BACK RIVER PROJECT
Responses to 2022 Annual Report Comments

02 October 2023

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Responses to 2021 Annual Report Comments

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TABLES

APPENDICES

(Will be provided with 2023 Annual Report)

1. Introduction

Sabina Gold & Silver Corp. (Sabina), submitted its 2021 Annual Report to the Nunavut Water Board (NWB) on 4 April 2022, as required by the Back River Gold Mine Project Certificate No. 007. Interested Parties were then requested by the NWB to provide comments on the 2021 Annual Report.

On 30 June 2022, the NWB received comments from the following interested parties:

- Kitikmeot Inuit Association (KIA) = 11 comments
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) = 12 comments
- Environment and Climate Change Canada = 3 comments
- Nunavut Water Board (NWB) = 1 comment

2. Responses to Comments

2.1 RESPONSE TO KITIKMEOT INUIT ASSOCIATION

KIA-NWB-01: Quality control of metals data

References:

Appendix E Back River Project 2022 Aquatic Baseline Report;

Sub appendix A – Section 3.3.2.3

Summary:

Clarity in the specificity of notable dissolved solids is required.

Detailed Review Comment

It is stated on pg. A-5 that “Where results of the total and dissolved concentrations were more than five times the DL and the RPD between the dissolved and total concentration was more than or equal to 20%, the dissolved concentration was considered notable.”

Presumably what is meant is that if the dissolved metals concentration is >20% above the total, the sampled is flagged. As stated, the text also means that a sample is considered "notable" if <80% of a metal is present in dissolved form (based on the definition of Relative Percent Difference (RPD) in Section 3.3.2.2); in reality, there is no reason to expect this.

Recommendation/Request:

Please revise the text so that it accurately identifies the notability of a sample only when the concentration of dissolved metals is greater than the concentration of total metals. The action that follows the identification of a "notable" result should also be specified.

Importance of Issue:

Moderate

Sabina Response:

The reviewer is correct; the dissolved concentration of a parameter was only considered notable if the dissolved concentration was higher than the total concentration, with an RPD of ≥20% and the total and dissolved concentrations were more than five times the DL. Section 4.1.5 of sub appendix A states this more clearly, which is also where notable results are discussed.

Section 4.1.5 of sub appendix A discussed the notable results, including identifying dissolved metals data that failed the quality control criteria in Table A3 and stating that these data should be interpreted with caution. In particular, dissolved uranium and dissolved zinc results more frequently failed to meet the quality control criteria and should be interpreted with this in mind.

KIA-NWB-2: Underground Ramp

References:

Operations Overview \ 2022 HIGHLIGHTS AND CHALLENGES

Summary:

Approximately 1,500 m of exploration underground ramp completed.

Detailed Review Comment

No information about the development of the exploration underground ramp was included in the 2022 Annual Report. KIA's consultant should indicate the conditions encountered during the construction of the exploration underground ramp. In particular, the consultants should indicate if permafrost conditions were encountered during the excavation of the ramp, or if inflow of saline water or freshwater was experienced during the development of the ramp.

Recommendation/Request:

In case inflow into the ramp was experienced, the consultants should indicate the type of water (saline or fresh), the amount, the quality and the discharge point.

Importance of Issue:

Moderate.

Sabina Response:

All water discharged from the project is documented in B2Golds annual reporting. At present, the Back River Project decline remains in permafrost and no discharge to the environment of any groundwater has been undertaken.

KIA-NWB-03: Appendices

References:

Appendix C Monitoring Activity Overview by Station

Summary:

Appendix C is missing from the PDF of the report.

Detailed Review Comment

The missing Appendix C may contain information pertaining to fish and fish habitat.

Recommendation/Request:

Please repost the 2022 Annual Report with all appendices.

Importance of Issue:

Moderate.

Sabina Response:

Appendix C (Monitoring Summary) has been attached to this submission.

KIA-NWB-4: Spills

References:

Section 2.11 A LIST AND DESCRIPTION OF ALL UNAUTHORIZED DISCHARGES INCLUDING VOLUMES, SPILL REPORT LINE IDENTIFICATION NUMBER AND SUMMARIES OF FOLLOW-UP ACTION TAKEN

Summary:

Dozer fell through the ice. 150 L of hydrocarbons is listed as being spilled.

Detailed Review Comment

For mitigation of this spill, it is stated the incident is currently under investigation. The hydrocarbon type is not listed, nor whether they are still contained in the vehicle or if the vehicle is still in the water body.

Recommendation/Request:

Please provide more information on the type of hydrocarbons and whether the total amount of 150 L was actually lost in the water body. Additionally, please provide information on fish presence in the water body and whether any spill containment or cleanup occurred in 2022.

Importance of Issue:

Moderate

Sabina Response:

Due to the significant logistical difficulty and high safety risk retrieval, B2Gold has determined that the dozer is not recoverable. This determination has been based on a consideration of the chemicals the dozer contains, their behaviour on release, and Bathurst Inlet oceanographic conditions as well as factors impacting the ability to safely retrieve the machinery which include it's deep depth and the soft sediments at the location of the dozer (which hinders retrieval). The human safety risk and logistical difficulty of retrieval is believed to outweigh the environmental risk of these chemicals being released (if not already released). B2Gold will reach out to the KIA to discuss this further.

KIA-NWB-5: Water and Load Balance Report - Flow

References:

Flow Diagrams

Summary:

Pit Dewatering

Detailed Review Comment

Umwelt Open Pit inflows will be pumped to Primary Pond during construction. Llama Pit inflows will be pumped to the Saline Water Pond during Operations (Year 1).

In addition, inflows into the Umwelt Open Pit are considered "Contact Water" (Figure B-2) while inflows into Llama Pit are considered Saline Water.

Recommendation/Request:

Please provide the rationale for considering the inflows into Umwelt Open Pit as "Contact Water" and the inflow into Llama Pit as "Saline Water".

Importance of Issue:

Moderate

Sabina Response:

Within the Back River Project Water and Load Balance (Sabina 2022, Section 3.2.7), the Umwelt Open Pit inflows are classified as contact water because Umwelt Open Pit is expected to be fully within permafrost and primarily receives surface water runoff. While groundwater may flow through the top 1 to 3 m of overburden during unfrozen months, the volume of flow is likely insignificant in comparison to the surface water runoff. Conversely, the Llama Open Pit inflows are classified as saline water because open pit mining at Llama Open Pit will occur underneath a large lake, associated with taliks, and therefore susceptible to groundwater inflows, which are classified as saline water.

References:

Sabina (Sabina Gold & Silver Corp.). 2022. Back River Project Water and Load Balance. Submitted to the Nunavut Water Board. 30 August 2022.

KIA-NWB-6: Water and Load Balance Report – Appendix C

References:

Fe-flow model

Summary:

Calibration

Detailed Review Comment

Golder made the following modifications to the 2015 SRK numerical model:

• Grid refinement in proximity of Llama Open Pit, the Llama, Goose Main, and Echo underground workings;

• Addition of two layers to increase the maximum depth of the modelled area;

• Layers 2 and 3 of the previous model were removed; and

Boundary conditions have been updated.

Recommendation/Request:

Golder should clarify how these changes affected the calibration and the overall baseline condition model mass budget.

Importance of Issue:

Moderate

Sabina Response:

The model based on interpretated baseline conditions but is not calibrated. The model can be calibrated in the future as operation data is collected. Without calibration, the scenarios have been developed to reasonable bracket expected conditions.

The changes made to the model are designed to make the model predictions more accurate or more conservative (e.g., predict higher TDS or higher groundwater inflows to an open pit or underground).

The grid refinement made near the mine facilities enhanced the predicted resolution of hydraulic heads near the mine. The addition of two layers to the base the model improved the accuracy of the model to predict upwelling of deeper saline ground water during dewatering of the underground development. Both of these changes did not alter the model's representation of baseline conditions or adversely impact the mass budget error of the model.

The two near surface layers that represented lakebed sediments in the SRK model, were removed to improve numerical stability. Furthermore, it has been shown that lakebed sediments are often not continuous enough to provide a uniform resistance to flow and can result in an underestimate of inflow from lakes near to dewatered undergrounds and pits.

KIA-NWB-07: Water and Load Balance Report – Appendix C

References:

Fe-flow model

Summary:

Hydraulic Conductivity - 1

Detailed Review Comment

The vertical profile for the hydraulic conductivity shows a decrease in K-values with depth. Based on this assumption, higher groundwater inflows should be expected in the open pits rather than in the underground workings. The results included in Table 1 show the opposite occurring, with higher inflow values for the underground workings rather than the open pits.

In addition, the model should take into consideration that up to a depth of approximately 400 metres below ground surface, the soil is frozen, which results in minimal inflows into the open pits.

Recommendation/Request:

Golder should clarify the reason why higher groundwater inflows have been estimated for the underground workings rather than the open pits, considering that the K values decrease with depth.

In addition, it should be further explained if the numerical model is capable of simulating (e.g., by reducing the K value) the presence of frozen soil up to 400 mbgs.

Importance of Issue:

Moderate

Sabina Response:

The interpreted extents of permafrost are considered in the numerical groundwater model and are unchanged from the 2015 SRK model. Where permafrost is interpreted to be present the model elements are deactivated, and the groundwater model predicts no inflow will occur.

Groundwater inflow to the Llama Open pit is lower than the underground because the area is under drained by the dewatered Llama Underground. If the underground was not present, groundwater inflows to the open pit would be higher. Because the Llama underground is present, groundwater flows is direct away from the pit to the deeper underground.

KIA-NWB-08: Water and Load Balance Report - Appendix C

References:

Fe-flow model

Summary:

Hydraulic Conductivity - 2

Detailed Review Comment

The bullet point list at Page 4 of Appendix C describing two scenarios for conductivity (see screenshot below) should indicate mbgs rather than masl. If 0 masl is being used a local datum, that should also be stated.

Scenario 1:

- 0 to 200 masl - Near surface hydraulic conductivity assumed to equal to the arithmetic average of packer testl results
- Below 200 masl – Equivalent to the bedrock hydraulic conductivity profile adopted in the SRK model (SRK 2015). The hydraulic conductivity reduction was truncated at a minimum hydraulic conductivity of 5 x 10^{-10} m/s

Scenario 2:

- 0 to 200 masl - Near surface hydraulic conductivity assumed to be equal to the arithmetic average of packer test results
- 200 masl to -500 masl – hydraulic conductivity assumed to be three times the geometric average
- Below -500 masl – assumed to progressively reduce to 5 x 10^{-10} m/s

Recommendation/Request:

Please review and update/ clarify the bullet point list, as needed.

Importance of Issue:

Low

Sabina Response:

The plots and scenarios are described relative to elevation, with the datum taken to be mean annual sea level.

KIA-NWB-09: Water and Load Balance Report – Appendix C

References:

Fe-flow model

Summary:

Model Predictions

Detailed Review Comment

Golder states that groundwater inflows to the Llama Open Pit are expected to be minimal (i.e., less than 50 m3/day) as the area is under drained by the dewatered Llama Underground.

No groundwater inflows have been estimated for Umwelt Pit, Echo Pit and Goose Pit.

Recommendation/Request:

It is recommended to produce an additional model run to estimate the groundwater inflow with the open pit only scenario.

Please clarify the rationale for not estimating groundwater inflows for Umwelt Pit, Echo Pit and Goose Pit.

Importance of Issue:

Moderate

Sabina Response:

No inflow is predicted for the Umwelt Pit, Echo Pit and Goose Pit as these pits sit within permafrost.

At this time a scenario is not required to simulate groundwater inflow to Llama Open pit in the absence of the underground. If the underground is not advanced, the predicted inflow to the Llama Open Pit will be a proportion of the total inflow predicted to the Llama Open Pit and Llama underground combined. The inflow to the open pit on its own would not exceed the presently predicted total inflow to both the open pit and underground. If water management planning needs to account for the exact proportion of inflow, as opposed to the more conservative total of both the open pit and underground, the groundwater model will be re-run.

KIA-NWB-10: Water and Load Balance Report – Appendix

References:

Fe-flow model

Summary:

Model Predictions

Detailed Review Comment

Golder states that to estimate groundwater inflows, the 2015 SRK Fe-flow model was used. Minor changes have been made by Golder, as described in Comment KIA-NWB-04.

Golder Scenario 1, which has the same hydraulic conductivity profile as the SRK model, provides groundwater inflows that are significantly different than the one estimated by SRK.

Recommendation/Request:

Please provide an explanation for obtaining different groundwater inflow values, from using the same numerical model. Alternatively, please outline any changes to the model parameters that were implemented and their rationale.

Importance of Issue:

Moderate

Sabina Response:

In additional to the described changes in hydraulic conductivity and as described in the groundwater technical memorandum, Golder modified the specific storage assigned to the model and implemented a new mine plan. The specific storage was reduced from 1×10^{-4} m/s to 1×10^{-6} m/s. The original value of 1×10^{-4} m/s is unrealistically high for bedrock and is more representative of unconsolidated deposits. It is suspected that the assigned specific storage in the SRK model was inadvertently left unchanged from the default model settings applied by the software when building the model. As a result of the unrealistic specific storage, the 2015 SRK model incorrectly predicts higher inflow than the Golder model for a similarly applied hydraulic conductivity profile.

KIA-NWB-11: Maintenance and aggradation of permafrost below and within landfills.

References:

Landfill and Waste Management Plan

Summary:

An updated Landfill and Waste Management plan (LWMP) was presented in consideration of all applicable guidelines and requirements, including those of the Type A Water Licence, 2AM-BRP1831, and Project Certificate, No. 007. The revision reflects construction phase waste management activities, to align with the overall project waste management approach, and to complement and remove overlap with related waste management plans.

Detailed Review Comment

KIA understands that Sabina proposes to use the area fill method to develop landfills within the Waste Rock Storage Areas (WRSAs). According to the LWMP (Section 7.3.1) they "will be designed to ensure the maintenance and aggradation of permafrost". However, based on the information provided in Section 8 (Environmental Protection Measures and Monitoring Program) of the LWMP, it is not clear how the performance of the landfills, specifically the maintenance and aggradation of permafrost, is measured.

Recommendation/Request:

Sabina (B2Gold Nunavut) should provide information on how the ground thermal regime is monitored and what performance criteria is used to ensure the maintenance and aggradation of permafrost below and within the landfills.

Importance of Issue:

Moderate

Sabina Response:

Full details on the WRSA design, including measures in place to ensure permafrost is protected can be found in the Waste Rock Management Plan. These measures including placement of WRSAs in areas covered in less than 2 m of overburden, preferentially laying the first layer waste rock during the winter to encapsulate the existing permafrost, building the WRSA (and associated landfill) in layers promoting progressive freeze-back, capping landfill waste in cells using waste rock, and placement of a 5 m thick closure capping layer. Additionally, final grades of the landfill will be at a slope of 5% or greater, to minimize ponding and infiltration through the cover to minimize permafrost or cover damage and leachate generation. These measures will allow maintenance of permafrost conditions throughout all waste layers, which will be verified under the Back River Project Thermal Monitoring Program. It is also noted that the landfill with not contain any hazardous wastes.

KIA-NWB-12: Incinerator Log

References:

Sabina, Back River Project 2022 Annual Report for Water Licence 2AM-BRP1831 (March 31, 2023)

- FEIS Vol 10: No.10 - Waste Management Plan
- FEIS Vol 10: No. 11 - Incineration Management Plan

Summary:

Section 8 (Record Keeping) of the FEIS (Vol 10: Waste Management Plan) states that "Waste material logs will be completed to track the volume, material type and material source for all materials that are passed through the waste segregation and waste management process". The IMP states that "Prior to incineration, the type of waste in each bag will be determined, weighed, and the source noted. The total weight of each type of waste will be recorded before the burn cycle is started." However, there is no information on record-keeping for the incinerator at the MLA except during the months of November and December 2022.

Detailed Review Comment

Within the 2022 Annual Report for Water Licence 2AM-BRP1831, pages 2-8, Sabina states that "wastes incinerated at the MLA were not tracked until November of 2022 due to a record-keeping oversight." In addition, Sabina states in Section 2.10 "No incinerator testing was conducted in 2022." However, it is unclear from the IMP whether stack emissions testing is required during the pre-construction and construction phases.

Garbage and waste can pose a wildlife management concern as they can be attractants for grizzly bears. In addition, if no incineration testing is conducted, it is impossible to determine if toxic ash may be spread through dust on the tundra. If as contains toxic components, these toxic components may be ingested by wildlife that eat vegetation or may build up in surrounding soils and vegetation.

Currently, information on waste incineration and incinerator testing is necessary to determine if Sabina is in compliance with Canada-wide Standards.

Recommendation/Request:

The KIA requests the following:

In the absence of a record-keeping log for incinerated waste between January and October 2022, please clarify approximate volumes of waste and waste types incinerated at the MLA during the 2022 period and whether there were any unusual incinerating events (e.g., unusually large incinerating events or incineration of waste types that should be disposed of differently).

Importance of Issue:

Low

Sabina Response:

MLA incineration practices, material types, and quantities in 2022 would have been comparable to previous years; there were no significant differences in site activities in 2022 or significant expected differences in quantities of waste generated.

KIA-NWB-13: Updates to Plan and Reports

References:

Sabina, Back River Project, 2022 Annual Report for Water Licence 2AM-BRP 1831 (March 31, 2023) Section 2.20

Summary:

Section 2.20 provides a table describing updates made to various plans and includes the current update date. While plans submitted in April of 2022 were indeed available on the WLB FTP site (Water Management Plan, Tailings Management Plan, Mine Waste Rock Management Plan), these plans are still listed as pending NWB approval in a Table in Section 2.20. Sabina has not addressed the KIA's previous review comments on the Landfill and Waste Management Plan, Waste Rock Management Plan, and 2021 Interim Closure and Reclamation Plan.

Detailed Review Comment

In Section 2.20 Sabina states that they have submitted updates to the following plans:

- Landfill and Waste Management Plan (August 2022)

- Water Management plan (April 2022)

- Tailings Management Plan (April 2022)

- Mine Waste Rock Management Plan (April 2022)

These 2022 plans were available on the NWB FTP site. However, there is potentially a typo within the table in Section 2.20, which lists these updated plans as "pending NWB approval". This may not be a typo, if the NWB has indeed not accepted them.

The KIA previously submitted review comments on the August 2022 version of the Landfill and Waste Management Plan, submitted to the NWB in September 2022. As Sabina still needs to produce an updated Landfill and Waste Management Plan, the KIA's questions and concerns still need to be addressed.

In addition, in the 2021 Annual Review of Water Licence 2AM-BRP1831, the KIA indicated that the Waste Rock Management Plan is vague on measures to manage waste rock seepage and runoff. Sabina responded that updates would be completed in the next iteration of the Waste Rock Management Plan and appended as an addendum to the Annual Report (March 2023). The 2022 Waste Rock Management Plan should have included these updates. It is unclear whether these updates are in progress and will be provided as an addendum to the 2022 Annual Report for Water Licence 2AM-BRP1831, as there were no plan updates since April 2022 on the NWB FTP site.

Similarly, during the 2021 Annual Report for the Water Licence review, the KIA noted discrepancies between waste rock and overburden volumes reported in the WRMP compared to those presented in the July 2021 Interim Closure and Reclamation Plan (ICRP). Sabina responded that updates would be completed to the volumes and areas of the waste rock storage areas, as appropriate, in the next iteration of the ICRP, as an addendum to the Annual Report (March 2023). At the time of review of the 2022 Annual Report, an updated ICRP was unavailable.

Recommendation/Request:

The KIA requests the following:

• Please update the table in Section 2.20 to correct the plans, if they are erroneously listed as pending NWB approval, and are available on the NWB registry.

• The KIA would like to review the ICRP update when it becomes available. Please indicate when updated ICRP and Landfill and Waste Management Plans can be expected.

• Future iterations of the Annual Report should reflect reporting commitments, including any updates to the above plans.

Importance of Issue:

Low

Sabina Response:

At the time of submission of the 2022 Annual report to the NWB the plans noted were still pending NWB approval. B2Gold was not aware of comments submitted by the KIA on the Landfill and Waste Management Plan at that time, but will be updating this plan for submission with the 2023 Annual report and will address all relevant comments then. B2Gold will also review the KIA's comments on the Waste Rock Management Plan and Interim Closure and Reclamation Plan to ensure they are addressed appropriately in these plans. B2Gold notes that the Landfill and Waste Management Plan and the Interim Closure and Reclamation Plan are currently also in review as part of B2Gold's Back River Energy Center proposal and any updates would also address comments received on those plans during that review process.

2.2 RESPONSE TO CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA

CIRNAC-#R-01: Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Model

References:

Sabina 2022 Annual Report, Section 1.3; Appendix E Back River Project - 2022 Aquatic Baseline Report – Appendix C, Tables C-1, C-2, C-3, C-4, C-5,C-6, C-7

Comment:

Upon review of the water quality monitoring data presented in the Back River Project - 2022 Aquatic Baseline Report for Goose Lake West Bay (Table C-1) Goose Lake Central Basin (Table C-2), Goose Lake SE Basin (Table C-3), Goose Lake Tail (Table C-4),Propeller Lake (Table C-5), and Reference Lake B (Table C-6), it is apparent that pH values in all of these water bodies sampled in 2022 were consistently reported to be below a pH of 6.5, with average values of 6.3 at Goose Lake West Bay, 6.3 at Goose lake Central Basin, 6.4 at Goose Lake SE Basin, 6.15 at Goose Tail, 6.3 at Propeller Lake and 6.5 at Reference Lake B.

As reported, these pH values are generally below the CCME Guideline (chronic) range for the protection of freshwater aquatic life of 6.5-9.0 and the Health Canada Aesthetic Guideline range of 7.0-10.5. This indicates that the pH of the water in these water bodies are indicative of a naturally low level of acidity.

Similarly, the low degree of hardness (as CaCO3) consistently measured in these water bodies, with average values of 29 mg/L at Goose Lake West Bay, 17.3 mg/L at Goose lake Central Basin, 12 mg/L at Goose Lake SE Basin, 14 mg/L at Propeller Lake and 16.6 mg/L 6 at Reference Lake B are indicative of naturally very soft water, which typically ranges from 0-60 mg/L. (Health Canada Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Hardness, 2022).

The combination of chronically low pH water, combined with the very soft waters that are characteristic of the freshwater bodies in the Back River project area, indicate that these waters have a low buffering capacity. This means that these waters, and the resident aquatic resources, are exceptionally vulnerable to the introduction of contaminants such as mine-related wastewater.

Recommendation:

CIRNAC recommends that the Licensee update the Goose Lake Hydrodynamic and Water Quality Model by incorporating the results of the 2022 field program reported in the Back River Project - 2022 Aquatic Baseline Report. The updated Hydrodynamic Model should be made available for review prior to submission of the 2023 Annual Report to allow for review to be completed and recommendations on Aquatic effects developed.

Sabina Response:

B2Gold confirms that the low pH and hardness conditions observed in 2022 have already been accounted for in the current version (i.e., August 2022) of the Goose Lake Hydrodynamic and Water Quality Model. Although pH is not directly modelled, it is accounted for in toxicity modifying factors that influence the surface water quality effects benchmarks for the protection of aquatic life used to screen against model predictions. As described in the footnotes of Table 1 of the Goose Lake Hydrodynamic and Water Quality Model Report, a minimum pH value of 5.9 was applied when calculating surface water quality benchmarks that decrease with lower pH values; in these cases, a pH value of 5.9 is a more conservative estimate of pH than using the lowest pH (i.e., 6.15) observed during the 2022 monitoring program. The model predicts hardness values are based on predicted calcium and magnesium concentrations, and these predicted hardness values were used to calculate surface water quality effects benchmarks; these benchmarks decrease with lower hardness. The lowest hardness used in the model (i.e., <1 mg/L as $CaCO_3$) was a more conservative estimate than the lowest hardness values measured in Goose Lake (i.e.,

12 mg/L as $CaCO_3$) during the 2022 monitoring programs. In summary, based on the results of the 2022 monitoring, the conservative assumptions applied to pH and hardness in the current model continue to be adequately conservative and updates to these assumptions are not warranted.

B2Gold will continue to monitor water quality in Goose Lake and in accordance with the Type A Water Licence 2AM-BRP1831 Amendment No. 1 (Schedule I; NWB 2021) and will consider this information in the next model update consistent with typical Type A License requirements for updates to reflect changes in operation.

References:

NWB (Nunavut Water Board). 2021. Water Licence 2AM-BRP1831 (Amendment No. 1) for Sabina Gold and Silver Corp.'s Back River Project. Issued August 31, 2021.

CIRNAC-#R-02: Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Modeling

References:

Hydrodynamic and Water Quality modelling of Goose Lake, August 2022

Comment:

In the 2022 Annual Report, Sabina has made a number of revisions to the Modeling done. CIRNAC recognizes these modifications based on feedback from intervenors. The following further issues have been identified;

- The modelling time period has been increased to 67 years (Sections 2.2, 3.2), this addresses one of the deficiencies of the previous model that ended with the end of operations. Various sensitivity analyses were run to evaluate effects of changes to meteorological conditions, ice cover, and inflow quantity and quality for a 10-year period – extending five years into post-closure. A longer ice cover period was also evaluated. However, modelling 67 years into the future should also consider the possible effect of climate change. Presently, their hydrological inputs are the past 10 years repeated into the future.

- Selenium concentrations – in Section 9.0, the predicted 95th percentile concentrations of iron and phosphorous are slightly above the water quality guideline values but there is no mention of selenium. In the Appendix B timeseries for constituents, concentrations of selenium for PN04 are well above the water quality benchmark value and slightly over for PN05. In Appendix C, the concentrations of selenium at GLTL are over the benchmark value.

- Phosphorous concentrations – in Section 9.0, the 95th percentile concentrations of most constituents are predicted to remain below water quality benchmarks (Table 1) at the edge of mixing zones, with the exception of phosphorus. The predicted 95th percentile concentration of phosphorus at two other assessment locations (i.e., central basin and tail of Goose Lake) are also predicted to be above the benchmark. The conservative model approach adopted (e.g., exclusion of biological uptake during open-water conditions) likely contributed to the exceedances of the phosphorus benchmark.

Recommendation:

CIRNAC recommends that the as follows;

- The Licensee is to include a discussion of climate change effects on the forecasts provided in further Annual reports. This includes an evaluation of various scenarios.

- As Selenium can be more toxic than iron or phosphorous, it is recommended that risks associated with Selenium exceedances should be discussed and addressed in the aquatic effects management plan and included in the next annual report.

- It is recommended that the Licensee attempt to quantify what the phosphorous uptake could be over the summer and indicate whether elevated levels of phosphorus may contribute to a change in the lake's trophic status over time. This is to be reported on in the next Annual Report.

Sabina Response:

- B2Gold notes that further discussion of climate change was provided by B2Gold in its responses to interveners' comment on the Hydrodynamic and Water Quality Model of Goose Lake (Sabina 2022), refer to KIA-NWB-07 and ECCC-03. As per CIRNAC request, B2Gold will provide further discussion on

climate change in the next model update consistent with typical Type A License requirements for updates to reflect changes in operation.

- The predicted concentrations of selenium in Goose Lake are not expected to result in harmful effects to aquatic life because the exceedances of the water quality benchmark (Table 1 in the Hydrodynamic and Water Quality Modelling of Goose Lake Report), which is based on the CCME chronic guideline for the protection of aquatic life, occur infrequently (i.e., approximately one month or less in a given year), are temporary (i.e., occur for 2 or 3 years during Closure) and are localized (i.e., at the edge of a mixing zone or in the tail of Goose Lake). The predicted exceedances occur every year during a transition period in the model that represents a potential 'worse case' condition when temperatures are warm enough that runoff from the site is occurring but the entire lake is still frozen (e.g., late May to late June). Although the risk to aquatic life based on predictions for selenium are considered negligible, selenium concentrations at the mixing zone boundaries and in Goose Lake will be monitored as part of the Aquatic Effects Management Plan (AEMP; Sabina 2017) and relevant changes in concentrations will be addressed through the response framework.

- Sabina disagrees that quantification of the phosphorus uptake in Goose Lake during the summer is necessary or relevant in the next annual report. Sabina would like to reiterate that the predicted changes in total phosphorus concentrations in Goose Lake, which indicate no change in trophic status of Goose Lake, conservatively assumed no removal of phosphorus from the water column. Sabina has committed to monitoring phosphorus and chlorophyll annually in Goose Lake through the Aquatic Effects Management Plan (AEMP; Sabina 2017), which will provide an indirect measurement of processes that remove phosphorus from the water column, including biological uptake. Sabina has also committed to applying nutrient enrichment Action Levels in the AEMP Response Framework. If Action Levels are triggered for nutrient enrichment, then additional follow-up activities, such as plankton monitoring or assessing uptake of phosphorus (e.g., by comparing modelled versus observed phosphorus concentrations in Goose Lake), will be considered.

References:

Sabina (Sabina Gold and Silver Corp.). 2022. Back River Project. Responses to Review of Water and Load Balance Report and Hydrodynamic and Water Quality Modelling of Goose Lake Report. November 2022.

Sabina (Sabina Gold and Silver Corp.). 2017. Back River Project. Aquatic Effects Management Plan. October 2017.

CIRNAC-#R-03: Surface Water Quality- Water Management Plan Revisions

References:

Nunavut Water Board Water Licence No: 2AM-BRP1831 (Amendment No.1) Issued August 31, 2021, Expiry December 31, 2031. Part B: General Conditions.

Sabina Back River Project Annual Report for Water Licence 2AM-BRP1831, March 2023. Section 2.20, revisions to plans.

Sabina Back River Project Water Management Plan, October 2020. Full report, with emphasis on summary tables 6.3-2 (Level of Risk for Each Item of Goose Infrastructure) and 6.4-1 (Goose Property Pond Capacity and Pumping Rate Summary).

Sabina Back River Project Water Management Plan, April 2022. Full report, with emphasis on summary tables 6.3-2 (Level of Risk for Each Item of Goose Infrastructure) and 6.4-1 (Goose Property Pond Capacity and Pumping Rate Summary).

Comment:

The April 2022 Water Management Plan has been substantially revised from the October 2020 Water Management Plan that is approved under the Water Licence. Revisions identified within the document have been presented without complying with Part B item 16 that explicitly requires the submission of a revisions list detailing where significant content changes are made.

Compliance with Part B item 16 is necessary for implementation of Part B item 12 that affects the Board's process for review and approval of the proposed revisions to the plan.

Relevant Water Licence Conditions are copied below for reference, with bold font added to highlight key requirements.

> 2. **The Licensee shall file an Annual Report** with the Board no later than March 31st in the year following the calendar year being reported. The Annual Report shall be developed in accordance with Schedule B of the Licence.
>
> 12. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as **approved** by the Board in writing. **Any changes to the plans deemed significant shall be reviewed by the Board to determine the process for the Board's review and approval of the amendment to the plan(s)**. Reflecting the scale and scope of the future changes to an approved plan, the Board may subsequently process the changes as solely an amendment to the plan, as a Modification under Part G of the Licence or as an Amendment to the Licence.
>
> 13. **The Board has approved the following Plans for implementation** under the relevant sections in the Licence: (the list of Plans includes item q. Water Management Plan (October 2020)).
>
> 16. The Licensee shall review the Plans referred to in this Licence, as required by changes in operation and/or technology and modify the Plans accordingly. **Revisions to the Plans are to be submitted** in the form of an Addendum to be **included with the Annual Report** required by Part B, Item 2, **complete with a revisions list detailing where significant content changes are made**.

Water Licence Part B item 16 above is addressed by Section 2.20 of the 2022 Annual Report, titled "WHERE APPLICABLE, REVISIONS AS ADDENDA, WITH AN INDICATION OF WHERE CHANGES HAVE BEEN MADE, FOR PLANS, REPORTS, AND MANUALS" with relevant parts copied below.

The section states that Sabina submitted revisions to the NWB in 2022 for several plans

including the Water Management Plan updated April 2022. The description of updates is "All sections of this plan were updated for submission to the NWB as a Supporting Document for Type A Water License Amendment Application."

2.20 WHERE APPLICABLE, REVISIONS AS ADDENDA, WITH AN INDICATION OF WHERE CHANGES HAVE BEEN MADE, FOR PLANS, REPORTS, AND MANUALS

In addition to updates to the Hydrodynamic Model and Water and Load Balance Model Reports submitted to the NWB in August of 2022, Sabina submitted revisions to the following plans to the NWB in 2022:

Plan	Current Update Date	NWB Approval	Updates
Water Management Plan	April 2022	Pending	All sections of this plan were updated for submission to the NWB as a Supporting Document for Type A Water Licence Amendment Application.

The 2022 Annual Report does not include a revisions list detailing where significant content changes are made.

The revised April 2022 **Water Management Plan (WMP)** includes a revision log, copied below, which states that there were revisions were to all pages of all sections.

Revision Log

Version	Date	Section	Page	Revision
0	November 2015	All	All	Supporting Document for Final Environmental Impact Statement; submitted to Nunavut Impact Review Board (NIRB).
1	October 2017	All	All	Supporting Document for Type A Water Licence Application; submitted to Nunavut Water Board (NWB).
2	June 2020	All	All	Updated to reflect the 2020 Modification Package changes, and as a Supporting Document; submitted to the Nunavut Planning Commission (NPC) and NIRB.
3	October 2020	All	All	Submitted as a Supporting Document for the Type A Water Licence Amendment Application to the NWB.
4	April 2022	All	All	Supporting Document for Type A Water Licence Amendment Application; submitted to Nunavut Water Board (NWB)

The 2022 WMP does not include a revisions list detailing where significant content changes are made.

In comparing the 2020 and 2022 WMP documents one can see that revisions were made to all pages of all sections. There are minor revisions to all page headers and footers that include a persistent error of the wrong date in page footers beginning with Section 6.

Other changes are potentially significant and should be identified as such. Manual comparison of summary tables in the 2020 and 2022 WMP documents indicate that there have been changes to the proposed infrastructure, for example;

- The 2022 WMP adds Echo Pit infrastructure and has removed (or makes no mention of) the TSF WRSA.
- The Plant Site Pond is re-named (or re-purposed) as the Ore Stockpile Pond.
- Four diversion berms previously identified as medium or high risk infrastructure have been reclassified as low risk infrastructure.
- There have been numerous revisions to facility catchment areas.
- Four of the water management pumps proposed in the approved 2020 WMP are missing in the 2022 update.

Recommendation:

CIRNAC recommends that plans that are provided to the NWB with out a revision list to track significant change should not be consider for review.

Sabina Response:

With the initiation of construction, amendment of the Project, and for the purposes of better aligning the various Project plans, extensive changes have been needed to most management plans recently submitted to operationalize then and tailor them to the Project. For such extensive edits, a detailed list of each edit was not deemed helpful and instead, in these cases, it was made clear that edits were made throughout the plan to ensure all reviewers carefully reviewed the updated plan in full. In future, it is anticipated that less significant edits will be required to the plans which have already been updated and/or apply to activities already underway (as the necessary management activities and infrastructure is less likely to change). For such more limited future edits, detail will be provided on significant modifications made to allow reviewers focus their review.

CIRNAC-#R-04: Acid Rock Drainage / Metal Leaching – Waste Rock

References:

Sabina 2022 Annual Report, Section 2.6a, 2.6b, 2.8; Sabina Back River Project Waste Rock Management Plan 2022, Sections 6.1, 7.1 & 7.2

Comment:

Section 2.6a and b of the annual report state that no waste rock was generated to date and therefore no testing of waste rock has been done. Section 2.8 states that 358,043 m^3 of NPAG rock was generated from the Echo Pit and underground decline and was used as construction material in lieu of being placed on waste rock storage area.

Recommendation:

CIRNAC recommends that Licensee provide clarification as to why the waste rock generated from Echo Pit and underground decline are not reported as waste rock in Section 2.6. Provide the rationale and backup data which confirms that the waste rock used in construction is NPAG, in accordance with section 7.2 of the Sabina Back River Project Waste Rock Management Plan.

Sabina Response:

B2Gold confirms that 358,043 m3 of NPAG rock was generated at the Project in 2022 and geochemical characterization was completed, and results provided in Table 2.6-1 of the annual report.

For further clarify, an updated table (Appendix B) has been provided to include additional visibility on sulphide sulphur (wt. %) and sulphate sulphur (wt. %). B2Gold highlights that for material identified as PAG - Uncertain for this batch of samples, the sulphur speciation data demonstrates that overwhelmingly the non-extractable (i.e., non-reactive) sulphur was the dominate sulphur species, and that that sulphide (i.e., reactive) sulphur had a very low range (i.e., <0.01 to 0.05).

CIRNAC-#R-05: Borrow and Source Materials – Source Locations

References:

Sabina 2022 Annual Report, Section 2.6c,

Sabina Back River Project Borrow Pits and Quarry Management Plan (2020), Sections 5, 7, 8 and 10

Comment:

Geochemical analysis related to roads and quarries does not provide volume of material quarried or excavated from roads (such as from cut and fill areas, or road leveling), or location of quarries or road excavations. It is not indicated if geochemical characterization was completed as pre-development characterization program, or as operational monitoring. A summary of some results parameters is provided in the text of the annual report, however there are no lab certificates or full data of the rock analysis, or specific locations of where the samples were collected from. There is no indication of where the material was used in construction.

Recommendation:

CIRNAC recommends that the Licensee:

- Provide information of source location and end use location for waste rock used in construction as well as volumes of rock excavated from quarries and roads, as per Sabina Back River Project Borrow Pits and Quarry Management Plan, Section 10 requirements.

- Provide lab certificates of data, and particulars of which component of the Quarry Management Plan the geochemical analysis was completed for (Preliminary characterization or monitoring).

- Provide locations of geochemical analysis samples reported in the annual report. Ideally a map or figure showing both the location of the quarried material and the location of the samples will be provided.

Sabina Response:

B2Gold will provide information on the following in the next annual report for 2022 and 2023:

- source location and end use location for waste rock used in construction as well as volumes of rock excavated from quarries and roads
- lab certification
- locations of geochemical analysis samples in the form of a map or a figure showing both the location of the quarried material and the location of the samples

The geochemical analysis completed in 2022 was completed for the purposes of preliminary characterization and monitoring as outlined in Figure 8.3-1 of the Borrow Pits and Quarry Management Plan (2020).

CIRNAC-#R-06: Acid Rock Drainage / Metal Leaching – Classification criteria for NPAG Material.

References:

Sabina 2022 Annual Report, Section 2.6c,

Sabina Back River Project Borrow Pits and Quarry Management Plan (2020), Section 8

Comment:

The 2022 annual report Section 2.6 c provides ARD classification criteria as NPAG being NPR value of greater than 3, or low sulphur samples with total sulphur less than 0.16 wt. %. Sabina Back River Project Borrow Pits and Quarry Management Plan (2020), Section 8, evaluation criteria is listed as NPR greater than 3, or low sulphur (total sulphur content less than 0.15%). Sample ID 28 presented in Table 2.6-1 has a reported total Sulphur value of 0.15% and is classified as NPAG – Low Sulphur.

Recommendation:

CIRNAC recommends that the Licensee confirm classification criteria as NPAG is in accordance with the Sabina Back River Project Borrow Pits and Quarry Management Plan (2020), Section 8, in particular with respect to the low sulphur metric of total sulphur content less than 0.15% and adjust any classifications of samples as required. Alternatively if the low sulphur criteria has changed, was this change submitted or approved by the board and regulators.

Sabina Response:

B2Gold notes the editorial error in the annual report and confirms that the definition of NPAG – Low Sulphur should have been listed as shown below, which is consistent with the Borrow Pits and Quarry Management Plan (2020) and the Waste Rock Management Plan (2020).

NPAG - Low Sulphur = NP / AP < 3 and Total Sulphur < 0.15 wt. %.

B2Gold also highlights that the classification criterium for this material is intended to state less than or equal to 0.15 wt. %; this clarification is consistent with the determinations and calculations provided in the Geochemical Characterization Report (171005 2AM-BRP----MAD App E-3_GeochemCharactRpt-IMLE). Based on this clarification, Sample ID 28 is correctly classified as NPAG – Low Sulphur.

B2Gold also identified a table heading error in Table 2.6-1 of the annual report associated with the AP and NP columns. An updated table (Appendix B) has been provided to correct this error as well as in response to CIRNAC-IR-04.

CIRNAC-#R-07: Monitoring

References:

Sabina 2022 Annual Report, Appendix C, Monitoring Activity Overview by Station

Comment:

There is no information on Monitoring Activity, Appendix C is empty.

Recommendation:

CIRNAC recommends that Sabina confirms that there is no Monitoring Activity to report.

Sabina Response:

Appendix C (Monitoring Summary) has been attached to this submission.

CIRNAC-#R-08: Landfill and Waste Management Plan

References:

Sabina 2022 Annual Report, Section 2.9 and Appendix B

Comment:

Section 2.9 of the Annual Report references Tables 1 and 2 in Appendix B. Appendix B does not contain any table numbering scheme, and there is a further third table apparent in Appendix B.

Recommendation:

CIRNAC recommends that the Licensee provide appropriate numbering and table titles in Appendix B of Annual report.

Sabina Response:

Updated LWMP Appendix B attached with numbering and table titles

CIRNAC-#R-09: Landfill and Waste Management Plan – Approvals

References:

Sabina 2022 Annual Report, Section 2.20; September 21, 2022 letter re. CIRNAC review of Landfill & Waste Management Plan; September 16, 2022 letter re. Kitikmeot Inuit Association (KIA) review of Landfill and Waste Management Plan

Comment:

Section 2.20 of the annual report references revisions to the Landfill and Waste Management Plan were submitted in August 2022. There is no reference to responses to this plan received from CIRNAC and KIA, or of follow-up actions by Sabina.

Recommendation:

CIRNAC recommends that the Licensee provide clarification on Section 2.20 reference that responses were received and feedback is pending and include a detailed explanation of how the comments received have been incorporated into the plan to date.

Sabina Response:

As part of B2Gold's Back River Energy Center proposal, B2Gold has committed to include and update of the LWMP in the next annual report to the NWB. B2Gold will address input from CIRNAC and the KIA in this update.

CIRNAC-#R-10: Landfill and Waste Management Plan

References:

Sabina 2022 Annual Report, Section 2.9, September 21, 2022 letter re. CIRNAC review of Landfill & Waste Management Plan

Comment:

The CIRNAC review reiterated the requirement for submission of a design and construction report 60 days prior to construction of a landfill. Section 2.9 of annual report indicates landfill will be constructed in the future, however the timing is unclear. We present this comment to flag that pre-development reporting will be required for this element, and that with a 60-day window for review it should be well in advance of the planned construction season so as to avoid potential construction delays.

Recommendation:

CIRNAC recommends that the Licensee provide an approximate timeframe for development and a proposed workplan for the coming year that includes milestones for submission of plans to be reviewed.

Sabina Response:

A design and construction report will be filed with the NWB 60 days prior to initiation of landfill construction as per Part D, Item 2 of Water Licence 2AM-BRP1831. At this time, landfill construction is anticipated to Q1 2024.

CIRNAC-#R-11: Waste Management Plans – Waste oil

References:

Sabina 2022 Annual Report, Section 2.9 and Appendix B.

Comment:

Appendix B, second table includes a column itemizing "waste oil to furnace". This is not referenced in Section 2.9 of the annual report or any other location within the 2022 Annual Report.

Recommendation:

CIRNAC recommends that the Licensee provide clarity related to this item and explain why it is included in Section 2.9 of the annual report. Sabina is to provide information on what this item represents and whether it is included according to a specific plan that has been reviewed.

Sabina Response:

The "waste oil to furnace" column notes the waste oil used in an oil furnace for the generation of heat, B2Gold recycles our waste oil in this manner. This information will be clarified or removed in future reports.

2.3 RESPONSE TO ENVIRONMENT AND CLIMATE CHANGE CANADA

ECCC-#01: Aquatic Baseline Report – Graphs and Summary Statistics

References:

Sabina Gold & Silver Back River Project, 2022 Annual Report for Water Licence 2AM-BRP1831, Appendix E: Back River Project 2022 Aquatic Baseline Report, Section 4.0 - Results

Comment:

The Aquatic Baseline Report identifies several observed guideline exceedances during the 2022 baseline monitoring. Exceedances included pH (Goose Lake, Propeller Lake, Reference B Lake), total aluminum (Goose Lake, Propeller Lake), total copper (Goose Lake), total chromium (Reference B Lake). The report states that exceedances for pH, aluminum, and copper were also observed in previous years of baseline monitoring. However, previous data has not been summarized or presented to support these statements. A graph depicting baseline data collected to date, and/or a table summarizing the existing baseline dataset would aid in support and understanding how the 2022 data fits into the existing dataset.

Recommendation:

ECCC recommends the Proponent provide graphs and summary statistics of the baseline data collected to date to support the conclusions that 2022 data is consistent with previously collected baseline data.

Sabina Response:

Graphs and summary statistics of baseline data collected up to 2018 are provided in the Aquatic Baseline Synthesis Report (Golder 2019), which is publicly available on the NWB registry. The purpose of the 2022 Aquatic Baseline Report was to present the methods and results of the 2022 baseline data collection and not to provide a comprehensive re-analysis of baseline conditions. The comparisons to previous baseline results in the 2022 report appropriately references the Aquatic Baseline Synthesis Report.

It is noted that once the AEMP is initiated, analysis of water quality in exposure and reference areas will include visual assessment of time series plots showing historical data.

References:

Golder (Golder Associates Ltd.). 2019. Back River Project – Aquatic Baseline Synthesis Report. Appendix A to the Aquatic Effects Management Plan. July 2019. Also found on the Nunavut Water Board public registry at: ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-BRP1831%20Sabina/3%20TECH/I%20AQUATIC%20EFFECTS%20MONITORING/I2%20Baseline%20Data/

ECCC-#02: Aquatic Baseline Report – Future Monitoring.

References:

Sabina Gold & Silver Back River Project, 2022 Annual Report for Water Licence 2AM-BRP1831, Appendix E: Back River Project 2022 Aquatic Baseline Report, Section 5.0 – Summary and Conclusions

Comment:

The Aquatic Baseline Report notes that, “baseline conditions for the AEMP are still being characterized and variability is expected within the baseline dataset as the data accumulate over time.” No further

discussion is provided on future baseline data collection or existing data gaps that need to be filled during future monitoring programs.

Recommendation:

ECCC recommends the Proponent provide a description of planned future aquatic baseline monitoring, including identification of existing data gaps.

Sabina Response:

The Aquatic Baseline Synthesis Report (Golder 2019) identified the need for additional under-ice water quality data, and additional data for all AEMP components (water and sediment quality, benthic invertebrate community, and fish health/tissue chemistry) from Propeller Lake.

In response, Sabina committed to collecting another year of under-ice water quality data in Goose Lake and Reference B Lake, collecting more water quality data in Propeller Lake prior to a potential Project-related influence on Propeller Lake (i.e., late in the Operations phase), and collecting additional Lake Trout data during the fish health surveys (i.e., during future AEMPs).

Additional baseline data were collected in 2021 and 2022, including:

- Water quality during the ice-cover season in four areas in Goose Lake (i.e., West Bay, Central Basin, Southeast Basin, and Goose Lake Tail), one area in Reference B Lake, and one or two areas in Propeller Lake (one area in 2021, two areas in 2022).
- Water quality during the open-water season in four areas in Goose Lake (i.e., West Bay, Central Basin, Southeast Basin, and Goose Lake Tail) and two areas within Propeller Lake (i.e., north and south basins).
- Water quality during the open-water season, including during freshet, at several inflows and outflows of Goose Lake.
- Sediment quality and benthic invertebrate community in two areas in Propeller Lake (i.e., north and south basins).
- Fish health and tissue chemistry (mercury) of Lake Trout from Goose Lake and Propeller Lake.
- Fish health and tissue chemistry (metals) of Slimy Sculpin from two areas in Propeller Lake.

The data collection in 2021 and 2022 fulfilled the commitments made by Sabina for additional baseline data collection to support the AEMP, and no further data collection is planned to address the identified data gaps prior to the initiation of the AEMP.

ECCC-#03: Aquatic Baseline Report – Water Quality Guidelines

References:

Sabina Gold & Silver Back River Project, 2022 Annual Report for Water Licence 2AM-BRP1831, Appendix E: Back River Project 2022 Aquatic Baseline Report, Appendix C: 2022 Water Quality – Analytical Chemistry Results

Federal Environmental Quality Guidelines (FEQGs) - Canada.ca

Comment:

The guidelines used for assessment of water quality data include the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for Protection of Aquatic Life. ECCC notes that some of these guidelines are outdated and newer guidelines based on more recent science have been developed in the form of the Federal Environmental Quality Guidelines (FEQG). The FEQGs have been developed to support environmental monitoring on substances for which CCME guidelines do not yet exist or are not reasonably expected to be updated in the future.

Recommendation:

ECCC recommends the Proponent review the available FEQGs for inclusion in the list of guidelines used for analysis of water quality data at the Back River project.

Sabina Response:

Acknowledged. Sabina can consider the use of Federal Environmental Quality Guidelines (FEQG) in future water quality assessments.

ECCC-#04: No Identification of Materials That Were Open Burned

References:

Sabina Gold & Silver Back River Project, 2022 Annual Report for Water Licence 2AM-BRP1831, Appendix B: Waste Disposal

Guideline for the Burning and Incineration of Solid Waste (gov.nu.ca)

ECCC Solid Waste Management for Northern and Remote Communities Planning and Technical Guidance Document (publications.gc.ca)

Comment:

Appendix B (Waste Disposal) quantifies the volume of materials that were open burned at the Back River Project but does not identify what materials were burned. The Government of Nunavut's guidelines for open burning restrict this method to paper products, paperboard packing including boxboard and cardboard, untreated wood including lumber and plywood, and natural fiber textiles. Both the Government of Nunavut and ECCC discourage open burning, and it is not evident why open burning was performed when an incinerator was available.

Recommendation:

ECCC requests that items subjected to open burning be specified, and recommends that these items be considered for incineration, contingent on incinerator availability, as a preferred alternative to open burning.

Sabina Response:

B2Gold confirm that only paper products, paperboard packing including boxboard and cardboard, untreated wood including lumber and plywood, and natural fiber textiles are open burned at the Back River Project, in accordance with the Government of Nunavut's guidelines and water licence 2AM-BRP1831 allowances. Generally, open burning is utilized when there are larger quantities of wood and cardboard to burn, as is the case during construction phase. These quantities cannot be addressed through incineration as the operational requirements of the incinerator necessitate that such more highly combustible material only comprise a small proportion of each incineration batch.

Appendix A

Annual Report Appendix C – Monitoring Summary

2022 Monitoring Activity Overview by Station

Monitoring Program Station	Monitoring Type	Description	Mine Phase	Group Code*	Frequency	Monitoring Activity
BRP-G-01 to BRP-G-TBD	Regulated Monitoring	**General Site Runoff** Surficial runoff anywhere at both Goose Property and MLA, including quarries; monitoring for erosion and sedimentation.	Construction	C	Weekly if flow enters a waterbody	No flow entering a waterbody was observed in 2022.
BRP-S-01 to BRP-S-TBD	General Monitoring	**General Seeps** Seepage or runoff from excavated and/or stockpiled material anywhere at both Goose Property and MLA, including quarries, that does not gather into a collection system or the site is reclaimed.	Construction and Operations	A, D	Monthly during flow, or as found	No seepage was observed in 2022
BRP-01	Regulated Monitoring	**Goose Lake Discharge** (discharge point for release of dewatering effluent with or without treatment)	Construction	A, B, G	Weekly during dewatering	N/A – dewatering activities have not been initiated
				D	Four times during dewatering, at the same time as the weekly samples	
				H	Once per month during dewatering, at the same time as Group D	
				I	One time during dewatering, at the same time as Group D	
BRP-02	General Monitoring	**Llama Lake** (intake point for dewatering, triggers need for treatment prior to discharge at BRP-01)	Construction	C (TSS only)	Weekly if treatment is required; no sample if treatment is not required	N/A – dewatering activities have not been initiated
BRP-03	Verification Monitoring	**Llama Pit** (representative of collected pit water prior to transfer to tailings management facility)	Operations Stage 1 to Operations Stage 2	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-04	General Monitoring	**Llama Pit Lake** (representative of flooded pit during flooding and before overflow to the downstream environment)	Closure* to Post-Closure	A, D	Twice per year	N/A – facility construction has not been initiated/ n/a mine phase
BRP-05	Verification Monitoring	**Llama WRSA Pond** (representative of collected water quality)	Operations Stage 1 to Closure	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-06	General Monitoring	**Umwelt Lake** (intake point for dewatering, triggers need for treatment prior to discharge at BRP-01)	Construction	C (TSS only)	Weekly if treatment is required; no sample if treatment is not required	N/A – dewatering activities have not been initiated
BRP-07	Verification Monitoring	**Umwelt Pit** (representative of collected pit water prior to transfer to tailings management facility)	Construction to Operations Stage 2	A, G	At Licensee's discretion	N/A – facility construction has not been initiated
BRP-08	General Monitoring	**Umwelt Pit Lake** (representative of flooded pit during flooding and before overflow to the downstream environment)	Closure to Post-Closure	A, D	Twice per year	N/A – facility construction has not been initiated/ n/a mine phase
BRP-09	Verification Monitoring	**Umwelt WRSA Pond** (representative of collected water quality, including landfill seepage/runoff)	Construction to Closure (early)*	A, G	At Licensee's discretion	N/A – facility construction has not been initiated
BRP-10	Verification Monitoring	**Primary Water Pond** (representative of collected water quality)	Construction to Closure (early)	A, D	At Licensee's discretion	N/A – facility construction has not been initiated

BRP-11	Verification Monitoring	**Saline Water Pond** (representative of stored water quality)	Construction (late) to Closure (early)	A, D	At Licensee's discretion	N/A – facility construction has not been initiated
BRP-12	General Monitoring	**Big Lake Intake** (intake point for potable and industrial water withdrawal)	Construction to Closure	A, D	Four times per year	N/A – facility construction has not been initiated
				B	Weekly	
BRP-13	Verification Monitoring	**Ore Stockpile Pond** (representative of collected water quality)	Construction to Closure (early)	A, D	At Licensee's discretion	N/A – facility construction underway but not completed
BRP-14	Verification Monitoring	**ANFO Plant** (representative of collected water quality)	Construction to Closure	A, E	At Licensee's discretion	N/A – facility construction has not been initiated
BRP-15	Regulated Monitoring	**Goose Fuel Tank Farm** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	N/A – facility constructed, consturction summary report in progress, no ponding water observed
BRP-16	Regulated Monitoring	**Goose Hazardous Waste Management Area** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	N/A – facility construction has not been initiated
BRP-17	Regulated Monitoring	**Goose Property Sewage Treatment Plant** (discharge point for treated sewage onto land)	Construction to Closure	A, F	Prior to discharge	N/A – facility construction has not been initiated
BRP-17A	Regulated Monitoring	**Goose Property Sewage Treatment Plant** (discharge point for treated sewage into Tailings Storage Facility or Tailing Facility)	Construction to Closure*	A, F	Prior to discharge	N/A – facility construction has not been initiated
BRP-18	General Monitoring	**Llama Watershed Outflow** (representative of non-contact water, PN04 from Water and Load Balance)	Operations Stage 1 to Closure	A, D	Once during freshet	N/A mine phase
BRP-19	General Monitoring	**Echo Outflow** (representative of non-contact water). PN09 from water and load balance	Operations Stage 1 to Closure	A, D	Once during freshet	N/A mine phase
BRP-20	Verification Monitoring	**Echo Pit** (representative of collected pit water prior to transfer to tailings management facility)	Operations Stage 2	A, G	At Licensee's discretion	Initial construction has occured; no transfer or discharge of water required in 2022
BRP-21	General Monitoring	**Echo Pit Lake** (representative of flooded pit during flooding and before overflow to the downstream environment)	Closure to Post-Closure	A, D	Twice per year	N/A – facility construction has not been initiated/ n/a mine phase
BRP-22	Verification Monitoring	**Echo WRSA Pond** (representative of collected water quality)	Operations Stage 2 to Closure (early)	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-23	General Monitoring	**Gander Pond Outflow** (representative of non-contact water, PN07 from Water and Load Balance)	Operations Stage 1 to Closure	A, D	Once during freshet	N/A mine phase
BRP-24	General Monitoring	**Goose Lake Intake** (intake point for potable and industrial water withdrawal)	Operations Stage 1 to Closure (early)	B	Weekly	N/A- no water withdrawn under this Licence in 2022
BRP-25	Verification Monitoring	**Goose Pit** (representative of collected pit water prior to transfer to tailings management facility)	Operations Stage 1 to Operations Stage 2	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-26	General Monitoring	**Goose Pit Lake** (representative of flooded pit during flooding and before overflow to the downstream environment)	Closure* to Post-Closure	A, D	Twice per year	N/A – facility construction has not been initiated/ n/a mine phase

BRP-27	Verification Monitoring	**Goose Main Tailings Facility** (intake point for water treatment, represents pre- treatment water quality)	Operations Stage 3 to Closure	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-28	Verification Monitoring	**Goose Main Tailings Facility** (discharge point for water treatment, represents post-treatment water quality)	Operations Stage 3 to Closure	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-29	Verification Monitoring	**TSF WRSA Pond** (representative of collected water quality, including landfill seepage/runoff)	Operations Stage 1 to Closure	A, G	At Licensee's discretion	N/A – facility construction has not been initiated/ n/a mine phase
BRP-30	General Monitoring	**Goose Southeast Inflow** (representative of non-contact water, PN06 from Water and Load Balance)	Operations Stage 1 to Closure	A, D	Once during freshet	N/A mine phase
BRP-40	General Monitoring	**Bathurst Inlet Intake** (intake point in marine environment for potable and industrial water withdrawal)	Construction to Closure	A, D, B	At Licensee's discretion	Water was withdrawn from this Location in 2022
BRP-41	General Monitoring	**Bathurst Inlet Discharge** (discharge point in marine environment for effluent from desalinization plant)	Construction to Closure	A, J	At Licensee's discretion	Water was discharged at this location in 2022
BRP-42	Regulated Monitoring	**MLA Greywater** (discharge point for treated greywater onto land)	Construction to Closure	A, F	Prior to discharge or transfer of water	Greywater was discharged at the MLA in 2022 but no water was available for sampling at BRP-42
BRP-43	Regulated Monitoring	**MLA Fuel Tank Farm** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	Discharge of 10 m3 from Temporary MLA berms
BRP-44	Regulated Monitoring	**MLA Landfarm** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	N/A – facility construction has not been initiated
BRP-45	Regulated Monitoring	**MLA Hazardous Waste Management Area** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	N/A – facility construction has not been initiated
BRP-49	Regulated Monitoring	**MLA Temporary Fuel Storage Facility** (representative of collected water quality)	Construction	A, E	Prior to discharge or transfer of water	Water was sampled prior to discharge. See Annual report
BRP-51	Regulated Monitoring	**Goose Landfarm** (representative of collected water quality)	Construction to Closure	A, E	Prior to discharge or transfer of water	N/A - no water was discharged from this facility
BRP-52	General Monitoring	**MLA Pond S1** (intake point for potable and industrial water withdrawal)	Construction to Closure	A, D	Once per quarter when in use	No water was withdrawn from this location in 2022
				B	Weekly when in use	
BRP-53	General Monitoring	**MLA Pond S2** (intake point for potable and industrial water withdrawal)	Construction to Closure	A, D	Once per quarter when in use	No water was withdrawn from this location in 2022
				B	Weekly when in use	
BRP-54	General Monitoring	**MLA Lake 3** (intake point for potable and industrial water withdrawal)	Construction to Closure	A, D	Once per quarter when in use	No water was withdrawn from this location in 2022
				B	Weekly when in use	
BRP-55	General Monitoring	**MLA Lake 4** (intake point for potable and industrial water withdrawal)	Construction to Closure	A, D	Once per quarter when in use	No water was withdrawn from this location in 2022
				B	Weekly when in use	
BRP-I-01 to BRP-I-TBD	General Monitoring	**Interconnection Winter Ice Road Proximal Water Bodies** (intake points for fresh water used in the construction of the Interconnection Winter Ice Road)	Construction to Closure	B	Weekly when in use	No water was withdrawn from this location in 2022

* Refers to Group Code from Water Licence 2AM-BRP1831 Schedule I Table 1

Appendix B

2022 Annual Report – Table 2.6-1

2022 Annual Report - Table 2.6-1

Sample ID	Total Carbon (wt. %)	Total Sulphur (wt. %)	Sulphide Sulphur (wt. %)	Sulphate Sulphur (wt. %)	AP (kg $CaCO_3$/t)	NP (kg $CaCO_3$/t)	NPR (NP/AP)	Classification
18	0.19	0.13	0.01	0.02	4.1	7.2	1.8	NPAG - Low Sulphur
19	0.23	0.12	0.04	0.02	3.8	7.1	1.9	NPAG - Low Sulphur
4	0.15	0.13	0.02	0.02	4.1	7.5	1.8	NPAG - Low Sulphur
8	0.08	0.17	0.01	0.01	5.3	6.9	1.3	PAG - Uncertain
9	0.08	0.16	0.02	0.01	5.0	6.4	1.3	PAG - Uncertain
17	0.13	0.07	0.01	0.02	2.2	6.6	3.0	NPAG
20	0.18	0.16	0.05	0.01	5.0	5.9	1.2	PAG - Uncertain
32	0.22	0.12	0.02	0.02	3.8	5.7	1.5	NPAG - Low Sulphur
33	0.05	0.17	<0.01	0.01	5.3	7.2	1.4	PAG - Uncertain
7	0.19	0.04	<0.01	0.02	1.3	5.1	4.1	NPAG
10	0.22	0.07	0.01	0.02	2.2	5.5	2.5	NPAG - Low Sulphur
16	0.25	0.09	0.02	0.01	2.8	7.6	2.7	NPAG - Low Sulphur
21	0.17	0.14	<0.01	0.01	4.4	9.5	2.2	NPAG - Low Sulphur
31	0.12	0.11	<0.01	0.02	3.4	6.6	1.9	NPAG - Low Sulphur
34	0.26	0.23	0.03	0.02	7.2	5.9	0.8	PAG
44	0.09	0.12	<0.01	0.01	3.8	7.6	2.0	NPAG - Low Sulphur
6	1.57	0.82	0.61	0.03	25.6	4.8	0.2	PAG
11	0.24	0.14	0.05	0.01	4.4	6.1	1.4	NPAG - Low Sulphur
15	0.2	0.21	0.02	0.02	6.6	8.3	1.3	PAG - Uncertain
22	0.08	0.12	<0.01	0.01	3.8	6.8	1.8	NPAG - Low Sulphur
30	0.12	0.1	<0.01	0.02	3.1	6.8	2.2	NPAG - Low Sulphur
35	0.09	0.13	<0.01	0.01	4.1	7.0	1.7	NPAG - Low Sulphur
5	0.16	0.17	0.03	0.02	5.3	6.4	1.2	PAG - Uncertain
12	0.14	0.18	0.03	0.01	5.6	6.9	1.2	PAG - Uncertain
14	0.17	0.11	0.01	0.02	3.4	10.1	2.9	NPAG - Low Sulphur
23	0.09	0.09	0.02	0.01	2.8	6.7	2.4	NPAG - Low Sulphur
29	0.08	0.06	<0.01	0.01	1.9	9.5	5.1	NPAG
36	0.07	0.13	0.02	0.01	4.1	7.2	1.8	NPAG - Low Sulphur
43	0.05	0.21	<0.01	0.01	6.6	7.7	1.2	PAG - Uncertain
13	0.15	0.12	<0.01	0.01	3.8	6.7	1.8	NPAG - Low Sulphur
24	0.09	0.08	0.01	0.01	2.5	6.5	2.6	NPAG - Low Sulphur
28	0.12	0.15	<0.01	0.01	4.7	8.6	1.8	NPAG - Low Sulphur
37	0.09	0.16	<0.01	0.02	5.0	8.9	1.8	PAG - Uncertain
42	0.12	0.11	<0.01	0.02	3.4	9.5	2.8	NPAG - Low Sulphur
25	0.11	0.14	<0.01	0.02	4.4	7.5	1.7	NPAG - Low Sulphur
26	0.05	0.19	<0.01	0.01	5.9	8.1	1.4	PAG - Uncertain
41	0.08	0.11	0.02	0.01	3.4	7.8	2.3	NPAG - Low Sulphur
27	0.11	0.12	<0.01	0.01	3.8	6.9	1.8	NPAG - Low Sulphur
39	0.07	0.14	0.02	0.02	4.4	6.4	1.5	NPAG - Low Sulphur
3	0.08	0.12	0.02	0.01	3.8	7.4	2.0	NPAG - Low Sulphur
40	0.06	0.17	<0.01	0.01	5.3	8.1	1.5	PAG - Uncertain

Appendix C

Updated LWMP Appendix B

(Will be provided with 2023 Annual Report)