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Karén Kharatyan

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Gjoa Haven, Nunavut
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Sent by E-mail: karen.kharatyan@nwb-oen.ca

2018-04-04

Re: KIA's Technical Review of Back River Project Type A Water License Application

Dear Karén Kharatyan, the KIA has completed its technical review of Sabina Gold & Silver Corp.'s Type A Water License application for the Back River Project. The KIA's consultants in the areas of wildlife, aquatic sciences, fish sciences, and geotechnical engineering reviewed the FEIS and addendum for the Back River Project and the Type A water application. Thirty-two issues are to be brought forward at the NWB's Technical Meeting.

There are six identified issues for Hydrology and Hydrogeology, one identified for Fisheries and Aquatic Environments, and twenty-five identified issues for Water Quality and Monitoring. KIA believes these issues to be resolvable and will meet with Sabina Gold & Silver Corp. prior to the NWB technical meeting to settle them.

For each of our technical review comments, we have provided tangible, specific, and executable recommendations that provide a clear path to addressing the issues identified. We hope that our review comments and recommendations prove useful to the NWB and Sabina to assist them in better understanding and managing project risks, and in ultimately producing an enhanced Type A water license application acceptable to all parties and the NWB.

John Roesch, P.Eng.

Senior Hope Bay Project Officer
Department of Lands and Environment
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Hydrology and Hydrogeology

Review Comment Number	KIA-NWB-01
Subject/Topic	Sensitivity of mine inflows to presence of EPZ
References	MAD Appendix F-5_Hydrogeological Characterization and Model Report, Section 6.3
Summary	Conduct sensitivity run based on the presence of Enhanced Permeability Zones (EPZs) in the mined volumes, for a preliminary estimate of an upper bound of mine inflows.
Importance	The presence of Enhanced Permeability Zones (EPZs) within the planned mines can lead to a significant increase in inflow to the mines. Even though not supported by the existing data, the presence of these zones cannot be ruled out for the mines in the Goose property. The presence of EPZs in other northern mines with similar hydrogeological settings as the Goose mines demonstrates that the presence of these zones is not uncommon. It is therefore important to account for them in the model sensitivity analysis.
Detailed Review Comment	The report states that there are similarities between the Ekati mines and the four mines at the Goose property: both sets of mines are developed in taliks within competent bedrock, and the project areas have a similar permafrost depth and TDS profile. While Enhanced Permeability Zones (EPZs) were identified in the Ekati mines, the data collected at the Goose property do not indicate the presence of these zones. Nonetheless, the distribution of hydraulic conductivity (K) in the Goose property mines is subject to uncertainty as it is inevitably based on a discrete data set. Given that the EPZs can lead to a significant increase in mine inflow, a sensitivity scenario where these zones are represented should be conducted, to provide a preliminary estimate of an upper bound for inflows. It is recognized that more information on the presence and extent of EPZs will be acquired during mining. However, conducting a sensitivity run based on the presence of these zones would provide a valuable first-pass upper bound of mine inflow, and it would

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	allow the adequacy of the water management plan to be assessed based on this key uncertainty.
Recommendation/Request	Conduct a sensitivity run based on the presence of EPZs in the mines.
Importance	High

Review Comment Number	KIA-NWB-02
Subject/Topic	Sensitivity of mine inflows to location of permafrost boundaries
References	MAD Appendix F-5_Hydrogeological Characterization and Model Report, Section 6.4.5.
Summary	Conduct sensitivity run based on a plausible shift of the permafrost boundaries, so to quantify the effect of the uncertainty of the permafrost geometry on mine inflows.
Importance	It is important to assess the effect that changes in the 3D geometry of permafrost from those represented in the model may have on mine inflows, since the permafrost geometry is uncertain, and even small changes in the vertical and lateral extent of the permafrost may translate into considerably higher mine inflows. Considering the possibility of higher inflows in relation to the uncertainty of permafrost geometry is important to assess the adequacy of the proposed water management plan.
Detailed Review Comment	In section 6.4.5 it is stated that "*the distribution of permafrost is reasonably understood, but the exact 3D distribution of frozen vs. unfrozen ground is not known.*" The effect of different permafrost geometries on mine inflows is described in qualitative terms, but no indication is given that a sensitivity run was conducted to quantify these effects. It is recommended that a sensitivity run be conducted, by assuming plausible changes in the permafrost vertical and lateral boundaries. This would allow the adequacy of the water management plan to be assessed based on the uncertainty in permafrost geometry.
Recommendation/Request	Conduct a sensitivity run based on a plausible reduced vertical and lateral extent of permafrost in the mine areas, to quantify the resulting increase in mine inflow.
Importance	High

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Review Comment Number	KIA-NWB-03
Subject/Topic	Consideration of total concentrations in mine effluents
References	MAD Appendix E-2_Water Load Balance Report, Section 5.4.1, Section 7. MAD Appendix F-1_Site-WideWater Management Report, Section 4.2.1. Attachment A Type A_IR Responses, KIA-IR12.
Summary	Include Total Suspended Solids (TSS) and total concentrations in the water load balance model.
Importance	An increase in Total Suspended Solids (TSS) can have an adverse effect of the aquatic habitat. TSS typically reduce the clarity of water, with the effect of reducing photosynthesis and increasing water surface temperature, due to increased absorption of solar heat. Other adverse effects include inhibition of egg development, physical injury of fish gill membranes and clogging of aquatic insect filtering apparati. Total concentrations of substances with potential toxicity (e.g. metals) account for the presence of these substances both in the dissolved and suspended form. Modelling of the dissolved form only underestimates the toxicity potential of contaminant substances. No consideration for TSS in the water load balance model and the comparison of the dissolved concentrations generated by the model with the CCME benchmarks for the protection of aquatic life is also not appropriate, since these benchmarks include consideration of TSS and refer to total, not dissolved concentrations. It is therefore important to model TSS and total concentrations, so that treatment requirements can be defined based on an appropriate comparison with CCME guidelines.
Detailed Review Comment	Section 7 of the Water Load Balance report indicates that the water load balance model generates dissolved concentrations (e.g. Section 7.2, "*Monthly average water quality predictions for dissolved metal concentrations were evaluated…".* The comparison of the modelled dissolved concentrations with the CCME benchmarks for the protection of aquatic life, which are expressed in terms of total concentrations, is not

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	appropriate and leads to underestimating the number of constituents with concentrations above the guidelines, as well as the concentrations in excess of the guidelines. In response to this observation, which is presented in KIA-IR12, the Proponent states that the mine effluents have minimal to no presence of Total Suspended Solids (TSS), so that dissolved concentrations are effectively equal to total concentrations. However, in Section 5.4.1 of the Water Load Balance Report and in section 4.2.1 of the Site-wide Water Management Report it is stated that the water from Llama Lake and Umwelt Lake that will be pre-dewatered and pumped into Goose Lake has a high content of suspended solids. Table 5-1 of the Water Load Balance Report indicates that 50% of the water removed from Umwelt Lake will be discharged directly into Goose Lake, and the water removed from Llama Lake will be treated for TSS and Arsenic only at the final dewatering stage. Therefore, the assumption of negligible TSS in the effluent to Goose Lake does not seem to hold. The discharge of a TSS load can have an adverse effect on the aquatic habitat in Goose Lake, as it may lead to a local reduction in water clarity near the effluent discharge point. The presence of a TSS load in the effluent also implies that constituents with toxicity potential, such as metals, will be discharged not only in dissolved form but also in suspended form. Not including TSS in the water load balance model and considering only dissolved concentrations leads to an underestimate of the substances with potential toxicity that are discharged into Goose Lake.
Recommendation/Request	The water load balance model should be modified to include consideration of Total Suspended Solids (TSS) and total constituent concentrations, so that water treatment requirements based on the comparison with CCME benchmarks can be adequately defined. The modeling of total metals is also included in the list of the Proponent's commitments of the FEIS and FEIS Addendum Project Certificate (170601-12MN036-FHA EX 45-Recommended PC Terms and Conditions Committments-IA2E), item INAC-C-1

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Importance	High

Review Comment Number	KIA-NWB-04
Subject/Topic	Monitoring of seepage from TSF dam
References	MAD Appendix F-4_Tailings Management System Design, Section 5.13 and 5.14.
Summary	No provision is made for the installation of monitoring wells downstream of the seepage collection berm that will be installed downstream of the TSF dam, to detect possible by-pass flow through the berm, in case of leakage of the liner.
Importance	The installation of monitoring wells allows the early detection of by-pass seepage from the seepage collection berm, and is therefore important to ensure that contamination of shallow groundwater from the TSF is contained and risk of contamination from the streams located downstream of the TSF is minimized.
Detailed Review Comment	Section 5.13 states that fractured bedrock was identified in the top 2-3 meters in the western portion of the TSF dam, which may allow seepage from the dam. The 6-m dam back fill in this portion of the dam exceeds the minimum thermal thickness required to maintain the underlying materials in frozen state, thus minimizing the likelihood of seepage. A seepage collection berm will also be constructed to intercept the seepage that may be generated from the TSF dam. Nonetheless, it is possible that the liner installed at the base of this berm may not be completely impervious allow some by-pass seepage. The installation of shallow monitoring wells located at a short distance downstream of the berm and drilled through the overburden (if present) to the top 2-3 m of bedrock would allow the early detection of by-pass seepage, and trigger measures for early seepage containment.
Recommendation/Request	Include the installation of monitoring wells downstream of the seepage collection berm for early detection of by-pass seepage. The review of seepage monitoring options is also included in the list of the Proponent's commitments of the FEIS and FEIS Addendum Project Certificate (170601-12MN036-FHA EX 45-

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	Recommended PC Terms and Conditions Committments-IA2E); item INAC-C-4.
Importance	Medium

Review Comment Number	KIA-NWB-05
Subject/Topic	Effect of increase in temperature in climate change predictions
References	Site-wide Water Management Report, Section 2.1.4.
Summary	A projected increase in temperature at the Goose property consistent with the climate change predictions for northern Nunavut should be considered to properly account for climate change in the design of the water management infrastructure.
Importance	Northern Nunavut has experienced an increase in temperature in the last 100 years ranging from 1 to 3°C, and a further significant increase is projected for the next few decades (Nunavut Climate Change Centre, 2018, https://www.climatechangenunavut.ca/en/understanding-climate-change/climate-change-nunavut). An increase in temperature is bound to have significant effects on the design of the water management system for the Goose property, since it would potentially lead to a greater snowmelt rate, increase in active layer thickness and talik extent, resulting in larger volumes of water requiring management.
Detailed Review Comment	In Section 2.4.1 of the Site-wide Water Management Report it is stated that "*In accordance with the Standardized Procedure for Climate Change Integration into Engineering Design adopted for the Project (SRK Consulting (Canada) Inc., 2015e), the primary climate variable that is important from a water management infrastructure design perspective is variability in precipitation patterns*." Accordingly, climate change is accounted for in the design of the water management system only by considering the 10% increase in rainfall expected by 2040.Nevertheless, temperature is also estimated to increase significantly in the project area in the next few decades. The Nunavut Climate Change Centre indicates that temperature in northern Nunavut has increased by an average of 1 to 3°C over the last

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	100 years, and that this trend is likely to continue into the future. The effect of an increase in temperature based on the historic trend of up to 1.2°C in 2040 will likely be a greater snowmelt rate, greater duration of the open water season, deepening of the active layer and expansion in the volume of taliks. These effects will generate greater volumes of water requiring management at the Goose property. As such, these additional volumes should be accounted for in the design of the water management infrastructure for the project.
Recommendation/Request	Estimate additional volumes of water requiring management, which would result from the likely increase in temperature over the life of the project based on the current projections for northern Nunavut.
Importance	High

Review Comment Number	KIA-NWB-06
Subject/Topic	Discrepancy in mine inflows reported in the Hydrogeology and Modeling Report, the Water Load Balance Report and the Site-Wide Management Plan
References	MAD Appendix F-5_Hydrogeological Characterization and Modeling Report, Section 6.2, Table 5; MAD Appendix E-2_Water Load Balance Report, Section 3.2.7, Table 3-10; SD05-Water Management Plan, Section 5.1.3, Table 5.1-1
Summary	Some of the modelled mine inflows in Table 5 of the Hydrogeology and Modeling Report differ from those listed in Table 3-10 of the Water Load Balance report and Table 5.1-1 of the Site-wide water management plan.
Importance	It is important to have consistency in the mine inflows reported in different documents supporting the Application, to avoid confusion and possible errors in the assessment results. This discrepancy is likely a typo, however it needs correcting.
Detailed Review Comment	The following mine inflows listed in Table 5 of the Hydrogeology and Modeling Report differ from those listed in Table 3-10 of the Water Load Balance Report

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	and Table 5.1-1 of the Site-Wide Water Management Plan: Unwelt U/G 2028: 156 m3/d (Table 5) vs. 312 m3/d (Table 3-10 and 5.1.-1) Llama U/G 2022: 185 m3/d (Table 5) vs. 246 m3/d (Table 3-10 and 5.1.-1) Llama Open Pit 2020: 109 m3/d (Table 5) vs. 76 m3/d (Table 3-10 and 5.1.-1) Llama Open Pit 2021: 702 m3/d (Table 5) vs. 19 m3/d (Table 3-10 and 5.1.-1) Goose Main U/G 2027: 64 m3/d (Table 5) vs. 16 m3/d (Table 3-10 and 5.1.-1) These discrepancies may be a 'typo', but if they are not, they need to be resolved or a clarification is needed to justify them.
Recommendation/Request	Resolve or clarify the discrepancies in the mine inflows listed in the Hydrogeology and Modeling Report, Table 5, and those listed in the Water Load Balance Report, Table 3-10, and in the Site-Wide Water Management Plan, Table 5.1-1.
Importance	Low

Fisheries and Aquatic Environments

Review Comment Number	KIA-NWB-07
Subject/Topic	Frequency of Biological Monitoring (AEMP)
References	AEMP: 171005- 2AM-BRP SD21 AEMP Section 4.3
Summary	Conduct biological Monitoring within the first year after commencement of dewatering of the Llama and Umwelt Lakes to Goose Lake and in Year 1 of each phase of the Project and every subsequent 3 years (including during the Construction Phase), unless a statistically significant difference is observed between receiving sites and reference sites. In this case, adaptive management should be implemented and monitoring should be conducted annually until exposed area is recovered.
Importance	It is imperative to detect effects as early as possible during the life of the mine in order to adaptively manage any unexpected outcomes.
Detailed Review Comment	Each phase of the Project represents different exposure regimes to Goose Lake and downstream receiving environments. During the construction phase Llama and Umwelt lakes will be dewatered to Goose Lake. While these practices are not expected to increase metal and

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	nutrient concentrations to Goose Lake, they represent unusual hydrological inputs to Goose lake that could have impacts to the benthic and fish communities in Goose Lake and downstream areas. Thus, it is recommended to monitor these areas relative to reference areas early on (within a year) of discharge to Goose Lake for the early detection of possible changes to these communities. If no statistically significant change to benthic and fish communities are observed, subsequent monitoring should be conducted at 3-year intervals (as indicated by the proponent). This would therefore mean year 1 and year 4 of construction However, if statistically relevant changes are detected that cannot be attributed to natural events, adaptive management should be immediately implemented, and annual monitoring should be instituted until results have normalized. During the operations and closure phases, contact water will be stored in the tailings storage facility or the saline water ponds and effluent will not be release to the receiving environment. Freshwater to support domestic and industrial uses will be sourced from Goose Lake. During these phases, it is important to continue monitoring these areas to ensure that water withdrawals do not result in unintended effects to biological compartments in Goose Lake and the downstream areas. In addition, the ground surface in the areas upstream of Goose Lake will be developed for infrastructure, and while all contact water will be diverted to the TSF and other water storage ponds, it is important to monitor that these facilities are not unintentionally discharging waters to downstream environments and to ensure that baseline conditions of biologically relevant communities remain stable. Thus, monitoring at Year 1, 4, 7 and 10 of Operations (in a 10 year Operations phase) and Year 1, 4, and 7 of Closure (8 year closure phase) is recommended. At post-closure water from the TSF will be released to the receiving environment once it meets applicable guidelines. During this phase it is critical to monitor the biological communities downstream of discharge points. Thus, biological monitoring is recommended during Year 1 of Post-closure and if no changes detected on year 3 and 5 of the 5-year post-closure phase to ensure the mine is chemically and physically stable and that no risk of biological harm remains.
Recommendation/Request	Conduct biological Monitoring within the first year after commencement of dewatering of the Llama and Umwelt Lakes to Goose Lake and in Year 1 of each phase of the Project and during every subsequent 3 years (including during the Construction, Operations, and Closure Phase) and in year 1, 3, and 5 of post-closure, unless statistically significant differences are observed between receiving sites and reference sites. In this case, adaptive management should be immediately implemented and

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	monitoring should be conducted annually until exposed area is recovered.
Importance	High

Water Quality and Monitoring

Review Comment Number	KIA-NWB-08
Subject/Topic	Winter ice road melt management
References	Road Management Plan Sections 4.1.7 and 4.2.2
Summary	Sabina has not provided enough information on how it will prevent fill applied to the winter ice road (WIR) from entering watercourses or waterbodies.
Importance	Deleterious substances such as excavated material could inadvertently drain, or be washed, into local waterways.
Detailed Review Comment	In Section 4.2.2, Sabina states that a "discontinuous pad of granular fill may be required over short areas of rough terrain or where there is insufficient snow cover to create a smooth surface" for the WIR (p. 4-11). Sabina does not discuss how it will manage this fill when the WIR melts in the spring. Insufficient management of the melting WIR may result in runoff and a pulse of suspended solids into adjacent waterbodies.
Recommendation/Request	Please provide additional information on how fill along the WIR will be managed to avoid entering waterways.
Importance	Medium

Review Comment Number	KIA-NWB-09
Subject/Topic	MLA PAG storage
References	Borrow Pits and Quarry Management Plan Section 6.1
Summary	It is not clear where PAG rock found at the MLA will be stored.
Importance	Improper storage of PAG rock could lead to acid rock drainage.
Detailed Review Comment	Gap/Issue In Section 6.1, Sabina states that quarry material from MLA has *"negligible potential for ARD"* (p. 6-2), but if PAG

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	material is found at the MLA it will be stored appropriately (e.g., covered with NPAG waste rock). Where would PAG rock found at the MLA be stored? No WRSA is currently planned for the MLA.
Recommendation/Request	Please indicate where PAG rock found at the MLA will be stored.
Importance	Medium

Review Comment Number	KIA-NWB-10
Subject/Topic	Borrow pit and quarry problematic water discharges
References	Borrow Pits and Quarry Management Plan Section 46.2
Summary	Insufficient information is provided on how problematic water will be managed.
Importance	Improperly managed problematic water may cause water quality issues in receiving waters.
Detailed Review Comment	In Section 6.2, Sabina states, *"any flowing water which may leave the working area will be sampled as part of ongoing monitoring and allowed to discharge to the environment if it meets Project discharge criteria as defined in the Water Management Plan (SD-05). Any problematic water will be directed away from waterbodies or held in contact water event ponds with enough capacity to contain high runoff from the spring freshet"* (p. 6-3). We are concerned that problematic water discharged to the land may result in environmental degradation. How will the location for discharge be selected? Will discharge locations be monitored? How will it be monitored? Will contact water event ponds also be designed with enough capacity for increased precipitation forecast under climate change?
Recommendation/Request	Please provide additional details on how contact water will be managed. In particular, please explain (i) where this water will be discharged, (ii) under what conditions it will be discharged, (iii) whether discharge will be monitored and how and (iv) whether contact water event

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	ponds are designed with sufficient capacity to contain increased precipitation predicted under climate change.
Importance	Medium

Review Comment Number	KIA-NWB-11
Subject/Topic	Seep and runoff seep surveys
References	Borrow Pits and Quarry Management Plan Section 7 Mine Waste Rock Management Plan Section 7
Summary	Monitoring for seepage and runoff at quarries and the waste rock management facilities are insufficient to assess water quality.
Importance	Improperly monitored seepage and runoff could adversely affect water quality in the receiving environment.
Detailed Review Comment	Table 7-1 outlines the monitoring frequency of different parameters at quarries. *"Seepage and runoff water quality"* will be assessed through a *"Spring seep survey of all quarries and major infrastructure components except roads"*. The spring seep survey will also be conducted for waste rock storage facility seeps. This approach appears to focus on freshet but neglects to characterize the impacts of rainfall events. We recommend that both a seep survey and a runoff survey also be carried out following extreme rainfall events. Sabina lists the parameters to be measured in seep water (and presumably runoff), but these do not include TSS nor nutrients, components of ammonium nitrate fuel oil (ANFO).
Recommendation/Request	Please monitor seepage and runoff from quarries after extreme rainfall events. Please include TSS and nitrogenous compounds in seep water and runoff.
Importance	Medium

Review Comment Number	KIA-NWB-12
Subject/Topic	Ore stockpile runoff management
References	Ore Storage Management Plan Section 5.2

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Summary	Insufficient information is provided on the monitoring and treatment of ore stockpile runoff.
Importance	Improperly managed runoff could adversely affect water quality in the receiving environment.
Detailed Review Comment	Based on results from humidity cell tests, some ore stockpiles may develop acidic conditions over 10 or fewer years. As a precaution, Sabina states that it will collect ore stockpile runoff and treat *"if required prior to discharge"*. How will Sabina determine if runoff requires treatment? Will regular monitoring be conducted of runoff? What treatment will be undertaken?
Recommendation/Request	Please indicate what criteria will be used to determine whether ore stockpile runoff requires treatment and what treatment will be used.
Importance	Medium

Review Comment Number	KIA-NWB-13
Subject/Topic	Ore storage runoff metal monitoring
References	Ore Storage Management Plan Section 7.2
Summary	Runoff discharge criteria do not include measures for metals.
Importance	Metal leaching from ore stockpiles could potentially affect water quality in the receiving environment.
Detailed Review Comment	Table 7.2-1 lists site runoff discharge criteria (TSS, oil and grease, and pH). Metals are not measured, despite the potential for metal leaching from stockpiles.
Recommendation/Request	Please include a runoff discharge criterion for metals and a commitment to monitor metals in ore storage runoff.
Importance	Medium

Review Comment Number	KIA-NWB-14
Subject/Topic	Tailings facility seepage
References	Tailings Management Plan Section 4.2.7
Summary	No discharge criteria are provided for seepage from the Tailings Storage Facility (TSF).

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Importance	Seepage could affect water quality in the receiving environment.
Detailed Review Comment	Sabina states that seepage from the TSF *"may be released to the receiving environment if water quality permits"* (p. 4-10) but provides no discharge criteria. Sabina should propose discharge criteria for seepages stemming from the TSFs.
Recommendation/Request	Please indicate what the discharge criteria are for seepage from the primary TSF and other flooded open pits, which will be used as tailings facilities. We propose using CCME water quality objectives as the criteria to ensure no impacts from direct discharges to the receiving environment.
Importance	High

Review Comment Number	KIA-NWB-15
Subject/Topic	Construction related dust fall management
References	Tailings Management Plan Section 6.3 Water Management Plan Section 9.7
Summary	The potential for dust generation during construction is not considered in sufficient detail.
Importance	Dust could enter contact and non-contact water, adversely affecting the water quality in the receiving environment.
Detailed Review Comment	Sabina states that *"minimal site preparation is required for TSF construction; therefore, dust is not expected to be problematic during the Construction Phase"* (p. 6-1). However, section 4.2.6 describes numerous features that will be constructed during the Construction Phase including trenches, embankments, dykes, and pony walls. Several features will be made with fine crushed gravel or pea-sized gravel, and drilling and blasting will be required. Thus, it appears that conditions may create significant dust during construction. Sabina should indicate how it will monitor for and manage dust during construction.
Recommendation/Request	Please explain how dust will be monitored for and managed during construction.
Importance	Medium

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Review Comment Number	KIA-NWB-16
Subject/Topic	Ash and asbestos management
References	Landfill Waste Management Plan Section 7.4
Summary	Disposal procedures for ash and asbestos in the landfill are lacking information.
Importance	It is difficult to assess the potential risk of ash and asbestos contamination of the receiving information without further information.
Detailed Review Comment	7.4 The landfills will take non-combustible waste, incinerator ash and waste asbestos. Waste will be compacted with a bulldozer and covered daily,with Sabina stating that *"care is to be taken during compaction to ensure that containers of ash are not ruptured and that areas containing waste asbestos are not disturbed"* (p. 7-6). The asbestos waste will be disposed of in labelled bags and buried with *"a minimum of 500 mm of cover material and temporary signage placed to ensure it is not disturbed"* (p. 7-7). Records will be kept on the location of asbestos waste and signage will indicate the area not to be disturbed. What will waste be covered with? Will ash containers be deposited in designated areas of the landfill, that are marked (as with asbestos)? What type of container will be used for ash? What is the source of the asbestos? How much will be disposed of at each landfill? Will asbestos be disposed throughout the project, or just during certain times? What material will the bags be made out of (biodegradable or not?)?
Recommendation/Request	Please indicate (i) how ash and asbestors will be covered; (ii) whether ash containers will be deposited in designated areas; (iii) what type of container will be used for ash; (iv) the source of and volume of asbestos waste; timing of asbestos disposal; (v) what steps will be taken to minimize or eliminate the use of asbestos and (vi) type of bags to be used for asbestos disposal.
Importance	Low

Review Comment Number	KIA-NWB-17
Subject/Topic	Hazardous materials water management at MLA
References	Hazardous Materials Management Plan Section 7.1.1

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Summary	Insufficient information is provided on the testing and disposal of water collected at the MLA storage pads for hazardous waste.
Importance	It is difficult to evaluate the whether this contact water will pose a risk to aquatic environments.
Detailed Review Comment	7.1.1 Sabina states that there will be a hazardous material storage pad at the MLA that will lined and graded to collect and contain contact water and snow melt in sumps. How will the contact water and snowmelt collecting in the sumps at the hazardous material storage pad be managed? Will it be tested? How will it be disposed of? We are also concerned that there is not treatment options at the MLA should water not be suitable for discharges. Sabina also states that an additional unlined laydown pad will be constructed at the MLA for inert materials, such as ammonium nitrate within sea cans to be transported to the Goose Property. Will the contact water and snowmelt from the unlined laydown pad at the MLA be collected and contained? How will it be managed? Note that diversion berms will be used at the Goose Property laydown pad for ammonium nitrate to direct runoff to a sump according to 7.1.2l; these do not appear to be present at the MLA.
Recommendation/Request	Please explain how contact water and snowmelt collecting at the hazardous material storage pad and the unlined laydown pad at the MLA will be monitored and disposed of.
Importance	Low

Review Comment Number	KIA-NWB-18
Subject/Topic	Hazardous material storage
References	Hazardous Materials Management Plan Section 8
Summary	Insufficient discussion is provided regarding storage practices for hazardous waste.
Importance	It is difficult to evaluate the potential risks of hazardous waste stored on site to the aquatic environment.

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Detailed Review Comment	Sabina states that *"where appropriate, hazardous materials will be stored in a covered building or sea cans to prevent exposure to the influences of weather"* (p. 8-1). It is not clear how Sabina will decide whether to store hazardous materials under cover or outside.
Recommendation/Request	Please clarify what criteria will be used to determine whether it is appropriate to store hazardous materials under cover (e.g., hazardous material type? Quantity? Time of year?). What are the risks of storing hazardous materials outside, exposed to the weather, and how will these risks be minimized or avoided for hazardous material stored in this way?
Importance	Low

Review Comment Number	KIA-NWB-19
Subject/Topic	Risk assessment and evaluation
References	Risk Management and Emergency Response Plan Section 7.1
Summary	The classification of environmental impacts for the consequence severity categories used in the risk assessment process is vague and lacks scientific rigour.
Importance	An overly simplified classification system could inadequately assess risk to and impact on the natural environment of the project's activities.
Detailed Review Comment	Sabina follows a four-step risk assessment process: • Identify hazards • Evaluate probability of hazards • Evaluate severity of hazards • Evaluate risk of hazards based on probability and severity. Table 7.1-2 lists the different levels of consequence severity of identified hazards. Under the Critical category, the environmental impact is described as *"very serious environmental impacts with impairment on landscape/marine ecology. Long-term, widespread effects on significant environment"* (p. 7-2). There is no mention of potential impacts on freshwater ecology or ecosystems.

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	Please include potential impacts on freshwater ecology or ecosystems. The classification of environmental impacts for the five consequence categories is vague and overly general. It is not clear how it will be determined whether an impact is *"very serious with impairment on landscape/marine ecology"* vs *"serious environmental impacts with impairment on ecosystems"* vs *"some impairment on ecosystem function"* vs *"minor effects on biological or physical environment"* vs *"low-level effects on biological or physical environment"*. Furthermore, it is not clear how *"displacement of species"* is assigned to the Moderate consequence category. Species could be displaced under all five-consequence scenarios. It would be more appropriate to assign degrees of displacement to different consequence categories (e.g., number of species or proportion of a population displaced is a better measure of impact than the current blanket "displacement of species"). Please develop more stringent and scientifically defensible environmental criteria to classify impacts into the five consequence categories. These criteria should be clearly defined (e.g., what constitutes *"minor effect"* or *"short-term damage"* or *"widespread effects"*).
Recommendation/Request	Please include consideration of potential impacts on freshwater ecology or ecosystems in all consequence categories. Please develop more stringent, specific and scientifically defensible environmental criteria to classify impacts into the five consequence categories. These criteria should be clearly defined (e.g., what constitutes *"minor effect"* or *"short-term damage"* or *"widespread effects"*).
Importance	Medium

Review Comment Number	KIA-NWB-20
Subject/Topic	Bulk fuel storage discharge criteria – lead
References	Fuel Management Plan Section 8
Summary	The discharge criterion for lead in bulk fuel storage pooling water is less conservative than that used at the Meadowbank Gold Mine.

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Importance	Elevated levels of lead in pooling water could adversely affect water quality in the receiving environment.
Detailed Review Comment	Sabina states that *"water pooling within the secondary containment of the fuel storage facilities will be sampled, treated as necessary, and released to the receiving environment once water quality criteria has been met"* as presented in Table 8-1: **Table 8-1. Proposed Bulk Fuel Storage Pooling Water Discharge Criteria** **Parameter** / **Maximum Average Concentration (mg/L)** Benzene: 0.370 Ethyl benzene: 0.090 Toluene: 0.002 Xylene: 0.300 Lead: 0.200 Oil and Grease: 15 and no visible sheen *Notes:* *The concentrations for Benzene, Ethyl benzene, Toluene, Xylene, and Lead are Freshwater CCME Guidelines for the Protection of Aquatic Life (CCME 2013).* *The concentration for Oil and Grease is included in CCME (2003).* The discharge criteria correspond to the criteria used in the Meadowbank water license, except for lead. Meadowbank has a lead discharge criterion of 0.001 mg/L for bulk fuel storage pooling water, while Sabina proposes 0.200 mg/L. 6. Effluent from fuel containment facilities that require Discharge to land, shall not exceed the following Effluent quality limits: Parameter / Maximum Average Concentration Benzene (ug/L): 370 Toluene (ug/L): 2 Ethylbenzene (ug/L): 90 Lead (ug/L): 1 Oil and Grease (mg/L): 15 and no visible sheen It is not clear why Sabina is adopting a less stringent discharge criterion than comparable projects in the territory. Reference: Agnico Eagle. 2014. Appendix B12 – Meadowbank Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan, Version 2. (June 2014).
Recommendation/Request	Please explain why Sabina is adopting a less stringent discharge criterion for lead than other comparable projects in the territory.
Importance	Medium

Review Comment Number	KIA-NWB-21
Subject/Topic	Sewage spill response

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References	Spill Contingency Plan Section 8.3.2
Summary	Sabina does not plan to remove ice or soils contaminated by untreated sewage in the event of a spill.
Importance	Contaminated ice and soils could adversely affect water quality in the receiving environment.
Detailed Review Comment	Sabina indicates that if there is a spill of untreated sewage at the Goose Property *"any affected water will be recovered and discharged into the active tailings facility"* but that *"it will not be necessary to remove affected ice or excavate affected soils"* (p. 8-7). It is not clear why contaminated ice and soils would not be removed. In addition, how often will sewage pipes be inspected to ensure there are no leaks?
Recommendation/Request	Please explain why contaminated ice and soils will not be removed in the event of a spill of untreated sewage. Please describe how often sewage pipes will be inspected for leaks.
Importance	Medium

Review Comment Number	KIA-NWB-22
Subject/Topic	Bulk fuel volumes
References	Oil Pollution Emergency Plan Base Annex 5
Summary	Conflicting information is provided regarded volume of bulk fuel transfers and length of floating hose used.
Importance	It is difficult to evaluate the effectiveness of safety measures with inconsistent information.
Detailed Review Comment	Annex 5: Bulk Cargo Transfer Procedures – Sabina states that the total annual volume of the bulk fuel transfers is expected to be approximately 30 – 45 ML. However, in 6.1 of the Oil Pollution Emergency Plan, Sabina states that the total annual volume is expected to be 60 ML (p.6-1). Please clarify. Annex 5: Sabina indicates that there will be a single or double floating hose approximately 1000 m long linking the vessel to the connecting flange on shore. Does this mean hoses are single or double walled? We recommend that all hoses be double walled to protect against leakage. In Annex 4: Resident Spill Response Equipment, Sabina lists 1 oil containment boom 300 m long in its spill

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	response equipment inventory. Is this length sufficient to deal with leaks along a 1000 m long hose? – Note that Annex 6: Spill Response Equipment Onboard lists a containment boom that is 1000 ft. long (~300 m). Is it possible that the unit for length of hose is incorrect in Annex 5 (i.e., does Sabina mean 1000 ft. instead of 1000 m? That would fit with ship to shore distance illustrated in Base Figure 4). Annex 6: It is confusing that this document uses imperial measurement, when metric measurement is used throughout the rest of the Oil Pollution Emergency Plan, and the other Water License application documents.
Recommendation/Request	Please fix discrepancies noted for bulk fuel volume and length of floating hose. We recommend use of double walled hoses for all fueling activities. Please use metric units in Annex to be consistent with the rest of the Water License application.
Importance	Low

Review Comment Number	KIA-NWB-23
Subject/Topic	Quarry PAG bedrock cover at closure
References	Interim Closure and Reclamation Plan Sections 5.2.10.9
Summary	Sabina plans to cover PAG bedrock with a thinner layer of NPAG rock than will be used on other PAG waste rock.
Importance	PAG and metal leaching may adversely affect water quality in the receiving environment.
Detailed Review Comment	5.2.10.9 Quarry rock will be tested to determine PAG status. If any PAG bedrock is exposed, Sabina will either handle it as it does other PAG waste rock onsite, or leave in place and cover *"with a minimum of a 2 m thick layer of non-acid generating soil or rock"* (p. 5-42). The treatment of other PAG waste rock is to cover it with a 5 m NPAG cover. It is not clear why the greater thickness of NPAG cover will not be applied to PAG bedrock.
Recommendation/Request	Please explain why the greater thickness of NPAG cover (5 m) will not be applied to PAG bedrock.

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Importance	Medium

Review Comment Number	KIA-NWB-24
Subject/Topic	Licence Length
References	Main Application Document (MAD) Section 2.2.2
Summary	The requested licence length of 14 years does not allow for a fulsome evaluation of management and mitigation practices, the incorporation of that evaluation into ongoing operational activities, or the opportunity to review the license to address changes in practices.
Importance	The requested licence length does not provide an opportunity to evaluate all management and mitigation activities against their performance and update them accordingly in a revised licence.
Detailed Review Comment	**Gap/Issue** Sabina has sought a licence term of 14 years to allow for all proposed construction and operational activities of the known resource. The requested license length would conclude immediately prior to closure when discharges of contact water to the aquatic environment are planned. This licence length does not provide an opportunity for substantive review of all management plans and the implementation of improved practices, which would occur through a licence renewal prior to the conclusion of operations. **Disagreement with WL information/ conclusion** The requested licence length of 14 years does not allow for a fulsome evaluation of management and mitigation practices, and the incorporation of that evaluation into ongoing operational activities. This concern is compounded as Sabina is continuing to explore and further delineate the underground resource within the site footprint as described in the project certificate. Any increases to mine life would benefit from the incorporation of the evaluation of the ongoing practices and incorporation into future operational practices. **Reasons for disagreement** The requested licence length does not provide an opportunity to evaluate all management and mitigation activities against their performance and update them accordingly. A 14 year licence length for the Back River project is longer than that at Hope Bay (2013- 2023; amended 2016 – Licence NO: 2AM-DOH1323 – AMENDMENT NO.1), Meadowbank (2015-2025; Licence NO: 2AM-MEA1525) and Baffinland (2013-2025; Licence NO: 2AM-MRY1325).

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	We note that the Meliadine Water Licence is longer (2016-2031, Licence NO: 2AM-MEL1631), but stipulate that a) a start date for construction and operations was not firm at the time of licencing, and b) the proponent was currently operating in the territory (Meadowbank) with a proven record of compliance.
Recommendation/Request	We request the Type A water licence duration be restricted to 10 years ensuring that a renewal process is required and any amendments to operational practices are incorporated into the latter half of extracting the known resource on site.
Importance	Medium

Review Comment Number	KIA-NWB-25
Subject/Topic	Deviations from original design plans
References	Main Application Document (MAD) Section 2.2.3
Summary	Deviations from proposed engineer designed water management structures presented in the application may not be adequately justified in the construction summary report. These deviations may affect the effectiveness of water management structures.
Importance	The proposed practices do not provide assurance water management will occur as proposed within the Water Licence Application.
Detailed Review Comment	**Gap/Issue** Sabina has stated *"The construction summary report will be prepared by an Engineer(s) in accordance with the following requirements… Documentation of field decisions that deviate from the original plans and any data used to support or developed facilities and infrastructure to withhold, divert or retain water and/or waste;".* It is important that the Engineer(s) document the potential implications of field decisions deviating from the original plans on water management on site. **Disagreement with WL information/ conclusion** The proposed practices do not provide assurance water management will occur as proposed within the Water Licence Application. **Reasons for disagreement** See above.
Recommendation/Request	It is requested that engineer reported deviations from field decisions be accompanied with an assessment of

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	how those decisions may influence the effectiveness of proposed water management structures. The Construction Summary report including the discussion of deviations and their implications for water management should be provided to the KIA for review.
Importance	Low

Review Comment Number	KIA-NWB-26
Subject/Topic	Phosphorus enrichment
References	Main Application Document (MAD) Section 5.3.2; Table 5.3-1; Water and Load Balance Report Appendix D.
Summary	It is not clear whether Sabina has evaluated the impacts of a short-term shift in trophic level at PN02, PN03, PN04, PN06, and PN10 and in Goose Lake. A significant pulse temporarily shifting a system's trophic level may result in a sustained alternate steady state thereby maintaining the new lake condition.
Importance	A significant pulse of phosphorus can result in long-term internal loading within the receiving environment, which may not have been incorporated into modelling results.
Detailed Review Comment	**Gap/Issue** Sabina indicates *"Treated effluent [from the wastewater treatment plant will be] discharged to active tailings facility during Operations. If effluent discharge from the STP meets discharge criteria, effluent will be discharged to land."* We note that effluent in the tailings facility will only reach the receiving environment during closure. We express concern maximum modelled phosphorus concentrations resulting from the discharges indicates a shift in trophic level at PN02, PN03, PN04, PN06, PN10 and in Goose Lake. **Disagreement with WL information/ conclusion** It is unclear if Sabina has accounted for the potential effects of a large influx of nutrients, namely phosphorus, in the receiving environment, and whether the potential for a shift in the receiving environment's trophic status is a potentiality. An alternate steady trophic state may present a potential unmitigated risk to the receiving environment that may be rectified with more stringent sewage effluent criteria for nutrients. **Reasons for disagreement**

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	A significant pulse of phosphorus can result in long-term internal loading within the receiving environment, which may not have been incorporated into modelling results.
Recommendation/Request	Please indicate the length of time phosphorus concentrations will be elevated above the baseline trophic levels in Goose Lake and at the prediction nodes. Please provide a discussion as to the impact-elevated concentrations will have with respect to a shift in trophic levels. Note the modeled length of time phosphorus concentrations will be elevated should rely on the updated model as requested in the KIA Technical Comment titled "Water quality modelling results".
Importance	Medium

Review Comment Number	KIA-NWB-27
Subject/Topic	Water quality modelling results
References	Main Application Document (MAD) Section 5.4.1, Table 5.4.1; Water and Load Balance Report (WLBR) Section 4.2.2, Appendix D. Nunavut Impact Review Board Final-Hearing Report Back River Gold Mine Project. Page 118. FEIS KIA-C-8
Summary	Sabina has not updated the water quality baseline with additional seasonal data as requested by ECCC and KIA during the FEIS hearings. The KIA and ECCC had indicated that insufficient water quality data had been collected from freshet. This was to have been completed prior to the water licence.
Importance	Failure to incorporate an adequate characterization of seasonal variation into the baseline water quality data inputs to the water and load balance model decreases confidence in its outputs. This may preclude Sabina from providing adequate water treatment for water quality in the pit lakes resulting in an undue negative impact to the aquatic environment.
Detailed Review Comment	**Gap/Issue** Sabina has summarized existing lake and stream water quality in the Project area indicating available data was from 1993 through 2013. As indicated in the KIA's comments as well as ECCC's on Sabina's FEIS (KIA-C-8), additional water quality data was required to substantiate the claim that there was no seasonal variation in water quality data. The KIA and ECCC had indicated that

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	insufficient water quality data had been collected from freshet, a time of year when melting snow mobilizes terrestrial inputs into the aquatic environment and influence water quality. Sabina has not updated the water quality baseline with additional seasonal data as requested by ECCC and KIA. **Disagreement with WL information/ conclusion** The baseline water quality data was a key input into the water and load balance model, which has not been updated since it, was presented in the FEIS. Note that the KIA had requested that Sabina commit *"to collect additional baseline water quality data from the lakes in the Project area during freshet and fall as confirmed by measurements of higher flow, prior to construction. The Proponent commits to use this data to update the water and load balance model. The Proponent will ensure sampling is an appropriate and accurate representation of at least one (1) full year of seasonal data."* **Reasons for disagreement** Failure to incorporate an adequate characterization of seasonal variation into the baseline water quality data inputs to the water and load balance model decreases confidence in its outputs. This may preclude Sabina from providing adequate water treatment for water quality in the pit lakes resulting in an undue negative impact to the aquatic environment.
Recommendation/Request	We again request the proponent commit to collect additional baseline water quality data from the lakes in the Project area during freshet and fall as confirmed by measurements of higher flow, prior to construction. Sabina should commit to use this data to update the water and load balance model. The Proponent will ensure sampling is an appropriate and accurate representation of at least one (1) full year of seasonal data. The occurrence of freshet should be confirmed with on site meteorological and flow measurements. If the results diverge from those presented in the 2015 Water and Load balance report, we request that Sabina provide additional water treatment options as necessary. We further request that Sabina present monthly outputs for Goose Lake water quality and prediction nodes (PN) 01 through 13 to assist reviewers in determining when site water quality will comply with CCME water quality objectives for the protection of aquatic life and when Goose Lake will return to the baseline trophic level. Monthly outputs should be provided using the updated dataset.

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Importance	High

Review Comment Number	KIA-NWB-28
Subject/Topic	Load Balance for Marine Laydown Area
References	Water and Load Balance Report (WLBR) Section 4, Section 7.1 Final Environmental Impact Statement Volume 7 Table 2.1-5.
Summary	Sabina has not included source terms and inputs for load balance results in the MLA. This is of direct concern as results show elevated arsenic concentrations above the CCME marine water quality objective.
Importance	Elevated modeled concentrations represent a risk to the aquatic environment while a clear understanding of the pathway between project activities and the receiving environment has not been presented.
Detailed Review Comment	**Gap/Issue** Load balance source terms and inputs for the MLA have not clearly been defined. This raises particular concern as Sabina has presented water quality predictions for the MLA, which indicate arsenic concentrations (0.045 mg/L) well in excess of the CCME marine WQO (0.0125 mg/L). We note that this is significantly elevated above baseline arsenic concentrations as presented in the FEIS; all arsenic measurements in the local study area between 2001 and 2013 were below the analytical detection limit of 0.002 mg/L and ranged between 0.008 mg/L and 0.011 mg/L in the regional study area. **Disagreement with WL information/ conclusion** Elevated modelled arsenic concentrations represent a risk to the aquatic environment. A clear characterization of the pathway between project activities and the receiving environment with respect to arsenic enrichment has not been presented. **Reasons for disagreement** Failure to characterize the pathway may preclude implementation of appropriate mitigation measures and adaptive management.
Recommendation/Request	Sabina should provide the source inputs for water quality predictions in the MLA, and a discussion as to why certain parameters such as arsenic are elevated above both baseline concentrations and the CCME marine WQO.

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	Sabina should also outline appropriate management options that will be implemented to mitigate the impact.
Importance	Medium

Review Comment Number	KIA-NWB-29
Subject/Topic	Water Quality Model Results
References	Water and Load Balance Report (WLBR) Section 4, Section 7.2
Summary	Sabina has not provided a discussion as to how the varying "upper case" scenarios in the water and load balance sensitivity analysis reflect potentialities at the project site and what measures are in place to mitigate them.
Importance	Failure to accurately model and evaluate scenarios diverging from the base case may improperly characterize the impacts of project activities under conditions less optimal than average. This may result in the proponent having insufficient adaptive management in place should these potentialities occur.
Detailed Review Comment	**Gap/Issue** Sabina indicates, *"The predicted water quality concentrations are based on a deterministic modelling approach, assuming average hydrological conditions. This approach is consistent with the derivation of source terms, which are developed based on average hydrology. The predicted water quality under these conditions provides the most likely results to occur."* While the sensitivity analysis provides variances from this average "base case", no discussion as to how these "upper cases" reflect realistic potentialities. Many of these scenarios currently appear arbitrary; no rationale has been provided to indicate how realistic these scenarios are, and whether Sabina has a response framework in place should they occur. **Disagreement with WL information/ conclusion** Sabina has not provided a discussion as to how the varying "upper case" scenarios in the water and load balance sensitivity analysis reflect potentialities at the project site. **Reasons for disagreement** Failure to accurately model and evaluate scenarios diverging from the base case may improperly characterize the impacts of project activities under conditions less optimal than average.

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Recommendation/Request	We recommend Sabina provide a discussion as to how the "upper case" scenarios presented in the water and load balance sensitivity analysis reflect realistic potentialities at the Project site, what factors may cause such deviation and whether a more conservative sensitivity analysis is warranted. We further request Sabina provide a discussion as to how these "upper case" scenarios may be adaptively managed. We are particularly concerned with arsenic concentrations resulting from the "upper case" scenarios as outlined in Figure 9-1, which shows exceedances of the SSWQO (0.01 mg/L) in perpetuity. If this information has already been provided, we request Sabina direct us to that information.
Importance	High

Review Comment Number	KIA-NWB-30
Subject/Topic	Saline Water Management Plan
References	Water Management Plan, Section 8.1.8, Section 9.4.2
Summary	Sabina has not included sufficient details on their saline water management plan in their water licence application to provide confidence that the project can operate within the predictions as outlined in the FEIS.
Importance	Failure to manage saline water appropriately is a significant liability associated with the Project. This concern is confounded by the fact that a meromictic lake with saline water at the bottom is an intended legacy of the project; this is only acceptable with appropriate management.
Detailed Review Comment	*"Sabina proposes to include a Saline Water Management Plan as a component of the next revision to the Water Management Plan."* Saline water management is a significant liability associated with the Back River project. Failure to provide a Saline Water Management Plan at the time of water licencing precludes our capacity to assess whether the project can operate within the confines of the predictions outlined in the Final Environmental Impact Statement.
Recommendation/Request	We request Sabina provide a full saline water management plan prior to receiving a water licence. We note that the conceptual details of the plan provided in section 9.4.2 of the existing water-managing plan are insufficient.

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Importance	High

Review Comment Number	KIA-NWB-31
Subject/Topic	Flooded Pit Water Management
References	Water Management Plan Section 8.3.3 Water and Load Balance Figure 7-1 through 7-4.
Summary	Sabina has not presented sufficient evidence to validate the claim that the long-term water quality in the pits will meet CCME guidelines or SSWQOs as appropriate.
Importance	Prolonged exceedances of CCME WQOs and the SSWQO may require additional treatment and adaptive management, which may not be available.
Detailed Review Comment	**Gap/Issue** Sabina notes *"Pit water will meet applicable discharge criteria and then be allowed to overtop into nearby watercourses. Table 6.1-2 provides a summary of the average monthly water quality concentrations at the time of flooding and the average open water long-term steady state conditions in each of the flooded open pits. These predictions are compared to MMER discharge limits. All parameters in each pit lake facility are expected to meet MMER limits at the time of flooding and long-term steady state conditions are expected to meet CCME guidelines or SSWQOs as appropriate"*. Sabina has not presented sufficient evidence to validate the claim that the long-term water quality in the pits will meet CCME guidelines or SSWQOs as appropriate. **Disagreement with WL information/ conclusion** Water quality presented in Table 6.1-2 indicates many parameters in the flooded pits, including those converted to tailings facilities during phased mining, will continue to exceed several long-term CCME water quality objectives in perpetuity. This appears to invalidate Sabina's claim leading to concern with water quality in the receiving environment; we acknowledge the flooded pits will be listed tailings impoundment areas under Schedule 2 of MMER. Our concern therefore is for the receiving environment downstream of the flooded pits. Modelling results presented in the Water and Load Balance Report indicate exceedances in the receiving environment at closure, which do not persist in perpetuity. We are concerned this discrepancy may reflect a calculation error, which affects the duration in which concentrations may continue to exceed CCME WQOs at prediction nodes throughout

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	Goose Lake; additional treatment may therefore be required. **Reasons for disagreement** See above.
Recommendation/Request	Sabina should provide a discussion as to the discrepancy between the statement *"All parameters in each pit lake facility are expected to meet MMER limits at the time of flooding and long-term steady state conditions are expected to meet CCME guidelines or SSWQOs as appropriate"* and the modelling results presented in Table 6.1-2 of the water management plan. Further discussion should be provided with regard to how this may influence predicted water quality as presented in the water and load balance.
Importance	High

Review Comment Number	KIA-NWB-32
Subject/Topic	Freshet Monitoring
References	Water Management Plan, Appendix B, Table B-01 Aquatic Effects Monitoring Plan Table 4.3-3
Summary	The description of the monitoring frequency outlined for sites BRP-18, BRP-19 and BRP-23 (water management plan), and BRP-31 and BRP-34 (AEMP) is not clearly enough defined to provide assurance that potential contaminants or sediment mobilized during freshet or by project activities that may reach the aquatic environment will be adequately characterized. We recommend the monitoring frequency for BRP-18, BRP-19 and BRP-23 be further refined to read "*once during freshet as confirmed by on site air temperature and flow measurements consistent with an increase in flow indicative of melting snow and ice, and monthly during construction while visible flow is present at the station."* We recommend that the samples collected from BRP-31 and BRP-34 in June coincide with freshet as defined above.
Importance	Failure to collect seasonally appropriate samples may result in an unrepresentative characterization of aquatic conditions during freshet and any corresponding impacts from project activities. This may in turn result in a failure to implement an appropriate adaptive response to project related changes in the aquatic environment.

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Detailed Review Comment	**Gap/Issue** Water quality monitoring stations BRP 18 (Lama Watershed Outflow), BRP-19 (Echo Outflow), BRP-23 (Gander Pond outflow) and BRP-3- (Goose Southeast Inflow) are all designated to *"Test quality of non-contact water runoff from…"* their respective sub watersheds. Table B-01 indicates that this monitoring will occur once during freshet. This monitoring frequency is not sufficiently detailed to provide assurance that potential airborne contaminants deposited on the tundra and sediment mobilized during freshet will be appropriately characterized prior to reaching the aquatic environment. Similarly, AEMP stations BRP-31 and BRP-34 be should characterize the aquatic environment during freshet but the sampling frequency provided in AEMP Table 4.3-3 does not provide confidence that this will be achieved. The stated sampling "frequency" is *"four times per year*" and *"June, August"* respectively. **Disagreement with WL information/ conclusion** Freshet represents a relatively short sampling window in which on land particulate matter may be rapidly mobilized to the aquatic environment. Insufficient detail regarding sampling frequency for sites BRP-18, BRP-19, BRP-23, BRP-31 and BRP 34 has been included in the application to provide assurance that monitoring will occur during this critical period. **Reasons for disagreement** Failure to collect seasonally appropriate samples may result in an unrepresentative characterization of aquatic conditions during freshet and any corresponding impacts from preconstruction activities. This may in turn result in a failure to implement an appropriate adaptive response to changes in the aquatic environment.
Recommendation/Request	We recommend the monitoring frequency for BRP-18, BRP-19 and BRP-23 be further refined to once during freshet as confirmed by on site air temperature and flow measurements consistent with an increase in flow indicative of melting snow and ice, and monthly during construction while visible flow is present at the station. We recommend the monitoring frequency for BRP-31 and BRP-34 be reined such that at least one sample annually will be collected during freshet as defined above.
Importance	Medium