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

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
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Your file - Votre référence
2AM-MEL1631
Our file - Notre référence
GCdocs # 96074181

July 12, 2021

Mr. Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
sent via e-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's Review of the 2020 Annual Report for Meliadine Gold Mine Project, Type A Water Licence No. 2AM-MEL1631

Dear Mr. Dwyer,

Thank you for your April 9, 2021 invitation to review the 2020 Annual Report for the Meliadine Gold Mine Project, submitted by Agnico Eagle Mines Limited, for Type A Water Licence No. 2AM-MEL1631.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the Report and its attachments pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act.* Please find CIRNAC comments and recommendations in the attached Technical Memorandum for the Nunavut Water Board's consideration.

If there are any questions or concerns, please contact me at (867) 975-4689 or by e-mail at john.onita@canada.ca or Sarah Forté at (867) 975-3876 or sarah.forte@canada.ca.

Sincerely,

John Onita
Regional Water Coordinator

Canada

Technical Review Memorandum

Date: July 12, 2021

To: Richard Dwyer, Manager of Licensing, Nunavut Water Board

From: John Onita, Regional Water Coordinator, CIRNAC

Subject: Crown-Indigenous Relations and Northern Affairs Canada's Review of the 2020 Annual Report for Agnico Eagle Mines Limited, Type A Water Licence No. 2AM-MEL1631

Region: ☐ Kitikmeot ✓ Kivalliq ☐ Qikiqtani

A. BACKGROUND

Agnico Eagle Mines Limited (AEM) Meliadine Gold Mine Project is located near the western shore of Hudson Bay in the Kivalliq Region of Nunavut, approximately 25 km north of Rankin Inlet, 80 km southwest of Chesterfield Inlet, and 290 km southeast of the Meadowbank mine. The Project site is situated on a peninsula amongst the east, south, and west basins of Meliadine Lake (63°1'23.8''N, 92°13'6.42''W), on Inuit owned land. The 111,358-hectare property covers an 80-km-long greenstone belt. A 24-km All-Weather Access Road (AWAR) (built in October 2013) links the Meliadine project site with Rankin Inlet. AEM was issued a water licence for this project by the Nunavut Water Board (NWB) on April 15, 2016. The mine commenced its commercial production on May 14, 2019. The project is anticipated to have a mine life of about 14 years with potential for extension to 25 years should more ore be identified.

Meliadine includes seven gold deposits namely Tiriganiaq, Normeg, Wesmeg, Pump, F-Zone, Wolf and Discovery. The approved Project consists of mining at five deposits (Tiriganiaq, Wesmeg, Pump, F Zone, and Discovery) through a phased approach and processing of the ore at an on-site milling operation at a rate of 8,500 tonnes per day, as well as transportation of the gold bullion south for final refinement and sale. There are three (3) main Project areas: the Tiriganiaq mine site, the Discovery deposit, and the Itivia Harbour. The Tiriganiaq mine site includes the camp, landfarm, landfill, incinerator, and fuel tank farms, all of which were completed in late 2017. In addition, the underground portal has been active since 2007/2008 when it was constructed for bulk sampling. The mine site also includes three (3) waste rock piles, three (3) ore stockpiles, and a tailings storage facility. Transportation of personnel and supplies

occurs via the AWAR between Rankin Inlet and the Meliadine site; Phase 1 of the AWAR was approved by the NIRB in 2012 as an exception to the Review of the Meliadine Gold Mine project and was completed in 2013. Scheduled to occur in 2024, Agnico Eagle anticipates Phase 2 of the AWAR, which would include widening of the existing Phase 1 road, twinning part of the road to separate oncoming traffic, and developing a spur road to the Discovery deposit.

The various components and activities associated with the project require an authorization from the Nunavut Water Board (NWB) Type A Water Licence 2AM-MEL1631. A condition of the water licence is the submission of an annual monitoring for the project by AEM, which is the subject of this CIRNAC review.

CIRNAC provides the following comments and recommendations pertaining to the 2020 Annual report submitted by AEM Limited.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-01	Follow-up on 2019 report comment - Higher than Expected TDS in CP1
R-02	Follow-up on 2019 report comment - Higher than Predicted Acid Rock Drainage (ARD) Potential of Filtered Tailings
R-03	Surface Disposition of Waste Rock
R-04	Update the Tailings Storage Facility (TSF) Capacity
R-05	Reporting on Milling Operations
R-06	Tracking Acid Rock Drainage (ARD) Classified Waste Rock Volumes
R-07	Geotechnical Concerns / Issues
R-08	Cyanide Management and Use Handling
R-09	Reporting on Flow Volumes of any Watercourse diverted during Construction Activities
R-10	Tracking Volume of Freshwater obtained from other Permitted Locations for Road Dust Suppression Activities

B. DOCUMENTS REVIEWED

The referenced documents on table 2 associated with AEM's 2020 Annual Monitoring Report for the Meliadine Gold Mine Project were reviewed.

Table 2: Documents Reviewed during the Review of AEM's 2020 Annual Monitoring Report for the Meliadine Gold Mine Project

Report Title	Author/Date
210331-2AM-MEL1631: AEM 2020 Annual Report & Appendices	
Meliadine Gold Project – 2020 Annual Report, Main Document	AEM, March 2021
Appendix Documents	
Appendix 01 - 2020 Annual Report Appendix Summary Table	AEM, March 2021
Appendix 02 - 2020 Drill Site Locations	AEM, March 2021
Appendix 03 - 2021 Mine Plan (Production Lease KVP11D01)	AEM, March 2021
Appendix 04 - General Site Print	AEM, March 2021
Appendix 05 - Water Balance and Water Quality Modeling Tabular Data	AEM, March 2021
Appendix 06 - 2020 Annual Geotechnical Inspection Report	Tetra Tech, February 2021
Appendix 07 - 2019 Annual Geotechnical Report Agnico Eagle Responses and Action Table	AEM, March 2021
Appendix 08 - 2020 Annual Geotechnical Report Agnico Eagle Responses and Action Table	AEM, March 2021
Appendix 09 - As-Built Drawing of Tiriganiaq 02 Open Pit Access Road	AEM, 18 March 2021
Appendix 10 - 2020 Site wide GTC Locations	AEM, 12 March 2021
Appendix 11 - 2020 Annual Geochemical Report (Metal Leaching and Arcadisd Rock Drainage Monitoring Report)	AEM, March 2021
Appendix 12 - 2020 Results of the Tailings Supernatant Sampling	AEM, March 2021
Appendix 13 - 2020 Hazardous Waste Documentation (Waste Bakhaul Report)	Qikiqtaaluk Environmental, 12 March 2021
Appendix 14 - 2020 Stack Testing Report (Atmospheric Emission Characterisation Report, Domestic Waste Incinerator)	Consulair, November 2020
Appendix 15 - 2020 Reportable Spills & Follow-up Reports	AEM, March 2021
Appendix 16 - Mock Scenario Spill Report (Mock Spill Itivia 2020)	AEM, 10 July 2020
Appendix 17 - 2020 Aquatic Ecosystem Monitoring Program (AEMP) Report	Azimuth, March 2021
Appendix 18 - 2020 Calibration Data	AEM, March 2021
Appendix 19 – 2020 Water Monitoring Stations Results	AEM, March 2021

Report Title	Author/Date
Appendix 20 - 2020 Water Quality Management and Optimization Plan Tabular Results	AEM, March 2021
Appendix 21 - DDH Samples	AEM, March 2021
Appendix 32 - 2020 Tundra Restoration and Natural Recovery Monitoring Report	Dr. Stewart & Dr. Conway, June 2020, updated October 2020
Appendix 33 - Management Plans	
Mine Waste Management Plan	AEM, March 2021, V7
Ore Storage Management Plan	AEM, March 2021, V3
Explosives Management Plan	AEM, March 2021, V7
Blast Monitoring Program	AEM, March 2021, V3
Ammonia Management Plan	AEM, March 2021, V3
Sediment and Erosion Management Plan	AEM, March 2021, V3
Appendix 42 - NIRB Project Certificate Tracking Table	AEM, March 2021

C. RESULTS OF REVIEW

CIRNAC's review of the 2020 Annual Report resulted in the generation of ten comments which were prepared with the support of Arcadis Canada Inc. The first two comments are a follow-up on CIRNAC's 2019 review comments.

1. Follow-up on 2019 report comment - Higher than Expected TDS in CP1

Comment

CIRNAC recommended that AEM provide a summary of the measures taken in 2019 to identify the sources and to reduce the total dissolved solids (TDS) loads to containment pond 1 (CP1). Subsequently, CIRNAC also asked for further clarification as to whether any underground saline water, either treated or untreated, ended up in CP1 in 2019. AEM has carried out a number of studies and updated models to assess the issues related to the geotechnical aspects and the water management considerations and impacts of excess water storage in 2019 and the potential impacts of emergency

discharge of waters into Meliadine Lake in 2020. These studies have been presented as part of the NWB Type A Water Licence amendment application. During the NWB Type A Water Licence amendment process in 2020 and 2021, CIRNAC requested additional information on the nature and make-up of “rest of site” areas/facilities that contributed so significantly to the TDS loadings to CP1 (as per the SNC Lavalin upper bound model report; Memo Re: Assessment of Water Balance and Water Quality Forecast Around Pond CP1 at Meliadine, 12 November 2020) because this information would be useful for ongoing management and mitigation of potential impacts of these site areas to future water quality in CP1 and ultimately offsite. This information has not yet been provided, but is expected with the 2021 annual report, as per schedule B, Item 8 of the newly amended licence.

Recommendation

(R-01) CIRNAC recommends that AEM provide information with the 2021 annual report on the nature and make-up of “rest of site” (as per the SNC upper bound model report) areas/facilities that contributed so significantly to the TDS loadings to CP1.

2. Follow-up on 2019 report comment - Higher than Predicted Acid Rock Drainage (ARD) Potential of Filtered Tailings

Comment

CIRNAC recommended AEM re-evaluate and update the Water Quality Model and all Management Plans associated with monitoring and management of filtered tailings and submit them for review, as existing Geochemical Monitoring and Tailings Management Plans were designed based on the assumption that filtered tailings were non-potentially acid generating (Non-PAG), instead of potentially acid generating (PAG).

Filtered tailings samples (40 samples) tested for acid rock drainage (ARD) in 2020 had a higher neutralization potential (NP) (based on NP-Ca) and lower acid potential (AP) compared to samples tested in 2019. In 2019, all but two samples were classified as having Uncertain ARD potential with the remaining two classified as PAG compared to approximately 1/3 of the tailings samples classified as non-PAG and approximately 2/3 as having Uncertain ARD potential in 2020. These results have also yielded a higher median neutralizing potential ratio (NPR) value of 1.8 for 2020 compared to 1.4 in 2019, although both values are within the Uncertain ARD potential range (1<NPR<2).

Using the less conservative modified Sobek titration method that was used in the final environmental impact statement (FEIS) to determine NP, the 2020 NPR value is 2.0 (non-PAG) compared to a value of 2.7 predicted in the FEIS. AEM expects the ARD

potential to continue to decrease as lower grade materials from the underground are mined compared to the highest-grade material that was targeted in the early operations, which also has the highest sulphur content. Furthermore, AEM states that there have been some indications from the commercial laboratory that the method used to determine NP-Ca based on the measurement of total inorganic carbon (TIC) has been biased low for Meliadine operational samples.

The consequence of this would be that NPR ratios (NP-Ca/AP) have also been biased low, meaning that the samples could have lower ARD potential than indicated by the NPR values. If this is the case, this could lead to a reclassification of many samples from an Uncertain ARD potential to non-PAG. AEM states that they will be reporting on this issue and the laboratory's findings under separate cover once the issue is resolved.

CIRNAC considers this issue to be an ongoing concern until the issues with NPR measurement are resolved and an increasing trend in the NPR value of filtered tailings is clearly demonstrated in subsequent years.

Recommendation

(R-02) CIRNAC recommends that the report on the laboratory findings regarding the determination of NPR be provided to the NWB for review whenever it is completed.

3. Surface Disposition of Waste Rock

Comment

The 2020 Annual Report notes that a total of 1,354,831 tonnes of overburden and 3,395,398 tonnes of waste rock were excavated from the Tiriganiaq Open Pit #2 as well as 316,982 tonnes of underground waste rock that was brought to surface. The Annual Report does not present information on the final disposition of the waste rock during 2020 including where and how much waste rock was used for construction, or how much waste rock was placed into either of the waste rock storage facilities (WRSF1 or WSF3). No information is provided on the configuration of waste rock facilities as at the end of 2020.

Recommendation

(R-03) CIRNAC recommends that AEM provide:

- Additional discussion/information in the Annual Report with respect to the distribution by location and quantity of waste rock used for construction and placed in the waste rock storage facilities;

- Information confirming that waste rock used for construction was Non-PAG;
- Summary tables of annual and cumulative waste rock volumes in the annual report that use the same formats as Tables 3.3 and 4.3 of the Mine Waste Management Plan; and
- Plans and sections illustrating the status of the WRSFs as at the end of 2020.

4. Update the Tailings Storage Facility (TSF) Capacity

Comment

The Annual Report states that active tailings placement into the tailings storage facility (TSF) continued throughout the year and that a total of 642,502 m^3 (1,060,128 t) of tailings were placed into the facility in 2020. The remaining design capacity is 5,468,217 m^3 (9,022,558 t). The Annual Report notes that in addition to tailings, a total of 86,301 m^3 (162,246 t) of waste rock was placed as progressive cover material around the side-slopes of the facility in 2020 and that according to design specifications, an additional 516,875 m^3 (971,725 t) of rock remains to be placed. Table 11 of the Annual Report provides the 2020 monthly placement tailings and waste rock volumes.

CIRNAC could not find any discussions or figures (plans/sections) with respect to where and how tailings and waste rock were placed in 2020 and the physical status of the facility at the end of 2020.

Recommendation

(R-04) CIRNAC recommends that AEM provide:

- A discussion of 2020 placement that includes reference to how and where materials were placed along with “as built” plans or sections as at the end of 2020.
- Additional information in the Annual Report verifying placement was in accordance with the Mine Waste Management Plan; and
- Plan(s) and section(s) illustrating the physical status of the TSF as at the end of 2020

5. Reporting on Milling Operations

Comment

In reviewing the 2020 Annual Report, it is noted that there is no discussion in the report regarding mill operations (e.g., days of milling, tons of ore processed, tailings generated, water used, and related activities on cyanide management and consumption and tailings detoxification, etc.). This information is important with respect to understanding total ore storage volumes on surface during the year and assessing ore storage management and the potential impacts of ore storage on water quality.

CIRNAC is of the opinion that a discussion of the milling operations during the year would provide reviewers and stakeholders with a more fulsome perspective of the Meliadine operations and would be a useful addition to the Annual Report.

Recommendation

(R-05) CIRNAC recommends that AEM:

- Add a section to future annual reports describing mill operations at the Meliadine site (e.g., days of milling, tons of ore processed, tailings generated, water used, and related activities on cyanide management and consumption and tailings detoxification, etc.); and
- Provide information regarding 2020 milling operations and activities at the Meliadine Mine be provided for review by interested parties.

6. Tracking Acid Rock Drainage (ARD) Classified Waste Rock Volumes

Comment

The number of underground waste rock samples classified as having Uncertain ARD potential was one in 2017-18, one in 2019 and seven in 2020.

13 samples were classified as PAG in 2020.

In addition, one sample collected in 2020 from the open pit was classified as having Uncertain ARD potential.

AEM indicates that these findings are consistent with predictions (Golder 2014) that the majority of operational waste rock would be non-PAG and that ARD potential is low.

AEM considers the Uncertain ARD potential and PAG samples to represent a low ARD risk given the excess neutralization capacity determined in all other waste rock samples that have been tested.

As the number of waste rock samples classified as having Uncertain ARD potential has increased in 2020 and with a number of samples also classified as PAG, CIRNAC reiterates the need to track volumes of waste rock classified as Uncertain/PAG. With respect to underground waste rock, approximately 25% of samples tested were classified as Uncertain/PAG in 2020. Waste rock from the underground in 2020 was used for construction in addition to placement in the Tailings Management Facility (TSF) while waste rock from the open pits was used for construction. According to the 2021 Mine Work Plan outlined in Section 2.2, 421,484 tonnes of waste rock will be hauled to the surface while 331,278 tonnes of waste rock will remain underground as rockfill.

Recommendation

(R-06) CIRNAC recommends that in future annual reports, AEM track volumes of waste rock classified as PAG and uncertain ARD from the underground mine and open pits.

7. Geotechnical Concerns / Issues

Comment

In both 2019 and 2020, AEM requested a comprehensive geotechnical inspections which were carried out by Tetra Tech for all of the project facilities. Observations and recommendations were provided to AEM for consideration. AEM provided responses and CIRNAC had no issues with the inspection findings, recommendations and responses. From our review of the 2020 Annual Report, CIRNAC did not see any direct reporting on piezometric and inclinometer measurements as provided in the 2019 Annual Report. We also note that while permafrost degradation is discussed for some aspects of the site's critical infrastructure it is not discussed for other elements of the operation in particular the roads (site, AWAR, bypass) and borrow areas. The inclusion of such a discussion would be helpful to address NWB water licence Schedule B requirements.

Recommendation

(R-07) CIRNAC recommends that AEM:

- Add a section to the Geotechnical Inspection Report that provides clear and concise information on the status of any permafrost degradation that may be occurring on site.
- Include reporting of piezometric and inclinometer measurements in the Annual Report.

8. Cyanide Management and Use Handling

Comment

The 2020 Annual report has not provided discussions on the nature and extent of cyanide use, transportation, handling and storage. Brief mentions of cyanide are made within sections 4.2 Geochemical data, 4.2.4 Filtered Tailings Supernatant, 11.2 Community Meetings (teleconference re cyanide transport), Appendix 6 Geotechnical Inspection (temporary cyanide storage pad & former cyanide storage pad currently used as a burn pad), Appendix 37 - 2020 Communication Engagement table (communications re ICMC & Cyanide Transport), Appendix 39 2020 Socio Economic Monitoring (cultural). None of the discussions provide any insight into the technical and management aspects of cyanide use as part of the gold recovery process.

Establishment of proper management practices and adherence to internationally accepted best practices such as those articulated in the Cyanide Code go far to eliminate and mitigate potential issues and impacts during normal conditions and to ensure that prompt and appropriate actions are able to be undertaken in the event of upsets, accidents, and potential unforeseen incidents during offsite and onsite transport, handling, storage and process use. Detailed information on the management of cyanide is required for effective review of this aspect of AEM operations.

Recommendation

(R-08) CIRNAC recommends that AEM provide a discussion of its cyanide management practices and use in future Annual Reports complete with appropriate appendix details as needed with respect to cyanide source, transportation to site, on site handling and storage, and emergency procedures.

9. Reporting on flow volumes of any watercourse diverted during construction activities

Comment

In Section 2.1.2 of the 2020 Annual Report, there was no reference to the construction of the new access road in Table 1 as a 2020 construction activity. Page 30, Item-(e) of the Annual Report indicates that: *"The access road to the Tiriganiaq 02 Open Pit has been constructed downstream of Dike D-CP5. The area between the dike and the road has been graded with crushed rock covering the seepage collection pond that was located downstream of the dike. An as-built drawing of the Tiriganiaq 02 Open Pit access road is included in Appendix 9."*

Schedule B, Item #1 (e) of the Water Licence 2AM-MEL1631 requires AEM to report on *"any changes in the design and/or as-built condition and respective consequences of any changes to safety, water balance and water quality".*

CIRNAC was unable to find a section or comment with respect to "Schedule B, Item #1 (e)" and Item #1 (h) of the Water Licence 2AM-MEL1631 on expected or projected consequences of the newly constructed access road to water balance and water quality in the report.

Recommendation

(R-09) CIRNAC recommends that AEM:

- Provide information with respect to "Schedule B, Item #1(e) of the Water Licence 2AM-MEL1631 that includes expected or projected consequences of the newly constructed access road to water balance and water quality of all freshwater bodies located south of Dike D-CP5 for 2020 Annual Report.
- Provide information with respect to "Schedule B, Item #1(h)" of the Water Licence 2AM-MEL1631 on whether or not, any water course(s) was diverted during the construction of the new access road downstream of Dike D-CP5 for 2020 Annual Report. If no watercourses were diverted during construction, this should be specified.

10. Tracking Volume of Freshwater obtained from other permitted locations for Road Dust suppression activities

Comment

Section 3.1.2 of the 2020 Annual Report notes that *"No water was obtained from Meliadine River for the purpose of Road Dust suppression activities; instead, water was withdrawn from other permitted locations, including small ponds proximal to the All-Weather-Access-Road (AWAR)"*.

According to monitoring requirements in water licence 2BB-MEL1424, MEL-1 is the raw water supply intake at Meliadine Lake for the exploration camp where no sampling is required, only volume records. MEL-2 is the raw water supply intake at A8 or other lakes where again, no sampling is required, only volume records.

Table shows the combined total volume of water obtained from stations MEL-1 and MEL-2 in Meliadine Lake distributed over each month.

CIRNAC was unable to find records for how much water was withdrawn from small ponds proximal to the AWAR since the volumes for MEL-1 and MEL-2 are combined.

Recommendation

(R-10) CIRNAC recommends that AEM provide information with respect to "Schedule C, Item #1 (Amend)" of the Water Licence 2BB-MEL1424 for 2020 Annual Report that includes breakdown of the monthly and annual volumes of freshwater obtained from other permitted freshwater bodies (locations) other than the Meliadine Lake; used for the purpose of road dust suppression activities.

REFERENCES

Other Reports/Information	
Department of Crown-Indigenous Relations and Northern Affairs Act (2020)	CIRNAC, 2020
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2016)Nunavut Water Board,	NWNSRTA, 2016
Nunavut Water Board Water Licence No: 2AM-MEL1631	NWB, 1 April 2016
210108 2AM-MEL1631 CIRNAC Reply to AEM Response to Comments on 2019 Annual Report-ILAE	CIRNAC, 8 Jan. 2021
201202 2AM-MEL1631 AEM 2019 Meliadine Annual Report NWB Follow-Up Answers-IMLE	AEM, 2 December 2020
201125 2AM-MEL1631 2019 Annual Report AEM to Respond to Comment-OMLE	NWB, 25 Nov. 2020
201124 2AM-MEL1631 2019 Annual Report CIRNA Reply to AEM Response-IMLE	CIRNAC 19 Nov. 2020
Type A Water Licence 2AM-MEL1631 Amendment	AEM, August 2020
Water Management Plan	AEM, August 2020, V10
Meliadine Site Water Balance and Water Quality Model, Type A 2AM-MEL1631 Water Licence Amendment	Golder, 21 August 2020
Water Quality Management and Optimization Plan Progress Update Rev3, Phase 3: Finalize Meliadine Mine Effluent Discharge Benchmarks for Total Dissolved Solids	Golder, 24 August 2020
Water Quality Management and Optimization Plan Progress Update Rev4, Phase 3: Finalize Meliadine Mine Effluent Discharge Benchmarks for Total Dissolved Solids	Golder, 13 November 2020
Meliadine Lake Updated 3-D Modelling of the Discharge Assessment	Tetra Tech, 12 November 2020
Memo Re: Assessment of Water Balance and Water Quality Forecast Around Pond CP1 at Meliadine	SNC Lavalin, 12 November 2020
Design Report Saline Effluent Treatment Plant (SETP) Upgrade, Rev1	AEM, 27 July 2020
Design Report Saline Effluent Treatment Plant (SETP) Upgrade, Rev2	AEM, 28 August 2020
Water Licence No: 2AM-MEL1631 – Emergency Amendment No. 1	NWB, 29 April 2020 to 31 October 2020