Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Nunavut Regional Office
Iqaluit, NU X0A 0H0

Your file - Votre référence
2AM-WTP1826

July 29, 2019

Our file - Notre référence
CIDM# 1258099

Richard Dwyer
Manager of Licensing
Nunavut Water Board
Gjoa Haven, NU X0E 1J0

Sent via email:licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) review of Type 'A' Water Licence 2018 Annual Report, 2AM-WTP1826, Whale Tail Pit Project – Agnico Eagle Mines Limited (AEM).

Dear Mr. Dwyer,

Thank you for the email notice, received on April 29, 2019, regarding the above mentioned Type 'A' Water Licence 2018 Annual Report at Whale Tail Pit Project.

CIRNAC reviewed the application and the results of our review are provided in the enclosed memorandum for the Nunavut Water Board's consideration. Comments have been provided pursuant to the mandated responsibilities of CIRNAC under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Indian Affairs and Northern Development Act*.

If you have any questions or require further information with respect to this matter, contact me at (867) 975-3877 or michelle.blade@canada.ca, or Godwin Okonkwo at (867) 975-4550 or email godwin.okonkwo@canada.ca.

Regards,

Michelle Blade
Regional Coordinator, Water Resource Division

Canada

Technical Review Memorandum

To: Richard Dwyer, Manager of Licensing, NWB

From: Michelle Blade, Regional Coordinator, Water Resource Division – CIRNAC, NRO

Date: July 29, 2019

Re: CIRNAC's review of Type 'A' Water Licence 2018 Annual Report, 2AM-WTP1826, AEM Whale Tail Pit Project in response to NWB's letter dated April 29, 2019.

Applicant:	Agnico Eagle Mines Limited (AEM)
Representative:	Marie-Pier Marcil
Project:	Whale Tail Pit Project
Region:	Kivalliq

A. BACKGROUND

The Whale Tail Pit Project is part of the Amaruq gold deposit located approximately 150 km north of Baker Lake, Nunavut. It consists of Whale Tail Pit, Whale Tail Waste Rock Storage Facility, and Whale Tail Attenuation Pond. Whale Tail Pit will be mined as an open pit, and ore will be hauled approximately 50 km southwest by truck to Meadowbank Mine for milling. On July 11, 2018, the Minister of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) approved Agnico Eagle Mines Limited's (AEM) Whale Tail Pit Project Type 'A' Water Licence No. 2AM-WTP1826 application. The Whale Tail Site was under construction in 2018. Further construction, infrastructure commissioning, and operations is anticipated for 2019. CIRNAC noted in the 2018 Annual Report that the:

> Amaruq deposit remains on track for production start-up in Q3 2019: Development activities at Amaruq are progressing as planned. Open pit mining has commenced at the Whale Tail pit and commissioning of the long-haul truck fleet is underway.

B. RESULTS OF REVIEW

Comments and recommendations are provided by CIRNAC Water Resources Division, pursuant to the Department's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Indian Affairs and Northern Development Act*.

Table 1 provides a summary of the comments associated with each Annual Report review section.

Table 1: Number of CIRNAC Technical Comments

Annual Report Section	Comment Topic	CIRNAC
CONSTRUCTION Schedule B, Item 1; Part I, Item 16	Whale Tail Dike and other water management structures is being constructed and commissioned in 2019 - and therefore reviewed as part of the 2019 Annual Report.	No comment.
WATER Schedule B, Items 2 to 6.	Lake level monitoring. Water use from Nemo Lake, Whale Tail Lake, and unnamed water bodies is within water licence volume requirements.	Comment 1.
WASTE Schedule B, Items 7 to 12.	Quarry 1 seepage analysis.	Comment 2.
SPILLS Schedule B, Item 13.	15 reported spills and 114 non-reportable spills. Contaminated material disposed at Meadowbank.	No comment.
MODIFICATIONS Schedule B, Item 14.	No modifications nor major maintenance work reported in 2018.	No comment.
MONITORING Schedule B, Items 15 and 16.	Seeps and groundwater monitoring, Hydraulic Conductivity, Horizontal Groundwater Flow.	Comment 3, Comment 4, Comment 5.
CLOSURE Schedule B, Items 17 to 19.	Before operations site photos.	Comment 6
PLANS/REPORTS/STUDIES Schedule B, Items 20 to 22.	Updated management plans.	Comment 7, Comment 8, Comment 9.
GENERAL Schedule B, Item 23.	Actions taken to address inspection reports.	No comment.
OTHER Schedule B, Items 24 and 25.	Details on Water use or Waste Disposal requested by the Board.	No comment.
Part D, Item 14	Field checks of engineered structures.	Comment 10

1 Lake Level Monitoring

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report. Section 4.2.2.

Comment:

Whale Tail Lake South Basin, Whale Tail Lake North Basin, and Mammoth Lake water levels were monitored on a weekly basis, during open water season and weather permitting. 2018 water level results were reported as a range and average for each lake. CIRNAC requests in the 2018 annual report, individual water level measurements are presented for each lake in tabular and graphical form for the NWB to review.

2 Quarry 1 Seepage Analysis

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report. Section 8.5.8.2.5.

Comment:

In the 2018 Annual Report, AEM reported:

> In 2018 water inflow from Whale Tail Lake into Quarry 1 was observed. This water was managed by pumping it into AP-5. A total of 232,870 m^3 of seepage water was managed this way.

Analysis of Quarry 1 seepage was not reported in Section 8.5.8.2.5 of the 2018 Annual Report. CIRNAC requests that the 2018 Quarry 1 seepage analysis be submitted to the NWB for review.

3 Seeps and Groundwater Monitoring

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report.
- Appendix 1 – Meadowbank and Whale Tail 2018 Annual Report Table.

Comment:

Construction activities commenced at the Whale Tail Site in 2018, including operations of the starter pit within the Whale Tail Pit footprint. Section I Items 15

and 16 of the water licence indicates "*Seepage at Pit Wall and Pit Wall Freeze/Thaw and Permafrost Aggradation*" shall be monitored quarterly. Schedule I Table 2 of the water licence states seeps are to be monitored monthly or as found; the results and interpretation of the seepage monitoring shall be submitted in the Annual Report. AEM reported that seep monitoring was "*not applicable for the 2018 Annual Report*."

Groundwater wells are to be monitored annually and the results and interpretation provided in the Annual report, as per Schedule I Table 2 and Schedule B Item 15, respectively. AEM reported that "*groundwater monitoring in 2018 continued in the baseline phase.*"

CIRNAC requests the 2018 seepage and groundwater results, pursuant to the water licence, are submitted to the NWB for review.

4 Hydraulic Conductivity

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report. Section 8.7.2.
- Appendix 38 – Whale Tail 2018 Groundwater Management Monitoring report.
- Agnico Eagle Whale Tail Pit Project Groundwater Monitoring Plan Version 2.1, February 2019.

Comment:

Golder states in the Whale Tail 2018 Groundwater Management Monitoring report:

> …A hydrogeological testing program was conducted between 7 and 9 of December 2018…The testing was conducted in deep bedrock in the subpermafrost zone over a depth interval of about 375 m to 626 m below ground surface. All three of these tests resulted in estimated hydraulic conductivities of less than 1 x 10^{-10} m/s… the one high value of hydraulic conductivity over a 30 m zone from a depth of about 436 m to 466 m in deep bedrock that was measured during the drilling of the borehole for the Westbay multi-level well is likely an isolated zone of jointing near the test interval…

The amount of jointing at the Whale Tail Site is unknown. Permafrost restricts groundwater flow. However, Groundwater Monitoring Plan Version 2.1 projects the majority of permafrost under the pit lake will thaw after closure.

CIRNAC therefore requests Whale Tail models use the measured higher

hydraulic conductivity to account for the unknown amount of jointing at the Whale Tail Site.

5 Horizontal Groundwater Flow

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report. Section 8.7.2.
- Appendix 38 – Whale Tail 2018 Groundwater Management Monitoring report.
- Agnico Eagle Whale Tail Pit Project Groundwater Monitoring Plan Version 2.1, February 2019.
- CIRNAC comments on Groundwater Monitoring Plan Version 2.1, March 1, 2019.
- Agnico Eagle Whale Tail Pit Project Groundwater Monitoring Plan Version 2.1, February 2019.

Comment:

Section 8.7.2 of the 2018 Annual Report states:

> …horizontal groundwater flow below the active layer is restricted by permafrost in at least the upper 425 m.

Whale Tail site measurements in the 2018 Groundwater Management Monitoring report indicates:

> …temperature profiles observed in thermistors between Nemo Lake and Whale Tail lake are showing signs of permafrost degradation below the active layer.

And that 212,580 m^3 of water was recorded to flow:

> …from Whale Tail Lake to Quarry 1 through non-cohesive overburden that was most likely fractured after blasting the Quarry 1 top benches.

The Groundwater Monitoring Plan Version 2.1 relies heavily on the assumption of continuous permafrost surrounding the Whale Tail Lake talik thereby impeding groundwater flow. However, 212,580 m^3 of water was measured to flow horizontally from Whale Tail Lake to Quarry 1 through non-cohesive overburden. There are currently no groundwater wells installed nor monitored in the active layer between Nemo Lake and Whale Tail Pit. CIRNAC recommends the thresholds for, and commitment to, installing groundwater monitoring wells in the active layer are specified

in the groundwater adaptive management plan (Section 3.3) of the Groundwater Monitoring Plan.

With respect to thermal monitoring between Nemo Lake and Whale Tail Pit, Section 3.1 of Groundwater Monitoring Plan Version 2.1 states:

> …thermal monitoring will continue at each of the installed thermistors to monitor the presence of permafrost below the active layer during construction and operations phases. The monitoring will continue until such time as a thermistor is destroyed by active mining. Two thermistors, AMQ17-1233 and AMQ17-1337, are located outside of the pit footprint and will be used to monitor permafrost conditions between Nemo Lake and Whale Tail Pit. The thermistor data will be used to verify the presence of permafrost and the restricted horizontal movement of groundwater below the active layer due to permafrost in the upper 425 to 495 m of bedrock.

CIRNAC understands that thermal monitoring will occur at each of the installed thermistors during construction and operation phases, and that thermistors AMQ17-1277A and AMQ15-452 will be destroyed during active mining as they are located within the Whale Tail Pit footprint. As thermistors AMQ17-1277A and AMQ15-452 are positioned to validate AEM's model of pit wall freeze/thaw and permafrost aggradation (Part I Item 15 of the 2AM-WTP1826 water licence) as it pertains to horizontal groundwater flow. CIRNAC recommends replacement of thermistors AMQ17-1277A and AMQ15-452 in the vicinity of the Whale Tail Pit 'north wall' to detect pit wall freeze/thaw, and the proposed replacement thermistor locations and depths be specified in AEM's Groundwater Monitoring Plan as part of adaptive management.

Relevant thermal monitoring during operations and closure is essential to validate groundwater assumptions at the Whale Tail Pit Project. CIRNAC appreciates the thermistor data to validate the horizontal hydrogeological profile assumptions that continuous permafrost surrounding the Whale Tail Lake talik negates horizontal hydrogeological flow, and to monitor changes in active layer depth. The thermistors are also used to monitor the potential horizontal groundwater flow pathway from Nemo Lake (of higher measured water level) to Whale Tail Pit (of lower measured water level) via the active layer – however only one of the four thermistors (AMQ17-1337) has temperature readings in the active layer. CIRNAC recommends future thermistors are installed with temperature readings both within and below the active layer.

CIRNAC appreciates the addition of thermistors AMQ17-1337, AMQ17-1233, AMQ17-1277A and AMQ15-452, between Nemo Lake and Whale Tail Pit, to Groundwater Monitoring Plan Version 2.1. CIRNAC

recommends the Groundwater Monitoring Plan state the thermistors have, at minimum, a quarterly frequency of observations as per Part I Item 15 of the 2AM-WTP1826 water licence, and that the thermistor data is submitted in the Annual Report.

6 Before operations site photos

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report. Section 9.1.2.

Comment:
Schedule B Item 17 of the water licence requires:

> …photographic records of site conditions before and after completion of operations…

As construction activities at the Whale Tail site are currently underway, CIRNAC requests a summary document of before operations photos be compiled for each activity area of the Whale Tail site to inform closure and reclamation plans. The summary document should be submitted to the NWB for review.

7 Groundwater Monitoring Plan

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report.
- Agnico Eagle Whale Tail Pit Project Groundwater Monitoring Plan Version 2.1, February 2019.

Comment:
Due to AEM's high reliance on seeps to validate the horizontal and vertical groundwater flow models and inform the adaptive management plan, CIRNAC is adamant that the seep minimum frequency of observations and monitoring parameters adheres to Part I Item 15 and Schedule I Table 2 of the 2AM-WTP1826 water licence. Specifically that the minimum frequency of observation for seepage at the pit wall is quarterly, and that seeps shall be monitored monthly or as found during operations for Group 1 parameters. Considering the uncertainties and risks around long term water treatment, CIRNAC also requests seeps in the vicinity of lithologies with high acid rock draining and metal leaching (ARD/ML) potential are highlighted in reporting tables.

CIRNAC acknowledges the 2016 Westbay Multiport Well System has been added to Groundwater Monitoring Plan Version 2.1, and that the well will be

sampled and the hydraulic gradient monitored on an annual basis. CIRNAC would like to confirm that all 6 ports of the 2016 Westbay Multiport Well System will be sampled and the hydraulic gradient monitored annually.

CIRNAC appreciates the thresholds and triggers that are included in Section 3.3 and Table 4 of Groundwater Monitoring Plan Version 2.1. CIRNAC is not comfortable with thresholds for groundwater quality parameters set by six-month averaging period of observations as gradual increases in parameter concentrations would not trigger adaptive management. CIRNAC also notes Groundwater Monitoring Plan Version 2.1 does not include a comparable threshold for arsenic concentrations. As arsenic is identified as an important element of concern, an arsenic threshold would allow for the early identification of potential water quality issues that might arise during the closure and post-closure phases. CIRNAC therefore recommends threshold and trigger values are fixed numbers as agreed upon by the NWB and interested parties, and that an arsenic concentration threshold and trigger be included in the plan.

8 Mitigation if arsenic concerns materialize

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report.

Comment:

CIRNAC considers model updating and calibration insufficient mitigative actions when certain thresholds are exceeded, especially when addressing scenarios of Waste Rock Storage Facility (WRSF) water discharge or Whale Tail Pit water quality exceeding predictions and/or guidelines. In the October 17, 2018 meeting with AEM, it was agreed that AEM would provide options available for mitigation if arsenic concerns materialized and that AEM would incorporate these mitigation measures in the plans being submitted under Part B Item 15 of the 2AM-WTP1826 water licence. The current versions of the plans submitted to the NWB does not contain this information, including but not limited to the ARD-ML monitoring plan, Water Quality and Flow Monitoring Plan, Water Management Plan and Waste Management Plan. CIRNAC recommends that AEM identify which plan(s) will contain the details of the adaptive management actions for Waste Rock Storage Facility (WRSF) water discharge, and that the plan(s) are submitted with the 2018 Annual Report to the NWB for review.

9 Geotechnical investigation reports

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report.

Comment:

CIRNAC recognizes 2018 was important in the construction of the Whale Tail Pit Project and thorough geotechnical investigations have been carried out during the period 2014 to 2018. CIRNAC recommends that the results of the geotechnical investigation reports be made accessible.

10 Field checks for engineering structures

Reference:

- Nunavut Water Board Water Licence No. 2AM-WTP1826.
- Agnico Eagle Meadowbank Gold Project 2018 Annual Report.

Comment:

CIRNAC was unable to locate field check narratives in the 2018 Annual Report. CIRNAC requests AEM submit adequate field checks, in accordance to Part D – Item 14 of the Water Licence to the NWB for review, for all engineered structures listed as being in the construction phase in the submitted 2018 Annual Report.