DORIS MINE

RESPONSES TO COMMENTS ON MANAGEMENT PLANS, NUNAVUT WATER BOARD:

AQUATIC EFFECTS MONITORING PROGRAM AND REVISIONS TO THE SURVEILLANCE NETWORK PROGRAM

GROUNDWATER MANAGEMENT PLAN

TAILINGS IMPOUNDMENT AREA OPERATIONS, MAINTENANCE AND SURVEILLANCE MANUAL

Revisions to Amendment Application No. 1 of Project Certificate No. 003 and Water Licence No. 2AM-DOH1323: Proponent's Response Comments on Management Plans

June 2016

Prepared by:

TMAC Resources Inc.
Toronto, Ontario

TMAC Resources Inc.

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DORIS MINE

Responses to Comments on Management Plans, Nunavut Water Board

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LIST OF ACRONYMS

Acronym	Definition
AEMP	Aquatics Effect Monitoring Program
AMF	Aquatic Monitoring Framework
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
ERM	ERM Consultants Canada Ltd.
INAC	Indigenous and Northern Affairs Canada
IR	Information Request
KIA	Kitikmeot Inuit Association
MMER	*Metal Mining Effluent Regulations*
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
ROQ	Run of quarry
SNP	Surveillance Network Program
SOP	Standard Operating Procedures
SRK	SRK Consulting (Canada) Inc.
TC	Technical Comments
TIA	Tailings Impoundment Area
TIA OMS	Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual
TMAC	TMAC Resources Inc.
TMP	Tailings Management Plan

1. ID# DFO-1

1.1 SUBJECT

n/a

1.2 REFERENCE

n/a

1.3 COMMENT

Low Action Level Trigger

Fisheries and Oceans - Fisheries Protection Program (DFO-FPP) recommends that the low action level trigger for water levels represent the mean total drawdown for ice and water levels combined, instead of considering mean ice thickness and water level separately (p. 17).

Medium and High Action Level Mitigation Options

DFO-FPP recommends that the mitigation options that maybe implemented in the event that Medium and High Action Levels are exceeded should be more specifically described. That is, examples of the relevant management plans that may be modified, and structures or facilities that may be constructed should be provided (p. 18).

Commitments and Recommendations to Monitor Water Levels

At the Public Hearing for the Project Certificate Reconsideration of the Doris North Gold Mine Project held in April 2016, DFO-FPP recommended that TMAC revise their Aquatic Monitoring Framework to include reporting of

> a) ongoing monitoring of water levels in Doris Lake and outflows, as well as
>
> b) thresholds beyond which localized effects to fish populations and fish habitat may occur and must be evaluated (such as a reduction in water levels beyond the natural range of variability in Doris Lake).

DFO-FPP notes that the inclusion of the Doris Hydrometric Station site (monitoring water levels) and the Doris Lake North (Existing AEMP Site, monitoring ice thickness, temperature and dissolved oxygen) as shown in Figure 3.1-1 of the Plan, as well as Action Level Triggers in the Plan fully addresses DFO-FPP's recommendations identified above.

Duty to Notify DFO

TMAC indicates in the Plan that if the water level in Doris Lake drops below the natural maxima, "egg mortality may ensue and potentially result in an adverse effect to the fisheries in Doris Lake. This could require offsetting under the *Fisheries Act*"(p. 6). Furthermore, if water level thresholds are exceeded DFO should be notified for "potential fisheries compensation mitigation." (p. 18)

DFO-FPP notes that it is not possible to offset unauthorized serious harm to fish. Proponents have a Duty to Notify DFO (under subsection 38(4) of the *Fisheries Act*) if they believe they have caused, or are about to cause, an occurrence resulting in serious harm to fish. If DFO determines that serious harm to fish has occurred, then proponents have a Duty to Take Corrective Measures (subsection 38(6) of the *Fisheries Act*).

DFO-FPP recommends that TMAC revise the Plan by removing references to offsetting, compensation, or mitigation where the reporting of potential unauthorized serious harm to fish is being discussed.

DFO-FPP will continue to participate in the Nunavut Water Board's review processes as they relate to DFO-FPP's mandate regarding the Doris North Gold Mine project.

1.4 TMAC RESPONSE

Low Action Level Trigger

TMAC agrees with DFO's suggestion to revise the AEMP Response Framework Low Action Level trigger to represent the mean total drawdown for ice and water levels combined.

Medium and High Action Level Mitigation Options

TMAC will also include further description of the Medium and High Action Level mitigation options in a revised AEMP, as suggested by DFO.

Duty to Notify

TMAC has assessed the likelihood of causing harm to fisheries due to Doris Lake water drawdown as being low. However, to ensure compliance with the *Fisheries Act*, TMAC will prepare an offsetting plan under subsection 35(2) in advance of potential effects to Doris Lake to ensure that operations remain compliant with the *Fisheries Act* in all circumstances. Water Level and ice thickness monitoring will proceed as described in the AEMP. These data will be used to determine the effect to fisheries in Doris Lake, should the natural range be exceeded. If no effect occurs, or if the effect equates to less than the offset amount, TMAC would like to either bank the remaining offset for potential future use related to Hope Bay Belt development or recover the remaining costs set aside for offsetting.

2. ID# ECCC-1

2.1 SUBJECT

AEMP and SNP

2.2 REFERENCE

n/a

2.3 COMMENT

ECCC has no comments on either the AEMP or the SNP at this time but respectfully request the option to submit comments in the near future as our expert is otherwise engaged for the remainder of the week.

2.4 TMAC RESPONSE

Acknowledged. Once party comments are submitted, TMAC will provide a written response under separate cover.

3. ID# INAC R1

3.1 SUBJECT

4.0 Review of Tailings Management Plan (TMP)

3.2 REFERENCE

n/a

3.3 COMMENT

4.1 General Comment

The document submitted by TMAC and presented in the workshop, is entitled the Tailings Impoundment Area Operations, Maintenance and Surveillance (OMS) Manual. It is understood that this document will also function as the Tailings Management Plan (TMP), which is required under the water licence. Its purpose is to outline the procedures that TMAC and their contractors will use for the safe construction, operation, maintenance and surveillance and closure of the Tailings Impoundment Area (TIA).

This document, together with the other studies and management plans submitted for the design, construction, and closure of the Project, form the Tailings Management Framework for the Doris North Project.

4.2 Review of Content

The document provides information in accordance with the guidance given in the Canadian Dam Association (CDA 2013) and the Mining Association of Canada (MAC 2011) for the development of an OMS Manual.

It is noted that TMAC has only provided a high level document. For example, a detailed description of the construction of the North Dam is not included, since there is a library of as-built available. Furthermore, individual roles and responsibilities are defined only at the Vice President, Manager and Superintendent levels, with the intent that more detailed information about other staff member roles and responsibilities is contained in the mine site Standard Operating Procedures. It has also noted that the Emergency Preparedness and Response Plan for the TIA will be included in the Surface Emergency Response Plan, which is currently being prepared by TMAC.

INAC R1: While the use of multiple documents to support a high level OMS manual is acceptable, it is recommended that at the end of each section of the OMS include a reference to where detailed information can be found.

4.3 Review for Outstanding Issues

The tailings management design system was evaluated during earlier phases of the water licence amendment application review (the completeness review and technical review). During the earlier review phases, information requests (IR's) and technical comments (TC's) were generated. The IR's and TC's, and the submittals made in response to them, have been tracked through the review process.

The tracking table had been reviewed prior to the workshop to determine if there were any outstanding responses to IR's and TC's. The status of INAC TC11 required an update to the TMP to include details regarding the use of environmentally suitable chemical dust suppressants.

As part of the updated TMP, TMAC submitted Appendix A - Summary of Currently Available Dust Control Products. Each of the three dust control suppressants presented in the Appendix are considered environmentally safe. Details on application rates will depend on material-specific testing (of the tailings).

Based on the updated TMA submission this issue is considered to be resolved.

5.0 Summary

Amec Foster Wheeler has reviewed the Tailings Management Plan, and offers the following:

- The activities identified in the application include acceptable mitigation measures that will protect the quality and quantity of surrounding freshwater sources;
- Information should be provided within each section of the OMS providing cross-reference to where detailed information can be found in other related TMAC documents;
- Reasonable commitments have been made by the Proponent during the application review process to date, and these are sufficient for the protection of surrounding freshwater sources; and
- Amec Foster Wheeler has not identified any further outstanding issues pertaining to the Tailings Management Plan that should be addressed at this time.

3.4 TMAC RESPONSE

INAC R1

TMAC will revisit the TIA OMS Manual and confirm that references to other related documents are provided throughout. Any changes made will be reflected in a revised TIA OMS Manual to be submitted prior to the Public Hearing.

4. ID# INAC R2 & R3

4.1 SUBJECT

4.0 Review of Groundwater Management Plan (GWMP)

4.2 REFERENCE

N/a

4.3 COMMENT

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 m^3/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.

INAC R2: Therefore, mine inflow rates could potentially exceed 3,000 m^3/day relatively early in mine development and the contingency plan in the GWMP should provide greater detail on the contingency plans for this possibility.

INAC R3: 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 m^3/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.

4.4 TMAC RESPONSE

INAC R2

The extensive modelling undertaken by TMAC and described in Document P6-3 (Hydrogeologic Model) indicates that the maximum anticipated flow into the mine is 2,650 m^3/d on a continuous basis when mining in the talik. The design criteria for mine water extraction pumps has been chosen to be 3,000 m^3/d, more than enough to accommodate this volume. Should flows in excess of 3,000 m^3/d be encountered TMAC will endeavour to accommodate these flows by using standby pumps that would be available temporarily to remove the excess water to the TIA. To support this operational philosophy, the mine dewatering system would be designed with sufficient service pumping capacity to handle continuous flows of 3,000 m^3/d, plus standby capacity that could be put into service in the event of temporary high flows. Section 8 of the Groundwater Management Plan will be revised to include this content and submitted prior to the Public Hearing.

Also, as presented in Section 8 of the Groundwater Management Plan, an alternate contingency plan in the event of unanticipated high flows is emergency storage of water within mine sumps and the lower parts of the mine.

INAC R3

During periods of mine water discharge directly to Roberts Bay, mine water will be sampled for specific parameters at a frequency in accordance with the *MMER*, including effluent characterization under the EEM program.

Given this, TMAC feels it is appropriate to retain mine water monitoring requirements consistent with those outlined in Schedule J of the water licence, and as reflected in the Groundwater Management Plan. The following mine water sampling will occur during periods of continuous mine water discharge, either directly to Roberts Bay, or to the TIA:

- Weekly at the mine sump, for chloride, total dissolved solids (TDS), and nitrate.
- Monthly at the mine sump, for total ammonia-N, nitrate-N, nitrite-N, pH, EC, ICPMS metals, alkalinity, acidity, sulphate, TSS, major ions and total and WAD CN.
- Twice annually from backfilled stopes, for total ammonia-N, nitrate-N, nitrite-N, pH, EC, ICPMS metals, alkalinity, acidity, sulphate, and total and WAD CN.

The Groundwater Management Plan will be updated to reflect this list and submitted to parties prior to the Public Hearing.

5. ID# INAC R4-R7A, R8

5.1 SUBJECT

4.0 Review of Aquatic Effects Monitoring Plan (AEMP) for Freshwater Discharge

5.2 REFERENCE

N/a

5.3 COMMENT

4.1 General Comment

The document submitted to, and presented by TMAC at the workshop is entitled the Hope Bay Project, Doris Aquatic Effects Monitoring Plan (AEMP),June 2016. This plan is required as a submission under Part 7, Item K of the water licence.

As a result of the proposed changes under the licence amendment application, all mine and groundwater will be discharged into the marine environment. Proposed revisions to the AEMP for marine discharge were discussed in the Environmental Effects Assessment package of the water licence amendment No. 1 application.

Based on the results of discussions in an Aquatic Monitoring Workshop (AMW) held in March 2016, a revised AEMP for freshwater discharge was developed. The purpose of the revised plan is to assess the potential effects of Doris Mine activities on the freshwater environment, as the proposed changes to the scope of the mining project will see expansion of the underground mine into the talik under Doris Lake.

4.2 Review of Content

The AEMP document provides information on the proposed changes to the mine plan. The document also presents potential changes to environmental effects as a result of the changes to the mine plan, and defines how these effects will be handled in terms of monitoring and surveillance, reporting requirements and response / alert levels.

Based on the review of the revised AEMP, Amec Foster Wheeler offers the following observations and recommendations:

INAC R4: 1. Downstream monitoring: Under the revised AEMP, the Proponent proposes to eliminate water quality monitoring downstream from Doris Lake. However, the Proponent also states that water will be discharged directly into Doris Creek if the mine enters into Care and Maintenance, and the water quality meets minimum standards. In

this situation there would be no water quality monitoring of effluent if the downstream monitoring points are removed. It is therefore recommended that the downstream monitoring points be maintained as part of a robust AEMP.

INAC R5: 2. Cross referencing with SNP Report: It is recommended that the results from the two Doris Creek sample locations included in the SNP (TL-2 and 3) be included in the AEMP report with a discussion of temporal trends.

INAC R6: 3. Sediment sampling: The proponent has removed sediment sampling in the revised AEMP. Considering that dust from mine tailings, roads and other aspects of mine operation will settle into the lake, it is recommended that sediment sampling be continued as an integral activity in the AEMP.

INAC R7a: 4. Testing parameters: It is recommended that all water samples be tested for sulphate and major ions in solution. Although these parameters are not typically regulated parameters, analysis of the major ions (e.g. Ca, Na, Cl) provides an opportunity to assess the quality of the data and identify potential matrix interferences that may not be noticeable otherwise (i.e., quality control). Sulphate analysis is recommended since it provides an indicator for sulphide oxidation.

INAC R8: 5. Reference point monitoring: The proponent has removed the reference stations from the revised AEMP. While it is understood that reference lakes have provided some historical baseline information, removing the use of reference lakes undermines the potential for determining effects resulting from widespread environmental changes. It is, therefore, recommended that TMAC continue to use reference lakes as an integral activity in the AEMP.

4.3 Review for Outstanding Issues

Based on the earlier review phases of the amendment application documents (the completeness review and technical review), information requests (IR's) and technical comments (TC's) were generated. The IR's and TC's and the responses provided by TMAC, have been tracked throughout the review process. The tracking table has been reviewed to determine if any IR's or TC's were outstanding:

TC4 - This technical comment stated the need for reviewing post-closure monitoring requirements for water flowing from Tail Lake to Doris Lake. However, the current water licence expires in 2023, prior to closure. It was noted that monitoring discharge to the freshwater environment after closure is a matter which should be addressed at the time of water licence renewal.

Based on the updated TMAC submission this issue is considered to be resolved.

5.4 TMAC RESPONSE

INAC R4 and 5

TMAC would like to clarify that, post deposition of tailings in the TIA, water from the TIA will no longer be discharged to Doris Creek, during Operations or during Closure, or during a Care and Maintenance phase that occurs post tailings deposition. As such, TMAC monitoring in Doris Creek is not warranted during these phases.

INAC R6

TMAC's monitoring of Doris Lake water quality will provide near-field and rapid identification of potential Project effects. Although, at this time, sediment sampling is not deemed a necessary or effective monitoring parameter based on potential Project effects, should Doris Lake water quality results trigger the Response Framework, sediment sampling may be resumed, and baseline data will be available for comparison.

Annual AEMP sampling completed to date has covered the periods of heaviest expected project dustfall influence on Doris Lake (active construction with surface quarrying, crushing, and rock transport) without indicating any effects on lake sediment quality.

Changes in sediment quality are expected to be less likely and less detectable than changes in water quality. Not all lake inputs that enter the water column would necessarily deposit onto the lake bottom and interact with the sediments. Furthermore, the sediment sampling location would necessarily occur at a location further from potential Project inputs than the current water monitoring station because of the requirement to sample from sediment accumulation zones in the lake. As well, sediment has naturally high spatial variability, which would further decrease the sensitivity of sediment quality as a sentinel of change. If potential effects that might alter sediment quality are identified through the Aquatic Response Framework, sediment sampling could be resumed and would have a robust pre-Operations dataset with which to compare.

INAC R7a

Additional major ions will be measured in the freshwater AEMP. Sodium, calcium, chloride, and sulphate will be included in the assessment of effects as recommended.

INAC R8

In consideration of the limited anticipated Project-influence on the freshwater system in the absence of point-discharges to freshwater, TMAC has proposed that a reference site is not needed for routine AEMP monitoring. Reference data would only provide

some additional ability to preclude the Project as a possible source of any change observed in the Doris Lake data. In the absence of concurrent reference lake data, changes observed in Doris Lake water quality must conservatively be attributed to a potential Project effect, thereby triggering the response framework and associated further investigation and/or mitigation. As a result, the risk to not having reference site data for a given year rests with TMAC, in that the frequency of triggering the response framework is potentially increased. Although, at this time, reference site sampling is not deemed as necessary based on potential Project effects, should Doris Lake water quality results trigger the Response Framework, reference site sampling may be resumed, and baseline data will be available for comparison.

6. ID# INAC R7B, 9 & 10

6.1 SUBJECT

5.0 Review of Surveillance Network Program (SNP)

6.2 REFERENCE

N/a

6.3 COMMENT

Amec Foster Wheeler has reviewed the materials presented at the June 2016 workshop and offers the following observations and comments at this time:

1. The overall rationale for changing the SNP has not been fully explained. The proposed changes reduce the overall sampling strategy without providing sufficient detail on why sample sites have been removed or sampling frequency reduced.

2. Sampling at TL-5, ST-1, ST-2 has been eliminated – TMAC indicated that sampling in regard to the load balance model calibration it is being conducted under the Water Management Plan, but it has not been included in the June 2015 version of the WMP. TMAC has committed to providing a new WMP in Sept. 2016. It is not possible to determine the appropriateness of the sampling strategy at this time without the updated WMP.

3. TL-1 and 2: TMAC has reduced sampling to the construction phase only, and have removed sampling during operation and closure.

> a. Sampling should be required post-closure sometime before TIA water is discharged to Doris Creek. It is recommended that to ensure completeness in the monitoring strategy, sampling should be conducted at these locations should the project enter into Care and Maintenance.
>
> b. There is some concern that the removal of TL-1 during operations will reduce the robustness of the sampling strategy. It is important that sampling be conducted at the point where water can enter the marine outflow box before discharge to environment.

INAC R9: 4. TL-3: Post-closure sampling frequency is only annual. It is recommended that sampling be conducted more frequently (several times per year) before and for a few years after TIA discharge to Doris Creek restarts.

INAC R7b: 5. TL-12: TMAC has removed this sample from the SNP and included it into the GWMP. Under this plan mine water will be sampled weekly for only 3 parameters (Cl, TDS, NO3). It is recommended that sampling parameters be expanded as noted in our GWMP review memorandum.

INAC R10: 6. It is recommended that all water samples submitted for inorganic testing include analyses for sulphate and major ions in solution. This provides an opportunity to assess the quality of the data and identify potential matrix interferences that may not be noticeable otherwise (i.e., quality control). Sulphate is an indicator for sulphide oxidation.

6.0 Summary

With respect to the review of the Aquatic Effects Monitoring Plan (AEMP) for Freshwater Discharge, the following conclusions are that:

- The activities identified in the application include acceptable monitoring measures that will facilitate protection of the quality and quantity of surrounding freshwater sources;
- In general, reasonable commitments have been made by the Proponent during the application review process, however for the protection of surrounding freshwater sources these commitments can be enhanced by additional attention to downstream monitoring, sediment sampling and cross referencing samples with a reference lake; and
- Amec Foster Wheeler has not identified any further outstanding issues pertaining to the AEMP that should be addressed at this time.

With respect to the review of the Surveillance Network Program (SNP), the following conclusions are that:

- Greater detail of the rationale for changes to the number of sampling sites and frequency of sampling in the revised SNP should be provided.
- The number of parameters analysed from samples should be increased to include sulphate and major Ions in solution for TL-12 and sites where samples are analysed for inorganic testing.
- Sampling of sites on Doris Creek should be conducted under Care and Maintenance and Post closure.

6.4 TMAC RESPONSE

SNP Rationale

TMAC's proposed revisions to the water monitoring specified in the Water Licence 2AM-DOH1323, the SNP revisions, are reflective of the amended project. These changes address errata or inconsistencies in the existing licence or address changes related to the new water management and discharge strategy, wherein discharge during Operations will be to the marine environment instead of the freshwater environment.

Elimination of TL-5, ST-1, ST-2

During the June 6th Aquatic Monitoring Workshop it was requested that TIA inputs be characterized under the water licence jurisdiction (either in the licence or in a management plan), on the basis that such information would be useful to have available publically in the event of an uncontrolled release. Such inputs would include those from TL-5, ST-1 and ST-2. TMAC has agreed to characterizing these TIA input streams and reporting the data for this purpose. However, such characterization (in advance of any potential spill) does not merit inclusion in the Water Licence, nor does it merit the frequency of monitoring currently outlined in 2AM-DOH1323, which was based on freshwater discharge from the TIA to Doris Creek. As per INAC's suggestion, TMAC will update the Water Management Plan to include information on how the waters discharged into the TIA will be characterized, based primarily on operational data requirements, and will report this data annually to the Nunavut Water Board.

TL-1 and 2 sampling during Operations and Closure

TMAC would like to confirm that no TIA effluent will be discharged to Doris Creek during Operations, Closure, or Care and Maintenance once tailings have been deposited in the TIA. Sampling of the TIA water would be conducted prior to Post-Closure to ensure the North Dam can be safely breached. This sampling will be outlined in the Final Closure Plan, and would be discussed with Parties prior to dam breaching. As noted in the June 6th Aquatic Monitoring Workshop, the water licence will likely be renewed at that time as well, allowing the inclusion of any appropriate changes based on known and quantified water quality.

TIA water will be characterized in Operations and Closure as will be described in a revision to the Water Management Plan. Please see response to INAC R32 for further information. Sampling for the purposes of marine discharge will comply with the *Metal Mining Effluent Regulations*.

INAC R9

Post-Closure is defined as being initiated by breaching of the dam. As previously described and submitted, the Closure phase will entail pumping out the TIA completely

and allowing the facility to refill with water. This water will be sampled, and, if the quality is appropriate to meet criteria applicable at TL-3, the North Dam would then be breached, ending the Closure phase and initiating the Post-Closure phase. During Post-Closure, monitoring will occur once annually for up to 9 years following the cessation of mining, as per existing water licence requirements. As no camp facilities will be available on site, more intensive sampling is prohibitive and unnecessary given the closure measures completed (as described in Document P5-2 Interim Closure Plan). However, should results preceding Post-Closure indicate the necessity, more frequent sampling would be considered at that time.

INAC R7b

TMAC agrees to the expansion of the sampling program outlined in the Groundwater Management Plan to include electrical conductivity and major ions in monthly and weekly sampling. Given that during periods of discharge, mine water will be sampling in accordance with the *MMER* EEM requirements, sampling a full suite of parameters at an increased frequency is not considered necessary.

TMAC will revise the Groundwater Management Plan to reflect this change and provide it to parties prior to the Public Hearing.

INAC R10

TMAC agrees to the expansion of the semi-annual and monthly sampling suite for underground minewater to include sulphate and major ions in solution. Sodium, calcium, chloride, and sulphate will also be included in the AEMP sampling at ST-7 as well. Further expansion of other sampling sets is not required for the data quality assessment described; matrix interferences are identified, and corrected for as appropriate, at the analytical laboratory as part of their standard QA/QC practices.

7. ID# INAC R11

7.1 SUBJECT

1.1 Surface emergency response plan

7.2 REFERENCE

- Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 1.5 & Table 3

7.3 COMMENT

The list of documents related to the manual includes a Surface Emergency Response Plan which is in preparation. The plan is to replace the current Emergency Response Plan.

Recommendation:

INAC R11: INAC recommends that the licensee provide the Surface Emergency Response Plan within 30 days of licence issuance.

7.4 TMAC RESPONSE

INAC R11

In accordance with Item 4 Commitment 32, the Doris Mine has an existing Emergency Response Plan in place. Further to correspondence issued to the NWB and the NIRB on November 12, 2015, TMAC will submit updates to the ERP as/when needed. Therefore, TMAC sees no need to provide a new Surface ERP within 30 days of licence issuance.

8. ID# INAC R12

8.1 SUBJECT

1.3 Tailings cover design at closure

8.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 3.1

Doris North Mine, Interim Closure and Reclamation Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2015, Sections 2.9 & 3.7.

8.3 COMMENT

The TIA OMS Manual states:

"Upon closure, the tailings surface will be covered with a nominal 0.3 m thick run of quarry (ROQ) cover. The function of the cover is to prevent aeolian and hydraulic erosion of the tailings."

INAC is concerned the 0.3 m thick ROQ cover may be insufficient to prevent tailings erosion. The rationale behind the design should be provided. It is not included in the Interim Closure and Reclamation Plan, which provides even less detail on the cover design.

Recommendation:

INAC R12: INAC recommends that the licensee provide the cover design to be applied at closure. The design should ensure long-term physical and chemical stability of the TIA.

8.4 TMAC RESPONSE

INAC R12

Further to discussions with INAC at the Pre-hearing Conference, INAC has indicated that this issue is resolved as the final cover design will be provided at a time closer to Closure. No further response is required.

9. ID# INAC R13

9.1 SUBJECT

1.4 Interim dyke/filter

9.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 3.4.3

9.3 COMMENT

The project proposal as it was evaluated by the NIRB involved three structures in the TIA; North Dam, South Dam, Interim Dyke. This is the project that must be executed unless proposed changes are vetted by NIRB.

INAC has concerns with the fact that the Interim Dyke now appears as a possibility amongst others, Section 3.4.3 states:

"Tailings will be deposited between the South Dam and the North Dam, with a filter in place to reduce total suspended solids in the Reclaim Pond thus ensuring Reclaim Pond water is suitable both for reuse in the mill and compliant discharge to Roberts Bay. This Interim Filter will be comprised of one of several options. The current preferred option is the Interim Dike, described below. Other options for the Interim Filter may include a silt curtain, a modified dike structure, or a combination thereof."

Recommendation:

INAC R13: INAC recommends that the licensee be required to modify its TIA OMA Manual so that the Interim Dyke is an integral feature.

9.4 TMAC RESPONSE

INAC R13

TMAC will submit a revised TIA OMS Manual, updated to reflect the Interim Dike as an integral feature, prior to the Public Hearing.

10. ID# INAC R14

10.1 SUBJECT

Geochemical characterization of tailings deposited in impoundment area

10.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 3.6.2

10.3 COMMENT

The project will produce two types of tailings; detoxified and flotation tailings. Static and humidity cell tests indicate that the flotation tailings, which will be stored in the TIA, are non-potentially acid generating (PAG).

The assumption that flotation tailings are non-PAG is important as it impacts the reclamation at closure. The TIA OMS manual does not describe what measures and tests will be done to confirm that flotation tailings remain non-PAG throughout all of the ore body being mined.

Recommendation:

INAC R14: INAC recommends that the licensee be required to include measures, tests and a schedule used to characterize the flotation tailings as non-PAG through the mine life.

10.4 TMAC RESPONSE

INAC R14

Given the high neutralization potential and low sulphur content of the flotation tailings samples tested to date, the potential for ARD is considered to be very low. Despite this, TMAC agrees that some confirmatory monitoring would be appropriate.

Appendix J, Table 2, Station TL-6 of the current (2013) water licence, requires weekly collection of tailings solids and preparation of a monthly composite for analysis of total metals and sulphur by ICP-MS and total inorganic carbon (TIC). The sulphur and TIC can be used to calculate the NP(TIC)/AP ratio of the tailings and verify that they are not potentially acid generating.

TMAC believes that the current requirement is sufficient for confirmation monitoring of the tailings, but would like to request moving the monitoring requirement from the water licence to the TIA OMS Manual, and adding a provision to allow for potential adjustments to the frequency of sampling and testing after the first year of monitoring is complete. TMAC recognizes that any adjustments would require provision of further information on the tailings chemistry and submission of an updated TIA OMS Manual to the Board.

11. ID# INAC R15

11.1 SUBJECT

South Dam as water retaining structure

11.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 3.8, 3.9 & 4.8, Table 6, Figure 9

11.3 COMMENT

The design parameters for the South Dam are presented in Table 6 and include:

Active use period as water retaining structure: 1 year

Design basis as active water retaining structure: 5 years

According to Figure 9, active tailings deposition from the South Dam will continue into Year 3 of the project. It is not clear why active water retention would not be required through the period during which tailings will be deposited from the dam. Given the frequency at which projects start up more slowly than planned, the design basis of 5 years as a water retaining structure also seems rather brief.

The freeboard requirement section states: "once the tailings beach develops at South Dam, there will not be any water adjacent to the structure." Water is therefore expected when tailings are deposited from spigots located on the dam. According to the dam break analysis, a break of the South Dam would result in release of tailings solids into Ogama Lake, so presumably water filtering through the South Dam would also enter this lake.

It is essential that all tailings water be contained within the TIA.

Recommendation:

INAC R15: INAC recommends that TMAC clarify why the planned active use period for the South Dam as a water retaining structure is of 1 year and provide assurances that both as it is planned, and if it runs a few years behind schedule, the project would not cause the release of tails or tailing dewatering water through the South Dam.

11.4 TMAC RESPONSE

INAC R15

As described in Section 4.12 of the Tailings Management System Design Report (Document P6-13), the purpose of the South Dam is to retain tailings and supernatant water. To ensure water retention, the South Dam has been designed as a frozen foundation dam, with an integral geosynthetic liner. Tailings deposition will be done such that a beach will develop upstream of the dam, which will have the resultant effect of ensuring that there would never be any water in close proximity of the Dam. During the first year of tailings deposition it is conceivable that beach development would not be completed and therefore the "active" period for water retention without a beach developed has been set at 1 year. However, specifically to account for unforeseen conditions, such as the project running behind schedule, the design basis for "active" water retention without a beach developed has been set as 5 years. To demonstrate how effective the South Dam would be at water retention, a seepage analysis was completed (Appendix H of Document P6-10). This analysis was done to determine what the seepage would be under a condition where the TIA was at its full supply level of 33.5 m, and the foundation was completely thawed, i.e. a worst case condition, beyond the "active" water retention design life of the facility, where seepage containment is solely reliant on the geosynthetic liner. This seepage amounts to about 0.6 m^3/day, which is negligible.

Detailed thermal analysis was completed to specifically confirm whether the design is appropriate, and to demonstrate the low likelihood of the worst case seepage being realised (Appendix F of Document P6-10). The analysis demonstrates that the time to complete tailings freeze back (which is deposited against the South Dam) is less than four years where the ground surface is exposed (i.e. at the South Dam location), and six years where lake talik has developed. These estimates are based on the very conservative assumption that the tailings will maintain at 4^{o}C throughout the deposition period, which is not realistic. The actual freeze-back time is likely to be significantly less and may be measured in months rather than years due to progressive freeze-back over the life of project.

In addition, the evolution of the thermal profile following tailings deposition at the South Dam was modelled. The results indicate that the foundation remains below -3^{o}C (the design value is -2.3^{o}C) throughout the deposition period, which has been estimated at less than five years.

Finally, it is important to note that at Closure, when the North Dam gets breached and the water level returns to 28.3 m there is no chance of any seepage from the South Dam, because the ground elevation of the South Dam is at elevation 32.0 m.

12. ID# INAC R16

12.1 SUBJECT

Earthquake design ground motion

12.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 3.8, Table 6

12.3 COMMENT

The annual exceedance probability (AEP) for earthquake design ground motion for the Interim Dyke is listed as 1/100 in the table and 1/2465 in the notes.

Recommendation:

INAC R16: INAC recommends that the licensee provide a single consistent value for the AEP for earthquake design ground motion.

12.4 TMAC RESPONSE

INAC R16

The Tailings Management System (Document P6-13, Tailings Management System Design), including the primary containment structures, i.e. the North Dam, South Dam and Interim Dike has been designed in accordance with the Canadian Dam Safety Guidelines (CDA 2007, updated 2013). This guideline specifies the design criteria (i.e. annual exceedance probability, AEP) for earthquake design ground motion (EDGM) based on the Hazard Classification assigned to each of the containment structures. As described in Document P6-13, the Hazard Classification of the North and South Dams are HIGH, while for the Interim Dike it is LOW. In accordance with the Canadian Dam Safety Guidelines the AEP EDGM for the North and South Dams are therefore 1/2465, while for the Interim Dike it is 1/500. This is what is listed in Section 3.8, Table 6 of the Doris Tailings Impoundment Area Operations, Maintenance and Surveillance Manual. The footnote under Table 6 denotes that notwithstanding the design requirements, the AEP EDGM for the Interim Dike was kept the same as for the North and South Dams, which is over and above the minimum requirements.

13. ID# INAC R17

13.1 SUBJECT

1.8 Mitigation strategy for load balance concern

13.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.2, Table 7

13.3 COMMENT

When discussing operating constraints, water unsuitable for reclaim or discharge is listed as a possible load balance concern. The operations and preventative maintenance consideration for this case is to: "retain water provided capacity is available." The mitigation strategy is to: "develop strategy to treat water".

Recommendation:

INAC R17: INAC recommends that if water treatment becomes necessary, the licensee provide a plan for review with the treatment method they propose to implement.

13.4 TMAC RESPONSE

INAC R17

In the event that a contingency measure such as treatment prior to discharge to Roberts Bay is required TMAC will prepare a Wastewater Treatment Plan during the design phase for the treatment plant. This will be provided for information to the NWB. This approach is consistent with Part H Item 1 of 2AM-DOH1323 wherein modifications require notification of the NWB 60 days prior to beginning the Modifications.

TMAC restates our commitment to discharge in compliance with the *MMER*, regardless of whether or not treatment is required.

14. ID# INAC R18

14.1 SUBJECT

1.9 Dust suppressants

14.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.4 & Appendix A

14.3 COMMENT

The primary dust control measure in the TIA will be water. Chemical dust suppressants will only be used if water proves to be ineffective. Three chemical dust suppressants are listed in Appendix A as examples of suitable currently available products.

The wording of the TIMA OMS Manual is such that other chemical dust suppressants might be used since "specific suitable products will be sought at that time".

Recommendation:

INAC R18: INAC recommends that the licensee modify the TIA OMS Manual to use one of the three products proposed or to seek approval from the Board prior to using any other chemical dust suppressant.

14.4 TMAC RESPONSE

INAC R18

The text in the TIA OMS manual pertaining to the use of dust suppressants, as referenced above, has been presented to allow for flexibility for the following reasons:

- Efficacy of chemical dust suppressants is based on specific tailings characteristics such as particle sizes. As tailings have not yet been generated, flexibility is required to determine a suitable a product for use in the future.
- Technological advances in chemical dust suppressants are expected over the life of mine so flexibility is required to determine a suitable a product for use in the future.

Accordingly, TMAC will utilize one of the three products proposed in the current version of the TIA OMS Manual, or other as approved by the Inspector. If other products are approved by the Inspector for use, this will be reflected in a routine update to the Appendix of the TIA OMS Manual.

15. ID# INAC R19

15.1 SUBJECT

1.10 Shoreline erosion monitoring transects

15.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 5.3.1

15.3 COMMENT

One of the maintenance tasks associated with shoreline erosion protection is inspecting, surveying and maintaining four shoreline erosion monitoring transects.

It would be helpful to have these transects drawn on one of the figures in the manual to ensure monitoring is done in the same locations and so that outside parties can also inspect these transects.

Recommendation:

INAC R19: INAC recommends that the licensee include the shoreline erosion monitoring transects on one of the figures included in the TIA OMS Manual.

15.4 TMAC RESPONSE

INAC R19

TMAC will submit a revised TIA OMS Manual, updated to include a figure identifying the shoreline erosion transects, prior to the Public Hearing.

16. ID# INAC R20

16.1 SUBJECT

1.11 Discharge of TIA water to Doris Creek

16.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.2, Table 7

Water Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2015, Section 4, Table 4.

16.3 COMMENT

There appears to be an inconsistency between the TIA OMS Manual and the Water Management Plan regarding possible discharge of TIA water to Doris Creek. An adaptive management solution to malfunctioning discharge pipeline to Roberts Bay in the Water Management Plan is "Excess water management in the TIA that meets water quality and discharge criteria as described in the water license will be discharged to Doris Creek during the open water season."

This possibility is not in the TIA OMS Manual, where operational and preventative maintenance considerations and maintenance strategies for three different pipeline malfunction scenarios are discussed.

Recommendation:

INAC R20: INAC recommends that the updated version of the Water Management Plan correct an apparent inconsistency regarding discharging TIA water into Doris Creek.

16.4 TMAC RESPONSE

To clarify, excess water in the TIA will be discharged as follows:

- Prior to tailings deposition:
  - to Doris Creek, in compliance with water licence discharge criteria;
- Following tailings deposition:
  - during Operations and Closure to Roberts Bay, in compliance with the *MMER;*
- Post-Closure:
  - following the natural discharge pathway, which is to Doris Lake, and will meet compliance criteria in Doris Creek asper the water licence.

TMAC will review the Water Management Plan and the TIA OMS Manual for consistency and issue an updated plan in September 2016 and prior to the Public Hearing, respectively.

17. ID# INAC R21

17.1 SUBJECT

1.12 Detoxified tailings management

17.2 REFERENCE

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016

Doris North Project, Tailings Management System Design, SRK Consulting (Canada) Inc., May 2015, Section 3.3

17.3 COMMENT

The TIA OMS Manual was provided in lieu of a Tailings Management Plan. It is understood that detoxified tailings which have been exposed to cyanide are not discussed in the Manual as they will not be sent to the TIA but rather be disposed of in an area of the underground mine in permafrost.

An outline of the deposition of detoxified tailings underground is included in the Tailings Management System Design, but details on their management needs to be provided.

Recommendation:

INAC R21: INAC recommends that TMAC provide details on the management of detoxified tailings in the appropriate management plan.

17.4 TMAC RESPONSE

INAC R21

As described in Document P6-13, Tailings Management System Design, about 6% (i.e. 150,000 tonnes or 116,000 m^3) of the tailings are comprised of detoxified tailings, and this tailings stream will be sent underground where it will be mixed with underground waste rock for use as structural mine backfill.

To provide the necessary management plan level of detail regarding handling of the detoxified tailings, TMAC will update their Waste Rock and Ore Management Plan to include the text presented below. TMAC believes that the Waste Rock and Ore Management Plan is the best place to include this information, as the detoxified tailings will be placed underground with the waste rock.

The Plan will be provided to the NWB as a component of routine annual reporting and will be updated to include the following additional text:

Detoxified Tailings

About 6% (i.e. 150,000 tonnes or 116,000 m^3, assuming a dry density of 1.3 t/m^3) of the tailings are comprised of detoxified tailings, and this tailings stream will be sent underground where it will be mixed with underground waste rock for use as structural mine backfill. The amount of detoxified tailings produced per day is between 60 and 120 tonnes per day (46 and 93 m^3/day), assuming processing rates of 1,000 to 2,000 tonnes per day.

This tailings stream will be dewatered in the processing plant using a filter press. Free water is recirculated as a closed loop within the facility. The dry "filter cake", which has a saturation of about 80%, has no free water and can be handled with conventional earthmoving equipment. The product is stockpiled below the belt filter, in an area within the processing facility.

This product will be loaded into trucks using a front-end loader and transported to the Pad T Waste Rock Storage Area as needed. The material will be placed immediately adjacent to, or on top of, waste rock material that is designated for backhaul to the mine as underground backfill. As waste rock material is loaded for backhaul as underground backfill, trucks are loaded such loads contain detoxified tailings (when available) at the necessary mixing of waste rock and detoxified tailings to ensure the appropriate structural backfill requirements are met.

No special water management requirements are required while detoxified tailings are stockpiled on Pad T, as all materials will be within the existing water management system.

18. ID# INAC R22

18.1 SUBJECT

2. GROUNDWATER MANAGEMENT PLAN

Developing a Groundwater Management Plan was one of the commitments made by TMAC at the NIRB final hearing. At that time, INAC Impact Assessment provided a framework with a list of items the plan had to address. Subsequently, TMAC shared a memorandum dated March 15, 2016 entitled Doris Project- Groundwater Management Plan (GWMP) Framework - Final. The Groundwater Management Plan provided was compared to both these documents to see if all points had been addressed.

During the June 6 – 8 meetings in Iqaluit and in a follow-up email sent by Sharleen Hamm on June 14, 2016, TMAC explained that the response to some of the commitments were found in documents other than the Groundwater Management Plan. We are including comments for those commitment items not found in the Plan to facilitate tracking of these items, as well as newly generated comments.

2.1 Demonstration of robustness of management plan with numerical analysis

18.2 REFERENCE

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Sections 2.1 & 2.3.1

5MN047 Doris Amendment: Groundwater Management Plan Commitment, available from the NIRB ftp site:

Groundwater Management Plan Commitment ftp site:

http://ftp.nirb.ca/03-MONITORING/05MN047-DORIS%20NORTH%20GOLD%20MINE/01-PROJECT%20CERTIFICATE/03-AMENDMENTS/AMENDMENT%20No.1/8-TECHNICAL%20REVIEW/06-COMMITMENTS/160211-05MN047-Supplemental%20Information%20Re%20GMP%20Framework-IA2E.pdf

P6-3 Groundwater Inflow and Quality Model: Hydrogeological Modeling of the Proposed North Project, Hope Bay, Nunavut, SRK Consulting (Canada) Inc., June 2015, Section 4.4

18.3 COMMENT

This comment is a further discussion of recommendation 2 made by AMEC Foster Wheeler.

Item 3b from the Commitments is to: "Provide numerical analysis to show the robustness of the water management plan to various possible scenarios (i.e. more water in underground, poorer quality water in underground, longer discharge to tailings impoundment etc.)"

TMAC has responded that this is addressed in Section 4.4 of the Groundwater Inflow and Quality Model (Document P6-3), which consists of a sensitivity analysis. The conclusion is that: "predictions of inflows are sensitive to the hydraulic conductivities of volcanic rock and lake sediment, and not sensitive to the surface water elevation in Doris Lake nor to the hydraulic conductivity of the diabase." For the analysis, the hydraulic conductivity of the lake bed sediment and the volcanic rock were increased by one order of magnitude and the relative % change to mine inflow were +160% and +183% respectively.

An increase in hydraulic conductivity of one order of magnitude is quite possible given the uncertainty in measuring this property and the difficulty in scaling up packer and pumping test-scale measurements to model-scale.

The Groundwater Management Plan states the maximum inflow rates are estimated to be less than 3000 m^3/day and that a maximum pumping rate of 3000 m^3/day is considered sufficient. The maximum mine inflow rate predicted by the model is 2650 m^3/day, therefore 3000 m^3/day is only 13% increase in inflow. The contingency plan for excess inflow is emergency storage of water in the mine.

The sensitivity analysis does not include effects on water quality. Nor is there a discussion of effects of longer discharge to tailings impoundment.

During the June 6-8 meetings, TMAC stated that impacts of pumping rates greater than 3000 m^3/day were not investigated because they may not be economically feasible. If greater pumping rates proved necessary, TMAC would have to stop and reconsider the costs of the operations as a whole.

Recommendation:

INAC R22: INAC recommends that the licensee limit the allowable pumping rate for groundwater to 3000m^3/day because impacts of pumping at a higher rate have not been assessed.

18.4 TMAC RESPONSE

INAC R22

TMAC does not see the necessity or suitability for the NWB to limit pumping of groundwater to 3,000 m^3/day. The effects of discharging up to 7,000 m^3/day of *MMER*-compliant TIA effluent to the receiving environment have been assessed.

Should inflows greater than 3,000 m^3/day of groundwater be encountered, contingencies such as emergency storage in the mine or pumping to the TIA will be employed. Both of these contingencies have been considered in the assessment.

A pumping value of 3,000 m^3/day has been presented in the Application as this is expected to be adequate capacity to accommodate predicted maximum inflows. It is anticipated that higher inflow rates would potentially be uneconomical with the current power supply configuration. TMAC sees 3,000 m^3/day as an internal operations limit, not an enforceable limit; in circumstances of ensuring safety of workers and facilities, short term pumping of greater volumes might be contemplated. Assuming compliant discharge and water management within the permitted levels in the TIA, an exceedance would only pose operational challenges and economic risk, both of which would be TMAC's to bear. TMAC believes it is inappropriate to place a compliance standard on this flow.

19. ID# INAC R23

19.1 SUBJECT

2.4 Remedial stage actions for management of mine inflow

19.2 REFERENCE

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016

Doris Project – Groundwater Management Plan (GWMP) Framework – Final, SRK Consulting (Canada) Inc., March 15, 2016, Section 4.6

19.3 COMMENT

Under Mine Inflow Management considerations, the framework states:

"Remedial stage actions may include:

Modifying and/or adjusting the mine plan to avoid areas of concern; Facilities and actions to arrest inflow from open exploration drill holes and enhanced permeability zones; and Isolation of mining sections as a means to control or minimize mine inflow."

The Groundwater Management Plan discusses grouting as an action to arrest inflow and states that emergency storage of water in the mine could be undertaken as a contingency measure. The remedial actions of the first and second bullets are not discussed explicitly in the plan.

INAC R23: Recommendation:

INAC recommends that the licensee explicitly list all remedial stage actions for managing mine inflow in the updated version of the Groundwater Management Plan.

TMAC RESPONSE

INAC R23

TMAC will update the Groundwater Management Plan (GWMP) for submission prior to the Public Hearing to specifically include the following text related to managing mine inflow:

Section 6 – Adaptive Management

The review process outlined in the Specific Responses allows for performance (ingress control) to be assessed relative to the expanding knowledge of the site hydrogeological system, feedback on inflow control measures provided and inflow control measures adapted as a result. The following adaptive changes to inflow control measures could include:

- *Review of discretionary vs. mandatory pre-grouting planning;*
- *Confirmation that pre-grouting plans are adequate for anticipating and preventing inflow;*
- *Modifications to pre-grouting plans or procedures to provide better inflow control;*
- *Changes to grouting techniques and materials;*
- *Modifying and/or adjusting the mine plan to avoid areas of concern; and*
- *Isolation of mining sections to avoid areas of concern.*

When the mine plan is modified or adjusted, the appropriate Risk Zone Mapping is updated.

When isolation of an area is deemed an appropriate strategy to control mine inflow, a suitable isolation barrier will be designed and constructed under the direction and guidance of a qualified engineer, with the approval of the Mines Inspector.

20. ID# INAC R24

20.1 SUBJECT

2.5 Mine discharge management

20.2 REFERENCE

Doris Project – Groundwater Management Plan (GWMP) Framework – Final, SRK Consulting (Canada) Inc., March 15, 2016, Section 4.6

Water Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2015, Section A4.1

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016

20.3 COMMENT

The framework states that mine discharge management will be covered by the Surface Water Management Plan. It states further: "This chapter will outline and refer to the SOP's anticipated to be required to properly operate these facilities, including installation and operation of sumps, piping, sump pumps, main mine pumps, etc."

The Water Management Plan submitted in June 2015 contains inconsistencies with the Groundwater Management Plan submitted a year later. According to the Water Management Plan, "Groundwater will be intercepted in underground sumps and pumped to the mill building and discharged to Roberts Bay. Intercepted groundwater will be discharged to Roberts Bay year round via a diffuser." This appears inconsistent with the Groundwater Management Plan, which states that if water quality exceeds *MMER* criteria, discharge will occur via the TIA and /or with treatment.

Additionally, the Water Management Plan does not refer to SOPs for operating the facilities used to manage water on the surface.

Recommendation:

INAC R24: INAC recommends that the updated version of the Management Plan correct an apparent inconsistency regarding the discharge of groundwater to Roberts Bay and refer to SOPs for operating facilities used to manage water.

20.4 TMAC RESPONSE

Subsequent to the submission of the Water Management Plan in June 2015, TMAC submitted a memo outlining the Interim Water Management Strategy, which involves discharge of groundwater to Roberts Bay via the TIA. During the NIRB project certificate reconsideration process TMAC committed to revising the Water Management Plan to include this Strategy. The planned submission date for the revised Plan is September 2016, 90 days prior to the start of Operations.

Where suitable, the Plan will also be revised to include reference to relevant Standard Operating Procedures.

21. ID# INAC R25

21.1 SUBJECT

2.6 Source of increased inflow

21.2 REFERENCE

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 2.2

21.3 COMMENT

When discussing mine inflow chemistry, the argument is made that: "As geological structures in the Doris Mine area have been observed to be sub-vertical, the increased flow will likely originate from the lake." This has a large impact on the chemistry of mine inflow water since the lake has fresher water than the connate water coming from the rock mass, and the resultant mixed inflow water would have lower concentrations of chloride and other parameters.

The hydrogeological model includes two sources of inflow other than Doris Lake; the open talik base and the mine lithologies themselves. Since the open talik base would also be intersected by geological structures in the sub-vertical direction, it is not clear why it should not also contribute to increased flow.

Recommendation:

INAC R25: INAC recommends that the updated version of the Groundwater Management Plan better explain why increased mine inflow rates would likely originate from the lake.

21.4 TMAC RESPONSE

INAC R25

As discussed in Document P6-3, Hydrogeological Model, 70% of the mine inflow is from Doris Lake, compared to 30% from the surrounding rock mass interstitial water within the talik. The primary reason that the Doris Lake is contributing such a large component is the close proximity of the lake to the mine, presenting a significant pressure head, which drives the flow. This is demonstrated through the sensitivity analysis, which illustrates that the results are most sensitive towards the hydraulic conductivity of the Doris Lake bed sediments. Sub-vertical geologic features connected to Doris Lake, or within the shallow crown pillar between the mine and Doris Lake would therefore have

the most pronounced effect on the mine inflow, with the flow originating from the lake. However, if sub-vertical geological features are below the mine, these features are less likely to yield considerable water, as demonstrated by the fact that only 30% of the flow is from the surrounding rock mass interstitial water in the talik, not dominated by the pressure head presented by Doris Lake.

To better clarify this, TMAC will revise the text in Section 2.2 of the GWMP to read as follows:

> *"The chemistry of discharged mine water considered in the site water and load balance was based on a mixture of Doris Lake water chemistry and sub-permafrost (connate water) chemistry, at the 70:30 ratio. This concentration has been used in the water and load balance at the conservative constant maximum underground pumping rate of 3,000 m^3/day for loading calculations. The Doris Lake water chemistry, which is equivalent to background concentrations for all constituents, dilutes the sub-permafrost water chemistry, which is naturally elevated in chloride, boron, cadmium, manganese, mercury, cobalt, copper and nickel. The water and load balance also accounts for mine water chemistry impacted as a result of mining operations though blasting (elevated nitrate), permafrost drilling with brine, and introduction of oxidation products from backfilled waste rock and detoxified tailings.*
>
> *Increases to the mine inflow rate could occur if mine development intersects uncontrolled/ungrouted faults, joint sets, open drill holes, etc. As geological structures, such as faults, in the Doris Mine area have been observed to be sub-vertical, and of higher permeability than the surrounding rock, increased flow will likely originate from the lake, if these structures are connected to the lake, or at shallow depth between the lake and the mine. Also, the lake bed sediments which dominate the inflow rate from the lake could prove to be more permeable than anticipated. The effect of these conditions on the mine water chemistry would be to change the mixing ratio from 70:30, to a ratio more in favour of the lake inflow. Therefore, while inflow volumes/rates would increase, the concentrations of the constituents from the groundwater should decrease as fresh water increases in the mixing ratio.*
>
> *Conversely, if the lake bed sediments prove to be less permeable, mine inflow rates would reduce and the mixing ratio could favor towards the rock mass inflow, with a subsequent increase in concentrations of the constituents from the groundwater."*

TMAC will update the GWMP for submission prior to the Public Hearing.

22. ID# INAC R26

22.1 SUBJECT

3 AQUATIC EFFECTS MONITORING PLAN

The modified Aquatic Effects Monitoring Plan (AEMP) submitted in June 2016 proposes cutting back monitoring in the freshwater environment because discharge of mine, process and contact water would be in the marine environment under an amended licence and no effects have been measured to date, through the most intensive construction period.

INAC is cognisant of the lack of measured effects to date but is of the opinion that the AEMP needs to remain robust in order to assess potential effects of planned activities, which have yet to occur such as milling and associated tailings transfers, increased mining and truck traffic, and mine dewatering. The AEMP, with modifications as proposed by TMAC, therefore appears insufficient for adequate monitoring.

3.1 Sampling station locations on Doris Lake

22.2 REFERENCE

Hope Bay Project, Doris Aquatic Effects Monitoring Plan, TMAC Resources Inc., June 2016

Doris North Gold Mine Project: Aquatic Effects Monitoring Plan, Rescan Environmental Services Ltd., February 2010

22.3 COMMENT

Two water sampling station locations are proposed on Doris Lake: ST-7, a surveillance network program (SNP) station at the water intake on the west shore and a Doris Lake North, an existing AEMP site in deep water at the north end of the lake. Water quality is to be measured monthly at ST-7 and ice thickness, temperature and dissolved oxygen are to be measured once a year, in April, at Doris Lake North. At the June 6-8 meetings, TMAC stated that Doris Lake was well mixed and the data available demonstrated that water chemistry at the ST-7 and Doris Lake North sites was equivalent.

Given the size of Doris Lake, more than one station should be used to characterise its water chemistry. Keeping a near shore shallower station and a deep water station further from potential sources would help identify any changes due to mining activity. Through the water chemistry at both sites is said to be equivalent, this may [no] longer be the case should a point source locally alter certain parameter concentrations.

Water quality measurements in the 2010 version of the AEMP also included Secchi depths and conductivity measurements, as well as the temperature and dissolved oxygen included in the present plan. Keeping these simple field parameters will help characterise the water and confirm that the lake remains well mixed.

Recommendation:

INAC R26: INAC recommends that water chemistry sampling be continued at both stations ST-7 and Doris Lake North at least four times a year. Profile of temperature, dissolved oxygen and conductivity should be collected at Doris Lake North at least twice a year, as well as ice thickness or Secchi depth according to the season.

22.4 TMAC RESPONSE

INAC R26

Although ST-7 is similar to Doris Lake North, given the mixed nature of the lake, the premise for switching sampling to ST-7 rather than Doris Lake North is that this site has a more robust historical dataset (with monthly sampling since 2008), will continue to be sampled monthly (as opposed to 4 times a year), and this site is closer to potential project inputs (potential effects from the mill, camp, and mining operations). These features mean that sampling at ST-7 can provide earlier warning and increased sensitivity to potential changes as compared to sampling at Doris Lake North. Should potential Project effects be detected at ST-7, sampling could expand to Doris Lake North under the Response Framework.

TMAC will expand the AEMP sampling to include collection of conductivity profiles at Doris North during the under-ice sampling events to confirm Doris Lake remains well-mixed and unanticipated changes in mixing and water quality are not occurring. This conductivity sampling will serve as an additional sentinel for changes in water quality.

23. ID# INAC R27

23.1 SUBJECT

3.2 Biological monitoring

23.2 REFERENCE

Hope Bay Project, Doris Aquatic Effects Monitoring Plan, TMAC Resources Inc., June 2016

Doris North Gold Mine Project: Aquatic Effects Monitoring Plan, Rescan Environmental Services Ltd., February 2010

23.3 COMMENT

No biological monitoring is included in the modified AEMP, in contrast to the 201 version which included plankton, benthic invertebrate, fish population and fish tissue monitoring. At the June 6-8 meetings, TMAC stated chlorophyll *a* was not included because no effect had been measured to date and, since there shouldn't be differences in chlorophyll *a* if the nutrients remained constant, analysing for nutrients should be sufficient.

Monitoring can be either stressor-based or effects-based, and both should be used to adequately characterise a system. The AEMP as it is presented, focusing solely on water quality parameters, has only stressor-based monitoring. Given the complexity of biological systems effects-based monitoring is also relevant, should be included as the name of the plan indicates.

INAC is of the opinion that measuring chlorophyll *a* should be continued as, in arctic systems, these populations can sometimes be used to measure changes in water quality that nutrient analyses do not pick up because of detection limits. Characterizing algal assemblages can also be helpful in detecting changes.

Recommendation:

INAC R27: INAC recommends biota sampling be continuous to include effects-based monitoring in the Aquatic Effects Monitoring Plan. This is a precautionary approach for the plan to include two monitoring methods, increasing the changes of detecting changes to t4he aquatic environment by using both water quality parameters and biological indicators.

23.4 TMAC RESPONSE

INAC R27

TMAC considers the on-site monitoring programs to comprise stressor- and effects-based monitoring. These two monitoring methods are both used to adequately characterize the Projects effects on the surrounding aquatic environment.

Stressor-based monitoring includes dustfall and SNP monitoring, which directly measure the stressors from the Project that have the potential to interact with the aquatic receiving environment. Effluent and dust originating from the project are, and will continue to be, measured for a range of constituents that may cause effects on environmental quality and organisms.

Effects based monitoring is undertaken under the AEMP and EEM monitoring programs, which measure the Project effect on these aquatic environments. The most sensitive indicator, to Project-related stressors in the aquatic environment, is water quality. Water is not only a major pathway that connects the project with the environment (i.e., through runoff, for example) but is also the primary abiotic component of the aquatic ecosystem. By measuring water quality, the proposed AEMP is monitoring the most sensitive component of the aquatic receiving environment for Project-related effects. For example, the proposed water quality monitoring program will be measuring nutrient concentrations on a monthly basis. The monthly monitoring frequency can detect nutrient changes across ecologically relevant periods, which include the winter remineralization, spring dilution and mixing, and nutrient uptake by primary producers across the growing season. The current AEMP program has demonstrated sufficient analytical sensitivity to measure natural variation in nutrient concentrations (e.g., nitrate and total phosphorus). If changes in nutrient concentrations are observed, the Aquatic Response Framework will consider the ecological consequences of the observed changes, which may include changes in primary producer biomass and community structure. This approach is considered conservative because of the Before-After design (discussed below) and because it focuses on the high-resolution measurements of nutrient concentrations rather than the indirect effects of changes in nutrients on primary producer biomass. Further, water quality as a sensitive indicator will be monitored on a regular basis allowing improved response ability.

The Aquatic Response Framework outlines the responses that would occur if changes in water quality were observed in Doris Lake. Because the proposed program is a Before-After design, the AEMP and its associated Aquatic Response Framework is conservative in that it assumes any change is associated with Project activities. If any changes in water quality are observed that are greater than benchmarks, then response plans will be developed. These response plans may include biological monitoring, such as the monitoring of phytoplankton biomass and community structure if changes in nutrient concentrations were observed.

Despite confidence in the efficacy of the proposed AEMP program, TMAC understands the desire to ensure no unforeseen effects are being missed. As a result, TMAC agrees to collection of chlorophyll *a* samples in Doris Lake as an indicator of eutrophication once annually.

24. ID# INAC R28

24.1 SUBJECT

3.3 Monitoring during care and maintenance

24.2 REFERENCE

Hope Bay Project, Doris Aquatic Effects Monitoring Plan, TMAC Resources Inc., June 2016

24.3 COMMENT

The AEMP states: Should the site re-enter a phase of care and maintenance, the program will be carried out once every third year using data collected from ST-7 during months of water use.

This schedule would be insufficient to react in a timely manner should changes be occurring.

Recommendation:

INAC R28: INAC recommends that sampling be conducted at least twice a year during care and maintenance to adequately monitor the site and any potential effects of infrastructure, ore and waste rock piles as well as tailings.

24.4 TMAC RESPONSE

INAC R28

In clarification, although AEMP reporting is proposed to occur every third year, should the Project enter Care and Maintenance SNP monitoring will be conducted as prescribed under the Water Licence, and will be reported in both the monthly and annual water licence reports. This is expected to include monthly sampling at ST-7 in any months water is drawn from Doris Lake under Water Licence 2AM-DOH1323. TMAC agrees to setting this sampling at a minimum of twice a year during Care and Maintenance.

For further clarification, during Care and Maintenance, water from site collection sumps (including the water collection facilities associated with the waste rock, ore, infrastructure and tailings) will continue to be managed and sampled as prescribed under the water licence or otherwise applicable legislation.

25. ID# INAC R29 & R30

25.1 SUBJECT

4.2 Station at the TIA discharge pump (TL-1)

25.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323 – presentation, TMAC Resources Inc., June 6, 2016, Slide 7

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.5

Nunavut Water Board Licence 2AM-DOH1323, Nunavut Water Board, August 16, 2013

25.3 COMMENT

This comment adds to what is presented in point 3 of section 5.0 of the AMEC Foster Wheeler review memorandum on the AEMP and SNP revisions.

Station TL-1 in the present licence is described as "TIA at the Reclaim Pump Barge Depth 1.5 m below surface" and TMAC proposes to change the description to "TIA at the Discharge Pump". They also suggest restricting sampling to the construction period during discharge to fresh water.

Characterising water in the TIA is important so that in event of spills from the pipelines or malfunctions, regulators are aware of the characteristics of the water TMAC is dealing with. During the June 6-8, 2016 meetings, TMAC stated that TIA water would be monitored during operations for operational purposes, so keeping this station in licence ensures that the data will be clearly identified and reported in the annual report.

According to the TIA Operations, Maintenance and Surveillance Manual: "During operations, in addition to tailings slurry, the following sources of mine contact water may be pumped to the TIA: underground mine water, pollution control pond water, sedimentation pond water, landfill sump water, bulk fuel storage sump water, treated sewage effluent, and any other industrial contact water collected at site from various locations." The addition of treated sewage makes it appropriate to include monitoring for biological parameters, as suggested by TMAC. The addition of bulk fuel storage sump water and other industrial contact water makes it appropriate to include monitoring of petroleum hydrocarbons, as Total Oil & Grease or some other form.

Recommendation:

INAC R29: INAC recommends that sampling at station TL-1 be required during operations and closure, in addition to during construction. Sampling at the pump could not continue post-closure, but would be necessary in an adjacent location.

We agree with the addition of biological parameters in the list to be tested and recommend petroleum hydrocarbon parameters be included as well.

INAC R30: INAC recommends that the updated Water Management Plan explicitly specify how all mine contact water will be handled. The TIA OMS Manual states that some waters may be pumped to the TIA, implying they could be sent elsewhere. All possible contact water disposal locations need to be identified.

25.4 TMAC RESPONSE

INAC R29

TMAC agrees with sampling the TIA water during Operations, and with the inclusion of oil and grease in the parameter suite during this period. This characterization will be outlined in a revision to the Water Management Plan to be provided in September 2016. Post-Closure sampling would be described in the Final Closure Plan and at the time of water licence renewal.

INAC R30

The Water Licence 2AM-DOH1323 describes the allowable discharges for the Project. This includes disposal in the TIA, or, for many effluent streams, tundra discharge if specific discharge criteria are met. The amended Water Licence is expected to maintain this flexibility, as is routinely the case for Nunavut water licences.

26. ID# INAC R31

26.1 SUBJECT

4.3 Doris Creek monitoring stations (TL-2, TL-3, TL-4)

26.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 8, 9 & 10

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.5

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013

26.3 COMMENT

In the present licence, three stations are located on Doris Creek. TL-2 (Doris Outflow Creek- upstream (at the flow monitoring station adjacent to the bridge)), TL-3 (Doris outflow Creek (-80 m downstream of the base of the waterfall), and TL-4 (TIA Discharge End of Pipe (taken at a valve at the discharge end of the transfer pump pipeline). TMAC proposes restricting sampling to the construction period during discharge to fresh water for TL-2, changing sampling phases at TL-3 to construction and post-closure, and removing TL-4 since it will be equivalent to TL-1.

INAC agrees that station TL-4 would bring no new information. We are of the opinion that at least one station on Doris Creek needs to be monitored throughout all phases of the project. This would provide downstream monitoring of any potential effects from dust deposition on Doris Lake, seepage from the TIA through North Dam, and unforeseen events on site.

INAC R31: INAC recommends keeping a monitoring station on Doris Creek during construction, operation, closure and post-closure.

26.4 TMAC RESPONSE

INAC R31

Monitoring effects of dust deposition occurs in accordance with the Air Quality Monitoring Program, which involves collecting samples at a number of dustfall

monitoring stations across the site. Through the NIRB Project Certificate reconsideration process, this program was reviewed and expanded.

Seepage through the TIA is monitored through execution of the annual geotechnical inspection of the North Dam. This process is currently in place and has been ongoing since dam construction.

Any unforeseen events on site such as a spill would trigger the Spill Contingency Plan and related sampling and reporting.

Given the proximity to site and the local topography, Doris Lake is the most proximal receiving environment for any non-point source inputs. The Aquatic Effects Monitoring Program (existing and proposed revisions) includes a station in Doris Lake and a response framework wherein if effects are detected in Doris Lake, additional sampling will be carried out.

For these reasons, additional monitoring of Doris Creek throughout Operations is considered redundant.

27. ID# INAC R32

27.1 SUBJECT

4.4 Water component of tailings discharged into TIA (TL-5)

27.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 8, 9 & 10

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.5

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013

27.3 COMMENT

TMAC proposes removing station TL-5 (Tailings Discharged into TIA (Water Component) taken from valve in the mill at the discharge end of the mill tailings pumps) on the grounds that: "Characterization of waters discharged into the TIA for the purposes of Water and Load balance model calibration will be outlined in the Water Management Plan."

As mentioned in point 2 of section 5.0 of the AMEC Foster Wheeler review memorandum on the AEMP and SNP revisions, this was not found in the June 2015 Water Management Plan. Keeping SNP station TL-5 will ensure that sampling which will be done in any case for operations is reported in the annual report.

Recommendation:

INAC R32: INAC recommends that station TL-5 be kept in the licence and that the updated version of the Water Management Plan include how the waters discharged into the TIA will be characterized.

27.4 TMAC RESPONSE

INAC R32

During the June 6th Aquatic Monitoring Workshop it was requested that TIA inputs be characterized under the water licence jurisdiction (either in the licence or in a

management plan), on the basis that such information would be useful to have available publically in the event of an uncontrolled release. TMAC has agreed to characterizing these TIA input streams and making the data publically for this purpose. However, such characterization (in advance of any potential spill) does not merit inclusion in the Water Licence, nor does it merit the frequency of monitoring currently outlined in 2AM-DOH1323, which was based on freshwater discharge from the Tailings Impoundment Area to Doris Creek. As per INAC's suggestion, TMAC will update the Water Management Plan to include information on how the waters discharged into the TIA will be characterized, based primarily on operational data requirements, and will ensure this data is reported annually to the Nunavut Water Board.

28. ID# INAC R33

28.1 SUBJECT

Sampling station TL-9 – barren bleed solution

28.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 8, 9 & 10

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August 16, 2013

28.3 COMMENT

TMAC proposes removing station TL-9 (Barren Bleed Solution sent to tailings taken from a sampling valve with the mill) because the amended project will no longer use this process. During the June 6-8 meetings, TMAC stated there was no analogous process under the revised processing, but that they would look into if there was any liquid along the cyanide process that could be analysed to see how successful the sulphur-dioxide-oxygen cyanide destruction process was.

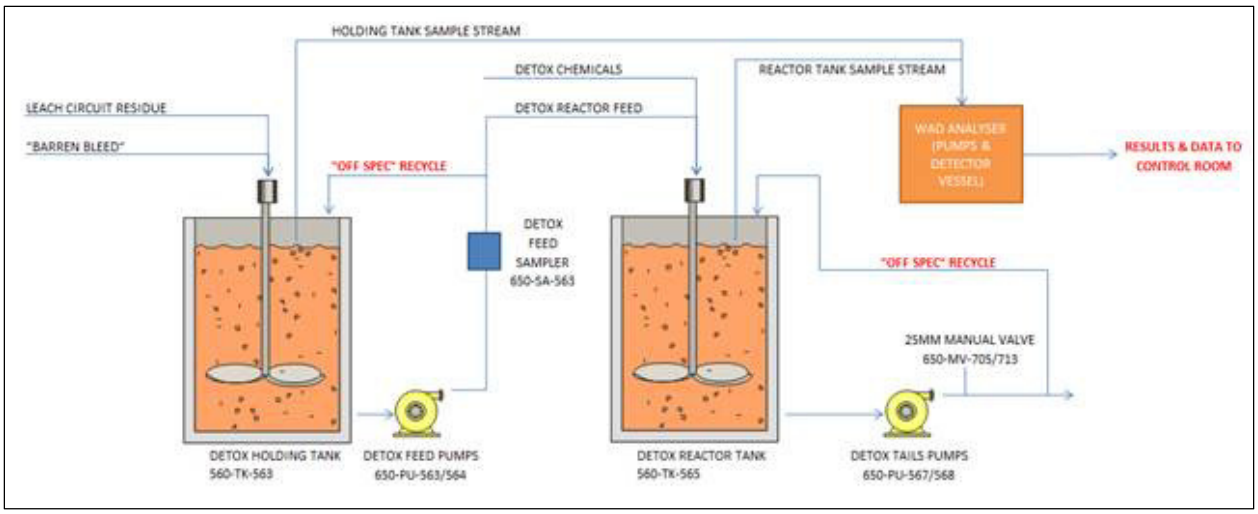
Recommendation:

INAC R33: INAC recommends that station TL-9 be modified to a location where it can serve to monitor the efficacy of the cyanide destruction process.

28.4 TMAC RESPONSE

INAC R33

As has been previously noted, the new metallurgical process in the Doris Mill does not have a barren bleed process in the same form as planned in the previous mill metallurgical design. Instead, the barren bleed stream is internal to the process plant; the bulk of the solution is recycled with a small bleed of <5m^3/h cyanide solution being directed to the detox feed stream. So the "barren bleed" is now a bleed to detox feed as opposed to a possible bleed to tailings or out of the process plant as was previously the case. See the flowchart (below) for the detox (aka cyanide destruction) process.



To ensure adequate process control, both a feed forward and feedback control loop are provided within the detox circuit. The control is based on frequent regular automated analysis of weak acid dissociable (WAD) cyanide in both the detox feed and the detox reactor by a WAD CN Analyser located over the detox reactor tank (650-TK-565). This WAD CN analyser continuously samples, measures and makes adjustments to ensure the detox product is less than the required 1ppm total cyanide. The process control and sampling process is multi-faceted. The first automated sample is sourced from the detox holding tank (650-TK-563) with secondary samples for laboratory analysis also taken using a sampler ~~is~~ located at the detox feed (650-SA-563) on the discharge of pumps (650-PU-563/564) as shown in the attached figure. This two stage sampling process allows pro-active automated adjustment of reagent inputs to match variations in the cyanide concentration entering the detox reactor (i.e. chemical dosage, etc). To verify the effectiveness of the detox process a second automated sample is taken from the reactor itself to give a direct measure of WAD CN in the treated solution. The detox reactor pH and dissolved oxygen are key operating variables; these are measured and controlled using duplicate sensors and controlled by caustic and oxygen addition respectively.

For the purposes of assuring the effectiveness of the cyanide destruction process, the results of the continuous sampling and measurement of the content of the detox reactor tank (650-TK-565) will be used. This is important process control data and is measured on an ongoing basis during Operations. This information will be retained at the mill and the results from the WAD CN sampling will be available for an inspector to review during regular inspections. Regular manual samples and analysis are used to verify the online WAD CN analyser measurements.

In the event the WAD analyser fails, we would then take more frequent manual samples from the detox feed sampler and from one of the 25mm manual valves on the discharge of the detox filter feed pumps aka detox tails (650-PU-567/568) and do manual picric acid tests in the lab. The results from the manual sampling would be

manually entered in to the PLC control system to enable automated control of the detox system to continue. All data will be retained for inspection.

Total cyanide is also monitored within the detox circuit. Total cyanide includes strong iron cyanide complexes as well as the WAD cyanide component. These iron cyanide complexes are precipitated in the detox reactor by adjusting the addition of copper sulphate. This is monitored and controlled based on regular laboratory analysis of iron in the feed and detox reactor. Reagent dosage is adjusted accordingly to ensure final product is less than the required 1ppm total cyanide.

Additionally, the process plant is configured such that out of specification product is not discharged from the process plant. In the event the detox reactor product is 'out of specification' the feed to the reactor can be stopped and product slurry recycled whilst continuing to add reagents until the reactor contents are again within target. After addressing the cause of the issue, the feed to the detox reactor can be restarted.

Given this process and the commitment to make the data available to the Inspector, TMAC see no need to maintain station TL-9.

29. ID# INAC R34

29.1 SUBJECT

4.6 Underground mine water (TL-11 and TL-12)

29.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 17 & 18

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 5.2

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013

29.3 COMMENT

TMAC proposes removing station TL-11 and TL-12 because "groundwater will either be discharged directly to the ocean, or to the TIA and then to the ocean" and "groundwater seepage will be monitored under the Groundwater Management Plan".

INAC is of the opinion that groundwater monitoring should be kept in the SNP so that sampling, which will be done in any case for operations, is reported in the annual report. The results can provide helpful information for understanding where the water is coming from and verifying model predictions.

Parameters which should be tested are discussed in INAC R7 from AMEC Foster Wheeler review memo on the Groundwater Management Plan, point 4 section 4.2 and AMEC Foster Wheeler review memo on the AEMP and SNP revisions, point 5 of section 5.0.

Recommendations

INAC R34: INAC recommends that a station to monitor underground water to be discharged on the surface be included in the SNP, and that parameters tested included those listed in INAC R7.

29.4 TMAC RESPONSE

INAC R34

TMAC accepts this recommendation and refers the reader to TMAC's response to INAC R3 and R7b for further discussion.

30. ID# INAC R35

30.1 SUBJECT

4.8 Discharge from sumps (ST-3, ST-4, ST-5, ST-6, ST-11 and ST-13)

30.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 22 to 25, 31, 33

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013

30.3 COMMENT

Comment:

Six stations are related to discharging from sumps: ST-3 (Discharge from Non- hazardous Landfill pollution control sump), ST-4 (Discharge from Landfarm sump), ST-5 (Discharge from the Plant Site Fuel Storage and Containment Area Sump), ST-6 (Discharge from the Roberts Bay Fuel Storage and Containment Area Sumps), ST-11(Discharge from the Reagent and Cyanide Storage Facility Sumps) and ST-13 (Discharge from Sedimentation Pond (for pad U)). In the present licence, discharge sampling is prescribed once before any discharge and daily when discharging onto the tundra.

In their submitted presentation, TMAC proposed changing the frequency to once before any discharge and once when discharging onto the tundra. The volume of the sumps was discussed during the June 6-8 meetings. TMAC stated that the Non-hazardous Landfill pollution control sump might contain approximately 500m^3 of water when emptied and the Roberts Bay Fuel Storage and Containment Area Sumps might collect approximately 275 m^3 per year.

A single sample collected prior to discharge could be sufficient to properly characterize water contained in a small sump.

Recommendation:

INAC R35: INAC recommends the licensee demonstrate with data they collect from discharging sumps that water quality does not change during discharge and all the water in the sump can be accurately characterized by a reduced number of samples.

30.4 TMAC RESPONSE

INAC R35

Daily sampling during discharge is not typically a requirement of other licences, nor is it of operational value. As discussed during the June 6th Aquatic Monitoring Workshop, the berms are constructed so that each berm drains to a single sump, and berm water is contiguous. As a result, pre-discharge samples are representative of the water contained within the berm as a whole. Day-to-day variability in water quality is possible due to mechanical disturbance, such as strong winds or pumping activity. However, such ephemeral suspension of solids is not justification for daily sampling during pumping, particularly in consideration of the limited ability to transport samples for analysis (flights off site may only occur once or twice a week) and analytical turn around times. These factors mean that discharge is often complete by the time the any discharge sampling results are received. This sampling is therefore not able to provide actionable information, nor was its continuation recommended by the Project INAC Inspector.

31. ID# INAC R36

31.1 SUBJECT

4.9 Runoff from sediment controls (ST-10)

31.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 30

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013, Part D and Schedule D

31.3 COMMENT

TMAC proposes removing station ST-10 (Site Runoff from Sediment Controls) because "rock is used solely for construction on site in accordance with the construction technical specifications". During the June 6-8 meetings, TMAC added that since the construction section of the water licence had monitoring requirements, removing this station would not remove monitoring requirements for construction zones.

Including ST-10 as an SNP station allows a more precise description of the monitoring prescribed in Part D an schedule D of the water licence. This station is also broader than just construction and requires monitoring of all sediment control measures throughout the life of the project.

Recommendation:

INAC R36: INAC recommends keeping station ST-10 as in the SNP.

31.4 TMAC RESPONSE

INAC R36

TMAC understands INAC's position on this matter and is willing to maintain ST-10 as part of the water monitoring program (SNP).

Given that water quality in relation to sediment is the key parameter monitored at this station and real time feedback can aid in implementation of and modification to sediment control measures, TMAC considers it suitable to monitor turbidity instead of Total Suspended Solids at this station. Accordingly, TMAC requests that the monitoring program be adjusted to reflect this change.

32. ID# INAC-1.2

32.1 SUBJECT

1.2 Tailing impoundment area responsible persons

32.2 REFERENCE

- Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 2.1 & Table 4
- Spill Contingency Plan - Hope Bay, Nunavut, TMAC Resources Inc., April 2016, page II

32.3 COMMENT

The list of personnel to contact contains many positions for which the people are yet to be determined. It is understood that not all positions would be filled at this stage in the project, however the list does not seem to be up to date.

The list of Hope Bay emergency phone numbers in the Spill Contingency Plan includes contact names and numbers for the positions of Manager of Mining, Surface Manager and Environmental Coordinator, and these do not appear in Table 4 of the Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual (TIA OMS Manual). Additionally, no contact information is provided for Andy Mortimore, the Mill Manager.

Recommendation:

INAC recommends that the licensee update Table 4 of the TIA OMS Manual, the list of tailings impoundment area (TIA) responsible persons.

32.4 TMAC RESPONSE

TMAC will submit a revised TIA OMS Manual with an updated Table 4 prior to the Public Hearing.

33. ID# INAC-2.2

33.1 SUBJECT

2.2 Contingencies for poor groundwater quality

33.2 REFERENCE

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Sections 2.1 & 2.3.1

5MN047 Doris Amendment: Groundwater Management Plan Commitment, available from the NIRB ftp site:

Groundwater Management Plan Commitment ftp site:

http://ftp.nirb.ca/03-MONITORING/05MN047-DORIS%20NORTH%20GOLD%20MINE/01-PROJECT%20CERTIFICATE/03-AMENDMENTS/AMENDMENT%20No.1/8-TECHNICAL%20REVIEW/06-COMMITMENTS/160211-05MN047-Supplemental%20Information%20Re%20GMP%20Framework-IA2E.pdf

P6-6 Roberts Bay Discharge System: Water Management Options, SRK Consulting (Canada) Inc., June 11, 2015, Section 5

Hope Bay Project, Doris Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual - Hope Bay, Nunavut, TMAC Resources Inc., June 2016, Section 4.2, Table 7

33.3 COMMENT

Item 4c from the Commitment is to describe: "contingencies for unforeseen conditions of low flow, poor quality" groundwater.

TMAC has responded that this is addressed in Sections 8 and 2.2 of the Groundwater Management Plan. Section 8 speaks to unexpected high inflows but does not mention unexpected poor water quality. Section 2.2.1 offers a management response: "If mine water discharge water quality exceed *MMER* criteria, discharge to Roberts Bay occurs via the TIA and/or with treatment."

Our understanding of the comments made by TMAC on this topic, when it was discussed during the June 6-8, 2016 meetings, is that according to their models, groundwater of unexpectedly poor quality could still be discharged to Roberts Bay, through the TIA. Different water quality discharge alternatives are discussed in the Roberts Bay Discharge System: Water Management Options, however, the alternatives

discussed are different proportions of groundwater and TIA water. For groundwater parameters, values used are based on the median concentrations of all sample depths and mixed concentration from hydrogeological modelling, according to the note below Table 6. Median concentrations would not qualify as unexpectedly poor quality.

INAC was seeking assurances that if groundwater of poor quality was pumped to the surface, adequate mechanisms were in place to dispose of the water. TMAC's response to TC-6 demonstrates satisfactorily that should the water require treatment before discharge, the TIA has sufficient capacity to store excess water during the development and implementation of a water treatment method.

33.4 TMAC RESPONSE

Acknowledged.

34. ID# INAC-2.3

34.1 SUBJECT

2.3 Schematic of water storage and removal facilities

34.2 REFERENCE

Hope Bay Project, Groundwater Management Plan – Hope Bay, Nunavut, TMAC Resources Inc., June 2016

Doris Project – Groundwater Management Plan (GWMP) Framework – Final, SRK Consulting (Canada) Inc., March 15, 2016, Section 4.3

34.3 COMMENT

The framework outlines what is to be included in the Groundwater Management Plan. One of the items in the framework which is not found in the Plan is: "A description of the facilities installed and/or on site to be used in the management of groundwater entering the mine. This will include general schematics of water storage and removal facilities."

The explanation given by TMAC during the June 6-8 meetings for the lack of description and schematics was that this was going to be included in standard operating procedures (SOPs) instead of being in the plan. TMAC also mentioned that other relevant information could be found in Table 1 of the Plan.

INAC is satisfied with this answer, provided TMAC indicates where, on site, the plans are located, so they may be reviewed by INAC staff, if required.

34.4 TMAC RESPONSE

Standard Operating Procedures are stored on TMAC's server and are accessed on site in the relevant offices of end users and management. Hard copies are located in Environment and Operations offices onsite, where suitable. These documents will be made available to the Inspector upon request.

35. ID# INAC-4.1

35.1 SUBJECT

4. PROPOSED SURVEILLANCE NETWORK PROGRAM REVISIONS

TMAC submitted a presentation where Table 2 from Schedule J of water license 2AM-DOH1323 is presented with proposed modifications marked in red. Below each slide a rational for the change is included.

There was quite a bit of back and forth when proposed changes were discussed at the June 6-8, 2016 meetings, so the following comments are mostly to state INAC's understanding at the end of the conversation but also to raise points on which we disagree with proposed changes.

35.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323 – presentation, TMAC Resources Inc., June 6, 2016, Slide 3.

35.3 COMMENT

In the table of analytical parameters for different monitoring groups, measurement units for Fecal Coliform are modified from "CFU/100 mL (colony forming units)" to "CFU or MFU/100ml". It was understood that MFU was a mistake and should be MPN (most probable number), so that the measurement units would read "CFU or MPN/100 mL".

35.4 TMAC RESPONSE

Acknowledged.

36. ID# INAC-4.7

36.1 SUBJECT

4.7 Discharge from sedimentation and pollution ponds (ST-1 and ST-2)

36.2 REFERENCE

Aquatic Working Group Meeting: Proposed Surveillance Network Program Revisions for Water Licence 2AM-DOH1323- presentation, TMAC Resources Inc., June 6, 2016, Slides 20 & 21

Nunavut Water Board Water Licence 2AM-DOH1323, Nunavut Water Board, August16, 2013

36.3 COMMENT

TMAC proposes removing stations ST-1 and ST-2 because water will be discharged into the TIA.

INAC is satisfied that if the possibility of discharging to the tundra is removed, these stations can be as well.

36.4 TMAC RESPONSE

No response required.

37. ID# KIA-1

37.1 SUBJECT

Environmental Effects Monitoring

37.2 REFERENCE

N/a

37.3 COMMENT

The KIA has reviewed TMAC Resources Inc.'s Environmental Effects Monitoring (EEM) program for the Doris North Project. The KIA finds the Technical Memorandum dated April 29, 2016, by ERM to be thorough and a well-development program. The monitoring plan provides the sampling locations, monitoring components, measured parameters and indicators, and the rationale for the monitoring program.

The design of the program was informed by the near-field and far-field mixing models (ERM 2016a and ERM 2016b), that predicted rapid mixing of the effluent in the bottom layer of the water column in Robert's Bay, and dilutions between 1,000:1 and 10,000:1 at 250m from the discharge diffuser.

The KIA has no outstanding concerns or issues on the proposed EEM program and believes the plan to be adequate.

37.4 TMAC RESPONSE

No further response required.

38. ID# KIA-2

38.1 SUBJECT

Aquatic Effects Monitoring Plan (AEMP)

38.2 REFERENCE

N/a

38.3 COMMENT

Concerning the AEMP, the plan contains all the main components of an AEMP. It provides the sampling locations, monitoring components, monitoring schedule, reporting and response framework. KIA's comments on the AEMP are provided below:

- 3.1 Study Design Monitoring Sites (Page 10): TMAC is not proposing reference sites the Plan, but rather using background water quality data collected from 2015 and prior to assess changes to water quality, with the rationale that it provides a more robust dataset. Monitoring of a reference site outside of the project site is necessary to tease out project-related and climate related changes to water quality. The Plan proposed to potentially monitor the reference site if project effects to water quality have been detected. The conclusion of project-related effects necessitates the collection of on-going reference data for comparison.
- 3.2 Monitoring Components, Analysis of Effects (Page 11): Water quality parameters will be evaluated for potential Project-related by comparing CCME parameters against historical data. Non-CCME parameters (i.e. TDS) should be included in the analysis to look for change in water quality in its own merit.
- 3.2 Monitoring Components, Analysis of Effects (Page 12): The plan proposed that if monthly water quality concentrations are greater than their 75th percentile concentration in three samples collected over a six-month period the parameter will be analyzed for differences in means. Using the 75th percentile is a good conservative metric to use for additional analysis.
- 3.2 Monitoring Components, Analysis of Effects (Page 12): The plan says that water quality data collected from 2015 and prior will be used as the "before" data since there have been no indications of changes to Doris Lake water quality due to Project activities over the course of the original AEMP. TMAC should include or provide a reference to the statistical analysis that shows that there have been no changes to Doris Lake water quality from 2015 and prior.
- 3.2 Monitoring Components, QA/QC (Page 13): The QA/QC program provides for the collection of travel blanks, field blanks, and replicate samples. TMAC

should explain how the QA/QC results will be interpreted (e.g. acceptable levels for blanks, duplicates, etc.

38.4 TMAC RESPONSE

Study Design Monitoring Sites

In consideration of the limited anticipated Project-influence on the freshwater system in the absence of point-discharges to freshwater, TMAC has proposed that a reference site is not needed for routine AEMP monitoring. Reference data would only provide some additional ability to preclude the Project as a possible source of any change observed in the Doris Lake data. In the absence of concurrent reference lake data, changes observed in Doris Lake water quality must conservatively be attributed to a potential Project effect, thereby triggering the response framework and associated further investigation and/or mitigation. As a result, the risk to not having reference site data for a given year rests with TMAC, in that the frequency of triggering the response framework is potentially increased.

Monitoring Components, Analysis of Effects

Additional base cation and anion parameters will be analyzed in comparison to CCME guidelines (where applicable) and historical data [see response to INAC (AMEC) 4.2.2]. The parameter list for the assessment of effects comprises a wide range of physico-chemical parameters, nutrients, and metals, including integrative parameters such as conductivity that measures changes in the concentration of ions. Assessment of TDS for example, would be redundant with the assessments of conductivity, chloride, sodium, calcium, nutrients, alkalinity, hardness, and metals. Other water quality parameters, such as the trace metals without CCME guidelines measured in the standard water metals analytical suite, will be measured to support future analyses and included in appendices to the annual reports.

Monitoring Components, QA/QC

A comparison of Doris Lake water quality to that of previous years is undertaken each year and reported in TMAC's Aquatic Effects Monitoring Program Report. The evaluation of QA/QC data would also occur as outlined in these reports, with screening of blanks, replicates and detection limits. These reports are available on the Nunavut Water Board's public registry, and are routinely reviewed by the KIA.

39. ID# KIA-3

39.1 SUBJECT

Surveillance Network Program (SNP)

39.2 REFERENCE

N/a

39.3 COMMENT

The KIA has also reviewed the proposed Surveillance Network Program (SNP) revisions and finds them to be adequate and we have no further comments on them.

39.4 TMAC RESPONSE

No further response required.