Environment and Climate Change Canada | Environnement et Changement climatique Canada

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

ECCC File: 6100 000 008/015
NWB File: 2AM-WTP1826

November 8, 2018

Via email at: licensing@nwb-oen.ca

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

Dear Ms Porter:

RE: 2AM-WTP1826 – Agnico Eagle Mines Ltd. – Whale Tail Project – AEM Response to ECCC comments on Water Quality Flow, Waste Rock and Water Management Plans

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the above-mentioned responses and is submitting replies via email. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act*, and the pollution prevention provisions of the *Fisheries Act*.

Water Quality and Flow Monitoring Plan

1. ECCC #1 – Monitoring Parameters

Agnico Eagle's Response to Recommendation:

This revision of the Water Quality and Flow Monitoring Plan was completed to align with recently issued Water Licence 2AM-WTP1826 requirements. Field pH and field temperature are not part of Water Licence 2AM-WTP1826 requirements.

ECCC Response:

Environmental pH and temperature cannot be stabilized in a water quality sample, therefore monitoring the field conditions is necessary to obtain accurate data for these parameters.

Accurate pH measurements are important to the overall monitoring program. As pH determines the solubility and biological availability of various water quality parameters (e.g., nutrients and heavy metals), pH data is required in determining the form and toxicity of such parameters. Accurate temperature measurements are necessary for determinations of parameters such as pH, electrical conductivity, and dissolved oxygen,

and for the determination of chemical reaction rates and equilibria as well as biological activity.

ECCC recommends as best practice the inclusion of field pH and field temperature in the monitoring program. Inclusion of these parameters is necessary to support the interpretation of monitoring data for various water quality parameters.

2. ECCC #2 – Total Suspended Solids/turbidity regression curve

Agnico Eagle's Response to Recommendation:

The TSS-turbidity relationship was developed using paired data collected across a range of TSS sources and concentrations. Agnico Eagle is confident that the TSS-turbidity relationship developed will be adequate.

ECCC Response:

Due to the site-specific nature of the relationship between Total Suspended Solids (TSS) and turbidity, it is standard practice to use site-specific data to establish the TSS-turbidity relationship. In lieu of establishing a Whale Tail specific TSS-turbidity relationship, it appears that the Meadowbank relationship will be applied directly to the Whale Tail Project.

ECCC recommends conducting periodic validation of the TSS-turbidity relationship through lab analysis of TSS and turbidity values in order to assess/monitor the validity of the approach proposed by Agnico Eagle.

3. ECCC #3 – Group 1 Parameters

Agnico Eagle's Response to Recommendation:

This revision of the Water Quality and Flow Monitoring Plan was completed to align with Water Licence 2AM-WTP1826 requirements. Agnico Eagle agrees with ECCC's comments, but Group 1 is listed as per Water Licence 2AM-WTP1826.

ECCC Response:

ECCC is satisfied with this response and has no further comments. ECCC recommends that the NWB consider revising the listing of Group 1 parameters.

4. ECCC #4 – Attenuation pond post-treatment characterization

Agnico Eagle's Response to Recommendation:

This revision of the Water Quality and Flow Monitoring Plan was completed to align with recently issued Water Licence 2AM-WTP1826 requirements. The monitoring requirements for station "Attenuation pond post-treatment characterization" are parameters from Group 1.

ECCC Response:

The Group 1 parameters are insufficient to appropriately characterize water quality in the attenuation pond. The list should be expanded to Group 2 parameters, which are more comprehensive and more appropriate for monitoring contact water constituents.

ECCC recommends that the NWB consider revising the requirement to Group 2 for the water quality sampling station ST-WT-02.

5. ECCC #5 – Attenuation pond post-treatment monitoring

Agnico Eagle's Response to Recommendation:

This revision of the Water Quality and Flow Monitoring Plan was completed to align with recently issued Water Licence 2AM-WTP1826 requirements. BOD5 and bacteriological parameters are not listed as monitoring requirements for either the sewage treatment plant or the attenuation pond prior to release to Mammoth Lake.

ECCC response:

Monitoring for BOD5 and bacteriological parameters is an important component in assessing the effectiveness of wastewater treatment.

ECCC recommends that the NWB consider revising the monitoring requirements to include BOD5 and bacteriological analyses.

Water Management Plan

6. ECCC #1 – Water Management During Closure

Agnico Eagle's Response to Recommendation:

Agnico Eagle does not agree with ECCC's recommendation. Agnico Eagle will monitor untreated contact water during the Closure phase to provide confidence in the consistency of discharge and seepage quality as per Water Licence monitoring requirements. These will be established prior to the Closure phase in collaboration with ECCC and the Nunavut Water Board (NWB).

ECCC response:

The quality of the seepage/contact water may vary on a seasonal or precipitation-related basis. To ensure compliance with the Water Licence, as well as the pollution prevention provisions of the *Fisheries Act*, the quality of such waters entering surface waters will need to be demonstrated to be consistently acceptable prior to terminating treatment in the Closure phase.

ECCC notes that Agnico Eagle has committed to monitor seepage/contact water and treat until the quality of untreated contact water is acceptable for release into surface waters. It is unclear why Agnico Eagle does not agree with ECCC's recommendation as the response provided above by Agnico Eagle is consistent with ECCC's recommendation.

7. ECCC #2 – Sludge Management

Agnico Eagle's Response to Recommendation:

For clarification, Agnico Eagle agreed to dispose of sludge in the Whale Tail WRSF during the Whale Tail Pit final hearings and have updated the Water Management Plan to reflect this commitment. However, Agnico Eagle would like to clarify the Water Treatment Plant described in the previous version of the Water Management Plan is the Construction Water Treatment Plant (CWTP). The CWTP is only used to treat total suspended solids generated during the Construction Phase. The text in the Water Management Plan will be modified to:

Sludge water from the Operation Water Treatment Plant (OWTP) will be dewatered with a centrifuge to produce a cake having a density with 20% of solid content. This cake will be stored in the Whale Tail WRSF. The maximum predicted annual volume of cake from the OWTP is approximately 5,760 cubic metres (m3). The OWTP, is designed to treat total suspended solids and arsenic during the Operations Phase.

ECCC response:

ECCC is satisfied with this response and has no further comments at this time.

Waste Rock Management Plan

8. ECCC #1 – Water Management During Closure

Agnico Eagle's Response to Recommendation:

Agnico Eagle does not agree with ECCC's recommendation. Agnico Eagle will monitor untreated contact water during the Closure phase to provide confidence in the consistency of discharge and seepage quality as per Water Licence monitoring requirements. These will be established prior to the Closure phase in collaboration with ECCC and the Nunavut Water Board (NWB).

ECCC reply:

The quality of the seepage/contact water may vary on a seasonal or precipitation-related basis. To ensure compliance with the Water Licence, as well as the pollution prevention provisions of the *Fisheries Act*, the quality of such waters entering surface waters will need to be demonstrated to be consistently acceptable prior to terminating treatment in the Closure phase.

ECCC notes that Agnico Eagle has committed to monitor seepage/contact water and treat until the quality of untreated contact water is acceptable for release into surface waters. It is unclear why Agnico Eagle does not agree with ECCC's recommendation as the response provided above by Agnico Eagle is consistent with ECCC's recommendation.

9. ECCC #2 – Closure and Post-Closure

Agnico Eagle's Response to Recommendation:

Agnico Eagle does not agree with ECCC's recommendation. For the Whale Tail Pit Project, selected RCPs have been grouped into two unique scenarios (Golder 2018):

- Scenario 1: ensemble of all RCP 4.5 and RCP 8.5 model runs considered representative of a RCP 6.0 scenario.
- Scenario 2: ensemble of all RCP 4.5 model runs.

This modelling approach was evaluated and approved as part of the NIRB Project Certificate and NWB Water License process.

RCP 4.5 is representative of intermediate emissions levels with greenhouse gas reduction and RCP 8.5 is representative of high emissions levels with no reduction in greenhouse gas emissions. The blend of RCP 4.5 and RCP 8.5 is considered representative of a future with intermediate to high emissions levels, where there have been some reductions in greenhouse gas emissions but not as ambitious as those required by RCP 4.5. The range of projections for Scenario 1 very likely covers the range of projections from RCP 6.0.

General circulation models have inherent limitations that are important to bear in mind when evaluating variability and the rate of climate change, (i.e., when comparing future projections to historical observations). These limitations are dependent on the research institution's approach to overcoming model uncertainty. Since no one model or climate scenario can be viewed as completely accurate, the Intergovernmental Panel on Climate Change (IPCC) recommends that climate change assessments use as many models and climate scenarios as possible. For this reason, the multi-model ensemble approach described above was used to account for these uncertainties and limitations.

The WRSF was designed to be physically and chemically stable under above-mentioned Scenario 1. Agnico Eagle will continue to monitor and validate these findings during Operations and Closure phase as per the Thermal Monitoring plan, Waste Rock Management Plan, ARD-ML Sampling and Testing Plan, Water Quality and Flow Monitoring Plan, and Water Management Plan.

Agnico Eagle will continue to use industry standard practices to evaluate the impacts of climate change on the WRSF in collaboration with ECCC and NWB.

ECCC response:

ECCC is satisfied with Agnico Eagle's commitment to monitor and validate conditions, and to revisit evaluating the impacts of climate change on the WRSF. Depending on monitoring data and WRSF performance, a revised model scenario may be appropriate to run in the future.

10. ECCC #3 – Onset of Acid Rock Drainage (ARD)/Metal Leaching (ML)

Agnico Eagle's Response to Recommendation:

For clarification, the estimated field time equivalency of laboratory weathering tests is explained in the Final Environmental Impact Statement (FEIS) Appendix 5E Sections 2.2.4.2 and 3.5.1.1 as follows: From Section 2.2.4.2

The 1-kg HCT is an accelerated weathering test meant to speed up the process of sulphide mineral oxidation to facilitate the measurement of weathering and its products on a shorter time scale than might occur in reality. This is achieved by forcing a rapid succession of alternating wet and dry cycles, and by actively flushing out the weathering products through the use of a high liquid to solid ratio (1:1 water to rock proportion by weight). The HCT test method (ASTM D 5744-07), is typically observed to be many times faster than rates inferred from field observations of drainage from the toe of waste rock piles (e.g., Malstrom et al., 2000).

In practice, many factors will influence weathering characteristics of the exposed mined materials and the rate of chemical release at site. Of importance are site climate on

mineral reaction rates, availability of liquid water to transport weathering products, and pile hydrology (wetting and flow of water in pile pore spaces) which in turn also affects the water-to-solid contact and the rate of chemical reactions.

The Whale Tail and IVR waste rock will be piled and will be exposed to far less precipitation than both HCT and leaching columns. The average annual rainfall is 145 mm over 4 frost-free months (average of 36 mm/month), while each of the HCTs receive the equivalent of 127mm/week (508 mm/month), and the leaching columns receive the equivalent of between 63 and 122 mm/week (254 and 488 mm/month). Each weekly cycle represents more flushing than one average summer month at site. Thus conservatively, one leaching cycle can be said to represent 1 month of leaching at site. Comparatively, a 10-fold weathering rate acceleration (estimated from findings in Malstrom et al., 2000) would equate to 1 weekly leach cycle representing 2.5 months of weathering in the field. In addition, as observed at Meadowbank, freezing conditions prevail for 8 months of the year in the surficial active thaw depth of the rock storage facility. The deeper portion of the pile remains frozen. The frozen winter conditions are not represented in laboratory leaching cycles. Laboratory tests simulate frost-free periods only (the four summer months).

Consequently, 4 leaching cycles can be considered to represent the four months of active water ingress into the waste rock pile, or one year at site, insofar as 4 months in the field constitutes the frost-free summer period where water can seep through the waste rock pile. By extension, a 20-cycle kinetic test would represent approximately 5 years at site.

From Section 3.5.1.1

Mineral depletion calculation results are in general agreement with the static ABA results indicating that the ultramafic, iron formation, mafic volcanic and intermediate intrusive lithologies will remain buffered with carbonate minerals, and largely outlast the time required for complete oxidation of sulphide minerals in these samples.

Conversely, the chert samples could acidify in the HCT in another year, and in 2 years in the leaching column. The PAG greywacke leaching column would be amenable to acidification in more than 4 years under laboratory conditions. This time frame for the laboratory leaching columns (1.5 to 5 years or 78 to 260 weeks) represents more than a decade in the field (Section 2.2.4.2). Furthermore, this period of time could be underestimated because it does not consider 1) the buffering capacity afforded by the other waste rock with which it will be mixed in the pile, 2) slower sulphide mineral oxidation kinetics at lower site temperatures (according to Arrhenius equation) and 3) the 8 months of freezing conditions and lower rock to liquid ratio in the field that slows the rate of buffering mineral dissolution (consumption).

In summary, the calculated delay to the onset of ARD in PAG samples is substantially longer than the 7 years of mine construction, operations and closure, with the possible exception of the upper tier high sulphur – low buffering capacity greywacke or chert rock.

ECCC response:

ECCC is satisfied with Agnico Eagle’s response and has no additional comments on Onset of Acid Rock Drainage (ARD)/Metal Leaching (ML) at this time.

Should you require further information, please do not hesitate to contact Gabriel Bernard-Lacaille at (867) 669-4746 or Gabriel.Bernard-Lacaille@canada.ca.

Sincerely,

[*Original signed by*]

Eva Walker
Environmental Assessment Coordinator

cc:
Gabriel Bernard-Lacaille, Senior Environmental Assessment Coordinator
Georgina Williston, Head, Environmental Assessment North (NT and NU)