

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

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August 11, 2022

via email at: licensing@nwb-oen.ca

Karen Costello
Manager Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Richard Dwyer,

RE: 2AM-MEA1530 / 2AM-WTP1830 – Agnico Eagle Mines Ltd. – Meadowbank Gold Mine and Whale Tail Pit Projects – 2021 Annual Report

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Impact Review Board (NIRB) by Agnico Eagle Mines Ltd. (the Proponent) regarding the above-mentioned Annual Report.

ECCC is providing technical, science-based information and knowledge based on our mandate pursuant to the *Canadian Environmental Protection Act*, the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act*, and the *Species at Risk Act*. These comments are intended to inform the assessment of this project's potential effects in the receiving environment and on valued ecosystem components. 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. Stack Testing

Reference(s)

- Section 6.2.1.1 Stack Testing

Comment

Stack testing at the Meadowbank incinerator resumed in 2021. Logistical issues truncated testing in September. Stack testing was completed in November; however, results indicated



application standards were exceeded for dioxins and furans for two of the tests as well as the overall average.

ECCC Recommendation(s)

ECCC requests that the Proponent provide the conclusions, when available, of their investigation for the cause of the exceedances in dioxin and furan levels that occurred during the November 2021 stack tests.

ECCC recommends the Proponent provide a targeted time frame for 2022 stack testing. Given that freezing may have been a significant factor for the 2021 tests, ECCC recommends that the Proponent perform 2022 stack testing prior to the onset of freezing conditions.

2. Bird Nests

Reference(s)

- Appendix 47 – Meadowbank and Whale Tail 2021 Wildlife Monitoring Summary Report

Comment

Section 4.5.3 states that an exemption permit from the Government of Nunavut was obtained to remove two nests of migratory birds – a passerine sp. and American robin, in 2021.

ECCC reminds the Proponent that it is illegal to disturb, destroy or take the nest or egg of a migratory bird, pursuant to Section 6 of the *Migratory Birds Regulations*, without a permit or authorization from ECCC.

ECCC Recommendation(s)

ECCC recommends that:

- the Proponent conduct a thorough review of the notification procedures and protection measures for migratory birds outlined in their current Terrestrial Ecosystem Management Plan (TEMP), and revise as necessary to comply with the *Migratory Birds Regulations*; and
- the Proponent update ECCC's contact information in the TEMP for migratory bird interactions, incidents, and mortality notifications to cwsnorth-scfnd@ec.gc.ca.

3. Shorebirds at the Tailings Storage Facility

Reference(s)

- Appendix 48 –Wildlife and HHRA Screening Level Risk Assessment Plan – Version 6
- Appendix 46 – 2021 Wildlife and Country Foods Screening Level Risk Assessment
- Terrestrial Ecosystem Management Plan

Comment

The 2021 results of the Wildlife and Country Foods Screening Level Risk Assessment report indicate exceedances (i.e. hazard quotients >1) for the shorebird receptor at the Tailings Storage Facility (TSF). The Proponent changed certain assumptions (e.g. exposure concentration, time-in-area, contribution of benthic invertebrates from the TSF in diet) resulting in a revised characterization of the risks for shorebirds at the TSF to negligible.

ECCC is concerned with the changes to these assumptions without more discussion and targeted studies. There is insufficient information about monitoring methods for bird use of the TSF in the TEMP and annual reports to support changes to the time-in-area assumption for shorebirds. ECCC is unable to determine, based on information provided, whether shorebirds are adequately being surveyed at the TSF, using a systematic approach and experienced observers. The more conservative approach is to assume birds are present and use the TSF for the majority of the breeding season and not just for eight days.

ECCC does not support the change in the contribution of benthic invertebrates from the TSF to the diet of shorebirds based on the measured average abundance of benthic invertebrates in the 2021 sediment samples (i.e. from 100% to 13%). The more conservative approach is to assume that 100% of the diet of shorebirds is coming from benthic invertebrates at the TSF. Not enough is known about how the availability of prey influences foraging and habitat selection of shorebirds on their breeding grounds.

ECCC Recommendation(s)

ECCC recommends that a more conservative approach be used with the time-in-area and contribution of benthic invertebrates from the TSF in diet assumptions of the Wildlife Screening Risk Assessment Plan until targeted studies are conducted to refine site-specific conditions.

4. Predicted vs Measured Water Quantity

Reference(s)

- Section 4.4.3.1 Meadowbank Site - Water Quality (report p. 74)
- Appendix 20 – Meadowbank Predicted Water Quantity & Quality

Comment

The comparisons to predicted water quality are presented in Appendix 20 for the various pit sumps and lakes. The tables start at Year 3, which appears to correspond to 2012, and go annually to Year 12, which would then be 2021. On the Year 12 table, measured data is included for 2012 to 2021, with comparisons of the mean and 25th percentile measured values to predicted values. In the various tables provided in Appendix 20, the comparisons for Probable Scenario and Possible Poor end Scenario appear to be done inconsistently between the various tables for the sites. The comparisons are made using different model year predictions (e.g. for the tables for Water Quality Year 12, North Portage uses Year 4 predictions; Goose Island Pit uses Year 3 predictions; Phaser Pit uses Year 10). Similarly, the preceding tables for Water Quality Years 3-11 use variable modeled years for comparison.

It is not clear why the predictions were not compared to previously modeled current-year concentrations, nor what actual years the model years correspond to.

For example, in the table titled “Vault Pit Sumps Water Quality Year 12” the columns for model comparisons are titled “Probable Scenario Year 10*” and “Possible Poor end Scenario Year 10*”. There is also a footnote stating, “*Used year 10 predictions for Vault which represent 3rd year of pit flooding, year 3 for Goose and year 4 for Portage which represent active pit operations as presented in Golder, 2007 - Water Quality Predictions Meadowbank Gold Project Doc No 516. Ver 0”. It is not clear in this example, which year the Year 10 predictions for Vault correspond to – perhaps 2019.

Comparisons to CCME guidelines and MDMER criteria are provided for measured parameters, using the dissolved fraction for metals. Total fractions (measured) should be compared to these guidelines and criteria, which are based on the total concentrations for metals.

Errata: In section 4.4.3.1 of the Annual Report (report p. 74) the description of comparisons for Phaser Pit states that dissolved barium is below the 20% difference with -5% and -17%. This should be cadmium, not barium.

Also in section 4.4.3.1 of the Annual Report, Figure 12 is missing 2014 data.

ECCC Recommendation(s)

ECCC requests clarification on the timing as to what actual years the Water Quality Years and the Scenario Years correspond to, and the rationale for using the various scenario comparison years chosen rather than the most recent year available for predicted concentrations.

ECCC recommends that measured total metals be compared to the CCME guidelines and MDMER criteria.

ECCC recommends the Proponent update Figure 12 with the missing 2014 data and update the description of comparisons for Phaser Pit with the correct metal.

5. Closure Pit Water

Reference(s)

- Section 9.1.1.1 Closure: Mine Site
- Appendix 12 – Meadowbank Water Management Plan
 - Section 3.4 Pit Flooding – Closure Concept
 - Appendix C. Page 62 Bullet iv.

Comment

Section 3.4 of the Meadowbank Water Management Plan describes the reflooding of the Portage and Goose pits as follows (pdf page 35):

The reflooding concept of the Portage and Goose area includes water from tailings deposition activity, passive flooding, water transfers from the pit, water treatment, and active flooding from Third Portage Lake. More

details on the treatment strategy including the discharge location and assimilative capability of the receiver is required to advance the Portage Area flooding concept.

In the 2021 Annual Report section 9.1.1.1 (pdf page 527), the Proponent described activities including: “Started environmental studies to assess the assimilative capacity of Third Portage Lake. The results from these studies will help define the allowable annual discharge volume and treated effluent requirements.”

The modeling update in Appendix C of the Meadowbank Water Management Plan states that “It is important to note that the treated effluent discharge water quality criteria shall need to be assessed based on the assimilative capacity of the receiving water body, Third Portage Lake.”

The proposed closure strategy is to treat and discharge the water in the pits, prior to capping tailings and reflooding. The approach of defining assimilative capacity implies a “pollute up to” approach, which is not compatible with maintaining the pristine water quality in the lakes.

ECCC notes that the closure commitment from the Proponent is to ensure pit water quality either meets background, meets the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life, or meets appropriate site-specific objectives prior to reconnecting the pits to surface waters. Water quality in Third Portage Lake should be held at the same or better standards up to and beyond closure.

ECCC acknowledges that a detailed understanding of conditions in Third Portage Lake is needed to develop protective site-specific water quality objectives for closure, noting that these objectives should not be set to incorporate higher loadings and increases in concentrations of contaminants.

ECCC Recommendation(s)

ECCC recommends that the work planned for understanding conditions in receiving water bodies be described such that the focus is not on quantifying levels of contaminants that can be discharged, noting that the objective is to maintain baseline or guideline/protective water quality in the lakes.

6. 2021 Water Management Plan Water Balance Tables

Reference(s)

- Appendix 12 – Meadowbank Water Management Plan
 - Appendix A – 2021 Water Balance Update
 - Appendix B – Water Management Schematic Flow Sheets

Comment

The first table showing water flows and volumes for Third Portage Lake, Reclaim Tailings Water, and the Mill presents water quantity amounts over time. In 2026, Mill Fresh Water Volumes and Mill Process Water Volumes (pdf page 24-25) are negative, the reason for which is not clear given that these are not water reservoirs with capacity to be withdrawn.

The table starting on pdf page 61 includes a column for Tear Drop Lake to SC, but there are no volumes associated with this. It is not clear if these volumes are included in Pit A inputs.

The Water Balance Update would benefit from descriptive text in the Appendix to indicate what the highlighted cells and rows signify. Numbering of the tables would be useful.

ECCC also notes that the schematics provided in Appendix B were very helpful in showing the planned water management and changes over time. It would also be useful to include the post-reconnection schematic showing flows from Goose Pit and Portage pits and whether the pits are anticipated to be groundwater sinks (recharges).

ECCC Recommendation(s)

ECCC requests:

- clarification of the 2026 water balance volumes associated with the mill and Tear Drop Lake;
- clarification of the significance of highlighted cells and rows in the tables; and
- provision of post-closure flow schematics.

7. Aluminium Guidelines

Reference(s)

- Appendix 12 – Meadowbank Water Management Plan, Appendix C, Table 2-2: Discharge Criteria and CCME Guidelines for the Parameters Evaluated

Comment

Table 2-2 presents the aluminium guideline from CCME dated 1987. In June 2021, the Federal Environmental Quality Guidelines for Aluminium were released; these guidelines incorporate several toxicity modifying factors (Dissolved Organic Carbon [DOC], hardness, and pH) to effectively calculate a site-specific guideline. The Federal Water Quality Guideline (FWQG) equation is valid between hardness 10 and 430 mg/L, pH 6 and 8.7, and DOC 0.08 and 12.3 mg/L. The guideline is available at <https://www.canada.ca/content/dam/eccc/documents/pdf/pded/fegg-aluminium/Federal-environmental-quality-guidelines-aluminium.pdf>

ECCC Recommendation(s)

ECCC recommends use of the updated FWQG for aluminium.

8. Graphs

Reference(s)

- Appendix 12 – Meadowbank Water Management Plan, Appendix C, Figure 2-1: Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals

Comment

The legends on the various figures include a green line for the “Water Licence Limit” as a useful point of reference for concentrations. However, it is not shown on the graphs for cyanide, arsenic, and lead on Figure 2-1. Figure 2-4 is also missing the water licence limit line on the graphs for these parameters.

ECCC notes that the plotting of the previous year forecast is useful in providing indication of how closely current concentrations are tracking forecast levels.

ECCC Recommendation(s)

ECCC recommends that figures in future report iterations include the water licence limit as a reference point on the graphs where missing for cyanide, arsenic and lead.

9. Modeling Contaminant Contributions from Pore Water

Reference(s)

- Appendix 12 – Meadowbank Water Management Plan Appendix C
 - Section 2.7.3 Water Quality Table 2-7: Water Quality in Central Dike D/S Pond for 2020
 - Section 3.4 Input Parameters
 - Section 6.2 Recommendations

Comment

The discussion of the water quality results in Table 2-7 suggests that the source of elevated ammonia, chloride, sulphate and fluoride in the Central Dike Downstream Pond could be from pore water in the tailings moving toward the pond. The pits receiving tailings (Goose Pit and Portage Pit E) will similarly have pore water that is high in contaminants. This pore water will be expressed upwards, as tailings are deposited and consolidate. Contaminant loadings from tailings have been reviewed using various approaches. Shake Flask Extraction tests were done in 2021 on ores from Vault, Portage and Whale Tail pits to quantify loadings from leaching of the tailings, to include as model inputs, although this assumed Total Dissolved Solids (TDS), chloride and cyanide were negligible. Mill effluent has been used as an (adjusted) model input and includes ammonia, chloride, sulphate and TDS; however, pit pore water in the tailings has not been explicitly incorporated, and it is not clear to what degree these steps will account for the pore water contributions to the overlying pit waters.

The recommendation is made in the Water Quality Forecasting Update (Section 6.2) to regularly monitor pit water quality in Portage and Goose pits, for use in modeling the pit water quality. ECCC notes that if possible, sample collection should be done at various levels in the water column to identify any difference associated with density stratification or upwelling pore water contributions.

Note that the title for Table 2-7 should refer to 2021 rather than 2020.

ECCC Recommendation(s)

ECCC requests clarification regarding how pore water quality in the pits has been accounted for in the modeling update.

ECCC supports the recommendation in Section 6.2 to regularly analyse pit water quality, and recommends that various depths be monitored, including near the tailings/water interface.

10. Elevated Arsenic and Chloride at Pit-E; Elevated Copper at Pit-A East – Seepage Monitoring

Reference(s)

- Appendix 42 – Meadowbank 2020 Groundwater Monitoring Report, Section 6 – Conclusions; Section 7 – Recommendations

Comment

The 2021 Meadowbank Groundwater Monitoring Report notes that seepage from the west wall of Pit-E continues to contain elevated concentrations of arsenic and chloride, and trace levels of cyanide indicating some TSF contributions. Waste rock contact water contributions may also be a factor. Arsenic, calcium, copper, manganese, potassium, sodium and sulphate at MW-16-01 are trending upward and are attributed to reclaim water from the South Cell TSF. There was also elevated copper in the Pit-A East wall seepage, and the source of that is unknown.

Section 7 notes that there should be detailed surveys of water levels to document hydraulic gradients influencing the movement of reclaim water, which is contained in various sites (e.g. Pit-A, Pit-E, Goose Pit, Central Dike ST-S-5) noting that the movement of reclaim water across the site will vary as water levels in the in-pit tailings deposition (IPD) pits increase. The recommendation is made to use isotopic signatures of groundwater affected by reclaim water to identify the source of arsenic in Pit-E waste wall seepage samples. It is not clear whether this can be done with analysis of current samples from the wall seepage, or if it will be necessary to collect wall seepage samples in 2022. Given the rising water levels in Pit-A and Pit-E re: safety concerns, the report notes it may not be possible to collect future pit wall seepage samples.

ECCC Recommendation(s)

ECCC recommends that the Proponent identify alternative investigations for the source of the elevated arsenic and chloride concentrations at Pit-E Seepage location and copper at Pit-A east if needed wall seepage samples cannot be collected.

11. QA/QC Plan

Reference(s)

- Appendix 54 – Meadowbank and Whale Tail Quality Assurance/Quality Control (QA/QC) Plan, Version 7, Table 2-2
- Agnico Eagle's response to Meadowbank (2AM-MEA1530) and Whale Tail (2AM-WTP1830) 2020 Annual Report comments (dated Nov. 19, 2021)

Comment

In response to ECCC's 2020 Annual Report recommendations to update QA/QC sampling frequencies outlined in Table 2.2, the Proponent has outlined that the numbers of QA/QC samples are above the 10% minimum threshold. However, the frequencies currently listed in Table 2.2 still do not reflect sufficient numbers for mine facilities and groundwater chemistry, nor do they all include trip blanks. The Proponent's response indicates that they are in fact collecting sufficient numbers of samples and of appropriate types (trip/field /duplicate) but ECCC notes that the frequency in Table 2-2 contradicts stated practices.

ECCC Recommendation(s)

ECCC recommends that the Proponent update Table 2-2 of the QA/QC Plan to reflect the current practices and confirm that the minimum frequency of 10% is met for groundwater samples and mine facilities samples.

12. TSF Cover Design

Reference(s)

- Appendix 22 – Meadowbank Mine Waste Rock and Tailings Management Plan, Version 12, Section 7.1 TSF Cover Design

Comment

In section 7.1, the current design criteria for the cover system design include:

- *For 90% of the TSF surface area, the active layer shall remain within the constructed NAG cover system and the underlying tailings material shall remain frozen for a warm year event with a return period of 1 in 100 years, accounting for the climate change scenario;*
- *In areas where the active layer extends into the tailings material, the thawed layer should be limited to the upper 30 cm of the tailings mass and saturation of the tailings should remain above 85% to limit oxidation of the tailings; and*
- *As an additional method to reduce tailings reactivity, the degree of saturation within the tailings mass should remain above 85%. This will reduce the tailings reactivity should part of the upper region of the tailings mass thaw during a warm year event.*

Based on the design criteria above, it is not clear:

- a) why only 90% of the TSF surface area is covered with non-potentially acid generating (NAG) rock such that the active layer is within the NAG cover, and whether the remaining 10% was left uncovered purposefully given that the tailings below it is not protected from infiltration of water and air; and
- b) how the proponent intends to keep the saturation of the tailings above 85% at all times as indicated in the second and third bullets above.

ECCC Recommendation(s)

ECCC requests clarification on:

- why only 90% of the TSF surface area are covered with NAG rock whereas 10% are not; and
- how the Proponent intends to keep the saturation of the tailings above 85% at all times.

If you need more information, please contact Victoria Shore at Victoria.Shore@ec.gc.ca.

Sincerely,

[original signed by]

Victoria Shore
Senior Environmental Assessment Officer

cc: Jody Small, Acting Head, Environmental Assessment North (NT and NU)