ERM

Blackwater Mine

Aquatic Effects Monitoring Program Plan, Version 4.0

PREPARED FOR

ARTEMIS GOLD INC | Blackwater Mine

BW Gold LTD.

DATE

April 2025

REFERENCE

0761009

SIGNATURE PAGE

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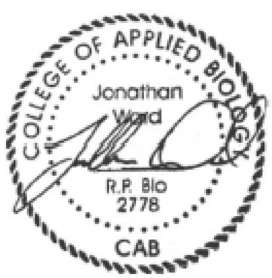
Aquatic Effects Monitoring Program Plan, Version 4.0

April 2025

As required by Condition 4.6.6 of *Environmental Management Act* Permit 110652, a permittee (Blackwater Gold LTD.) must cause a Qualified Professional (QP) to review and update the Aquatic Effects Monitoring Program (AEMP) Plan based on the recommendations included in the AEMP interpretive report. The director may require modifications to the approved AEMP Plan based on the monitoring results and any other information received by the director in connection with effluent discharges. The permittee must cause a QP to modify or amend the AEMP Plan as required by the director and the permittee must, within the timeframe specified by the director, resubmit to the director for approval of the AEMP Plan with required modifications or amendments. The AEMP Plan, Version 3.1 was prepared by QPs, as shown below. A QP is a person who has training, experience, and expertise in a discipline relevant to the field of practice set out in the condition, is registered with a professional organization enabled under an Act who must follow a code of ethics issued by the professional organization, perform her or his duties in the public interest, and can be subject to disciplinary action by the organization.



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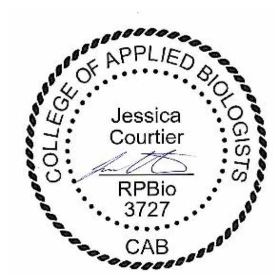

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
°C	degrees Celsius
ADCP	Acoustic Doppler Current Profiler
AEMP	Aquatic Effects Monitoring Program
ANOVA	analysis of variance
Artemis	Artemis Gold Inc.
ATU	Accumulated Thermal Units
AUC	area-under-the-curve
BACI	before-after-control-impact
BC	British Columbia
BC ENV	BC Ministry of Environment and Climate Change Strategy (2017–2024) BC Ministry of Environment and Parks (2024–present)
BEAST	Benthic Assessment of Sediment
BC MOE	BC Ministry of Environment
BW Gold	BW Gold LTD.
CABIN	Canadian Aquatic Biomonitoring Network
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
CEO	Chief Executive Officer
CFMP	Country Foods Monitoring Plan
CM	Construction Manager
COC	Chain-of-Custody
COO	Chief Operating Officer
CPUE	catch-per-unit-effort
CSFN	Carrier Sekani First Nations
CSM	Conceptual Site Model
DFO	Fisheries and Oceans Canada
DL	detection limit
DOC	dissolved organic carbon
DS	Decision Statement
EA	Environmental Assessment
EAC	Environmental Assessment Certificate

EAO	Environmental Assessment Office
ECCC	Environment and Climate Change Canada
ECD	Environmental Control Dam
ELoMC	Environmental Life of Mine Committee
EM	Environmental Manager
EMA	*Environmental Management Act*
EMB	Environmental Monitoring Board
EMC	Environmental Monitoring Committee
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EMS	Environmental Management System
EPCM	Engineering, Procurement and Construction Management
EPT	Ephemeroptera, Plecoptera, and Trichoptera
ERM	ERM Consultants Canada Ltd.
BC FOR	BC Ministry of Forests
FAA	*Fisheries Act* Authorization
FSR	Forest Service Road
FWR	Freshwater Reservoir
GAUC	Gaussian area-under-the-curve
GM	General Manager
ha	Hectares
IECD	Interim Environmental Control Dam
IEM	Independent Environmental Monitor
IFN	instream flow needs
Indigenous nations	Indigenous nations 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).
ISQG	Interim Sediment Quality Guidelines
Joint MA/EMA Application	Joint Application for *Mines Act* and *Environmental Management Act* Permits Application
km	Kilometre
KP	Knight Piésold
LDN	Lhoosk'uz Dené Nation
LGO	Low Grade Ore
LoM	Life of Mine
Lorax	Lorax Environmental Services Ltd.
m	Metre

MA	*Mines Act*
MDL	method detection limit
MDMER	Metal and Diamond Mining Effluent Regulation
mg/L	milligrams per litre
Mine, the	Blackwater Mine
CFMP	Mine Site Water, and Discharge Monitoring and Management Plan
Mt	million tonnes
Mtpa	million tonnes per annum
BC MWLAP	Ministry of Water, Land and Air Protection
New Gold	New Gold Inc.
NFNs	Nechako First Nations
NPM	numeric performance metric
NTU	nephelometric turbidity unit
O:E	observed against expected taxa
PEL	Probable Effect Levels
POC	parameter of concern
POPC	parameter of potential concern
QA/QC	Quality Assurance/Quality Control
QRP	Qualified Registered Professional
RCA	Reference Condition Approach
RIB	rapid infiltration basins
RIC	Resource Inventory Committee
RISC	Resources Information Standards Committee
RIVPACS	River Invertebrate Prediction and Classification System
ROC	receptor of concern
RPD	relative percent difference
SBEB	Science-Based Environmental Benchmark
SCP	Sediment Control Pond
SNF	Saik'uz First Nation
SOP	Standard Operating Procedure
SQG-ALs	Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life
t	Tonnes
TAUC	trapezoidal area-under-the-curve
TDS	total dissolved solids
TOC	total organic carbon

tpd	tonnes per day
TRP	Trigger Response Plan
TSF	Tailings Storage Facility
TSS	total suspended solids
UFN	Ulkatcho First Nation
VP	Vice President
WAD	weak acid dissociable
WBM	Water Balance Model
BC WLRS	BC Ministry of Water, Land and Resource Stewardship
WMMP	Wildlife Mitigation and Monitoring Plan
WMOP	Wetlands Management and Offsetting Plan
WMP	Water Management Pond
WQG	Water Quality Guideline
WQG-AL	Water Quality Guideline for the Protection of Aquatic Life
WQG-WL	Water Quality Guidelines or Standards for the Protection of Wildlife and Livestock
WTP	Water Treatment Plant
YDWL	Yinka Dene Water Law
YoY	young-of-year

REVISION HISTORY

The Aquatic Effects Monitoring Program (AEMP) Plan, Version 1.0 was submitted on July 3, 2023, to meet Condition 4.6.1 of the *Environmental Management Act* Permit 110652. A revision history table (Table 1) has been provided to summarize major revisions made to the document since the submission of Version 1.0 and identify the particular section(s) where the revision(s) took place. The source of the revision has been included in Table 1 (i.e., recommendations made in the 2023 AEMP Interpretive Report, received from the Ministry of Environment and Climate Change Strategy, or received from Indigenous groups). Notable revisions have been summarized by section; administrative updates and typographic corrections not listed.

TABLE 1 AQUATIC EFFECTS MONITORING PROGRAM PLAN REVISION HISTORY

Section	Description	Source
Version 1.0, July 2023		
Various	• See Appendix A-1 for a complete list of revisions	BC ENV and Indigenous group comments; Conditions in PE-110652.
Version 2.0, April 2024		
Various	• See Appendix A-2 for a complete list of revisions	BC ENV and Indigenous group comments; Conditions in PE-110652.
Version 3.0, December 2024		
Various	• See Appendix A-3 for a complete list of revisions	BC ENV and Indigenous group comments
Version 3.1, March 2025		
Various	• See Appendix A-4 for a complete list of revisions	BC ENV, BC WLRS, EAO, 2024 AEMP Interpretive Report, and Indigenous group comments
Version 4.0, April 2025		
Section 4.8.1.2	• Addition of footnote regarding potential re-location of fish sampling site at TC-05 to facilitate triple-pass electrofishing	2024 Interpretive Report
Section 4.8.3.2	• Revised sampling frequency of kokanee fry outmigration to every second night.	BC ENV, BC WLRS

Notes:
AEMP = Aquatic Effects Monitoring Program; BC ENV = BC Ministry of Environment and Climate Change Strategy;
NFNs = Nechako First Nations; BC WLRS = BC Ministry of Water, Land and Resource Stewardship;
EAO = Environmental Assessment Office.

1. INTRODUCTION

The Blackwater Mine (the Mine) is located approximately 112 kilometers (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver (Figure 1-1), 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 Mine is a greenfield gold and silver open pit mine with associated ore processing facilities and following completion of Construction, the Mine has begun Operations in 2025. The 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 Year +24 to approximately Year +36 and is defined by the duration required to fill the Open Pit to the target closure level, and the tailings storage facility (TSF) is allowed to passively discharge to Davidson Creek via a closure spillway. The Closure phase is shorter than that what was presented in the *Joint Mines Act*/*Environmental Management Act* Permits Application (March 2022) as a result of optimizations to the Mine. The Post-closure is now estimated to begin in Year +37. Ore will be processed in a mill 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.

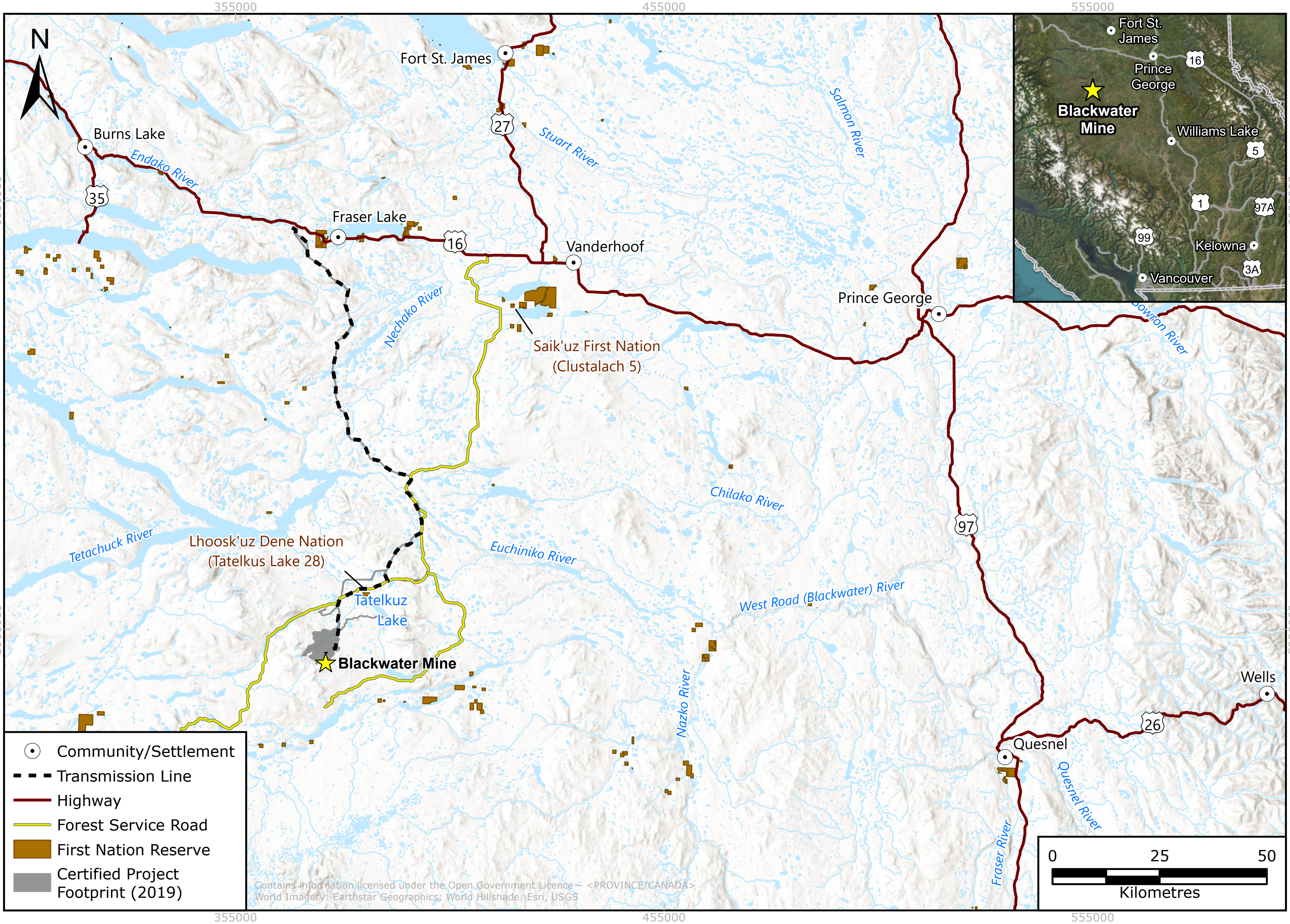
The mine site will cover an area of approximately 4,400 hectares to accommodate ore processing, the mine, mine waste, and on-site infrastructure (Figure 1-2). A TSF has been designed to store tailings, and potentially acid generating waste rock from the development of the open pit and ore processing (Figure 1-2). The TSF also includes a storage allowance for two supernatant ponds within each of the adjacent sites (TSF C and TSF D).

Recoverable seepage from TSF C and TSF D (when constructed), and runoff from the Main Dam D will be collected into the Interim Environmental Control Dam (IECD) or ECD and recycled back to the TSF (Figure 1-2). Surplus water from TSF C will be treated at a membrane water treatment plant (WTP) for nitrogen, sulphate, and metals prior to pumping to the water management pond (WMP). Seepage from TSF C not collected into the ECD contributes to groundwater that enters Davidson Creek and Creek 661 (Figure 1-2). Davidson Creek will also receive TSF D seepage to groundwater (Figure 1-2).

Surplus non-acid generating waste rock and overburden from the Open Pit, and not used in construction, will be placed in the Lower and Upper waste stockpiles. Runoff and seepage from the waste stockpiles will be collected at the base of the stockpiles and directed to a collection pond and treated prior to pumping to the WMP (Figure 1-2).

Runoff and infiltration from the low-grade ore (LGO) stockpile will be collected and neutralized with lime (in the processing plant) to increase the pH, and precipitate metals before gravity conveyance to the TSF (Figure 1-2). The Open Pit sump water (surface water that collects in the pit sump, and groundwater from dewatering and depressurization wells) will be treated for metals, and the treated water will be pumped for use in the mill or sent to the WMP (Figure 1-2).

FIGURE 1.1 BLACKWATER MINE LOCATION



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CLIENT: BW Gold LTD.
GIS NUMBER: BLW-14-293-04

DATE: 04/24/2025

PROJECTION: NAD 1983 UTM Zone 10N
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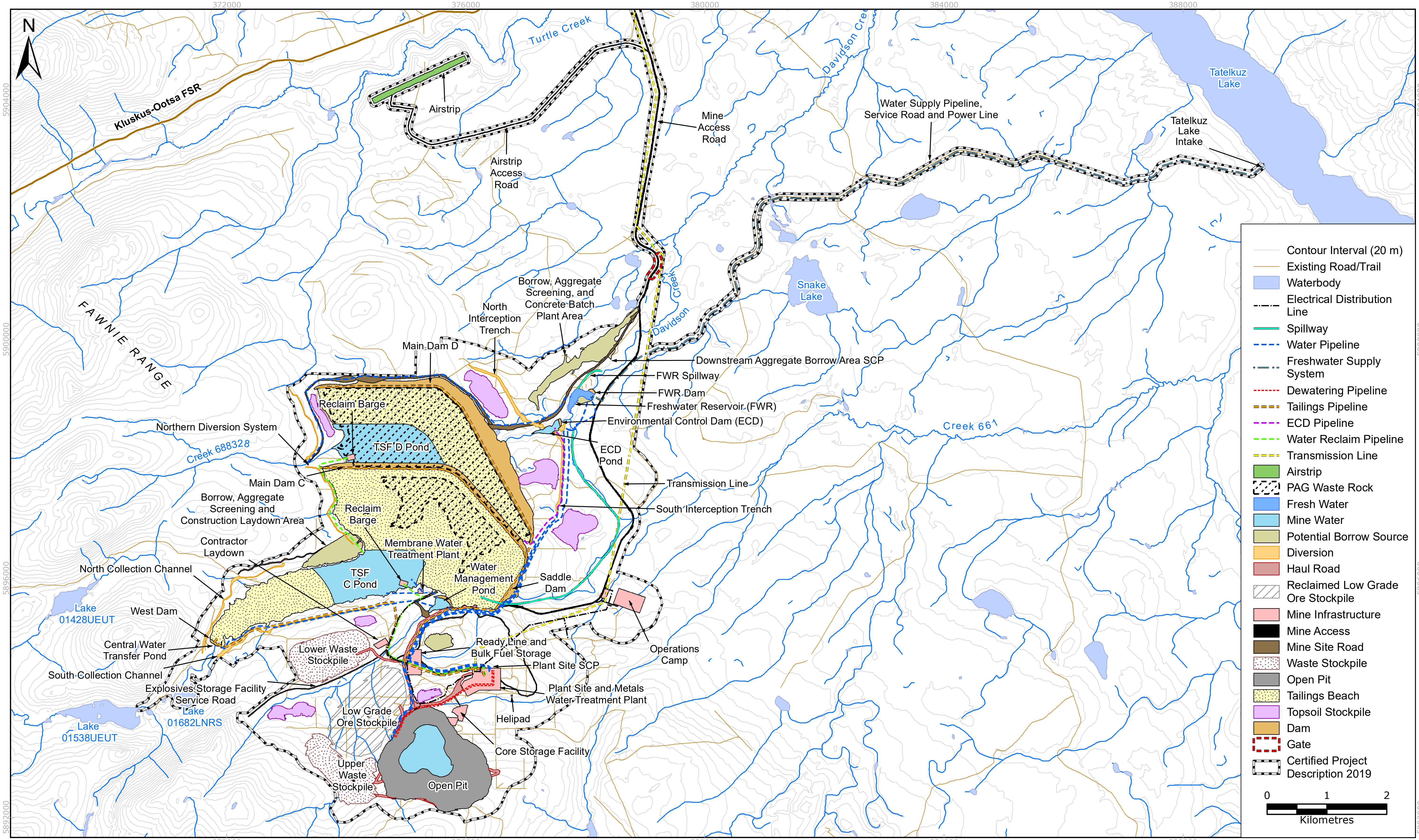
FIGURE 1-2 THE BLACKWATER MINE PLAN



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CLIENT: BW Gold LTD.
GIS NUMBER: BLW-14-290

DATE: 12/02/2024

PROJECTION: NAD 1983 UTM Zone 10N
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The WMP is used to manage water released from the WTPs as well as non-contact surface runoff diverted from catchment area upslope of TSF C (Figure 1-2). The WMP provides make-up water to support ore processing at the mill, and water not required for mill operations will be pumped to the freshwater reservoir (FWR), when constructed.

The primary purpose of the FWR (located immediately downstream of the ECD) will be to maintain environmental flows in Davidson Creek through a controlled release of water in Operation through to Closure. The FWR, when constructed, will receive: 1) water pumped from the WMP, which consists of both treated contact water and diverted non-contact water; 2) diverted non-contact water via the Central and Northern Diversion channels; and 3) water from Tatelkuz Lake via the freshwater supply pipeline later in Operations (Figure 1-2). Thus, the FWR pond outlet is considered a final discharge location (point of compliance) for the Mine at which permit limits, and Metal and Diamond Mining Effluent Regulation (MDMER) will apply.

There are three sediment control ponds (SCPs) permitted for discharge: the TSF Stage 1 SCP (Construction phase only), the Plant Site SCP (Construction and Operations), and the Downstream Aggregate Borrow Area SCP (to be constructed in Operations). The TSF Stage 1 SCP operated through 2024 to capture background surface runoff, background groundwater, and runoff from the Davidson Creek basin and Mine Area Creek basin and discharged to Davidson Creek during construction in 2024. A cessation of TSF Stage 1 SCP discharge notification was submitted on December 10, 2024, and there are no future TSF Stage 1 SCP discharges planned. The Plant Site SCP captures contact water around the Plant Site. Water collected in the Plant Site SCP during the Operations phase will either be used for mining operations or will be transferred to the WMP. Discharge from the Downstream Aggregate Borrow Area SCP (when constructed) will be directed to Davidson Creek.

The permanent operations camp stormwater runoff is authorized under the *Environmental Management Act* (EMA) Permit PE-110652 as a non-point source discharge to ground.

Creek 705 will receive diverted flows from the headwaters of Lake 1682, resulting in a predicted increase in flow of 10 L/s on an average annual basis at all locations on Creek 705 (Chapter 5 of BW Gold 2022). Creek 705 will not receive mine contact water as surface water or as seepage to groundwater, and no changes in water quality were predicted for Creek 705.

1.1 PURPOSE AND OBJECTIVES

This Aquatic Effects Monitoring Program (AEMP) Plan has been developed for aquatic receiving environment monitoring and to address Permit PE-110652 Condition 4.6.3 (Appendix B). The purpose of the AEMP is to provide information on the aquatic receiving environment necessary to achieve the following objectives:

- Detect the Mine-related effects on the aquatic ecosystem components (including water quality).
- Confirm water quality predictions as presented in Lorax (2022a), and effects assessments as presented in the *Joint Application for Mines Act* and *Environmental Management Act* Permits Application (Joint MA/EMA Application; Chapter 6 of BW Gold 2022).
- Meet permit and regulatory requirements for effluent and receiving environment water quality.
- Assess the performance of mitigation and management measures.
- Provide the necessary feedback and information for the adaptive management of potential Mine-related effects.

Monitoring surface water and groundwater flow and quality within the mine site (i.e., WMP or WTP effluent) or effluent at the end of pipe are not included in the AEMP. The Mine Site Water and Discharge Monitoring and Management Plan (MSDP) details the monitoring procedures for each phase of mine life for the effective interception, conveyance, diversion, storage, and discharge of water (contact and non-contact) on the mine site. The MSDP also provides the operational and monitoring plans for all discharges of mine contact water to the receiving environment.

The AEMP Plan addresses the Environmental Assessment Certificate (EAC) #M19-01 (EAC; BC EAO 2019) Conditions 3, 28, and 30. Appendix C provides the concordance tables where the EAC conditions are addressed in the AEMP Plan. The AEMP Plan was formally approved by the Environmental Assessment Office (EAO) on February 18, 2022.

The AEMP also addresses (whole or in part) the following conditions in the federal Decision Statement (DS) (DS; CEA Agency 2019): 3.8, 3.9, 3.15, and 3.16; in addition to consultation conditions 2.3 and 2.4; Follow-Up and adaptive management conditions 2.5, 2.6, 2.7, 2.8, 2.9, and 2.10; and annual reporting conditions 2.11, 2.12, and 2.13. Appendix D provides a table of concordance indicating where the condition is addressed in the AEMP Plan.

The AEMP is linked to EAC #M19-01 Condition 41, Country Foods Monitoring Plan (CFMP), which identifies monitoring of the environment for human health objectives. The AEMP is also linked to the DS Condition 3.14 to develop a Fish and Fish Habitat Follow-Up Program to monitor rainbow trout (*Oncorhynchus mykiss*) and Kokanee (*Oncorhynchus nerka*) populations in Davidson Creek (DS 3.14.2).

1.2 ROLES AND RESPONSIBILITIES

BW Gold has the obligation of ensuring that all commitments are met, and that all relevant obligations are made known to mine personnel and site contractors during all phases of the mine life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working at the mine site is essential to meet Environmental Management System (EMS) objectives.

Table 1.2-1 provides an overview of general environmental management responsibilities during all phases of the mine life for key positions that will be involved in environmental management. Other positions not specifically listed in Table 1.2-1 that will provide supporting roles include independent environmental monitors, an Engineer of Record for each tailings storage facility and dam, an Independent Tailings Review Board, a TSF qualified person, a geochemistry Qualified Registered Professional (QRP), and other qualified persons and QRPs.

BW Gold will employ a qualified person as an Environmental Manager (EM), who will ensure that the EMS requirements are established, implemented, and maintained, and that environmental performance is reported to management for review and action. The EM is responsible for retaining the services of qualified persons or QRPs with specific scientific or engineering expertise to provide direction and management advice in their areas of specialization. The EM will be supported by Environmental Monitors that will include Environmental Specialists and Technicians and a consulting team of subject matter experts in the fields of environmental science and engineering.

TABLE 1.2-1 BLACKWATER ROLES AND RESPONSIBILITIES

Role	Responsibility
Chief Executive Officer (CEO)	The CEO is responsible for overall the Mine governance. Reports to the Board.
Chief Operating Officer (COO)	The COO is responsible for engineering and the Mine development, and coordinates with the Mine Manager to ensure overall Mine objectives are being managed. Reports to the CEO.
Vice President (VP) Environment & Social Responsibility	The VP of Environment & Social Responsibility is responsible for championing the Environmental Policy Statement and Environmental Management System (EMS), establishing environmental performance targets, and overseeing permitting. Reports to the COO.
General Manager (GM) Development	The GM is responsible for managing project permitting, the Blackwater Mine administration services and external entities, and delivering systems and programs that ensure Artemis' values are embraced and supported, Putting People First, Outstanding Corporate Citizenship, High Performance Culture, and Rigorous Project Management and Financial Discipline. Reports to the COO.
Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, EMS implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate some of their responsibilities to other qualified personnel. Reports to the GM.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments and obligations are being met during the construction phase. Reports to the GM.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Blackwater Mine environmental programs and compliance with environmental permits and updating EMS and Management Plans. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) of contractor, other contractors, the Company, and regulatory agencies, where required. The Environmental Manager informs the Environmental Monitors of current site conditions that may influence monitoring programs. Supports the CM and reports to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of the EMS relevant to their areas. Reports to the Mine Manager.
Indigenous Relations Manager	Indigenous Relations Manager is responsible for Indigenous engagement throughout the life of mine. Also responsible for day-to-day management and communications with Indigenous groups. Reports to the VP Environment & Social Responsibility.
Communications Coordinator	The Communications Coordinator is responsible for developing communication processes and procedures during a potential mine emergency situation as well as establishment and testing of communication systems. Reports to the Mine Manager.
Community Relations Advisor	Community Relations Advisor is responsible for managing the Community Liaison Committee and Community Feedback Mechanism. Reports to the Indigenous Relations Manager.

Role	Responsibility
Environmental Monitors	Environmental Monitors (Environmental Specialists and Technicians) are responsible for tracking and reporting on environmental permit obligations through field-based monitoring programs. Report to the EM.
Aboriginal Monitors	Aboriginal Monitors are required under EAC #M19-01 Condition 17 and will be responsible for monitoring for potential effects from the Blackwater Mine on the Indigenous interests. Indigenous Monitors will be involved in the adaptive management and Follow-Up monitoring programs. Reports to the EM.
Employees and Contractors	Employees are trained and responsible for being aware of permit requirements specific to their roles and responsibilities. Reports to Departmental Managers.
Qualified Registered Professionals (QRP) and Qualified Persons	Qualified Registered Professionals and qualified persons will be retained to review objectives and conduct various aspects of environmental and social monitoring as specified in Environmental and Social Management Plans.

The Construction Manager is accountable for ensuring that environmental and regulatory commitments/obligations are being met during the Construction phase. The EM will be responsible for ensuring that construction activities are proceeding in accordance with the objectives of the EMS and associated management plans. The EM or designate will be responsible for reporting non-compliance to the CM and EPCM contractor, other contractors, and regulatory agencies, where required. The EM or designate will have the authority to stop any construction activity that is deemed to pose a risk to the environment; work will only proceed when the identified risk and concern have been addressed and rectified.

Environmental management during operation of the Mine will be integrated under the direction of the EM, who will liaise closely with departmental managers and will report directly to the Mine Manager. The EM will be supported by the Vice President (VP) of Environment and Social Responsibility to provide an effective and integrated approach to environmental management and ensure adherence to corporate environmental standards. The EM will be accountable for implementing the approved management plans and reviewing them periodically for effectiveness. Departmental area managers (e.g., mining, milling, and plant/site services) will be directly responsible for the implementation of the EMS and management plans, and standard operating procedures relevant to their areas. All employees and contractors are responsible for daily implementation of the practices and policies contained in the EMS.

Pursuant to Condition 19 of EAC #M19-01, BW Gold has established an Environmental Monitoring Committee (EMC) to facilitate information sharing and provide advice on the development and operation of the Mine, and the implementation of EAC conditions, in a coordinated and collaborative manner. Committee members include representatives of the EAO, Ulkatcho First Nation (UFN), Lhoosk'uz Dené Nation (LDN), Nadleh Whut'en First Nation, Saik'uz First Nation (SFN), and Stellat'en First Nation, as well as the traditional territories of the Nazko First Nations, Ministry of Energy, Mines and Low Carbon Innovation (EMLI, now Ministry of Mining and Critical Minerals), Ministry of Environment and Parks (BC ENV; formerly Ministry of Environment and Climate Change Strategy), and BC Ministry of Forests (BC FOR; formerly, Ministry of Forests, Lands, Natural Resource Operations and Rural Development).

Pursuant to Condition 17 of the EAC #M19-01, Aboriginal Group Monitor and Monitoring Plan, BW Gold will retain or provide funding to retain a monitor for each Indigenous nation defined in the EAC #M19-01 prior to commencing construction and through all phases of the mine life. The general scope of the monitor's activities will be related to monitoring for potential effects from the Mine on Indigenous nations' interests.

1.3 COMPLIANCE OBLIGATIONS, GUIDELINES, AND BEST MANAGEMENT PRACTICES

1.3.1 LEGISLATION

Federal legislation applicable to the AEMP:

- *Canadian Environmental Protection Act*, 1999;
- *Fisheries Act*;
    - Metal and Diamond Mining Effluent Regulations;
- *Impact Assessment Act*;
- *Species at Risk Act*; and
- *United Nations Declaration on the Rights of Indigenous Peoples Act*.

Provincial legislation applicable to the AEMP:

- *Declaration on the Rights of Indigenous Peoples Act*;
- *Drinking Water Protection Act*;
- *Environmental Assessment Act*;
- *Environmental Management Act;*
    - Environmental Data Quality Assurance Regulation;
    - Waste Discharge Regulation;
- *Mines Act*;
    - Health, Safety and Reclamation Code for Mines in BC; and
- *Water Sustainability Act*.

In addition to considering EAC #M19-01 Condition 30 (see Section 1.1) and the typical monitoring required under EMA discharge authorizations for mines, the AEMP has been designed to incorporate MDMER requirements for the receiving environment required for the Environmental Effects Monitoring program (Schedule 5 of the MDMER).

1.3.2 EXISTING PERMITS

BW Gold received EMA Permit PE-110602 on June 24, 2021, authorizing early construction works for the Mine. These works include clearing, grubbing, ditching, and site levelling at the Plant Site location, and sediment and erosion controls, including construction of ditches, diversions, and a SCP. BW Gold received an amended *Mines Act* Permit M-246 on March 8, 2023, approving the Mine Plan and Reclamation Program, and superseding the previous version. BW Gold received EMA Permit PE-110652 on May 3, 2023, authorizing discharge of effluent to surface water and groundwater from the Blackwater Mine site. BW Gold received a *Fisheries Act* Authorization in June 2023 to offset losses to fish habitat that result from the deposition of a deleterious substance into water bodies beneath the tailings storage facilities C and D (excluding dam footprints), the ore stockpiles, and the upper overburden stockpile and in July 2023 for works, undertakings, and activities that are likely to result in the harmful alteration, disruption, or destruction of fish habitat.

1.3.3 GUIDELINES AND BEST MANAGEMENT PRACTICES

Federal, provincial, and regional guidance documents inform the monitoring practices in the AEMP Plan. Several of these documents are referenced in the EAC #M19-01 and are referenced in this plan. Key guidance documents include:

- *British Columbia Environmental Laboratory Manual* (BC ENV 2023b);
- *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE 2016a);
- *British Columbia Field Sampling Manual* (BC MWLAP 2013 and BC MWLAP 2020);
- *British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Summary Report* (BC WLRS 2025a);
- *British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture* (BC WLRS 2025b);
- *Manual of British Columbia Hydrometric Standards, Version 2.0* (RISC 2018);
- *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures* (RIC 2001);
- *Metal Mining Technical Guidance Document for Environmental Effects Monitoring* (Environment Canada 2012a);
- *Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2025a);
- *CCME Sediment Quality Guidelines for the Protection of Aquatic Life* (CCME 2025c);
- *CCME Water Quality Guidelines for the Protection of Agriculture Water Uses* (CCME 2025b);
- *Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota: Methylmercury* (CCME 2000); and
- *Canadian Aquatic Biomonitoring Network: Field Manual for Wadeable Streams protocols* (Environment Canada 2012b).

The AEMP Plan also takes into consideration the Yinka Dene Water Law (YDWL), as required by EAC #M19-01 Condition 30, and is described in the following documents:

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

BW Gold has been collaborating with the Nechako First Nations (NFNs; formerly, the Carrier Sekani First Nations) regarding the implementation of the YDWL, and discussions with the NFNs 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) include sampling frequency recommendations. Site-specific comparison of predicted water quality data with water quality standards calculated using the YDWL guidance was also completed for one sampling location in Chedakuz Creek in the *2011 to 2020 Baseline Water Quality Report* (ERM 2022), as required by Condition 27 of the EAC #M19-01.

1.4 COMPONENTS INCLUDED IN THE AQUATIC EFFECTS MONITORING PROGRAM

The following components of the aquatic ecosystem are included in the AEMP:

- Hydrology;
- Surface water temperature, quality, and chronic toxicity testing;
- Sediment quality and sediment toxicity testing;
- Aquatic primary producers and benthic invertebrates (referred to as aquatic resources);
- Benthic invertebrate tissue metals;
- Fish community, fish spawning, and fish tissue metals; and
- Water-dependent wildlife.

Additional, monitoring in accordance with aquatic ecosystem special studies maybe referred to in the AEMP however the methods and assessment endpoints will be reported under a separate cover. Special studies including investigation of cause studies triggered by the response framework (Section 5) or studies requested by the Director will have specific objectives and reporting requirements.

1.5 LINKAGES WITH OTHER MANAGEMENT AND MONITORING PLANS

Other Mine management and monitoring plans have linkages to the AEMP Plan to provide inputs or information to aid in the interpretation of data and provide outputs for use in other plans.

The MSDP provides the framework for monitoring of surface water, groundwater, and effluent quality and quantity within the mine site. Results from the MSDP will be used to inform the interpretation of AEMP monitoring results. For example, the MSDP includes monitoring of effluent quality at discharge points, which can be useful in understanding changes or trends in water quality measured in downstream receiving environments. Similarly, groundwater monitoring can serve to confirm seepage pathways and seepage quality, which can also inform the interpretation of water quality monitoring results in the receiving environment downgradient of the mine site.

A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4. The TRP will provide triggers based on results of effluent quality, hydrology, or other metrics that would prompt more timely or immediate responses than the actions that may be recommended annually based on AEMP Plan monitoring results (see Section 5). The TRP will also incorporate triggers and responses based on receiving environment water quality monitoring in Davidson Creek or Creek 661 for compliance with EAC #M19-01 Condition 26.

Results of the Wildlife Mitigation and Monitoring Plan (WMMP) will inform the water-dependent wildlife component of the AEMP, specifically for amphibians and water (see Section 4.9).

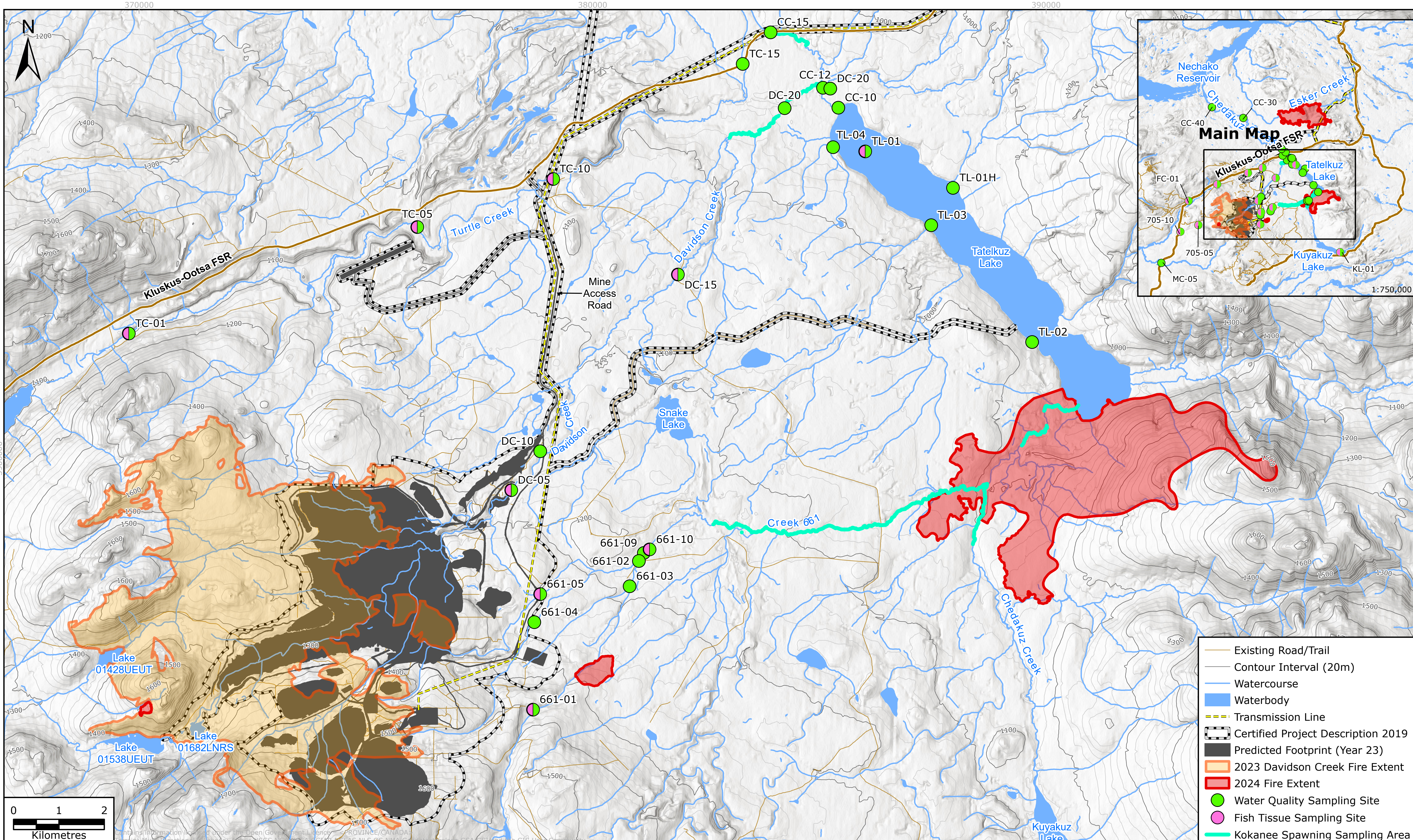
Results of the AEMP will inform the CFMP, which is required by EAC #M19-01 Condition 41. Specifically, the AEMP surface water quality and fish tissue metal monitoring will be used in the CFMP to fulfill the requirements for water quality sampling (EAC #M19-01 Condition 41(d)(vii)) and fish tissue sampling (EAC #M19-01 Condition 41(d)(vi)). As required by EAC #M19-01 Condition 41(d)(vi)(i), fish tissue and surface water quality samples will be co-collected at the same site and at the same time, as described in the Field Methods under Section 4.8.1.2.

1.6 WILDFIRE

A wildfire spread from the surrounding area into the mine site on July 10, 2023 (Davidson Creek), and grew to 4,808 hectares in size, burning approximately 60% of the mine site (Figure 1.6-1). In July 2024, a wildfire spread through the surrounding area of the Mine site - near Tatelkuz Lake (~1200 hectare (ha) fire), 10 km north of Tatelkuz Lake (~700 ha fire), and Laidman Lake to the west (~5000 ha) in addition to other smaller fires southeast of Tatelkuz Lake (Figure 1.6-1).

The 2023 Davidson Creek Wildfire and the 2024 wildfire events are anticipated to have an impact on results of the surface water quality and fish habitat in the short-term and long-term. Potential effects related to stream hydrology, sediment erosion, and increased metal deposition may be observed at both potential impact and control sites. In the case of a new wildfire occurrence in the area, the extent will be documented in the subsequent AEMP Interpretive report and the next iteration of the AEMP Plan. The AEMP effects analysis already utilizes a precautionary, weight of evidence approach to assess Mine-related effects, and is expected to differentiate from the fire and mine activities in most cases. For example, in the case that aquatic resource and fish habitat endpoints have significantly been altered, this may be linked to upstream hydrological changes associated with a fire that occurred historically or in the current reporting year and not associated with the Mine discharges. The spatial overlap between the fire extent(s) and the mine site activities, such as vegetation removal and earth movement, could result in increased sediment mobilization. Therefore, the increases in fine sediment transport and subsequent changes in sediment and/or water quality, as a result of the fire, are more difficult to differentiate from the Mine-related effects. However, the increases are expected to peak (with the magnitude and timing related to precipitation events following the fire), while the Mine-related effects may be discerned based on characteristics of the water discharged to the receiving environment and/or seepage that may enter the receiving environment.

FIGURE 1.6-1 2024 AND 2023 WILDFIRE EXTENTS AND SURFACE WATER AND FISH TISSUE SAMPLING SITES



CLIENT: BW Gold LTD.
GIS NUMBER: BLW-14-293-05

DATE: 04/24/2025

PROJECTION: NAD 1983 UTM Zone 10N
SCALE: 1:80,000 when printed at 11x17

2. ENGAGEMENT

BW Gold has completed engagement and consultation regarding the AEMP plan with Indigenous nations and have planned additional engagement and consultation. Activities to date are described in Section 2.1, and future opportunities are described in Section 2.2 for engagement and consultation for subsequent iterations of the AEMP Plan.

2.1 COMPLETED ENGAGEMENT

During the preparation of the Joint MA/EMA Application and this AEMP Plan, and prior to the completion of the first draft of the AEMP Plan, BW Gold engaged with UFN and LDN as part of the regular Blackwater Environmental Monitoring Board (EMB) meetings to discuss the proposed sampling plans for the AEMP during meetings to discuss the CFMP (required by EAC #M19-01 Condition 41). There is a significant overlap between the AEMP and the CFMP, particularly related to water quality and fish tissue sampling (Section 1.5). The first discussion on May 5, 2021, included a presentation of the preliminary plans for sampling under the AEMP and CFMP, during which UFN, LDN, and their consultants were invited to provide input and feedback on the preliminary proposed sampling plans.

Draft comments were provided by UFN and LDN to BW Gold in an Excel tracking spreadsheet in early June 2021. Although the comments were focused on aquatic sampling in the context of the CFMP, several comments were relevant to the AEMP proposed sampling plan related to sampling frequency (annually versus every three years), sampling locations (lakes versus streams), and type of sampling (adult versus juvenile fish). As a result of the input and feedback received from the UFN and LDN, the proposed sampling plan for both the AEMP and CFMP was revised to include:

- Sampling frequency is proposed to be set to annually, initially (rather than every three years), with a framework to decrease sampling frequency if effects were not identified, and a minimum sampling frequency of once every three years.
- Sampling of fish tissue from adult fish (Kokanee [*Oncohynchus nerka*], rainbow trout [*Oncorhynchus mykiss*], and mountain whitefish [*Prosopium williamsoni*]) from Tatelkuz Lake and Kuyakuz Lake (control site) were added to the sampling plan, rather than focusing only on rainbow trout in the stream sites closest to the mine site. Sampling of fish tissue from locations where there is Kokanee spawning habitat (e.g., lower Davidson Creek, Chedakuz Creek) is not recommended to ensure that this important fish habitat is not altered or damaged by methods requiring in-creek sampling.

The revised AEMP and CFMP sampling plans were presented and discussed at a meeting on July 29, 2021, and no comments specific to the AEMP plan or requiring changes to the revised plans were received. However, following issuing of a draft CFMP plan for review in December 2021, comments were received on the CFMP that indicated the sampling frequency for CFMP tissue sampling programs be reverted to once every three years. The AEMP Plan for fish tissue sampling was updated to align with the frequencies for fish tissue sampling in the CFMP, which also align with the requirements for MDMER fish tissue sampling.

Indigenous nations also provided comments on the Draft Information Requirements Table for the Joint MA/EMA Application issued by EMLI and the Initial Project Description. Comments specific to the AEMP were provided by the Carrier Sekani First Nations, UFN, and LDN on April 16, 2021. Draft responses were provided by BW Gold in late July 2021, and BW Gold met with groups on August 19, 2021, to discuss comments. BW Gold provided a draft AEMP Plan to the Indigenous nations for review in advance of the Joint MA/EMA Application submission. The AEMP Plan was revised to address comments prior to submission of the AEMP Plan with the Joint MA/EMA Application in March 2022 (BW Gold 2022). Indigenous nations, regulators, and others reviewed the AEMP Plan and provided comments. BW Gold tracked the comments in an Information Tracking Table and considered and responded to all comments received from reviewers. The AEMP Plan, Version 1.0 was revised to consider applicable comments (Appendix E).

A 2022 cumulative baseline report (ERM 2023b) was produced in accordance with PE-110652 Condition 3.14 with recommendation from the baseline program provided in Appendices F-1 and F-2. Comments on the baseline report were received from consultants for Carrier Sekani First Nations and, where applicable, updates to the AEMP Plan were made in response to the comments.

BW Gold provided the AEMP Plan, Version 1.0 to BC ENV, and Indigenous groups for review on July 2, 2023 (as required by PE-110652 Condition 4.6.1). BW Gold provided the AEMP Plan, Version 2.0 to BC ENV, Ministry of Water, Land, and Resource Stewardship (BC WLRS), and Indigenous groups for review on April 30, 2023 (as required by PE-110652 Condition 4.6.6). The comments on Version 2.0 were considered and in response to BC ENV direction, the AEMP Plan, Version 3.0 was provided to BC ENV, BC, WLRS and Indigenous groups for review on December 6, 2024. Version 3.1 was submitted March 28, 2025 for approval based on comments received from BC ENV, BC WLRS, and NFNs. The conditions for approval of Version 3.1 and recommendations from the 2024 AEMP Interpretive Report were considered in the update to this Version 4.0 as outlined in the Cover Letter. The section where required updates were completed in each of the AEMP Plan versions are indicated in Appendix A and Table 1.

Table 2.1-1 lists 2022, 2023, 2024, and 2025 meetings with Indigenous nations in attendance to discuss components of the AEMP Plan. Where Follow-Up was required, the section in the AEMP Plan is provided where the comment has been addressed. A letter of with additional comments on the AEMP was provided by NFNs following the meeting with Environmental Life of Mine Committee (ELoMC) on February 15, 2024. Appendix A documents where in the AEMP Plan applicable changes have been made in response to comments.

TABLE 2.1-1 MEETINGS TO DISCUSS THE AQUATIC EFFECTS MONITORING PROGRAM, 2022 TO DECEMBER 2024

Date	Topic(s)	Attendees[1]	Follow-Up	Section in AEMP Plan, Version 3.0
September 15, 2022	• Provide an overview of revisions to the AEMP sampling plan following technical review of the Joint MA/EMA Permits Application Review (Round 1 and Round 2).	EMC	Not required	Not Applicable
December 7, 2022	• Joint MA/EMA Permits Application Review comments #1027 and #2118.	EMB	BW Gold to evaluate the potential for a water quality and sediment quality control site on Creek 705 to assess the potential effects when non-contact water from Lake 1682 is diverted to Lake 1538.	Not Applicable–The evaluation of a potential water quality and sediment quality control site on Creek 705 will be initiated in 2023. The results of the study will be reported on in the 2023 AEMP Interpretive Report.
March 16, 2023	• Provide an overview of revisions to the AEMP sampling plan following technical review of the Joint MA/EMA Permits Application Review. • Share preliminary findings related to the 2022 Aquatic Effects Monitoring Program Interpretive Report.	EMC	Provide Kasandra (and EMC) with details/dates of the 2022 Kokanee summer spawning surveys.	Not Applicable (the details/dates were provided via email and reported in ERM 2023b).
September 21, 2023	• Provide a summary of the responses to Nechako First Nations comments on the 2023 AEMP Interpretive Report and the 2022 AEMP Cumulative Baseline Report.	ELoMC	Not required	Not Applicable (see Version 2.0)
February 15, 2024	• Share the preliminary findings of the 2023 AEMP fisheries results.	ELoMC	NFNs to have a Follow-Up meeting to discuss potential issues with the AEMP fisheries study design.	See Version 2.0
July 19, 2024	• Discussion of NFNs concerns that were not addressed in the AEMP Plan, Version 2.0.	NFNs, BC ENV	To address additional issues with the AEMP fisheries study design.	See the Cover Letter for sections in the AEMP Plan where issues have been addressed.

Date	Topic(s)	Attendees[1]	Follow-Up	Section in AEMP Plan, Version 3.0
September 18, 2024	• Provide a summary of responses to the NFNs comments on the 2024 AEMP Interpretive Report and Federal Follow-Up Program Reports for Decision Station 3.15, 3.14, and 3.16.	NFNs	Additional meeting to have further in-depth discussions regarding comments on Federal Follow-Up Program 3.14 and 3.16 Annual Reports	See the Cover Letter for comments regarding the fisheries study design, responses, and, if applicable, the section in the AEMP Plan where the comment was addressed.
October 29, 2024	• Review of three ENV requests identified to be completed outside of the submission of the AEMP Plan Version 3.	BC ENV	Not required	Not applicable
November 6, 2024	• Discussion of NFNs comments on the 2023 Federal Follow-Up Program Annual Report.	NFNs	Additional meeting to discuss potential study design changes.	Not applicable
January 23, 2025	• Discussion of AEMP Plan Version 3	ELoMC	Not required	Not applicable
January 30, 2025	• Discussion of AEMP Plan Version 3 comments and how they will be addressed	NFNs	Not required	Not applicable
February 20, 2025	• AEMP Implementation Framework	NFNs	Not required	Not applicable
February 27, 2025	• Discussion of AEMP Plan Version 3 comments and how they will be addressed	ELoMC	Not required	Not applicable
March 20, 2025	• Discussion of high fish mortality rates observed in monitoring traps	NFNs	Request for mortality rates, rationale for high number, and mitigations	Response to request provided in April 24 meeting.
March 27, 2025	• Status of AEMP Plan Version 4 updates	ELoMC	Not required	Not applicable
April 24, 2025	• AEMP Plan – Kokanee fry mortality during the outmigration surveys	ELoMC	Not required	Not applicable

Notes:
MA/EMA = *Mines Act*/*Environmental Management Act*
[1] EMC = Blackwater Environmental Monitoring Committee; EMB = Blackwater Environmental Monitoring Board; EloMC = Environmental Life of Mine Committee; NFNs = Nechako First Nations

2.2 FUTURE ENGAGEMENT

All subsequent iterations of the AEMP Plan will be reviewed and revised (if necessary) on an annual basis to ensure that the objectives described in Section 1.1 are achieved. Future revisions to the AEMP Plan may include adjusting, adding, or removing monitoring components to ensure that the objectives remain current and are achieved, to reflect changes/updates to field practices or guidance, and to address uncertainties identified in future monitoring. Future engagement and consultation will be conducted in accordance with DS Condition 2.3 and Condition 2.4 (see Appendix C for condition wording).

Separate from the AEMP, EAC #M19-01 Condition 12 requires an Independent Environmental Monitor (IEM) be retained by the proponent during all phases of the Mine. This is in addition to EAC #M19-01 Condition 17, which requires an Aboriginal Group Monitor and Monitoring plan, where the proponent must retain or provide funding to retain one monitor for each Aboriginal Group. It is possible that the IEM retained under EAC #M19-01 Condition 12 or monitor retained under EAC #M19-01 Condition 17 could identify and recommend additional sampling be incorporated into the AEMP Plan, rather than under a separate monitoring program. BW Gold would consider and respond to any input or comments received from the IEM or Aboriginal Group monitor as it relates to the AEMP.

3. OVERVIEW OF EXISTING CONDITIONS, ISSUES, AND CONCERNS IN THE AQUATIC ENVIRONMENT

3.1 OVERVIEW

As required by EAC #M19-01 Condition 30(d), the AEMP Plan must include a "*description of the water quality issues and concerns with respect to the Project that exist in the vicinity of the Project site*". To fulfill this requirement, the following sections provide an overview of the stand-alone Conceptual Site Model (CSM) report (Entia 2022) that describes the Mine-related sources, transport pathways, and exposure pathways for parameters of concern (POC) in surface water to the different types of receptors of concern (ROCs) that may be found at or near the Mine. Detailed information about existing water quality conditions prior to the Mine construction, including all baseline observations, is provided in the 2022 Cumulative Aquatic Effects Monitoring Program Baseline report (ERM 2023b).

The effects assessment for the Mine found that adverse effects to biota in the receiving environment were not predicted to occur (Chapter 6 of BW Gold 2022); therefore, there are no "known effects to local biota or related species from POCs" to describe in the AEMP, as the Mine effects on biota are not expected to be different from baseline conditions.

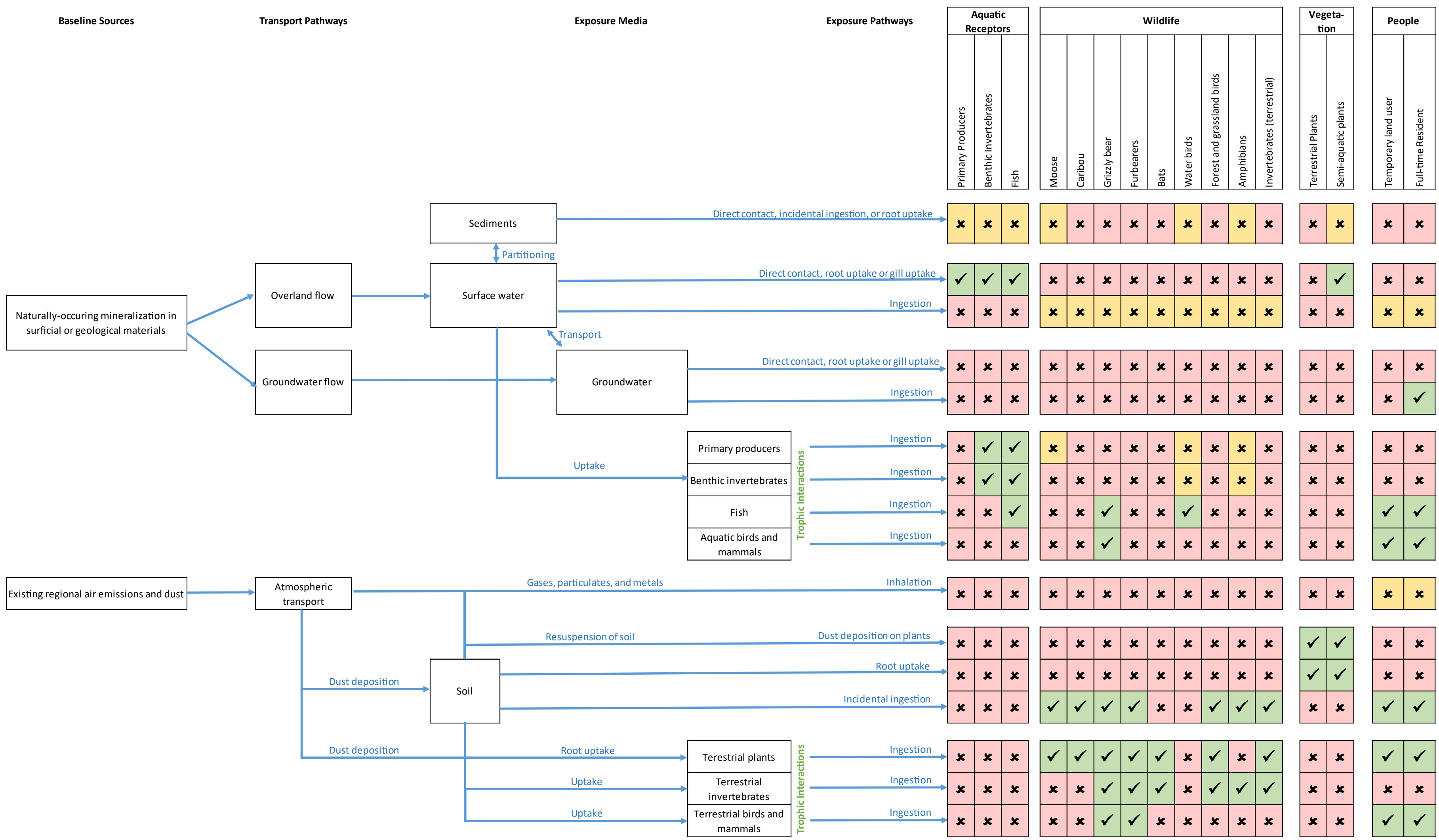
3.2 CONCEPTUAL SITE MODEL

3.2.1 TYPES, SOURCES, AND TRANSPORT PATHWAYS FOR PARAMETERS OF CONCERN IN THE AQUATIC ENVIRONMENT

Considering guidance from BC ENV (2019), the CSM identified Parameters of Potential Concern (POPCs) in the receiving environment, as all parameters with baseline (2011 to 2020 baseline data) or predicted concentrations exceeding or approaching an applicable water quality guideline (i.e., concentrations of more than 80% of the applicable guideline). A POC was then identified from the POPC list as a parameter that had, as a result of the Mine, a predicted concentration higher than an applicable water quality guideline for a receptor of concern and higher than the range of existing concentrations. The results of the evaluation of the Mine-related sources, transport pathways, and exposure pathways to POCs for each receptor were summarized in the CSM schematics for the Baseline Case (pre-development) and Project Case (based on Construction and Operations) scenarios (Figure 3.2-1 and Figure 3.2-2).

Potential POPCs for the Mine included various water constituents, such as metals, anions, and nutrients (nitrogen forms and phosphorus). When concentrations of these parameters are higher than the water quality guideline for protection of aquatic life (WQG-AL), there is potential for adverse effects on aquatic biota (e.g., mortality or impairment of growth and reproduction), which can lead to changes in abundance, distribution, or community structure of primary producers, benthic invertebrates, and fish.

FIGURE 3.2-1 CONCEPTUAL SITE MODEL FOR BLACKWATER MINE: BASELINE CASE



Notes:
✓ *Pathway is complete and operable and exposure to existing parameters of concern (POC) may occur.*
✗ *Pathway is incomplete and not operable or is complete but insignificant and is not considered further.*
✗ *Pathway is complete but no POCs were identified for this exposure route.*
POC = parameter of concern

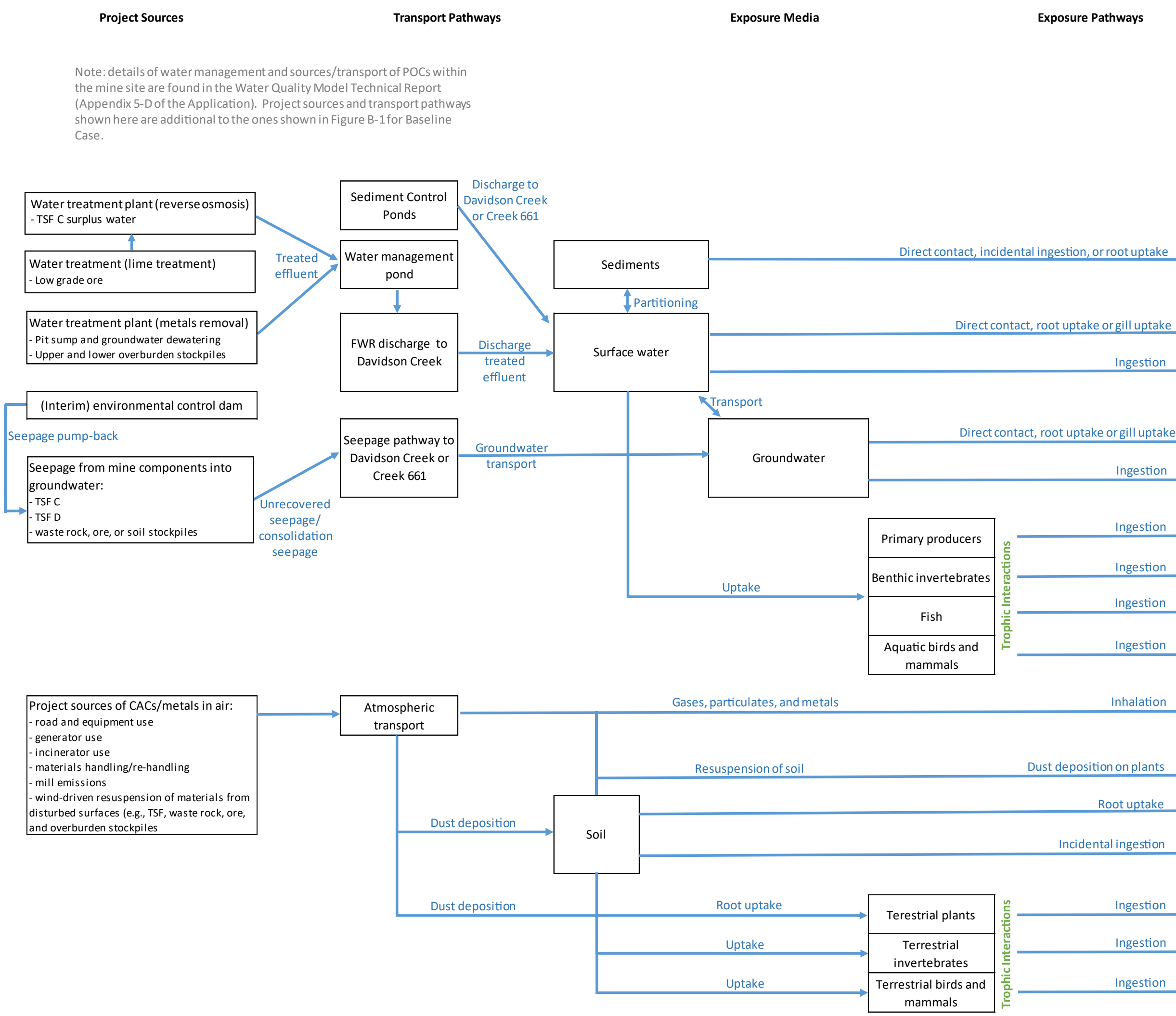
ENTIA ENVIRONMENTAL CONSULTANTS

Source: Entia (2022).

ERM

CLIENT: BW Gold LTD.
GRAPHICS NUMBER: BWG-24ERM-024:1

FIGURE 3.2-2 CONCEPTUAL SITE MODEL FOR BLACKWATER MINE: PROJECT CASE



Exposure Media	Exposure Pathway	Aquatic Receptors: Primary Producers	Benthic Invertebrates	Fish	Wildlife: Moose	Caribou	Grizzly bear	Furbearers	Bats	Water birds	Forest and grassland birds	Amphibians	Invertebrates (terrestrial)	Vegetation: Terrestrial Plants	Semi-aquatic plants	People: Temporary land user	Full-time Resident	Off-duty Worker
Sediments	Direct contact, incidental ingestion, or root uptake	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Surface water	Direct contact, root uptake or gill uptake	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗
Surface water	Ingestion	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗
Groundwater	Direct contact, root uptake or gill uptake	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Groundwater	Ingestion	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗
Primary producers	Ingestion	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Benthic invertebrates	Ingestion	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Fish	Ingestion	✗	✗	✓	✗	✗	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✗
Aquatic birds and mammals	Ingestion	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗
Air	Inhalation	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Soil	Dust deposition on plants	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗
Soil	Root uptake	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗
Soil	Incidental ingestion	✗	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓
Terrestrial plants	Ingestion	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✗	✓	✓	✗
Terrestrial invertebrates	Ingestion	✗	✗	✗	✗	✗	✓	✓	✓	✗	✓	✓	✓	✗	✗	✗	✗	✗
Terrestrial birds and mammals	Ingestion	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗

Notes:

✓ *Pathway is complete and operable and exposure to existing parameters of concern (POC) may occur.*

✗ *Pathway is incomplete and not operable or is complete but insignificant and is not considered further.*

✗ *Pathway is complete but no POCs were identified for this exposure route.*

POC = parameter of concern; TSF = tailings storage facility; CAC = criteria air contaminant; FWR = freshwater reservoir

Source: Entia (2022).

CLIENT: BW Gold LTD.

GRAPHICS NUMBER: BWG-24ERM-024:2

The Mine infrastructure, such as the Open Pit and dewatering system, TSF, waste and LGO stockpiles, water management infrastructure, haulage and service roads, and mining activities, such as milling, equipment use, and blasting, were considered sources of the Mine-related POPCs. Anions, metals, and nitrogen-containing compounds from these components can be transported to the receiving environment outside of the mine site through either effluent discharge or seepage, as described in the surface water quality model (Lorax 2022a), water balance model (KP 2022), and the groundwater model (KP 2021).

Specific ROCs were identified for the Mine based on their expected or confirmed presence in the area, water uses, land uses, and species identified as receptors in environmental assessment or Joint MA/EMA Application effects assessments. Aquatic life receptors included periphyton, benthic invertebrates, and fish. Specific water-dependent wildlife receptors included amphibians and water birds, although all wildlife ROCs were assumed to have the potential to drink surface water. For the purposes of the AEMP Plan, human ROCs were not considered because there is a separate CFMP (per EAC #M19-01 Condition 41), where monitoring and endpoints specific to human health are included.

The ways in which the ROCs could be exposed to the Mine-related POCs were identified based on whether potential exposure pathways were operable, operable but insignificant (and not considered further), or not operable. The following exposure pathways were identified as being operable for further consideration:

- Aquatic Life ROCs: direct contact with water and/or sediment, uptake from diet.
- Wildlife ROCs: ingestion of soil, food, or water.

3.2.2 IDENTIFICATION OF SPECIFIC PARAMETERS OF CONCERN

When concentrations of parameters are higher than the WQG-AL there is potential for adverse effects on aquatic biota (e.g., mortality or impairment of growth and reproduction) which can lead to changes in abundance, distribution, or community structure of primary producers, benthic invertebrates, and fish.

Identification of POCs considered relevant exposure media for each receptor group and conservatively compared the 95th percentile (base case water quality predictions) of a parameter in Baseline Case (pre-development concentrations) and Project Case (concentrations predicted in Construction and Operations phases) to applicable guidelines in each media.

Within the mine site (not in the receiving environment), a number of parameters were identified as POPC with concentrations higher than 80% of the WQG-AL in untreated effluent, including nitrogen forms (ammonia, nitrate, nitrite), sulphate, dissolved aluminum, antimony, arsenic, beryllium, dissolved cadmium, chromium, cobalt, dissolved copper, dissolved iron, lead, manganese, mercury, nickel, silver, and zinc (Lorax 2022c). However, because water management and water treatment are integral components of the Mine design, concentrations of these parameters (other than dissolved aluminum) were not predicted to be higher than WQG-AL in the receiving environment downstream or downgradient of the mine site during Construction or Operations phases. The POPCs identified in untreated effluent will be included in the suite of parameters to be analyzed in receiving environment surface water quality samples (see Section 4.4) and will be included as parameters for the water quality adaptive management response framework (see Section 5.2.1).

Baseline surface water quality data collected between 2011 and 2022 indicated that concentrations of several parameters (total chromium, total iron, and total zinc) were sporadically higher than WQG-AL (in 5 to 10% of samples) at one or more sites in Davidson Creek or Creek 661. Generally, the 95th percentile concentration, the statistic typically used to calculate a science-based environmental benchmark (SBEB) using the background method, of these parameters was below the WQG-AL. However, total and dissolved aluminum concentrations were regularly higher than WQG-AL at most sites in Davidson Creek, Creek 661, and Chedakuz Creek. Consequently, a SBEB for aluminum calculated using the background method was proposed for Davidson Creek and Creek 661 in place of the WQG-AL.

Based on water quality predictions in the receiving environment downstream or downgradient of the mine site, for Aquatic Life ROCs, 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 result in mortality and changes in the growth or reproduction of aquatic biota. However, given that the predicted concentrations of dissolved aluminum are within the range of baseline concentrations to which resident aquatic biota have adapted, the Mine-related effects on aquatic biota were not predicted to occur.

Nitrogen forms (nitrate, nitrite, and ammonia) and total phosphorus were identified as "special case" POCs 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) were 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.

Total zinc was predicted to exceed the WQG-AL in Creek 661 on an annual basis in January throughout Construction and Operations phases. However, this predicted exceedance was not due to contributions from the Mine and was associated with elevated total zinc concentrations measured in baseline studies (i.e., maximum predicted Project Case concentration is the same as the baseline concentration). The Mine is not predicted to change total zinc concentrations in January; therefore, total zinc was not carried forward as the Mine-related POC and no effects were predicted from total zinc in Creek 661 as a result of the Mine.

Based on baseline water quality data and predicted water quality from the surface water quality model, no parameters of concern for wildlife were identified in the receiving environment outside of the mine site.

3.2.3 CONCEPTUAL SITE MODEL UNCERTAINTIES

Several uncertainties related to the aquatic environment were identified in the CSM and additional monitoring was recommended to address those uncertainties. This included:

1. Collecting surface water samples for chromium speciation analysis.
    - This monitoring was recommended and implemented in Q3 2021 to address uncertainty because the total chromium concentration, when compared to the most conservative chromium WQG-AL (i.e., hexavalent chromium (Cr[VI]), sporadically exceeded the WQG-AL for Cr(VI) in baseline sampling. However, it was not known what proportion of the total chromium was in the Cr(VI) form.
    - Results of the chromium speciation analysis are provided in the *2022 Cumulative Aquatic Effects Monitoring Program Baseline report* (ERM 2023b). Given the relatively infrequent detection of chromium (total, dissolved, or hexavalent) in water samples and the infrequent, low magnitude exceedances of the Cr(VI) WQG-AL for total chromium or Cr(VI) concentrations, continuation of chromium speciation analysis in future AEMP Plan monitoring is not recommended. It was recommended that analysis of both total and dissolved chromium concentrations be continued for water samples.
2. Co-collecting surface water and fish tissue samples for mercury analysis during Construction and Operations phases.
    - This recommendation was made because the surface water quality model predicted an increase in surface water concentrations for mercury, which then led to a predicted increase in fish tissue concentrations. However, the increased concentrations predicted by the surface water quality model are due to detection limits higher than the WQG-AL for mercury in some of the geochemistry source terms and are expected to be overestimates of the actual future concentrations. Thus, monitoring of mercury in both surface water and fish tissue was recommended to confirm whether mercury concentrations change as a result of the Mine.
    - This recommendation is incorporated into the future monitoring described in the AEMP Plan for water (Section 4.4.2) and fish tissue (Section 4.8.1).

4. DESIGN OF THE AQUATICS EFFECTS MONITORING PROGRAM

The AEMP has been designed to assess the potential long-term effects (i.e., changes from year to year) in each of the physical, chemical, and biological components identified in Section 1.4. For each of the AEMP components, sampling and data analysis has been designed to address the following questions:

- Are AEMP component assessment endpoints at impact sites changing from baseline conditions or reference ranges (e.g., concentrations higher than the site-specific baseline data or reference ranges) as a result of the Mine?
- Are AEMP component assessment endpoints changing in ways that were not predicted by models or is mitigation less successful than anticipated (e.g., concentrations of water constituents higher than predicted by surface water quality model)?
- Are AEMP component assessment endpoints at impact sites changing to levels that may be associated with effects with effects as a result of the Mine (e.g., does the change result in an exceedance of a WQG or another benchmark)?

These questions also directly feed into the adaptive management framework described in Section 5.2 to define numeric performance metrics for various action levels.

The water quality sampling design (i.e., monitoring locations and data analysis) considers the requirements of EAC #M19-01 Condition 28 (Chedakuz Creek and Tatelkuz Lake Water Quality Monitoring Plan; see Appendix B for sections in the AEMP Plan in which the requirements are addressed). This AEMP Plan considers the requirements of the DS Conditions 3.14, 3.15, and 3.16 Follow-Up programs for hydrology, surface water quality, and the fish community sample design (see Appendix C for the DS Condition requirements that have been considered in the identified section of the AEMP Plan). The associated Fish and Fish Habitat Follow-Up Programs design plans for DS Condition 3.14 and DS Condition 3.16 were provided in May 2023 (Palmer 2023a,b). The design plan of the associated Follow-Up Monitoring Program to meet DS Condition 3.15 was provided in June 2023 (BW Gold 2023). Each of the Follow-Up Programs describes the monitoring and reporting components of this AEMP Plan that addresses the condition requirements. The results of AEMP and the Follow-Up programs will be considered in tandem as the compliance endpoints and regulatory review processes of the two programs differ. Additionally, the Follow-Up programs reporting is also separate from the annual AEMP reporting because there is the potential for Follow-Up program conditions to be fulfilled and the program ceases before AEMP monitoring is terminated as defined in the AEMP Plan. In the case that the requirements of a Follow-Up program are fulfilled, and the program ceases before the planned AEMP monitoring, consideration will be given to whether the AEMP would benefit from continued monitoring of the parameters in the Follow-Up program, or portions thereof.

The design of the AEMP monitoring components have been refined to reflect learnings from the 2022 baseline field program (Appendix F), and comments from BC ENV and Indigenous nations as outlined in Table 1.2-1, and Appendix A and Appendix E.

Sampling conducted in accordance with this AEMP Plan was initiated beginning in Construction and will continue while point source discharge to the receiving environment occurs (as authorized by

EMA Permit PE-110652). A QRP may determine that sufficient sampling has been completed under the AEMP 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 AEMP Plan must be supported by rationale either in a stand-alone report or in the annual reporting required by this AEMP Plan. Rationale provided could include some or all of the following:

- The Mine 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 the Mine phases and after a predetermined number of years once the Mine is in Post-closure phase. The number of Post-closure monitoring years will be determined by a QRP 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 Mine, are either decreasing or have stabilized and are unlikely to change significantly in the future.
- Monitoring for predetermined number of years, once the Mine 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 QRP, once water quality models have been updated with operational data.
- Any other rationale that the QRP identifies to warrant a recommendation to significantly decrease the frequency or terminate monitoring.

4.1 STUDY AREA

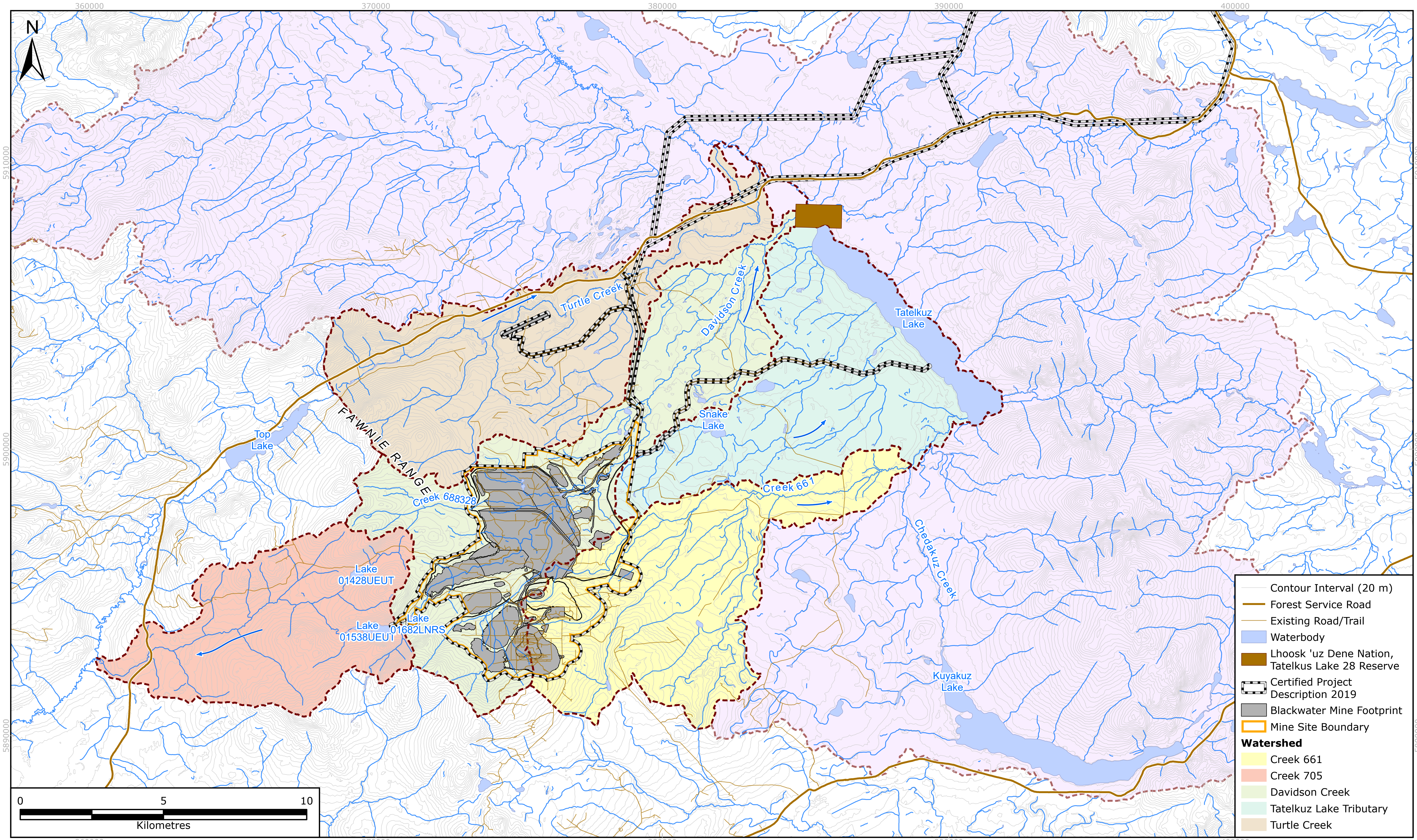
The Mine is located on the Nechako Plateau in the Nechako River watershed within the Fraser River drainage. Specifically, the Blackwater deposit is located on the north slope of Mount Davidson, in the headwaters of the Davidson Creek watershed. Davidson Creek flows northwest from the Mine site toward Chedakuz Creek, with the confluence of the two creeks being approximately 800 m downstream of Tatelkuz Lake (Figure 4.1-1).

Turtle Creek and Creek 661 are parallel drainages to Davidson Creek that also flow northeast to Chedakuz Creek, which then flows northwest to the Nechako Reservoir.

Creek 705 is located on the southern side of a topographic divide from the aforementioned catchments and flows southwest to Fawnie Creek.

Water discharged from the mine site via the FWR outlet reports directly to upper Davidson Creek, which enters Chedakuz Creek downstream of Tatelkuz Lake. Unrecovered seepage from mine site infrastructure (primarily TSF C and TSF D) is also expected to report to Davidson Creek downstream of the FWR. There will be two SCPs that will discharge to Davidson Creek (from the TSF Stage 1 SCP [Construction phase only] and Aggregate Borrow Area SCP [Construction to Closure phase]). The Plant Site SCP will discharge to ground via RIBs during Construction phase; during Operations phase, water collected in the Plant Site SCP will either be used for mining operations or be transferred to the WMP.

FIGURE 4.1-1 STUDY AREA FOR AQUATIC EFFECTS MONITORING PROGRAM



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Thus, the AEMP study area includes four stream watersheds and one lake anticipated to be potentially influenced by mine-related activities as they are downstream of mine infrastructure or discharge points:

- Davidson Creek;
- Creek 661;
- Chedakuz Creek;
- Turtle Creek[1]; and
- Tatelkuz Lake.

The study area also includes three stream watersheds and one lake upstream or outside of the immediate zone of influence of the Mine, and are considered control sites (regional control sites):

- Creek 705[2];
- Fawnie Creek Tributary;
- Mathews Creek[3]; and
- Kuyakuz Lake.

The AEMP study area watersheds in relation to the Mine is provided in Figure 4.1-1, with a description of each watershed in the following sections.

4.1.1 DAVIDSON CREEK

Davidson Creek watershed is a sub-watershed of the Chedakuz Creek watershed. Davidson Creek is a third order stream draining the Blackwater property, flowing northeast into Chedakuz Creek north of Tatelkuz Lake. Davidson Creek watershed contains the majority of the Mine facilities, including TSF C, TSF D, the Open Pit, and related mine site water management structures.

The Mine discharge from the FWR outlet, which includes treated contact water and diverted non-contact water, will discharge into upper Davidson Creek during Construction and Operations phases. Runoff from the extreme upper extents of the Davidson Creek watershed will be permanently diverted to the Creek 705 watershed as part of TSF construction. During mining operations, water from Tatelkuz Lake will be used to provide instream flow needs (IFN) in Davidson Creek. Saik’uz First Nation asserts that the lower reaches of Davidson Creek are within SFN’s traditional territory and, therefore, the lower reaches of the stream have been classified as a Class III waterbody for the purposes of the YDWL (Sinclair et. al. 2017).

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[1] Turtle Creek is the watershed where the Project airstrip would be located, and assessment of effects will be specific to the airstrip construction and operations.

[2] Creek 705 is a control site for all aquatic components except hydrology. No Project discharge or seepage is predicted to report to Creek 705 and no changes to water quality are predicted for Creek 705 and, therefore, no change to aquatic resources were predicted because of water quality changes.

[3] Mathews Creek is labelled ‘Matthews Creek’ in previous drafts of the AEMP Plan and EMA Permit PE-110652 but has been revised in this AEMP Plan for consistency with BW Gold internal documentation.

4.1.2 CREEK 661

The Creek 661 watershed is a sub-watershed of the Chedakuz Creek watershed, draining into Chedakuz Creek upstream of Tatelkuz Lake. Creek 661 is a third order stream with two branches originating east of the Mine site. A tributary to Creek 661 is located within the footprint of mining facilities, including a portion of the proposed Open Pit and potentially may receive seepage from the TSF (Figure 4.1-1). Creek 661 has been classified as a Class III water for the purposes of YDWL (Sinclair et al. 2017).

4.1.3 CHEDAKUZ CREEK

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. The Creek 661, Davidson Creek, and Turtle Creek watersheds, with associated mining infrastructure, are all contained within the Chedakuz Creek watershed. Chedakuz Creek is classified as a Class II waterbody for the purposes of the YDWL.

4.1.4 TURTLE CREEK

The Turtle Creek watershed is a sub-watershed of the Chedakuz Creek watershed. Turtle Creek is a third order stream north of Davidson Creek. It originates east of Top Lake, the headwaters of Fawnie Creek. Turtle Creek enters Chedakuz Creek, approximately 2 km downstream of Davidson Creek, confluence in a wetland area. No mining facilities are located in this watershed; however, the airstrip and limited portions of the proposed mine access road will be located within the Turtle Creek watershed. Turtle Creek has been classified as a Class III waterbody for the purposes of the YDWL (Sinclair et al. 2017).

4.1.5 TATELKUZ LAKE

Tatelkuz Lake is the second-largest lake near the headwaters of Chedakuz Creek. It has a surface area of 927 ha, a volume of 188 mm^3, and a mean depth of 20 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 several species of fish (10 species of fish were observed or captured during 2013 baseline studies). Tatelkuz Lake will be the source of make-up water for Davidson Creek IFN via discharge from the FWR and is located downstream of Creek 661 which will receive unrecovered seepage from the Plant Site, or Camp Site during Construction phase and seepage from the TSF in Operations (or Closure and Post-closure, which will be addressed in a future amendment to the AEMP plan). Tatelkuz Lake has been classified as a Class I waterbody for the purposes of the YDWL.

4.1.6 CREEK 705

The Creek 705 watershed is a sub-watershed of the Fawnie Creek watershed. Creek 705 is a third order stream on the western side of Mount Davidson, flowing into Fawnie Creek approximately 8 km downstream of Top Lake. Creek 705 watershed contains a moderately-sized lake (Lake 1538) near the headwaters of the southern drainage and receives flow from a number of small tributaries in the middle to upper watershed. The main northern basin in the upper part of the watershed is drained by Creek 606013 through a headwater lake (Lake 1428).

There will be no Mine infrastructure or mining facilities located in the Fawnie Creek watershed and no discharge or seepage is predicted to report to this watershed and Creek 705 sampling sites are considered control sites for Davidson Creek for most AEMP components. However, minor changes in flow to Creek 705 may occur as result of the surface runoff diversions; thus, for the purpose of the AEMP, Creek 705 is considered an impacted site for the hydrology component only.

Fawnie Creek Tributary (Section 4.1.7) may be used as an alternative control site for Davidson Creek, if monitoring results that suggest minor changes in flow affects other components or that seepage is unexpectedly reporting to the Creek 705 watershed. Creek 705 has not received a classification for YDWL purposes.

4.1.7 FAWNIE CREEK TRIBUTARY

Fawnie Creek is located approximately 10 km northwest of the Blackwater deposit. The creek flows southwest to join the Entiako River, which flows into the Nechako Reservoir. There will be no Mine infrastructure or mining facilities located in the Fawnie Creek watershed. Thus, Fawnie Creek sampling locations are considered control sites. Baseline aquatic resource sampling has occurred on a tributary of Fawnie Creek (see ERM 2023b), and the sampling location will be consistent with the proposed monitoring site. Fawnie Creek has not received a YDWL classification.

4.1.8 MATHEWS CREEK

Mathews Creek is located southwest of the Mine within the Fawnie Creek watershed. Creek 705 combines with Fawnie Creek and flows toward Laidman Lake and joins with Mathews Creek. There will be no Mine infrastructure or mining facilities located in the Fawnie Creek watershed and hydrology sampling location located on Mathews Creek is considered a control site. Mathews Creek has not received a YDWL classification.

4.1.9 KUYAKUZ LAKE

Kuyakuz Lake is located approximately 20 km southeast of the Mine and sampling locations at Kuyakuz Lake are considered control sites because it is upstream of potential the Mine influences. The lake has a surface area of 820 ha, a volume of 63 mm^3, a mean depth of 7.7 m, and provides spawning and overwintering habitat for fish. Kuyakuz Lake has not received a YDWL classification.

4.2 SAMPLING SITES, TIMING, AND FREQUENCY

The AEMP stream and lake sampling sites, and the rationale for their selection are outlined in Table 4.2-1, with the sites and types of sampling shown on Figures 4.2-1 to Figures 4.2-4.

TABLE 4.2-1 AQUATIC EFFECTS MONITORING PROGRAM STREAM AND LAKE SAMPLING SITES AND RATIONALE

Watershed	Site ID (PE 110652 ID)	Easting	Northing	Type of Site	Rationale
Streams					
Davidson Creek	DC-05 (E331279)	378205	5899299	Near-field impact site	• Approximately 140 m downstream of FWR reservoir discharge • 3.4 km downstream of TSF Stage 1 SCP discharge • Downstream of seepage
	DC-10 (E331280)	378845	5900157	Near-field impact site	• Approximately 100 m downstream of Downstream Aggregate Borrow Area SCP discharge • 1.4 km downstream of downstream of FWR reservoir • Downstream of seepage
	DC-15 (E331281)	381880	5904054	Near-field impact site	• 7.9 km downstream of FWR reservoir discharge • 6.6 km downstream of Downstream Aggregate Borrow Area SCP discharge • Downstream of seepage
	DC-20 (E331281)	384234	5907722	Mid-field impact site	• 14.2 km downstream of FWR reservoir discharge • 13.0 km downstream of Downstream Aggregate Borrow Area SCP discharge • Downstream of seepage • 1.2 km upstream of the confluence with Chedakuz Creek
Turtle Creek	TC-01 (E331283)	369772	5902753	Control site (upstream control site)	• Control site upstream of the airstrip on Turtle Creek
	TC-05 (E331284)	376375	5904723	Near-field impact site	• Downstream and downwind of the airstrip
	TC-10 (E331285)	379129	5906160	Mid-field impact site	• Downstream and downwind of the airstrip
	TC-15 (E331286)	383300	5908691	Mid-field impact site	• Downstream and downwind of the airstrip • Adjacent to access road

Watershed	Site ID (PE 110652 ID)	Easting	Northing	Type of Site	Rationale
Streams *(cont'd)*					
Creek 661–Mainstem	661-01 (E331287)	378620	5894431	Control site (upstream control site) for water quality, sediment, aquatic resources, and fish only	• Control site on mainstem Creek 661, upstream of confluence with Creek 543585
	661-02 (E331288)	380977	5897748	Control site (upstream control site) for hydrology and water temperature only	• Mainstem Creek 661, 160 m upstream of the confluence with Creek 505659
	661-10 (E331289)	381179	5897915	Near-field impact site	• Downstream of seepage
	661-20 (E331290)	388662	5899439	Mid-field impact site	• 370 m upstream of the Creek 661 confluence with Chedakuz Creek • Downstream of seepage
Tributary of Creek 661–Creek 543585	661-03 (E331291)	380803	5897193	Near-field impact site on Creek 543585	• Downstream of groundwater seepage from the Camp Site
Tributary of Creek 661–Creek 146920	661-04 (E331292)	378714	5896389	Near-field impact site on Creek 146920	• Downstream of groundwater seepage from the Camp Site
Tributary of Creek 661–Creek 505659	661-05 (E331293)	378843	5897007	Near-field impact site on Creek 505659	• Downstream of seepage
	661-09 (E331294)	381129	5897914	Near-field impact site on Creek 505659 (hydrology and water temperature only)	• Downstream of seepage

Watershed	Site ID (PE 110652 ID)	Easting	Northing	Type of Site	Rationale
Streams *(cont'd)*					
Chedakuz Creek	CC-03 (E331295)	388645	5899175	Control site (upstream control site) for water quality only	• Control site on Chedakuz Creek, 300 m upstream of the confluence of upper Chedakuz Creek and Creek 661 • Identified as CC-02 for Kokanee spawning sampling
	CC-05 (E331296)	389737	5900563	Mid-field impact site	• 1.8 km downstream of the confluence of upper Chedakuz Creek and Creek 661 • Upstream of inflow to Tatelkuz Lake • Downstream of seepage to Creek 661
	CC-10 (E331297)	385418	5907732	Mid-field impact site	• At outflow of Tatelkuz Lake • Downstream of seepage to Creek 661
	CC-12 (E331298)	385080	5908171	Mid-field impact site (Hydrology and water temperature only)	• 100 m upstream of the confluence of Davidson Creek and lower Chedakuz Creek • Downstream of seepage
	CC-15 (E331299)	383924	5909393	Mid-field impact site	• 18.1 km downstream of FWR reservoir • 2.7 km downstream of confluence with Davidson Creek • 1.0 km upstream of Turtle Creek confluence • Downstream of seepage • Adjacent to access road and upstream of the bridge
	CC-20 (E331300)	383097	5910077	Far-field impact site	• 19.1 km downstream of FWR reservoir • 3.9 km downstream of confluence with Davidson Creek • Downstream of seepage

Watershed	Site ID (PE 110652 ID)	Easting	Northing	Type of Site	Rationale
Streams *(cont'd)*					
Chedakuz Creek *(cont'd)*	CC-30 (E331301)	375187	5916462	Far-field impact site	• 40.0 km downstream of FWR reservoir • 16.2 km downstream of private properties located near Tatelkuz Lake • Downstream of seepage
	CC-40 (E331302)	368695	5918685	Far-field impact site	• 52.9 km downstream of FWR reservoir • 2.3 km upstream of the confluence of with the Nechako Reservoir • Downstream of seepage
Creek 705	705-05 (E331303)	365887	5894321	Control site (regional control site)	• Regional control site for Davidson Creek • 7.4 km downstream of Lake 1682 • 7.1 km upstream of confluence with Fawnie Creek
	705-10 (E331304)	362169	5892943	Control site (regional control site)	• Regional control site for Davidson Creek • 11.5 km downstream of Lake 1682 • 3.0 km upstream of confluence with Fawnie Creek
Fawnie Creek Tributary	FC-01 (E331305)	363860	5899323	Control site (regional control site)	• Regional control site for Davidson Creek • 1.6 km upstream of confluence with Fawnie Creek
Mathews Creek	MC-05 (E331306)	358247	5886498	Control site (regional control site) for hydrology and water temperature only	• Regional control site located in an adjacent watershed, upstream of confluence with Fawnie Creek

Watershed	Site ID (PE 110652 ID)	Easting	Northing	Type of Site	Rationale
Lakes					
Kuyakuz Lake	KL-01 (E331307)	395187	5888710	Control site (upstream control site)	• Control lake located in upper Chedakuz Creek, upstream of the confluence with Creek 661
Tatelkuz Lake	TL-01 (E331308)	386010	5906768	Mid-field impact site (water quality and fish tissue only)	• Lake located at the terminus of upper Chedakuz Creek • Downstream of seepage to Creek 661
	TL-01H (E331309)	387946	5905964	Mid-field impact site (water level and temperature only)	
	TL-02 (E331310)	389691	5902565	Mid-field impact site (water only)	• Littoral zone sampling site to monitor for seepage-influenced groundwater in Tatelkuz Lake
	TL-03 (E331311)	387466	5905141	Mid-field impact site (water only)	• Littoral zone sampling site to monitor for seepage-influenced groundwater in Tatelkuz Lake
	TL-04 (E331312)	385302	5906861	Mid-field impact site (water only)	• Littoral zone sampling site to monitor for seepage-influenced groundwater in Tatelkuz Lake

Figure 4.2-2 and Figure 4.2-3 are more focused maps showing the sampling sites in Davidson Creek and Creek 661, respectively. Figure 4.2-4 shows fisheries program sampling sites and areas.

A conceptual flow diagram is also provided in Figure 4.2-5 showing the effluent discharge points in relation to the sampling sites in the downstream receiving environment.

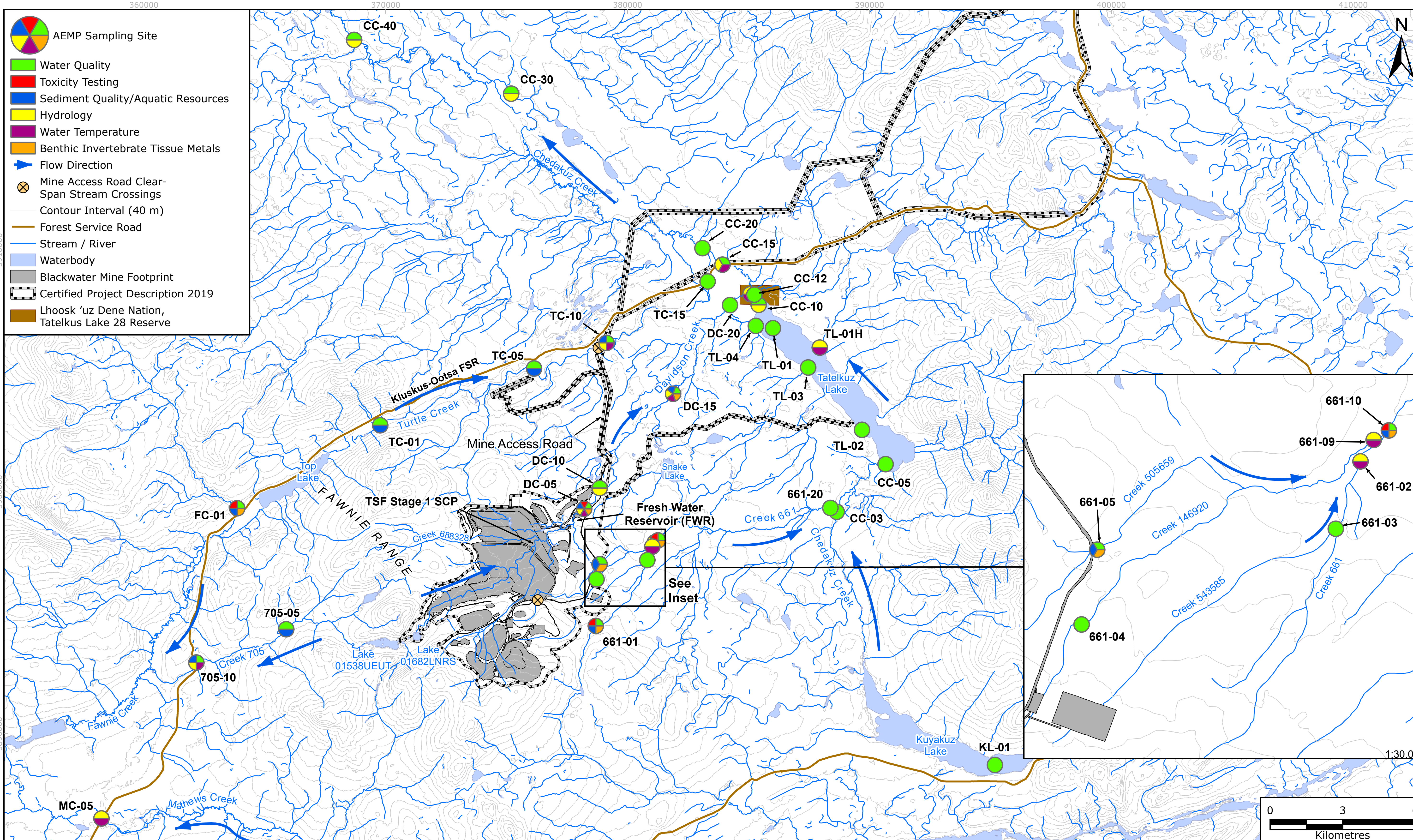
Sampling sites were selected based on a gradient design and include near-field (closest to the mine site), mid-field, and far-field sites (furthest downstream of the mine site), in addition to control sites. Control sites include upstream reference sites (located in the same creek as impact sites, but at a location upstream of potential Mine impacts) and regional control sites (located in an adjacent watershed, used when no upstream control site is available or possible), where no effects are anticipated as a result of the Mine.

In general, the sampling sites for the AEMP have been selected and grouped (Table 4.2-1) to enable the identification of the Mine-related effects (near-field sites, immediately downstream of the mine site in Davidson Creek or Creek 661), as well as mid- and far-field sites to enable identification of potential interactions of Mine effects with other, non-Mine-related effects (e.g., cumulative effects, such as from logging or agricultural activities). If changes in the aquatic environment are identified in mid- or far-field sites, but not at near-field sites, the changes are unlikely to be due to the Mine-related effects. If changes in the aquatic environment are identified in near-field sites, particularly the sites closest to the mine site, the changes are likely attributed to the Mine. In this case, a gradient analysis (either statistically or through visual data exploration) will be completed to identify the extent of the Mine-related effects.

Sampling components at each site have been selected based on the likelihood and magnitude of potential impacts, suitability for sampling (i.e., aquatic resource or other instream sampling will not be completed in areas of Kokanee spawning habitat to avoid causing damage or disruption to bed substrates), and the requirement for control sites (Table 4.2-2; Figure 4.2-1 and Figure 4.2-4).

Water quality will be characterized by monthly water quality sampling conducted at stream sites expected to receive Mine contact water (seepage) or discharge (i.e., discharge point or compliance point) and at one or two sites downstream of the discharge points (i.e., near-field impact sites; Tables 4.2-2 and Table 4.2-3), as well as at control sites. Quarterly sampling of stream water quality at mid-field and far-field impact sites will be completed to capture variability during both the ice-covered season (November and February) and open water season (May and August). Quarterly sampling of lake water quality (open water and littoral zone sites) also will be completed to capture seasonal variability, with samples to be collected in the winter ice-covered season (February), spring and summer open water (May and August), and late fall open water (October or November).

FIGURE 4.2-1 AQUATIC EFFECTS MONITORING PROGRAM (SURFACE WATER, SEDIMENT, AND AQUATIC RESOURCES) SAMPLING LOCATIONS



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DATE: 03/20/2025

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FIGURE 4.2-2 SURFACE WATER DISCHARGE TO DAVIDSON CREEK AND AQUATIC EFFECTS MONITORING PROGRAM (SURFACE WATER, SEDIMENT, AND AQUATIC RESOURCES) SAMPLING LOCATIONS

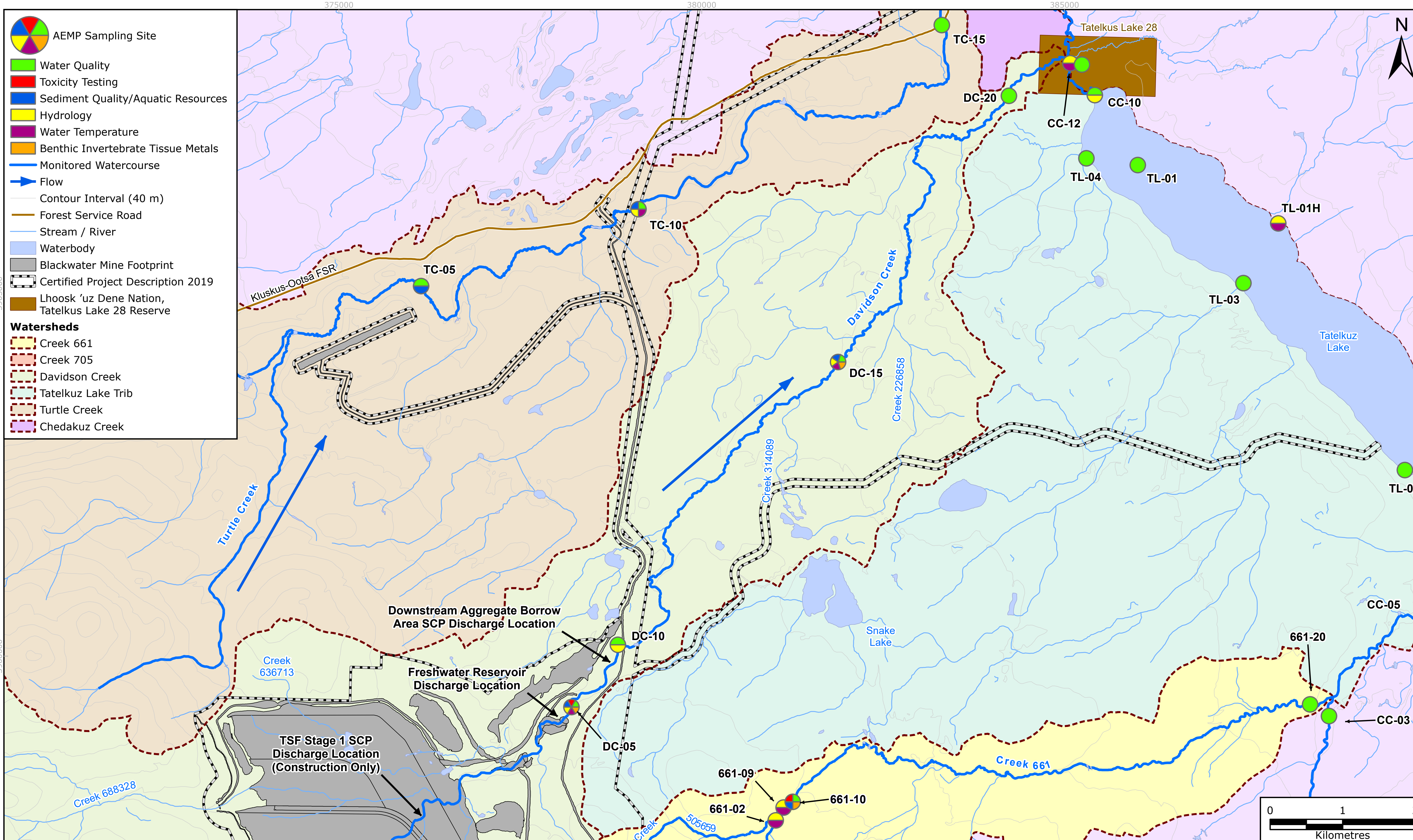
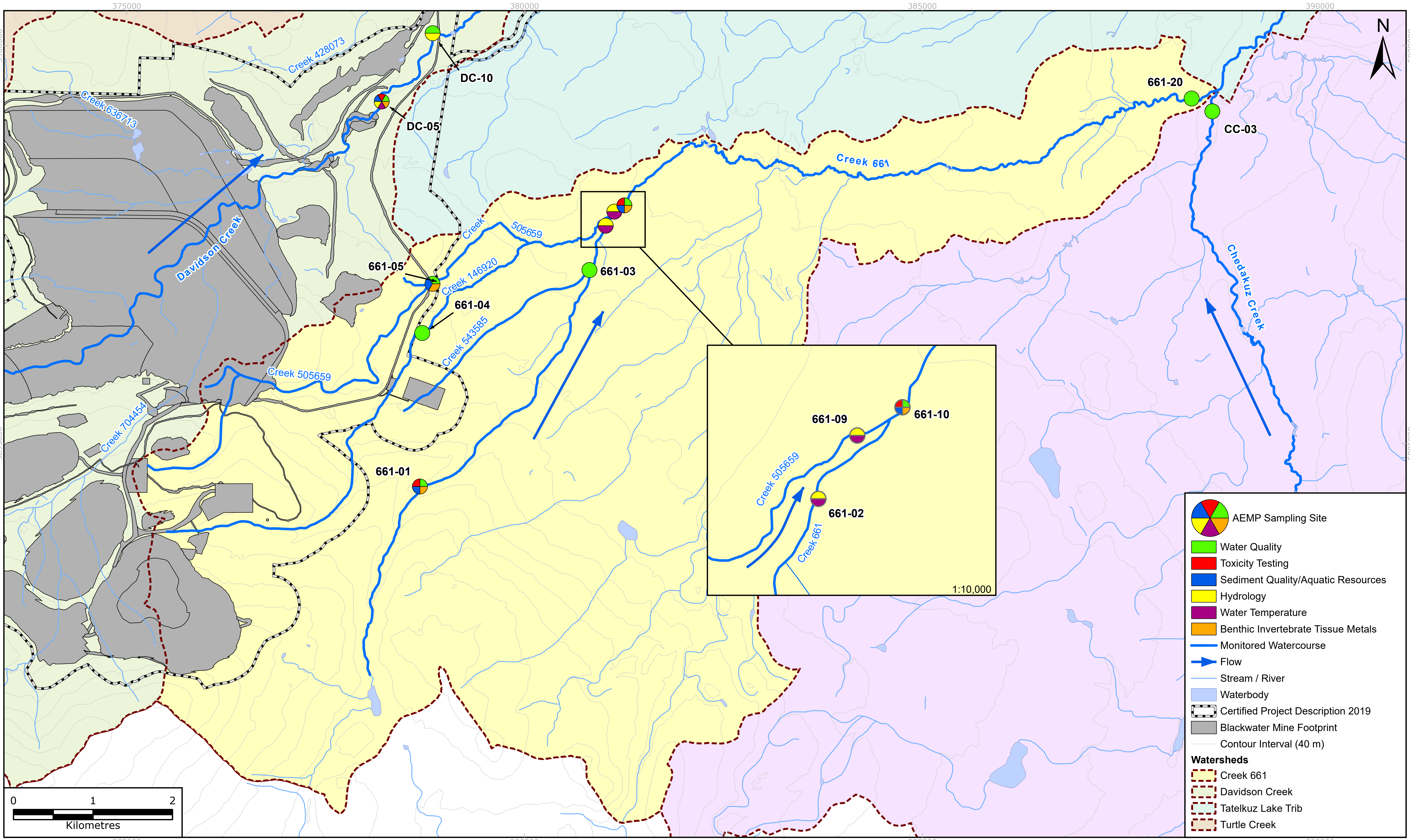


FIGURE 4.2-3 SURFACE WATER DISCHARGE TO CREEK 661 AND AQUATIC EFFECTS MONITORING PROGRAM SAMPLING LOCATIONS



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GIS NUMBER: BLW-10-089-04

DATE: 03/20/2025

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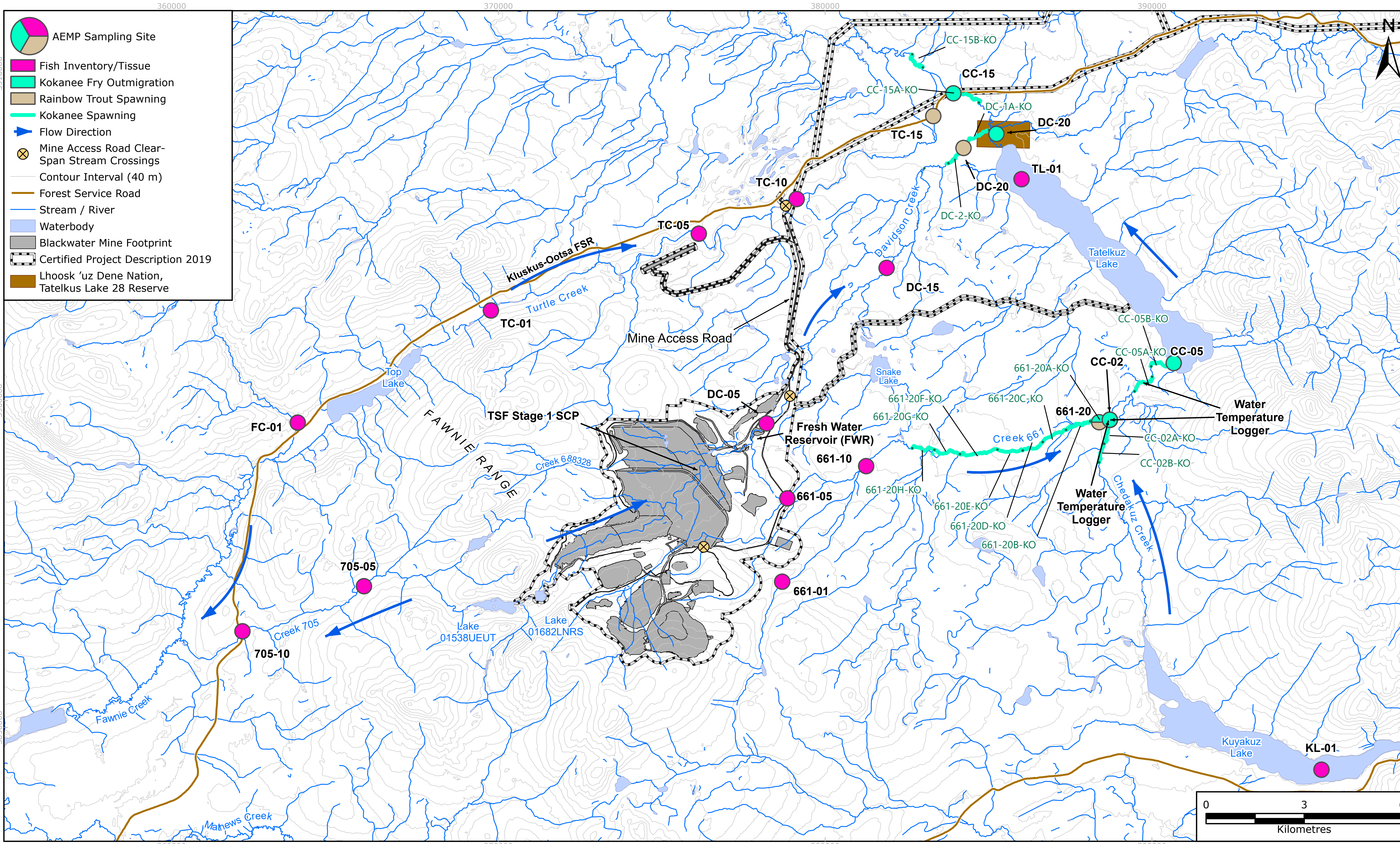
FIGURE 4.2-4 AQUATIC EFFECTS MONITORING PROGRAM FISHERIES SAMPLING LOCATIONS



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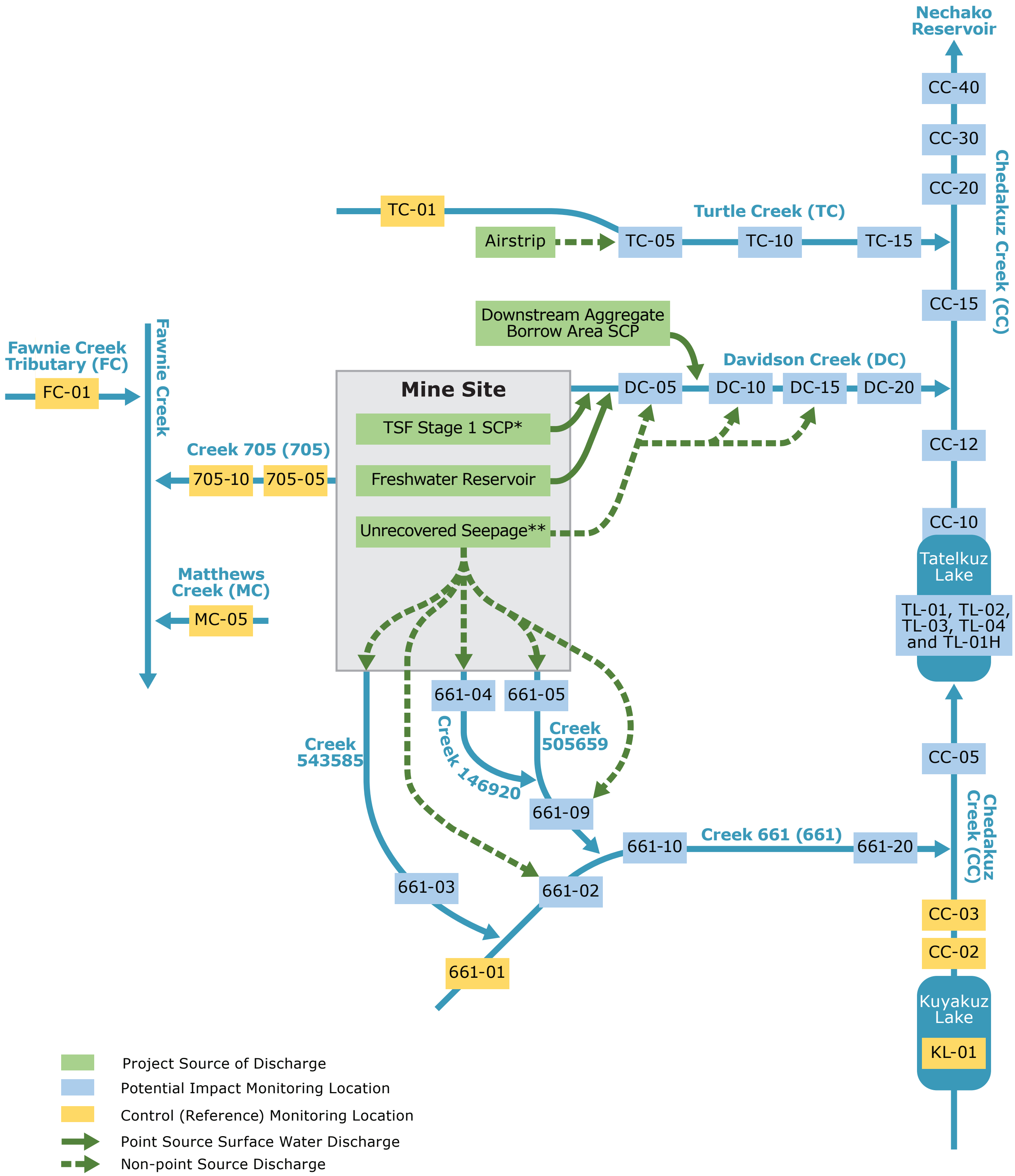
CLIENT: BW Gold LTD.
GIS NUMBER: BLW-10-089-05

DATE: 03/24/2025

PROJECTION: NAD 1983 UTM Zone 10N
SCALE: 1:110,000 when printed at 11x17

FIGURE 4.2-5 CONCEPTUAL FLOW DIAGRAM OF BLACKWATER MINE DISCHARGES AND AQUATIC EFFECTS MONITORING PROGRAM MONITORING LOCATIONS



Notes: Flow diagram representative of Construction and Operations phases and relative distances are not to scale (i.e., the figure is conceptual).
TSF = Tailings Storage Facility; SCP = sediment control pond.
**TSF Stage 1 SCP will be present and discharging during Construction phase only.*
***Unrecovered seepage may be from TSF C, Plant Site, or Camp Site.*

ERM

CLIENT: BW Gold LTD.
GRAPHICS NUMBER: BWG-24ERM-017:3

TABLE 4.2-2 AQUATIC EFFECTS MONITORING PROGRAM STREAM AND LAKE SAMPLING SCHEME

Watershed	Site ID	Hydrology[1]	Water Temperature	Water Quality			Chronic Toxicity Testing	Fish Spawning or Outmigration Survey			Sediment Quality	Aquatic Resources[4]	Benthic Invertebrate Tissue Metals	Fish Inventory and Tissue Metals
				Monthly	Quarterly	5-in-30[2]		Rainbow Trout Spawning	Kokanee Summer Spawning[3]	Kokanee Fry Spring Outmigration				
Streams														
Davidson Creek	DC-05	✓	✓	✓	-	✓	✓	-	-	-	✓	✓	✓	✓
	DC-10	✓ (manual)	-	✓	-	-	-	-	-	-	-	-	-	-
	DC-15	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓	✓
	DC-20	-	-	✓	-	✓	-	✓	✓	✓	-	-	-	-
Turtle Creek	TC-01	-	-	✓	-	-	-	-	-	-	✓	✓	-	✓
	TC-05	-	-	✓	-	-	-	-	-	-	✓	✓	-	✓
	TC-10	✓	✓	-	✓	-	-	-	-	-	✓	✓	-	✓
	TC-15	-	-	-	✓	-	-	✓	-	-	-	-	-	-
Creek 661–Mainstem	661-01	-	-	✓	-	✓	✓	-	-	-	✓	✓	✓	✓
	661-02	✓	✓	-	-	-	-	-	-	-	-	-	-	-
	661-10	-	-	✓	-	✓	✓	-	-	-	✓	✓	✓	✓
	661-20	-	-	-	✓	-	-	✓	✓	✓	-	-	-	-
Tributary of Creek 661–Creek 543585	661-03	-	-	✓	-	-	-	-	-	-	-	-	-	-
Tributary of Creek 661–Creek 146920	661-04	-	-	✓	-	-	-	-	-	-	-	-	-	-
Tributary of Creek 661–Creek 505659	661-05	-	-	✓	-	-	-	-	-	-	✓	✓	✓	✓
	661-09	✓	✓	-	-	-	-	-	-	-	-	-	-	-
Chedakuz Creek	CC-02	-	-	-	-	-	-	-	✓	✓	-	-	-	-
	CC-03	-	-	✓	-	✓	-	-	-	-	-	-	-	-
	CC-05	-	-	-	✓	-	-	-	✓	✓	-	-	-	-
	CC-10	✓ (manual)	-	-	✓	-	-	-	-	-	-	-	-	-
	CC-12	✓	✓	-	-	-	-	-	-	-	-	-	-	-
	CC-15	✓	✓	✓	-	✓	-	-	✓	✓	-	-	-	-
	CC-20	-	-	✓	-	✓	-	-	-	-	-	-	-	-
	CC-30	✓ (manual)	-	-	✓	-	-	-	-	-	-	-	-	-
	CC-40	✓ (manual)	-	✓	-	✓	-	-	-	-	-	-	-	-

Watershed	Site ID	Hydrology[1]	Water Temperature	Water Quality			Chronic Toxicity Testing	Fish Spawning or Outmigration Survey			Sediment Quality	Aquatic Resources[4]	Benthic Invertebrate Tissue Metals	Fish Inventory and Tissue Metals
				Monthly	Quarterly	5-in-30[2]		Rainbow Trout Spawning	Kokanee Summer Spawning[3]	Kokanee Fry Spring Outmigration				
Streams *(cont'd)*														
Creek 705	705-05	-	-	✓	-	-	-	-	-	-	✓	✓	-	✓
	705-10	✓	✓	✓	-	✓	-	-	-	-	✓	✓	-	✓
Fawnie Creek Tributary	FC-01	-	-	✓	-	✓	✓	-	-	-	✓	✓	✓	✓
Mathews Creek	MC-05	✓	✓	-	-	-	-	-	-	-	-	-	-	-
Lakes														
Kuyakuz Lake	KL-01	–	–	–	✓	–	–	–	–	–	–	–	–	✓
Tatelkuz Lake	TL-01	–	–	–	✓	–	–	–	–	–	–	–	–	✓
	TL-01H	✓ (water level)	✓	–	–	–	–	–	–	–	–	–	–	–
	TL-02	–	–	–	✓	–	–	–	–	–	–	–	–	–
	TL-03	–	–	–	✓	–	–	–	–	–	–	–	–	–
	TL-04	–	–	–	✓	–	–	–	–	–	–	–	–	–

Notes:
Per Appendix B (Receiving Environment Monitoring Program) and Appendix C (Aquatic Effects Monitoring Program) in PE-110652.
Dashes indicate sampling component is not completed at that site.
[1] A continuous hydrology monitoring station will be installed at selected locations unless indicated as manual flow measurements or a water level station at TL-01H (see KP 2024a).
[2] 5-in-30 water sampling refers to the collection of 5 water samples in 30 days during spring freshet and fall rains high flow periods and replaces the monthly or quarterly sample during the month(s) when the 5-in-30 samples are collected.
[3] At each of the site IDs indicated a minimum of two reach/site IDs are surveyed–DC-05 (Reach ID DC-1A and DC-3), 661-20 (Reach ID 661-20A, 661-20B, 661-20C, 661-20D, 661-20E, 661-20F, 661-20G, and 661-20H), CC-02 (Reach ID CC-02A and CC-02B), CC-05 (Reach ID CC-05A and CC-05B), and CC-15 (Reach ID CC-15A and CC-15B) (Section 4.8.2).
[4] Aquatic resources include primary producer sampling (biomass and taxonomy, Section 4.6), and benthic invertebrate sampling (abundance and CABIN/taxonomy, Section 4.7).

TABLE 4.2-3 AEMP SAMPLING FREQUENCY AND REPLICATION

Monitoring Component	Annual Frequency[1]	Monthly Frequency or Time of Year	Replication and Depths at Each Stream/Lake Sampling Event
Streams			
Automated hydrometric stations	Annual	Permanent installation with telemetry allowing real-time data download	n = 1
Manual flow measurements	Annual	Manual flow measurements, minimum of five per year with one winter flow measurement per year	n = 1
Water temperature	Annual	Permanent installation with telemetry allowing real-time data download	n = 1
Water quality	Annual	Monthly	n = 1, plus quality control (QC) samples at 20% of all samples collected within 48 hours of each other[2]
	Annual	Quarterly	n = 1, plus QC samples at 20% of all samples collected within 48 hours of each other[2]
	Annual	5-in-30 samples during freshet and fall rains	n = 5, plus QC samples at 20% of all samples collected within 48 hours of each other[2]
Chronic toxicity testing	Annual for the first three years	Late August–Early September	n = 1
Sediment quality	Annual for the first three years	Late August–Early September	n = 5, plus 10% field duplicate samples
Periphyton biomass and taxonomy	Annual for the first three years	Late August–Early September	n = 5
Benthic invertebrates	CABIN annual for the first three years	Late August–Early September	Abundance, n = 1 Taxonomy, n = 1, plus a duplicate sample
Benthic invertebrate tissue metals	Once per three years	Late August–Early September	n = 5
Fish community–summer inventory of the fish community	Annual for the first three years	After late July or early August	n = 10 rainbow trout per size class
Fish tissue metals	Annual for the first three years	After late July or early August	n = 8 rainbow trout
Fish community–kokanee summer spawning survey	Annual for the first eight years	Mid-July–Late September	Weekly counts

Monitoring Component	Annual Frequency[1]	Monthly Frequency or Time of Year	Replication and Depths at Each Stream/Lake Sampling Event
Streams *(cont'd)*			
Fish community–kokanee fry spring outmigration survey	Annual for the first eight years	Early spring (freshet)	Throughout outmigration period Mark-recapture over multiple two-night sample events during outmigration period
Fish community–rainbow trout spring spawning survey	Annual for the first eight years	Mid-April–Late June	Daily trap checks
Lakes			
Water level	Annual	Permanent installation with telemetry allowing real-time data download	n = 1
Water quality for lake limnetic zone	Annual	Quarterly	n = 3 (surface, mid-depth, and near bottom), plus QC samples at 20% of all samples collected within 48 hours of each other[2]
Water quality for lake littoral zone	Annual	Quarterly	n = 1, plus QC samples at 20% of all samples collected within 48 hours of each other[2]
Fish tissue in Tatelkuz Lake–rainbow trout, mountain whitefish, and Kokanee. Fish tissue in Kuyakuz Lake–rainbow trout and mountain whitefish.	Once per three years	Late August–Early September	n = 8 of each species

[1] Annual frequency during Operations. Changes to frequency will be proposed at the discretion of a Qualified Registered Professional, and a notification to request a proposed reduction in sampling frequency will be provided to BC Ministry of Environment and Climate Change Strategy (BC ENV) and Indigenous groups. Changes in frequency will be implemented upon BC ENV approval (PE-110652 Condition 4.6.6).
[2] Per Condition 4.10.3 of EMA Permit PE-110652.

There will also be 5-in-30 water quality sampling (where 5 water samples are collected in a 30 day period instead of the monthly or quarterly sample) completed once in May/June and once in September/October at a subset of sites to characterize water quality during the most variable periods of the year (freshet and fall rains, when guideline exceedances are most likely to occur). The 5-in-30 sampling will be focused primarily on Davidson Creek and Chedakuz Creek sites (Table 4.2-2).

For sites where surface water quality monitoring data will be used for the purposes of comparison with YDWL standards (i.e., DC-05 in Davidson Creek and CC-15 in Chedakuz Creek), the water quality sampling frequency has been set at monthly with 5-in-30 sampling. For the control site located in upper Chedakuz Creek (CC-03), sampling frequency is also set at monthly with 5-in-30 sampling. For other water quality sampling sites in Chedakuz Creek, the sampling frequency has been set to quarterly.

The AEMP will be conducted annually for most sampling components (Table 4.2-3). However, a decrease in sampling frequency may be proposed (at the discretion of a QRP) by one year after each three-year period in which no effects are identified, to a minimum sampling frequency of once every three years. The selected components proposed for a reduction in frequency are chronic toxicity testing, sediment quality, benthic invertebrate community, and periphyton community. A notification to request the proposed change in monitoring frequency will be provided to BC ENV and Indigenous groups as part of AEMP Plan recommendations in the interpretive report (in accordance with EMA Permit PE-110652 Condition 4.6.6). Rationale for the proposed reduction in frequency will be provided in addition to the supporting statistical analysis of an effect that includes a post-hoc power analysis. The reduction in frequency will be implemented upon approval from BC ENV. Subsequent to the approved reduction in sampling frequency, an increase in sampling frequency may be recommended if effects are identified (as shown in the adaptive management response framework, Section 5.2), up to an annual frequency.

The sampling frequency for benthic invertebrate tissue and lake fish tissue metal analysis will be once every three years during Operations. However, sampling frequency could be decreased to after two successive cycles in which no effects are identified. The reduction in frequency would be proposed with rationale in the interpretive report and provided as AEMP Plan recommendations for review by BC ENV and Indigenous groups. The reduction will be implemented upon approval from BC ENV. Subsequent to the approved reduction in sampling frequency, the frequency will be increased if effects are identified (as shown in the adaptive management response framework, Section 5.2).

The sampling frequency for stream fish tissue metals is annual and could be decreased to a sampling frequency of once every three years if no effects are identified after a three-year period. A notification to request the proposed change in monitoring frequency will be provided along with rationale and supporting statistical analysis (that includes a post-hoc power analysis) to BC ENV and Indigenous groups as part of AEMP Plan recommendations in the interpretive report. The reduction in frequency will be implemented upon approval from BC ENV. The once every three years sampling frequency is consistent with those used by other mining projects in BC and are consistent with the fish tissue sampling requirements under the MDMER. The sampling frequency will minimize the potential for causing adverse effects to fish populations due to the monitoring program (i.e., cumulative loss of individuals from the populations through lethal sampling). The adaptive management framework for fish tissue (Section 5.2.5) also allows for additional sampling to be added or adjusted, both in terms of sampling frequency and sampling sites, when warranted to identify magnitude, spatial extent, or reversibility of observed Mine-related effects.

Rainbow trout spawning surveys, Kokanee spawning surveys, and fry outmigration surveys will be completed on an annual basis (Table 4.2-3) for at minimum the first eight years of Operations, to ensure that two complete Kokanee cohort generations are assessed. Beyond the eight-year mark, spawning survey frequency could be reduced to once every two years, if no trend (changes) in fish spawning or outmigration is observed and upon approval by BC ENV. Spawning substrate composition will be characterized once every three years during operations starting on the first year, with a framework to decrease the frequency if no significant trends are observed over two, three-year monitoring cycles and upon approval by BC ENV. Due to the potential changes in flow regime associated with the Freshwater Supply System, substrate composition within Davidson Creek will be monitored according to the framework described in the 3.14 Follow-Up Program (Palmer 2023a).

4.3 HYDROLOGY

4.3.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Stage is converted to streamflow estimates using an empirical stage-discharge relationship (a rating curve; Table 4.3-1). Temporary or permanent changes in a rating curve can occur when the hydraulic control that defines the rating relationship changes. Rating curves for each station are constructed using rating measurements collected during each year of monitoring in order to assess the overall stability of hydraulic conditions in the channel. Discharge hydrographs will be generated for each hydrology station to assess freshet flows (timing and volume) in addition to flows driven by rainfall events, and flows sustained by groundwater inflows (Table 4.3-1). Annual unit runoff at stations will be assessed within each of the five major catchments:

- Davidson Creek catchment, consisting of DC-05 and DC-15;
- Turtle Creek catchment, consisting of TC-10;
- Creek 661 catchment, consisting of 661-02 and 661-09;
- Chedakuz Creek and Tatelkuz Lake catchments, consisting of CC-10, CC-12 and CC-15; and
- The Creek 705 and Mathews Creek catchments, consisting of 705-10 and MC-05.

TABLE 4.3-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR HYDROLOGY

Measurement Endpoint	Assessment Endpoint
Rating Curve	• Streamflow
Discharge Hydrograph	• Freshet, summer, and winter discharge • Mean month discharge • Annual unit runoff

Manual measurements (five times per year including one winter flow measurement per year) will be completed at DC-10, CC-30, and CC-40.

Potential changes in streamflow were predicted in Davidson Creek, Creek 661, Chedakuz Creek, and Creek 705 as a result of water diversions, alteration of watershed areas (and subsequent runoff volumes), and capture of runoff by various infrastructure components required for the Mine (KP 2022). Thus, IFN have been developed for Davidson Creek to address potential effects on fish and fish habitat, which are defined in the *Fisheries Act* Authorization (FAA) for the Mine. During all phases of the Mine, streamflow will be monitored to maintain the IFN in Davidson Creek as defined by the FAA, as authorized by Fisheries and Oceans Canada (DFO; as per DS Condition 3.8).

4.3.2 SAMPLING SITES AND METHODS

4.3.2.1 AUTOMATED STATIONS

The hydrometric program will consist of automated hydrometric stations at 10 stream sites and one lake site to collect continuous stage data throughout the year (Table 4.2-2 and Table 4.2-3; Figure 4.2-1). The hydrology monitoring stations consist of a pressure transducer installed inside a protective aluminum pipe on the bank of the creek or lake and wired to a telemetry logger in a protective case, which is installed on a nearby tree. The stations are installed year-round to provide continuous data collection. The pressure transducers continuously record water levels at 15-minute intervals.

Site DC-05 (formerly called station H2B) in upper Davidson Creek was installed in February 2018 and is considered the point of compliance at which water flows are expected to meet permit conditions (i.e., Davidson Creek IFN). This station will be an eventual replacement for the former H2, which will be removed during the construction of the ECD, as per the 2020 Prefeasibility Design (Artemis 2020).

The AEMP hydrology stations with details on installation dates, sites, and former station names from baseline studies for each of the stations are as follows:

- DC-05 (formerly called station H2B) in upper Davidson Creek: H2B was installed in February 2018 to eventually replace the former H2 site as the point of compliance for IFN.
- DC-10 (no former station, new site) in upper Davidson Creek: manual measurements between hydrology stations to confirm flows for IFN monitoring.
- DC-15 (formerly called station H4B) in middle Davidson Creek: H4B was installed in May 2012 to replace station H4 (decommissioned in 2011 and was located approximately 4 km downstream of H4B).
- TC-10 (formerly called station H6B) in Turtle Creek: H6B was installed in May 2021 to replace station H6 (decommissioned in October 2014, recommissioned in October 2017, and decommissioned again in 2021 due to beaver activity). H6B is located approximately 500 m downstream of the former station H6.
- 661-09 (formerly called station H11): installed on June 12, 2013, in Creek 505659 (at tributary to Creek 661).
- 661-02 (formerly called station H1) in Creek 661: installed in May 2011 at the outlet of a culvert below the Forest Service Road (FSR).
- CC-10 (formerly called station L1-Outlet) at the outlet of Tatelkuz Lake: installed in May 2012 to monitor lake outflow (stage is measured at L1).
- CC-12 (no former station, new site): station was installed in February 2023 to monitor streamflow in Chedakuz Creek between the outlet of Tatelkuz Lake and the confluence with Davidson Creek. The station will remain operational year-round, as the site often experiences open water conditions throughout the winter.

- CC-15 (formerly called station H5) in Chedakuz Creek: installed in April 2011 at the Kluskus FSR crossing. The station will remain operational year-round, as the site often experiences open water conditions throughout the winter.
- CC-30 (no former station, new site) in lower Chedakuz Creek: manual measurements to correspond to the water quality station, approximately midway between the confluence with Davidson Creek and the outlet of Chedakuz Creek at the Nechako Reservoir.
- CC-40 (no former station, new site) in lower Chedakuz Creek: manual measurements to correspond to the water quality station near the outlet of Chedakuz Creek at the Nechako Reservoir.
- 705-10 (formerly called station H7) in Creek 705: installed in May 2012 on Creek 705.
- MC-05 (formerly called station H12) in Mathews Creek: installed in May 2014 on Matthews Creek to monitor streamflow. The station was decommissioned in October 2014 and recommissioned in February 2018.
- TL-01H (formerly station L1) in Tatelkuz Lake: installed in April 2012 to monitor lake levels.

4.3.2.2 MANUAL FLOW MEASUREMENTS

Standard techniques are employed at all hydrometric stations to manually measure streamflow and will follow BW Gold Standard Operating Procedure (SOP) for manual flow measurements. Measurements are manually taken throughout the year to record a range of flows under different flow conditions. At each station, a minimum of five stage-discharge manual measurements (including one winter flow measurement per year) are collected annually at different flow conditions in order to validate developed empirical relationships (rating curves) between water level (stage; h) and streamflow (discharge; Q). Discharge measurements will be collected during the winter months at monitoring stations, where site conditions allow (typically late October to early April). For each station, these rating curves are then used to convert continuous stage data into continuous streamflow and, from this information, specific hydrologic parameters, such as runoff and unit yield, are calculated.

Manual streamflow measurements require either measuring water velocity and depth at intervals along a cross-section of the stream or using dilution techniques. The depth-velocity measurement method uses the cross-sectional area of the stream (m^2) and the velocity of the water (m/s) to compute flow (m^3/s). Dilution techniques calculate flow using a known volume injection (typically salt or Rhodamine WT) and continuously measuring the concentration downstream. Streamflow can be calculated using the measured concentrations data. One of three different techniques will be used to collect discharge measurements:

1. Measurements are collected using a hand-held electromagnetic current meter (Marsh-McBirney FloMate 2000, Hach FH950 Flow Meter, or equivalent). At each gauging location, a minimum of 20 velocity and depth measurements are typically obtained across the stream cross-section. In some cases, during low flow conditions, the channel width may be narrower, and the number of measurements obtained is less than 20. Velocity measurements are collected at 60% of the flow depth, which is generally accepted as representing the mean velocity of the vertical water section (Herschy 2009). When water depths are greater than 0.75 m,

stream velocities are measured at 20% and 80% of the water depth, with the mean of the two readings taken to represent the mean velocity for the vertical. At each vertical water section, a mean velocity is calculated over a measurement time of 40 seconds to represent the flow conditions.

2. If streamflow is too high to allow for safe wading, or conditions are too turbulent, an Acoustic Doppler Current Profiler (ADCP) will be used. This method also makes use of the velocity-area technique. The ADCP is engineered to float on the water surface and is pulled across the channel on a tethered rope. It uses Doppler technology to measure high-resolution depth and velocity data.
3. If an ADCP cannot be used for any reason, an alternate means of measuring streamflow will be employed. For example, the dilution technique may be employed using a Rhodamine WT dye slug injection. Velocity is assessed by measuring the dye concentration as it travels downstream, and a travel time-distance curve can be generated.

During each site visit, the stage will be determined independently of the data logger record either from reference mark observations or by surveying the water level from the station benchmarks. Typically, at least two discharge measurements will be taken during each site visit, and if the stage remained constant throughout the visit, the average of the two discharges will be used in the delineation of the rating curve.

4.3.2.3 BENCHMARKS

Benchmark surveys were conducted during the establishment of each monitoring station and will be done at the start and end of each open water season. For each hydrometric station, the elevation of the pressure transducer is surveyed relative to a local arbitrary datum established through surveying of locally installed benchmarks. The benchmarks and datum are used to maintain elevation control at each station. This allows the accuracy and precision of the transducers to be assessed, for continuity between years of monitoring, and increases simplicity in rating curve development. Surveying the stations relative to local benchmarks also allows the transducers to be moved as required while maintaining accuracy and precision in data collection.

Simultaneous to streamflow measurements, hydrometric levelling surveys will be completed, and the water levels measured by the pressure transducers will be checked and compared to surveyed water levels and the established benchmarks at the site. Surveys are completed using an engineer’s rod and level to check whether any change in the position or drift of the transducer signal has occurred.

4.3.2.4 STAFF GAUGE SURVEYS

A vertical staff gauge can be an alternative or addition to the benchmark survey. The vertical staff gauge is used as a reference gauge to which the pressure transducer is set. The staff gauges are 1 m sections of enameled steel plate accurately graduated to 0.01 of a metre with each decimetre numbered. The gauge is read to the nearest millimeter, if possible, with maximum and minimum values recorded over a 10 second interval to account for high flows, turbulent water, or windy conditions that may cause fluctuations in the water level. The staff gauge is surveyed into the local station datum using the benchmarks as described in Section 4.3.2.3. The staff gauge water level reading is used to correct recorded pressure transducer water level to the local station datum by calculating the difference (offset) in value between staff gauge water level value (corrected to the local datum) and the pressure transducer water level.

4.3.3 QUALITY ASSURANCE AND QUALITY CONTROL

The hydrometric data collected for the Mine will be reviewed by a qualified Hydrometric Data Reviewer in general accordance with the "Standard Process for Review of Hydrometric Data," as detailed in the *Manual of British Columbia Hydrometric Standards* (RISC 2018). Information regarding all aspects of the Mine hydrometric monitoring field program is currently recorded and documented on KP's FULCRUM online data management system and is reviewed for quality and completeness. Data is available for remote viewing by external agencies at the approval of BW Gold. BW Gold is also in the process of implementing its own data management system in the EQuIS environment and is in the process of integrating historical datasets into the database.

In accordance with the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE 2016a) the following information will be documented as part of the hydrology analysis Quality Assurance and Quality Control (QA/QC):

- Error bounds of instruments, data loggers, conversion factors, rating curves, and other data or equipment, as required;
- Operational limits of sensors (e.g., performance in sub-zero temperatures);
- Sensor drift and correction procedures;
- Benchmark surveys and shift corrections;
- Sensitivity analyses;
- Chronological record of field visits, maintenance, and calibration programs; and
- Whether discharge data have been estimated by extrapolating beyond measured discharge on the rating curve (may introduce error at the low and high ends of the curve).

Uncertainty exists in the measurement of both water level and discharge recorded as part of a hydrometric program. Water level uncertainty primarily arises from wave action above the water level sensor and is positively correlated to the magnitude of discharge (e.g., larger water level uncertainties exist at higher flows). Uncertainties may also arise from other factors such as winter conditions and beaver activity. An estimate of the variability in the true water level will be recorded during each site visit to document this uncertainty. This estimate is determined during the reading of the water level from the reference mark or during a benchmark survey and will be considered when determining the rating curve for each station.

Uncertainty in the manual discharge measurements will also be recorded during each site visit when discharge was recorded. Discharge uncertainty is estimated based on the characteristics of the measurement cross-section, the percent discharge recorded in each flow column, and the variability in calculated discharge between multiple measurements recorded during a single site visit. Discharge uncertainty will be presented graphically as error bounds on the rating curve figures.

The water level sensors installed for the Mine will operate in a water depth up to 4 m and in temperatures ranging from 0 ºC to 50 ºC. Considering that air temperatures routinely drop below -5 ºC during the winter and that freezing of the sensor could cause pressures to exceed pressures equivalent to 4 m of water depth, the sensors are removed from stations that are likely to have very low flows during the winter months or are winterized to prevent freezing.

Sensor drift refers to the ability of electronic sensors to “drift” out of calibration. Sensor drift will be monitored at the Mine stations by tracking the offset between gauge height determined from reading a staff gauge or reference mark and the water level recorded by the sensor. If the staff gauge or reference mark is determined to be stable over time (by conducting periodic benchmark surveys), and the relationship between gauge height and water depth measurement is found to linearly increase or decrease over time, the cause would most often be sensor drift.

4.3.4 DATA ANALYSIS

4.3.4.1 RATING CURVES

A rating curve describes the relationship between water level (stage) and discharge at a single location in a stream. A rating curve will be developed at each monitoring station and is then applied to the respective continuous water level record to derive a continuous streamflow record for each station. The stage-discharge rating curves are represented by an equation, or series of equations, of the form:

$$Q = C\ x\ (Stage - A)^n$$

where Q is the discharge in cubic meters per second (m^3/s), C is a curve coefficient, *Stage* is the height of the water surface above an arbitrary site datum, A is an offset (frequently given as the stage of zero flow), and n is a curve exponent.

Each rating curve will be matched to the measured data by manually fitting ‘visual-best-fit’ lines to the calibration data, with consideration of the physical conditions at each site and with the objective of minimizing the difference between the rating curve predicted discharges and the measured discharges. The hydraulic characteristics of the control section are also considered during the delineation of the rating curves. The basic form of the rating curve equation is based on general hydraulic theory pertaining to open channel flow, and the values of the coefficient and exponent are dependent on the hydraulic characteristics of the control section at the gauge, which provides a means of checking the validity of the derived equation (Maidment 1993).

4.3.4.2 MEASURED DISCHARGE RECORDS

Measured discharge records will be developed for each hydrology station by applying the rating curves to their respective stage records. Prior to the application of the rating curves, the water level data are corrected to the station datum for all data collected during open water conditions, when the stage-discharge relationship was not altered by transient effects such as icing of the channel. The offset for water levels is based on the benchmark surveys completed throughout the period of record and the corrected water level data are referred to as stage data. Periods with erroneous water level data that could be due to ice effects, instrumentation malfunction, and sensor or clock drift, will be reviewed and corrected or removed from the data sets. Water level to stage corrections is calculated using the Aquarius™ or equivalent time series software, which allows for advanced data correction and correction tracking. Average daily discharge values are derived from the 15-minute record to produce daily discharge records for each station.

4.3.4.3 ESTIMATED WINTER STREAMFLOW

Winter discharge is typically very low due to cold temperatures and freezing conditions. Measurements that are affected by ice are not used for rating curve development but are used to characterize winter streamflow. Estimated winter flow values are calculated using linear interpolation between winter discharge measurements to infill the gap between individual measurements. These estimated flows will be calculated when a sufficient number of measurements are made during a short period to estimate the hydrograph shape with some certainty. Winter flows are typically steady as they are primarily based on groundwater contribution and it is, therefore, reasonable for them to be predicted in this manner. The estimated winter discharge values will be added to the discharge records for each station.

4.3.4.4 MEAN MONTHLY DISCHARGE

Mean monthly discharge will be calculated for stations at which there are a minimum of 20 days of discharge data during the month.

4.4 SURFACE WATER

4.4.1 SURFACE WATER TEMPERATURE

4.4.1.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Surface water temperature is an important characteristic of fish habitat. Temperature affects both the chemical and biological characteristics of surface water. It affects the dissolved oxygen concentrations of water, metabolic rates of aquatic organisms, and the sensitivity of these organisms to pollution, parasites, and disease.

Surface water temperature records will be developed for each of the temperature stations using the continuous monitoring data from each site and the in-situ measurements recorded to verify recorded temperatures (Table 4.4-1).

TABLE 4.4-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR SURFACE WATER TEMPERATURE

Measurement Endpoint	Assessment Endpoint
Surface water temperature–continuous	• Station trends will be compared within creeks and to baseline trends • Before-after-control-impact analysis

The *Fisheries Act* Authorization Application submitted in May 2022 (Palmer 2022a) indicated that there will be changes in water temperature in Davidson Creek as a result of flow augmentation from the FWR. Thus, a spatial comparison of average daily water temperatures at dedicated water temperature stations along Davidson Creek will be completed annually during FWR discharge along with a comparison to baseline trends.

Water temperatures in Davidson Creek will be maintained in accordance with DS Condition 3.9, unless otherwise authorized by DFO.

4.4.1.2 SAMPLING SITES AND METHODS

Water temperature monitoring will be conducted at hydrometric stations where the installed continuous monitoring hydrology station also collects water temperatures (Table 4.2-2).

4.4.1.3 QUALITY ASSURANCE AND QUALITY CONTROL

All temperature data will be reviewed for erroneous readings, which can often occur when the temperatures have logged prior to the time that the sensor was installed. At most sites, sensors will be removed during the winter season to prevent damage and replaced prior to the onset of freshet.

In situ water temperature will be measured on a regular basis at each station using a YSI Pro Plus multiparameter probe or equivalent to verify sensor temperature readings. If the average differences between the in-situ measurements and the logged data are within ± 0.5 ºC, the recorded data are not corrected (this value is based on analysis of 2015 to 2020 water temperature data indicating that the differences between the *in situ* measurements and the logged data were typically within ± 0.5 ºC; see ERM 2023b).

4.4.1.4 DATA ANALYSIS

Annual water temperature records will be compiled and graphically presented to examine seasonal trends relative to baseline conditions. Comparison to the nearest hydrology station discharge record will also be completed using graphical analysis to determine if trends are related to water flows and depth.

To assess if Davidson Creek water temperature changes may be related to the discharge from the FWR a Before-After-Control-Impact (BACI) analysis will be completed (Table 4.4-1). The BACI is a standard method used to assess an environmental impact. The BACI analysis compares a before-after trend apparent at the potential impact sites with that at the corresponding control site, to see if the trends are parallel and, thus, attributable to a natural process. A significant interaction for the *class* (impact versus control) and *period* (before versus after) will be used to determine if a significant change in temperature has occurred.

It is hypothesized that if mine activities affected temperatures in surface water, then there would be a significant change in water temperature at near-field sites in comparison with site-specific baseline water temperatures or control sites. However, if a change in the trend is detected by the before-after comparison but the BACI analysis indicates that a parallel change also occurred at the control site (control versus impact), it is reasonable to conclude that this change could be a natural phenomenon or unrelated to the Mine activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites or the control site, it is reasonable to conclude that this change is likely the result of non-Mine activities (e.g., forestry or agricultural activities downstream of the Mine and upstream of the sampling location).

4.4.2 SURFACE WATER QUALITY

4.4.2.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Surface water quality samples will be collected at sites downstream from the mine site and at control sites, as indicated in Table 4.2-1 and Table 4.2-2, at the frequencies identified in Table 4.2-3. Surface water quality will be evaluated with one or more assessment endpoints including graphical analysis, reference ranges, and BACI analysis (Table 4.4-2). Comparison to the most current water quality guidelines for the protection of freshwater aquatic life (BC WLRS 2025a, 2025b; CCME 2025a or updated), approved Science-based Environmental Benchmarks (SBEBs; BC ENV 2023a) and the proposed YDWL water quality standards at sites DC-05 and CC-15 will also be completed for applicable water quality parameters (Table 4.4-2).

TABLE 4.4-2 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR SURFACE WATER QUALITY

Measurement Endpoint	Assessment Endpoint
Surface water quality parameters	• Graphical comparison to baseline data • Comparison to baseline reference ranges[1] • Before-after-control-impact (BACI) analysis[2] • Comparison to water quality model predictions • Comparison to BC or CCME Water Quality Guidelines (BC WLRS 2025a, 2025b; CCME 2025a or updated), approved Science-Based Environmental Benchmarks (BC ENV 2023a), and proposed Yinka Dene Water Law water quality standards

[1] For in situ water quality parameters: pH, temperature, turbidity (stream sites and lake sites TL-02, TL-03, and TL-04), conductivity, and dissolved oxygen.
[2] For water quality parameters analyzed at the laboratory: total suspended solids; total dissolved solids; pH; alkalinity; total phosphorus; ammonia-N; nitrate-N; nitrite-N; chloride; fluoride; sulphate; cyanide (total and weak acid dissociable); total metals including aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, and zinc; and dissolved metals including aluminum, cadmium, calcium, copper iron, manganese, and zinc.

4.4.2.2 SAMPLING SITES AND METHODS

Field Methods

Stream sampling will be completed at water quality sites identified in Table 4.2-2 and Figure 4.2-1. Generally, sampling will be conducted monthly at sites closest to the mine site and quarterly at sites further away from the mine site. In addition, 5-in-30 sampling will be completed at a subset of sites in place of the monthly or quarterly samples in spring freshet and fall rains. Water sampling will also be completed to align with sediment quality and biological sampling, at the same sites and timing (Table 4.2-2 and Table 4.2-3). Sampling methods will follow best practices as outlined in *British Columbia Field Sampling Manual* (BC MWLAP 2013) and the BW Gold SOP for surface water quality sampling[4].

Two lakes will be sampled (Tatelkuz Lake and Kuyakuz Lake; Table 4.2-2; Figure 4.2-1) following best practices (BC MWLAP 2013) and the BW Gold SOP for surface water sampling. For lake water quality samples, discrete samples will be collected at three depths (hypolimnion, metalimnion, and epilimnion) in the water column. The sampling site for Tatelkuz Lake (TL-01) is at the same location as

[4] Standard Operating Procedures (SOPs) were provided in previous drafts of this AEMP Plan for permitting and reviewing purposes. All SOPs are managed on site by the Project team and may be subject to more frequent revisions than the management plan to adapt to changing needs at site. However, the SOPs will continue to be aligned with and governed by the mitigations in the management plan.

was used in baseline sampling between 2011 and 2022 (originally WQ-21 site). However, the Kuyakuz Lake sampling location (KL-01) was moved in 2021 away from the outlet (original WQ-20 shallow site used in 2012-2013 baseline sampling) to a deeper location to increase the depth available for profiles and water quality sampling.

In situ measures of pH, temperature, turbidity, conductivity, and dissolved oxygen will be measured at each stream site and lake sites TL 02, TL-03, and TL 04. Depth profiles of physical parameters of pH, temperature, conductivity, and dissolved oxygen will be completed at approximately 1 m intervals at TL-01 and KL-01. *In situ* water measures will be completed using a calibrated multiparameter meter (e.g., YSI Professional Plus or similar equipment).

All samples will be field filtered and/or preserved in the field according to the analytical laboratory protocols. Samples will be stored in coolers on ice and/or refrigerated until shipped to a Canadian Association for Laboratory Accreditation (CALA) certified laboratory for analysis.

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 CALA certified laboratory. The water quality parameters will be analyzed using standard methodologies, as recommended in BC MOE (2016a). Targeted detection limits for parameters will be at least 10 times lower than water quality guidelines or standards, where available, consistent with recommendations in BC MOE (2016a). Parameters to be analyzed by the laboratory are provided in Table 4.4-3.

TABLE 4.4-3 ANALYZED WATER QUALITY PARAMETERS

Physical Parameters and Dissolved Anions	Nutrients/Cyanides/ Organic Carbon	Metals (Total and Dissolved)	
• temperature (field) • dissolved oxygen (field) • pH (field and laboratory) • total alkalinity (as $CaCO_3$) • acidity (as $CaCO_3$) • conductivity (field and laboratory) • hardness (as $CaCO_3$) • total dissolved solids • turbidity (field and laboratory) • total suspended solids • bromide • chloride • fluoride • sulphate	• ammonia-N • nitrate-N • nitrite-N • Total Kjeldahl Nitrogen • total phosphorous • ortho-phosphorus • total cyanide • cyanide, weak acid dissociable • thiocyanate • total organic carbon • dissolved organic carbon	• aluminum • antimony • arsenic • barium • beryllium • bismuth • boron • cadmium • calcium • chromium • cobalt • copper • iron • lead • lithium • magnesium	• manganese • mercury • molybdenum • nickel • potassium • selenium • silicon • silver • sodium • strontium • thallium • tin • titanium • uranium • vanadium • zinc

Quality Assurance and Quality Control

The QA/QC principles will follow those outlined in guidance documents throughout the field sample collection and laboratory analysis phases (BC MOE 2016a; Environment Canada 2012a; BC MWLAP 2013; BC ENV 2023b). Standard QA/QC practices to be incorporated include water quality samples will be collected by qualified personnel using suitable sampling equipment; Chain-of-Custody (COC) forms will be used to track the samples; and analyses will be conducted by a CALA certified laboratory.

The QA/QC procedures for measurement of field (*in situ*) parameters include daily calibration of the meter before use, as per the manufacturer's manual and recorded in a calibration log. The meter will be allowed to stabilize before taking each reading and the data will be reviewed for unreasonable values.

In addition, QC samples will be collected and include field blanks, travel blanks, and field duplicates in accordance with EMA Permit PE-110652 Condition 4.10.3 (the number of QC surface water samples should be 20% of all samples collected [environmental + QC samples] within 48 hours of each other). A minimum of one field blank and one travel blank will be collected per sampling event.

Field blanks are empty sample bottles filled with deionised water at randomly selected stations to assess potential contamination from the surrounding environmental conditions (e.g., aerial particulates) and sample handling techniques. Travel blanks are pre-filled by the analytical laboratory and are not opened in the field to assess potential contamination from travel, storage, or from the laboratory handling. Field duplicate samples will be collected in the field at randomly selected stations and submitted to the laboratory to provide an indication of the variability inherent in field sampling (i.e., environmental heterogeneity). Equipment blanks are sample bottles filled with deionised water collected from the cleaned and rinsed sampler to provide an indication of decontamination or potential contamination from the sampling equipment.

Detected concentrations of water quality parameters (concentrations above the method detection limit [MDL]) will be noted for both travel and field blanks to indicate possible contamination. For each pair of QC field duplicate water samples, the relative percent differences (RPD) will be calculated as:

$$RPD = 100\% \times \left(\frac{|replicate\ 1 - replicate\ 2|}{\frac{replicate\ 1 + replicate\ 2}{2}} \right)$$

The RPD between the field duplicates is a measure of the variability inherent in field sampling (environmental heterogeneity, sampler handling leading to contamination, potential laboratory errors). Water quality parameters where one or both values were less than five times the MDL are not included in the RPD calculations because variability near the MDL is too high (BC MWLAP 2013). The *British Columbia Field Sampling Manual Part A Quality Control and Quality Assurance* (BC MWLAP 2013) recommends that any field duplicates with RPD values exceeding 20% and 50% should be noted and data should be interpreted accordingly.

The results of RPD calculations are examined to detect patterns of high variation for multiple parameters within sample pairs, indicating possible contamination during field sampling.

Both field and water quality observations will be examined for their expected range of values and/or previous results. Based on statistical metrics and professional judgement, outliers indicating an error will be removed. A combination of statistical metrics and/or criteria will be used to identify potential outliers (e.g., data points outside of the 95th or 99th percentile or statistical tests such as the Dixon [1950, 1951] or Rosner [1975, 1983] test) along with graphical analysis (Gilbert 1987). Professional judgement will also be used to determine whether the data are likely to be outliers due to sampling or analysis issues (e.g., unit errors in the laboratory report, sample contamination), or whether the data represent the true extreme of natural or expected conditions (e.g., very high concentrations of total suspended solids and metals that may occur during a natural 1 in 100 storm event). The method for identifying potential outliers and the rationale for excluding or including those data in analysis will be provided in the AEMP Interpretive Report.

Laboratory QA/QC measurements and protocols will be completed to determine and confirm the accuracy, sensitivity, precision, and comparability of the data, as recommended by BC ENV (2023b). This will include the use of method blanks, replicates, laboratory control samples and reference material, and matrix spikes. Method blanks are clean control samples that detect potential contamination during sample preparation and analysis. Laboratory duplicates are field-collected samples split at the laboratory and analyzed separately. These determine the methodological precision. Accuracy will be tested using laboratory control samples, reference materials, and matrix spikes. Laboratory control samples are a clean matrix (i.e., distilled, de-ionized water) spiked with test parameters. Reference materials are samples with a known concentration of a parameter. Matrix spikes are field-collected samples that are spiked with test analytes. Anomalous results (for example, detected concentrations in the blanks) will be verified by the laboratory with repeated analysis.

4.4.2.3 DATA ANALYSIS

Data analysis and reporting will focus on the POPCs in untreated effluent and POCs in the receiving environment for the Mine (see Section 3.2). The POPCs in untreated effluent included ammonia-N, nitrate-N, nitrite-N, sulphate, dissolved aluminum, antimony, arsenic, beryllium, dissolved cadmium, dissolved copper, cobalt, chromium, dissolved iron, mercury, manganese, nickel, lead, silver, and zinc (Section 3.2). Dissolved aluminum, nitrogen forms (nitrate-N, nitrite-N, ammonia-N), total phosphorus, and TDS were the water quality parameters identified as the Mine-related POCs in the receiving environment (Section 3.2). The CSM also recommended the inclusion of total mercury in monitoring due to uncertainties in the geochemical source terms used in water quality predictions (Section 3.2.3). 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 quality will include constituents with the most current BC WQG-AL (BC WLRS 2025a, 2025b, or updated), federal WQG-AL (CCME 2025a), approved SBEBs (BC ENV 2023a), or YDWL water quality standards (Table 4.4-2). A dissolved aluminum SBEB has been approved for Davidson Creek sites (DC-05, DC-10, DC-15, and DC-20) that is based on the background method (BC ENV 2023a). No Mine-related effects to aquatic biota would be expected if the future concentrations of dissolved aluminum remain below the SBEB. The dissolved aluminum SBEB will be used as the applicable benchmark in place of the BC WQG-AL.

Site-specific YDWL standards were proposed using the guidance within the Yinka Dene 'Uza'hné Surface Water Guide to Surface Water Quality Standards for two sites DC-05 (in Davidson Creek) and CC-15 (in Chedakuz Creek) (Nadleh Whut'en and Stellat'en 2016b; Artemis Gold 2023). The YDWL standards were develop based on a water classification system developed by Nadleh Whut'en and Stellat'en that provides a systematic basis for classifying receiving water bodies relative to their importance and sensitivity to disturbance (Nadleh Whut'en and Stellat'en 2016a). Each numerical water quality standard is developed using the procedures appropriate for the water body under consideration. For example, Class II (sensitive waters) have standards that allocate no more than 50% of the assimilative capacity of receiving waters (Nadleh Whut'en and Stellat'en 2016b).

For the purpose of data analysis and presentation, if a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). Field duplicates will be treated as one sample represented by the average concentration of the duplicate samples. Weekly samples collected in one month (from 5-in-30 sampling) will be treated as one sample as a monthly mean concentration.

Graphical Analysis

All field and laboratory analyzed water quality parameters will be graphically presented as monthly means (and standard error if field duplicates or 5-in-30 sampling has been completed) to assess visual annual and seasonal trends in water quality and support statistical analysis. For all parameters and seasons the concentrations measured at WQ-10 were similar to DC-05 suggesting that observations at this site can be used for the purpose of evaluating baseline conditions at DC-05 and will be included in graphical analysis (ERM 2023b).

Assessment of Field Water Quality Parameters

Potential effects on field pH, temperature, turbidity (stream sites and lake sites TL-02, TL-03, and TL 04), conductivity, and dissolved oxygen as a result of the Mine will be assessed by graphical analysis for comparison to reference ranges (Table 4.4-2). Reference ranges were calculated in ERM (2023b) and are defined as the 5th to 95th percentile concentrations of data collected prior to the beginning of early works construction initiated at the end of September 2022. Field turbidity has not been measured prior to 2023; therefore, observations will be compared to control sites.

Before-After-Control-Impact Statistical Analysis

To assess the Mine-related effects on surface water quality, a BACI analysis will be completed (Table 4.4-2). Analysis will be performed using the most recent R statistical computing package (e.g., R Core Team 2024), or equivalent. Data transformations (e.g., log transformation) will be completed, if determined to be appropriate (e.g., to achieve random distribution of residuals).

For all effects analyses, statistical results are considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical MDLs (i.e., highly censored data).

The BACI analysis introduces a class effect to a mixed model analysis of variance (ANOVA), which is based on the classification of a site as an impact or a control site. For the purpose of this analysis, impact sites are identified in Table 4.2-1 for each watershed. Regional control sites and upstream sites identified in Table 4.2-1 will serve as the control sites in the BACI analysis. Kuyakuz Lake will act as a control site for the assessment of the Mine-related effects in Tatelkuz Lake. To identify the sites and months that differ significantly, the mixed model ANOVA will also include the fixed effects of period (before versus after), and a random effect of year and month to account for variability in water quality data. Surface water quality baseline observations have been collected since 2011 (ERM 2023b). However, a comparison of the water quality collected prior to 2016 (analyzed by AMEC laboratory), and water quality collected between 2016 and 2022 (analyzed by ALS) suggested there were differences between the laboratories for reported concentrations (ERM 2023b). Therefore, for the period effect, data will be grouped into one of two periods: before the start of early works construction (2016 to September 2022) or after the start of early works construction (October 2022 onwards).

A significant interaction between the (time) period and class effects reveals whether any before (baseline) - after (Construction or Operations phases) change in the mean parameter concentration that occurred in the exposure site has not occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than the significance level (α) of 0.05) will be assessed using an F-test. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction will be applied. An appropriate non-parametric test will be considered in the case that parametric tests (ANOVA) are not suitable for the monitoring component.

It is hypothesized that if mine activities affected surface water quality, then there would be a significant change in surface water quality at near-field impact sites in comparison with baseline concentrations or control sites. However, if a change in the mean is detected by the before-after comparison but the BACI analysis indicates that a parallel change also occurred at the control site (control versus impact), it is reasonable to conclude that this change is likely a natural phenomenon or unrelated to the Mine activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites or the control site, it is reasonable to conclude that this change is likely the result of non-Mine activities (e.g., forestry or agricultural activities downstream of the Mine and upstream of the sampling location).

A precautionary approach will be used to determine if an effect is attributable to Mine activities in cases of unexplained significant interactions using professional judgement, additional sampling, and/or field data to confirm significantly elevated or lower concentrations.

Comparison to Concentrations Predicted by Water Quality Modelling

Observations from the receiving environment monitoring sampling locations that were included as modelling nodes in the surface water quality predictive model will also be used to evaluate the assumptions integrated into the model (i.e., comparison of measured concentrations to modelled predictions). Monitoring locations that were also model nodes include (model node names in brackets): DC-05 (WQ28), DC10 (WQ27), DC-15 (WQ26), and DC-20 (WQ7) in Davidson Creek; 661-05 (WQ3), 661-10 (WQ5) and 661-20 (WQCreek661) in Creek 661; and CC-10 (WQ8), CC-15 (WQ9), and CC-20 (WQ13) in Chedakuz Creek.

Comparison of measured concentrations to water quality model predictions will be completed as part of the adaptive management response framework for surface water quality described in Section 5.2.1. Comparison of measured and predicted concentrations is also required per EMA Permit PE-110652 Condition 5.3.3 (iv) and expected as part of Annual Reporting under the EMA Waste Discharge Authorization for effluent (BC MOE 2016b). Where the surface water quality model is found to over-predict or under-predict concentrations of parameters at a particular site, additional evaluation will be completed to identify if adjustments to the model are required. Over time, incorporation of additional Mine-specific information and site understanding will result in the refinement of the water quality model to improve the accuracy of future predictions.

Comparison to Water Quality Guidelines for the Protection of Aquatic Life

Surface water quality for parameters with guidelines will be compared to the most current BC (e.g., BC WLRS 2025a, 2025b) or federal (e.g., CCME 2025a) WQG-AL (Table 4.4-2) or approved SBEBs (BC ENV 2023a). Comparisons of measured parameter concentrations to WQG-AL follows the hierarchy provided in *Technical Guidance 4: Annual Reporting under the Environmental Management Act* (BC MOE 2016b), with WQG-AL applied in the following order:

1. Use the most current BC Approved Water Quality Guideline (BC WLRS 2025a or updated) or approved SBEBs (BC ENV 2023a).
2. If no approved WQG-AL are available, use the most current Working Water Quality Guideline for British Columbia (BC WLRS 2025b or updated).
3. If neither of these has yet been established, use the most current guideline provided by the CCME (2025a or updated).

Parameter concentrations that are less than the MDL but greater than the applicable WQG-AL will be noted but excluded from WQG-AL exceedance calculations. For pH-, hardness-, DOC-, and chloride-dependent WQG-AL, the sample-specific hardness, pH, DOC, or chloride values will be used to calculate the WQG-AL.

Long-term average ("chronic") WQG-AL will be used for initial comparisons. Long-term WQG-AL are the most conservative; consequently, if no exceedances of long-term guidelines are identified for a parameter, no further investigation is necessary. If exceedances of the chronic WQG-AL are noted, concentrations will also be compared to the short-term ("maximum") WQG-AL, where available. Comparisons to the WQG-AL will be done for each sample or for the average of the five weekly (5-in-30) samples, as recommended by BC MOE (2016c).

Guideline exceedances calculated for each month the site was sampled and characterized using the magnitude (factor) of exceedance (i.e., by how much the WQG-AL is exceeded, calculated from the average of parameter concentration, from the subset of concentrations greater than the WQG-AL divided by the WQG-AL).

4.4.3 CHRONIC TOXICITY TESTING

4.4.3.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Surface water toxicity testing as chronic or sublethal toxicity testing will be assessed based on the calculation of the LC_x (lethal concentration that causes mortality in x% of test organisms), the EC_x (effect concentration that causes effects in x% of test organisms), or the IC_x (concentration that results in inhibition in x% of the test organisms) as shown in Table 4.4-4. The "x" is defined by the standardized Environment Canada methodologies (see Section 4.4.3.2).

TABLE 4.4-4 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR SURFACE WATER TOXICITY

Measurement Endpoint	Assessment Endpoint
Surface water toxicity testing (growth, reproduction, or survival)	• Calculation of LC_x, EC_x or IC_x[1]

Notes:
LC= Lethal Concentration; EC = Effective Concentration; IC = Inhibition Concentration
[1] Test species for fish species: fathead minnow or rainbow trout; invertebrate species: *Ceriodaphnia dubia;* plant species: *Lemna minor*; and an algal species.

Chronic toxicity testing will be conducted using the following test methodologies, as defined in Schedule 5 (Environmental Effects Monitoring Studies) of the MDMER (Table 4.4-4):

- Fish species will be assessed using the Biological Test Method: *Toxicity Tests Using Early Life Stages of Salmonid Fish (Rainbow Trout)* (Environment Canada 1998);
- Invertebrate species will be assessed using Biological Test Method: *Test of Reproduction and Survival Using the Cladoceran* Ceriodaphnia dubia (Environment Canada 2007a);
- An algal species will be assessed using Biological Test Method: *Growth Inhibition Test Using a Freshwater Alga* (Environment Canada 2007b); and
- Plant species will be assessed using Biological Test Method: *Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte*, Lemna minor (Environment Canada 2007c).

Surface water will be collected at two near-field sampling sites downstream from the mine site (DC-05 in Davidson Creek and 661-10 in Creek 661) and at two control sites (FC-01 in Fawnie Creek and 661-01 in Creek 661) for the purpose of chronic toxicity testing (Table 4.2-2 and Figure 4.2-1). Surface water toxicity testing sampling must be co-collected with a sample for water quality analysis. This co-collection of samples is critical to the interpretation of the toxicity test results in the event that the water causes adverse effects on laboratory organisms in the toxicity test. Samples for toxicity testing should also be collected during the same time of year as sampling under the AEMP for other biota (e.g., sediment quality, primary producers, invertebrates), typically in late August or early September.

4.4.3.2 DATA ANALYSIS

At the end of each laboratory-based test, the endpoint (e.g., growth, reproduction, or survival) is evaluated statistically to determine the LC_x (mortality), EC_x (e.g., reproduction, growth), or IC_x (inhibition of growth or reproduction).

The toxicity testing is based on a dilution series where the surface water sample is diluted in the laboratory and effects on exposed organisms are measured over time. The LC_x, EC_x, or IC_x concentration will be reported based on the dilution of water associated with the effect (i.e., concentrations reported in percent volume/volume, % v/v). When the undiluted water has no effect, the LC_x, EC_x, or IC_x is reported as greater than 100% v/v. These metrics are calculated by the laboratory using standard software and accepted methods (Environment Canada 1998, 2007a, 2007b, 2007c), and are typically reported with confidence intervals around the LC_x, EC_x, or IC_x.

Where the LC_x, EC_x, or IC_x is less than 100% v/v, it indicates that the tested sample can cause adverse effects to laboratory organisms and suggests that there is potential for toxicity to occur in the source waters. However, effects in a laboratory-based toxicity test does not necessarily mean that adverse effects will occur in source waters, as the types of organisms used in the tests may not fully represent those in the source waters (e.g., organisms in the source waters may have adapted to the conditions in ways that laboratory organisms are not). It is not unusual to find that natural, non-impacted surface waters (e.g., controls sites) can cause adverse effects (an LC_x, EC_x, or IC_x of less than 100% v/v) in laboratory organisms.

Results of the surface water toxicity testing will be interpreted based on a comparison between control and impact (downstream of the mine site) sites, as well as considering results of the co-collected water quality data. Results of effluent characterization at the final discharge point under Schedule 5 of the MDMER (i.e., analysis of effluent using the same tests listed in Section 4.4.3.2, as described in the MSDP) should also be considered in the interpretation of results of receiving environment surface water toxicity testing.

Results of the toxicity testing are intended to be a supplemental line of evidence to other data collected under the AEMP and will not be used alone to identify the Mine-related effects in the receiving environment.

4.5 SEDIMENT

4.5.1 SEDIMENT QUALITY

4.5.1.1 MEASUREMENT ASSESSMENT ENDPOINTS

Sediment quality samples will be collected at sites downstream from the mine site and control sites, as indicated in Table 4.2-2. Sediment quality will be evaluated with one or more assessment endpoint: baseline data, reference ranges, BACI analysis, and/or comparison to the most current BC or CCME sediment quality guidelines for the protection of freshwater aquatic life (SQG-AL; BC WLRS 2025b; CCME 2025c or updated; Table 4.5-1).

TABLE 4.5-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR SEDIMENT QUALITY

Measurement Endpoint	Assessment Endpoint
Particle size and total organic carbon	• Graphical comparison to baseline data[1]
Sediment quality parameters	• Before-after-control-impact (BACI) analysis[2] • Comparison to sediment quality guidelines for the protection of freshwater aquatic life (BC WLRS 2025b; CCME 2025c or updated)

[1] For particle size and total organic carbon (parameters required as part of the benthic invertebrate surveys as per Schedule 5 of the MDMER).
[2] For parameters that have BC or CCME sediment quality guidelines for the protection of aquatic life including arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, and zinc.

4.5.1.2 SAMPLING LOCATIONS AND METHODS

Field Methods

Sediment quality samples will be collected from six potentially impacted sites in Davidson Creek (DC-05 and DC-15), Turtle Creek (TC-05 and TC-10), and Creek 661 (661-05 and 661-10), at the upstream control sites (661-01 and TC-01) and three regional controls sites (FC-01, 705-05, and 705-10) identified in Table 4.2-2 and Figure 4.2-1. Sediment sampling will occur at the same time as water quality, periphyton, and benthic invertebrate sampling (late August or early September; Table 4.2-2 and Table 4.2-3).

Sediment samples will be collected in accordance with the BW Gold SOP for sediment collection that follows the *British Columbia Field Sampling Manual – Part D* (BC MWLAP 2020). Five replicates will be collected from distinct areas of each stream site (e.g., different stretches of the main channel) covering 50 to 100 m depending on stream size and site access. Samples will be stored in coolers on ice and/or refrigerated until shipped to a CALA certified laboratory for analysis.

Laboratory Methods

Targeted detection limits for parameters will be at least 10 times lower than sediment quality guidelines or standards, where available, consistent with recommendations for other environmental media in BC MOE (2016a). Parameters to be analyzed are provided in Table 4.5-2.

Particle size analysis will be completed on the whole sediment sample. Metal and total organic carbon (TOC) analysis will be conducted on the fraction of the sample smaller than 63 µm (Table 4.5-2), as per guidance from the BC MOE (2016a). Results of metals analysis will be reported in dry weight (mg/kg).

TABLE 4.5-2 ANALYZED SEDIMENT QUALITY PARAMETERS

Physical Tests, Particle Size, Organic Carbon	Total Metals		
• Moisture • pH • Gravel (> 2 mm) • Sand (2 mm–63 μm) • Silt (63 μm–4 μm • Clay (< 4 μm) • Total organic carbon	• Aluminum • Antimony • Arsenic • Barium • Beryllium • Bismuth • Boron • Cadmium • Calcium • Chromium • Cobalt	• Copper • Iron • Lead • Lithium • Magnesium • Manganese • Mercury • Molybdenum • Nickel • Potassium • Selenium	• Silicon • Silver • Sodium • Strontium • Thallium • Tin • Titanium • Uranium • Vanadium • Zinc

Quality Assurance and Quality Control

The sediment quality QA/QC practices will follow those outlined in guidance documents during sample collection and laboratory analyses (BC MOE 2016a; Environment Canada 2012a; BC MWLAP 2013). All sediment quality samples will be collected by qualified personnel using suitable sampling equipment. Samples will be stored in appropriate containers and transported following accepted procedures. Chain-of-Custody forms will be used, and the analyses will be conducted by a CALA certified laboratory.

The sediment QA/QC program also includes five sediment replicate samples collected at each stream site to determine within site variability. Field split duplicate samples (i.e., the composite sample is divided into two separate sample bags) will be conducted for approximately 10% of the replicates and submitted to the analytical laboratory to determine the effectiveness of sample homogenization. The RPD between sediment field splits will be calculated for every parameter with concentrations greater than five times the analytical MDLs (BC MWLAP 2013; see Section 4.4.2.2).

According to *British Columbia Field Sampling Manual Part A Quality Control and Quality Assurance* (BC MWLAP 2013), the data quality objective for field split samples is an RPD of less than 20%. An RPD greater than 20% indicates a possible problem, and an RPD greater than 50% indicates a definite problem such as contamination or lack of sample representativeness (BC MWLAP 2013).

Laboratory QA/QC includes evaluation of holding times, laboratory duplicates, certified reference material spikes, laboratory control samples, and method blanks, as recommended in BC ENV (2023b).

Sediment quality observations will be examined in comparison to previous results. Based on professional judgement, outliers indicating an error will be removed.

4.5.1.3 DATA ANALYSIS

For the purpose of data analysis and presentation, if a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). Replicate samples will be averaged to obtain a site mean and calculate the standard error.

Graphical Analysis

All laboratory analyzed sediment quality parameters will be graphically presented as means (and standard error) of replicates (and field duplicates if collected) to assess visual annual trends in sediment quality and support statistical analysis.

As per the MDMER Schedule 5, sediment samples are to be collected and analyzed for particle size and TOC content to complement the benthic invertebrate community surveys.

Before-After-Control-Impact Analysis

To assess the Mine-related effects on sediment metals, a BACI analysis will be completed. Analysis will be performed using the most recent R statistical computing package (e.g., R Core Team 2024), or equivalent. Data transformations (e.g., log transformation) will be completed, if determined to be appropriate (e.g., to achieve random distribution of residuals). For all effects analyses, statistical results are considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical MDLs (i.e., highly censored data).

The BACI analysis introduces a class effect to a mixed model ANOVA, which is based on the classification of a site as an impact or a control site. A random effect of year to account for variability in sediment quality data will also be included. For the purpose of this analysis, impact and control sites are identified in Table 4.2-1 for each watershed. Sediment quality baseline samples have been collected in 2011, 2012, 2017, 2021, and 2022. However, evaluation of baseline sediment quality data indicated that baseline data should be limited to data analyzed by ALS in 2017, 2021, and 2022 (ERM 2023b). For the period effect, data were grouped into one of two periods: "before" or baseline years and Year 1 of Construction (2017, 2021, 2022, and 2023) and "after" construction activities and discharge to Davidson Creek (2024). Year 1 of Construction (2023) was added to the "before" period because there was limited construction activities and no surface water discharge in 2023 (ERM 2025).

The interaction between the period (before or after) and class (impact or control) effects reveals whether any before-after change in the mean parameter concentration that occurred in the impact site also occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than significance level [α] of 0.05) will be assessed using an F-test. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction will be applied. An appropriate non-parametric test will be considered in the case that parametric tests (ANOVA) are not suitable for the monitoring component.

It is hypothesized that if mine activities affected sediment quality, then there would be a significant change in sediment quality at near-field impact sites in comparison with baseline concentrations or control sites. If potential impact site parameters increase or decrease over time relative to control sites (i.e., a significant interaction effect), this may suggest that the Mine is having an effect on the surrounding sediments (i.e., a non-parallel effect). However, the change over time at potential impact sites could also be due to natural episodic events (e.g., higher than average streamflow) or slight differences in sampling locations (leading to differences in grain size composition). If a change in the mean is detected by the before-after comparison but the BACI analysis indicates that a parallel change also occurred at the control site, it is reasonable to assume that this change is likely a natural phenomenon or unrelated to the Mine activities.

A precautionary approach will be used to determine if an effect is attributable to the Mine activities, in cases of unexplained significant interactions using professional judgement, additional sampling, and/or field data to confirm significantly elevated or lower concentrations.

Comparison to Sediment Quality Guidelines for the Protection of Aquatic Life

Sediment quality parameters will also be compared to the most current BC (BC WLRS 2025b or updated) and CCME (CCME 2025c or updated) SQG-AL. For parameters with both a BC and CCME SQG-AL (arsenic, cadmium, chromium, copper, lead, mercury, and zinc), the guidelines are the same for both jurisdictions. British Columbia provides additional SQG-AL for iron, manganese, molybdenum, nickel, selenium, and silver.

British Columbia SQG-AL generally include a lower guideline and an upper guideline as these provide a flexible interpretive tool for evaluating the toxicological significance of sediment quality data. Sediment chemical concentrations below the lower guideline are rarely associated with adverse effects on biological communities and concentrations between the lower and upper guideline are occasionally associated with adverse biological effects. Sediment concentrations above the upper guideline are more frequently associated with adverse effects on biological communities. Similarly, the CCME guidelines include the Interim Sediment Quality Guidelines (ISQG) and the Probable Effect Levels (PEL), analogous to the BC lower and upper guidelines.

The percentage of stream mean sediment samples with concentrations greater than BC and CCME SQG-AL and the average factor by which concentrations are greater than the SQG-AL will be calculated.

4.5.2 SEDIMENT TOXICITY TESTING

Sediment toxicity testing will only be completed if triggered through the adaptive management response framework to aid in the interpretation of changes in sediment quality or changes in benthic communities (taxonomy). Planning for a sediment toxicity study would be triggered at the medium action level for either sediment quality (Section 5.2.2) or changes in benthic invertebrate community (Section 5.2.4) and would be implemented at the high action level for either sediment quality or benthic invertebrate community endpoints.

4.5.2.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Sublethal sediment toxicity tests will be completed on a test species and using a test method that is best suited for the investigation (i.e., will depend on the type of trigger for sediment toxicity testing; Table 4.5-3). For example, if sediment toxicity testing has been triggered based on a benthic invertebrate trigger, the testing will use a surrogate laboratory species for the potentially affected species. Test conditions will be based on the change in sediment quality concentrations observed. Prior to implementing sediment toxicity testing, BW Gold will consult with regulators (e.g., BC ENV, EAO) and Indigenous nations for input on the sampling plan design.

TABLE 4.5-3 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR SEDIMENT QUALITY

Measurement Endpoint	Assessment Endpoint
Sediment toxicity testing	• LC_x or EC_x[1]

[1] Test species and endpoints (survival, growth, and/or reproduction) will be determined based on the type of investigation required.

4.5.2.2 SAMPLING LOCATIONS AND METHODS

Field Methods

In the event the sediment toxicity testing is triggered, this will be identified in the AEMP Interpretive Report and sampling for sediment toxicity testing will occur concurrently with the next scheduled aquatic resources sampling event (i.e., will be co-collected with sediment quality, periphyton, and benthic invertebrate sampling). Sediment samples for toxicity testing will be collected from the site(s) identified in the response framework (see Section 5.2.3 and 5.2.5) and at least one control site.

Sediment toxicity testing samples must always be co-collected, spatially and temporally, with surface water quality and sediment quality samples, because the quality data are critical to interpretation of the sediment toxicity test results. Depending on the study design, both sediment and surface water from the site may be used in the laboratory-based toxicity testing.

Sample volumes and replicate numbers will vary depending on the study design (e.g., type and duration of the sediment toxicity testing). Sampling methods are likely to be similar to that described for sediment quality sampling (Section 4.5.1.2), although the targeted depths of sediment may vary with the type of test selected. As with sediment quality sampling, samples will be stored in coolers on ice and/or refrigerated until shipped to a CALA certified laboratory for toxicity testing. Laboratory COC forms will also be used for submission of sediment toxicity testing samples.

Toxicity testing

Sediment toxicity testing will be carried out based on a sampling plan, which will be developed in consultation with Indigenous nations and regulators. The toxicity testing plan will be designed to account for the type of effect that triggered the sampling, but may include the use of one or more of the following standardized test organisms and assays:

- Invertebrates using the Biological Test Method: Test for Survival, Growth and Reproduction in Sediment and Water Using the Freshwater Amphipod *Hyalella azteca* (ECCC 2017); and
- Invertebrates using the Biological Test Method: Test for Survival and Growth in Sediment Using Larvae of Freshwater Midges (*Chironomus tentans* or *Chironomus riparius*) (Environment Canada 1997).

Additional types of tests using other freshwater invertebrates such as oligochaetes (e.g., *Lumbricoides variegatus* or *Tubifex tubifex*) or mayflies (e.g., *Hexagenia* sp.) may also be available through commercial laboratories such as Nautilus Environmental in Burnaby, BC.

4.5.2.3 DATA ANALYSIS

The specific data analysis to be used for sediment toxicity testing would be described in the sampling plan developed in consultation with Indigenous nations and regulators.

In general, it is expected that at the end of each laboratory-based test, the endpoint (e.g., growth, reproduction, or survival) is evaluated statistically to determine the LC_x (mortality) or EC_x (e.g., reproduction, growth). Results of the sediment toxicity testing will be interpreted based on comparison between control and impact sites, as well as considering results of the co-collected water and sediment quality data and aquatic resources sampling results.

Results of sediment toxicity testing are intended to be a supplemental line of evidence to other data collected under the AEMP and will not be used alone to identify the Mine-related effects in the receiving environment.

4.6 AQUATIC PRIMARY PRODUCERS

4.6.1 MEASUREMENT ENDPOINTS AND ASSESSMENT ENDPOINTS

Periphyton (attached algae, fungi, bacteria, and associated detritus, also referred to as biofilm; BC MOE 2016a) was measured during baseline studies (ERM 2023b). Periphyton was selected for the aquatic plant monitoring required by EAC #M19-01 Condition 30(g) instead of macrophytes as an indicator of water quality and primary productivity. Aquatic macrophytes (aquatic plants that are often rooted or with roots that have distinct component structures large enough to be visible to the naked eye; BC MOE 2016a) are generally more abundant in lentic environments and, as indicated during baseline monitoring completed in 2011 and 2012, there was minimal macrophyte coverage at AEMP sampling sites (AMEC 2013a).

The selected measurement endpoints for periphyton analysis are focused on metrics associated with the primary producer (plant) component of periphyton. Periphyton biomass (as chlorophyll *a*) will be assessed to determine the Mine-related effects on aquatic primary producers (Table 4.6-1). Assessment endpoints will include BACI analysis and comparison to BC guidelines for the protection of freshwater aquatic life.

TABLE 4.6-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR AQUATIC PRIMARY PRODUCERS

Measurement Endpoint	Assessment Endpoint
Biomass (as chlorophyll *a*)	• Graphical comparison to baseline data • Before-after-control-impact analysis • Comparison to BC water quality guideline for the protection of aquatic life (BC WLRS 2025b)
Taxonomy (community composition)	• Comparison to baseline[1]

[1] Diversity indices genus richness and the Simpson's Diversity Index are assessed.

Periphyton community composition (taxonomy) is completed to aid in the understanding of changes in periphyton biomass. The assessment endpoint for community composition will be comparison to baseline community composition.

4.6.2 SAMPLING LOCATIONS AND METHODS

4.6.2.1 FIELD METHODS

Primary producers (periphyton) biomass and community composition samples will be collected at six potentially impacted sites in Davidson Creek (DC-05 and DC-15), Turtle Creek (TC-05 and TC-10), and Creek 661 (661-05 and 661-10), at the upstream control sites (661-01 and TC-01) and three regional controls sites (FC-01, 705-05, and 705-10) as identified in Table 4.2-2 and Figure 4.2-1. Periphyton sampling will occur at the same time as water quality, sediment quality, and benthic invertebrate sampling in late August or early September (Table 4.2-2 and Table 4.2-3).

Sampling will follow established protocols described in the *British Columbia Field Sampling Manual* (BC MWLAP 2013) and the BW Gold SOP for periphyton sampling. For periphyton biomass samplings, five replicate periphyton samples per site will be collected using a template of known area (19.6 cm^2) from rocks large enough to collect three complete template scrapings. Periphyton biomass samples will be processed by gently filtering samples filtered through a 0.45 µm filter. Filters will be stored and transported frozen and in the dark to an analytical laboratory.

For periphyton community samples, three replicates will be collected per site using the same method (three template scrapings per rock) as with periphyton biomass samples. The periphyton community samples will be preserved with Lugol's Iodine solution, kept cool, and transported to a qualified taxonomist for identification and enumeration.

4.6.2.2 LABORATORY ANALYSIS

Analysis of periphyton biomass (as chlorophyll *a*) will be completed at a CALA certified laboratory. Periphyton samples will be quantified for chlorophyll *a* concentration, which is a pigment associated with photosynthesis and an indicator of primary producer biomass.

For the taxonomy samples, at the laboratory the sample volume is measured using a graduated cylinder and the initial sample volume is recorded. Depending on the density of the algae and detritus observed, an appropriate subsample will be taken, and the subsample volume is recorded. The subsample will be homogenized thoroughly and allowed to settle in an Utermohl-type settling chamber for approximately 24 hours to allow the algae to settle to the bottom. The settled sample is then examined and enumerated at 630× magnification using an inverted Leica microscope. For each sample taxa, cell counts are reported in cells/ml.

4.6.2.3 QUALITY ASSURANCE/QUALITY CONTROL

Five replicate periphyton biomass and three taxonomy samples will be collected from each site to provide data on within site variability. The QA/QC principles for periphyton biomass sampling will follow those outlined in the *British Columbia Field Sampling Manual Part A Quality Control and Quality Assurance* (BC MWLAP 2013). Samples will be stored in appropriate containers and transported following accepted procedures. Chain-of-Custody forms will be used. The analysis of chlorophyll *a* concentration will be conducted by a CALA certified laboratory.

A qualified taxonomist will conduct the identification and enumeration of the periphyton community samples and follow standard protocols for subsampling, reference collections, and data quality assurance. The reproducibility of subsampling and taxonomy will be tested on 10% of periphyton samples. Two different taxonomists will subsample, identify, and enumerate periphyton from the same sample using identical methods. Results will be compared by calculating the percent similarity:

$$\text{Percent similarity} = 100 - 0.5 \sum |a - b|$$

where *a* is the percentage of individuals of a taxon in subsample A, and *b* is the percentage of the same taxon in subsample B. The percent similarity between the samples is an indication of subsampling and taxonomic precision. A percent similarity of greater than or equal to 70% is required as the acceptable QA/QC threshold. If 70% similarity is not met, the reasons for the discrepancies between analysts are discussed and necessary adjustments made to the dataset.

4.6.3 DATA ANALYSIS

For the purpose of data analysis and presentation, if a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). Replicate samples will be averaged to obtain a site mean and calculate the standard error.

Graphical Analysis

Periphyton biomass will be graphically presented as means (and standard error) of replicates (and field duplicates if collected) to assess visual annual trends and support statistical analysis.

Before-After-Control-Impact Statistical Analysis

To further assess the Mine-related effects on periphyton biomass a BACI analysis will be completed. Analysis will be performed using the most recent R statistical computing package (e.g., R Core Team 2024), or equivalent. Data transformations (e.g., log transformation) will be completed if determined to be appropriate (e.g., to achieve random distribution of residuals). For all effects analyses, statistical results are considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical MDLs (i.e., highly censored data).

Similar to the BACI analysis for water (Section 4.4.2.3) and sediment quality (Section 4.5.1.3), the BACI analysis for periphyton biomass introduces a class effect to a mixed model ANOVA, which is based on the classification of a site as an impact or a control site. A random effect of year to account for variability in chlorophyll *a* concentration data will also be included. For the purpose of this analysis impact and control sites are identified in Table 4.2-1 for each watershed. Periphyton samples were collected in 2011, 2012, 2017, 2021, and 2022 however the sampling method was not consistent between these monitoring years (i.e., the use of three pooled templates to form a replicate; consistent with the British Columbia Field Sampling Manual). A different sampling method (single template) was used in 2011 and 2012, that would underestimate the species and richness and diversity calculations. Therefore, only the 2017, 2021, and 2022 observations will be utilized as the baseline years for the assessment of the Mine-related effects because of variability in field collection and laboratory methods in earlier sampling programs (ERM 2023b). The "before" period was the data collected in baseline (2017 and 2022) and Year 1 of Construction (2023). The Year 1 of Construction (2023) was added to the "before" period because there was limited construction activities and no surface water discharge in 2023 (ERM 2025).

The interaction between the period (before or after) and class (impact or control) effects reveals whether any before-after change in the mean parameter concentration that occurred in the impact site also occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than significance level (α) of 0.05) will be assessed using an Ftest. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction will be applied. An appropriate non-parametric test will be considered in the case that parametric tests (ANOVA) are not suitable for the monitoring component.

It is hypothesized that if mine activities affected periphyton biomass, then there would be a significant change in periphyton biomass at near-field sites in comparison with baseline concentrations or control sites. However, if a change in the mean is detected by the before-after comparison, but the BACI analysis indicates that a parallel change also occurred at the control site (control versus impact), it is reasonable to conclude that this change is likely a natural phenomenon or unrelated to the Mine activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites or the control site, it is reasonable to conclude that this change is likely the result of non-Mine activities (e.g., forestry or agricultural activities downstream of the Mine and upstream of the sampling location).

A precautionary approach will be used to determine if an effect is attributable to the Mine activities in cases of unexplained significant interactions using professional judgement, additional sampling, and/or field data to confirm significantly elevated or lower concentrations.

Comparison to Water Quality Guidelines for the Protection of Aquatic Life

Periphyton biomass (as chlorophyll *a* concentration; µg chl a/cm^2) will be calculated for each replicate sample and a mean calculated for each stream site. Periphyton biomass at each of the sampling sites will be compared to the BC WQG-AL (10 µg chl a/cm^2; BC WLRS 2025b or updated).

Community Composition Metrics

The periphyton mean total density and community composition of major taxonomic groups will be calculated and presented graphically for each sampling location. Mean diversity metrics (genus richness and Simpson's Diversity Index) will be compared against available baseline information (ERM 2023b) as well as control sites to evaluate whether the Mine activities caused changes to periphyton community indices.

Periphyton taxonomic data includes all organisms identified in the periphyton counts, except those that are not counted following a consistent method across years. Mean total density and community composition of a major taxonomic groups will be calculated and presented graphically for each site.

Diversity metrics will be calculated at the genus level. If periphyton are identified to the species level, they will be grouped into their respective genera designation. If an organism is not identified to the genus level, and no other organism is identified within that group (i.e., order, family, etc.), it is assumed that there is one genus in that group of organisms. All other specimens are otherwise excluded from the diversity calculations.

Diversity analyses include the calculation of genus richness (G) and the Simpson's Diversity Index (D) according to:

G = the total number of genera present per sample;

$$D = 1 - \sum_{i=1}^{S} (p_i)^2$$

where:
S = the number of taxa in the replicate
p_i = the proportion of the ith taxon in the replicate

The relative abundance of each genera will be calculated as n_i/N, where n_i is the number of individuals in genera *i,* and *N* is the total number of all individuals.

Richness is based on presence/absence of a taxa, with all taxa identified to genus included in richness calculations (i.e., taxa with unit-length measurements); however, taxa with different counting methods would be excluded from the Simpson's diversity calculations. Simpson's diversity can range from 0 (lowest diversity) to 1 (maximum diversity). The use of Simpson's diversity index accounts for both the number of taxa present and the relative abundance of organisms from each taxa (evenness).

4.7 AQUATIC INVERTEBRATES

4.7.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Benthic invertebrates are widely used as indicators of environmental conditions and changes in streams. Stream benthic invertebrate surveys will be conducted and abundance, community composition, and diversity metrics at each sampling site will be evaluated using Reference Condition Approach (RCA; Table 4.7-1). Using the available RCA models, the potentially impacted sites can be matched to the available reference sites (provided by Canadian Aquatic Biomonitoring Network [CABIN] repository) with similar habitats for comparison of benthic invertebrate communities. The extent of the difference between the Mine benthic invertebrate sites and reference sites (provided by CABIN repository) is the measure of the Mine-related effect. Evaluation of the appropriate reference site model for the RCA was completed and suggested that the Fraser 2021 reference site model is the most appropriate (see ERM 2023b).

TABLE 4.7-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR AQUATIC INVERTEBRATES

Measurement Endpoint	Assessment Endpoint
Abundance (number of organisms/unit area)	Reference Condition Approach analysis
Taxonomy (community sampling)	Reference Condition Approach analysis[1]
Tissue metal concentration	• Before-after-control-impact analysis • Comparison to BC tissue residue guidelines for selenium (BC MOE 2014, or updated) and CCME tissue residue guideline for mercury (CCME 2000 or updated)

[1] Abundance, family richness, Simpson's Diversity and Evenness indices, and the Bray-Curtis Index is completed for whole community and the Ephemeroptera, Plecoptera, and Trichoptera taxa.

The assessment endpoint for tissue metals analysis would be changes identified at impact sites through BACI analysis. Tissue metal concentrations will also be compared to the most current BC ENV and CCME guidelines for the protection of wildlife consumers of aquatic biota (BC MOE 2014; CCME 2000 or updated). The assessment can provide an additional line of evidence to aid in the interpretation of the water quality, sediment quality, and/or benthic invertebrate community observations.

4.7.2 SAMPLING LOCATIONS AND METHODS

4.7.2.1 FIELD METHODS

Benthic invertebrate surveys will be conducted at sites six potentially impacted sites in Davidson Creek (DC-05 and DC-15), Turtle Creek (TC-05 and TC-10), and Creek 661 (661-05 and 661-10), at the upstream control sites (661-01 and TC-01) and three regional controls sites (FC-01, 705-05, and 705-10) identified in Table 4.2-2 and Figure 4.2-1 at the frequencies identified in Table 4.2-3. Sampling will occur at the same time as water quality, sediment quality, and periphyton sampling (Table 4.2-2) in late August or early September, consistent with recommendations in BC MOE (2016a) and Environment Canada (2012b).

Benthic invertebrate surveys will be conducted by CABIN-certified field personnel using a standard CABIN kick net (400-µm mesh) following CABIN protocols (Environment Canada 2012b) and the BW Gold SOP for benthic invertebrate collection. Samples will be sent to an accredited taxonomic laboratory for sorting and identification following CABIN protocols (ECCC 2020). Environment and Climate Change Canada recommended to use a modified wadable streams protocol to assess the aquatic invertebrate community at sites TC-01 and TC-05.

A habitat characterization will also be assessed following CABIN protocols (Environment Canada 2012b) for each site. This includes characterizing the reach (canopy cover, streamside vegetation, periphyton coverage, etc.), channel (slope, wetted width, velocity, etc.), substrate (100-pebble count, embeddedness, etc.), and in situ water quality (temperature, pH, conductivity, and dissolved oxygen).

Benthic invertebrate tissue metal samples will be collected using a standard CABIN kick net (400 µm mesh) to collect five replicate samples at sites identified in Table 4.2-2. Benthic invertebrates will be collected until a sufficient mass is sampled (greater than 0.5 g of tissue per replicate). Samples will be placed in a clean sampling tube and frozen until analysis by a CALA certified laboratory. Samples of benthic invertebrates for tissue metal analysis will only be collected after the CABIN sampling is completed.

4.7.2.2 LABORATORY ANALYSIS

Invertebrates will be sorted and identified to the lowest possible taxonomic level (usually genus). Ostracoda, Cladocera, Nematoda, Copepoda, Porifera, Platyhelminthes, and terrestrial organisms will be excluded from all analysis following Environment Canada CABIN protocols (ECCC 2020).

Benthic invertebrate tissue metal samples will be analyzed for percent moisture and total metals at the MDLs consistent with BC ENV requirements (BC MOE 2016a; Table 4.7-2).

TABLE 4.7-2 ANALYZED TISSUE METAL PARAMETERS

Physical Tests	Total Metals		
• Moisture (%)	• Aluminum • Antimony • Arsenic • Barium • Beryllium • Bismuth • Boron • Cadmium • Calcium • Cesium • Chromium • Cobalt	• Copper • Iron • Lead • Lithium • Magnesium • Manganese • Mercury (wet weight) • Molybdenum • Nickel • Phosphorus • Potassium	• Selenium • Sodium • Strontium • Thallium • Tin • Uranium • Vanadium • Zinc • Zirconium

Note:
Units are in mg/kg dry weight unless otherwise indicated.

4.7.2.3 QUALITY ASSURANCE/QUALITY CONTROL

Qualified personnel will conduct the sampling and COC forms will be used for all benthic invertebrate samples. Benthic invertebrate survey QA/QC will follow CABIN protocols (ECCC 2020), which include determining the sorting efficiency of the subsampled benthic invertebrates and the percent similarity of samples identified by two separate taxonomists. Percent similarity calculations are the same as those described in Section 4.6.2.3 for periphyton. For benthic invertebrates, a percent similarity of greater than or equal to 90% is the data quality objective. If this is not met, the reasons for the discrepancies between taxonomists are discussed. If a major discrepancy is found between the two taxonomists in terms of organism identification or enumeration, the last batch of samples that had been counted by the taxonomist under review is recounted.

For benthic invertebrate tissue metal samples, five replicates will be collected at each site to provide data on the within site variability. Field split duplicate samples will be collected at the rate of 10% of the total number of samples, where one sample (replicate) is split in half and the split sample is submitted as a blind sample for laboratory analysis. Laboratory QA/QC practices will be consistent with those required by BC ENV (2023b).

4.7.3 DATA ANALYSIS

Abundance and Community Composition Metrics

Several community descriptors will be calculated from the taxonomic results, including benthic invertebrate abundance, family richness, Simpson's Diversity and Evenness indices, and the Bray-Curtis Index. Abundance, richness, diversity, and evenness calculation are performed on the whole community as well as Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa. The abundance, richness, diversity, and evenness of Ephemeroptera, and the families within Order Ephemeroptera, specifically focusing on Family Heptageniidae, may also be calculated. The EPT taxa, particularly Heptageniidae, are considered sensitive to environmental pollution. Heptageniidae abundance is considered a sensitive metric for detecting potential impacts from heavy metals.

Family richness is calculated as the total number of benthic invertebrate families present in each replicate sample. The Simpson's Diversity Index (D) is calculated as:

$$D = 1 - \sum_{i=1}^{F} (p_i)^2$$

where F is the number of families present (i.e., family richness), and p_i is the relative abundance of each family calculated as n_i/N, where n_i is the number of individuals in family i, and N is the total number of all individuals.

Simpson's Evenness Index (E) is calculated as:

$$E = 1/\sum_{i=1}^{F} (p_i^2)/F$$

where E is the evenness, F is the number of families present (i.e., family richness), and p_i is the relative abundance of each family calculated as above.

A complete dissimilarity matrix will also be generated to include pairwise comparisons of all monitored sites with reference sites located in the Fraser Plateau that are stored in the CABIN repository and used to build the Fraser 2021 Benthic Assessment of Sediment (BEAST) model. The Bray-Curtis Index compares the community composition within a benthic invertebrate community sample to the median reference community composition in the CABIN database. The reference sites identified in the Fraser 2021 model included 130 sites in total with 67 sites located in the Fraser Plateau, where the mine site is located. The reference composition is generated from the median abundance of each represented family from all of the control site replicates. Since the median reference composition is generated from the combined reference site replicates, the comparison of a single control site replicate community to the median reference community composition will produce a dissimilarity value (although generally a much lower value than exposure sites). Because the Bray-Curtis Index measures the percent difference between sites, the greater the dissimilarity value between a site and the median reference community, the more dissimilar those benthos communities are. The Bray-Curtis Index ranges from 0 to 1, with 1 representing completely dissimilar communities, and 0 representing identical communities. This index is calculated as:

$$\text{Bray-Curtis Index (BC)} = \sum_{i=1}^{F} |\text{yi1} - \text{yi2}| \,/\, \sum_{i=1}^{F} |\text{yi1} + \text{yi2}|$$

where BC is the Bray-Curtis distance between sites 1 and 2, n is the total number of families present at the two sites, yi1 is the count for family i at site 1, and yi2 is the count for family i at site 2.

River Invertebrate Prediction and Classification System (RIVPACS) will be calculated using CABIN online repository and in-built software to assess the benthic invertebrate community composition at potential impact sites. The RIVPACS uses benthic invertebrate presence/absence data comparing observed against expected taxa (O:E ratios). Under RIVPACS, where taxa are absent but are expected to be present, it is assumed that some environmental condition is impacting the community. The RIVPACS uses reference sites (from the CABIN repository) to determine which taxa are expected to be present. An O:E ratio close to 1 suggests impacted sites that are in good condition based on the observed present taxa at impacted sites compared to reference sites (from the CABIN repository).

It is hypothesized that if mine activities affected benthic invertebrate communities, then there would be a significant divergence of benthic invertebrate abundance or community composition from the control sites and/or the CABIN reference site model.

Similarly, the BEAST analysis uses the habitat characteristics to infer what the benthic invertebrate community would be, assuming that unimpacted sites with the same habitat would contain a benthic invertebrate community similar to reference sites. Turtle Creek sites TC-01 and TC-05 will not be included in the BEAST analysis because sampling at these sites necessitates a modified CABIN sampling protocol that results in data not meeting assumptions for interpretable and comparable BEAST analysis results.

It is hypothesized that if mine activities affected benthic invertebrate communities, then there would be a significant divergence of benthic invertebrate abundance or community composition from the control sites and/or the CABIN reference site model despite having similar habitats as reference sites.

Tissue Metals Graphical Analysis

For tissue metals analysis, summary statistics including mean, median, standard deviation, standard error, MDL, sample size, and percent non-detects for dry weight and wet weight metal contents will be calculated for each site, as recommended in BC MOE (2016a). If a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). Graphical analysis of tissue metal means (and standard error) of replicates (and field duplicates if collected) will be completed to assess visual annual trends and support statistical analysis.

The analysis will focus on mercury and selenium because there is an invertebrate tissue residue guideline (CCME 2000; BC MOE 2014). Additional parameters may be included in AEMP reporting if changes in water quality are identified (Section 4.4.2.3), particularly if those changes were not predicted by the surface water quality model.

Tissue Metals Before-After-Control-Impact Analysis

To assess the Mine-related effects on benthic invertebrate tissue metal concentrations a BACI analysis will be completed. Analysis will be performed using the most recent R statistical computing package (e.g., R Core Team 2024), or equivalent. Data transformations (e.g., log transformation) will be completed if determined to be appropriate (e.g., to achieve random distribution of residuals). If a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). For all effects analyses, statistical results are considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical MDLs (i.e., highly censored data). To maintain sufficient replication necessary for use in a BACI analysis, tissue metals concentrations for Creek 661, Davidson Creek, and Turtle Creek may be averaged within years for each watershed and compared to a combined set of control sites in a BACI analysis.

Similar to both water (Section 4.4.2.3) and sediment quality (Section 4.5.1.3) analysis, the BACI analysis for benthic invertebrate tissue metal concentrations introduces a class effect to a mixed model ANOVA, which is based on the classification of a site as an impact or a control site. For the purpose of this analysis impact and control sites are identified in Table 4.2-1 for each watershed. A random effect of year to account for variability in benthic invertebrate tissue metal concentration data will also be included. Benthic invertebrate tissue samples were collected in 2012, 2017 and 2022 and observations in those years will be utilized as the baseline years for the assessment of the Mine-related effects (ERM 2023b). The "before" period was the data collected in baseline (2012, 2017, and 2022) and Year 1 of Construction (2023). The Year 1 of Construction (2023) was added to the "before" period because there was limited construction activities and no surface water discharge in 2023.

The interaction between the period (before or after) and class (impact or control) effects indicates whether any before-after change in the mean parameter concentration that occurred in the impact site also occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than significance level (ɑ) of 0.05) will be assessed using an F-test. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction will be applied. An appropriate non-parametric test will be considered in the case that parametric tests (ANOVA) are not suitable for the monitoring component.

It is hypothesized that if mine activities affected benthic invertebrate tissue metal concentrations, then there would be a significant change in benthic invertebrate tissue metal concentrations at near-field sites in comparison with baseline concentrations or control sites. However, if a change in the mean is detected by the before-after comparison, but the BACI analysis indicates that a parallel change also occurred at the control site (control versus impact), it is reasonable to conclude that this change is likely a natural phenomenon or unrelated to the Mine activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites or the control site, it is reasonable to conclude that this change is likely the result of non-Mine activities (e.g., forestry or agricultural activities downstream of the Mine and upstream of the sampling location).

A precautionary approach will be used to determine if an effect is attributable to the Mine activities in cases of unexplained significant interactions using professional judgement, additional sampling, and/or field data to confirm significantly elevated or lower concentrations.

Comparison to Tissue Metal Guidelines

Tissue metal concentrations will be compared to the most current BC ENV and CCME tissue guidelines (e.g., BC MOE 2014; CCME 2000). Specifically, mercury and selenium concentrations will be compared to the CCME guideline for mercury in aquatic biota (i.e., 0.033 milligrams per kilogram wet weight [mg/kg wwt]; CCME 2000) and the BC interim benthic invertebrate tissue guideline for selenium (4 milligrams per kilogram dry weight [mg/kg dwt]; BC MOE 2014), which are both protective for wildlife that consume aquatic biota. For the purpose of comparison, measurements of total mercury in benthic invertebrate tissue samples will be assumed to be 100% methylmercury. While actual concentrations of methylmercury are likely to be slightly less than the total concentration, this assumption provides a conservative estimate of methylmercury in benthic invertebrate tissues from total mercury concentrations.

4.8 FISH COMMUNITY

Description of the fish community will require four separate monitoring programs:

- Summer inventory of the fish community and tissue metals sampling;
- Summer Kokanee spawning survey;
- Spring Kokanee fry outmigration survey; and
- Spring rainbow trout spawning survey.

These monitoring programs will be completed at different times of the year and at separate locations. Sample requirements will follow BC MOE (2016a) and field protocols will follow BC MWLAP (2013).

4.8.1 FISH COMMUNITY INVENTORY AND TISSUE METAL SAMPLING

The purpose of the fish community inventory survey is to describe both the structure of the fish community and fish health within the AEMP study area. The focus will be on rainbow trout in the streams closest to the mine site because it is the most abundant and widespread species during the summer months, and because there is a resident population dominated by immature rainbow trout.

Two lakes (Tatelkuz and Kuyakuz) will be sampled for fish tissue metals analysis to support CFMP sampling program. For Tatelkuz Lake, sampling for tissue metals analysis will include rainbow trout, kokanee and mountain whitefish. However, only rainbow trout and mountain whitefish will be targeted for tissue analyses in Kuyakuz Lake because of the limited kokanee population (ERM 2023b).

4.8.1.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Measurement and assessment endpoints have been selected with a focus on non-lethal monitoring of the fish community, to the extent possible. The summer fish inventory measurement endpoints will include an inventory of the fish community, fish health, and fish tissue metals (Table 4.8-1).

TABLE 4.8-1 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR THE FISH COMMUNITY SURVEY AND TISSUE METAL SAMPLING

Measurement Endpoint	Assessment Endpoint
Fish inventory	• Catch-Per-Unit-Effort • Fish abundance and density (fish/100 m^2) for each identified species by size/age class
Fish health	• Population structure–length and age • Condition–length and weight
Fish tissue metals concentrations	• Graphical comparison to baseline data • Before-after-control-impact analysis • Comparison to BC or CCME tissue residue guidelines for selenium and mercury (BC MOE 2014; CCME 2000)

Notes:
BC =British Columbia; CCME = Canadian Council of Ministers of the Environment

4.8.1.2 SAMPLING LOCATIONS AND METHODS

Field Methods

The fish community inventory will be completed at eleven stream sites where surface water quality monitoring is completed (Table 4.2-2; Figure 4.2-4; excluding Tatelkuz Lake and Kuyakuz Lake) to provide concurrent water and fish sampling at the same location (i.e., co-collected). Fish sampling will be completed as close as practical to the surface water quality site, typically within 100 to 200 m (Table 4.2-1)[5].

The fish community inventory surveys will be completed in late summer (i.e., after late July or early August) to minimize potential impacts to developing rainbow trout embryos and young-of-year (YoY). Sites have been selected to avoid overlap with identified Kokanee spawning areas and can therefore be sampled during Kokanee spawning and egg incubation periods (i.e., late July to end of August, with Kokanee egg incubation lasting until spring). Specific timing of the sampling program will be informed by field-based monitoring triggers outlined in the following subsection.

[5] The fish sampling location at site TC-05 is currently located in an area of beaver dam impoundment; the resulting water depths in this area render electrofishing ineffective. In order to conduct triple-pass electrofishing required to obtain estimates of population abundance and density, the electrofishing site may be moved more than 200 m from the water quality sampling location, pending field investigations in 2025. Fish sampling for tissue metals will occur at the original fish sampling location.

Fish will be collected using closed-site backpack electrofishing undertaken by a three-person crew using a backpack electrofisher. At each electrofishing site, block nets will be placed at the upstream and downstream extents to ensure no movement of fish in or out of the sampling area. To standardize sampling methodology and data analyses, sampling will involve 100 m long sites electrofished using a three-pass minimum removal method, beginning at the downstream block net and ending at the upstream block net. The entire stream width will be sampled. The voltage, duty cycle, and frequency settings will be adjusted based on site conditions to maximize efficiency and minimize the risk of injury to fish. The electrofishing effort will be recorded for each site. If the total number of fish caught during the third pass exceeds the total number of fish captured from the second pass (e.g., pass two caught ten fish and pass three caught 20 fish), then additional passes will be completed in an attempt to reach depletion, up to a maximum of five passes.

Additional electrofishing efforts will be completed to obtain required sample size for tissue metals analyses; additional sampling methods may be utilized if electrofishing does not result in sufficient number (e.g., minnow traps or larger gee-style traps). Observations of beaver dams near sampling locations will be recorded and where safe to do so measurements (length, height, width) and distance from sampling location will be recorded.

Captured fish will be identified to species, enumerated, and measured for length (to the nearest 1 mm) and wet weight (to the nearest 0.1 g using a digital scale). Fish will be examined for the presence of marks (e.g., adipose clips). Any fish with a clearly clipped adipose fin will be classified as ‘salvaged’, i.e., fish that were relocated from upstream watercourses within the mine footprint. Any lesions, parasites, or other deformities (or lack thereof) on fish will be recorded before the fish are live released at the site of capture.

A subset of up to ten rainbow trout per size class, will be live sampled at each site to obtain ageing structures (scales). The subsampled size classes (i.e., in mm, 81-125 (1+), 126-200 (2+), 201-275 (3+), 276-350 (4+), 351-400 (5+), 401-450 (6+) generally correspond to the age classes of rainbow trout, although there is variation on an individual and stream subpopulation level. A review of these size/age classes will be provided in the 2024 AEMP interpretive report and may be adjusted at a site specific level, if deemed necessary. Due to analytical limitations and potential for fish mortality, no age structure collection from the < 80 mm (0+) size/age group is proposed.

Tissue metals samples will be collected from eight euthanized rainbow trout per site. For these detailed analyses, an ageing structure (otoliths) will be collected and the whole body will be used for tissue metal analysis. Rainbow trout have been proposed for age and tissue sampling because there is potentially a resident population within the watersheds and because the life history characteristics of nonmigratory rainbow trout make this species a good indicator for tracking metal contaminants (Environment Canada 2012a).

Tissue metals samples will also be collected from rainbow trout, kokanee, and mountain whitefish captured in Tatelkuz Lake as well as rainbow trout and mountain whitefish from Kuyakuz Lake (Figure 4.2-4). A target sample size of eight fish of the aforementioned species will be captured from each lake using a combination of gill netting, trap netting, and angling. Fish intended for tissue metals analysis will be sacrificed, and their weight and fork length recorded and ageing structures (otoliths) will be collected. Muscle plugs were considered for the fish sampled in the lakes; however metals that accumulate through various parts of the fish are being assessed, including liver, muscle, and carcass tissues, therefore the fish are being euthanized in order to separate these parts. Samples for tissue metals analysis from adult fish will be separated into liver (liver weight to be recorded), muscle, and remaining carcass (rest of fish, minus liver and muscle samples) for laboratory analysis. Juvenile fish will be submitted as whole-body samples for tissue metals analysis.

All tissue samples for metals analysis will be immediately frozen in individually labelled plastic bags before being shipped to a CALA certified laboratory for determination of tissue moisture and metal content.

Implementation Framework

It is intended that the fish community surveys will generally commence and terminate based on this framework however, exact survey timing may be adjusted based on external factors such as severe weather events, safety considerations, and/or unforeseen circumstances; Professional judgement will be applied and documented in these cases.

Stream Sites

Commencement Trigger

Fish community inventory sampling is generally planned for late summer, with the aim to minimize potential impacts to developing rainbow trout embryos and YoY in the stream sites. As in most fish, the development rate of rainbow trout eggs is a function of incubation temperatures. Hatch and emergence timing can be estimated using Accumulated Thermal Units (ATUs). Generally, rainbow trout yolk absorption and emergence is expected to occur between 500 and 525 ATUs (Giesbrecht, G. 2024).

Where continuous daily average water temperature and timing of rainbow trout spawning data are available[6], ATUs will be calculated and used to estimate the emergence timing of Rainbow Trout Young-of-Year. The start of the sampling program will be scheduled after the latest estimated emergence date. The latest estimated emergence date will be based on the most conservative ATU threshold (i.e., 525) and the end of rainbow trout spawning period (i.e., last gravid/spawning fish captured) observed during the current year spring rainbow trout surveys in each watercourse.

For watercourses where continuous temperature and timing of rainbow trout spawning data are unavailable, fish community inventory sampling will be scheduled towards the end of the program.

Termination Trigger

Fish community inventory sampling will terminate at the completion of sampling at all planned sites.

[6] Continuous temperature data that spans rainbow trout spawning and incubation periods are available from long-term hydrology stations located in Davidson Creek, upper Creek 661, and Turtle Creek. A tidbit temperature logger was also installed near the mouth of Creek 661 in 2024 to collect temperature data for ATU calculations. Timing of rainbow trout spawning is available for Davidson Creek, Creek 661, and Turtle Creek.

Lake Sites

There is no specific commencement trigger for lake sampling; it is generally planned for late summer to early fall to align with sampling timing conducted in previous years. Lake sampling will terminate upon capture of the targeted number of samples of rainbow trout, kokanee, and mountain whitefish from Tatelkuz Lake and rainbow trout and mountain whitefish from Kuyakuz Lake.

Laboratory Analysis

Otoliths and scales will be analyzed by a laboratory for age determination. These ageing structures will be prepared (e.g., mounted, polished, or otherwise treated) as necessary. Age will be determined by counting the number of annuli (i.e., yearly rings) through a compound microscope.

Tissue samples will be analyzed for moisture content and metals (standard suite of parameters, including selenium and mercury; Table 4.7-2) by a CALA certified laboratory targeting detection limits described in BC MOE (2016a). Laboratory methods will be performed following BC ENV (2023b) sample preparation procedures.

Quality Assurance/Quality Control

Field equipment will be calibrated prior to the start of each field trip or more frequently (e.g., if values are outside of range, or as recommended by equipment manufacturers), properly maintained, and kept clean and free of excess water. The fine scale will be located indoors on a flat surface; only a field scale will be taken to each site. All scales will be regularly tared to maintain accuracy while in use. Care will be taken to clean equipment during collection of tissue metal samples to minimize the potential for cross-contamination.

Field crew members that are experienced and knowledgeable of local fish species will identify all captured fish to species. A subset will be photographed for verification of species identification. Sample bags, envelopes, and vials will be labelled with site name, date, and sample type. An inventory of all samples will be maintained and verified prior to shipping. Chain-of-custody forms will be completed and shipped with all samples for laboratory analysis.

All field data will be recorded on waterproof paper or in electronic field forms and examined for completeness and accuracy. Field notes will be copied (e.g., scanned) after each field day to ensure redundancy and uploaded to a secure online database. Data will be entered into a Mine-specific database for future analysis. Changes to the field methods and/or deviations from the Implementation Framework will be recorded and reported in the annual report along with rationale for the change.

4.8.1.3 DATA ANALYSIS

All statistical analyses will be performed using R statistical computing package (e.g., R Core Team 2024), or equivalent. Fish classified as 'salvaged' will be excluded from assessment endpoints including catch-per-unit-effort (CPUE), abundance, and density.

Catch-Per-Unit-Effort

Fish community data will be summarized by calculating CPUE for each individual fishing effort and fish species captured. The CPUE will be calculated as the number of fish captured per sampling device per unit time as follows:

*CPUE (fish/100 s) = number of fish caught * [100/(electrofishing effort)]; or*
CPUE (fish/trap-hour) = number of fish caught / minnow trap hours

The CPUE is an index of relative abundance that can be used to compare fish populations over time with the assumption that catch is proportional to the amount of effort for each gear-type used.

For effects assessment, a Mann-Kendall temporal trends test will be completed for each site and to compare control and impact sites: this will require a minimum of five years of monitoring data. It is hypothesized that if mine activities affected the fish community, then there would be a significant reduction in CPUE at impact sites in comparison with no significant reduction at control sites.

Fish Abundance and Density

Population estimates for each fish species by size class will be calculated in R using the Carle and Strub (1978) or similar method (e.g., Leslie and Delury Methods), best suited to the dataset in package 'FSA' (Ogle et al. 2022). Data from three-pass removal electrofishing will be used to calculate population size at each site that would have been captured if sampling continued until all fish at the site were caught. This method is based on each subsequent pass removing fewer fish and extrapolating the decreasing number to zero. Standard error and confidence intervals will also be calculated. Density estimates will then be calculated based on the population estimate and the area of the sampling site. If the population estimate from depletion data is not possible, density will be determined using cumulative catch across all electrofishing passes. Density and abundance estimates will include a standard error and 95% confidence limits.

Population Structure

Population structures of rainbow trout will be assessed using length frequency distributions and length-age regressions. The length frequency distributions between control and impact sites will be compared using a two-level Kolmogorov-Smirnov Test. Five individual length measurements will be considered the minimum sample size required for the Kolmogorov-Smirnov Test, although field sampling (Section 4.8.1.2) will aim to capture as many fish as possible to a maximum of 100 fish, to maximize the statistical power of the test.

It is hypothesized that if mine activities affected the fish community, then there would be an alteration to the length-at-age and age distribution at impact sites in comparison with no significant alteration at control sites.

Fish Condition

Length-weight data will be plotted to visually assess the entire data set and to identify outliers. Once outliers are visually identified, potential explanations for the outlier values will be investigated and decisions will be made to either repair the outlier, include the outlier in data analysis, or remove the outlier from further analysis. Rationale for how outliers are handled will be documented in the AEMP Interpretive Report.

Fulton's condition (K) will be used as the metric for condition and will be calculated by comparing the measured weight to the expected weight from the measured length as:

$$K = \frac{100 \times W}{L^3}$$

where:
W = measured fish weight (g)
L = measured fish fork length (cm)

Fulton's condition will be statistically compared between control and impact sites. First, the distributions will be tested for normality using an Anderson-Darling test and if normally distributed, a single factor ANOVA followed by a Tukey's multiple comparison test will be computed to compare relative condition. If the data are not normally distributed, a Kruskal-Wallis test by ranks will be used with a Steel-Dwass test for multiple comparisons. It is hypothesized that if mine activities affected the fish community, then there would be a significant loss of fish condition at impact sites in comparison with no significant loss of fish condition at control sites.

Tissue Metals Concentrations

For tissue metals analysis, summary statistics including minimum, maximum, mean, median, standard deviation, standard error, MDL, sample size, and percent non-detects for dry weight and wet weight metal contents will be calculated for each site, as recommended in BC MOE (2016a). If a concentration is below the MDL, then half the MDL will be used during calculations of summary statistics (BC MOE 2016a). Graphical and statistical analysis will focus on selenium and mercury because tissue residue guidelines have been developed for these parameters (BC MOE 2014; CCME 2000 or updated). Additional parameters may be included in AEMP reporting if changes in water quality are identified (Section 4.4.2.3), particularly if those changes were not predicted by the surface water quality model.

Similar to both water (Section 4.4.2.3) and sediment quality (Section 4.5.1.3) analysis, to further assess Mine-related effects on tissue metals concentrations a BACI analysis will be completed. Analysis will be performed using the most recent R statistical computing package (e.g., R Core Team 2024), or equivalent. Data transformations (e.g., log transformation) will be completed if determined to be appropriate (e.g., to achieve random distribution of residuals). For all effects analyses, statistical results are considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical MDLs (i.e., highly censored data).

Age or the most appropriate metric (i.e., length or weight) to address the potential for bioaccumulation in fish tissue will be included as a covariate in statistical analyses of fish tissue concentrations of mercury and selenium. The BACI analysis introduces a class effect to a mixed model ANOVA, which is based on the classification of a site as an impact or a control site. A random effect of year to account for variability in fish tissue metals concentration data will also be included. The “before” period was the data collected in baseline (2017 and 2022) and Year 1 of Construction (2023). The Year 1 of Construction (2023) was added to the “before” period because there was limited construction activities and no surface water discharge in 2023 (ERM 2025).

The interaction between the period (before or after) and class (impact or control) effects reveals whether any before-after change in the mean parameter concentration that occurred in the impact site also occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than significance level (ɑ) of 0.05) will be assessed using an F-test. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction will be applied.

It is hypothesized that if mine activities affected concentrations of metals in surface water and the metals were taken up from the water into fish tissue, then there would be a significant increase in tissue metal concentrations in fish collected at impact sites (particularly at near-field sites) in comparison with baseline concentrations or control sites. However, if a change in the mean is detected by the before-after comparison, but the BACI analysis indicates that a parallel change also occurred at the control sites, it is reasonable to assume that this change is likely a natural phenomenon and unrelated to the Mine activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites, it is reasonable to conclude that this change is likely the result of non-Mine activities (e.g., forestry or agricultural activities).

A precautionary approach will be used to determine if an effect is attributable to Mine activities in cases of unexplained significant interactions using professional judgement, additional sampling, and/or field data to confirm significantly elevated or lower concentrations.

Selenium and mercury concentrations in fish tissue will also be compared to the most current BC and federal tissue residue guidelines as an assessment endpoint (BC MOE 2014; CCME 2000 or updated).

4.8.2 KOKANEE SUMMER SPAWNING SURVEY

The purpose of the Kokanee Summer Spawning Survey is to monitor the size of the kokanee spawning run in the AEMP study area (Figure 4.8-1). Kokanee spawning success will be assessed for effects related to changes in water quality and the water withdrawal from Tatelkuz Lake to Davidson Creek.

4.8.2.1 MEASUREMENT ENDPOINTS, ASSESSMENT ENDPOINTS

The assessment endpoints for the Kokanee Summer Spawning Survey will be the number and density of spawning kokanee, the number and density of kokanee redds, the fish length at maturity, the substrate composition, and mesohabitat relative abundance (Table 4.8-2).

FIGURE 4.8-1 DISTRIBUTION OF KOKANEE SPAWNING HABITAT ASSESSED IN 2011 TO 2012 AND PLANNED SURVEY SITES

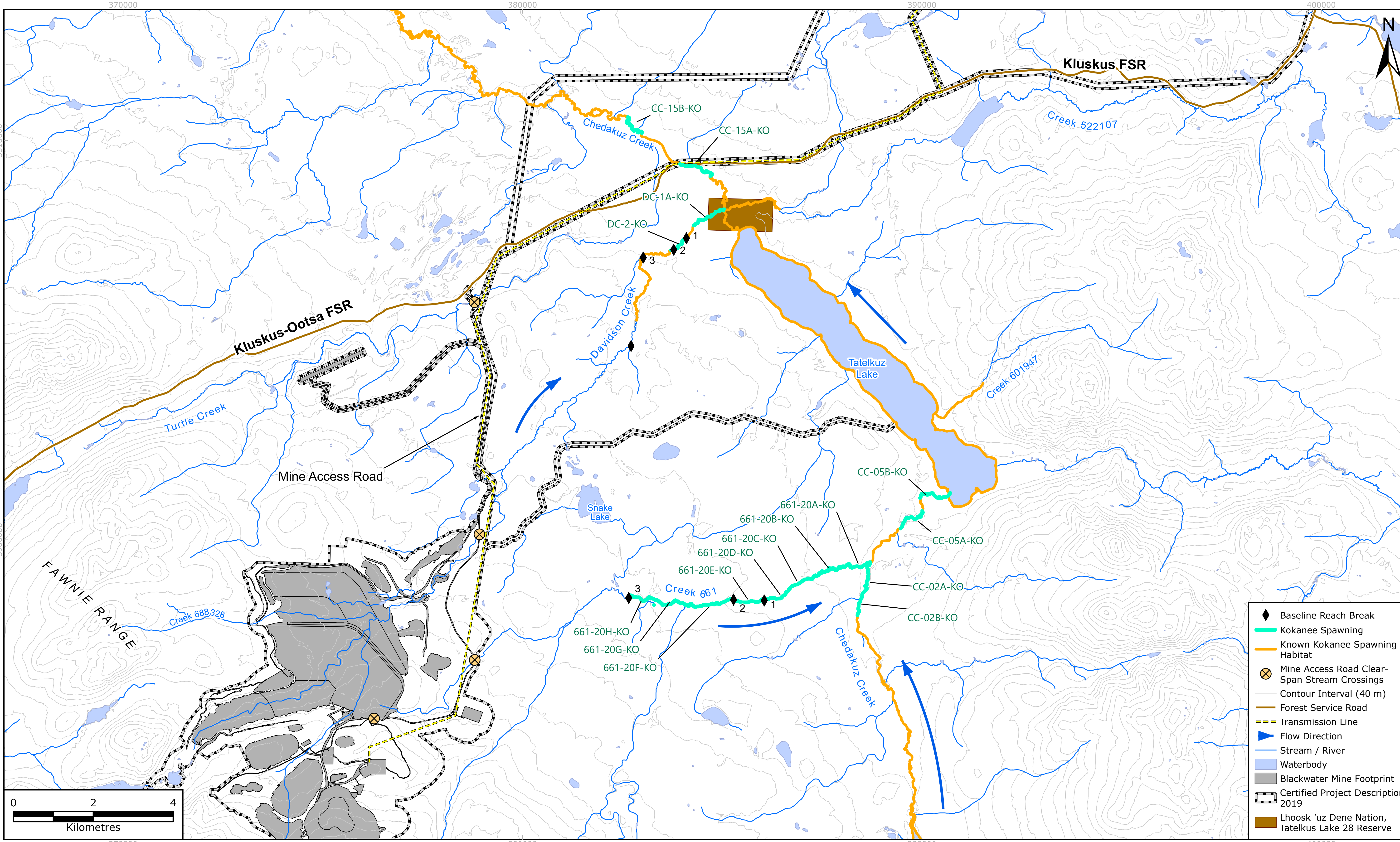


TABLE 4.8-2 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR THE KOKANEE SPAWNING SURVEY

Measurement Endpoint	Assessment Endpoint
Kokanee spawning	• Number of spawning Kokanee and density (Kokanee/100 m^2) • Number of redds and redd density (redds/100 m^2) • Fish length at 100% maturity • Substrate composition (geometric mean diameter and percent composition of less than 0.85 mm diameter) • Mesohabitat relative abundance

4.8.2.2 SAMPLING LOCATIONS AND METHODS

Field Methods

Monitoring of spawning kokanee will be completed at a total of ten survey sites (Table 4.8-3; Figure 4.8-1) including:

- Reaches 1 and 2 in Davidson Creek (DC-20);
- Reach 1 in Creek 661 (661-20);
- Downstream of Tatelkuz Lake in Lower Chedakuz Creek (CC-15);
- Upstream of the confluence with Creek 661 in Middle Chedakuz Creek (CC-02); and
- Downstream of the confluence with Creek 661 in Middle Chedakuz Creek (CC-05).

TABLE 4.8-3 KOKANEE SPAWNING SURVEY SITES

Waterbody	Reach/Site ID	UTM Coordinate Location	UTM Coordinates	
			Easting (m)	Northing (m)
Davidson Creek	DC-1A-KO	Downstream end	385019	5908270
Davidson Creek	DC-2-KO	Downstream end	384105	5907542
Creek 661	661-20A-KO	Downstream end	388717	5899420
Creek 661	661-20B-KO	Downstream end	388124	5899370
Creek 661	661-20C-KO[1]	Downstream end	387369	5899101
Creek 661	661-20D-KO[1]	Downstream end	386659	5898730
Creek 661	661-20E-KO[1]	Downstream end	386047	5898470
Creek 661	661-20F-KO[1]	Downstream end	385272	5898499
Creek 661	661-20G-KO[1]	Downstream end	384125	5898360
Creek 661	661-20H-KO[1]	Downstream end	383343	5898491
Lower Chedakuz Creek	CC-15A-KO	Downstream end	383936	5909402
Lower Chedakuz Creek	CC-15B-KO	Downstream end	382582	5910615

Waterbody	Reach/Site ID	UTM Coordinate Location	UTM Coordinates	
			Easting (m)	Northing (m)
Middle Chedakuz Creek	CC-02A-KO	Downstream end	388711	5899411
Middle Chedakuz Creek	CC-02B-KO	Downstream end	388521	5898667
Middle Chedakuz Creek	CC-05A-KO	Downstream end	390004	5900728
Middle Chedakuz Creek	CC-05B-KO	Downstream end	390645	5901156

Note:
Coordinates are in North American Datum (NAD) 83, Universal Transverse Mercator (UTM) Zone 10.
[1] Spawning surveys reaches in Creek 661 were added in 2024 to encompass entire kokanee spawning distribution.

Repeated surveys of upper Chedakuz Creek have resulted in observations of low numbers of kokanee (i.e., two total observations in 2022). Therefore, long-term kokanee monitoring in upper Chedakuz Creek has been discontinued. Two control reaches (CC-02A-KO and CC-02B-KO; Table 4.8-3) for Kokanee spawner surveys were selected to substitute for the Upper Chedakuz Creek control site in 2023, informed by field reconnaissance and historical Kokanee abundance and fish habitat information. These two reaches are located in middle Chedakuz Creek, upstream of the confluence with Creek 661. A second reach (CC-05B-KO) in Middle Chedakuz Creek was also added in 2023 and two sites were selected for monitoring in Lower Chedakuz Creek (CC-15A-KO and CC-15B-KO) (Table 4.8-2).

A study, separate from the AEMP Plan, to inform the distribution of spawning kokanee throughout Middle Chedakuz Creek, between Tatelkuz Lake and Kuyakuz Lake, will be conducted in 2025; The objective of this study is to determine if the existing AEMP sites are adequately located and are representative of the spawning distribution within this watercourse. Results of this study, to be reported on in January 2026, will be used to inform site selection in future versions of the AEMP Plan (i.e., April 2026). The entire spawning distribution of kokanee in Davidson Creek will be surveyed as part of the federal Condition 3.14 long-term monitoring (Palmer 2023a) and reported under a separate cover and summarized in the AEMP Interpretive Report. Reach 1 and Reach 3 have been used as the AEMP monitoring reaches in Davidson Creek for BACI and trends analyses, depending on the monitoring metric. However, a large beaver dam, located in the lower portion of Reach 3 limits kokanee spawning use throughout most of this reach. Therefore, Reach 1 and Reach 2 will be used as the AEMP monitoring reaches going forward.

The entire spawning distribution of kokanee in Creek 661 will be surveyed as part of the AEMP. In addition to the two existing AEMP monitoring reaches in Creek 661, six reaches (661-20C-KO through 661-20H-KO), totaling approximately 5.7 km, will also be surveyed.

The selected reaches within each of the sampling locations will facilitate comparison of spawner abundance over time to help identify potential changes in kokanee escapements. Peak spawner counts have been shown to be highly correlated with total abundance and to be accurate in capturing relative changes in spawner abundance (Askey et. al. 2023). Surveys at these locations will also provide data on the movement of spawning kokanee from Tatelkuz Lake and other waterbodies into specific watersheds, including the Davidson Creek watershed, the Creek 661 watershed, and Lower and Middle Chedakuz Creek watershed downstream and upstream of Tatelkuz Lake. Spawner surveys completed in 2022 included bank walk lengths of 500 m that were established to count Kokanee spawners and their redds. Beginning in 2023, site lengths were extended either 500 m further upstream or downstream, for a total length of approximately 1,000 m.

The kokanee spawning surveys will be completed from mid July- to late September (Table 4.2-3), which is when kokanee have been observed to spawn (AMEC 2013a, 2013b). The lengthy monitoring period is due to the differential spawning periods in the various watersheds (e.g., lower Chedakuz Creek is weeks later than other reaches). It is expected, however, that the spawning run will occur over a period of approximately four weeks at any given site. Specific timing of the sampling program, number of surveys, and survey termination will be informed by field-based monitoring triggers outlined in the following subsection.

Kokanee and kokanee redds will be counted weekly over the entire spawning run (i.e., approximately late July to mid-September, although exact timing varies by stream) by a two-person crew hiking upstream alongside each selected 1,000 m reach of stream. Hiking will occur on the banks, not in the watercourses, except when topographic features, heavy large woody debris, log jams, and/or thick vegetation requires the crew to move from one side of a watercourse to the other. In these instances, care will be taken to cross where there are no observed redds or spawning fish present to reduce potential disturbance. By walking upstream, the crew will reduce the startle response of fish, which are usually oriented head-first into the flowing water. This will increase the probability of accurately counting fish. Redd sites will be recorded based on observations of cleaned gravel and local depressions in suitable spawning areas. When redd counts and spawner abundance data are collected simultaneously, it may be possible to calibrate the two datasets. This calibration can then be used to derive spawner estimates and assess their associated uncertainty when only redd count data are available (Dauphin 2010). Additionally, redd density relative to fish density can provide an indication of spawning timing (i.e., how late or early in the spawning run a survey event is occurring). Redd distribution can be used to spatially monitor changes in habitat distributions.

Both live and dead kokanee will be counted, but as separate categories. Live fish will be further classified as migrating/holding, spawning, or spent, depending on their behaviour. Migrating/holding counts will be pooled together as one category due to the difficulty in differentiating between the two behaviours. Fish tallied as migrating/holding will be swimming steadily, usually upstream, or holding in a group with no evidence of spawning activity. Spawning fish will be those paired and engaged in courtship behaviour with one or more mates, or actively digging or guarding a redd. Spent fish will be those observed in pools and backwaters or drifting downstream along the stream margins with clear damage to the body and fins.

Fish in each of the four classes (i.e., migrating/holding, spawning, spent, and dead) will be counted together by the crew. A subset of observed dead fish will be sampled for sex, fork length, and postorbital hypural length, due to the variability of the morphological changes associated with the spawning condition (e.g., kype formation), and the likelihood of mouth or caudal fin damage and/or decomposition. Female dead kokanee will be assessed as either spent (approximately 100% of eggs released), partially spawned (approximately 50% of eggs released), or not spawned (approximately 0% of eggs released). A sample size of 30 dead fish will be targeted for otolith collection to determine size and age at maturity. Carcasses will be cut in half with a machete to avoid recounting during subsequent walks.

Spawning habitat availability and substrate assessments will be completed during the first bank walk survey conducted at the start of the kokanee survey period. Sampling will be conducted at each stream site on the first spawning survey of the year, while the majority of fish are migrating or holding, to avoid disturbing spawning fish or redds. Mesohabitat mapping, following the Fish Habitat Assessment Procedure (Johnston and Slaney 1996) will be used to quantify the amount of riffle, run, and pool habitat along the entirety of each survey site and the number of "riffle crests" at pool tailouts will be counted. This data will be used to evaluate change in habitat availability resulting from potential changes to sediment transport dynamics.

Additionally, direct substrate sampling will be completed to evaluate substrate particle size distribution in spawning areas (i.e., riffle crests). The substrate sampling procedure will use a McNeil Core Sampler in accordance with the method for substrate particle size distribution sampling in the British Columbia Field Sampling Manual, Part D (BC ENV 2020). Additionally, the sampling methodology and subsequent analysis of the substrate samples will follow the Salmonid Spawning Gravel Composition Module in the Timber, Fish and Wildlife Ambient Monitoring Program Manual (Schuett-Hames et al. 1994). Four riffle crests will be randomly selected from the total number counted during the fish habitat assessment and used for substrate sample collection. If the number of riffle crests is less than four in a spawning survey reach, then gravel patches of a similar depth and minimum dimensions of 2 m x 2 m will be used. Sediment samples will be located along a channel-spanning transect at each riffle crest at 25%, 50%, and 75% of the channel width, to provide 12 substrate samples for each spawning reach, as recommended by Schuett-Hames et al (1994). All sample locations will be recorded with a handheld GPS. McNeil core samples will be collected and processed according to Schuett-Hames et al (1994), where samples will be placed in a labelled container and shipped to a laboratory for particle size distribution analysis.

Coordinates will be collected at the start and end locations of each spawner survey with bankfull, and wetted width channel measurements taken every 200 m along fixed locations of each bank walk. In situ water quality measurements will be recorded at the beginning and end of each bank walk. Measured surface water parameters will include temperature (ºC), dissolved oxygen (mg/L), pH, conductivity (µS/cm), and turbidity (NTU). The location of potential barriers that may limit upstream fish passage (e.g., beaver dams) will be collected and where safe to do so measurements (length, height, width) will also be recorded.

All data will be recorded in field notebooks and electronic field forms with photographs taken of selected stream sites. Changes to the field methods and/or deviations from the Implementation Framework will be recorded and reported in the annual report along with rationale for the change.

Implementation Framework

Kokanee summer spawner surveys are generally planned from mid July until late September. To achieve an accurate estimate of spawner abundance, the objective is to conduct surveys over the full duration of the spawning period and to obtain survey events with near zero observations bounding the start and end of the spawning period. Kokanee spawner visual bank walk surveys will occur over each survey reach once per week thus the total number of surveys will depend on the length of the spawning period. It is intended that the kokanee spawner surveys will generally commence and terminate based on this framework however exact survey timing may be adjusted based on external factors such as severe weather events, safety considerations, and/or unforeseen circumstances; Professional judgement will be applied and documented in these cases.

Commencement Trigger

Kokanee spawning visual bank walks surveys will commence approximately one week prior to the estimated start of spawning migration; the current migration timing is based on historical knowledge (AMEC 2013, Palmer 2022b, 2023c, 2024a, 2024b) in each system and will be refined based on observed timing of spawning in subsequent years:

- Davidson Creek – mid July
- Middle Chedakuz Creek and Creek 661– early August
- Lower Chedakuz Creek – mid August

As additional years of watercourse specific data become available, the roles of water temperature and discharge on the timing of Kokanee spawning migration will be investigated, for watercourses where both these datasets are available near kokanee spawning reaches. The results of these investigations will be considered and may be incorporated with respect to commencement triggers in future versions of this plan.

Field survey components related to mesohabitat mapping and substrate sampling (in required sampling years) will commence in early-to-mid July to minimize potential impacts to developing rainbow trout embryos and Young-of-the-Year (YoY) and to avoid disturbance to migrating/spawning kokanee and/or kokanee redds.

Termination Trigger

Visual bank walk surveys in each survey reach will terminate when the following criteria are met:

- Peak[7] of Kokanee spawning observed within the watercourse during current years sampling program, and
- A survey event with few[8] to no holding/migrating and/or spawning kokanee observed within the survey reach.

[7] A bimodal spawning distribution has been documented in Davidson Creek in 2022, 2023, and 2024. In this watercourse, the secondary peak should be used in this criterion. In future, this should occur for any other watercourses where bimodal spawning distributions are documented.

[8] 'Few' - to equal less than 1% of total number of mature kokanee observed in the survey reach throughout the duration of the program to the current sampling day.

In the event a potential barrier to upstream fish migration (e.g., beaver dam) is documented, weekly visual bank walk surveys will continue in survey reaches located upstream from the potential barrier until the following are met:

- No kokanee observed upstream of potential barrier, and
- Peak of kokanee spawning observed within survey reaches downstream.

Once the above have been met and the barrier has been documented as a full obstruction to upstream fish migration by a Qualified Professional, visual bank walk surveys will be terminated in reaches upstream of the identified barrier for the remainder of the kokanee spawning period. If any significant changes to the barrier are observed during the sampling season (i.e., beaver dam breach/collapse) visual bank walk surveys will recommence in the upstream survey reaches.

Laboratory Analysis

Collected otoliths, fin clips, and/or scales will be assessed using the same methods and analyses as discussed in Section 4.8.1.2.

Particle size distribution will be assessed according to the methods used by the laboratory to provide the composition by weight of substrate size classes according to Schuett-Hames et al. (1994) which includes 0.125 mm, 0.25 mm, 0.5 mm, 0.85 mm, 1.0 mm, 2.0 mm, 4.0 mm, 8.0 mm, 16.0 mm, 32.0 mm, and 64.0 mm sieve sizes.

Quality Assurance/Quality Control

The QA/QC for field equipment, electronic field forms, field notes, and data entry will be carried out as discussed in Section 4.8.2.2.

4.8.2.3 DATA ANALYSIS

Fish data will be transcribed from field notes and downloaded from electronic field forms and submitted to the ENV Fisheries Data Submission site in accordance with collection permit conditions.

The kokanee salmon life cycle (fertilization to spawning and death) can span from three to five years, with the majority of fish returning to spawn and then die in their fourth year. Similar to sockeye salmon and other Pacific salmon species, fish returning each year are the progeny of fish that spawned four years earlier and mostly separated from other years. Because of this cyclical trend, each "run-year" should be treated as a separate entity in assessing abundance trends, rather than a general assessment of abundance across all years.

There are baseline data for kokanee spawning each of the four possible 'run-years.' These data are based on the Kokanee spawning surveys that occurred in 2011, 2012, 2013 (AMEC 2013a, 2013b) and 2022 (ERM 2023b), assuming a four-year run cycle.

Spawner Count and Density

Estimates of spawning kokanee escapement for Davidson Creek (the entire distribution of spawning kokanee in this creek is surveyed as part of the federal Follow-up Program for Condition 3.14) and Creek 661 will be calculated using area-under-the-curve (AUC) methods based on live counts (adjusted for observer efficiency) obtained during the spawner surveys; 95% confidence intervals will be calculated and reported, where possible. Observer efficiency and survey life estimates will also be reported. Escapement estimates using both the Gaussian AUC (GAUC) method and the trapezoidal AUC (TAUC) method will be reported, for comparison.

To standardize counts of kokanee spawners and allow for comparison to baseline, counts will be divided by both the length of stream and by the estimated area of stream surveyed. Spawner density will be calculated based on counts observed and the area of the sampling site.

A Mann-Kendall temporal trends analysis for kokanee spawners will be used to assess for temporal alterations in spawning activity for each run-year. It is hypothesized that if mine activities affected the kokanee community, then there would be a significant decrease in spawning activity at impact sites in comparison with spawning at control sites or there would be a significant decline in spawning activity over time.

Redd Count and Density

To standardize counts of kokanee redds and to allow for comparison to baseline, counts will be divided by both the length of stream and by area of stream surveyed. The total number of observed redds per system will be presented as a density of redd counts by stream area (redds/100 m^2).

A Mann-Kendall trend analysis will be used to assess for any temporal alterations of redd counts for each run-year.

A spatial analysis (e.g., heat map) of kokanee redd distribution for Davidson Creek, Creek 661, and Middle Chedakuz Creek will also be reported.

Length at Maturity

Length measurements (fork and postorbital hypural) will be used to create length-at-age and size--at-maturity distributions. BACI analyses will be used to assess for Mine-related impacts to kokanee spawner length at maturity.

Substrate Composition and Mesohabitat

Substrate sampling for grain size composition will provide data to determine the percentage of substrate less than 0.85 mm, the geometric mean diameter, and a proportional weight of material per grain size range as described in Schuett-Hames et al (1994). The threshold particle size of 0.85 mm is used because the percentage of substrate less than 0.85 mm has been shown to be the most sensitive indicator of changes to substrate induced by land management activities (Young et al. 1991). The geometric mean diameter of the substrate will be calculated because it has been shown to be the most sensitive measure of survival to emergence for salmonids (Young et al. 1991).

Mesohabitat data will be used to evaluate the relative amount of riffle, run, and pool habitat types in each survey site and to identify and shifts in mesohabitat availability over time.

A BACI analysis (as described in Section 4.5.1.3) will be used to assess for the Mine-related changes to the aforementioned substrate composition endpoints and mesohabitat.

4.8.3 KOKANEE FRY SPRING OUTMIGRATION SURVEY

The purpose of the Kokanee Fry Outmigration Survey is to monitor the success of the kokanee spawning run in the AEMP study area. The results of the surveys will be assessed for effects related to changes in water quality and of water withdrawal from Tatelkuz Lake and into Davidson Creek.

4.8.3.1 MEASUREMENT ENDPOINTS AND ASSESSMENT ENDPOINTS

The assessment endpoints for the Kokanee Summer Spawning Survey will include total fry abundance for the outmigration period, and the length-weight distribution, and condition of fry (Table 4.8-4).

TABLE 4.8-4 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR THE KOKANEE FRY OUTMIGRATION SURVEY

Measurement Endpoint	Assessment Endpoint
Kokanee fry outmigration	Calculated total fry abundance for the outmigration period
Kokanee fry health	Condition – length and weight

4.8.3.2 SAMPLING LOCATIONS AND METHODS

Field Methods

Five sites will be monitored for kokanee outmigration (Table 4.2-2; Figure 4.2-4) including:

- One site in Davidson Creek (DC-20);
- One site in Creek 661 (661-20);
- One site in Lower Chedakuz Creek (CC-15), downstream of Tatelkuz Lake ;
- One site in Middle Chedakuz Creek, at its outlet into Tatelkuz Lake (CC-05); and
- One control site in Middle Chedakuz Creek upstream of the confluence with Creek 661 (CC-02).

Sampling these reaches will provide data on the movement of kokanee fry from specific watersheds, including the Davidson Creek watershed, the Creek 661 watershed, and middle Chedakuz Creek watershed into Tatelkuz Lake. Sampling these reaches will provide data on the movement of kokanee fry from specific watersheds, including the Davidson Creek watershed, the Creek 661 watershed, and Middle Chedakuz Creek watershed into Tatelkuz Lake. Davidson Creek (DC-20) and Creek 661 (661-20) sites are located at the creek mouths to capture fry outmigration from the entire distribution of Kokanee spawning in each respective creek. The control site (CC-02) in Middle Chedakuz Creek was established in 2024 and is located immediately upstream of the confluence with Creek 661 to capture fry out-migrating from the portion of Middle Chedakuz Creek unaffected by the Mine. The CC-05 site is located at the mouth of Middle Chedakuz Creek on Tatelkuz Lake and captures fry from the entire Middle Chedakuz Creek watershed; this site intercepts fry that are also sampled at CC-02 and 661-20. The CC-15 sampling location in Lower Chedakuz Creek captures fry from the portion of the watercourse between the Tatelkuz Lake outlet and the sampling location but may also intercept fry outmigration from Davidson Creek (initially sampled at DC-20) if fry movement downstream in Lower Chedakuz Creek occurs prior to an upstream migration into Tatelkuz Lake.

Kokanee fry outmigration surveys will be completed initially on an annual basis for eight years in early spring (Table 4.2-3). Sampling will occur during spring freshet, which is when the kokanee fry are expected to return to the lake (AMEC 2013a, 2013b). The start of the sampling program will coincide with the approximate commencement of fry emergence date based on peak kokanee spawning times in the previous year and ATUs. Specific timing of the sampling program, trap efficiency tests, and sampling termination will be informed by field-based monitoring triggers outlined in the following subsubsection. The sampling period is anticipated to last four to six weeks but will be dictated by the length of the observed fry outmigration period in each watercourse.

Sampling will occur overnight as most (greater than 90%) fry outmigration occurs between 19:00 hours and 02:00 hours (Manson 2005). Initial sampling will be conducted approximately every 5 nights during the pre-peak period. As fry outmigration rates increase (e.g. >50 fry captured in a single night) the sampling frequency will increase to every second night for the duration of the peak outmigration period. Sampling will decrease to approximately once every 5 nights following the peak outmigration period (e.g., as capture rates fall below 50 fry per night) until surveys are terminated based on triggers outlined in the following subsection. Periodically, sampling will occur over two consecutive nights during mark-recapture events.

On each sampling night, two fine-mesh funnel (drift) nets (0.94 m width x 0.53 m height; cross-sectional area of 0.5 m^2), with holding boxes attached to the cod ends (based on Fraley and Clancey 1984), will be deployed. The holding boxes are designed with mesh windows and an internal v-shaped baffle to provide flow refugia for captured fry to minimize mortality. Near-continuous overnight sampling will occur between approximately 19:00 hours and 03:00 hours, with individual net sets lasting approximately 30 minutes. The duration of net sets will be adjusted based on the number of fry captured and/or the amount of debris present. Mitigations to reduce fry mortality, e.g., reducing net set times to 15 minutes or less and employing debris deflectors, will be implemented during high flow events and/or when mortality rates increase during the first sets on a sampling night. On any given night, sampling may be terminated prematurely, at the discretion of the field crew lead, if these mitigations fail to reduce fry mortality rates; Professional judgement will be applied and documented in these cases.

Fish collection and processing will occur after each net set. Fish will be removed from holding boxes into separate holding buckets and the nets will be cleared of debris between each set. Captured fish will be identified to species, life stage, and enumerated. Any lesions, parasites, or other deformities (or lack thereof) will be recorded. During each sample night, a subset of 30 fry will be randomly chosen and measured for fork length (to the nearest 1 mm) and wet-weight (to the nearest 0.01 g). All mortalities and any incidental species captured will be measured and weighed. Kokanee fry mortalities will be dried prior to weighing to provide a more accurate weight measurement.

Trap efficiency will be determined via a mark-recapture program conducted over multiple two-night sampling events (i.e., mark captured fish on night one and recapture marked fish on night two). Multiple mark-recapture events will be completed at each site, spanning the outmigration period, when fry capture rates allow (marking target >100 fish per event). Mark-recapture events will be distributed throughout the outmigration period thereby determining trap efficiencies during a variety of flow stages and creek conditions. Captured fry will be marked with a Bismarck Brown Y solution, held in an instream livewell until the following day, and then released upstream (>100 m) of the capture location. Separate subgroups of marked fry will be released over approximately 10 to 20 m of stream bank on both sides of the watercourse to maximize dispersal and reduce predation risk. All fry captured on the following night will be examined for mark presence, and recaptured marked fry will be tallied.

To assess for dye retention and survival rate associated with marking, subsets of marked and unmarked fry (to a maximum of 20 each) will be held separately in mesh bags within the instream livewell overnight. The number of mortalities in each bag will be tallied the following morning. Surviving marked fry will be added to the marked fry subgroups and released as described above. The subset of unmarked fry will be released at the livewell location to ensure they are not recounted.

The date, time, weather conditions, in-situ water quality measurements (water temperature [°C], dissolved oxygen [mg/L, %], pH, and conductivity [µS/cm]) will be recorded prior to each night of sampling. The wetted cross-sectional area of both nets will be recorded and discharge will be measured at an established transect at the sampling location. These data will provide a cross-sectional area of the watercourse at the net location to be used in area-based expansion calculations of fry estimates.

All data will be recorded in field notebooks and/or electronic field forms with photographs taken of selected stream sites. The AEMP Interpretive Report will provide the calculated ATUs for streams with available temperature monitoring. Changes to the field methods and/or deviations from the Implementation Framework will be recorded and reported in the annual report along with rationale for the change.

Implementation Framework

Kokanee fry spring outmigration surveys are generally planned from mid-to-late April through to mid-June. During kokanee fry outmigration surveys conducted in 2024, fry outmigration was observed in late April prior to spring freshet.

As in most fish, the development rate of kokanee eggs is a function of incubation temperatures. Hatch and emergence timing, followed by outmigration, can be estimated using ATUs. Generally, kokanee fry emergence is expected to occur between 900 to 950 ATUs (DFO 2023; Giesbrecht, G. 2024). Kokanee fry emergence was estimated between 902 and 970 ATUs for stream-spawning Kokanee in Okanagan Lake (Sheperd 1999).

To achieve an accurate estimate of total fry abundance, the objective is to obtain sampling events with near zero captures bounding the start and end of the outmigration period. The total number of outmigration surveys at each site will depend on the length of the outmigration period. It is intended that the Kokanee fry outmigration surveys will generally commence and terminate based on this framework however exact survey timing may be adjusted based on external factors such as severe weather events, safety considerations, and/or unforeseen circumstances; Professional judgement will be applied and documented in these cases.

Commencement Trigger

Where continuous daily average water temperature and timing of kokanee spawning data are available[9], ATUs will be calculated and used to estimate the outmigration timing window. The start of the sampling program in each watercourse will be scheduled closely but prior to the earliest estimated

[9] Continuous temperature data are available from long-term hydrology stations located in Davidson Creek and Lower Chedakuz Creeks. Tidbit temperature loggers were also installed in near the mouth of Creek 661 and in middle Chedakuz Creek in 2024 to collect temperature data for ATU calculations.

emergence date. The earliest estimated emergence date will be based on the most conservative ATU threshold (i.e., 900) and the observed start of kokanee spawning (i.e., first observed constructed redd) during the previous years' kokanee spawning surveys in each watercourse.

Where continuous daily average water temperature data are available, ATUs will also be back calculated using the observed start of the fry outmigration and kokanee spawning timing to refine the estimated emergence ATU range; this range will be used as the commencement trigger in subsequent years. The results from the 2024 field season indicated that kokanee fry outmigration in the surveyed watercourses began prior to freshet. If continuous temperature data are unavailable (e.g., due to logger malfunction or damage) to calculate ATUs, outmigration surveys will commence immediately post ice-off.

Termination Trigger

Where continuous daily average water temperature and timing of kokanee spawning data are available, ATUs will be calculated and used to estimate the outmigration timing window. The latest estimated emergence date will be based on the most conservative ATU threshold (i.e., 970) and the observed end of kokanee spawning (i.e., last observed constructed redd) during the previous years' kokanee spawning surveys in each watercourse.

Where continuous temperature data are unavailable to calculate ATUs, the latest emergence date will be based on results from previous years. For example, results from 2024 indicated that kokanee fry outmigration continued into mid June in all sampled watercourses.

Kokanee fry outmigration surveys will terminate when the following criteria are met:

- Peak[10] of kokanee fry outmigration observed during the current years sampling program,
- Sampling date falling after the latest estimated emergence date, and
- Overnight sampling event with few[11] to no Kokanee fry captures.

Quality Assurance/Quality Control

The QA/QC methods for field equipment, electronic field forms, field notes, and data entry will be carried out as discussed in Section 4.8.2.2.

4.8.3.3 DATA ANALYSIS

Fish data will be transcribed from field notes and downloaded from electronic field forms and submitted to the BC ENV Fisheries Data Submission site in accordance with collection permit conditions. The number of kokanee fry mortalities and mortality rate will be reported upon in the AEMP Interpretive Report.

[10] A bimodal Kokanee spawning distribution has been documented in Davidson Creek in 2022, 2023, and 2024. Thus it is plausible to expect a bimodal fry outmigration. In this watercourse, the secondary peak (if observed) should be used in this criterion. In future, this should occur for any other watercourses where bimodal spawning distributions are documented.

[11] 'Few' - the daily catch estimate (adjusted for trap efficiency or based on area-based approach) equal to less than 1% of the total kokanee fry estimate.

Kokanee Fry Abundance

Trapping Efficiency Catch Expansion

Chapman-corrected trapping efficiency (the probability of capturing fry passing the sampling location), which adjusts for small sample bias, will be calculated using the following equation:

$$p_c = \frac{m + 0.5}{M + 1}$$

where:
M = Number of marked fish released during night one
m = Number of marked fish captured during night two
p_c = Chapman-corrected trap efficiency

The total number of kokanee fry captured at a site on a given night will then be expanded by trapping efficiency to account for fish that passed the sampling site but were not captured, using the following equation, resulting in a total nightly abundance estimate:

$$N = \frac{n_i}{p_c}$$

where:
N = Total nightly abundance estimate
n_i = Total catch at sampling night i
p_c = Chapman-corrected trap efficiency

Trapping efficiencies will be applied to sampling nights in the time period in which the mark-recapture events occur. If correlations are found to exist between creek discharge and trap efficiency, trapping efficiencies will be used to expand nightly catches within time periods of similar flow stages.

Area-based Catch Expansion

The total number of kokanee fry passing a site on a given sampling night will also be estimated by expanding the total catch of each set by the fraction of the stream cross-section (wetted cross-sectional area of the stream at the sampling location versus the wetted cross-sectional area of the net openings) and the fraction of the set period that was fished. The following equation will be used to calculate a fry estimate for each set (adapted from Manson 2005):

$$n = C \cdot \left(\frac{A}{a}\right) \cdot \left(\frac{T}{t}\right)$$

where:
n = Fry estimation for each set
C = Total catch of set
A = Cross-sectional wetted channel area
a = Wetted net area
T = Time from set start to start of subsequent set
t = Set time

The total nightly abundance estimate (N) is then calculated as the sum of all fry estimates per set.

Kokanee Fry Abundance Estimate

For each site, two estimates of kokanee fry outmigration abundance will then be calculated using a TAUC method, similar to that used for adult kokanee escapement. One abundance estimate will be calculated using the mark-recapture derived nightly estimates and the other using the area-based derived nightly estimates. Where possible, 95% confidence intervals will be reported in the AEMP Interpretive Report.

A Mann-Kendall temporal trends analysis will be used to assess for alterations in fry abundance for each run-year. It is hypothesized that if mine activities affected the kokanee fry community, then there would be a significant decrease in fry abundance at impact sites in comparison to abundance at control sites or there would be a significant decline in fry abundance activity over time.

Kokanee Fry Condition

To evaluate kokanee fry health, fish condition metrics will be calculated, and analysis completed as described in Section 4.8.1.3 (Data Analysis, Fish Condition).

Egg to Fry Survival

In addition to the assessment endpoints, estimates of kokanee egg to fry survival and 95% confidence intervals (CI) will be calculated for Davidson Creek, Creek 661, and Middle Chedakuz Creek. Supporting metrics such as fecundity per female and total (mean, CI, range), annual egg production (mean, CI, range), and sex ratios will be reported. Literature cited fecundity values will be used to remove the need for intrusive lethal sampling of females; local fecundity values may be used if available. Sex ratios will be assumed to be 50/50 unless the previous year's field data collected during the Kokanee Summer Spawner Surveys indicate otherwise.

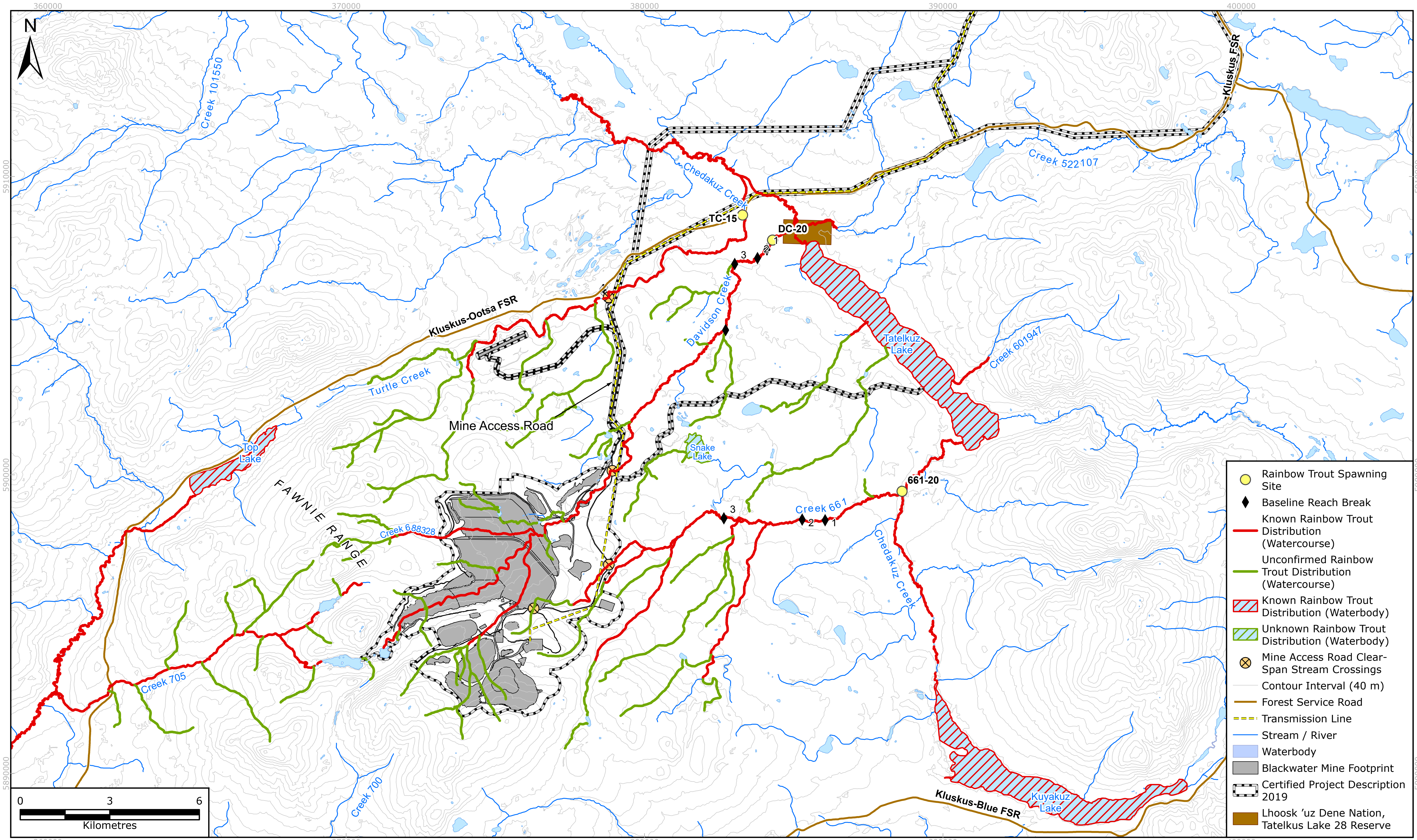
4.8.4 RAINBOW TROUT SPRING SPAWNING SURVEY

The purpose of the rainbow trout spring spawning survey is to monitor the size of the rainbow trout spawning run in the AEMP study area (Figure 4.8-2). The results of the surveys will be used to assess effects related to changes in water quality, from water withdrawal from Tatelkuz Lake to Davidson Creek, or the rerouting of water from Lake 1682 into Lake 1538 on rainbow trout spawning success.

4.8.4.1 MEASUREMENT ENDPOINTS, ASSESSMENT ENDPOINTS, AND DATA ANALYSIS

Measurement and assessment endpoints will be specifically selected with a focus on non-lethal monitoring of the fish community. The spring spawning survey measurement endpoints will include an inventory of the number and age of the spawning rainbow trout community, and fish health assessed as indicated by length and weight data (Table 4.8-5).

FIGURE 4.8-2 POTENTIAL RAINBOW TROUT SPAWNING LOCATIONS AND PLANNED SURVEY SITES



ERM

CLIENT: BW Gold LTD.
GIS NUMBER: BLW-10-089-07

DATE: 03/20/2025

PROJECTION: NAD 1983 UTM Zone 10N
SCALE: 1:120,000 when printed at 11x17

TABLE 4.8-5 MEASUREMENT AND ASSESSMENT ENDPOINTS FOR THE RAINBOW TROUT SPRING SPAWNING SURVEY

Measurement Endpoint	Assessment Endpoint
Fish inventory	• Abundance of spawning rainbow trout • Population structure – length and age
Fish health	• Condition – length and weight

4.8.4.2 SAMPLING LOCATIONS AND METHODS

Field Methods

Rainbow trout spawning will be monitored at three sampling locations (Table 4.2-2; Figure 4.2-4). Sample locations were selected based on baseline studies (AMEC 2013a). Surveys will be completed at one site within each reach, as follows:

- Reach 1 in Davidson Creek (DC-20);
- Reach 1 in Creek 661 (661-20); and
- Reach 1 in Turtle Creek (TC-15).

The site selection is designed to provide data on the movement of spawning rainbow trout from Tatelkuz Lake and Kuyakuz Lake into specific watersheds, including the Davidson Creek watershed, the Creek 661 watershed, and the Turtle Creek watershed. The rainbow trout spawning survey will be completed from mid April to late June (Table 4.2-3). Specific timing of the sampling program and sampling termination will be informed by field-based monitoring triggers outlined in the following subsection.

Upstream-facing (for downstream migrating fish) and downstream-facing (for upstream migrating fish) trap boxes will be installed at each site prior to the start of predicted rainbow trout spawning movement. Trap boxes will be installed within a rigid fence spanning the channel at each site. Traps will be checked regularly (e.g., daily) for spawning rainbow trout. Fish captured will be identified, enumerated, and measured for length (to the nearest 1 mm) and weight (to the nearest 0.1 g). Any lesions, parasites, or other deformities (or lack thereof) on fish will be recorded.

Rainbow trout will be scanned for implanted Passive Integrated Transponder (PIT) tags and visually examined for marks (e.g., adipose clips). Spawning ripeness (i.e., exuding milt or eggs) will be determined by lightly pressing on the abdomen. Sexually mature fish (> 200 mm fork length or fish expressing milt/eggs) will be tagged with a PIT tag, if one is not present at capture; the PIT tag will be implanted in the dorsal sinus on the left side of the fish. As movement is allowed in both directions at each capture site, so as to not fully impede downstream migration post spawning, it is plausible that an individual fish may be recaptured multiple times if it repeatedly moves through a capture site. PIT tags are used to identify individual fish to determine the true total abundance rather than the total number of captures at a site which might artificially inflated with repeated captures. PIT tags also allow for mark-recapture of individual fish and can be used to determine residence time, spawning distribution (assessment endpoint under the follow-up program for Condition 3.14), repeat spawning in subsequent years, and/or potential movement between watercourses.

Ageing structures (scales) will be collected from a subset of 30 rainbow trout per site per size class for fish greater than 200 mm fork length (i.e., 3+ age classes that are migrating to spawn). A review of the size/age classes will be provided in the 2024 AEMP Interpretive Report and the 200 mm fork length may be adjusted at a site-specific level, if deemed necessary. Following processing, fish will be released upstream or downstream of the traps, dependent on the direction of migration at capture. If incidental mortalities occur, otoliths will be collected and fish dissected to confirm sex and spawning status.

The date, time, weather conditions, water velocity at trap entrances, water temperature (°C), dissolved oxygen (mg/L), pH, and conductivity (μS/cm) will be recorded during each set. Continuous water temperature and flow data from the surface water surveys will be correlated with rainbow trout surveys.

All data will be recorded in field notebooks and electronic field forms with photographs taken of selected stream sites. The annual report will provide the ATUs for streams with available temperature monitoring. Changes to the field methods and/or deviations from the Implementation Framework will be recorded and reported in the annual report along with rationale for the change.

Implementation Framework

Generally, the rainbow trout spring spawning surveys are planned for late April to late June. Spawning migrations of rainbow trout are triggered by rising water temperatures and water levels, and in British Columbia can begin at or just prior to ice-off (McPhail 2007). During the rainbow trout spawning surveys conducted in 2024, upstream movement of adult rainbow trout spawners into Davidson Creek was observed at temperatures less than 3°C (Triton unpublished data). The objective is to sample for the entirety of the rainbow trout upstream spawning migration in order to determine true spawner abundance. It is intended that the rainbow trout spawner surveys will generally commence and terminate based on this framework however exact survey timing may be adjusted based on external factors such as severe weather events, safety considerations, and/or unforeseen circumstances; Professional judgement will be applied and documented in these cases.

Commencement Trigger

Rainbow trout spring spawning surveys will commence prior to daily average water temperatures reaching 1°C to 2°C post ice-off, based on current understanding of migration timing. To fully enumerate the rainbow trout spawner populations, the box traps need to be installed prior to movement of spawners into each watercourse to capture the beginning of the spawning migration. Physical installation of the traps and associated rigid fences is logistically challenging and poses an increased safety risk during higher flows, and scheduling installation prior to freshet will be considered for safety purposes.

Termination Trigger

Rainbow trout spring spawning surveys will terminate when the following criteria are met:

- Peak of upstream rainbow trout spawning migration observed during the current years sampling program;

- Minimal upstream movement of adult rainbow trout exhibiting signs of spawning sexual maturity (i.e., full spawning colours, gonads at maximum size/body cavity feels full, gravid state); and
- Minimum three consecutive days with zero to few[12] captures in the upstream direction trap per day.

Laboratory Analysis

Collected otoliths, and/or scales will be assessed using the same methods and analyses as discussed in Section 4.8.1.2.

Quality Assurance/Quality Control

The QA/QC methods for field equipment, electronic field forms, field notes, and data entry will be carried out as discussed in Section 4.8.2.2.

4.8.4.3 DATA ANALYSIS

Abundance

The abundance estimates for each of the streams surveyed will be calculated as true abundance accounting for days of trap operations and/or trap efficiency. Abundance will be determined based on the total number of unique PIT tags implanted and/or observed in rainbow trout captured at each site. A Mann-Kendall temporal trends analysis will be used to assess for temporal alterations in spawning activity. It is hypothesized that if mine activities affected the rainbow trout community, then there would be a significant decrease in spawning activity at impact sites in comparison with spawning at control sites, or there would be a significant decline in spawning activity over time.

Population Structure

Population structures of fish will be assessed using length frequency distributions and length-age regressions. The length frequency-distributions between control and impact sites will be compared using a two-level Kolmogorov-Smirnov Test. A minimum of ten individual length measurements will be considered the minimum sample size required for the Kolmogorov-Smirnov Test.

It is hypothesized that if mine activities affected the fish community, then there would be a significant reduction in length and length-at-age at impact sites in comparison with no significant reduction at control sites.

Fish Condition

Fish condition will be assessed using the same methods and analyses as described in Section 4.8.1.3 (Data Analysis, Fish Condition).

[12] 'Few' - to equal less than 1% of total number of mature rainbow trout captured in the upstream trap throughout the duration of the program to the current sampling day

4.9 WATER-DEPENDENT WILDLIFE

The WMMP describes a range of monitoring programs for wildlife, including water-dependent wildlife. Specifically, Section 4.1.3 (Amphibians) of the WMMP includes programs for monitoring habitat loss (Section 4.1.3.1), toad mortality on roads (Section 4.1.3.2 in the WMMP), monitoring toad breeding ponds (Section 4.1.3.3 of the WMMP), and facility waterbody monitoring (Section 4.1.3.4 of the WMMP). Section 4.7.3.5 (Waterbird Population Monitoring) of the WMMP includes surveys to monitor potential impacts of the Mine on waterbird populations, focusing on areas closest to the mine site where habitat alteration may occur (and compared to control sites located further away).

Additional targeted assessment of amphibians or waterbirds as a scheduled AEMP monitoring component will only be completed if triggered through the adaptive management response framework to aid in the understanding the effects of WQG-AL exceedances and/or significant changes in water quality that are related to the Mine. Planning for a water-dependent wildlife study additional to those already outlined in the WMMP, if needed, would be triggered at the medium action level for water quality and would be implemented at the high action level for water quality (see Section 5.2.1).

4.9.1 MEASUREMENT AND ASSESSMENT ENDPOINTS

Graphical analysis of the spatial distribution of target species will be completed to compare baseline and Construction or Operation phase years (Table 4.9-1). Dependent on the availability of data, statistical analysis may be developed to evaluate if the Mine-related changes have occurred.

TABLE 4.9-1 MEASUREMENT AND ASSESSMENT ENDPOINTS WATER-DEPENDENT WILDLIFE

Measurement Endpoint	Assessment Endpoint
Presence or non-detection	• Graphical analysis of spatial distribution

4.9.2 SAMPLING LOCATIONS AND METHODS

Amphibian and/or waterbird surveys will be completed at selected sites (breeding ponds) as described in the WMMP. Sites with available baseline data will preferentially be selected (AMEC 2013c; ERM 2017; and see WMMP).

Amphibian sampling will be completed using the same protocols used during baseline assessments (see AMEC 2013c; ERM 2017). Surveys will be completed to determine presence or non-detection of species following the *Inventory Methods for Pond Breeding Amphibians and Painted Turtle* (RIC 1998). Visual encounter and road-based surveys will be completed during the breeding season to determine the presence of breeding amphibians.

Aerial breeding waterbird surveys will be conducted using the aerial transect survey methodology (RIC 1999). All waterbirds encountered during the surveys will be identified by species and age, sex, and number of individuals will be recorded if possible.

5. ADAPTIVE MANAGEMENT

5.1 OVERVIEW OF ADAPTIVE MANAGEMENT

The AEMP plan is a living document that will evolve in response to the results of the monitoring program, changing conditions or development at the site, updates to scientific methods, and through consultation and discussions with Indigenous nations, regulators, or other stakeholders. This process of improvement with changing conditions is referred to as adaptive management.

Condition 3 of EAC #M19-01 requires an adaptive management plan to provide a framework for identifying triggers to determine the effectiveness of mitigation and whether additional mitigation is required to address the effects of the Mine on water and sediment quality, aquatic resources, and fish. The monitoring (AEMP) and adaptive management plan, as defined in Condition 3(d) to 3(l) of the EAC #M19-01, must include:

> "3(d) the monitoring program that will be used including methods, location, frequency, timing and duration of the monitoring;
>
> 3(e) the baseline information that will be used, or collected where existing baseline information is insufficient, to support the monitoring program;
>
> 3(f) the scope, content and frequency of reporting of the monitoring results;
>
> 3(g) the identification of qualitative and quantitative triggers, which, when observed through monitoring required under paragraph d), will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects;
>
> 3(h) methods that will be applied to detect when a numeric trigger, or type or level of change referred to in paragraph g) occurs;
>
> 3(i) a description of the process for and timing to alter existing mitigation measures or develop new mitigation measures to reduce or avoid effects;
>
> 3(j) identification of the new and/or altered mitigation measures that will be applied when any of the changes identified in paragraphs a) to c) occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;
>
> 3(k) the monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activities are effectively mitigating or remediating the effects and or avoiding potential effects; and
>
> 3(l) The scope, content and frequency of reporting on the implementation of altered or new mitigation measures."

In June 2022, BC ENV issued new guidance on the development and use of adaptive management plans (BC ENV 2022a), using different terminology (numeric performance metrics [NPMs]) than that used in the EAC #M19-01 (quantitative triggers) for the thresholds for action levels in adaptive management plans. The Ministry of Environment and Climate Change Strategy also issued guidance in May 2022 on TRPs, which makes clear that TRPs are different than adaptive management plans (BC ENV 2022b).

Although this adaptive management plan was developed to satisfy EAC #M19-01 Condition 3 and EMA Permit PE-110652 Condition 4.6.3(d), the language and content of the BC ENV (2022a) guidance for adaptive management plans has been incorporated into this section, where possible.

To avoid confusing the metrics and terminology used in the adaptive management plan with those used in TRPs, the adaptive management framework presented here uses the terminology "NPMs" when referring to the thresholds for determining adaptive management action levels and avoids the use of the word "trigger." The NPM thresholds described herein are equivalent to the "qualitative and quantitative triggers" mentioned in EAC #M19-01 Condition 3(g).

Figure 5.1-1 identifies the components of the adaptive management framework.

FIGURE 5.1-1 ADAPTIVE MANAGEMENT FRAMEWORK

Plan (Assess and Design): The AEMP study design considered planned mitigation and management measures and the requirements for aquatic effects monitoring programs to meet EAC #M19-01 Condition 30. BW Gold has engaged, and will continue to engage, throughout the Mine with Indigenous groups and relevant federal and provincial authorities on these measures and programs.

Do (Implement): Implementing the mitigation measures as described in Mitigation and Management Plans for the Mine.

Monitor: Section 4 of the AEMP plan includes monitoring programs to determine if, after mitigations and management has been applied, the Mine-related effects on the aquatic receiving environment occur.

BW Gold will review and update monitoring programs, including the AEMP, as required during the life of the Mine. This will include:

- Review of the monitoring program in terms of its sensitivity to detect effects;
- Recommendations provided by a QP for changes to the monitoring plan, objectives, frequency, methods, or timing; and
- Engagement tracking to record input from Indigenous groups and regulators such as the EAO and BC ENV.

Adjust (Evaluate and Adjust): numeric performance metrics relative to baseline conditions, predicted conditions, and other benchmarks such as water, sediment, and tissue quality guidelines, were developed, to determine whether mitigation measures need to be altered or additional mitigation measures implemented.

Numeric performance metrics are provided at the following action levels of the adaptive management framework: none, low, medium, and high. The framework is intended to provide an early-warning system such that when defined action level NPMs are exceeded there is sufficient time to identify the cause of unexpected changes and modify existing or implement new mitigation measures to prevent irreversible adverse effects.

5.2 ACTION LEVELS, NUMERIC PERFORMANCE METRICS, AND MANAGEMENT ACTIONS

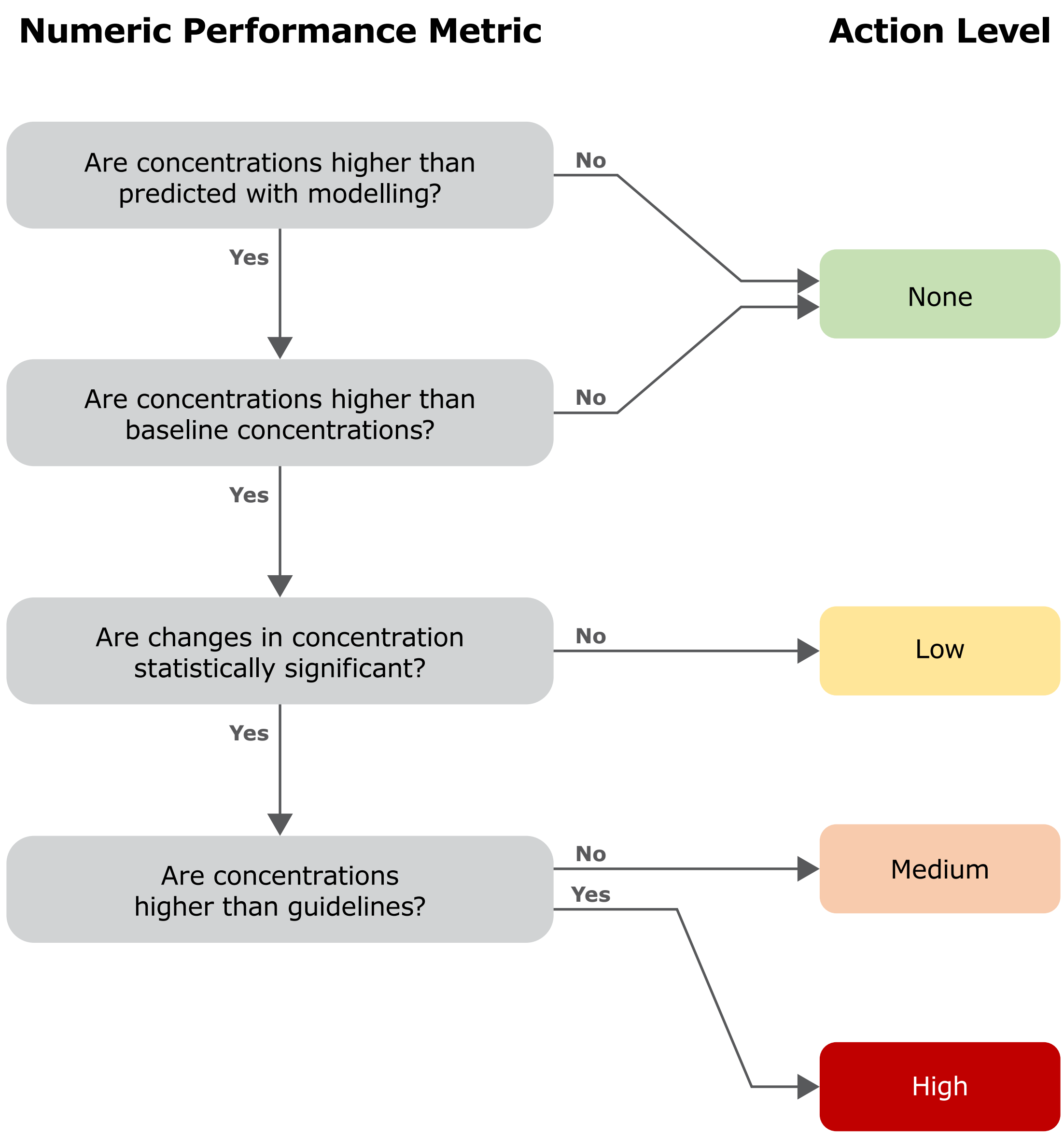
The NPM thresholds for each of the action level considers the following questions:

- Are AEMP component assessment endpoints at impact sites changing from baseline conditions or reference ranges (e.g., concentrations higher than the site-specific baseline data or reference ranges) as a result of the Mine?
- Are AEMP component assessment endpoints changing in ways that were not predicted by models or is mitigation less successful than anticipated (e.g., concentrations of water constituents higher than predicted by surface water quality model)?
- Are AEMP component assessment endpoints at impact sites changing to levels that may be associated with effects as a result of the Mine (e.g., does the change result in an exceedance of a WQG or another benchmark)?

Figure 5.2-1 depicts the questions and general approach to determining the management action level based on the results of AEMP monitoring relative to NPM thresholds. Management responses for water quality, sediment quality, periphyton, aquatic invertebrates, and fish are described in Sections 5.2.1 to 5.2.5 for each action level. Importantly, the management actions listed are not exclusive, as the adaptive management framework needs to be flexible enough to enable the tailoring of specific management responses at each action level to the types of actions most likely to address the root cause of changes to the aquatic environment.

At the “none” action level, the results of monitoring are lower than NPM thresholds for predicted conditions or baseline conditions and are lower than applicable guidelines (Figure 5.2-1). At the “none” action level, mitigation measures are assumed to be working as expected since the results of monitoring are within the range of what was predicted to occur or are similar to baseline conditions.

FIGURE 5.2-1 FLOW DIAGRAM OF NUMERIC PERFORMANCE METRICS AND ACTION LEVELS



At the low or medium action level differences have been identified between monitoring results and NPM thresholds for predicted conditions or baseline conditions but guidelines are not exceeded (Figure 5.2-1). The statistical significance of results between near-field and control sites is used to determine whether the action level is low (no significant differences) or medium (significant differences). At both the low and medium action levels, confirmation of effects and investigation of the root cause of effects are critical foundational management actions that will dictate what additional actions may be required to stabilize or reverse unexpected trends and prevent adverse effects. Acting before reaching the high action level will allow time for the refinement of existing mitigation measures or the identification, development, and implementation of new mitigation measures before adverse effects may occur.

At the high action level, results of monitoring indicate that guidelines or other indicators for potential adverse effects have been exceeded, and monitoring results are higher than both NPM thresholds for predicted conditions and are outside of the range of baseline conditions (Figure 5.2-1). At this action level, mitigation measures are not performing as expected (and thus require adjustment) or additional new mitigation measures are required so that adverse effects do not occur.

Reporting of the results of the aquatic effects adaptive management plan will be completed on an annual basis with management responses intended to ensure mitigation measures perform as expected (or better than expected) and address potential adverse effects over longer periods. This is different than the triggers and actions defined in the TRP, which identifies triggers, actions, and contingency measures to "*help authorization holders respond to changing situations in a timely manner and take meaningful actions that will keep them operating within their permit requirements*" (BC ENV 2022b). Triggers and actions identified in the TRP will address issues that require more immediate attention and implementation of corrective action or contingency measures (e.g., exceedances of water quality guidelines in Davidson Creek or Creek 661, IFN in Davidson Creek, or water temperature in Davidson Creek).

5.2.1 WATER QUALITY RESPONSE FRAMEWORK

The selection of parameters to be included in the adaptive management water quality response framework begins with the list of parameters routinely monitored and analyzed at the laboratory for AEMP water quality monitoring (Table 5.2-1). Parameters were excluded from the list for the water quality response framework if they represent indicators of water quality or are not constituents of water themselves (i.e., total alkalinity, hardness, ion balance, and specific conductivity) or the parameter is represented by another variable that is carried forward into the water quality response framework. Rationale for parameters excluded because they are represented by another variable is as follows:

- Turbidity is represented by total suspended solids (TSS) because it is an alternate measure of the risk represented by particles present in the water column.
- Total Kjeldahl Nitrogen is represented by the inclusion of total ammonia-N, which has an established WQG-AL.
- Ortho-phosphorous is represented by the inclusion of total phosphorus, which has a WQG-AL.

- Organic carbon is represented by dissolved oxygen, which has an established WQG-AL, because the risk that is represented by TOC is oxygen deficiency in the water.
- Calcium and magnesium represent hardness which is often a toxicity modifying factor for other parameters. Thus, calcium and magnesium are indirectly included in the development of water quality guidelines.

TABLE 5.2-1 SELECTION OF AQUATIC EFFECTS MONITORING PROGRAM RESPONSE FRAMEWORK WATER QUALITY PARAMETERS

Parameter	Exclusions		Inclusions		Parameter for Water Quality Response Framework
	Non-specific Parameters	Represented by Other Variable	Water Quality Guideline[1]	Parameter of Potential Concern or Parameter of Concern[2]	
Physical Parameters and Dissolved Anions					
Conductivity	✓	-			No
pH	-	-	✓	-	Yes
Total Suspended Solids	-		✓	-	Yes
Turbidity	-	✓			No
Total Dissolved Solids	-	-	✓[3]	✓	Yes
Hardness (as $CaCO_3$)	✓	-			No
Total Alkalinity (as $CaCO_3$)	✓	-			No
Acidity (as $CaCO_3$)	✓	-			No
Bromide	-	-	-	-	No
Chloride	-	-	✓	-	Yes
Fluoride	-	-	✓	-	Yes
Sulphate	-	-	✓	✓	Yes
Nutrients					
Ammonia (as N)	-	-	✓	✓	Yes
Nitrate (as N)	-	-	✓	✓	Yes
Nitrite (as N)	-	-	✓	✓	Yes
Total Kjeldahl Nitrogen	-	✓			No
Total Phosphorous	-		✓	✓	Yes
Ortho-phosphorous	-	✓			No

Parameter	Exclusions		Inclusions		Parameter for Water Quality Response Framework
	Non-specific Parameters	Represented by Other Variable	Water Quality Guideline[1]	Parameter of Potential Concern or Parameter of Concern[2]	
Cyanides					
Total Cyanide	-	-	✓	-	Yes
Cyanide, Weak Acid Dissociable	-	-	✓	-	Yes
Thiocyanate	-	-	-	✓	Yes
Organic Carbon					
Total Organic Carbon	-	✓			No
Dissolved Organic Carbon	-	✓			No
Total and Dissolved Metals					
Aluminum	-	-	✓[4]	✓	Yes
Antimony	-	-	✓[4]	✓	Yes
Arsenic	-	-	✓[4]	✓	Yes
Barium	-	-	✓[4]	-	Yes
Beryllium	-	-	✓[4]	✓	Yes
Bismuth	-	-	-	-	No
Boron	-	-	✓[4]	-	Yes
Cadmium	-	-	✓	✓	Yes
Calcium	-	✓			No
Chromium	-	-	✓[4]	✓	Yes
Cobalt	-	-	✓[4]	✓	Yes
Copper	-	-	✓	✓	Yes
Iron	-	-	✓	✓	Yes
Lead	-	-	✓	✓	Yes
Magnesium	-	✓			No
Manganese	-	-	✓	✓	Yes
Mercury	-	-	✓[4]	✓	Yes
Molybdenum	-	-	✓[4]	-	Yes
Nickel	-	-	✓[4]	✓	Yes
Potassium	-	-	-	-	No

Parameter	Exclusions		Inclusions		Parameter for Water Quality Response Framework
	Non-specific Parameters	Represented by Other Variable	Water Quality Guideline[1]	Parameter of Potential Concern or Parameter of Concern[2]	
Total and Dissolved Metals *(cont'd)*					
Selenium	-	-	✓[4]	-	Yes
Silicon	-	-	-	-	No
Silver	-	-	✓[4]	✓	Yes
Sodium	-	-	-	-	No
Strontium	-	-	✓	-	Yes
Thallium	-	-	✓[4]	-	Yes
Tin	-	-	-	-	No
Titanium	-	-	-	-	No
Uranium	-	-	✓[4]	-	Yes
Vanadium	-	-	✓[4]	-	Yes
Zinc	-	-	✓	✓	Yes

Notes:
Dashes indicate parameter did not meet the criteria for exclusion or inclusion.
Shading indicates the parameter was not evaluated because it met the criteria for exclusion.
[1] British Columbia Guidelines for the Protection of Freshwater Aquatic Life or Wildlife (BC WLRS 2025a, 2025b), Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 2025a), or Calculated Class II Standard as defined in Yinka Dene 'Uza'hné Surface Water Management Policy (Nadleh Whut'en and Stellat'en 2016a).
[2] Predicted to be greater than 80% of the federal of BC WQG-AL during the Construction and/or Operations phase in untreated effluent (Parameter of Potential Concern), predicted to be greater than WQG-AL in the receiving environment, or a special-case parameter of concern for the Mine (see Section 3.1.2).
[3] A Mine-specific benchmark was proposed at 500 mg/L (Section 6.3.4.3 in the Application).
[4] Available guidelines for total metal only.

The next step was for those parameters that were not excluded was to evaluate the parameters that met the following criteria for inclusion in the framework:

- POPCs and POCs identified in Section 3.1.2 in untreated effluent including nitrogen forms (nitrate, nitrite, ammonia), sulphate, dissolved aluminum, total antimony, total arsenic, total beryllium, dissolved cadmium, total chromium, dissolved copper, total cobalt, dissolved iron, total lead, total mercury, total manganese, total nickel, total silver, and total zinc.
- Parameters identified as POCs in the receiving environment including dissolved aluminum, nitrogen forms (ammonia, nitrate, nitrite), total phosphorus, and TDS.
- Parameters identified as having uncertainties in predictive modelling that should be monitored (i.e., total mercury).

- Parameters with available BC (BC WLRS 2025a, 2025b), federal (CCME 2025a) WQG-AL or WQG-WL, approved SBEBs (BC ENV 2023a), or YDWL water quality standards (Table 4.4-2).

Parameters will be excluded in future iterations of the AEMP Plan and AEMP Interpretive Report if parameter concentrations are regularly below MDL or if concentrations are not found to be increasing and are not predicted to increase.

Based on the criteria for exclusion and inclusion, the following water quality parameters will be included in the water quality response framework (Table 5.2-1):

- Dissolved oxygen;
- pH;
- TSS and TDS;
- Ions: chloride, fluoride, and sulphate;
- Cyanides: total cyanide, Weak Acid Dissociable (WAD) Cyanide, and thiocyanate;
- Total metals: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, and zinc; and
- Dissolved metals: aluminum, cadmium, copper, iron, lead, manganese, nickel, strontium, and zinc.

Nutrients (total ammonia-N, nitrate-N, nitrite-N, and total phosphorus) as required by EMA Permit PE 110652 Condition 4.6.3[d]) will be assessed as part of the 'Periphyton and Nutrient Response Framework' provided in Section 5.2.3.

For all NPMs, the evaluation of results against NPMs for water quality will be based on near-field sites. The near-field sites represent sites closest to the influence of the mine site discharge points and non-point source seepage. Any effects of the Mine on environmental media (surface water, sediment) are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05, DC-10, and DC-15;
- Turtle Creek (only once the airstrip is constructed): TC-05; and
- Creek 661: 661-03, 661-04, 661-05, and 661-10.

The use-protection approach was considered when defining the level of change in concentration of a water quality parameter that could result in irreversible adverse effects to aquatic life or wildlife water users; this has the potential to occur at the NPMs defined in the high action level. The potential for irreversible adverse effects were defined based on the parameter concentrations that are potentially unsafe to use for wildlife and aquatic life and are potentially unable to survive, grow, or reproduce. Where available, water quality NPMs at the high action level have been based on the chronic or long-term WQG-AL, WQG-WL, or approved SBEBs. The use of guidelines or SBEBs as the NPM at the high action level still provides some conservatism and time to implement mitigation measures to prevent irreversible effects from occurring since concentrations equivalent to the WQG-AL, WQG-WL, and SBEBs are still considered to be protective of aquatic and wildlife water uses.

Water quality NPMs and management responses for each action level are provided in Table 5.2-2. The specific NPMs used for water quality guidelines, predicted concentrations, and baseline concentrations will be provided as an Appendix in each annual AEMP Interpretive Report (Appendix G-1). Water quality guidelines for several parameters are based on concentrations of toxicity modifying factors (e.g., hardness, dissolved organic carbon). For these parameters, water quality guidelines will be calculated for each sample based on the concentration of the parameter and toxicity modifying factors in the same sample, as recommended by BC ENV (2016a).

TABLE 5.2-2 ACTION LEVELS, NUMERIC PERFORMANCE METRICS AND MANAGEMENT RESPONSES FOR WATER QUALITY (EXCLUDING NUTRIENTS) AT NEAR-FIELD SITES

Level	Numeric Performance Metric	Management Response
None	Average monthly measured parameter concentrations in water are: • Lower than the WQG-AL, WQG-WL, or approved SBEB; and • Less than or equal to the 95th percentile of the predicted concentration (base case) in the same month; or • Lower than or equal to the 95th percentile baseline concentration plus 20%.	No change to mitigation as mitigation measures are performing as expected, water concentrations are below levels of concern (WQG-AL) and water quality is in the range predicted by the surface water quality model or within site-specific baseline concentrations.
Low	Water concentrations may be increasing in a manner not predicted by the surface water quality model. Average monthly measured parameter concentrations in water in two or more consecutive months are: • Lower than the WQG-AL, WQG-WL, or approved SBEB; and • Higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Higher than the 95th percentile baseline concentration plus 20% in the same month; and • Changes in concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Actions implemented as defined in the TRP for receiving environment water quality; • Investigate to identify causes of potential changes in water concentrations so that existing mitigation measures can be adjusted or targeted mitigation measures can be identified for implementation if needed. Additional responses may include: • Plan a water sampling program to define the magnitude, spatial extent, and reversibility of the potential effect; or • Other responses as defined in the annual AEMP Interpretive Report.

Level	Numeric Performance Metric	Management Response
Medium	Water concentrations are increasing in a manner not predicted by the surface water quality model but are below levels of concern. Average monthly measured water quality concentrations measured parameter concentrations in water in two or more consecutive months are: • Lower than the WQG-AL, WQG-WL, or approved SBEB; and • Higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Higher than the 95th percentile baseline concentration plus 20% in the same month; and • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Actions implemented as defined in the TRP for receiving environment water quality; • Investigate to identify causes of potential changes in water concentrations to identify targeted mitigation; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible and how long it would take to implement; • If metal concentrations are meeting the NPMs for medium action level in water, plan a water-dependent wildlife study as described in Section 4.9; and • Plan a water sampling program to define the magnitude, spatial extent, and reversibility of the effect. Additional responses may include: • Review the WQG-AL, WQG-WL, or approved SBEB and identify if a new proposal for an SBEB is appropriate as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.
High	Water concentrations have increased in a manner not predicted by the surface water quality model, are higher than baseline concentrations, and are at levels of concern. Average monthly measured water quality concentrations measured parameter concentrations in water in two or more consecutive months are: • At or higher than the WQG-AL, WQG-WL, or approved SBEB; and • Higher than the 95th percentile baseline concentration plus 20% in the same month; and • Greater than the 95th percentile of the predicted concentration (base case) for the same month.	Responses will include: • Actions implemented as defined in the TRP for receiving environment water quality; • Investigate to confirm root cause of changes in water concentrations; • Implement new mitigation measures or adjust existing mitigation measures to address root cause; • Implement a water sampling program to define the magnitude, spatial extent, and reversibility of the effect; • If metal concentrations are meeting the NPMs for high action levels in water, implement a water-dependent wildlife study as described in Section 4.9 and as developed at the medium action level; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include: • Evaluate if an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; • Review the WQG-AL, WQG-WL, or approved SBEB and propose a new SBEB, if appropriate; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes:
BACI = before-after-control-impact; NPM = Numeric Performance Metric; SBEB = Science-Based Environmental Benchmark; WQG-AL = water quality guideline for the protection of aquatic life; TRP = Trigger Response Plan; WQG-WL = water quality guidelines or standards for the protection of wildlife and livestock

5.2.2 SEDIMENT QUALITY RESPONSE FRAMEWORK

Parameters to be included in the sediment quality response framework are metals with BC (BC WLRS 2025b) or federal (CCME 2025c) SQG-AL, in addition to TOC and particle size. The metals with SQG-AL include arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, and zinc.

As described for water quality (Section 5.2.1), spatially, the evaluation of sediment quality monitoring results against NPMs will be based on near-field sites. Any effects of the Mine on environmental media (surface water, sediment) are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05 and DC-15;
- Turtle Creek (only once the airstrip is constructed): TC-05; and
- Creek 661: 661-05 and 661-10.

The use-protection approach was considered when defining the level of change in concentration of a sediment quality parameter that could result in adverse effects; this has the potential to occur at the NPM defined in the high action level. Adverse effects were defined based on the parameter concentrations where sediment metal concentrations are at a level where aquatic life is potentially unable to survive, grow, or reproduce. Where available, sediment NPMs for guidelines have been based on the most conservative SQG-AL (the lower SQG from BC and the ISQG from CCME; BC WLRS 2025b, CCME 2025c). The use of the SQG-AL as the NPM at the high action level still provides some conservatism and time to implement mitigation measures to prevent adverse effects from occurring since SQGs are still considered to be protective of aquatic water uses. Particle size and TOC in sediments do not have available SQG-AL; thus, only a comparison to site-specific baseline data will be completed.

Sediment quality triggers and management responses to prevent an adverse effect from occurring in monitored creeks are provided in Table 5.2-3. The specific NPMs used for the sediment quality response framework will be provided as an Appendix in the annual AEMP Interpretive Report (Appendix G-2). The baseline sediment metal concentrations include the baseline years 2017, 2021, and 2022 in addition to 2023 as recommended by ERM (2024) and ERM (2025).

TABLE 5.2-3 ACTION LEVELS, NUMERIC PERFORMANCE METRICS, AND MANAGEMENT RESPONSES FOR SEDIMENT QUALITY AT NEAR-FIELD SITES

Level	Numeric Performance Metric	Management Response
None	Average annual measured sediment concentrations are: • Lower than the most conservative SQG-AL; <u>or</u> • Lower than or equal to the 95th percentile baseline concentration[1].	No change to mitigation as mitigation measures are performing as expected. Sediment concentrations are well below levels of concern (SQGs-AL) or are within the reference range.

Level	Numeric Performance Metric	Management Response
Low	Sediment concentrations may be changing from baseline concentrations. Average annual measured sediment concentrations are: • Lower than the most conservative SQG-AL; or • Greater than the 95th percentile baseline concentration[1]; and • Changes in concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to identify potential causes of changes in sediment concentrations so that targeted mitigation measures can be identified for implementation. • After the first three years of monitoring with no statistically significant effects on sediment quality (and any additional supporting evidence at the discretion of a QRP) submit for approval from BC ENV a request to decrease the sampling frequency by one year to once every two years. Thereafter, subsequent request can be made to decrease sampling frequency by one year after two cycles of monitoring in which no statistically significant effects and other supporting evidence are identified, to a minimum sampling frequency of once every three years.[2] Additional responses may include: • Plan a sampling program to define the magnitude, spatial extent, and reversibility of the effect; • Review the SQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.
Medium	Sediment concentrations are changing from baseline concentrations but are below levels of concern. Average annual measured sediment concentrations are: • Lower than the most conservative SQG-AL; or • Greater than the 95th percentile baseline concentration[1]; and • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to identify causes of potential changes in sediment concentrations so that targeted mitigation can be identified; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible and how long it would take to implement; • Increase sediment monitoring frequency by one year (e.g., from every three years to every two years or from every two years to once per year) if frequency is less than once per year; • Plan a sediment sampling program to define the magnitude, spatial extent, and reversibility of the effect; and • Plan a sediment toxicity study, as defined in Section 4.5.2. Additional responses may include: • Review the SQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Level	Numeric Performance Metric	Management Response
High	Sediment concentrations are higher than baseline concentrations and are at levels of concern. Average annual measured sediment concentrations are: • At or higher than the most conservative SQG-AL; and • Greater than the 95th percentile baseline concentration[1]; and • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to confirm root cause of changes in concentrations and implement new mitigation measures or further adjust existing mitigation measures to address root cause; • Increase monitoring frequency to annual if frequency is less than once per year; • Implement a sediment sampling program to define the magnitude, spatial extent, and reversibility of the effect; • Implement a sediment toxicity study, as defined in Section 4.5.2 and as developed at the medium action level; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include: • Evaluate if an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; • Review the SQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes:
BACI = before-after-control-impact; SQG-AL = sediment quality guidelines for the protection of freshwater aquatic life; BC ENV = BC Ministry of Environment and Climate Change Strategy; QRP = Qualified Registered Professional
[1] Particle size and TOC in sediments do not have available SQG-AL; thus, only a comparison to site-specific baseline data will be completed.
[2] A request for a reduction in sampling frequency will be provided to BC ENV and Indigenous groups and will be implemented only upon approval from BC ENV (PE-110652 Condition 4.6.6).

5.2.3 PERIPHYTON AND NUTRIENT RESPONSE FRAMEWORK

Periphyton assessment endpoints to be included in the periphyton response framework are based on periphyton biomass as chlorophyll *a* concentration. Total ammonia-N, nitrate-N, nitrite-N, and total phosphorus (as required by EMA Permit PE 110652 Condition 4.6.3[d]) are also included in the response framework.

As described for water quality (Section 5.2.1) and sediment quality (Section 5.2.2), spatially, the evaluation of chlorophyll *a* and nutrient monitoring results against NPMs will be at near-field sites only. Any effects of the Mine on aquatic biota are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05 and DC-15;
- Turtle Creek (only once the airstrip is constructed): TC-05; and
- Creek 661: 661-05 and 661-10.

The use-protection approach was considered when defining the periphyton biomass that could result in adverse effects; this has the potential to occur at the threshold defined in the high action level. Adverse effects were defined based on the chlorophyll *a* concentrations where aquatic life or fish habitats are potentially affected due to the overabundance of periphyton. The use of the chlorophyll *a* WQG-AL as the NPM at the high action level still provides some conservatism and time to implement mitigation measures to prevent irreversible effects from occurring since the WQG-AL is still considered to be protective of aquatic life water uses.

The use-protection approach was considered when defining the level of change in concentration of a water quality nutrient parameters that could result in irreversible adverse effects to aquatic life or wildlife water users; this has the potential to occur at the NPMs defined in the high action level. The potential for irreversible adverse effects were defined based on the nutrient parameter concentrations that are potentially unsafe to use for aquatic life and are potentially unable to survive, grow, or reproduce. Where available, water quality NPMs at the high action level have been based on the chronic or long-term WQG-AL. The use of guidelines as the NPM at the high action level still provides some conservatism and time to implement mitigation measures to prevent irreversible effects from occurring since concentrations equivalent to the WQG-AL are still considered to be protective of aquatic water uses.

Periphyton biomass and nutrient triggers and management responses to prevent an irreversible adverse effect from occurring in monitored creeks are provided in Table 5.2-4 (as required by EMA Permit PE-110652 Condition 4.6.3[d]). The specific NPMs used for the chlorophyll *a* WQG-AL and baseline concentrations will be provided in an appendix of each annual AEMP Interpretive Report (Appendix G-3).

5.2.4 AQUATIC INVERTEBRATE RESPONSE FRAMEWORK

The use-protection approach was considered when defining the assessment endpoints for each action level. Abundance is considered appropriate for identifying high-level changes in invertebrate communities. Changes in community composition (family richness, Simpson's Diversity and Evenness indices, or Bray-Curtis index) can vary in their ecological significance given the importance of a group as a food resource for fish or other invertebrates or known tolerance of the group to disturbance. Loss of EPT (pollution sensitive taxa) taxa or taxa representing an important fish or other invertebrate food source may result in adverse effects on fish.

Benthic invertebrate measurement endpoints based on abundance and taxonomy (community composition) are included in the aquatic invertebrate response framework. Specifically, the "indicators" described as the NPMs in Table 5.2-5 for benthic invertebrates include:

- Benthic invertebrate abundance and community composition (with supporting O:E ratios) used to assess if the Mine-related abiotic components (e.g., nutrient enrichment) are causing a change in aquatic invertebrate numbers;
- Benthic invertebrate family richness and diversity indices (richness, Simpson's Diversity and Simpson's Evenness) used to assess if taxa indicative of healthy communities and habitat are changing as a result of the Mine; and
- The Bray-Curtis Index (similarity index).

TABLE 5.2-4 ACTION LEVELS, NUMERIC PERFORMANCE METRICS, AND MANAGEMENT RESPONSES FOR PERIPHYTON (CHLOROPHYLL A) AND NUTRIENTS AT NEAR-FIELD SITES

Level	Numeric Performance Metric – Chlorophyll *a*	Numeric Performance Metric - Nutrients	Management Response
None	Average annual measured chlorophyll *a* concentrations are: • Lower than the chlorophyll *a* WQG-AL; or • Lower than or equal to the 95th percentile baseline concentration of chlorophyll *a*.	Average monthly measured nutrient (total ammonia-N, nitrate-N, and nitrite-N) parameter concentrations in water are: • Lower than the WQG-AL; and • Less than or equal to the 95th percentile of the predicted concentration (base case) in the same month; or • Lower than or equal to the 95th percentile baseline concentration plus 20%. Average monthly measured total phosphorus concentrations in water are: • Less than the lower of the baseline monthly mean total phosphorus + 50% or the upper limit of the baseline tropic range for the same month; or • Lower than or equal to the 95th percentile baseline concentration plus 20%.	No change to mitigation as mitigation measures are performing as expected. Chlorophyll *a* concentrations are below levels of concern (WQG-AL) or are within the reference range. Nutrient concentrations are below levels of concern (WQG-AL) and in the range predicted by the surface water quality model or within site-specific baseline concentrations.
Low	Chlorophyll *a* concentrations may be changing from baseline concentrations. Average annual measured chlorophyll *a* concentrations are: • Lower than the chlorophyll *a* WQG-AL; and • Greater than the 95th percentile baseline concentration of chlorophyll *a*;	Nutrient concentrations may be increasing in a manner not predicted by the surface water quality model. Average monthly measured nutrient (total ammonia-N, nitrate-N, and nitrite-N) concentrations in water in two or more consecutive months are: • Lower than the WQG-AL;	Responses will include: • Investigate to identify potential causes of changes in chlorophyll *a* and/or nutrient concentrations so that targeted mitigation measures can be identified for implementation.

Level	Numeric Performance Metric – Chlorophyll *a*	Numeric Performance Metric - Nutrients	Management Response
	and • Changes in chlorophyll *a* concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	and • higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Higher than the 95th percentile baseline concentration plus 20% in the same month; and • Changes in concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis). Average monthly measured total phosphorus concentrations in water are: • Less than the lower of the baseline monthly mean total phosphorus + 50% or the upper limit of the baseline tropic range for the same month; and • Higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Changes in concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	• After the first three years of monitoring with no statistically significant effects on periphyton (chlorophyll *a*; and any additional supporting evidence at the discretion of a QRP) submit for approval from BC ENV a request to decrease the sampling frequency by one year to once every two years. Thereafter, a subsequent request can be made to decrease sampling frequency by one year after two cycles of monitoring in which no statistically significant effects and other supporting evidence are identified, to a minimum sampling frequency of once every three years[1]. • Plan a collection program to define the magnitude, spatial extent, and reversibility of the effect. • Other responses as defined in the annual AEMP Interpretive Report.

Level	Numeric Performance Metric – Chlorophyll *a*	Numeric Performance Metric - Nutrients	Management Response
Medium	Chlorophyll *a* concentrations are changing from baseline concentrations but are below levels of concern. Average annual measured chlorophyll *a* concentrations are: • Lower than the chlorophyll *a* WQG-A; and • Greater than the 95th percentile baseline concentration of chlorophyll *a*; and • Changes in chlorophyll *a* concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Nutrient concentrations are increasing in a manner not predicted by the surface water quality model but are below levels of concern. Average monthly measured nutrient (total ammonia-N, nitrate-N, and nitrite-N) in water in two or more consecutive months are: • Lower than the WQG-AL; and • Higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Higher than the 95th percentile baseline concentration plus 20% in the same month; and • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis). Average monthly measured total phosphorus concentrations in water are: • Less than the lower of the baseline monthly mean total phosphorus + 50% or the upper limit of the baseline tropic range for the same month; and • Higher than the 95th percentile of the predicted concentration (base case) for the same month; and • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to identify causes of potential changes in chlorophyll *a* and/or nutrient concentrations so that targeted mitigation can be identified; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible and how long it would take to implement; • Plan a nutrient and chlorophyll *a* sampling program to define the magnitude, spatial extent, and reversibility of the effect; and • Increase monitoring frequency by one year (e.g., from every three years to every two years or from every two years to once per year) if frequency is less than once per year. Additional responses may include: • Review the chlorophyll *a* WQG-AL and nutrient WQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Level	Numeric Performance Metric – Chlorophyll *a*	Numeric Performance Metric - Nutrients	Management Response
High	Chlorophyll *a* concentrations are higher than baseline concentrations and are at levels of concern. Average annual measured chlorophyll *a* concentrations are: • Higher than the chlorophyll *a* WQG-AL; <u>and</u> • Greater than the 95th percentile baseline concentration of chlorophyll *a*; <u>and</u> • Changes in chlorophyll *a* concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Nutrient concentrations have increased in a manner not predicted by the surface water quality model, are higher than baseline concentrations, and are at levels of concern. Average monthly measured nutrient (total ammonia-N, nitrate-N, and nitrite-N) concentrations in water in two or more consecutive months are: • At or higher than the WQG-AL; <u>and</u> • Higher than the 95th percentile baseline concentration plus 20% in the same month; <u>and</u> • Greater than the 95th percentile of the predicted concentration (base case) for the same month. Average monthly measured total phosphorus concentrations in water are: • At or higher than the lower of the baseline monthly mean total phosphorus + 50% or the upper limit of the baseline tropic range for the same month; <u>and</u> • Higher than the 95th percentile of the predicted concentration (base case) for the same month; <u>and</u> • Changes in concentration are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to confirm root cause of changes in concentrations and implement new mitigation measures or further adjust existing mitigation measures to address root cause; • Increase monitoring frequency to annual if frequency is less than once per year; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include, but are not limited to: • Evaluate if an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; • Review the chlorophyll *a* WQG-AL and nutrient WQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes:

BACI = before-after-control-impact; WQG-AL = water quality guideline for the protection of aquatic life; BC ENV = BC Ministry of Environment and Climate Change Strategy; QRP = Qualified Registered Professional

[1] A request for a reduction in sampling frequency will be provided to BC ENV and Indigenous groups and will be implemented only upon approval from BC ENV (PE-110652 Condition 4.6.6).

TABLE 5.2-5 ACTION LEVELS, NUMERIC PERFORMANCE INDICATORS, AND MANAGEMENT RESPONSES FOR AQUATIC INVERTEBRATES

Level	Numeric Performance Metric	Management Response
None	• Benthic invertebrate indicators (abundance and community composition, richness and diversity indices, and Bray-Curtis index) are unchanged from baseline conditions. There is no change in the similarity to reference communities using the reference condition analysis.	No change to mitigation as mitigation measures are performing as expected. Aquatic invertebrate indicators are within the reference range.
Low	• Benthic invertebrate indicators (abundance and community composition and Bray-Curtis index) may be changing from baseline conditions (defined by the dissimilarity from the predictive CABIN reference site model, and O:E ratios close to 1; i.e., 0.9 to 1.1). • Benthic invertebrate communities are similar to reference conditions, but the results of the reference condition analysis indicate potential shifts in community indicating there is a stressor at the near-field site (i.e., shift to between the 90% and 99% confidence ellipses).	Responses will include: • Investigate to identify potential causes of changes in aquatic invertebrate indicators (e.g., changes in hydrograph) to identify targeted mitigation measures for implementation. • After the first three years of monitoring with no statistically significant effects on benthic invertebrate indicators based on abundance or taxonomy (and any additional supporting evidence at the discretion of a QRP) submit for approval from BC ENV a request to decrease the sampling frequency by one year to once every two years. Thereafter, a subsequent request can be made to decrease sampling frequency by one year after two cycles of monitoring in which no statistically significant effects and other supporting evidence are identified, to a minimum sampling frequency of once every three years.[1] Responses may include: • Plan a collection program to define the magnitude, spatial extent, and reversibility of the effect; or • Other responses as defined in the annual AEMP Interpretive Report.
Medium	• Benthic invertebrate indicators (abundance and community composition and Bray-Curtis index) are changing from baseline conditions (defined by the dissimilarity from the predictive CABIN reference site model or O:E ratios from 0.8 to 1.2). • Benthic communities are increasingly dissimilar and divergent from the reference communities based on the reference condition analysis (i.e., between the 99% and 99.9% confidence ellipses).	Responses will include: • Investigate to identify causes of potential changes in aquatic invertebrate indicators so that targeted mitigation can be identified; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible; and how long it would take to implement; • Plan a sampling program to define the magnitude, spatial extent, and reversibility of the effect; • If changes in sediment metal concentrations are identified as a potential cause of the changes in aquatic invertebrate indicators, plan a sediment toxicity testing study, as defined in Section 4.5.2;

Level	Numeric Performance Metric	Management Response
		• Increase monitoring frequency by one year (e.g., from every three years to every two years or from every two years to once per year) if frequency is less than once per year; and • Any additional responses will be defined in the annual AEMP Interpretive Report.
High	• Benthic invertebrate indicators (abundance and community composition and Bray-Curtis index) have changed from baseline conditions in two or more consecutive sampling events (defined by the dissimilarity from the predictive CABIN reference site model or O:E ratios < 0.8 to > 1.2). • Benthic communities are increasingly dissimilar and highly divergent from the reference communities based on the reference condition analysis in two or more consecutive sampling events (i.e., outside of the 99% confidence ellipses). Benthic invertebrate indicators are outside of the reference range. Losses of EPT (pollution sensitive taxa) taxa or taxa representing an important fish or other invertebrate food source.	Responses will include: • Investigate to confirm root cause of changes in community composition and implement new mitigation measures or further adjust existing mitigation measures to address root cause; • Implement a sampling program to define the magnitude, spatial extent, and reversibility of the effect; • Implement a sediment toxicity testing study, as defined in Section 4.5.2 and as developed at the medium action level; • Increase monitoring frequency to annual if frequency is less than once per year; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include: • Evaluate if additional monitoring and an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes (completed):
CABIN = Canadian Aquatic Biomonitoring Network; EPT = Ephemeroptera, Plecoptera, and Trichoptera; O:E = observed against expected taxa; BC ENV = BC Ministry of Environment and Climate Change Strategy; QRP = Qualified Registered Professional
[1] A request for of a reduction in sampling frequency will be provided to BC ENV and Indigenous groups and will be implemented only upon approval from BC ENV (PE-110652 Condition 4.6.6).

Benthic invertebrate tissue metal concentrations are also included in the aquatic invertebrate response framework. Selenium and mercury, which are parameters known to bioaccumulate in the aquatic food chain, can cause adverse effects to higher trophic level organisms if concentrations in benthic invertebrates (as prey items) increase to sufficiently high concentrations. Selenium (dietary guideline of 4 mg/kg dry weight for the protection of fish; BC MOE 2014) and mercury (0.033 mg/kg wet weight for the protection of wildlife consumers; CCME 2000) are the only parameters that have guidelines for tissue concentrations in benthic invertebrates.

Spatially, the response levels for aquatic invertebrates will be applied to near-field sites only. Any effects of the Mine on aquatic biota are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05 and DC-15;
- Turtle Creek (only once the airstrip is constructed): TC-05; and
- Creek 661: 661-05 and 661-10.

Aquatic invertebrate action levels, NPMs, and management responses to prevent adverse effects from occurring in monitored creeks are provided in Table 5.2-5 for community metrics and Table 5.2-6 for tissue metal concentrations. The NPMs used for benthic invertebrate tissue metal concentrations will be provided in an appendix of each annual AEMP Interpretive Report (Appendix G-4). The baseline tissue metal concentrations include the baseline years 2012, 2017, 2022 in addition to 2023 as recommended by ERM (2024) and ERM (2025).

TABLE 5.2-6 ACTION LEVELS, NUMERIC PERFORMANCE METRICS, AND MANAGEMENT RESPONSES FOR BENTHIC INVERTEBRATE TISSUE METAL CONCENTRATIONS AT NEAR-FIELD SITES

Level	Numeric Performance Metric	Management Response
None	Average annual benthic invertebrate tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in benthic invertebrate tissue; or • Lower than or equal to the 95th percentile baseline concentration of benthic invertebrate tissue concentrations for selenium and mercury.	No change to mitigation as mitigation measures are performing as expected.
Low	Benthic invertebrate tissue concentrations may be changing from baseline concentrations. Average annual benthic invertebrate tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in benthic invertebrate tissue; and • Higher than the 95th percentile baseline concentration of benthic invertebrate tissue concentrations for selenium and mercury; and • Changes in selenium or mercury in benthic invertebrate tissue concentrations are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Investigate to identify potential causes of changes in benthic invertebrate tissue concentrations so that targeted mitigation measures can be identified for implementation. Responses may include: • After two cycles of monitoring with no statistically significant effects (and any additional supporting evidence at the discretion of a QRP) submit for approval from BC ENV a request to decrease the sampling frequency[1]; • Plan a collection program to define the magnitude, spatial extent, and reversibility of the effect; or • Other responses as defined in the annual AEMP Interpretive Report.
Medium	Benthic invertebrate tissue concentrations are changing from baseline concentrations. Average annual benthic invertebrate tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in benthic invertebrate tissue; and • Higher than the 95th percentile baseline concentration for selenium or mercury in benthic invertebrate tissue;	Responses may include: • Increase monitoring frequency to once every three years; • Investigate to identify causes of potential changes in benthic invertebrate tissue concentrations so that targeted mitigation can be identified; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible and how long it would take to implement; and • Plan a benthic invertebrate tissue concentrations sampling program to define

Level	Numeric Performance Metric	Management Response
	<u>and</u> • Changes in selenium or mercury concentrations in benthic invertebrate tissue are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	the magnitude, spatial extent, and reversibility of the effect. Additional responses may include: • Review the benthic invertebrate tissue WQG-AL as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.
High	Benthic invertebrate tissue concentrations are higher than baseline concentrations and are at levels of concern. Average annual benthic invertebrate tissue concentrations of selenium and mercury are: • Higher than the tissue residue guideline for selenium or mercury in benthic invertebrate tissue; <u>and</u> • Higher than the 95th percentile baseline concentration for selenium or mercury in benthic invertebrate tissue; <u>and</u> • Changes in selenium or mercury concentrations in benthic invertebrate tissue are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Increase monitoring frequency to once every three years; • Investigate to confirm root cause of changes in benthic invertebrate tissue concentrations and implement new mitigation measures or further adjust existing mitigation measures to address root cause; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include: • Evaluate if an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; • Review the benthic invertebrate tissue guidelines as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes:
BACI = before-after-control-impact; BC ENV = BC Ministry of Environment and Climate Change Strategy; QRP = Qualified Registered Professional
[1] A request for of a reduction in sampling frequency will be provided to BC ENV and Indigenous groups and will be implemented only upon approval from BC ENV (PE-110652 Condition 4.6.6).

5.2.5 FISH TISSUE METAL RESPONSE FRAMEWORK

Fish community metrics (e.g., abundance, density, and population structure) and fish health metrics (e.g., length, weight, and condition factor) are highly variable both temporally and spatially, therefore they have not been included in this framework. The methods used to assess these metrics are also highly variable, depending on local environmental conditions (e.g., weather, time of day, stream discharge, turbidity). Given the high variability of the metrics, establishment of specific thresholds and triggers for action is not feasible. Instead, reliance on fish habitat metrics (e.g., water quality) and fish tissue metal concentrations to establish actionable NPMs are provided.

Parameters to be included in the fish tissue metal response framework are metals with BC or CCME tissue residue guidelines which are for selenium and mercury (BC WLRS 2025a; CCME 2000). Mercury in fish tissue was also identified as a POC for monitoring in the CSM Report (Entia 2022) due to uncertainties in surface water quality model predictions (see Section 3.1.3). Including mercury in fish tissue in the adaptive response framework will help to address uncertainties associated with the surface water quality and fish tissue model predictions for mercury.

As described for other metal-based components such as water quality (Section 5.2.1), sediment quality (Section 5.2.2), chlorophyll *a* (Section 5.2.3), and aquatic invertebrates (Section 5.2.4), spatially, the evaluation of fish tissue metal monitoring results against NPMs will be at near-field sites only. Any effects of the Mine on aquatic biota are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05 and DC-15;
- Turtle Creek (only once the airstrip is constructed): TC-05; and
- Creek 661: 661-05 and 661-10.

The use-protection approach was considered when defining the fish tissue metal concentrations that could result in adverse effects; this has the potential to occur at NPMs defined in the high action level. Adverse effects were defined based on the concentration where fish tissue selenium or mercury concentrations are at a level where potential effects may begin to occur in either fish or wildlife consumers of fish. The use of the guideline for fish tissue for selenium and mercury as the NPMs at the high action level still provides some conservatism and time to implement mitigation measures to prevent irreversible effects from occurring since the guideline is still considered to be protective of fish and wildlife water uses.

Fish tissue selenium and mercury concentration action levels, NPMs, and management responses to prevent adverse effects from occurring in aquatic life or wildlife are provided in Table 5.2-7. The specific NPMs used for fish tissue metal guidelines and baseline fish tissue metal concentrations will be provided in the appendix of the annual AEMP Interpretive Report (Appendix G-5). The baseline tissue metal concentrations include the baseline years 2021 and 2022 in addition to 2023 as recommended in ERM (2024) and ERM (2025).

TABLE 5.2-7 ACTION LEVELS, NUMERIC PERFORMANCE METRICS, AND MANAGEMENT RESPONSES FOR FISH TISSUE METAL CONCENTRATIONS AT NEAR-FIELD SITES

Level	Numeric Performance Metric	Management Response
None	Average annual fish tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in fish tissue; <u>or</u> • Lower than or equal to the 95th percentile baseline concentration of fish tissue concentrations for selenium and mercury.	No change to mitigation as mitigation measures are performing as expected.
Low	Fish tissue concentrations may be changing from baseline concentrations. Average annual fish tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in fish tissue; <u>and</u> • Higher than the 95th percentile baseline concentration of fish tissue concentrations for selenium and mercury; <u>and</u>	Responses will include: • Investigate to identify potential causes of changes in fish tissue concentrations so that targeted mitigation measures can be identified for implementation. Responses may include: • After three cycles of monitoring with no statistically significant effects at stream sites, (and any additional supporting evidence at the discretion of a QRP) submit for approval from BC ENV a request to decrease sampling frequency to once every three years[1];

Level	Numeric Performance Metric	Management Response
	• Changes in selenium or mercury in fish tissue concentrations are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	• Plan a collection program to define the magnitude, spatial extent, and reversibility of the effect; or • Other responses as defined in the annual AEMP Interpretive Report.
Medium	Fish tissue concentrations are changing from baseline concentrations. Average annual fish tissue concentrations of selenium and mercury are: • Lower than the tissue residue guideline for selenium or mercury in fish tissue; and • Higher than the 95th percentile baseline concentration of fish tissue concentrations for selenium and mercury; and • Changes in selenium or mercury concentrations in fish tissue are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Increase monitoring frequency to annual (if changes are observed at stream sites); • Investigate to identify causes of potential changes in fish tissue concentrations so that targeted mitigation can be identified; • Review and optimize existing mitigation; • Evaluate if new mitigation is feasible and how long it would take to implement; and • Plan a fish tissue concentrations sampling program to define the magnitude, spatial extent, and reversibility of the effect. Additional responses may include: • Review the fish tissue residue guideline as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.
High	Fish tissue concentrations are higher than baseline concentrations and are at levels of concern. Average annual fish tissue concentrations of selenium and mercury are: • Higher than the tissue residue guideline for selenium or mercury in fish tissue; and • Higher than the 95th percentile baseline concentration of fish tissue concentrations for selenium and mercury; and • Changes in selenium or mercury concentrations in fish tissue are statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).	Responses will include: • Increase monitoring frequency to annual (if changes are observed at stream sites); • Investigate to confirm root cause of changes in fish tissue concentrations and implement new mitigation measures or further adjust existing mitigation measures to address root cause; and • Implement monitoring to assess effectiveness of mitigation options. Additional responses may include: • Evaluate if an ecological risk assessment is required to identify spatial extent, magnitude, and reversibility of the effect; • Review the fish tissue residue guideline as new and relevant science becomes available; or • Other responses as defined in the annual AEMP Interpretive Report.

Notes:

BACI = before-after-control-impact; BC ENV = BC Ministry of Environment and Climate Change Strategy; QRP = Qualified Registered Professional

[1] A request for of a reduction in sampling frequency will be provided to BC ENV and Indigenous groups and will be implemented only upon approval from BC ENV (PE-110652 Condition 4.6.6).

6. REPORTING

6.1 ANNUAL AQUATIC EFFECTS MONITORING PROGRAM INTERPRETIVE REPORT

An annual AEMP Interpretive Report will be generated for each year in which AEMP monitoring is completed (EMA Permit PE-110652 Condition 4.6.5). The report will include all data collected within a given calendar year, with the report completed for submission to Indigenous nations, the ELoMC, and regulators including ENV, EAO, EMLI, and FOR by March 31 of the following year.

At minimum, each annual AEMP Interpretive Report will include data and analysis of water quality, and a summary of the hydrology assessment, and temperature data because these AEMP components will be sampled regularly or monitored continuously each year. A separate annual hydrology and water temperature report including all data collected with the given calendar year will be provided in accordance with the EMA Permit PE-110652 Condition 5.3.3k.

Initially, the complete AEMP monitoring program (i.e., all standard components except benthic invertebrate and lake fish tissue metals, not including triggered components) is anticipated to be completed on an annual basis for the first three years, beginning in the first full year of the Operations phase. Sampling of benthic invertebrate and lake fish tissues for metal analysis will be once every three years beginning in the first full year of the Operations phase. A reduction in sampling frequency may be requested (with rationale) if no effects are detected for aquatic components with the exception of surface water quality (see Section 4.2). Kokanee community sampling will initially be conducted on an annual basis for at least the first eight years of Operations, to ensure that two complete Kokanee cohort generations are assessed. Beyond the eight-year mark, survey frequency for fish community may be requested to be reduced once every two years, if no trend in fish community is observed.

Thus, after the first three years of AEMP reporting, the AEMP Interpretive Report may include sediment quality, aquatic primary producers, aquatic invertebrates, or fish community and fish tissue components in years in which they are sampled. The monitoring frequency for these components can vary from year to year therefore, the AEMP Interpretive Report will outline the anticipated sampling components for the following three years (indicating if notifications for the request to reduce the sampling frequency have been submitted or approved).

The AEMP Interpretive Report will include a summary of field and laboratory methods, data, analysis and results, and the status of each assessment endpoint in the adaptive management framework (none, low, medium, high). Summary statistics of the NPMs used for baseline conditions, predicted conditions, and guidelines (e.g., water quality parameter concentration, fish tissue metal concentration) used for the purpose of the adaptive management framework will also be provided. When a management action level (low, medium, high) is met, this will be identified in the AEMP Interpretive Report for that reporting period. The AEMP Interpretive Report will also document the specific steps or actions identified to respond to the action level exceeded and the timelines for when the responses will be implemented. The results of the annual CFMP will be summarized to provide potential linkages with human health.

As part of each AEMP Interpretive Report, the AEMP Plan, analysis, and adaptive management framework will be reviewed to evaluate the effectiveness of the plan and ensure that the objectives defined in Section 1.1 are being met. This may include updates to the sampling plan to address potential effects related to emergencies and/or temporary shutdowns. The AEMP Interpretive Report will include any recommendations for changes to the scope or timing of the AEMP monitoring, including rationale for any recommended changes.

6.2 DECISION STATEMENT ANNUAL REPORTING AND INFORMATION SHARING

DS Conditions 2.11, 2.12 and 2.13 set out annual reporting requirements related to the implementation of conditions in the DS. Condition 2.14 sets out information sharing requirements related to the annual reports. Reporting will commence when BW Gold begins to implement the conditions set out in the DS. Requirements in DS Conditions 2.11 to 2.14 are presented below.

DS Condition 2.11 requires:

> "The Proponent [BW Gold] shall, commencing in the reporting year during which the Proponent begins the implementation of the conditions set out in this Decision Statement, prepare an annual report that sets out:
>
> 2.11.1 the activities undertaken by the Proponent in the reporting year to comply with each of the conditions set out in this Decision Statement;
>
> how the Proponent complied with condition 2.1;
>
> 2.11.3 for conditions set out in this Decision Statement for which consultation is a requirement, how the Proponent considered any views and information that the Proponent received during or as a result of the consultation, including a rationale for how the views have, or have not, been integrated;
>
> 2.11.4 the information referred to in conditions 2.5 and 2.6 for each Follow-Up program;
>
> 2.11.5 the results of the Follow-Up program requirements identified in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22 if required;
>
> 2.11.6 any update made to any Follow-Up program in the reporting year;
>
> 2.11.7 any modified or additional mitigation measures implemented or proposed to be implemented by the Proponent, as determined under condition 2.9 and rationale for why mitigation measures were selected pursuant to condition 2.5.4; and
>
> 2.11.8 any change(s) to the Designated Project in the reporting year."

DS Condition 2.12 requires: *"The Proponent [BW Gold] will provide the draft annual report to Indigenous groups, no later than June 30 following the reporting year to which the annual report applies. BW Gold will consult Indigenous groups on the content and findings in the draft annual report."*

DS Condition 2.13 requires: *"The Proponent [BW Gold], in consideration of any comments received from Indigenous groups pursuant to condition 2.12 shall revise and submit to the Agency [Impact Assessment Agency of Canada] and Indigenous groups a final annual report, including an* *executive summary in both official languages, no later than September 30 following the reporting year to which the annual report applies."*

DS Condition 2.14 requires: *"The Proponent [BW Gold] shall publish on the Internet, or any medium which is publicly available, the annual reports and the executive summaries referred to in conditions 2.11 and 2.13.*

The Proponent shall keep these documents publicly available for 25 years following the end of decommissioning of the Designated Project. The Proponent shall notify the Agency and Indigenous groups of the availability of these documents within 48 hours of their publication."

DS Condition 2.15 requires: "*When the development of any plan is a requirement of a condition set out in this Decision Statement, the Proponent [BW Gold] shall submit the plan to the Agency and to Indigenous groups prior to construction, unless otherwise required through the condition.*"

6.3 ENVIRONMENTAL ASSESSMENT CERTIFICATE REPORTING

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

a. At least 30 days prior to the start of Construction;
b. On or before March 31 in each year after the start of Construction ;
c. At least 30 days prior to the start of Operations;
d. On or before March 31 in each year after the start of Operations;
e. At least 30 days prior to the start of Closure;
f. On or before March 31 in each year after the start of Closure until the end of Closure;
g. At least 30 days prior to the start of Post-Closure; and
h. 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 Indigenous nations within the timelines specified in Condition 5.

6.4 PLAIN LANGUAGE REPORT

In addition to the detailed technical report described in Section 6.1.1, an AEMP executive summary-style report written in manner understandable to a lay audience will be provided to Indigenous nations, the ELoMC, and regulators including ENV, EAO, EMLI, and FOR by March 31 of the following year. The intent of this short report will be to provide a high-level overview of the AEMP data, results, and conclusions in an easier to understand, plain language format, as required by EAC #M19-01 Condition Section 30(j).

6.5 PLAN REVISIONS

This AEMP Plan will be updated (if any revisions are required) based on the recommendations provided in the AEMP interpretive report (EMA Permit PE-110652 Condition 4.6.6) and any feedback received through the ELoMC meetings or correspondence. Updates will include a notification to request changes in monitoring frequency. Any updates to the AEMP Plan (including justifications of recommended modifications in a cover letter) will be submitted to BC ENV for approval within 30 days of submission of the AEMP Interpretive Report.

The AEMP Plan may also be updated as directed by BC ENV following review of the monitoring results or any other information received in connection with effluent discharges (EMA Permit PE-110652 Condition 4.6.7). The updated AEMP Plan (with required modifications or amendments) will be submitted for approval within the timeframe specified by BC ENV.
The proposed changes will be submitted to the ELoMC, which includes representatives from Indigenous nations and provincial regulatory agencies.

Each updated AEMP Plan indicating the changes (in a Revision History Table) will be issued as the next sequential version number (i.e., updates to the AEMP Plan, Version 3.0 will be issued as a new AEMP Plan, Version 4.0). Upon approval from regulators, the new version of the AEMP Plan will supersede all previous versions of the AEMP Plan.

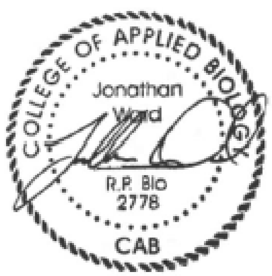
Upon approval of the AEMP Plan, future changes to the AEMP will require robust review to ensure that the AEMP will continue to meet regulatory requirements (e.g., elimination of a monitoring component required by the EAC, or effluent discharge authorization cannot be completed without an amendment authorizing the removal).

Revisions or updates to the AEMP Plan will be completed by a Qualified Registered Professional.

7. QUALIFIED REGISTERED PROFESSIONALS

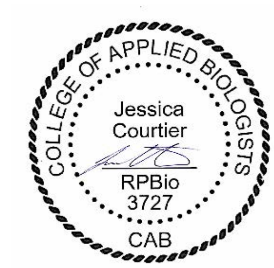
As required by Condition 30 of the EAC #M19-01 and EMA Permit PE-110652 Condition 4.6.1, the AEMP Plan was prepared by QRPs, as shown on this signature page. A QRP is a person who has training, experience, and expertise in a discipline relevant to the field of practice set out in the condition, is registered with a professional organization enabled under an Act who must follow a code of ethics issued by the professional organization, perform her or his duties in the public interest, and can be subject to disciplinary action by the organization.

Sections 1 to 3, Section 4.9, and Sections 5 to 6 Prepared and Revised by:



Jonathan Ward, MSc., R.P.Bio, P.Biol.
ERM Permit to Practice No: 1001271

Section 4.8 Reviewed and Revised by:



Jessica Courtier, BSc., R.P.Bio

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APPENDIX A AQUATIC EFFECTS MONITORING PROGRAM PLAN REVISIONS

Table A-1: Aquatic Effects Monitoring Program Plan, Version 1.0 Revisions (July 2023)

Section	Description
Acronyms and Abbreviations	• Updates to replace Aboriginal groups with Indigenous nations. • Update BC Ministry of Forests. • Add missing acronyms and remove acronyms not used in the text.
Section 1 (Introduction)	• Update the length of Closure phase to reflect Project optimizations.
Section 1 (Introduction)	• Update the description of sediment control ponds to reflect the *Environmental Management Act* Permit PE-110652.
Section 1.1 (Purpose and Objectives)	• Update to indicate the plan addresses the EAC Conditions 3, 28, and 30 and the federal Decision Statement conditions in whole or in part.
Section 1.2 (Roles and Responsibilities)	• Updates consistent with other Blackwater Gold Management Plans.
Section 1.3.2 (Existing Permits)	• Update to indicate received *Mines Act* and *Environmental Management Act* permit amendments.
Section 1.4 (Components Included in the Aquatic Effects Monitoring Program)	• Added benthic invertebrate tissue metals as a sampling component.
Section 1.5 (Conceptual Site Model)	• Moved to Section 3.2 to replace the baseline information sections (formerly sections 3.1, 3.2, 3.3, 3.4, 3.5, and 3.6).
Section 1.5 (Linkages with Other Management and Monitoring Plans)	• A new section to describe the linkages of the AEMP Plan with other Project management and monitoring plans.
Section 2 (Engagement and Consultation)	• Updated sections to summarize completed and planned engagement and consultation.
Section 3 (Overview of Existing Conditions, Issues, and Concerns in the Aquatic Environment)	• Replaced the baseline information sections (formerly sections 3.1, 3.2, 3.3, 3.4, 3.5, and 3.6) with a reference to the 2022 Cumulative Aquatic Effects Monitoring Program Baseline report and an overview of the Conceptual Site Model.
Section 3.2 (Conceptual Site Model)	• Minor revisions to the text to improve clarity and remove repetitive information.
Section 4 (Design of the Aquatic Effects Monitoring Program)	• Added text originally provided in Section 1.1 detailing closure and post-closure monitoring.
Section 4.2 (Sampling Sites, Timing, and Frequency)	• Table 4.2-1, Table 4.2-2, and Table 4.2-3, Figure 4.2-1, Figure 4.2-2, and Figure 4.2-3 have been added and/or modified to reflect comments during the Application review. Sampling sites and sampling components and frequency are consistent with Appendix C in EMA Permit PE-110652. • Figure 4.2-4 (conceptual flow diagram) has been added in response to comments during the Application review.
Section 4.3 (Hydrology)	• Revised 'Surface Water Quantity' to 'Hydrology' for consistency with EMA Permit 110652.

Section	Description
Section 4.3.2 (Hydrology Sampling Sites and Methods)	• Revised to indicate automated stations will be installed year-round. In accordance with EMA Permit PE-110652 the use of manual measurements replaces 'spot measurements' to be completed five times annually including one winter flow measurement per year.
Section 4.4.1 (Surface Water Temperature)	• Removed reference to stations ("DEEP" or "KO") that are not included in Table 4.2-2.
Section 4.4.2 (Surface Water Quality)	• Replaced 'water chemistry' with 'water quality'. • Added explanation regarding changes to lake sampling locations. • Update quality control sample collection for consistency with EMA Permit PE-110652. • Revisions to the data analysis to reflect POPCs in untreated effluent and POCs in the receiving environment. • Revisions to data analysis to indicate all field and laboratory analyzed water quality parameters will be graphed to assess visual trends and support statistical analysis.
Section 4.4.3 (Chronic Toxicity Testing)	• Surface water toxicity test (an EAC #M19-01 Condition 30) is referred to as Chronic Toxicity Testing to align with EMA Permit PE-110652. • Sampling locations are consistent with EMA Permit PE-110652.
Section 4.5 (Sediment Quality)	• Table 4.5-1 has been revised to indicate that particle size and total organic carbon will be compared to baseline data or reference ranges.
Section 4.6 (Aquatic Primary Producers)	• Field methods have been revised to indicate methods for the collection of periphyton biomass (five replicates) and collection of periphyton taxonomy (three replicates) in accordance with BC MWLAP 2013. • Updated approach to assessment endpoints using the Fraser 2021 reference site model for the Reference Condition Approach. • Revised to indicate that benthic invertebrate tissue metal analysis will be completed as part of regular AEMP monitoring (i.e., not a triggered monitoring component).
Section 4.8 (Fish Community)	• Updated monitoring programs as 'Summer Kokanee spawning survey,' 'Spring Kokanee fry outmigration survey, and 'Spring Rainbow trout spawning survey' for consistency with Appendix C of the EMA Permit PE-110652. • Updates to the monitoring programs methods and data analysis to reflect learnings from the 2022 baseline field program, and comments from ENV and Indigenous nations as outlined in Appendix E of the plan.
Section 4.9 (Water-Dependent Wildlife)	• Updates to provide sections of the Wildlife Mitigation and Monitoring Plan that provide descriptions of monitoring programs for water-dependent wildlife.
Section 5 (Adaptive Management)	• The former Section 5 (Trigger Action Response Plan) has been removed to address comments received as part of the Joint MA/EMA Application review. The Trigger Action Response Plan TARP will be developed as a separate document, to provide immediate triggers and actions for water quality, flows and temperature. • The AEMP adaptive management plan has been revised to align with the June 2022 ENV Technical Guidance MIN-20: Development and Use of Adaptive Management Plans, Version 3.0.

Section	Description
Section 6 (Reporting)	• The subsection regarding linkages with other management and monitoring plans has been moved to Section 1.5. • Section 6.1 and reporting are revised as annual AEMP Interpretive Report consistent with EMA Permit PE-110652.
Appendix A	• New to provide concordance with EMA Permit PE-110652 Condition 4.6.3, AEMP Plan.
Appendix B	• Formerly Attachment A. • Updates to reference to section numbers where revisions to the AEMP Plan have been made.
EAC #M19-01 Condition 28	• Formerly Attachment B has been incorporated throughout the AEMP Plan, the sections indicating concordance with EAC #M19-01 Condition 28 are provided in Appendix B.
Appendix C	• Formerly Attachment C. • Updates to reference to section numbers where revisions to the AEMP Plan have been made.
Attachment D and Attachment E	• Attachment D (Baseline and Proposed Water Quality and Aquatic Resource Sampling Locations) is provided in the Cumulative AEMP Baseline Report (ERM 2023b). • Attachment E (2020 WQG-AL) is now provided as the 2022 WQG-AL in both the 2022 AEMP Interpretive Report and the Cumulative AEMP Baseline Report (ERM 2023a, b).
Appendix D	• NEW to provide a table of concordance regarding Joint MA/EMA Permits Application Review Comments that have been addressed in the AEMP Plan, Version 1.0.
Appendix E	• NEW to provide revisions and rationale made to Section 4.8 (Fish Community) that reflect learnings from the 2022 baseline field program, and comments from ENV and Indigenous nations.
Appendix F	• NEW to provide benchmarks for each of the environmental monitoring components (water quality, sediment quality, periphyton biomass, benthic invertebrate and fish tissue metals.
General Edits	• The term ‘reference sites’ has been replaced with ‘control sites’ to align with the terminology for the before-after-control-impact statistical analysis.

Table A-2: Aquatic Effects Monitoring Program Plan, Version 2.0 Revisions (April 2024)

Section	Description	Source
Section 1.3.3 and Section 4.4.2.3	• Reference for the most current BC Approved Water Quality Guideline is provided.	BC ENV
Section 2.1	• Completed engagement and consultation has been updated to include meetings and reviews completed between July 1, 2023 and March 31, 2024.	Condition 4.6.2 in PE-110652
Section 3.2.1	• Addition of Conceptual Site Model schematics (Figure 3.2-1 and Figure 3.2-2).	BC ENV

Section	Description	Source
Section 4.2 and Table 4.2-3	• Changes in monitoring frequency will be at the discretion of a Qualified Registered Professional and notifications of a change in frequency will be provided to BC ENV for approval.	BC ENV and Condition 4.6.6 in PE-110652
Table 4.2-2	• Addition of CC-02, a control site for Kokanee sampling and rainbow trout sampling. • Identification of Kokanee sampling sites in notes.	NFNs and BC ENV
Table 4.2-2 and Table 4.6-1	• Primary producer monitoring requires both biomass and taxonomy sampling.	BC ENV
Section 4.3.2.3	• A minimum of three benchmarks should be used to allow field staff to address discrepancies in surveyed benchmarks.	2023 Hydrology and Water Temperature Annual Report
Section 4.4.3.1	• Chronic toxicity measurement endpoints are updated to include the calculation of IC_x.	2023 AEMP Interpretive Report
Section 4.7.2	• A modified wadable streams protocol will be used to assess the aquatic invertebrate community at sites TC-01 and TC-05.	ECCC
Table 4.7-1 and Section 4.7.3	• Abundance, richness, diversity, and evenness calculations will be performed on the whole community **and** Ephemeroptera, Plecoptera, and Trichoptera taxa. • Metrics for the Family Heptageniidae, will may also be calculated to detect potential impacts from heavy metals.	BC ENV
Section 4.7.2.1	• Greater than 0.5 g of benthic invertebrate tissue will be collected for analysis of tissue metal concentrations.	2023 AEMP Interpretive Report
Table 4.7-2 (new)	• A list of all parameters to be analyzed for tissue metals is provided in Table 4.7-2.	NFNs
Section 4.7.3 and Section 4.8.1.3	• Additional parameters may be added to tissue metal analysis (in addition to mercury and selenium) if changes in water quality are identified, and those changes were not predicted by the surface water quality model.	NFNs
Section 4.8.1.2	• Beaver dam measurements will be recorded at the time of fish community sampling. • Additional efforts outside of three pass electrofishing fish community sampling will be completed at sites that do not result in sufficient numbers for fish tissue sampling.	2023 AEMP Interpretive Report
Section 4.8.1.2, Section 4.8.3.2, and Section 4.8.4.2	• Any lesions, parasites, or deformities (or lack thereof) will be recorded.	BC ENV
Section 4.8.1.3	• Fish density and abundance estimates will include standard error and 95% confidence limit.	NFNs

Section	Description	Source
Section 4.8.1.3	• Age of the fish will be added as a covariate in statistical analyses of fish tissue concentrations of mercury and selenium.	2023 AEMP Interpretive Report
Section 4.8.2.2	• Table 4.8-2 and Figure 4.8-3 provide the location of each of the selected sampling locations. • Rationale for the Kokanee summer spawning survey locations are provided along with justification for not including the entire spawning distribution in the AEMP. • Rationale for inclusion of redd counts. • Any changes to the field methods outlined in the AEMP Plan will be recorded and documented in the annual interpretive report along with rationale for the change.	NFNs
Section 4.8.2.3	• Data analysis includes Kokanee egg estimates (based on literature) for the purposes of an egg to fry survival calculation.	NFNs
Section 4.8.3.2	• One additional site upstream of the confluence with Creek 661 in middle Chedakuz Creek (CC-02) will be added to the outmigration surveys as a control site. • The annual report will document any changes to the field methods outlined in the AEMP Plan along with rationale for the change.	AEMP Interpretive Report, NFNs
Section 4.8.4	• Continuous water temperature and flow data from the surface water surveys will be correlated with rainbow trout surveys. • The rainbow trout abundance estimates for each of the streams surveyed will be calculated as true abundance accounting for days of trap operations and/or trap efficiency. • Any changes to the field methods outlined in the AEMP Plan will be recorded and documented in the annual interpretive report along with rationale for the change.	NFNs
Table 5.2-3, Table 5.2-4, Table 5.2-5, Table 5.2-6, and Table 5.2-7	• Reduction in sampling frequency will be at the discretion of a Qualified Registered Professional and a notification will be provided to BC ENV for approval prior to implementing.	BC ENV and Condition 4.6.6 in PE-110652
Section 5.2.3 and Table 5.2-4	• A periphyton and nutrient response framework is provided to include both periphyton biomass and the nutrients, total ammonia-N, nitrate-N, nitrite-N, and total phosphorus.	BC ENV and 2023 AEMP Interpretive Report
Section 6.1	• The results of the annual Country Foods Monitoring Program will be summarized to provide potential linkages with human health.	BC ENV

Notes:
AEMP = Aquatic Effects Monitoring Program; BC ENV = BC Ministry of Environment and Climate Change Strategy; NFNs = Nechako First Nations; ECCC = Environment and Climate Change Canada

Table A-3: Aquatic Effects Monitoring Program Plan, Version 3.0 Revisions (December 2024)

Section	Description	Source
Section 1.6	• Added documentation and map of the 2023 Wildfire and how future AEMP interpretive reports will assess the potential impacts of the wildfire (current and historical).	BC ENV comments (May 2024)
Figures 4.2-1 to 4.4-4	• Revised AEMP sampling location maps to include areas surveyed for fisheries components (new map Figure 4.4-4).	Indigenous group comments
Section 4.3.2.2	• A standard operating procedure (SOP) for manual flow measurements is referred to and details regarding the surveys will be included in the SOP.	Not Applicable
Section 4.2 and Table 4.2-3	• Revised to indicate that a reduction in sampling frequency will be implemented only upon approval from BC ENV. • The proposed reduction in frequency to once every six years would only be requested if no effects were detected after two successive AEMP monitoring cycles, in which effects as a result of the Mine are identified and with sufficient evidence at the discretion of a Qualified Registered Professional.	BC ENV comments (May 2024)
Section 4.2	• Post-hoc power analyses will be completed in future AEMP interpretive reports to support the assessment of effect and/or may be provided as the rationale for a reduction in frequency.	BC ENV comments (May 2024)
Sections 4.5.13, 4.6.3, and 4.7.3	• Addition of detail regarding the available baseline data to be used in the assessment of effects.	BC WLRS comments (June 2024)
Section 4.7.3	• Addition of detail regarding how the Bray-Curtis Index is calculated to compare the community composition among the sites sampled.	BC WLRS comments (June 2024)
Section 4.8.1.2 and Table 4.2-3	• Clarified that aging structures (scales) will be obtained for up to ten rainbow trout collected at stream site per size class. Aging structures (otoliths) will be collected for fish collected from streams and lakes used for tissue metal analysis.	BC ENV comments (May 2024) and BC WLRS comments (June 2024)
Section 4.8.1.2	• Clarified that for the assessment of fish community endpoints (e.g., CPUE, abundance, density), fish classified as salvaged will not be included.	BC WLRS comments (June 2024)
Section 4.8.1.2	• Revised to indicate that Fulton's condition (K) will be used as the metric for condition.	BC WLRS comments (June 2024)
Section 4.8.2.2 and Figure 4.8-1	• Revised to indicate additional survey reaches in Creek 661 were added to encompass the entire Kokanee spawning distribution.	NFNs comments
Sections 4.8.2.2, 4.8.3.2, and 4.8.4.2	• Revised to indicate an Implementation Framework will be used to inform the specific timing of field surveys.	NFNs comments
Section 4.8.2.3	• Escapement estimates using both the Gaussian AUC (GAUC) method and the trapezoidal AUC (TAUC) method will be reported, for comparison.	BC ENV comments (May 2024) and NFNs comments

Section	Description	Source
Section 4.8.2.3	• Revised to indicate a spatial analysis of Kokanee redd distribution will be included in reporting.	NFNs comments
Section 4.8.3.2	• Revised field methods for the Kokanee fry outmigration assessment.	BC WLRS comments (June 2024)
Section 4.8.3.3	• Addition of egg to fry survival estimate in addition to the Kokanee fry assessment endpoints.	BC WLRS comments (June 2024) and NFNs comments
Section 4.8.4.3	• Revised to indicate that abundance will be determined based on the total number of unique PIT tags implanted and/or observed in rainbow trout captured at each site.	BC WLRS comments (June 2024)
Tables 5.2-3, 5.2-4, 5.2-5, 5.2-6, and 5.2-7	• Revised to indicate that a request for a reduction in sampling frequency will be provided to BC ENV and only implemented only upon approval from BC ENV.	BC ENV comments (May 2024)

Notes:

AEMP = Aquatic Effects Monitoring Program; BC ENV = BC Ministry of Environment and Climate Change Strategy; NFNs = Nechako First Nations; WLRS = BC Ministry of Water, Land and Resource Stewardship

Table A-4: Aquatic Effects Monitoring Program Plan, Version 3.1 Revisions (March 28)

Section	Description	Source
Section 1.4	• Acknowledge that aquatic ecosystem special studies may be required that are outside the scope of the annual AEMP monitoring but may be required for supporting info on investigation of cause	BC ENV
Section 1.4	• Aquatic resources is defined to include aquatic primary producers and benthic invertebrates	BC WLRS
Section 4.2 and Table 5.2-6	• The reduction in the sampling frequency to 'every six years' is no longer proposed for benthic invertebrate tissue and lake fish tissue metal	BC ENV and BC WLRS
Sections 4.5.1.2, 4.6.2.1, and 4.7.2.1	• Addition of text to indicate the impact and control sites sampled for periphyton, sediment quality, and benthic invertebrate community monitoring	BC ENV
4.8.1.3	• Acknowledge that to address potential bioaccumulation for fish tissue to be influenced by external factors including age, size, and weight. Age or the most appropriate metric (i.e., length or weight) to address the potential for bioaccumulation in fish tissue will be included as a covariate in statistical analyses of fish tissue concentrations of mercury and selenium.	BC ENV
Appendix C	• A complete table of concordance with EAC #M19-01 is now provided.	EAO
Appendix G	• Numeric performance benchmarks were updated consistent with the 2024 AEMP Interpretive Report	2024 AEMP Interpretive Report

Section	Description	Source
Section 4.8.1.2	• Acknowledge consideration of muscle plugs for collection of tissue metals from fish in lakes	BC ENV
Section 4.8.1.2	• Temperature loggers, installed for purposes of ATU calculations, included on figures	BC ENV
Section 4.8.1.2	• Acknowledge review of fish size/age classes in 2024 interpretive report and that adjustments to size classes may be required	Indigenous groups
Sections 4.8.1.2, 4.8.2.2, 4.8.3.2, and 4.8.4.2	• Implementation framework (commencement and termination triggers) for fish community inventory and tissue metal sampling, kokanee spawner surveys, kokanee fry outmigration surveys, and rainbow trout spawner surveys incorporated into the body of the AEMP	BC ENV, BC WLRS, and Indigenous group
Section 4.8.1.2	• Addition of ATU calculation for rainbow trout emergence in implementation framework for fish community inventory surveys	Indigenous groups
Section 4.8.1.2	• Addition of lake sites in implementation framework for tissue metal sampling	BC WLRS
Section 4.8.2.2	• Revised to indicate special study of kokanee spawner distribution throughout Middle Chedakuz Creek, planned to occur in 2025	BC ENV and WLRS
	• Kokanee spawning monitoring Reach 3 in Davidson Creek (DC-3-KO), replaced by Reach 2 (DC-2-KO)	2024 Interpretive Report, BC ENV and BC WLRS
Section 4.8.2.2	• Acknowledge bimodal distribution of spawning kokanee in Davidson Creek with respect to implementation framework termination trigger	BC WLRS
Section 4.8.2.2	• Acknowledge roles of water temperature and discharge on timing of kokanee spawning migration in defining implementation framework commencement triggers and possible incorporation in future versions as additional watercourse specific data become available	Indigenous groups
Section 4.8.3.2	• Expanded description of kokanee fry outmigration field methods, including clarification of sampling frequency, trap efficiency (mark-recapture) and area-based expansions	BC ENV, BC WLRS, Indigenous groups
	• Two-fine mesh funnel nets deployed during kokanee fry outmigration sampling	2024 Interpretive Report
Section 4.8.3.3	• Expanded description of kokanee fry outmigration abundance estimate data analysis	BC ENV, BC WLRS, Indigenous groups
Section 4.8.4.2	• Additional context provided for use of PIT tags in rainbow trout	BC WLRS

Notes:
AEMP = Aquatic Effects Monitoring Program; BC ENV = BC Ministry of Environment and Climate Change Strategy; NFNs = Nechako First Nations; BC WLRS = BC Ministry of Water, Land and Resource Stewardship

APPENDIX B CONCORDANCE WITH *ENVIRONMENTAL MANAGEMENT ACT* PERMIT 110652

Table B-1: Concordance of the *Environmental Management Act* Permit 110652 Aquatic Effects Monitoring Program

Environmental Management Act Permit 110652 Condition	Section in the Aquatic Effects Monitoring Program Plan
4.6 Aquatic Effects Monitoring Program	
4.6.1 The permittee must cause a Qualified Professional to develop an Aquatic Effects Monitoring Program (AEMP) and the permittee must submit an AEMP Plan for approval to the director within 60 days after the issuance of this authorization	Section 7; the authorization was issued on May 2, 2023, therefore the AEMP Plan, Version 1.0 was submitted by July 2, 2023.
4.6.2 The permittee must engage with the UFN, LDN and CSFNs during the development of the draft AEMP Plan. The permittee must provide a summary of the engagement, including comments received and permittee responses with an explanation of efforts made to resolve comments, in a cover letter as part of the AEMP Plan submitted for approval.	Section 2.1 and Appendix A
4.6.3 The AEMP Plan must include, but is not necessarily limited to, the following:	-
(a) A conceptual model that describes the relationships between mining-related activities and potential effects on the aquatic environment,	Section 3.2
(b) The objectives and a list of questions the AEMP is intended to answer,	Section 1.1 (objectives); Section 4 (list of questions)
(c) A detailed description of the design of the monitoring program, including a list of assessment endpoints and measurement endpoints that will be incorporated into the AEMP,	Section 4 (design); assessment and measurement endpoints provided in – Section 4.3.1 (hydrology) Section 4.4.1.1 (surface water temperature) Section 4.4.2.1 (surface water quality) Section 4.4.3.1 (chronic toxicity testing) Section 4.5.1 (sediment quality) Section 4.6.1 (periphyton) Section 4.7.1 (benthic invertebrates) Section 4.8.1.1 (fish community inventory and tissue metals) Section 4.8.2.1 (Kokanee summer spawning) Section 4.8.3.1 (Kokanee fry spring outmigration) Section 4.8.4.1 (Rainbow Trout spring spawning)
(d) Trigger response framework for nutrient concentrations and periphyton biomass	Section 5.2.3 (periphyton biomass and nutrient concentrations)
(e) The monitoring stations and sampling components outlined in Appendix C	Table 4.2-1 and Table 4.2-2

***Environmental Management Act* Permit 110652 Condition**	**Section in the Aquatic Effects Monitoring Program Plan**
4.6 Aquatic Effects Monitoring Program *(cont'd)*	
(f) The means by which the data collected will be analyzed to determine the effects on the aquatic environment.	Section 4.3.4 (hydrology) Section 4.4.1.4 (surface water temperature) Section 4.4.2.3 (surface water quality) Section 4.4.3.2 (chronic toxicity testing) Section 4.5.2.3 (sediment quality) Section 4.6.3 (periphyton) Section 4.7.3 (benthic invertebrates) Section 4.8.1.3 (fish community inventory and tissue metals) Section 4.8.2.3 (Kokanee summer spawning) Section 4.8.3.3 (Kokanee fry spring outmigration) Section 4.8.4.3 (Rainbow Trout spring spawning)
4.6.6 The permittee must cause a Qualified Professional to review and update the AEMP Plan based on the recommendations included in the AEMP interpretive report. The updated AEMP Plan must be submitted to the director for approval within 30 days of submission of AEMP interpretive report. The permittee must provide justification where any of the recommended modifications have not been included in the updated AEMP Plan in a cover letter for the updated AEMP Plan.	Section 7; the AEMP Interpretive Report was issued on March 31, 2024, therefore the AEMP Plan, Version 2.0 was submitted by April 30, 2024.

Notes:
LDN = Lhoosk'uz Dené Nation; UFN = Ulkatcho First Nation; CSFN = Carrier Sekani First Nations now Nechako First Nations.

APPENDIX C CONCORDANCE WITH ENVIRONMENTAL ASSESSMENT CERTIFICATE #M19-01 (JUNE 21, 2019)

Table C-1: Concordance of EAC #M19-01 Conditions with the Aquatic Effects Monitoring Program Plan

Environmental Assessment Certificate	Section in the Aquatic Effects Monitoring Program Plan
Condition 28: Chedakuz Creek and Tatelkuz Lake Water Quality Monitoring Plan	
The plan must include at least the following:	
a) Monitoring locations;	Section 4.2
b) Frequency of monitoring;	Section 4.2
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: a. Tatelkuz Lake; and b. Chedakuz Creek upstream of Nechako Reservoir;	Sections 4.4.2
d) 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 4.4.2 (BW Gold has been collaborating with the Nechako First Nations (NFNs) in regard to implementation of the YDWL and discussions with the NFNs are ongoing.)
e) Conditions, if any, under which monitoring would no longer be required; and	Section 4
f) 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 6
Condition 30: Aquatic Effects Monitoring Plan	
The Holder must retain a Qualified Professional to develop an Aquatic Effects Monitoring Plan (AEMP).	Section 1.2 and 7
The AEMP must be developed in consultation with EMPR, ENV, FLNRORD, and Aboriginal Groups.	Section 2; Ongoing
The AEMP must include at least the following:	
a) a description of how the plan takes into consideration the YDWL and any other Aboriginal water policies made available to the Holder by the Aboriginal Groups;	Section 1.3, Section 4.4.2 (BW Gold has been collaborating with the Nechako First Nations regarding implementation of the YDWL and discussions are ongoing.)
b) a description of the Project, associated activities, and study area;	Section 1, Section 4.1
c) a conceptual model that describes the relationships between mining-related activities and potential effects on the aquatic environment;	Section 3.2

Environmental Assessment Certificate		Section in the Aquatic Effects Monitoring Program Plan
Condition 30: Aquatic Effects Monitoring Plan *(cont'd)*		
d)	a description of the water quality issues and concerns with respect to the Project that exist in the vicinity of the Project Site;	Section 3
e)	the objectives and a list of questions the AEMP is intended to answer;	Section 1.1 (objectives); Section 4 (list of questions)
f)	a detailed description of the design of the monitoring program, including a list of assessment endpoints (for example, survival, growth, and reproduction of fish in receiving waters) and measurement endpoints (for example, surface water chemistry) that will be incorporated into the AEMP;	Section 4 (Tables 4.3-1, 4.4-1, 4.4-2, 4.4-4, 4.5-1, 4.5-3, 4.6-1, 4.7-1, 4.8-1, 4.8-2, 4.8-4, 4.8-5, and 4.9-1)
g)	a description of the locations, timing, and frequency of sampling for each of the measurement endpoints and metrics (e.g., concentrations of major ions in surface water) that will be included in the AEMP, including those for surface water chemistry, surface water toxicity, sediment chemistry, sediment toxicity, tissue chemistry, aquatic plant communities, aquatic invertebrate communities, fish communities, and aquatic-dependent wildlife communities;	Section 4.2 (Table 4.2-2 and 4.2-3); see Section 4.6.1 for why aquatic plant communities are excluded
h)	the means by which the data collected under the AEMP will be analyzed to determine the effects of the Project on the aquatic environment;	Section 4.3.4 (hydrology) Section 4.4.1.4 (surface water temperature) Section 4.4.2.3 (surface water quality) Section 4.4.3.3 2 (chronic toxicity testing) Section 4.5.2.3 (sediment quality) Section 4.6.3 (periphyton) Section 4.7.3 (benthic invertebrates) Section 4.8.1.3 (fish community inventory and tissue metals) Section 4.8.2.3 (kokanee summer spawning) Section 4.8.3.3 (kokanee fry spring outmigration) Section 4.8.4.3 (rainbow trout spring spawning)
i)	means by which the AEMP will inform the Country Foods Monitoring Plan (Condition 41);	Section 1.5
j)	a list of reports that will be prepared to disseminate the results of the AEMP, including a description of the proposed frequency, timing, structure, and content of each report. The reports must include a report that summarizes the results of the AEMP in language understandable to a lay audience; and	Section 6.1 (Annual AEMP Interpretive Report), Section 6.2 (Decision Statement Annual Reporting), Section 6.3 (EAC Reporting), Section 6.4 (Plain Language Report)
k)	the process and timing for sharing monitoring and study results, including the reports required under paragraph (j), with ENV, EMPR, FLNRORD, Aboriginal Groups and the EMC.	Section 6

Environmental Assessment Certificate	Section in the Aquatic Effects Monitoring Program Plan
Condition 30: Aquatic Effects Monitoring Plan *(cont'd)*	
The adaptive management aspect of this plan, as required under Condition 3, may be in a stand-alone section of this plan.	Section 5
The Holder must provide the draft plan that was developed in consultation with EMPR, ENV, FLNRORD, and Aboriginal Groups to EAO, EMPR, ENV, FLNRORD, and Aboriginal Groups for review a minimum of 60 days prior to the planned commencement of Construction or as listed in the Document Submission Plan required by Condition 10 of this Certificate.	Section 2
The AEMP, and any amendments thereto, must be implemented to the satisfaction of a Qualified Professional throughout Construction, Operations, Closure and Post-Closure and to the satisfaction of the EAO.	Ongoing, Section 1.2 and 6
Condition 2: Plan Development	
Where a condition of this Certificate requires the Holder to develop a plan, program, or other document, any such plan, program or other document must, at a minimum, include the following information:	
a) purpose and objectives of the plan, program, or other document;	Section 1.1
b) roles and responsibilities of the Holder and Employees;	Section 1.2
c) names and, if applicable, professional certifications and professional stamps/seals, of those responsible for the preparation of the plan, program, or other document;	Section 7
d) schedule for implementing the plan, program, or other document throughout the relevant Project phases;	Section 4
e) means by which the effectiveness of the mitigation measures will be evaluated including the schedule for evaluating effectiveness;	Section 5
f) schedules and methods for the submission of reporting to specific agencies, Aboriginal Groups and the public and the required form and content of those reports; and	Section 6
g) process and timing for updating and revising the plan, program, or other document, including any consultation with agencies and Aboriginal Groups that would occur in connection with such updates and revisions.	Section 2 (Engagement) and Section 6.5 (Plan Revisions)
Condition 3: Adaptive Management	
Where a condition of this Certificate requires the Holder to develop a plan, program or other document that includes monitoring, including monitoring of mitigation measures or monitoring to determine the effectiveness of the mitigation measures, the Holder must include adaptive management in that plan.	Section 5

Environmental Assessment Certificate	Section in the Aquatic Effects Monitoring Program Plan
Condition 3: Adaptive Management *(cont'd)*	
The objective of the adaptive management is to address the circumstances that will require the Holder to implement alternate or additional mitigation measures to address effects of the Project if the monitoring shows that those effects:	Section 5.2
a) are not mitigated to the extent contemplated in the Application;	
b) are not predicted in the Application; or	
c) have exceeded the triggers identified in paragraph g) of this condition.	
The adaptive management in the plan must include at least the following:	
a) the monitoring program that will be used including methods, location, frequency, timing, and duration of the monitoring;	Section 4
b) the baseline information that will be used, or collected where existing baseline information is insufficient, to support the monitoring program;	Section 3 and 5.2
c) the scope, content, and frequency of reporting of the monitoring results;	Section 6
d) the identification of qualitative and quantitative triggers, which, when observed through monitoring required under paragraph d), will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects;	Section 5.2 (Tables 5.2-2, 5.2-3, 5.2-4, 5.2-5, 5.2-6, and 5.2-7)
e) the methods that will be applied to detect when a numeric trigger, or type or level of change referred to in paragraph g), has occurred;	Section 4 (Data Analysis sections) and Section 5.2
f) a description of the process for and timing to alter existing mitigation measures or develop new mitigation measures to reduce or avoid effects;	Section 4 (Data Analysis sections) and Section 5.2
g) identification of the new and/or altered mitigation measures that will be applied when any of the changes identified in paragraphs a) to c) occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;	Section 4 (Data Analysis sections) and Section 5.2
h) the monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activities are effectively mitigating or remediating the effects and or avoiding potential effects; and	Section 4 (Data Analysis sections) and Section 5.2
i) the scope, content, and frequency of reporting on the implementation of altered or new mitigation measures.	Section 6

Environmental Assessment Certificate	Section in the Aquatic Effects Monitoring Program Plan
Condition 3: Adaptive Management *(cont'd)*	
If there are any requirements or mitigation measures required in the plan, program or other document for which adaptive management, or elements of adaptive management listed in paragraphs d) to l) are assessed to be not appropriate or applicable, the plan must include identification of those requirements and measures, and the rationale for that assessment.	Ongoing

Notes:
YDWL = Yinka Dene Water Law; EMPR = BC Ministry of Energy Mines and Petroleum Resources, ENV = BC Ministry of Environment and Climate Change Strategy, FLNRORD = BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, EAO = Environmental Assessment Office.

APPENDIX D CONCORDANCE WITH FEDERAL DECISION STATEMENT (APRIL 15, 2019)

Table D-1: Concordance of the Federal Decision Statement with Aquatic Effects Monitoring Program Plan

Federal Decision Statement Condition	Section in the Aquatic Effects Monitoring Program Plan
Fish and Fish Habitat	
3.14 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada (DFO), and other relevant authorities, a Follow-Up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as it pertains to adverse environmental effects of the Designated Project on fish and fish habitat. The Proponent shall implement the Follow-Up program during all phases of the Designated Project and shall apply conditions 2.9 and 2.10 when implementing the Follow-Up program. As part of the Follow-Up program, the Proponent shall:	Considered in the AEMP Plan. Follow-Up program design submitted under a separate cover (Palmer 2023a).
3.14.1 conduct parasite and pathogen inventories in Lake 01538UEUT and Lake 01682LNRS prior to enlarging Lake 01682LNRS and connecting it to Lake 01538UEUT pursuant to Condition 3.13 and compare the results of the parasite and pathogen inventories for the two lakes;	
3.14.2 monitor, starting when the Proponent starts to pump water into Davidson Creek and continuing through until the freshwater supply system has been decommissioned, Rainbow Trout (Oncorhynchus mykiss) and kokanee (Oncorhynchus nerka) populations in Davidson Creek, including: 3.14.2.1 community composition of Rainbow Trout (Oncorhynchus mykiss) and kokanee (Oncorhynchus nerka), their absolute abundance, genetic structure and diversity; 3.14.2.2 absolute abundance of overwintering Rainbow Trout juveniles; and 3.14.2.3 characteristics of spawner populations through surrogate monitoring metrics including size at 50% maturity, redd counts and spawner distribution.	Sections 4.8.1 through 4.8.4
3.15 The Proponent shall develop, in consultation with Indigenous groups and other relevant authorities, a Follow-Up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as it pertains to adverse environmental effects of the Designated Project on fish habitat in Davidson Creek, Creek 661 and Chedakuz Creek. The Proponent shall develop the Follow-Up program prior to construction and shall implement the Follow-Up program during all phases of the Designated Project. The Proponent shall apply conditions 2.9 and 2.10 when implementing the Follow-Up program. As part of the Follow-Up program, the Proponent shall:	Section 1.1 (Purpose and Objectives)
3.15.1 monitor water flows in Davidson Creek during the open water season from construction until decommissioning, and temperature continuously from construction until decommissioning;	Water flow monitoring for major catchments including Davidson Creek catchment is described in 4.3 (Surface Water Quantity)

Federal Decision Statement Condition	Section in the Aquatic Effects Monitoring Program Plan
Fish and Fish Habitat *(cont'd)*	
3.15.2 monitor water quality in Davidson Creek, Creek 661 and Chedakuz Creek for contaminants of potential concern, including those identified in Table 5 of the environmental assessment report, during all phases of the Designated Project; and	Surface water quality monitoring is described in Section 4.4.2 (Surface Water Quality Sampling)
3.15.3 monitor, during all phases of the Designated Project, groundwater quality and quantity downstream of the tailings storage facility site D, open pit, west waste rock dump and low-grade ore stockpile to confirm that groundwater quantity and quality parameters are at or below the values identified by the Proponent in the modelled predictions in Section 5 of Blackwater Gold Project: Additional Water Quality Model Sensitivity Scenario (July 20, 2017) and Section 3 of Blackwater Gold Project: Water Treatment Responses for Comments 1266, 1270, 1271, 1272, and 1273 (February 15, 2017) for nitrite and contaminants of potential concern, and to verify the effectiveness of water management measures.	Not in the AEMP Plan. Mine site groundwater quality and flow monitoring are described in Section 7.3.4 (Mine Site Groundwater Quality and Flow) of the Mine Site Water and Discharge Monitoring and Management Plan. Adaptive management for groundwater is described in Section 11 (Table 11-1: Mine Site Water Adaptive Management Actions) and Section 11.1 (Groundwater Adaptive Management and Contingency Actions) of the Mine Site Water and Discharge Monitoring and Management Plan.
3.16 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a Follow-Up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as it pertains to fish habitat in Tatelkuz Lake and Chedakuz Creek. The Proponent shall implement the Follow-Up program from construction through decommissioning and shall apply conditions 2.9 and 2.10 when implementing the Follow-Up program. As part of the Follow-Up program, the Proponent shall:	Considered in the AEMP Plan. Follow-Up program design submitted under a separate cover (Palmer 2023b).
3.16.1 conduct, prior to the commissioning of the freshwater supply system, fish habitat quantity and quality surveys in the Tatelkuz Lake littoral zone;	
3.16.2 monitor the Tatelkuz Lake littoral zone from the commissioning of the freshwater supply system until decommissioning; and	
3.16.3 monitor water flows in Chedakuz Creek between Tatelkuz Lake and the confluence with Davidson Creek during the open water season from construction until decommissioning.	Section 4.3
Consultation	
2.3 The Proponent shall, where consultation is a requirement of a condition set out in this Decision Statement:	Referenced in Section 2.3 for future engagement and consultation
2.3.1 provide a written notice of the opportunity for the party or parties being consulted to present their views and information on the subject of the consultation;	
2.3.2 provide all information available and relevant on the scope and the subject matter of the consultation and a period of time agreed upon with the party or parties being consulted, not less than 15 days, to prepare their views and information;	

Federal Decision Statement Condition	Section in the Aquatic Effects Monitoring Program Plan
Consultation *(cont'd)*	
2.3.3 undertake a full and impartial consideration of all views and information presented by the party or parties being consulted on the subject matter of the consultation;	
2.3.4 strive to reach consensus with Indigenous groups; and	
2.3.5 advise the party or parties being consulted on how the views and information received have been considered by the Proponent including a rationale for why the views have, or have not, been integrated. The Proponent shall advise the party or parties in a time period that does not exceed the period of time taken in 2.3.2.	
2.4 The Proponent shall, where consultation with Indigenous groups is a requirement of a condition set out in this Decision Statement, determine and strive to reach consensus with each Indigenous group regarding the manner by which to satisfy the consultation requirements referred to in condition 2.3, including:	Referenced in Section 2.3 for future engagement and consultation
2.4.1 the methods of notification;	
2.4.2 the type of information and the period of time to be provided when seeking input;	
2.4.3 the process to be used by the Proponent to undertake impartial consideration of all views and information presented on the subject of the consultation; and	
2.4.4 the period of time and the means by which to advise Indigenous groups of how their views and information were considered by the Proponent.	
Follow-Up and Adaptive Management – Condition 3.15	
2.5 The Proponent shall, where a Follow-Up program is a requirement of a condition set out in this Decision Statement, have a Qualified Professional, where such a qualification exists for the subject matter of the Follow-Up program, determine, as part of the development of each Follow-Up program and in consultation with the party or parties being consulted during the development, the following information:	Section 7
2.5.1 the Follow-Up activities that must be undertaken by a qualified individual;	Section 1.2 and Section 7
2.5.2 the methodology, location, frequency, timing and duration of monitoring associated with the Follow-Up program;	Sections 4.3, 4.4.1, and 4.4.2 provide methodology; Section 4.2 provides the locations, timing, and frequency of sampling
2.5.3 the scope, content, format and frequency of reporting of the results of the Follow-Up program;	Section 6.1.2
2.5.4 the levels of environmental change relative to baseline conditions that would require the Proponent to implement modified or additional mitigation measure(s), including instances where the Proponent may require Designated Project activities to be stopped; and	Section 5.2 (Tables 5.2-2, 5.2-3, 5.2-4, 5.2-5, 5.2-6, and 5.2-7)

Federal Decision Statement Condition	Section in the Aquatic Effects Monitoring Program Plan
Follow-Up and Adaptive Management – Condition 3.15 *(cont'd)*	
2.5.5 the technically and economically feasible mitigation measures to be implemented by the Proponent if monitoring conducted as part of the Follow-Up program shows that the levels of environmental change referred to in condition 2.5.4 have been reached or exceeded.	Section 5.2 (Tables 5.2-2, 5.2-3, 5.2-4, 5.2-5, 5.2-6, and 5.2-7)
2.6 The Proponent shall update and maintain the Follow-Up and adaptive management information referred to in condition 2.5 during the implementation of each Follow-Up program in consultation with the party or parties being consulted during the development of each Follow-Up program.	Section 2
2.7 The Proponent shall provide a draft of the Follow-Up programs referred to in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22, if required, to the party or parties being consulted during the development of each Follow-Up program for a consultation period of up to 60 days prior to providing Follow-Up programs pursuant to condition 2.8.	Section 2
2.8 The Proponent shall provide the Follow-Up programs referred to in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22, if required, to the Agency and to the party or parties being consulted during the development of each Follow-Up program prior to the implementation of each Follow-Up program. The Proponent shall also provide any update(s) made pursuant to condition 2.6 to the Agency and to the party or parties being consulted during the development of each Follow-Up program within 30 days of the Follow-Up program being updated.	Section 2.1 and Section 2.2
2.9 The Proponent shall, where a Follow-Up program is a requirement of a condition set out in this Decision Statement:	
2.9.1 conduct the Follow-Up program according to the information determined pursuant to condition 2.5;	The AEMP will be conducted in accordance with the information determined pursuant to condition 2.5.
2.9.2 undertake monitoring and analysis to verify the accuracy of the environmental assessment as it pertains to the particular condition and/or to determine the effectiveness of any mitigation measure(s);	Monitoring- sections 4.1, 4.2, 4.3 and 4.4 Analysis- sections 4.3.4, 4.4.2.3, and 4.4.3.3
2.9.3 determine whether modified or additional mitigation measures are required based on the monitoring and analysis undertaken in accordance with condition 2.9.2; and	Section 5.2
2.9.4 if modified or additional mitigation measures are required pursuant to condition 2.9.3, develop and implement these mitigation measures in a timely manner and monitor them in accordance with condition 2.9.2.	Section 5.2
2.10 Where consultation with Indigenous groups is a requirement of a Follow-Up program, the Proponent shall discuss the Follow-Up program with Indigenous groups and determine, in consultation with Indigenous groups, opportunities for their participation in the implementation of the Follow-Up program, including the analysis of the Follow-Up results and whether modified or additional mitigation measures are required, as set out in condition 2.9.	Section 2

Federal Decision Statement Condition	Section in the Aquatic Effects Monitoring Program Plan
Annual Reporting	
2.11 The Proponent shall, commencing in the reporting year during which the Proponent begins the implementation of the conditions set out in this Decision Statement, prepare an annual report that sets out:	Section 6.2
2.11.1 the activities undertaken by the Proponent in the reporting year to comply with each of the conditions set out in this Decision Statement;	
2.11.2 how the Proponent complied with condition 2.1;	
2.11.3 for conditions set out in this Decision Statement for which consultation is a requirement, how the Proponent considered any views and information that the Proponent received during or as a result of the consultation, including a rationale for how the views have, or have not, been integrated;	
2.11.4 the information referred to in conditions 2.5 and 2.6 for each Follow-Up program;	
2.11.5 the results of the Follow-Up program requirements identified in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22 if required;	
2.11.6 any update made to any Follow-Up program in the reporting year;	
2.11.7 any modified or additional mitigation measures implemented or proposed to be implemented by the Proponent, as determined under condition 2.9 and rationale for why mitigation measures were selected pursuant to condition 2.5.4; and	
2.11.8 any change(s) to the Designated Project in the reporting year.	
2.12 The Proponent shall provide a draft annual report referred to in condition 2.11 to Indigenous groups, no later than June 30 following the reporting year to which the annual report applies. The Proponent shall consult Indigenous groups on the content and findings in the draft annual report.	
2.13 The Proponent, in consideration of any comments received from Indigenous groups pursuant to condition, 2.12 shall revise and submit to the Agency and Indigenous groups a final annual report, including an executive summary in both official languages, no later than September 30 following the reporting year to which the annual report applies.	

APPENDIX E JOINT *MINES ACT* / *ENVIRONMENTAL MANAGEMENT ACT* PERMIT APPLICATION REVIEW COMMENTS ON THE AQUATIC EFFECTS MONITORING PROGRAM PLAN – CONCORDANCE TABLE

Table E-1: *Joint Mines Act/Environmental Management Act* Permit Application Review Comments on the Aquatic Effects Monitoring Program Plan – Concordance Table

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
25	BC ENV (Andrew Foster)	Jun 01, 2022	1	1. Please confirm the location of the headwaters for Creek 661. 2. Which map or figure in the application accurately shows Creek 661 and its tributaries?	1 and 2. Figure 4.2-2b will be provided in the updated Aquatic Effects Monitoring Program Plan, Version 1.0 to show the headwaters of Creek 661 and its tributaries. The figure is provided in the memo titled: Blackwater_AEMP_Comment Responses 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, and 61.	Figure 4.2-3
30	BC ENV (Andrew Foster)	Jun 01, 2022	1	1. How could SBEBs be adapted to changes in water quality (e.g., climate change) if unimpacted upstream locations are not available (e.g., engulfed within mine footprint)? For example if Creek 661 tributary flows naturally decline and aluminum concentrations become more concentrated is there a method or plan to adjust the SBEB if needed? 2. Is there a suitable reference stream that could be used to monitor flow declines?	1. The ENV Technical Guidance document "A Framework for the Development and Use of Freshwater Science-Based Environmental Benchmarks for Aquatic Life in Environmental Management Act Permitting for Mines" does not contain guidance on the adaptation of SBEBs in the specific event of changes to background water quality, such as effects related to climate change. BW Gold will work within the adaptive management framework presented in the SBEB application documents and the AEMP to evaluate the appropriateness of SBEBs as new scientific information and monitoring program results become available. If the need to adjust the SBEB is identified, BW Gold will work with ENV to develop an updated SBEB or an alternative framework from which to evaluate D-Al concentrations. 2. An extensive hydrological monitoring network has been established for the Project and will continue to be monitored as the project progresses. Notably, hydrology and water quality will continue to be measured at stations established in reference streams identified in the AEMP - Turtle Creek and Creek 705 - both of which show dissolved aluminum concentrations above the BC long-term water quality guideline. Monitoring results from these stations may support the evaluation of the appropriateness of the SBEB.	Table 5.2-2 to indicates that the "approved SBEB" would be reviewed and if a new proposal for an SBEB is appropriate as new and relevant science becomes available.
30	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. BW Gold may want to be proactive in determining a way to adjust SBEB values as upstream background sites will become engulfed by the project and a simple recalculation of background concentrations will not be possible. (Comment, no action needed) 2. It is my understanding Creek 705 is expected to see an increase flow to mine activities and therefore may not be a preferred reference site in the example scenario. (Comment, no action needed)	1. Thank you for this comment. The need to be proactive to ensure the SBEB appropriately reflects background conditions is noted. 2. Thank you for this comment. As a result of this and related comments, the AEMP wording will be adjusted to clarify that monitoring stations in Creek 705 are currently identified as reference locations but project effects to flow may result in these stations no longer being appropriate for use as reference sites. A tributary to Fawnie Creek (FC-01) and Turtle Creek (TC-01) will continue to be monitored as a reference sites. A new station in the upper Creek 661 mainstem (661-01) has also been added to the AEMP and may be used to support the evaluation of potential changes to background conditions.	Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available.
38	BC ENV (Andrew Foster)	Jun 01, 2022	1	Why were the Kuyakuz and Tatelkuz Lake sampling sites shifted from baseline locations?	Baseline sampling of both Tatelkuz Lake and Kuyakuz Lake was completed in 2012 to 2014 at locations near the outlet of each lake. In 2021, quarterly baseline sampling was re-initiated at the new sites at the deepest part of each lake (near the center). Water quality sampling at the deepest part of the lake provides a general representation of the overall mixed lake chemistry (i.e.., not influenced by lake inflows). Baseline sampling locations are also located in Chedakuz Creek at the outlet of Tatelkuz Lake (CC-10 in the AEMP, WQ8 in the baseline program) and at the inlet of Tatelkuz Lake (CC-05 in the AEMP). Kuyakuz Lake is the reference lake for Tatelkuz Lake, therefore the water quality monitoring station was also moved to the deepest part of the lake, representing the water quality of the entire waterbody.	Section 4.4.2.2

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
38	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thank-you for the response. In the updated baseline report and AEMP please include this rationale so future reviewers will be aware.	The requested information will be added to the 2022 Cumulative AEMP Baseline report (to be prepared in 2023) and to the next version of the AEMP Plan.	Section 4.4.2.2
39	BC ENV (Andrew Foster)	Jun 01, 2022	1	Why hasn't an upstream reference site for Creek 661 been proposed?	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 1 and Section 4.1 have been updated to indicate that the Camp Site SCP effluent discharge permit application will be submitted in 2023 and the AEMP Plan may be updated accordingly.
39	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Why is 661-04 450m downstream of the discharge location? Is an initial dilution zone (IDZ) being proposed? 2. Is it possible to use an alternative colour for the invertebrate metal sampling symbol? (For ease of future reviewers; request/comment not requirement)	1. 661-04 is located approximately 450 m downstream of the proposed Camp Site Sediment Control Pond discharge location because this is the first point outside of the mine site boundary on Creek 146920. Sampling closer to the discharge point would be within the mine site boundary, which is fish habitat that is assumed to be lost (see *Fisheries Act Authorization Application*). Sampling within the mine site boundary is not considered the 'aquatic receiving environment'. 2. BW Gold will change the colours for the different AEMP components to make them more distinctive in the next iteration of the Aquatic Effects Monitoring Program Plan. See also the updated map in the attachment "R2_ENV_Comment ID 58 and 64" in response to comment ID #58.	1. Site 661-04 is still included in the AEMP as a water quality only site since the Camp Site SCP discharge is not included in the EMA Permit PE-110652. 2. Figure 4.2-1, Figure 4.2-2, and Figure 4.2-3.
39	BC ENV (Andrew Foster)	Aug 25, 2022	3	Thank-you for your response, 1. ENV will follow up with Federal Agencies to confirm mine boundaries and considered habitat lost at a later date. 2. This approach seems to contradict how aquatic effects monitoring is conducted on Davidson Creek, as DC-05 is within the illustrated mine boundary. Please provide further clarification on your response (i.e., is the mine boundary under the *Fisheries Act* different from what has been shown in this application?). Is it different from figure 1.3-1 in chapter 1?	Please refer to response in the attachment "R3_ENV_Comment ID 39 and 46.pdf'	Site 661-04 is still included in the AEMP as a water quality only site since the Camp Site SCP discharge is not included in the EMA Permit PE-110652.
39	BC ENV (Andrew Foster)	Sep 27, 2022	4	1. If Creek 146920 still functions as a stream and provides habitat for environmental receptors, ENV will likely still consider the area upstream of the mine boundary to be the aquatic receiving environment. ENV may recommend water quality and AEMP sampling further upstream near the edge of the IDZ. 2. Will Creek 146920 or other Creek 661 tributaries still function as watercourses and provide habitat for environmental receptors? 3. Further recommendations may be provided when the plan for Camp Site SCP and associated discharge is submitted.	Thank you for your comments. An IDZ or discharge point for the Camp Site SCP has not been defined as BW Gold is withdrawing the application for effluent discharge for the Camp Site SCP from the Joint Application. These comments will be considered when BW Gold applies for an effluent discharge authorization for the Camp Site SCP in early to mid-2023, well in advance of the anticipated construction activities at this location (late 2023 or early 2024) when water management would be required.	Site 661-04 is still included in the AEMP as a water quality only site since the Camp Site SCP discharge is not included in the EMA Permit PE-110652.

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
41	BC ENV (Andrew Foster)	Jun 01, 2022	1	For monitoring sites located close to Forest Service Roads (e.g., TC-15, CC-15), it is recommended they are moved further upstream (e.g., 100m upstream of roads) to avoid detecting impacts from the road. Please provide rationale for why these sites need to be so close to the road or proposed relocating them further upstream.	CC-15 is an impact site on Chedakuz Creek because it is downstream of the confluence with Davidson Creek. This site is located within 10 m of the FSR. The adjacent Kluskus-Ootsa FSR road will be used by the Project and any potential effects from increased Project-related traffic is useful to capture in the sampling. In addition, this is a long-term monitoring site (equivalent to WQ9 in baseline studies) that has been regularly sampled on a monthly frequency since 2011, including 5-in-30 sampling. Relocating this site is not recommended. TC-15 is a potential impact site downstream of the airstrip. The adjacent Kluskus-Ootsa FSR will be used by the Project and any potential effects from increased Project-related traffic is useful to capture in the sampling if 10 m or 50 m u/s of d/s. This site is located approximately 50 m from the FSR. Relocating this site is not recommended.	Table 4.2-1
41	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Is the purpose of the site to capture road effects, mine effluent effects, or both? Please explicitly state in the final AEMP. This would be so future reviewers/writers do not overlook potential road impacts when analyzing the data.	The purpose of the Aquatic Effects Monitoring Program (AEMP) sites is to monitor for potential effects due to the Project, which could include both discharge of mine effluent and increased traffic on the roads. However, run-off (quality and quantity) from sites near the FSR is not expected to change as a result of the Project and would be the same under both existing and future conditions. The potential Project-related effect from roads is from increased traffic and the associated potential increase in dust deposition. While potential effects on the aquatic environment from dust deposition from roads is likely to be negligible relative to mine effluent, it is still a potential Project-related effect. A note will be added to Table 4.2-1 in the rationale column for the sites located proximal to roads (please see the revised Table 4.2-1 that was provided in response to comment ID #58 in the attachment "R2_ENV_Comment ID 58 and 64").	Table 4.2-1
41	BC ENV (Andrew Foster)	Aug 25, 2022	3	1. I am concerned if the intent is to capture road runoff quality as a mine effect that having a site too close to the road (e.g., 10 m) would potentially miss plumes from the road or would reflect water quality that is not fully mixed. Please provide rationale for why my concerns are not valid. 2. I understand it would be beneficial to maintain site continuity.	1. The primary intent of the monitoring locations is not to monitor for road runoff quality, particularly from the existing Kluskus-Ootsa Forest Service Road (FSR) where no physical changes to the road are proposed. For sites that are close to the Kluskus-Ootsa FSR, monitoring for effects associated with increased traffic (i.e., dust deposition) could be a secondary purpose for monitoring. However, deposition of dust generated from the road, even with increased traffic, is expected to result in negligible loading of POPCs into adjacent waters, particularly for flowing water courses like Chedakuz Creek or Turtle Creek. Given the negligible loading contributed by dust deposition on flowing water, changes to water chemistry from dust deposition is not expected to be measurable, whether the dust is fully mixed or not. 2. BW Gold acknowledges ENV's comment.	Table 4.2-1

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
41	BC ENV (Andrew Foster)	Sep 27, 2022	4	1. CC-15 is located upstream of the bridge, not downstream? [Clarification] 2. Typically ENV recommends site selection that is representative of broader conditions within the creek and is not likely to be skewed by potential road impacts (e.g., runoff). The typical ENV recommendation would be to shift the CC-15 site 50-100m if water quality differences are negligible and data continuity can be preserved. [Comment] 3. It would be beneficial in the 2022 Cumulative AEMP Baseline Report to assess if water quality from this site is potentially skewed by road impacts and representative of broader stream conditions. [Comment]	1. CC-15 is located upstream of the bridge. 2. Run-off from the road will not report to the CC-15 site, as the water quality sampling site is located upstream of the bridge. The only potential road influence would be from dust deposition, and the contribution from dust to water chemistry collected from a flowing stream is negligible. Water quality is the only analytical sample collected at this location; other monitoring includes hydrology, water temperature, and kokanee spawning/escapement surveys which would not be affected by dust deposition from the road. 3. Based on an initial visual examination of water chemistry data presented in Figures 4.1-1 to 4.1-33 in Appendix 2-K (Surface Water Quality Cumulative Baseline Report) for sites WQ9 (CC-15) and WQ13 (CC-20, the next downstream site from WQ9 on Chedakuz Creek), mean concentrations of most parameters are similar between the two sites. Water chemistry between WQ9 (CC-15) and WQ8 (CC-10, located upstream from WQ9 at the outlet of Tatelkuz Lake) is similar for most parameters, except certain parameters such as dissolved aluminum which have elevated concentrations in Davidson Creek (Davidson Creek enters Chedakuz Creek between sites WQ9 and WQ8). No impacts from the road are apparent in the water chemistry data for site WQ9 (CC-15).	Table 4.2-1
43	BC ENV (Andrew Foster)	Jun 01, 2022	1	Is it possible to have AEMP Creek 661 tributary sampling sites closer to the sediment control pond discharge?	The Camp Site sediment control pond (SCP) discharge location is located approximately 480 m upstream of the new Aquatic Effect Monitoring Program 661-04 monitoring site. The discharge location and the new monitoring site 661-04 are located in Creek 146920 (a tributary to Creek 661). Please also refer to response in the memo titled: Blackwater_AEMP_Comment Responses 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, and 61 for additional information on monitoring sites in upper Creek 661. As indicated in response to comment ID#s 151 and 152, the Plant Site SCP is no longer proposed to directly discharge to surface water during any phase of the Project.	Site 661-04 is still included in the AEMP as a water quality only site since the Camp Site SCP discharge is not included in the EMA Permit PE-110652.
43	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thanks for your response. Additional questions are addressed in other comment numbers.	BW Gold acknowledges that the comment is closed.	Not Applicable
44	BC ENV (Andrew Foster)	Jun 01, 2022	1	1. Please provide and update this table in the final AEMP to explicitly state which references sites are associated with which impact sites (e.g., what is 705-05 a reference site for?). 2. Please update this table to include a station description (e.g., X Xkm downstream of discharge point Y above confluence of Z).	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Table 4.2-1
46	BC ENV (Andrew Foster)	Jun 01, 2022	1	In the final version of the AEMP, please include flow diagrams to show the relationship between discharge locations, monitoring sites, streams, and where streams confluence with one another. This is very useful tool to show water quality relationships to those not familiar with the site.	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Figure 4.2-4: Conceptual Flow Diagram of Blackwater Gold Project Discharges and Aquatic Effects Monitoring Program Monitoring Locations
46	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thank-you for the maps these are very useful. To clarify I was actually proposing more of schematic or arrow drawing that shows the relationships at a high level at the cost of losing spatial accuracy. If there is a meeting discussing the AEMP I can show you an example.	BW Gold is familiar with the type of figure ENV was proposing (i.e., a conceptual diagram or graphic, not based on a map, similar to a conceptual model used in water quality model reports). However, we believe that adding insets and flow arrows to the maps shows the same information ENV requested and maintains the value of spatial accuracy of the actual site locations.	Figure 4.2-4: Conceptual Flow Diagram of Blackwater Gold Project Discharges and Aquatic Effects Monitoring Program Monitoring Locations

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46	BC ENV (Andrew Foster)	Aug 25, 2022	3	Please provide flow diagrams for Davidson Creek and 661 in addition to the maps. ENV has found these diagrams to be excellent at providing high level information quickly to a range of audiences.	Please refer to response in the attachment "R3_ENV_Comment ID 39 and 46.pdf"	Figure 4.2-4: Conceptual Flow Diagram of Blackwater Gold Project Discharges and Aquatic Effects Monitoring Program Monitoring Locations
51	BC ENV (Andrew Foster)	Jun 01, 2022	1	This trigger response plan should be re-evaluated as substantial measures addressing the issue (i.e.., temperature) should be made well before lethal effects are possible.	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4.
52	BC ENV (Andrew Foster)	Jun 01, 2022	1	Triggers need to be clear and well-defined. How are changes to invertebrate indicators being defined for each indicator (e.g., +/- 2 standard deviations) for each trigger level?	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 5.2.4
52	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Triggers should be clear and well defined in the Trigger response section (i.e., Attachment B). That is, this table or preceding text needs to have sufficient information to be a stand-alone section. For example, what is O:E close to 1 (+/- 0.05, 0.1%)? How is the reference range being defined (+/- 2 SD from reference group mean)? How is the background range being defined? Are you looking at the overall O:E ratio or the ratio for specific groups? What qualifies as EPT losses? This is partially captured in the revised section 4.7.1 but would be good to capture in either the text before the table or immediately following the table. 2. For simplicity, it be better to split out tissue sampling from community metrics. 3. Is the intent for periphyton and invertebrate plans to have clear triggers with a clear response or general guidance? 4. ENV may suggest these issues associated with triggers be addressed on a case-by-case basis using a weight of evidence approach given the variability of invertebrate community metrics. ENV would likely not incorporate this approach as a true "trigger response plan" (i.e., based on Technical Guidance 12: Trigger Response Plans).	As discussed during a clarification meeting with ENV on July 28, 2022, the adaptive management plan in Section 6 of the AEMP Plan was drafted to meet the requirements outlined in EAC Condition 26 and the federal Decision Statement related to adaptive management and quantitative triggers. The triggers, action levels, and responses identified in Section 6 were not necessarily intended to be used by ENV for EMA effluent discharge authorization purposes. BW Gold understands that BC ENV has recently issued new guidance documents for development of trigger response plans (Technical Guidance 12 issued March 2022) and adaptive management plans (Technical Guidance 20 issued June 2022), which were issued after the AEMP was drafted. ENV considered these new guidance documents in their review of the AEMP Plan and found that the AEMP Plan adaptive management described in Section 6 (as well as the Trigger Action Response Plan in Section 5 of the AEMP Plan) does not align with these new guidance documents. BW Gold understands that there are differences between expectations of different regulators (e.g., ENV, EAO, IAAC) in relation to how the results of the AEMP will be interpreted, actioned, and reported. BW Gold is working to try to prepare an AEMP Plan that will meet all regulatory requirements without having to produce multiple different AEMP Plans. To this end, BW Gold proposes to substantially restructure the latter sections of the AEMP and make minor revisions to the earlier sections of the AEMP to try to clarify which components of the AEMP are applicable to which regulatory requirements. Sections 1 to 4 of the AEMP Plan which provide an introduction, overview of consultation and engagement, existing conditions and concerns, and the details of the design of the monitoring program would be relevant to meeting requirements for each regulatory regime (EAC, federal Decision Statement, and EMA permit receiving environment monitoring). Sections 5 through 7 would be substantively restructured and edited so that there are separate sections for EAC Condition 26, Federal Decision Statement, and EMA Permit requirements. This would mean that there would be at least two and potentially three different AEMP annual reports (or sections of a single AEMP report) that would be required that would provide the required information, analysis, and interpretation expected by each regulator to satisfy the different regulatory requirements. As these are extensive revisions, BW Gold requests to provide an updated AEMP report towards the end of the Joint Application review period, or the required revisions could be an EMA permit condition with a specified timeline.	Section 5.2.4

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53	BC ENV (Andrew Foster)	Jun 01, 2022	1	What changes are considered to be "of concern" and what CABIN status is associated with a given trigger level?	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 5.2.4
53	BC ENV (Andrew Foster)	Jul 22, 2022	2	See comment 52. CABIN thresholds clear now, thanks.	BW Gold acknowledges that the comment is closed.	Section 5.2.4
54	BC ENV (Andrew Foster)	Jun 01, 2022	1	Please provide justification for the selection of invertebrate metrics. You could consider adding specific metrics that sensitive to certain contaminants of concern (e.g., abundance for increases in nutrients).	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 5.2.4
56	BC ENV (Andrew Foster)	Jun 01, 2022	1	For simplification of triggers, it would be useful to set triggers as percentages (e.g., 80% of a BC WQG or SBEB concentration) and then explain changes with additional statistics or comparison to background/reference. Triggers must be clear, well-defined, and enforceable to be approved.	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4.
56	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Thanks for your comments. ENV may require water quality parameters are made into a true "trigger response plan" within the EMA permit in relation to permit limits. A more flexible approach would likely be recommended for periphyton and invertebrates.	As discussed during a clarification meeting with ENV on July 28, 2022, the trigger response plan in Section 5 of the AEMP Plan (and the adaptive management in Section 6) was drafted to meet the requirements outlined in EAC Condition 26 and in the federal Decision Statement. BW Gold understands that BC ENV has recently issued new guidance documents for development of trigger response plans (Technical Guidance 12 issued March 2022) and adaptive management plans (Technical Guidance 20 issued June 2022), which were issued after the AEMP was drafted. ENV considered these new guidance documents in their review of the AEMP Plan and found that the AEMP Plan adaptive management described in Section 6 (as well as the Trigger Action Response Plan in Section 5 of the AEMP Plan) does not align with these new guidance documents. BW Gold notes that there are differences between expectations of different regulators (e.g., ENV, EAO, IIAC) in relation to how triggers and associated actions will be defined in the AEMP Plan. While BW Gold agrees with ENV that a more flexible approach would be recommended for some components, EAC Condition 26 and the federal Decision Statement are more prescriptive and require quantitative triggers be defined relative to baseline condition, predicted conditions, and/or guidelines. BW Gold understands that a formal Trigger Response Plan (TRP) is likely to be required as an EMA effluent discharge permit condition, which would be developed, reviewed, and approved after issuance of a permit. BW Gold anticipates that the TRP will be mainly associated with results from monitoring under the Mine Site Water and Discharge Management and Monitoring Plan (MSDP, Appendix 9-E of the Joint Application) related to end of pipe discharge limits. Although not typically included, BW Gold proposes that the TRP include water chemistry monitoring results from Davidson Creek and Creek 661 to satisfy requirements of EAC Condition 26. Including water chemistry in Davidson Creek and Creek 661 relative to BC WQG or SBEBs would allow BW Gold to keep compliance requirements requiring more timely review and immediate action related to water chemistry samples in one plan (the TRP). The AEMP Plan could then be left to address longer term trends and monitoring results at the annual level, as is more typical for an AEMP. This would eliminate Section 5 of the AEMP (as hydrology and water temperature triggers/responses would be shifted into management/ operation plans for ensuring IFN in Davidson Creek).	A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4.

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
56	BC ENV (Andrew Foster)	Jul 22, 2022	Follow-Up	Thank you for your response. 1. This sounds like a good approach. 2. Please provide a draft Trigger Response Plan that includes specific water chemistry triggers, and corresponding actions associated with the proposed permits at all points of discharge to the environment where BWG is seeking authorization during construction and operations (i.e., FWR, TSF Stage 1 SCP, Downstream Aggregate Borrow SCP and Camp site SCP). Refer to ENV guidance document 12 "Development and Use of Trigger response Plans" for more information: https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/guidance-documents/tg12_trigger_response_plans.pdf 3. ENV is also considering a permit condition that requires separate TRPs be developed for the metals and membrane water treatment plants proposed to be operated during operations. These TRPs would be focused on tracking treatment plant performance and removal efficiency to ensure downstream compliance with the FWR proposed permit limits. This will be discussed further during the draft EMA permitting stage.	Not Required.	A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4.
57	BC ENV (Andrew Foster)	Jun 01, 2022	1	Clear rationale should be provided to why benthic invertebrate tissue analysis is not being considered at some scale or level of effort prior to trigger limits being reached. Set percentages compared to background levels should be considered.	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 4.7
58	BC ENV (Andrew Foster)	Jun 01, 2022	1	Benthic invertebrate sampling is typical in most environmental monitoring programs, and I may recommend it is required in this program as well. Benthic invertebrate tissue monitoring may provide insight into environmental trends and can be used to supplement or support trends in water or sediment quality. Delaying invertebrate tissue data collection until a trend is identified in another monitoring component would result in the inability to compare trends between water, sediment, and tissue through time.	Rationale for not including benthic invertebrate tissue sampling was provided in Section 4.7-1 of the C.1 version of the Aquatic Effects Monitoring Program (AEMP) Plan (March 2022); however, based on comments 57 to 59, we understand that ENV is not satisfied with the rationale. Therefore, the AEMP Plan will be revised to include benthic invertebrate tissue sampling for metals and moisture content analysis at near field sites on Davidson Creek (DC-05 and DC-15) and Creek 661 (661-04, 661-05 and 661-10) and at reference sites (FC-01 and 661-01) at the same frequency as fish tissue metal sampling. The proposed revisions to include the benthic invertebrate tissue sampling in the next version of the AEMP (i.e.., Version 1.0) will be issued following completion of the Joint Application review, and the revisions are provided in the memo referenced in response to comment #57.	Section 4.7
58	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thank-you for the response. 1. In "Responses for Chapter 2, Comment ID #s 64 to 67 and 77 to 82" in figure 1 please update the inset map to include benthic metal testing (discrepancy between map and inset map) in the final AEMP document. 2. In "Responses for Chapter 2, Comment ID #s 64 to 67 and 77 to 82" Table 1 appears to be missing 661-20. Please ensure the table is not missing any information.	Please refer to response in the attachment "R2_ENV_Comment ID 58 and 64".	Section 4.7
61	BC ENV (Andrew Foster)	Jun 01, 2022	1	1. Additional metrics should be proposed such as #EPT taxa, % Ephemeroptera, % Chironomidae, CABIN metric, etc... 2. Please provide rationale for the chosen metrics and why additional assessment endpoints are not needed; alternatively suggest additional endpoints that could be used.	Please refer to response in the attachment "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf"	Section 4.7 and Section 5.2.4 (adaptive management response framework)

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62	BC ENV (Andrew Foster)	Jun 01, 2022	1	The environmental effects assessment should have carried additional POPCs forwards as POCs. In section 1.5.2, please discuss the other POPCs in this section as you have done for aluminum and nitrogen (i.e.., description of POCs and their known effects to local biota or related species)	Updates to Section 1.5.2 of the Aquatic Effects Monitoring Program Plan will reflect the POPCs and POCs identified in response to comment ID #99. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	Section 3.2.2 (formerly Section 1.5.2)
63	BC ENV (Andrew Foster)	Jun 01, 2022	1	The environmental effects assessment should have carried additional POPCs forwards as POCs. Please update the POC information in the final AEMP to reflect ENV's policy to carry the POPCs forward to POCs.	Updates to the Aquatic Effects Monitoring Program Plan will reflect the POPCs and POCs identified in response to comment ID #99. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	Section 3.1.2
63	BC ENV (Andrew Foster)	Jun 01, 2022	1	The environmental effects assessment should have carried additional POPCs forwards as POCs. Please update the POC information in the final AEMP to reflect ENV's policy to carry the POPCs forward to POCs.	Updates to the Aquatic Effects Monitoring Program Plan will reflect the POPCs and POCs identified in response to comment ID #99. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	Section 3.1.2
64	BC ENV (Andrew Foster)	Jun 01, 2022	1	1. Why was Skeena 2010 CABIN model used opposed to Fraser Basin model? 2. Please provide rationale and comparison of sites' features fitting both models. 3. Which reference groups were the sites assigned to and with what probability? 4. How do the habitat attributes at Blackwater sites compare to the model reference group selected vs the groups assigned by the model? 5. What model will be used moving forward (note updated model versions available)?	Please refer to response in the attachment "R1_BC ENV_Comment ID 64 to 67, 77 to 82.pdf"	Not Applicable
64	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Please provide an updated version of Table 4.2-2 from the AEMP that reflects the proposed changes. For example, site 661-01 changed locations so the original AEMP table is no longer accurate. 2. The questions posed by ENV in this comment must be addressed in the "2022 Cumulative Aquatic Effects Monitoring Program Baseline Report"	1. Please refer to response in the attachment "R2_ENV_Comment ID 58 and 64". 2. BW Gold commits to including responses to the questions posed by ENV in the Round 1 in the 2022 Cumulative Aquatic Effects Monitoring Program Baseline Report that will be provided in 2023.	Table 4.2-1, Table 4.2-2, and Table 4.2-3
64	BC ENV (Andrew Foster)	Oct 28, 2022	3	1. Please provide a final version of "Table 4.2-2: Aquatic Effects Monitoring Program Stream and Lake Sampling Scheme" from "R2 ENV Comment ID 58 and 64" that captures all recent changes and reflects the proposed sampling for the AEMP (not 2022 baseline study). Aside from water quality, if any items in the table are not proposed on an annual basis, please note this in the table. [Information Requirement] 2. Please confirm no additional changes are proposed for "Table 4.2-1: AEMP Stream and Lake Sampling Locations and Rationale [Revised]" from "R2 ENV Comment ID 58 and 64." If any changes are proposed or have been made to this table, please provide an updated version of this table. [Information Requirement]	1. An updated Table 4.2-2: Aquatic Effects Monitoring Program Stream and Lake Sampling Scheme from the AEMP Plan is provided in "R3 ENV Comment ID 64.pdf". Table 4.2-3: AEMP Sampling Frequency and Replication is also provided to detail the replication and frequency for each site that is not proposed on an annual basis. 2. An updated Table 4.2-1: Aquatic Effects Monitoring Program Stream and Lake Sampling Sites and Rationale from the AEMP Plan is provided in "R3 ENV Comment ID 64.pdf".	Table 4.2-1, Table 4.2-2, and Table 4.2-3

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72	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thank-you for the response. 1. Please provide the inferred rainbow trout spawning locations in map form in the final AEMP as well as Kokanee spawning locations. 2. Please provide the location of a map with Creek 700 labelled on it (not captured in Figure 1). 3. Please provide the location of a map with Creek 101550, Creek 522107, and Creek 601947 labelled on it (not captured in Figure 1).	1. Please see "R2_ENV Comment ID 72.pdf" for a map showing rainbow trout and Kokanee spawning locations. 2. and 3. Please see "R2_ENV Comment ID 72.pdf" for a map showing the requested Creek labels.	Figure 4.8-1 (Kokanee Spawning) and Figure 4.8-2 (Rainbow Trout Spawning)
93	BC ENV (Andrew Foster)	Jun 01, 2022	1	I am concerned the use of trophic ranges combined with maximum baseline data leads to a misleading benchmark or threshold. Do you have an alternative suggestion to supplement these benchmarks (e.g., baseline mean + 50% from CCME)? For example comparing WQ26 and WQ27 in Table 6.3-8, if WQ26 maximum is increased by 0.001 mg/L it would exceed the benchmark compared to 0.014 mg/L needed at WQ27 needed to exceed a benchmark.	Please refer to attachment "R1_ENV Comment ID 89 92(3) 93.pdf"	Appendix F-1
93	BC ENV (Andrew Foster)	Jul 22, 2022	2	Thank-you for your response. Please include both benchmarks (i.e., baseline mean + 50% and CCME Trophic Status Category Benchmark) in the AEMP for future reference.	Thank you for the response. Both benchmarks will be included in the next iteration of the AEMP for reference.	Appendix F-1
99	BC ENV (Andrew Foster)	Jun 01, 2022	1	As noted during screening the response to comment 64 contained most of what would be expected in an effects assessment of POCs, but additional information is needed. 1. In addition to the response to screening comment 64, a discussion of potential or typical effects associated with a given parameter to complete the POC effect assessment. Discussion length may be brief for parameters determined to have low risk based on data provided. 2. Please provide untreated effluent data. Untreated effluent data is used for screening POPCs as ENV must consider a scenario where water treatment is not in place. Treated effluent data may be used as part of the effects assessment. The provided response to screening comment 64 is not consistent with ENV's POC Mining factsheet located here: https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/guidance-documents/parameter_of_concern_fs.pdf	As discussed between the proponent and ENV on June 7, 2022, an "Untreated Effluent" model scenario has been conducted. Please refer to attachment "R1_ENV Comment ID 99.pdf".	Section 3.2.2 (formerly Section 1.5.2)
99	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. Zinc should have been carried forward as a POC per ENV policy and an effects assessment should have been conducted for it. [Comment]	Thank you for the response. Blackwater acknowledges that this comment is closed.	Section 3.2.2 (formerly Section 1.5.2)
1027	LDN/UFN	11-Jun-22	0	As per Section 7 Water Quality: Aquatic Sediments in the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators, "Key locations should include sites upstream from, adjacent to, and downstream from the proposed mine." - Why are there no sampling locations upstream or adjacent to the mine area?	Baseline sediment quality has been conducted at two sites located adjacent to and upstream from the mine site (Creek 705 and Fawnie Creek Tributary), as shown in Figure 2.8-1.	See ERM (2023) and Figure 4.2-1

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1027	LDN/UFN	11-Jun-22	1	Creek 705 and Mathews Creek both flows west of the deposit area and combine with westward flowing Fawnie Creek to form a second predominant surface water flow pattern in the region. These appear to be locations outside of the project in a different drainage flowing away from the project and would not be considered upstream of the proposed mine. Please advise which of the sediment sampling locations are upstream of the proposed mine.	Creek 705 is a reference site, because it is not predicted to be impacted by the mine. Fawnie Creek tributary (FC-01) is another reference site located in an adjacent watershed that will not be impacted by the mine. These sites were selected as reference sites for monitoring locations in Davidson Creek below the mine site. An upstream reference site in Davidson Creek is not possible, because the mine site is located in the headwaters of Davidson Creek and there are no upstream locations within Davidson Creek since areas within the mine site are considered impacted and cannot be used as reference sites. In this situation, it is appropriate to include reference sites located in another non-impacted watershed, which has been done for this Project.	Figure 4.2-1 and Table 4.2-1 provides rationale for each site selected.
1027	LDN/UFN (Baylie Sjodin)	22-Jul-22	2	"Although Creek 705 and Fawnie Creek receive outflow from areas outside of the mine site, they are still technically downstream AND receiving diverted flows from Lake 16 and therefore cannot be considered "non-impacted" by operations as they will be altered. There appears to be no sediment quality sampling locations in non-impacted, upstream locations despite the headwater tributaries that flow into the mine site. According to the 2016 BC Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators, section 7.3 Site Selection (under Water Quality: Aquatic Sediments) "Key locations should include sites upstream from, adjacent to, and downstream from the proposed mine." Request a memo addressing this comment.	A memo is not required for the response because no changes to Chapter 2 or the Aquatic Effects Monitoring Program (AEMP) Plan are being made in response to the comment. An upstream site on Davidson Creek outside of the mine site is not possible because the mine site is situated in the headwaters for this creek. Any remaining headwater tributaries of Davidson Creek located upstream of the mine site are considered to be lost habitat due to isolation (e.g., Creek 668328) for which fish offsetting is proposed. These tributaries are generally small, often ephemeral, and would not be good references sites for sites located downstream of the mine site on Davidson Creek. For Creek 661, a new reference site on the Creek 661 mainstem (661-01) has been added in response to a Round 1 comment from ENV (see comment ID # 39). For Davidson Creek, where an upstream reference location is not possible, a reference site is in an adjacent waterway or watershed is appropriate. Creek 705 (via Lake 15) is expected to receive diverted flows from Lake 16 as a habitat offsetting component; however, predicted changes in flows for Creek 705 were small and changes to water quality were not expected. Monitoring proposed in the AEMP Plan (Appendix 7-A) over time will identify if there are unexpected changes in water quality or aquatic biota in Creek 705, relative to other reference sites (e.g., 661-01 in upper Creek 661 or FC-01 in Fawnie Creek). If no changes are identified, then this waterway is an appropriate reference location for Davidson Creek. The FC-01 reference site is on a tributary of Fawnie Creek (i.e., on a stream that flows into Fawnie Creek) and is outside of any expected influence from the mine site. Creek 705 flows into Fawnie Creek downstream of the tributary where FC-01 is located (i.e., FC-01 is located upstream of the confluence with Creek 705). There is no potential for mine influence of the Fawnie Creek tributary where FC-01 is located; this site was also a reference site recommended by BC ENV.	Figure 4.2-1 and Table 4.2-1 provides rationale for each site selected.

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1027	LDN/UFN (Baylie Sjodin)	01-Sep-22	3	This request is in reference to sediment quality, in which there appears to be no control baseline for future monitoring. A station should be established on Creek 688328 for a control (there is no text that suggests it is ephemeral) and another at WQ15. The sediment sampling at WQ12 is not an appropriate control baseline as it will receive diverted flows in the future. Please see Comment 2118 for further explanation on the need for control baseline for future monitoring.	Before-after-control-impact (BACI) analysis will be used to assess if there are Project related effects. The BACI analysis compares the incremental changes in impact and control sites between before (i.e., pre-Construction) and after Construction and Operations. If a statistically significant before-after change is observed at the impact site and not at the control or reference site, then it would be reasonable to conclude the change was as a result of the Project (see also Section 4.4.2.3 in the Aquatic Effects Monitoring Program (AEMP) Plan). BACI analysis does not require that a control site be located in the same water course as an impact site and instead it is preferential to have a number of reference or control sites that are similar characteristics to the impact sites. It is also important that the frequency of sampling and method of data collection is similar at all sites in the before and after period. The AEMP Plan has proposed six control (reference sites) located throughout the study area that can support the BACI analysis of impact sites in Davidson Creek. Based on modelling and effects assessment completed for the Project, water chemistry, sediment chemistry or biota at these control sites are not expected to be influenced by the Project and the baseline data and stream characteristics indicate similarities with the impact sites (see Appendix 2-N). Control sites in streams include the following: 661-01 (new site, upper Creek 661 mainstem), CC-03 (water quality only), TC-01, 705-05, 705-10, and FC-01. In addition, the control sites in Creek 705 and Fawnie Creek tributary have two or more years of water quality, sediment quality, aquatic resources, and fish inventory/fish tissue data collected within the last 5 years (including in 2022). As indicated in the Application and in previous responses, water quality, sediment quality, and aquatic biota in Creek 705 are not predicted to be affected by diverted water. In the event that these media or biota are unexpectedly affected by the Project, there are other alternative reference sites available for Davidson Creek. Creek 688328 is not an appropriate control site location. This tributary is considered to be lost habitat under the *Fisheries Act* Authorization Application. This creek will also be diverted around the TSF (and may be subject to instream works) and is proximal to the mine site. Locating a site in the upper parts of this tributary, sufficiently far enough away from the mine site infrastructure for it to be considered a control site, is unlikely to be representative of the channel, water chemistry, or sediment chemistry downstream of the mine site in Davidson Creek. In addition, there are no pre-development aquatic resources data (sediment, periphyton, benthic invertebrates) for Creek 688328 and limited water quality (sampling initiated in 2020 to characterize diversion water). The BACI analysis would not be possible if Creek 668328 were used as a reference site for Davidson Creek. Water quality at WQ15 in Creek 705 has not been monitored since 2014 (monitoring was from 2012 to 2014, as indicated in Table 3.1-1 of Appendix 2-K). There are no current water quality data at this location. There is a single year of sediment sampling in 2013, which consisted of a single replicate. There are also no data for aquatic resources or fish tissue metals and only limited historic aquatic resources data (one year of benthic invertebrates in 2013, no periphyton). The BACI analysis would not be possible if WQ15 was used as a reference site for Davidson Creek.	Figure 4.2-1 and Table 4.2-1 provides rationale for each site selected.

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1027	LDN/UFN (Baylie Sjodin)	06-Oct-22	4	This comment is not questioning how a BACI design works, it is stating that there is no adequate CONTROL as per the C in BACI for it to effectively evaluate sediment impacts. It is understood that Creek 705 is not expected to see impacts, but if it does than the only control is completely null. The suggestion was to establish a NEW control point in the upstream portion of Creek 688328 and start collecting sediment quality at WQ15 as it is upstream of the diverted flows and will not show potential effects.	As indicated in the Round 0, 1, 2, and 3 responses to Comment ID#1027, in the event that two Creek 705 control sites are impacted by the Project, there are multiple other control sites located throughout the study area that can be used as alternative control locations. Fawnie Creek tributary (FC-01), as an example, is a control (reference) site for Davidson Creek that will not be impacted by the Project because it is upstream, upwind (of the prevailing wind direction), and upgradient of the mine site. It is our opinion that there are sufficient control sites in the AEMP Plan currently and that additional control sites are not required.	Figure 4.2-1 and Table 4.2-1 provides rationale for each site selected. Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available.
1027	LDN/UFN (Baylie Sjodin)	17-Nov-22	5	Thank you for the response. Can the proponent please indicate the exact section (i.e., in the management plans) where sediment quality monitoring site's locations are, and the corresponding control sites? It is understood water quality will be tested in various locations; however, this comment is specific to sediment quality. According to the existing data in Chapter 2, there are no other control sites for sediment quality.	The proposed monitoring for the receiving environment can be found in the Aquatic Effects Monitoring Program (AEMP) Plan, which was provided as Appendix 7-A of the Joint Application (March 2022). Proposed sampling sites are provided in Table 4.2-2 of the AEMP Plan, which shows that sediment quality sampling at control sites was included for TC-01, 705-05, 705-10, and FC-01. During the Application review, in response to comment ID#39 from BC ENV, a new control site located on Creek 661 (661-01) was added. This site is located on the mainstem of Creek 661, upstream of Project influence and includes sediment quality sampling. Chapter 2 of the Joint Application included a summary of sediment quality baseline data up until 2020. Additional baseline data collection occurred in 2021 and 2022. A 2022 Cumulative AEMP Baseline report is in preparation that will summarize available data, including sediment quality data, to provide the foundation for the AEMP. BW Gold anticipates the cumulative baseline report will be available by Q2 2023. Please refer to the memo from Round 1 memo -"R1_BC ENV_Comment ID 64 to 67, 77 to 82.pdf". This memo describes the information that will be compiled and presented in the 2022 Cumulative AEMP Baseline report. Table 1 in the memo also provides a summary of the baseline data that are available for each of the AEMP sampling locations, including for sediment quality. Note that Table 1 indicates fish inventory and fish tissue sampling was "nsp", or no sampling planned, for the new reference site 661-01; however, this sampling was completed at this site in 2022 and is expected to continue (as reflected in the memo text and on Figure 1). Also note that the actual location of site 661-01 was moved further upstream on the Creek 661 mainstem than shown on Figure 1 to ensure that it is upstream of potential seepage pathways from the mine site. An update of the AEMP Plan to reflect changes made during the Application review is underway. A revised AEMP Plan will be issued after all comments related to potential changes to the AEMP are closed. Reviewers will be provided with the revised AEMP Plan for another round of review before the AEMP Plan is finalized into a Version 1.0.	Figure 4.2-1 and Table 4.2-1 provides rationale for each site selected. Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available. A study will be initiated in 2023 to evaluate the potential for a water quality and sediment quality control site on Creek 705 to assess the potential effects when non-contact water from Lake 1682 is diverted to Lake 1538. The result of the study will be reported on in the 2023 AEMP Interpretive Report
1556	LDN/UFN	Jun 11, 2022	0	You should refer to a table of governmental guidelines for concentration thresholds, this should be in an appendix in this document (not in another document) to make it easy to check	The table reflects monitoring completed in 2020 and refers to the federal and BC guidelines current to 2020. Thus, to avoid confusion with future updates of the AEMP Plan, the reference to the baseline report is provided.	Table 4.4-2

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1556	LDN/UFN	Jun 11, 2022	1	Adding the most recent guidelines used for the monitoring within this plan (and updating the guidelines within the plan as necessary) is more efficient for the reader to reference. Please update.	Guidelines are updated periodically by the province (BC Ministry of Environment and Climate Change Strategy) or Canadian Council of Ministers of the Environment. Given the complexity involved in updating the Aquatic Effects Monitoring Program (AEMP) Plan, once it is approved, the intent is not to update the AEMP Plan each time a guideline is revised, or a new guideline is issued. Therefore, a table of specific guidelines will not be provided in each update of the AEMP plan. However, in response to the reviewer's comment in Round 0, Attachment E was provided to include the 2020 provincial and federal guidelines (see Attachment E in Appendix 7-A, March 2022). Reports prepared annually with the results of the AEMP will include the numerical provincial and federal guidelines used in analysis and interpretation of the data. The numerical guidelines in an AEMP report will reflect the guidelines available at the time an AEMP report is prepared.	Table 4.4-2
1560	LDN/UFN	Jun 11, 2022	0	I understand that you do not want to set alarms off immediately if an increase in harmful substances is found but has not been confirmed, however the text suggests you are not controlling for type 2 errors sufficiently - by reducing statistical power and then only confirming a statistic is significant when an expert deems it so. It seems wise to double check when concentrations appear elevated despite the chance of a type 1 error. Please format the text to make it clear that you are using a precautionary approach and give a method to check all unusual readings either by subsampling or using field data confirmation.	The statement at section 4.5.1.3 has been revised as follows: "A precautionary approach will be used to determine if an effect is attributable to Project activities in cases of unexplained significant interactions (i.e., there is no Project related source) using professional judgement, additional sampling and/or field data to confirm significantly elevated or lower concentrations."	Section 4.5.1.3
1560	LDN/UFN	Jun 11, 2022	1	"A precautionary approach will be used to determine if an effect is attributable to Project activities in cases of unexplained significant interactions (i.e.., there is no Project related source) using professional judgement, additional sampling and/or field data to confirm significantly elevated or lower concentrations." Providing the example "i.e., there is no Project related source" is redundant. The sentence stands true without the example, and removing it strengthens the emphasis that a non-bias approach will be taken when investigating unexplained significant interactions.	This comment was addressed to remove "i.e.., there is no Project related source" from the Section 4.5.1.3 of the Aquatic Effects Monitoring Program Plan (Appendix 7-A; March 2022) submitted with the Application for review. No action required.	Section 4.5.1.3
2089	BC ENV (Anna Akkerman)	Jul 12, 2022	2	Updated AEMP monitoring locations were provided in "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf" (ERM 2022). As the focus of this response was on water quality and aquatic resources, I would like to confirm the proposed changes to the hydrometric monitoring program. Please confirm current proposed hydrometric monitoring as part of the AEMP program on Creek 661 and its tributaries is as follows: • 661-01 (new station) • 661-02 (previously H1) • 661-09 (previously H11) My understanding is that these three stations are proposed as continuous monitoring locations during the open water season with instantaneous winter measurements to characterize low flows - is this correct?	Station 661-01 is no longer a hydrology/water temperature station and is now designated as a water quality/aquatic resources/fish sampling site only in the revised Aquatic Effects Monitoring Program (AEMP) Plan. The station for water quality/aquatic resources/fish sampling was added as an upstream reference site in response to comment ID #39 from ENV and resulted in the renumbering of sites in upper Creek 661. The map provided in "R1_BC ENV_Comment ID 39, 44, 45, 46, 47, 49, 51, 52, 53, 54, 56, 57, 61.pdf" mistakenly still showed hydrology and water temperature monitoring at 661-01; this has been corrected in an updated map provided in response to Round 2 comments (see the attachment "R2_ENV_Comment ID 58 and 64"). The revised AEMP Plan also indicates that there are two hydrology/water temperature sites on Creek 661: 661-02 (previously H1 and labeled as 661-01 in the March 2022 version of the AEMP Plan (Appendix 7-A)) and 661-09 (previously H11, labelled as 661-10 in the March 2022 version of the AEMP Plan (Appendix 7-A)). The only change to these stations was in the renumbering of both sites to accommodate additional sampling locations for other components in upper Creek 661 and to show their correct locations relative to the confluence between Creek 505649 and mainstem Creek 661. The reviewer is correct that the hydrology stations are proposed as continuous monitoring locations during the open water season, with instantaneous winter measurements to characterize low flows.	Figure 4.2-1 and Section 4.3

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2090	BC ENV (Anna Akkerman)	Jul 12, 2022	2	I appreciate the description of the proposed hydrometric monitoring methodology in the AEMP. I will likely recommend that the following language be included in section of the permit that addresses receiving environment hydrometric monitoring: "The hydrometric monitoring procedures, data analysis, quality and quantifying data grades must follow the standards as outlined by the Ministry's Resources Information Standards Committee (RISC) in the "Manual of British Columbia Hydrometric Standards Version 2.0 (2018)" or most recent edition. Hydrometric monitoring programs must be designed and implemented, and flow measurements conducted, with the intent of achieving acceptable Grade B data quality or better as defined by RISC (2018). To appropriately determine data quality, flow measurement must be conducted in accordance with the Manual of British Columbia Hydrometric Standards (RISC, 2018), or by suitable alternative procedures as authorized by the director."	BW Gold acknowledges the comment and the AEMP Plan related to hydrometric monitoring will be revised if necessary to meet the permit condition recommended by the reviewer.	Section 4.2.3
2096	BC ENV (Andrew Foster)	Jul 22, 2022	2	1. In the final AEMP please provide the sediment working guidelines so trigger limits are easily referenced. 2. In the table it be useful to refer to lowest applicable SWG so it is clear whether you are referring to lower or upper SWQ. I did see this discussed in the text above. 3. At the high trigger level, it would make sense for this to trigger annual sediment sampling rather than increasing frequency by 1 year (similar to lower triggers) given levels are of concern.	1. Appendix E of the Aquatic Effects Monitoring Program (AEMP) Plan will be revised to provide all benchmarks applicable to the Adaptive Management Framework (Section 6 of the AEMP Plan). Appendix E of the revised AEMP Plan will include guidelines, baseline concentrations/benchmarks, and predicted concentrations for all environmental media (including sediment) or biota. Baseline data collection is in progress, therefore, the next version of the AEMP Plan will include a revised draft of Appendix E. 2. The most conservative sediment quality guideline will be used for comparison to sediment quality concentrations (this is indicated in the text immediately preceding Table 6.2-3). A note for Table 6.2-3 indicating the most conservative sediment quality guideline will be included in the revised AEMP Plan. 3. As requested by the reviewer, Table 6.2-3, Table 6.2-4 and Table 6.2-5 will be revised to indicate that sediment quality, periphyton, and aquatic invertebrate sampling will be increased to an annual frequency rather than by one year at the high action level. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	1. Appendix F includes all benchmarks. 2. Table 5.2-3 indicated the most conservative SQG-AL will be used. 3. Table 5.2-3, Table 5.2-4, Table 5.2-5 have been revised to indicate an increase to annual sampling at the high action level.
2118	LDN/UFN (Brenley Yuan)	27-Jul-22	1	Figure 3.1-1: Creek 705 is identified as an upstream monitoring location. From our understanding, Lake 16 will be redirected into Lake 15, which drains into Creek 705. Can you confirm that Lake 16 is not affected in any way by the project? If it is, Creek 705 will not be a true upstream monitoring station.	Non-contact water will be diverted from Lake 16 to Lake 15, located near the headwaters of the Creek 705 watershed. There are predicted changes in flow to Creek 705 as a result of the diversions therefore Creek 705 is considered an impacted creek for the hydrology component only (see Section 4.1.6 of the Aquatic Effects Monitoring Program (AEMP) Plan; Appendix 7-A). As indicated in the AEMP Plan (Appendix 7-A, specifically Section 3.1.2 in the bullet point for Creek 705 watershed) "water quality in this creek is not expected to be influenced by Project effluent discharges or seepage and is, thus, considered to be a reference location for surface water quality". Effects from Project effluent discharge are seepage and are not expected to affect Creek 705 watershed water quality. Monitoring proposed in the AEMP Plan (Appendix 7-A) over time will identify if there are unexpected changes in water quality or aquatic biota in Creek 705, relative to other reference sites (e.g., 661-01 in upper Creek 661 or FC-01 in Fawnie Creek). If no changes are identified, then this waterway is an appropriate reference location for Davidson Creek.	Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available. A study will be initiated in 2023 to evaluate the potential for a water quality and sediment quality control site on Creek 705 to assess the potential effects when non-contact water from Lake 1682 is diverted to Lake 1538. The result of the study will be reported on in the 2023 AEMP Interpretive Report.

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2118	LDN/UFN (Brenley Yuan)	24-Aug-22	2	Thank you for your response. This follow up comment also applies to comment ID 1027 regarding an upstream sediment monitoring point. We are concerned about the potential effects from construction of the channel between Lake 16 and 15 on the Creek 705 "control" site (705-05). We feel that site 705-05 could be an impact site if sediments/ metals/contaminants are stirred up and exposed during the channel construction. While we support continued monitoring of site 705-05, we strongly feel that a better alternative for an upstream control site would be site WQ15 from Appendix 2-K "2011 TO 2020 BASELINE WATER QUALITY REPORT" (Table 3.1-1; page 3-3). This tributary of Creek 705 drains an area close to the headwaters of Davidson Creek and will not be impacted from any upstream works. Thus, this site can be more confidently assigned as an undisturbed site. We understand that monitoring at site WQ15 has been conducted from 2011-2020 and thus should not have any issues with access/logistics. We also wish to request that if feasible, to add an upstream control site at Creek 688328, a tributary of Davidson Creek. The upper portion of this creek is not affected by the project and would serve as a good additional control site within the Davidson Creek watershed (as there currently are not any within this watershed).	Monitoring of potential impacts associated with construction of the channel between Lake 15 and Lake 16 would be under the Construction Environmental Management Plan. Mitigation measures would be adopted to minimize the potential for effects associated with construction activities. Potential impacts, if any, would be short term and associated with construction activities, and localized in extent of effects. Water quality modelling and effects assessment completed for the Project do not identify potential effects to Creek 705 from Project operations, discharges, seepage, or diversions. As indicated in Chapter 6 of the Application and in previous responses, water quality, sediment quality, and aquatic biota in Creek 705 are not predicted to be affected by Project activities. In the event that these media or biota are unexpectedly affected by the Project, there are multiple alternative reference sites available for Davidson Creek. See response to the Round 3 response to Comment ID#1027 for how control and impact sites were selected for the purpose of the Aquatic Effects Monitoring Program (AEMP; i.e., use of the Before-After-Control-Impact study design). In addition, the Round 3 response to Comment ID#1027 provides rationale for why 705-05 and not WQ15 is an appropriate control (reference) site for the AEMP.	Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available. A study will be initiated in 2023 to evaluate the potential for a water quality and sediment quality control site on Creek 705 to assess the potential effects when non-contact water from Lake 1682 is diverted to Lake 1538. The result of the study will be reported on in the 2023 AEMP Interpretive Report.
2118	LDN/UFN (Brenley Yuan)	06-Oct-22	3	How will you know whether media/biota at 705-05 were unexpectedly affected by the project or if these changes are natural? If there is insufficient baseline data for the proposed WQ15 station, can you concurrently monitor 705-05 against WQ15 until you can reasonably establish that 705-05 is unaffected by the project?	See also response to Round 4 Comment ID #1027. It is BW Gold's opinion there are already sufficient control (reference) sites included in the Aquatic Effects Monitoring Program Plan (Appendix 7-A). The control sites are located throughout the study area in the event that Creek 705 is identified as being unexpectedly impacted by the Project.	Section 4.1.6 indicates that sites in Creek 705 are assumed to be control sites for AEMP components other than flow. If monitoring indicates effects to other components, then other reference sites are available. A study will be initiated in 2023 to evaluate the potential for a water quality and sediment quality control site on Creek 705 to assess the potential effects when non-contact water from Lake 1682 is diverted to Lake 1538. The result of the study will be reported on in the 2023 AEMP Interpretive Report.
2131	LDN/UFN Brenley Yuan	Jul 27, 2022	2	Table 4.2-3: Table states that continuous data is downloaded every visit. Since you are installing real-time hydrometrics stations, are you not able to have data transmitted online in real-time? Having access to real-time data is crucial for the trigger response plan. Please provide memo confirming that real-time data will be available online.	A memo is not required as no changes will be made to the AEMP at this time in response to the comment. Work is underway to convert the current hydrometric/temperature monitoring network to a cellular telemetry-based monitoring network. Ultimately, this will allow a more continuous, real-time monitoring network to be established. Once details of this monitoring network are worked out, the AEMP Plan will be updated as needed to reflect the equipment, methods, and data analysis for both hydrology and water temperature.	Section 4.3 and Section 4.4.1 have been revised to indicate continuous monitoring stations.

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2138	LDN/UFN Brenley Yuan	25-Aug-22	3	Thank you for your response. The reviewer is of the opinion that some measure of spawning habitat quality should be measured to support Kokanee surveys as described in the Round 3 follow up comment 2137. Several transects can be set up to capture variability within a creek. GPS points of redds or redd patches should also be documented to collect data on the spatial distributions of spawning activity. This enables much higher analytical power in the future when new research questions arise. For example, spatial distribution patterns of spawning activity can be used to support narrowing of the spawning survey areas in the future.	BW Gold reiterates that occupancy of suitable spawning habitats in Davidson Creek is high and detailed spawning habitat measurements would be highly variable temporally and spatially and would not provide and effective measure habitat use. The reviewer's suggestion in IR 2142 of taking measurements of substrate size has merit, particularly if placed near the upstream and downstream ends of known spawning areas. These samples could measure potential changes such as long-term sedimentation due to lower flows, or gravel accumulation or loss. A version of this sediment quality sampling is already planned as part of the AEMP (Section 4.5.1, Appendix 7-A, Aquatic Effects Monitoring Plan) at two locations in Davidson Creek, and at other impacted streams and reference sites. Additional sites can be added to Davidson Creek to include some identified spawning areas.	Section 4.8 (and see Appendix E)
2138	LDN/UFN Brenley Yuan	25-Aug-22	2	Thank you for your response. The reviewer is of the opinion that some measure of spawning habitat quality should be measured to support Kokanee surveys as described in the Round 3 follow up comment 2137. Several transects can be set up to capture variability within a creek. GPS points of redds or redd patches should also be documented to collect data on the spatial distributions of spawning activity. This enables much higher analytical power in the future when new research questions arise. For example, spatial distribution patterns of spawning activity can be used to support narrowing of the spawning survey areas in the future.	BW Gold reiterates that occupancy of suitable spawning habitats in Davidson Creek is high and detailed spawning habitat measurements would be highly variable temporally and spatially and would not provide and effective measure habitat use. The reviewer's suggestion in IR 2142 of taking measurements of substrate size has merit, particularly if placed near the upstream and downstream ends of known spawning areas. These samples could measure potential changes such as long-term sedimentation due to lower flows, or gravel accumulation or loss. A version of this sediment quality sampling is already planned as part of the AEMP (Section 4.5.1, Appendix 7-A, Aquatic Effects Monitoring Plan) at two locations in Davidson Creek, and at other impacted streams and reference sites. Additional sites can be added to Davidson Creek to include some identified spawning areas.	Section 4.8 (and see Appendix E)
2138	LDN/UFN Brenley Yuan	06-Oct-22	3	The reviewer agrees that monitoring substrate size composition at upstream and downstream ends of spawning areas, along with 2-3 key spawning areas in-between, would strengthen the monitoring program. However, spawning substrate monitoring should be kept separate from Section 4.5.1 (sediment quality monitoring). The sediment quality monitoring only measures substrate composition in the lower size range (clay to gravel), which represents relevant sizes for sediment quality but not spawning substrate (which looks at the full range of sizes). Furthermore, the sediment quality sampling sites target the upper portions of creeks and misses some lower spawning habitat. The reviewer suggests continuing this discussion in conjunction with the spawner survey program in the bi-weekly fisheries meetings. Once an agreed-upon plan is available, the AEMP can be revised accordingly. The reviewer also recognizes there are commitments to measure spawning substrate size under the updated Condition 3.14 Follow-Up program (dated September 2022; Table 3.6, page 13). The reviewer plans to provide comments with respect to this topic in Condition 3.14 to include more sampling sites. The reviewer also understands that Condition 3.14 covers Davidson Creek and not other creeks. Because these separate plans have some overlapping topics, it would be important to have these two documents be consistent once an agreed-upon plan is available.	BW Gold agrees to further discuss sediment quality sampling plans with the Nations during the bi-weekly fisheries meetings. As recently discussed in the bi-weekly fisheries meeting, adjustments to the AEMP methods are ongoing, to incorporate feedback from First Nation reviewers and other sources. Inclusion of sediment characterization via pebble counts (or another method suggested by the reviewer) will be included in the method revision.	Section 4.8 (and see Appendix E)

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
2139	LDN/UFN Brenley Yuan	Jul 27, 2022	2	This section is confusing as it refers to "escapement surveys" (which refers to adults returning to spawn) but to my understanding, this section is targeted at juvenile fry. If my understanding is correct, please remove the use of "escapement" in this section, including the title. There are also various mentions of "spawning survey" throughout this section. Please edit to make clear which life stage you are targeting. I am assuming that this section refers to juvenile fry only as the previous section already described kokanee spawner surveys. Please address this comment in a memo.	The reviewer is correct that salmon escapement is the amount of a salmon population that does not get caught by commercial or recreational fisheries and return to their freshwater spawning habitat. Kokanee fry leaving their natal streams is referred to as outmigration, to which Section 4.8.3 is referring. The previous and planned surveys estimate the number of out-migrating fry from Davidson Creek. This term should be changed throughout the document in a subsequent revision.	Section 4.8.3 has been revised to specify kokanee fry (replaced copy/paste errors)
2140	LDN/UFN Brenley Yuan	Jul 27, 2022	1	Turtle Creek can no longer be a control site for Rainbow Trout spawners after the construction of the airstrip. It is recommended that TC-15 be kept as a monitoring site, and another control site should be used. Please address this comment in a memo.	The airstrip is planned to be constructed parallel to Turtle Creek, outside of the 30 m riparian buffer (Appendix 7-A, Figure 1-2). As stated in the AEMP, until the airstrip is constructed, Turtle Creek sampling sites will be considered reference sites. The schedule for airstrip construction currently is indeterminate.	Section 4.8 (and see Appendix E)
2140	LDN/UFN Brenley Yuan	Aug 25, 2022	2	The reviewer agrees that the Turtle Creek sampling site will be a reference site until the airstrip is constructed. But after airstrip construction, it will not be considered an undisturbed site, even if mitigation measures (i.e., 30 m buffer) are in place. There are no other known Rainbow Trout sampling sites which satisfies the criteria of an undisturbed control site, which is crucial to a BACI sampling design.	A potential location for an additional control site is on upper Chedakuz Creek, immediately upstream of its confluence with Creek 661 and near across from the 661-20 sampling site shown in the AEMP (Figure 4.2-1, Appendix 7-A, Aquatic Effects Monitoring Plan). BW Gold is willing to discuss the potential future addition of a control site in this location with LDN/UFN to further develop a technically feasible and statistically robust Rainbow Spawner Follow-Up Program.	Section 4.8 (and see Appendix E)
2140	LDN/UFN Brenley Yuan	06-Oct-22	3	The proposed control site sounds like a reasonable location so long as there is not too much noise from the Kuyakuz Lake population. Is there much known about habitat use distributions by both Tatelkuz and Kuyakuz lake populations? What about the eastern tributaries to Tatelkuz Lake? Are any of those feasible sites?	The potential control site on upper Chedakuz Creek has a separate population of rainbow trout from Davidson Creek (Section 5.10.3.7 Microsatelite DNA Analysis of Appendix 5.1.2.6A Fisheries Baseline of the EIS/ EA Application) which is good for a control site. The tributaries along the eastern shore of Tatelkuz Lake are primarily first order streams without headwater lakes, which are not good control site matches for Davidson Creek.	Section 4.8 (and see Appendix E)
2141	LDN/UFN Brenley Yuan	Jul 27, 2022	2	Locations listed in Table 4.8-7 does not match Figure 4.2-1 (pg 4-9). Figure 4.2-1 shows Rainbow Trout monitoring at FC:01 and 705-10, which is not listed in the Table.	Thank you for noticing this discrepancy. In response to several comments from BC ENV in Round 1 and Round 2, some modifications to the AEMP were proposed. As part of Round 2 responses to BC ENV, an updated version of Table 4.2-1 (showing site locations and rationale), Table 4.2-2 (showing sites and AEMP sampling components) and Figure 4.2-1 (showing sampling locations) is provided in the memo attachment titled "R2_ENV_Comment ID 58 and 64".	Table 4.2-1, Table 4.2-2, and Figure 4.2-1 have been updated to align with text.
2205	BC ENV (Luc Turcotte)	Aug 25, 2022	3	4.8.3.2 - page 4-43 paragraph 3, what is the sample size of Kokanee fry for the escapement survey per creek, or is the intent to enumerate all out-migrating fry in each creek at the monitoring locations for length and wet weight?	The method for enumerating Kokanee Fry Outmigration has been revised from the last AEMP Plan submission. Kokanee fry outmigration assessment will be completed using a sub-sampling mark-recapture method. Sampling will involve deploying fine-mesh nets of known dimensions into the channel at predetermined locations, according to the methods of Fraley and Clancey (1984). Each net will be sampled at a set interval and the fry captured will be enumerated and recorded. The duration of sampling period will be adjusted based on the numbers of fry netted and/or the amount of debris present, although it is expected to last approximately four weeks, based on literature review. Data including date, time, water depth, water temperature and weather conditions will be recorded.	Additional text regarding Kokanee fry spring outmigration is provided in Section 4.8.2.2

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
					Sampling will be conducted once per week, between 19:00 hours and 02:00 hours as most (>90%) fry emigration occurs during this period (Manson 2005). Capture efficiency of the nets will be determined using a mark-recapture approach by marking captured fry with Bismarck Brown Y and releasing them upstream of the capture location. Recaptured marked fish will be counted and the proportion of recaptured fish will indicate the trap's effectiveness. The revised methods will be reflected in the next version of the AEMP Plan. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups. Manson, H. 2005. Hill Creek Spawning Channel Kokanee Fry Enumeration Report – 2004. Columbia Basin Fish & Wildlife Compensation Program. Nelson, BC. November 2004. 13 pp. + 3 App. Fraley JJ, Clancey PT 1988. Downstream migration of stained kokanee fry in the Flathead River system, Montana. Northwest Science. 62(3): 111-117.	
2206	BC ENV (Luc Turcotte)	Aug 25, 2022	3	4.8.3.3 Data Analysis - section references section 4.7.3 - Aquatic invertebrate data analysis - please check this is the correct section reference. Kokanee summer inventory monitoring program is Section 4.8.2.3	The correct section reference should be to Section 4.8.2.3 (Data Analysis for Kokanee Summer Spawning Survey). The section reference will be updated in the next version of the AEMP Plan. BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	The cross-reference section for Kokanee Fry Condition data analysis now refers to Section 4.8.1.3 (Data Analysis, Fish Condition)
2207	BC ENV (Luc Turcotte)	Aug 25, 2022	3	4.8.4.2 (page 4-44) - Are the aging structures from selection of fish collected lethally (otoliths) or fish rays/scales? What is the desired sample size per stream/site?	Non-lethal collection of Rainbow Trout age structures will include scales and fin rays. Sample size will depend on the number of migrating fish captured in bi-directional hoop nets during the spawning period. In 2021 a total of 47 Rainbow Trout were captured using this method.	Section 4.8.1.2 indicates the types of aging structures to be sampled in juvenile Rainbow Trout versus adult fish at lake sites.
2208	BC ENV (Luc Turcotte)	Aug 25, 2022	3	Davidson Creek temperature - is the intent to manage temperature to background conditions or to optimal temperatures for Kokanee and Rainbow trout? Table 4.4-1 trends will be comparted to baseline trends, Section 4.4.1 refences DS condition 3.9 - maintain water temperature in Davidson Creek. Section 5 Trigger Action Response Plan - Table 5-2 references optimum temperatures for Rainbow Trout and Kokanee - please clarify and consider stating management intent in Section 4.4.1.	Please refer to responses to comment IDs 47 to 51 from BC ENV regarding temperature, and comment IDs 52 and 56 from BC ENV regarding the trigger response. The approach for management of water temperature in Davidson Creek downstream of the Project continues to be a discussion with both federal and provincial regulators. Baseline water temperature observations are often outside of optimal temperature ranges specified in the BC water quality guideline. Discussion and follow up correspondence with representatives of BC ENV, BC EAO, and FLNRO in July 2022 indicate that their expectation is that the BC water quality guideline for temperature will not apply (in the context of Environmental Assessment Certificate Condition 26, that requires the proponent 'must ensure the Project does not cause downstream water quality to exceed BC Water Quality Guidelines, unless the Holder has developed and ENV has accepted one or more Science Based Environmental Benchmarks (SBEBs), in which case the accepted SBEB must not be exceeded).	A Trigger Response Plan (TRP) will be developed to support the management of FWR discharge per EMA Permit PE-110652 Condition 3.4.

Comment ID	Comment Author	Date Comment Received	Review Phase	Comment	Proponent Response	Section Addressed in the AEMP Plan, Version 1.0
					However, the federal Decision Statement (Condition 3.9) requires the proponent to maintain water temperature in Davidson Creek as predicted in the 2016 Environmental Assessment (EA), unless authorized by Fisheries and Oceans Canada. BW Gold has submitted a *Fisheries Act* Authorization Application (under review and not yet approved) to maintain water temperature in Davidson Creek relative to baseline conditions (e.g., remain within 1-2 degrees of baseline temperatures) instead of the BC water quality guideline optimum temperature ranges. The *Fisheries Act* Authorization Application is based on Project Optimizations since the EA and revised Davidson Creek water temperature predictions. Thus, the framework for trigger response or adaptive management of water temperature in Davidson Creek will be revised or refined to ensure that it aligns with requirements in the federal Decision Statement and approved *Fisheries Act* Authorization. These updates to the trigger response or adaptive management frameworks will be made in the next version of the Aquatic Effects Monitoring Program Plan (provided that the *Fisheries Act Authorization* is available at that time). BW Gold recognizes that management plans may need various updates as a result of permitting reviews. BW Gold will track all edits and discuss with EMLI and other regulators the appropriate timing to submit updated plans. As appropriate, updated plans will also be filed with other relevant regulators and Indigenous groups.	
2212	LDN/UFN Brenley Yuan	24-Aug-22	3	It has been indicated that a survey of the entire spawning distribution along Davidson Creek will be conducted, but Table 4.8-3 (page 4-40) in Appendix 7-A still indicates that only Reach 1 will be surveyed. Please ensure this is edited in future revisions.	Table 4.8-3 in Appendix 7-A refers only to the Kokanee spawner survey program for the AEMP. The entire spawning distribution of Kokanee along Davidson Creek will be surveyed as part of the federal Condition 3.14 long-term monitoring (Palmer 2022, Follow-Up Programs for Condition 3.14 of the Blackwater Gold Project Decision Statement Issued under Section 54 of the *Canadian Environmental Assessment Act, 2012*).	Section 4.8 (and see Appendix E)
2212	LDN/UFN Brenley Yuan	06-Oct-22	2	In future revisions of the AEMP, increased spawner survey coverage per Condition 3.14 should be mentioned to avoid confusion.	A statement will be added to the Kokanee spawner survey program in the AEMP explaining that the entire spawning distribution of Kokanee along Davidson Creek will be surveyed as part of the federal Condition 3.14 long-term monitoring (Palmer 2022, Follow-Up Programs for Condition 3.14 of the Blackwater Gold Project Decision Statement Issued under Section 54 of the *Canadian Environmental Assessment Act, 2012*). As discussed in a recent biweekly fisheries technical meeting, revisions to the AEMP are ongoing. BW Gold proposes to expand the scope of Kokanee surveys and provide more clarity on the overlap between the AEMP and other monitoring programs, including 3.14.	Section 4.8 (and see Appendix E)

APPENDIX F AQUATIC EFFECTS MONITORING PROGRAM CUMULATIVE BASELINE REPORT RECOMMENDATIONS

Appendix F-1: AEMP 2022 Findings and Recommendations (Palmer 2022)

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Memorandum

Date: November 30, 2022

Project #: 2006504

To: Lesley Shelley; Entia Environmental Consultants
Tonia Robb, Nicole Bishop; ERM Consultants Canada

From: Marissa Heppner, Amanda Miller, Ian MacLeod, Rick Palmer; Palmer

cc: Ryan Todd, Travis Desormeaux; Artemis Gold Inc.

Re: AEMP 2022 Findings and Recommendations

Palmer Environmental Consulting Group Inc. (Palmer) was retained by BW Gold Ltd., a subsidiary of Artemis Gold Inc., to complete environmental monitoring as part of the Blackwater Gold Project, a gold and silver mine in central BC (the Project). In accordance with the joint *Mines Act* / *Environmental Management Act* (MAEMA) permit conditions, an Aquatics Effect Monitoring Program (AEMP; ERM 2022b) has been developed and implemented to monitor Project-related impacts to the aquatic receiving environment. The following memo describes findings and recommendations related to field procedures for the 2022 Fish Community monitoring component of the AEMP, which will inform methodology changes to be considered for future iterations of the Program.

1. Introduction

An AEMP update is required to incorporate refinements to the field programs, and responses to comments received from the BC Ministry of Environment and Climate Change Strategy and First Nations as part of the joint MAEMA permit application review. Some modifications to the fisheries sampling plan were implemented during the 2022 field program (e.g., Creek 661 sample sites as per ERM 2022a), whereas others (e.g., Kokanee fry outmigration survey) will begin in the 2023 field season. A summary of the findings and recommendations from the 2022 Fish Community monitoring field work is outlined in Section 2.

2. Findings and Recommendations

2.1 Fish Community Inventory

The findings and recommendations related to the fish community inventory are presented in Table 1.

The 2022 fish community inventory sampling events have resulted in the following recommendations for future program iterations. Recommendations include changing the electrofishing methodology from single pass to triple pass depletion; increasing the collection of aging structures (scales, fin clips, and/or otoliths);

discontinuing Kokanee sampling in Kuyakuz Lake due to very low catch per unit effort; adding additional sampling sites to Creek 661 and relocating one site on Turtle Creek; and dissecting fish in the field.

Table 1. Fish Community Inventory Findings and Recommendations

Finding	Recommendation
Closed site single-pass electrofishing, where one bank was fished in the upstream direction and one bank was fished in the downstream direction, does not provide as much confidence in capturing fish as the standard upstream only three-pass depletion method used under the Condition 3.14 sampling. For several streams, additional passes were needed to catch the eight required Rainbow Trout for metals analysis.	To standardize sampling methodology and analysis across field programs, it is recommended that closed-site single-pass electrofishing is replaced with the three-pass depletion method, moving from downstream to upstream while sampling the entire stream width for a 100 m^2 area.
Opportunities were available through sampling efforts to collect aging structures from more than the 8 Rainbow Trout required for metals analysis.	Ageing structures should be collected from all stream fish captured up to a maximum of 10 samples per size class per site to further expand on data availability (scales and fin clips, as well as otoliths for any mortalities).
Due to the limited Kokanee population in Kuyakuz Lake, the adequate sample size for metals analysis could not be captured. Despite extensive gill netting and angling at multiple locations and depth strata conducted in 2021 and 2022, the target sample size of Kokanee were not captured from Kuyakuz Lake.	Discontinue Kokanee sampling in Kuyakuz Lake. Continue to target Mountain Whitefish and Rainbow Trout. The Country Foods Monitoring Program (CFMP) will need to be updated to reflect this change.
Additional sampling locations should be considered for Creek 661. Catches of Rainbow Trout at Site 661-05 were low in 2022 and the required sample size for metals analysis could not be obtained from this site despite extensive sampling by electrofishing, minnow trap sets or large gee-style trap sets.	The addition of two new sample sites (661-01 and 661-04) in Creek 661 was implemented for the 2022 field program and will be continued during long-term monitoring. Sampling at Site 661-05 will continue in future monitoring.
One site located on Turtle Creek, TC-05, was not suitable for electrofishing due to water depth. Only a 40-metre-long section of side channel could be electrofished. Due to poor conditions including low flow, deep water, and fine substrate, no fish could be captured during the electrofishing effort. Minnow trapping was required to catch the fish required for metals analysis.	The relocation of TC-05 should be considered to allow for standard electrofishing procedures to be implemented at this site.
Fish collected in the field were sent to Biologica for dissection prior to being sent to ALS for metals analysis.	As requested by Artemis, fish will be dissected in the field to remove otoliths and separate tissue into muscle, liver and carcass/viscera sample types, reducing lab handling effort and processing time.

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2.2 Rainbow Trout Spring Spawning Surveys

The findings and recommendations related to the Rainbow Trout spring spawning surveys are presented in Table 2.

Sampling events from the 2022 Rainbow Trout spring spawning surveys have resulted in the following recommendations for future program iterations. Recommendations include sampling earlier in the season; increasing the collection of aging structures (scales, fin clips, and/or otoliths); and exploring the potential for new sampling designs.

Table 2. Rainbow Trout Spring Spawning Survey Findings and Recommendations

Finding	Recommendation
Deployment of the hoop nets occurred later than the start of Rainbow Trout migration, resulting in lower in-migrating adult captures than expected.	The start of the sampling period will be shifted earlier in the year, especially for Turtle Creek where Rainbow Trout are first to spawn.
More than 8 Rainbow Trout were routinely captured from hoop net traps allowing for the additional sampling of aging structures.	Increase collection of aging structures (scales, fin clips and/or otoliths) from 8 captured Rainbow Trout to a maximum of 30 Rainbow Trout per site per size class for fish greater than 200 mm fork length (i.e., 3+ age classes that are migrating to spawn).
Due to the high stream discharge during the spring freshet, hoop nets could not always be successfully maintained. Issues with hoop nets included net blowouts and overtopping with water.	Alternative trap design, such as upstream and downstream facing rigid steel conduit traps with sill plates and fences, should be considered to replace hoop nets for spring sampling.

2.3 Kokanee Summer Spawning Surveys

The findings and recommendations related to the Kokanee summer spawning surveys are presented in Table 3.

Sampling events from the 2022 Kokanee summer spawning surveys have resulted in the following recommendations for future program iterations. Recommendations include increasing the length of bank walk surveys and adding additional survey sites to increase survey frequency; increasing the duration of survey periods to encompass the entire spawning run duration; eliminating the upper Chedakuz Creek sampling site due to very low Kokanee abundances, increasing the collection of aging structures (scales, fin clips, and/or otoliths) and the collection of data from spent fish; modifying in situ water measurement recordings; adding sediment and habitat characterization metrics; discontinuing drone surveys; and pooling together the counts of holding and migrating fish.

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Table 3. Kokanee Summer Spawning Survey Findings and Recommendations

Finding	Recommendation
Bank walk lengths of 500 m resulted in key habitat just outside of the survey length to be excluded from the survey. First Nations groups were also interested in expanding on the information collected from Kokanee spawning surveys.	Extend bank walk site lengths from 500 m to 1000 m and add a second survey site of the same length to each stream. Additional survey sites should be co-located with water quality sample locations and based on field reconnaissance (e.g., drone or helicopter flight) for optimal spawning habitat, where possible.
Kokanee spawning activity in upper Chedakuz Creek is very low (i.e., only two individuals observed during six bank walks), based on the results of the 2022 field survey.	Eliminate the Kokanee spawning sampling site from upper Chedakuz Creek. The removal of this site from the AEMP will be balanced by the addition of the four sampling sites (described above) in streams with large Kokanee populations and the lengthening of all Kokanee sampling sites.
The duration of spawning runs was greater than the four-week timing window anticipated to capture the majority of fish/	Increase bank walk timing window from four weeks to the entire spawning period (i.e., Late July to mid-September), counting once per week.
Many spent, deceased fish were observed during bank walks which could add information to aging databases.	A maximum sample size of 30 deceased fish will be targeted for otolith collection to determine size and age at maturity. Fork length, postorbital hypural length (due to likelihood of mouth damage and/or decomposition) and sex will also be recorded. Female deceased Kokanee will be characterized as either spent (approximately 100% of eggs released), partially spawned (approximately 50% of eggs released) or not spawned (approximately 0% of eggs released).
Water quality measurements recorded at the start and end of each bank walk were highly similar and the recording to both measurements creates unnecessary redundancy.	In situ water quality will be recorded once, at the beginning of each bank walk. Measured surface water parameters will include temperature (ºC), dissolved oxygen (mg/L), pH, conductivity (µS/cm), and turbidity (NTU).
Concerns were raised by reviewers about changes in sediment transportation and subsequent potential effects on spawning habitat availability or substrate composition.	Conduct spawning habitat and substrate assessments at each site at the start of the Kokanee survey period. Mesohabitat mapping following the Fish Habitat Assessment Procedure (FAHP; Johnston and Slaney 1996) method will be used to evaluate change in habitat availability. Sediment sampling will be conducted at six randomly selected spawning sites (three riffles and three runs) per Kokanee spawning site. At each spawning site, three replicate grab samples will be taken for particle size analysis.

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Drone surveys were not as effective in counting fish as bank walk surveys, as they could not identify fish hiding under extensive cover or holding in deep pools.	Discontinue the drone survey.
Similarities between migrating and holding fish behaviors required field interpretation.	Migrating and holding fish counts will be pooled together as one category due to the difficulty in differentiating between the two behaviours. Fish tallied as migrating/holding will be swimming steadily, usually upstream, or holding in a group with no evidence of spawning activity

2.4 Kokanee Fry Outmigration Surveys

Kokanee fry outmigration sampling has not been conducted to date. A revision to the sampling methodology based on pilot programs and field surveys is presented in the findings and recommendations table for Kokanee fry surveys, Table 4.

Table 4. Kokanee Fry Outmigration Survey Findings and Recommendations

Finding	Recommendation
The term escapement does not entirely describe the behavior of Kokanee fry.	Change program name to Kokanee Fry Outmigration Survey.
Underwater camera installation were not effective ways to monitor Kokanee fry movement. The funnel trap method piloted in 2022 appears to be effective at capturing Kokanee fry.	The 2023 Kokanee fry outmigration survey field program will be undertaken using a sub-sampling mark-recapture method using funnel nets. Funnel nets will be connected to a larger trap that will divert flow and provide a refuge for the captured fry. This will allow for the trap to be checked daily and avoid overnight sampling.
Kokanee spawning activity in upper Chedakuz Creek is very low, based on the results of the 2022 field survey.	Eliminate the Kokanee fry outmigration sampling site from upper Chedakuz Creek.

3. Closing

As part of the AEMP revision for the Blackwater Gold Project, Palmer has provided these findings and recommendations to better inform updated methodologies for the fisheries monitoring component. Some changes were incorporated into the 2022 field program, while others will be implemented in 2023. All method revisions will be incorporated into monitoring from 2023 onward. Please contact the undersigned if you have any questions or concerns.

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Table F-2: AEMP 2022 Findings and Recommendations

2022 AEMP Cumulative Baseline Report Recommendations	Section in the Aquatic Effects Monitoring Program Plan
Surface Water Quality	
Surface water quality baseline laboratory analysis was completed by AMEC for samples collected between 2011 and 2014 and by ALS for samples collected between 2016 and 2022. Statistical comparison of selected water quality parameters analyzed by AMEC versus ALS suggested there were differences between the laboratories (or years sampled) for reported concentrations (Section 4.4.1.1). Therefore, the laboratory or the year data was collected represented a large proportion of the overall variance in the dataset. The variability between the baseline monitoring years may result in undetected Project-related effects (i.e., less power to detect significance). The QA/QC analysis of field and travel blanks and RPD analysis of duplicate samples also suggested a difference between the laboratories. Overall, field and travel blanks collected since 2014 demonstrated improved quality, and the duplicate samples analyzed by ALS suggested there was an increase in the data quality (Section 4.4.8). Therefore, for the purpose of future AEMP analysis (i.e., the AEMP interpretive report) and reporting the stream and lake baseline dataset the monitoring years were restricted to 2016 to 2022.	Section 4.4.2.3 (surface water quality data analysis)
For all parameters and seasons the concentrations measured at WQ-10 were similar to DC-05 suggesting that observations at this site can be used for the purpose of evaluating baseline conditions at DC-05 (Section 4.4.1.3). The concentrations observed in the September 2017 sample collected at BI-12 was not similar to open-water concentrations measure at 705-05 suggesting that the observations at BI-12 should not be used for the purpose of evaluating baseline conditions at site 705-05 (Section 4.4.1.3).	Section 4.4.2.3 (surface water quality data analysis)
Given the relatively infrequent detection of chromium (total, dissolved, or hexavalent) in water samples and the infrequent, low magnitude exceedances of the Cr(VI) WQG-AL for total chromium or Cr(VI) concentrations, continuation of chromium speciation analysis in future AEMP Plan monitoring is not recommended (Section 4.4.4). It is recommended that analysis of both total and dissolved chromium concentrations be continued for water samples.	Section 3.2.3 and Table 4.4.3 indicates that total and dissolved chromium will be analyzed in water quality samples.
Weekly winter stream water quality was completed in February and March 2022 to assess the water quality variability (Section 4.4.5). Water quality parameters with high variability also tended to exceed guideline values in one or more of the weekly samples (total aluminum, total iron, and total and dissolved manganese). High variability among observations was limited to few parameters and sites 661-10 (total aluminum, total iron, and total manganese) and Chedakuz Creek sites (CC-05, CC-10; total and dissolved manganese). Therefore, it is recommended that weekly winter stream water quality sampling is not continued.	Section 4.2
Statistical analysis and visual comparison suggest that the use of the regional control sites is appropriate for the assessment of Project-related effects on water quality in Davidson Creek.	Section 4.4.2.3 (surface water quality data analysis)
Baseline seasonal trends in surface water quality at the upstream sites suggest that they are appropriate for use in the statistical analysis to detect Project-related effects in Creek 661 and Chedakuz Creek.	Section 4.4.2.3 (surface water quality data analysis)
The use of Kuyakuz Lake as a control site for the assessment of Project-related effects in Tatelkuz Lake is appropriate.	Section 4.4.2.3 (surface water quality data analysis)

2022 AEMP Cumulative Baseline Report Recommendations	Section in the Aquatic Effects Monitoring Program Plan
Aquatic Invertebrate Community	
Remove TC-01 and TC-05 from CABIN sampling, as they do not meet the CABIN criteria for wadeable streams.	Environment and Climate Change Canada recommended to use a modified wadeable streams protocol to assess the aquatic invertebrate community at sites TC-01 and TC-05. The sites will not be applicable for the reference condition approach (i.e., must be excluded from BEAST analysis in CABIN) but will be used for the proposed BACI statistical analysis. Section 4.7.2.1 and Section 4.7.3 have been revised to indicate the modified field methods and data analysis.
The Fraser 2021 model is the most appropriate BEAST model to use for the following reasons: (1) ecoregion concurrence, (2) a large and regionally-relevant dataset used to build the model, and the use of regionally-relevant environmental parameters, and (3) concurrence with previously-identified predictor variables driving the benthic invertebrate community.	Section 4.7.1
To maintain sufficient replication necessary for use in a BACI analysis, it is recommended that data for Creek 661 and Davidson Creek be averaged within years for each watershed and compared to a combined set of control sites in a BACI analysis. Turtle Creek and Chedakuz Creek lack sufficient temporal replication, thus, alternative statistical analyses will be completed to assess the potential for impacts in these watersheds.	Section 4.7.3
Fish Tissue Metals	
Due to the number of metals having significantly different average concentrations between these baseline sampling periods and the recommended, but less robust method of handling values BDL, it is advised that baseline data from only the later sampling periods (2017 to 2022) be included in the AEMP.	Section 4.8.1.3
Consideration of pre-exiting differences in metal concentrations in fish tissue between control and potentially impacted sites will need to be addressed in the context of the data analysis and presentation of results, after mining activities begin.	Section 4.8.1.3

APPENDIX G BENCHMARKS FOR THE ADAPATIVE MANAGEMENT FRAMEWORK

Appendix G-1: Water Quality Benchmarks

Appendix G-2: Sediment Quality Benchmarks

Appendix G-3: Periphyton and Nutrient Benchmarks

Appendix G-4: Benthic Invertebrate Tissue Metal Benchmarks

Appendix G-5: Fish Tissue Metal Benchmarks

APPENDIX G-1A: WATER QUALITY BENCHMARKS FOR ALL SITES BASED ON WATER QUALITY GUIDELINES FOR THE PROTECTION OF AQUATIC LIFE, WILDLIFE, AND AGRICULTURE (LIVESTOCK)

Parameter	Water Quality Guideline[1]			
	BC WQG	Type of Guideline	CCME WQG	Type of Guideline
Physical Parameters and Dissolved Anions				
pH (pH units)	6.5 to 9	Aquatic life	6.5 to 9	Aquatic life
Total suspended solids	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life
Total dissolved solids	ng[3]	ng	3000	Livestock
Chloride	150	Aquatic life	120	Aquatic life
Fluoride	sample specific[2]	Aquatic life	0.12	Aquatic life
Sulphate	sample specific[2]	Aquatic life	1000	Livestock
Nutrients				
Ammonia-N	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life
Nitrate-N	3	Aquatic life	3	Aquatic life
Nitrite-N	sample specific[2]	Aquatic life	0.06	Aquatic life
Total Phosphorous	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life
Cyanides				
Total Cyanide	ng	ng	0.005	Aquatic life
Cyanide, Weak Acid Dissociable	0.005	Aquatic life	ng	ng
Total Metals				
Aluminum	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life
Antimony	0.074	Aquatic life	ng	ng
Arsenic	0.005	Aquatic life	0.005	Aquatic life
Barium	1	Aquatic life	ng	ng
Beryllium	0.00013	Aquatic life	0.1	Livestock
Boron	1.2	Aquatic life	1.5	Aquatic life
Cadmium	ng	ng	sample specific[2]	Aquatic life
Chromium[4]	0.0025	Aquatic life	0.001	Aquatic life
Cobalt	0.004	Aquatic life	1	Livestock
Copper	300	Wildlife	sample specific[2]	Aquatic life
Iron	1	Aquatic life	0.3	Aquatic life
Lead	ng	Aquatic life	sample specific[2]	Aquatic life
Lithium	ng	ng	ng	ng
Manganese	sample specific[2]	Aquatic life	ng	ng
Mercury	0.00001	Aquatic life	0.000026	Aquatic life
Molybdenum	0.016	Livestock	0.073	Aquatic life
Nickel	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life
Selenium	0.002	Aquatic life	0.001	Aquatic life
Silver	sample specific[2]	Aquatic life	0.00025	Aquatic life
Strontium	ng	ng	ng	ng
Thallium	0.00003	Aquatic life	0.0008	Aquatic life
Uranium	0.0085	Aquatic life	0.015	Aquatic life
Vanadium	0.1	Livestock	0.1	Livestock
Zinc	ng	ng	5	Livestock

APPENDIX G-1A: WATER QUALITY BENCHMARKS FOR ALL SITES BASED ON WATER QUALITY GUIDELINES FOR THE PROTECTION OF AQUATIC LIFE, WILDLIFE, AND AGRICULTURE (LIVESTOCK)

Parameter	Water Quality Guideline[1]			
	BC WQG	Type of Guideline	CCME WQG	Type of Guideline
Dissolved Metals				
Aluminum	ng	ng	ng	ng
Cadmium	sample specific[2]	Aquatic life	ng	ng
Copper	sample specific[2]	Aquatic life	ng	ng
Iron	0.35	Aquatic life	ng	ng
Manganese	ng	ng	sample specific[2]	sample specific[2]
Zinc	sample specific[2]	Aquatic life	sample specific[2]	sample specific[2]

Notes:

units are mg/L unless indicated.

ng = no guideline.

[1] Only the most conservative guideline is shown in the table. Sources of water quality guidelines include:

- Approved or working BC Water quality guidelines for the protection of aquatic life, wildlife, and agriculture-livestock (BC WLRS 2025a, 2025b).
- Canadian Council of Ministers of the Environment water quality guidelines for the protection of aquatic life or agriculture-livestock (CCME 2025a).

[2] This parameter has a water quality guideline based on toxicity modifying factors (e.g., hardness, pH). The guideline will be calculated on a sample-by-sample basis, consistent with guidance in BC MOE (2016a).

[3] No guideline is available for this parameter. A benchmark of 500 mg/L, used in effects assessment, will be used to confirm the results of the effects assessment.

[4] Based on the guideline for hexavalent chromium, as there is no guideline for total chromium.

APPENDIX G-1B: BASELINE WATER QUALITY AT DC-05

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Physical Parameters and Dissolved Anions												
pH (pH units)	9.52	9.44	9.60	9.55	9.14	8.97	9.39	9.57	9.59	9.32	9.22	9.34
Total suspended solids	1.8	4.1	3.4	2.8	27.6	9.8	4.1	2.3	9.3	2.9	4.1	1.8
Total dissolved solids	86.6	87.6	93.8	89.4	78.7	62.4	75.6	97.7	114.0	85.8	69.2	78.7
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.64	0.30	0.30
Fluoride	0.055	0.053	0.055	0.053	0.046	0.035	0.048	0.049	0.051	0.059	0.042	0.044
Sulphate	3.4	3.6	3.7	3.6	1.6	1.0	2.3	3.5	3.3	2.9	2.3	2.7
Cyanides												
Total Cyanide	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Cyanide, Weak Acid Dissociable	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Total Metals												
Aluminum	0.067	0.062	0.042	0.244	0.543	0.340	0.208	0.152	0.078	0.163	0.389	0.126
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000125	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060
Arsenic	0.0008	0.0007	0.0007	0.0007	0.0008	0.0006	0.0009	0.0010	0.0009	0.0009	0.0007	0.0007
Barium	0.0089	0.0093	0.0094	0.0195	0.0088	0.0064	0.0086	0.0120	0.0114	0.0078	0.0075	0.0075
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Cadmium	0.000004	0.000006	0.000004	0.000008	0.000022	0.000011	0.000010	0.000008	0.000004	0.000007	0.000010	0.000005
Chromium	0.00035	0.00038	0.00038	0.00048	0.00077	0.00035	0.00034	0.00036	0.00038	0.00037	0.00050	0.00040
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00013	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006
Copper	0.00030	0.00030	0.00030	0.00070	0.00097	0.00085	0.00124	0.00064	0.00030	0.00061	0.00086	0.00066
Iron	0.130	0.123	0.094	0.251	0.399	0.237	0.161	0.176	0.158	0.243	0.284	0.149
Lead	0.000049	0.000137	0.000030	0.000054	0.000161	0.000075	0.000055	0.000030	0.000030	0.000151	0.000071	0.000030
Lithium	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060
Manganese	0.0098	0.0065	0.0033	0.0085	0.0380	0.0161	0.0091	0.0100	0.0066	0.0095	0.0142	0.0071
Mercury	0.0000036	0.0000036	0.0000036	0.0000044	0.0000133	0.0000107	0.0000088	0.0000043	0.0000073	0.0000036	0.0000118	0.0000059
Molybdenum	0.00098	0.00103	0.00106	0.00123	0.00048	0.00038	0.00090	0.00127	0.00105	0.00069	0.00068	0.00077
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030
Selenium	0.000127	0.000102	0.000125	0.000100	0.000082	0.000070	0.000089	0.000087	0.000090	0.000079	0.000082	0.000084
Silver	0.0000096	0.0000060	0.0000060	0.0000060	0.0000227	0.0000103	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Strontium	0.105	0.108	0.117	0.108	0.068	0.041	0.092	0.128	0.119	0.077	0.078	0.088
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000096	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Uranium	0.00030	0.00029	0.00039	0.00030	0.00026	0.00023	0.00022	0.00035	0.00028	0.00022	0.00021	0.00023
Vanadium	0.0009	0.0009	0.0009	0.0005	0.0011	0.0009	0.0008	0.0008	0.0004	0.0007	0.0008	0.0007
Zinc	0.0036	0.0031	0.0018	0.0018	0.0041	0.0040	0.0018	0.0038	0.0021	0.0052	0.0018	0.0018

APPENDIX G-1B: BASELINE WATER QUALITY AT DC-05

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.057	0.041	0.026	0.162	0.288	0.249	0.176	0.117	0.072	0.112	0.293	0.088
Cadmium	0.000004	0.000005	0.000004	0.000004	0.000013	0.000013	0.000007	0.000004	0.000004	0.000005	0.000008	0.000007
Copper	0.00031	0.00030	0.00030	0.00048	0.00089	0.00068	0.00059	0.00031	0.00045	0.00058	0.00078	0.00059
Iron	0.096	0.084	0.087	0.169	0.201	0.129	0.105	0.132	0.115	0.170	0.181	0.111
Manganese	0.0046	0.0034	0.0024	0.0046	0.0068	0.0042	0.0055	0.0057	0.0042	0.0046	0.0049	0.0039
Zinc	0.00180	0.00180	0.00180	0.00180	0.00188	0.00180	0.00180	0.00180	0.00180	0.00180	0.00180	0.00180

Notes:

Concentrations in mg/L, unless otherwise noted.

[1] 95th percentile concentration measured in baseline studies at DC-05 and WQ-10 between 2016 and September 30, 2022.

APPENDIX G-1C: BASELINE WATER QUALITY AT DC-10

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Physical Parameters and Dissolved Anions												
pH (pH units)	9.43	9.45	9.66	9.53	9.17	9.11	9.38	9.51	9.57	9.23	9.26	9.39
Total suspended solids	1.8	1.8	1.8	3.3	14.8	4.7	1.8	3.2	3.8	1.8	2.6	1.8
Total dissolved solids	80.2	144.7	86.2	88.8	72.0	69.1	78.5	93.6	109.8	86.5	69.4	80.5
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.58	0.30	0.30
Fluoride	0.053	0.054	0.054	0.052	0.043	0.035	0.046	0.048	0.052	0.064	0.039	0.045
Sulphate	3.5	3.6	3.8	3.6	1.6	1.0	2.7	3.4	3.4	2.9	2.4	2.8
Cyanides												
Total Cyanide	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Cyanide, Weak Acid Dissociable	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Total Metals												
Aluminum	0.050	0.035	0.032	0.241	0.629	0.349	0.196	0.116	0.078	0.149	0.140	0.109
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060
Arsenic	0.0007	0.0007	0.0007	0.0007	0.0009	0.0007	0.0008	0.0009	0.0008	0.0008	0.0007	0.0006
Barium	0.0091	0.0089	0.0095	0.0092	0.0102	0.0060	0.0092	0.0118	0.0118	0.0075	0.0072	0.0076
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Cadmium	0.000004	0.000004	0.000004	0.000008	0.000025	0.000012	0.000012	0.000007	0.000004	0.000007	0.0000036	0.0000278
Chromium	0.00033	0.00030	0.00030	0.00038	0.00079	0.00033	0.00033	0.00031	0.00031	0.00048	0.00033	0.00033
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00018	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006
Copper	0.00030	0.00030	0.00030	0.00078	0.00114	0.00090	0.00076	0.00045	0.00030	0.00074	0.00030	0.00030
Iron	0.091	0.086	0.065	0.214	0.504	0.244	0.156	0.152	0.152	0.241	0.123	0.148
Lead	0.000030	0.000030	0.000030	0.000059	0.000217	0.000076	0.000058	0.000030	0.000030	0.000030	0.000030	0.000102
Lithium	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.0006
Manganese	0.0048	0.0046	0.0027	0.0081	0.0375	0.0152	0.0073	0.0068	0.0062	0.0082	0.0054	0.0065
Mercury	0.0000036	0.0000036	0.0000036	0.0000128	0.0000142	0.0000106	0.0000079	0.0000036	0.0000084	0.0000036	0.0000048	0.0000036
Molybdenum	0.00100	0.00098	0.00108	0.00100	0.00049	0.00038	0.00089	0.00111	0.00108	0.00067	0.00067	0.00073
Nickel	0.00030	0.00030	0.00030	0.00030	0.00071	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030
Selenium	0.000087	0.000124	0.000103	0.000108	0.000070	0.000080	0.000116	0.000074	0.000078	0.000068	0.000072	0.000103
Silver	0.0000060	0.0000060	0.0000060	0.0000060	0.0000182	0.0000108	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Strontium	0.106	0.101	0.124	0.110	0.055	0.046	0.092	0.120	0.117	0.078	0.077	0.085
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000115	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Uranium	0.00028	0.00029	0.00037	0.00030	0.00028	0.00024	0.00021	0.00029	0.00027	0.00021	0.00019	0.00020
Vanadium	0.0009	0.0008	0.0003	0.0005	0.0015	0.0008	0.0007	0.0007	0.0006	0.0008	0.0008	0.0006
Zinc	0.0018	0.0057	0.0018	0.0018	0.0018	0.0018	0.0018	0.0027	0.0031	0.0048	0.0018	0.0018

APPENDIX G-1C: BASELINE WATER QUALITY AT DC-10

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.042	0.028	0.021	0.185	0.306	0.225	0.155	0.095	0.066	0.104	0.123	0.073
Cadmium	0.000004	0.000004	0.000004	0.000008	0.000012	0.000006	0.000004	0.000006	0.000004	0.000004	0.000004	0.0000117
Copper	0.00030	0.00030	0.00030	0.00068	0.00087	0.00067	0.00054	0.00030	0.00038	0.00034	0.00088	0.00043
Iron	0.074	0.056	0.049	0.135	0.191	0.123	0.095	0.123	0.118	0.148	0.093	0.093
Manganese	0.0026	0.0025	0.0019	0.0026	0.0056	0.0030	0.0043	0.0046	0.0039	0.0038	0.0026	0.00229
Zinc	0.00299	0.00173	0.00162	0.00180	0.00254	0.00180	0.00156	0.00201	0.00180	0.00175	0.0016	0.00162

Notes:

Concentrations in mg/L, unless otherwise noted.

[1] 95th percentile concentration measured in baseline studies at DC-10 between 2016 and September 30, 2022.

APPENDIX G-1D: BASELINE WATER QUALITY AT DC-15

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Physical Parameters and Dissolved Anions												
pH (pH units)	9.65	9.52	9.72	9.62	9.34	9.12	9.50	9.62	9.64	9.51	9.36	9.50
Total suspended solids	1.8	1.8	1.8	5.0	22.6	9.2	1.8	2.9	5.0	10.8	3.2	1.8
Total dissolved solids	90.8	98.2	99.7	98.1	73.9	73.8	88.6	107.5	261.6	96.7	77.8	86.2
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Fluoride	0.058	0.054	0.060	0.057	0.048	0.038	0.052	0.053	0.057	0.047	0.048	0.050
Sulphate	3.3	3.5	3.6	3.5	1.7	1.1	2.3	3.0	3.1	2.6	2.7	2.8
Cyanides												
Total Cyanide	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Cyanide, Weak Acid Dissociable	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Total Metals												
Aluminum	0.035	0.039	0.020	0.304	0.671	0.338	0.226	0.097	0.055	0.272	0.229	0.084
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000127	0.000060	0.000060	0.000060	0.000060	0.000060
Arsenic	0.0007	0.0007	0.0007	0.0007	0.0009	0.0007	0.0008	0.0008	0.0008	0.0010	0.0007	0.0006
Barium	0.0097	0.0100	0.0101	0.0100	0.0110	0.0064	0.0098	0.0116	0.0118	0.0100	0.0080	0.0087
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Cadmium	0.000004	0.000004	0.000004	0.000010	0.000020	0.000009	0.000011	0.000005	0.000004	0.000020	0.0000081	0.0000064
Chromium	0.00030	0.00030	0.00035	0.00052	0.00085	0.00039	0.00033	0.00036	0.00030	0.00054	0.00043	0.00031
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00022	0.00006	0.00006	0.00006	0.00006	0.00014	0.00006	0.00006
Copper	0.00030	0.02982	0.00030	0.00086	0.00118	0.00091	0.00070	0.00054	0.00245	0.00071	0.00030	0.00066
Iron	0.067	0.068	0.044	0.267	0.587	0.247	0.185	0.121	0.111	0.428	0.202	0.127
Lead	0.000030	0.000030	0.000030	0.000092	0.000223	0.000094	0.000030	0.000030	0.000062	0.000115	0.000086	0.000030
Lithium	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.0006
Manganese	0.0057	0.0060	0.0050	0.0140	0.0424	0.0135	0.0141	0.0097	0.0079	0.0505	0.0162	0.0070
Mercury	0.0000036	0.0000036	0.0000036	0.0000108	0.0000160	0.0000121	0.0000074	0.0000036	0.0000036	0.0000138	0.0000036	0.0000036
Molybdenum	0.00092	0.00098	0.00190	0.00104	0.00057	0.00043	0.00087	0.00108	0.00103	0.00134	0.00071	0.00078
Nickel	0.00030	0.00830	0.00030	0.00030	0.00039	0.00551	0.00030	0.00030	0.00030	0.00070	0.00030	0.00030
Selenium	0.000077	0.000076	0.000086	0.000135	0.000094	0.000065	0.000115	0.000077	0.000067	0.000082	0.000072	0.000084
Silver	0.0000060	0.0000060	0.0000060	0.0000105	0.0000218	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Strontium	0.116	0.116	0.133	0.120	0.067	0.055	0.103	0.123	0.120	0.086	0.088	0.097
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Uranium	0.00024	0.00027	0.00032	0.00026	0.00030	0.00023	0.00021	0.00024	0.00023	0.00019	0.00018	0.00018
Vanadium	0.0009	0.0009	0.0006	0.0009	0.0017	0.0010	0.0009	0.0008	0.0009	0.0013	0.0008	0.0007
Zinc	0.0018	0.0089	0.0018	0.0018	0.0040	0.0026	0.0018	0.0032	0.0029	0.0018	0.0018	0.0018

APPENDIX G-1D: BASELINE WATER QUALITY AT DC-15

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.029	0.021	0.012	0.154	0.247	0.212	0.126	0.066	0.043	0.082	0.110	0.053
Cadmium	0.000004	0.000004	0.000004	0.000008	0.000009	0.000004	0.000006	0.000004	0.000004	0.000010	0.000004	0.0000036
Copper	0.00031	0.00030	0.00030	0.00065	0.00083	0.00068	0.00056	0.00032	0.00163	0.00088	0.00043	0.00073
Iron	0.051	0.042	0.031	0.130	0.165	0.126	0.082	0.089	0.086	0.114	0.094	0.077
Manganese	0.0051	0.0042	0.0036	0.0046	0.0047	0.0036	0.0071	0.0065	0.0048	0.0079	0.0047	0.00395
Zinc	0.00180	0.00434	0.00169	0.00180	0.00180	0.00180	0.00190	0.00234	0.00204	0.00173	0.0016	0.00162

Notes:

Concentrations in mg/L, unless otherwise noted.

[1] 95th percentile concentration measured in baseline studies at DC-15 between 2016 and September 30, 2022.

APPENDIX G-1E: BASELINE WATER QUALITY AT 661-05

Parameter	95th Percentile plus 20% Baseline Concentration [1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Physical Parameters and Dissolved Anions												
pH (pH units)	9.52	9.46	9.61	9.36	9.32	8.68	9.40	9.50	9.42	9.37	9.33	9.43
Total suspended solids	1.8	6.1	1.8	1.8	12.9	10.4	108.2	3.8	5.5	9.3	1.8	1.8
Total dissolved solids	82.8	90.0	91.2	72.0	80.7	68.4	109.2	101.3	117.5	87.1	81.1	88.8
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.84	0.30	0.30
Fluoride	0.066	0.082	0.065	0.071	0.060	0.038	0.060	0.068	0.067	0.072	0.069	0.067
Sulphate	1.5	2.7	1.5	1.6	1.1	0.7	1.0	1.2	1.3	1.5	1.3	1.4
Cyanides												
Total Cyanide	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Cyanide, Weak Acid Dissociable	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Total Metals												
Aluminum	0.072	0.065	0.050	0.032	0.455	0.199	0.126	0.089	0.126	0.671	0.172	0.067
Antimony	0.000060	0.000137	0.000132	0.000060	0.000060	0.000060	0.000136	0.000060	0.000060	0.000060	0.000182	0.000060
Arsenic	0.0015	0.0014	0.0016	0.0014	0.0014	0.0008	0.0018	0.0026	0.0021	0.0022	0.0015	0.0013
Barium	0.0069	0.0058	0.0060	0.0052	0.0092	0.0043	0.0062	0.0069	0.0079	0.0123	0.0056	0.0054
Beryllium	0.000012	0.000060	0.000012	0.000012	0.000060	0.000032	0.000055	0.000060	0.000055	0.000058	0.000060	0.000012
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Cadmium	0.000004	0.000004	0.000004	0.000004	0.000015	0.000009	0.000010	0.000011	0.000010	0.000021	0.0000113	0.0000036
Chromium	0.00102	0.00093	0.00108	0.00288	0.00149	0.00073	0.00134	0.00104	0.00164	0.00243	0.00087	0.00092
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00017	0.00006	0.00006	0.00006	0.00006	0.00033	0.00006	0.00006
Copper	0.00030	0.00030	0.00030	0.00030	0.00103	0.00091	0.00075	0.00030	0.00085	0.00114	0.00030	0.00030
Iron	0.204	0.215	0.138	0.133	0.554	0.229	0.231	0.500	0.327	0.853	0.307	0.212
Lead	0.000030	0.000066	0.000030	0.000030	0.000141	0.000030	0.000030	0.000030	0.000030	0.000334	0.000090	0.000030
Lithium	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.0006
Manganese	0.0180	0.0145	0.0104	0.0083	0.0377	0.0071	0.0104	0.0206	0.0150	0.0778	0.0180	0.0151
Mercury	0.0000036	0.0000036	0.0000036	0.0000036	0.0000099	0.0000097	0.0000036	0.0000036	0.0000036	0.0000036	0.0000068	0.0000036
Molybdenum	0.00097	0.00103	0.00124	0.00103	0.00069	0.00034	0.00141	0.00122	0.00143	0.00089	0.00083	0.00090
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00072	0.00030	0.00030
Selenium	0.000085	0.000116	0.000096	0.000074	0.000122	0.000101	0.000158	0.000119	0.000205	0.000200	0.000147	0.000094
Silver	0.0000060	0.0000060	0.0000060	0.0000060	0.0000123	0.0000060	0.0000060	0.0000060	0.0000060	0.0000140	0.0000193	0.0000060
Strontium	0.095	0.098	0.106	0.100	0.080	0.039	0.090	0.096	0.100	0.086	0.090	0.100
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000764	0.0000060
Uranium	0.00027	0.00022	0.00025	0.00020	0.00027	0.00019	0.00025	0.00023	0.00029	0.00045	0.00019	0.00022
Vanadium	0.0022	0.0022	0.0022	0.0019	0.0027	0.0019	0.0039	0.0024	0.0031	0.0035	0.0020	0.0018
Zinc	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0073	0.0018	0.0018

APPENDIX G-1E: BASELINE WATER QUALITY AT 661-05

Parameter	95th Percentile plus 20% Baseline Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.017	0.025	0.013	0.013	0.164	0.126	0.077	0.061	0.082	0.070	0.105	0.019
Cadmium	0.000004	0.000004	0.000004	0.000004	0.000006	0.000004	0.000008	0.000008	0.000009	0.000006	0.000004	0.0000036
Copper	0.00012	0.00030	0.00012	0.00012	0.00079	0.00072	0.00060	0.00033	0.00070	0.00029	0.00060	0.00012
Iron	0.068	0.108	0.050	0.065	0.194	0.148	0.154	0.366	0.236	0.194	0.215	0.095
Manganese	0.0084	0.0091	0.0054	0.0053	0.0068	0.0024	0.0064	0.0112	0.0089	0.0086	0.0087	0.00908
Zinc	0.00060	0.00156	0.00060	0.00060	0.00180	0.00060	0.00168	0.00060	0.00168	0.00174	0.0006	0.00060

Notes:

Concentrations in mg/L, unless otherwise noted.

[1] 95th percentile concentration measured in baseline studies at 661-05 between 2016 and September 30, 2022.

APPENDIX G-1F: BASELINE WATER QUALITY AT 661-10

Parameter	95th Percentile plus 20% Baseline Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Physical Parameters and Dissolved Anions												
pH (pH units)	9.38	9.38	9.22	9.34	8.98	8.30	9.34	9.40	9.25	9.25	9.03	9.30
Total suspended solids	1.8	3.1	1.8	1.8	27.3	10.0	10.0	4.9	4.5	3.2	1.8	3.8
Total dissolved solids	81.1	79.3	70.8	70.8	83.3	67.2	88.3	92.6	96.2	77.3	72.8	90.0
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Fluoride	0.061	0.067	0.065	0.056	0.049	0.036	0.052	0.062	0.054	0.058	0.055	0.053
Sulphate	2.4	2.7	2.3	2.6	1.8	1.2	0.8	1.5	3.0	2.8	2.4	2.5
Cyanides												
Total Cyanide	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Cyanide, Weak Acid Dissociable	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Total Metals												
Aluminum	0.107	0.241	0.056	0.067	0.626	0.412	0.203	0.153	0.142	0.178	0.296	0.073
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000108	0.000060	0.000060
Arsenic	0.0012	0.0013	0.0011	0.0011	0.0012	0.0008	0.0020	0.0022	0.0023	0.0011	0.0011	0.0012
Barium	0.0070	0.0082	0.0054	0.0053	0.0084	0.0051	0.0071	0.0062	0.0070	0.0052	0.0051	0.0059
Beryllium	0.000012	0.000060	0.000012	0.000012	0.000060	0.000034	0.000055	0.000060	0.000060	0.000050	0.000060	0.000012
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Cadmium	0.000018	0.000020	0.000008	0.000007	0.000043	0.000031	0.000027	0.000038	0.000034	0.000014	0.0000221	0.0000130
Chromium	0.00030	0.00076	0.00030	0.00030	0.00091	0.00066	0.00068	0.00062	0.00082	0.00030	0.00058	0.00030
Cobalt	0.00006	0.00014	0.00006	0.00006	0.00021	0.00006	0.00006	0.00006	0.00014	0.00006	0.00006	0.00006
Copper	0.00030	0.00144	0.00030	0.00030	0.00111	0.00094	0.00069	0.00065	0.00070	0.00030	0.00070	0.00030
Iron	0.245	0.438	0.169	0.245	0.698	0.337	0.372	0.451	0.646	0.287	0.305	0.229
Lead	0.000030	0.000161	0.000030	0.000030	0.000692	0.000197	0.000159	0.000030	0.000080	0.000030	0.000091	0.000030
Lithium	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00118	0.00060	0.0006
Manganese	0.0241	0.0430	0.0111	0.0149	0.0561	0.0132	0.0209	0.0287	0.0553	0.0214	0.0200	0.0235
Mercury	0.0000036	0.0000036	0.0000036	0.0000036	0.0000129	0.0000080	0.0000036	0.0000036	0.0000056	0.0000036	0.0000071	0.0000036
Molybdenum	0.00123	0.00093	0.00080	0.00067	0.00039	0.00023	0.00079	0.00111	0.00080	0.00052	0.00050	0.00068
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030
Selenium	0.000030	0.000091	0.000030	0.000030	0.000089	0.000030	0.000080	0.000071	0.000104	0.000087	0.000085	0.000030
Silver	0.0000060	0.0000060	0.0000060	0.0000060	0.0000257	0.0000228	0.0000060	0.0000060	0.0000111	0.0000060	0.0000152	0.0000060
Strontium	0.079	0.114	0.079	0.074	0.059	0.030	0.079	0.084	0.076	0.069	0.065	0.074
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060
Vanadium	0.0016	0.0018	0.0018	0.0012	0.0021	0.0014	0.0018	0.0017	0.0027	0.0014	0.0014	0.0012
Zinc	0.0038	0.0066	0.0018	0.0018	0.0091	0.0082	0.0053	0.0102	0.0082	0.0042	0.0073	0.0018

APPENDIX G-1F: BASELINE WATER QUALITY AT 661-10

Parameter	95th Percentile plus 20% Baseline Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Uranium	0.00013	0.00017	0.00011	0.00012	0.00021	0.00020	0.00018	0.00015	0.00016	0.00011	0.00012	0.00012
Aluminum	0.038	0.054	0.029	0.034	0.207	0.222	0.128	0.124	0.085	0.105	0.249	0.033
Cadmium	0.000007	0.000009	0.000007	0.000004	0.000018	0.000017	0.000016	0.000017	0.000017	0.000010	0.000016	0.0000067
Copper	0.00012	0.00030	0.00012	0.00026	0.00076	0.00073	0.00060	0.00035	0.00057	0.00035	0.00067	0.00012
Iron	0.116	0.201	0.096	0.151	0.322	0.149	0.221	0.324	0.402	0.189	0.229	0.130
Manganese	0.0135	0.0144	0.0085	0.0095	0.0199	0.0036	0.0091	0.0177	0.0111	0.0133	0.0124	0.01380
Zinc	0.00236	0.00432	0.00156	0.00180	0.00559	0.00600	0.00410	0.00350	0.00436	0.00274	0.0063	0.00240

Notes:

Concentrations in mg/L, unless otherwise noted.

[1] 95th percentile concentration measured in baseline studies at 661-10 between 2016 and September 30, 2022.

APPENDIX G-1G: PREDICTED WATER QUALITY AT DC-05

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Anions												
Chloride	0.98	0.79	0.67	0.56	0.53	0.82	0.78	0.88	1.11	1.04	1.05	1.02
Fluoride	0.28	0.22	0.23	0.20	0.17	0.27	0.27	0.37	0.45	0.36	0.31	0.28
Sulphate	76	69	59	44	30	70	78	100	123	107	92	70
Nutrients												
Ammonia-N	0.39	0.36	0.40	0.29	0.36	0.21	0.19	0.22	0.31	0.42	0.44	0.37
Nitrate-N	1.9	1.6	1.6	1.2	1.5	1.5	1.3	1.8	1.9	2.2	2.3	2.1
Nitrite-N	0.014	0.013	0.013	0.0098	0.014	0.012	0.0090	0.011	0.016	0.018	0.019	0.016
Total Phosphorous	0.034	0.035	0.036	0.038	0.027	0.024	0.025	0.030	0.036	0.034	0.038	0.035
Orthophosphate	0.034	0.030	0.030	0.032	0.023	0.016	0.016	0.016	0.019	0.021	0.029	0.028
Cyanides												
Total Cyanide	0.0031	0.0030	0.0031	0.0034	0.0032	0.0033	0.0032	0.0029	0.0034	0.0034	0.0031	0.0032
Cyanide, Weak Acid Dissociable	0.0031	0.0030	0.0031	0.0034	0.0032	0.0033	0.0032	0.0029	0.0034	0.0034	0.0031	0.0032
Total Metals												
Aluminum	0.10	0.082	0.079	0.072	0.18	0.33	0.33	0.23	0.19	0.19	0.14	0.12
Antimony	0.0068	0.0065	0.0065	0.0054	0.0033	0.0030	0.0026	0.0042	0.0055	0.0071	0.0069	0.0059
Arsenic	0.0019	0.0017	0.0016	0.0014	0.0013	0.00091	0.0011	0.0013	0.0014	0.0015	0.0015	0.0014
Barium	0.0089	0.0088	0.0085	0.0086	0.0091	0.0096	0.0081	0.0077	0.0097	0.0094	0.0092	0.0083
Beryllium	0.000084	0.000082	0.000087	0.000078	0.000065	0.000076	0.000071	0.000068	0.000071	0.000077	0.000077	0.000092
Boron	0.025	0.025	0.024	0.022	0.016	0.013	0.012	0.017	0.020	0.022	0.024	0.026
Cadmium	0.000054	0.000050	0.000048	0.000042	0.000027	0.000027	0.000028	0.000032	0.000040	0.000049	0.000051	0.000054
Chromium	0.00095	0.00085	0.00084	0.00068	0.00062	0.00046	0.00051	0.00056	0.00067	0.00067	0.00068	0.00068
Cobalt	0.00076	0.00074	0.00068	0.00058	0.00035	0.00033	0.00028	0.00044	0.00055	0.00064	0.00063	0.00062
Copper	0.00052	0.00051	0.00048	0.00045	0.00046	0.00073	0.00069	0.00054	0.00047	0.00045	0.00045	0.00053
Iron	0.11	0.11	0.10	0.094	0.15	0.24	0.233	0.18	0.14	0.154	0.132	0.12
Lead	0.00018	0.00017	0.00018	0.00014	0.00017	0.00015	0.00013	0.00013	0.00017	0.00020	0.00021	0.00019
Lithium	0.021	0.018	0.016	0.011	0.0075	0.020	0.025	0.028	0.037	0.032	0.026	0.020
Manganese	0.089	0.074	0.064	0.061	0.046	0.104	0.100	0.11	0.19	0.14	0.13	0.113
Mercury	0.000014	0.000014	0.000015	0.000013	0.0000089	0.0000098	0.000011	0.000011	0.000012	0.000014	0.000014	0.000015
Molybdenum	0.0025	0.0027	0.0026	0.0024	0.0015	0.0013	0.0011	0.0012	0.0017	0.0020	0.0020	0.0022
Nickel	0.00095	0.00090	0.00091	0.00078	0.00050	0.00060	0.00053	0.00074	0.00088	0.00098	0.00089	0.00083
Selenium	0.00015	0.00016	0.00018	0.00018	0.00011	0.00012	0.000095	0.00010	0.00013	0.00015	0.00016	0.00018
Silver	0.000029	0.000024	0.000023	0.000021	0.000022	0.000029	0.000029	0.000025	0.000027	0.000026	0.000028	0.000027
Strontium	0.17	0.15	0.14	0.12	0.10	0.15	0.15	0.19	0.23	0.21	0.18	0.15
Thallium	0.000069	0.000056	0.000053	0.000041	0.000038	0.000046	0.000038	0.000038	0.000062	0.000064	0.000071	0.000067

APPENDIX G-1G: PREDICTED WATER QUALITY AT DC-05

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Total Metals *(cont'd)*												
Uranium	0.00026	0.00027	0.00031	0.00030	0.00028	0.00031	0.00024	0.00021	0.00024	0.00027	0.00026	0.00031
Vanadium	0.0062	0.0053	0.0047	0.0035	0.0023	0.0061	0.0073	0.0083	0.0109	0.0095	0.0077	0.0058
Zinc	0.0046	0.0042	0.0039	0.0036	0.0026	0.0032	0.0034	0.0033	0.0038	0.0037	0.0040	0.0042
Dissolved Metals												
Aluminum	0.039	0.026	0.021	0.022	0.13	0.14	0.101	0.102	0.053	0.093	0.11	0.070
Cadmium	0.000055	0.000051	0.000049	0.000043	0.000027	0.000024	0.000028	0.000032	0.000041	0.000048	0.000050	0.000053
Copper	0.00052	0.00049	0.00046	0.00041	0.00044	0.00069	0.00068	0.00053	0.00046	0.00045	0.00045	0.00053
Iron	0.085	0.082	0.078	0.071	0.085	0.14	0.14	0.11	0.10	0.11	0.091	0.091
Manganese	0.088	0.074	0.063	0.060	0.045	0.10	0.094	0.11	0.19	0.14	0.13	0.11
Zinc	0.0041	0.0036	0.0032	0.0030	0.0022	0.0029	0.0030	0.0028	0.0034	0.0033	0.0035	0.0038

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ28 in the water quality prediction model v.13e (Lorax 2022a).

APPENDIX G-1H: PREDICTED WATER QUALITY AT DC-10

Parameter	Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Anions												
Chloride	0.98	0.79	0.67	0.55	0.53	0.81	0.78	0.88	1.1	1.0	1.0	1.0
Fluoride	0.28	0.22	0.23	0.19	0.17	0.27	0.27	0.37	0.45	0.36	0.31	0.28
Sulphate	75.6	68.9	59.0	43.8	30.4	69.8	77.5	100	123	107	91.6	69.6
Cyanides												
Total Cyanide	0.0031	0.0030	0.0031	0.0033	0.0032	0.0033	0.0032	0.0029	0.0034	0.0033	0.0031	0.0032
Cyanide, Weak Acid Dissociable	0.0031	0.0030	0.0031	0.0033	0.0032	0.0033	0.0032	0.0029	0.0034	0.0033	0.0031	0.0032
Total Metals												
Aluminum	0.094	0.074	0.071	0.070	0.18	0.33	0.33	0.23	0.18	0.19	0.14	0.109
Antimony	0.0068	0.0065	0.0064	0.0054	0.0033	0.0030	0.0026	0.0042	0.0055	0.0070	0.0069	0.0059
Arsenic	0.0017	0.0015	0.0015	0.0014	0.0013	0.00090	0.0010	0.0012	0.0013	0.0014	0.0014	0.0013
Barium	0.0089	0.0087	0.0085	0.0084	0.0091	0.0096	0.0081	0.0077	0.0096	0.0093	0.0090	0.0083
Beryllium	0.000083	0.000081	0.000087	0.000078	0.000065	0.000076	0.000071	0.000068	0.000071	0.000077	0.000077	0.000092
Boron	0.024	0.022	0.022	0.021	0.016	0.013	0.012	0.016	0.020	0.022	0.024	0.024
Cadmium	0.000054	0.000050	0.000048	0.000042	0.000027	0.000027	0.000028	0.000032	0.000040	0.000049	0.000050	0.000054
Chromium	0.00086	0.00077	0.00075	0.00065	0.00062	0.00046	0.00049	0.00053	0.00062	0.00064	0.00064	0.00062
Cobalt	0.00076	0.00073	0.00068	0.00058	0.00035	0.00033	0.00028	0.00044	0.00055	0.00063	0.00063	0.00062
Copper	0.00052	0.00051	0.00048	0.00045	0.00046	0.00073	0.00069	0.00054	0.00047	0.00045	0.00045	0.00053
Iron	0.11	0.11	0.10	0.091	0.15	0.24	0.23	0.18	0.14	0.15	0.13	0.11
Lead	0.00018	0.00017	0.00018	0.00013	0.00017	0.00015	0.00013	0.00012	0.00017	0.00020	0.00021	0.00019
Lithium	0.021	0.018	0.016	0.011	0.0075	0.020	0.025	0.028	0.037	0.032	0.026	0.020
Manganese	0.089	0.074	0.059	0.060	0.046	0.10	0.099	0.11	0.19	0.14	0.13	0.099
Mercury	0.000014	0.000014	0.000015	0.000013	0.0000089	0.0000098	0.000011	0.000011	0.000012	0.000014	0.000014	0.000015
Molybdenum	0.0024	0.0027	0.0026	0.0024	0.0015	0.0013	0.0011	0.0012	0.0017	0.0020	0.0020	0.0022
Nickel	0.00095	0.00090	0.00091	0.00078	0.00050	0.00060	0.00053	0.00074	0.00087	0.00098	0.00089	0.00083
Selenium	0.00015	0.00016	0.00018	0.00018	0.00011	0.00012	0.000095	0.00010	0.00013	0.00015	0.00016	0.00018
Silver	0.000029	0.000024	0.000023	0.000020	0.000022	0.000029	0.000028	0.000025	0.000027	0.000026	0.000028	0.000027
Strontium	0.17	0.15	0.14	0.12	0.10	0.15	0.15	0.19	0.23	0.21	0.18	0.15
Thallium	0.000069	0.000056	0.000053	0.000039	0.000038	0.000046	0.000038	0.000037	0.000062	0.000064	0.000071	0.000067
Uranium	0.00026	0.00027	0.00031	0.00030	0.00028	0.00031	0.00024	0.00021	0.00024	0.00027	0.00026	0.00031
Vanadium	0.0062	0.0053	0.0047	0.0035	0.0023	0.0061	0.0073	0.0083	0.0109	0.0094	0.0077	0.0058
Zinc	0.0045	0.0042	0.0038	0.0036	0.0026	0.0032	0.0034	0.0033	0.0038	0.0037	0.0040	0.0042

APPENDIX G-1H: PREDICTED WATER QUALITY AT DC-10

Parameter	Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.037	0.024	0.018	0.022	0.13	0.14	0.099	0.098	0.053	0.088	0.11	0.064
Cadmium	0.000054	0.000051	0.000048	0.000043	0.000027	0.000024	0.000028	0.000032	0.000041	0.000048	0.000050	0.000053
Copper	0.00052	0.00049	0.00046	0.00041	0.00044	0.00069	0.00068	0.00053	0.00046	0.00045	0.00045	0.00053
Iron	0.085	0.082	0.078	0.070	0.085	0.14	0.14	0.11	0.10	0.10	0.089	0.091
Manganese	0.088	0.073	0.058	0.059	0.044	0.10	0.093	0.11	0.19	0.14	0.13	0.098
Zinc	0.0041	0.0036	0.0031	0.0030	0.0022	0.0029	0.0029	0.0028	0.0034	0.0033	0.0035	0.0038

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ27 in the water quality prediction model v.13e (Lorax 2022a).

APPENDIX G-1I: PREDICTED WATER QUALITY AT DC-15

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Anions												
Chloride	0.78	0.65	0.56	0.49	0.52	0.77	0.69	0.76	0.90	0.88	0.90	0.80
Fluoride	0.22	0.18	0.19	0.17	0.16	0.25	0.24	0.30	0.35	0.31	0.26	0.22
Sulphate	58	54	44	36	28	65	65	81	98	87	72	51
Cyanides												
Total Cyanide	0.0029	0.0029	0.0029	0.0031	0.0031	0.0032	0.0031	0.0028	0.0032	0.0032	0.0030	0.0029
Cyanide, Weak Acid Dissociable	0.0029	0.0029	0.0028	0.0031	0.0031	0.0032	0.0031	0.0028	0.0032	0.0032	0.0030	0.0029
Total Metals												
Aluminum	0.077	0.062	0.060	0.065	0.19	0.31	0.28	0.19	0.15	0.17	0.13	0.092
Antimony	0.0050	0.0049	0.0046	0.0043	0.0030	0.0028	0.0022	0.0035	0.0045	0.0058	0.0059	0.0045
Arsenic	0.0015	0.0013	0.0013	0.0013	0.0012	0.0009	0.0010	0.0011	0.0012	0.0013	0.0012	0.0012
Barium	0.0086	0.0085	0.0083	0.0083	0.0088	0.0094	0.0080	0.0077	0.0093	0.0091	0.0085	0.0077
Beryllium	0.000077	0.000075	0.000079	0.000075	0.000065	0.000075	0.000069	0.000066	0.000068	0.000073	0.000073	0.000080
Boron	0.019	0.019	0.019	0.019	0.016	0.013	0.011	0.014	0.017	0.020	0.020	0.019
Cadmium	0.000040	0.000039	0.000036	0.000035	0.000026	0.000025	0.000025	0.000028	0.000034	0.000042	0.000044	0.000038
Chromium	0.00072	0.00064	0.00062	0.00059	0.00060	0.00045	0.00044	0.00047	0.00054	0.00059	0.00057	0.00053
Cobalt	0.00057	0.00055	0.00053	0.00048	0.00033	0.00031	0.00025	0.00037	0.00045	0.00050	0.00053	0.00048
Copper	0.00045	0.00044	0.00042	0.00041	0.00049	0.00071	0.00063	0.00049	0.00043	0.00048	0.00043	0.00044
Iron	0.092	0.089	0.080	0.086	0.15	0.23	0.204	0.16	0.12	0.147	0.122	0.10
Lead	0.00015	0.00014	0.00014	0.00012	0.00016	0.00014	0.00011	0.00011	0.00014	0.00017	0.00018	0.00015
Lithium	0.016	0.013	0.011	0.0094	0.0070	0.019	0.021	0.022	0.029	0.025	0.021	0.015
Manganese	0.066	0.058	0.048	0.052	0.045	0.099	0.084	0.092	0.151	0.117	0.105	0.081
Mercury	0.000011	0.000011	0.000011	0.000011	0.0000090	0.0000094	0.0000094	0.0000095	0.000010	0.000012	0.000012	0.000011
Molybdenum	0.0020	0.0022	0.0021	0.0020	0.0015	0.0012	0.0010	0.0011	0.0015	0.0018	0.0018	0.0017
Nickel	0.00077	0.00075	0.00074	0.00070	0.00049	0.00059	0.00051	0.00065	0.00077	0.00083	0.00079	0.00069
Selenium	0.00013	0.00014	0.00015	0.00016	0.00011	0.00011	0.000092	0.000096	0.00011	0.00013	0.00014	0.00014
Silver	0.000022	0.000019	0.000019	0.000017	0.000021	0.000027	0.000025	0.000022	0.000023	0.000023	0.000024	0.000022
Strontium	0.14	0.13	0.13	0.12	0.095	0.15	0.14	0.16	0.20	0.18	0.15	0.12
Thallium	0.000052	0.000042	0.000042	0.000036	0.000037	0.000044	0.000033	0.000033	0.000051	0.000055	0.000058	0.000052
Uranium	0.00023	0.00025	0.00029	0.00028	0.00027	0.00029	0.00022	0.00020	0.00022	0.00024	0.00023	0.00025
Vanadium	0.0046	0.0040	0.0035	0.0030	0.0022	0.0058	0.0062	0.0068	0.0087	0.0073	0.0062	0.0046
Zinc	0.0037	0.0038	0.0032	0.0031	0.0026	0.0031	0.0031	0.0030	0.0033	0.0034	0.0037	0.0035

APPENDIX G-1I: PREDICTED WATER QUALITY AT DC-15

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.026	0.014	0.011	0.021	0.13	0.13	0.077	0.068	0.035	0.073	0.078	0.047
Cadmium	0.000041	0.000040	0.000036	0.000035	0.000026	0.000022	0.000024	0.000027	0.000034	0.000041	0.000044	0.000038
Copper	0.00045	0.00042	0.00040	0.00039	0.00045	0.00066	0.00062	0.00048	0.00043	0.00041	0.00043	0.00044
Iron	0.070	0.067	0.060	0.065	0.086	0.13	0.12	0.097	0.091	0.10	0.083	0.078
Manganese	0.065	0.057	0.047	0.051	0.043	0.10	0.079	0.089	0.15	0.12	0.104	0.080
Zinc	0.0032	0.0032	0.0026	0.0027	0.0022	0.0028	0.0027	0.0025	0.0030	0.0030	0.0030	0.0031

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ26 in the water quality prediction model v.13e (Lorax 2022a).

APPENDIX G-1J: PREDICTED WATER QUALITY AT 661-05

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Anions												
Chloride	0.42	0.27	0.32	0.37	0.29	0.27	0.33	0.28	0.22	0.27	0.28	0.32
Fluoride	0.070	0.061	0.061	0.063	0.055	0.066	0.059	0.048	0.053	0.053	0.054	0.076
Sulphate	3.4	3.3	3.1	3.0	3.9	3.0	2.1	2.4	2.3	3.0	3.4	4.7
Cyanides												
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.057	0.042	0.088	0.13	0.26	0.20	0.083	0.066	0.056	0.073	0.076	0.070
Antimony	0.00035	0.00034	0.00034	0.00039	0.00061	0.00061	0.00042	0.00042	0.00037	0.00039	0.00044	0.00034
Arsenic	0.0007	0.0012	0.0012	0.0013	0.0012	0.0011	0.0009	0.0012	0.0008	0.0008	0.0010	0.0007
Barium	0.0072	0.0048	0.0063	0.0078	0.0047	0.0036	0.0042	0.0046	0.0052	0.0041	0.0044	0.0055
Beryllium	0.000065	0.000065	0.000065	0.000069	0.000078	0.000079	0.000070	0.000069	0.000068	0.000068	0.000070	0.000066
Boron	0.0021	0.0065	0.0054	0.0047	0.0078	0.0036	0.0026	0.0069	0.0024	0.0068	0.0051	0.0029
Cadmium	0.00011	0.000014	0.000014	0.000015	0.000031	0.000021	0.000017	0.000018	0.000016	0.000016	0.000023	0.000026
Chromium	0.00015	0.00030	0.00029	0.00027	0.00047	0.00015	0.00019	0.00032	0.00023	0.00015	0.00034	0.00015
Cobalt	0.00011	0.000096	0.000095	0.00010	0.00014	0.00013	0.000088	0.00011	0.000085	0.000087	0.00010	0.000090
Copper	0.00054	0.00029	0.00046	0.00064	0.00069	0.00033	0.00050	0.00037	0.00035	0.00025	0.00041	0.00044
Iron	0.37	0.17	0.17	0.17	0.22	0.11	0.10	0.19	0.21	0.12	0.17	0.19
Lead	0.000354	0.000034	0.000153	0.000274	0.000096	0.000042	0.000037	0.000036	0.000035	0.000036	0.000037	0.000076
Lithium	0.0011	0.0011	0.0011	0.0012	0.0015	0.0016	0.0013	0.0012	0.0012	0.0012	0.0013	0.0011
Manganese	0.027	0.020	0.019	0.020	0.025	0.018	0.014	0.019	0.013	0.013	0.021	0.022
Mercury	0.0000037	0.0000037	0.0000037	0.0000040	0.0000088	0.0000049	0.0000041	0.0000040	0.0000039	0.0000040	0.0000063	0.0000045
Molybdenum	0.00037	0.00080	0.00056	0.00035	0.00052	0.00045	0.00039	0.00060	0.00052	0.00039	0.00043	0.00039
Nickel	0.00029	0.00032	0.00036	0.00041	0.00039	0.00034	0.00031	0.00034	0.00025	0.00019	0.00035	0.00028
Selenium	0.00031	0.000041	0.000054	0.000070	0.000085	0.00032	0.00019	0.000074	0.00011	0.00031	0.00021	0.00019
Silver	0.000026	0.0000066	0.000017	0.000027	0.000022	0.000027	0.000027	0.0000071	0.000027	0.000027	0.000021	0.000026
Strontium	0.073	0.067	0.058	0.049	0.032	0.031	0.041	0.047	0.059	0.045	0.049	0.061
Thallium	0.000030	0.000011	0.000021	0.000032	0.000016	0.000035	0.000032	0.000012	0.000031	0.000031	0.000022	0.000031
Uranium	0.000067	0.000096	0.000087	0.000080	0.00014	0.00012	0.000079	0.00010	0.000077	0.000070	0.000084	0.000056
Vanadium	0.00037	0.00098	0.00062	0.00029	0.0012	0.00056	0.00070	0.00094	0.00050	0.00041	0.00065	0.00059
Zinc	0.028	0.0018	0.0024	0.0030	0.0050	0.0020	0.0019	0.0036	0.0020	0.0029	0.0021	0.0012

APPENDIX G-1J: PREDICTED WATER QUALITY AT 661-05

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.047	0.032	0.075	0.12	0.17	0.19	0.075	0.054	0.043	0.058	0.062	0.22
Cadmium	0.000063	0.0000093	0.000012	0.000015	0.000024	0.000021	0.000017	0.000017	0.000016	0.000016	0.000019	0.000015
Copper	0.00054	0.00029	0.00046	0.00064	0.00064	0.00033	0.00038	0.00030	0.00035	0.00010	0.00028	0.00044
Iron	0.18	0.13	0.14	0.16	0.13	0.091	0.10	0.15	0.11	0.10	0.12	0.11
Manganese	0.025	0.016	0.017	0.018	0.018	0.016	0.013	0.015	0.013	0.013	0.014	0.015
Zinc	0.013	0.0039	0.0034	0.0030	0.0039	0.0020	0.0019	0.0024	0.0020	0.0019	0.0024	0.00061

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ3 in the water quality prediction model v.13e (Lorax 2022a).

APPENDIX G-1K: PREDICTED WATER QUALITY AT 661-10

Parameter	2022 Predicted Concentration[1]											
	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Dissolved Anions												
Chloride	0.42	0.27	0.32	0.37	0.27	0.25	0.32	0.27	0.22	0.27	0.27	0.32
Fluoride	0.073	0.064	0.063	0.060	0.045	0.056	0.056	0.047	0.052	0.053	0.053	0.078
Sulphate	3.7	3.6	3.3	2.6	2.7	1.7	1.7	2.2	2.3	3.0	3.3	4.9
Cyanides												
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.057	0.042	0.088	0.13	0.26	0.21	0.083	0.066	0.056	0.074	0.076	0.070
Antimony	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000049	0.000049
Arsenic	0.00074	0.0013	0.0013	0.0012	0.00091	0.00074	0.00077	0.0011	0.00080	0.00082	0.00098	0.00074
Barium	0.0072	0.0049	0.0063	0.0077	0.0045	0.0033	0.0041	0.0046	0.0052	0.0041	0.0044	0.0055
Beryllium	0.000068	0.000068	0.000069	0.000064	0.000065	0.000066	0.000066	0.000067	0.000067	0.000068	0.000068	0.000068
Boron	0.0024	0.0068	0.0057	0.0042	0.0065	0.0021	0.0021	0.0067	0.0023	0.0068	0.0049	0.0032
Cadmium	0.00011	0.000015	0.000016	0.000014	0.000025	0.000015	0.000015	0.000017	0.000015	0.000016	0.000022	0.000027
Chromium	0.00015	0.00030	0.00029	0.00027	0.00047	0.00015	0.00019	0.00032	0.00023	0.00015	0.00034	0.00015
Cobalt	0.00012	0.00011	0.00011	0.000090	0.00010	0.000089	0.000074	0.00010	0.000083	0.000086	0.000097	0.000097
Copper	0.00054	0.00030	0.00047	0.00063	0.00066	0.00029	0.00049	0.00037	0.00034	0.00025	0.00040	0.00045
Iron	0.37	0.17	0.17	0.17	0.22	0.11	0.10	0.19	0.21	0.12	0.17	0.19
Lead	0.00035	0.000036	0.00015	0.00027	0.000089	0.000034	0.000034	0.000035	0.000035	0.000035	0.000036	0.000077
Lithium	0.0012	0.0012	0.0012	0.0010	0.0010	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012
Manganese	0.029	0.021	0.021	0.018	0.019	0.012	0.012	0.018	0.013	0.013	0.020	0.023
Mercury	0.0000040	0.0000040	0.0000040	0.0000037	0.0000078	0.0000038	0.0000038	0.0000038	0.0000039	0.0000039	0.0000061	0.0000047
Molybdenum	0.00041	0.00083	0.00059	0.00030	0.00035	0.00028	0.00033	0.00057	0.00051	0.00038	0.00041	0.00042
Nickel	0.00030	0.00034	0.00037	0.00039	0.00032	0.00027	0.00028	0.00033	0.00025	0.00019	0.00034	0.00029
Selenium	0.00031	0.000045	0.000058	0.000066	0.000071	0.00031	0.00019	0.000071	0.000110	0.00031	0.00020	0.00019
Silver	0.000027	0.0000069	0.000017	0.000026	0.000020	0.000026	0.000026	0.0000068	0.000026	0.000027	0.000021	0.000027
Strontium	0.073	0.068	0.058	0.048	0.028	0.027	0.039	0.047	0.059	0.045	0.049	0.061
Thallium	0.000031	0.0000117	0.000022	0.000030	0.0000105	0.000031	0.000031	0.0000112	0.000031	0.000031	0.000022	0.000031
Uranium	0.000070	0.000099	0.000090	0.000076	0.00013	0.000103	0.000074	0.000100	0.000077	0.000070	0.000081	0.000058
Vanadium	0.00040	0.00101	0.00065	0.000241	0.00103	0.00041	0.00065	0.00092	0.00049	0.00040	0.00062	0.00061
Zinc	0.028	0.0019	0.0024	0.0029	0.0048	0.0017	0.0018	0.0035	0.0019	0.0028	0.0020	0.00122

APPENDIX G-1K: PREDICTED WATER QUALITY AT 661-10

Parameter	2022 Predicted Concentration[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
Dissolved Metals												
Aluminum	0.047	0.032	0.075	0.12	0.17	0.19	0.076	0.054	0.043	0.058	0.062	0.22
Cadmium	0.000064	0.000011	0.000013	0.000014	0.000018	0.000015	0.000015	0.000016	0.000015	0.000016	0.000019	0.000016
Copper	0.00054	0.00030	0.00047	0.00063	0.00061	0.00029	0.00037	0.00029	0.00034	0.00010	0.00027	0.00045
Iron	0.18	0.13	0.14	0.16	0.13	0.092	0.10	0.15	0.11	0.10	0.12	0.11
Manganese	0.026	0.018	0.018	0.016	0.012	0.010	0.011	0.014	0.012	0.012	0.014	0.016
Zinc	0.013	0.0039	0.0035	0.0029	0.0036	0.0017	0.0018	0.0023	0.0019	0.0019	0.0023	0.00066

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ5 in the water quality prediction model v.13e (Lorax 2022a).

APPENDIX G-2: BASELINE SEDIMENT QUALITY AT 661-10

Parameter	N	95th percentile[1]
Percent Clay (< 4 um)	15	3.1
Percent Silt (4 um - 63 um)	15	20.71
Percent Sand (63 um - 2 mm)	15	88.4
Percent Gravel (> 2mm)	15	80.77
Inorganic Carbon[2]	10	0.21
Total Carbon[2]	10	6.86
Total Organic Carbon[2]	10	6.65
pH (pH units)	10	7.63
Aluminum	15	19530
Antimony	15	0.56
Arsenic	15	16.75
Barium	15	159
Beryllium	15	0.96
Bismuth	15	0.14
Boron	15	2.5
Cadmium	15	0.852
Chromium	15	32.73
Cobalt	15	8.32
Copper	15	14.23
Iron	15	24090
Lead	15	13.69
Lithium	15	12.73
Manganese	15	1600
Mercury	15	0.089
Molybdenum	15	1.915
Nickel	15	17.58
Phosphorus	15	1083
Selenium	15	1.10
Silver	15	0.30
Strontium	15	74.45
Thallium	15	0.17
Tin	15	1
Titanium	15	814.1
Uranium	15	6.02
Vanadium	15	56.99
Zinc	15	115.3

Notes:

concentrations in mgkg unless otherwise noted

[1] 95th percentile concentration measured at DC-05 in baseline (2017 and 2022) and Year 1 of Construction (2023).

[2] Carbon in the 63 µm fraction. The 2017 laboratory analysis of carbon was in the total fraction and was not included in the calculation of the 95th percentile.

APPENDIX G-2: BASELINE SEDIMENT QUALITY AT 661-10

Parameter	N	95th percentile[1]
Percent Clay (< 4 um)	16	2.83
Percent Silt (4 um - 63 um)	16	14.89
Percent Sand (63 um - 2 mm)	16	90.65
Percent Gravel (> 2mm)	16	42.2
Inorganic Carbon[2]	16	0.16
Total Carbon[2]	16	4.57
Total Organic Carbon[2]	16	4.43
pH (pH units)	11	7.70
Aluminum	16	20325
Antimony	16	0.5325
Arsenic	16	13.73
Barium	16	158.75
Beryllium	16	0.82
Bismuth	16	0.12
Boron	16	2.5
Cadmium	16	0.53
Chromium	16	55.9
Cobalt	16	9.45
Copper	16	25.68
Iron	16	27500
Lead	16	17.65
Lithium	16	11.875
Manganese	16	1652.5
Mercury	16	0.080
Molybdenum	16	4.04
Nickel	16	32.95
Phosphorus	16	1145
Selenium	16	0.73
Silver	16	0.22
Strontium	16	70.05
Thallium	16	0.15
Tin	16	6.24
Titanium	16	1270
Uranium	16	4.22
Vanadium	16	72.95
Zinc	16	99.88

Notes:

concentrations in mgkg unless otherwise noted

[1] 95th percentile concentration measured at DC-15 in baseline (2021 and 2022) and Year 1 of Construction (2023).

[2] Carbon in the 63 µm fraction. The 2017 laboratory analysis of carbon was in the total fraction and was not included in the calculation of the 95th percentile.

APPENDIX G-2: BASELINE SEDIMENT QUALITY AT 661-10

Parameter	N	95th percentile[1]
Percent Clay (< 4 um)	20	3.56
Percent Silt (4 um - 63 um)	20	23.38
Percent Sand (63 um - 2 mm)	20	87.6
Percent Gravel (> 2mm)	20	61.54
Inorganic Carbon[2]	15	0.21
Total Carbon[2]	15	7.96
Total Organic Carbon[2]	15	7.80
pH (pH units)	15	7.33
Aluminum	20	14175
Antimony	20	0.591
Arsenic	20	17.01
Barium	20	148.2
Beryllium	20	0.63
Bismuth	20	0.10
Boron	20	2.5
Cadmium	20	0.43
Chromium	20	88.505
Cobalt	20	8.69
Copper	20	14.06
Iron	20	18705
Lead	20	14.555
Lithium	20	8.34
Manganese	20	2541
Mercury	20	0.094
Molybdenum	20	6.7925
Nickel	20	45.52
Phosphorus	20	1375.5
Selenium	20	1.26
Silver	20	0.21
Strontium	20	79.825
Thallium	20	0.14
Tin	20	6.43
Titanium	20	795.4
Uranium	20	5.77
Vanadium	20	53.615
Zinc	20	83.20

Notes:

concentrations in mgkg unless otherwise noted

[1] 95th percentile concentration measured at 661-05 in baseline (2017, 2021, and 2022) and Year 1 of Construction (2023).

[2] Carbon in the 63 µm fraction. The 2017 laboratory analysis of carbon was in the total fraction and was not included in the calculation of the 95th percentile.

APPENDIX G-2: BASELINE SEDIMENT QUALITY AT 661-10

Parameter	N	95th percentile[1]
Percent Clay (< 4 um)	15	1.60
Percent Silt (4 um - 63 um)	15	6.10
Percent Sand (63 um - 2 mm)	15	94.76
Percent Gravel (> 2mm)	15	80.73
Inorganic Carbon[2]	10	0.18
Total Carbon[2]	10	6.51
Total Organic Carbon[2]	10	6.33
pH (pH units)	10	7.35
Aluminum	15	23230
Antimony	15	0.892
Arsenic	15	15.73
Barium	15	131.2
Beryllium	15	0.85
Bismuth	15	0.14
Boron	15	2.5
Cadmium	15	1.48
Chromium	15	35.79
Cobalt	15	8.58
Copper	15	14.44
Iron	15	21190
Lead	15	21.13
Lithium	15	11.9
Manganese	15	1207
Mercury	15	0.080
Molybdenum	15	1.074
Nickel	15	15.46
Phosphorus	15	1146
Selenium	15	0.58
Silver	15	0.52
Strontium	15	67.12
Thallium	15	0.20
Tin	15	1
Titanium	15	958.9
Uranium	15	5.53
Vanadium	15	58.24
Zinc	15	330.60

Notes:

concentrations in mgkg unless otherwise noted

[1] 95th percentile concentration measured at 661-10 in baseline (2017 and 2022) and Year 1 of Construction (2023).

[2] Carbon in the 63 µm fraction. The 2017 laboratory analysis of carbon was in the total fraction and was not included in the calculation of the 95th percentile.

APPENDIX G-3A: BASELINE PERIPHYTON BIOMASS (AS CHLOROPHYLL *A*)

Site	**N**	**95th Percentile[1] (µg/cm^2)**
DC-05	10	0.37
DC-15	5	0.13
661-05	10	1.98
661-10	10	0.56

Notes:

[1] 95th percentile concentration measured at sites in 2017 and 2022

APPENDIX G-3B: BASELINE UPPER LIMIT OF THE TOTAL PHOSPHORUS TROPHIC RANGE

Site	Baseline Upper Limit of Trophic Range[1]											
	January	February	March	April	May	June	July	August	September	October	November	December
DC-05	0.01	0.04	0.02	0.02	0.04	0.02	0.01	0.01	0.01	0.01	0.02	0.01
DC-15	0.01	0.04	0.01	0.02	0.04	0.02	0.01	0.01	0.01	0.04	0.01	0.01
661-05	0.10	0.10	0.10	0.10	0.10	0.04	0.10	0.10	0.10	0.10	0.10	0.10
661-10	0.04	0.10	0.04	0.02	0.10	0.04	0.04	0.10	0.04	0.04	0.04	0.04

Notes:

Concentrations in mg/L

[1] Upper trophic range (CCME 2022a) based on the baseline concentrations measured at sites between 2017 and September 30, 2022

APPENDIX G-3C: NUTRIENT BASELINE BENCHMARKS FOR DC-05 AND DC-15 IN DAVIDSON CREEK AND FOR 661-05 AND 661-10 IN CREEK 661

Site	Parameter	Nutrient Baseline Benchmark[1]											
		January	February	March	April	May	June	July	August	September	October	November	December
DC-05	Ammonia-N	0.0060	0.0030	0.0030	0.0030	0.0124	0.0030	0.0115	0.0068	0.0261	0.0030	0.0047	0.0074
	Nitrate-N	0.0437	0.0398	0.0505	0.0235	0.0030	0.0030	0.0041	0.1442	0.0030	0.0030	0.0073	0.0183
	Nitrite-N	0.0006	0.0006	0.0011	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	Total Phosphorous	0.010	0.031	0.016	0.020	0.035	0.020	0.010	0.010	0.010	0.010	0.018	0.010
DC-15	Ammonia-N	0.0030	0.0030	0.0053	0.0068	0.0085	0.0091	0.0030	0.0063	0.0075	0.0089	0.0058	0.0059
	Nitrate-N	0.0431	0.0426	0.0716	0.0248	0.0040	0.0030	0.0030	0.0030	0.0030	0.0030	0.0091	0.0305
	Nitrite-N	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	Total Phosphorous	0.010	0.032	0.010	0.020	0.035	0.020	0.010	0.010	0.010	0.034	0.010	0.010
661-05	Ammonia-N	0.0030	0.0104	0.0030	0.0030	0.0094	0.0095	0.0191	0.0118	0.0080	0.0030	0.0164	0.0173
	Nitrate-N	0.0670	0.0768	0.0587	0.0230	0.0267	0.0030	0.0067	0.0332	0.0221	0.0275	0.0343	0.0559
	Nitrite-N	0.0006	0.0016	0.0006	0.0006	0.0006	0.0006	0.0006	0.0013	0.0006	0.0006	0.0006	0.0006
	Total Phosphorous	0.066	0.070	0.067	0.057	0.074	0.035	0.068	0.100	0.073	0.066	0.071	0.070
661-10	Ammonia-N	0.0137	0.0160	0.0071	0.0030	0.0071	0.0065	0.0063	0.0084	0.0030	0.0030	0.0171	0.0127
	Nitrate-N	0.0446	0.0712	0.0395	0.0301	0.0627	0.0030	0.0068	0.0216	0.0120	0.0077	0.0135	0.0414
	Nitrite-N	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0015	0.0006	0.0006	0.0011	0.0006
	Total Phosphorous	0.035	0.056	0.031	0.020	0.056	0.035	0.035	0.057	0.035	0.035	0.035	0.032

Notes:

Concentrations in mg/L

[1] 95th percentile concentration + 20% for total ammonia-N, nitrate-N, and nitrite-N measured in baseline studies between 2016 and September 30, 2022; the lower of the monthly mean total phosphorus + 50% or the upper limit of the baseline tropic range for total phosphorus

APPENDIX G-3D: PREDICTED NUTRIENT CONCENTRATIONS FOR DC-05 AND DC-15 IN DAVIDSON CREEK AND FOR 661-05 AND 661-10 IN CREE

Site	Parameter	Predicted Concentration[1]											
		January	February	March	April	May	June	July	August	September	October	November	December
DC-05	Ammonia-N	0.39	0.36	0.40	0.29	0.36	0.21	0.19	0.22	0.31	0.42	0.44	0.37
	Nitrate-N	1.9	1.6	1.6	1.2	1.5	1.5	1.3	1.8	1.9	2.2	2.3	2.1
	Nitrite-N	0.014	0.013	0.013	0.0098	0.014	0.012	0.0090	0.011	0.016	0.018	0.019	0.016
	Total Phosphorous	0.034	0.035	0.036	0.038	0.027	0.024	0.025	0.030	0.036	0.034	0.038	0.035
DC-15	Ammonia-N	0.28	0.28	0.30	0.25	0.33	0.20	0.16	0.17	0.26	0.35	0.36	0.29
	Nitrate-N	1.4	1.3	1.2	1.0	1.4	1.3	1.1	1.4	1.6	1.9	2.0	1.6
	Nitrite-N	0.011	0.010	0.010	0.0083	0.013	0.011	0.0078	0.009	0.013	0.015	0.016	0.012
	Total Phosphorous	0.025	0.026	0.027	0.030	0.026	0.023	0.022	0.025	0.030	0.029	0.029	0.026
661-05	Ammonia-N	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Nitrate-N	0.2	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Nitrite-N	0.002	0.001	0.002	0.0039	0.002	0.003	0.0023	0.001	0.002	0.002	0.002	0.002
	Total Phosphorous	0.019	0.020	0.023	0.023	0.026	0.015	0.005	0.022	0.022	0.010	0.019	0.019
661-10	Ammonia-N	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Nitrate-N	0.2	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Nitrite-N	0.002	0.001	0.003	0.0038	0.001	0.002	0.0021	0.001	0.002	0.002	0.002	0.002
	Total Phosphorous	0.019	0.020	0.023	0.023	0.026	0.015	0.005	0.022	0.022	0.010	0.019	0.019

Notes:

Concentrations in mg/L.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases in the water quality prediction model v.13e (Lorax 2022).

APPENDIX G-4: BENTHIC INVERTEBRATE TISSUE RESIDUE BASELINE BENCHMARKS

Parameter	Watershed	Number of Samples	95th Percentile[1]
Aluminum	Davidson Creek	50	2,816
	Creek 661	58	2,972
	Turtle Creek	2	3,401
	Fawnie Creek	17	11,884
Antimony	Davidson Creek	50	0.08
	Creek 661	58	0.15
	Turtle Creek	2	0.04
	Fawnie Creek	17	0.18
Arsenic	Davidson Creek	50	3.75
	Creek 661	58	7.81
	Turtle Creek	2	5.46
	Fawnie Creek	17	4.74
Barium	Davidson Creek	50	61.60
	Creek 661	58	55.30
	Turtle Creek	2	74.80
	Fawnie Creek	17	76.88
Beryllium	Davidson Creek	50	0.15
	Creek 661	58	0.18
	Turtle Creek	2	0.23
	Fawnie Creek	17	0.19
Bismuth	Davidson Creek	50	0.02
	Creek 661	58	0.03
	Turtle Creek	2	0.03
	Fawnie Creek	17	0.03
Boron	Davidson Creek	50	9.94
	Creek 661	58	7.95
	Turtle Creek	2	2.48
	Fawnie Creek	17	7.24
Cadmium	Davidson Creek	50	1.17
	Creek 661	58	4.04
	Turtle Creek	2	0.76
	Fawnie Creek	17	4.55
Calcium	Davidson Creek	50	6,643
	Creek 661	58	5,580
	Turtle Creek	2	48,771
	Fawnie Creek	17	7,816
Cesium	Davidson Creek	50	0.53
	Creek 661	58	0.62
	Turtle Creek	2	0.32
	Fawnie Creek	17	4.46
Chromium	Davidson Creek	50	4.30
	Creek 661	58	8.51
	Turtle Creek	2	6.19
	Fawnie Creek	17	4.91

Note:

Units are mg/kg dry weight except for Mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline studies between 2011 and September 30, 2022 and Year 1 of Construction (2023).

APPENDIX G-4: BENTHIC INVERTEBRATE TISSUE RESIDUE BASELINE BENCHMARKS

Parameter	Watershed	Number of Samples	95th Percentile[1]
Cobalt	Davidson Creek	50	1.92
	Creek 661	58	3.50
	Turtle Creek	2	1.95
	Fawnie Creek	17	2.90
Copper	Davidson Creek	50	39.07
	Creek 661	58	37.69
	Turtle Creek	2	24.09
	Fawnie Creek	17	40.78
Iron	Davidson Creek	50	4,088
	Creek 661	58	4,944
	Turtle Creek	2	5,830
	Fawnie Creek	17	5,284
Lead	Davidson Creek	50	1.96
	Creek 661	58	3.28
	Turtle Creek	2	0.94
	Fawnie Creek	17	4.17
Lithium	Davidson Creek	50	1.93
	Creek 661	58	2.34
	Turtle Creek	2	2.43
	Fawnie Creek	17	4.66
Magnesium	Davidson Creek	50	3,973
	Creek 661	58	3,245
	Turtle Creek	2	2,093
	Fawnie Creek	17	3,632
Manganese	Davidson Creek	50	630
	Creek 661	58	1,562
	Turtle Creek	2	1,204
	Fawnie Creek	17	226
Mercury	Davidson Creek	50	0.03
	Creek 661	58	0.03
	Turtle Creek	2	0.02
	Fawnie Creek	17	0.01
Molybdenum	Davidson Creek	50	1.41
	Creek 661	58	2.39
	Turtle Creek	2	1.18
	Fawnie Creek	17	1.21
Nickel	Davidson Creek	50	3.49
	Creek 661	58	4.53
	Turtle Creek	2	3.33
	Fawnie Creek	17	4.02
Phosphorus	Davidson Creek	50	12,230
	Creek 661	58	13,365
	Turtle Creek	2	8,176
	Fawnie Creek	17	14,720

Note:

Units are mg/kg dry weight except for Mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline studies between 2011 and September 30, 2022 and Year 1 of Construction (2023).

APPENDIX G-4: BENTHIC INVERTEBRATE TISSUE RESIDUE BASELINE BENCHMARKS

Parameter	Watershed	Number of Samples	95th Percentile[1]
Potassium	Davidson Creek	50	9,323
	Creek 661	58	11,375
	Turtle Creek	2	7,915
	Fawnie Creek	17	12,600
Rubidium	Davidson Creek	50	6.77
	Creek 661	58	17.50
	Turtle Creek	2	4.15
	Fawnie Creek	17	21.60
Selenium	Davidson Creek	50	2.95
	Creek 661	58	3.91
	Turtle Creek	2	2.13
	Fawnie Creek	17	5.33
Silver	Davidson Creek	23	0.39
	Creek 661	17	0.26
	Turtle Creek	2	0.20
	Fawnie Creek	6	0.16
Sodium	Davidson Creek	50	7,721
	Creek 661	58	11,660
	Turtle Creek	2	2,890
	Fawnie Creek	17	7,846
Strontium	Davidson Creek	50	49.48
	Creek 661	58	43.50
	Turtle Creek	2	146.12
	Fawnie Creek	17	55.68
Tellurium	Davidson Creek	50	0.01
	Creek 661	58	0.01
	Turtle Creek	2	0.01
	Fawnie Creek	17	0.01
Thallium	Davidson Creek	50	0.03
	Creek 661	58	0.04
	Turtle Creek	2	0.04
	Fawnie Creek	17	0.15
Thorium	Davidson Creek	23	0.45
	Creek 661	17	0.42
	Turtle Creek	2	0.74
	Fawnie Creek	6	0.05
Tin	Davidson Creek	50	13.12
	Creek 661	58	19.17
	Turtle Creek	2	0.04
	Fawnie Creek	17	47.42
Titanium	Davidson Creek	23	84.85
	Creek 661	17	71.31
	Turtle Creek	2	131.99
	Fawnie Creek	6	19.20

Note:

Units are mg/kg dry weight except for Mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline studies between 2011 and September 30, 2022 and Year 1 of Construction (2023).

APPENDIX G-4: BENTHIC INVERTEBRATE TISSUE RESIDUE BASELINE BENCHMARKS

Parameter	Watershed	Number of Samples	95th Percentile[1]
Uranium	Davidson Creek	50	0.96
	Creek 661	58	1.29
	Turtle Creek	2	0.91
	Fawnie Creek	17	0.24
Vanadium	Davidson Creek	50	6.94
	Creek 661	58	12.32
	Turtle Creek	2	10.40
	Fawnie Creek	17	13.02
Yttrium	Davidson Creek	23	2.46
	Creek 661	17	2.37
	Turtle Creek	2	5.56
	Fawnie Creek	6	0.52
Zinc	Davidson Creek	50	334
	Creek 661	58	578
	Turtle Creek	2	261
	Fawnie Creek	17	347
Zirconium	Davidson Creek	50	2.58
	Creek 661	58	3.14
	Turtle Creek	2	4.18
	Fawnie Creek	17	1.08

Note:

Units are mg/kg dry weight except for Mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline studies between 2011 and September 30, 2022 and Year 1 of Construction (2023).

APPENDIX G-5A: FISH TISSUE RESIDUE BENCHMARK AT DC-05

Fish Species	Tissue	Parameter	Number of Samples	95th Percentile[1]
Rainbow Trout	Whole Fish	Aluminum	24	215.3
Rainbow Trout	Whole Fish	Antimony	24	0.01355
Rainbow Trout	Whole Fish	Arsenic	24	0.4993
Rainbow Trout	Whole Fish	Barium	24	4.516
Rainbow Trout	Whole Fish	Beryllium	24	0.005
Rainbow Trout	Whole Fish	Bismuth	24	0.005
Rainbow Trout	Whole Fish	Boron	24	0.5
Rainbow Trout	Whole Fish	Cadmium	24	0.18445
Rainbow Trout	Whole Fish	Calcium	24	34845
Rainbow Trout	Whole Fish	Chromium	24	0.8995
Rainbow Trout	Whole Fish	Cobalt	24	0.1601
Rainbow Trout	Whole Fish	Copper	24	5.85
Rainbow Trout	Whole Fish	Iron	24	354.8
Rainbow Trout	Whole Fish	Lead	24	0.3821
Rainbow Trout	Whole Fish	Lithium	24	0.25
Rainbow Trout	Whole Fish	Magnesium	24	1826.5
Rainbow Trout	Whole Fish	Manganese	24	33.795
Rainbow Trout	Whole Fish	Mercury	24	0.12035
Rainbow Trout	Whole Fish	Molybdenum	24	0.203
Rainbow Trout	Whole Fish	Nickel	24	0.376
Rainbow Trout	Whole Fish	Phosphorus	24	28940
Rainbow Trout	Whole Fish	Potassium	24	14255
Rainbow Trout	Whole Fish	Selenium	24	3.564
Rainbow Trout	Whole Fish	Sodium	24	4193
Rainbow Trout	Whole Fish	Strontium	24	42.62
Rainbow Trout	Whole Fish	Thallium	24	0.0313
Rainbow Trout	Whole Fish	Tin	24	1.271
Rainbow Trout	Whole Fish	Uranium	24	0.077025
Rainbow Trout	Whole Fish	Vanadium	24	0.549
Rainbow Trout	Whole Fish	Zinc	24	161.4
Rainbow Trout	Whole Fish	Zirconium	24	0.2275

Notes:

Units are mg/kg dry weight except for mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline years (2021 and 2022) and Year 1 of Construction (2023).

APPENDIX G-5B: FISH TISSUE RESIDUE BENCHMARK AT DC-15

Fish Species	Tissue	Parameter	Number of Samples	95th Percentile[1]
Rainbow Trout	Whole Fish	Aluminum	24	369.4
Rainbow Trout	Whole Fish	Antimony	24	0.03675
Rainbow Trout	Whole Fish	Arsenic	24	0.498
Rainbow Trout	Whole Fish	Barium	24	6.6595
Rainbow Trout	Whole Fish	Beryllium	24	0.012725
Rainbow Trout	Whole Fish	Bismuth	24	0.005
Rainbow Trout	Whole Fish	Boron	24	2.48
Rainbow Trout	Whole Fish	Cadmium	24	0.3051
Rainbow Trout	Whole Fish	Calcium	24	37440
Rainbow Trout	Whole Fish	Chromium	24	0.687
Rainbow Trout	Whole Fish	Cobalt	24	0.32235
Rainbow Trout	Whole Fish	Copper	24	6.8245
Rainbow Trout	Whole Fish	Iron	24	459.4
Rainbow Trout	Whole Fish	Lead	24	0.24415
Rainbow Trout	Whole Fish	Lithium	24	0.25
Rainbow Trout	Whole Fish	Magnesium	24	1649.5
Rainbow Trout	Whole Fish	Manganese	24	82.1
Rainbow Trout	Whole Fish	Mercury	24	0.1393
Rainbow Trout	Whole Fish	Molybdenum	24	0.3402
Rainbow Trout	Whole Fish	Nickel	24	0.297
Rainbow Trout	Whole Fish	Phosphorus	24	31070
Rainbow Trout	Whole Fish	Potassium	24	14670
Rainbow Trout	Whole Fish	Selenium	24	2.9705
Rainbow Trout	Whole Fish	Sodium	24	3735
Rainbow Trout	Whole Fish	Strontium	24	43.245
Rainbow Trout	Whole Fish	Thallium	24	0.037085
Rainbow Trout	Whole Fish	Tin	24	3.6405
Rainbow Trout	Whole Fish	Uranium	24	0.05787
Rainbow Trout	Whole Fish	Vanadium	24	0.986
Rainbow Trout	Whole Fish	Zinc	24	191.2
Rainbow Trout	Whole Fish	Zirconium	24	0.2885

Notes:

Units are mg/kg dry weight except for mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline years (2021 and 2022) and Year 1 of Construction (2023).

APPENDIX G-5C: FISH TISSUE RESIDUE BENCHMARK AT TC-05

Fish Species	Tissue	Parameter	Number of Samples	95th Percentile[1]
Rainbow Trout	Whole Fish	Aluminum	19	361.1
Rainbow Trout	Whole Fish	Antimony	19	0.01925
Rainbow Trout	Whole Fish	Arsenic	19	0.42995
Rainbow Trout	Whole Fish	Barium	19	5.5405
Rainbow Trout	Whole Fish	Beryllium	19	0.01
Rainbow Trout	Whole Fish	Bismuth	19	0.01
Rainbow Trout	Whole Fish	Boron	19	1
Rainbow Trout	Whole Fish	Cadmium	19	0.38055
Rainbow Trout	Whole Fish	Calcium	19	38500
Rainbow Trout	Whole Fish	Chromium	19	0.79
Rainbow Trout	Whole Fish	Cobalt	19	0.3083
Rainbow Trout	Whole Fish	Copper	19	4.953
Rainbow Trout	Whole Fish	Iron	19	407.85
Rainbow Trout	Whole Fish	Lead	19	0.22445
Rainbow Trout	Whole Fish	Lithium	19	0.5
Rainbow Trout	Whole Fish	Magnesium	19	1894
Rainbow Trout	Whole Fish	Manganese	19	81.145
Rainbow Trout	Whole Fish	Mercury	19	0.0910263
Rainbow Trout	Whole Fish	Molybdenum	19	0.31035
Rainbow Trout	Whole Fish	Nickel	19	0.3355
Rainbow Trout	Whole Fish	Phosphorus	19	30885
Rainbow Trout	Whole Fish	Potassium	19	12855
Rainbow Trout	Whole Fish	Selenium	19	1.8575
Rainbow Trout	Whole Fish	Sodium	19	3968.5
Rainbow Trout	Whole Fish	Strontium	19	51.39
Rainbow Trout	Whole Fish	Thallium	19	0.03222
Rainbow Trout	Whole Fish	Tin	19	2.521
Rainbow Trout	Whole Fish	Uranium	19	0.091025
Rainbow Trout	Whole Fish	Vanadium	19	0.845
Rainbow Trout	Whole Fish	Zinc	19	244.65
Rainbow Trout	Whole Fish	Zirconium	19	0.2935

Notes:

Units are mg/kg dry weight except for mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline years (2021 and 2022) and Year 1 of Construction (2023).

APPENDIX G-5D: FISH TISSUE RESIDUE BENCHMARK AT 661-05

Fish Species	Tissue	Parameter	Number of Samples	95th Percentile[1]
Rainbow Trout	Whole Fish	Aluminum	14	71.68
Rainbow Trout	Whole Fish	Antimony	14	0.01
Rainbow Trout	Whole Fish	Arsenic	14	0.2932
Rainbow Trout	Whole Fish	Barium	14	2.8455
Rainbow Trout	Whole Fish	Beryllium	14	0.01
Rainbow Trout	Whole Fish	Bismuth	14	0.01
Rainbow Trout	Whole Fish	Boron	14	1
Rainbow Trout	Whole Fish	Cadmium	14	0.095065
Rainbow Trout	Whole Fish	Calcium	14	30195
Rainbow Trout	Whole Fish	Chromium	14	0.45215
Rainbow Trout	Whole Fish	Cobalt	14	0.23235
Rainbow Trout	Whole Fish	Copper	14	5.0125
Rainbow Trout	Whole Fish	Iron	14	193.85
Rainbow Trout	Whole Fish	Lead	14	0.11955
Rainbow Trout	Whole Fish	Lithium	14	0.5
Rainbow Trout	Whole Fish	Magnesium	14	1413.5
Rainbow Trout	Whole Fish	Manganese	14	30.78
Rainbow Trout	Whole Fish	Mercury	14	0.123
Rainbow Trout	Whole Fish	Molybdenum	14	0.18775
Rainbow Trout	Whole Fish	Nickel	14	0.2
Rainbow Trout	Whole Fish	Phosphorus	14	28260
Rainbow Trout	Whole Fish	Potassium	14	14405
Rainbow Trout	Whole Fish	Selenium	14	3.7185
Rainbow Trout	Whole Fish	Sodium	14	3663.5
Rainbow Trout	Whole Fish	Strontium	14	38.125
Rainbow Trout	Whole Fish	Thallium	14	0.04542
Rainbow Trout	Whole Fish	Tin	14	0.9105
Rainbow Trout	Whole Fish	Uranium	14	0.05804
Rainbow Trout	Whole Fish	Vanadium	14	0.4375
Rainbow Trout	Whole Fish	Zinc	14	122.15
Rainbow Trout	Whole Fish	Zirconium	14	0.2

Notes:

Units are mg/kg dry weight except for mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline years (2021 and 2022) and Year 1 of Construction (2023).

APPENDIX G-5E: FISH TISSUE RESIDUE BENCHMARK AT 661-10

Fish Species	Tissue	Parameter	Number of Samples	95th Percentile[1]
Rainbow Trout	Whole Fish	Aluminum	24	361.1
Rainbow Trout	Whole Fish	Antimony	24	0.01925
Rainbow Trout	Whole Fish	Arsenic	24	0.42995
Rainbow Trout	Whole Fish	Barium	24	5.5405
Rainbow Trout	Whole Fish	Beryllium	24	0.01
Rainbow Trout	Whole Fish	Bismuth	24	0.01
Rainbow Trout	Whole Fish	Boron	24	1
Rainbow Trout	Whole Fish	Cadmium	24	0.38055
Rainbow Trout	Whole Fish	Calcium	24	38500
Rainbow Trout	Whole Fish	Chromium	24	0.79
Rainbow Trout	Whole Fish	Cobalt	24	0.3083
Rainbow Trout	Whole Fish	Copper	24	4.953
Rainbow Trout	Whole Fish	Iron	24	407.85
Rainbow Trout	Whole Fish	Lead	24	0.22445
Rainbow Trout	Whole Fish	Lithium	24	0.5
Rainbow Trout	Whole Fish	Magnesium	24	1894
Rainbow Trout	Whole Fish	Manganese	24	81.145
Rainbow Trout	Whole Fish	Mercury	24	0.0910263
Rainbow Trout	Whole Fish	Molybdenum	24	0.31035
Rainbow Trout	Whole Fish	Nickel	24	0.3355
Rainbow Trout	Whole Fish	Phosphorus	24	30885
Rainbow Trout	Whole Fish	Potassium	24	12855
Rainbow Trout	Whole Fish	Selenium	24	1.8575
Rainbow Trout	Whole Fish	Sodium	24	3968.5
Rainbow Trout	Whole Fish	Strontium	24	51.39
Rainbow Trout	Whole Fish	Thallium	24	0.03222
Rainbow Trout	Whole Fish	Tin	24	2.521
Rainbow Trout	Whole Fish	Uranium	24	0.091025
Rainbow Trout	Whole Fish	Vanadium	24	0.845
Rainbow Trout	Whole Fish	Zinc	24	244.65
Rainbow Trout	Whole Fish	Zirconium	24	0.2935

Notes:

Units are mg/kg dry weight except for mercury is mg/kg wet weight.

[1] 95th percentile concentration measured in baseline years (2021 and 2022) and Year 1 of Construction (2023).