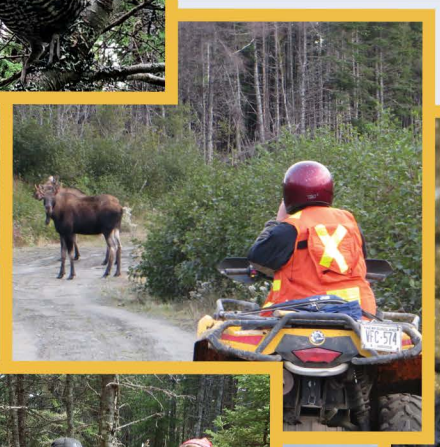
MARATHON GOLD

Valentine Gold Project Baseline Study Appendix 5: Acid Rock Drainage / Metal Leaching (ARD/ML)

September 2020



Valentine Gold Project
Environmental Impact Statement

Final Report

Baseline Study Appendix 5: Acid Rock Drainage / Metal Leaching (ARD/ML) (BSA.5)

Prepared for:

Marathon Gold Corporation
36 Lombard Street, Suite 600
Toronto, ON M5C 2X3

Prepared by:

Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

File No: 121416408

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Abbreviations and Acronyms

ABA	Acid-Base Accounting
AP	Acid Potential
ARD/ML	Acid Rock Drainage / Metal Leaching
BSA	Baseline Study Appendix
CWQG	Canadian Water Quality Guidelines
EIS	Environmental Impact Statement
km	kilometres
Marathon	Marathon Gold Corporation
MDMER	*Metal and Diamond Mining Effluent Regulations*
MEND	Mine Environment Neutral Drainage
mg/L	milligrams per litre
Mm^3	million cubic metres
MMER	*Mining Metal Effluent Regulations*
Mt	megatonne
NL	Newfoundland and Labrador
NLDECCM	NL Department of Environment, Climate Change and Municipalities
NLEPA	*NL Environmental Protection Act*
NP	Neutralization Potential
NPR	Neutralization Potential Ratio
PAG	potentially acid-generating
PPoC	potential parameters of concern
SFE	Shake Flask Extraction
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Total Inorganic Carbon
TMF	Tailings Management Facility
VC	Valued Components

1.0 INTRODUCTION

Marathon Gold Corporation (Marathon) is planning to develop an open pit gold mine south of Valentine Lake, located in the Central Region of the Island of Newfoundland, approximately 60 kilometres (km) southwest of the town of Millertown, Newfoundland and Labrador (NL) (Figure 1-1). The Valentine Gold Project (the Project) will consist primarily of open pits, waste rock piles, crushing and stockpiling areas, conventional milling and processing facilities (the mill), a tailings management facility, personnel accommodations, and supporting infrastructure including roads, on-site power lines, buildings, and water and effluent management facilities. The mine site is accessed by an existing public access road that extends south from Millertown approximately 88 km to Marathon's existing exploration camp. Marathon will upgrade and maintain the access road from a turnoff approximately 8 km southwest of Millertown to the mine site, a distance of approximately 76 km.

The Minister of the NL Department of Environment, Climate Change and Municipalities (NLDECCM) has determined that the Project will require preparation of an Environmental Impact Statement (EIS) under the provincial *Environmental Protection Act* (NLEPA). The Provincial EIS Guidelines require the preparation of a number of baseline studies to describe and provide data on specific components of the EIS; to address baseline data requirements to support the assessment of one or more Valued Components (VCs); and to support the development of mitigation measures and follow-up monitoring programs. Each has been prepared as a stand-alone Baseline Study Appendix (BSA) to the EIS:

- BSA.1: Dam Safety
- BSA.2: Woodland Caribou
- BSA.3: Water Resources
- BSA.4: Fish, Fish Habitat and Fisheries
- BSA.5: Acid Rock Drainage / Metal Leaching (ARD/ML)
- BSA.6: Atmospheric Environment
- BSA.7: Avifauna, Other Wildlife and Their Habitats
- BSA.8: Species at risk / Species of conservation concern (SAR / SOCC)
- BSA.9: Community Health, Services and Infrastructure / Employment and Economy
- BSA.10: Historic Resources

Table 1.1 outlines the organization for BSA.5: ARD/ML.

Table 1.1 BSA.5: ARD/ML

Number	Baseline Study Appendix	Attachment Number	Attachment Name
BSA.5	Acid Rock Drainage / Metal Leaching (ARD/ML)	5-A	Phase I Acid Rock Drainage / Metal Leaching (ARD/ML) Assessment (2018)
		5-B	Valentine Gold Project: Acid Rock Drainage/Metal Leaching (ARD/ML) Assessment (2020)

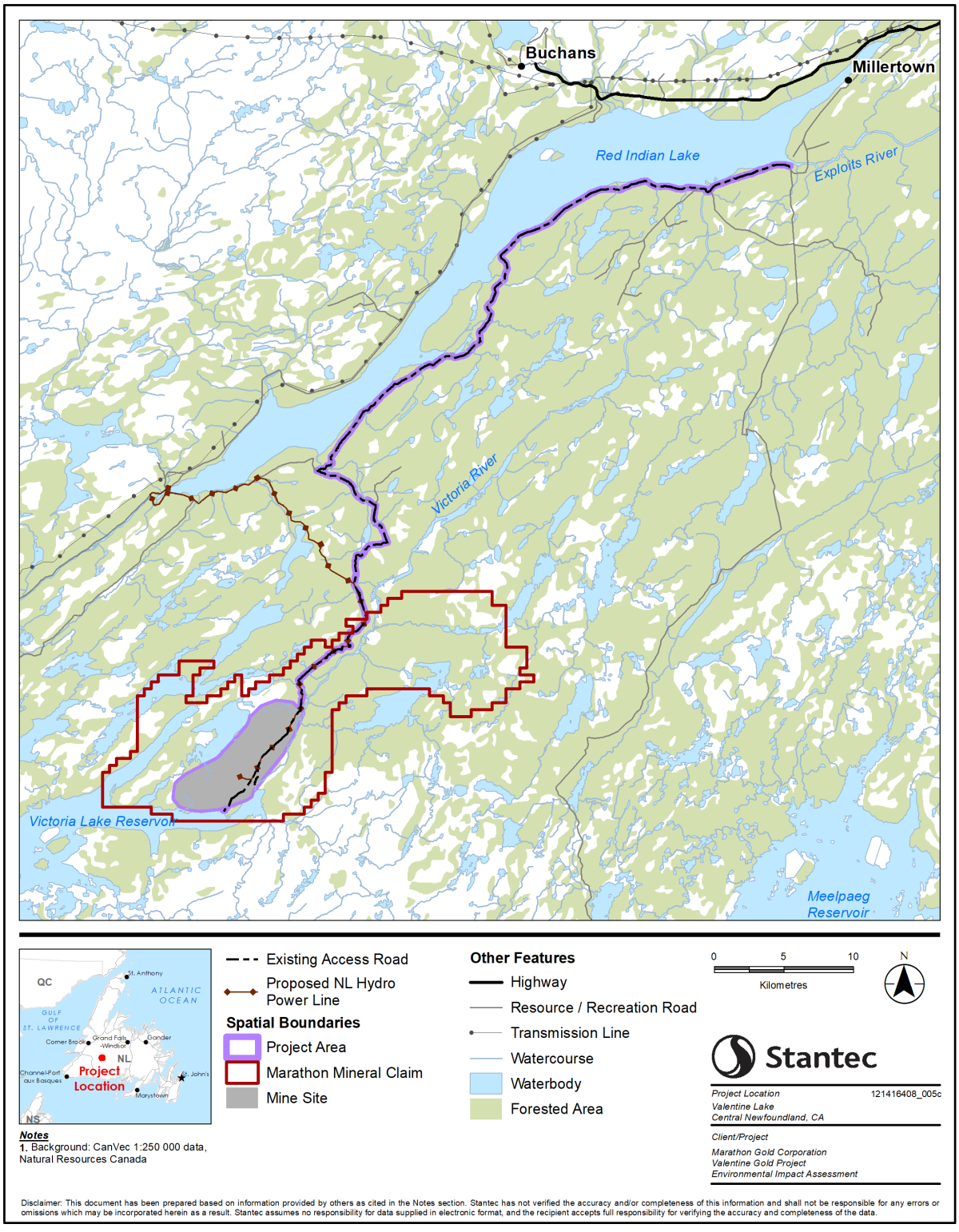

Figure 1-1 Project Area

Note that the BSAs consist of data reports that have been prepared for Marathon over a number of years (i.e., 2011 to 2020), during which the Project has undergone a series of refinements. The study areas and Project references in these data reports reflect the Project description at the time of preparation of these reports. The current Project description for the purposes of environmental assessment is found in Section 2 of the EIS.

2.0 SUMMARY OF ARD/ML BSA ATTACHMENTS

Two field programs were completed by Stantec Consulting Inc. (Stantec) in support of the assessment of ARD/ML for the Project:

- a 2018 ARD/ML field program as reported in *Phase I Acid Rock Drainage / Metal Leaching (ARD/ML) Assessment (2018)*
- an ongoing ARD/ML field program as reported in Valentine Gold Project: Acid Rock Drainage/Metal Leaching (ARD/ML) Assessment Report *(2020)*

Table 2.1 provides a summary of the objectives, study area, methods, and results of each of these programs and studies.

Table 2.1 Summary of ARD/ML BSA Attachments

Rationale / Objectives and Study Area	Methods	Results
Attachment 5-A - Phase I Acid Rock Drainage / Metal Leaching (ARD/ML) Assessment (2018)		
Rationale / Objectives The study's main objectives include: 1) Developing ARD classification and estimating percentages of potentially acid-generating (PAG) materials in major ore and mine rock lithologies. 2) Screening these lithologies for potential parameters of concern (PPoC) that may result in metal leaching. 3) Evaluation of ARD/ML properties of processed materials based on existing metallurgical reports. **Study Area** The study was conducted within the Project Area (Figure 1-1).	Methods involved sampling, laboratory analyses, calculations and classification criteria. **Sampling**: Individual samples representing major mine rock types (Au<0.4 g/t) and ore (Au=>0.4 g/t) lithologies were collected from 1- to 2-m intervals of drill core. One hundred and fifteen (115) and fifty-six (56) samples were taken from the Leprechaun and Marathon deposits, respectively and tested for Acid-Base Accounting (ABA) and total metal content. To assess metal leaching, Shake Flask Extraction (SFE) testing was carried out for approximately half of the samples, including 52 samples from the Leprechaun deposit and for 30 samples from Marathon Deposit. Neutralization Potential Ratios (NPR) were based on carbonate neutralization potential and acid generation potential calculated from sulfide sulfur. ARD/ML results from Leprechaun tailings and concentrates are based on testing done by Thibault & Associates Inc. (2015 and 2017)	**Preliminary results**: Ore from the Leprechaun deposit can potentially contain up to 13% of PAG material. No *Mining Metal Effluent Regulation* (MMER) exceedances were observed in leachates from ore. Exceedances of Canadian Water Quality Guidelines (CWQG) for aluminum (0.1 mg/L) were found in 66% of samples. From 50 to 75% of Marathon ore was conservatively classified as PAG and based on average NPR values. No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for aluminum (0.1 mg/L) were found in 67% of samples. Tailings from Leprechaun deposits are expected to be non-PAG and have excess Neutralization Potential (NP). This excess of NP can be used to offset ARD potential of tailings from Marathon if ores from Marathon and Leprechaun deposit are processed at the same time and mixed. Therefore, ARD is not expected from the mixed tailings, unless Marathon ore is processed separately from Leprechaun ore and resulting solids are left exposed after closure. Tailings and concentrates from Leprechaun have low ML potential, except for copper which exceeded MMER limits in Toxicity Characteristic Leaching Procedure (TCLP) leachates. Mine rock from the Leprechaun deposit has low ARD potential (< 2% of samples are PAG). No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for Al (0.1 mg/L) were found in 74% of SFE tests. Copper, arsenic and lead exceeded CWQG in 2-6% of samples indicating that these elements could be PPoC. Between 4 and 15% of mine rock from the Marathon deposit could be PAG material. No MMER exceedances were observed in SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in all SFE tests indicating that this element could be a PPoC.

Table 2.1 Summary of ARD/ML BSA Attachments

Rationale / Objectives and Study Area	Methods	Results
Attachment 5-B - Phase II ARD/ML Assessment (2020)		
Rationale / Objectives The study's main objectives included: 1. Additional static testing to satisfy Mine Environment Neutral Drainage (MEND) requirements for number of samples. 2. Kinetic testing of representative samples of waste rock lithologies and different ore grades to assist in predicting the chemistry of runoff and seepage from stockpiles and pit walls. ARD onset time can be derived from the results of kinetic tests and used for development of waste rock and tailings management plans. 3. Mineralogical and geochemical characterization of samples selected for kinetic tests. **Study Area** The study was conducted within the Project Area (Figure 1-1).	**Sampling**: In total approximately 350 individual samples representing major mine rock types, high and low grade ore (LGO) were collected from 1- to 2-m intervals of drill core during phase I and II ARD/ML assessments. **Analysis:** Acid Potential (AP) was calculated from sulphide-sulphur hosted in pyrite and marcasite. Neutralization Potential (NP) was calculated from Total Inorganic Carbon (TIC) considering that calcite and dolomite are dominant acid neutralization minerals in the deposits. ARD classification is based on a Neutralization Potential Ratio (NPR=NP/AP) of samples compared to generic thresholds proposed by Price (2009). A sample is conservatively classified as Potentially Acid Generating (PAG) if NPR is below 2; otherwise, the sample is classified as non-PAG. Metal leaching potentials were evaluated by comparing the concentrations of trace elements in the leachates from SFE and kinetic tests to the effluent quality limits prescribed in the Metal Mining Effluent and Diamond Regulations (MDMER) and to the Canadian Water Quality Guidelines (CWQG) for the protection of Freshwater Aquatic Life. Concentrations exceeding MDMER and/or 10x CWQG in kinetic tests indicate parameters with high leaching potential, while concentrations between the CWQG and 10x CWQG value were arbitrarily assigned to moderate leaching potential.	**Results:** **Leprechaun Deposit:** Approximately 1.9 Mm^3 of overburden will be excavated from the Leprechaun open pit. Overburden is classified as non-PAG material with moderate leaching potential for Al, Fe, Pb, and Zn, and no exceedances of the MDMER limits. Less than 0.5% of the approximately 50 Mm^3 of Leprechaun waste rock is classified as PAG. The waste rock pile is not expected to generate ARD due to the small amount of PAG material and significant excess of NP, therefore, specific ARD management of waste rock is not required. There are no exceedances of MDMER limits observed in humidity cell leachates. The waste rock pile will be covered during rehabilitation reducing the already low risk of ARD/ML. Waste rock lithologies show moderate ML potential for Al, P, Cu, Se, and Zn. The assimilative capacity assessment estimates levels of these elements in the receiving environment and will address management for ML, if needed. About 10% of low-grade ore is estimated to be PAG, but overall is not expected to generate ARD. Kinetic testing suggests moderate leaching potential for Al and P. There are no exceedances of MDMER limits observed in these tests. **Marathon Deposit:** Approximately 4.4 Mm^3 of overburden will be generated from the Marathon open pit. Overburden is classified as non-PAG material, with moderate leaching potential for F, Al, As, Cd, Cu, Fe, Mn, Pb, Se, and Zn based on shake flask extracts. There are no exceedances of MDMER limits observed in leachates from overburden. Most of the stockpiled overburden will be used during reclamation. Approximately 14% of the 60 Mm^3 of waste rock is conservatively estimated to be PAG. Blending PAG and non-PAG rock with excess of neutralization potential and/or encapsulation of PAG waste by non-PAG rock is recommended to neutralize acidity potentially generated in PAG pockets. If these recommendations are followed, the

Table 2.1 Summary of ARD/ML BSA Attachments

Rationale / Objectives and Study Area	Methods	Results
		final drainage from waste rock is not expected to be acidic. The waste rock pile will be covered by growth medium / overburden during rehabilitation, further reducing the risk of ARD/ML. There are no exceedances of MDMER limits observed in leachates from the waste rock humidity cells. Overall, waste rock lithologies show moderate ML potential for Al, Hg, Se, and Zn. Approximately one-half of the low-grade ore is conservatively classified as PAG. The ARD onset time in PAG pockets of low-grade ore is approximately six years based on maximum laboratory leaching rates. The Marathon low-grade ore stockpile effluent has been segregated from other mine component flow streams in the overall mine design to facilitate collection and further ARD treatment, if required. There are no exceedances of MDMER limits observed in leachates from low-grade ore under neutral conditions. Based on kinetic testing, Al, P and Zn have moderate leaching potential. **Plant Site:** High-grade ore from the Leprechaun and Marathon deposits will be stockpiled together with 30% of the material originating from Leprechaun and the reminder from Marathon, on average. Approximately 13% and 67% of ore samples from Leprechaun and Marathon pits, respectively are conservatively classified as PAG. The overall mixture of Leprechaun and Marathon high-grade ores is non-PAG and the high-grade ore stockpile is not expected to generate ARD. Drainage from the high-grade ore stockpile flows to the TMF by gravity and any potential acidity will be neutralized in the decant pond or in the mill during pH adjustment required as a part of the gold recovery by cyanide process. No exceedances of MDMER are observed in SFE extracts. Moderate Al leaching was assigned for both Leprechaun and Marathon high-grade ores. Approximately 41 Mt of tailings will be produced from both high-grade ore and low-grade ore with about 38% of the material originating from the Leprechaun pit and the remainder from the Marathon pit.

Table 2.1 Summary of ARD/ML BSA Attachments

Rationale / Objectives and Study Area	Methods	Results
		Composite samples of tailings from both deposits are classified as non-PAG and are not expected to generate ARD. During operation, TMF pond and pore water will likely exceed the MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu sourced from process water. In addition, high leaching potential is also determined for total ammonia, CN_{WAD} (surrogate for free), F, Hg, P, and Fe. After closure, covered tailings beaches are not expected to produce acidic runoff and/or have high or moderate leaching except for P. Seepage from the TMF is conservatively predicted to exceed MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu in post-closure. Requirement for treatment is further predicted by the water quality models and assimilative capacity assessment and discussed in the EIS.

3.0 REFERENCES

Thibault & Associates Inc. 2015. Valentine Lake Gold Process Development Preliminary Assessment of Gold Processing Options: Project Number 6536, Phase I Final Report. Prepared for Marathon Gold Corporation, February 5, 2015.

Thibault & Associates Inc. 2017. Valentine Lake Gold Process Development Marathon Deposit Flowsheet Assessment: Project Number 6536, Phase II Final Report. Prepared for Marathon Gold Corporation, January 30, 2017.

Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, Report prepared for MEND. Report 1.20.1, p. 1-579.

ATTACHMENT 5-A

Phase I Acid Rock Drainage / Metal Leaching (ARD/ML) Assessment (2018)

Preliminary Results of Phase I ARD/ML Assessment

Final Report

Prepared for:
Marathon Gold Corp.
36 Birchview Drive
Pasadena, NL A0L 1K0

Prepared by:
Stantec Consulting Ltd.
500-311 Portage Avenue
Winnipeg, MB R3B 2B9

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March 23, 2018

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Executive Summary

Marathon Gold is currently in early stages of Preliminary Economic Assessment (PEA) and environmental baseline studies for the Valentine Lake Project (the Project), which is located in central Newfoundland approximately 57 km south of the town of Buchans. The project includes several significant gold deposits, the Leprechaun, Marathon, Sprite and Victory. A conceptual site layout comprises four open pits, one at each deposit, containing in total ~ 21 Mt of ore and ~210 Mt of mine rock. The location of infrastructure and processing options is subject to change and will be determined once the PEA is complete.

As part of environmental baseline studies, and in support of PEA, Stantec was asked to conduct a geochemical evaluation and provide assessment of Acid Rock Drainage/Metal Leaching (ARD/ML) properties of materials exposed by the Project. The geochemistry work is being conducted in two phases. Phase I is focused on the analysis of static testing of samples from the Leprechaun and Marathon deposits that account for 90-95 % of gold resource. This report presents results of Phase I, major tasks of which were:

- Developing ARD classification and estimating percentages of potentially acid-generating (PAG) materials in ore and mine rock.
- Screening these materials for potential parameters of concern (PPoC) that may result in ML.
- Evaluation of ARD/ML properties of processed materials based on existing metallurgical reports.

The method for the ARD/ML assessment generally follows the Mine Environment Neutral Drainage (MEND) "Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials" (Price 2009). One hundred fifteen (115) and fifty-six (56) samples were taken from the Leprechaun and Marathon deposits, respectively. The samples were tested for Acid-Base Accounting (ABA), Shake Flask Extraction (SFE) and Total Metals. Neutralization Potential (NP) was calculated from Carbonate Carbon and Acid Potential (AP) was calculated from Suphide-Sulphur. ARD classification is based on Neutralization Potential Ratio (NPR=NP/AP) of sample results compared to generic thresholds proposed by Price (2009). A sample/material is conservatively classified as PAG if NPR is below 2, otherwise the material is considered to be non-PAG. Metal Leaching potentials were evaluated by comparison of concentrations of trace elements in the leachates from SFE to *Mining Metal Effluent Regulation* (MMER) limits and to *Canadian Water Quality Guidelines (CWQG)* for the protection of *Freshwater Aquatic Life (FAL)*.

Preliminary key findings for Phase I ARD/ML assessment are:

- Ore from the Leprechaun deposit can potentially contain up to 13% PAG material based on testing of eight samples. No MMER exceedances were observed in SFE leachates from ore. Exceedances of CWQG for aluminum (0.1 mg/L) were found in 66% of samples.

PRELIMINARY RESULTS OF PHASE I ARD/ML ASSESSMENT

Introduction
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- Marathon ore was conservatively classified as PAG and could potentially contain from 50 to 75% PAG materials. Additional testing of Marathon ore is recommended to better define percentages of PAG materials. No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for aluminum (0.1 mg/L) were found in 67% of samples.

- Tailings from Leprechaun deposits, are expected to be non-PAG and have excess of NP. This excess of NP can be used to offset ARD potential of tailings from Marathon if ores from Marathon and Leprechaun deposit are processed at the same time and mixed. Therefore, the mixed tailings are not expected to show ARD potential, unless Marathon ore is processed separately from Leprechaun ore and resulting solids are left exposed after the closure. Tailings and concentrates from Leprechaun have low ML potential, except for copper which exceeded MMER limits.

- Mine rock from the Leprechaun deposit has low ARD potential (less than 2% of samples are PAG). No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for Al (0.1 mg/L) were found in 74% of SFE tests. Copper, arsenic and lead exceeded CWQG in 2-6% of samples indicating that these elements could be PPoC.

- Mine rock form the Marathon deposit could contain between 4 and 15% PAG material. No MMER exceedances were observed in SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in all SFE tests indicating that this element could be a PPoC.

- Aluminum exceedances in SFE tests from all materials are likely related to analysis of fine solids/colloids (i.e., total suspended solids) present in leachate. Because mine rock deposits are expected to also generate drainage containing total suspended solids, the potential aluminum exceedances can be mitigated by precipitation of aluminum colloids in sedimentation ponds by addition of coagulants and/or flocculants during operation.

These preliminary conclusions are based on a limited number of samples and conservative assumptions. The conclusions should be supported by additional static and kinetic testing as recommended for the second phase of ARD/ML assessment.

1.0 Introduction

Marathon Gold is currently in early stages of Preliminary Economic Assessment (PEA) and environmental baseline studies for the Valentine Lake Project, which is located in central Newfoundland approximately 57 km south of the town of Buchans. The project includes several significant gold deposits, the Leprechaun, Marathon, Sprite and Victory gold deposits. The Leprechaun and Marathon deposits represent 90-95% of the Valentine Lake Gold Camp resources.

The existing infrastructure is limited to a 90-km long network of gravel logging roads, a 55-person year-round camp equipped with a kitchen, core-logging facilities, office, warehouse, three diesel generators, and other assorted buildings. The southwest side of the Valentine Lake property is bounded by the Victoria Lake hydroelectric reservoir, which serves the Granite Lake power generating station of Newfoundland and Labrador Hydro, 40 km to the southeast. The Newfoundland government operates a hydroelectric power generating station 30 km to the north at Star Lake. The Valentine Lake Project area does not contain historical features of existing mining activities such as extraction and processing of ore.

A conceptual site layout produced by John T. Boyd company (2017) comprises four open pits, including the Leprechaun pond pit, Marathon pit, Sprite pits, and Victory pit, with two waste disposal areas adjacent to the Leprechaun pond pit and Marathon pit, and a mill and crusher located north-west of the Marathon pit within 1 km of each other. All four deposits have potential for underground development. The location of infrastructure and processing options is subject to change and will be determined once the PEA is complete.

1.1 PURPOSE

As part of environmental baseline studies, Stantec was asked to conduct a geochemical evaluation and provide assessment of Acid Rock Drainage/Metal Leaching (ARD/ML) properties of materials exposed by the Project. The geochemistry work is being conducted in two phases. Phase I is focused on the analysis of static testing of rock and ore samples from the Leprechaun and Marathon deposits that account for 90-95 % of the gold resource. Phase II work will include additional static and kinetic testing and will include Victory and Sprite deposits. The major tasks of Phase I are:

- Developing ARD classification and estimating percentages of potentially acid-generating (PAG) materials in major ore and mine rock lithologies.
- Screening these lithologies for potential parameters of concern (PPoC) that may result in metal leaching.
- Evaluation of ARD/ML properties of processed materials based on existing metallurgical reports.

2.0 Review of Preliminary Data Reports, Regulatory Requirements, and Data Requirements

2.1 REGULATORY REQUIREMENTS

Recent Environmental Impact Statement (EIS) guidelines issued for environmental assessments of individual metal mines under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) routinely recommend using the "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials" produced by the Mine Environment Neutral Drainage (MEND) for ARD/ML prediction (Price 2009). This manual was used in developing the study design and establishing ARD classification for this study. The specific guidelines from this manual are discussed in Section 1.0. This study also considered the federal "Environmental Code of Practice for Metal Mines" prepared by Environment and Climate Change Canada (Environment Canada 2009).

The Geochemistry Baseline Program has been designed to provide information for the future environmental assessment and to satisfy the following regulations and guidelines:

- The *Metal Mining Effluent Regulations (MMER) SOR/2002/222* (2015), which will also be referenced during the environmental assessment (EA) process (MMER 2017).
- The *Canadian Environmental Quality Guidelines* for the quality of aquatic ecosystems, namely the Canadian Water Quality Guidelines for the protection of the Freshwater Aquatic Life (CWQG-FAL) (CCME 2017).
- The *Newfoundland and Labrador Regulation 65/03: Environmental Control Water and Sewage Regulations* under the *Water Resources Act (O.C. 2003-231)* (NLR 2003).

Schedule C of the Newfoundland and Labrador Regulation *65/03* refers to Sections 3, 19.1, and 20 and Schedule 4 of the *MMER SOR/2002-222*. Therefore, the CWQG-FAL and MMER are used as the primary criteria.

2.2 DATA REQUIREMENTS

Development of an adequate geochemistry baseline dataset requires:

- Bedrock and host rock geology of the deposit, including a table of geologic descriptions, geological maps and cross-sections of appropriate scale.
- Geochemical characterization of expected mine material such as mine rock, ore, low-grade ore, tailings, overburden and potential construction material to predict ARD/ML including:
    1. Acid-Base Accounting (ABA)
    2. Short-term ML properties

3. Estimates of the ARD/ML potentials for mined materials

4. Long-term leaching rates

5. Estimates of potential time to the onset of ARD

6. Chemistry of column tests liquid from acid rock testing

The first three items of the list shown above are covered in the present Phase I ARD/ML assessment report. The rest of the list will be addressed in the Phase II of the proposed ARD/ML assessment.

2.3 EXISTING DATA

Geochemical data gathered for the Project includes prior assessments completed by others. The following reports and publications containing data related to Acid Rock Drainage (ARD) and Metal Leaching (ML) characterization of mine materials were available to Stantec (shown in chronological order):

- G&T Metallurgical Services Ltd. 2010. Flowsheet Development Testing - Valentine Lake Project. Prepared for Marathon Gold Corporation, October 18, 2010.

- G&T Metallurgical Services Ltd. 2012. Metallurgical Testing – Master Composite, Valentine Lake Project, Marathon Gold Corporation. Prepared for Marathon Gold Corporation, January 24, 2012.

- Micon International Ltd. 2012. Technical Report on the Updated Mineral Resource Estimate for the Leprechaun Gold Deposit, Valentine Lake Property, Central Newfoundland, Canada. Prepared for Marathon Gold Corporation, January 9, 2012.

- Micon International Ltd. 2017. Technical Report on the Mineral Resource Estimate for the Valentine Lake Project, Newfoundland, Canada. Prepared for Marathon Gold Corporation, February 16, 2017.

- Thibault & Associates Inc. 2015. Valentine Lake Gold Process Development Preliminary Assessment of Gold Processing Options: Project Number 6536, Phase I Final Report. Prepared for Marathon Gold Corporation, February 5, 2015.

- Thibault & Associates Inc. 2017. Valentine Lake Gold Process Development Marathon Deposit Flowsheet Assessment: Project Number 6536, Phase II Final Report. Prepared for Marathon Gold Corporation, January 30, 2017.

PRELIMINARY RESULTS OF PHASE I ARD/ML ASSESSMENT

Review of Preliminary Data Reports, Regulatory Requirements, and Data Requirements
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Metallurgical studies of high and low grade ore from the Leprechaun and Marathon deposits were carried out by Thibault & Associates Inc. Five flowsheet options are under consideration, including:

- flotation followed by Carbon-in-Leach (CIL) cyanidation of the flotation concentrate
- flotation followed by CIL cyanidation of the flotation concentrate and flotation tailings
- gravity gold recovery followed by CIL cyanidation of the gravity tailings
- heap leach at crush size ½ inch minus short dynamic column test for low grade ore
- heap leach at crush size ¾ inch minus short dynamic column test for low grade ore

A preferred processing option(s) will be selected after the PEA is complete. Mineralogical and chemical testing of water rock, ore, and proceeded materials have been conducted as part of the metallurgical program. Results of these testing related to ARD/ML assessment are discussed in Sections 4 and 5.

3.0 Methods

3.1 SAMPLING

3.1.1 Solid Samples

The maps and cross-sections containing the samples selected for this study are shown in Appendix A. Individual samples representing major mine rock types (Au<0.4 g/t) and ore (Au=>0.4 g/t) lithologies were collected from 1- to 2-m intervals of drill core. One hundred and fifteen (115) and fifty-six (56) samples were taken from the Leprechaun and Marathon deposits, respectively. These samples were submitted to Maxxam Analytics Inc., Burnaby, BC, and tested for ABA and total metal content. To assess metal leaching, Shake Flask Extraction (SFE) testing was carried out for approximately half of the samples, including 52 samples from the Leprechaun deposit and for 30 samples from Marathon Deposit. The SFE testing was done by Global ARD Testing Services Inc., Burnaby, BC.

The analytical methods are summarized in Section 3.2 and laboratory reports and the data tables based on the laboratory reports are presented in Appendices B and C.

3.2 LABORATORY ANALYSES

3.2.1 Static Testing

In this report, static testing is defined as the following analyses: ABA and total concentrations of trace elements. SFE testing was used to assess short-term leaching of trace elements. Methods for these tests are discussed below in detail.

Preparation of individual samples for static testing included drying samples at 40°C, crushing, subsampling, and pulverization to 200 mesh (0.074 mm).

The ABA analysis included the following:

- Paste pH was measured by inserting a combination pH electrode into a sample paste using a ratio of 1:2 water-to-solid solution.
- Total S was analyzed by the Leco induction furnace (Leco) with an infrared detector (IR) at or above 1,650°C.
- Sulphate-sulphur was extracted by a 15% hydrochloric acid (HCl) digestion method and the leachate was measured for sulphate by the turbidimetric method.
- Carbonate Carbon (TIC) was analyzed by the conversion of carbonate minerals to carbon dioxide using dissolution in hydrochloric acid and measured using colorimetric titration. Carbonate carbon was calculated from a concentration of TIC using conversion for molecular weight.

- Neutralization Potential (NP) was determined using the Modified-Sobek method, with the addition of hydrochloric acid over 24 hours at room temperature to maintain the pH between 1.5 and 2.0. The extract was then filtered and treated with hydrogen peroxide (H_2O_2) to oxidize ferrous iron to ferric iron prior to back titration with sodium hydroxide (NaOH). This method is also referred to as the Modified Sobek neutralization potential with siderite correction.

Testing for total concentrations of trace elements involved *aqua-regia* digestion of pulverized samples followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) analysis. Mercury was analyzed by Cold-Vapour Atomic Adsorption Spectrometry (CVAAS).

The SFE testing involved continuous mixing of 250 g of a crushed sample with 750 mL of deionized water for 24 hours using gyratory shaking at minimum agitation. The resulting leachate was filtered through a 0.45-µm membrane and analyzed for trace elements by ICP-MS. In addition, SFE leachates were analyzed for pH, alkalinity by titration, and sulphate by turbidimetry.

The certificates of analyses of static and SFE tests are presented in Appendix C.

As part of a metallurgical study by Thibault & Associates Inc. (2015 and 2017), ore, waste rock, concentrate and tailings samples from the Leprechaun deposit were analyzed for ABA by the Sobek method and Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method 1311 as follows:

1. Thibault & Associates Inc. 2015:

    - Twelve (12) samples of drill core pulps, including five samples representing non-mineralized waste rock (containing 0.005 g/t Au) and seven samples representing varying ore grades.

    - A sub-sample of direct flotation tailings from bulk flotation tests (FL-11 to FL-20 Comp. Tails).

    - A sub-sample of solid residue from cyanide leaching of direct flotation tailings (CN-LEA-18 Residue).

    - A sub-sample of flotation concentrate from bulk flotation tests on gravity tails – neutralized with lime to pH 10.5 to 11.0 (FL-07 to FL-10 BSC-Neutralized).

2. Thibault & Associates Inc. 2017:

    - A sub-sample of cyanide leach residue (CN-LEA-15 Residue).

    - A sub-sample of flotation tailings (FL-05 to FL-18).

The ABA procedure by the modified Sobek method was used without siderite correction. This method produces overestimated NP potential if Fe and Mg carbonates are present in tested samples.

In addition, composite ore samples from Leprechaun and Marathon Deposit were tested for sulfur and carbon species by Thibault & Associates Inc. (2017) (Appendix B, Table B-9). These results were also used for ARD classification in this report.

3.2.2 Quality Control

The analyses described above were completed by laboratories accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).

The details on the laboratory Quality Assurance/Quality Control (QA/QC) procedures used during the analyses and the specific details on the methods are provided in Appendix C.

Additional QA/QC measures were applied, including the following:

- The analytical laboratories were obliged to provide high-quality analyses to ensure that the method detection limits (DLs) for the analyzed parameters were less than the Canadian Water Quality Guidelines (CWQG) for the protection of Freshwater Aquatic Life (FAL) by Canadian Council of Ministers of the Environment (CCME 2017).

- Results of analysis have been screened following Stantec's Standard Operating Procedures. In the event of a discrepancy, samples were reanalyzed to confirm or replace the originally reported value.

The following sections describe the criteria used for classification of ARD/ML applied for this assessment.

3.3 CALCULATIONS AND CLASSIFICATION CRITERIA

3.3.1 ARD Criteria

3.3.1.1 Static Tests

The method for the ARD/ML assessment generally follows the (MEND) "Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials" (Price 2009). ARD classification is based on Neutralization Potential Ratios (NPR) of samples compared to generic thresholds proposed by Price (2009) and includes the following:

- Carbonate NPR = Carbonate NP/AP
- Siderite NPR = Siderite NP/AP

where NP and AP are Neutralization and Acid Generation Potentials, respectively.

MEND guidelines recommend classifying samples as follows:

- PAG if NPR is less than 1
- Uncertain ARD potential if NPR is between 1 and 2
- A non-PAG if NPR is greater than 2

To eliminate the uncertainty related with the samples within the range of NPR between 1 and 2, a sample is conservatively classified as PAG if NPR is below 2. The paste pH values were used to confirm if any of the samples with NPR below 2 are currently generating acid.

Carbonate NP was calculated by Maxxam using CO_2 concentrations measured by the evolution method and applying the following equation:

$$\text{Carb. NP } (CaCO_3 \text{ kg/t}) = \text{Carbonate Carbon } (CO_2, \text{ wt\%}) \times (100/44) \times 10 \quad (3.3\text{-}1)$$

Siderite NP was measured using Modified Sobek method with correction for iron and manganese in carbonates (Siderite correction).

Siderite NP and Carbonate NP are very close in samples from both Sites and generally plot along a 1:1 line if Carbonate NP is above approximately 40 kg $CaCO_3$/t for the Leprechaun deposit and approximately 20 kg $CaCO_3$/t for the Marathon Deposit (Appendix D, Figures D-1 and D-2). Below these values, Siderite NP reports noticeably higher values than Carbonate NP. Therefore, Carbonate NP will produce lower NPR values than Siderite NP below approximately 40 kg $CaCO_3$/t for the Leprechaun deposit and approximately 20 kg $CaCO_3$/t for Marathon Deposit, resulting in a more conservative ARD classification.

AP was calculated by Maxxam as the arithmetic difference between total Sulphur and Sulphur extractable by HCl acid, which was then multiplied by the conversion factor of 31.25:

$$AP = 31.25 \times (\text{Total Sulphur, wt\%} - \text{HCl Extractable Sulphur, wt\%}) \quad (3.3\text{-}2)$$

This calculation is valid for all samples of mine rock, ore, and tailings with total sulphur content greater than 0.1 wt.% because almost all sulphur occurs as sulphide in these samples (Appendix D, Figures D-3 and D-4). In samples with total sulphur content less than 0.1 wt.%, AP is overestimated, which is true for several overburden samples. Overestimation of AP reduces NPR values, resulting in more conservative ARD classification.

For completeness, Net Neutralization Potential (NNP) was calculated and reported using the following equation:

$$NNP \text{ (kg } CaCO_3\text{/t)} = NP - AP \quad (3.3\text{-}3)$$

Siderite NPR and Carbonate NPR are very close in samples from both deposits and generally plot along a 1:1 line if Carbonate NPR is above 2 (Appendix D, Figures D-5 and D-6). Below a NPR of

2, Siderite NPR reports higher values than Carbonate NPR. Therefore, Carbonate NPR will produce lower NPR values than Siderite NPR below 2, resulting in a more conservative ARD classification.

Values below the respective detection limits (DL) were set to a value of 1/2 DL in calculations presented in this report.

Carbonate NP, AP and Carbonate NPR in composite ore samples were calculated using inorganic carbon and sulphide-sulphur analysis obtained by Thibault & Associates Inc. (2017).

3.3.2 Metal Leaching (ML) Criteria

The term Metal Leaching (ML) was initially applied to metals; however, in current practice, this term generally defines a broad range of leachable trace elements including such metalloids as arsenic, antimony and selenium. Metal concentrations and pH in SFE leachates were compared to respective parameters prescribed by the MMER. The results of the SFE were also compared with the CWQG-FAL or, thereafter CWQG (CCME 2017). For hardness-dependent guidelines, the lowest CWQG values were used conservatively assuming soft water. The following percentages of CWQG exceedances were arbitrarily used to rank the leaching potential of specific elements:

75% or higher – high potential

25% to 75% – moderate potential

25% or less – low potential

Comparison of the SFE results to the MMER limits and CWQG guidelines represents only a qualitative comparison because the Rock:Solution ratio of 1:3 used in the leaching tests will differ from the actual project field condition ratio.

Total metal content in the ore and mine rock was also compared with average elemental abundances in the upper Earth's crust (Rudnick and Gao 2004). Element concentrations exceeding ten times (10x) the average crustal elemental abundances were arbitrarily selected to show an enriched sample. However, elemental enrichment alone does not adequately predict the leaching behavior of that element and may not have environmental significance. Therefore, exceedances of 10x the average elemental abundances in the upper crust were only discussed for elements showing moderate or high leaching potentials from SFE analyses.

4.0 Results

4.1 GEOLOGY

The geological description is mostly based on the recent Micon reports (2012 and 2017) that summarize previous findings. The Valentine Lake Project lies approximately 15 km south of the north-northeast trending Red Indian Line, which is a major regional structure separating the rocks of the Victoria Lake Group from the younger Buchans volcanic sequence.

Gold mineralization occurs along the boundary between the Valentine Lake Intrusive Complex and the Silurian Rogerson Lake conglomerate, which lies on the eastern flank of the Valentine Lake Intrusive Complex. The gold mineralization forms a thin, but laterally extensive unit that lies unconformably (overturned) on the southeast margin of the Valentine Lake Intrusive Complex (Appendix A, Figure A-1).

The Valentine Lake property has undergone an initial deformation event (D1) associated with the strong northeast trending foliation and a small-scale isoclinal folding event (D2). The fabrics associated with the D1 event, consist of a mica foliation (S1), locally grading to metamorphic layering, and within the conglomerates by elongation and flattening of the clasts along a prominent lineation direction (L1) plunging at 50° towards 150°. The more competent lithologies, such as the trondhjemite, deformed in a brittle fashion resulting in quartz filled, tension-gash veins and providing a route for later mafic dykes. All intrusive rocks demonstrate saussuritization of plagioclase and strong alteration of mafic minerals to chlorite and epidote.

The Leprechaun Gold deposit is hosted by dominantly trondhjemite, lesser mafic dike while the Marathon Gold deposit is hosted by quartz porphyry and aphanitic quartz porphyry with lesser amounts of mafic dike (Appendix A, Figures A-2 and A-3). Sedimentary host rocks are conglomerates, banded- to finely-laminated siltstones, argillites, and tuffaceous siltstones, with minor intercalated mafic tuffs.

The host lithologies in both deposits are deformed with a strong penetrative foliation and lineation. The major types of veining encountered in the Project area are gold-bearing quartz-tourmaline-pyrite (QTP) veins and barren quartz-calcite-chlorite veins. The QTP veining occurs as dominantly shallow southwest dipping extensional veining with orientation high angle to the penetrative stretching lineation and as lesser steep northwest to sub-vertical shear parallel veining. A pervasive carbonate-sericite and variably silicified alteration of the host rocks occurs in association with the QTP mineralized veining.

The Leprechaun Gold deposit lies along a major regional fault zone at the southwestern end of the Valentine Lake property. The Leprechaun Gold deposit consists of dominantly shallow southwest dipping enechlon stacked extensional quartz-tourmaline-pyrite (QTP) veins and lesser steep northeast dipping, shear parallel QTP veins that collectively form a northeast-southwest striking mineralized corridor dipping 65 degrees to the northwest and ranging from 25 to 40

meters wide (Appendix A, Figures A-4 and A-5).(These sections relate to the Marathon Deposit and should go with the last paragraph) Shallow-dipping mineralization is recognized to extend beyond the boundaries of the main, steeply-dipping mineralized structure, into the hanging wall. Mineralization occurs in several domains including the Main zone, focused proximal to two large mafic dykes, and Zones 2 and 3, which are in the hanging wall and footwall.

Discontinuous mafic dykes are parallel to the Main zone and appear to be intimately associated with the development of mineralized veins. Immediately above the upper mafic dyke, in contact with the hanging wall, are zones of mineralized tension-gash quartz-tourmaline veins.

The Marathon deposit consists of a 40- to 100-m wide, near vertical corridor of alteration and mineralization that is open along strike and to depth. It hosts shallow, southwest-dipping, enechelon quartz-tourmaline-pyrite gold-bearing vein arrays.

4.2 MINERALOGY

Mineralogical characterization is not in the scope of the Phase I ARD/ML assessment, but will be included in Phase II. Mineralogical tests were done for the ore from the Leprechaun deposit by G&T Mineralogical Services Ltd. in 2010 and 2012. A Particle Mineral Analysis (PMA) technique of the QEMSCAN (Quantitative Evaluation of Minerals by Scanning Electron Microscope) using Automated Digital Imaging System (ADIS) were conducted.

The 2010 studies used a composite sample made from combination of four samples representing typical mineralization at about average grade for the Leprechaun deposit (total estimated weight of 53.6 kg). The results of the study showed the following:

- Pyrite was the dominant sulphide mineral (1% of sample). Approximately 81% of the pyrite was contained in a coarse size fraction (>32 µm) while chalcopyrite and pyrrhotite were present in lesser amounts (0.08 and 0.1, respectively) and as fine grain size (<12 µm K_{80}).
- Calcite and ankerite content was 3.3% and 2.0%, respectively.
- The dominant gangue minerals were feldspars (49.3%), quartz (25.3%), and micas (9.4%). Minor non-sulfide minerals include tourmaline, chlorite, iron oxides, clays, garnet and apatite.

The 2012 studies were conducted using a master composite sample produced from the three grade composite samples (low, medium, and high) from the Leprechaun Gold deposit. The study showed the following:

- The sulphide mineral content was 1.31% of the composite mass. The main sulphide minerals were pyrite (1.29%) and chalcopyrite (0.02%). Minor sulfides include pyrrhotite, bornite, covellite, sphalerite and galena.
- Calcite and ankerite content was 5.4% and 1.4%, respectively.

- The dominant non-sulphide minerals were feldspars (47.8%), quartz (25%), and micas (10%).

4.3 GEOCHEMISTRY

The results of the ABA analysis, total concentrations of trace elements, and SFE tests are presented in Appendix B, Table B-1 to Table B-11.

4.3.1 Leprechaun Deposit

4.3.1.1 Ore

In ore, one of eight samples analyzed records both Carbonate NPR and Siderite NPR below 2 and can potentially generate acid (Appendix B, Table B-1). Based on the limited number of samples and using Carbonate NPR, up to 13% of the ore from the Leprechaun deposit may be PAG material.

In ore, exceedances of 10x Average Concentration in the Earth's Upper Crust (ACUC) were detected for cadmium in one of eight samples (Appendix B, Table B-1). This metal does not exceed CWQG in SFE tests indicating low metal leaching potential (Appendix B, Table B-4). No MMER exceedances were observed in SFE leachates. Aluminum concentrations exceeded CWQG (0.1 mg/L) in four of five SFE tests indicating that this element could be a PPoC. This finding should be confirmed with kinetic testing and water quality modeling.

Acid base accounting testing during metallurgical studies of ore of different grades from the Leprechaun deposit showed that four of five samples have NPR>2 and would be classified as non-PAG (Thibault & Associates Inc. 2015). The metal leaching potential was low with exception of copper concentration that exceeded MMER guidelines in TCLP leachate.

In another set of composite ore samples from metallurgical tests, carbonate NPR was greater than 2 in all three samples, which can be classified as non-PAG (Appendix B, Table B-10).

Results from this study and metallurgical tests, both indicate that bulk ore from Leprechaun deposit can be classified as is non-PAG.

4.3.1.2 Mine Rock

Thibault & Associates Inc. (2015) tested five composite samples of waste rock from the Leprechaun deposit. All five samples had NPR ratios significantly higher than 2 indicating that the waste rock would be classified as non-PAG.

The results from this study are summarized separately for major lithologies.

Trondhjemite (TRJ)

In 46 samples of trondhjemite all Carbonate and Siderite NPR values were above 2 indicating that this dominant lithology of the Leprechaun open pit is non-PAG (Appendix B, Table B-1). No exceedances of 10x ACUC and MMER were detected (Appendix B, Table B-3).

Concentrations of aluminum exceeded CWQG (0.1 mg/L) in four of 15 SFE tests indicating that these elements could be a PPoC. (Appendix B, Table B-4).

Quartz Mineralized Zone and Trondhjemite + Quartz-Tourmaline-Pyrite veins (QZ-TQTP)

In one of 28 samples of QZ-TQTP lithology, Carbonate NPR and Siderite NPR value are below 2 (Appendix B, Table B-1). This indicates that about 4% of QZ-TQTP lithology is PAG material.

Exceedances of 10x ACUC were detected for molybdenum in one of 28 samples (Appendix B, Table B-3). This metal does not exceed CWQG in SFE tests indicating low metal leaching potential (Appendix B, Table B-4).

No MMER exceedances were observed in SFE leachates (Appendix B, Table B-4). Concentrations of aluminum, copper, and lead exceeded CWQG (0.1 mg/L) in nine, two, and one of nine SFE tests, respectively.

Mafic Dike (MD)

One of 15 samples of mafic dykes had Carbonate NPR and Siderite NPR values below 2 and can potentially generate acid (Appendix B, Table B-1). This sample result indicates that about 4% of MD lithology is PAG material.

No exceedances of 10x ACUC were detected mafic dykes (Appendix B, Table B-3). No MMER exceedances were observed in SFE leachates (Appendix B, Table B-4). Concentrations of aluminum, and arsenic exceeded CWQG criteria in nine and one of nine SFE tests, respectively.

Sediment (SED)

No Carbonate or Siderite NPR values were below 2 in 13 samples indicating that sediment lithology is non-PAG (Appendix B, Table B-1). No exceedances of 10x ACUC (Appendix B, Table B-3).

No MMER exceedances were observed in SFE leachates (Appendix B, Table B-4). Concentrations of aluminum and copper exceeded CWQG in eight and one of nine SFE tests, respectively (Appendix B, Table B-4).

QZ-MQTP, QZ-QTP, and QZ-SQTP

This section describes the three lithologies, including Quartz Mineralized Zone in Mafic Dike with Quartz-Tourmaline-Pyrite veins (QZ-MQTP), Quartz Mineralized Zone containing Quartz-

Tourmaline-Pyrite veins (QZ-QTP), and Quartz Mineralized Zone in Sediments with Quartz-Tourmaline-Pyrite veins (QZ-SQTP). Due to the small number of samples analyzed for each of the lithologies they are grouped together.

A single sample analyzed for QZ-SQTP lithology had Carbonate NPR value below 2 (Appendix B, Table B-1). No exceedances of 10x ACUC (Appendix B, Table B-3).

No MMER exceedances were observed in SFE leachates. Concentrations of aluminum exceeded CWQG criteria (0.1 mg/L) in all SFE tests.

4.3.1.3 Tailings

Preliminary studies of the sub-samples of tailings from processing of the Leprechaun deposit by Thibault & Associates Inc. (2015 and 2017) show the following results:

- The two composite samples of the flotation tailings (FL-11 to FL-20 Comp. Tails and FL-07 to FL-10 BSC-Neutralized) and one samples of tailings residue after cyanide leaching (CN-LEA-18 Residue) have NPR>2 and can be classified as non-PAG.
- These samples have very low metal leachability, except for copper that exceeded MMER in TCLP leachate in one sample of tailings (FL-11 to FL-20 Comp. Tails) and in the tailings residue (CN-LEA-18 Residue).
- Two samples of concentrates (FL-07 to FL-10 BSC-Neutralized and FL-07 to FL-10 BSC-Neutralized) are PAG with a Neutralization Potential Ratio less than 1.
- The concentration of copper exceeded MMER guidelines in the TCLP leachate from one sample of concentrate (FL-07 to FL-10 BSC-Neutralized).

4.3.2 Marathon Deposit

4.3.2.1 Ore

Two of three composite samples of Marathon ore from metallurgical testing had Carbonate NPR between 1 and 2 and could be conservatively classified as PAG (Appendix B, Table B-10). The remaining sample had NPR slightly over 2. Marathon ore composites have higher potential to generate acid than Leprechaun ore composites.

In this study, Carbonate NPR ratios in three of four samples were less than 2, indicating that these samples are likely PAG (Appendix B, Table B-5). In two of the four samples, Siderite NPR values were also less than 2. Therefore, up to 50 to 75% of Marathon ore could be PAG material depending on Carbonate or Siderite NPR input selected for the classification. Based on average values of Carbonate or Siderite NPR (0.8 and 1.9, respectively) Marathon ore is conservatively classified as PAG (Appendix B, Table B-6). More samples should be tested to provide more

definitive conclusions of ARD classification of ore and better define percentages of PAG materials in ore.

In individual ore samples selected by Stantec, no MMER exceedances were observed in SFE leachates. Exceedances of 10x ACUC were detected for molybdenum in two samples (Appendix B, Table B-7). Molybdenum does not exceed CWQG in SFE tests indicating low metal leaching potential (Appendix B, Table B-8). Aluminum concentration exceeded CWQG in two of three SFE tests indicating that this element could be a PPoC .

4.3.2.2 Mine Rock

Quartz-eye Porphyry (QE-POR)

Siderite and Carbonate NPR ratios were below 2 in one and three of 26 samples, respectively indicating that from 4% to 12% of quartz-eye porphyry lithology might be potentially acid generating (Appendix B, Table B-5).

Exceedances of 10x ACUC were detected for molybdenum in one sample and selenium in one sample (Appendix B, Table B-7). None of these elements exceeded MMER limits or CWQG guidelines in SFE tests indicating low leaching potential (Appendix B, Table B-8). No MMER exceedances for other parameters were observed in SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in all 11 SFE tests indicating that this element could be a PPoC. This finding should be confirmed with kinetic testing. The final pH value in four of 11 samples exceeded the upper limit of the pH range recommended by CWQG guidelines.

Mafic Dike (MD)

No Carbonate or Siderite NPR values were below 2 in all eight samples indicating that mafic dikes are non-PAG (Appendix B, Table B-5).

No exceedances of 10x ACUC and MMER were detected (Appendix B, Table B-7).

Aluminum concentration exceeded CWQG (0.1 mg/L) in all four samples analyzed for SFE indicating that this element could be a PPoC (Appendix B, Table B-8).

Quartz Mineralized Zone in Quarts-eye Porphyry in Quartz-Tourmaline-Pyrite veins (QZ-QE-POR-QTP)

No Siderite NPR values were below 2 in all seven samples, but Carbonate NPR ratios were below 2 in four samples contributing to about 57% of QZ-QE-POR-QTP lithology (Appendix B, Table B-5). No exceedances of 10x ACUC and MMER were detected (Appendix B, Table B-7).

Aluminum concentration exceeded CWQG (0.1 mg/L) in all four SFE tests indicating that this element could be a PPoC (Appendix B, Table B-8).

Conglomerate (CG)

No Carbonate or Siderite NPR values were below 2 indicating that unmineralized conglomerate is non-PAG (Appendix B, Table B-5). No exceedances of 10x ACUC and MMER were detected (Appendix B, Table B-7).

Aluminum concentration exceeded CWQG (0.1 mg/L) in all three SFE tests indicating that this element could be a PPoC (Appendix B, Table B-8).

Gabbro (GB)

Both Siderite and Carbonate NPR ratios were below 2 in one of four samples indicating that about 25% of gabbro might be potentially acid generating (Appendix B, Table B-5).

Exceedances of 10x ACUC were detected for arsenic in one sample, cobalt in one sample, copper in two samples, and selenium in one sample of four (Appendix B, Table B-7). None of these elements exceeded MMER limits or CWQG guidelines in SFE tests indicating low leaching potential (Appendix B, Table B-8). No MMER exceedances for other parameters were observed in SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in all SFE tests indicating that this element could be a PPoC.

Aphanitic Quartz Porphyry (AQPOR)

No Carbonate or Siderite NPR values were below 2 indicating that the mafic dike is non-PAG (Appendix B, Table B-5). No exceedances of 10x ACUC and MMER were detected (Appendix B, Table B-7).

Aluminum concentrations exceeded CWQG (0.1 mg/L) in all three SFE tests indicating that this element could be a PPoC (Appendix B, Table B-8).

4.3.2.3 Tailings

At the time of producing the present ARD/ML report, no information is available related to ARD/ML studies of the tailings from the Marathon deposit.

5.0 Discussion

The discussion is based on the analysis of the results represented in Appendix D, Figure 1 to Figure 11.

5.1 ORE

5.1.1 Leprechaun Deposit

Mineralogical analysis of Leprechaun ore shows that pyrite constituting approximately 1% of ore is a major contributor to acid potential. Major carbonate minerals in composite ore samples are calcite and ankerite with contents ranging 3.3-5.4% and 1.4-2%, respectively. These carbonates contribute to approximately 87% Modified Sobek NP with siderite correction based on regression shown on Figure D-1 (Appendix D). Release of Fe and Mn from ankerite with subsequent oxidation and hydrolysis will result in partial consumption of NP provided by carbonates. The content of ankerite and calcite in the samples and mole fractions of Fe and Mn in ankerite determines the amount of Carbonate NP that will not be available for neutralization of ARD. Based on the theoretical composition of ankerite with ~0.1 Fe and Mn in cationic sites and contents of carbonate minerals, that percentage of Carbonate NP unavailable for acid neutralization is expected to be only between 2% and 4% of reported values. These low percentages of unavailable Carbonate NP will likely change the ARD classification. Stantec recommends determining the composition of ankerite in ore and waste rock during Phase II to better estimate unavailable Carbonate NP.

The results of ARD tests on Leprechaun ore done in different studies can be summarized as follows:

- All three of ore composites are non-PAG (Thibault & Associates Inc. 2015, 2017).
- Only one of seven individual samples was PAG (or 14% of samples) based on Thibault & Associates Inc. (2015).
- In this study, only one of eight individual samples was PAG (or 13% of samples).

These results indicate that relatively small percentage of samples (13-14%) are PAG with majority of samples being non-PAG and having excess of NP. When ore is blended in stockpile, this excess of NP will be sufficient to create non-PAG material, which is shown by testing of composite ore samples from the Leprechaun deposit.

No exceedances of the MMER regulations were observed in SFE leachates of Leprechaun ore. Aluminum concentrations exceeded CWQG guidelines in four of five SFE tests indicating that this element could be classified as a potential parameter of concern. Elevated concentrations of Al also have elevated Si in the SFE extracts Figure D-11 (Appendix D). This implies a high likelihood that there is very-fine-grained/colloidal detrital alumino-silicate mixture (e.g., micas and chlorite

abundant in ore) that was analyzed as part of the leachate regardless of filtration. Therefore, the elevated values of Al in the SFE probably do not reflect truly dissolved Al, which would be orders of magnitude lower, as expected thermodynamically for the observed pH range. These assumptions should be confirmed with kinetic testing, water quality modeling and operational monitoring. If confirmed, suspended and colloidal material can be mitigated by precipitation in sedimentation ponds by addition of coagulants and/or flocculants.

5.1.2 Marathon Deposit

Marathon ore was not as well characterized as ore from Leprechaun deposit. The results of ARD tests on Marathon ore can be summarized as follows:

- Based on testing by Thibault & Associates Inc. (2017), one of three ore composites was non-PAG and two others are PAG (NPR values between 1 and 2).
- This study indicates that 50 to 75% of ore from the Marathon deposit could potentially contain PAG materials based on the four samples analyzed.
- Based on average values of Carbonate or Siderite NPR values (0.8 and 1.9, respectively) Marathon ore is conservatively classified as PAG (Appendix B, Table B-6).

These studies indicate that there is uncertainty about ARD potential of Marathon ore. Therefore, more samples should be tested to provide more definitive conclusions of ARD classification of ore and better define percentages of PAG materials in ore.

Marathon ore has low metal leaching potential for all elements expect aluminum, which exceeded CWQG guideline in 67% of SFE leachates. The elevated values of Al are likely related to suspended and colloidal particles present in the tested leachate (see discussion on Al exceedances in Section 5.1.1).

5.2 TAILINGS AND CONCENTRATES

ARD results from Leprechaun tailings and concentrates are based on testing done by Thibault & Associates Inc. (2015 and 2017) and can be summarized as follows:

- Three samples of flotation tailings, including tailings residue after cyanide leaching, are non-PAG.
- Two samples of flotation concentrates including concentrate cyanidation are PAG.

The PAG residue will be mixed with tailings at the plant. The resulting mixture will have ARD characteristics of reconstituted Leprechaun ore, which is non-PAG and will have excess of NP on average. This excess of NP which can be used to offset potential ARD tailings from Marathon if ores from Marathon and Leprechaun open pits are processed at the same time and mixed. Based average NP and AP values of these ores and ore fractions, Carbonate NPR of the

resulting mixture is 2.1 and can be classified as non-PAG (Appendix B, Table B-11). Therefore, ARD is not anticipated from tailings, unless:

- Marathon ore is processed separately from Leprechaun ore and resulting solids are left exposed after closure and/or
- Cyanide residues from concentrate is separated from flotation tailings (e.g., preferential settling denser materials close to spigots discharging the slurry)

Potential for ML in processed materials is based on five TCLP tests from Leprechaun tailings and concentrates as reported by Thibault & Associates Inc. (2015 and 2017). It should be noted that, the detection limits in analyses of leachates were below MMER limits, but above many CWQG, which did not allow full screening for ML potential. Tailings and concentrates have low ML potential, except for copper, which exceeded MMER in TCLP leachates. Copper leaching could be related to chalcopyrite and bornite observed in the ore and/or to the addition of copper sulfate during flotation (Thibault & Associates Inc., 2015, 2017). Additional ARD/ML testing of processed solids and associated solutions (e.g., supernatant after cyanide destruction process) is recommended.

5.3 LEPRECHAUN MINE ROCK

Mine rock from Leprechaun and Marathon deposits are discussed separately as they will likely form separate stockpiles, while ore, tailings and concentrates will be mixed during stockpiling and processing. This section discusses mine rock from the Leprechaun deposit.

In previous studies of all composite samples, mine rock were classified as non-PAG with low metal leaching potential (Thibault & Associates Inc. 2015).

In this study, mine rock has two of 107 samples with Carbonate NPR below 2, while Siderite NPR in these samples is above 2 (Appendix B, Table B-1). The potential PAG samples represent Quartz Zone with QTP veins in Sediments (QZ-SQTP) and Trondhjemite (QZ-TQTP). These samples constitute approximately 2% of mine rock from the Leprechaun deposit if Carbonate NPR is conservatively used for ARD classification.

In Leprechaun mine rock, exceedances of 10x ACUC were detected for molybdenum in one of 107 samples (Appendix B, Table B-1). This metal does not exceed CWQG in SFE tests indicating low metal leaching potential (Appendix B, Table B-1 and B-4). No MMER exceedances were observed in any of the SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in 74% of all SFE tests indicating high leaching potential for aluminum, which might be related to a suspended colloidal form of metal and not reflective of mobilization of dissolved Al from the mine rock (see discussion on Al exceedances in Section 5.1.1 and Figure D-11 (Appendix D). Concentrations of copper exceeded CWQG (0.002 mg/L) in three of 47 SFE leachates. Single exceedances of CWQG concentrations were observed for arsenic (0.005 mg/L) and lead (0.001 mg/L). Based on a small number of exceedances, ML potential for copper, arsenic and lead is low. Leachability of these metals do not correlate with NPR values or to total concentrations in

the solid samples (Appendix D, Figure D-7 and D-9). Metal leaching potentials in Leprechaun mine rock should be confirmed with kinetic testing and water quality modeling.

5.4 MARATHON MINE ROCK

Overall, between 4% and 15% of mine rock from the Marathon deposit might be PAG depending on Carbonate or Siderite NPR selected for the classification. This range can be narrowed by further studies. Fifty-seven percent of zones of QTP veins occurring in Quartz-eye Porphyry (QZ-QE-POR-QTP) are identified as PAG material. Singe PAG samples represented gabbro (GB) and Quartz-eye Porphyry (QE-POR) lithologies.

Selenium and copper in two of 52 samples and molybdenum, arsenic and cobalt in one of 52 samples exceeded 10x ACEUC and did not exceed MMER limits or CWQG guidelines in SFE tests indicating low leaching potential of these elements. No MMER exceedances for other parameters were observed in SFE leachates. Aluminum concentration exceeded CWQG guideline in all SFE tests indicating that this element could be a potential parameter of concern. Please refer to discussion on aluminum exceedances in Section 5.1.1 and Figure D-12 (Appendix D).

6.0 Conclusions

Preliminary results for an ARD/ML assessment for ore, mine rock and processed material from the Leprechaun and Marathon deposits can be summarized as follows:

- Up to 13% of ore from the Leprechaun deposit can potentially contain PAG material based on testing of eight samples. No MMER exceedances were observed in leachates from ore. Exceedances of CWQG for aluminum (0.1 mg/L) were found in 66% of samples.

- From 50 to 75% of Marathon ore was conservatively classified as PAG. Overall, Marathon ore is conservatively classified as PAG material based on average NPR values. Additional testing of Marathon ore is recommended to better define percentages of PAG materials. No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for aluminum (0.1 mg/L) were found in 67% of samples.

- Tailings from Leprechaun deposits, are expected to be non-PAG and have excess NP. This excess of NP can be used to offset ARD potential of tailings from Marathon if ores from Marathon and Leprechaun deposit are processed at the same time and mixed. Therefore, ARD is not expected from the mixed tailings, unless Marathon ore is processed separately from Leprechaun ore and resulting solids are left exposed after closure. Tailings and concentrates from Leprechaun have low ML potential, except for copper which exceeded MMER limits in TCLP leachates.

- Mine rock from the Leprechaun deposit has low ARD potential (less than 2% of samples are PAG). No MMER exceedances were observed in SFE leachates. Exceedances of CWQG for Al (0.1 mg/L) were found in 74% of SFE tests. Copper, arsenic and lead exceeded CWQG in 2-6% of samples indicating that these elements could be PPoC.

- Between 4 and 15% of mine rock from the Marathon deposit could be PAG material. No MMER exceedances were observed in SFE leachates. Aluminum concentration exceeded CWQG (0.1 mg/L) in all SFE tests indicating that this element could be a PPoC.

- Aluminum exceedances in SFE tests from all materials are likely related to analysis of fine solids/colloids present in leachate. Potential aluminum exceedances can be mitigated by precipitation of aluminum colloids in sedimentation ponds by addition of coagulants and/or flocculants during operation.

- These preliminary conclusions are based on a limited number of samples and conservative assumptions. The conclusions should be supported by additional static and kinetic testing as recommended for the second phase of ARD/ML assessment in Section 7.

7.0 Recommendations

Based on typical information needs for Environmental Impact Assessment (EIA) and prefeasibility studies, the following key items are recommended for Phase II ARD/ML assessment:

- Additional static testing to satisfy MEND requirements for number of samples or/and development of block model for PAG materials.
- Kinetic testing of representative samples of mine rock lithologies and different ore grades to evaluate chemistry of runoff and seepage from stockpiles and pit walls.
- Mineralogical and geochemical characterization of samples selected for kinetic tests.
- Additional ARD/ML testing of processed solid waste such as tailings and associated solutions to understand chemistry of discharge from mill plant to TMF.
- Ageing testing of solutions discharged to TMF to evaluate rates of cyanide degradation, metal precipitation and ammonia formation.
- Humidity cell testing of representative samples of tailings to evaluate chemistry of runoff from these materials (e.g., exposed TMF beaches).
- Subaqueous column testing representative tailings samples to evaluate long-term seepage chemistry from TMF.

8.0 Technical Limitations

This Phase I ARD/ML assessment should be considered as preliminary due to the scale and nature of testing. The testing conducted is also qualitative given the state of mine planning and the amount of available information. Further advancement of the mine plan and processing options may change these estimates.

9.0 References

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March 23, 2018

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10.0 Stantec Quality Management Program

This report, entitled **Preliminary Results of Phase I ARD/ML Assessment** prepared for Marathon Gold Corp., dated February 25, 2018, was produced by Stantec Consulting Ltd.

This report was written by the following individuals:

This report was written by the following individuals:

Nikolay Sidenko, Ph.D., P.Geo.
Senior Environmental Geochemist

PROVINCE OF MANITOBA REGISTERED PROFESSIONAL GEOSCIENTIST N. V. SIDENKO Member 32024G 23/03/2018

Signature

Elena Khozhina, B.Sc., M.Sc., Ph.D.
Environmental Scientist

Signature

This report was reviewed by the following individuals:

Bill Stiebel, M.Sc., P.Geo., PGC
Senior Principal

PROFESSIONAL GEOSCIENTIST WILLIAM H. STIEBEL PRACTISING MEMBER 0004 ONTARIO 2018.03.23

Signature

Signature

Approval to transmit to client:

Barry Wicks, Project Manager

Signature

11.0 Limitations

This document entitled **Preliminary Results of Phase I ARD/ML Assessment** was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Marathon Gold Corp. (the "Client") to support the approvals and permitting process for the Valentine Lake Project in central Newfoundland, approximately 57 km south of the town of Buchans, Newfoundland. In connection thereto, this document may be reviewed and used by the federal and provincial government agencies participating in the approvals and permitting process in the normal course of their duties; and stakeholders may provide comment as part of the regulatory approvals process. Except as set forth in the existing sentence, any reliance on this document by any third party for any other purpose is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in contents of the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any unauthorized use that a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on unauthorized use of this document.

Appendix A Maps

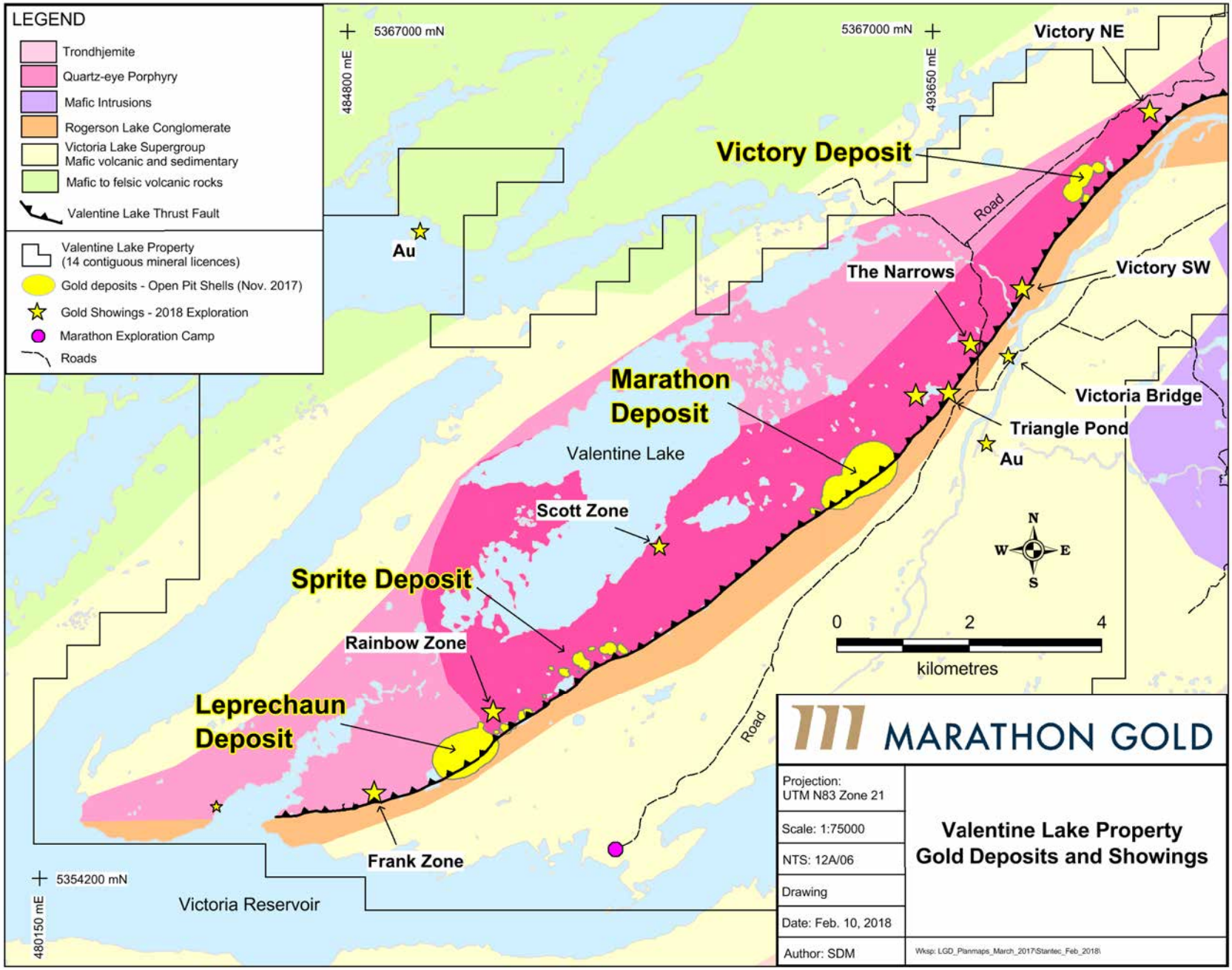

Figure A-1: Deposit Locations.

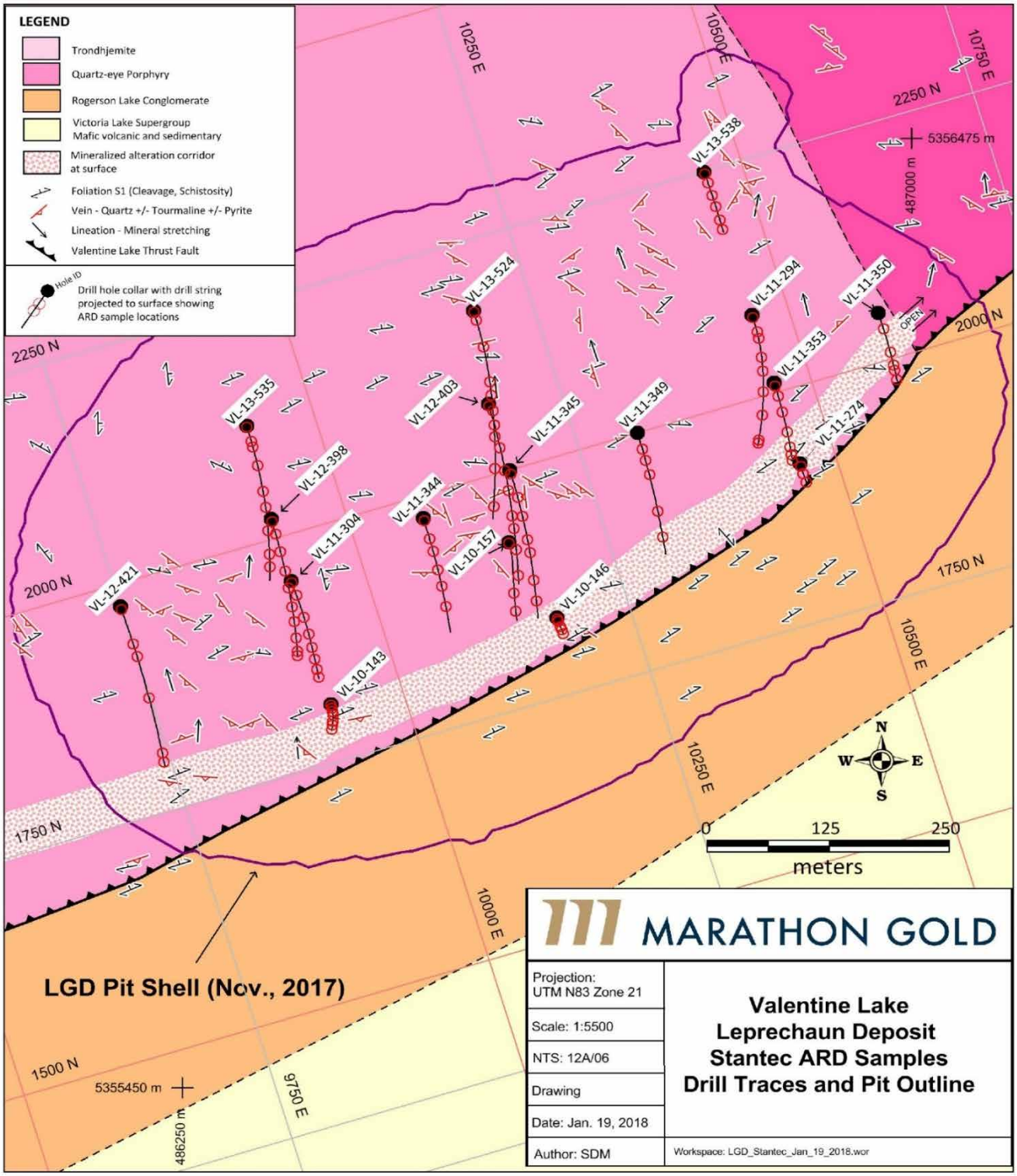

Figure A-2: Samples from the Leprechaun Deposit.

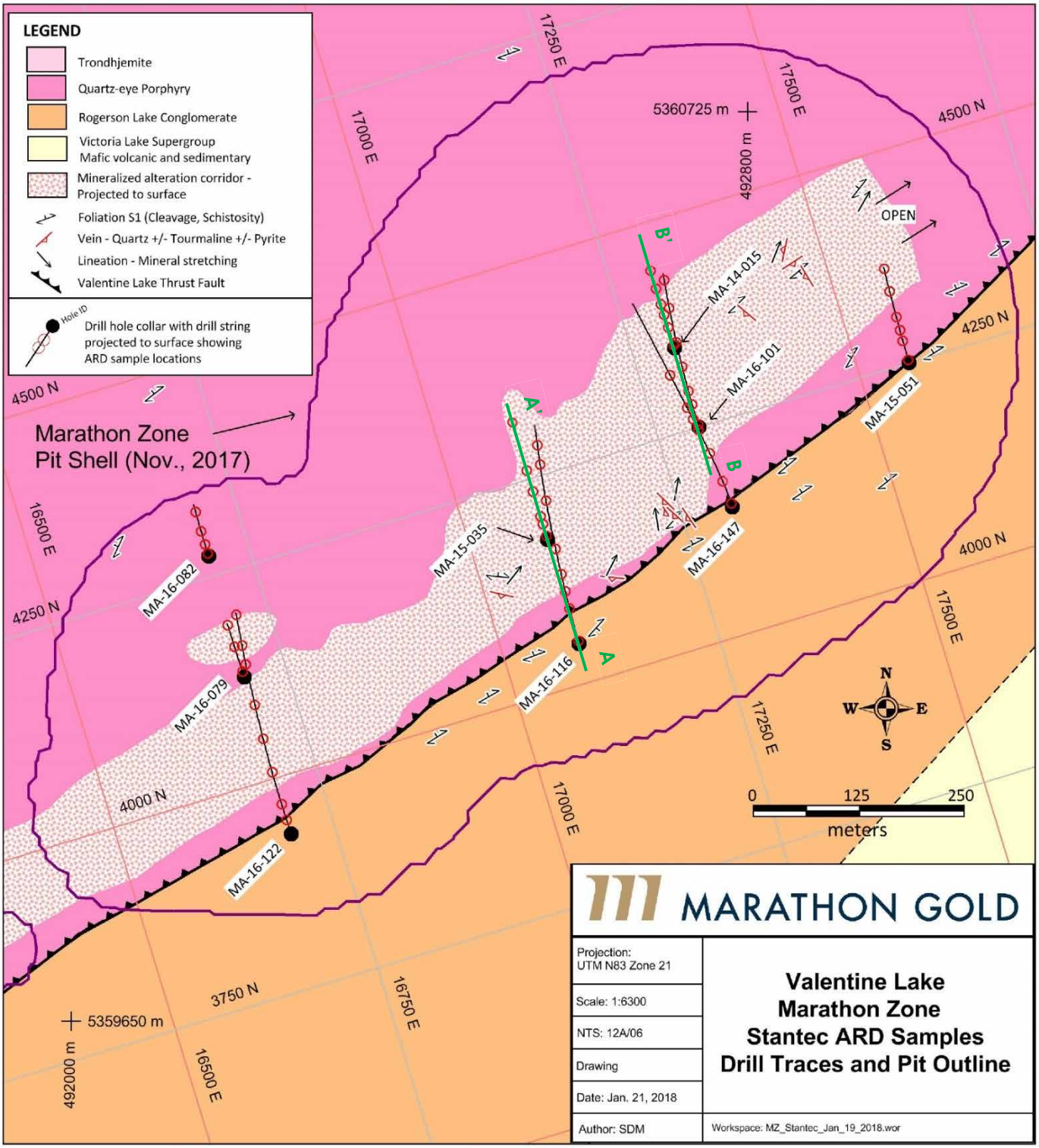

Figure A-3: Samples from the Marathon Deposit.

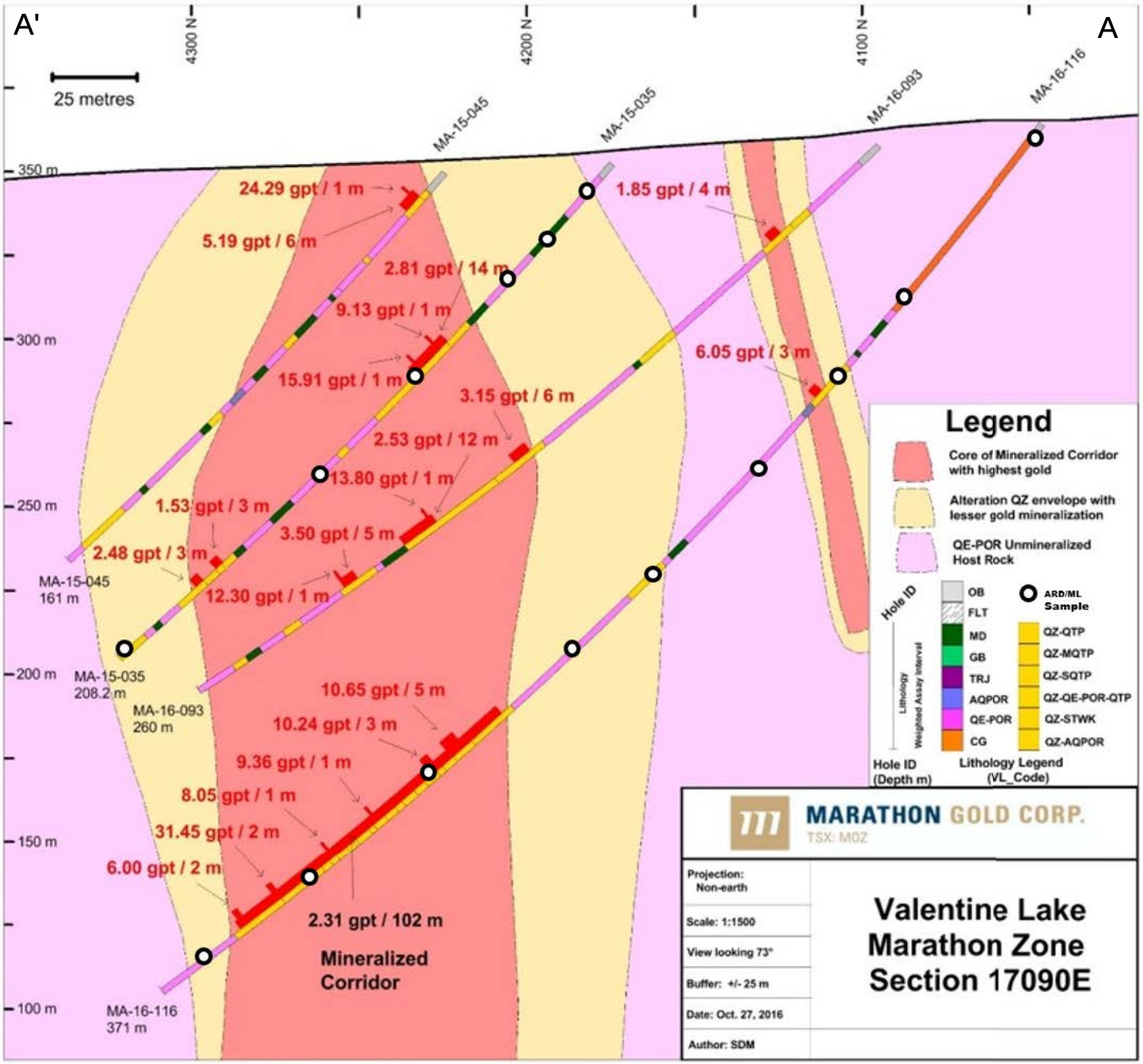

Figure A-4: Marathon Deposit A-A' Cross-Section.

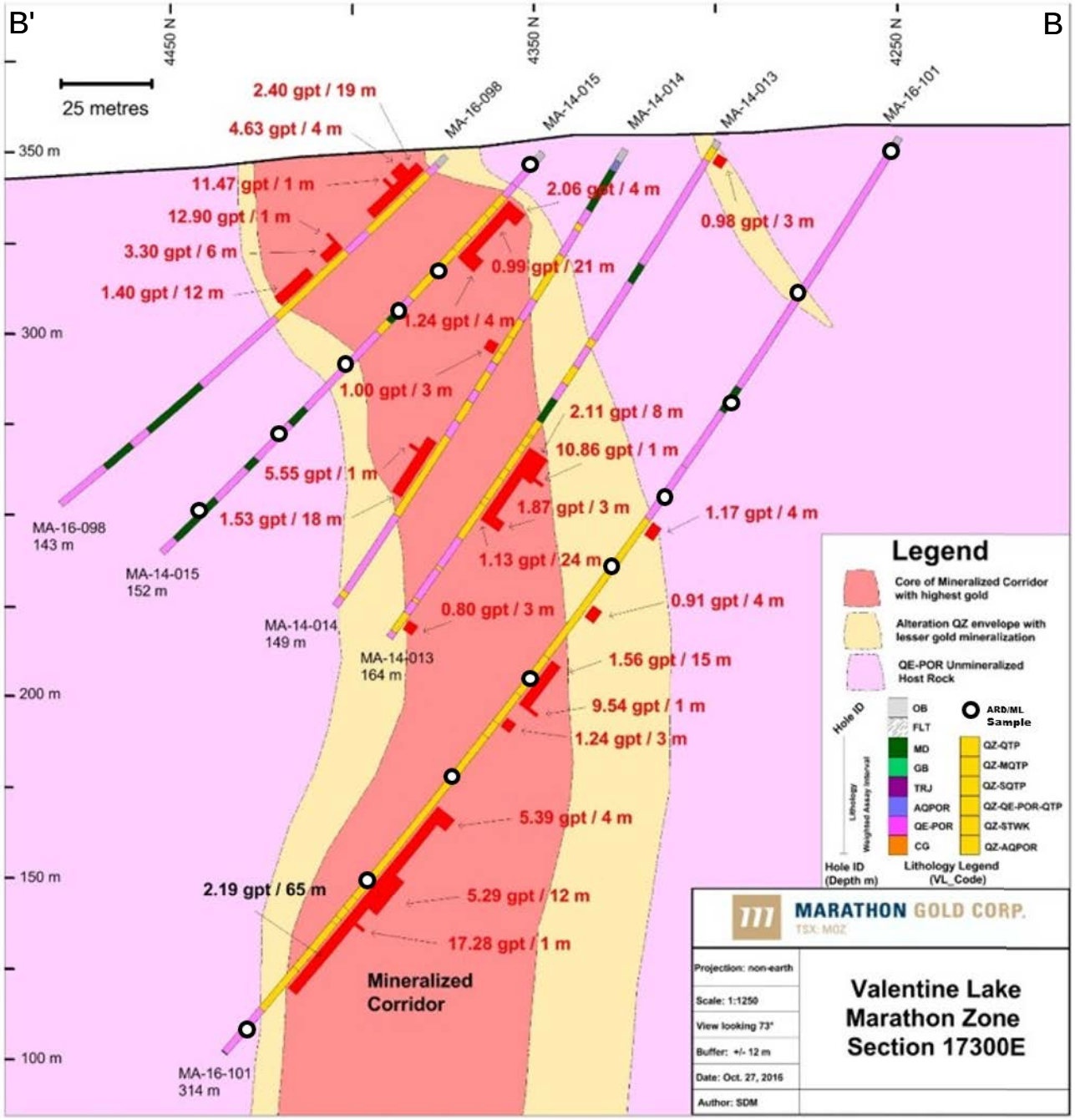

Figure A-5: Marathon Deposit B-B' Cross-Section.

Appendix B Tables

Table B-1: Numbers and Percentages of Samples from Leprechaun Deposit Exceeding Selected ARD/ML Criteria

Parameter	Units	Criteria	Ore		Mine Rock Lithocodes and Estimated Percentages of Lithologies													
					15%		3%		2%		1%		28%		11%		40%	
					MD		QZ-MQTP		QZ-QTP		QZ-SQTP		QZ-TQTP		SED		TRJ	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acid-Base Accounting (ABA)			8	100	15	100	3	100	1	100	1	100	28	100	13	100	46	100
Paste pH*	pH unit	<4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sid NPR	ratio	<2	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carb NPR	ratio	<2	1	13	0	0	0	0	0	0	1	100	1	4	0	0	0	0
Trace Element Concentration																		
10 x Average Concentration in the Earth's Upper Crust (ACUC) Criteria																		
Ag	ppm	>530	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	%	>41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	ppm	>48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Be	ppm	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	ppm	>0.9	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Co	ppm	>173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	ppm	>920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	ppm	>280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe	%	>32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg*	ppm	>0.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mo	ppm	>11	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0
Ni	ppm	>470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	ppm	>170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	ppm	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sn	ppm	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	ppm	>9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	ppm	>27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	ppm	>970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	ppm	>670	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shake Flask Extractions (SFE)			5	100	9	100	3	100	1	100	1	100	9	100	9	100	15	100
Metal Mining Effluent Regulation (MMER) Criteria																		
As	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shake Flask Extractions (SFE)																		
Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG FAL) Criteria																		
Final pH	pH unit	<6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final pH	pH unit	>8.5	0	0	4	44	0	0	1	100	0	0	1	11	0	0	3	20
Ag	mg/L	>0.00025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	mg/L	>0.1	4	80	9	100	3	100	1	100	1	100	9	100	8	89	4	27
As	mg/L	>0.005	0	0	1	11	0	0	0	0	0	0	0	0	0	0	0	0
Be	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	mg/L	>1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	mg/L	>0.00009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Co	mg/L	>0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.002	0	0	0	0	0	0	0	0	0	0	2	22	1	11	0	0
Fe	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg	mg/L	>0.00003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	mg/L	>0.073	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	1	11	0	0	0	0
Se	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	mg/L	>0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	mg/L	>0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: QTP - Quartz-Tourmaline-Pyrite veins; QZ - Quartz-Au Mineralized Zone; Ore - Quartz Eye Porphyry + QTP; MD - Mafic Dike; QZ-MQTP - QZ- Mafic Dike +QTP; QZ-QTP - QZ and QTP; QZ-SQTP - QZ - Sediments + QTP; QZ-TQTP - QZ - Trondhjemite + QTP; SED - Sediment; TRJ - Trondhjemite.

Sid NPR - Siderite Neutralization Potential Ratio (Siderite NP/AP);

Carb NPR - Carbonate Neutralization Potential Ratio (Carbonate NP/AP);

MMER - Metal Mining Effluent Regulation, authorized limits of deleterious substances in a grab sample (SOR/2002-222);

CWQG - Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater Aquatics Long Term (CCME,

ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x - ACUC are counted;

CWQG guidelines for copper, lead, and nickel have been selected based on the median hardness value of 32.3 mg/L measured during SFE analysis;

* - no mercury results.

Table B-2: Summary of ABA Statistics for Materials from Leprechaun Deposit

Parameter	Paste pH	S_{TOTAL}	$S_{SULPHATE}$	$S_{SULPHIDE}$	Carb. NP	AP	Sid. NP	NNP	Sid. NPR	Carb. NPR
Units	pH Units	wt.%			kg $CaCO_3$/t				unit less	
Ore, 8 samples										
Min	8.57	0.24	0.005	0.23	12	7.2	28	11	**1.6**	**0.7**
10th, %ile	8.82	0.25	0.005	0.25	22	7.8	44	34	3.3	**1.9**
Median	9.57	0.39	0.010	0.39	41	12	68	59	7.1	3.3
90th, %ile	9.86	0.66	0.019	0.63	88	20	154	134	13	7.5
Max	9.90	0.79	0.040	0.78	154	24	285	271	20	11
Average	9.44	0.43	0.012	0.42	52	13	93	80	7.8	4.4
St. Dev.	0.43	0.18	0.011	0.18	41	5.6	75	75	5.3	3.0
MD, 15 samples										
Min	8.33	0.02	0.010	0.01	22	0.30	55	53	5.4	3.5
10th, %ile	8.78	0.04	0.010	0.02	36	0.54	83	81	16	7.3
Median	9.16	0.13	0.040	0.09	126	2.8	196	181	71	49
90th, %ile	9.73	0.38	0.068	0.34	173	11	241	240	312	168
Max	9.88	1.15	0.100	1.11	228	35	256	253	700	320
Average	9.17	0.20	0.039	0.17	113	5.2	173	168	133	75
St. Dev.	0.40	0.28	0.025	0.28	55	8.6	62	62	177	82
QZ-MQTP, 3 samples										
Min	9.07	0.01	0.010	0.01	158	0.30	173	173	61	59
10th, %ile	9.08	0.03	0.016	0.02	163	0.62	176	176	75	71
Median	9.13	0.10	0.040	0.06	183	1.9	189	186	131	121
90th, %ile	9.35	0.14	0.048	0.09	220	2.9	236	234	487	444
Max	9.40	0.15	0.050	0.10	230	3.1	248	246	577	525
Average	9.20	0.09	0.033	0.06	190	1.8	203	202	256	235
St. Dev.	0.14	0.06	0.017	0.04	30	1.1	32	32	228	207
QZ-QTP, 1 sample										
Min	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
10th, %ile	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
Median	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
90th, %ile	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
Max	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
Average	9.10	0.07	0.010	0.06	101	1.9	166	164	87	53
St. Dev.	0.00	0.00	0.000	0.00	0	0.0	0	0	0	0.0
QZ-SQTP, 1 sample										
Min	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
10th, %ile	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
Median	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
90th, %ile	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
Max	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
Average	8.31	0.77	0.070	0.70	17	22	63	41	2.9	**0.8**
St. Dev.	0.00	0.00	0.000	0.00	0	0.0	0	0	0.0	0.0
QZ-TQTP, 28 samples										
Min	9.31	0.03	0.005	0.02	11	0.60	21	14	3.0	**1.5**
10th, %ile	9.49	0.03	0.005	0.03	18	0.81	47	45	7.9	3.2
Median	9.80	0.12	0.010	0.12	31	3.6	71	66	21	9.9
90th, %ile	9.89	0.29	0.010	0.28	71	8.8	99	92	85	52
Max	9.91	0.38	0.020	0.36	163	11	211	204	133	75
Average	9.75	0.15	0.009	0.14	42	4.3	75	71	35	19
St. Dev.	0.15	0.10	0.004	0.10	32	3.1	35	34	36	21
SED, 13 samples										
Min	8.71	0.01	0.010	0.01	2	0.30	13	13	43	7.0
10th, %ile	8.77	0.01	0.010	0.01	4	0.30	15	15	51	12
Median	9.50	0.01	0.010	0.01	14	0.30	29	29	97	46
90th, %ile	9.63	0.01	0.020	0.01	32	0.30	68	68	228	107
Max	9.66	0.02	0.050	0.01	51	0.30	83	83	275	168
Average	9.37	0.01	0.017	0.01	17	0.30	35	35	117	56
St. Dev.	0.33	0.00	0.011	0.00	14	0.0	22	22	72	46
TRJ, 46 samples										
Min	9.03	0.01	0.005	0.01	18	0.30	30	28	9.1	5.9
10th, %ile	9.39	0.01	0.005	0.01	23	0.30	48	47	20	13
Median	9.75	0.03	0.010	0.03	36	0.75	66	64	74	50
90th, %ile	9.89	0.13	0.015	0.11	59	3.5	90	90	217	125
Max	10.00	0.30	0.020	0.29	168	9.1	178	175	308	214
Average	9.69	0.06	0.010	0.05	41	1.6	70	69	108	58
St. Dev.	0.22	0.06	0.004	0.06	26	1.8	27	26	83	46

Notes: See the list of lithocodes under Table B-1;

S_{TOTAL} = Total Sulphur; $S_{SULPHIDE}$ = Sulphide Sulphur; $S_{SULPHATE}$ = Sulphate Sulphur;

AP = Acid Potential;

NP = Neutralization Potential; NNP = Net Neutralization Potential; NPR =Neutralization Potential Ratio; NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations;

Carb. NP = Carbonate NP;

Sid. NP = Siderite Correction Neutralization Potential;

Sid. NPR = Siderite Correction Neutralization Potential Ratio;

Carb. NPR - Carbonate Neutralization Potential Ratio;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-3: Summary of Statistics for Total Concentration of Trace Elements in Materials from Leprechaun Deposit

Parameter	Ag	Al	As	Be	Cd	Co	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	V	Zn
Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
ACUCx10	530	41	48	21	0.90	173	920	280	32	11	470	170	0.9	9	27	970	670
Ore, 8 samples																	
Min	0.05	3.3	1.0	0.5	0.05	3.0	47	5.7	0.64	0.1	1.7	4.4	0.5	0.25	0.1	11	7
10th, %ile	0.05	5.9	1.7	0.5	0.05	3.1	49	8.8	0.93	0.2	1.9	5.4	0.5	0.25	0.2	19	18
Median	0.05	7.1	3.0	0.5	0.05	4.2	57	13	1.5	0.4	2.9	8.7	0.5	0.25	0.3	29	34
90th, %ile	0.32	7.4	5.6	1.0	0.34	24	85	56	5.3	0.6	28	51.2	0.5	0.25	0.9	158	155
Max	0.60	7.9	7.0	1.0	1.00	42	95	62	8.1	0.9	28	60.6	0.5	0.25	1.6	318	267
Average	0.16	6.7	3.5	0.7	0.17	10	63	24	2.5	0.4	8.9	19.2	0.5	0.25	0.5	69	71
St. Dev.	0.18	1.3	1.9	0.2	0.31	13	16	20	2.3	0.2	11	20.4	0.0	0.00	0.5	97	80
MD, 15 samples																	
Min	0.05	5.8	0.5	0.5	0.05	1.2	27	3.0	0.70	0.1	1.5	2.7	0.5	0.25	0.1	6	19
10th, %ile	0.05	6.3	3.4	0.5	0.05	20	41	27	4.7	0.1	12	4.7	0.5	0.25	0.1	160	62
Median	0.05	7.3	11	0.5	0.05	36	64	57	7.5	0.6	29	7.4	0.5	0.25	0.5	265	83
90th, %ile	0.05	9.1	19	1.0	0.20	42	119	86	7.9	1.7	34	9.7	0.5	0.25	0.6	314	101
Max	0.05	9.3	42	2.0	0.30	45	146	108	8.6	2.7	35	10.1	0.5	0.25	0.6	320	115
Average	0.05	7.5	13	0.8	0.10	32	75	58	6.6	0.8	25	7.3	0.5	0.25	0.4	243	80
St. Dev.	0.00	1.0	9.3	0.4	0.08	11	36	25	1.9	0.7	9.5	2.0	0.0	0.00	0.2	81	21
QZ-MQTP, 3 samples																	
Min	0.05	6.2	0.5	0.5	0.05	18	91	36	3.0	0.1	28	9.5	0.5	0.25	0.2	138	69
10th, %ile	0.05	6.3	0.8	0.5	0.05	21	94	40	3.5	0.2	29	10.7	0.5	0.25	0.2	159	69
Median	0.05	6.7	2.0	0.5	0.05	37	104	57	5.8	0.6	33	15.5	0.5	0.25	0.3	243	71
90th, %ile	0.05	7.2	4.4	1.7	0.25	38	169	65	6.9	0.8	90	17.1	0.5	0.25	0.4	245	94
Max	0.05	7.3	5.0	2.0	0.30	39	185	68	7.1	0.9	104	17.5	0.5	0.25	0.4	245	100
Average	0.05	6.7	2.5	1.0	0.13	31	127	53	5.3	0.5	55	14.2	0.5	0.25	0.3	209	80
St. Dev.	0.00	0.47	1.9	0.7	0.12	9.6	42	13	1.7	0.3	35	3.4	0.0	0.00	0.1	50	14
QZ-QTP, 1 sample																	
Min	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
10th, %ile	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
Median	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
90th, %ile	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
Max	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
Average	0.05	6.0	2.0	1.0	0.05	4.8	59	8.0	1.4	0.2	3.5	8.5	0.5	0.25	0.2	44	36
St. Dev.	0.00	0.0	0.0	0.0	0.00	0.0	0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	0.0	0	0
QZ-SQTP, 1 sample																	
Min	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
10th, %ile	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
Median	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
90th, %ile	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
Max	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
Average	0.05	7.5	5.0	1.0	0.05	24	93	1.5	5.1	0.2	31	10.3	0.5	0.25	2.6	113	69
St. Dev.	0.00	0.0	0.0	0.0	0.00	0	0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	0.0	0	0
QZ-TQTP, 28 samples																	
Min	0.05	4.7	0.5	0.5	0.05	0.7	30	2.3	0.42	0.1	1.2	4.8	0.5	0.25	0.1	2	9
10th, %ile	0.05	5.9	0.5	0.5	0.05	0.9	37	3.2	0.57	0.1	1.3	5.9	0.5	0.25	0.1	5	11
Median	0.05	6.6	1.0	0.5	0.05	2.4	53	9.0	1.1	0.3	1.6	9.2	0.5	0.25	0.3	15	30
90th, %ile	0.05	7.7	2.0	1.0	0.05	6.5	64	38	1.7	0.7	4.2	15.0	0.5	0.25	0.7	47	47
Max	0.05	8.1	3.0	2.0	0.10	14	69	68	4.4	28	8.2	20.9	0.5	0.25	0.8	160	62
Average	0.05	6.7	1.1	0.8	0.05	3.4	52	14	1.2	1.4	2.4	10.1	0.5	0.25	0.3	25	30
St. Dev.	0.00	0.80	0.7	0.4	0.01	3.2	10	16	0.79	5.2	1.7	3.8	0.0	0.00	0.2	32	14
SED, 13 samples																	
Min	0.05	6.0	1.0	0.5	0.05	4.3	42	1.0	1.3	0.1	2.4	10	0.5	0.25	0.2	27	39
10th, %ile	0.05	6.4	3.2	0.5	0.05	13	55	1.3	3.3	0.1	19.4	11	0.5	0.25	0.6	91	66
Median	0.05	6.9	5.0	1.0	0.05	16	69	22	3.8	0.2	25.9	14	0.5	0.25	1.5	101	73
90th, %ile	0.05	7.7	6.8	1.0	0.09	18	77	42	4.3	0.3	28.4	15	0.5	0.25	1.8	110	88
Max	0.20	7.8	9.0	1.0	0.20	23	88	265	4.9	0.4	30.8	17	0.5	0.25	2.0	161	94
Average	0.06	7.0	5.1	0.8	0.07	16	67	37	3.7	0.2	23.7	13	0.5	0.25	1.3	99	74
St. Dev.	0.04	0.50	1.9	0.2	0.04	4.0	11	67	0.79	0.1	6.9	1.6	0.0	0.00	0.5	27	13
TRJ, 46 samples																	
Min	0.05	5.7	0.5	0.5	0.05	0.8	29	2.1	0.60	0.1	1.1	3.7	0.5	0.25	0.1	4	19
10th, %ile	0.05	6.0	0.5	0.5	0.05	1.2	41	2.8	0.70	0.1	1.2	10	0.5	0.25	0.1	6	21
Median	0.05	6.5	1.0	0.5	0.05	1.9	49	4.7	0.90	0.3	1.6	13	0.5	0.25	0.2	11	33
90th, %ile	0.05	7.9	2.5	1.0	0.05	6.3	58	16	1.9	0.4	4.6	17	0.5	0.25	0.3	47	50
Max	0.05	8.3	5.0	2.0	0.05	23	104	56	4.8	1.1	19.1	22	0.5	0.25	1.2	157	70
Average	0.05	6.8	1.4	0.7	0.05	3.5	49	8.4	1.2	0.3	2.9	13	0.5	0.25	0.2	24	35
St. Dev.	0.00	0.69	1.0	0.4	0.00	4.2	10	10	0.78	0.2	3.3	3.4	0.0	0.00	0.2	32	12

Notes: See the list of lithocodes under Table B-1;

ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are underlined;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-4: Summary of SFE Statistics for Materials from Leprechaun Deposit

Parameter	Final pH	Ag	Al	As	Be	B	Cd	Co	Cr	Cu	Fe	Hg	Mo	Ni	Pb	Se	Tl	U	V	Zn
Unit	pH units	mg/L																		
MMER	-	-	-	0.5	-	-	-	-	-	0.3	-	-	-	0.5	0.2	-	-	-	-	0.5
CWQG	6.5-8.5	0.00025	0.1	0.005	0.1	1.5	0.00009	0.05	0.001	0.002	0.3	0.00003	0.073	0.025	0.001	0.001	0.0008	0.015	0.1	0.03
Ore, 5 samples																				
Min	7.38	0.000005	0.04	0.0001	0.000005	0.001	0.000002	0.000007	0.00005	0.00031	0.0010	0.00001	0.00018	0.00006	0.000025	0.00005	0.000002	0.000030	0.0001	0.0005
10th, %ile	7.46	0.000005	0.08	0.0002	0.000005	0.002	0.000002	0.000009	0.00005	0.00035	0.0010	0.00001	0.00023	0.00006	0.000025	0.00005	0.000004	0.000041	0.0002	0.0005
Median	7.61	0.000005	0.18	0.0005	0.000005	0.003	0.000002	0.000018	0.00005	0.00065	0.0030	0.00001	0.00051	0.00007	0.000025	0.00005	0.000013	0.000158	0.0004	0.0005
90th, %ile	7.74	0.000009	0.22	0.0012	0.000005	0.011	0.000009	0.000044	0.00005	0.00133	0.0060	0.00001	0.00106	0.00015	0.000064	0.00009	0.000022	0.000317	0.0008	0.0011
Max	7.76	0.000012	0.25	0.0017	0.000005	0.012	0.000013	0.000057	0.00005	0.00137	0.0066	0.00001	0.00120	0.00017	0.000065	0.00012	0.000023	0.000407	0.0009	0.0015
Average	7.60	0.000006	0.16	0.0006	0.000005	0.006	0.000004	0.000024	0.00005	0.00080	0.0034	0.00001	0.00061	0.00010	0.000040	0.00006	0.000013	0.000167	0.0005	0.0007
St. Dev.	0.13	0.000003	0.07	0.0005	0.000000	0.004	0.000004	0.000018	0.00000	0.00044	0.0022	0.00000	0.00037	0.00004	0.000019	0.00003	0.000008	0.000133	0.0003	0.0004
MD, 9 samples																				
Min	7.23	0.000005	0.18	0.0001	0.000005	0.001	0.000001	0.000009	0.00005	0.00041	0.0010	0.00001	0.00008	0.00005	0.000025	0.00005	0.000002	0.000001	0.0002	0.0005
10th, %ile	7.35	0.000005	0.18	0.0003	0.000005	0.001	0.000001	0.000011	0.00005	0.00047	0.0010	0.00001	0.00009	0.00005	0.000025	0.00005	0.000002	0.000001	0.0003	0.0005
Median	8.10	0.000005	0.21	0.0009	0.000005	0.001	0.000001	0.000014	0.00005	0.00074	0.0010	0.00001	0.00017	0.00008	0.000025	0.00010	0.000002	0.000002	0.0006	0.0005
90th, %ile	9.41	0.000005	0.38	0.0031	0.000005	0.003	0.000003	0.000030	0.00005	0.00123	0.0028	0.00001	0.00047	0.00022	0.000025	0.00013	0.000004	0.000005	0.0019	0.0005
Max	9.64	0.000005	0.46	0.0082	0.000005	0.006	0.000005	0.000062	0.00005	0.00147	0.0034	0.00001	0.00076	0.00024	0.000025	0.00015	0.000005	0.000010	0.0035	0.0005
Average	8.26	0.000005	0.26	0.0017	0.000005	0.002	0.000002	0.000020	0.00005	0.00077	0.0016	0.00001	0.00023	0.00010	0.000025	0.00009	0.000003	0.000003	0.0010	0.0005
St. Dev.	0.90	0.000000	0.09	0.0024	0.000000	0.002	0.000001	0.000015	0.00000	0.00032	0.0009	0.00000	0.00021	0.00007	0.000000	0.00004	0.000001	0.000003	0.0010	0.0000
QZ-MQTP, 3 samples																				
Min	7.46	0.000005	0.11	0.0002	0.000005	0.001	0.000001	0.000012	0.00005	0.00045	0.0010	0.00001	0.00011	0.00006	0.000025	0.00005	0.000002	0.000002	0.0001	0.0005
10th, %ile	7.59	0.000005	0.13	0.0002	0.000005	0.001	0.000001	0.000013	0.00005	0.00048	0.0010	0.00001	0.00013	0.00007	0.000025	0.00005	0.000004	0.000002	0.0001	0.0005
Median	8.09	0.000005	0.23	0.0004	0.000005	0.002	0.000001	0.000020	0.00005	0.00058	0.0010	0.00001	0.00022	0.00015	0.000025	0.00005	0.000011	0.000005	0.0002	0.0005
90th, %ile	8.19	0.000005	0.24	0.0007	0.000005	0.003	0.000002	0.000025	0.00005	0.00068	0.0110	0.00001	0.00852	0.00018	0.000025	0.00014	0.000019	0.000897	0.0005	0.0005
Max	8.21	0.000005	0.25	0.0008	0.000005	0.004	0.000003	0.000026	0.00005	0.00071	0.0135	0.00001	0.01060	0.00019	0.000025	0.00016	0.000021	0.001120	0.0005	0.0005
Average	7.92	0.000005	0.20	0.0005	0.000005	0.002	0.000002	0.000019	0.00005	0.00058	0.0052	0.00001	0.00364	0.00013	0.000025	0.00009	0.000011	0.000375	0.0003	0.0005
St. Dev.	0.33	0.000000	0.06	0.0003	0.000000	0.001	0.000001	0.000006	0.00000	0.00011	0.0059	0.00000	0.00492	0.00006	0.000000	0.00005	0.000008	0.000526	0.0002	0.0000
QZ-QTP, 1 sample																				
Min	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
10th, %ile	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
Median	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
90th, %ile	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
Max	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
Average	9.32	0.000005	0.35	0.0015	0.000005	0.006	0.000001	0.000016	0.00017	0.00147	0.0139	0.00001	0.00079	0.00022	0.000025	0.00005	0.000010	0.000194	0.0011	0.0005
St. Dev.	0.00	0.000000	0.00	0.0000	0.000000	0.000	0.000000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.000000	0.00000	0.000000	0.000000	0.0000	0.0000
QZ-SQTP, 1 sample																				
Min	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
10th, %ile	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
Median	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
90th, %ile	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
Max	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
Average	8.26	0.000005	0.11	0.0004	0.000005	0.016	0.000001	0.000014	0.00005	0.00070	0.0010	0.00001	0.00026	0.00008	0.000025	0.00005	0.000006	0.000161	0.0003	0.0005
St. Dev.	0.00	0.000000	0.00	0.0000	0.000000	0.000	0.000000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.000000	0.00000	0.000000	0.000000	0.0000	0.0000
QZ-TQTP, 9 samples																				
Min	7.32	0.000005	0.13	0.0003	0.000005	0.002	0.000001	0.000009	0.00005	0.00052	0.0010	0.00001	0.00012	0.00005	0.000025	0.00005	0.000002	0.000001	0.0001	0.0005
10th, %ile	7.51	0.000005	0.16	0.0004	0.000005	0.002	0.000001	0.000010	0.00005	0.00054	0.0010	0.00001	0.00015	0.00006	0.000025	0.00005	0.000002	0.000058	0.0001	0.0005
Median	7.79	0.000005	0.22	0.0005	0.000005	0.004	0.000001	0.000015	0.00005	0.00095	0.0030	0.00001	0.00018	0.00008	0.000025	0.00005	0.000002	0.000207	0.0003	0.0005
90th, %ile	8.64	0.000007	0.30	0.0009	0.000005	0.009	0.000003	0.000039	0.00009	0.00242	0.0073	0.00001	0.00147	0.00016	0.000443	0.00005	0.000007	0.000529	0.0007	0.0005
Max	9.43	0.000013	0.44	0.0009	0.000005	0.022	0.000004	0.000054	0.00024	0.00368	0.0083	0.00001	0.00618	0.00028	0.001800	0.00005	0.000010	0.000953	0.0009	0.0005
Average	8.01	0.000006	0.23	0.0006	0.000005	0.006	0.000002	0.000021	0.00007	0.00133	0.0040	0.00001	0.00086	0.00010	0.000235	0.00005	0.000003	0.000261	0.0003	0.0005
St. Dev.	0.59	0.000003	0.09	0.0002	0.000000	0.006	0.000001	0.000014	0.00006	0.00097	0.0027	0.00000	0.00188	0.00007	0.000554	0.00000	0.000003	0.000273	0.0003	0.0000
SED, 9 samples																				
Min	7.36	0.000005	0.09	0.0004	0.000005	0.001	0.000001	0.000007	0.00005	0.00029	0.0010	0.00001	0.00009	0.00007	0.000025	0.00005	0.000002	0.000003	0.0001	0.0005
10th, %ile	7.48	0.000005	0.11	0.0004	0.000005	0.001	0.000001	0.000008	0.00005	0.00057	0.0010	0.00001	0.00011	0.00008	0.000025	0.00005	0.000004	0.000004	0.0003	0.0005
Median	7.63	0.000005	0.18	0.0010	0.000005	0.002	0.000002	0.000015	0.00005	0.00071	0.0041	0.00001	0.00019	0.00008	0.000025	0.00005	0.000008	0.000090	0.0007	0.0005
90th, %ile	7.76	0.000006	0.26	0.0013	0.000005	0.003	0.000006	0.000142	0.00005	0.00180	0.0072	0.00001	0.00044	0.00012	0.000039	0.00007	0.000018	0.000287	0.0009	0.0005
Max	7.83	0.000010	0.27	0.0015	0.000005	0.003	0.000007	0.000622	0.00005	0.00285	0.0083	0.00001	0.00066	0.00013	0.000094	0.00017	0.000034	0.000306	0.0010	0.0005
Average	7.61	0.000006	0.18	0.0009	0.000005	0.002	0.000003	0.000081	0.00005	0.00102	0.0045	0.00001	0.00025	0.00009	0.000033	0.00006	0.000011	0.000107	0.0006	0.0005
St. Dev.	0.13	0.000002	0.06	0.0003	0.000000	0.001	0.000002	0.000191	0.00000	0.00072	0.0024	0.00000	0.00017	0.00002	0.000022	0.00004	0.000009	0.000109	0.0003	0.0000
TRJ, 15 samples																				
Min	7.30	0.000005	0.10	0.0001	0.000005	0.001	0.000001	0.000006	0.00005	0.00055	0.0010	0.00001	0.00006	0.00005	0.000025	0.00005	0.000002	0.000055	0.0001	0.0005
10th, %ile	7.44	0.000005	0.17	0.0002	0.000005	0.001	0.000001	0.000011	0.00005	0.00060	0.0021	0.00001	0.00008	0.00006	0.000025	0.00005	0.000002	0.000074	0.0001	0.0005
Median	7.84	0.000005	0.22	0.0005	0.000005	0.003	0.000001	0.000021	0.00005	0.00112	0.0048	0.00001	0.00013	0.00007	0.000025	0.00005	0.000011	0.000185	0.0002	0.0005
90th, %ile	9.31	0.000005	0.45	0.0016	0.000005	0.003	0.000003	0.000073	0.00005	0.00148	0.0087	0.00001	0.00061	0.00011	0.000060	0.00005	0.000019	0.000397	0.0004	0.0005
Max	9.62	0.000005	0.49	0.0037	0.000005	0.004	0.000004	0.000169	0.00005	0.00196	0.0096	0.00001	0.00441	0.00013	0.000073	0.00010	0.000023	0.000538	0.0006	0.0015
Average	8.08	0.000005	0.26	0.0008	0.000005	0.003	0.000002	0.000036	0.00005	0.00110	0.0054	0.00001	0.00049	0.00008	0.000035	0.00005	0.000010	0.000219	0.0002	0.0006
St. Dev.	0.71	0.000000	0.11	0.0009	0.000000	0.001	0.000001	0.000041	0.00000	0.00038	0.0027	0.00000	0.00106	0.00002	0.000017	0.00001	0.000007	0.000136	0.0002	0.0002

Notes: See the list of lithocodes under Table B-1;

MMER = Metal Mining Effluent Regulations (MMER) SOR/2002/222 (2015); Values above MMER guidelines are bolded;

CWQG = Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life - Long Term (CCME, 2017) (See text for selection of CWQG guidelines); Values above CWQG guidelines are double underlined;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-5: Numbers and Percentages of Samples from Marathon Deposit Exceeding Selected ARD/ML Criteria

Parameter	Units	Criteria	Ore		Mine Rock Lithocodes and Estimated Percentages of Lithologies											
					QE-POR		QZ-QE-POR-QTP		MD		GB		CG		AQPOR	
					50%		13%		15%		8%		8%		6%	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acid-Base Accounting (ABA)			4	100	26	100	7	100	8	100	4	100	4	100	3	100
Paste pH*	pH unit	<4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sid NPR	ratio	<2	2	50	1	4	0	0	0	0	1	25	0	0	0	0
Carb NPR	ratio	<2	3	75	3	12	4	57	0	0	1	25	0	0	0	0
Trace Element Concentration																
10 x Average Concentration in the Earth's Upper Crust (ACUC) Criteria																
Ag	ppm	>530	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	%	>41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	ppm	>48	0	0	0	0	0	0	0	0	1	25	0	0	0	0
Be	ppm	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	ppm	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Co	ppm	>173	0	0	0	0	0	0	0	0	1	25	0	0	0	0
Cr	ppm	>920	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	ppm	>280	0	0	0	0	0	0	0	0	2	50	0	0	0	0
Fe	%	>32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg*	ppm	>0.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mo	ppm	>11	2	50	1	4	0	0	0	0	0	0	0	0	0	0
Ni	ppm	>470	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	ppm	>170	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	ppm	>0.9	0	0	1	4	0	0	0	0	1	25	0	0	0	0
Sn	ppm	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	ppm	>9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	ppm	>27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	ppm	>970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	ppm	>670	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shake Flask Extractions (SFE)			3	100	11	100	4	100	4	100	2	100	3	100	3	100
Metal Mining Effluent Regulation (MMER) Criteria																
As	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shake Flask Extractions (SFE)																
Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG FAL) Criteria																
Final pH	pH unit	<6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final pH	pH unit	>8.5	1	33	4	36	1	25	0	0	0	0	1	33	2	67
Ag	mg/L	>0.00025	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	mg/L	>0.1	2	67	11	100	4	100	4	100	2	100	3	100	3	100
As	mg/L	>0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Be	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	mg/L	>1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	mg/L	>0.00009	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Co	mg/L	>0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg	mg/L	>0.00003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	mg/L	>0.073	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	mg/L	>0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	mg/L	>0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: QTP - Quartz-Tourmaline-Pyrite veins; QZ - Quartz-Au Mineralized Zone; and Qtz - Quartz Veins; Ore - Quartz Eye Porphyry + QTP; QE-POR - Qtz-eye Porphyry; QZ-QE-POR-QTP - QZ and Qtz-eye and Porphyry + QTP veins; MD - Mafic Dike; GB - Gabbro; CG - Conglomerate; QPOR - Aphanitic quartz porphyry;
Sid NPR - Siderite Neutralization Potential Ratio (Siderite NP/AP);
Carb NPR - Carbonate Neutralization Potential Ratio (Carbonate NP/AP);
MMER - Metal Mining Effluent Regulation, authorized limits of deleterious substances in a grab sample (SOR/2002-222);
CWQG - Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater Aquatics Long Term (CCME, 2017);
ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x - ACUC are counted;
CWQG guidelines for copper, lead, and nickel have been selected based on the medium hardness value of 27.0 mg/L measured during SFE analysis;
* - no mercury results.

Table B-6: Summary of ABA Statistics for Materials from Marathon Deposit

Parameter	Paste pH	S_{TOTAL}	$S_{SULPHATE}$	$S_{SULPHIDE}$	Carb. NP	AP	Sid. NP	NNP	Sid. NPR	Carb. NPR
Units	pH Units	wt.%			kg $CaCO_3$/t				unit less	
Ore, 4 samples										
Min	9.18	0.51	0.005	0.50	5.9	16	15	-11	**0.6**	**0.2**
10th, %ile	9.25	0.57	0.005	0.56	7.1	18	19	-10	**0.6**	**0.3**
Median	9.50	0.76	0.005	0.76	12	24	40	11	**1.6**	**0.4**
90th, %ile	9.81	1.1	0.009	1.1	26	33	57	39	3.3	**1.6**
Max	9.90	1.2	0.010	1.2	32	37	59	43	3.8	2.0
Average	9.52	0.80	0.006	0.80	15	25	38	14	**1.9**	**0.8**
St. Dev.	0.26	0.24	0.002	0.25	9.8	7.7	18	24	**1.3**	**0.7**
QE-POR, 26 samples										
Min	8.55	0.01	0.005	0.01	4.3	0.3	16	7.2	**1.8**	**0.7**
10th, %ile	9.15	0.01	0.005	0.01	17	0.3	50	42	6.1	2.2
Median	9.53	0.11	0.010	0.10	36	3.1	74	70	28	15
90th, %ile	9.73	0.33	0.020	0.31	108	9.6	166	165	357	228
Max	9.87	0.59	0.060	0.59	143	18	219	219	730	475
Average	9.48	0.15	0.014	0.14	50	4.3	91	87	123	69
St. Dev.	0.27	0.14	0.013	0.14	37	4.4	50	52	198	124
QZ-QE-POR-QTP, 7 samples										
Min	9.44	0.13	0.005	0.13	14	4.1	44	33	2.1	**0.8**
10th, %ile	9.45	0.24	0.005	0.23	15	7.3	44	33	2.6	**1.0**
Median	9.56	0.35	0.010	0.34	19	11	50	38	4.9	**1.9**
90th, %ile	9.71	0.74	0.010	0.74	34	23	68	47	7.5	2.9
Max	9.73	1.0	0.010	1.0	38	32	71	57	11	3.8
Average	9.58	0.45	0.008	0.45	22	14	53	39	5.0	**2.0**
St. Dev.	0.11	0.27	0.002	0.27	8.3	8.4	10	7.6	2.6	**0.9**
MD, 8 sample										
Min	8.17	0.01	0.005	0.01	3.4	0.3	46	45	11	7.8
10th, %ile	8.77	0.02	0.009	0.01	9	0.3	66	65	28	8.5
Median	9.32	0.05	0.015	0.03	65	0.8	132	126	154	30
90th, %ile	9.77	0.21	0.064	0.19	105	6.1	165	163	513	320
Max	9.79	0.35	0.120	0.34	120	11	168	163	543	401
Average	9.27	0.09	0.031	0.07	60	2.3	118	116	240	109
St. Dev.	0.51	0.11	0.036	0.11	40	3.4	43	43	219	141
GB, 4 sample										
Min	8.82	0.01	0.010	0.01	12	0.3	59	-36	**0.6**	**0.1**
10th, %ile	8.82	0.03	0.010	0.03	42	1.0	94	27	19	12
Median	8.90	0.10	0.010	0.09	115	2.8	184	181	66	41
90th, %ile	9.10	2.2	0.010	2.2	124	67	215	214	544	305
Max	9.16	3.0	0.010	3.0	125	95	224	224	747	417
Average	8.94	0.81	0.010	0.81	92	25	163	138	220	125
St. Dev.	0.14	1.3	0.000	1.3	46	40	62	102	305	169
CG, 4 samples										
Min	9.30	0.01	0.005	0.01	68	0.3	73	73	244	226
10th, %ile	9.32	0.01	0.007	0.01	72	0.3	84	84	280	240
Median	9.49	0.01	0.010	0.01	121	0.3	160	160	533	404
90th, %ile	9.67	0.01	0.010	0.01	163	0.3	219	219	731	545
Max	9.70	0.01	0.010	0.01	165	0.3	223	223	743	549
Average	9.49	0.01	0.009	0.01	119	0.3	154	154	514	396
St. Dev.	0.17	0.00	0.002	0.00	44	0.0	64	64	214	147
AQPOR, 3 samples										
Min	9.79	0.04	0.005	0.03	16	0.9	53	52	15	4.8
10th, %ile	9.80	0.04	0.005	0.04	17	1.1	54	52	19	7.5
Median	9.83	0.06	0.005	0.06	18	1.9	58	54	36	18
90th, %ile	9.90	0.11	0.009	0.11	35	3.4	66	63	54	20
Max	9.92	0.12	0.010	0.12	39	3.8	68	66	58	20
Average	9.85	0.07	0.007	0.07	24	2.2	59	57	36	14
St. Dev.	0.05	0.03	0.002	0.04	10	1.2	6.2	6.2	18	6.9

Notes:
See the list of lithocodes under Table B-5;
S_{TOTAL} = Total Sulphur; $S_{SULPHIDE}$ = Sulphide Sulphur; $S_{SULPHATE}$ = Sulphate Sulphur;
AP = Acid Potential;
NP = Neutralization Potential; NNP = Net Neutralization Potential; NPR =Neutralization Potential Ratio; NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations;
Carb. NP = Carbonate NP;
Sid. NP = Siderite Correction Neutralization Potential;
Sid. NPR = Siderite Correction Neutralization Potential Ratio;
Carb. NPR - Carbonate Neutralization Potential Ratio;
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-7: Summary of Statistics for Total Concentration of Trace Elements in Materials from Marathon Deposit

Parameter	Ag	Al	As	Be	Cd	Co	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	V	Zn
Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
ACUCx10	530	41	48	21	0.90	173	920	280	32	11	470	170	0.9	9	27	970	670
Ore, 4 samples																	
Min	0.05	2.5	0.5	0.5	0.05	1.2	68	2.5	0.99	1.0	1.9	1.0	0.5	0.25	0.1	2	2
10th, %ile	0.05	3.0	0.5	0.5	0.05	1.2	72	4.2	1.1	1.2	2.0	1.2	0.5	0.25	0.1	2	2
Median	0.08	4.7	0.5	0.5	0.45	1.6	85	13	1.2	14	2.6	1.6	0.5	0.25	0.3	3	5
90th, %ile	0.52	5.8	0.9	0.5	52	2.6	126	33	1.3	38	7.7	2.4	0.5	0.25	0.4	8	11
Max	0.70	6.0	1.0	0.5	67	2.9	142	40	1.3	43	9.8	2.8	0.5	0.25	0.4	10	12
Average	0.23	4.5	0.6	0.5	13	1.8	95	17	1.2	18	4.2	1.7	0.5	0.25	0.3	5	6
St. Dev.	0.28	1.3	0.2	0.0	23	0.7	28	14	0.12	18	3.2	0.7	0.0	0.00	0.1	3	4
QE-POR, 26 samples																	
Min	0.05	5.2	0.5	0.5	0.05	0.9	28	1.0	0.48	0.2	1.5	1.0	0.5	0.25	0.1	6	5
10th, %ile	0.05	5.8	0.5	0.5	0.05	2.8	53	1.9	1.5	0.3	1.8	1.3	0.5	0.25	0.2	9	11
Median	0.05	6.3	0.5	0.5	0.05	5.5	70	5.7	2.5	0.6	2.2	1.7	0.5	0.25	0.4	34	21
90th, %ile	0.05	7.3	2.0	0.5	0.05	17	98	37	4.0	2.0	11.1	4.4	0.5	0.25	0.6	116	40
Max	0.05	10	5.0	2.0	0.05	27	228	71	6.4	13	106	22	1.0	0.25	0.8	209	80
Average	0.05	6.4	1.0	0.6	0.05	7.8	78	14	2.8	1.2	8.2	2.9	0.5	0.25	0.4	55	24
St. Dev.	0.00	1.00	0.9	0.3	0.00	6.8	35	19	1.3	2.4	20.2	4.1	0.1	0.00	0.2	54	15
QZ-QE-POR-QTP, 7 samples																	
Min	0.05	5.1	0.5	0.5	0.05	0.8	60	2.7	0.96	0.4	1.6	1.0	0.5	0.25	0.2	2	5
10th, %ile	0.05	5.1	0.5	0.5	0.05	1.5	62	6.7	0.98	0.5	1.7	1.4	0.5	0.25	0.3	3	6
Median	0.05	5.4	0.5	0.5	0.05	2.3	78	11	1.1	0.9	1.7	1.7	0.5	0.25	0.4	6	11
90th, %ile	0.11	6.0	2.0	0.5	0.05	13	93	30	2.0	3.6	2.3	3.3	0.5	0.25	0.4	14	21
Max	0.20	6.0	2.0	0.5	0.05	26	106	57	2.1	3.8	2.4	4.4	0.5	0.25	0.5	21	22
Average	0.07	5.5	1.1	0.5	0.05	5.8	79	16	1.4	1.6	1.9	2.1	0.5	0.25	0.4	8	12
St. Dev.	0.05	0.38	0.7	0.0	0.00	8.2	14	17	0.45	1.3	0.3	1.0	0.0	0.00	0.1	6	6
MD, 8 sample																	
Min	0.05	5.1	0.5	0.5	0.05	2.6	26	1.5	1.5	0.1	1.3	1.4	0.5	0.25	0.1	10	18
10th, %ile	0.05	5.9	0.5	0.5	0.05	4.1	36	3.4	1.9	0.2	1.4	1.7	0.5	0.25	0.2	11	19
Median	0.05	7.2	1.0	0.5	0.05	11	54	27	5.2	0.3	5.0	2.2	0.5	0.25	0.3	100	52
90th, %ile	0.05	7.9	2.3	0.5	0.05	40	65	59	8.7	0.7	14	6.6	0.5	0.25	0.4	392	90
Max	0.05	8.2	3.0	0.5	0.05	41	72	67	9.9	1.5	23	15	0.5	0.25	0.5	454	93
Average	0.05	7.0	1.3	0.5	0.05	18	52	30	5.4	0.4	6.9	3.7	0.5	0.25	0.3	179	55
St. Dev.	0.00	0.90	0.9	0.0	0.00	15	13	24	2.9	0.4	6.5	4.4	0.0	0.00	0.1	172	28
GB, 4 sample																	
Min	0.05	8.9	3.0	0.5	0.05	31	105	52	3.9	0.1	38	0.8	0.5	0.25	0.1	137	23
10th, %ile	0.05	9.1	4.2	0.5	0.05	34	110	76	4.1	0.1	42	0.9	0.5	0.25	0.1	140	27
Median	0.05	9.5	8.0	0.5	0.13	44	122	211	5.1	0.2	56	1.1	0.5	0.25	0.1	176	36
90th, %ile	0.23	9.6	111	0.5	0.20	161	158	1173	7.7	0.4	191	1.3	4.4	0.25	0.1	234	49
Max	0.30	9.6	155	0.5	0.20	209	172	1550	8.6	0.5	248	1.4	6.0	0.25	0.1	246	54
Average	0.11	9.4	44	0.5	0.13	82	130	506	5.7	0.2	99	1.1	1.9	0.25	0.1	184	37
St. Dev.	0.11	0.27	64	0.0	0.08	73	25	609	1.8	0.2	86	0.2	2.4	0.00	0.0	45	11
CG, 4 samples																	
Min	0.05	6.5	1.0	0.5	0.05	12	66	2.2	3.0	0.1	20	4.8	0.5	0.25	0.3	83	53
10th, %ile	0.05	6.5	1.3	0.7	0.05	13	68	4.4	3.1	0.1	20	5.5	0.5	0.25	0.4	86	53
Median	0.05	7.1	2.0	1.0	0.05	20	76	20	3.9	0.3	25	7.8	0.5	0.25	1.0	117	59
90th, %ile	0.05	8.4	2.7	1.0	0.09	27	85	50	4.7	0.3	29	11	0.5	0.25	1.5	148	67
Max	0.05	8.7	3.0	1.0	0.10	28	88	58	4.9	0.3	30	13	0.5	0.25	1.6	150	68
Average	0.05	7.3	2.0	0.9	0.06	20	76	25	3.9	0.2	25	8.3	0.5	0.25	1.0	117	60
St. Dev.	0.00	0.93	0.7	0.2	0.02	6.8	8	22	0.74	0.1	4.1	2.9	0.0	0.00	0.5	30	6
AQPOR, 3 samples																	
Min	0.05	5.6	0.5	0.5	0.05	1.8	72	1.3	1.5	0.8	1.6	1.1	0.5	0.25	0.3	6	4
10th, %ile	0.05	5.7	0.6	0.5	0.05	2.1	74	1.6	1.6	1.2	1.6	1.2	0.5	0.25	0.3	7	5
Median	0.05	6.0	1.0	0.5	0.05	3.3	82	2.9	2.3	2.6	1.6	1.6	0.5	0.25	0.4	11	11
90th, %ile	0.05	6.1	1.0	0.5	0.05	6.3	92	5.0	2.4	3.0	2.4	1.6	0.5	0.25	0.4	16	34
Max	0.05	6.1	1.0	0.5	0.05	7.1	94	5.5	2.4	3.1	2.6	1.6	0.5	0.25	0.4	17	40
Average	0.05	5.9	0.8	0.5	0.05	4.1	83	3.2	2.1	2.2	1.9	1.4	0.5	0.25	0.4	11	18
St. Dev.	0.00	0.22	0.2	0.0	0.00	2.2	9	1.7	0.42	1.0	0.5	0.2	0.0	0.00	0.0	4	16

Notes: See the list of lithocodes under Table B-5;
ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are underlined;
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-8: Summary of SFE Statistics for Materials from Marathon Deposit

Parameter	Final pH	Ag	Al	As	Be	B	Cd	Co	Cr	Cu	Fe	Hg	Mo	Ni	Pb	Se	Tl	U	V	Zn
Unit	pH units	mg/L																		
MMER	-	-	-	0.5	-	-	-	-	-	0.3	-	-	-	0.5	0.2	-	-	-	-	0.5
CWQG	6.5-8.5	0.00025	0.1	0.005	0.1	1.5	0.00009	0.05	0.001	0.002	0.3	0.00003	0.073	0.025	0.001	0.001	0.0008	0.015	0.1	0.03
Ore, 3 samples																				
Min	7.73	0.000005	0.06	0.0005	0.000005	0.000	0.000001	0.000016	0.00005	0.00075	0.0010	0.00001	0.00106	0.00005	0.000025	0.00005	0.000002	0.000021	0.0001	0.0005
10th, %ile	7.84	0.000005	0.10	0.0006	0.000005	0.000	0.000002	0.000020	0.00005	0.00087	0.0018	0.00001	0.00132	0.00007	0.000025	0.00005	0.000003	0.000025	0.0001	0.0005
Median	8.29	0.000005	0.25	0.0011	0.000005	0.000	0.000005	0.000034	0.00005	0.00134	0.0050	0.00001	0.00235	0.00014	0.000025	0.00005	0.000005	0.000038	0.0001	0.0005
90th, %ile	9.11	0.000011	0.35	0.0012	0.000005	0.021	0.000007	0.000045	0.00016	0.00148	0.0148	0.00001	0.02359	0.00029	0.000025	0.00005	0.000033	0.000084	0.0002	0.0010
Max	9.31	0.000013	0.37	0.0012	0.000005	0.023	0.000007	0.000048	0.00019	0.00152	0.0172	0.00001	0.02890	0.00033	0.000025	0.00005	0.000040	0.000095	0.0002	0.0011
Average	8.44	0.000008	0.23	0.0009	0.000005	0.005	0.000004	0.000033	0.00010	0.00120	0.0077	0.00001	0.01077	0.00017	0.000025	0.00005	0.000016	0.000052	0.0001	0.0007
St. Dev.	0.65	0.000004	0.13	0.0003	0.000000	0.008	0.000003	0.000013	0.00007	0.00033	0.0069	0.00000	0.01283	0.00012	0.000000	0.00000	0.000018	0.000032	0.0001	0.0003
QE-POR, 11 samples																				
Min	7.35	0.000005	0.12	0.0001	0.000005	0.001	0.000001	0.000003	0.00005	0.00028	0.0010	0.00001	0.00007	0.00006	0.000025	0.00005	0.000002	0.000001	0.0001	0.0005
10th, %ile	7.37	0.000005	0.17	0.0001	0.000005	0.002	0.000001	0.000005	0.00005	0.00028	0.0010	0.00001	0.00008	0.00006	0.000025	0.00005	0.000002	0.000002	0.0001	0.0005
Median	7.81	0.000005	0.21	0.0003	0.000005	0.003	0.000001	0.000009	0.00005	0.00049	0.0037	0.00001	0.00037	0.00007	0.000025	0.00005	0.000009	0.000025	0.0003	0.0005
90th, %ile	9.41	0.000005	0.51	0.0007	0.000005	0.005	0.000005	0.000016	0.00005	0.00090	0.0091	0.00001	0.00141	0.00011	0.000087	0.00005	0.000098	0.000082	0.0009	0.0005
Max	9.42	0.000010	0.55	0.0012	0.000005	0.011	0.000006	0.000028	0.00019	0.00195	0.0093	0.00001	0.00543	0.00017	0.000150	0.00013	0.000138	0.000171	0.0010	0.0010
Average	8.17	0.000005	0.27	0.0004	0.000005	0.004	0.000002	0.000010	0.00006	0.00064	0.0042	0.00001	0.00095	0.00008	0.000042	0.00006	0.000029	0.000046	0.0004	0.0005
St. Dev.	0.78	0.000001	0.13	0.0003	0.000000	0.002	0.000002	0.000006	0.00004	0.00046	0.0027	0.00000	0.00148	0.00003	0.000038	0.00002	0.000043	0.000047	0.0003	0.0001
QZ-QE-POR-QTP, 4 samples																				
Min	7.02	0.000005	0.10	0.0002	0.000005	0.001	0.000001	0.000018	0.00005	0.00047	0.0010	0.00001	0.00014	0.00007	0.000025	0.00005	0.000002	0.000025	0.0001	0.0005
10th, %ile	7.21	0.000005	0.11	0.0002	0.000005	0.002	0.000002	0.000019	0.00005	0.00051	0.0018	0.00001	0.00015	0.00007	0.000025	0.00005	0.000002	0.000059	0.0001	0.0005
Median	7.70	0.000005	0.13	0.0006	0.000005	0.006	0.000004	0.000026	0.00005	0.00073	0.0046	0.00001	0.00092	0.00008	0.000025	0.00005	0.000003	0.000140	0.0001	0.0005
90th, %ile	8.34	0.000005	0.27	0.0019	0.000005	0.019	0.000008	0.000034	0.00011	0.00155	0.0120	0.00001	0.00698	0.00009	0.000044	0.00025	0.000011	0.000223	0.0003	0.0016
Max	8.59	0.000005	0.32	0.0024	0.000005	0.024	0.000009	0.000036	0.00014	0.00185	0.0149	0.00001	0.00925	0.00009	0.000052	0.00033	0.000014	0.000259	0.0003	0.0020
Average	7.75	0.000005	0.17	0.0009	0.000005	0.009	0.000005	0.000027	0.00007	0.00094	0.0063	0.00001	0.00281	0.00008	0.000032	0.00012	0.000006	0.000141	0.0002	0.0009
St. Dev.	0.56	0.000000	0.09	0.0009	0.000000	0.009	0.000003	0.000007	0.00004	0.00054	0.0052	0.00000	0.00377	0.00001	0.000012	0.00012	0.000005	0.000083	0.0001	0.0006
MD, 4 sample																				
Min	7.75	0.000005	0.22	0.0001	0.000005	0.001	0.000001	0.000008	0.00005	0.00033	0.0010	0.00001	0.00006	0.00005	0.000025	0.00005	0.000002	0.000002	0.0001	0.0005
10th, %ile	7.77	0.000005	0.23	0.0001	0.000005	0.001	0.000001	0.000009	0.00005	0.00034	0.0010	0.00001	0.00007	0.00006	0.000025	0.00005	0.000002	0.000006	0.0001	0.0005
Median	7.88	0.000005	0.25	0.0002	0.000005	0.002	0.000001	0.000011	0.00008	0.00045	0.0018	0.00001	0.00026	0.00006	0.000025	0.00005	0.000002	0.000021	0.0003	0.0005
90th, %ile	8.02	0.000005	0.26	0.0004	0.000005	0.002	0.000002	0.000015	0.00011	0.00061	0.0033	0.00001	0.00065	0.00006	0.000025	0.00011	0.000036	0.000089	0.0004	0.0012
Max	8.05	0.000005	0.26	0.0006	0.000005	0.002	0.000003	0.000016	0.00012	0.00065	0.0037	0.00001	0.00074	0.00007	0.000025	0.00013	0.000051	0.000115	0.0004	0.0015
Average	7.89	0.000005	0.25	0.0002	0.000005	0.002	0.000002	0.000012	0.00008	0.00047	0.0021	0.00001	0.00033	0.00006	0.000025	0.00007	0.000014	0.000040	0.0003	0.0008
St. Dev.	0.12	0.000000	0.02	0.0002	0.000000	0.001	0.000001	0.000003	0.00003	0.00013	0.0011	0.00000	0.00028	0.00000	0.000000	0.00003	0.000021	0.000044	0.0001	0.0004
GB, 2 sample																				
Min	7.28	0.000005	0.22	0.0002	0.000005	0.004	0.000002	0.000010	0.00021	0.00023	0.0010	0.00001	0.00008	0.00009	0.000025	0.00005	0.000004	0.000001	0.0004	0.0005
10th, %ile	7.32	0.000005	0.22	0.0002	0.000005	0.004	0.000002	0.000010	0.00021	0.00024	0.0010	0.00001	0.00008	0.00010	0.000033	0.00005	0.000006	0.000001	0.0004	0.0005
Median	7.50	0.000005	0.22	0.0002	0.000005	0.004	0.000003	0.000011	0.00022	0.00027	0.0010	0.00001	0.00010	0.00014	0.000067	0.00005	0.000015	0.000001	0.0004	0.0005
90th, %ile	7.67	0.000005	0.23	0.0002	0.000005	0.005	0.000003	0.000011	0.00022	0.00029	0.0010	0.00001	0.00012	0.00018	0.000100	0.00005	0.000024	0.000001	0.0004	0.0005
Max	7.71	0.000005	0.23	0.0002	0.000005	0.005	0.000003	0.000011	0.00022	0.00030	0.0010	0.00001	0.00012	0.00019	0.000108	0.00005	0.000027	0.000001	0.0004	0.0005
Average	7.50	0.000005	0.22	0.0002	0.000005	0.004	0.000003	0.000011	0.00022	0.00027	0.0010	0.00001	0.00010	0.00014	0.000067	0.00005	0.000015	0.000001	0.0004	0.0005
St. Dev.	0.22	0.000000	0.01	0.0000	0.000000	0.001	0.000001	0.000000	0.00001	0.00004	0.0000	0.00000	0.00002	0.00005	0.000042	0.00000	0.000011	0.000000	0.0000	0.0000
CG, 3 samples																				
Min	7.89	0.000005	0.12	0.0002	0.000005	0.001	0.000001	0.000006	0.00005	0.00022	0.0010	0.00001	0.00013	0.00005	0.000025	0.00005	0.000002	0.000007	0.0003	0.0005
10th, %ile	7.91	0.000005	0.13	0.0002	0.000005	0.001	0.000001	0.000009	0.00005	0.00025	0.0013	0.00001	0.00016	0.00005	0.000025	0.00005	0.000003	0.000008	0.0004	0.0005
Median	7.99	0.000005	0.16	0.0002	0.000005	0.002	0.000001	0.000021	0.00005	0.00038	0.0027	0.00001	0.00031	0.00006	0.000025	0.00005	0.000009	0.000014	0.0005	0.0005
90th, %ile	8.57	0.000005	0.20	0.0009	0.000005	0.004	0.000001	0.000021	0.00021	0.00063	0.0045	0.00001	0.00070	0.00008	0.000082	0.00005	0.000023	0.000923	0.0011	0.0014
Max	8.71	0.000005	0.21	0.0010	0.000005	0.004	0.000001	0.000022	0.00025	0.00069	0.0049	0.00001	0.00080	0.00008	0.000096	0.00005	0.000026	0.001150	0.0012	0.0016
Average	8.20	0.000005	0.16	0.0005	0.000005	0.002	0.000001	0.000016	0.00012	0.00043	0.0029	0.00001	0.00041	0.00006	0.000049	0.00005	0.000012	0.000390	0.0007	0.0009
St. Dev.	0.37	0.000000	0.03	0.0004	0.000000	0.001	0.000000	0.000007	0.00009	0.00020	0.0016	0.00000	0.00029	0.00001	0.000033	0.00000	0.000010	0.000537	0.0004	0.0005
AQPOR, 3 samples																				
Min	7.54	0.000005	0.18	0.0003	0.000005	0.002	0.000001	0.000009	0.00005	0.00028	0.0026	0.00001	0.00013	0.00005	0.000025	0.00005	0.000002	0.000004	0.0001	0.0005
10th, %ile	7.83	0.000005	0.19	0.0003	0.000005	0.002	0.000001	0.000011	0.00005	0.00029	0.0027	0.00001	0.00020	0.00005	0.000025	0.00005	0.000002	0.000009	0.0001	0.0005
Median	9.00	0.000005	0.22	0.0004	0.000005	0.002	0.000001	0.000015	0.00005	0.00035	0.0031	0.00001	0.00050	0.00005	0.000025	0.00005	0.000002	0.000025	0.0003	0.0005
90th, %ile	9.44	0.000005	0.26	0.0005	0.000005	0.003	0.000001	0.000023	0.00005	0.00057	0.0068	0.00001	0.00058	0.00007	0.000025	0.00023	0.000008	0.000036	0.0004	0.0005
Max	9.55	0.000005	0.27	0.0006	0.000005	0.003	0.000001	0.000025	0.00005	0.00063	0.0077	0.00001	0.00060	0.00007	0.000025	0.00028	0.000009	0.000039	0.0005	0.0005
Average	8.70	0.000005	0.22	0.0004	0.000005	0.002	0.000001	0.000016	0.00005	0.00042	0.0045	0.00001	0.00041	0.00006	0.000025	0.00013	0.000004	0.000023	0.0003	0.0005
St. Dev.	0.85	0.000000	0.03	0.0001	0.000000	0.000	0.000000	0.000006	0.00000	0.00015	0.0023	0.00000	0.00020	0.00001	0.000000	0.00011	0.000003	0.000014	0.0002	0.0000

Notes: See the list of lithocodes under Table B-5;

MMER = Metal Mining Effluent Regulations (MMER) SOR/2002/222 (2015); Values above MMER guidelines are bolded;

CWQG = Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life - Long Term (CCME, 2017) (See text for selection of CWQG guidelines); Values above CWQG guidelines are double underlined;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-9: Summary of Acid Base Accounting for Leprechaun Deposit Drill Core Pulps and the Test Program Products (Thibault and Associates 2015 and 2017)

Sample number	Sample Description	Gold Grade *	Paste pH	Sulphide Sulphur	Acid Production Potential (AP)	Neutralizing Potential pH 8.3 (NP)	Net NP pH 8.3	NP/AP
Units		g/t	pH units	wt.%	kg $CaCO_3$/tonne			
Ore and waste rock 2015 (Leprechaun deposit drill core pulps)								
1	FW-Sed NE-LGD	0.005	10.4	< 0.005	< 0.2	41.5	41.5	-
2	MD Cent-NE-LGD	0.005	10.2	0.165	5.2	163	158	31.7
3	MD SW-LGD	0.005	10.2	< 0.005	< 0.2	131	131	-
4	HW NE-LGD	0.005	10.3	0.061	1.9	49.3	47.4	25.8
5	HW SW-LGD	0.005	10.3	0.060	1.9	73.5	71.6	39.3
6	HW-QTP NE-LGD	1.100	10.3	0.239	7.5	52.9	45.4	7.1
7	MZ-Low Grade LGD	1.351	10.2	0.360	11.3	60.7	49.4	5.4
8	MZ-Aver Grade Cent-NE LGD	2.322	10.2	0.504	15.7	57.2	41.5	3.6
9	MZ-Aver Grade SW-Cent LGD	2.639	10.3	0.502	15.7	53.0	37.3	3.4
10	HW-QTP SW-Cent-LGD	5.039	10.3	0.140	4.4	33.9	29.5	7.8
11	FW-Sed-QTP SW-LGD	5.415	10.1	1.24	38.9	27.0	-11.9	0.7
12	MZ-High Grade LGD	6.442	9.8	0.192	6.0	77.9	71.9	13.0
Test Program Products 2015								
13	FL-11 to FL-20 Comp. Tails	0.193	8.9	0.009	0.3	56.6	56.3	210
14	CN-LEA-18 Residue	0.048	9.1	0.012	0.4	55.8	55.4	153
15	FL-07 to FL-10 BSC- Neutralized	66.236	7.6	16.7	521	73.5	-448	0.1
Test Program Products 2017								
-	CN-LEA-15 Residue	-	7.4	25.49	797	47.4	-749.2	0.06
-	FL-05 to FL-18 Float Tails	-	8.5	0.033	1.0	31.0	30.0	31.0

Table Notes: * Weighted average gold grade of composite samples submitted for ABA and TCLP analysis as calculated from individual drill core pulp gold grades defined by Marathon Gold Corporation;
Aver - Average; BSC - Bulk Sulphide Concentrate; Cent - Central; Comp - Composite; FW - Footwall Zone; HW - Hanging Wall Zone; LGD - Leprechaun Gold Deposit; MZ - Main Zone; MD - Mafic Dike; NE - Northeast; QTP - Quartz-Tourmaline-Pyrite; Sed - Sedimentary; SW - Southwest.

Table B-10: Summary of Acid Base Accounting for ore composites used in metallurgical testing

Parameter	Units	Leprechaun Deposit Master Composite 3	Leprechaun LG Composite	Leprechaun LG2	Marathon HG Composite	Marathon LG Composite	Marathon LG2 Composite
Total Carbon *	wt%	0.74	0.91	0.93	0.42	0.37	0.54
Organic Carbon *	wt%	0.019	0.090	0.030	0.025	0.048	0.025
Inorganic Carbon (by Diff.) *	wt%	0.72	0.82	0.90	0.40	0.33	0.52
Total Sulphur *	wt%	0.31	0.42	0.30	0.67	0.58	0.50
Sulphate Sulphur *	wt%	0.003	0.008	0.001	0.011	0.014	0.003
Sulphide Sulphur (by Diff.) *	wt%	0.31	0.41	0.30	0.66	0.56	0.50
AP from Sulphide Sulphur **	kg CaCO3/t	9.7	12.9	9.4	20.5	17.6	15.5
NP from Inorganic Carbon **	kg CaCO3/t	59.8	68.7	75.2	32.9	27.2	42.9
NPR = NP/AP **	ratio	6.15	5.32	7.96	**1.60**	**1.54**	2.77

Notes:
* - Parameter analyzed by Thibault and Associates Inc. (2017);
** - Parameter calculated by Stantec;
Carbonate NPR values below 2 are bolded;

Table B-11: ABA Estimates for combined Marathon and Leprechaun tailings

Parameter	% Ore*	Carb. NP	AP	Sid. NP	Sid. NPR	Carb. NPR
Units		kg $CaCO_3$/t			unit less	
Average Leprechaun	60%	52	13	93	7.2	4.0
Average Marathon	40%	15	25	38	**1.5**	**0.6**
Mixture	100%	37	18	71	4.0	2.1

*Based on preliminary tonnages of Marathon and Leprechaun ores from the Open pits.

Appendix C Certificates of Analyses and Laboratory Reports

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: STANTEC CONSULTING LTD

Table 1: ABA Test Results for project LEPRECHUAN

Maxxam Sample No	Sample ID	Paste pH	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Siderite Corr. Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
SD0597	VL-10-143: 4.5-5.5	9.21	1.71	38.9	0.03	0.02	<0.02	<0.6	58.8	MODERATE	58.8	#N/A
SD0598	VL-10-143: 24-25	9.73	1.76	40.0	<0.02	0.01	<0.02	<0.6	66.3	MODERATE	66.3	#N/A
SD0599	VL-10-143: 42.5-43.4	9.61	1.22	27.7	0.20	0.01	0.19	5.9	57.5	MODERATE	51.6	9.7
SD0600	VL-10-143: 69-70	9.84	1.74	39.6	0.47	0.01	0.46	14.4	65.0	MODERATE	50.6	4.5
SD0601	VL-10-143: 95-97	8.93	6.50	147.7	0.13	0.10	0.03	0.9	224	STRONG	223	248.7
SD0602	VL-10-143: 114-115	9.62	1.98	45.0	<0.02	0.01	<0.02	<0.6	73.8	MODERATE	73.8	#N/A
SD0603	VL-10-143: 135-137	9.64	0.55	12.5	<0.02	0.01	<0.02	<0.6	25.0	SLIGHT	25.0	#N/A
SD0604	VL-10-146: 6-7	9.63	1.68	38.2	<0.02	0.01	<0.02	<0.6	63.8	MODERATE	63.8	#N/A
SD0605	VL-10-146: 21-22	9.82	2.04	46.4	0.04	0.01	0.03	0.9	67.5	MODERATE	66.6	75.0
SD0606	VL-10-146: 54-55	9.50	0.99	22.5	0.02	0.01	<0.02	<0.6	56.3	MODERATE	56.3	#N/A
SD0607	VL-10-146: 74-76	9.55	0.19	4.3	<0.02	0.01	<0.02	<0.6	16.8	SLIGHT	16.8	#N/A
SD0608	VL-10-146: 98-100	9.52	2.22	50.5	<0.02	0.01	<0.02	<0.6	82.5	MODERATE	82.5	#N/A
SD0609	VL-10-157: 1-2	9.53	1.09	24.8	0.04	0.01	0.03	0.9	52.5	MODERATE	51.6	58.3
SD0610	VL-10-157: 120-121	9.02	10.03	228.0	0.15	0.05	0.10	3.1	256	STRONG	253	82.7
SD0611	VL-10-157: 160.5-161	9.10	4.44	100.9	0.07	0.01	0.06	1.9	166	STRONG	164	87.5
SD0612	VL-11-274: 5-7	9.52	2.89	65.7	0.09	<0.01	0.09	2.8	95.0	MODERATE	92.2	33.9
SD0613	VL-11-274: 17-19	9.87	1.27	28.9	<0.02	0.01	<0.02	<0.6	60.0	MODERATE	60.0	#N/A
SD0614	VL-11-274: 33-35	9.50	1.31	29.8	<0.02	0.01	<0.02	<0.6	41.8	SLIGHT	41.8	#N/A
SD0615	VL-11-294: 7-9	9.71	1.22	27.7	<0.02	<0.01	<0.02	<0.6	39.8	SLIGHT	39.8	#N/A
SD0616	VL-11-294: 49-50	9.34	5.98	135.9	0.13	0.04	0.09	2.8	200	STRONG	197	71.4
SD0617	VL-11-294: 67-68	9.13	8.06	183.2	0.15	0.05	0.10	3.1	189	MODERATE	186	60.9
SD0618	VL-11-294: 117-119	9.66	1.83	41.6	0.12	0.02	0.10	3.1	66.3	MODERATE	63.2	21.4
SD0619	VL-11-294: 153-154	9.90	1.96	44.6	0.03	0.01	0.02	0.6	73.8	MODERATE	73.2	123.0
SD0620	VL-11-294: 204-205	9.82	2.33	53.0	0.14	0.02	0.12	3.8	86.3	MODERATE	82.5	22.7
SD0621	VL-11-294: 259-260	9.54	2.64	60.0	0.79	0.01	0.78	24.4	97.5	MODERATE	73.1	4.0
SD0622	VL-11-294: 315-316	8.93	0.51	11.6	0.61	0.04	0.57	17.8	28.3	SLIGHT	10.5	1.6
SD0623	VL-11-294: 322-324	8.71	0.61	13.9	<0.02	0.01	<0.02	<0.6	29.3	SLIGHT	29.3	#N/A
SD0624	VL-11-304: 4-6	9.79	1.61	36.6	<0.02	0.01	<0.02	<0.6	46.0	SLIGHT	46.0	#N/A
SD0625	VL-11-304: 41-42	9.47	1.83	41.6	0.24	0.01	0.23	7.2	51.3	SLIGHT	44.1	7.1
SD0626	VL-11-304: 76-77	9.75	1.04	23.6	0.07	0.01	0.06	1.9	37.5	SLIGHT	35.6	19.7
SD0627	VL-11-304: 102-104	9.81	1.49	33.9	0.04	0.01	0.03	0.9	58.8	MODERATE	57.9	65.3
SD0628	VL-11-304: 147-149	10.0	1.33	30.2	<0.02	<0.01	<0.02	<0.6	60.0	MODERATE	60.0	#N/A
SD0629	VL-11-304: 182-184	9.03	1.47	33.4	0.03	0.01	0.02	0.6	67.5	MODERATE	66.9	112.5
SD0630	VL-11-304: 213-214	9.79	1.44	32.7	0.29	0.01	0.28	8.8	63.8	MODERATE	55.0	7.3
SD0631	VL-11-304: 240-241	9.76	3.28	74.6	0.08	0.02	0.06	1.9	120	MODERATE	118	63.2
SD0632	VL-11-304: 259-261	9.59	0.33	7.5	<0.02	0.02	<0.02	<0.6	20.5	SLIGHT	20.5	#N/A
SD0633	VL-11-349: 28-29	8.57	6.79	154.3	0.46	0.01	0.45	14.1	285	STRONG	271	20.2
SD0634	VL-11-349: 48-49	9.16	8.16	185.5	0.14	0.04	0.10	3.1	220	STRONG	217	71.0
SD0635	VL-11-349: 72-73	9.48	1.97	44.8	0.03	0.01	0.02	0.6	80.0	MODERATE	79.4	133.3
SD0636	VL-11-349: 133-134	9.67	2.38	54.1	0.30	0.01	0.29	9.1	82.5	MODERATE	73.4	9.1
SD0637	VL-11-349: 174-175	9.70	2.23	50.7	0.29	0.01	0.28	8.8	85.0	MODERATE	76.2	9.7
SD0638	VL-11-350: 28-30	9.16	3.17	72.1	0.19	0.01	0.18	5.6	111	MODERATE	106	19.9
SD0639	VL-11-350: 69-71	9.22	5.70	129.6	0.54	0.05	0.49	15.3	196	STRONG	181	12.8
SD0640	VL-11-350: 92-93	9.44	4.70	106.8	0.08	0.02	0.06	1.9	135	MODERATE	133	71.1
SD0641	VL-11-350: 100-102	8.97	5.41	123.0	1.15	0.04	1.11	34.7	188	STRONG	153	5.4
SD0642	VL-11-350: 116-118	9.58	0.16	3.6	<0.02	0.01	<0.02	<0.6	15.0	SLIGHT	15.0	#N/A
SD0643	VL-11-353: 6-8	9.73	1.36	30.9	0.03	0.01	0.02	0.6	63.8	MODERATE	63.2	106.3

Maxxam Sample No	Sample ID	Paste pH	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Siderite Corr. Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
SD0644	VL-11-353: 29-31	8.76	5.53	125.7	0.07	0.01	0.06	1.9	200	STRONG	198	105.3
SD0645	VL-11-353: 65-66	9.61	1.83	41.6	0.07	0.01	0.06	1.9	75.0	MODERATE	73.1	39.5
SD0646	VL-11-353: 108-109	9.70	2.09	47.5	0.12	<0.01	0.12	3.8	81.3	MODERATE	77.5	21.4
SD0647	VL-11-353: 139-140	9.86	1.98	45.0	0.09	0.02	0.07	2.2	73.8	MODERATE	71.6	33.5
SD0648	VL-11-353: 154-156	9.66	0.09	2.1	<0.02	0.02	<0.02	<0.6	13.0	SLIGHT	13.0	#N/A
SD0649	VL-11-353: 166-167	9.48	0.17	3.9	<0.02	0.02	<0.02	<0.6	16.3	SLIGHT	16.3	#N/A
SD0650	VL-11-344: 5-7	9.75	1.07	24.3	0.06	0.01	0.05	1.6	50.0	MODERATE	48.4	31.3
SD0651	VL-11-344: 46-47	9.87	0.54	12.3	0.08	0.01	0.07	2.2	45.0	MODERATE	42.8	20.5
SD0652	VL-11-344: 73-75	9.80	1.53	34.8	0.02	0.02	<0.02	<0.6	66.3	MODERATE	66.3	#N/A
SD0653	VL-11-344: 114-115	9.82	1.70	38.6	0.10	0.01	0.09	2.8	68.8	MODERATE	66.0	24.6
SD0654	VL-11-344: 147-149	9.84	1.89	43.0	0.02	<0.01	0.02	0.6	71.3	MODERATE	70.7	118.8
SD0655	VL-11-344: 189-190	9.38	5.68	129.1	0.12	0.03	0.09	2.8	180	MODERATE	177	64.3
SD0656	VL-11-344: 189-190	9.88	1.10	25.0	0.06	0.01	0.05	1.6	55.0	MODERATE	53.4	34.4
SD0657	VL-11-345: 43-45	9.90	1.85	42.1	0.06	0.01	0.05	1.6	76.3	MODERATE	74.7	47.7
SD0658	VL-11-345: 74-75	9.85	1.09	24.8	0.25	0.01	0.24	7.5	63.8	MODERATE	56.3	8.5
SD0659	VL-11-345: 110-111	9.79	1.83	41.6	0.05	0.01	0.04	1.3	73.8	MODERATE	72.5	56.8
SD0660	VL-11-345: 130-131	9.70	2.48	56.4	0.21	<0.01	0.21	6.6	77.5	MODERATE	70.9	11.7
SD0661	VL-11-345: 171-173	9.69	0.98	22.3	0.12	0.01	0.11	3.4	67.5	MODERATE	64.1	19.9
SD0662	VL-11-345: 203-204	9.49	7.19	163.4	0.25	0.01	0.24	7.5	211	STRONG	204	28.2
SD0663	VL-12-398: 8-9	9.79	0.79	18.0	0.05	0.01	0.04	1.3	47.5	MODERATE	46.2	36.5
SD0664	VL-12-398: 44-46	9.63	1.30	29.6	0.08	0.01	0.07	2.2	61.3	MODERATE	59.1	27.9
SD0665	VL-12-398: 94-96	9.73	2.82	64.1	0.02	0.01	<0.02	<0.6	92.5	MODERATE	92.5	#N/A
SD0666	VL-12-398: 146-148	9.82	0.83	18.9	0.03	<0.01	0.03	0.9	57.5	MODERATE	56.6	63.9
SD0667	VL-12-398: 190-192	9.82	1.36	30.9	<0.02	0.01	<0.02	<0.6	61.3	MODERATE	61.3	#N/A
SD0668	VL-12-398: 240-241	9.84	1.40	31.8	0.08	<0.01	0.08	2.5	75.0	MODERATE	72.5	30.0
SD0669	VL-12-398: 276-277	9.60	1.47	33.4	0.32	<0.01	0.32	10.0	71.3	MODERATE	61.3	7.1
SD0670	VL-12-398: 316-318	9.40	3.06	69.6	0.13	0.01	0.12	3.8	116	MODERATE	113	30.6
SD0671	VL-12-398: 348-349	8.31	0.76	17.3	0.77	0.07	0.70	21.9	62.5	MODERATE	40.6	2.9
SD0672	VL-12-398: 358-360	8.72	1.43	32.5	<0.02	0.02	<0.02	<0.6	71.3	MODERATE	71.3	#N/A
SD0673	VL-12-403: 3-4	9.50	1.16	26.4	0.15	0.01	0.14	4.4	61.3	MODERATE	56.9	13.9
SD0674	VL-12-403: 41-42	9.89	0.74	16.8	0.05	<0.01	0.05	1.6	51.3	MODERATE	49.7	32.1
SD0675	VL-12-403: 84-85	9.91	1.34	30.5	0.03	0.01	0.02	0.6	65.0	MODERATE	64.4	108.3
SD0676	VL-12-403: 126-128	9.20	5.58	126.8	0.11	0.01	0.10	3.1	170	MODERATE	167	54.8
SD0677	VL-12-403: 162-163	9.85	1.59	36.1	0.11	<0.01	0.11	3.4	81.3	MODERATE	77.9	23.9
SD0678	VL-12-403: 206-207	9.65	2.12	48.2	0.18	0.01	0.17	5.3	66.3	MODERATE	61.0	12.5
SD0679	VL-12-403: 227-228	9.65	1.17	26.6	0.26	<0.01	0.26	8.1	63.8	MODERATE	55.7	7.9
SD0680	VL-12-403: 261-263	8.90	6.81	154.8	0.14	0.08	0.06	1.9	253	STRONG	251	132.9
SD0681	VL-12-403: 303-305	9.44	0.90	20.5	<0.02	0.05	<0.02	<0.6	39.3	SLIGHT	39.3	#N/A
SD0682	VL-12-421: 5-7	9.61	1.06	24.1	<0.02	0.01	<0.02	<0.6	61.3	MODERATE	61.3	#N/A
SD0683	VL-12-421: 69-70	9.83	2.30	52.3	0.05	<0.01	0.05	1.6	81.3	MODERATE	79.7	50.8
SD0684	VL-12-421: 92-93	9.07	10.10	229.6	0.10	0.04	0.06	1.9	248	MODERATE	246	130.3
SD0685	VL-12-421: 163-165	9.85	1.82	41.4	0.02	<0.01	0.02	0.6	77.5	MODERATE	76.9	129.2
SD0686	VL-12-421: 254-256	8.33	4.22	95.9	0.02	0.05	<0.02	<0.6	210	STRONG	210	#N/A
SD0687	VL-12-421: 268-270	8.96	0.62	14.1	<0.02	0.02	<0.02	<0.6	29.0	SLIGHT	29.0	#N/A
SD0688	VL-13-524: 3-5	9.91	1.39	31.6	0.02	0.01	<0.02	<0.6	87.5	MODERATE	87.5	#N/A
SD0689	VL-13-524: 26-27	9.80	1.32	30.0	0.03	<0.01	0.03	0.9	67.5	MODERATE	66.6	75.0
SD0690	VL-13-524: 97-99	9.83	0.96	21.8	0.06	<0.01	0.06	1.9	30.0	SLIGHT	28.1	15.8
SD0691	VL-13-524: 179-181	9.77	1.73	39.3	0.08	0.01	0.07	2.2	73.8	MODERATE	71.6	33.5
SD0692	VL-13-524: 209-210	9.79	0.96	21.8	0.13	0.01	0.12	3.8	68.8	MODERATE	65.0	18.1
SD0693	VL-13-524: 242-243	9.73	0.94	21.4	0.24	<0.01	0.24	7.5	61.3	MODERATE	53.8	8.2
SD0694	VL-13-524: 294-295	9.84	1.14	25.9	0.14	0.01	0.13	4.1	60.0	MODERATE	55.9	14.6
SD0695	VL-13-524: 354-355	9.74	1.35	30.7	0.15	0.01	0.14	4.4	75.0	MODERATE	70.6	17.0
SD0696	VL-13-524: 422-423	8.81	2.26	51.4	0.03	0.05	<0.02	<0.6	106	MODERATE	106	#N/A
SD0697	VL-13-535: 3-5	9.64	0.78	17.7	<0.02	0.01	<0.02	<0.6	58.8	MODERATE	58.8	#N/A

Maxxam Sample No	Sample ID	Paste pH	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Siderite Corr. Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
SD0698	VL-13-535: 51-53	9.84	1.59	36.1	0.07	0.01	0.06	1.9	75.0	MODERATE	73.1	39.5
SD0699	VL-13-535: 69-70	9.40	6.93	157.5	<0.02	0.01	<0.02	<0.6	173	MODERATE	173	#N/A
SD0700	VL-13-535: 127-129	9.97	0.92	20.9	<0.02	<0.01	<0.02	<0.6	52.5	MODERATE	52.5	#N/A
SD0701	VL-13-535: 205-206	9.86	1.72	39.1	0.05	0.01	0.04	1.3	81.3	MODERATE	80.0	62.5
SD0702	VL-13-535: 250-251	9.85	0.84	19.1	0.10	0.01	0.09	2.8	28.5	SLIGHT	25.7	10.2
SD0703	VL-13-535: 312-314	10.0	1.61	36.6	0.03	0.01	0.02	0.6	43.3	SLIGHT	42.7	71.2
SD0704	VL-13-535: 373-374	9.90	2.17	49.3	0.26	<0.01	0.26	8.1	83.8	MODERATE	75.7	10.3
SD0705	VL-13-535: 403-405	9.39	1.24	28.2	0.03	0.01	0.02	0.6	70.0	MODERATE	69.4	116.7
SD0706	VL-13-538: 3-5	9.84	0.84	19.1	<0.02	<0.01	<0.02	<0.6	53.8	MODERATE	53.8	#N/A
SD0707	VL-13-538: 20-21	9.90	0.49	11.1	0.24	0.01	0.23	7.2	21.3	SLIGHT	14.1	3.0
SD0708	VL-13-538: 43-45	9.84	1.26	28.6	0.03	0.01	0.02	0.6	63.8	MODERATE	63.2	106.3
SD0709	VL-13-538: 64-65	9.31	4.66	105.9	0.38	0.02	0.36	11.3	131	MODERATE	120	11.6
SD0710	VL-13-538: 88-89	9.72	1.36	30.9	0.33	<0.01	0.33	10.3	73.8	MODERATE	63.5	7.2
SD0711	VL-13-538: 105-106	9.38	7.37	167.5	0.10	0.01	0.09	2.8	178	MODERATE	175	63.4
Detection Limits		*N/A*	*0.08*	*1.8*	*0.02*	*0.01*	*0.02*	*0.6*	*0.1*	*N/A*	*0.1*	*0.1*
Maxxam SOP #		*BBY0SOP-00016*	*LECO*	*BBY WI-00033*	*LECO*	*BBY0SOP-00010*	*BBY WI-00033*	*BBY WI-00033*	*BBY0SOP-00024*	*BBY0SOP-00020*	*BBY WI-00033*	*BBY WI-00033*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

Skousen, J., Renton, J., Brown, H., Evans, P., Leavitt, B., Brady, K., Cohen, L. and Ziemkiewicz, P. 1997. Neutralization Potential of Overburden Samples containing Siderite, Journal of Environmental Quality, 26 (3): 673-681.

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Carbonate carbon (CO2; HCl direct method) by Leco.

Fizz Rating - Reference method used is based on NP method.

Net Neutralization Potential = (Siderite Correction Neutralization Potential)-(Acid Generation Potential (S-S by diff))

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Siderite Corr. Neutralization Potential - Skousen et al., Neutralization Potential of Samples With Siderite, J. Environ. Qual. 26:673-681(1997).

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

Sulphide Sulphur = (Total Sulphur)-(Sulphate Sulphur)

Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco.

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: STANTEC CONSULTING LTD

Table 2: ABA QAQC Test Results for project LEPRECHUAN

	Duplicate QC												
Maxxam Sample No	**Sample ID**	Paste pH Reported	**Paste pH Dup**	CO2 Reported	**CO2 Dup**	Total S Reported	**Total S Dup**	HCl Extractable Sulphur Reported	**HCl Extractable Sulphur Dup**	Siderite Corr. Neutralization Potential Reported Reported	**Siderite Corr. Neutralization Potential Reported Dup**	Fizz Rating Reported	**Fizz Rating Dup**
	Units	pH Units	pH Units	wt%	wt%	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	N/A
SD0602 Dup	VL-10-143: 114-115			1.98	1.98								
SD0606 Dup	VL-10-146: 54-55	9.50	9.64					0.01	0.01	56.3	55.0	MODERATE	MODERATE
SD0616 Dup	VL-11-294: 49-50	9.34	9.29					0.04	0.05	200	201	STRONG	STRONG
SD0626 Dup	VL-11-304: 76-77	9.75	9.84					0.01	0.01	37.5	37.0	SLIGHT	SLIGHT
SD0630 Dup	VL-11-304: 213-214			1.44	1.48								
SD0631 Dup	VL-11-304: 240-241	9.76	9.75					0.02	0.02	120	121	MODERATE	MODERATE
SD0636 Dup	VL-11-349: 133-134	9.67	9.73					0.01	0.01	82.5	86.3	MODERATE	MODERATE
SD0637 Dup	VL-11-349: 174-175			2.23	2.07								
SD0646 Dup	VL-11-353: 108-109	9.70	9.82					<0.01	<0.01	81.3	80.0	MODERATE	MODERATE
SD0656 Dup	VL-11-344: 189-190	9.88	9.94					0.01	0.01	55.0	53.8	MODERATE	MODERATE
SD0665 Dup	VL-12-398: 94-96			2.82	2.69								
SD0666 Dup	VL-12-398: 146-148	9.82	9.87					<0.01	0.01	57.5	63.8	MODERATE	MODERATE
SD0672 Dup	VL-12-398: 358-360			1.43	1.38								
SD0676 Dup	VL-12-403: 126-128	9.20	9.32					0.01	0.01	170	150	MODERATE	MODERATE
SD0686 Dup	VL-12-421: 254-256	8.33	8.47					0.05	0.05	210	205	STRONG	STRONG
SD0696 Dup	VL-13-524: 422-423	8.81	8.83					0.05	0.05	106	100	MODERATE	MODERATE
SD0700 Dup	VL-13-535: 127-129			0.92	0.99								
SD0701 Dup	VL-13-535: 205-206	9.86	9.92					0.01	<0.01	81.3	75.0	MODERATE	MODERATE
SD0709 Dup	VL-13-538: 64-65					0.38	0.28						
SD0711 Dup	VL-13-538: 105-106	9.38	9.39	7.37	7.16			0.01	0.01	178	181	MODERATE	MODERATE

Reference Material QC					
	Paste pH	CO2	Total S		Siderite Corr. Neutralization Potential Reported
Units	pH Units	wt%	wt%		Kg CaCO3/T
Reference Material					
ARD REF MAT GS311-1 (8812445) (2.32 wt%)			2.16		
ARD Spike 2.37% CO2 (8812459) (2.39 wt%)		2.37			
ARD-Paste pH 8.29 (8813633) (8.29 pH Units)	8.29				
ARD GS910-4 CS (8812445) (8.27 wt%)			7.98		
ARD Spike 2.37% CO2 (8812459) (2.39 wt%)		2.33			
RS10 STD (8810224) (0.06 % S)				0.06	
ARD Ref Mat DBOHC (8810224) (0.27 wt%)				0.27	
Blank QC					
Method Blank			<0.02		
Method Blank		<0.08			
Method Blank				<0.01	-0.30

Table 3: 4 Acid Metals Test Results for project LEPRECHUAN

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	Al	Na	K	W	Zr	Ce	Sn	Y	Nb	Ta	Be	Sc	Li	S	Rb	Hf	In	Re	Se	Te	Tl
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SD0597	VL-10-143: 4.5-5.5	0.2	4.3	14.4	34	<0.1	1.7	1.9	471	0.89	3	0.2	0.4	363	<0.1	0.7	<0.1	9	1.68	0.018	5.3	53	0.17	1530	0.054	7.27	3.76	1.47	0.3	8.4	11	0.3	3.0	0.7	<0.1	<1	1	3.7	<0.1	38.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0598	VL-10-143: 24-25	0.3	3.1	13.8	39	<0.1	1.9	1.8	580	0.98	2	0.1	0.4	401	<0.1	0.4	<0.1	14	1.83	0.025	8.2	60	0.21	1210	0.071	6.98	3.78	1.32	0.4	4.3	18	0.4	3.8	0.7	<0.1	<1	1	3.4	<0.1	32.5	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD0599	VL-10-143: 42.5-43.4	0.1	8.3	6.0	12	<0.1	1.6	1.3	301	0.63	3	0.1	0.2	294	<0.1	0.4	0.3	8	1.46	0.014	3.1	48	0.08	1100	0.043	5.86	3.90	0.96	2.8	7.1	7	0.3	2.3	0.8	<0.1	1	<1	2.2	0.2	19.5	0.3	<0.05	<0.005	<1	1.1	<0.5
SD0600	VL-10-143: 69-70	0.4	13.4	5.8	22	0.2	2.0	3.1	426	1.05	5	0.2	0.9	275	<0.1	0.4	0.4	23	1.51	0.029	9.3	53	0.26	669	0.076	7.21	5.11	0.70	2.3	6.6	18	0.3	2.5	0.8	<0.1	1	2	1.6	0.4	16.1	0.5	<0.05	<0.005	<1	1.7	<0.5
SD0601	VL-10-143: 95-97	0.7	56.2	7.4	94	<0.1	33.8	39.4	1440	7.57	10	0.4	1.4	306	<0.1	1.4	<0.1	265	6.38	0.091	9.5	108	3.20	28	0.719	7.24	2.49	0.04	1.4	81.5	25	0.5	27.8	2.3	0.2	<1	37	17.5	0.1	1.1	2.0	0.08	<0.005	<1	1.2	<0.5
SD0602	VL-10-143: 114-115	0.1	3.5	11.8	49	<0.1	3.5	5.6	390	1.56	3	0.3	1.1	400	<0.1	0.4	<0.1	41	3.06	0.049	11.0	29	0.70	518	0.073	8.02	3.70	1.10	0.1	7.3	24	0.3	3.3	0.2	<0.1	<1	3	9.5	<0.1	23.0	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0603	VL-10-143: 135-137	0.2	22.0	13.9	71	<0.1	23.3	15.1	1070	3.64	6	1.4	5.5	265	<0.1	0.3	0.1	93	1.85	0.070	18.7	68	1.35	657	0.133	6.81	1.68	1.32	0.3	46.9	39	0.8	15.8	0.9	<0.1	<1	12	18.6	<0.1	34.0	1.4	0.07	<0.005	<1	<0.5	<0.5
SD0604	VL-10-146: 6-7	0.2	16.4	10.1	41	<0.1	1.5	3.5	416	1.36	2	0.2	0.8	457	<0.1	0.5	<0.1	26	2.00	0.031	6.4	38	0.25	979	0.104	7.99	4.03	1.55	0.5	6.5	14	0.4	3.0	0.8	<0.1	<1	2	2.7	<0.1	37.9	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0605	VL-10-146: 21-22	0.1	8.9	10.3	43	<0.1	1.4	2.8	384	1.20	1	<0.1	0.3	408	<0.1	0.2	<0.1	22	2.06	0.029	5.5	40	0.31	700	0.066	7.63	4.53	1.13	0.2	5.4	12	0.3	2.6	0.5	<0.1	<1	2	3.5	<0.1	26.1	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0606	VL-10-146: 54-55	0.2	3.6	10.4	39	<0.1	2.4	4.3	332	1.33	1	0.2	0.5	542	<0.1	0.4	<0.1	27	3.39	0.034	4.0	42	0.37	561	0.079	7.13	2.26	0.73	0.5	9.0	9	0.4	2.3	0.7	<0.1	1	2	17.3	<0.1	11.2	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0607	VL-10-146: 74-76	<0.1	1.0	13.6	81	<0.1	25.9	17.6	807	4.12	6	1.5	5.4	311	<0.1	0.4	0.1	101	1.34	0.087	18.9	71	1.42	806	0.134	7.75	1.37	1.86	0.3	55.1	41	0.9	16.8	0.9	<0.1	<1	13	16.7	<0.1	44.2	1.6	<0.05	<0.005	<1	<0.5	<0.5
SD0608	VL-10-146: 98-100	0.3	33.2	13.2	65	<0.1	19.5	13.1	1230	3.22	6	1.1	4.7	247	<0.1	0.4	0.1	90	3.73	0.061	16.4	64	1.25	596	0.109	6.40	1.66	1.27	0.2	42.2	37	0.8	15.1	0.8	<0.1	<1	13	13.5	<0.1	23.7	1.2	<0.05	<0.005	<1	<0.5	<0.5
SD0609	VL-10-157: 1-2	0.3	2.4	15.8	24	<0.1	1.2	1.2	550	0.78	2	<0.1	0.4	399	<0.1	0.5	<0.1	8	1.35	0.014	6.1	42	0.09	2580	0.041	6.67	3.89	1.32	0.2	9.6	13	0.4	2.9	0.7	<0.1	<1	1	0.9	<0.1	36.9	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0610	VL-10-157: 120-121	0.8	49.6	8.7	87	<0.1	25.9	31.2	1400	6.92	11	0.5	1.2	276	<0.1	2.4	<0.1	242	6.82	0.084	9.0	100	2.61	247	0.937	5.75	2.32	0.59	9.5	64.5	23	1.4	18.8	3.5	0.2	1	31	5.4	<0.1	17.0	1.2	0.08	<0.005	<1	1.1	<0.5
SD0611	VL-10-157: 160.5-161	0.2	8.0	8.5	36	<0.1	3.5	4.8	592	1.42	2	0.2	0.9	424	<0.1	0.3	<0.1	44	5.42	0.052	6.4	59	0.41	713	0.081	6.01	2.25	1.28	1.2	7.0	14	0.4	3.8	0.5	<0.1	1	3	5.6	<0.1	19.0	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0612	VL-11-274: 5-7	0.7	3.9	9.6	46	<0.1	4.8	6.3	493	1.86	4	0.3	0.9	431	<0.1	0.5	<0.1	49	3.49	0.053	15.0	53	0.43	728	0.118	7.96	4.23	1.12	1.4	8.3	32	0.4	4.3	0.7	<0.1	1	3	3.7	<0.1	20.1	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0613	VL-11-274: 17-19	0.1	2.1	10.9	55	<0.1	3.3	6.1	410	1.97	5	0.2	1.1	667	<0.1	0.5	<0.1	49	2.40	0.058	16.4	48	0.57	936	0.042	7.93	4.60	0.82	<0.1	5.6	35	0.4	4.1	0.2	<0.1	<1	3	6.5	<0.1	13.8	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0614	VL-11-274: 33-35	0.2	2.3	13.8	73	<0.1	28.5	17.1	1260	3.94	4	1.3	5.1	206	<0.1	0.4	0.2	104	2.34	0.073	18.6	70	1.45	584	0.128	7.49	0.878	1.45	0.2	49.6	39	0.8	17.5	0.8	<0.1	<1	15	25.0	<0.1	28.3	1.5	<0.05	<0.005	<1	<0.5	<0.5
SD0615	VL-11-294: 7-9	0.3	4.4	13.6	20	<0.1	1.6	1.2	483	0.67	1	<0.1	0.5	215	<0.1	0.3	<0.1	6	1.52	0.010	6.7	54	0.15	1310	0.037	6.26	3.36	1.29	0.4	7.9	14	0.4	3.0	1.1	<0.1	<1	<1	1.5	<0.1	35.9	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0616	VL-11-294: 49-50	1.1	60.1	9.7	115	<0.1	30.7	38.8	1570	7.61	14	0.5	1.5	204	0.2	1.0	<0.1	273	6.59	0.099	9.8	100	3.06	26	1.06	6.94	2.66	0.03	0.3	56.0	26	1.3	34.6	4.4	0.3	<1	37	9.3	0.1	0.6	1.4	0.09	<0.005	<1	0.6	<0.5
SD0617	VL-11-294: 67-68	0.9	56.6	9.5	100	<0.1	32.7	38.8	1430	7.13	5	0.4	1.3	231	0.3	1.0	<0.1	245	6.60	0.075	8.1	104	3.12	65	0.579	6.70	2.63	0.17	3.5	61.6	21	0.6	27.4	1.3	0.1	2	36	6.9	0.1	5.2	1.2	0.09	<0.005	<1	0.9	<0.5
SD0618	VL-11-294: 117-119	<0.1	4.5	8.2	25	<0.1	1.1	1.6	469	0.87	<1	0.1	0.4	356	<0.1	0.4	<0.1	9	2.20	0.013	5.0	41	0.20	1820	0.053	6.52	3.80	1.13	2.3	8.4	10	0.3	3.2	0.8	<0.1	2	1	1.2	0.1	28.6	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0619	VL-11-294: 153-154	0.2	17.7	9.9	33	<0.1	1.6	2.8	389	1.18	<1	0.3	0.9	485	<0.1	0.3	<0.1	23	2.14	0.027	5.1	40	0.29	1380	0.096	7.24	4.08	1.49	1.7	7.1	12	0.4	2.9	0.7	<0.1	1	2	2.0	<0.1	35.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0620	VL-11-294: 204-205	0.3	6.1	11.1	45	<0.1	4.0	6.2	474	1.78	2	0.2	0.8	497	<0.1	0.2	<0.1	44	3.24	0.052	17.4	43	0.51	345	0.045	8.00	4.94	0.61	0.2	5.5	32	0.4	3.8	0.4	<0.1	<1	3	4.9	0.2	12.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0621	VL-11-294: 259-260	0.4	12.8	4.4	23	0.2	3.9	7.1	507	1.58	2	0.3	1.1	380	<0.1	0.3	0.2	31	2.97	0.054	15.1	47	0.37	297	0.088	7.91	5.98	0.53	1.9	6.6	32	0.3	3.7	0.6	<0.1	<1	2	3.2	0.8	10.0	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0622	VL-11-294: 315-316	0.3	20.6	9.1	73	<0.1	27.2	15.9	684	4.11	5	1.6	6.0	327	<0.1	0.5	0.3	89	1.89	0.066	19.5	81	1.20	608	0.088	7.12	1.58	1.32	1.7	58.1	40	0.9	15.1	1.6	<0.1	1	14	16.4	0.5	26.2	1.7	<0.05	<0.005	<1	0.6	<0.5
SD0623	VL-11-294: 322-324	0.4	29.1	13.2	70	<0.1	27.0	13.7	1040	3.75	5	1.5	5.3	268	<0.1	0.4	<0.1	95	2.00	0.072	17.8	77	1.31	622	0.143	6.94	1.74	1.31	0.5	58.9	38	0.9	16.4	0.9	<0.1	<1	13	16.0	<0.1	32.4	1.6	0.06	<0.005	<1	<0.5	<0.5
SD0624	VL-11-304: 4-6	0.3	4.7	15.9	24	<0.1	2.1	1.3	510	0.75	1	0.2	0.5	277	<0.1	0.7	<0.1	8	1.48	0.012	6.7	49	0.20	1640	0.039	6.36	3.17	1.56	0.3	8.4	14	0.3	2.4	0.9	<0.1	<1	1	1.1	<0.1	44.0	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0625	VL-11-304: 41-42	0.4	10.7	60.6	267	<0.1	1.7	4.5	681	1.52	4	0.3	1.1	273	1.0	0.8	<0.1	28	1.63	0.032	11.2	53	0.37	1480	0.111	6.95	3.51	1.49	2.2	22.4	23	0.4	4.8	1.6	<0.1	<1	2	4.4	0.2	39.8	0.7	<0.05	<0.005	<1	<0.5	<0.5
SD0626	VL-11-304: 76-77	0.3	4.1	13.0	43	<0.1	1.1	1.0	456	0.66	2	<0.1	0.7	275	<0.1	0.3	<0.1	6	1.26	0.009	9.2	40	0.12	1430	0.049	6.33	3.95	1.09	0.9	7.1	18	0.3	2.9	1.4	<0.1	<1	<1	2.4	<0.1	31.6	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD0627	VL-11-304: 102-104	0.3	5.1	13.8	26	<0.1	1.4	1.9	460	0.90	1	0.1	1.2	267	<0.1	0.7	<0.1	13	1.56	0.023	23.1	46	0.18	2180	0.073	7.26	4.01	1.28	0.7	5.5	49	0.4	4.3	0.9	<0.1	<1	1	2.0	<0.1	37.1	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0628	VL-11-304: 147-149	0.3	4.7	21.2	34	<0.1	1.4	1.2	403	0.85	<1	0.2	0.6	331	<0.1	0.6	<0.1	10	1.48	0.013	7.0	49	0.13	1530	0.065	6.36	3.90	1.34	0.3	8.9	13	0.3	2.9	0.9	<0.1	2	<1	2.1	<0.1	39.3	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0629	VL-11-304: 182-184	0.2	15.1	14.8	47	<0.1	1.7	3.1	473	1.42	2	0.2	0.5	459	<0.1	0.3	<0.1	25	2.50	0.040	7.8	54	0.39	1190	0.101	6.99	4.86	0.80	<0.1	3.4	16	0.4	3.0	0.7	<0.1	1	2	5.0	<0.1	18.4	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD0630	VL-11-304: 213-214	<0.1	10.1	7.9	23	<0.1	1.3	2.9	349	1.17	1	0.4	0.8	407	<0.1	0.4	0.1	19	1.77	0.028	7.7	36	0.19	1050	0.083	7.37	4.71	1.05	6.7	6.9	14	0.5	2.5	0.8	<0.1	2	1	4.7	0.3	24.1	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0631	VL-11-304: 240-241	0.4	86.2	6.6	58	<0.1	11.2	17.6	957	4.12	9	0.5	1.8	286	<0.1	1.0	0.2	143	4.67	0.083	17.8	64	1.41	135	0.561	8.23	5.82	0.09	0.2	24.8	35	1.1	14.6	2.6	0.1	2	13	8.3	<0.1	1.7	0.7	0.05	<0.005	<1	0.5	<0.5
SD0632	VL-11-304: 259-261	0.2	43.7	17.0	81	<0.1	26.3	16.9	1220	4.18	6	1.3	5.3	275	0.1	0.3	0.1	111	2.95	0.096	14.3	88	1.52	612	0.141	7.25	1.24	1.20	0.2	37.3	32	1.0	14.1	0.7	<0.1	1	13	25.6	<0.1	17.7	0.9	0.08	<0.005	<1	<0.5	<0.5
SD0633	VL-11-349: 28-29	0.9	62.1	8.3	107	<0.1	28.2	42.4	1210	8.10	7	0.6	1.6	240	<0.1	1.1	0.1	318	6.77	0.098	11.5	67	2.96	312	0.965	7.05	0.633	1.36	26.0	71.1	27	1.2	29.5	2.9	0.2	<1	37	10.1	0.5	43.4	2.1	<0.05	<0.005	<1	1.0	<0.5
SD0634	VL-11-349: 48-49	0.7	42.6	9.1	105	<0.1	21.2	36.3	1570	8.64	12	0.6	2.0	272	0.3	1.8	<0.1	320	5.79	0.123	10.9	46	2.65	633	1.44	6.85	2.50	0.71	4.3	79.6	27	1.9	32.1	5.0	0.4	1	32	8.1	0.1	28.7	1.7	0.09	<0.005	<1	0.7	<0.5
SD0635	VL-11-349: 72-73	0.3	13.7	10.4	36	<0.1	1.6	3.1	426	1.18	<1	0.3	0.5	387	<0.1	0.4	<0.1	22	2.14	0.024	4.1	38	0.28	848	0.096	6.71	4.11	1.30	3.7	7.9	10	0.2	3.7	1.4	<0.1	<1	2	2.6	<0.1	32.3	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0636	VL-11-349: 133-134	0.3	2.5	12.0	48	<0.1	3.8	6.4	418	1.89	1	0.3	0.9	607	<0.1	0.3	<0.1	45	2.93	0.055	13.0	41	0.63	747	0.097	7.83	4.62	0.62	0.9	7.3	27	0.5	3.4	0.5	<0.1	1	2	7.3	0.3	10.5	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0637	VL-11-349: 174-175	0.3	2.3	12.5	45	<0.1	4.1	6.0	398	1.72	<1	0.3	0.9	436	<0.1	0.3	<0.1	44	2.73	0.057	13.2	55	0.46	352	0.072	7.68	5.40	0.66	0.4	6.8	27	0.4	3.5	0.5	<0.1	<1	3	5.5	0.3	14.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0638	VL-11-350: 28-30	1.1	27.6	3.7	36	<0.1	5.2	9.1	706	2.64	2	0.3	1.0	208	<0.1	0.6	0.1	60	4.15	0.025	3.9	58	0.63	247	0.140	5.84	1.74	0.75	1.4	36.3	9	0.6	13.5	0.6	<0.1	<1	15	8.0	0.2	17.1	1.2	<0.05	<0.005	<1	<0.5	<0.5
SD0639	VL-11-350: 69-71	2.1	108	2.7	68	<0.1	18.4	27.7	1180	5.83	4	0.2	0.7	127	<0.1	0.5	<0.1	208	6.47	0.037	6.6	41	2.43	475	0.108	7.73	1.10	1.36	0.5	11.9	13	0.4	13.1	0.3	<0.1	<1	29	14.5	0.6	42.5	0.4	0.06	0.007	<1	0.7	<0.5
SD0640	VL-11-350: 92-93	0.2	67.5	8.8	57	<0.1	8.2	11.5	635	2.70	3	0.5	1.7	398	<0.1	0.3	<0.1	85	4.38	0.075	13.9	50	0.95	346	0.080	7.70	4.20	0.92	0.3	10.4	27	0.4	4.9	0.4	<0.1	1	7	6.3	<0.1	15.6	0.6	<0.05	<0.005	<1	<0.5	<0.5
SD0641	VL-11-350: 100-102	2.7	85.0	6.6	70	<0.1	28.7	31.3	994	7.14	3	0.2	0.4	664	<0.1	0.2	<0.1	309	8.00	0.026	6.9	27	1.82	296	0.073	9.06	1.66	0.70	156	4.0	14	0.4	5.2	<0.1	<0.1	<1	16	25.6	1.1	9.1	0.2	<0.05	<0.005	<1	0.7	<0.5
SD0642	VL-11-350: 116-118	<0.1	3.9	13.9	88	<0.1	27.2	17.7	877	3.82	7	1.7	5.9	263	<0.1	0.7	0.1	102	1.29	0.074	21.5	56	1.52	814	0.140	6.86	0.787	1.52	0.9	49.5	42	0.9	18.4	0.9	<0.1	1	13	23.6	<0.1	41.7	1.4	<0.05	<0.005	<1	<0.5	<0.5
SD0643	VL-11-353: 6-8	0.1	3.5	11.0	21	<0.1	1.4	1.5	448	0.87	2	0.1	0.5	359	<0.1	0.6	<0.1	9	1.49	0.016	9.4	51	0.14	1540	0.066	6.50	3.88	1.40	1.8	7.1	19	0.3	3.5	1.0	<0.1	1	1	1.4	<0.1	37.2	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0644	VL-11-353: 29-31	0.3	70.1	10.1	80	<0.1	30.2	40.1	1500	7.47	13	0.4	1.2	404	<0.1	1.0	<0.1	251	5.81	0.082	11.7	46	2.93	231	0.572	7.29	2.42	0.23	8.7	64.3	24	0.5	23.3	4.8	0.3	1	32	19.7	<0.1	6.7	1.5	0.06	<0.005	<1	0.7	<0.5
SD0645	VL-11-353: 65-66	0.1	10.1	8.4	34	<0.1	2.7	3.8	380	1.32	<1	0.2	0.7	405	<0.1	0.3	<0.1	31	2.27	0.038	7.2	45	0.35	1010	0.094	7.23	4.55	1.00	1.6	6.9	15	0.4	2.9	0.7	<0.1	1	2	3.8	<0.1	24.1	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0646	VL-11-353: 108-109	0.1	5.5	8.7	36	<0.1	3.4	5.3	393	1.52	1	0.2	1.1	504	<0.1	0.4	<0.1	34	2.32	0.052	19.2	53	0.47	389	0.087	7.41	5.01	0.70	1.4	4.1	33	0.4	3.2	0.5	<0.1	<1	2	2.9	0.1	12.1	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0647	VL-11-353: 139-140	0.1	2.6	11.6	53	<0.1	4.4	5.9	373	1.80	1	0.3	1.0	467	<0.1	0.3	<0.1	42	2.47	0.056	16.1	42	0.53	481	0.104	7.74	5.00	0.83	0.9	9.0	33	0.4	3.9	0.7	<0.1	1	3	6.1	0.1	16.8	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0648	VL-11-353: 154-156	<0.1	1.0	12.3	86	<0.1	30.8	18.6	773	4.29	5	1.8	6.0	157	<0.1	0.5	<0.1	101	0.54	0.084	14.9	70	1.56	673	0.161	6.37	0.874	1.62	0.4	72.3	30	0.9	13.1	1.0	<0.1	1	12	23.5	<0.1	40.6	2.0	0.08	<0.005	<1	<0.5	<0.5
SD0649	VL-11-353: 166-167	0.2	265	10.8	94	0.2	24.1	15.8	784	3.85	3	2.0	6.3	129	<0.1	0.4	0.1	96	0.77	0.077	20.1	69	1.43	455	0.119	5.98	0.825	1.43	1.5	65.7	39	0.9	16.6	1.1	<0.1	1	11	27.1	<0.1	34.1	1.9	<0.05	<0.005	<1	<0.5	<0.5
SD0650	VL-11-344: 5-7	0.3	3.7	11.1	20	<0.1	1.2	0.8	364	0.60	<1	1.2	1.1	245	<0.1	0.4	<0.1	4	1.14	0.007	11.1	48	0.11	1430	0.043	5.97	3.54	1.38	0.8	21.6	21	0.3	2.7	1.5	<0.1	<1	<1	1.2	<0.1	45.6	0.8	<0.05	<0.005	<1	<0.5	<0.5
SD0651	VL-11-344: 46-47	0.6	3.0	4.8	10	<0.1	2.1	0.8	232	0.42	<1	0.2	0.5	262	<0.1	0.3	0.1	6	0.89	0.006	8.1	69	0.06	581	0.027	4.74	3.65	0.49	2.0	9.5	16	0.2	1.8	0.7	<0.1	<1	<1	0.7	<0.1	14.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0652	VL-11-344: 73-75	0.3	3.3	18.6	31	<0.1	1.6	1.3	430	0.77	<1	0.1	0.6	336	<0.1	0.5	<0.1	10	1.48	0.012	7.9	58	0.13	2040	0.049	6.34	3.81	1.45	0.3	9.7	15	0.3	3.1	0.7	<0.1	<1	1	1.9	<0.1	41.0	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0653	VL-11-344: 114-115	0.2	51.1	11.8	50	<0.1	1.9	3.5	536	1.29	<1	0.8	0.7	403	<0.1	0.3	<0.1	23	1.70	0.035	7.3	61	0.32	1030	0.120	7.16	4.59	1.30	0.3	7.1	15	0.3	3.3	1.1	<0.1	2	2	3.6	<0.1	31.9	0.6	<0.05	<0.005	<1	<0.5	<0.5
SD0654	VL-11-344: 147-149	0.2	3.5	14.4	30	<0.1	1.2	1.5	353	0.71	<1	0.5	0.7	242	<0.1	0.3	<0.1	6	1.85	0.009	7.8	41	0.11	966	0.058	5.66	3.39	1.25	0.3	13.8	16	0.3	4.2	1.4	<0.1	<1	<1	1.7	<0.1	32.9	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0655	VL-11-344: 189-190	0.5	60.5	7.4	91	<0.1	30.5	40.0	1540	7.66	13	0.6	1.7	215	<0.1	2.1	<0.1	294	6.34	0.095	11.2	86	3.05	19	1.17	7.16	3.07	0.02	0.5	68.8	28	1.5	37.4	4.4	0.3	1	38	7.5	0.1	0.5	2.4	0.08	<0.005	<1	0.9	<0.5
SD0656	VL-11-344: 189-190	0.2	3.0	8.3	19	<0.1	1.5	1.2	403	0.70	<1	0.1	0.5	225	<0.1	0.3	<0.1	6	1.10	0.010	7.8	44	0.15	1770	0.055	5.90	3.11	1.50	0.6	8.3	15	0.3	2.7	1.2	<0.1	<1	<1	1.3	<0.1	48.0	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0657	VL-11-345: 43-45	0.2	3.0	21.8	44	<0.1	1.6	2.0	474	0.88	2	0.1	0.6	283	<0.1	0.5	<0.1	14	1.63	0.011	7.3	56	0.19	871	0.080	6.29	3.80	1.34	0.8	10.5	15	0.3	3.0	1.4	<0.1	<1	1	1.5	<0.1	36.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0658	VL-11-345: 74-75	1.0	7.3	13.1	35	<0.1	1.4	1.4	411	0.81	2	0.2	0.8	269	<0.1	0.4	<0.1	10	1.22	0.011	9.1	55	0.12	1400	0.071	6.26	4.12	1.26	2.5	10.5	18	0.5	3.0	1.6	<0.1	<1	<1	2.7	0.3	34.6	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0659	VL-11-345: 110-111	0.1	10.5	12.0	32	<0.1	1.6	3.5	389	1.21	<1	0.3	0.7	262	<0.1	0.6	<0.1	23	1.78	0.030	7.1	43	0.27	954	0.105	7.21	4.51	1.19	0.8	9.1	14	0.4	2.8	0.9	<0.1	<1	2	2.3	<0.1	34.2	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0660	VL-11-345: 130-131	0.3	15.0	14.1	44	<0.1	3.8	5.6	437	1.50	<1	0.7	0.9	556	<0.1	0.3	<0.1	38	2.39	0.042	10.5	54	0.48	1450	0.103	7.79	4.66	1.13	0.3	6.6	24	0.4	3.5	0.8	<0.1	<1	2	2.6	0.2	27.7	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0661	VL-11-345: 171-173	0.5	57.2	9.7	82	<0.1	35.1	43.1	1460	7.63	42	0.5	1.6	325	0.2	4.8	<0.1	315	6.78	0.094	10.0	146	3.21	25	1.22	7.56	2.77	0.07	0.4	44.3	26	1.7	35.6	4.6	0.3	<1	41	3.1	0.1	0.9	1.4	0.09	<0.005	<1	0.8	<0.5
SD0662	VL-11-345: 203-204	0.2	5.3	10.9	30	<0.1	3.3	7.7	931	1.72	<1	0.4	1.2	645	<0.1	0.4	<0.1	55	7.40	0.060	23.0	30	0.56	799	0.138	7.68	3.63	1.15	2.3	8.5	39	0.4	10.4	0.7	<0.1	<1	4	3.7	0.2	24.0	0.5	<0.05	<0.005	<1	0.8	<0.5
SD0663	VL-12-398: 8-9	0.2	3.3	20.9	20	<0.1	1.4	1.0	379	0.58	<1	0.4	1.2	361	<0.1	0.6	<0.1	6	0.98	0.006	9.7	51	0.10	2310	0.049	5.99	3.50	1.51	0.7	29.9	17	0.2	3.0	1.0	0.1	1	<1	0.7	<0.1	45.7	1.0	<0.05	<0.005	<1	<0.5	<0.5

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	Al	Na	K	W	Zr	Ce	Sn	Y	Nb	Ta	Be	Sc	Li	S	Rb	Hf	In	Re	Se	Te	Tl
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SD0664	VL-12-398: 44-46	0.3	5.5	21.9	29	<0.1	3.4	1.9	515	0.77	<1	0.2	0.5	250	<0.1	1.2	<0.1	8	1.17	0.012	7.9	48	0.23	1790	0.050	5.87	2.09	2.05	1.5	9.6	14	0.3	2.4	1.2	<0.1	<1	1	3.6	<0.1	54.8	0.3	0.07	<0.005	<1	<0.5	<0.5
SD0665	VL-12-398: 94-96	0.4	7.0	16.5	25	<0.1	11.2	4.0	652	1.06	1	0.1	0.5	319	<0.1	2.1	<0.1	16	1.90	0.012	7.3	62	0.46	1650	0.044	6.22	3.30	1.40	0.2	9.0	15	0.3	2.4	0.7	<0.1	<1	2	1.1	<0.1	36.9	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0666	VL-12-398: 146-148	0.2	2.9	13.4	19	<0.1	1.4	1.4	500	0.76	<1	0.4	0.6	305	<0.1	0.6	<0.1	5	1.14	0.010	8.3	54	0.13	1480	0.055	6.32	3.93	1.24	1.3	6.6	16	0.3	2.5	1.3	<0.1	1	<1	1.5	<0.1	36.7	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0667	VL-12-398: 190-192	0.2	2.1	17.8	23	<0.1	1.2	1.1	341	0.84	<1	0.2	0.7	241	<0.1	1.6	<0.1	9	1.19	0.012	7.3	41	0.21	1720	0.064	6.76	2.82	1.91	0.6	14.3	15	0.4	2.8	1.0	<0.1	<1	<1	2.9	<0.1	50.9	0.5	<0.05	<0.005	<1	<0.5	<0.5
SD0668	VL-12-398: 240-241	0.1	10.4	10.9	44	<0.1	2.1	3.7	480	1.39	<1	0.3	1.3	434	<0.1	0.4	<0.1	27	1.88	0.034	12.8	63	0.40	830	0.136	8.07	4.94	0.74	0.3	7.1	23	0.3	3.7	1.0	<0.1	1	2	3.2	<0.1	17.0	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0669	VL-12-398: 276-277	0.3	53.7	11.3	43	<0.1	2.5	3.5	545	1.45	2	0.3	0.9	423	<0.1	0.5	0.4	23	2.04	0.025	7.2	61	0.34	453	0.094	6.93	3.72	0.98	1.2	5.4	16	0.3	3.7	0.9	<0.1	1	1	3.8	0.3	21.6	0.3	<0.05	<0.005	<1	1.7	<0.5
SD0670	VL-12-398: 316-318	0.6	53.9	6.5	85	<0.1	32.9	44.5	1700	8.00	19	0.5	1.7	361	0.2	2.2	<0.1	302	8.52	0.095	10.5	125	3.21	41	1.29	7.52	2.35	0.07	0.3	43.1	25	1.7	36.9	4.9	0.3	<1	38	6.2	<0.1	1.0	1.1	<0.05	<0.005	<1	1.0	<0.5
SD0671	VL-12-398: 348-349	0.2	1.5	10.3	69	<0.1	31.3	23.8	1110	5.11	5	2.6	7.3	265	<0.1	0.4	0.2	113	2.20	0.093	25.9	93	1.51	701	0.110	7.51	0.809	1.67	1.8	49.0	52	1.3	22.0	1.2	<0.1	1	19	18.9	0.8	29.3	1.6	0.05	<0.005	<1	<0.5	<0.5
SD0672	VL-12-398: 358-360	0.1	32.3	13.9	69	<0.1	27.9	15.2	1200	3.69	4	1.6	5.1	215	<0.1	0.2	0.2	101	2.62	0.065	14.1	76	1.32	588	0.159	6.87	1.82	1.34	0.3	64.0	30	0.8	13.3	1.3	<0.1	1	13	19.1	<0.1	20.2	1.8	0.07	<0.005	<1	<0.5	<0.5
SD0673	VL-12-403: 3-4	0.6	6.2	10.9	22	<0.1	1.5	1.5	559	0.83	2	0.2	0.5	244	<0.1	0.6	<0.1	7	1.16	0.014	7.2	52	0.12	1110	0.046	6.47	3.66	1.35	11.8	12.0	13	0.3	2.8	1.1	<0.1	<1	<1	1.8	0.1	41.3	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0674	VL-12-403: 41-42	0.5	4.0	17.1	15	<0.1	1.2	0.7	332	0.53	1	0.7	1.6	280	<0.1	0.7	<0.1	4	0.89	0.006	10.4	50	0.07	1680	0.029	6.30	3.81	1.20	1.1	38.2	19	0.2	2.5	0.8	<0.1	<1	<1	0.8	<0.1	44.5	1.2	<0.05	<0.005	<1	<0.5	<0.5
SD0675	VL-12-403: 84-85	0.3	52.5	16.7	23	<0.1	1.4	1.1	594	0.70	<1	0.4	0.6	270	<0.1	0.7	<0.1	4	1.26	0.010	8.2	59	0.14	2460	0.040	6.26	3.39	1.45	0.4	9.0	16	0.4	2.3	1.0	<0.1	1	<1	1.3	<0.1	42.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0676	VL-12-403: 126-128	0.4	34.5	12.1	68	<0.1	11.9	19.0	998	3.74	1	0.2	0.9	320	<0.1	0.5	<0.1	153	3.65	0.021	5.6	48	1.62	1180	0.106	6.84	3.10	1.11	0.7	27.1	13	0.4	5.6	0.8	<0.1	1	19	7.0	<0.1	20.6	0.9	<0.05	<0.005	<1	<0.5	<0.5
SD0677	VL-12-403: 162-163	0.3	3.5	8.7	33	<0.1	1.4	1.7	517	0.82	1	0.1	0.8	278	<0.1	0.3	<0.1	8	1.43	0.010	8.2	52	0.19	1190	0.065	6.39	4.06	1.10	1.1	7.9	17	0.3	3.0	1.4	<0.1	1	1	3.6	<0.1	27.9	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0678	VL-12-403: 206-207	0.1	56.0	14.7	50	<0.1	4.1	5.5	445	1.53	<1	0.4	0.6	468	<0.1	0.3	<0.1	38	2.40	0.045	9.7	46	0.47	1170	0.090	8.28	4.40	1.21	0.4	5.8	22	0.7	3.5	0.7	<0.1	1	3	3.4	0.2	29.9	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0679	VL-12-403: 227-228	0.5	5.7	47.1	7	0.6	2.6	3.0	323	0.64	1	0.1	0.3	200	<0.1	0.2	2.6	11	1.51	0.020	6.5	95	0.10	352	0.055	3.34	2.28	0.33	3.9	3.0	13	0.3	2.1	0.5	<0.1	<1	<1	0.8	0.3	8.4	0.2	<0.05	<0.005	<1	27.5	<0.5
SD0680	VL-12-403: 261-263	0.6	64.1	7.5	83	<0.1	33.3	39.9	1520	7.54	19	0.5	1.6	213	0.1	0.9	<0.1	312	6.80	0.088	10.5	110	3.00	120	1.07	7.06	2.64	0.06	1.6	51.1	26	1.4	33.8	4.1	0.3	1	37	7.1	<0.1	2.2	1.1	0.10	<0.005	<1	0.8	<0.5
SD0681	VL-12-403: 303-305	0.2	11.9	12.1	74	<0.1	19.4	22.7	1360	4.93	9	0.5	2.1	438	0.2	1.1	<0.1	161	5.40	0.111	10.7	55	1.90	456	0.104	7.73	0.748	0.80	0.2	16.0	22	0.5	8.3	0.4	<0.1	<1	13	20.8	<0.1	8.5	0.5	0.06	<0.005	<1	0.7	<0.5
SD0682	VL-12-421: 5-7	0.3	4.4	13.8	21	<0.1	1.7	1.4	429	0.73	<1	0.1	0.9	203	<0.1	0.6	<0.1	7	1.37	0.012	9.8	52	0.16	1320	0.050	6.34	3.36	1.26	0.6	9.0	19	0.3	3.1	1.1	<0.1	<1	1	2.5	<0.1	40.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0683	VL-12-421: 69-70	0.3	9.2	14.2	30	<0.1	6.4	3.9	534	1.08	1	0.1	0.3	259	<0.1	0.5	<0.1	19	1.92	0.014	4.5	62	0.38	1520	0.062	6.80	3.52	1.27	0.7	9.5	9	0.4	3.1	1.3	<0.1	<1	3	2.2	<0.1	35.2	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0684	VL-12-421: 92-93	0.1	67.6	17.5	71	<0.1	104	36.7	1620	5.78	<1	0.2	0.6	449	<0.1	0.8	<0.1	243	6.04	0.028	3.2	185	3.92	1220	0.105	7.34	2.49	0.38	0.1	16.7	8	0.3	7.2	0.3	<0.1	<1	29	18.0	<0.1	9.6	0.5	0.08	<0.005	<1	0.8	<0.5
SD0685	VL-12-421: 163-165	0.2	11.3	15.2	30	<0.1	3.8	2.9	549	1.08	<1	0.2	0.6	326	<0.1	0.3	<0.1	24	1.77	0.012	4.7	50	0.31	1190	0.069	6.63	3.63	1.39	<0.1	9.6	9	0.3	3.2	0.9	<0.1	1	2	1.7	<0.1	32.3	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0686	VL-12-421: 254-256	<0.1	54.3	5.4	80	<0.1	26.1	31.4	1270	6.24	9	0.1	0.3	528	<0.1	0.7	<0.1	214	6.36	0.132	7.9	48	2.70	210	0.106	9.17	3.01	0.35	0.3	2.5	16	0.3	6.2	0.1	<0.1	<1	16	20.1	<0.1	4.7	<0.1	<0.05	<0.005	<1	0.9	<0.5
SD0687	VL-12-421: 268-270	<0.1	33.8	14.8	71	<0.1	25.4	16.3	1160	3.63	4	1.6	5.7	263	<0.1	0.4	0.2	100	2.00	0.067	16.0	65	1.40	596	0.146	6.95	1.86	1.29	0.4	54.8	33	0.9	15.5	1.3	<0.1	1	13	16.8	<0.1	28.0	1.6	0.06	<0.005	<1	<0.5	<0.5
SD0688	VL-13-524: 3-5	0.2	3.0	11.8	25	<0.1	1.4	1.3	585	0.84	<1	<0.1	0.2	301	<0.1	0.2	<0.1	4	1.74	0.012	4.2	44	0.14	1140	0.063	6.40	3.42	1.16	0.5	3.4	9	0.3	2.9	1.1	<0.1	<1	2	1.8	<0.1	30.6	0.1	<0.05	<0.005	<1	<0.5	<0.5
SD0689	VL-13-524: 26-27	0.4	9.4	6.4	9	<0.1	1.3	0.9	491	0.51	<1	<0.1	0.1	292	<0.1	0.3	<0.1	<4	1.63	0.018	4.0	33	0.09	1070	0.038	7.70	5.14	0.88	2.2	4.5	8	0.3	3.0	0.7	<0.1	1	1	1.3	<0.1	22.0	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD0690	VL-13-524: 97-99	0.2	6.4	16.4	28	<0.1	1.3	1.6	403	0.77	<1	0.3	1.2	281	<0.1	0.5	<0.1	11	0.91	0.007	8.8	52	0.14	1580	0.062	6.17	3.54	1.39	0.8	21.4	17	0.2	2.4	1.4	<0.1	<1	1	1.7	<0.1	47.9	0.8	<0.05	<0.005	<1	<0.5	<0.5
SD0691	VL-13-524: 179-181	0.3	6.5	15.7	34	<0.1	1.6	3.3	570	1.27	2	0.2	0.5	295	<0.1	0.7	<0.1	30	1.68	0.022	6.4	58	0.22	2280	0.083	6.38	3.36	1.41	1.0	11.0	13	0.3	3.5	1.1	<0.1	1	3	1.9	<0.1	43.8	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0692	VL-13-524: 209-210	0.3	4.3	8.1	32	<0.1	1.3	0.8	472	0.62	1	0.2	0.7	231	0.1	0.4	<0.1	8	1.04	0.009	9.2	53	0.12	1280	0.044	5.74	3.59	1.03	44.0	7.7	17	0.2	2.6	1.4	<0.1	<1	<1	2.4	0.1	30.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0693	VL-13-524: 242-243	0.3	9.8	5.6	14	<0.1	1.4	1.5	454	0.78	2	0.2	0.8	252	<0.1	0.3	0.1	8	1.09	0.014	9.3	66	0.12	1300	0.059	6.24	4.04	0.98	2.3	7.8	18	0.4	2.5	1.2	<0.1	<1	1	2.1	0.3	27.7	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0694	VL-13-524: 294-295	0.2	13.2	6.7	26	<0.1	1.6	1.4	446	0.83	1	0.3	0.7	274	<0.1	0.2	<0.1	10	1.29	0.012	7.9	65	0.15	1480	0.063	5.92	3.53	1.19	2.0	8.9	16	0.4	2.9	1.3	<0.1	<1	<1	4.0	0.1	32.1	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0695	VL-13-524: 354-355	0.3	8.8	9.0	39	<0.1	3.9	4.8	368	1.47	1	0.3	1.1	382	<0.1	0.2	<0.1	32	1.94	0.046	12.8	54	0.45	278	0.049	7.55	5.12	0.46	0.3	5.2	25	0.3	2.8	0.4	<0.1	<1	2	4.3	0.1	9.3	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0696	VL-13-524: 422-423	<0.1	16.2	4.3	83	<0.1	13.4	22.8	1020	5.47	11	<0.1	0.2	646	0.1	1.0	<0.1	185	5.31	0.176	9.0	41	2.01	359	0.421	9.27	4.09	0.40	0.2	1.8	24	0.5	6.0	0.6	<0.1	<1	9	13.5	<0.1	3.7	<0.1	<0.05	<0.005	<1	<0.5	<0.5
SD0697	VL-13-535: 3-5	0.2	12.8	13.7	30	<0.1	1.2	2.0	596	0.93	2	<0.1	0.2	317	<0.1	0.7	<0.1	7	1.49	0.016	4.2	52	0.17	1470	0.046	6.57	3.51	1.19	0.2	2.9	9	0.3	4.2	0.9	<0.1	<1	2	2.7	<0.1	36.2	0.2	0.05	<0.005	<1	<0.5	<0.5
SD0698	VL-13-535: 51-53	0.2	4.9	11.9	40	<0.1	1.3	1.4	655	0.99	2	<0.1	0.2	261	<0.1	0.8	<0.1	4	1.59	0.011	3.8	55	0.18	1480	0.057	6.20	3.35	1.38	1.9	4.6	8	0.3	2.9	0.9	<0.1	<1	1	1.2	<0.1	37.0	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD0699	VL-13-535: 69-70	0.6	36.0	15.5	69	<0.1	27.5	17.5	886	2.97	2	0.3	0.9	267	<0.1	1.5	<0.1	138	4.02	0.019	3.5	91	1.56	1950	0.125	6.18	0.947	2.67	4.5	36.4	8	0.4	3.4	1.6	<0.1	<1	18	4.2	<0.1	31.5	1.1	<0.05	<0.005	<1	<0.5	<0.5
SD0700	VL-13-535: 127-129	0.4	4.6	15.6	31	<0.1	1.7	1.0	525	0.69	3	0.3	0.5	300	<0.1	1.1	<0.1	6	1.00	0.011	8.3	44	0.14	1540	0.053	6.02	3.57	1.19	0.3	9.5	15	0.4	2.8	1.7	0.1	<1	1	1.3	<0.1	42.4	0.3	0.07	<0.005	<1	<0.5	<0.5
SD0701	VL-13-535: 205-206	28.4	3.2	9.3	27	<0.1	1.4	2.0	679	1.15	2	0.2	0.5	266	<0.1	0.9	<0.1	11	1.68	0.013	9.4	53	0.27	1160	0.039	6.23	4.10	0.80	0.4	6.4	17	0.3	3.0	0.9	<0.1	1	2	2.1	<0.1	26.6	0.2	<0.05	0.099	<1	<0.5	<0.5
SD0702	VL-13-535: 250-251	0.4	3.2	10.4	20	<0.1	1.6	0.9	439	0.68	<1	0.3	0.6	275	<0.1	0.4	<0.1	8	0.95	0.009	9.6	50	0.13	1820	0.055	6.87	3.45	1.54	3.3	9.4	18	0.3	2.8	1.4	<0.1	<1	<1	2.4	<0.1	44.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0703	VL-13-535: 312-314	0.1	3.3	16.2	42	<0.1	1.3	1.4	477	0.84	1	0.1	0.5	330	<0.1	0.9	<0.1	8	1.52	0.014	6.0	46	0.16	1640	0.052	6.41	3.43	1.45	0.1	9.3	12	0.3	2.8	1.0	<0.1	1	1	2.4	<0.1	35.4	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0704	VL-13-535: 373-374	0.1	10.1	7.0	25	<0.1	3.1	3.9	427	1.24	2	0.2	0.7	391	<0.1	0.3	0.1	30	2.21	0.040	8.8	50	0.37	636	0.101	7.23	4.32	0.89	1.4	5.8	18	0.4	2.8	0.9	<0.1	<1	2	3.4	0.2	17.0	0.3	<0.05	<0.005	<1	0.6	<0.5
SD0705	VL-13-535: 403-405	0.2	8.6	11.1	38	<0.1	2.0	2.8	336	1.14	1	0.3	0.6	290	<0.1	0.2	<0.1	23	2.04	0.025	5.7	49	0.28	545	0.095	7.10	4.51	0.79	<0.1	5.3	13	0.3	3.0	0.7	<0.1	<1	1	5.4	<0.1	20.7	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0706	VL-13-538: 3-5	0.3	5.0	12.1	19	<0.1	1.3	1.0	331	0.67	1	<0.1	0.7	217	<0.1	0.8	<0.1	4	1.21	0.010	6.7	49	0.08	1110	0.029	5.99	3.01	1.01	3.3	9.6	13	0.4	2.6	0.7	<0.1	<1	1	3.4	<0.1	30.0	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0707	VL-13-538: 20-21	0.3	3.9	5.6	9	<0.1	1.6	1.0	240	0.60	1	0.2	0.7	254	<0.1	0.3	<0.1	5	0.76	0.014	13.3	56	0.08	732	0.023	6.12	4.03	0.60	1.0	7.5	25	0.2	2.2	0.6	<0.1	<1	1	1.7	0.2	16.5	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0708	VL-13-538: 43-45	0.3	7.2	12.2	24	<0.1	1.1	1.2	370	0.85	1	0.1	0.4	168	<0.1	0.9	<0.1	6	1.68	0.016	7.1	42	0.18	515	0.058	6.43	2.91	1.06	1.5	8.1	14	0.4	2.9	1.1	<0.1	<1	2	3.1	<0.1	27.4	0.3	<0.05	<0.005	<1	<0.5	<0.5
SD0709	VL-13-538: 64-65	3.1	32.9	6.4	62	<0.1	4.5	14.3	1030	4.43	2	0.2	0.8	249	<0.1	0.4	0.2	160	3.38	0.080	6.9	59	1.01	986	0.166	6.43	3.08	0.90	13.8	20.5	16	0.4	7.4	0.6	<0.1	1	17	6.3	0.3	14.4	0.6	0.07	0.021	<1	0.9	<0.5
SD0710	VL-13-538: 88-89	0.3	14.4	7.6	28	<0.1	1.7	3.6	565	1.24	<1	0.8	1.2	194	0.1	0.4	0.1	25	1.76	0.018	6.7	52	0.29	790	0.056	5.86	3.33	1.15	2.3	29.0	14	0.4	3.7	1.6	<0.1	1	4	2.7	0.3	29.2	1.1	<0.05	<0.005	<1	<0.5	<0.5
SD0711	VL-13-538: 105-106	0.5	29.5	11.8	70	<0.1	19.1	23.3	1120	4.75	2	0.3	0.9	253	<0.1	1.4	<0.1	157	4.38	0.066	8.0	104	1.77	1040	0.338	6.55	2.26	1.29	0.4	21.0	19	0.9	11.8	1.9	0.1	<1	22	7.6	<0.1	35.3	0.5	<0.05	<0.005	<1	<0.5	<0.5
QAQC																																																
Duplicates																																																
SD0597 Dup	VL-10-143: 4.5-5.5	0.3	4.1	14.2	32	<0.1	1.5	1.4	472	0.86	2	0.2	0.5	363	<0.1	0.6	<0.1	10	1.68	0.017	5.6	52	0.18	1490	0.055	7.25	3.72	1.45	0.3	8.1	12	0.3	3.1	0.8	<0.1	<1	1	3.2	<0.1	38.6	0.4	<0.05	<0.005	<1	<0.5	<0.5
SD0633 Dup	VL-11-349: 28-29	1.1	60.1	8.9	115	<0.1	28.2	39.8	1190	8.01	6	0.6	1.7	249	<0.1	1.2	0.1	323	6.73	0.094	11.7	70	2.92	318	0.912	6.97	0.609	1.32	26.6	69.8	27	1.3	31.5	2.8	0.2	<1	36	9.7	0.5	46.2	1.7	0.07	<0.005	<1	1.3	<0.5
SD0669 Dup	VL-12-398: 276-277	0.2	58.0	11.5	45	0.2	2.1	4.3	545	1.51	1	0.4	0.7	428	<0.1	0.6	0.4	25	2.03	0.027	7.4	65	0.34	447	0.088	7.23	3.80	1.04	1.3	5.7	16	0.4	3.7	0.9	<0.1	2	2	3.6	0.3	20.7	0.4	<0.05	<0.005	<1	1.5	<0.5
SD0701 Dup	VL-13-535: 205-206	32.8	3.4	9.4	28	<0.1	1.5	1.8	646	1.16	2	0.2	0.5	265	<0.1	1.0	<0.1	11	1.72	0.013	8.4	50	0.26	1180	0.039	6.24	4.10	0.84	0.5	6.3	15	0.3	2.9	1.0	<0.1	<1	2	2.1	<0.1	26.7	0.2	<0.05	0.099	<1	<0.5	<0.5
Blanks																																																
Method Blank										<0.01									<0.01	<0.001			<0.01		<0.001	<0.01	0.003	<0.01											<0.1							
Method Blank		<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.2	<1		<1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<4			<0.1	<1		<1					<0.1	0.5	<1	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1		<0.1	<0.1	<0.05	<0.005	<1	<0.5	<0.5
Reference Material																																																
SPIKE OREAS 45E (%) (8812480)										24.59									0.07	0.034			0.16		0.55	7.15	0.055	0.34											<0.1							
True Values SPIKE OREAS 45E										**24.12**									**0.065**	**0.034**			**0.156**		**0.559**	**6.78**	**0.059**	**0.324**											**0.046**							
Percent Difference (8812480)										1.9									7.7	0.0			2.6		-1.6	5.5	-6.8	4.9											-100.0							
Reference Material																																																
SPIKE OREAS45E (ppm) (8812523)		2.2	763.5	19	46	0.3	456.6	59.5	569		17	2.5	12.7	18	<0.1	1	0.4	319			10.9	978		258					1	92.9	25	1.2	8.2	6.2	0.5		90	7		20.4	3	0.15		1	<0.5	<0.5
True Values SPIKE OREAS45E		**2.4**	**780**	**18.2**	**46.7**	**0.311**	**454**	**57**	**550**		**16.3**	**2.41**	**12.9**	**15.9**	**0.06**	**1**	**0.28**	**322**			**11**	**979**		**252**					**1.07**	**110**	**23.5**	**1.32**	**8.28**	**6.8**	**0.56**		**93**	**6.58**		**21.2**	**3.11**	**0.099**		**2.97**	**0.1**	**0.15**
Percent Difference (8812523)		-8.3	-2.1	4.4	-1.5	-3.5	0.6	4.4	3.5		4.3	3.7	-1.6	13.2	-100.0	0.0	42.9	-0.9			-0.9	-0.1		2.4					-6.5	-15.5	6.4	-9.1	-1.0	-8.8	-10.7		-3.2	6.4		-3.8	-3.5	51.5		-66.3	-100.0	-100.0
Reference Material																																																
OREAS25A-4% (8812480)										6.81									0.29	0.051			0.33		0.91	9.39	0.13	0.5											<0.1							
True Values OREAS25A-4%										**6.6**									**0.309**	**0.048**			**0.327**		**0.977**	**8.71**	**0.134**	**0.482**											**0.1**							
Percent Difference (8812480)										3.2									-6.1	6.2			0.9		-6.9	7.8	-3.0	3.7											-100.0							
Reference Material																																																
OREAS25A-4A PPM (8812523)		2.1	34.7	26	44	<0.1	46.6	7.8	536		10	2.8	16.2	51		0.6	0.4	157			22.7	118		152					1.7	154.6	53	3.9	11.1	19.7	1.4	2	13	39.5		60.7	4.2	0.1		3		<0.5
True Values OREAS25A-4A PPM		**2.55**	**33.9**	**25.2**	**44.4**	**0.1**	**45.8**	**8.2**	**470**		**12**	**2.94**	**15.8**	**48.5**		**0.67**	**0.35**	**157**			**21.8**	**115**		**147**					**2.1**		**48.9**	**4.06**	**12.3**	**22.4**	**1.6**	**1.02**	**13.7**	**36.7**		**61**	**4.53**					**0.35**
Percent Difference (8812523)		-17.6	2.4	3.2	-0.9	-100.0	1.7	-4.9	14.0		-16.7	-4.8	2.5	5.2		-10.4	14.3	0.0			4.1	2.6		3.4					-19.0		8.4	-3.9	-9.8	-12.1	-12.5	96.1	-5.1	7.6		-0.5	-7.3					-100.0
Detection Limits		0.1	0.1	0.1	1	0.1	0.1	0.2	1	0.01	1	0.1	0.1	1	0.1	0.1	0.1	4	0.01	0.001	0.1	1	0.01	1	0.001	0.01	0.001	0.01	0.1	0.1	1	0.1	0.1	0.1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.005	1	0.5	0.5
Maxxam SOP #		1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX

Table 4: Sample List Test Results for project LEPRECHUAN **Client: STANTEC CONSULTING LTD**

Maxxam Sample ID	Client Sample ID	Sample Form	Dry Weight Received (kg)
SD0597	VL-10-143: 4.5-5.5	Dry Core Rock	2.08
SD0598	VL-10-143: 24-25	Dry Core Rock	2.28
SD0599	VL-10-143: 42.5-43.4	Dry Core Rock	1.92
SD0600	VL-10-143: 69-70	Dry Core Rock	2.47
SD0601	VL-10-143: 95-97	Dry Core Rock	4.87
SD0602	VL-10-143: 114-115	Dry Core Rock	2.34
SD0603	VL-10-143: 135-137	Dry Core Rock	4.42
SD0604	VL-10-146: 6-7	Dry Core Rock	2.36
SD0605	VL-10-146: 21-22	Dry Core Rock	2.23
SD0606	VL-10-146: 54-55	Dry Core Rock	2.42
SD0607	VL-10-146: 74-76	Dry Core Rock	4.60
SD0608	VL-10-146: 98-100	Dry Core Rock	5.50
SD0609	VL-10-157: 1-2	Dry Core Rock	2.33
SD0610	VL-10-157: 120-121	Dry Core Rock	2.36
SD0611	VL-10-157: 160.5-161	Dry Core Rock	0.85
SD0612	VL-11-274: 5-7	Dry Core Rock	4.45
SD0613	VL-11-274: 17-19	Dry Core Rock	4.49
SD0614	VL-11-274: 33-35	Dry Core Rock	4.53
SD0615	VL-11-294: 7-9	Dry Core Rock	4.42
SD0616	VL-11-294: 49-50	Dry Core Rock	2.46
SD0617	VL-11-294: 67-68	Dry Core Rock	2.35
SD0618	VL-11-294: 117-119	Dry Core Rock	3.70
SD0619	VL-11-294: 153-154	Dry Core Rock	2.32
SD0620	VL-11-294: 204-205	Dry Core Rock	2.18
SD0621	VL-11-294: 259-260	Dry Core Rock	1.83
SD0622	VL-11-294: 315-316	Dry Core Rock	2.31
SD0623	VL-11-294: 322-324	Dry Core Rock	4.82
SD0624	VL-11-304: 4-6	Dry Core Rock	3.97
SD0625	VL-11-304: 41-42	Dry Core Rock	2.11
SD0626	VL-11-304: 76-77	Dry Core Rock	2.21
SD0627	VL-11-304: 102-104	Dry Core Rock	4.00
SD0628	VL-11-304: 147-149	Dry Core Rock	4.91
SD0629	VL-11-304: 182-184	Dry Core Rock	4.45
SD0630	VL-11-304: 213-214	Dry Core Rock	2.34
SD0631	VL-11-304: 240-241	Dry Core Rock	2.20
SD0632	VL-11-304: 259-261	Dry Core Rock	4.42
SD0633	VL-11-349: 28-29	Dry Core Rock	2.29
SD0634	VL-11-349: 48-49	Dry Core Rock	2.69
SD0635	VL-11-349: 72-73	Dry Core Rock	2.46
SD0636	VL-11-349: 133-134	Dry Core Rock	2.24
SD0637	VL-11-349: 174-175	Dry Core Rock	2.30
SD0638	VL-11-350: 28-30	Dry Core Rock	4.53
SD0639	VL-11-350: 69-71	Dry Core Rock	4.42
SD0640	VL-11-350: 92-93	Dry Core Rock	2.19
SD0641	VL-11-350: 100-102	Dry Core Rock	4.71
SD0642	VL-11-350: 116-118	Dry Core Rock	4.61
SD0643	VL-11-353: 6-8	Dry Core Rock	4.37
SD0644	VL-11-353: 29-31	Dry Core Rock	3.56
SD0645	VL-11-353: 65-66	Dry Core Rock	2.13
SD0646	VL-11-353: 108-109	Dry Core Rock	2.26
SD0647	VL-11-353: 139-140	Dry Core Rock	2.11
SD0648	VL-11-353: 154-156	Dry Core Rock	4.28
SD0649	VL-11-353: 166-167	Dry Core Rock	2.05
SD0650	VL-11-344: 5-7	Dry Core Rock	4.32
SD0651	VL-11-344: 46-47	Dry Core Rock	2.12

Maxxam Sample ID	Client Sample ID	Sample Form	Dry Weight Received (kg)
SD0652	VL-11-344: 73-75	Dry Core Rock	4.53
SD0653	VL-11-344: 114-115	Dry Core Rock	2.15
SD0654	VL-11-344: 147-149	Dry Core Rock	4.25
SD0655	VL-11-344: 189-190	Dry Core Rock	2.68
SD0656	VL-11-344: 189-190	Dry Core Rock	2.30
SD0657	VL-11-345: 43-45	Dry Core Rock	4.33
SD0658	VL-11-345: 74-75	Dry Core Rock	2.02
SD0659	VL-11-345: 110-111	Dry Core Rock	2.32
SD0660	VL-11-345: 130-131	Dry Core Rock	2.06
SD0661	VL-11-345: 171-173	Dry Core Rock	4.70
SD0662	VL-11-345: 203-204	Dry Core Rock	2.26
SD0663	VL-12-398: 8-9	Dry Core Rock	2.03
SD0664	VL-12-398: 44-46	Dry Core Rock	4.52
SD0665	VL-12-398: 94-96	Dry Core Rock	4.55
SD0666	VL-12-398: 146-148	Dry Core Rock	4.22
SD0667	VL-12-398: 190-192	Dry Core Rock	4.52
SD0668	VL-12-398: 240-241	Dry Core Rock	2.20
SD0669	VL-12-398: 276-277	Dry Core Rock	2.45
SD0670	VL-12-398: 316-318	Dry Core Rock	4.64
SD0671	VL-12-398: 348-349	Dry Core Rock	2.19
SD0672	VL-12-398: 358-360	Dry Core Rock	4.62
SD0673	VL-12-403: 3-4	Dry Core Rock	2.17
SD0674	VL-12-403: 41-42	Dry Core Rock	2.26
SD0675	VL-12-403: 84-85	Dry Core Rock	2.24
SD0676	VL-12-403: 126-128	Dry Core Rock	4.92
SD0677	VL-12-403: 162-163	Dry Core Rock	2.56
SD0678	VL-12-403: 206-207	Dry Core Rock	2.12
SD0679	VL-12-403: 227-228	Dry Core Rock	2.24
SD0680	VL-12-403: 261-263	Dry Core Rock	4.67
SD0681	VL-12-403: 303-305	Dry Core Rock	5.09
SD0682	VL-12-421: 5-7	Dry Core Rock	4.21
SD0683	VL-12-421: 69-70	Dry Core Rock	2.36
SD0684	VL-12-421: 92-93	Dry Core Rock	2.33
SD0685	VL-12-421: 163-165	Dry Core Rock	4.43
SD0686	VL-12-421: 254-256	Dry Core Rock	4.53
SD0687	VL-12-421: 268-270	Dry Core Rock	4.46
SD0688	VL-13-524: 3-5	Dry Core Rock	4.35
SD0689	VL-13-524: 26-27	Dry Core Rock	1.91
SD0690	VL-13-524: 97-99	Dry Core Rock	4.40
SD0691	VL-13-524: 179-181	Dry Core Rock	4.39
SD0692	VL-13-524: 209-210	Dry Core Rock	2.31
SD0693	VL-13-524: 242-243	Dry Core Rock	2.38
SD0694	VL-13-524: 294-295	Dry Core Rock	2.17
SD0695	VL-13-524: 354-355	Dry Core Rock	1.95
SD0696	VL-13-524: 422-423	Dry Core Rock	2.41
SD0697	VL-13-535: 3-5	Dry Core Rock	5.01
SD0698	VL-13-535: 51-53	Dry Core Rock	4.00
SD0699	VL-13-535: 69-70	Dry Core Rock	2.57
SD0700	VL-13-535: 127-129	Dry Core Rock	4.06
SD0701	VL-13-535: 205-206	Dry Core Rock	2.16
SD0702	VL-13-535: 250-251	Dry Core Rock	2.17
SD0703	VL-13-535: 312-314	Dry Core Rock	4.10
SD0704	VL-13-535: 373-374	Dry Core Rock	1.97
SD0705	VL-13-535: 403-405	Dry Core Rock	4.73
SD0706	VL-13-538: 3-5	Dry Core Rock	4.00
SD0707	VL-13-538: 20-21	Dry Core Rock	2.00
SD0708	VL-13-538: 43-45	Dry Core Rock	4.44
SD0709	VL-13-538: 64-65	Dry Core Rock	2.21
SD0710	VL-13-538: 88-89	Dry Core Rock	1.86
SD0711	VL-13-538: 105-106	Dry Core Rock	2.33

Total Weight	366.85
Total Samples Re	115

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Table 6: Sample Summary for project LEPRECHUAN

STANTEC CONSULTING LTD, LEPRECHUAN

Date Samples Rec'd by Maxxam:	115 sample were rec'd on 26-Sep-2017.
Sample Prep Conducted by Maxxam:	YES
Date of Analysis:	October 2017

Client:	STANTEC CONSULTING LTD
Client Project Name:	LEPRECHUAN
Client Project No:	121414740-180.300
ARD Project #:	N/A
Maxxam Job No:	B786840
Contact Person:	Nikolay Sidenko; Barry Wicks
E-mail Address:	**Nikolay.Sidenko@stantec.com; Barry.Wicks@stantec.com**

Data Validated by:	SAID ZEINAB
Position:	Senior Manager, Acid Rock Drainage

Sample Storage

Sample rejects (and selected test residues where applicable) have been archived
Standard archive protocol is archiving for samples for 3 months after testing is complete.
If archiving is required past 3 months a fee will be required.

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Client: STANTEC CONSULTING LTD

Table 1: ABA Test Results for project MARATHON GOLD

Maxxam Sample No	Sample ID	Paste pH	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Siderite Corr. Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	wt%	Kg CaCO3/T	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
SD1208	MA-14-015: 5-7	9.54	0.82	18.6	0.22	0.01	0.21	6.6	48.8	MODERATE	42.2	7.4
SD1209	MA-14-015: 38-39	9.63	0.74	16.8	0.35	0.01	0.34	10.6	43.8	MODERATE	33.2	4.1
SD1210	MA-14-015: 61-63	9.19	5.29	120.2	0.04	0.03	<0.02	<0.6	145	MODERATE	145	#N/A
SD1211	MA-14-015: 79-81	9.73	2.03	46.1	0.04	<0.01	0.04	1.3	81.3	MODERATE	80.0	62.5
SD1212	MA-14-015: 107-109	9.74	2.48	56.4	0.05	0.01	0.04	1.3	85.0	MODERATE	83.7	65.4
SD1213	MA-14-015: 139-141	9.44	3.65	83.0	0.35	0.01	0.34	10.6	118	MODERATE	107	11.1
SD1214	MA-15-035: 7-9	9.48	1.23	28.0	0.59	<0.01	0.59	18.4	65.0	MODERATE	46.6	3.5
SD1215	MA-15-035: 29-31	9.02	4.36	99.1	0.15	0.02	0.13	4.1	168	STRONG	163	40.9
SD1216	MA-15-035: 43-45	9.54	4.27	97.1	0.21	<0.01	0.21	6.6	124	MODERATE	117	18.8
SD1217	MA-15-035: 88-89	9.55	1.40	31.8	0.47	<0.01	0.47	14.7	71.3	MODERATE	56.6	4.9
SD1218	MA-15-035: 125-127	9.14	4.24	96.4	<0.02	0.01	<0.02	<0.6	153	STRONG	153	#N/A
SD1219	MA-15-035: 206-207	9.69	1.02	23.2	0.21	<0.01	0.21	6.6	57.5	MODERATE	50.9	8.7
SD1220	MA-15-051: 5-6	9.03	0.15	3.4	0.02	0.04	<0.02	<0.6	150	STRONG	150	#N/A
SD1221	MA-15-051: 38-40	9.56	1.51	34.3	0.11	<0.01	0.11	3.4	66.3	MODERATE	62.9	19.5
SD1222	MA-15-051: 56-58	9.83	0.80	18.2	0.12	<0.01	0.12	3.8	57.5	MODERATE	53.7	15.1
SD1223	MA-15-051: 78-80	9.36	1.50	34.1	0.10	0.01	0.09	2.8	72.5	MODERATE	69.7	25.9
SD1224	MA-15-051: 120-122	9.39	0.87	19.8	<0.02	0.01	<0.02	<0.6	61.3	MODERATE	61.3	#N/A
SD1225	MA-15-051: 156-158	9.87	0.87	19.8	<0.02	<0.01	<0.02	<0.6	51.3	MODERATE	51.3	#N/A
SD1226	MA-16-079: 9-11	9.68	0.64	14.6	0.35	<0.01	0.35	10.9	52.5	MODERATE	41.6	4.8
SD1227	MA-16-079: 51-53	9.42	1.90	43.2	0.30	0.02	0.28	8.8	80.0	MODERATE	71.2	9.1
SD1228	MA-16-079: 87-89	9.71	2.00	45.5	0.11	0.01	0.10	3.1	86.3	MODERATE	83.2	27.8
SD1229	MA-16-082: 5-6	8.83	5.28	120.0	0.11	0.01	0.10	3.1	193	STRONG	189	62.1
SD1230	MA-16-082: 20-22	9.16	5.50	125.0	<0.02	0.01	<0.02	<0.6	224	STRONG	224	#N/A
SD1231	MA-16-082: 42-44	8.82	0.54	12.3	3.04	0.01	3.03	94.7	58.8	MODERATE	-35.9	0.6
SD1232	MA-16-082: 74-76	8.96	4.86	110.5	0.09	0.01	0.08	2.5	175	MODERATE	173	70.0
SD1233	MA-16-101: 4-6	9.73	1.57	35.7	0.04	0.02	0.02	0.6	75.0	MODERATE	74.4	125.0
SD1234	MA-16-101: 52-54	9.73	1.20	27.3	0.14	<0.01	0.14	4.4	65.0	MODERATE	60.6	14.8
SD1235	MA-16-101: 82-84	9.76	0.50	11.4	0.05	0.01	0.04	1.3	46.3	MODERATE	45.0	35.6
SD1236	MA-16-101: 134-136	9.52	3.80	86.4	0.10	<0.01	0.10	3.1	119	MODERATE	116	38.3
SD1237	MA-16-101: 184-185	9.40	0.62	14.1	1.18	<0.01	1.18	36.9	28.0	SLIGHT	-8.90	0.8
SD1238	MA-16-101: 216-217	9.44	0.63	14.3	0.54	<0.01	0.54	16.9	50.0	MODERATE	33.1	3.0
SD1239	MA-16-101: 250-251	9.90	0.44	10.0	0.71	<0.01	0.71	22.2	52.5	MODERATE	30.3	2.4
SD1240	MA-16-101: 302-304	8.55	5.34	121.4	0.05	0.02	0.03	0.9	178	STRONG	177	197.2
SD1241	MA-16-116: 4.5-5.5	9.70	2.98	67.7	<0.02	0.01	<0.02	<0.6	73.3	SLIGHT	73.3	#N/A
SD1242	MA-16-116: 69-71	9.61	3.61	82.1	<0.02	<0.01	<0.02	<0.6	109	MODERATE	109	#N/A
SD1243	MA-16-116: 101-102	9.31	2.50	56.8	0.13	0.01	0.12	3.8	110	MODERATE	106	28.9
SD1244	MA-16-116: 132-134	9.69	1.60	36.4	0.08	0.01	0.07	2.2	70.0	MODERATE	67.8	31.8
SD1245	MA-16-116: 176-177	9.45	1.66	37.7	1.04	0.01	1.03	32.2	66.3	MODERATE	34.1	2.1
SD1246	MA-16-116: 256-257	9.18	1.39	31.6	0.51	0.01	0.50	15.6	58.8	MODERATE	43.2	3.8
SD1247	MA-16-116: 312-313	9.60	0.26	5.9	0.80	<0.01	0.80	25.0	14.5	SLIGHT	-10.5	0.6
SD1248	MA-16-116: 341-343	9.40	0.27	6.1	0.30	0.02	0.28	8.8	16.0	SLIGHT	7.20	1.8
SD1249	MA-16-122: 24-26	9.30	7.24	164.6	<0.02	0.01	<0.02	<0.6	223	STRONG	223	#N/A
SD1250	MA-16-122: 50-52	9.57	0.19	4.3	<0.02	0.01	<0.02	<0.6	16.3	SLIGHT	16.3	#N/A
SD1251	MA-16-122: 102-104	9.16	6.27	142.5	0.05	0.05	<0.02	<0.6	219	STRONG	219	#N/A
SD1252	MA-16-122: 152-154	9.79	1.33	30.2	<0.02	0.01	<0.02	<0.6	73.8	MODERATE	73.8	#N/A
SD1253	MA-16-122: 202-204	9.72	0.99	22.5	<0.02	<0.01	<0.02	<0.6	58.8	MODERATE	58.8	#N/A
SD1254	MA-16-122: 262-263	9.70	0.94	21.4	0.31	0.01	0.30	9.4	50.0	MODERATE	40.6	5.3
SD1255	MA-16-122: 288-289	9.73	0.83	18.9	0.32	0.01	0.31	9.7	47.5	MODERATE	37.8	4.9
SD1256	MA-16-122: 330-332	9.08	5.23	118.9	0.05	0.06	<0.02	<0.6	200	STRONG	200	#N/A
SD1257	MA-16-147: 10-11	9.36	7.06	160.5	<0.02	0.01	<0.02	<0.6	211	STRONG	211	#N/A
SD1258	MA-16-147: 78-80	9.46	2.27	51.6	0.35	0.02	0.33	10.3	114	STRONG	104	11.0
SD1259	MA-16-147: 157-159	9.92	1.70	38.6	0.06	<0.01	0.06	1.9	67.5	MODERATE	65.6	35.5
SD1260	MA-16-147: 221-223	9.43	2.86	65.0	0.26	0.02	0.24	7.5	120	STRONG	113	16.0
SD1261	MA-16-147: 249-251	9.79	0.72	16.4	0.04	0.01	0.03	0.9	52.5	MODERATE	51.6	58.3
SD1262	MA-16-147: 277-279	8.17	3.77	85.7	0.09	0.12	<0.02	<0.6	163	STRONG	163	#N/A
SD1263	MA-16-147: 357-358	9.56	0.68	15.5	0.13	<0.01	0.13	4.1	43.8	MODERATE	39.7	10.7
Detection Limits		*N/A*	*0.08*	*1.8*	*0.02*	*0.01*	*0.02*	*0.6*	*0.1*	*N/A*	*0.1*	*0.1*
Maxxam SOP #		*BBY0SOP-0*	*LECO*	*BBY WI-00033*	*LECO*	*BBY0SOP-00010*	*BBY WI-00033*	*BBY WI-00033*	*BBY0SOP-00024*	*BBY0SOP-00*	*BBY WI-00033*	*BBY WI-00033*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

Skousen, J., Renton, J., Brown, H., Evans, P., Leavitt, B., Brady, K., Cohen, L. and Ziemkiewicz, P. 1997. Neutralization Potential of Overburden Samples containing Siderite, Journal of Environmental Quality, 26 (3): 673-681.

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Carbonate carbon (CO2; HCl direct method) by Leco.

Fizz Rating - Reference method used is based on NP method.

Net Neutralization Potential = (Siderite Correction Neutralization Potential)-(Acid Generation Potential (S-S by diff))

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Siderite Corr. Neutralization Potential - Skousen et al., Neutralization Potential of Samples With Siderite, J. Environ. Qual. 26:673-681(1997).

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

Sulphide Sulphur = (Total Sulphur)-(Sulphate Sulphur)

Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco.

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: STANTEC CONSULTING LTD

Table 2: ABA QAQC Test Results for project MARATHON GOLD

Duplicate QC

Maxxam Sample No	Sample ID	Paste pH Reported	Paste pH Dup	CO2 Reported	CO2 Dup	Total S Reported	Total S Dup	HCl Extractable Sulphur Reported	HCl Extractable Sulphur Dup	Siderite Corr. Neutralization Potential Reported	Siderite Corr. Neutralization Potential Reported Dup	Fizz Rating Reported	Fizz Rating Dup
	Units	pH Units	pH Units	wt%	wt%	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	N/A
SD1217 Dup	MA-15-035: 88-89	9.55	9.61	1.40	1.35			<0.01	<0.01	71.3	67.5	MODERATE	MODERATE
SD1227 Dup	MA-16-079: 51-53	9.42	9.39					0.02	0.01	80.0	86.3	MODERATE	MODERATE
SD1230 Dup	MA-16-082: 20-22					<0.02	<0.02						
SD1237 Dup	MA-16-101: 184-185	9.40	9.35					<0.01	<0.01	28.0	28.8	SLIGHT	SLIGHT
SD1241 Dup	MA-16-116: 4.5-5.5			2.98	3.06								
SD1247 Dup	MA-16-116: 312-313	9.60	9.60					<0.01	0.05	14.5	14.8	SLIGHT	SLIGHT
SD1248 Dup	MA-16-116: 341-343			0.27	0.33								
SD1257 Dup	MA-16-147: 10-11	9.36	9.42					0.01	<0.01	211	209	STRONG	STRONG
SD1260 Dup	MA-16-147: 221-223					0.26	0.31						
SD1262 Dup	MA-16-147: 277-279			3.77	3.78								
SD1263 Dup	MA-16-147: 357-358	9.56	9.48					<0.01	<0.01	43.8	47.5	MODERATE	MODERATE

Reference Material QC

	Paste pH	CO2	Total S		Siderite Corr. Neutralization Potential Reported
Units	pH Units	wt%	wt%		Kg CaCO3/T
Reference Material					
ARD REF MAT GS311-1 (8828994) (2.45 wt%)			2.38		
ARD Spike 2.37% CO2 (8829042) (2.39 wt%)		2.34			
ARD-Paste pH 8.29 (8831806) (8.29 pH Units)	8.30				
ARD Ref Mat C&S (8828994) (0.16 wt%)			0.16		
ARD Spike 2.37% CO2 (8829042) (2.39 wt%)		2.30			
RS10 STD (8830966) (0.06 % S)				0.07	
ARD Ref Mat DBOHC (8830966) (0.27 wt%)				0.26	

Blank QC

Method Blank			<0.02		
Method Blank		<0.08			
Method Blank				<0.01	2.50

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: STANTEC CONSULTING LTD

Table 3: 4 Acid Metals Test Results for project MARATHON GOLD

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Th	Sr
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
SD1208	MA-14-015: 5-7	0.6	6.6	1.8	25	<0.1	1.6	4.4	370	2.18	<1	0.3	0.8	75
SD1209	MA-14-015: 38-39	0.7	12.3	2.6	11	<0.1	1.7	0.8	333	0.99	2	0.5	1.2	64
SD1210	MA-14-015: 61-63	0.3	42.8	2.3	53	<0.1	9.7	13.3	1590	6.51	1	0.2	0.7	146
SD1211	MA-14-015: 79-81	0.3	4.2	15.3	18	<0.1	1.3	2.6	374	1.50	<1	0.2	0.7	90
SD1212	MA-14-015: 107-109	0.4	2.5	9.9	13	<0.1	1.5	1.4	411	1.42	<1	0.2	0.7	92
SD1213	MA-14-015: 139-141	0.3	1.5	1.8	51	<0.1	5.6	9.1	1150	3.79	1	0.3	0.7	101
SD1214	MA-15-035: 7-9	0.8	3.8	21.6	11	<0.1	1.9	4.5	267	1.92	1	0.5	1.5	130
SD1215	MA-15-035: 29-31	0.3	46.0	2.8	88	<0.1	7.1	32.9	1650	8.15	3	0.3	0.8	226
SD1216	MA-15-035: 43-45	0.6	1.7	1.6	20	<0.1	3.0	5.7	434	2.60	1	0.2	0.4	151
SD1217	MA-15-035: 88-89	3.5	10.5	4.4	5	0.2	1.6	1.9	504	0.96	2	0.4	1.5	61
SD1218	MA-15-035: 125-127	0.3	31.5	1.8	42	<0.1	10.7	18.6	697	3.87	2	0.1	0.6	166
SD1219	MA-15-035: 206-207	0.5	17.5	1.9	29	<0.1	2.5	6.2	424	2.13	<1	0.4	1.1	127
SD1220	MA-15-051: 5-6	<0.1	55.1	2.1	93	<0.1	4.3	39.2	1880	9.87	2	<0.1	0.3	98
SD1221	MA-15-051: 38-40	2.3	5.3	1.7	18	<0.1	1.9	7.4	392	2.54	<1	0.4	1.0	109
SD1222	MA-15-051: 56-58	2.6	2.9	1.6	11	<0.1	1.6	7.1	271	2.31	1	0.4	0.9	96
SD1223	MA-15-051: 78-80	1.4	2.5	1.6	17	<0.1	1.9	7.9	429	2.74	<1	0.5	1.2	158
SD1224	MA-15-051: 120-122	0.8	1.9	1.7	10	<0.1	2.2	8.6	375	3.87	1	0.4	1.0	171
SD1225	MA-15-051: 156-158	0.3	1.8	1.0	5	<0.1	1.7	0.9	112	0.48	<1	0.3	1.1	94
SD1226	MA-16-079: 9-11	12.7	65.4	3.6	22	<0.1	2.1	3.0	349	1.62	5	0.3	0.9	128
SD1227	MA-16-079: 51-53	0.8	31.2	2.0	38	<0.1	11.5	16.1	980	3.86	2	0.3	0.7	177
SD1228	MA-16-079: 87-89	0.7	42.4	2.3	27	<0.1	2.2	3.3	429	1.67	1	0.2	0.8	191
SD1229	MA-16-082: 5-6	0.2	292	1.4	36	<0.1	52.4	40.1	1030	4.66	7	<0.1	<0.1	169
SD1230	MA-16-082: 20-22	<0.1	52.2	1.0	23	<0.1	37.5	31.2	849	3.91	3	<0.1	0.1	146
SD1231	MA-16-082: 42-44	0.5	1550	0.8	54	0.3	248	209	1070	8.62	155	<0.1	<0.1	134
SD1232	MA-16-082: 74-76	0.1	130	1.2	36	<0.1	58.8	48.2	1040	5.58	9	<0.1	<0.1	221
SD1233	MA-16-101: 4-6	0.7	7.7	1.4	12	<0.1	3.3	7.2	304	2.42	<1	0.6	1.6	124
SD1234	MA-16-101: 52-54	0.9	2.9	1.3	9	<0.1	2.2	5.3	297	2.51	<1	0.6	1.4	136
SD1235	MA-16-101: 82-84	1.5	11.2	1.4	19	<0.1	1.4	4.8	317	2.04	<1	0.4	1.0	122
SD1236	MA-16-101: 134-136	0.4	4.4	1.6	30	<0.1	6.1	6.3	523	2.59	<1	0.1	0.3	107
SD1237	MA-16-101: 184-185	1.6	40.3	1.6	2	<0.1	2.3	1.8	250	1.27	<1	0.4	1.2	67
SD1238	MA-16-101: 216-217	3.8	10.7	1.0	7	<0.1	2.4	2.3	340	1.05	<1	0.4	1.3	43
SD1239	MA-16-101: 250-251	43.0	2.5	2.8	7	0.1	2.8	1.2	323	1.19	1	0.2	0.9	39
SD1240	MA-16-101: 302-304	0.3	1.0	5.2	15	<0.1	4.3	3.2	891	3.78	1	0.8	1.7	393
SD1241	MA-16-116: 4.5-5.5	0.3	58.0	12.8	54	<0.1	19.5	12.0	910	3.04	2	1.4	6.6	171
SD1242	MA-16-116: 69-71	0.2	31.2	8.3	63	<0.1	22.2	14.3	881	3.40	3	1.6	8.3	150
SD1243	MA-16-116: 101-102	0.2	6.0	1.3	13	<0.1	2.0	3.1	355	1.44	1	0.4	1.1	114
SD1244	MA-16-116: 132-134	0.6	4.0	1.4	16	<0.1	2.3	4.1	407	2.12	1	0.7	1.8	120
SD1245	MA-16-116: 176-177	0.4	2.7	1.7	8	<0.1	2.3	25.6	244	2.10	<1	0.4	1.5	136
SD1246	MA-16-116: 256-257	25.5	17.6	1.0	12	0.7	9.8	2.9	497	1.31	<1	0.1	0.5	54
SD1247	MA-16-116: 312-313	1.0	8.0	1.5	3	<0.1	1.9	1.3	100	0.99	<1	0.3	0.9	49
SD1248	MA-16-116: 341-343	0.9	22.8	2.1	35	<0.1	2.1	4.7	642	4.18	<1	0.6	1.5	89
SD1249	MA-16-122: 24-26	0.3	2.2	4.8	53	<0.1	30.1	27.7	1160	4.88	1	0.3	0.6	186
SD1250	MA-16-122: 50-52	0.4	7.0	1.4	29	<0.1	2.1	2.7	404	1.94	<1	0.3	0.7	80
SD1251	MA-16-122: 102-104	0.2	8.4	1.3	48	<0.1	106	26.7	1390	5.41	2	0.4	1.3	119
SD1252	MA-16-122: 152-154	0.4	11.3	2.2	35	<0.1	3.2	4.9	934	3.34	<1	0.5	1.2	167
SD1253	MA-16-122: 202-204	0.6	4.2	1.4	21	<0.1	1.9	2.8	416	2.46	<1	0.2	0.6	131
SD1254	MA-16-122: 262-263	1.2	11.6	1.6	21	<0.1	1.9	2.9	535	1.90	<1	0.2	0.5	128
SD1255	MA-16-122: 288-289	0.5	9.3	1.7	22	<0.1	1.7	2.1	581	1.58	<1	0.4	1.0	124
SD1256	MA-16-122: 330-332	0.4	70.5	1.7	80	<0.1	26.9	26.1	1620	6.44	<1	0.3	1.1	149
SD1257	MA-16-147: 10-11	<0.1	9.4	7.2	68	<0.1	26.9	25.4	918	4.42	2	0.6	5.3	184
SD1258	MA-16-147: 78-80	2.4	7.4	1.7	28	<0.1	5.9	11.8	486	3.53	<1	0.4	0.9	144
SD1259	MA-16-147: 157-159	3.1	1.3	1.1	4	<0.1	1.6	1.8	226	1.46	<1	0.3	0.7	134
SD1260	MA-16-147: 221-223	1.6	4.0	1.3	14	<0.1	2.4	10.2	618	3.22	1	0.3	1.1	107
SD1261	MA-16-147: 249-251	0.8	5.5	1.6	40	<0.1	2.6	3.3	557	2.38	1	0.4	1.1	94
SD1262	MA-16-147: 277-279	0.2	67.3	2.0	82	<0.1	22.7	40.7	1730	8.10	2	0.2	0.6	220
SD1263	MA-16-147: 357-358	0.9	57.2	2.0	13	<0.1	1.7	5.2	295	1.01	2	0.4	1.1	78
QAQC														
Duplicates														
SD1208 Dup	MA-14-015: 5-7	0.6	6.6	1.6	25	<0.1	1.6	4.2	392	2.20	1	0.3	0.9	72
Blanks														
Method Blank										<0.01				
Method Blank		<0.1	0.1	<0.1	<1	<0.1	<0.1	<0.2	<1		<1	<0.1	<0.1	<1
Reference Material														
SPIKE OREAS 45E (%) (8829078)										25.9				
True Values SPIKE OREAS 45E										**24.12**				
Percent Difference (8829078)										7.4				
Reference Material														
SPIKE OREAS45E (ppm) (8829117)		2.3	818.8	19.9	45	0.3	489.1	64.2	601		16	2.7	14.5	18
True Values SPIKE OREAS45E		**2.4**	**780**	**18.2**	**46.7**	**0.311**	**454**	**57**	**550**		**16.3**	**2.41**	**12.9**	**15.9**
Percent Difference (8829117)		-4.2	5.0	9.3	-3.6	-3.5	7.7	12.6	9.3		-1.8	12.0	12.4	13.2
Reference Material														
OREAS25A-4% (8829078)										6.62				
True Values OREAS25A-4%										**6.6**				
Percent Difference (8829078)										0.3				
Reference Material														
OREAS25A-4A PPM (8829117)		2.2	37.7	25.6	46	<0.1	46.3	8.1	513		9	3	17.1	47
True Values OREAS25A-4A PPM		**2.55**	**33.9**	**25.2**	**44.4**	**0.1**	**45.8**	**8.2**	**470**		**12**	**2.94**	**15.8**	**48.5**
Percent Difference (8829117)		-13.7	11.2	1.6	3.6	-100.0	1.1	-1.2	9.1		-25.0	2.0	8.2	-3.1
Detection Limits		0.1	0.1	0.1	1	0.1	0.1	0.2	1	0.01	1	0.1	0.1	1
Maxxam SOP #		1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX

Maxxam Sample No	Sample ID	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	Al	Na	K
	Units	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	%	%	%
SD1208	MA-14-015: 5-7	<0.1	0.2	<0.1	21	1.13	0.023	3.2	63	0.45	66	0.080	6.03	4.05	0.22
SD1209	MA-14-015: 38-39	<0.1	0.1	0.2	<4	0.89	0.005	5.1	78	0.13	105	0.036	5.09	3.81	0.28
SD1210	MA-14-015: 61-63	<0.1	0.2	<0.1	142	4.23	0.023	2.6	59	1.81	370	0.075	6.96	1.85	0.76
SD1211	MA-14-015: 79-81	<0.1	0.4	<0.1	10	1.70	0.015	2.7	52	0.27	256	0.047	5.14	2.46	0.64
SD1212	MA-14-015: 107-109	<0.1	0.6	<0.1	10	2.72	0.015	2.3	64	0.21	273	0.052	5.18	1.84	1.11
SD1213	MA-14-015: 139-141	<0.1	0.4	<0.1	58	3.97	0.025	2.0	40	0.90	908	0.079	7.48	0.791	2.62
SD1214	MA-15-035: 7-9	<0.1	0.3	0.1	35	2.26	0.022	4.3	72	0.47	183	0.054	5.77	3.08	0.36
SD1215	MA-15-035: 29-31	<0.1	0.7	<0.1	360	5.86	0.027	3.4	47	2.74	40	0.098	7.74	1.47	0.09
SD1216	MA-15-035: 43-45	<0.1	0.6	<0.1	32	3.54	0.060	2.6	48	0.92	421	0.056	6.56	1.87	0.62
SD1217	MA-15-035: 88-89	<0.1	0.2	0.4	6	1.65	0.005	7.0	60	0.11	130	0.036	5.36	4.08	0.43
SD1218	MA-15-035: 125-127	<0.1	0.6	<0.1	128	4.09	0.013	1.7	78	1.64	55	0.049	6.62	2.29	0.14
SD1219	MA-15-035: 206-207	<0.1	0.2	<0.1	25	1.52	0.022	4.1	70	0.54	154	0.042	6.17	3.67	0.35
SD1220	MA-15-051: 5-6	<0.1	0.6	<0.1	454	3.97	0.019	1.4	26	2.76	8	0.069	7.60	2.83	<0.01
SD1221	MA-15-051: 38-40	<0.1	0.3	<0.1	29	1.91	0.025	3.0	63	0.68	74	0.052	5.88	2.80	0.35
SD1222	MA-15-051: 56-58	<0.1	0.3	<0.1	6	1.71	0.028	3.5	82	0.46	53	0.064	6.03	3.95	0.21
SD1223	MA-15-051: 78-80	<0.1	0.3	<0.1	40	2.84	0.032	3.2	57	0.83	148	0.047	6.33	2.12	0.63
SD1224	MA-15-051: 120-122	<0.1	0.3	<0.1	83	4.39	0.028	3.3	95	1.16	61	0.061	6.34	1.24	0.39
SD1225	MA-15-051: 156-158	<0.1	0.1	<0.1	8	1.65	0.016	4.0	46	0.13	71	0.039	5.95	3.98	0.40
SD1226	MA-16-079: 9-11	<0.1	0.2	0.1	6	1.23	0.012	4.0	81	0.25	178	0.066	5.83	3.51	0.17
SD1227	MA-16-079: 51-53	<0.1	0.6	0.1	104	3.39	0.031	2.6	91	1.42	99	0.052	7.14	3.28	0.13
SD1228	MA-16-079: 87-89	<0.1	1.0	0.2	21	4.29	0.042	1.8	66	0.43	69	0.056	6.72	3.14	0.14
SD1229	MA-16-082: 5-6	<0.1	1.9	<0.1	206	10.9	<0.001	0.1	172	4.67	9	0.103	9.46	0.361	<0.01
SD1230	MA-16-082: 20-22	<0.1	0.9	<0.1	137	8.87	0.008	0.6	124	4.08	73	0.112	8.90	2.09	0.10
SD1231	MA-16-082: 42-44	0.2	2.0	<0.1	146	8.64	0.003	0.4	105	4.88	11	0.102	9.49	0.521	0.02
SD1232	MA-16-082: 74-76	0.2	1.6	<0.1	246	9.91	0.002	0.4	120	4.91	15	0.131	9.58	0.701	0.02
SD1233	MA-16-101: 4-6	<0.1	0.2	<0.1	43	2.95	0.029	5.1	60	0.68	74	0.057	5.95	2.57	0.35
SD1234	MA-16-101: 52-54	<0.1	0.3	<0.1	37	2.64	0.032	4.0	72	0.58	85	0.049	6.23	2.84	0.37
SD1235	MA-16-101: 82-84	<0.1	0.5	<0.1	12	1.78	0.028	3.6	56	0.76	158	0.045	6.29	2.88	0.47
SD1236	MA-16-101: 134-136	<0.1	0.5	<0.1	53	3.83	0.075	2.3	61	1.02	460	0.058	5.17	0.899	0.75
SD1237	MA-16-101: 184-185	<0.1	<0.1	0.3	4	1.03	0.004	4.1	80	0.07	167	0.031	5.36	3.73	0.44
SD1238	MA-16-101: 216-217	<0.1	0.1	0.2	6	1.01	0.005	3.7	85	0.13	95	0.028	5.05	4.10	0.23
SD1239	MA-16-101: 250-251	<0.1	0.2	0.8	<4	0.86	0.008	2.1	68	0.11	47	0.035	5.97	7.15	0.12
SD1240	MA-16-101: 302-304	<0.1	0.5	0.2	84	7.94	0.012	6.7	28	0.36	3640	0.055	10.4	2.44	1.31
SD1241	MA-16-116: 4.5-5.5	<0.1	0.6	0.3	83	1.96	0.066	20.3	66	1.06	735	0.145	6.47	1.82	1.45
SD1242	MA-16-116: 69-71	<0.1	1.2	0.1	92	2.66	0.063	15.7	73	1.24	539	0.162	6.47	1.84	1.22
SD1243	MA-16-116: 101-102	<0.1	0.5	<0.1	24	2.81	0.023	3.6	63	0.37	451	0.064	5.95	3.43	0.37
SD1244	MA-16-116: 132-134	<0.1	0.3	<0.1	25	2.24	0.025	4.7	77	0.61	383	0.052	6.38	3.50	0.29
SD1245	MA-16-116: 176-177	<0.1	0.2	<0.1	21	2.06	0.016	3.1	82	0.28	256	0.033	5.93	2.79	0.62
SD1246	MA-16-116: 256-257	<0.1	0.1	5.2	10	1.66	0.008	1.8	142	0.22	72	0.022	2.48	1.25	0.15
SD1247	MA-16-116: 312-313	<0.1	0.2	0.9	<4	0.53	0.003	3.5	89	0.04	65	0.026	4.12	3.12	0.14
SD1248	MA-16-116: 341-343	<0.1	0.4	<0.1	12	0.71	0.006	7.1	101	0.61	363	0.047	6.21	1.58	0.91
SD1249	MA-16-122: 24-26	<0.1	0.4	<0.1	150	6.23	0.059	8.0	88	2.09	319	0.061	8.65	2.19	0.74
SD1250	MA-16-122: 50-52	<0.1	0.2	<0.1	6	0.57	0.018	2.5	88	0.37	212	0.061	5.73	3.17	0.42
SD1251	MA-16-122: 102-104	<0.1	0.4	<0.1	209	6.87	0.036	5.0	228	3.90	130	0.029	8.10	2.48	0.16
SD1252	MA-16-122: 152-154	<0.1	0.4	<0.1	29	2.62	0.061	4.8	72	0.68	167	0.179	6.71	3.40	0.22
SD1253	MA-16-122: 202-204	<0.1	0.3	<0.1	24	1.78	0.027	2.7	82	0.57	210	0.029	6.32	3.14	0.54
SD1254	MA-16-122: 262-263	<0.1	0.2	0.1	10	1.61	0.020	1.9	106	0.30	187	0.070	5.80	3.16	0.38
SD1255	MA-16-122: 288-289	<0.1	0.1	0.1	8	1.55	0.014	3.7	78	0.24	208	0.077	6.04	3.54	0.42
SD1256	MA-16-122: 330-332	<0.1	0.2	<0.1	202	5.49	0.043	7.6	121	2.65	229	0.041	7.52	2.09	0.32
SD1257	MA-16-147: 10-11	0.1	0.4	<0.1	142	5.13	0.046	13.3	78	2.46	512	0.121	7.78	2.24	1.19
SD1258	MA-16-147: 78-80	<0.1	0.3	<0.1	89	3.04	0.026	3.3	70	1.13	197	0.034	6.35	2.14	0.35
SD1259	MA-16-147: 157-159	<0.1	0.2	<0.1	11	2.44	0.017	3.1	72	0.21	51	0.022	5.58	3.25	0.20
SD1260	MA-16-147: 221-223	<0.1	0.3	<0.1	74	3.98	0.023	4.3	70	0.70	65	0.084	6.27	2.85	0.34
SD1261	MA-16-147: 249-251	<0.1	0.4	<0.1	17	1.45	0.025	3.8	94	0.50	35	0.078	6.06	3.88	0.12
SD1262	MA-16-147: 277-279	<0.1	0.8	<0.1	365	6.95	0.024	2.6	62	3.34	4	0.050	8.15	1.27	<0.01
SD1263	MA-16-147: 357-358	<0.1	0.2	0.2	4	1.09	0.006	5.4	64	0.16	176	0.039	5.29	3.99	0.27
QAQC															
Duplicates															
SD1208 Dup	MA-14-015: 5-7	<0.1	0.2	<0.1	21	1.17	0.021	3.0	62	0.45	62	0.078	6.06	4.00	0.24
Blanks															
Method Blank						<0.01	<0.001			<0.01		<0.001	<0.01	<0.001	<0.01
Method Blank		<0.1	<0.1	<0.1	<4			<0.1	<1		<1				
Reference Material															
SPIKE OREAS 45E (%) (8829078)						0.28	0.036			0.17		0.566	7.22	0.062	0.34
True Values SPIKE OREAS 45E						**0.065**	**0.034**			**0.156**		**0.559**	**6.78**	**0.059**	**0.324**
Percent Difference (8829078)						330.8	5.9			9.0		1.3	6.5	5.1	4.9
Reference Material															
SPIKE OREAS45E (ppm) (8829117)		<0.1	1.1	0.3	344			12.6	987		261				
True Values SPIKE OREAS45E		**0.06**	**1**	**0.28**	**322**			**11**	**979**		**252**				
Percent Difference (8829117)		-100.0	10.0	7.1	6.8			14.5	0.8		3.6				
Reference Material															
OREAS25A-4% (8829078)						1.09	0.048			0.34		0.94	9	0.146	0.47
True Values OREAS25A-4%						**0.309**	**0.048**			**0.327**		**0.977**	**8.71**	**0.134**	**0.482**
Percent Difference (8829078)						252.8	0.0			4.0		-3.8	3.3	9.0	-2.5
Reference Material															
OREAS25A-4A PPM (8829117)			0.7	0.4	161			23.6	118		148				
True Values OREAS25A-4A PPM			**0.67**	**0.35**	**157**			**21.8**	**115**		**147**				
Percent Difference (8829117)			4.5	14.3	2.5			8.3	2.6		0.7				
Detection Limits		0.1	0.1	0.1	4	0.01	0.001	0.1	1	0.01	1	0.001	0.01	0.001	0.01
Maxxam SOP #		1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX

Maxxam Sample No	Sample ID	W	Zr	Ce	Sn	Y	Nb	Ta	Be	Sc	Li	S	Rb	Hf	In	Re	Se	Te	Tl
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SD1208	MA-14-015: 5-7	0.7	40.2	7	0.6	6.2	0.4	<0.1	<1	14	3.2	0.2	4.7	1.4	<0.05	<0.005	<1	<0.5	<0.5
SD1209	MA-14-015: 38-39	2.2	44.7	12	0.7	4.5	0.5	<0.1	<1	11	1.7	0.3	5.5	1.7	<0.05	<0.005	<1	<0.5	<0.5
SD1210	MA-14-015: 61-63	1.5	31.5	7	0.6	4.8	0.3	<0.1	<1	27	9.4	<0.1	8.8	1.3	0.19	<0.005	<1	<0.5	<0.5
SD1211	MA-14-015: 79-81	2.1	31.2	7	0.6	4.0	0.2	<0.1	<1	11	2.8	<0.1	15.7	1.1	0.06	<0.005	<1	<0.5	<0.5
SD1212	MA-14-015: 107-109	1.4	26.8	6	0.5	6.4	0.3	<0.1	<1	12	2.9	<0.1	24.6	0.9	0.07	<0.005	<1	<0.5	<0.5
SD1213	MA-14-015: 139-141	7.0	40.5	6	0.8	8.6	0.2	<0.1	<1	22	5.5	0.3	41.1	1.4	0.09	<0.005	<1	<0.5	<0.5
SD1214	MA-15-035: 7-9	0.2	60.6	11	0.7	17.0	0.4	<0.1	<1	13	6.6	0.6	6.5	2.2	0.06	0.006	<1	<0.5	<0.5
SD1215	MA-15-035: 29-31	0.2	10.2	8	0.4	16.9	0.2	<0.1	<1	40	14.0	0.1	0.8	0.3	0.06	<0.005	<1	<0.5	<0.5
SD1216	MA-15-035: 43-45	0.3	19.8	7	0.8	7.2	0.1	<0.1	<1	21	9.8	0.2	10.4	0.7	0.08	<0.005	<1	<0.5	<0.5
SD1217	MA-15-035: 88-89	5.3	51.6	17	0.7	4.3	0.5	<0.1	<1	9	1.3	0.5	7.1	1.9	0.05	<0.005	<1	1.2	<0.5
SD1218	MA-15-035: 125-127	0.1	12.6	4	0.4	11.0	0.1	<0.1	<1	26	10.3	<0.1	1.0	0.5	0.06	<0.005	<1	<0.5	<0.5
SD1219	MA-15-035: 206-207	0.8	39.9	11	0.7	6.9	0.3	<0.1	<1	14	4.3	0.3	6.3	1.6	0.12	<0.005	<1	<0.5	<0.5
SD1220	MA-15-051: 5-6	<0.1	4.4	3	0.2	8.5	<0.1	<0.1	<1	48	21.4	<0.1	<0.1	0.2	0.06	<0.005	<1	<0.5	<0.5
SD1221	MA-15-051: 38-40	0.5	51.6	8	0.8	6.3	0.4	<0.1	<1	14	7.5	0.1	5.5	1.7	0.06	<0.005	<1	<0.5	<0.5
SD1222	MA-15-051: 56-58	0.2	36.1	9	0.6	22.8	0.3	<0.1	<1	15	3.0	0.1	4.6	1.2	0.05	0.011	<1	<0.5	<0.5
SD1223	MA-15-051: 78-80	0.4	50.3	8	0.6	22.0	0.3	<0.1	<1	16	6.1	<0.1	9.0	1.9	0.07	<0.005	<1	<0.5	<0.5
SD1224	MA-15-051: 120-122	0.1	38.4	8	1.5	28.2	0.2	<0.1	<1	21	4.4	<0.1	5.3	1.2	0.15	<0.005	<1	<0.5	<0.5
SD1225	MA-15-051: 156-158	<0.1	23.1	10	0.8	18.6	0.3	<0.1	<1	12	1.2	<0.1	9.7	0.8	0.05	<0.005	<1	<0.5	<0.5
SD1226	MA-16-079: 9-11	0.2	40.4	9	0.6	8.1	0.5	<0.1	<1	11	4.7	0.3	3.5	1.4	<0.05	<0.005	<1	<0.5	<0.5
SD1227	MA-16-079: 51-53	0.2	21.4	7	0.6	21.9	0.2	<0.1	<1	26	6.6	0.3	1.4	0.9	0.05	<0.005	<1	<0.5	<0.5
SD1228	MA-16-079: 87-89	0.2	16.7	5	2.3	53.0	0.3	<0.1	<1	33	3.7	0.1	1.8	0.7	0.25	<0.005	<1	<0.5	<0.5
SD1229	MA-16-082: 5-6	0.2	0.7	<1	0.2	2.3	<0.1	<0.1	<1	61	3.8	<0.1	0.3	<0.1	<0.05	<0.005	<1	1.4	<0.5
SD1230	MA-16-082: 20-22	0.2	2.2	1	0.1	5.0	0.1	<0.1	<1	56	2.6	<0.1	1.5	0.1	<0.05	<0.005	<1	2.4	<0.5
SD1231	MA-16-082: 42-44	<0.1	1.6	<1	0.2	3.6	<0.1	<0.1	<1	45	1.6	2.7	0.3	<0.1	0.06	0.033	6	0.8	<0.5
SD1232	MA-16-082: 74-76	0.1	1.0	<1	<0.1	3.7	0.1	<0.1	<1	53	4.2	<0.1	0.4	<0.1	<0.05	<0.005	<1	1.8	<0.5
SD1233	MA-16-101: 4-6	0.2	65.8	13	1.2	25.0	0.4	<0.1	<1	14	5.8	<0.1	4.5	2.3	0.10	<0.005	<1	<0.5	<0.5
SD1234	MA-16-101: 52-54	0.1	59.3	11	1.0	26.9	0.3	<0.1	<1	14	4.4	0.1	5.5	1.9	0.07	<0.005	<1	<0.5	<0.5
SD1235	MA-16-101: 82-84	<0.1	30.8	9	0.6	25.1	0.2	<0.1	<1	15	4.5	<0.1	8.5	1.0	<0.05	0.040	<1	<0.5	<0.5
SD1236	MA-16-101: 134-136	0.6	12.6	6	0.6	12.9	0.2	<0.1	<1	20	9.3	0.1	9.7	0.5	0.07	<0.005	<1	<0.5	<0.5
SD1237	MA-16-101: 184-185	3.5	46.3	10	0.6	4.4	0.5	<0.1	<1	9	1.4	1.0	8.8	1.8	0.11	<0.005	<1	0.6	<0.5
SD1238	MA-16-101: 216-217	2.4	49.9	9	0.9	3.5	0.4	<0.1	<1	7	1.1	0.6	4.4	1.6	<0.05	<0.005	<1	<0.5	<0.5
SD1239	MA-16-101: 250-251	5.5	58.5	6	0.4	2.9	0.5	<0.1	<1	8	0.7	0.6	1.5	2.2	0.06	0.046	<1	2.2	<0.5
SD1240	MA-16-101: 302-304	0.6	59.7	19	1.0	58.5	0.5	<0.1	2	27	15.4	<0.1	21.0	2.4	0.30	<0.005	1	<0.5	<0.5
SD1241	MA-16-116: 4.5-5.5	0.4	65.2	39	0.9	7.4	1.4	0.1	1	13	17.8	<0.1	45.4	1.8	<0.05	<0.005	<1	<0.5	<0.5
SD1242	MA-16-116: 69-71	0.4	65.6	31	0.8	7.5	1.9	0.2	1	14	10.4	<0.1	28.2	1.9	0.05	<0.005	<1	<0.5	<0.5
SD1243	MA-16-116: 101-102	1.3	45.1	10	0.5	9.2	0.5	<0.1	<1	13	6.3	0.1	7.0	1.5	<0.05	<0.005	<1	<0.5	<0.5
SD1244	MA-16-116: 132-134	0.5	57.5	13	0.5	21.3	0.6	<0.1	<1	14	5.0	<0.1	5.6	2.3	0.05	<0.005	<1	<0.5	<0.5
SD1245	MA-16-116: 176-177	0.8	50.9	9	1.1	12.5	0.3	<0.1	<1	11	4.6	1.1	12.6	1.6	<0.05	<0.005	<1	<0.5	<0.5
SD1246	MA-16-116: 256-257	1.2	14.2	5	0.5	3.2	0.2	<0.1	<1	5	1.1	0.5	3.2	0.5	<0.05	0.024	<1	11.6	<0.5
SD1247	MA-16-116: 312-313	4.6	36.5	9	0.4	3.0	0.4	<0.1	<1	6	0.6	0.8	2.9	1.3	<0.05	<0.005	<1	1.7	<0.5
SD1248	MA-16-116: 341-343	2.4	57.8	21	0.9	8.6	1.0	<0.1	<1	17	4.1	0.3	19.1	2.5	0.06	<0.005	<1	<0.5	<0.5
SD1249	MA-16-122: 24-26	0.4	11.7	17	0.3	7.3	0.2	<0.1	<1	26	19.7	<0.1	14.2	0.5	<0.05	<0.005	<1	0.7	<0.5
SD1250	MA-16-122: 50-52	0.5	44.9	6	1.3	7.7	0.3	<0.1	<1	14	4.8	<0.1	9.5	1.5	0.06	<0.005	<1	<0.5	<0.5
SD1251	MA-16-122: 102-104	<0.1	24.5	11	0.3	16.5	<0.1	<0.1	<1	36	17.6	<0.1	4.3	0.7	0.08	<0.005	<1	0.5	<0.5
SD1252	MA-16-122: 152-154	0.3	30.9	13	0.4	21.6	0.4	<0.1	<1	19	6.4	<0.1	3.7	1.1	0.11	<0.005	<1	<0.5	<0.5
SD1253	MA-16-122: 202-204	0.1	31.2	8	0.7	13.0	0.1	<0.1	<1	13	3.9	<0.1	12.1	1.0	0.12	<0.005	<1	<0.5	<0.5
SD1254	MA-16-122: 262-263	0.6	17.2	5	0.5	11.2	0.3	<0.1	<1	13	2.0	0.3	6.9	0.6	<0.05	<0.005	<1	<0.5	<0.5
SD1255	MA-16-122: 288-289	0.6	22.5	10	0.7	18.2	0.5	<0.1	<1	13	1.6	0.4	8.1	0.8	0.07	<0.005	<1	<0.5	<0.5
SD1256	MA-16-122: 330-332	0.9	19.5	16	0.6	10.9	<0.1	<0.1	<1	31	11.4	<0.1	4.7	0.6	<0.05	<0.005	<1	<0.5	<0.5
SD1257	MA-16-147: 10-11	0.3	18.2	27	0.4	6.6	0.3	<0.1	1	19	19.2	<0.1	26.1	0.6	<0.05	<0.005	<1	<0.5	<0.5
SD1258	MA-16-147: 78-80	0.4	47.4	9	0.5	9.8	0.2	<0.1	<1	19	12.7	0.4	4.8	1.7	0.06	0.014	<1	0.5	<0.5
SD1259	MA-16-147: 157-159	0.2	13.9	8	0.3	18.7	0.1	<0.1	<1	12	2.0	<0.1	3.5	0.5	0.11	0.014	<1	<0.5	<0.5
SD1260	MA-16-147: 221-223	0.3	38.1	12	0.5	20.6	0.5	<0.1	<1	16	6.3	0.3	7.0	1.4	<0.05	0.006	<1	<0.5	<0.5
SD1261	MA-16-147: 249-251	0.2	39.0	10	0.3	18.8	0.4	<0.1	<1	14	4.0	<0.1	2.3	1.3	<0.05	<0.005	<1	<0.5	<0.5
SD1262	MA-16-147: 277-279	0.1	4.5	6	0.2	12.5	<0.1	<0.1	<1	42	10.1	0.1	0.4	0.2	<0.05	<0.005	<1	<0.5	<0.5
SD1263	MA-16-147: 357-358	0.8	42.2	14	0.4	8.7	0.5	<0.1	<1	14	1.2	0.2	5.0	1.7	0.07	<0.005	<1	<0.5	<0.5
QAQC																			
Duplicates																			
SD1208 Dup	MA-14-015: 5-7	0.9	41.8	8	0.5	6.1	0.4	<0.1	<1	14	2.8	0.2	4.5	1.5	0.09	<0.005	<1	<0.5	<0.5
Blanks																			
Method Blank												<0.1							
Method Blank		<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1		<0.1	<0.1	<0.05	<0.005	<1	<0.5	<0.5
Reference Material																			
SPIKE OREAS 45E (%) (8829078)												<0.1							
True Values SPIKE OREAS 45E												**0.046**							
Percent Difference (8829078)												-100.0							
Reference Material																			
SPIKE OREAS45E (ppm) (8829117)		1	94.2	26	1.4	9	6.2	0.5		96	7		23.3	3.1	0.12		3	<0.5	<0.5
True Values SPIKE OREAS45E		**1.07**	**110**	**23.5**	**1.32**	**8.28**	**6.8**	**0.56**		**93**	**6.58**		**21.2**	**3.11**	**0.099**		**2.97**	**0.1**	**0.15**
Percent Difference (8829117)		-6.5	-14.4	10.6	6.1	8.7	-8.8	-10.7		3.2	6.4		9.9	-0.3	21.2		1.0	-100.0	-100.0
Reference Material																			
OREAS25A-4% (8829078)												<0.1							
True Values OREAS25A-4%												**0.1**							
Percent Difference (8829078)												-100.0							
Reference Material																			
OREAS25A-4A PPM (8829117)		1.7	137.4	48	3.9	10.1	18	1.4	1	12	38.2		58.4	4.1	0.11		2		<0.5
True Values OREAS25A-4A PPM		**2.1**	**155**	**48.9**	**4.06**	**12.3**	**22.4**	**1.6**	**1.02**	**13.7**	**36.7**		**61**	**4.53**	**0.09**		**2.5**		**0.35**
Percent Difference (8829117)		-19.0	11.4	-1.8	-3.9	-17.9	-19.6	-12.5	-2.0	-12.4	4.1		-4.3	-9.5	-22.2		20.0		-100.0
Detection Limits		0.1	0.1	1	0.1	0.1	0.1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.005	1	0.5	0.5
Maxxam SOP #		1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX	1EX

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Table 4: Sample List Test Results for project MARATHON GOLD Client: STANTEC CONSULTING LTD

Maxxam Sample ID	Client Sample ID	Sample Form	Dry Weight Received (kg)
SD1208	MA-14-015: 5-7	Dry Core Rock	3.69
SD1209	MA-14-015: 38-39	Dry Core Rock	2.20
SD1210	MA-14-015: 61-63	Dry Core Rock	4.45
SD1211	MA-14-015: 79-81	Dry Core Rock	4.07
SD1212	MA-14-015: 107-109	Dry Core Rock	4.43
SD1213	MA-14-015: 139-141	Dry Core Rock	4.52
SD1214	MA-15-035: 7-9	Dry Core Rock	4.19
SD1215	MA-15-035: 29-31	Dry Core Rock	4.61
SD1216	MA-15-035: 43-45	Dry Core Rock	3.61
SD1217	MA-15-035: 88-89	Dry Core Rock	2.20
SD1218	MA-15-035: 125-127	Dry Core Rock	4.61
SD1219	MA-15-035: 206-207	Dry Core Rock	2.06
SD1220	MA-15-051: 5-6	Dry Core Rock	2.14
SD1221	MA-15-051: 38-40	Dry Core Rock	4.16
SD1222	MA-15-051: 56-58	Dry Core Rock	4.51
SD1223	MA-15-051: 78-80	Dry Core Rock	4.24
SD1224	MA-15-051: 120-122	Dry Core Rock	4.73
SD1225	MA-15-051: 156-158	Dry Core Rock	2.71
SD1226	MA-16-079: 9-11	Dry Core Rock	4.18
SD1227	MA-16-079: 51-53	Dry Core Rock	4.15
SD1228	MA-16-079: 87-89	Dry Core Rock	4.45
SD1229	MA-16-082: 5-6	Dry Core Rock	2.52
SD1230	MA-16-082: 20-22	Dry Core Rock	4.65
SD1231	MA-16-082: 42-44	Dry Core Rock	5.33
SD1232	MA-16-082: 74-76	Dry Core Rock	4.68
SD1233	MA-16-101: 4-6	Dry Core Rock	4.57
SD1234	MA-16-101: 52-54	Dry Core Rock	4.35
SD1235	MA-16-101: 82-84	Dry Core Rock	4.27
SD1236	MA-16-101: 134-136	Dry Core Rock	4.50
SD1237	MA-16-101: 184-185	Dry Core Rock	2.20
SD1238	MA-16-101: 216-217	Dry Core Rock	2.27
SD1239	MA-16-101: 250-251	Dry Core Rock	2.09
SD1240	MA-16-101: 302-304	Dry Core Rock	5.10
SD1241	MA-16-116: 4.5-5.5	Dry Core Rock	2.65
SD1242	MA-16-116: 69-71	Dry Core Rock	3.62
SD1243	MA-16-116: 101-102	Dry Core Rock	2.11
SD1244	MA-16-116: 132-134	Dry Core Rock	4.14
SD1245	MA-16-116: 176-177	Dry Core Rock	2.43
SD1246	MA-16-116: 256-257	Dry Core Rock	1.82
SD1247	MA-16-116: 312-313	Dry Core Rock	1.85
SD1248	MA-16-116: 341-343	Dry Core Rock	4.73
SD1249	MA-16-122: 24-26	Dry Core Rock	4.20
SD1250	MA-16-122: 50-52	Dry Core Rock	3.88
SD1251	MA-16-122: 102-104	Dry Core Rock	4.63
SD1252	MA-16-122: 152-154	Dry Core Rock	4.60
SD1253	MA-16-122: 202-204	Dry Core Rock	4.50
SD1254	MA-16-122: 262-263	Dry Core Rock	2.19
SD1255	MA-16-122: 288-289	Dry Core Rock	2.12
SD1256	MA-16-122: 330-332	Dry Core Rock	3.77
SD1257	MA-16-147: 10-11	Dry Core Rock	2.35
SD1258	MA-16-147: 78-80	Dry Core Rock	4.58
SD1259	MA-16-147: 157-159	Dry Core Rock	4.66
SD1260	MA-16-147: 221-223	Dry Core Rock	4.41
SD1261	MA-16-147: 249-251	Dry Core Rock	4.62
SD1262	MA-16-147: 277-279	Dry Core Rock	4.98
SD1263	MA-16-147: 357-358	Dry Core Rock	1.86
		Total Weight	206.95
		Total Samples Received	56

Notes:
Acme File No: VAN17002345

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Table 5: Sample Summary for project MARATHON GOLD

STANTEC CONSULTING LTD, MARATHON GOLD

Date Samples Rec'd by Maxxam: 56 sample were rec'd on 26-Sep-2017.

Sample Prep Conducted by Maxxam: YES

Date of Analysis: November 2017

Client:	STANTEC CONSULTING LTD
Client Project Name:	MARATHON GOLD
Client Project No:	121414740-180.300
ARD Project #:	N/A
Maxxam Job No:	B786931
Contact Person:	Nikolay Sidenko; Barry Wicks
E-mail Address:	**nikolay.sidenko@stantec.com; barry.wicks@stantec.com**

Data Validated by:	SAID ZEINAB
Position:	Senior Manager, Acid Rock Drainage

Sample Storage

Sample rejects (and selected test residues where applicable) have been archived
Standard archive protocol is archiving for samples for 3 months after testing is complete.
If archiving is required past 3 months a fee will be required.

CERTIFICATE OF ANALYSIS ▪ COVER PAGE

Global ARD Testing Services Inc.

CLIENT INFORMATION	
Client:	Stantec Consulting Inc.
Project Manager:	Nikolay Sidenko
Email Address:	Nikolay.Sidenko@stantec.com
Mailing Address	500 - 311 Portage Avenue, Winnipeg, MB R3B 2B9.
Contact No:	Office: (204) 928-8862; Cell: (204) 292-1368
Fax No:	N/A

COMPANY INFORMATION	
Legal Name:	Global ARD Testing Services Inc.
Mailing Address:	6891 Antrim Avenue, Burnaby, BC, Canada V5J 4M5.
Contact No:	Main: (604) 428-2730
	Ivy Rajan (Cell): (604) 319-7707
	Prab Bhatia (Cell): (604) 603-1359
Fax No:	(604) 428-2731

PROJECT INFORMATION	
Project Name:	Marathon Gold & Leprechaun (NWT ARD)
Project Number:	N/A

RESULTS		
Reported To:		Nikolay Sidenko (Nikolay.Sidenko@stantec.com)
cc:	**1**	Barry Wicks (Barry.Wicks@stantec.com)
	2	Victoria Greeley (Victoria.Greeley@stantec.com)
Date Reported:		Dec. 14, 2017 (Thursday)

REPORTING	
Global Project No:	1746
Report Version:	1
Pages (Including Cover):	4
Report Title:	SFE 82 NWT-ARD Samples (rec'd 29-Nov17)
Analysis Reviewed By:	Ivy Rajan (IRajan@GlobalARDTesting.com)
Position:	Acid Rock Drainage (ARD) Lab & Project Manager
Report Certified By:	Ivy Rajan
Signature:	Ivy Rajan

INVOICE	
Submitted To:	APInvoices@stantec.com
cc:	Nikolay Sidenko (Nikolay.Sidenko@stantec.com)
	Senior Environmental Geochemist
Global Invoice No:	ARD1746-1217A
Date Submitted:	Dec. 12, 2017 (Tuesday)

NOTES
All samples are stored at no charge for 90 days past reporting date.
HCT, column, custom leach columns (Lysimeters) & SAD column samples will be
stored free for 90 days past kinetic testing program or Closedown.
Please contact the lab if you require additional sample storage time.
Storage charges will apply.

CERTIFICATE OF ANALYSIS ▪ SAMPLE DETAILS

Global ARD Testing Services Inc.

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Sample Receipt Info:	
Date Samples Received:	Nov. 29, 2017 (Wednesday) from Maxxam Analytics
No. of Samples Received:	82 Crushed (<6.3 mm) samples
Samples Received By:	Ivy Rajan

Analytical Instructions:	
	Nikolay Sidenko (Nikolay.Sidenko@stantec.com)
From:	by email confirmation.
Date:	Nov. 27, 2017 (Monday)

Sample List:

S. No.	Hole ID	From_m	To_m	Maxxam Sample No.	Global Notes (if any)
Batch-1 SFE - #1 to 41:					
1	MA-14-015 (5-7)	5.0	7.0	SD1208	
2	MA-14-015 (38-39)	38.0	39.0	SD1209	
3	MA-14-015 (79-81)	79.0	81.0	SD1211	
4	MA-15-035 (7-9)	7.0	9.0	SD1214	
5	MA-15-035 (43-45)	43.0	45.0	SD1216	
6	MA-15-035 (88-89)	88.0	89.0	SD1217	
7	MA-15-051 (5-6)	5.0	6.0	SD1220	
8	MA-15-051 (56-58)	56.0	58.0	SD1222	
9	MA-15-051 (120-122)	120.0	122.0	SD1224	
10	MA-16-079 (9-11)	9.0	11.0	SD1226	
11	MA-16-082 (5-6)	5.0	6.0	SD1229	
12	MA-16-082 (74-76)	74.0	76.0	SD1232	
13	MA-16-101 (4-6)	4.0	6.0	SD1233	
14	MA-16-101 (82-84)	82.0	84.0	SD1235	
15	MA-16-101 (184-185	184.0	185.0	SD1237	
16	MA-16-101 (250-251)	250.0	251.0	SD1239	
17	MA-16-101 (302-304)	302.0	304.0	SD1240	
18	MA-16-116 (69-71)	69.0	71.0	SD1242	
19	MA-16-116 (132-134)	132.0	134.0	SD1244	
20	MA-16-116 (256-257)	256.0	257.0	SD1246	
21	MA-16-116 (341-343)	341.0	343.0	SD1248	
22	MA-16-122 (24-26)	24.0	26.0	SD1249	
23	MA-16-122 (50-52)	50.0	52.0	SD1250	
24	MA-16-122 (152-154)	152.0	154.0	SD1252	
25	MA-16-122 (262-263)	262.0	263.0	SD1254	
26	MA-16-122 (288-289)	288.0	289.0	SD1255	
27	MA-16-122 (330-332)	330.0	332.0	SD1256	
28	MA-16-147 (10-11)	10.0	11.0	SD1257	
29	MA-16-147 (157-159)	157.0	159.0	SD1259	
30	MA-16-147 (249-251)	249.0	251.0	SD1261	
31	VL-10-143 (4.5-5.5)	4.5	5.5	SD0597	
32	VL-10-143 (42.5-43.4)	42.5	43.4	SD0599	
33	VL-10-143 (95-97)	95.0	97.0	SD0601	
34	VL-10-143 (135-137)	135.0	137.0	SD0603	
35	VL-10-146 (21-22)	21.0	22.0	SD0605	
36	VL-10-146 (54-55)	54.0	55.0	SD0606	
37	VL-10-157 (120-121)	120.0	121.0	SD0610	
38	VL-10-157 (160.5-161)	160.5	161.0	SD0611	
39	VL-11-274 (5-7)	5.0	7.0	SD0612	
40	VL-11-274 (33-35)	33.0	35.0	SD0614	
41	VL-11-294 (49-50)	49.0	50.0	SD0616	

S. No.	Hole ID	From_m	To_m	Maxxam Sample No.	Global Notes (if any)
Batch-2 SFE - #42 to 82:					
42	VL-11-294 (67-68)	67.0	68.0	SD0617	
43	VL-11-294 (117-119)	117.0	119.0	SD0618	
44	VL-11-294 (259-260)	259.0	260.0	SD0621	
45	VL-11-294 (315-316)	315.0	316.0	SD0622	
46	VL-11-304 (4-6)	4.0	6.0	SD0624	
47	VL-11-304 (41-42)	41.0	42.0	SD0625	
48	VL-11-304 (182-184)	182.0	184.0	SD0629	
49	VL-11-304 (240-241)	240.0	241.0	SD0631	
50	VL-11-304 (259-261)	259.0	261.0	SD0632	
51	VL-11-349 (28-29)	28.0	29.0	SD0633	
52	VL-11-349 (133-134)	133.0	134.0	SD0636	
53	VL-11-349 (174-175)	174.0	175.0	SD0637	
54	VL-11-350 (69-71)	69.0	71.0	SD0639	
55	VL-11-350 (116-118)	116.0	118.0	SD0642	
56	VL-11-353 (65-66)	65.0	66.0	SD0645	
57	VL-11-353 (108-109)	108.0	109.0	SD0646	
58	VL-11-353 (166-167)	166.0	167.0	SD0649	
59	VL-11-344 (46-47)	46.0	47.0	SD0651	
60	VL-11-344 (73-75)	73.0	75.0	SD0652	
61	VL-11-344 (189-190)	189.0	190.0	SD0656	Rec'd ID: SD0655
62	VL-11-345 (43-45)	43.0	45.0	SD0657	
63	VL-12-398 (146-148)	146.0	148.0	SD0666	
64	VL-12-398 (240-241)	240.0	241.0	SD0668	
65	VL-12-398 (316-318)	316.0	318.0	SD0670	
66	VL-12-398 (348-349)	348.0	349.0	SD0671	
67	VL-12-398 (358-360)	358.0	360.0	SD0672	
68	VL-12-403 (3-4)	3.0	4.0	SD0673	
69	VL-12-403 (162-163)	162.0	163.0	SD0677	
70	VL-12-403 (227-228)	227.0	228.0	SD0679	
71	VL-12-403 (261-263)	261.0	263.0	SD0680	
72	VL-12-403 (303-305)	303.0	305.0	SD0681	
73	VL-12-421 (69-70)	69.0	70.0	SD0683	
74	VL-12-421 (92-93)	92.0	93.0	SD0684	
75	VL-12-421 (268-270)	268.0	270.0	SD0687	
76	VL-13-524 (179-181)	179.0	181.0	SD0691	
77	VL-13-524 (422-423)	422.0	423.0	SD0696	
78	VL-13-535 (69-70)	69.0	70.0	SD0699	
79	VL-13-535 (205-206)	205.0	206.0	SD0701	
80	VL-13-535 (312-314)	312.0	314.0	SD0703	
81	VL-13-538 (88-89)	88.0	89.0	SD0710	
82	VL-13-538 (105-106)	105.0	106.0	SD0711	

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	1	1 R	2	3	4	5	6	7	8	9	10	10 D	11	11 R	12	13	14	15
				Sample ID																	
				MA-14-015 (5-7)	MA-14-015 (5-7) - Rep	MA-14-015 (38-39)	MA-14-015 (79-81)	MA-15-035 (7-9)	MA-15-035 (43-45)	MA-15-035 (88-89)	MA-15-051 (5-6)	MA-15-051 (56-58)	MA-15-051 (120-122)	MA-16-079 (9-11)	MA-16-079 (9-11) - Dup	MA-16-082 (5-6)	MA-16-082 (5-6) - Rep	MA-16-082 (74-76)	MA-16-101 (4-6)	MA-16-101 (82-84)	MA-16-101 (184-185
Weight of dry sample used	Weighing Scale	g	0.01	250	N/A	250	250	250	250	250	250	250	250	250	250	250	N/A	250	250	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	N/A	750	750	750	750	750	750	750	750	750	750	750	N/A	750	750	750	750
On filtered samples using 0.45 micron filter paper																					
pH	pH Meter	pH units	0.01	7.8		7.8	8.0	8.9	9.4	8.6	7.8	7.5	9.4	9.0	9.1	7.3		7.7	7.4	7.8	8.3
EC	EC Meter	µS/cm	0.5	78		76	91	67	74	65	72	86	61	76	76	77		71	88	85	66
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	37.5		33.1	45.0	25.5	32.8	22.5	33.1	31.7	21.4	25.6	27.0	35.0		33.5	40.0	40.0	20.0
Sulphate	Turbidimetry	mg/L	1.0	<1.0		2.8	<1.0	3.0	7.9	2.5	<1.0	2.5	<1.0	4.0	4.0	<1.0		<1.0	<1.0	<1.0	3.8
Dissolved Metals by ICP-MS:																					
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	27.1	26.4	25.1	30.7	16.6	15.9	16.6	29.5	22.8	15.9	15.9		34.6	34.5	32.5	30.9	29.9	16.6
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.189	0.195	0.142	0.252	0.355	0.548	0.320	0.222	0.180	0.207	0.506		0.230	0.236	0.219	0.251	0.250	0.253
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000112	0.000107	0.000233	0.000152	0.000204	0.000407	0.000715	0.000085	0.000235	0.000151	0.000218		0.000242	0.000235	0.000200	0.000151	0.000408	0.000212
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.000347	0.000338	0.000861	0.000138	0.000677	0.000360	0.00235	0.000113	0.000565	0.000406	0.001160		0.000183	0.000180	0.000228	0.000272	0.000568	0.001050
Barium, dissolved	ICP-MS	mg/L	0.0001	0.00041	0.00040	0.00044	0.00076	0.00038	0.00040	0.00036	0.00139	0.00020	0.00023	0.00042		0.00075	0.00075	0.00111	0.00023	0.00043	0.00040
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Boron, dissolved	ICP-MS	mg/L	0.002	0.0023	0.0023	0.0077	<0.0020	0.0037	0.0029	0.0242	0.0022	0.0022	0.0024	0.0025		0.0054	0.0028	0.0035	0.0044	0.0021	0.0088
Cadmium, dissolved	ICP-MS	mg/L	0.000002	0.0000022	0.0000020	0.0000090	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020		0.0000023	<0.000002	0.0000034	<0.0000020	<0.0000020	<0.0000020
Calcium, dissolved	ICP-MS	mg/L	0.04	10.20	9.95	9.69	11.20	5.98	5.11	6.09	10.50	8.46	5.62	5.46		11.90	11.90	10.90	11.50	11.00	6.10
Chromium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.0001	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		0.00022	0.00021	0.00021	<0.00010	0.00010	<0.00010
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000161	0.0000153	0.0000219	0.0000160	0.0000089	0.0000066	0.0000358	0.0000092	0.0000150	0.0000054	0.0000278		0.0000110	0.0000114	0.0000100	0.0000126	0.0000127	0.0000163
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00038	0.00039	0.00060	0.00033	0.00090	0.00038	0.00185	0.00065	0.00063	0.00028	0.00195		0.00023	0.00022	0.00030	0.00049	0.00037	0.00075
Iron, dissolved	ICP-MS	mg/L	0.002	0.0061	0.0062	0.0053	<0.0020	0.0027	0.0037	0.0149	<0.0020	0.0077	0.0039	0.0093		<0.0020	<0.002	<0.0020	0.0021	0.0037	0.0050
Lead, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.00005	0.000108	0.000087	<0.000050	<0.000050
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000084	0.000083	0.000125	0.000137	0.000289	0.000227	0.000295	0.000124	0.000104	<0.000050	0.000300		<0.000050	<0.00005	<0.000050	0.000136	0.000087	0.000195
Magnesium, dissolved	ICP-MS	mg/L	0.01	0.386	0.395	0.219	0.675	0.390	0.759	0.331	0.795	0.403	0.458	0.536		1.180	1.180	1.290	0.506	0.583	0.325
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.0621	0.0629	0.138	0.0674	0.00113	0.000785	0.00745	0.0431	0.0209	0.000229	0.00218		0.0131	0.0131	0.011	0.0221	0.0303	0.00495
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.00002	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.00130	0.00128	0.00925	0.000087	0.000704	0.000430	0.001680	0.000426	0.000604	0.000274	0.001410		0.000124	0.000115	0.000078	0.000160	0.000741	0.001060
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000058	0.000057	0.000082	0.000064	0.000071	0.000080	0.000090	0.000065	0.000070	0.000055	0.000062		0.000185	0.000173	0.000093	0.000088	0.000053	0.000049
Phosphorus, dissolved	ICP-MS	mg/L	0.01	0.012	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.01	<0.010	<0.010	<0.010	<0.010
Potassium, dissolved	ICP-MS	mg/L	0.01	0.537	0.544	0.573	1.370	1.270	1.410	1.56	0.19	0.61	0.92	0.64		0.282	0.291	0.343	1.150	1.730	0.966
Selenium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0003	0.0001	0.0003	<0.00010	0.0001		<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Silicon, dissolved	ICP-MS	mg/L	0.10	1.35	1.41	1.35	1.35	1.98	1.44	1.62	0.49	1.66	1.22	2.18		0.58	0.60	0.48	1.42	1.48	1.50
Silver, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, dissolved	ICP-MS	mg/L	0.02	4.99	5.09	4.61	5.54	5.75	7.72	5.40	2.13	5.45	2.57	8.18		0.82	0.84	0.97	4.92	4.08	5.15
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.00557	0.00565	0.00926	0.00868	0.00633	0.00532	0.00814	0.00892	0.00701	0.00546	0.00656		0.01280	0.01270	0.01170	0.00721	0.01050	0.01660
Sulphur, dissolved	ICP-MS	mg/L	1.0	<1.00	<1.00	1.0	<1.00	1.6	<1.00	1.84	<1.00	<1.00	<1.00	1.95		<1.00	<1.00	<1.00	<1.00	<1.00	3.1
Tellurium, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	0.00115	<0.000050	<0.000050	<0.000050	0.00007		<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	0.00043
Thallium, dissolved	ICP-MS	mg/L	0.000004	0.0000088	0.0000095	<0.0000040	<0.0000040	0.0000055	0.0001380	<0.0000040	<0.0000040	<0.0000040	0.0000150	0.0000084		0.0000042	<0.000004	0.0000265	<0.0000040	0.0000508	<0.0000040
Thorium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.0000200	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050
Titanium, dissolved	ICP-MS	mg/L	0.0002	0.00036	0.00023	0.00023	<0.00020	<0.00020	<0.00020	0.00061	<0.00020	0.00027	<0.00020	0.00079		<0.00020	<0.0002	<0.00020	<0.00020	<0.00020	<0.00020
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0000222	0.0000215	0.0002590	0.0001150	0.0000244	0.0000822	0.0001390	0.0000020	0.0000251	0.0000024	0.0000676		<0.0000010	<0.000001	<0.0000010	0.0000253	0.0000270	0.0000954
Vanadium, dissolved	ICP-MS	mg/L	0.0002	0.00024	0.00025	<0.00020	<0.00020	0.00101	0.00056	0.00033	0.00043	<0.00020	0.00085	0.00025		0.00035	0.00035	0.00038	0.00063	0.00024	<0.00020
Zinc, dissolved	ICP-MS	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000023	0.000052	0.000062	<0.000020	<0.000020	<0.000020	0.000592	<0.000020	0.000108	<0.000020	0.000122		<0.000020	0.000071	<0.000020	<0.000020	0.000041	0.000124
Tungsten, dissolved	ICP-MS	ug/L	0.20	1.28	1.24	0.24	0.45	0.56	<0.20	0.28	1.82	<0.20	<0.20	1.11		0.29	0.29	0.23	<0.20	<0.20	0.28
Ion Balance																					
Major Anions	Calc.	meq/L		0.75	0.75	0.72	0.90	0.57	0.82	0.50	0.66	0.69	0.43	0.60		0.70	0.70	0.67	0.80	0.80	0.48
Major Cations	Calc.	meq/L		0.80	0.79	0.74	0.92	0.65	0.75	0.65	0.71	0.73	0.48	0.75		0.76	0.76	0.73	0.89	0.85	0.61
Difference	Calc.	meq/L		-0.05	-0.04	-0.02	-0.02	-0.08	0.07	-0.15	-0.05	-0.04	-0.05	-0.15		-0.06	-0.06	-0.06	-0.09	-0.05	-0.13
Balance (%)	Calc.	%		-3.0%	-2.5%	-1.3%	-1.2%	-6.6%	4.4%	-12.8%	-3.7%	-3.1%	-5.4%	-11.2%		-4.2%	-4.3%	-4.0%	-5.3%	-2.9%	-12.1%
			SF Extract ID:	*7120457-01*	*7120457-01*	*7120457-02*	*7120457-03*	*7120457-04*	*7120457-05*	*7120457-06*	*7120457-07*	*7120457-08*	*7120457-09*	*7120457-10*	*N/A*	*7120457-11*	*7120457-11*	*7120457-12*	*7120457-13*	*7120457-14*	*7120457-15*

Notes:
Job No: 7120457V1
Reported Detection Limit (RDL) may be higher than the Method Reporting Limit (MRL) due to various factors such as dilutions, limited sample volume, high moisture, or interferences.

Date of Analysis (24 h) - Batch-1 (1 - 41): Nov. 30, 2017/Dec. 1, 2017; Batch-2 (42 - 82): Dec. 4/5, 2017
pH of DI water used (pH Units): 5.49, 5.56.
EC of DI water used (µS/cm): 0.17, 0.29

Abbreviations:
R / Rep = Replicate (which involves the analysis of the same Shake Flask Extract aliquot).
D / Dup = Duplicate (which involves the analysis of a separate SF extract, produced by processing a secopnd split of the original client sample received).
EC = Electrical Conductivity
ORP = Oxidation Reduction Potential
N/A = Not Applicable.
NR = Not Reported.
mg/L = Milligrams per Litre

Method Reference: Prediction Manual for Drainage Chemistry from Sulphidic Geologic Material, MEND Report 1.20.1; Version 0 - Dec. 2009. Section 11.5; P 11 (8-9).
Extraction Method used: Using gyratory shaker for 24 h (± 2 h; gentle agitation).
Liquid: Solid ratio used: 3: 1; L: S; 750 mL DI H_2O: 250 g of crushed sample (85% passing 1/4 inch - i.e. 6.3 mm)

Global ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	16	17	18	19	20	20 D	21	22	23	24	25	26	27	28	29	29 R	30	30 D
				Sample ID																	
				MA-16-101 (250-251)	MA-16-101 (302-304)	MA-16-116 (69-71)	MA-16-116 (132-134)	MA-16-116 (256-257)	MA-16-116 (256-257) - Dup	MA-16-116 (341-343)	MA-16-122 (24-26)	MA-16-122 (50-52)	MA-16-122 (152-154)	MA-16-122 (262-263)	MA-16-122 (288-289)	MA-16-122 (330-332)	MA-16-147 (10-11)	MA-16-147 (157-159)	MA-16-147 (157-159) - Dup	MA-16-147 (249-251)	MA-16-147 (249-251) - Dup
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	N/A	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	N/A	750	750
On filtered samples using 0.45 micron filter paper																					
pH	pH Meter	pH units	0.01	9.3	7.6	7.9	7.8	7.7	8.0	7.6	8.0	7.7	8.1	7.6	7.0	7.4	8.7	9.0		9.6	9.1
EC	EC Meter	µS/cm	0.5	68	213	119	87	92	92	79	94	83	89	90	66	79	68	73		71	73
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	22.5	49.4	56.3	34.8	33.8	34.5	27.5	38.1	34.4	38.1	35.9	24.4	30.6	27.5	26.3		26.3	24.5
Sulphate	Turbidimetry	mg/L	1.0	3.2	39.3	<1.0	<1.0	2.5	2.5	2.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
Dissolved Metals by ICP-MS:																					
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	14.2	76.5	51.1	28.0	33.1		22.1	27.3	28.0	28.8	29.1	19.5	26.8	18.1	14.1	13.7	13.2	
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.369	0.286	0.121	0.202	0.056		0.165	0.163	0.119	0.264	0.117	0.103	0.171	0.206	0.220	0.223	0.265	
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000156	0.000173	0.000200	0.000118	0.000796		0.000657	0.000063	<0.000050	0.000147	0.000072	0.000069	<0.000050	0.000062	0.000183	0.000183	0.000201	
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.000508	0.000134	0.001030	0.000290	0.001210		0.000308	0.000198	0.000249	0.000171	0.000218	0.000308	0.000069	0.000152	0.000350	0.000341	0.000328	
Barium, dissolved	ICP-MS	mg/L	0.0001	0.00034	0.04040	0.00211	0.00128	0.00080		0.00161	0.00034	0.00048	0.00042	0.00038	0.00039	0.00065	0.00024	0.00030	0.00031	0.00015	
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010	
Bismuth, dissolved	ICP-MS	mg/L	0.00001	0.00002	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010	
Boron, dissolved	ICP-MS	mg/L	0.002	0.0226	0.0046	0.0039	0.0032	0.0218		0.0105	0.0022	0.0047	<0.0020	<0.0020	0.0041	<0.0020	<0.0020	0.0027	0.0027	0.0022	
Cadmium, dissolved	ICP-MS	mg/L	0.000002	0.0000072	0.0000033	<0.0000020	0.0000059	0.0000051		0.0000027	<0.0000020	0.0000052	0.0000030	0.0000049	0.0000034	<0.0000020	<0.0000020	<0.0000020	<0.000002	<0.0000020	
Calcium, dissolved	ICP-MS	mg/L	0.04	5.26	28.90	16.40	10.30	12.70		8.25	8.75	9.72	10.70	11.20	7.45	9.71	5.56	5.03	4.87	4.78	
Chromium, dissolved	ICP-MS	mg/L	0.0001	0.00019	<0.00010	<0.00010	<0.00010	<0.00010		0.00019	0.00025	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.00010	
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000337	0.0000078	0.0000205	0.0000101	0.0000483		0.0000105	0.0000215	0.0000071	0.0000084	0.0000175	0.0000309	<0.0000050	0.0000060	0.0000094	0.0000089	0.0000250	
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00152	0.00034	0.00038	0.00055	0.00134		0.00089	0.00069	0.00055	0.00052	0.00047	0.00085	0.00028	0.00022	0.00035	0.00035	0.00028	
Iron, dissolved	ICP-MS	mg/L	0.002	0.0172	<0.0020	0.0049	0.0030	<0.0020		0.0091	0.0027	0.0040	0.0025	<0.0020	0.0038	<0.0020	<0.0020	0.0026	0.0026	0.0031	
Lead, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	0.000096	0.000150	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050	
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000160	0.000293	0.000534	0.000145	0.000105		0.000082	0.000207	0.000208	0.000166	0.000110	0.000058	0.000053	0.000161	0.000145	0.000147	0.000084	
Magnesium, dissolved	ICP-MS	mg/L	0.01	0.261	1.000	2.450	0.542	0.312		0.359	1.330	0.903	0.490	0.276	0.217	0.618	1.010	0.371	0.375	0.310	
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.00494	0.063	0.0595	0.0361	0.126		0.067	0.0253	0.0408	0.0653	0.076	0.092	0.0437	0.00196	0.000821	0.000826	0.00129	
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00002	<0.000020	
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.028900	0.000254	0.000126	0.000076	0.002350		0.000369	0.000801	0.005430	0.000061	0.000168	0.000144	0.000074	0.000309	0.000495	0.000494	0.000130	
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000137	0.000112	0.000055	0.000062	0.000329		0.000081	0.000080	0.000171	0.000062	0.000069	0.000072	0.000067	0.000048	0.000052	0.000055	0.000048	
Phosphorus, dissolved	ICP-MS	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010		0.013	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.01	<0.010	
Potassium, dissolved	ICP-MS	mg/L	0.01	0.94	2.84	2.63	0.49	0.63		1.700	0.877	0.756	0.352	0.418	0.34	0.42	1.30	0.34	0.35	0.20	
Selenium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.00010	
Silicon, dissolved	ICP-MS	mg/L	0.10	1.61	0.80	1.32	1.13	1.35		1.18	0.92	1.49	1.24	1.17	0.93	0.42	0.75	1.72	1.72	1.53	
Silver, dissolved	ICP-MS	mg/L	0.00001	0.000013	<0.000010	<0.000010	0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010	
Sodium, dissolved	ICP-MS	mg/L	0.02	6.73	7.82	4.44	3.81	2.09		4.61	6.25	4.20	4.16	3.56	3.13	2.84	4.41	7.10	7.09	6.71	
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.01570	0.21500	0.03460	0.01810	0.02530		0.01320	0.01370	0.01370	0.01330	0.02310	0.01620	0.03530	0.00658	0.00765	0.00760	0.01790	
Sulphur, dissolved	ICP-MS	mg/L	1.0	2.04	15.80	<1.00	<1.00	1.32		1.3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
Tellurium, dissolved	ICP-MS	mg/L	0.00005	0.00109	<0.000050	<0.000050	<0.000050	0.00057		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050	
Thallium, dissolved	ICP-MS	mg/L	0.000004	0.0000404	0.0000979	0.0000262	0.0000265	0.0000045		0.0000071	0.0000085	0.0000110	<0.0000040	0.0000047	0.0000139	<0.0000040	<0.0000040	0.0000091	0.0000093	<0.0000040	
Thorium, dissolved	ICP-MS	mg/L	0.00001	0.0000190	<0.000010	0.0000130	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010	
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050	
Titanium, dissolved	ICP-MS	mg/L	0.0002	0.00052	<0.00020	0.00034	<0.00020	<0.00020		0.00022	<0.00020	<0.00020	<0.00020	<0.00020	0.00031	<0.00020	<0.00020	<0.00020	<0.0002	<0.00020	
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0000379	0.0000607	0.0011500	0.0000128	0.0000212		0.0000387	0.0000136	0.0001710	0.0000155	0.0000251	0.0001400	<0.0000010	0.0000069	0.0000391	0.0000374	0.0000044	
Vanadium, dissolved	ICP-MS	mg/L	0.0002	0.00022	0.00024	0.00120	0.00028	<0.00020		<0.00020	0.00033	<0.00020	0.00029	<0.00020	<0.00020	0.00025	0.00049	0.00031	0.00031	0.00048	
Zinc, dissolved	ICP-MS	mg/L	0.001	0.001	<0.0010	<0.0010	0.001	<0.0010		<0.0010	<0.0010	<0.0010	0.0015	0.0020	<0.0010	<0.0010	0.002	<0.0010	<0.001	<0.0010	
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000975	<0.000020	0.000190	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00002	0.000056	
Tungsten, dissolved	ICP-MS	ug/L	0.20	0.53	0.29	<0.20	0.22	<0.20		0.86	0.63	0.56	<0.20	0.22	0.63	0.43	0.37	0.24	0.24	<0.20	
Ion Balance																					
Major Anions	Calc.	meq/L		0.52	1.81	1.13	0.70	0.73		0.61	0.76	0.69	0.76	0.72	0.49	0.61	0.55	0.53	0.53	0.53	
Major Cations	Calc.	meq/L		0.65	1.98	1.30	0.76	0.78		0.71	0.86	0.78	0.80	0.76	0.55	0.69	0.61	0.62	0.62	0.59	
Difference	Calc.	meq/L		-0.13	-0.17	-0.17	-0.07	-0.06		-0.10	-0.10	-0.09	-0.03	-0.04	-0.06	-0.08	-0.06	-0.10	-0.09	-0.07	
Balance (%)	Calc.	%		-11.4%	-4.5%	-7.1%	-4.6%	-3.8%		-7.7%	-6.0%	-6.2%	-2.2%	-3.0%	-6.1%	-6.0%	-5.1%	-8.7%	-8.0%	-6.0%	
			SF Extract ID:	*7120457-16*	*7120457-17*	*7120457-18*	*7120457-19*	*7120457-20*	*N/A*	*7120457-21*	*7120457-22*	*7120457-23*	*7120457-24*	*7120457-25*	*7120457-26*	*7120457-27*	*7120457-28*	*7120457-29*	*7120457-29*	*7120457-30*	*N/A*

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	31	32	33	34	35	36	37	38	39	40	40 D	41	Method blank - 1 (1 - 41)	42	43	44	44 R	45
				Sample ID													Sample ID					
				VL-10-143 (4.5-5.5)	VL-10-143 (42.5-43.4)	VL-10-143 (95-97)	VL-10-143 (135-137)	VL-10-146 (21-22)	VL-10-146 (54-55)	VL-10-157 (120-121)	VL-10-157 (160.5-161)	VL-11-274 (5-7)	VL-11-274 (33-35)	VL-11-274 (33-35) - Dup	VL-11-294 (49-50)		VL-11-294 (67-68)	VL-11-294 (117-119)	VL-11-294 (259-260)	VL-11-294 (259-260) - Dup	VL-11-294 (315-316)
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250	250	250	250	250	250	250	250	N/A	250	250	250	N/A	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	N/A	750
On filtered samples using 0.45 micron filter paper																					
pH	pH Meter	pH units	0.01	7.3	7.8	7.4	7.6	7.4	7.8	9.0	9.3	8.2	7.5	7.8	7.4	5.41	8.1	8.0	7.6		7.6
EC	EC Meter	µS/cm	0.5	93	92	86	64	87	90	70	68	89	75	65	85	0.91	67	96	114		106
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	39.4	41.3	39.0	28.8	39.4	42.5	28.8	21.9	35.3	29.4	26.0	33.8	1.3	29.3	41.3	41.9		27.5
Sulphate	Turbidimetry	mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.5	3.6		14.0
Dissolved Metals by ICP-MS:																					
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	32.3	32.5	35.5	21.9	31.0	33.9	24.6	18.6	25.0	19.8		30.6	<0.100	26.5	31.4	37.7	37.6	36.9
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.207	0.181	0.192	0.166	0.184	0.261	0.204	0.350	0.175	0.265		0.179	<0.0010	0.245	0.245	0.250	0.247	0.138
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000270	0.000329	0.000189	0.000135	0.000183	0.000353	0.001250	0.000215	0.000120	0.000118		0.000269	<0.000050	0.000178	0.000234	0.000255	0.000261	0.000182
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.000479	0.000522	0.000088	0.001240	0.000251	0.000406	0.001770	0.001490	0.000262	0.000619		0.000361	<0.000050	0.000395	0.000398	0.000598	0.000601	0.000179
Barium, dissolved	ICP-MS	mg/L	0.0001	0.01910	0.00403	0.00837	0.00119	0.00182	0.00140	0.00334	0.00198	0.00114	0.00058		0.00185	<0.00010	0.00064	0.12400	0.00181	0.00186	0.00240
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010
Bismuth, dissolved	ICP-MS	mg/L	0.00001	<0.000010	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010
Boron, dissolved	ICP-MS	mg/L	0.002	0.0031	0.0063	<0.0020	<0.0020	<0.0020	0.0026	0.0022	0.0060	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	0.0023	0.0032	0.0034	0.0100
Cadmium, dissolved	ICP-MS	mg/L	0.000002	0.0000030	0.0000038	0.0000047	0.0000063	<0.0000020	0.0000025	<0.0000020	<0.0000020	<0.0000020	0.0000020		0.0000023	0.0000090	<0.0000020	0.0000021	0.0000022	0.0000027	0.0000028
Calcium, dissolved	ICP-MS	mg/L	0.04	12.00	12.50	12.30	7.73	11.10	12.70	6.94	6.31	9.23	7.02		10.90	<0.040	7.32	11.60	14.30	14.30	13.80
Chromium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00017	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000931	0.0000543	0.0000621	0.0000215	0.0000355	0.0000182	0.0000138	0.0000162	0.0000128	0.0000109		0.0000108	0.0000284	0.0000119	0.0000091	0.0000253	0.0000244	0.0000119
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00196	0.00368	0.00147	0.00071	0.00156	0.00064	0.00064	0.00147	0.00056	0.00071		0.00041	0.00028	0.00058	0.00131	0.00126	0.00127	0.00031
Iron, dissolved	ICP-MS	mg/L	0.002	0.0081	0.0083	<0.0020	0.0041	0.0031	<0.0020	0.0026	0.0139	0.0096	0.0069		<0.0020	0.0024	<0.0020	0.0040	<0.0020	<0.002	0.0066
Lead, dissolved	ICP-MS	mg/L	0.00005	0.000057	0.001800	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	0.001210	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000283	0.000271	0.000061	0.000312	0.000173	0.000337	<0.000050	0.000131	0.000087	0.000194		<0.000050	<0.000050	<0.000050	0.000167	0.000194	0.000192	0.000179
Magnesium, dissolved	ICP-MS	mg/L	0.01	0.563	0.319	1.170	0.628	0.775	0.541	1.770	0.688	0.464	0.540		0.804	<0.0050	1.980	0.598	0.484	0.477	0.613
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.128	0.105	0.0341	0.162	0.0563	0.0653	0.000801	0.00167	0.0235	0.0632		0.0301	0.00147	0.00268	0.084	0.0605	0.0612	0.085
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00002	<0.000020
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.000110	0.000157	0.000097	0.000127	0.000134	0.000244	0.000761	0.000791	0.000543	0.000660		0.000165	<0.000010	0.000222	0.000198	0.001200	0.001230	0.000180
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000129	0.000283	0.000054	0.000079	0.000074	0.000083	0.000238	0.000222	0.000093	0.000106		0.000061	<0.000040	0.000055	0.000067	0.000069	0.000079	0.000057
Phosphorus, dissolved	ICP-MS	mg/L	0.01	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.01	<0.010
Potassium, dissolved	ICP-MS	mg/L	0.01	4.410	2.420	0.398	2.950	2.180	1.39	2.21	1.45	2.95	3.09		0.98	<0.010	1.210	4.410	2.360	2.320	2.590
Selenium, dissolved	ICP-MS	mg/L	0.0001	0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	0.0002	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.00010
Silicon, dissolved	ICP-MS	mg/L	0.10	1.18	1.26	0.34	1.03	1.15	1.38	0.48	1.35	0.87	1.06		0.38	<0.10	0.53	1.43	1.08	1.06	0.79
Silver, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	0.000012	0.000014	<0.000010
Sodium, dissolved	ICP-MS	mg/L	0.02	3.22	3.99	2.32	2.02	3.57	3.40	2.31	4.20	4.03	3.55		1.94	<0.020	2.16	3.90	6.02	5.90	2.57
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.05210	0.03700	0.05950	0.01410	0.02800	0.02660	0.03920	0.10800	0.01670	0.00792		0.02360	<0.00010	0.08310	0.14600	0.07460	0.07550	0.03700
Sulphur, dissolved	ICP-MS	mg/L	1.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<1.00	<1.00	<1.00	1.1	2.5	2.4	6.3
Tellurium, dissolved	ICP-MS	mg/L	0.00005	<0.000050	0.00011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050
Thallium, dissolved	ICP-MS	mg/L	0.000004	0.0000142	<0.0000040	<0.0000040	0.0000134	0.0000199	0.0000047	<0.0000040	0.0000102	0.0000181	<0.0000040		<0.0000040	<0.0000040	<0.0000040	0.0000055	0.0000227	0.0000224	0.0000126
Thorium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000130		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00001	<0.000010
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00005	<0.000050
Titanium, dissolved	ICP-MS	mg/L	0.0002	0.00045	0.00028	<0.00020	0.00029	0.00022	<0.00020	<0.00020	0.00021	0.00031	0.00025		<0.00020	<0.00020	<0.00020	0.00047	<0.00020	<0.0002	0.00023
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0003830	0.0004230	<0.0000010	0.0000195	0.0001150	0.0001210	0.0000103	0.0001940	0.0001500	0.0001170		0.0000019	<0.0000010	0.0000015	0.0001850	0.0001580	0.0001600	0.0000586
Vanadium, dissolved	ICP-MS	mg/L	0.0002	<0.00020	<0.00020	0.00022	0.00079	<0.00020	0.00035	0.00101	0.00106	0.00021	0.00070		0.00046	<0.00020	0.00052	0.00041	0.00082	0.00083	0.00038
Zinc, dissolved	ICP-MS	mg/L	0.001	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.001	<0.0010
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000119	0.000114	<0.000020	0.000098	<0.000020	<0.000020	0.000038	0.000028	<0.000020	0.000177		<0.000020	<0.000020	<0.000020	0.000107	0.000023	0.000027	<0.000020
Tungsten, dissolved	ICP-MS	ug/L	0.20	1.14	0.31	<0.20	<0.20	<0.20	<0.20	1.64	0.21	0.36	<0.20		<0.20	<0.20	0.93	1.04	1.81	1.80	0.29
Ion Balance																					
Major Anions	Calc.	meq/L		0.79	0.83	0.78	0.58	0.79	0.85	0.58	0.44	0.71	0.59		0.68		0.59	0.88	0.91	0.91	0.84
Major Cations	Calc.	meq/L		0.93	0.91	0.85	0.63	0.85	0.89	0.67	0.63	0.77	0.66		0.74		0.68	0.95	1.11	1.10	0.94
Difference	Calc.	meq/L		-0.14	-0.09	-0.06	-0.05	-0.06	-0.04	-0.10	-0.20	-0.06	-0.07		-0.07		-0.10	-0.07	-0.20	-0.19	-0.10
Balance (%)	Calc.	%		-8.2%	-5.0%	-4.0%	-4.2%	-3.9%	-2.5%	-7.9%	-18.4%	-4.4%	-5.8%		-4.7%		-7.6%	-3.8%	-9.7%	-9.4%	-5.5%
			SF Extract ID:	*7120457-31*	*7120457-32*	*7120457-33*	*7120457-34*	*7120457-35*	*7120457-36*	*7120457-37*	*7120457-38*	*7120457-39*	*7120457-40*	*N/A*	*7120457-41*	*7120457-83*	*7120457-42*	*7120457-43*	*7120457-44*	*7120457-44*	*7120457-45*

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	46	47	48	49	50	50 D	51	52	53	54	55	56	57	58	59	60	60 D	61
				Sample ID																	
				VL-11-304 (4-6)	VL-11-304 (41-42)	VL-11-304 (182-184)	VL-11-304 (240-241)	VL-11-304 (259-261)	VL-11-304 (259-261) - Dup	VL-11-349 (28-29)	VL-11-349 (133-134)	VL-11-349 (174-175)	VL-11-350 (69-71)	VL-11-350 (116-118)	VL-11-353 (65-66)	VL-11-353 (108-109)	VL-11-353 (166-167)	VL-11-344 (46-47)	VL-11-344 (73-75)	VL-11-344 (73-75) - Dup	VL-11-344 (189-190)
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
On filtered samples using 0.45 micron filter paper																					
pH	pH Meter	pH units	0.01	7.5	7.8	7.8	9.4	7.6	7.6	7.4	8.2	8.2	8.8	7.6	7.7	7.9	7.4	8.4	7.7	8.3	8.1
EC	EC Meter	µS/cm	0.5	93	103	131	30	59	52	85	97	97	58	56	105	108	69	58	110	90	92
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	42.5	39.4	17.2	23.1	26.3	24.0	35.9	39.4	38.1	23.9	25.0	46.3	47.5	30.0	23.8	47.8	38.2	39.1
Sulphate	Turbidimetry	mg/L	1.0	<1.0	4.4	32.6	<1.0	<1.0	<1.0	2.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.5	2.5	<1.0
Dissolved Metals by ICP-MS:																					
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	32.4	36.5	39.7	17.1	17.7		33.4	32.2	32.0	18.6	12.9	36.0	36.7	21.1	15.6	38.0		36.9
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.217	0.175	0.281	0.365	0.175		0.179	0.304	0.270	0.461	0.118	0.250	0.218	0.094	0.231	0.170		0.287
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000293	0.002270	0.000199	0.000581	0.000124		0.000133	0.000145	0.000220	0.000238	0.000202	0.000190	0.000169	0.000131	0.000272	0.000278		0.000674
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.000487	0.001650	0.000915	0.001600	0.001020		0.000131	0.000409	0.000684	0.000995	0.001030	0.000462	0.000392	0.000429	0.000835	0.000399		0.000884
Barium, dissolved	ICP-MS	mg/L	0.0001	0.00811	0.00582	0.01230	0.06850	0.00084		0.00148	0.00255	0.00114	0.00064	0.00077	0.00312	0.00112	0.00049	0.00183	0.13800		0.00101
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010
Bismuth, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010
Boron, dissolved	ICP-MS	mg/L	0.002	0.0032	0.0030	<0.0020	<0.0020	<0.0020		<0.0020	0.0025	0.0024	<0.0020	<0.0020	0.0042	0.0040	0.0021	0.0221	0.0030		<0.0020
Cadmium, dissolved	ICP-MS	mg/L	0.000002	<0.0000020	0.0000126	<0.0000020	<0.0000020	<0.0000020		0.0000022	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000022	<0.0000020	<0.0000020	<0.0000020	0.0000028		0.0000022
Calcium, dissolved	ICP-MS	mg/L	0.04	11.90	12.80	15.10	6.10	6.20		11.70	10.80	11.90	6.58	4.49	13.30	13.00	7.52	5.87	14.20		13.30
Chromium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000214	0.0000570	0.0001690	0.0000221	0.0000098		0.0000069	0.0000171	0.0000168	0.0000094	0.0000070	0.0000203	0.0000123	0.0000081	0.0000103	0.0000254		0.0000153
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00112	0.00065	0.00105	0.00077	0.00070		0.00041	0.00069	0.00052	0.00077	0.00029	0.00136	0.00055	0.00285	0.00211	0.00066		0.00117
Iron, dissolved	ICP-MS	mg/L	0.002	0.0036	0.0030	0.0020	<0.0020	0.0035		<0.0020	0.0022	0.0030	0.0027	0.0056	0.0083	<0.0020	0.0037	0.0067	0.0052		<0.0020
Lead, dissolved	ICP-MS	mg/L	0.00005	<0.000050	0.000062	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000104	0.000073		<0.000050
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000222	0.000391	0.000149	<0.000050	0.000284		0.000061	0.000201	0.000105	<0.000050	0.000091	0.000145	0.000125	0.000202	0.000156	0.000257		<0.000050
Magnesium, dissolved	ICP-MS	mg/L	0.01	0.654	1.130	0.485	0.448	0.523		1.010	1.240	0.520	0.516	0.404	0.666	1.020	0.564	0.223	0.597		0.924
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.112	0.142	0.00534	0.00049	0.0603		0.0248	0.0308	0.0401	0.000794	0.0425	0.0568	0.0533	0.0573	0.0112	0.144		0.0272
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.000350	0.000848	0.000277	0.000168	0.000088		0.000507	0.000101	0.000122	0.000166	0.000193	0.000655	0.000185	0.000256	0.000177	0.000062		0.000083
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000083	0.000174	0.000055	0.000070	0.000100		0.000070	0.000071	0.000126	0.000081	0.000071	0.000122	0.000066	0.000077	0.000082	0.000065		0.000079
Phosphorus, dissolved	ICP-MS	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010		<0.010
Potassium, dissolved	ICP-MS	mg/L	0.01	5.000	3.67	2.98	0.38	3.94		3.370	1.690	1.380	3.060	3.490	3.62	1.90	3.00	1.82	3.75		0.223
Selenium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	0.0001	<0.00010		0.00012	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	0.0002	<0.00010	<0.00010		<0.00010
Silicon, dissolved	ICP-MS	mg/L	0.10	1.23	1.01	1.56	0.89	1.05		0.48	1.07	1.13	0.74	1.11	1.43	1.17	0.99	2.06	1.34		0.64
Silver, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	<0.000010		<0.000010
Sodium, dissolved	ICP-MS	mg/L	0.02	3.08	3.38	6.10	3.39	2.57		1.38	3.86	4.04	1.07	3.99	4.71	5.73	3.27	4.18	3.67		1.95
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.03390	0.04210	0.12800	0.03020	0.01160		0.03980	0.15300	0.06420	0.00821	0.00727	0.04120	0.09600	0.01190	0.02460	0.14200		0.03270
Sulphur, dissolved	ICP-MS	mg/L	1.0	<1.00	2.66	12.60	<1.00	<1.00		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<1.00
Tellurium, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00023	<0.000050		<0.000050
Thallium, dissolved	ICP-MS	mg/L	0.000004	<0.0000040	0.0000200	<0.0000040	0.0000044	0.0000041		<0.0000040	<0.0000040	0.0000099	0.0000045	0.0000084	0.0000133	<0.0000040	0.0000065	<0.0000040	0.0000179		<0.0000040
Thorium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.0000140		<0.000010	<0.000010	<0.000010	<0.000010	0.0000150	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010		<0.000010
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050
Titanium, dissolved	ICP-MS	mg/L	0.0002	<0.00020	0.00028	<0.00020	<0.00020	0.00029		0.00026	<0.00020	<0.00020	<0.00020	0.00030	0.00037	<0.00020	<0.00020	0.00038	0.00032		<0.00020
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0002800	0.0004070	0.0000722	0.0000023	0.0000028		0.0000298	0.0001780	0.0000728	<0.0000010	0.0000040	0.0003130	0.0000745	0.0000217	0.0001020	0.0002150		0.0000017
Vanadium, dissolved	ICP-MS	mg/L	0.0002	<0.00020	<0.00020	0.00046	0.00111	0.00082		0.00086	0.00028	0.00039	0.00145	0.00100	0.00038	<0.00020	0.00052	0.00027	<0.00020		0.00063
Zinc, dissolved	ICP-MS	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000138	0.000083	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	0.000052	0.000105	<0.000020	0.000075	0.000117	0.000101		<0.000020
Tungsten, dissolved	ICP-MS	ug/L	0.20	0.31	0.33	<0.20	0.21	<0.20		0.25	<0.20	0.24	0.29	1.34	8.54	0.29	<0.20	0.43	<0.20		0.22
Ion Balance																					
Major Anions	Calc.	meq/L		0.85	0.88	1.02	0.46	0.53		0.77	0.79	0.76	0.48	0.50	0.93	0.95	0.60	0.48	1.01		0.78
Major Cations	Calc.	meq/L		0.94	1.00	1.17	0.54	0.59		0.83	0.89	0.88	0.55	0.54	1.05	1.06	0.65	0.57	1.04		0.86
Difference	Calc.	meq/L		-0.09	-0.12	-0.15	-0.08	-0.06		-0.06	-0.10	-0.12	-0.07	-0.04	-0.12	-0.11	-0.05	-0.10	-0.04		-0.08
Balance (%)	Calc.	%		-5.0%	-6.4%	-6.7%	-7.8%	-5.6%		-4.0%	-6.2%	-7.2%	-6.8%	-3.4%	-6.2%	-5.5%	-4.3%	-9.3%	-1.7%		-5.0%
			SF Extract ID:	*7120457-46*	*7120457-47*	*7120457-48*	*7120457-49*	*7120457-50*	*N/A*	*7120457-51*	*7120457-52*	*7120457-53*	*7120457-54*	*7120457-55*	*7120457-56*	*7120457-57*	*7120457-58*	*7120457-59*	*7120457-60*	*N/A*	*7120457-61*

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	62	63	64	65	66	67	68	69	70	70 D	71	72	72 R	73	74	75	76	77
				Sample ID																	Sample ID
				VL-11-345 (43-45)	VL-12-398 (146-148)	VL-12-398 (240-241)	VL-12-398 (316-318)	VL-12-398 (348-349)	VL-12-398 (358-360)	VL-12-403 (3-4)	VL-12-403 (162-163)	VL-12-403 (227-228)	VL-12-403 (227-228) - Dup	VL-12-403 (261-263)	VL-12-403 (303-305)	VL-12-403 (303-305) - Dup	VL-12-421 (69-70)	VL-12-421 (92-93)	VL-12-421 (268-270)	VL-13-524 (179-181)	VL-13-524 (422-423)
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250	250	250	250	250	250	250	250	N/A	250	250	250	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750	750	750	750	750	750	N/A	750	750	750	750	750
On filtered samples using 0.45 micron filter paper																					
pH	pH Meter	pH units	0.01	9.5	9.6	9.4	9.6	8.3	7.5	7.7	7.3	7.7	7.8	7.4	7.7		7.8	7.5	7.7	7.7	7.2
EC	EC Meter	µS/cm	0.5	76	75	73	68	475	278	87	79	80	78	93	94		77	90	116	96	151
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	28.8	25.0	26.3	22.5	9.4	31.9	33.1	31.3	30.6	31.0	33.8	42.5		36.3	40.5	34.4	40.6	30.0
Sulphate	Turbidimetry	mg/L	1.0	<1.0	<1.0	<1.0	2.5	173.5	71.1	<1.0	<1.0	2.3	2.8	<1.0	<1.0		<1.0	<1.0	13.6	2.8	28.5
Dissolved Metals by ICP-MS:																					
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	16.6	14.2	16.2	19.0	200.0	98.1	27.9	24.6	27.0		34.6	32.3	32.1	27.3	37.3	43.6	32.8	57.5
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.486	0.421	0.443	0.271	0.109	0.127	0.101	0.131	0.040		0.176	0.200	0.201	0.216	0.233	0.200	0.189	0.208
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000529	0.000264	0.000691	0.001370	0.000214	0.000199	0.000168	0.000323	0.000197		0.000210	0.000345	0.000339	0.000246	0.000599	0.000134	0.000359	0.000258
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.001420	0.000720	0.000920	0.008180	0.000427	0.000756	0.000229	0.000513	0.000527		0.000621	0.001470	0.001460	0.000372	0.000203	0.001110	0.001640	0.000359
Barium, dissolved	ICP-MS	mg/L	0.0001	0.00259	0.00442	0.00177	0.00053	0.00461	0.00364	0.00256	0.00343	0.00229		0.06590	0.00371	0.00370	0.00105	0.02810	0.00152	0.07310	0.00536
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Boron, dissolved	ICP-MS	mg/L	0.002	0.0030	0.0035	0.0029	0.0063	0.0162	0.0029	0.0022	0.0040	0.0115		<0.0020	0.0032	0.0035	0.0023	0.0022	0.0020	0.0033	0.0024
Cadmium, dissolved	ICP-MS	mg/L	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000068	0.0000039	<0.0000020	0.0000024		<0.0000020	<0.0000020	<0.000002	0.0000025	<0.0000020	0.0000061	<0.0000020	<0.0000020
Calcium, dissolved	ICP-MS	mg/L	0.04	5.87	5.27	5.61	6.37	78.60	36.40	10.60	9.09	10.30		12.50	11.50	11.50	9.64	9.66	16.00	12.00	21.70
Chromium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000224	0.0000061	0.0000352	0.0000167	0.0000139	0.0006220	0.0000184	0.0000258	0.0000183		0.0000129	0.0000207	0.0000208	0.0000086	0.0000195	0.0000147	0.0000368	0.0000139
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00132	0.00135	0.00117	0.00074	0.00070	0.00094	0.00118	0.00151	0.00137		0.00048	0.00154	0.00151	0.00055	0.00045	0.00079	0.00095	0.00051
Iron, dissolved	ICP-MS	mg/L	0.002	0.0089	0.0048	0.0055	0.0034	<0.0020	<0.0020	0.0084	0.0071	0.0052		<0.0020	0.0065	0.0064	<0.0020	<0.0020	0.0083	0.0047	<0.0020
Lead, dissolved	ICP-MS	mg/L	0.00005	0.000060	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000059	0.000063	0.000065		<0.000050	0.000094	0.000067	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000178	0.000126	0.000137	0.000075	0.000176	0.000654	0.000255	0.000193	0.000092		<0.000050	0.000368	0.000366	0.000181	0.000237	0.000572	0.000199	0.000078
Magnesium, dissolved	ICP-MS	mg/L	0.01	0.474	0.259	0.520	0.753	0.847	1.710	0.329	0.465	0.291		0.811	0.842	0.844	0.776	3.210	0.900	0.678	0.808
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.00475	0.00405	0.00384	0.000409	0.0253	0.164	0.047	0.0918	0.082		0.0323	0.0716	0.0715	0.0434	0.0171	0.198	0.104	0.0374
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.000118	0.000090	0.000151	0.000402	0.000257	0.000384	0.004410	0.000269	0.000317		0.000108	0.000120	0.000125	0.000180	0.000107	0.000143	0.000121	0.000094
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000088	0.000066	0.000082	0.000211	0.000084	0.000120	0.000098	0.000107	0.000125		0.000082	0.000126	0.000125	0.000089	0.000192	0.000083	0.000069	0.000048
Phosphorus, dissolved	ICP-MS	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010
Potassium, dissolved	ICP-MS	mg/L	0.01	3.680	3.660	2.160	0.320	3.30	5.82	2.83	2.04	0.96		0.547	2.990	2.990	3.150	1.240	3.730	3.79	1.30
Selenium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.0001	<0.00010	0.00016	<0.00010	<0.00010	<0.00010
Silicon, dissolved	ICP-MS	mg/L	0.10	1.89	2.28	1.87	1.13	0.62	1.08	0.99	0.95	1.77		0.34	1.44	1.43	0.84	0.45	1.19	1.45	0.55
Silver, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	0.00001	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, dissolved	ICP-MS	mg/L	0.02	4.31	5.40	4.98	3.51	2.45	4.32	3.20	3.20	2.79		1.97	4.53	4.58	2.88	2.59	2.55	3.97	3.54
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.01750	0.05450	0.09210	0.02130	0.15200	0.09310	0.01900	0.07680	0.05540		0.05780	0.05180	0.05170	0.02810	0.31100	0.03560	0.35800	0.07570
Sulphur, dissolved	ICP-MS	mg/L	1.0	<1.00	<1.00	<1.00	<1.00	69.20	27.90	<1.00	<1.00	<1.00		<1.00	<1.00	<1.00	<1.00	<1.00	6.3	<1.00	11.90
Tellurium, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	0.00007	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00041		<0.000050	<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium, dissolved	ICP-MS	mg/L	0.000004	0.0000051	0.0000230	<0.0000040	<0.0000040	0.0000061	0.0000116	0.0000154	<0.0000040	0.0000059		<0.0000040	0.0000119	0.0000123	<0.0000040	0.0000105	0.0000343	<0.0000040	<0.0000040
Thorium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Titanium, dissolved	ICP-MS	mg/L	0.0002	0.00034	0.00039	0.00024	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00042		<0.00020	0.00029	0.00030	<0.00020	<0.00020	0.00025	0.00031	<0.00020
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0001010	0.0005380	0.0002070	0.0000040	0.0001610	0.0002820	0.0000772	0.0002330	0.0001820		0.0000019	0.0003060	0.0003040	0.0000011	0.0000048	0.0000904	0.0002110	0.0000030
Vanadium, dissolved	ICP-MS	mg/L	0.0002	0.00059	0.00028	0.00088	0.00346	0.00032	0.00039	<0.00020	<0.00020	0.00024		0.00037	<0.00020	<0.0002	0.00061	0.00022	0.00065	0.00021	0.00030
Zinc, dissolved	ICP-MS	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000064	0.000055	0.000027	<0.000020	<0.000020	<0.000020	0.000056	0.000074	0.000042		<0.000020	0.000097	0.000093	<0.000020	<0.000020	<0.000020	0.000115	<0.000020
Tungsten, dissolved	ICP-MS	ug/L	0.20	<0.20	<0.20	<0.20	0.41	<0.20	<0.20	0.61	<0.20	1.01		<0.20	0.21	0.21	<0.20	<0.20	<0.20	<0.20	<0.20
Ion Balance																					
Major Anions	Calc.	meq/L		0.58	0.50	0.53	0.50	3.80	2.12	0.66	0.63	0.66		0.68	0.85	0.85	0.73	0.81	0.97	0.87	1.19
Major Cations	Calc.	meq/L		0.67	0.66	0.65	0.57	4.20	2.32	0.78	0.70	0.70		0.81	0.94	0.95	0.78	0.93	1.11	0.96	1.36
Difference	Calc.	meq/L		-0.09	-0.16	-0.12	-0.07	-0.40	-0.20	-0.12	-0.08	-0.04		-0.14	-0.09	-0.10	-0.05	-0.11	-0.14	-0.09	-0.17
Balance (%)	Calc.	%		-7.6%	-14.0%	-10.4%	-6.6%	-5.0%	-4.5%	-8.3%	-6.0%	-2.6%		-9.3%	-5.2%	-5.4%	-3.5%	-6.6%	-6.7%	-4.8%	-6.6%
			SF Extract ID:	*7120457-62*	*7120457-63*	*7120457-64*	*7120457-65*	*7120457-66*	*7120457-67*	*7120457-68*	*7120457-69*	*7120457-70*	*N/A*	*7120457-71*	*7120457-72*	*7120457-72*	*7120457-73*	*7120457-74*	*7120457-75*	*7120457-76*	*7120457-77*

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

Parameter	Method	Unit	RDL	78	79	80	80 D	81	82	Method blank - 2 (42 - 82)
				VL-13-535 (69-70)	VL-13-535 (205-206)	VL-13-535 (312-314)	VL-13-535 (312-314) - Dup	VL-13-538 (88-89)	VL-13-538 (105-106)	
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250	250	N/A
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750
On filtered samples using 0.45 micron filter paper										
pH	pH Meter	pH units	0.01	8.2	7.6	9.1	9.3	7.7	7.9	5.49
EC	EC Meter	µS/cm	0.5	104	105	71	77	109	99	0.88
Alkalinity (to pH 4.5)	Titration/Calc.	mg $CaCO_3$/L	0.5	45.0	48.8	30.6	33.0	46.9	46.9	1.9
Sulphate	Turbidimetry	mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Metals by ICP-MS:										
Hardness, Total (as CaCO3)	ICP-MS	mg/L	0.1	38.4	39.6	17.8		39.4	38.7	<0.100
Aluminum, dissolved	ICP-MS	mg/L	0.001	0.108	0.167	0.467		0.187	0.188	<0.0010
Antimony, dissolved	ICP-MS	mg/L	0.00005	0.000348	0.000414	0.000510		0.000181	0.000296	<0.000050
Arsenic, dissolved	ICP-MS	mg/L	0.00005	0.000829	0.000584	0.003740		0.000299	0.000068	<0.000050
Barium, dissolved	ICP-MS	mg/L	0.0001	0.00537	0.00506	0.00442		0.00520	0.00240	<0.00010
Beryllium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Bismuth, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Boron, dissolved	ICP-MS	mg/L	0.002	0.0036	0.0054	0.0026		0.0056	0.0026	<0.0020
Cadmium, dissolved	ICP-MS	mg/L	0.000002	0.0000025	0.0000024	<0.0000020		0.0000028	<0.0000020	0.0000074
Calcium, dissolved	ICP-MS	mg/L	0.04	11.40	14.20	6.39		14.70	10.50	<0.040
Chromium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Cobalt, dissolved	ICP-MS	mg/L	0.000005	0.0000260	0.0000151	0.0000145		0.0000106	0.0000428	<0.0000050
Copper, dissolved	ICP-MS	mg/L	0.0001	0.00071	0.00095	0.00093		0.00089	0.00055	0.00029
Iron, dissolved	ICP-MS	mg/L	0.002	0.0135	<0.0020	0.0065		0.0028	<0.0020	<0.0020
Lead, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	0.001280
Lithium, dissolved	ICP-MS	mg/L	0.00005	0.000228	0.000185	0.000392		0.000172	0.000155	<0.000050
Magnesium, dissolved	ICP-MS	mg/L	0.01	2.420	1.020	0.454		0.654	3.010	<0.0050
Manganese, dissolved	ICP-MS	mg/L	0.00005	0.00524	0.103	0.00796		0.143	0.0329	0.000092
Mercury, dissolved	ICP-MS	mg/L	0.00002	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020
Molybdenum, dissolved	ICP-MS	mg/L	0.00001	0.010600	0.006180	0.000065		0.000289	0.000127	<0.000010
Nickel, dissolved	ICP-MS	mg/L	0.00004	0.000151	0.000046	0.000049		0.000061	0.000079	<0.000040
Phosphorus, dissolved	ICP-MS	mg/L	0.01	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010
Potassium, dissolved	ICP-MS	mg/L	0.01	5.11	1.56	3.70		2.99	2.80	<0.010
Selenium, dissolved	ICP-MS	mg/L	0.0001	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Silicon, dissolved	ICP-MS	mg/L	0.10	1.51	1.38	2.19		1.19	0.74	<0.10
Silver, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Sodium, dissolved	ICP-MS	mg/L	0.02	2.25	4.42	4.40		3.52	2.66	<0.020
Strontium, dissolved	ICP-MS	mg/L	0.0001	0.23900	0.20400	0.14000		0.05790	0.03430	<0.00010
Sulphur, dissolved	ICP-MS	mg/L	1.0	<1.00	<1.00	<1.00		<1.00	<1.00	<1.00
Tellurium, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050
Thallium, dissolved	ICP-MS	mg/L	0.000004	0.0000205	<0.0000040	0.0000112		0.0000064	<0.0000040	<0.0000040
Thorium, dissolved	ICP-MS	mg/L	0.00001	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Tin, dissolved	ICP-MS	mg/L	0.00005	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050
Titanium, dissolved	ICP-MS	mg/L	0.0002	<0.00020	<0.00020	0.00043		0.00021	<0.00020	<0.00020
Uranium, dissolved	ICP-MS	mg/L	0.000001	0.0011200	0.0002820	0.0004060		0.0009530	0.0000546	<0.0000010
Vanadium, dissolved	ICP-MS	mg/L	0.0002	<0.00020	<0.00020	0.00030		0.00038	<0.00020	<0.00020
Zinc, dissolved	ICP-MS	mg/L	0.001	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010
Zirconium, dissolved	ICP-MS	mg/L	0.00002	0.000192	<0.000020	0.000163		0.000111	<0.000020	<0.000020
Tungsten, dissolved	ICP-MS	ug/L	0.20	1.30	<0.20	<0.20		0.36	<0.20	<0.20
Ion Balance										
Major Anions	Calc.	meq/L		0.90	0.98	0.61		0.94	0.94	
Major Cations	Calc.	meq/L		1.02	1.05	0.70		1.05	0.98	
Difference	Calc.	meq/L		-0.12	-0.08	-0.09		-0.11	-0.05	
Balance (%)	Calc.	%		-6.0%	-3.9%	-6.6%		-5.5%	-2.3%	
			SF Extract ID:	*7120457-78*	*7120457-79*	*7120457-80*	*N/A*	*7120457-81*	*7120457-82*	*7120457-84*

CERTIFICATE OF ANALYSIS ▪ MEND-SFE QA/QC RESULTS

Global
ARD Testing Services Inc.

GLOBAL PROJECT NO: 1746
CLIENT: Stantec Consulting Inc.
PROJECT NAME: Marathon Gold & Leprechaun (NWT ARD)
PROJECT NO:
REPORT VERSION: 1

SFE - Sulphate:

Certified Reference Material:	Parameter: Sulphate	% Recover	Matrix Spike % Recovery	Units	QC Limits (%)
STD Mineral Water (10.5 mg/L)	10.7	101.9%		%	80 - 120
Spiked Blank (19.61 mg/L)	17.70		90.3%	%	80 - 120

SFE - Dissolved Metals by ICP-MS:

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0428-BLK1	Aluminum dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0428-BLK1	Antimony dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Arsenic dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Barium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-BLK1	Beryllium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-BLK1	Bismuth dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-BLK1	Boron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0428-BLK1	Cadmium dissolved	<	0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0428-BLK1	Calcium dissolved	<	0.04	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0428-BLK1	Chromium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-BLK1	Cobalt dissolved	<	0.000005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0428-BLK1	Copper dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-BLK1	Iron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0428-BLK1	Lead dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Lithium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Magnesium dissolved	<	0.005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0428-BLK1	Manganese dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Mercury dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0428-BLK1	Molybdenum dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-BLK1	Nickel dissolved	<	0.00004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0428-BLK1	Phosphorus dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0428-BLK1	Potassium dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0428-BLK1	Selenium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-BLK1	Silicon dissolved	<	0.1	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0428-BLK1	Silver dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-BLK1	Sodium dissolved	<	0.02	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0428-BLK1	Strontium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-BLK1	Sulfur dissolved	<	1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0428-BLK1	Tellurium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Thallium dissolved	<	0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0428-BLK1	Thorium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-BLK1	Tin dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-BLK1	Titanium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0428-BLK1	Tungsten dissolved	<	0.2	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0428-BLK1	Uranium dissolved	<	0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0428-BLK1	Vanadium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0428-BLK1	Zinc dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0428-BLK1	Zirconium dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0428-BS1	Aluminum dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Antimony dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Arsenic dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Barium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Beryllium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Bismuth dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Boron dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Cadmium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Calcium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Chromium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Cobalt dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Copper dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Iron dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Lead dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Lithium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Magnesium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Manganese dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Mercury dissolved		89	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Molybdenum dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Nickel dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Phosphorus dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Potassium dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Selenium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Silicon dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Silver dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Sodium dissolved		115	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Strontium dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Sulfur dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Tellurium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0428-BS1	Thallium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Thorium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Tin dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Titanium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Tungsten dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Uranium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Vanadium dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Zinc dissolved		115	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-BS1	Zirconium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0428-DUP1 = 7120457-01 = MA-14-015 (5-7) (SFE)												
7120457_B7L0428-DUP1	Aluminum dissolved		0.195	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0428-DUP1	Antimony dissolved		0.000107	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Arsenic dissolved		0.000338	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Barium dissolved		0.0004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-DUP1	Beryllium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-DUP1	Bismuth dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-DUP1	Boron dissolved		0.0023	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0428-DUP1	Cadmium dissolved		0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0428-DUP1	Calcium dissolved		9.95	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0428-DUP1	Chromium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-DUP1	Cobalt dissolved		0.0000153	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0428-DUP1	Copper dissolved		0.00039	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-DUP1	Iron dissolved		0.0062	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0428-DUP1	Lead dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Lithium dissolved		0.000083	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Magnesium dissolved		0.395	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0428-DUP1	Manganese dissolved		0.0629	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Mercury dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0428-DUP1	Molybdenum dissolved		0.00128	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-DUP1	Nickel dissolved		0.000057	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0428-DUP1	Phosphorus dissolved	<	<0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0428-DUP1	Potassium dissolved		0.544	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0428-DUP1	Selenium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-DUP1	Silicon dissolved		1.41	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0428-DUP1	Silver dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-DUP1	Sodium dissolved		5.09	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0428-DUP1	Strontium dissolved		0.00565	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0428-DUP1	Sulfur dissolved	<	<1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0428-DUP1	Tellurium dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Thallium dissolved		0.0000095	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0428-DUP1	Thorium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0428-DUP1	Tin dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0428-DUP1	Titanium dissolved		0.00023	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0428-DUP1	Uranium dissolved		0.0000215	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0428-DUP1	Vanadium dissolved		0.00025	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0428-DUP1	Zinc dissolved	<	<0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0428-DUP1	Zirconium dissolved		0.000052	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0428-DUP1	Tungsten dissolved		1.24	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0428-SRM1	Aluminum dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	79
7120457_B7L0428-SRM1	Antimony dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0428-SRM1	Arsenic dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0428-SRM1	Barium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	85
7120457_B7L0428-SRM1	Beryllium dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	122	79
7120457_B7L0428-SRM1	Boron dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	79
7120457_B7L0428-SRM1	Cadmium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	89
7120457_B7L0428-SRM1	Calcium dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	85
7120457_B7L0428-SRM1	Chromium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0428-SRM1	Cobalt dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	90
7120457_B7L0428-SRM1	Copper dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	115	90
7120457_B7L0428-SRM1	Iron dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	86
7120457_B7L0428-SRM1	Lead dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0428-SRM1	Lithium dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	127	77
7120457_B7L0428-SRM1	Magnesium dissolved		110	%	F	metals	EPA 6020B	8-Dec-17	1	%	116	84
7120457_B7L0428-SRM1	Manganese dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	85
7120457_B7L0428-SRM1	Molybdenum dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	87
7120457_B7L0428-SRM1	Nickel dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	90
7120457_B7L0428-SRM1	Phosphorus dissolved		110	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	74
7120457_B7L0428-SRM1	Potassium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	78
7120457_B7L0428-SRM1	Selenium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0428-SRM1	Sodium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	81
7120457_B7L0428-SRM1	Strontium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	111	82
7120457_B7L0428-SRM1	Thallium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0428-SRM1	Uranium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0428-SRM1	Vanadium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	110	85
7120457_B7L0428-SRM1	Zinc dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	88
7120457_B7L0523-BLK1	Aluminum dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0523-BLK1	Antimony dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Arsenic dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Barium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-BLK1	Beryllium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-BLK1	Bismuth dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-BLK1	Boron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0523-BLK1	Cadmium dissolved	<	0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0523-BLK1	Calcium dissolved	<	0.04	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0523-BLK1	Chromium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-BLK1	Cobalt dissolved	<	0.000005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0523-BLK1	Copper dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-BLK1	Iron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0523-BLK1	Lead dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Lithium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Magnesium dissolved	<	0.005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0523-BLK1	Manganese dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Mercury dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0523-BLK1	Molybdenum dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-BLK1	Nickel dissolved	<	0.00004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0523-BLK1	Phosphorus dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0523-BLK1	Potassium dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0523-BLK1	Selenium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-BLK1	Silicon dissolved	<	0.1	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0523-BLK1	Silver dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-BLK1	Sodium dissolved	<	0.02	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0523-BLK1	Strontium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-BLK1	Sulfur dissolved	<	1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0523-BLK1	Tellurium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Thallium dissolved	<	0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0523-BLK1	Thorium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-BLK1	Tin dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-BLK1	Titanium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0523-BLK1	Tungsten dissolved	<	0.2	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0523-BLK1	Uranium dissolved	<	0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0523-BLK1	Vanadium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0523-BLK1	Zinc dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0523-BLK1	Zirconium dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0523-BS1	Aluminum dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Antimony dissolved		88	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Arsenic dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Barium dissolved		86	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Beryllium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Bismuth dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Boron dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Cadmium dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Calcium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Chromium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Cobalt dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Copper dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Iron dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Lead dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Lithium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Magnesium dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Manganese dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Mercury dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Molybdenum dissolved		88	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Nickel dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Phosphorus dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Potassium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Selenium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Silicon dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Silver dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Sodium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Strontium dissolved		87	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Sulfur dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Tellurium dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Thallium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Thorium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Tin dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Titanium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Tungsten dissolved		90	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Uranium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Vanadium dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Zinc dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-BS1	Zirconium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0523-DUP1 = 7120457-29 = MA-16-147 (157-159) (SFE)												
7120457_B7L0523-DUP1	Aluminum dissolved		0.223	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0523-DUP1	Antimony dissolved		0.000183	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Arsenic dissolved		0.000341	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Barium dissolved		0.00031	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-DUP1	Beryllium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-DUP1	Bismuth dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-DUP1	Boron dissolved		0.0027	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0523-DUP1	Cadmium dissolved	<	<0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0523-DUP1	Calcium dissolved		4.87	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0523-DUP1	Chromium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-DUP1	Cobalt dissolved		0.0000089	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0523-DUP1	Copper dissolved		0.00035	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-DUP1	Iron dissolved		0.0026	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0523-DUP1	Lead dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Lithium dissolved		0.000147	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Magnesium dissolved		0.375	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0523-DUP1	Manganese dissolved		0.000826	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Mercury dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0523-DUP1	Molybdenum dissolved		0.000494	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-DUP1	Nickel dissolved		0.000055	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0523-DUP1	Phosphorus dissolved	<	<0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0523-DUP1	Potassium dissolved		0.346	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0523-DUP1	Selenium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-DUP1	Silicon dissolved		1.72	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0523-DUP1	Silver dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-DUP1	Sodium dissolved		7.09	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0523-DUP1	Strontium dissolved		0.0076	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0523-DUP1	Sulfur dissolved	<	<1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0523-DUP1	Tellurium dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Thallium dissolved		0.0000093	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0523-DUP1	Thorium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0523-DUP1	Tin dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0523-DUP1	Titanium dissolved	<	<0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0523-DUP1	Uranium dissolved		0.0000374	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0523-DUP1	Vanadium dissolved		0.00031	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0523-DUP1	Zinc dissolved	<	<0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0523-DUP1	Zirconium dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0523-DUP1	Tungsten dissolved		0.24	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0523-SRM1	Aluminum dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	79
7120457_B7L0523-SRM1	Antimony dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0523-SRM1	Arsenic dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0523-SRM1	Barium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	85
7120457_B7L0523-SRM1	Beryllium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	122	79
7120457_B7L0523-SRM1	Boron dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	79
7120457_B7L0523-SRM1	Cadmium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	89
7120457_B7L0523-SRM1	Calcium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	85
7120457_B7L0523-SRM1	Chromium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0523-SRM1	Cobalt dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	90
7120457_B7L0523-SRM1	Copper dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	115	90
7120457_B7L0523-SRM1	Iron dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	86
7120457_B7L0523-SRM1	Lead dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0523-SRM1	Lithium dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	127	77
7120457_B7L0523-SRM1	Magnesium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	116	84
7120457_B7L0523-SRM1	Manganese dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	85
7120457_B7L0523-SRM1	Molybdenum dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	87
7120457_B7L0523-SRM1	Nickel dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	90
7120457_B7L0523-SRM1	Phosphorus dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	74
7120457_B7L0523-SRM1	Potassium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	78
7120457_B7L0523-SRM1	Selenium dissolved		110	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0523-SRM1	Sodium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	81
7120457_B7L0523-SRM1	Strontium dissolved		92	%	F	metals	EPA 6020B	8-Dec-17	1	%	111	82
7120457_B7L0523-SRM1	Thallium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0523-SRM1	Uranium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0523-SRM1	Vanadium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	110	85
7120457_B7L0523-SRM1	Zinc dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	88
7120457_B7L0545-BLK1	Aluminum dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0545-BLK1	Antimony dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Arsenic dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Barium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-BLK1	Beryllium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-BLK1	Bismuth dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-BLK1	Boron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0545-BLK1	Cadmium dissolved	<	0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0545-BLK1	Calcium dissolved	<	0.04	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0545-BLK1	Chromium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-BLK1	Cobalt dissolved	<	0.000005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0545-BLK1	Copper dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-BLK1	Iron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0545-BLK1	Lead dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Lithium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Magnesium dissolved	<	0.005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0545-BLK1	Manganese dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Mercury dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0545-BLK1	Molybdenum dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-BLK1	Nickel dissolved	<	0.00004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0545-BLK1	Phosphorus dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0545-BLK1	Potassium dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0545-BLK1	Selenium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-BLK1	Silicon dissolved	<	0.1	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0545-BLK1	Silver dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-BLK1	Sodium dissolved	<	0.02	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0545-BLK1	Strontium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-BLK1	Sulfur dissolved	<	1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0545-BLK1	Tellurium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Thallium dissolved	<	0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0545-BLK1	Thorium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-BLK1	Tin dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-BLK1	Titanium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0545-BLK1	Tungsten dissolved	<	0.2	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0545-BLK1	Uranium dissolved	<	0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0545-BLK1	Vanadium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0545-BLK1	Zinc dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0545-BLK1	Zirconium dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0545-BS1	Aluminum dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Antimony dissolved		89	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Arsenic dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Barium dissolved		86	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Beryllium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Bismuth dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Boron dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Cadmium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Calcium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Chromium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Cobalt dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Copper dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Iron dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Lead dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Lithium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Magnesium dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Manganese dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Mercury dissolved		115	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Molybdenum dissolved		90	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Nickel dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Phosphorus dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Potassium dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Selenium dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Silicon dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Silver dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Sodium dissolved		114	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Strontium dissolved		88	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Sulfur dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Tellurium dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Thallium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Thorium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Tin dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Titanium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Tungsten dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Uranium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Vanadium dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Zinc dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-BS1	Zirconium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0545-DUP1 = 7120457-11 = MA-16-082 (5-6) (SFE)												
7120457_B7L0545-DUP1	Aluminum dissolved		0.236	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0545-DUP1	Antimony dissolved		0.000235	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Arsenic dissolved		0.00018	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Barium dissolved		0.00075	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-DUP1	Beryllium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-DUP1	Bismuth dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-DUP1	Boron dissolved		0.0028	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0545-DUP1	Cadmium dissolved	<	<0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0545-DUP1	Calcium dissolved		11.9	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0545-DUP1	Chromium dissolved		0.00021	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-DUP1	Cobalt dissolved		0.0000114	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0545-DUP1	Copper dissolved		0.00022	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-DUP1	Iron dissolved	<	<0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0545-DUP1	Lead dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Lithium dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Magnesium dissolved		1.18	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0545-DUP1	Manganese dissolved		0.0131	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Mercury dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0545-DUP1	Molybdenum dissolved		0.000115	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-DUP1	Nickel dissolved		0.000173	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0545-DUP1	Phosphorus dissolved	<	<0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0545-DUP1	Potassium dissolved		0.291	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0545-DUP1	Selenium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-DUP1	Silicon dissolved		0.6	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0545-DUP1	Silver dissolved		0.000011	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-DUP1	Sodium dissolved		0.837	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0545-DUP1	Strontium dissolved		0.0127	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0545-DUP1	Sulfur dissolved	<	<1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0545-DUP1	Tellurium dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Thallium dissolved	<	<0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0545-DUP1	Thorium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0545-DUP1	Tin dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0545-DUP1	Titanium dissolved	<	<0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0545-DUP1	Uranium dissolved	<	<0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0545-DUP1	Vanadium dissolved		0.00035	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0545-DUP1	Zinc dissolved	<	<0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0545-DUP1	Zirconium dissolved		0.000071	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0545-DUP1	Tungsten dissolved		0.29	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0545-SRM1	Aluminum dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	79
7120457_B7L0545-SRM1	Antimony dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0545-SRM1	Arsenic dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0545-SRM1	Barium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	85
7120457_B7L0545-SRM1	Beryllium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	122	79
7120457_B7L0545-SRM1	Boron dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	79
7120457_B7L0545-SRM1	Cadmium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	89
7120457_B7L0545-SRM1	Calcium dissolved		113	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	85
7120457_B7L0545-SRM1	Chromium dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0545-SRM1	Cobalt dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	90
7120457_B7L0545-SRM1	Copper dissolved		110	%	F	metals	EPA 6020B	8-Dec-17	1	%	115	90
7120457_B7L0545-SRM1	Iron dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	86
7120457_B7L0545-SRM1	Lead dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0545-SRM1	Lithium dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	127	77
7120457_B7L0545-SRM1	Magnesium dissolved		115	%	F	metals	EPA 6020B	8-Dec-17	1	%	116	84
7120457_B7L0545-SRM1	Manganese dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	85
7120457_B7L0545-SRM1	Molybdenum dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	87
7120457_B7L0545-SRM1	Nickel dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	90
7120457_B7L0545-SRM1	Phosphorus dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	74
7120457_B7L0545-SRM1	Potassium dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	78
7120457_B7L0545-SRM1	Selenium dissolved		114	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0545-SRM1	Sodium dissolved		114	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	81
7120457_B7L0545-SRM1	Strontium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	111	82
7120457_B7L0545-SRM1	Thallium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0545-SRM1	Uranium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0545-SRM1	Vanadium dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	110	85
7120457_B7L0545-SRM1	Zinc dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	88
7120457_B7L0558-BLK1	Aluminum dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0558-BLK1	Antimony dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Arsenic dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Barium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-BLK1	Beryllium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-BLK1	Bismuth dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-BLK1	Boron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0558-BLK1	Cadmium dissolved	<	0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0558-BLK1	Calcium dissolved	<	0.04	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0558-BLK1	Chromium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-BLK1	Cobalt dissolved	<	0.000005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0558-BLK1	Copper dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-BLK1	Iron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0558-BLK1	Lead dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Lithium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Magnesium dissolved	<	0.005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0558-BLK1	Manganese dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Mercury dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0558-BLK1	Molybdenum dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-BLK1	Nickel dissolved	<	0.00004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0558-BLK1	Phosphorus dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0558-BLK1	Potassium dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0558-BLK1	Selenium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-BLK1	Silicon dissolved	<	0.1	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0558-BLK1	Silver dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-BLK1	Sodium dissolved	<	0.02	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0558-BLK1	Strontium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-BLK1	Sulfur dissolved	<	1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0558-BLK1	Tellurium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Thallium dissolved	<	0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0558-BLK1	Thorium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-BLK1	Tin dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-BLK1	Titanium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0558-BLK1	Tungsten dissolved	<	0.2	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0558-BLK1	Uranium dissolved	<	0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0558-BLK1	Vanadium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0558-BLK1	Zinc dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0558-BLK1	Zirconium dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0558-BS1	Aluminum dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Antimony dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Arsenic dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Barium dissolved		89	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Beryllium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Bismuth dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Boron dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Cadmium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Calcium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Chromium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Cobalt dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Copper dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Iron dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Lead dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0558-BS1	Lithium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Magnesium dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Manganese dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Mercury dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Molybdenum dissolved		92	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Nickel dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Phosphorus dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Potassium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Selenium dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Silicon dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Silver dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Sodium dissolved		113	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Strontium dissolved		90	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Sulfur dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Tellurium dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Thallium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Thorium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Tin dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Titanium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Tungsten dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Uranium dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Vanadium dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Zinc dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-BS1	Zirconium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0558-DUP1 = 7120457-44 = VL-11-294 (259-260) (SFE)												
7120457_B7L0558-DUP1	Aluminum dissolved		0.247	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0558-DUP1	Antimony dissolved		0.000261	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Arsenic dissolved		0.000601	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Barium dissolved		0.00186	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-DUP1	Beryllium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-DUP1	Bismuth dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-DUP1	Boron dissolved		0.0034	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0558-DUP1	Cadmium dissolved		0.0000027	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0558-DUP1	Calcium dissolved		14.3	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0558-DUP1	Chromium dissolved		0.00011	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-DUP1	Cobalt dissolved		0.0000244	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0558-DUP1	Copper dissolved		0.00127	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-DUP1	Iron dissolved	<	<0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0558-DUP1	Lead dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Lithium dissolved		0.000192	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Magnesium dissolved		0.477	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0558-DUP1	Manganese dissolved		0.0612	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Mercury dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0558-DUP1	Molybdenum dissolved		0.00123	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-DUP1	Nickel dissolved		0.000079	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0558-DUP1	Phosphorus dissolved	<	<0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0558-DUP1	Potassium dissolved		2.32	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0558-DUP1	Selenium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-DUP1	Silicon dissolved		1.06	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0558-DUP1	Silver dissolved		0.000014	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-DUP1	Sodium dissolved		5.9	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0558-DUP1	Strontium dissolved		0.0755	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0558-DUP1	Sulfur dissolved		2.39	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0558-DUP1	Tellurium dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Thallium dissolved		0.0000224	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0558-DUP1	Thorium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0558-DUP1	Tin dissolved	<	<0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0558-DUP1	Titanium dissolved	<	<0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0558-DUP1	Uranium dissolved		0.00016	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0558-DUP1	Vanadium dissolved		0.00083	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0558-DUP1	Zinc dissolved	<	<0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0558-DUP1	Zirconium dissolved		0.000027	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0558-DUP1	Tungsten dissolved		1.8	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0558-SRM1	Aluminum dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	79
7120457_B7L0558-SRM1	Antimony dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0558-SRM1	Arsenic dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0558-SRM1	Barium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	85
7120457_B7L0558-SRM1	Beryllium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	122	79
7120457_B7L0558-SRM1	Boron dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	79
7120457_B7L0558-SRM1	Cadmium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	89
7120457_B7L0558-SRM1	Calcium dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	85
7120457_B7L0558-SRM1	Chromium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0558-SRM1	Cobalt dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	90
7120457_B7L0558-SRM1	Copper dissolved		109	%	F	metals	EPA 6020B	8-Dec-17	1	%	115	90
7120457_B7L0558-SRM1	Iron dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	86
7120457_B7L0558-SRM1	Lead dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0558-SRM1	Lithium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	127	77
7120457_B7L0558-SRM1	Magnesium dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	116	84
7120457_B7L0558-SRM1	Manganese dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	85
7120457_B7L0558-SRM1	Molybdenum dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	87
7120457_B7L0558-SRM1	Nickel dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	90
7120457_B7L0558-SRM1	Phosphorus dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	74
7120457_B7L0558-SRM1	Potassium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	78

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0558-SRM1	Selenium dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0558-SRM1	Sodium dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	81
7120457_B7L0558-SRM1	Strontium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	111	82
7120457_B7L0558-SRM1	Thallium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0558-SRM1	Uranium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0558-SRM1	Vanadium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	110	85
7120457_B7L0558-SRM1	Zinc dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	88
7120457_B7L0560-BLK1	Aluminum dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0560-BLK1	Antimony dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Arsenic dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Barium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-BLK1	Beryllium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-BLK1	Bismuth dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-BLK1	Boron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0560-BLK1	Cadmium dissolved	<	0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0560-BLK1	Calcium dissolved	<	0.04	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0560-BLK1	Chromium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-BLK1	Cobalt dissolved	<	0.000005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0560-BLK1	Copper dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-BLK1	Iron dissolved	<	0.002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0560-BLK1	Lead dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Lithium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Magnesium dissolved	<	0.005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.005	mg/L		
7120457_B7L0560-BLK1	Manganese dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Mercury dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0560-BLK1	Molybdenum dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-BLK1	Nickel dissolved	<	0.00004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0560-BLK1	Phosphorus dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0560-BLK1	Potassium dissolved	<	0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
7120457_B7L0560-BLK1	Selenium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-BLK1	Silicon dissolved	<	0.1	mg/L	F	metals	EPA 6020B	8-Dec-17	0.1	mg/L		
7120457_B7L0560-BLK1	Silver dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-BLK1	Sodium dissolved	<	0.02	mg/L	F	metals	EPA 6020B	8-Dec-17	0.02	mg/L		
7120457_B7L0560-BLK1	Strontium dissolved	<	0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-BLK1	Sulfur dissolved	<	1	mg/L	F	metals	EPA 6020B	8-Dec-17	1	mg/L		
7120457_B7L0560-BLK1	Tellurium dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Thallium dissolved	<	0.000004	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000004	mg/L		
7120457_B7L0560-BLK1	Thorium dissolved	<	0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-BLK1	Tin dissolved	<	0.00005	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-BLK1	Titanium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0560-BLK1	Tungsten dissolved	<	0.2	ug/L	F	metals	EPA 6020B	8-Dec-17	0.2	ug/L		
7120457_B7L0560-BLK1	Uranium dissolved	<	0.000001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000001	mg/L		
7120457_B7L0560-BLK1	Vanadium dissolved	<	0.0002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0002	mg/L		
7120457_B7L0560-BLK1	Zinc dissolved	<	0.001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0560-BLK1	Zirconium dissolved	<	0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0560-BS1	Aluminum dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Antimony dissolved		92	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Arsenic dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Barium dissolved		88	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Beryllium dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Bismuth dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Boron dissolved		94	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Cadmium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Calcium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Chromium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Cobalt dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Copper dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Iron dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Lead dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Lithium dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Magnesium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Manganese dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Mercury dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Molybdenum dissolved		91	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Nickel dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Phosphorus dissolved		98	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Potassium dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Selenium dissolved		104	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Silicon dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Silver dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Sodium dissolved		113	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Strontium dissolved		90	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Sulfur dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Tellurium dissolved		90	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Thallium dissolved		97	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Thorium dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Tin dissolved		95	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Titanium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Tungsten dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Uranium dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Vanadium dissolved		93	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-BS1	Zinc dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80

Sample Code	Parameter	Prefix	Result	Units	Total or Filtered	Method Type	Method Name	Date Analyzed	EQL	EQL Units	UCL	LCL
7120457_B7L0560-BS1	Zirconium dissolved		96	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	80
7120457_B7L0560-DUP1 = 7120457-72 = VL-12-403 (303-305) (SFE)												
7120457_B7L0560-DUP1	Aluminum dissolved		0.201	mg/L	F	metals	EPA 6020B	8-Dec-17	0.001	mg/L		
7120457_B7L0560-DUP1	Antimony dissolved		0.000339	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-DUP1	Arsenic dissolved		0.00146	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00005	mg/L		
7120457_B7L0560-DUP1	Barium dissolved		0.0037	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-DUP1	Beryllium dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-DUP1	Bismuth dissolved	<	<0.00001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-DUP1	Boron dissolved		0.0035	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
7120457_B7L0560-DUP1	Cadmium dissolved	<	<0.000002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000002	mg/L		
7120457_B7L0560-DUP1	Calcium dissolved		11.5	mg/L	F	metals	EPA 6020B	8-Dec-17	0.04	mg/L		
7120457_B7L0560-DUP1	Chromium dissolved	<	<0.0001	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-DUP1	Cobalt dissolved		0.0000208	mg/L	F	metals	EPA 6020B	8-Dec-17	0.000005	mg/L		
7120457_B7L0560-DUP1	Copper dissolved		0.00151	mg/L	F	metals	EPA 6020B	8-Dec-17	0.0001	mg/L		
7120457_B7L0560-DUP1	Iron dissolved		0.0064	mg/L	F	metals	EPA 6020B	8-Dec-17	0.002	mg/L		
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7120457_B7L0560-DUP1	Mercury dissolved	<	<0.00002	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00002	mg/L		
7120457_B7L0560-DUP1	Molybdenum dissolved		0.000125	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00001	mg/L		
7120457_B7L0560-DUP1	Nickel dissolved		0.000125	mg/L	F	metals	EPA 6020B	8-Dec-17	0.00004	mg/L		
7120457_B7L0560-DUP1	Phosphorus dissolved	<	<0.01	mg/L	F	metals	EPA 6020B	8-Dec-17	0.01	mg/L		
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7120457_B7L0560-SRM1	Antimony dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0560-SRM1	Arsenic dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0560-SRM1	Barium dissolved		100	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	85
7120457_B7L0560-SRM1	Beryllium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	122	79
7120457_B7L0560-SRM1	Boron dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	79
7120457_B7L0560-SRM1	Cadmium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	89
7120457_B7L0560-SRM1	Calcium dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	120	85
7120457_B7L0560-SRM1	Chromium dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0560-SRM1	Cobalt dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	90
7120457_B7L0560-SRM1	Copper dissolved		111	%	F	metals	EPA 6020B	8-Dec-17	1	%	115	90
7120457_B7L0560-SRM1	Iron dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	86
7120457_B7L0560-SRM1	Lead dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0560-SRM1	Lithium dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	127	77
7120457_B7L0560-SRM1	Magnesium dissolved		105	%	F	metals	EPA 6020B	8-Dec-17	1	%	116	84
7120457_B7L0560-SRM1	Manganese dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	85
7120457_B7L0560-SRM1	Molybdenum dissolved		101	%	F	metals	EPA 6020B	8-Dec-17	1	%	112	87
7120457_B7L0560-SRM1	Nickel dissolved		108	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	90
7120457_B7L0560-SRM1	Phosphorus dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	74
7120457_B7L0560-SRM1	Potassium dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	119	78
7120457_B7L0560-SRM1	Selenium dissolved		110	%	F	metals	EPA 6020B	8-Dec-17	1	%	123	89
7120457_B7L0560-SRM1	Sodium dissolved		115	%	F	metals	EPA 6020B	8-Dec-17	1	%	117	81
7120457_B7L0560-SRM1	Strontium dissolved		99	%	F	metals	EPA 6020B	8-Dec-17	1	%	111	82
7120457_B7L0560-SRM1	Thallium dissolved		103	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	90
7120457_B7L0560-SRM1	Uranium dissolved		102	%	F	metals	EPA 6020B	8-Dec-17	1	%	113	87
7120457_B7L0560-SRM1	Vanadium dissolved		107	%	F	metals	EPA 6020B	8-Dec-17	1	%	110	85
7120457_B7L0560-SRM1	Zinc dissolved		106	%	F	metals	EPA 6020B	8-Dec-17	1	%	114	88

Notes:

Job No: 7120457V1

EQL = Estimated Quantitation Limits

PQL = Practical Quantitation Limits

UCL = Upper Control Limit

LCL = Lower Control Limit

BLK = Blank

BS = Blank Spike

MS = Matrix Spike

DUP = Duplicate

SRM = Standard Reference Materials

Appendix D Figures

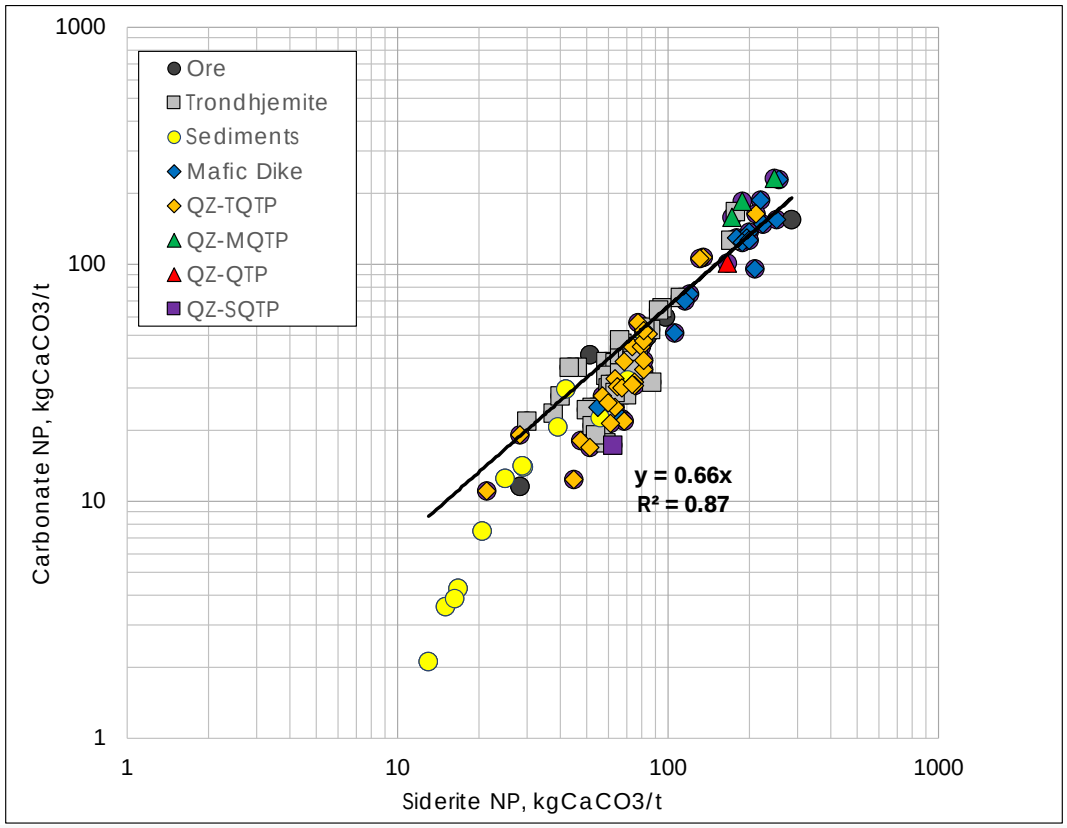

Figure D-1: Plots of Siderite NP vs Carbonate NP for Leprechaun Deposit Samples.

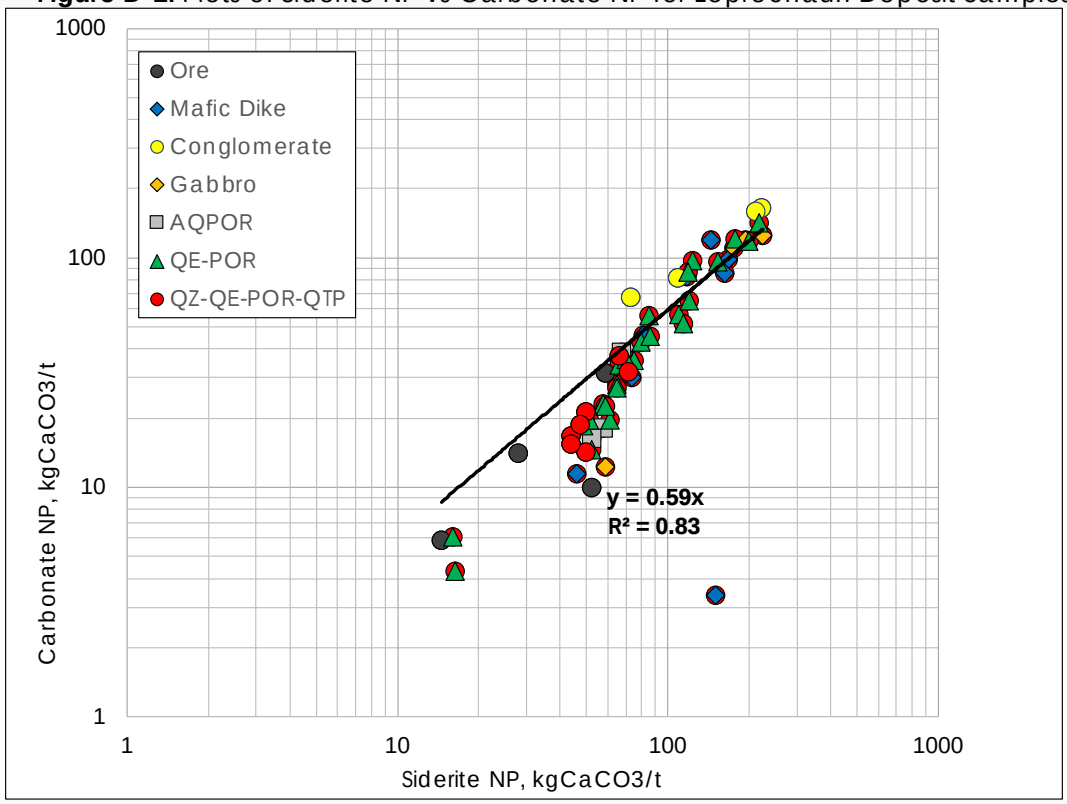

Figure D-2: Plots of Siderite NP vs Carbonate NP for Marathon Deposit Samples.

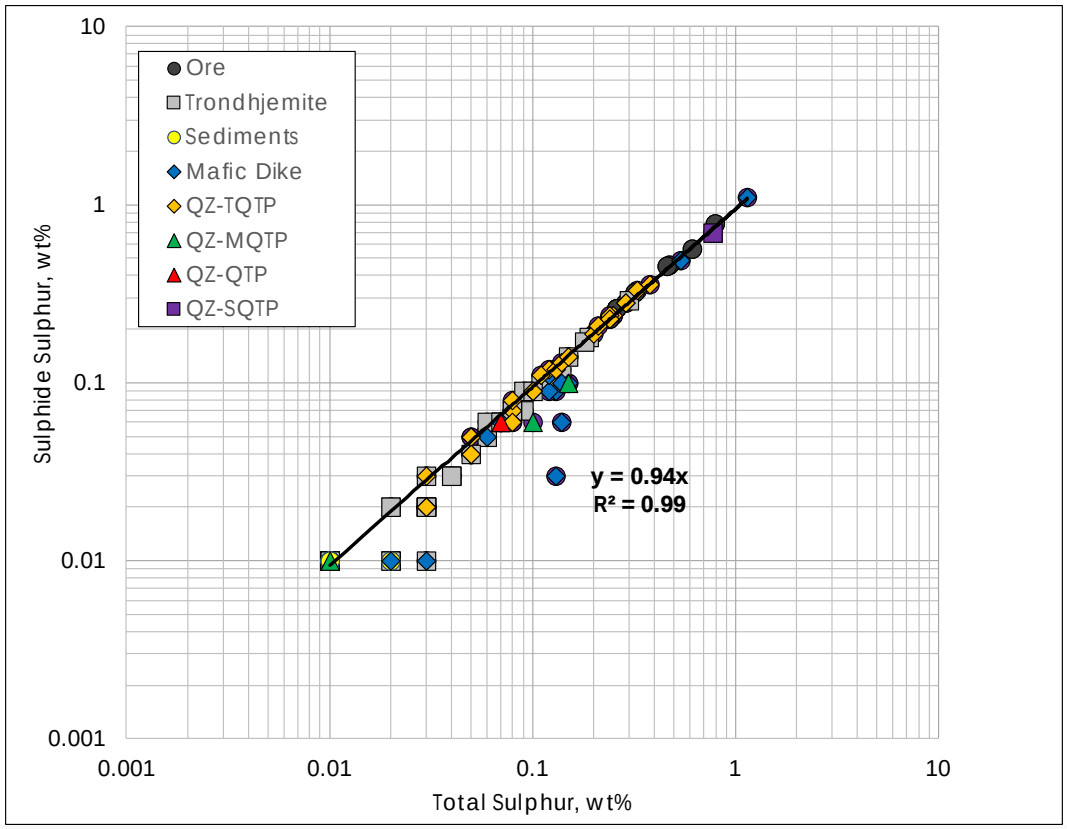

Figure D-3: Plots of Total Sulphur vs Sulphide Sulphur for Leprechaun Deposit Samples.

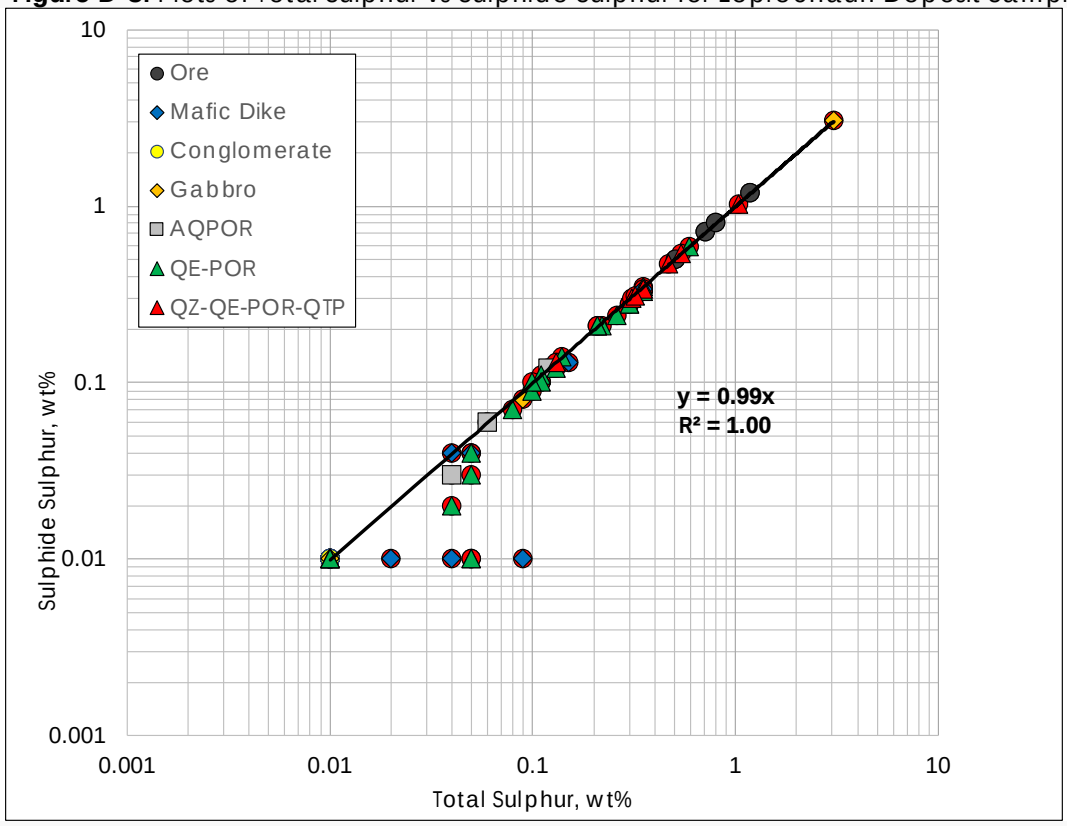

Figure D-4: Plots of Total Sulphur vs Sulphide Sulphur for Marathon Deposit Samples.

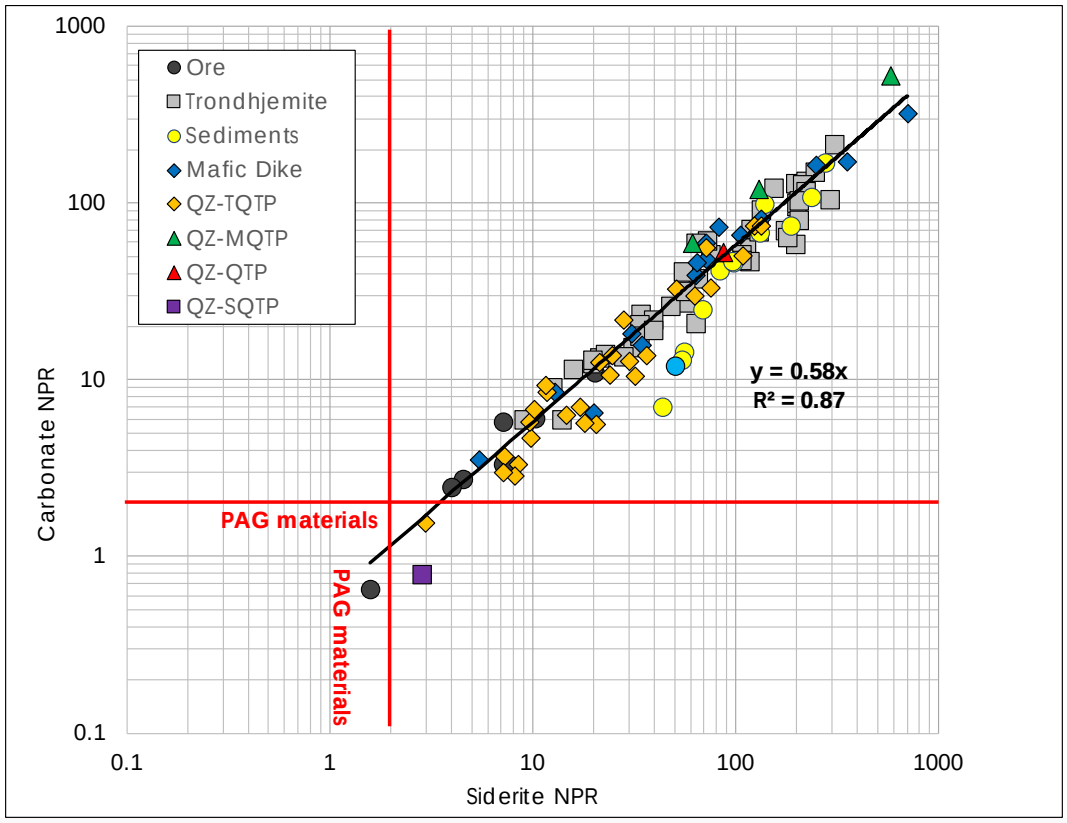

Figure D-5: Plots of Siderite NPR vs Carbonate NPR for Leprechaun Deposit Samples.

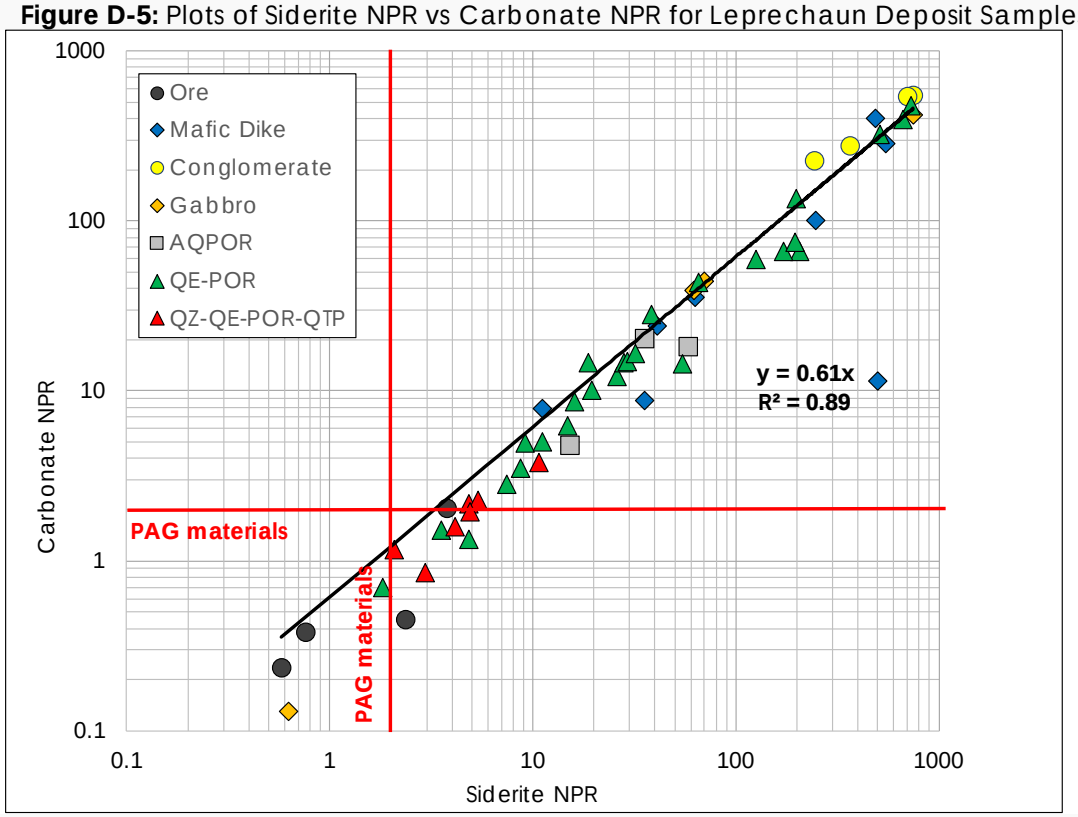

Figure D-6: Plots of Siderite NPR vs Carbonate NPR for Marathon Deposit Samples.

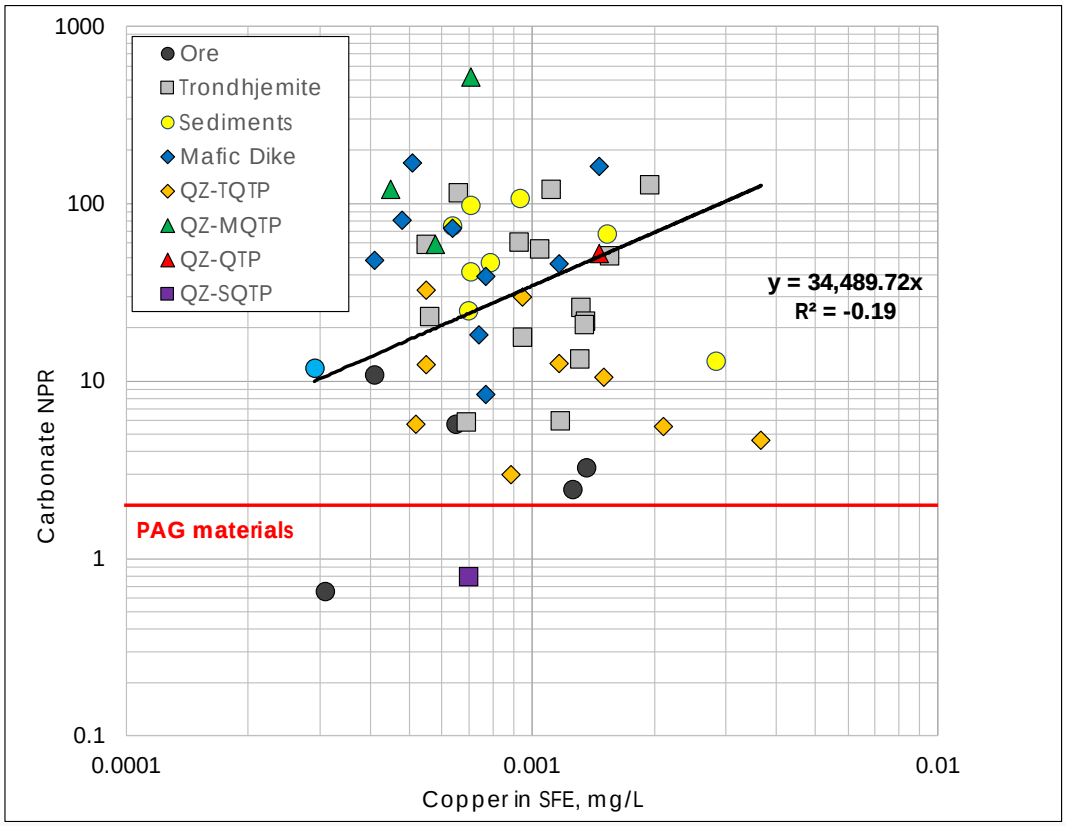

Figure D-7: Plots of Copper-SFE vs Carbonate NPR for Leprechaun Deposit Samples.

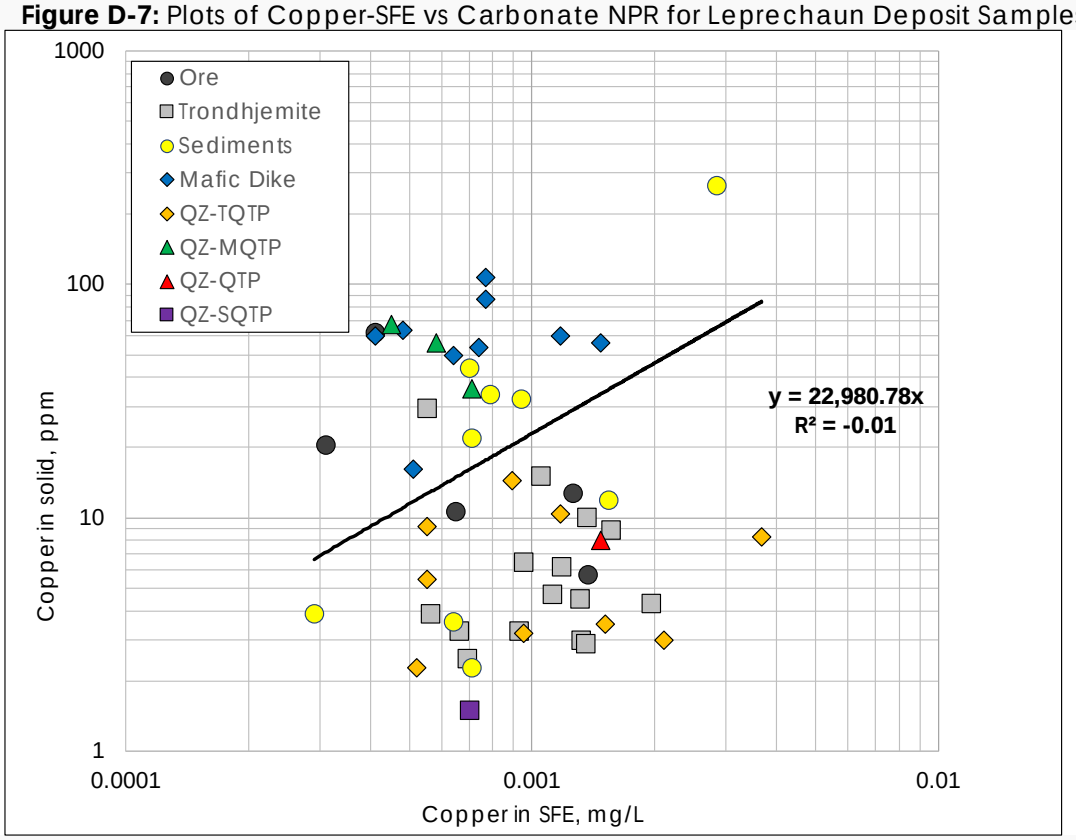

Figure D-8: Plots of Copper-SFE vs Copper-Total for Leprechaun Deposit Samples.

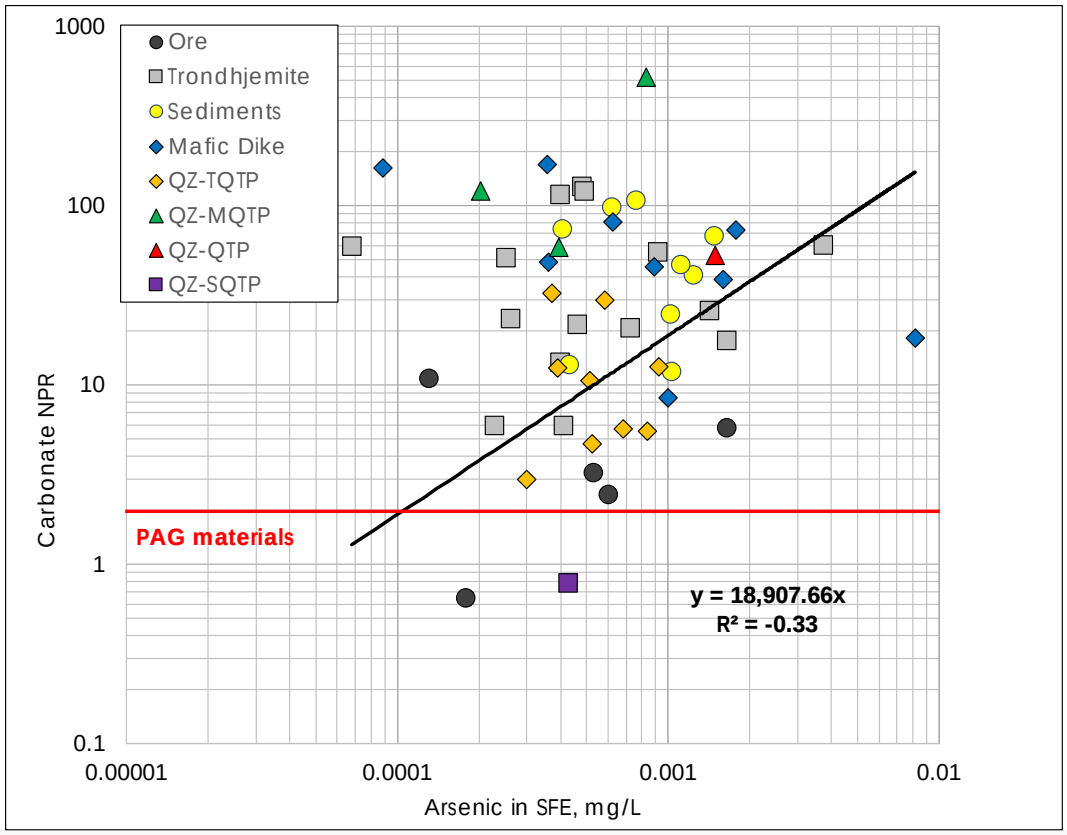

Figure D-9: Plots of Arsenic-SFE vs Carbonate NPR for Leprechaun Deposit Samples.

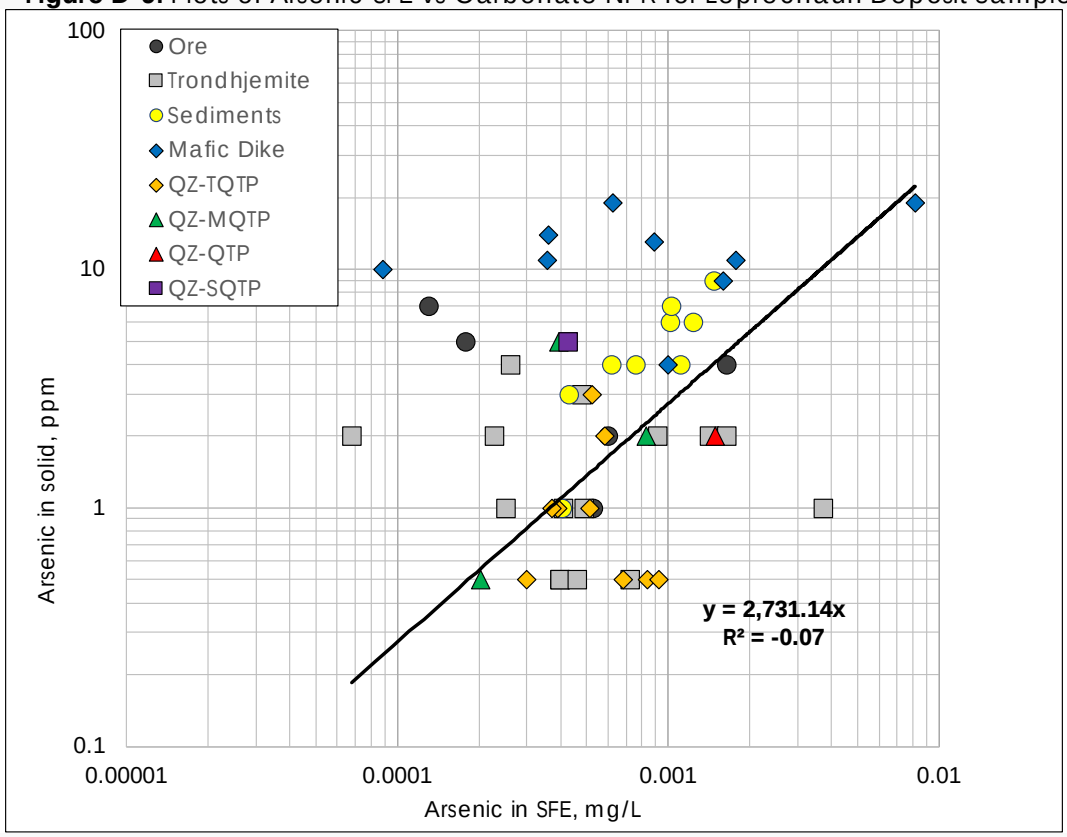

Figure D-10: Plots of Arsenic-SFE vs Arsenic-Total for Leprechaun Deposit Samples.

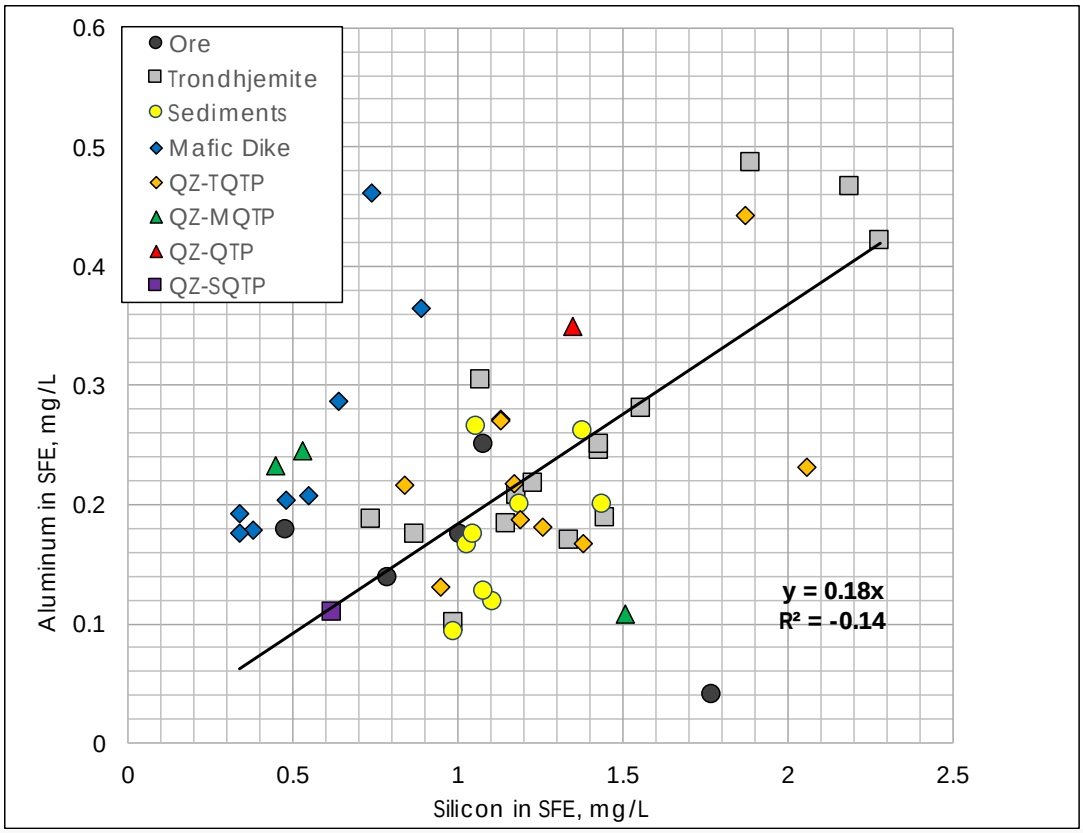

Figure D-11: Plots of Silicon-SFE vs Aluminum-SFE for Leprechaun Deposit Samples.

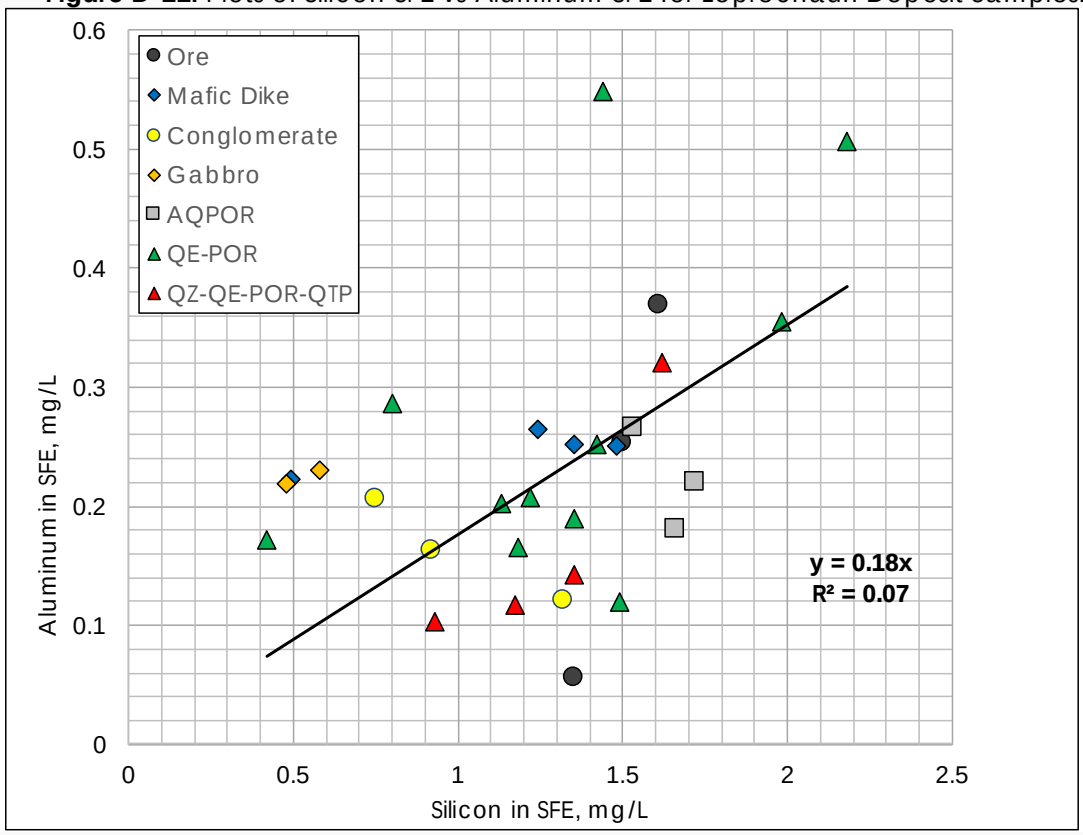

Figure D-12: Plots of Silicon-SFE vs Aluminum-SFE for Marathon Deposit Samples.

ATTACHMENT 5-B

Phase II ARD/ML Assessment

Valentine Gold Project: Acid Rock Drainage/Metal Leaching (ARD/ML) Assessment Report

Final Report

September 22, 2020

Prepared for:

Marathon Gold Corp.
36 Lombard Street, Suite 600,
Toronto, ON M5C 2X3

Prepared by:

Stantec Consulting Ltd.
141 Kelsey Drive,
St. John's, NL A1B 0L2

File No: 121416288.200

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Prepared by Elena Khozhina Digitally signed by Elena Khozhina Date: 2020.09.23 16:24:27 -05'00'
(signature)

Elena Khozhina, Ph.D., P.Ag., R.P.Bio.

Prepared by 2020.09.23 14:32:50 -05'00'
(signature)

Nikolay Sidenko, Ph.D., P.Geo.

Reviewed by Finley, Jim Digitally signed by Finley, Jim Date: 2020.09.24 13:01:36 -06'00'
(signature)

Jim Finley, Ph.D., PG.

Approved by Barry Wicks Digitally signed by Barry Wicks Date: 2020.09.24 18:07:18 -02'30'
(signature)

Barry Wicks, B.Sc.

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Executive Summary

Marathon Gold Corporation (Marathon) is currently completing an Environmental Impact Statement (EIS) for the Valentine Gold Project (the Project), located in the west-central region of the Island of Newfoundland, approximately 60 kilometres (km) southwest of the Town of Millertown, Newfoundland and Labrador (NL). Gold mineralization occurs along the fault occurring between the Valentine Lake Intrusive Complex and the Silurian Rogerson Lake conglomerate. The major types of veining encountered in the Project Area are gold-bearing quartz-tourmaline-pyrite (QTP) veins and barren quartz-calcite-chlorite veins generally hosted in felsic rock of the Valentine Lake Intrusive Complex. A pervasive carbonate-sericite and variably silicified alteration of the host rocks occurs in association with the QTP mineralized veining. The Leprechaun and Marathon gold deposits are major resources of the Project. The Project layout comprises the Leprechaun and Marathon open pits, two waste rock piles, two low-grade ore stockpiles, and two overburden stockpiles adjacent to each pit. The Project also includes an (high-grade) ore stockpile, process plant, and a tailings management facility (TMF), which is located approximately 1.5 km west of the Leprechaun pit. Ore from the pits will be mined for nine years, and for another three years, the plant will be fed from low-grade ore stockpiles. For the last three years, tailings will be deposited into the exhausted Leprechaun pit.

This report provides information about the potential for development of acid rock drainage (ARD) and metal leaching (ML) in mined materials and identifies parameters of potential concern (PoPC). This work is required to support planning and an assessment of potential environmental effects of the Project.

The methods for the ARD/ML assessment generally followed the Mine Environment Neutral Drainage (MEND) publication entitled “Prediction Manual for Characterizing Drainage Chemistry from Sulphidic Geologic Materials” (Price 2009). The geochemistry baseline program included:

- Static testing of approximately 350 samples of waste rock, ore, overburden and tailings for Acid-Base Accounting (ABA), Shake Flask Extraction (SFE), and total metals
- Characterization of composite samples using the static tests and a mineralogical methods
- Kinetic testing of composite samples including 14 humidity cells, two ageing tests and two sub-aqueous columns tests

Acid Potential (AP) was calculated from sulphide-sulphur hosted in pyrite and marcasite. Neutralization Potential (NP) was calculated from Total Inorganic Carbon (TIC) considering that calcite and dolomite are dominant acid neutralization minerals in the deposits. ARD classification is based on a Neutralization Potential Ratio (NPR=NP/AP) of samples compared to generic thresholds proposed by Price (2009). A sample is conservatively classified as Potentially Acid Generating (PAG) if NPR is below 2; otherwise, the sample is classified as non-PAG.

Metal leaching potentials were evaluated by comparing the concentrations of trace elements in the leachates from SFE and kinetic tests to the effluent quality limits prescribed in the *Metal Mining Effluent and Diamond Regulations* (MDMER) and to the Canadian Water Quality Guidelines (CWQG) for the

protection of Freshwater Aquatic Life. Concentrations exceeding MDMER and/or 10x CWQG in kinetic tests indicate parameters with high leaching potential, while concentrations between the CWQG and 10x CWQG value were arbitrarily assigned to moderate leaching potential.

The findings of this assessment are summarized below for each source of mine material:

Leprechaun Deposit

Approximately 1.9 Mm^3 of overburden will be excavated from the Leprechaun open pit. Overburden is classified as non-PAG material with moderate leaching potential for Al, Fe, Pb, and Zn, and no exceedances of the MDMER limits.

Less than 0.5% of the approximately 50 Mm^3 of Leprechaun waste rock is classified as PAG. Overall, the waste rock pile is not expected to generate ARD due to the small amount of PAG material and significant excess of NP. Therefore, specific ARD management of waste rock is not required.

There are no exceedances of MDMER limits observed in humidity cell leachates. The waste rock pile will be covered during rehabilitation reducing the already low risk of ARD/ML. Waste rock lithologies show moderate ML potential for Al, P, Cu, Se, and Zn. The assimilative capacity assessment estimates levels of these elements in the receiving environment and will address management for ML, if needed.

About 10% of low-grade ore is estimated to be PAG, but overall is not expected to generate ARD. Kinetic testing suggests moderate leaching potential for Al and P. There are no exceedances of MDMER limits observed in these tests.

Marathon Deposit

Approximately 4.4 Mm^3 of overburden will be generated from the Marathon open pit. Overburden is classified as non-PAG material, with moderate leaching potential for F, Al, As, Cd, Cu, Fe, Mn, Pb, Se, and Zn based on shake flask extracts. There are no exceedances of MDMER limits observed in leachates from overburden. Most of the stockpiled overburden will be used during reclamation.

Approximately 14% of the 60 Mm^3 of waste rock is conservatively estimated to be PAG. Blending PAG and non-PAG rock with excess of neutralization potential and/or encapsulation of PAG waste by non-PAG rock is recommended to neutralize acidity potentially generated in PAG pockets. If these recommendations are followed, the final drainage from waste rock is not expected to be acidic. The waste rock pile will be covered by growth medium / overburden during rehabilitation, further reducing the risk of ARD/ML. There are no exceedances of MDMER limits observed in leachates from the waste rock humidity cells. Overall, waste rock lithologies show moderate ML potential for Al, Hg, Se, and Zn.

Approximately one-half of the low-grade ore is conservatively classified as PAG. The ARD onset time in PAG pockets of low-grade ore is approximately six years based on maximum laboratory leaching rates. The Marathon low-grade ore stockpile effluent has been segregated from other mine component flow streams in the overall mine design to facilitate collection and further ARD treatment, if required. There are no exceedances of MDMER limits observed in leachates from low-grade ore under neutral conditions. Based on kinetic testing, Al, P and Zn have moderate leaching potential.

Plant Site

High-grade ore from the Leprechaun and Marathon deposits will be stockpiled together with 30% of the material originating from Leprechaun and the reminder from Marathon, on average. Approximately 13% and 67% of ore samples from Leprechaun and Marathon pits, respectively are conservatively classified as PAG. The overall mixture of Leprechaun and Marathon high-grade ores is non-PAG and the high-grade ore stockpile is not expected to generate ARD. Drainage from the high-grade ore stockpile flows to the TMF by gravity and any potential acidity will be neutralized in the decant pond or in the mill during pH adjustment required as a part of the gold recovery by cyanide process. No exceedances of MDMER are observed in SFE extracts. Moderate Al leaching was assigned for both Leprechaun and Marathon high-grade ores.

Approximately 41 Mt of tailings will be produced from both high-grade ore and low-grade ore with about 38% of the material originating from the Leprechaun pit and the remainder from the Marathon pit.

Composite samples of tailings from both deposits are classified as non-PAG and are not expected to generate ARD. During operation, TMF pond and pore water will likely exceed the MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu sourced from process water. In addition, high leaching potential is also determined for total ammonia, CN_{WAD} (surrogate for free), F, Hg, P, and Fe. After closure, covered tailings beaches are not expected to produce acidic runoff and/or have high or moderate leaching except for P. Seepage from the TMF is conservatively predicted to exceed MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu in post-closure. Requirement for treatment is further predicted by the water quality models and assimilative capacity assessment and discussed in the EIS.

Abbreviations

Parameter	Comment
ABA	Acid-Base Accounting
ACUC	Average Concentration in the Upper Crust
AP	Acid Potential
ARD/ML	Acid Rock Drainage/Metal Leaching
CEA Agency	Canadian Environmental Assessment Agency
CND	Cyanide Destruction
CVAAS	Cold Vapor Atomic Absorption Spectroscopy
CWQG FAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life.
EIS	Environmental Impact Statement
HCT	Humidity Cell Testing
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
$kgCaCO_3/t$	Kilogram $CaCO_3$ per tonne
km	Kilometre
LGO	Low-Grade Ore
m	Metre
MDMER	*Metal and Diamond Mining Effluent Regulations*
MEND	*Mine Environment Neutral Drainage*
mg/L	Milligrams per liter
mL	Milliliter
Mt	Megatonne
NAG	Net Acid Generating
NNP	Net Neutralization Potential
NP	Neutralization Potential
NPR	Neutralization Potential Ratio
PAG	Potentially Acid Generating

PoPC	Parameters of Potential Concern
PSD	Particle Size Distribution
QEMSCAN	Quantitative Evaluation of Materials by Scanning Electron Microscopy
DL	Detection Limit
SFE	Shake Flask Extraction
t/day	Tonnes per day
TEC	Total Element Concentrations
TIC	Total Inorganic Carbon
TMF	Tailings Management Facility
VC	Valued Component
wt.%	Percent by weight
%	Percent
µS/cm	Microsiemens per centimeter
˚C	Degrees Celsius

1.0 INTRODUCTION

Marathon Gold Corporation (Marathon) is currently completing environmental baseline studies and an Environmental Impact Statement (EIS) for the Valentine Gold Project (the Project). The Project is located in the west-central region of the Island of Newfoundland, approximately 60 kilometres (km) southwest of the Town of Millertown, Newfoundland and Labrador (NL) (Appendix A, Figure A-1). The Project Area includes several significant gold deposits, the Leprechaun, Marathon, Sprite and Victory gold deposits (Ausenco 2020). The Leprechaun and Marathon deposits represent 90-95% of the Valentine Lake property resources; these two deposits form the planned open pits for the Project and the EIS and are addressed in this report. The Project Area does not contain historical mining features, such as facilities associated with extraction and processing of ore.

The mine site layout comprises the Leprechaun and Marathon open pits, a waste rock pile and low-grade ore stockpile adjacent to each of these pits, a processing plant, and a tailings management facility (TMF) (Appendix A, Figure A-2). Ore from the pits will be mined for approximately nine years, and for another three years, the plant will be fed from low-grade ore stockpiles. For last three years, tailings will be deposited into the exhausted Leprechaun pit.

1.1 PURPOSE

The exposure and weathering of some mine materials may result in acid generation and/or leaching of contaminants causing degradation of runoff and groundwater quality. The geochemistry program provides information about the acid rock drainage (ARD) classification of mine materials and screening of parameters of potential concern (PoPC). Geochemical characterization is required to support planning and an assessment of potential environmental effects of the Project, including mine closure.

As part of environmental baseline studies, Stantec Consulting Ltd. (Stantec) was retained to conduct a geochemical evaluation and provide assessment of the Acid Rock Drainage/Metal Leaching (ARD/ML) properties of materials exposed by the Project. The baseline geochemistry work has been conducted in two phases. Phase I was focused on the analysis of static testing of rock and ore samples from the Leprechaun and Marathon deposits (Stantec 2018). Phase II work includes kinetic testing and additional static tests. The major tasks completed during Phase II were:

- Additional static testing to satisfy Mine Environment Neutral Drainage (MEND) requirements for number of samples
- Kinetic testing of representative samples of waste rock lithologies and different ore grades to assist in predicting the chemistry of runoff and seepage from stockpiles and pit walls. Site-specific ARD criteria and ARD onset time can be derived from the results of kinetic tests and used for development of waste rock and tailings management plans
- Mineralogical and geochemical characterization of samples selected for kinetic tests

As part of the recent metallurgical testing, ARD/ML characterization of ore and tailings were also conducted. This report includes analysis of available data from Phase I and Phase II of ARD/ML evaluation, as well as ARD/ML testing of ore and tailings.

1.2 REPORT STRUCTURE

This report consists of 10 sections and four appendices that present the results of the ARD/ML assessment:

- Section 1: Introduction
- Section 2: Regulatory Requirements
- Section 3: Methodology
- Section 4: Results
- Section 5: Discussion
- Section 6: Conclusions
- Section 7: References
- Appendix A: Figures
- Appendix B: Tables
- Appendix C: Plots
- Appendix D: Certificates of Analyses and Tabulated Results

2.0 REGULATORY REQUIREMENTS

2.1 REGULATORY REQUIREMENTS

The ARD/ML assessment has been designed to satisfy the Provincial and Federal EIS Guidelines issued for the environmental assessment of the Project under the Newfoundland and Labrador *Environmental Protection Act* (Government of NL 2020) and the *Canadian Environmental Assessment Act, 2012* (CEA Agency 2019), respectively. The Federal EIS Guidelines recommend use of the “Manual for Drainage Chemistry from Sulphidic Geologic Materials" produced by the MEND for ARD/ML prediction (Price 2009). This manual was used in developing the study design and establishing ARD classification for this study. This study also considered the federal “Environmental Code of Practice for Metal Mines” prepared by Environment and Climate Change Canada (Environment Canada 2009).

The water quality criteria applicable to this study include the following:

1. Schedule 4 of *Metal and Diamond Mining Effluent Regulations* (MDMER) promulgated under the *Fisheries Act* (SOR/2002-222 2020)
2. Canadian Water Quality Guidelines (CWQG) for Protection of Freshwater Aquatic Life (FAL) (Canadian by Council of Ministers of the Environment [CCME] 2020)
3. Schedule C of Newfoundland and Labrador Regulation 65/03 *Environmental Control Water and Sewage Regulations*, 2003 under the *Water Resources Act* (O.C. 2003-231) (NLR 65/03 2003)

Schedule C of the Newfoundland and Labrador Regulation 65/*03* refers to Sections 3, 19.1, and 20 and Schedule 4 of the MDMER as follows:

"A person primarily in the Metal Mining Industry shall comply with sections 3 and 19.1 and 20 and Schedule 4 of the Metal Mining Effluent Regulations (Canada) SOR/2002-222, including any changes or amendments to those sections of and that schedule to those regulations over time."

Therefore, the CWQG and MDMER are the water quality criteria applied in this report.

2.2 DATA REQUIREMENTS

Provincial EIS Guidelines (Government of NL 2020) require ARD/ML program report investigation to include the following:

- the design of the ARD/ML program and, if a phased program, the chronology of ARD/ML investigations (include all mineralogy, elemental analysis, static and kinetic test work conducted to date)
- determination of the distribution of sample test results for each lithological/alteration/waste management unit. The assessment should account for vertical and horizontal distribution, as well as sampling biases, to permit proper characterization of the unit including the units range of variability
- the rationale, advantages and disadvantages including a description, for all test work
- predictions of the ARD/ML potential of all material management units (ore, waste rock, overburden, quarry materials and tailings) to be disturbed or created during all phases (construction, operation, decommissioning, reclamation and post-closure) of the proposed project. This shall include an interpretation of the results, an estimation of risk for the onset of ARD for each lithological/alteration/waste management unit and the predicted drainage chemistry for each unit (including the types and concentrations of major trace elements)
- clear, concise cross-sections which relate the ARD/ML assessment (static/kinetic sample locations and results), geology, and Project development plans

As required by the Federal EIS Guidelines (CEA Agency 2019), available baseline information provides sufficient detail to allow assessment of how the Project could affect Valued Components (VCs) with respect to ARD/ML potential (including oxidation of primary sulphides and dissolution of soluble secondary sulphate minerals) for the following components of the ore deposit:

- The bedrock and host rock geology of the deposit, including a table of geologic descriptions, geological maps and cross-sections of appropriate scale
- The geochemical characterization of expected mine material such as waste rock, high-grade ore, low-grade ore, tailings, overburden and potential construction material

To predict changes in water quality resulting from carrying out each phase of the Project (construction, operation, decommissioning, rehabilitation and closure) the ARD/ML characteristics of waste rock, high-grade ore, low-grade ore, tailings, overburden and potential construction material have been investigated, including:

- Short term ML properties
- Longer term rates of acid generation (if any) and ML
- Estimates of the potential for mined materials (including waste rock, tailings and low-grade ore) to be sources of ARD/ML
- Estimates of potential time to the onset of ARD/ML
- Quality of leachate from samples of tailings, waste rock, and ore
- Quality of humidity cell or column test leachate from acid rock testing
- Sensitivity analysis to assess the effects of imperfect segregation of waste rock
- Quality of drainage from the site to receiving waters
- Pit water chemistry during operation and post-closure, and pit closure management measures (e.g., flooding). This will include geochemical modelling of pit water quality in the post-closure period
- Surface and seepage water quality from the waste rock piles, TMF, stockpiles and other infrastructure during operation and post-closure.

This report discusses each of these items, with the exception of the last three, which are addressed in the water balance and water quality modeling reports (Stantec 2020a, 2020b, 2020c). This report provides inputs to the water quality model.

3.0 METHODOLOGY

3.1 SAMPLING

3.1.1 Individual Samples

For individual overburden, waste rock, low-grade ore, and high-grade ore samples (totaling 322 samples, including 153 samples for Leprechaun and 169 samples for Marathon) evaluation of ARD and ML risks were carried out based on analysis of carbonate neutralization potential ratios (NPR), total element concentrations (TEC), and SFE, including mercury (Hg).

Collection of samples for geochemistry baseline programs occurred in 2017 and 2019 during Phase I and II ARD/ML programs. A total of 322 individual samples of ore and waste rock were collected from the exploration drill cores, excluding internal standards and blanks. The individual samples usually represent from 1.0 to 1.5 m intervals of core, with a few exceptions of shorter cores.

Twenty samples of overburden were collected by Gemtec from geotechnical test pits and drill holes located near the proposed open pits (Gemtec 2019). Sampling intervals and descriptions of the overburden samples can be found in Gemtec (2019).

All samples were submitted to SGS Canada Inc. laboratories. The analytical methods are summarized in Section 3.2 and laboratory reports are presented in Appendix D-1 to D-3.

3.1.2 Composite Samples

Select individual samples from the Phase II program were used to create ten composite samples of different waste rock lithologies, including TRJ, L QZ-TQTP, L SED, L MD, and L QZ-QTP for Leprechaun and M QE-POR, M AQPOR, M CG, M MD, and M QZ-QE-POR-QTP-MIN for Marathon (Appendix B, Table B-2). These composite samples were prepared from the individual core samples crushed to minus 6 mm (¼") for detailed characterization and laboratory (humidity cells) kinetic testing. Two composite samples were prepared for low-grade ore from the individual geochemical samples: L LGO for Leprechaun and M LGO for Marathon. The descriptions of the composite samples are presented in Table B-1 (Appendix B).

As part of a metallurgical study conducted by others, composite samples of ore, including LLGO-Met for Leprechaun and MLGO-Met for Marathon, and solid tailings were derived from the process design work (Goode, 2019a and b, SGS 2019, 2020a, and 2020b). Metallurgical low-grade ore composites (LLGO-Met and MLGO-Met) were selected for kinetic testing since they are more representative and Acid-Base Accounting (ABA) is more conservative (higher S and AP and lower NPR) than the low-grade composites created from the individual geochemical samples (Appendix B).

Tailings for Leprechaun (CND2) and Marathon (CND1) were used for this study (Appendix B, Table B-2). The combined tailings from each of the bulk leach procedures for Leprechaun and Marathon flotation concentrates were subjected to CN destruction (CND) tests using the Inco Air-SO_2 process and the Picric acid determination to obtain weak-acid dissociable cyanide (CN_{WAD}) levels from ~0.5 to 2 mg/L depending on the level of copper (Cu) addition.

The humidity cells containing the composite samples were set up by SGS, as shown in Appendix B, Table B-2.

3.2 LABORATORY ANALYSES

3.2.1 Static Testing

Preparation of individual samples for static testing included drying samples at 60°C, crushing, subsampling, and pulverization to 200 mesh (0.74 mm). The SGS Metallurgical Study describes preparation and leaching procedures (SGS 2019, 2020a, and 2020b).

In this report, static testing is defined as the following analyses: ABA, Net Acid Generating (NAG) testing, total concentrations of trace elements, and Shake Flask Extraction (SFE) testing. Methods for these tests are discussed below in detail.

ABA included the following analyses of samples:

- Paste pH was measured by inserting a combination pH electrode into a sample paste using a ratio of 1:2 water-to-solid solution

- Total S was analyzed by the Horiba induction furnace (Horiba) with an infrared detector (IR) at or above 1,650 °C
- Sulphate-sulphur ($S_{SULPHATE}$) was extracted by a 15% hydrochloric acid (HCl) digestion method and the leachate was measured for sulphate (SO_4) by gravimetric methods
- Acid Potential (AP) was calculated from difference between from the measurement of total and $S_{SULPHATE}$ species in a sample
- Total Inorganic Carbon (TIC) was analyzed by the conversion of carbonate minerals to carbon dioxide using dissolution in hydrochloric acid and the liberated carbon dioxide gas measured using colorimetric titration. Carbonate carbon was calculated as a concentration of TIC using conversion for molecular weight
- Neutralization Potential (NP) was determined using the modified-Sobek method, with the addition of hydrochloric acid over 24 hours at room temperature to maintain the pH between 1.5 and 2.0. The extract was then filtered and titrated with sodium hydroxide (NaOH). In the Phase I program, the filtrate was treated with hydrogen peroxide (H_2O_2) to oxidize ferrous iron (Fe) to ferric Fe prior titration. This method is also referred to as the Modified Sobek neutralization potential with siderite correction. Siderite correction H_2O_2 should not make any significant effect on resulting NP based on the mineralogy of project samples and recent study comparing two methods (i.e. with and without siderite correction)
- Carbonate NP was calculated as a concentration of TIC using a conversion for calcium carbonate and carbon

The NAG test was used as an additional method to verify the ARD potential of tailings samples involved in the metallurgical study. The NAG test involves the reaction of 150 mL of 15% H_2O_2 at room temperature with 1.5 g of pulverized sample in 1:100 (solid:solution) mass ratio for 12 hours, and then boiled. The resulting NAG extract pH is measured and then titrated with NaOH to endpoint pHs of 4.5 and 7.5. The NAG testing is completed before the start of the humidity cell testing (pre-HCT) and after the shutdown (post-HCT).

Total concentrations of trace elements were measured in 322 samples collected as part of the baseline study. This testing involved *aqua-regia* digestion of pulverized samples followed by analysis using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Mercury was analyzed using Cold Vapor Atomic Absorption Spectroscopy (CVAAS).

SFE testing was used to assess short-term leaching of trace elements in 96 samples during the Phase I program as described in Stantec (2018). All samples were crushed to minus 6 mm (¼") except for tailings, which are finer grained. The SFE testing involved continuous mixing of 250 g of a crushed sample with 750 mL of deionized water for 24 hours. The resulting leachate was filtered through a 0.45-µm membrane and analyzed for trace elements by ICP-MS and for Hg by CVAAS. In addition, SFE leachates were analyzed for pH, alkalinity by titration, and sulphate by colorimetric analysis.

The certificates of analyses of these static tests are presented in Appendix D.

3.2.2 Characterization of Composite Samples

Broad geochemical characterization was done on composite samples selected for kinetic testing. These samples were subjected to:

- ABA, SFE, and total metals analyses as described previously
- Net Acid Generation (NAG)
- Particle Size Distribution (PSD) tests, consisting of dry screening in combination with the hydrometer method suitable for particle sizes less than 75 mm (or 200 mesh). The hydrometer method involves a dispersing agent, which allows for wet screening a sample at specific time intervals. The final dry weight of the sample is recorded, and a series of calculations are performed. The results of the PSD analyses were used for the water quality predictions discussed in the respective reports ()
- For the waste rock composite samples, Quantitative Evaluation of Materials by Scanning Electron Microscopy (QEMSCAN) is used for quantitative mineral abundance. For the low-grade ore composite samples (LLGO-Met and MLGO-Met), mineral identification and interpretation is based on simple bulk mineralogy analyzed with QEM Automated Rapid Mineral SCAN (METH# 8.11.1) and X-ray Diffraction (XRD), which provide semi-quantitative mineral abundance, as well as liberation and grain size analyses of minerals

The results of the above described geochemical characterization are presented in Appendix B.

3.2.3 Kinetic Tests

3.2.3.1 Humidity Cell Tests

Fourteen humidity cells containing composite samples of waste rock, ore, and tailings were set up by SGS, as shown in Table B-2 (Appendix B). A kilogram of sample was split from a larger composite, placed into a standard cell and subjected to weekly “air and flood” cycles. The humidity cells were leached weekly with 1 L of deionized water. The HCT effluents were filtered through a 0.45-µm membrane and tested for the following parameters:

- pH and conductivity using electrodes
- Alkalinity by titration
- Sulphate and fluoride (F) by turbidimetry
- Trace elements by ICP-MS
- Mercury by CVAAS

Effluent pH and conductivity were tested weekly from Week 0 to Week 22. Alkalinity, SO_4, F, trace elements and Hg were measured at weeks: 0, 1, 2, 4, 8, 12, 16, 18, 20, and 22.

Humidity cells were run for at least 22 weeks in total and showed stable leaching rates for sulphate and metals at least for last 5 weeks. Analytical results of humidity cell tests are presented in Appendix D.

3.2.3.2 Ageing Tests

To account for the natural degradation of cyanide and ammonia species, and the attenuation of trace elements in tailings water, supernatant from the tailings slurry after cyanide destruction was subjected to ageing tests (Table B-2, Appendix B). The tailings pulp supernatant was mixed at 200 rotation per minute for 1 hour before being split into five representative test charges. Test charges were then allowed to age undisturbed under ultraviolet (UV) lamps for 24 hours per day. The test charges were: sampled at the beginning of the test (day 0) and then on days 7, 14, 28, and 56; filtered through a 0.45-µm membrane; and analysed for general water chemistry, trace elements, nitrogen, and cyanide species following the same methods as leachates from humidity cells. Analytical results of ageing tests are presented in the laboratory certificates of analysis in Appendix D.

3.2.3.3 Sub-aqueous Column Tests

Two samples (CND 1 and CND 2) of tailings resulting from the cyanide destruction procedure were subjected to sub-aqueous column tests to simulate seepage quality from the TMF under flow-through conditions. A 3-kg dry equivalent weight of tailing slurry was loaded into a column and allowed to settle overnight. Process water was added to the column from Week 0 to Week 8. Deionized water, spiked with Li, was added to the column after Week 8 to simulate infiltration to tailing after closure. Samples of column effluent were collected at the base of the column at the beginning of the test (Week 0), then Week 1, 2, and 4 and every fourth week thereafter. The sampled solutions were filtered through a 0.45-µm membrane and tested for similar parameters, and using the same methods, as ageing tests. The analytical results of sub-aqueous columns tests are presented the laboratory certificates of analysis in Appendix D. The results from the columns tested up to Week 30 are considered in this report. The columns will be continued until Week 40.

3.2.4 Quality Control

All analyses described above were completed by SGS Canada Inc. analytical laboratory, which is certified for the analyses discussed in this report by the Canadian Association for Laboratory Accreditation (CALA). Laboratory certificates contain specific details on the methods. Quality Assurance / Quality Control (QA/QC) used for the analyses are provided in Appendix D, including analysis of a standard sample, laboratory duplicate samples, and spike recoveries for every batch of samples. The sample batch size has been determined from the source methods and approved through CALA accreditation.

Additional QA/QC measures were applied, including the following:

- SGS laboratory was contracted to provide high-quality analyses to ensure that the method detection limits (DLs) for all analyzed parameters were less than the CWQG-FAL guidelines. The laboratories have internal QA/QC procedures to meet the contractual obligations; and
- All results of analysis have been screened following Stantec's Standard Operating Procedures. In the event of a discrepancy, samples were rechecked or reanalyzed to confirm or replace the originally reported value.

The following sections describe the criteria for ARD/ML classification for the materials produced from the Leprechaun and Marathon sites.

3.3 CALCULATIONS AND CLASSIFICATION CRITERIA

3.3.1 ARD Criteria

3.3.1.1 Static Tests

The method for the ARD/ML assessment generally follows the MEND Manual (Price 2009). ARD classification is based on NPR of samples compared to generic thresholds established by Price (2009) and includes the following:

$$\text{Carbonate NPR} = \text{Carbonate NP/AP},$$

- where NP and AP are Neutralization and Acid Generation potentials, respectively.

The MEND Manual recommends classifying samples as follows:

- PAG, if NPR is less than 1;
- Uncertain ARD potential if NPR is between 1 and 2; and
- A non-PAG if NPR is greater than 2.

To eliminate the uncertainty related with the samples within the range of NPR between 1 and 2, a sample is conservatively classified as PAG if NPR is below 2. The paste pH and SFE pH values were used to confirm if any of the samples with NPR below 2 have generated acid.

Carbonate NP was calculated using the laboratory results of analysis of TIC and by applying the following equation:

$$\text{Carb. NP } (CaCO_3 \text{ kg/t}) = \text{Total Inorganic Carbon (wt.\%)} \times (100.09/12.01) \times 10, \quad (3.3\text{-}1\text{-}2)$$

where 100.09/12.01 is the ratio of the molar mass of calcium carbonate to elemental carbon and 10 is the conversion factor from wt.% to kg/t.

Siderite NP and carbonate NP are very close in samples from both deposits and generally plot along a 1:1 line if carbonate NP is above approximately 40 kg $CaCO_3$/t for the Leprechaun deposit and approximately 20 kg $CaCO_3$/t for the Marathon deposit (Figures D-1 and D-2 in Appendix D in Stantec 2018). Below these values, Siderite NP reports noticeably higher values than carbonate NP. Therefore, carbonate NP will produce lower NPR values than Siderite NP resulting in a more conservative ARD classification of samples with low NP. Hence, carbonate NP is selected for ARD/ML assessment for the Project.

AP was calculated by the laboratory as the arithmetic difference between total Sulphur and Sulphur extractable by HCl acid, the difference was then multiplied by the conversion factor of 31.25:

$$AP = 31.25 \times (\text{Total Sulphur, wt\%} - \text{HCl Extractable Sulphur, wt\%}) \quad (3.3\text{-}2)$$

This calculation is valid for all samples of waste rock, ore, and tailings with total sulphur content greater than 0.1 wt.% because almost all sulphur occurs as sulphide in these samples (Appendix D and Figures D-3 and D-4 in Stantec 2018). In samples with total sulphur content less than 0.1 wt.%, AP is overestimated, which is true for several overburden samples. Overestimation of AP reduces NPR values, resulting in more conservative ARD classification.

For completeness, Net Neutralization Potential (NNP) was calculated and reported using the following equation:

$$NNP\ (kg\ CaCO_3/t) = \text{Carb. NP} - AP \quad (3.3\text{-}3)$$

Values below the respective detection limits (DL) were set to a value of 1/2 DL in calculations presented in this report.

Carbonate NP, AP and Carbonate NPR in composite ore samples are calculated using carbonate carbon and sulphide-sulphur ($S_{SULPHIDE}$) analysis obtained by SGS (2019, 2020a, and 2020b).

3.3.1.2 Kinetic Tests

Site-specific ARD criteria and ARD onset time can be derived from the results of kinetic tests and potentially used for development of waste rock and tailings management plans. Weekly acidity and alkalinity mass rates were calculated by multiplying the concentrations of sulphate and alkalinity by the volume of recovered leachate and dividing by the mass of material in the humidity cell. For humidity cells, average sulphate production or alkalinity depletion rates were calculated for the first month (five weeks) and are considered representative of the first flush. Data for the last month (five weeks) represents steady-state conditions. Therefore, the average leaching rate for the last month was used for calculations of long-term leaching rates discussed in this section. For kinetic tests, concentrations reported below the detection limits were set at one half the value of the detection limit for statistical calculations (Appendix B).

The average sulphate, acidity, and alkalinity production rates were used as inputs in equations 3.5-7 and 3.5-8. Average rates of AP and NP consumption for the humidity cells were calculated using equations 3.5-9 and 3.5-10 (Table 18.1 in Price 2009):

$$\text{AP depletion rate } (CaCO_3 \text{ mg/kg/week}) = \text{Sulphate production rate (mg/kg/week)} \times 100.09/96.06 \quad (3.5\text{-}7)$$

$$\text{Empirical Open System NP depletion rate } (CaCO_3 \text{ mg/kg/week}) = \text{AP depletion rate } (CaCO_3 \text{ mg/kg/week}) + (\text{Alkalinity Production Rate } (CaCO_3 \text{ mg/kg/week}) - \text{Acidity Production Rate } (CaCO_3 \text{ mg/kg/week}) \quad (3.5\text{-}8)$$

Depletion time for AP and NP were calculated as follows:

$$\text{AP depletion time (years)} = \text{AP (kg } CaCO_3\text{/t)} / \text{AP depletion rate (mg } CaCO_3 \text{ /kg/week)} \times 1000/(365/7) \quad (3.5\text{-}9)$$

$$\text{NP depletion time} = \text{NP (kg } CaCO_3\text{/t)/ Empirical Open System NP depletion rate (mg } CaCO_3 \text{ /kg/week)} \times 1000/(365/7) \quad (3.5\text{-}10)$$

3.3.2 Metal Leaching Criteria

ML is the term initially applied to metals; however, in current practice, this term generally defines a broad range of trace elements, including such metalloids as arsenic (As) and selenium (Se). To screen for PoPC, metal concentrations and pH in SFE leachates were compared to respective parameters prescribed by the MDMER, Table 1 of Schedule 4, in the case of a green-field mine that starts on or after June 1, 2021. The results of the SFE were also compared with the CWQG-FAL (hereafter, CWQG, CCME 2020). For temperature-, pH-, hardness-, and DOC-dependent guidelines, the lowest CWQG values were used conservatively. Comparison of the SFE results to the MDMER limits and CWQG represents a qualitative comparison because the rock:solution ratio of 1:3 used in the leaching tests will differ from the actual Project field condition ratio.

Kinetic tests generally better predict concentrations of elements in contact waters than short-term SFE tests. In kinetic tests leachates and metal concentrations were also compared to the MDMER and CWQG to re-evaluate PoPC identified from short-term leaching tests (SFE). The magnitude of MDMER and CWQG exceedances resulted in the following reclassification of leaching potential:

Concentration exceeds MDMER and/or 10x CWQG – high potential

Concentration is between 10x CWQG and CWQG – moderate potential

Concentration is below CWQG – low potential

This classification was applied to kinetic tests, including humidity cells, ageing and sub-aqueous column tests.

Total metal content in the ore, waste rock, and overburden was compared with average elemental abundances in the upper Earth's crust or Average Concentration in the Upper Crust (ACUC) (Rudnick and Gao 2004). Element concentrations exceeding ten times (10x) the average elemental abundances were arbitrarily selected to show an enriched sample. However, elemental enrichment alone does not adequately predict the leaching behavior of that element and probably does not have environmental significance. Therefore, exceedances of 10x the average elemental abundances in the upper crust were only discussed for elements showing leaching potentials from SFE analyses and/or exceedances in kinetic tests.

4.0 RESULTS

4.1 LEPRECHAUN DEPOSIT

4.1.1 Geology

The geznological description is mostly based on the Micon reports (2012 and 2017) that summarize previous findings. The Project lies approximately 15 km south of the north-northeast trending Red Indian Line, which is a major regional structure separating the rocks of the Victoria Lake Group from the younger Buchans volcanic sequence.

Gold mineralization occurs along the boundary between the Valentine Lake Intrusive Complex and the Silurian Rogerson Lake conglomerate, which lies on the eastern flank of the Valentine Lake Intrusive Complex. The gold mineralization forms a thin, but laterally extensive unit that lies unconformably (overturned) on the southeast margin of the Valentine Lake Intrusive Complex (Appendix A, Figure A-3).

The Valentine Lake property underwent an initial deformation event (D1) associated with the strong northeast trending foliation and a small-scale isoclinal folding event (D2). The fabrics associated with the D1 event, consist of a mica foliation (S1), locally grading to metamorphic layering, and, within the conglomerates, by elongation and flattening of the clasts along a prominent lineation direction (L1) plunging at 50º with an azimuth of 150º. The more competent lithologies, such as the trondhjemite, deformed in a brittle fashion resulting in quartz filled, tension-gash veins and providing a route for later emplacement of mafic dikes. All intrusive rocks demonstrate saussuritization of plagioclase and strong alteration of mafic minerals to chlorite and epidote.

The Leprechaun deposit lies along a major regional fault zone at the southwestern end of the Valentine Lake property. The Leprechaun deposit is hosted by dominantly trondhjemite (logged as granodiorite) comprising approximately 80% of the proposed open pit based on the geological model (Appendix A, Figures A-4). The remaining 20% of the deposit is in sedimentary host rocks: conglomerates, banded- to finely-laminated siltstones, argillites, and tuffaceous siltstones, with minor intercalated mafic tuffs.

The host lithologies in both deposits, Leprechaun and Marathon, are deformed with a strong penetrative foliation and lineation. The major types of veining encountered in the Project Area are gold-bearing quartz-tourmaline-pyrite (QTP) veins and barren quartz-calcite-chlorite veins. The QTP veining occurs as dominantly shallow southwest dipping extensional veining with orientation high angle to the penetrative stretching lineation and as lesser steep northwest to sub-vertical shear parallel veining. A pervasive carbonate-sericite and variably silicified alteration of the host rocks occurs in association with the QTP mineralized veining.

The Leprechaun deposit consists of dominantly shallow southwest dipping echelon stacked extensional quartz-tourmaline-pyrite (QTP) veins and lesser steep northeast dipping, shear parallel QTP veins that collectively form a northeast-southwest striking mineralized corridor dipping 65 degrees to the northwest and ranging from 25 to 40 meters wide (Appendix A, Figures A-5 and A-6). Shallow-dipping mineralization is recognized to extend beyond the boundaries of the main, steeply-dipping mineralized structure, into the hanging wall. Mineralization occurs in several domains including the Main zone, focused proximal to two large mafic dikes, and Zones 2 and 3, which are in the hanging wall and footwall, respectively.

Discontinuous mafic dikes are parallel to the Main zone and appear to be intimately associated with the development of mineralized veins. Immediately above the upper mafic dike, in contact with the hanging wall, are zones of mineralized tension-gash quartz-tourmaline veins.

4.1.2 Mineralogy

The mineralogical analysis is carried out for the five waste rock lithologies and the Leprechaun low-grade ore composite samples described in this section. A dominant mineral in each lithology is either plagioclase or quartz, the most common rock forming minerals (Appendix B, Table B-3). Minerals that can potentially contribute to ARD/ML drainage are sulphides: chalcopyrite, pyrite, and marcasite. Minerals that can potentially neutralize ARD are ankerite, calcite, and dolomite.

Major minerals in trondhjemite lithology (L TRJ) are plagioclase (42%) and quartz (32.2%), followed by muscovite/illite (16.6%), calcite (3.7%), ankerite (1.9%), and chlorite (1.8%) (Appendix B, Table B-3). The mineral weight percentages of the neutralizing minerals, ankerite (1.9%) and calcite (3.74%), in the analyzed sample is more than a factor of two greater than the mineral mass percentage of the sulphide minerals, pyrite/marcasite (0.18%).

Trondhjemite/granodiorite QZ + QTP veins lithology (L QZ-TQTP) dominantly consists of plagioclase (52.50%) followed by quartz (22.50%), muscovite/illite (13.24%), calcite (4.57%), chlorite (2.77%), and ankerite (2.17) (Appendix B, Table B-3). Sulphide minerals detected include pyrite/marcasite (0.14%).

Sediment lithology (L SED) dominantly consists of quartz (40.73%) followed by muscovite/illite (21.01%), plagioclase (14.29%), chlorite (11.25%), epidote (3.21%), other silicates (3.07%), Fe -oxides (1.89%), clays (1.35%), and calcite (1.05%) (Appendix B, Table B-3). Sulphide minerals are not detected. The mineral mass percentages of the neutralizing minerals are 0.01% for ankerite and 1.05% for calcite.

Major minerals in mafic dike lithology (L MD) are plagioclase (24.43%), quartz (23.33%), chlorite (22.47%) followed by calcite (14.25%), muscovite/illite (7.33%), ankerite (3.06%), titanium (Ti) -(Fe)-oxides (1.51%), other silicates (1.48%) (Appendix B, Table B-3). ARD/ML producing minerals are chalcopyrite (0.01%) and pyrite/marcasite (0.14%). Mineral mass percentage of carbonates, ankerite (3.06%) and calcite (14.3%), in the analyzed sample is more than a factor of two greater than the mineral mass percentage of the ARD/ML producing minerals.

Major minerals in quartz-Au mineralized zone within quartz-tourmaline-pyrite veins lithology (L QZ – QTP) are plagioclase (43.49%) and quartz (30.34%) followed by muscovite/illite (13.47%), calcite (4.54%), chlorite (3.94%), and ankerite (2.23%) (Appendix B, Table B-3). Sulphide minerals are chalcopyrite (0.01%) and pyrite/marcasite (0.09%). The mineral mass percentage of carbonates, ankerite (2.23%) and calcite (4.54%), in the analyzed sample is more than a factor of two greater than the percentage of sulphides.

Leprechaun low-grade ore (QZ-QTP and QZ-TQTP) lithology (LLGO-Met) dominantly consists of plagioclase (50.20%) followed by quartz (22.90%), sericite/muscovite (10.40%), calcite (5.04%), chlorite (3.93%), dolomite/ankerite (2.76%), and tourmaline (1.86%) (Appendix B, Table B-3). Detected sulphides are pyrite/marcasite (0.32%).

4.1.3 Geochemistry

4.1.3.1 Static Tests Results

Overburden

None of the six samples of overburden lithology have carbonate NPR below 2 (Appendix B, Table B-4 and B-11). This indicates that this lithology is non-PAG material. The average AP value (0.16 kg $CaCO_3$/t) is approximately nine times lower than the carbonate NP value (1.4 kg $CaCO_3$/t; Appendix B, Table B-5). All six samples have paste pH above 6.0.

Concentrations of aluminum (Al), Fe, lead (Pb), and zinc (Zn) exceed CWQG (0.005 mg/L, 0.3 mg/L, 0.001 mg/L, and 0.0017 mg/L, respectively) in four, one, one, and three of five SFE tests, respectively (Appendix B, Table B-4 and B-6). Levels of pH are below the lower CWQG limit (6.0) in all five SFE tests, which indicates that the SFE solutions from overburden are acidic.

Enrichments of 10x ACUC were detected for manganese (Mn) in two of six samples (Appendix B, Table B-4 and B-7). This metal does not exceed MDMER and CWQG in SFE tests indicating low Mn leaching potential from overburden (Appendix B, Table B-4 and B-6).

Waste Rock

Trondhjemite and Granodiorite (TRJ)

None of the 54 samples of trondhjemite / granodiorite lithology has carbonate NPR below 2 (Appendix B, Table B-4). This indicates that this lithology is non-PAG. The average AP value (1.5 kg $CaCO_3$/t) is

approximately 29 times lower than the carbonate NP value (42.4 kg $CaCO_3$/t; Appendix B, Table B-5). All 54 samples have paste pH above 9.03. Concentrations of Al exceed CWQG (0.1 mg/L) in all 14 SFE tests, which is confirmed by kinetic testing (Section 4.1.3.2). Measured pH exceeds the upper CWQG limit (9.0) in three of 14 SFE tests indicating an increased concentration of base contributing compounds that supports acid neutralization.

L TRJ composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (0.94 kg $CaCO_3$/t) is approximately 51 times lower than the carbonate NP value (48.3 kg $CaCO_3$/t) with paste pH of 9.63. Concentration of Al exceeds CWQG (0.1 mg/L) (Appendix B, Table B-9), which is confirmed by kinetic testing (Section 4.1.3.2).

QZ - Trondhjemite + QTP; QZ - Granodiorite + QTP (QZ-TQTP)

In one of 33 samples of L QZ-TQTP lithology, carbonate NPR is between 1 and 2, while the rest have NPR values above 2 (Appendix B, Table B-4). Therefore, about 3% of L QZ-TQTP lithology is classified as PAG material. The average AP value (4.1 kg $CaCO_3$/t) is approximately 11 times lower than the carbonate NP value (45.2 kg $CaCO_3$/t; Appendix B, Table B-5). All 33 samples have paste pH above 9.31. Concentrations of Al, Cu, and Pb exceed CWQG (0.1 mg/L, 0.002 mg/L, and 0.001 mg/L, respectively).

L QZ-TQTP composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (1.88 kg $CaCO_3$/t) is approximately 24 times lower than the carbonate NP value (44.7 kg CaCO3/t) with paste pH of 9.69. The concentration of Al exceeds CWQG (0.1 mg/L) in SFE.

Conglomerate and Sediments (CG and SED)

None of the 17 samples of conglomerate and sediments lithology has carbonate NPR below 2 (Appendix B, Table B-4). This indicates that this lithology is a non-PAG material. The average AP value (0.4 kg $CaCO_3$/t) is approximately 38 times lower than the average carbonate NP value (15.0 kg $CaCO_3$/t; Appendix B, Table B-5). All 17 samples have paste pH above 8.7. Manganese exceeds CWQG by a factor of 10 in one of eight SFE tests (Section 4.1.3.2). Concentrations of Al exceed CWQG (0.1 mg/L) in all eight SFE tests, which is confirmed by kinetic testing (Section 4.1.3.2).

L SED composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (0.62 kg $CaCO_3$/t) is approximately 15 times lower than the carbonate NP value (9.2 kg $CaCO_3$/t) with paste pH of 9.63. Concentrations of F, Al, and As exceed CWQG (0.12 mg/L, 0.1 mg/L, and 0.005 mg/L, respectively, Appendix B, Table B-9).

QZ - Conglomerate + QTP; QZ - Sediments + QTP (QZ-SQTP)

In one of the four samples of L QZ-SQTP lithology, carbonate NPR is below 1, while the rest have NPR values above 2 (Appendix B, Table B-4). This indicates that about 25% of L QZ-SQTP lithology is a PAG material. The average AP value (21.9 kg $CaCO_3$/t) is approximately 3.1 times lower than the average carbonate NP value (68.8 kg $CaCO_3$/t; Appendix B, Table B-5). All four samples have paste pH above 8.3. Concentration of Al exceeds CWQG (0.1 mg/L) in the SFE test.

Mafic Dike (MD)

All of the 19 samples of mafic dike have carbonate NPR above 2 (Appendix B, Table B-4). This indicates that this lithology is non-PAG. The average AP value (4.8 kg $CaCO_3$/t) is approximately 24 times lower than the average carbonate NP value (116.3 kg $CaCO_3$/t; Appendix B, Table B-5). All 19 samples have paste pH above 8.33. Concentrations of Al and As exceed CWQG (0.1 mg/L and 0.005 mg/L, respectively) in nine and one of nine SFE tests, respectively.

The L MD composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (2.19 kg $CaCO_3$/t) is approximately 44 times lower than the carbonate NP value (97.3 kg $CaCO_3$/t) with paste pH of 9.14. Concentration of Al exceeds CWQG (0.1 mg/L) (Appendix B, Table B-9), which is not confirmed by kinetic testing (Section 4.1.3.2).

Mafic Dike+ QTP (L QZ-MQTP)

None of the three samples of mafic dike lithology have carbonate NPR below 2 (Appendix B, Table B-4). This indicates that this lithology is non-PAG. The average AP value (1.8 kg $CaCO_3$/t) is approximately 108 times lower than the average carbonate NP value (190.1 kg $CaCO_3$/t; Appendix B, Table B-5). All three samples have paste pH above 9.07. Concentrations of Al exceed CWQG (0.1 mg/L) in all three SFE tests.

QZ – QTP

All of the three samples of L QZ – QTP lithology have carbonate NPR above 2 (Appendix B, Table B-4). This indicates that this lithology is non-PAG. The average AP value (1.2 kg $CaCO_3$/t) is approximately 60 times lower than the average carbonate NP value (69.7 kg $CaCO_3$/t; Appendix B, Table B-5). All three samples have paste pH above 9.10. Concentration of Al and pH level exceed CWQG (0.1 mg/L) and the upper CWQG limit (9.0), respectively, in the SFE test (Appendix B, Table B-4 and B-6).

Composite sample L QZ – QTP has carbonate NPR above 2 (Appendix B, Table B-8). This indicates that this lithology is non-PAG. The AP value (0.62 kg $CaCO_3$/t) is approximately 83 times lower than the average carbonate NP value (51.6 kg $CaCO_3$/t) with a paste pH of 9.6. Concentrations of F and Al exceed CWQG (0.12 mg/L and 0.1 mg/L, Appendix B, Table B-9).

Low-Grade Ore and High-Grade Ore

Low-Grade Ore

In one of 10 samples of low-grade ore, carbonate NPR is below 1, while the rest have NPR values above 2 (Appendix B, Table B-4). This indicates that about 10% of low-grade ore is PAG. The average AP value (6.8 kg $CaCO_3$/t) is approximately 7 times lower than the average carbonate NP value (45.4 kg $CaCO_3$/t; Appendix B, Table B-5). All 10 samples have paste pH above 8.3. Concentrations of Al and Cu exceed CWQG (0.1 mg/L and 0.002 mg/L, respectively) in three and two of five SFE tests, respectively.

Three variability composites of low-grade ore were prepared during the process design work and tested for ABA. All these samples have carbonate NPR>2 and classified as non-PAG (Table B-11).

LLGO-Met sample, which was made during the metallurgical testing, has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (7.19 kg $CaCO_3$/t) is approximately 8.5 times lower than the carbonate NP value (61.3 kg $CaCO_3$/t) with paste pH of 9.48. This is confirmed by ABA testing of other composite samples from the Leprechaun area (Appendix B, Table B-11). SFE tests (LGO Pre-HCT Metallurg.) show that F and Al exceed CWQG (Appendix B, Table B-9).

Another low-grade ore composite sample (L LGO), which was created from individual samples as a part of geochemical testing, also has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (3.12 kg $CaCO_3$/t) is approximately 12 times lower than the carbonate NP value (37.9 kg $CaCO_3$/t) with paste pH of 9.67. Concentration of Al exceeds CWQG (0.1 mg/L) in SFE tests (LGO Pre-HCT Stantec for Leprechaun) (Appendix B, Table B-9).

LLGO-Met sample is conservatively selected for kinetic testing because it has higher AP, lower NPR ratio and higher content of total metals.

High-Grade Ore

In one of eight samples of high-grade ore, carbonate NPR is below 1 (Appendix B, Table B-4). This indicates that about 13% of high-grade ore is PAG. The average AP value (11.0 kg $CaCO_3$/t) is approximately four times lower than the average carbonate NP value (45.8 kg $CaCO_3$/t; Appendix B, Table B-5). All eight samples have paste pH above 8.89. Concentrations of Al exceed CWQG (0.1 mg/L) in all three SFE tests.

Three variability composites of high-grade ore were prepared during the process design work and tested for ABA. All these samples have carbonate NPR>2 and classified as non-PAG (Table B-11).

Tailings

CND2 composite sample has carbonate NPR above 2 (Appendix B, Table B-12). This indicates that tailings generated from Leprechaun ore have low potential for ARD and can be classified as non-PAG. The AP value (8.75 kg $CaCO_3$/t) is approximately 8.5 times lower than the carbonate NP value (74.5 kg $CaCO_3$/t) with a paste pH of 8.78. NAG at 4.5 and 7.0 pH at post-HCT stage is 0 kg H_2SO_4/tonne with NAG pH above 4.5 (10.65 s.u.), which confirms that bulk tailings are not acid generating and confirms the results of ABA testing (Appendix D).

4.1.3.2 Kinetic

The results of kinetic testing for Leprechaun deposit rocks include the following (Appendix B, Table B-2):

- Five humidity cells of composite samples of waste rock (L TRJ, L MD, L QZ-QTP, L QZ-TQTP, and L SED) monitored for 22 weeks

- One humidity cell of composite sample of low-grade ore (LLGO-Met) monitored for 20 weeks (only select parameters on Week 20 in accordance with monitoring schedule)
- One composite sample of tailings (CND2) subjected:
  - to ageing for 56 days
  - humidity cell testing for 22 weeks (only select parameters on Week 22)
  - sub-aqueous testing for 30 weeks (only select parameters on Week 29 and 30 because test was ongoing at time of data analysis)

The humidity cell testing for the waste rock and tailings was discontinued because leaching rates for most parameters had stabilized. The humidity cell testing for the low-grade ore and sub-aqueous testing for the tailings is ongoing at time of data analysis.

Waste Rock

No exceedances of MDMER are observed in any waste rock lithologies from the Leprechaun site in humidity cell effluents (Appendix B, Table B-14). Values of pH level are above or near neutral with the minimum pH value of 6.96 in L SED composite sample.

L TRJ Humidity Cell

Exceedances of CWQG include Al (up to 1.5x), Cu (up to 1.3x), and P (up to 3.3x) in leachates from L TRJ (trondhjemite/granodiorite) humidity cell for the 22-week testing period (Appendix B, Table B-14). Values of pH are above neutral with the minimum pH value of 7.21. A temporal trend for SO_4 as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from L TRJ humidity cell decrease during the 22-week testing period (Appendix C, Figure C-1). Concentrations of Al, Cu, and P also decrease from 0.15 mg/L, 0.0026 mg/L, and 0.013 mg/L, respectively, in Week 0 to 0.056 mg/L, 0.0003 mg/L, and <0.003 mg/L, respectively, in Week 22 (Appendix D-3).

L QZ – TQTP Humidity Cell

Exceedances of CWQG include Al (up to 1.3x), P (up to 1.5x), Pb (up to 1.2x), and Zn (up to 1.2x) in leachates from the L QZ – TQTP (non-ore veins in trondhjemite/granodiorite) humidity cell for the 22-week testing period (Appendix B, Table B-14). The pH value is above neutral with the minimum pH value of 7.34. A temporal trend for SO_4 as an indicator of sulphide oxidation rate shows that the concentrations in the leachates from L QZ - TQTP humidity cell decrease during the 22-week testing period with a spike in Week 1 and 8 (Appendix C, Figure C-1). Temporal trends for Al, and P show that concentrations in leachate from L QZ – TQTP humidity cell decrease from 1.8 mg/L, 0.13 mg/L, and, 0.0060 mg/L in Week 0 to 0.80 mg/L, 0.047 mg/L, and <0.003 mg/L, respectively, in Week 22 (Appendix C, Figure C-1; Appendix D-3. Lead also decreases with the exception of Week 8 when the concentration increase and exceed CWQG (1.2x). Based on communications with the SGS laboratory, this increase can be attributed to a laboratory error of analysis.

L SED Humidity Cell

Constituents exceeding CWQG include F (up to 2x), Al (up to 1.6x), P (up to 1.8x), and Cu (marginally) in leachates from L SED (metasediments) humidity cell for the 22-week testing period (Appendix B, Table B-14). pH level is near neutral with the minimum pH value of 6.96. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from L SED humidity cell decrease during the 22-week testing period (Appendix C, Figure C-1). Temporal trends for Al and P show that concentrations in leachates from L QZ – TQTP humidity cell decrease from 0.157 mg/L and 0.007 mg/L respectively, in Week 0 to 0.052 mg/L and <0.003 mg/L, respectively, in Week 22 (Appendix C, Figure C-1; Appendix D-3). The highest concentrations for these elements are identified during the first 4 weeks of monitoring with P being below or at the detection limit of analysis (0.003 mg/L) in all weeks, except Week 0. F is below the detection limit (0.06 mg/L) in all weeks, except Week 2 when concentration of this element increased (2x) above CWQG. A temporal trend for Cu is unclear.

L MD Humidity Cell

No exceedances of CWQG are observed in leachates from L MD (mafic dikes) humidity cell for the 22-week testing period with exception of Zn (up to 1.2x of CWQG) (Appendix B, Table B-14). Values of pH are above neutral with a minimum pH value of 7.29. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from L MD humidity cell decrease during the 22-week testing period (Appendix C, Figure C-1).

L QZ – QTP Humidity Cell

Exceedances of CWQG include Al (up to 1.5x), Cu (up to 3x), P (up to 2.8x), Pb (up to 3.8x), Se (up to 1.4x), and Zn (up to 1.8x) in leachates from L QZ – QTP (non-ore vein zones) humidity cell for the 22-week testing period (Appendix B, Table B-14). Recorded pH values are above neutral with a minimum pH value of 7.22. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from L QZ - QTP humidity cell decrease during the 22-week testing period (Appendix C, Figure C-1). Temporal trends for Al, Cu, P, Pb, and Se show that concentrations in leachates from L QZ – QTP humidity cell decrease from 0.15 mg/L, 0.006 mg/L, 0.011 mg/L, 0.0003 mg/L, and 0.00139 mg/L in Week 0 to 0.083 mg/L, 0.002 mg/L, <0.003 mg/L, 0.0002 mg/L, and <0.00004 mg/L, respectively, in Week 22 (Appendix C, Figure C-1; Appendix D-3). The highest concentrations for these elements are identified during the first four weeks of monitoring with P being below or at the detection limit of analysis (0.003 mg/L) in all weeks, except Week 0. Pb also decreases with exception of Week 8 when the concentration of this metal increases and exceeds CWQG. Based on communications with the SGS laboratory this increase can be attributed to a laboratory error of analysis. Therefore, this exceedance is not valid.

Low-Grade Ore (LLGO-Met) Humidity Cell

Exceedances of CWQG include Al (up to 3x) and P (up to 5.5x in leachates from LLGO-Met humidity cell for the 20-week testing period (Appendix B, Table B-14). Recorded pH values are above neutral with a minimum pH value of 7.49. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows

that the concentrations in the leachates from LLGO-Met humidity cell decrease during the 22-week testing period (Appendix C, Figure C-2). Temporal trends for Al and P show that concentrations in leachates decrease from 0.298 mg/L and 0.022 mg/L, respectively, in Week 0 to 0.087 mg/L and <0.003 mg/L, respectively, in Week 18 (Appendix C, Figure C-2; Appendix D-3). The highest concentrations for these elements were observed during the first 4 weeks of monitoring.

Tailings

Ageing

Total cyanide ($CN_{(T)}$) exceeds MDMER during the first days of testing, Day 0 (2.4x) and Day 7 (1.5x), and rapidly decreased from Day 0 (2.4 mg/L) to Day 56 (0.10 mg/L) (Appendix B, Table B-15). Un-ionized ammonia (NH_3) steadily increases from Day 0 (0.067 mg/L) to Day 56 (1.10 mg/L) and exceeds MDMER closer to the end of testing, Day 28 (2.1x) and Day 56 (2.2x). Copper exceeds MDMER on Day 14 (2.0x) and exceeds CWQG in all days of testing (up to 99x). Fluoride exceeds CWQG on all days (up to 14x). Weak-acid dissociable cyanide, which was used as surrogate for free cyanide (CN_{Free}) exceeds CWQG for CN_{Free} on all days (up to 44x). Total ammonia (NH_3+NH_4) exceeds CWQG on all days (up to 47x). Mercury exceeds CWQG on all days (up to 8.8x), except Day 56. Silver (Ag) exceeds CWQG on all days (up to 3x), except Days 28 and 56. Iron exceeds CWQG only on Day 0 (2.8x). Molybdenum (Mo) exceeds CWQG on Day 0 (marginally), Day 28 (marginally), and Day 56 (1.4x). Phosphorous exceeds CWQG on all days (up to 8x). Selenium and Zn exceed CWQG on all days (up to 4.3x), except Days 28 and 56. Concentrations of F, ammonia species, and Mo increase and concentrations of $CN_{(T)}$, CN_{WAD}, Hg, Ag, Se, and Zn decrease during the period of testing. No clear trend for Cu is apparent. Recorded pH values are above neutral with a minimum pH value of 7.34 on Day 0.

Humidity Cell

No exceedances of MDMER are observed for leachates from the CND2 humidity cell (Appendix B, Table B-15). Exceedances of CWQG include F (up to 1.3x), CN_{WAD} (up to 2x), Cu (up to 3.8x), P (up to 1.8x), and Zn (up to 1.8x) in leachates from CND2 humidity cell for the 22-week testing period. Recorded pH values are above neutral with a minimum pH value of 7.34. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates gradually increase, with minor fluctuations, until Week 10 and then begin decreasing, with fluctuations, in later weeks (Appendix C, Figure C-3). A temporal trend for F is unclear. Weak-acid dissociable cyanide is below or at the detection limit (0.01 mg/L) in all weeks (Appendix D-3). Note that the detection limit for CN_{WAD} exceeds the CWQG for CN_{Free} (0.005 mg/L). Temporal trend for Cu shows that concentrations in leachates decrease from 0.006 mg/L in Week 0 to 0.0018 mg/L in Week 20 with the highest concentrations observed in the first 4 weeks (Appendix C, Figure C-3; Appendix D-3). Phosphorous is below or close to the detection limit (0.003 mg/L) in all weeks with no clear temporal trend.

Sub-Aqueous

Total cyanide, un-ionized NH_3, and Cu exceed MDMER (up to 2.7x, 5.7x and 3.8x, respectively) during the 30-week testing period (Table B-15 in Appendix B). Fluoride exceeds CWQG in all weeks (up to 19x), CN_{WAD} in all weeks except Week 0 (up to 202x), NH_3+NH_4 in all weeks (up to 70x), un-ionized NH_3 in all

weeks except Week 0 (up to 18x), Hg in Week 0, 1, 2, 4, and 24 (up to 38x), Ag in Week 0, 1, 2, 4, and 24 (up to 9x), cadmium (Cd) in Week 0, 12, 16, and 20 (up to 1.7x), Cu in all weeks (up to 565x), Mn in Week 0 (up to 1.1x), Mo in Week 4, 8, and 12 (up to 1.1x), P in all weeks (up to 9x), Se in Week 0, 4, 20, 24 (up to 1.5x), and Zn in all weeks (up to 6.5x). Recorded pH values are above neutral with a minimum pH value of 8.08.

Sub-aqueous temporal trends for the potential PoPCs in tailings composites for the Leprechaun site are as follows (Appendix C, Figure C-4; Appendix D-3):

- Concentrations in leachates decrease during the testing period:
  - Temporal trends for Mn, Mo, and Zn show that concentrations in leachates decrease from 0.202 mg/L, 0.0601 mg/L, and 0.011 mg/L, respectively, in Week 0 to 0.0330 mg/L, 0.0287 mg/L, and <0.002 mg/L, respectively, in Week 28. The highest concentrations for these elements are observed during the first 4 weeks of monitoring for Mn and Zn and the first 20 weeks for Mo.
- Concentrations in leachates increase and then decrease in later weeks of testing with overall increases in concentrations between the beginning and end of the 30-week testing period:
  - A temporal trend for F shows that concentrations increase from Week 0 to Week 20 with an initial decrease in Weeks 24 and 28. Overall, concentrations of F increase from 1.18 mg/L in Week 0 to 1.80 mg/L in Week 28 of testing;
  - Concentrations of CN_{WAD} and Cu increase from Week 0 to Week 20 and then decrease. Overall, concentrations of CN_{WAD} and Cu increase from 0.01 mg/L and 0.0404 mg/L, respectively, in Week 0 to 0.64 mg/L and 0.748 mg/L, respectively, in Week 28 of testing;
  - Concentrations of NH_3+NH_4 and un-ionized NH_3 increase from Week 0 to Week 24 and decrease in Week 28. Overall, concentrations of NH_3+NH_4 and un-ionized NH_3 increase from 3.1 mg/L and 0.14 mg/L, respectively, in Week 0 to 27.1 mg/L and 1.66 mg/L, respectively, in Week 28 of testing; and
  - A temporal trend for Cd shows that concentrations increase, with fluctuations, until Week 16 and then decrease such that there is an overall decrease concentration of Cd from 0.000057 mg/L in Week 0 to 0.000008 mg/L in Week 28 of testing.
- Concentrations in leachates increase during the testing period:
  - A temporal trend for $CN_{(T)}$ shows that concentrations increase from Week 0 (0.02 mg/L) to Week 28 (0.98 mg/L) with the highest concentrations after Week 4.
- Unclear trends:
  - Concentrations of Hg and Ag decrease during the testing period with exception of Week 24; and
  - Trends of P and Se are unclear.

Temporal trends of declining concentrations in the last weeks of sub-aqueous testing for F, $CN_{(T)}$, CN_{WAD}, NH_3+NH_4, un-ionized NH_3, and Cu.

4.3 MARATHON DEPOSIT

4.3.1 Geology

The Marathon deposit is hosted by quartz porphyry and aphanitic quartz porphyry that constitute 78% of the proposed open pit based on the geological block model (Appendix A, Figures A-7). Approximately 17% of the open pit is occupied by sedimentary host rocks: conglomerates, banded- to finely-laminated siltstones, argillites, and tuffaceous siltstones, with minor intercalated mafic tuffs. Gabbro located on west side of the deposit occupies 5% of the pit volume. Gabbro and quartz porphyry are cut by mafic dikes, similar to the Leprechaun deposit.

The Marathon deposit consists of a 40- to 100-m wide, near vertical corridor of alteration and mineralization that is open along strike and to depth. The deposit hosts shallow, southwest-dipping, en echelon quartz-tourmaline-pyrite (QTP) gold-bearing vein arrays (Appendix A, Figures A-8 and A-9).

4.3.2 Mineralogy

The mineralogical analysis was carried out for the five waste rock lithologies and the Marathon low-grade ore composite samples described below. Either plagioclase, quartz, or chlorite is the dominant mineral in each lithology (only in M MD) (Appendix B, Table B-3). Sulphide minerals that can potentially contribute to ARD/ML are chalcopyrite, pyrite, marcasite, and sphalerite. Minerals that can potentially neutralize ARD are ankerite, calcite, and dolomite.

Major minerals in quartz-eye porphyry lithology (M QE-POR) are quartz (41.08%) and plagioclase (31.75%) followed by chlorite (8.64%), muscovite/illite (6.75%), calcite (4.13%), epidote (3.36%), clays (1.47%), and other silicates (1.01%) (Appendix B, Table B-3). Sulphides are pyrite/marcasite (0.23%). The total percentage of neutralizing minerals, ankerite (0.27%) and calcite (4.13%), is greater by more than a factor of 2 than the mineral mass percentage of sulphide minerals.

Major minerals in Aphanitic quartz porphyry lithology (M AQPOR) are quartz (42.48%) and plagioclase (27.77%) followed by muscovite/illite (12.30%), chlorite (8.48%), clays (2.94%), calcite (2.56%), and other silicates (1.24%) (Appendix B, Table B-3). Sulphides are chalcopyrite (0.01%), pyrite/marcasite (0.62%), and sphalerite (0.17%). The total mineral mass percentage of neutralizing minerals, ankerite (0.07%) and calcite (2.56%), in the analyzed sample is greater by more than a factor of 2 than the percentage of sulphides. The content of apatite is 0.24%, a potential source of F.

Conglomerate lithology (M CG) dominantly consists of quartz (49.15%) followed by muscovite/illite (19.79%), plagioclase (11.56%), ankerite (8.85%), chlorite (3.80%), calcite (1.74%), and Fe-oxides (1.27%) (Appendix B, Table B-3). Sulphides are not detected, except for low percentage of sphalerite (0.01%). The content of apatite is 0.40%, which could be a source of F.

Major minerals in Mafic dike lithology (M MD) are chlorite (34.32%), quartz (21.20%), and plagioclase (18.80%) followed by calcite (10.45%), epidote (6.73%), other silicates (3.24%), ankerite (1.65%), and Fe-

oxides (1.52%) (Appendix B, Table B-3). Sulphide minerals are chalcopyrite (0.03%) and pyrite/marcasite (0.70%).

Major minerals in Quartz-Au mineralized zone quartz -eye porphyry + minor quartz-tourmaline-pyrite veins lithology (M QZ-QE-POR-QTP-MIN) are quartz (46.80%) and plagioclase (34.30%) followed by muscovite/illite (4.54%), calcite (4.19%), chlorite (3.75%), clays (2.72%), epidote (1.55%), and other silicates (1.16%) (Appendix B, Table B-3). Minor amounts of sulphides, pyrite/marcasite (0.26%), are detected. The percentage of carbonates, ankerite (0.05%) and calcite (4.19%), in the analyzed sample is greater by more than a factor of 2 than the percentage of sulphides.

Major minerals in Marathon low-grade ore lithology (MLGO-Met) are quartz (44.27%) and plagioclase (37.81%) followed by sericite/muscovite (5.87%), chlorite (4.67%), calcite (3.36%), and pyrite/marcasite (1.03%) (Appendix B, Table B-3). Traces of chalcopyrite (0.01%) and apatite (0.05%) were also detected.

4.3.3 Geochemistry

4.3.3.1 Static

Overburden

None of the 14 samples of overburden lithology have carbonate NPR below 2 (Appendix B, Table B-16), indicating that this lithology is non-PAG. The average AP value (0.16 kg $CaCO_3$/t) is approximately nine times lower than the average carbonate NP value (1.4 kg $CaCO_3$/t; Appendix B, Table B-17). All 14 samples have paste pH above 6.03.

Arsenic and Mn exceed CWQG in SFE tests indicating a moderate metal leaching potential from overburden (Appendix B, Table B-16 and B-18). Concentrations of F, Al, Cd, Cu, Fe, Pb, Se, and Zn also exceed the respective CWQG guideline (0.12 mg/L, 0.1 mg/L, 0.00004 mg/L, 0.002 mg/L, 0.3 mg/L, 0.001 mg/L, 0.001 mg/L, and 0.0017 mg/L).

Enrichments of 10x ACUC are detected for As and Mn in eight and seven of 14 samples (Appendix B, Table B-16 and B-19).

Waste Rock

Quartz-eye Porphyry; Qtz-Porphyry Breccia (M QE-POR and M QE-POR-BX)

In four of 66 samples of M QE-POR and M QE-POR-BX lithology carbonate NPR is between 1 and 2 (Appendix B, Table B-16). One sample of this lithology showed carbonate NPR below 1. This indicates that about 8% of quartz porphyry including brecciated varieties could be PAG. The average AP value (3.9 kg $CaCO_3$/t) is approximately 13 times lower than the average carbonate NP value (48.4 kg $CaCO_3$/t; Appendix B, Table B-17). All 66 samples have paste pH above 8.39, indicating ARD delay in PAG samples. Concentrations of Al exceed CWQG (0.1 mg/L) in all 11 SFE tests.

The M QE-POR composite sample has a carbonate NPR above 2 and is not expected to generate ARD. The AP value (1.56 kg $CaCO_3$/t) is approximately 40 times lower than the carbonate NP value (62.5 kg $CaCO_3$/t) with a paste pH of 8.74. The concentration of Al exceeds CWQG (Appendix B, Table B-9).

Aphanitic Qtz Porphyry (M AQPOR)

Carbonate NPR is between 1 and 2 in one sample, and less than 1 in one sample out of the 19 samples of M AQPOR lithology tested (Appendix B, Table B-16). Thus, about 16% of the M AQPOR lithology has potential to generate ARD. The average AP value (6.9 kg $CaCO_3$/t) is approximately five times lower than the average carbonate NP value (31.5 kg $CaCO_3$/t; Appendix B, Table B-17). All 19 samples have paste pH above 8.96, indicating a delay in ARD generation in PAG samples. Concentrations of Al exceed CWQG (0.1 mg/L) in all SFE tests.

The M AQPOR composite sample has carbonate NPR above 2 and is not expected to generate ARD in a humidity cell test (Appendix B, Table B-8), indicating that this lithology is non-PAG. The AP value (7.50 kg $CaCO_3$/t) is approximately 6.5 times lower than the carbonate NP value (48.6 kg $CaCO_3$/t) with a paste pH of 9.48. Concentrations of F and Al in SFE the extract exceed the respective CWQG (0.12 mg/L and 0.1 mg/L, respectively).

Conglomerate (M CG)

None of the nine samples of conglomerate lithology have carbonate NPR below 2 (Appendix B, Table B-16), indicating that this lithology is non-PAG. The average AP value (0.5 kg $CaCO_3$/t) is approximately 212 times lower than the average carbonate NP value (101.1 kg $CaCO_3$/t; Appendix B, Table B-17). All nine samples have paste pH values above 9.30. Concentrations of Al exceeded the CWQG (0.1 mg/L) in all SFE tests (Section 4.2.3.2).

The M CG composite sample has carbonate NPR above 2 and is not expected to generate ARD in humidity cell (Appendix B, Table B-8. The AP value (0.62 kg $CaCO_3$/t) is approximately 141 times lower than the carbonate NP value (87.3 kg $CaCO_3$/t) with a paste pH of 8.96. Concentrations of F and Al in SFE exceed the respective CWQG (0.12 mg/L and 0.1 mg/L).

Gabbro (M GB)

In one of 4 samples of the gabbro lithology, carbonate NPR is below 1 (Appendix B, Table B-16). Therefore, 25% of gabbro lithology is classified as PAG. The average AP value (25.2 kg $CaCO_3$/t) is approximately four times lower than the average carbonate NP value (92.0 kg $CaCO_3$/t; Appendix B, Table B-17). All 10 samples have paste pH values above 8.82, indicating a delay in ARD generation in the PAG sample.

Concentrations of Al exceeded CWQG (0.1 mg/L) in all but two SFE tests (Appendix B, Table B-16 and B-18).

Mafic Dike (M MD)

None of the 19 samples of mafic dike lithology have carbonate NPR below 2 indicating that this lithology is classified as non-PAG. The average AP value (2.5 kg $CaCO_3$/t) is approximately 38 times lower than the average carbonate NP value (96.4 kg $CaCO_3$/t; Appendix B, Table B-17). All 19 samples have paste pH values above 8.17. The concentrations of Al exceed CWQG (0.1 mg/L) in all four SFE tests.

The M MD composite sample has carbonate NPR above 2 and is classified as non-PAG. The AP value (5.94 kg $CaCO_3$/t) is approximately 15 times lower than the carbonate NP value (88.7 kg $CaCO_3$/t) with a paste pH of 8.96. The concentration of Al exceeds CWQG (0.1 mg/L) (Appendix B, Table B-9).

QZ – Quartz-eye Porphyry + Minor QTP (M QZ-QE-POR-QTP-MIN)

In two of 10 samples of the M QZ-QE-POR-QTP-MIN lithology, carbonate NPR is below 1 (Appendix B, Table B-16). This indicates that about 20% of M QZ-TQTP lithology is PAG. The average AP value (6.2 kg $CaCO_3$/t) is approximately five times lower than the average carbonate NP value (32.9 kg $CaCO_3$/t; Appendix B, Table B-17). All 10 samples have paste pH values above 9.31, indicating a delay in ARD generation in PAG samples.

The M QZ-QE-POR-QTP-MIN composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (8.75 kg $CaCO_3$/t) is approximately 2.6 times lower than the carbonate NP value (22.7 kg $CaCO_3$/t) with a paste pH of 9.71. The concentration of Al exceeds CWQG in SFE (0.1 mg/L).

QZ – Quartz-eye Porphyry + QTP (M QZ-QE-POR-QTP)

Carbonate NPR is between 1 and 2 in four samples and is below 1 in one of 11 samples analyzed (Appendix B, Table B-16). This indicates that about 45% of non-ore veins in quartz porphyry M QZ-QE-POR-QTP can be conservatively classified as PAG. The average AP value (9.6 kg $CaCO_3$/t) is approximately 3.2 times lower than the average carbonate NP value (30.8 kg $CaCO_3$/t; Appendix B, Table B-17). All 11 samples have paste pH values above 9.28, indicating a delay in ARD generation in PAG materials. Concentrations of Al and Zn exceeded CWQG (0.1 mg/L and 0.0017 mg/L, respectively) in SFE tests.

Low-Grade Ore and High-Grade Ore

Low-Grade Ore

In two of eight samples of low-grade ore, carbonate NPR is between 1 and 2 (Appendix B, Table B-16). In another two of eight samples, carbonate NPR is below 1. This indicates that about 50% of low-grade ore from Marathon pit could be PAG. The average AP value (15.3 kg $CaCO_3$/t) is approximately 1.7 times lower than the average carbonate NP value (26.2 kg $CaCO_3$/t; Appendix B, Table B-17). All eight samples have paste pH values above 9.23, indicating a delay in ARD generation in PAG samples. Concentrations of Al exceeded CWQG (0.1 mg/L) in SFE tests.

Three variability composites of Marathon low-grade ore were prepared during the process design work and were tested for ABA. One of these samples has carbonate NPR of 1.3 and is conservatively

classified as PAG (Table B-11). The two other samples had NPR values above 2. Metallurgical and geochemical programs indicate that from 33% to 50 % of Marathon low-grade ore could generate ARD.

The M LGO composite sample has carbonate NPR above 2 (Appendix B, Table B-8). The AP value (5.94 kg $CaCO_3$/t) is approximately 8.3 times lower than the carbonate NP value (49.2 kg $CaCO_3$/t) with a paste pH of 9.48. Concentrations of F and Al exceed CWQG (0.12 mg/L and 0.1 mg/L) in SFE test (See sample LGO Pre-HCT Stantec in Appendix B, Table B-9).

The MLGO-Met composite sample generated as part of the metallurgical testing has carbonate NPR between 1 and 2 indicating that sample could potentially generate ARD (Table B-8). The AP value (18.8 kg $CaCO_3$/t) is approximately 1.5 times lower than the NP value (28.9 kg $CaCO_3$/t) with paste pH of 9.16. SFE tests show that F and Al exceed CWQG (See sample LGO Pre-HCT Metallurg. in Appendix B, Table B-9).

The MLGO-Met sample was conservatively selected for kinetic testing because the material has higher AP, lower NPR, and a higher content of total metals.

High-Grade Ore

Carbonate NPR is between 1 and 2 for one sample and less than 1 in five of nine samples of Marathon high-grade ore (Appendix B, Table B-16). This indicates that about 67% of the high-grade ore has potential to develop ARD. The average carbonate NP value (15.6 kg $CaCO_3$/t) is lower than the average AP value (18.3 kg $CaCO_3$/t; Appendix B, Table B-17) with an NPR ratio (0.9). All nine samples have paste pH values above 9.17, indicating a delay in ARD generation. Concentration of Al exceeds CWQG (0.1 mg/L) in one of two SFE tests.

Five variability composites of Marathon high grade ore were prepared during the process design work and were tested for ABA. Four of these samples have carbonate NPR between 1 and 2 and conservatively classify as PAG (Table B-11). The remaining sample had a NPR value above 2. Metallurgical program composites and geochemical programs provide similar results indicating that from 67% to 80% of Marathon high-grade ore could generate ARD.

Tailings

The CND1 composite sample has carbonate NPR (2.7) above 2 (Appendix B, Table B-12). This indicates that overall tailings produced from Marathon ore are not expected to generate ARD. This is confirmed by NAG pH of 10.48 (Appendix D).

4.3.3.3 Kinetic

The results of kinetic testing for rocks from the Marathon deposit include the following (Appendix B, Table B-2):

- Five humidity cells of composite waste rock samples (M QE-POR, M AQPOR, M MD, M CG, and M QZ-QE-POR-QTP-MIN) monitored for 22 weeks
- One humidity cell of a low-grade ore composite (MLGO-Met) monitored for 20 weeks (only select parameters on Week 20 in accordance with monitoring schedule)
- One composite sample of tailings (CND2) subjected to:
  - ageing tests for 56 days
  - humidity cell testing for 22 weeks (only select parameters on Week 22)
  - sub-aqueous testing for 30 weeks (only select parameters on Week 29 and 30 in accordance with monitoring schedule)

The humidity cell testing for the waste rock and tailings was discontinued when concentrations for metals and sulphate stabilized. The humidity cell testing for the low-grade ore and sub-aqueous testing for the tailings has continued during the time of data analysis and report.

SFE tests indicate a decrease in concentrations of F from above CWQG, before humidity cell tests, to below CWQG after all humidity cells (Appendix B, Table B-9). In contrast, Al in SFE remains at approximately the same level or increases from pre- to post- humidity cell tests.

Waste Rock

No exceedances of MDMER are observed in humidity cells for all waste rock lithologies at Marathon site (Appendix B, Table B-20). Values of pH are above or near neutral with the minimum pH value of 7.05 in tests containing major lithologies quartz porphyry (M QE-POR), conglomerate (M CG), and mafic dikes (M MD).

M QE-POR Humidity Cell

Exceedances of CWQG include Al (marginally), Cu (up to 1.3x), and Se (up to 1.3x) in leachates from the M QE – POR humidity cell for the 22-week testing period (Appendix B, Table B-20). Recorded pH values are near neutral with a minimum pH of 7.05. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from M QE-POR humidity cell decrease during the 22-week testing period (Appendix C, Figure C-5). Temporal trends for Al and Se show that concentrations in leachates from the M QE - POR humidity cell decrease from 0.099 mg/L and 0.00134 mg/L in Week 0 to 0.038 mg/L and <0.00004 mg/L, respectively, in Week 22 (Appendix C, Figure C-5; Appendix D-3). The highest concentrations for these elements were observed during the first four weeks of monitoring with Se being below the detection limit (0.00004 mg/L) after Week 2. Copper declines below CWQG in the first week of testing and remains below CWQG for the remainder of the tests.

M AQPOR Humidity Cell

Exceedances of CWQG include Hg (up to 7.7x), Al (up to 1.2x), Cd (up to 1.9x), Cu (up to 12x), and Zn (up to 1.8x) in leachates from the M AQPOR humidity cell for the 22-week testing period (Appendix B, Table B-20). Recorded pH values are above neutral with a minimum pH value of 7.18. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from M AQPOR humidity cell decrease during the 22-week testing period (Appendix C, Figure C-5). Temporal trends for Al and Cd show that concentrations in leachates from the M AQPOR humidity cell decrease (Appendix C, Figure C-5; Appendix D-3). The highest concentrations for these elements were observed during the first four weeks of monitoring. Mercury is below the detection limit (0.00001 mg/L) in all weeks, except Week 12 when the concentration of this metalloid increased above the CWQG guideline. Based on communications with the SGS laboratory, this increase can be attributed to a laboratory error of analysis. Copper declines below CWQG in the first week of testing and remained below CWQG through the end of the tests.

M CG Humidity Cell

Exceedances of CWQG include Al (up to 1.2x), Cu (up to 5x), and Pb (up to 1.1x) in leachates from the M CG humidity cell for the 22-week testing period (Appendix B, Table B-20). Recorded pH values are near neutral with a minimum pH value of 7.05. A temporal trend for SO_4, as an indicator of the sulphide oxidation rate, shows that the concentrations in the leachates from the M CG humidity cell decrease during the 22-week testing period (Appendix C, Figure C-5). Temporal trends for Al and Cu show that concentrations in leachates from the M CG humidity cell decrease during the test below the respective CWQG (Appendix C, Figure C-5; Appendix D-3). The highest concentrations of Al and Cu were observed during the first four weeks of monitoring.

Pb also decreases with exception of Week 8 when concentration of this metal increased and exceeded CWQG (1.1x). Based on communications with the SGS laboratory this increase can be attributed to a laboratory error of analysis.

M MD Humidity Cell

Exceedances of CWQG were observed for Cd (up to 6.9x) and Zn (up to 1.2x) in leachates from the M MD humidity cell for the 22-week testing period (Appendix B, Table B-20). Recorded pH values are near neutral with a minimum pH value of 7.05. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from the M MD humidity cell decreased during the 22-week testing period (Appendix C, Figure C-5). Cadmium is below the detection limit (0.000003 mg/L) in all weeks, except Week 12 when the concentration of this metal increased (6.9x) above CWQG. Based on communications with the SGS laboratory, this increase can be attributed to a laboratory error of analysis.

M QZ-QE-POR-QTP-MIN Humidity Cell

Exceedances of CWQG include Al (marginally), Cu (marginally), Pb (up to 1.6x), and Zn (up to 2.4x) in leachates from the M QZ-QE-POR-QTP-MIN humidity cell for the 22-week testing period (Appendix B, Table B-20). Recorded pH values are around neutral with a minimum pH of 7.15. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates from the M QZ-QE-POR-QTP-MIN humidity cell decrease during the 22-week testing period (Appendix C, Figure C-5). Temporal trends for Al show that concentrations in leachates decrease from 1.3 mg/L and 0.105 mg/L, respectively, in Week 0 to 0.2 mg/L and 0.046 mg/L, respectively, in Week 22 (Appendix C, Figure C-5; Appendix D-3). The highest concentrations for these parameters are observed during the first four weeks of monitoring. Copper declines below CWQG in the first week of testing and remains below CWQG through the end of the tests. Lead also decreases with exception of Week 8 when concentration of this metal increased and exceeded CWQG. Based on communications with the SGS laboratory this increase can be attributed to a laboratory error of analysis.

Low-Grade Ore (MLGO-Met) Humidity Cell

Exceedances of CWQG include Al (up to 2.4x), P (up to 4x), and Zn (up to 1.2x) in leachates from the MLGO-Met humidity cell for the 20-week testing period (Appendix B, Table B-20). Recorded pH values are above neutral with a minimum pH of 7.34. A temporal trend for SO_4, as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates decrease during the 22-week testing period (Appendix C, Figure C-2). Temporal trends for Al and P show that concentrations in leachates decrease from 0.239 mg/L and 0.012 mg/L, respectively, in Week 0 to 0.074 mg/L and 0.006 mg/L, respectively, in Week 18 (Appendix C, Figure C-2; Appendix D-4). The highest concentrations for Al are observed during the first two weeks of monitoring.

ARD onset time was estimated because the Marathon low-grade ore classifies as PAG. This estimate is highly conservative because it is based on the highest acid production and neutralization laboratory rates, which are significantly higher than the average rates. Also, laboratory rates are significantly faster than field rates. The highly conservative ARD onset time is 6.3 years for PAG portions of Marathon low-grade ore.

Tailings

Ageing

Total cyanide exceeds the MDMER limit (0.5 mg/L) during all days of testing up to 18x except for Day 56. Overall, concentrations declined over the testing period decreasing from Day 0 (8.8 mg/L) to Day 56 (0.050 mg/L) (Appendix B, Table B-21). Un-ionized NH_3 exceeds the MDMER limit at the end of testing on Day 56 (1.5x), and steadily increased from Day 0 (0.087 mg/L) to Day 56 (0.75 mg/L). Copper exceeds the MDMER limit on Day 14 (2.5x) and Day 28 (1.1) and exceeds CWQG in all days of testing (up to 124x). Fluoride exceeds CWQG on all days (up to 6.5x). WAD cyanide exceeds CWQG for CN_{Free} on all days (up to 68x). Total ammonia exceeds CWQG on all days (up to 80x). Mercury exceeds CWQG on all days (up to 30x), except for Days 28 and 56. Silver exceeds CWQG on all days (up to 5.6x), except for Day 28 and 56. Arsenic exceeds CWQG on all days (up to 3.3x). Cadmium exceeds CWQG on all

days (up to 2.1x). Iron exceeds CWQG on Day 0 (10x), Day 7 (6.7x), and Day 14 (4.8x). Molybdenum exceeds CWQG on all days (up to 1.8x). Phosphorous exceeds the CWQG on all days (up to 9.8x). Selenium exceeds CWQG on all days (up to 4.3x), except for Days 28 and 56. Zinc exceeds CWQG on all days (up to 2.4x), except for Days 7 and 56. Concentrations of F, ammonia species, and Mo increase and concentrations of $CN_{(T)}$, Hg, Ag, As, Fe, Se, and Zn decrease during the period of testing. The trends for CN_{WAD}, Cd, and Cu are not well defined. Recorded pH values are above neutral with a minimum pH of 7.99 on Day 0.

Humidity Cell

No exceedance of the MDMER limits are observed for CND1 humidity cell (Appendix B, Table B-21). Exceedances of CWQG include F (up to 1.3x), Hg (up to 1.5x), Cu (up to 3x), and Mn (up to 1.1x). A temporal trend for SO_4 as an indicator of sulphide oxidation rate, shows that the concentrations in the leachates gradually increased, with fluctuations, until Week 10 and started decreasing, with fluctuations, in later weeks (Appendix C, Figure C-3). A temporal trend for F is not well defined. Temporal trends for Hg and Cu show that concentrations in leachates decrease below the respective guidelines by Week 16. The temporal trend for Mn shows that concentrations in the leachates increase until Week 12 and begin decreasing in Weeks 16 with Mn below CWQG in Week 20 (Appendix C, Figure C-3; Appendix D-4). Recorded pH values are above neutral with a minimum pH value of 7.14.

Sub-Aqueous

Total cyanide, un-ionized NH_3, and Cu exceed the MDMER limit (up to 3.5x, 5.8x and 5.6x, respectively) during the 30-week testing period, except in Week 0 (Table B-21 in Appendix B and Appendix C). Fluoride exceeds CWQG in all weeks (up to 9x), CN_{WAD} in all weeks (up to 342x), except Week 0, NH_3+NH_4 in all weeks (up to 83x), un-ionized NH_3 in all weeks (up to 18x), Hg in Weeks 0, 1, 2, 4, 8, and 24 (up to 30x), Ag in Weeks 0, 1, 2, 4, and 24 (up to 18x), As in all weeks (up to 3.6x), Cd in all weeks (up to 3x), except the later weeks (24 and 28), Cu in all weeks (up to 835x), Mn in Weeks 0 and 1 (up to 1.7x), Mo in all weeks (up to 1.5x), except the later weeks, i.e. 24 and 28, P in all weeks (up to 48x), Se in Week 0 and 4 (up to 3.4x), and Zn in Weeks 0, 1, and 2 (up to 2.7x). Recorded pH values are above neutral with a minimum pH of 8.03.

Sub-aqueous temporal trends for the PoPCs in tailings composites for the Marathon site are as follows (Appendix C, Figure C-4; Appendix D-4):

- Concentrations in leachates decrease during the testing period:
  - Temporal trends for Mn, Mo, and Zn decrease during the testing period from 0.317 mg/L, 0.0774 mg/L, and 0.016 mg/L, respectively, in Week 0 to 0.0280 mg/L, 0.0417 mg/L, and 0.0020 mg/L, respectively, in Week 28. All metal concentrations decreased below CWQG, except Zn.
- Concentrations in leachates first increased and then decreased in later weeks of testing with an overall increase in concentration between the beginning and end of the 30-week testing period:
  - The temporal trend for Cd shows that, overall, concentrations of this metal decrease from 0.000098 mg/L in Week 0 to 0.000016 mg/L in Week 28 with the peak concentration on Week 16 of testing
  - The temporal trend for F shows that concentrations increase from Week 0 to Week 20 and then decreased through in Week 28. Overall, concentrations of F increased from 0.53 mg/L in Week 0 to 0.85 mg/L in Week 28 of testing
  - Concentrations of CN_{WAD} increase from Week 0 to Week 16 and then decrease through the end of the test. Overall, concentrations of CN_{WAD} increase from <0.01 mg/L in Week 0 to 1.20 mg/L in Week 28 of testing
  - The temporal trend for NH_3+NH_4 shows that concentrations increase from Week 0 to Week 20 and then decrease through the rest of the test. Overall, concentrations of NH_3+NH_4 increase from 11.4 mg/L in Week 0 to 28.4 mg/L in Week 28 of testing
  - The temporal trend for un-ionized NH_3 is similar to NH_3+NH_4 with the exception of a later start of decline in concentration that occurs in Week 28. Overall, concentrations of un-ionized NH_3 increase from 3.1 mg/L in Week 0 to 27.1 mg/L in Week 28 of testing
  - The temporal trend for Cu shows that concentrations increase from Week 0 to Week 20 and then decrease through the end of the test. Overall, concentrations of Cu increase from 0.0574 mg/L in Week 0 to 1.13 mg/L in Week 28 of testing
- Concentrations in leachates increased during the testing period:
  - The temporal trend for $CN_{(T)}$ shows that concentrations increase from Week 0 (0.02 mg/L) to Week 28 (1.65 mg/L) reaching a stable or slowing declining concentration of approximately 1.7 mg/L
  - The temporal trend for As shows that concentrations in leachates increase during the testing period from 0.0088 mg/L in Week 0 to 0.018 mg/L in Week 28 with all concentrations above CWQG (0.005 mg/L)
- Unclear trends:
  - Concentrations of Hg and Ag decrease during the testing period with exception of Week 24
  - There are no clear temporal trends for P and Se through P exceeds the CWQG guideline (0.004 mg/L) over the entire period of testing.

Declining temporal trends of concentrations in the last weeks of testing were observed for F, CN_{WAD}, NH_3+NH_4, un-ionized NH_3, and Cu though there is an overall increase in concentrations during the testing period that will need to be confirmed by further monitoring.

5.0 DISCUSSION

5.1 OVERBURDEN

5.1.1 Leprechaun Deposit

Approximately 1.9 Mm^3 of overburden will be excavated from the Leprechaun open pit and stockpiled. Most of this material will be used as cover material for the waste rock stockpile during closure. Overburden is classified as a non-PAG material based on individual sample analysis. However, SFE tests of some samples indicate the potential for development of mildly acidic conditions with pH between 5.5 and 6.3, which is likely associated with organic acids leached out from peat material that is present on top of the overburden where the sample was collected. No exceedances of the MDMER limit are observed in SFE, but Al, Fe, Pb, and Zn are above CWQG, indicating a moderate leaching potential (Table 5-1).

5.1.2 Marathon Deposit

Approximately 4.4 Mm^3 of overburden will be generated from the Marathon open pit. Overburden is classified as a non-PAG material based on individual sample analysis. No exceedances of the MDMER limit are observed in SFE tests of individual samples. Concentrations exceed the CWQG guidelines for F, Al, As, Cd, Cu, Fe, Mn, Pb, Se, and Zn. These parameters have a moderate potential for leaching and are, therefore, considered as PoPC in the Marathon overburden material (Table 5-1).

The results presented above indicate that overburden stockpiles do not require specific ARD management at either deposit. The assimilative capacity assessment estimates levels of PoPC in the receiving environment and will address management for ML, if needed.

Table 5-1 Summary of Parameters of Potential Concern for the Materials from Leprechaun and Marathon

PoPC	Leprechaun														Marathon														Total Count
Lithology	OB	L TRJ	L QZ-TQTP	L CG and L SED	L QZ-SQTP	L MD	L QZ-MQTP	L QZ-QTP	L LGO	Ore	Tailings (CND2)			Count	OB	M QE-POR and M QE-	M AQPOR	M CG	M GB	M MD	M QZ-QE-POR-QTP-MIN	M QZ-QE-POR-QTP	M LGO	Ore	Tailings (CND1)			Count	
Sample type	Individ	Individ, Comp	Individ, Comp	Individ, Comp	Individ	Individ, Comp	Individ	Individ, Comp	Individ, Comp	Individ	Comp - Ageing	Comp - HC	Comp - Sub-Aq		Individ	Individ, Comp	Individ, Comp	Individ, Comp	Individ	Individ, Comp	Individ, Comp	Individ	Individ, Comp	Individ	Comp - Ageing	Comp - HC	Comp - Sub-Aq		
F				✓							✓	✓	✓	4	X										✓	✓	✓	4	8
P		✓	✓	✓				✓	✓		✓	✓	✓	8									✓		✓	✓	✓	4	12
$CN_{(T)}$											✓		✓	2											✓		✓	2	4
CN_{WAD}											✓	✓	✓	3											✓		✓	2	5
NH_3+NH_4											✓		✓	2											✓		✓	2	4
Un-ion. NH_3											✓		✓	2											✓		✓	2	4
Ag											✓		✓	2											✓		✓	2	4
Al	X	✓	✓	✓	X		X	✓	✓	X				9	X	✓	✓	✓	X		✓	X	✓	X				9	18
As														0	X										✓		✓	3	3
Cd													✓	1	X		✓			✓					✓		✓	5	6
Cu		✓		✓				✓			✓	✓	✓	6	X	✓	✓	✓			✓				✓	✓	✓	8	14
Fe	X										✓			2	X										✓			2	4
Hg											✓		✓	2			✓								✓	✓	✓	4	6
Mn													✓	1	X											✓	✓	3	4
Mo											✓		✓	2											✓		✓	2	4
Pb	X		✓					✓						3	X			✓			✓							3	6
Se								✓			✓		✓	3	X	✓									✓		✓	4	7
Zn	X		✓					✓			✓	✓	✓	6	X		✓			✓	✓	X	✓		✓	✓	✓	9	15

Notes:
HC - Humidity Cell; Sub-Aq - Sub-Aqueous.
X - Shake Flask Extraction (SFE) exceedance.
✓ - HC exceedance.
Orange cells - parameter exceeds MDMER.
Gray cells - parameter exceeds 10 x CWQG.
Orange and gray cells indicate high ML, Not highlighted SFE and HC exceedances indicate moderate ML.

5.2 WASTE ROCK

5.2.1 Leprechaun Deposit

Analysis of individual samples shows that the major lithologies of waste rock, trondhjemite/Granodiorite and sediments, are non-PAG. PAG rock is associated with non-ore veins with an estimated 25% of the Quartz- Mineralized Zone (QZ) with Sediment Quartz-Tourmaline-Pyrite veins (SQTP) lithology and 3% of the Trondhjemite/Granodiorite (QZ + TQTP). The geological block model indicates that less than 0.5% of the approximately 50 Mm^3 volume of Leprechaun waste rock might be PAG. Leachates from the humidity cells of waste rock lithologies are near neutral or slightly basic. This indicates that overall drainage from waste rock is not expected to be acidic regardless of the small percentage of PAG rock. Therefore, specific ARD management of waste rock is not required.

Chemistry of leachates from the humidity cells are considered a more conservative measure of the potential for ML than concentrations measured in SFE. SFE leachates are used for an ML assessment if humidity cell tests were not done for specific lithology. No exceedances of the MDMER limits are observed in any humidity cell leachates from waste rock at Leprechaun Site.

The PoPC are delineated as follows:

- *L TRJ:* Based on kinetic testing Al, Cu and P are classified as PoPCs. Concentrations of Al and Cu decrease below CWQG during the 22-week period of kinetic testing
- *L QZ-TQTP:* Kinetic testing suggests Al, P, Pb, and Zn are PoPCs; however, Pb and Zn are not considered PoPCs because the exceedance of CWQG was caused by a laboratory error. Concentrations of Al and P decrease below CWQG during the 22-week period of kinetic testing
- *L CG and L SED*: Kinetic testing suggests F, Al, Cu, and P are PoPCs. Concentrations of Al and Cu decrease below CWQG during the 22-week period of kinetic testing of L SED. Fluoride is below the detection limit in all weeks, except Week 2 when the concentration of F exceeded CWQG in L SED
- *L QZ-SQTP:* Based on SFE tests of individual samples, Al is the PoPC for this lithology. Confirmation by kinetic testing is not available because humidity cell testing was not conducted for this lithology
- *L MD:* No PoPCs are identified for this lithology based on both kinetic and SFE testing
- *L QZ-MQTP:* Based on SFE tests of individual samples, Al is the PoPC for this lithology. Confirmation by kinetic testing is not available because humidity cell testing was not conducted for this lithology
- *L QZ – QTP:* Based on SFE tests of composite and individual samples, Al is the PoPC for this lithology, which is confirmed by kinetic testing. Kinetic testing indicates there are other PoPCs including Cu, P, Pb, Se, and Zn. Lead is not considered a PoPC because the CWQG exceedance was caused by laboratory error. Concentrations of Al, Cu, Se and Zn decrease below CWQG during the 22-week period of kinetic testing

Overall waste rock lithologies show moderate ML potential for Al, P, Cu, Se, and Zn (Table 5-1). The fate of these PoPCs in the receiving environment is predicted in assimilative capacity assessment (Stantec 2020c), with the results discussed in the EIS.

5.2.2 Marathon Deposit

Two of seven waste rock lithologies are classified as non-PAG based on the individual sample analysis. Five of seven waste rock lithologies indicate the presence of PAG material, including Quartz-eye Porphyry plus Quartz -Porphyry Breccia (8% of PAG samples), Aphanitic Quartz Porphyry (16% of PAG samples), Gabbro (25% of PAG samples), minor QTP veins Quartz-eye Porphyry (20% of PAG samples), and QTP veins Quartz - Quartz-eye Porphyry (45% of PAG samples). Leachates from the humidity cells of waste rock lithologies are near neutral or slightly basic in pH and are not expected to become acidic based on ABA of the composite rock samples.

Approximately 14% of the 60 Mm^3 waste rock is conservatively estimated to be PAG. Stantec recommends refining estimates of PAG by conducting more testing and constructing the ARD block model for the Marathon deposit. Potentially acid generating “pockets” (discrete zones) are not expected to generate acidity within 29 years of exposure based on minimum NP depletion time among Marathon waste rock lithologies (Table 5-2). The acidic pore water generated in these pockets will be neutralized as the ARD migrates and interacts with the non-PAG rock that constitutes the majority of waste rock and that has an excess of NP. To achieve the neutralization, blending PAG and non-PAG rock is recommended and PAG rock should be encapsulated with non-PAG rock (e.g., no PAG rock deposited within 10 m of final stockpile shell). As a result of the two recommended management measures, the final drainage from waste rock is not expected to be acidic.

During closure, waste rock piles will be covered with overburden, which reduces the advective flux of oxygen, reduces infiltration of water, and creates a diffusion barrier resulting in limited oxidation of sulphides, further reducing the risk of ARD.

Table 5-2 Estimates of the Maximum AP and NP Depletion Times in Humidity Cells

Parameter	Unit	Leprechaun						Marathon						Marathon Tailings (CND 1)	Leprechaun Tailings (CND 2)
		L TRJ	L QZ-TQTP	L SED	L MD	L QZ-QTP	LLGO - Met	M QE-POR	M AQPOR	M CG	M MD	M QZ-QE-POR-QTP-MIN	MLGO - Met		
Paste pH	pH Units	9.63	9.69	9.63	9.14	9.58	9.39	8.74	9.48	9.53	8.96	9.71	9.16	8.73	8.78
S_{TOTAL}	wt.%	0.080	0.109	< 0.005	0.133	0.048	0.266	0.083	0.326	< 0.005	0.271	0.383	0.589	0.353	0.314
$S_{SULPHATE}$	wt.%	0.05	0.05	< 0.02	0.06	0.03	0.04	0.03	0.09	< 0.02	0.08	0.10	< 0.02	< 0.02	0.03
$S_{SULPHIDE}$	wt.%	0.03	0.06	< 0.02	0.07	0.02	0.23	0.05	0.24	< 0.02	0.19	0.28	0.60	0.36	0.28
Carb. NP	kg $CaCO_3$/t	48.3	44.7	9.2	97.3	51.6	61.3	62.5	48.6	87.3	88.7	22.7	28.9	30.2	74.5
AP	kg $CaCO_3$/t	0.94	1.88	0.62	2.19	0.62	7.19	1.56	7.50	0.62	5.94	8.75	18.8	11.2	8.75
NNP	kg $CaCO_3$/t	47.3	42.8	8.6	95.1	51.0	54.1	60.9	41.1	86.7	82.7	13.9	10.1	19.0	65.8
NPR	unitless	51	24	15	44	83	8.5	40	6.5	141	15	2.6	1.5	2.7	8.5
Carbon (total)	wt.%	0.724	0.670	0.138	1.46	0.774	0.843	0.937	0.729	1.31	1.33	0.340	0.430	0.377	0.919
Sulphate Rate	mg/kg/week	0.68	1.8	0.44	0.93	0.63	4.7	1.3	3.0	0.32	28	0.86	6.4	130	123
Alkalinity Rate	mg $CaCO_3$/kg/week	14	18	9.4	15	10	44	12	10	14	10	10	56	14	21
NP Depletion Rate	mg $CaCO_3$/kg/week	17	25	13	23	13	69	15	17	21	59	14	88	149	148
NP Depletion Time	year	55	34	14	81	78	17	79	55	80	29	32	6.3	3.9	10
AP Depletion Time	year	15	12	16	29	11	16	16	30	22	2.3	140	33	1.6	1.3

Notes:
Sulphate and NP rates are calculated for the first month of humidity cell testing, i.e. week 1 to 4, except tailings, for which these rates are calculated for week 1 to 8.
NP Depletion Time = (Carb. NP/Max NP Depletion Rate) x 1000/(365.25/7).
AP Depletion Time = (Carb. NP/Max Sulphate Rate) x 1000/(365.25/7).

No exceedances of the MDMER limits are observed in leachates from all waste rock composite samples at Marathon site. The PoPC are delineated as follows:

- *M QE-POR and M QE-POR-BX:* Kinetic testing suggests Al, Cu and Se are PoPCs in the M QE-POR. Concentrations of Al and Se decrease below the CWQG guideline during the 22-week period of kinetic testing. The temporal trend of Cu is unclear.
- *M AQPOR:* Kinetic testing suggests that Hg, Al, Cd, Cu, and Zn are PoPCs. Becuase Zn is below the detection limit (0.002 mg/L) in all weeks, except Week 0 when the concentration of this element (0.003 mg/L) marginally exceeded the detection limit, Zn is not considered a PoPC. Concentrations of Al and Cd decreased below CWQG during the 22-week period of testing. Mercury is below the detection limit (0.00001 mg/L) in all weeks, except Week 12 when the concentration of Hg exceeded CWQG, which is likely attributed to a laboratory error of analysis. Therefore, Hg is not included as a PoPC.
- *M CG:* Kinetic testing suggests Al, Cu, and Pb are PoPCs; however, Pb is not considered a PoPC because the CWQG exceedance was caused by laboratory error. Concentrations of PoPC elements decreased below CWQG during the 22-week period of testing.
- *M GB:* Based on SFE testing of individual samples, Al is the PoPC for this lithology. Confirmation by kinetic testing is not available for this lithology, because it was not conducted.
- *M MD:* Kinetic testing suggests Cd and Zn are PoPCs for this lithology. Because Zn is below the detection limit (0.002 mg/L) in all weeks, except Week 8 when concentration of Zn was equal to the detection limit, Zn is not considered a PoPC. Concentrations of Cd in leachates is below the detection limit in all weeks, except Week 12 when the concentration of this metal exceeded CWQG, which could be attributable to a laboratory analysis error.
- *M QZ-QE-POR-QTP-MIN:* Kinetic testing suggests Al, Cu, Pb, and Zn are PoPCs. Concentrations of Al decrease below CWQG during the 22-week period of testing. Temporal trends in Cu are unclear. Lead also decreases over time and is below CWQG with the exception of Week 8 when the concentration of Pb increased and exceeded CWQG. However, on further review, the increase in Pb was attributable to laboratory error. Zinc is below the detection limit (0.002 mg/L) in all weeks, except Week 8 when concentration of Zn (0.004 mg/L) exceeded the detection limit but remained within 5 x DL (100% uncertainty of laboratory analysis).
- *M QZ-QE-POR-QTP:* Based on SFE tests of individual samples, the PoPCs for this lithology are Al and Zn, which cannot be confirmed by kinetic testing, because humidity cell testing was not conducted for this lithology.

Only Cu might have high ML potential as indicated by an over 10x exceedance of CWQG in the first flush from the humidity cells containing aphanitic quartz porphyry (*AQPOR*) and due to the concentration dropping below the guideline thereafter. Considering these circumstances, Stantec assigned a moderate leaching potential for Cu. Note that Al exceeds 10x the CWQG guideline in SFE, while in humidity cells of the same materials, concentrations are approximately 15 to 20x lower (Appendix A, Figure 10). In SFE, there is faster dissolution of aluminosilicates and greater potential for formation of colloidal Al-hydroxides, which can pass through a 0.45 µm filter during sampling resulting in a false indication of elevated concentration of Al. In humidity cells, dissolution rates are slower, and colloids that might form have enough time to coagulate and partially remain in the rock sample mass when the cell is drained for

leachate collection, which is the process expected to occur in the waste rock facility. Because kinetic tests provide more realistic estimate of Al behavior in the rock mass, leaching potential for this metal was evaluated using the humidity cell results.

Overall, waste rock lithologies show moderate ML potential for Al, Hg, Se, and Zn. The fate of PoPCs is predicted using the water quality models and assimilative capacity study (Stantec 2020a, 2020b, 2020c) and are discussed in the EIS. Rehabilitation during mine closure reduces oxidation and metal leaching from sulphides. Placement of the overburden cover also reduces transport of the PoPCs from the waste rock pile by reducing infiltration and provides dilution of seepage from the pile by runoff from the cover.

5.3 LOW-GRADE ORE

5.3.1 Leprechaun Deposit

Analysis of a composite low-grade ore created using individual samples from Leprechaun site classified the material as non-PAG. Based on the analysis of individual samples, about 10% of low-grade ore is classified as PAG. The low-grade ore composite is classified as non-PAG and produces neutral leachate in humidity cell testing. The composite analysis was used to estimate an NP depletion time of approximately 17 years for laboratory conditions (Table 5-2). Therefore, isolated PAG pockets in the low-grade stockpile are not expected to generate ARD before the stockpile is processed in the mill.

No exceedances of the MDMER limits are observed. Kinetic testing suggests Al and P are PoPCs with moderate ML potential (Table 5-1).

5.3.2 Marathon Deposit

Based on the analysis of individual samples, about 50% of the low-grade ore is conservatively classified as PAG. The composite sample of low-grade ore, created as part of metallurgical studies, has uncertain ARD potential (Table 5-2). Humidity cell leachate pH from this sample was near neutral throughout the test period. The minimum ARD onset time for discrete zones of PAG materials (i.e., PAG pockets) is approximately six years based on the first month leaching rates from the humidity cell. Stantec recommends additional kinetic field testing to refine the ARD onset time estimates and identify the need for mitigation measures related to ARD. Proactively, the Marathon low-grade ore stockpile effluent has been segregated from other mine component flow streams in the current mine design to facilitate collection and further ARD treatment, if required.

No exceedances of the MDMER limit were observed. Based on kinetic testing, Al, P and Zn are PoPCs with moderate leaching potential (Table 5-1). Concentrations and the fate of PoPCs from low-grade ore stockpiles is evaluated by water quality modeling along with assimilative capacity studies (Stantec 2020a, 2020b, 2020c), and the results are discussed further in the EIS.

5.4 HIGH-GRADE ORE

High-grade ore from the Leprechaun and Marathon deposits will be stockpiled together with approximately 30% on average of the material originating from Leprechaun and the remainder from Marathon. The high-grade ore stockpile will be exhausted by the end of mine Year 5, with mill feed thereafter coming directly from the pits and from the low-grade ore stockpiles.

Based on the analysis of individual samples, 13% of Leprechaun high-grade ore is classified as PAG and 67% of Marathon high-grade ore is classified as PAG material. The overall mixture of Leprechaun and Marathon ores is non-PAG because of NPR=2.8 based on inputs from Table B-11 (Appendix B). Therefore, the high-grade ore stockpile is not expected to generate ARD. Moreover, drainage from the high-grade ore stockpile flows to the TMF by gravity and any potential acidity generated in the stockpile will be neutralized in the pond or in the mill during the pH adjustment required as a part of the gold recovery by cyanide process.

No exceedances of the MDMER limits were observed. SFE tests of individual samples show 10x exceedance of the CWQG guideline for AL suggesting classifying Al as having a high ML potential (Table 5-1). As discussed in Section 5.2.2, SFE overestimates Al leaching compared to kinetic tests, and therefore moderate ML potential was assigned to this element for both Leprechaun and Marathon high-grade ores.

5.5 TAILINGS

Tailings will be produced from a combination of the Marathon and Leprechaun high-grade ore and low-grade ore with approximately 38% of the material originating from the Leprechaun pit and the remainder from the Marathon pit. Tailings slurry will be deposited in the TMF during the first nine years and to the exhausted Leprechaun pit in the last three years of operation. Composite samples of tailings are classified as non-PAG and are not expected to generate ARD. Preferential settling of denser minerals, such as sulphides, near spigots may result in formation of patches of PAG tailings, which may create localized ARD. The TMF surface will be covered with a combination of soil and water after deposition of tailings ceases at the end of mine Year 9, reducing risks of localized ARD/ML during post closure (Ausenco 2020).

During the operation stage, the tailings pond will receive a discharge from the plant represented by Day 0 of the aging tests, runoff from tailings beaches evaluated by the humidity cell tests, and collected seepage simulated by the sub-aqueous columns. Based on the combined exceedances of the MDMER limits in the sources, treatment of the discharge from the TMF pond might be required for $CN_{(T)}$, un-ionized NH_3, and Cu during the first 9 years of operation. In addition, high leaching potential is also determined for NH_3+NH_4, CN_{WAD} (surrogate for CN_{Free}), F, Hg, P, and Fe. The water quality model results will define if these parameters with high leaching potential would require treatment after taking into account the water balance and overall water management system (Stantec 2020a, 2020b, 2020c). During closure, overflow from the TMF pond and seepage will be directed to the Marathon pit to accelerate pit filling and submerge PAG materials exposed on pit walls and benches. After closure, covered tailings

beaches are not expected to produce acidic runoff and/or have high or moderate leaching of PoPCs based on leachates from humidity cells, except for P (Table 5-1). The toe and base seepage from the TMF is expected to exceed the MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu in the post-closure stage and may require mitigation. Additional testing and evaluation are required to confirm these exceedances.

6.0 CONCLUSIONS

Leprechaun Deposit

Overburden is classified as non-PAG with moderate leaching potential for Al, Fe, Pb, and Zn. There are no exceedances of the MDMER limits observed in leachates from overburden.

The waste rock pile is estimated to contain less than 0.5% PAG material. Overall, the waste rock pile is not expected to generate ARD due to the small amount of PAG material. There are no exceedances of the MDMER limits observed in humidity cell leachates. The waste rock pile will be covered during rehabilitation further reducing the already low risk of ARD/ML. Waste rock lithologies show moderate ML potential for Al, P, Cu, Se, and Zn.

About 10% of low-grade ore is estimated to be PAG, but overall is not expected to generate ARD. There are no exceedances of the MDMER limits observed in leachates from low-grade ore. The kinetic testing suggests moderate leaching potential for Al and P.

Marathon Deposit

Overburden is classified as non-PAG material with moderate leaching potential for F, Al, As, Cd, Cu, Fe, Mn, Pb, Se, and Zn based on shake flask extracts. There are no exceedances of the MDMER limits observed in leachates from overburden. Most of the overburden pile will be consumed during closure and rehabilitation.

Approximately 14% of waste rock is conservatively classified as PAG. The acidic pore water generated in pockets of PAG rock within the pile will be neutralized as the ARD migrates and interacts with the non-PAG rock that has an excess of NP and constitutes the majority of waste rock. To achieve the neutralization, blending PAG and non-PAG rock is recommended and PAG rock should be encapsulated with non-PAG rock. As a result of the recommended management measures, the final drainage from waste rock is not expected to be acidic. The waste rock pile will be covered during rehabilitation further reducing the risk of ARD/ML. There are no exceedances of the MDMER limits observed in leachates from the waste rock humidity cells. Overall, waste rock lithologies show moderate ML potential for Al, Hg, Se, and Zn.

Approximately 50% of the low-grade ore is conservatively classified as PAG. The minimum ARD onset time in PAG ore is approximately six years based on conservative laboratory leaching rates. The Marathon low-grade ore stockpile effluent has been segregated from other mine flow streams in the design to facilitate collection and further ARD treatment, if required. There are no exceedances of the

MDMER limits observed in leachates humidity cell under neutral pH conditions. Based on kinetic testing, Al, P and Zn show moderate leaching potential in low-grade ore.

Plant Site

High-grade ore from the Leprechaun and Marathon deposits will be stockpiled together with approximately 30%, on average, of the material originating from Leprechaun and the remainder from Marathon. Approximately 13% of Leprechaun high-grade ore is classified as PAG, and 67% of Marathon high-grade ore is conservatively classified as PAG. Overall, the mixture of Leprechaun and Marathon ores is non-PAG and the high-grade ore stockpile is not expected to generate ARD. No exceedances of the MDMER are observed. Moderate Al leaching was assigned for both Leprechaun and Marathon high-grade ores based on SFE results. Drainage from the high-grade ore stockpile flows to the TMF by gravity and any potential acidity will be neutralized in the pond or in the mill during the pH adjustment required as a part of the gold recovery by cyanide process.

Tailings will be produced from a combination of the Marathon and Leprechaun high-grade and low-grade ores, with approximately 38% of the material originating from the Leprechaun pit and the remainder from the Marathon pit. Composite samples of tailings are classified as non-PAG and are not expected to generate ARD. The TMF pond and pore water in tailings will likely exceed the MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu sourced from process water and collected seepage. In addition, high leaching potential is also predicted for NH_3+NH_4, CN_{WAD} (surrogate for CN free), F, Hg, P, and Fe. After closure, covered tailings beaches are not expected to produce acidic runoff and/or have high or moderate leaching except for P, which shows moderate potential. The seepage from the TMF is conservatively predicted to exceed the MDMER limits for $CN_{(T)}$, un-ionized NH_3, and Cu in post-closure. Additional testing and evaluation are required to confirm these exceedances.

The fate of PoPC are further evaluated using the water quality models (Stantec 2020a, 2020b) and the assimilative capacity study (Stantec 2020c), with results discussed in the EIS.

7.0 RECOMMENDATIONS

The following additional geochemical work is recommended during the permitting phase:

- Continue field kinetic testing to refine ARD onset time estimates and provide better predictions of seepage quality from stockpiles
- Conduct of additional sampling of the Marathon pit sufficient to develop an ARD block model. This is recommended for a better understanding of how the mining schedule influences the timing of PAG materials deposition and to support development of ARD management plans, if required
- Continuation of kinetic testing on a carbonate depleted sample of Marathon low-grade ore to evaluate leaching potential in isolated acidic pockets expected to develop in the low-grade ore stockpile

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8.1 PERSONAL COMMUNICATIONS

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APPENDIX A

Figures

Existing Access Road

Proposed NL Hydro Power Line

Spatial Boundaries

Project Area

Mine Site

Other Features

Highway

Resource / Recreation Road

Transmission Line

Watercourse

Waterbody

Forested Area

0 5 10

Kilometres

N

Stantec

Project Location
Valentine Lake
Central Newfoundland, CA

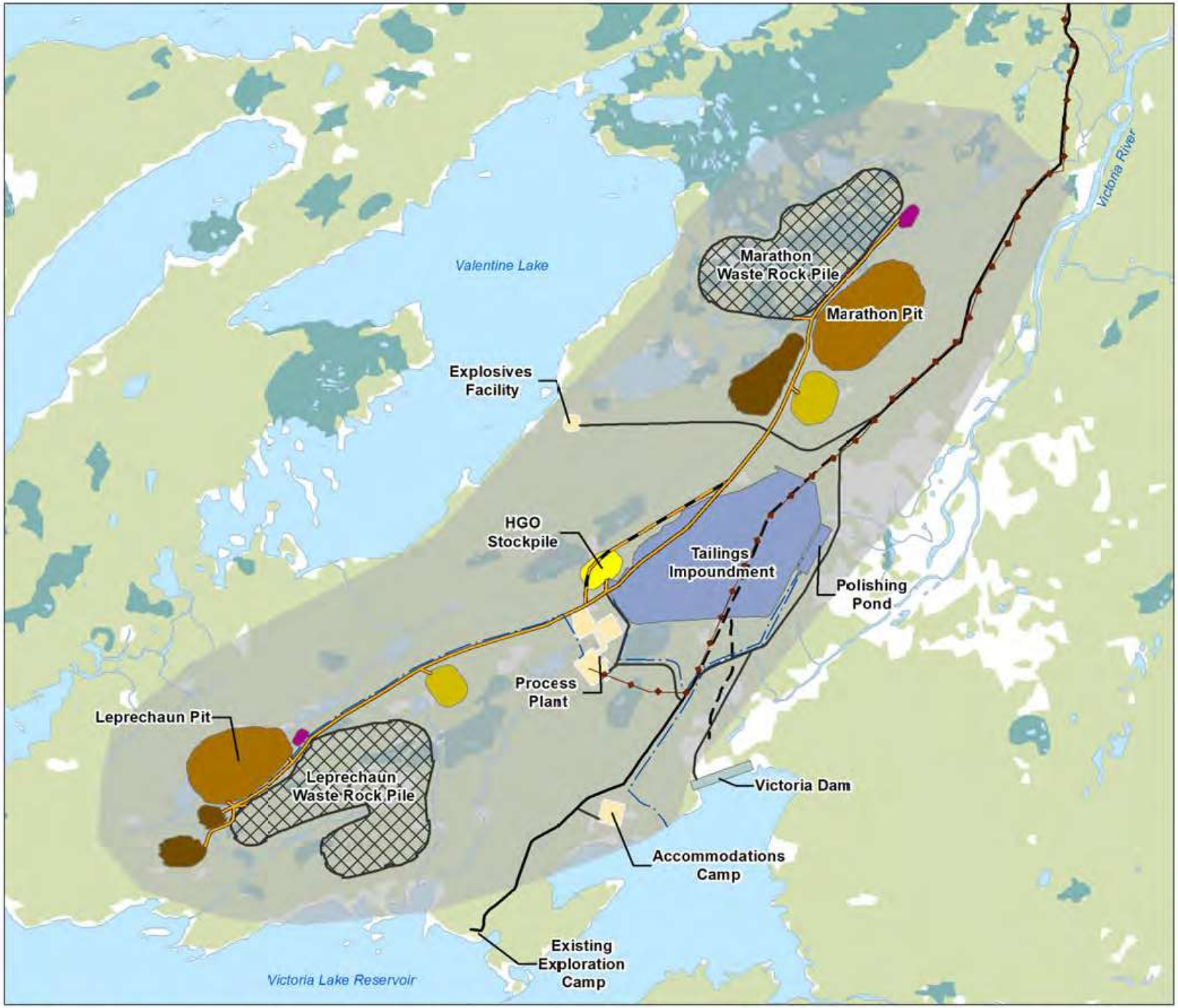
121416408_005

Client/Project

Marathon Gold Corporation
Valentine Gold Project
Environmental Impact Assessment

Notes

1. Background: CanVec 1:250 000 data, Natural Resources Canada



Stantec

Mine Features

- Initial Haul Road (years 1 to 6)
- Future Haul Road (years 5+)
- Existing Access Road
- Existing Access Road (to be removed)
- Site Road
- Pipeline
- Power Line
- Open Pit
- Topsoil Stockpile
- Overburden Stockpile
- Low-grade Ore (LGO) Stockpile
- High-grade Ore (HGO) Stockpile
- Waste Rock Pile
- Tailings Management Facility
- Other Mine Infrastructure
- Mine Site

Other Features

- Watercourse
- Victoria Dam
- Waterbody
- Wetland
- Forested Area

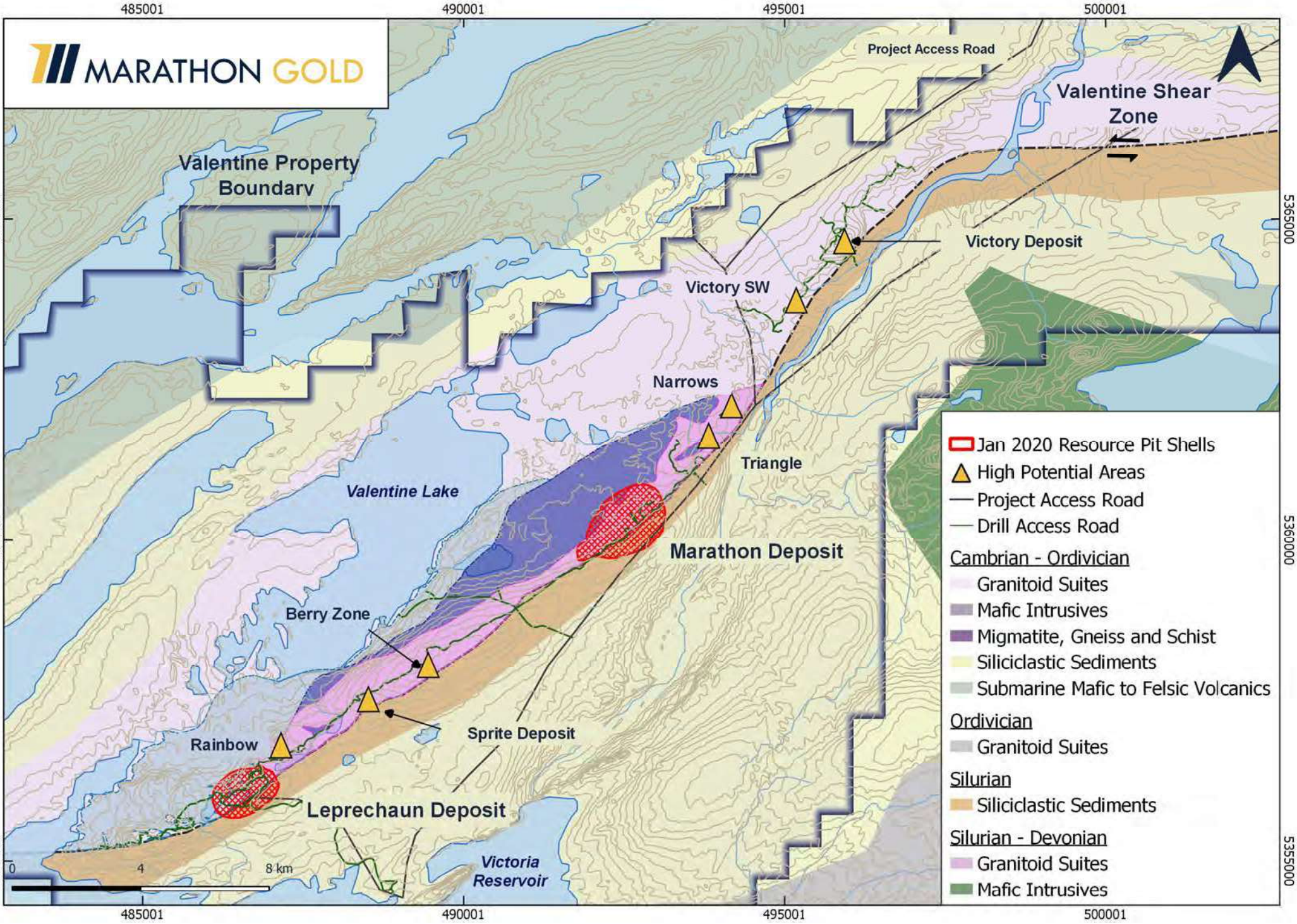
N

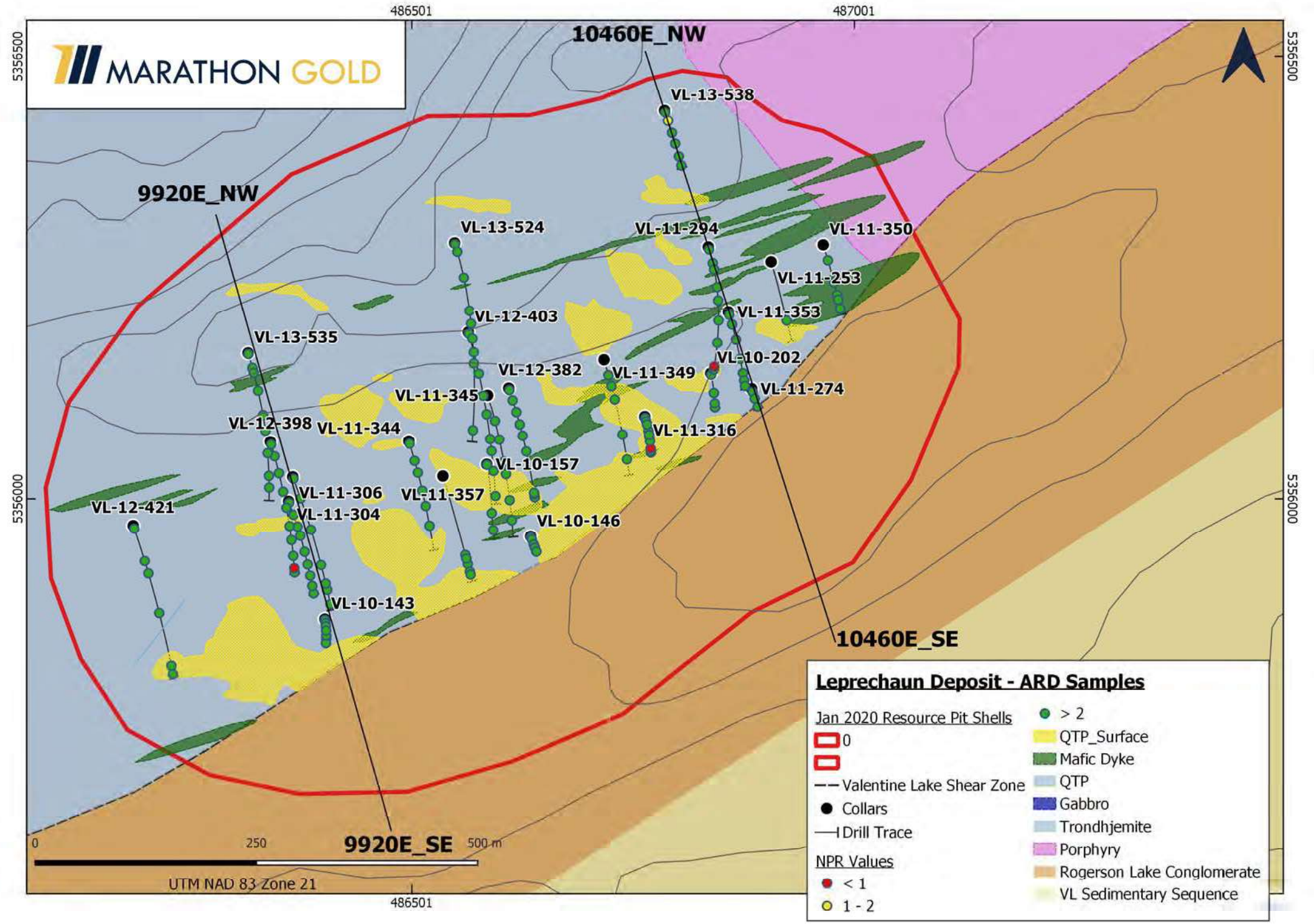
0 0.5 1

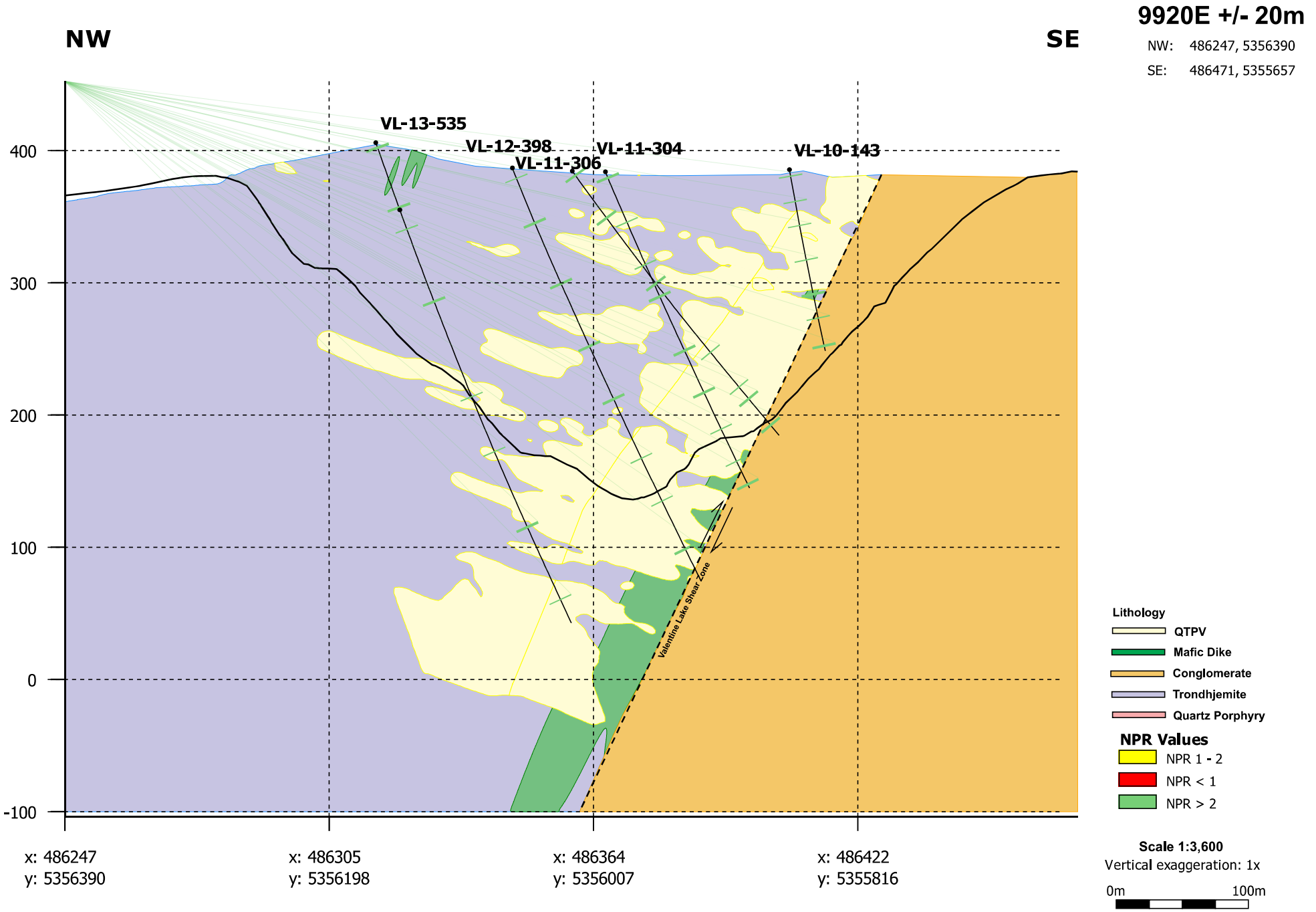
Kilometres

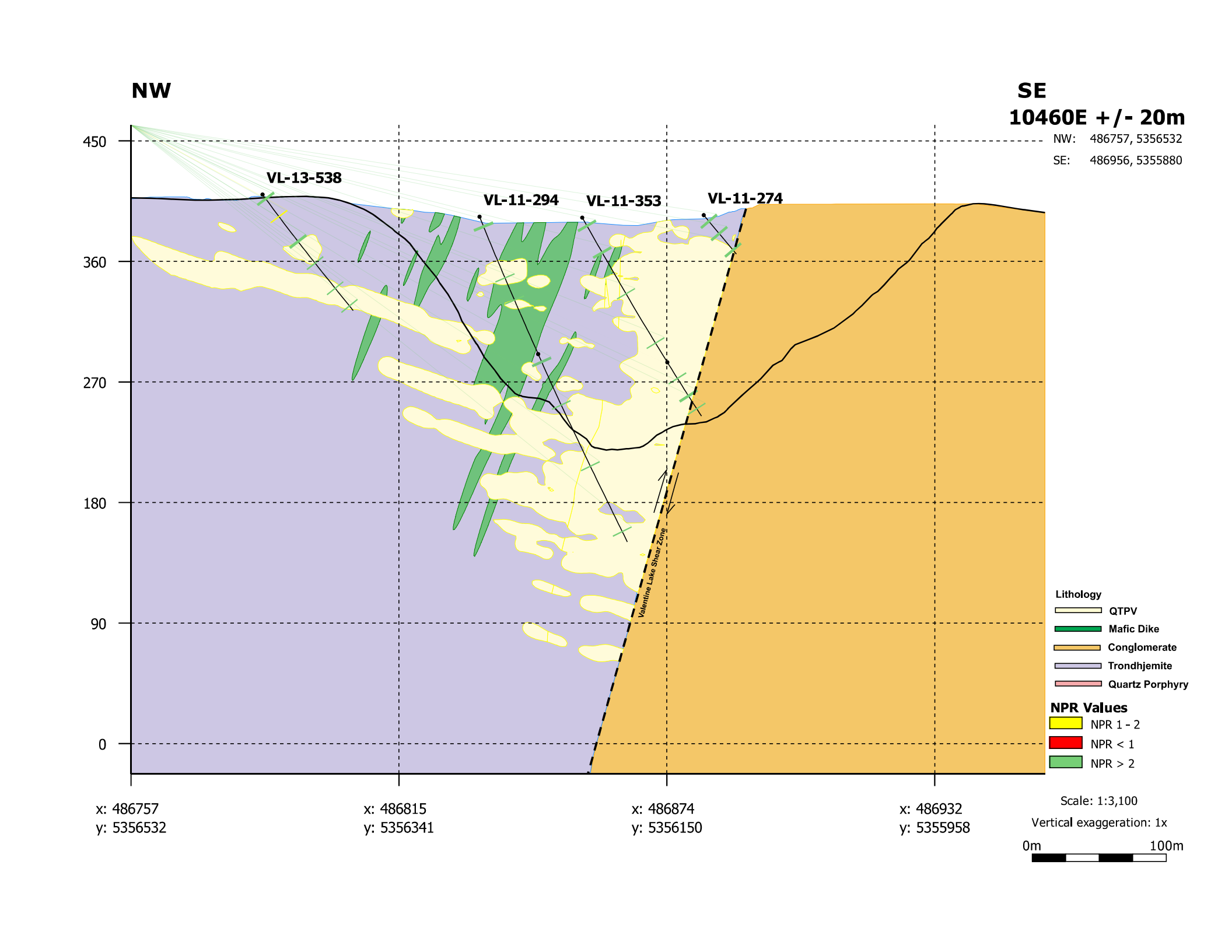
Project Location
Valentine Lake
Central Newfoundland, CA

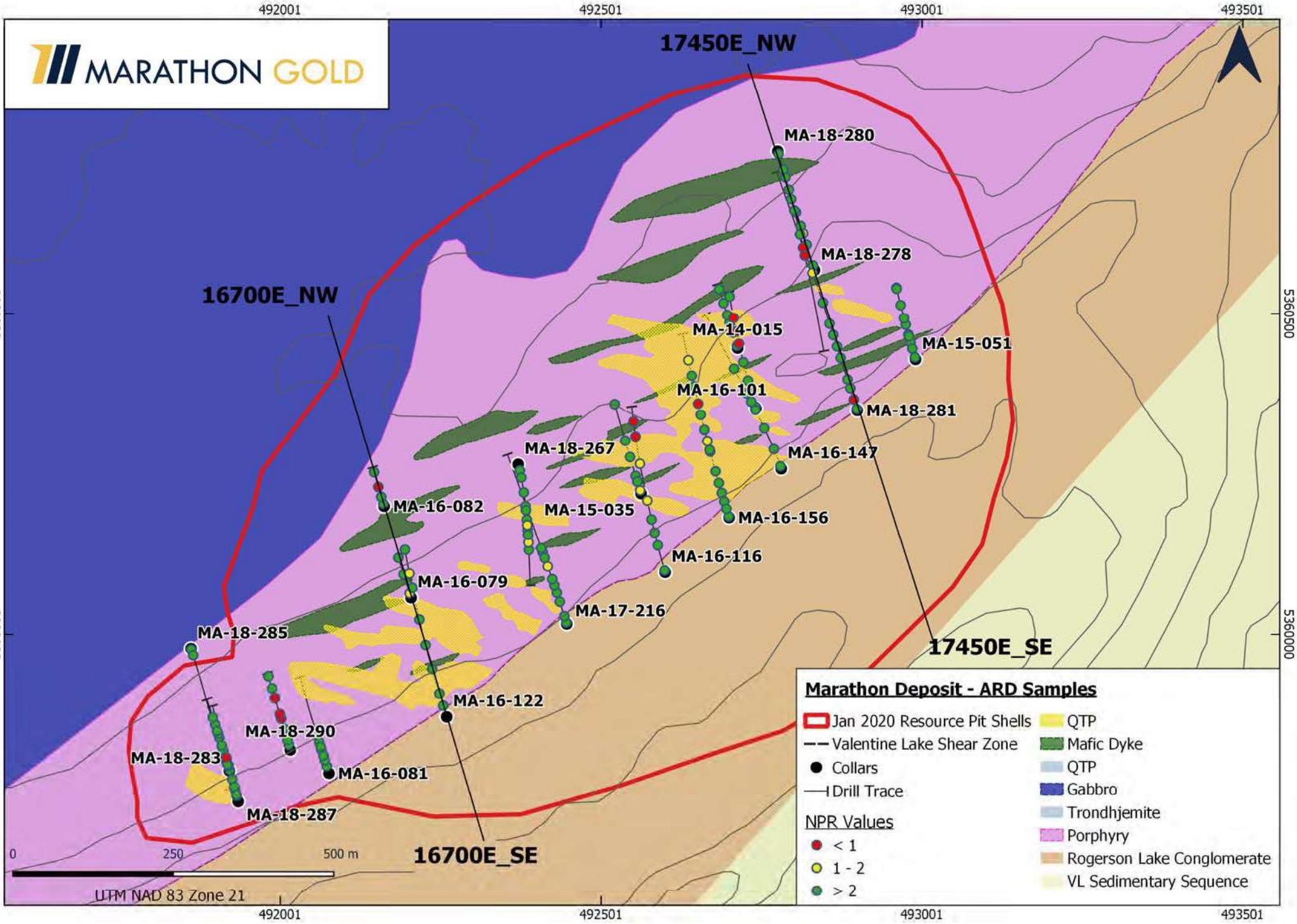
Client/Project 121416408_001a
Marathon Gold Corporation
Valentine Gold Project
Environmental Impact Statement

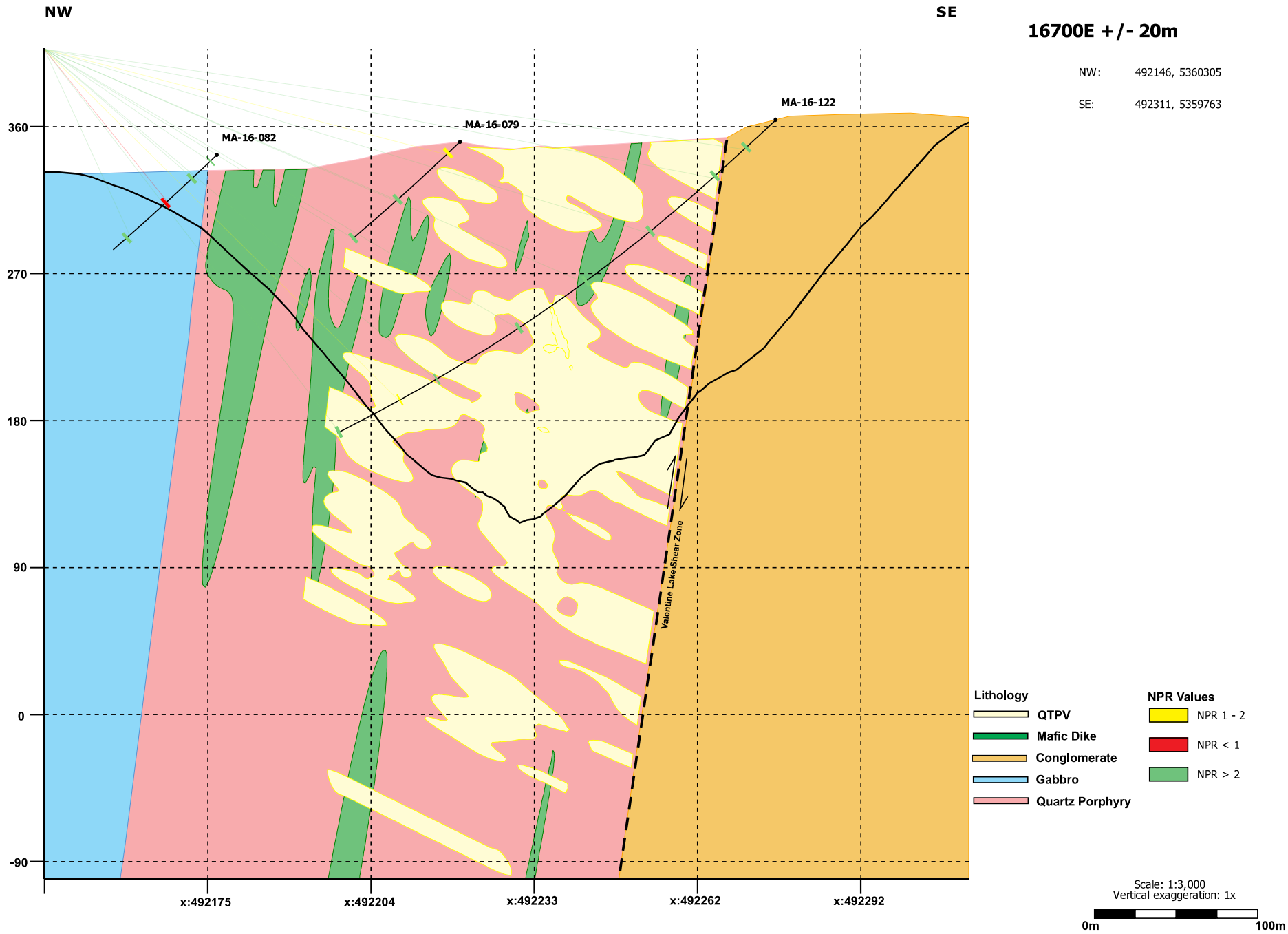

MARATHON GOLD
485001
490001
495001
500001
5365000
5360000
5355000
Project Access Road
Valentine Shear Zone
Valentine Property Boundary
Victory Deposit
Victory SW
Narrows
Triangle
Valentine Lake
Marathon Deposit
Berry Zone
Sprite Deposit
Rainbow
Leprechaun Deposit
Victoria Reservoir
0
4
8 km
Jan 2020 Resource Pit Shells
High Potential Areas
Project Access Road
Drill Access Road
Cambrian - Ordivician
Granitoid Suites
Mafic Intrusives
Migmatite, Gneiss and Schist
Siliciclastic Sediments
Submarine Mafic to Felsic Volcanics
Ordivician
Granitoid Suites
Silurian
Siliciclastic Sediments
Silurian - Devonian
Granitoid Suites
Mafic Intrusives


MARATHON GOLD
486501
487001
5356500
5356000
10460E_NW
9920E_NW
9920E_SE
10460E_SE
VL-13-538
VL-13-524
VL-11-294
VL-11-350
VL-11-253
VL-11-353
VL-12-403
VL-13-535
VL-10-202
VL-12-382
VL-11-349
VL-11-345
VL-11-274
VL-12-398
VL-11-344
VL-11-316
VL-10-157
VL-11-306
VL-11-357
VL-12-421
VL-11-304
VL-10-146
VL-10-143
0
250
500 m
UTM NAD 83 Zone 21
Leprechaun Deposit - ARD Samples
Jan 2020 Resource Pit Shells
0
Valentine Lake Shear Zone
Collars
Drill Trace
NPR Values
< 1
1 - 2
> 2
QTP_Surface
Mafic Dyke
QTP
Gabbro
Trondhjemite
Porphyry
Rogerson Lake Conglomerate
VL Sedimentary Sequence


9920E +/- 20m
NW: 486247, 5356390
SE: 486471, 5355657
NW
SE
VL-13-535
VL-12-398
VL-11-306
VL-11-304
VL-10-143
400
300
200
100
0
-100
Valentine Lake Shear Zone
x: 486247
y: 5356390
x: 486305
y: 5356198
x: 486364
y: 5356007
x: 486422
y: 5355816
Lithology
QTPV
Mafic Dike
Conglomerate
Trondhjemite
Quartz Porphyry
NPR Values
NPR 1 - 2
NPR < 1
NPR > 2
Scale 1:3,600
Vertical exaggeration: 1x
0m
100m


NW
SE
10460E +/- 20m
NW: 486757, 5356532
SE: 486956, 5355880
450
360
270
180
90
0
VL-13-538
VL-11-294
VL-11-353
VL-11-274
Valentine Lake Shear Zone
Lithology
QTPV
Mafic Dike
Conglomerate
Trondhjemite
Quartz Porphyry
NPR Values
NPR 1 - 2
NPR < 1
NPR > 2
x: 486757
y: 5356532
x: 486815
y: 5356341
x: 486874
y: 5356150
x: 486932
y: 5355958
Scale: 1:3,100
Vertical exaggeration: 1x
0m
100m


MARATHON GOLD
492001
492501
493001
493501
5360500
5360000
17450E_NW
16700E_NW
16700E_SE
17450E_SE
MA-18-280
MA-18-278
MA-14-015
MA-15-051
MA-16-101
MA-18-281
MA-18-267
MA-16-147
MA-16-082
MA-15-035
MA-16-156
MA-16-116
MA-16-079
MA-17-216
MA-18-285
MA-16-122
MA-18-290
MA-18-283
MA-16-081
MA-18-287
0
250
500 m
UTM NAD 83 Zone 21
Marathon Deposit - ARD Samples
Jan 2020 Resource Pit Shells
Valentine Lake Shear Zone
Collars
Drill Trace
NPR Values
< 1
1 - 2
> 2
QTP
Mafic Dyke
QTP
Gabbro
Trondhjemite
Porphyry
Rogerson Lake Conglomerate
VL Sedimentary Sequence


NW
SE
16700E +/- 20m
NW: 492146, 5360305
SE: 492311, 5359763
MA-16-082
MA-16-079
MA-16-122
360
270
180
90
0
-90
x:492175
x:492204
x:492233
x:492262
x:492292
Valentine Lake Shear Zone
Lithology
QTPV
Mafic Dike
Conglomerate
Gabbro
Quartz Porphyry
NPR Values
NPR 1 - 2
NPR < 1
NPR > 2
Scale: 1:3,000
Vertical exaggeration: 1x
0m
100m

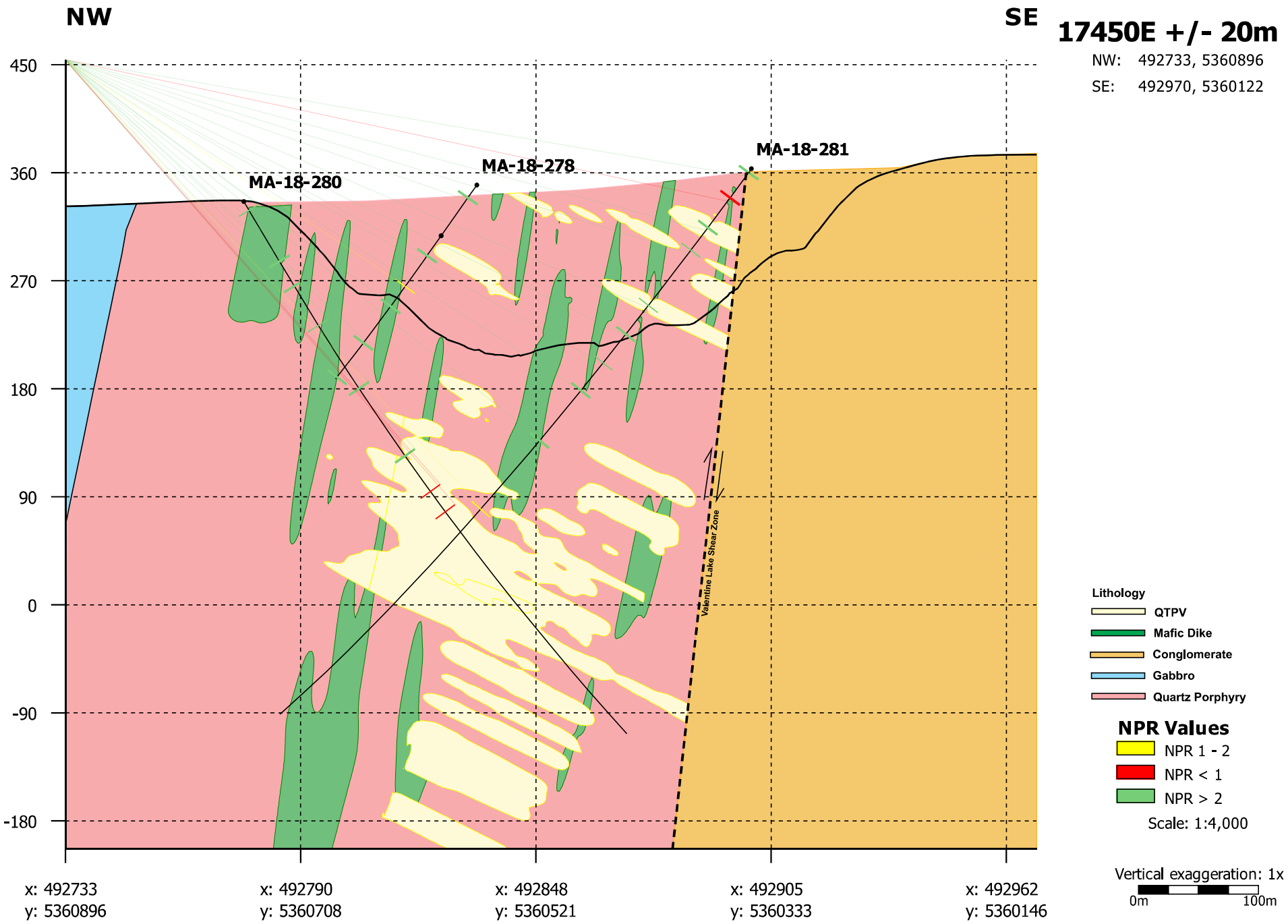
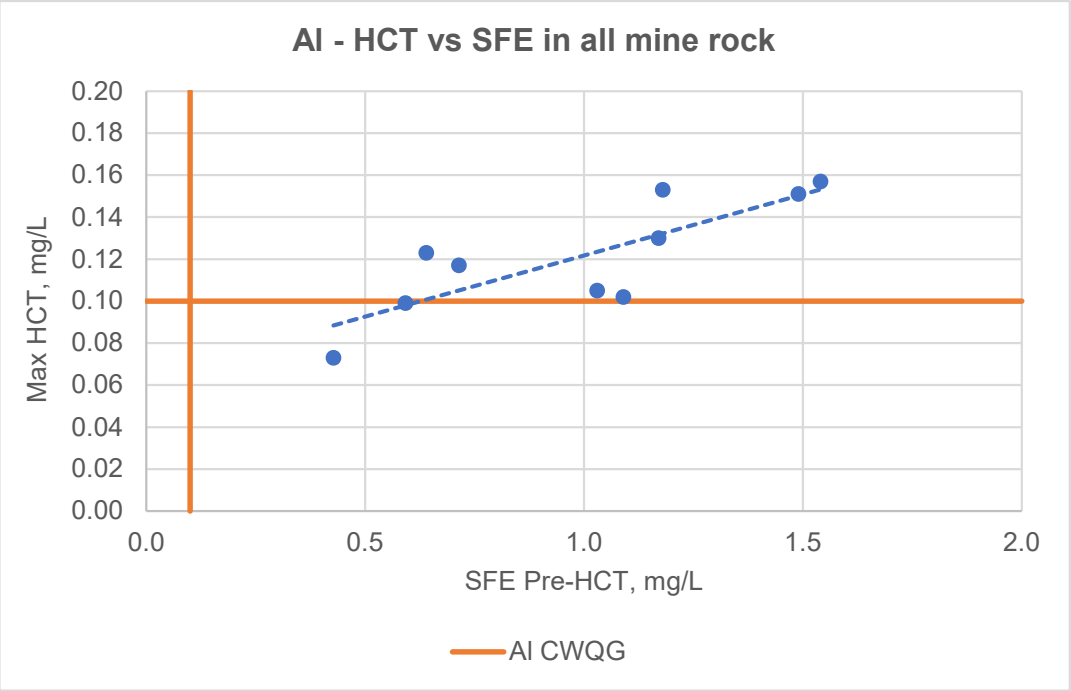

NW
SE
17450E +/- 20m
NW: 492733, 5360896
SE: 492970, 5360122
450
360
270
180
90
0
-90
-180
MA-18-280
MA-18-278
MA-18-281
Valentine Lake Shear Zone
x: 492733
y: 5360896
x: 492790
y: 5360708
x: 492848
y: 5360521
x: 492905
y: 5360333
x: 492962
y: 5360146
Lithology
QTPV
Mafic Dike
Conglomerate
Gabbro
Quartz Porphyry
NPR Values
NPR 1 - 2
NPR < 1
NPR > 2
Scale: 1:4,000
Vertical exaggeration: 1x
0m
100m

Figure A-10: Concentration of aluminum in humidty cells versus SFE in waste rock composites from Leprechaun and Marathon deposits.



APPENDIX B

Tables

Table B-1: Lithological codes for composite samples

Composite ID	Lithological Description
Leprechaun	
L TRJ	Trondhjemite
L QZ-TQTP	Trondhjemite/Granodiorite QZ + QTP veins
L SED	Sediment
L MD	Mafic Dike
L QZ-QTP	Quartz-Au Mineralized Zone (QZ) with Quartz-Tourmaline-Pyrite veins (QTP)
LLGO-Met	Leprechaun Low-Grade Ore (QZ-QTP and QZ-TQTP)
Marathon	
M QE-POR	Qtz-eye Porphyry
M AQPOR	Aphanitic quartz porphyry
M CG	Conglomerate
M MD	Mafic Dike
M QZ-QE-POR-QTP-MIN	Quartz-Au Mineralized Zone (QZ) Quartz -eye Porphyry + Minor QTP
MLGO-Met	Marathon Low-Grade Ore (QZ-QE-POR-QTP and QZ-TQTP)

Table B-2: Description of composite samples selected for ageing, humidity cell, and subaqueous column testing

Material	Sampe ID	Test type	Start	Finish	No. of weeks/days
Leprechaun					
Waste Rock	L TRJ	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	L QZ-TQTP	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	L SED	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	L MD	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	L QZ-QTP	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Low-Grade Ore	LLGO-Met	Humidity Cell	18-Dec-19	Ongoing	20 weeks
Leprechaun Tailings Composite	CND2	Humidity Cell	24-Sep-19	25-Feb-20	22 weeks
		Ageing	19-Sep-19	14-Nov-19	56 days
		Sub-Aqeous	24-Sep-19	Ongoing	30 weeks
Marathon					
Waste Rock	M QE-POR	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	M AQPOR	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	M CG	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	M MD	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Waste Rock	M QZ-QE-POR-QTP-MIN	Humidity Cell	17-Sep-19	18-Feb-20	22 weeks
Low-Grade Ore	MLGO-Met	Humidity Cell	18-Dec-19	Ongoing	20 weeks
Marathon Tailings Composite	CND1	Humidity Cell	24-Sep-19	25-Feb-20	22 weeks
		Ageing	19-Sep-19	14-Nov-19	56 days
		Sub-Aqeous	24-Sep-19	Ongoing	30 weeks

Table B-3: Mineralogical analysis of composite samples of waste rock and low grade ore

Site	Leprechaun						Marathon					
Sample ID	**L TRJ**	**L QZ-TQTP**	**L SED**	**L MD**	**L QZ-QTP**	**LLGO-Met**	**M QE-POR**	**M AQPOR**	**M CG**	**M MD**	**M QZ-QE-POR-QTP-MIN**	**MLGO-Met**
Mineral Mass (%)												
Ankerite	1.90	2.17	0.01	3.06	2.23	0.00	0.27	0.07	8.85	1.65	0.05	0.00
Apatite	0.17	0.21	0.56	0.50	0.26	0.39	0.18	0.24	0.40	0.13	0.12	0.05
Biotite	0.02	0.01	0.96	0.46	0.02	0.00	0.02	0.02	0.27	0.02	0.01	0.00
Calcite	3.74	4.75	1.05	14.25	4.54	5.04	4.13	2.56	1.74	10.45	4.19	3.36
Chalcopyrite	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.01
Chlorite	1.77	2.77	11.25	22.47	3.94	3.93	8.64	8.48	3.80	34.32	3.75	4.67
Clays	0.22	0.18	1.35	0.10	0.23	0.89	1.47	2.94	0.98	0.44	2.72	0.69
Dolomite/Ankerite	0.00	0.00	0.00	0.00	0.00	2.76	0.00	0.00	0.00	0.00	0.00	0.38
Epidote	0.18	0.42	3.21	0.57	0.27	0.00	3.36	0.67	0.41	6.73	1.55	0.00
Fe-Oxides	0.19	0.21	1.89	0.28	0.06	0.09	0.86	0.15	1.27	1.52	0.42	0.41
Muscovite/Illite	16.62	13.24	21.01	7.33	13.47	0.00	6.75	12.30	19.79	0.96	4.54	0.00
Other Oxides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37
Other Silicates	0.73	0.84	3.08	1.48	0.82	0.53	1.02	1.25	1.21	3.25	1.16	0.40
Other Sulphides*	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.00
Plagioclase	41.97	52.46	14.29	24.43	43.49	50.20	31.75	27.77	11.56	18.08	34.30	37.81
Pyrite/Marcasite**	0.18	0.14	0.00	0.23	0.09	0.32	0.23	0.62	0.00	0.70	0.26	1.03
Pyrrhotite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quartz	32.17	22.45	40.73	23.33	30.34	22.90	41.08	42.48	49.15	21.20	46.80	44.27
Rutile	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00
Sericite/Muscovite	0.00	0.00	0.00	0.00	0.00	10.40	0.00	0.00	0.00	0.00	0.00	5.87
Sphalerite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.00	0.00
Ti-(Fe)-Oxides	0.13	0.16	0.62	1.51	0.23	0.00	0.24	0.24	0.56	0.53	0.13	0.00
Tourmaline	0.00	0.00	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note:
Mineralogy is based on the SGS laboratory reports shown in Appendix D-1.
* Other sulphides include trace levels of galena along with even lower levels of tentatively identified chalcocite, pentlandite, arsenopyrite and bornite in mine rock lithologies, trace quantities of sphalerite and chalcopyrite in L LGO, and trace quantities of sphalerite and tetrahedrite and galena in M LGO (Appendix D-
**Marcasite is identified only in L LGO and M LGO.
The values of mineral mass greater than 30% are highlighted red, greater than 10% - green, and greater than 1% - yellow.

Table B-4: Number and percentages of samples from Leprechaun Deposit exceeding selected ARD/ML criteria

Parameter	Units	Criteria	1.TRJ		2. QZ-TQTP		3. CG and SED		4. QZ-SQTP		5. MD		6. QZ-MQTP		7. QZ-QTP		8. Low-Grade Ore		9. Ore		10. OB	
NPR ratio criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acid-Base Accounting (ABA)			54	100	33	100	17	100	4	100	19	100	3	100	3	100	10	100	8	100	6	100
NPR	ratio	>1 <2	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NPR	ratio	<1	0	0	0	0	0	0	1	25	0	0	0	0	0	0	1	10	1	13	0	0
MDMER Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Shake Flask Extraction (SFE)			14	100	8	100	8	100	1	100	9	100	3	100	1	100	5	100	3	100	5	100
pH	pH unit	<6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	60
pH	pH unit	>9.5	1	7	0	0	0	0	0	0	1	11	0	0	0	0	0	0	0	0	0	0
As	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CWQG Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Shake Flask Extraction (SFE)			14	100	8	100	8	100	1	100	9	100	3	100	1	100	5	100	3	100	5	100
Final pH	pH unit	<6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	100
Final pH	pH unit	>9	3	21	1	13	0	0	0	0	2	22	0	0	1	100	0	0	0	0	0	0
F	mg/L	>0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ag	mg/L	>0.00025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	mg/L	>0.1	14	100	8	100	8	100	1	100	9	100	3	100	1	100	3	60	3	100	-	-
Al	mg/L	>0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
As	mg/L	>0.005	0	0	0	0	0	0	0	0	1	11	0	0	0	0	0	0	0	0	0	0
B	mg/L	>1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd*	mg/L	>0.00004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	mg/L	>0.0089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu*	mg/L	>0.002	0	0	1	13	0	0	0	0	0	0	0	0	0	0	2	40	0	0	0	0
Fe	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20
Hg	mg/L	>0.000026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn*	mg/L	>0.19	0	0	0	0	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	mg/L	>0.073	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni*	mg/L	>0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb*	mg/L	>0.001	0	0	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20
Se	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	mg/L	>0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	mg/L	>0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn*	mg/L	>0.0017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	60
10 x ACUC Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Trace Element Concentration (TEC)			54	100	33	100	17	100	4	100	19	100	3	100	3	100	10	100	8	100	6	100
Ag	µg/g	>530	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	µg/g	>407639	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	µg/g	>48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	µg/g	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Be	µg/g	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	µg/g	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25	0	0
Co	µg/g	>173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	µg/g	>920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	µg/g	>280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe	µg/g	>320415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg	µg/g	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn	µg/g	>774.5	2	4	3	9	12	71	4	100	17	89	3	100	0	0	2	20	1	13	2	33
Mo	µg/g	>11	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	µg/g	>470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	µg/g	>654.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	µg/g	>170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	µg/g	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	µg/g	>9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	µg/g	>27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	µg/g	>970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	µg/g	>670	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are double underlined and bold.
MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).
CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).
For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

Table B-5: Summary of ABA statistics for materials from Leprechaun Deposit

Parameter	Paste pH	S_{TOTAL}	$S_{SULPHATE}$	$S_{SULPHIDE}$	Carb. NP	AP	NNP	Carb. NPR	TIC
ABA Criteria	-	-	-	-	-	-	-	Less than 1; 1 to 2	-
Units	pH Units	wt.%			kg $CaCO_3$/t			unit less	wt.%
1. Trondhjemite and Granodiorite (TRJ), 54 samples									
Min	9.03	0.0090	0.005	0.01	17.7	0.3	27	59	0.212
10th, %ile	9.42	0.010	0.005	0.01	23.8	0.3	39	79	0.285
Median	9.77	0.035	0.010	0.02	36.6	0.6	61	59	0.439
90th, %ile	9.91	0.13	0.020	0.10	62.2	3.1	86	20	0.747
Max	10.03	0.30	0.060	0.29	167.5	9.1	175	18	2.01
Average	9.71	0.06	0.013	0.05	42.4	1.5	65	29	0.509
St. Dev.	0.21	0.06	0.011	0.05	24.8	1.7	26	15	0.297
2. QZ - Trondhjemite + QTP and QZ - Granodiorite + QTP (QZ-TQTP), 33 samples									
Min	9.31	0.0300	0.005	0.02	11.1	0.6	14	19	0.133
10th, %ile	9.48	0.034	0.005	0.02	19.6	0.6	39	32	0.235
Median	9.79	0.110	0.010	0.09	36.1	2.8	65	13	0.433
90th, %ile	9.90	0.29	0.040	0.28	72.2	8.8	80	8	0.866
Max	10.00	0.44	0.120	0.36	163.4	11.3	204	14	1.96
Average	9.74	0.15	0.017	0.13	45.2	4.1	69	11	0.542
St. Dev.	0.16	0.11	0.022	0.10	30.5	3.3	33	9	0.365
3. Conglomerate and Sediments (CG and SED), 17 samples									
Min	8.71	0.0025	0.010	0.01	2.1	0.3	2	7	0.025
10th, %ile	8.86	0.003	0.010	0.01	3.4	0.3	7	11	0.041
Median	9.54	0.010	0.010	0.01	12.5	0.3	21	42	0.150
90th, %ile	9.70	0.01	0.020	0.01	30.9	0.6	62	50	0.371
Max	9.84	0.02	0.050	0.01	50.5	0.6	83	81	0.606
Average	9.45	0.01	0.015	0.01	15.0	0.4	28	38	0.180
St. Dev.	0.32	0.00	0.010	0.00	12.5	0.1	23	86	0.150
4. QZ - Conglomerate + QTP and QZ - Sediments + QTP (QZ-SQTP), 4 samples									
Min	8.31	0.0025	0.010	0.01	10.9	0.6	10	18	0.131
10th, %ile	8.37	0.003	0.010	0.01	12.8	0.6	14	21	0.154
Median	8.95	0.038	0.020	0.03	20.9	0.9	32	22	0.251
90th, %ile	9.53	0.56	0.058	0.50	55.5	15.7	59	4	0.666
Max	9.59	0.77	0.070	0.70	68.8	21.9	68	3.1	0.825
Average	8.95	0.21	0.030	0.19	30.4	6.1	36	5	0.364
St. Dev.	0.55	0.32	0.024	0.29	22.7	9.1	21	2.5	0.272
5. Mafic Dike (MD), 19 samples									
Min	8.33	0.0200	0.010	0.01	22.3	0.3	46	74	0.268
10th, %ile	8.80	0.054	0.010	0.03	42.6	0.8	62	55	0.511
Median	9.16	0.120	0.040	0.06	125.7	1.9	171	66	1.51
90th, %ile	9.72	0.38	0.056	0.35	175.1	10.8	229	16	2.10
Max	9.88	1.15	0.100	1.11	228.0	34.7	253	7	2.74
Average	9.18	0.19	0.039	0.15	116.3	4.8	159	24	1.40
St. Dev.	0.38	0.25	0.023	0.25	54.8	7.8	62	7	0.658
6. Mafic Dike + QTP (QZ-MQTP), 3 samples									
Min	9.07	0.0100	0.010	0.01	157.5	0.3	173	525	1.89
10th, %ile	9.08	0.028	0.016	0.02	162.6	0.6	176	262	1.95
Median	9.13	0.100	0.040	0.06	183.2	1.9	186	96	2.20
90th, %ile	9.35	0.14	0.048	0.09	220.3	2.9	234	77	2.64
Max	9.40	0.15	0.050	0.10	229.6	3.1	246	74	2.75
Average	9.20	0.09	0.033	0.06	190.1	1.8	202	108	2.28
St. Dev.	0.14	0.06	0.017	0.04	29.8	1.1	32	26	0.358

Table B-5: Summary of ABA statistics for materials from Leprechaun Deposit

7. QZ-QTP, 3 samples									
Min	9.10	0.0290	0.010	0.01	38.5	0.6	38	62	0.462
10th, %ile	9.26	0.037	0.014	0.01	44.8	0.7	44	65	0.537
Median	9.91	0.068	0.030	0.03	69.8	0.9	69	74	0.837
90th, %ile	10.00	0.07	0.038	0.05	94.7	1.7	145	55	1.14
Max	10.02	0.07	0.040	0.06	100.9	1.9	164	53	1.21
Average	9.68	0.06	0.027	0.03	69.7	1.2	90	60	0.837
St. Dev.	0.41	0.02	0.012	0.02	25.5	0.5	54	47	0.306
8. Low-Grade Ore, 10 samples									
Min	8.28	0.0100	0.005	0.01	3.3	0.3	-17	11	0.039
10th, %ile	8.54	0.064	0.005	0.06	3.8	1.7	13	2.2	0.046
Median	9.63	0.213	0.015	0.15	34.1	4.5	52	8	0.409
90th, %ile	9.87	0.50	0.079	0.47	91.2	14.7	99	6	1.09
Max	9.90	0.81	0.160	0.65	154.3	20.3	271	8	1.85
Average	9.44	0.25	0.039	0.22	45.4	6.8	67	7	0.545
St. Dev.	0.52	0.22	0.046	0.19	43.4	5.9	74	7	0.521
9. Ore, 8 samples									
Min	8.89	0.1740	0.005	0.10	11.6	3.1	11	4	0.139
10th, %ile	8.92	0.182	0.009	0.13	20.6	4.0	16	5	0.247
Median	9.57	0.361	0.025	0.28	40.6	8.6	47	5	0.487
90th, %ile	9.90	0.66	0.106	0.63	74.5	19.8	82	4	0.894
Max	9.93	0.79	0.190	0.78	108.3	24.4	104	4	1.30
Average	9.51	0.40	0.048	0.35	45.8	11.0	51	4	0.549
St. Dev.	0.38	0.20	0.058	0.22	27.3	6.9	28	4	0.327
10. Overburden (OB), 6 samples									
Min	6.03	0.0025	0.010	0.010	1.2	0.08	0.89	15	0.014
10th, %ile	6.04	0.0025	0.010	0.010	1.2	0.08	1.0	15	0.014
Median	6.57	0.0038	0.010	0.010	1.3	0.12	1.2	11	0.016
90th, %ile	7.18	0.0090	0.010	0.010	1.8	0.28	1.6	6	0.021
Max	7.52	0.0090	0.010	0.010	1.8	0.28	1.8	7	0.022
Average	6.59	0.0051	0.010	0.010	1.4	0.16	1.3	9	0.017
St. Dev.	0.51	0.0029	0	0	0.3	0.09	0.3	2.9	0.003

Notes:

S_{TOTAL} - Total Sulphur;

$S_{SULPHIDE}$ - Sulphide Sulphur; $S_{SULPHIDE}=S_{TOTAL}-S_{SULPHATE}$.

$S_{SULPHATE}$ - Sulphate Sulphur;

Carb. NP - Carbonate Neutralization Potential; Carb. NP=TIC*M($CaCO_3$)/M(C)*10(kg/t from % diff.)

AP - Acid Potential; AP=$S_{SULPHIDE}$(%) x 31.25.

NNP - Net Neutralization Potential;

NPR - Neutralization Potential Ratio;

TIC - Total Inorganic Carbon.

Overburden AP is calculated using S_{TOTAL} x 31.25.

Overburden NP is calculated as (50 x (N of HCL x Total HCL added - N NaOH x NaOH added))/Weight of Sample.

Respective samples from Phase I and II are combined.

NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-6: Summary of SFE statistics for materials from Leprechaun Deposit

Parameter	pH	SO_4	F	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Hg	Mn*	Mo	Ni*	Pb*	Se	Tl	U	Zn*
MDMER	6.0-9.5	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	n/v	0.25	0.08	n/v	n/v	n/v	0.4
CWQG	6.5-9.0	n/v	0.12	0.00025	0.005/0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.000026	0.19	0.073	0.025	0.001	0.001	0.0008	0.015	0.006
Unit	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1. Trondhjemite and Granodiorite (TRJ), 14 samples																				
Min	7.30	0.50	-	0.000005	**0.10**	0.00007	0.0010	0.0000010	0.00005	0.00055	0.0010	0.000010	0.0041	0.000062	0.000049	0.000025	0.000050	0.0000020	0.000055	0.00050
10th, %ile	7.44	0.50	-	0.000005	**0.17**	0.00024	0.0010	0.0000010	0.00005	0.00059	0.0021	0.000010	0.0049	0.000073	0.000058	0.000025	0.000050	0.0000020	0.000074	0.00050
Median	7.85	0.50	-	0.000005	**0.21**	0.00044	0.0026	0.0000010	0.00005	0.00109	0.0048	0.000010	0.040	0.00012	0.000073	0.000025	0.000050	0.0000084	0.00018	0.00050
90th, %ile	**9.35**	2.7	-	0.000005	**0.45**	0.00157	0.0033	0.0000029	0.00005	0.00150	0.0088	0.000010	0.12	0.00049	0.00010	0.000060	0.000050	0.000019	0.00040	0.00050
Max	**9.62**	33	-	0.000005	**0.49**	0.00374	0.0035	0.0000039	0.00005	0.00196	0.0096	0.000010	0.14	0.0044	0.00013	0.000073	0.00010	0.000023	0.00054	0.0015
Average	8.11	3.2	-	0.000005	**0.26**	0.00082	0.0025	0.0000016	0.00005	0.00109	0.0052	0.000010	0.056	0.00048	0.000078	0.000036	0.000054	0.000010	0.00021	0.00057
St. Dev.	0.72	8.2	-	0	0.11	0.00092	0.0008	0.0000009	0	0.00039	0.0027	0	0.048	0.0011	0.000019	0.000017	0.000013	0.000008	0.00014	0.00026
2. QZ - Trondhjemite + QTP and QZ - Granodiorite + QTP (QZ-TQTP), 8 samples																				
Min	7.32	0.50	-	0.000005	**0.13**	0.00030	0.0023	0.0000010	0.00005	0.00052	0.0010	0.000010	0.0038	0.00012	0.000046	0.000025	0.000050	0.0000020	0.0000011	0.00050
10th, %ile	7.49	0.50	-	0.000005	**0.16**	0.00035	0.0024	0.0000010	0.00005	0.00054	0.0010	0.000010	0.029	0.00014	0.000057	0.000025	0.000050	0.0000020	0.000051	0.00050
Median	7.78	0.50	-	0.000005	**0.20**	0.00052	0.0040	0.0000017	0.00005	0.00092	0.0029	0.000010	0.073	0.00018	0.000086	0.000025	0.000050	0.0000020	0.00022	0.00050
90th, %ile	8.54	0.50	-	0.000005	**0.32**	0.00075	0.0058	0.0000031	0.00011	**0.00216**	0.0075	0.000010	0.12	0.0021	0.00017	0.00058	0.000050	0.0000075	0.00058	0.00050
Max	**9.43**	0.50	-	0.000005	**0.44**	0.00092	0.0063	0.0000038	0.00024	**0.00368**	0.0083	0.000010	0.14	0.0062	0.00028	**0.0018**	0.000050	0.000010	0.00095	0.00050
Average	7.96	0.50	-	0.000005	**0.23**	0.00054	0.0041	0.0000019	0.00007	0.00123	0.0037	0.000010	0.073	0.00094	0.00011	0.00025	0.000050	0.0000035	0.00028	0.00050
St. Dev.	0.60	0	-	0	0.09	0.00019	0.0014	0.0000010	0.00006	0.00098	0.0027	0	0.042	0.0020	0.000071	0.00059	0	0.0000028	0.00028	0
3. Conglomerate and Sediments (CG and SED), 8 samples																				
Min	7.51	0.50	-	0.000005	**0.12**	0.00041	0.0010	0.0000010	0.00005	0.00029	0.0010	0.000010	0.043	0.000088	0.000071	0.000025	0.000050	0.0000020	0.0000028	0.00050
10th, %ile	7.52	0.50	-	0.000005	**0.12**	0.00056	0.0010	0.0000010	0.00005	0.00054	0.0010	0.000010	0.055	0.00011	0.000077	0.000025	0.000050	0.0000035	0.0000036	0.00050
Median	7.63	0.50	-	0.000005	**0.19**	0.00103	0.0015	0.0000023	0.00005	0.00071	0.0049	0.000010	0.068	0.00017	0.000092	0.000025	0.000050	0.000010	0.00010	0.00050
90th, %ile	7.77	31	-	0.000007	**0.26**	0.00131	0.0030	0.0000065	0.00005	0.00112	0.0073	0.000010	0.17	0.00047	0.00012	0.000046	0.000050	0.000020	0.00029	0.00050
Max	7.83	71	-	0.000010	**0.27**	0.00147	0.0032	0.0000068	0.00005	0.00154	0.0083	0.000010	**0.20**	0.00066	0.00013	0.000094	0.000050	0.000034	0.00031	0.00050
Average	7.64	11	-	0.000006	**0.19**	0.00096	0.0018	0.0000033	0.00005	0.00079	0.0046	0.000010	0.10	0.00024	0.000096	0.000034	0.000050	0.000011	0.00012	0.00050
St. Dev.	0.10	23	-	0.000002	0.05	0.00032	0.0009	0.0000024	0	0.00033	0.0025	0	0.057	0.00018	0.000019	0.000023	0.000000	0.000010	0.00011	0
4. QZ - Conglomerate + QTP and QZ - Sediments + QTP (QZ-SQTP), 1 sample																				
Average	8.26	174	-	0.000005	**0.11**	0.00043	0.0162	0.0000010	0.00005	0.00070	0.0010	0.000010	0.025	0.00026	0.000084	0.000025	0.000050	0.0000061	0.00016	0.00050
5. Mafic Dike (MD), 9 samples																				
Min	7.23	0.50	-	0.000005	**0.18**	0.00009	0.0010	0.0000010	0.00005	0.00041	0.0010	0.000010	0.00041	0.000083	0.000048	0.000025	0.000050	0.0000020	0.0000005	0.00050
10th, %ile	7.35	0.50	-	0.000005	**0.18**	0.00030	0.0010	0.0000010	0.00005	0.00047	0.0010	0.000010	0.00047	0.000092	0.000053	0.000025	0.000050	0.0000020	0.0000005	0.00050
Median	8.10	0.50	-	0.000005	**0.21**	0.00088	0.0010	0.0000010	0.00005	0.00074	0.0010	0.000010	0.027	0.00017	0.000079	0.000025	0.00010	0.0000020	0.0000019	0.00050
90th, %ile	**9.41**	7.7	-	0.000005	**0.38**	0.00305	0.0032	0.0000028	0.00005	0.00123	0.0028	0.000010	0.035	0.00047	0.00022	0.000025	0.00013	0.0000044	0.0000053	0.00050
Max	**9.64**	29	-	0.000005	**0.46**	**0.00818**	0.0063	0.0000047	0.00005	0.00147	0.0034	0.000010	0.037	0.00076	0.00024	0.000025	0.00015	0.0000045	0.000010	0.00050
Average	8.26	3.8	-	0.000005	**0.26**	0.00165	0.0019	0.0000017	0.00005	0.00077	0.0016	0.000010	0.018	0.00023	0.00010	0.000025	0.000089	0.0000025	0.0000029	0.00050
St. Dev.	0.90	8.7	-	0	0.09	0.00237	0.0017	0.0000012	0	0.00032	0.0009	0	0.016	0.00021	0.000066	0	0.000037	0.0000010	0.0000028	0
6. Mafic Dike + QTP (QZ-MQTP), 3 samples																				
Min	7.46	0.50	-	0.000005	**0.11**	0.00020	0.0010	0.0000010	0.00005	0.00045	0.0010	0.000010	0.0027	0.00011	0.000055	0.000025	0.000050	0.0000020	0.0000015	0.00050
10th, %ile	7.59	0.50	-	0.000005	**0.13**	0.00024	0.0012	0.0000010	0.00005	0.00048	0.0010	0.000010	0.0032	0.00013	0.000074	0.000025	0.000050	0.0000037	0.0000022	0.00050
Median	8.09	0.50	-	0.000005	**0.23**	0.00040	0.0022	0.0000010	0.00005	0.00058	0.0010	0.000010	0.0052	0.00022	0.00015	0.000025	0.000050	0.000011	0.0000048	0.00050
90th, %ile	8.19	0.50	-	0.000005	**0.24**	0.00074	0.0033	0.0000022	0.00005	0.00068	0.0110	0.000010	0.015	0.0085	0.00018	0.000025	0.00014	0.000019	0.00090	0.00050
Max	8.21	0.50	-	0.000005	**0.25**	0.00083	0.0036	0.0000025	0.00005	0.00071	0.0135	0.000010	0.017	0.011	0.00019	0.000025	0.00016	0.000021	0.0011	0.00050
Average	7.92	0.50	-	0.000005	**0.20**	0.00048	0.0023	0.0000015	0.00005	0.00058	0.0052	0.000010	0.008	0.0036	0.00013	0.000025	0.000087	0.000011	0.00038	0.00050
St. Dev.	0.33	0	-	0	0.06	0.00026	0.0011	0.0000007	0	0.00011	0.0059	0	0.006	0.0049	0.000057	0	0.000052	0.000008	0.00053	0

See notes on last page.

Table B-6: Summary of SFE statistics for materials from Leprechaun Deposit

Parameter	pH	SO_4	F	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Hg	Mn*	Mo	Ni*	Pb*	Se	Tl	U	Zn*
MDMER	6.0-9.5	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	n/v	0.25	0.08	n/v	n/v	n/v	0.4
CWQG	6.5-9.0	n/v	0.12	0.00025	0.005/0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.000026	0.19	0.073	0.025	0.001	0.001	0.0008	0.015	0.006
Unit	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
7. QZ-QTP, 1 sample																				
Average	**9.32**	0.50	-	0.000005	**0.35**	0.00149	0.0060	0.0000010	0.00017	0.00147	0.0139	0.000010	0.0017	0.00079	0.00022	0.000025	0.000050	0.000010	0.00019	0.00050
8. Low-Grade Ore, 5 samples																				
Min	7.36	0.50	-	0.000005	0.040	0.00013	0.0010	0.0000010	0.00005	0.00041	0.0010	0.000010	0.011	0.00018	0.000070	0.000025	0.000050	0.0000020	0.000022	0.00050
10th, %ile	7.37	0.50	-	0.000005	0.062	0.00025	0.0014	0.0000010	0.00005	0.00079	0.0021	0.000010	0.017	0.00021	0.000073	0.000025	0.000050	0.0000020	0.000025	0.00050
Median	7.70	0.50	-	0.000005	**0.18**	0.00046	0.0042	0.0000022	0.00005	0.00137	0.0052	0.000010	0.057	0.00032	0.000082	0.000025	0.000050	0.0000059	0.00010	0.00050
90th, %ile	8.15	2.4	-	0.000010	**0.24**	0.00071	0.0179	0.0000023	0.00005	**0.00255**	0.0077	0.000010	0.072	0.00060	0.00012	0.000088	0.00015	0.000011	0.00026	0.0011
Max	8.44	2.5	-	0.000013	**0.25**	0.00084	0.0221	0.0000024	0.00005	**0.00285**	0.0083	0.000010	0.082	0.00066	0.00013	0.00010	0.00017	0.000013	0.00031	0.0015
Average	7.72	1.3	-	0.000007	**0.16**	0.00048	0.0082	0.0000018	0.00005	0.00162	0.0050	0.000010	0.046	0.00038	0.000095	0.000049	0.000088	0.000006	0.00013	0.00070
St. Dev.	0.39	0.9	-	0.000003	0.08	0.00022	0.0079	0.0000006	0	0.00082	0.0025	0	0.025	0.00017	0.000023	0.000032	0.000049	0.000004	0.00011	0.00040
9. Ore, 3 samples																				
Min	7.57	3.6	-	0.000005	**0.14**	0.00018	0.0030	0.0000022	0.00005	0.00031	0.0010	0.000010	0.061	0.00018	0.000057	0.000025	0.000050	0.000013	0.000059	0.00050
10th, %ile	7.58	3.8	-	0.000005	**0.15**	0.00026	0.0030	0.0000023	0.00005	0.00038	0.0014	0.000010	0.065	0.00031	0.000059	0.000025	0.000050	0.000014	0.000078	0.00050
Median	7.61	4.4	-	0.000005	**0.18**	0.00060	0.0032	0.0000028	0.00005	0.00065	0.0030	0.000010	0.085	0.00085	0.000069	0.000025	0.000050	0.000020	0.00016	0.00050
90th, %ile	7.73	12	-	0.000011	**0.24**	0.00144	0.0086	0.0000106	0.00005	0.00114	0.0059	0.000010	0.13	0.0011	0.00015	0.000055	0.000050	0.000022	0.00036	0.00050
Max	7.76	14	-	0.000012	**0.25**	0.00165	0.0100	0.0000126	0.00005	0.00126	0.0066	0.000010	0.14	0.0012	0.00017	0.000062	0.000050	0.000023	0.00041	0.00050
Average	7.65	7.3	-	0.000007	**0.19**	0.00081	0.0054	0.0000059	0.00005	0.00074	0.0035	0.000010	0.096	0.00074	0.00010	0.000037	0.000050	0.000018	0.00021	0.00050
St. Dev.	0.08	4.7	-	0.000003	0.05	0.00062	0.0033	0.0000048	0	0.00039	0.0023	0	0.034	0.00042	0.000053	0.000017	0	0.000004	0.00015	0
10. Overburden (OB), 5 samples																				
Min	**5.53**	1.0	0.030	0.000025	0.0020	0.00030	0.0030	0.0000030	0.00004	0.00010	0.0035	0.000005	0.0020	0.000070	0.00020	0.000005	0.000040	0.0000025	0.0000010	0.0010
10th, %ile	**5.71**	1.0	0.030	0.000025	0.0036	0.00034	0.0030	0.0000030	0.00004	0.00022	0.0035	0.000005	0.0082	0.000082	0.00024	0.000011	0.000044	0.0000025	0.0000014	0.0010
Median	**5.99**	3.0	0.030	0.000025	**0.12**	0.00060	0.0030	0.0000040	0.00028	0.00090	0.12	0.000005	0.025	0.00011	0.00050	0.00012	0.000080	0.0000025	0.000012	0.0050
90th, %ile	**6.25**	5.2	0.048	0.000025	**0.32**	0.00156	0.0052	0.0000098	0.00058	0.00156	**0.31**	0.000005	0.079	0.00017	0.00082	**0.0016**	0.000092	0.000015	0.000025	**0.043**
Max	**6.30**	6.0	0.060	0.000025	**0.36**	0.00180	0.0060	0.0000110	0.00073	0.00160	**0.35**	0.000005	0.10	0.00019	0.00090	**0.0025**	0.00010	0.000024	0.000027	**0.053**
Average	**6.00**	3.0	0.036	0.000025	**0.15**	0.00086	0.0038	0.0000058	0.00029	0.00090	0.14	0.000005	0.039	0.00012	0.00052	0.00057	0.000070	0.0000068	0.000013	**0.018**
St. Dev.	0.26	1.9	0.012	0	0.14	0.00056	0.0012	0.0000032	0.00025	0.00059	0.14	0	0.033	0.00004	0.00026	0.00095	0.000022	0.0000086	0.000010	0.020

Notes:
SFE is analyzed for waste rock and ore in Phase I and for overburden in Phase II.
MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).
CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).
For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.
Guidelines were not applied to the standard deviation values.
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-7: Summary of statistics for total concentration of trace elements in materials from Leprechaun Deposit

	Ag	Al	As	Be	Cd	Co	Cr	Cu	Fe	Hg	Mn	Mo	Ni	P	Pb	Se	Tl	U	V	Zn
ACUCx10	530	407639	48	21	0.90	173	920	280	320415	0.5	774.5	11	470	654.3	170	0.9	9	27	970	670
Units	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
1. Trondhjemite and Granodiorite (TRJ), 54 samples																				
Min	0.005	2000	0.3	0.07	0.010	0.80	29	2.1	600	0.025	320	0.050	1.1	7.0	1.3	0.35	0.010	0.050	0.50	9.9
10th, %ile	0.007	4358	0.5	0.11	0.013	1.1	41	2.9	716	0.025	366	0.10	1.2	10	2.9	0.35	0.010	0.050	4.0	19
Median	0.050	6420	1.0	0.50	0.050	1.9	50	4.8	1025	0.025	465	0.30	1.7	14	12	0.50	0.25	0.20	9.0	32
90th, %ile	0.050	7900	2.7	1.0	0.050	6.2	75	16	8750	0.025	593	0.67	5.1	53	16	0.50	0.25	0.30	45	49
Max	0.050	8280	5.0	2.0	0.050	23	104	56	17000	0.025	**1120**	1.8	19	66	22	0.50	0.25	1.2	157	70
Average	0.044	6323	1.4	0.59	0.044	3.5	53	8.3	2721	0.025	486	0.35	3.0	23	12	0.48	0.21	0.20	21	33
St. Dev.	0.015	1395	1.1	0.39	0.013	4.0	15	9.3	3834	0	141	0.35	3.1	16	5.1	0.06	0.09	0.17	30	13
2. QZ - Trondhjemite + QTP and QZ - Granodiorite + QTP (QZ-TQTP), 33 samples																				
Min	0.005	2900	0.3	0.09	0.010	0.70	30	2.3	510	0.025	240	0.050	1.2	6.0	1.7	0.35	0.010	0.050	0.50	9.0
10th, %ile	0.012	5764	0.5	0.16	0.032	0.9	38	3.3	604	0.025	349	0.12	1.3	9.0	3.0	0.35	0.010	0.10	4.0	14
Median	0.050	6710	1.0	0.50	0.050	3.1	54	8.8	1180	0.025	446	0.30	1.7	18	8.7	0.50	0.25	0.30	10	33
90th, %ile	0.050	7772	2.0	1.0	0.050	7.4	68	35	15000	0.025	670	2.06	4.3	58	14	0.50	0.25	0.66	53	45
Max	0.050	11000	3.0	2.0	0.100	14	100	68	30000	0.025	**1030**	**28**	8.2	80	21	0.50	0.25	0.80	160	62
Average	0.043	6674	1.1	0.69	0.049	3.8	55	14.1	3913	0.025	496	1.48	2.6	27	8.9	0.47	0.21	0.31	25	32
St. Dev.	0.015	1416	0.7	0.46	0.018	3.3	13	15.7	6594	0	172	4.83	1.6	21	4.4	0.06	0.09	0.19	32	13
3. Conglomerate and Sediments (CG and SED), 17 samples																				
Min	0.005	6370	1.0	0.11	0.010	4.30	37	0.4	1330	0.025	332	0.050	2.4	34	0.91	0.35	0.010	0.20	27	39
10th, %ile	0.005	6646	2.5	0.12	0.010	12.6	47	0.9	3466	0.025	654	0.05	19	61	1.0	0.35	0.010	0.48	33	52
Median	0.050	7250	5.0	0.50	0.050	15.2	68	3.9	4120	0.025	**877**	0.20	26	73	13	0.50	0.25	1.3	95	70
90th, %ile	0.050	15200	6.4	1.0	0.070	18.1	76	33	28600	0.025	**1242**	0.76	29	95	14	0.50	0.25	1.6	107	83
Max	0.050	18000	9.0	1.0	0.200	23	88	44	36000	0.025	**1360**	9.0	31	111	17	0.50	0.25	1.8	161	88
Average	0.037	9268	4.7	0.57	0.053	15.1	64	14.0	11032	0.025	**938**	0.74	24	75	10	0.46	0.18	1.1	81	69
St. Dev.	0.021	3717	1.9	0.35	0.042	3.7	13	14.5	11721	0	275	2.08	6.4	18	5.8	0.07	0.11	0.52	37	12
4. QZ - Conglomerate + QTP and QZ - Sediments + QTP (QZ-SQTP), 4 samples																				
Min	0.005	7510	2.2	0.05	0.030	13.00	24	0.8	5110	0.025	**860**	0.050	13	93	1.0	0.35	0.010	0.050	45	60
10th, %ile	0.016	9457	2.5	0.06	0.036	14.8	33	1.0	11677	0.025	**932**	0.10	15	93	1.0	0.35	0.010	0.18	48	63
Median	0.045	18000	3.3	0.13	0.050	21.4	61	17.3	34500	0.025	**1105**	0.40	21	93	1.1	0.35	0.01	0.50	84	70
90th, %ile	0.057	31100	4.5	0.8	0.078	26.0	86	94	58100	0.025	**1173**	0.95	28	93	7.5	0.46	0.18	2.0	139	85
Max	0.060	35000	5.0	1.0	0.090	27	93	120	65000	0.025	**1200**	1.1	31	93	10	0.50	0.25	2.6	150	91
Average	0.039	19628	3.4	0.33	0.055	20.7	60	38.8	34778	0.025	**1068**	0.49	22	93	3.3	0.39	0.07	0.91	91	73
St. Dev.	0.021	10252	1.0	0.39	0.022	5.3	25	48.6	21830	0	126	0.41	6.5	0	4.0	0.06	0.10	0.99	43	11
5. Mafic Dike (MD), 19 samples																				
Min	0.005	3000	0.5	0.11	0.030	1.20	27	3.0	700	0.025	403	0.050	1.5	10	1.5	0.35	0.010	0.050	4.0	19
10th, %ile	0.005	5870	1.7	0.22	0.050	14.6	41	14.4	5200	0.025	**884**	0.17	9.5	30	2.4	0.35	0.010	0.10	116	50
Median	0.050	7520	10	0.50	0.050	36.3	81	58.0	7570	0.025	**1400**	0.60	28	91	6.6	0.50	0.25	0.40	250	83
90th, %ile	0.050	27000	19	1.0	0.200	43.3	113	86	64600	0.025	**1570**	1.94	33	128	10	0.50	0.25	0.52	313	99
Max	0.050	37000	42	2.0	0.300	45	146	108	83000	0.025	**1700**	2.7	35	176	10	0.50	0.25	0.60	320	115
Average	0.041	11038	11	0.65	0.101	31.7	77	56.9	17397	0.025	**1264**	0.83	24	88	6.3	0.47	0.20	0.34	225	78
St. Dev.	0.017	9069	9.2	0.43	0.072	12.3	34	25.9	25010	0	338	0.71	10	40	2.7	0.06	0.10	0.19	92	24
6. Mafic Dike + QTP (QZ-MQTP), 3 samples																				
Min	0.050	6180	0.50	0.50	0.050	17.50	91	36.0	2970	-	**886**	0.10	28	19	9.5	0.50	0.25	0.20	138	69
10th, %ile	0.050	6284	0.80	0.50	0.050	21.3	94	40.1	3532	-	**995**	0.20	29	21	11	0.50	0.25	0.22	159	69
Median	0.050	6700	2.0	0.50	0.050	36.7	104	56.6	5780	-	**1430**	0.60	33	28	16	0.50	0.25	0.30	243	71
90th, %ile	0.050	7212	4.4	1.7	0.250	38.4	169	65	6860	-	**1582**	0.84	90	66	17	0.50	0.25	0.38	245	94
Max	0.050	7340	5.0	2.0	0.300	39	185	68	7130	-	**1620**	0.9	104	75	18	0.50	0.25	0.40	245	100
Average	0.050	6740	2.5	1.0	0.133	31.0	127	53.4	5293	-	**1312**	0.53	55	41	14	0.50	0.25	0.30	209	80
St. Dev.	0	474	1.9	0.71	0.118	9.6	42	13.1	1733	-	311	0.33	35	25	3.4	0.0	0	0.08	50	14
7. QZ-QTP, 3 samples																				
Min	0.005	4200	0.70	0.12	0.010	2.40	51	3.2	1420	0.025	460	0.20	2.1	52	1.4	0.35	0.010	0.19	5.0	34
10th, %ile	0.005	4560	1.0	0.12	0.010	2.9	53	4.2	3116	0.025	474	0.20	2.4	52	1.5	0.35	0.010	0.19	6.4	34
Median	0.005	6000	2.0	0.13	0.010	4.8	59	8.0	9900	0.025	530	0.20	3.5	52	1.7	0.35	0.01	0.20	12	36
90th, %ile	0.041	6008	2.7	0.83	0.042	5.4	68	33	16380	0.025	580	1.24	3.8	52	7.1	0.47	0.20	0.26	38	44

Table B-7: Summary of statistics for total concentration of trace elements in materials from Leprechaun Deposit

Max	0.050	6010	2.9	1.0	0.050	6	70	39	18000	0.025	592	1.5	3.9	52	8.5	0.50	0.25	0.27	44	46
Average	0.020	5403	1.9	0.42	0.023	4.2	60	16.7	9773	0.025	527	0.63	3.2	52	3.9	0.40	0.09	0.22	20	39
St. Dev.	0.021	851	0.9	0.41	0.019	1.3	7.8	15.9	6769	0	54	0.61	0.8	0	3.3	0.07	0.11	0.04	17	5.2
8. Low-Grade Ore, 10 samples																				
Min	0.010	3340	0.50	0.10	0.010	0.80	45	3.0	420	0.025	232	0.10	2.1	6.0	1.2	0.35	0.010	0.10	4.0	7.0
10th, %ile	0.028	4384	0.50	0.10	0.019	2.8	50	5.4	618	0.025	275	0.10	2.6	13	1.6	0.35	0.010	0.15	5.8	10
Median	0.050	6515	1.8	0.50	0.050	5.0	69	11.1	5975	0.025	414	0.40	4.3	39	6.4	0.50	0.25	0.22	23	33
90th, %ile	0.240	8050	3.4	1.0	0.056	19.5	123	82	21200	0.061	**827**	2.71	27	88	14	0.50	0.25	1.2	118	95
Max	0.600	13000	7.0	1.0	0.110	42	150	265	41000	0.070	**1210**	2.8	28	98	47	0.50	0.25	2.0	318	107
Average	0.115	6547	2.2	0.45	0.048	10.5	81	42.1	10457	0.040	512	0.83	12	47	9.9	0.44	0.15	0.51	56	41
St. Dev.	0.169	2540	1.8	0.32	0.025	11.8	31	76.1	12157	0.021	279	0.99	11	32	13	0.07	0.12	0.57	91	32
9. Ore, 8 samples																				
Min	0.050	2700	1.4	0.09	0.050	2.80	47	6.7	1050	0.025	340	0.20	1.7	25	1.9	0.35	0.010	0.17	3.0	22
10th, %ile	0.050	4030	1.8	0.11	0.050	3.0	51	9.5	1330	0.025	340	0.27	1.9	27	2.3	0.35	0.010	0.17	5.8	23
Median	0.120	7035	4.5	0.50	0.050	4.4	62	16.2	2845	0.025	526	0.40	3.3	32	5.1	0.50	0.25	0.26	26	58
90th, %ile	0.245	17237	5.1	1.0	**1.2**	23.4	93	62	32400	0.025	**869**	2.53	29	61	26	0.50	0.25	0.69	116	280
Max	0.350	39000	5.1	1.0	**1.7**	41	120	80	80000	0.025	**1300**	4.7	33	66	61	0.50	0.25	1.6	180	310
Average	0.143	10303	3.7	0.55	0.379	10.3	68	27.1	14089	0.025	603	1.04	9.6	41	12	0.44	0.16	0.41	48	110
St. Dev.	0.099	10965	1.5	0.38	0.588	12.3	22	24.2	25254	0	292	1.45	12	16	18	0.07	0.12	0.45	56	108
10. Overburden (OB), 6 samples																				
Min	0.005	8900	19	0.15	0.030	8.0	24	20	25000	0.025	410	0.50	11	-	3.6	0.35	0.030	0.29	40	34
10th, %ile	0.008	9350	20	0.16	0.040	8.5	28	22	25000	0.025	415	0.50	12	-	4.0	0.35	0.030	0.32	44	38
Median	0.020	12500	23	0.18	0.065	11	33	29	29500	0.025	600	0.65	14	-	4.7	0.35	0.045	0.37	59	48
90th, %ile	0.025	14000	28	0.22	0.120	17	38	36	38000	0.025	**1000**	1.3	16	-	8.1	0.35	0.050	0.74	74	55
Max	0.030	14000	29	0.22	0.130	19	41	39	41000	0.025	**1000**	1.7	16	-	10	0.35	0.050	0.86	75	57
Average	0.018	11950	24	0.18	0.075	12	33	29	30833	0.025	672	0.80	14	-	5.6	0.35	0.042	0.48	59	47
St. Dev.	0.008	2138	3.6	0.02	0.035	3.8	5.0	6.0	6012	0	248	0.42	1.7	-	2.1	0	0.009	0.20	13	7.7

Notes:
Respective samples from Phase I and II are combined.
ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are double underlined and bold;
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-8: ABA analysis and rates for composite samples

Parameter	Units	Leprechaun						Marathon						Leprechaun - Metallurgical	Marathon - Metallurgical
		L TRJ	L QZ-TQTP	L SED	L MD	L QZ-QTP	L LGO	M QE-POR	M AQPOR	M CG	M MD	M QZ-QE-POR-QTP-MIN	M LGO	LLGO-Met	MLGO-Met
Paste pH	pH Units	9.63	9.69	9.63	9.14	9.58	9.67	8.74	9.48	9.53	8.96	9.71	9.48	9.39	9.16
S_{TOTAL}	wt.%	0.080	0.109	< 0.005	0.133	0.048	0.161	0.083	0.326	< 0.005	0.271	0.383	0.284	0.266	0.589
$S_{SULPHATE}$	wt.%	0.05	0.05	< 0.02	0.06	0.03	0.06	0.03	0.09	< 0.02	0.08	0.10	0.09	0.04	< 0.02
$S_{SULPHIDE}$	wt.%	0.03	0.06	< 0.02	0.07	0.02	0.10	0.05	0.24	< 0.02	0.19	0.28	0.19	0.23	0.60
Carb. NP	kg $CaCO_3$/t	48.3	44.7	9.2	97.3	51.6	37.9	62.5	48.6	87.3	88.7	22.7	49.2	61.3	28.9
AP	kg $CaCO_3$/t	0.94	1.88	0.62	2.19	0.62	3.12	1.56	7.50	0.62	5.94	8.75	5.94	7.19	18.8
NNP	kg $CaCO_3$/t	47.3	42.8	8.6	95.1	51.0	34.8	60.9	41.1	86.7	82.7	13.9	43.3	54.1	10.1
NPR	unit less	51	24	15	44	83	12	40	6.5	141	15	2.6	8.3	8.5	1.5
Carbon (total)	wt.%	0.724	0.670	0.138	1.46	0.774	0.569	0.937	0.729	1.31	1.33	0.340	0.738	0.843	0.430
Carbonate	wt.%	2.67	2.37	0.420	6.42	3.02	2.11	3.93	2.78	5.76	5.82	0.934	2.79	3.68	1.73
Total Inorganic Carbon	wt.%	-	-	-	-	-	-	-	-	-	-	-	-	0.736	0.347
Max Sulphate Rate	mg/kg/week	1.2	2.9	0.70	1.4	1.1	-	1.8	4.6	0.51	47	1.2	-	8.3	11
Max NP Rate	mg $CaCO_3$/kg/week	16	22	12	22	12	-	13	12	20	11	12	-	60	77
Max NP Depetion Rate	mg $CaCO_3$/kg/week	17	25	13	23	13	-	15	17	21	58	14	-	69	87
NP Depletion Time	year	55	34	14	81	78	-	80	55	80	30	32	-	17	6.4
AP Depletion Time	year	793	295	253	1353	933	-	666	202	3289	36	377	-	141	53

Notes:

S_{TOTAL} = Total Sulphur; $S_{SULPHIDE}$ = Sulphide Sulphur; $S_{SULPHATE}$ = Sulphate Sulphur.

AP = Acid Potential (% Sulphide Sulphur x 31.25).

Carb. NP - Carbonate Neutralization Potential calculated as C (total)*M($CaCO_3$)/M(C)*10(kg/t from % diff.)*0.80, where 0.80 is conservatively 80% TIC of carbon (total); Carb. NP for metallurgical LGOs is calclated as TIC*M($CaCO_3$)/M(C)*10(kg/t from % diff.); NNP = Net Neutralization Potential (NP-AP); NPR =Neutralization Potential Ratio (NP/AP).

NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations.

Maximum sulphate and NP rates are calculated for the first month of humidity cell testing, i.e. week 1 to 4, except tailings, for which these rates are calculated for week 1 to 8.

Max NP Depetion Rate = Max Sulphate Rate + Max NP Rate.

NP Depletion Time = (Carb. NP/Max NP Depetion Rate) x 1000/(365.25/7)

AP Depletion Time = (Carb. NP/Max Sulphate Rate) x 1000/(365.25/7)

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-9: SFE for composite samples

Parameter	Unit	MDMER	CWQG	Leprechaun												
				L TRJ		L QZ-TQTP		L SED		L MD		L QZ-QTP		LGO		
				Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT Stantec	Pre-HCT Metallurg.	Post-HCT Metallurg.
pH	pH Unit	6.0-9.5	6.5-9.0	**9.24**	8.81	**9.03**	8.55	**9.08**	8.46	8.57	8.29	**9.06**	8.83	8.96	8.59	8.22
Conductivity	µS/cm	n/v	n/v	90	77	107	81	91	65	120	92	107	78	112	96	80
Alkalinity	mg/L as $CaCO_3$	n/v	n/v	42	38	47	40	38	33	54	41	49	39	51	42	37
SO_4	mg/L	n/v	n/v	< 2	< 2	3	2	< 2	< 2	3	< 2	2	< 2	< 2	4	< 2
F	mg/L	n/v	0.12	0.08	0.06	0.12	0.06	**0.16**	0.10	0.10	< 0.06	**0.15**	0.09	0.12	**0.15**	0.08
Hardness (Calc)	mg/L	n/v	n/v	14	15	17	20	10	12	35	29	16	16	21	21	24
Ag	mg/L	n/v	0.00025	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al	mg/L	n/v	0.005/0.1	**1.18**	**1.24**	**1.17**	**1.24**	**1.54**	**1.48**	**0.592**	**0.597**	**1.49**	**1.47**	**1.17**	**1.29**	**1.52**
As	mg/L	0.3	0.005	0.0014	0.0008	0.0016	0.0008	**0.0052**	0.0024	0.0006	0.0017	0.0009	0.0005	0.0036	0.0013	0.0009
Ba	mg/L	n/v	n/v	0.00546	0.00734	0.00279	0.00256	0.00200	0.00206	0.0312	0.0126	0.00377	0.00369	0.00228	0.00323	0.00269
B	mg/L	n/v	1.5	0.011	0.008	0.028	0.014	0.013	0.007	0.008	0.004	0.012	0.009	0.079	0.025	0.023
Be	mg/L	n/v	n/v	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi	mg/L	n/v	n/v	0.000276	< 0.000007	0.000151	< 0.000007	< 0.000007	< 0.000007	0.000027	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca	mg/L	n/v	n/v	4.85	5.30	5.79	6.76	3.55	4.25	9.22	8.51	5.13	5.42	6.54	6.73	7.97
Cd*	mg/L	n/v	0.00004	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003	< 0.000003	< 0.000003	0.000004
Co	mg/L	n/v	n/v	0.000019	< 0.000004	0.000012	< 0.000004	0.000021	0.000006	0.000016	< 0.000004	0.000017	< 0.000004	0.000170	0.000007	0.000004
Cr	mg/L	n/v	0.0089	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.00011	0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu*	mg/L	0.3	0.002	0.0009	0.0003	0.0009	0.0003	0.0005	0.0007	0.0016	< 0.0002	0.0011	0.0005	0.0007	0.0003	0.0014
Fe	mg/L	n/v	0.3	0.016	< 0.007	< 0.007	< 0.007	0.030	0.028	< 0.007	< 0.007	0.007	< 0.007	0.012	< 0.007	< 0.007
K	mg/L	n/v	n/v	4.29	3.38	5.90	3.55	6.87	4.48	5.29	2.19	6.33	3.76	5.33	4.47	3.63
Li	mg/L	n/v	n/v	0.0005	0.0002	0.0003	0.0003	0.0060	0.0004	0.0004	0.0002	0.0006	0.0003	0.0006	0.0003	0.0002
Mg	mg/L	n/v	n/v	0.481	0.548	0.716	0.813	0.314	0.266	2.93	1.91	0.698	0.593	1.10	0.920	1.02
Mn*	mg/L	n/v	0.19	0.00114	0.00130	0.00165	0.00229	0.00145	0.00163	0.00160	0.00140	0.00116	0.00127	0.00152	0.00177	0.00204
Mo	mg/L	n/v	0.073	0.00028	0.00008	0.00031	0.00011	0.00069	0.00012	0.00054	0.00010	0.00016	0.00009	0.00028	0.00116	0.00021
Na	mg/L	n/v	n/v	9.71	7.64	10.1	6.01	8.71	5.88	7.12	5.51	10.7	7.37	9.51	8.53	6.79
Ni*	mg/L	0.5	0.025	< 0.0001	0.0001	< 0.0001	0.0002	< 0.0001	0.0004	0.0002	0.0002	< 0.0001	0.0002	0.0001	< 0.0001	< 0.0001
Pb*	mg/L	0.1	0.001	0.00007	0.00003	0.00003	0.00002	0.00006	0.00003	0.00004	0.00001	0.00003	0.00003	0.00001	0.00004	0.00008
Sb	mg/L	n/v	n/v	< 0.0009	< 0.0009	0.0020	< 0.0009	0.0119	< 0.0009	0.0023	0.0011	< 0.0009	< 0.0009	0.0026	0.0015	< 0.0009
Se	mg/L	n/v	0.001	0.00012	< 0.00004	0.00013	0.00004	0.00006	< 0.00004	0.00005	0.00005	0.00005	0.00004	0.00014	0.00022	0.00015
Sn	mg/L	n/v	n/v	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr	mg/L	n/v	n/v	0.0215	0.0251	0.0279	0.0253	0.0143	0.0139	0.102	0.0585	0.0534	0.0547	0.0378	0.0444	0.0352
Ti	mg/L	n/v	n/v	0.00049	0.00018	0.00018	0.00012	0.00134	0.00137	< 0.00005	0.00044	0.00012	0.00013	0.00016	< 0.00005	0.00008
Tl	mg/L	n/v	0.0008	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.000034
U	mg/L	n/v	0.015	0.000187	0.000236	0.000344	0.000609	0.000148	0.000283	0.000008	0.000040	0.000303	0.000634	0.000438	0.000260	0.000306
V	mg/L	n/v	n/v	0.00400	0.00363	0.00589	0.00413	0.00891	0.00691	0.00122	0.00130	0.00576	0.00440	0.00522	0.00447	0.00488
W	mg/L	n/v	n/v	0.00072	0.00032	0.00080	0.00041	0.00050	0.00036	0.00085	0.00071	0.00084	0.00029	0.0165	-	0.0222
Y	mg/L	n/v	n/v	0.000016	< 0.000002	0.000005	< 0.000002	0.000026	0.000023	0.000002	0.000002	0.000002	0.000003	0.000004	-	< 0.000002
Zn*	mg/L	0.5	0.0017	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

See notes at the end of the table.

Table B-9: SFE for composite samples

Parameter	Unit	MDMER	CWQG	Marathon													Leprechaun	Marathon
				M QE-POR		M AQPOR		M CG		M MD		M QZ-QE-POR-QTP-		LGO			CND2	CND1
				Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT	Post-HCT	Pre-HCT Stantec	Pre-HCT Metallurg.	Post-HCT Metallurg.	Post-HCT	Post-HCT
pH	pH Unit	6.0-9.5	6.5-9.0	8.73	8.52	8.42	8.25	8.85	8.64	7.98	8.21	**9.05**	8.57	8.72	8.46	8.03	8.23	8.06
Conductivity	µS/cm	n/v	n/v	93	79	128	96	106	83	193	83	89	69	111	111	75	355	397
Alkalinity	mg/L as $CaCO_3$	n/v	n/v	38	32	44	37	52	42	29	36	36	32	41	39	32	34	29
SO_4	mg/L	n/v	n/v	2	< 2	5	2	< 2	< 2	58	3	< 2	< 2	3	9	< 2	140	170
F	mg/L	n/v	0.12	0.11	0.06	**0.15**	0.08	**0.14**	0.08	0.11	0.08	0.09	< 0.06	**0.13**	**0.18**	0.07	0.41	0.17
Hardness (Calc)	mg/L	n/v	n/v	18	17	27	24	22	21	64	29	16	16	20	26	24	179	207
Ag	mg/L	n/v	0.00025	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al	mg/L	n/v	0.005/0.1	**1.09**	**1.14**	**0.714**	**0.912**	**0.640**	**0.807**	**0.428**	**0.624**	**1.03**	**1.16**	**0.910**	**1.02**	**1.30**	0.035	0.018
As	mg/L	0.3	0.005	0.0010	0.0007	0.0012	0.0006	0.0037	0.0024	0.0004	0.0004	0.0009	0.0005	0.0018	0.0029	0.0015	0.0005	0.0011
Ba	mg/L	n/v	n/v	0.00119	0.00213	0.00148	0.00216	0.00088	0.00109	0.0519	0.0679	0.00063	0.00109	0.00116	0.00415	0.00232	0.00681	0.00333
B	mg/L	n/v	1.5	0.015	0.007	0.012	0.008	0.011	0.008	0.006	0.002	0.028	0.012	0.021	0.021	0.019	0.018	0.018
Be	mg/L	n/v	n/v	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi	mg/L	n/v	n/v	< 0.000007	< 0.000007	0.000015	< 0.000007	0.000021	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	0.000104	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca	mg/L	n/v	n/v	6.44	6.05	9.54	8.64	6.01	6.25	19.1	8.86	5.82	5.76	6.89	8.90	8.41	54.3	79.0
Cd*	mg/L	n/v	0.00004	< 0.000003	< 0.000003	0.000003	0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003	< 0.000003	< 0.000003	0.000005	0.000003	< 0.000003	< 0.000003	0.000017
Co	mg/L	n/v	n/v	0.000011	< 0.000004	0.000148	< 0.000004	0.000007	< 0.000004	0.000010	0.000004	0.000011	< 0.000004	0.000012	0.000007	0.000004	0.00147	0.00250
Cr	mg/L	n/v	0.0089	< 0.00008	0.00015	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.00010	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.00009
Cu*	mg/L	0.3	0.002	0.0003	< 0.0002	0.0004	0.0003	0.0009	0.0003	< 0.0002	0.0002	0.0004	0.0003	0.0011	0.0004	0.0018	0.0031	0.0017
Fe	mg/L	n/v	0.3	< 0.007	< 0.007	0.016	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	0.007	< 0.007	< 0.007	0.681	0.253
K	mg/L	n/v	n/v	1.84	1.15	1.91	1.12	5.67	3.44	0.785	0.173	1.32	0.664	1.93	3.37	2.34	1.19	0.516
Li	mg/L	n/v	n/v	0.0002	0.0002	0.0005	0.0003	0.0009	0.0007	0.0003	0.0001	0.0028	0.0002	0.0003	0.0003	0.0002	0.0012	0.0041
Mg	mg/L	n/v	n/v	0.553	0.471	0.750	0.504	1.78	1.32	4.02	1.65	0.351	0.291	0.656	0.866	0.717	10.6	2.27
Mn*	mg/L	n/v	0.19	0.00112	0.00112	0.00294	0.00179	0.00209	0.00202	0.00440	0.00587	0.00114	0.00143	0.00219	0.00295	0.00291	0.0436	0.160
Mo	mg/L	n/v	0.073	0.00296	0.00019	0.00096	0.00090	0.00048	0.00012	0.00094	0.00014	0.00114	0.00022	0.0195	0.00835	0.00123	0.00183	0.00512
Na	mg/L	n/v	n/v	9.53	6.97	12.2	8.78	9.84	6.31	6.48	4.14	8.97	7.55	10.8	8.69	6.22	3.02	1.90
Ni*	mg/L	0.5	0.025	< 0.0001	0.0002	0.0007	0.0002	< 0.0001	0.0002	0.0001	0.0002	< 0.0001	0.0003	0.0001	< 0.0001	< 0.0001	0.0002	0.0003
Pb*	mg/L	0.1	0.001	0.00001	0.00001	0.00007	0.00003	0.00001	0.00002	< 0.00001	0.00001	0.00004	0.00006	0.00005	0.00015	0.00011	0.00004	0.00001
Sb	mg/L	n/v	n/v	0.0023	< 0.0009	0.0011	< 0.0009	0.0013	< 0.0009	0.0010	< 0.0009	< 0.0009	< 0.0009	0.0011	0.0021	< 0.0009	< 0.0009	0.0010
Se	mg/L	n/v	0.001	0.00009	0.00007	0.00032	0.00020	0.00005	0.00007	0.00006	0.00005	0.00011	0.00006	0.00012	0.00028	0.00011	0.00071	0.00070
Sn	mg/L	n/v	n/v	0.00229	< 0.00006	< 0.00006	0.00007	< 0.00006	< 0.00006	< 0.00006	< 0.00006	0.00070	< 0.00006	0.00007	< 0.00006	0.00011	0.00282	0.00221
Sr	mg/L	n/v	n/v	0.0122	0.0108	0.0133	0.0118	0.0137	0.0127	0.132	0.0599	0.0121	0.00918	0.0189	0.0224	0.0123	0.148	0.0553
Ti	mg/L	n/v	n/v	0.00236	0.00017	0.00010	0.00031	0.00014	< 0.00005	< 0.00005	< 0.00005	0.00097	0.00014	0.00014	0.00006	0.00009	< 0.00005	< 0.00005
Tl	mg/L	n/v	0.0008	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.000032	< 0.000005	< 0.000005
U	mg/L	n/v	0.015	0.000043	0.00189	0.000134	0.000233	0.000609	0.000560	0.000011	0.000429	0.000106	0.000185	0.000048	0.000088	0.000362	0.000773	0.00280
V	mg/L	n/v	n/v	0.00375	0.00342	0.00101	0.00172	0.00584	0.00503	0.00094	0.00151	0.00185	0.00172	0.00321	0.00156	0.00237	0.00005	0.00004
W	mg/L	n/v	n/v	0.00339	0.00040	0.00100	0.00051	0.00063	0.00025	0.00087	0.00038	0.00132	0.00036	0.00540	-	0.00281	0.00137	0.00020
Y	mg/L	n/v	n/v	0.000018	0.000004	0.000019	0.000002	0.000012	0.000004	0.000002	0.000002	0.000010	0.000014	0.000035	-	< 0.000002	0.000014	0.000009
Zn*	mg/L	0.5	0.006	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

See notes at the end of the table.

Table B-9: SFE for composite samples

Notes:

HCT - Humidity Cell Testing.

The most stringent guideline was selected when two or more guidelines are established for the same parameter under the same jurisdiction (CCME, Government of Canada).

CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).

MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).

*Equations were used to calculate hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines as follows:

- Total cadmium CWQG-FAL: at hardness > 280 mg/L the guideline is 0.00037 mg/L, at hardness between 17 and 280 mg/L the guideline (in µg/L) is 10^(1.016*(log10(Hardness))-1.71), at hardness < 17 mg/L the guideline is 0.00004 mg/L. The most stringent guideline value is applied when the water hardness is < 17 mg/L.
- Total copper CWQG: When the water hardness is 0 to < 82 mg/L the CWQG is 0.002 mg/L, at hardness ≥82 to ≤180 mg/L the CWQG is calculated as CWQG (µg/L) = 0.2 * e{0.8545[ln(hardness)]-1.465}, at hardness >180 mg/L the CWQG is 0.004 mg/L, if the hardness was unknown the CWQG was 0.002 mg/L. The most stringent guideline value is applied when the water hardness is < 82 mg/L.
- Total lead CWQG: When the hardness is 0 to ≤ 60 mg/L the CWQG is 0.001 mg/L, at hardness >60 to ≤ 180 mg/L the CWQG is calculated as CWQG (µg/L)= e{1.273[ln(hardness)]-4.705}, at hardness >180 mg/L the CWQG is 0.007 mg/L, if the hardness was unknown the CWQG was 0.001 mg/L. The most stringent long-term guideline value is applied when the water hardness is < 60 mg/L.
- Dissolved manganese CWQG-FAL (mg/L): pH- and hardness-dependent guideline calculated based on the CWQG and benchmark calculator in Appendix B or Table 5 of the Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life: Manganese (Dissolved) 2019 (CCME 2019). The table is valid between hardness 10 and 670 mg/L and pH 5.5 and 9.0. The most stringent guideline value is applied using 10 mg/L hardness and 5.5 pH.
- Total nickel CWQG: When the water hardness is 0 to ≤ 60 mg/L the CWQG is 0.025 mg/L, at hardness > 60 to ≤ 180 mg/L the CWQG is calculated as CWQG (µg/L) = e{0.76[ln(hardness)]+1.06}. at hardness >180 mg/L, the CWQG is 150 µg/L. If the hardness is unknown, the CWQG is 25 µg/L. The most stringent long-term guideline value is applied when the water hardness is < 60 mg/L.
- Dissolved zinc CWQG-FAL: pH-, hardness-, and DOC-dependent guideline calculated as exp(0.947[ln(Hardness)] - 0.815[pH] + 0.398[ln(DOC)] + 4.625). The equation is valid between hardness 23.4 and 399 mg/L hardness, pH 6.5 and 8.13 and DOC 0.3 to 22.9 mg/L. The most stringent guideline value is applied using 23.4 mg/L hardness, 8.13 pH, and 0.3 mg/L DOC, the values for which the equation is valid, and which generate the most stringent guideline. The Zn concentrations in this table are below the detection limit (0.002), which exceeds the guideline.

Hardness is the calcium and magnesium hardness calculated as the concentration of calcium and magnesium ions expressed as equivalent of calcium carbonate.

CWQG for total phosphorus: Canadian Guidance Frameworks is used for total phosphorus (CCME 2014): ultra-oligotrophic <4 µg/L, oligotrophic 4-10 µg/L, mesotrophic 10-20 µg/L, meso-eutrophic 20-35 µg/L, eutrophic 35-100 µg/L, hyper-eutrophic >100 µg/L.

Ammonia CWQG: pH and temperature-dependent guideline for total ammonia presented in Table 2 of the CWQG guidelines for the protection of aquatic life: Ammonia (CCME 2010).

The values from Table 2 are multiplied by 0.8224 to convert them into total ammonia (as N).

Nitrate and Nitrite Nitrogen: CWQG for nitrate is applied.

Aluminum CWQG: 0.1 mg/L if pH>6.5, otherwise 0.005 mg/L.

n/v - no value, guideline is not established.

Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.

Mercury is below/equal to the detection limit (0.00001 mg/L) in shutdown SFE leachates from waste rock and low-grade ore composite samples.

Table B-10: Total concentrations of trace elements in composite samples

Sample ID	Unit	ACUCx10	Leprechaun						Marathon						Leprechaun	Marathon
			L TRJ	L QZ-TQTP	L SED	L MD	L QZ-QTP	L LGO	M QE-POR	M AQPOR	M CG	M MD	M QZ-QE-POR-QTP-MIN	M LGO	LLGO-Met	MLGO-Met
Hg	µg/g	0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.35	< 0.05
Ag	µg/g	530	< 0.01	0.01	< 0.01	0.01	< 0.01	0.03	0.02	0.05	0.05	0.03	0.02	0.02	0.04	0.23
As	µg/g	48	0.8	0.8	3.2	2.2	0.5	2.0	< 0.5	0.7	1.3	1.4	0.5	3.0	1.3	2.6
Al	µg/g	407639	5600	6300	14000	22000	5900	4100	11000	14000	6500	35000	8100	15000	5300	6800
Be	µg/g	21	0.12	0.13	0.16	0.17	0.14	0.10	0.06	0.10	0.16	0.18	0.07	0.09	0.12	0.08
Cd	µg/g	0.90	0.03	0.03	0.03	0.07	0.02	0.07	< 0.02	< 0.02	0.07	0.04	< 0.02	0.03	0.03	0.10
Co	µg/g	173	3.3	4.0	14	29	4.6	4.1	6.3	8.4	11	36	3.5	9.9	5.5	4.0
Cr	µg/g	920	54	59	50	70	38	70	100	110	53	120	95	98	29	57
Cu	µg/g	280	6.9	10	2.5	50	10.0	20	14	15	30	69	13	11	8.1	19
Fe	µg/g	320415	12000	13000	31000	59000	15000	13000	25000	33000	24000	84000	20000	33000	14000	21000
Mn	µg/g	774.5	430	490	750	1100	460	340	580	680	1100	1800	310	900	430	430
Mo	µg/g	11	2.7	3.0	0.8	1.1	1.9	1.7	2.2	3.5	1.1	0.9	5.4	15	0.8	2.1
Ni	µg/g	470	3.2	3.4	24	22	3.2	5.3	13	22	18	38	4.1	11	3.8	5.0
P	µg/g	654.3	280	260	810	610	440	390	190	380	400	200	120	190	-	-
Pb	µg/g	170	3.4	2.5	1.2	2.0	1.6	1.8	0.89	0.66	2.3	0.65	0.29	1.9	7.3	5.3
Se	µg/g	0.9	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tl	µg/g	9	0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U	µg/g	27	0.12	0.16	0.47	0.12	0.17	0.15	0.094	0.10	0.50	0.098	0.11	0.13	0.80	0.52
V	µg/g	970	8	12	46	170	11	8	31	28	27	280	12	70	8	10
Zn	µg/g	670	27	35	61	70	42	26	17	42	46	90	12	42	33	21

Notes:
ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are underlined;

Table B-11: ABA of composite ore used in metallurgical testing

Parameter	Units	Heap Leach Composites -Low-Grade Ore						Milling Composites - High-Grade Ore									
		Marathon Comps			Leprechaun Comps			Marathon Comps					Leprechaun Comps				
		A	B	C	D	E	F	MZA	MZB	MZC	MZD	MZE	LZA	LZB	LZC	LZD	LZE
Total Sulphur *	wt%	0.44	0.45	0.66	0.19	0.21	0.31	0.68	0.68	0.79	0.70	0.51	0.30	0.28	0.43	0.34	0.36
Sulphide Sulphur *	wt%	0.30	0.42	0.59	0.15	0.20	0.30	0.68	0.60	0.74	0.64	0.47	0.28	0.25	0.37	0.34	0.33
Total Carbon *	wt%	0.39	0.41	0.22	0.69	0.75	0.85	0.48	0.41	0.38	0.33	0.38	0.80	0.64	1.40	0.93	0.84
Total Organic Carbon, LECO *	wt%	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbonate carbon (CO2)	wt%	1.66	1.75	1.08	2.51	2.71	3.00	1.81	1.52	1.46	1.24	1.49	2.98	2.44	5.12	3.47	3.09
AP from Sulphide Sulphur **	kg $CaCO_3$/t	9.4	13.1	18.4	4.7	6.3	9.4	21.3	18.8	23.1	20.0	14.7	8.8	7.8	11.6	10.6	10.3
NP from Carbonate Carbon **	kg $CaCO_3$/t	37.7	39.8	24.5	57.0	61.6	68.2	41.1	34.5	33.2	28.2	33.9	67.7	55.5	116.4	78.9	70.2
NPR = NP/AP **	ratio	4.0	3.0	**1.3**	12.2	9.9	7.3	**1.9**	**1.8**	**1.4**	**1.4**	2.3	7.7	7.1	10.1	7.4	6.8

Notes:
* - Parameter analyzed by SGS (2019, 2020a, 2020b);
** - Parameter calculated by Stantec;
Carbonate NPR values below 2 are bolded;

Table B-12: ABA analysis and rates in tailings

Parameter	Unit	Compoite Tailings	
		Leprechaun (CND 2)	Marathon (CND 1)
Paste pH	no unit	8.78	8.73
NP	t $CaCO_3$/1000 t	68.5	31.7
AP	t $CaCO_3$/1000 t	8.75	11.2
Net NP	t $CaCO_3$/1000 t	59.8	20.4
NP/AP	ratio	7.8	2.8
S_{TOTAL}	%	0.314	0.353
$S_{SULPHATE}$	%	0.03	< 0.02
$S_{SULPHIDE}$	%	0.28	0.36
Carbon (total)	%	0.919	0.377
Carbonate	%	4.49	1.82
Carb. NP	t $CaCO_3$/1000 t	74.5	30.2
Carb. Net NP	t $CaCO_3$/1000 t	65.8	19.0
Carb. NP/AP	ratio	8.5	2.7
NP Attributed to CO_3	%	109	95
Max Sulphate Rate	mg/kg/week	123	130
Max NP Rate	mg $CaCO_3$/kg/week	21	14
Max NP Depetion Rate	mg $CaCO_3$/kg/week	143	144
NP Depletion Time	year	10	4.0
AP Depletion Time	year	12	4.5

Notes:

S_{TOTAL} = Total Sulphur; $S_{SULPHIDE}$ = Sulphide Sulphur; $S_{SULPHATE}$ = Sulphate Sulphur.

AP = Acid Potential (% Sulphide Sulphur x 31.25).

Carb. NP - Carbonate Neutralization Potential calculated by laboratory based on measured carbonate content (not total carbon); Carb. NP for metallurgical LGOs is calclated as TIC*M($CaCO_3$)/M(C)*10(kg/t from % diff.); NNP = Net Neutralization Potential (NP-AP); NPR NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations.

Maximum sulphate and NP rates are calculated for the first month of humidity cell testing, i.e. week 1 to 4, except tailings, for which these rates are calculated for week 1 to 8.

Max NP Depetion Rate = Max Sulphate Rate + Max NP Rate.

NP Depletion Time = (Carb. NP/Max NP Depetion Rate) x 1000/(365.25/7)

AP Depletion Time = (Carb. NP/Max Sulphate Rate) x 1000/(365.25/7)

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-13: Total Concentration of Trace Elements in Tailings

Parameter	Unit	ACUCx10	Compoite Tailings	
			Leprechaun (CND 2)	Marathon (CND 1)
Hg	µg/g	0.5	< 0.05	< 0.05
Ag	µg/g	530	0.044	0.067
As	µg/g	48	2.9	28
Al	µg/g	407639	3800	3500
Be	µg/g	21	0.14	0.057
Cd	µg/g	0.90	0.078	0.10
Co	µg/g	173	7.2	3.8
Cr	µg/g	920	59	55
Cu	µg/g	280	210	73
Fe	µg/g	320415	16000	14000
Mn	µg/g	774.5	530	390
Mo	µg/g	11	2.3	3.4
Ni	µg/g	470	22	19
P	µg/g	654.3	480	90
Pb	µg/g	170	4.7	4.7
Se	µg/g	0.9	< 0.7	< 0.7
Tl	µg/g	9	< 0.02	< 0.02
U	µg/g	27	0.18	0.083
V	µg/g	970	12	7.9
Zn	µg/g	670	41	19

Table B-14: Summary of leachate chemistries from HC in materials from Leprechaun deposit

Material	Parameter	pH	F	SO_4	Hg	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Mn*	Mo	Ni*	P	Pb*	Se	Tl	U	Zn*
	Unit	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	6.0-9.5	n/v	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.25	n/v	0.08	n/v	n/v	n/v	0.4
	CWQG	6.5-9.0	0.12	n/v	0.000026	0.00025	0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.19	0.073	0.025	0.004	0.001	0.001	0.0008	0.015	0.0017
Waste Rock	**L TRJ**																					
	Max (Min for pH)	7.21	0.080	1.2	0.000010	0.000025	**0.153**	0.0016	0.020	0.0000030	0.00012	**0.0026**	0.024	0.0189	0.00050	0.000050	**0.013**	0.00049	0.00014	0.0000080	0.00086	0.0010
	Average First Month	7.82	0.030	0.70	0.0000050	0.000025	0.0860	0.00033	0.0013	0.0000015	0.000040	0.00060	0.010	0.0184	0.00023	0.000050	0.0015	0.000040	0.000020	0.0000025	0.00059	0.0010
	Average Last Month	7.46	0.030	0.10	0.0000050	0.000025	0.0563	0.00010	0.0010	0.0000015	0.000087	0.00027	0.0060	0.0135	0.00019	0.000050	0.0015	0.0000050	0.000020	0.0000033	0.00043	0.0010
	L QZ-TQTP																					
	Max (Min for pH)	7.34	0.080	2.9	0.000010	0.000025	**0.13**	0.0005	0.005	0.0000030	0.00018	0.002	0.013	0.0225	0.00028	0.000100	**0.006**	**0.0012**	0.00025	0.0000100	0.00160	**0.0020**
	Average First Month	7.78	0.030	1.87	0.0000050	0.000025	0.0587	0.00043	0.0037	0.0000015	0.000040	0.00053	0.005	0.0222	0.00018	0.000050	0.0015	0.000022	0.000033	0.0000025	0.00118	0.0013
	Average Last Month	7.45	0.030	0.77	0.0000050	0.000025	0.0470	0.00027	0.0010	0.0000015	0.000087	0.00030	0.0035	0.0163	0.00009	0.000050	0.0015	0.0000150	0.000020	0.0000025	0.00019	0.0013
	L SED																					
	Max (Min for pH)	6.96	**0.240**	0.7	0.000005	0.00008	**0.157**	0.0007	0.005	0.0000050	0.00024	**0.0021**	0.023	0.0324	0.00032	0.000050	**0.007**	0.00005	0.0001	0.0000070	0.00032	0.0010
	Average First Month	7.54	0.100	0.47	0.0000050	0.000025	**0.1147**	0.00057	0.0017	0.0000015	0.000040	0.00037	0.009	0.0217	0.00016	0.000050	0.0015	0.000018	0.000027	0.0000025	0.00028	0.0010
	Average Last Month	7.16	0.030	0.10	0.0000050	0.000025	0.0500	0.00010	0.0010	0.0000015	0.000147	0.00077	0.0035	0.01066	0.00009	0.000050	0.0015	0.0000167	0.000020	0.0000040	0.00016	0.0010
	L MD																					
	Max (Min for pH)	7.29	0.110	1.4	0.000010	0.000025	0.099	0.0005	0.011	0.0000050	0.0001	0.0016	0.017	0.0198	0.00031	0.000100	0.003	0.00077	0.00019	0.0000025	0.00019	**0.0020**
	Average First Month	7.92	0.030	1.00	0.0000050	0.000025	0.0840	0.00047	0.0013	0.0000015	0.000040	0.00053	0.005	0.0154	0.00013	0.000067	0.0015	0.000012	0.000140	0.0000025	0.00018	0.0010
	Average Last Month	7.71	0.030	0.10	0.0000067	0.000025	0.0550	0.00013	0.0010	0.0000023	0.000040	0.00047	0.0035	0.016367	0.00006	0.000050	0.002	0.0000150	0.000020	0.0000025	0.00013	0.0013
	L QZ-QTP																					
	Max (Min for pH)	7.22	0.060	1.1	0.000005	0.000025	**0.151**	0.0008	0.003	0.0000015	0.00016	**0.006**	0.099	0.0195	0.00050	0.000050	**0.011**	**0.00376**	**0.00139**	0.0000025	0.00121	**0.0030**
	Average First Month	7.77	0.040	0.67	0.0000050	0.000025	**0.1067**	0.00023	0.0017	0.0000015	0.000040	**0.00237**	0.007	0.0168	0.00011	0.000050	0.0015	0.000018	0.000030	0.0000025	0.00089	0.0010
	Average Last Month	7.41	0.030	0.10	0.0000050	0.000025	0.0733	0.00010	0.0010	0.0000015	0.000090	0.00030	0.0035	0.0134	0.00020	0.000050	0.0015	0.0000150	0.000020	0.0000025	0.00028	0.0017
Low-Grade Ore	**L LGO***																					
	Max (Min for pH)	7.49	0.060	9.5	0.000005	0.000025	**0.298**	0.0005	0.011	0.0000100	0.00022	0.0007	0.004	0.0222	0.00467	0.001000	**0.022**	0.00005	0.00029	0.0000150	0.00085	0.0010
	Average First Month	7.97	0.030	5.17	0.0000050	0.000025	**0.1153**	0.00043	0.0077	0.0000048	0.000100	0.00020	0.004	0.0171	0.00215	0.000367	**0.0072**	0.000010	0.000183	0.0000067	0.00049	0.0010
	Average Last Month	7.90	0.030	0.40	0.0000050	0.000025	0.0820	0.00015	0.0025	0.0000015	0.000040	0.00010	0.0035	0.0115	0.00025	0.000050	0.0015	0.0000050	0.000020	0.0000025	0.00039	0.0010

Notes:
SFE is analyzed for waste rock and ore in Phase I and for overburden in Phase II.
MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).
CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).
For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.
Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.
* L LGO is a metallurgical composite.

Table B-15: Summary of ageing, humidity cell, and sub-aqueous chemistries in materials from Leprechaun Deposit (CND2)

Test	Parameter	pH	F	NO_2	NO_3	NO_2+NO_3	Cl	SO_4	$CN_{(T)}$	CN_{WAD}	NH_3+NH_4	Un-ionized NH_3 (calc'd)	Hg	Ag	Al	As	B	Cd *	Cr
	Unit	no unit	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	6.0-9.5	n/v	n/v	n/v	n/v	n/v	n/v	0.5	n/v	n/v	0.5	n/v	n/v	n/v	0.1	n/v	n/v	n/v
	CWQG	6.5-9.0	0.12	0.06	13	n/v	120	n/v	n/v	0.005	0.499	0.16	0.000026	0.00025	0.1	0.005	1.5	0.00004	0.0089
Ageing	2019-SEP19 CND 2 Day 0	7.91	**1.15**	< 0.3	< 0.6	< 0.6	27	980	**2.4**	**0.080**	**2.3**	0.067	**0.00023**	**0.00052**	0.10	0.0025	0.091	0.000039	0.00047
	2019-SEP26 CND 2 Day 7	8.14	**1.14**	< 0.3	< 0.6	< 0.6	34	990	**1.5**	**0.22**	**6.5**	**0.31**	**0.000080**	**0.00075**	0.059	0.0022	0.080	0.000031	0.00022
	2019-OCT3 CND 2 Day 14	8.34	**1.21**	< 0.3	< 0.6	< 0.6	31	1000	0.47	**0.18**	**5.6**	**0.45**	**0.000070**	**0.00061**	0.047	0.0022	0.067	0.000033	< 0.00008
	2019-OCT17 CND 2 Day 28	8.35	**1.26**	< 0.3	< 0.6	< 0.6	38	1100	0.090	**0.040**	**12**	**1.06**	**0.000030**	< 0.00005	0.035	0.0024	0.085	0.000032	< 0.00008
	2019-NOV 14 CND 2 Day 56	8.22	**1.65**	< 0.3	< 0.6	< 0.6	42	1700	0.10	**0.040**	**24**	**1.10**	< 0.00001	< 0.00005	0.039	0.0027	0.10	0.000030	< 0.00008
Humidity Cell	Max (Min for pH)	7.34	**0.15**	-	-	-	1.1	140	0.28	**0.010**	-	-	0.000020	0.000025	0.077	0.00040	0.026	0.000018	0.00020
	Average First Month	8.17	0.083	-	-	-	0.48	60	-	-	-	-	0.0000050	0.000025	0.039	0.00010	0.0028	0.0000094	0.000080
	Average Last Month	7.70	0.12	-	-	-	0.10	90	0.11	**0.0075**	-	-	0.0000050	0.000025	0.024	0.00010	0.0020	0.0000028	0.000085
Sub-Aqueous	Max (Min for pH)	8.08	**2.2**	0.015	0.03	0.03	33	1100	**1.4**	**1.0**	**35**	**2.9**	**0.0010**	**0.00224**	0.066	0.0029	0.087	**0.000067**	0.0018
	Average First Month	8.27	**1.5**	0.015	0.03	0.03	32	963	-	-	**13**	**0.90**	0.000067	**0.00084**	0.029	0.0024	0.080	0.000033	0.000040
	Average Last Month	8.34	**2.0**	0.015	0.03	0.03	12	475	**0.91**	**0.70**	**31**	**2.3**	**0.00051**	**0.0011**	0.023	0.0022	0.048	0.000023	0.00016

Notes:

MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).

CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).

For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

CN_{FREE} CWQG guideline is applied to CN_{WAD}.

Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-15: Summary of ageing, humidity cell, and sub-aqueous chemistries in materials from Leprechaun Deposit (CND2)

Test	Parameter	Cu*	Fe	Mn	Mo	Ni*	P	Pb*	Se	Tl	U	Zn*
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	0.1	n/v	n/v	n/v	0.25	n/v	0.08	n/v	n/v	n/v	0.4
	CWQG	0.002	0.3	0.19	0.073	0.025	0.004	0.001	0.001	0.0008	0.015	0.0017
Ageing	2019-SEP19 CND 2 Day 0	**0.015**	**0.85**	0.028	**0.074**	0.00060	**0.031**	0.00014	**0.0043**	< 0.000005	0.0030	**0.0060**
	2019-SEP26 CND 2 Day 7	**0.088**	0.25	0.044	0.066	0.00060	**0.030**	0.000060	**0.0021**	< 0.000005	0.0040	**0.0030**
	2019-OCT3 CND 2 Day 14	**0.20**	0.26	0.042	0.069	0.00090	**0.019**	0.000030	**0.0014**	< 0.000005	0.0040	**0.0040**
	2019-OCT17 CND 2 Day 28	**0.026**	0.028	0.034	**0.079**	0.00060	**0.032**	0.000050	0.00073	0.0000080	0.0044	< 0.002
	2019-NOV 14 CND 2 Day 56	**0.010**	0.077	0.032	**0.10**	0.00080	**0.021**	0.000030	0.00069	0.0000050	0.0051	< 0.002
Humidity Cell	Max (Min for pH)	**0.0075**	0.13	0.054	0.0015	0.00020	**0.0070**	0.000070	0.00024	0.0000025	0.00072	**0.0030**
	Average First Month	**0.0053**	0.046	0.028	0.00075	0.000088	0.0015	0.000024	0.000088	0.0000025	0.00026	0.0015
	Average Last Month	0.0017	0.055	0.044	0.00086	0.00010	**0.0043**	0.000020	0.00014	0.0000025	0.000081	0.0010
Sub-Aqueous	Max (Min for pH)	**1.1**	0.032	**0.20**	**0.078**	0.0055	**0.034**	0.00020	**0.0015**	0.0000090	0.0050	**0.011**
	Average First Month	**0.72**	0.015	0.093	0.072	0.00077	**0.023**	0.000017	0.00073	0.0000067	0.0040	**0.0040**
	Average Last Month	**0.80**	0.028	0.030	0.035	0.0031	**0.011**	0.000020	0.00085	0.0000085	0.0034	0.0025

Notes:

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For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

CN_{FREE} CWQG guideline is applied to CN_{WAD}.

Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-15: Summary of ageing, humidity cell, and sub-aqueous chemistries in materials from Leprechaun Deposit (CND2)

Test	Parameter
	Unit
	MDMER
	CWQG
Ageing	2019-SEP19 CND 2 Day 0
	2019-SEP26 CND 2 Day 7
	2019-OCT3 CND 2 Day 14
	2019-OCT17 CND 2 Day 28
	2019-NOV 14 CND 2 Day 56
Humidity Cell	Max (Min for pH)
	Average First Month
	Average Last Month
Sub-Aqueous	Max (Min for pH)
	Average First Month
	Average Last Month

Table B-16: Number and percentages of samples from Marathon Deposit exceeding selected ARD/ML Criteria

Parameter	Units	Criteria	1. QE-POR and QE-POR-BX		2. AQPOR		3. CG		4. GB		5. MD		6. QZ-QE-POR-QTP-MIN		7. QZ-QE-POR-QTP		8. Low-Grade Ore		9. Ore		10. OB	
NPR ratio criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acid-Base Accounting (ABA)			66	100	19	100	9	100	4	100	19	100	10	100	11	100	8	100	9	100	14	100
NPR	ratio	>1 <2	4	6	1	5	0	0	0	0	0	0	0	0	4	36	2	25	1	11	0	0
NPR	ratio	<1	1	2	2	11	0	0	1	25	0	0	2	20	1	9	2	25	5	56	0	0
MDMER Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Shake Flask Extraction (SFE)			11	100	3	100	3	100	2	100	4	100	0	100	2	100	3	100	2	100	10	100
pH	pH unit	<6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pH	pH unit	>9.5	0	0	1	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CWQG Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Shake Flask Extraction (SFE)			11	100	3	100	3	100	2	100	4	100	0	100	2	100	3	100	2	100	10	100
Final pH	pH unit	<6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final pH	pH unit	>9	2	18	1	33	0	0	0	0	0	0	0	0	0	0	0	0	1	50	0	0
F	mg/L	>0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	40
Ag	mg/L	>0.00025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	mg/L	>0.1	11	100	3	100	3	100	2	100	4	100	0	0	2	100	3	100	1	50	6	60
As	mg/L	>0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	60
B	mg/L	>1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd*	mg/L	>0.00004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	30
Cr	mg/L	>0.0089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu*	mg/L	>0.002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	50
Fe	mg/L	>0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	50
Hg	mg/L	>0.000026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn*	mg/L	>0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	20
Mo	mg/L	>0.073	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni*	mg/L	>0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb*	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10
Se	mg/L	>0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	30
Tl	mg/L	>0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	mg/L	>0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn*	mg/L	>0.0017	0	0	0	0	0	0	0	0	0	0	0	0	1	50	0	0	0	0	4	40
10 x ACUC Criteria			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Trace Element Concentration (TEC)			66	100	19	100	9	100	4	100	19	100	10	100	11	100	8	100	9	100	14	100
Ag	µg/g	>530	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Al	µg/g	>407639	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	µg/g	>48	0	0	0	0	0	0	1	25	0	0	0	0	0	0	0	0	0	0	8	57
Be	µg/g	>21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	µg/g	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	13	0	0	0	0
Co	µg/g	>173	0	0	0	0	0	0	1	25	0	0	0	0	0	0	0	0	0	0	0	0
Cr	µg/g	>920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	µg/g	>280	0	0	0	0	0	0	2	50	0	0	0	0	0	0	0	0	0	0	0	0
Fe	µg/g	>320415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hg	µg/g	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn	µg/g	>774.5	12	18	4	21	8	89	4	100	17	89	0	0	1	9	0	0	0	0	7	50
Mo	µg/g	>11	1	2	0	0	0	0	0	0	0	0	0	0	1	9	1	13	2	22	0	0
Ni	µg/g	>470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	µg/g	>654.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	µg/g	>170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	µg/g	>0.9	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	µg/g	>9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	µg/g	>27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	µg/g	>970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	µg/g	>670	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are double underlined and bold.

MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).

CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).

For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

Table B-17: Summary of ABA statistics for materials from Marathon Deposit

Parameter	Paste pH	S_{TOTAL}	$S_{SULPHATE}$	$S_{SULPHIDE}$	Carb. NP	AP	NNP	Carb. NPR	TIC
Units	pH Units	wt.%			kg $CaCO_3$/t			unit less	wt.%
1. Qtz-eye Porphyry and Qtz-Porphyry Breccia (QE-POR and QE-POR-BX), 66 samples									
Min	8.39	0.0025	0.005	0.01	4.3	0.3	7	14	0.052
10th, %ile	9.15	0.007	0.005	0.01	18.5	0.5	15	41	0.222
Median	9.52	0.100	0.020	0.07	36.8	2.0	48	18	0.441
90th, %ile	9.75	0.37	0.090	0.32	99.0	10.0	117	10	1.19
Max	9.94	1.13	1.110	0.61	142.5	19.1	219	7	1.71
Average	9.47	0.17	0.051	0.12	48.4	3.9	61	13	0.581
St. Dev.	0.31	0.21	0.137	0.14	34.0	4.5	46	8	0.408
2. Aphanitic Qtz Porphyry (AQPOR), 19 samples									
Min	8.96	0.0025	0.005	0.01	0.4	0.6	-67	**0.7**	0.005
10th, %ile	9.00	0.007	0.009	0.01	8.5	0.6	-1	14	0.102
Median	9.69	0.076	0.030	0.05	18.5	1.6	22	12	0.222
90th, %ile	9.93	0.46	0.110	0.35	63.7	10.8	68	6	0.764
Max	10.00	2.52	0.370	2.15	174.2	67.2	170	2.6	2.09
Average	9.60	0.27	0.062	0.22	31.5	6.9	30	5	0.377
St. Dev.	0.32	0.58	0.088	0.49	38.7	15.3	45	2.5	0.465
3. Conglomerate (CG), 9 samples									
Min	9.30	0.0025	0.005	0.01	59.1	0.3	58	197	0.709
10th, %ile	9.32	0.003	0.009	0.01	66.0	0.3	70	220	0.792
Median	9.56	0.003	0.010	0.01	84.2	0.6	99	136	1.01
90th, %ile	9.66	0.01	0.010	0.01	161.3	0.6	213	260	1.94
Max	9.70	0.01	0.010	0.01	164.6	0.6	223	265	1.98
Average	9.50	0.01	0.009	0.01	101.1	0.5	116	212	1.21
St. Dev.	0.15	0.00	0.002	0.00	36.5	0.2	56	230	0.438
4. Gabbro (GB), 4 samples									
Min	8.82	0.0100	0.010	0.01	12.3	0.3	-36	41	0.148
10th, %ile	8.82	0.034	0.010	0.03	41.8	1.0	27	44	0.501
Median	8.90	0.100	0.010	0.09	115.3	2.8	181	41	1.38
90th, %ile	9.10	2.16	0.010	2.15	123.5	67.2	214	**1.8**	1.48
Max	9.16	3.04	0.010	3.03	125.0	94.7	224	**1.3**	1.50
Average	8.94	0.81	0.010	0.81	92.0	25.2	138	4	1.10
St. Dev.	0.14	1.29	0.000	1.29	46.3	40.2	102	**1.2**	0.555
5. Mafic Dike (MD), 19 samples									
Min	8.17	0.0025	0.005	0.01	3.4	0.3	21	11	0.041
10th, %ile	8.63	0.012	0.010	0.01	22.7	0.3	44	76	0.273
Median	9.03	0.090	0.030	0.04	93.3	1.3	105	72	1.12
90th, %ile	9.74	0.23	0.124	0.19	178.2	5.9	171	30	2.14
Max	9.79	0.50	0.180	0.36	295.0	11.2	294	26	3.54
Average	9.05	0.12	0.051	0.08	96.4	2.5	118	38	1.16
St. Dev.	0.42	0.13	0.051	0.10	69.4	3.1	63	22	0.833
6. QZ - Qtz-eye Porphyry + Minor QTP (QZ-QE-POR-QTP-MIN), 10 samples									
Min	9.31	0.0025	0.010	0.01	12.5	0.6	-9	20	0.150
10th, %ile	9.48	0.003	0.010	0.01	15.0	0.6	-3	24	0.180
Median	9.64	0.157	0.045	0.11	26.3	3.3	20	8	0.316
90th, %ile	9.90	0.67	0.103	0.56	48.3	17.6	48	2.7	0.580
Max	9.91	0.81	0.130	0.68	99.2	21.2	98	5	1.19
Average	9.67	0.25	0.056	0.20	32.9	6.2	27	5	0.395
St. Dev.	0.17	0.27	0.042	0.22	24.2	6.9	28	3.5	0.290

Table B-17: Summary of ABA statistics for materials from Marathon Deposit

7. QZ - Qtz-eye Porphyry + QTP (QZ-QE-POR-QTP), 11 samples									
Min	9.28	0.0120	0.005	0.01	10.4	0.6	4	17	0.125
10th, %ile	9.44	0.047	0.005	0.02	14.3	0.6	9	23	0.172
Median	9.59	0.310	0.010	0.30	18.3	9.4	33	**2.0**	0.220
90th, %ile	9.71	0.54	0.070	0.54	59.3	16.9	59	4	0.712
Max	9.76	1.04	0.070	1.03	91.7	32.2	81	2.8	1.10
Average	9.57	0.33	0.028	0.30	30.8	9.6	35	3.2	0.370
St. Dev.	0.14	0.27	0.024	0.27	23.6	8.5	21	2.8	0.283
8. Low-Grade Ore, 8 samples									
Min	9.23	0.0230	0.005	0.01	11.4	0.6	-9	18	0.137
10th, %ile	9.30	0.231	0.005	0.22	13.3	7.0	-7	**1.9**	0.160
Median	9.48	0.506	0.050	0.42	24.1	13.2	27	**1.8**	0.289
90th, %ile	9.75	0.87	0.143	0.77	40.3	24.2	43	**1.7**	0.484
Max	9.78	1.18	0.150	1.18	49.1	36.9	57	**1.3**	0.589
Average	9.50	0.55	0.066	0.49	26.2	15.3	21	**1.7**	0.314
St. Dev.	0.19	0.31	0.060	0.31	12.0	9.8	21	**1.2**	0.144
9. Ore, 9 samples									
Min	9.17	0.1830	0.005	0.13	4.1	4.1	-25	**1.0**	0.049
10th, %ile	9.18	0.197	0.005	0.14	5.5	4.3	-13	**1.3**	0.066
Median	9.60	0.710	0.060	0.67	12.3	20.9	5	**0.6**	0.147
90th, %ile	9.83	0.99	0.142	0.84	30.9	26.3	33	**1.2**	0.370
Max	9.90	1.16	0.230	0.93	31.6	29.1	43	**1.1**	0.379
Average	9.57	0.66	0.078	0.59	15.6	18.3	6	**0.9**	0.187
St. Dev.	0.24	0.30	0.070	0.27	9.8	8.4	21	**1.2**	0.118
10. Overburden (OB), 14 samples									
Min	6.03	0.0025	0.010	0.01	1.2	0.08	0.89	15	0.014
10th, %ile	6.04	0.0025	0.010	0.01	1.2	0.08	1.0	15	0.014
Median	6.57	0.0038	0.010	0.01	1.3	0.12	1.2	11	0.016
90th, %ile	7.18	0.0090	0.010	0.01	1.8	0.28	1.6	6	0.021
Max	7.52	0.0090	0.010	0.01	1.8	0.28	1.8	7	0.022
Average	6.59	0.0051	0.010	0.01	1.4	0.16	1.3	9	0.017
St. Dev.	0.51	0.0029	0	0	0.3	0.09	0.3	2.9	0.003

Notes:

S_{TOTAL} - Total Sulphur;

$S_{SULPHIDE}$ - Sulphide Sulphur; $S_{SULPHIDE}=S_{TOTAL}-S_{SULPHATE}$.

$S_{SULPHATE}$ - Sulphate Sulphur;

Carb. NP - Carbonate Neutralization Potential; Carb. NP=TIC*M($CaCO_3$)/M(C)*10(kg/t from % diff.)

AP - Acid Potential; AP=$S_{SULPHIDE}$(%) x 31.25.

NNP - Net Neutralization Potential;

NPR - Neutralization Potential Ratio;

TIC - Total Inorganic Carbon.

Overburden AP is calculated using S_{TOTAL} x 31.25.

Overburden NP is calculated as (50 x (N of HCL x Total HCL added - N NaOH x NaOH added))/Weight of Sample.

Respective samples from Phase I and II are combined.

NPR values between 1 and 2 are bolded and below 1 are bolded and shaded; See text for assumptions and calculations;

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-18: Summary of SFE statistics for materials from Marathon Deposit

Parameter	pH	SO_4	F	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Hg	Mn*	Mo	Ni*	Pb*	Se	Tl	U	Zn*
MDMER	6.0-9.5	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	n/v	0.25	0.08	n/v	n/v	n/v	0.4
CWQG	6.5-9.0	n/v	0.12	0.00025	0.005/0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.000026	0.19	0.073	0.025	0.001	0.001	0.0008	0.015	0.0017
Unit	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1. Qtz-eye Porphyry and Qtz-Porphyry Breccia (QE-POR and QE-POR-BX), 11 samples																				
Min	7.35	0.50	-	0.000005	0.12	0.00007	0.0010	0.0000010	0.00005	0.00028	0.0010	0.000010	0.0002	0.000074	0.000055	0.000025	0.000050	0.0000020	0.0000005	0.00050
10th, %ile	7.37	0.50	-	0.000005	0.17	0.00013	0.0023	0.0000010	0.00005	0.00028	0.0010	0.000010	0.0008	0.000076	0.000058	0.000025	0.000050	0.0000020	0.0000024	0.00050
Median	7.81	0.50	-	0.000005	**0.21**	0.00031	0.0032	0.0000010	0.00005	0.00049	0.0037	0.000010	0.036	0.00037	0.000071	0.000025	0.000050	0.0000088	0.000025	0.00050
90th, %ile	**9.41**	7.9	-	0.000005	**0.51**	0.00068	0.0047	0.0000052	0.00005	0.00090	0.0091	0.000010	0.063	0.00141	0.00011	0.000087	0.000050	0.000098	0.000082	0.00050
Max	**9.42**	39	-	0.000010	**0.55**	0.0012	0.011	0.0000059	0.00019	0.00195	0.0093	0.000010	0.067	0.0054	0.00017	0.000150	0.00013	0.000138	0.00017	0.0010
Average	8.17	5.5	-	0.000005	**0.27**	0.00039	0.0038	0.0000023	0.00006	0.00064	0.0042	0.000010	0.031	0.00095	0.000082	0.000042	0.000057	0.000029	0.000046	0.00055
St. Dev.	0.78	11	-	0.000001	0.13	0.00029	0.0024	0.0000017	0.00004	0.00046	0.0027	0	0.026	0.00148	0.000032	0.000038	0.000023	0.000043	0.000047	0.00014
2. Aphanitic Qtz Porphyry (AQPOR), 3 samples																				
Min	7.54	0.50	-	0.000005	**0.18**	0.00033	0.0022	0.0000010	0.00005	0.00028	0.0026	0.000010	0.00082	0.00013	0.000048	0.000025	0.000050	0.0000020	0.0000044	0.00050
10th, %ile	7.83	0.50	-	0.000005	**0.19**	0.00033	0.0022	0.0000010	0.00005	0.00029	0.0027	0.000010	0.00091	0.00020	0.000049	0.000025	0.000050	0.0000020	0.0000085	0.00050
Median	9.00	0.50	-	0.000005	**0.22**	0.00035	0.0022	0.0000010	0.00005	0.00035	0.0031	0.000010	0.0013	0.00050	0.000052	0.000025	0.000050	0.0000020	0.000025	0.00050
90th, %ile	**9.44**	2.1	-	0.000005	**0.26**	0.00052	0.0026	0.0000010	0.00005	0.00057	0.0068	0.000010	0.017	0.00058	0.000066	0.000025	0.00023	0.0000077	0.000036	0.00050
Max	**9.55**	2.5	-	0.000005	**0.27**	0.00057	0.0027	0.0000010	0.00005	0.00063	0.0077	0.000010	0.021	0.00060	0.000070	0.000025	0.00028	0.000009	0.000039	0.00050
Average	8.70	1.2	-	0.000005	**0.22**	0.00041	0.0024	0.0000010	0.00005	0.00042	0.0045	0.000010	0.0077	0.00041	0.000057	0.000025	0.00013	0.0000044	0.000023	0.00050
St. Dev.	0.85	0.9	-	0	0.03	0.00011	0.0002	0	0	0.00015	0.0023	0	0.0094	0.00020	0.000010	0	0.00011	0.0000033	0.000014	0
3. Conglomerate (CG), 3 samples																				
Min	7.89	0.50	-	0.000005	**0.12**	0.00015	0.0010	0.0000010	0.00005	0.00022	0.0010	0.000010	0.0020	0.00013	0.000048	0.000025	0.000050	0.0000020	0.0000069	0.00050
10th, %ile	7.91	0.50	-	0.000005	**0.13**	0.00016	0.0012	0.0000010	0.00005	0.00025	0.0013	0.000010	0.0066	0.00016	0.000049	0.000025	0.000050	0.0000033	0.0000082	0.00050
Median	7.99	0.50	-	0.000005	**0.16**	0.00020	0.0022	0.0000010	0.00005	0.00038	0.0027	0.000010	0.025	0.00031	0.000055	0.000025	0.000050	0.0000085	0.000014	0.00050
90th, %ile	8.57	0.50	-	0.000005	**0.20**	0.00086	0.0036	0.0000010	0.00021	0.00063	0.0045	0.000010	0.053	0.00070	0.000075	0.000082	0.000050	0.000023	0.00092	0.00138
Max	8.71	0.50	-	0.000005	**0.21**	0.00103	0.0039	0.0000010	0.00025	0.00069	0.0049	0.000010	0.060	0.00080	0.000080	0.000096	0.000050	0.000026	0.00115	0.00160
Average	8.20	0.50	-	0.000005	**0.16**	0.00046	0.0024	0.0000010	0.00012	0.00043	0.0029	0.000010	0.029	0.00041	0.000061	0.000049	0.000050	0.000012	0.00039	0.00087
St. Dev.	0.37	0	-	0	0.03	0.00040	0.0012	0	0.00009	0.00020	0.0016	0	0.024	0.00029	0.000014	0.000033	0	0.000010	0.00054	0
4. Gabbro (GB), 2 samples																				
Min	7.28	0.50	-	0.000005	**0.22**	0.00018	0.0035	0.0000023	0.00021	0.00023	0.0010	0.000010	0.011	0.00008	0.000093	0.000025	0.000050	0.0000042	0.0000005	0.00050
10th, %ile	7.32	0.50	-	0.000005	**0.22**	0.00019	0.0037	0.0000024	0.00021	0.00024	0.0010	0.000010	0.011	0.00008	0.00010	0.000033	0.000050	0.0000064	0.0000005	0.00050
Median	7.50	0.50	-	0.000005	**0.22**	0.00021	0.0045	0.0000029	0.00022	0.00027	0.0010	0.000010	0.012	0.00010	0.00014	0.000067	0.000050	0.000015	0.0000005	0.00050
90th, %ile	7.67	0.50	-	0.000005	**0.23**	0.00022	0.0052	0.0000033	0.00022	0.00029	0.0010	0.000010	0.013	0.00012	0.00018	0.000100	0.000050	0.000024	0.0000005	0.00050
Max	7.71	0.50	-	0.000005	**0.23**	0.00023	0.0054	0.0000034	0.00022	0.00030	0.0010	0.000010	0.013	0.00012	0.000185	0.000108	0.000050	0.0000265	0.0000005	0.00050
Average	7.50	0.50	-	0.000005	**0.22**	0.00021	0.0045	0.0000029	0.00022	0.00027	0.0010	0.000010	0.012	0.00010	0.00014	0.000067	0.000050	0.000015	0.0000005	0.00050
St. Dev.	0.22	0	-	0	0.01	0.00002	0.0010	0.0000006	0.00001	0.00004	0	0	0.001	0.00002	0.00005	0.000042	0	0.000011	0	0
5. Mafic Dike (MD), 4 samples																				
Min	7.75	0.50	-	0.000005	**0.22**	0.00011	0.0010	0.0000010	0.00005	0.00033	0.0010	0.000010	0.030	0.000061	0.000053	0.000025	0.000050	0.0000020	0.0000020	0.00050
10th, %ile	7.77	0.50	-	0.000005	**0.23**	0.00012	0.0010	0.0000010	0.00005	0.00034	0.0010	0.000010	0.034	0.000069	0.000056	0.000025	0.000050	0.0000020	0.0000061	0.00050
Median	7.88	0.50	-	0.000005	**0.25**	0.00015	0.0016	0.0000010	0.00008	0.00045	0.0018	0.000010	0.054	0.00026	0.000063	0.000025	0.000050	0.0000020	0.000021	0.00050
90th, %ile	8.02	0.50	-	0.000005	**0.26**	0.00045	0.0022	0.0000024	0.00011	0.00061	0.0033	0.000010	0.067	0.00065	0.000065	0.000025	0.00011	0.000036	0.000089	0.00120
Max	8.05	0.50	-	0.000005	**0.26**	0.00057	0.0022	0.0000030	0.00012	0.00065	0.0037	0.000010	0.067	0.00074	0.000065	0.000025	0.00013	0.0000508	0.000115	0.00150
Average	7.89	0.50	-	0.000005	**0.25**	0.00025	0.0016	0.0000015	0.00008	0.00047	0.0021	0.000010	0.052	0.00033	0.000061	0.000025	0.000070	0.000014	0.000040	0.00075
St. Dev.	0.12	0	-	0	0.02	0.00019	0.0006	0.0000009	0.00003	0.00013	0.0011	0	0.016	0.00028	0.000005	0	0.000035	0.000021	0.000044	0.00043

See notes on last page.

Table B-18: Summary of SFE statistics for materials from Marathon Deposit

Parameter	pH	SO_4	F	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Hg	Mn*	Mo	Ni*	Pb*	Se	Tl	U	Zn*
MDMER	6.0-9.5	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	n/v	0.25	0.08	n/v	n/v	n/v	0.4
CWQG	6.5-9.0	n/v	0.12	0.00025	0.005/0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.000026	0.19	0.073	0.025	0.001	0.001	0.0008	0.015	0.0017
Unit	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
7. QZ - Qtz-eye Porphyry + QTP (QZ-QE-POR-QTP), 2 samples																				
Min	7.64	0.50	-	0.000005	**0.12**	0.00022	0.0010	0.0000049	0.00005	0.00047	0.0010	0.000010	0.076	0.00017	0.00007	0.000025	0.000050	0.0000020	0.000025	0.00050
10th, %ile	7.65	0.73	-	0.000005	**0.12**	0.00028	0.0017	0.0000053	0.00006	0.00048	0.0014	0.000010	0.082	0.0011	0.00007	0.000025	0.000050	0.0000023	0.000048	0.00065
Median	7.70	1.7	-	0.000005	**0.13**	0.00054	0.0044	0.0000070	0.00010	0.00054	0.0032	0.000010	0.11	0.0047	0.00008	0.000025	0.000050	0.0000034	0.00014	0.00125
90th, %ile	7.75	2.6	-	0.000005	**0.14**	0.00080	0.0070	0.0000086	0.00013	0.00059	0.0049	0.000010	0.13	0.0083	0.00008	0.000025	0.000050	0.0000044	0.00024	**0.00185**
Max	7.76	2.8	-	0.000005	**0.14**	0.00086	0.0077	0.0000090	0.00014	0.00060	0.0053	0.000010	0.14	0.00925	0.00008	0.000025	0.000050	0.0000047	0.00026	**0.00200**
Average	7.70	1.7	-	0.000005	**0.13**	0.00054	0.0044	0.0000070	0.00010	0.00054	0.0032	0.000010	0.11	0.0047	0.00008	0.000025	0.000050	0.0000034	0.00014	0.00125
St. Dev.	0.06	1.2	-	0	0.01	0.00032	0.0034	0.0000021	0.00005	0.00007	0.0022	0	0.03	0.0045	0.00001	0	0	0.0000014	0.00012	0.00075
8. Low-Grade Ore, 3 samples																				
Min	7.02	0.50	-	0.000005	**0.10**	0.00031	0.0041	0.0000010	0.00005	0.00075	0.0038	0.000010	0.005	0.00014	0.000049	0.000025	0.000050	0.0000020	0.000095	0.00050
10th, %ile	7.27	0.90	-	0.000005	**0.13**	0.00046	0.0050	0.0000010	0.00005	0.00077	0.0040	0.000010	0.005	0.00033	0.000054	0.000025	0.000050	0.0000020	0.00010	0.00050
Median	8.29	2.5	-	0.000005	**0.25**	0.00105	0.0088	0.0000010	0.00005	0.00085	0.0050	0.000010	0.007	0.0011	0.000072	0.000025	0.000050	0.0000020	0.00014	0.00050
90th, %ile	8.53	3.5	-	0.000005	**0.31**	0.00209	0.021	0.0000029	0.00005	0.00165	0.0129	0.000010	0.075	0.0016	0.000086	0.000047	0.00027	0.0000115	0.00014	0.00050
Max	8.59	3.8	-	0.000005	**0.32**	0.00235	0.024	0.0000034	0.00005	0.00185	0.0149	0.000010	0.092	0.00168	0.000090	0.00005	0.00033	0.0000139	0.00014	0.00050
Average	7.97	2.3	-	0.000005	**0.23**	0.00124	0.012	0.0000018	0.00005	0.00115	0.0079	0.000010	0.035	0.00096	0.000070	0.000034	0.00014	0.0000060	0.00012	0.00050
St. Dev.	0.68	1.4	-	0	0.09	0.00084	0.0086	0.0000011	0	0.00050	0.0050	0	0.040	0.00063	0.000017	0.000013	0.00013	0.0000056	0.00002	0
9. Ore, 2 samples																				
Min	7.73	2.5	-	0.000005	0.056	0.00051	0.0218	0.0000051	0.00005	0.00134	0.0010	0.000010	0.005	0.0024	0.00014	0.000025	0.000050	0.0000045	0.000021	0.00050
10th, %ile	7.89	2.6	-	0.000006	0.087	0.00058	0.0219	0.0000053	0.00006	0.00136	0.0026	0.000010	0.017	0.0050	0.00016	0.000025	0.000050	0.0000081	0.000023	0.00056
Median	8.52	2.9	-	0.000009	**0.21**	0.00086	0.0222	0.0000062	0.00012	0.00143	0.0091	0.000010	0.065	0.016	0.00023	0.000025	0.000050	0.0000225	0.000030	0.00080
90th, %ile	**9.15**	3.1	-	0.000012	**0.34**	0.00114	0.0225	0.0000070	0.00018	0.00150	0.0156	0.000010	0.11	0.026	0.00031	0.000025	0.000050	0.0000368	0.000036	0.00104
Max	**9.31**	3.2	-	0.000013	**0.37**	0.00121	0.0226	0.0000072	0.00019	0.00152	0.0172	0.000010	0.13	0.0289	0.00033	0.000025	0.000050	0.0000404	0.000038	0.00110
Average	8.52	2.9	-	0.000009	**0.21**	0.00086	0.0222	0.0000062	0.00012	0.00143	0.0091	0.000010	0.065	0.016	0.00023	0.000025	0.000050	0.0000225	0.000030	0.00080
St. Dev.	0.79	0.4	-	0.000004	0.16	0.00035	0.0004	0.0000011	0.00007	0.00009	0.0081	0	0.061	0.013	0.00010	0	0	0.0000180	0.000008	0
10. Overburden (OB), 10 samples																				
Min	7.23	1.0	0.060	0.000025	0.055	0.0029	0.0030	0.0000015	0.00004	0.0013	0.0430	0.000005	0.0047	0.00021	0.00020	0.000040	0.000020	0.0000025	0.000023	0.0010
10th, %ile	7.39	1.0	0.096	0.000025	0.068	0.0036	0.0030	0.0000029	0.00011	0.0015	0.0529	0.000005	0.0054	0.00037	0.00038	0.000076	0.000074	0.0000025	0.000023	0.0010
Median	7.64	2.5	0.12	0.000025	**0.14**	**0.0071**	0.0040	0.000013	0.00021	**0.0021**	0.28	0.000005	0.031	0.0018	0.00065	0.00020	0.00034	0.0000025	0.000078	0.0010
90th, %ile	8.79	5.9	**0.16**	0.000025	**0.27**	**0.037**	0.0061	**0.000049**	0.00043	**0.0151**	**0.45**	0.000006	**0.20**	0.0070	0.00081	0.00063	**0.0011**	0.0000065	0.0016	**0.0024**
Max	8.95	14	**0.19**	0.000025	**0.27**	**0.070**	0.0070	**0.000122**	0.00059	**0.0179**	**0.60**	0.000010	**0.22**	0.00753	0.00090	**0.0011**	**0.0014**	0.0000110	0.0018	**0.0060**
Average	7.98	3.6	**0.13**	0.000025	**0.15**	**0.017**	0.0044	0.000027	0.00025	**0.0051**	0.27	0.000006	0.068	0.0029	0.00059	0.00030	0.00050	0.0000037	0.00044	**0.0018**
St. Dev.	0.64	3.8	0.037	0	0.07	0.020	0.0013	0.000035	0.00015	0.0057	0.18	0.000002	0.075	0.0026	0.00020	0.00030	0.00046	0.0000026	0.00065	0.0015

Notes:
SFE is analyzed for waste rock and ore in Phase I and for overburden in Phase II.
MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).
CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).
For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.
Guidelines were not applied to the standard deviation values.
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-19: Summary of statistics for total concentration of trace lements in materials from Marathon Deposit

	Ag	Al	As	B	Be	Cd	Co	Cr	Cu	Fe	Hg	Mn	Mo	Ni	P	Pb	Se	Tl	U	V	Zn
ACUCx10	530	407639	48	-	21	0.90	173	920	280	320415	0.5	774.5	11	470	654.3	170	0.9	9	27	970	670
Units	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
1. Qtz-eye Porphyry and Qtz-Porphyry Breccia (QE-POR and QE-POR-BX), 66 samples																					
Min	0.005	3300	0.25	-	0.030	0.010	0.71	1.5	0.1	480	0.025	112	0.050	0.40	6.0	0.18	0.35	0.010	0.037	0.50	1.5
10th, %ile	0.005	4800	0.25	-	0.040	0.010	1.5	2.9	0.4	2030	0.025	240	0.30	1.1	13	0.25	0.35	0.010	0.054	4.5	5
Median	0.025	6345	0.60	-	0.070	0.010	4.5	73	4.7	13000	0.025	418	0.90	2.4	25	0.86	0.35	0.01	0.13	17.0	16
90th, %ile	0.050	16000	1.7	-	0.50	0.050	17.1	126	31	32500	0.025	**985**	2.6	8.0	43	2.0	0.50	0.25	0.45	102	38
Max	0.080	39000	5.2	-	2.0	0.050	36	280	71	110000	0.025	**1800**	**13**	106	75	22	**1.0**	0.25	0.8	209	89
Average	0.029	9000	0.87	-	0.25	0.027	7.0	75	11.3	16551	0.025	537	1.4	6.0	28	1.5	0.42	0.10	0.21	38	21
St. Dev.	0.021	6782	0.93	-	0.31	0.019	7.1	52	15.0	18647	0	358	1.7	14	15	2.8	0.10	0.12	0.18	48	17
2. Aphanitic Qtz Porphyry (AQPOR), 19 samples																					
Min	0.005	4000	0.25	-	0.010	0.010	1.80	1.7	0.1	1460	0.025	18	0.30	0.30	17	0.15	0.35	0.010	0.057	1.00	2.4
10th, %ile	0.005	5940	0.25	-	0.038	0.010	2.3	4.1	0.8	2366	0.025	253	0.56	0.58	19	0.16	0.35	0.010	0.083	4.4	10
Median	0.010	8700	0.60	-	0.060	0.010	4.7	82	4.3	23000	0.025	400	1.80	2.2	25	0.60	0.35	0.01	0.12	10.0	22
90th, %ile	0.050	19000	1.0	-	0.50	0.050	15.2	134	33	37200	0.025	**854**	3.1	28	27	2.1	0.66	0.25	0.32	45	50
Max	0.250	28000	3.9	-	0.50	0.12	20	160	65	48000	0.025	**1200**	3.8	41	28	3.1	**1.7**	0.25	0.4	72	91
Average	0.029	11093	0.80	-	0.14	0.023	7.2	76	12.0	22955	0.025	494	1.8	7.7	23	0.93	0.49	0.05	0.15	18	28
St. Dev.	0.054	6058	0.79	-	0.17	0.027	5.5	47	18.4	11985	0	286	0.96	13	4.6	0.85	0.35	0.09	0.10	20	21
3. Conglomerate (CG), 9 samples																					
Min	0.005	5000	1.0	-	0.14	0.040	7.70	10	1.6	3040	0.025	740	0.050	11	46	1.8	0.35	0.010	0.300	24.00	34.0
10th, %ile	0.041	5160	1.1	-	0.14	0.048	9.5	12	2.1	3328	0.025	772	0.17	13	50	1.9	0.35	0.010	0.332	24.0	38
Median	0.050	6470	1.6	-	0.23	0.050	11.0	66	22.0	22000	0.025	**918**	0.30	20	61	3.0	0.35	0.02	0.67	36.0	48
90th, %ile	0.098	9120	3.3	-	1.0	0.10	25.9	80	66	26600	0.025	**1168**	0.68	28	65	9.2	0.50	0.25	1.44	144	64
Max	0.130	11000	4.7	-	1.0	0.11	28	88	100	29000	0.025	**1200**	1.4	30	66	13	0.50	0.25	1.6	150	68
Average	0.058	7119	2.0	-	0.49	0.069	14.2	53	30.6	15193	0.025	**962**	0.43	20	59	4.9	0.42	0.12	0.75	69	49
St. Dev.	0.032	1849	1.1	-	0.38	0.025	6.8	28	29.9	10304	0	152	0.36	5.8	7.6	3.6	0.07	0.12	0.43	48	11
4. Gabbro (GB), 4 samples																					
Min	0.050	8900	3.0	-	0.50	0.050	31.20	105	52.2	3910	-	**849**	0.050	38	0.5	0.80	0.50	0.250	0.050	137.00	23.0
10th, %ile	0.050	9068	4.2	-	0.50	0.050	33.9	110	75.5	4135	-	**903**	0.07	42	1.0	0.86	0.50	0.250	0.050	139.7	27
Median	0.050	9475	8.0	-	0.50	0.13	44.2	122	211.0	5120	-	**1035**	0.15	56	2.5	1.1	0.50	0.25	0.05	176.0	36
90th, %ile	0.225	9553	**111**	-	0.50	0.20	160.8	158	1173	7708	-	**1061**	0.41	191	6.5	1.3	**4.4**	0.25	0.05	234	49
Max	0.300	9580	**155**	-	0.50	0.20	209	172	1550	8620	-	**1070**	0.50	248	8.0	1.4	**6.0**	0.25	0.1	246	54
Average	0.113	9358	44	-	0.50	0.13	82.1	130	506.1	5693	-	**997**	0.21	99	3.4	1.1	**1.9**	0.25	0.05	184	37
St. Dev.	0.108	268	**64**	-	0	0.08	73.5	25	608.9	1791	-	87	0.17	86	2.8	0.2	**2.4**	0.00	0.00	45	11
5. Mafic Dike (MD), 19 samples																					
Min	0.005	5140	0.25	-	0.030	0.010	2.60	5.2	0.1	1500	0.025	317	0.05	1.3	15	0.21	0.35	0.010	0.010	10.00	18.0
10th, %ile	0.005	6626	0.45	-	0.040	0.010	4.9	14	1.2	3080	0.025	**822**	0.09	2.8	18	0.41	0.35	0.010	0.025	25.6	32
Median	0.040	27000	0.80	-	0.090	0.050	32.0	56	55.1	65000	0.025	**1650**	0.30	7.1	25	0.84	0.35	0.01	0.06	250.0	81
90th, %ile	0.050	38000	2.2	-	0.50	0.050	40.1	192	168	88200	0.025	**1920**	0.92	50	38	2.4	0.50	0.25	0.32	376	89
Max	0.100	42000	3.7	-	0.50	0.080	48	880	220	100000	0.025	**2300**	1.5	225	61	15	0.50	0.25	0.5	454	93
Average	0.036	22793	1.2	-	0.26	0.040	27.4	109	67.3	47647	0.025	**1507**	0.44	26	28	1.9	0.41	0.11	0.15	223	67
St. Dev.	0.023	13946	0.92	-	0.22	0.018	13.5	192	64.3	37397	0	503	0.39	51	13	3.3	0.07	0.12	0.14	131	24
6. QZ - Qtz-eye Porphyry + Minor QTP (QZ-QE-POR-QTP-MIN), 10 samples																					
Min	0.005	2600	0.25	-	0.040	0.010	1.00	2.1	0.3	7100	0.025	150	0.20	0.30	-	0.20	0.35	0.010	0.048	1.00	1.9
10th, %ile	0.005	4040	0.25	-	0.040	0.010	1.2	2.6	0.7	7280	0.025	186	0.92	0.57	-	0.25	0.35	0.010	0.059	1.9	4
Median	0.010	5200	0.38	-	0.045	0.010	2.1	93	4.7	17500	0.025	270	1.4	2.5	-	0.39	0.35	0.01	0.11	7.0	8
90th, %ile	0.031	7480	0.73	-	0.072	0.010	5.0	121	7	22200	0.025	480	2.7	2.6	-	1.1	0.35	0.01	0.14	17	11
Max	0.040	8200	1.0	-	0.090	0.010	6	130	12	24000	0.025	750	2.8	2.9	-	2.2	0.35	0.01	0.2	18	12
Average	0.015	5520	0.45	-	0.053	0.010	2.7	67	4.6	15480	0.025	322	1.6	1.8	-	0.63	0.35	0.01	0.11	8	8
St. Dev.	0.012	1629	0.24	-	0.016	0	1.6	53	3.2	5786	0	162	0.84	1.0	-	0.58	0.00	0.00	0.04	6	3

Table B-19: Summary of statistics for total concentration of trace lements in materials from Marathon Deposit

7. QZ - Qtz-eye Porphyry + QTP (QZ-QE-POR-QTP), 11 samples																					
Min	0.005	4200	0.25	-	0.050	0.010	0.80	64	2.6	990	0.025	160	0.40	1.7	5.0	0.17	0.35	0.010	0.093	0.50	4.3
10th, %ile	0.005	4200	0.25	-	0.060	0.010	1.4	67	2.7	1010	0.025	220	0.70	1.7	5.0	0.23	0.35	0.010	0.094	2.0	5
Median	0.050	5290	0.50	-	0.14	0.050	2.9	85	8.3	9500	0.025	333	1.2	2.4	6.0	1.0	0.35	0.01	0.20	4.0	11
90th, %ile	0.050	9700	2.0	-	0.50	0.050	20.0	120	31	23000	0.025	630	3.8	3.7	18	2.6	0.50	0.25	0.40	21	28
Max	0.070	29000	17	-	0.50	0.050	26	140	57	53000	0.025	**1700**	**89**	16	20	3.5	0.50	0.25	0.5	140	75
Average	0.037	7824	2.3	-	0.27	0.033	6.5	93	13.8	12232	0.025	472	9.4	3.6	10	1.3	0.42	0.12	0.24	18	18
St. Dev.	0.021	6876	4.7	-	0.21	0.019	7.9	23	15.7	14720	0	412	**25**	4.0	6.3	1.1	0.07	0.12	0.15	39	19
8. Low-Grade Ore, 8 samples																					
Min	0.005	4300	0.25	-	0.050	0.010	1.80	1.4	3.3	960	0.025	210	0.30	1.0	4.0	0.33	0.35	0.010	0.097	1.00	2.0
10th, %ile	0.016	5042	0.43	-	0.050	0.010	1.9	42	4.2	1177	0.025	224	0.44	1.4	4.2	0.41	0.35	0.010	0.098	1.7	4
Median	0.050	6020	0.50	-	0.11	0.040	3.5	89	11.3	14500	0.025	455	2.1	2.4	5.0	1.4	0.35	0.01	0.14	5.5	14
90th, %ile	0.296	9190	2.6	-	0.50	0.335	4.1	116	64	21300	0.025	538	8.7	3.6	12	6.1	0.50	0.25	0.40	8	18
Max	0.520	9400	3.9	-	0.50	**1.00**	5	130	120	22000	0.025	581	**12**	4.8	14	10	0.50	0.25	0.4	8	22
Average	0.121	6533	1.1	-	0.24	0.15	3.1	83	26.6	11976	0.025	401	3.7	2.5	7.7	2.6	0.41	0.10	0.22	5	12
St. Dev.	0.161	1699	1.2	-	0.21	0.32	1.0	37	36.9	8715	0	139	3.8	1.1	4.5	3.0	0.07	0.12	0.14	2	6
9. Ore, 9 samples																					
Min	0.005	2480	0.25	-	0.040	0.010	1.10	2.8	1.9	990	0.025	100	1.0	0.30	3.0	0.42	0.35	0.010	0.058	1.00	0.9
10th, %ile	0.041	2656	0.25	-	0.040	0.010	1.2	55	2.4	1150	0.025	180	2.0	1.3	4.0	0.69	0.35	0.010	0.073	1.8	3
Median	0.110	4200	0.50	-	0.070	0.010	1.6	89	11.0	13000	0.025	310	4.5	2.4	8.0	1.5	0.35	0.01	0.11	2.0	7
90th, %ile	0.396	8880	2.4	-	0.50	0.050	4.3	140	26	23600	0.025	395	**29**	4.4	8.0	12	0.50	0.25	0.22	9	20
Max	0.700	9200	5.2	-	0.50	0.050	5	142	40	30000	0.025	497	**43**	10	8.0	38	0.50	0.25	0.3	10	21
Average	0.211	5308	1.1	-	0.21	0.024	2.5	92	13.7	12877	0.025	297	11	3.0	6.3	6.0	0.40	0.09	0.13	4	10
St. Dev.	0.199	2442	1.5	-	0.21	0.018	1.4	41	11.6	10002	0	108	**13**	2.5	2.4	11.4	0.07	0.11	0.07	3	7
10. Overburden (OB), 14 samples																					
Min	0.030	8300	35	-	0.14	0.090	11.0	25	29	23000	0.025	500	0.60	15	-	3.7	0.35	0.060	0.40	38	39
10th, %ile	0.033	8660	43	-	0.16	0.093	12.0	27	30	24500	0.025	518	0.70	16	-	3.9	0.35	0.060	0.45	40	44
Median	0.050	12000	**49**	-	0.22	0.13	17	38	39	34000	0.025	760	0.95	23	-	5.0	0.35	0.080	0.67	56	57
90th, %ile	0.067	14000	**67**	-	0.26	0.24	20	62	48	40500	0.025	**914**	1.3	30	-	6.1	0.35	0.097	1.10	70	67
Max	0.070	18000	**71**	-	0.26	0.44	25	88	54	43000	0.025	**2600**	1.7	31	-	7.5	0.35	0.150	1.40	71	71
Average	0.049	11936	**52**	-	0.21	0.16	17	41	39	33214	0.025	**850**	1.0	23	-	5.2	0.35	0.081	0.73	55	55
St. Dev.	0.012	2675	10	-	0.04	0.09	3.6	17	7.2	5954	0	506	0.29	5.4	-	1.0	0	0.022	0.29	12	9.1

Notes:

Respective samples from Phase I and II are combined.

ACUC - Average Concentration in the Upper Crust of the Earth based on Rudnick and Gao (2004); Values exceeding 10x the Average Concentration in the Upper Crust are double underlined and bold.

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-20: Summary of leachate chemistries from HC in materials from Marathon Deposit

Material	Parameter	pH	F	SO_4	Hg	Ag	Al	As	B	Cd*	Cr	Cu*	Fe	Mn*	Mo	Ni*	P	Pb*	Se	Tl	U	Zn*
	Unit	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	6.0-9.5	n/v	n/v	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.1	n/v	n/v	n/v	0.25	n/v	0.08	n/v	n/v	n/v	0.4
	CWQG	6.5-9.0	0.12	n/v	0.000026	0.00025	0.1	0.005	1.5	0.00004	0.0089	0.002	0.3	0.19	0.073	0.025	0.004	0.001	0.001	0.0008	0.015	0.0017
Waste Rock	M QE-POR																					
	Max (Min for pH)	7.05	0.030	2	0.000010	0.000025	**0.102**	0.001	0.004	0.0000050	0.00016	**0.0027**	0.011	0.021	0.00093	0.000100	0.003	0.00012	**0.00134**	0.0000080	0.00062	0.0010
	Average First Month	7.86	0.030	1.43	0.0000050	0.000025	0.0863	0.00030	0.0017	0.0000015	0.000040	0.00100	0.008	0.0186	0.00050	0.000050	0.0015	0.000018	0.000043	0.0000025	0.00041	0.0010
	Average Last Month	7.40	0.030	0.20	0.0000067	0.000025	0.0567	0.00010	0.0010	0.0000032	0.000103	0.00067	0.0035	0.01308	0.00043	0.000050	0.0015	0.000030	0.000020	0.0000033	0.00018	0.0010
	M AQPOR																					
	Max (Min for pH)	7.18	0.060	4.9	**0.000200**	0.000025	**0.117**	0.0014	0.003	**0.0000770**	0.00008	**0.0249**	0.016	0.0254	0.00099	0.000100	0.003	0.00010	0.00053	0.0000070	0.00064	**0.0030**
	Average First Month	7.65	0.030	3.27	0.0000050	0.000025	0.0833	0.00043	0.0017	0.0000015	0.000040	0.00050	0.008	0.0202	0.00070	0.000050	0.0015	0.000045	0.000110	0.0000025	0.00037	0.0010
	Average Last Month	7.35	0.030	1.23	0.0000050	0.000025	0.0527	0.00013	0.0010	0.0000028	0.000053	0.00057	0.0035	0.0121	0.00032	0.000067	0.0015	0.000013	0.000020	0.0000040	0.00022	0.0010
	M CG																					
	Max (Min for pH)	7.05	0.030	0.5	0.000010	0.000025	**0.123**	0.0008	0.002	0.0000260	0.00016	**0.0103**	0.015	0.022	0.00093	0.000200	0.004	**0.0011**	0.00015	0.0000080	0.00172	0.0010
	Average First Month	7.82	0.030	0.33	0.0000050	0.000025	0.0877	0.00057	0.0013	0.0000015	0.000057	0.00133	0.009	0.0144	0.00059	0.000100	0.002333	0.000022	0.000057	0.0000025	0.00144	0.0010
	Average Last Month	7.32	0.030	0.10	0.0000067	0.000025	0.0400	0.00027	0.0010	0.0000020	0.000117	0.00097	0.0035	0.009953	0.00035	0.000050	0.0015	0.0000067	0.000020	0.0000033	0.00027	0.0010
	M MD																					
	Max (Min for pH)	7.05	0.030	49	0.000020	0.000025	0.073	0.0005	0.001	**0.0002780**	0.00016	0.001	0.004	0.0302	0.00243	0.000100	0.0015	0.00012	0.00017	0.0000070	0.00038	**0.0020**
	Average First Month	7.46	0.030	30.00	0.0000050	0.000025	0.0683	0.00010	0.0010	0.0000015	0.000040	0.00050	0.004	0.0240	0.00051	0.000050	0.0015	0.000018	0.000050	0.0000025	0.00012	0.0010
	Average Last Month	7.47	0.030	1.20	0.0000100	0.000025	0.0473	0.00010	0.0010	0.0000028	0.000113	0.00047	0.0035	0.020613	0.00039	0.000050	0.0015	0.0000083	0.000037	0.0000033	0.00014	0.0010
	M QZ-QE-POR-QTP-MIN																					
	Max (Min for pH)	7.15	0.030	1.3	0.000010	0.000025	**0.105**	0.0028	0.009	0.0000040	0.00015	**0.0021**	0.025	0.0208	0.00076	0.000100	0.0015	**0.0016**	0.0001	0.0000200	0.00052	**0.0040**
	Average First Month	7.75	0.030	0.93	0.0000050	0.000025	0.0767	0.00037	0.0020	0.0000015	0.000040	0.00093	0.007	0.0184	0.00048	0.000067	0.0015	0.000015	0.000033	0.0000025	0.00024	0.0010
	Average Last Month	7.35	0.030	0.27	0.0000050	0.000025	0.0447	0.00010	0.0010	0.0000032	0.000083	0.00123	0.0035	0.0125	0.00017	0.000050	0.0015	0.0000050	0.000020	0.0000037	0.00023	0.0010
Low-Grade Ore	M LGO*																					
	Max (Min for pH)	7.34	0.070	11	0.000010	0.000025	**0.239**	0.0008	0.012	0.0000170	0.00027	0.0007	0.008	0.0328	0.00800	0.000600	**0.016**	0.000060	0.00036	0.0000250	0.00294	**0.0020**
	Average First Month	7.91	0.040	6.83	0.0000050	0.000025	**0.1103**	0.00047	0.0077	0.0000065	0.000093	0.00047	0.005	0.0212	0.00418	0.000233	**0.0082**	0.000025	0.000223	0.0000100	0.00122	0.0010
	Average Last Month	7.57	0.030	0.75	0.0000050	0.000025	0.0695	0.00020	0.0025	0.0000015	0.000040	0.00010	0.0035	0.027	0.00081	0.000050	0.00375	0.000018	0.000020	0.0000025	0.00012	0.0015

Notes:
SFE is analyzed for waste rock and ore in Phase I and for overburden in Phase II.
MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).
CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).
For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.
Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.
For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.
* M LGO is a metallurgical composite.

Table B-21: Summary of ageing, humidity cell, and sub-aqueous chemistries in materials from Marathon Deposit (CND1)

Test	Parameter	pH	F	NO_2	NO_3	NO_2+NO_3	Cl	SO_4	$CN_{(T)}$	CN_{WAD}	NH_3+NH_4	Un-ionized NH_3 (calc'd)	Hg	Ag	Al	As	B	Cd *	Cr
	Unit	no unit	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	6.0-9.5	n/v	n/v	n/v	n/v	n/v	n/v	0.5	n/v	n/v	0.5	n/v	n/v	n/v	0.1	n/v	n/v	n/v
	CWQG	6.5-9.0	0.12	0.06	13	n/v	120	n/v	n/v	0.005	0.499	0.16	0.000026	0.00025	0.1	0.005	1.5	0.00004	0.0089
Ageing	Day 0	7.99	**0.56**	< 0.3	< 0.6	< 0.6	35	960	**8.8**	**0.13**	**2.5**	0.087	**0.00077**	**0.00045**	0.10	**0.016**	0.087	**0.000044**	0.0036
	Day 7	7.88	**0.55**	< 0.3	< 0.6	< 0.6	41	1000	**6.2**	**0.28**	**4.2**	0.11	**0.00013**	**0.00064**	0.081	**0.014**	0.060	**0.000070**	0.0021
	Day 14	8.26	**0.58**	< 0.3	< 0.6	< 0.6	39	1000	**6.1**	**0.34**	**6.8**	**0.46**	**0.000080**	**0.0014**	0.059	**0.012**	0.064	**0.000083**	0.0010
	Day 28	8.31	**0.61**	< 0.3	< 0.6	< 0.6	39	1100	**1.2**	**0.29**	**12**	**0.48**	0.000020	0.00025	0.028	**0.0096**	0.071	**0.000080**	0.00025
	Day 56	8.07	**0.78**	< 0.3	< 0.6	< 0.6	49	1600	0.050	**0.020**	**40**	**0.75**	< 0.00001	< 0.00005	0.021	**0.0086**	0.090	**0.000051**	0.00018
Humidity Cell	Max (Min for pH)	7.14	**0.15**	-	-	-	3.2	170	0.21	0.0050	-	-	**0.000040**	0.00011	0.041	0.0025	0.044	0.000010	0.00021
	Average First Month	7.41	0.060	-	-	-	0.58	86	-	-	-	-	0.0000050	0.000025	0.019	0.00080	0.0063	0.0000040	0.000083
	Average Last Month	7.27	0.03	-	-	-	0.10	112	0.025	0.0050	-	-	0.0000050	0.000025	0.013	0.00025	0.0015	0.0000085	0.000090
Sub-Aqueous	Max (Min for pH)	8.03	**1.1**	0.015	0.030	0.030	40	1200	**1.7**	**1.7**	**42**	**2.9**	**0.00078**	**0.0045**	0.039	**0.018**	0.089	**0.000122**	0.00070
	Average First Month	8.19	**0.70**	0.015	0.030	0.030	38	963	-	-	**17**	**1.0**	**0.00045**	**0.0023**	0.028	**0.011**	0.079	0.000066	0.00017
	Average Last Month	8.30	**0.92**	0.015	0.030	0.030	17	325	**1.6**	**1.3**	**33**	**2.2**	**0.000083**	**0.00072**	0.023	**0.018**	0.048	0.000028	0.000040

Notes:

MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).

CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).

For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

CN_{FREE} CWQG guideline is applied to CN_{WAD}.

Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

Table B-21: Summary of ageing, humidity cell, and sub-aqueous chemistries in materials from Marathon Deposit (CND1)

Test	Parameter	Cu*	Fe	Mn	Mo	Ni*	P	Pb*	Se	Tl	U	Zn*
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	MDMER	0.1	n/v	n/v	n/v	0.25	n/v	0.08	n/v	n/v	n/v	0.4
	CWQG	0.002	0.3	0.19	0.073	0.025	0.004	0.001	0.001	0.0008	0.015	0.0017
Ageing	Day 0	**0.010**	**3.0**	0.034	**0.085**	0.0029	**0.031**	0.00017	**0.0043**	< 0.000005	0.0016	**0.0030**
	Day 7	**0.022**	**2.0**	0.055	**0.086**	0.0033	**0.028**	0.00021	**0.0022**	0.0000080	0.0018	< 0.002
	Day 14	**0.25**	**1.4**	0.066	**0.098**	0.0049	**0.021**	0.00010	**0.0016**	0.0000090	0.0023	**0.0040**
	Day 28	**0.109**	0.29	0.035	**0.11**	0.0046	**0.039**	0.000030	0.00087	0.000016	0.0025	**0.0020**
	Day 56	**0.008**	0.014	0.051	**0.13**	0.0041	**0.033**	0.000020	0.00061	0.000023	0.0029	< 0.002
Humidity Cell	Max (Min for pH)	**0.0059**	0.090	**0.21**	0.0068	0.00050	0.0040	0.000070	0.00015	0.0000050	0.00019	0.0010
	Average First Month	**0.0031**	0.020	0.089	0.0016	0.00038	0.0015	0.000025	0.000095	0.0000025	0.00014	0.0010
	Average Last Month	0.0016	0.019	0.18	0.00097	0.00030	0.0015	0.000010	0.000085	0.0000025	0.000030	0.0010
Sub-Aqueous	Max (Min for pH)	**1.7**	0.096	**0.32**	**0.11**	0.0080	**0.19**	0.00020	**0.0034**	0.000016	0.0033	**0.016**
	Average First Month	**0.85**	0.028	0.16	**0.098**	0.0058	**0.029**	0.000033	**0.0015**	0.000015	0.0032	**0.0070**
	Average Last Month	**1.21**	0.086	0.030	0.051	0.0029	**0.019**	0.000020	0.00043	0.0000025	0.0019	0.0020

Notes:

MDMER - Metal and Diamond Mining Effluent Regulations (Canada), Table 1 of Schedule 4, Maximum Authorized Monthly Mean Concentrations (SOR/2002-222 2020).

CWQG - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, long-term (CWQG-FAL referred to as CWQG) by Canadian Council of Ministers of the Environment (CCME 2020).

For the details on guideline selection and calculations of hardness-, pH-, temperature-, and DOC-dependent CWQG guidelines (*) see Table B-9.

CN_{FREE} CWQG guideline is applied to CN_{WAD}.

Concentrations exceeding CWQG are bold and MDMER are highlighted orange and double underlined.

For the values less than Reportable Detection Limit (RDLs) values, 1/2 of RDLs are used to calculate statistical parameters.

APPENDIX C

Plots

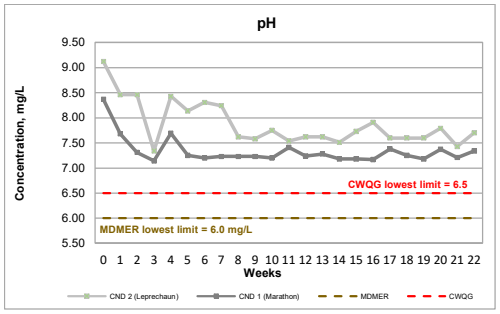
Figure C-1: Leprechaun Waste Rock Humidity Cell Plots

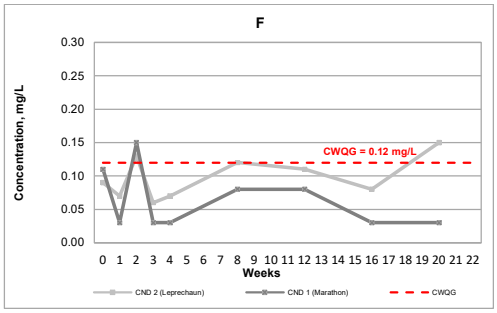
Note: Values below the respective detection limits (DLs) are shown as half DLs.

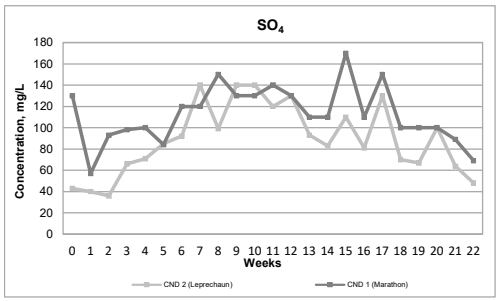
Figure C-2: Marathon and Leprechaun Low-Grade Ore Humidity Cell Plots

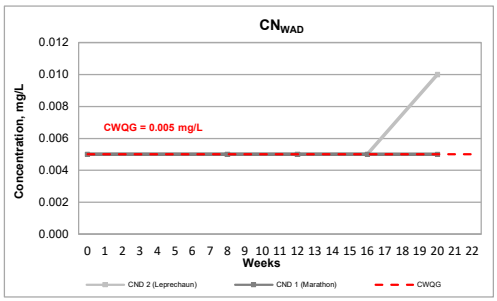
Note: Values below the respective detection limits (DLs) are shown as half DLs.

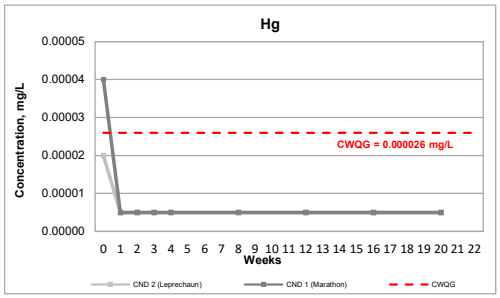
Figure C-3: Tailings humidity cell plots

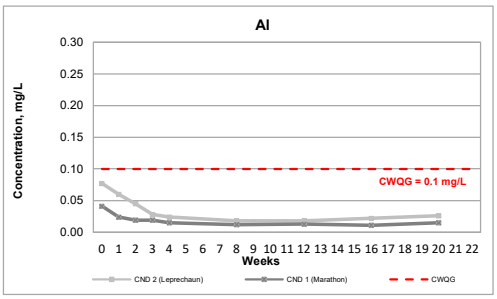


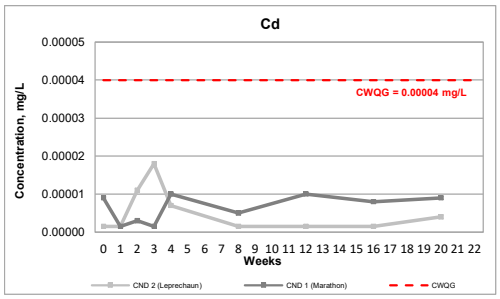


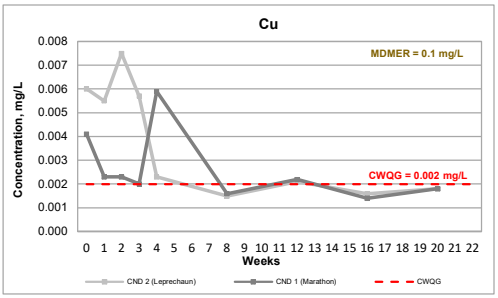


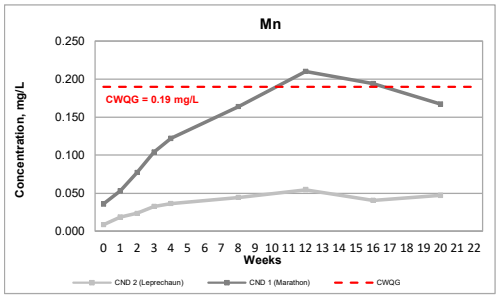


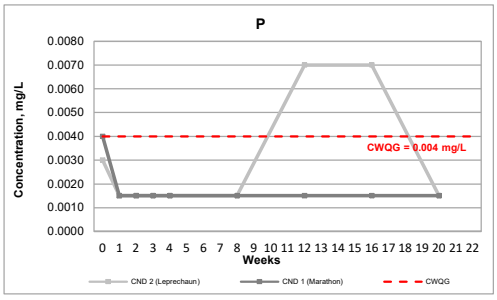


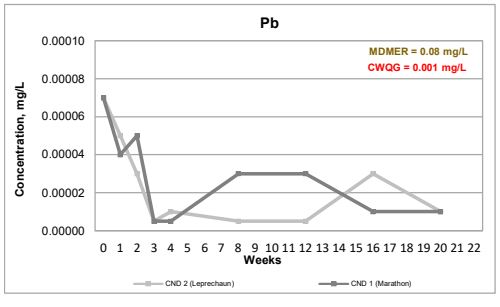


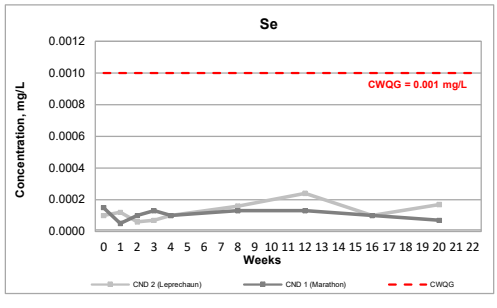






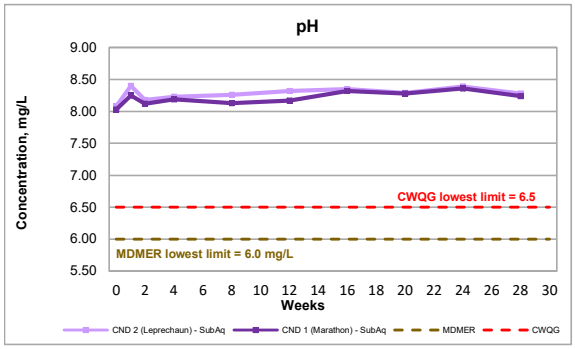


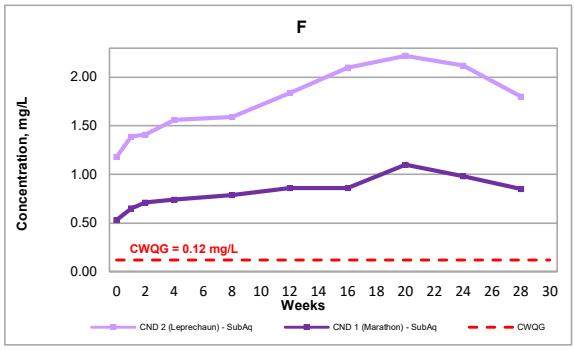


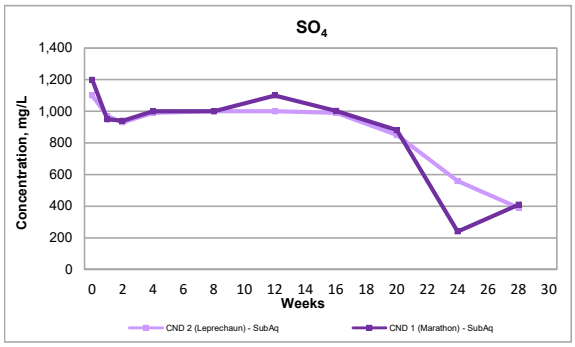


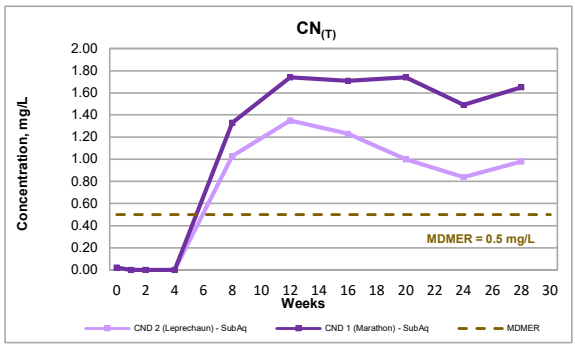
Note: Values below the respective detection limits (DLs) are shown as half DLs.

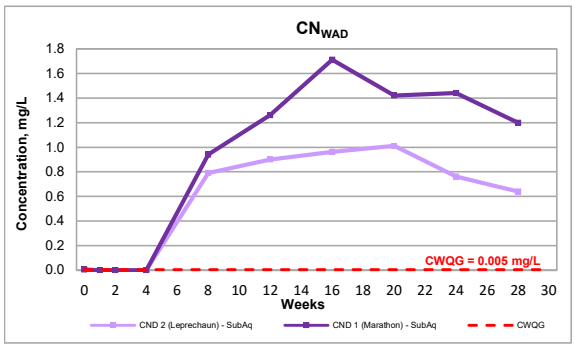
Figure C-4: Tailings sub-aqueous column plots

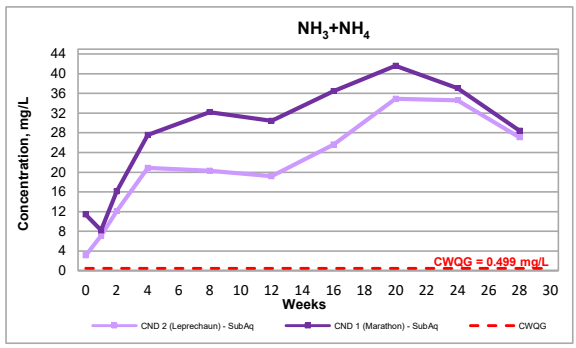


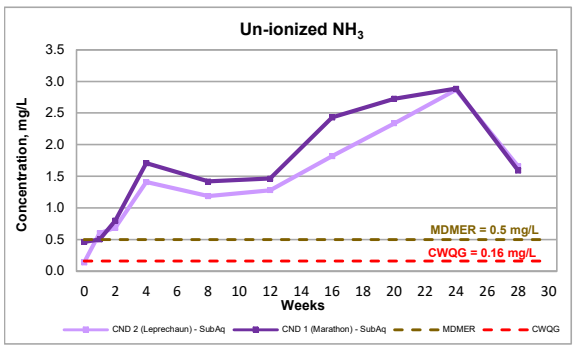


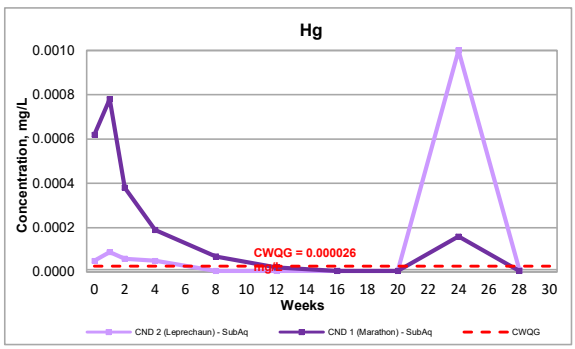


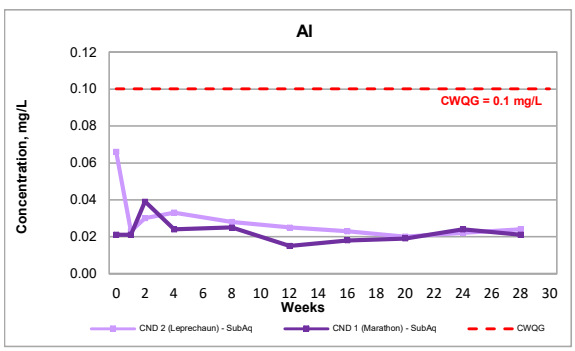


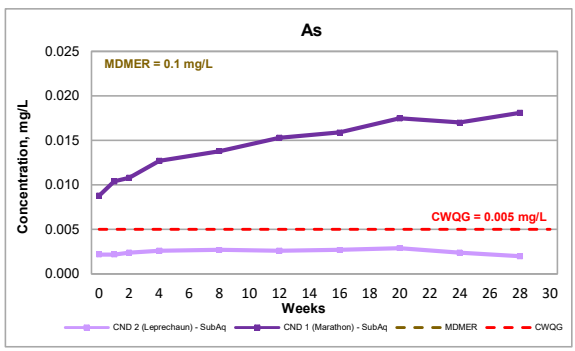






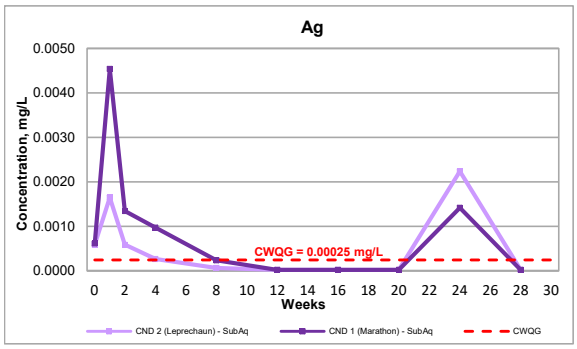


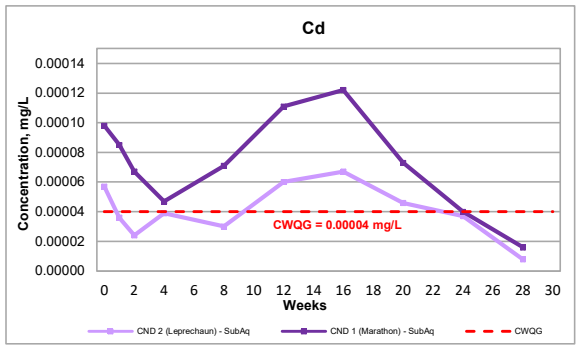


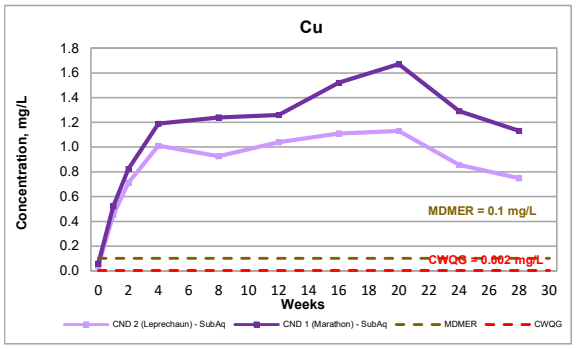


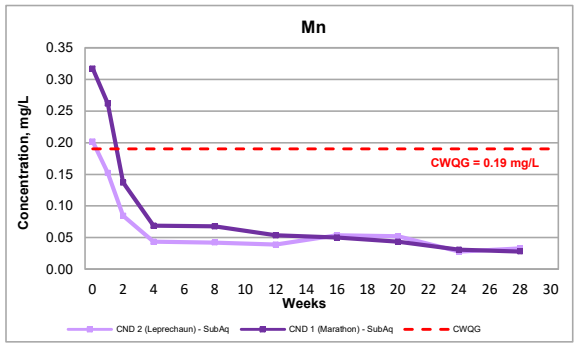
Note: Values below the respective detection limits (DLs) are shown as half DLs.

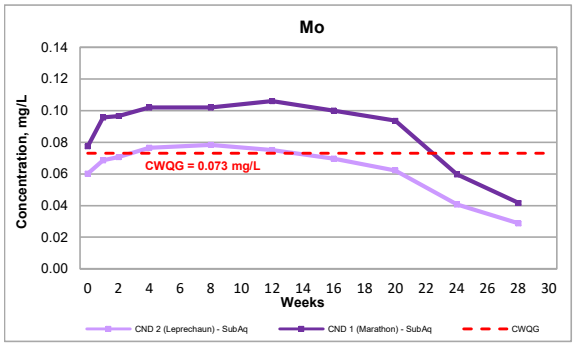
Figure C-4: Tailings sub-aqueous column plots

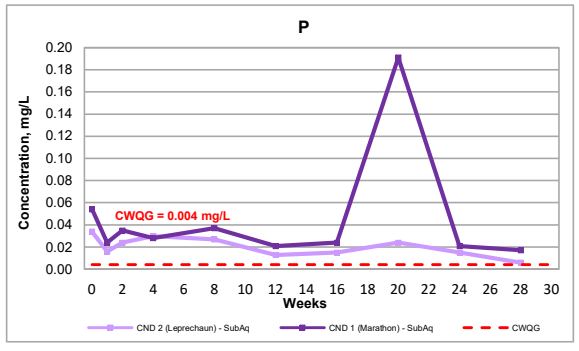


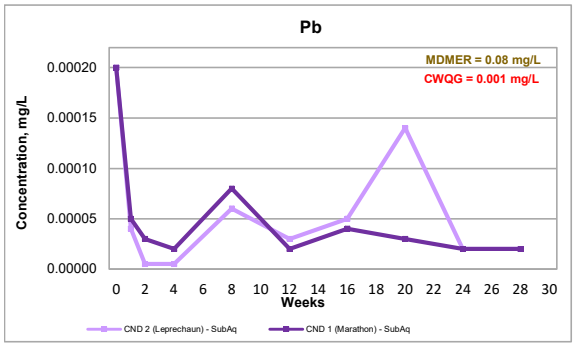


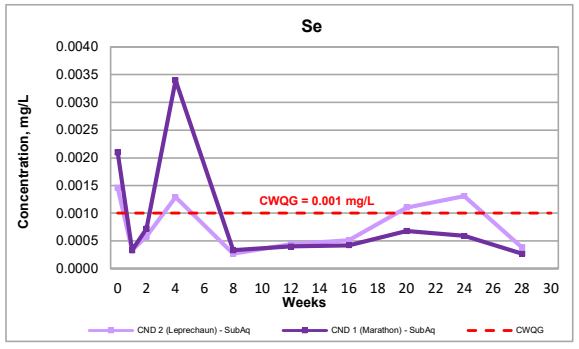


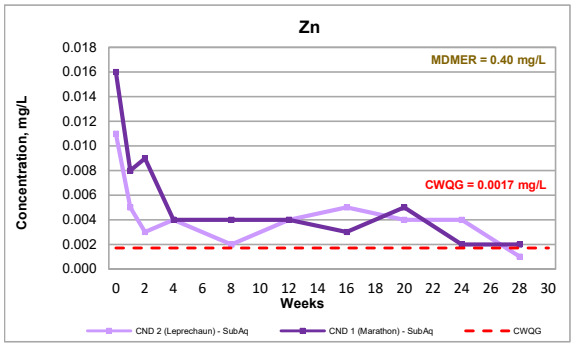






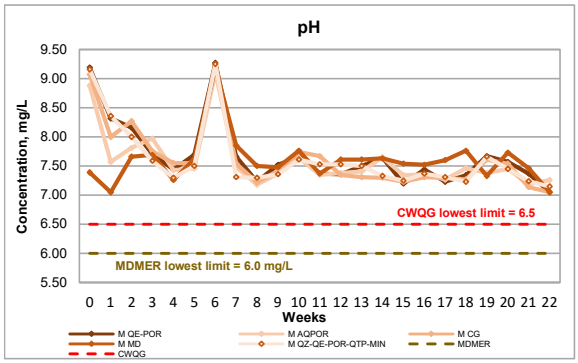


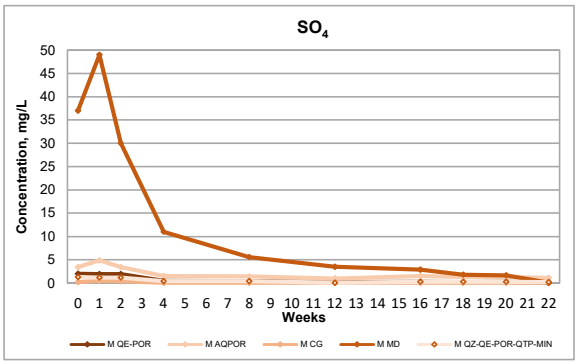


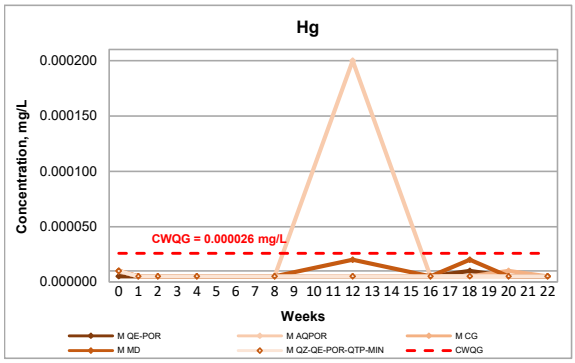


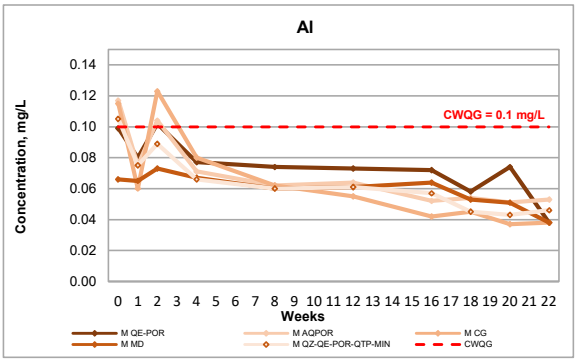
Note: Values below the respective detection limits (DLs) are shown as half DLs.

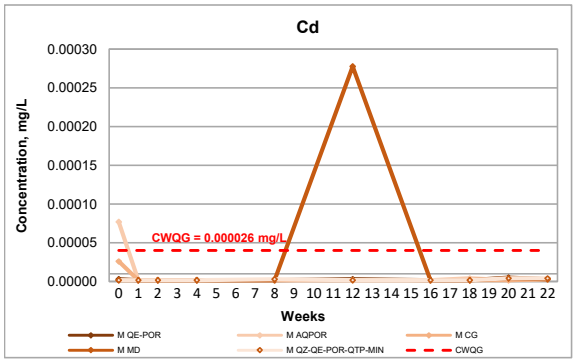
Figure C-5: Marathon waste rock humidity cell plots

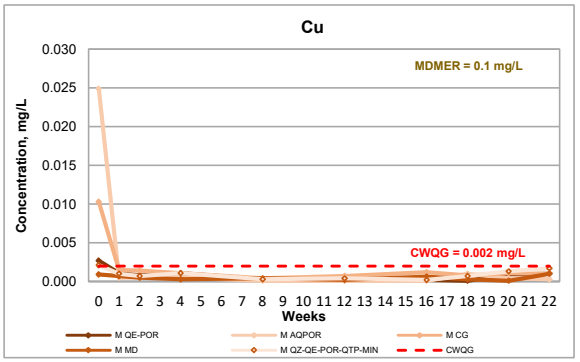


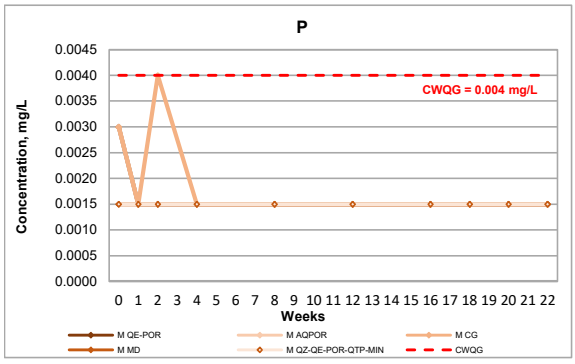


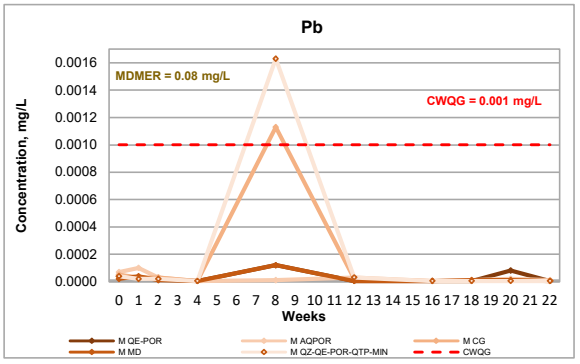


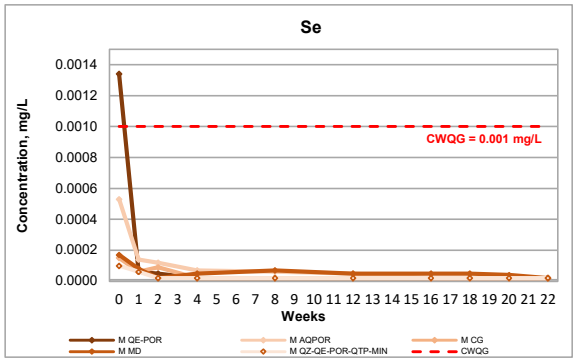


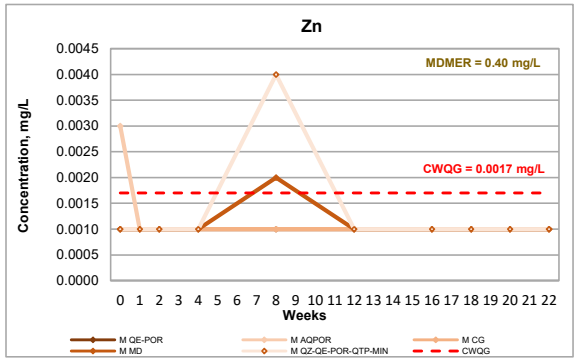












Note: Values below the respective detection limits (DLs) are shown as half DLs.

APPENDIX D

Certificates of Analyses and Laboratory Reports

QEMSCAN Data
prepared for
Marathon Gold
Project Custom-Min/MI5018-MAR20
April 13, 2020

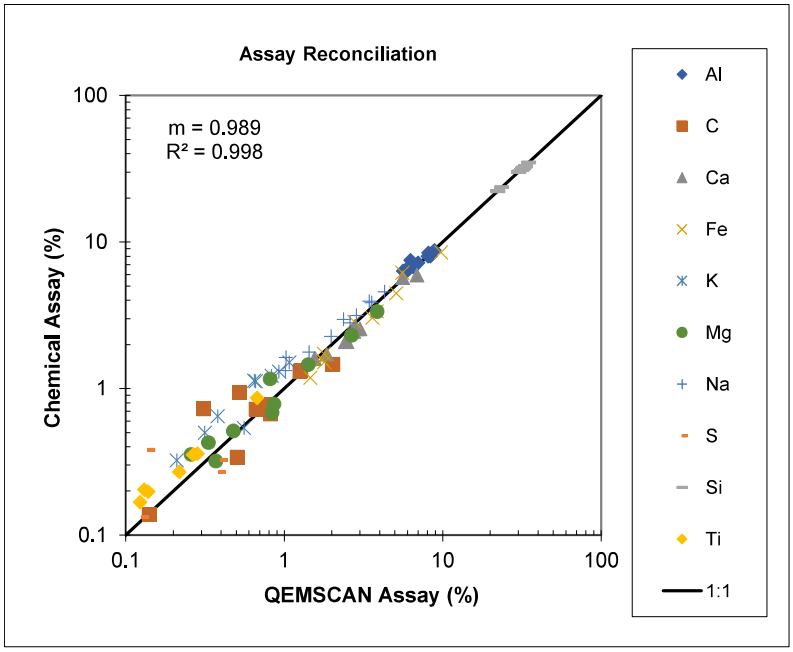
Kathryn Sheridan, P.Geo.
Mineralogist

Stephanie Downing, M.Sc.
Mineralogy Manager

SGS Minerals
a division of SGS Canada Inc.
P.O. Box 4300, 185 Concession Street, Lakefield, Ontario, Canada K0L 2H0
Tel: (705) 652-2000 Fax: (705) 652-6365 www.sgs.com www.sgs.com/met
Member of the SGS Group (SGS SA)

Marathon Gold
Custom-Min
MI5018-MAR20

High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)



Sample/Element	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
Al (QEMSCAN)	7.00	5.64	6.28	6.33	5.93	6.52	8.08	8.87	8.15	8.36
Al (Chemical)	7.20	6.35	7.52	7.04	6.30	6.77	7.99	8.79	8.41	7.99
C (QEMSCAN)	0.31	1.26	1.27	0.52	0.50	2.03	0.79	0.82	0.14	0.67
C (Chemical)	0.73	1.31	1.33	0.94	0.34	1.46	0.77	0.67	0.14	0.72
Ca (QEMSCAN)	1.55	2.75	5.60	2.80	2.49	6.87	2.87	3.02	1.85	2.43
Ca (Chemical)	1.60	2.46	5.72	2.67	2.09	5.93	2.56	2.57	1.72	2.09
Fe (QEMSCAN)	2.77	3.83	9.78	3.61	1.79	5.56	1.78	1.73	5.10	1.46
Fe (Chemical)	2.85	3.36	8.53	3.04	1.52	6.16	1.73	1.58	4.48	1.18
K (QEMSCAN)	0.56	0.93	0.04	0.31	0.21	0.38	0.66	0.65	1.08	0.84
K (Chemical)	0.54	1.30	0.07	0.50	0.32	0.65	1.12	1.13	1.50	1.22
Mg (QEMSCAN)	0.84	0.81	3.86	0.86	0.37	2.66	0.48	0.33	1.41	0.26
Mg (Chemical)	0.69	1.16	3.37	0.78	0.32	2.31	0.51	0.43	1.45	0.36
Na (QEMSCAN)	2.37	1.02	1.43	2.60	2.86	1.97	3.56	4.31	1.02	3.44
Na (Chemical)	2.97	1.63	1.77	2.81	3.15	2.27	3.85	4.58	1.33	3.94
S (QEMSCAN)	0.39	0.01	0.38	0.13	0.14	0.13	0.05	0.08	0.00	0.10
S (Chemical)	0.33	0.01	0.27	0.08	0.38	0.13	0.05	0.11	0.01	0.08
Si (QEMSCAN)	33.3	32.0	22.3	32.5	34.9	23.6	31.4	30.3	30.4	32.1
Si (Chemical)	32.8	31.4	22.2	32.1	34.9	23.7	31.0	30.1	30.3	32.1
Ti (QEMSCAN)	0.13	0.22	0.28	0.14	0.08	0.67	0.12	0.09	0.27	0.07
Ti (Chemical)	0.20	0.27	0.36	0.20	0.11	0.86	0.17	0.16	0.35	0.11

Marathon Gold
Custom-Min
MI5018-MAR20

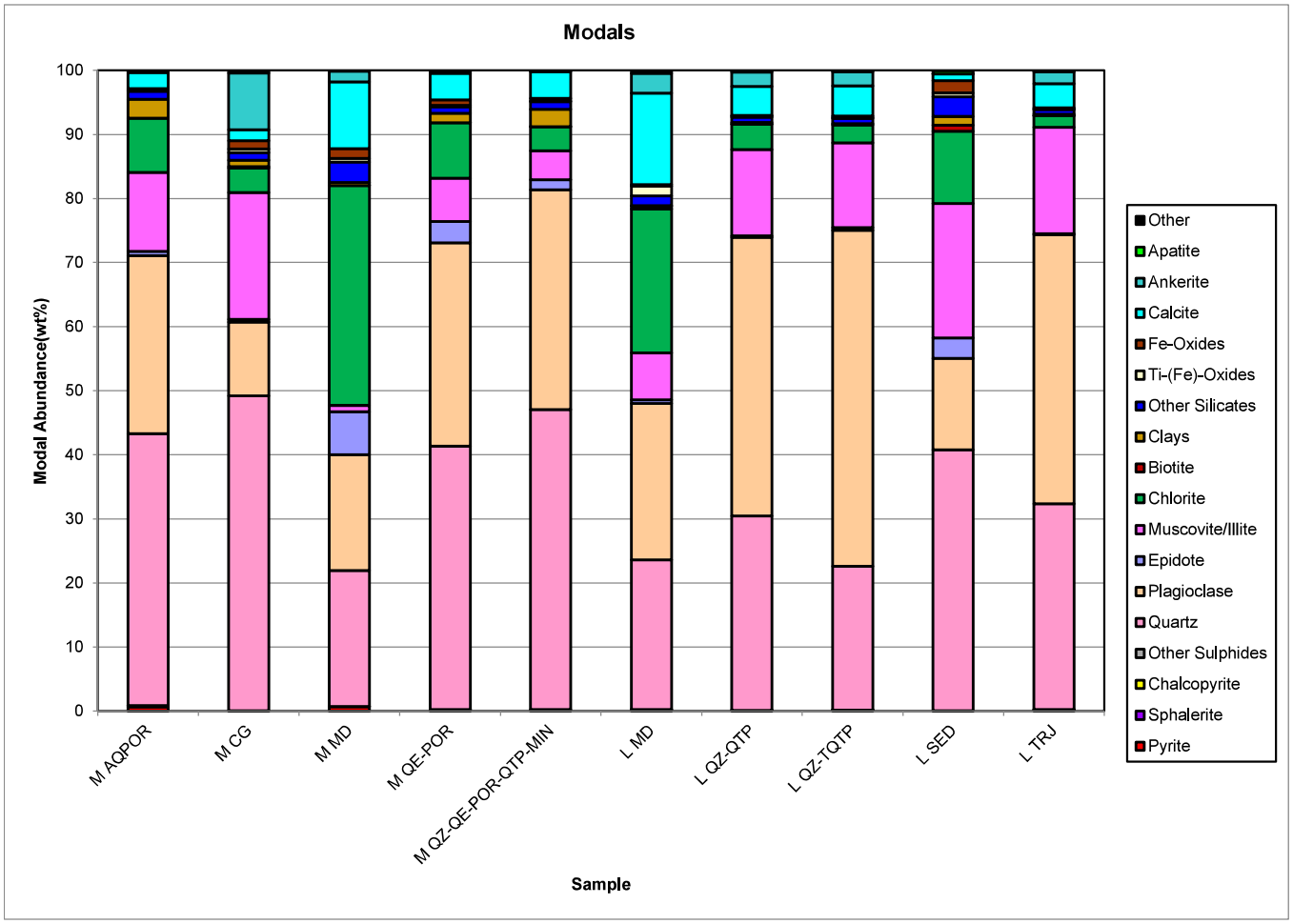
High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

Modals

Sample		M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
Fraction		-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um	-300/+3um
Calculated ESD Particle Size (µm)		36	30	35	36	40	30	33	36	25	32
Mineral Mass (%)	Pyrite	0.62	0.00	0.70	0.23	0.26	0.23	0.09	0.14	0.00	0.18
	Sphalerite	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Chalcopyrite	0.01	0.00	0.03	0.00	0.00	0.01	0.01	0.00	0.00	0.00
	Other Sulphides*	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Quartz	42.5	49.2	21.2	41.1	46.8	23.3	30.3	22.5	40.7	32.2
	Plagioclase	27.8	11.6	18.1	31.7	34.3	24.4	43.5	52.5	14.3	42.0
	Epidote	0.67	0.41	6.73	3.36	1.55	0.57	0.27	0.42	3.21	0.18
	Muscovite/Illite	12.3	19.8	0.96	6.75	4.54	7.33	13.5	13.2	21.0	16.6
	Chlorite	8.48	3.80	34.3	8.64	3.75	22.5	3.94	2.77	11.2	1.77
	Biotite	0.02	0.27	0.02	0.02	0.01	0.46	0.02	0.01	0.96	0.02
	Clays	2.94	0.98	0.44	1.47	2.72	0.10	0.23	0.18	1.35	0.22
	Other Silicates	1.24	1.20	3.24	1.01	1.16	1.48	0.81	0.83	3.07	0.70
	Ti-(Fe)-Oxides	0.24	0.56	0.53	0.24	0.13	1.51	0.23	0.16	0.62	0.13
	Fe-Oxides	0.15	1.27	1.52	0.86	0.42	0.28	0.06	0.21	1.89	0.19
	Calcite	2.56	1.74	10.4	4.13	4.19	14.3	4.54	4.75	1.05	3.74
	Ankerite	0.07	8.85	1.65	0.27	0.05	3.06	2.23	2.17	0.01	1.90
	Apatite	0.24	0.40	0.13	0.18	0.12	0.50	0.26	0.21	0.56	0.17
	Other	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.03
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean Grain Size by Frequency (µm)	Pyrite	26	7	74	30	33	39	17	41	6	30
	Sphalerite	14	6	0	6	0	6	10	10	9	0
	Chalcopyrite	9	6	41	9	0	20	26	10	0	9
	Other Sulphides	12	12	6	6	0	6	7	6	8	10
	Quartz	26	27	26	34	37	29	35	38	24	36
	Plagioclase	25	23	26	32	34	30	33	37	22	34
	Epidote	14	15	25	22	22	12	9	11	17	9
	Muscovite/Illite	18	15	10	14	14	14	14	15	14	14
	Chlorite	16	13	19	16	20	16	16	21	14	18
	Biotite	6	7	7	6	6	9	7	7	7	7
	Clays	10	8	8	10	13	7	8	7	9	8
	Other Silicates	7	7	7	7	10	6	7	8	7	7
	Ti-(Fe)-Oxides	13	10	14	13	14	16	15	14	10	14
	Fe-Oxides	19	11	34	23	27	23	13	26	12	27
	Calcite	19	14	21	18	24	24	20	23	16	19
	Ankerite	15	25	23	17	16	25	21	21	11	19
	Apatite	14	19	14	15	16	13	18	16	15	18
	Other	15	13	12	11	0	7	8	11	10	15

Note: The samples were stage-ground to a P_{80} of 150 µm prior to testing.

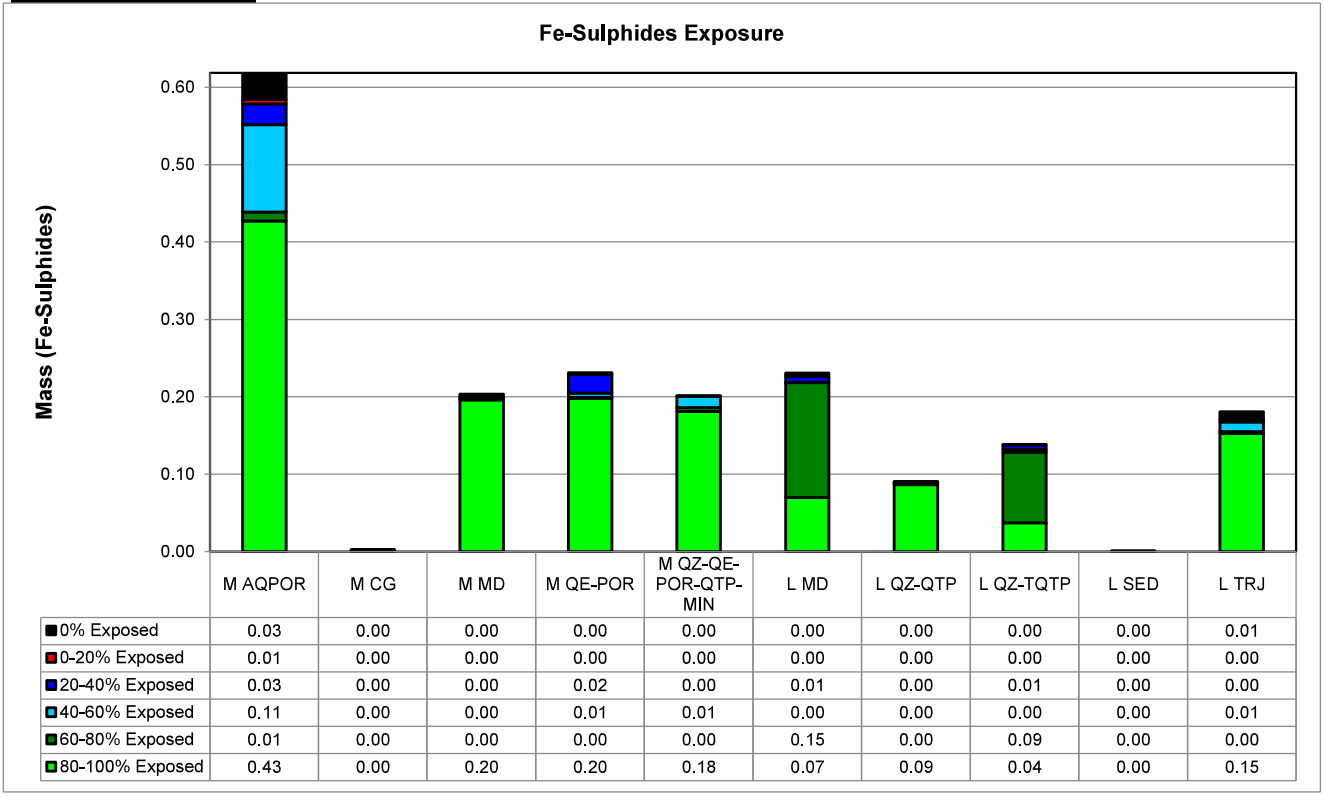
* Other Sulphides includes trace levels of galena along with even lower levels of tentatively identified chalcocite, pentlandite, arsenopyrite and bornite.


Modals
Modal Abundance(wt%)
100
90
80
70
60
50
40
30
20
10
0
M AQPOR
M CG
M MD
M QE-POR
M QZ-QE-POR-QTP-MIN
L MD
L QZ-QTP
L QZ-TQTP
L SED
L TRJ
Sample
Other
Apatite
Ankerite
Calcite
Fe-Oxides
Ti-(Fe)-Oxides
Other Silicates
Clays
Biotite
Chlorite
Muscovite/Illite
Epidote
Plagioclase
Quartz
Other Sulphides
Chalcopyrite
Sphalerite
Pyrite

Marathon Gold
Custom-Min
MI5018-MAR20

High Definition Mineralogical Analysis using QEMSCAN
(Quantitative Evaluation of Materials by Scanning Electron Microscopy)

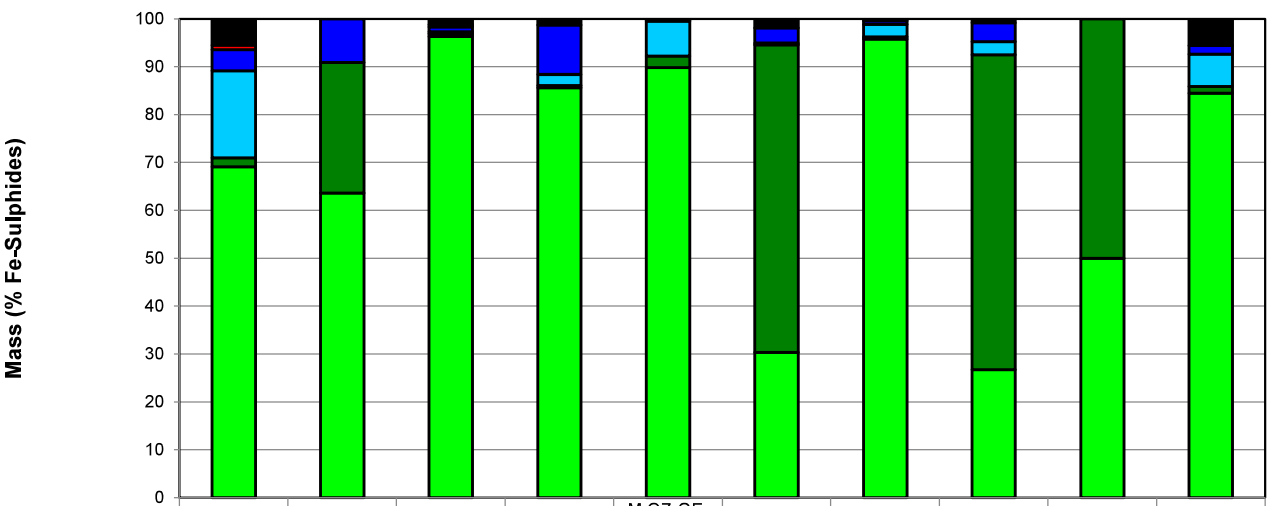
Fe-Sulphides Exposure



	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
0% Exposed	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0-20% Exposed	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-40% Exposed	0.03	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00
40-60% Exposed	0.11	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01
60-80% Exposed	0.01	0.00	0.00	0.00	0.00	0.15	0.00	0.09	0.00	0.00
80-100% Exposed	0.43	0.00	0.20	0.20	0.18	0.07	0.09	0.04	0.00	0.15

Absolute Mass of Fe-Sulphides Across Samples

Mineral Name	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
80-100% Exposed	0.43	0.00	0.20	0.20	0.18	0.07	0.09	0.04	0.00	0.15
60-80% Exposed	0.01	0.00	0.00	0.00	0.00	0.15	0.00	0.09	0.00	0.00
40-60% Exposed	0.11	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01
20-40% Exposed	0.03	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00
0-20% Exposed	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0% Exposed	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Total	0.62	0.00	0.20	0.23	0.20	0.23	0.09	0.14	0.00	0.18

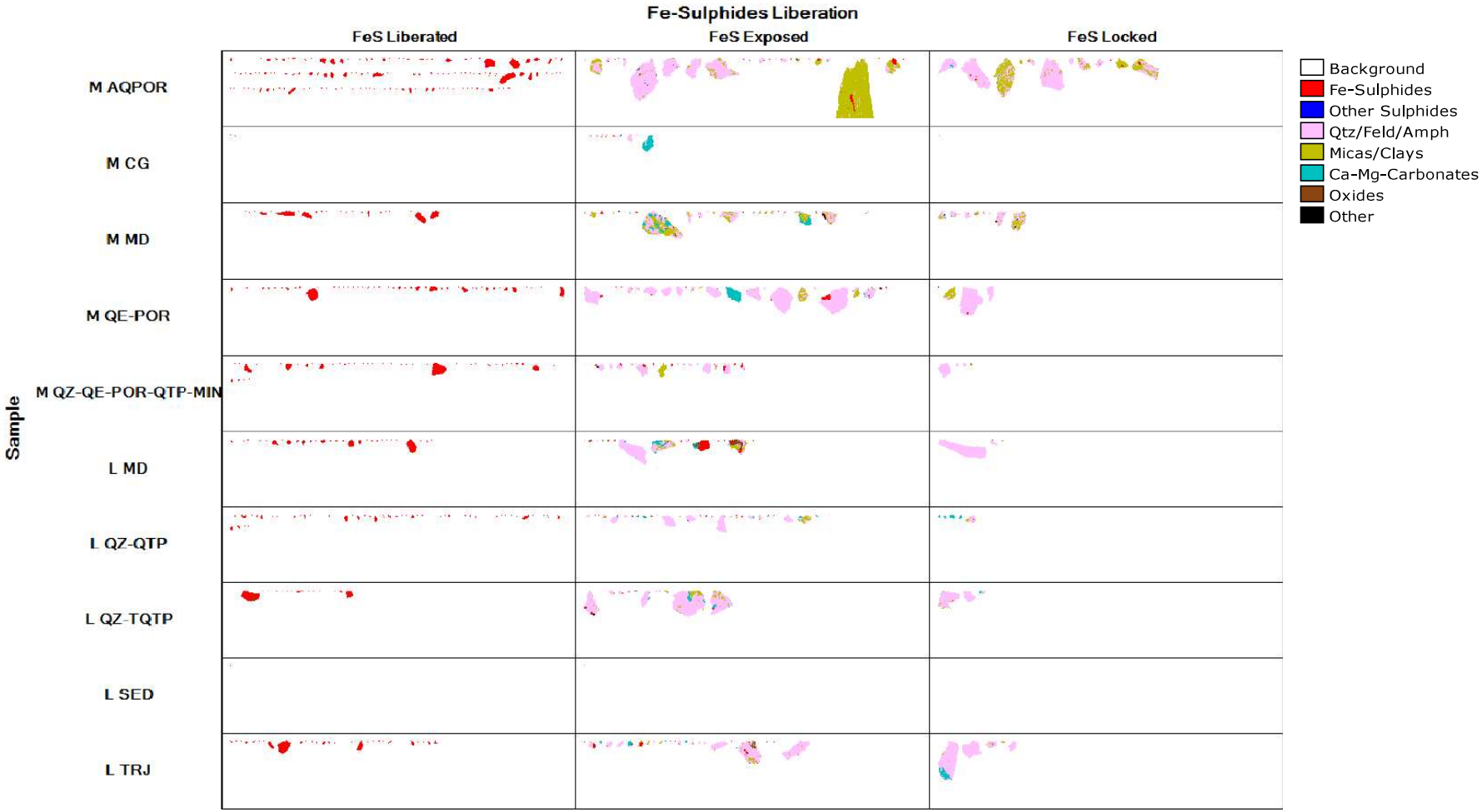


	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
0% Exposed	5.52	0.00	1.25	1.30	0.35	1.88	0.40	0.78	0.00	5.56
0-20% Exposed	0.94	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-40% Exposed	4.39	9.09	0.98	10.3	0.09	3.19	0.80	4.01	0.00	1.85
40-60% Exposed	18.2	0.00	0.45	2.28	7.36	0.33	2.61	2.73	0.00	6.72
60-80% Exposed	1.89	27.3	0.54	0.49	2.37	64.3	0.40	65.8	50.00	1.37
80-100% Exposed	69.1	63.6	96.3	85.6	89.8	30.3	95.8	26.7	50.00	84.5

Normalized Mass of Fe-Sulphides Across Samples

Mineral Name	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
80-100% Exposed	69.1	63.6	96.3	85.6	89.8	30.3	95.8	26.7	50.00	84.5
60-80% Exposed	1.89	27.3	0.54	0.49	2.37	64.3	0.40	65.8	50.00	1.37
40-60% Exposed	18.2	0.00	0.45	2.28	7.36	0.33	2.61	2.73	0.00	6.72
20-40% Exposed	4.39	9.09	0.98	10.3	0.09	3.19	0.80	4.01	0.00	1.85
0-20% Exposed	0.94	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0% Exposed	5.52	0.00	1.25	1.30	0.35	1.88	0.40	0.78	0.00	5.56
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Exposed	70.9	90.9	96.9	86.1	92.2	94.6	96.2	92.5	100.0	85.9

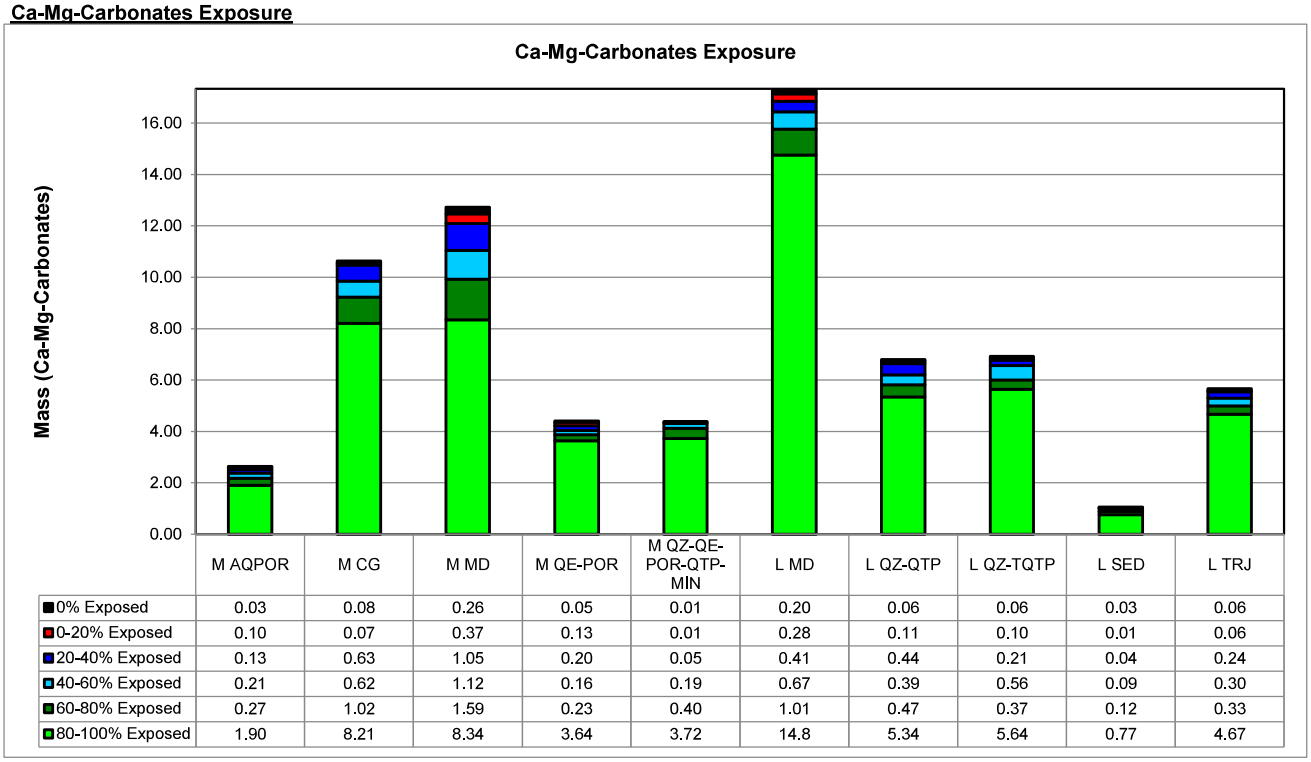
Notes: The samples were stage-ground to a P_{80} of 150 µm prior to testing.
For samples with low grades (<0.5%), results should be interpreted with caution due to low particle statistics.


Fe-Sulphides Liberation
FeS Liberated
FeS Exposed
FeS Locked
Sample
M AQPOR
M CG
M MD
M QE-POR
M QZ-QE-POR-QTP-MIN
L MD
L QZ-QTP
L QZ-TQTP
L SED
L TRJ
Background
Fe-Sulphides
Other Sulphides
Qtz/Feld/Amph
Micas/Clays
Ca-Mg-Carbonates
Oxides
Other

Marathon Gold
Custom-Min
MI5018-MAR20

High Definition Mineralogical Analysis using QEMSCAN
(Quantitative Evaluation of Materials by Scanning Electron Microscopy)

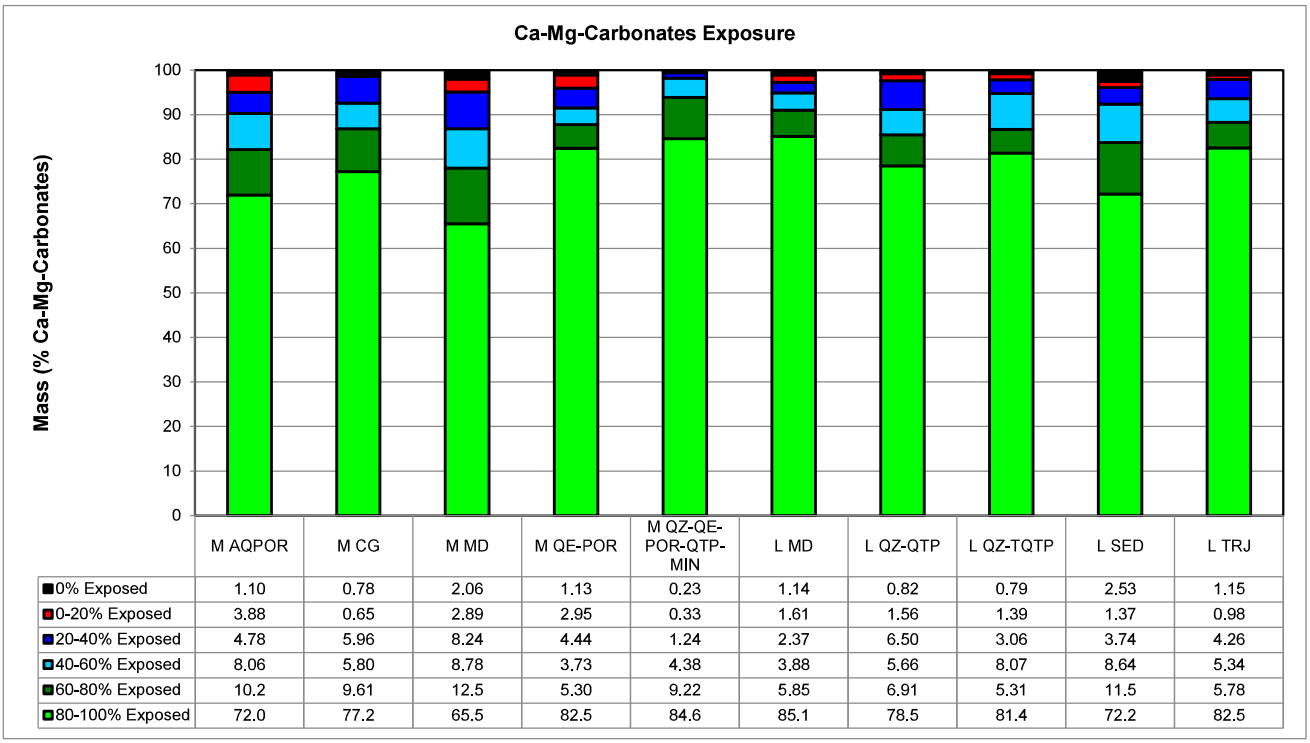
Ca-Mg-Carbonates Exposure



	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
0% Exposed	0.03	0.08	0.26	0.05	0.01	0.20	0.06	0.06	0.03	0.06
0-20% Exposed	0.10	0.07	0.37	0.13	0.01	0.28	0.11	0.10	0.01	0.06
20-40% Exposed	0.13	0.63	1.05	0.20	0.05	0.41	0.44	0.21	0.04	0.24
40-60% Exposed	0.21	0.62	1.12	0.16	0.19	0.67	0.39	0.56	0.09	0.30
60-80% Exposed	0.27	1.02	1.59	0.23	0.40	1.01	0.47	0.37	0.12	0.33
80-100% Exposed	1.90	8.21	8.34	3.64	3.72	14.8	5.34	5.64	0.77	4.67

Absolute Mass of Ca-Mg-Carbonates Across Samples

Mineral Name	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
80-100% Exposed	1.90	8.21	8.34	3.64	3.72	14.8	5.34	5.64	0.77	4.67
60-80% Exposed	0.27	1.02	1.59	0.23	0.40	1.01	0.47	0.37	0.12	0.33
40-60% Exposed	0.21	0.62	1.12	0.16	0.19	0.67	0.39	0.56	0.09	0.30
20-40% Exposed	0.13	0.63	1.05	0.20	0.05	0.41	0.44	0.21	0.04	0.24
0-20% Exposed	0.10	0.07	0.37	0.13	0.01	0.28	0.11	0.10	0.01	0.06
0% Exposed	0.03	0.08	0.26	0.05	0.01	0.20	0.06	0.06	0.03	0.06
Total	2.65	10.6	12.7	4.41	4.39	17.3	6.80	6.93	1.06	5.66

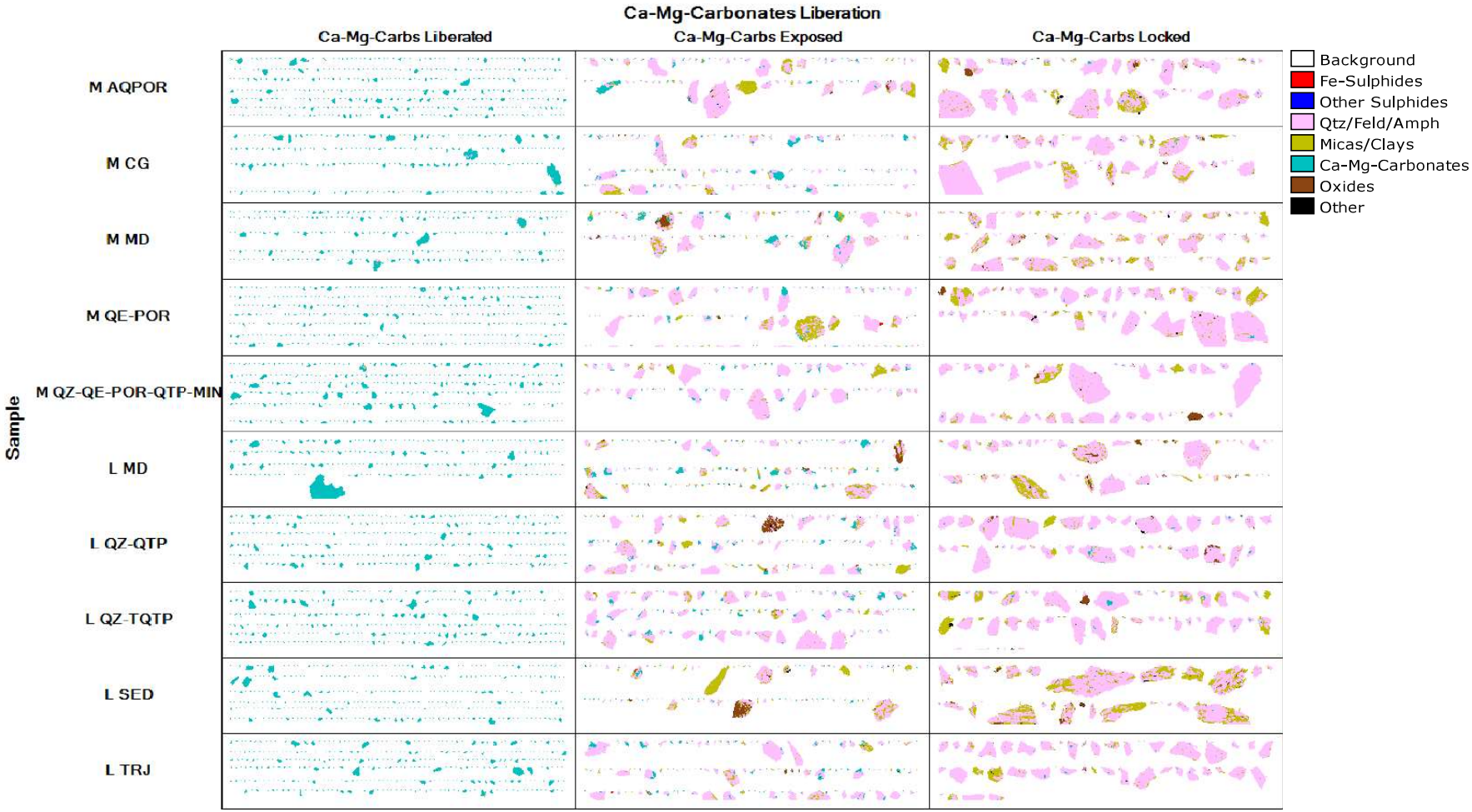


	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
0% Exposed	1.10	0.78	2.06	1.13	0.23	1.14	0.82	0.79	2.53	1.15
0-20% Exposed	3.88	0.65	2.89	2.95	0.33	1.61	1.56	1.39	1.37	0.98
20-40% Exposed	4.78	5.96	8.24	4.44	1.24	2.37	6.50	3.06	3.74	4.26
40-60% Exposed	8.06	5.80	8.78	3.73	4.38	3.88	5.66	8.07	8.64	5.34
60-80% Exposed	10.2	9.61	12.5	5.30	9.22	5.85	6.91	5.31	11.5	5.78
80-100% Exposed	72.0	77.2	65.5	82.5	84.6	85.1	78.5	81.4	72.2	82.5

Normalized Mass of Ca-Mg-Carbonates Across Samples

Mineral Name	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
80-100% Exposed	72.0	77.2	65.5	82.5	84.6	85.1	78.5	81.4	72.2	82.5
60-80% Exposed	10.2	9.61	12.5	5.30	9.22	5.85	6.91	5.31	11.5	5.78
40-60% Exposed	8.06	5.80	8.78	3.73	4.38	3.88	5.66	8.07	8.64	5.34
20-40% Exposed	4.78	5.96	8.24	4.44	1.24	2.37	6.50	3.06	3.74	4.26
0-20% Exposed	3.88	0.65	2.89	2.95	0.33	1.61	1.56	1.39	1.37	0.98
0% Exposed	1.10	0.78	2.06	1.13	0.23	1.14	0.82	0.79	2.53	1.15
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Exposed	82.2	86.8	78.0	87.8	93.8	91.0	85.5	86.7	83.7	88.3

Notes: The samples were stage-ground to a P_{80} of 150 µm prior to testing.
For samples with low grades (<0.5%), results should be interpreted with caution due to low particle statistics.


Ca-Mg-Carbonates Liberation
Ca-Mg-Carbs Liberated
Ca-Mg-Carbs Exposed
Ca-Mg-Carbs Locked
Sample
M AQPOR
M CG
M MD
M QE-POR
M QZ-QE-POR-QTP-MIN
L MD
L QZ-QTP
L QZ-TQTP
L SED
L TRJ
Background
Fe-Sulphides
Other Sulphides
Qtz/Feld/Amph
Micas/Clays
Ca-Mg-Carbonates
Oxides
Other

Marathon Gold
Custom-Min
MI5018-MAR20

High Definition Mineralogical Analysis using QEMSCAN
(Quantitative Evaluation of Materials by Scanning Electron Microscopy)

Mineralogical Acid-Base Accounting

Parameter/Sample	M AQPOR	M CG	M MD	M QE-POR	M QZ-QE-POR-QTP-MIN	L MD	L QZ-QTP	L QZ-TQTP	L SED	L TRJ
NP from Ca-Mg Carbonates (tonnes CaCO3/1000 tonnes)	26.3	103	120	43.9	42.4	172	67.1	68.5	10.6	55.8
AP from Fe-Sulphides (tonnes CaCO3/1000 tonnes)	10.3	0.03	11.6	3.86	4.31	3.85	1.51	2.31	0.01	3.01
NP/AP	2.55	3070	10.3	11.4	9.83	44.7	44.5	29.6	1593	18.5
Available NP/AP	2.96	2931	8.33	11.6	10.0	43.0	39.5	27.7	1334	19.0

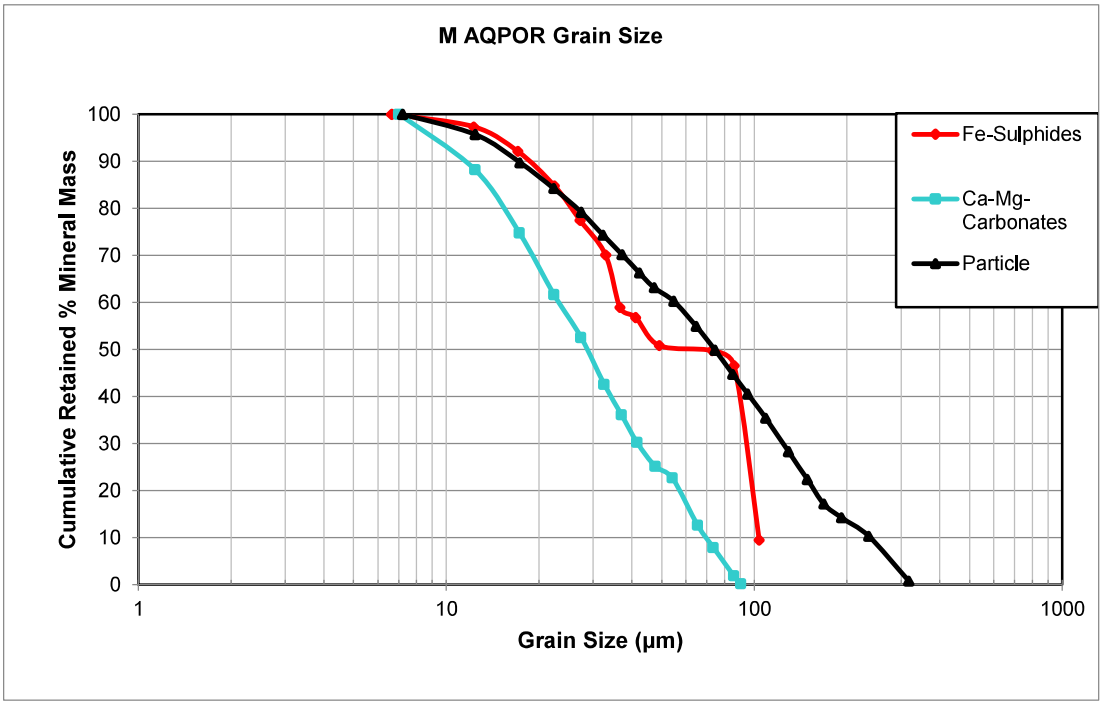
Notes:
NP = Neutralization Potential
AP = Acid Generation Potential
"Available NP/AP" takes into account the exposure of Ca-Mg-carbonates and Fe-sulphides

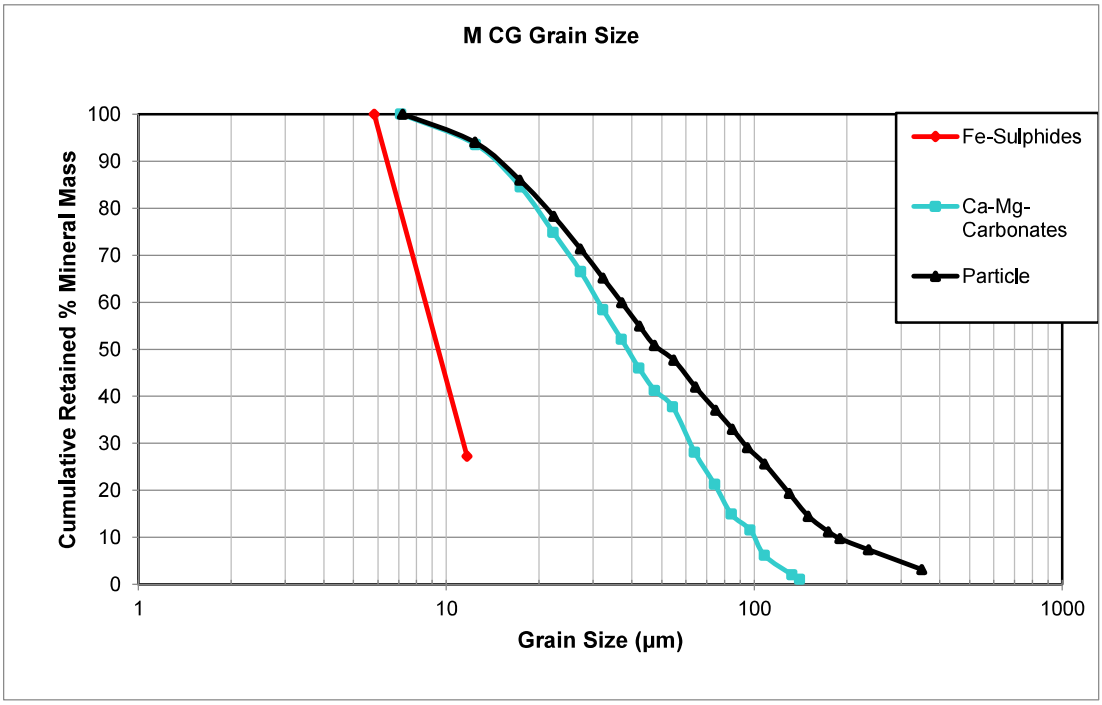
A carbonate/sulphide ratio > 2 indicates probable net neutralizing conditions. Only net acid consuming carbonates (Ca-Mg carbonates) are used for the mineralogical neutralization potential (NP) determination. Only Fe-sulphides are used for the mineralogical acid generation potential (AGP) as they are the main sulphides to contribute to net acidity.

In cases of low carbonate and sulphide abundance (typically <0.5 wt.% of each), values are only semi-quantitative due to low particle statistics for study. More replicate analyses are recommended to properly quantify the NP/AGP potential of these samples.

High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

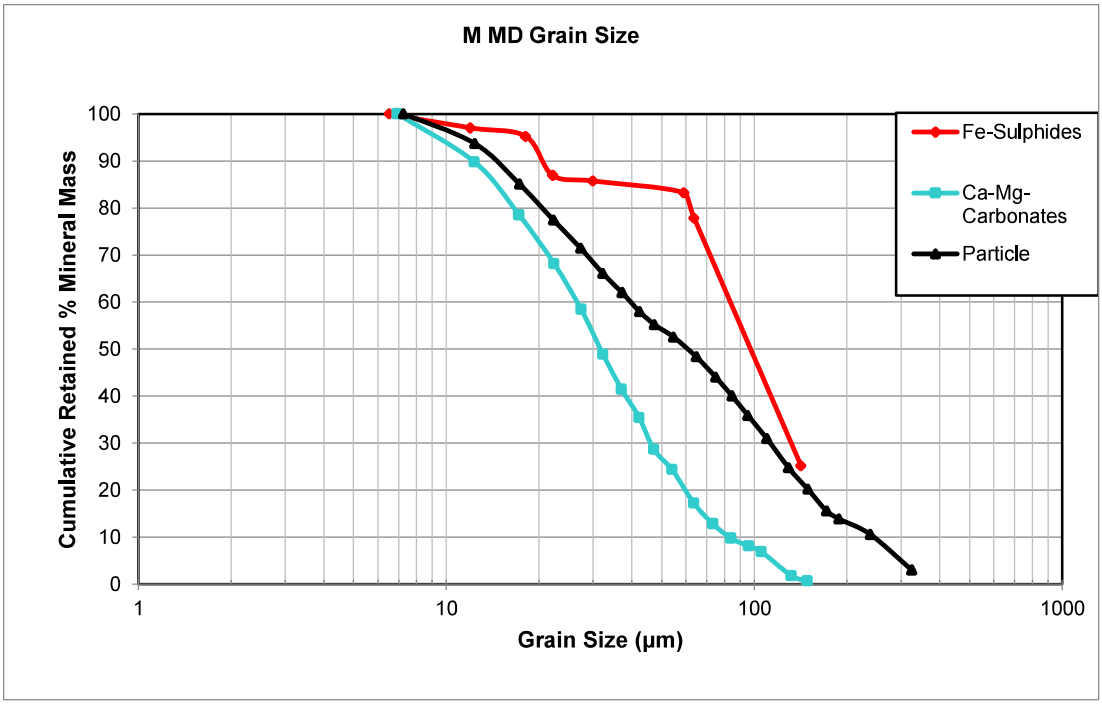
Cumulative Retained Grain Size Distribution

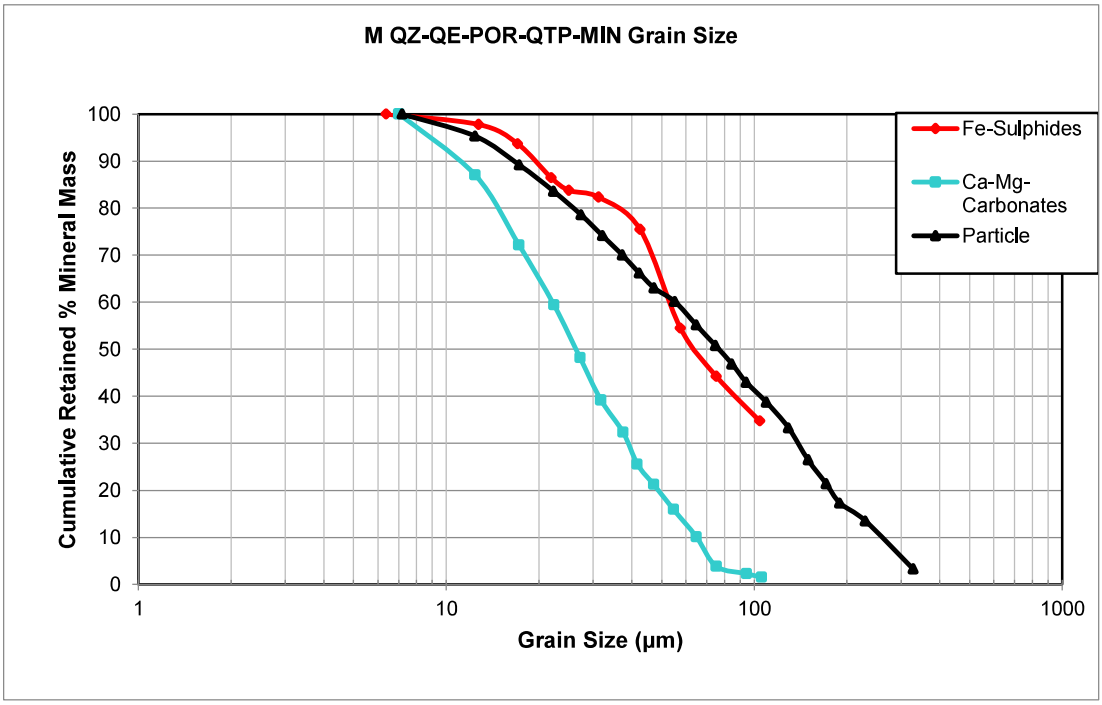




High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

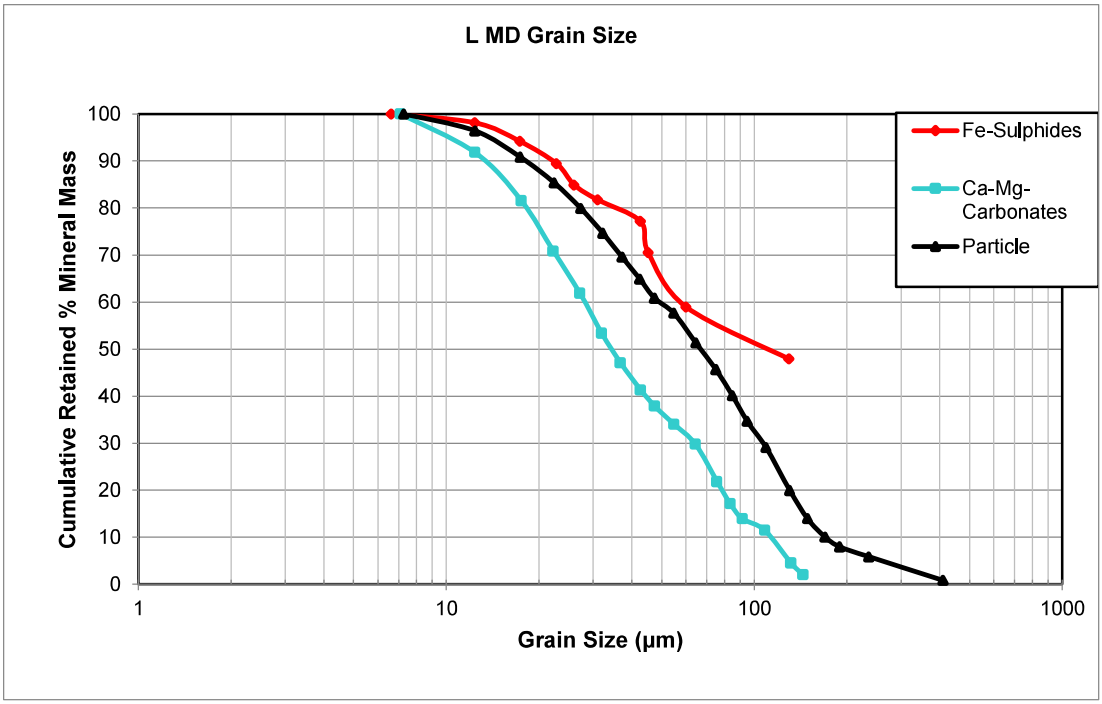
Cumulative Retained Grain Size Distribution

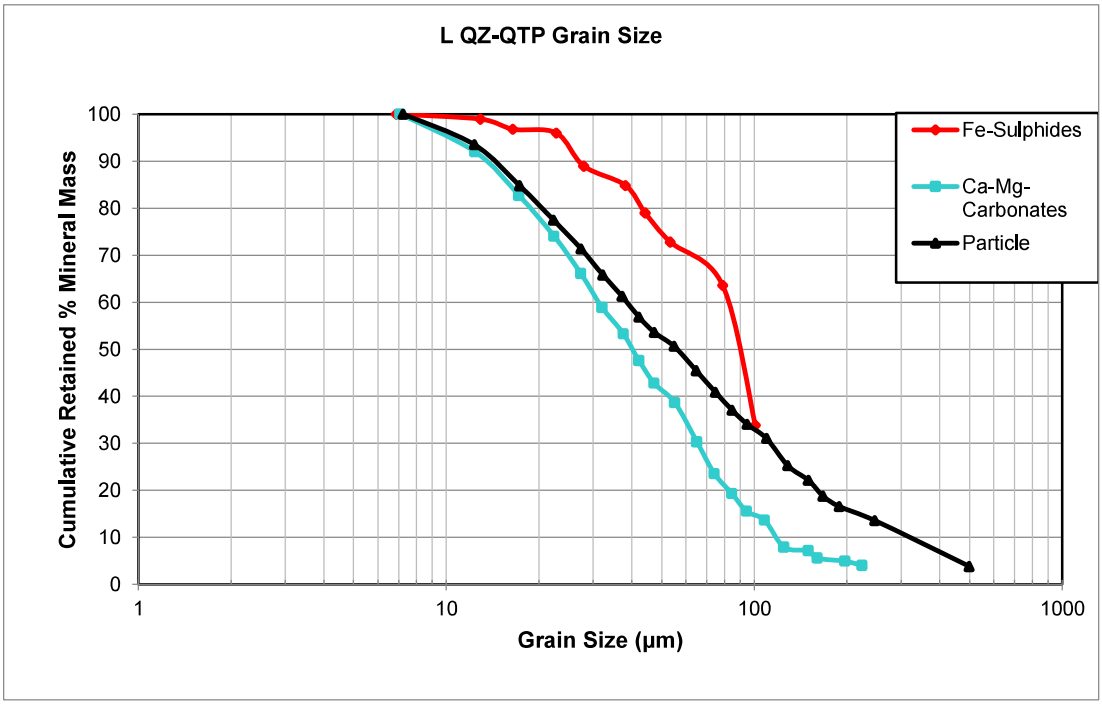




High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

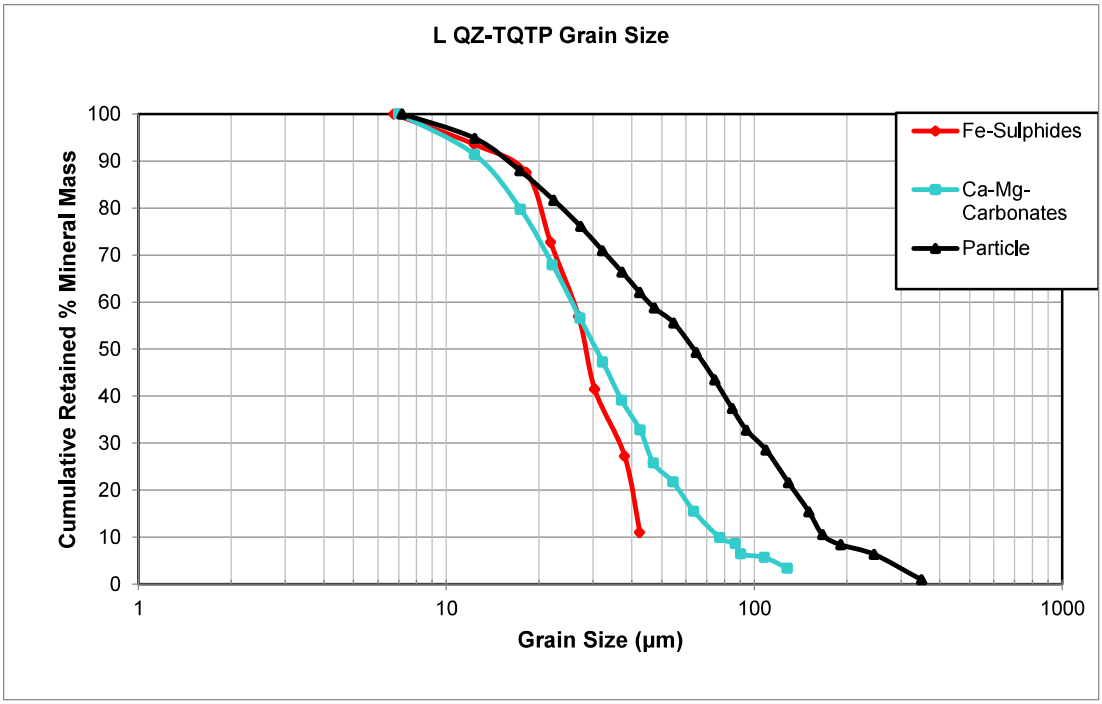
Cumulative Retained Grain Size Distribution

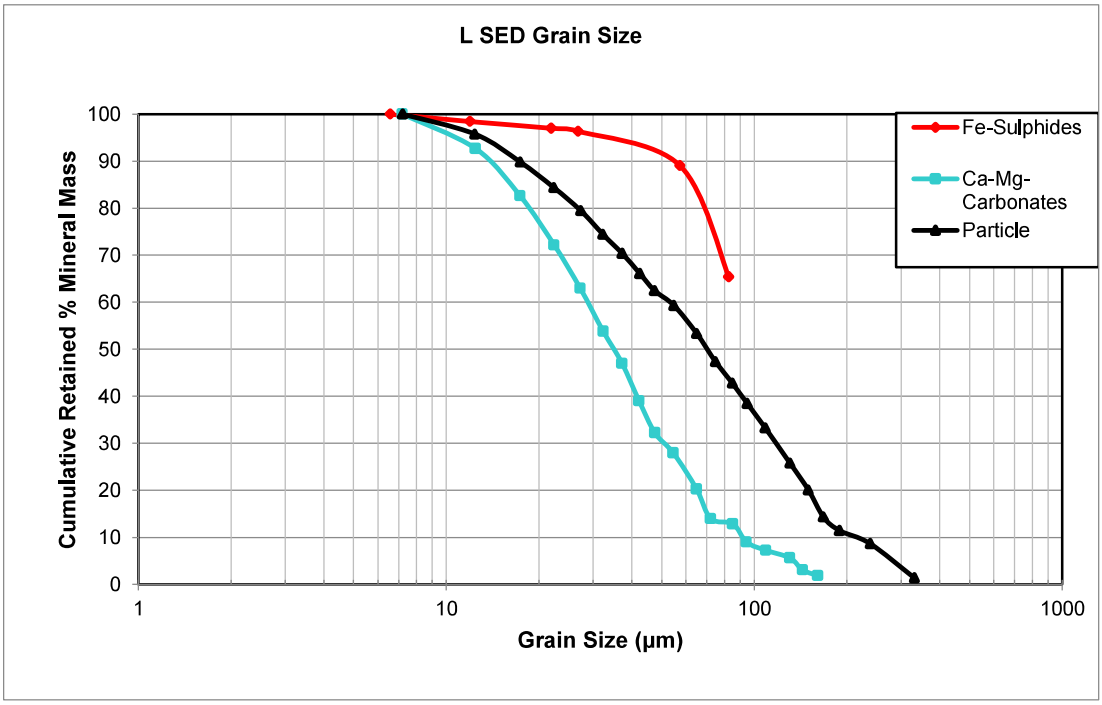




High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

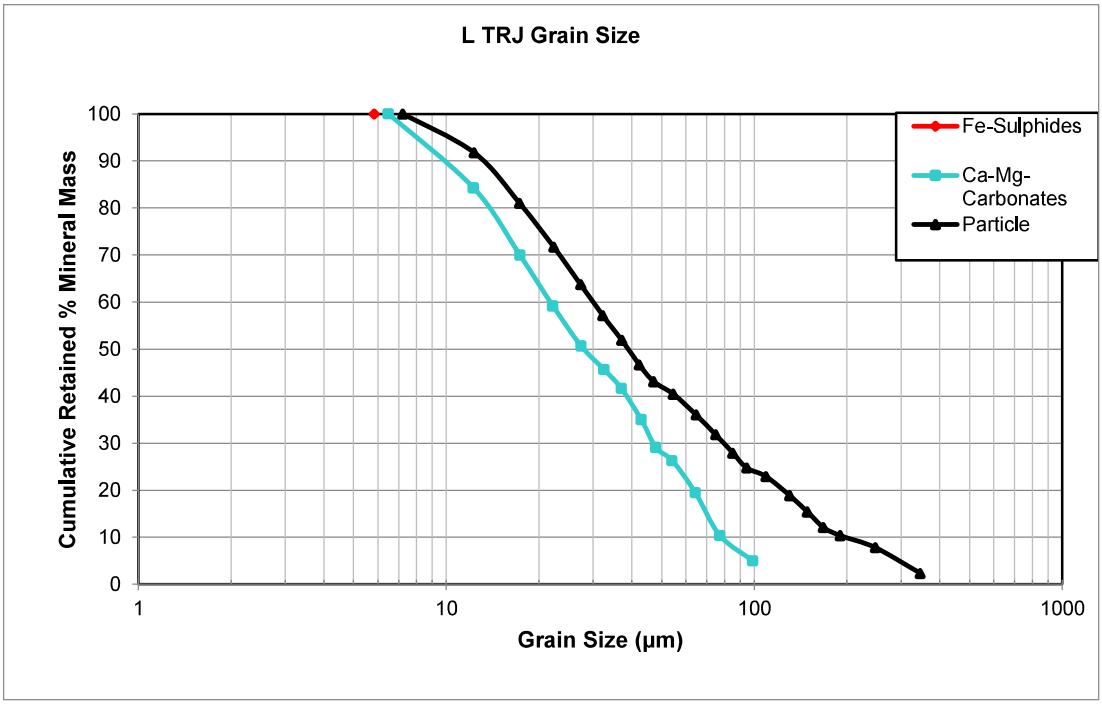
Cumulative Retained Grain Size Distribution

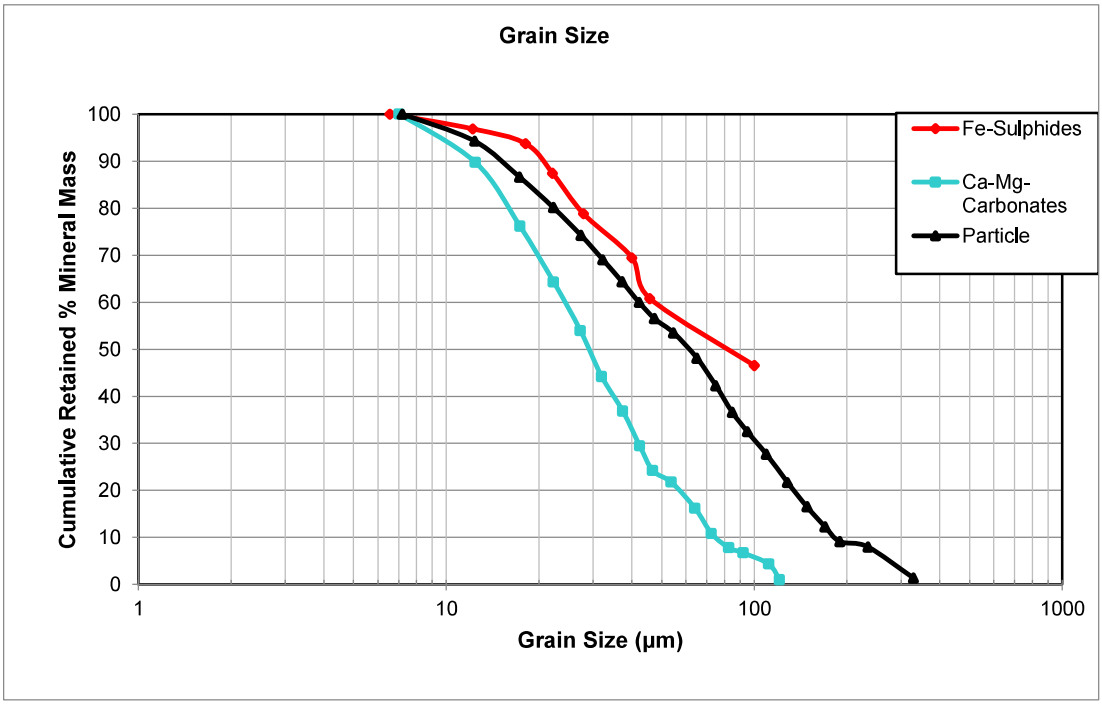




High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)

Cumulative Retained Grain Size Distribution





Note: The samples were stage-ground to a P_{80} of 150 µm prior to testing.

QEM AUTOMATED RAPID MINERAL SCAN

Project Sample

prepared for

Marathon Gold

Project 16863-01/MI6002-OCT18

October 31, 2018

Kathryn Sheridan, P.Geo.
Mineralogist

Chris Gunning, B.Sc. Hons
Senior Mineralogist

SGS Minerals
a division of SGS Canada Inc.

P.O. Box 4300, 185 Concession Street, Lakefield, Ontario, Canada K0L 2H0
Tel: (705) 652-2000 Fax: (705) 652-6365 www.sgs.com www.sgs.com/met
Member of the SGS Group (SGS SA)

QEMSCAN Method Summary

Mineral Identification and Interpretation:
The QEM-ARMS, or Automated Rapid Mineral Scan is a method designed to provide simple bulk mineralogy using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy) (METH# 8.11.1) and XRD (X-ray Diffraction, BRUKER AXS D8 Advance Diffractometer). Semi-quantitative mineral abundance, as well as liberation and grain size analyses of one or two key minerals of interest which occur in significant quantities (>1% mineral mass) are presented.

Test Limitations:
The reader should note that this is a semi-quantative study. Any data should be treated as approximations. The study is subject to the representativity of the sample selected, and its accuracy limited by the particle statistics.

XRD Method Summary

Mineral Identification and Interpretation:

Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (Whole Rock Analysis, Inductively Coupled Plasma - Optical Emission Spectroscopy, etc.).

The Qualitative XRD method (METH # 8-8-1) used by SGS Minerals Services,
P.O. Box 4300, 185 Concession Street, Lakefield, Ontario, Canada K0L 2H0.
Tel: (705) 652-2000 Fax: (705) 652-6365 Mini-method available upon request.

Terminology for Association data

Association classes were defined as the following;

• **Free Py Mrc** - A particle that has >=95% of Pyrite/Marcasite

• **Liberated Py Mrc**: A particle that has ≥80 but <95 area% of Pyrite/Marcasite

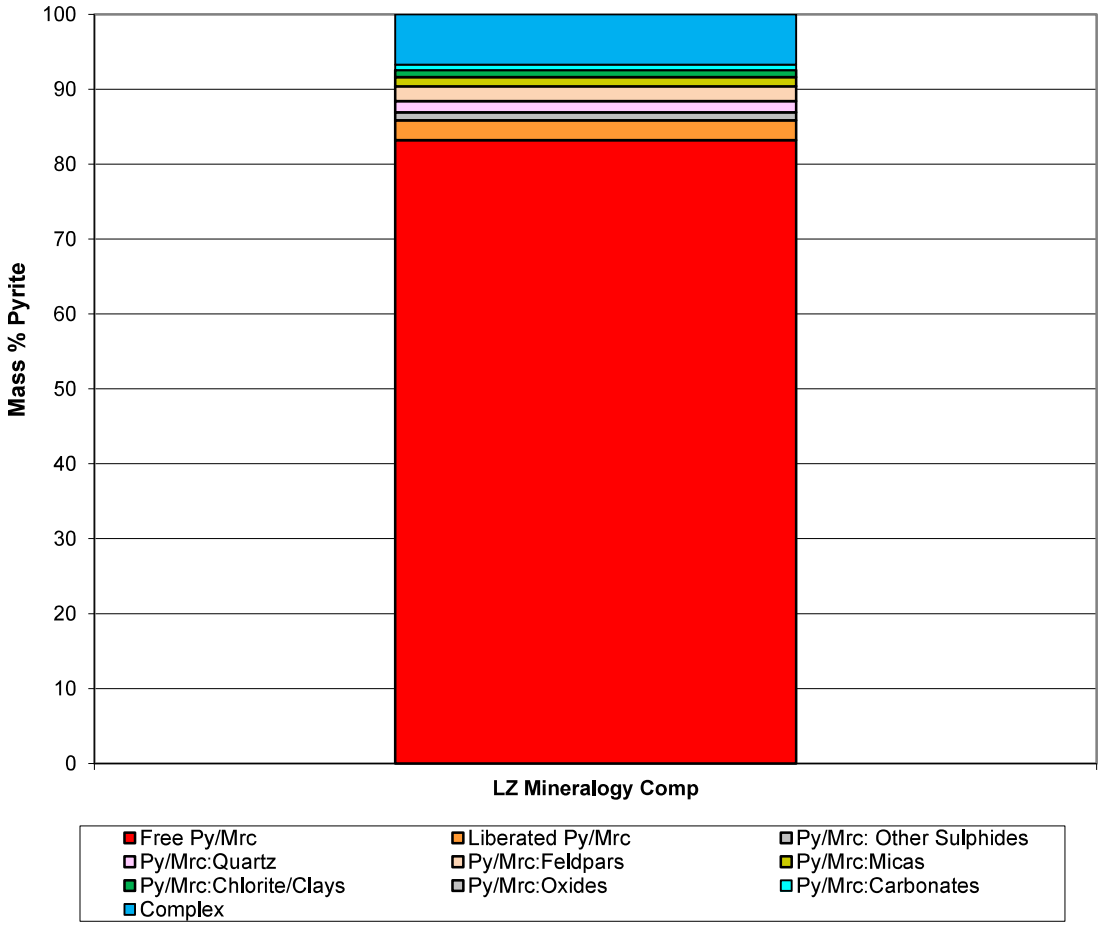
• **Py Mrc**: **Other Sulphides** - A particle that has ≥95 area% of Pyrite/Marcasite + Other Sulphides
• **Py Mrc: Quartz** - A particle that has ≥95 area% of Pyrite/Marcasite + Quartz
• **Py Mrc: Feldspars** - A particle that has ≥95 area% of Pyrite/Marcasite + Feldspars
• **Py Mrc: Micas** - A particle that has ≥95 area% of Pyrite/Marcasite + Quartz
• **Py Mrc: Chlorite/Clays** - A particle that has ≥95 area% of Pyrite/Marcasite + Chlorite/Clays
• **Py Mrc**: **Oxides** - A particle that has ≥95 area% of Pyrite/Marcasite + Oxides
• **Py Mrc: Carbonates** - A particle that has ≥95 area% of Pyrite/Marcasite + Carbonates
• **Complex**: Any combination of the above definitions has been defined as a complex particle.

QEMSCAN Modals

Survey		MI6000-OCT18
Project/LIMS		16863-01
Sample		LZ Mineralogy Comp
Mineral Mass (%)	Pyrite/Marcasite	0.32
	Other Sulphides	0.01
	Quartz	22.9
	Plagioclase	50.2
	Tourmaline	1.86
	Sericite/Muscovite	10.4
	Chlorite	3.93
	Clays	0.89
	Other Silicates	0.50
	Fe-Oxides	0.09
	Rutile	0.64
	Calcite	5.04
	Dolomite/Ankerite	2.76
	Apatite	0.39
	Other	0.03
	Total	*100.0*

Note: Other Sulphides includes trace quantities of sphalerite and chalcopyrite.

Pyrite Association

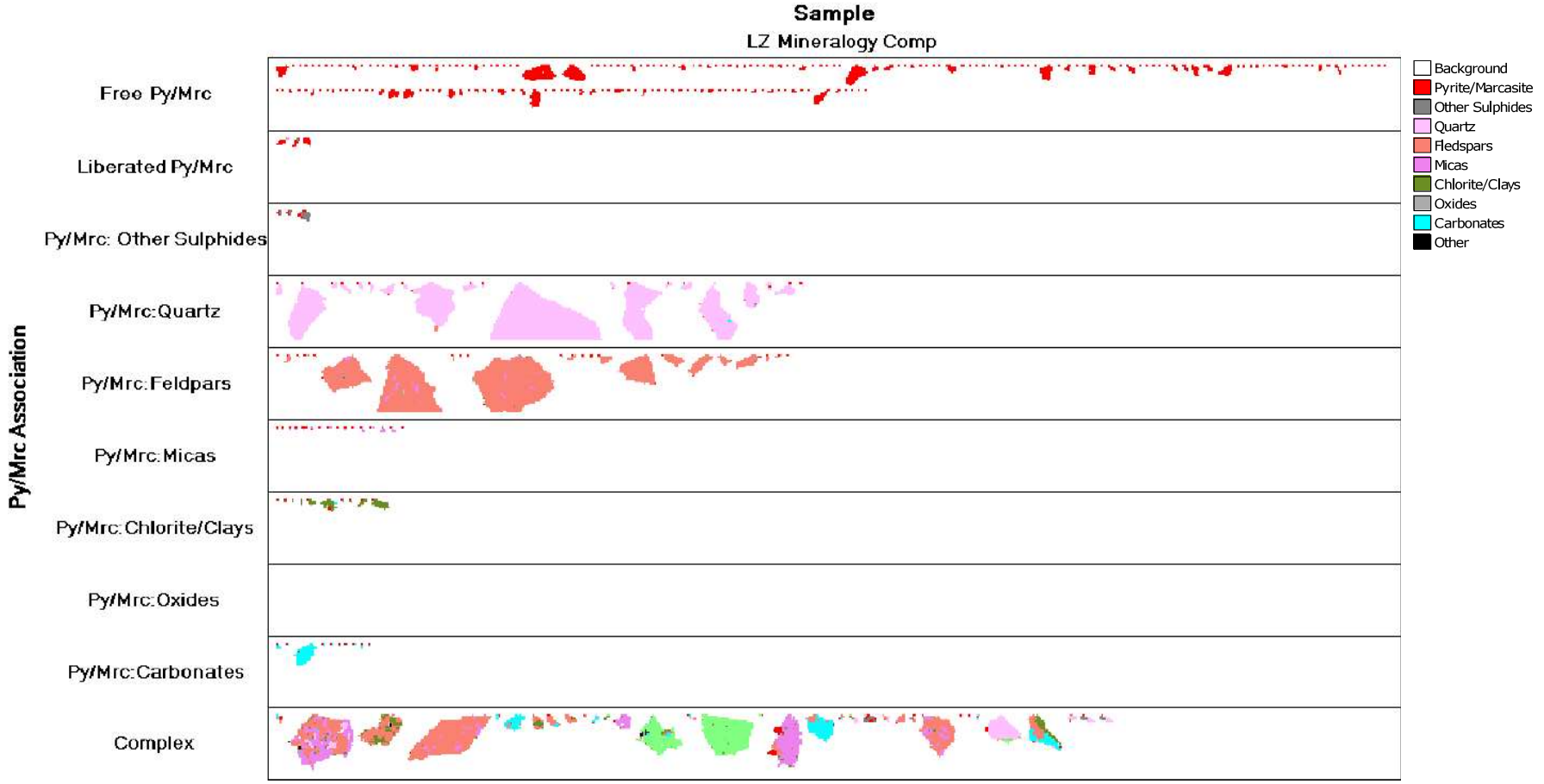


Normalized Mass of Pyrite Across Samples

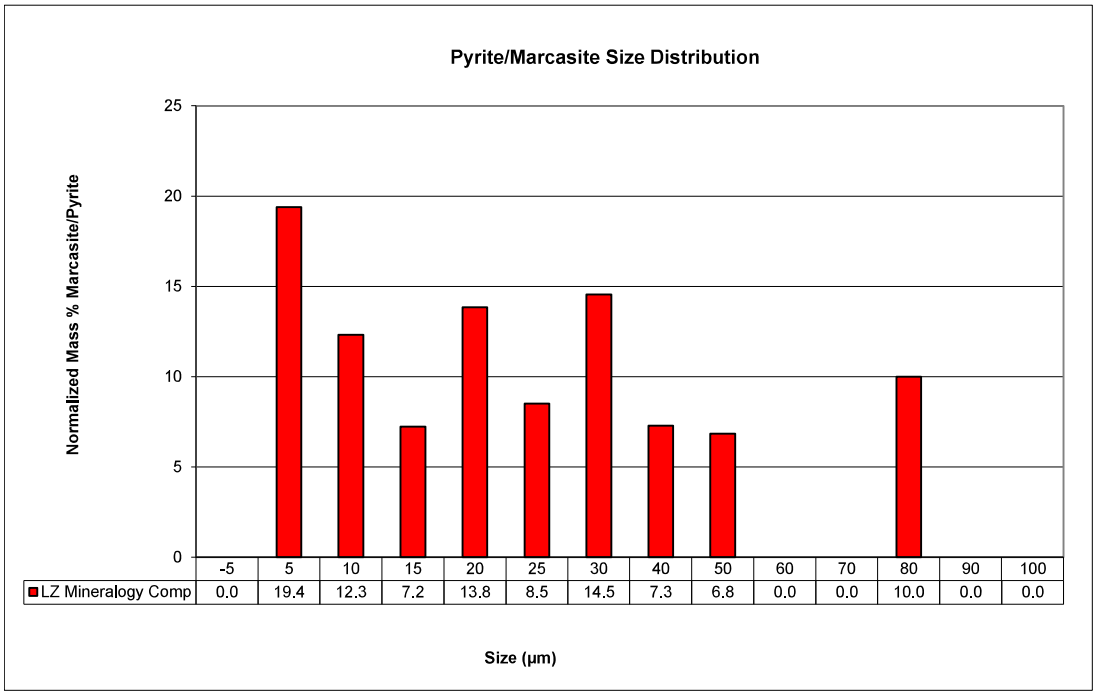
Mineral Name	LZ Mineralogy Comp
Free Py/Mrc	83.2
Liberated Py/Mrc	2.63
Py/Mrc: Other Sulphides	1.11
Py/Mrc:Quartz	1.52
Py/Mrc:Feldpars	1.95
Py/Mrc:Micas	1.24
Py/Mrc:Chlorite/Clays	0.93
Py/Mrc:Oxides	0.00
Py/Mrc:Carbonates	0.69
Complex	6.72
Total	100.0

Notes: For samples with low grades, results should be interpreted with caution due to low particle statistics.
Sample was stage-ground to a P_{80} of 150 µm.

Image Grid - Pyrite Association



Histograms - Pyrite/Marcasite Size by Mass



	-5	5	10	15	20	25	30	40	50	60	70	80	90	100
LZ Mineralogy Comp	0.0	19.4	12.3	7.2	13.8	8.5	14.5	7.3	6.8	0.0	0.0	10.0	0.0	0.0

Summary of Qualitative X-ray Diffraction Results

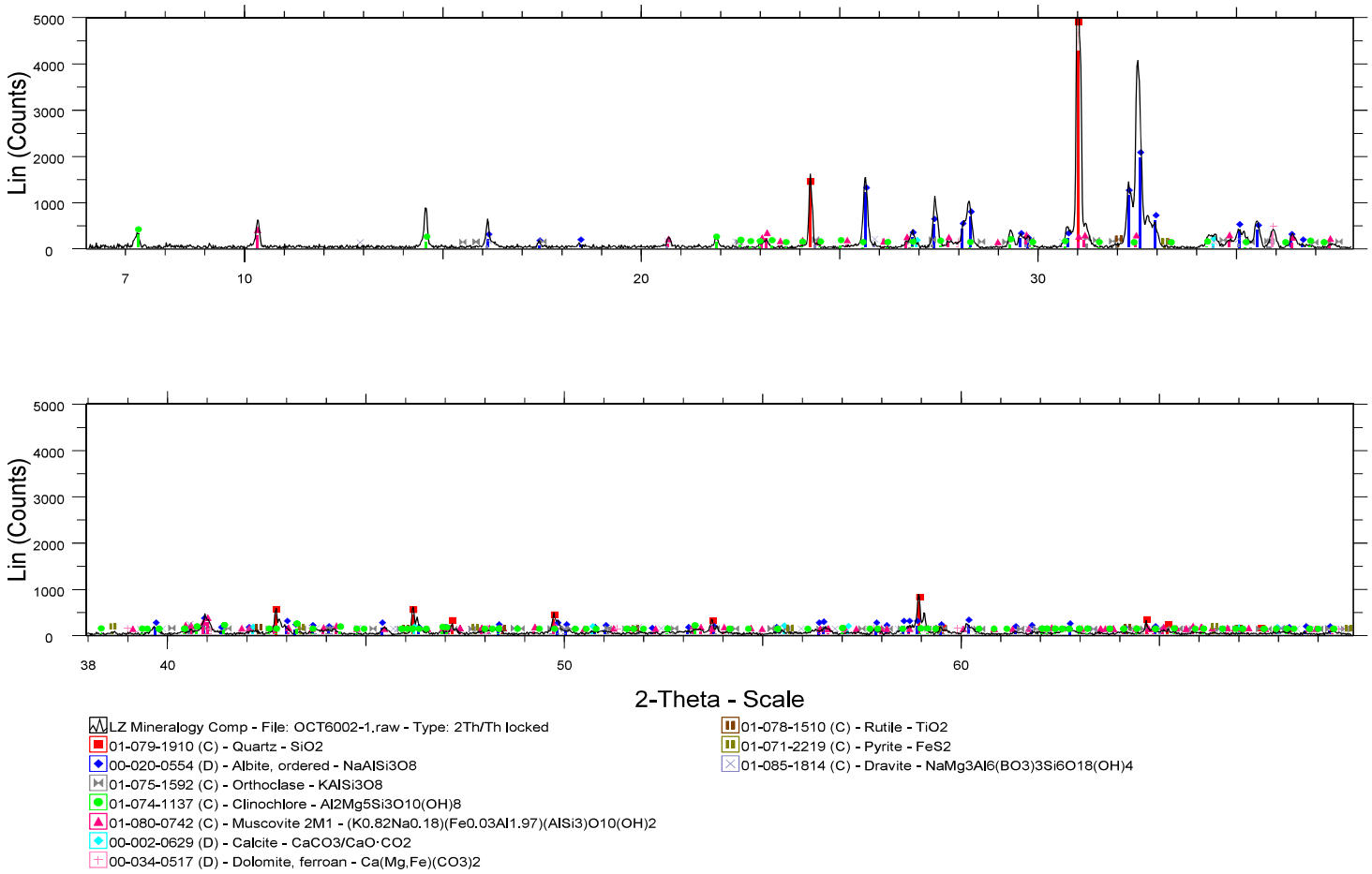
Crystalline Mineral Assemblage (relative proportions based on peak height)

Sample	Major (>30% Wt)	Moderate (10% -30% Wt)	Minor (2% -10% Wt)	Trace (<2% Wt)
LZ Mineralogy Comp	plagioclase	quartz	chlorite, mica, dolomite, calcite	*rutile, *pyrite, *tourmaline, *potassium-feldspar

** Tentative identification due to low concentrations, diffraction line overlap or poor crystallinity.*

Mineral	Composition
Calcite	$CaCO_3$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Dolomite	$CaMg(CO_3)_2$
Mica	$K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$
Plagioclase	$(NaSi,CaAl)AlSi_2O_8$
Potassium Feldspar	$KAlSi_3O_8$
Pyrite	FeS_2
Quartz	SiO_2
Rutile	TiO_2
Tourmaline	$(Na,Ca)(Li,Mg,Al)(Al,Fe,Mn)_6(BO_3)_3(Si_6O_{18})(OH)_4$

LZ Mineralogy Comp



QEM AUTOMATED RAPID MINERAL SCAN

Project Sample

prepared for

Marathon Gold

Project 16863-01

October 12, 2018

Kareen Fleury-Frenette
Senior Mineralogist

Chris Gunning, B.Sc. Hons
Senior Mineralogist

SGS Minerals
a division of SGS Canada Inc.

P.O. Box 4300, 185 Concession Street, Lakefield, Ontario, Canada K0L 2H0
Tel: (705) 652-2000 Fax: (705) 652-6365 www.sgs.com www.sgs.com/met
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XRD Method Summary

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Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (Whole Rock Analysis, Inductively Coupled Plasma - Optical Emission Spectroscopy, etc.).

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Tel: (705) 652-2000 Fax: (705) 652-6365 Mini-method available upon request.

Terminology for Association data

Association classes were defined as the following;

• **Free Py Mrc -** A particle that has >=95% of Pyrite/Marcasite

• **Liberated Py Mrc**: A particle that has ≥80 but <95 area% of Pyrite/Marcasite

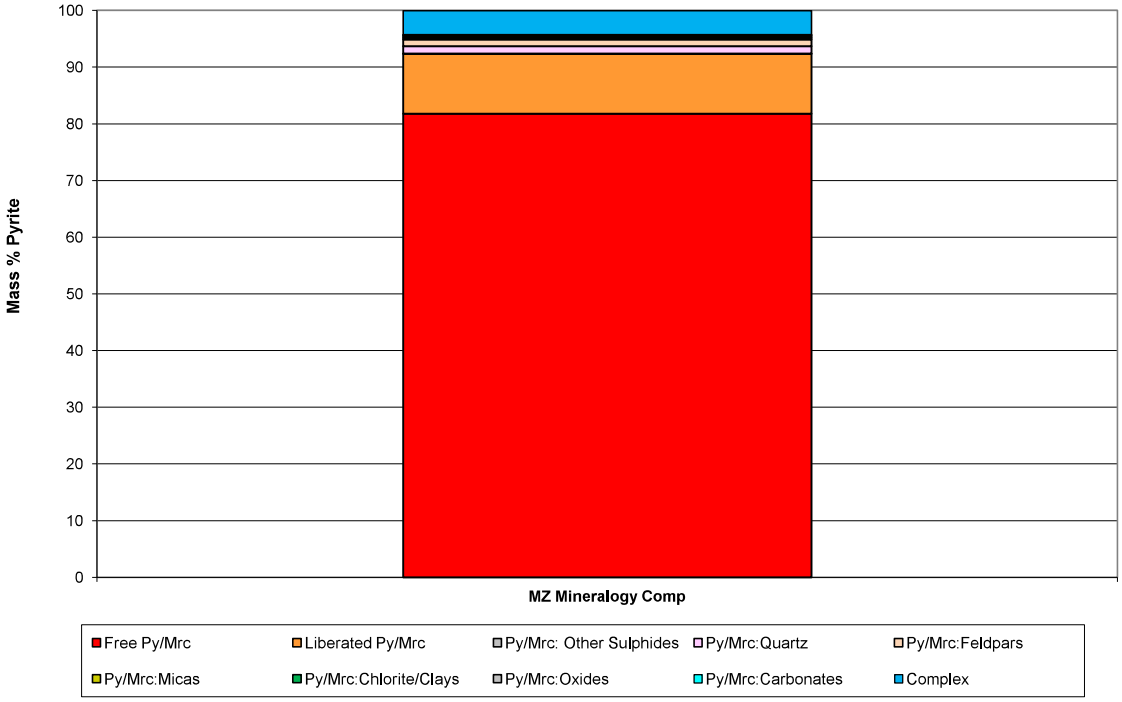
• **Py Mrc**: **Other Sulphides -** A particle that has ≥95 area% of Pyrite/Marcasite + Other Sulphides
• **Py Mrc: Quartz -** A particle that has ≥95 area% of Pyrite/Marcasite + Quartz
• **Py Mrc: Feldspars -** A particle that has ≥95 area% of Pyrite/Marcasite + Feldspars
• **Py Mrc: Micas -** A particle that has ≥95 area% of Pyrite/Marcasite + Quartz
• **Py Mrc: Chlorite/Clays -** A particle that has ≥95 area% of Pyrite/Marcasite + Chlorite/Clays
• **Py Mrc**: **Oxides -** A particle that has ≥95 area% of Pyrite/Marcasite + Oxides
• **Py Mrc: Carbonates -** A particle that has ≥95 area% of Pyrite/Marcasite + Carbonates
• **Complex**: Any combination of the above definitions has been defined as a complex particle.

QEMSCAN Modals

Survey		MI6000-OCT18
Project/LIMS		16863-01
Sample		MZ Mineralogy Comp
Mineral Mass (%)	Pyrite/Marcasite	1.03
	Pyrrhotite	0.00
	Chalcopyrite	0.01
	Arsenopyrite	0.00
	Other Sulphides	0.00
	Quartz	44.27
	Plagioclase	37.81
	K-Feldspar	0.00
	Sericite/Muscovite	5.87
	Chlorite	4.67
	Clays	0.69
	Tourmaline	0.69
	Other Silicates	0.18
	Fe-Oxides	0.41
	Other Oxides	0.37
	Calcite	3.36
	Dolomite/Ankerite	0.38
	Siderite	0.00
	Apatite	0.05
	Other	0.22
	Total	*100.0*

Note: Other Sulphides includes trace quantities of sphalerite and tetrahedrite and galena.

Pyrite Association

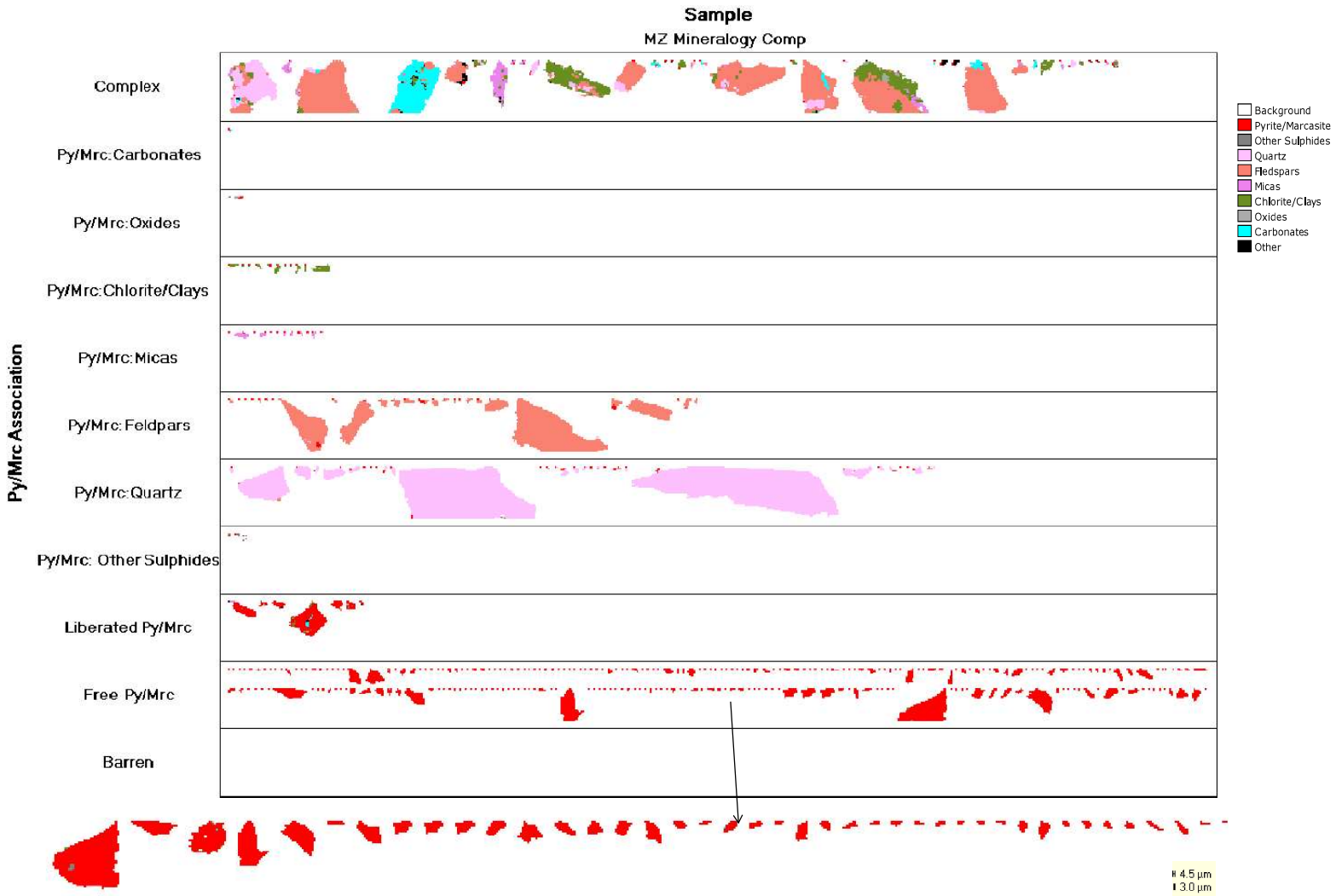


Normalized Mass of Pyrite Across Samples

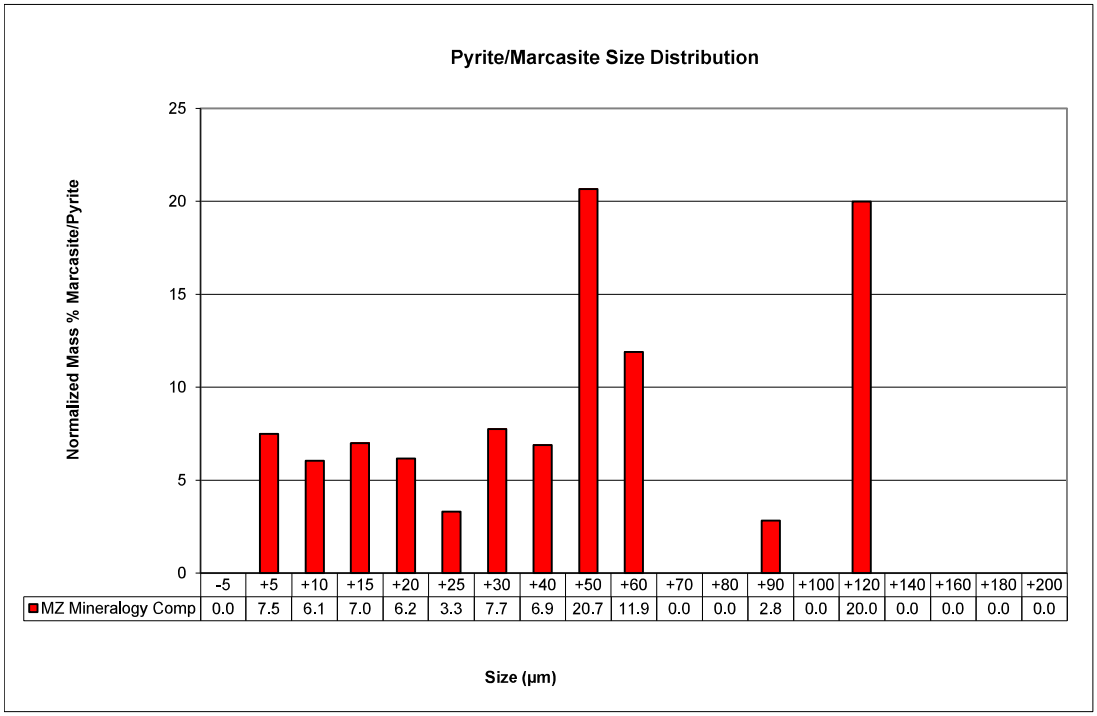
Mineral Name	MZ Mineralogy Comp
Free Py/Mrc	81.8
Liberated Py/Mrc	10.5
Py/Mrc: Other Sulphides	0.1
Py/Mrc:Quartz	1.3
Py/Mrc:Feldpars	1.2
Py/Mrc:Micas	0.3
Py/Mrc:Chlorite/Clays	0.3
Py/Mrc:Oxides	0.2
Py/Mrc:Carbonates	0.1
Complex	4.2
Total	100.0

Note: For samples with low grades, results should be interpreted with caution due to low particle statistics.

Image Grid - Pyrite Association



Histograms - Pyrite/Marcasite Size by Mass



	-5	+5	+10	+15	+20	+25	+30	+40	+50	+60	+70	+80	+90	+100	+120	+140	+160	+180	+200
MZ Mineralogy Comp	0.0	7.5	6.1	7.0	6.2	3.3	7.7	6.9	20.7	11.9	0.0	0.0	2.8	0.0	20.0	0.0	0.0	0.0	0.0

Summary of Qualitative X-ray Diffraction Results

Crystalline Mineral Assemblage (relative proportions based on peak height)

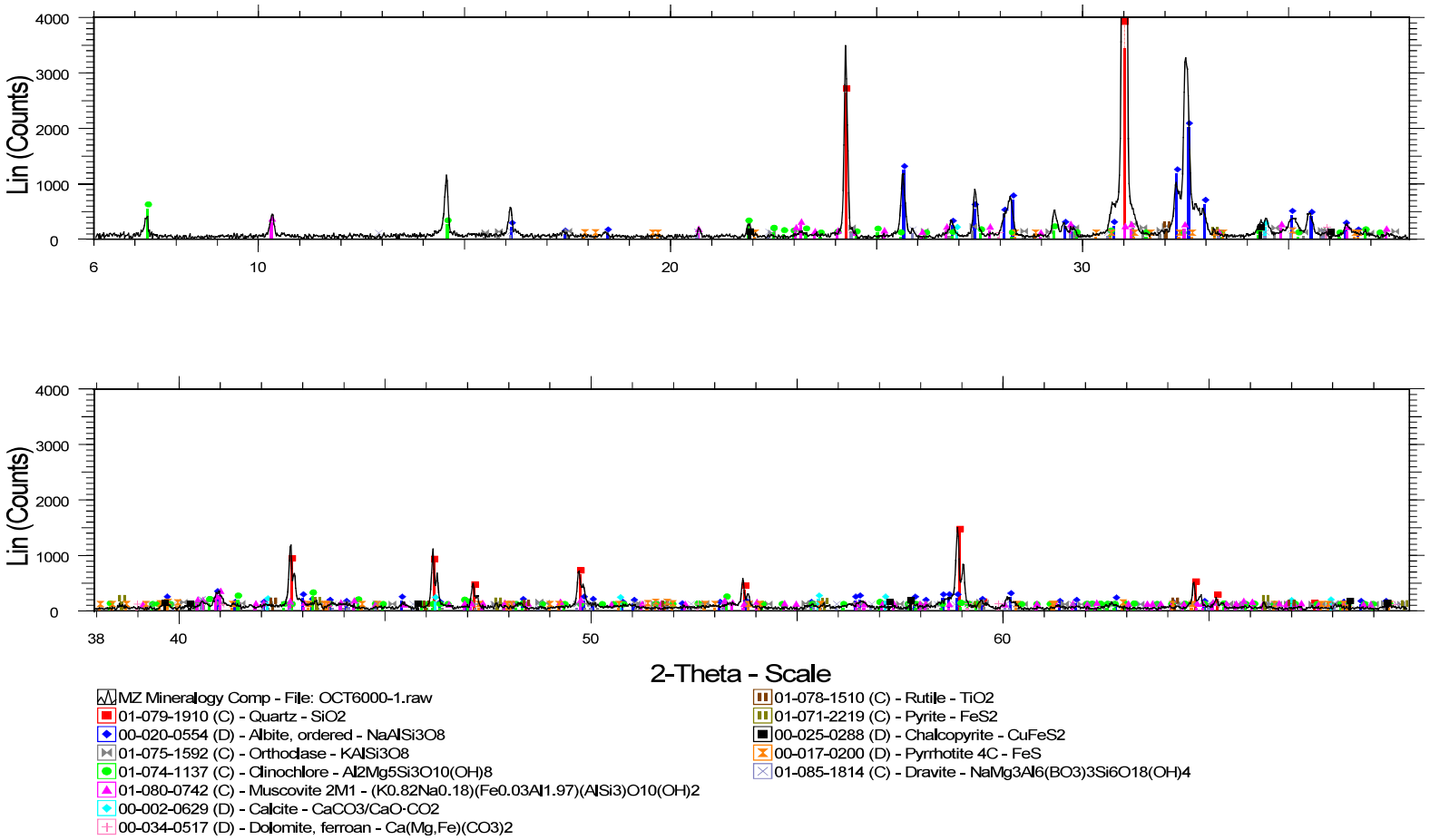
Sample	Major (>30% Wt)	Moderate (10% -30% Wt)	Minor (2% -10% Wt)	Trace (<2% Wt)
(1) MZ Mineralogy Comp	quartz	plagioclase	chlorite, mica, potassium-feldspar	*calcite, *dolomite, *rutile, *pyrite, *chalcopyrite, *pyrrhotite, *tourmaline

** Tentative identification due to low concentrations, diffraction line overlap or poor crystallinity.*

Brackets indicate non-clay minerals present in the clay fraction.

Mineral	Composition
Calcite	$CaCO_3$
Chalcopyrite	$CuFeS_2$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Dolomite	$CaMg(CO_3)_2$
Tourmaline	$(Na,Ca)(Li,Mg,Al)(Al,Fe,Mn)_6(BO_3)_3(Si_6O_{18})(OH)_4$
Mica	$K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$
Plagioclase	$(NaSi,CaAl)AlSi_2O_8$
Potassium-Feldspar	$KAlSi_3O_8$
Pyrite	FeS_2
Pyrrhotite	$Fe_{(1-x)}S$
Quartz	SiO_2
Rutile	TiO_2

MZ Mineralogy Comp



SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

17-June-2020

Date Rec. : 31 October 2019
LR Report: **CA19198-OCT19**
Reference: Job# 80018.06

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1	9: 19-TP-5 BS2	10: 19-TP-5 BS3	11: 19-TP-6 BS1	12: 19-TP-6 BS2	13: 19-TP-6 BS3
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	13-Nov-19	09:14	15-Nov-19	11:47	5.94	6.19	7.21	8.64	8.41	8.84	7.74	8.46	8.56
Fizz Rate [no unit]	13-Nov-19	09:14	15-Nov-19	11:47	1	1	1	3	3	2	2	2	2
Sample weight [g]	13-Nov-19	09:14	15-Nov-19	11:47	2.00	2.00	2.05	2.00	2.02	2.00	2.00	2.02	2.00
HCl_add [mL]	14-Nov-19	07:15	15-Nov-19	11:47	20.00	20.00	20.00	27.00	25.50	20.00	20.00	40.50	20.00
HCl [Normality]	13-Nov-19	09:14	15-Nov-19	11:47	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	13-Nov-19	09:14	15-Nov-19	11:47	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	14-Nov-19	07:15	15-Nov-19	11:47	19.94	20.21	19.40	9.56	10.18	10.59	17.51	19.82	8.18
Final pH [no unit]	14-Nov-19	07:15	15-Nov-19	11:47	0.81	1.32	0.95	1.64	1.55	1.35	1.01	1.61	1.65
NP [t CaCO3/1000 t]	14-Nov-19	07:15	15-Nov-19	11:47	0.1	-0.5	1.5	43.6	37.9	23.5	6.2	51.2	29.5
AP [t CaCO3/1000 t]	15-Nov-19	11:47	15-Nov-19	11:48	0.62	0.62	0.62	0.62	0.94	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	15-Nov-19	11:47	15-Nov-19	11:48	-0.52	-1.12	0.88	43.0	37.0	22.9	5.58	50.6	28.9
NP/AP [ratio]	15-Nov-19	11:47	15-Nov-19	11:48	0.16	-0.81	2.40	70.3	40.4	37.9	10.0	82.6	47.2
S [%]	12-Nov-19	13:43	14-Nov-19	10:38	0.005	< 0.005	0.019	0.008	0.043	0.006	0.016	0.011	0.018
Acid Leachable SO4-S [%]	14-Nov-19	10:38	14-Nov-19	10:38	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Sulphide [%]	14-Nov-19	10:34	14-Nov-19	10:38	< 0.02	< 0.02	0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02	0.02
C [%]	12-Nov-19	13:43	15-Nov-19	11:48	0.903	0.829	0.068	0.598	0.547	0.350	0.198	0.840	0.426
CO3 [%]	15-Nov-19	08:10	15-Nov-19	11:48	0.045	0.070	0.055	2.51	2.15	1.20	0.350	2.91	1.58
TIC [%]	15-Nov-19	08:10	15-Nov-19	11:48	0.009	0.014	0.011	0.503	0.430	0.241	0.070	0.583	0.317

OnLine LIMS

00021527G0

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

LR Report : CA19198-OCT19

Analysis	14: 19-TP-7 BS1	15: 19-TP-7 BS2	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1	19: 19-TP-10 BS2	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	23: 19-TP-13 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	7.60	7.56	7.74	7.43	8.36	6.87	8.62	7.20	6.04	7.52	6.03	6.53	6.83	6.60
Fizz Rate [no unit]	1	1	1	1	1	1	3	1	1	1	1	1	1	1
Sample weight [g]	1.98	2.00	2.02	2.03	2.00	2.02	2.03	2.02	2.05	1.96	1.98	2.00	2.00	2.00
HCl_add [mL]	20.00	20.00	20.00	20.00	20.00	20.00	30.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	17.93	17.96	17.52	17.86	17.01	17.95	11.26	17.78	19.62	18.27	20.31	19.11	19.12	18.82
Final pH [no unit]	1.14	1.11	1.04	1.05	1.40	1.12	1.77	0.98	0.88	1.04	1.28	1.09	1.08	0.93
NP [t CaCO3/1000 t]	5.2	5.1	6.1	5.3	7.5	5.1	46.2	5.5	0.9	4.4	-0.8	2.2	2.2	3.0
AP [t CaCO3/1000 t]	0.62	0.62	0.62	0.62	0.62	2.19	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	4.58	4.48	5.48	4.68	6.88	2.91	45.6	4.88	0.28	3.78	-1.42	1.58	1.58	2.38
NP/AP [ratio]	8.39	8.23	9.84	8.55	12.1	2.33	74.5	8.87	1.45	7.10	-1.29	3.55	3.55	4.84
S [%]	< 0.005	0.011	0.008	< 0.005	< 0.005	0.071	0.014	0.007	< 0.005	0.009	0.009	0.005	< 0.005	< 0.005
Acid Leachable SO4-S [%]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Sulphide [%]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.07	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
C [%]	0.132	0.104	0.097	0.336	0.156	0.204	0.648	0.187	0.825	0.121	0.768	0.103	0.104	0.108
CO3 [%]	0.145	0.100	0.095	0.395	0.085	0.295	2.58	0.110	0.110	0.100	0.070	0.090	0.070	0.070
TIC [%]	0.029	0.020	0.019	0.079	0.017	0.059	0.516	0.022	0.022	0.020	0.014	0.018	0.014	0.014

Analysis	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Sample Date & Time	N/A	N/A	N/A
Paste pH [no unit]	8.50	7.93	7.28
Fizz Rate [no unit]	1	1	1
Sample weight [g]	1.99	2.01	2.03
HCl_add [mL]	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	17.38	18.41	18.19
Final pH [no unit]	1.07	1.02	1.08
NP [t CaCO3/1000 t]	6.6	4.0	4.5
AP [t CaCO3/1000 t]	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	5.98	3.38	3.88

OnLine LIMS

00021527760

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Analysis	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
NP/AP [ratio]	10.6	6.45	7.26
S [%]	0.006	0.006	< 0.005
Acid Leachable SO4-S [%]	< 0.02	< 0.02	< 0.02
Sulphide [%]	< 0.02	< 0.02	< 0.02
C [%]	0.084	0.102	0.151
CO3 [%]	0.130	0.105	0.065
TIC [%]	0.026	0.021	0.013

*NP (Neutralization Potential)

$$= \frac{50 \times (\text{N of HCL} \times \text{Total HCL added} - \text{N NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Revised with QC report.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002152760

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Carbon/Sulphur - QCBatchID: ECS0019-NOV19													
Carbonate	0.025	%	< 0.005			5	20				95	70	130
Total Inorganic Carbon	0.005	%	N/A			N/A	20				N/A	70	130
Carbon/Sulphur - QCBatchID: ECS0021-NOV19													
Carbon (total)	0.005	%	<0.005			1	20				102	70	130
Sulphur (total)	0.005	%	<0.005			1	20				93	70	130
Carbon/Sulphur - QCBatchID: ECS0022-NOV19													
Sulphide	0.02	%	< 0.02			ND	20	109	80	120			

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1,

Phone: 709-730-5046
Fax:

Date Rec. : 19 August 2019
LR Report: **CA14626-AUG19**
Reference: Valentine Gold

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MA-18-281 177033	6: MA-18-281 177047	7: MA-18-281 177067
Sample Date & Time					N/A	N/A	N/A
Paste pH [no unit]	04-Sep-19	10:10	06-Sep-19	09:26	9.56	9.51	9.61
Fizz Rate [no unit]	04-Sep-19	10:10	06-Sep-19	09:26	3	3	3
Sample weight [g]	04-Sep-19	10:10	06-Sep-19	09:26	1.97	1.99	1.97
HCl_add [mL]	05-Sep-19	07:48	06-Sep-19	09:26	42.00	25.60	26.90
HCl [Normality]	04-Sep-19	10:10	06-Sep-19	09:26	0.10	0.10	0.10
NaOH [Normality]	04-Sep-19	10:10	06-Sep-19	09:26	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	05-Sep-19	07:48	06-Sep-19	09:26	11.05	13.96	13.77
Final pH [no unit]	05-Sep-19	07:48	06-Sep-19	09:26	1.86	1.54	1.58
NP [t CaCO3/1000 t]	05-Sep-19	07:48	06-Sep-19	09:26	78.6	29.3	33.3
AP [t CaCO3/1000 t]	06-Sep-19	11:33	06-Sep-19	11:35	0.62	26.6	2.50
Net NP [t CaCO3/1000 t]	06-Sep-19	11:33	06-Sep-19	11:35	78.0	2.74	30.8
NP/AP [ratio]	06-Sep-19	11:33	06-Sep-19	11:35	127	1.10	13.3
S [%]	29-Aug-19	15:07	05-Sep-19	10:38	< 0.005	1.08	0.126
Acid Leachable SO4-S [%]	05-Sep-19	10:38	05-Sep-19	10:38	< 0.02	0.23	0.05
Sulphide [%]	04-Sep-19	16:44	05-Sep-19	10:38	< 0.02	0.85	0.08
C [%]	29-Aug-19	15:07	06-Sep-19	11:36	0.914	0.342	0.389
CO3 [%]	04-Sep-19	08:30	06-Sep-19	11:36	4.51	1.11	1.53
TIC [%]	04-Sep-19	08:30	06-Sep-19	11:36	0.902	0.222	0.306
Weight [g]	---	---	---	---	1976.5	2459.7	2053.1

Analysis	8: MA-18-281 177081	9: MA-18-281 177119	10: MA-18-281 177138	11: MA-18-281 177158	12: MA-18-281 177179	13: MA-18-281 177208	14: MA-18-281 177251
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.65	9.35	8.96	9.62	8.42	8.79	9.41
Fizz Rate [no unit]	3	3	3	3	3	4	3
Sample weight [g]	2.00	1.99	2.05	1.98	2.00	2.01	2.05
HCl_add [mL]	32.00	32.00	100.00	20.00	35.00	58.00	20.00

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14626-AUG19**

Analysis	8: MA-18-281 177081	9: MA-18-281 177119	10: MA-18-281 177138	11: MA-18-281 177158	12: MA-18-281 177179	13: MA-18-281 177208	14: MA-18-281 177251
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	14.68	15.09	26.31	8.76	13.24	25.69	7.50
Final pH [no unit]	1.58	1.58	1.75	1.74	1.70	1.77	1.93
NP [t CaCO3/1000 t]	43.3	42.5	180	28.4	54.4	80.4	30.5
AP [t CaCO3/1000 t]	1.88	11.6	3.75	7.19	0.62	1.88	14.4
Net NP [t CaCO3/1000 t]	41.4	30.9	176	21.2	53.8	78.5	16.1
NP/AP [ratio]	23.1	3.68	47.9	3.95	87.0	42.9	2.12
S [%]	0.087	0.519	0.186	0.287	1.13	0.119	0.580
Acid Leachable SO4-S [%]	0.03	0.15	0.07	0.06	1.11	0.06	0.12
Sulphide [%]	0.06	0.37	0.12	0.23	0.02	0.06	0.46
C [%]	0.525	0.510	2.16	0.345	0.677	0.935	0.374
CO3 [%]	2.27	2.19	10.4	1.36	3.22	4.19	1.39
TIC [%]	0.455	0.439	2.09	0.272	0.644	0.838	0.278
Weight [g]	2199.1	1999.5	2017.3	2173.8	2127.6	2452.9	2185.0

Analysis	15: MA-18-278 167645	16: MA-18-278 167678	17: MA-18-278 167699	18: MA-18-278 167710	19: MA-18-278 167730	20: MA-18-278 167749	21: MA-18-280 167753
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.70	9.99	9.52	8.98	9.45	8.78	9.08
Fizz Rate [no unit]	3	2	3	4	3	4	3
Sample weight [g]	2.00	2.03	2.00	2.03	2.01	2.04	2.00
HCl_add [mL]	20.00	20.00	33.00	56.00	64.90	165.10	26.90
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	10.40	13.82	16.54	22.32	19.50	50.64	13.66
Final pH [no unit]	1.59	1.39	2	1.65	1.60	1.72	1.68
NP [t CaCO3/1000 t]	24.0	15.2	41.1	83.0	113	280	33.1
AP [t CaCO3/1000 t]	0.62	1.56	19.1	0.62	0.62	0.62	4.69
Net NP [t CaCO3/1000 t]	23.4	13.6	22.0	82.4	112	280	28.4
NP/AP [ratio]	38.4	9.73	2.16	133	181	452	7.06
S [%]	0.008	0.052	0.811	0.006	< 0.005	< 0.005	0.184
Acid Leachable SO4-S [%]	< 0.02	< 0.02	0.20	< 0.02	< 0.02	< 0.02	0.03
Sulphide [%]	0.02	0.05	0.61	0.02	0.02	< 0.02	0.15
C [%]	0.290	0.162	0.520	0.967	0.919	3.58	0.333
CO3 [%]	1.25	0.664	2.02	4.62	4.39	17.7	1.53
TIC [%]	0.250	0.133	0.405	0.925	0.879	3.54	0.307
Weight [g]	2244.4	2351.0	2529.7	2544.2	2370.6	2557.5	2174.1

Analysis	22: MA-18-280 167779	23: MA-18-280 167792	24: MA-18-280 167815	25: MA-18-280 167852	26: MA-18-280 167890	27: MA-18-280 167924	28: MA-18-280 167946
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14626-AUG19**

Analysis	22: MA-18-280 167779	23: MA-18-280 167792	24: MA-18-280 167815	25: MA-18-280 167852	26: MA-18-280 167890	27: MA-18-280 167924	28: MA-18-280 167946
Paste pH [no unit]	9.80	9.01	9.91	9.48	9.17	9.61	9.72
Fizz Rate [no unit]	3	4	3	3	4	3	3
Sample weight [g]	2.03	2.02	2.00	2.01	2.04	2.01	2.03
HCl_add [mL]	20.00	52.30	20.00	32.00	77.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	9.70	23.54	11.74	11.54	22.89	12.46	14.67
Final pH [no unit]	1.67	1.74	1.47	1.88	1.82	1.41	1.25
NP [t CaCO3/1000 t]	25.4	71.2	20.6	50.9	133	18.8	13.1
AP [t CaCO3/1000 t]	0.62	0.94	1.25	5.00	3.12	21.2	17.8
Net NP [t CaCO3/1000 t]	24.8	70.3	19.4	45.9	129	-2.45	-4.71
NP/AP [ratio]	40.6	75.9	16.5	10.2	42.4	0.88	0.74
S [%]	< 0.005	0.009	0.035	0.195	0.264	0.808	0.674
Acid Leachable SO4-S [%]	< 0.02	< 0.02	< 0.02	0.04	0.16	0.13	0.10
Sulphide [%]	0.02	0.03	0.04	0.16	0.10	0.68	0.57
C [%]	0.308	0.778	0.248	0.623	1.54	0.230	0.153
CO3 [%]	1.39	3.70	1.04	2.71	7.67	0.749	0.475
TIC [%]	0.278	0.740	0.208	0.542	1.54	0.150	0.095
Weight [g]	1818.8	2620.7	2482.9	2049.2	2399.0	2209.7	2050.1

Analysis	29: MA-15-051 85430	30: MA-15-051 85441	31: MA-15-051 85455	32: MA-15-051 85476	33: MA-15-051 85509	34: MA-17-216 136251	35: MA-17-216 136252
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	8.98	9.52	9.50	9.21	9.74	9.38	9.33
Fizz Rate [no unit]	4	3	3	4	3	4	3
Sample weight [g]	2.04	1.98	1.97	1.99	2.05	2.01	2.01
HCl_add [mL]	78.40	20.00	20.00	52.20	27.30	58.40	71.30
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	33.23	10.74	10.10	21.73	13.06	20.64	26.86
Final pH [no unit]	1.63	1.76	1.75	1.64	1.56	1.73	1.62
NP [t CaCO3/1000 t]	111	23.4	25.1	76.6	34.7	93.9	111
AP [t CaCO3/1000 t]	0.62	0.62	1.56	2.81	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	110	22.8	23.5	73.8	34.1	93.3	110
NP/AP [ratio]	179	37.7	16.1	27.2	56.0	151	178
S [%]	0.014	0.016	0.109	0.138	< 0.005	< 0.005	< 0.005
Acid Leachable SO4-S [%]	< 0.02	< 0.02	0.06	0.05	< 0.02	< 0.02	< 0.02
Sulphide [%]	< 0.02	< 0.02	0.05	0.09	< 0.02	< 0.02	< 0.02
C [%]	1.34	0.263	0.294	0.913	0.402	1.30	1.48
CO3 [%]	6.33	1.10	1.18	4.24	1.84	5.98	6.98
TIC [%]	1.27	0.221	0.236	0.848	0.369	1.20	1.40
Weight [g]	2271.4	2217.3	2278.5	2003.7	2353.2	4182.9	4900.1

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14626-AUG19**

Analysis	36: MA-17-216 145217	37: MA-17-216 145241	38: MA-17-216 145260	39: MA-17-216 145277	40: MA-17-216 145319	41: MA-17-216 145344	42: MA-17-216 145358
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.44	9.63	8.92	9.33	9.49	9.66	9.62
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	2.00	2.03	2.01	2.03	1.99	2.04	2.00
HCl_add [mL]	30.80	20.00	125.30	40.00	27.20	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	11.15	9.22	37.91	17.33	12.24	12.75	7.23
Final pH [no unit]	1.94	1.71	1.78	1.54	1.57	1.53	1.92
NP [t CaCO3/1000 t]	49.1	26.6	217	55.8	37.6	17.8	31.9
AP [t CaCO3/1000 t]	6.25	9.69	2.50	18.8	25.6	4.06	7.19
Net NP [t CaCO3/1000 t]	42.8	16.9	215	37.0	12.0	13.7	24.7
NP/AP [ratio]	7.86	2.75	87.0	2.98	1.47	4.38	4.44
S [%]	0.286	0.396	0.202	0.742	0.944	0.188	0.310
Acid Leachable SO4-S [%]	0.09	0.09	0.12	0.14	0.12	0.06	0.08
Sulphide [%]	0.20	0.31	0.08	0.60	0.82	0.13	0.23
C [%]	0.597	0.319	2.53	0.690	0.481	0.207	0.399
CO3 [%]	2.53	1.30	12.3	2.94	1.84	0.799	1.54
TIC [%]	0.506	0.260	2.45	0.589	0.368	0.160	0.309
Weight [g]	2071.7	1786.9	2055.5	1958.2	2526.8	2423.4	1900.9

Analysis	43: MA-17-216 145372	44: MA-18-267 175013	45: MA-18-267 175037	46: MA-18-267 175085	47: MA-18-267 175127	48: MA-18-267 175143	49: MA-18-267 175178
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.69	9.48	9.78	9.31	8.39	9.90	9.63
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	2.00	2.02	1.98	2.01	2.05	2.00	2.04
HCl_add [mL]	20.00	32.10	20.00	31.10	63.30	20.00	27.60
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	11.01	14.78	10.39	10.38	21.49	11.24	12.98
Final pH [no unit]	1.49	1.61	1.60	1.92	1.62	1.44	1.52
NP [t CaCO3/1000 t]	22.5	42.9	24.3	51.5	102	21.9	35.8
AP [t CaCO3/1000 t]	2.50	12.5	0.62	0.62	0.62	4.69	5.94
Net NP [t CaCO3/1000 t]	20.0	30.4	23.7	50.9	101	17.2	29.9
NP/AP [ratio]	9.00	3.43	39.2	83.1	165	4.67	6.03
S [%]	0.141	0.479	0.030	0.029	0.016	0.227	0.294
Acid Leachable SO4-S [%]	0.06	0.08	0.03	0.03	< 0.02	0.08	0.10
Sulphide [%]	0.08	0.40	< 0.02	< 0.02	< 0.02	0.15	0.19
C [%]	0.275	0.584	0.291	0.671	1.26	0.267	0.445
CO3 [%]	1.05	2.18	1.24	2.97	6.05	1.03	1.79
TIC [%]	0.211	0.437	0.248	0.594	1.21	0.207	0.359
Weight [g]	2030.0	2616.4	2132.0	2560.9	2230.5	2465.4	2269.5

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	50: MA-18-267 175199	51: MA-18-267 175217	52: MA-18-267 175238	53: MA-18-267 175269	54: MA-18-267 175290	55: MA-18-290 178231	56: MA-18-290 178243
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.23	9.10	9.81	9.76	9.11	9.61	9.71
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.99	2.04	2.00	1.99	1.99	2.00	2.04
HCl_add [mL]	20.00	70.50	20.00	20.00	55.50	29.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	10.48	30.03	12.05	14.20	15.89	15.50	11.69
Final pH [no unit]	1.78	1.63	1.39	1.34	1.88	1.71	1.53
NP [t CaCO3/1000 t]	23.9	99.2	19.9	14.6	99.5	33.7	20.4
AP [t CaCO3/1000 t]	11.6	0.62	4.38	6.25	0.94	1.25	0.62
Net NP [t CaCO3/1000 t]	12.3	98.6	15.5	8.35	98.6	32.4	19.8
NP/AP [ratio]	2.07	160	4.55	2.34	106	27.0	32.9
S [%]	0.492	0.012	0.201	0.266	0.071	0.076	0.012
Acid Leachable SO4-S [%]	0.12	< 0.02	0.06	0.07	0.04	0.04	< 0.02
Sulphide [%]	0.37	< 0.02	0.14	0.20	0.03	0.04	< 0.02
C [%]	0.302	1.20	0.245	0.177	1.20	0.368	0.249
CO3 [%]	1.11	5.60	0.889	0.624	5.69	1.53	1.05
TIC [%]	0.222	1.12	0.178	0.125	1.14	0.307	0.210
Weight [g]	2164.1	2402.6	2178.5	2072.0	2193.0	2222.0	2080.5

Analysis	57: MA-18-290 178265	58: MA-18-290 178278	59: MA-18-290 178287	60: MA-18-290 178314	61: MA-18-290 178331	62: MA-18-290 178355	63: MA-16-081 88987
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.53	8.96	9.55	9.50	9.71	9.41	9.66
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	2.03	2.00	2.03	1.97	2.00	2.03	2.03
HCl_add [mL]	30.80	20.00	20.00	20.00	20.00	25.80	30.70
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	13.83	19.04	12.18	11.44	14.88	14.32	14.01
Final pH [no unit]	1.60	1.14	1.54	1.53	1.33	1.55	1.59
NP [t CaCO3/1000 t]	41.8	2.4	19.3	21.7	12.8	28.3	41.1
AP [t CaCO3/1000 t]	1.88	67.2	20.9	17.2	0.62	0.62	1.56
Net NP [t CaCO3/1000 t]	39.9	-64.79	-1.64	4.51	12.2	27.7	39.5
NP/AP [ratio]	22.3	0.04	0.92	1.26	20.6	45.6	26.3
S [%]	0.104	2.52	0.790	0.654	0.007	< 0.005	0.087
Acid Leachable SO4-S [%]	0.04	0.37	0.12	0.10	< 0.02	< 0.02	0.04
Sulphide [%]	0.06	2.15	0.67	0.55	< 0.02	< 0.02	0.05
C [%]	0.525	0.025	0.241	0.262	0.138	0.341	0.511
CO3 [%]	2.24	< 0.025	0.734	0.914	0.560	1.47	2.22
TIC [%]	0.449	0.005	0.147	0.183	0.112	0.294	0.445
Weight [g]	2125.0	2152.1	2246.4	2306.4	2433.7	1470.2	1883.0

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	64: MA-16-081 88994	65: MA-16-081 89000	66: MA-16-081 89013	67: MA-16-081 89020	68: MA-16-081 89029	69: MA-18-287 177828	70: MA-18-287 177831
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.85	9.20	9.76	9.69	9.81	9.76	9.78
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.99	1.98	2.05	1.97	1.96	2.01	1.97
HCl_add [mL]	20.00	41.80	29.80	20.00	20.00	26.70	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	8.76	19.47	13.42	8.75	8.75	12.21	7.19
Final pH [no unit]	1.81	1.92	1.60	1.79	1.60	1.56	1.85
NP [t CaCO3/1000 t]	28.2	56.4	40.0	28.6	28.7	36.0	32.5
AP [t CaCO3/1000 t]	0.62	2.81	7.50	4.06	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	27.6	53.6	32.5	24.5	28.1	35.4	31.9
NP/AP [ratio]	45.5	20.1	5.33	7.04	46.3	58.1	52.4
S [%]	0.005	0.134	0.304	0.183	< 0.005	< 0.005	0.023
Acid Leachable SO4-S [%]	< 0.02	0.04	0.06	0.05	< 0.02	< 0.02	0.02
Sulphide [%]	< 0.02	0.09	0.24	0.13	< 0.02	< 0.02	< 0.02
C [%]	0.343	0.629	0.509	0.337	0.366	0.452	0.398
CO3 [%]	1.51	2.62	2.07	1.36	1.60	2.06	1.75
TIC [%]	0.302	0.525	0.415	0.273	0.320	0.413	0.351
Weight [g]	2311.0	2191.7	1976.1	2090.6	1825.0	1602.4	2102.3

Analysis	71: MA-18-287 177844	72: MA-18-287 177850	73: MA-18-287 177865	74: MA-18-287 177879	75: MA-18-287 177886	76: MA-18-287 177901	77: MA-18-285 177626
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.56	9.80	9.76	9.91	9.83	9.60	9.94
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.96	1.98	1.97	2.00	1.98	2.02	2.02
HCl_add [mL]	20.00	29.30	28.60	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	10.69	11.58	13.20	10.09	10.80	13.12	14.16
Final pH [no unit]	1.77	1.68	1.57	1.52	1.63	1.32	1.38
NP [t CaCO3/1000 t]	23.8	44.7	39.1	24.8	23.2	17.0	14.5
AP [t CaCO3/1000 t]	0.94	0.62	1.25	0.62	0.62	18.1	0.62
Net NP [t CaCO3/1000 t]	22.9	44.1	37.8	24.2	22.6	-1.12	13.9
NP/AP [ratio]	25.4	72.1	31.3	40.0	37.4	0.94	23.4
S [%]	0.024	< 0.005	0.083	0.012	0.030	0.655	< 0.005
Acid Leachable SO4-S [%]	< 0.02	< 0.02	0.04	< 0.02	0.03	0.08	< 0.02
Sulphide [%]	0.03	< 0.02	0.04	< 0.02	< 0.02	0.58	< 0.02
C [%]	0.249	0.547	0.458	0.303	0.256	0.206	0.128
CO3 [%]	0.984	2.56	1.95	1.37	1.07	0.684	0.540
TIC [%]	0.197	0.512	0.390	0.274	0.215	0.137	0.108
Weight [g]	2375.5	2557.8	4304.0	2137.5	2158.1	2040.3	2285.0

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	78: MA-18-285 177641	79: MA-18-283 177426	80: MA-18-283 177431	81: MA-18-283 177437	82: MA-18-283 177444	83: MA-18-283 177450	84: MA-18-283 177462
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.40	9.69	9.33	9.29	9.50	9.01	9.39
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.97	1.98	1.96	2.00	2.02	2.00	2.02
HCl_add [mL]	20.00	35.60	75.70	43.50	20.00	67.60	48.40
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	11.16	10.94	24.56	18.20	9.74	29.39	15.74
Final pH [no unit]	1.88	1.70	1.67	1.57	1.80	1.55	1.71
NP [t CaCO3/1000 t]	22.4	62.3	130	63.3	25.4	95.5	80.8
AP [t CaCO3/1000 t]	0.62	0.62	14.1	2.50	5.00	6.88	1.56
Net NP [t CaCO3/1000 t]	21.8	61.7	116	60.8	20.4	88.6	79.2
NP/AP [ratio]	36.1	99.7	9.28	25.3	5.08	13.9	51.7
S [%]	0.034	0.047	0.608	0.124	0.252	0.305	0.078
Acid Leachable SO4-S [%]	0.03	0.03	0.16	0.04	0.09	0.08	0.03
Sulphide [%]	< 0.02	0.02	0.45	0.08	0.16	0.22	0.05
C [%]	0.182	0.769	1.58	0.758	0.289	1.15	1.02
CO3 [%]	0.759	3.56	7.40	3.47	1.18	5.22	4.70
TIC [%]	0.152	0.712	1.48	0.695	0.237	1.04	0.941
Weight [g]	2193.5	1487.7	2026.0	2112.3	2041.9	2078.1	2198.0

Analysis	85: MA-18-283 177470	86: MA-18-283 177478	87: MA-18-283 177492	88: MA-18-283 177507	89: MA-16-156 136253	90: MA-16-156 136254	91: MA-16-156 108736
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.31	9.45	8.85	9.28	9.65	9.61	9.25
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.99	1.99	2.04	1.98	2.04	2.00	2.00
HCl_add [mL]	60.30	29.70	88.90	57.40	59.20	55.80	80.20
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	20.84	13.30	25.23	16.83	25.20	19.60	22.02
Final pH [no unit]	1.62	1.62	1.85	1.89	1.58	1.64	1.80
NP [t CaCO3/1000 t]	99.1	41.2	156	102	83.3	90.5	145
AP [t CaCO3/1000 t]	0.94	4.38	3.12	10.6	0.62	0.62	3.75
Net NP [t CaCO3/1000 t]	98.2	36.8	153	91.9	82.7	89.9	142
NP/AP [ratio]	106	9.42	50.0	9.65	134	146	38.8
S [%]	0.060	0.192	0.183	0.384	< 0.005	< 0.005	0.162
Acid Leachable SO4-S [%]	0.03	0.05	0.08	0.04	< 0.02	< 0.02	0.04
Sulphide [%]	0.03	0.14	0.10	0.34	< 0.02	< 0.02	0.12
C [%]	1.26	0.546	1.86	1.21	1.14	0.852	1.82
CO3 [%]	5.93	2.17	8.83	5.49	5.06	3.54	8.39
TIC [%]	1.19	0.434	1.77	1.10	1.01	0.709	1.68
Weight [g]	2313.0	2068.5	2342.5	1882.4	4268.8	4522.6	2200.5

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	92: MA-16-156 108748	93: MA-16-156 108761	94: MA-16-156 108777	95: MA-16-156 108804	96: MA-16-156 108806	97: MA-16-156 108817	98: MA-16-156 108832
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.74	9.67	9.65	9.64	9.69	10.00	8.27
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	1.96	2.02	1.98	2.02	2.04	2.01	2.02
HCl_add [mL]	30.50	30.30	40.10	29.50	20.00	20.00	77.90
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	10.23	12.46	16.98	11.37	8.33	15.68	33.69
Final pH [no unit]	1.76	1.65	1.52	1.72	1.86	1.23	1.57
NP [t CaCO3/1000 t]	51.7	44.2	58.4	44.9	28.6	10.7	109
AP [t CaCO3/1000 t]	0.62	0.62	5.31	0.62	1.56	3.75	0.62
Net NP [t CaCO3/1000 t]	51.1	43.6	53.1	44.3	27.0	6.95	109
NP/AP [ratio]	83.4	71.3	11.0	71.8	18.3	2.85	175
S [%]	0.022	< 0.005	0.263	0.040	0.070	0.202	0.202
Acid Leachable SO4-S [%]	0.02	< 0.02	0.09	0.02	0.02	0.08	0.18
Sulphide [%]	< 0.02	< 0.02	0.17	0.02	0.05	0.12	0.02
C [%]	0.653	0.565	0.730	0.551	0.350	0.083	1.26
CO3 [%]	2.88	2.47	3.13	2.41	1.42	0.305	6.08
TIC [%]	0.577	0.494	0.626	0.482	0.284	0.061	1.22
Weight [g]	2065.7	2198.1	2254.6	2304.5	1934.7	2340.1	2507.4

Analysis	99: MA-16-156 108851	100: MA-16-156 108866	101: MA-16-156 108902	102: MA-16-156 108927	103: MA-16-156 108949	104: VL-14-553 54173	105: VL-14-553 54255	106: VL-14-553 54295
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.21	9.17	8.72	9.48	9.59	9.43	9.41	9.38
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.01	1.99	2.00	1.96	1.99	2.02	2.01	1.98
HCl_add [mL]	53.50	20.00	105.50	30.20	20.00	30.70	28.20	29.60
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	14.79	16.34	33.10	13.57	10.59	10.79	12.32	11.90
Final pH [no unit]	1.90	1.25	1.82	1.60	1.53	1.76	1.62	1.72
NP [t CaCO3/1000 t]	96.3	9.2	181	42.4	23.6	49.3	39.5	44.7
AP [t CaCO3/1000 t]	2.50	29.1	11.2	0.94	9.38	0.62	0.94	0.62
Net NP [t CaCO3/1000 t]	93.8	-19.86	170	41.5	14.2	48.7	38.6	44.1
NP/AP [ratio]	38.5	0.32	16.1	45.2	2.52	79.5	42.1	71.5
S [%]	0.107	1.16	0.500	0.060	0.370	< 0.005	0.055	0.069
Acid Leachable SO4-S [%]	0.03	0.23	0.14	0.03	0.07	< 0.02	0.02	0.05
Sulphide [%]	0.08	0.93	0.36	0.03	0.30	< 0.02	0.03	0.02
C [%]	1.18	0.092	2.32	0.533	0.299	0.624	0.502	0.584
CO3 [%]	5.39	0.245	10.3	2.31	1.10	2.81	2.16	2.46
TIC [%]	1.08	0.049	2.06	0.463	0.220	0.562	0.432	0.493
Weight [g]	2253.9	2230.9	2422.9	2141.8	2220.2	3143.2	2779.4	3303.2

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	107: VL-14-570 55786	108: VL-14-570 55813	109: VL-14-570 55843	110: VL-14-577 56211	111: VL-14-577 56235	112: VL-14-577 56261	113: VL-11-260 7212	114: VL-11-260 7235
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.55	9.18	9.36	9.42	9.55	9.43	8.08	9.66
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.00	1.99	1.98	2.03	1.97	2.01	2.01	1.97
HCl_add [mL]	27.10	55.80	29.30	30.40	28.70	20.00	20.00	26.30
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	11.62	26.72	12.65	13.56	14.01	9.41	17.63	16.76
Final pH [no unit]	1.54	1.57	1.75	1.67	1.53	1.91	1.20	1.51
NP [t CaCO3/1000 t]	38.7	73.1	42.1	41.5	37.3	26.3	5.9	24.2
AP [t CaCO3/1000 t]	0.62	1.25	3.44	9.38	10.6	0.62	107	5.62
Net NP [t CaCO3/1000 t]	38.1	71.8	38.7	32.1	26.7	25.7	-100.98	18.6
NP/AP [ratio]	62.4	58.5	12.2	4.43	3.51	42.4	0.06	4.30
S [%]	0.006	0.068	0.159	0.420	0.428	0.006	3.34	0.324
Acid Leachable SO4-S [%]	< 0.02	0.03	0.05	0.12	0.09	< 0.02	< 0.02	0.14
Sulphide [%]	< 0.02	0.04	0.11	0.30	0.34	< 0.02	3.42	0.18
C [%]	0.486	0.993	0.544	0.519	0.471	0.337	0.076	0.323
CO3 [%]	2.25	4.10	2.11	2.07	1.83	1.33	0.125	0.979
TIC [%]	0.451	0.821	0.422	0.415	0.366	0.267	0.025	0.196
Weight [g]	3858.5	4641.1	4641.8	2407.5	2187.6	2347.6	2441.3	2414.5

Analysis	115: VL-11-260 7282	116: VL-11-260 7313	117: VL-11-316 31900	118: VL-11-316 31911	119: VL-11-316 31926	120: VL-11-316 31957	121: VL-11-316 31975	122: VL-11-316 31982
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	8.97	9.47	9.75	9.76	9.63	8.94	9.59	9.67
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.03	1.96	2.01	2.01	2.03	2.02	2.01	2.00
HCl_add [mL]	28.80	46.30	42.70	49.90	44.10	116.30	57.10	44.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	13.21	17.46	18.42	19.67	15.44	41.80	21.56	18.84
Final pH [no unit]	1.67	1.77	1.59	1.57	1.75	1.65	1.62	1.63
NP [t CaCO3/1000 t]	38.4	73.6	60.4	75.2	70.6	184	88.4	62.9
AP [t CaCO3/1000 t]	0.62	9.38	0.62	0.62	10.0	1.88	3.75	2.50
Net NP [t CaCO3/1000 t]	37.8	64.2	59.8	74.6	60.6	183	84.6	60.4
NP/AP [ratio]	61.4	7.85	97.4	121	7.06	98.3	23.6	25.2
S [%]	0.054	0.342	0.042	0.020	0.435	0.112	0.181	0.098
Acid Leachable SO4-S [%]	0.03	0.04	0.04	0.02	0.12	0.05	0.06	< 0.02
Sulphide [%]	0.02	0.30	< 0.02	< 0.02	0.32	0.06	0.12	0.08
C [%]	0.449	0.957	0.804	0.952	0.930	2.04	1.15	0.812
CO3 [%]	1.93	3.88	3.47	4.38	3.96	10.1	5.06	3.44
TIC [%]	0.386	0.777	0.695	0.876	0.793	2.03	1.01	0.688
Weight [g]	1644.0	2221.1	2315.6	4903.8	4402.7	2083.9	2120.4	2147.1

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	123: VL-11-316 32002	124: VL-11-316 32029	125: VL-11-316 32041	126: VL-11-316 32048	127: VL-12-382 45299	128: VL-12-382 45319	129: VL-12-382 45338	130: VL-12-382 45357
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.82	8.28	8.52	9.48	9.62	9.46	9.71	9.79
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.00	2.01	2.03	2.04	2.03	2.01	2.01	2.01
HCl_add [mL]	30.60	20.00	53.60	20.00	27.30	51.00	30.30	28.80
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	12.50	16.03	20.47	12.77	12.01	20.34	10.28	13.62
Final pH [no unit]	1.72	1.35	1.81	1.70	1.51	1.63	1.90	1.59
NP [t CaCO3/1000 t]	45.3	9.9	81.6	17.7	37.7	76.3	49.8	37.8
AP [t CaCO3/1000 t]	2.19	20.3	1.25	0.62	1.25	1.56	1.25	1.56
Net NP [t CaCO3/1000 t]	43.1	-10.41	80.4	17.1	36.4	74.7	48.6	36.2
NP/AP [ratio]	20.7	0.49	65.3	28.5	30.2	48.8	39.8	24.2
S [%]	0.122	0.810	0.073	< 0.005	0.074	0.086	0.076	0.097
Acid Leachable SO4-S [%]	0.05	0.16	0.03	< 0.02	0.03	0.04	0.04	0.05
Sulphide [%]	0.07	0.65	0.04	< 0.02	0.04	0.05	0.04	0.05
C [%]	0.550	0.068	0.859	0.142	0.494	0.994	0.674	0.486
CO3 [%]	2.39	0.195	4.12	0.610	2.16	4.42	2.82	1.97
TIC [%]	0.479	0.039	0.825	0.122	0.432	0.884	0.564	0.395
Weight [g]	2202.7	2427.0	2442.3	4317.6	3620.1	4563.7	4486.0	4393.4

Analysis	131: VL-12-382 45375	132: VL-12-382 45412	133: VL-12-382 45491	134: VL-12-382 45493	135: VL-12-382 45499	136: VL-11-306 13289	137: VL-11-306 13316	138: VL-11-306 13370
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.58	9.66	8.89	9.38	9.54	9.96	10.00	10.03
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.01	2.03	2.01	2.00	2.03	2.01	2.00	1.98
HCl_add [mL]	44.00	43.60	81.90	20.00	20.00	20.00	27.20	40.90
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	15.56	18.64	30.15	11.35	15.20	7.97	13.94	19.76
Final pH [no unit]	1.75	1.63	1.75	1.87	1.35	1.90	1.53	1.57
NP [t CaCO3/1000 t]	70.8	61.5	129	21.6	11.8	29.9	33.2	53.4
AP [t CaCO3/1000 t]	0.62	5.31	4.38	0.62	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	70.2	56.2	124	21.0	11.2	29.3	32.6	52.8
NP/AP [ratio]	113	11.6	29.4	34.8	19.0	48.2	53.1	86.1
S [%]	0.056	0.244	0.186	< 0.005	< 0.005	0.023	0.068	0.009
Acid Leachable SO4-S [%]	0.04	0.07	0.05	< 0.02	< 0.02	0.02	0.05	< 0.02
Sulphide [%]	0.02	0.17	0.14	< 0.02	< 0.02	< 0.02	0.02	< 0.02
C [%]	0.942	0.856	1.45	0.166	0.057	0.405	0.453	0.734
CO3 [%]	3.93	3.22	6.50	0.654	0.185	1.65	1.84	3.17
TIC [%]	0.787	0.644	1.30	0.131	0.037	0.330	0.368	0.634
Weight [g]	2255.9	2651.6	2028.0	4131.5	4665.2	3429.7	4282.4	4699.0

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	139: VL-11-306 13413	140: VL-11-306 13441	141: VL-11-306 13451	142: VL-11-306 13467	143: VL-10-202 2256	144: VL-10-202 2303	145: VL-10-202 2335	146: VL-10-202 2346
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	10.02	9.88	9.16	9.77	9.89	9.93	9.77	9.84
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.03	1.98	1.99	2.01	1.98	2.04	1.98	1.99
HCl_add [mL]	34.20	25.90	110.20	20.00	29.60	30.20	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	11.84	13.64	39.45	15.48	11.36	9.60	8.03	14.58
Final pH [no unit]	1.68	1.52	1.69	1.33	1.82	1.90	1.87	1.33
NP [t CaCO3/1000 t]	55.1	31.0	178	11.2	46.1	50.5	30.2	13.6
AP [t CaCO3/1000 t]	0.94	6.56	1.25	0.62	2.50	3.12	3.44	0.62
Net NP [t CaCO3/1000 t]	54.2	24.4	177	10.6	43.6	47.4	26.8	13.0
NP/AP [ratio]	58.8	4.72	142	18.1	18.4	16.2	8.79	21.9
S [%]	0.068	0.401	0.076	< 0.005	0.145	0.174	0.145	< 0.005
Acid Leachable SO4-S [%]	0.04	0.19	0.04	< 0.02	0.06	0.07	0.04	< 0.02
Sulphide [%]	0.03	0.21	0.04	< 0.02	0.08	0.10	0.11	< 0.02
C [%]	0.554	0.425	2.19	0.076	0.627	0.677	0.369	0.122
CO3 [%]	2.31	1.46	10.4	0.300	2.46	2.83	1.48	0.520
TIC [%]	0.462	0.293	2.07	0.060	0.493	0.567	0.297	0.104
Weight [g]	2135.7	2254.6	4950.2	4985.6	3039.1	2058.1	2571.9	4248.1

Analysis	147: VL-11-357 42837	148: VL-11-357 42843	149: VL-11-357 42852	150: VL-11-357 42858	151: VL-11-357 42862	152: VL-11-253 6875	153: VE-11-001 60007	154: VE-11-001 60031
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.83	9.09	9.88	9.57	9.59	9.91	9.80	9.73
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	1.98	2.03	2.00	1.98	1.97	1.98	2.00	2.03
HCl_add [mL]	40.00	93.10	39.50	20.00	26.50	43.00	27.30	56.80
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	17.14	35.60	16.04	12.27	14.30	13.40	12.37	24.38
Final pH [no unit]	1.57	1.65	1.61	1.68	1.62	1.90	1.69	1.58
NP [t CaCO3/1000 t]	57.7	142	58.6	19.5	31.0	74.7	37.3	79.8
AP [t CaCO3/1000 t]	0.94	9.69	0.62	0.62	0.62	0.62	0.62	3.44
Net NP [t CaCO3/1000 t]	56.8	132	58.0	18.9	30.4	74.1	36.7	76.4
NP/AP [ratio]	61.5	14.6	93.8	31.5	50.0	120	60.2	23.2
S [%]	0.058	0.344	0.049	< 0.005	< 0.005	0.029	0.024	0.160
Acid Leachable SO4-S [%]	0.03	0.03	0.03	< 0.02	< 0.02	0.03	0.02	0.05
Sulphide [%]	0.03	0.31	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.11
C [%]	0.731	1.64	0.777	0.191	0.352	1.00	0.438	1.14
CO3 [%]	3.29	7.40	3.43	0.819	1.47	4.18	1.94	4.63
TIC [%]	0.659	1.48	0.686	0.164	0.294	0.837	0.388	0.926
Weight [g]	2399.1	2214.4	4848.4	4790.1	2375.6	2350.6	4376.0	4552.5

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	155: VE-11-001 60046	156: VE-11-001 60064	157: VE-11-001 60095	158: VE-11-001 60117	159: VE-11-001 60147	160: VE-11-001 60177	161: VE-11-001 60201	162: VE-11-001 60221
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.41	9.83	9.87	9.66	9.39	9.35	9.89	9.50
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.06	2.02	1.99	1.99	1.97	2.05	2.00	2.03
HCl_add [mL]	40.00	20.00	20.00	20.00	123.10	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	15.60	14.70	11.88	9.14	52.41	10.32	8.37	10.33
Final pH [no unit]	1.64	1.33	1.36	1.64	1.61	1.63	1.77	1.51
NP [t CaCO3/1000 t]	59.2	13.1	20.4	27.3	179	23.6	29.1	23.8
AP [t CaCO3/1000 t]	9.06	6.88	0.94	17.2	0.62	4.06	1.56	0.62
Net NP [t CaCO3/1000 t]	50.1	6.22	19.5	10.1	179	19.5	27.5	23.2
NP/AP [ratio]	6.53	1.91	21.8	1.59	287	5.81	18.6	38.4
S [%]	0.357	0.356	0.085	0.772	0.055	0.188	0.100	0.048
Acid Leachable SO4-S [%]	0.07	0.14	0.06	0.22	0.04	0.06	0.05	0.05
Sulphide [%]	0.29	0.22	0.03	0.55	0.02	0.13	0.05	< 0.02
C [%]	0.760	0.176	0.287	0.371	2.39	0.305	0.372	0.304
CO3 [%]	3.23	0.440	1.03	1.23	10.6	1.17	1.52	1.25
TIC [%]	0.647	0.088	0.207	0.246	2.13	0.235	0.304	0.250
Weight [g]	1910.6	2489.9	2244.0	2311.0	2130.8	2480.0	2163.2	2620.1

Analysis	163: VE-13-008 64142	164: VE-13-008 64177	165: VE-13-008 64225	166: VE-13-008 64253	167: VGD-14-037 69435	168: VGD-14-037 69454	169: VGD-14-037 69474
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.83	9.85	8.96	9.99	9.06	9.82	9.20
Fizz Rate [no unit]	3	3	3	3	3	3	3
Sample weight [g]	2.04	2.02	1.97	2.03	2.01	2.02	2.03
HCl_add [mL]	20.00	20.00	20.00	20.00	82.60	20.00	130.10
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	10.67	9.11	10.16	13.15	27.64	12.64	43.67
Final pH [no unit]	1.58	1.61	1.64	1.28	1.78	1.34	1.81
NP [t CaCO3/1000 t]	22.9	27.0	25.0	16.9	137	18.2	213
AP [t CaCO3/1000 t]	0.62	1.56	72.2	0.62	4.06	11.9	20.9
Net NP [t CaCO3/1000 t]	22.3	25.4	-47.19	16.3	133	6.32	192
NP/AP [ratio]	36.9	17.3	0.35	27.0	33.6	1.53	10.2
S [%]	0.011	0.109	2.60	0.059	0.215	0.523	0.810
Acid Leachable SO4-S [%]	< 0.02	0.06	0.29	0.04	0.08	0.14	0.14
Sulphide [%]	< 0.02	0.05	2.31	0.02	0.13	0.38	0.67
C [%]	0.276	0.353	0.306	0.220	1.77	0.253	2.97
CO3 [%]	1.12	1.31	0.624	0.859	7.78	0.844	12.9
TIC [%]	0.224	0.263	0.125	0.172	1.56	0.169	2.57
Weight [g]	4191.2	2135.4	2106.3	1921.9	3251.5	2754.1	2369.7

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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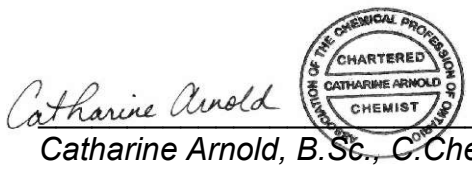
Analysis	170: VGD-14-037 69509	171: VGD-14-028 68844	172: VGD-14-028 68846
Sample Date & Time	N/A	N/A	N/A
Paste pH [no unit]	10.02	8.79	9.41
Fizz Rate [no unit]	3	3	3
Sample weight [g]	1.97	2.05	2.01
HCl_add [mL]	20.00	156.70	58.60
HCl [Normality]	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	12.70	61.52	24.35
Final pH [no unit]	1.41	1.61	1.67
NP [t CaCO3/1000 t]	18.5	232	85.2
AP [t CaCO3/1000 t]	1.56	1.25	19.7
Net NP [t CaCO3/1000 t]	16.9	231	65.5
NP/AP [ratio]	11.8	186	4.33
S [%]	0.106	0.069	0.775
Acid Leachable SO4-S [%]	0.06	0.03	0.14
Sulphide [%]	0.05	0.04	0.63
C [%]	0.243	3.11	1.13
CO3 [%]	0.879	14.3	4.36
TIC [%]	0.176	2.86	0.873
Weight [g]	3489.3	2332.7	2224.8

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Carbon/Sulphur - QCBatchID: ECS0006-SEP19													
Sulphide	0.02	%	< 0.02			7	20	84	80	120			
Carbon/Sulphur - QCBatchID: ECS0007-SEP19													
Carbon (total)	0.005	%	<0.005			2	20				98	70	130
Carbon/Sulphur - QCBatchID: ECS0046-AUG19													
Carbonate	0.025	%	< 0.005			1	20				95	70	130
Total Inorganic Carbon	0.005	%	< 0.005			N/A	20				N/A	70	130
Carbon/Sulphur - QCBatchID: ECS0050-AUG19													
Carbon (total)	0.005	%	<0.005			0	20				100	70	130
Sulphur (total)	0.005	%	<0.005			6	20				98	70	130
Carbon/Sulphur - QCBatchID: ECS0051-AUG19													
Carbon (total)	0.005	%	<0.005			1	20				102	70	130
Sulphur (total)	0.005	%	<0.005			6	20				89	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

17-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 31 October 2019
LR Report: **CA19200-OCT19**
Reference: Job# 80018.06

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1
Sample Date & Time					N/A	N/A	N/A	N/A
Sample weight [g]	11-Nov-19	08:55	14-Nov-19	09:47	250	250	250	250
Volume D.I. Water [mL]	11-Nov-19	08:55	14-Nov-19	09:47	750	750	750	750
Final pH [no unit]	12-Nov-19	07:47	14-Nov-19	09:47	5.74	5.92	7.00	8.95
pH [no unit]	13-Nov-19	16:49	14-Nov-19	15:53	6.39	6.81	6.80	7.76
Conductivity [uS/cm]	13-Nov-19	16:49	14-Nov-19	15:53	17	27	25	92
Alkalinity [mg/L as CaCO3]	13-Nov-19	16:49	14-Nov-19	15:53	3	4	5	39
SO4 [mg/L]	13-Nov-19	10:12	18-Nov-19	16:25	4	3	4	5
F [mg/L]	15-Nov-19	08:59	15-Nov-19	13:02	< 0.06	< 0.06	0.09	0.11
Hg [mg/L]	14-Nov-19	13:34	15-Nov-19	14:43	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.428	0.691	0.016	0.088
As [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0026	0.0019	0.0010	0.0331
Ba [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00184	0.00247	0.00075	0.00435
B [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.005	0.006	0.005	0.005
Be [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000010	0.000017	< 0.000007	< 0.000007
Bi [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000017	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.22	0.21	0.56	11.5
Cd [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000013	0.000009	0.000010	0.000122
Co [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000171	0.000625	0.000077	0.000892
Cr [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00113	0.00087	< 0.00008	0.00012
Cu [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0079	0.0029	0.0006	0.0037
Fe [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.391	0.412	0.017	0.043
K [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.277	0.565	0.577	3.60
Li [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0002	0.0003	< 0.0001	0.0033
Mg [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.083	0.220	0.607	1.52
Mn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0342	0.0522	0.0258	0.0256
Mo [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00027	0.00012	0.00147	0.00689
Na [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	2.35	2.89	2.68	3.32
Ni [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0018	0.0011	0.0009	0.0006

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19200-OCT19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1
Pb [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00842	0.00024	0.00002	0.00008
Sb [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.0009	< 0.0009	< 0.0009	0.0010
Se [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00022	0.00020	0.00006	0.00137
Si [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	3.92	4.22	3.34	4.56
Sn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00084	0.00115	0.00122	0.0332
Ti [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0633	0.0214	0.00129	0.00082
Tl [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000016	0.000008	< 0.000005	< 0.000005
U [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000054	0.000091	0.000005	0.000105
V [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00437	0.00076	0.00026	0.00105
Zn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.002	< 0.002	< 0.002	< 0.002

Analysis	10: 19-TP-5 BS3	11: 19-TP-6 BS1	13: 19-TP-6 BS3	14: 19-TP-7 BS1	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750
Final pH [no unit]	8.56	7.73	8.77	7.43	7.51	7.41	7.23
pH [no unit]	7.85	7.13	7.76	6.83	6.80	6.83	7.34
Conductivity [uS/cm]	111	64	105	12	15	14	43
Alkalinity [mg/L as CaCO3]	51	12	45	4	5	5	18
SO4 [mg/L]	4	14	4	< 2	< 2	< 2	< 2
F [mg/L]	0.10	0.16	0.16	0.19	0.16	0.06	0.11
Hg [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.091	0.069	0.055	0.205	0.274	0.167	0.268
As [mg/L]	0.0203	0.0037	0.0169	0.0046	0.0074	0.0044	0.0068
Ba [mg/L]	0.00738	0.00557	0.00831	0.00258	0.00386	0.00498	0.00654
B [mg/L]	0.006	0.004	0.005	0.004	0.003	0.004	0.003
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	0.000008	0.000009	0.000009	0.000015
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	0.000016	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	16.8	6.18	15.0	0.11	0.72	0.59	4.96
Cd [mg/L]	0.000017	0.000019	0.000007	0.000008	0.000008	0.000041	0.000041
Co [mg/L]	0.000203	0.000456	0.000095	0.000430	0.000504	0.000493	0.000374
Cr [mg/L]	0.00019	0.00013	< 0.00008	0.00059	0.00034	0.00026	0.00041
Cu [mg/L]	0.0013	0.0022	0.0015	0.0016	0.0019	0.0179	0.0148
Fe [mg/L]	0.111	0.148	0.054	0.377	0.431	0.407	0.598
K [mg/L]	2.77	1.93	3.58	0.347	0.754	0.678	1.10
Li [mg/L]	0.0030	0.0041	0.0062	0.0004	0.0018	0.0018	0.0003
Mg [mg/L]	1.65	1.22	1.18	0.058	0.172	0.100	0.510
Mn [mg/L]	0.00550	0.199	0.0152	0.0257	0.0358	0.223	0.0826
Mo [mg/L]	0.00753	0.00392	0.00239	0.00021	0.00039	0.00084	0.00126
Na [mg/L]	1.69	2.25	2.09	1.40	1.70	1.45	2.39

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19200-OCT19**

Analysis	10: 19-TP-5 BS3	11: 19-TP-6 BS1	13: 19-TP-6 BS3	14: 19-TP-7 BS1	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1
Ni [mg/L]	0.0004	0.0007	0.0002	0.0005	0.0007	0.0008	0.0007
Pb [mg/L]	0.00010	0.00009	0.00004	0.00036	0.00029	0.00105	0.00058
Sb [mg/L]	< 0.0009	0.0012	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se [mg/L]	0.00036	0.00103	0.00055	< 0.00004	0.00010	0.00008	0.00032
Si [mg/L]	4.84	4.81	5.39	5.38	5.46	5.05	3.63
Sn [mg/L]	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	0.0450	0.0198	0.0377	0.00049	0.00199	0.00197	0.0119
Ti [mg/L]	0.00178	0.00252	0.00076	0.01053	0.00956	0.00590	0.0123
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.000011	0.000006
U [mg/L]	0.000519	0.000046	0.00160	0.000023	0.000051	0.000040	0.000201
V [mg/L]	0.00084	0.00050	0.00109	0.00095	0.00108	0.00075	0.00177
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	0.002	0.006	0.002

Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750	750
Final pH [no unit]	8.69	7.54	5.53	5.99	5.99	6.18	6.30	8.20
pH [no unit]	7.82	6.79	3.92	5.88	6.08	5.93	5.72	7.24
Conductivity [uS/cm]	101	16	61	23	21	11	10	34
Alkalinity [mg/L as CaCO3]	46	4	< 2	< 2	< 2	< 2	< 2	14
SO4 [mg/L]	4	< 2	< 2	4	6	3	< 2	< 2
F [mg/L]	0.12	0.11	< 0.06	< 0.06	< 0.06	0.06	< 0.06	0.27
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.154	0.128	0.359	0.122	0.006	0.002	0.256	0.200
As [mg/L]	0.0700	0.0029	0.0012	0.0003	0.0004	0.0006	0.0018	0.0031
Ba [mg/L]	0.00432	0.00205	0.00100	0.00685	0.00125	0.00123	0.0118	0.00238
B [mg/L]	0.003	0.007	0.004	0.006	0.003	0.003	0.003	0.003
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	0.000013	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	16.6	0.21	0.08	0.48	0.41	0.08	0.41	3.77
Cd [mg/L]	0.000003	< 0.000003	0.000003	0.000004	0.000011	0.000003	0.000008	0.000005
Co [mg/L]	0.000176	0.000431	0.000066	0.000170	0.000323	0.000121	0.000243	0.000195
Cr [mg/L]	0.00018	0.00022	0.00073	0.00028	< 0.00008	< 0.00008	0.00035	0.00041
Cu [mg/L]	0.0047	0.0016	0.0015	0.0009	0.0004	< 0.0002	0.0016	0.0017
Fe [mg/L]	0.226	0.325	0.246	0.117	< 0.007	< 0.007	0.346	0.280
K [mg/L]	2.36	0.542	0.156	0.638	0.357	0.291	0.048	1.09
Li [mg/L]	0.0006	0.0009	0.0010	0.0002	0.0002	0.0002	0.0001	0.0009
Mg [mg/L]	0.392	0.057	0.046	0.193	0.525	0.080	0.053	0.338
Mn [mg/L]	0.00474	0.0600	0.00196	0.0511	0.0975	0.0247	0.0176	0.0130
Mo [mg/L]	0.00494	0.00085	0.00014	0.00011	0.00007	0.00019	0.00010	0.00360

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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LR Report : **CA19200-OCT19**

Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1
Na [mg/L]	2.05	2.21	1.30	2.30	1.72	1.43	0.75	2.06
Ni [mg/L]	0.0004	0.0009	0.0003	0.0002	0.0007	0.0005	0.0009	0.0003
Pb [mg/L]	0.00013	0.00027	0.00022	0.00012	0.00002	< 0.00001	0.00246	0.00010
Sb [mg/L]	0.0025	0.0010	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se [mg/L]	0.00107	0.00011	0.00008	0.00010	0.00008	0.00005	0.00004	< 0.00004
Si [mg/L]	3.76	5.04	3.92	4.32	3.39	4.53	3.98	4.79
Sn [mg/L]	< 0.00006	< 0.00006	0.00029	0.00009	< 0.00006	< 0.00006	0.00019	< 0.00006
Sr [mg/L]	0.0210	0.00064	0.00037	0.00159	0.00153	0.00054	0.00074	0.00535
Ti [mg/L]	0.00372	0.00502	0.0370	0.00768	0.00009	0.00009	0.0203	0.00708
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.000024	< 0.000005
U [mg/L]	0.00182	0.000023	0.000027	0.000012	0.000002	< 0.000002	0.000021	0.000011
V [mg/L]	0.00140	0.00060	0.00184	0.00025	0.00035	0.00045	0.00143	0.00095
Zn [mg/L]	< 0.002	0.002	0.005	0.029	< 0.002	< 0.002	0.053	< 0.002

Analysis	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Sample Date & Time	N/A	N/A
Sample weight [g]	250	250
Volume D.I. Water [mL]	750	750
Final pH [no unit]	7.49	7.26
pH [no unit]	6.87	6.65
Conductivity [uS/cm]	23	12
Alkalinity [mg/L as CaCO3]	6	3
SO4 [mg/L]	4	2
F [mg/L]	0.08	0.09
Hg [mg/L]	< 0.00001	0.00003
Ag [mg/L]	< 0.00005	< 0.00005
Al [mg/L]	0.354	0.737
As [mg/L]	0.0104	0.0085
Ba [mg/L]	0.0169	0.0179
B [mg/L]	0.004	0.003
Be [mg/L]	0.000020	0.000038
Bi [mg/L]	0.000015	0.000014
Ca [mg/L]	1.69	0.61
Cd [mg/L]	0.000040	0.000039
Co [mg/L]	0.00251	0.00222
Cr [mg/L]	0.00055	0.00092
Cu [mg/L]	0.0076	0.0091
Fe [mg/L]	0.592	0.807
K [mg/L]	0.740	0.318
Li [mg/L]	0.0007	0.0004
Mg [mg/L]	0.270	0.186
Mn [mg/L]	0.0769	0.0588

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Analysis	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Mo [mg/L]	0.00151	0.00083
Na [mg/L]	1.88	1.58
Ni [mg/L]	0.0022	0.0031
Pb [mg/L]	0.00182	0.00187
Sb [mg/L]	0.0012	< 0.0009
Se [mg/L]	0.00018	0.00021
Si [mg/L]	4.64	5.64
Sn [mg/L]	0.00008	< 0.00006
Sr [mg/L]	0.00497	0.00199
Ti [mg/L]	0.0122	0.0388
Tl [mg/L]	0.000006	0.000015
U [mg/L]	0.000259	0.000138
V [mg/L]	0.00291	0.00480
Zn [mg/L]	0.015	0.006

Revised report with QC report.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST — THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0220-NOV19													
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA		
Anions by discrete analyzer - QCBatchID: DIO0240-NOV19													
Sulphate	2	mg/L	<2			1	20	99	80	120	98	75	125
Anions by discrete analyzer - QCBatchID: DIO0266-NOV19													
Sulphate	2	mg/L	<2			ND	20	92	80	120	100	75	125
Anions by discrete analyzer - QCBatchID: DIO0287-NOV19													
Sulphate	2	mg/L	<2			ND	20	103	80	120	107	75	125
Conductivity - QCBatchID: EWL0220-NOV19													
Conductivity	2	uS/cm	< 2			1	20	101	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0258-NOV19													
Fluoride	0.06	mg/L	<0.06			0	10	102	90	110	106	75	125
Inorganics-General - QCBatchID: EHG0012-NOV19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	116	80	120	104	70	130
Inorganics-General - QCBatchID: EHG0015-NOV19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	111	80	120	126	70	130
Metals - QCBatchID: EMS0099-NOV19													
Cobalt	0.000004	mg/L	<0.000004			0	20	99	90	110	98	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0099-NOV19													
Aluminum	0.001	mg/L	<0.001			0	20	99	90	110	115	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	99	90	110	117	70	130
Arsenic	0.0002	mg/L	<0.0002			1	20	100	90	110	102	70	130
Barium	0.00002	mg/L	<0.00002			2	20	99	90	110	107	70	130
Beryllium	0.000007	mg/L	<0.000007			2	20	99	90	110	98	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	97	90	110	85	70	130
Boron	0.002	mg/L	<0.002			1	20	109	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			0	20	101	90	110	101	70	130
Calcium	0.01	mg/L	<0.01			0	20	100	90	110	103	70	130
Chromium	0.00008	mg/L	<0.00008			ND	20	97	90	110	98	70	130
Copper	0.0002	mg/L	<0.0002			1	20	101	90	110	99	70	130
Iron	0.007	mg/L	<0.007			1	20	98	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			2	20	100	90	110	98	70	130
Lithium	0.0001	mg/L	<0.0001			1	20	99	90	110	94	70	130
Magnesium	0.001	mg/L	<0.001			0	20	99	90	110	98	70	130
Manganese	0.00001	mg/L	<0.00001			0	20	98	90	110	100	70	130
Molybdenum	0.00004	mg/L	<0.00004			ND	20	104	90	110	98	70	130

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Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Nickel	0.0001	mg/L	<0.0001			1	20	100	90	110	100	70	130
Potassium	0.003	mg/L	<0.009			0	20	100	90	110	100	70	130
Selenium	0.00004	mg/L	<0.00004			ND	20	101	90	110	99	70	130
Silicon	0.02	mg/L	<0.02			2	20	102	90	110	NV	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	99	90	110	NV	70	130
Sodium	0.01	mg/L	<0.01			1	20	100	90	110	99	70	130
Strontium	0.00002	mg/L	<0.00002			1	20	100	90	110	99	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	99	90	110	95	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	96	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	109	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			4	20	98	90	110	98	70	130
Vanadium	0.00001	mg/L	<0.00001			ND	20	99	90	110	98	70	130
Zinc	0.002	mg/L	<0.002			0	20	102	90	110	111	70	130
pH - QCBatchID: EWL0220-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 31 October 2019
LR Report: **CA19200-OCT19**
Reference: Job# 80018.06

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1	10: 19-TP-5 BS3	11: 19-TP-6 BS1
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	11-Nov-19	08:55	14-Nov-19	09:47	250	250	250	250	250	250
Volume D.I. Water [mL]	11-Nov-19	08:55	14-Nov-19	09:47	750	750	750	750	750	750
Final pH [no unit]	12-Nov-19	07:47	14-Nov-19	09:47	5.74	5.92	7.00	8.95	8.56	7.73
pH [no unit]	13-Nov-19	16:49	14-Nov-19	15:53	6.39	6.81	6.80	7.76	7.85	7.13
Conductivity [uS/cm]	13-Nov-19	16:49	14-Nov-19	15:53	17	27	25	92	111	64
Alkalinity [mg/L as CaCO3]	13-Nov-19	16:49	14-Nov-19	15:53	3	4	5	39	51	12
SO4 [mg/L]	13-Nov-19	10:12	18-Nov-19	16:25	4	3	4	5	4	14
F [mg/L]	15-Nov-19	08:59	15-Nov-19	13:02	< 0.06	< 0.06	0.09	0.11	0.10	0.16
Hg [mg/L]	14-Nov-19	13:34	15-Nov-19	14:43	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Ag [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.428	0.691	0.016	0.088	0.091	0.069
As [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0026	0.0019	0.0010	0.0331	0.0203	0.0037
Ba [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00184	0.00247	0.00075	0.00435	0.00738	0.00557
B [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.005	0.006	0.005	0.005	0.006	0.004
Be [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000010	0.000017	< 0.000007	< 0.000007	< 0.000007	< 0.000007

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Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1	10: 19-TP-5 BS3	11: 19-TP-6 BS1
Bi [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000017	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.22	0.21	0.56	11.5	16.8	6.18
Cd [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000013	0.000009	0.000010	0.000122	0.000017	0.000019
Co [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000171	0.000625	0.000077	0.000892	0.000203	0.000456
Cr [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00113	0.00087	< 0.00008	0.00012	0.00019	0.00013
Cu [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0079	0.0029	0.0006	0.0037	0.0013	0.0022
Fe [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.391	0.412	0.017	0.043	0.111	0.148
K [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.277	0.565	0.577	3.60	2.77	1.93
Li [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0002	0.0003	< 0.0001	0.0033	0.0030	0.0041
Mg [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.083	0.220	0.607	1.52	1.65	1.22
Mn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0342	0.0522	0.0258	0.0256	0.00550	0.199
Mo [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00027	0.00012	0.00147	0.00689	0.00753	0.00392
Na [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	2.35	2.89	2.68	3.32	1.69	2.25
Ni [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0018	0.0011	0.0009	0.0006	0.0004	0.0007
Pb [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00842	0.00024	0.00002	0.00008	0.00010	0.00009
Sb [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.0009	< 0.0009	< 0.0009	0.0010	< 0.0009	0.0012
Se [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00022	0.00020	0.00006	0.00137	0.00036	0.00103
Si [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	3.92	4.22	3.34	4.56	4.84	4.81
Sn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00084	0.00115	0.00122	0.0332	0.0450	0.0198
Ti [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.0633	0.0214	0.00129	0.00082	0.00178	0.00252
Tl [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000016	0.000008	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.000054	0.000091	0.000005	0.000105	0.000519	0.000046
V [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.00437	0.00076	0.00026	0.00105	0.00084	0.00050
Zn [mg/L]	14-Nov-19	19:10	15-Nov-19	16:09	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

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Analysis	13: 19-TP-6 BS3	14: 19-TP-7 BS1	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	250	250	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750	750	750	750
Final pH [no unit]	8.77	7.43	7.51	7.41	7.23	8.69	7.54	5.53	5.99	5.99
pH [no unit]	7.76	6.83	6.80	6.83	7.34	7.82	6.79	3.92	5.88	6.08
Conductivity [uS/cm]	105	12	15	14	43	101	16	61	23	21
Alkalinity [mg/L as CaCO3]	45	4	5	5	18	46	4	< 2	< 2	< 2
SO4 [mg/L]	4	< 2	< 2	< 2	< 2	4	< 2	< 2	4	6
F [mg/L]	0.16	0.19	0.16	0.06	0.11	0.12	0.11	< 0.06	< 0.06	< 0.06
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.055	0.205	0.274	0.167	0.268	0.154	0.128	0.359	0.122	0.006
As [mg/L]	0.0169	0.0046	0.0074	0.0044	0.0068	0.0700	0.0029	0.0012	0.0003	0.0004
Ba [mg/L]	0.00831	0.00258	0.00386	0.00498	0.00654	0.00432	0.00205	0.00100	0.00685	0.00125
B [mg/L]	0.005	0.004	0.003	0.004	0.003	0.003	0.007	0.004	0.006	0.003
Be [mg/L]	< 0.000007	0.000008	0.000009	0.000009	0.000015	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	0.000016	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	15.0	0.11	0.72	0.59	4.96	16.6	0.21	0.08	0.48	0.41
Cd [mg/L]	0.000007	0.000008	0.000008	0.000041	0.000041	0.000003	< 0.000003	0.000003	0.000004	0.000011
Co [mg/L]	0.000095	0.000430	0.000504	0.000493	0.000374	0.000176	0.000431	0.000066	0.000170	0.000323
Cr [mg/L]	< 0.00008	0.00059	0.00034	0.00026	0.00041	0.00018	0.00022	0.00073	0.00028	< 0.00008
Cu [mg/L]	0.0015	0.0016	0.0019	0.0179	0.0148	0.0047	0.0016	0.0015	0.0009	0.0004
Fe [mg/L]	0.054	0.377	0.431	0.407	0.598	0.226	0.325	0.246	0.117	< 0.007
K [mg/L]	3.58	0.347	0.754	0.678	1.10	2.36	0.542	0.156	0.638	0.357
Li [mg/L]	0.0062	0.0004	0.0018	0.0018	0.0003	0.0006	0.0009	0.0010	0.0002	0.0002
Mg [mg/L]	1.18	0.058	0.172	0.100	0.510	0.392	0.057	0.046	0.193	0.525
Mn [mg/L]	0.0152	0.0257	0.0358	0.223	0.0826	0.00474	0.0600	0.00196	0.0511	0.0975
Mo [mg/L]	0.00239	0.00021	0.00039	0.00084	0.00126	0.00494	0.00085	0.00014	0.00011	0.00007
Na [mg/L]	2.09	1.40	1.70	1.45	2.39	2.05	2.21	1.30	2.30	1.72

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Analysis	13: 19-TP-6 BS3	14: 19-TP-7 BS1	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1
Ni [mg/L]	0.0002	0.0005	0.0007	0.0008	0.0007	0.0004	0.0009	0.0003	0.0002	0.0007
Pb [mg/L]	0.00004	0.00036	0.00029	0.00105	0.00058	0.00013	0.00027	0.00022	0.00012	0.00002
Sb [mg/L]	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	0.0025	0.0010	< 0.0009	< 0.0009	< 0.0009
Se [mg/L]	0.00055	< 0.00004	0.00010	0.00008	0.00032	0.00107	0.00011	0.00008	0.00010	0.00008
Si [mg/L]	5.39	5.38	5.46	5.05	3.63	3.76	5.04	3.92	4.32	3.39
Sn [mg/L]	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	0.00029	0.00009	< 0.00006
Sr [mg/L]	0.0377	0.00049	0.00199	0.00197	0.0119	0.0210	0.00064	0.00037	0.00159	0.00153
Ti [mg/L]	0.00076	0.01053	0.00956	0.00590	0.0123	0.00372	0.00502	0.0370	0.00768	0.00009
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	0.000011	0.000006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.00160	0.000023	0.000051	0.000040	0.000201	0.00182	0.000023	0.000027	0.000012	0.000002
V [mg/L]	0.00109	0.00095	0.00108	0.00075	0.00177	0.00140	0.00060	0.00184	0.00025	0.00035
Zn [mg/L]	< 0.002	< 0.002	0.002	0.006	0.002	< 0.002	0.002	0.005	0.029	< 0.002

Analysis	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750
Final pH [no unit]	6.18	6.30	8.20	7.49	7.26
pH [no unit]	5.93	5.72	7.24	6.87	6.65
Conductivity [uS/cm]	11	10	34	23	12
Alkalinity [mg/L as CaCO3]	< 2	< 2	14	6	3
SO4 [mg/L]	3	< 2	< 2	4	2
F [mg/L]	0.06	< 0.06	0.27	0.08	0.09
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00003
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.002	0.256	0.200	0.354	0.737

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Analysis	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
As [mg/L]	0.0006	0.0018	0.0031	0.0104	0.0085
Ba [mg/L]	0.00123	0.0118	0.00238	0.0169	0.0179
B [mg/L]	0.003	0.003	0.003	0.004	0.003
Be [mg/L]	< 0.000007	0.000013	< 0.000007	0.000020	0.000038
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	0.000015	0.000014
Ca [mg/L]	0.08	0.41	3.77	1.69	0.61
Cd [mg/L]	0.000003	0.000008	0.000005	0.000040	0.000039
Co [mg/L]	0.000121	0.000243	0.000195	0.00251	0.00222
Cr [mg/L]	< 0.00008	0.00035	0.00041	0.00055	0.00092
Cu [mg/L]	< 0.0002	0.0016	0.0017	0.0076	0.0091
Fe [mg/L]	< 0.007	0.346	0.280	0.592	0.807
K [mg/L]	0.291	0.048	1.09	0.740	0.318
Li [mg/L]	0.0002	0.0001	0.0009	0.0007	0.0004
Mg [mg/L]	0.080	0.053	0.338	0.270	0.186
Mn [mg/L]	0.0247	0.0176	0.0130	0.0769	0.0588
Mo [mg/L]	0.00019	0.00010	0.00360	0.00151	0.00083
Na [mg/L]	1.43	0.75	2.06	1.88	1.58
Ni [mg/L]	0.0005	0.0009	0.0003	0.0022	0.0031
Pb [mg/L]	< 0.00001	0.00246	0.00010	0.00182	0.00187
Sb [mg/L]	< 0.0009	< 0.0009	< 0.0009	0.0012	< 0.0009
Se [mg/L]	0.00005	0.00004	< 0.00004	0.00018	0.00021
Si [mg/L]	4.53	3.98	4.79	4.64	5.64
Sn [mg/L]	< 0.00006	0.00019	< 0.00006	0.00008	< 0.00006
Sr [mg/L]	0.00054	0.00074	0.00535	0.00497	0.00199
Ti [mg/L]	0.00009	0.0203	0.00708	0.0122	0.0388
Tl [mg/L]	< 0.000005	0.000024	< 0.000005	0.000006	0.000015
U [mg/L]	< 0.000002	0.000021	0.000011	0.000259	0.000138
V [mg/L]	0.00045	0.00143	0.00095	0.00291	0.00480
Zn [mg/L]	< 0.002	0.053	< 0.002	0.015	0.006

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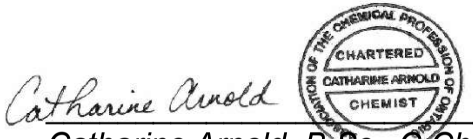

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0220-NOV19													
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA		
Anions by discrete analyzer - QCBatchID: DIO0240-NOV19													
Sulphate	2	mg/L	<2			1	20	99	80	120	98	75	125
Anions by discrete analyzer - QCBatchID: DIO0266-NOV19													
Sulphate	2	mg/L	<2			ND	20	92	80	120	100	75	125
Anions by discrete analyzer - QCBatchID: DIO0287-NOV19													
Sulphate	2	mg/L	<2			ND	20	103	80	120	107	75	125
Conductivity - QCBatchID: EWL0220-NOV19													
Conductivity	2	uS/cm	< 2			1	20	101	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0258-NOV19													
Fluoride	0.06	mg/L	<0.06			0	10	102	90	110	106	75	125
Inorganics-General - QCBatchID: EHG0012-NOV19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	116	80	120	104	70	130
Inorganics-General - QCBatchID: EHG0015-NOV19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	111	80	120	126	70	130
Metals - QCBatchID: EMS0099-NOV19													
Cobalt	0.000004	mg/L	<0.000004			0	20	99	90	110	98	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0099-NOV19													
Aluminum	0.001	mg/L	<0.001			0	20	99	90	110	115	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	99	90	110	117	70	130
Arsenic	0.0002	mg/L	<0.0002			1	20	100	90	110	102	70	130
Barium	0.00002	mg/L	<0.00002			2	20	99	90	110	107	70	130
Beryllium	0.000007	mg/L	<0.000007			2	20	99	90	110	98	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	97	90	110	85	70	130
Boron	0.002	mg/L	<0.002			1	20	109	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			0	20	101	90	110	101	70	130
Calcium	0.01	mg/L	<0.01			0	20	100	90	110	103	70	130
Chromium	0.00008	mg/L	<0.00008			ND	20	97	90	110	98	70	130
Copper	0.0002	mg/L	<0.0002			1	20	101	90	110	99	70	130
Iron	0.007	mg/L	<0.007			1	20	98	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			2	20	100	90	110	98	70	130
Lithium	0.0001	mg/L	<0.0001			1	20	99	90	110	94	70	130
Magnesium	0.001	mg/L	<0.001			0	20	99	90	110	98	70	130
Manganese	0.00001	mg/L	<0.00001			0	20	98	90	110	100	70	130
Molybdenum	0.00004	mg/L	<0.00004			ND	20	104	90	110	98	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Nickel	0.0001	mg/L	<0.0001			1	20	100	90	110	100	70	130
Potassium	0.003	mg/L	<0.009			0	20	100	90	110	100	70	130
Selenium	0.00004	mg/L	<0.00004			ND	20	101	90	110	99	70	130
Silicon	0.02	mg/L	<0.02			2	20	102	90	110	NV	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	99	90	110	NV	70	130
Sodium	0.01	mg/L	<0.01			1	20	100	90	110	99	70	130
Strontium	0.00002	mg/L	<0.00002			1	20	100	90	110	99	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	99	90	110	95	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	96	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	109	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			4	20	98	90	110	98	70	130
Vanadium	0.00001	mg/L	<0.00001			ND	20	99	90	110	98	70	130
Zinc	0.002	mg/L	<0.002			0	20	102	90	110	111	70	130
pH - QCBatchID: EWL0220-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

17-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 31 October 2019
LR Report: **CA19199-OCT19**
Reference: Job# 80018.06

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1	9: 19-TP-5 BS2	10: 19-TP-5 BS3
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.03	0.01	0.01	0.05	0.04	0.03
As [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	17	36	7.3	59	44	43
Al [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	12000	19000	6000	12000	9400	8800
Ba [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	22	36	17	37	41	45
Be [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.20	0.26	0.12	0.16	0.14	0.19
Bi [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	1600	2300	980	18000	15000	9300
Cd [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.05	0.05	0.17	0.12	0.13	0.09
Co [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	6.7	17	6.5	15	12	11
Cr [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	30	55	30	41	39	50
Cu [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	37	52	26	38	30	29
Fe [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	25000	43000	18000	31000	28000	23000
K [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	310	680	340	1000	1100	1100
Li [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	6	14	3	10	10	9
Mg [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5500	10000	3400	8500	6600	6000
Mn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	280	930	530	890	900	730
Mo [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	2.2	2.5	0.9	0.9	1.0	0.8
Ni [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	12	19	8.9	19	18	15
Pb [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	7.0	6.3	3.1	5.0	4.1	3.7
Sb [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5.7	7.6	3.4	31	27	21
Ti [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	1500	1200	510	720	630	670
Tl [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.04	0.06	0.03	0.07	0.07	0.06
U [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.52	0.72	0.29	0.47	0.44	0.59
V [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	64	65	27	61	47	40
Y [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5.7	8.1	4.9	7.8	7.4	7.8
Zn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	39	64	28	47	46	39

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19199-OCT19**

Analysis	11: 19-TP-6 BS1	12: 19-TP-6 BS2	13: 19-TP-6 BS3	14: 19-TP-7 BS1	15: 19-TP-7 BS2	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1	19: 19-TP-10 BS2
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.06	0.05	0.04	0.03	0.05	0.06	0.07	0.05	0.07
As [µg/g]	50	45	35	64	68	71	58	47	43
Al [µg/g]	11000	12000	8300	13000	14000	14000	8600	18000	14000
Ba [µg/g]	48	49	40	45	47	50	54	49	49
Be [µg/g]	0.21	0.21	0.16	0.26	0.22	0.23	0.18	0.26	0.25
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	3500	15000	12000	3000	2900	3100	2700	4500	2700
Cd [µg/g]	0.14	0.20	0.09	0.13	0.10	0.13	0.25	0.11	0.44
Co [µg/g]	17	16	12	19	17	17	14	19	25
Cr [µg/g]	28	67	27	44	33	33	25	88	38
Cu [µg/g]	42	44	30	39	40	41	39	50	54
Fe [µg/g]	32000	36000	23000	35000	37000	37000	28000	42000	37000
K [µg/g]	1300	1500	1000	1200	1200	1300	750	1300	1300
Li [µg/g]	12	15	10	13	11	10	11	15	17
Mg [µg/g]	6800	11000	6200	8700	8500	8600	5500	14000	11000
Mn [µg/g]	500	2600	790	820	570	560	680	620	500
Mo [µg/g]	1.0	0.8	0.6	0.9	0.7	0.7	1.7	1.3	1.3
Ni [µg/g]	24	30	19	25	23	22	23	30	30
Pb [µg/g]	5.8	5.0	4.0	5.0	5.9	5.9	5.8	4.8	7.5
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	11	28	25	10	11	11	8.8	17	8.9
Ti [µg/g]	780	760	570	910	770	820	570	1700	780
Tl [µg/g]	0.10	0.08	0.06	0.08	0.06	0.09	0.09	0.07	0.15
U [µg/g]	1.1	0.72	0.61	0.72	0.49	0.54	0.83	1.1	1.4
V [µg/g]	52	52	38	67	59	63	41	71	67
Y [µg/g]	11	11	7.6	9.9	9.6	9.5	8.5	12	10
Zn [µg/g]	55	58	43	56	61	61	49	61	69

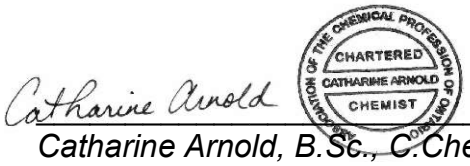
Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	23: 19-TP-13 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.04	0.04	0.02	0.03	< 0.01	0.01	0.02	0.02	0.04	0.03	0.02
As [µg/g]	49	49	20	29	19	27	24	22	23	18	27
Al [µg/g]	14000	10000	14000	8900	14000	14000	11000	9800	11000	10000	14000
Ba [µg/g]	30	48	37	110	43	35	42	54	42	40	51
Be [µg/g]	0.23	0.22	0.22	0.15	0.17	0.21	0.17	0.18	0.16	0.15	0.21
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19000	2400	2200	2500	1700	1400	1300	2000	3400	2500	2700
Cd [µg/g]	0.14	0.15	0.05	0.06	0.03	0.13	0.11	0.07	0.15	0.07	0.11
Co [µg/g]	18	20	8.0	10	15	19	12	8.9	13	14	18
Cr [µg/g]	27	37	34	32	32	35	41	24	35	29	77
Cu [µg/g]	31	36	20	28	24	39	29	32	28	27	47
Fe [µg/g]	43000	33000	35000	25000	41000	33000	26000	25000	30000	27000	31000
K [µg/g]	1300	970	1200	570	460	610	840	650	880	770	880
Li [µg/g]	11	12	10	6	8	7	7	6	7	8	7

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19199-OCT19**

Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	23: 19-TP-13 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Mg [µg/g]	9300	6500	8200	5500	6700	8600	6700	5700	7600	6900	9900
Mn [µg/g]	820	920	520	410	680	1000	1000	420	810	350	440
Mo [µg/g]	1.1	1.2	0.5	1.7	0.6	0.7	0.8	0.5	0.5	0.6	0.8
Ni [µg/g]	15	31	11	14	12	16	15	14	16	17	44
Pb [µg/g]	3.9	6.2	9.8	4.9	6.4	4.5	3.6	4.4	3.8	4.2	4.8
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	39	9.5	9.2	10	7.0	5.9	6.7	7.4	12	8.7	9.3
Ti [µg/g]	960	590	1500	590	1100	1100	990	900	870	740	950
Tl [µg/g]	0.08	0.08	0.04	0.03	0.03	0.05	0.05	0.05	0.05	0.04	0.05
U [µg/g]	0.40	0.86	0.86	0.62	0.38	0.36	0.29	0.35	0.39	0.72	0.57
V [µg/g]	71	43	67	40	73	75	51	48	61	48	60
Y [µg/g]	11	9.5	13	8.5	5.5	7.1	10	8.6	8.5	7.7	7.6
Zn [µg/g]	71	57	57	34	51	52	41	44	44	43	49

Revised report with QC report.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002152764

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19199-OCT19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0071-NOV19													
Mercury	0.05	ug/g	<0.05			ND	20	93	80	120	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0071-NOV19													
Aluminum	3	µg/g	<3			1	20	102	70	130	91	70	130
Antimony	0.8	µg/g	<0.8			ND	20	102	70	130	NV	70	130
Arsenic	0.5	µg/g	<0.5			0	20	99	70	130	119	70	130
Barium	0.01	µg/g	<0.01			1	20	102	70	130	96	70	130
Beryllium	0.02	µg/g	<0.02			4	20	97	70	130	NV	70	130
Bismuth	0.09	µg/g	<0.09			ND	20	97	70	130	NV	70	130
Cadmium	0.02	µg/g	<0.02			ND	20	99	70	130	NV	70	130
Calcium	3	µg/g	<3			1	20	102	70	130	NV	70	130
Chromium	0.5	µg/g	<0.5			1	20	105	70	130	80	70	130
Cobalt	0.01	µg/g	<0.01			1	20	104	70	130	100	70	130
Copper	0.1	µg/g	<0.1			1	20	107	70	130	100	70	130
Iron	3	µg/g	<3			0	20	103	70	130	98	70	130
Lead	0.05	µg/g	<0.05			5	20	98	70	130	111	70	130
Lithium	2	µg/g	<2			2	20	99	70	130	NV	70	130
Magnesium	3	µg/g	<3			0	20	102	70	130	NV	70	130
Manganese	0.1	µg/g	<0.1			1	20	107	70	130	109	70	130
Molybdenum	0.1	µg/g	<0.1			0	20	100	70	130	NV	70	130
Nickel	0.1	µg/g	<0.1			0	20	104	70	130	88	70	130
Potassium	3	µg/g	<3			3	20	99	70	130	NV	70	130
Selenium	0.7	µg/g	<0.7			ND	20	100	70	130	NV	70	130
Silver	0.01	µg/g	<0.01			2	20	94	70	130	113	70	130
Strontium	0.02	µg/g	<0.02			2	20	103	70	130	NV	70	130
Thallium	0.02	µg/g	<0.02			10	20	99	70	130	NV	70	130
Tin	0.5	µg/g	<0.5			ND	20	104	70	130	NV	70	130
Titanium	0.1	µg/g	<0.1			0	20	98	70	130	NV	70	130
Uranium	0.002	µg/g	<0.002			0	20	95	70	130	NV	70	130
Vanadium	1	µg/g	<1			0	20	107	70	130	104	70	130
Yttrium	0.004	µg/g	<0.004			0	20	104	70	130	NV	70	130
Zinc	0.7	µg/g	<0.7			0	20	103	70	130	82	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1,

Phone: 709-730-5046
Fax:

Date Rec. : 19 August 2019
LR Report: **CA14627-AUG19**
Reference: Valentine Gold

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MA-18-281 177033	6: MA-18-281 177047	7: MA-18-281 177067	8: MA-18-281 177081	9: MA-18-281 177119	10: MA-18-281 177138
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	03-Sep-19	07:13	06-Sep-19	16:00	< 0.05	---	---	---	< 0.05	< 0.05
Ag [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.01	0.03	0.01	0.02	0.52	0.02
As [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	4.7	1.2	0.6	< 0.5	0.5	1.0
Al [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	11000	9400	10000	6800	9400	19000
Ba [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	40	8.7	6.4	5.8	36	3.8
Be [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	0.23	0.04	0.05	0.06	0.05	0.27
Bi [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.09	0.26	< 0.09	0.10	0.14	0.12
Ca [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	31000	11000	13000	17000	17000	70000
Cd [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	0.05	< 0.02	< 0.02	< 0.02	1.0	0.03
Co [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	10	16	5.0	2.7	3.4	15
Cr [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	23	1.7	2.4	2.1	1.4	37
Cu [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	1.6	16	6.1	4.2	120	59
Fe [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	22000	31000	29000	17000	20000	30000
K [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	980	310	290	260	1100	210
Li [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	8	3	4	3	3	6
Mg [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	12000	4300	5800	4300	5300	15000
Mn [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	780	300	280	240	230	1200
Mo [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	0.4	3.8	1.2	1.0	2.4	1.5
Ni [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	16	0.3	0.7	0.6	1.0	16
Pb [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	3.0	2.3	1.1	2.2	0.93	1.5
Sb [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.7	1.3	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	40	8.9	9.8	13	8.4	76
Ti [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	310	58	39	17	15	17
Tl [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	0.34	0.068	0.13	0.11	0.16	0.13
V [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	36	2	20	8	5	58
Y [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	5.6	5.0	9.0	7.3	6.7	14
Zn [µg/g]	03-Sep-19	07:13	06-Sep-19	14:38	39	15	8.0	7.9	15	22

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	11: MA-18-281 177158	12: MA-18-281 177179	13: MA-18-281 177208	14: MA-18-281 177251	15: MA-18-278 167645	16: MA-18-278 167678	17: MA-18-278 167699	18: MA-18-278 167710	19: MA-18-278 167730	20: MA-18-278 167749
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	---	---	---	---	---	< 0.05
Ag [µg/g]	0.01	0.05	0.03	0.02	< 0.01	0.01	0.01	0.03	< 0.01	< 0.01
As [µg/g]	< 0.5	0.5	0.7	< 0.5	< 0.5	< 0.5	0.9	1.4	1.0	< 0.5
Al [µg/g]	8200	4700	36000	6700	6700	7100	5900	31000	9900	32000
Ba [µg/g]	7.3	5.2	0.50	11	7.8	2.9	6.5	0.39	5.8	6.0
Be [µg/g]	0.04	0.03	0.03	0.05	0.04	< 0.02	0.03	0.10	0.05	0.04
Bi [µg/g]	< 0.09	< 0.09	< 0.09	0.26	< 0.09	< 0.09	0.13	< 0.09	< 0.09	< 0.09
Ca [µg/g]	11000	36000	30000	12000	9600	5900	17000	34000	29000	72000
Cd [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.03
Co [µg/g]	5.6	0.97	33	2.9	3.2	3.1	8.0	36	6.0	38
Cr [µg/g]	2.9	2.0	16	1.5	1.6	4.4	2.8	62	22	880
Cu [µg/g]	0.7	5.4	160	7.5	< 0.1	0.2	14	51	3.3	< 0.1
Fe [µg/g]	22000	11000	88000	23000	16000	19000	19000	58000	27000	50000
K [µg/g]	320	300	31	440	500	150	150	20	250	48
Li [µg/g]	< 2	< 2	7	< 2	< 2	< 2	< 2	3	< 2	7
Mg [µg/g]	5200	3100	29000	3900	3800	3900	4100	33000	7200	64000
Mn [µg/g]	270	180	1800	430	220	260	360	1400	640	1400
Mo [µg/g]	1.7	1.0	0.4	1.1	1.7	1.3	1.4	0.2	2.5	< 0.1
Ni [µg/g]	0.6	0.6	6.7	0.4	0.4	0.5	1.2	26	7.4	225
Pb [µg/g]	0.80	1.2	0.53	1.6	0.50	1.1	0.79	0.42	0.65	0.79
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	9.3	45	22	11	8.4	5.3	15	25	17	68
Ti [µg/g]	18	26	160	21	13	31	24	1100	33	52
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.14	0.14	0.027	0.064	0.15	0.10	0.055	0.050	0.085	0.010
V [µg/g]	12	6	250	5	7	8	11	160	18	160
Y [µg/g]	8.0	7.1	4.9	4.8	5.0	5.5	5.6	1.7	5.0	1.8
Zn [µg/g]	9.8	4.0	52	16	8.1	16	8.2	71	17	48

Analysis	21: MA-18-280 167753	22: MA-18-280 167779	23: MA-18-280 167792	24: MA-18-280 167815	25: MA-18-280 167852	26: MA-18-280 167890	27: MA-18-280 167924	28: MA-18-280 167946	29: MA-15-051 85430	30: MA-15-051 85441
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	---	---	---	< 0.05	---	< 0.05	< 0.05
Ag [µg/g]	0.02	0.01	0.01	0.02	0.04	0.04	0.04	0.23	0.01	0.01
As [µg/g]	1.1	< 0.5	0.6	0.7	0.6	0.6	0.5	< 0.5	0.8	0.6
Al [µg/g]	27000	6800	39000	4400	8600	34000	4500	3100	36000	13000
Ba [µg/g]	3.9	15	23	11	18	75	23	13	2.9	12
Be [µg/g]	0.05	0.04	0.05	0.04	0.05	0.12	0.04	0.05	0.09	0.05
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	0.12	0.10	0.15	1.0	< 0.09	0.09
Ca [µg/g]	14000	10000	28000	9700	21000	55000	7500	5400	42000	9900
Cd [µg/g]	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	0.03	< 0.02
Co [µg/g]	26	1.8	23	1.9	7.5	18	4.4	1.1	40	6.6
Cr [µg/g]	5.2	5.2	6.0	4.2	3.5	6.5	2.6	2.8	5.8	2.4
Cu [µg/g]	57	< 0.1	0.2	0.3	< 0.1	< 0.1	5.7	23	56	< 0.1
Fe [µg/g]	65000	17000	74000	7300	17000	110000	18000	13000	100000	33000
K [µg/g]	99	400	440	280	400	1100	410	370	31	440
Li [µg/g]	3	< 2	7	< 2	< 2	7	< 2	< 2	17	5

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	21: MA-18-280 167753	22: MA-18-280 167779	23: MA-18-280 167792	24: MA-18-280 167815	25: MA-18-280 167852	26: MA-18-280 167890	27: MA-18-280 167924	28: MA-18-280 167946	29: MA-15-051 85430	30: MA-15-051 85441
Mg [µg/g]	23000	3400	29000	2000	4700	19000	1700	1100	27000	7300
Mn [µg/g]	1200	500	1300	190	490	1800	320	230	1800	390
Mo [µg/g]	0.4	0.4	< 0.1	1.1	0.9	< 0.1	1.1	4.5	0.2	1.0
Ni [µg/g]	6.2	1.0	6.5	0.6	1.0	4.3	0.3	0.3	3.8	0.9
Pb [µg/g]	0.39	0.60	0.32	0.97	0.60	0.55	0.53	2.8	0.84	0.76
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	17	9.3	22	15	15	30	9.3	9.0	32	9.9
Ti [µg/g]	390	37	93	18	22	73	12	6.6	220	30
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.040	0.19	0.042	0.062	0.070	0.085	0.11	0.085	0.026	0.098
V [µg/g]	150	5	110	5	28	130	8	1	420	26
Y [µg/g]	2.1	9.4	3.1	5.6	7.4	12	3.4	3.1	6.0	7.1
Zn [µg/g]	86	25	53	4.7	13	89	7.6	4.1	91	22

Analysis	31: MA-15-051 85455	32: MA-15-051 85476	33: MA-15-051 85509	34: MA-17-216 136251	35: MA-17-216 136252	36: MA-17-216 145217	37: MA-17-216 145241	38: MA-17-216 145260	39: MA-17-216 145277	40: MA-17-216 145319
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	---	< 0.05	< 0.05	---	---	< 0.05	< 0.05	---	< 0.05
Ag [µg/g]	0.01	0.01	< 0.01	0.13	0.09	0.02	0.02	< 0.01	0.09	0.32
As [µg/g]	0.8	1.9	< 0.5	1.2	1.6	3.5	0.5	3.7	3.9	1.7
Al [µg/g]	11000	24000	8100	5200	5000	11000	6200	42000	6700	4200
Ba [µg/g]	4.3	7.8	6.3	32	55	49	34	3.5	14	15
Be [µg/g]	0.11	0.07	0.03	0.14	0.14	0.06	0.07	0.42	0.06	0.04
Bi [µg/g]	< 0.09	< 0.09	< 0.09	0.26	0.17	0.37	0.10	< 0.09	0.26	1.3
Ca [µg/g]	9700	30000	15000	25000	31000	20000	11000	84000	23000	16000
Cd [µg/g]	< 0.02	0.02	< 0.02	0.11	0.09	< 0.02	< 0.02	0.03	0.03	< 0.02
Co [µg/g]	5.5	18	2.7	7.7	10.0	15	3.1	28	4.9	1.6
Cr [µg/g]	2.9	5.2	7.9	9.7	13	1.9	2.9	280	110	78
Cu [µg/g]	0.9	16	< 0.1	100	37	2.4	1.7	< 0.1	13	40
Fe [µg/g]	23000	51000	11000	22000	26000	24000	14000	69000	21000	18000
K [µg/g]	250	290	460	890	840	490	400	69	430	390
Li [µg/g]	4	5	< 2	4	3	4	2	18	< 2	< 2
Mg [µg/g]	5700	17000	5800	11000	12000	5900	3400	37000	3500	1200
Mn [µg/g]	330	980	190	970	1200	480	250	2300	520	370
Mo [µg/g]	1.7	1.8	0.7	0.5	0.3	1.2	1.1	0.4	7.3	2.3
Ni [µg/g]	0.6	4.7	1.4	11	14	1.1	0.9	79	3.1	2.2
Pb [µg/g]	0.66	0.59	0.31	1.9	2.1	0.93	1.5	0.92	10	38
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	12	14	13	44	44	18	15	113	19	21
Ti [µg/g]	21	51	65	310	470	22	10	54	29	15
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.13	0.13	0.050	0.40	0.68	0.13	0.096	0.25	0.11	0.077
V [µg/g]	13	94	7	24	30	16	4	210	7	2
Y [µg/g]	6.1	8.2	6.1	2.5	3.5	8.1	4.1	11	4.7	3.0
Zn [µg/g]	24	36	3.9	34	40	17	4.6	70	16	6.4

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	41: MA-17-216 145344	42: MA-17-216 145358	43: MA-17-216 145372	44: MA-18-267 175013	45: MA-18-267 175037	46: MA-18-267 175085	47: MA-18-267 175127	48: MA-18-267 175143	49: MA-18-267 175178	50: MA-18-267 175199
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	---	---	---	---	---	---	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.02	0.02	0.02	0.04	0.02	0.02	< 0.01	0.03	0.01	0.02
As [µg/g]	0.7	1.1	< 0.5	0.6	0.6	0.5	< 0.5	< 0.5	0.5	0.9
Al [µg/g]	9700	5700	4700	3300	7400	5000	4300	2600	4200	9100
Ba [µg/g]	21	10	9.9	19	13	6.3	8.9	15	10	48
Be [µg/g]	0.05	0.04	0.05	0.03	0.05	0.04	0.07	0.06	0.04	0.16
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.14	< 0.09	0.15	0.11
Ca [µg/g]	7000	13000	9100	14000	9600	20000	43000	8600	14000	10000
Cd [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02
Co [µg/g]	3.8	1.2	1.8	3.6	3.2	2.0	0.71	1.3	1.2	3.6
Cr [µg/g]	110	130	120	120	130	110	73	120	110	130
Cu [µg/g]	1.7	31	17	14	0.6	4.0	< 0.1	12	6.4	4.6
Fe [µg/g]	24000	18000	14000	15000	16000	14000	23000	7100	12000	22000
K [µg/g]	630	220	270	240	310	150	290	190	300	1300
Li [µg/g]	3	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Mg [µg/g]	4600	1900	1600	3600	4500	3800	960	730	1500	3800
Mn [µg/g]	410	540	230	420	330	320	590	150	310	490
Mo [µg/g]	3.1	0.7	3.0	1.1	2.5	0.3	3.2	1.0	2.8	12
Ni [µg/g]	2.7	2.8	2.6	2.9	6.3	2.9	2.0	2.6	2.5	2.7
Pb [µg/g]	0.42	0.62	0.23	0.64	0.28	0.27	0.33	0.26	0.29	1.2
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.7	< 0.5	< 0.5	< 0.5
Sr [µg/g]	7.9	17	8.0	13	12	18	32	11	12	15
Ti [µg/g]	82	23	20	7.3	18	12	9.2	4.0	16	15
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.12	0.10	0.10	0.081	0.13	0.080	0.34	0.18	0.12	0.097
V [µg/g]	5	1	< 1	3	6	7	15	1	2	1
Y [µg/g]	4.6	4.6	5.0	3.1	6.9	5.9	14	4.2	7.7	3.4
Zn [µg/g]	16	13	6.2	6.3	16	12	1.5	1.9	5.2	16

Analysis	51: MA-18-267 175217	52: MA-18-267 175238	53: MA-18-267 175269	54: MA-18-267 175290	55: MA-18-290 178231	56: MA-18-290 178243	57: MA-18-290 178265	58: MA-18-290 178278	59: MA-18-290 178287	60: MA-18-290 178314
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	< 0.05	< 0.05	< 0.05	---	---	---	---
Ag [µg/g]	0.03	0.11	0.04	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.27	< 0.01
As [µg/g]	0.5	< 0.5	17	1.2	0.6	< 0.5	< 0.5	0.6	0.6	1.0
Al [µg/g]	32000	2700	4200	25000	16000	7500	6200	4000	7200	6700
Ba [µg/g]	1.2	18	14	0.64	40	68	75	85	52	141
Be [µg/g]	0.06	0.04	0.05	0.06	0.05	0.06	0.05	0.07	0.07	0.07
Bi [µg/g]	< 0.09	0.85	0.09	< 0.09	< 0.09	< 0.09	0.25	0.51	1.5	0.11
Ca [µg/g]	38000	8000	5900	41000	13000	8000	17000	1000	8100	8300
Cd [µg/g]	< 0.02	< 0.02	0.02	0.04	< 0.02	< 0.02	< 0.02	0.12	< 0.02	< 0.02
Co [µg/g]	32	1.2	1.4	32	5.6	2.4	1.6	8.3	4.2	4.9
Cr [µg/g]	33	140	140	27	81	100	120	59	130	93
Cu [µg/g]	94	1.9	5.4	120	3.6	5.8	7.4	9.2	11	5.6
Fe [µg/g]	86000	8400	14000	89000	37000	15000	16000	24000	21000	19000
K [µg/g]	45	450	360	21	310	450	380	980	310	360
Li [µg/g]	8	< 2	< 2	6	6	3	2	< 2	2	2

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	51: MA-18-267 175217	52: MA-18-267 175238	53: MA-18-267 175269	54: MA-18-267 175290	55: MA-18-290 178231	56: MA-18-290 178243	57: MA-18-290 178265	58: MA-18-290 178278	59: MA-18-290 178287	60: MA-18-290 178314
Mg [µg/g]	24000	540	1000	22000	9400	4400	3900	95	3700	3800
Mn [µg/g]	1600	200	160	1900	760	260	400	18	310	270
Mo [µg/g]	0.8	6.6	1.3	0.2	2.5	1.0	2.5	1.8	6.3	1.7
Ni [µg/g]	9.4	3.1	2.9	4.6	2.7	2.4	3.0	1.5	2.9	2.4
Pb [µg/g]	0.42	0.76	3.5	0.49	0.17	0.17	0.49	3.1	5.4	0.41
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	1.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	42	8.7	9.3	38	9.9	10	16	14	15	13
Ti [µg/g]	150	11	15	340	79	19	16	3.3	15	15
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.10	0.12	0.12	0.036	0.16	0.094	0.052	0.093	0.13	0.10
V [µg/g]	310	2	< 1	290	19	4	6	1	4	6
Y [µg/g]	8.8	4.8	3.1	6.0	9.6	7.0	4.3	1.6	7.7	7.8
Zn [µg/g]	88	0.9	4.7	84	42	16	12	2.4	13	12

Analysis	61: MA-18-290 178331	62: MA-18-290 178355	63: MA-16-081 88987	64: MA-16-081 88994	65: MA-16-081 89000	66: MA-16-081 89013	67: MA-16-081 89020	68: MA-16-081 89029	69: MA-18-287 177828	70: MA-18-287 177831
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	< 0.05	---	< 0.05	< 0.05	---	< 0.05	< 0.05
Ag [µg/g]	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.08	< 0.01	< 0.01	< 0.01	< 0.01
As [µg/g]	< 0.5	< 0.5	1.0	< 0.5	1.8	< 0.5	< 0.5	< 0.5	< 0.5	0.5
Al [µg/g]	8700	9300	10000	6800	36000	4700	9200	3400	5100	6000
Ba [µg/g]	36	99	7.6	14	30	52	21	14	28	45
Be [µg/g]	0.05	0.11	0.05	0.05	0.07	0.07	0.04	0.03	0.05	0.06
Bi [µg/g]	< 0.09	< 0.09	0.10	< 0.09	0.19	0.56	0.16	< 0.09	< 0.09	< 0.09
Ca [µg/g]	5000	12000	16000	11000	21000	16000	11000	12000	15000	13000
Cd [µg/g]	< 0.02	< 0.02	0.05	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02
Co [µg/g]	3.0	2.6	5.7	2.4	24	1.8	4.2	0.93	1.3	3.8
Cr [µg/g]	94	140	88	99	110	100	98	110	130	97
Cu [µg/g]	4.0	3.3	2.9	4.3	80	5.0	3.4	1.8	2.9	3.3
Fe [µg/g]	17000	26000	24000	18000	84000	11000	22000	15000	9400	13000
K [µg/g]	150	450	270	440	300	660	380	290	190	310
Li [µg/g]	4	3	5	2	14	< 2	3	< 2	< 2	2
Mg [µg/g]	5600	5300	6500	3300	22000	1900	4700	1600	3000	4200
Mn [µg/g]	300	440	650	400	1500	320	370	220	270	420
Mo [µg/g]	2.1	2.7	2.4	0.3	1.4	3.8	2.3	0.3	2.7	0.3
Ni [µg/g]	2.2	3.1	2.6	2.2	7.4	2.3	2.4	2.3	2.9	4.8
Pb [µg/g]	0.16	0.24	0.61	0.19	0.21	1.9	0.42	0.19	0.25	0.44
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	8.0	23	11	9.9	13	15	8.0	9.7	14	12
Ti [µg/g]	21	14	43	56	84	12	49	12	19	18
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.088	0.12	0.072	0.087	0.060	0.092	0.058	0.053	0.060	0.10
V [µg/g]	8	4	12	6	190	1	9	8	3	8
Y [µg/g]	5.1	7.4	4.3	3.9	5.9	7.6	6.7	3.7	7.0	7.8
Zn [µg/g]	15	19	31	17	59	5.7	21	4.9	9.3	13

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	71: MA-18-287 177844	72: MA-18-287 177850	73: MA-18-287 177865	74: MA-18-287 177879	75: MA-18-287 177886	76: MA-18-287 177901	77: MA-18-285 177626	78: MA-18-285 177641	79: MA-18-283 177426	80: MA-18-283 177431
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	---	---	< 0.05	---	< 0.05	< 0.05	< 0.05
Ag [µg/g]	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.03	< 0.01	< 0.01	< 0.01	0.02
As [µg/g]	< 0.5	0.5	0.9	< 0.5	0.6	< 0.5	0.6	0.8	0.5	5.2
Al [µg/g]	16000	7400	8000	4500	13000	4300	10000	28000	4200	17000
Ba [µg/g]	63	24	31	16	8.4	31	5.9	4.2	41	38
Be [µg/g]	0.06	0.04	0.05	0.04	0.06	0.05	0.04	0.07	0.07	0.05
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.28	< 0.09	< 0.09	< 0.09	0.50
Ca [µg/g]	9700	18000	17000	11000	9900	7100	6400	9100	26000	52000
Cd [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Co [µg/g]	3.4	2.2	4.6	1.8	4.7	3.5	4.4	20	2.0	15
Cr [µg/g]	120	93	120	130	71	110	94	130	69	46
Cu [µg/g]	2.6	2.9	9.8	4.0	65	12	22	26	2.6	20
Fe [µg/g]	27000	19000	14000	9000	30000	16000	19000	48000	9500	41000
K [µg/g]	260	160	240	190	53	360	180	84	270	73
Li [µg/g]	7	3	3	< 2	5	< 2	< 2	2	< 2	6
Mg [µg/g]	12000	4700	4600	2200	8000	2200	6600	25000	1700	12000
Mn [µg/g]	450	450	440	270	710	210	360	850	480	1300
Mo [µg/g]	2.5	0.2	5.1	1.1	1.6	1.8	2.3	0.6	1.9	0.2
Ni [µg/g]	8.6	2.6	3.7	3.0	1.8	2.5	2.2	26	1.9	2.4
Pb [µg/g]	0.22	0.20	0.25	0.18	0.15	0.33	0.63	0.16	0.44	0.57
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	13	13	21	15	11	7.3	12	16	32	39
Ti [µg/g]	31	17	35	24	120	14	33	510	11	52
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.037	0.048	0.040	0.086	0.15	0.098	0.10	0.092	0.093	0.095
V [µg/g]	36	18	10	9	10	2	8	72	2	99
Y [µg/g]	4.7	7.6	6.4	8.3	11	7.9	5.1	2.0	4.8	11
Zn [µg/g]	30	11	12	6.1	51	7.4	28	91	4.3	38

Analysis	81: MA-18-283 177437	82: MA-18-283 177444	83: MA-18-283 177450	84: MA-18-283 177462	85: MA-18-283 177470	86: MA-18-283 177478	87: MA-18-283 177492	88: MA-18-283 177507	89: MA-16-156 136253	90: MA-16-156 136254
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	< 0.05	---	---	---	< 0.05	< 0.05	< 0.05
Ag [µg/g]	< 0.01	0.01	0.25	0.03	< 0.01	< 0.01	0.04	0.03	0.05	0.05
As [µg/g]	< 0.5	1.4	3.9	< 0.5	< 0.5	0.8	< 0.5	0.5	1.3	1.1
Al [µg/g]	19000	13000	18000	8900	5300	9700	38000	29000	5400	8100
Ba [µg/g]	59	39	68	158	21	16	264	13	51	54
Be [µg/g]	0.10	0.06	0.19	0.05	0.09	0.06	0.08	0.14	0.18	0.20
Bi [µg/g]	0.20	0.62	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.20	0.12	< 0.09
Ca [µg/g]	25000	10000	38000	32000	40000	17000	60000	41000	21000	17000
Cd [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	0.05	0.08	0.04
Co [µg/g]	15	6.0	12	3.9	1.0	4.6	34	20	10	11
Cr [µg/g]	160	81	150	100	110	120	170	67	62	68
Cu [µg/g]	2.5	36	17	4.0	5.2	31	200	4.5	22	14
Fe [µg/g]	32000	30000	38000	25000	24000	23000	74000	53000	22000	29000
K [µg/g]	530	610	580	400	390	300	180	240	1300	1500
Li [µg/g]	8	5	8	3	3	3	15	14	6	7

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	81: MA-18-283 177437	82: MA-18-283 177444	83: MA-18-283 177450	84: MA-18-283 177462	85: MA-18-283 177470	86: MA-18-283 177478	87: MA-18-283 177492	88: MA-18-283 177507	89: MA-16-156 136253	90: MA-16-156 136254
Mg [µg/g]	14000	7600	12000	5400	2200	5400	32000	23000	10000	8900
Mn [µg/g]	780	530	870	990	750	630	1800	1700	1100	740
Mo [µg/g]	2.2	0.6	2.3	0.4	2.7	1.0	0.5	89	1.4	0.4
Ni [µg/g]	38	2.4	41	2.5	2.5	3.7	43	16	18	24
Pb [µg/g]	0.24	0.26	2.1	0.38	0.37	0.26	0.47	0.46	2.1	1.8
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	19	12	54	28	30	23	59	61	37	39
Ti [µg/g]	28	35	19	23	42	23	91	48	400	350
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	0.02
U [µg/g]	0.057	0.078	0.16	0.12	0.14	0.14	0.022	0.20	0.67	0.74
V [µg/g]	40	10	42	6	17	10	280	140	24	36
Y [µg/g]	8.1	5.2	4.8	7.5	8.7	7.4	7.9	10	3.4	3.5
Zn [µg/g]	34	33	50	20	8.3	28	84	75	44	48

Analysis	91: MA-16-156 108736	92: MA-16-156 108748	93: MA-16-156 108761	94: MA-16-156 108777	95: MA-16-156 108804	96: MA-16-156 108806	97: MA-16-156 108817	98: MA-16-156 108832	99: MA-16-156 108851	100: MA-16-156 108866
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	---	---	---	---	---	< 0.05	---	---	---
Ag [µg/g]	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11
As [µg/g]	0.7	< 0.5	0.5	0.7	0.6	0.5	0.7	0.7	0.7	5.2
Al [µg/g]	20000	5500	5600	5700	9000	8700	7900	35000	16000	8800
Ba [µg/g]	43	17	12	13	6.8	9.4	2.7	0.53	6.8	14
Be [µg/g]	0.06	0.06	0.04	0.05	0.04	0.04	0.03	0.04	0.13	0.11
Bi [µg/g]	0.14	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.64
Ca [µg/g]	57000	21000	18000	23000	19000	12000	3300	45000	38000	3500
Cd [µg/g]	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	< 0.02	< 0.02
Co [µg/g]	14	1.2	1.5	3.6	5.1	4.7	2.8	38	12	4.8
Cr [µg/g]	48	92	93	86	120	96	87	61	280	76
Cu [µg/g]	20	3.8	2.8	5.1	3.0	4.7	4.8	53	33	16
Fe [µg/g]	43000	9800	12000	17000	22000	21000	21000	78000	32000	30000
K [µg/g]	390	580	390	360	270	370	110	44	240	490
Li [µg/g]	13	2	2	2	3	3	3	9	6	3
Mg [µg/g]	15000	2900	3200	3500	5000	5300	4400	31000	12000	3500
Mn [µg/g]	940	320	180	270	340	290	360	2000	850	270
Mo [µg/g]	1.2	0.7	2.1	0.8	2.9	0.6	2.0	0.1	2.0	3.8
Ni [µg/g]	6.2	2.2	2.4	2.2	3.3	2.5	2.0	13	51	1.6
Pb [µg/g]	1.3	0.61	0.24	0.36	0.29	0.33	0.27	0.48	0.37	1.2
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	33	17	22	16	14	11	3.7	60	36	8.0
Ti [µg/g]	39	17	11	17	24	26	94	140	37	17
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.14	0.20	0.18	0.079	0.13	0.12	0.098	0.026	0.11	0.11
V [µg/g]	97	6	7	8	16	16	5	270	60	2
Y [µg/g]	7.8	9.3	6.1	6.5	8.7	8.4	5.3	2.4	7.0	2.4
Zn [µg/g]	27	6.0	5.8	4.5	10	12	38	82	21	20

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	101: MA-16-156 108902	102: MA-16-156 108927	103: MA-16-156 108949	104: VL-14-553 54173	105: VL-14-553 54255	106: VL-14-553 54295	107: VL-14-570 55786	108: VL-14-570 55813	109: VL-14-570 55843	110: VL-14-577 56211
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	---	< 0.05	---	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.10	< 0.01	0.07	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
As [µg/g]	0.5	< 0.5	< 0.5	< 0.5	0.8	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Al [µg/g]	38000	4900	4300	8200	7800	8000	3900	16000	7600	9400
Ba [µg/g]	12	26	15	11	13	8.7	17	9.3	16	8.7
Be [µg/g]	0.07	0.07	0.06	0.04	0.06	0.06	0.10	0.06	0.04	0.04
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	66000	17000	9800	20000	16000	19000	16000	25000	16000	17000
Cd [µg/g]	0.08	< 0.02	< 0.02	< 0.02	0.04	0.03	< 0.02	< 0.02	< 0.02	< 0.02
Co [µg/g]	48	1.7	4.5	2.1	3.8	4.2	0.97	14	3.9	6.0
Cr [µg/g]	65	140	110	88	97	87	81	52	120	91
Cu [µg/g]	220	21	8.3	26	14	5.5	2.7	11	3.4	4.6
Fe [µg/g]	79000	9600	13000	20000	22000	21000	10000	54000	23000	26000
K [µg/g]	93	750	470	270	430	380	380	200	420	300
Li [µg/g]	10	< 2	< 2	< 2	< 2	< 2	< 2	3	< 2	2
Mg [µg/g]	39000	2200	1800	4200	3300	4300	2100	13000	3400	4200
Mn [µg/g]	1700	300	220	430	600	550	190	890	380	440
Mo [µg/g]	0.5	1.2	2.7	0.6	2.5	0.3	1.7	0.5	3.1	0.8
Ni [µg/g]	34	3.2	3.0	2.6	2.7	2.2	1.9	2.1	2.8	2.5
Pb [µg/g]	0.60	0.23	0.23	0.18	0.73	0.33	0.29	0.26	0.22	0.26
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	45	14	9.0	17	11	14	17	17	12	11
Ti [µg/g]	110	11	11	35	140	120	10	32	120	30
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.044	0.10	0.11	0.063	0.17	0.20	0.12	0.12	0.086	0.10
V [µg/g]	280	2	2	5	11	10	3	86	6	13
Y [µg/g]	5.3	6.8	7.8	6.2	8.0	8.6	9.8	6.1	6.1	8.8
Zn [µg/g]	81	7.6	8.1	15	27	26	7.0	62	14	18

Analysis	111: VL-14-577 56235	112: VL-14-577 56261	113: VL-11-260 7212	114: VL-11-260 7235	115: VL-11-260 7282	116: VL-11-260 7313	117: VL-11-316 31900	118: VL-11-316 31911	119: VL-11-316 31926	120: VL-11-316 31957
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	0.11	< 0.05	< 0.05	< 0.05	< 0.05	---	---
Ag [µg/g]	0.43	< 0.01	0.03	0.03	0.29	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
As [µg/g]	5.0	< 0.5	5.7	1.5	0.8	0.7	< 0.5	0.7	0.9	2.0
Al [µg/g]	5000	9300	7500	11000	14000	12000	2600	6500	4500	37000
Ba [µg/g]	12	10	27	8.2	6.2	63	173	72	67	3.7
Be [µg/g]	0.04	0.07	0.05	0.06	0.12	0.14	0.09	0.13	0.09	0.24
Bi [µg/g]	1.5	< 0.09	1.6	< 0.09	0.14	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	15000	11000	1600	8100	15000	24000	21000	32000	25000	73000
Cd [µg/g]	0.23	< 0.02	< 0.02	< 0.02	< 0.02	0.11	< 0.02	< 0.02	< 0.02	0.08
Co [µg/g]	4.5	3.7	1.1	5.0	14	17	2.7	4.6	5.7	44
Cr [µg/g]	150	110	65	100	210	67	86	79	56	52
Cu [µg/g]	42	4.2	13	38	23	38	8.9	9.6	3.3	86
Fe [µg/g]	16000	23000	39000	29000	33000	38000	10000	13000	17000	83000
K [µg/g]	420	460	990	400	320	1300	1200	1100	1100	47
Li [µg/g]	< 2	2	3	2	6	5	< 2	3	< 2	14

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	111: VL-14-577 56235	112: VL-14-577 56261	113: VL-11-260 7212	114: VL-11-260 7235	115: VL-11-260 7282	116: VL-11-260 7313	117: VL-11-316 31900	118: VL-11-316 31911	119: VL-11-316 31926	120: VL-11-316 31957
Mg [µg/g]	1600	3500	5600	5500	11000	11000	3000	4300	4900	31000
Mn [µg/g]	440	420	140	490	580	1200	410	460	360	1500
Mo [µg/g]	3.4	0.3	2.0	1.2	3.8	0.2	1.8	0.2	1.2	0.3
Ni [µg/g]	3.9	2.6	1.8	2.2	14	17	2.2	4.0	3.9	32
Pb [µg/g]	2.6	0.27	0.68	0.59	0.54	1.8	1.7	2.6	2.3	1.5
Sb [µg/g]	< 0.8	< 0.8	1.7	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	7.5	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	13	8.6	3.4	11	20	32	75	105	46	199
Ti [µg/g]	24	100	12	160	63	31	21	22	29	180
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.11	0.14	0.56	0.16	0.095	0.96	0.12	0.25	0.13	0.12
V [µg/g]	5	6	< 1	7	80	38	4	8	4	240
Y [µg/g]	4.0	6.7	2.3	5.3	7.3	11	2.7	2.9	2.3	20
Zn [µg/g]	16	13	15	39	37	43	18	40	43	87

Analysis	121: VL-11-316 31975	122: VL-11-316 31982	123: VL-11-316 32002	124: VL-11-316 32029	125: VL-11-316 32041	126: VL-11-316 32048	127: VL-12-382 45299	128: VL-12-382 45319	129: VL-12-382 45338	130: VL-12-382 45357
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	0.07	< 0.05	---	---	< 0.05	---	---	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.03	0.05	0.02	0.06	0.06	< 0.01	< 0.01	0.01	< 0.01	0.01
As [µg/g]	1.4	1.0	0.7	2.1	2.2	2.5	1.0	1.3	0.6	< 0.5
Al [µg/g]	7500	6300	8000	13000	35000	18000	2000	11000	3000	2900
Ba [µg/g]	38	114	54	32	18	62	248	92	221	197
Be [µg/g]	0.17	0.15	0.16	0.10	0.05	0.15	0.08	0.10	0.11	0.10
Bi [µg/g]	0.40	0.23	< 0.09	0.18	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	32000	23000	19000	5200	33000	7200	15000	28000	17000	14000
Cd [µg/g]	0.04	0.02	< 0.02	< 0.02	0.09	0.04	0.04	0.04	0.03	0.03
Co [µg/g]	8.1	5.0	5.3	17	27	14	1.3	12	2.6	1.5
Cr [µg/g]	150	61	71	88	24	75	67	55	97	86
Cu [µg/g]	7.3	8.5	8.8	15	120	3.5	3.5	16	7.0	3.1
Fe [µg/g]	19000	14000	17000	41000	65000	34000	4400	30000	9000	6300
K [µg/g]	630	1400	800	980	280	1400	1000	820	1100	1400
Li [µg/g]	3	2	3	6	21	11	< 2	7	< 2	< 2
Mg [µg/g]	8700	4600	4700	8000	27000	14000	620	8000	2400	960
Mn [µg/g]	610	370	350	400	1200	780	460	870	590	480
Mo [µg/g]	2.8	0.2	1.5	0.3	0.6	< 0.1	1.4	0.2	1.9	0.2
Ni [µg/g]	27	3.7	4.3	19	13	28	1.8	3.7	2.9	1.8
Pb [µg/g]	5.8	2.6	1.7	1.6	0.98	1.1	3.8	2.7	2.2	4.2
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	112	62	57	18	40	20	37	88	69	55
Ti [µg/g]	21	45	47	110	88	280	9.8	49	18	27
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.15	0.17	0.24	1.1	0.050	0.59	0.080	0.083	0.37	0.071
V [µg/g]	16	8	10	42	150	41	< 1	90	4	1
Y [µg/g]	3.5	2.7	2.6	10	2.8	6.0	2.9	5.0	3.1	2.7
Zn [µg/g]	32	33	41	44	91	69	13	38	19	21

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Analysis	131: VL-12-382 45375	132: VL-12-382 45412	133: VL-12-382 45491	134: VL-12-382 45493	135: VL-12-382 45499	136: VL-11-306 13289	137: VL-11-306 13316	138: VL-11-306 13370	139: VL-11-306 13413	140: VL-11-306 13441
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	< 0.05	< 0.05	< 0.05	< 0.05	---	< 0.05	---	< 0.05	< 0.05
Ag [µg/g]	0.02	0.05	0.15	0.04	< 0.01	0.02	< 0.01	< 0.01	< 0.01	0.09
As [µg/g]	< 0.5	2.7	5.1	3.4	3.4	0.9	0.8	4.7	2.9	5.1
Al [µg/g]	3200	4900	39000	22000	14000	2600	2900	3300	4200	2700
Ba [µg/g]	77	32	12	50	47	129	138	199	128	52
Be [µg/g]	0.16	0.10	0.16	0.17	0.15	0.08	0.11	0.10	0.13	0.12
Bi [µg/g]	< 0.09	0.30	0.33	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.85
Ca [µg/g]	23000	19000	50000	9200	4400	12000	13000	16000	17000	11000
Cd [µg/g]	< 0.02	0.11	0.08	0.03	< 0.02	< 0.02	0.03	< 0.02	< 0.02	1.7
Co [µg/g]	4.2	6.1	41	19	14	0.95	1.1	3.6	2.4	2.8
Cr [µg/g]	68	59	69	53	75	98	100	84	70	120
Cu [µg/g]	36	31	80	33	15	6.1	5.2	11	39	19
Fe [µg/g]	11000	18000	80000	42000	25000	4500	5300	9800	9900	11000
K [µg/g]	1300	680	270	1300	1100	1300	1200	1300	940	730
Li [µg/g]	< 2	< 2	21	15	11	< 2	< 2	< 2	2	< 2
Mg [µg/g]	3000	5900	33000	17000	12000	600	910	4100	1700	2100
Mn [µg/g]	530	470	1300	860	820	500	590	510	460	340
Mo [µg/g]	1.5	0.1	1.6	< 0.1	1.3	0.3	2.2	0.2	1.5	4.7
Ni [µg/g]	1.9	4.1	33	21	23	2.2	2.3	5.4	2.1	3.0
Pb [µg/g]	4.4	4.0	2.5	1.0	0.98	2.3	2.5	3.8	1.7	1.9
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	72	49	85	35	22	45	50	62	63	33
Ti [µg/g]	46	45	410	250	360	12	26	19	16	27
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.40	0.26	0.17	0.49	0.53	0.11	0.31	0.060	0.27	0.21
V [µg/g]	3	9	180	55	36	< 1	< 1	4	5	3
Y [µg/g]	4.3	2.4	8.6	5.8	3.7	2.1	2.5	1.9	2.6	1.7
Zn [µg/g]	45	41	120	70	61	9.9	21	15	34	310

Analysis	141: VL-11-306 13451	142: VL-11-306 13467	143: VL-10-202 2256	144: VL-10-202 2303	145: VL-10-202 2335	146: VL-10-202 2346	147: VL-11-357 42837	148: VL-11-357 42843	149: VL-11-357 42852	150: VL-11-357 42858
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	---	---	---	< 0.05	---	---	< 0.05	---	< 0.05
Ag [µg/g]	0.02	< 0.01	< 0.01	0.35	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
As [µg/g]	4.0	6.0	1.9	1.4	1.6	2.8	2.4	4.2	0.6	2.5
Al [µg/g]	26000	12000	3800	4600	4500	12000	7300	31000	7600	17000
Ba [µg/g]	68	41	250	31	91	16	39	3.7	20	50
Be [µg/g]	0.16	0.12	0.07	0.09	0.15	0.11	0.19	0.30	0.13	0.12
Bi [µg/g]	< 0.09	< 0.09	< 0.09	0.97	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	65000	5000	17000	20000	13000	6400	25000	55000	22000	8200
Cd [µg/g]	0.14	< 0.02	< 0.02	0.05	0.02	0.03	0.06	0.12	< 0.02	< 0.02
Co [µg/g]	33	12	3.5	4.3	3.9	13	4.3	37	5.8	16
Cr [µg/g]	81	50	55	63	120	37	81	110	44	52
Cu [µg/g]	63	0.7	17	6.7	12	1.2	6.0	58	3.8	0.4
Fe [µg/g]	61000	23000	13000	12000	11000	25000	16000	79000	17000	36000
K [µg/g]	1000	1000	830	570	950	580	640	54	460	1000
Li [µg/g]	9	11	< 2	< 2	< 2	9	3	10	3	11

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Lakefield - Ontario - KOL 2HO
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Analysis	141: VL-11-306 13451	142: VL-11-306 13467	143: VL-10-202 2256	144: VL-10-202 2303	145: VL-10-202 2335	146: VL-10-202 2346	147: VL-11-357 42837	148: VL-11-357 42843	149: VL-11-357 42852	150: VL-11-357 42858
Mg [µg/g]	25000	9900	3100	3100	2500	9100	4700	29000	5200	12000
Mn [µg/g]	1100	540	320	340	280	730	440	1300	400	740
Mo [µg/g]	0.8	< 0.1	1.2	0.2	2.7	9.0	3.5	1.5	1.3	0.2
Ni [µg/g]	24	19	2.6	3.5	4.4	20	4.2	28	6.4	29
Pb [µg/g]	2.5	1.0	1.3	3.4	1.2	1.0	4.0	3.5	2.5	0.91
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	86	19	37	59	56	14	108	139	53	21
Ti [µg/g]	860	320	33	37	28	340	49	310	60	150
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.10	0.45	0.12	0.17	0.24	0.52	0.24	0.18	0.29	0.69
V [µg/g]	150	31	6	7	4	35	8	250	18	45
Y [µg/g]	17	3.7	2.0	2.2	2.6	6.9	3.2	20	2.8	8.5
Zn [µg/g]	83	50	36	25	14	54	43	97	41	65

Analysis	151: VL-11-357 42862	152: VL-11-253 6875	153: VE-11-001 60007	154: VE-11-001 60031	155: VE-11-001 60046	156: VE-11-001 60064	157: VE-11-001 60095	158: VE-11-001 60117	159: VE-11-001 60147	160: VE-11-001 60177
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	---	< 0.05	< 0.05	---	< 0.05	< 0.05	< 0.05	---	< 0.05	---
Ag [µg/g]	< 0.01	< 0.01	< 0.01	0.01	0.04	< 0.01	< 0.01	0.13	0.03	0.01
As [µg/g]	3.1	0.7	1.0	0.9	1.9	1.2	0.6	6.7	1.0	0.7
Al [µg/g]	14000	6000	12000	6400	18000	3300	3500	11000	27000	5300
Ba [µg/g]	33	98	9.2	9.0	4.4	14	5.9	6.3	17	33
Be [µg/g]	0.09	0.12	0.04	0.05	0.19	0.06	0.05	0.08	0.07	0.05
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	0.20	0.24	0.45	0.92	< 0.09	0.14
Ca [µg/g]	12000	26000	15000	24000	25000	5100	8500	11000	60000	9600
Cd [µg/g]	0.05	< 0.02	< 0.02	0.07	< 0.02	0.02	0.03	0.06	0.08	< 0.02
Co [µg/g]	13	5.5	8.4	11	13	1.6	0.86	12	30	1.9
Cr [µg/g]	69	51	96	57	68	120	72	66	190	100
Cu [µg/g]	0.8	3.2	40	62	38	30	12	190	47	33
Fe [µg/g]	27000	18000	30000	31000	43000	12000	10000	34000	57000	16000
K [µg/g]	690	1000	270	250	160	470	250	240	480	540
Li [µg/g]	10	2	< 2	< 2	4	< 2	< 2	3	11	< 2
Mg [µg/g]	13000	5600	7400	8500	13000	1100	1300	6800	32000	2300
Mn [µg/g]	1100	530	670	720	850	230	400	720	1500	460
Mo [µg/g]	1.1	0.2	2.9	5.8	1.3	2.6	2.3	1.7	0.6	0.7
Ni [µg/g]	21	3.9	4.6	4.8	7.9	2.8	1.8	13	50	2.7
Pb [µg/g]	1.1	1.4	0.19	0.39	0.41	0.38	0.68	0.55	0.86	0.32
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	17	82	9.6	20	34	5.3	9.2	9.0	63	7.5
Ti [µg/g]	270	47	30	20	72	13	14	39	66	47
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.50	0.19	0.32	0.20	0.14	0.21	0.28	0.14	0.078	0.11
V [µg/g]	45	12	39	28	110	2	1	12	140	3
Y [µg/g]	6.1	2.8	5.9	4.1	4.9	2.6	4.2	5.8	4.8	5.1
Zn [µg/g]	60	46	31	25	42	8.0	12	38	84	20

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	161: VE-11-001 60201	162: VE-11-001 60221	163: VE-13-008 64142	164: VE-13-008 64177	165: VE-13-008 64225	166: VE-13-008 64253	167: VGD-14-037 69435	168: VGD-14-037 69454	169: VGD-14-037 69474
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	---	---	< 0.05	---	< 0.05	< 0.05	---	< 0.05
Ag [µg/g]	< 0.01	< 0.01	< 0.01	0.01	1.5	0.09	0.01	0.09	0.02
As [µg/g]	0.9	0.5	< 0.5	< 0.5	37	1.1	1.1	0.8	2.0
Al [µg/g]	4500	4500	7300	5100	5500	4100	33000	1500	22000
Ba [µg/g]	14	20	10	11	10	2.9	4.4	12	20
Be [µg/g]	0.04	0.04	0.04	0.05	0.07	0.04	0.13	0.04	0.25
Bi [µg/g]	0.10	< 0.09	< 0.09	< 0.09	5.0	3.1	0.28	3.1	0.30
Ca [µg/g]	12000	10000	9300	11000	10000	7100	47000	7800	61000
Cd [µg/g]	0.02	< 0.02	< 0.02	0.03	0.11	0.03	0.06	0.03	0.03
Co [µg/g]	2.1	3.0	2.6	4.5	3.1	0.98	33	1.1	35
Cr [µg/g]	110	110	140	110	140	110	50	130	450
Cu [µg/g]	9.2	11	4.4	24	120	190	55	6.8	38
Fe [µg/g]	14000	11000	16000	13000	37000	12000	83000	8900	62000
K [µg/g]	390	490	260	350	430	98	85	340	600
Li [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	12	< 2	8
Mg [µg/g]	2000	2100	4200	2300	2400	1500	28000	250	40000
Mn [µg/g]	560	280	480	350	360	350	1900	340	1400
Mo [µg/g]	2.4	0.3	2.9	1.0	3.4	3.2	0.7	0.9	0.8
Ni [µg/g]	3.2	3.2	3.5	3.5	5.0	2.7	17	3.1	99
Pb [µg/g]	0.29	0.27	0.17	0.23	1.0	0.70	0.64	2.6	1.2
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	1.0	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	7.9	12	9.7	14	11	8.3	34	7.5	77
Ti [µg/g]	21	13	26	16	26	15	84	11	52
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.15	0.11	0.057	0.19	0.042	0.094	0.31	0.078	1.2
V [µg/g]	6	9	6	10	2	2	270	< 1	150
Y [µg/g]	5.6	3.9	5.0	4.1	3.7	2.0	6.2	3.6	5.7
Zn [µg/g]	21	7.7	17	9.3	10	9.8	120	1.4	85

Analysis	170: VGD-14-037 69509	171: VGD-14-028 68844	172: VGD-14-028 68846
Sample Date & Time	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	---
Ag [µg/g]	0.02	< 0.01	0.04
As [µg/g]	0.6	1.0	1.5
Al [µg/g]	4300	22000	21000
Ba [µg/g]	11	5.7	7.3
Be [µg/g]	0.07	0.08	0.09
Bi [µg/g]	0.18	0.32	0.10
Ca [µg/g]	7600	79000	28000
Cd [µg/g]	< 0.02	0.20	0.06
Co [µg/g]	2.6	8.6	25
Cr [µg/g]	130	69	51
Cu [µg/g]	9.5	16	59
Fe [µg/g]	15000	67000	58000
K [µg/g]	360	260	200
Li [µg/g]	< 2	5	5

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Analysis	170: VGD-14-037 69509	171: VGD-14-028 68844	172: VGD-14-028 68846
Mg [µg/g]	1200	22000	18000
Mn [µg/g]	310	3100	1100
Mo [µg/g]	0.6	1.7	0.3
Ni [µg/g]	4.2	14	8.1
Pb [µg/g]	0.34	0.70	0.85
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Sr [µg/g]	7.1	52	28
Ti [µg/g]	37	91	79
Tl [µg/g]	< 0.02	< 0.02	< 0.02
U [µg/g]	0.14	0.096	0.26
V [µg/g]	1	81	170
Y [µg/g]	4.8	8.5	3.7
Zn [µg/g]	9.3	87	57

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN LIMS OnLine

0002145418

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14627-AUG19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0210-AUG19													
Mercury	0.05	ug/g	<0.05			ND	20	103	80	120	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0210-AUG19													
Aluminum	3	µg/g	<3			3	20	96	70	130	109	70	130
Antimony	0.8	µg/g	<0.8			ND	20	102	70	130	NV	70	130
Arsenic	0.5	µg/g	<0.5			4	20	96	70	130	107	70	130
Barium	0.01	µg/g	<0.01			1	20	106	70	130	95	70	130
Beryllium	0.02	µg/g	<0.02			4	20	95	70	130	NV	70	130
Bismuth	0.09	µg/g	<0.09			ND	20	100	70	130	NV	70	130
Cadmium	0.02	µg/g	<0.02			10	20	96	70	130	NV	70	130
Calcium	3	µg/g	<3			0	20	103	70	130	NV	70	130
Chromium	0.5	µg/g	<0.5			3	20	101	70	130	88	70	130
Cobalt	0.01	µg/g	<0.01			2	20	100	70	130	107	70	130
Copper	0.1	µg/g	<0.1			31	20	102	70	130	106	70	130
Iron	3	µg/g	<3			4	20	103	70	130	110	70	130
Lead	0.05	µg/g	<0.05			2	20	100	70	130	NV	70	130
Lithium	2	µg/g	<2			1	20	100	70	130	NV	70	130
Magnesium	3	µg/g	<3			3	20	109	70	130	NV	70	130
Manganese	0.1	µg/g	<0.1			0	20	99	70	130	118	70	130
Molybdenum	0.1	µg/g	<0.1			0	20	95	70	130	NV	70	130
Nickel	0.1	µg/g	<0.1			1	20	99	70	130	95	70	130
Potassium	3	µg/g	<3			3	20	110	70	130	NV	70	130
Selenium	0.7	µg/g	<0.7			ND	20	98	70	130	NV	70	130
Silver	0.01	µg/g	<0.01			ND	20	94	70	130	112	70	130
Strontium	0.02	µg/g	<0.02			1	20	100	70	130	NV	70	130
Thallium	0.02	µg/g	<0.02			ND	20	105	70	130	NV	70	130
Tin	0.5	µg/g	<0.5			ND	20	98	70	130	NV	70	130
Titanium	0.1	µg/g	<0.1			3	20	100	70	130	NV	70	130
Uranium	0.002	µg/g	<0.002			5	20	103	70	130	NV	70	130
Vanadium	1	µg/g	<1			6	20	100	70	130	113	70	130
Yttrium	0.004	µg/g	<0.004			1	20	99	70	130	NV	70	130
Zinc	0.7	µg/g	<0.7			1	20	98	70	130	87	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 31 October 2019
LR Report: **CA19199-OCT19**
Reference: Job# 80018.06

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: 19-TP-1	6: 19-TP-2	7: 19-TP-3	8: 19-TP-5 BS1	9: 19-TP-5 BS2	10: 19-TP-5 BS3
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.03	0.01	0.01	0.05	0.04	0.03
As [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	17	36	7.3	59	44	43
Al [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	12000	19000	6000	12000	9400	8800
Ba [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	22	36	17	37	41	45
Be [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.20	0.26	0.12	0.16	0.14	0.19
Bi [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	1600	2300	980	18000	15000	9300
Cd [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.05	0.05	0.17	0.12	0.13	0.09
Co [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	6.7	17	6.5	15	12	11
Cr [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	30	55	30	41	39	50
Cu [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	37	52	26	38	30	29
Fe [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	25000	43000	18000	31000	28000	23000
K [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	310	680	340	1000	1100	1100
Li [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	6	14	3	10	10	9
Mg [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5500	10000	3400	8500	6600	6000
Mn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	280	930	530	890	900	730
Mo [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	2.2	2.5	0.9	0.9	1.0	0.8
Ni [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	12	19	8.9	19	18	15
Pb [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	7.0	6.3	3.1	5.0	4.1	3.7
Sb [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5.7	7.6	3.4	31	27	21
Ti [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	1500	1200	510	720	630	670
Tl [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.04	0.06	0.03	0.07	0.07	0.06
U [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	0.52	0.72	0.29	0.47	0.44	0.59
V [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	64	65	27	61	47	40
Y [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	5.7	8.1	4.9	7.8	7.4	7.8
Zn [µg/g]	11-Nov-19	14:37	12-Nov-19	11:42	39	64	28	47	46	39

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19199-OCT19**

Analysis	11: 19-TP-6 BS1	12: 19-TP-6 BS2	13: 19-TP-6 BS3	14: 19-TP-7 BS1	15: 19-TP-7 BS2	16: 19-TP-7 BS3	17: 19-TP-9 BS1	18: 19-TP-10 BS1	19: 19-TP-10 BS2
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.06	0.05	0.04	0.03	0.05	0.06	0.07	0.05	0.07
As [µg/g]	50	45	35	64	68	71	58	47	43
Al [µg/g]	11000	12000	8300	13000	14000	14000	8600	18000	14000
Ba [µg/g]	48	49	40	45	47	50	54	49	49
Be [µg/g]	0.21	0.21	0.16	0.26	0.22	0.23	0.18	0.26	0.25
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	3500	15000	12000	3000	2900	3100	2700	4500	2700
Cd [µg/g]	0.14	0.20	0.09	0.13	0.10	0.13	0.25	0.11	0.44
Co [µg/g]	17	16	12	19	17	17	14	19	25
Cr [µg/g]	28	67	27	44	33	33	25	88	38
Cu [µg/g]	42	44	30	39	40	41	39	50	54
Fe [µg/g]	32000	36000	23000	35000	37000	37000	28000	42000	37000
K [µg/g]	1300	1500	1000	1200	1200	1300	750	1300	1300
Li [µg/g]	12	15	10	13	11	10	11	15	17
Mg [µg/g]	6800	11000	6200	8700	8500	8600	5500	14000	11000
Mn [µg/g]	500	2600	790	820	570	560	680	620	500
Mo [µg/g]	1.0	0.8	0.6	0.9	0.7	0.7	1.7	1.3	1.3
Ni [µg/g]	24	30	19	25	23	22	23	30	30
Pb [µg/g]	5.8	5.0	4.0	5.0	5.9	5.9	5.8	4.8	7.5
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	11	28	25	10	11	11	8.8	17	8.9
Ti [µg/g]	780	760	570	910	770	820	570	1700	780
Tl [µg/g]	0.10	0.08	0.06	0.08	0.06	0.09	0.09	0.07	0.15
U [µg/g]	1.1	0.72	0.61	0.72	0.49	0.54	0.83	1.1	1.4
V [µg/g]	52	52	38	67	59	63	41	71	67
Y [µg/g]	11	11	7.6	9.9	9.6	9.5	8.5	12	10
Zn [µg/g]	55	58	43	56	61	61	49	61	69

Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	23: 19-TP-13 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.04	0.04	0.02	0.03	< 0.01	0.01	0.02	0.02	0.04	0.03	0.02
As [µg/g]	49	49	20	29	19	27	24	22	23	18	27
Al [µg/g]	14000	10000	14000	8900	14000	14000	11000	9800	11000	10000	14000
Ba [µg/g]	30	48	37	110	43	35	42	54	42	40	51
Be [µg/g]	0.23	0.22	0.22	0.15	0.17	0.21	0.17	0.18	0.16	0.15	0.21
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19000	2400	2200	2500	1700	1400	1300	2000	3400	2500	2700
Cd [µg/g]	0.14	0.15	0.05	0.06	0.03	0.13	0.11	0.07	0.15	0.07	0.11
Co [µg/g]	18	20	8.0	10	15	19	12	8.9	13	14	18
Cr [µg/g]	27	37	34	32	32	35	41	24	35	29	77
Cu [µg/g]	31	36	20	28	24	39	29	32	28	27	47
Fe [µg/g]	43000	33000	35000	25000	41000	33000	26000	25000	30000	27000	31000
K [µg/g]	1300	970	1200	570	460	610	840	650	880	770	880
Li [µg/g]	11	12	10	6	8	7	7	6	7	8	7

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
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LR Report : **CA19199-OCT19**

Analysis	20: 19-TP-10 BS3	21: 19-TP-11 BS1	22: 19-TP-12 BS1	23: 19-TP-13 BS1	24: 19-TP-15 BS1	25: 19-TP-16 BS1	26: 19-TP-16 BS2	27: 19-TP-17 BS1	28: 19-TP-20 BS1	29: 19-TP-21 BS1	30: 19-TP-22 BS1
Mg [µg/g]	9300	6500	8200	5500	6700	8600	6700	5700	7600	6900	9900
Mn [µg/g]	820	920	520	410	680	1000	1000	420	810	350	440
Mo [µg/g]	1.1	1.2	0.5	1.7	0.6	0.7	0.8	0.5	0.5	0.6	0.8
Ni [µg/g]	15	31	11	14	12	16	15	14	16	17	44
Pb [µg/g]	3.9	6.2	9.8	4.9	6.4	4.5	3.6	4.4	3.8	4.2	4.8
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	39	9.5	9.2	10	7.0	5.9	6.7	7.4	12	8.7	9.3
Ti [µg/g]	960	590	1500	590	1100	1100	990	900	870	740	950
Tl [µg/g]	0.08	0.08	0.04	0.03	0.03	0.05	0.05	0.05	0.05	0.04	0.05
U [µg/g]	0.40	0.86	0.86	0.62	0.38	0.36	0.29	0.35	0.39	0.72	0.57
V [µg/g]	71	43	67	40	73	75	51	48	61	48	60
Y [µg/g]	11	9.5	13	8.5	5.5	7.1	10	8.6	8.5	7.7	7.6
Zn [µg/g]	71	57	57	34	51	52	41	44	44	43	49

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LMS

0002145266

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19199-OCT19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0071-NOV19													
Mercury	0.05	ug/g	<0.05			ND	20	93	80	120	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0071-NOV19													
Aluminum	3	µg/g	<3			1	20	102	70	130	91	70	130
Antimony	0.8	µg/g	<0.8			ND	20	102	70	130	NV	70	130
Arsenic	0.5	µg/g	<0.5			0	20	99	70	130	119	70	130
Barium	0.01	µg/g	<0.01			1	20	102	70	130	96	70	130
Beryllium	0.02	µg/g	<0.02			4	20	97	70	130	NV	70	130
Bismuth	0.09	µg/g	<0.09			ND	20	97	70	130	NV	70	130
Cadmium	0.02	µg/g	<0.02			ND	20	99	70	130	NV	70	130
Calcium	3	µg/g	<3			1	20	102	70	130	NV	70	130
Chromium	0.5	µg/g	<0.5			1	20	105	70	130	80	70	130
Cobalt	0.01	µg/g	<0.01			1	20	104	70	130	100	70	130
Copper	0.1	µg/g	<0.1			1	20	107	70	130	100	70	130
Iron	3	µg/g	<3			0	20	103	70	130	98	70	130
Lead	0.05	µg/g	<0.05			5	20	98	70	130	111	70	130
Lithium	2	µg/g	<2			2	20	99	70	130	NV	70	130
Magnesium	3	µg/g	<3			0	20	102	70	130	NV	70	130
Manganese	0.1	µg/g	<0.1			1	20	107	70	130	109	70	130
Molybdenum	0.1	µg/g	<0.1			0	20	100	70	130	NV	70	130
Nickel	0.1	µg/g	<0.1			0	20	104	70	130	88	70	130
Potassium	3	µg/g	<3			3	20	99	70	130	NV	70	130
Selenium	0.7	µg/g	<0.7			ND	20	100	70	130	NV	70	130
Silver	0.01	µg/g	<0.01			2	20	94	70	130	113	70	130
Strontium	0.02	µg/g	<0.02			2	20	103	70	130	NV	70	130
Thallium	0.02	µg/g	<0.02			10	20	99	70	130	NV	70	130
Tin	0.5	µg/g	<0.5			ND	20	104	70	130	NV	70	130
Titanium	0.1	µg/g	<0.1			0	20	98	70	130	NV	70	130
Uranium	0.002	µg/g	<0.002			0	20	95	70	130	NV	70	130
Vanadium	1	µg/g	<1			0	20	107	70	130	104	70	130
Yttrium	0.004	µg/g	<0.004			0	20	104	70	130	NV	70	130
Zinc	0.7	µg/g	<0.7			0	20	103	70	130	82	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

10-June-2020

Marathon Gold Corp
Attn : James Powell

Date Rec. : 26 November 2019
LR Report: **CA14985-NOV19**

Copy: #2

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO-Comp	6: LLGO-Comp
Sample Date & Time					NA	NA
Paste pH [no unit]	03-Dec-19	09:56	06-Dec-19	14:09	9.16	9.39
Fizz Rate [no unit]	03-Dec-19	09:56	06-Dec-19	14:09	3	3
Sample weight [g]	03-Dec-19	09:56	06-Dec-19	14:09	2.00	2.03
HCl_add [mL]	04-Dec-19	08:06	06-Dec-19	14:09	20.00	46.00
HCl [Normality]	03-Dec-19	09:56	06-Dec-19	14:09	0.10	0.10
NaOH [Normality]	03-Dec-19	09:56	06-Dec-19	14:09	0.10	0.10
Vol NaOH to pH=8.3 [mL]	04-Dec-19	10:26	06-Dec-19	14:09	6.28	19.76
Final pH [no unit]	04-Dec-19	10:26	06-Dec-19	14:09	1.78	1.50
NP [t CaCO3/1000 t]	04-Dec-19	10:26	06-Dec-19	14:09	34.3	64.6
AP [t CaCO3/1000 t]	06-Dec-19	14:09	06-Dec-19	14:09	18.8	7.19
Net NP [t CaCO3/1000 t]	06-Dec-19	14:08	06-Dec-19	14:09	15.6	57.4
NP/AP [ratio]	06-Dec-19	14:09	06-Dec-19	14:09	1.83	8.99
S [%]	02-Dec-19	11:08	03-Dec-19	09:16	0.589	0.266
Acid Leachable SO4-S [%]	03-Dec-19	09:16	03-Dec-19	09:16	< 0.02	0.04
Sulphide [%]	02-Dec-19	15:32	03-Dec-19	09:16	0.60	0.23
C [%]	02-Dec-19	11:07	03-Dec-19	08:56	0.430	0.843
CO3 [%]	02-Dec-19	14:59	03-Dec-19	08:56	1.73	3.68
TIC [%]	02-Dec-19	15:05	03-Dec-19	08:56	0.347	0.736

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

SMTInet

0002145239

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14985-NOV19**

_____

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

LR Report : **CA14985-NOV19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Carbon/Sulphur - QCBatchID: ECS0002-DEC19													
Carbonate	0.025	%	< 0.025			0	20				90	70	130
Total Inorganic Carbon	0.005	%	N/A			N/A	20				N/A	70	130
Carbon/Sulphur - QCBatchID: ECS0003-DEC19													
Sulphide	0.02	%	< 0.02			9	20	111	80	120			
Carbon/Sulphur - QCBatchID: ECS0005-DEC19													
Sulphur (total)	0.005	%	<0.005			2	20				100	70	130
Carbon/Sulphur - QCBatchID: ECS9004-DEC19													
Carbon (total)	0.005	%	<0.005			0	20				98	70	130
Sulphur (total)	0.005	%	<0.005			6	20				100	70	130

SGS Canada Inc.
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30-July-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 26 November 2019
LR Report: **CA14987-NOV19**

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Reissue

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO-Comp	6: LLGO-Comp
Sample Date & Time					NA	NA
Sample weight [g]	28-Nov-19	07:44	29-Nov-19	09:38	250	251
Volume D.I. Water [mL]	28-Nov-19	07:44	29-Nov-19	09:38	750	750
Final pH [no unit]	29-Nov-19	06:43	29-Nov-19	09:38	9.09	9.21
pH [no unit]	29-Nov-19	09:11	29-Nov-19	15:44	8.46	8.59
Conductivity [uS/cm]	29-Nov-19	09:11	29-Nov-19	15:44	111	96
Alkalinity [mg/L as CaCO3]	29-Nov-19	09:11	29-Nov-19	15:44	39	42
SO4 [mg/L]	29-Nov-19	15:.33	02-Dec-19	12:51	9	4
F [mg/L]	02-Dec-19	09:55	02-Dec-19	13:02	0.18	0.15
Ag [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.00005	< 0.00005
Al [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	1.02	1.29
As [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.0029	0.0013
Ba [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00415	0.00323
B [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.021	0.025
Be [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.000007	< 0.000007
Bi [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.000007	< 0.000007
Ca [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	8.90	6.73
Cd [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.000003	< 0.000003
Co [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.000007	0.000007
Cr [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.00008	< 0.00008
Cu [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.0004	0.0003
Fe [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.007	< 0.007
K [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	3.37	4.47
Li [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.0003	0.0003
Mg [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.866	0.920
Mn [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00295	0.00177
Mo [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00835	0.00116
Na [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	8.69	8.53
Ni [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.0001	< 0.0001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14987-NOV19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO-Comp	6: LLGO-Comp
Pb [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00015	0.00004
Sb [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.0021	0.0015
Se [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00028	0.00022
Si [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	1.93	2.14
Sn [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.00006	< 0.00006
Sr [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.0224	0.0444
Ti [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00006	< 0.00005
Tl [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.000005	< 0.000005
U [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.000088	0.000260
V [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	0.00156	0.00447
Zn [mg/L]	03-Dec-19	16:45	04-Dec-19	16:18	< 0.002	< 0.002

Reissued with QC report.

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0495-NOV19														
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA			
Anions by discrete analyzer - QCBatchID: DIO9100-DEC19														
Sulphate	2	mg/L	<2			ND	20	100	80	120	95	75	125	
Conductivity - QCBatchID: EWL0495-NOV19														
Conductivity	2	uS/cm	3			0	20	99	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0004-DEC19														
Fluoride	0.06	mg/L	<0.06			1	10	107	90	110	111	75	125	
Metals - QCBatchID: EMS0001-DEC19														
Cobalt	0.000004	mg/L	<0.000004			15	20	102	90	110	101	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0001-DEC19														
Aluminum	0.001	mg/L	<0.001			11	20	102	90	110	110	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	101	90	110	117	70	130	
Arsenic	0.0002	mg/L	<0.0002			ND	20	102	90	110	101	70	130	
Barium	0.00002	mg/L	<0.00002			3	20	102	90	110	103	70	130	
Beryllium	0.000007	mg/L	<0.000007			ND	20	99	90	110	97	70	130	
Bismuth	0.000007	mg/L	<0.000007			10	20	99	90	110	75	70	130	
Boron	0.002	mg/L	<0.002			8	20	104	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			6	20	101	90	110	106	70	130	
Calcium	0.01	mg/L	<0.01			1	20	104	90	110	100	70	130	
Chromium	0.00008	mg/L	<0.00008			8	20	101	90	110	101	70	130	
Copper	0.0002	mg/L	<0.0002			0	20	104	90	110	104	70	130	
Iron	0.007	mg/L	<0.007			11	20	105	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			12	20	101	90	110	98	70	130	
Lithium	0.0001	mg/L	<0.0001			ND	20	98	90	110	95	70	130	
Magnesium	0.001	mg/L	<0.001			2	20	104	90	110	100	70	130	
Manganese	0.00001	mg/L	<0.00001			2	20	103	90	110	98	70	130	
Molybdenum	0.00004	mg/L	<0.00004			12	20	103	90	110	109	70	130	
Nickel	0.0001	mg/L	<0.0001			2	20	102	90	110	100	70	130	
Potassium	0.003	mg/L	<0.009			2	20	106	90	110	97	70	130	
Selenium	0.00004	mg/L	<0.00004			ND	20	106	90	110	102	70	130	
Silicon	0.02	mg/L	<0.02			2	20	108	90	110	NV	70	130	
Silver	0.00005	mg/L	<0.00005			ND	20	101	90	110	73	70	130	
Sodium	0.01	mg/L	<0.01			2	20	103	90	110	99	70	130	
Strontium	0.00002	mg/L	<0.00002			1	20	102	90	110	100	70	130	
Thallium	0.000005	mg/L	<0.000005			ND	20	102	90	110	98	70	130	

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Tin	0.00006	mg/L	<0.00006			ND	20	100	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			10	20	100	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			ND	20	102	90	110	99	70	130
Vanadium	0.00001	mg/L	<0.00001			ND	20	102	90	110	101	70	130
Zinc	0.002	mg/L	<0.002			1	20	103	90	110	102	70	130
pH - QCBatchID: EWL0495-NOV19													
pH	0.05	no unit	NA			0		100			NA		

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
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10-June-2020

Marathon Gold Corp
Attn : James Powell

Date Rec. : 26 November 2019
LR Report: **CA14986-NOV19**

Copy: #2

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO-Comp	6: LLGO-Comp
Sample Date & Time					NA	NA
Hg [ug/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 0.05	0.35
Ag [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	0.23	0.04
As [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	2.6	1.3
Al [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	6800	5300
Ba [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	19	39
Be [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	0.08	0.12
Bi [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	0.56	0.32
Ca [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	13000	26000
Cd [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	0.10	0.03
Co [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	4.0	5.5
Cr [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	57	29
Cu [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	19	8.1
Fe [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	21000	14000
K [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	390	490
Li [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 2	2
Mg [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	3100	3900
Mn [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	430	430
Mo [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	2.1	0.8
Ni [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	5.0	3.8
Pb [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	5.3	7.3
Sb [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 0.8	< 0.8
Se [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 0.7	< 0.7
Sn [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 0.5	< 0.5
Sr [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	12	62
Ti [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	29	22
Tl [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	< 0.02	< 0.02
U [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	0.52	0.80
V [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	10	8

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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LR Report : **CA14986-NOV19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO-Comp	6: LLGO-Comp
Y [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	5.5	2.6
Zn [µg/g]	05-Dec-19	17:00	06-Dec-19	14:30	21	33

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LNT SMS

0002145284

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14986-NOV19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0028-DEC19													
Mercury	0.05	ug/g	<0.05			ND	20	NV	80	120	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0028-DEC19													
Aluminum	3	µg/g	<3			4	20	94	70	130	101	70	130
Antimony	0.8	µg/g	<0.8			ND	20	99	70	130	NV	70	130
Arsenic	0.5	µg/g	<0.5			16	20	93	70	130	118	70	130
Barium	0.01	µg/g	<0.01			2	20	98	70	130	96	70	130
Beryllium	0.02	µg/g	<0.02			0	20	98	70	130	NV	70	130
Bismuth	0.09	µg/g	<0.09			16	20	102	70	130	NV	70	130
Cadmium	0.02	µg/g	<0.02			ND	20	94	70	130	NV	70	130
Calcium	3	µg/g	<3			1	20	97	70	130	NV	70	130
Chromium	0.5	µg/g	<0.5			3	20	103	70	130	82	70	130
Cobalt	0.01	µg/g	<0.01			1	20	101	70	130	101	70	130
Copper	0.1	µg/g	<0.1			2	20	100	70	130	97	70	130
Iron	3	µg/g	<3			2	20	106	70	130	107	70	130
Lead	0.05	µg/g	<0.05			13	20	94	70	130	108	70	130
Lithium	2	µg/g	<2			ND	20	101	70	130	NV	70	130
Magnesium	3	µg/g	<3			5	20	104	70	130	NV	70	130
Manganese	0.1	µg/g	<0.1			1	20	94	70	130	113	70	130
Molybdenum	0.1	µg/g	<0.1			2	20	93	70	130	NV	70	130
Nickel	0.1	µg/g	<0.1			ND	20	100	70	130	87	70	130
Potassium	3	µg/g	<3			0	20	99	70	130	NV	70	130
Selenium	0.7	µg/g	<0.7			ND	20	98	70	130	NV	70	130
Silver	0.01	µg/g	<0.01			ND	20	95	70	130	111	70	130
Strontium	0.02	µg/g	<0.02			0	20	91	70	130	NV	70	130
Thallium	0.02	µg/g	<0.02			ND	20	94	70	130	NV	70	130
Tin	0.5	µg/g	<0.5			ND	20	105	70	130	NV	70	130
Titanium	0.1	µg/g	<0.1			1	20	96	70	130	NV	70	130
Uranium	0.002	µg/g	<0.002			0	20	100	70	130	NV	70	130
Vanadium	1	µg/g	<1			1	20	92	70	130	94	70	130
Yttrium	0.004	µg/g	<0.004			4	20	95	70	130	NV	70	130
Zinc	0.7	µg/g	<0.7			0	20	103	70	130	82	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : Valentine Gold

07-July-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 07 May 2020
LR Report: **CA10032-MAY20**
Reference: Hum Cell Shut Down

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp	6: LLGO Comp$D.I.	7:BLK: Leachate Blank
Sample Date & Time					07-May-20	07-May-20	
Hum Cell Shutdown	15-May-20	11:30	15-May-20	11:30	1	1	---
Sample weight [g]	14-May-20	11:08	15-May-20	11:30	250	250	---
Volume D.I. Water [mL]	14-May-20	11:08	15-May-20	11:30	750	750	750
Final pH [no unit]	15-May-20	11:23	15-May-20	11:30	9.22	9.34	5.26
pH [no unit]	15-May-20	13:46	19-May-20	18:59	8.03	8.22	7.16
Conductivity [uS/cm]	15-May-20	13:46	21-May-20	09:25	75	80	4
Alkalinity [mg/L as CaCO3]	15-May-20	13:46	21-May-20	09:25	32	37	2
SO4 [mg/L]	19-May-20	09:32	20-May-20	09:56	< 2	< 2	< 2
F [mg/L]	19-May-20	16:40	20-May-20	13:25	0.07	0.08	< 0.06
Hg [mg/L]	20-May-20	08:00	20-May-20	12:24	0.00001	0.00001	< 0.00001
Ag [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	20-May-20	10:31	21-May-20	11:41	1.30	1.52	< 0.001
As [mg/L]	20-May-20	10:31	21-May-20	11:41	0.0015	0.0009	< 0.0002
Ba [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00232	0.00269	0.00004
B [mg/L]	20-May-20	10:31	21-May-20	11:41	0.019	0.023	< 0.002
Be [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	20-May-20	10:31	21-May-20	11:41	8.41	7.97	< 0.01
Cd [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.000003	0.000004	< 0.000003
Co [mg/L]	20-May-20	10:31	21-May-20	11:41	0.000004	0.000004	< 0.000004
Cr [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	20-May-20	10:31	21-May-20	11:41	0.0018	0.0014	< 0.0002
Fe [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.007	< 0.007	< 0.007
K [mg/L]	20-May-20	10:31	21-May-20	11:41	2.34	3.63	0.040
Li [mg/L]	20-May-20	10:31	21-May-20	11:41	0.0002	0.0002	< 0.0001
Mg [mg/L]	20-May-20	10:31	21-May-20	11:41	0.717	1.02	< 0.001
Mn [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00291	0.00204	0.00001
Mo [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00123	0.00021	< 0.00004
Na [mg/L]	20-May-20	10:31	21-May-20	11:41	6.22	6.79	< 0.01
Ni [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.0001	< 0.0001	< 0.0001
Pb [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00011	0.00008	< 0.00001
Sb [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.0009	< 0.0009	< 0.0009
Se [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00011	0.00015	< 0.00004

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : Valentine Gold

LR Report : **CA10032-MAY20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp	6: LLGO Comp$D.I.	7:BLK: Leachate Blank
Sn [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00011	< 0.00006	< 0.00006
Sr [mg/L]	20-May-20	10:31	21-May-20	11:41	0.0123	0.0352	< 0.00002
Ti [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00009	0.00008	< 0.00005
Tl [mg/L]	20-May-20	10:31	21-May-20	11:41	0.000032	0.000034	< 0.000005
U [mg/L]	20-May-20	10:31	21-May-20	11:41	0.000362	0.000306	< 0.000002
V [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00237	0.00488	< 0.00001
W [mg/L]	20-May-20	10:31	21-May-20	11:41	0.00281	0.0222	< 0.00002
Y [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.000002	< 0.000002	< 0.000002
Zn [mg/L]	20-May-20	10:31	21-May-20	11:41	< 0.002	< 0.002	< 0.002

Catharine Arnold

CHEMICAL PROFESSION OF ONTARIO — CHARTERED — CATHARINE ARNOLD — CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0255-MAY20													
Alkalinity	2	mg/L as Ca	< 2			3	20	102	80	120	NA		
Alkalinity - QCBatchID: EWL0299-MAY20													
Alkalinity	2	mg/L as Ca	< 2			1	20	102	80	120	NA		
Anions by discrete analyzer - QCBatchID: DIO0303-MAY20													
Sulphate	2	mg/L	<2			1	20	101	80	120	107	75	125
Conductivity - QCBatchID: EWL0255-MAY20													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
Conductivity - QCBatchID: EWL0299-MAY20													
Conductivity	2	uS/cm	< 2			1	20	98	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0288-MAY20													
Fluoride	0.06	mg/L	<0.06			3	10	103	90	110	103	75	125
Inorganics-General - QCBatchID: EHG0015-MAY20													
Mercury	0.00001	mg/L	< 0.00001			ND	20	107	80	120	109	70	130
Metals - QCBatchID: EMS0091-MAY20													
Cobalt	0.000004	mg/L	<0.000004			7	20	99	90	110	91	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0091-MAY20													
Aluminum	0.001	mg/L	<0.001			13	20	97	90	110	NV	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	99	90	110	NV	70	130
Arsenic	0.0002	mg/L	<0.0002			8	20	102	90	110	97	70	130
Barium	0.00002	mg/L	<0.00002			4	20	102	90	110	NV	70	130
Beryllium	0.000007	mg/L	<0.000007			0	20	98	90	110	96	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	103	90	110	95	70	130
Boron	0.002	mg/L	<0.002			4	20	98	90	110	98	70	130
Cadmium	0.000003	mg/L	<0.000003			ND	20	98	90	110	103	70	130
Calcium	0.01	mg/L	<0.01			2	20	101	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			2	20	101	90	110	106	70	130
Copper	0.0002	mg/L	<0.0002			18	20	98	90	110	87	70	130
Iron	0.007	mg/L	<0.007			6	20	102	90	110	75	70	130
Lead	0.00001	mg/L	<0.00001			10	20	103	90	110	92	70	130
Lithium	0.0001	mg/L	<0.0001			1	20	100	90	110	93	70	130
Magnesium	0.001	mg/L	<0.001			4	20	109	90	110	NV	70	130
Manganese	0.00001	mg/L	<0.00001			1	20	99	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			2	20	101	90	110	103	70	130
Nickel	0.0001	mg/L	<0.0001			6	20	100	90	110	91	70	130
Potassium	0.009	mg/L	<0.009			4	20	103	90	110	NV	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : Valentine Gold

LR Report : **CA10032-MAY20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Selenium	0.00004	mg/L	<0.00004			9	20	99	90	110	90	70	130
Silver	0.00005	mg/L	<0.00005			2	20	101	90	110	99	70	130
Sodium	0.01	mg/L	<0.01			2	20	106	90	110	NV	70	130
Strontium	0.00002	mg/L	<0.00002			3	20	100	90	110	91	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	101	90	110	91	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	100	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			13	20	94	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	100	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			5	20	90	90	110	72	70	130
Vanadium	0.00001	mg/L	<0.00001			4	20	100	90	110	102	70	130
Yttrium	0.000002	mg/L	<0.000002			0	20	100	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			6	20	93	90	110	79	70	130
pH - QCBatchID: EWL0255-MAY20													
pH	0.05	no unit	NA			1		101			NA		

OnLine LIMS

0002173398

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

03-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 20 September 2019
LR Report: **CA14747-SEP19**
Reference: 16863-02-04

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	9: CND 1 Residue	10: CND 2 Residue
Sample Date & Time						N/A	N/A
Paste pH [no unit]	26-Sep-19	06:29				8.73	8.78
Fizz Rate [no unit]	26-Sep-19	06:29				3	3
Sample weight [g]	26-Sep-19	06:29				1.98	2.02
HCl Added [mL]	26-Sep-19	06:29				20.00	43.00
HCl [Normality]	26-Sep-19	06:29				0.10	0.10
NaOH [Normality]	26-Sep-19	06:29				0.10	0.10
NaOH to pH=8.3 [mL]	26-Sep-19	06:29				7.46	15.34
Final pH [no unit]	26-Sep-19	06:29				1.56	1.62
NP [t CaCO3/1000 t]	26-Sep-19	06:29				31.7	68.5
AP [t CaCO3/1000 t]	26-Sep-19	06:29				11.2	8.75
Net NP [t CaCO3/1000 t]	26-Sep-19	06:29				20.4	59.8
NP/AP [ratio]	26-Sep-19	06:29				2.82	7.83
Sulphur (total) [%]	24-Sep-19	11:05	< 0.005	93%	2%	0.353	0.314
Acid Leachable SO4-S [%]	24-Sep-19	11:05				< 0.02	0.03
Sulphide [%]	24-Sep-19	11:05	< 0.02	106%	9%	0.36	0.28
Carbon (total) [%]	24-Sep-19	11:05	< 0.005	102%	1%	0.377	0.919
Carbonate [%]	24-Sep-19	14:47	< 0.025	2%	0%	1.82	4.49

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH\ added)}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

SMN LIMS Online

00019134888

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14747-SEP19**

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

09-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 19 September 2019
LR Report: **CA14695-SEP19**
Reference: 16863-02-02

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-SEP19 CND 1 Day 0	10: 2019-SEP19 CND 2 Day 0
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	19.0	19.0
pH [no unit]	24-Sep-19	11:05	NA	100%	0%	NA	7.99	7.91
Alkalinity [mg/L as CaCO3]	24-Sep-19	11:05	< 2	102%	1%	NA	73	90
Conductivity [uS/cm]	24-Sep-19	11:05	< 2	99%	0%	NA	2660	2640
Redox Potential [mV]	24-Sep-19	10:25	NA	100%	1%	NA	148	142
Total Dissolved Solids [mg/L]	24-Sep-19	09:54	< 30	96%	ND	NA	2060	2090
Fluoride [mg/L]	23-Sep-19	08:43	< 0.06	107%	ND	106%	0.56	1.15
Nitrite (as N) [mg/L]	24-Sep-19	09:11	< 0.03	95%	1%	97%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	24-Sep-19	09:11	< 0.06	99%	2%	105%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	24-Sep-19	09:11	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	26-Sep-19	08:29	< 0.2	94%	1%	115%	35	27
Sulphate [mg/L]	27-Sep-19	16:50	< 0.2	97%	ND	107%	960	980
Cyanide (total) [mg/L]	09-Oct-19	09:40	< 0.01	96%	ND	98%	8.84	2.36
Cyanide (WAD) [mg/L]	09-Oct-19	09:40	< 0.01	98%	ND	97%	0.13	0.08
Thiocyanate [mg/L]	24-Sep-19	14:23	< 0.2	100%	2%	102%	35	70
Cyanate [mg/L]	25-Sep-19	15:24	< 0.1	104%	ND	98%	200	160
Ammonia+Ammonium (N) [as N mg/L]	26-Sep-19	10:02	< 0.1	100%	0%	102%	2.5	2.3
Thiosalts (total) [as S2O3 mg/L]	27-Sep-19	10:52	< 10	98%	NV	NV	**	**
Thiosulphate [mg/L]	03-Oct-19	08:59	< 0.2	100%	ND	104%	5.8	4.1
Mercury (dissolved) [mg/L]	26-Sep-19	15:43	< 0.00001	102%	ND	120%	0.00077	0.00023
Silver (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00005	98%	ND	85%	0.00045	0.00052
Aluminum (dissolved) [mg/L]	30-Sep-19	10:15	< 0.001	100%	12%	104%	0.096	0.100
Arsenic (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0002	96%	ND	92%	0.0164	0.0025
Boron (dissolved) [mg/L]	30-Sep-19	10:15	< 0.002	98%	3%	NV	0.087	0.091
Barium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00002	90%	3%	94%	0.0163	0.0381
Beryllium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000007	98%	ND	97%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000007	101%	ND	101%	0.000028	0.000016
Calcium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.01	99%	0%	94%	133	84.5
Cadmium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000003	97%	2%	101%	0.000044	0.000039
Cobalt (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000004	96%	11%	93%	0.227	0.0433

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14695-SEP19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-SEP19 CND 1 Day 0	10: 2019-SEP19 CND 2 Day 0
Chromium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00008	95%	19%	93%	0.00361	0.00047
Copper (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0002	97%	3%	124%	0.0102	0.0152
Iron (dissolved) [mg/L]	30-Sep-19	10:15	< 0.007	99%	ND	NV	3.01	0.846
Potassium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.009	99%	4%	91%	19.5	20.6
Lithium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0001	97%	3%	93%	0.0105	0.0025
Magnesium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.001	107%	7%	96%	4.52	8.01
Manganese (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00001	96%	0%	107%	0.0338	0.0283
Molybdenum (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00004	101%	17%	101%	0.0854	0.0738
Sodium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.01	104%	4%	93%	462	487
Nickel (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0001	98%	3%	90%	0.0029	0.0006
Phosphorus (dissolved) [mg/L]	30-Sep-19	10:15	< 0.003	98%	ND	NV	0.031	0.031
Lead (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00001	97%	1%	92%	0.00017	0.00014
Sulfur (dissolved) [mg/L]	30-Sep-19	10:15	< 0.3	95%	3%	NV	418	434
Antimony (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0009	101%	ND	98%	0.0164	0.0113
Selenium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00004	106%	20%	101%	0.00430	0.00432
Silicon (dissolved) [mg/L]	30-Sep-19	10:15	< 0.02	106%	1%	NV	2.48	2.15
Tin (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00006	99%	ND	NV	0.00187	0.00176
Strontium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00002	96%	3%	92%	0.234	0.568
Thorium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.0001	98%	ND	NV	0.0001	< 0.0001
Titanium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00005	100%	ND	NV	0.00013	0.00014
Thallium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000005	95%	ND	94%	< 0.000005	< 0.000005
Uranium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000002	91%	15%	93%	0.00164	0.00300
Vanadium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00001	96%	ND	93%	0.00014	0.00015
Tungsten (dissolved) [mg/L]	30-Sep-19	10:15	< 0.00002	100%	7%	NV	0.00411	0.0175
Yttrium (dissolved) [mg/L]	30-Sep-19	10:15	< 0.000002	98%	8%	NV	0.000029	0.000017
Zinc (dissolved) [mg/L]	30-Sep-19	10:15	< 0.002	99%	3%	111%	0.003	0.006

NA - Not applicable
ND - Not Detected
NV - No Value

**Unable to perform thiosalts titration due to a sample matrix interference. Analyzed thiosulphate as an alternative.

Report revised to correct results for Cyanide (total), Cyanide (WAD), Thiocyanate, Cyanate

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

08-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 26 September 2019
LR Report: **CA14981-SEP19**
Reference: 16863-02-06

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-SEP26 CND 1 Day 7	10: 2019-SEP26 CND 2 Day 7
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	19.0	19.0
pH [no unit]	30-Sep-19	11:15	NA	100%	0%	NA	7.88	8.14
Alkalinity [mg/L as CaCO3]	30-Sep-19	11:15	< 2	98%	2%	NA	83	114
Conductivity [uS/cm]	30-Sep-19	11:15	< 2	99%	0%	NA	2760	2760
Redox Potential [mV]	01-Oct-19	08:48	NA	106%	0%	NA	148	168
Total Dissolved Solids [mg/L]	30-Sep-19	14:09	< 30	92%	6%	NA	2066	1997
Fluoride [mg/L]	30-Sep-19	11:17	< 0.06	104%	2%	113%	0.55	1.14
Nitrite (as N) [mg/L]	02-Oct-19	10:14	< 0.03	103%	ND	108%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	02-Oct-19	10:14	< 0.06	104%	3%	113%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	02-Oct-19	10:14	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	02-Oct-19	09:31	< 0.2	94%	0%	107%	41	34
Sulphate [mg/L]	03-Oct-19	08:22	< 0.2	96%	2%	103%	1000	990
Cyanide (total) [mg/L]	03-Oct-19	14:26	< 0.01	95%	ND	82%	6.19	1.51
Cyanide (WAD) [mg/L]	04-Oct-19	13:49	< 0.01	99%	ND	95%	0.28	0.22
Thiocyanate [mg/L]	02-Oct-19	08:47	< 0.2	100%	1%	82%	37	70
Cyanate [mg/L]	01-Oct-19	13:52	< 0.1	102%	3%	98%	210	160
Ammonia+Ammonium (N) [as N mg/L]	04-Oct-19	14:54	< 0.1	97%	6%	100%	4.2	6.5
Thiosalts (total) [as S2O3 mg/L]	03-Oct-19	12:36	< 10	100%	ND	89%	**	**
Thiosulphate [mg/L]	04-Oct-19	11:48	< 0.2	91%	0%	106%	2.2	9.7
Mercury (dissolved) [mg/L]	27-Sep-19	12:07	< 0.00001	121%	ND	116%	0.00013	0.00008
Silver (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00005	103%	ND	99%	0.00064	0.00075
Aluminum (dissolved) [mg/L]	03-Oct-19	13:24	< 0.001	98%	1%	NV	0.081	0.059
Arsenic (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0002	99%	7%	103%	0.0140	0.0022
Boron (dissolved) [mg/L]	03-Oct-19	13:24	< 0.002	97%	1%	NV	0.060	0.080
Barium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00002	95%	1%	NV	0.0197	0.0509
Beryllium (dissolved) [mg/L]	08-Oct-19	13:47	< 0.000007	93%	14%	102%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000007	105%	ND	NV	0.000048	< 0.000007
Calcium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.01	106%	2%	NV	152	99.3
Cadmium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000003	103%	11%	85%	0.000070	0.000031
Cobalt (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000004	100%	15%	99%	0.252	0.0449
Chromium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00008	100%	8%	103%	0.00213	0.00022
Copper (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0002	100%	3%	NV	0.0216	0.0879
Iron (dissolved) [mg/L]	03-Oct-19	13:24	< 0.007	102%	9%	NV	2.01	0.254
Potassium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.009	99%	3%	NV	20.2	23.2
Lithium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0001	100%	1%	NV	0.0101	0.0025

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14981-SEP19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-SEP26 CND 1 Day 7	10: 2019-SEP26 CND 2 Day 7
Magnesium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.001	103%	0%	NV	5.78	11.3
Manganese (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00001	95%	3%	115%	0.0552	0.0437
Molybdenum (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00004	98%	17%	98%	0.0862	0.0662
Sodium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.01	106%	0%	NV	484	535
Nickel (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0001	99%	ND	93%	0.0033	0.0006
Phosphorus (dissolved) [mg/L]	03-Oct-19	13:24	< 0.003	105%	ND	NV	0.028	0.030
Lead (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00001	96%	2%	91%	0.00021	0.00006
Sulfur (dissolved) [mg/L]	04-Oct-19	17:07	< 0.3	94%	5%	NV	503	437
Antimony (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0009	108%	4%	77%	0.0107	0.0066
Selenium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00004	95%	ND	89%	0.00220	0.00212
Silicon (dissolved) [mg/L]	03-Oct-19	13:24	< 0.02	99%	0%	NV	2.63	2.14
Tin (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00006	94%	ND	NV	0.00206	0.00269
Strontium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00002	100%	3%	NV	0.274	0.657
Thorium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.0001	94%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00005	104%	ND	NV	0.00018	0.00009
Thallium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000005	102%	ND	95%	0.000008	< 0.000005
Uranium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000002	94%	4%	101%	0.00177	0.00403
Vanadium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00001	94%	6%	95%	0.00011	0.00012
Tungsten (dissolved) [mg/L]	03-Oct-19	13:24	< 0.00002	102%	ND	NV	0.00236	0.0125
Yttrium (dissolved) [mg/L]	03-Oct-19	13:24	< 0.000002	102%	18%	NV	0.000045	0.000006
Zinc (dissolved) [mg/L]	03-Oct-19	13:24	< 0.002	100%	4%	NV	< 0.002	0.003

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

**Unable to perform thiosalts titration due to a sample matrix interference. Analyzed thiosulphate as an alternative.

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

23-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 03 October 2019
LR Report: **CA14100-OCT19**
Reference: 16863-02-08

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-OCT3 CND 1 Day 14	10: 2019-OCT3 CND 2 Day 14
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	20.0	20.0
pH [no unit]	07-Oct-19	16:26	NA	100%	0%	NA	8.26	8.34
Alkalinity [mg/L as CaCO3]	07-Oct-19	16:26	< 2	100%	1%	NA	108	132
Conductivity [uS/cm]	07-Oct-19	16:26	< 2	98%	0%	NA	2120	2130
Redox Potential [mV]	07-Oct-19	15:26	NA	104%	1%		167	176
Total Dissolved Solids [mg/L]	16-Oct-19	08:41	< 30	100%	0%	NA	2050	1990
Fluoride [mg/L]	07-Oct-19	08:07	< 0.06	107%	ND	115%	0.58	1.21
Nitrite (as N) [mg/L]	07-Oct-19	13:16	< 0.03	95%	ND	99%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	07-Oct-19	13:16	< 0.06	96%	ND	99%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	07-Oct-19	13:16	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	10-Oct-19	08:29	< 0.2	92%	3%	105%	39	31
Sulphate [mg/L]	10-Oct-19	14:08	< 0.2	96%	1%	94%	1000	1000
Cyanide (total) [mg/L]	08-Oct-19	16:35	< 0.01	97%	ND	94%	6.10	0.47
Cyanide (WAD) [mg/L]	10-Oct-19	14:14	< 0.01	100%	ND	86%	0.34	0.18
Thiocyanate [mg/L]	09-Oct-19	14:59	< 0.2	98%	1%	98%	40	75
Cyanate [mg/L]	10-Oct-19	09:15	< 0.1	98%	3%	99%	200	150
Ammonia+Ammonium (N) [as N mg/L]	09-Oct-19	15:45	< 0.1	100%	5%	96%	6.8	5.6
Thiosulphate [mg/L]	10-Oct-19	13:48	< 0.2	90%	ND	106%	2.2	5.3
Mercury (dissolved) [mg/L]	07-Oct-19	11:04	< 0.00001	116%	ND	103%	0.00008	0.00007
Silver (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00005	104%	3%	98%	0.00139	0.00061
Aluminum (dissolved) [mg/L]	09-Oct-19	15:54	< 0.001	98%	3%	127%	0.059	0.047
Arsenic (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0002	102%	1%	104%	0.0121	0.0022
Boron (dissolved) [mg/L]	09-Oct-19	15:54	< 0.002	97%	19%	NV	0.064	0.067
Barium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00002	98%	2%	103%	0.0245	0.0531
Beryllium (dissolved) [mg/L]	09-Oct-19	15:54	<0.000007	98%	ND	102%	< 0.000007	< 0.000007
Beryllium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000007	98%	ND	102%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000007	107%	15%	97%	0.000018	0.000009
Calcium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.01	103%	1%	108%	153	92.6
Cadmium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000003	102%	1%	102%	0.000083	0.000033
Cobalt (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000004	104%	0%	104%	0.251	0.0417
Chromium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00008	103%	ND	106%	0.00103	< 0.00008
Copper (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0002	106%	1%	105%	0.247	0.198
Iron (dissolved) [mg/L]	09-Oct-19	15:54	< 0.007	101%	ND	NV	1.44	0.255
Potassium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.009	104%	1%	105%	20.9	23.8
Lithium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0001	109%	15%	104%	0.0134	0.0028

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14100-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-OCT3 CND 1 Day 14	10: 2019-OCT3 CND 2 Day 14
Magnesium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.001	106%	1%	105%	6.49	11.7
Manganese (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00001	103%	2%	108%	0.0660	0.0422
Molybdenum (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00004	100%	10%	105%	0.0980	0.0685
Sodium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.01	104%	2%	105%	474	493
Nickel (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0001	101%	1%	102%	0.0049	0.0009
Phosphorus (dissolved) [mg/L]	09-Oct-19	15:54	0.003	100%	ND	NV	0.021	0.019
Lead (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00001	102%	1%	101%	0.00010	0.00003
Sulfur (dissolved) [mg/L]	09-Oct-19	15:54	< 0.3	109%	0%	NV	447	444
Antimony (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0009	109%	13%	109%	0.0161	0.0091
Selenium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00004	98%	1%	86%	0.00155	0.00135
Silicon (dissolved) [mg/L]	09-Oct-19	15:54	< 0.02	96%	3%	NV	2.37	2.06
Tin (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00006	100%	1%	NV	0.00344	0.00230
Strontium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00002	100%	1%	102%	0.298	0.673
Thorium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.0001	99%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00005	95%	ND	NV	0.00020	< 0.00005
Thallium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000005	102%	3%	101%	0.000009	< 0.000005
Uranium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000002	99%	11%	100%	0.00230	0.00395
Vanadium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00001	101%	ND	103%	0.00009	0.00013
Tungsten (dissolved) [mg/L]	09-Oct-19	15:54	< 0.00002	101%	ND	NV	0.00214	0.00930
Yttrium (dissolved) [mg/L]	09-Oct-19	15:54	< 0.000002	102%	10%	NV	0.000020	0.000006
Zinc (dissolved) [mg/L]	09-Oct-19	15:54	< 0.002	102%	0%	124%	0.004	0.016

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

Report revised to correct result for Sulfur (dissolved)

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

28-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 17 October 2019
LR Report: **CA14541-OCT19**
Reference: 16863-02-10

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-OCT17 CND 1 Day 28	10: 2019-OCT17 CND 2 Day 28
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	21.0	21.0
pH [no unit]	24-Oct-19	08:21	NA	100%	0%	NA	8.31	8.35
Alkalinity [mg/L as CaCO3]	24-Oct-19	08:21	< 2	100%	3%	NA	122	155
Conductivity [uS/cm]	24-Oct-19	08:21	< 2	99%	1%	NA	2900	3100
Redox Potential [mV]	21-Oct-19	14:15	NA	105%	0%	NA	166	177
Total Dissolved Solids [mg/L]	23-Oct-19	11:19	< 30	NV	0%	NA	2090	2210
Fluoride [mg/L]	18-Oct-19	13:14	< 0.06	104%	0%	108%	0.61	1.26
Nitrite (as N) [mg/L]	23-Oct-19	11:12	< 0.03	95%	8%	100%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	23-Oct-19	11:12	< 0.06	98%	0%	102%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	23-Oct-19	11:12	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	25-Oct-19	13:33	< 0.2	101%	0%	113%	39	38
Sulphate [mg/L]	23-Oct-19	11:02	< 0.2	92%	0%	94%	1100	1100
Cyanide (total) [mg/L]	22-Oct-19	08:44	< 0.01	94%	ND	101%	1.19	0.09
Cyanide (WAD) [mg/L]	23-Oct-19	10:50	< 0.01	96%	ND	95%	0.29	0.04
Thiocyanate [mg/L]	18-Oct-19	13:38	< 0.2	102%	1%	99%	41	80
Cyanate [mg/L]	18-Oct-19	15:21	< 0.1	98%	7%	111%	140	110
Ammonia+Ammonium (N) [as N mg/L]	24-Oct-19	15:22	< 0.1	101%	1%	98%	12.1	12.2
Thiosulphate [mg/L]	23-Oct-19	11:20	< 0.2	98%	ND	100%	< 2	< 2
Mercury (dissolved) [mg/L]	22-Oct-19	08:26	< 0.00001	112%	ND	109%	0.00002	0.00003
Silver (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00005	101%	ND	94%	0.00025	< 0.00005
Aluminum (dissolved) [mg/L]	24-Oct-19	15:35	< 0.001	91%	9%	NV	0.028	0.035
Arsenic (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0002	98%	1%	101%	0.0096	0.0024
Boron (dissolved) [mg/L]	24-Oct-19	15:35	< 0.002	99%	4%	NV	0.071	0.085
Barium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00002	100%	0%	95%	0.0253	0.0622
Beryllium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000007	97%	3%	93%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000007	98%	ND	92%	< 0.000007	< 0.000007
Calcium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.01	100%	1%	NV	136	95.1
Cadmium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000003	103%	1%	107%	0.000080	0.000032
Cobalt (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000004	100%	5%	99%	0.248	0.0435
Chromium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00008	103%	6%	117%	0.00025	< 0.00008
Copper (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0002	100%	2%	96%	0.109	0.0262
Iron (dissolved) [mg/L]	24-Oct-19	15:35	< 0.007	100%	9%	NV	0.285	0.028
Potassium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.009	100%	1%	115%	22.9	28.4
Lithium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0001	97%	8%	101%	0.0143	0.0032
Magnesium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.001	102%	2%	84%	7.66	16.2

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14541-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-OCT17 CND 1 Day 28	10: 2019-OCT17 CND 2 Day 28
Manganese (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00001	101%	3%	121%	0.0352	0.0338
Molybdenum (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00004	101%	5%	106%	0.106	0.0791
Sodium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.01	105%	2%	NV	504	578
Nickel (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0001	101%	10%	97%	0.0046	0.0006
Phosphorus (dissolved) [mg/L]	24-Oct-19	15:35	< 0.003	98%	9%	NV	0.039	0.032
Lead (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00001	99%	2%	90%	0.00003	0.00005
Sulfur (dissolved) [mg/L]	24-Oct-19	15:35	< 0.3	101%	1%	NV	528	578
Antimony (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0009	104%	ND	93%	0.0075	0.0050
Selenium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00004	94%	ND	88%	0.00087	0.00073
Silicon (dissolved) [mg/L]	24-Oct-19	15:35	< 0.02	105%	8%	NV	3.02	2.61
Tin (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00006	97%	12%	NV	0.00300	0.00323
Strontium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00002	98%	1%	82%	0.303	0.747
Thorium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.0001	98%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00005	96%	18%	NV	0.00010	0.00009
Thallium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000005	95%	ND	88%	0.000016	0.000008
Uranium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000002	99%	1%	89%	0.00246	0.00439
Vanadium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00001	100%	4%	121%	0.00006	0.00008
Tungsten (dissolved) [mg/L]	24-Oct-19	15:35	< 0.00002	95%	ND	NV	0.00142	0.00584
Yttrium (dissolved) [mg/L]	24-Oct-19	15:35	< 0.000002	100%	2%	NV	0.000009	0.000003
Zinc (dissolved) [mg/L]	24-Oct-19	15:35	< 0.002	99%	3%	105%	0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001939814

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

26-November-2019

Date Rec. : 14 November 2019
LR Report: **CA14488-NOV19**
Reference: 16863-02-10

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-NOV14 CND 1 Day 56	10: 2019-NOV14 CND 2 Day 56
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	16.0	16.0
pH [no unit]	15-Nov-19	10:45	18-Nov-19	14:18	NA	100%	0%	NA	8.07	8.22
Alkalinity [mg/L as CaCO3]	15-Nov-19	10:45	18-Nov-19	14:18	< 2	101%	3%	NA	124	171
Conductivity [uS/cm]	15-Nov-19	10:45	18-Nov-19	14:18	< 2	100%	0%	NA	3530	3870
Redox Potential [mV]	15-Nov-19	15:51	18-Nov-19	14:59	NA	103%	0%	NA	-49	-60
TDS [mg/L]	18-Nov-19	15:23	20-Nov-19	08:03	< 30	101%	2%	NA	2540	2850
F [mg/L]	15-Nov-19	12:55	15-Nov-19	16:20	< 0.06	108%	3%	110%	0.78	1.65
NO2 [as N mg/L]	18-Nov-19	18:50	20-Nov-19	15:58	< 0.03	95%	2%	100%	< 0.3	< 0.3
NO3 [as N mg/L]	18-Nov-19	18:50	20-Nov-19	15:58	< 0.06	100%	ND	104%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	18-Nov-19	18:50	20-Nov-19	15:58	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	18-Nov-19	17:50	21-Nov-19	08:00	< 0.2	96%	1%	113%	49	42
SO4 [mg/L]	18-Nov-19	17:50	19-Nov-19	13:06	< 0.2	97%	0%	102%	1600	1700
CN(T) [mg/L]	15-Nov-19	09:23	15-Nov-19	13:47	< 0.01	93%	ND	80%	0.05	0.10
CNWAD [mg/L]	19-Nov-19	13:43	21-Nov-19	06:15	< 0.01	99%	ND	97%	0.02	0.04
CNS [mg/L]	18-Nov-19	11:52	19-Nov-19	12:30	< 0.2	101%	1%	103%	59	79

OnLine LIMS

00016997916

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14488-NOV19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-NOV14 CND 1 Day 56	10: 2019-NOV14 CND 2 Day 56
CNO [mg/L]	21-Nov-19	08:50	21-Nov-19	15:47	< 0.1	100%	ND	94%	< 1	51
NH3+NH4 [as N mg/L]	19-Nov-19	07:00	20-Nov-19	14:16	< 0.1	99%	ND	103%	40.0	23.6
S2O3 [mg/L]	20-Nov-19	09:48	22-Nov-19	09:12	< 0.2	98%	1%	82%	< 2	< 2
Hg (diss) [mg/L]	22-Nov-19	08:49	25-Nov-19	15:22	< 0.00001	107%	ND	115%	< 0.00001	< 0.00001
Ag (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00005	102%	ND	99%	< 0.00005	< 0.00005
Al (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.001	101%	6%	NV	0.021	0.039
As (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0002	102%	ND	100%	0.0086	0.0027
B (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.002	96%	ND	NV	0.090	0.103
Ba (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00002	101%	3%	101%	0.0292	0.0806
Be (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000007	100%	ND	96%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000007	97%	ND	97%	< 0.000007	< 0.000007
Ca (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.01	100%	1%	NV	90.5	92.4
Cd (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000003	101%	ND	107%	0.000051	0.000030
Co (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000004	99%	ND	102%	0.266	0.0398
Cr (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00008	101%	ND	105%	0.00018	< 0.00008
Cu (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0002	99%	4%	104%	0.0078	0.0101
Fe (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.007	101%	ND	NV	0.014	0.077
K (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.009	108%	1%	125%	28.6	36.5
Li (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0001	103%	ND	93%	0.0195	0.0045
Mg (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.001	103%	0%	107%	10.7	22.5
Mn (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00001	99%	ND	108%	0.0508	0.0319
Mo (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00004	104%	ND	107%	0.132	0.100
Na (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	0.049	98%	5%	92%	584	668
Ni (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0001	102%	ND	103%	0.0041	0.0008
P (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.003	101%	ND	NV	0.033	0.021
Pb (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00001	102%	ND	103%	0.00002	0.00003
S (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.3	96%	ND	NV	660	727
Sb (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0009	98%	ND	97%	0.0072	0.0048
Se (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00004	100%	2%	102%	0.00061	0.00069

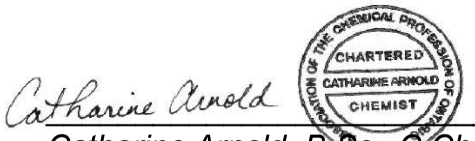
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14488-NOV19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: 2019-NOV14 CND 1 Day 56	10: 2019-NOV14 CND 2 Day 56
Si (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.02	104%	4%	NV	2.80	2.77
Sn (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00006	99%	ND	NV	0.00373	0.00366
Sr (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00002	98%	1%	120%	0.356	0.960
Th (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.0001	95%	ND	NV	0.0001	< 0.0001
Ti (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00005	103%	ND	NV	0.00010	0.00016
Tl (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000005	94%	ND	100%	0.000023	0.000005
U (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000002	91%	4%	91%	0.00289	0.00512
V (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00001	98%	3%	104%	0.00005	0.00007
W (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.00002	103%	ND	NV	0.00092	0.00384
Y (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.000002	99%	ND	NV	0.000012	0.000013
Zn (diss) [mg/L]	21-Nov-19	11:42	25-Nov-19	11:19	< 0.002	103%	ND	96%	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00001699716

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

17-March-2020

Date Rec. : 26 February 2020
LR Report: **CA10187-FEB20**
Reference: Hum Cell Shut Down

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue	10: CND 2 Residue
Sample Date & Time									26-Feb-20	26-Feb-20
Paste pH [no unit]	12-Mar-20	14:26	13-Mar-20	06:45					8.50	8.58
Fizz Rate [no unit]	11-Mar-20	09:37	13-Mar-20	06:45					3	3
Sample weight [g]	11-Mar-20	09:37	13-Mar-20	06:45					2.01	2.00
HCl_add [mL]	12-Mar-20	08:00	13-Mar-20	06:45					20.00	41.80
HCl [Normality]	11-Mar-20	09:37	13-Mar-20	06:45					0.10	0.10
NaOH [Normality]	11-Mar-20	09:37	13-Mar-20	06:45					0.10	0.10
Vol NaOH to pH=8.3 [mL]	12-Mar-20	08:00	13-Mar-20	06:45					6.72	14.66
Final pH [no unit]	12-Mar-20	08:00	13-Mar-20	06:45					1.85	1.62
NP [t CaCO3/1000 t]	12-Mar-20	08:00	13-Mar-20	06:45					33.0	67.8
AP [t CaCO3/1000 t]	12-Mar-20	08:00	13-Mar-20	06:45					21.6	9.06
Net NP [t CaCO3/1000 t]	12-Mar-20	08:00	13-Mar-20	06:45					11.4	58.7
NP/AP [ratio]	12-Mar-20	08:00	13-Mar-20	06:45					1.53	7.48
S [%]	11-Mar-20	12:09	12-Mar-20	10:46	< 0.005	109%	7%		0.683	0.309
Acid Leachable SO4-S [%]	12-Mar-20	09:10	12-Mar-20	10:46					-0.01	< 0.02
Sulphide [%]	12-Mar-20	09:05	12-Mar-20	10:46	< 0.02	107%	1%		0.69	0.29

OnLine LIMS

0000267495

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

LR Report : **CA10187-FEB20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue	10: CND 2 Residue
C [%]	11-Mar-20	12:09	12-Mar-20	10:43	< 0.005	98%	1%		0.418	0.876
CO3 [%]	12-Mar-20	09:25	12-Mar-20	10:43	< 0.025	101%	1%		2.02	4.32
S [%]	12-Mar-20	17:23	13-Mar-20	06:47	< 0.005	111%	7%		0.617	---
C [%]	12-Mar-20	17:23	13-Mar-20	06:47	< 0.005	99%	0%		0.497	---

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH \text{ added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002067495

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

09-April-2020

Date Rec. : 27 March 2020
LR Report: **CA10229-MAR20**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	9: CND 1 Residue
Sample Date & Time								26-Feb-20
Paste pH [no unit]	08-Apr-20	08:03	09-Apr-20	15:04				8.77
Fizz Rate [no unit]	08-Apr-20	08:03	09-Apr-20	15:04				2
Sample weight [g]	08-Apr-20	08:03	09-Apr-20	15:04				1.99
HCl_add [mL]	09-Apr-20	06:09	09-Apr-20	15:04				20.00
HCl [Normality]	08-Apr-20	08:03	09-Apr-20	15:04				0.10
NaOH [Normality]	08-Apr-20	08:03	09-Apr-20	15:04				0.10
Vol NaOH to pH=8.3 [mL]	09-Apr-20	06:09	09-Apr-20	15:04				7.91
Final pH [no unit]	09-Apr-20	06:09	09-Apr-20	15:04				1.81
NP [t CaCO3/1000 t]	09-Apr-20	06:09	09-Apr-20	15:04				30.4
AP [t CaCO3/1000 t]	09-Apr-20	15:52	09-Apr-20	15:51				11.9
Net NP [t CaCO3/1000 t]	09-Apr-20	15:52	09-Apr-20	15:51				18.5
NP/AP [ratio]	09-Apr-20	15:52	09-Apr-20	15:51				2.56
S [%]	03-Apr-20	15:42	08-Apr-20	09:26	< 0.005	95%	2%	0.391
Acid Leachable SO4-S [%]	07-Apr-20	20:40	08-Apr-20	09:26				0.01
Sulphide [%]	07-Apr-20	20:38	08-Apr-20	09:26	< 0.04	114%	0%	0.38
C [%]	03-Apr-20	15:42	08-Apr-20	09:28	< 0.005	98%	1%	0.368

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

LR Report : **CA10229-MAR20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	9: CND 1 Residue
CO3 [%]	07-Apr-20	21:10	08-Apr-20	09:28	< 0.025	101%	8%	1.74

*NP (Neutralization Potential)

$$= \frac{50 \times (\text{N of HCL} \times \text{Total HCL added} - \text{N NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00002087869

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

ABA - Modified Sobek

Project : CA20M-00000-110-16863-02

27-March-2020

Date Rec. : 16 March 2020
LR Report: **CA14654-MAR20**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	6: QC - Blank	7: QC - STD % Recovery	8: QC - DUP %RPD	9: QC - Spike Rep	10: CND 1 Residue A	11: CND 1 Residue B
Sample Date & Time									N/A	N/A
Paste pH [no unit]	18-Mar-20	06:31	20-Mar-20	19:47					8.25	8.31
Fizz Rate [no unit]	16-Mar-20	08:01	20-Mar-20	19:47					2	2
Sample weight [g]	16-Mar-20	08:01	20-Mar-20	19:47					1.99	1.99
HCl_add [mL]	17-Mar-20	06:14	20-Mar-20	19:47					20.00	20.00
HCl [Normality]	16-Mar-20	08:01	20-Mar-20	19:47					0.10	0.10
NaOH [Normality]	16-Mar-20	08:01	20-Mar-20	19:47					0.10	0.10
Vol NaOH to pH=8.3 [mL]	17-Mar-20	06:14	20-Mar-20	19:47					6.84	6.94
Final pH [no unit]	17-Mar-20	06:14	20-Mar-20	19:47					1.45	1.39
NP [t CaCO3/1000 t]	17-Mar-20	06:14	20-Mar-20	19:47					33.1	32.8
AP [t CaCO3/1000 t]	26-Mar-20	18:36	26-Mar-20	18:37					15.6	15.3
Net NP [t CaCO3/1000 t]	26-Mar-20	18:36	26-Mar-20	18:37					17.5	17.5
NP/AP [ratio]	26-Mar-20	18:36	26-Mar-20	18:37					2.12	2.14
S [%]	24-Mar-20	17:28	26-Mar-20	18:36	< 0.005	105%	5%		0.509	0.536
Acid Leachable SO4-S [%]	26-Mar-20	17:41	26-Mar-20	18:36					< 0.02	0.05
Sulphide [%]	26-Mar-20	17:39	26-Mar-20	18:36	< 0.02	103%	3%		0.50	0.49
C [%]	24-Mar-20	17:28	25-Mar-20	17:42	< 0.005	98%	2%		0.388	0.411
CO3 [%]	25-Mar-20	16:52	25-Mar-20	17:42					1.91	2.02

*NP (Neutralization Potential)

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : CA20M-00000-110-16863-02

LR Report : **CA14654-MAR20**

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002077745

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

NAG Test

Project : CA20M-00000-110-16863-02

12-March-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 26 February 2020
LR Report: **CA10188-FEB20**
Reference: Hum Cell Shut Down

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	9: CND 1 Residue	10: CND 2 Residue
Sample Date & Time					26-Feb-20	26-Feb-20
Sample weight [g]	12-Mar-20	06:40	12-Mar-20	11:16	1.52	1.49
Vol H2O2 [mL]	12-Mar-20	06:40	12-Mar-20	11:16	150	150
Final pH [no unit]	12-Mar-20	06:40	12-Mar-20	11:16	10.48	10.65
NaOH [Normality]	12-Mar-20	06:40	12-Mar-20	11:16	0.10	0.10
Vol NaOH to PH 4.5 [mL]	12-Mar-20	06:40	12-Mar-20	11:16	0.00	0.00
Vol NaOH to PH 7.0 [mL]	12-Mar-20	06:40	12-Mar-20	11:16	0.00	0.00
NAG (pH 4.5) [kg H2SO4/tonne]	12-Mar-20	06:40	12-Mar-20	11:16	0.0	0.0
NAG (pH 7.0) [kg H2SO4/tonne]	12-Mar-20	06:40	12-Mar-20	11:16	0.0	0.0

NAG = (49 x Vol. of base x N of base)/sample weight
kg H2SO4/tonne

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMLNet OnLine

0002062769

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

NAG Test

Project : CA20M-00000-110-16863-02

17-April-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**
,

Phone:
Fax:

Date Rec. : 09 April 2020
LR Report: **CA10097-APR20**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	9: CND 1 Residue
Sample Date & Time					26-Feb-20
Sample weight [g]	14-Apr-20	10:50	14-Apr-20	17:19	1.51
Vol H2O2 [mL]	14-Apr-20	10:50	14-Apr-20	17:19	150
Final pH [no unit]	14-Apr-20	10:50	14-Apr-20	17:19	10.26
NaOH [Normality]	14-Apr-20	10:50	14-Apr-20	17:19	0.10
Vol NaOH to PH 4.5 [mL]	14-Apr-20	10:50	14-Apr-20	17:19	0.00
Vol NaOH to PH 7.0 [mL]	14-Apr-20	10:50	14-Apr-20	17:19	0.00
NAG (pH 4.5) [kg H2SO4/tonne]	14-Apr-20	10:50	14-Apr-20	17:19	0.0
NAG (pH 7.0) [kg H2SO4/tonne]	14-Apr-20	10:50	14-Apr-20	17:19	0.0

NAG = (49 x Vol. of base x N of base)/sample weight
kg H2SO4/tonne

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002094086

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

SFE 3:1 ratio 24hr prefilter pH Hum Cell Shutdown

Project : CA20M-00000-110-16863-02

18-March-2020

Date Rec. : 26 February 2020
LR Report: **CA10186-FEB20**
Reference: Hum Cell Shutdown (Bottle Roll)

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue	10: CND 2 Residue
Sample Date & Time									26-Feb-20	26-Feb-20
Hum Cell Shutdown	09-Mar-20	07:44	09-Mar-20	10:45					1	1
Sample weight [g]	03-Mar-20	14:30	06-Mar-20	15:40					1000	1000
Volume D.I. Water [mL]	03-Mar-20	14:30	06-Mar-20	15:40					3000	3000
Final pH [no unit]	04-Mar-20	12:34	06-Mar-20	15:40					8.14	8.39
pH [no unit]	06-Mar-20	14:40	10-Mar-20	09:08	NA	101%	0%	NA	8.06	8.23
Acidity [mg/L as CaCO3]	06-Mar-20	14:40	10-Mar-20	09:08	2	102%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	06-Mar-20	14:40	10-Mar-20	09:08	< 2	102%	2%	NA	29	34
Conductivity [uS/cm]	06-Mar-20	14:40	10-Mar-20	09:08	< 2	98%	0%	NA	397	355
SO4 [mg/L]	04-Mar-20	19:04	06-Mar-20	15:40	< 0.2	96%	ND	93%	170	140
Cl [mg/L]	04-Mar-20	19:04	06-Mar-20	15:40	< 0.2	96%	ND	101%	< 0.2	< 0.2
F [mg/L]	05-Mar-20	10:58	06-Mar-20	09:10	< 0.06	101%	ND	97%	0.17	0.41
CN(T) [mg/L]	05-Mar-20	09:46	06-Mar-20	14:55	< 0.01	93%	ND	89%	0.79	0.06
CN(T) [mg/L]	13-Mar-20	08:10	13-Mar-20	13:09	< 0.01	92%	ND	81%	0.55	---
CNWAD [mg/L]	05-Mar-20	13:11	05-Mar-20	17:49	< 0.01	94%	ND	93%	< 0.01	0.02
CNO [mg/L]	06-Mar-20	08:56	09-Mar-20	12:46	< 0.1	106%	ND	94%	< 1	< 1
CNS [mg/L]	05-Mar-20	09:07	05-Mar-20	15:31	< 0.2	100%	ND	98%	0.4	< 0.2

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr prefilter pH Hum Cell Shutdown

Project : CA20M-00000-110-16863-02

LR Report : **CA10186-FEB20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue	10: CND 2 Residue
Hg [mg/L]	05-Mar-20	11:44	09-Mar-20	16:04	< 0.00001	114%	ND	126%	0.00001	< 0.00001
Ag [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00005	101%	ND	90%	< 0.00005	< 0.00005
Al [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.001	95%	1%	118%	0.018	0.035
As [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0002	99%	7%	97%	0.0011	0.0005
B [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.002	96%	ND	NV	0.018	0.018
Ba [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00002	101%	1%	103%	0.00333	0.00681
Be [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000007	100%	ND	97%	< 0.000007	< 0.000007
Bi [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000007	96%	ND	89%	< 0.000007	< 0.000007
Ca [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.01	97%	1%	101%	79.0	54.3
Cd [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000003	101%	ND	93%	0.000017	< 0.000003
Co [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000004	101%	ND	97%	0.00250	0.00147
Cr [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00008	102%	ND	95%	0.00009	< 0.00008
Cu [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0002	100%	ND	100%	0.0017	0.0031
Fe [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.007	98%	ND	NV	0.253	0.681
K [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.009	101%	1%	101%	0.516	1.19
Li [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0001	100%	1%	NV	0.0041	0.0012
Mg [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.001	97%	0%	99%	2.27	10.6
Mn [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00001	99%	1%	102%	0.160	0.0436
Mo [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00004	102%	2%	105%	0.00512	0.00183
Na [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.01	101%	1%	108%	1.90	3.02
Ni [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0001	97%	ND	99%	0.0003	0.0002
P [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.003	102%	ND	NV	< 0.003	< 0.003
Pb [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00001	97%	3%	100%	0.00001	0.00004
S [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.3	90%	ND	NV	59.7	51.5
Sb [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0009	100%	ND	105%	0.0010	< 0.0009
Se [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00004	99%	ND	99%	0.00070	0.00071
Si [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.02	93%	1%	NV	1.41	1.32
Sn [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00006	98%	ND	NV	0.00221	0.00282
Sr [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00002	96%	3%	96%	0.0553	0.148
Th [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.0001	90%	ND	NV	< 0.0001	< 0.0001
Ti [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00005	102%	19%	NV	< 0.00005	< 0.00005

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr prefilter pH Hum Cell Shutdown

Project : CA20M-00000-110-16863-02

LR Report : **CA10186-FEB20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue	10: CND 2 Residue
Tl [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000005	98%	ND	103%	< 0.000005	< 0.000005
U [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000002	92%	1%	93%	0.00280	0.000773
V [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00001	99%	2%	101%	0.00004	0.00005
W [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.00002	100%	1%	NV	0.00020	0.00137
Y [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.000002	100%	ND	NV	0.000009	0.000014
Zn [mg/L]	09-Mar-20	20:21	17-Mar-20	09:24	< 0.002	93%	ND	129%	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002068445

SGS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

04-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 20 September 2019
LR Report: **CA14746-SEP19**
Reference: 16863-02-04

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	9: CND 1 Residue	10: CND 2 Residue
Sample Date & Time						N/A	N/A
Mercury [ug/g]	03-Oct-19	09:01	< 0.05	95%	ND	< 0.05	< 0.05
Silver [µg/g]	03-Oct-19	09:01	< 0.01	97%	ND	0.067	0.044
Arsenic [µg/g]	03-Oct-19	09:01	< 0.5	98%	ND	28	2.9
Aluminum [µg/g]	03-Oct-19	09:01	< 3	99%	14%	3500	3800
Boron [µg/g]	03-Oct-19	09:01	< 1	95%	ND	1.8	1.5
Barium [µg/g]	03-Oct-19	09:01	< 0.01	98%	18%	4.6	18
Beryllium [µg/g]	03-Oct-19	09:01	< 0.02	96%	16%	0.057	0.14
Bismuth [µg/g]	03-Oct-19	09:01	< 0.09	100%	19%	1.3	1.3
Calcium [µg/g]	03-Oct-19	09:01	< 3	105%	12%	12000	25000
Cadmium [µg/g]	03-Oct-19	09:01	< 0.02	96%	8%	0.10	0.078
Cobalt [µg/g]	03-Oct-19	09:01	< 0.01	100%	ND	3.8	7.2
Chromium [µg/g]	03-Oct-19	09:01	< 0.5	101%	ND	55	59
Copper [µg/g]	03-Oct-19	09:01	< 0.1	100%	ND	73	210
Iron [µg/g]	03-Oct-19	09:01	< 3	101%	18%	14000	16000
Potassium [µg/g]	03-Oct-19	09:01	< 3	100%	ND	74	170
Lithium [µg/g]	03-Oct-19	09:01	< 2	102%	ND	< 2	2.1
Magnesium [µg/g]	03-Oct-19	09:01	< 3	101%	11%	2000	4600
Manganese [µg/g]	03-Oct-19	09:01	< 0.1	102%	12%	390	530
Molybdenum [µg/g]	03-Oct-19	09:01	< 0.1	99%	20%	3.4	2.3
Sodium [µg/g]	03-Oct-19	09:01	< 3	101%	5%	240	320
Nickel [µg/g]	03-Oct-19	09:01	< 0.1	97%	ND	19	22
Phosphorus [µg/g]	03-Oct-19	09:01	< 3	101%	9%	90	480
Lead [µg/g]	03-Oct-19	09:01	< 0.05	98%	20%	4.7	4.7
Antimony [µg/g]	03-Oct-19	09:01	< 0.8	108%	ND	< 0.8	< 0.8
Selenium [µg/g]	03-Oct-19	09:01	< 0.7	98%	ND	< 0.7	< 0.7
Tin [µg/g]	03-Oct-19	09:01	< 0.5	106%	ND	< 0.5	< 0.5
Strontium [µg/g]	03-Oct-19	09:01	< 0.02	100%	13%	9.4	62
Thorium [µg/g]	03-Oct-19	15:34	< 0.01	103%	5%	0.22	0.27
Titanium [µg/g]	03-Oct-19	09:01	< 0.1	106%	ND	6.5	24
Thallium [µg/g]	03-Oct-19	09:01	< 0.02	95%	ND	< 0.02	< 0.02

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14746-SEP19**

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	9: CND 1 Residue	10: CND 2 Residue
Uranium [µg/g]	03-Oct-19	09:01	< 0.002	93%	16%	0.083	0.18
Vanadium [µg/g]	03-Oct-19	09:01	< 1	102%	14%	7.9	12
Tungsten [µg/g]	03-Oct-19	09:01	< 0.04	99%	ND	0.82	8.1
Yttrium [µg/g]	03-Oct-19	09:01	< 0.004	101%	12%	3.2	3.3
Zinc [µg/g]	03-Oct-19	09:01	< 0.7	97%	18%	19	41

ND - Not Detected

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001914690

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

ABA - Modified Sobek

Project : PO#49734

10-June-2020

Date Rec. : 27 August 2019
LR Report: **CA15455-AUG19**
Reference: Valentine Gold

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR	6: M CG	7: M MD	8: M QE-POR	9: M QZ-QE-POR-Q TP-MIN	10: M LGO	11: SZ QE-POR
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	04-Sep-19	10:10	06-Sep-19	11:38	9.48	9.53	8.96	8.74	9.71	9.48	9.61
Fizz Rate [no unit]	04-Sep-19	10:10	06-Sep-19	11:38	3	3	3	3	3	3	3
Sample weight [g]	04-Sep-19	10:10	06-Sep-19	11:38	1.98	1.98	1.99	1.99	1.96	1.99	1.99
HCl_add [mL]	05-Sep-19	07:48	06-Sep-19	11:38	53.00	68.60	100.00	50.00	33.00	50.10	31.00
HCl [Normality]	04-Sep-19	10:10	06-Sep-19	11:38	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	04-Sep-19	10:10	06-Sep-19	11:38	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	05-Sep-19	07:48	06-Sep-19	11:38	28.55	32.80	50.32	19.35	21.45	25.72	16.86
Final pH [no unit]	05-Sep-19	07:48	06-Sep-19	11:38	1.67	1.57	1.82	1.81	1.61	1.55	1.83
NP [t CaCO3/1000 t]	05-Sep-19	07:48	06-Sep-19	11:38	61.7	90.4	125	77.0	29.5	61.3	35.5
AP [t CaCO3/1000 t]	06-Sep-19	11:38	06-Sep-19	11:39	7.50	0.62	5.94	1.56	8.75	5.94	1.88
Net NP [t CaCO3/1000 t]	06-Sep-19	11:38	06-Sep-19	11:39	54.2	89.8	119	75.4	20.8	55.4	33.6
NP/AP [ratio]	06-Sep-19	11:38	06-Sep-19	11:39	8.23	146	21.0	49.3	3.37	10.3	18.9
S [%]	05-Sep-19	13:16	06-Sep-19	11:45	0.326	< 0.005	0.271	0.083	0.383	0.284	0.129
Acid Leachable SO4-S [%]	06-Sep-19	11:38	06-Sep-19	11:45	0.09	< 0.02	0.08	0.03	0.10	0.09	0.07
Sulphide [%]	06-Sep-19	10:38	06-Sep-19	11:45	0.24	< 0.02	0.19	0.05	0.28	0.19	0.06

OnLine LIMS

0002145280

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#49734

LR Report : CA15455-AUG19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR	6: M CG	7: M MD	8: M QE-POR	9: M QZ-QE-POR-QTP-MIN	10: M LGO	11: SZ QE-POR
C [%]	05-Sep-19	13:16	06-Sep-19	11:42	0.729	1.31	1.33	0.937	0.340	0.738	0.460
CO3 [%]	05-Sep-19	15:59	06-Sep-19	11:42	2.78	5.76	5.82	3.93	0.934	2.79	1.55

Analysis	12: L MD	13: L LGO	14: L QZ-QTP	15: L QZ-TQTP	16: L SED	17: L TRJ	18: V QE-POR	19: V QE-POR-QTP
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH [no unit]	9.14	9.67	9.58	9.69	9.63	9.63	9.75	9.66
Fizz Rate [no unit]	3	3	3	3	3	3	3	3
Sample weight [g]	2.01	1.97	2.01	1.98	1.97	2.00	1.95	1.96
HCl_add [mL]	90.00	31.00	48.00	70.00	20.00	49.00	28.50	33.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	43.04	14.80	24.46	25.23	13.67	27.31	17.19	18.83
Final pH [no unit]	1.63	1.70	1.55	1.55	1.79	1.50	1.52	1.66
NP [t CaCO3/1000 t]	117	41.1	58.6	113	16.1	54.2	29.0	36.2
AP [t CaCO3/1000 t]	2.19	3.12	0.62	1.88	0.62	0.94	0.94	3.12
Net NP [t CaCO3/1000 t]	115	38.0	58.0	111	15.5	53.3	28.1	33.1
NP/AP [ratio]	53.4	13.2	93.8	60.3	26.0	57.8	30.9	11.6
S [%]	0.133	0.161	0.048	0.109	< 0.005	0.080	0.073	0.214
Acid Leachable SO4-S [%]	0.06	0.06	0.03	0.05	< 0.02	0.05	0.04	0.21
Sulphide [%]	0.07	0.10	0.02	0.06	< 0.02	0.03	0.03	0.10
C [%]	1.46	0.569	0.774	0.670	0.138	0.724	0.364	0.428
CO3 [%]	6.42	2.11	3.02	2.37	0.420	2.67	1.25	1.36

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH \text{ added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25

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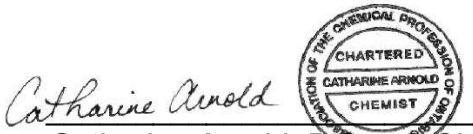
ABA - Modified Sobek

Project : PO#49734

LR Report : **CA15455-AUG19**

*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002145280

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ABA - Modified Sobek

Project : PO#49734

LR Report : **CA15455-AUG19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Carbon/Sulphur - QCBatchID: ECS0002-SEP19														
Carbonate	0.025	%	< 0.005			1	20				88	70	130	
Carbon/Sulphur - QCBatchID: ECS0003-SEP19														
Sulphide	0.02	%	< 0.02			2	20	92	80	120				
Carbon/Sulphur - QCBatchID: ECS0007-SEP19														
Carbon (total)	0.005	%	<0.005			2	20				98	70	130	
Sulphur (total)	0.005	%	<0.005			1	20				99	70	130	

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SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : PO#49734

10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 27 August 2019
LR Report: **CA15457-AUG19**
Reference: Valentine Gold

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR	6: M CG	7: M MD	8: M QE-POR	9: M QZ-QE-POR-QT P-MIN
Sample Date & Time					N/A	N/A	N/A	N/A	N/A
Sample weight [g]	29-Aug-19	07:30	30-Aug-19	10:01	250	250	250	250	250
Volume D.I. Water [mL]	29-Aug-19	07:30	30-Aug-19	10:01	750	750	750	750	750
Final pH [no unit]	30-Aug-19	07:35	30-Aug-19	10:01	8.87	9.27	8.76	9.31	9.42
Sample weight [g]	05-Sep-19	08:15	06-Sep-19	11:52	250	250	250	250	250
Volume D.I. Water [mL]	05-Sep-19	08:15	06-Sep-19	11:52	750	750	750	750	750
Final pH [no unit]	06-Sep-19	07:07	06-Sep-19	11:52	8.99	9.27	8.85	9.26	9.35
pH [no unit]	06-Sep-19	10:28	09-Sep-19	13:47	8.42	8.85	7.98	8.73	9.05
Conductivity [uS/cm]	06-Sep-19	10:28	09-Sep-19	13:47	128	106	193	93	89
Alkalinity [mg/L as CaCO3]	06-Sep-19	10:28	09-Sep-19	13:47	44	52	29	38	36
SO4 [mg/L]	06-Sep-19	15:16	09-Sep-19	09:50	5	< 2	58	2	< 2
F [mg/L]	09-Sep-19	13:47	10-Sep-19	11:18	0.15	0.14	0.11	0.11	0.09
Ag [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.714	0.640	0.428	1.09	1.03
As [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0012	0.0037	0.0004	0.0010	0.0009
Ba [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00148	0.00088	0.0519	0.00119	0.00063
B [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.012	0.011	0.006	0.015	0.028
Be [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.000015	0.000021	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	9.54	6.01	19.1	6.44	5.82
Cd [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Co [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.000148	0.000007	0.000010	0.000011	0.000011
Cr [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0004	0.0009	< 0.0002	0.0003	0.0004
Fe [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.016	< 0.007	< 0.007	< 0.007	< 0.007
K [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	1.91	5.67	0.785	1.84	1.32
Li [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0005	0.0009	0.0003	0.0002	0.0028
Mg [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.750	1.78	4.02	0.553	0.351
Mn [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00294	0.00209	0.00440	0.00112	0.00114
Mo [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00096	0.00048	0.00094	0.00296	0.00114
Na [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	12.2	9.84	6.48	9.53	8.97
Ni [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0007	< 0.0001	0.0001	< 0.0001	< 0.0001
Pb [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00007	0.00001	< 0.00001	0.00001	0.00004
Sb [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0011	0.0013	0.0010	0.0023	< 0.0009

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : PO#49734

LR Report : **CA15457-AUG19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR	6: M CG	7: M MD	8: M QE-POR	9: M QZ-QE-POR-QTP-MIN
Se [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00032	0.00005	0.00006	0.00009	0.00011
Sn [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.00006	< 0.00006	< 0.00006	0.00229	0.00070
Sr [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.0133	0.0137	0.132	0.0122	0.0121
Ti [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00010	0.00014	< 0.00005	0.00236	0.00097
Tl [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.000134	0.000609	0.000011	0.000043	0.000106
V [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00101	0.00584	0.00094	0.00375	0.00185
W [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.00100	0.00063	0.00087	0.00339	0.00132
Y [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	0.000019	0.000012	0.000002	0.000018	0.000010
Zn [mg/L]	03-Sep-19	19:15	05-Sep-19	11:02	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Analysis	10: M LGO	11: SZ QE-POR	12: L MD	13: L LGO	14: L QZ-QTP	15: L QZ-TQTP	16: L SED	17: L TRJ	18: V QE-POR
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample weight [g]	250	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750	750	750
Final pH [no unit]	9.24	9.46	8.93	9.32	9.47	9.37	9.54	9.56	9.41
Sample weight [g]	250	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750	750	750
Final pH [no unit]	9.17	9.32	8.90	9.25	9.37	9.35	9.37	9.52	9.38
pH [no unit]	8.72	8.93	8.57	8.96	9.06	9.03	9.08	9.24	9.11
Conductivity [uS/cm]	111	98	120	112	107	107	91	90	95
Alkalinity [mg/L as CaCO3]	41	46	54	51	49	47	38	42	44
SO4 [mg/L]	3	< 2	3	< 2	2	3	< 2	< 2	< 2
F [mg/L]	0.13	0.14	0.10	0.12	0.15	0.12	0.16	0.08	0.10
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.910	0.980	0.592	1.17	1.49	1.17	1.54	1.18	0.807
As [mg/L]	0.0018	0.0015	0.0006	0.0036	0.0009	0.0016	0.0052	0.0014	0.0022
Ba [mg/L]	0.00116	0.00048	0.0312	0.00228	0.00377	0.00279	0.00200	0.00546	0.00055
B [mg/L]	0.021	0.011	0.008	0.079	0.012	0.028	0.013	0.011	0.020
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	0.000104	< 0.000007	0.000027	< 0.000007	< 0.000007	0.000151	< 0.000007	0.000276	< 0.000007
Ca [mg/L]	6.89	4.93	9.22	6.54	5.13	5.79	3.55	4.85	6.50
Cd [mg/L]	0.000005	0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Co [mg/L]	0.000012	0.000023	0.000016	0.000170	0.000017	0.000012	0.000021	0.000019	0.000015
Cr [mg/L]	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.00011	< 0.00008	< 0.00008
Cu [mg/L]	0.0011	0.0003	0.0016	0.0007	0.0011	0.0009	0.0005	0.0009	0.0011
Fe [mg/L]	0.007	0.017	< 0.007	0.012	0.007	< 0.007	0.030	0.016	0.012
K [mg/L]	1.93	1.36	5.29	5.33	6.33	5.90	6.87	4.29	0.851
Li [mg/L]	0.0003	0.0004	0.0004	0.0006	0.0006	0.0003	0.0060	0.0005	0.0002
Mg [mg/L]	0.656	0.360	2.93	1.10	0.698	0.716	0.314	0.481	0.901
Mn [mg/L]	0.00219	0.00086	0.00160	0.00152	0.00116	0.00165	0.00145	0.00114	0.00159
Mo [mg/L]	0.0195	0.00053	0.00054	0.00028	0.00016	0.00031	0.00069	0.00028	0.00091
Na [mg/L]	10.8	10.9	7.12	9.51	10.7	10.1	8.71	9.71	10.9
Ni [mg/L]	0.0001	< 0.0001	0.0002	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Pb [mg/L]	0.00005	< 0.00001	0.00004	0.00001	0.00003	0.00003	0.00006	0.00007	0.00002
Sb [mg/L]	0.0011	< 0.0009	0.0023	0.0026	< 0.0009	0.0020	0.0119	< 0.0009	0.0009
Se [mg/L]	0.00012	0.00012	0.00005	0.00014	0.00005	0.00013	0.00006	0.00012	0.00009
Sn [mg/L]	0.00007	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	0.0189	0.00577	0.102	0.0378	0.0534	0.0279	0.0143	0.0215	0.00865

OnLine LMS

0002145263

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : PO#49734

LR Report : **CA15457-AUG19**

Analysis	10: M LGO	11: SZ QE-POR	12: L MD	13: L LGO	14: L QZ-QTP	15: L QZ-TQTP	16: L SED	17: L TRJ	18: V QE-POR
Ti [mg/L]	0.00014	0.00069	< 0.00005	0.00016	0.00012	0.00018	0.00134	0.00049	0.00037
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.000048	0.000103	0.000008	0.000438	0.000303	0.000344	0.000148	0.000187	0.000153
V [mg/L]	0.00321	0.00189	0.00122	0.00522	0.00576	0.00589	0.00891	0.00400	0.00376
W [mg/L]	0.00540	0.00159	0.00085	0.0165	0.00084	0.00080	0.00050	0.00072	0.00207
Y [mg/L]	0.000035	0.000014	0.000002	0.000004	0.000002	0.000005	0.000026	0.000016	0.000013
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Analysis	19: V QE-POR-QTP
Sample Date & Time	N/A
Sample weight [g]	250
Volume D.I. Water [mL]	750
Final pH [no unit]	9.19
Sample weight [g]	250
Volume D.I. Water [mL]	750
Final pH [no unit]	9.18
pH [no unit]	8.79
Conductivity [uS/cm]	113
Alkalinity [mg/L as CaCO3]	43
SO4 [mg/L]	5
F [mg/L]	0.11
Ag [mg/L]	< 0.00005
Al [mg/L]	0.690
As [mg/L]	0.0015
Ba [mg/L]	0.00103
B [mg/L]	0.030
Be [mg/L]	< 0.000007
Bi [mg/L]	< 0.000007
Ca [mg/L]	7.86
Cd [mg/L]	< 0.000003
Co [mg/L]	0.000015
Cr [mg/L]	< 0.00008
Cu [mg/L]	0.0004
Fe [mg/L]	< 0.007
K [mg/L]	1.70
Li [mg/L]	0.0002
Mg [mg/L]	1.40
Mn [mg/L]	0.00155
Mo [mg/L]	0.00060
Na [mg/L]	10.9
Ni [mg/L]	< 0.0001
Pb [mg/L]	< 0.00001
Sb [mg/L]	0.0015
Se [mg/L]	0.00005
Sn [mg/L]	0.00023
Sr [mg/L]	0.0177
Ti [mg/L]	0.00016
Tl [mg/L]	< 0.000005
U [mg/L]	0.000039

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Lakefield - Ontario - KOL 2HO
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SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : PO#49734

LR Report : **CA15457-AUG19**

Analysis	19: V QE-POR-QTP
V [mg/L]	0.00276
W [mg/L]	0.00122
Y [mg/L]	0.000003
Zn [mg/L]	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LMS

0002145263

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0079-SEP19													
Alkalinity	2	mg/L as Ca	< 2			3	20	104	80	120	NA		
Anions by discrete analyzer - QCBatchID: DIO0089-SEP19													
Sulphate	2	mg/L	<2			ND	20	106	80	120	106	75	125
Conductivity - QCBatchID: EWL0079-SEP19													
Conductivity	2	uS/cm	< 2			1	20	99	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0107-SEP19													
Fluoride	0.06	mg/L	<0.06			1	10	97	90	110	106	75	125
Metals - QCBatchID: EMS0212-AUG19													
Cobalt	0.000004	mg/L	< 0.000004			10	20	100	90	110	95	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0212-AUG19													
Aluminum	0.001	mg/L	< 0.001			8	20	99	90	110	NV	70	130
Antimony	0.0009	mg/L	< 0.0009			ND	20	103	90	110	110	70	130
Arsenic	0.0002	mg/L	< 0.0002			10	20	101	90	110	97	70	130
Barium	0.00002	mg/L	< 0.00002			6	20	97	90	110	NV	70	130
Beryllium	0.000007	mg/L	< 0.000007			17	20	92	90	110	89	70	130
Bismuth	0.000007	mg/L	< 0.000007			2	20	101	90	110	NV	70	130
Boron	0.002	mg/L	< 0.002			4	20	96	90	110	NV	70	130
Cadmium	0.000003	mg/L	< 0.000003			9	20	100	90	110	NV	70	130
Calcium	0.01	mg/L	< 0.01			7	20	97	90	110	NV	70	130
Chromium	0.00008	mg/L	< 0.00008			ND	20	102	90	110	NV	70	130
Copper	0.0002	mg/L	< 0.0002			19	20	101	90	110	NV	70	130
Iron	0.007	mg/L	< 0.007			14	20	100	90	110	NV	70	130
Lead	0.00001	mg/L	< 0.00001			ND	20	97	90	110	NV	70	130
Lithium	0.0001	mg/L	< 0.0001			3	20	93	90	110	80	70	130
Magnesium	0.001	mg/L	< 0.001			2	20	109	90	110	89	70	130
Manganese	0.00001	mg/L	< 0.00001			11	20	97	90	110	NV	70	130
Molybdenum	0.00004	mg/L	< 0.00004			7	20	98	90	110	101	70	130
Nickel	0.0001	mg/L	< 0.0001			2	20	101	90	110	NV	70	130
Potassium	0.003	mg/L	< 0.009			3	20	107	90	110	NV	70	130
Selenium	0.00004	mg/L	< 0.00004			16	20	100	90	110	98	70	130
Silver	0.00005	mg/L	< 0.00005			ND	20	100	90	110	71	70	130
Sodium	0.01	mg/L	< 0.01			3	20	100	90	110	NV	70	130
Strontium	0.00002	mg/L	< 0.00002			7	20	95	90	110	125	70	130
Thallium	0.000005	mg/L	< 0.000005			14	20	101	90	110	82	70	130
Tin	0.00006	mg/L	< 0.00006			3	20	99	90	110	NV	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : PO#49734

LR Report : **CA15457-AUG19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank				Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)			Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High			Low	High
Titanium	0.00005	mg/L	< 0.00005			10	20	98	90	110		NV	70	130
Tungsten	0.00002	mg/L	< 0.00002			ND	20	106	90	110		NV	70	130
Uranium	0.000002	mg/L	< 0.000002			4	20	94	90	110		88	70	130
Vanadium	0.00001	mg/L	< 0.00001			17	20	96	90	110		77	70	130
Yttrium	0.000002	mg/L	< 0.000002			13	20	101	90	110		NV	70	130
Zinc	0.002	mg/L	< 0.002			ND	20	104	90	110		NV	70	130
pH - QCBatchID: EWL0079-SEP19														
pH	0.05	no unit	NA			0		100				NA		

OnLine LIMS

0002145263

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#49734

10-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO
Mt. Pearl, NL
A1N 0A1, Canada

Phone: 709-730-5046
Fax:

Date Rec. : 27 August 2019
LR Report: **CA15456-AUG19**
Reference: Valentine Gold

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

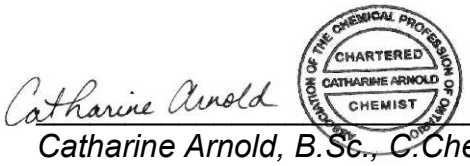
Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR	6: M CG	7: M MD	8: M QE-POR	9: M QZ-QE-POR-QT P-MIN	10: M LGO
Sample Date & Time					N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.05	0.05	0.03	0.02	0.02	0.02
As [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.7	1.3	1.4	< 0.5	0.5	3.0
Al [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	14000	6500	35000	11000	8100	15000
Ba [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	62	61	7.8	20	24	22
Be [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.10	0.16	0.18	0.06	0.07	0.09
Bi [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.12	0.17	< 0.09	< 0.09	0.11	0.10
Ca [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	18000	20000	34000	23000	8500	18000
Cd [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.02	0.07	0.04	< 0.02	< 0.02	0.03
Co [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	8.4	11	36	6.3	3.5	9.9
Cr [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	110	53	120	100	95	98
Cu [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	15	30	69	14	13	11
Fe [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	33000	24000	84000	25000	20000	33000
K [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	740	1500	130	470	730	480
Li [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	4	4	9	3	< 2	6
Mg [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	8700	11000	31000	7000	3500	11000
Mn [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	680	1100	1800	580	310	900
Mo [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	3.5	1.1	0.9	2.2	5.4	15
Na [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	1100	770	530	880	1600	1100
Ni [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	22	18	38	13	4.1	11
P [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	380	400	200	190	120	190
Pb [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.66	2.3	0.65	0.89	0.29	1.9
Sb [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	33	47	56	26	17	33
Ti [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	42	220	180	27	23	31
Tl [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	< 0.02	0.03	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	0.10	0.50	0.098	0.094	0.11	0.13
V [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	28	27	280	31	12	70
Y [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	6.7	3.5	6.7	8.2	7.8	7.2
Zn [µg/g]	09-Sep-19	13:00	09-Sep-19	15:59	42	46	90	17	12	42

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#49734

LR Report : **CA15456-AUG19**

Analysis	11: SZ QE-POR	12: L MD	13: L LGO	14: L QZ-QTP	15: L QZ-TQTP	16: L SED	17: L TRJ	18: V QE-POR	19: V QE-POR-QTP
Sample Date & Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg [ug/g]	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ag [µg/g]	0.01	0.01	0.03	< 0.01	0.01	< 0.01	< 0.01	0.01	0.02
As [µg/g]	0.7	2.2	2.0	0.5	0.8	3.2	0.8	0.5	0.9
Al [µg/g]	8700	22000	4100	5900	6300	14000	5600	6200	8700
Ba [µg/g]	21	79	59	180	150	58	260	22	23
Be [µg/g]	0.07	0.17	0.10	0.14	0.13	0.16	0.12	0.06	0.07
Bi [µg/g]	< 0.09	< 0.09	0.17	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.30
Ca [µg/g]	11000	34000	10000	15000	13000	5100	14000	7500	8600
Cd [µg/g]	0.02	0.07	0.07	0.02	0.03	0.03	0.03	0.02	0.03
Co [µg/g]	3.4	29	4.1	4.6	4.0	14	3.3	4.0	4.5
Cr [µg/g]	80	70	70	38	59	50	54	73	88
Cu [µg/g]	13	50	20	10.0	10	2.5	6.9	29	21
Fe [µg/g]	23000	59000	13000	15000	13000	31000	12000	20000	23000
K [µg/g]	670	690	770	1500	1700	1400	1800	520	640
Li [µg/g]	< 2	6	< 2	< 2	< 2	8	< 2	< 2	< 2
Mg [µg/g]	3900	21000	3600	4000	3300	11000	2800	3500	4900
Mn [µg/g]	440	1100	340	460	490	750	430	420	570
Mo [µg/g]	4.4	1.1	1.7	1.9	3.0	0.8	2.7	2.2	4.3
Na [µg/g]	1300	460	740	990	1200	740	1200	1000	1200
Ni [µg/g]	3.0	22	5.3	3.2	3.4	24	3.2	4.2	7.8
P [µg/g]	220	610	390	440	260	810	280	150	72
Pb [µg/g]	0.46	2.0	1.8	1.6	2.5	1.2	3.4	0.28	0.45
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	17	114	48	74	68	26	67	11	12
Ti [µg/g]	85	290	32	35	37	300	40	29	36
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	0.02	< 0.02	< 0.02
U [µg/g]	0.13	0.12	0.15	0.17	0.16	0.47	0.12	0.16	0.18
V [µg/g]	8	170	8	11	12	46	8	15	32
Y [µg/g]	8.0	15	2.3	3.0	3.1	6.8	2.7	5.6	6.1
Zn [µg/g]	23	70	26	42	35	61	27	18	32



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002145261

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#49734
LR Report : **CA15456-AUG19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Mercury by CVAAS - QCBatchID: EMS0036-SEP19													
Mercury	0.05	ug/g	<0.05			10	20	101	80	120	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0036-SEP19													
Aluminum	3	µg/g	<3			1	20	99	70	130	97	70	130
Antimony	0.8	µg/g	<0.8			3	20	100	70	130	NV	70	130
Arsenic	0.5	µg/g	<0.5			6	20	94	70	130	115	70	130
Barium	0.01	µg/g	<0.01			1	20	103	70	130	95	70	130
Beryllium	0.02	µg/g	<0.02			0	20	96	70	130	NV	70	130
Bismuth	0.09	µg/g	<0.09			10	20	101	70	130	NV	70	130
Cadmium	0.02	µg/g	<0.02			2	20	99	70	130	NV	70	130
Calcium	3	µg/g	<3			5	20	103	70	130	NV	70	130
Chromium	0.5	µg/g	<0.5			0	20	105	70	130	82	70	130
Cobalt	0.01	µg/g	<0.01			1	20	105	70	130	106	70	130
Copper	0.1	µg/g	<0.1			0	20	107	70	130	105	70	130
Iron	3	µg/g	<3			2	20	106	70	130	105	70	130
Lead	0.05	µg/g	<0.05			1	20	100	70	130	125	70	130
Lithium	2	µg/g	<2			2	20	92	70	130	NV	70	130
Magnesium	3	µg/g	<3			0	20	99	70	130	NV	70	130
Manganese	0.1	µg/g	<0.1			1	20	104	70	130	117	70	130
Molybdenum	0.1	µg/g	<0.1			2	20	100	70	130	NV	70	130
Nickel	0.1	µg/g	<0.1			0	20	104	70	130	90	70	130
Phosphorus	3	µg/g	<3			5	20	93	70	130	NV	70	130
Potassium	3	µg/g	<3			1	20	107	70	130	NV	70	130
Selenium	0.7	µg/g	<0.7			0	20	101	70	130	NV	70	130
Silver	0.01	µg/g	<0.01			2	20	100	70	130	113	70	130
Sodium	3	µg/g	<3			1	20	97	70	130	NV	70	130
Strontium	0.02	µg/g	<0.02			1	20	102	70	130	NV	70	130
Thallium	0.02	µg/g	<0.02			0	20	100	70	130	NV	70	130
Tin	0.5	µg/g	<0.5			ND	20	97	70	130	NV	70	130
Titanium	0.1	µg/g	<0.1			4	20	94	70	130	NV	70	130
Uranium	0.002	µg/g	<0.002			2	20	99	70	130	NV	70	130
Vanadium	1	µg/g	<1			2	20	105	70	130	111	70	130
Yttrium	0.004	µg/g	<0.004			3	20	103	70	130	NV	70	130
Zinc	0.7	µg/g	<0.7			0	20	100	70	130	82	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : Valentine Gold

06-July-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 11 March 2020
LR Report: **CA10108-MAR20**
Reference: Hum Cell Shut Down

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Reissue

Sample ID	Sample Date & Time	Hum Cell Shutdown	Sample weight g	Volume D.I. Water mL	Final pH no unit	pH no unit	Conductivity uS/cm	Alkalinity mg/L as CaCO3
1: Analysis Start Date		13-Mar-20	12-Mar-20	12-Mar-20	13-Mar-20	13-Mar-20	13-Mar-20	13-Mar-20
2: Analysis Start Time		10:48	12:05	12:05	10:30	14:38	14:38	14:38
3: Analysis Completed Date		13-Mar-20	13-Mar-20	13-Mar-20	13-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20
4: Analysis Completed Time		10:49	10:49	10:49	10:49	09:08	09:08	09:08
5: M AQPOR	11-Mar-20	1	250	750	9.21	8.25	96	37
6: M CG	11-Mar-20	1	250	750	9.35	8.64	83	42
7: M MD	11-Mar-20	1	250	750	9.16	8.21	83	36
8: M QE-POR	11-Mar-20	1	250	750	9.48	8.52	79	32
9: M QZ-QE-POR-QTP-MIN	11-Mar-20	1	250	750	9.50	8.57	69	32
11: L MD	11-Mar-20	1	250	750	9.09	8.29	92	41
12: L QZ-QTP	11-Mar-20	1	250	750	9.57	8.83	78	39
13: L QZ-TQTP	11-Mar-20	1	250	750	9.36	8.55	81	40
14: L SED	11-Mar-20	1	250	750	9.58	8.46	65	33
15: L TRJ	11-Mar-20	1	250	750	9.56	8.81	77	38

Sample ID	SO4 mg/L	F mg/L	Hg mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L
1: Analysis Start Date	18-Mar-20	12-Feb-20	17-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20
2: Analysis Start Time	15:11	11:29	14:04	13:48	13:48	13:48	13:48	13:48
3: Analysis Completed Date	19-Mar-20	16-Mar-20	18-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20
4: Analysis Completed Time	15:34	07:50	13:03	14:55	14:55	14:55	14:55	14:55
5: M AQPOR	2	0.08	< 0.00001	< 0.00005	0.912	0.0006	0.00216	0.008
6: M CG	< 2	0.08	< 0.00001	< 0.00005	0.807	0.0024	0.00109	0.008
7: M MD	3	0.08	< 0.00001	< 0.00005	0.624	0.0004	0.0679	0.002
8: M QE-POR	< 2	0.06	< 0.00001	< 0.00005	1.14	0.0007	0.00213	0.007
9: M QZ-QE-POR-QTP-MIN	< 2	< 0.06	< 0.00001	< 0.00005	1.16	0.0005	0.00109	0.012
11: L MD	< 2	< 0.06	< 0.00001	< 0.00005	0.597	0.0017	0.0126	0.004
12: L QZ-QTP	< 2	0.09	< 0.00001	< 0.00005	1.47	0.0005	0.00369	0.009
13: L QZ-TQTP	2	0.06	< 0.00001	< 0.00005	1.24	0.0008	0.00256	0.014
14: L SED	< 2	0.10	< 0.00001	< 0.00005	1.48	0.0024	0.00206	0.007

OnLine LIMS

0002171827

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : Valentine Gold

LR Report : **CA10108-MAR20**

Sample ID	SO4 mg/L	F mg/L	Hg mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L
15: L TRJ	< 2	0.06	< 0.00001	< 0.00005	1.24	0.0008	0.00734	0.008

Sample ID	Be mg/L	Bi mg/L	Ca mg/L	Cd mg/L	Co mg/L	Cr mg/L	Cu mg/L	Fe mg/L
1: Analysis Start Date	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20
2: Analysis Start Time	13:48	13:48	13:48	13:48	13:48	13:48	13:48	13:48
3: Analysis Completed Date	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20
4: Analysis Completed Time	14:55	14:55	14:55	14:55	14:55	14:55	14:55	14:55
5: M AQPOR	< 0.000007	< 0.000007	8.64	0.000003	< 0.000004	< 0.00008	0.0003	< 0.007
6: M CG	< 0.000007	< 0.000007	6.25	< 0.000003	< 0.000004	< 0.00008	0.0003	< 0.007
7: M MD	< 0.000007	< 0.000007	8.86	0.000003	0.000004	< 0.00008	0.0002	< 0.007
8: M QE-POR	< 0.000007	< 0.000007	6.05	< 0.000003	< 0.000004	0.00015	< 0.0002	< 0.007
9: M QZ-QE-POR-QTP-MIN	< 0.000007	< 0.000007	5.76	< 0.000003	< 0.000004	0.00010	0.0003	< 0.007
11: L MD	< 0.000007	< 0.000007	8.51	< 0.000003	< 0.000004	< 0.00008	< 0.0002	< 0.007
12: L QZ-QTP	< 0.000007	< 0.000007	5.42	0.000003	< 0.000004	< 0.00008	0.0005	< 0.007
13: L QZ-TQTP	< 0.000007	< 0.000007	6.76	< 0.000003	< 0.000004	< 0.00008	0.0003	< 0.007
14: L SED	< 0.000007	< 0.000007	4.25	< 0.000003	0.000006	0.00008	0.0007	0.028
15: L TRJ	< 0.000007	< 0.000007	5.30	< 0.000003	< 0.000004	< 0.00008	0.0003	< 0.007

Sample ID	K mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Na mg/L	Ni mg/L	Pb mg/L
1: Analysis Start Date	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20
2: Analysis Start Time	13:48	13:48	13:48	13:48	13:48	13:48	13:48	13:48
3: Analysis Completed Date	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20
4: Analysis Completed Time	14:55	14:55	14:55	14:55	14:55	14:55	14:55	14:55
5: M AQPOR	1.12	0.0003	0.504	0.00179	0.00090	8.78	0.0002	0.00003
6: M CG	3.44	0.0007	1.32	0.00202	0.00012	6.31	0.0002	0.00002
7: M MD	0.173	0.0001	1.65	0.00587	0.00014	4.14	0.0002	0.00001
8: M QE-POR	1.15	0.0002	0.471	0.00112	0.00019	6.97	0.0002	0.00001
9: M QZ-QE-POR-QTP-MIN	0.664	0.0002	0.291	0.00143	0.00022	7.55	0.0003	0.00006
11: L MD	2.19	0.0002	1.91	0.00140	0.00010	5.51	0.0002	0.00001
12: L QZ-QTP	3.76	0.0003	0.593	0.00127	0.00009	7.37	0.0002	0.00003
13: L QZ-TQTP	3.55	0.0003	0.813	0.00229	0.00011	6.01	0.0002	0.00002
14: L SED	4.48	0.0004	0.266	0.00163	0.00012	5.88	0.0004	0.00003
15: L TRJ	3.38	0.0002	0.548	0.00130	0.00008	7.64	0.0001	0.00003

Sample ID	Sb mg/L	Se mg/L	Sn mg/L	Sr mg/L	Ti mg/L	Tl mg/L	U mg/L	V mg/L
1: Analysis Start Date	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20	16-Mar-20
2: Analysis Start Time	13:48	13:48	13:48	13:48	13:48	13:48	13:48	13:48
3: Analysis Completed Date	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20	17-Mar-20
4: Analysis Completed Time	14:55	14:55	14:55	14:55	14:55	14:55	14:55	14:55
5: M AQPOR	< 0.0009	0.00020	0.00007	0.0118	0.00031	< 0.000005	0.000233	0.00172

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : Valentine Gold
LR Report : **CA10108-MAR20**

Sample ID	Sb mg/L	Se mg/L	Sn mg/L	Sr mg/L	Ti mg/L	Tl mg/L	U mg/L	V mg/L
6: M CG	< 0.0009	0.00007	< 0.00006	0.0127	< 0.00005	< 0.000005	0.000560	0.00503
7: M MD	< 0.0009	0.00005	< 0.00006	0.0599	< 0.00005	< 0.000005	0.000429	0.00151
8: M QE-POR	< 0.0009	0.00007	< 0.00006	0.0108	0.00017	< 0.000005	0.00189	0.00342
9: M QZ-QE-POR-QTP-MIN	< 0.0009	0.00006	< 0.00006	0.00918	0.00014	< 0.000005	0.000185	0.00172
11: L MD	0.0011	0.00005	< 0.00006	0.0585	0.00044	< 0.000005	0.000040	0.00130
12: L QZ-QTP	< 0.0009	0.00004	< 0.00006	0.0547	0.00013	< 0.000005	0.000634	0.00440
13: L QZ-TQTP	< 0.0009	0.00004	< 0.00006	0.0253	0.00012	< 0.000005	0.000609	0.00413
14: L SED	< 0.0009	< 0.00004	< 0.00006	0.0139	0.00137	< 0.000005	0.000283	0.00691
15: L TRJ	< 0.0009	< 0.00004	< 0.00006	0.0251	0.00018	< 0.000005	0.000236	0.00363

Sample ID	W mg/L	Y mg/L	Zn mg/L
1: Analysis Start Date	16-Mar-20	16-Mar-20	16-Mar-20
2: Analysis Start Time	13:48	13:48	13:48
3: Analysis Completed Date	17-Mar-20	17-Mar-20	17-Mar-20
4: Analysis Completed Time	14:55	14:55	14:55
5: M AQPOR	0.00051	0.000002	< 0.002
6: M CG	0.00025	0.000004	< 0.002
7: M MD	0.00038	0.000002	< 0.002
8: M QE-POR	0.00040	0.000004	< 0.002
9: M QZ-QE-POR-QTP-MIN	0.00036	0.000014	< 0.002
11: L MD	0.00071	0.000002	< 0.002
12: L QZ-QTP	0.00029	0.000003	< 0.002
13: L QZ-TQTP	0.00041	< 0.000002	< 0.002
14: L SED	0.00036	0.000023	< 0.002
15: L TRJ	0.00032	< 0.000002	< 0.002

Report reissued with QC report.

Catharine Arnold
CHARTERED CATHARINE ARNOLD CHEMIST ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002171827

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0202-MAR20													
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA		
Anions by discrete analyzer - QCBatchID: DIO0268-MAR20													
Sulphate	2	mg/L	<2			2	20	108	80	120	108	75	125
Anions by discrete analyzer - QCBatchID: DIO0276-MAR20													
Sulphate	2	mg/L	<2			ND	20	101	80	120	102	75	125
Conductivity - QCBatchID: EWL0202-MAR20													
Conductivity	2	uS/cm	< 2			0	20	101	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0211-MAR20													
Fluoride	0.06	mg/L	<0.06			ND	10	105	90	110	106	75	125
Inorganics-General - QCBatchID: EHG0015-MAR20													
Mercury	0.00001	mg/L	< 0.00001			0	20	105	80	120	111	70	130
Metals - QCBatchID: EMS0077-MAR20													
Cobalt	0.000004	mg/L	<0.000004			4	20	94	90	110	95	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0077-MAR20													
Aluminum	0.001	mg/L	<0.001			7	20	97	90	110	105	70	130
Antimony	0.0009	mg/L	<0.0009			3	20	99	90	110	78	70	130
Arsenic	0.0002	mg/L	<0.0002			3	20	96	90	110	94	70	130
Barium	0.00002	mg/L	<0.00002			5	20	96	90	110	98	70	130
Beryllium	0.000007	mg/L	<0.000007			15	20	94	90	110	94	70	130
Bismuth	0.000007	mg/L	<0.000007			19	20	93	90	110	87	70	130
Boron	0.002	mg/L	<0.002			6	20	95	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			1	20	95	90	110	91	70	130
Calcium	0.01	mg/L	<0.01			3	20	100	90	110	98	70	130
Chromium	0.00008	mg/L	<0.00008			1	20	98	90	110	93	70	130
Copper	0.0002	mg/L	<0.0002			1	20	95	90	110	98	70	130
Iron	0.007	mg/L	<0.007			4	20	106	90	110	105	70	130
Lead	0.00001	mg/L	<0.00001			5	20	95	90	110	95	70	130
Lithium	0.0001	mg/L	<0.0001			5	20	91	90	110	87	70	130
Magnesium	0.001	mg/L	<0.001			0	20	101	90	110	98	70	130
Manganese	0.00001	mg/L	<0.00001			1	20	99	90	110	94	70	130
Molybdenum	0.00004	mg/L	<0.00004			8	20	94	90	110	92	70	130
Nickel	0.0001	mg/L	<0.0001			4	20	98	90	110	93	70	130
Potassium	0.009	mg/L	<0.009			3	20	102	90	110	95	70	130
Selenium	0.00004	mg/L	<0.00004			5	20	93	90	110	95	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	96	90	110	95	70	130

SGS Canada Inc.
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SFE 3:1 ratio 24hr (MEND) prefilter pH

Project : Valentine Gold

LR Report : **CA10108-MAR20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Sodium	0.01	mg/L	<0.01			4	20	101	90	110	98	70	130
Strontium	0.00002	mg/L	<0.00002			4	20	94	90	110	94	70	130
Thallium	0.000005	mg/L	<0.000005			9	20	94	90	110	92	70	130
Tin	0.00006	mg/L	<0.00006			4	20	93	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			4	20	96	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			14	20	98	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			7	20	94	90	110	97	70	130
Vanadium	0.00001	mg/L	<0.00001			4	20	95	90	110	101	70	130
Yttrium	0.000002	mg/L	2e-006			2	20	95	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			3	20	94	90	110	98	70	130
pH - QCBatchID: EWL0202-MAR20													
pH	0.05	no unit	NA			0		102			NA		

OnLine LIMS

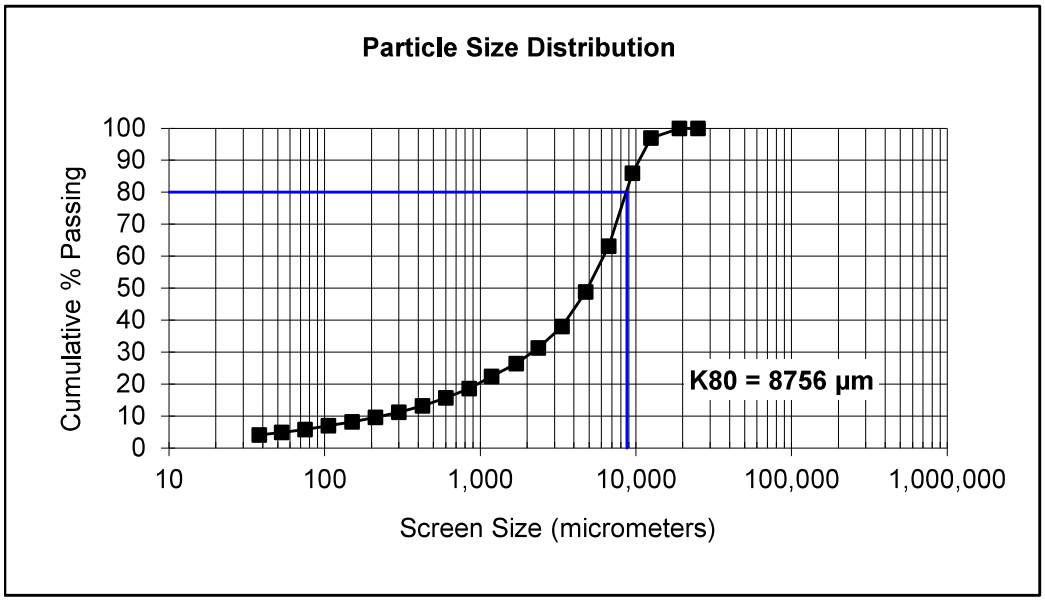
0002171827

SGS Minerals Services
Size Distribution Analysis

Project No.
CA14153-SEP19

Sample: **L-QZ TQTP+QZ-QIP** Test No.: **Enviro**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
1"	25,000	0.0	0.0	0.0	100.0
3/4"	19,000	0.0	0.0	0.0	100.0
1/2"	12,500	72.2	3.0	3.0	97.0
3/8"	9,500	260.1	11.0	14.0	86.0
3	6,700	541.1	22.8	36.8	63.2
4	4,750	340.5	14.4	51.2	48.8
6	3,350	256.3	10.8	62.0	38.0
8	2,360	158.2	6.7	68.7	31.3
10	1,700	115.7	4.9	73.6	26.4
14	1,180	96.0	4.0	77.6	22.4
20	850	90.1	3.8	81.4	18.6
28	600	67.9	2.9	84.3	15.7
35	425	59.1	2.5	86.8	13.2
48	300	48.9	2.1	88.9	11.1
65	212	36.9	1.6	90.4	9.6
100	150	33.7	1.4	91.8	8.2
150	106	28.7	1.2	93.0	7.0
200	75	26.9	1.1	94.2	5.8
270	53	23.1	1.0	95.1	4.9
400	38	19.3	0.8	96.0	4.0
Pan	-38	95.7	4.0	100.0	0.0
Total	**-**	**2370.4**	100.0	**-**	**-**
K80	**8,756**				

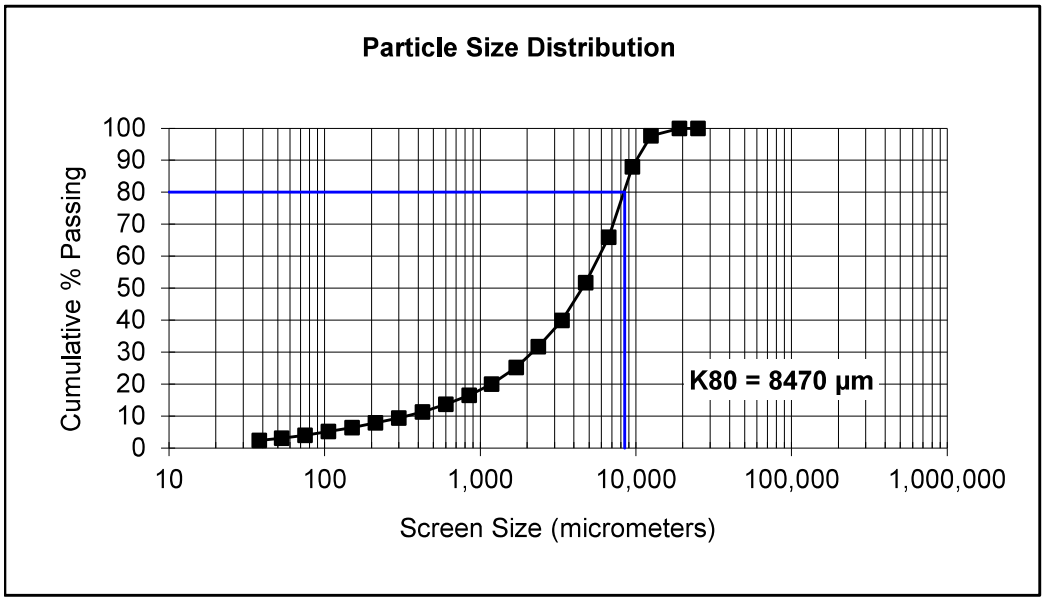


SGS Minerals Services
Size Distribution Analysis

Project No.
CA14153-SEP19

Sample: **M+L LGO** Test No.: **Enviro**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
1"	25,000	0.0	0.0	0.0	100.0
3/4"	19,000	0.0	0.0	0.0	100.0
1/2"	12,500	55.3	2.3	2.3	97.7
3/8"	9,500	232.5	9.7	12.0	88.0
3	6,700	528.3	22.1	34.1	65.9
4	4,750	338.0	14.1	48.2	51.8
6	3,350	284.1	11.9	60.1	39.9
8	2,360	196.0	8.2	68.3	31.7
10	1,700	155.8	6.5	74.8	25.2
14	1,180	124.7	5.2	80.0	20.0
20	850	83.4	3.5	83.5	16.5
28	600	66.9	2.8	86.3	13.7
35	425	57.2	2.4	88.7	11.3
48	300	46.7	2.0	90.7	9.3
65	212	35.5	1.5	92.1	7.9
100	150	35.2	1.5	93.6	6.4
150	106	29.4	1.2	94.8	5.2
200	75	28.8	1.2	96.0	4.0
270	53	22.0	0.9	97.0	3.0
400	38	15.6	0.7	97.6	2.4
Pan	-38	56.9	2.4	100.0	0.0
Total	**-**	**2392.3**	100.0	**-**	**-**
K80	**8,470**				

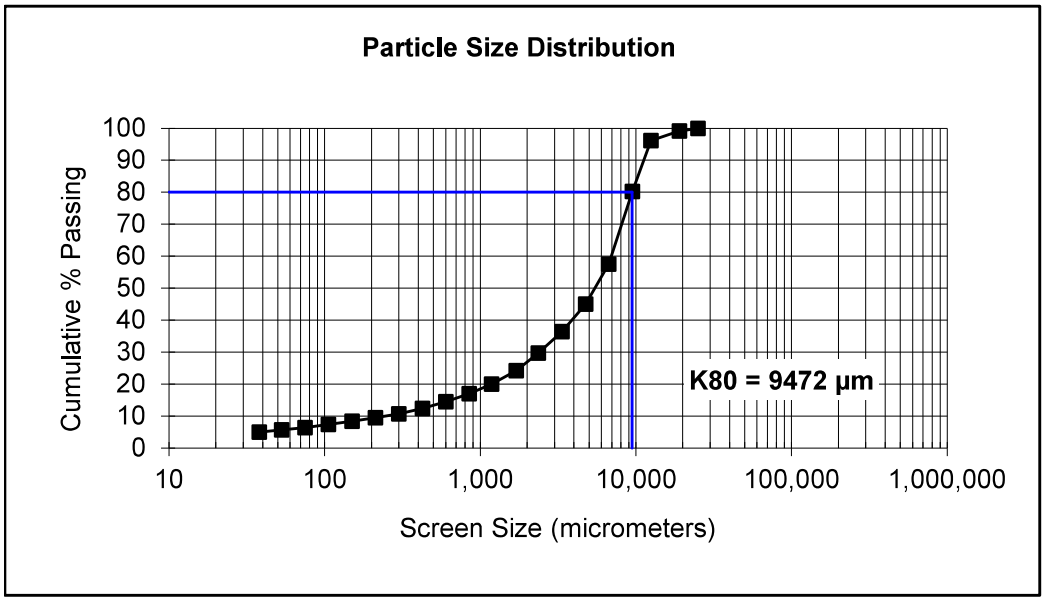


SGS Minerals Services
Size Distribution Analysis

Project No.
CA14153-SEP19

Sample: **M+L MD** Test No.: **Enviro**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
1"	25,000	0.0	0.0	0.0	100.0
3/4"	19,000	18.3	0.8	0.8	99.2
1/2"	12,500	68.2	3.0	3.8	96.2
3/8"	9,500	357.9	15.9	19.8	80.2
3	6,700	510.2	22.7	42.5	57.5
4	4,750	281.8	12.5	55.0	45.0
6	3,350	192.0	8.5	63.5	36.5
8	2,360	151.7	6.7	70.3	29.7
10	1,700	123.3	5.5	75.8	24.2
14	1,180	94.1	4.2	80.0	20.0
20	850	67.5	3.0	83.0	17.0
28	600	56.9	2.5	85.5	14.5
35	425	46.5	2.1	87.6	12.4
48	300	38.0	1.7	89.3	10.7
65	212	29.2	1.3	90.6	9.4
100	150	23.3	1.0	91.6	8.4
150	106	23.8	1.1	92.7	7.3
200	75	20.9	0.9	93.6	6.4
270	53	16.5	0.7	94.3	5.7
400	38	14.5	0.6	95.0	5.0
Pan	-38	113.0	5.0	100.0	0.0
Total	**-**	**2247.7**	100.0	**-**	**-**
K80	**9,472**				

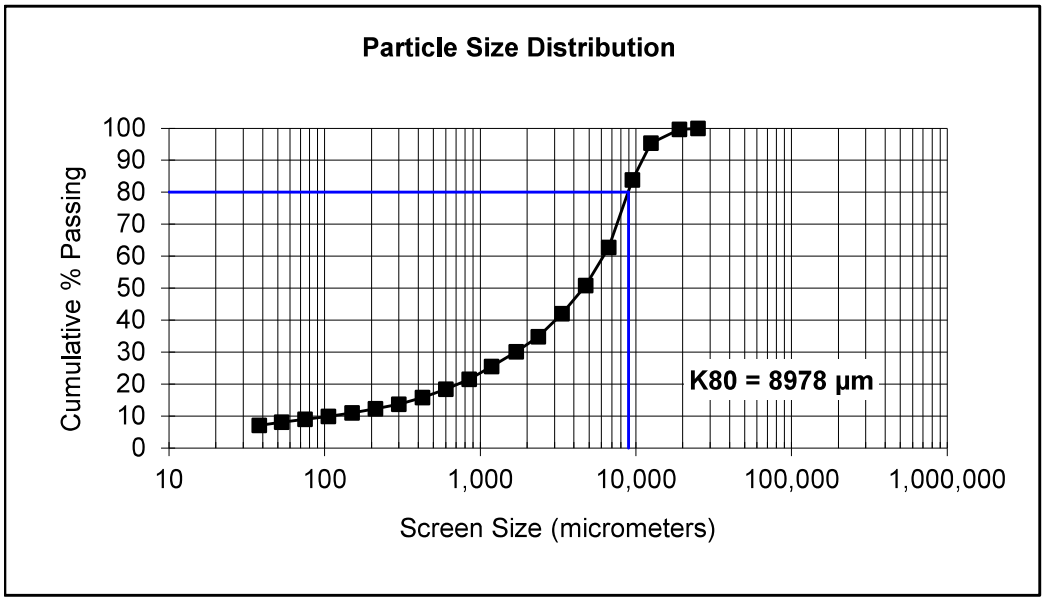


SGS Minerals Services
Size Distribution Analysis

Project No.
CA14153-SEP19

Sample: **M+L SED** Test No.: **Enviro**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
1"	25,000	0.0	0.0	0.0	100.0
3/4"	19,000	8.5	0.3	0.3	99.7
1/2"	12,500	117.3	4.4	4.7	95.3
3/8"	9,500	306.9	11.5	16.2	83.8
3	6,700	565.3	21.1	37.3	62.7
4	4,750	318.0	11.9	49.1	50.9
6	3,350	237.6	8.9	58.0	42.0
8	2,360	191.8	7.2	65.2	34.8
10	1,700	126.1	4.7	69.9	30.1
14	1,180	124.1	4.6	74.5	25.5
20	850	107.4	4.0	78.5	21.5
28	600	81.8	3.1	81.6	18.4
35	425	70.2	2.6	84.2	15.8
48	300	55.5	2.1	86.3	13.7
65	212	39.6	1.5	87.7	12.3
100	150	35.3	1.3	89.1	10.9
150	106	27.2	1.0	90.1	9.9
200	75	26.0	1.0	91.0	9.0
270	53	24.0	0.9	91.9	8.1
400	38	26.4	1.0	92.9	7.1
Pan	-38	189.3	7.1	100.0	0.0
Total	**-**	**2678.3**	100.0	**-**	**-**
K80	**8,978**				

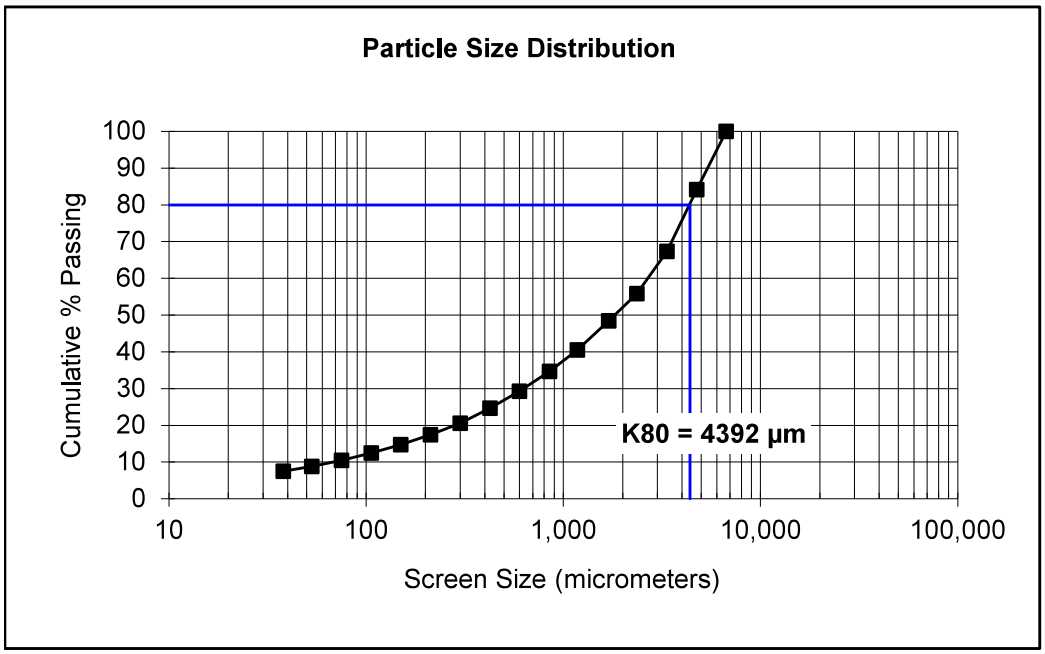


SGS Minerals Services
Size Distribution Analysis

Project No.
CA14987-Nov 19

Sample: **LLGO Comp** Test No.:

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
3	6,700	0.0	0.0	0.0	100.0
4	4,750	91.5	15.9	15.9	84.1
6	3,350	96.7	16.8	32.7	67.3
8	2,360	66.1	11.5	44.2	55.8
10	1,700	42.4	7.4	51.5	48.5
14	1,180	45.9	8.0	59.5	40.5
20	850	33.5	5.8	65.3	34.7
28	600	30.8	5.4	70.7	29.3
35	425	27.0	4.7	75.4	24.6
48	300	23.4	4.1	79.4	20.6
65	212	18.0	3.1	82.6	17.4
100	150	15.5	2.7	85.3	14.7
150	106	13.1	2.3	87.5	12.5
200	75	11.4	2.0	89.5	10.5
270	53	9.4	1.6	91.2	8.8
400	38	7.9	1.4	92.5	7.5
Pan	-38	43.0	7.5	100.0	0.0
Total	**-**	**575.6**	100.0	**-**	**-**
K80	**4,392**				

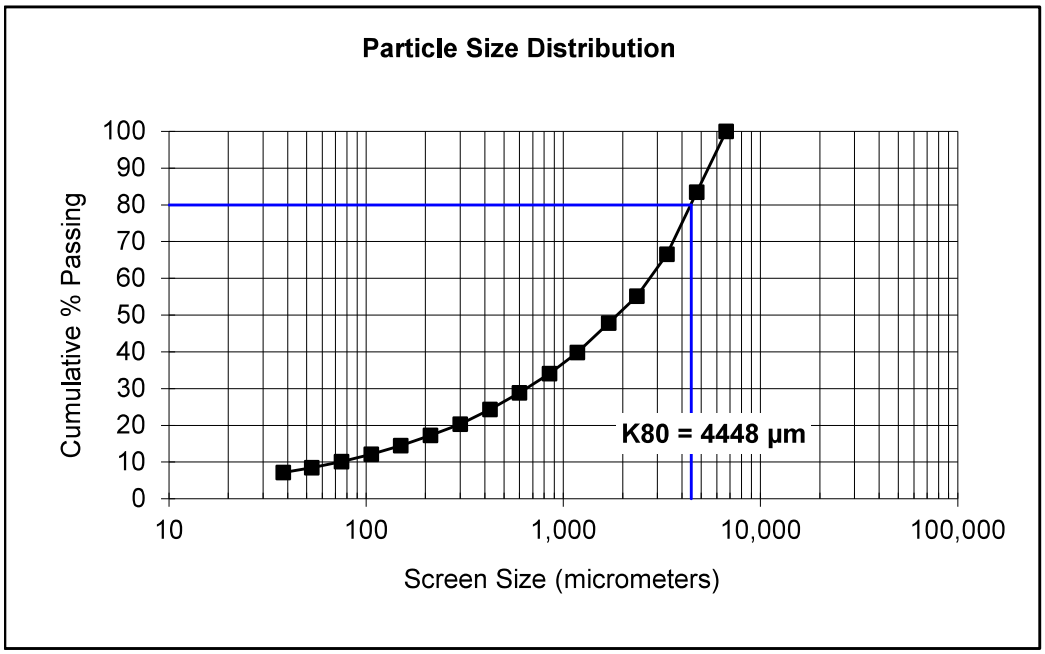


SGS Minerals Services
Size Distribution Analysis

Project No.
CA14987-Nov 19

Sample: **MILGO Comp** Test No.:

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
3	6,700	0.0	0.0	0.0	100.0
4	4,750	90.8	16.5	16.5	83.5
6	3,350	92.8	16.9	33.4	66.6
8	2,360	62.9	11.4	44.9	55.1
10	1,700	40.4	7.4	52.2	47.8
14	1,180	43.9	8.0	60.2	39.8
20	850	31.5	5.7	65.9	34.1
28	600	28.7	5.2	71.2	28.8
35	425	24.9	4.5	75.7	24.3
48	300	21.8	4.0	79.7	20.3
65	212	17.0	3.1	82.7	17.3
100	150	15.1	2.7	85.5	14.5
150	106	12.9	2.3	87.8	12.2
200	75	11.2	2.0	89.9	10.1
270	53	9.1	1.7	91.5	8.5
400	38	7.2	1.3	92.8	7.2
Pan	-38	39.3	7.2	100.0	0.0
Total	**-**	**549.5**	100.0	**-**	**-**
K80	**4,448**				



SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

09-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 24 September 2019
LR Report: **CA14863-SEP19**
Reference: 16863-02-05

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 0	10: CND 2 Column Week 0
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	14.0	14.0
pH [no unit]	30-Sep-19	10:03	NA	100%	0%	NA	8.03	8.08
Alkalinity [mg/L as CaCO3]	30-Sep-19	10:03	< 2	98%	2%	NA	117	138
Conductivity [uS/cm]	30-Sep-19	10:03	< 2	99%	0%	NA	2930	2840
Redox Potential [mV]	26-Sep-19	21:19	NA	106%	1%	NA	226	228
Total Dissolved Solids [mg/L]	25-Sep-19	16:13	< 30	93%	4%	NA	2290	2080
Fluoride [mg/L]	26-Sep-19	13:37	< 0.06	105%	ND	108%	0.53	1.18
Nitrite (as N) [mg/L]	26-Sep-19	11:10	< 0.03	98%	13%	103%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	26-Sep-19	11:10	< 0.06	99%	1%	101%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	26-Sep-19	11:10	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	28-Sep-19	07:32	< 0.2	93%	0%	106%	33	27
Sulphate [mg/L]	30-Sep-19	07:08	< 0.2	98%	1%	97%	1200	1100
Cyanide (total) [mg/L]	01-Oct-19	11:11	< 0.01	104%	ND	99%	0.02	0.02
Cyanide (WAD) [mg/L]	30-Sep-19	11:16	< 0.01	100%	ND	92%	< 0.01	< 0.01
Thiocyanate [mg/L]	01-Oct-19	12:00	< 0.2	100%	1%	82%	38	68
Cyanate [mg/L]	25-Sep-19	15:24	< 0.1	104%	ND	98%	180	140
Ammonia+Ammonium (N) [as N mg/L]	03-Oct-19	13:40	< 0.1	93%	9%	107%	11.4	3.1
Thiosalts (total) [as S2O3 mg/L]	03-Oct-19	12:35	< 10	100%	ND	89%	**	**
Thiosulphate [mg/L]	04-Oct-19	11:48	< 0.2	91%	0%	106%	4.2	3.4
Mercury (dissolved) [mg/L]	27-Sep-19	12:06	< 0.00001	121%	ND	116%	0.00062	0.00005
Silver (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00005	103%	ND	99%	0.00062	0.00059
Aluminum (dissolved) [mg/L]	03-Oct-19	13:23	< 0.001	98%	1%	NV	0.021	0.066
Arsenic (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0002	99%	7%	103%	0.0088	0.0022
Boron (dissolved) [mg/L]	03-Oct-19	13:23	< 0.002	97%	1%	NV	0.081	0.084
Barium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00002	95%	1%	NV	0.0383	0.0788
Beryllium (dissolved) [mg/L]	08-Oct-19	16:44	< 0.000007	93%	14%	102%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000007	105%	ND	NV	0.000008	0.000009
Calcium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.01	106%	2%	NV	199	125
Cadmium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000003	103%	11%	85%	0.000098	0.000057
Cobalt (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000004	100%	15%	99%	0.154	0.0271
Chromium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00008	100%	8%	103%	0.00070	0.00183
Copper (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0002	100%	3%	NV	0.0574	0.0404
Iron (dissolved) [mg/L]	03-Oct-19	13:23	< 0.007	102%	9%	NV	0.016	0.020
Potassium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.009	99%	3%	NV	23.0	27.2
Lithium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0001	100%	1%	NV	0.0282	0.0053

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14863-SEP19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 0	10: CND 2 Column Week 0
Magnesium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.001	103%	0%	NV	14.3	22.9
Manganese (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00001	95%	3%	115%	0.317	0.202
Molybdenum (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00004	98%	17%	98%	0.0774	0.0601
Sodium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.01	106%	0%	NV	478	517
Nickel (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0001	99%	ND	93%	0.0049	0.0016
Phosphorus (dissolved) [mg/L]	03-Oct-19	13:23	< 0.003	105%	ND	NV	0.054	0.034
Lead (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00001	96%	2%	91%	0.00020	0.00020
Sulfur (dissolved) [mg/L]	03-Oct-19	13:23	< 0.3	94%	5%	NV	484	471
Antimony (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0009	108%	4%	77%	0.0070	0.0039
Selenium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00004	95%	ND	89%	0.00210	0.00146
Silicon (dissolved) [mg/L]	03-Oct-19	13:23	< 0.02	99%	0%	NV	4.49	2.73
Tin (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00006	94%	ND	NV	0.00090	0.00086
Strontium (dissolved) [mg/L]	04-Oct-19	14:52	< 0.00002	100%	3%	NV	0.0401	0.950
Thorium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.0001	94%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00005	104%	ND	NV	0.00016	0.00016
Thallium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000005	102%	ND	95%	0.000015	0.000007
Uranium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000002	94%	4%	101%	0.00272	0.00303
Vanadium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00001	94%	6%	95%	0.00009	0.00012
Tungsten (dissolved) [mg/L]	03-Oct-19	13:23	< 0.00002	102%	ND	NV	0.00114	0.00294
Yttrium (dissolved) [mg/L]	03-Oct-19	13:23	< 0.000002	102%	18%	NV	0.000020	0.000017
Zinc (dissolved) [mg/L]	03-Oct-19	13:23	< 0.002	100%	4%	NV	0.016	0.011

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

**Unable to perform thiosalts titration due to a sample matrix interference. Analyzed thiosulphate as an alternative.

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

23-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 01 October 2019
LR Report: **CA14007-OCT19**
Reference: 16863-02-07

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 1	10: CND 2 Column Week 1
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	19.0	19.0
pH [no unit]	08-Oct-19	11:16	NA	100%	0%	NA	8.25	8.40
Alkalinity [mg/L as CaCO3]	08-Oct-19	11:58	< 2	101%	1%	NA	134	178
Conductivity [uS/cm]	08-Oct-19	11:16	< 2	98%	0%	NA	2240	2150
Redox Potential [mV]	07-Oct-19	15:26	NA	105%	1%	NA	205	137
Total Dissolved Solids [mg/L]	04-Oct-19	11:47	< 30	94%	0%	NA	1940	1930
Fluoride [mg/L]	03-Oct-19	08:24	< 0.06	109%	6%	113%	0.65	1.39
Nitrite (as N) [mg/L]	07-Oct-19	14:48	< 0.03	95%	ND	99%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	07-Oct-19	14:48	< 0.06	96%	ND	99%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	07-Oct-19	14:48	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	09-Oct-19	10:10	< 0.2	91%	4%	108%	37	33
Sulphate [mg/L]	09-Oct-19	10:10	< 0.2	94%	NV	NV	950	970
Ammonia+Ammonium (N) [as N mg/L]	09-Oct-19	09:18	< 0.1	95%	3%	90%	8.2	7.1
Thiosalts (total) [as S2O3 mg/L]	03-Oct-19	11:03	< 10	100%	ND	89%	**	**
Thiosulphate [mg/L]	04-Oct-19	11:47	< 0.2	91%	0%	106%	10	10
Mercury (dissolved) [mg/L]	07-Oct-19	11:04	< 0.00001	116%	ND	103%	0.00078	0.00009
Silver (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00005	104%	3%	98%	0.00454	0.00165
Aluminum (dissolved) [mg/L]	09-Oct-19	15:21	< 0.001	98%	3%	127%	0.021	0.023
Arsenic (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0002	102%	1%	104%	0.0104	0.0022
Boron (dissolved) [mg/L]	09-Oct-19	15:21	< 0.002	97%	19%	NV	0.072	0.072
Barium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00002	98%	2%	103%	0.0332	0.0636
Beryllium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000007	98%	ND	102%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000007	107%	15%	97%	< 0.000007	0.000016
Calcium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.01	103%	1%	108%	169	99.1
Cadmium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000003	102%	1%	102%	0.000085	0.000036
Cobalt (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000004	104%	0%	104%	0.110	0.0152
Chromium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00008	103%	ND	106%	< 0.00008	< 0.00008
Copper (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0002	106%	1%	105%	0.524	0.453
Iron (dissolved) [mg/L]	09-Oct-19	15:21	< 0.007	101%	ND	NV	0.022	0.016
Potassium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.009	104%	1%	105%	23.2	27.2
Lithium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0001	109%	15%	104%	0.0246	0.0057
Magnesium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.001	106%	1%	105%	10.7	18.1
Manganese (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00001	103%	2%	108%	0.262	0.152
Molybdenum (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00004	100%	10%	105%	0.09570	0.06866
Sodium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.01	104%	2%	105%	470	488

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14007-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 1	10: CND 2 Column Week 1
Nickel (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0001	101%	1%	102%	0.0047	0.0009
Phosphorus (dissolved) [mg/L]	09-Oct-19	15:21	0.003	100%	ND	NV	0.024	0.016
Lead (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00001	102%	1%	101%	0.00005	0.00004
Sulfur (dissolved) [mg/L]	09-Oct-19	15:21	< 0.3	109%	0%	NV	483	443
Antimony (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0009	109%	13%	109%	0.0109	0.0064
Selenium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00004	98%	1%	86%	0.00033	0.00033
Silicon (dissolved) [mg/L]	09-Oct-19	15:21	< 0.02	96%	3%	NV	3.07	2.62
Tin (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00006	100%	1%	NV	0.00090	0.00084
Strontium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00002	100%	1%	102%	0.380	0.808
Thorium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.0001	99%	ND	NV	< 0.0001	0.0001
Titanium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00005	95%	ND	NV	0.00007	0.00010
Thallium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000005	102%	3%	101%	0.000014	0.000006
Uranium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000002	99%	11%	100%	0.00314	0.00371
Vanadium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00001	101%	ND	103%	0.00009	0.00011
Tungsten (dissolved) [mg/L]	09-Oct-19	15:21	< 0.00002	101%	ND	NV	0.00072	0.00239
Yttrium (dissolved) [mg/L]	09-Oct-19	15:21	< 0.000002	102%	10%	NV	0.000015	0.000007
Zinc (dissolved) [mg/L]	09-Oct-19	15:21	< 0.002	102%	0%	124%	0.008	0.005

NA - Not applicable
ND - Not Detected
NV - No Value

**Unable to perform thiosalts titration due to a sample matrix interference. Analyzed thiosulphate as an alternative.

Report revised to correct result for Sulfur (dissolved)

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001934806

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

22-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 08 October 2019
LR Report: **CA14227-OCT19**
Reference: 16863-02-09

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 2	10: CND 2 Column Week 2
Sample Date & Time							N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	20.0	20.0
pH [no unit]	18-Oct-19	12:02	NA	99%	0%	NA	8.12	8.18
Alkalinity [mg/L as CaCO3]	18-Oct-19	12:02	< 2	100%	0%	NA	132	173
Conductivity [uS/cm]	18-Oct-19	12:02	< 2	100%	0%	NA	2750	2740
Redox Potential [mV]	09-Oct-19	16:36	NA	104%	0%	NA	223	137
Total Dissolved Solids [mg/L]	16-Oct-19	08:41	< 30	100%	0%	NA	1960	1900
Fluoride [mg/L]	11-Oct-19	13:27	< 0.06	103%	ND	113%	0.71	1.41
Nitrite (as N) [mg/L]	15-Oct-19	14:39	< 0.03	95%	ND	97%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	15-Oct-19	14:39	< 0.06	98%	7%	100%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	15-Oct-19	14:39	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	18-Oct-19	11:59	< 0.2	94%	2%	96%	38	30
Sulphate [mg/L]	22-Oct-19	13:11	< 0.2	97%	ND	102%	940	930
Ammonia+Ammonium (N) [as N mg/L]	16-Oct-19	11:31	< 0.1	103%	8%	102%	16.1	12.1
Thiosulphate [mg/L]	11-Oct-19	08:20	< 0.2	100%	1%	103%	7.0	6.3
Mercury (dissolved) [mg/L]	11-Oct-19	14:20	< 0.00001	120%	ND	126%	0.00038	0.00006
Silver (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00005	98%	ND	87%	0.00135	0.00059
Aluminum (dissolved) [mg/L]	22-Oct-19	13:47	< 0.001	143%	9%	NV	0.039	0.030
Arsenic (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0002	99%	9%	97%	0.0108	0.0024
Boron (dissolved) [mg/L]	22-Oct-19	13:47	< 0.002	94%	5%	NV	0.076	0.081
Barium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00002	101%	5%	NV	0.0272	0.0506
Beryllium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000007	95%	0%	91%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000007	105%	ND	103%	0.000017	0.000011
Calcium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.01	108%	1%	NV	142	75.1
Cadmium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000003	100%	4%	99%	0.000067	0.000024
Cobalt (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000004	96%	4%	91%	0.113	0.0139
Chromium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00008	103%	9%	88%	0.00017	< 0.00008
Copper (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0002	97%	4%	92%	0.823	0.710
Iron (dissolved) [mg/L]	22-Oct-19	13:47	< 0.007	107%	4%	NV	0.030	0.016
Potassium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.009	106%	1%	NV	23.1	29.5
Lithium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0001	94%	5%	97%	0.0184	0.0042
Magnesium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.001	104%	2%	NV	9.70	15.9
Manganese (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00001	106%	2%	125%	0.137	0.0844
Molybdenum (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00004	103%	7%	100%	0.0966	0.0706
Sodium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.01	108%	1%	NV	466	491
Nickel (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0001	91%	ND	94%	0.0060	0.0007

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14227-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 2	10: CND 2 Column Week 2
Phosphorus (dissolved) [mg/L]	22-Oct-19	13:47	< 0.003	101%	6%	NV	0.035	0.024
Lead (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00001	103%	8%	102%	0.00003	< 0.00001
Sulfur (dissolved) [mg/L]	22-Oct-19	13:47	< 0.3	105%	ND	NV	383	383
Antimony (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0009	106%	ND	95%	0.0054	0.0042
Selenium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00004	106%	2%	101%	0.00072	0.00058
Silicon (dissolved) [mg/L]	22-Oct-19	13:47	< 0.02	100%	3%	NV	3.51	2.96
Tin (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00006	99%	0%	NV	0.00085	0.00081
Strontium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00002	98%	3%	NV	0.296	0.619
Thorium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.0001	97%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00005	106%	8%	NV	0.00025	0.00008
Thallium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000005	103%	ND	96%	0.000015	0.000007
Uranium (dissolved) [mg/L]	22-Oct-19	13:47	2e-006	104%	3%	101%	0.00326	0.00416
Vanadium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00001	97%	5%	116%	0.00011	0.00013
Tungsten (dissolved) [mg/L]	22-Oct-19	13:47	< 0.00002	99%	15%	NV	0.00057	0.00349
Yttrium (dissolved) [mg/L]	22-Oct-19	13:47	< 0.000002	95%	2%	NV	0.000014	0.000007
Zinc (dissolved) [mg/L]	22-Oct-19	13:47	< 0.002	101%	4%	NV	0.009	0.003

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001934020

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

31-October-2019

Date Rec. : 22 October 2019
LR Report: **CA14688-OCT19**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 4	10: CND 2 Column Week 4
Sample Date & Time									N/A	N/A
Temperature Upon Receipt [°C]	---	---	---	---	---	---	---	---	21.0	21.0
pH [no unit]	23-Oct-19	08:30	24-Oct-19	14:20	NA	100%	1%	NA	8.19	8.23
Alkalinity [mg/L as CaCO3]	23-Oct-19	08:30	24-Oct-19	14:20	< 2	97%	0%	NA	139	191
Conductivity [uS/cm]	23-Oct-19	08:30	24-Oct-19	14:20	2	99%	2%	NA	2750	2780
Redox Potential [mV]	22-Oct-19	19:40	23-Oct-19	17:26	NA	106%	0%	NA	196	126
Total Dissolved Solids [mg/L]	22-Oct-19	18:21	24-Oct-19	11:40	< 30	98%	1%	NA	1700	1730
Fluoride [mg/L]	23-Oct-19	08:09	23-Oct-19	11:15	< 0.06	100%	ND	111%	0.74	1.56
Nitrite (as N) [mg/L]	28-Oct-19	11:57	28-Oct-19	15:13	< 0.03	94%	ND	99%	< 0.3	< 0.3
Nitrate (as N) [mg/L]	28-Oct-19	11:57	28-Oct-19	15:13	< 0.06	98%	4%	104%	< 0.6	< 0.6
Nitrate + Nitrite (as N) [mg/L]	28-Oct-19	11:57	28-Oct-19	15:13	< 0.06	NA	NA	NA	< 0.6	< 0.6
Chloride [mg/L]	28-Oct-19	21:18	29-Oct-19	09:13	< 0.2	97%	0%	120%	40	32
Sulphate [mg/L]	28-Oct-19	21:18	29-Oct-19	09:13	< 0.2	96%	5%	90%	1000	990
Ammonia+Ammonium (N) [as N mg/L]	25-Oct-19	21:00	29-Oct-19	14:13	< 0.1	94%	ND	94%	27.6	20.9
Thiosulphate [mg/L]	25-Oct-19	09:04	25-Oct-19	16:08	< 0.2	96%	ND	103%	5.1	1.1
Mercury (dissolved) [mg/L]	25-Oct-19	15:23	28-Oct-19	10:20	< 0.00001	120%	ND	130%	0.00019	0.00005
Silver (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00005	98%	ND	93%	0.00097	0.00027
Aluminum (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.001	97%	ND	NV	0.024	0.033
Arsenic (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0002	99%	2%	101%	0.0127	0.0026

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0001943907

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14688-OCT19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 4	10: CND 2 Column Week 4
Boron (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.002	109%	7%	NV	0.089	0.087
Barium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00002	104%	0%	87%	0.0238	0.0399
Beryllium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000007	103%	4%	95%	< 0.000007	< 0.000007
Bismuth (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000007	103%	ND	NV	< 0.000007	< 0.000007
Calcium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.01	97%	4%	NV	82.6	48.9
Cadmium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000003	94%	9%	94%	0.000047	0.000039
Cobalt (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000004	98%	5%	103%	0.121	0.0159
Chromium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00008	100%	ND	NV	0.00029	< 0.00008
Copper (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0002	97%	15%	109%	1.19	1.01
Iron (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.007	98%	2%	NV	0.031	0.013
Potassium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.009	96%	2%	NV	21.0	26.7
Lithium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0001	103%	9%	102%	0.0159	0.0034
Magnesium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.001	97%	2%	NV	7.53	12.6
Manganese (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00001	99%	1%	NV	0.0686	0.0436
Molybdenum (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00004	99%	11%	104%	0.102	0.0764
Sodium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.01	99%	2%	NV	432	469
Nickel (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0001	97%	6%	94%	0.0067	0.0007
Phosphorus (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.003	98%	6%	NV	0.028	0.030
Lead (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00001	99%	0%	96%	0.00002	< 0.00001
Sulfur (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.3	105%	11%	NV	453	444
Antimony (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0009	104%	2%	90%	0.0063	0.0040
Selenium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00004	106%	2%	80%	0.00340	0.00129
Silicon (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.02	102%	5%	NV	3.27	2.72
Tin (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00006	98%	2%	NV	0.00087	0.00074
Strontium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00002	98%	2%	90%	0.261	0.504
Thorium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.0001	94%	ND	NV	< 0.0001	< 0.0001
Titanium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00005	101%	20%	NV	0.00009	0.00012
Thallium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000005	105%	10%	103%	0.000016	0.000007
Uranium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000002	102%	ND	93%	0.00315	0.00424
Vanadium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00001	98%	6%	104%	0.00011	0.00016
Tungsten (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.00002	99%	ND	NV	0.00106	0.00489
Yttrium (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.000002	99%	9%	NV	0.000016	0.000005

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14688-OCT19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 4	10: CND 2 Column Week 4
Zinc (dissolved) [mg/L]	30-Oct-19	15:24	31-Oct-19	10:35	< 0.002	100%	1%	NV	0.004	0.004

NA - Not applicable
ND - Not Detected
NV - No Value

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001943907

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

02-December-2019

Date Rec. : 19 November 2019
LR Report: **CA14715-NOV19**
Reference: 16863-02-13

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 8	10: CND 2 Column Week 8
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	18.0	18.0
pH [no unit]	27-Nov-19	10:29	27-Nov-19	16:18	NA	100%	0%	NA	8.13	8.26
Alkalinity [mg/L as CaCO3]	27-Nov-19	10:29	27-Nov-19	16:18	< 2	97%	3%	NA	145	186
Conductivity [uS/cm]	27-Nov-19	10:29	27-Nov-19	16:18	< 2	99%	0%	NA	2440	2370
Redox Potential [mV]	20-Nov-19	18:01	22-Nov-19	21:11	NA	101%	4%	NA	250	213
TDS [mg/L]	20-Nov-19	16:21	22-Nov-19	09:12	< 30	96%	5%	NA	1730	1800
F [mg/L]	20-Nov-19	20:21	21-Nov-19	09:56	< 0.06	101%	ND	105%	0.79	1.59
NO2 [as N mg/L]	21-Nov-19	03:05	26-Nov-19	12:46	< 0.03	97%	ND	99%	< 0.3	< 0.3
NO3 [as N mg/L]	21-Nov-19	03:05	26-Nov-19	12:46	< 0.06	100%	ND	105%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	21-Nov-19	03:05	26-Nov-19	12:46	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	22-Nov-19	16:01	27-Nov-19	15:56	< 0.2	97%	3%	106%	36	28
SO4 [mg/L]	22-Nov-19	16:01	27-Nov-19	15:56	< 0.2	97%	17%	103%	1000	1000
CN(T) [mg/L]	20-Nov-19	09:32	21-Nov-19	06:17	< 0.01	99%	ND	102%	1.33	1.03
CNWAD [mg/L]	20-Nov-19	15:00	20-Nov-19	17:03	< 0.01	98%	ND	79%	0.94	0.79
CNS [mg/L]	21-Nov-19	10:41	22-Nov-19	08:05	< 0.2	101%	5%	99%	38	70
CNO [mg/L]	21-Nov-19	08:50	22-Nov-19	07:52	< 0.1	100%	ND	94%	9.4	< 1

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00001975956

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14715-NOV19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 8	10: CND 2 Column Week 8
NH3+NH4 [as N mg/L]	20-Nov-19	16:23	26-Nov-19	07:49	< 0.1	97%	8%	95%	32.2	20.3
S2O3 [mg/L]	20-Nov-19	09:48	22-Nov-19	08:13	< 0.2	98%	1%	82%	2.8	4.6
Hg (diss) [mg/L]	22-Nov-19	08:49	25-Nov-19	15:07	< 0.00001	107%	ND	115%	0.00007	< 0.00001
Ag (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00005	106%	ND	78%	0.00024	0.00007
Al (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.001	107%	4%	112%	0.025	0.028
As (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.0002	102%	ND	99%	0.0138	0.0027
B (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.002	102%	1%	NV	0.077	0.083
Ba (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00002	107%	4%	107%	0.0222	0.0351
Be (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.000007	106%	ND	101%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	7e-006	98%	ND	84%	0.000019	0.000007
Ca (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.01	101%	1%	103%	70.8	52.6
Cd (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.000003	103%	2%	103%	0.000071	0.000030
Co (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.000004	103%	6%	100%	0.116	0.0139
Cr (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00008	103%	7%	100%	< 0.00008	< 0.00008
Cu (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.0002	104%	2%	98%	1.24	0.926
Fe (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.007	101%	ND	NV	0.039	0.018
K (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.009	96%	2%	98%	21.3	27.3
Li (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.0001	109%	4%	103%	0.0138	0.0032
Mg (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.001	95%	1%	98%	6.80	11.7
Mn (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00001	102%	6%	101%	0.0677	0.0422
Mo (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00004	104%	9%	120%	0.102	0.0784
Na (diss) [mg/L]	29-Nov-19	13:46	02-Dec-19	10:14	< 0.01	100%	0%	99%	495	494
Ni (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.0001	102%	3%	101%	0.0074	0.0010
P (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.003	105%	ND	NV	0.037	0.027
Pb (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00001	107%	3%	104%	0.00008	0.00006
S (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.3	107%	2%	NV	437	436
Sb (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.0009	102%	ND	104%	0.0060	0.0030
Se (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00004	109%	2%	100%	0.00033	0.00027
Si (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.02	102%	1%	NV	3.75	3.25
Sn (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00006	103%	1%	NV	0.00237	0.00327
Sr (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00002	103%	2%	100%	0.231	0.481

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

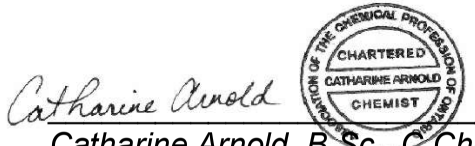
Project : CA20M-00000-110-16863-02
LR Report : **CA14715-NOV19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 8	10: CND 2 Column Week 8
Th (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	---	---	---	---	0.0011	0.0014
Ti (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00005	107%	ND	NV	0.00030	0.00017
Tl (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.000005	108%	ND	101%	0.000009	0.000007
U (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	2e-006	107%	2%	102%	0.00294	0.00444
V (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00001	102%	ND	99%	0.00009	0.00012
W (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.00002	102%	ND	NV	0.00946	0.0121
Y (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.000002	104%	9%	NV	0.000023	0.000008
Zn (diss) [mg/L]	27-Nov-19	23:42	28-Nov-19	14:11	< 0.002	103%	1%	103%	0.004	0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

RL raised for CNO due to sample matrix.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00001755956

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

31-December-2019

Date Rec. : 17 December 2019
LR Report: **CA14618-DEC19**
Reference: 16863-02-14

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 12	10: CND 2 Column Week 12
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]									18.0	18.0
pH [no unit]	19-Dec-19	13:51	24-Dec-19	09:19	NA	100%	0%	NA	8.17	8.32
Alkalinity [mg/L as CaCO3]	19-Dec-19	13:51	24-Dec-19	09:19	< 2	106%	3%	NA	148	197
Conductivity [uS/cm]	19-Dec-19	13:51	24-Dec-19	09:19	< 2	94%	0%	NA	2330	2350
Redox Potential [mV]	18-Dec-19	10:40	18-Dec-19	14:18	NA	98%	0%	NA	182	199
TDS [mg/L]	18-Dec-19	16:57	24-Dec-19	13:21	< 30	98%	ND	NA	1710	1710
F [mg/L]	18-Dec-19	13:20	19-Dec-19	09:26	< 0.06	109%	11%	111%	0.86	1.84
NO2 [as N mg/L]	18-Dec-19	11:44	19-Dec-19	15:22	< 0.03	99%	ND	102%	< 0.3	< 0.3
NO3 [as N mg/L]	18-Dec-19	11:44	19-Dec-19	15:22	< 0.06	100%	ND	101%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	18-Dec-19	11:44	19-Dec-19	15:22	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	18-Dec-19	10:20	20-Dec-19	10:09	< 0.2	96%	2%	101%	36	28
SO4 [mg/L]	18-Dec-19	10:20	20-Dec-19	10:09	< 0.2	98%	10%	97%	1100	1000
CN(T) [mg/L]	23-Dec-19	10:00	24-Dec-19	07:41	< 0.01	92%	ND	88%	1.74	1.35
CNWAD [mg/L]	20-Dec-19	18:00	23-Dec-19	10:07	< 0.01	107%	ND	81%	1.26	0.90
CNS [mg/L]	18-Dec-19	08:17	18-Dec-19	12:00	< 0.2	101%	0%	102%	35	52

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00002002276

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14618-DEC19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 12	10: CND 2 Column Week 12
CNO [mg/L]	18-Dec-19	08:20	18-Dec-19	14:01	< 0.1	100%	8%	85%	< 1	< 1
NH3+NH4 [as N mg/L]	18-Dec-19	17:12	20-Dec-19	21:01	< 0.1	100%	ND	98%	30.4	19.2
S2O3 [mg/L]	23-Dec-19	08:56	23-Dec-19	15:12	< 0.2	100%	3%	98%	0.6	0.3
Hg (diss) [mg/L]	19-Dec-19	10:12	19-Dec-19	14:19	< 0.00001	88%	ND	95%	0.00002	< 0.00001
Ag (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00005	100%	ND	96%	0.00020	0.00011
Al (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.001	95%	2%	126%	0.026	0.011
As (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0002	98%	ND	103%	0.0100	0.0019
B (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.002	95%	3%	NV	0.083	0.085
Ba (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00002	98%	0%	101%	0.0102	0.0175
Be (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000007	97%	ND	100%	< 0.000007	0.000020
Bi (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000007	94%	7%	90%	0.000070	0.000070
Ca (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.01	102%	0%	108%	26.1	15.6
Cd (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000003	103%	ND	103%	0.000380	0.000160
Co (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000004	97%	ND	102%	0.131	0.0178
Cr (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00008	97%	3%	116%	0.00044	0.00022
Cu (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0002	97%	16%	103%	1.05	0.692
Fe (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.007	100%	1%	NV	0.110	0.050
K (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.009	100%	1%	93%	20.7	27.7
Li (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0001	99%	0%	98%	0.0128	0.0036
Mg (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.001	98%	4%	102%	0.670	0.110
Mn (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00001	98%	2%	103%	0.00706	0.00066
Mo (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00004	99%	7%	105%	0.105	0.0729
Na (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.01	106%	5%	102%	3080	2510
Ni (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0001	97%	1%	100%	0.0151	0.0058
P (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.003	100%	0%	NV	0.090	0.050
Pb (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00001	93%	ND	102%	0.00010	0.00084
S (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.3	108%	6%	NV	523	523
Sb (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0009	93%	4%	123%	0.0076	0.0049
Se (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00004	99%	7%	108%	0.00034	0.00010

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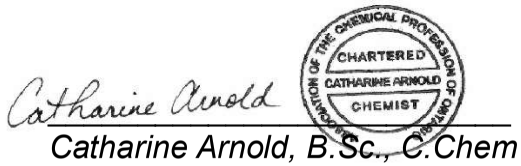
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14618-DEC19

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 12	10: CND 2 Column Week 12
Si (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.02	105%	3%	NV	3.20	3.03
Sn (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00006	99%	9%	NV	0.00082	0.00071
Sr (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00002	97%	0%	102%	0.159	0.363
Th (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.0001	91%	ND	NV	0.0002	0.0001
Ti (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00005	97%	10%	NV	0.00008	< 0.00005
Tl (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000005	94%	ND	98%	< 0.000005	< 0.000005
U (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.000002	101%	ND	107%	0.000760	0.000760
V (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00001	95%	6%	100%	0.00005	0.00011
W (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.00002	101%	ND	NV	0.00067	0.00439
Y (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	2e-006	100%	5%	NV	0.000030	< 0.000002
Zn (diss) [mg/L]	20-Dec-19	17:44	24-Dec-19	10:01	< 0.002	98%	2%	129%	0.026	0.016

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

23-January-2020

Date Rec. : 20 January 2020
LR Report: **CA14573-JAN20**
Reference: 16863-02-14

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 12	10: CND 2 Column Week 12
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]									18.0	18.0
Ag (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00005	99%	ND	94%	< 0.00005	< 0.00005
Al (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.001	96%	1%	125%	0.015	0.025
As (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0002	98%	14%	101%	0.0153	0.0026
B (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.002	98%	5%	NV	0.073	0.077
Ba (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00002	97%	2%	103%	0.0197	0.0313
Be (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000007	94%	9%	97%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000007	95%	16%	93%	< 0.000007	< 0.000007
Ca (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.01	93%	2%	100%	65.9	54.7
Cd (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000003	97%	14%	100%	0.000111	0.000060
Co (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000004	98%	3%	101%	0.125	0.0165
Cr (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00008	95%	3%	105%	< 0.00008	< 0.00008
Cu (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0002	99%	2%	108%	1.26	1.04
Fe (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.007	94%	4%	NV	0.035	0.018
K (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.009	98%	1%	101%	20.0	26.6

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14573-JAN20

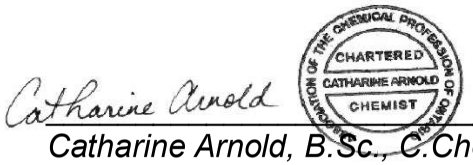
Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 12	10: CND 2 Column Week 12
Li (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0001	95%	1%	98%	0.0122	0.0031
Mg (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.001	99%	1%	98%	5.45	9.90
Mn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00001	97%	1%	103%	0.0538	0.0388
Mo (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00004	97%	0%	109%	0.106	0.0751
Na (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.01	98%	4%	98%	476	506
Ni (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0001	97%	ND	101%	0.0080	0.0015
P (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.003	93%	ND	NV	0.021	0.013
Pb (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00001	97%	1%	99%	0.00002	0.00003
S (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.3	97%	24%	NV	448	450
Sb (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0009	101%	ND	127%	0.0075	0.0055
Se (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00004	98%	ND	97%	0.00040	0.00044
Si (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.02	103%	2%	NV	3.42	3.15
Sn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00006	98%	ND	NV	0.00080	0.00071
Sr (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00002	97%	1%	102%	0.219	0.524
Th (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.0001	90%	ND	NV	< 0.0001	< 0.0001
Ti (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00005	98%	3%	NV	0.00009	< 0.00005
Tl (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000005	97%	ND	102%	< 0.000005	< 0.000005
U (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000002	96%	0%	100%	0.00303	0.00483
V (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00001	99%	ND	101%	0.00009	0.00011
W (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.00002	100%	10%	NV	0.00079	0.00438
Y (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.000002	98%	2%	NV	0.000018	0.000010
Zn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	14:49	< 0.002	105%	6%	122%	0.004	0.004

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14573-JAN20**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

23-January-2020

Date Rec. : 14 January 2020
LR Report: **CA14405-JAN20**
Reference: 16863-02-15

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 16	10: CND 2 Column Week 16
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	18.0	18.0
pH [no unit]	16-Jan-20	08:41	20-Jan-20	10:29	NA	100%	0%	NA	8.32	8.35
Alkalinity [mg/L as CaCO3]	16-Jan-20	08:41	20-Jan-20	10:29	< 2	97%	1%	NA	163	229
Conductivity [uS/cm]	16-Jan-20	08:41	20-Jan-20	10:29	3	98%	0%	NA	2540	2500
Redox Potential [mV]	14-Jan-20	14:35	16-Jan-20	11:00	NA	104%	1%	NA	200	212
TDS [mg/L]	14-Jan-20	08:55	17-Jan-20	11:39	< 30	99%	3%	NA	1750	1710
F [mg/L]	16-Jan-20	08:29	16-Jan-20	13:14	< 0.06	99%	9%	89%	0.86	2.10
NO2 [as N mg/L]	15-Jan-20	17:29	16-Jan-20	15:18	< 0.03	102%	ND	106%	< 0.3	< 0.3
NO3 [as N mg/L]	15-Jan-20	17:29	16-Jan-20	15:18	< 0.06	100%	ND	105%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	15-Jan-20	17:29	16-Jan-20	15:18	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	15-Jan-20	21:49	20-Jan-20	22:19	< 0.2	92%	6%	97%	34	26
SO4 [mg/L]	15-Jan-20	21:49	20-Jan-20	22:19	< 0.2	96%	ND	91%	1002	990
CN(T) [mg/L]	21-Jan-20	13:09	21-Jan-20	15:52	< 0.01	92%	ND	102%	1.71	1.23
CNWAD [mg/L]	21-Jan-20	09:03	21-Jan-20	11:45	< 0.01	97%	ND	81%	1.71	0.96
CNS [mg/L]	18-Jan-20	08:03	20-Jan-20	15:47	< 0.2	97%	5%	102%	22	24
CNO [mg/L]	18-Jan-20	08:28	21-Jan-20	13:26	< 0.1	97%	ND	100%	< 1	< 1
NH3+NH4 [as N mg/L]	17-Jan-20	15:36	20-Jan-20	14:47	< 0.1	99%	ND	87%	36.5	25.6
S2O3 [mg/L]	15-Jan-20	11:58	17-Jan-20	15:56	< 0.2	94%	ND	99%	< 0.2	< 0.2
Hg (diss) [mg/L]	22-Jan-20	15:54	23-Jan-20	09:53	< 0.00001	115%	ND	100%	< 0.00001	< 0.00001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : CA14405-JAN20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 16	10: CND 2 Column Week 16
Ag (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.00005	< 0.00005
Al (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.018	0.023
As (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0159	0.0027
B (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.076	0.076
Ba (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0185	0.0280
Be (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.000007	< 0.000007
Bi (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.000007	< 0.000007
Ca (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	60.8	51.8
Cd (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.000122	0.000067
Co (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.122	0.0180
Cr (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.00008	< 0.00008
Cu (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	1.52	1.11
Fe (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.070	0.028
K (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	19.9	27.5
Li (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0114	0.0035
Mg (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	4.33	7.74
Mn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0500	0.0538
Mo (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.100	0.0697
Na (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	452	467
Ni (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0070	0.0016
P (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.024	0.015
Pb (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00004	0.00005
S (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	416	397
Sb (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.0076	0.0059
Se (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00042	0.00051
Si (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	3.54	3.30
Sn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00080	0.00074
Sr (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.198	0.492
Th (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.0001	0.0001
Ti (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00010	0.00006
Tl (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	< 0.000005	< 0.000005
U (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00295	0.00494
V (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00007	0.00012
W (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.00077	0.00424
Y (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.000018	0.000010
Zn (diss) [mg/L]	22-Jan-20	12:00	22-Jan-20	15:28	---	---	---	---	0.003	0.005

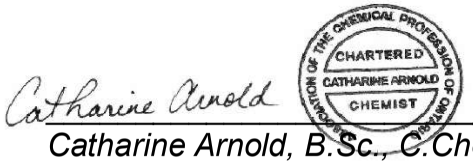
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14405-JAN20**

NA - Not applicable
ND - Not Detected
NV - No Value

Note: Some reporting limits may be elevated due to sample matrix interferences.

RL raised for CNO due to sample matrix.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002020145

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

24-February-2020

Date Rec. : 11 February 2020
LR Report: **CA14356-FEB20**
Reference: 16863-02-16

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 20	10: CND 2 Column Week 20
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	19.0	19.0
pH [no unit]	12-Feb-20	13:44	18-Feb-20	14:34	NA	101%	0%	NA	8.28	8.29
Alkalinity [mg/L as CaCO3]	12-Feb-20	13:44	18-Feb-20	14:34	< 2	100%	0%	NA	173	232
Conductivity [uS/cm]	12-Feb-20	13:44	18-Feb-20	14:34	< 2	101%	0%	NA	2290	2290
Redox Potential [mV]	12-Feb-20	15:36	14-Feb-20	11:40	NA	105%	2%	NA	198	247
TDS [mg/L]	14-Feb-20	17:58	19-Feb-20	10:33	< 30	106%	4%	NA	1420	1410
F [mg/L]	14-Feb-20	08:30	14-Feb-20	11:36	< 0.06	105%	0%	106%	1.10	2.22
NO2 [as N mg/L]	14-Feb-20	10:21	14-Feb-20	17:02	< 0.03	102%	ND	106%	< 0.3	< 0.3
NO3 [as N mg/L]	14-Feb-20	10:21	14-Feb-20	17:02	< 0.06	102%	ND	103%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	14-Feb-20	10:21	14-Feb-20	17:02	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	15-Feb-20	11:03	19-Feb-20	16:50	< 0.2	98%	ND	110%	29	22
SO4 [mg/L]	15-Feb-20	11:03	19-Feb-20	16:50	< 0.2	97%	1%	100%	880	850
CN(T) [mg/L]	12-Feb-20	08:06	12-Feb-20	11:47	< 0.01	92%	ND	NV	1.74	1.00
CNWAD [mg/L]	18-Feb-20	08:00	18-Feb-20	13:48	< 0.01	99%	ND	87%	1.42	1.01
CNS [mg/L]	18-Feb-20	10:00	19-Feb-20	09:21	< 0.2	102%	1%	106%	9.5	8.0

OnLine LIMS

0002047593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14356-FEB20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 20	10: CND 2 Column Week 20
CNO [mg/L]	13-Feb-20	12:38	18-Feb-20	09:17	< 0.1	88%	ND	98%	< 1	< 1
NH3+NH4 [as N mg/L]	18-Feb-20	10:00	18-Feb-20	17:53	< 0.1	98%	ND	NV	57.1	45.2
S2O3 [mg/L]	12-Feb-20	08:00	14-Feb-20	16:50	< 0.2	93%	ND	99%	< 0.2	< 0.2
Hg (diss) [mg/L]	20-Feb-20	11:23	20-Feb-20	13:11	< 0.00001	96%	27%	127%	< 0.00001	< 0.00001
Ag (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00005	103%	ND	99%	< 0.00005	< 0.00005
Al (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.001	97%	7%	124%	0.019	0.020
As (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	16:45	< 0.0002	99%	0%	109%	0.0175	0.0029
B (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.002	103%	0%	NV	0.069	0.071
Ba (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00002	105%	4%	NV	0.0198	0.0260
Be (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000007	102%	ND	95%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000007	100%	5%	103%	< 0.000007	0.000007
Ca (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.01	100%	2%	NV	50.3	45.5
Cd (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000003	102%	ND	112%	0.000073	0.000046
Co (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000004	101%	1%	106%	0.0920	0.0178
Cr (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00008	100%	0%	NV	< 0.00008	< 0.00008
Cu (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.0002	100%	5%	111%	1.67	1.13
Fe (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.007	100%	ND	NV	0.056	0.026
K (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.009	101%	6%	102%	18.8	27.8
Li (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.0001	103%	5%	93%	0.0116	0.0029
Mg (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.001	106%	1%	110%	3.25	6.16
Mn (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00001	99%	0%	120%	0.0436	0.0523
Mo (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00004	105%	3%	117%	0.0936	0.0622
Na (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.01	108%	0%	115%	422	422
Ni (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.0001	98%	1%	97%	0.0063	0.0014
P (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.003	98%	ND	NV	0.191	0.024
Pb (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00001	106%	8%	108%	0.00003	0.00014
S (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.3	90%	0%	NV	381	364
Sb (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.0009	101%	ND	107%	0.0034	0.0033
Se (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00004	104%	ND	110%	0.00068	0.00110

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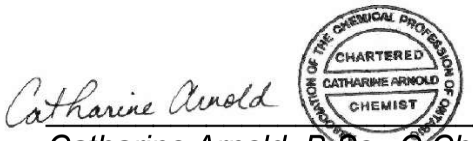
0002047593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14356-FEB20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 20	10: CND 2 Column Week 20
Si (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.02	96%	2%	NV	3.46	3.44
Sn (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00006	104%	ND	NV	0.00106	0.00090
Sr (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00002	100%	1%	NV	0.161	0.423
Th (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.0001	101%	ND	NV	< 0.0001	< 0.0001
Ti (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00005	106%	ND	NV	0.00009	0.00011
Tl (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000005	103%	ND	106%	< 0.000005	0.000006
U (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000002	107%	3%	114%	0.00309	0.00497
V (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00001	99%	13%	109%	0.00009	0.00013
W (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.00002	102%	5%	NV	0.00109	0.00493
Y (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.000002	102%	0%	NV	0.000014	0.000009
Zn (diss) [mg/L]	18-Feb-20	11:32	19-Feb-20	12:57	< 0.002	101%	ND	NV	0.005	0.004

Note: Some reporting limits may be elevated due to sample matrix interferences.



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002047593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

25-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 25 February 2020
LR Report: **CA14844-FEB20**
Reference: 16863-02-16

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temp Upon Receipt °C	NH3+NH4 as N mg/L
1: Analysis Start Date		---	25-Feb-20
2: Analysis Start Time		---	12:00
3: Analysis Approval Date		---	25-Feb-20
4: Analysis Approval Time		---	15:16
5: QC - Blank		---	< 0.1
6: QC - STD % Recovery		---	102%
7: QC - DUP % RPD		---	ND
8: QC - Spike Rep		---	104%
9: CND 1 Column Week 20	N/A	19.0	41.6
10: CND 2 Column Week 20	N/A	19.0	34.9

Note: Some reporting limits may be elevated due to sample matrix interferences.

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMTL OnLine

00020488858

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

03-April-2020

Date Rec. : 10 March 2020
LR Report: **CA14466-MAR20**
Reference: 16863-02-17

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 2 Column Week 24	10: CND 1 Column Week 24
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	19.0	19.0
pH [no unit]	13-Mar-20	14:38	16-Mar-20	14:05	NA	102%	0%	NA	8.39	8.36
Alkalinity [mg/L as CaCO3]	13-Mar-20	14:38	16-Mar-20	14:05	< 2	102%	0%	NA	202	163
Conductivity [uS/cm]	13-Mar-20	14:38	16-Mar-20	14:05	< 2	101%	0%	NA	1690	1710
Redox Potential [mV]	10-Mar-20	15:50	13-Mar-20	10:10	NA	106%	1%	NA	222	194
TDS [mg/L]	10-Mar-20	19:07	16-Mar-20	07:51	< 30	99%	1%	NA	997	1040
F [mg/L]	11-Mar-20	10:59	11-Mar-20	13:54	< 0.06	101%	5%	94%	2.12	0.98
NO2 [as N mg/L]	12-Mar-20	08:58	13-Mar-20	22:20	< 0.03	103%	ND	107%	< 0.3	< 0.3
NO3 [as N mg/L]	12-Mar-20	08:58	13-Mar-20	22:20	< 0.06	103%	ND	107%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	12-Mar-20	08:58	13-Mar-20	22:20	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	17-Mar-20	21:31	18-Mar-20	22:08	< 0.2	96%	ND	105%	15	20
SO4 [mg/L]	17-Mar-20	21:31	18-Mar-20	22:08	< 0.2	1005	ND	106%	560	240
CN(T) [mg/L]	12-Mar-20	07:56	12-Mar-20	11:27	< 0.01	90%	ND	86%	0.84	1.49
CNWAD [mg/L]	11-Mar-20	14:21	16-Mar-20	13:12	< 0.01	94%	ND	NV	0.76	1.44
CNS [mg/L]	13-Mar-20	10:24	18-Mar-20	14:20	< 0.2	104%	ND	104%	1.1	1.3
CNO [mg/L]	13-Mar-20	10:59	16-Mar-20	13:37	< 0.1	90%	ND	93%	< 1	< 1

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14466-MAR20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 2 Column Week 24	10: CND 1 Column Week 24
NH3+NH4 [as N mg/L]	12-Mar-20	15:52	16-Mar-20	14:09	< 0.1	99%	6%	90%	34.6	37.1
S2O3 [mg/L]	12-Mar-20	10:21	17-Mar-20	15:17	< 0.2	102%	ND	101%	< 0.2	< 0.2
Hg (diss) [mg/L]	23-Mar-20	20:57	24-Mar-20	16:57	< 0.00001	101%	ND	115%	0.00100	0.00016
Ag (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00005	110%	ND	71%	0.00224	0.00142
Al (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.001	98%	ND	93%	0.022	0.024
As (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0002	98%	5%	97%	0.0024	0.0170
B (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.002	99%	6%	NV	0.060	0.061
Ba (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00002	101%	4%	98%	0.0168	0.0102
Be (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000007	97%	ND	93%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000007	99%	ND	78%	< 0.000007	< 0.000007
Ca (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.01	100%	1%	95%	32.8	34.0
Cd (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000003	100%	ND	95%	0.000037	0.000040
Co (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000004	101%	1%	98%	0.0149	0.0707
Cr (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00008	100%	2%	95%	< 0.00008	< 0.00008
Cu (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0002	103%	3%	94%	0.856	1.29
Fe (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.007	101%	ND	100%	0.024	0.096
K (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.009	102%	1%	96%	19.9	14.8
Li (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0001	102%	5%	97%	0.586	0.669
Mg (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.001	101%	1%	96%	4.08	2.43
Mn (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00001	102%	0%	101%	0.0278	0.0310
Mo (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00004	102%	0%	94%	0.0407	0.0597
Na (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.01	101%	1%	100%	262	268
Ni (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0001	102%	2%	99%	0.0055	0.0034
P (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.003	101%	50%	NV	0.015	0.021
Pb (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00001	100%	20%	96%	0.00002	0.00002
S (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 1	94%	0%	NV	220	236
Sb (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0009	109%	ND	108%	0.0021	0.0023
Se (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00004	104%	3%	102%	0.00131	0.00059
Si (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.02	107%	0%	NV	3.02	3.24
Sn (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00006	108%	ND	NV	0.00083	0.00084
Sr (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00002	100%	0%	97%	0.291	0.106

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14466-MAR20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 2 Column Week 24	10: CND 1 Column Week 24
Th (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.0001	93%	13%	NV	< 0.0001	< 0.0001
Ti (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00005	106%	ND	NV	< 0.00005	< 0.00005
Tl (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000005	99%	3%	98%	0.000008	< 0.000005
U (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000002	100%	4%	98%	0.00354	0.00212
V (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00001	101%	8%	97%	0.00012	0.00009
W (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.00002	107%	0%	NV	0.00616	0.00133
Y (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.000002	102%	7%	NV	0.000004	0.000013
Zn (diss) [mg/L]	25-Mar-20	17:42	26-Mar-20	11:40	< 0.002	101%	ND	97%	0.004	0.002

Note: Some reporting limits may be elevated due to sample matrix interferences.

Revised report - Samples switched due to sample history.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00002083504

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

23-April-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 20 April 2020
LR Report: **CA10152-APR20**
Reference: 16863-02-17

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 2 Column Week 24
Sample Date & Time									N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	19.0
Hg (diss) [mg/L]	21-Apr-20	15:47	21-Apr-20	18:15	< 0.00001	105%	ND	117%	0.00079
Ag (diss) [mg/L]	22-Apr-20	16:20	23-Apr-20	06:43	< 0.00005	103%	ND	90%	0.00197

Analysis	10: CND 1 Column Week 24
Sample Date & Time	N/A
Temp Upon Receipt [°C]	19.0
Hg (diss) [mg/L]	0.00023
Ag (diss) [mg/L]	0.00159

Note: Some reporting limits may be elevated due to sample matrix interferences.

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 neuno

0002099747

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SGS Lakefield Environmental Met
Attn : Barb Bowman

Project : CA20M-00000-110-16863-02

22-April-2020

Date Rec. : 07 April 2020
LR Report: **CA14208-APR20**
Reference: 16863-02-18

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 28	10: CND 2 Column Week 28
Sample Date & Time									N/A	N/A
Temp Upon Receipt [°C]	---	---	---	---	---	---	---	---	18.0	18.0
pH [no unit]	15-Apr-20	12:19	16-Apr-20	11:52	NA	101%	0%	NA	8.24	8.28
Alkalinity [mg/L as CaCO3]	15-Apr-20	12:19	16-Apr-20	11:52	< 2	96%	0%	NA	144	182
Conductivity [uS/cm]	15-Apr-20	12:19	16-Apr-20	11:52	< 2	99%	0%	NA	1230	1250
Redox Potential [mV]	15-Apr-20	16:14	16-Apr-20	15:05	NA	101%	0%	NA	238	227
TDS [mg/L]	09-Apr-20	19:45	13-Apr-20	08:38	< 30	106%	2%	NA	643	674
F [mg/L]	14-Apr-20	18:01	15-Apr-20	06:33	< 0.06	100%	ND	99%	0.85	1.80
NO2 [as N mg/L]	09-Apr-20	14:51	14-Apr-20	16:32	< 0.03	95%	ND	97%	< 0.3	< 0.3
NO3 [as N mg/L]	09-Apr-20	14:51	14-Apr-20	16:32	< 0.06	98%	ND	102%	< 0.6	< 0.6
NO2+NO3 [as N mg/L]	09-Apr-20	14:51	14-Apr-20	16:32	< 0.06	NA	NA	NA	< 0.6	< 0.6
Cl [mg/L]	09-Apr-20	20:43	14-Apr-20	13:02	< 0.2	98%	1%	99%	13	9.4
SO4 [mg/L]	09-Apr-20	20:43	13-Apr-20	16:03	< 0.2	91%	0%	108%	410	390
CN(T) [mg/L]	14-Apr-20	13:20	15-Apr-20	15:16	< 0.01	95%	ND	83%	1.65	0.98
CNWAD [mg/L]	16-Apr-20	09:30	16-Apr-20	15:25	< 0.01	99%	ND	NV	1.20	0.64
CNS [mg/L]	14-Apr-20	20:44	16-Apr-20	16:43	< 0.2	102%	0%	97%	1.2	1.2
CNO [mg/L]	15-Apr-20	16:45	16-Apr-20	09:46	< 0.1	96%	ND	94%	< 1	< 1

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : CA14208-APR20

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 28	10: CND 2 Column Week 28
NH3+NH4 [as N mg/L]	14-Apr-20	20:32	16-Apr-20	10:53	< 0.1	98%	1%	100%	28.4	27.1
S2O3 [mg/L]	14-Apr-20	09:08	15-Apr-20	18:35	< 0.2	103%	0%	104%	< 0.2	< 0.2
Hg (diss) [mg/L]	09-Apr-20	17:00	13-Apr-20	12:49	< 0.00001	113%	ND	117%	< 0.00001	0.00001
Ag (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00005	104%	ND	93%	< 0.00005	< 0.00005
Al (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.001	93%	2%	111%	0.021	0.024
As (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0002	108%	ND	106%	0.0181	0.0020
B (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.002	105%	5%	NV	0.035	0.036
Ba (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00002	101%	2%	NV	0.00831	0.0158
Be (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000007	99%	ND	95%	< 0.000007	< 0.000007
Bi (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000007	100%	11%	90%	< 0.000007	< 0.000007
Ca (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.01	100%	1%	NV	26.9	28.8
Cd (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000003	102%	18%	106%	0.000016	0.000008
Co (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000004	104%	3%	106%	0.0372	0.0111
Cr (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00008	103%	17%	83%	< 0.00008	0.00028
Cu (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0002	106%	3%	90%	1.13	0.748
Fe (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.007	100%	1%	100%	0.075	0.032
K (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.009	100%	1%	14%	10.4	13.9
Li (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0001	99%	4%	75%	1.85	1.79
Mg (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.001	98%	1%	114%	1.72	2.87
Mn (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00001	107%	6%	100%	0.0280	0.0330
Mo (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00004	104%	1%	101%	0.0417	0.0287
Na (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.01	104%	2%	NV	156	164
Ni (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0001	106%	4%	102%	0.0024	0.0007
P (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.003	100%	ND	NV	0.017	0.006
Pb (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00001	100%	1%	98%	0.00002	0.00002
S (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 1	92%	4%	NV	130	122
Sb (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0009	101%	ND	111%	0.0018	0.0019
Se (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00004	101%	0%	101%	0.00027	0.00038
Si (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.02	107%	0%	NV	2.99	2.82
Sn (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	0	102%	ND	NV	0.00087	0.00113
Sr (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00002	103%	1%	NV	0.0839	0.259

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA14208-APR20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Column Week 28	10: CND 2 Column Week 28
Th (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.0001	90%	ND	NV	< 0.0001	< 0.0001
Ti (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00005	103%	ND	NV	< 0.00005	< 0.00005
Tl (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000005	102%	0%	99%	< 0.000005	0.000009
U (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000002	102%	4%	96%	0.00168	0.00328
V (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00001	107%	7%	111%	0.00010	0.00013
W (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.00002	99%	ND	NV	0.00162	0.00664
Y (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.000002	105%	0%	NV	0.000010	0.000003
Zn (diss) [mg/L]	15-Apr-20	22:18	14-Apr-20	15:36	< 0.002	106%	7%	NV	0.002	< 0.002

Reporting limits for some paratemeter may be raised due to sample matrix.

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00002097701

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

02-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 24 September 2019
LR Report: **CA10285-SEP19**
Reference: Wk#0

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#0	10: CND 2 Residue Wk#0
Sample Date & Time							24-Sep-19	24-Sep-19
Hum Cell Leachate Volume [mL]	24-Sep-19	14:48					775	812
pH [no unit]	26-Sep-19	09:52	NA	101%	1%	NA	8.37	9.12
Acidity [mg/L as CaCO3]	26-Sep-19	09:52	< 2	100%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	26-Sep-19	09:52	< 2	100%	0%	NA	24	33
Conductivity [uS/cm]	26-Sep-19	09:52	< 2	96%	1%	NA	402	171
Sulphate [mg/L]	01-Oct-19	13:11	< 0.2	94%	1%	NV	130	43
Chloride [mg/L]	01-Oct-19	15:34	< 0.2	93%	0%	109%	3.2	1.1
Fluoride [mg/L]	30-Sep-19	13:13	< 0.06	104%	2%	113%	0.11	0.09
Cyanide (total) [mg/L]	01-Oct-19	11:57	< 0.01	104%	ND	99%	0.21	0.28
Cyanide (WAD) [mg/L]	30-Sep-19	12:47	< 0.01	100%	ND	92%	< 0.01	< 0.01
Cyanate [mg/L]	25-Sep-19	16:12	< 0.1	104%	ND	98%	12	4.3
Thiocyanate [mg/L]	30-Sep-19	10:45	< 0.2	99%	ND	95%	4.8	2.8
Mercury [mg/L]	27-Sep-19	13:50	< 0.00001	121%	ND	116%	0.00004	0.00002
Silver [mg/L]	30-Sep-19	10:51	< 0.00005	98%	ND	85%	0.00011	< 0.00005
Aluminum [mg/L]	30-Sep-19	10:51	< 0.001	100%	12%	104%	0.041	0.077
Arsenic [mg/L]	30-Sep-19	10:51	< 0.0002	96%	ND	92%	0.0025	0.0004
Boron [mg/L]	30-Sep-19	10:51	< 0.002	98%	3%	NV	0.044	0.026
Barium [mg/L]	30-Sep-19	10:51	< 0.00002	90%	3%	94%	0.00227	0.00209
Beryllium [mg/L]	30-Sep-19	10:51	< 0.000007	98%	ND	97%	< 0.000007	< 0.000007
Bismuth [mg/L]	30-Sep-19	10:51	< 0.000007	101%	ND	101%	< 0.000007	< 0.000007
Calcium [mg/L]	30-Sep-19	10:51	< 0.01	99%	0%	94%	30.4	9.35
Cadmium [mg/L]	30-Sep-19	10:51	< 0.000003	97%	2%	101%	0.000009	< 0.000003
Cobalt [mg/L]	30-Sep-19	10:51	< 0.000004	96%	11%	93%	0.0161	0.00132
Chromium [mg/L]	30-Sep-19	10:51	< 0.00008	95%	19%	93%	< 0.00008	< 0.00008
Copper [mg/L]	30-Sep-19	10:51	< 0.0002	97%	3%	124%	0.0041	0.0060
Iron [mg/L]	30-Sep-19	10:51	< 0.007	99%	ND	NV	0.090	0.125
Potassium [mg/L]	30-Sep-19	10:51	< 0.009	99%	4%	91%	3.61	1.47
Lithium [mg/L]	30-Sep-19	10:51	< 0.0001	97%	3%	93%	0.0031	0.0003
Magnesium [mg/L]	30-Sep-19	10:51	< 0.001	107%	7%	96%	1.60	0.946
Manganese [mg/L]	30-Sep-19	10:51	< 0.00001	96%	0%	107%	0.0357	0.00843
Molybdenum [mg/L]	30-Sep-19	10:51	< 0.00004	101%	17%	101%	0.00676	0.00151
Sodium [mg/L]	30-Sep-19	10:51	< 0.01	104%	4%	93%	47.3	19.5
Nickel [mg/L]	30-Sep-19	10:51	< 0.0001	98%	3%	90%	0.0005	0.0002
Phosphorus [mg/L]	30-Sep-19	10:51	< 0.003	98%	ND	NV	0.004	0.003
Lead [mg/L]	30-Sep-19	10:51	< 0.00001	97%	1%	92%	0.00007	0.00007

OnLine LIMS

0001911754

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA10285-SEP19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#0	10: CND 2 Residue Wk#0
Antimony [mg/L]	30-Sep-19	10:51	< 0.0009	101%	ND	98%	0.0013	< 0.0009
Sulfur [mg/L]	30-Sep-19	10:51	< 0.3	95%	3%	NV	72.3	23.2
Selenium [mg/L]	30-Sep-19	10:51	< 0.00004	106%	20%	101%	0.00015	0.00010
Silicon [mg/L]	30-Sep-19	10:51	< 0.02	106%	1%	NV	0.48	0.23
Tin [mg/L]	30-Sep-19	10:51	< 0.00006	99%	ND	NV	0.00020	0.00015
Strontium [mg/L]	30-Sep-19	10:51	< 0.00002	96%	3%	92%	0.0456	0.0352
Thorium [mg/L]	30-Sep-19	10:51	< 0.0001	98%	ND	NV	< 0.0001	< 0.0001
Titanium [mg/L]	30-Sep-19	10:51	< 0.00005	100%	ND	NV	0.00013	0.00015
Thallium [mg/L]	30-Sep-19	10:51	< 0.000005	95%	ND	94%	< 0.000005	< 0.000005
Uranium [mg/L]	30-Sep-19	10:51	< 0.000002	91%	15%	93%	0.000185	0.000081
Vanadium [mg/L]	30-Sep-19	10:51	< 0.00001	96%	ND	93%	0.00003	0.00008
Tungsten [mg/L]	30-Sep-19	10:51	< 0.00002	100%	7%	NV	0.00008	0.00017
Yttrium [mg/L]	30-Sep-19	10:51	< 0.000002	98%	8%	NV	0.000006	0.000004
Zinc [mg/L]	30-Sep-19	10:51	< 0.002	99%	3%	111%	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001911754

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

08-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 01 October 2019
LR Report: **CA10046-OCT19**
Reference: Wk#1

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#1	10: CND 2 Residue Wk#1
Sample Date & Time							01-Oct-19	01-Oct-19
Hum Cell Leachate Volume [mL]	01-Oct-19	11:16					952	948
pH [no unit]	03-Oct-19	14:44	NA	100%	0%	NA	7.68	8.46
Acidity [mg/L as CaCO3]	03-Oct-19	14:44	< 2	94%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	03-Oct-19	14:44	< 2	93%	ND	NA	15	22
Conductivity [uS/cm]	03-Oct-19	14:44	3	96%	0%	NA	199	160
Sulphate [mg/L]	07-Oct-19	09:26	< 0.2	95%	ND	100%	57	40
Chloride [mg/L]	08-Oct-19	08:49	< 0.2	95%	ND	108%	0.8	0.7
Fluoride [mg/L]	02-Oct-19	13:39	< 0.06	107%	0%	105%	< 0.06	0.07
Mercury [mg/L]	02-Oct-19	14:33	< 0.00001	96%	ND	129%	< 0.00001	< 0.00001
Silver [mg/L]	07-Oct-19	15:39	< 0.00005	94%	ND	96%	< 0.00005	< 0.00005
Aluminum [mg/L]	07-Oct-19	15:39	< 0.001	99%	9%	126%	0.024	0.060
Arsenic [mg/L]	07-Oct-19	15:39	< 0.0002	92%	6%	107%	0.0011	< 0.0002
Boron [mg/L]	07-Oct-19	15:39	< 0.002	97%	0%	NV	0.005	0.004
Barium [mg/L]	07-Oct-19	15:39	< 0.00002	96%	0%	NV	0.00189	0.00220
Beryllium [mg/L]	07-Oct-19	15:39	< 0.000007	93%	14%	102%	< 0.000007	< 0.000007
Bismuth [mg/L]	07-Oct-19	15:39	< 0.000007	98%	ND	82%	0.000008	0.000008
Calcium [mg/L]	07-Oct-19	15:39	< 0.01	98%	2%	NV	18.9	11.6
Cadmium [mg/L]	07-Oct-19	15:39	< 0.000003	96%	ND	107%	< 0.000003	< 0.000003
Cobalt [mg/L]	07-Oct-19	15:39	< 0.000004	93%	8%	100%	0.00444	0.000861
Chromium [mg/L]	07-Oct-19	15:39	< 0.00008	94%	ND	105%	< 0.00008	< 0.00008
Copper [mg/L]	07-Oct-19	15:39	< 0.0002	94%	4%	NV	0.0023	0.0055
Iron [mg/L]	07-Oct-19	15:39	< 0.007	97%	1%	NV	0.028	0.079
Potassium [mg/L]	07-Oct-19	15:39	< 0.009	97%	2%	NV	1.28	1.26
Lithium [mg/L]	07-Oct-19	15:39	< 0.0001	97%	3%	99%	0.0020	0.0003
Magnesium [mg/L]	07-Oct-19	15:39	< 0.001	99%	1%	NV	1.43	1.78
Manganese [mg/L]	07-Oct-19	15:39	< 0.00001	94%	4%	NV	0.0529	0.0186
Molybdenum [mg/L]	07-Oct-19	15:39	< 0.00004	92%	16%	92%	0.00187	0.00097
Sodium [mg/L]	07-Oct-19	15:39	< 0.01	105%	2%	NV	16.9	16.1
Nickel [mg/L]	07-Oct-19	15:39	< 0.0001	94%	3%	100%	0.0003	< 0.0001
Phosphorus [mg/L]	07-Oct-19	15:39	< 0.003	98%	3%	NV	< 0.003	< 0.003

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA10046-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#1	10: CND 2 Residue Wk#1
Lead [mg/L]	07-Oct-19	15:39	< 0.00001	96%	3%	90%	0.00004	0.00005
Sulfur [mg/L]	07-Oct-19	15:39	< 0.3	103%	ND	NV	36.1	23.9
Antimony [mg/L]	07-Oct-19	15:39	< 0.0009	104%	ND	113%	< 0.0009	< 0.0009
Selenium [mg/L]	07-Oct-19	15:39	< 0.00004	100%	ND	87%	0.00005	0.00012
Silicon [mg/L]	07-Oct-19	15:39	< 0.02	90%	9%	NV	0.24	0.20
Tin [mg/L]	07-Oct-19	15:39	< 0.00006	98%	ND	NV	0.00008	0.00012
Strontium [mg/L]	07-Oct-19	15:39	< 0.00002	92%	3%	NV	0.0251	0.0421
Thorium [mg/L]	07-Oct-19	15:39	< 0.0001	95%	0%	NV	< 0.0001	< 0.0001
Titanium [mg/L]	07-Oct-19	15:39	< 0.00005	94%	ND	NV	< 0.00005	0.00012
Thallium [mg/L]	07-Oct-19	15:39	< 0.000005	98%	ND	91%	< 0.000005	< 0.000005
Uranium [mg/L]	07-Oct-19	15:39	< 0.000002	95%	ND	90%	0.000119	0.000117
Vanadium [mg/L]	07-Oct-19	15:39	< 0.00001	93%	5%	106%	0.00002	0.00005
Tungsten [mg/L]	07-Oct-19	15:39	< 0.00002	96%	9%	NV	0.00004	0.00008
Yttrium [mg/L]	07-Oct-19	15:39	< 0.000002	95%	7%	NV	0.000003	0.000002
Zinc [mg/L]	07-Oct-19	15:39	< 0.002	93%	2%	NV	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Patti Stark
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

17-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 08 October 2019
LR Report: **CA10089-OCT19**
Reference: Wk #2

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk #2	10: CND 2 Residue Wk #2
Sample Date & Time							08-Oct-19	08-Oct-19
Hum Cell Leachate Volume [mL]	09-Oct-19	08:58					935	906
pH [no unit]	09-Oct-19	14:25	NA	101%	0%	NA	7.31	8.46
Acidity [mg/L as CaCO3]	16-Oct-19	15:37	< 2	94%	ND	NA	18	< 2
Alkalinity [mg/L as CaCO3]	09-Oct-19	14:25	< 2	100%	3%	NA	12	15
Conductivity [uS/cm]	09-Oct-19	14:25	2	96%	0%	NA	272	136
Sulphate [mg/L]	15-Oct-19	11:07	< 0.2	97%	0%	91%	93	36
Chloride [mg/L]	15-Oct-19	11:07	< 0.2	95%	11%	102%	0.7	0.4
Fluoride [mg/L]	11-Oct-19	08:32	< 0.06	100%	0%	109%	0.15	0.13
Mercury [mg/L]	10-Oct-19	10:49	< 0.00001	119%	ND	129%	< 0.00001	< 0.00001
Silver [mg/L]	16-Oct-19	09:29	< 0.00005	100%	ND	NV	< 0.00005	< 0.00005
Aluminum [mg/L]	16-Oct-19	09:29	< 0.001	110%	4%	116%	0.019	0.045
Arsenic [mg/L]	16-Oct-19	09:29	< 0.0002	95%	1%	NV	0.0007	< 0.0002
Boron [mg/L]	16-Oct-19	09:29	< 0.002	103%	4%	NV	0.006	0.005
Barium [mg/L]	16-Oct-19	09:29	< 0.00002	99%	1%	NV	0.00282	0.00295
Beryllium [mg/L]	16-Oct-19	09:29	< 0.000007	109%	6%	96%	< 0.000007	< 0.000007
Bismuth [mg/L]	16-Oct-19	09:29	< 0.000007	96%	ND	123%	< 0.000007	< 0.000007
Calcium [mg/L]	16-Oct-19	09:29	< 0.01	103%	0%	NV	34.6	12.7
Cadmium [mg/L]	16-Oct-19	09:29	< 0.000003	95%	5%	81%	0.000003	0.000011
Cobalt [mg/L]	16-Oct-19	09:29	< 0.000004	99%	1%	NV	0.00394	0.000447
Chromium [mg/L]	16-Oct-19	09:29	< 0.00008	98%	ND	101%	0.00021	0.00020
Copper [mg/L]	16-Oct-19	09:29	< 0.0002	100%	1%	NV	0.0023	0.0075
Iron [mg/L]	16-Oct-19	09:29	< 0.007	101%	0%	NV	0.021	0.042
Potassium [mg/L]	16-Oct-19	09:29	< 0.009	99%	1%	82%	1.65	1.11
Lithium [mg/L]	16-Oct-19	09:29	< 0.0001	106%	7%	92%	0.0027	0.0002
Magnesium [mg/L]	16-Oct-19	09:29	0.001	100%	ND	115%	2.65	1.82
Manganese [mg/L]	16-Oct-19	09:29	< 0.00001	105%	2%	NV	0.0770	0.0235
Molybdenum [mg/L]	16-Oct-19	09:29	< 0.00004	98%	2%	98%	0.00211	0.00067
Sodium [mg/L]	16-Oct-19	09:29	< 0.01	101%	ND	NV	14.1	9.06
Nickel [mg/L]	16-Oct-19	09:29	< 0.0001	99%	2%	NV	0.0004	0.0001
Phosphorus [mg/L]	16-Oct-19	09:29	0.003	107%	15%	NV	< 0.003	< 0.003
Lead [mg/L]	16-Oct-19	09:29	< 0.00001	95%	2%	85%	0.00005	0.00003
Sulfur [mg/L]	16-Oct-19	09:29	< 0.3	92%	1%	NV	43.0	16.2
Antimony [mg/L]	16-Oct-19	09:29	< 0.0009	101%	2%	NV	< 0.0009	< 0.0009
Selenium [mg/L]	16-Oct-19	09:29	< 0.00004	95%	1%	126%	0.00010	0.00006
Silicon [mg/L]	16-Oct-19	09:29	< 0.02	102%	4%	NV	0.27	0.14

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02
LR Report : **CA10089-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk #2	10: CND 2 Residue Wk #2
Tin [mg/L]	16-Oct-19	09:29	< 0.00006	99%	ND	NV	0.00006	0.00020
Strontium [mg/L]	16-Oct-19	09:29	< 0.00002	95%	3%	94%	0.0436	0.0449
Thorium [mg/L]	16-Oct-19	09:29	< 0.0001	97%	ND	NV	< 0.0001	< 0.0001
Titanium [mg/L]	16-Oct-19	09:29	< 0.00005	106%	ND	NV	< 0.00005	0.00008
Thallium [mg/L]	16-Oct-19	09:29	< 0.000005	94%	6%	89%	< 0.000005	< 0.000005
Uranium [mg/L]	16-Oct-19	09:29	< 0.000002	91%	3%	94%	0.000130	0.000075
Vanadium [mg/L]	16-Oct-19	09:29	< 0.00001	97%	8%	100%	0.00004	0.00006
Tungsten [mg/L]	16-Oct-19	09:29	< 0.00002	99%	9%	NV	0.00002	0.00005
Yttrium [mg/L]	16-Oct-19	09:29	< 0.000002	99%	2%	NV	0.000006	0.000005
Zinc [mg/L]	16-Oct-19	09:29	< 0.002	101%	1%	NV	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001927073

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

29-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 24 October 2019
LR Report: **CA14754-OCT19**
Reference: Reassay - Wk #2

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk #2
Sample Date & Time							08-Oct-19
Acidity [mg/L as CaCO3]	26-Oct-19	13:00	2	106%	ND	NA	18

Original SGS report CA10089-OCT19

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LMS

0001940707

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

14-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 15 October 2019
LR Report: **CA10167-OCT19**
Reference: Wk# 3

Copy: #3

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 3	10: CND 2 Residue Wk# 3
Sample Date & Time							15-Oct-19	15-Oct-19
HumCell Leachate Vol [mL]	15-Oct-19	14:22					920	948
pH [no unit]	16-Oct-19	16:08	NA	100%	1%	NA	7.14	7.34
Acidity [mg/L as CaCO3]	16-Oct-19	16:08	2	104%	0%	NA	22	< 2
Alkalinity [mg/L as CaCO3]	16-Oct-19	16:08	< 2	102%	3%	NA	10	12
Conductivity [uS/cm]	16-Oct-19	16:08	3	100%	0%	NA	287	183
SO4 [mg/L]	22-Oct-19	13:46	< 0.2	95%	13%	121%	98	66
Cl [mg/L]	18-Oct-19	16:00	< 0.2	96%	ND	113%	0.5	0.4
F [mg/L]	17-Oct-19	09:46	< 0.06	106%	ND	119%	< 0.06	0.06
Hg [mg/L]	17-Oct-19	08:32	< 0.00001	101%	ND	93%	< 0.00001	< 0.00001
Ag [mg/L]	22-Oct-19	14:40	< 0.00005	98%	ND	87%	< 0.00005	< 0.00005
Al [mg/L]	22-Oct-19	14:40	< 0.001	143%	9%	NV	0.019	0.028
As [mg/L]	22-Oct-19	14:40	< 0.0002	99%	9%	97%	0.0008	< 0.0002
B [mg/L]	22-Oct-19	14:40	< 0.002	94%	5%	NV	0.004	< 0.002
Ba [mg/L]	22-Oct-19	14:40	< 0.00002	101%	5%	NV	0.00284	0.00320
Be [mg/L]	22-Oct-19	14:40	< 0.000007	95%	0%	91%	< 0.000007	< 0.000007
Bi [mg/L]	22-Oct-19	14:40	< 0.000007	105%	ND	103%	< 0.000007	< 0.000007
Ca [mg/L]	22-Oct-19	14:40	< 0.01	108%	1%	NV	40.6	17.8
Cd [mg/L]	22-Oct-19	14:40	< 0.000003	100%	4%	99%	< 0.000003	0.000018
Co [mg/L]	22-Oct-19	14:40	< 0.000004	96%	4%	91%	0.00299	0.000592
Cr [mg/L]	22-Oct-19	14:40	< 0.00008	103%	9%	88%	< 0.00008	< 0.00008
Cu [mg/L]	22-Oct-19	14:40	< 0.0002	97%	4%	92%	0.0020	0.0057
Fe [mg/L]	22-Oct-19	14:40	< 0.007	107%	4%	NV	0.021	0.038
K [mg/L]	22-Oct-19	14:40	< 0.009	106%	1%	NV	1.36	1.21
Li [mg/L]	22-Oct-19	14:40	< 0.0001	94%	5%	97%	0.0025	0.0004
Mg [mg/L]	22-Oct-19	14:40	< 0.001	104%	2%	NV	2.95	2.89
Mn [mg/L]	22-Oct-19	14:40	< 0.00001	106%	2%	125%	0.104	0.0326
Mo [mg/L]	22-Oct-19	14:40	< 0.00004	103%	7%	100%	0.00158	0.00064
Na [mg/L]	22-Oct-19	14:40	< 0.01	108%	1%	NV	10.5	9.99
Ni [mg/L]	22-Oct-19	14:40	< 0.0001	91%	ND	94%	0.0004	0.0001
P [mg/L]	22-Oct-19	14:40	< 0.003	101%	6%	NV	< 0.003	< 0.003
Pb [mg/L]	22-Oct-19	14:40	< 0.00001	103%	8%	102%	< 0.00001	< 0.00001
S [mg/L]	22-Oct-19	14:40	< 0.3	105%	ND	NV	43.0	21.0
Sb [mg/L]	22-Oct-19	14:40	< 0.0009	106%	ND	95%	< 0.0009	< 0.0009

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10167-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 3	10: CND 2 Residue Wk# 3
Se [mg/L]	22-Oct-19	14:40	< 0.00004	106%	2%	101%	0.00013	0.00007
Si [mg/L]	22-Oct-19	14:40	< 0.02	100%	3%	NV	0.27	0.16
Sn [mg/L]	22-Oct-19	14:40	< 0.00006	99%	0%	NV	0.00008	0.00011
Sr [mg/L]	22-Oct-19	14:40	< 0.00002	98%	3%	NV	0.0451	0.0612
Th [mg/L]	22-Oct-19	14:40	< 0.0001	97%	ND	NV	< 0.0001	< 0.0001
Ti [mg/L]	22-Oct-19	14:40	< 0.00005	106%	8%	NV	< 0.00005	< 0.00005
Tl [mg/L]	22-Oct-19	14:40	< 0.000005	103%	ND	96%	< 0.000005	< 0.000005
U [mg/L]	22-Oct-19	14:40	2e-006	104%	3%	101%	0.000158	0.000720
V [mg/L]	22-Oct-19	14:40	< 0.00001	97%	5%	116%	0.00001	0.00003
W [mg/L]	22-Oct-19	14:40	< 0.00002	99%	15%	NV	0.00005	0.00003
Y [mg/L]	22-Oct-19	14:40	< 0.000002	95%	2%	NV	0.000006	< 0.000002
Zn [mg/L]	22-Oct-19	14:40	< 0.002	101%	4%	NV	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001958634

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

12-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 05 November 2019
LR Report: **CA14135-NOV19**
Reference: Wk# 3

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 3
Sample Date & Time							15-Oct-19
HumCell Leachate Vol [mL]	15-Oct-19	14:22	---	---	---	---	920
Acidity [mg/L as CaCO3]	07-Nov-19	11:11	2	98%	0%	NA	12

NA - Not applicable

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LNT

0001955352

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

14-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 11 November 2019
LR Report: **CA14277-NOV19**
Reference: Wk# 3

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	10: CND 2 Residue Wk# 3
Sample Date & Time							15-Oct-19
HumCell Leachate Vol [mL]	13-Nov-19	14:57					948
pH [no unit]	11-Nov-19	13:30	NA	100%	0%	NA	7.35

NA - Not applicable
ND - Not Detected
NV - No Value

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 anrUno

0001958505

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

29-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 22 October 2019
LR Report: **CA10238-OCT19**
Reference: Wk# 4

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 4	10: CND 2 Residue Wk# 4
Sample Date & Time							22-Oct-19	22-Oct-19
Hum Cell Leachate Volume [mL]	23-Oct-19	13:53					935	896
pH [no unit]	23-Oct-19	16:06	NA	100%	0%	NA	7.69	8.43
Acidity [mg/L as CaCO3]	23-Oct-19	16:06	< 2	100%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	23-Oct-19	16:06	< 2	102%	ND	NA	11	11
Conductivity [uS/cm]	23-Oct-19	16:06	< 2	99%	0%	NA	269	196
Sulphate [mg/L]	29-Oct-19	10:16	< 0.2	106%	0%	99%	100	71
Chloride [mg/L]	29-Oct-19	10:16	< 0.2	98%	ND	117%	0.3	0.4
Fluoride [mg/L]	23-Oct-19	11:58	< 0.06	100%	ND	111%	0.35	0.66
Mercury [mg/L]	23-Oct-19	13:53	< 0.00001	126%	ND	126%	< 0.00001	< 0.00001
Silver [mg/L]	25-Oct-19	09:27	< 0.00005	101%	ND	94%	< 0.00005	< 0.00005
Aluminum [mg/L]	25-Oct-19	09:27	< 0.001	91%	9%	NV	0.015	0.024
Arsenic [mg/L]	25-Oct-19	09:27	< 0.0002	98%	1%	101%	0.0006	< 0.0002
Boron [mg/L]	25-Oct-19	09:27	< 0.002	99%	4%	NV	0.010	< 0.002
Barium [mg/L]	25-Oct-19	09:27	< 0.00002	100%	0%	95%	0.00280	0.00320
Beryllium [mg/L]	25-Oct-19	09:27	< 0.000007	97%	3%	93%	< 0.000007	< 0.000007
Bismuth [mg/L]	25-Oct-19	09:27	< 0.000007	98%	ND	92%	< 0.000007	< 0.000007
Calcium [mg/L]	25-Oct-19	09:27	< 0.01	100%	1%	NV	41.2	23.1
Cadmium [mg/L]	25-Oct-19	09:27	< 0.000003	103%	1%	107%	0.000010	0.000007
Cobalt [mg/L]	25-Oct-19	09:27	< 0.000004	100%	5%	99%	0.00169	0.000449
Chromium [mg/L]	25-Oct-19	09:27	< 0.00008	103%	6%	117%	< 0.00008	< 0.00008
Copper [mg/L]	25-Oct-19	16:53	< 0.0002	100%	2%	96%	0.0059	0.0023
Iron [mg/L]	25-Oct-19	09:27	< 0.007	100%	9%	NV	0.010	0.026
Potassium [mg/L]	25-Oct-19	09:27	< 0.009	100%	1%	115%	1.01	1.08
Lithium [mg/L]	25-Oct-19	09:27	< 0.0001	97%	8%	101%	0.0018	< 0.0001
Magnesium [mg/L]	25-Oct-19	09:27	< 0.001	102%	2%	84%	2.91	3.26
Manganese [mg/L]	25-Oct-19	16:53	< 0.00001	101%	3%	121%	0.122	0.0363
Molybdenum [mg/L]	25-Oct-19	09:27	< 0.00004	101%	5%	106%	0.00097	0.00070
Sodium [mg/L]	25-Oct-19	09:27	< 0.01	105%	2%	NV	6.08	7.53
Nickel [mg/L]	25-Oct-19	09:27	< 0.0001	101%	10%	97%	0.0004	0.0001
Phosphorus [mg/L]	25-Oct-19	09:27	< 0.003	98%	9%	NV	< 0.003	< 0.003
Lead [mg/L]	25-Oct-19	09:27	< 0.00001	99%	2%	90%	< 0.00001	0.00001
Sulfur [mg/L]	25-Oct-19	09:27	< 0.3	101%	1%	NV	43.7	29.1
Antimony [mg/L]	25-Oct-19	09:27	< 0.0009	104%	ND	93%	< 0.0009	< 0.0009
Selenium [mg/L]	25-Oct-19	09:27	< 0.00004	94%	ND	88%	0.00010	0.00010
Silicon [mg/L]	25-Oct-19	09:27	< 0.02	105%	8%	NV	0.22	0.12

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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Project : CA20M-00000-110-16863-02
LR Report : **CA10238-OCT19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 4	10: CND 2 Residue Wk# 4
Tin [mg/L]	25-Oct-19	09:27	< 0.00006	97%	12%	NV	0.00006	0.00017
Strontium [mg/L]	25-Oct-19	09:27	< 0.00002	98%	1%	82%	0.0457	0.0757
Thorium [mg/L]	25-Oct-19	09:27	< 0.0001	98%	ND	NV	< 0.0001	< 0.0001
Titanium [mg/L]	25-Oct-19	09:27	< 0.00005	96%	18%	NV	< 0.00005	< 0.00005
Thallium [mg/L]	25-Oct-19	09:27	< 0.000005	95%	ND	88%	< 0.000005	< 0.000005
Uranium [mg/L]	25-Oct-19	09:27	< 0.000002	99%	1%	89%	0.000169	0.000120
Vanadium [mg/L]	25-Oct-19	09:27	< 0.00001	100%	4%	121%	< 0.00001	0.00002
Tungsten [mg/L]	25-Oct-19	09:27	< 0.00002	95%	ND	NV	0.00002	0.00004
Yttrium [mg/L]	25-Oct-19	09:27	< 0.000002	100%	2%	NV	0.000004	0.000002
Zinc [mg/L]	25-Oct-19	16:53	< 0.002	99%	3%	105%	< 0.002	0.003

NA - Not applicable
ND - Not Detected
NV - No Value

Patti Stark
Project Specialist,
Environment, Health & Safety

OnLine LNMS

0001940747

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

15-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 14 November 2019
LR Report: **CA14452-NOV19**
Reference: Wk# 4

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 4	10: CND 2 Residue Wk# 4
Sample Date & Time							22-Oct-19	22-Oct-19
HumCell Leachate Vol [mL]	23-Oct-19	13:53	---	---	---	---	935	896
F [mg/L]	15-Nov-19	12:58	< 0.06	102%	0%	106%	< 0.06	0.07

NA - Not applicable
ND - Not Detected
NV - No Value

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT Online

0001960383

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

29-October-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 24 October 2019
LR Report: **CA14755-OCT19**
Reference: Reassay - Wk# 4

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk# 4
Sample Date & Time							22-Oct-19
Acidity [mg/L as CaCO3]	28-Oct-19	12:00	2	106%	ND	NA	< 2

Original SGS report CA10238-OCT19

Patti Stark
Project Specialist,
Environment, Health & Safety

SMN1 ane LNMS

0001940713

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

08-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 29 October 2019
LR Report: **CA10368-OCT19**
Reference: Wk#5

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#5	10: CND 2 Residue Wk#5
Sample Date & Time							29-Oct-19	29-Oct-19
HumCell Leachate Vol [mL]	29-Oct-19	13:10					944	929
pH [no unit]	31-Oct-19	09:44	NA	100%	0%	NA	7.25	8.14
Acidity [mg/L as CaCO3]	31-Oct-19	09:44	2	98%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	31-Oct-19	09:44	< 2	102%	0%	NA	7	11
Conductivity [uS/cm]	31-Oct-19	09:44	2	99%	1%	NA	229	226
SO4 [mg/L]	05-Nov-19	08:28	< 0.2	95%	ND	96%	84	85

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnTune LIMS

0001951516

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

12-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 05 November 2019
LR Report: **CA10014-NOV19**
Reference: Wk# 6

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#6	10: CND 2 Residue Wk#6
Sample Date & Time							05-Nov-19	05-Nov-19
HumCell Leachate Vol [mL]	05-Nov-19	12:12					910	898
pH [no unit]	07-Nov-19	14:42	NA	100%	0%	NA	7.20	8.31
Acidity [mg/L as CaCO3]	06-Nov-19	11:15	2	110%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	06-Nov-19	11:15	< 2	97%	0%	NA	6	10
Conductivity [uS/cm]	06-Nov-19	11:15	< 2	100%	0%	NA	302	256
SO4 [mg/L]	12-Nov-19	09:56	< 0.2	93%	0%	85%	120	92

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnTune LIMS

0001955574

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

21-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 12 November 2019
LR Report: **CA10066-NOV19**
Reference: Wk#7

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#7	10: CND 2 Residue Wk#7
Sample Date & Time							12-Nov-19	12-Nov-19
HumCell Leachate Vol [mL]	13-Nov-19	09:44					866	875
pH [no unit]	15-Nov-19	10:46	NA	100%	1%	NA	7.23	8.24
Acidity [mg/L as CaCO3]	13-Nov-19	16:00	2	104%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	13-Nov-19	16:00	< 2	95%	0%	NA	8	11
Conductivity [uS/cm]	13-Nov-19	16:00	< 2	100%	0%	NA	294	342
SO4 [mg/L]	19-Nov-19	13:13	< 0.2	95%	2%	77%	120	140

NA - Not applicable
ND - Not Detected

CHARTERED CATHARINE ARNOLD CHEMIST — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001965320

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

26-November-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 19 November 2019
LR Report: **CA10097-NOV19**
Reference: Wk#8

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#8	10: CND 2 Residue Wk#8
Sample Date & Time							19-Nov-19	19-Nov-19
HumCell Leachate Vol [mL]	19-Nov-19	15:16					865	872
pH [no unit]	26-Nov-19	16:14	NA	100%	0%	NA	7.23	7.62
Acidity [mg/L as CaCO3]	20-Nov-19	11:46	< 2	98%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	20-Nov-19	11:46	< 2	100%	0%	NA	7	9
Conductivity [uS/cm]	20-Nov-19	11:46	2	101%	0%	NA	321	275
SO4 [mg/L]	26-Nov-19	09:06	< 0.2	101%	0%	101%	150	99
Cl [mg/L]	25-Nov-19	15:31	< 0.2	97%	ND	113%	< 0.2	0.2
F [mg/L]	21-Nov-19	10:45	< 0.06	101%	ND	105%	0.08	0.12
CN(T) [mg/L]	20-Nov-19	13:14	< 0.01	99%	ND	102%	0.01	0.06
CNWAD [mg/L]	21-Nov-19	06:14	< 0.01	98%	ND	79%	< 0.01	< 0.01
CNO [mg/L]	22-Nov-19	08:04	< 0.1	100%	ND	94%	< 1	< 1
CNS [mg/L]	20-Nov-19	08:44	< 0.2	100%	1%	101%	2.3	< 0.2
Hg [mg/L]	21-Nov-19	10:23	< 0.00001	118%	ND	NV	< 0.00001	< 0.00001
Ag [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.00005	< 0.00005
Al [mg/L]	25-Nov-19	11:04	---	---	---	---	0.012	0.018
As [mg/L]	25-Nov-19	11:04	---	---	---	---	0.0003	< 0.0002
B [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.002	< 0.002
Ba [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00277	0.00327
Be [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.000007	< 0.000007
Bi [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.000007	< 0.000007
Ca [mg/L]	25-Nov-19	11:04	---	---	---	---	53.9	30.9
Cd [mg/L]	25-Nov-19	11:04	---	---	---	---	0.000005	< 0.000003
Co [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00144	0.000398
Cr [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.00008	< 0.00008
Cu [mg/L]	25-Nov-19	11:04	---	---	---	---	0.0016	0.0015
Fe [mg/L]	25-Nov-19	11:04	---	---	---	---	0.009	0.017
K [mg/L]	25-Nov-19	11:04	---	---	---	---	0.618	0.933
Li [mg/L]	25-Nov-19	11:04	---	---	---	---	0.0019	0.0003
Mg [mg/L]	25-Nov-19	11:04	---	---	---	---	3.19	5.56
Mn [mg/L]	25-Nov-19	11:04	---	---	---	---	0.164	0.0443
Mo [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00156	0.00067
Na [mg/L]	25-Nov-19	11:04	---	---	---	---	3.00	5.53
Ni [mg/L]	25-Nov-19	11:04	---	---	---	---	0.0004	0.0001

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10097-NOV19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#8	10: CND 2 Residue Wk#8
P [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.003	< 0.003
Pb [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00003	< 0.00001
S [mg/L]	25-Nov-19	11:04	---	---	---	---	54.0	39.1
Sb [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.0009	< 0.0009
Se [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00013	0.00016
Si [mg/L]	25-Nov-19	11:04	---	---	---	---	0.18	0.13
Sn [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00009	< 0.00006
Sr [mg/L]	25-Nov-19	11:04	---	---	---	---	0.0498	0.0949
Th [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.0001	< 0.0001
Ti [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.00005	< 0.00005
Tl [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.000005	< 0.000005
U [mg/L]	25-Nov-19	11:04	---	---	---	---	0.000084	0.000082
V [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.00001	< 0.00001
W [mg/L]	25-Nov-19	11:04	---	---	---	---	0.00007	0.00019
Y [mg/L]	25-Nov-19	11:04	---	---	---	---	0.000004	0.000002
Zn [mg/L]	25-Nov-19	11:04	---	---	---	---	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

RL raised for CNO due to sample matrix.

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0001969692

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

02-December-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 26 November 2019
LR Report: **CA10158-NOV19**
Reference: Wk#9

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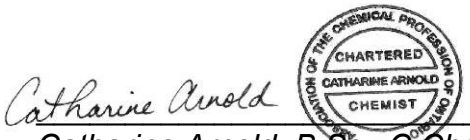
CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#9	10: CND 2 Residue Wk#9
Sample Date & Time							26-Nov-19	26-Nov-19
HumCell Leachate Vol [mL]	26-Nov-19	15:35					932	925
pH [no unit]	27-Nov-19	15:05	NA	100%	0%	NA	7.23	7.58
Acidity [mg/L as CaCO3]	27-Nov-19	15:05	3	102%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	29-Nov-19	08:35	< 2	97%	0%	NA	8	11
Conductivity [uS/cm]	27-Nov-19	15:06	3	100%	0%	NA	318	342
SO4 [mg/L]	02-Dec-19	08:33	< 0.2	97%	2%	109%	130	140

NA - Not applicable
ND - Not Detected



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnTune LIMS

0001975616

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

17-December-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 03 December 2019
LR Report: **CA10014-DEC19**
Reference: Wk#10

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP %RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#10	10: CND 2 Residue Wk#10
Sample Date & Time							03-Dec-19	03-Dec-19
HumCell Leachate Vol [mL]	03-Dec-19	14:40					855	866
pH [no unit]	04-Dec-19	14:36	NA	100%	0%	NA	7.20	7.75
Acidity [mg/L as CaCO3]	04-Dec-19	14:36	< 2	Error!	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	04-Dec-19	14:36	< 2	104%	0%	NA	7	11
Conductivity [uS/cm]	04-Dec-19	14:36	< 2	100%	0%	NA	309	347
SO4 [mg/L]	09-Dec-19	11:20	< 0.2	95%	1%	102%	130	140

NA - Not applicable
ND - Not Detected

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMLI Online

00019896

SGS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

24-December-2019

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 17 December 2019
LR Report: **CA10106-DEC19**
Reference: Wk#12

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: QC - Blank**	**6: QC - STD % Recovery**	**7: QC - DUP % RPD**	**8: QC - Spike Rep**	**9: CND 1 Residue Wk#12**	**10: CND 2 Residue Wk#12**
Sample Date & Time							17-Dec-19	17-Dec-19
HumCell Leachate Vol [mL]	17-Dec-19	12:24					882	894
pH [no unit]	18-Dec-19	13:56	NA	100%	1%	NA	7.24	7.62
Acidity [mg/L as CaCO3]	18-Dec-19	13:56	2	102%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	18-Dec-19	13:56	< 2	102%	0%	NA	7	11
Conductivity [uS/cm]	18-Dec-19	13:56	2	100%	2%	NA	315	324
SO4 [mg/L]	23-Dec-19	14:38	< 0.2	100%	3%	87%	130	130
Cl [mg/L]	24-Dec-19	08:10	< 0.2	96%	0%	104%	< 0.2	< 0.2
F [mg/L]	18-Dec-19	10:09	< 0.06	95%	ND	92%	0.08	0.11
CN(T) [mg/L]	18-Dec-19	21:58	< 0.01	102%	ND	86%	0.03	0.10
CNWAD [mg/L]	23-Dec-19	10:57	< 0.01	107%	ND	81%	< 0.01	< 0.01
CNO [mg/L]	18-Dec-19	14:17	< 0.1	100%	8%	85%	< 1	< 1
CNS [mg/L]	18-Dec-19	09:37	< 0.2	100%	1%	98%	1.8	< 0.2
Hg [mg/L]	18-Dec-19	09:03	< 0.00001	113%	ND	113%	< 0.00001	< 0.00001
Ag [mg/L]	20-Dec-19	13:24	< 0.00005	100%	ND	101%	< 0.00005	< 0.00005
Al [mg/L]	20-Dec-19	13:24	< 0.001	104%	3%	83%	0.013	0.018
As [mg/L]	20-Dec-19	13:24	< 0.0002	100%	13%	114%	0.0003	< 0.0002
B [mg/L]	20-Dec-19	13:24	< 0.002	91%	0%	NV	0.002	0.004
Ba [mg/L]	20-Dec-19	13:24	< 0.00002	98%	0%	129%	0.00297	0.00356
Be [mg/L]	20-Dec-19	13:24	< 0.000007	92%	15%	75%	< 0.000007	< 0.000007
Bi [mg/L]	20-Dec-19	13:24	< 0.000007	102%	ND	99%	0.000007	< 0.000007
Ca [mg/L]	20-Dec-19	13:24	< 0.01	103%	1%	NV	53.8	37.1
Cd [mg/L]	20-Dec-19	13:24	< 0.000003	98%	11%	101%	0.000010	< 0.000003
Co [mg/L]	20-Dec-19	13:24	< 0.000004	100%	3%	107%	0.002228	0.000773
Cr [mg/L]	20-Dec-19	13:24	< 0.00008	99%	9%	122%	< 0.00008	< 0.00008
Cu [mg/L]	20-Dec-19	13:24	< 0.0002	100%	2%	NV	0.0022	0.0021
Fe [mg/L]	20-Dec-19	13:24	< 0.007	103%	9%	NV	0.014	0.043
K [mg/L]	20-Dec-19	13:24	< 0.009	103%	0%	120%	0.610	1.13
Li [mg/L]	20-Dec-19	13:24	< 0.0001	94%	1%	NV	0.0021	0.0004
Mg [mg/L]	20-Dec-19	13:24	< 0.001	105%	0%	90%	3.90	10.4
Mn [mg/L]	20-Dec-19	13:24	< 0.00001	100%	4%	NV	0.210	0.05447
Mo [mg/L]	20-Dec-19	13:24	< 0.00004	100%	1%	123%	0.00093	0.00091
Na [mg/L]	20-Dec-19	13:24	< 0.01	110%	3%	NV	2.38	5.22
Ni [mg/L]	20-Dec-19	13:24	< 0.0001	100%	2%	108%	0.0004	0.0001

OnLine LIMS

0001996683

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10106-DEC19**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#12	10: CND 2 Residue Wk#12
P [mg/L]	20-Dec-19	13:24	< 0.003	100%	ND	NV	< 0.003	0.007
Pb [mg/L]	20-Dec-19	13:24	< 0.00001	102%	3%	126%	0.00003	< 0.00001
S [mg/L]	20-Dec-19	13:24	< 0.3	105%	1%	NV	53.9	50.1
Sb [mg/L]	20-Dec-19	13:24	< 0.0009	105%	17%	125%	< 0.0009	0.0009
Se [mg/L]	20-Dec-19	13:24	< 0.00004	100%	13%	115%	0.00013	0.00024
Si [mg/L]	20-Dec-19	13:24	< 0.02	103%	1%	NV	0.20	0.18
Sn [mg/L]	20-Dec-19	13:24	< 0.00006	98%	16%	NV	< 0.00006	< 0.00006
Sr [mg/L]	20-Dec-19	13:24	< 0.00002	100%	2%	NV	0.0454	0.101
Th [mg/L]	20-Dec-19	13:24	< 0.0001	Error!	ND	NV	< 0.0001	< 0.0001
Ti [mg/L]	20-Dec-19	13:24	< 0.00005	102%	17%	NV	< 0.00005	< 0.00005
Tl [mg/L]	20-Dec-19	13:24	< 0.000005	102%	ND	107%	0.000005	< 0.000005
U [mg/L]	20-Dec-19	13:24	< 0.000002	106%	5%	125%	0.000101	0.000085
V [mg/L]	20-Dec-19	13:24	< 0.00001	101%	5%	109%	< 0.00001	< 0.00001
W [mg/L]	20-Dec-19	13:24	< 0.00002	104%	12%	NV	0.00004	0.00006
Y [mg/L]	20-Dec-19	13:24	< 0.000002	101%	5%	NV	< 0.000002	< 0.000002
Zn [mg/L]	20-Dec-19	13:24	< 0.002	100%	1%	127%	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LNT

0001996683

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

07-January-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 24 December 2019
LR Report: **CA10160-DEC19**
Reference: Wk#13

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#13	10: CND 2 Residue Wk#13
Sample Date & Time							24-Dec-19	24-Dec-19
HumCell Leachate Vol [mL]	24-Dec-19	13:21					838	849
pH [no unit]	31-Dec-19	08:14	NA	100%	0%	NA	7.28	7.62
Acidity [mg/L as CaCO3]	31-Dec-19	08:14	< 2	98%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	31-Dec-19	08:14	< 2	100%	0%	NA	8	9
Conductivity [uS/cm]	02-Jan-20	07:56	2	99%	0%	NA	271	256
SO4 [mg/L]	27-Dec-19	15:55	< 0.2	101%	ND	100%	110	93

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002004743

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

07-January-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

:

Date Rec. : 31 December 2019
LR Report: **CA10186-DEC19**
Reference: Wk#14

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#14	10: CND 2 Residue Wk#14
Sample Date & Time							31-Dec-19	31-Dec-19
HumCell Leachate Vol [mL]	02-Jan-20	08:06					856	855
pH [no unit]	03-Jan-20	11:47	NA	99%	0%	NA	7.18	7.51
Acidity [mg/L as CaCO3]	03-Jan-20	11:48	2	100%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	03-Jan-20	11:48	< 2	104%	ND	NA	15	12
Conductivity [uS/cm]	03-Jan-20	11:48	< 2	99%	0%	NA	275	220
SO4 [mg/L]	02-Jan-20	09:11	< 0.2	99%	0%	104%	110	83

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002004794

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

15-January-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 07 January 2020
LR Report: **CA10025-JAN20**
Reference: Wk#15

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#15	10: CND 2 Residue Wk#15
Sample Date & Time							07-Jan-20	07-Jan-20
HumCell Leachate Vol [mL]	07-Jan-20	15:51					919	929
pH [no unit]	09-Jan-20	12:42	NA	100%	0%	NA	7.18	7.73
Acidity [mg/L as CaCO3]	08-Jan-20	10:38	< 2	100%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	08-Jan-20	10:38	< 2	100%	ND	NA	15	13
Conductivity [uS/cm]	09-Jan-20	12:42	< 2	101%	0%	NA	398	289
SO4 [mg/L]	14-Jan-20	08:56	< 0.2	95%	2%	95%	170	110

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002011736

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

23-January-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 14 January 2020
LR Report: **CA10051-JAN20**
Reference: Wk#16

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#16	10: CND 2 Residue Wk#16
Sample Date & Time							14-Jan-20	14-Jan-20
HumCell Leachate Vol [mL]	14-Jan-20	14:03					885	876
CN(T) [mg/L]	16-Jan-20	12:00	< 0.01	95%	ND	102%	0.02	0.10
CNWAD [mg/L]	16-Jan-20	14:57	< 0.01	102%	ND	83%	< 0.01	< 0.01
CNO [mg/L]	21-Jan-20	13:26	< 0.1	97%	ND	100%	< 1	< 1
CNS [mg/L]	20-Jan-20	15:47	< 0.2	97%	5%	102%	1.2	< 0.2
pH [no unit]	17-Jan-20	10:08	NA	100%	1%	NA	7.17	7.91
Acidity [mg/L as CaCO3]	17-Jan-20	10:08	2	106%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	15-Jan-20	11:31	< 2	102%	0%	NA	7	11
Conductivity [uS/cm]	15-Jan-20	11:31	< 2	99%	0%	NA	269	229
SO4 [mg/L]	21-Jan-20	13:17	< 0.2	97%	3%	97%	110	81
Cl [mg/L]	21-Jan-20	12:53	< 0.2	91%	4%	105%	< 0.2	< 0.2
F [mg/L]	15-Jan-20	11:41	< 0.06	100%	ND	96%	< 0.06	0.08
Hg [mg/L]	16-Jan-20	08:25	< 0.00001	107%	ND	123%	< 0.00001	< 0.00001
Ag [mg/L]	17-Jan-20	09:59	< 0.00005	104%	18%	99%	< 0.00005	< 0.00005
Al [mg/L]	17-Jan-20	09:59	< 0.001	102%	ND	107%	0.011	0.022
As [mg/L]	17-Jan-20	09:59	< 0.0002	103%	ND	102%	0.0002	< 0.0002
B [mg/L]	17-Jan-20	09:59	< 0.002	93%	ND	NV	0.002	0.002
Ba [mg/L]	17-Jan-20	09:59	< 0.00002	99%	ND	102%	0.00191	0.00251
Be [mg/L]	17-Jan-20	09:59	< 0.000007	97%	ND	95%	< 0.000007	< 0.000007
Bi [mg/L]	17-Jan-20	09:59	< 0.000007	101%	ND	92%	< 0.000007	0.000008
Ca [mg/L]	17-Jan-20	09:59	< 0.01	100%	ND	104%	45.9	26.9
Cd [mg/L]	17-Jan-20	09:59	3e-006	100%	ND	96%	0.000008	< 0.000003
Co [mg/L]	17-Jan-20	09:59	< 0.000004	102%	ND	103%	0.00148	0.000420
Cr [mg/L]	17-Jan-20	09:59	< 0.00008	106%	ND	100%	< 0.00008	0.00009
Cu [mg/L]	17-Jan-20	09:59	< 0.0002	106%	18%	103%	0.0014	0.0016
Fe [mg/L]	17-Jan-20	09:59	< 0.007	101%	ND	100%	0.021	0.057
K [mg/L]	17-Jan-20	09:59	< 0.009	100%	ND	93%	0.464	0.671
Li [mg/L]	17-Jan-20	09:59	< 0.0001	95%	ND	92%	0.0016	0.0003
Mg [mg/L]	17-Jan-20	09:59	< 0.001	102%	ND	99%	2.82	5.91
Mn [mg/L]	17-Jan-20	09:59	< 0.00001	105%	1%	105%	0.194	0.0406
Mo [mg/L]	17-Jan-20	09:59	< 0.00004	99%	ND	109%	0.00096	0.00053
Na [mg/L]	17-Jan-20	09:59	< 0.01	99%	ND	98%	1.13	1.69
Ni [mg/L]	17-Jan-20	09:59	< 0.0001	102%	ND	100%	0.0003	0.0001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10051-JAN20**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#16	10: CND 2 Residue Wk#16
P [mg/L]	17-Jan-20	09:59	< 0.003	100%	ND	NV	< 0.003	0.007
Pb [mg/L]	17-Jan-20	09:59	< 0.00001	100%	ND	99%	0.00001	0.00003
S [mg/L]	17-Jan-20	09:59	< 0.3	98%	4%	NV	55.4	40.0
Sb [mg/L]	17-Jan-20	09:59	< 0.0009	98%	ND	118%	< 0.0009	< 0.0009
Se [mg/L]	17-Jan-20	09:59	< 0.00004	106%	ND	100%	0.00010	0.00010
Si [mg/L]	17-Jan-20	09:59	< 0.02	106%	4%	NV	0.21	0.18
Sn [mg/L]	17-Jan-20	09:59	< 0.00006	103%	ND	NV	0.00006	0.00007
Sr [mg/L]	17-Jan-20	09:59	< 0.00002	101%	ND	102%	0.0358	0.0708
Th [mg/L]	17-Jan-20	09:59	< 0.0001	98%	ND	NV	< 0.0001	< 0.0001
Ti [mg/L]	17-Jan-20	09:59	< 0.00005	99%	ND	NV	< 0.00005	0.00013
Tl [mg/L]	17-Jan-20	09:59	< 0.000005	100%	ND	103%	< 0.000005	< 0.000005
U [mg/L]	17-Jan-20	09:59	< 0.000002	99%	ND	99%	0.000021	0.000052
V [mg/L]	17-Jan-20	09:59	< 0.00001	101%	ND	100%	< 0.00001	0.00001
W [mg/L]	17-Jan-20	09:59	< 0.00002	102%	ND	NV	< 0.00002	0.00007
Y [mg/L]	17-Jan-20	09:59	< 0.000002	104%	ND	NV	< 0.000002	0.000002
Zn [mg/L]	17-Jan-20	09:59	< 0.002	100%	15%	104%	< 0.002	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002019827

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

28-January-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 21 January 2020
LR Report: **CA10104-JAN20**
Reference: Wk#17

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#17	10: CND 2 Residue Wk#17
Sample Date & Time							21-Jan-20	21-Jan-20
HumCell Leachate Vol [mL]	21-Jan-20	15:55					894	897
pH [no unit]	23-Jan-20	13:53	NA	101%	0%	NA	7.38	7.60
Acidity [mg/L as CaCO3]	23-Jan-20	13:53	2	102%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	23-Jan-20	13:53	< 2	106%	0%	NA	11	17
Conductivity [uS/cm]	23-Jan-20	13:53	2	101%	0%	NA	352	313
SO4 [mg/L]	28-Jan-20	13:09	< 0.2	97%	3%	95%	150	130

NA - Not applicable
ND - Not Detected

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

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0002024284

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

03-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 28 January 2020
LR Report: **CA10142-JAN20**
Reference: Wk#18

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#18	10: CND 2 Residue Wk#18
Sample Date & Time							28-Jan-20	28-Jan-20
HumCell Leachate Vol [mL]	28-Jan-20	12:38					880	892
pH [no unit]	29-Jan-20	12:54	NA	101%	1%	NA	7.25	7.60
Acidity [mg/L as CaCO3]	29-Jan-20	12:54	2	108%	0%	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	31-Jan-20	09:39	< 2	100%	ND	NA	8	12
Conductivity [uS/cm]	31-Jan-20	09:39	< 2	98%	1%	NA	259	211
SO4 [mg/L]	03-Feb-20	10:45	< 0.2	95%	ND	94%	100	70

NA - Not applicable
ND - Not Detected

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

CHARTERED CATHARINE ARNOLD CHEMIST

OnLine LMS

0002028983

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

13-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 04 February 2020
LR Report: **CA10013-FEB20**
Reference: Wk#19

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#19	10: CND 2 Residue Wk#19
Sample Date & Time							04-Feb-20	04-Feb-20
HumCell Leachate Vol [mL]	04-Feb-20	12:53					872	883
pH [no unit]	05-Feb-20	15:06	NA	100%	0%	NA	7.18	7.60
Acidity [mg/L as CaCO3]	07-Feb-20	08:45	< 2	102%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	05-Feb-20	15:06	< 2	100%	ND	NA	8	11
Conductivity [uS/cm]	07-Feb-20	08:45	< 2	100%	0%	NA	255	198
SO4 [mg/L]	11-Feb-20	08:22	< 0.2	96%	ND	100%	100	67

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002038835

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

24-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 11 February 2020
LR Report: **CA10043-FEB20**
Reference: Wk#20

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#20
Sample Date & Time							11-Feb-20
HumCell Leachate Vol [mL]	11-Feb-20	12:59					995
pH [no unit]	13-Feb-20	10:54	NA	100%	0%	NA	7.37
Acidity [mg/L as CaCO3]	13-Feb-20	10:54	2	102%	ND	NA	< 2
Alkalinity [mg/L as CaCO3]	13-Feb-20	10:54	< 2	108%	6%	NA	8
Conductivity [uS/cm]	13-Feb-20	10:54	< 2	2%	0%	NA	256
SO4 [mg/L]	19-Feb-20	11:11	< 0.2	91%	1%	101%	100
Cl [mg/L]	19-Feb-20	16:27	< 0.2	96%	ND	105%	< 0.2
F [mg/L]	12-Feb-20	13:27	< 0.06	104%	2%	107%	< 0.06
CN(T) [mg/L]	11-Feb-20	14:51	< 0.01	90%	ND	90%	0.03
CNWAD [mg/L]	18-Feb-20	13:47	< 0.01	99%	ND	87%	< 0.01
CNO [mg/L]	19-Feb-20	15:01	< 0.1	82%	ND	93%	< 1
CNS [mg/L]	19-Feb-20	09:21	< 0.2	102%	1%	106%	1.1
Hg [mg/L]	13-Feb-20	11:25	< 0.00001	90%	ND	119%	< 0.00001
Ag [mg/L]	19-Feb-20	15:48	< 0.00005	102%	ND	94%	< 0.00005
Al [mg/L]	19-Feb-20	15:48	< 0.001	102%	2%	122%	0.015
As [mg/L]	19-Feb-20	15:48	< 0.0002	100%	4%	103%	0.0003
B [mg/L]	19-Feb-20	15:48	< 0.002	96%	4%	NV	< 0.002
Ba [mg/L]	19-Feb-20	15:48	< 0.00002	100%	0%	114%	0.00172
Be [mg/L]	19-Feb-20	15:48	< 0.000007	101%	ND	93%	< 0.000007
Bi [mg/L]	19-Feb-20	15:48	< 0.000007	95%	ND	86%	< 0.000007
Ca [mg/L]	19-Feb-20	15:48	< 0.01	91%	3%	NV	41.9
Cd [mg/L]	19-Feb-20	15:48	< 0.000003	97%	4%	95%	0.000009
Co [mg/L]	19-Feb-20	15:48	< 0.000004	100%	0%	103%	0.00128
Cr [mg/L]	19-Feb-20	15:48	< 0.00008	100%	ND	85%	0.00014
Cu [mg/L]	19-Feb-20	15:48	< 0.0002	102%	1%	125%	0.0018
Fe [mg/L]	19-Feb-20	15:48	< 0.007	95%	10%	NV	0.017
K [mg/L]	19-Feb-20	15:48	< 0.009	91%	3%	NV	0.365

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10043-FEB20**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#20
Li [mg/L]	19-Feb-20	15:48	< 0.0001	104%	3%	130%	0.0022
Mg [mg/L]	19-Feb-20	15:48	< 0.001	101%	3%	101%	2.63
Mn [mg/L]	19-Feb-20	15:48	< 0.00001	100%	2%	NV	0.167
Mo [mg/L]	19-Feb-20	15:48	< 0.00004	99%	1%	110%	0.00097
Na [mg/L]	19-Feb-20	15:48	< 0.01	91%	3%	107%	3.20
Ni [mg/L]	19-Feb-20	15:48	< 0.0001	100%	5%	99%	0.0003
P [mg/L]	19-Feb-20	15:48	< 0.003	92%	ND	NV	< 0.003
Pb [mg/L]	19-Feb-20	15:48	< 0.00001	99%	2%	94%	0.00001
S [mg/L]	19-Feb-20	15:48	< 0.3	100%	ND	NV	54.6
Sb [mg/L]	19-Feb-20	15:48	< 0.0009	102%	1%	116%	< 0.0009
Se [mg/L]	19-Feb-20	15:48	< 0.00004	99%	4%	106%	0.00007
Si [mg/L]	19-Feb-20	15:48	< 0.02	96%	2%	NV	0.27
Sn [mg/L]	19-Feb-20	15:48	< 0.00006	97%	2%	NV	0.00020
Sr [mg/L]	19-Feb-20	15:48	< 0.00002	102%	0%	NV	0.0300
Th [mg/L]	19-Feb-20	15:48	< 0.0001	102%	ND	NV	< 0.0001
Ti [mg/L]	19-Feb-20	15:48	< 0.00005	93%	16%	NV	< 0.00005
Tl [mg/L]	19-Feb-20	15:48	< 0.000005	101%	3%	98%	< 0.000005
U [mg/L]	19-Feb-20	15:48	< 0.000002	100%	3%	100%	0.000038
V [mg/L]	19-Feb-20	15:48	< 0.00001	101%	ND	107%	0.00001
W [mg/L]	19-Feb-20	15:48	< 0.00002	100%	ND	NV	0.00010
Y [mg/L]	19-Feb-20	15:48	< 0.000002	101%	9%	NV	0.000003
Zn [mg/L]	19-Feb-20	15:48	< 0.002	102%	1%	NV	< 0.002

Analysis	10: CND 2 Residue Wk#20
Sample Date & Time	11-Feb-20
HumCell Leachate Vol [mL]	984
pH [no unit]	7.79
Acidity [mg/L as CaCO3]	< 2
Alkalinity [mg/L as CaCO3]	14
Conductivity [uS/cm]	276
SO4 [mg/L]	100
Cl [mg/L]	< 0.2
F [mg/L]	0.15
CN(T) [mg/L]	0.12
CNWAD [mg/L]	0.01
CNO [mg/L]	< 1
CNS [mg/L]	< 0.2
Hg [mg/L]	< 0.00001
Ag [mg/L]	< 0.00005
Al [mg/L]	0.026

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Project : CA20M-00000-110-16863-02

LR Report : **CA10043-FEB20**

Analysis	10: CND 2 Residue Wk#20
As [mg/L]	< 0.0002
B [mg/L]	0.002
Ba [mg/L]	0.00320
Be [mg/L]	< 0.000007
Bi [mg/L]	< 0.000007
Ca [mg/L]	31.7
Cd [mg/L]	0.000004
Co [mg/L]	0.000922
Cr [mg/L]	0.00008
Cu [mg/L]	0.0018
Fe [mg/L]	0.052
K [mg/L]	0.761
Li [mg/L]	0.0006
Mg [mg/L]	9.49
Mn [mg/L]	0.0470
Mo [mg/L]	0.00119
Na [mg/L]	4.28
Ni [mg/L]	0.0001
P [mg/L]	< 0.003
Pb [mg/L]	0.00001
S [mg/L]	55.6
Sb [mg/L]	< 0.0009
Se [mg/L]	0.00017
Si [mg/L]	0.29
Sn [mg/L]	0.00022
Sr [mg/L]	0.0877
Th [mg/L]	< 0.0001
Ti [mg/L]	< 0.00005
Tl [mg/L]	< 0.000005
U [mg/L]	0.000110
V [mg/L]	0.00003
W [mg/L]	0.00045
Y [mg/L]	0.000003
Zn [mg/L]	< 0.002

NA - Not applicable
ND - Not Detected
NV - No Value

Raised RL for CNO due to sample matrix.

OnLine LMS

0002047536

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

LR Report : **CA10043-FEB20**

_____

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

24-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

Date Rec. : 18 February 2020
LR Report: **CA10118-FEB20**
Reference: Wk#21

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#21	10: CND 2 Residue Wk#21
Sample Date & Time							18-Feb-20	18-Feb-20
HumCell Leachate Vol [mL]	19-Feb-20	09:03					906	924
pH [no unit]	20-Feb-20	14:02	NA	97%	21%	NA	7.21	7.43
Acidity [mg/L as CaCO3]	20-Feb-20	14:02	< 2	100%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	20-Feb-20	14:02	< 2	96%	0%	NA	9	13
Conductivity [uS/cm]	20-Feb-20	14:02	2	100%	0%	NA	219	184
SO4 [mg/L]	24-Feb-20	10:52	< 0.2	93%	5%	123%	89	64

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002047568

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : CA20M-00000-110-16863-02

28-February-2020

SGS Lakefield Environmental Met
Attn : Barb Bowman

QC Required in reports**,
,
Phone: , Fax:

Date Rec. : 25 February 2020
LR Report: **CA10179-FEB20**
Reference: Wk#22

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: QC - Blank	6: QC - STD % Recovery	7: QC - DUP % RPD	8: QC - Spike Rep	9: CND 1 Residue Wk#22	10: CND 2 Residue Wk#22
Sample Date & Time							25-Feb-20	25-Feb-20
HumCell Leachate Vol [mL]	25-Feb-20	13:07					892	893
pH [no unit]	26-Feb-20	15:07	NA	101%	1%	NA	7.34	7.70
Acidity [mg/L as CaCO3]	26-Feb-20	15:07	< 2	98%	ND	NA	< 2	< 2
Alkalinity [mg/L as CaCO3]	26-Feb-20	15:07	< 2	100%	ND	NA	9	12
Conductivity [uS/cm]	27-Feb-20	11:29	< 2	99%	3%	NA	215	184
SO4 [mg/L]	27-Feb-20	10:11	< 0.2	93%	0%	101%	69	48

NA - Not applicable
ND - Not Detected

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002052932

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 18 December 2019
LR Report: **CA10208-DEC19**
Reference: Wk#0

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#0	6: LLGO Comp Wk#0
Sample Date & Time					18-Dec-19	18-Dec-19
HumCell Leachate Vol [mL]	18-Dec-19	10:24	18-Dec-19	14:42	846	833
pH [no unit]	18-Dec-19	15:29	19-Dec-19	10:57	8.56	8.84
Alkalinity [mg/L as CaCO3]	18-Dec-19	15:29	19-Dec-19	10:57	31	34
Conductivity [uS/cm]	18-Dec-19	15:29	19-Dec-19	10:57	85	65
F [mg/L]	18-Dec-19	13:20	19-Dec-19	10:04	0.07	0.06
SO4 [mg/L]	21-Dec-19	13:57	24-Dec-19	09:49	9.8	2.9
Hg [mg/L]	19-Dec-19	10:12	19-Dec-19	15:06	< 0.00001	< 0.00001
Ag [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.00005	< 0.00005
Al [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.239	0.298
As [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.0008	0.0005
Ba [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00265	0.00146
B [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.007	0.006
Be [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.000007	< 0.000007
Bi [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.000007	< 0.000007
Ca [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	6.81	5.71
Cd [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.000017	0.000005
Co [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.000039	0.000038
Cr [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.00008	< 0.00008
Cu [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.0004	0.0005
Fe [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.007	< 0.007
K [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	1.71	1.61
Li [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.0002	0.0001
Mg [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.535	0.369
Mn [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00772	0.00371
Mo [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00589	0.00087
Na [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	7.46	5.43
Ni [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.0001	0.0001
P [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.012	0.022
Pb [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00005	0.00005

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10208-DEC19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#0	6: LLGO Comp Wk#0
Sb [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.0009	< 0.0009
Se [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00029	0.00023
Sn [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00021	0.00030
Sr [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.0147	0.0256
Th [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.0001	< 0.0001
Ti [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00007	< 0.00005
Tl [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.000005	< 0.000005
U [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.000732	0.000715
V [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00021	0.00042
W [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.00250	0.00528
Y [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	0.000004	0.000006
Zn [mg/L]	20-Dec-19	17:44	24-Dec-19	09:59	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN LIMS

0002139710

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10208-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0258-DEC19														
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA			
Anions by IC - QCBatchID: DIO0328-DEC19														
Sulphate	0.2	mg/L	<0.2			1	20	96	80	120	92	75	125	
Conductivity - QCBatchID: EWL0258-DEC19														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0251-DEC19														
Fluoride	0.06	mg/L	<0.06			ND	10	109	90	110	111	75	125	
Inorganics-General - QCBatchID: EHG0019-DEC19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	88	80	120	95	70	130	
Metals - QCBatchID: EMS0129-DEC19														
Cobalt	0.000004	mg/L	<0.000004			ND	20	97	90	110	102	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0129-DEC19														
Aluminum	0.001	mg/L	<0.001			2	20	95	90	110	126	70	130	
Antimony	0.0009	mg/L	<0.0009			4	20	93	90	110	123	70	130	
Arsenic	0.0002	mg/L	<0.0002			ND	20	98	90	110	103	70	130	
Barium	0.00002	mg/L	<0.00002			0	20	98	90	110	101	70	130	
Beryllium	0.000007	mg/L	<0.000007			ND	20	97	90	110	100	70	130	
Bismuth	0.000007	mg/L	<0.000007			7	20	94	90	110	90	70	130	
Boron	0.002	mg/L	<0.002			3	20	95	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			ND	20	103	90	110	103	70	130	
Calcium	0.01	mg/L	<0.01			0	20	102	90	110	108	70	130	
Chromium	0.00008	mg/L	<0.00008			3	20	97	90	110	116	70	130	
Copper	0.0002	mg/L	<0.0002			16	20	97	90	110	103	70	130	
Iron	0.007	mg/L	<0.007			1	20	100	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			ND	20	93	90	110	102	70	130	
Lithium	0.0001	mg/L	<0.0001			0	20	99	90	110	98	70	130	
Magnesium	0.001	mg/L	<0.001			4	20	98	90	110	102	70	130	
Manganese	0.00001	mg/L	<0.00001			2	20	98	90	110	103	70	130	
Molybdenum	0.00004	mg/L	<0.00004			7	20	99	90	110	105	70	130	
Nickel	0.0001	mg/L	<0.0001			1	20	97	90	110	100	70	130	
Phosphorus	0.003	mg/L	<0.003			0	20	100	90	110	NV	70	130	
Potassium	0.003	mg/L	<0.009			1	20	100	90	110	93	70	130	
Selenium	0.00004	mg/L	<0.00004			7	20	99	90	110	108	70	130	
Silver	0.00005	mg/L	<0.00005			ND	20	100	90	110	96	70	130	
Sodium	0.01	mg/L	<0.01			5	20	106	90	110	102	70	130	

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0002139710

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10208-DEC19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Strontium	0.00002	mg/L	<0.00002			0	20	97	90	110	102	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	94	90	110	98	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	91	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			9	20	99	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			10	20	97	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	101	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			ND	20	101	90	110	107	70	130
Vanadium	0.00001	mg/L	<0.00001			6	20	95	90	110	100	70	130
Yttrium	0.000002	mg/L	2e-006			5	20	100	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			2	20	98	90	110	129	70	130
pH - QCBatchID: EWL0258-DEC19													
pH	0.05	no unit	NA			0		100			NA		

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0002139710

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 17 September 2019
LR Report: **CA10141-SEP19**
Reference: Wk#0

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#0	6: M CG Wk#0	7: M MD Wk#0	8: M QE-POR Wk#0	9: M QZ-QE-POR-QT P-MIN Wk#0	10: SZ QE-POR Wk#0	11: L MD Wk#0
Sample Date & Time					17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19
HumCell Leachate Vol [mL]	17-Sep-19	10:55	17-Sep-19	16:00	882	873	890	884	911	908	880
pH [no unit]	17-Sep-19	16:03	20-Sep-19	15:11	8.88	9.07	7.39	9.19	9.16	8.35	9.00
Alkalinity [mg/L as CaCO3]	17-Sep-19	16:03	20-Sep-19	15:11	26	26	15	33	29	26	31
Conductivity [uS/cm]	17-Sep-19	16:03	20-Sep-19	15:11	56	46	140	53	49	51	53
F [mg/L]	17-Sep-19	14:18	18-Sep-19	08:47	0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.11
SO4 [mg/L]	19-Sep-19	17:58	24-Sep-19	14:07	3.4	0.2	37	2.0	1.3	0.7	0.7
Hg [mg/L]	18-Sep-19	12:32	19-Sep-19	11:54	0.00001	0.00001	0.00001	< 0.00001	0.00001	0.00001	0.00001
Ag [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.117	0.115	0.066	0.099	0.105	0.128	0.088
As [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.0014	0.0008	0.0005	0.0010	0.0028	0.0003	0.0005
Ba [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00099	0.00073	0.0191	0.00159	0.00144	0.00054	0.00273
B [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.002	< 0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002
Be [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.000012	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	5.34	4.17	20.1	5.59	5.05	4.97	6.52
Cd [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.000077	0.000026	< 0.000003	0.000003	< 0.000003	< 0.000003	< 0.000003

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0002139995

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10141-SEP19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#0	6: M CG Wk#0	7: M MD Wk#0	8: M QE-POR Wk#0	9: M QZ-QE-POR-QTP-MIN Wk#0	10: SZ QE-POR Wk#0	11: L MD Wk#0
Co [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.000066	0.000016	< 0.000004	0.000038	0.000012	0.000006	0.000011
Cr [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.0249	0.0103	0.0009	0.0027	0.0021	0.0017	0.0016
Fe [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.016	0.010	< 0.007	0.011	0.008	0.010	< 0.007
K [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	1.42	2.22	0.732	1.05	0.827	1.31	1.68
Li [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.0002	0.0003	< 0.0001	0.0002	0.0002	0.0001	< 0.0001
Mg [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.415	0.577	1.21	0.343	0.237	0.187	0.432
Mn [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.0195	0.0122	0.0184	0.0126	0.0132	0.0117	0.00887
Mo [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00068	0.00038	0.00062	0.00064	0.00038	0.00050	0.00017
Na [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	4.06	2.73	1.97	3.50	3.39	3.75	2.07
Ni [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.003	0.003	< 0.003	0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00007	0.00005	0.00002	0.00004	0.00004	0.00002	0.00002
Sb [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00053	0.00015	0.00017	0.00134	0.00010	0.00008	0.00019
Sn [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00012	0.00008	0.00014	0.00011	0.00013	0.00012	0.00008
Sr [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.0116	0.00818	0.0790	0.0149	0.0150	0.00707	0.0312
Th [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00052	0.00050	< 0.00005	0.00035	0.00027	0.00042	0.00030
Tl [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.000153	0.000233	0.000091	0.000074	0.000122	0.000681	0.000050
V [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00021	0.00051	0.00027	0.00036	0.00025	0.00016	0.00038
W [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.00037	0.00023	0.00031	0.00039	0.00045	0.00040	0.00013
Y [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.000183	0.000053	0.000013	0.000100	0.000189	0.000087	0.000012
Zn [mg/L]	19-Sep-19	11:56	20-Sep-19	16:06	0.003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10141-SEP19**

Analysis	12: L QZ-QTP Wk#0	13: L QZ-TQTP Wk#0	14: L SED Wk#0	15: L TRJ Wk#0	16: V QE-POR Wk#0	17: V QE-POR-QTP Wk#0
Sample Date & Time	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19	17-Sep-19
HumCell Leachate Vol [mL]	915	872	888	917	915	903
pH [no unit]	9.12	8.91	8.96	8.93	9.03	8.98
Alkalinity [mg/L as CaCO3]	28	30	21	31	25	28
Conductivity [uS/cm]	57	54	43	56	48	63
F [mg/L]	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	1.0	1.8	0.4	0.9	1.4	4.1
Hg [mg/L]	< 0.00001	0.00001	< 0.00001	0.00001	0.00001	0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.151	0.130	0.157	0.153	0.100	0.100
As [mg/L]	0.0007	0.0005	0.0004	0.0016	0.0007	0.0009
Ba [mg/L]	0.00231	0.00217	0.00082	0.00532	0.00047	0.00044
B [mg/L]	< 0.002	0.003	< 0.002	0.002	0.003	0.005
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	4.60	5.03	3.81	4.98	4.95	5.89
Cd [mg/L]	< 0.000003	0.000003	0.000005	< 0.000003	0.000005	0.000004
Co [mg/L]	0.000011	0.000020	0.000014	0.000025	0.000016	0.000016
Cr [mg/L]	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0060	0.0020	0.0021	0.0026	0.0017	0.0045
Fe [mg/L]	0.009	0.013	0.011	0.017	0.010	0.011
K [mg/L]	2.97	2.55	2.43	3.11	0.893	1.34
Li [mg/L]	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Mg [mg/L]	0.349	0.368	0.214	0.353	0.298	0.405
Mn [mg/L]	0.0128	0.0171	0.0250	0.0126	0.0204	0.0213
Mo [mg/L]	0.00028	0.00028	0.00032	0.00050	0.00178	0.00091
Na [mg/L]	3.94	3.54	2.80	3.66	3.53	4.94
Ni [mg/L]	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001
P [mg/L]	0.011	0.006	0.007	0.013	0.007	0.009
Pb [mg/L]	0.00003	0.00004	0.00002	0.00007	0.00002	0.00005

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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LR Report : **CA10141-SEP19**

Analysis	12: L QZ-QTP Wk#0	13: L QZ-TQTP Wk#0	14: L SED Wk#0	15: L TRJ Wk#0	16: V QE-POR Wk#0	17: V QE-POR-QTP Wk#0
Sb [mg/L]	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	0.00139	0.00025	0.00010	0.00014	0.00016	0.00099
Sn [mg/L]	0.00008	0.00007	0.00010	0.00011	0.00016	0.00019
Sr [mg/L]	0.0460	0.0264	0.0243	0.0309	0.00767	0.0136
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00046	0.00071	0.00054	0.00051	0.00033	0.00055
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.000313	0.000335	0.000026	0.000295	0.000153	0.000111
V [mg/L]	0.00034	0.00039	0.00043	0.00036	0.00023	0.00022
W [mg/L]	0.00017	0.00026	0.00016	0.00042	0.00028	0.00045
Y [mg/L]	0.000027	0.000078	0.000039	0.000092	0.000082	0.000095
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.003

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139695

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10141-SEP19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0240-SEP19														
Alkalinity	2	mg/L as Ca	< 2			ND	20	102	80	120	NA			
Alkalinity - QCBatchID: EWL0245-SEP19														
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA			
Alkalinity - QCBatchID: EWL0299-SEP19														
Alkalinity	2	mg/L as Ca	< 2			2	20	100	80	120	NA			
Anions by IC - QCBatchID: DIO0278-SEP19														
Sulphate	0.2	mg/L	<0.2			0	20	94	80	120	99	75	125	
Anions by IC - QCBatchID: DIO0335-SEP19														
Sulphate	0.2	mg/L	<0.2			0	20	95	80	120	98	75	125	
Conductivity - QCBatchID: EWL0240-SEP19														
Conductivity	2	uS/cm	3			0	20	98	90	110	NA			
Conductivity - QCBatchID: EWL0245-SEP19														
Conductivity	2	uS/cm	< 2			4	20	97	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0239-SEP19														
Fluoride	0.06	mg/L	<0.06			0	10	110	90	110	103	75	125	
Inorganics-General - QCBatchID: EHG0020-SEP19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	116	80	120	113	70	130	
Metals - QCBatchID: EMS0116-SEP19														
Cobalt	0.000004	mg/L	<0.000004			ND	20	100	90	110	100	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0116-SEP19														
Aluminum	0.001	mg/L	<0.001			2	20	96	90	110	NV	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	104	90	110	100	70	130	
Arsenic	0.0002	mg/L	<0.0002			ND	20	102	90	110	104	70	130	
Barium	0.00002	mg/L	<0.00002			6	20	105	90	110	NV	70	130	
Beryllium	0.000007	mg/L	<0.000007			ND	20	100	90	110	90	70	130	
Bismuth	0.000007	mg/L	<0.000007			ND	20	103	90	110	92	70	130	
Boron	0.002	mg/L	<0.002			6	20	92	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			ND	20	103	90	110	94	70	130	
Calcium	0.01	mg/L	<0.01			1	20	94	90	110	NV	70	130	
Chromium	0.00008	mg/L	<0.00008			ND	20	105	90	110	114	70	130	
Copper	0.0002	mg/L	<0.0002			ND	20	99	90	110	92	70	130	
Iron	0.007	mg/L	<0.007			1	20	95	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			ND	20	98	90	110	91	70	130	
Lithium	0.0001	mg/L	<0.0001			11	20	101	90	110	110	70	130	
Magnesium	0.001	mg/L	<0.001			0	20	99	90	110	NV	70	130	

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10141-SEP19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Manganese	0.00001	mg/L	<0.00001			5	20	100	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			ND	20	97	90	110	95	70	130
Nickel	0.0001	mg/L	<0.0001			ND	20	100	90	110	94	70	130
Phosphorus	0.003	mg/L	0.003			11	20	98	90	110	NV	70	130
Potassium	0.003	mg/L	0.009			2	20	97	90	110	70	70	130
Selenium (total)	0.00004	mg/L	<0.00004			ND	20	106	90	110	106	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	101	90	110	92	70	130
Sodium	0.01	mg/L	<0.01			0	20	91	90	110	NV	70	130
Strontium	0.00002	mg/L	<0.00002			3	20	99	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			NV	20	99	90	110	88	70	130
Thorium	0.0001	mg/L	<0.0001			NV	20	100	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	97	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			0	20	107	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	102	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			2	20	94	90	110	98	70	130
Vanadium	0.00001	mg/L	<0.00001			ND	20	95	90	110	99	70	130
Yttrium	0.000002	mg/L	<0.000002			0	20	104	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			ND	20	106	90	110	102	70	130
pH - QCBatchID: EWL0240-SEP19													
pH	0.05	no unit	NA			3		100			NA		
pH - QCBatchID: EWL0245-SEP19													
pH	0.05	no unit	NA			2		100			NA		
pH - QCBatchID: EWL0299-SEP19													
pH	0.05	no unit	NA			0		100			NA		

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 25 December 2019
LR Report: **CA10209-DEC19**
Reference: Wk#1

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#1	6: LLGO Comp Wk#1
Sample Date & Time					25-Dec-19	25-Dec-19
HumCell Leachate Vol [mL]	24-Dec-19	09:12	24-Dec-19	13:22	957	960
pH [no unit]	24-Dec-19	13:20	27-Dec-19	16:39	8.08	8.46
Alkalinity [mg/L as CaCO3]	24-Dec-19	13:20	27-Dec-19	16:39	22	23
Conductivity [uS/cm]	24-Dec-19	13:20	27-Dec-19	16:39	80	63
F [mg/L]	27-Dec-19	11:37	30-Dec-19	10:27	0.06	< 0.06
SO4 [mg/L]	27-Dec-19	12:35	30-Dec-19	11:20	11	4.5
Hg [mg/L]	30-Dec-19	09:34	30-Dec-19	09:35	< 0.00001	< 0.00001
Ag [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	< 0.00005	< 0.00005
Al [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.103	0.131
As [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0006	0.0005
Ba [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00321	0.00150
B [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.012	0.011
Be [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000037	0.000021
Bi [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000020	0.000011
Ca [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	7.10	4.94
Cd [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000010	0.000010
Co [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000024	0.000023
Cr [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00015	0.00022
Cu [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0004	< 0.0002
Fe [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.008	< 0.007
K [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	1.07	1.02
Li [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0009	0.0005
Mg [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.923	0.529
Mn [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0227	0.0113
Mo [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00800	0.00147
Na [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	5.48	4.94
Ni [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0006	0.0010
P [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.016	0.017
Pb [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00006	0.00002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10209-DEC19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#1	6: LLGO Comp Wk#1
Sb [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0013	0.0012
Se [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00036	0.00029
Sn [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00012	0.00014
Sr [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.0260	0.0307
Th [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	< 0.0001	< 0.0001
Ti [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00007	0.00021
Tl [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000025	0.000015
U [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00294	0.000745
V [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00025	0.00040
W [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.00192	0.00378
Y [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	0.000029	0.000012
Zn [mg/L]	30-Dec-19	13:22	31-Dec-19	09:53	< 0.002	< 0.002

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnTuo LIMS

0002139716

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10209-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0338-DEC19													
Alkalinity	2	mg/L as Ca	< 2			1	20	100	80	120	NA		
Anions by IC - QCBatchID: DIO0368-DEC19													
Sulphate	0.2	mg/L	<0.2			2	20	96	80	120	91	75	125
Conductivity - QCBatchID: EWL0338-DEC19													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0347-DEC19													
Fluoride	0.06	mg/L	<0.06			0	10	99	90	110	92	75	125
Inorganics-General - QCBatchID: EHG0025-DEC19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	113	80	120	119	70	130
Metals - QCBatchID: EMS0174-DEC19													
Cobalt	0.000004	mg/L	<0.000004			3	20	100	90	110	97	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0174-DEC19													
Aluminum	0.001	mg/L	<0.001			14	20	106	90	110	121	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	100	90	110	117	70	130
Arsenic	0.0002	mg/L	<0.0002			ND	20	103	90	110	118	70	130
Barium	0.00002	mg/L	<0.00002			1	20	98	90	110	123	70	130
Beryllium	0.000007	mg/L	<0.000007			ND	20	96	90	110	121	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	99	90	110	89	70	130
Boron	0.002	mg/L	<0.002			2	20	100	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			ND	20	99	90	110	124	70	130
Calcium	0.01	mg/L	<0.01			3	20	99	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			ND	20	102	90	110	103	70	130
Copper	0.0002	mg/L	<0.0002			0	20	102	90	110	93	70	130
Iron	0.007	mg/L	<0.007			1	20	96	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			14	20	101	90	110	102	70	130
Lithium	0.0001	mg/L	<0.0001			3	20	98	90	110	101	70	130
Magnesium	0.001	mg/L	<0.001			0	20	98	90	110	NV	70	130
Manganese	0.00001	mg/L	<0.00001			1	20	103	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			1	20	104	90	110	100	70	130
Nickel	0.0001	mg/L	<0.0001			11	20	104	90	110	95	70	130
Phosphorus	0.003	mg/L	<0.003			ND	20	95	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			3	20	98	90	110	119	70	130
Selenium	0.00004	mg/L	<0.00004			11	20	101	90	110	109	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	101	90	110	98	70	130
Sodium	0.01	mg/L	<0.01			0	20	104	90	110	NV	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10209-DEC19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Strontium	0.00002	mg/L	<0.00002			2	20	104	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			13	20	101	90	110	106	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	95	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	102	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	101	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	104	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			9	20	109	90	110	115	70	130
Vanadium	0.00001	mg/L	<0.00001			12	20	102	90	110	107	70	130
Yttrium	0.000002	mg/L	4e-006			ND	20	105	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			ND	20	98	90	110	108	70	130
pH - QCBatchID: EWL0338-DEC19													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002139716

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 24 September 2019
LR Report: **CA10267-SEP19**
Reference: Wk#1

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#1	6: M CG Wk#1	7: M MD Wk#1	8: M QE-POR Wk#1	9: M QZ-QE-POR-QT P-MIN Wk#1	10: SZ QE-POR Wk#1	11: L MD Wk#1
Sample Date & Time					24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19
HumCell Leachate Vol [mL]	24-Sep-19	08:49	24-Sep-19	14:48	939	1018	953	946	961	964	985
pH [no unit]	25-Sep-19	15:49	26-Sep-19	14:50	7.57	8.00	7.05	8.32	8.36	8.47	8.42
Alkalinity [mg/L as CaCO3]	25-Sep-19	15:49	26-Sep-19	14:50	13	20	11	14	13	15	22
Conductivity [uS/cm]	25-Sep-19	15:49	26-Sep-19	14:50	49	47	157	40	37	38	48
F [mg/L]	24-Sep-19	15:22	25-Sep-19	14:41	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	27-Sep-19	18:01	28-Sep-19	08:33	4.9	0.5	49	1.9	1.2	1.0	1.4
Hg [mg/L]	25-Sep-19	14:12	26-Sep-19	15:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.075	0.060	0.065	0.080	0.075	0.087	0.076
As [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.0004	0.0005	< 0.0002	0.0003	0.0003	0.0003	0.0004
Ba [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00093	0.00106	0.01026	0.00151	0.00110	0.00092	0.00376
B [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Be [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.000009	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	4.04	3.23	22.9	3.72	4.09	3.88	4.99
Cd [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003

OnLine LIMS

0002139367

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10267-SEP19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#1	6: M CG Wk#1	7: M MD Wk#1	8: M QE-POR Wk#1	9: M QZ-QE-POR-QT P-MIN Wk#1	10: SZ QE-POR Wk#1	11: L MD Wk#1
Co [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.000062	0.000040	0.000022	0.000029	0.000026	0.000019	0.000035
Cr [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.0005	0.0015	0.0007	0.0011	0.0010	0.0008	0.0007
Fe [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.010	0.009	< 0.007	0.010	0.010	0.010	< 0.007
K [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	1.04	1.98	0.620	0.735	0.572	0.927	1.52
Li [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.0002	0.0003	0.0002	0.0001	0.0001	< 0.0001	< 0.0001
Mg [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.416	0.635	1.44	0.284	0.185	0.151	0.619
Mn [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.0254	0.0220	0.0267	0.0210	0.0208	0.0181	0.0179
Mo [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00099	0.00076	0.00071	0.00054	0.00076	0.00061	0.00016
Na [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	3.04	3.38	1.77	2.44	2.53	2.82	2.06
Ni [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00010	0.00003	0.00004	0.00003	0.00002	0.00003	0.00002
Sb [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00014	0.00006	0.00008	0.00006	0.00006	< 0.00004	0.00016
Sn [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00010	0.00006	0.00020	0.00013	0.00013	0.00013	0.00024
Sr [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00988	0.00800	0.105	0.0113	0.0105	0.00502	0.0299
Th [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00026	0.00032	0.00005	0.00010	0.00008	0.00025	0.00033
Tl [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.000254	0.00155	0.000113	0.000119	0.000226	0.000182	0.000182
V [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00022	0.00041	0.00031	0.00038	0.00015	0.00012	0.00048
W [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.00028	0.00028	0.00020	0.00029	0.00040	0.00048	0.00016
Y [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	0.000137	0.000055	0.000012	0.000097	0.000220	0.000112	0.000030
Zn [mg/L]	30-Sep-19	11:29	02-Oct-19	10:39	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

OnLine LIMS

00021393367

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10267-SEP19**

Analysis	12: L QZ-QTP Wk#1	13: L QZ-TQTP Wk#1	14: L SED Wk#1	15: L TRJ Wk#1	16: V QE-POR Wk#1	17: V QE-POR-QTP Wk#1
Sample Date & Time	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19	24-Sep-19
HumCell Leachate Vol [mL]	964	999	994	972	964	926
pH [no unit]	8.21	8.12	7.88	8.17	8.21	7.99
Alkalinity [mg/L as CaCO3]	12	22	12	16	14	14
Conductivity [uS/cm]	38	57	35	44	42	54
F [mg/L]	0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.09
SO4 [mg/L]	1.1	2.9	0.7	1.2	2.3	5.3
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.109	0.059	0.100	0.078	0.079	0.066
As [mg/L]	0.0003	0.0005	0.0005	0.0004	0.0004	0.0004
Ba [mg/L]	0.00213	0.00226	0.00065	0.00464	0.00048	0.00049
B [mg/L]	< 0.002	0.005	< 0.002	< 0.002	< 0.002	0.006
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	3.78	4.38	2.28	3.82	3.45	4.33
Cd [mg/L]	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Co [mg/L]	0.000023	0.000023	0.000029	0.000021	0.000017	0.000026
Cr [mg/L]	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0041	0.0007	0.0006	0.0010	0.0014	0.0023
Fe [mg/L]	0.010	0.007	0.009	0.009	0.010	0.010
K [mg/L]	1.77	2.66	1.62	2.13	0.751	1.02
Li [mg/L]	0.0002	0.0002	0.0002	0.0001	< 0.0001	0.0001
Mg [mg/L]	0.296	0.575	0.175	0.338	0.263	0.433
Mn [mg/L]	0.0195	0.0223	0.0324	0.0189	0.0292	0.0296
Mo [mg/L]	0.00015	0.00026	0.00028	0.00034	0.00185	0.00136
Na [mg/L]	1.99	4.11	2.64	2.12	3.58	3.70
Ni [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	0.00003	0.00003	0.00003	0.00006	0.00002	0.00003

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Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10267-SEP19**

Analysis	12: L QZ-QTP Wk#1	13: L QZ-TQTP Wk#1	14: L SED Wk#1	15: L TRJ Wk#1	16: V QE-POR Wk#1	17: V QE-POR-QTP Wk#1
Sb [mg/L]	< 0.0009	0.0019	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	0.00005	0.00006	0.00004	< 0.00004	< 0.00004	0.00006
Sn [mg/L]	0.00057	0.00017	0.00188	0.00009	0.00011	0.00015
Sr [mg/L]	0.0468	0.0312	0.0186	0.0284	0.00575	0.0105
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00028	0.00016	0.00030	0.00015	0.00018	0.00010
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.000807	0.00160	0.000226	0.000844	0.000280	0.000288
V [mg/L]	0.00028	0.00035	0.00047	0.00027	0.00019	0.00020
W [mg/L]	0.00014	0.00050	0.00023	0.00099	0.00021	0.00045
Y [mg/L]	0.000036	0.000073	0.000057	0.000088	0.000108	0.000090
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139367

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10267-SEP19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0413-SEP19														
Alkalinity	2	mg/L as Ca	< 2			4	20	102	80	120	NA			
Anions by IC - QCBatchID: DIO0424-SEP19														
Sulphate	0.2	mg/L	<0.2			0	20	96	80	120	94	75	125	
Conductivity - QCBatchID: EWL0413-SEP19														
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0381-SEP19														
Fluoride	0.06	mg/L	<0.06			ND	10	108	90	110	113	75	125	
Fluoride by Specific Ion Electrode - QCBatchID: EWL0392-SEP19														
Fluoride	0.06	mg/L	<0.06			ND	10	103	90	110	98	75	125	
Inorganics-General - QCBatchID: EHG0033-SEP19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	102	80	120	120	70	130	
Metals - QCBatchID: EMS0168-SEP19														
Cobalt	0.000004	mg/L	<0.000004			0	20	102	90	110	100	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0168-SEP19														
Aluminum	0.001	mg/L	<0.001			16	20	96	90	110	104	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	100	90	110	97	70	130	
Arsenic	0.0002	mg/L	<0.0002			1	20	101	90	110	108	70	130	
Barium	0.00002	mg/L	<0.00002			0	20	98	90	110	NV	70	130	
Beryllium	0.000007	mg/L	<0.000007			ND	20	97	90	110	98	70	130	
Bismuth	0.000007	mg/L	<0.000007			20	20	95	90	110	97	70	130	
Boron	0.002	mg/L	<0.002			3	20	100	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			ND	20	104	90	110	106	70	130	
Calcium	0.01	mg/L	<0.01			3	20	100	90	110	NV	70	130	
Chromium	0.00008	mg/L	<0.00008			1	20	103	90	110	111	70	130	
Copper	0.0002	mg/L	<0.0002			0	20	102	90	110	NV	70	130	
Iron	0.007	mg/L	<0.007			5	20	98	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			0	20	97	90	110	90	70	130	
Lithium	0.0001	mg/L	<0.0001			3	20	97	90	110	NV	70	130	
Magnesium	0.001	mg/L	<0.001			0	20	102	90	110	106	70	130	
Manganese	0.00001	mg/L	<0.00001			1	20	96	90	110	NV	70	130	
Molybdenum	0.00004	mg/L	<0.00004			5	20	101	90	110	107	70	130	
Nickel	0.0001	mg/L	<0.0001			0	20	102	90	110	128	70	130	
Phosphorus	0.003	mg/L	<0.003			2	20	99	90	110	NV	70	130	
Potassium	0.003	mg/L	<0.009			1	20	100	90	110	NV	70	130	
Selenium (total)	0.00004	mg/L	<0.00004			7	20	102	90	110	111	70	130	

OnLine LIMS

0002139367

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10267-SEP19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Silver	0.00005	mg/L	<0.00005			ND	20	103	90	110	96	70	130
Sodium	0.01	mg/L	<0.01			0	20	108	90	110	NV	70	130
Strontium	0.00002	mg/L	<0.00002			0	20	102	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			0	20	98	90	110	91	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	100	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			1	20	100	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	95	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			4	20	103	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			1	20	95	90	110	113	70	130
Vanadium	0.00001	mg/L	<0.00001			1	20	100	90	110	110	70	130
Yttrium	0.000002	mg/L	2e-006			9	20	102	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			1	20	102	90	110	NV	70	130
pH - QCBatchID: EWL0413-SEP19													
pH	0.05	no unit	NA			1		100			NA		

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 01 January 2020
LR Report: **CA10009-JAN20**
Reference: Wk#2

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#2	6: LLGO Comp Wk#2
Sample Date & Time					01-Jan-20	01-Jan-20
HumCell Leachate Vol [mL]	02-Jan-20	09:21	02-Jan-20	15:09	908	876
pH [no unit]	02-Jan-20	14:59	03-Jan-20	10:46	8.09	7.95
Alkalinity [mg/L as CaCO3]	02-Jan-20	14:59	03-Jan-20	10:46	21	15
Conductivity [uS/cm]	02-Jan-20	14:59	03-Jan-20	10:46	62	48
F [mg/L]	02-Jan-20	14:25	03-Jan-20	08:24	< 0.06	< 0.06
SO4 [mg/L]	03-Jan-20	09:24	07-Jan-20	10:02	6.1	9.5
Hg [mg/L]	02-Jan-20	16:42	06-Jan-20	09:56	< 0.00001	< 0.00001
Ag [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.00005	< 0.00005
Al [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.119	0.127
As [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.0004	0.0005
Ba [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00128	0.00309
B [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.008	0.008
Be [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.000007	< 0.000007
Bi [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.000007	< 0.000007
Ca [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	4.37	6.30
Cd [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.000003	< 0.000003
Co [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.000007	0.000006
Cr [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00009	< 0.00008
Cu [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.0003	0.0004
Fe [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.007	< 0.007
K [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.775	0.794
Li [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.0001	0.0001
Mg [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.386	0.723
Mn [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.0135	0.0222
Mo [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00228	0.00467
Na [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	3.85	2.99
Ni [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.0001	< 0.0001
P [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.007	0.003
Pb [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.00001	< 0.00001

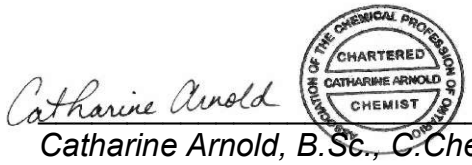
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10009-JAN20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#2	6: LLGO Comp Wk#2
Sb [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.0009	0.0012
Se (tot) [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00023	0.00018
Sn [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00009	0.00008
Sr [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.0224	0.0164
Th [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.0001	< 0.0001
Ti [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00006	< 0.00005
Tl [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.000005	< 0.000005
U [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.000597	0.000217
V [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00036	0.00020
W [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.00142	0.00112
Y [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	0.000006	0.000012
Zn [mg/L]	03-Jan-20	07:45	06-Jan-20	14:26	< 0.002	< 0.002



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139722

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10009-JAN20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0021-JAN20													
Alkalinity	2	mg/L as Ca	< 2			2	20	97	80	120	NA		
Anions by IC - QCBatchID: DIO0021-JAN20													
Sulphate	0.2	mg/L	<0.2			1	20	98	80	120	92	75	125
Conductivity - QCBatchID: EWL0021-JAN20													
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0018-JAN20													
Fluoride	0.06	mg/L	<0.06			ND	10	98	90	110	97	75	125
Inorganics-General - QCBatchID: EHG0002-JAN20													
Mercury	0.00001	mg/L	< 0.00001			ND	20	112	80	120	NV	70	130
Metals - QCBatchID: EMS0003-JAN20													
Cobalt	0.000004	mg/L	<0.000004			4	20	102	90	110	104	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0003-JAN20													
Aluminum	0.001	mg/L	<0.001			8	20	99	90	110	88	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	108	90	110	116	70	130
Arsenic	0.0002	mg/L	<0.0002			9	20	100	90	110	113	70	130
Barium	0.00002	mg/L	<0.00002			1	20	100	90	110	110	70	130
Beryllium	0.000007	mg/L	<0.000007			ND	20	90	90	110	80	70	130
Bismuth	0.000007	mg/L	7e-006			13	20	101	90	110	98	70	130
Boron	0.002	mg/L	<0.002			7	20	95	90	110	NV	70	130
Cadmium	0.000003	mg/L	3e-006			2	20	100	90	110	119	70	130
Calcium	0.01	mg/L	<0.01			3	20	102	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			11	20	98	90	110	106	70	130
Copper	0.0002	mg/L	<0.0002			4	20	101	90	110	106	70	130
Iron	0.007	mg/L	<0.007			10	20	101	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			7	20	99	90	110	93	70	130
Lithium	0.0001	mg/L	<0.0001			10	20	92	90	110	NV	70	130
Magnesium	0.001	mg/L	<0.001			0	20	103	90	110	NV	70	130
Manganese	0.00001	mg/L	<0.00001			0	20	100	90	110	113	70	130
Molybdenum	0.00004	mg/L	<0.00004			3	20	105	90	110	NV	70	130
Nickel	0.0001	mg/L	<0.0001			ND	20	101	90	110	93	70	130
Phosphorus	0.003	mg/L	<0.003			ND	20	103	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			4	20	101	90	110	101	70	130
Selenium (total)	0.00004	mg/L	<0.00004			2	20	101	90	110	114	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	103	90	110	99	70	130
Sodium	0.01	mg/L	<0.01			1	20	103	90	110	NV	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10009-JAN20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Strontium	0.00002	mg/L	<0.00002			3	20	99	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			4	20	101	90	110	93	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	91	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			15	20	102	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	100	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			20	20	105	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			ND	20	99	90	110	101	70	130
Vanadium	0.00001	mg/L	<0.00001			2	20	102	90	110	116	70	130
Yttrium	0.000002	mg/L	<0.000002			ND	20	100	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			3	20	101	90	110	NV	70	130
pH - QCBatchID: EWL0021-JAN20													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002139722

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 01 October 2019
LR Report: **CA10012-OCT19**
Reference: Wk#2

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#2	6: M CG Wk#2	7: M MD Wk#2	8: M QE-POR Wk#2	9: M QZ-QE-POR-QT P-MIN Wk#2	10: SZ QE-POR Wk#2	11: L MD Wk#2
Sample Date & Time					01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19
HumCell Leachate Vol [mL]	01-Oct-19	08:21	01-Oct-19	11:16	886	875	902	904	890	912	880
pH [no unit]	01-Oct-19	15:21	02-Oct-19	11:16	7.81	8.27	7.66	8.16	8.00	8.06	8.39
Alkalinity [mg/L as CaCO3]	01-Oct-19	15:21	02-Oct-19	11:16	11	13	12	13	12	13	15
Conductivity [uS/cm]	01-Oct-19	15:21	02-Oct-19	11:16	38	34	110	37	32	34	38
F [mg/L]	01-Oct-19	10:32	02-Oct-19	13:39	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.11	< 0.06
SO4 [mg/L]	02-Oct-19	23:35	08-Oct-19	09:43	3.4	0.4	30	1.9	1.2	1.0	1.2
Hg [mg/L]	02-Oct-19	10:36	02-Oct-19	14:33	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.104	0.123	0.073	0.102	0.089	0.097	0.099
As [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.0004	0.0007	< 0.0002	0.0004	0.0004	0.0003	0.0005
Ba [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00085	0.00081	0.00564	0.00144	0.00100	0.00048	0.00304
B [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.003	0.002	< 0.002	0.003	0.004	0.003	0.002
Be [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.000007	0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	3.45	1.96	14.2	3.71	3.18	2.58	3.90
Cd [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003

OnLine LIMS

0002139383

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10012-OCT19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#2	6: M CG Wk#2	7: M MD Wk#2	8: M QE-POR Wk#2	9: M QZ-QE-POR-QT P-MIN Wk#2	10: SZ QE-POR Wk#2	11: L MD Wk#2
Co [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.000012	0.000012	0.000006	0.000014	0.000008	0.000006	0.000009
Cr [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.00008	0.00009	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.0005	0.0014	0.0005	0.0008	0.0007	0.0007	0.0006
Fe [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.010	0.015	< 0.007	0.009	0.008	0.008	0.008
K [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.889	1.46	0.515	0.741	0.556	0.922	1.12
Li [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.0002	0.0003	0.0002	0.0001	0.0002	< 0.0001	< 0.0001
Mg [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.437	0.457	1.75	0.355	0.214	0.172	0.695
Mn [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.0173	0.0105	0.0212	0.0165	0.0171	0.0131	0.0134
Mo [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00064	0.00060	0.00053	0.00051	0.00042	0.00091	0.00016
Na [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	2.38	3.04	1.65	2.23	2.32	3.17	1.32
Ni [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.003	0.004	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00003	0.00003	0.00001	0.00002	0.00002	0.00004	0.00001
Sb [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00012	0.00009	< 0.00004	0.00005	< 0.00004	0.00005	0.00017
Sn [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00756	0.00403	0.0650	0.0107	0.00898	0.00380	0.0224
Th [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00034	0.00061	< 0.00005	0.00024	0.00025	0.00037	0.00046
Tl [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.000639	0.00106	0.000142	0.000490	0.000301	0.00228	0.000183
V [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00023	0.00054	0.00030	0.00039	0.00018	0.00014	0.00057
W [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.00026	0.00021	0.00033	0.00030	0.00044	0.00055	0.00010
Y [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	0.000122	0.000048	0.000007	0.000078	0.000167	0.000092	0.000035
Zn [mg/L]	03-Oct-19	15:02	07-Oct-19	15:39	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10012-OCT19**

Analysis	12: L QZ-QTP Wk#2	13: L QZ-TQTP Wk#2	14: L SED Wk#2	15: L TRJ Wk#2	16: V QE-POR Wk#2	17: V QE-POR-QTP Wk#2
Sample Date & Time	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19	01-Oct-19
HumCell Leachate Vol [mL]	911	999	897	964	949	930
pH [no unit]	8.14	7.88	7.80	7.88	7.85	7.83
Alkalinity [mg/L as CaCO3]	12	18	10	13	11	12
Conductivity [uS/cm]	31	47	29	32	31	37
F [mg/L]	< 0.06	< 0.06	0.24	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	0.6	1.7	0.6	0.6	1.2	3.1
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.120	0.059	0.143	0.088	0.067	0.066
As [mg/L]	0.0003	0.0004	0.0005	0.0003	0.0003	0.0004
Ba [mg/L]	0.00179	0.00207	0.00064	0.00441	0.00032	0.00029
B [mg/L]	0.003	0.005	0.003	0.002	0.003	0.007
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	2.92	4.62	1.62	3.39	3.01	3.57
Cd [mg/L]	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003
Co [mg/L]	0.000007	0.000008	0.000011	0.000006	0.000008	0.000005
Cr [mg/L]	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0024	0.0004	0.0004	0.0004	0.0008	0.0009
Fe [mg/L]	0.007	< 0.007	0.011	0.009	0.011	< 0.007
K [mg/L]	1.51	1.90	1.60	1.30	0.552	0.684
Li [mg/L]	0.0002	0.0002	0.0002	0.0001	< 0.0001	0.0001
Mg [mg/L]	0.331	0.671	0.182	0.309	0.254	0.424
Mn [mg/L]	0.0142	0.0217	0.0158	0.0178	0.0241	0.0264
Mo [mg/L]	0.00008	0.00015	0.00015	0.00015	0.00093	0.00048
Na [mg/L]	1.29	2.36	2.82	0.92	2.14	2.16
Ni [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	0.00002	0.00003	0.00002	0.00005	0.00001	0.00002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10012-OCT19**

Analysis	12: L QZ-QTP Wk#2	13: L QZ-TQTP Wk#2	14: L SED Wk#2	15: L TRJ Wk#2	16: V QE-POR Wk#2	17: V QE-POR-QTP Wk#2
Sb [mg/L]	< 0.0009	0.0013	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	0.00004
Sn [mg/L]	< 0.00006	< 0.00006	0.00030	< 0.00006	0.00007	0.00006
Sr [mg/L]	0.0470	0.0290	0.0136	0.0228	0.00473	0.00742
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00038	0.00007	0.00052	0.00011	0.00007	0.00012
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.00121	0.00122	0.000281	0.000462	0.000268	0.00122
V [mg/L]	0.00027	0.00026	0.00057	0.00021	0.00014	0.00017
W [mg/L]	0.00015	0.00027	0.00019	0.00036	0.00017	0.00036
Y [mg/L]	0.000023	0.000035	0.000047	0.000043	0.000054	0.000042
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139383

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10012-OCT19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0014-OCT19														
Alkalinity	2	mg/L as Ca	< 2			1	20	100	80	120	NA			
Anions by IC - QCBatchID: DIO0042-OCT19														
Sulphate	0.2	mg/L	<0.2			ND	20	95	80	120	100	75	125	
Anions by IC - QCBatchID: DIO0047-OCT19														
Sulphate	0.2	mg/L	<0.2			0	20	97	80	120	95	75	125	
Anions by IC - QCBatchID: DIO0064-OCT19														
Sulphate	0.2	mg/L	<0.2			0	20	94	80	120	90	75	125	
Conductivity - QCBatchID: EWL0014-OCT19														
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0005-OCT19														
Fluoride	0.06	mg/L	<0.06			ND	10	99	90	110	106	75	125	
Fluoride by Specific Ion Electrode - QCBatchID: EWL0023-OCT19														
Fluoride	0.06	mg/L	<0.06			0	10	107	90	110	105	75	125	
Inorganics-General - QCBatchID: EHG0001-OCT19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	96	80	120	129	70	130	
Metals - QCBatchID: EMS0007-OCT19														
Cobalt	0.000004	mg/L	<0.000004			8	20	93	90	110	100	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0007-OCT19														
Aluminum	0.001	mg/L	<0.001			9	20	99	90	110	126	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	104	90	110	113	70	130	
Arsenic	0.0002	mg/L	<0.0002			6	20	92	90	110	107	70	130	
Barium	0.00002	mg/L	<0.00002			0	20	96	90	110	NV	70	130	
Beryllium	0.000007	mg/L	<0.000007			14	20	93	90	110	102	70	130	
Bismuth	0.000007	mg/L	<0.000007			ND	20	98	90	110	82	70	130	
Boron	0.002	mg/L	<0.002			0	20	97	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			ND	20	96	90	110	107	70	130	
Calcium	0.01	mg/L	<0.01			2	20	98	90	110	NV	70	130	
Chromium	0.00008	mg/L	<0.00008			ND	20	94	90	110	105	70	130	
Copper	0.0002	mg/L	<0.0002			4	20	94	90	110	NV	70	130	
Iron	0.007	mg/L	<0.007			1	20	97	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			3	20	96	90	110	90	70	130	
Lithium	0.0001	mg/L	<0.0001			3	20	97	90	110	99	70	130	
Magnesium	0.001	mg/L	<0.001			1	20	99	90	110	NV	70	130	
Manganese	0.00001	mg/L	<0.00001			4	20	94	90	110	NV	70	130	
Molybdenum	0.00004	mg/L	<0.00004			16	20	92	90	110	92	70	130	

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10012-OCT19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Nickel	0.0001	mg/L	<0.0001			3	20	94	90	110	100	70	130
Phosphorus	0.003	mg/L	<0.003			3	20	98	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			2	20	97	90	110	NV	70	130
Selenium (total)	0.00004	mg/L	<0.00004			ND	20	100	90	110	87	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	94	90	110	96	70	130
Sodium	0.01	mg/L	<0.01			2	20	105	90	110	NV	70	130
Strontium	0.00002	mg/L	<0.00002			3	20	92	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	98	90	110	91	70	130
Thorium	0.0001	mg/L	<0.0001			0	20	95	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	98	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	94	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			9	20	96	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			ND	20	95	90	110	90	70	130
Vanadium	0.00001	mg/L	<0.00001			5	20	93	90	110	106	70	130
Yttrium	0.000002	mg/L	<0.000002			7	20	95	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			2	20	93	90	110	NV	70	130
pH - QCBatchID: EWL0014-OCT19													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002139383

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 08 January 2020
LR Report: **CA10036-JAN20**
Reference: Wk#3

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#3	6: LLGO Comp Wk#3
Sample Date & Time					08-Jan-20	08-Jan-20
HumCell Leachate Vol [mL]	08-Jan-20	09:53	08-Jan-20	13:59	923	976
pH [no unit]	08-Jan-20	14:52	09-Jan-20	12:43	7.66	7.74
Conductivity [uS/cm]	08-Jan-20	14:52	09-Jan-20	12:43	53	43

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT Online

0002139726

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10036-JAN20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0095-JAN20														
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA			
pH - QCBatchID: EWL0095-JAN20														
pH	0.05	no unit	NA			0		100			NA			

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0002139726

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 08 October 2019
LR Report: **CA10088-OCT19**
Reference: Wk#3

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#3	6: M CG Wk#3	7: M MD Wk#3	8: M QE-POR Wk#3	9: M QZ-QE-POR-QT P-MIN Wk#3	10: SZ QE-POR Wk#3	11: L MD Wk#3
Sample Date & Time					08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19
HumCell Leachate Vol [mL]	08-Oct-19	10:15	09-Oct-19	08:58	898	891	927	932	915	927	901
pH [no unit]	08-Oct-19	15:47	09-Oct-19	13:37	7.97	7.75	7.69	7.70	7.59	7.51	7.45
Conductivity [uS/cm]	08-Oct-19	15:47	09-Oct-19	13:37	36	25	76	28	24	26	33

Analysis	12: L QZ-QTP Wk#3	13: L QZ-TQTP Wk#3	14: L SED Wk#3	15: L TRJ Wk#3	16: V QE-POR Wk#3	17: V QE-POR-QTP Wk#3
Sample Date & Time	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19	08-Oct-19
HumCell Leachate Vol [mL]	934	1005	910	950	949	940
pH [no unit]	7.48	7.74	7.49	7.53	7.43	7.32
Conductivity [uS/cm]	25	42	21	27	25	30

OnLine LIMS

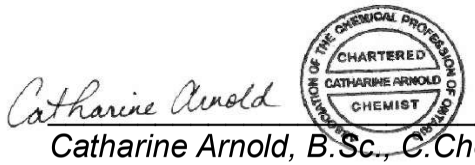
0002139417

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10088-OCT19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139417

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10088-OCT19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0147-OCT19													
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA		
pH - QCBatchID: EWL0147-OCT19													
pH	0.05	no unit	NA			0		101			NA		

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0002139417

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

11-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 15 January 2020
LR Report: **CA10060-JAN20**
Reference: Wk#4

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#4	6: LLGO Comp Wk#4
Sample Date & Time					15-Jan-20	15-Jan-20
HumCell Leachate Vol [mL]	15-Jan-20	08:38	15-Jan-20	10:56	932	940
pH [no unit]	15-Jan-20	13:51	17-Jan-20	11:22	7.94	7.86
Alkalinity [mg/L as CaCO3]	15-Jan-20	13:51	17-Jan-20	11:22	15	12
Conductivity [uS/cm]	15-Jan-20	13:51	17-Jan-20	11:22	39	32
F [mg/L]	16-Jan-20	08:29	16-Jan-20	13:13	< 0.06	< 0.06
SO4 [mg/L]	16-Jan-20	01:59	21-Jan-20	13:18	3.4	1.5
Hg [mg/L]	16-Jan-20	12:09	16-Jan-20	16:11	< 0.00001	< 0.00001
Ag [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.00005	< 0.00005
Al [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.109	0.088
As [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.0004	0.0003
Ba [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00241	0.00113
B [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.003	0.004
Be [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.000007	< 0.000007
Bi [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.000014	< 0.000007
Ca [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	4.94	3.68
Cd [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.000008	0.000003
Co [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.000011	0.000010
Cr [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.00008	< 0.00008
Cu [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.0007	< 0.0002
Fe [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.007	< 0.007
K [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.402	0.487
Li [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.0001	< 0.0001
Mg [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.484	0.397
Mn [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.0274	0.0177
Mo [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00227	0.00032
Na [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.87	1.33
Ni [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.0001	< 0.0001
P [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.003	< 0.003
Pb [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00001	< 0.00001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10060-JAN20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#4	6: LLGO Comp Wk#4
Sb [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.0009	< 0.0009
Se [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00008	0.00008
Sn [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00016	< 0.00006
Sr [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.0107	0.0164
Th [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.0001	< 0.0001
Ti [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00011	0.00006
Tl [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.000005	< 0.000005
U [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.000113	0.000511
V [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00014	0.00025
W [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.00045	0.00153
Y [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	0.000015	0.000004
Zn [mg/L]	16-Jan-20	18:22	17-Jan-20	13:05	< 0.002	< 0.002

Revised report with sample name edited to week 4.

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002146924

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10060-JAN20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0197-JAN20													
Alkalinity	2	mg/L as Ca	< 2			ND	20	102	80	120	NA		
Anions by IC - QCBatchID: DIO0170-JAN20													
Sulphate	0.2	mg/L	<0.2			3	20	97	80	120	97	75	125
Conductivity - QCBatchID: EWL0197-JAN20													
Conductivity	2	uS/cm	2			0	20	99	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0207-JAN20													
Fluoride	0.06	mg/L	<0.06			9	10	99	90	110	89	75	125
Inorganics-General - QCBatchID: EHG0016-JAN20													
Mercury	0.00001	mg/L	< 0.00001			ND	20	115	80	120	116	70	130
Metals - QCBatchID: EMS0068-JAN20													
Cobalt	0.000004	mg/L	<0.000004			7	20	104	90	110	96	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0068-JAN20													
Aluminum	0.001	mg/L	<0.001			1	20	109	90	110	NV	70	130
Antimony	0.0009	mg/L	<0.0009			6	20	106	90	110	114	70	130
Arsenic	0.0002	mg/L	<0.0002			7	20	102	90	110	95	70	130
Barium	0.00002	mg/L	<0.00002			1	20	101	90	110	NV	70	130
Beryllium	0.000007	mg/L	<0.000007			18	20	101	90	110	103	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	104	90	110	100	70	130
Boron	0.002	mg/L	<0.002			1	20	99	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			9	20	100	90	110	94	70	130
Calcium	0.01	mg/L	<0.01			3	20	101	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			10	20	104	90	110	108	70	130
Copper	0.0002	mg/L	<0.0002			5	20	105	90	110	NV	70	130
Iron	0.007	mg/L	<0.007			2	20	98	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			1	20	104	90	110	100	70	130
Lithium	0.0001	mg/L	<0.0001			3	20	102	90	110	122	70	130
Magnesium	0.001	mg/L	<0.001			2	20	98	90	110	NV	70	130
Manganese	0.00001	mg/L	<0.00001			2	20	103	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			3	20	101	90	110	106	70	130
Nickel	0.0001	mg/L	<0.0001			8	20	104	90	110	84	70	130
Phosphorus	0.003	mg/L	<0.003			6	20	98	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			3	20	101	90	110	NV	70	130
Selenium	0.00004	mg/L	<0.00004			14	20	100	90	110	100	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	99	90	110	84	70	130
Sodium	0.01	mg/L	<0.01			4	20	107	90	110	NV	70	130

OnLine LIMS

0002146924

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10060-JAN20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Strontium	0.00002	mg/L	<0.00002			2	20	103	90	110	111	70	130
Thallium	0.000005	mg/L	<0.000005			16	20	104	90	110	100	70	130
Thorium	0.0001	mg/L	<0.0001			17	20	96	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			4	20	100	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			3	20	101	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			12	20	103	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			2	20	106	90	110	114	70	130
Vanadium	0.00001	mg/L	<0.00001			4	20	103	90	110	110	70	130
Yttrium	0.000002	mg/L	<0.000002			ND	20	105	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			5	20	105	90	110	81	70	130
pH - QCBatchID: EWL0197-JAN20													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002146924

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 15 October 2019
LR Report: **CA10166-OCT19**
Reference: Wk#4

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#4	6: M CG Wk#4	7: M MD Wk#4	8: M QE-POR Wk#4	9: M QZ-QE-POR-QT P-MIN Wk#4	10: SZ QE-POR Wk#4	11: L MD Wk#4
Sample Date & Time					15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19
HumCell Leachate Vol [mL]	15-Oct-19	09:55	15-Oct-19	14:22	898	894	931	933	922	918	913
pH [no unit]	15-Oct-19	15:12	16-Oct-19	13:20	7.43	7.55	7.26	7.44	7.30	7.29	7.59
Alkalinity [mg/L as CaCO3]	15-Oct-19	15:12	16-Oct-19	13:20	9	10	10	11	9	9	12
Conductivity [uS/cm]	15-Oct-19	15:12	16-Oct-19	13:20	25	21	56	24	21	21	28
F [mg/L]	16-Oct-19	11:49	17-Oct-19	09:44	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	18-Oct-19	03:05	23-Oct-19	11:03	1.5	< 0.2	11	0.5	0.4	0.3	0.4
Hg [mg/L]	16-Oct-19	14:34	17-Oct-19	08:32	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.071	0.080	0.067	0.077	0.066	0.069	0.077
As [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.0005	0.0005	< 0.0002	0.0002	0.0004	0.0002	0.0005
Ba [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00065	0.00064	0.00552	0.00126	0.00079	0.00047	0.00260
B [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Be [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	3.12	2.07	8.42	3.66	3.09	2.86	3.91
Cd [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003	< 0.000003

OnLine LIMS

0002139414

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10166-OCT19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#4	6: M CG Wk#4	7: M MD Wk#4	8: M QE-POR Wk#4	9: M QZ-QE-POR-QT P-MIN Wk#4	10: SZ QE-POR Wk#4	11: L MD Wk#4
Co [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004
Cr [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.0005	0.0011	0.0003	0.0011	0.0011	0.0004	0.0003
Fe [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
K [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.536	1.05	0.243	0.451	0.385	0.597	0.551
Li [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Mg [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.283	0.376	0.615	0.240	0.168	0.142	0.463
Mn [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.0180	0.0108	0.0240	0.0183	0.0173	0.0158	0.0148
Mo [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00048	0.00042	0.00028	0.00045	0.00025	0.00031	0.00008
Na [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.61	0.80	0.31	0.46	0.57	0.77	0.27
Ni [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.0001	0.0002	< 0.0001	< 0.0001	0.0001	0.0001	0.0001
P [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Sb [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00007	< 0.00004	0.00005	< 0.00004	< 0.00004	< 0.00004	0.00009
Sn [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00601	0.00387	0.0356	0.00918	0.00826	0.00357	0.0189
Th [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00008	0.00034	< 0.00005	0.00005	0.00008	0.00031	0.00023
Tl [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.000209	0.00172	0.000097	0.000619	0.000198	0.000637	0.000164
V [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00021	0.00045	0.00036	0.00036	0.00014	0.00010	0.00055
W [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.00013	0.00010	0.00026	0.00014	0.00020	0.00024	0.00007
Y [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	0.000033	0.000022	0.000002	0.000025	0.000045	0.000035	0.000020
Zn [mg/L]	18-Oct-19	10:57	22-Oct-19	14:38	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

OnLine LIMS

0002139414

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10166-OCT19**

Analysis	12: L QZ-QTP Wk#4	13: L QZ-TQTP Wk#4	14: L SED Wk#4	15: L TRJ Wk#4	16: V QE-POR Wk#4	17: V QE-POR-QTP Wk#4
Sample Date & Time	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19	15-Oct-19
HumCell Leachate Vol [mL]	937	952	920	955	946	943
pH [no unit]	7.32	7.55	7.12	7.83	7.18	7.23
Alkalinity [mg/L as CaCO3]	9	14	8	14	9	9
Conductivity [uS/cm]	22	33	18	24	22	25
F [mg/L]	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.06
SO4 [mg/L]	0.3	1.0	< 0.2	0.3	0.7	1.6
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.091	0.058	0.101	0.092	0.065	0.067
As [mg/L]	< 0.0002	0.0004	0.0007	0.0003	0.0003	0.0003
Ba [mg/L]	0.00161	0.00165	0.00057	0.00533	0.00029	0.00025
B [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	3.08	4.24	1.66	3.50	2.91	3.48
Cd [mg/L]	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003
Co [mg/L]	< 0.000004	0.000004	< 0.000004	0.000044	0.000012	< 0.000004
Cr [mg/L]	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0006	0.0005	< 0.0002	0.0004	0.0003	0.0004
Fe [mg/L]	< 0.007	< 0.007	0.008	0.013	0.009	0.008
K [mg/L]	0.860	1.06	1.21	0.860	0.380	0.400
Li [mg/L]	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Mg [mg/L]	0.270	0.475	0.152	0.249	0.220	0.329
Mn [mg/L]	0.0168	0.0225	0.0170	0.0184	0.0238	0.0280
Mo [mg/L]	0.00010	0.00014	0.00006	0.00019	0.00045	0.00022
Na [mg/L]	0.33	0.60	0.80	0.25	0.72	0.52
Ni [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10166-OCT19**

Analysis	12: L QZ-QTP Wk#4	13: L QZ-TQTP Wk#4	14: L SED Wk#4	15: L TRJ Wk#4	16: V QE-POR Wk#4	17: V QE-POR-QTP Wk#4
Sb [mg/L]	< 0.0009	0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sn [mg/L]	< 0.00006	< 0.00006	0.00007	< 0.00006	0.00006	0.00007
Sr [mg/L]	0.0495	0.0227	0.0133	0.0219	0.00393	0.00616
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00010	0.00008	0.00034	0.00018	0.00016	0.00017
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.000654	0.000714	0.000321	0.000468	0.000174	0.000452
V [mg/L]	0.00021	0.00023	0.00051	0.00022	0.00013	0.00017
W [mg/L]	0.00007	0.00014	0.00010	0.00017	0.00011	0.00018
Y [mg/L]	0.000009	0.000014	0.000069	0.000023	0.000043	0.000020
Zn [mg/L]	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139414

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10166-OCT19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0258-OCT19														
Alkalinity	2	mg/L as Ca	< 2			0	20	104	80	120	NA			
Anions by IC - QCBatchID: DIO0342-OCT19														
Sulphate	0.2	mg/L	<0.2			1	20	99	80	120	96	75	125	
Anions by IC - QCBatchID: DIO0407-OCT19														
Sulphate	0.2	mg/L	<0.2			0	20	92	80	120	94	75	125	
Conductivity - QCBatchID: EWL0258-OCT19														
Conductivity	2	uS/cm	2			0	20	100	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0276-OCT19														
Fluoride	0.06	mg/L	<0.06			ND	10	106	90	110	119	75	125	
Inorganics-General - QCBatchID: EHG0018-OCT19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	101	80	120	93	70	130	
Metals - QCBatchID: EMS0083-OCT19														
Cobalt	0.000004	mg/L	<0.000004			4	20	96	90	110	91	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0083-OCT19														
Aluminum	0.001	mg/L	<0.001			9	20	97	90	110	NV	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	106	90	110	95	70	130	
Arsenic	0.0002	mg/L	<0.0002			9	20	99	90	110	97	70	130	
Barium	0.00002	mg/L	<0.00002			5	20	101	90	110	NV	70	130	
Beryllium	0.000007	mg/L	<0.000007			0	20	95	90	110	91	70	130	
Bismuth	0.000007	mg/L	<0.000007			ND	20	105	90	110	103	70	130	
Boron	0.002	mg/L	<0.002			5	20	94	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			4	20	100	90	110	99	70	130	
Calcium	0.01	mg/L	<0.01			1	20	108	90	110	NV	70	130	
Chromium	0.00008	mg/L	<0.00008			9	20	103	90	110	88	70	130	
Copper	0.0002	mg/L	<0.0002			4	20	97	90	110	92	70	130	
Iron	0.007	mg/L	<0.007			4	20	107	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			8	20	103	90	110	102	70	130	
Lithium	0.0001	mg/L	<0.0001			5	20	94	90	110	97	70	130	
Magnesium	0.001	mg/L	<0.001			2	20	104	90	110	NV	70	130	
Manganese	0.00001	mg/L	<0.00001			2	20	106	90	110	125	70	130	
Molybdenum	0.00004	mg/L	<0.00004			7	20	103	90	110	100	70	130	
Nickel	0.0001	mg/L	<0.0001			ND	20	90	90	110	94	70	130	
Phosphorus	0.003	mg/L	<0.003			6	20	101	90	110	NV	70	130	
Potassium	0.003	mg/L	<0.009			1	20	106	90	110	NV	70	130	
Selenium (total)	0.00004	mg/L	<0.00004			2	20	106	90	110	101	70	130	

OnLine LIMS

0002139414

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10166-OCT19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Silver	0.00005	mg/L	<0.00005			ND	20	98	90	110	87	70	130	
Sodium	0.01	mg/L	<0.01			1	20	108	90	110	NV	70	130	
Strontium	0.00002	mg/L	<0.00002			3	20	98	90	110	NV	70	130	
Thallium	0.000005	mg/L	<0.000005			ND	20	103	90	110	96	70	130	
Thorium	0.0001	mg/L	<0.0001			ND	20	97	90	110	NV	70	130	
Tin	0.00006	mg/L	<0.00006			0	20	99	90	110	NV	70	130	
Titanium	0.00005	mg/L	<0.00005			8	20	106	90	110	NV	70	130	
Tungsten	0.00002	mg/L	<0.00002			15	20	99	90	110	NV	70	130	
Uranium	0.000002	mg/L	<0.000002			3	20	104	90	110	101	70	130	
Vanadium	0.00001	mg/L	<0.00001			5	20	97	90	110	116	70	130	
Yttrium	0.000002	mg/L	<0.000002			2	20	95	90	110	NV	70	130	
Zinc	0.002	mg/L	<0.002			4	20	101	90	110	NV	70	130	
pH - QCBatchID: EWL0258-OCT19														
pH	0.05	no unit	NA			0		100			NA			

OnLine LIMS

0002139414

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 22 January 2020
LR Report: **CA10113-JAN20**
Reference: Wk#5

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#5	6: LLGO Comp Wk#5
Sample Date & Time					22-Jan-20	22-Jan-20
HumCell Leachate Vol [mL]	22-Jan-20	07:30	23-Jan-20	09:48	962	934
pH [no unit]	22-Jan-20	14:43	24-Jan-20	09:05	7.80	7.82
Conductivity [uS/cm]	22-Jan-20	14:43	24-Jan-20	09:05	44	36

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT LNO

0002139738

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10113-JAN20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0307-JAN20													
Conductivity	2	uS/cm	< 2			0	20	97	90	110	NA		
pH - QCBatchID: EWL0307-JAN20													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002139738

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 21 October 2019
LR Report: **CA10237-OCT19**
Reference: Wk#5

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#5	6: M CG Wk#5	7: M MD Wk#5	8: M QE-POR Wk#5	9: M QZ-QE-POR-QTP-MIN Wk#5	10: SZ QE-POR Wk#5	11: L MD Wk#5
Sample Date & Time					22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19
HumCell Leachate Vol [mL]	22-Oct-19	08:21	29-Oct-19	15:19	901	894	927	933	925	923	905
pH [no unit]	22-Oct-19	16:05	25-Oct-19	10:25	7.46	7.55	7.62	7.69	7.50	7.53	7.73
Conductivity [uS/cm]	22-Oct-19	16:05	25-Oct-19	10:25	22	22	50	26	20	22	32

Analysis	12: L QZ-QTP Wk#5	13: L QZ-TQTP Wk#5	14: L SED Wk#5	15: L TRJ Wk#5	16: V QE-POR Wk#5	17: V QE-POR-QTP Wk#5
Sample Date & Time	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19	22-Oct-19
HumCell Leachate Vol [mL]	938	990	915	956	938	923
pH [no unit]	7.68	7.62	7.42	7.68	7.49	7.92
Conductivity [uS/cm]	25	34	16	28	20	34

OnLine LIMS

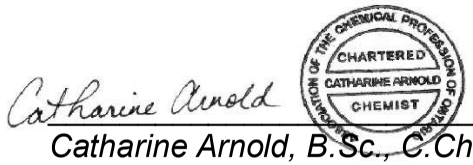
0002139432

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10237-OCT19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139432

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10237-OCT19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0392-OCT19													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
pH - QCBatchID: EWL0392-OCT19													
pH	0.05	no unit	NA			0		100			NA		

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0002139432

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 29 January 2020
LR Report: **CA10150-JAN20**
Reference: Wk#6

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#6	6: LLGO Comp Wk#6
Sample Date & Time					29-Jan-20	29-Jan-20
HumCell Leachate Vol [mL]	29-Jan-20	07:10	30-Jan-20	10:12	936	926
pH [no unit]	30-Jan-20	08:08	06-Feb-20	16:17	8.77	9.32
Conductivity [uS/cm]	30-Jan-20	08:08	31-Jan-20	13:42	27	30

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10150-JAN20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
pH - QCBatchID: EWL0405-JAN20														
pH	0.05	no unit	NA			0		101			NA			

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 29 October 2019
LR Report: **CA10367-OCT19**
Reference: Wk#6

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#6	6: M CG Wk#6	7: M MD Wk#6	8: M QE-POR Wk#6	9: M QZ-QE-POR-QTP-MIN Wk#6	10: SZ QE-POR Wk#6	11: L MD Wk#6
Sample Date & Time					29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19
HumCell Leachate Vol [mL]	29-Oct-19	09:26	29-Oct-19	13:10	912	896	909	925	930	926	905
pH [no unit]	30-Oct-19	09:53	31-Oct-19	08:15	9.10	9.24	9.19	9.27	9.25	9.22	9.23
Conductivity [uS/cm]	30-Oct-19	10:23	01-Nov-19	08:58	24	20	48	26	21	20	27

Analysis	12: L QZ-QTP Wk#6	13: L QZ-TQTP Wk#6	14: L SED Wk#6	15: L TRJ Wk#6	16: V QE-POR Wk#6	17: V QE-POR-QTP Wk#6
Sample Date & Time	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19	29-Oct-19
HumCell Leachate Vol [mL]	931	929	923	956	940	941
pH [no unit]	9.12	9.28	8.81	9.16	9.04	8.66
Conductivity [uS/cm]	21	31	16	24	20	22

OnLine LIMS

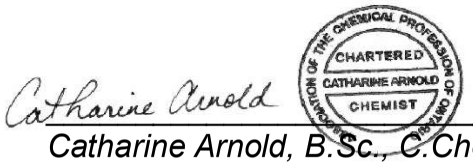
0002139434

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10367-OCT19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139434

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10367-OCT19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0533-OCT19														
Conductivity	2	uS/cm	< 2			ND	20	100	90	110	NA			
Conductivity - QCBatchID: EWL0563-OCT19														
Conductivity	2	uS/cm	< 2			ND	20	100	90	110	NA			
pH - QCBatchID: EWL0532-OCT19														
pH	0.05	no unit	NA			0		99			NA			

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0002139434

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 05 February 2020
LR Report: **CA10021-FEB20**
Reference: Wk#7

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#7	6: LLGO Comp Wk#7
Sample Date & Time					05-Feb-20	05-Feb-20
HumCell Leachate Vol [mL]	05-Feb-20	07:09	05-Feb-20	11:10	941	963
pH [no unit]	05-Feb-20	15:18	06-Feb-20	13:43	7.47	7.67
Conductivity [uS/cm]	05-Feb-20	15:18	06-Feb-20	13:43	41	39

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 1neUno

0002139756

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10021-FEB20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0053-FEB20													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
pH - QCBatchID: EWL0053-FEB20													
pH	0.05	no unit	NA			0		101			NA		

OnLine LIMS

0002139756

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 05 November 2019
LR Report: **CA10013-NOV19**
Reference: Wk#7

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#7	6: M CG Wk#7	7: M MD Wk#7	8: M QE-POR Wk#7	9: M QZ-QE-POR-QT P-MIN Wk#7	10: SZ QE-POR Wk#7	11: L MD Wk#7
Sample Date & Time					05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19
HumCell Leachate Vol [mL]	05-Nov-19	10:28	05-Nov-19	12:12	918	933	959	948	970	946	946
pH [no unit]	06-Nov-19	09:00	07-Nov-19	09:52	7.48	7.54	7.85	7.66	7.31	7.86	7.75
Conductivity [uS/cm]	06-Nov-19	09:00	07-Nov-19	09:52	19	18	42	25	22	19	26

Analysis	12: L QZ-QTP Wk#7	13: L QZ-TQTP Wk#7	14: L SED Wk#7	15: L TRJ Wk#7	16: V QE-POR Wk#7	17: V QE-POR-QTP Wk#7
Sample Date & Time	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19	05-Nov-19
HumCell Leachate Vol [mL]	947	992	970	970	952	929
pH [no unit]	7.27	7.79	7.52	7.85	7.74	7.47
Conductivity [uS/cm]	20	31	15	21	17	20

OnLine LIMS

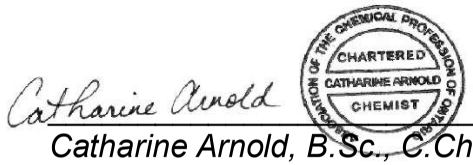
0002139442

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10013-NOV19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139442

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10013-NOV19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0085-NOV19													
Conductivity	2	uS/cm	< 2			2	20	101	90	110	NA		
pH - QCBatchID: EWL0085-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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0002139442

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 12 February 2020
LR Report: **CA10078-FEB20**
Reference: Wk#8

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#8	6: LLGO Comp Wk#8
Sample Date & Time					12-Feb-20	12-Feb-20
HumCell Leachate Vol [mL]	12-Feb-20	06:54	12-Feb-20	13:45	938	936
pH [no unit]	12-Feb-20	13:44	18-Feb-20	14:32	8.08	8.42
pH [no unit]	24-Feb-20	15:13	25-Feb-20	11:10	7.31	7.63
Alkalinity [mg/L as CaCO3]	12-Feb-20	13:44	18-Feb-20	14:32	17	16
Conductivity [uS/cm]	12-Feb-20	13:44	18-Feb-20	14:32	24	26
F [mg/L]	12-Feb-20	16:52	13-Feb-20	08:40	< 0.06	< 0.06
SO4 [mg/L]	15-Feb-20	17:03	20-Feb-20	11:27	1.3	0.9
Hg [mg/L]	13-Feb-20	10:58	13-Feb-20	13:58	0.00001	< 0.00001
Ag [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.00005	< 0.00005
Al [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.099	0.098
As [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.0004	< 0.0002
Ba [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00195	0.00113
B [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.002	< 0.002
Be [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.000007	< 0.000007
Bi [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.000007	< 0.000007
Ca [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	3.61	3.70
Cd [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.000003	< 0.000003
Co [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.000024	< 0.000004
Cr [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.00008	< 0.00008
Cu [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.0002	0.0007
Fe [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.007	< 0.007
K [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.222	0.374
Li [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.0001	< 0.0001
Mg [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.300	0.458
Mn [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.0268	0.0196
Mo [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00128	0.00059
Na [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.26	0.45
Ni [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.0001	< 0.0001
P [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.003	< 0.003

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10078-FEB20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#8	6: LLGO Comp Wk#8
Pb [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00002	0.00003
Sb [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.0009	< 0.0009
Se [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00005	0.00006
Sn [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.00006	0.00009
Sr [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00752	0.0170
Th [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.0001	< 0.0001
Ti [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00005	< 0.00005
Tl [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.000005	< 0.000005
U [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00270	0.000375
V [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00017	0.00025
W [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.00017	0.00090
Y [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	0.000012	0.000005
Zn [mg/L]	14-Feb-20	14:48	19-Feb-20	15:49	< 0.002	< 0.002

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT InnUno

0002139763

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10078-FEB20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0159-FEB20													
Alkalinity	2	mg/L as Ca	< 2			0	20	100	80	120	NA		
Anions by IC - QCBatchID: DIO0260-FEB20													
Sulphate	0.2	mg/L	<0.2			0	20	93	80	120	94	75	125
Conductivity - QCBatchID: EWL0159-FEB20													
Conductivity	2	uS/cm	< 2			0	20	101	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0166-FEB20													
Fluoride	0.06	mg/L	<0.06			ND	10	103	90	110	101	75	125
Inorganics-General - QCBatchID: EHG0015-FEB20													
Mercury	0.00001	mg/L	< 0.00001			ND	20	118	80	120	116	70	130
Metals - QCBatchID: EMS0066-FEB20													
Cobalt	0.000004	mg/L	<0.000004			0	20	100	90	110	103	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0066-FEB20													
Aluminum	0.001	mg/L	<0.001			2	20	102	90	110	122	70	130
Antimony	0.0009	mg/L	<0.0009			1	20	102	90	110	116	70	130
Arsenic	0.0002	mg/L	<0.0002			4	20	100	90	110	103	70	130
Barium	0.00002	mg/L	<0.00002			0	20	100	90	110	114	70	130
Beryllium	0.000007	mg/L	<0.000007			ND	20	101	90	110	93	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	95	90	110	86	70	130
Boron	0.002	mg/L	<0.002			4	20	96	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			4	20	97	90	110	95	70	130
Calcium	0.01	mg/L	<0.01			3	20	91	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			ND	20	100	90	110	85	70	130
Copper	0.0002	mg/L	<0.0002			1	20	102	90	110	125	70	130
Iron	0.007	mg/L	<0.007			10	20	95	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			2	20	99	90	110	94	70	130
Lithium	0.0001	mg/L	<0.0001			3	20	104	90	110	130	70	130
Magnesium	0.001	mg/L	<0.001			3	20	101	90	110	101	70	130
Manganese	0.00001	mg/L	<0.00001			2	20	100	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			1	20	99	90	110	110	70	130
Nickel	0.0001	mg/L	<0.0001			5	20	100	90	110	99	70	130
Phosphorus	0.003	mg/L	<0.003			ND	20	92	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			3	20	91	90	110	NV	70	130
Selenium	0.00004	mg/L	<0.00004			4	20	99	90	110	106	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	102	90	110	94	70	130
Sodium	0.01	mg/L	<0.01			3	20	91	90	110	107	70	130

OnLine LIMS

0002139763

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10078-FEB20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank				Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)			Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High			Low	High
Strontium	0.00002	mg/L	<0.00002			0	20	102	90	110		NV	70	130
Thallium	0.000005	mg/L	<0.000005			3	20	101	90	110		98	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	102	90	110		NV	70	130
Tin	0.00006	mg/L	<0.00006			2	20	97	90	110		NV	70	130
Titanium	0.00005	mg/L	<0.00005			16	20	93	90	110		NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	100	90	110		NV	70	130
Uranium	0.000002	mg/L	<0.000002			3	20	100	90	110		100	70	130
Vanadium	0.00001	mg/L	<0.00001			ND	20	101	90	110		107	70	130
Yttrium	0.000002	mg/L	<0.000002			9	20	101	90	110		NV	70	130
Zinc	0.002	mg/L	<0.002			1	20	102	90	110		NV	70	130
pH - QCBatchID: EWL0159-FEB20														
pH	0.05	no unit	NA			0		101				NA		
pH - QCBatchID: EWL0309-FEB20														
pH	0.05	no unit	NA			2		101				NA		

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0002139763

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 02 March 2020
LR Report: **CA14024-MAR20**
Reference: Wk#8

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#8	6: LLGO Comp Wk#8
Sample Date & Time					12-Feb-20	12-Feb-20
Cd [mg/L]	04-Mar-20	17:02	05-Mar-20	15:50	< 0.000003	---
Cu [mg/L]	04-Mar-20	17:02	05-Mar-20	15:50	< 0.0002	0.0007

Catharine Arnold

CHARTERED CHEMICAL PROFESSION OF ONTARIO CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMS LIMS OnTuo

0002139814

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA14024-MAR20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0014-MAR20													
Cadmium	0.000003	mg/L	<0.000003			ND	20	100	90	110	98	70	130
Copper	0.0002	mg/L	<0.0002			4	20	102	90	110	108	70	130

OnLine LIMS

0002139814

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 12 November 2019
LR Report: **CA10065-NOV19**
Reference: Wk#8

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#8	6: M CG Wk#8	7: M MD Wk#8	8: M QE-POR Wk#8	9: M QZ-QE-POR-QT P-MIN Wk#8	10: SZ QE-POR Wk#8	11: L MD Wk#8
Sample Date & Time					12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19
HumCell Leachate Vol [mL]	12-Nov-19	08:27	13-Nov-19	09:44	900	896	920	914	908	922	894
pH [no unit]	12-Nov-19	16:58	13-Nov-19	16:19	7.18	7.22	7.50	7.23	7.30	7.24	7.57
Alkalinity [mg/L as CaCO3]	12-Nov-19	16:58	13-Nov-19	16:19	8	8	11	9	9	8	12
Conductivity [uS/cm]	12-Nov-19	16:58	13-Nov-19	16:19	21	19	41	24	24	19	28
F [mg/L]	13-Nov-19	08:58	14-Nov-19	10:48	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	14-Nov-19	09:39	20-Nov-19	08:07	1.4	< 0.2	5.6	0.4	0.3	0.2	0.2
Hg [mg/L]	12-Nov-19	14:07	13-Nov-19	12:21	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.062	0.062	0.060	0.074	0.060	0.063	0.074
As [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.0002	0.0006	0.0002	0.0003	< 0.0002	< 0.0002	0.0004
Ba [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00061	0.00063	0.00778	0.00161	0.00098	0.00048	0.00328
B [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.002	< 0.002	< 0.002	0.004	0.009	< 0.002	0.011
Be [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	2.84	1.84	5.88	3.28	2.74	2.63	4.04
Cd [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.000003	< 0.000003	< 0.000003	< 0.000003	0.000003	< 0.000003	0.000003

OnLine LIMS

0002139447

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10065-NOV19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#8	6: M CG Wk#8	7: M MD Wk#8	8: M QE-POR Wk#8	9: M QZ-QE-POR-QT P-MIN Wk#8	10: SZ QE-POR Wk#8	11: L MD Wk#8
Co [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.000009	0.000009	0.000007	0.000008	0.000009	0.000010	0.000008
Cr [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.00008	< 0.00008	< 0.00008	< 0.00008	0.00015	< 0.00008	< 0.00008
Cu [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.0002	0.0004	0.0004	0.0003	0.0003	0.0008	0.0003
Fe [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.007	0.008	< 0.007	< 0.007	0.007	< 0.007	< 0.007
K [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.375	0.668	0.151	0.327	0.290	0.452	0.294
Li [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Mg [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.290	0.431	0.452	0.249	0.170	0.162	0.458
Mn [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.0131	0.00985	0.0240	0.0152	0.0132	0.0118	0.0155
Mo [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00020	0.00011	0.00243	0.00033	0.00019	0.00015	0.00006
Na [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.28	0.28	0.16	0.24	0.26	0.32	0.15
Ni [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00001	0.00113	0.00012	0.00012	0.00163	0.00002	0.00077
Sb [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00006	< 0.00004	0.00007	< 0.00004	< 0.00004	< 0.00004	0.00007
Sn [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.00006	0.00008	0.00010	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00572	0.00366	0.0237	0.00834	0.00750	0.00370	0.0171
Th [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00010	0.00027	< 0.00005	0.00010	0.00007	0.00025	0.00016
Tl [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.000005	0.000008	0.000006	< 0.000005	0.000020	< 0.000005	< 0.000005
U [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.000093	0.000443	0.000032	0.000108	0.000094	0.000065	0.000159
V [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00018	0.00035	0.00041	0.00034	0.00014	0.00008	0.00055
W [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.00008	0.00007	0.00012	0.00007	0.00010	0.00035	0.00005
Y [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	0.000023	0.000019	0.000008	0.000021	0.000037	0.000020	0.000018
Zn [mg/L]	13-Nov-19	10:05	15-Nov-19	14:58	< 0.002	< 0.002	0.002	< 0.002	0.004	< 0.002	< 0.002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10065-NOV19**

Analysis	12: L QZ-QTP Wk#8	13: L QZ-TQTP Wk#8	14: L SED Wk#8	15: L TRJ Wk#8	16: V QE-POR Wk#8	17: V QE-POR-QTP Wk#8
Sample Date & Time	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19
HumCell Leachate Vol [mL]	932	959	934	933	910	900
pH [no unit]	7.25	7.34	7.18	7.25	7.36	7.48
Alkalinity [mg/L as CaCO3]	8	12	7	9	8	9
Conductivity [uS/cm]	20	32	17	23	19	24
F [mg/L]	< 0.06	0.08	< 0.06	< 0.06	0.14	< 0.06
SO4 [mg/L]	0.2	2.8	< 0.2	< 0.2	0.3	0.7
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.092	0.059	0.086	0.080	0.054	0.073
As [mg/L]	0.0008	0.0004	0.0003	0.0003	0.0003	0.0003
Ba [mg/L]	0.00164	0.00152	0.00061	0.00611	0.00027	0.00038
B [mg/L]	< 0.002	< 0.002	0.005	0.020	0.006	0.014
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	3.06	4.60	1.68	3.14	2.48	3.02
Cd [mg/L]	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Co [mg/L]	0.000010	0.000004	0.000010	0.000004	0.000012	0.000012
Cr [mg/L]	0.00016	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0009	< 0.0002	< 0.0002	0.0003	0.0005	0.0007
Fe [mg/L]	0.018	0.009	0.009	0.024	0.008	0.016
K [mg/L]	0.485	0.602	0.863	0.445	0.252	0.250
Li [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Mg [mg/L]	0.282	0.539	0.179	0.265	0.233	0.325
Mn [mg/L]	0.0138	0.0200	0.0127	0.0140	0.0164	0.0184
Mo [mg/L]	0.00016	0.00010	0.00010	0.00014	0.00028	0.00019
Na [mg/L]	0.18	0.30	0.26	0.15	0.32	0.26
Ni [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001
P [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	0.00376	0.00120	0.00005	0.00049	0.00035	0.00008

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10065-NOV19**

Analysis	12: L QZ-QTP Wk#8	13: L QZ-TQTP Wk#8	14: L SED Wk#8	15: L TRJ Wk#8	16: V QE-POR Wk#8	17: V QE-POR-QTP Wk#8
Sb [mg/L]	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sn [mg/L]	< 0.00006	< 0.00006	0.00007	< 0.00006	0.00011	0.00008
Sr [mg/L]	0.0544	0.0226	0.0140	0.0197	0.00354	0.00526
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00015	0.00011	0.00046	0.00011	0.00011	< 0.00005
Tl [mg/L]	< 0.000005	0.000010	< 0.000005	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	0.000339	0.000280	0.000305	0.000376	0.000107	0.000166
V [mg/L]	0.00020	0.00022	0.00055	0.00020	0.00014	0.00018
W [mg/L]	0.00006	0.00005	0.00007	0.00012	0.00008	0.00012
Y [mg/L]	0.000009	0.000013	0.000018	0.000061	0.000028	0.000029
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139447

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10065-NOV19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0197-NOV19														
Alkalinity	2	mg/L as Ca	< 2			2	20	95	80	120	NA			
Anions by IC - QCBatchID: DIO0260-NOV19														
Sulphate	0.2	mg/L	<0.2			1	20	99	80	120	94	75	125	
Anions by IC - QCBatchID: DIO0264-NOV19														
Sulphate	0.2	mg/L	<0.2			ND	20	98	80	120	96	75	125	
Conductivity - QCBatchID: EWL0197-NOV19														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0208-NOV19														
Fluoride	0.06	mg/L	<0.06			ND	10	109	90	110	100	75	125	
Inorganics-General - QCBatchID: EHG0011-NOV19														
Mercury	0.00001	mg/L	< 0.00001			ND	20	116	80	120	114	70	130	
Metals - QCBatchID: EMS0081-NOV19														
Cobalt	0.000004	mg/L	<0.000004			3	20	104	90	110	105	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0081-NOV19														
Aluminum	0.001	mg/L	<0.001			4	20	108	90	110	123	70	130	
Antimony	0.0009	mg/L	<0.0009			8	20	101	90	110	124	70	130	
Arsenic	0.0002	mg/L	<0.0002			11	20	105	90	110	101	70	130	
Barium	0.00002	mg/L	<0.00002			2	20	103	90	110	115	70	130	
Beryllium	0.000007	mg/L	<0.000007			5	20	98	90	110	104	70	130	
Bismuth	0.000007	mg/L	8e-006			ND	20	104	90	110	94	70	130	
Boron	0.002	mg/L	<0.002			3	20	106	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			3	20	103	90	110	107	70	130	
Calcium	0.01	mg/L	<0.01			3	20	108	90	110	109	70	130	
Chromium	0.00008	mg/L	<0.00008			7	20	103	90	110	106	70	130	
Copper	0.0002	mg/L	<0.0002			4	20	101	90	110	127	70	130	
Iron	0.007	mg/L	<0.007			3	20	107	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			2	20	103	90	110	108	70	130	
Lithium	0.0001	mg/L	<0.0001			2	20	98	90	110	86	70	130	
Magnesium	0.001	mg/L	<0.001			4	20	107	90	110	107	70	130	
Manganese	0.00001	mg/L	<0.00001			5	20	103	90	110	103	70	130	
Molybdenum	0.00004	mg/L	<0.00004			ND	20	100	90	110	99	70	130	
Nickel	0.0001	mg/L	<0.0001			0	20	100	90	110	100	70	130	
Phosphorus	0.003	mg/L	<0.003			6	20	103	90	110	NV	70	130	
Potassium	0.003	mg/L	<0.009			5	20	108	90	110	110	70	130	
Selenium (total)	0.00004	mg/L	<0.00004			4	20	110	90	110	109	70	130	

OnLine LIMS

0002139447

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10065-NOV19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Silver	0.00005	mg/L	<0.00005			ND	20	104	90	110	101	70	130
Sodium	0.01	mg/L	<0.01			6	20	108	90	110	126	70	130
Strontium	0.00002	mg/L	<0.00002			5	20	97	90	110	92	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	100	90	110	102	70	130
Thorium	0.0001	mg/L	<0.0001			5	20	94	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			12	20	103	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			8	20	95	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			0	20	103	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			3	20	91	90	110	94	70	130
Vanadium	0.00001	mg/L	<0.00001			0	20	102	90	110	102	70	130
Yttrium	0.000002	mg/L	<0.000002			7	20	104	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			2	20	103	90	110	123	70	130
pH - QCBatchID: EWL0197-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 19 February 2020
LR Report: **CA10102-FEB20**
Reference: Wk#9

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#9	6: LLGO Comp Wk#9
Sample Date & Time					19-Feb-20	19-Feb-20
HumCell Leachate Vol [mL]	19-Feb-20	07:42	19-Feb-20	14:35	937	901
pH [no unit]	20-Feb-20	08:55	27-Feb-20	13:16	8.26	8.31
Conductivity [uS/cm]	20-Feb-20	08:55	27-Feb-20	13:17	69	91

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139772

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10102-FEB20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0249-FEB20													
Conductivity	2	uS/cm	2			0	20	99	90	110	NA		
pH - QCBatchID: EWL0249-FEB20													
pH	0.05	no unit	NA			0		101			NA		

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0002139772

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 02 March 2020
LR Report: **CA14000-MAR20**
Reference: Wk#9

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#9	6: LLGO Comp Wk#9
Sample Date & Time					19-Feb-20	19-Feb-20
pH [no unit]	02-Mar-20	16:22	04-Mar-20	14:43	8.12	8.24
Conductivity [uS/cm]	02-Mar-20	16:22	04-Mar-20	14:43	87	106

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 anrUno

0002139807

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA14000-MAR20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0013-MAR20														
Conductivity	2	uS/cm	2			0	20	98	90	110	NA			
pH - QCBatchID: EWL0013-MAR20														
pH	0.05	no unit	NA			1		101			NA			

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

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Project : Valentine Gold

04-June-2020

Date Rec. : 19 November 2019
LR Report: **CA10096-NOV19**
Reference: Wk#9

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#9	6: M CG Wk#9	7: M MD Wk#9	8: M QE-POR Wk#9	9: M QZ-QE-POR-QT P-MIN Wk#9	10: SZ QE-POR Wk#9	11: L MD Wk#9
Sample Date & Time					19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19
HumCell Leachate Vol [mL]	19-Nov-19	08:48	19-Nov-19	15:16	911	899	920	926	929	932	909
pH [no unit]	19-Nov-19	14:26	21-Nov-19	11:39	7.37	7.42	7.48	7.52	7.36	7.40	7.52
Conductivity [uS/cm]	19-Nov-19	14:26	21-Nov-19	11:39	19	20	37	20	17	17	24

Analysis	12: L QZ-QTP Wk#9	13: L QZ-TQTP Wk#9	14: L SED Wk#9	15: L TRJ Wk#9	16: V QE-POR Wk#9	17: V QE-POR-QTP Wk#9
Sample Date & Time	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19	19-Nov-19
HumCell Leachate Vol [mL]	926	943	929	947	932	947
pH [no unit]	7.25	7.52	7.29	7.51	7.28	7.41
Conductivity [uS/cm]	19	29	13	20	16	20

OnLine LIMS

0002139450

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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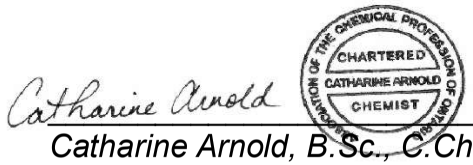
Project : Valentine Gold

LR Report : **CA10096-NOV19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139450

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10096-NOV19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0311-NOV19													
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA		
pH - QCBatchID: EWL0311-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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0002139450

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 26 February 2020
LR Report: **CA10155-FEB20**
Reference: Wk#10

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#10	6: LLGO Comp Wk#10
Sample Date & Time					26-Feb-20	26-Feb-20
HumCell Leachate Vol [mL]	26-Feb-20	07:41	26-Feb-20	12:47	946	935
pH [no unit]	26-Feb-20	13:28	03-Mar-20	11:58	7.85	7.87
Conductivity [uS/cm]	26-Feb-20	13:28	28-Feb-20	13:45	26	30

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139775

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10155-FEB20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0336-FEB20														
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA			
pH - QCBatchID: EWL0336-FEB20														
pH	0.05	no unit	NA			2		101			NA			

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0002139775

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 26 November 2019
LR Report: **CA10157-NOV19**
Reference: Wk#10

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#10	6: M CG Wk#10	7: M MD Wk#10	8: M QE-POR Wk#10	9: M QZ-QE-POR-QTP-MIN Wk#10	10: SZ QE-POR Wk#10	11: L MD Wk#10
Sample Date & Time					26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19
HumCell Leachate Vol [mL]	26-Nov-19	10:11	26-Nov-19	15:35	898	881	917	905	905	919	923
pH [no unit]	27-Nov-19	14:50	29-Nov-19	11:18	7.64	7.74	7.76	7.66	7.61	7.49	7.72
Conductivity [uS/cm]	27-Nov-19	14:50	29-Nov-19	11:18	54	60	82	56	53	42	54

Analysis	12: L QZ-QTP Wk#10	13: L QZ-TQTP Wk#10	14: L SED Wk#10	15: L TRJ Wk#10	16: V QE-POR Wk#10	17: V QE-POR-QTP Wk#10
Sample Date & Time	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19	26-Nov-19
HumCell Leachate Vol [mL]	914	966	914	943	942	928
pH [no unit]	7.63	7.53	7.49	7.40	7.34	7.36
Conductivity [uS/cm]	60	32	29	22	18	18

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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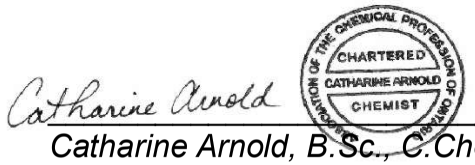
Project : Valentine Gold

LR Report : **CA10157-NOV19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

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0002139454

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10157-NOV19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0457-NOV19													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
pH - QCBatchID: EWL0457-NOV19													
pH	0.05	no unit	NA			0		100			NA		

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0002139454

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 04 March 2020
LR Report: **CA10019-MAR20**
Reference: Wk#11

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#11	6: LLGO Comp Wk#11
Sample Date & Time					04-Mar-20	04-Mar-20
HumCell Leachate Vol [mL]	04-Mar-20	07:51	05-Mar-20	09:34	939	928
pH [no unit]	04-Mar-20	15:33	13-Mar-20	15:45	7.63	7.84
Conductivity [uS/cm]	04-Mar-20	15:33	13-Mar-20	15:45	29	27

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT 1 neUno

0002139779

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10019-MAR20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0055-MAR20													
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA		
pH - QCBatchID: EWL0055-MAR20													
pH	0.05	no unit	NA			0		101			NA		

OnLine LIMS

0002139779

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

04-June-2020

Date Rec. : 03 December 2019
LR Report: **CA10013-DEC19**
Reference: Wk#11

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#11	6: M CG Wk#11	7: M MD Wk#11	8: M QE-POR Wk#11	9: M QZ-QE-POR-QT P-MIN Wk#11	10: SZ QE-POR Wk#11	11: L MD Wk#11
Sample Date & Time					03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19
HumCell Leachate Vol [mL]	03-Dec-19	07:30	03-Dec-19	14:40	920	1007	950	958	966	970	928
pH [no unit]	03-Dec-19	15:31	06-Dec-19	10:29	7.35	7.67	7.37	7.37	7.53	7.43	7.29
Conductivity [uS/cm]	03-Dec-19	15:31	04-Dec-19	14:52	24	22	35	23	20	20	31

Analysis	12: L QZ-QTP Wk#11	13: L QZ-TQTP Wk#11	14: L SED Wk#11	15: L TRJ Wk#11	16: V QE-POR Wk#11	17: V QE-POR-QTP Wk#11
Sample Date & Time	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19	03-Dec-19
HumCell Leachate Vol [mL]	964	993	950	977	954	951
pH [no unit]	7.66	7.41	7.48	7.40	7.52	7.59
Conductivity [uS/cm]	24	32	13	28	19	22

OnLine LIMS

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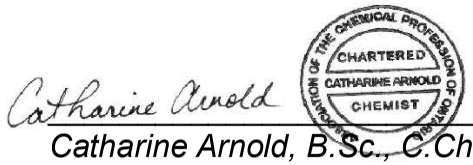
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10013-DEC19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

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0002139459

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10013-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0027-DEC19														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
Conductivity - QCBatchID: EWL0031-DEC19														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
pH - QCBatchID: EWL0027-DEC19														
pH	0.05	no unit	NA			1		100			NA			
pH - QCBatchID: EWL0031-DEC19														
pH	0.05	no unit	NA			0		100			NA			

OnLine LIMS

0002139459

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 11 March 2020
LR Report: **CA10073-MAR20**
Reference: Wk#12

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#12	6: LLGO Comp Wk#12
Sample Date & Time					11-Mar-20	11-Mar-20
HumCell Leachate Vol [mL]	11-Mar-20	07:00	11-Mar-20	12:45	961	935
pH [no unit]	11-Mar-20	15:03	12-Mar-20	14:36	7.57	7.66
Alkalinity [mg/L as CaCO3]	11-Mar-20	15:03	12-Mar-20	14:36	10	11
Conductivity [uS/cm]	11-Mar-20	15:03	12-Mar-20	14:36	24	24
F [mg/L]	12-Mar-20	12:37	13-Mar-20	11:12	< 0.06	< 0.06
SO4 [mg/L]	11-Mar-20	21:54	13-Mar-20	22:09	0.8	0.4
Hg [mg/L]	11-Mar-20	15:20	12-Mar-20	12:12	< 0.00001	< 0.00001
Ag [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.00005	< 0.00005
Al [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.064	0.082
As [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.0003	< 0.0002
Ba [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00163	0.00091
B [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.002	< 0.002
Be [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.000007	< 0.000007
Bi [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.000007	< 0.000007
Ca [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	3.69	3.36
Cd [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.000028	0.000027
Co [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.000004	0.000004
Cr [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00027	0.00009
Cu [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.0002	< 0.0002
Fe [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.007	< 0.007
K [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.112	0.238
Li [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.0001	0.0001
Mg [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.221	0.446
Mn [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.0328	0.0157
Mo [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00056	0.00011
Na [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.50	0.68
Ni [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.0001	< 0.0001
P [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.008	< 0.003
Pb [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00003	0.00002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10073-MAR20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#12	6: LLGO Comp Wk#12
Sb [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.0009	< 0.0009
Se [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00006	0.00016
Sn [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00011	0.00013
Sr [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00668	0.0143
Th [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.0001	< 0.0001
Ti [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00008	< 0.00005
Tl [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.000005	< 0.000005
U [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00117	0.000849
V [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00003	0.00016
W [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.00011	0.00047
Y [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	0.000005	0.000004
Zn [mg/L]	13-Mar-20	11:59	17-Mar-20	12:02	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LMN

0002139788

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10073-MAR20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Alkalinity - QCBatchID: EWL0162-MAR20														
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA			
Anions by IC - QCBatchID: DIO0158-MAR20														
Sulphate	0.2	mg/L	<0.2			1	20	96	80	120	96	75	125	
Conductivity - QCBatchID: EWL0162-MAR20														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
Fluoride by Specific Ion Electrode - QCBatchID: EWL0180-MAR20														
Fluoride	0.06	mg/L	<0.06			ND	10	101	90	110	93	75	125	
Inorganics-General - QCBatchID: EHG0012-MAR20														
Mercury	0.00001	mg/L	< 0.00001			ND	20	104	80	120	NV	70	130	
Metals - QCBatchID: EMS0070-MAR20														
Cobalt	0.000004	mg/L	<0.000004			4	20	101	90	110	94	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0070-MAR20														
Aluminum	0.001	mg/L	<0.001			7	20	100	90	110	112	70	130	
Antimony	0.0009	mg/L	<0.0009			ND	20	102	90	110	106	70	130	
Arsenic	0.0002	mg/L	<0.0002			10	20	100	90	110	106	70	130	
Barium	0.00002	mg/L	<0.00002			0	20	101	90	110	88	70	130	
Beryllium	0.000007	mg/L	<0.000007			8	20	98	90	110	94	70	130	
Bismuth	0.000007	mg/L	<0.000007			ND	20	99	90	110	85	70	130	
Boron	0.002	mg/L	<0.002			6	20	93	90	110	NV	70	130	
Cadmium	0.000003	mg/L	<0.000003			ND	20	102	90	110	100	70	130	
Calcium	0.01	mg/L	<0.01			4	20	98	90	110	NV	70	130	
Chromium	0.00008	mg/L	<0.00008			ND	20	97	90	110	NV	70	130	
Copper	0.0002	mg/L	<0.0002			4	20	103	90	110	92	70	130	
Iron	0.007	mg/L	<0.007			6	20	100	90	110	NV	70	130	
Lead	0.00001	mg/L	<0.00001			3	20	100	90	110	96	70	130	
Lithium	0.0001	mg/L	<0.0001			1	20	99	90	110	99	70	130	
Magnesium	0.001	mg/L	<0.001			1	20	100	90	110	103	70	130	
Manganese	0.00001	mg/L	<0.00001			6	20	101	90	110	NV	70	130	
Molybdenum	0.00004	mg/L	<0.00004			10	20	104	90	110	106	70	130	
Nickel	0.0001	mg/L	<0.0001			1	20	100	90	110	92	70	130	
Phosphorus	0.003	mg/L	<0.003			0	20	101	90	110	NV	70	130	
Potassium	0.003	mg/L	<0.009			5	20	100	90	110	98	70	130	
Selenium	0.00004	mg/L	<0.00004			ND	20	106	90	110	97	70	130	
Silver	0.00005	mg/L	<0.00005			ND	20	103	90	110	104	70	130	
Sodium	0.01	mg/L	<0.01			2	20	101	90	110	98	70	130	

OnLine LIMS

0002139788

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10073-MAR20**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Strontium	0.00002	mg/L	<0.00002			3	20	100	90	110	92	70	130
Thallium	0.000005	mg/L	<0.000005			ND	20	99	90	110	93	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	93	90	110	NV	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	101	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			3	20	98	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	103	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			0	20	99	90	110	83	70	130
Vanadium	0.00001	mg/L	<0.00001			1	20	100	90	110	108	70	130
Yttrium	0.000002	mg/L	<0.000002			2	20	99	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			11	20	98	90	110	81	70	130
pH - QCBatchID: EWL0162-MAR20													
pH	0.05	no unit	NA			0		101			NA		

OnLine LIMS

0002139788

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 17 April 2020
LR Report: **CA14436-APR20**
Reference: Wk#12

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#12	6: LLGO Comp Wk#12
Sample Date & Time						11-Mar-20
Cd [mg/L]	20-Apr-20	23:41	21-Apr-20	15:28	---	< 0.000003

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139859

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA14436-APR20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0104-APR20													
Cadmium	0.000003	mg/L	<0.000003			ND	20	94	90	110	94	70	130

OnLine LIMS

00021398859

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

16-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 26 March 2020
LR Report: **CA15478-MAR20**
Reference: Wk#12

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#12
Sample Date & Time					11-Mar-20
Cd [mg/L]	27-Mar-20	11:42	08-Apr-20	17:57	0.000004

Revised report with QR report.

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002151387

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA15478-MAR20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0142-MAR20													
Cadmium	0.000003	mg/L	<0.000003			14	20	102	90	110	107	70	130

OnLine LIMS

0002151387

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 10 December 2019
LR Report: **CA10038-DEC19**
Reference: Wk#12

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#12	6: M CG Wk#12	7: M MD Wk#12	8: M QE-POR Wk#12	9: M QZ-QE-POR-QT P-MIN Wk#12	10: SZ QE-POR Wk#12	11: L MD Wk#12
Sample Date & Time					10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19
HumCell Leachate Vol [mL]	10-Dec-19	09:02	10-Dec-19	13:50	896	896	916	917	913	918	899
pH [no unit]	10-Dec-19	15:03	16-Dec-19	10:16	7.38	7.35	7.61	7.36	7.53	7.56	7.57
Alkalinity [mg/L as CaCO3]	10-Dec-19	15:03	12-Dec-19	11:39	8	8	10	9	9	8	11
Conductivity [uS/cm]	10-Dec-19	15:03	12-Dec-19	11:39	21	16	36	20	20	20	25
F [mg/L]	10-Dec-19	13:34	11-Dec-19	11:00	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	13-Dec-19	20:24	17-Dec-19	09:37	1.0	< 0.2	3.5	0.2	< 0.2	< 0.2	< 0.2
Hg [mg/L]	10-Dec-19	15:30	11-Dec-19	10:10	0.00020	< 0.00001	0.00002	< 0.00001	0.00233	< 0.00001	< 0.00001
Ag [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.064	0.055	0.061	0.073	0.061	0.058	0.064
As [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
Ba [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00050	0.00038	0.00775	0.00142	0.00070	0.00036	0.00341
B [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Be [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	2.98	1.88	5.28	3.35	2.89	2.86	3.76
Cd [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.000003	< 0.000003	0.000278	0.000003	< 0.000003	< 0.000003	0.000005

OnLine LIMS

0002139593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10038-DEC19**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#12	6: M CG Wk#12	7: M MD Wk#12	8: M QE-POR Wk#12	9: M QZ-QE-POR-QT P-MIN Wk#12	10: SZ QE-POR Wk#12	11: L MD Wk#12
Co [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.000004	< 0.000004	0.000006	0.000007	0.000009	0.000006	< 0.000004
Cr [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.0002	0.0007	0.0002	0.0004	0.0004	0.0007	0.0008
Fe [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.007	0.013	< 0.007	0.008	0.025	0.020	0.008
K [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.295	0.442	0.116	0.250	0.237	0.341	0.227
Li [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.0001	0.0001	0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
Mg [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.257	0.392	0.400	0.206	0.154	0.175	0.417
Mn [mg/L]	12-Dec-19	08:54	16-Dec-19	16:11	0.0138	0.0106	0.0241	0.0164	0.0152	0.0145	0.0144
Mo [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00013	0.00009	0.00020	0.00008	0.00014	0.00017	0.00006
Na [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.13	0.10	0.07	0.10	0.11	0.16	0.07
Ni [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00003	0.00002	< 0.00001	< 0.00001	0.00003	0.00029	< 0.00001
Sb [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00005	< 0.00004	0.00005	< 0.00004	< 0.00004	< 0.00004	0.00006
Sn [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Sr [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00552	0.00327	0.0209	0.00764	0.00667	0.00333	0.0161
Th [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00009	0.00015	0.00019	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tl [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.000006	< 0.000005	0.000007	0.000008	< 0.000005	< 0.000005	< 0.000005
U [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.000122	0.000374	0.000052	0.000197	0.000155	0.000127	0.000191
V [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00014	0.00027	0.00034	0.00023	0.00011	0.00007	0.00035
W [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.00006	0.00004	0.00006	0.00006	0.00011	0.00009	0.00003
Y [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	0.000017	0.000010	0.000010	0.000013	0.000020	0.000016	0.000017
Zn [mg/L]	12-Dec-19	08:54	13-Dec-19	09:41	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

OnLine LIMS

0002139593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10038-DEC19**

Analysis	12: L QZ-QTP Wk#12	13: L QZ-TQTP Wk#12	14: L SED Wk#12	15: L TRJ Wk#12	16: V QE-POR Wk#12	17: V QE-POR-QTP Wk#12
Sample Date & Time	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19	10-Dec-19
HumCell Leachate Vol [mL]	922	969	913	982	954	941
pH [no unit]	7.47	7.39	6.96	7.34	7.31	7.25
Alkalinity [mg/L as CaCO3]	9	11	4	8	8	8
Conductivity [uS/cm]	20	27	10	19	17	18
F [mg/L]	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
SO4 [mg/L]	< 0.2	1.6	< 0.2	< 0.2	0.2	0.6
Hg [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Ag [mg/L]	< 0.00005	< 0.00005	0.00008	< 0.00005	< 0.00005	< 0.00005
Al [mg/L]	0.091	0.047	0.065	0.064	0.049	0.056
As [mg/L]	< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	0.0002
Ba [mg/L]	0.00154	0.00136	0.00039	0.00592	0.00035	0.00019
B [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Be [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bi [mg/L]	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Ca [mg/L]	3.71	4.14	1.38	3.11	2.63	2.86
Cd [mg/L]	< 0.000003	< 0.000003	< 0.000003	0.000003	< 0.000003	< 0.000003
Co [mg/L]	0.000021	< 0.000004	0.000009	< 0.000004	< 0.000004	0.000004
Cr [mg/L]	< 0.00008	< 0.00008	0.00013	< 0.00008	< 0.00008	< 0.00008
Cu [mg/L]	0.0006	0.0003	< 0.0002	< 0.0002	< 0.0002	0.0004
Fe [mg/L]	0.099	0.011	0.023	< 0.007	< 0.007	< 0.007
K [mg/L]	0.311	0.370	0.645	0.262	0.173	0.147
Li [mg/L]	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001
Mg [mg/L]	0.327	0.445	0.163	0.195	0.202	0.228
Mn [mg/L]	0.0138	0.0169	0.0107	0.0167	0.0184	0.0240
Mo [mg/L]	0.00018	0.00010	0.00008	0.00021	0.00014	0.00013
Na [mg/L]	0.11	0.20	0.12	0.06	0.13	0.11
Ni [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pb [mg/L]	0.00003	0.00002	0.00002	0.00002	0.00003	0.00002

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10038-DEC19**

Analysis	12: L QZ-QTP Wk#12	13: L QZ-TQTP Wk#12	14: L SED Wk#12	15: L TRJ Wk#12	16: V QE-POR Wk#12	17: V QE-POR-QTP Wk#12
Sb [mg/L]	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
Se (tot) [mg/L]	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sn [mg/L]	< 0.00006	< 0.00006	0.00006	0.00006	0.00007	< 0.00006
Sr [mg/L]	0.0528	0.0193	0.0109	0.0187	0.00303	0.00410
Th [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Ti [mg/L]	0.00009	< 0.00005	0.00017	0.00007	0.00006	< 0.00005
Tl [mg/L]	< 0.000005	< 0.000005	< 0.000005	0.000008	< 0.000005	0.000009
U [mg/L]	0.000228	0.000258	0.000242	0.000134	0.000089	0.000107
V [mg/L]	0.00014	0.00015	0.00036	0.00013	0.00008	0.00012
W [mg/L]	0.00003	0.00004	0.00004	0.00009	0.00005	0.00007
Y [mg/L]	0.000025	0.000007	0.000012	0.000012	0.000019	0.000011
Zn [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10038-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0138-DEC19													
Alkalinity	2	mg/L as Ca	< 2			3	20	102	80	120	NA		
Anions by IC - QCBatchID: DIO0189-DEC19													
Sulphate	0.2	mg/L	<0.2			6	20	96	80	120	96	75	125
Conductivity - QCBatchID: EWL0138-DEC19													
Conductivity	2	uS/cm	< 2			0	20	97	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0134-DEC19													
Fluoride	0.06	mg/L	<0.06			2	10	99	90	110	95	75	125
Inorganics-General - QCBatchID: EHG0010-DEC19													
Mercury	0.00001	mg/L	< 0.00001			ND	20	93	80	120	NV	70	130
Metals - QCBatchID: EMS0072-DEC19													
Cobalt	0.000004	mg/L	<0.000004			1	20	97	90	110	98	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0072-DEC19													
Aluminum	0.001	mg/L	<0.001			3	20	93	90	110	106	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	107	90	110	107	70	130
Arsenic	0.0002	mg/L	<0.0002			11	20	97	90	110	108	70	130
Barium	0.00002	mg/L	<0.00002			8	20	97	90	110	NV	70	130
Beryllium	0.000007	mg/L	<0.000007			ND	20	94	90	110	88	70	130
Bismuth	0.000007	mg/L	<0.000007			ND	20	101	90	110	97	70	130
Boron	0.002	mg/L	<0.002			4	20	100	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			8	20	99	90	110	102	70	130
Calcium	0.01	mg/L	<0.01			4	20	102	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			13	20	96	90	110	95	70	130
Copper	0.0002	mg/L	<0.0002			7	20	96	90	110	99	70	130
Iron	0.007	mg/L	<0.007			12	20	99	90	110	NV	70	130
Lead	0.00001	mg/L	<0.00001			5	20	100	90	110	95	70	130
Lithium	0.0001	mg/L	<0.0001			2	20	95	90	110	NV	70	130
Magnesium	0.001	mg/L	<0.001			4	20	102	90	110	NV	70	130
Manganese	0.00001	mg/L	<0.00001			4	20	99	90	110	NV	70	130
Molybdenum	0.00004	mg/L	<0.00004			4	20	101	90	110	108	70	130
Nickel	0.0001	mg/L	<0.0001			17	20	97	90	110	98	70	130
Phosphorus	0.003	mg/L	0.003			1	20	100	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			7	20	101	90	110	NV	70	130
Selenium (total)	0.00004	mg/L	<0.00004			3	20	101	90	110	NV	70	130
Silver	0.00005	mg/L	<0.00005			ND	20	98	90	110	88	70	130
Sodium	0.01	mg/L	<0.01			3	20	105	90	110	NV	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10038-DEC19**

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank				Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)			Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High			Low	High
Strontium	0.00002	mg/L	<0.00002			5	20	97	90	110		NV	70	130
Thallium	0.000005	mg/L	<0.000005			7	20	100	90	110		97	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	107	90	110		NV	70	130
Tin	0.00006	mg/L	<0.00006			ND	20	94	90	110		NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	94	90	110		NV	70	130
Tungsten	0.00002	mg/L	<0.00002			9	20	100	90	110		NV	70	130
Uranium	0.000002	mg/L	<0.000002			10	20	99	90	110		97	70	130
Vanadium	0.00001	mg/L	<0.00001			7	20	98	90	110		105	70	130
Yttrium	0.000002	mg/L	<0.000002			ND	20	99	90	110		NV	70	130
Zinc	0.002	mg/L	<0.002			2	20	95	90	110		NV	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0079-DEC19														
Manganese	0.00001	mg/L	<0.00001			3	20	103	90	110		NV	70	130
pH - QCBatchID: EWL0138-DEC19														
pH	0.05	no unit	NA			0		100				NA		

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0002139593

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 16 January 2020
LR Report: **CA14489-JAN20**
Reference: Wk#12

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	9: MQZ-QE-POR-QTP-MIN Wk#12
Sample Date & Time					10-Dec-19
HumCell Leachate Vol [mL]	10-Dec-19	09:02	10-Dec-19	13:50	913
Hg [mg/L]	17-Jan-20	10:48	17-Jan-20	10:51	< 0.00001
Cd [mg/L]	17-Jan-20	09:21	21-Jan-20	13:59	< 0.000003

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139636

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA14489-JAN20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Inorganics-General - QCBatchID: EHG0019-JAN20														
Mercury	0.00001	mg/L	< 0.00001			ND	20	107	80	120	NV	70	130	
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0074-JAN20														
Cadmium	0.000003	mg/L	<0.000003			12	20	101	90	110	100	70	130	

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0002139636

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 18 March 2020
LR Report: **CA10124-MAR20**
Reference: Wk#13

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#13	6: LLGO Comp Wk#13
Sample Date & Time					18-Mar-20	18-Mar-20
HumCell Leachate Vol [mL]	18-Mar-20	07:45	18-Mar-20	11:16	957	925
pH [no unit]	18-Mar-20	15:22	19-Mar-20	14:54	7.76	7.69
Conductivity [uS/cm]	18-Mar-20	15:22	19-Mar-20	14:54	26	34

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMT Online

0002139794

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10124-MAR20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0261-MAR20														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
pH - QCBatchID: EWL0261-MAR20														
pH	0.05	no unit	NA			1		101			NA			

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0002139794

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 17 December 2019
LR Report: **CA10105-DEC19**
Reference: Wk# 13

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#13	6: M CG Wk#13	7: M MD Wk#13	8: M QE-POR Wk#13	9: M QZ-QE-POR-QTP-MIN Wk#13	10: SZ QE-POR Wk#13	11: L MD Wk#13
Sample Date & Time					17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19
HumCell Leachate Vol [mL]	17-Dec-19	08:22	17-Dec-19	12:24	908	896	914	921	928	925	904
pH [no unit]	17-Dec-19	15:16	18-Dec-19	14:03	7.41	7.31	7.61	7.50	7.50	7.40	7.60
Conductivity [uS/cm]	17-Dec-19	15:16	18-Dec-19	10:33	21	15	34	22	16	16	24

Analysis	12: L QZ-QTP Wk#13	13: L QZ-TQTP Wk#13	14: L SED Wk#13	15: L TRJ Wk#13	16: V QE-POR Wk#13	17: V QE-POR-QTP Wk#13
Sample Date & Time	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19
HumCell Leachate Vol [mL]	925	955	922	966	941	924
pH [no unit]	7.50	7.45	7.25	7.46	7.39	7.37
Conductivity [uS/cm]	18	24	10	18	15	22

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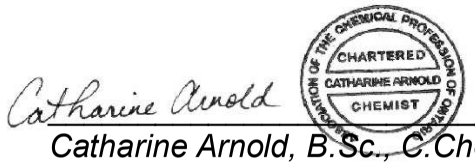
SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10105-DEC19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139599

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10105-DEC19**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0236-DEC19													
Conductivity	2	uS/cm	< 2			0	20	101	90	110	NA		
pH - QCBatchID: EWL0236-DEC19													
pH	0.05	no unit	NA			2		100			NA		

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 25 March 2020
LR Report: **CA10191-MAR20**
Reference: Wk#14

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#14	6: LLGO Comp Wk#14
Sample Date & Time					25-Mar-20	25-Mar-20
HumCell Leachate Vol [mL]	25-Mar-20	07:43	25-Mar-20	12:27	935	919
pH [no unit]	25-Mar-20	13:27	26-Mar-20	10:08	7.61	7.77
Conductivity [uS/cm]	25-Mar-20	13:27	26-Mar-20	10:08	26	26

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 enuO

0002139803

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

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Project : Valentine Gold

LR Report : **CA10191-MAR20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0357-MAR20														
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA			
pH - QCBatchID: EWL0357-MAR20														
pH	0.05	no unit	NA			0		101			NA			

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00021139803

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 24 December 2019
LR Report: **CA10159-DEC19**
Reference: Wk#14

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#14	6: M CG Wk#14	7: M MD Wk#14	8: M QE-POR Wk#14	9: M QZ-QE-POR-QTP-MIN Wk#14	10: SZ QE-POR Wk#14	11: L MD Wk#14
Sample Date & Time					24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19
HumCell Leachate Vol [mL]	23-Dec-19	07:30	24-Dec-19	13:21	914	918	918	927	931	937	908
pH [no unit]	23-Dec-19	15:40	27-Dec-19	16:37	7.65	7.30	7.63	7.64	7.33	7.29	7.77
Conductivity [uS/cm]	23-Dec-19	15:40	27-Dec-19	16:37	23	16	27	17	17	18	20

Analysis	12: L QZ-QTP Wk#14	13: L QZ-TQTP Wk#14	14: L SED Wk#14	15: L TRJ Wk#14	16: V QE-POR Wk#14	17: V QE-POR-QTP Wk#14
Sample Date & Time	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19	24-Dec-19
HumCell Leachate Vol [mL]	932	1000	923	952	928	918
pH [no unit]	7.52	7.47	7.01	7.36	7.32	7.33
Conductivity [uS/cm]	15	24	9	14	12	17

OnLine LIMS

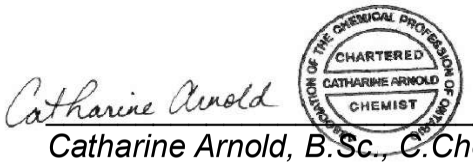
0002139603

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10159-DEC19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139603

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10159-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0316-DEC19													
Conductivity	2	uS/cm	< 2			0	20	98	90	110	NA		
Conductivity - QCBatchID: EWL0324-DEC19													
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA		
pH - QCBatchID: EWL0316-DEC19													
pH	0.05	no unit	NA			0		100			NA		
pH - QCBatchID: EWL0324-DEC19													
pH	0.05	no unit	NA			0		100			NA		

OnLine LIMS

0002139603

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 01 April 2020
LR Report: **CA10003-APR20**
Reference: Wk#15

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#15	6: LLGO Comp Wk#15
Sample Date & Time					01-Apr-20	01-Apr-20
HumCell Leachate Vol [mL]	01-Apr-20	06:15	03-Apr-20	10:34	949	933
pH [no unit]	01-Apr-20	12:15	02-Apr-20	10:36	7.88	7.91
Conductivity [uS/cm]	01-Apr-20	12:15	02-Apr-20	10:36	22	23

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002139829

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10003-APR20**

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Conductivity - QCBatchID: EWL0008-APR20													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
pH - QCBatchID: EWL0008-APR20													
pH	0.05	no unit	NA			0		101			NA		

OnLine LIMS

0002139829

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

11-June-2020

Date Rec. : 31 December 2019
LR Report: **CA10185-DEC19**
Reference: Wk#15

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#15	6: M CG Wk#15	7: M MD Wk#15	8: M QE-POR Wk#15	9: MQZ-QE-POR-QTP-MIN Wk#15	10: SZ QE-POR Wk#15
Sample Date & Time					31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19
HumCell Leachate Vol [mL]	31-Dec-19	08:43	02-Jan-20	08:06	917	931	943	945	956	956
pH [no unit]	31-Dec-19	13:31	06-Jan-20	09:05	7.34	7.23	7.54	7.20	7.25	7.32
Conductivity [uS/cm]	02-Jan-20	09:57	06-Jan-20	09:05	16	12	26	17	17	14

Analysis	11: L MD Wk#15	12: L QZ-QTP Wk#15	13: L QZ-TQTP Wk#15	14: L SED Wk#15	15: L TRJ Wk#15	16: V QE-POR Wk#15	17: V QE-POR-QTP Wk#15
Sample Date & Time	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19
HumCell Leachate Vol [mL]	928	958	987	936	974	942	935
pH [no unit]	7.43	7.22	7.67	7.50	7.21	7.18	7.16
Conductivity [uS/cm]	22	18	24	9	17	15	17

Revised report sent with QC report added.

OnLine LIMS

0002146844

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10185-DEC19**

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0002146844

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10185-DEC19**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
Conductivity - QCBatchID: EWL0007-JAN20														
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA			
Conductivity - QCBatchID: EWL0013-JAN20														
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA			
Conductivity - QCBatchID: EWL0028-JAN20														
Conductivity	2	uS/cm	2			0	20	99	90	110	NA			
pH - QCBatchID: EWL0382-DEC19														
pH	0.05	no unit	NA			0		99			NA			

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0002146844

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Quoted for 20 Weeks

Project : Valentine Gold

05-June-2020

Date Rec. : 31 December 2019
LR Report: **CA10185-DEC19**
Reference: Wk#15

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: M AQPOR Wk#15	6: M CG Wk#15	7: M MD Wk#15	8: M QE-POR Wk#15	9: M QZ-QE-POR-QTP-MIN Wk#15	10: SZ QE-POR Wk#15	11: L MD Wk#15
Sample Date & Time					31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19
HumCell Leachate Vol [mL]	31-Dec-19	08:43	02-Jan-20	08:06	917	931	943	945	956	956	928
pH [no unit]	31-Dec-19	13:31	06-Jan-20	09:05	7.34	7.23	7.54	7.20	7.25	7.32	7.43
Conductivity [uS/cm]	02-Jan-20	09:57	06-Jan-20	09:05	16	12	26	17	17	14	22

Analysis	12: L QZ-QTP Wk#15	13: L QZ-TQTP Wk#15	14: L SED Wk#15	15: L TRJ Wk#15	16: V QE-POR Wk#15	17: V QE-POR-QTP Wk#15
Sample Date & Time	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19	31-Dec-19
HumCell Leachate Vol [mL]	958	987	936	974	942	935
pH [no unit]	7.22	7.67	7.50	7.21	7.18	7.16
Conductivity [uS/cm]	18	24	9	17	15	17

OnLine LIMS

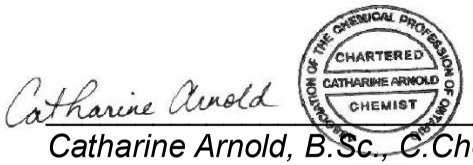
00021399609

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Quoted for 20 Weeks

Project : Valentine Gold

LR Report : **CA10185-DEC19**



Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00021399609

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

05-June-2020

Marathon Gold Corp
Attn : James Powell

P.O. Box 4006, Pearlgate PO, Mt. Pearl
Canada, A1N 0A1
Phone: 709-730-5046, Fax:

Date Rec. : 08 April 2020
LR Report: **CA10036-APR20**
Reference: Wk#16

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#16	6: LLGO Comp Wk#16
Sample Date & Time					08-Apr-20	08-Apr-20
HumCell Leachate Vol [mL]	08-Apr-20	07:35	13-Apr-20	11:45	936	924
pH [no unit]	08-Apr-20	12:47	14-Apr-20	17:22	7.67	9.06
Alkalinity [mg/L as CaCO3]	08-Apr-20	12:47	09-Apr-20	13:42	9	10
Conductivity [uS/cm]	08-Apr-20	12:47	09-Apr-20	13:42	19	20
F [mg/L]	09-Apr-20	11:39	14-Apr-20	07:19	< 0.06	< 0.06
SO4 [mg/L]	09-Apr-20	15:58	14-Apr-20	16:11	0.8	0.4
Hg [mg/L]	09-Apr-20	17:00	13-Apr-20	16:01	< 0.00001	< 0.00001
Ag [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00005	< 0.00005
Al [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.065	0.077
As [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.0002	0.0002
Ba [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.00154	0.00094
B [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.002	0.002
Be [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.000007	< 0.000007
Bi [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.000007	< 0.000007
Ca [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	3.10	2.95
Cd [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.000003	< 0.000003
Co [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.000004	< 0.000004
Cr [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00008	< 0.00008
Cu [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.0002	< 0.0002
Fe [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.007	< 0.007
K [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.123	0.203
Li [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.0001	< 0.0001
Mg [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.190	0.371
Mn [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.0260	0.0114
Mo [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.00086	0.00572
Na [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.14	0.19
Ni [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.0001	< 0.0001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10036-APR20**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MLGO Comp Wk#16	6: LLGO Comp Wk#16
P [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.003	< 0.003
Pb [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00001	< 0.00001
Sb [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.0009	< 0.0009
Se [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00004	< 0.00004
Sn [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00006	0.00006
Sr [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.00591	0.0135
Th [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.0001	< 0.0001
Ti [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.00005	< 0.00005
Tl [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.000005	< 0.000005
U [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.000161	0.000520
V [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.00011	0.00022
W [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.00012	0.00036
Y [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	0.000008	0.000003
Zn [mg/L]	15-Apr-20	22:18	14-Apr-20	16:29	< 0.002	< 0.002

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

SMN1 neNuO

0002139835

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10036-APR20**

Quality Control Report

Inorganic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0105-APR20													
Alkalinity	2	mg/L as Ca	< 2			0	20	96	80	120	NA		
Anions by IC - QCBatchID: DIO0134-APR20													
Sulphate	0.2	mg/L	<0.2			0	20	92	80	120	94	75	125
Conductivity - QCBatchID: EWL0105-APR20													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
Fluoride by Specific Ion Electrode - QCBatchID: EWL0126-APR20													
Fluoride	0.06	mg/L	<0.06			ND	10	104	90	110	101	75	125
Fluoride by Specific Ion Electrode - QCBatchID: EWL0149-APR20													
Fluoride	0.06	mg/L	<0.06			ND	10	104	90	110	100	75	125
Inorganics-General - QCBatchID: EHG0013-APR20													
Mercury	0.00001	mg/L	< 0.00001			ND	20	113	80	120	117	70	130
Metals - QCBatchID: EMS0050-APR20													
Cobalt	0.000004	mg/L	<0.000004			3	20	104	90	110	106	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0050-APR20													
Aluminum	0.001	mg/L	<0.001			2	20	93	90	110	111	70	130
Antimony	0.0009	mg/L	<0.0009			ND	20	101	90	110	111	70	130
Arsenic	0.0002	mg/L	<0.0002			ND	20	108	90	110	106	70	130
Barium	0.00002	mg/L	<0.00002			2	20	101	90	110	NV	70	130
Beryllium	0.000007	mg/L	<0.000007			ND	20	99	90	110	95	70	130
Bismuth	0.000007	mg/L	<0.000007			11	20	100	90	110	90	70	130
Boron	0.002	mg/L	<0.002			5	20	105	90	110	NV	70	130
Cadmium	0.000003	mg/L	<0.000003			18	20	102	90	110	106	70	130
Calcium	0.01	mg/L	<0.01			1	20	100	90	110	NV	70	130
Chromium	0.00008	mg/L	<0.00008			17	20	103	90	110	83	70	130
Copper	0.0002	mg/L	<0.0002			3	20	106	90	110	90	70	130
Iron	0.007	mg/L	<0.007			1	20	100	90	110	100	70	130
Lead	0.00001	mg/L	<0.00001			1	20	100	90	110	98	70	130
Lithium	0.0001	mg/L	<0.0001			4	20	99	90	110	75	70	130
Magnesium	0.001	mg/L	<0.001			1	20	98	90	110	114	70	130
Manganese	0.00001	mg/L	<0.00001			6	20	107	90	110	100	70	130
Molybdenum	0.00004	mg/L	<0.00004			1	20	104	90	110	101	70	130
Nickel	0.0001	mg/L	<0.0001			4	20	106	90	110	102	70	130
Phosphorus	0.003	mg/L	<0.003			ND	20	100	90	110	NV	70	130
Potassium	0.003	mg/L	<0.009			1	20	100	90	110	NV	70	130
Selenium	0.00004	mg/L	<0.00004			0	20	101	90	110	101	70	130

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Comp

Project : Valentine Gold

LR Report : **CA10036-APR20**

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Silver	0.00005	mg/L	<0.00005			ND	20	104	90	110	93	70	130
Sodium	0.01	mg/L	<0.01			2	20	104	90	110	NV	70	130
Strontium	0.00002	mg/L	<0.00002			1	20	103	90	110	NV	70	130
Thallium	0.000005	mg/L	<0.000005			0	20	102	90	110	99	70	130
Thorium	0.0001	mg/L	<0.0001			ND	20	90	90	110	NV	70	130
Tin	0.00006	mg/L	9.6e-005			ND	20	102	90	110	NV	70	130
Titanium	0.00005	mg/L	<0.00005			ND	20	103	90	110	NV	70	130
Tungsten	0.00002	mg/L	<0.00002			ND	20	99	90	110	NV	70	130
Uranium	0.000002	mg/L	<0.000002			4	20	102	90	110	96	70	130
Vanadium	0.00001	mg/L	<0.00001			7	20	107	90	110	111	70	130
Yttrium	0.000002	mg/L	<0.000002			0	20	105	90	110	NV	70	130
Zinc	0.002	mg/L	<0.002			7	20	106	90	110	NV	70	130
pH - QCBatchID: EWL0105-APR20													
pH	0.05	no unit	NA			0		99			NA		

OnLine LIMS

0002139835