



Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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Your file - Votre référence
2AM-MEA1530 & 2AM-WTP1830
Our file - Notre référence
GCDOCS#100887627

February 14, 2022

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

Re: Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC's) Review of the Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update for Water Licences 2AM-MEA1530 and 2AM-WTP1830

Dear Mr. Dwyer,

Thank you for the December 31, 2021 invitation to review the Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update, submitted by Agnico Eagle Mines (AEM), for Type A Water Licence Nos. 2AM-MEA1530 and 2AM-WTP1830.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the CREMP (2021) Plan Update 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.

CIRNAC appreciates the opportunity to participate in this review. If there are any questions, please contact John Onita at john.onita@rcaanc-cirnac.gc.ca; or (867) 975-3876 or Andrew Keim at (867) 975-4550 or andrew.keim@rcaanc-cirnac.gc.ca

Sincerely,

John Onita
Regional Water Coordinator



Technical Review Memorandum

Date: February 14, 2022

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 (CIRNAC's)
Review of the Core Receiving Environment Monitoring Program
(CREMP) 2021 Plan Update for Water Licences 2AM-MEA1530 and 2AM-
WTP1830**

Region: ☐ Kitikmeot ☒ Kivalliq ☐ Qikiqtani

A. BACKGROUND

Agnico Eagle Mines (AEM) Limited described the Core Receiving Environment Monitoring Program (CREMP) Plan as the “how-to” manual for conducting aquatic receiving environment monitoring at the Meadowbank Complex, which was last updated in 2015 as part of the Type A Water Licence renewal (2AM-MEA1526). According to AEM, the CREMP 2015 Plan Update included refinements to the sampling design and an overview of the general risk-based framework for monitoring in the flooded pits at Meadowbank during the closure phase (Section 1.0, CREMP Plan 2021 Update).

AEM further noted that an addendum to the CREMP Plan was prepared in 2016 to incorporate monitoring areas within Whale Tail Pit Project into the overall CREMP Plan. This was in response to a condition of the Nunavut Impact Review Board (NIRB) Project Certificate No. 008 (the Approved Project) and the Nunavut Water Board (NWB) Type A Water Licence (2AM-WTP1826). The 2016 version of the CREMP Plan for Whale Tail Pit was re-issued (with minor updates) in May and December 2018 as part of the proposed expansion of the Whale Tail open pit, IVR Pit (and associated waste rock storage facility and attenuation pond), and an underground mining operation. The Expansion Project, as it is referred to, was approved by the NIRB on February 19th, 2020 (Project Certificate amendment No. 1). The amended Water Licence (2AM-WTP1830) was issued by the NWB on May 12th, 2020.

In Section 1:1 of the CREMP Plan 2021 Update, AEM states that the CREMP is an adaptive program, meaning results from previous monitoring cycles or changes in the scope of the development are used to make informed decisions on how to effectively monitor changes in the aquatic environment caused by mining activities. This update was undertaken, in part, to amalgamate the CREMP Plans for the Meadowbank and Baker Lake study areas (2015) and the Whale Tail Pit study area (2018) into one document. Other minor updates to the project description and study areas were completed to reflect the current state of development at Meadowbank, Whale Tail, and Baker Lake.



On “Page iv” of the CREMP Plan 2021 Update, AEM proposes two modifications to the sampling strategy for the CREMP moving forward:

- First, winter water sampling in Third Portage Lake east basin (TPE), north basin (TPN), and Wally Lake (WAL) is no longer recommended now that several years have passed since discharge occurred (2014 for TPN; 2017 for WAL).
- Second, the long-term benthic invertebrate data from TPN, WAL, and Baker Lake support reducing the frequency of monitoring from annually to once every 3-years. If adopted, the next monitoring cycle for benthic invertebrates at TPN, WAL, and Baker Lake would occur in August 2023, coinciding with the timing of sediment coring.

AEM acknowledges (in section 1:1) that significant changes to the CREMP Plan require approval from the NWB as stipulated in Part B section 13 of the most recent amended Type A Water Licence (2AM-MEA1530 and 2AM-WTP1830).

CIRNAC provides the following comments and recommendations pertaining to the CREMP Plan (2021) Update. A summary of the subjects of recommendations can be found in Table 1. Documents reviewed as part of this submission can be found in Table 2 of Section B. Detailed technical review comments can be found in Section C.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-01	Winter water sampling suspension
R-02	Benthic invertebrates monitoring frequency

B. DOCUMENTS REVIEWED AND REFERENCED

The following table (Table 2) provides a list of the documents reviewed under the submission and reference during the review.

Table 2: Documents Reviewed and Referenced

Document Title	Author, File No., Rev., Date
Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update; Meadowbank Complex	Agnico Eagle Mines Ltd; FINAL; December 22, 2021
Dissolved Oxygen in a Shallow Ice-Covered Lake in Winter: Effect of Changes in Light, Thermal and Ice Regimes.	Zdorovenнова <i>et al.</i> ; Water; September 2021;



C. RESULTS OF REVIEW

1. Winter Water Sampling Suspension

Comment:

AEM recommends in the CREMP Plan 2021, that Winter water sampling (and Limnology profiling) at Third Portage Lake North Basin (TPN) and East Basin (TPE) and Wally Lake (WAL) be suspended now that Third Portage Lake and Wally Lake are no longer receiving environments as of 2014 and 2017, respectively (Page 2; Section 1:1).

This sampling recommendation is concerning to CIRNAC because during winter periods, northern Lakes experience low irradiance as a result of ice and snow cover which cause poor light penetration into the water column of these lakes. The ecological significance of low light penetration in Lakes during winter is that respiration by aquatic organisms, often exceeds primary production leading to low dissolved oxygen (DO) concentrations. Thus, AEM states in Section 2.3.4 of the CREMP 2021 Plan Update that, Limnological parameters include a Secchi depth measurement and vertical profiling for temperature (°C), dissolved oxygen (mg/L), specific conductivity (µS/cm), and pH at every meter from surface to 1 m off the bottom (or up to 20 m).

Despite the suspension/stoppage of discharges into TPN, TPE and WAL, it is very important to CIRNAC that AEM continues monitoring the dissolved oxygen (DO) concentration and other Limnological parameters in TPN, TPE and WAL during winter and ensure that the ongoing mining activities within the vicinity of the Meadowbank project, do not indirectly exacerbate the respiratory conditions of aquatic organisms in lakes within the Meadowbank and Whale Tail project's footprints. The rationale for this is that dissolved oxygen (DO) involved in chemical and biological processes is one of the most important parameters of aquatic ecosystems. A decrease in the oxygen content worsens the quality of water and the habitat of aquatic organisms. The development of hypoxia (low oxygen in the body of organisms) and anoxia (absence of oxygen in the body of organisms) can lead to severe consequences like mass fish die offs. Moreover, under anaerobic conditions, the release and accumulation of greenhouse gases can occur.

During the open water period, oxygen conditions in lakes are largely formed through the gas exchange with the atmosphere and gas redistribution over the water column due to wind-wave mixing and convective movements. In the presence of photosynthesis, oxygen is released and organic matter is formed, which then settles to the bottom and creates the prerequisites for oxygen deficiency in the following winter season.

Continuous ice cover almost completely suppresses the exchange of heat, gas, and momentum between the water mass and the atmosphere. Snow on ice sharply reduces the penetration of photosynthetic radiation into the water column. Inhibited by low illumination,



photosynthesis cannot be a significant source of oxygen as long as the snow layer on the ice exceeds 10–20 cm. Thus, in the absence of significant sources of oxygen, its content decreases during the winter, mainly due to bacterial decomposition of organic matter, respiration of organisms, and chemical reactions near the surface of bottom sediments in lakes.

CIRNAC notes AEM's reason for this recommendation is that Third Portage Lake and Wally Lake are no longer receiving environments for effluent discharges as of 2014 and 2017, hence the recommendation to stop winter water sampling at TPN, TPE and WAL respectively.

It is important to note that seven (7) years (2014 to 2021); and four (4) years (2017 to 2021); are still under the specified duration of years suggested for post closure monitoring activities (25 years post-closure monitoring). CIRNAC had consistently recommended and supported a 25-year post closure monitoring as part of the reclamation plan while using this timeline as the benchmark to conclude that a monitoring station has been restored to its baseline data status after all assessment indicators have been considered. CIRNAC views the continuous winter water sampling at TPN, TPE and WAL as a valuable process that would provide insight into how these lakes ecosystems would respond after mining activities have been brought to a close. This information is pivotal for monitoring post-closure implementation plans.

Recommendation:

(R-01) CIRNAC recommends that AEM continue Winter water sampling (and Limnology profiling) at Third Portage Lake North Basin (TPN) and East Basin (TPE) and Wally Lake (WAL) as long as mining activities continue to take place within the vicinity of Meadowbank and Whale Tail project's footprints.

2. Benthic invertebrates monitoring frequency

Comment:

In the Meadowbank CREMP, AEM recommends an annual monitoring of the invertebrate communities at sampling stations SP and TPE respectively (Page 22; CREMP Plan 2021 Update). For sampling stations TPN and WAL, AEM recommends a reduction in the frequency of benthic invertebrate sampling from annually to a 3-year cycle; given that discharge to both lakes has ceased and the benthic invertebrate communities have remained stable relative to baseline/reference conditions (Pages 22 and 23; CREMP Plan 2021 Update).

CIRNAC is concerned that the inconsistency in the recommended sampling frequencies for Meadowbank's benthic invertebrates monitoring stations, might result in incomparable



results that might alter the statistical significance of the data. Thus, CIRNAC is of the opinion that the benthic invertebrates monitoring frequency for all sampling stations at Meadowbank be uniformly performed annually, irrespective of whether discharge has ceased in the sampling location or not. A uniform annually generated data for all Meadowbank's benthic invertebrates monitoring stations, would provide the opportunity for better scientific analysis which would reveal how these invertebrate communities have responded to prolonged years of mining activities within the Meadowbank project's footprint. Furthermore, a uniform annually generated data, would provide the opportunity to perform comparative statistical analyses of the results generated from each of Meadowbank's sampling stations; against the other; to better enable informed decision making as to next steps in the reclamation implementation plan. It would be problematic to compare an annually generated data to a three-yearly generated data and still expect to arrive at a reasonable conclusion that would apply to all, given that the data were not generated at the same frequencies. This is the scenario that AEM's recommendations for Meadowbank's benthic invertebrates monitoring; as in the cases of SP and TPE (annually recommended) and; TPN and WAL (three-yearly recommended); tend to suggest.

CIRNAC reiterates that comparison of results from all Meadowbank's benthic invertebrates monitoring stations, is pivotal to providing insight into how each of these lake ecosystems would respond after mining activities have been brought to a close in the region; as well as ensuring that yearly information is readily available to make an informed decision on monitoring post-closure implementation plans.

As stated in comment #1 above, CIRNAC suggests that AEM assume seven (7) years (2014 to 2021); and four (4) years (2017 to 2021) time horizons after discharges ceased to occur at monitoring stations TPN and WAL respectively. These time horizons are still under the specified duration of years recommended for post closure monitoring activities (25 years post-closure monitoring). CIRNAC had consistently recommended and supported 25-year post closure monitoring as part of the reclamation plan while using this timeline as the benchmark to conclude that a monitoring station has been restored to its baseline data status after all assessment indicators have been considered. More importantly, any halt of direct discharge operations into these lakes while mining activities are still ongoing in the vicinity does not mean that the lakes are immune to indirect impacts as a result of the ongoing mining activities within the Meadowbank project's footprint.

CIRNAC prefers an annual monitoring frequency recommendation for benthic invertebrates at Meadowbank, to a three-year monitoring cycle recommendation, irrespective of whether or not there has been a halt to direct discharge operations into the monitoring stations. An annual monitoring frequency will ensure the yearly availability of data to make informed decision as long as mining activities continue to take place within the vicinity of Meadowbank



and Whale Tail project's footprints. A three-year monitoring frequency might result in missing vital ecosystem signals that would provide insight on how the ecosystems are responding to ongoing mining activities within Meadowbank project's vicinity.

Recommendation:

(R-02) CIRNAC recommends that the benthic invertebrates monitoring frequency for all sampling stations at Meadowbank (i.e. SP, TPE, TPN and WAL) be uniformly performed annually as long as mining activities continue to take place within the Meadowbank and Whale Tail project's footprints; (i.e. irrespective of whether or not there had been a halt to direct discharge operations into the monitoring stations).

References:

Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update; Meadowbank Complex; FINAL; Agnico Eagle Mines Limited, December 22, 2021.

Zdorovenova, G.; Palshin, N.; Golosov, S.; Efremova, T.; Belashev, B.; Bogdanov, S.; Fedorova, I.; Zverev, I.; Zdorovenov, R.; Terzhevik, A; Dissolved Oxygen in a Shallow Ice-Covered Lake in Winter: Effect of Changes in Light, Thermal and Ice Regimes. *Water* **2021**, 13, 2435. <https://doi.org/10.3390/w13172435>