

MEMORANDUM

To **David Abernethy, INAC** File no **TV154011**
Sarah Forte, INAC

From **Tracy Cochrane, Amec Foster Wheeler** Copy **Chris Milley, Amec Foster Wheeler**
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Email

Date **June 21, 2016**

Subject **Application for Amendment No. 1 to Nunavut Water Board Licence No. 2AM-DOH1323 and Nunavut Impact Review Board Project Certificate No. 003**
Technical Review and Evaluation of Groundwater Management Plan
Submission – Option 3
Doris North Project
Hope Bay, Nunavut

1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler) was retained by Indigenous and Northern Affairs Canada (INAC) to carry out a technical review and evaluation of the Doris North Project Groundwater Management Plan, submitted as part of the Application for Amendment No. 1 to the Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 and the Nunavut Impact Review Board (NIRB) Project Certificate No. 003.

This work was carried out under Standing Offer Agreement 46-0000-1035, Call-up No. 1, Option 3. The scope of work is in accordance with the Statement of Work received from INAC dated May 26, 2016, and Amec Foster Wheeler's quote dated May 30, 2016.

2.0 Background

The Doris North Project is owned by TMAC Resources Inc (TMAC). TMAC is applying to amend its NWB Type A Water Licence 2AM-DOH1323 and the NIRB Project Certificate 003. The amendment application will allow increased production rates, an increased mine size, changes to the management of tailings, the discharge of effluent reporting from the tailings impoundment area to the marine environment rather than to an approved creek, and other associated project changes.

Earlier phases in the amendment review process have included:

Completeness Review submission, September 9, 2015

This preliminary phase was carried out to determine if additional information was required to carry out the Technical Review phase of the application. Amec Foster Wheeler technical experts reviewed the water licence amendment application and relevant documents, and generated Information Requests (IR's) that were considered necessary to complete sufficient analysis.

Technical Review submission, December 8, 2015

The Technical Review phase of the review process involved an assessment of information presented in the water licence amendment application and the Information Request (IR) responses submitted by TMAC was carried out. Amec Foster Wheeler technical experts carried out the assessment to determine whether the measures proposed would be sufficient to protect the quality and quantity of freshwater from the mining project activities.

Technical Meeting, January 28-29, 2016

Amec Foster Wheeler participated in a technical meeting to discuss outstanding issues with INAC, TMAC and other stakeholders. During the meeting, a list of commitments to resolve remaining issues were made, and which would be carried forward to the Final Hearing.

3.0 Scope of Work

Together with other deliverables, the overall goal of Option 3 work is to provide support to INAC's review of the Proponent's water licence amendment application, and:

- Determine if activities identified in the application include mitigation measures that will protect the quality and quantity of surrounding freshwater sources;
- Determine if commitments made by the Proponent during the application review process to date are sufficient for the protection of surrounding freshwater sources; and
- Identify any outstanding issues pertaining to water management that need to be addressed.

The scope of work for this portion of the assignment was to carry out a review of the Groundwater Management Plan for the Doris North Project, which was submitted to INAC in June 2016. The digital name of the document is 160602 2AM-DOH1323 Doris Amendment Groundwater Management Plan IAAE.

This review also included Amec Foster Wheeler's participation in a workshop (via teleconference) on June 6-8, 2016. One of the goals of workshop was to afford TMAC an opportunity to present the Groundwater Management Plan, and to be available to address questions or issues.

Other tasks that are included in the work for Option 3 include:

- A review of the Tailings Management Plan and related documents;
- A review of the Aquatic Effects Monitoring Framework, Freshwater Component and related documents;
- A review of the Interim Dike filter design trade-off study and detailed design of selected filtering method; and

- Preparation of a revised Reclamation Cost Estimate prepared by Amec Foster Wheeler Environment & Infrastructure in 2015.

Separate memos are being prepared for the other tasks.

4.0 Review of Groundwater Management Plan (GWMP)

4.1 General Comment

The Groundwater Management Plan (GWMP) was developed for the portions of the mine that will result in groundwater inflow. It is an adaptive response plan for managing underground mine water. The objectives of the GWMP are to: (i) minimize the influence of mining on the Doris Lake water levels; and (ii) characterize the mine flow discharge and water quality. The document provides an overview of the hydrogeology and water management plans, the basis for the adaptive management trigger points (also called specific performance thresholds), monitoring, evaluation, specific responses to the trigger points, and the adaptive response plan for managing underground mine water.

4.2 Review of Content

The GWMP provides a concise description of TMAC's approach to managing groundwater, including adaptive management and contingencies. However, given the uncertainty associated with groundwater inflow estimates, it is recommended that more detail be provided regarding contingency plans in the event that flow rates exceed 3,000 m³/day. While the total volume of the mine is provided in the GWMP, mine inflow rates are estimated to be high by the end of the first year of mining. Therefore, mine inflow rates could potentially exceed 3,000 m³/day relatively early in mine development and the contingency plan in the GWMP should provide greater detail on the contingency plans for this possibility.

Furthermore, it is recommended that the monitoring of mine inflow water quality be modified. The GWMP states that during periods of mine water discharge, mine water samples will be tested weekly for only chloride, total dissolved solids and nitrate. The list of parameters should be increased to include all those listed on page 12 of the GWMP, which include: total ammonia-N, nitrite-N, pH, EC, ICPMS metals, alkalinity, acidity, sulphate, total and WAD cyanide.

Amec Foster Wheeler has identified no other concerns with the content of the GWMP at this time.

4.3 Review for Outstanding Issues

There are no outstanding issues related to the GWMP.

5.0 Summary

Amec Foster Wheeler's review of the Doris North Project Groundwater Management Plan, (submitted in June 2016 as part of the Application for Amendment No. 1 to the Nunavut Water

Board (NWB) Licence No. 2AM-DOH1323) identified two issues which should require further attention. It is recommended that:

1. More detailed contingency plans for possible groundwater flows rates in excess of 3,000 m³/day be included in the GWMP; and
2. During periods of mine water discharge, mine water discharge testing should be expanded to include total ammonia-N, nitrite-N, pH, EC, ICPMS metals, alkalinity, acidity, sulphate, total and WAD cyanide.

