APPENDIX E
Geochemical Monitoring Plan

REPORT

Geochemical Monitoring Plan

Coffee Gold Mine

Prepared for:

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REVISION TRACKING LOG

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0	November 2023	-	First submission of the Geochemical Monitoring Plan
1			
2			

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LIST OF TABLES (WITHIN TEXT)

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ABA	Acid Base Accounting
AP	Acid Potential
ARD	Acid Rock Drainage
C	carbon
CN	cyanide
HLF	Heap Leach Facility
ML/ARD	Metal Leaching/Acid Rock Drainage
NP	Neutralization Potential
NPAG	Non-Potentially Acid Generating
PAG	Potentially Acid Generating
QA/QC	Quality Assurance/Quality Control
RCP	Reclamation and Closure Plan
S	sulfur
SFE	Shake Flask Extraction

LIST OF SYMBOLS AND UNITS OF MEASURE

Symbol / Unit of Measure	Definition
%	percent
ha	hectare
m	metre
m^3	cubic metre
mm	millimeter

1.0 INTRODUCTION

The following report outlines the metal leaching and acid rock drainage monitoring plans for the Project. This plan has been developed in accordance with applicable legislation, regulations, and guidelines. A formal metal leaching / acid rock drainage (ML/ARD) Monitoring Plan is required in support of the applications for licenses issued by the Yukon's Department of Energy, Mines and Resources under the *Quartz Mining Act* (Quartz Mining License) and by the Yukon Water Board under the *Water Act* (Type A Water License). This plan has been produced for the purposes of meeting these requirements. The ML/ARD monitoring data gathered as part of this plan will be reported in the Annual Surveillance and Monitoring Report required under the *Quartz Mining Act* Permit. Potential updates to monitoring will be reviewed in the Reclamation and Closure Plan (RCP) updated for the mine, which must be submitted every two years.

1.1 Scope and Purpose

The scope of this document is limited to monitoring of ML/ARD potential associated with geologic materials that will be excavated as part of the Project at the mine site. The commitments made in this document regarding monitoring are summarized in Table 1-1.

Table 1-1 Monitoring Commitments

Material Type	Sampling Commitment	Sampling Location	Reporting Requirements	Section
Waste Rock and Ore	1 sample per 100,000 tonnes for Double Double, Latte and Supremo Pits; one sample per 25,000 tonnes for Kona Pit	Mine Pits	Results to be provided in Annual Monitoring Report	Section 2.1.1
Overburden	1 sample per 25,000 m3 excavated	Overburden Sources	Results to be provided in Annual Monitoring Report	Section 2.1.2
Haul Road Construction Material	2 samples per 100 m	Haul Roads	Progress to be reported in Annual Monitoring Report	Section 2.1.3
Leach Tailings	10 samples per quarter	Heap Leach Facility	Results to be provided in Annual Monitoring Report	Section 2.1.4
Pit Wall	1 sample per 0.2 ha	Mine Pits	Results to be provided in Annual Monitoring Report	Section 2.1.5

2.0 MINE WASTE MONITORING

Mine rock will be monitored for ML/ARD potential as part of the ongoing effort to characterize mine waste over the Project life. This monitoring program will provide continuous characterization of the ML/ARD potential of ore, overburden, waste rock and leach tailings as it is produced. The objectives of further characterization and monitoring are as follows:

- Confirm that the ML/ARD potential is predicted in geochemical characterization work conducted prior to mine construction.
- Confirm that the block model is providing accurate predictions of spatial variability of As leaching potential in waste rock and in-pit overburden.
- Provide continuous characterization of geologic material sent to various storage facilities or used in construction.
- Inform periodic revisions and updates to the RCP.

A summary of sample frequency and characterization methods for different material types is shown in Table 2-1. Regular sampling will consist of rinse pH to confirm in-situ pH of mine rock and stockpiles; an neutralization potential (NP) measurement to confirm ARD potential and carbonate content, total S measurements to confirm acid potential (AP), and total metals analysis to monitor metal enrichment. Sample frequency will vary depending on the type of geologic material and the material source (e.g., elevated sample frequency in Kona Pit). A more complete set of analysis at a commercial laboratory will be conducted for every tenth sample collected as part of the quality assurance/quality control (QA/QC) program. The sample frequency prescribed in Table 2-1 will result in over 7,400 samples being collected for geochemical analysis over the mine life. All data produced as part of ongoing monitoring activities will be included in annual reporting in support of the Quartz Mining License.

Table 2-1 Summary of Sampling Frequency and Analytical Parameters Monitored for Characterization of Mine Rock

Monitoring Program	Sample Type	Regular Sampling		QA/QC	
		Frequency	Parameters	Frequency	Parameters[1]
In-pit mine rock	Drill cutting or assay pulp1	1/100,000 tonnes	Rinse-pH, Total S, Total C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals
In-pit Kona mine rock	Drill cutting or assay pulp1	1/25,000 tonnes	Rinse-pH, Total S, Total C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals
Overburden	Test Pit	1/25,000 m^3	Rinse-pH, Total S, Inorganic C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals
Leach Tailings	Test Pit	10/quarter	Rinse-pH, Total S, Total C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals
Haul Road	Test Pit	2/100 m	Rinse-pH, Total S, Total C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals
Pit Wall	Grab sample	1/0.2 ha	Rinse-pH, Total S, Total C, aqua regia metals	1/10 samples	ABA, SFE, aqua regia metals

Notes:

ABA: Acid Base Accounting; SFE: Shake Flask Extraction

[1] full suite of ABA includes, paste and rinse pH, total S, sulphate-S, sulphide-S, total and inorganic C, Sobek NP, and Siderite NP

2.1 Sample Collection and Frequency

In this section, sample collection and sampling frequency for specific mine materials are described.

2.1.1 Monitoring of Waste rock and Ore

Waste rock and ore will be monitored by collecting either blast hole or grade control drill cuttings within the mine pit. In-pit monitoring samples will either be collected directly from blast hole or taken as splits from grade control drill cuttings. Sampling frequency for the Double Double Pit, Supremo Pit and Latte Pit will be one sample per 100,000 tonnes. Due to the known presence of potentially acid generating (PAG) material in the Kona Pit, higher sampling frequency of one sample per 25,000 tonnes mined will be adopted. This sample frequency will result in approximately 6,000 samples of waste rock and ore being collected for geochemical analysis over mine life.

2.1.2 Monitoring of Overburden

Inorganic overburden will be monitored by collecting composite samples from test pits or active excavation areas as it is being produced. One composite overburden sample is to be collected for every 25,000 m^3 of material removed. A minimum of two well-spaced samples will be collected from each Project component where excavation of overburden amounts to <50,000 m^3 (e.g., pond and dam areas).

2.1.3 Monitoring of Haul Roads

Haul roads will be constructed using waste rock which is subject to in-pit monitoring as described above. In order to confirm the composition of haul roads, additional test pit samples will be collected. Two test pit sample will be collected from every 100 m of haul road constructed. Of these two samples, the first sample will be collected of the road surfacing material, and the second will be collected from haul road fill. This sample frequency will result in over 320 samples being collected for geochemical analysis over mine life.

2.1.4 Monitoring of Leach Tailings

Ore will be stacked on the lined Heap Leach Facility (HLF) pad where it will be mixed with lime and irrigated with a sodium cyanide solution to extract gold. After gold has been extracted from the ore, the material is referred to as leach tailings. Leach tailings will be monitored by collecting quarterly samples from sections of the HLF where cyanide (CN) leaching is complete. A minimum of ten test pit samples will be collected on a quarterly basis from the HLF. This sample frequency will result in approximately 440 samples being collected for geochemical analysis over mine life.

2.1.5 Monitoring of Pit Wall Rock

During active mining, pit wall rock exposures will be constantly changing. Samples from active pit wall faces will be collected from drill cuttings as part of the in-pit monitoring program of ore and waste rock. Once mine excavations uncover the final pit wall exposures, the sampling program will be conducted to characterize the geochemical composition of the final pit wall rock exposures. It is proposed that one sample per 0.2 ha of surface area be collected from each pit. This will result in approximately 700 wall rock samples being collected for geochemical analysis over mine life.

2.2 Analytical Techniques

A variety of static testwork will be conducted as part of the ML/ARD monitoring program. An abridged list of parameters will be monitored as part of the regular sample collection while a more complete set of analyses will be conducted as part of the QA/QC samples (Table 2-1). Regular monitoring of total carbon (C) and total sulfur (S) in waste rock, ore and leach tailings will be measured by a LECO© Induction Furnace (Leco furnace). This analysis along with rinse-pH can be carried out at an offsite commercial analytical laboratory or at an onsite laboratory. The broader range of analyses being conducted as part of the QA/QC program will be carried out at an offsite analytical laboratory (Table 2-1). Analysis of ML/ARD monitoring samples will be carried out in accordance with Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price, 1998).

2.3 QAQC Sampling

In order to maintain QA/QC of monitoring data, duplicate samples will be periodically collected and submitted to an offsite analytical laboratory. One QA/QC sample will be taken for every 10 samples collected, with sample splits taken from the ground homogenized samples. In addition to parameters monitored as part of the regular testing program, QA/QC samples will be analyzed for additional ABA parameters as outlined in Table 2-1.

3.0 ROUTINE EVALUATION

Newmont is committed to the routine evaluation of this plan and monitoring results. Most rock that will be disturbed over mine life has little or no potential for acid generation. The only rock type which may be PAG and requires special management plans to mitigate ARD potential is ore from Kona Pit. If monitoring results demonstrate increased potential for ARD generation from any other rock units, modifications to mine waste management plans will be required.

Mine rock monitoring results will be evaluated against criteria for definition of PAG rock and As and U metal leaching potential described in Waste Rock and Overburden Management Plan. Monitoring results will be reviewed in the Annual Report and compared to ARD characteristics determined during mine permitting. If monitoring of mine rock or water quality at the mine site indicates that a rock unit has higher ML/ARD potential than expected based on geochemical characterization test work conducted as part of mine permitting, mine rock classification will be reviewed, and potential management strategies will be assessed. Some scatter in these results is expected, therefore, a small number of samples that have greater ML/ARD potential than expected may not warrant changes in mine waste management.

In the event that further testing determines that certain rock units or overburden are potentially acid producing, there are several possible mitigation measures that may be employed to mitigate the development of ARD and associated increases in metal leaching. For waste rock and overburden there are two main mitigation options:

- Subaqueous disposal by placing mine waste in areas of mined out pits that will be flooded at the end of mine life
- Mixing/blending of PAG material with acid consuming material (non-potentially acid generation; NPAG).

With respect to the subaqueous disposal mitigation option, it should be noted that the potential for acid generation at the site is very limited and confined to the Kona material which is mined later in the mine life in Year 8. At that time, a number of pit voids (e.g., SU1, SU2, Latte W, SU3) are completed mining and filling with meteoric water. These pits therefore offer the opportunity of direct placement of any ARD material underwater immediately upon extraction. As such, there is little to no risk of onset of ARD as subaqueous disposal will eliminate the potential for sulphide oxidation.

If the blending option is selected over subaqueous disposal, the blending of NPAG and PAG material would need to be assessed on a site-specific basis. The mitigation is feasible where PAG rock has relatively low sulphur content, NPAG rock is available and has excess NP, and the relative available volume of the two material types is adequate for this mitigation.

Options for ARD mitigation from the HLF are as follows:

- Amend additional lime to provide ore stacked on HLF with additional NP
- Mixing potentially acid generating ore with acid consuming ore in HLF
- Encapsulate PAG leach tailings in interior of HLF.

The management strategy adopted will depend on the geochemical characteristics of the PAG rock that is identified. Key characteristics that will impact decision making include lag time until onset of ARD; mass of acidity that could potentially be generated from acidic material; and the volume and location of rock requiring management.

4.0 IMPLEMENTATION AND REPORTING

4.1 Communication and Operational Protocols

The Environmental Manager is responsible for the implementation of the ML/ARD Monitoring program. The Environmental Manager or designate is responsible for coordinating sampling and will arrange for sampling support by qualified geologists through requests to the Chief Mine Engineer or delegate. Currently, the staffing and associated organizational structure for aspects relating to operational management have not been formalized. Once these components are finalized, more detail with respect to communication protocols can be provided as necessary.

4.2 Record Keeping and Tracking

Field results will be recorded when taken, and external lab test results will be transferred electronically into a database. The Environmental Manager or designate will be responsible to ensure the maintenance of the original records and database. Parameters of concern will also be tracked graphically and reviewed periodically to identify trends. Routine monitoring will include, at minimum, the following, unless otherwise approved based on additional analytical results and assessment:

- In-Pit mine rock 1 sample / 100,000 tonnes
- In-Pit Kona mine rock 1 sample / 25,000 tonnes
- Leach Tailings 10 samples / quarter
- Pit wall rock 1 sample / 0.2 ha
- Haul Road 2 samples / 100 m
- Overburden 1 sample / 25,000 m^3.

Investigation and corrective action will be undertaken if monitoring data indicate that actual geochemical characteristics are significantly different than expected based on geochemical characterization test work conducted to date.

4.3 Reporting

Results of the ML/ARD monitoring program will be reviewed and incorporated into external reports as needed. These are anticipated to include:

- The annual report required under the Water Use Licence and Quartz Mining Licence
- Reclamation and Closure Plan updates for the mine, which must be submitted every two years.

5.0 REFERENCES

Appendix 12-D. Lorax 2017. Coffee Gold Project Geochemical Characterization Report. Report Submitted as part of Goldcorp. Project Proposal Submission to YESAB.

Lorax 2022. Coffee Mine Project Geochemical Source Term Report. Submitted to Newmont February 1, 2022.

Price, W. A., 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Prepared by CANMET – Mining and Minerals Sciences Laboratories: Smithers, BC.