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## 5.3.4 Sediment Quality

### 5.3.4.1 Introduction

This section of the Application discusses the potential effects of the proposed Blackwater Gold Project (the Project) on sediment quality in watersheds that are either within or adjacent to the Project during the construction, operations, closure, and post-closure phases. The scoping process concluded that sediment quality is a key Valued Component (VC) for the aquatic subject area under the environmental pillar for this Environmental Assessment (EA). Refer to **Section 5.3.1** for further discussion on VC selection. As this section only pertains to sediment quality, other sections in Aquatic Environment contain further information on surface water flows and lake levels, surface water quality, fish and fish habitat, groundwater quantity and quality, and wetlands.

#### 5.3.4.1.1 Applicable Guidelines and Regulations

Guidelines pertinent to sediment quality in British Columbia are:

- British Columbia Ministry of Environment (BC MOE). 2006. A Compendium of Working Water Quality Guidelines for British Columbia;
- BC MOE. 2012. Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators; and
- Canadian Council of Ministers of the Environment (CCME). 2007. Environmental Quality Guidelines.

Guidelines are screening tools for evaluating potential for toxicological risk.

#### 5.3.4.1.2 Information Sources

Prior to commencement of environmental studies for the Project, no baseline sediment data were available for the water bodies in the immediate area of the Project, which include:

- Lakes: Kuyakuz, Tatelkuz, Snake, Top, 1682, 1428, and 1538; and
- Streams: Davidson Creek, Turtle Creek, Fawnie Creek, Creek 705, and Creek 661.

Therefore, a program of sediment quality monitoring was conducted in 2011, 2012, and 2013 at the same locations as the water quality samples for streams (**Table 5.3.4-1**). In 2013, lake bottom sediment samples were also collected.

***Table 5.3.4-1: Sediment Sampling Program***

| Site | Type | 2011 | 2012 | 2013 | Effects Site |
|---|---|---|---|---|---|
| WQ1 | Stream | X | X | | No[1] |
| WQ3 | Stream | X | X | | Yes |
| WQ4 | Stream | X | X | | No[1] |
| WQ5 | Stream | X | X | | Yes |
| WQ6 | Stream | X | X | | No[1] |
| WQ7 | Stream | X | X | | Yes |
| WQ8 | Stream | X | X | | Yes |
| WQ9 | Stream | X | X | | Yes |
| WQ10 | Stream | X | X | | Yes |
| WQ11 | Stream | X | X | | No |
| WQ12 | Stream | X | X | | No |
| WQ13 | Stream | X | X | | No |
| WQ14 | Stream | X[(a)] | X[(a)] | | No |
| WQ15 | Stream | | | X | Yes |
| WQ16 | Stream | | | X | Yes |
| WQ17 | Stream | | X | | Discontinued |
| WQ18 | Stream | | X | | Discontinued |
| WQ19 | Stream | | X | | Discontinued |
| WQ21 | Lake | | | X[(a)] | No |
| WQ22 | Lake | | | X | Yes |
| WQ23 | Lake | | | X | Yes |
| WQ24 | Lake | | | X | Yes |
| WQ25 | Lake | | | X | Yes |

**Note:** [(a)] site where five replicates were collected
[1] Eliminated by site construction

### 5.3.4.1.3 Spatial and Temporal Scope

#### *5.3.4.1.3.1 Spatial Scope*

The Project and associated facilities will be in the headwaters of Davidson Creek, with the exception of the Site C West Dam and the East waste rock dump. The Site C Dam of the TSF will be in the headwaters of Creek 705. The East waste rock dump will be in the headwaters of Creek 661. The Local Study Area (LSA) includes:

- Mine site: entire watersheds of Davidson Creek, Creek 661, Turtle Creek, and Creek 705. Tributaries flowing in to the south side of Tatelkuz Lake. Chedakuz Creek, from confluence with Creek 661 to Tatelkuz Lake. Chedakuz Creek, from Tatelkuz Lake to confluence with Turtle Creek; and
- Transmission line, including re-route options, transmission line access roads, mine access road, and water supply pipeline: 100 m on either side of the centre line of these

proposed developments (i.e., 200 m total width). See **Section 2.2.4.4.1** for transmission line access road details. The final location of the transmission line access roads will be determined during the detailed engineering and permitting stage, and will consider traditional knowledge and traditional use information provided by Aboriginal groups as appropriate. Its design will follow the same principles of using existing roads avoiding sensitive habitat to the extent possible.

The Regional Study Area (RSA) includes:

- Mine site: entire watershed of Chedakuz Creek not included in LSA. Entire watershed of Laidman Lake not included in the LSA; and
- Transmission line, including re-route options, transmission line access roads, mine access road, and water supply pipeline: same corridor as for LSA (200 m total width) along the proposed road access route, transmission line, and water supply pipeline. See **Section 2.2.4.4.1** for transmission line access road details. The final location of the transmission line access roads will be determined during the detailed engineering and permitting stage, and will consider traditional knowledge and traditional use information provided by Aboriginal groups as appropriate. Its design will follow the same principles of using existing roads avoiding sensitive habitat to the extent possible.

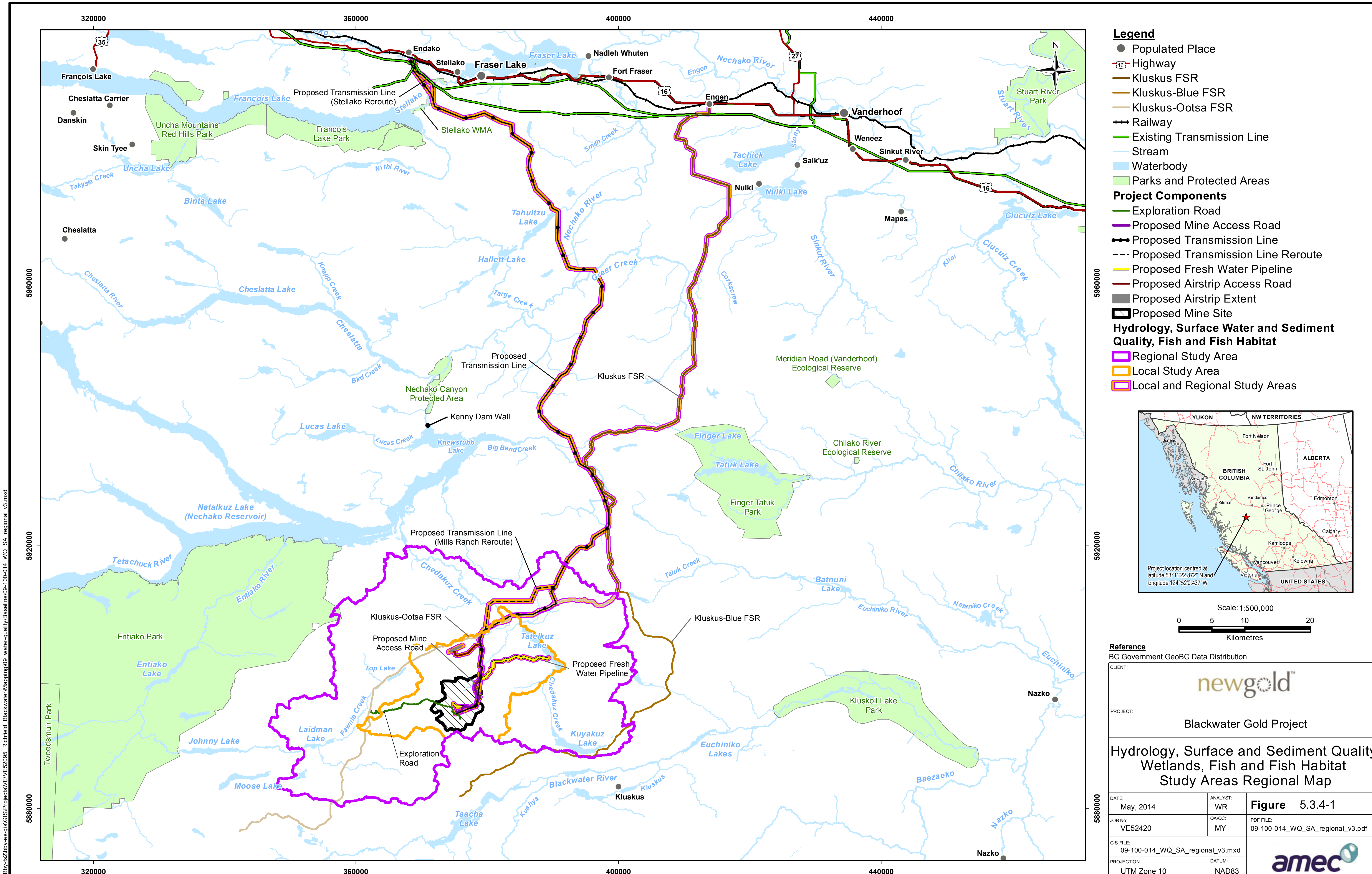
**Figure 5.3.4-1** shows place names that indicate the Project footprint, water resources LSA, and the RSA.

The LSA includes all water bodies that have the potential to be measurably affected by the Project's development and operation. The RSA includes water bodies upstream and downstream of the Project that either potentially influence LSA water body sediments, or could be influenced indirectly by the Project.

Administrative boundaries (as defined in **Section 4.3.1.3**) do not apply to the sediment quality assessment as all waters in the subject watershed potentially affected by the proposed Project are considered. Technical boundaries (as defined in **Section 4.3.1.4**) do not apply to assessment of sediment quality because all sediment concentrations measured were above detection limits.

##### *5.3.4.1.3.2 Temporal Scale*

The temporal scale for the sediment quality effects assessment is from pre-construction (baseline) through post-closure (when the TSF discharges). Baseline sediment quality is required to determine whether effects are occurring during construction and operation of the Project. During operation, and for a period of time after closure, there will be no discharge from the TSF. However, approximately 18 years after closure, the TSF will discharge to Davidson Creek post closure, and this discharge may influence sediment quality in the creek.




CLIENT: newgold

PROJECT: Blackwater Gold Project

Hydrology, Surface and Sediment Quality, Wetlands, Fish and Fish Habitat Study Areas Regional Map

| | | | |
|---|---|---|---|
| DATE: May, 2014 | ANALYST: WR | Figure | 5.3.4-1 |
| JOB No: VE52420 | QA/QC: MY | PDF FILE: 09-100-014_WQ_SA_regional_v3.pdf | |
| GIS FILE: 09-100-014_WQ_SA_regional_v3.mxd | | | |
| PROJECTION: UTM Zone 10 | DATUM: NAD83 | | |

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##### *5.3.4.1.3.3 Assessment Approach*

The approach for assessing potential effects on sediment quality is qualitative, because there is no correlation between expected surface water quality and sediment quality. Therefore, no quantitative modelling was conducted. Periodic monitoring of sediment quality will be required to determine whether changes in water quality are mirrored in sediment quality changes.

### 5.3.4.2 Valued Component Baseline

Sediment quality was monitored in 2011, 2012, and 2013 at the same locations as the water quality samples for streams, as shown in **Table 5.3.4-1**.

A comprehensive list of past, present, and future project activities located within the regional study areas for all selected VCs is present in **Appendix 4C**. The project and activities with the potential to affect sediment quality in its regional study area include Pacific Gas Looping Project and Forestry logging and transportation.

As per BC MOE (2012) guidelines, one station was sampled with five replicates each year, and laboratory splits were analyzed for every third sample. Exceedances of CCME Interim Sediment Quality Guidelines (ISQG) and Probable Effects Level (PEL) guidelines and BC MOE Lowest Effects Level (LEL) and Severe Effects Level (SEL) guidelines occurred, and are listed in **Table 5.3.4-2**. Arsenic, iron, and manganese were exceeded most frequently (eight, five, and eight exceedances, respectively). Results are not atypical for streams, particularly in mineralized areas where sediment guidelines are often naturally exceeded. Healthy aquatic populations exist in all area streams, and thus exceedances of guidelines do not indicate naturally occurring impairment of aquatic ecosystems. Sediment guidelines are often not a useful indicator of metals exposure for aquatic organisms particularly where metals are present as sulphide minerals with low solubility and bioavailability at neutral pH.

***Table 5.3.4-2: Exceedances of CCME and BC MOE Sediment Guidelines in Project Area Streams***

| Parameter | CCME ISQG | CCME PEL | BC MOE Lowest Effects SLC | BC MOE Severe Effects SLC |
|---|---|---|---|---|
| Arsenic | WQ1, WQ5, WQ10, WQ13, WQ17 | WQ4, WQ6, WQ14 | WQ1, WQ5, WQ10, WQ13, WQ17 | WQ4, WQ6, WQ14 |
| Cadmium | WQ2 | WQ4 | WQ2 | WQ4 |
| Chromium | WQ18, WQ19 | | WQ18, WQ19 | |
| Copper | WQ15, WQ19 | | WQ15, WQ19 | |
| Iron | WQ4, WQ13, WQ17, WQ18 | WQ14 | WQ4, WQ13, WQ17, WQ18 | WQ14 |
| Manganese | | | WQ5, WQ7, WQ10, WQ11, WQ17 | WQ4, WQ13, WQ14 |
| Mercury | WQ4 | | WQ4 | |
| Nickel | | | WQ4, WQ7, WQ18, WQ19 | |

| Parameter | CCME ISQG | CCME PEL | BC MOE Lowest Effects SLC | BC MOE Severe Effects SLC |
|---|---|---|---|---|
| Silver | | | | WQ4 |
| Zinc | WQ1, WQ14 | WQ4 | WQ1, WQ14 | WQ4 |

**Note:** SLC = Screening Level Concentration

For stations where sampling occurred in 2011 and 2012, there was a fairly good agreement of metal concentrations between years. For WQ14, where five replicates were collected in both 2011 and 2012, mercury had the highest inter-replicate variability, although recorded concentrations were low (0.02 µg/g to 0.04 µg/g). Zinc also had high variability (97 µg/g to 150 µg/g). **Table 5.3.4-3** lists mean results (individual results for sites with only one sample).

Lake sediments were collected in 2013 in response to the observation that increases in suspended sediments in hypolimnion (lake bottom), water samples typically correlated with increased metals concentrations. The Project will not directly affect lake sediments, but background information on lake sediment levels may be useful in interpreting water quality results.

**Table 5.3.4-4** provides summary results; the complete results are provided in Surface Water and Sediment Quality Baseline Report included in **Appendix 5.1.2.2A**. Only one replicate sample was measured for particle size. **Figure 5.3.4-2** shows the location of sites listed in the table.

There were few guideline exceedances, all of which were for both ISQG and LEL:

| | | | |
|---|---|---|---|
| WQ22 | Cu, Pb, Hg | WQ24 | Hg |
| WQ23 | Hg | WQ25 | Hg, Zn |

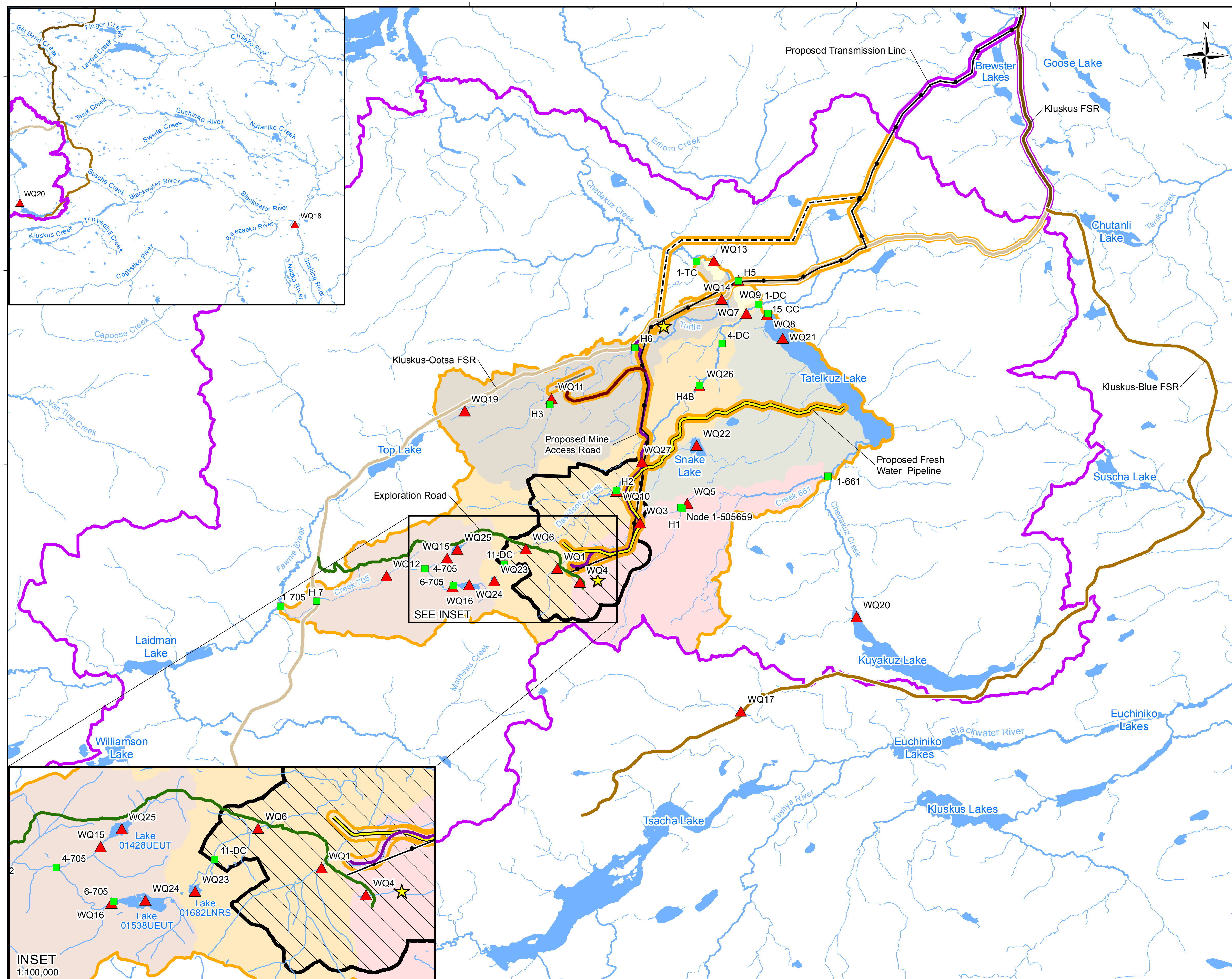
Mercury in lake bottom sediments was slightly above guidelines in all lakes except Tatelkuz. The relatively low concentrations of sediment metals does not correlate with the observed elevation in hypolimnion water samples with increased sediment, suggesting that metals in lake bottom sediments were only loosely bound and easily leached and/or fine particles in suspension in water contain more metals.

***Table 5.3.4-3: Blackwater Stream Sediment Summary***

| Station / Number / Analytical Parameter | Unit | MDL | CCME ISQG (mg/kg) | CCME PEL (mg/kg) | BC MOE Working Guidelines for Sediments LEL based on SLC (mg/kg) | BC MOE Working Guidelines for Sediments SEL based on SLC (mg/kg) | WQ1 Mean 2 | WQ3 Mean 4 | WQ4 Mean 4 | WQ5 Mean 2 | WQ6 Mean 3 | WQ7 Mean 4 | WQ8 Mean 2 | WQ9 Mean 2 | WQ10 Mean 2 | WQ11 Mean 2 | WQ12 Mean 4 | WQ13 Mean 2 | WQ14 Mean 11 | WQ15 1 | WQ16 1 | WQ17 1 | WQ18 1 | WQ19 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***General Parameters*** | | | | | | | | | | | | | | | | | | | | | | | | |
| Moisture | % | 0.5 | | | | | 58 | 66 | 13 | 32 | 88 | 28 | 10 | 54 | 42 | 50 | 65 | 50 | 13 | 65.2 | 41.9 | 26 | 35 | 34 |
| pH (1:1 H2O) BC | pH unit | 0.01 | | | | | 6.99 | 5.97 | 5.52 | 5.6 | 5.27 | 6.61 | 6.17 | 5.7 | 6.57 | 6.66 | 5.41 | 5.57 | 7.01 | 5.37 | 6.02 | 6.35 | 7.28 | 7.28 |
| ***Metals*** | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | µg/g (ppm) | 1 | | | | | 15,200 | 9,215 | 29,600 | 15,400 | 14,633 | 10,775 | 7,565 | 9,760 | 13,200 | 21,100 | 12,000 | 13,425 | 17,133 | 9,040 | 13,300 | 10,200 | 14,500 | 13,100 |
| Antimony | µg/g (ppm) | 0.1 | | | | | 0.9 | 0.5 | 3.2 | 0.5 | 0.7 | 0.5 | 0.3 | 0.4 | 0.3 | 0.2 | 0.3 | 0.3 | 0.15 | 1.5 | < 0.5 | 0.5 | 0.4 | 0.5 |
| Arsenic | µg/g (ppm) | 0.05 | 5.9 | 17 | 5.9 | 17 | 16.2 | 5.8 | 23.5 | 7.3 | 19.4 | 5.4 | 2.3 | 3.4 | 9.5 | 5.3 | 4.4 | 12.9 | 19.1 | 5.4 | 1.9 | 11.2 | 3.99 | 4.53 |
| Barium | µg/g (ppm) | 0.1 | | | | | 112 | 81.1 | 243 | 104.6 | 135.3 | 95.6 | 56.7 | 83.3 | 121 | 163 | 109 | 168 | 258 | 161 | 123 | 92.5 | 119 | 58.9 |
| Beryllium | µg/g (ppm) | 0.1 | | | | | 1 | 0.475 | 1.77 | 0.55 | 0.8 | 0.425 | 0.2 | 0.3 | 0.55 | 0.85 | 0.425 | 0.5 | 0.8 | 1 | 1.3 | 0.4 | 0.3 | 0.4 |
| Bismuth | µg/g (ppm) | 0.1 | | | | | 0.1 | < 0.1 | 0.2 | 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 0.1 | | | 0.6 | < 0.1 | < 0.1 |
| Boron | µg/g (ppm) | 0.5 | | | | | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.9 | | | < 0.5 | 0.6 | 2.1 |
| Cadmium | µg/g (ppm) | 0.01 | 0.6 | 3.5 | 0.6 | 3.5 | 1 | 0.3 | 9.6 | 0.3 | 0.6 | 0.2 | 0.1 | 0.1 | 0.2 | 0.3 | 0.1 | 0.3 | 0.5 | 0.6 | 0.3 | 0.3 | 0.2 | 0.4 |
| Calcium | µg/g (ppm) | 5 | | | | | 3,410 | 5,535 | 7,213 | 4,210 | 3,823 | 4,995 | 7,620 | 4,860 | 4,250 | 6,290 | 4,285 | 8,820 | 10,437 | 7,630 | 5,380 | 4,390 | 4,690 | 17,900 |
| Chromium | µg/g (ppm) | 0.05 | 37.3 | 90 | 37.3 | 90 | 13.2 | 26.3 | 21.2 | 17.1 | 12.5 | 23.1 | 14.6 | 18.3 | 16.4 | 16.5 | 16.7 | 22.2 | 30 | 9.4 | 11.3 | 20.7 | 51.6 | 67.3 |
| Cobalt | µg/g (ppm) | 0.05 | | | | | 3.7 | 3.77 | 14.8 | 5.66 | 4.46 | 7.3 | 3.2 | 5.5 | 5.19 | 6.2 | 5.37 | 6.4 | 6.8 | 3.2 | 3 | 7.9 | 12.7 | 10.5 |
| Copper | µg/g (ppm) | 0.01 | 35.7 | 197 | 35.7 | 197 | 10.5 | 9.6 | 25.8 | 12.9 | 12.1 | 12.8 | 14.4 | 11.4 | 9.3 | 18.2 | 11.4 | 24.7 | 36.8 | 37.3 | 20.8 | 25.6 | 15 | 61.8 |
| Iron | µg/g (ppm) | 5 | | | 21200 | 43766 | 11,800 | 9,733 | 31,267 | 15,600 | 16,400 | 18,875 | 8,875 | 15,250 | 17,950 | 19,900 | 16,900 | 34,450 | 47,050 | 10,900 | 7,300 | 23,600 | 28,700 | 18,800 |
| Lead | µg/g (ppm) | 0.1 | 35 | 91.3 | 35 | 91.3 | 10.9 | 11.2 | 48.4 | 10.9 | 17 | 7.9 | 4.5 | 6 | 9.8 | 7.4 | 6.9 | 6.1 | 6.1 | 19.4 | 13.7 | 8.9 | 3.9 | 7.2 |
| Magnesium | µg/g (ppm) | 1 | | | | | 1,700 | 1,600 | 2,150 | 2,655 | 2,063 | 3,678 | 2,660 | 3,090 | 2,265 | 2,750 | 2,590 | 3,450 | 3,725 | 1,230 | 1,800 | 2,900 | 6,110 | 7,620 |
| Manganese | µg/g (ppm) | 0.1 | | | 460 | 1100 | 212 | 400 | 5,370 | 544 | 430 | 462 | 195 | 250 | 494 | 743 | 339 | 1,208 | 1,590 | 1,090 | 95.4 | 596 | 454 | 364 |
| Mercury | µg/g (ppm) | 0.02 | 0.17 | 0.486 | 0.17 | 0.486 | 0.11 | 0.07 | 0.23 | 0.06 | 0.15 | 0.04 | < 0.02 | 0.03 | 0.06 | 0.065 | 0.048 | 0.045 | 0.043 | 0.22 | 0.13 | 0.02 | 0.06 | 0.06 |
| Molybdenum | µg/g (ppm) | 0.1 | | | | | 2.7 | 0.8 | 5.7 | 0.7 | 1.3 | 0.7 | 1.2 | 0.5 | 1.3 | 1.2 | 0.8 | 1.1 | 1.2 | 3.6 | 1.7 | 2.1 | 0.6 | 0.6 |
| Nickel | µg/g (ppm) | 0.1 | | | 16 | 75 | 8.5 | 7.2 | 20.5 | 11 | 11.9 | 18.3 | 11.3 | 13.5 | 9.3 | 11 | 11 | 21.2 | 29.8 | 2.8 | 7.1 | 11.1 | 45.3 | 16.7 |
| Phosphorus | µg/g (ppm) | 5 | | | | | 812 | 661 | 1160 | 671 | 739 | 647 | 801 | 633 | 701 | 799 | 718 | 997 | 1,102 | 745 | 438 | 662 | 663 | 1,060 |
| Potassium | µg/g (ppm) | 1 | | | | | 459 | 346 | 786 | 439 | 522 | 458 | 473 | 421 | 420 | 566 | 388 | 709 | 944 | 452 | 515 | 675 | 427 | 412 |
| Selenium | µg/g (ppm) | 0.01 | | | 5 | 5 | 0.41 | 0.96 | 0.66 | 0.3 | 0.61 | 0.33 | 0.35 | 0.31 | 0.36 | 0.42 | 0.3 | 0.59 | 0.76 | 0.6 | < 0.5 | 0.21 | 0.24 | 3.69 |
| Silver | µg/g (ppm) | 0.05 | | | 0.5 | 0.5 | 0.37 | 0.15 | 3.62 | 0.27 | 0.44 | 0.13 | 0.06 | 0.08 | 0.17 | 0.17 | 0.1 | 0.14 | 0.21 | 0.3 | 0.2 | 0.13 | 0.09 | 0.18 |
| Sodium | µg/g )ppm) | 1 | | | | | 94 | 109 | 105 | 141 | 87 | 199 | 269 | 212 | 124 | 130 | 159 | 187 | 177 | 116 | 113 | 249 | 336 | 364 |
| Strontium | µg/g (ppm) | 0.1 | | | | | 35.7 | 46.8 | 63.5 | 36.7 | 43.1 | 41.8 | 52.6 | 36.9 | 36.6 | 55.2 | 34.2 | 63.7 | 80.2 | 74.2 | 42.3 | 36.2 | 37.9 | 70.3 |
| Thallium | µg/g (ppm) | 0.05 | | | | | 0.4 | 0.1 | 0.4 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | < 0.5 | < 0.5 | 0.1 | < 0.05 | 0.1 |
| Tin | µg/g (ppm) | 0.1 | | | | | 0.6 | 1.5 | 1.2 | 0.6 | 0.4 | 0.6 | 0.9 | 0.3 | 0.4 | 1 | 0.4 | 0.6 | 0.7 | 7.6 | 1.4 | 1.1 | 0.5 | 7.8 |
| Titanium | µg/g (ppm) | 0.5 | | | | | 171 | 336 | 201 | 424 | 79 | 704 | 635 | 681 | 318 | 187 | 492 | 403 | 230 | 239 | 137 | 1,220 | 1,650 | 1,400 |
| Vanadium | µg/g (ppm) | 0.05 | | | | | 38.6 | 28.7 | 53.2 | 30.9 | 26.7 | 42.8 | 24.2 | 34.9 | 34.2 | 35.5 | 33.8 | 45 | 56.5 | 18.4 | 13.5 | 55.6 | 65.9 | 53 |
| Zinc | µg/g (ppm) | 0.5 | 123 | 315 | 123 | 315 | 125 | 50.4 | 2913 | 95.4 | 98.2 | 66.4 | 32.9 | 51 | 75.3 | 57.6 | 51.1 | 78.4 | 127.7 | 119 | 42.2 | 112 | 74 | 98 |
| ***Organics*** | | | | | | | | | | | | | | | | | | | | | | | | |
| Inorganic Carbon | % | 0.1 | | | | | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 0.16 | <0.10 | <0.10 | <0.10 | <0.10 |
| Total Organic Carbon | % | 0.1 | | | | | 4.09 | 2.48 | 7.32 | 1.33 | 3.93 | 0.51 | 1.95 | 0.99 | 0.48 | 3.84 | 1.94 | 0.95 | 7.24 | 9.53 | 2.397 | 0.66 | 0.44 | 3.1 |
| $CaCO_3$ Equivalent | % | 0.1 | | | | | <0.80 | <0.80 | <0.80 | <0.80 | 0.075 | <0.80 | <0.80 | <0.80 | <0.80 | <0.80 | <0.80 | <0.80 | 0.832 | 1.34 | <0.80 | <0.80 | <0.80 | <0.80 |
| Total Carbon by Combustion | % | 0.1 | | | | | 4.1 | 2.5 | 7.3 | 1.3 | 3.9 | 0.5 | 1.9 | 1 | 0.5 | 3.8 | 2 | 1 | 7.3 | 9.7 | 3.0 | 0.7 | 0.4 | 3.1 |

| Station / Number / Analytical Parameter | Unit | MDL | CCME ISQG (mg/kg) | CCME PEL (mg/kg) | BC MOE Working Guidelines for Sediments LEL based on SLC (mg/kg) | BC MOE Working Guidelines for Sediments SEL based on SLC (mg/kg) | WQ1 Mean 2 | WQ3 Mean 4 | WQ4 Mean 4 | WQ5 Mean 2 | WQ6 Mean 3 | WQ7 Mean 4 | WQ8 Mean 2 | WQ9 Mean 2 | WQ10 Mean 2 | WQ11 Mean 2 | WQ12 Mean 4 | WQ13 Mean 2 | WQ14 Mean 11 | WQ15 1 | WQ16 1 | WQ17 1 | WQ18 1 | WQ19 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Particle Size*** | | | | | | | | | | | | | | | | | | | | | | | | |
| % Gravel (>2 mm) | % | 0.1 | | | | | 0.1 | 0.1 | <0.10 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 5.07 | 7.71 | <0.10 | <0.10 | <0.10 |
| % Sand (2.00 mm to 1.00 mm) | % | 0.1 | | | | | 5.8 | 6.6 | 2.7 | 23 | 8.5 | 6.4 | 15.2 | 7.7 | 15.1 | 26 | 7.1 | 10.7 | 6.4 | 4.21 | 14.1 | 10 | 1.1 | 19.8 |
| % Sand (1.00 mm to 0.50 mm) | % | 0.1 | | | | | 14.3 | 16.6 | 12 | 26 | 14.9 | 16.6 | 23.4 | 12.6 | 26.2 | 22.8 | 17.5 | 18.5 | 12.4 | 5.3 | 17.8 | 35.4 | 16.7 | 30.6 |
| % Sand (0.50 mm to 0.25 mm) | % | 0.1 | | | | | 23.7 | 16.1 | 11.7 | 17.1 | 10.8 | 18.4 | 28.4 | 26.8 | 27.5 | 14.1 | 17.6 | 27.1 | 6.6 | 13.3 | 19.7 | 24.5 | 22.1 | 21 |
| % Sand (0.25 mm to 0.125 mm) | % | 0.1 | | | | | 19.4 | 27.8 | 11.4 | 13.7 | 22.3 | 33.4 | 20.2 | 26.5 | 17.9 | 7.1 | 25.5 | 23.5 | 9.9 | 23.8 | 11.9 | 16.8 | 37.5 | 12.3 |
| % Sand (0.125 mm to 0.063 mm) | % | 0.1 | | | | | 11.4 | 10 | 3.7 | 7.6 | 10.8 | 8.7 | 5.1 | 10.3 | 5.1 | 5.3 | 9.7 | 8.5 | 5.7 | 8.41 | 5.38 | 5.2 | 8.1 | 3.7 |
| % Silt (0.063 mm to 0.0312 mm) | % | 0.1 | | | | | 13.5 | 10.7 | 19.6 | 4.5 | 14.8 | 7.6 | 2.5 | 8.7 | 3.3 | 7.9 | 10.1 | 4.9 | 24.3 | 17.5 | 8.1 | 2.8 | 3.9 | 4.7 |
| % Silt (0.0312 mm to 0.004 mm) | % | 0.1 | | | | | 9.2 | 10 | 26.3 | 2.4 | 14.9 | 7.1 | 1.4 | 5.2 | 2.4 | 4.7 | 10.2 | 3.8 | 28.8 | 19 | 10.4 | 3.5 | 5.1 | 5.4 |
| % Clay (<4 µm) | % | 0.1 | | | | | 5.15 | 2.09 | 12.6 | 0.9 | 3.1 | 1.9 | 0.9 | 2 | 1.7 | 1.3 | 2.4 | 2.9 | 5.9 | 3.42 | 5.03 | 1.9 | 5.6 | 2.4 |

**Note:** SLC = Screening Level Concentration




## Legend

- Meteorology Station
- Hydrology Station
- Water Quality Site
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Stream (>= 2nd Order)
- Waterbody (> 50 Ha)

**Project Components**

- Exploration Road
- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Re-route)
- Proposed Fresh Water Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

**Watersheds**

- Chedakuz Creek Local
- Creek 661
- Creek 705
- Davidson Creek
- Tatelkuz Lake Tributaries
- Turtle Creek

**Hydrology, Surface Water and Sediment Quality, Fish and Fish Habitat**

- Regional Study Area
- Local Study Area
- Regional and Local Study Areas

Scale:1:200,000

0 2.5 5 10

Kilometres

**Reference**
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

# Surface Water Quality Monitoring Sites

| DATE: May, 2014 | ANALYST: WR | Figure 5.3.4-2 |
|---|---|---|
| JOB No: VE52420 | QA/QC: MY | PDF FILE: 09-100-003_v22_SA_WQ_sites.pdf |
| GIS FILE: 09-100-003_v22.mxd | | |
| PROJECTION: UTM Zone 10 | DATUM: NAD83 | amec |

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\09_water-quality\Baseline\09-100-003_v22.mxd

***Table 5.3.4-4: Lake Sediment Mean Concentrations***

| Station | | | CCME | | BC MOE Working Guidelines for Sediments | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | | | | | | | | | | | |
| **Analytical Parameter** | **Units** | **MDL** | **ISQG (mg/kg)** | **PEL (mg/kg)** | **LEL Based on SLC (mg/kg)** | **SEL Based on SLC (mg/kg)** | **WQ21 Mean 5** | **WQ22 Mean 2** | **WQ23 1** | **WQ24 1** | **WQ25 1** |
| ***General Parameters*** | | | | | | | | | | | |
| Moisture | % | 0.5 | | | | | 27.2 | 93.4 | 90 | 89.3 | 88.1 |
| pH (1:1 H2O) BC | pH units | 0.01 | | | | | 6.30 | 5.90 | 5.72 | 5.52 | 5.84 |
| ***Metals**** | | | | | | | | | | | |
| Aluminum | µg/g (ppm) | 1 | | | | | 8,212 | 5,500 | 9,610 | 12,400 | 8,970 |
| Antimony | µg/g (ppm) | 0.1 | | | | | < 0.5 | 0.7 | 3.1 | 1.4 | 0.6 |
| Arsenic | µg/g (ppm) | 0.05 | 5.9 | **17** | 5.9 | **17** | 4.84 | 4.35 | 13.6 | 18 | 4.1 |
| Barium | µg/g (ppm) | 0.1 | | | | | 74.2 | 59 | 80 | 83 | 96 |
| Beryllium | µg/g (ppm) | 0.1 | | | | | 0.22 | 0.2 | 0.9 | 1.1 | 0.7 |
| Bismuth | µg/g (ppm) | 0.1 | | | | | | | | | |
| Boron | µg/g (ppm) | 0.5 | | | | | | | | | |
| Cadmium | µg/g (ppm) | 0.01 | 0.6 | **3.5** | 0.6 | **3.5** | 0.1 | 0.4 | 0.4 | 0.6 | 0.4 |
| Calcium | µg/g (ppm) | 5 | | | | | 4,050 | 10,300 | 3,970 | 3,450 | 3,510 |
| Chromium | µg/g (ppm) | 0.05 | 37.3 | **90** | 37.3 | **90** | 26.66 | 22.9 | 18.3 | 14.3 | 9.2 |
| Cobalt | µg/g (ppm) | 0.05 | | | | | 5.32 | 3.2 | 2.7 | 3 | 2.7 |
| Copper | µg/g (ppm) | 0.01 | 35.7 | **197** | 35.7 | **197** | 28.74 | 46.9 | 20 | 28.2 | 17.5 |
| Iron | µg/g (ppm) | 5 | | | 21200 | **43766** | 13,460 | 8,025 | 7,100 | 9,630 | 6,730 |
| Lead | µg/g (ppm) | 0.1 | 35 | **91.3** | 35 | **91.3** | 18.72 | 44.55 | 16.4 | 23 | 18.1 |
| Magnesium | µg/g (ppm) | 1 | | | | | 3,628 | 2,815 | 1,220 | 1,350 | 764 |
| Manganese | µg/g (ppm) | 0.1 | | | 460 | **1100** | 264 | 262 | 158 | 254 | 464 |
| Mercury | µg/g (ppm) | 0.02 | 0.17 | **0.486** | 0.17 | **0.486** | 0.08 | 0.455 | 0.38 | 0.36 | 0.29 |
| Molybdenum | µg/g (ppm) | 0.1 | | | | | 1.24 | 2.5 | 4.8 | 7.3 | 3.5 |
| Nickel | µg/g (ppm) | 0.1 | | | 16 | **75** | 15.5 | 15.1 | 6.3 | 7.3 | 5.7 |
| Phosphorus | µg/g (ppm) | 5 | | | | | 720.2 | 603.5 | 615 | 733 | 962 |
| Potassium | µg/g (ppm) | 1 | | | | | 533 | 483.5 | 529 | 492 | 347 |
| Selenium | µg/g (ppm) | 0.01 | | | 5 | **5** | 0.8 | 1.1 | 0.9 | 0.8 | < 0.5 |
| Silver | µg/g (ppm) | 0.05 | | | 0.5 | **0.5** | 0.1 | 0.2 | 0.3 | 0.3 | 0.2 |
| Sodium | µg/g )ppm) | 1 | | | | | 249 | 791 | 125 | 102 | 79.6 |
| Strontium | µg/g (ppm) | 0.1 | | | | | 30.1 | 59.8 | 36.4 | 35 | 44.8 |
| Thallium | µg/g (ppm) | 0.05 | | | | | <0.5 | <0.5 | < 0.5 | <0.5 | <0.5 |
| Tin | µg/g (ppm) | 0.1 | | | | | 15.5 | 44.2 | 4.6 | 3.4 | 19 |
| Titanium | µg/g (ppm) | 0.5 | | | | | 839 | 205 | 198 | 157 | 97.4 |
| Vanadium | µg/g (ppm) | 0.05 | | | | | 33.24 | 26.5 | 21.5 | 26 | 16.4 |
| Zinc | µg/g (ppm) | 0.5 | 123 | **315** | 123 | **315** | 58 | 101 | 77 | 94 | 140 |
| ***Organics*** | | | | | | | | | | | |
| Inorganic Carbon | % | 0.1 | | | | | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| Total Organic Carbon | % | 0.1 | | | | | 0.53 | 27.3 | 12.7 | 11.1 | 10.4 |
| $CaCO_3$ Equivalent | % | 0.1 | | | | | <0.80 | <0.80 | <0.80 | <0.80 | <0.80 |
| Total Carbon by Combustion | % | 0.1 | | | | | 0.5 | 27.3 | 12.7 | 11.1 | 10.4 |
| ***Particle Size*** | | | | | | | | | | | |
| % Gravel (>2 mm) | % | 0.1 | | | | | 12 | <0.10 | <0.10 | <0.10 | <0.10 |
| % Sand (2.00 mm to 1.00 mm) | % | 0.1 | | | | | 11.9 | <0.10 | <0.10 | <0.10 | <0.10 |
| % Sand (1.00 mm to 0.50 mm) | % | 0.1 | | | | | 15.8 | 0.19 | <0.10 | <0.10 | <0.10 |
| % Sand (0.50 mm to 0.25 mm) | % | 0.1 | | | | | 32.9 | 0.29 | 0.12 | <0.10 | <0.10 |
| % Sand (0.25 mm to 0.125 mm) | % | 0.1 | | | | | 14.3 | 0.91 | 0.47 | <0.10 | <0.10 |
| % Sand (0.125 mm to 0.063 mm) | % | 0.1 | | | | | 7.19 | 2.76 | 1.64 | 0.39 | <0.10 |
| % Silt (0.063 mm to 0.0312 mm) | % | 0.1 | | | | | 3.59 | 39.4 | 31.7 | 23.1 | 27.8 |
| % Silt (0.0312 mm to 0.004 mm) | % | 0.1 | | | | | 2.22 | 47.5 | 50.6 | 56 | 51.3 |
| % Clay (<4 µm) | % | 0.1 | | | | | 0.13 | 8.87 | 15.4 | 20.3 | 20.8 |

**Note:** red font = above ISQG/LEL; **red & bold** = above PEL/SEL; SLC = Screening Level Concentration

#### 5.3.4.2.1 Traditional Knowledge

No traditional knowledge (TK) was identified with respect to sediment quality in discussion with Aboriginal groups.

#### 5.3.4.2.2 Past, Present and Future Activities

Past, present and future projects and activities that may have the potential to affect sediment quality and are present in the RSA are mineral exploration and forestry logging.

### 5.3.4.3 Potential Effects of the Proposed Project and Proposed Mitigation

For sediment quality key interactions included mine site activities at each phase, moderate interactions included site clear activities for off-site components (access road, transmission line, water supply line, airstrip), and no interaction was assessed for other activities (see **Section 4, Table 4.3-2**), Key interactions were carried forward and are discussed in detail in this section as direct or indirect effects. Moderate interactions were assessed as those activities that were not likely to have significant effects because established, best management practices can mitigate any effects on sediment quality; moderate interactions are discussed only briefly. 'No interaction' activities are not discussed because there is no link between the activity and sediment quality.

The potential direct effects of different Project components on the sediment quality VC are assessed in the following sections. The nature of the expected effects and the likelihood of their occurrence are presented. As well, the effects' indirect interactions are presented in the context of potential effects on other disciplines. Those effects carried forward in the effects assessment are presented.

The effects of past and present projects and activities that are present in the RSA, when measurable, are captured in the baseline characterization presented in **Section 5.1.2.2**. Forestry activities could lead to increases in sediment bed loads where the FSR crosses streams and is used by both forestry and mining traffic. If the residual effect of the proposed Project on sediment quality is determined to be other than negligible and a potential temporal or spatial interaction with a project or activity is identified, then a cumulative effects assessment was conducted taking into account past, present, certain and reasonably foreseeable future project or activities. The cumulative effects assessment is discussed in **Section 5.3.4.5**.

#### 5.3.4.3.1 Potential Project Effects

##### *5.3.4.3.1.1 Potential Direct Effects on Sediment Quality*

###### *5.3.4.3.1.1.1 Construction*

During construction, some erosion and sedimentation are expected from land clearing activities including construction of the plant facilities and tailings impoundment dams. Sediment control ponds will be constructed prior to major clearing activities in all areas where sediment could enter water bodies, principally Davidson Creek. Control of erosion and sedimentation is discussed in the Mine Water Management Plan (MWAMP) (**Section 12.2.1.18.4.18**) and the Sediment and Erosion

Control Plan (SECP) (**Section 12.2.1.18.4.1**). All discharges will meet MMER and provincial permit requirements. Only one of the seven ponds proposed (the camp sediment control pond that will discharge to ground) will be required beyond the first two construction years. Further, only two of the construction-period ponds will be directly in Davidson Creek and one directly to Creek 661. With the proposed controls, there are no impacts predicted from sediment export to site water bodies. Further, any sediment that is exported will be of similar chemistry to baseline sediments in area streams and therefore no changes in sediment quality (metals concentrations) are expected during construction.

Construction of linear developments (airstrip and access road, transmission line, water supply pipeline) will use best management practices that are designed to limit any export of sediment to water bodies. Again, if sediment is exported, the chemistry will be similar to baseline sediments in streams and no changes in sediment quality are expected during construction.

##### *5.3.4.3.1.1.2 Operations*

At the proposed mine site during operation, all contact water will be routed to the TSF, and as a result, there will be no opportunity for sediment export to the receiving environment (Davidson Creek and Creek 661). As discussed, the TSF will operate with no surface water discharge and only very limited seepage. TSF seepage, due to the filtering effect of tailings and subsurface sands and gravels, will not contain suspended sediment. Water pumped from Tatelkuz Lake will be from subsurface but well above the lake bottom where suspended sediments would not be expected to be routinely drawn into the intake.

Any increase in metal concentrations in seepage water has the potential to be accumulated in stream sediments over time due to adsorption. However, there is no correlation between sediment concentrations found in the Project area and water concentrations based on baseline spatial and temporal exceedances for water and sediment (see **Table 5.3.4-2**). The lack of correlation between background water and sediment quality, occurs principally because the method of assessing sediment metals levels is a strong acid leach, which will never occur in a natural stream not subject to acid drainage. Therefore, the only source of sediment metals is precipitation/adsorption from surface water. Due to the lack of correlation between water and sediment metals, a qualitative effects assessment was carried out for the Application. Periodic monitoring will be required to determine whether sediment metals are increasing and whether any increases should they occur are significant.

Some seepage will be generated by the dam on the west side of the tailing impoundment, but because of the local topography, is expected to flow back toward the dam rather than to the west.

Over all, capture and pump back of seepage is the proposed mitigation to limit metals uptake by stream sediments.

Traffic on the access road could result in dust export to streams that are crossed by the road. However with dust controls in place (e.g. road dressing), contributions from traffic dust to sediment in crossed streams are expected to be minor compared to watershed sediment export upstream of the road crossing. Changes in sediment quality from road dust will be unmeasurable, and in any case, inseparable from upstream changes.

*5.3.4.3.1.1.3 Closure*

During closure, other than rerouting some contact water to fill the open pit, there will be no change in water management and no water will be discharged to the environment other than the aforementioned seepage. Effects, if any, on sediment quality are expected to remain the same as through the operations period.

*5.3.4.3.1.1.4 Post Closure*

Once the open pit fills, it will overflow to the TSF, and the TSF will discharge. Suspended sediment concentrations will need to meet *MMER* limits of 15 mg/L long term, and 30 mg/L maximum grab concentration. Due to the settling action in the open pit and the TSF, no difficulty is expected in meeting or staying under these limits. Post closure water quality in Davidson Creek downstream from the TSF is forecast to meet BC FWGs or site-specific water quality objectives and thus no change in Davidson Creek sediment quality in the post closure period is expected.

*5.3.4.3.1.2 Potential Indirect Effects on Sediment Quality*

Potential indirect effects on sediment quality will be similar to those for water quality: indirect effects on freshwater aquatic resources, human health (from ingestion of affected aquatic organisms—principally fish), and environmental health in general from animals that might ingest affected freshwater organisms.

*5.3.4.3.1.3 Potential Combined Effects*

No combined Project effects on sediment quality are expected due to Project design. During construction, as previously noted, no sediments having higher than baseline metals concentrations would be exported to area water bodies. Once exposure of the ore body commences and ore and waste rock that could contain elevated metals are stored on surface, contact water will be routed to the TSF where sediment will be trapped. Other construction-related sediment export would be expected to have baseline chemistry.

During operations and closure, the only potential source of metals loading to sediments will be seepage from the TSF, as previously discussed. During post closure, again, the only source of metals loading will be via the TSF.

*5.3.4.3.1.4 Effects Combined Spatially or Temporarily With Other Project Effects*

Cumulative effects are discussed in **Section 5.3.4.5**. Sediment transport into streams mutually crossed by the proposed Project and other activities could lead to an increase in sediment quantity but not sediment quality. Contaminants loading from cumulative sources are not possible unless routine or accidental spills of contaminants, e.g. fuel, were to occur simultaneously by the proposed Project and other FSR users at any stage of the proposed Project, and that the accidental spills were into, or migrated to, water bodies.

### 5.3.4.3.2 Mitigation Measures

#### *5.3.4.3.2.1 Mitigation Inherent in Design*

The key design mitigation will be to limit sediment export during all phases and surface water discharge during operations and closure. Post closure water quality in Davidson Creek downstream from the TSF is expected to meet BC FWG or site specific water quality objective and thus is not expected to result in harmful accumulation and release of metals from downstream sediments. Conceptual management of mine water is discussed in detail in **Section 2.2** and in the MWAMP, **Section 12.2.1.18.4.18** and **Section 5.3.3** discusses potential effects on water quality.

#### *5.3.4.3.2.2 Additional Mitigation*

Any additional mitigation will be undertaken in response to monitoring, and will be integrated into adaptive management practices at the site. Triggers will, in principle, consist of increasing trends in sediment metals concentrations over baseline concentrations. A possible trigger could be an increase over baseline concentrations of 25 per cent. Frequency of sediment sampling may be increased in consultation with BC MOE. Examination of the potential sources for the increase(s) would be undertaken and an investigation of aquatic biota would commence to determine if sediment metals increases were reflected in the aquatic biota. Any remedial action would be dictated by the nature of the source(s) and its significance to aquatic biota and undertaken in consultation with BC MOE.

#### *5.3.4.3.2.3 Effectiveness of Mitigation*

**Table 5.3.4-5** provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on surface water quality of mine site development, detailed in the above sections. Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

***Table 5.3.4-5: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Sediment Quality of Mine Site Development***

| Likely Environmental Effect | Project Phase | Mitigation/Enhancement Measure | Effectiveness of Mitigation Rating |
|---|---|---|---|
| Sediment quality | Construction, Operations, Closure, Post-closure | Limit sediment export | High |
| | | Any additional mitigation will be undertaken in response to monitoring, and will be integrated into adaptive management practices at the site | Moderate |
| | Operations, Closure | Limit surface water discharge | High |

A high rating for success of mitigation has been applied to management methods that have been proven effective at other mine sites. Where the mitigation measures are unspecified, a moderate rating for success has been applied as the specific mitigation measures will depend on the circumstances; mitigation that has a low chance of success would not be applied.

### 5.3.4.4 Residual Effects and their Significance

#### 5.3.4.4.1 Residual Effects after Mitigation

##### *5.3.4.4.1.1 Sediment Metals Increase*

Increases in metal concentrations in the seepage and the discharge could potentially cause accumulation of metal in the sediments downstream of the TSF, i.e., in Davidson Creek. Seepage or runoff from other mine facilities will be captured and routed to the TSF and thus would not result in increase in metals loadings to water bodies other than Davidson Creek. These water bodies are Creek 661 and Creek 705 and small lakes (1682, 1428, 1538) at the Project site.

#### 5.3.4.4.2 Significance of Residual Project Effects

There are limited residual effects predicted for sediment after mitigation, since mitigation is built into the design of the Project. Baseline exceedances were noted as discussed in **Section 5.3.4.2**. These exceedances are therefore, not residual effects of the Project. Any effects on sediment metal loadings from the Project are expected to be minor and therefore not significant. The significance of residual Project effects is listed in **Table 5.3.4-6**. The probability (likelihood) of effects is low to moderate; moderate because of the lack of correlation between sediment and water metals. Confidence in metals loading predictions is moderate based on the prediction of the limited seepage source during operations and the expectation that, at post closure, water discharged from the TSF and polished by the downstream wetlands should meet BCFWG. The risk that the predictions are incorrect is small but to account for this risk, monitoring is proposed. In the long term, assuming reclamation and closure follows the plan set out, the potential effects of the proposed Project on sediment quality are reversible.

***Table 5.3.4-6: Significance of Residual Project Effects***

| Categories for Significance Determination | Project Phase | | |
|---|---|---|---|
| | Construction | Operation/Closure | Post-Closure |
| ***Sediment Metal Concentration*** | | | |
| Context | n/a | n/a | low |
| Magnitude | n/a | n/a | low |
| Geographic Extent | n/a | n/a | local |
| Duration | n/a | n/a | chronic |
| Frequency | n/a | n/a | periodic |
| Reversibility | n/a | n/a | reversible |
| Likelihood | n/a | n/a | –low – moderate |
| Significance Determination | n/a | n/a | not significant – minor |
| Confidence | n/a | n/a | moderate |

#### 5.3.4.5 Cumulative Effects

There are other possible activities in the RSA that could contribute residual effects outside of the background range for measured parameters for sediment chemistry. Forestry activities could lead to increases in sediment bed loads where the FSR crosses streams and is used by both forestry and mining traffic. Sediment export from the mine will be mitigated through the SECP (**Section 12.2.1.18.4.1**). Best management practices will limit sediment export during off-site construction and the potential increase in erosion will be managed through BMPs. Road dust from traffic, if found to be significant, will be controlled through road watering or other measures in cooperation with other principal road users. Thus, there no cumulative effects from the proposed Blackwater Project and other sources are expected. While there is extensive mineral exploration activity adjacent to the RSA, there are no projects that have entered the approval process and thus it is unknown whether any future projects could potentially add to the proposed Project residual effects, i.e., act cumulatively with the Project.

#### 5.3.4.6 Limitations

There is some uncertainty as to the occurrence of residual effects and a number of sediment parameters are above, or well above, guidelines. Monitoring of water, sediment, and aquatic biota will be required to determine if negative effects due to the Project are occurring taking into account background exceedances. As well, changes in the proposed Project following completion of the assessment could alter conclusions. However, with the proposed Project as detailed in this Application, no direct or indirect effects on stream sediments in area streams are anticipated.

#### 5.3.4.7 Conclusion

Project design and mitigation measures will mitigate sedimentation and erosion from affecting the sediment quality in the study area by limiting effects on downstream water quality. As well, potential metals loadings from seepage or discharge water will be limited by Project design including use of sediment control ponds during construction and routing all contact water to the TSF during operations and closure. The potential residual effect to sediment quality in the Davidson watershed is predicted to be indistinguishable from the natural range of variability in physical and chemical characteristics and no effects are predicted for the other two watersheds adjacent to the proposed mine site: creeks 661 and 705 and small lakes contained in the latter's watershed. The overall residual effect of the proposed Blackwater project on sediment quality is rated not significant (minor). As such, there would be no cumulative effects to sediment quality as a result of the proposed Blackwater project in conjunction with other existing or known projects. Some increase in sediment quantity at stream crossings could accrue from the combined traffic of the Project and the other major user: forest companies. Road dust management and road maintenance are expected to mitigate this potential effect.