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WLWB File: W2022L2-0001



September 4, 2024

via email to [kdefrancis@wlwb.ca](mailto:kdefrancis@wlwb.ca)

Kassandra DeFrancis  
Regulatory Specialist  
Wek'èezhii Land and Water Board  
1-4905 48th Street  
Yellowknife, NT X1A 3S3

Dear Kassandra DeFrancis:

**RE: W2022L2-0001 – Burgundy Diamond Mines – Ekati – Type A Water License  
Amendment Application – Sable Underground Project – ECCC Final Intervention**

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Wek'èezhii Land and Water Board (WLWB) regarding the above mentioned Type A Water License Amendment Application for the Sable Underground Project.

ECCC provides expert information and knowledge to project assessments on subjects within the department's mandate, including climate change, air quality, water quality, biodiversity, environmental preparedness and emergencies. This work includes reviewing proponent characterization of environmental effects and proposed mitigation measures. We provide advice to decision-makers regarding a proponent's characterization of environmental effects, the efficacy of their proposed mitigation activities, and may suggest additional mitigation measures. Any comments received from ECCC in this context does not relieve the proponent of its obligations to respect all applicable federal legislation.

If you need more information, please contact Jennifer Sabourin at [Jennifer.Sabourin@ec.gc.ca](mailto:Jennifer.Sabourin@ec.gc.ca).

Sincerely,

N. John Olyslager  
Acting Regional Director, EPOD-PNR

cc: Eva Walker, Head, Environmental Assessment North (NT and NU)





# ENVIRONMENT AND CLIMATE CHANGE CANADA'S FINAL INTERVENTION TO THE WEK'ÈEZHÌI LAND AND WATER BOARD

## RESPECTING THE BURGUNDY MINES LIMITED TYPE A WATER LICENCE APPLICATION FOR THE SABLE UNDERGROUND DEVELOPMENT AT THE EKATI DIAMOND MINE (W2022L2-0001)

SEPTEMBER 4, 2024



## Executive Summary

Burgundy Diamond Mines Limited (the Proponent) has submitted an application for a Type A Water License permit for their proposed Sable Underground Project (the Project) at the Ekati mine site.

Environment and Climate Change Canada (ECCC) provides specialist expert information or knowledge to the Wek'èezhii Land and Water Board (WLWB or Board) in accordance with the *Mackenzie Valley Resource Management Act*. ECCC has participated in all phases of the Type A Water License and Land Use process for the Project thus far and is continuing its participation through the submission of this Final Intervention to the WLWB for consideration.

This Final Intervention summarizes the results of ECCC's technical review of the outstanding issues, and the additional information provided by the Proponent following the Technical Meeting held on July 23 to 24, 2024.

ECCC provides expert information and knowledge to project assessments on subjects within the department's mandate, including climate change, air quality, water quality, biodiversity, environmental preparedness and emergencies. This work includes reviewing proponent characterization of environmental effects and mitigation measures, and providing advice to decision makers on activities needed to mitigate these environmental effects. Any comments received from ECCC in this context does not relieve the proponent of its obligations to respect all applicable federal legislation.

ECCC's comments and recommendations are with respect to the Proponent's effluent and water quality model, the monitoring frequency of the Surveillance Network Program (SNP) at the existing station and creation of SNP station 0008-SA2B, Horseshoe Lake water quality, mixing zones and considerations for the plume delineation study, and the chloride and sulfate effluent quality criteria proposed.

## List of Acronyms

AEMP	Aquatic Effects Monitoring Plan
CEPA	Canadian Environmental Protection Act
ECCC	Environment and Climate Change Canada
EQC	Effluent Quality Criteria
MBCA	<i>Migratory Birds Convention Act</i>
SARA	<i>Species at Risk Act</i>
SNP	Surveillance Network Program
TRSP	Two Rock Settling Pond
WL	Water License
WLWB	Wek'èezhii Land and Water Board

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## 1.0 Introduction

Burgundy Diamond Mines Limited (the Proponent) has submitted an application for a Type A Water License and Type A Land Use permit to the Wek'èezhii Land and Water Board (WLWB) for their proposed Sable Underground Project (the Project) at the Ekati mine site. The Project is proposing to use underground mining methods to extend mine life of the Sable kimberlite formation by a period of five years beginning in 2026.

The Project will use existing infrastructure on currently disturbed lands, does not require new processing facilities, processed kimberlite (PK) containment areas, or other base infrastructure. Waste rock will be placed into the existing waste rock storage areas, and underground mine water will be managed in the Two Rock Settling Pond (TRSP), in accordance with procedures already defined in the Water Licence.

The comments and recommendations provided are based on ECCC's mandate in the context of the *Canadian Environmental Protection Act* (CEPA), the pollution prevention provisions of the *Fisheries Act*, the *Species at Risk Act* (SARA) and the *Migratory Birds Convention Act* (MBCA).

Within the Mackenzie Valley in the Northwest Territories, ECCC provides specialist expert information or knowledge to the WLWB in accordance with the *Mackenzie Valley Resource Management Act*. ECCC has participated in all phases of the review process for the Project thus far and is continuing its participation through the submission of this Final Intervention to the WLWB for consideration.

A summary of ECCC's mandate and legislation is provided in Section 2.0. ECCC's technical review comments and recommendations are provided in Section 3.0 and Acknowledgments are provided in Section 4.0.

ECCC's comments and recommendations for the outstanding issues are provided with respect to the Proponents effluent and water quality model, the monitoring frequency of the Surveillance Network Program (SNP) station and creation of SNP station 0008-SA2B, Horseshoe Lake water quality, mixing zones and considerations for the plume delineation study, and the chloride and sulfate effluent quality criteria proposed.

## 2.0 Environment and Climate Change Canada's Mandate, Roles, and Responsibilities

The mandate of ECCC is determined by the statutes and regulations under the responsibility of the Minister of Environment and Climate Change. ECCC's mandate covers matters such as 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, and the enforcement of rules and regulations. ECCC's specialist advice is provided in the context of the CEPA, the pollution prevention provisions of the *Fisheries Act*, SARA, and the MBCA.

ECCC administers the pollution prevention provisions of the *Fisheries Act*, which prohibits the deposit of a deleterious substance into fish-bearing waters. ECCC also participates in the regulation of toxic chemicals and the development and implementation of environmental quality guidelines pursuant to CEPA.

ECCC is responsible for protecting and conserving migratory bird populations and individuals under the MBCA. ECCC also administers SARA in cooperation with Fisheries and Oceans Canada, and the Parks Canada Agency to prevent wildlife species from becoming extirpated or extinct, provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming threatened, endangered or extirpated.

Additional information on ECCC's mandate can be found at: <https://www.canada.ca/en/environment-climate-change/corporate/transparency/acts-regulations/acts-administered.html>

## 3.0 Environment and Climate Change Canada's Technical Review Comments

to

### 3.1 ECCC# 1 - Effluent and Water Quality Model

This Final Written Submission summarizes the results of ECCC's technical review of the outstanding issues. For additional information provided by the Proponent following the Technical Meeting on July 23 -24, 2024.

**References**  
Ekati Diamond Mine - Proposed Development of the Sable Underground Project – Project Description; Appendix B Sable Underground Project – Two Rock Sedimentation Pond Water Quality Model Update (ERM 2024)

Response to IR#2 from Technical Session held on July 23 to -34, 2024.

Response to IR#3 (Table 3-1) from Technical Session held on July 23 to-34, 2024

Response to IR#4 from Technical Session held on July 23 to-34, 2024

#### Background

The expansion of the Sable Project into the underground has resulted in changes to the water balance and effluent and water quality predictions as contrasted to the Sable Open Pit project. Specifically, the base case modelling that was provided in Appendix B of the Project Application indicated that there was the potential for nitrate to approach and exceed effluent quality criteria.

The water quality modelling was discussed extensively at the technical meeting. This resulted in the Proponent providing additional information on the source terms used as inputs into the model and completing sensitivity scenarios associated with the groundwater inflows into the underground mine (response to IR#2). In addition to the sensitivity scenario, the Proponent also completed refinements to the base case, which resulted in concentrations of parameters being lower than the concentrations that were originally presented as the base case in the Application.

The additional refinements made to the base case model as part of the sensitivity analysis include changes in surface inflows and reductions to the assumed concentrations of nitrogen species in surface runoff. Specifically, the Proponent has applied a 50% reduction of nitrogen species in 2024/25 and a further 50% reduction after 2025. The percentage reduction has not been supported with data and no rationale on the basis for the 50% reduction or how these values were arrived at (e.g. observations at other pits) has been provided.

Additionally, a 75th percentile sensitivity scenario for the winter misery underground water quality dataset was also included. The need for this additional scenario was identified in response to IR#3, which demonstrated that the Misery Underground winter average concentration does not necessarily represent a conservative estimate of water quality (Table 3-1). Data presented in Table 3-1 suggested that average



water quality concentrations in the Misery Underground during freshet or summer may be similar or higher than the winter average, indicating that the winter average may not be sufficiently conservative.

The results of the model refinements and additional sensitivity scenarios indicate that, unlike the base case provided in Appendix B of the Application, there are no predicted exceedances of effluent quality criteria in any of the modelled scenarios and subsequently no predicted exceedances of water quality objectives in Horseshoe Lake. This outcome diverges from the original predictions that identified the potential for exceedances of nitrate effluent quality criteria (EQC) and exceedances of nitrate, phosphorus, and chromium water quality guidelines in Horseshoe Lake.

ECCC is of the view that there is still notable uncertainty associated with the expected effluent concentrations for the Sable Underground project. In response to IR#4 the Proponent has acknowledged the potential for future model validation and updates based on monitoring results through the Aquatic Effects Monitoring Program (AEMP) and Surveillance Network Program (SNP). ECCC agrees that comparison of monitoring data to the modelling predictions is a useful tool in assessing accuracy of predictions, and providing early identification of divergences from the modelling, such that updates to the model can be completed and implications can be assessed.

Since the model uses a proxy dataset from Misery Underground to predict effluent quality for Sable Underground the model may benefit from a scheduled update once site-specific Sable Underground data is available. An update would increase understanding and refine predictions to provide a better estimate of effluent quality. Model updates at key project milestones such as; once mining has progressed sufficiently into the underground, and/or once mining has proceeded below the permafrost and increased quantities of groundwater are encountered may be appropriate.

**ECCC Recommendation(s):**

1.1 ECCC recommends that the Proponent provide additional description of the model refinements that were applied to the base case in response to IR#2. This should include detailed descriptions and interpretation for the key source term changes that resulted in the updated base case having no exceedances of EQC in the TRSP and no predicted exceedances of water quality guidelines in Horseshoe Lake.

1.2 ECCC recommends that if approved, then on an annual basis, the Proponent compare predicted effluent quality to the measured effluent quality in TRSP to identify whether there are any divergences from predictions. This could be reported as part of the annual report. If measured concentrations are greater than predictions, then the cause of the differences should be identified, and the implications should be assessed.

1.3 ECCC recommends that if approved, then consideration should be given to the completion of a scheduled model update to TRSP once sufficient site-specific water quality data is available for the Sable Underground.

## 3.2 ECCC# 2 - Surveillance Network Program (SNP) Monitoring at Station and 0008-Sa2b

### References

Ekati Diamond Mine - Sable Underground Project Applications – Attachment A: Requested Changes to Water Licence W2022L2-0001

### Background

The Proponent has proposed modifications to the sampling frequency at the existing SNP station within Sable Open Pit (formerly 0008-Sa2, proposed to be 0008-Sa2a) and the addition of a new sampling station associated with the Sable Underground sump (0008-Sa2b). The proposed modification includes a reduction in sampling frequency from “weekly during discharge” to “monthly during discharge from Sable Pit into Two Rock Settling Pond” and for the new underground sump station to also be monitored on a frequency of “monthly during discharge”. The rationale provided by the Proponent states that the proposed frequency is consistent with monitoring requirements in the Misery Underground, and that Sable underground mine water is predicted to be more consistent than Misery due to the nature of the geology in the Sable formation.

It is noted that the Misery Underground sump was originally monitored weekly during discharge and moved to a reduced frequency once monitoring demonstrated that the reduced frequency was appropriate. A similar approach should also be applied to Sable Underground, where monitoring is initially completed weekly, such that sufficient data can be collected, and the understanding of water quality within the underground is refined.

Throughout the review process there has been discussion related to the conservatism of the modelling and the resulting predicted mine water concentrations and overall effluent quality. ECCC notes that this uncertainty provides additional justification for more frequent monitoring at the Sable Underground sump. Maintaining a frequency of weekly monitoring during discharge in the Sable Underground would provide a more robust site-specific dataset to contribute to reducing uncertainty in the effluent quality by providing site-specific data to compare to model source terms and assumptions.

### ECCC Recommendation(s):

2.1 ECCC recommends that Surveillance Network Program monitoring at the Sable Underground sump (Station 0008-Sa2b) be conducted on a frequency of weekly during discharge.

### **3.3 ECCC# 3 - Horseshoe Lake Water Quality, Mixing Zone, and Plume Delineation Study**

#### **References**

Response to IR#4 from Technical Session held on July 23-34, 2024

Ekati Diamond Mine - Proposed Development of the Sable Underground Project; Appendix B Sable Underground Project – Two Rock Sedimentation Pond Water Quality Model Update (ERM 2024)

#### **Background**

The assumptions for mixing of effluent in Horseshoe Lake are based on dilution factors that were established in the Two Rock Outfall Report. However, it was acknowledged at the Technical Meeting that a plume delineation study will be completed to fully assess the dispersion of effluent within the receiving environment. Once completed, the outcome of the plume delineation will contribute to validation of the predicted 20:1 dilution factor, provide information necessary to update the Two Rock Outfall Report, and confirm the ability to meet water quality benchmarks at the edge of the mixing zone in Horseshoe Lake as predicted by the Proponent.

Confirmation of the mixing conditions in Horseshoe Lake is a key consideration related to whether benchmarks can be expected to be met within 100 m of the discharge. If the results of the plume delineation study are different than expected, then the modelling may need to be revisited to confirm the circumstances under which benchmarks can be achieved in Horseshoe Lake. Specifically, the results of the plume delineation study should also be reviewed for whether the results alter the conclusions presented in the Sable Underground application related to changes to water quality in Horseshoe Lake from the TRSP discharge.

The Proponent acknowledges in their response to IR#4 from the Technical Meeting that model validation and/or updates may be completed in the future based on ongoing monitoring as part of the AEMP and SNP if monitoring results are not aligning with model predictions. Then ECCC is supportive of continued comparison of predictions to measured concentrations in Horseshoe Lake and suggests that it would be informative if this comparison were included as part of the AEMP annual report so that all parties are clear on whether water quality is as trending as predicted.

#### **ECCC Recommendation(s):**

3.1 ECCC recommends that the Proponent review and update the water quality predictions at the edge of the mixing zone based on the outcome of the plume delineation model.

3.2 ECCC recommends that, on an annual basis, the Proponent compare predicted water quality versus measured water quality concentrations at the edge of the mixing zone in Horseshoe Lake. This could be reported as part of the AEMP annual report.

### 3.4 ECCC# 4 - Chloride and Sulphate Effluent Quality Criteria (EQC)

#### References

Response to IR#10 from Technical Session held on July 23-34, 2024

#### Background

In response to IR#10 from Board Staff, the Proponent has completed a parameter screening to identify any new parameters of potential concern. As part of their response the Proponent has included proposed EQC for chloride and sulphate that uses a dilution factor and the water quality benchmark to calculate a variable EQC based on hardness. The proposed dilution factor of 5.2 is based on the results of the Two Rock Outfall Report and the calculated dilution required to achieve water quality objectives in Horseshoe Lake.

ECCC notes when implementing a dilution factor based EQC, there is always the potential for a discrepancy between the dilution factor used to calculate the EQC and the realized dilution within Horseshoe Lake. If EQC are to incorporate a dilution factor, then this dilution factor must be maintained at a minimum in all scenarios. Calculated dilution factors also rely on conditions remaining stable. This includes the discharge volumes, discharge speed, receiving lake volume, and mixing conditions within the lake.

Another potential gap of using the dilution factor is accumulation over time. As noted by the Proponent in response to IR#10, the predicted dilution factor calculations did not account for the accumulation of constituents over time. Horseshoe Lake has three separate basins that are separated by two shallow connecting areas that are less than 1 m deep. This lake configuration may impact the mixing within the lake and the overall water quality. Some of the uncertainty regarding mixing in the lake is proposed to be addressed through the planned plume delineation study. Given that ongoing plume delineation modelling is to be completed to assess mixing within the receiving environment and the assumption of dilution factors, it is unclear whether it is pre-emptive to include dilution factor related EQC in advance of a fulsome understanding of the mixing conditions.

If hardness-dependent EQC for sulphate and chloride are to be included, then an additional SNP monitoring station within Horseshoe Lake would be required to measure the hardness in the lake. The station would function to match the monitoring requirements at TRSP and allow hardness to be measured for the purpose of determining the hardness-related EQC applicable to the TRSP. ECCC notes that a similar station exists for Cujo Lake, which acts as the hardness monitoring station for hardness-dependent EQC from King Pond Settling Facility.

#### ECCC Recommendation(s):

4.1 ECCC recommends that the Proponent clarify whether the outcomes of the plume delineation study could potentially impact the proposed EQC for chloride and sulphate

4.2 ECCC recommends that if a hardness-dependent EQC is to be included in the Licence, then an additional SNP station be established to measure hardness in Horseshoe Lake for purposes of determining the hardness-related EQC.

## 4.0 Acknowledgements

ECCC acknowledges and appreciates the effort that the Proponent has taken to provide information and to address concerns brought forward by parties throughout the Type A Water License process. ECCC would like to thank the Wek'èezhii Land and Water Board for this opportunity to provide input to the Burgundy Diamond Mines Limited Type A Water License Process for the Sable Underground Project and looks forward to continuing its participation in this process.

ECCC's technical review comments and recommendations are not to be interpreted as any type of acknowledgement, compliance, permission, approval, authorization, or release of liability related to any requirements to comply with federal or territorial statutes and regulations.