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Environment and Climate Change Canada's Presentation to the Nunavut Water Board Respecting the Back River Project Type A Water License Amendment Application by Sabina Gold and Silver Corp.

2AM-BRP1831 – Technical Meeting

March 23-24, 2021

Overview

- Mandate
- Relevant Acts and Regulations
- Status of Environment and Climate Change Canada’s Concerns
- Technical Comments and Recommendations
- Technical Comments on the Hydrodynamic Model

Environment and Climate Change Canada's Mandate

- The preservation and enhancement of the quality of the natural environment, including water, air and soil quality, and the coordination of the relevant policies and programs of the Government of Canada
- Renewable resources, including migratory birds and other non-domestic flora and fauna
- Meteorology
- The enforcement of rules and regulations

Relevant Acts and Regulations

- *Department of the Environment Act*
- *Canadian Environmental Protection Act*
- *Fisheries Act* – Pollution Prevention Provisions
- *Migratory Birds Convention Act*
- *Species at Risk Act*

ECCC-Technical Comment 1

Tailings Production and Storage

- Three small streams and four ponds are located within the Tailings Storage Facility footprint.
- ECCC requested the Proponent confirm the three streams and four ponds have been assessed for listing in Schedule II of the *Metal and Diamond Mining Effluent Regulations* (MDMER). This comment was resolved.

ECCC-Technical Comment 2

Tailings Storage Facility

- The Proponent indicated that during the 2015 drill program small zones of fractured bedrock (2-3m thick) were found in some of the drill holes, and may provide a pathway for seepage through the foundation of the dam.
- The Proponent intends to complete packer testing in select drill-holes to evaluate bedrock hydraulic conductivity.
- ECCC requested the Proponent provide clarification as to:
  - Whether packer testing will provide a determination of hydraulic conductivity of the 2-3m fracture zone.
  - Additional information on how the bulk fill prevents flow through the 2-3m fracture zone.

ECCC-Technical Comment 3

Waste Rock Storage Area Design

- The Proponent indicates that one small stream and two ponds are located within (or immediately upstream of) the Umwelt Waste Rock Storage Area.
- Additionally, three small streams and four ponds are located within the footprint of the Tailings Storage Facility Waste Rock Storage Area.
- ECCC requested confirmation that the Proponent has assessed the streams and ponds and determined whether or not they are water bodies frequented by fish. This comment was resolved.

ECCC-Technical Comment 4

Changes to Outputs of the Water and Load Balance

- The Proponent provided a table outlining changes in model assumptions from the 2015 model to the 2020 Modification Package.
- Additional information was requested in order to understand how the changes to the mine plan and corresponding changes to assumptions in the Water and Load Balance have resulted in changes to water quality on site.
- ECCC recommended the Proponent provide a comparison of changes in outputs from the water and load balance as a result of the changes to model assumptions.

ECCC-Technical Comment 5

Establishment of Meromixis in Umwelt Reservoir

- It is unclear how changes to the Approved Project, including the volume of saline water that would be deposited into the Umwelt Reservoir, will impact the potential to develop meromixis.
- It is not discussed whether the thickness of the freshwater cap over the thickness of saline layer assessed for the Llama Pit continues to be applicable to the Umwelt Pit.
- ECCC recommended that the Proponent:
  - Provide a discussion of how the changes to the initial conditions and reduced annual freshwater inputs may impact the development of meromixis in Umwelt pit as compared to Llama pit.
  - Provide information on the final ratio of freshwater to saline water in Umwelt Pit as compared to Llama Pit.

ECCC-Technical Comment 6

Hydrodynamic Modelling and Water Quality in Goose Lake

- The Proponent has identified that the location within Goose Lake where quality will meet water quality guidelines (CCME and site-specific water quality objectives (SSQWO)) has not yet been determined and will be proposed based on results of ongoing hydrodynamic modelling and mixing zone assessment.
- The Proponent committed to submitting an updated hydrodynamic model in advance of technical meetings.
- ECCC agreed that the updated model would aid in interpretation of modelling results and understanding of the extent of aquatic impacts within the Project Area.

ECCC-Technical Comment 7

Inconsistencies in Water and Load Balance

- ECCC identified several inconsistencies in the data presented in Appendix D of the Water and Load Balance Modelling
- ECCC recommended that the Proponent review the outputs of the water balance model presented in Attachment IR-C to ensure accuracy.

ECCC-Technical Comment 8

Updated Modelling Predictions and Comparison to Water Quality Guidelines

- Modelling predicted that PN03 water quality will exceed several CCME water quality guidelines and is of concern with respect serious effects to aquatic life.
- ECCC recommended the Proponent:
  - Model nodes intended to meet specific criteria (CCME, SSWQO, MDMER, etc.) and provide a comparison of modelled water quality to guidelines and criteria.
  - Discuss sources of exceedances of CCME Water Quality Guidelines for the Protection of Aquatic life and whether assumptions used in the model have resulted in accurate predictions for water quality
  - Discuss modelled exceedances of CCME Water Quality Guidelines for the Protection of Aquatic Life at PN03 and other relevant nodes, and potential impacts to aquatic life if these concentrations are realized.

Hydrodynamic Model
ECCC-Technical Comment 1

Predictions at the Outlet of Goose Lake

- Several of the water quality parameters are predicted to exceed CCME guidelines and/or site specific water quality objectives at the outlet of Goose Lake.
- Modelling was not conducted within Goose Lake, in the vicinity of discharges.
- ECCC recommended the Proponent:
  - Provide a rationale for the selection of PN03 to assess potential impacts to water quality in the model.
  - Provide a discussion of the potential impacts to aquatic life within Goose Lake given the modelling predictions, and predicted exceedances.
  - Provide a discussion on the extent of the mixing zones from PN04 and PN05 and provide modelled concentrations at the edge of the proposed mixing zones.

Hydrodynamic Model
ECCC-Technical Comment 2

Model Calibration

- The Proponent calibrated the model using measured temperature and total dissolved solids (TDS) concentrations to match measured and predicted thermal and transport behavior in Goose Lake.
- ECCC noted that small sample sizes at the monitoring stations was used to calibrate the model.
- ECCC recommended the Proponent provide a discussion of the minimal data used to calibrate the model and how outcomes of the model have been impacted, and may be impacted in future iterations.

Hydrodynamic Model
ECCC-Technical Comment 3

Uncertainty and Limitations

- The Proponent identifies a number of uncertainties related to the modelling, including the use of average conditions and no climate variations.
- ECCC acknowledges this is an early model iteration, but recommends that model updates include additional sensitivity scenarios to reduce model uncertainty.

Hydrodynamic Model
ECCC-Technical Comment 4

Comparison of Model Results to Background Concentrations

- The Proponent compares modelled concentrations at PN03 to site-specific water quality objectives and CCME guidelines, but not to natural background concentrations of Goose Lake.
- ECCC recommends providing a comparison of modelled water quality in Goose Lake to natural background concentrations in order to detect changes to water quality conditions in Goose Lake.

Hydrodynamic Model
ECCC-Technical Comment 5

Chromium Water Quality Guideline Exceedances at PN03

- The Model Results note that concentrations of several parameters are predicted to exceed chronic water quality benchmarks, including chromium.
- ECCC noted that the concentrations of chromium provided in Table 8 did not indicate any exceedances of the guidelines.
- ECCC recommends the Proponent provide further clarification on potential chromium exceedances.

Hydrodynamic Model
ECCC-Technical Comment 6

Predicted Water Quality at Goose Lake

- Hydrodynamic and water quality modelling predicts exceedances of water quality benchmarks (closure and post-closure), and ECCC noted that limited information on potential mitigation measures were provided to reduce effects in Goose Lake.
- ECCC recommends the Proponent provide clarification on when water quality at PN03 and within Goose Lake expect to meet guidelines and that modelling may need to be extended further into the post-closure timeframe.
- ECCC notes that additional years of post-closure monitoring may be required given predictions of guideline exceedances late into post-closure.
- While the Proponent provides several potential approaches to manage concentrations in order to meet guidelines, it is necessary to develop a clear path forward to manage water quality.
- ECCC recommends providing feasible options for management of site water quality such that impacts to Goose Lake are minimized.
- ECCC recommends providing a timeline of proposed model updates to further refine the model

Thank You