Indigenous and Northern Affairs Canada | Affaires autochtones et du Nord Canada

Your file - Votre référence
2AM-DOH1323

September 10, 2016

Licensing Department
Nunavut Water Board
GJOA HAVEN, NU X0E 1J0

Sent via email: licensing@nwb-oen.ca

Re: Review of TMAC Resources Inc.'s Final Written Submission, Amendment Application No. 1 to Nunavut Water Board Water Licence No. 2AM-DOH1323

To Whom It May Concern,

Attached for your consideration is a memorandum that details Indigenous and Northern Affairs Canada's (INAC or the Department) review of TMAC Resources Inc.'s August 15, 2015 Final Written Submission for the above referenced application. This Departmental memo summarizes the resolution status of issues that were outstanding in INAC's August 3, 2016 Final Written Submission.

A subsequent memo specific to the Department's reclamation cost estimate will be provided on Monday September 12, 2016. It will integrate information acquired through ongoing discussions with TMAC Resources Inc.

Comments and recommendations have been provided pursuant to Indigenous and Northern Affairs Canada's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Indian Affairs and Northern Development Act*.

Please do not hesitate to contact me by telephone at 867-975-4555 or email at David.Abernethy@aandc-aadnc.gc.ca for further information.

Sincerely,

David Abernethy
Regional Coordinator
Water Resources Division
Resource Management Directorate
Indigenous and Northern Affairs Canada
IQALUIT, NU X0A 0H0

Encl.

Cc. John Roberts, TMAC Resources Inc.

Canada

Technical Memorandum

To: Licensing Department, Nunavut Water Board
John Roberts, Sharleen Hamm, TMAC Resources Inc.

From: Sarah Forté, David Abernethy, Amjad Tariq, Water Resources Division, INAC

Date: September 10, 2016

Re: Updated status of technical review comments following "Responses to Final Written Submissions" Type A Water Licence 2AM-DOH1323 amendment application

Applicant: TMAC Resources Inc.
Project: Doris North Gold Mine Project
Region: Kitikmeot

A. BACKGROUND

Indigenous and Northern Affairs Canada (INAC, or the Department) has participated in the ongoing review of the TMAC Resources Inc.'s (the Licensee, or TMAC) application for amendment #1 of its Type A Nunavut Water Board (NWB, or the Board) water licence 2AM-DOH1323 for the Doris North Gold Mine Project (the application). This project is situated on Roberts Bay off Melville Sound in Nunavut's Kitikmeot region.

In preparation for the Public Hearing, the Department submitted its final written submission on August 3, 2016. It included the status of all the information requests, technical comments and recommendations we had made and many were resolved but required follow-up. TMAC replied on August 15, 2015 with the document "Responses to Final Written Submissions, Nunavut Water Board" and following five updated plans:

1. Aquatic Effects Monitoring Plan;
2. Groundwater Management Plan;
3. Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual;
4. Waste Rock and Ore Management Plan; and
5. Water Management Plan.

This memorandum is in reply to TMAC's response, in order to share with all parties our evaluation of the responses and plan modifications provided by TMAC. The layout of this memo is similar to the layout of the Department's final written submission. Each comment is included in one of six tables. Previous status refers to the status assigned in the final written submission. Current status refers to the status as of today and considers the responses and plan modifications provided by TMAC. A total of 73 comments were tabulated in the Department's final written submission, of these 65 are resolved and 8 are unresolved. Three new comments arose from the Department's review of the updated *Waste Rock and Ore Management Plan* and *Water Management Plan* (August 2016 versions).

Responses for a subset of comments are also found in a report produced by Amec Foster Wheeler, included as Appendix A. These are marked with an asterisk (*) for ease of reference. All but two issues mentioned in their report are considered to be resolved.

1.0 Water Quality and Quantity Predictions

All of the Department's comments pertaining to water quality and quantity predictions have been resolved, as summarised in Table 1.

Table 1 Status of comments pertaining to water quality and quantity predictions

Comment #	Issue	Previous status	Current status
INAC IR2	Location of document: Geochemical characterization of tailings	Resolved	Resolved
INAC IR3	Location of document: Hydrogeological modeling	Resolved	Resolved
INAC IR5	Water inflow to underground mine	Resolved	Resolved
INAC IR6	Water losses from Doris Lake	Resolved	Resolved
INAC IR7	Sensitivity analyses	Resolved	Resolved
INAC TC1	Process water source terms	Resolved	Resolved
INAC TC2	Underground mine water loadings	Resolved	Resolved
INAC TC5	Ore and waste rock source terms	Resolved	Resolved
INAC TC6	TIA storage capacity	Resolved	Resolved
INAC R8*	Reference point monitoring	Unresolved	Resolved
INAC R10*	Sulphate and major ions analysis	Resolved. Follow-up required.	Resolved
INAC R22	Numerical analysis to demonstrate robustness of management plan	Resolved. Follow-up required.	Resolved

* Further discussion included in Appendix A

The modifications made to the *Aquatic Effects Monitoring Plan* (*AEMP*) and the *Groundwater Management Plan* adequately address concerns that were raised about **Reference point monitoring (INAC R8), Sulphate and major ion analysis (INAC R10)** and **Numerical analysis to demonstrate robustness of management plan (INAC R22)**.

2.0 Roberts Bay Discharge Monitoring

As stated in previous submissions, the Department has no outstanding comments concerning Roberts Bay discharge monitoring with respect to the water licence amendment application.

3.0 Waste Rock and Tailings

Of the 18 comments INAC submitted on the Tailings Impoundment Area (TIA) structures and waste rock handling, 17 are resolved and one is outstanding, as summarised in Table 2.

Table 2 Status of comments pertaining to waste rock and tailings

Comment #	Issue	Previous status	Current status
INAC IR4	Supporting document not included in the application	Resolved	Resolved
INAC IR10	Backfilling of ANFO and hydrocarbon impacted materials	Resolved. Follow-up required	Resolved
INAC IR12	Excavated and available underground volumes	Resolved. Follow-up required.	Resolved. Comment included.
INAC IR13	Groundwater contamination by PAG material and detoxified tailings	Resolved	Resolved
INAC TC7	Criteria for using rock for construction purposes	Resolved	Resolved
INAC TC8	Monitoring mineralized rock	Resolved	Resolved
INAC TC9	Interim dike filter	Resolved	Resolved
INAC R1*	References for TIA OMS Manual	Resolved. Follow-up required.	Resolved
INAC R13	Interim dike/filter	Resolved. Follow-up required.	Resolved
INAC R14	Geochemical characterization of tailings deposited in impoundment area	Resolved. Follow-up required.	Unresolved

INAC R15	South Dam as water retaining structure	Resolved	Resolved
INAC R37*	Position of tailings deposition before and during interim dike construction	Unresolved	Resolved
INAC R38*	Construction methodology	Unresolved	Resolved
INAC R39	Construction of interim dike	Unresolved	Resolved
INAC R40	Timing of dike construction	Unresolved	Resolved
INAC R41	Characterization of tailings for filter design - 1	Unresolved	Resolved
INAC R42	Characterization of tailings for filter design - 2	Unresolved	Resolved
INAC R43*	Interim dike crest elevation	Unresolved	Resolved

* Further discussion included in Appendix A

Modifications to the *Waste Rock and Ore Management Plan*, the *TIA Operations, Maintenance and Surveillance (OMS) Manual*, and TMAC's "Responses to Final Written Submissions" adequately address concerns that were raised regarding the following comments:

- References for *TIA OMS Manual* **(INAC R1)**
- Backfilling of Ammonium Nitrate Fuel Oil (ANFO) and hydrocarbon impacted materials **(INAC IR10)**
- Interim dike/filter **(INAC R13)**
- Position of tailings deposition before and during interim dike construction **(INAC R37)**
- Construction methodology **(INAC R38)**
- Construction of interim dike **(INAC R39)**
- Timing of dike construction **(INAC R40)**
- Characterization of tailings for filter design **(INAC R41 & 42)**
- Interim dike crest elevation **(INAC R43)**

<u>Resolved. Comment Included:</u>

Excavated and available underground volumes (INAC IR12): During the Nunavut Impact Review Board process, TMAC and INAC agreed on wording for monitoring rock and void volumes. This is important because the final storage location of all waste rock and detoxified leach tailings is the backfilled mine, and monitoring will verify that modelling results predicting sufficient void space in the mine are correct. We recommend the Board consider including the following condition in an amended licence.

> *"The Proponent shall monitor the underground backfill use and mine waste placement underground during operations to confirm that ultimate targets of returning all waste rock and leach tails underground can be achieved".*

This monitoring is already included in the *Waste Rock and Ore Management Plan*.

Outstanding Issue:

Geochemical characterization of tailings deposited in impoundment area (INAC R14): Tests done to date show that the tailings are non-potentially acid generating, which makes them less harmful and simplifies their reclamation. INAC recommends characterising the flotation tailings that will be deposited in the TIA throughout the mine life, as different regions of the ore body are mined and characteristics might change. Knowledge of the acid generating potential of tailings is important for confirming that the current management strategy and reclamation plan remain appropriate. The Department disagrees with some of the time limitations included in the modified *TIA OMS Manual* regarding the characterisation of flotation tailings. In section 6.5.4 TMAC has included the following sentence:

> *"Following Year 1 of monitoring, frequency of sampling and testing will be revisited and any adjustments to the tailings geochemistry monitoring program will be justified and reported to the NWB in the annual report."*

We interpret this as if TMAC could modify the frequency of sampling and testing following Year 1 of monitoring, informing the NWB but not obtaining authorisation prior to modifications.

4.0 Mitigation Measures

Four comments were provided on mitigation measures. Presently two are unresolved, as presented in Table 3.

Table 3 Status of comments pertaining to mitigation measures

Comment #	Issue	Previous status	Current status
INAC TC11	Dust control for tailings	Resolved	Resolved
INAC R6*	Sediment sampling	Resolved. Follow-up required.	Unresolved
INAC R17	Mitigation strategy for load balance concern	Resolved	Resolved
INAC R18	Approval of dust suppressants	Unresolved	Unresolved

* Further discussion included in Appendix A

Outstanding Issues:

Sediment sampling (INAC R6): Lake sediment sampling can be used to monitor project effects such as nutrient enrichment from run-off exposed to nitrogen contained in explosives or metal enrichment from dust deposition. Sediment characteristics such as particle size and total organic carbon concentration are also important for understanding benthic invertebrate results. The *AEMP* includes sediment sampling at the Doris Lake North station and we recommend testing the list of parameters included in the presently approved AEMP (Rescan, February 2010), found in Table 4 below.

Table 4 Sediment quality parameters

Physical	% moisture, pH
Particle size	
Nutrients	total nitrogen, ammonium, nitrate, nitrite, phosphate
Total organic carbon	
Metals	Al, Sb, As, Ba, Be, Bi, Cd, Ca, Co, Cr, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Ag, Na, Sr, S-total, Tl, Sn, Ti, V, Zn

Table 4 has more parameters than the August 2015 version of the *AEMP*.

Approval of dust suppressants (INAC R18): The modification made to the *TIA OMS Manual* satisfies our recommendation that alternate dust suppressants be approved by the Board before use on site. However, TMAC has also requested that "*products in use at other industrial or municipal sites in Nunavut should be available for use at Hope Bay, unless verifiable data indicates otherwise*". It is not clear how they see this request fitting in with the need for NWB approval for alternate dust suppressants.

5.0 Water Treatment

As outlined in Table 5, all comments on water treatment were considered resolved and this remains unchanged.

Table 5 Status of comments pertaining to water treatment

Comment #	Issue	Previous status	Current status
INAC IR1	On-site laboratory	Resolved	Resolved
INAC IR8	Proposed sewage treatment plant	Resolved	Resolved
INAC TC12	Sewage treatment	Resolved	Resolved
INAC TC13	TIA water treatment	Resolved	Resolved

6.0 Management Plans and Reports

Three subsections were included under management plans and reports to address not only the Department's comments on specific plans, but also a list of plan equivalencies and reporting requirements.

6.1 Comments on management plans

Of the 26 initial comments about management plans, 21 are resolved and 5 are unresolved. Table 6 lists all comments and their status. Three additional comments have been added regarding modifications made to two of the management plans during the updates.

Table 6 Status of comments pertaining to management plans and reports

Comment #	Issue	Previous status	Current status
INAC IR9	Module B of Waste Rock and Ore Management Plan	Resolved	Resolved
INAC R2*	Contingency plans for greater mine inflow	Resolved. Follow-up required.	Resolved
INAC R3*	Monitoring mine inflow water	Resolved. Follow-up required.	Unresolved
INAC R4*	Downstream monitoring	Unresolved	Resolved
INAC R5*	Cross referencing between SNP and AEMP reports	Resolved	Resolved
INAC R7*	Testing parameters	Resolved. Follow-up required.	Resolved
INAC R11	Surface Emergency Response Plan	Unresolved	Resolved
INAC R no number	Tailing impoundment area responsible persons	Resolved. Follow-up required.	Resolved
INAC R16	Interim Dike earthquake design	Resolved	Resolved
INAC R19	Shoreline erosion monitoring transects	Resolved. Follow-up required.	Resolved
INAC R20	Discharge of TIA water to Doris Creek	Partially resolved. Follow-up required.	Resolved
INAC R21	Detoxified tailings management	Partially resolved. Follow-up required.	Resolved

Comment #	Issue	Previous status	Current status
INAC R23	Remedial stage actions for mine inflow management	Resolved. Follow-up required.	Resolved
INAC R24	Mine discharge management	Resolved. Follow-up required.	Resolved
INAC R25	Source of increased mine inflow	Resolved. Follow-up required.	Resolved
INAC R26	Doris Lake sampling stations	Unresolved	Unresolved
INAC R27	*Chlorophyll a* monitoring	Resolved. Follow-up required.	Resolved
INAC R28	Monitoring during care and maintenance	Resolved. Follow-up required.	Unresolved
INAC R29	Station at the TIA discharge pump (TL-1)	Resolved. Follow-up required.	Resolved
INAC R30	Contact water disposal locations	Unresolved	Resolved
INAC R31	Doris Creek monitoring stations (TL-2, TL-3, TL-4)	Unresolved	Unresolved
INAC R32	Water component of tailings discharged into TIA (TL-5)	Resolved. Follow-up required.	Resolved
INAC R33	Sampling station TL-9 – barren bleed solution	Unresolved	Resolved
INAC R34	Underground mine water (TL-11 and TL-12)	Resolved. Follow-up required.	Resolved
INAC R35	Discharge from sumps (ST-3, ST-4, ST-5, ST-6, ST-11 and ST-13)	Unresolved	Unresolved
INAC R36	Runoff from sediment controls (ST-10)	Resolved	Resolved
INAC R44	Personnel for geotechnical waste rock pile inspections	NEW	Unresolved
INAC R45	Stope seep surveys	NEW	Unresolved
INAC R46	Calibration of water and load balance model	NEW	Unresolved

* Further discussion included in Appendix A

Updates to the *Groundwater Management Plan*, the *TIA OMS*, the *Aquatic Effects Monitoring Plan* and the *Waste Rock and Ore Management Plan* adequately address concerns that were raised regarding the following comments:

- Contingency plans for greater mine inflow **(INAC R2)**,
- Downstream monitoring **(INAC R4)**,
- Cross-referencing between SNP and AEMP reports **(INAC R5)**,
- Testing Parameters **(INAC R7)**,
- Surface Emergency Response Plan **(INAC R11)**,
- Tailing impoundment area responsible persons **(INAC R no number)**,
- Shoreline erosion monitoring transects **(INAC R19)**,
- Discharge of TIA water to Doris Creek **(INAC R20)**,
- Detoxified tailings management **(INAC R21)**,
- Remedial stage actions for mine inflow management **(INAC R23)**,
- Mine discharge management **(INAC R24)**,
- Source of increased mine inflow **(INAC R25)**,
- *Chlorophyll a* monitoring **(INAC R27)**,
- Station at the TIA discharge pump (TL-1) **(INAC R29)**,
- Contact water disposal locations **(INAC R30)**,
- Water component of tailings discharged into TIA (TL-5) **(INAC R32)**,
- Sampling station TL-9 – barren bleed solution **(INAC R33)**, and
- Underground mine water (TL-11 and TL-12) **(INAC R34)**.

Monitoring mine inflow water (INAC R3): Modifications made to the *Groundwater Management Plan* integrate monitoring of mine inflow water as prescribed in Schedule J of the Licence. The Department does not have an issue with transferring the monitoring requirements from the licence to the plan but believes the plan should include sharing results with the NWB. This is not evident in the current plan and we recommend that this be included. Reporting results to the NWB is important because it lets regulators monitor activities to check if they are occurring as planned.

Doris Lake sampling stations (INAC R26): INAC's recommendation on water sampling in Doris Lake is to maintain two stations: ST-7 and Doris Lake North. The stations can provide complimentary information because they are at separate locations on a large lake, one in the near shore environment and the other in the center, at different water depths.

Station ST-7 is the mine's water intake and will be sampled monthly. The August 2015 version of the *AEMP* schedules water sampling at the Doris Lake North station once every three years. The Department recommends sampling water quality four times a year at the Doris Lake North station because the data will help monitor for any possible effects on Doris Lake.

Monitoring during care and maintenance (INAC R28): Monitoring during care and maintenance is important because, though the interruption of mining activities may lessen potential impacts, less presence on site will also lead to reduced surveillance of water management facilities. The modified *AEMP* states:

> *"Should the site re-enter a phase of care and maintenance, the program will be carried out once every third year using any data collected from ST-7 during months of water use, with a minimum of twice per year."*

The Department agrees *AEMP* reporting could be done every 3 years, but we recommend the program's sampling frequency (monitoring activities) remain unchanged during periods of care and maintenance.

Doris Creek monitoring stations (TL-2, TL-3, TL-4) (**INAC R31)**: Doris Creek is the outlet of Doris Lake and predicted project impacts on the creek include modifications to the quantity of water that will be discharged and the dates when flow will commence and end each year. Monitoring the creek's hydrology is therefore important for verifying that impacts are not greater than predicted. TMAC has committed to monitor Doris Lake and Outflow levels.

TMAC proposes to monitor Doris Creek discharge indirectly, calculating it from Doris Lake water levels using an empirical relationship. They have presented the argument that an empirical relationship has been accepted as a method for calculating the Doris Lake outflow invert, or sill level. The Department does not believe monitoring Doris Creek discharge indirectly from Doris Lake levels and an empirical relationship is effective for the following reasons:

1) *The relationship between Doris Lake water surface elevation and streamflow has changed during the period of record, i.e. 2004-2014* (Identification of Potential Environmental Effects and Proposed Mitigation, ERM, June 2015, page 2-20).
2) *It is likely that the location and elevation of Doris Lake Outflow invert will change over time as the soft sand channel is susceptible to scour from high flows, wave action and lake ice* (Determination of Doris Lake Outflow Invert Elevation for Technical Review Comment INAC-1, ERM, February 18, 2016, page 3). The variable invert elevation could influence creek discharge and modify an empirical relationship with Doris Lake levels.
3) It would be difficult to accurately predict dates of flow onset and ceasing with an empirical relationship.

Therefore, INAC recommends keeping a hydrometric monitoring station on Doris Creek.

Discharge from sumps (ST-3, ST-4, ST-5, ST-6, ST-11 and ST-13) (INAC R35): TMAC is requesting water quality sampling frequency for sumps and ponds be reduced from the current licence condition of "*once before discharge, daily when discharging onto the tundra*". Sampling water quality from sumps is needed to determine if water can be discharged to the surrounding environment (meets criteria) or to characterize water sent to the TIA. Sampling requirements set out in the current licence allow for confirmation that water quality is constant throughout discharge.

The sampling frequency in Table A2 of the *Water Management Plan* is "*annually, before discharge*". TMAC believe the ponds and sumps are well mixed so one sample is sufficient to characterize the whole volume of water. They plan to confirm this after the 2017 season. We recommend this licence condition (included in Schedule J) be maintained until evidence has been provided, and that if it is altered, it be modified to "*once before discharge*" to require sampling prior to every discharge event.

Personnel for geotechnical waste rock pile inspections (INAC R44): The *Waste Rock and Ore Management Plan* includes inspections of waste rock piles. The aim of the annual rock pile inspection in the June 2015 version was to verify that diabase was properly segregated from other waste rock. In the August 2016 version, the aim is modified and is to ensure the pile's geotechnical stability and to inspect for potential acid generation. In both versions, the inspection is to be carried out by the mine geologist. An appropriately qualified person should monitor the waste rock pile's geotechnical stability.

Stope seep surveys (INAC R45): Semi-annual seep surveys of underground backfilled stopes were included in the June 2015 *Waste Rock and Ore Management Plan*. They have been removed from the list of monitoring activities in the August 2016 version. These surveys help characterize and understand groundwater flow; the Department seeks clarification as to why they were removed and any alternate methods proposed for gaining the information they could provide

Calibration of water and load balance model (INAC R46): The water and load balance model predicts water volumes and chemistry across the site. Calibrating this model involves comparing predictions with actual measurements and is an important tool for effective water management. The frequency of calibration for the water and load balance model, as described in the "Documentation and Reporting" section of the *Water Management Plan* has been modified.

> June 2015 version, section A6.4: *"…reports will include but not limited to: ...*
> - *An annual calibration of the water balance and water quality prediction model."*
>
> August 2016 version, section A5.4: *"…reports will include but are not limited to: …*
> - *Calibration of the water and load balance model as required ".*

No information has been provided on who would determine if a calibration was required and what criteria would be used in the determination. INAC recommends that additional information be provided or that the previous wording included in the June 2015 version be maintained.

6.2 Plan equivalencies

The Department's only comment about plan equivalencies was that the June 2015 *Water Management Plan* did not include specific actions to manage spring freshet. The updated *Water Management Plan* satisfactorily addresses this concern.

6.3 Reporting

TMAC updated several plans to include monitoring requirements that were previously contained in Schedule J of the water licence. The Department is concerned that monitoring parameters and frequency requirements for stations moved to the plans are sometimes different than what is in the current licence or what was discussed at the Aquatic Effects Monitoring Workshop held in Iqaluit on June 6, 2016. INAC recommends that monitoring parameters and frequency for stations moved to the plans remain as was discussed at the workshop.

The Department would also like to re-iterate its recommendation that if monitoring of certain stations is moved to various management plans, the Licensee be required to keep and provide a single stand-alone list of monitoring stations found in their management plans. This would help regulators check that results from all monitoring stations, including those found in various plans, are included in annual report submissions.

Another concern pertains to reporting of monitoring activities transferred from the water licence to management plans. The *Water Management Plan* is clear in stating: "*Results of sampling as presented in Table A.2 are reported to the NWB in conjunction with Annual Reporting*". However, Section 6.5.4 of the *TIA OMS Manual* states that reports need to be submitted to the Engineer of Record on a monthly basis without describing when and how the data will be transmitted to the Board. Likewise, in the *Groundwater Management Plan,* reporting requirements are internal to TMAC. INAC recommends that all reporting data be provided to the NWB in annual report submissions and monthly monitoring reports when applicable.

7.0 Closure and Reclamation Planning

This heading also included two subsections in INAC's final written submission. Only the first is included in this memo because discussions are still ongoing on the second topic, the reclamation cost estimate.

7.1 Comments on closure and reclamation planning

Comments on closure and reclamation planning are listed in Table 7. All of them have been resolved.

Table 7 Status of comments pertaining to closure and reclamation planning

Comment #	Issue	Previous status	Current status
INAC IR14	Tailings cover design	Resolved	Resolved
INAC IR15	Slope grades for reclaimed overburden dump	Resolved	Resolved
INAC TC3	Post closure groundwater quality	Resolved	Resolved
INAC TC4	Tailings beach source terms	Resolved. Follow-up required.	Resolved
INAC TC10*	Ponding along pads	Resolved. Follow-up required.	Resolved. Comment included.
INAC R9*	Doris Outflow Creek	Resolved. Follow-up required.	Resolved
INAC R12	Tailings cover design at closure	Resolved	Resolved

* Further discussion included in Appendix A

TMAC's response to our comments and the updated *Water Management Plan* adequately address the concerns raised regarding the **Tailings beach source terms (INAC TC4)** and **Doris Outflow Creek (INAC R9)**.

Resolved. Comment Included:

Ponding along pads (INAC TC10): TMAC has stated they will update the *Interim Closure and Reclamation Plan* to include text regarding measures to prevent ponding along pads but this has not been done yet.

B. CONCLUSION

Significant progress has been made in resolving issues which the Department believed required follow-up. We are open to discussing the remaining outstanding points as part of the public hearing.

APPENDIX A

Amec Foster Wheeler Report on
Review of Nunavut Water Board Licence No. 2AM-DOH1323

Report on
Review of Nunavut Water Board Licence No. 2AM-DOH1323
Doris North Project
Kitikmeot Region, Nunavut
LICENCEE REPONSE TO FINAL WRITTEN SUBMISSIONS

Submitted to:

Indigenous and Northern Affairs Canada
P.O. Box 100, Building 918
Iqaluit, Nunavut
X0A 0H0

Submitted by:
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50 Troop Ave
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September 10, 2016

CONTENTS

1.0 INTRODUCTION

Indigenous and Northern Affairs Canada (INAC) has engaged the services of Amec Foster Wheeler, Environment & Infrastructure to complete an expert review of TMAC Resources Inc. (TMAC or the Licensee) application to amend the Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 for the Doris North Project. This Review is intended to support INAC in their determination of a final position to the NWB on many of the technical issues raised during the Licensee's water licence amendment application.

This memorandum specifically addresses unresolved issues generated from the:

- September 9, 2015 Completeness Review submission;
- December 8, 2015 Technical Review submission;
- January 28-29, 2016 Technical Meeting;
- Comments on various Management Plans; and
- Amec Foster Wheeler memos – four submitted on June 21, 2016 and the last one on July 25, 2016.

A compilation of the outstanding issues was submitted by Amec Foster Wheeler to INAC in July 2016, for review and response by the Licencee (file name IQALUIT-#1085309-v3-SUMMARY-REPORT-OF-ISSUES-DORIS-V4). The Licencee has responded with the submission of the following documents to INAC on August 15, 2016:

- TMAC Resources. Hope Bay Project. Doris Aquatic Effects Monitoring Plan. August 2016.
- TMAC Resources. Hope Bay Project. Groundwater Management Plan. August 2016.
- TMAC Resources. Hope Bay Project. Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual. Parts 1 and 2. August 2016.
- TMAC Resources. Waste Rock and Ore Management Plan. Hope Bay Project, Nunavut. August 2016.
- TMAC Resources. Water Management Plan. Hope Bay Project, Nunavut. August 2016.
- TMAC Resources. Responses to Final Written Submissions, Nunavut Water Board. August 2016.

Amec Foster Wheeler has reviewed these documents specifically with respect to the unresolved issues described in the compilation document (file reference - IQALUIT-#1085309-v3-SUMMARY_REPORT_OF_ISSUES_DORIS-V4).

Amec Foster Wheeler's specific comments are presented in the following narrative sections.

2.0 WATER QUALITY PREDICTIONS

2.1 INAC R8 – Reference Point Monitoring

The AEMP has been revised to include sampling of reference Lake B at three-year intervals for temperature, DO, conductivity, water quality (physical, nutrients, total metals), phytoplankton biomass and benthic invertebrates.

Amec Foster Wheeler has no further comments on this matter.

2.2 INAC R10 – Sulphate and Major Ion Analysis

The AEMP (Section 3.2, Tables 3.1-1 and 3.2-1) and the Groundwater Management Plan (section 5.2) have been updated to include an expanded parameter suite.

Amec Foster Wheeler has no further comments on this matter.

3.0 WASTE ROCK AND TAILINGS

3.1 INAC R1 – References to OMS Manual

The Tailings Impoundment Area (TIA) Operation, Maintenance and Surveillance (OMS) Manual has been updated to include references with respect to where standard operating procedures and other related documents can be found.

Amec Foster Wheeler has no further comments on this matter.

4.0 MITIGATION MEASURES

4.1 INAC R6 – Sediment Sampling

The AEMP has been updated (Sections 2.4, 3.1, 3.2, Table 3.1-1) to include sediment sampling. Amec Foster Wheeler recommends that the sediment sampling regime should include analysis of particle size, total N, NH4+, NO3-, NO2-, PO42-, TOC, Al, Sb, As, Ba, Be, Bi, Cd, Ca, Co, Cr, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Ag, Na, Sr, S-total, Tl, Sn, Ti, V, Zn, as had been in the initial monitoring plan.

5.0 MANAGEMENT PLANS AND REPORTS

5.1 INAC R2 – Contingency for Greater Mine Inflow

The TIA OMS manual and the Groundwater Management Plan have been revised to indicate that standby pump capacity will be available in the event of mine water flows greater than 3,000 m^3/day.

Amec Foster Wheeler has no further comments on this matter.

5.2 INAC R3 – Monitoring Mine Inflow Water

TMAC has indicated that the Groundwater Management Plan has been updated (Section 5.2) to include relevant monitoring requirements. However, they have not indicated that the monitoring results will be submitted to Regulators. The format and frequency of reporting should be stated in the plan.

5.3 INAC R4 – Downstream Monitoring

Under the revised AEMP, water quality monitoring in Doris Creek has been eliminated since it will not receive TIA discharge water during or after operations. However, should the North Dam not perform as expected, TMAC has committed to monitor Doris Creek. (This monitoring would be in addition to the investigation and remedies that would be considered as noted in the Tailings Impoundment Area Operations, Maintenance and Surveillance Manual.)

Amec Foster Wheeler has no further comments on this matter.

5.4 INAC R5 – Cross Referencing between SNP and AEMP Reports

This item related to including SNP sample locations within Doris Creek in the AEMP report. As discussed in INAC R4, TMAC will monitor Doris Creek if the North Dam does not perform as expected.

Amec Foster Wheeler has no further comments on this matter.

5.5 INAC R7 – Testing Parameters

The Groundwater Management Plan (section 5.2) has been updated to include an expanded parameter suite.

Amec Foster Wheeler has no further comments on this matter.

5.6 Interim Tailings Dike

5.6.1 INAC R37

This subject related to maintaining sufficient distance between the limit of the deposited tailings and the proposed location of the Interim Dike, prior to construction of the dike.

TMAC's response indicates that the initial phases of the tailings deposition plan considers this, and that the tailings beach will not extend beyond the proposed footprint of the Interim Dike, prior to its construction.

5.6.2 INAC R38

This subject related to the review of the trade-off study for Interim Dike filter construction. Comments were provided regarding the method of construction for either a graded granular filter or a geosynthetic filter.

Amec Foster Wheeler has no further comments on this matter.

5.6.3 INAC R43

This matter relates to the interim dike crest elevation, and as such is not a matter of environmental concern. It is an operational activity.

Amec Foster Wheeler has no further comments on this matter.

5.6.4 INAC R No Number (2)

This matter relates to the graded rock filter design.

Amec Foster Wheeler has no further comments on this matter.

6.0 CLOSURE AND RECLAMATION PLANNING

6.1 INAC TC10 – Ponding Along Pads

Resolution of this matter is conditional upon acceptance of the revised closure plan.

6.2 INAC R9 – Doris Creek Outflow

TMAC has updated the Water Management Plan.

Amec Foster Wheeler has no further comments on this matter.

6.3 Security Cost Estimate

Analysis of, and comments on the security cost estimate are provided in a separate memorandum.

7.0 CONCLUSION

Based on the additional details provided from TMAC's responses, many of the unresolved technical comments and recommendations have been addressed, upon acceptance of the revised closure plan and closure cost estimate. Additional information is requested from TMAC on issues R3 and R6.

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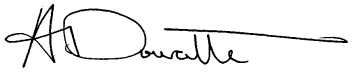
Prepared by:



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