

Environmental Protection Operations Directorate
Prairie & Northern Region
5019 52nd Street, 4th Floor
P.O. Box 2310
Yellowknife, NT X1A 2P7

ECCC File: 6100 000 011/004
NWB File: 2AM-MRY1325



February 27, 2025

via email at: licensing@nwb-oen.ca

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Richard Dwyer:

RE: 2AM-MRY1325 – Baffinland – Mary River Water Licence – ICRP Ver 6 and Thermal Model Reviewed

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) by Baffinland regarding the above-mentioned Interim Closure and Reclamation Plan Version 6 and Thermal Model.

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 emergencies preparedness and responses. 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

The following comments are provided:

1. Topic: Dimension of Thermal Model

Reference:

- 241101 2AM-MRY1325 WRF Thermal Model Att 2. CA0020274.4798-005-ILAE(005)
Assessment of Active Zone Depth Considering SSP1-2.6 Climate Change
Projections at the Mary River Mine Site
 - 3.1 Objectives and Model Set Up



Comment

In section 3.1 *Objectives and Model Setup* of the Thermal Model, the proponent stated:

“A one-dimensional (1D) transient thermal model was prepared using the finite element software TEMP/W developed by Geo-Slope International Ltd. (Version 2023.1.0) to predict the potential variation in active zone depths in the long term over 100 years.”

It is not clear why 1D was used and not two-dimensional (2D) given that in reality the dissipation of heat -temperature on the ground surface or within the Waste Rock Facility (WRF) is both vertical and lateral.

ECCC Recommendation(s)

ECCC recommends that the proponent clarify why the model is only one-dimensional.

2. Topic: Type of Waste Rock Used for Model Geometry

Reference

- 241101 2AM-MRY1325 WRF Thermal Model Att 2. CA0020274.4798-005-ILAE(005)
Assessment of Active Zone Depth Considering SSP1-2.6 Climate Change
Projections at the Mary River Mine Site
 - 3.2 Model Geometry

Comment

In section 3.2 *Model Geometry* of the Thermal Model, the Proponent stated:

“A 30-m tall column of waste rock was used to simulate a waste rock pile assumed to be homogeneous in depth with uniform material properties.”

In a model, it may be possible to select a homogenous rock column that measures 30 m tall. However, realistically, any 30 m tall section (column) of the waste rock facility that is isolated in the facility is not expected to be homogeneous. Therefore, it is not clear why the model is limited to homogeneous rock when different rocks in the WRF have different material properties.

Recommendation

ECCC recommends that the model use heterogeneous rock to represent the column of waste rock.

3. Topic: Model Assumptions

Reference

- 241101 2AM-MRY1325 WRF Thermal Model Att 2. CA0020274.4798-005-ILAE(005)
Assessment of Active Zone Depth Considering SSP1-2.6 Climate Change
Projections at the Mary River Mine Site
 - 3.6 Model Assumptions and Limitations

Comment

Regarding the list of assumptions in *3.6 Model Assumptions and Limitations*, the Proponent states:

“The model considers a homogeneous waste rock mass, and the one-dimensional nature of the column can only capture heat transfer in the vertical direction and does not consider lateral heat transfer from adjacent areas.”

ECCC notes that the assumption of homogeneous waste rock may be limiting because it is likely that the makeup of the waste rock facility will be heterogeneous. In the same section, the Proponent states:

“Uncoupled thermal models do not incorporate the impact of heat transfer associated with air and water flow through the pile, and only consider heat flow due to conduction. The thermal properties of waste rock materials change with variations in water content, and air and water convection can affect the depth of the active zone.”

ECCC notes that there is no mention of other possible heat sources such as heat from hot spots within the WRF that may occur due to sulphide oxidation.

ECCC agrees with the comment that the ground surface temperature increases do not occur linearly, however, there is no indication how this will be accommodated in the improved model.

Given the assumptions listed in section 3.6, the model is limited to using the material properties of homogenous rock. It is not clear whether the proponent considered using different sets of material properties and/or parameters that represent the different individual rock types, to then compare the results of the different rock types. The material properties of heterogeneous waste rock will be an important component of the waste rock facility to consider because there will be a mix of rock types from the mining operation or sourced from borrow.

Recommendation

ECCC recommends the Proponent:

1. Consider other possible heat sources within the waste rock storage facility;
2. Please clarify how non-linear ground surface temperature can be incorporated in the model;
3. Clarify how the heterogeneous properties of heterogeneous waste rock can be included or accommodated in the Thermal Model.

4. Topic: Air quality monitoring activities for the post-closure phase

Reference

- Interim Closure and Reclamation Plan Version 6
 - Section 9.11 Air quality monitoring and reporting, p. 220-221

Comment

In section 9.11 of the Interim Closure and Reclamation Plan, the Proponent outlines the planned monitoring activities for the post-closure phase. However, the following section lacks clarity:

“As all the major impacts are removed, 2 years of post-closure monitoring is planned to confirm ambient levels of TSP, PM_{2.5}, SO₂ and NO₂ are within the closure criteria (NU standards).

Baffinland expects to continue this monitoring during the first year of post-closure activities (Year 4). TSP and PM_{2.5} were selected as particulate matter poses health concerns due to their ability to be inhaled and accumulate in the respiratory system.”

It is unclear if post-closure monitoring is planned during one or two years, and whether only TSP and PM_{2.5} or SO₂ and NO₂ in addition will be monitored during this period.

Recommendation

ECCC recommends clarifying the planned air quality monitoring during closure and post-closure.

5. Topic: Reference to Environment and Climate Change Canada Climate Station

Reference

- Interim Closure and Reclamation Plan Version 6
 - Section 3.11 Climate, p. 56

Comment

In section 3.11 of the *Interim Closure and Reclamation Plan*, the Proponent makes references to the Environment and Climate Change Canada climate station at Pond Port. It appears that the reference was intended to be Pond Inlet. However, clarity is needed, as meteorological parameters are also measured at Milne Port.

Recommendation

ECCC requests confirmation that references to Pond Port are in fact intended to be for Pond Inlet.

6. Topic: Sensitivity of Thermal Model

Reference

- 241101 2AM-MRY1325 WRF Thermal Model Att 2. CA0020274.4798-005-ILAE(005) Assessment of Active Zone Depth Considering SSP1-2.6 Climate Change Projections at the Mary River Mine Site
 - Section 2.0 Climate Change Projects, ClimateData.ca Learning Zone, Topic 3: Understanding Future Projects, available online at <https://climatedata.ca/resource/understanding-shared-socio-economic-pathways-ssps/>

Comment

Section 2.0 of the WRF Thermal Model states that climate change projection scenario SSP1-2.6 was used at the request of BIM. This represents a near-ideal sustainability scenario (SSP1-1.9 being the most ideal). While consistent with Canadian government environmental policies, this scenario may be too optimistic given uncertainty regarding degree of environmental commitment among some of the higher-emitting foreign nations. Scenarios such as SSP3-7.0 and SSP5-8.5 are more likely to be overly conservative, however it would be useful to evaluate to the first order the sensitivity of the analysis by considering the SSP2-4.5 scenario.

Recommendation

ECCC recommends a first order evaluation of the Thermal Model's sensitivity by consideration of the SSP2-4.5 scenario.

If you need more information, please contact Jessica Kassar at (867) 222-2036 or Jessica.Kassar@ec.gc.ca.

Sincerely,

**Kassar,
Jessica**

Digitally signed by
Kassar, Jessica
Date: 2025.02.27
15:41:47 -05'00'

Jessica Kassar
Environmental Assessment Officer

Attachment(s):

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