BW GOLD LTD
a subsidiary company of Artemis Gold Inc

Blackwater Gold Project

EAC #M19-01 Condition 28: Chedakuz Creek and Tatelkuz Lake Surface Water Quality Monitoring Plan

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ACRONYMS AND ABBREVIATIONS

Aboriginal Groups or Indigenous nations	Aboriginal Groups include: Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation and Nazko First Nation (as defined in the Project's Environmental Assessment Certificate #M19-01)
AEMP	Aquatic Effects Monitoring Plan
BACI	Before-after-control-impact
BC	British Columbia
BC MOE	BC Ministry of Environment
Project, the	Blackwater Gold Project
BW Gold	BW Gold LTD.
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CSFNs	Carrier Sekani First Nations
DOC	Dissolved organic carbon
DS	Decision Statement
EAC	Environmental Assessment Certificate
ECCC	Environment and Climate Change Canada
EMC	Environmental Monitoring Committee
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
ENV	BC Ministry of Environment and Climate Change Strategy
FWR	Freshwater Reservoir
km	Kilometre
m	Metre
MDL	Method detection limit
MDMER	*Metal and Diamond Mining Effluent Regulations*
µS/cm	Microsiemens per centimetre
mg/mL	Milligrams per millilitre
Mt	Million tonnes
Mtpa	Million tonnes per annum
MWLAP	Ministry of Water, Land and Air Protection
NTU	Nephelometric turbidity unit
POC	Parameter of concern
POPC	Parameter of potential concern

QA/QC	Quality Assurance and Quality Control
ROC	Receptor of concern
SBEB	Science Based Environmental Benchmark
SCP	Sediment Control Pond
t	Tonne
TDS	Total dissolved solids
tpd	Tonnes per day
TOC	Total organic carbon
TSF	Tailings Storage Facility
TSS	Total suspended solids
WMP	Water management pond
WQG-AL	Water quality guideline for the protection of aquatic life
WTP	Water treatment plant
YDWL	Yinka Dene Water Law

1. INTRODUCTION

The Blackwater Gold Project (the Project) is located approximately 112 kilometres (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver, British Columbia (BC). The mine site is centered at latitude 53°11'22.872" N, and longitude 124°52'0.437" W (375400 E, 5893000 N) on National Topographic System sheet 93F/02.

The Project is a greenfield gold and silver open-pit mine with associated ore processing facilities. Project construction is anticipated to take two years. Mine operations will be phased with an initial milling capacity of 15,000 t/d or 5.5 million tones per annum (Mtpa) for the first five years of operation. After the first five years, the milling capacity will increase to 33,000 t/d (or 12 Mtpa) for the next five-years, and to 55,000 t/d (20 Mtpa) in Year +11 until the end of the 23-year mine life. The Closure phase is 24 to approximately 45 years, ending when the Open Pit has filled and the TSF is allowed to passively discharge to Davidson Creek, and the Post-closure phase is 46+ years. Ore will be processed in a plant by a combined gravity circuit and whole ore cyanide leach to recover gold and silver. The gold and silver will be recovered into a gold-silver doré product.

Surface water and groundwater discharges from the Project to the aquatic receiving environment are required through all phases (Construction, Operations, Closure, and Post-Closure) to maintain the site water balance requirements (see Appendix 9-E, Mine Site Water and Discharge Monitoring and Management Plan). Water will be discharged to Davidson Creek and Creek 661 in a manner that minimizes the potential for adverse effects to downstream receptors (flow and water quality). Thus, aquatic receiving environment monitoring programs have been developed to confirm adverse effects are not observed to either water flow or water quality in Davidson Creek and Creek 661 and downstream waters Tatelkuz Lake and Chedakuz Creek.

1.1 Purpose and Objective

The Chedakuz Creek and Tatelkuz Lake Surface Water Quality Monitoring Plan (the Plan) has been developed in accordance with Environmental Assessment Certificate (EAC) #M19-01 Condition 28. Surface water quality monitoring and reporting to be conducted under the Plan will coincide with the Aquatic Effects Monitoring Program (AEMP) Plan developed as part of the Project's Joint *Mines Act*/*Environmental Management Act* Permits Application (the Application).

The purpose of the Plan is to detail Chedakuz Creek and Tatelkuz Lake surface water quality monitoring to achieve the following objectives:

- Detect Project-related effects on Tatelkuz Lake and Chedakuz Creek upstream of Nechako Reservoir surface water quality; and
- Confirm water quality predictions and effects assessments, as presented in Chapter 5 of the Application (Modelling, Mitigation, and Discharges) and Chapter 6 of the Application (Environmental Assessment Predictions), respectively.

An update to the Plan will be issued and appended to or incorporated into the AEMP Plan Version 1.0 following review, engagement, and consultation with Indigenous Nations and regulators. The AEMP Plan Version 1.0 will include the appended first, final version of the Plan with subsequent Versions (e.g., Version 2.0, Version 3.0, etc.) issued when revisions to the Plan are needed to reflect updates or adjustments to the AEMP and the Plan over time.

1.2 Environmental Assessment Certificate

The Project received an EAC #M19-01 on June 21, 2019 under the 2002 *Environmental Assessment Act* approving the Project with conditions. The Plan has been developed to address EAC Condition 28, which requires the development of a Chedakuz Creek and Tatelkuz Lake Surface Water Quality Monitoring Plan.

Table 1.2-1 indicates the concordance of the Plan with the EAC Condition 28 requirements.

Table 1.2-1: Concordance with Environmental Assessment #M19-01 Condition 28

Condition	Section of the Chedakuz Creek and Tatelkuz Lake Surface Water Quality Monitoring Plan
The plan must include at least the following:	
a) Monitoring locations;	Section 3.1
b) Frequency of monitoring;	Section 3.2
c) The means by which the baseline information in Condition 27, Water Quality Report, and any other appropriate information or criteria as determined by a Qualified Professional, will be used to determine if there are adverse effects due to the Project to: d) Tatelkuz Lake; and e) Chedakuz Creek upstream of Nechako Reservoir;	Section 2.0
f) How the Holder has considered YDWL, other Aboriginal policies made available to the Holder from Aboriginal Groups, and ENV guidance in development of the criteria in paragraph c);	Section 3.5 (BW Gold has been collaborating with the Carrier Sekani First Nations (CSFNs) in regards to implementation of the YDWL and discussions with the CSFNs are ongoing.)
g) Conditions, if any, under which monitoring would no longer be required; and	Section 4 (Monitoring is no longer required when surface water and groundwater is no longer discharged to the aquatic receiving environment)
h) The means by which the Holder will communicate this information to Aboriginal Groups, including identification of the type of information to be provided, the frequency of reporting and the implications of the water quality observed at Chedakuz Creek for the Nechako Reservoir. Reports must include a summary written for a lay audience.	Section 4

1.3 Yinka Dene Water Law

The Plan takes into consideration the Yinka Dene Water Law (YDWL) as required by EAC Condition 28 and is described in the following documents:

- Yinka Dene ‘Uza’hné Surface Water Management Policy (Nadleh Whut’en and Stellat’en 2016a); and
- Yinka Dene ‘Uza’hné Guide to Surface Water Quality Standards (Nadleh Whut’en and Stellat’en 2016b).

BW Gold has been collaborating with the Carrier Sekani First Nations (CSFN) in regards to implementation of the YDWL and discussions are ongoing. The YDWL describes a system that classifies waters into three categories based on their cultural and ecological significance, including:

- High Cultural or Ecological Significance (Class I Waters);

- Sensitive Waters (Class II Waters); and
- Typical Waters (Class III Waters).

Baseline characterization requirements for implementation of the Yinka Dene ‘Uza’hné Surface Water Management Policy (Nadleh Whut’en and Stellat’en 2016a) including sampling frequency recommendations provided by CSFN representatives is expected to be completed at potential attainment sites by the end of 2022 (Appendix 2-K, 2011 to 2020 Baseline Water Quality Report).

2. EXISTING CONDITIONS AND WATER QUALITY PREDICTIONS

Surface water quality baseline data has been collected in Chedakuz Creek (at a location where Chedakuz Creek is expected to be affected by mine effluent discharge into Davidson Creek) and from Tatelkuz Lake. Spatial and temporal background (baseline) water quality observations are detailed in Appendix 2-K (2011 to 2020 Baseline Water Quality Report). The baseline observations and water quality model predictions summarized below will be used for analysis of Project related effects described in Section 3.5.

2.1 Chedakuz Creek Existing Conditions

Chedakuz Creek is a third to fourth order stream that originates above Kuyakuz Lake and flows approximately northwest to the Nechako Reservoir. Upper Chedakuz Creek is approximately 15 km long and flows into Kuyakuz Lake. Middle Chedakuz Creek is approximately 12 km long and flows between Kuyakuz and Tatelkuz lakes. Downstream of Tatelkuz Lake, Lower Chedakuz Creek flows northwest to the Nechako Reservoir for approximately 53 km. Chedakuz Creek is classified as a Class II waterbody for the purposes of the YDWL.

Baseline surface water quality sampling has been conducted at five locations within Lower Chedakuz upstream of the Nechako Reservoir (and downstream of Tatelkuz Lake; WQ8, WQ9, WQ-13, WQ29, and WQ 30; Table 2.1-1).

Water quality results indicated Chedakuz Creek is near-neutral to slightly alkaline with year-round low sensitivity to acid inputs. Alkalinity was seasonally variable and was generally inversely related to streamflows; the lowest mean alkalinity values were measured during freshet in May and June. Monthly mean stream hardness was soft (< 60 mg/L as CaCO3) and moderately hard (61 to 120 mg/L as $CaCO_3$). Total dissolved solids (TDS) followed a similar monthly variability as hardness and alkalinity with a reduction in TDS values during freshet (snowmelt) and other high flow periods (rainfall) as a result of dilution of surface waters. Total suspended solids and turbidity were generally low with peaks in suspended material observed in October and November 2017 likely related to fall rainfall events. Elevated mean monthly total suspended solids (TSS) concentrations and turbidity values during other months were typically the result of one sample weighting the average value and likely the result of sample contamination by sediment.

Total nitrogen was predominantly in its organic form as represented by Total Kjeldahl Nitrogen, although in some samples nitrate was the dominant species. All nitrogen species were below water quality guideline for the protection of aquatic life (WQG-AL). Phosphorus concentrations were generally in the oligotrophic to mesotrophic range of values. Phosphorus concentrations varied intra-annually, and were typically highest in April and May. Organic carbon concentrations were high and was predominantly observed as dissolved organic carbon (DOC). The highest concentrations of total organic carbon (TOC) and DOC were typically observed during freshet months (May and June). Higher concentrations of organic carbon were also observed during late summer/early fall (September and October). Total cyanide, thiocyanate, and Weak Acid Dissociable (WAD) cyanide concentrations at Chedakuz Creek stations tended to be below their detection limits. Chloride, fluoride, and sulphate concentrations tended to be low and less than federal and BC WQG-AL.

Guideline exceedances were observed in Chedakuz Creek for 11 total and dissolved metals: total and dissolved aluminum, total and dissolved cadmium, total and dissolved copper, dissolved iron, total mercury, total silver, and total and dissolved zinc (see Appendix 2-K, 2011 to 2020 Baseline Water Quality Report). Total and dissolved cadmium and total mercury exceedances were observed once each at WQ13; the instance of elevated total mercury in late May 2013 was consistent with observations in other Project streams.

The most frequently observed guideline exceedance in Chedakuz Creek was for total aluminum. Infrequent guideline exceedances for total zinc were also observed, and can be attributed to elevated zinc concentrations in lower Davidson and Turtle creeks.

Table 2.1-1: Baseline and Proposed Tatelkuz Lake and Chedakuz Creek Surface Water Quality Sampling Sites

Watershed	Site ID		GPS Coordinates		Rationale	Sampling History
	Baseline	Monitoring	Easting	Northing		
Tatelkuz Lake	WQ21	TL-01	387247	5905786	Deepest location at center of Tatlekuz Lake. Source of make-up water for Davidson Creek. Receive seepage from TSF spillway.	2012 to 2014
	-	TL-02	389674	5902558	Littoral zone sampling location. Potential TSF groundwater flow path to Tatelkuz Lake	New in 2022*
	-	TL-03	387455	5905132	Littoral zone sampling location. Potential TSF groundwater flow path to Tatelkuz Lake.	New in 2022*
	-	TL-04	385297	5906826	Littoral zone sampling location. Potential TSF groundwater flow path to Tatelkuz Lake.	New in 2022*
Chedakuz Creek	-	CC-05	390399	5901047	Mid-field impact site in lower Chedakuz Creek, near the inlet to Tatelkuz Lake. Potential receiving environment for seepage for pit lake and TSF.	New in 2021
	WQ8	CC-10	385401	5907627	Tatelkuz Lake outlet, inlet to Chedakuz Creek, potential receiving environment for seepage from pit lake and TSF. Upstream of confluence with Davidson Creek.	2011 - 2014, 2017 - 2020
	WQ9	CC-15	383937	5909423	Mid-field monitoring site on Chedakuz Creek, downstream of Davidson Creek confluence. This site would be expected to be affected by mine effluent discharge into Davidson Creek and seepage from pit lake and TSF.	2011 - 2014, 2016 - 2020
	WQ13	CC-20	383097	5910077	Far-field monitoring site on Chedakuz Creek, downstream of Turtle Creek confluence. This site would be expected to be affected by mine effluent discharge into Davidson Creek and seepage from pit lake and TSF.	2011 - 2013, 2017 - 2020
	WQ29	CC-30	375187	5916462	Far-field monitoring site on Chedakuz Creek, downstream of private properties. Established in 2019 in consultation with CSFNs as a potential site to meet EAC Condition 27 where no further effects on water quality from the project are predicted.	2019 - 2020
	WQ30	CC-40	368695	5918685	Far-field monitoring site on Chedakuz Creek, upstream of confluence with Nechako Reservoir. Established in 2019 in consultation with CSFNs as a potential site to meet EAC Condition 27 where no further effects on water quality from the project are predicted.	2019 - 2020

** Baseline water quality sampling will be collected in 2022, 2023, and 2024.*

2.2 Tatelkuz Lake Existing Conditions

Tatelkuz Lake is the second largest lake near the headwaters of Chedakuz Creek. It has a surface area of 927 hectares, a volume of 188 million cubic metres, and a mean depth of 20 metres (m). Tatelkuz Lake has six inlets and one outlet. The lake is categorized by exposed cobble and sandy beaches, and by a forested shoreline and supports a several species of fish (10 species of fish were observed or captured during 2013 baseline studies). Tatelkuz Lake has been classified as a Class I waterbody for the purposes of the YDWL.

Baseline sampling of Tatelkuz Lake was completed in 2012 (June and September), 2013 (January and April), and 2014 (April, July, September) at one site (WQ21; Table 2.1-1). Sampling was completed at the surface, middle, and bottom of the water column (with the exception of July and September 2014 whereby samples were collected at the middle depth only). Lake depth profiles (temperature, pH, conductivity, specific conductivity, and dissolved oxygen) were collected at 1 m intervals during each sampling event.

Results of the Tatelkuz Lake baseline sampling indicated that the lake is near-neutral to slightly alkaline in pH and classified as a moderately hard lake. Total dissolved solids were typically higher during winter months (representing under-ice measurements) than when measured in summer and early fall. Total suspended solids and turbidity were typically low exhibited minor seasonal variability. Concentrations of nutrients were generally low, except for occasional nitrate and phosphorus concentrations in samples from the lower layer of lakes, which may have been influenced by capture of lake bottom sediments. Nutrient concentrations did not exceed federal or BC WQG-AL. Phosphorus concentrations indicated conditions ranging from mesotrophic (0.01 to 0.02 mg/L) to meso eutrophic (0.02 to 0.035 mg/L), and exhibited minimal variability with depth. The majority of total organic carbon was in the dissolved phase as dissolved organic carbon. Total and WAD cyanide concentrations in Tatelkuz Lake were below the analytical detection limit (0.005 mg/L) in all samples collected. Chloride, fluoride, and sulphate concentrations tended to be low and less than federal and BC WQG-AL.

Overall, metal concentrations were low in Tatelkuz Lake with exceedance of the federal or BC WQG-AL in January 2013 samples only:

- Cadmium exceeded the CCME long-term WQG-AL by a factor of 1.01 in the bottom lake sample;
- Lead exceeded the CCME long-term WQG-AL by a factor of 1.49 in the bottom lake sample; and
- Zinc exceeded the BC WQG-AL by a factor of 2.71 in the bottom lake sample and by a factor of 1.59 in the middle lake sample.

2.3 Water Quality Predictions

Water quality predictions were not completed for Tatelkuz Lake however the node WQ8 at the outlet Tatelkuz Lake in Chedakuz Creek can be considered to be representative of Tatelkuz Lake water quality (Appendix 5-D, Surface Water Quality Model Technical Report). Assessment nodes were also at Chedakuz Creek baseline surface water quality monitoring stations WQ9 and WQ13.

Model predictions were screened against BC or federal WQG-AL to identify parameters of potential concern (POPCs) for aquatic life: nitrite; fluoride; total and dissolved aluminum; total and dissolved cadmium; total chromium; total iron; and total zinc. A parameter of concern (POC) was then identified from the POPC list as a parameter that had, as a result of the Project, a predicted concentration higher than an applicable water quality guideline for a receptor of concern and higher than the range of existing concentrations. Dissolved aluminum was identified as a POC because predicted concentrations were higher than the WQG-AL and were higher than the range of existing concentrations at one modelling node (WQ9 in Chedakuz Creek) during one month of Construction phase. High concentrations of aluminum can cause osmoregulatory stress and result in mortality and changes in growth or reproduction of aquatic biota. However, given that the predicted concentrations of dissolved aluminum are within the range of background concentrations to which resident aquatic biota have adapted, Project-related effects to aquatic biota were not predicted to occur.

Nitrogen forms (nitrate, nitrite, and ammonia) and total phosphorus were identified as “special case” POCs to be assessed in Chapter 6 (Effects Assessment Predictions) for aquatic resources, because changes in concentrations of these parameters, even at levels lower than the WQG-AL, can cause nutrient enrichment or eutrophication; this, in turn, can cause changes in primary producer abundance or community structure.

Although there is no WQG-AL, total dissolved solids (TDS) was also carried forward as a special case POC, based on interest expressed by ENV and best professional judgement. High TDS concentrations can cause osmoregulatory stress in aquatic biota which can affect biota abundance or community structure through impacts on growth, reproduction or survival.

3. DESIGN OF SURFACE WATER QUALITY MONITORING

3.1 Monitoring Locations

3.1.1 Chedakuz Creek

The Creek 661, Davidson Creek, and Turtle Creek watersheds, with associated mining infrastructure, are all contained within the Chedakuz Creek watershed.

Surface water quality monitoring of Lower Chedakuz Creek (downstream of Davidson Creek) and Middle Chedakuz Creek will utilize the AEMP sampling sites and will be completed at six locations: CC-05, CC-10, CC-15, CC-20, CC-30, and CC-40 (Table 2.1-1 and Figure 3.1-1).

3.1.2 Tatelkuz Lake

Tatelkuz Lake is located downstream of Creek 661 which will receive discharge from a SCP during Construction phase and seepage from the TSF in Operations (and Closure and Post-closure). During operations, Tatelkuz Lake will be the source of make-up water for Davidson Creek instream flow needs via discharge from the FWR. In accordance with EAC Condition 31, a Tatelkuz Lake Protection Plan will be developed to address effects to Chedakuz Creek and Tatelkuz Lake fish habitat and lake ice conditions associated with drawdown of Tatelkuz Lake. Therefore, this Plan will focus on changes in water quality as a result of the Project discharges and seepage.

Surface water quality monitoring of Tatelkuz Lake for the purpose of this Plan will utilize the AEMP sampling site and will be conducted at TL-01 (Table 2.1-1 and Figure 3.1-1).

Groundwater flow from Davidson Creek and Creek 661 watersheds flows towards Tatelkuz Lake. A groundwater water quality monitoring program is planned to assess the effect of mine activities on groundwater quality during construction and operations (see Appendix 9-E, Mine Site Water and Discharge Monitoring and Management Plan). Monitoring wells will be used to assess the potential effects of seepage from the TSF that may bypass seepage collection measures and evaluate seepage flow paths and depths downgradient of the TSF and the Closure Spillway in the Creek 661 catchment. Thus, if groundwater quality is found to be influenced by mine activities, littoral zones in Tatelkuz Lake will be sampled the following year to assess potential effects specific to minewater seepage in Tatelkuz Lake (e.g., if the 2025 Groundwater Monitoring Program report determines a mine related effect at groundwater monitoring wells downstream of the TSF, littoral zones will be sampled beginning in the open water season of 2026). Three littoral sites have been selected for sampling where potential groundwater flow paths may occur (see Figure 3-8, Appendix 5-F, Numerical Groundwater Modelling Report) along the western perimeter of Tatelkuz Lake where seepage flow paths may exist (TL-02, TL-03, and TL-04; Table 2.1-1 and Figure 3.1-1). Seepage travel times are anticipated to be 5 to 6 years after construction thus baseline information at the littoral sites can be collected in years 2022, 2023, and 2024.

3.2 Sample Timing, Frequency, and Replication

Monthly, quarterly, or weekly sampling of Chedakuz Creek sites will be conducted as per the AEMP sampling program (see Table 4.2-2 of the AEMP Plan).

Quarterly sampling of Tatelkuz Lake (TL-01) water quality will be completed to capture variability during both the ice-covered season (November and February) and open-water season (May and August). Lake sampling will be conducted at three depths within water column (surface, middle, and bottom) with 10% duplication at each sampling event (coinciding with the AEMP sampling program and the Tatelkuz Lake Protection Plan; see Table 4.2-2 of the AEMP Plan). Monthly sampling of Tatelkuz Lake littoral zone sites (TL-02, TL-03, and TL-04) will be completed when/if initiated. Under-ice sampling at littoral zone sites may be limited to months where access is safe for sample collection. Baseline water quality samples will be collected for the first time at the littoral sites in 2022, therefore timing of sampling may be adjusted as well as adjustments to location to avoid sampling water influenced by sediment in shallow areas.

3.3 Measurement and Assessment Endpoints

Surface water chemistry will be evaluated with one or more assessment endpoints including comparison to water quality guidelines for the protection of freshwater aquatic life (WQG-AL; BC ENV 2019a, 2021, CCME 2021a), the YDWL water quality standards, background (baseline) or reference ranges, and/or before-after-control-impact (BACI) analysis (Table 3.3-1).

Table 3.3-1: Measurement and Assessment Endpoints for Surface Water Quality

Measurement Endpoint	Assessment Endpoint
Surface water chemistry	Comparison to BC or CCME WQG (BC 2019a, 2021; CCME 2021a) or Yinka Dene Water Law water quality standards Comparison to background or reference ranges[1] Before-after-control-impact (BACI) analysis[2]

Notes:

[1] For in situ water quality parameters: temperature, pH, conductivity, turbidity, and dissolved oxygen.

[2] For water quality parameters analyzed at the laboratory: total suspended solids, pH, alkalinity, radium-226, total phosphorus, ammonia-N, nitrate-N, nitrite-N, chloride, fluoride, sulphate, cyanide (total and WAD), total metals including aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, and zinc; dissolved metals including aluminum, cadmium, calcium, copper iron, manganese, and zinc.

3.4 Sampling Methods

3.4.1 Field Methods

In situ profiles of dissolved oxygen, pH, conductivity, specific conductivity, and temperature at approximately 1 m intervals will be completed at each lake sampling event and at each stream site. When the lake is thermally stratified (indicated by the water column profile) sampling depths will include above and below the thermocline. In situ measurements will be taken using a calibrated multi-parameter meter (e.g., YSI Professional Plus).

For lake chemistry samples, discrete samples will be collected at three depths (shallow, middle, and bottom) in the water column during the open-water season using an acid washed Van Dorn water sampler or similar (e.g., Kemmerer).

All samples will be collected for the parameters outlined in Table 4.4-3 of the AEMP Plan (Appendix 7-A) and field filtered and/or preserved in the field according to the analytical laboratories protocols. Samples will be stored in coolers on ice and/or refrigerated until shipped to an accredited analytical laboratory for sample analysis.

3.4.2 Laboratory Methods

Water quality samples will be collected for analysis of general physical/ion parameters, nutrients and organics, cyanide, and total and dissolved metals at a Canadian Association for Laboratory Accreditation (CALA) laboratory. The water quality parameters to be analysed (see Table 4.4-3 of the AEMP Plan) will be completed using standard practices. Targeted detection limits for parameters will be at least 10 times lower than water quality guidelines or standards, where available, consistent with recommendations for other environmental media in BC ENV (2016).

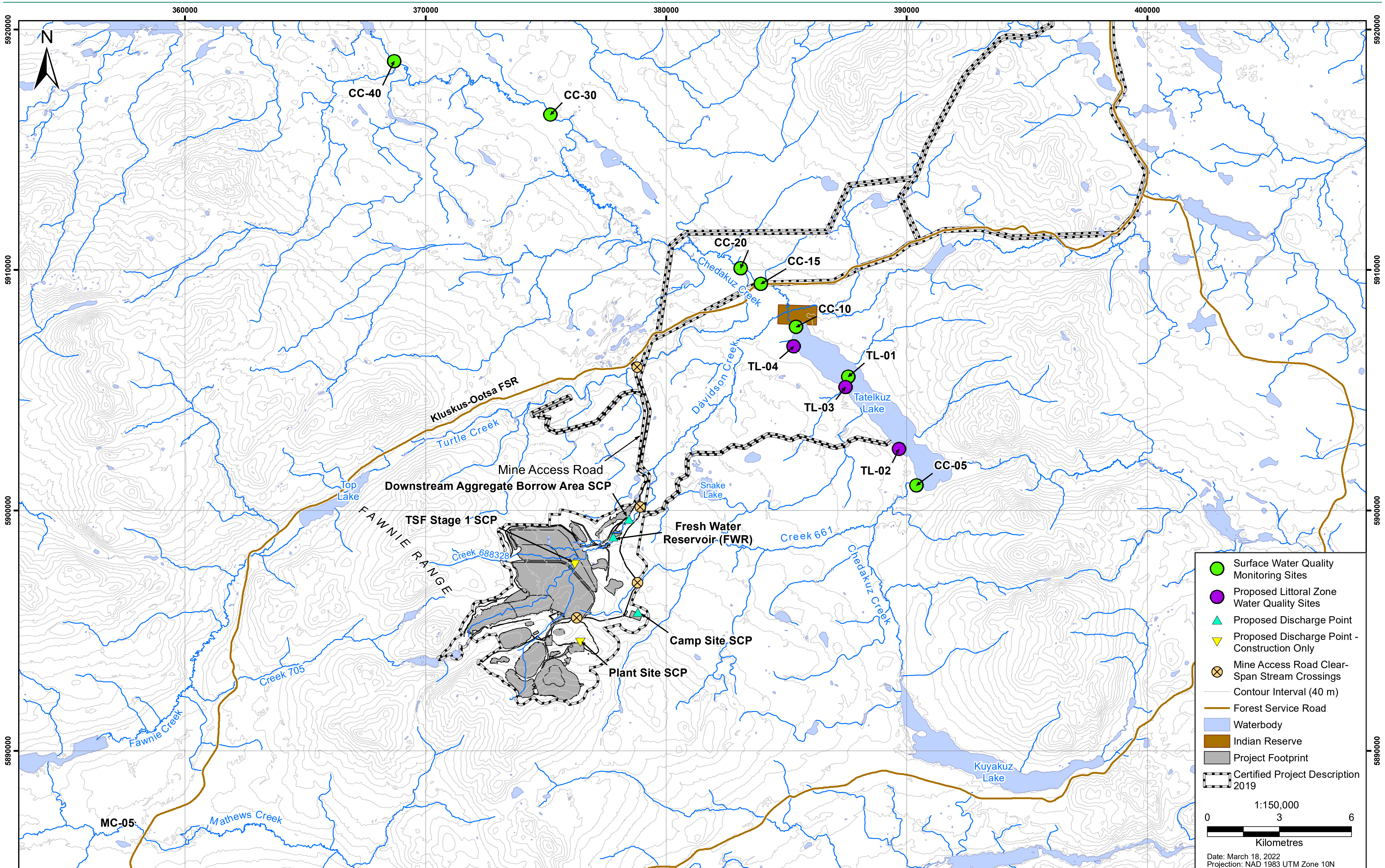

Figure 3.1-1: Chedakuz Creek and Tatelkuz Lake Surface Water Quality Sampling Locations

3.4.3 Quality Assurance and Quality Control

Quality assurance and quality control principles and procedures will follow those detailed in Section 4.4.2.2 of the AEMP Plan.

3.5 Data Analysis

For analysis and graphing purposes, parameter concentrations below the MDL will be assigned a concentration of half the reported MDL. Field duplicates will be treated as one sample represented by the average concentration of the replicate samples. Weekly samples collected in one month (from 5-in-30 sampling) will be treated as one sample as a monthly mean concentration.

Potential effects of temperature, field pH, conductivity, turbidity, and dissolved oxygen will be assessed by graphical analysis for comparison to baseline and/or reference ranges (Table 3.3-1). Reference ranges will be defined as the 5th to 95th percentile concentrations from the baseline (background) or reference dataset. Since baseline data collection is ongoing for surface water quality, background and/or reference ranges will be based on data collected prior to Project construction and data collected at reference sites. Data collected at AEMP reference sites will be made available for comparison and analysis of surface water quality changes in Tatelkuz Lake and Chedakuz Creek.

Data analysis and reporting will focus on the POPCs and POCs for the Project. Nitrite, fluoride, sulfate, total and dissolved aluminum, total cadmium, total chromium, total iron, and total zinc were identified as the POPCs in the CSM because their baseline or predicted concentrations were higher than 80% of the WQG-AL (Appendix 7-B). Nitrogen forms (nitrate, nitrite, ammonia), total phosphorus, and TDS were the water quality parameters identified as the Project-related special-case POCs for aquatic life in the CSM and dissolved aluminum was identified as a POC (Appendix 7-B). The CSM also recommended the inclusion of total mercury in monitoring due to uncertainties in the geochemical source terms used in water quality predictions (Appendix 7-B). The list of evaluated parameters may be modified as part of the AEMP reporting to include other parameters if concentrations increase or are predicted to increase.

In addition to the POPCs and POCs, analysis of water chemistry will include constituents with available BC WQG-AL (ENV 2019a, 2021), federal WQG-AL (CCME 2021a), approved SBEBs, or YDWL water quality standards (Table 3.3-1). A dissolved aluminum SBEB has been proposed for Davidson Creek and Creek 661 that is based on the background method (i.e., the SBEB is based on the seasonal 95th percentile + 20% of concentrations measured in Davidson Creek and Creek 661 prior to development of the Project; Lorax 2022). No Project-related effects to aquatic biota would be expected if the future concentrations of dissolved aluminum remain below the SBEB. Once approved, the dissolved aluminum SBEB would be used as the applicable benchmark in place of the BC WQG-AL.

To assess Project-related effects on surface water quality in Tatelkuz Lake and Chedakuz Creek a BACI analysis will be completed as defined in Section 4.4.2.3 of the AEMP Plan. The list of evaluated parameters may be modified as part of the Plan reporting to include other parameters if concentrations increase or are predicted to increase. To assess Project-related effects on surface water quality at the Tatelkuz Lake littoral zones, a before-after analysis will be completed similar to the BACI, with classification of the sites as either ‘before’ or ‘after’ exposure.

Observations of groundwater quality at monitoring wells that assess the groundwater flow paths that potentially enter Tatelkuz Lake will be used to aid in the interpretation of water quality observations in Tatelkuz Lake including littoral zone sites if sampled.

4. IMPLEMENTATION AND REPORTING

Sampling conducted in accordance with this Plan will be initiated beginning in Construction and continue while point source discharge to the receiving environment occurs. A qualified professional may determine that sufficient sampling has been completed under the Plan and recommend the termination of selected or all long-term monitoring through the Closure and Post-closure phases. The recommendation to terminate water quality monitoring under this Plan must be supported by rationale either in a stand-alone report or in the annual reporting required by this Plan. Rationale provided could include some or all of the following:

- The Project has been successfully decommissioned and monitoring under the Closure and Reclamation Plan confirms that reclamation has been successful and continued monitoring of the aquatic receiving environment is not warranted.
- Statistically significant changes in water quality have not occurred in preceding Project phases and after a predetermined number of years once the Project is in Post-closure phase. The number of Post-closure monitoring years will be determined by a qualified professional once water quality models have been updated with operational data.
- Data (e.g., monitoring or predictive modelling) suggests that sources including groundwater and/or transport pathways of POCs from the Project are either decreasing or have stabilized and are unlikely to change significantly in the future.
- Monitoring for predetermined number of years once the Project is in Post-closure phase shows that measured concentrations are below applicable guidelines, standards or benchmarks. The number of Post-closure monitoring years will be determined by a qualified professional once water quality models have been updated with operational data.
- Any other rationale that the qualified professional identifies to warrant a recommendation to significantly decrease the frequency or terminate the Plan monitoring.

Condition 5 of the EAC sets out timelines for reporting requirements. BW Gold must submit a report to the attention of the EAO and Aboriginal Groups on the status of compliance with EAC #M19-01 at the following times:

1. *at least 30 days prior to the start of Construction;*
2. *on or before March 31 in each year after the start of Construction;*
3. *at least 30 days prior to the start of Operations;*
4. *on or before March 31 in each year after the start of Operations;*
5. *at least 30 days prior to the start of Closure;*
6. *on or before March 31 in each year after the start of Closure until the end of Closure;*
7. *at least 30 days prior to the start of Post-Closure; and*
8. *on or before March 31 in each year after the start of Post-Closure until the end of Post-Closure.*

BW Gold will submit reports to the EAO and Aboriginal Groups within the timelines specified in Condition 5.

A Chedakuz Creek and Tatelkuz Lake Surface Water Quality Monitoring report will be generated for each year in which data are collected under the Plan and will be incorporated into the annual AEMP report and include:

- A summary written for a lay audience;

- A statistical summary (i.e., mean, and standard error) of surface water data collected at Chedakuz Creek and Tatelkuz Lake within a given calendar year (analytical results will be referenced and provided in the AEMP report);
- An analysis of Project related effects on Chedakuz Creek and Tatelkuz Lake;
- A discussion of implications of water quality observed at Chedakuz Creek for Nechako Reservoir if Project related effects are observed; and
- Evaluate the effectiveness of the Plan and ensure that the objectives defined in Section 1.1 are being met.

The report will be completed for submission to Indigenous nations, the Environmental Monitoring Committee (EMC), regulators including ENV, EAO, BC Ministry of Energy, Mines, and Low-carbon Initiatives, and BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development by March 31 of the following year.

Changes or improvements to the sampling can be implemented between annual review cycles, with agreement of Indigenous nations. This may include updates to the sampling plan to address potential effects related to emergencies and/or temporary shutdowns. The annual AEMP report will include any recommendations for changes to the scope or timing of the AEMP sampling, including rationale for any recommended changes.

5. REFERENCES

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