -FW	QRD02A-13SEP21-M	AGE916	C169603	2-Methylnaphthalene	0.0202	0.076	0.001	mg/kg
CCME Sediment Quality -FW	QRD02A-13SEP21-M	AGE916	C169603	Acenaphthene	0.00671	0.0074	0.0005	mg/kg
CCME Sediment Quality -FW	QRD02A-13SEP21-M	AGE916	C169603	Phenanthrene	0.0419	0.052	0.001	mg/kg
CCME Sediment Quality -FW	QRD02A-13SEP21-M	AGE916	C169603	Total Arsenic (As)	5.9	13.1	0.2	mg/kg
CCME Sediment Quality -FW	QRD02B-13 SEP21-M	AGE917	C169603	Total Arsenic (As)	5.9	13.7	0.2	mg/kg
CCME Sediment Quality -FW	QRD02C-13SEP21-M	AGE918	C169603	2-Methylnaphthalene	0.0202	0.021	0.001	mg/kg
CCME Sediment Quality -FW	QRD02C-13SEP21-M	AGE918	C169603	Total Arsenic (As)	5.9	10.6	0.2	mg/kg
CCME Sediment Quality -FW	QRD02E-13 SEP21-M	AGE919	C169603	Total Arsenic (As)	5.9	16.6	0.2	mg/kg
CCME Sediment Quality -FW	QRD02DL-13 SEP21-M	AGE920	C169603	Total Arsenic (As)	5.9	45.3	0.2	mg/kg
CCME Sediment Quality -FW	QRD02DR-13 SEP21-M	AGE921	C169603	Total Arsenic (As)	5.9	15.4	0.2	mg/kg
CCME Sediment Quality -FW	QRD03A-14 SEP31-M	AGE922	C169603	Total Arsenic (As)	5.9	10.8	0.2	mg/kg
CCME Sediment Quality -FW	QRD03B-14 SEP31-M	AGE923	C169603	Total Arsenic (As)	5.9	10.7	0.2	mg/kg
CCME Sediment Quality -FW	QRD03C-14 SEP31-M	AGE924	C169603	Total Arsenic (As)	5.9	13.4	0.2	mg/kg
CCME Sediment Quality -FW	QRD03D-14 SEP31-M	AGE925	C169603	Total Arsenic (As)	5.9	15.7	0.2	mg/kg
CCME Sediment Quality -FW	QRD03E-14 SEP21-M	AGE926	C169603	2-Methylnaphthalene	0.0202	0.023	0.001	mg/kg
CCME Sediment Quality -FW	QRD03E-14 SEP21-M	AGE926	C169603	Total Arsenic (As)	5.9	13.4	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03A-15SEP21-M Lab-Dup	AGE927	C169603	Total Arsenic (As)	5.9	7.92	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03A-15SEP21-M	AGE927	C169603	Total Arsenic (As)	5.9	8.07	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03B-15SEP21-M	AGE928	C169603	Total Arsenic (As)	5.9	6.32	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03C-15SEP21-M	AGE929	C169603	Total Arsenic (As)	5.9	18.4	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03C-15SEP21-M	AGE929	C169603	Total Cadmium (Cd)	0.6	0.654	0.05	mg/kg
CCME Sediment Quality -FW	7SQ03D-15SEP21-M	AGE930	C169603	Total Arsenic (As)	5.9	11.1	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03E-15SEP21-M	AGE931	C169603	Total Arsenic (As)	5.9	10.8	0.2	mg/kg
CCME Sediment Quality -FW	7SQ03A-15SEP21-S	AGE932	C169603	Total Arsenic (As)	5.9	8.22	0.2	mg/kg
CCME Sediment Quality-PEL	S2-13 SEP21-M	AGE915	C169603	Total Arsenic (As)	17	8290	0.2	mg/kg
CCME Sediment Quality-PEL	QRD02DL-13 SEP21-M	AGE920	C169603	Total Arsenic (As)	17	45.3	0.2	mg/kg
CCME Sediment Quality-PEL	7SQ03C-15SEP21-M	AGE929	C169603	Total Arsenic (As)	17	18.4	0.2	mg/kg

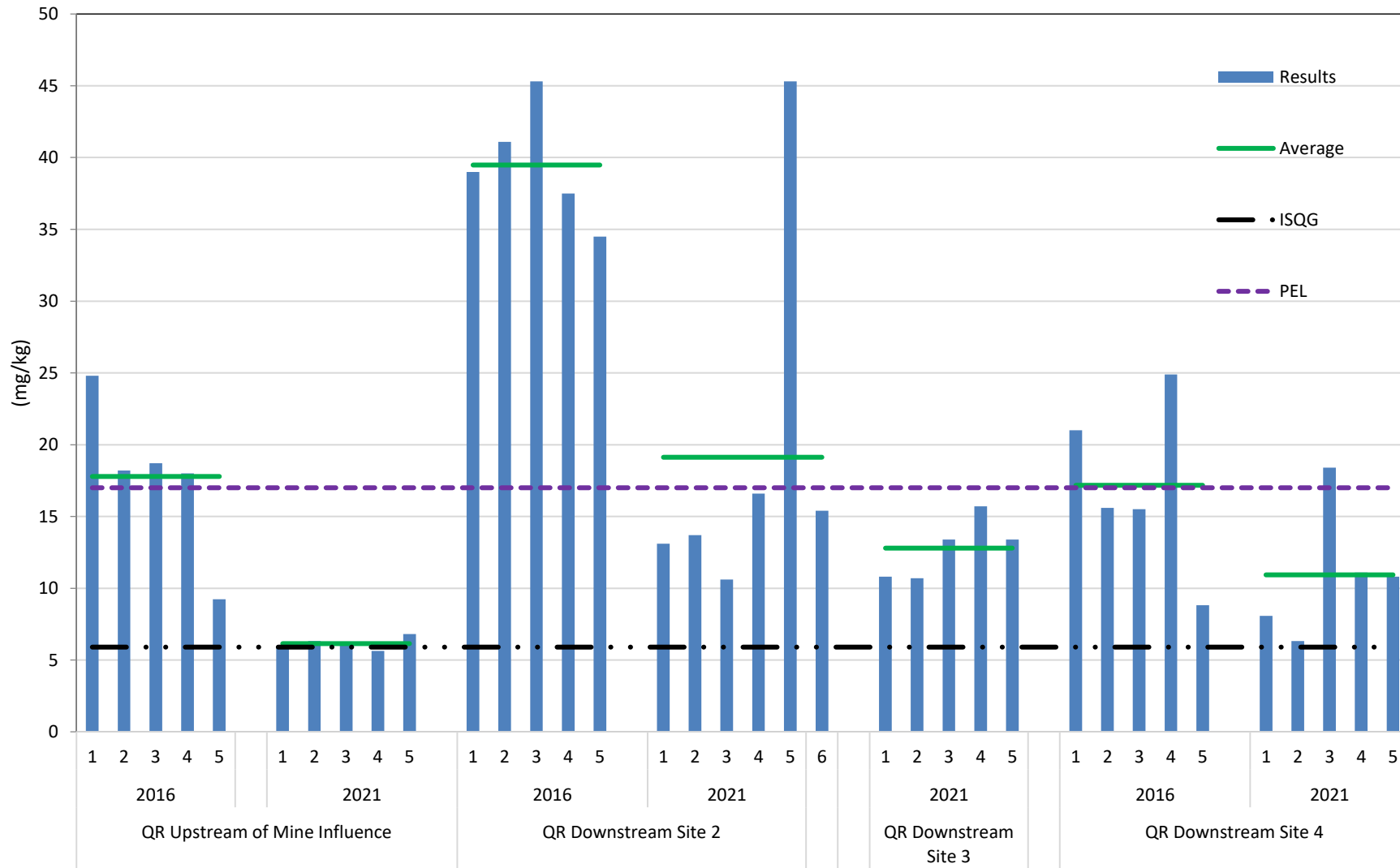
Appendix A-2
Table 36
Summary of Analysis Dates

<i>Sample ID</i>	<i>Project</i>	<i>Bureau Veritas Sample ID</i>	<i>Bureau Veritas Job ID</i>	<i>Date Sampled</i>	<i>Time Sampled</i>	<i>Date Range: Extracted</i>	<i>Date Range: Analyzed</i>
WA1-SEP21-M	SEDIMENT WA QUINSAM RIVER	AFO979	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
WA2-SEP21-M	SEDIMENT WA QUINSAM RIVER	AFO980	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
WA3-SEP21-M	SEDIMENT WA QUINSAM RIVER	AFO981	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
WA4-SEP21-M	SEDIMENT WA QUINSAM RIVER	AFO982	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
WA5-SEP21-M	SEDIMENT WA QUINSAM RIVER	AFO983	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
WA1-SEP21-S	SEDIMENT WA QUINSAM RIVER	AFO984	C167190	2021/09/07		2021/09/16 - 2021/09/16	2021/09/16 - 2021/09/22
S2-13 SEP21-M	SEDIMENT QUINSAM RIVER	AGE915	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD02A-13SEP21-M	SEDIMENT QUINSAM RIVER	AGE916	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD02B-13 SEP21-M	SEDIMENT QUINSAM RIVER	AGE917	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD02C-13SEP21-M	SEDIMENT QUINSAM RIVER	AGE918	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD02E-13 SEP21-M	SEDIMENT QUINSAM RIVER	AGE919	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD02DL-13 SEP21-M	SEDIMENT QUINSAM RIVER	AGE920	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/24
QRD02DR-13 SEP21-M	SEDIMENT QUINSAM RIVER	AGE921	C169603	2021/09/13		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD03A-14 SEP31-M	SEDIMENT QUINSAM RIVER	AGE922	C169603	2021/09/14		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD03B-14 SEP31-M	SEDIMENT QUINSAM RIVER	AGE923	C169603	2021/09/14		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD03C-14 SEP31-M	SEDIMENT QUINSAM RIVER	AGE924	C169603	2021/09/14		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD03D-14 SEP31-M	SEDIMENT QUINSAM RIVER	AGE925	C169603	2021/09/14		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
QRD03E-14 SEP21-M	SEDIMENT QUINSAM RIVER	AGE926	C169603	2021/09/14		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03A-15SEP21-M	SEDIMENT QUINSAM RIVER	AGE927	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03B-15SEP21-M	SEDIMENT QUINSAM RIVER	AGE928	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03C-15SEP21-M	SEDIMENT QUINSAM RIVER	AGE929	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03D-15SEP21-M	SEDIMENT QUINSAM RIVER	AGE930	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03E-15SEP21-M	SEDIMENT QUINSAM RIVER	AGE931	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30
7SQ03A-15SEP21-S	SEDIMENT QUINSAM RIVER	AGE932	C169603	2021/09/15		2021/09/21 - 2021/09/22	2021/09/22 - 2021/09/30

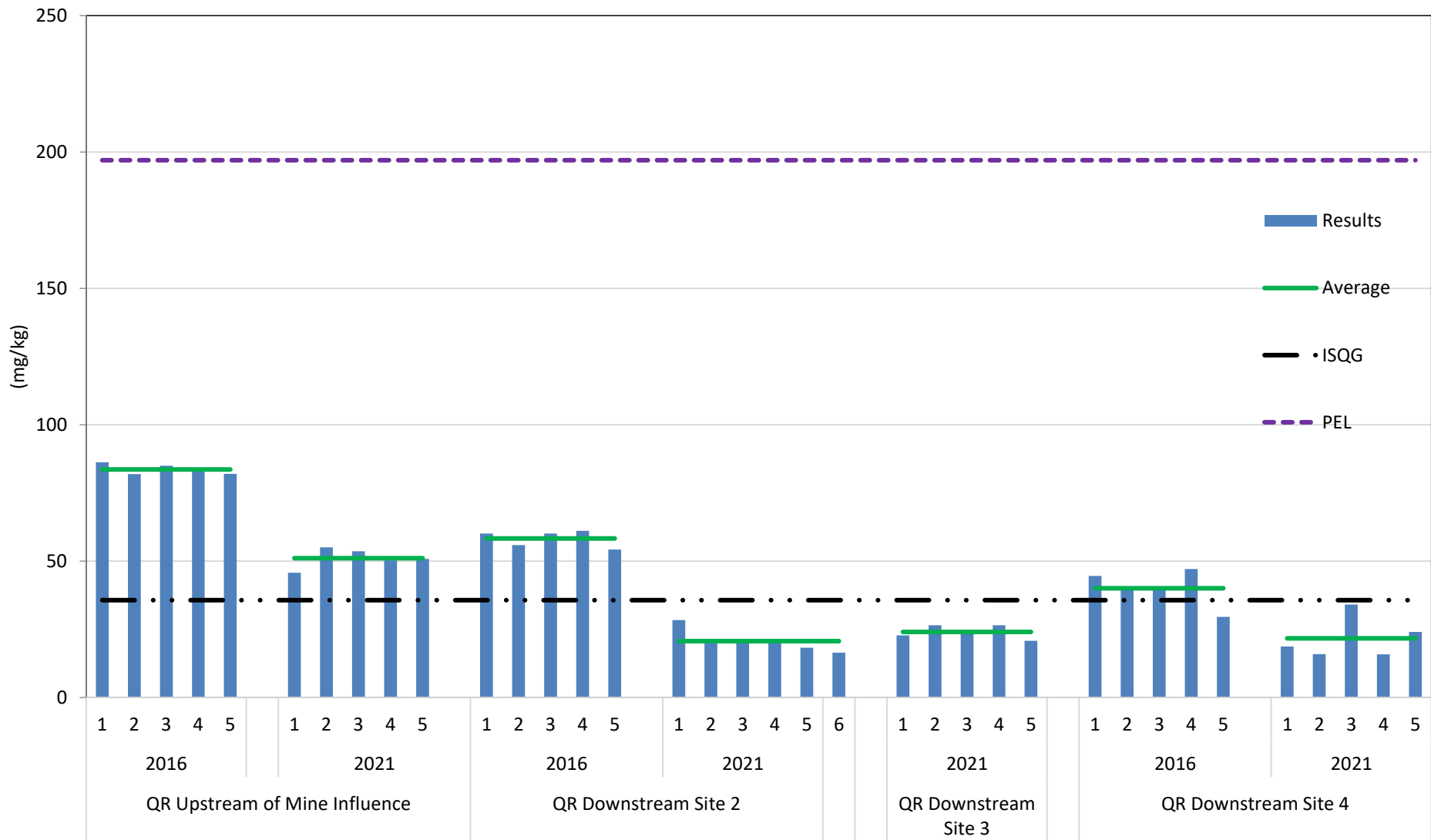
Quinsam River 2016 compared to 2021 - Arsenic (mg/kg)



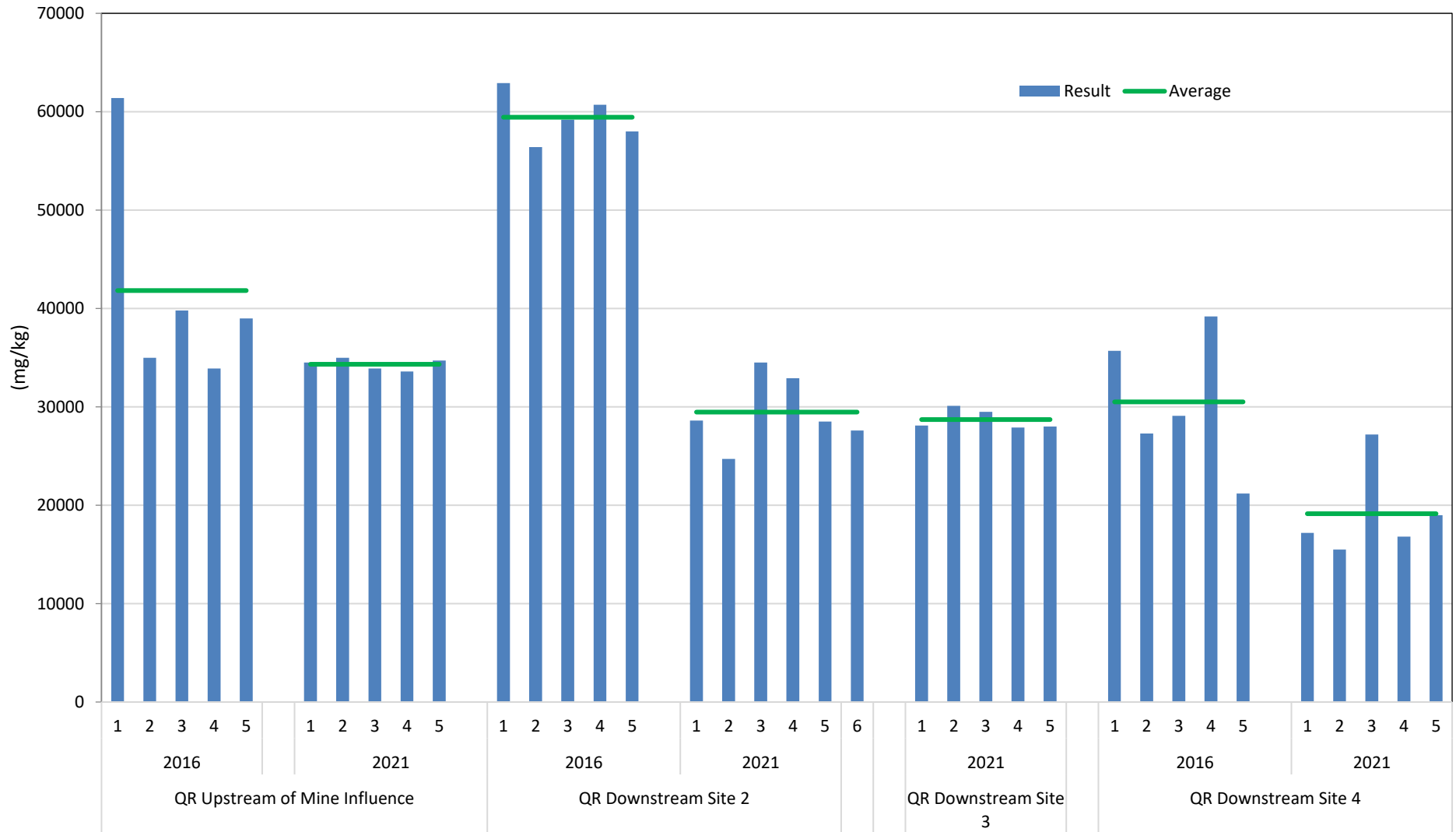
Quinsam River 2016 compared to 2021 - Arsenic (mg/kg)



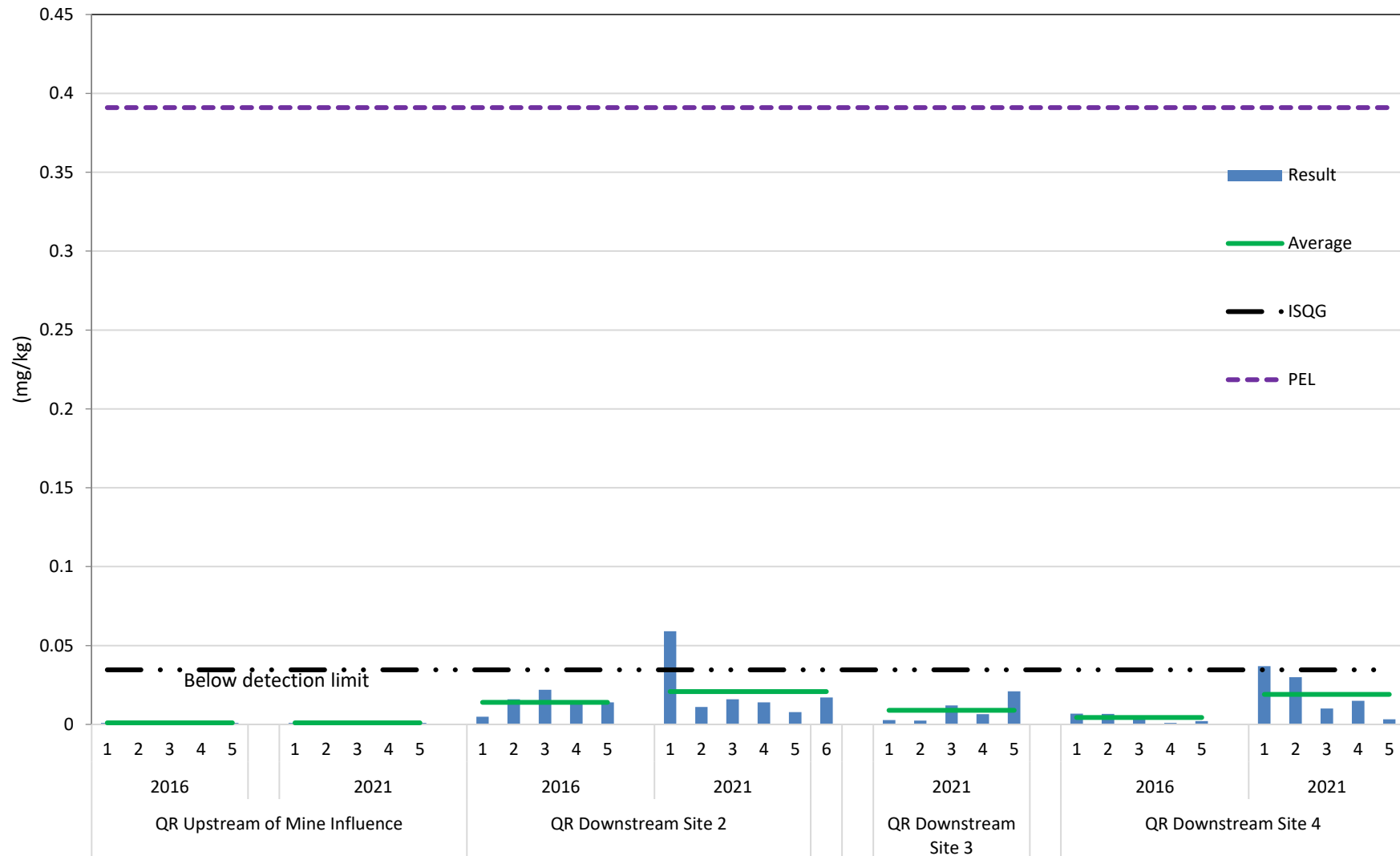
Quinsam River 2016 compared to 2021 - Copper (mg/kg)



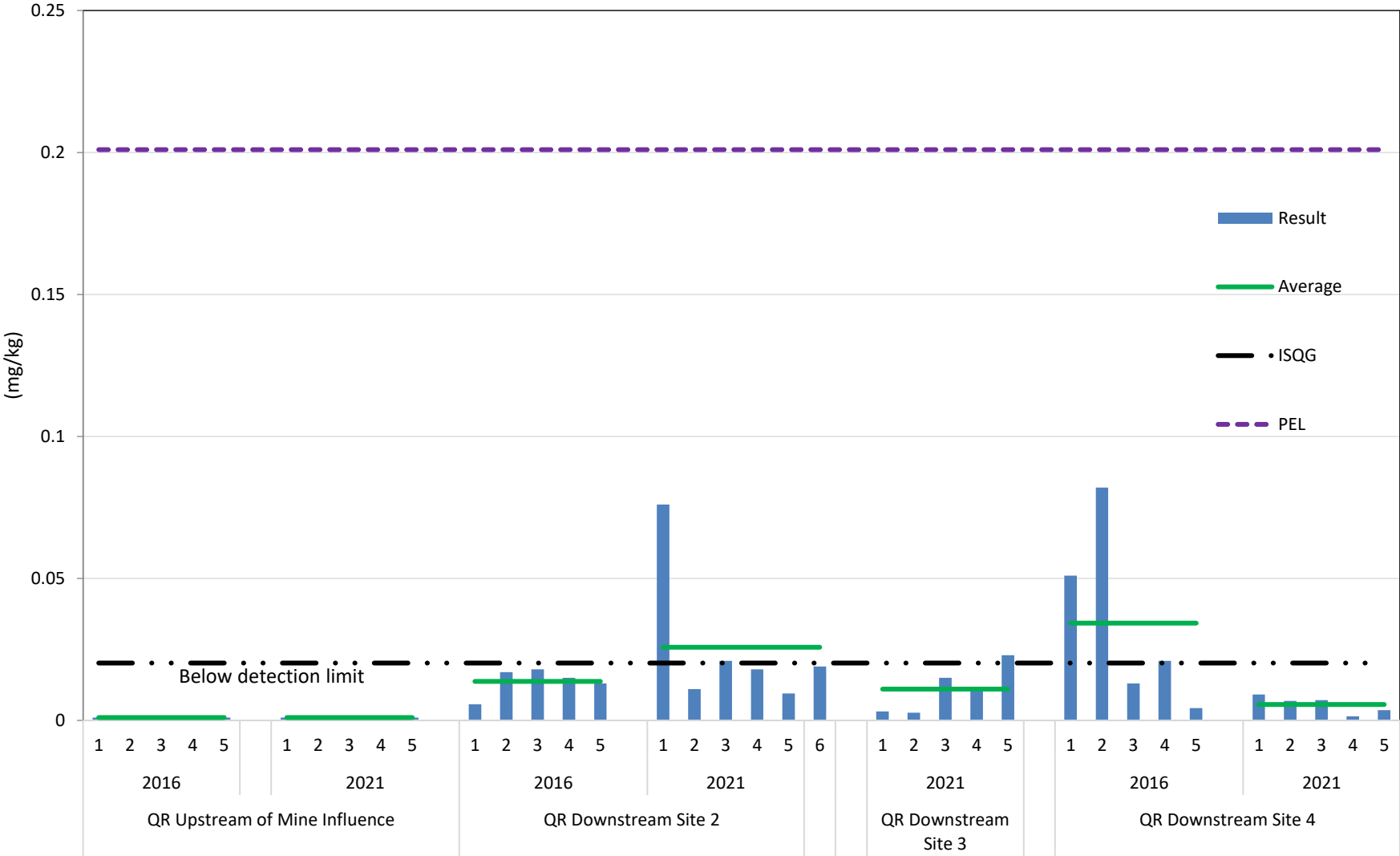
Quinsam River 2016 compared to 2021 - Iron (mg/kg)



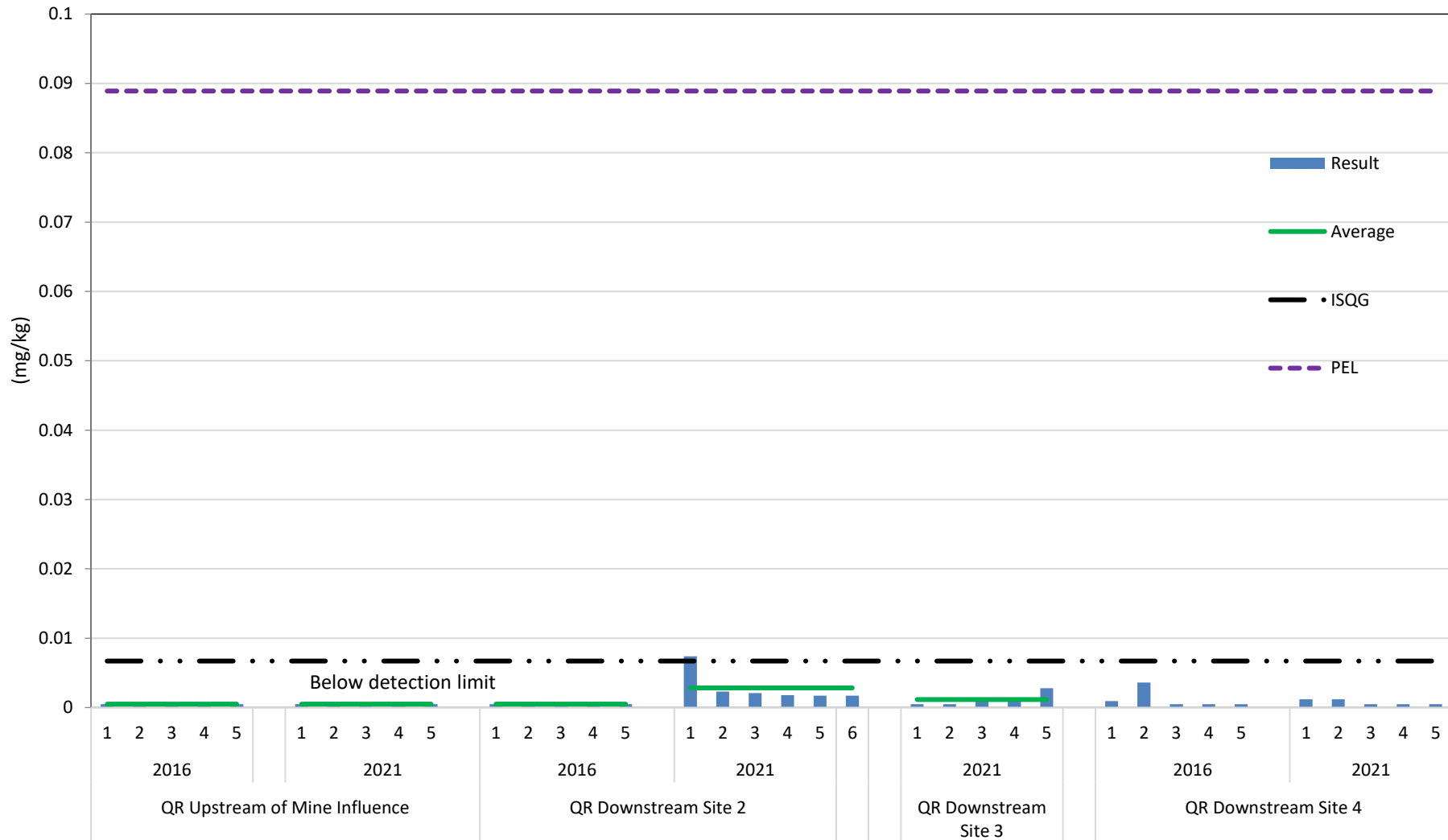
Quinsam River 2016 compared to 2021 - Naphthalene (mg/kg)



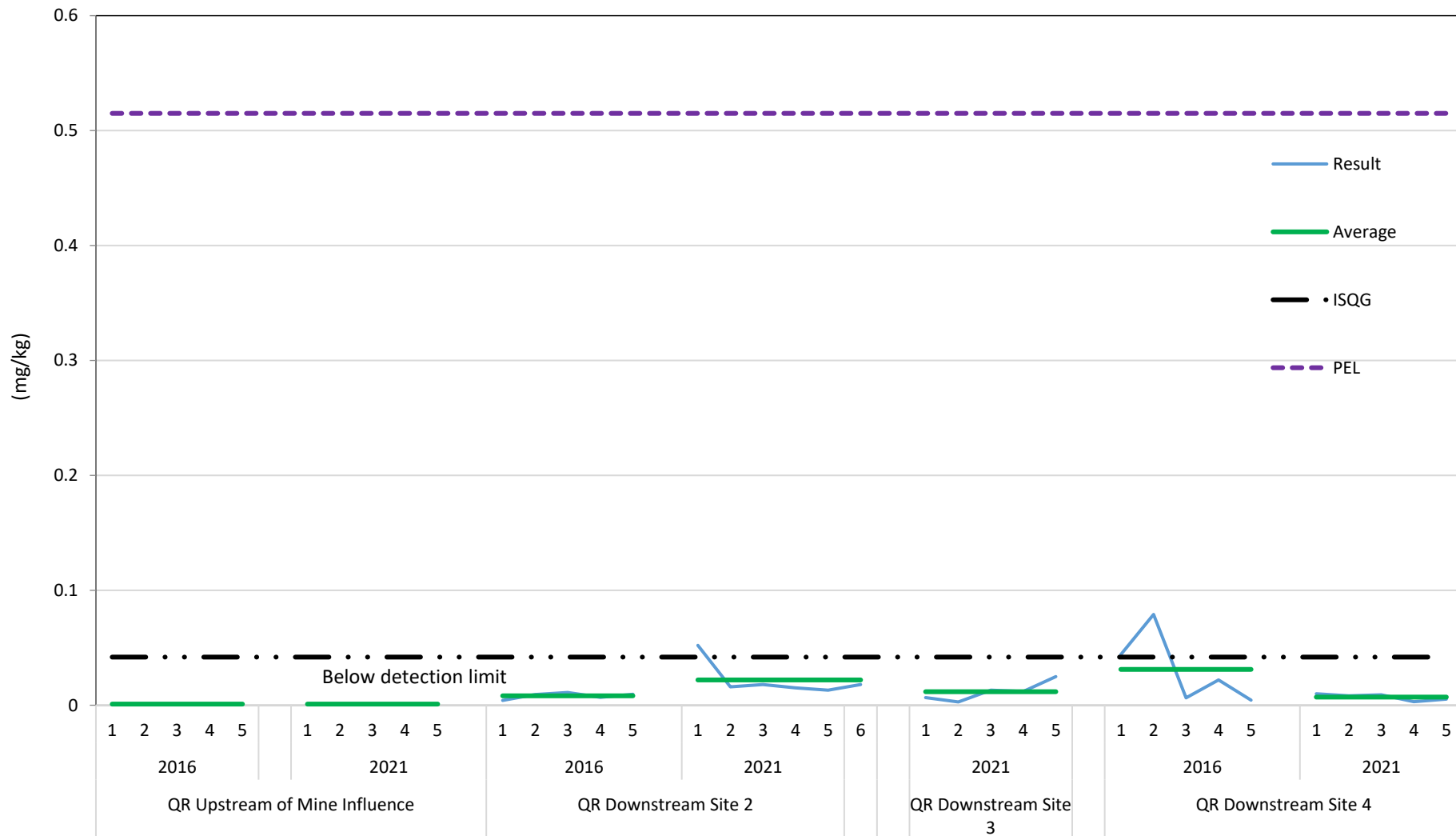
Quinsam River 2016 compared to 2021 - 2-Methylnaphthalene (mg/kg)



Quinsam River 2016 compared to 2021 - Acenaphthene (mg/kg)



Quinsam River 2016 compared to 2021 - Phenanthrene (mg/kg)



Appendix A-4
Table 1
Relative Percent Difference

Relative Percent Difference (RPD) for Sediment Sample Splits									
Stn.Code 1	Date	Param.Code	Units	Lab MDL 1	Lab MDL 2	Result 1	Result 2	Rel.% Diff.	Ratio
75QR1	2021-09-15	(2)Methylnaphthalen	mg/kg	0.001	0.001	0.012	0.0091	27.5	1.32
75QR1	2021-09-15	Acenaphthene	mg/kg	0.0005	0.0005	0.0018	0.0012	40.0	1.50
75QR1	2021-09-15	Acenaphthylene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
75QR1	2021-09-15	Ag-T	mg/kg	0.05	0.05	<0.050	<0.050	0.0	1.00
75QR1	2021-09-15	Al-T	mg/kg	100	100	10700	10900	-1.9	0.98
75QR1	2021-09-15	Anthracene	mg/kg	0.001	0.001	0.0012	<0.0010	18.2	1.20
75QR1	2021-09-15	As-T	mg/kg	0.2	0.2	8.22	8.07	1.8	1.02
75QR1	2021-09-15	Ba-T	mg/kg	0.1	0.1	28.2	25.5	10.1	1.11
75QR1	2021-09-15	Benzo(a)anthracene	mg/kg	0.001	0.001	0.0018	0.0014	25.0	1.29
75QR1	2021-09-15	Benzo(a)pyrene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
75QR1	2021-09-15	Benzo(b&j)fluoranthene	mg/kg	0.001	0.001	0.0018	0.0014	25.0	1.29
75QR1	2021-09-15	Benzo(ghi)perylene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
75QR1	2021-09-15	Benzo(k)fluoranthene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
75QR1	2021-09-15	Be-T	mg/kg	0.2	0.2	<0.20	<0.20	0.0	1.00
75QR1	2021-09-15	Bi-T	mg/kg	0.1	0.1	<0.10	<0.10	0.0	1.00
75QR1	2021-09-15	Ca-T	mg/kg	100	100	5770	5900	-2.2	0.98
75QR1	2021-09-15	Cd-T	mg/kg	0.05	0.05	0.137	0.116	16.6	1.18
75QR1	2021-09-15	Chrysene	mg/kg	0.001	0.001	0.0035	0.0026	29.5	1.35
75QR1	2021-09-15	Clay	%	2	2	<2.0	2.1	-4.9	0.95
75QR1	2021-09-15	CONV30.2	%	0.05	0.05	0.90	1.0	-10.5	0.90
75QR1	2021-09-15	Co-T	mg/kg	0.1	0.1	7.09	6.95	2.0	1.02
75QR1	2021-09-15	Cr-T	mg/kg	0.5	0.5	15.7	15.0	4.6	1.05
75QR1	2021-09-15	Cu-T	mg/kg	0.5	0.5	20.8	18.7	10.6	1.11
75QR1	2021-09-15	Dibenz(ah)anthracene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
75QR1	2021-09-15	Fe-T	mg/kg	100	100	17300	17200	0.6	1.01
75QR1	2021-09-15	Fluoranthene	mg/kg	0.001	0.001	0.0037	0.0028	27.7	1.32
75QR1	2021-09-15	Fluorene	mg/kg	0.001	0.001	0.0018	0.0011	48.3	1.64
75QR1	2021-09-15	Hg-T	mg/kg	0.01	0.01	0.016	0.011	37.0	1.45
75QR1	2021-09-15	HighMolecularWeight	mg/kg	0.001	0.001	0.012	0.0089	29.7	1.35
75QR1	2021-09-15	IARC	N/A	0.1	0.1	<0.10	<0.10	0.0	1.00
75QR1	2021-09-15	Indeno(123-cd)pyrene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
75QR1	2021-09-15	K-T	mg/kg	100	100	139	139	0.0	1.00
75QR1	2021-09-15	Li-T	mg/kg	0.5	0.5	4.35	4.28	1.6	1.02
75QR1	2021-09-15	LowMolecularWeight	mg/kg	0.001	0.001	0.038	0.029	26.9	1.31
75QR1	2021-09-15	MET33	mg/kg	0.5	0.5	<0.50	<0.50	0.0	1.00
75QR1	2021-09-15	MET7	mg/kg	1	1	4.5	3.9	14.3	1.15
75QR1	2021-09-15	Mg-T	mg/kg	100	100	3600	3630	-0.8	0.99
75QR1	2021-09-15	Mn-T	mg/kg	0.2	0.2	196	198	-1.0	0.99
75QR1	2021-09-15	Moisture	%	0.3	0.3	43	35	20.5	1.23
75QR1	2021-09-15	Mo-T	mg/kg	0.1	0.1	0.47	0.40	16.1	1.18
75QR1	2021-09-15	Naphthalene	mg/kg	0.001	0.001	0.0071	0.0068	4.3	1.04
75QR1	2021-09-15	Na-T	mg/kg	100	100	170	174	-2.3	0.98
75QR1	2021-09-15	Ni-T	mg/kg	0.5	0.5	11.2	11.1	0.9	1.01
75QR1	2021-09-15	PAH15	mg/kg	0.001	0.001	0.0018	0.0014	25.0	1.29
75QR1	2021-09-15	Pb-T	mg/kg	0.1	0.1	1.70	1.41	18.6	1.21
75QR1	2021-09-15	Phenanthrene	mg/kg	0.001	0.001	0.014	0.010	33.3	1.40
75QR1	2021-09-15	pH-L	pH Units			6.32	6.38	-0.9	0.99
75QR1	2021-09-15	P-T	mg/kg	10	10	258	224	14.1	1.15
75QR1	2021-09-15	Pyrene	mg/kg	0.001	0.001	0.0025	0.0022	12.8	1.14
75QR1	2021-09-15	Sand	%	2	2	83	93	-11.4	0.89
75QR1	2021-09-15	Sb-T	mg/kg	0.1	0.1	0.14	0.12	15.4	1.17
75QR1	2021-09-15	Se-T	mg/kg	0.5	0.5	<0.50	<0.50	0.0	1.00
75QR1	2021-09-15	Silt	%	2	2	15	4.5	107.7	3.33
75QR1	2021-09-15	Sn-T	mg/kg	0.1	0.1	0.30	0.29	3.4	1.03
75QR1	2021-09-15	Sr-T	mg/kg	0.1	0.1	20.5	19.9	3.0	1.03
75QR1	2021-09-15	S-T	%	0.06	0.06	<0.06	<0.06	0.0	1.00
75QR1	2021-09-15	Ti-T	mg/kg	1	1	923	1090	-16.6	0.85
75QR1	2021-09-15	Tl-T	mg/kg	0.05	0.05	<0.050	<0.050	0.0	1.00
75QR1	2021-09-15	TotalPAH	mg/kg	0.001	0.001	0.049	0.038	25.3	1.29
75QR1	2021-09-15	U-T	mg/kg	0.05	0.05	0.230	0.208	10.0	1.11
75QR1	2021-09-15	V-T	mg/kg	1	1	63.4	63.3	0.2	1.00
75QR1	2021-09-15	Zn-T	mg/kg	1	1	30.4	28.1	7.9	1.08
75QR1	2021-09-15	Zr-T	mg/kg	0.5	0.5	3.23	3.25	-0.6	0.99

Appendix A-4
Table 2
Relative Percent Difference

Relative Percent Difference (RPD) for Sediment Sample Splits									
Stn.Code 1	Date	Param.Code	Units	Lab MDL 1	Lab MDL 2	Result 1	Result 2	Rel.% Diff.	Ratio
IRN06E	2020-09-03	(2)Methylnaphthalen	mg/kg	0.001	0.001	0.032	0.027	16.9	1.19
IRN06E	2020-09-03	Acenaphthene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
IRN06E	2020-09-03	Acenaphthylene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
IRN06E	2020-09-03	Ag-T	mg/kg	0.05	0.05	0.076	0.071	6.8	1.07
IRN06E	2020-09-03	Al-T	mg/kg	100	100	23700	23200	2.1	1.02
IRN06E	2020-09-03	Anthracene	mg/kg	0.001	0.001	<0.0010	0.0014	-33.3	0.71
IRN06E	2020-09-03	As-T	mg/kg	0.2	0.2	118	98.1	18.4	1.20
IRN06E	2020-09-03	Ba-T	mg/kg	0.1	0.1	148	131	12.2	1.13
IRN06E	2020-09-03	Benzo(a)anthracene	mg/kg	0.001	0.001	0.0024	0.0022	8.7	1.09
IRN06E	2020-09-03	Benzo(a)pyrene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
IRN06E	2020-09-03	Benzo(b&j)fluoranthene	mg/kg	0.001	0.001	0.0011	<0.0010	9.5	1.10
IRN06E	2020-09-03	Benzo(ghi)perylene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
IRN06E	2020-09-03	Benzo(k)fluoranthene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
IRN06E	2020-09-03	Be-T	mg/kg	0.2	0.2	0.61	0.56	8.5	1.09
IRN06E	2020-09-03	Bi-T	mg/kg	0.1	0.1	0.11	<0.10	9.5	1.10
IRN06E	2020-09-03	Ca-T	mg/kg	100	100	9330	9140	2.1	1.02
IRN06E	2020-09-03	Cd-T	mg/kg	0.05	0.05	1.33	1.26	5.4	1.06
IRN06E	2020-09-03	Chrysene	mg/kg	0.001	0.001	0.0035	0.0035	0.0	1.00
IRN06E	2020-09-03	Clay	%	2	2	2.6	<2.0	26.1	1.30
IRN06E	2020-09-03	CONV30.2	%	0.064	0.05	1.6	1.5	6.5	1.07
IRN06E	2020-09-03	Co-T	mg/kg	0.1	0.1	25.7	25.1	2.4	1.02
IRN06E	2020-09-03	Cr-T	mg/kg	0.5	0.5	44.5	42.7	4.1	1.04
IRN06E	2020-09-03	Cu-T	mg/kg	0.5	0.5	63.9	59.9	6.5	1.07
IRN06E	2020-09-03	Dibenz(ah)anthracene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
IRN06E	2020-09-03	Fe-T	mg/kg	100	100	61900	60100	3.0	1.03
IRN06E	2020-09-03	Fluoranthene	mg/kg	0.001	0.001	0.0025	0.0024	4.1	1.04
IRN06E	2020-09-03	Fluorene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
IRN06E	2020-09-03	Hg-T	mg/kg	0.01	0.01	0.016	0.016	0.0	1.00
IRN06E	2020-09-03	HighMolecularWeight	mg/kg	0.001	0.001	0.011	0.011	0.0	1.00
IRN06E	2020-09-03	IARC	N/A	0.1	0.1	<0.10	<0.10	0.0	1.00
IRN06E	2020-09-03	Indeno(123-cd)pyrene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
IRN06E	2020-09-03	K-T	mg/kg	100	100	1140	1100	3.6	1.04
IRN06E	2020-09-03	Li-T	mg/kg	0.5	0.5	16.9	16.1	4.8	1.05
IRN06E	2020-09-03	LowMolecularWeight	mg/kg	0.001	0.001	0.077	0.071	8.1	1.08
IRN06E	2020-09-03	MET33	mg/kg	0.5	0.5	<0.50	<0.50	0.0	1.00
IRN06E	2020-09-03	MET7	mg/kg	1	1	17.5	16.6	5.3	1.05
IRN06E	2020-09-03	Mg-T	mg/kg	100	100	6840	7140	-4.3	0.96
IRN06E	2020-09-03	Mn-T	mg/kg	0.2	0.2	1250	1130	10.1	1.11
IRN06E	2020-09-03	Moisture	%	0.3	0.3	11	17	-42.9	0.65
IRN06E	2020-09-03	Mo-T	mg/kg	0.1	0.1	4.28	3.77	12.7	1.14
IRN06E	2020-09-03	Naphthalene	mg/kg	0.001	0.001	0.024	0.019	23.3	1.26
IRN06E	2020-09-03	Na-T	mg/kg	100	100	339	373	-9.6	0.91
IRN06E	2020-09-03	Ni-T	mg/kg	0.5	0.5	40.9	39.1	4.5	1.05
IRN06E	2020-09-03	Pb-T	mg/kg	0.1	0.1	5.44	5.09	6.6	1.07
IRN06E	2020-09-03	Phenanthrene	mg/kg	0.001	0.001	0.021	0.024	-13.3	0.88
IRN06E	2020-09-03	pH-L	pH Units			7.46	7.44	0.3	1.00
IRN06E	2020-09-03	P-T	mg/kg	10	10	630	613	2.7	1.03
IRN06E	2020-09-03	Pyrene	mg/kg	0.001	0.001	0.0027	0.0028	-3.6	0.96
IRN06E	2020-09-03	Sand	%	2	2	96	99	-3.1	0.97
IRN06E	2020-09-03	Sb-T	mg/kg	0.1	0.1	1.36	0.98	32.5	1.39
IRN06E	2020-09-03	Se-T	mg/kg	0.5	0.5	1.40	1.19	16.2	1.18
IRN06E	2020-09-03	Silt	%	2	2	<2.0	<2.0	0.0	1.00
IRN06E	2020-09-03	Sn-T	mg/kg	0.1	0.1	0.58	0.68	-15.9	0.85
IRN06E	2020-09-03	Sr-T	mg/kg	0.1	0.1	66.9	65.0	2.9	1.03
IRN06E	2020-09-03	S-T	%	0.06	0.06	<0.06	<0.06	0.0	1.00
IRN06E	2020-09-03	Ti-T	mg/kg	1	1	549	604	-9.5	0.91
IRN06E	2020-09-03	TI-T	mg/kg	0.05	0.05	0.206	0.183	11.8	1.13
IRN06E	2020-09-03	TotalPAH	mg/kg	0.001	0.001	0.088	0.082	7.1	1.07
IRN06E	2020-09-03	U-T	mg/kg	0.05	0.05	0.791	0.759	4.1	1.04
IRN06E	2020-09-03	V-T	mg/kg	1	1	149	145	2.7	1.03
IRN06E	2020-09-03	Zn-T	mg/kg	1	1	122	119	2.5	1.03
IRN06E	2020-09-03	Zr-T	mg/kg	0.5	0.5	4.73	5.09	-7.3	0.93

Appendix A-4
Table 3
Relative Percent Difference

Relative Percent Difference (RPD) for Sediment Sample Splits									
Stn.Code 1	Date	Param.Code	Units	Lab MDL 1	Lab MDL 2	Result 1	Result 2	Rel.% Diff.	Ratio
WA1	2021-09-07	(2)Methylnaphthalen	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Acenaphthene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
WA1	2021-09-07	Acenaphthylene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
WA1	2021-09-07	Ag-T	mg/kg	0.05	0.05	<0.050	<0.050	0.0	1.00
WA1	2021-09-07	Al-T	mg/kg	100	100	18400	17500	5.0	1.05
WA1	2021-09-07	Anthracene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	As-T	mg/kg	0.2	0.2	6.11	5.89	3.7	1.04
WA1	2021-09-07	Ba-T	mg/kg	0.1	0.1	42.6	45.3	-6.1	0.94
WA1	2021-09-07	Benzo(a)anthracene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Benzo(a)pyrene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Benzo(b&j)fluoranthene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Benzo(ghi)perylene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
WA1	2021-09-07	Benzo(k)fluoranthene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Be-T	mg/kg	0.2	0.2	0.22	0.21	4.7	1.05
WA1	2021-09-07	Bi-T	mg/kg	0.1	0.1	<0.10	<0.10	0.0	1.00
WA1	2021-09-07	Ca-T	mg/kg	100	100	9410	8940	5.1	1.05
WA1	2021-09-07	Cd-T	mg/kg	0.05	0.05	0.104	0.098	5.9	1.06
WA1	2021-09-07	Chrysene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Clay	%	2	2	<2.0	2.1	-4.9	0.95
WA1	2021-09-07	CONV30.2	%	0.05	0.05	0.85	0.76	11.2	1.12
WA1	2021-09-07	Co-T	mg/kg	0.1	0.1	12.3	12.2	0.8	1.01
WA1	2021-09-07	Cr-T	mg/kg	0.5	0.5	23.0	19.5	16.5	1.18
WA1	2021-09-07	Cu-T	mg/kg	0.5	0.5	49.2	45.8	7.2	1.07
WA1	2021-09-07	Dibenz(ah)anthracene	mg/kg	0.0005	0.0005	<0.00050	<0.00050	0.0	1.00
WA1	2021-09-07	Fe-T	mg/kg	100	100	40600	34500	16.2	1.18
WA1	2021-09-07	Fluoranthene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Fluorene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Hg-T	mg/kg	0.01	0.01	0.020	0.023	-14.0	0.87
WA1	2021-09-07	HighMolecularWeight	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	IARC	N/A	0.1	0.1	<0.10	<0.10	0.0	1.00
WA1	2021-09-07	Indeno(123-cd)pyrene	mg/kg	0.002	0.002	<0.0020	<0.0020	0.0	1.00
WA1	2021-09-07	K-T	mg/kg	100	100	273	243	11.6	1.12
WA1	2021-09-07	Li-T	mg/kg	0.5	0.5	4.17	3.95	5.4	1.06
WA1	2021-09-07	LowMolecularWeight	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	MET33	mg/kg	0.5	0.5	<0.50	<0.50	0.0	1.00
WA1	2021-09-07	MET7	mg/kg	1	1	2.6	2.7	-3.8	0.96
WA1	2021-09-07	Mg-T	mg/kg	100	100	8380	8350	0.4	1.00
WA1	2021-09-07	Mn-T	mg/kg	0.2	0.2	526	494	6.3	1.06
WA1	2021-09-07	Moisture	%	0.3	0.3	16	14	13.3	1.14
WA1	2021-09-07	Mo-T	mg/kg	0.1	0.1	0.43	0.33	26.3	1.30
WA1	2021-09-07	Naphthalene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Na-T	mg/kg	100	100	341	282	18.9	1.21
WA1	2021-09-07	Ni-T	mg/kg	0.5	0.5	17.7	18.0	-1.7	0.98
WA1	2021-09-07	PAH15	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Pb-T	mg/kg	0.1	0.1	2.97	2.51	16.8	1.18
WA1	2021-09-07	Phenanthrene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	pH-L	pH Units			6.87	6.82	0.7	1.01
WA1	2021-09-07	P-T	mg/kg	10	10	309	296	4.3	1.04
WA1	2021-09-07	Pyrene	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	Sand	%	2	2	97	95	2.1	1.02
WA1	2021-09-07	Sb-T	mg/kg	0.1	0.1	0.11	0.12	-8.7	0.92
WA1	2021-09-07	Se-T	mg/kg	0.5	0.5	<0.50	<0.50	0.0	1.00
WA1	2021-09-07	Silt	%	2	2	2.2	3.3	-40.0	0.67
WA1	2021-09-07	Sn-T	mg/kg	0.1	0.1	0.42	0.37	12.7	1.14
WA1	2021-09-07	Sr-T	mg/kg	0.1	0.1	34.8	34.3	1.4	1.01
WA1	2021-09-07	S-T	%	0.06	0.06	<0.06	0.20	-107.7	0.30
WA1	2021-09-07	Ti-T	mg/kg	1	1	2180	1980	9.6	1.10
WA1	2021-09-07	Tl-T	mg/kg	0.05	0.05	<0.050	<0.050	0.0	1.00
WA1	2021-09-07	TotalPAH	mg/kg	0.001	0.001	<0.0010	<0.0010	0.0	1.00
WA1	2021-09-07	U-T	mg/kg	0.05	0.05	0.279	0.255	9.0	1.09
WA1	2021-09-07	V-T	mg/kg	1	1	147	116	23.6	1.27
WA1	2021-09-07	Zn-T	mg/kg	1	1	50.4	47.9	5.1	1.05
WA1	2021-09-07	Zr-T	mg/kg	0.5	0.5	9.42	9.28	1.5	1.02
Notes:									
Sample classes included in query: B,M,R,S									
Factor applied to less-than results when calculating statistics: 1.0									
Factor applied to greater-than results when calculating statistics: 1.0									
<20% RPD displayed as blue values									

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	IRN-06
Sampling Date	Sep 03 2020
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.91734 N, 125.44074 W
Altitude	256
Local Basin Name	Iron River
	Quinsam Subbasin
Stream Order	



Across Reach



Down Stream

Field Sheet (No image found)



Substrate



Up Stream

Cabin Assessment Results

Reference Model Summary			
Model	BC Coastal Preliminary March 2010		
Analysis Date	June 10, 2022		
Taxonomic Level	Family		
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull		
Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.3%	90.8%	9.0%
CABIN Assessment of IRN-06 on Sep 03, 2020	Similar to Reference		

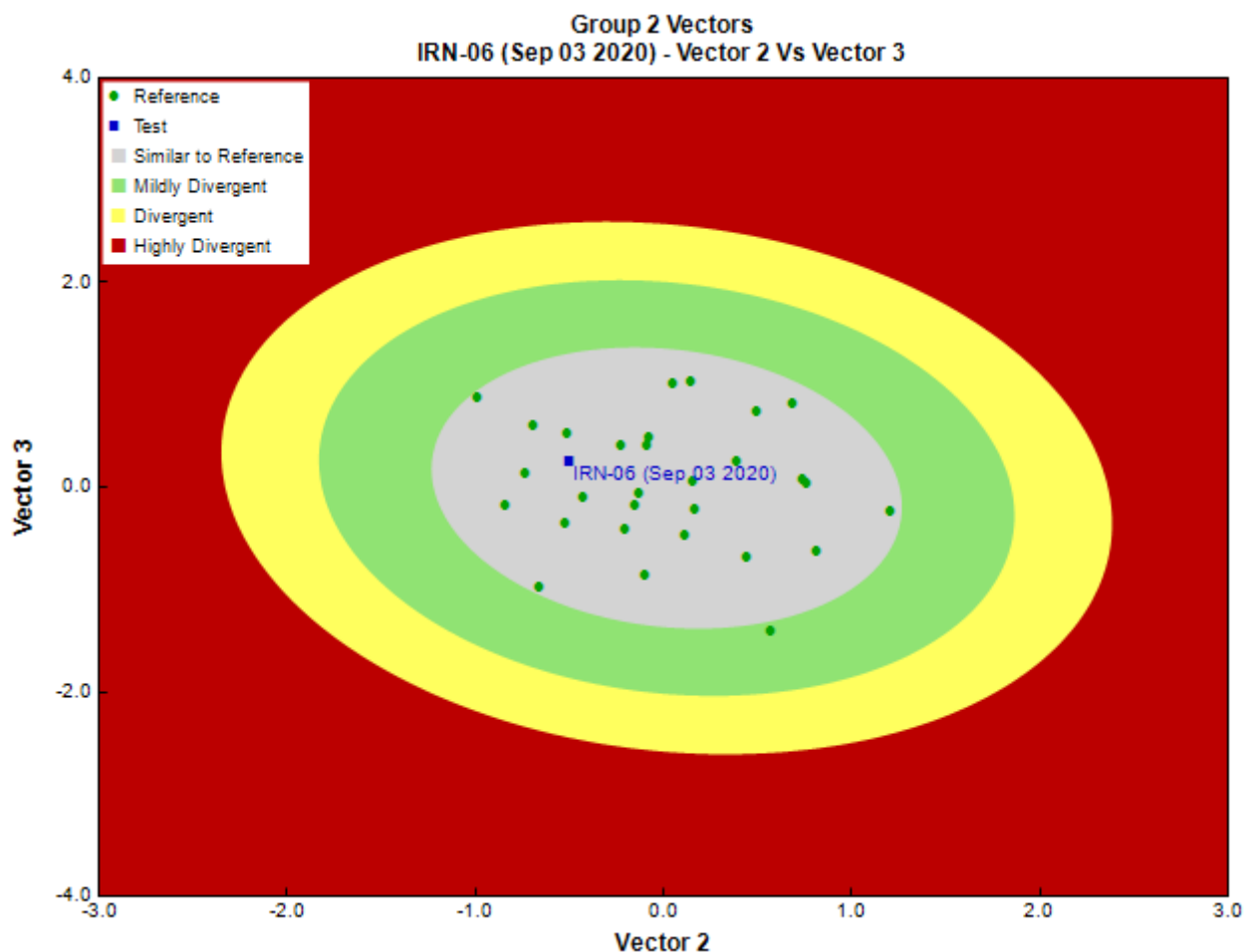


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Arthropoda	Arachnida	Trombidiformes	Hydryphantidae	9	36.0
			Hygrobatidae	2	8.0
			Sperchontidae	13	52.0
			Torrenticolidae	20	80.0
	Insecta	Coleoptera	Elmidae	6	24.0
			Chironomidae	15	60.0
		Diptera	Dixidae	2	8.0
			Simuliidae	6	24.0
			Tipulidae	3	12.0
			Ameletidae	9	36.0
		Ephemeroptera	Baetidae	85	340.0
			Ephemerellidae	29	116.0
			Heptageniidae	87	348.0
			Leptophlebiidae	1	4.0
		Plecoptera	Chloroperlidae	6	24.0
			Nemouridae	12	48.0
			Perlodidae	6	24.0
		Trichoptera		4	16.0
			Glossosomatidae	2	8.0
			Hydropsychidae	6	24.0
			Limnephilidae	17	68.0
			Rhyacophilidae	3	12.0
			Total	343	1,372.0

Metrics

Name	IRN-06	Predicted Group Reference Mean $\pm$SD
Bray-Curtis Distance	0.49	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	4.4	12.7 $\pm$ 12.9
% Coleoptera	1.8	2.1 $\pm$ 5.1
% Diptera + Non-insects	20.6	32.8 $\pm$ 19.4
% Ephemeroptera	62.2	38.7 $\pm$ 20.1
% EPT Individuals	77.6	65.1 $\pm$ 19.7
% Odonata	0.0	0.0 $\pm$ 0.0
% Plecoptera	7.1	18.0 $\pm$ 11.0
% Tricoptera	8.3	8.5 $\pm$ 10.8
Total Abundance	1372.0	1368.6 $\pm$ 852.0
Richness		
EPT Individuals (Sum)	1052.0	885.2 $\pm$ 668.4
EPT taxa (no)	12.0	10.9 $\pm$ 2.2
Pielou's Evenness	0.8	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	2.3	2.1 $\pm$ 0.4
Simpson's Diversity	0.9	0.8 $\pm$ 0.1
Simpson's Evenness	0.3	0.3 $\pm$ 0.1
Total No. of Taxa	21.0	19.9 $\pm$ 3.5

Habitat Description

Variable	IRN-06	Predicted Group Reference Mean $\pm$SD
Channel		
XSEC-VelMethod (Category(1-3))	3	0 $\pm$ 0
Landcover		
Substrate Data		
%Bedrock (%)	0	0 $\pm$ 0
Water Chemistry		

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	IRN-08
Sampling Date	Sep 01 2020
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.93082 N, 125.42052 W
Altitude	210
Local Basin Name	Iron River
	Quinsam Subbasin
Stream Order	



Across Reach



Down Stream

Field Sheet (No image found)



Substrate



Up Stream

Cabin Assessment Results

Reference Model Summary			
Model	BC Coastal Preliminary March 2010		
Analysis Date	June 10, 2022		
Taxonomic Level	Family		
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull		
Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.2%	96.7%	3.1%
CABIN Assessment of IRN-08 on Sep 01, 2020	Similar to Reference		

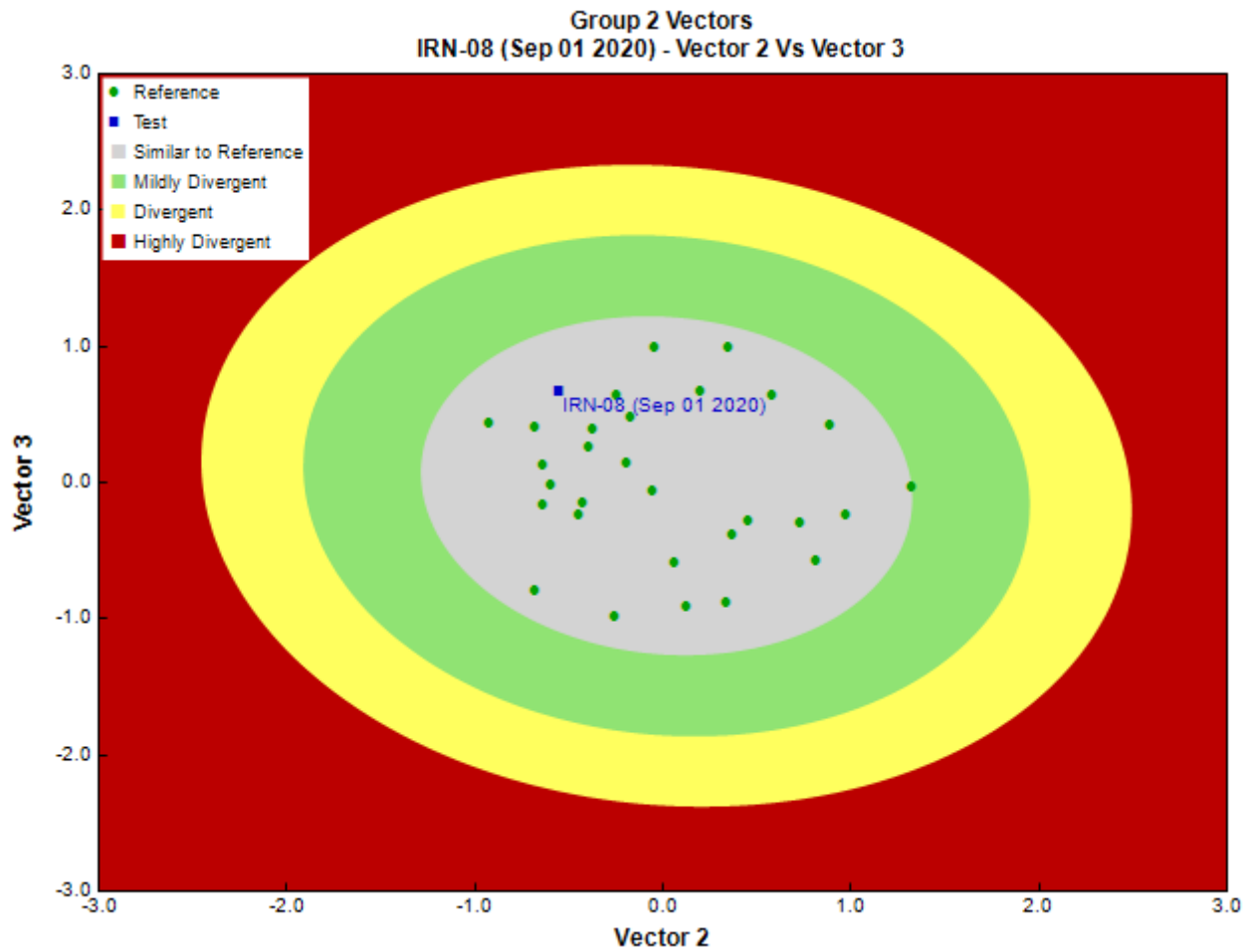


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata		Enchytraeidae	1	9.1
		Tubificida	Naididae	1	9.1
Arthropoda	Arachnida	Sarcoptiformes		1	9.1
		Trombidiformes		2	18.2
			Hydryphantidae	1	9.1
			Hygrobatidae	24	218.2
			Sperchontidae	6	54.5
			Stygothrombiidae	2	18.2
			Torrenticolidae	24	218.2
	Insecta	Coleoptera	Elmidae	11	100.0
		Diptera	Ceratopogonidae	2	18.2
			Chironomidae	63	572.8
			Simuliidae	48	436.3
			Tipulidae	2	18.2
		Ephemeroptera	Ameletidae	10	90.9
			Baetidae	31	281.9
			Ephemerellidae	68	618.2
			Heptageniidae	44	400.0
			Leptophlebiidae	7	63.6
		Plecoptera	Capniidae	8	72.7
			Chloroperlidae	11	100.0
			Nemouridae	22	200.0
			Perlodidae	2	18.2
		Trichoptera		3	27.3
			Brachycentridae	1	9.1

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Glossosomatidae	1	9.1
			Hydropsychidae	23	209.1
			Limnephilidae	3	27.3
			Rhyacophilidae	1	9.1
Mollusca	Gastropoda			2	18.2
			Total	425	3,863.9

Metrics

Name	IRN-08	Predicted Group Reference Mean $\pm$ SD
Bray-Curtis Distance	0.7	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	15.1	12.7 $\pm$ 12.9
% Coleoptera	2.6	2.1 $\pm$ 5.1
% Diptera + Non-insects	41.5	32.8 $\pm$ 19.4
% Ephemeroptera	38.4	38.7 $\pm$ 20.1
% EPT Individuals	55.6	65.1 $\pm$ 19.7
% Plecoptera	10.3	18.0 $\pm$ 11.0
% Tricoptera	7.0	8.5 $\pm$ 10.8
Total Abundance	3863.6	1368.6 $\pm$ 852.0
Richness		
EPT Individuals (Sum)	2109.1	885.2 $\pm$ 668.4
EPT taxa (no)	14.0	10.9 $\pm$ 2.2
Pielou's Evenness	0.8	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	2.6	2.1 $\pm$ 0.4
Simpson's Diversity	0.9	0.8 $\pm$ 0.1
Simpson's Evenness	0.4	0.3 $\pm$ 0.1
Total No. of Taxa	26.0	19.9 $\pm$ 3.5

Habitat Description

Variable	IRN-08	Predicted Group Reference Mean $\pm$ SD
Channel		
Depth-Avg (cm)	11.8	15.6 $\pm$ 12.3
Depth-BankfullMinusWetted (cm)	100.00	0.00 $\pm$ 0.00
Depth-Max (cm)	21.5	25.3 $\pm$ 19.1
Macrophyte (PercentRange)	0	1 $\pm$ 0
Reach-%CanopyCoverage (PercentRange)	4.00	1.55 $\pm$ 0.83
Reach-%Logging (PercentRange)	0	0 $\pm$ 1
Reach-DomStreamsideVeg (Category(1-4))	2	0 $\pm$ 0
Reach-Pools (Binary)	1	1 $\pm$ 0
Reach-Rapids (Binary)	0	0 $\pm$ 1
Reach-Riffles (Binary)	1	1 $\pm$ 0
Reach-StraightRun (Binary)	0	1 $\pm$ 0
Slope (m/m)	2.0000000	0.0305714 $\pm$ 0.0130765
Veg-Coniferous (Binary)	1	1 $\pm$ 0
Veg-Deciduous (Binary)	1	1 $\pm$ 0
Veg-GrassesFerns (Binary)	1	0 $\pm$ 1
Veg-Shrubs (Binary)	1	1 $\pm$ 0
Velocity-Avg (m/s)	0.08	0.35 $\pm$ 0.27
Velocity-Max (m/s)	0.10	0.67 $\pm$ 0.52
Width-Bankfull (m)	23.9	25.6 $\pm$ 22.0
Width-Wetted (m)	6.1	14.8 $\pm$ 12.7
XSEC-VelInstrumentDirect (Category(1-3))	3	0 $\pm$ 0
XSEC-VelMethod (Category(1-3))	3	0 $\pm$ 0
Landcover		
Reg-#NationalParks (Undefined)	0.00000	0.03448 $\pm$ 0.18570
Reg-Alpine (%)	0.00000	6.74453 $\pm$ 11.56609
Substrate Data		
%Bedrock (%)	0	0 $\pm$ 0
%Boulder (%)	10	13 $\pm$ 12

Habitat Description

Variable	IRN-08	Predicted Group Reference Mean $\pm$SD
%Cobble (%)	58	55 $\pm$ 11
%Gravel (%)	5	4 $\pm$ 5
%Pebble (%)	27	27 $\pm$ 15
%Sand (%)	0	0 $\pm$ 0
%Silt+Clay (%)	0	0 $\pm$ 0
D50 (cm)	10.00	13.22 $\pm$ 8.93
Dg (cm)	8.8	10.3 $\pm$ 4.4
Dominant-1st (Category(0-9))	6	7 $\pm$ 1
Dominant-2nd (Category(0-9))	7	6 $\pm$ 1
Embeddedness (Category(1-5))	4	5 $\pm$ 1
PeriphytonCoverage (Category(1-5))	1	2 $\pm$ 1
SurroundingMaterial (Category(0-9))	6	3 $\pm$ 0
Water Chemistry		
General-DO (mg/L)	10.3800000	10.4903448 $\pm$ 1.0793566
General-pH (pH)	7.8	7.4 $\pm$ 0.4
General-SpCond (μS/cm)	156.2000000	56.5222222 $\pm$ 47.0417436
General-TempAir (Degrees Celsius)	18.0	14.2 $\pm$ 3.2
General-TempWater (Degrees Celsius)	13.3450000	11.7186207 $\pm$ 2.2836527

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	WA
Sampling Date	Sep 07 2021
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.93005 N, 125.51057 W
Altitude	297
Local Basin Name	Quinsam River
	Quinsam Subbasin
Stream Order	4



Across Reach



Down Stream

Field Date: 10/1/05 Site Code: 0001-3
Sampling Date: 10/1/2005 Date: 10/1/2005

☒ Occupational Health & Safety Site Inspection Sheet Completed

PRIMARY SITE DATA

Golden Study Name: Quartzite Intrusion Land Use Name: Quartzite Subdivision
Address/Street Name: Quartzite Road Street Order: First Mile: 0.00
Section: 14 T: 14 R: 14 Parcel Reference: 14

Geographical Description/Notes:

Surrounding Land Use (check three present):
☒ Forest ☐ Agriculture ☐ Information Service ☐ Local Airport
☐ Logging ☐ Mining ☐ Residential ☐ Other
Dominant Surrounding Land Use (check one):
☐ Forest ☐ Agriculture ☐ Information Service ☐ Residential ☐ Local Airport
☐ Logging ☐ Mining ☐ Commercial/Industrial ☐ Other

Location Data
Location: 60° 00' 00" N, Longitude: 65° 55' 00" W
Elevation: 297 m (975 ft) GPS Datum: ☐ GRS80 ☐ NAD83 ☐ Other

Site Location Map Drawing

Map showing the site location relative to the Quartzite Subdivision, with a north arrow and a scale bar indicating 0.0000 to 0.0000.

Field Sheet



Substrate



Up Stream

Cabin Assessment Results

Cabin Assessment Results	
	Reference Model Summary
Model	BC Coastal Preliminary March 2010
Analysis Date	June 10, 2022
Taxonomic Level	Family
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull

Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.2%	30.8%	69.1%
CABIN Assessment of WA on Sep 07, 2021	Divergent		

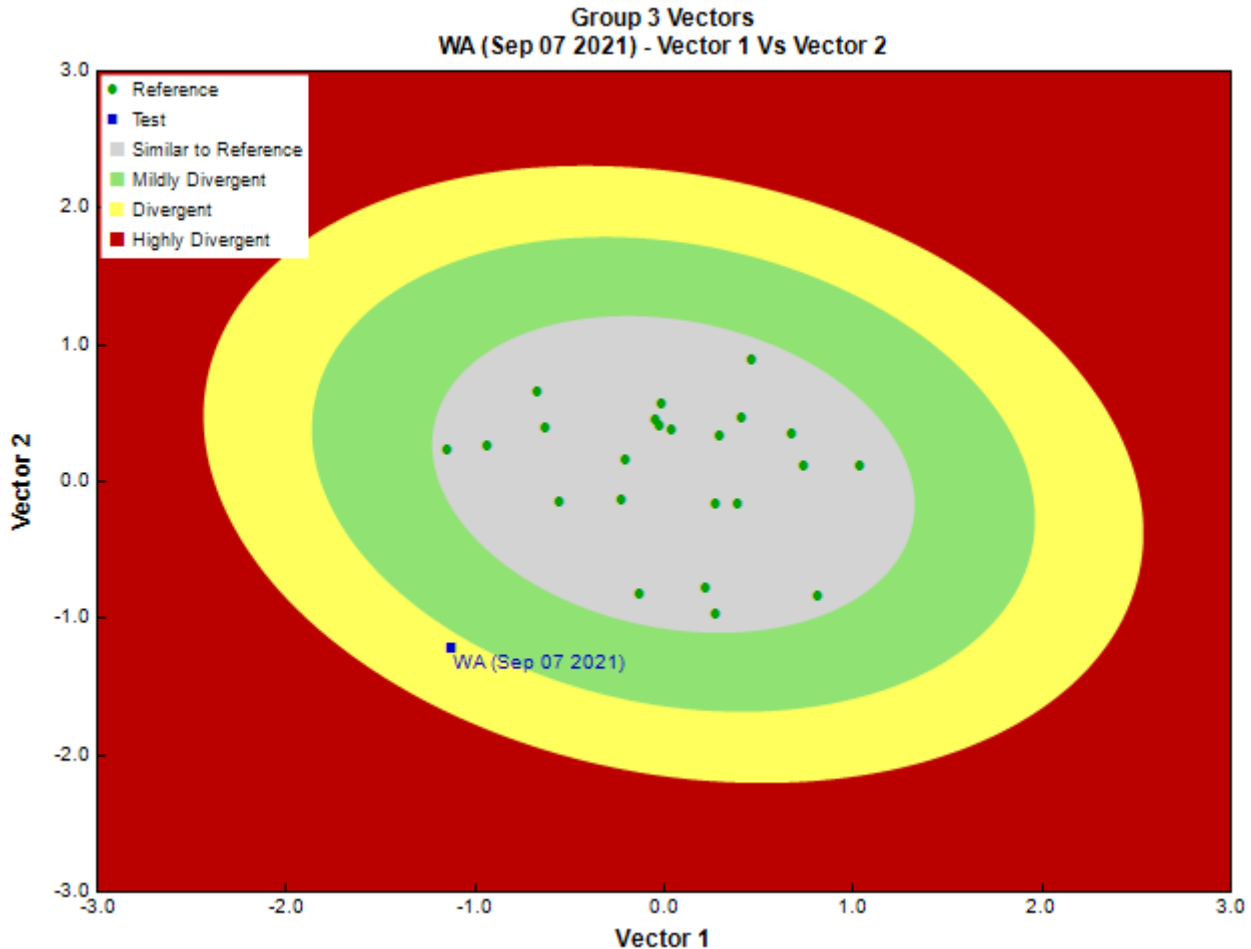


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	11	78.6
		Tubificida	Naididae	14	100.0
Arthropoda	Arachnida	Trombidiformes	Hygrobatidae	3	21.4
			Lebertiidae	4	28.6
			Sperchontidae	3	21.4
			Torrenticolidae	13	92.8
	Insecta	Coleoptera	Elmidae	7	50.0
		Diptera	Ceratopogonidae	1	7.1
			Chironomidae	50	356.9
			Empidiidae	2	14.3
			Simuliidae	22	157.1
		Ephemeroptera	Baetidae	94	671.3
			Heptageniidae	2	14.3
			Leptophlebiidae	17	121.4
		Plecoptera	Chloroperlidae	4	28.6
			Nemouridae	1	7.1

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
		Trichoptera	Hydropsychidae	20	142.9
			Philopotamidae	8	57.1
	Malacostraca	Decapoda	Cambaridae	1	7.1
Mollusca	Bivalvia	Veneroida	Pisidiidae	1	7.1
	Gastropoda			4	28.6
		Basommatophora	Planorbidae	12	85.7
			Total	294	2,099.4

Metrics

Name	WA	Predicted Group Reference Mean $\pm$ SD
Bray-Curtis Distance	0.89	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	17.2	15.8 $\pm$ 16.1
% Coleoptera	2.4	0.3 $\pm$ 0.8
% Diptera + Non-insects	47.2	28.8 $\pm$ 20.4
% Ephemeroptera	39.0	38.1 $\pm$ 19.9
% EPT Individuals	50.3	70.7 $\pm$ 20.8
% Odonata	0.0	0.0 $\pm$ 0.0
% Plecoptera	1.7	25.1 $\pm$ 16.9
% Tricoptera	9.7	7.4 $\pm$ 9.8
Total Abundance	2100.0	1109.9 $\pm$ 879.9
Richness		
EPT Individuals (Sum)	1042.9	824.3 $\pm$ 695.9
EPT taxa (no)	7.0	10.5 $\pm$ 1.6
Pielou's Evenness	0.8	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	2.3	2.0 $\pm$ 0.3
Simpson's Diversity	0.8	0.8 $\pm$ 0.1
Simpson's Evenness	0.3	0.3 $\pm$ 0.1
Total No. of Taxa	21.0	18.4 $\pm$ 3.5

Habitat Description

Variable	WA	Predicted Group Reference Mean $\pm$ SD
Channel		
Depth-Avg (cm)	33.7	23.0 $\pm$ 7.8
Depth-BankfullMinusWetted (cm)	98.00	22.30 $\pm$ 29.42
Depth-Max (cm)	65.0	36.7 $\pm$ 13.3
Macrophyte (PercentRange)	0	0 $\pm$ 0
Reach-%CanopyCoverage (PercentRange)	3.00	2.13 $\pm$ 1.32
Reach-%Logging (PercentRange)	0	0 $\pm$ 0
Reach-DomStreamsideVeg (Category(1-4))	2	4 $\pm$ 1
Reach-Pools (Binary)	0	0 $\pm$ 0
Reach-Rapids (Binary)	1	1 $\pm$ 0
Reach-Riffles (Binary)	1	1 $\pm$ 0
Reach-StraightRun (Binary)	1	0 $\pm$ 1
Slope (m/m)	1.1300000	0.0359797 $\pm$ 0.0268718
Veg-Coniferous (Binary)	1	1 $\pm$ 0
Veg-Deciduous (Binary)	1	1 $\pm$ 0
Veg-GrassesFerns (Binary)	1	1 $\pm$ 0
Veg-Shrubs (Binary)	1	1 $\pm$ 0
Velocity-Avg (m/s)	0.41	0.30 $\pm$ 0.18
Velocity-Max (m/s)	0.77	0.60 $\pm$ 0.27
Width-Bankfull (m)	12.7	15.4 $\pm$ 7.4
Width-Wetted (m)	10.8	10.1 $\pm$ 6.5
Landcover		
Reg-#NationalParks (Undefined)	0.00000	0.00000 $\pm$ 0.00000
Reg-Alpine (%)	0.00000	19.39677 $\pm$ 9.80781
Substrate Data		
%Bedrock (%)	0	1 $\pm$ 2
%Boulder (%)	1	21 $\pm$ 8

Habitat Description

Variable	WA	Predicted Group Reference Mean $\pm$ SD
%Cobble (%)	22	47 $\pm$ 14
%Gravel (%)	12	6 $\pm$ 6
%Pebble (%)	65	26 $\pm$ 12
%Sand (%)	0	0 $\pm$ 0
%Silt+Clay (%)	0	0 $\pm$ 0
D50 (cm)	3.80	8.00 $\pm$ 4.49
Dg (cm)	3.8	10.1 $\pm$ 3.4
Dominant-1st (Category(0-9))	5	7 $\pm$ 1
Dominant-2nd (Category(0-9))	4	7 $\pm$ 1
Embeddedness (Category(1-5))	4	4 $\pm$ 1
PeriphytonCoverage (Category(1-5))	3	1 $\pm$ 0
SurroundingMaterial (Category(0-9))	5	4 $\pm$ 1
Water Chemistry		
General-DO (mg/L)	937.0000000	11.0608696 $\pm$ 1.1569431
General-pH (pH)	7.3	7.6 $\pm$ 0.2
General-SpCond (μ S/cm)	55.3000000	51.4200000 $\pm$ 26.3421420
General-TempAir (Degrees Celsius)	19.2	12.6 $\pm$ 5.2
General-TempWater (Degrees Celsius)	17.4960000	9.8613043 $\pm$ 1.8204153

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	QRD-02
Sampling Date	Sep 09 2021
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.94135 N, 125.45995 W
Altitude	216
Local Basin Name	Quinsam River
	Qunsam Subbasin
Stream Order	3



Across Reach



Down Stream

Site Color: 250-100

Occupational Health & Safety: Site Inspection Sheet completed

PRIMARY SITE DATA

Cabin Study Name: Durkorn Island Local Name: Durkorn Sub Island

River/Stream Name: Durkorn River Stream Order (map scale 1:50,000): 1

Selected one: ☒ Test Site ☐ Potential Reference Site

Geographical Description/Notes

Surrounding Land Use (check boxes present):

☒ Agriculture ☐ Pasture ☐ Residential

☒ Logging ☐ Mining ☐ Other

Vegetation (check boxes present):

☒ Forest ☐ Pasture ☐ Residential

☒ Logging ☐ Mining ☐ Other

Location Data

Latitude: 49° 15' 11" N Longitude: 123° 05' 11" W Date: June 10, 2022

Elevation: 210 m (map scale) GPS Name: Durkorn Sub Island ☒ Cabin ☐ Reference

Site Location Map Drawing

Hand-drawn map showing the site location, including a river/stream, a cabin, and surrounding land use.

Field Sheet



Substrate



Up Stream

Cabin Assessment Results

Reference Model Summary	
Model	BC Coastal Preliminary March 2010
Analysis Date	June 10, 2022
Taxonomic Level	Family
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull

Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.2%	38.5%	61.3%
CABIN Assessment of QRD-02 on Sep 09, 2021	Divergent		

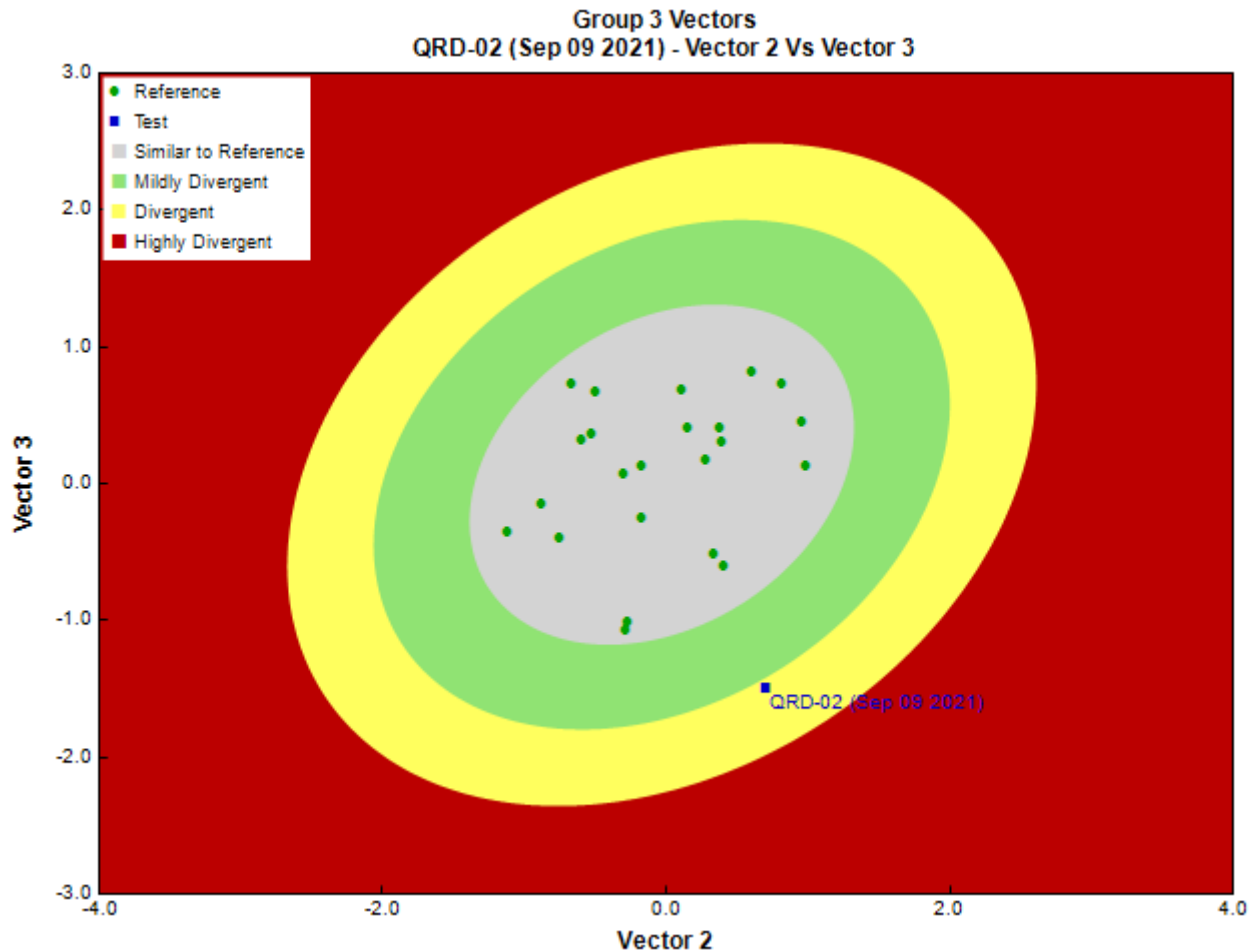


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	2	11.1
Arthropoda	Arachnida	Sarcoptiformes		1	5.6
		Trombidiformes	Sperchontidae	1	5.6
			Torrenticolidae	1	5.6
	Insecta	Coleoptera	Elmidae	34	188.9
		Diptera		3	16.7
			Chironomidae	3	16.8
			Empididae	9	50.0
			Tipulidae	4	22.2
		Ephemeroptera	Ameletidae	2	11.1
			Baetidae	232	1,288.9
			Ephemerellidae	2	11.1
			Heptageniidae	9	50.0
			Leptophlebiidae	11	61.1
		Plecoptera	Chloroperlidae	11	61.1
			Nemouridae	1	5.6

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Perlodidae	4	22.2
		Trichoptera	Brachycentridae	1	5.6
			Philopotamidae	1	5.6
			Total	332	1,844.8

Metrics

Name	QRD-02	Predicted Group Reference Mean $\pm$ SD
Bray-Curtis Distance	0.86	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	0.9	15.8 $\pm$ 16.1
% Coleoptera	10.4	0.3 $\pm$ 0.8
% Diptera + Non-insects	6.1	28.8 $\pm$ 20.4
% Ephemeroptera	78.0	38.1 $\pm$ 19.9
% EPT Individuals	83.5	70.7 $\pm$ 20.8
% Odonata	0.0	0.0 $\pm$ 0.0
% Plecoptera	4.9	25.1 $\pm$ 16.9
% Tricoptera	0.6	7.4 $\pm$ 9.8
Richness		
EPT Individuals (Sum)	1522.2	824.3 $\pm$ 695.9
EPT taxa (no)	10.0	10.5 $\pm$ 1.6
Pielou's Evenness	0.4	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	1.2	2.0 $\pm$ 0.3
Simpson's Diversity	0.5	0.8 $\pm$ 0.1
Simpson's Evenness	0.1	0.3 $\pm$ 0.1
Total No. of Taxa	17.0	18.4 $\pm$ 3.5
Trichoptera taxa	2.0	3.0 $\pm$ 1.0

Habitat Description

Variable	QRD-02	Predicted Group Reference Mean $\pm$ SD
Channel		
Depth-Avg (cm)	34.2	23.0 $\pm$ 7.8
Depth-BankfullMinusWetted (cm)	49.00	22.30 $\pm$ 29.42
Depth-Max (cm)	44.0	36.7 $\pm$ 13.3
Macrophyte (PercentRange)	0	0 $\pm$ 0
Reach-%CanopyCoverage (PercentRange)	1.00	2.13 $\pm$ 1.32
Reach-%Logging (PercentRange)	0	0 $\pm$ 0
Reach-DomStreamsideVeg (Category(1-4))	2	4 $\pm$ 1
Reach-Pools (Binary)	0	0 $\pm$ 0
Reach-Rapids (Binary)	1	1 $\pm$ 0
Reach-Riffles (Binary)	1	1 $\pm$ 0
Reach-StraightRun (Binary)	1	0 $\pm$ 1
Slope (m/m)	1.0300000	0.0359797 $\pm$ 0.0268718
Veg-Coniferous (Binary)	1	1 $\pm$ 0
Veg-Deciduous (Binary)	1	1 $\pm$ 0
Veg-GrassesFerns (Binary)	1	1 $\pm$ 0
Veg-Shrubs (Binary)	1	1 $\pm$ 0
Velocity-Avg (m/s)	0.40	0.30 $\pm$ 0.18
Velocity-Max (m/s)	0.46	0.60 $\pm$ 0.27
Width-Bankfull (m)	16.1	15.4 $\pm$ 7.4
Width-Wetted (m)	13.2	10.1 $\pm$ 6.5
XSEC-VelMethod (Category(1-3))	1	2 $\pm$ 1
Landcover		
Reg-#NationalParks (Undefined)	0.00000	0.00000 $\pm$ 0.00000
Reg-Alpine (%)	0.00000	19.39677 $\pm$ 9.80781
Substrate Data		
%Bedrock (%)	0	1 $\pm$ 2
%Boulder (%)	0	21 $\pm$ 8
%Cobble (%)	40	47 $\pm$ 14
%Gravel (%)	11	6 $\pm$ 6

Habitat Description

Variable	QRD-02	Predicted Group Reference Mean $\pm$SD
%Pebble (%)	49	26 $\pm$ 12
%Sand (%)	0	0 $\pm$ 0
%Silt+Clay (%)	0	0 $\pm$ 0
D50 (cm)	4.60	8.00 $\pm$ 4.49
Dg (cm)	4.7	10.1 $\pm$ 3.4
Dominant-1st (Category(0-9))	6	7 $\pm$ 1
Dominant-2nd (Category(0-9))	5	7 $\pm$ 1
Embeddedness (Category(1-5))	4	4 $\pm$ 1
PeriphytonCoverage (Category(1-5))	2	1 $\pm$ 0
SurroundingMaterial (Category(0-9))	5	4 $\pm$ 1
Water Chemistry		
General-DO (mg/L)	9.2300000	11.0608696 $\pm$ 1.1569431
General-pH (pH)	7.8	7.6 $\pm$ 0.2
General-SpCond (μS/cm)	217.9000000	51.4200000 $\pm$ 26.3421420
General-TempAir (Degrees Celsius)	17.7	12.6 $\pm$ 5.2
General-TempWater (Degrees Celsius)	18.4960000	9.8613043 $\pm$ 1.8204153

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	QRD-03
Sampling Date	Sep 14 2021
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.94628 N, 125.45480 W
Altitude	205
Local Basin Name	Quinsam River
	Quinsam Subbasin
Stream Order	4



Across Reach



Down Stream

Field Date: 10/10/22 Site Name: Dungeness
Sampling Date: 06/10/2022

☒ Occupational Health & Safety: Site Inspection Sheet completed

PRIMARY SITE DATA
Cabin Study Name: Dungeness Biological Land Base Name: Dungeness Subbasin
Researcher Name: Dungeness Reef
Sheet one: ☐ Test Site ☒ Environmental Reference Site

Geographical Description/Notes

Surrounding Land Use (check those present):
☒ Forest ☐ Pasture ☐ Agriculture ☐ Residential
☐ Logging ☐ Mining ☐ Commercial/Industrial ☐ Other

Current Surrounding Land Use (check one):
☒ Forest ☐ Pasture ☐ Agriculture ☐ Residential
☐ Logging ☐ Mining ☐ Commercial/Industrial ☐ Other

Location Data
 Locality: 2000 ft. N. Longitude: 122° 05' 00" W. Date: 10/10/22
 Elevation: 2000 ft. and 6000 ft. on Summit ☐ Other: none

Site Location Map Drawing

Field Sheet



Substrate



Up Stream

Cabin Assessment Results

Reference Model Summary	
Model	BC Coastal Preliminary March 2010
Analysis Date	June 10, 2022
Taxonomic Level	Family
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull

Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.2%	32.9%	66.9%
CABIN Assessment of QRD-03 on Sep 14, 2021	Divergent		

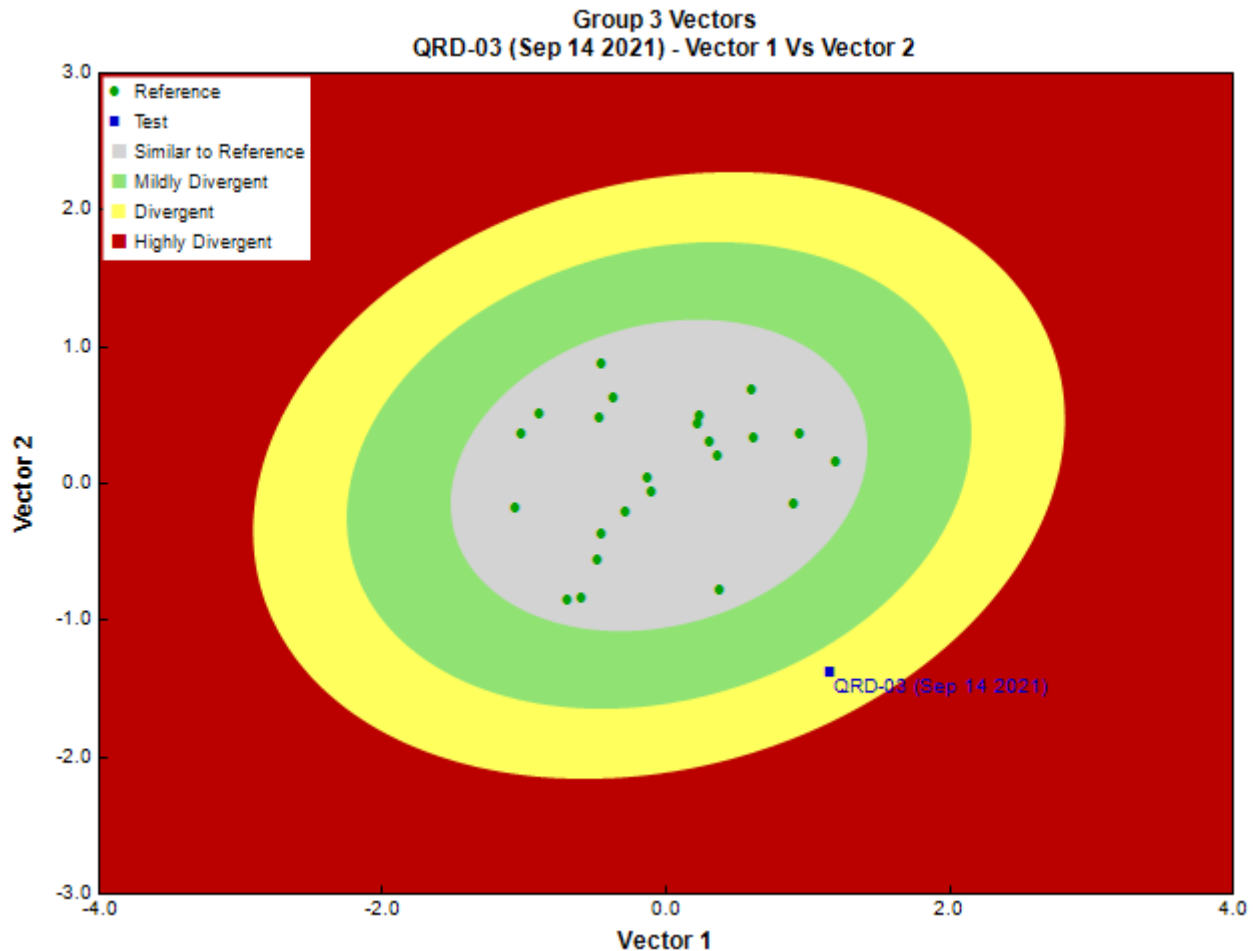


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	4	50.0
		Tubificida	Naididae	10	125.0
Arthropoda	Arachnida	Trombidiformes	Sperchontidae	1	12.5
			Torrenticolidae	2	25.0
	Collembola	Collembola	Sminthuridae	1	12.5
	Insecta	Coleoptera	Elmidae	28	350.0
		Diptera		7	87.5
			Chironomidae	23	287.5
			Empididae	1	12.5
			Simuliidae	20	250.0
			Tipulidae	6	75.0
		Ephemeroptera	Baetidae	136	1,700.0
			Heptageniidae	15	187.5
			Leptophlebiidae	23	287.5
		Plecoptera	Capniidae	1	12.5
			Chloroperlidae	12	150.0

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
			Perlodidae	9	112.5
		Trichoptera	Hydropsychidae	1	12.5
			Hydroptilidae	12	150.0
	Malacostraca	Decapoda	Cambaridae	1	12.5
			Total	313	3,912.5

Metrics

Name	QRD-03	Predicted Group Reference Mean $\pm$ SD
Bray-Curtis Distance	0.89	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	7.5	15.8 $\pm$ 16.1
% Coleoptera	9.2	0.3 $\pm$ 0.8
% Diptera + Non-insects	22.2	28.8 $\pm$ 20.4
% Ephemeroptera	56.9	38.1 $\pm$ 19.9
% EPT Individuals	68.3	70.7 $\pm$ 20.8
% Odonata	0.0	0.0 $\pm$ 0.0
% Plecoptera	7.2	25.1 $\pm$ 16.9
% Tricoptera	4.2	7.4 $\pm$ 9.8
Total Abundance	3912.5	1109.9 $\pm$ 879.9
Richness		
EPT Individuals (Sum)	2612.5	824.3 $\pm$ 695.9
EPT taxa (no)	8.0	10.5 $\pm$ 1.6
Pielou's Evenness	0.7	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	2.0	2.0 $\pm$ 0.3
Simpson's Diversity	0.8	0.8 $\pm$ 0.1
Simpson's Evenness	0.2	0.3 $\pm$ 0.1
Total No. of Taxa	19.0	18.4 $\pm$ 3.5

Habitat Description

Variable	QRD-03	Predicted Group Reference Mean $\pm$ SD
Channel		
Depth-Avg (cm)	36.5	23.0 $\pm$ 7.8
Depth-BankfullMinusWetted (cm)	94.00	22.30 $\pm$ 29.42
Depth-Max (cm)	93.0	36.7 $\pm$ 13.3
Macrophyte (PercentRange)	0	0 $\pm$ 0
Reach-%CanopyCoverage (PercentRange)	1.00	2.13 $\pm$ 1.32
Reach-%Logging (PercentRange)	0	0 $\pm$ 0
Reach-DomStreamsideVeg (Category(1-4))	2	4 $\pm$ 1
Reach-Pools (Binary)	1	0 $\pm$ 0
Reach-Rapids (Binary)	1	1 $\pm$ 0
Reach-Riffles (Binary)	1	1 $\pm$ 0
Reach-StraightRun (Binary)	1	0 $\pm$ 1
Veg-Coniferous (Binary)	1	1 $\pm$ 0
Veg-Deciduous (Binary)	1	1 $\pm$ 0
Veg-GrassesFerns (Binary)	1	1 $\pm$ 0
Veg-Shrubs (Binary)	1	1 $\pm$ 0
Velocity-Avg (m/s)	0.73	0.30 $\pm$ 0.18
Velocity-Max (m/s)	1.25	0.60 $\pm$ 0.27
Width-Bankfull (m)	16.6	15.4 $\pm$ 7.4
Width-Wetted (m)	12.8	10.1 $\pm$ 6.5
XSEC-VelInstrumentDirect (Category(1-3))	3	3
XSEC-VelMethod (Category(1-3))	3	2 $\pm$ 1
Landcover		
Reg-#NationalParks (Undefined)	0.00000	0.00000 $\pm$ 0.00000
Reg-Alpine (%)	0.00000	19.39677 $\pm$ 9.80781
Substrate Data		
%Bedrock (%)	0	1 $\pm$ 2
%Boulder (%)	0	21 $\pm$ 8
%Cobble (%)	17	47 $\pm$ 14

Habitat Description

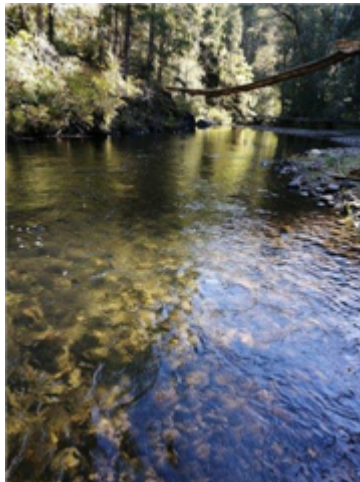
Variable	QRD-03	Predicted Group Reference Mean $\pm$SD
%Gravel (%)	17	6 $\pm$ 6
%Pebble (%)	66	26 $\pm$ 12
%Sand (%)	0	0 $\pm$ 0
%Silt+Clay (%)	0	0 $\pm$ 0
D50 (cm)	3.25	8.00 $\pm$ 4.49
Dg (cm)	3.1	10.1 $\pm$ 3.4
Dominant-1st (Category(0-9))	5	7 $\pm$ 1
Dominant-2nd (Category(0-9))	4	7 $\pm$ 1
Embeddedness (Category(1-5))	4	4 $\pm$ 1
PeriphytonCoverage (Category(1-5))	2	1 $\pm$ 0
SurroundingMaterial (Category(0-9))	5	4 $\pm$ 1
Water Chemistry		
General-DO (mg/L)	9.2500000	11.0608696 $\pm$ 1.1569431
General-pH (pH)	7.7	7.6 $\pm$ 0.2
General-SpCond (μS/cm)	205.9000000	51.4200000 $\pm$ 26.3421420
General-TempAir (Degrees Celsius)	13.5	12.6 $\pm$ 5.2
General-TempWater (Degrees Celsius)	17.1840000	9.8613043 $\pm$ 1.8204153

Site Description

Study Name	BC-Quinsam Watershed-Quinsam Coal Corp
Site	7SQR
Sampling Date	Sep 15 2021
Know Your Watershed Basin	East Central Vancouver Island
Province / Territory	British Columbia
Terrestrial Ecological Classification	Pacific Maritime EcoZone Eastern Vancouver Island EcoRegion
Coordinates (decimal degrees)	49.93948 N, 125.41700 W
Altitude	197
Local Basin Name	Quinsam River
	Quinsam Subbasin
Stream Order	4



Across Reach



Down Stream

Field Date: 06/10/22 Site Code: 001-001

Sampling Date: 06/10/22

☒ Occupational Health & Safety: Site Inspection Sheet completed

PRIMARY SITE DATA

Cabin Study Name: Upper Kootenai Cabin Name: Upper Kootenai

Water Stream Name: Upper Kootenai Stream Order (map scale 1:50,000): 12

Stream use: ☐ Trout Site ☒ Federal Wilderness Site

Geographical Description/Notes

Surrounding Land Use (check development): ☒ Forest ☐ Pasture ☐ Agriculture ☐ Residential ☐ Other

Stream Surrounding Land Use (check use): ☒ Forest ☐ Pasture ☐ Agriculture ☐ Residential ☐ Other

Location Data: Latitude: 48.111111 Longitude: -116.111111 Elevation: 1000 m

Stream: Upper Kootenai GPS Station: ☐ Station: ☐ Other

Site Location Map Drawing

Map showing the location of the site within the watershed, with a scale bar and a north arrow.

CABIN Field Sheet June 2012 Page 1 of 2

Field Sheet



Substrate



Up Stream

Cabin Assessment Results

Reference Model Summary	
Model	BC Coastal Preliminary March 2010
Analysis Date	June 10, 2022
Taxonomic Level	Family
Predictive Model Variables	Depth-Avg Reg-#NationalParks Reg-Alpine Width-Bankfull

Reference Groups	1	2	3
Number of Reference Sites	33	28	22
Group Error Rate	13.5%	17.2%	4.3%
Overall Model Error Rate	12.4%		
Probability of Group Membership	0.2%	30.7%	69.1%
CABIN Assessment of 7SQR on Sep 15, 2021	Mildly Divergent		

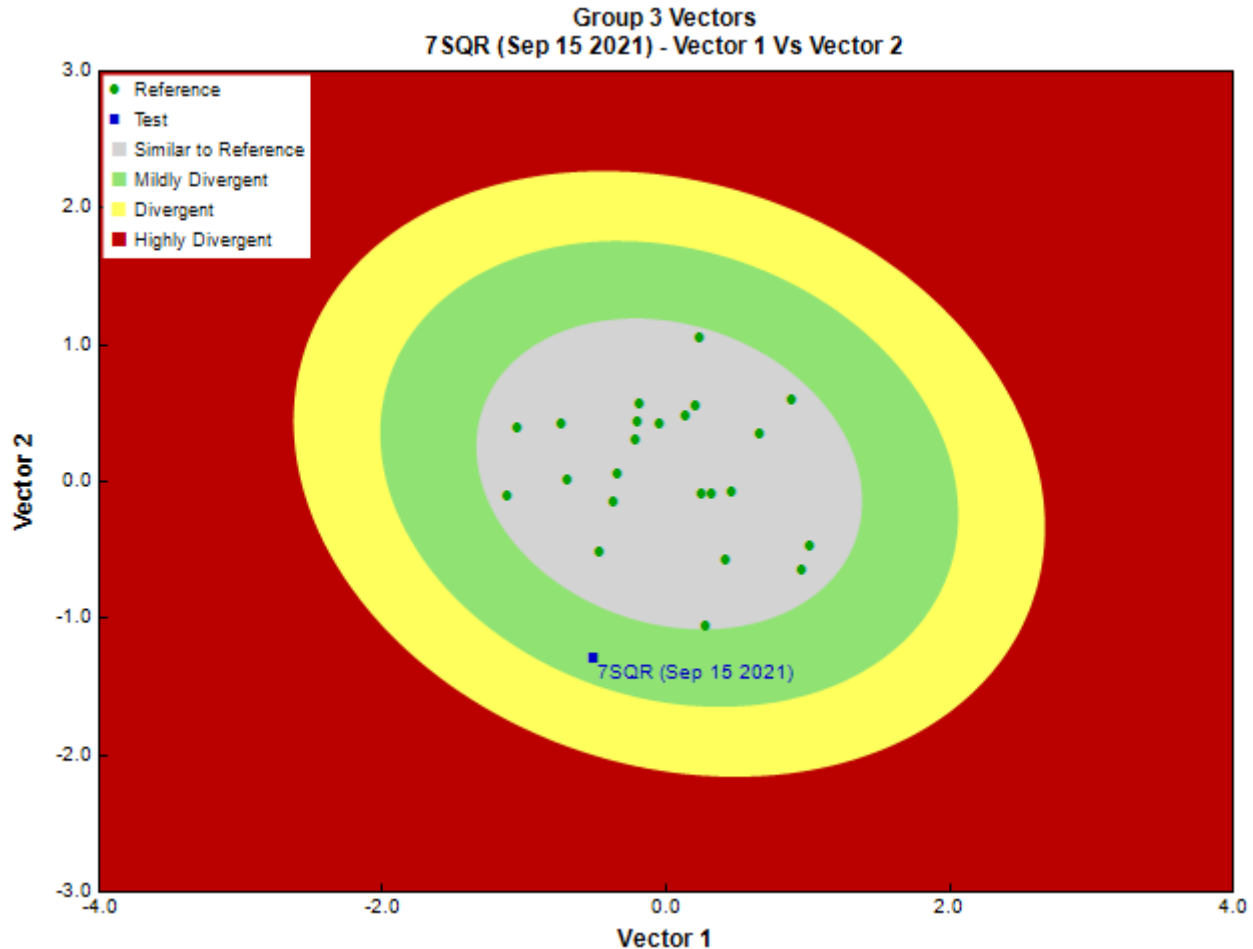


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata	Lumbriculida	Lumbriculidae	25	166.7
		Tubificida	Naididae	14	93.3
Arthropoda	Arachnida	Trombidiformes		1	6.7
			Hygrobatidae	1	6.7
			Lebertiidae	5	33.3
			Sperchontidae	29	193.3
			Torrenticolidae	17	113.3
	Insecta	Coleoptera		11	73.3
			Elmidae	6	40.0
		Diptera	Chironomidae	23	153.3
			Empididae	1	6.7
			Simuliidae	7	46.7
		Ephemeroptera	Baetidae	127	846.6
			Ephemerellidae	1	6.7
			Heptageniidae	14	93.3
			Leptophlebiidae	13	86.7

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
		Odonata	Coenagrionidae	1	6.7
			Gomphidae	1	6.7
		Plecoptera	Capniidae	1	6.7
			Chloroperlidae	1	6.7
			Nemouridae	2	13.3
		Trichoptera	Hydropsychidae	29	193.4
			Hydroptilidae	6	40.0
	Malacostraca	Decapoda	Cambaridae	1	6.7
Mollusca	Bivalvia	Unionoida	Unionidae	1	6.7
	Gastropoda	Basommatophora	Planorbidae	1	6.7
			Total	339	2,260.2

Metrics

Name	7SQR	Predicted Group Reference Mean $\pm$ SD
Bray-Curtis Distance	0.83	0.5 $\pm$ 0.1
Number Of Individuals		
% Chironomidae	7.0	15.8 $\pm$ 16.1
% Coleoptera	1.8	0.3 $\pm$ 0.8
% Diptera + Non-insects	38.2	28.8 $\pm$ 20.4
% Ephemeroptera	47.4	38.1 $\pm$ 19.9
% EPT Individuals	59.3	70.7 $\pm$ 20.8
% Odonata	0.6	0.0 $\pm$ 0.0
% Plecoptera	1.2	25.1 $\pm$ 16.9
% Tricoptera	10.7	7.4 $\pm$ 9.8
Total Abundance	2260.0	1109.9 $\pm$ 879.9
Richness		
EPT Individuals (Sum)	1293.3	824.3 $\pm$ 695.9
Pielou's Evenness	0.7	0.7 $\pm$ 0.1
Shannon-Wiener Diversity	2.2	2.0 $\pm$ 0.3
Simpson's Diversity	0.8	0.8 $\pm$ 0.1
Simpson's Evenness	0.2	0.3 $\pm$ 0.1
Total No. of Taxa	24.0	18.4 $\pm$ 3.5

Habitat Description

Variable	7SQR	Predicted Group Reference Mean $\pm$ SD
Channel		
Depth-Avg (cm)	40.9	23.0 $\pm$ 7.8
Depth-BankfullMinusWetted (cm)	75.00	22.30 $\pm$ 29.42
Depth-Max (cm)	66.0	36.7 $\pm$ 13.3
Macrophyte (PercentRange)	0	0 $\pm$ 0
Reach-%CanopyCoverage (PercentRange)	1.00	2.13 $\pm$ 1.32
Reach-%Logging (PercentRange)	0	0 $\pm$ 0
Reach-DomStreamsideVeg (Category(1-4))	2	4 $\pm$ 1
Reach-Pools (Binary)	1	0 $\pm$ 0
Reach-Rapids (Binary)	0	1 $\pm$ 0
Reach-Riffles (Binary)	1	1 $\pm$ 0
Reach-StraightRun (Binary)	1	0 $\pm$ 1
Slope (m/m)	0.8000000	0.0359797 $\pm$ 0.0268718
Veg-Coniferous (Binary)	1	1 $\pm$ 0
Veg-Deciduous (Binary)	1	1 $\pm$ 0
Veg-GrassesFerns (Binary)	1	1 $\pm$ 0
Veg-Shrubs (Binary)	1	1 $\pm$ 0
Velocity-Avg (m/s)	0.24	0.30 $\pm$ 0.18
Velocity-Max (m/s)	0.54	0.60 $\pm$ 0.27
Width-Bankfull (m)	20.5	15.4 $\pm$ 7.4
Width-Wetted (m)	17.1	10.1 $\pm$ 6.5
XSEC-VelInstrumentDirect (Category(1-3))	3	3
XSEC-VelMethod (Category(1-3))	3	2 $\pm$ 1
Landcover		

Habitat Description

Variable	7SQR	Predicted Group Reference Mean $\pm$ SD
Reg-#NationalParks (Undefined)	0.00000	0.00000 $\pm$ 0.00000
Reg-Alpine (%)	0.00000	19.39677 $\pm$ 9.80781
Legacy		
Reg-Alpine_LE (%)	0.00000	0.00000 $\pm$ 0.00000
Substrate Data		
%Bedrock (%)	0	1 $\pm$ 2
%Boulder (%)	0	21 $\pm$ 8
%Cobble (%)	6	47 $\pm$ 14
%Gravel (%)	11	6 $\pm$ 6
%Pebble (%)	83	26 $\pm$ 12
%Sand (%)	0	0 $\pm$ 0
%Silt+Clay (%)	0	0 $\pm$ 0
D50 (cm)	2.80	8.00 $\pm$ 4.49
Dg (cm)	2.8	10.1 $\pm$ 3.4
Dominant-1st (Category(0-9))	4	7 $\pm$ 1
Dominant-2nd (Category(0-9))	5	7 $\pm$ 1
Embeddedness (Category(1-5))	4	4 $\pm$ 1
PeriphytonCoverage (Category(1-5))	2	1 $\pm$ 0
Water Chemistry		
General-DO (mg/L)	9.1800000	11.0608696 $\pm$ 1.1569431
General-pH (pH)	7.3	7.6 $\pm$ 0.2
General-SpCond (μ S/cm)	202.7000000	51.4200000 $\pm$ 26.3421420
General-TempAir (Degrees Celsius)	9.1	12.6 $\pm$ 5.2
General-TempWater (Degrees Celsius)	15.3720000	9.8613043 $\pm$ 1.8204153

Methods and QC Report 2021

Project ID: Iron River Baseline

Client: Quinsam Coal



Prepared by:

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Summerland, BC
© 2021

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Sample Reception

On May 17, 2021, Cordillera Consulting received 2 benthic samples from Quinsam Coal Corp. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed. See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Sample	Site Code	CC#	Date	Size	# of Jars
IRN08	IRN08	CC212009	9/1/2020	400µM	4
IRN06	IRN06	CC212010	9/3/2020	400µM	2

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence (given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.
- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control –

Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Site	Sample	Date	CC#	400 micron fraction	
				% Sampled	# Invertebrates
IRN08	IRN08	01-Sep-20	CC212009	11%	425
IRN06	IRN06	03-Sep-20	CC212010	25%	343

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera's laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculate sorting efficiency the following formula was used:

$$\frac{\text{\#Organisms Missed}}{\text{Total Organisms Found}} * 100 = \%OM$$

Table 3 Summary of sorting efficiency

		Total from Sample	Percent Efficiency
Site - QC, Sample - QC1, CC# - CC212010, Percent sampled = 25%, Sieve size = 400			
Ephemeroptera	1		
Trombidiformes	5		
Total:	6	343	98%

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual¹, SAFIT², and PNAMP³ were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomy Notes: *Baetis tricaudatus* group has now been renamed to *Baetis rhodani* group. There has been no change in the determination of the taxa. See Webb 2017 in the taxonomy keys.

Taxonomists

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Scott Finlayson: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West); Group 4 Oligochaeta

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae

Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

Taxonomic QC

Taxonomic QC was performed in house by someone other than the original taxonomist.

- Quality control protocol involved complete, blind re-identification and re-enumeration of at least 10% of samples by a second SFS-certified taxonomist.
- Samples for taxonomic quality control were randomly selected and quality control procedures were conducted as the project progresses through the laboratories.
- The second (QC) taxonomist will calculate and record four types of errors:
 1. Misidentification error
 2. Enumeration error
 3. Questionable taxonomic resolution error
 4. Insufficient taxonomic resolution error

The QC coordinator then calculates the following estimates of taxonomic precision.

1. The percent total identification error rate is calculated as:

$$\frac{\text{Sum of incorrect identifications}}{\text{total organisms counted in audit}} * (100)$$

The average total identification error rate of audited samples did not exceed 5%. All samples that exceed a 5% error rate were re-evaluated to determine whether repeated errors or patterns in error contributed.

2. The percent difference in enumeration (PDE) to quantify the consistency of specimen counts.

$$PDE = \frac{|n_1 - n_2|}{n_1 + n_2} \times 100$$

3. The percent taxonomic disagreement (PTD) to quantify the shared precision between two sets of identifications.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) \times 100$$

4. Bray Curtis dissimilarity Index to quantify the differences in identifications.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_j + S_i}$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 4 Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - IRN08, Sample - IRN08, CC# - CC212009, Percent sampled = 11%, Sieve size = 400	423	0.00	0.23584906	0.70588235	0.00471698

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Error Rationale

Site - IRN08, Sample - IRN08, CC# - CC212009, Percent sampled = 11%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	10	10						
Atractides	5	5						
Baetidae	4	5	No			X		
Baetis	25	24	No			X		
Brachycentridae	1	1						
Brillia	10	10						
Capniidae	8	8						
Ceratopogonidae	1	1						
Chironomidae	1	1						
Chloroperlidae	3	3						
Dicranota	2	2						
Ecclisomyia	3	3						
Elmidae	4	4						
Enchytraeus	1	1						
Epeorus	1	1						
Ephemerellidae	68	67	No			X		
Eukiefferiella	1	1						
Fallceon	2	2						
Gastropoda	2	2						
Glossosomatidae	1	1						
Heptageniidae	42	42						
Hydropsyche	4	4						
Hydropsychidae	19	19						
Hygrobates	19	19						
Leptophlebiidae	7	7						
Mallochohelea	1	1						
Nemouridae	3	3						
Oribatida	1	1						
Orthocladius complex	2	2						
Perlodidae	2	2						
Polypedilum	7	7						
Pristina	1	1						
Protzia	1	1						
Rheotanytarsus	2	2						
Rhithrogena	1	1						
Rhyacophila	1	1						
Simuliidae	7	7						

Simulium	41	40	No			X		
Sperchon	6	6						
Stempellinella	3	3						
Stygothrombium	2	2						
Sweltsa	8	8						
Tanytarsus	20	20						
Testudacarus	1	1						
Thienemanniella	1	1						
Torrenticola	23	23						
Trichoptera	3	3						
Trombidiformes	2	2						
Tvetenia	15	15						
Zaitzevia	5	5						
Zaitzevia	2	2						
Zapada	6	6						
Zapada cinctipes	13	13						
Zavrelimyia	1	1						
Total:	425	423						
					0	4	0	
% Total Misidentification Rate =	misidentifications	x100 =	0.00	Pass				
	total number							

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¹ McDermott, H., Paull, T., Strachan, S. (May 2014). Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples, Environment Canada. ISBN: 978-1-100-25417-3

² Southwest Association of Freshwater Invertebrate Taxonomists. (2015). www.safit.org

³ Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

Taxonomic Keys

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015).

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Methods and QC Report 2021

Project ID: Quinsam River

Client: Quinsam Coal Corp



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Sample Reception

On September 22, 2021, Cordillera Consulting received 4 benthic samples from Quinsam Coal Corp. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed.

See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Site Code	CC#	Date	Size	# of Jars
QWA01	CC221094	9/7/2021	400µM	3
QRD02	CC221095	9/8/2021	400µM	2
QRD03	CC221096	9/14/2021	400µM	4
7SQ03	CC221097	9/15/2021	400µM	5

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence (given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.
- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.

- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Sample	Date	CC#	400 micron fraction	
			% Sampled	# Invertebrates
QWA01	07-Sep-21	CC221094	14%	296
QRD02	08-Sep-21	CC221095	18%	332
QRD03	14-Sep-21	CC221096	8%	313
7SQ03	15-Sep-21	CC221097	15%	339

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera's laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculate sorting efficiency the following formula was used:

$$\frac{\text{\#Organisms Missed}}{\text{Total Organisms Found}} * 100 = \%OM$$

Table 3 Summary of sorting efficiency

	Total from Sample	Percent Efficiency
Site - QC, Sample - QC 1, CC# - CC221095, Percent sampled = 18%, Sieve size = 400		
Coleoptera	1	
Chironomidae	1	
Ephemeroptera	7	
Trombidiformes	1	
Oligochaeta	1	

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual¹, SAFIT², and PNAMP³ were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomy Notes: *Baetis tricaudatus* group has now been renamed to *Baetis rhodani* group. There has been no change in the determination of the taxa. See Webb 2017 in the taxonomy keys.

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Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

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Taxonomic QC was performed in house by someone other than the original taxonomist.

- Quality control protocol involved complete, blind re-identification and re-enumeration of at least 10% of samples by a second SFS-certified taxonomist.
- Samples for taxonomic quality control were randomly selected and quality control procedures were conducted as the project progresses through the laboratories.
- The second (QC) taxonomist will calculate and record four types of errors:
 1. Misidentification error
 2. Enumeration error
 3. Questionable taxonomic resolution error
 4. Insufficient taxonomic resolution error

The QC coordinator then calculates the following estimates of taxonomic precision.

1. The percent total identification error rate is calculated as:

$$\frac{\text{Sum of incorrect identifications}}{\text{total organisms counted in audit}} * (100)$$

The average total identification error rate of audited samples did not exceed 5%. All samples that exceed a 5% error rate were re-evaluated to determine whether repeated errors or patterns in error contributed.

2. The percent difference in enumeration (PDE) to quantify the consistency of specimen counts.

$$PDE = \frac{|n_1 - n_2|}{n_1 + n_2} \times 100$$

3. The percent taxonomic disagreement (PTD) to quantify the shared precision between two sets of identifications.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) \times 100$$

4. Bray Curtis dissimilarity Index to quantify the differences in identifications.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_j + S_i}$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 4 Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - 2021, Sample - QRD02, CC# - CC221095, Percent sampled = 18%, Sieve size = 400	331	0.00	0.15082956	0.90361446	0.00754148

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Error Rationale

Site - 2021, Sample - QRD02, CC# - CC221095, Percent sampled = 18%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	2	2						
Baetidae	12	14	No			X		
Baetis	189	186	No			X		
Chironomidae	1	1						
Cinygmula	1	1						
Eloeophila	3	3						
Ephemerellidae	2	2						
Fallceon	31	31						
Hemerodromia	9	9						
Heptageniidae	8	8						
Leptophlebiidae	6	6						
Lumbriculus	2	2						
Micrasema	1	1						
Neoleptophlebia	5	5						
Oribatida	1	1						
Perlodidae	4	4						
Sperchonopsis	1	1						
Stempellinella	1	1						
Sweltsa	11	11						
Thienemanniella	1	1						
Tipula	4	4						
Torrenticola	1	1						
Wormaldia	1	1						
Zaitzevia	1	1						
Zaitzevia	33	33						
Zapada columbiana	1	1						
Total:	332	331						
					0	2	0	
% Total Misidentification Rate =	misidentifications	x100 =	0.00	Pass				
	total number							

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¹ McDermott, H., Paull, T., Strachan, S. (May 2014). Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples, Environment Canada. ISBN: 978-1-100-25417-3

² Southwest Association of Freshwater Invertebrate Taxonomists. (2015). www.safit.org

³ Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

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