

APPENDIX B

Surface Water Quality Monitoring Plan

REPORT

Surface Water Quality Monitoring Plan

Coffee Gold Mine

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2			

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Figure 2-1 Surface Water Quality Monitoring Stations – Construction and Operations Phase 5

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
AMP	Adaptive Management Plan
BC MoE	British Columbia Ministry of Environment
CoC	Chain of Custody
D-As	Dissolved Arsenic
DDW	Deionized Water
DI	de-ionized
DO	Dissolve Oxygen
DOC	Dissolved Organic Carbon
EEM	Environmental Effects Monitoring
EMAMP	Environmental Monitoring and Adaptive Management Plan
EMR	Yukon Energy, Mines and Resources
EoP	End of Pipe
FPOD	Final Point of discharge
GHG	Greenhouse Gases
HLF	Heap Leach Facility
IC	Intermediate Component
LSA	Local Study Area
MDMER	Metal and Diamond Mining Effluent Regulations
N-NO ₃	Nitrate as nitrogen
ORP	Oxidation-Reduction Potential
POPC	Parameter of Potential Concern
QA/QC	Quality Assurance/Quality Control
RDL	Reportable Detection Limit
RISC	Resource Inventory Standards Committee
RSA	Regional Study Area
RPD	Relative Percent Difference
SD	Snow Depth
SWE	Snow Water Equivalent
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total suspended Solids
UP WQO	Use Protection Water Quality Objective
VC	Valued Component
WAD	Weak Acid Dissociable
WMO	World Meteorological Organization

Acronym / Abbreviation	Definition
WQM	Water Quality Model
WQO	Water Quality Objective
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plan
YESAB	Yukon Environment and Socio-Economic Assessment Board
YWB	Yukon Water Board

LIST OF SYMBOLS AND UNITS OF MEASURE

Symbol, Unit of Measure	Definition
$\mu\text{S/cm}$	Microsiemens per centimetre
mg/L	Milligrams per litre
$\mu\text{g/L}$	Micrograms per litre
pH	pH
masl	Metres Above Sea Level
NTU	Nephelometric Turbidity Units

1.0 INTRODUCTION

This Plan describes surface water quality monitoring for the Coffee Gold Project (the Project). Surface water quality monitoring is the systematic measurement of the quality of water within the mine site, discharged as mine effluent, and in the receiving environment, to ensure that it is within expected ranges. This plan describes surface water quality monitoring across all phases of the Project, including Baseline, Construction, and Operations phases. Monitoring during the Closure, and Post-closure phases will be further described under the Reclamation and Closure plan.

Surface water quality is a valued component (VC) and is linked to several other disciplines, discussed further in the Environmental Monitoring and Adaptive Management Plan (EMAMP) summary document. Surface water quality data collected as part of the surface water quality monitoring is supported by several other disciplines (e.g., groundwater and hydrological monitoring) and supports monitoring of aquatic ecology receptors which will be used collectively to assess impacts from the Project on the environment. The surface water quality records collected from both the mine site and receiving environment monitoring stations will also be critical in the management of the Heap Leach Facility (HLF), open pit mining operations, dust control, future exploration activities and water management infrastructure.

The surface water quality effects assessment conducted for the YESAB submission outlined specific requirements for the implementation of a strategic and flexible water monitoring program at the mine site:

- To verify and update water quality predictions for all phases of the Project, based on monitoring results, as necessary.
- To assess compliance with applicable water quality discharge limits for mine site effluent.
- Identify analysis discrepancies that may arise related to the Surface Water Quality VC.
- Verify the accuracy of the residual change and residual cumulative change predictions.
- Assess the efficacy of proposed mitigation measures and the need for modifications to those measures.
- Implement additional mitigation measures as per the surface water quality and aquatic life adaptive management plans as required.

To accomplish these objectives, the Surface Water Quality Monitoring Plan includes multiple monitoring stations within the mine site, at the effluent discharge point, and within the down-gradient receiving streams. The monitoring system will be implemented in a systematic manner to ensure that reliable and consistent data is obtained. Key considerations include assignment of responsibilities, data management, and data interpretation and reporting.

This plan reflects the current understanding of the baseline surface water and groundwater systems, including both quantity (flows) and quality. It includes a description of monitoring methods, baseline conditions, monitoring locations and frequency, and outlines monitoring procedures, including quality assurance/quality control (QA/QC) protocols. In addition, it outlines some key considerations for implementation. These, and other aspects of this Plan, will be updated periodically, as mine planning and development proceed.

Monitoring conducted as per the Surface Water Quality Monitoring Plan will:

- Allow the management of mine site effluent to be optimized so as to reduce the potential impacts to the receiving streams
- Assess/confirm compliance with applicable standards, limits, and guidelines at discharge locations and within the receiving environment
- Verify and refine water quality predictions for the construction and operations phases.

To meet these objectives, monitoring will be conducted at three main areas:

1. **Mine site monitoring** will record the quality of surface water that is affected by the various mine components. It is required primarily to verify geochemical 'source terms', (quantitative assumptions and predictions made to anticipate the effects of bedrock disturbance that will occur in the course of mine development, that underlie the source loadings within the Coffee water balance and water quality model), and to ensure that the water management system is effective. Mine site monitoring includes monitoring of pit sump and sediment pond discharges.
2. **Effluent monitoring** records the quality of surface water that collects in sediment control ponds, located downgradient of mine infrastructure, and is discharged to the receiving environment. Monitoring to ensure compliance with appropriate discharge limits for treated effluent pond discharges are important components of the plan and are expected to be subject to certain regulatory requirements.
3. **Receiving environment monitoring** will record the quality of water in the receiving environment, downstream of mine inputs. Flows and water quality in the receiving environment downstream of the mine will reflect the ultimate effects of the mine.

2.0 MONITORING LOCATIONS AND FREQUENCIES

Surface water quality monitoring is conducted within the area in which the Project is reasonably expected to interact with surface water quality, including all streams expected to receive effluent from the mine site, up to and including the Yukon River in the immediate vicinity of the confluence with Coffee Creek, YT-24 and Halfway Creek, including the clear water plumes within the Yukon River below the confluence with the site tributaries. A summary of the mine site and receiving environment monitoring stations is provided in Table 2-1 and locations are identified on Figure 2-1. Table 2-2 details the receiving environment surface water quality monitoring locations and Table 2-3 describes the mine site monitoring.

2.1.1 Mine Site

Water quality samples will be obtained from the Events Ponds (EP-N1, EP-S1, EP-2) and Rainwater Pond on a monthly basis. The purpose of this sampling is to verify heap leach facility geochemical source terms and water balance assumptions. Monitoring data will also be used to update water quality predictions.

2.1.2 Mine Effluent Discharge Point

Water quality samples will be obtained from the Alpha Pond (M1) on a weekly basis while discharging as the Alpha Pond discharges both through direct pumping to Halfway Creek as well as foundation seepage. The purpose of this sampling is to verify that mine contact water meets regulatory requirements prior to discharge to Halfway Creek. Monitoring of the influent and effluent from the WTP will be performed weekly when operating.

Pit spill points will also be monitored under MDMER, commencing at the time of passive pit spilling; stations M10 through M15 as noted in Table 2-1 and Table 2-3

2.1.3 Receiving Environment

Water quality samples will be obtained downstream of the Mine Site at the Use Protection Water Quality Objective (UP WQO) attainment points in Halfway Creek (HC-1.0), Latte Creek (LC-11.4) and YT-24 Creek (YT24-0.1), as well as at Non-degradation Water Quality Objective attainment points on Coffee Creek (CC-10.9) and the Yukon River (YUK-49.3, YUK-38.9 and YUK-37.6; Table 2-2). It is anticipated that this sampling will be undertaken on a monthly basis. Monthly monitoring will also continue on the Yukon River upstream of the mine influence at YUK-51.3.

Depending upon the final pit configuration for Double Double, it may be necessary in the closure period to include an additional monitoring location in Latte Creek downstream of LC-11.4 and below the small, unnamed creek to the east of Double Double pit. The proposed configuration of the Double Double pit has a spill point at 1,044 m at the eastern margin of the pit; however, the western margin of the pit is within the LCT20.1 catchment at an elevation of roughly 1,050 m and there is a possibility that the final Double Double pit shell could have the spill point in the LCT20.1 catchment. The current water balance prediction is for the backfilled Double Double pit to passively spill in Year 24. Upon completion of mining in Double Double in Year 2, should the final pit layout for Double Double result in the pit spill point entering the small un-named catchment to the east (e.g., not into LCT20.1), then a new monitoring station would be required in Latte Creek below the confluence of this small tributary. Monitoring of this station would not commence until closer to the Double Double spilling projection but would ensure at least three years of water quality data prior to spilling.

Table 2-1 Summary of Surface Water Monitoring Station Locations

Station ID	Mine Site Monitoring Stations	Easting	Northing
M1	Alpha Pond (MDMER ¹ EoP ²)	582,848	6,975,463
M2	HLF Event Pond (EP-2)	582,105	6,972,635
M3	HLF Water Treatment Plant (Influent and Discharge)	582,080	6,972,448
M4	Facility Pond	582,334	6,972,851
M5	Rainwater Pond	581,639	6,972,371
M6	HLF Event Pond (EP-N1)	581,523	6,972,434
M7	HLF Event Pond (EP-S1)	581,671	6,972,276
M8	Downstream Alpha WRSF Toe	582,637	6,975,135
M9	Upstream Alpha WRSF	581,064	6,973,450
M10	SU3W Spill Point (provisional MDMER ¹) ³	584,065	6,974,982
M11	SU3 Spill Point (provisional MDMER ¹) ³	584,632	6,975,349
M12	SU5 Spill Point (provisional MDMER ¹) ³	584,847	6,974,908
M13	SU4W Spill Point (provisional MDMER ¹) ³	584,706	6,973,285
M14	Double Double Spill Point (provisional MDMER ¹) ³	585,453	6,973,375
M15	SU1 Spill Point (provisional MDMER ¹) ³	584,100	6,973,228
Receiving Environment Monitoring Stations			
YUK-51.3	Yukon River above confluence with Coffee Creek	601,011	6,975,946
LC-15.5	Upper Latte Creek	581,317	6,970,960
LCT20-0.1	Small tributary to Latte Creek	584,890	6,971,733
LC-11.4	Latte Creek downstream of LCT20-0.1 drainage	585,071	6,971,654
LC-0.2	Latte Creek immediately upstream of confluence with Coffee Creek	594,319	6,970,375
CC-11.6	Coffee Creek immediately upstream of confluence with Latte Creek	594,719	6,970,225
CC-10.9	Coffee Creek downstream of confluence with Latte Creek	594,715	6,970,586
CC-3.2	Far-field monitoring in Coffee Creek near Yukon River	598,330	6,975,084
YUK-49.3	Yukon River below confluence with Coffee Creek in clearwater plume	599,397	6,977,180
YT24-0.1	Mouth of YT-24, small tributary to Yukon River	589,526	6,979,073
YUK-38.9	Yukon River below YT-24 confluence	589,708	6,979,237
HC-6.8	Halfway Creek below Alpha Pond	584,089	6,976,548
HC-1.0	Halfway Creek 1 km upstream from the Mouth	588,823	6,980,536
YUK-37.6	Yukon River below confluence with Halfway Creek	588,962	6,980,651
DMC-2.0	Dan Man Creek (Reference)	585,599	6,982,145
KT-0.3	Kona Creek, small tributary to Independence Creek	575,334	6,979,357

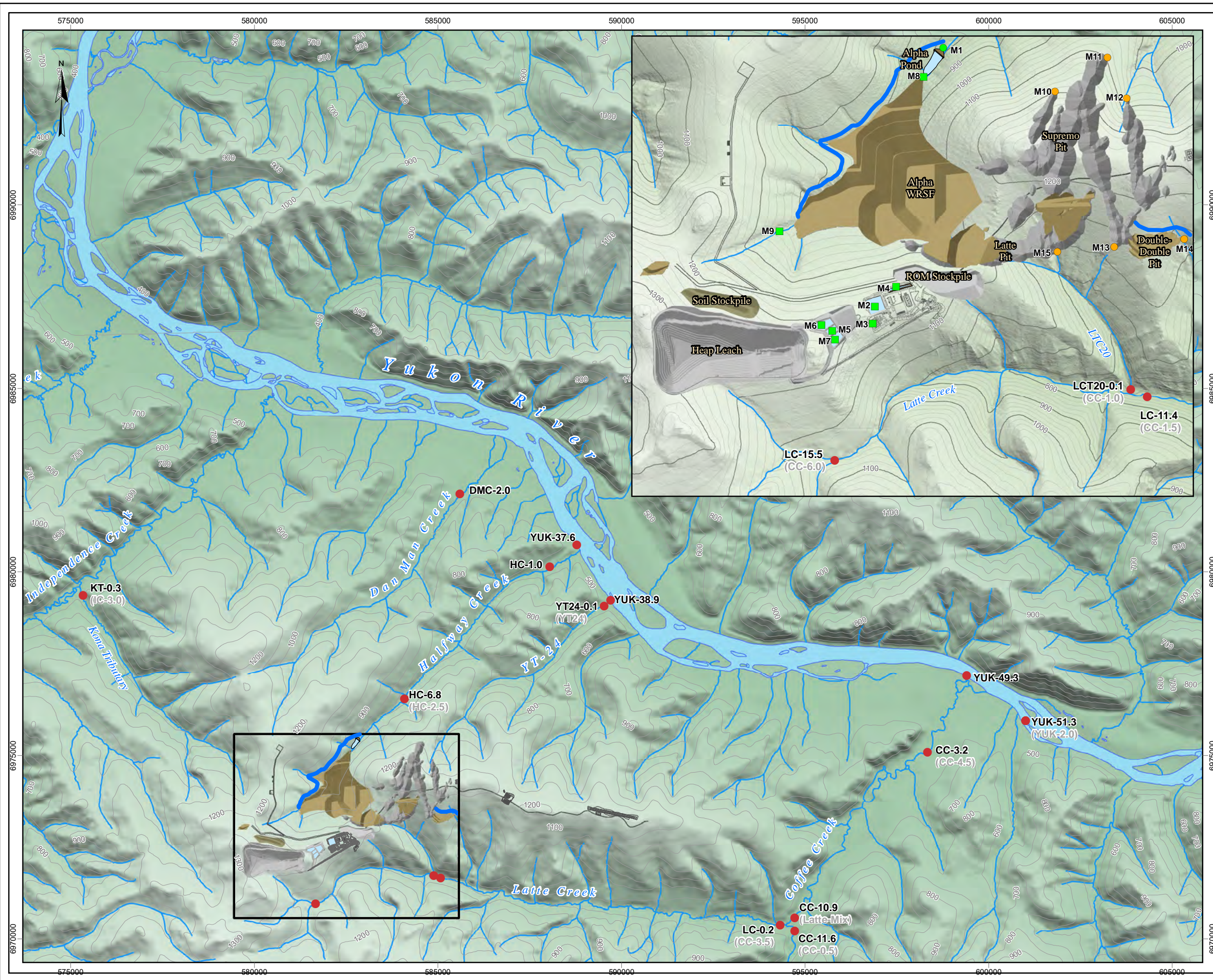
Notes:

All station co-ordinates are in UTM Zone 7

¹MDMER = Metal and Diamond Mining Effluent Regulations (Canada 2023)

²EoP = End of Pipe

³Monitoring will only be conducted at the pit spill points when passively discharging.



COFFEE GOLD MINE

Surface Water Quality Monitoring Stations

Legend

- Receiving Environment Station
- Pit Sump/Sediment Pond, not subject to MMR
- Provisional MDMER FPoD
- MDMER FPoD
- Watercourses
- Waterbodies
- Surface Contours (100m)

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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Kilometres

NAD 1983 UTM Zone 7N

Page Size: 11" x 17"

Figure 2-1	Date: Apr 9, 2024	Drawn by: AL	Reviewed By: SJ
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Table 2-2 Summary of Receiving Environment Surface Water Quality Monitoring Stations.

Catchment	Watercourse	Station ID	Rationale	Parameters	Frequency	
					Const.	Ops
Coffee Creek	Latte Creek	LC-15.5	Monitor Latte Creek below Heap Leach Facility	See Table 3-1 for analytical parameter list and detection limits	Monthly	
	Latte Creek Trib 10 (LTC20)	LCT20-0.1	Monitor Latte Creek Tributary below Supremo South discharge and above confluence with Latte Creek			
	Latte Creek	LC-11.4	Monitor Latte Creek below last point of mine effluent control Proposed Use-Protection water quality objective (WQO) attainment point			
		LC-0.2	Monitor Latte Creek above confluence with Coffee Creek			
	Coffee Creek	CC-11.6	Monitor background in Coffee Creek above confluence with Latte Creek.			
		CC-10.9	Proposed Non-Degradation attainment point			
		CC-3.2	Far-field: Monitor Coffee Creek in important reach downstream of Latte Creek confluence			
	Yukon River	YUK-51.3	Far-field: Monitor in Yukon River above confluence			
		YUK-49.3	Proposed Non-Degradation attainment point			
YT-24	YT-24	YT24-0.1	Monitor YT-24 below last point of mine effluent control Proposed Use Protection WQO attainment point			
		YUK-38.9	Proposed Non-Degradation attainment point			
Halfway Creek	Halfway Creek	HC-6.8	Monitor Halfway Creek below Alpha Pond			
		HC-1.0	Monitor Halfway Creek below Alpha Pond and last point of mine effluent control Proposed Use Protection WQO attainment point			
	Yukon River	YUK-37.6	Proposed Non-Degradation attainment point			
Independence Creek	Kona Tributary	KT-0.3	Far-field for Kona Pit			
Dan Man Creek	Dan Man Creek	DMC-2.0	Proposed new reference watershed			

Table 2-3 Summary of Mine Site and Effluent Discharge Surface Water Quality Monitoring Stations

Catchment	Station ID	Rationale	Parameters	Frequency	
				Construction	Operations
Halfway Creek	M1	Alpha Pond (MDMER ¹ EoP ²)	MDMER	Weekly when discharging	
	M2	HLF Event Pond (EP-2)	Selected	Monthly	
	M3	HLF Water Treatment Plant (Influent and Discharge)	Selected	Weekly when operating	
	M4	Facility Pond	Selected	Monthly	
	M5	Rainwater Pond	Selected		
	M6	HLF Event Pond (EP-N1)	Selected		
	M7	HLF Event Pond (EP-S1)	Selected		
	M8	Downstream Alpha WRSF Toe	Selected	Monthly, as possible given safety considerations	
	M9	Upstream Alpha WRSF	Selected	Weekly when discharging	
	M10	SU3W Spill Point (provisional MDMER ¹)	MDMER		
YT-24	M11	SU3 Spill Point (provisional MDMER ¹)	MDMER		
	M12	SU5 Spill Point (provisional MDMER ¹)	MDMER		
Latte Creek	M13	SU4W Spill Point (provisional MDMER ¹)	MDMER	Weekly when discharging	
	M14	Double Double Spill Point (provisional MDMER ¹)	MDMER		
	M15	SU1 Spill Point (provisional MDMER ¹)	MDMER		

Notes:

Selected = parameters will be selected by Newmont to inform day-to-day water management.

¹MDMER = Metal and Diamond Mining Effluent Regulations (Canada 2023)

²EoP = End of Pipe

Pit sumps will be monitored until backfill begins, then monitoring will switch to any surface discharges from the pit in question (generally in Closure and Post-closure phases – refer to the Reclamation and Closure Plan)

Stations expected to be regulated under Metal and Diamond Mining Regulations (MDMER) are identified in bold.

HLF – Heap Leach Facility

During Project construction, the surface water quality monitoring program will be gradually phased in and will continue to be phased in as mine components are built and mine operations progress. The primary sediment control pond for the Project is the Alpha Pond and surface water quantity and quality will be monitored routinely at this facility.

Monitoring of the Event Ponds will occur as excess water from these facilities will be the primary feed water to the water treatment plant. Details related to monitoring of the HLF are contained in the Heap Leach Facility Operations, Maintenance, and Surveillance Plan, while monitoring of the water treatment plant discharges is included in Table 2-3. Receiving environment monitoring will be conducted at stations on Latte Creek, Coffee Creek, YT-24, Halfway Creek, Kona Tributary and on the Yukon River (Table 2-2).

Water collected in the pit sumps is not planned for discharge to the receiving environment and will only be used in dust control or directed to the Alpha Pond. The number and location of sumps are anticipated to vary through mine life will be monitored internally as necessary.

3.0 MONITORING METHODOLOGY

3.1 Monitoring System Overview

A generic surface water quality monitoring program is discussed herein for the Coffee Gold Project, with a focus on monitoring concepts as they relate to Mine Site monitoring, Effluent Monitoring and Receiving Environment Monitoring during the Construction and Operations phases. During Construction, surface water quality monitoring is anticipated to evolve and expand as mine design concepts, construction schedules and regulatory requirements are refined. Additional monitoring initiatives may be required during the Closure Phase, which will be outlined in the Reclamation and Closure Plan. Surface water quality monitoring requirements will be reduced following successful reclamation and closure of the mine site. Design and delivery of future monitoring activities will require the involvement of regulatory agencies that have jurisdiction over water-related issues, affected First Nations, and coordinated efforts by mine staff.

3.1.1 Mine Site Monitoring

Mine site monitoring will be undertaken to assess the quality of surface water that is affected by the various mine facilities. It is required primarily to verify geochemical source terms and to ensure that the effective water management decisions are made (i.e., remaining within effluent discharge criteria).

3.1.2 Effluent Monitoring

Effluent monitoring is intended to assess the quality of surface water that collects in the Alpha Pond. The quality of water treatment plant effluent will also be monitored once the water treatment plant is operated. Monitoring will be undertaken to ensure effluent quality standards are achieved and to identify any potential upset conditions.

3.1.3 Receiving Environment Monitoring

Surface water quality monitoring will include monitoring at selected stations on Latte Creek, Coffee Creek, YT-24, Halfway Creek, and on the Yukon River. Water quality in the receiving environment downstream of the mine will reflect the ultimate effects of the mine on the relevant intermediate and valued components (ICs and VCs, respectively) from the environmental assessment. Surface water quality in the receiving environment is expected to be subject to specific regulatory requirements.

The methods employed for the existing programs will continue through operations and the post-mining phase. Water quality sampling will be undertaken in accordance with the British Columbia Field Sampling Manual (BC MoE, 2013) and any relevant updates to that methodology. A YSI Sonde handheld instrument will be used to obtain *in situ* measurements of temperature, pH, specific conductance, dissolved oxygen (DO), and oxidation-reduction potential (ORP) at the time and location that water quality samples are taken. Samples will be collected and shipped to an accredited laboratory for analysis.

3.1.4 Analytical Procedures

Samples will be shipped to an accredited laboratory and are analyzed for physical parameters, major ions, nutrients, total and dissolved organic carbon, weak acid dissociable (WAD) cyanide, and total and dissolved metals. The full list of parameters that are analyzed, and detection limits, are provided in Table 3-1 below.

Table 3-1 Analytical Parameter List and Reportable Detection Limits

Analysis	Units	Detection Limit
Physical Parameters		
Conductivity	µS/cm	1.0
Hardness (as CaCO ₃)	mg/L	0.5
pH	pH	0.01 unit
Total Suspended Solids (TSS)	mg/L	1.0
Total Dissolved Solids (TDS)	mg/L	10.0
Turbidity	NTU	0.1
Major Ions and Nutrients		
Alkalinity _{Total} (as CaCO ₃)	mg/L	0.5
Alkalinity _{PP} (as CaCO ₃)	mg/L	0.5
Bicarbonate (HCO ₃)	mg/L	0.5
Carbonate (CO ₃)	mg/L	0.5
Chloride (Cl)	mg/L	0.5
Sulphate (SO ₄)	mg/L	0.5
Fluoride (F)	mg/L	0.01
Nitrate (as N)	mg/L	0.002
Nitrite (as N)	mg/L	0.002
Total Ammonia (as N)	mg/L	0.005
Nitrate plus Nitrite (as N)	mg/L	0.002
Total Phosphorus as P	µg/L	0.002
Cyanide		
Weak acid dissociable cyanide (CN _{WAD})	mg/L	0.0005
Organic Carbon		
Total Organic Carbon (TOC)	mg/L	0.5
Dissolved Organic Carbon (DOC)	mg/L	0.5
Total and Dissolved Metals		
Aluminum (Al)	µg/L	0.5
Antimony (Sb)	µg/L	0.02
Arsenic (As)	µg/L	0.02
Barium (Ba)	µg/L	0.02
Beryllium (Be)	µg/L	0.02
Bismuth (Bi)	µg/L	0.01
Boron (B)	µg/L	10
Cadmium (Cd)	µg/L	0.005
Calcium (Ca)	mg/L	0.05
Chromium (Cr)	µg/L	0.1
Cobalt (Co)	µg/L	0.005
Copper (Cu)	µg/L	0.05
Iron (Fe)	µg/L	1.0
Lead (Pb)	µg/L	0.005

Analysis	Units	Detection Limit
Total and Dissolved Metals		
Lithium (Li)	µg/L	0.5
Magnesium (Mg)	mg/L	0.05
Manganese (Mn)	µg/L	0.05
Mercury (Hg)	µg/L	0.002
Molybdenum (Mo)	µg/L	0.5
Nickel (Ni)	µg/L	0.02
Potassium (K)	mg/L	0.05
Selenium (Se)	µg/L	0.04
Silicon (Si)	mg/L	50
Silver (Ag)	µg/L	0.005
Sodium (Na)	mg/L	0.05
Strontium (Sr)	µg/L	0.05
Thallium (Tl)	µg/L	0.002
Tin (Sn)	µg/L	0.2
Titanium (Ti)	µg/L	0.5
Uranium (U)	µg/L	0.002
Vanadium (V)	µg/L	0.2
Zinc (Zn)	µg/L	0.1

3.1.5 Timing, Frequency and Duration

In general, water quality monitoring will be undertaken year-round. It may not be possible to obtain water quality samples at some locations at times when there is inadequate flowing water, when dry conditions prevail in summer or early autumn, or in winter, when smaller watercourses may be frozen, and aufeis prevalent. While every attempt will be made to sample on the prescribed frequency, if conditions are deemed to be unsafe by field staff, sampling will not occur.

In general, it is intended that water quality monitoring be undertaken on a monthly basis within the mine site (for selected parameters of interest [e.g., nitrate, uranium arsenic, weak acid dissociable [WAD] cyanide), weekly at effluent discharge locations when discharging, and monthly in the receiving environment. Weekly samples of selected parameters are expected to be adequate to evaluate whether the quality of mine contact water is consistent with predictions, and to allow mine staff to manage contact water effectively to meet discharge requirements. Weekly monitoring of mine effluent is anticipated to be required at final points of discharge (FPoD) pursuant to the MDMER (Canada 2023). Monthly monitoring in the receiving environment is expected to be sufficient for evaluating potential effects, and to verify that water quality is consistent with predictions.

Surface water quality monitoring has been undertaken for numerous years (e.g., >10) to establish baseline conditions, and will be continued through construction, operations and the post-mining period of the reclamation and closure phase. The monitoring program will be scaled back, as appropriate, as the mine site is reclaimed.

4.0 DATA CONTROL, ANALYSIS AND INTERPRETATION

4.1 Document Control

Once field and laboratory analytical data has been obtained, it will be entered by the responsible site personnel into a standardized surface water quality database. This will form the primary record, and any adjustments or corrections that are performed on this data will be saved as separate files, to ensure that the original data records remain unaltered. All data and associated field notes will be stored in standard electronic format.

Site personnel will routinely evaluate the database to identify any potential anomalies or errors in data entry. Preparation of monthly reports will help to identify trends, and any anomalous results in water quality results, as further described below. It is anticipated that both monthly, and more detailed annual, water quality reports will be required as conditions of the Water Use License(s) that will be issued for the Coffee Gold Mine.

4.2 Quality Assurance and Quality Control

The primary objective of data quality assurance and Quality Assurance/Quality Control (QA/QC) program is to ensure that the data collected by the site monitoring programs is both accurate and precise, and properly represents the parameters that the monitoring programs are intended to measure. This provides regulators, First Nations, the public and mine staff with confidence in the data collected by the monitoring programs, and thus in the conclusions and actionable responses drawn from these data.

QA/QC measures include use of field and travel blanks (one per sampling event), and duplicate samples (approximately 1 in 10). These components are briefly described in the sections below.

4.2.1 Blanks

Blank water quality samples are comprised of analyte-free reagent water and are used to assess sample contamination (as recommended by BC MoE 2013). Field blanks are used to detect potential contamination resulting from the sample collection method, handling, filtration, preservation, and exposure to the environment. Blank samples are typically collected by having the environmental monitor pour de-ionized (DI) water into clean sample bottles in the same environment in which actual samples are collected, and then processing the blank at the laboratory in the same manner as other samples.

4.2.2 Replicates

Replicates are independent samples collected as close as possible from the same location and at the same time as the original to characterize environmental variability and the precision of the entire sampling and analytical process (as per BC MoE 2013). For the purpose of this memorandum, originals and duplicates are considered paired replicates collected from the same location sequentially in time.

The BC Field Sampling Manual (BC MoE 2013) provides the following acceptability criteria for field duplicates:

It should be expected that the Relative Percent Difference (RPD) is somewhat greater than that for laboratory duplicates. If one of a set of duplicate values is at or greater than five times the Method

Detection Limit, then RPD values >20% indicate a possible problem, and > 50% indicate a definite problem, most likely either contamination or lack of sample representativeness.

Any duplicate samples for which the RPD is greater than 20% and greater than 50% are reported. In addition, duplicates that had parameters with RPDs greater than 50%, in which the parameter value was greater than five-times the reportable detection limit (RDL) in at least one of the sample duplicates, are reported in a separate table.

4.2.3 Total versus Dissolved Metals

For the purpose of this QA/QC program, a dissolved metal concentration that is higher than the corresponding total metal concentration is considered to be an indication of potential sample contamination or analytical error. Total and dissolved metals data for samples collected at all water quality monitoring stations will be compared on a quarterly basis. The dissolved metal concentration will be flagged as a potential QA/QC issue if the concentration is >20% higher than the corresponding total metal value in the same sample. Variability of less than 20% is excluded because it is within the analytical margin of error.

Dissolved and total metal pairs are included in this analysis if the dissolved value is greater than five-times its RDL, similar to guidance presented in the BC Field Sampling Manual (BC MoE 2013) for acceptability criteria for duplicate sample. This is more conservative than the industry convention which limits the analysis to parameter pairs where both total and dissolved values are greater than five-times RDL.

Activities associated with the QA/QC program include:

- Regular checks and calibration of field instruments, and sampling protocols and procedures
- Automated error trapping and flagging for review in databases and spreadsheets
- Review of collected data and elemental analysis results by site environmental staff
- Evaluation of sample blanks for the detection of cross contamination during collection
- Evaluation of replicates (RPD) to determine sample integrity
- Evaluation of dissolved versus total metal concentrations for the detection of measurement errors
- Flagging of samples that may need re-analysis (e.g., if QA/QC issues are identified)
- Periodic review, as necessary by external review by qualified professionals.

4.2.4 Sample Holding Time

Sample holding time is the length of time between collection of a water sample and its analysis at the laboratory. Recommended holding times are summarized in Table 4-1 below as established by good laboratory practice protocols. Parameters with the shortest hold-times (three days or less) typically include ammonia (if unpreserved), nitrate / nitrite, pH, and turbidity. Collected samples are planned to be submitted to the analytical laboratory within holding times. However, if holding times are exceeded, field and laboratory quality assurance/quality control QA/QC results will be reviewed to confirm the good quality and applicability of the reported data. In addition, laboratory reports include a summary of both, data quality objective achievement and information relative to holding times.

Table 4-1 Recommended water quality sample hold times

Analytical Parameter	Hold Time
Alkalinity	14 Days
Ammonia	28 Days
Ammonia, Un-Preserved	3 Days
Bromide	28 Days
Chloride	28 Days
Chromium VI - Dissolved	30 Days
Chromium VI - Total	30 Days
Conductivity	28 Days
Dissolved Organic Carbon (DOC)	28 Days
Fluoride	28 Days
Metals – Dissolved	180 Days
Metals – Total	180 Days
Nitrate/Nitrite	3 Days
pH	15 Minutes
Phosphorus – Total	28 Days
Solids - TDS	7 Days
Solids – TSS	7 Days
Sulphate	28 Days
Total Organic Carbon (TOC)	28 Days
Total Nitrogen (TN)	28 Days
Turbidity	3 Days

4.2.5 Toxicity

The surface water quality monitoring will also include sampling and analysis to evaluate acute and chronic toxicity of mine effluent. Acute and sublethal toxicity tests of mine effluent are required by MDMER (Canada 2023) and the Environmental Effect Monitoring (EEM), respectively. Acute toxicity will be evaluated for each final discharge point at a monthly frequency. Tests will include both, rainbow trout (*Oncorhynchus mykiss*) and the invertebrate *Daphnia magna* under exposure conditions of full-strength effluent waters to determine the presence of lethality. Sublethal tests will be initially (first three years) performed twice per year using a dilution series of collected effluent waters. These tests will include species of fish, invertebrate and algae relevant to the study area and the derivation of chronic endpoints (e.g., growth). Further details on these programs will be provided in due course and will be discussed in detail as part of the effluent characterization and EEM study planned to be developed for the Project.

4.3 Laboratory and Data Analysis

Chain of Custody (CoC) forms will be completed and sent with surface water quality samples to be analyzed at an accredited laboratory. Analysis will include all required parameters and will achieve the required method detection limits noted in Section 3.1.4 above. Laboratory results will be compared against relevant water quality objectives and guidelines for the protection of aquatic life.

5.0 ADAPTIVE MANAGEMENT PLAN

The Surface Water Quality and Aquatic Life Adaptive Management Plan (AMP) is a tool to track and proactively respond to water quality conditions within the Project area receiving streams that deviate from the predicted range. The Project's Surface Water Quality and Aquatic Life AMP is precautionary in that it is recognized that it is impossible to plan for every eventuality, and therefore a framework must exist to address unforeseen changes in the water quality of receiving streams. The proposed Surface Water Quality and Aquatic Life AMP incorporates specific indicators and performance thresholds developed in close consultation with FNs and applicable to maintain water quality in receiving environments. A full description of the Surface Water Quality and Aquatic Life AMP applicable to the Project can be found in Appendix L of the EMAMP.

6.0 REPORTING AND ANNUAL REVIEW

Reporting will be undertaken on a monthly and annual basis, as further described below.

6.1 Monthly Data Reports

Submission of monthly water quality monitoring data reports is typically required as a condition of Water Licenses issued by the Yukon Water Board (YWB). These reports will include monitoring data, routine statistical compilation, and notes regarding the QA/QC aspects of the monitoring program. These reports will be provided to appropriate regulatory authorities as well as First Nations.

6.2 Annual Interpretive Reports

Annual interpretive reports are presumed to be included as a water licence requirement for the Project. It is anticipated that annual interpretive reports will summarize water quality monitoring data, including both field data and laboratory analyses. The reports will also identify trends, anomalies, and other relevant information. These reports will summarize the data collected for the previous year in tabular and graphical format, as well as providing summary statistics.

Any significant changes to the monitoring network, such as addition or deletion of monitoring stations, or change to analytical parameters, for example, will be noted, along with a rationale for the changes. If necessary, recommendations will be made concerning upgrades or changes that are deemed necessary for the following year, along with the rationale.

Finally, the annual report will relate the site-data to water quality predictions, benchmark objectives, and guidelines, as appropriate. The annual report will make note of instances of any exceedances, and the results of the investigation undertaken to identify the cause, whether an event (e.g., large rainfall event, a "near-miss" associated with water management infrastructure or protocols) or trend (e.g., such as sediment pond water quality that consistently exceeds predictions).

Annual reports, and all associated data, will be provided to appropriate regulatory authorities as well as FN according to licence conditions.

7.0 REFERENCES

British Columbia Ministry of Environment, 2013. British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Available at: https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_e.pdf. Accessed May 2023.

Government of Canada (Canada). 2023. Metal and Diamond Mining Effluent Regulations (MDMER). SOR/2002-222. Last Amended June 9, 2023. Available at: <https://laws-lois.justice.gc.ca/PDF/SOR-2002-222.pdf>. Accessed May 2023.