NEW GOLD RAINY RIVER MINE
APPENDIX A
GEOCHEMICAL MONITORING PLAN AND RESULTS

NEW GOLD RAINY RIVER MINE
APPENDIX A.1
GEOCHEMICAL MONITORING PLAN

RAINY RIVER PROJECT

CONSTRUCTION AND OPERATION PHASES GEOCHEMICAL MONITORING PLAN

PER ENVIRONMENTAL COMPLIANCE APPROVAL

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1.0 PROJECT BACKGROUND

New Gold Inc. (New Gold) is planning to construct, operate and eventually reclaim a new open pit and underground gold mine, the Rainy River Project (RRP) to produce doré bars (gold with silver) for sale. Physical works related to the RRP will consist primarily of:

- Open pit;
- Underground mine;
- Overburden, mine rock and low grade ore stockpiles;
- Primary crusher and process plant;
- Tailings management area;
- 230 kilovolt transmission line;
- Relocation of a portion of gravel-surfaced Highway 600; and
- Associated buildings, facilities and infrastructure.

During the construction phase of the project in broad terms the following activities will involve disturbance of overburden or rock:

- Pre-stripping of the open pit in preparation for production mining;
- Extraction of sand and gravel from the Roen Road Pit and production of crushed rock from the Tait Quarry and Outcrop 3 Quarry;
- Road construction including the East Access Road and realignment of Highway 600;
- Preparation and construction of water management structures / dams;
- Levelling and grade preparation for the plant site and foundation preparation for site buildings; and
- Excavation and establishment of diversion channels.

The operation phase of the project will include the following activities involving the disturbance of overburden or rock:

- Continued stripping of the open pit in support of production mining;
- Placement of overburden and rock in the mine stockpiles;
- Production mining from the open pit and eventually, underground mine

- Potential for ongoing extraction of sand and gravel from the Roen Road Pit and production of crushed rock from the Tait Quarry and Outcrop 3 Quarry; and

- Raising of existing water management structures / dams.

An extensive mine rock characterization study related to the future open pit has been conducted along with additional targeted investigations of the quarry sites (including Tait Quarry and Outcrop 3 Quarry), the plant site, and the Stockpile Pond Diversion Channel. In addition, a mine rock and overburden management plan was developed for the RRP Environmental Assessment (EA 05-09-02) and Closure Plan (EAIMS 13102):

- Final Environmental Assessment Report (Environmental Impact Statement), Version 2, Rainy River Project, Township of Chapple, Ontario (AMEC 2014a).

- Closure Plan, Rainy River Project, Version 1 (Amec Foster Wheeler 2015).

With respect to overburden materials, only the generally coarse grained Labradorean age Whiteshell till has been identified with a possibility of containing potentially acid generating (PAG) material, and then only when in the proximity of mineralized bedrock. Based on investigations to date, the till is expected to be encountered at depth (>5 m) which will generally limit the locations were this material will be encountered; although where shallow bedrock is present, limited near surface exposures could be present. In short, coarse till materials within approximately 3 m of bedrock surface represent some risk of acidic drainage and require consideration in terms of geochemical monitoring.

2.0 PURPOSE AND SCOPE OF MONITORING PLAN

Through the environmental approvals process for construction and operation of the RRP, New Gold is required to prepare a number of plans for submission to the Ministry of the Environment and Climate Change (MOECC). Version 1 of this document was prepared to satisfy the requirement per Environmental Compliance Approval (ECA) 5781-9VJQ2J Condition 10 (10), for a geochemical monitoring plan to be followed to characterize non-ore mine rock (hereafter mine rock) and overburden resulting from the construction phase of the RRP. The ECA condition states the following:

> *The Owner shall submit a Geochemical Monitoring Plan to the District Manager for approval within thirty (30) days of issuance of this Approval. This plan shall assess the potential acid generating conditions of all materials extracted during the construction phase, either as mine waste rock or to be used for construction purposes, such that these materials can be handled appropriately.*

This approval was issued on May 8, 2015 and the plan was provided to the MOECC prior to June 7, 2015.

The plan was subsequently revised and re-issued as Version 2, to address the requirements of ECA 5178-9TUPD9 issued on September 1, 2015 as follows:

> *The Owner shall submit a Geochemical Monitoring Plan to the District Manager for approval within thirty (30) days of issuance of this Approval. This plan shall assess the potential acid generating conditions of all materials extracted during the construction and operations phases, either as mine waste rock or to be used for construction purposes, such that these materials can be handled appropriately.*

The document has subsequently been revised and re-issued as Version 3, to address several comments provided by MOECC dated December 11, 2015.

This plan is intended to fulfill New Gold's obligation to appropriately identify and manage PAG mine rock and overburden for the RRP during construction and preproduction phases of the project. Construction of the RRP will occur over a period of approximately 30 months (second quarter 2015 through 2017).

Accordingly, this plan has been developed to monitor all overburden and rock materials extracted by the project where PAG material has been identified or could be present and incorporates existing investigation findings where available. The plan also includes guidance on minimum monitoring requirements for any excavation of rock or overburden to be conducted at the site during construction.

It is envisioned that the geochemical monitoring plan will evolve over the life of the RRP and be revised, as additional site specific data is collected and interpreted. Additional monitoring requirements related to underground mining will be developed at a later date and prior to initiation of underground mine development.

For the purposes of this Geochemistry Monitoring Plan, suitably trained and supervised personnel are defined as appropriately trained New Gold geologists or engineers, or another person suitably trained and supervised in the action or procedure by such New Gold geologist or engineer.

3.0 ACID ROCK DRAINAGE STANDARDS AND CRITERIA

3.1 Applicable Standards in Ontario

The approach and methodology for the collection and characterization of overburden and Mine rock materials is based upon the requirements described under the Ontario *Mining Act*; namely guidance found within the document:

- DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine sites in British Columbia (Price 1997) which has been updated in the document Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND 2009).

The MEND (2009) document represents best practice and industry standard approaches and methodologies for metal leaching / acid rock drainage (ML/ARD) sampling and characterization in Canada.

The standards for characterization, segregation and management of PAG rock for the RRP have been established based on site specific studies and best practices that are detailed in the Closure Plan and in accordance with Ontario standards.

3.2 PAG Rock Criteria

For the RRP a threshold of neutralization potential ratio of less than two (NPR <2) has been established previously to identify PAG rock:

- Mine Rock and Overburden Management Plan, Rainy River Project (AMEC 2014b).

For the open pit a further categorization of PAG rock has been developed on the basis of inferred time to acid onset (time to neutralization potential; NP depletion) as identified in Table 1.

Table 1: NP Threshold Values for Open Pit PAG Subdivision

PAG Class	Depletion of NP Years	Available NP* Threshold kg $CaCO_3$/t
PAG 1	<5	12.5
PAG 2	5 to 15	19
PAG 3	>15	>19

*Available NP = Measured Sobek NP minus 10 kg $CaCO_3$/t to account for assumed unavailable

4.0 OVERBURDEN GEOCHEMICAL MONITORING REQUIREMENTS

The overburden geochemical monitoring plan includes the following:

- Overburden excavation / management activities exempt from monitoring;
- A minimum monitoring requirement applicable to any excavation;
- Monitoring requirements for the Roen Road Pit; and
- Monitoring requirements where the potential for management of PAG overburden (inferred PAG in Whiteshell till) has already been identified.

In the event Whiteshell till material is identified it will be managed as PAG material, with tracking and documentation of appropriate onsite disposal.

4.1 Overburden Excavation Activities Exempt from Monitoring

The intent of the Geochemical Monitoring Plan is to identify and monitor overburden materials that represent a risk of ARD if disturbed and exposed to air. The following activities are considered low risk and are therefore exempt from overburden monitoring requirements:

- Topsoil stripping; and
- Narrow strip excavations (such as utilities and footings) where excavated overburden material will be backfilled in place.

Excess material from stripping (excavations) that requires removal with final placement at surface including stockpiles, is subject to minimum monitoring overburden requirements described in Section 4.2.

4.2 Minimum Overburden Monitoring Requirements

During construction, any excavation of overburden (with the exception of exclusions identified in Section 4.1) is subject to the following requirements to be conducted by suitably trained and supervised personnel:

- Review of excavation plans to confirm size, location and depth of planned excavation.
- Review of available geology information in proximity to the planned excavation to assess the presence of mineralized bedrock.

- Review of available surficial geology information in proximity to the planned excavation especially in terms of depth to bedrock and previously mapped or logged surficial geology.

- Where data is sufficient to reasonably rule out the possible presence of Whiteshell till or identify bedrock at more than 2 m below the maximum excavation depth, this will be supported by at least one documented inspection of the open excavation during the work to confirm Whiteshell till was not encountered.

- Where data is insufficient to reasonably rule out the possible presence of Whiteshell till within the planned excavation, the excavation will be monitored visually at a frequency or tonnage commensurate with progress to identify and document if Whiteshell till is encountered in the excavation.

- Where Whiteshell till is identified in the excavation, it will be handled and managed as PAG overburden material unless investigation is completed to confirm the material is non-potentially acid generating (NPAG) material.

- In the absence of a testing program, Whiteshell till will be visually segregated on the basis of textural contrast with the finer overlying material (consistent with previous investigations and testing results) and managed accordingly as PAG material.

- Quantities of Whiteshell till managed as PAG will be recorded and their storage in PAG management areas documented.

Note it is presently considered that the Whiteshell till material will be limited in extent in planned excavations and as a result, it is not cost effective to sample, analyse and segregate PAG from NPAG material for this unit. In the event that quantities dictate otherwise, a standard operating procedure and testing program will be developed to support such segregation. Such a testing program, if implemented, could take the form of sampling of the Whiteshell till material with ABA screening by carbon and sulphur analyses. Alternately testing could involve temporary stockpiling of the Whiteshell till material with sampling and routine ABA analysis.

4.3 Roen Road Pit Overburden

Amec Foster Wheeler has identified no concern regarding the potential for presence of PAG material within sand and gravel of the Roen Road Pit. On this basis, monitoring for the Roen Road Pit will include visual inspection at a frequency commensurate with the excavation progress and the risk of exposing PAG material. In the event any concerns are identified through visual inspection, additional testing and evaluation will be completed; and if appropriate, the minimum monitoring requirements identified in Section 4.2 will be applied.

4.4 Open Pit Overburden

The monitoring plan for overburden within the open pit will follow all requirements identified in Section 4.2 with the exception that previous investigations have already identified the presence of possible PAG material as Whiteshell till. Monitoring can be guided by available geological and geochemical investigations already completed.

4.5 Preparation of Mine Rock Stockpiles

Ditching and related activities required for the construction of the East and West Stockpiles will follow all requirements identified in Section 4.2.

5.0 MINE ROCK GEOCHEMICAL MONITORING PLAN

The mine rock monitoring plan includes the following:

- A generic monitoring requirement for excavation of bedrock where insufficient or no previous characterization has been conducted to confirm or refute the presence of PAG rock;
- A minimum on-going monitoring requirement applicable to any blasting and excavations with a low risk of PAG as defined by previous investigations and sampling; and
- Specific monitoring requirements for previously investigated project components.

Sampling conducted in support of this geochemistry monitoring plan will be carried out by suitably trained and supervised personnel following accepted technical practices.

For sampling of blast hole cuttings which are integral to both production and environmental sampling, the following approach is defined:

- For each blast hole to be sampled, a channel sample of cuttings will be collected by a suitably trained and supervised person, and placed in a labelled plastic rock bag; and
- Following sample collection, the sample will be either immediately placed into the sample queue for analysis under chain of custody, or placed on the drill hole marker (red hat placed in the drill collar) and picked up twice daily by a member of the New Gold geology team for placement in sample queue and chain of custody for analysis.

Any unanticipated sampling challenges will be documented by New Gold geologists or engineers, along with the means to mitigate and avoid in the future if applicable.

5.1 Generic Bedrock Geochemical Monitoring (Areas Not Investigated)

During construction, any blasting and/or excavation of bedrock sources not previously investigated (Sections 5.3 to 5.6 provide monitoring requirements for previously investigated areas) is subject to the following requirements that are to be conducted under the direction of suitably trained and supervised personnel:

- Review of excavation plans to confirm size, location and depth of planned excavation into bedrock.

- Review available bedrock geology and geochemical information in proximity to the planned excavation especially in terms of lithology, potential for sulphide mineralization, inspection of any detailed core logs and availability of previous geochemical testing.

- Conduct a reconnaissance geological inspection of surface outcrop or exposed subcrop and submit grab rock samples for geochemical testing (including visual worst case sampling) of at least one sample from each distinct lithological unit.

- Where excavations are to extend to more than 3 m below bedrock surface or where surficial cover limits surface inspection and sampling; drilling and sampling will be completed with sample selection, review and interpretation of results.

- Where investigations are completed and indicate a low potential for PAG rock, geochemical monitoring will proceed as described in Section 5.2.

- Where PAG rock is confirmed to be present or where screening investigations cannot be completed due to construction time constraints; sampling and analysis of blast hole cuttings or excavated rock will be completed for <u>each</u> blast hole drilled or at most every 2,000 m^3 of material produced.

- Segregation and management of PAG materials will be directed by the testing results as interpreted by suitably trained and supervised personnel or per a plan prepared by suitably trained and supervised personnel.

- Quantities of PAG rock managed will be recorded and their management in appropriate PAG management areas documented.

5.2 Minimum Bedrock Monitoring Requirements (Low Risk of PAG)

Bedrock excavations that have been identified at the lowest risk for the presence of PAG material on the basis of previous geochemical investigation and sampling (Section 5.1), will be subject to the following minimum on-going monitoring by suitably trained and supervised personnel:

- For each active excavation, suitably trained and supervised personnel will routinely confirm continuity of observed geology with that described in characterization investigations, and conduct a more formal visual inspection with collection of a representative sample of each distinct lithology at every 100,000 cubic metres (m^3) of material moved; and

- Photograph and document conditions at the time of the detailed assessment.

If unexpected sulphide mineralization not observed in prior investigations is encountered, suspect material will be left in place or stockpiled pending further assessment by suitably trained and supervised personnel.

5.3 Crushed Rock from Quarries

Available ML/ARD investigations for the Tait Quarry and Outcrop 3 Quarry have determined that there is low potential to encounter PAG material in development of these sources. Therefore, these sources will be subject to the minimum monitoring requirements specified in Section 5.2.

In the event additional quarries or aggregate sources are identified or the quarry designs change significantly with respect to aerial extent or depth, the requirements specified in Section 5.1 will apply.

5.4 Open Pit Mine Rock

Segregation of mine rock will be based on management of acid generation potential. Metal leaching in the absence of acidic conditions appears to be of minimal concern for the RRP mine rock wastes based on all testing to date.

Open pit mining at the RRP will follow the standard practice of an open pit operation, with a conventional drill and blast, load and haul cycle. The mine rock produced by the pit excavation will be segregated into either PAG or NPAG rock. The methodologies used will be the same that are employed for ore / waste grade control during operations.

Prior to the blast, blast hole cuttings will be sampled and analysed to confirm the geochemistry of the mining block. Mine rock blast holes will be spaced on a 7.0 m x 7.5 m pattern and a 10 m bench height. Sample collection protocols will follow those used for grade control, with subsamples collected from the cuttings surrounding the completed blast holes.

Blast hole subsamples will be analysed for total sulphur and inorganic carbon using an onsite instrumentation to generate surrogate AP and NP values and guide definition of PAG and NPAG rock for appropriate management.

During mine planning the ARD block model will be merged with the mine plan to classify the mine rock into the following categories and schedule its blasting and excavation from the pit:

- Ore;
- Low Grade Ore;
- NPAG mine rock;
- PAG 1 waste;
- PAG 2 waste; and
- PAG 3 waste.

The distribution of these material types will be determined for each blast (dig limits) and compared against the results of the blast hole sampling for confirmatory purposes prior to haulage. Dig limits will be defined using the same protocols as those used for grade control. Blast hole sampling results for ARD parameters (NP and AP derived from the carbon and sulphur analysis) will be provided to the mine geology department for calculation of NPR values for each blast hole and incorporation of this information into the grade control database. This information will be used to determine the dig limits of the mining blocks as: ore, low grade ore, or waste. Waste block dig limits will be further subdivided into NPAG, PAG 1, PAG 2 and PAG 3. Results from the mapping of these ore and waste categories will be transferred to the mine survey so that the dig limits can be mapped onto each individual blast pattern.

To track the removal and placement of mine rock, daily shift reports will be completed that describe the materials moved (by truck counts) from the pit to the stockpiles, or other locations on site. This information will be maintained in a database and used to cross check material inventories/volumes generated from the ARD block model and mine plan, plus as-built surveys of the mine rock stockpiles.

On a monthly basis, a comparison of the blast hole Leco analysis for C and S will be compared against the replicate samples analysed for ABA parameters (Section 6.0 and 7.2). These results will be used to improve the segregation of PAG and NPAG rock based on the on-going surrogate analyses. Based on analytical experience, the replicate ABA analysis may be reduced to a subset of ABA indicator parameters as supported by review of the on-going results.

The information collected from these confirmatory steps will be compiled and reported annually and reviewed to validate/correct the ML/ARD predictions and the ARD block model results. Where applicable, improvements to optimize the mine rock management plan will be identified and implemented. The frequency of duplicate checks and verification against the block model may be reduced as experience is gained with on-going sampling.

The above description reflects monitoring in close proximity to ore where segregation is expected to be complex. For regions of the RRP open pit away from the ore, the complexity in mine rock management may be substantially less. It is expected that experience gained with the block model and on-going testing will support establishing a reduced frequency of blast hole testing particularly in certain areas of the pit. Based on this experience, a standard operating procedure will be developed to guide blast hole sampling density requirements and methods that may vary by area within pit development.

Management of PAG rock within the pit will be in accordance with the open pit mine rock management plan.

Only NPAG rock defined on the basis of methods outlined above would be deemed suitable for use as site construction aggregate, with the exception that PAG may be used under the following condition as agreed to through the Environmental Assessment process:

- Environmental Commitment #25: PAG material would only be used for fill material in areas where it can be maintained in a saturated state to exclude oxygen and inhibit Sulphide oxidation. These uses may include underground backfill and construction of the upstream portion of the TMA dams.

5.5 Plant Site Regrading

PAG rock has been identified as likely to be present within portions of the planned construction excavation areas in rock at the plant site. All excavated rock in support of plant site construction will be considered PAG and managed accordingly; or alternatively will be subject to segregation on the basis of screening analysis of blast hole cuttings. The specific sampling strategy for the screening analysis may be supported by available characterization data.

5.6 Diversion Channels

PAG rock has been identified within planned excavation limits of only the Stockpile Diversion Channel and none of the other diversion channels proposed at the RRP. All excavated rock in support of the Stockpile Diversion Channel will be considered PAG and managed accordingly; or alternatively will be subject to segregation on the basis of screening analysis of blast hole cuttings. The specific sampling strategy may be supported by available characterization data.

The presence of PAG rock within localized sections of the Stockpile Diversion Channel has a potential to lead to poorer quality drainage or add metal loadings to water draining through this channel. The following provisions have been made to manage this concern during the construction and operation of this diversion channel:

- Overblasting of the base of the channel section with suspected PAG rock by 1.3 m during construction, and lining the channel base of this section with 1 to 1.2 m of compacted local clay;

- Visual walkover and photo documentation inspection of rock sidewalls and channel twice annually (spring and late summer or fall) noting evidence of changes in rock or water condition (e.g. iron staining related to ARD);

- Annual sampling of water quality under low flow conditions (e.g. summer or early fall) to assess ARD and metal related loadings, and trends at the Stockpile Diversion Channel discharge; and

- Annual water sampling of water at the exit from the channel to include at a minimum a flow rate estimate, field measured temperature, pH and conductivity, and laboratory analysis consistent with the parameters specified for leachable metals analysis as identified in Table 2.

In the event mitigation of ML/ARD concerns from sidewalls is required, provision has been made for isolation of this material by application of shotcrete to problematic areas of the channel side walls.

5.7 Underground Mine Rock

Development of the Underground Mine is still in the planning stages with work scheduled to begin in 2017. A geochemical monitoring plan for underground mine rock will be developed prior to advancing the underground workings once the mine plan is complete and geochemical verification of the rock units to be encountered is understood.

Table 2: Analytical Methods for Geochemical Monitoring Plan

Test	Category	Parameter	Unit	Method Code	Detection Limit
S & C Analysis	ABA Screening	Carbon (Total)	%	CSA06V	0.005
		Sulphur (Total)	%	CSA06V	0.005
		Maximum Potential Acidity*	$CarbNP/AP_{max}$	Calc.	-
Modified Acid Base Accounting	Routine ABA	Paste pH	pH	Sobek	0.2
		Total Inorganic Carbon	%	CSB02V	0.1
		$CaCO_3$ (CarbNP)	kg $CaCO_3$/t	Calc.	-
		Carbon (Total)	%	CSA06V	0.005
		Sulphur (Total)	%	CSA06V	0.005
		Sulphur (SO_4)	%	CSA07V	0.01
		Sulphur (S^{-2})	%	CSA08D	0.01
		Sulphur (S^{-2})	%	Calc.	-
		Acid Potential (AP)	kg $CaCO_3$/t	Calc.	-
		Modified NP (NP)	kg $CaCO_3$/t	Modified	0.5
		NPR	NP/AP	Calc.	-
		Fizz Test	-	Sobek	-
Low Level Metals by Aqua-Regia Digestion with ICP-MS Finish	Metals Screening	Ag, Al, B , Ba, Ca, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, P, S, Sr, Ti, V, Zn, Zr, As, Be, Bi, Cd, Ce, Co, Cs, Ga, Ge, Hf, Hg, In, La, Lu, Mo, Nb, Pb, Rb, Sb, Sc, Se, Sn, Ta, Tb, Te, Th, Tl, U, W, Y, Yb	% and ppm	ICM14B	varies by element
Low-Level Selenium Assays	Metals Screening	Se	ppm	HAS14B	0.05
Shake Flask Extraction - (3:1 Liquid to Solid Ratio)	Leachable Metals	pH	pH	Meter	0.1
		Redox	mV	Meter	1
		Conductivity	uS/cm	Meter	1
		Acidity (to pH 4.5)	mg $CaCO_3$/L	Titration	1
		Total Acidity (to pH 8.3)	mg $CaCO_3$/L	Titration	1
		Alkalinity	mg $CaCO_3$/L	Titration	1
		Chloride	mg/L	Ion Chrom.	0.1
		Fluoride	mg/L	Spec. Ion Electrode	0.2
		Sulphate	mg/L	Turbidity	0.06
		Hardness $CaCO_3$	mg/L	Calc.	-
		Major Anions	meq/L	Calc.	-
		Major Cations	meq/L	Calc.	-
		Difference	meq/L	Calc.	-
		Balance (%)	%	Calc.	-
		Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, S, Tl, Sn, Ti, U, V, Zn, Zr	mg/L and µg/L	ICP-MS	varies by element

Note:
* maximum potential acidity assumes no iron carbonate present

6.0 ANALYTICAL TESTING METHODS

The analytical methods to be applied for the construction phase of the RRP as described in this Geochemical Monitoring Plan are provided in Table 2. Two general approaches to testing will occur at the RRP:

- Carbon and sulphur analyses (screening acid base accounting (ABA) analysis); and
- Follow-up ABA analyses (routine ABA analysis).

Screening of PAG materials at the RRP by analyzing carbon and sulphur is considered to be a conservative surrogate for full ABA analysis and is suitable for application in most areas (AMEC 2014b). This method provides data in a timely and cost-effective manner to support active excavations where PAG rock may be present. Determination of NPR on the basis of carbon and sulphur will be supported by routine ABA analysis as described in Table 2. For blast hole sampling, routine ABA analysis of laboratory splits (replicate analyses) will be completed at a rate of 1 in 20 samples to allow monitoring against the surrogate ABA analysis. Alternatively, supported by on-going test results, key target parameters within the routine ABA suite (rather than the full set) may be established for the program based on experience. The routine ABA analytical list will also form the basis of any additional characterization investigations should they be required. Metals screening and leachable metal testing will be also be completed on selected samples.

7.0 DOCUMENTATION AND QUALITY ASSURANCE / CONTROL OF DATA

The following sections outline specific documentation and quality assurance / control requirements related to geochemical monitoring.

7.1 Documentation

For each excavation a complete set of notes will be maintained documenting pertinent assessment, sampling and analysis completed.

A database will be established for all analytical data collected recording excavation identification, sample ID, sample location, lithology, and analytical results. For blast hole monitoring, the blast hole ID and bench references will also be included.

7.2 Analytical Quality Assurance and Quality Control

Standard operating procedures will be developed for all overburden and mine rock sampling at the RRP site. Samples will be submitted to onsite or offsite laboratories as appropriate under chain of custody documentation developed as part of the procedures.

Field duplicate and laboratory replicate samples will be submitted for analysis at a rate of 1 sample in 20 samples, or as established in the standard operating procedures. Laboratory replicate samples will be analysed at a qualified commercial laboratory for the routine ABA suite or a subset ABA parameters as identified in the standard operating procedures.

7.3 Reporting

An annual geochemical monitoring report including all characterization work completed for PAG rock segregation and mine rock and overburden quality assessment will be prepared in support of the annual Works Performance and Surface Water Monitoring reports.

8.0 QUALIFICATIONS OF AUTHOR AND REVIEWERS

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NEW GOLD RAINY RIVER MINE
APPENDIX A.2
GEOCHEMICAL MONITORING RESULTS

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Memorandum

To:	Sitotaw Yirdaw, Senior Water Resources Engineer
From:	Jared Robertson, Senior Geochemist
Cc:	Brent Kazamel – Okane Consultants
Our ref:	1003-222-001
Date:	March 25, 2022
Re:	**Rainy River Mine 2021 Annual Geochemical Monitoring Report**

The Rainy River Mine (RRM) has requested that Okane Consultants (Okane) compile and assess geochemical monitoring data collected in 2021 by RRM with respect to requirements defined in the "Construction and Operation Phases Geochemical Monitoring Plan" (Geochemical Monitoring Plan; AFW, 2016). Monitoring requirements outlined in the Geochemical Monitoring Plan were developed per Environmental Compliance Approvals #5781-9VJQ2J Condition 10 (10) and #5178-9TUPD9 Condition 8 (12). The approach and methodology provided in the Geochemical Monitoring Plan were developed in accordance with guidance in the Prediction Manual for Drainage Chemistry from Sulfidic Geologic Materials (MEND, 2009). This technical memorandum provides the following:

- Summary of current mine rock classification and segregation approach;
- Description of database developed to manage data and information per the Geochemical Monitoring Plan;
- Geochemical classification of mine rock and overburden produced from the open pit in 2021;
- Placement locations of all mine rock and overburden within the RRM site;

- Assessment of quality assurance/quality control audit data;
    - Laboratory duplicates analyzed for carbon and sulfur at the RRM onsite LECO facility to check precision of data used for operational classification of mine rock and overburden
    - Samples submitted to off-site laboratories for acid-base accounting (ABA) analysis to check accuracy of the onsite LECO analyses;
- Appendices that provide tabulated audit data and laboratory reports

The following report is preliminary and only contains partial data for 2021 due to delayed laboratory turnaround times. A final report with the complete dataset will be issued once the data is available. Dataset limitations are indicated in the appropriate sections.

Summary of Current Mine Rock Classification and Segregation Approach

Operationally, mine rock and overburden are classified as potentially acid generating (PAG) or not potentially acid generating (NPAG) based on the relative content of sulfur and carbon (assumed, based on ore-body knowledge, to be entirely present as inorganic carbon) in the material. Total sulfur and total carbon contents are determined using a LECO Carbon-Sulfur analyzer (combustion analysis with infrared detection) per method CSA06V. The acid potential (AP) and neutralization potential (NP) are calculated from the total carbon and sulfur using the following calculations provided in MEND (2009):

Neutralization Potential (kg $CaCO_3$/t rock) = Total Carbon (wt.%) * 83.4

Acid Potential (kg $CaCO_3$/t rock) = Total Sulfur (wt.%) * 31.25

In addition to the NP calculation above, RRM adjusts NP by a factor of 0.96 to correct for the presence of Fe-carbonate minerals that do not provide any NP (Okane, 2020a). The neutralization potential ratio (NPR) is calculated as the quotient of NP and AP such that NPR = NP/AP. If the NPR is greater than 2, the material is classified as NPAG and if the NPR is less than 2 the material is classified as PAG (AFW, 2013).

In addition, a second level of characterization was developed for PAG rock produced from the open pit based on inferred time to acid onset. The system was originally designed to account for three levels of PAG:

- PAG1 inferred to have the potential to generate acidic conditions within five years of production or fewer;
- PAG2 inferred to have the potential to generate acidic conditions within five to 15 years of productions;

- PAG3 inferred to remain circumneutral for at least 15 years.

The three PAG sub-classifications were based on NP with threshold values of available NP of <12.5 kg $CaCO_3$/t, 12.5 to 19 kg $CaCO_3$/t and > 19 kg $CaCO_3$, respectively. Available NP was defined as the measured Sobek NP minus 10 kg $CaCO_3$/t to account for the silicate-neutralization potential that reports to the Sobek analysis but may not react fast enough to neutralize acidity produced by oxidation of pyrite and other sulfide minerals. Operationally, RRM has only implemented the PAG1/PAG2 designation. PAG1 material is always deposited of in the EMRS. Some PAG 2/3 rock is used in construction of the upstream side of the TMA embankment, and in the downstream shells of the Cell 1 and 2 where it will be inundated by tailings. There is not currently any difference in the way PAG2 and PAG3 materials are managed or deposited of on site, which is conservative with respect to mine rock and overburden management because it does not overestimate the lag period to potential onset of acidic conditions for PAG materials.

Mine rock blast holes are arranged on a 7.0 x 7.5 m grid with a 10 m bench height. Cuttings from every blast hole are sampled and analyzed for total carbon and total sulfur and each mining block is classified as PAG1, PAG2/3, or NPAG and routed to the appropriate location.

Data Management

All blast hole and audit geochemistry data are maintained in an onsite database as specified in Section 7.1 of the Geochemical Monitoring Plan. The database is implemented in the MineSight database platform and includes (but is not limited to) sample identification, sample location, lithology, material destination, and analytical results. Data and analytical results included in the current monitoring report were provided to Okane from RRM via email. All statistics presented herein refer to data available from January 1 to September 7, 2021. A complete set of data for 2021 are expected to be received at a later date; this report will be updated accordingly once that data is received.

Open Pit Geological Materials Classification

From January to September 2021, RRM collected and analyzed 34,271 samples of geologic materials from the open pit. The lithology and geochemical classifications of these materials are summarized in Table 1.

Table 1: Lithologic / geochemical classification of open pit samples by lithology.

Lithology	No. of Samples	% of 2021 Open Pit Samples	Geochemical Classification	No. of Samples	% of Lithology
Mafic Volcanics	3,878	11.32%	PAG 2/3	1	0.03%
			NPAG	3,260	84.06%
			PAG 1	559	14.41%
			LGO	58	1.50%
Intermediate Volcanics	9,254	27.0%	PAG 1	2,386	25.78%
			PAG 2/3	207	2.24%
			NPAG	6,623	71.57%
			HGO	4	0.04%
			MGO	1	0.01%
			LGO	33	0.36%
Dacitic Tuff	19,955	58.23%	PAG 1	9,441	47.31%
			PAG 2/3	2,133	10.69%
			NPAG	263	1.32%
			HGO	1,811	9.08%
			MGO	2,014	10.09%
			LGO	2,975	14.91%
Diabase	1,184	3.45%	PAG 1	235	19.85%
			PAG 2/3	59	4.98%
			NPAG	869	73.40%
			HGO	3	0.25%
			MGO	4	0.34%
			LGO	14	1.18%

PAG – potentially acid generating; NAG – not potentially acid generating; LGO – low grade ore, includes material classified as Mineralized PAG; MGO – medium-grade ore; HGO – high grade ore.

Materials Destination

In 2021, RRM produced PAG 1 mine rock, PAG 2/3 mine rock, NPAG mine rock, and ore from the open pit. The destination of these materials is summarized in Table 2.

Table 2: Destination of open pit geologic materials.

Material Description	Destination
PAG 1 mine rock	EMRS
PAG 2/3 mine rock	EMRS / TMA upstream embankment
High-grade ore	Mill
Medium-grade ore	Mill
Low-grade ore	Low-grade ore stockpile
NPAG	WMRS / TMA
Overburden	EMRS / WMRS

Assessment of Quality Assurance/Quality Control Procedures

Two categories of quality assurance (QA) samples are submitted for analysis per the Geochemical Monitoring Plan:

- Laboratory duplicates are analyzed onsite to demonstrate acceptable method precision in total carbon and total sulfur analyses by combustion/IR (LECO); and
- Sample splits are sent to an independent laboratory for ABA analysis to check that the onsite laboratory produces data of sufficient accuracy to ensure that geologic materials produced from the open pit are assigned the correct geochemical classification.

Raw analytical data from laboratory duplicate and ABA audit samples collected in 2021 will be provided as an appendix once the 2021 dataset if complete. The goal, per the Geochemical Monitoring Plan, is for both laboratory duplicates and the sample splits to be submitted for 1 in 20 (5%) of the blast hole samples. In 2021 carbon/sulfur duplicate samples and ABA audit samples were submitted for 9.7% and 1.8% of samples collected, respectively. Audit samples are currently only available up to April 2021; as such, the percentage of samples submitted for the ABA audit will increase once those sample results are received. A final memorandum will be issued with the complete dataset when available.

Assessment of Laboratory Duplicates

As of September 2021, 3,316 duplicates were analyzed for total carbon and total sulfur. Figure 1 and Figure 2 show the duplicate values plotted against each other with the 1:1 line for reference. Relative percent difference (RPD) was calculated for each duplicate pair using the following equation:

$$RPD = \frac{|S - D|}{\frac{S + D}{2}} \times 100$$

Where S is the sample result (original) and D is the duplicate result. The acceptable RPD range defined for this study is ± 20% for those samples with concentrations greater than five times the detection limit based on U.S. Environmental Protection Agency (U.S. EPA) guidance (U.S.EPA, 2004). Original and duplicate data are provided in Appendix A.

Original and Duplicate Assessment: Carbon

Visual inspection of Figure 1 indicates that the match between total carbon analyses and duplicates is generally good with some scatter but no systematic deviation. The RPD was calculated for 3,316 pairs of duplicate total carbon analyses. Of the 3,316 pairs, 3,246 (97.9%) meet the acceptable RPD range (i.e., they have RPDs below 20% and contain carbon at more than five times the detection limit of 0.005 wt.% defined in the Geochemical Monitoring Plan, Table 2). These results indicate that the LECO laboratory is providing effective precision for total carbon measurements of the mine rock.

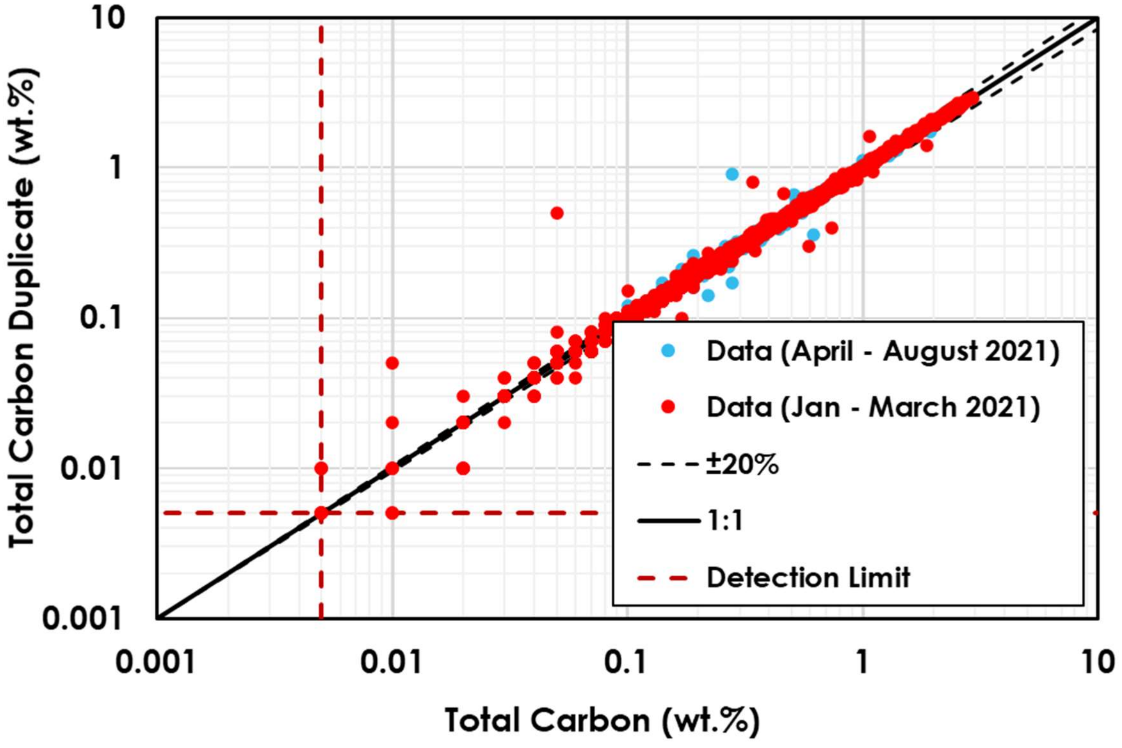

Figure 1: Comparison of original and duplicate carbon data from RRM onsite LECO facility.

Original and Duplicate Assessment: Sulfur

Visual inspection of Figure 2 indicates that the match between total sulfur analyses and duplicates is generally good with some scatter but no systematic error. The RPD was calculated for 3,316 pairs of duplicate total sulfur analyses. Of the 3,316 pairs, 3,292 (99.3%) meet the acceptable RPD range (i.e., they have RPDs below 20% and contain sulfur at more than five times the detection limit of 0.005 wt.%). These results indicate that the LECO laboratory is providing effective precision for total sulfur measurements of the mine rock.

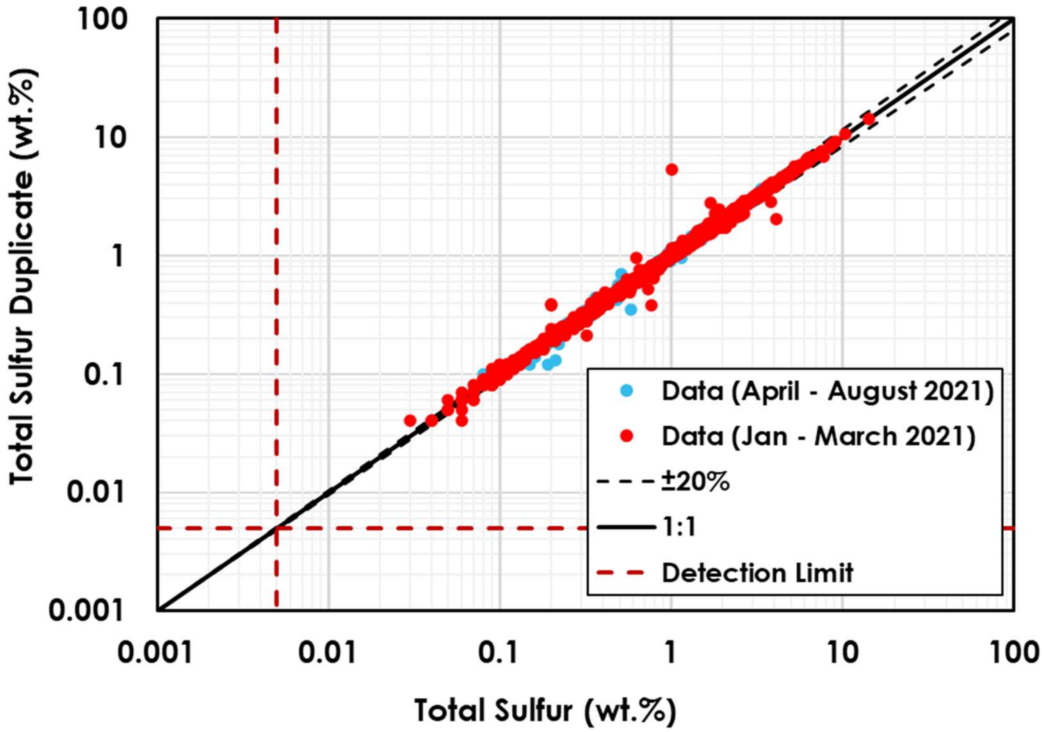

Figure 2: Comparison of original and duplicate sulfur data from RRM onsite LECO facility.

Acid-Base Accounting (ABA) Audit Results

As of April 2021, 619 results for samples submitted for auditing by an independent analytical laboratory were received. More samples have been submitted for auditing and data will be received at a later date and a final memorandum will be issued when available. Samples were sent to Activation Laboratories in Ancaster, Ontario, Canada. Laboratory reports will be provided in Appendix B.

On-Site LECO NPR Determination vs. Independent Laboratories

Descriptive statistics are provided in Table 3; data are plotted in Figure 3 and box-and-whisker plots are shown in Figure 4. A correction factor of 0.96 is now being applied to the on-site LECO NP values to account for Fe-carbonate minerals which do not provide any buffering capacity. This change was recommended during the April 2020 ITRB (No. 10) meeting (Okane, 2020a; New Gold Independent Technical Review Board, 2020). The median NPR values determined by modified Sobek (independent laboratory) and LECO (on-site laboratory) are 1.7 and 2.1, respectively, and indicates a small overestimation of NPR from the on-site LECO instrument for the first quarter of 2021. This outcome will be monitored for the remaining 2021 data when available and will be investigated if LECO measurements continue to be high.

The match between on-site LECO NPR values and modified Sobek NPR duplicates is generally good for data collected between January 1 and March 31, although there is slightly more deviation at low NPR values (Figure 3). At low NPR values, the LECO NPR is slightly overestimated; however, this effect is less pronounced as the NPR reaches the PAG/NPAG cut-off of 2. The comparable results between the independent laboratory and the on-site LECO laboratory demonstrate that the accuracy of the LECO laboratory produced acceptable results during 2021 and mine rock is being segregated as intended.

Table 3: Descriptive statistics for Sobek and NPR values.

Descriptive Statistics	Sobek NPR	LECO NPR
Sample Size	616	617
Minimum	0.0002	0.019
Maximum	123	46.1
Median	1.7	2.1
Average	3.6	4.1
90^{th} Percentile	8.1	9.7
10^{th} Percentile	0.3	0.4

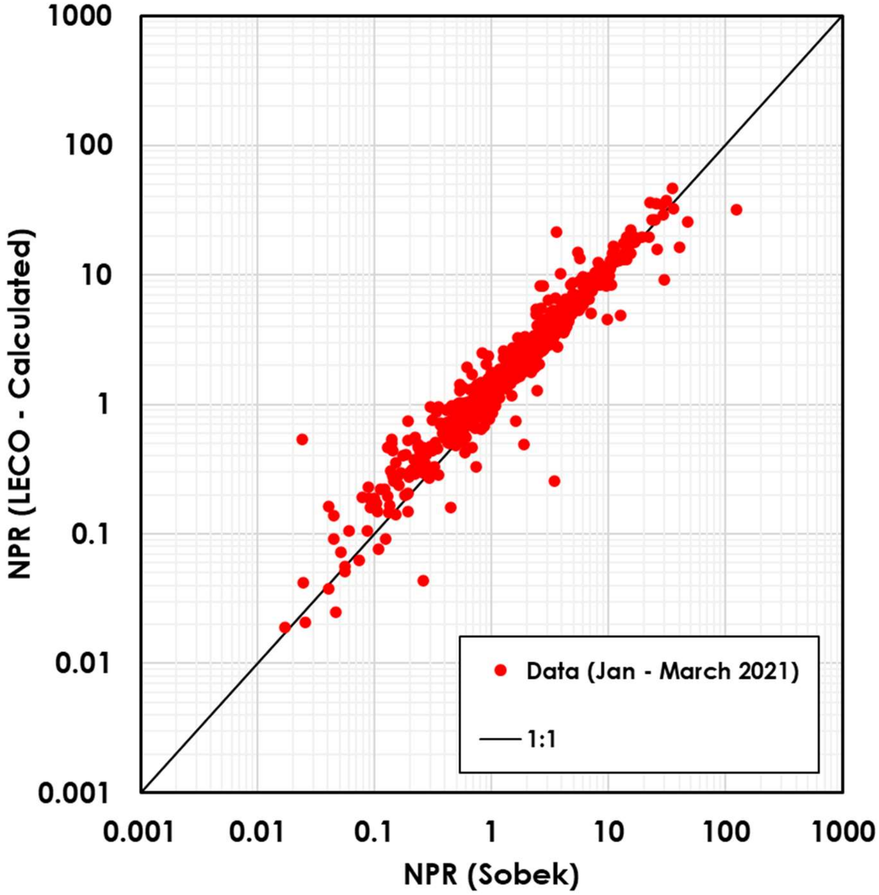

Figure 3: **Scatter plot showing comparison of NPR calculated from on-site LECO carbon and sulfur.**

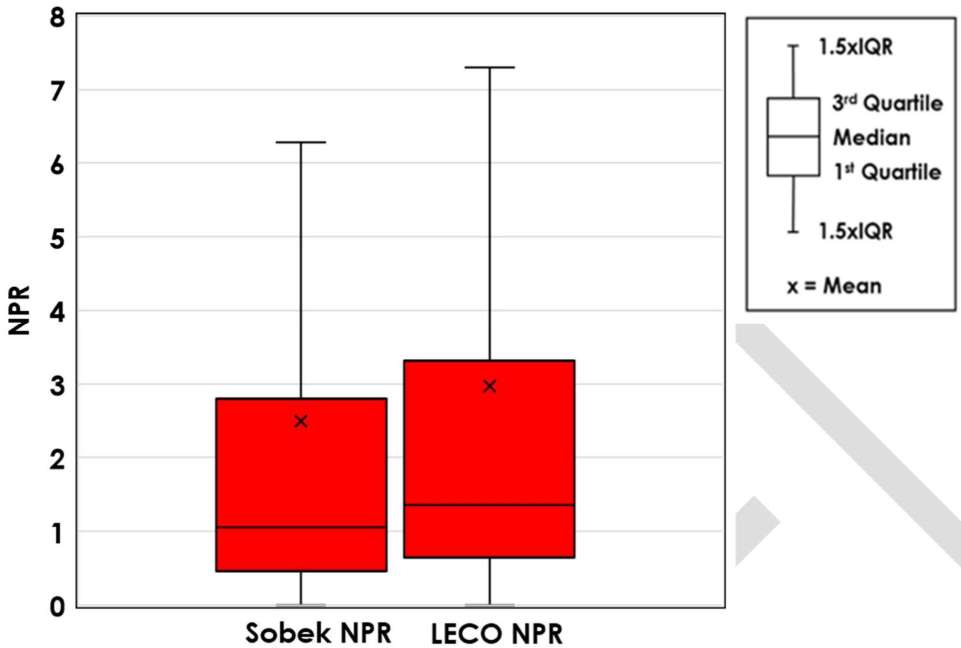

Figure 4: Box-and-whisker plots showing comparison of NPR calculated from on-site LECO carbon and sulfur and NPR from Sobek analyses. IQR = Inter-quartile range.

Conclusions

Duplicate data and independent laboratory data were evaluated to verify the performance of mine rock classification for the purpose of segregating and properly handling PAG and NPAG material at RRM. Duplicate data indicated that a high level of precision was achieved in 2021 and that measured NPR values were repeatable at the on-site LECO laboratory. Independent ABA measurements confirmed that the NPR of mine rock samples being measured by the LECO laboratory were accurate during 2021 and that mine rock is being properly classified as PAG or NPAG. Only data up to September 2021 for laboratory duplicates and April 2021 for ABA audits are available; a final memorandum will be issued with the complete dataset when available. Overall, the Geochemical Monitoring Plan was executed as intended in 2021. Geochemical focused studies will continue into 2022 under the guidance and recommendations of the internal technical review board.

Closure

We trust information provided in this memorandum is satisfactory for your requirements. Please do not hesitate to contact me at 306-713-1695 or jrobertson@okc-sk.com should you have any questions or comments.

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