

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

ECCC File: 6100 000 010/42
NWB File: 2AM-DOH1335



August 12, 2019

via email at: licensing@nwb-oen.ca

Ida Porter
Licence Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Ida Porter:

RE: 2AM-DOH1335 –TMAC – Hope Bay Belt – 2018 Annual Report

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) by TMAC (the Proponent) regarding the above-mentioned Annual Report. This letter and comments provides ECCC's specialist advice based on our mandate, in the context of the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*.

The following comments are provided:

1. Surveillance Network Program Station for Tailings Impoundment Area effluent

Reference(s)

- Appendix D-1 – Table D1-1

Comment

It is unclear based on the table of the Surveillance Network Program (SNP) stations provided which SNP station is intended to quantify the concentrations of parameters within the tailings impoundment area (TIA) effluent prior to discharge. Based on the eventual water management strategy, whereby the two effluent streams, TIA and mine water, will discharge via a single outlet pipeline. It is important that both effluents be sampled prior to combining in order to have an understanding of the composition of each effluent separately, as well as overall combined discharge to Roberts Bay.

ECCC Recommendation(s)

ECCC recommends the Proponent clarify which SNP station will be used to assess overall TIA effluent quality prior to discharge and mixing with the mine water discharge.



2. Under-prediction of Ammonia Concentrations

Reference(s)

- Appendix E (Doris Mine Water and Load Balance Assessment -2018 Calendar Year)
 - Tables 4-6

Comment

The Final Environmental Impact Statement (FEIS) model predictions significantly underestimated the concentrations of total ammonia in the process water and mine water. The FEIS predicted total ammonia concentrations of 0.52 mg/L in the process water and 3.4 mg/L in the mine water while 2018 sampling results indicate an average of 23 mg/L in the process water and 29 mg/L in the mine water. The water and load balance assessment provides no discussion on the sources of the greater-than-anticipated ammonia concentrations, or any steps that will be taken by the Proponent to reduce ammonia concentrations in effluents.

ECCC Recommendation(s)

ECCC recommends the Proponent provide a discussion on the sources of ammonia in the process water and mine water and outline any current or planned measures being undertaken to reduce ammonia concentrations.

3. Updated Water Quality Predictions

Reference(s)

- Appendix E (Doris Mine Water and Load Balance Assessment -2018 Calendar Year)
 - Section 5 – Comparison to MDMER

Comment

The current mine water management at Doris Mine consists of mine water being transferred from the underground to the Doris Mine TIA for storage prior to discharge to Roberts Bay. Discharge to Roberts Bay from the TIA is anticipated to begin in October 2019. The future mine water management plan shifts from this strategy to having the effluent instead discharged to Roberts Bay concurrently with the TIA process water discharge (post-treatment) instead of being transferred first to the TIA.

Section 5 of the Water and Load Balance Assessment states that “updated water quality predictions for the TIA were compared to the MDMER limits.” However, based on this statement and the subsequent analysis, it is unclear whether the “Doris TIA” water quality prediction includes just process water or the combination of mine water and TIA process water. If mine water is not included in the “Doris TIA” current water quality predictions, then the mine water predicted water quality concentrations should also be compared to Metal and Diamond Mining Effluent Regulations (MDMER) limits.

ECCC Recommendation(s)

ECCC recommends the Proponent clarify whether Doris Mine TIA water quality predictions include inputs from the mine water. If not, the predicted mine water quality should also be compared to MDMER limits.

4. Phytoplankton and Trophic Status

Reference(s)

- Doris Project 2018 Aquatic Effects Monitoring Program
 - Section 3.3.9 (Total Phosphorus)
 - Section 3.4 (Phytoplankton)

Comment

Using the Canadian Council of the Ministers of the Environment (CCME) phosphorus guidelines, the concentrations of total phosphorus in Doris Lake indicate a trophic status of mesotrophic to eutrophic. However, Reference Lake B has a total phosphorus concentration that is indicative of an ultra-oligotrophic lake. These differences in the two waterbodies are further illustrated by the difference in phytoplankton biomass as assessed using chlorophyll a. In the analysis of the phytoplankton biomass, *“statistical analysis and graphical analysis were used to determine if there were changes in phytoplankton biomass over time compared to baseline conditions. Biomass trends were also compared between exposure and reference sites to determine whether a low action level was exceeded according to the Response Framework.”*

Given the differences in trophic status between the two lakes, it is unclear what potential implications trophic status may have on the analysis of phytoplankton biomass, and potentially other biotic variables. There is no discussion on how the difference in trophic status is managed and/ or accounted for within the study design or any implications this may have going forward.

ECCC Recommendation(s)

ECCC recommends the Proponent:

- Discuss the applicability of Reference Lake B to act as a reference lake for Doris Lake, given the differences in trophic status. This should include a discussion on how differences in trophic status are accounted for within the study design.
- Discuss the comparability of phytoplankton biomass trends between reference and exposure lakes.

5. Seepage Survey Results

Reference(s)

- Appendix F – 2018 Waste Rock, Quarry and Tailings Monitoring Report –
 - Section 5.2 (Seepage Survey Results)

- Appendix B – 2018 Doris Waste Rock, Ore and Infrastructure seep monitoring
- 2018 Seep Survey Memo

Comment

The seepage survey monitoring results for the waste rock pile are compared to historical monitoring results as well as the 2015 source terms used in modelling. Monitoring results indicate concentrations exceeding screening criteria for chloride, nitrate, nitrite, ammonia, sulfate, copper, and selenium. Of those that exceed the screening criteria the median concentrations for sulfate, copper, selenium, and nitrate exceed the source term inputs that were used in the 2015 modelling. There is no discussion provided on the implications of these exceedances of source term inputs on the overall mine water management and mine water quality.

ECCC Recommendation(s)

ECCC recommends the Proponent provide a discussion on any implications to water balance and water quality predictions if concentrations in seepage continue to exceed the 2015 source term concentrations.

6. Seepage Monitoring

Reference(s)

- Appendix F - 2018 Waste Rock, Quarry and Tailings Monitoring Report, Doris Mine, Hope Bay Project. Section 6 Conclusions

Comment

In the Waste Rock, Quarry and Tailings Monitoring Report Appendix F, Section 6 the Proponent concludes that the monitoring of the seepage from the camp pad and the ore stockpiles indicates that the water quality for the contaminants of concern are within the range of the historical data. However, the Proponent did not indicate whether they comply with the required limits.

The Proponent also indicates that “some contaminants of concern are not attenuated by the tundra as predicted”, but then further states that “the concentrations observed in the ephemeral streams indicate that the tundra continues to effectively attenuate contaminants of concern and the breakthrough of the effectiveness of the attenuation process has not occurred.” The tundra is part of the environment, so it is not clear how the tundra is being used to attenuate the contaminants of concern, and whether the tundra is being used as a treatment option, or as an alternative to treatment.

ECCC Recommendation(s)

ECCC recommends that the Proponent clarify the apparent contradicting statements about the water quality and contaminants of concern.

ECCC recommends that the proponent provide an explanation of why the tundra is being used or relied on to attenuate contaminants of concern rather than using an actual treatment option.

7. Sample Testing Program

Reference(s)

- Source: Appendix F - 2018 Waste Rock, Quarry and Tailings Monitoring Report, Doris Mine, Hope Bay Project
 - Section: 5.1 Sampling and Testing Program; 5.2 Results

Comment

The Proponent states that “This stockpile is immediately upstream of the waste rock seepage sample sites. Increased concentrations of sulphate, copper and selenium may be attributed to the presence of ore, which has higher sulphide content than waste rock.” Concentrations of arsenic and iron for the 2018 waste rock seepage samples were higher than the screening criteria; however, this was attributed to the presence of colloids. When the sample set was screened for samples suspected of containing colloids, the overall arsenic and iron concentrations since 2012 were stable.

Colloid is defined as “A homogeneous noncrystalline substance consisting of large molecules or ultramicroscopic particles of one substance dispersed through a second substance. Colloids include gels, sols, and emulsions; the particles do not settle, and cannot be separated out by ordinary filtering or centrifuging like those in a suspension. Or simply a mixture in which one substance of microscopically dispersed insoluble particles is suspended throughout another substance.”

If this definition is correct, it is unclear how the higher concentration of arsenic and iron in the analysed seepage can be attributed to the presence of colloids. Even if these metals are adsorbed to the surfaces of the colloids, they are still present in the water columns it is unclear how their increase would be because of the presence of colloids.

It is also unclear what is meant by the following statement “When the sample set was screened for samples suspected of containing colloids, the overall arsenic and iron concentrations since 2012 were stable”

ECCC Recommendation(s)

ECCC recommends that the Proponent explain why the higher concentration of arsenic and iron in the waste rock has been attributed to colloids and provide rationale for this conclusion including how these high concentrations occur.

ECCC recommends that the Proponent provide the source of the colloids present in the seepage.

ECCC recommends that the proponent clarify what is meant by “when the sample set was screened for samples suspected of containing colloids, the overall arsenic and iron concentrations since 2012 were stable”.

8. Rock Sampling Depths

Reference(s)

- Appendix F - 2018 Waste Rock, Quarry and Tailings Monitoring Report, Doris Mine, Hope Bay Project
 - Section: 3 Ore Stockpiles Rinse Survey; 3.1 Sampling and Testing Program

Comment

The Proponent indicates that rock samples were collected from approximately 25 cm depth. If waste rock samples have been exposed to the elements of the environment for a long time a sampling depth of 25 cm may not be deep enough to collect a representative samples, given that the contaminants in the top layer of that waste rock would have been flushed out and washed away. The rinse testing of samples from the top layer (25 cm) will yield results that do not accurately reflect the state of the waste rock oxidation in the ore and waste rock.

ECCC Recommendation(s)

ECCC recommends that the Proponent provide clarification on the rationale that led to not selecting samples from a depth deeper than 25 cm and why these samples are considered representative.

9. 2018 Waste Rock and Ore Monitoring Report, Boston Camp, Hope Bay Project

Reference(s)

- Source: Appendix F - 2018 Waste Rock, Quarry and Tailings Monitoring Report, Doris Mine, Hope Bay Project
 - Section 3.2 Results

Comment

ECCC notes that the “tarnishing of the sulphide crystals” mentioned in Appendix F- Section 3.2 of the Waste Rock and Ore Monitoring Report is likely evidence of oxidation of the sulphide minerals, which will lead to Acid Rock Drainage/ Metal Leaching (ARD/ML). It is not clear why the Proponent has compared the monitoring results from 2008 to the results from 2018, and not compared the results for any of the years in between where seepage samples may have indicated ARD/ML activities.

ECCC Recommendation(s)

ECCC recommends that the Proponent analyse the monitoring results of the years in between 2008 and 2018 in order to check for evidence of ARD/ML or verify trends, if any.

ECCC also recommends that the Proponent provide an explanation as to why the only the 2018 monitoring results are being compared to that of 2008 and not the years in between.

Please contact Eva Walker at (867) 669-4744 or eva.walker@canada.ca should you require more information.

Sincerely,

[Original signed by]

Eva Walker
Environmental Assessment Coordinator

Attachment(s):

cc: Georgina Williston, Head, Environmental Assessment North (NT and NU)