ACRONYMNS

AANDC	Aboriginal Affairs and Northern Development Canada
AEMP	Aquatics Effect Monitoring Program
ANFO	Ammonium nitrate/fuel oil
AQMP	Air Quality Management Plan
BACI	Before-after-control-impact
CCME	Canadian Council of Ministers of the Environment
DFO	Department of Fisheries and Oceans (Canada)
DoE	Department of Environment
EC	Environment Canada
EEM	Environmental Effects Monitoring
FEIS	Final Environmental Impact Statement
GHG	Greenhouse Gas
GN	Government of Nunavut
HAZID	Hazard Identification
IEAC	Inuit Environment Advisory Committee
IFC	Issued for Construction
IIBA	Inuit Impacts and Benefits Agreement
IR	Information Request
KIA	Kitikmeot Inuit Association
MMER	Metal Mining Effluent Regulations
OMS	Operations, Maintenance and Surveillance
NOC	National Occupational Classification
NWB	Nunavut Water Board
RB	Roberts Bay
TC	Transport Canada
TIA	Talings Impoundment Area
TSS	Total Suspended Solids
VEC	Valued Ecosystem Component
VSEC	Valued Socio-economic Component
WMMP	Wildlife Mitigation and Monitoring Plan

TMAC Resources Inc. Responses to IR Comments on the Doris North Project Terms and Conditions within Project Certificate No.003 and application to amend the Water Licence 2AM-DOH1323

ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
NRCan IR#1	Permafrost	Commenter's introductory remarks to IRs. Introduction: TMAC's amendment application included a revised project description which identifies a revision of the design of the Tailings Impoundment Area (TIA), which is a key change from the 2013 amendment application. The project (approved in 2006) consisted of subaqueous tailings disposal with a water cover at closure. The 2013 amendment application also proposed subaqueous tailings disposal with a reduced water cover at closure. Subsequent modification to mine plans and an anticipated increase in tailings volume necessitated a further modification to the TIA to handle an increased tailings volume. The revised project description now consists of subaerial tailing deposition and a dry cover at closure. NRCan's permafrost review focussed on the revised plans for the TIA and potential issues of stability of the foundation and tailings containment structures. NRCan requests additional clarifications to aid in its technical review as outlined below.	n/a	n/a	No response required.
NRCan IR#1	Design and stability of the proposed Tailings Impoundment Area (TIA)	A significant modification to the Project is the design of the TIA. The approved Project consisted of subaqueous disposal of tailings and a water cover at closure. The planned extension of underground mining means that a greater volume of tailings will be produced and these cannot be accommodated in the TIA that was originally approved. Subaerial deposition (slurry deposition) of floatation tailings is now proposed. Tailings will be deposited in the south end of the TIA between the South Dam and an Interim Dike (new feature). Closure will include a dry cover. Leach tailings which are potentially acid generating will be disposed of as mine backfill. It is NRCan's understanding that the approved TIA was considered to be a walk-away-solution for tailings disposal with no need to ensure integrity of the dams in perpetuity. Under the revised plan for the TIA, the dams and dikes will need to remain in perpetuity. It is therefore not clear whether a site presence and monitoring will be required over the long-term following closure to ensure stability of the TIA including dams and dikes. Freezing of the tailings pile and the foundation (i.e. current unfrozen lake bed sediments) is anticipated and will enhance performance of the TIA. It is unclear whether the potential for frost heave within the tailings (or the foundation materials) and its potential effect on performance of the protective cover (due to deformation) and the pile stability has been considered in the impact analysis. It is also not clear whether pore water expulsion during freezing of the tailings and potential migration of contaminants into the underlying talik and shallow groundwater has been considered in the impact analysis.	a. Please clarify whether frozen conditions in the tailings pile and foundation are required to ensure long-term performance of the TIA. b. Please clarify whether a site presence and ongoing monitoring beyond closure is required to ensure the integrity of the TIA, including dams and dikes, over the long-term. c. Please clarify whether the potential for frost heave, associated with freezing of the tailings and the underlying foundation materials, has been considered in the stability analysis including the potential for deformation and impacts on performance of the protective cover. d. Please clarify whether pore water expulsion during freezing of tailings and potential impacts on shallow groundwater has been considered in the impact analysis.	Technical Comment	a) Frozen conditions in the TIA and beneath the containment dams are expected but are not required to ensure the long term integrity of the facility. Fully thawed foundation conditions have been evaluated to confirm containment dam stability under 'worst-case' conditions. b) Monitoring of the TIA containment dams will be required for a period of time during the post closure phase of the project. It is not anticipated that monitoring will be required into perpetuity. The monitoring program will be defined in the Tailings Operations, Maintenance and Surveillance (OMS) Manual which will be submitted to the NWB prior to the commencement of TIA operations. Triggers will be specified in this plan by which time such monitoring can be suspended, however, for the purposes of the review of this Application it can be reasonably assumed that post-closure monitoring of the dams may be required for a period in the order of five (5) years. c) TMAC confirms that frost heave of the underlying foundation materials has not been considered in the stability analysis including the potential for deformation and impacts on performance of the protective cover. Frost heave is not expected to have any discernable effect on the facility stability; however an analysis demonstrating this will be provided prior to the Technical Review. The closure cover design is conceptual and will be refined in future revisions of the Closure and Reclamation Plan for the Project as the Project moves closer to closure implementation. d) TMAC confirms that pore water expulsion during freezing of the tailings and the potential for effects on shallow groundwater has been considered qualitatively. Shallow groundwater beneath the TIA is confined to the closed talik beneath the TIA and the surrounding active layer. A quantitative evaluation of this will be provided prior to the Technical Review.
NRCan IR#2	Hydrogeology	Commenter's introductory remarks to IRs. Introduction: TMAC's revised project description (June 2015) outlines several changes from the 2013 amendment application which could have an impact to groundwater. These changes include: (1) revision of the design of the Tailings Impoundment Area (TIA) to subaerial deposition with dry cover at closure; (2) disposal of cyanide leach tailings as backfill into the underground mine; and (3) the use of Quarry 3 for the disposal of non-hazardous waste. Following from the permafrost gap analysis (NRCan IR 1), additional clarification is needed with respect to whether frozen conditions in the tailings pile and foundation are required to achieve acceptable seepage rates from the TIA and to minimize impacts to groundwater. Clarification is also needed on whether pore water expulsion during freezing of tailings will have an impact on shallow groundwater. A response to the permafrost Information Requests 1-1 and 1-4 will likely provide sufficient information to clarify these issues. However, an additional IR with respect the TIA is presented below as NRCan IR 2.	n/a	n/a	No response required.

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NRCan IR#2 (*cont'd)*	Hydrogeology (*cont'd)*	Numerical groundwater modeling has been completed using the modeling software FEFLOW to model the talik beneath Doris Lake. The model is well documented and provides detailed information on groundwater inflows into the underground mine. According to the proponent, by year 6, after the last stope is mined, the total inflow to the mine is predicted to be approximately 1,630 m^3/d. Approximately 70% of the mine inflow is associated with water from Doris Lake with the remainder coming from deep regional groundwater. However, NRCan was unable to locate information on groundwater flow into the underground mine once mining has ceased. An additional IR with respect to the post-mining groundwater flow regime in the vicinity of the underground mine is presented as NRCan IR 3. The Quarry 3 Landfill is a non-hazardous waste facility, situated in a quarry within the watershed of the TIA. The landfill will be constructed on competent bedrock within a region of continuous permafrost and will be hydrogeologically isolated due to the presence of permafrost. Any leachate generated is expected to be minimal, non-contaminated, and will accumulate in a sump incorporated into the landfill design. In the event that contaminated leachate is produced, it will accumulate in the sump and be sampled before being pumped or flowing naturally to the TIA prior to discharge to the environment. NRCan did not note any gaps in the proponent's assessment of potential impacts to groundwater resulting from this landfill.	n/a	n/a	No response required.
NRCan IR#2	Seepage from the proposed Tailings Impoundment Area (TIA)	NRCan requests clarification as to whether the proponent has considered how the proposed change to subaerial tailings deposition may affect shallow groundwater quality in the active layer of the permafrost. In addition to monitoring permafrost conditions and ground stability, it may be necessary to monitor seepage rates and groundwater quality of seepage water from the TIA. Such monitoring could be used to ensure that predicted seepage rates and groundwater quality are accurate.	Please clarify whether long-term monitoring of seepage rates and shallow groundwater quality in the vicinity of the TIA will be included in the monitoring plans.	Technical Comment	Monitoring plans for the TIA will be documented in a site-wide Water Management Plan and in the Tailings Containment Area Operational, Management and Surveillance (OMS) Manual (document is analogous to the Tailings Management Plan). Both of these plans will be submitted to the NWB prior to the commencement of TIA operations. TMAC intends to monitor seepage rates down gradient from the North and South Dams. TMAC is not anticipating the need to monitor shallow groundwater in the vicinity of the TIA; as addressed in NRCan IR#1.
NRCan IR#3	Post-mining groundwater flow regime around the underground mine	NRCan requests clarification as to how groundwater flow into the underground mine will change once mining has ceased. NRCan requests clarification on how groundwater inflow rates will change and an approximate time frame for when the groundwater system will reach a post mining state of equilibrium. This information will assist in confirming that the long-term potential contaminants in the underground mine (resulting from disposal of waste) do not have an effect on local groundwater that surrounds the underground mine. Such contamination could potentially occur if there is a groundwater flow reversal once a mine has filled with surface water and groundwater.	a. Please provide clarification on the post-mining groundwater flow regime in the vicinity of the underground mine. b. Please provide information on the time required for the underground mine to fill and clarification on post-mining groundwater regime (flow directions and rates) and potential impacts to the groundwater quality	Technical Comment	a) and b): The project is not anticipated to have adverse effects to groundwater quality. For clarification, once mining operational activities cease, the underground workings within the talik zones will be allowed to refill. At that time, the mine workings will have no further impact on the groundwater regime. TMAC has conceived the mine geometric design such that in all cases the final expected groundwater elevation is well below any surface openings and therefore mine water outflow to the environment cannot occur. Regarding the time required for the underground mine to fill, TMAC plans to present the inflow calculations subsequently, these details are more appropriately considered during the Technical Review process.
EC IR#1	Baseline Data – Water and Sediment Quality	The Proponent completed sampling programs in Roberts Bay from 2009 to 2011 in order to establish baseline conditions. Since then the discharge location has changed and therefore the baseline data collected during those studies may be insufficient to provide an accurate representation of the existing conditions in the new location. According to figures 4.3-13 (water quality sampling locations), and 4.3-14 (sediment quality sampling locations) limited data has been collected in the proposed discharge location. The Proponent proposes to release the effluent at a depth of 40 m. The proposed release point is below the pycnocline which makes it unlikely that surface or near shore samples will be useful in establishing a baseline that will aid in detecting changes resulting from effluent discharge.	a) Outline what additional baseline sampling will be undertaken in Roberts Bay to ensure that project related changes can be detected; b) Describe how plume modelling was incorporated into the selection of appropriate baseline sampling locations within Roberts Bay.	Request for Additional Information	a) There is sufficient baseline data to test for Project effects for physical profiles (temperature, salinity, dissolved oxygen), water quality, and primary producer biomass/taxonomy in the deep waters of Roberts Bay near the proposed discharge site. While the terminus of the proposed pipeline has changed slightly since 2011, three years of data have been collected near the current proposed end-of-pipe (sites RB1, ST4, and WT4; Figure 4.3-11 of document P4-1) and would be used for an effects analysis given the similar physical and chemical nature of the Roberts Bay deep waters (see Fig. 4.3-11 of document P4-1). Water and physical data was collected 4x in each of 2010 and 2011 and twice in 2009 at 4 depths in water column. Phytoplankton data was collected on multiple occasions in 2010-11 and in August 2009. This data included sampling multiple depths below the pycnocline, and any effects analysis would exclude near-shore surface data. Additional baseline deep water sediment quality and benthos samples will be collected in Roberts Bay (and reference site) prior to construction to support the development of the Aquatic Monitoring Framework. b) Plume modelling was not used for site selection. Initial baseline sites were selected prior to the consideration of ocean discharge, but multiple sites were placed 1-2 km apart throughout the length of the inlet to be able to determine Project effects over a broad spatial scale. Once ocean discharge was considered, additional baseline end-of-pipe (RB1) and far-field sites (RB2) were added (and coincided with past baseline sites; ST4/WT4 and ST5/WT6).

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EC IR#2	Marine Water Quality Objectives	CCME guidelines for parameters in the marine environment are limited and it is logical to use the guidelines where they exist. However, EC notes that the effluent may contain contaminants of concern for which guidelines do not exist. In order to understand potential effluent related impacts the constituents of the effluent must be identified and assessed to determine if they are of potential concern. Guidelines/objectives/thresholds for action should be developed for any contaminants of concern identified in the effluent so that project related impacts can be identified. In some cases it may be appropriate to adopt guidelines from another jurisdiction or to development of site specific guidelines to encompass any contaminants of concern that may be elevated in the effluent.	a) Identify the contaminants of concern in the TIA and groundwater effluent that could cause impacts to the Roberts Bay receiving environment; b) Describe the potential impacts to the Roberts Bay receiving environment from contaminants of concern identified in a); c) develop objectives/thresholds for action for contaminants of concern for which there are no CCME guidelines are identified.	Request for Additional Information	TMAC has evaluated the discharge from the proposed amended Doris operations against existing regulations governing effluent discharge (MMER) and guidelines for protection of marine life (CCME). The contaminants included in these two instruments have been carefully considered by experts in environmental protection and mining operations from industry, government and the academic scientific community. Accordingly, their inclusion in the respective instruments has been fully considered and adjudicated by these expert bodies. In that respect the contaminants included in these instruments represent the relevant contaminants of concern for an evaluation of potential environmental effects associated with the amendment application. As required by MMER, an Environmental Effects Monitoring Program (EEM) will be established for Roberts Bay. This program will serve to as an early warning system of any effects that have not been predicted. As part of this early warning system, the EEM will be used to identify any parameters of concern that may require site specific consideration to ensure protection of the receiving environment. TMAC is of the opinion that the effects assessment provided with the Amendment Application (document P4-1) adequately assesses the effects of those parameters that have been identified as requiring limited discharge.
EC IR#3	Sediment Baseline Exceedances	The Proponent indicates that when sediment quality sampling was completed at the one deep location (RB1) it was found that copper and chromium exceeded the ISQGs but remained below the PEL. Copper and chromium may naturally exceed guidelines in the receiving environment around the discharge therefore an accurate baseline for these parameters is required to assess changes due to effluent deposition.	Clarify what copper and chromium guidelines/indicators will be used to identify project related impacts on sediment- associated biota.	Technical Comment	Project-related effects will be assessed using a before-after-control-impact (BACI) design following Metal Mining Effluent Regulations (MMER) and Environmental Effects Monitoring (EEM) recommended critical effect sizes, power, and probabilities. For benthos, if an assessed endpoint (density, diversity, etc.) at any site in Roberts Bay significantly decreased over time compared to a reference site, these results would be compared against a suite of sediment quality (SQ) parameters (including chromium and copper) to determine if there was a concomitant statistical change in SQ. To clarify for the reviewer, in the case of chromium and copper, statistically significant increases in concentrations would be evaluated against changes in particle size and BACI tests for water quality to determine if the increase was likely due to natural enrichment (or environmental heterogeneity) or due to Project activities.
EC IR#4	Roberts Bay Marine Life Baseline	Section 4.4.1 indicates that in order to establish baseline phytoplankton and zooplankton samples were collected throughout Roberts Bay between 2009 and that benthos were sampled in shallow water near the southern and southwestern shores of the Bay and at one deep location near the centre of the Bay. Given that baseline sampling occurred at different depths throughout Roberts Bay they are representative of the communities at those depths. It would therefore be inappropriate to draw conclusions about overall baseline conditions based on the pooling of data from shallow and deep sites. Depth specific baseline conditions should be determined. It would appear that insufficient data was collected to determine a benthic invertebrate baseline in the receiving environment of immediately adjacent to the diffuser.	a) Describe how data will be pooled and analyzed to establish baseline given depth differences; b) Describe what additional baseline sampling is to be conducted in order to accurately determine baseline conditions in the receiving environment around the diffuser.	Technical Comment	a) Baseline data to test for Project effects will be pooled from similar depths or comparable environments. For example, water quality and physical profiles will be pooled from the several years of data that exist from relevant sites (e.g., sites RB1, ST4, and WT4; Figure 4.3-11 in document P4-1) that are proximate to one another. Shallow sites will not be pooled with deep sites as indicated in EC IR#4. b) Collection of additional benthos and sediment quality data is proposed for the deep-waters prior to construction of the outfall system.
EC IR#5	Sediment Quality	Marine sediment quality is only briefly mentioned in the environmental effects assessment which indicates that the discharge of TIA water and groundwater through the diffuser in Roberts Bay is expected to have little interaction with the sediments. Further, the Proponent indicates that the effluent will meet MMER limits and will therefore have a low concentration of suspended solids. Based on this assessment TMAC does not anticipate adverse effects on Roberts Bay sediments. The EIS addendum indicates that the effluent will be discharged from a diffuser located on the ocean floor in close proximity to the generally fine natural sediments of Roberts Bay. The predicted low TSS concentration in the effluent does not eliminate all potential impacts to sediments from other contaminants, such as metals, present in the effluent.	a) Provide information to support the conclusion that impacts to marine sediments are unlikely. b) Provide any modelling results on impacts to sediments that could result from increased metal concentrations in the effluent and describe the potential impacts.	Technical Comment	a) and b) The discharge will be less dense than the receiving environment and will therefore form a buoyant plume and not interact with the bottom sediments. Maximum total suspended solids (TSS) concentrations to be discharged will be 15 mg/L, which is comparable to that seen in the deep waters of Roberts Bay (Rescan 2010; 2011; 2012). Furthermore, this effluent will be subject to acute toxicity testing (as per MMER) and will therefore be safe for marine life. An Aquatic Monitoring Framework will be developed to monitor the sediment quality and benthos near the outfall. Given these attributes, we predict there will be no significant effects to sediment quality or marine life resulting from the effluent.

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EC IR#6	Effluent Quality	Figures 4.5-1 to 4.5-3 include projections of concentrations of several parameters (total N, Salinity, As, Cd, Cr and Hg) in the Roberts Bay receiving environment. Section 4.5.3 also indicates what the maximum concentration of the above noted parameters can be without resulting in receiving environment concentrations exceeding CCME marine water quality guidelines. However the Proponent does not indicate what the concentrations of these parameters are expected to be in the effluent nor what impacts might occur in Roberts Bay.	Provide: a) A comprehensive list of contaminants to be evaluated in the receiving environment, and that discharge targets identified. b) Estimates of predicted effluent chemistry for all parameters at end of pipe; c) Figures presenting the expected concentrations within Roberts Bay over time (operations through post-closure) based on actual effluent quality predictions for all parameters in the effluent which may be above background levels in the receiving environment; d) An estimate of the range of groundwater inflow that is predicted, including episodic high inflow scenarios, and how these inflow fluctuations would affect concentrations of each parameter of concern in the effluent; e) A description of how effluent salinity will be managed to ensure effluent is non-toxic at end of pipe and is appropriate for the immediate receiving environment.	Request for Additional Information	a) See EC IR#2. TMAC commits to evaluate water quality parameters with established CCME marine WQ guidelines and will consider additional WQ benchmarks if the annual aquatic monitoring framework reveals that the Project is adversely altering ambient water quality. b) The predicted effluent chemistry for all parameters at end of pipe is provided in the application. It can be found in document P6-10 (Site-Wide Water and Load Balance). c) Predictive water quality results are included within the application P4-1 (Identification of Potential Environmental Effects and Proposed Mitigation, Section 4.5.2) including monthly time-stepped results for TIA/groundwater discharge during 6 years of operation. Using a conservative approach, the effluent parameters used represent maximum concentrations estimated from Site-wide water balance and load. As outlined in P4-1, Section 4.5.2 (pg 4-58) the maximum effluent used to determine water quality in Roberts Bay is higher than the estimated effluent quality presented in P6-6. At closure this discharge is stopped and has not been included in the predictive water quality presented. d) The groundwater inflow predictions to the mine can be found in document P6-3 (Groundwater Inflow and Quality Model) provided with the application. This document includes a comprehensive discussion on range of inflows and expected water quality. e) The maximum predicted effluent salinity is 26.7 ppt which is less than the deep waters of Roberts Bay (~28 ppt). The effluent will pass acute toxicity tests and will be subject to water quality testing in accordance with the MMER provisions. Given these attributes, salinity will not be toxic at end-of-pipe and will not affect marine life in Roberts Bay. In accordance with the provisions of the MMER, TMAC proposes to work with EC to define a substitute species for use on occasion when the effluent salinity is greater than 10 parts per thousand. Given current knowledge of the effluent characteristics, it is anticipated that the effluent will be non-toxic to the appropriate substitute species.
EC IR#7	Effluent Quality - Toxicity Testing	The Proponent states that "Any TIA effluent and groundwater discharged to the marine environment will meet the MMER limits prior to discharge. This includes passing the required MMER toxicity tests." No discussion has been provided regarding toxicity testing and whole effluent predicted characterization.	a) Describe any toxicity testing carried out on the effluent to date, including testing results; b) Describe any proposed toxicity testing of effluent at end of pipe.	Technical Comment	a.) On October 31, 2010 a groundwater sample was collected for 96-h acute fish toxicity testing. The salinity of the sample was 31‰. Given that rainbow trout fry cannot be acclimated and tested at a salinity of 31‰, and that an Environment Canada-sanctioned 96-h acute fish toxicity test method exists for 3-spine stickleback, which can be tested at this elevated salinity, testing was conducted with that fish species. Testing was conducted by the accredited IRC Integrated Resource Consultants aquatic toxicity testing laboratory in Vancouver. Testing was initiated within the specified sample holding times, with the groundwater sample tested at the following dilutions (all dilutions are in % and were achieved using clean seawater): 100, 50, 25, 12.5, 6.25, control. All quality assurance / quality control parameters and test procedures were met. 70% of the stickleback were alive at the 100% groundwater concentration after 96h, 100% survival was recorded in all other tested concentrations. The 96-h LC50 value was thus >100%. Accordingly, the groundwater sample was not acutely lethal as defined in the Metal Mining Effluent Regulations (MMER). b) Proposed toxicity testing on end-of-pipe effluent will be conducted in accordance with Metal Mining Effluent Regulations (MMER) requirements, including acute lethality testing (Reference Method EPS 1/RM/13) and sublethal toxicity testing (Schedule 5, paragraph 5(4)).
EC IR#8	Aquatic Effects Monitoring Program	The Proponent indicates that the current version of their AEMP includes two near-shore sites in Roberts Bay and one reference site in Ida Bay. The Proponent has indicated that they intend to modify the monitoring program to include the new areas that may be impacted.	Provide an updated version of the AEMP as soon as possible so that the Proponent can identify sampling sites and collect baseline data prior to construction.	Request for Additional Information	TMAC commits to developing and Aquatic Monitoring Framework, which will be inclusive of a scope typically addressed in an Aquatic Effects Monitoring Program (AEMP), yet will extend to the marine environment. Development of the Framework will follow the Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT (INAC 2009). This process calls for establishment of a multi-stakeholder Working Group to review working drafts of an AEMP. Accordingly, TMAC will commence the process of Framework development following the technical review of the Application in order to adequately consider Party comments and any additional considerations that may arise through the technical review process. TMAC anticipates initiating the Working Group and developing of a first draft Study Design in Q1 2016, with a final Framework in place prior to entering operations in January 2017.

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EC IR#9	Marine Outfall Discharge	The Proponent proposes a marine outfall which will be designed to disperse effluent at a depth of 40 m such that mixing is optimized and effects on the upper productive layer of the water column are minimized. The Proponent has indicated that the diffuser will be anchored on the sea floor and discharge will be occurring at a rate of up to 81 L/s. Sediment composition analysis shows that this area is primarily composed of fine material. The turbulence caused by the effluent flow will cause scouring of the adjacent sediments which will result in disturbance to the benthic areas and turbidity in the water column. However: a) Section 4.5 of the addendum suggests that the salinity of the effluent could be up to 260 PPT (many times the average salinity found in Roberts Bay) which would make the effluent negatively buoyant and more likely to impact the sediments. b) The Proponent response to EC IR #4 (April 18, 2014) states that: ….. "The current design of the outfall includes mitigation measures to avoid and prevent disturbance of the bottom sediments. Risers branching off the diffuser have been designed to direct the turbulent jets outward horizontally and upwards. The buoyancy of the discharge will deflect the plumes upward in the water column which will avoid and minimize disturbance of the bottom"	a) Clarify the statement that the buoyancy of the discharge will deflect plumes upward; and discuss the effects of differences in salinity and temperature between the discharge and the marine receiving waters. b) Identify monitoring and mitigation measures which will be used to ensure the outfall is performing as predicted;	Technical Comment	a) The density of estuarine waters are controlled primarily by salinity and less so by temperature. In both cases, the effluent will contribute to decreasing the ambient density leading to a positively buoyant plume (i.e., lower salinity and warmer temperatures). The effluent has a maximum predicted salinity of 26.7 ppt (Table 4.5-3, Package 4) which is less than the ~28 ppt that is present year around in the deep waters of the bay (see Figs 4.3-10 and 4.3-11, Package 4; Rescan 2010, 2011, 2012 (These reports are available directly from TMAC upon request from the Commenter)). Also, the effluent temperature must be above 2°C to inhibit freezing, which is warmer than the annual deep-water temperatures found in Roberts Bay (range: -1.0°C to -0.4°C), and therefore also contributes to the buoyancy of the effluent. The 260 ppt salinity mentioned in the comment refers to the theoretical maximum salinity that could be discharged that would increase the salinity in the effluent trapping plume by 10% over ambient salinity (as per CCME PAL Guidelines (marine) salinity guidelines). In reality, the maximum predicted salinity of groundwater and/or TIA water to be discharged into Roberts Bay will be lower than the inlet salinity (see description above). This is one of the primary mitigations regarding the effluent so it is less dense than ambient Roberts Bay water. This will maintain its positive buoyancy so as not to interact with the sediments, and is trapped below the pycnocline so as not to interact with the surface mixed layer (no nutrient inputs to euphotic zone). b) The efficacy of the outfall performance will be monitored based on an approved aquatic monitoring framework in Roberts Bay.
EC IR#10	Closure Water Management	The Proponent indicates that at closure the TIA waters will be drawn down, with year-round pumping of the dewatering flows from the TIA to the mixing box and on to Roberts Bay at a rate of 4000 m^3/day. At closure the effluent will consist of TIA water only, as groundwater collection will cease at closure and no longer be pumped to the mixing box. Appendix B of the Site –Wide Water and Load Balance presents figures B1 – B17 which show predicted water quality in the TIA over time. At the time of drawdown, a number of the parameters have predicted concentrations that are elevated well above CCME guidelines. Table 6-2 shows low salinity in the TIA waters at closure; 4000 m^3/day of fresh water would be discharged to Roberts Bay.	a) Describe contingency measures that are available if the water in the TIA is not suitable for discharge to the marine environment. b) Provide information on the potential effects of discharging 4000 m^3/day of fresh water to Roberts Bay?	Technical Comment	a.) The TIA has been designed with sufficient storage capacity so that in the event that conditions develop and the water is not suitable for discharge to Roberts Bay the water can be retained in the facility for an extended period of time. The amount of storage capacity will vary from year to year across the life of the mine but in all cases there will be sufficient time (measured in years) to identify the root cause of the water quality issues and to design and commission a water treatment facility to address specific contaminants of concerns should it be determined necessary to do so in order to meet discharge criteria. b) There would be a small effect on buoyancy-driven flow (thermohaline or estuarine circulation) and trapping layer salinity in the bay should the effluent discharge to Roberts Bay is comparable to freshwater of the Project area. The circulation and flushing of the Bay is dominated by wind-driven flows in summer (Rescan 2011) and the buoyancy-driven (estuarine) flows of mixing fresh and marine waters are comparatively small. Therefore, having freshwater discharged from the pipeline will have a minor effect on circulation or marine quality in Roberts Bay.
EC IR#11	Loss of migratory bird habitat	The Proponent explains that there is a possibility that the water level in Doris Lake could change temporarily as a result of encountering groundwater while mining under the lake. The Proponent assessed possible effects to fish habitat under water loss scenarios greater than those currently permitted but did not assess the possible loss of migratory bird habitat. Paragraph 6(a) of the Migratory Bird Regulations states that no one shall disturb or destroy the nests or eggs of migratory birds. Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities–including but not limited to draining or flooding land, vegetation clearing or using fishing gear. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is known as incidental take. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents.	Indicate if water level reductions could occur during the period when migratory birds are present and provide an assessment of potential effects on migratory bird habitat resulting from the activities propose under this amendment including: a) quantifying potential habitat loss in terms of lost wetland, water surface area and/or exposed soil; b) summarizing available migratory bird information for Doris Lake and other potentially impacted areas downstream; and c) assessing whether there is a risk of incidental take of migratory birds, the nests of migratory birds and/or their eggs due to changes in water level in Doris Lake and other possible impacted areas downstream d) identifying possible mitigation measures to address any risks.	Technical Comment	a) A survey of the shoreline of Doris Lake was conducted in September, 2015 by Fraser Ross, Consultant ERM. The shoreline is predominantly bedrock and/or cobble boulders with only a few vegetated riparian areas with willows present (personal communication, Fraser Ross Sept. 2015). There are no wetland areas with emergent vegetation that would be most suitable for nesting waterbirds that could be affected by water drawdowns such as loon species. Empty nests were observed on rocky islands towards the south of the lake however, due to the fact that they were not located directly adjacent to the water's edge and the substrate present, they are assumed to be gull nests. b) Species that have been observed on or within 200 m of Doris Lake during aerial waterbird surveys include: greater scaup, Pacific loon, red-breasted merganser, red-throated loon, long-tailed duck, Canada goose, yellow billed loon, and herring gull. c) Model predictions indicated that the expected drawdown of Doris Lake is 23 cm with a slight reduction in discharge to Doris Creek. Water drawdowns would be a concern for nesting loons due to their nest proximity to water and their lack of mobility on land. However, appropriate habitat for loon nesting is not present along the shoreline of Doris Lake. Similarly, habitat along Doris Creek would not be appropriate for loon nesting as they nest on shorelines of ponds and lakes. As such, incidental take is not anticipated to be an outcome of decreased water levels in Doris Lake and downstream areas. d) No additional mitigation measures have been identified, however, a remote camera was set up along the eastern shoreline of Doris Lake in 2015 that will assist with determining wildlife use of the area.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
EC IR#12	Shipping impacts on marine birds	The Proponent states that expanded mining activities will result in additional materials shipped to the site and that marine transport activities will remain limited to seasonal resupply and waste backhaul. Melville Sound is part of a larger area of national importance for migratory birds that EC refers to as a Key Habitat Site (KHS). The Bathurst and Elu Inlets KHS supports more than 10% of the national populations of Pacific Common Eider and Thayer's Gull. Project related marine shipping has the potential to negatively impact marine birds during feeding, brood-rearing, staging and migration periods. Marine shipping also has the potential to cause the direct loss of marine birds through collisions and oil spill incidents.	a) Assess how much marine shipping traffic will increase as a result of the activities proposed under this amendment. b) Describe any changes to potential marine impacts as a result of the activities proposed under this amendment.	Technical Comment	a) The activities proposed will lengthen mine life, but not increase annual shipping levels. Annual shipping activity will be similar to that conducted to date. Generally, shipping will consist of one tanker of fuel, two freighters of cargo (east and west port sources) and barge (river route) traffic of varying tonnages based on cost and availability of supplies. b) No changes to marine impacts due to this application are anticipated.
EC IR#13	Marine bird surveys	The Proponent conducted seabird surveys aboard a ship from 10-12 August 2010 between Roberts Bay and Cambridge Bay. Few birds were observed during these surveys and details on the methodology were lacking to provide any weight to the observations or conclusions. The survey was also not summarized in the 2010 Wildlife Mitigation and Monitoring Program Annual Report. Melville Sound is part of a larger area of national importance that EC refers to as a Key Habitat Site (KHS) for migratory birds. The Bathurst and Elu Inlets KHS supports more than 10% of the national populations of Pacific Common Eider and Thayer's Gull. Marine shipping could potentially lead to disturbance to marine birds during feeding, brood-rearing, staging and migration periods. Marine shipping could also potentially lead to the direct loss of marine birds through collisions and oil spill incidents.	Provide the following information regarding the ship-based seabird surveys described in Section 4.4.3.2: a) a map indicating the ship survey route including the survey effort and observations along that route; b) the source for the selected methodology; c) the general weather and ice conditions during surveys; and d) a description of the observer's experience in conducting ship based seabird surveys.	Request for Additional Information	a) Results of this survey are included in a supplementary report "Hope Bay Belt Project - Marine Wildlife Baseline Report, 2011" by Rescan Environmental Services. Please see Appendix 2.0 Figure 3 for the survey route within the marine regional study area. b) Survey methodology was based on Kenyon et al. 2009. Atlas of Pelagic Seabirds off the west coast of Canada and adjacent areas. Technical Report Series No. 499. CWS, Pacific and Yukon Region, BC with modifications in regards to survey distance based on Hyrenback et al. 2007. Optimizing the width of strip transects for seabird surveys from vessels of opportunity. Marine Ornithology 35:29-38. c) The survey was conducted September 9th - 12th, 2010 (August was a typo and nothing was observed on September 9th). Weather conditions were primarily cloudy with an average of 15 knot winds and calm waters. One day of surveying, September 10th, 2010 winds increased to 25-30 knots and swells to 30-50 cm after 17:00. d) Damian Sean Powers was the biologist who conducted the survey. He has over 40 years of field biology experience including marine mammal and seabird work in Nunavut, off the British Columbia coast near Vancouver, in the Queen Charlotte Islands, in the Gulf of Alaska and the Bering Sea.
EC IR#14	Overwintering of fuel barges	The Proponent proposes to maintain the ongoing option of overwintering fuel in vessels and/or barges in Roberts Bay in the future to allow some logistical flexibility. The Proponent indicates that the activity would occur in full compliance with all applicable regulatory requirements. Melville Sound is part of a larger area of national importance that EC refers to as Key Habitat Site (KHS) for migratory birds. The Bathurst and Elu Inlets KHS supports more than 10% of the national populations of Pacific Common Eider and Thayer's Gull. Overwintering fuel barges could potentially lead to the direct loss of marine birds through oil spill incidents. This was originally proposed as a temporary strategy to be used when there was insufficient fuel storage on site.	Given the complexities of an arctic oil spill response: a) Clarify when sufficient on-land storage will be constructed to avoid the use of overwintering fuel barges as a long term fuel storage option; b) provide an assessment of alternatives to this fuel storage strategy including a rationale for not implementing a permanent land based storage solution; c) describe what procedures will be implemented to ensure that overwintering barges are regularly inspected; d) identify the mitigations that will be in place to detect and clean up a spill from such a vessel.	Technical Comment	TMAC would like to clarify the circumstances around which fuel vessels may overwinter in Roberts Bay. The current Project on-land storage capacity is sufficient to meet Project needs and no expansion is currently planned or required. Fuel has been and will continue to be received on site via fuel barges. The annual fuel offload process can take up to three months to efficiently transfer the fuel from Roberts Bay to Doris Camp with the minimum of handling. Off-loaded barges may overwinter following fuel offloading if they have missed the ice-free window for departure. The overall management of fuel will not change in nature or scope and all activities will continue to be subject to, and conform with, Transport Canada review and regulation, the primary authority having jurisdiction of fuel transport. Appendix 3 includes the Table of Contents for TMAC's current Oil Pollution Prevention Plan/Oil Pollution Emergency Plan. This is a large report file and TMAC would be pleased to provide this document to the reviewer directly, upon request.
AANDC IR#1	Water Quality	On-site laboratory removed from scope of application Rationale: Existing water licence includes commitment to build an on-site laboratory. Page v of Executive Summary states that "The revisions that TMAC is requesting to TIA water management (which include treatment, if needed) will ensure that discharge meets required criteria and as such, the on-site laboratory previously proposed by Miramar Hope Bay and described in the Project Certificate is no longer necessary." It is not clear how the improved water quality predictions with the revised Tailings Impoundment Area (TIA) plan will lead to the removal of the on-site laboratory as ongoing water quality monitoring will be required.	Provide clarification or the methodology and rationale on how the improved water predictions can be verified if on-site water quality monitoring laboratory is not required.	Technical Comment	The on-site laboratory identified in the Project Certificate was required to confirm water quality met discharge criteria prior to discharge. Under the current Project Certificate and Water Licence, Tailings Impoundment Area (TIA) effluent is permitted to discharge seasonally into a low flow, sensitive freshwater creek, and so frequent monitoring during discharge was required. With the change to a marine discharge strategy, there will no longer be a discharge to the creek, so monitoring to the extent that an onsite lab would be needed is no longer required. Further, with the change in mill process from Merrill Crowe to resin in leach, and tailings disposal wherein leach tailings are disposed of underground instead of co-disposed in the TIA, source terms have changed and metals levels in the TIA effluent will be significantly reduced. Based on the water and load balance (document P6-10 submitted with the Application), metals are not predicted to be of concern; routine analysis provided by an off-site laboratory is sufficient to confirm effluent quality.

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TMAC Resources Inc. Responses to IR Comments on the Doris North Project Terms and Conditions within Project Certificate No.003 and Application to Amend the Water Licence 2AM-DOH1323

ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC IR#2	Water Quality	Supporting document not included in the application Rationale: Basis for process water source terms referenced in Section 4.2.4, P6-10 and for exposed tailings sources terms referenced in Section 4.2.6, P6- 10 is in a supporting document not included in application. As a result there is insufficient information upon which to base an informed decision.	Please provide "Geochemical Characterization of Tailings from the Doris Deposits, Hope Bay", dated April 2015 by SRK.	Request for Additional Information	"Geochemical Characterization of Tailings from the Doris Deposits, Hope Bay", dated June 2015 by SRK was provided with the Application as document P6-12. This is an updated version of the April 2015 version document; the document reference date should have been listed as June 2015, not April 2015. The primary differences between the April version and June versions are editorial, not technical.
AANDC IR#3	Water Quality	Supporting document not included in the application Rationale: Basis for some groundwater quality assumptions referenced in Section 4.2.3, P6-10, is provided in a supporting document not included in the application. As a result there is insufficient information upon which to base an informed decision.	Please provide "Hydrogeological Modeling of the Proposed Doris Mine, Hope Bay Project", dated May 2015 by SRK.	Request for Additional Information	"Hydrogeological Modeling of the Proposed Doris Mine, Hope Bay Project", dated June 2015 by SRK was provided with the Application as document P6-3. This is an updated version of the May 2015 version document; the document reference date should have been listed as June 2015, not May 2015. The primary differences between the May version and June versions are editorial, not technical.
AANDC IR#4	Water Quality	Supporting document not included in the application Rationale: Report makes several conclusions (e.g., kinetic test results) by referring to a supporting document not included in the application. As a result there is insufficient information upon which to base an informed decision.	Please provide "Static Testing and Mineralogical Characterization of Waste Rock and Ore from the Doris Deposit, Hope Bay - Supporting Data", dated May 2015 by SRK.	Request for Additional Information	"Static Testing and Mineralogical Characterization of Waste Rock and Ore from the Doris Deposit, Hope Bay - Supporting Data", dated June 2015 by SRK was provided with the Application as document P6-14. This is an updated version of the May 2015 version document; the document reference date should have been listed as June 2015, not May 2015. The primary differences between the May version and June versions are editorial, not technical.
AANDC IR#5	Mine Water Quality and Water Treatment Plan	Lack of discussion describing potential loadings from mine water that has come in contact with underground mine workings (i.e., potential for acid rock drainage and metal leaching). Rationale: There is no discussion regarding potential metal loadings from the exposed mine working to generate acid rock drainage and metal leaching. A source term for this mechanism is not readily apparent in Section 4.2, P5-10. In Section 2.2, P5-3, it states that “additional treatment of contact water is expected”, where contact water refers to water in contact with ore and waste rock. As per item 8, additional details regarding the treatment system are requested. As a result there is insufficient information upon which to base an informed decision.	Please provide the study describing the groundwater inflow predictions to the mine, including inflows from Doris Lake and groundwater.	Request for Additional Information	The groundwater inflow predictions to the mine, including inflows from Doris Lake and groundwater, can be found in document P6-3 provided with the application: "Hydrogeological Modeling of the Proposed Doris Mine, Hope Bay Project", SRK 2015.
AANDC IR#6	Water Management & Treatment	Potential effects from additional water losses from Doris Lake into the underground mine Rationale: Water losses from Doris Lake are, as stated in the Executive Summary, “predicted to result in serious harm to fisheries and an Offset Plan and DFO Authorization will be obtained"; however, that statement contradicts the following statement in Section 2.5.3: "it is anticipated that the drawdown of water from Doris Lake will not result in adverse effects on fish and fish habitat as natural variability in water level and ice thickness is similar to maximum predicted drawdown depth.	Please provide information describing how estimated losses from the lake are determined, and the fate of the lake as a result of these losses.	Technical Comment	Information describing the groundwater inflow modelling is discussed in document P6-3, (Hydrogeological Model), submitted with the Application. As presented in document P4-1 (Effects Assessment, pg. 2-26) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. The hydrologic assessment indicates a lake level decrease of up to 0.23 m during winter; this change is within the natural range of water level and ice thickness and is not expected to result in adverse effects to fish and fish habitat in Doris Lake. To confirm this assessment, TMAC completed a field study on Doris Lake in fall 2015 and included a detailed habitat survey around the entire perimeter of the lake, focusing on the 1.5 to 4 m zone, the primary area of concern immediately below natural lake ice, where eggs and larvae left by fall-spawning fish overwinter. If the lake is drawn down below the natural range, eggs and alevins close to the ice could perish. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. These field data will be summarized in Q4 2015 as part of the self-assessment process to determine effects. The field information will be assessed in conjunction with existing fisheries and hydrological baseline data to accurately quantify potential effects and if the analysis of the field program results do in fact indicate that the drawdown of Doris Lake will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed.
AANDC IR#7	Water Management & Treatment	No sensitivity analyses reported (e.g. wet and dry years) Rationale: It would be helpful to see sensitivity analyses reported for the hydrologic modelling. The report discussion is primarily based on average flows and reported conservative assumptions, but the basis for these assumptions are not demonstrated in detail. As a result there is insufficient information upon which to base an informed decision.	Please provide an analysis of the hydrological effects on the design in wet and dry years and show how the system can handle the differing conditions.	Request for Additional Information	The SRK water and load balance does include a stochastic analysis of variable hydrologic conditions illustrating the system sensitivity (P6-10 Water and Load Balance) included in the amendment application

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AANDC IR#8	Water Management & Treatment	Details of proposed treatment plant and/or management plan if fail discharge guidelines Rationale: A commitment is made to treat water before discharge if required, however no details are provided that might describe this contingency measure and/or what would trigger this type of action (beyond guideline failures, which may not provide sufficient warning to have a new treatment system in place). Depending on the type of treatment that may be needed, there could be a significant lead time. It is understood that current predictions are that no treatment will be needed beyond the existing management plans, however little rationalization is provided. In addition, the description of the interaction between the two different water sources that may require treatment (underground mine and tailings impoundment area) is limited.	Please provide further details regarding water treatment plans and a description of the management processes that will be in place to help ensure that sufficient early warning signals are built into the environmental management system such that the need for treatment, if required, can be proactively identified and installed before water quality criteria failures.	Request for Additional Information	Water treatment has been identified by TMAC as a contingency measure in the event that conditions develop and water quality is not suitable for discharge to Roberts Bay. Together, the MMER, Water Management Plan and the Tailings Operation and Maintenance Surveillance Manual will detail the sampling frequency that will be implemented to enable detection of changes in water quality over time so that appropriate adaptive management action can be taken. A revised Water Management Plan was submitted with the application (document P5-3): the current approved Plan has been updated to reflect the proposed project changes, and will be revised again should the need for treatment arise. The Tailings OMS manual (analogous to the Tailings Management Plan) will be submitted to the NWB prior to the commencement of TIA operations. Should water treatment of tailings effluent water be required, TMAC will design and commission a waste water treatment facility.
AANDC IR#9	Report Presentation	Possible section missing Rationale: A title page is provided for Module B, but there is no additional which to base an informed decision.	Please provide the contents for Module B or indicate if this title page should be removed from the document.	Technical Comment	The title page for Module B of the *Waste Rock and Ore Storage Management Plan* refer to Type B Water Licence for Madrid. The application for Madrid water licence is currently undergoing review and is outside the scope of the Doris application. Once the BB licence is administered, Module B will be updated to address terms and conditions of the BB licence. The Module B title page was included in the *Waste Rock and Ore Storage Management Plan* to illustrate the new modularized format of the Hope Bay management plans. Parties are directed to Module A for Doris-specific waste rock and management.
AANDC IR#10	Report Presentation	Potential effects to groundwater and water bodies (e.g., Doris Lake) from the backfilling of materials impacted by ANFO and hydrocarbon spills. Rationale: According to sections 2.3 and 2.5 of the Waste Rock and Ore Management Plan, material contaminated by ANFO and any fuel or lubricant spills will be hauled to the waste rock storage pile where it will be eventually used as backfill in the mine. However, section 1.4 of the Interim Closure and Reclamation Plan states that "no hydrocarbon contaminated soils will be disposed of underground." The backfilling of material impacted by ANFO or hydrocarbon substances can negatively impact the quality of groundwater and nearby water bodies.	Please explain why materials impacted by ANFO and hydrocarbon substances will not be remediated on surface (e.g., land farm) or removed to a hazardous waste management facility.	Technical Comment	Placement of hydrocarbon-impacted materials underground is allowed for under the Current Water Licence 2AM-DOH1323 Part L, Item 6 (l). The 2015 Interim Closure and Reclamation Plan will be updated accordingly. Placement of ANFO-impacted material underground has been standard practice in mining for many years. As stopes are excavated underground, adjacent pillars need to be supported so that other parts of the orebody can be safely excavated. This represents an environmentally and technically acceptable way to eliminate the possible surface impacts of rock containing blasting products, as in the case at Doris, or which are acid generating. It also represents a beneficial use of waste material that if it were left on the surface could have negative environmental effects.
AANDC IR#11	Water Management Plan	Water quality criteria for any potential discharge into the marine environment is included within the Water Licence. The proponent states, 'During operations, mill effluent, surface runoff water, precipitation and contact water accumulating in the sediment control pond, pollution control pond (PCP) 1, landfill sump and Pad U (PCP 2) will be pumped to the TIA.', and, 'Excess water will be pumped from the TIA to the Marine Outfall Mixing Box located in the mill building, and then be pumped via a pipeline along existing corridors to the Roberts Bay Discharge System.' In order to discharge the effluent into the marine environment, water quality criteria should be the part of the Water Licence. In this regard, the proponent has used CCME water quality guidelines for marine aquatic life to evaluate the water quality requirements for the proposed discharge.	Please provide proposed effluent discharge criteria for marine disposal both with respect to the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life as well as the Metal Mining Effluent Regulations.	Technical Comment	Effluent criteria are provided in Table 4.5-3 of document P4-1 (Effects assessment; 3rd column) for all considered marine Canadian Council of Ministers of the Environment (CCME) water quality (WQ) parameters. CCME guideline concentrations were outlined in Table 4.5-1 of document 4.5-3 (3rd column). Metal Mining Effluent Regulations (MMER) WQ parameters were not presented explicitly in document P4-1. Effluent discharge criteria are also presented in Table 5-2 of the water and load balance model (document P6-10) submitted with the Application, and Table A5 of the Water Management Plan (document P5-3).
AANDC IR#12	Waste Rock and Ore Management Plan	Concern that the volume of the excavated material (waste rock) will be much larger than the available volume of the cavities for the underground disposal. The proponent states: 'Mine planning indicates there is sufficient capacity to place all waste rock underground at closure.' However, a large quantity of waste rock can be sent back in to the cavities as backfill but all the waste rock may not be sent underground.	Please provide an explanation how all the waste rock can be placed underground as backfill at closure taking into consideration that the volume of excavated material will be much larger than the volume of the underground cavities.	Technical Comment	Refer to Table A1 of document P5-4, Waste Rock and Ore Management Plan, submitted with the Application. This table illustrates the mining schedule including production of ore and waste rock. Over the life of mine, about 3.9 M tonnes of ore and waste rock will be extracted from the underground mine (2,399,000 tonnes of ore and 1,523,000 tonnes of waste rock). The in-situ density of the rock is about 2.89 tonnes/m^3 yielding a total available void space of about 1.4 Mm^3. The 1.5 M tonnes of waste rock will be returned back underground as backfill, but will be subject to bulking during excavation, and subsequently compaction when placed underground. A reasonable swell factor of 1.34 can be assumed for this material which means that the waste rock will require a void space of 0.71 Mm^3 which is 52% of the available space. About 6% of the tailings are leach tailings and will be used for backfill. They will be compacted to a density of 1.4 tonnes/m^3 and will occupy a void space of about 0.10 Mm^3. Therefore the total void space required for backfill in the mine is about 0.81 Mm^3 which is 60% of the available void space.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC IR#13	Tailings Management Plan	Concern that the strategy proposed by the proponent will accumulate a large volume of potentially acid generating (PAG) material and detoxified tailings underground. The detoxified tailings with acidic pH and elevated concentration of Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn can contaminate underground water. About 6% (i.e. 150,000 tonnes or 116,000 m^3) of the tailings are comprised of detoxified cyanide leach 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 proponent states, that 'The detoxified tailings also showed a propensity for leaching of several metals in the humidity cell tests. In addition to arsenic, neutral pH metal leaching of ammonia, cadmium, copper, iron, selenium and silver was reported in the Doris North detoxified tailings, and cadmium and selenium in the Doris Central detoxified tailings. Acidic conditions developed in the Doris Central detoxified tailings after 202 weeks of testing. At acidic pH, increased metal leaching of Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn was noted.' The potential leaching of contaminates under low pH conditions can be a significant source of underground water contamination.	Please provide an analysis of the combined impact of detoxified tailings and backfilled PAG waste rock on groundwater.	Request for Additional Information	The project is not anticipated to have significant adverse effects to groundwater quality outside the underground mine zone, given that the mine is located in permafrost. During operations, the underground workings will intersect groundwater flow and act as a sink; i.e. the volume and/or pressure within the collected groundwater will not result in flow out of the working into the groundwater regime. This groundwater collected in the mine operations will be managed as outlined in document P5-3 (the Water Management Plan) section A.4 to ensure effects to surface and groundwater quality and quantity is mitigated. The Site Water Management Plan will be updated on a regular basis as per terms and conditions of the current Type A Water Licence incorporating ongoing data collection, mining planning and operational needs. During operations, waste rock and detoxified tailings will be placed underground for mine stability and long term disposal. Depending on operational needs, these areas will be allowed to fill with groundwater to promote freeze back conditions and to get the reactive material under a water cover in a timely manner to minimize oxidation reactions. Time needed to fill the underground workings will depend on mine operations, and the remaining space after placement of waste rock and detoxified tailings. This timeframe is related to closure effort and will be part of technical discussions for the closure plan and ongoing effort during mine operations to revise and update the closure plan as per the current Type A Water Licence and KIA Commercial Lease Agreements. At closure, all the mine workings will be flooded and those areas outside the talik will freeze and those areas within the talik will go through a seasonal freeze/thaw cycle. The mine geometric design is such that the final expected groundwater elevation is well below any surface openings and therefore mine water outflow to the environment cannot occur.
AANDC IR#14	Tailings Management Plan	Concern that the strategy proposed by the proponent will accumulate a large volume of potentially acid generating (PAG) material and detoxified tailings underground. The detoxified tailings with acidic pH and elevated concentration of Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn can contaminate underground water. The proponent states, that 'This containment would be in the form of a thermal cover that would ensure that the tailings surface remain perpetually frozen, or a synthetic cover such as a High Density Polyethylene (HDPE) or Geosynthetic Clay Liner (GCL). Preliminary thermal modeling suggests that a thermal cover constructed from quarry rock would have to be in the order of 4 to 5 m thick.'	Please provide a detailed design of the final cover system (s) to deal with potential acid generation and metal leaching processes. Measures to control surface and underground water contamination due to potential precipitation and possible temperature rise should also be documented.	Request for Additional Information	The tailings have been classified as non-acid generating with potential for neutral metal leaching. A source load associated with the tailings has been developed and incorporated into the site wide water and load balance model (Document P6-10, already submitted with the application). The model indicates that the design of the tailings cover does not need to reduce water infiltration or oxygenation as contamination of surface or subsurface waters are not predicted. Based on these results, TMAC believes that all of the information needed for the review is included in the Application. The design of the final cover will be provided to the NWB prior to its construction.
AANDC IR#15	Interim Closure and Reclamation Plan	Concern about the assumed percentages for the cost estimate. The proponent has assumed the following percentages in the cost estimates without supporting justification: • re-slope to 3H:1V (30%), • grade top for positive drainage (60%), and • install erosion protection measures (10%).	Please provide the basis for the assumed percentages.	Technical Comment	Assumptions used in the development of the cost estimate for the Interim Closure and Reclamation plan are included in the document appended to the Application as P5-2. TMAC is willing to address any specific questions the reviewer may have, as appropriate during the Technical Review.
AANDC IR#16	Madrid Advanced Exploration	Impact of Madrid Advanced Exploration Project to Doris North Facilities According to the submitted application for a new type B water licence specific to the Madrid Advanced Exploration Program, the Doris North mill will be used to process two 50,000 tonne bulk ore samples from the Madrid North and Madrid South deposits and the tailings impoundment area will be used to manage the resultant tailings and all contact water that does not meet discharge criteria (including saline groundwater). The design of the Doris North facilities should take into consideration the impact of the Madrid Advanced Exploration Program if it is licenced by the Nunavut Water Board.	Explain whether the proposed amendment to the Doris North Gold Project's type A water licence considers the impact of developing the Madrid Advanced Exploration Project.	Technical Comment	While the Doris facilities have the capacity to support use by future development in the Hope Bay Belt, the scope of the Amendment Application is limited to the Doris Mine. Consideration of future developments in the Hope Bay Belt, including the Madrid Advanced Exploration Project, and their associated impacts should be considered as either a separate application or a future amendment to an existing licence, as appropriate. Accordingly, TMAC respectfully requests that the consideration of Madrid use of Doris infrastructure be considered in the Madrid Type B water licence process.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
GN IR#1	Project Employment	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "the likely evolution of the local, regional, territorial, and national economies over the life of the Project, having regard to direct, indirect, and induced effects on income and employment, in particular the effects on: (a) wage and salary employment by skills category over the life of the Project (including estimates of Nunavummiut and other participation); (b) opportunities for local, regional, and territorial businesses to supply goods and services both directly to the Project and to meet the demand created by the expenditure of new income by employees and suppliers; (c) opportunities to diversify the economic base of Nunavut to produce and to supply new goods and services; and (d) prices and the cost of living" And "opportunities for participation by Nunavummiut workers from the West Kitikmeot Region and Nunavut in wage and salary employment, considering such factors as: the number of jobs to be created and the required skills; the effect of competition for labour between the Project and existing businesses, institutions, and traditional activities; the adequacy of training opportunities available to Nunavummiut to take advantage of jobs created by the Project, including apprenticeship opportunities and training organized by the Proponent; the extent to which the skills of the available workers match job requirements; the level of interest in mining work; commuting arrangements for workers; and barriers to employment, such as issues pertaining to the care of children and Elders" Employment opportunities are a primary source of benefits to evaluate the net benefit of the proposed amendments and it is critical that a sufficient amount of information is provided to understand if all the challenges have been identified and if the appropriate mitigation measures have been proposed. The assessments in the original FEIS are not sufficient and the current assessment also lacks the detail necessary to perform an adequate review. Employment opportunities are a primary source of benefits to evaluate the net benefit of the proposed amendments and it is critical that a sufficient amount of information is provided to understand if all the challenges have been identified and if the appropriate mitigation measures have been proposed. The assessments in the original FEIS are not sufficient and the current assessment also lacks the detail necessary to perform an adequate review. **Labour Force Demand** Section 6.4.1 'Project Employment' of the Amendment Application does not present labour demand by skills categories in its figures. Understanding that it is too early for the Proponent to develop a detailed workforce schedule for the proposed amendments, it is still possible to deduce the general skill level composition of a typical underground gold mine workforce. For career development purposes the GN uses the National Occupational Classification (NOC) coding system to understand labour demand and better align labour supply via the design and delivery of programs and services. At this point in time it is not unreasonable to request that the Proponent identify their planned labour demand consistent with skill level categories A, B, C, and D of the NOC coding system. **Labour Force Supply** Section 6.2.2 'Employment Opportunities' and Section 6.2.3 'Education and Training' of the Amendment Application provide a good baseline of the Kitikmeot and Nunavut in general. It would be helpful is this information were presented more formally as a labour supply analysis, accompanied by a table. Similar to the presentation of labour demand, labour supply should be categorized by skill level categories A, B, C, and D of the NOC coding system. **Assessment** Together, the information in the detailed labour demand and supply tables should be used to address identified employment targets, the need for education and training, and the adequacy of mitigation measures (benefit enhancements) proposed in 2005.	The GN requests that the Proponent provide: 1. A supplementary table related to Section 6.4.1 to indicate planned project employment demand by skill category, consistent with the NOC coding system; this effort should extend to direct (on-site and off-site) and also mine contractor employment. 2. A supplementary table related to Section 6.4.1 to indicate the composition of the regional labour force by skill category, consistent with the NOC coding system 3. An assessment of the information provided in the two tables mentioned above that gives consideration to proposed employment targets, gaps in education and training, and the adequacy of proposed mitigation measures.	Request for Additional Information	The purpose of the 2015 Amendment Application is to conduct an assessment of the potential effects of the proposed changes to the Phase 1 Doris North Project on the natural and human environment. To meet this requirement for socio-economics, TMAC provides an analysis that focuses on the effects of the Project, as detailed in the 2005 Environmental Impact Statement, and considers whether the proposed changes to the Project would alter the previously documented (2005 FEIS) socio-economic effects of the Project (Miramar 2005). Specifically, the 2015 Amendment Application provides: 1. Information on the recent socio-economic baseline conditions and description of changes that have occurred since the 2005 Doris North Final EIS Submission (Miramar 2005); 2. Information on the actual recent and expected future direct employment and expenditures by the Project; 3. Review of the 2005 Doris North Final EIS migration and effects assessment conclusions; and 4. A screening of the effects of the proposed changes in the Project in relation to the identified mitigation and effects assessment conclusions. TMAC acknowledges that an updated economic model and related analysis may assist with local and regional planning, but it is not required to review the current project. TMAC Resources does not make use of the National Occupational Classification (NOC) system for employment and training planning purposes. Additionally, we note that the Government of Nunavut abandoned use of the NOC based Nunavut Community Skills Inventory System several years ago. A staffing level scenario is provided in TMAC's May 2015 Pre-Feasibility Study. These numbers are expected to change through the course of the next year as optimization of staffing needs occurs. It is also an important input into project planning and a requirement of the recently negotiated IIBA that has been signed with the KIA. A copy of the IIBA is attached to this submission for reference purposes. As per the terms of the IIBA, TMAC will provide the IIBA Implementation Committee with information about the Project's projected labour requirements once available to. This information will help the IIBA Implementation Committee set Inuit training and employment targets as described in the 2015 IIBA (KIA & TMAC, 2015). TMAC submits that the information presented within the tables and associated discussion in the 2015 Amendment Application are adequate to perform the level of review associated with amendments to the Water Licence Application and Project Certificate.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
GN IR#2	Training and Development	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "opportunities for participation by Nunavummiut workers from the West Kitikmeot Region and Nunavut in wage and salary employment, considering such factors as: the number of jobs to be created and the required skills; the effect of competition for labour between the Project and existing businesses, institutions, and traditional activities; the adequacy of training opportunities available to Nunavummiut to take advantage of jobs created by the Project, including apprenticeship opportunities and training organized by the Proponent; the extent to which the skills of the available workers match job requirements; the level of interest in mining work; commuting arrangements for workers; and barriers to employment, such as issues pertaining to the care of children and Elders" Training and education are essential components of an effective Human Resources Plan. Without a well-developed approach, any benefits associated with increased employment opportunities can be quickly eroded if there is no upward transitioning in skill levels and the availability of lower skill level category positions are exhausted. Aside from references in Section 6.5.1 and the inclusion of the term 'Training and Development' in the Human Resources Plan from the 2005 Doris North Technical Report, there is no meaningful discussion of proposed training initiatives. By extension, there is no way to understand what dependencies will exist with other training agencies, or to what extent training will be applied to achieve planned employment targets.	The GN requests that the Proponent elaborate on the proposed 'Training and Development' content of the Human Resources Plan and consider more fully developing a draft version for review before the technical meeting and/or Final Hearing. Where partnerships are planned with other training agencies please be specific.	Request for Additional Information	TMAC has worked with the KIA to review, mitigate, and enhance the opportunities and potential impacts of the Project, resulting in an Inuit Impact and Benefit Agreement (IIBA) (KIA & TMAC, 2015). The IIBA includes measures that are relevant to the Human Resources Plan as well as training and development. Additionally, TMAC supports the preparation of the Kitikmeot labour force for mining related employment generally through participation in Socio-economic Monitoring Committees and as part of the Community Readiness Committees and other skills training initiatives as indicated in the 2015 Amendment Application. TMAC Resources participates in the Nunavut Mine Training Roundtable and continues to track progress made to establish a Nunavut Mine Training Center in Cambridge Bay. TMAC's Human Resources requirements will be subject to optimization over the next year as we progress to gold production. TMAC Resources is required under Condition 32 of the existing Doris North Project Certificate to have relevant Human Resource plans in place prior to commencement of Production which is scheduled for early 2017. TMAC does not feel providing this information to the Technical Meeting is necessary. TMAC acknowledges that the Kitikmeot Region is progressing its Community Readiness for employment and will continue to participate in the Committees and education opportunities as available and meet IIBA commitments. Details of training and education programs will be managed as per the terms and conditions of these existing Committees and Agreements. TMAC submits that the detail provided in the 2015 Amendment Application is adequate to perform the level of review associated with amendments to a Water Licence Application and Project Certificate.
GN IR#3	Project Expenditures	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "the likely evolution of the local, regional, territorial, and national economies over the life of the Project, having regard to direct, indirect, and induced effects on income and employment, in particular the effects on: (a) wage and salary employment by skills category over the life of the Project (including estimates of Nunavummiut and other participation); (b) opportunities for local, regional, and territorial businesses to supply goods and services both directly to the Project and to meet the demand created by the expenditure of new income by employees and suppliers; (c) opportunities to diversify the economic base of Nunavut to produce and to supply new goods and services; and (d) prices and the cost of living" Project expenditures can be a significant source of benefits from resource development but unlike other mining jurisdictions in Canada, Nunavut lacks an established industrial base to fully realize them. Understanding that the Project has gone through the bulk of its construction phase already and that a substantial share of expenditures did flow through Nunavut based businesses is important, but it is not sufficient to properly evaluate what may occur into the amended operation phase. Section 6.4.2. 'Project Expenditures' of the Amendment Application does not include considerations for local, regional, and territorial businesses in their assessment of planned project expenditures. Instead, planned project expenditures are summarized by their capital (CAPEX) and operational (OPEX) nature only. This does not adequately illustrate how Nunavut businesses may continue to benefit from supplying goods and services to the amended Project. While the inclusion of direct expenditures from 2008 to 2010 does provide some insight into the participation by Nunavut businesses during the construction phase of the Project, the transition into the operational phase reduces the certainty with which the relative share of total expenditures can be extrapolated and applied to future years. The assessment in the original FEIS is not sufficient to account for the proposed amendments and further work is required to accurately understand how planned project expenditures may be distributed in the future. This will help to confirm whether previously proposed mitigation measures remain adequate. The Proponent indicates that they will continue to use Kitikmeot based or Inuit owned businesses for the provision of air transportation, logistical services, camp supplies, medical and safety supplies, and catering, as well as other goods and services (Volume 4, Section 6.4.2, Page 6-22). Considering these services as well as the current profile of registered Inuit businesses in the region against the anticipated change in operational requirements of goods and services is desirable at this time.	The GN requests that the Proponent provide an updated table related to Section 6.4.2 that includes projections (2016 to 2021) for project expenditures by Inuit, Regional, and Nunavut based businesses that considers the operations phase uniquely from the construction phase (i.e. does not solely rely on the share of expenditures from the construction phase).	Request for Additional Information	Updated, detailed expenditure information is not yet available for the Project as the IR is related to procurement level of detail. Therefore, it is not possible to provide an updated forecast of annual expenditures for the operations phase. The economic benefits of the Project are expected to be enhanced as a result of the proposed changes to the Project, including increased Project expenditures and longer Project life. The proposed changes to the Project are not expected to change the type of effect (e.g., the distribution of Project expenditures). Kitikmeot Based Inuit Owned businesses are capable of capturing a proportion of this planned spending based on company capabilities and competitiveness. The extent to which Kitikmeot Based Inuit business is able to realize contracting success with our project depends on the implementation of contracting provisions of the 2015 IIBA, contained in Schedule F of this agreement (attached). Pursuant to Schedule F of the 2015 IIBA, TMAC Resources is committed to utilizing qualified and capable Kitikmeot Based Inuit owned business in 14 areas of Contracting Opportunity. The value of contracts throughout the life of mine in these 14 areas of Contracting Opportunity has not yet been calculated, and will only be determined with detailed mine planning to come. TMAC submits that the detail provided in the 2015 Amendment Application is adequate to perform the level of review associated with amendments to the Water Licence Application and Project Certificate. The provisions of the IIBA are intended to maximize the supply of goods and services from local businesses.

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GN IR#4	Economy	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "the likely evolution of the local, regional, territorial, and national economies over the life of the Project, having regard to direct, indirect, and induced effects on income and employment, in particular the effects on: (a) wage and salary employment by skills category over the life of the Project (including estimates of Nunavummiut and other participation); (b) opportunities for local, regional, and territorial businesses to supply goods and services both directly to the Project and to meet the demand created by the expenditure of new income by employees and suppliers; (c) opportunities to diversify the economic base of Nunavut to produce and to supply new goods and services; and (d) prices and the cost of living" The proposed increases in the mining rate and mine life of the Project will certainly have a significant effect on the local, regional, and territorial economies* beyond what was assessed in the original FEIS. While the Proponent has provided their planned direct employment and direct expenditures in Section 6.4, there are no presentation of what the radiating effects (indirect and induced) may be and what their combined effect will have on the overall economy. More specifically, there is no dedicated baseline information provided for the local, regional, or territorial economies; and there is no effects assessment that considers the indirect and induced effects on employment and incomes from increased and prolonged employment and contracting opportunities. Without these there is no opportunity to meaningfully discuss the overall economic effect the proposed amendments may have. *It is assumed that the Project will not be a significant contributor to the national economy and is not considered necessary to consider at this point in time.	The GN requests that the Proponent provide the following: 1. A presentation and description of available baseline information for the local, regional, and territorial economies. 2. Additional projections for potential indirect and induced employment and income related to Sections 6.4.1. and 6.4.2. 3. An assessment of the proposed amendments overall economic effects considering increases in aggregate employment, government revenue, and GDP as well as influences on CPI and economic diversification.	Request for Additional Information	TMAC acknowledges that an updated economic model may assist with local, regional and project planning. However, updated economic impact modelling is not expected to substantially alter conclusions about the effects of the Project as described in the 2015 Amendment Application. Moreover, updated baseline and economic impact modelling conform to a level of detail typically provided in more in-depth reviews, rather than the screening level of detail typically provided for licences and certificate amendments. TMAC submits that the detail in the Amendment Application provided is adequate for the current level of review.
GN IR#5	Fiscal and Infrastructure Impacts	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "revenues accruing to federal, Nunavut, and local governments, and the net incremental costs imposed on governments by the Project, including savings realized and incremental costs of infrastructure and services" The proposed increases in the mining rate and mine life of the Project will certainly have a significant effect on the revenues accruing to federal (AANDC), Nunavut (GN; NTI; and KIA), and local governments (Kitikmeot Communities), however, there is no presentation of figures or associated discussions included in the Amendment Application. Similarly, GN infrastructure and services are likely to experience increased demand that may have a cost component, which should also be given additional consideration. In both cases the assessments in the original FEIS are not sufficient to accurately deduce the net fiscal benefits of the proposed amendments.	The GN requests that the Proponent provide a detailed summary of anticipated revenues, by source, accruing to the organizations mentioned above in a table format*. In the case of the GN, the only direct revenue sources to present are taxes and include: payroll tax, personal income tax, corporate tax, fuel tax, and property tax. In the associated discussions, it should be understood that there are limitations on the benefits increased tax revenues can have as they are collected into the general budget and are allocated across the territory and not to any single community or region. In light of this, the Proponent is also encouraged to reconsider where it has presented revenues accrued to the GN as a mitigating factor to offset the costs associated with increased demand on programs and services including, but not limited to, health services, social services, public housing, and safety and protection services. Furthermore, the Proponent should give additional clarification as to the anticipated increase in costs likely to be experienced for the above-mentioned programs and services in light of the amended Project. An indication of low, medium, or high would be sufficient in this case. *Where confidentiality agreements are in place the GN understands that detailed information cannot be included, however, it is desired that the Proponent indicate where this is the case.	Request for Additional Information	The 2015 Amendment Application predicts minimal adverse effects on health care services, community well-being, and the delivery of social services, housing, and public safety and protection services as a result of a minor (or low) effect on in-migration. This finding is supported by 1) the adoption of multiple point-of-hire (minimizing intra-regional migration), 2) the fly-in/fly-out operation of the Project and well-equipped camp facilities (minimizing the potential for in-migration to the region), and 3) the high unemployment rates within the Kitikmeot communities coupled with planned training partnerships and initiatives. The minor in-migration predicted in the 2015 Amendment Application stems from the induced and indirect economic benefits of the Project including business growth in Cambridge Bay. Existing mitigation included in the 2005 FEIS (KIA & TMAC 2015) and the recent Inuit Impact and Benefits Agreement (IIBA) are expected to further reduce the predicted minor in-migration by supporting local residents in meeting this demand. As a result, the effects of the Project on community services due to in-migration to the region are anticipated to be minor (or low), as indicated in the 2015 Amendment Application. Economic modeling is not expected to substantially alter conclusions about the effects of the Project as described in the 2015 Amendment Application (Document P4-1). TMAC submits that the detail provided as adequate to perform the level of review associated with amending the previously approved Water Licence Application and Project Certificate.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
GN IR#6	Student hiring	1) On page 6-21, it states "Similar to 2013, TMAC hired one student to work at the Project in 2014. Comparatively, in 2010, there were 16, and in 2011, 20 individuals, primarily students, hired as Environmental Field Assistants to work on the Project (A. Buchan, pers. comm.).The concern from the Department of Education is twofold. One is the type of students that are being hired, and for what types of projects, and two, the large decrease in student involvement in the course of the project. 2) In Table 6.5-1 2005 Socio-economic Effects and Mitigation Summary, on pg 6-23, the Proponent reports that on potential effect of the mine is "increased educational attainment within the region". The concern that the Department of Education would like to address is a lack of a proposed mitigation process (benefit enhancements) to address this. 3) In Table 6.5-1 2005 Socio-economic Effects and Mitigation Summary, on pg 6-23, the Proponent reports that one mitigation plan is to "Collaborate and partner with relevant agencies and contractors to ensure requirements are being met". Further in the Mitigation explanation (6.5.2.1 Mitigation pg 6-26) the Proponent suggests that they are working with the Arctic College and KIA, as well as members of three working groups to discuss training opportunities. However, there is little to no explanation on what those working groups have accomplished.	1) In regards to the first concern, the Department would like further information on the type of students being hired onto the Project. For example, are these students attending high school, or post-secondary programs; is the employment being used towards credit to a program that they are enrolled in; what types of employment are the students being hired for; and during their employment, were there training opportunities for them that would better ready them for future employment at the mine upon completion of the education program they are in? In regards to the second concern, from 2011 to 2013, there was a significant decrease in student hiring. The department is requesting more information on the reasons why this is. It is understood that the Project went into care and maintenance but was there also an exhibited lack of interest or applications to the program; was there a lack of human and/or financial resource support on the end of the Proponent to deliver the program? 2) As reported in the Doris North Project 2014 Socio-economic Monitoring Program report, "A close correlation between Doris North Project activities and high school graduation rates was not evident". The Department of Education would like to request further information on what the Proponents projections are, if any, on how this may change with the extension of the project. As the proximity of the mine to the nearest community is quite far, is the Proponent planning on delivering career planning information to the communities, in particular to schools in the region? Is there a communication strategy to inform community members of the job opportunities, particularly those at a high school age, who may need information on how to better prepare themselves to be work ready? 3) While it is understood that there are certain restrictions to the age of people working at the mine site, which would explain the focus on post-secondary institutions under the assumption of a shorter timeline the mine originally proposed. However, with a proposed new lengthened schedule, could the proponent expand on the current training opportunity plan to involve career ready/preparedness programming to students in the k-12 system, as some of those youth soon to be graduates will be able to benefit from the mining activities. Other mining companies have capitalized on partnering with Regional School Operations to incorporate mining curriculum into the school program, as well as worked with individual schools to host career planning sessions that are trades and mining specific with success. As concluded by the Proponent, "It is predicted that with the longer duration of mine operation a greater number of Inuit will be able to take advantage of education and training opportunities. This will result in an increase in the human capital available within Kitikmeot communities, thus supporting continued economic development across the region and minimizing the need for the hiring of workers from elsewhere".	Request for Additional Information	While the information requested would contribute to local and regional education planning as well as a deeper understanding of successful approaches to education and training, TMAC does not interpret this as an information gap within the 2015 Amendment Application nor as relevant to the intent of the current review, which is to determine the adequacy of information provided in the 2015 Amendment Application. TMAC conducts socio-economic monitoring and reporting for the Project annually, and works with the KIA, AANDC, and GN to ensure that the ongoing monitoring program meets its objectives. TMAC also actively participates in school-based and regional 'career day' events (e.g. Kitikmeot Trade Show) as available to promote the opportunities within the construction and operation of a gold mine. Student hiring was a common practice during the larger construction program. During the care and maintenance period of the last few years workforce reductions meant a reduction in student hiring opportunities. In addition, employment related age restrictions are in place for safety reasons and in compliance with the Nunavut Mining Regulations (2014). Prior to project acquisition in 2013, TMAC understands that student employment at Hope Bay consisted of persons currently undertaking some form of post-secondary education, and being hired on for term, seasonal employment within the Hope Bay Environment Department. In 2013 and 2014, during which time TMAC Resources operated the project under Care and Maintenance, the Hope Bay workforce was significantly reduced overall, leading to commensurate declines in opportunities for student involvement. As discussed in Section 6.2.3 of the Doris Amendment Application, there are a number of complex inter-related factors affecting primary and secondary education attainment in the Kitikmeot Region, the potential opportunity for wage employment at Doris being only one such factor. Given the prevalence of other factors; truancy at its causes, attractiveness of remote rotational work, it is not possible or practical at this level of assessment to assign changes in high school graduation in the Kitikmeot as a result of our project changes. While the information requested would contribute to local and regional education planning as well as a deeper understanding of successful approaches to education and training, TMAC does not interpret this as an information gap within the 2015 Amendment Application nor as relevant to the intent of the current review, which is to determine the adequacy of information provided in the 2015 Amendment Application. TMAC conducts socio-economic monitoring and reporting for the Project annually, and works with the KIA, AANDC, and GN to ensure that the ongoing monitoring program meets its objectives. TMAC also actively participates in school-based and regional 'career day' events (e.g. Kitikmeot Trade Show) as available to promote the opportunities within the construction and operation of a gold mine.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
GN IR#6 *(cont'd)*	Student hiring *(cont'd)*	Continued from above	By turning a focus on K-12, the Proponent might consider the interconnectedness of other Socio-economic effects of the mine. For example, the Proponent might see an inadvertent mitigation to the housing needs in some areas, as with an increased focus on local training, potentially less people will need to be brought in from outside of Nunavut to work. With more attention paid to this, there may be more work ready people out of high school found locally who will not have the same housing needs.		See above.
GN IR#7	Housing -Short term impacts of in-migration and impacts of training	The Environmental Effects and Mitigation Package, p. 6-25 States: "…consideration for the potential direct and indirect effects of a Project on housing and overcrowding conditions within communities is warranted. While a direct effect of the Project is not anticipated…there is some potential for in-migration primarily associated with indirect and induced business growth, mainly in Cambridge Bay, when qualified local workers are not available and workers from elsewhere are brought in to meet the demand." The proponent identifies training and education as the main proposed measure to mitigate the impact on housing, stating that increasing local labour will eliminate the need for labour from outside of the region, and will limit in-migration. The NHC recognizes the importance of education and workforce training in improving the well-being and housing situation in Kitikmeot, and Nunavut, in the long term. However, increased in-migration will have an immediate impact on the housing situation of families in the Kitikmeot. Due to the severe shortage of housing in Nunavut, the NHC requests that the proponent identify more immediate proposed mitigation measures for the "Potential Effects" of increased demand for housing and increased conditions of overcrowding. The extent of the proposed training is described to some extent on p. 6-26, however, the full extent and proposed schedule and location of training is not identified. Training offered in a specific community, over a certain period of time, could lead to in-migration for the purposes of accessing the specialized training. This training, in itself, may then have a negative impact on already limited housing in the community. The NHC requests more information on the intended training.	The Nunavut Housing Corporation (NHC) requests: Identification of more immediate proposed mitigation measures for the "Potential Effects" of Increased demand for housing and increased conditions of overcrowding More information on the intended training related to direct and indirect employment to determine its effects on the demand for housing in the affected community.	Technical Comment	TMAC included additional consideration for effects to housing in the 2015 Amendment Application and submits that the additional mitigation measures presented are adequate to address the predicted adverse effect on increased demand for housing and increased overcrowding. This effect is predicted to be minimal due to the small-scale nature of the Project and additional housing-related mitigations presented in the 2015 Amendment Application.
GN IR#8	Mine Closure	The 2002 Environmental Assessment Guidelines for the Doris North Project give direction to the Proponent to assess the potential impacts on socio-economic components, taking into account, specifically: "The Proponent must evaluate how the temporary or final closure of the mine would affect workers and communities. For example, how does it perceive its responsibility to its work force and the local economy once operations shut down either temporarily or permanently? Would it put in place a program of work force adjustment for the last few years of operations, assuming that the Project life extends, to provide such things as employee assistance, career counselling, educational subsidies, and re-training programs?" The Amendment Application does not include an updated evaluation of the socio-economic impacts related mine closure nor does it include any proposed management measures. Given the increased length rate of mining and mine life and the subsequent increase in employment required, it is presumed that the impacts associated with temporary or final mine closure will be more significant than originally anticipated.	The GN requests that the Proponent develop a dedicated discussion of anticipated socio-economic impacts and effects of a temporary or final mine closure, with emphasis on employment and the local economy. The Proponent should also outline a management response that includes a mitigation plan for all potential socio-economic impacts resulting from temporary or final mine closure.	Request for Additional Information	The 2015 Amendment Application considered the potential for the amendments to the Project to alter the unemployment following mine closure. The material nature of the effect remains consistent with the description provided in the 2005 FEIS and existing mitigation is considered adequate to address this effect. As indicated in the 2015 Amendment Application, the proposed amendments to the Project are not anticipated to result in any new effects and the potential effects as identified in the 2005 FEIS remain valid. In addition, under the existing Doris North Project certificate, TMAC is required to have relevant Human Resource plans in place prior to commencement of Production (Condition 32) and to monitor social and economic impact of the project on the local communities (Condition 28). Furthermore, TMAC has entered into Inuit Impact and Benefit Agreement (IIBA) with the KIA and looks forwards to implementing the related mitigations contained within the IIBA, which are beyond that included in the 2005 Final EIS (KIA & TMAC, 2015). The 2015 IIBA is specifically relevant to temporary and final closure. TMAC submits that the information presented in the Amendment Application is adequate to perform the level of review associated with amendments to the Water Licence Application and Project Certificate.

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TMAC Resources Inc. Responses to IR Comments on the Doris North Project Terms and Conditions within Project Certificate No.003 and Application to Amend the Water Licence 2AM-DOH1323

ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
GN IR#9	Hydrology, Watersheds, runoffs	The proposed amendment contains significant changes in water management structures. The Government of Nunavut is not clear as to what the current fresh water quality baseline is, aside from Roberts Bay where the results of water samples for metal traces have been provided. In addition, assumed target concentrations have been modeled for Roberts Bay only once the Project becomes active (Table 4.5-1 to Table 4.5-3).	The Government of Nunavut requests the following information: 1) A table comparing the concentration of metal traces (ammonia, cyanide, cadmium, aluminum, arsenic, copper, iron, lead, nickel, mercury and zinc) registered at the groundwater intercept at the mill facility, the two pollution control ponds, sedimentation pond and the hydrometric monitoring stations (Glenn Hydro, Little Robert Hydro, Doris TL-3, Doris TL-2, Tail Hydro, Tailing Impoundment Area) with the concentrations that are found in Roberts Bay. 2) A table detailing the guideline limits along with the assumed and predicted target concentrations for modeling of the hydrometric monitoring stations cited above and the two pollution control ponds.	Request for Additional Information	Inputs to the water balance and quality model for the trace metals listed by the reviewer are included in (P6-10, Water and Load Balance and P6-13 TIA Tailings Management System). As per the Water Management Plan (P5-3 Water Management Plan), each of these sources of water are combined at the mill facility for discharge to Roberts Bay. The predicted water discharge chemistry to Roberts Bay from these combined sources used for the purpose of the effects assessment is provided in Table 6.2 (P6-10 Water and Load Balance). Comparison of the individual point sources to the marine quality is unnecessary as the individual sources will be combined in the TIA prior to discharge to Roberts Bay. The predicted concentration of each of these parameters is considerably lower than the target discharge criteria as required under MMER. The effects assessment further demonstrates that Roberts Bay can tolerate higher concentrations of these parameters than that stipulated in the MMER (P4-1, p 4-58). Baseline water quality in Roberts Bay is provided in P4-1 (Identification of Potential Environmental Effects and Proposed Mitigation) section 4.3.
GN IR#10	Air Quality	Dust emission is a human health and environmental concern, therefore, producing emission rates below an accepted guideline is an endeavor for which to aim.	The Government of Nunavut request the following information: 1) A Comparison of the measured TSP, PM_{10} and $PM_{2.5}$ with the Government of Nunavut Environmental Standards for Ambient Air Quality (October, 2011) 2) A Comparison of the Proponent's anticipated dustfall emissions and composition (TSP, PM_{10}, $PM_{2.5}$, Total dustfall in mg/cm/30 days, and fixed (non-combustible) with other major development projects' accepted limits/guidelines in an Arctic environment.	Request for Additional Information	1) Measured particulate matter and dustfall has been compared to the relevant Nunavut and Canadian guidelines and standards and are reported to the NIRB under the current and ongoing Air Quality Compliance Program. The most recent program report, December 2014 is available on the NIRB FTP site. 2) Airborne dust and dustfall emissions and concentrations associated with existing Project infrastructure have been presented in the 2006 FEIS Technical Report Chapter 10 (Atmospheric Environment), and the FEIS Supporting Document B3 (Doris North Project Air Quality Assessment Methods). These reports also compare the expected concentrations with the relevant Nunavut and Canadian guidelines and standards. Emissions from the proposed sub-aerial tailings will be mitigated as described in the Application Amendment Document P6-13 Appendix I. Air Quality monitoring will be revised to incorporate the TIA with results reported on a regular basis.
GN IR#11	Air Quality	Dust emission sources can be divided into two groups: a) dust generated by stationary Project infrastructure such as power generation, sub-aerial tailings deposition, material handling, unpaved roads, blasting, heating and ventilation; and b) dust generated by mobile Project equipment such as trucks, all-terrain vehicles, and aircraft.	The GN requests the Proponent provide the following information: 1) A table providing estimates of dust generation divided into stationary and mobile dust emission sources. 2) Estimates of projected dustfall emissions generated by sub-aerial tailing deposition.	Commenter is Requesting Additional Information	1) Emission estimates for existing infrastructure have been presented in the 2006 FEIS Technical Report Chapter 10 (Atmospheric Environment), and the FEIS Supporting Document B3 (Doris North Project Air Quality Assessment Methods). 2) Emissions from the proposed sub-aerial tailings will be mitigated as described in the Application Amendment Document P6-13 Appendix I. After mitigation, the expected dust emissions are expected to be very low to none. In consideration of the potential for dust deposition, changes to the Project footprint are relatively minor relative to the potential from the TIA. Therefore site wide modeling is unnnecessary. TMAC acknowledges that the change in tailings technology to subaerial has the potential for increased dust from this source. For the effects assessment, a conservative approach was taken and a broad potential aerial extent of dust deposition was considered. Detailed modeling would only refine the area (i.e. make it smaller) and as such TMAC submits that the Amendment Application has adequately assessed and incorporated design mitigation measures and monitoring measures, as detailed in the revised Air Quality Management Plan (document P5-1) and Tailings Management System report (document P6-13) provided with the Amendment Application.

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GN IR#12	Atmospherics and Potential Environmental Effect	Throughout the operational phase of the Project, portions of the sub-aerial tailing surface will be exposed and pose a potential for dust emission. The Government of Nunavut is of the understanding that the Proponent has concluded that chemical suppressants offer the greatest flexibility for application and will therefore be deployed.	The Government of Nunavut requests the following information: 1) What chemical dust suppression product will be deployed? 2) How and where the chemical dust suppression product will be stored on the mine site? 3) Which surfaces will the chemical dust suppression product be applied to? 4) In liters, what is the total volume of chemical dust suppressant anticipated to be required to manage dust generation from sub-aerial tailings? 5) At what frequency will the chemical dust suppression product be applied?	Request for Additional Information	TMAC has identified that chemical suppressants may be required to mitigate the generation of dust from the TIA. There are various environmentally benign, non-toxic options that are commercially available for consideration. At this stage in planning, TMAC has not selected the product or products that will be used. Products will be evaluated at the time of detailed mine planning. A description of the dust control strategy for the Tailings Impoundment Area is included in the Application Amendment Package P6-13 Appendix I. 1. An appropriate dust suppression product(s) will be chosen based on the product's intended application. The chosen product(s) will comply with the Nunavut Environmental Guideline for Dust Suppression (http://gov.nu.ca/sites/default/files/Guideline%20Dust%20Suppression.pdf). Any proposed product not on the approved list will be submitted for approval by the GN-DOE before use. 2. Dust suppression products will be stored according to the manufacturer's recommendations and any other applicable regulations. 3. The list of surfaces that will use chemical dust suppression products are described in the Application Amendment Package P4-1, Section 3.4.1, Package P5-1, Section 2.2, and Package P6-13 Appendix I. 4. Once the appropriate product(s) is chosen, the total volume required will be calculated based on manufacturer recommendations. 5. The dust suppression product(s) will be applied as needed, based on manufacturer recommendations and snow cover and general weather (wind, precipitation) conditions.
GN IR#13	Atmospherics and Potential Environmental Effect	The deposition of dust associated with the alteration of terrestrial ecosystems negatively effects vegetation. The Proponent concludes that the area considered for dustfall impacts encompasses 465 hectares (ha). Contained within this 465 ha, is 93.6 ha of special landscape features which may potentially be impacted by fugitive dust emissions from the sub-aerial tailing deposition. The proposal of two new vent raises present an additional source of dust emission that brings the total number of vent raises to three: Primary Vent Raise, Doris Connector Vent Raise and Doris Central Vent Raise.	The Government of Nunavut requests that the Proponent provide information detailing the total area, in hectares, that may be impacted by dustfall emissions associated with existing and proposed Project infrastructure (i.e. Doris Connector Vent Raise and Doris Central Vent Raise).	Technical Comment	Airborne dust and dustfall impact areas associated with existing Project infrastructure have been presented in the 2006 FEIS Technical Report Chapter 10 (Atmospheric Environment), and the FEIS Supporting Document B3 (Doris North Project Air Quality Assessment Methods). Emissions from the proposed sub-aerial tailings will be mitigated as described in the Application Amendment Package P6-13 Appendix I. In consideration of the potential for dust deposition, changes to the Project footprint are relatively minor relative to the potential from the TIA. Therefore site wide modeling is unnnecessary. TMAC acknowledges that the change in tailings technology to subaerial has the potential for increased dust from this source. For the effects assessment, a conservative approach was taken and a broad potential aerial extent of dust deposition was considered. Detailed modeling would only refine the area (i.e. make it smaller) and as such TMAC submits that the Amendment Application has adequately assessed and incorporated design mitigation measures and monitoring measures, as detailed in the revised Air Quality Management Plan (document P5-1) and Tailings Management System report (document P6-13) provided with the Amendment Application.
GN IR#14	Atmospherics and Potential Environmental Effect	Carbon dioxide is the primary greenhouse gas contributing to climate change. Atmospheric CO_2 concentrations have now reached a record high of 398.07 ppm. The Proponent is subject to Environment Canada's Greenhouse Gas Reporting Program under CEPA and the Proponent states that it has been voluntarily reporting GHG emissions through the program.	The Government of Nunavut (GN) requests that the Proponent provide the GN with the results of the Proponent's Greenhouse Gas (GHG) Reporting Program.	Technical Comment	Greenhouse Gas (GHG) results are publically available at http://www.ec.gc.ca/ges-ghg/donnees-data/index.cfm?do=facility_info&lang=en&ghg_id=G10681&year=2011. The facility has yet to meet the reporting threshold of 50,000 tonne GHGs in carbon dioxide equivalent units (CO_2 eq) per year. TMAC will continue to estimate GHG emissions annually and will provide copies of any reports associated with future GHG reporting to the Government of Nunavut.
GN IR#15	Alternation of ecosystem, vegetation and habitat	The impact to terrestrial habitat and vegetation by the proposed activities extends beyond the Project footprint. Due to the geographical location of the mine (Figure 2.3-2), changes in Doris Lake outflow caused by the mine could affect both the Doris/Roberts Watershed and the Windy Watershed.	The Government of Nunavut requests that the Proponent provide the following information: 1) What impacts to Glen Lake may result from the potential alteration of Doris Lake outflow? 2) If possible, the GN requests a map overlapping the type of vegetation in the Doris-Roberts Watershed and the Windy-Glenn Watershed downstream of the mine, the two watershed boundaries and the proposed Project footprint (4,103 ha consisting of five leases).	Request for Additional Information	1) No impacts are anticipated to Glen Lake as a result of the alteration of Doris Lake outflow since Glen Lake is in a different watershed. 2) Please see Appendix 2.0 - Figure 1a and Figure 1b - Terrestrial Ecosystems in the Doris, Windy and Roberts Bay 1, 2, and 3 Watersheds that show the vegetation types in proximity to the proposed Project footprint and associated watershed areas.

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TC-01	Tail Lake - Tailings Impoundment Area (TIA)	TMAC intends to install an new dike within the Tailings Impoundment Area (TIA) in order to store its tailings and eventually drain a portion of the lake and use that water as process water. Throwing or depositing of materials into a navigable water or in water that flows into any navigable water may be subject to Section 24 of *the Navigation Protection Act* (NPA). To determine if the NPA applies to the TIA, additional information regarding the Lake is required.	The proponent should provide the following information regarding the TIA: - Any information or evidence related to the past or historical use of the TIA for navigation either as an aqueous route as part of a navigation network (connecting waterways or locations) or as a self-contained route (fishing or recreation). - Any information about currently use (or predicted future public appeal) on the TLI.	Technical Comment	The TIA at the Doris Project has been assigned to Schedule 2 of the MMER and as such is no longer a navigable waterway. Further, during the assignment process all past uses of the watercourse were assessed prior to it being designated for Schedule 2 inclusion.
TC-02	Marine Based Infrastructure	TMAC intends to install a marine diffuser and outfall berm in Roberts Bay to discharge the mines process water. Because Roberts Bay is a part of the Arctic Ocean which is a scheduled water way under the *Navigation Protection Act* (NPA), any in water work will require an approval from the Navigation Protection Program.	Please provide the Navigation Protection Program with a complete application of the proposed work in Roberts Bay prior to construction and provide an assessment of any potential impacts to navigation resulting from the construction, operation or maintenance of this proposed diffuser.	Technical Comment	Proposed work in Roberts Bay associated with the effluent discharge pipeline and diffuser construction, operation and decommissioning meets the definition of a 'work' under the NPP. A “work” is defined as any structure, device or thing—temporary or permanent—made by humans that is in, on, over, under, though or across any navigable water. It also includes the dumping of fill or the excavation of materials from the bed of any navigable water. TMAC also acknowledges that Roberts Bay is part of the Arctic Ocean which is described in the List of Scheduled Waters, Part 1, Item 1 of the *Navigation Protection Act*. Authorizations under the NPP for works within Roberts Bay will be obtained in advance of construction.
AANDC-NIRB #1	Doris Lake Water Level Datum and Outlet Sill Elevation	Changes in Doris Lake water levels due to the predicted drawdown of Doris Lake are expected to have impacts to both Doris Lake and to downstream waterbodies, and need to be carefully and thoroughly evaluated. Potential impacts of the Project on surface water quantity are expected to occur as a result of the predicted drawdown of Doris Lake water levels to below the natural sill elevation, and below the natural range of fluctuation. To assess the natural range of fluctuation and to monitor actual performance, the sill elevation and historic water levels need to be established relative to a known stable datum. Doris Lake outlet water level monitoring station TL-2 has been operated with an assumed local vertical datum. Analyses to date have not identified the elevation of the controlling sill (high point of the channel bottom at the lake outlet), or identified whether a stable sill exists. Accurate baseline water level information that is referenced to the natural low water elevation is needed to fully assess potential Project impacts. The water level in Doris Lake is expected to be drawn down to below its natural low water level, which will have impacts on Doris Lake and downstream waterbodies. These impacts need to be further assessed.	a. Confirm whether the stage (water level) at Station TL-2 is representative of the Doris Lake water level. If yes, confirm whether the zero flow stage shown by Rescan (2012) to be approximately 98.58 m (local datum) represents the lake outlet sill elevation as of 2012. b. TMAC (2015) identifies changes in the Doris Lake outflow relationship from 2004 to 2014, and suggests that “varying datum for lake elevation data” may be a contributing factor. Provide comment on the year-to-year stability of the local assumed benchmark(s), and whether this would compromise the value and use of the historic baseline readings and/or complicate assessment of potential project effects based on future water level readings. c. TMAC (2015) identifies Doris Lake bathymetric survey results from Golder (2006) that were used to estimate the volume-depth curve for Doris Lake, possibly without an adjustment for the depth of outflow at the time of surveys. Considering the available water level records for Station TL-2, provide an estimate of the Doris Lake water surface elevation (to the local datum) corresponding to the date(s) of available bathymetric surveys. d. SRK (2015) also identifies uncertainty with the Doris Lake water level datum, but identifies a Doris Creek invert elevation of 21.5 m based on recent LiDAR data. Elaborate on the datum and accuracy of the LiDAR results, and whether the estimated invert elevation includes an adjustment for outlet water level depth at the time of data collection.	Technical Comment	a) The stage (water level) at Station TL-2 is not representative of the Doris Lake water level; however, discharge at TL-2 can be correlated to Doris Lake levels as described by Equation 2.5-1 in Document P4-1 (Effects Assessment) included with the amendment application. b) Elevations are comparable between years, assuming the same benchmarks are used each year. Benchmark locations are generally selected in stable features such as bedrock protrusions. Benchmarks that were established in 2009 were used as survey control points along the channel banks and lake shores at each of the monitoring stations that were re-established in 2012. Multiple benchmarks are also established at each site as a check between each benchmark as well as to provide back-up should something unforeseen happen to a benchmark. Additionally, hydrometric levelling surveys were carried out at each station to check and verify pressure transducer readings, as well as to determine the reliability of the water level data that were recorded between site visits. Typical error for level surveying can be expected to be +/- 0.005 m. Variation between benchmarks would occur if the data sets had independent (i.e. new) benchmarks each year and these were not tied into previous years benchmarks. This would result in valid data, but difficult to compare from a direct elevation comparison rather than a change in elevation. c) From Golder (2006) Doris the bathymetry was completed between July 31st to August 29th, 2006. The actual date for the survey of Doris Lake was not presented in Golder (2006). From Appendix G in Golder (2009) the mean water surface of Doris Lake for August 2006 was 21.225 (Max = 21.159 m, Min = 21.286 m) (local datum = 22.593 m). d) The LIDAR data was acquired in 2007 and was used to generate a DEM with 0.5 m contour intervals. The elevation of 21.5 m is the surface water elevation of Doris Lake at the time which the LIDAR was flown.
AANDC-NIRB #2:	Management of Unexpected Groundwater Flux Rates	The document indicates that “Should water be encountered in substantial volumes then a program of pressure grouting the area will be initiated”. Substantial is not defined. A thorough investigation program is needed to characterize areas of the underground geological structures that have a potential to produce high volumes of groundwater. Such information is needed to review the mine water balance and water management plan.	Define and provide criteria for “substantial flows”. Describe the investigation program proposed to identify location of potential “substantial flows” sources and how much water might be encountered.	Technical Comment	"Substantial flows" are defined as rates that exceed the design values presented in the application, i.e. 3,000 m^3/day. The rationale behind the selection of this value is described in the SRK Hydrogeological Report (document P6-3 Hydrogeological Model provided with the Application). If these flows are exceeded, mining in the affected area will cease and measures put into place to mitigate the inflow. As mining advances, forward exploration drilling is continuously carried out, which is the investigation method for determining whether greater than anticipated flows might be encountered.

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AANDC-NIRB #3:	Validity of Assumptions and Boundary Conditions Applied to the Groundwater Inflow and Quality Model	A number of the assumptions contained within the groundwater modelling report are based on other studies not provided in the amendment application. In order to be able to determine the validity of the modelling, the data upon which it is based must be reviewed. The report cites several studies, all of which have not been made available for review. The validity of the model predictions cannot be verified without reference to the underlying studies. This information is needed to assist AANDC in the subsequent technical review of this component of the Project, as the influx of groundwater may negatively impact the environment and Doris Lake.	Please provide all the data sources identified in document P6-3, including SRK 2005, SRK 2009b, SRK, 2012, and SRK 2014.	Request for Additional Information	The assumptions and boundary conditions used in the Groundwater Inflow and Quality Model (document P6-3 of the application) have been informed by other studies conducted to date. Many of these studies are reflective of project plans that are no longer current and not directly applicable to this Application in their entirety which is why they were not included. Should specific questions be raised by reviewers during their technical evaluation of the Application, TMAC can provide additional and relevant information contained within these references.
AANDC-NIRB #4:	Groundwater Inflow and Quality Model Calibration	The groundwater inflow and quality model is not calibrated. Typically groundwater models are calibrated to heads and flux rates. Head levels are available from the West Bay installations. Flux rates could be estimated into Doris Lake. Calibration of the groundwater inflow and quality model will enhance the reliability of model predictions. This is particularly important as considerable volumes of water are predicted to flow into the underground mine area beneath Doris Lake.	Provide rational for not calibrating the model or comparing the base case heads to measured heads, or otherwise provide an updated groundwater inflow and quality model with the suggested calibrations	Technical Comment	Suitable calibration data is not available because the mine has not been developed. Details pertaining to the engineering judgement and benchmarking that was done in lieu of calibration is provided in the document P6-3 Hydrogeological Model provided with the Application. Data used in the analysis is extensive and includes a Westbay well in the vicinity of the proposed workings.
AANDC-NIRB #5:	Validation of Groundwater Quality Predictions	The groundwater model predicts an inflow rate of up to 2,650 m^3/day. The worst case predicted groundwater quality into the mine is 14,750 mg/L of chloride. These predictions of water quantity and quality are critical for water management planning. Literature is available for sub-permafrost chemistry and for other northern Canadian underground mines. The existing study does not compare literature values with the predicted water chemistry. This would aid in identifying what the water quantity and quality predictions for the Doris North project are in relation to previously observed water qualities in other northern mines. Available information concerning groundwater quality of relevant, active, northern Canadian mines should be used to validate model predictions and evaluate the functionality of the mine site water management plan in preventing negative environmental effects to the receiving environment (Roberts Bay).	Provide a comparison with existing northern Canadian mines and academic studies to show that the predicted range for groundwater quantity and quality is reasonable. Show that the mine water management plan is capable of managing the “worst case” literature scenario.	Request for Additional Information	In consideration of the reviewer's comment, TMAC will provide a review of comparable information prior to the Technical Hearing.
AANDC-NIRB #6:	Groundwater Inflow and Quality Model Sensitivity Analysis	Groundwater sensitivity analysis indicates that the model is most sensitive to the hydraulic conductivity values applied to the model. Only two tests were performed in the diabase dyke, and it was given a very low conductivity value; in the sensitivity analysis this parameter could have been varied more. The long term duration test, representative of a larger aquifer area, provides higher hydraulic conductivity values than the short duration tests. Groundwater input to the mine site water management system may be higher than predicted. If this is the case, there is the potential for impacts to Doris Lake and the management of the water, which will need to be reflected in the mine water balance and water management plan.	Provide more rationale for not including higher conductivity values in the model and sensitivity analysis. Provide an indication of how the water would be managed in the event the bulk hydraulic conductivity values are more in line with the long duration tests than the short duration tests.	Technical Comment	A complete discussion regarding the selection of hydraulic conductivity and salinity values are provided in the Hydrogeology Report [Hydrogeological Model document P6-3, submitted with the application]. Should flows exceed those values modelled, and specifically should they exceed inflows of 3,000 m^3/day, mining in the area affected will cease and measures put into place to mitigate the inflow.
AANDC-NIRB #7:	Doris Lake Sediment Hydraulic Conductivity Values	The Appendix indicates a total of 13 locations where dissipation tests were conducted in lake-bottom sediments. The lowest hydraulic conductivity value was $1x10^{-9}$ m/s. This conductivity value is higher than the value applied to the indurated sediments. A better understanding of the distribution and characteristics of lake-bottom sediments is needed to evaluate model predictions. Presence of permeable lake sediment zones may result in higher infiltration of Doris Lake water and inflow into the underground works during operations and closure.	Provide the locations of the CPT test holes and an inferred thickness with associated hydraulic properties for the mapped lake-bottom sediments, along with an isopleth map, which would be useful for reviewers.	Request for Additional Information	This information is provided in SRK Consulting (Canada) Inc., 2009. Hope Bay Gold Project: Stage 2 Overburden Characterization Report. Report prepared for Hope Bay Mining Ltd. Project Number 1CH008.002. September. This is a large document so the Table of Contents of the Report is provided in Appendix 3.3. TMAC would be pleased to provide the Report directly to the Commenter directly upon request.
AANDC-NIRB #8:	Marine Water Quality - Winter Conditions	Concentrations of certain parameters (e.g. Cadmium and Mercury) exceeding CCME guidelines are present in the proposed winter effluent (SRK 2011). Detailed plume modelling results covering the range of potential plume behaviour are not presented (Rescan 2013). The Roberts Bay Report refers only to a buoyant plume behaviour trapped in a 20-metre deep portion of the water column, and provides a schematic description of diffuser and plume performance that does not encompass the range of potential mixing dynamics. The estimated effluent plume behaviour is an important input to the time stepping box model. This information will allow reviewers to evaluate the ability and capacity of the receiving environment to mix with and integrate the effluent. This information is needed to fully understand the potential zone of influence (impacts to the marine environment) of the proposed underground mine water discharge during ice-covered conditions.	What is the range of behaviour of the effluent plume under the various environmental conditions experienced at the project site, including quiescent winter circulation, negative and positive estuarine circulation, and flows lower than 120 L/s (10,360 m^3/day) consisting of only dense underground mine groundwater (e.g.3,000 m^3/day)? Please provide a description of numerical modelling methods and results behind there presentative schematics and diagrams.	Technical Comment	See response for AANDC-NIRB#11. Plume behaviour, mixing zones, and general circulation cannot be addressed with a box model; only with 3-dimensional hydrodynamic modelling. The modelling methods are presented in Document P4-1, Section 4.5.2.2 with results discussed Document P4-1, Section 4.5.2.3.

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AANDC-NIRB #9:	Marine Water Quality – Bathymetric Data Gaps	During the winter, exchange between Roberts Bay and Melville Sound is extremely low and effluent from the Tailings Impoundment Area (TIA) and groundwater is expected to "pool" during this period (Package 4). Pooling of effluent denser than seawater within Roberts Bay could occur in bathymetric depressions. Rescan (2013) states "All site-specific bathymetric information is included in Figure 4.2-7". The isobaths contours deeper than -50 do not appear on the figure, yet it is concluded that there is no sill at the mouth of Roberts Bay. Some figures, e.g. 4.2-9, appear to show a bowl-shaped depression within Roberts Bay. Localized pooling of saline groundwater effluent in a small volume of water could result in poor dilution and therefore could cause exceedances of the CCME guideline criteria for the protection of marine life, especially in slow moving water conditions under the ice. This information is needed to fully understand the potential zone of influence of the proposed underground mine water discharge into the marine environment during the winter ice-covered conditions.	Please provide the bathymetric survey data, including point measurements, survey methodology, and area of coverage, to support the estimates regarding the pooling behaviour of negatively buoyant effluent.	Request for Additional Information	To address the reviewer's comment, detailed bathymetry data and methods are available in the following reports on the NIRB Public registry: Rescan. 2013. *Doris North Gold Mine Project: 2012 Roberts Bay Bathymetry Monitoring Report*. Prepared for Hope Bay Mining Limited by Rescan Environmental Services Ltd. Rescan. 2009. *Doris North Project: 2009 Roberts Bay Jetty Fisheries Authorization Monitoring Report*. Prepared for Hope Bay Mining Ltd., North Vancouver, BC by Rescan Environmental Services Ltd., Vancouver, BC. Rescan. 2010. *Doris North Gold Mine Project: 2010 Roberts Bay Jetty Fisheries Authorization Monitoring Report*. Prepared for Hope Bay Mining Ltd., North Vancouver, BC by Rescan Environmental Services Ltd., Vancouver, BC. Rescan 2010. *Hope Bay Belt Project: 2009 Marine Fish and Fish Habitat Baseline Report*, Hope Bay Belt Project. Prepared for Hope Bay Mining Limited by Rescan Environmental Services Limited. March 2010. Rescan 2011. *Hope Bay Belt Project: 2010 Marine Fish and Fish Habitat Baseline Report*, Hope Bay Belt Project. Prepared for Hope Bay Mining Limited by Rescan Environmental Services Limited. April 2011. The previous sediment monitoring reports: Golder. 2008. *2008 Roberts Bay Fisheries Authorization Monitoring Report*. Prepared for Hope Bay Mining Ltd., North Vancouver, BC by Golder Associates Ltd., Edmonton, AB.
AANDC-NIRB #10:	Marine Water Quality – Time Stepping Box Model Description	The time stepping box model is used to demonstrate the assimilative capacity of the receiving environment. The model description does not state the volume of the assumed mixing zone, only the exchange rates between Roberts Bay and Melville Sound. As volumes of the receiving water winter 'pool' is identical to the summer volume, it is not clear if the box model appropriately represents receiving water conditions given the seasonal variations of volumes. The box model also assumes instantaneous mixing throughout the receiving volume. In any outfall system there is the potential for concentration of effluent on tidal timescales, especially during calm periods. No estimate of the reduction of effective dilution due to buildup of effluent was provided. This additional information regarding the variables and inputs into modelling of the effluent discharge into Roberts Bay is needed to assist AANDC in the subsequent technical review of this component of the Project, and should help to address any ongoing public concerns with marine discharge of the TIA and groundwater effluent into Roberts Bay.	Please provide technical details on the receiving water time stepping box model, including seasonal differences in water column properties and plume behaviour, along with representative maps of the areas and depths of the receiving water body affected. Please provide estimates of the degree of background buildup and effluent inhomogeneity in the receiving water.	Technical Comment	Technical details of the time-stepped model can be found in document P4-1, Section 4.5.2.2. Effluent inhomogeneity, plume behaviour, mixing zones, and general circulation cannot be addressed with a box model; only with 3-dimensional hydrodynamic modelling. The model applied a trapping layer of a particular volume with baseline metal concentrations then allowed effluent of particular concentrations to accumulate with flushing during the open-water season such that the Council of Ministers of the Environment (CCME) guidelines were met during the last year of the proposed discharge. This gave a water quality target for each CCME WQ parameter.
AANDC-NIRB #11:	Marine Water Quality – Diffuser HAZID (Hazard Identification)	There are potential hazards associated with the construction of a marine outfall pipe, an assessment of which has not been provided. The hydraulics of the diffuser, the delivery pipe and the de-aeration tank in the plant are crucial to meeting the stated performance of the marine outfall, and to its continuous operation as designed. There is insufficient information in the documents provided to conduct a technical appraisal of the proposed system. Any failure in the outfall system would have operational consequences for the Project and could change current environmental impact predictions. This additional information will assist AANDC in the subsequent technical review of this component of the Project, and should help to address any ongoing public concerns with marine discharge of the TIA and groundwater effluent into Roberts Bay.	Was a HAZID (hazard identification) conducted for the outfall system? If the answer is "yes", please provide the report or relevant documents, and any follow-up material. If the answer is "no", provide justification for why this step was excluded from the assessment. If there is supplementary information that fulfills a similar goal, please provide that documentation.	Technical Comment	A formal HAZID has not been completed to date and is typically undertaken as part of the detailed engineering phase of a project. This is consistent with all the engineering structures presented in this and past Water licence applications for this project. Detailed design of the outfall pipeline will be provided to the NWB prior to construction.

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AANDC-NIRB #12:	Marine Water Quality - Outfall System Hydraulics	The hydraulics of the diffuser, the delivery pipe and the de-aeration tank in the plant are crucial to meeting the stated performance of the marine outfall, and to its continuous operation as designed. There is insufficient information in the documents provided to conduct a technical appraisal of the proposed system. Any failure in the outfall system would have operational consequences for the Project and could change current environmental impact predictions. This additional information will assist AANDC in the subsequent technical review of this component of the Project and should help to address any ongoing public concerns with marine discharge of the TIA and groundwater effluent into Roberts Bay.	Please provide the design report for the outfall hydraulics. Specific questions are: a. Of concern is the manner in which the system was designed to operate over a wide range of flow rates, and maintain full-pipe conditions. AANDC requests the Proponent provide information supporting how the discharge system was designed to operate over a range of flow rates and maintain full-pipe conditions. b. What are the head requirements of the diffuser and outfall pipe? c. How was the surface area of the de-aeration tank determined? d. Will the mixture of the TIA supernatant and the mine groundwater lead to either generation of gas bubbles when combined, or scaling in the pipe? e. Is there provision for potential scaling in the pipe, or other processes that would increase its roughness? f. How will planned and emergency shut-downs be handled, especially to avoid freezing of the pipe when flow is not maintained?	Request for Additional Information	TMAC acknowledges the request of the reviewer for details on the hydraulic design of the outfall. A preliminary engineering assessment on the overall feasibility of the outfall serves as the basis of the information contained in the Application. Engineering planning has been completed at a level consistent with the expectations for Water Licence applications. Detailed design of the outfall will be provided to the NWB prior to construction. The reviewer is directed to documents P6-6, P6-7, and P6-8 in the Application for further details on the outfall structure.
AANDC-NIRB #13:	Marine Water Quality – Public Concerns	In past and more recent northern community meetings with the Proponent, some members of the public have raised concerns about the discharge of TIA and underground mine water to the marine environment because of potential contamination of the sea and possible negative effects on marine life. This additional information will assist AANDC in the subsequent technical review of this component of the Project and should help to address any ongoing public concerns with marine discharge of the TIA and groundwater effluent into Roberts Bay.	The Proponent has stated that the TIA and groundwater effluent will meet the legally-required MMER limits within the pipeline prior to discharge via the multiport diffuser in the marine environment and CCME guidelines will be met within Roberts Bay for the duration of groundwater and TIA discharge. Supporting Document P6-10 indicates that "concentrations of cadmium and mercury in the Marine Outfall Mixing Box effluent are predicted to exceed the marine (CCME) water quality guidelines at different timeframes during operations and post-closure dewatering". During the winter period the groundwater is predicted to pool (on or near the seafloor, presumably with limited mixing).Based on this information, and the community concerns relating to marine discharge from past consultations, please provide a more specific assessment of the anticipated mixing/dilution zone of the pooled groundwater during the winter period. In addition, AANDC requests information on whether the predicted exceedances of CCME marine guidelines have been clearly presented and explained to community members at consultations in plain, accessible language. If so, AANDC requests those consultation records be provided.	Technical Comment	There are no predicted exceedances in the Marine environment. Effluent is predicted to meet MMER end of pipe limits. Further, water quality is not predicted to exceed CCME guidelines in Roberts Bay at the extent of the mixing zone, which is within meters of the diffuser. Concentrations observed in the Marine Outfall Mixing Box are prior to discharge to Roberts Bay. At that point effluent is required to meet MMER limits. Between September 28th and October 2nd, 2015, TMAC Resources undertook a Kitikmeot community consultation tour aimed at specifically describing the Doris Amendment application and soliciting public comment on the same. TMAC was successful in concluding meetings in every Kitikmeot community with very well to fair turnout. Community questions focussed on marine discharge, tailings management and employment and training. A summary document is currently being prepared of these proceedings. No Kitikmeot resident encountered spoke out against our Amendment application.
AANDC-NIRB #14:	North Dam Spillway Effects on Permafrost	Reference is made to a proposed "North Dam Spillway", the location and design drawings of which are not included in P6-13 Tailings Management System. This spillway could thermally alter the permafrost boundary condition in the vicinity of the North Dam, which is a frozen core dam, or possibly negatively affect the surrounding permafrost ground conditions. The proposed "North Dam Spillway" (Section 2.4.2 Para 3), is a structure that may cut into and negatively impact the local permafrost condition in the vicinity of the North Dam, and potentially generate impacts to the environment if the permafrost is degraded.	Please provide the location, and design drawings for the proposed "North Dam Spillway". Also provide a statement describing the anticipated impact of the spillway on the surrounding permafrost ground conditions and the North Dam.	Request for Additional Information	The North Dam Spillway has already been reviewed and approved by the NWB as part of the existing Water Licence. The reviewer is directed to SRK (2007) [Design of the Tailings Containment Area Doris North Project, Hope Bay, Nunavut, Canada. report prepared for Miramar Hope Bay Ltd., Project 1CM01008.165, March 2007] on the NWB ftp site for information on this structure.

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AANDC-NIRB #15:	Frozen Soil Design Parameters	Frozen soil parameters used for the foundation soils to determine stability are not typical. These parameters were utilized to evaluate the stability of the pile. Ice-rich frozen soils are typically modelled as a f=0° material because confining stress has no effect on material strength. An apparent cohesion much higher than noted here is often the method utilized to simply model the strength of the frozen soil. The relatively high friction angle may over estimate stability. In addition the stockpile may generate creep deformation in the foundation soils depending on the length of time that the ore is stockpiled on the pad. This information is needed to review the engineering designs of the Ore Stockpile Pad and will help ensure that it will be stable for the secure stockpiling of ore on the pad. There is potential for environmental impacts to occur if the Ore Stockpile Pad has not been designed considering typical modelling variables.	Provide information that will confirm the suitability of the material property parameters for the frozen soil forming the foundation of Pad U stockpile. The parameters of apparent cohesion (40 kPa) and friction angle (f=26°) were noted. Provide information on the expected time that ore would be stockpiled on the pad to enable the potential for creep deformation to be considered.	Request for Additional Information	The frozen material properties are consistent with material properties adopted for the creep deformation analysis carried out for the North and South Dams as documented during the original Water licence Application in 2007. This is documented in the SRK TCA Design of the Tailings Containment Area Report dated March 2007 located on the NWB ftp site. The ore stockpile will be dynamic in nature as it serves as the feed to the process plant. An initial stockpile will be developed in advance of plant commissioning and it is expected that storage time could be up to 16 months. During normal operations, storage time will be more in the order of 6 months in duration.
AANDC-NIRB #16:	Waste Management System	Item 25 of Project Specific Information Requirements (PSIR) states “Describe the quantities, treatment, storage, transportation, and disposal methods for the following (where relevant): […] Combustible solid waste, non-combustible solid waste, hazardous waste or oil, […], empty barrels / fuel drums and any other waste produced”. The referenced sections in the application do not provide this information, only a design for a landfill. AANDC requires this information to complete the technical review of the overall waste management of the Project. Without this information, Intervenors cannot comment on whether there are potential impacts as a result of waste management.	Provide the proposed Waste Management Plan and Hazardous Waste Management Plan for the proposed project development. Provide descriptions as required by item 25 of the PSIR.	Request for Additional Information	The landfill design was the only component of the waste management system included in the Application as it is the only component requiring review and assessment. The other approved waste-related management plans can be found on the NWB Public Registry. Potential impacts arising as a result of construction and operation of approved waste management facilities has already been assessed as part of the Doris EIS. Accordingly, TMAC feels that Item 25 of the PSIR has been adequately fulfilled, given the scope of the Application.
AANDC-NIRB #17:	Quarry 3 – Condition of Bedrock	No information is provided to support the claim that cracks and fractures created by blasting will only be surficial. While leachate quality is not a key concern for the landfill, this assumption is essential during landfill operations as it is a fundamental parameter in determining whether the landfill is hydro--geologically isolated or not. This information is important to ensure that the landfilled wastes will be securely stored and will assist AANDC in the subsequent technical review of this component of the Project.	Provide additional information on bedrock quality and bedrock assessment to demonstrate that cracks and fractures will only be surficial. Provide a description of what steps will be undertaken to demonstrate, prior to waste placement, that cracks and fractures will only be surficial.	Request for Additional Information	Quarry #3 will be used as a non-hazardous landfill and as a result seepage will not contain any contaminants of concern that might impact the environment. Prior to putting the quarry into use as the non-hazardous landfill, the bedrock surface will be inspected by a qualified person to confirm that no fractures (if present) are extensive. The quarry is however located in permafrost so even if there was fractures they are not likely to be of concern.
AANDC-NIRB #18:	Waste Management Reports	The referenced reports are required to complete the review. The reports contain integral background information and assumptions that need to be reviewed. This additional information will assist AANDC in the subsequent technical review of this component of the Project.	TMAC provides references for the following reports: SRK 2006, SRK 2007 and SRK 2011c, but has not provided them for review. Please provide the referenced reports.	Request for Additional Information	The referenced waste management reports SRK 2006, SRK 2007, and SRK 2011c were used to inform the Application and SRK 2006 and SRK 2007 were previously submitted to the NWB as part of the existing Water Licence. Some of the content of these studies is reflective of project plans that are no longer current and not directly applicable to this Application. Should specific questions be raised by reviewers during their technical evaluation of the Application, TMAC can provide additional and relevant information contained within these references.
AANDC-NIRB #19:	Non-Hazardous Waste Landfill - Capacity	It is not possible to verify that sufficient landfill capacity is provided in the design. It is important to ensure that the non-hazardous waste landfill will have sufficient capacity for the life of the mine to determine if potential impacts to the environment could arise. This additional information will assist AANDC in the subsequent technical review of this component of the Project.	Provide a breakdown of anticipated waste quantities during development, operation and closure of the mine, as well as anticipated volumes for intermediate covers.	Technical Comment	Table 1. Volume of Estimated Non-Hazardous Solid Waste, in Appendix 4.0 presents the estimated non-hazardous solid waste generation volumes over the proposed six year mine life, including one final year of construction for the mill building assembly and commissioning, and other ancillary structures required, but not yet completed, such as the two additional vent raises. The annual volume estimates were based on high construction activity years, and are therefore considered conservative. The Doris North Project infrastructure is significantly completed and waste generation once the Project enters Operations is expected to be lower than these estimates. The total proposed landfill capacity includes the volumes for closure of Doris North as presented in the Interim Closure and Reclamation Cost Estimate (2015; document P5-2 included with the Application), plus a 13% contingency. The landfill design capacity was also intended to accommodate solid waste from the reclamation of Windy Camp under Water Licence 2BE-HOP1222, and to accommodate proposed closure wastes from the Madrid Advanced Exploration Program 2BB-MAE---, with contingency calculations for those closures being 3% and 6% respectively. With respect to the anticipated volumes for intermediate covers, the design brief (document P6-4 included in the Application) in section 4.3.2 indicates the cover thicknesses that will be applied during operations and at closure. Volumes of cover required will be dependent on the volumes of waste deposited and manner in which they are deposited and may vary dependent on operational considerations. The Doris North Project presently has access to five permitted quarries from which appropriate cover material may be sourced. Available material to cover the non-hazardous waste is not a limiting factor in the design or operation of the landfill.

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TMAC Resources Inc. Responses to IR Comments on the Doris North Project Terms and Conditions within Project Certificate No.003 and Application to Amend the Water Licence 2AM-DOH1323

ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC-NIRB #20:	Capacity of Proposed Underground Backfilling Space	The project description states that backfill requirements for the mine were calculated at 1,500,000 tonnes, based on volumes of planned stopes. It is also stated that all of the mineralized waste rock, all of the detoxified tailings (unspecified volume), and any potentially acid generating (PAG) material encountered in quarries (unspecified volume) will be placed underground. It is stated that all of the surface waste rock storage is temporary during mining and that at closure it is anticipated that all remaining Non-PAG waste rock on surface will be placed underground. Table A1 in the Waste Rock and Ore Management Plan presents volume of waste rock at 1,523,000 tonnes. It is understood that an unspecified amount of Non- PAG waste rock is proposed for use during construction; however, the concern is whether or not the underground space has capacity to accommodate the total volume of materials planned for backfill. A large component of the plans to manage potentially acid generating or metal leaching mine waste materials from the project relies upon placing materials as backfill in the underground workings which will be flooded at closure, and thus limiting potential leaching of acid and metals to the receiving environment. If there is insufficient space underground to accommodate all of the mine waste materials produced during the life of the mine, an evaluation of contingency permanent surface storage options for mine waste materials is needed, as well as assessment of related potential negative environmental effects.	a. Please provide a comprehensive tally of mine waste materials planned for underground disposal during operations and at closure (including but not limited to waste rock, detoxified tailings, and projected PAG from quarries). b. Please include details of how tonnage is converted into volumes, (i.e. swell factor considerations). c. Please provide a tally of available underground space for storage, including anticipated stope space (i.e. volume of space at the top of each stope evaluated as unusable for backfill storage, due to logistics of filling up all the way to the back of a stope).	Request for Additional Information	a. Refer to Table A1 of document P5-4, Waste Rock and Ore Management Plan, submitted with the Application. This table illustrates the mining schedule including production of ore and waste rock. Over the life of mine, about 3.9 M tonnes of ore and waste rock will be extracted from the underground mine (2,399,000 tonnes of ore and 1,523,000 tonnes of waste rock). The 1.5 M tonnes of waste rock will be returned back underground as backfill together with 6% of the tailings (leach tailings) which amounts to about 0.14 Mt of tailings. b. The in-situ density of the host rock is about 2.89 tonnes/m^3. Waste rock will be subject to bulking during excavation, and subsequently compaction when placed underground. A reasonable swell factor of 1.34 can be assumed for this material which means that the waste rock will require a void space of 0.71 Mm^3. The tailings will have a compacted density of 1.4 tonnes/m^3 and will occupy a void space of about 0.10 Mm^3. c. The available void space in the mine will be about 1.4 Mm^3. The required void space for backfill is 0.81 Mm^3, which is 60% of the available void space. The remaining 40% provides more than sufficient safety margin for possible unusable space.
AANDC-NIRB #21:	Preliminary Engineering - Tailings Management System	The use of the words “preliminary engineering” would seem to indicate that the engineering is not final and there is more engineering design to come. The Proponent should provide final engineering designs of the project for Intervenors to review and make comment on potential impacts at this stage of the impact assessment process. This will allow Intervenors to make fully informed comments in the subsequent stage of the impact assessment process.	Please clarify why the engineering presented in P6-13 Tailings Management System are considered “preliminary” and what additional engineering work has to be undertaken before these designs are ready for construction.	Technical Comment	Preliminary engineering is consistent with the level of engineering required for a Water licence Application, and is the same level of detail for all surface infrastructure provided to NIRB and NWB as part of past applications. This level of engineering can be considered Feasibility Level engineering. This means that there is demonstrated proof of concept, all appropriate trade-off analysis has been completed and the design is sufficiently refined to allow a cost estimate accurate to Plus/Minus 10%. Further confirmatory analysis is required prior to completion of Issued for Construction (IFC) drawings.
AANDC-NIRB #22:	TIA Interim Dike - Filtering Requirements	There are statements in the text which describe the purpose of the Interim Dike is to impound tailings between the South Dam and the Interim Dike. Therefore, it is inferred that the Interim Dike is actually a filter dike; retaining the tailings on the upstream side while allowing the supernatant water to flow through the dike to the downstream reclaim pond. However, the drawings show the Interim Dike to be mainly constructed with Run of Quarry material. The concern is if the Run of Quarry material will be a suitable filter material to retain the tailings upstream of the Interim Dike while allowing the water to filter through to the downstream reclaim pond. It is also noted that P6-13 Tailings Management System: Section 4.4.2 Para 1, does mention “The upstream face of the Interim Dike will, if required be clad with a layer of graded rock that would act as a filter to ensure tailings solids does not migrate through the Dike. Alternately, the upstream slope will be clad with a geotextile to serve this filtering function.” However, these mitigations may not be practical to employ if the Run of Quarry design does not work, since the tailings facility will already be in operation, and could have tailings and turbid supernatant water encroaching on the upstream face of the Dike. Given the importance of the Interim Dike, it is prudent to implement best practice, and design and construct the Dike in a way that does not require post-construction retrofitting from the onset. If the run of Run of Quarry material does not act as a filter it may result in reclaim water turbidity and silting up of the downstream reclaim pond. It is important that the Interim Dike function properly to retain tailings on the upstream side of the TIA while allowing filtered tailings water to flow through the dike to the downstream reclaim pond for the proposed TIA to function properly and avoid unpredicted impacts to the environment. This information will assist AANDC in the subsequent technical review of this component of the Project.	Please comment on the rational for the design process and the proposed mitigation strategy. Please provide supporting design calculations to show that the Interim Dike constructed of Run of Quarry material will in fact be a suitable filter matrix for retaining the tailings on the upstream side while allowing the supernatant water to flow through the dike to the downstream reclaim pond. If the Run of Quarry material becomes clogged, how will tailings supernatant water be transferred from the Tailings Management Pond to the downstream Reclaim Pond? Consequently, describe potential effects of possible buildup of hydrostatic head on the upstream side of the Interim Dike, on the dike’s stability.	Request for Additional Information	The entire TIA has been included in Schedule 2 of MMER including the area upstream and downstream of the Interim Dyke. Suspended solids in the Polishing Pond during operations are expected and will not impact the environment. The stability analysis for the Interim Dike includes scenarios where there is a hydrostatic head behind the dike. More detailed supporting calculations on the performance of the Interim Dike as a filter will be provided in advance of the Technical Hearing. TMAC plans to provide detailed supporting calculations on the performance of the Interim Dike as a filter. It should be noted that this IR comment period is not meant to serve as the technical review comments, but rather should identify conformity information gaps within the amendment application to be address. Therefore, TMAC commits to providing additional information more appropriately addressed during the technical review and/or technical meeting.

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TMAC Resources Inc. Responses to IR Comments on the Doris North Project Terms and Conditions within Project Certificate No.003 and Application to Amend the Water Licence 2AM-DOH1323

ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC-NIRB #23:	TIA Interim Dike – Underwater Slopes	The upstream and downstream slopes of the Interim Dike are designed as 3H:1V slopes. Given that the Dike will be constructed "in the wet" it is not clear if it is feasible to construct 3H:1V with the material that will be used to construct it and the depth of the water at this location. If due to water depth the Dike cannot be constructed with these slopes, potential related effects on stability and more importantly the filtering capacity of the Dike have not been described. AANDC requires the rationale for using the slopes as designed, along with how they will be constructed given the project-specific circumstances. This information is needed to confirm the current design parameters or to modify the design of the Interim Dike to ensure constructability and assist AANDC in the subsequent technical review of this component of the Project.	Please provide a description of how the upstream and downstream slopes of the Interim Dike will be constructed to slopes of 3H:1V, and if desired to improve the stability, to the even flatter 5H:1V discussed in P6-12 Section 4.6.2.	Request for Additional Information	TMAC is willing to provide additional details on constructability aspects as part of the Technical Hearing.
AANDC-NIRB #24:	TIA South Dam Engineering Drawings	The drawing and figure show different configurations of the materials surrounding the Geosynthetic Liner for the South Dam. The apparent inconsistencies between the drawings need to be resolved for AANDC to provide comment in the subsequent technical review.	Please indicate which of the details are correct and confirm the proposed construction sequence for the materials surrounding the Geosynthetic Liner.	Technical Comment	For clarification, the correct details are Section B/05 on Drawing DN-TIA-06 (document P6-13). The liner is bedded (i.e. placed) into the key trench of the excavation directly onto exposed permafrost that has been carefully levelled. A layer of bentonite powder or pellets is placed between the liner and the permafrost surface to help seal in the liner. The liner is covered with a heavy duty geotextile followed by a protective layer of crushed rock (pea gravel size).
AANDC-NIRB #25:	TIA South Dam – Downstream Slope Steepness	The South Dam is founded on very ice-rich saline silt that is expected to creep considerably over time. Earlier analyses of the North Dam (EBA Engineering Consultants Ltd., 2006), Thermal Design of Tailings Dams, Doris North Project NU. Report Prepared for SRK Consulting (Canada) Inc. Project Number 1100126. September 2006) identified the potential for considerable deformation of the Dam during its operating life, and as a result the slopes were flattened significantly (6H:1V) to reduce deformation. Although the South Dam might not fail due to creep during its life, it is possible the creep deformation could lead to the formation of substantial bulging of the downstream slope and cracking through the crest of the dam in the long term. This may lead to the requirement to undertake some form of remedial repairs. It is suggested that the slope could be flattened to 4H:1V if monitoring shows excessive movement but identifies it is not expected due to the results of the thermal analysis. It is unclear how the thermal analysis would lead to this conclusion as the thermal analysis does not show extensively cooler foundation soils which would reduce creep rates. There is a potential for excessive creep deformation of the downstream slope of the dam which is founded on very ice-rich foundation soils. This issue needs to be addressed to ensure the long term integrity of the TIA South Dam. There is the potential for environmental impacts to occur should the dam experience excessive creep deformation.	Provide analysis results showing the evaluation of potential creep deformation of the downstream slope of the South Dam.	Request for Additional Information	The commenter's requested analysis evaluating the potential creep deformation of the downstream slope of the South Dam and the potential for environmental impacts was previously provided in the original Water Licence Application. Please refer to the SRK Consulting (Canada) Inc., 2007 report, *Design of the Tailings Containment Area, Doris North Project, Hope Bay, Nunavut, Canada*. Report prepared for Miramar Hope Bay Ltd., Project Number: 1CM014.008.165. March 2007.
AANDC-NIRB #26:	Supernatant Pond Extent and Elevation	The proposed tailings deposition plan drawings are missing the extent and elevation of the tailings supernatant pond. The management of a tailings storage facility requires both the volume of solids (tailings) and the volume of water (supernatant water) to be managed in tandem within the facility. AANDC requires this information for the technical review of the project.	The extent of the tailings is not shown on the Tailings Deposition Plans; Figs 05, 06 and 07. AANDC requests that information regarding the extent and elevation of the supernatant pond be added to this drawing.	Request for Additional Information	TMAC acknowledges the reviewer's request and revised drawings from the application document P6-13 (Tailings Management System) are provided in Appendix 3.1 - Figures 05, 06 and 07 have been included to show the maximum level of the supernatant pond during operations and at closure.
AANDC-NIRB #27:	Sea Ice Impacts on the Marine Outfall Pipe	The Roberts Bay Outfall Berm only provides protection to the outfall pipe to a water depth of 3.0 m. It is typical in arctic marine environments that ice can move during the winter and also during breakup, often generating pressure ridges that can have keels that will penetrate below the ice surface elevation more than the typical ice thickness. If this occurs in Roberts Bay, it is possible that the keels could impact the pipe if they are deeper than 3.0 m. In addition there can be wind driven ice pile up in coastal areas that could also potentially lead to ice impacting the pipe at the end of the berm. Thus a 1.0 m allowance to protect against impact by sea ice may not provide sufficient protection. This information is needed to ensure that the potential impacts of ice scouring have been adequately considered in the design of the marine outfall pipe and help ensure that unpredicted impacts are not encountered for this component of the project.	Provide data on the typical characteristics of the sea ice (including thickness, presence of pressure ridges) and its movement in Roberts Bay during the winter and at breakup. Provide rationale for choosing a 1.0 m allowance to protect against impact by sea ice on the outfall pipe.	Technical Comment	Average ice thickness in Roberts Bay was 1.65 m in 2009 and 1.69 m in 2010. Pressure ridges are not present in the bay given the landfast nature of the ice sheet. On-site experience shows only small deformities in ice, but largely the ice is flat. Ice-off occurs over 1-2 weeks usually in late June and early July. The movement of the ice flow during thawing and freezing is primarily driven by surface winds with ice accumulating in the bay during northern winds and leaving the bay on southern winds. Sustained, high winds from the south can move ice from Roberts Bay in a matter of days. No direct measurements (i.e., using an ice profiler) of surface ice movement have been made in Roberts Bay. The 3 m depth was deemed sufficient as there has been no observed scour of rocks at that depth as evidenced by the bathymetric surveys of the jetty located immediately to the east of the proposed outfall structure.

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AANDC-NIRB #28:	Public Consultation Record	Section 4.3 outlines in chronological order a listing of the consultation activities that TMAC has undertaken since 2010 in relation to the project as well as a very brief summary of issues raised by community members. Recently, there have been many changes to project design, timeframes, etc. Reviewers would benefit from a comprehensive public consultation record including more detailed information about the project changes that have been communicated to communities and how they were communicated, any concerns that were raised, as well as how those concerns were responded to and how any concerns were taken into consideration in project design and activities. Providing a comprehensive consultation record as well as an overview of how the Proponent plans to address community concerns enables reviewers to ensure the Project is being undertaken in a manner that is acceptable to communities and incorporates their views and concerns.	It is recommended that the Proponent provide a comprehensive consultation record, including additional information on what project aspects have been communicated and how, a detailed record of concerns raised, as well as how the Project has been influenced by any public comments or concerns. Where concerns are identified it is recommended that the Proponent outline mitigation measures to address those concerns where feasible.	Request for Additional Information	A summary of consultation undertaken since 2010 was provided in the 2015 Amendment Application (Section 4.3). TMAC has continued to conduct community consultation related to the Doris North Project and specifically in relation to the 2015 Amendment Application, including recent public meetings in Gjoa Haven, Kugaaruk, Taloyoak, Cambridge Bay, and Kugluktuk in September/October 2015. While TMAC looks forward to reporting on ongoing and future consultation activities, the detail provided in the 2015 Amendment Application is considered adequate for the current level of review. Between September 28th and October 2nd, 2015, TMAC Resources undertook a Kitikmeot community consultation tour aimed at specifically describing the Doris Amendment application and soliciting public comment on the same. TMAC was successful in concluding meetings in every Kitikmeot community with very well to fair turnout. Community questions focussed on marine discharge, tailings management and employment and training. A summary document is currently being prepared of these proceedings. No Kitikmeot resident encountered spoke out against our Amendment application.
AANDC-NIRB #29:	Project Employment By Skill Level	Section 6.4.1 and Table 6.4-2 outlines projected project employment, and breaks down by year the number of project employees anticipated. However, the number of jobs indicated does not provide any information on the type of jobs and their skill levels. This information is important in order to understand if there have been any changes to the employment and skills profile of the new proposed development as well as to clarify for reviewers how the employment profile of the project may have changed given the updated timelines. This information will assist reviewers and communities in understanding the types of jobs that will be available for planning and training purposes. Given that the project anticipates to accelerate hiring in 2016 and 2017 this information would be helpful to receive in as far advance as possible. Understanding the socio-economic benefits of the updated project as a result of employment is important for reviewers. Having a solid understanding of the types of jobs available and their skill requirements will enable parties to plan ahead and allow for the maximum socio-economic benefit possible should the project proceeds.	It is recommended that the Proponent provide a breakdown of the types of jobs anticipated to be available as a result of the new development by year, categorized by skill level.	Request for Additional Information	Project-specific employment including detailed workforce schedule information (i.e., the number of positions each year, by area of employment, job category, and skills requirements) has not been developed. TMAC acknowledges that an updated economic model and related analysis may assist with local and regional planning, however, updated economic input data is not expected to alter the conclusions of the 2015 Amendment Application. TMAC submits that the 2015 Amendment Application provides a level of information adequate to perform the level of review associated with the proposed amendments to the Project. TMAC has entered into Inuit Impact and Benefit Agreement (IIBA) with the KIA and looks forwards to implementing the related mitigations contained within the IIBA, which are beyond that included in the 2005 FEIS (KIA & TMAC, 2015). TMAC will provide the IIBA Implementation Committee with information about the Project's projected labour requirements once available. This information will help the IIBA set Inuit training and employment targets as described in the 2015 IIBA (KIA & TMAC, 2015).
AANDC-NIRB #30:	Employment Projections	Section 6.4.1 and Table 6.4-2 outlines projected project employment, and breaks down by year the number of project employees anticipated as well as makes a prediction that 42% of the workforce will be comprised of Nunavummiut due to "the education profile within the communities and a requirement for a minimum of Grade 10, the types of jobs likely to be required by the project, and historic data on the number of Inuit employed at previous Hope Bay Projects/ works." However, little supporting analysis to illustrate the above points appears in the EIS addendum. It would be helpful for reviewers to have a clear picture of the number of jobs by type (labour demand) and skill level (as requested in AANDC-IR #29) correlated against the skills profile of the Kitikmeot region (labour supply), in order to understand the availability of Nunavummiut for project jobs. Furthermore, it is unclear how the rationale for 42% was arrived at, considering the historic Inuit employment levels at previous Hope Bay Projects were unable to achieve this target. Finally, does this target number take into consideration other projects in the region that may proceed at the same time as the proposed lengthened development? Understanding the socio-economic benefits of the updated project as a result of employment is important for reviewers.	It is recommended that the Proponent update their labor force analysis and employment impact assessment using the skill requirements and number of jobs available and the skills profile of the Kitikmeot region, and provide a more comprehensive understanding of the historic levels of employment at previous Hope Bay projects/ works in order to clearly demonstrate the employment impacts the project is predicted to have.	Technical Comment	The original prediction of project workforce sourced from impacted communities was made as part of the original 2005 Environmental Assessment. The development of employment projections for Doris North can be viewed at the following link on the NIRB FTP site. Since 2005, the Unemployment and Employment rate in the Kitikmeot region has not significantly changed. The Kitikmeot labour force has significantly increased. However, the constituent skills level has not significantly changed (comparing 2005 Table 26.3 with 2015 6.2.3 Discussion). Although a number of other major projects affecting impacted communities continue to operate (Diavik and Ekati Diamond Mines), two adjacent Nunavut mines have ceased operation (Jericho and Lupin). Our amended project will go forward with a larger workforce. However the type, and proportional representation of jobs has not changed. In summary, the available labour force since original assessment has grown, and competing development projects have decreased. Our projected labour requirements are similar but larger and for a longer duration. Based on these this history and our projected changes, it is acknowledged that uncertainty exists around how much project employment can be captured by Nunavummuit. However, pursuant to Schedule E of the 2015 IIBA, other tools have been created to enhance and maximize employment for Nunavummuit. For clarity, the Grade 10 minimum requirement for employment at Doris can be waived: Point 13 of Schedule E of the IIBA removed the grade 10 hiring requirement, stating: "TMAC will develop human resource policies which address minimum requirements for employment (which may include waiving requirements in appropriate circumstances for high school graduation or other similar aptitude tests or requiring minimum of Grade 12 level education). In consultation with the Implementation Committee, TMAC will identify jobs for which formal entry level educational requirements may be adjusted for Inuit job applicants."

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AANDC-NIRB #30: *(cont'd)*	Employment Projections *(cont'd)*	As above	As above	Technical Comment *(cont'd)*	TMAC acknowledges that an updated economic model and related analysis would enhance the level of detail TMAC is able to provide regarding the benefits of the Project and may assist with local and regional planning. However, TMAC does not expect that updated economic impact data would alter the conclusions of the effects assessment within the 2015 Amendment Application. TMAC submits that the Application provides adequate detail to perform the current level of review.
AANDC-NIRB #31:	Complete Assessment of Economic Effects	The EIS Addendum contains brief references to planned project expenditures from 2015-2021, including anticipated capital and operating expenditures and indicates that "the proposed amendment to the Project will result in the prolonging of contract and business opportunities" associated with the six year mine life. However, this does not include an analysis of the indirect and induced effects on the local and regional economy as is required, in order to enable a comprehensive understanding of the economic effects of the updated and lengthened project. Having a complete understanding of the economic effects of the updated project is important for reviewers to assess the overall economic benefit of the project on the local and regional economies.	It is recommended that the Proponent update their economic effects analysis to include consideration of the indirect and induced economic effects of the proposed lengthened development in accordance with the EIS guidelines. Due to the lengthened nature of the project, it is anticipated these will differ from the originally proposed effects.	Technical Comment	TMAC acknowledges that an updated economic impact model would enhance the level of detail TMAC is able to provide regarding the benefits of the Project and may assist with local and regional planning. However, TMAC does not expect that updated economic impact data would alter the conclusions of the effects assessment within the 2015 Amendment Application. The economic benefits of the Project are expected to be enhanced accordingly with the proposed increase in expenditures. TMAC submits that the 2015 Amendment Application provides adequate detail to perform the level of review associated with proposed amendments to the Project and current level of review.
AANDC-NIRB #32:	Employment Mitigation Measures Including Education and Training	The EIS Addendum contains brief references to training planned by the Proponent. Table 6.5-1 lists a commitment to 'collaborate with training agencies' in order to increase training opportunities. Considering the lengthened timeframe of the project there is an opportunity for the Proponent to outline a comprehensive training plan that assists maximizing the benefits of the project for Nunavummiut. Reviewers would benefit from understanding more details around the 'collaborative' training planned, including what courses are anticipated to be offered, and how the training program will enable Nunavummiut to participate more fully in the update project. Training and education is a key benefit of a major resource development project of this length and magnitude and having a clear understanding of what is being proposed by the Proponent in this regard is important for reviewers.	It is recommended that the Proponent add a more comprehensive 'Training and Education' plan to their EIS Addendum. This should include further detail on the proposed training collaborations, in addition to an overview of anticipated training and education programming, including specifics on how the training and education will enable Nunavummiut to participate more fully in the lengthened and updated project.	Request for Additional Information	TMAC has worked with the KIA to review, mitigate, and enhance the opportunities and potential impacts of the Project, resulting in an Inuit Impact and Benefit Agreement (IIBA) (KIA & TMAC, 2015). The IIBA includes measures that are relevant to the Human Resources Plan as well as training and development. Additionally, TMAC supports the preparation of the Kitikmeot labour force for mining related employment generally through participation in Socio-economic Monitoring Committees and as part of the Community Readiness Committees and other skills training initiatives as indicated in the 2015 Amendment Application. TMAC Resources is committed under Condition 32 of the existing Doris North Project Certificate to have relevant Human Resource plans in place prior to commencement of Production. The IIBA notwithstanding, TMAC submits that the detail provided in the 2015 Amendment Application is adequate to perform the level of review associated with amendments to a Water Licence Application and Project Certificate.
AANDC-NIRB #33:	Socio-Economic Impacts Related to Closure	Guidelines for the original Doris North project require the Proponent to "evaluate how the temporary or final closure of the mine would affect workers and communities," as well as to provide an overview of what measures the Proponent would put in place to reduce the socio-economic impacts of temporary or final closure. An updated version of this analysis and overview of management measures does not appear in the EIS Addendum. Given the increased length of the project being proposed, it is presumable that the socio- economic impacts of final closure would be greater than those originally anticipated, and thus would require more robust plan and response. Furthermore, it is anticipated that the Proponent may have lessons learned to draw from when completed this analysis, given the employment and economic profile of the Project as a result of its Care and Maintenance phase (i.e. project employment went from an average of 282 in 2011 to 48 in 2013). Were mitigation measures or management responses put in place to deal with this temporary closure? Are there best practices that should be implemented in the event of a temporary or final closure? Responding to the socio-economic impacts of a temporary or final closure is an issue of concern to Nunavummiut and communities. Given that the newly proposed development has a lengthened timeframe, these impacts may be greater than originally anticipated. Understanding how the Proponent evaluates these impacts, as well as having an understanding of proposed mitigation measures and management responses will enable reviewers to have a better understanding of how these impacts will be managed.	It is recommended that the Proponent include a section on the anticipated socio-economic impacts and effects of a temporary or final closure for the newly proposed development, including consideration of its lengthened timeframe. Furthermore, the Proponent should outline potential mitigation and management responses to a temporary or final closure based upon their own experiences and the experience of other nearby projects.	Request for Additional Information	The 2015 Amendment Application considered the potential for the amendments to the Project to alter the unemployment following mine closure. The material nature of the effect remains consistent with the description provided in the 2005 FEIS and existing mitigation is considered adequate to address this effect. As indicated in the 2015 Amendment Application, the proposed amendments to the Project are not anticipated to result in any new effects and the potential effects as identified in the 2005 EIS remain valid. Under the existing Doris North Project certificate, TMAC is required to have relevant Human Resource plans in place prior to commencement of Production (Condition 32) and to monitor social and economic impact of the project on the local communities (Condition 28). TMAC submits that this planning and monitoring program is sufficient to capture socio-economic impacts of temporary or final closure in a manner that will trigger any required management response. Furthermore, TMAC has entered into Inuit Impact and Benefit Agreement (IIBA) with the KIA and looks forwards to implementing the related mitigations contained within the IIBA, which are beyond that included in the 2005 Final EIS (KIA & TMAC, 2015). The 2015 IIBA is specifically relevant to temporary and final closure.

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AANDC-NIRB #34:	Scope of Doris North Review	The current scope of the Doris North Project Certificate No. 003 does not represent all uses of project components as proposed by the Proponent (TMAC). Presently, the NIRB is reviewing a proposal submitted by TMAC for the Madrid Advanced Exploration Program, a project south of the Doris North project area. TMAC clearly states in the project description for the Advanced Exploration Program and in responses to Intervenor comments that their intention is to use Doris North facilities for the Exploration Program. AANDC has summarized the following items of concern along with components of the Doris North project that will have shared use for the Madrid Advanced Exploration Program: • Project life of Madrid Advanced Exploration Program is 10 years, a considerably longer lifespan in relation proposed 6 year Doris North project under review. • As stated by TMAC in their response to comments regarding the 12.10.2 (b) Exception application, dated August 21, 2015, "with the exception of mine water and waste, rock generated through the Madrid Advanced Exploration Program, waste handling, processing, treatment and storage will occur at Doris North utilizing existing facilities", demonstrating that Doris North facilities will have greater use, and potential impacts, than what is described in the current amendment application package. • AANDC also has concerns with how TMAC intends to use Doris North facilities for the Madrid Advanced Exploration Program, considering that in their response August 21, 2015 it is unclear if the Exploration Program is contingent on using structures described in the previously approved Project Certificate No. 003. For example, it appears that TMAC intends to have tailings from the Exploration Program deposited into a sub-aqueous tailings management facility, previously approved in Project Certificate No. 003, as per their response: "Tailings from the initial bulk sample testing will be placed in the TIA subaqueously in compliance with the current Doris North mine Type A Water Licence." However, it seems that TMAC assumes that mitigation measures and an evaluation of the "capacity" for the Doris North TIA to accept tailings from the Madrid Advanced Exploration Program will be determined within this current impact assessment review, as also stated in their response August 21,2015, "If the proposed Doris North Project Certificate and Type A Water Licence amendments are ultimately approved by the NIRB and NWB (which provide for expanded TIA capacity and subaerial tailings deposition), and if TMAC needs to test mill more ore to support a further understanding of the deposit, TMAC will test mill the remaining volume of bulk samples utilizing any permitted capacity under the Doris North Project Certificate and Type A Water Licence." AANDC is of the opinion that the scope of this review should include all proposed uses of the Doris North infrastructure, including the additional tailings generated by processing ore from the Exploration Program. • TMAC states in their response to AANDC August 21, 2015, that "Adding the total tailings volume from the maximum size of the Madrid Advanced Exploration Program (120,000 t) would result in an additional 7 cm of tailings height over the entire area of the new land form produced by the tailings deposition. This small amount would be readily accepted within the proposed infrastructure of the Amended tailings management plan." AANDC notes that these assumptions should be reviewed as part of the impact assessment for the Doris North facility, as part of the scope of this review and Reconsideration of the Doris North Project Certificate Terms and Conditions. • AANDC is of the opinion that Intervenors could provide a more thorough and fulsome impact assessment if both the Exploration Program and Doris North project components were assessed as part of the Doris North review, contrary to what TMAC states in their response August 21, 2015, "As Madrid does anticipate utilizing some of the existing facilities operated under the Doris North mine, the plan for updating Madrid-specific modules within the suite of management plans will occur after updates have been made to address potential changes required pursuant to the Doris Amendment. This will be occurring in a manner that allows ample lead time for regulatory review of overall management planning for the Hope Bay Belt, and allow sufficient lead time for review of Madrid- specific plans in advance of advanced exploration activities at Madrid North and South."	AANDC requests that the NIRB provide clarification on how Intervenors should proceed in the Reconsideration of the Terms and Conditions of Project Certificate No. 003 given the TMAC's intention to use the project components under review for use by the Madrid Advanced Exploration Program. Please provide guidance on what information Intervenors should be reviewing from the Madrid Advanced Exploration Program if this will be included in the scope of the review. If the NIRB determines that the Madrid Advanced Exploration Program's use of Doris North project components fall outside the scope of this review, please provide rationale for the decision, and information on how the potential impacts from the Madrid Advanced Exploration Program's use of Doris North facilities will be fully captured through an additional impact assessment process.	Technical Comment	While the reviewer's comment is directed at the NIRB, it is TMAC's view that although the Doris facilities have the capacity to support use by future development in the Hope Bay Belt, the scope of the Amendment Application is limited to the Doris Mine. Consideration of future developments in the Hope Bay Belt, including the Madrid Advanced Exploration Project, and their associated impacts should be considered as either a separate application or a future amendment to an existing licence, as appropriate. Accordingly, TMAC respectfully requests that the consideration of Madrid use of Doris infrastructure be considered in the Madrid Type B water licence process.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC-NIRB #34: *(cont'd)*	Scope of Doris North Review *(cont'd)*	AANDC is concerned that the current scope of the Doris North project being reviewed fails to adequately address the potential impacts of the Madrid Advanced Exploration Program, and does not capture the full breadth of potential impacts. AANDC is of the opinion that a thorough and comprehensive assessment should consider the full scope of the intended use of project components, including the additional uses proposed by TMAC for the Madrid Advanced Exploration Program. AANDC is concerned that potential eco-systemic and socio-economic impacts arising from the use of Doris North facilities (such as using the mill to process ore from Madrid, depositing waste into the TIA and the subsequent discharge into the marine environment, use of camp facilities, etc.) for the Madrid Advanced Exploration Program will not be fully captured if it is not assessed as part of the scope of this current review.	As above	Technical Comment *(cont'd)*	As above
AANDC-NIRB #35:	Information on Madrid Advanced Exploration Program	The current scope of the Doris North Project Certificate No. 003 does not represent all uses of project components as proposed by the Proponent (TMAC). Presently, the NIRB is reviewing a proposal submitted by TMAC for the Madrid Advanced Exploration Program, a project south of the Doris North project area. TMAC clearly states in the project description for the Advanced Exploration Program and in responses to Intervenor comments that their intention is to use Doris North facilities for the Exploration Program. AANDC has summarized the following items of concern along with components of the Doris North project that will have shared use for the Madrid Advanced Exploration Program: • Project life of Madrid Advanced Exploration Program is 10 years, a considerably longer lifespan in relation proposed 6 year Doris North project under review. • As stated by TMAC in their response to comments regarding the 12.10.2 (b) Exception application, dated August 21, 2015, "with the exception of mine water and waste, rock generated through the Madrid Advanced Exploration Program, waste handling, processing, treatment and storage will occur at Doris North utilizing existing facilities", demonstrating that Doris North facilities will have greater use, and potential impacts, than what is described in the current amendment application package. • AANDC also has concerns with how TMAC intends to use Doris North facilities for the Madrid Advanced Exploration Program, considering that in their response August 21, 2015 it is unclear if the Exploration Program is contingent on using structures described in the previously approved Project Certificate No. 003. For example, it appears that TMAC intends to have tailings from the Exploration Program deposited into a sub-aqueous tailings management facility, previously approved in Project Certificate No. 003, as per their response: "Tailings from the initial bulk sample testing will be placed in the TIA subaqueously in compliance with the current Doris North mine Type A Water Licence." However, it seems that TMAC assumes that mitigation measures and an evaluation of the "capacity" for the Doris North TIA to accept tailings from the Madrid Advanced Exploration Program will be determined within this current impact assessment review, as also stated in their response August 21,2015, "If the proposed Doris North Project Certificate and Type A Water Licence amendments are ultimately approved by the NIRB and NWB (which provide for expanded TIA capacity and subaerial tailings deposition), and if TMAC needs to test mill more ore to support a further understanding of the deposit, TMAC will test mill the remaining volume of bulk samples utilizing any permitted capacity under the Doris North Project Certificate and Type A Water Licence." AANDC is of the opinion that the scope of this review should include all proposed uses of the Doris North infrastructure, including the additional tailings generated by processing ore from the Exploration Program. • TMAC states in their response to AANDC August 21, 2015, that "Adding the total tailings volume from the maximum size of the Madrid Advanced Exploration Program (120,000 t) would result in an additional 7 cm of tailings height over the entire area of the new land form produced by the tailings deposition. This small amount would be readily accepted within the proposed infrastructure of the Amended tailings management plan." AANDC notes that these assumptions should be reviewed as part of the impact assessment for the Doris North facility, as part of the scope of this review and Reconsideration of the Doris North Project Certificate Terms and Conditions.	AANDC requests that TMAC provide impact assessment information pertaining to the Madrid Advanced Exploration Program's use of Doris North Project infrastructure given TMAC's intention to use the project components for the Exploration Program. Please provide analyses and impact predictions, along with mitigation measures as appropriate, for the addition of the Madrid Advanced Exploration Program as it relates to the Doris North project, to be included as part of the Technical Review.	Technical Comment	While the Doris facilities have the capacity to support use by future development in the Hope Bay Belt, the scope of the Amendment Application is limited to the Doris Mine. Consideration of future developments in the Hope Bay Belt, including the Madrid Advanced Exploration Project, and their associated impacts should be considered as either a separate application or a future amendment to an existing licence, as appropriate. Accordingly, TMAC respectfully requests that the consideration of Madrid use of Doris infrastructure be considered in the Madrid Type B water licence process.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
AANDC-NIRB #35: *(cont'd)*	Information on Madrid Advanced Exploration Program *(cont'd)*	• AANDC is of the opinion that Intervenors could provide a more thorough and fulsome impact assessment if both the Exploration Program and Doris North project components were assessed as part of the Doris North review, contrary to what TMAC states in their response August 21, 2015, "As Madrid does anticipate utilizing some of the existing facilities operated under the Doris North mine, the plan for updating Madrid-specific modules within the suite of management plans will occur after updates have been made to address potential changes required pursuant to the Doris Amendment. This will be occurring in a manner that allows ample lead time for regulatory review of overall management planning for the Hope Bay Belt, and allow sufficient lead time for review of Madrid- specific plans in advance of advanced exploration activities at Madrid North and South. " AANDC is concerned that the current scope of the Doris North project being reviewed fails to adequately address the potential impacts of the Madrid Advanced Exploration Program, and does not capture the full breadth of potential impacts. AANDC is of the opinion that a thorough and comprehensive assessment should consider the full scope of the intended use of project components, including the additional uses proposed by TMAC for the Madrid Advanced Exploration Program. AANDC is concerned that potential eco-systemic and socio-economic impacts arising from the use of Doris North facilities (such as using the mill to process ore from Madrid, depositing waste into the TIA and the subsequent discharge into the marine environment, use of camp facilities, etc.) for the Madrid Advanced Exploration Program will not be fully captured if it is not assessed as part of the scope of this current review.	As above	Technical Comment *(cont'd)*	As above
1-KIA	General	"Mining all ore zones that are accessible via the existing Doris Portal in addition to the Doris North deposit will extend the life of the Doris Mine to approximately6 years. TMAC has conducted geochemical analysis to characterize the additional material expected to be mined and the results of these analyses confirms that the waste rock can be managed via existing site controls. Procedures for waste rock management on surface have been updated for operational efficiency."	• How will TMAC handle the additional waste rock?	Technical Comment	Waste rock will be handled in accordance with the revised Waste Rock and Ore Management Plan, document P5-4, submitted with the Application.
2-KIA	General	"Mining all ore zones that are accessible via the existing Doris Portal in addition to the Doris North deposit will extend the life of the Doris Mine to approximately6 years. TMAC has conducted geochemical analysis to characterize the additional material expected to be mined and the results of these analyses confirms that the waste rock can be managed via existing site controls. Procedures for waste rock management on surface have been updated for operational efficiency."	• How will the extended mine life impact the water balance and water management requirements?	Technical Comment	The effects of the proposed mine changes, including extended mine life, on water balance and water management requirements are addressed in document P5-3 (Water Management Plan) and P6-10 (Site-Wide Water and Load Balance).
3-KIA	General	"TMAC anticipates an initial mining and milling rate of 1,000 tonnes per day (tpd; daily average ore mining rate). This rate will ultimately increase up to 2,000 tpd."	• Will this increased milling rate result in a greater volume of effluent?	Technical Comment	The effects of the proposed mine milling rate change on volume of effluent is addressed in document P6-10 (Site-Wide Water and Load Balance).
4-KIA	General	'The Doris Camp will be enlarged to a capacity of280 personnel; no additional domestic water supply is anticipated."	• This will need to be validated in the water balance.	Technical Comment	Document P6-10, (Water and Load Balance) includes domestic water use as a source term. This source term is based on multiple years of actual domestic water use at Doris, which is measured, documented and reported according to the 2AM-DOH1323 SNP.
5-KIA	General	'The Doris Camp will be enlarged to a capacity of 280 personnel; no additional domestic water supply is anticipated."	• How will the expanded laydown area, camp and activities impact the zone of influence on wildlife?	Technical Comment	A zone of influence is currently being monitored under the existing approved WMMP for upland breeding birds, waterbirds and raptors using surveys in control and treatment areas while interactions with Project infrastructure is monitored for mammals. A determination of a zone of influence for caribou and grizzly bear will no longer be an objective of the 2015 Wildlife Mitigation and Monitoring Plan and as explained in Appendix 1-1 of the 2014 Wildlife Compliance Program report. The expanded laydown area will total 7.8 ha in size and additional personnel and activity will result in habitat loss and could lead to additional sensory disturbance of species occurring in close proximity to infrastructure. The water licence amendment assessed the additional habitat loss as negative and mitigable, and the conclusion of the 2005 FEIS of change in movement and behavior (i.e. due to sensory disturbance) being minor and not significant is still applicable. The expansion of the project and an increase in camp personnel to up to 280 people will not alter the predictions outlined in the Doris EIS, including those related to zone of effect. Wildlife will continue to be monitored, and impacts mitigated, through the Wildlife Mitigation and Monitoring Program, which includes monitoring for zone of effect where appropriate.

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6-KIA	General	"Expanded mining activities will result in additional materials shipped to site as well as ore that will require storage, therefore laydown areas and temporary ore storage areas will be expanded."	• Will these changes result in a need for additional water management structures?	Technical Comment	Use of Pad U will require an additional water management structure, as it is located outside of the current contact water management systems. Accordingly, the design brief for Pad U provided with the application, document P6-11, provides the specification for a new sediment/pollution control pond. A revised Water Management Plan, document P5-3, was submitted with the Application. This document was updated to include the Pad U sediment/pollution control pond.
7-KIA	General	"Expanded mining activities will result in additional materials shipped to site as well as ore that will require storage, therefore laydown areas and temporary ore storage areas will be expanded."	• Are the proposed water management plans sufficient to prevent interactions between contact and non-contact water?	Technical Comment	Water management planning has been updated to reflect facility changes arising as a result of the Amendment application. These changes are sufficient to prevent interaction between contact and non-contact water; a revised Water Management Plan, document P5-3, was submitted with the Application.
8-KIA	General	"Despite expanded mining activities, TMAC will maximize water recycle for milling, and as such, no additional surface water withdrawal beyond that current permitted withdrawal rate is required from Doris Lake."	• This statement will need to be validated in the mine plan and within the water balance	Technical Comment	The Site Wide Water and Load Balance model (P6-10) takes into consideration the revised mine plan and processing requirements. The modeling confirms that there is sufficient recycle water available for a range of hydrologic conditions such that no additional water withdrawal from Doris Lake beyond currently licence volumes is required.
9-KIA	General	"Materials from existing Windy Road quarries A, B, D and 3 will be used for general construction. Quarry 3 material will be used primarily for south dam, interim dike and access road construction."	• What is the acid generating potential of this material?	Technical Comment	Geochemical characterizations, including the acid-generating potential, of Quarries A, B, D and 3 have previously been submitted to the NWB and are available on the ftp site. Quarry 3 was part of the original Water Licence Application in 2007 and was always specifically intended as a candidate source to construct the North and South Dams. The characterization data for all the quarries has confirmed that the material is suitable for construction. The material is not acid generating and does not contain neutral metal leaching materials.
10-KIA	General	"Materials from existing Windy Road quarries A, B, D and 3 will be used for general construction. Quarry 3 material will be used primarily for south dam, interim dike and access road construction."	• Are they safe for use as long term construction materials?	Technical Comment	Geochemistry of rock in quarries A, B, D and 3 is known. Quarry rock has been approved for use as construction material. In the event that clean quarry rock is used for construction, the area in which the rock is used will be incorporated in the ongoing seep and sampling program currently established for the project, including requirements under Part D and Schedule D of 2AM-DOH1323.
11-KIA	General	"A non-hazardous waste landfill will be located in Quarry 3, to contain both operational and closure non-hazardous waste. This location was chosen because the area is already permitted, the quarry will be exploited early in the mine life, and it is located upstream of the TIA. All wastes permanently on site will now be co-located within in the same drainage area."	• Does the TIA have sufficient capacity to hold the additional drainage associated with the larger project footprint, particularly Quarry 3?	Technical Comment	Yes, the Tailings Impoundment Area (TIA) has sufficient capacity to hold the additional drainage. Quarry #3 is contained within the Tailing Impoundment Area catchment, and as such no additional drainage volume is added to the TIA. Therefore the drainage from this area is captured in the water and load balance for the project.
12-KIA	General	"Tailings from the mill process will be discharged to the Tailings Impoundment Area{TIA) but, because of the additional tonnes to be mined, tailings will now be deposited sub-aerially (placed on the land instead of sub-aqueously (underwater). Approximately 94% of the tailings, known as flotation tailings, will be disposed of sub-aerially in the TIA, placing the tailings in a beach in the south end of the T/A, behind a dike designed to retain solids. The remaining 6%, the cyanide leach tailings, will be deposited underground as backfill following destruction of residual cyanide, and in conjunction with waste rock. This approach maximizes use of capacity within the tailings area, isolates leach tailings and promotes water reuse."	• Is TMAC using proven technology to destroy the residual cyanide prior to using it as backfill?	Technical Comment	Yes, TMAC is using proven technology to destroy the residual cyanide prior to using it as backfill. As also noted in 28-KIA and KIA-28, we are using the INCO Process (air/SO_2) is used at more than 90 mines worldwide to destroy the cyanide. The residual slurry is then washed/rinsed and dewatered using a pressure filter which will further dilute any residual (which is already below required limits) prior to use as back fill underground.
13-KIA	General	"Tailings from the mill process will be discharged to the Tailings Impoundment Area{TIA) but, because of the additional tonnes to be mined, tailings will now be deposited sub-aerially (placed on the landJ instead of sub-aqueously (underwater). Approximately 94% of the tailings, known as flotation tailings, will be disposed of sub aerially in the TIA, placing the tailings in a beach in the south end of the TIA, behind a dike designed to retain solids. The remaining 6%, the cyanide leach tailings, will be deposited underground as backfill following destruction of residual cyanide, and in conjunction with waste rock. This approach maximizes use of capacity within the tailings area, isolates leach tailings and promotes water reuse."	• What challenges does sub-aerial disposal pose for the project and how has TMAC mitigated the associated risks?	Technical Comment	Document P6-13 (the Tailings Management System) outlines the proposed tailings deposition and management system, including discussion on the challenges and proposed solutions. Briefly, these challenges include ice entrainment in tailings deposition (for which a design allowance of 20% of the Tailings Impoundment Area storage capacity has been made) and dust generation (which will be mitigated as outlined in Document P6-13 Section 6.3, Appendix I and P5-1 (the Air Quality Management Plan)). With the implementation of dust mitigation measures outlined in the reference documents, no significant residual effects are anticipated (Document P4-1 Section 3.4).

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14-KIA	General	"Tailings from the mill process will be discharged to the Tailings Impoundment Area{TIA) but, because of the additional tonnes to be mined, tailings will now be deposited sub-aerially (placed on the land instead of sub-aqueously (underwater). Approximately 94% of the tailings, known as flotation tailings, will be disposed of sub-aerially in the TIA, placing the tailings in a beach in the south end of the T/A, behind a dike designed to retain solids. The remaining 6%, the cyanide leach tailings, will be deposited underground as backfill following destruction of residual cyanide, and in conjunction with waste rock. This approach maximizes use of capacity within the tailings area, isolates leach tailings and promotes water reuse."	• What are the impacts to caribou migration over the covered tailings facility?	Technical Comment	The Tailings Impoundment Area will be covered by 0.3 m of waste rock at closure for the purpose of preventing wind and water erosion and direct contact by wildlife. If the substrate is not as easy to cross as adjacent and flatter habitat then caribou may avoid the area during non-winter months. However, this area would not have been available as a movement corridor previously during non-winter months when the lake was unfrozen. During winter months when covered with snow and ice, movement is not anticipated to be impeded more than elsewhere on the landscape.
15-KIA	General	"The mine plan now includes Doris North, Doris Central and Doris Connector. Doris North is located in permafrost while the other zones are located beneath Doris Lake in an unfrozen zone, a talik. TMAC anticipates that groundwater encountered in the talik under Doris Lake will be saline. Any groundwater encountered during mining will be reused within the mine to the extent possible, with the remainder directed to the marine outfall in Roberts Bay through an overland pipeline."	• How will TMAC handle inflows of groundwater?	Technical Comment	TMAC management of groundwater inflow is outlined in Document P5-3 (the Water Management Plan), specifically Section 2.5. In summary, groundwater inflows will be minimized to the extent possible by grouting/plugging and intercepted water will be collected in sumps and used where possible for underground drilling. Excess groundwater will be pumped to the mill for discharge, through a diffuser, into Roberts Bay.
16-KIA	General	"The mine plan now includes Doris North, Doris Central and Doris Connector. Doris North is located in permafrost while the other zones are located beneath Doris Lake in an unfrozen zone, a talik. TMAC anticipates that groundwater encountered in the talik under Doris Lake will be saline. Any groundwater encountered during mining will be reused within the mine to the extent possible, with the remainder directed to the marine outfall in Roberts Bay through an overland pipeline."	• Does discharge pose a risk to surface freshwater?	Technical Comment	Intercepted groundwater will not pose a risk to, or contact, surface freshwater. It will be collected in underground sumps and be either used for underground drilling or pumped to the mill and from there, by overland pipe, to Roberts Bay for ocean discharge.
17-KIA	General	"Using conservative assumptions of hydrogeological characteristics, conventional mine water control technology and dynamic modelling techniques, the maximum groundwater inflow encountered at full mine development under Doris Lake is expected to be 3,000 m^3 jday. The modelling indicates a risk that some of the water entering the mine will originate in Doris Lake and could infiltrate at a rate that could cause reductions in Doris Lake water levels. Based on modelling and review of baseline data, the changes to Doris Lake are considered to be mostly within the natural variation of flows in the system. Should changes occur outside of natural variation, TMAC will offset for any negative effects to fisheries. I	• This rate of inflow will create a significant water management challenge. Has TMAC sufficiently demonstrated that changes to water levels in Doris Lake are within the natural variation?	Technical Comment	Yes, TMAC has demonstrated that Doris Lake levels are within the natural variability. As described in the application Document P4-1, Table 2.5.1 Summary of Predicted Effects on Doris Lake Hydrology, the draw down in Doris Lake is approximately 23 cm and within the range of natural variability.
18-KIA	General	"Using conservative assumptions of hydrogeological characteristics, conventional mine water control technology and dynamic modelling techniques, the maximum groundwater inflow encountered at full mine development under Doris Lake is expected to be 3,000 m^3/day. The modelling indicates a risk that some of the water entering the mine will originate in Doris Lake and could infiltrate at a rate that could cause reductions in Doris Lake water levels. Based on modelling and review of baseline data, the changes to Doris Lake are considered to be mostly within the natural variation of flows in the system. Should changes occur outside of natural variation, TMAC will offset for any negative effects to fisheries.	• Fisheries offsetting may need to be addressed by TMAC Resources Inc.	Technical Comment	As presented in document P4-1 (Effects Assessment, pg. 2-26) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. The hydrologic assessment indicates a lake level decrease of up to 0.23 m during winter; this change is within the natural range of water level and ice thickness and is not expected to result in adverse effects to fish and fish habitat in Doris Lake. To confirm this assessment, TMAC completed a field study on Doris Lake in fall 2015 and included a detailed habitat survey around the entire perimeter of the lake, focusing on the 1.5 to 4 m zone, the primary area of concern immediately below natural lake ice, where eggs and larvae left by fall-spawning fish overwinter. If the lake is drawn down below the natural range, eggs and alevins close to the ice could perish. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. These field data will be summarized in Q4 2015 as part of the self-assessment process to determine effects. The field information will be assessed in conjunction with existing fisheries and hydrological baseline data to accurately quantify potential effects and if the analysis of the field program results do in fact indicate that the drawdown of Doris Lake will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed.

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19-KIA	General	"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean .floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all weather road to Roberts Bay.	• Is the existing aquatic baseline adequate to characterize the new discharge location?	Technical Comment	Yes the existing aquatic baseline is adequate to characterize the discharge location. See EC IR#1, EC IR#2 response. Additional deep-water sediment quality and benthos data will be collected before construction of the pipeline.
20-KIA	General	"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean .floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all weather road to Roberts Bay.	• Has TMAC evaluated the potential environmental risks associated with this discharge method and location?	Technical Comment	Environmental risks were evaluated in Document P4-1 of the Amendment submission relative to the new discharge location and discharge method.
21-KIA	General	"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean .floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all weather road to Roberts Bay.	• How will TMAC meet MMER and the Type A Water Licence discharge criteria?	Technical Comment	TMAC will monitor end-of-pipe water quality at a frequency required by Metal Mining Effluent Regulations (MMER) and the Aquatic Monitoring Framework to develop in 2016.
22-KIA	General	"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean .floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all weather road to Roberts Bay.	• Has TMAC characterized the mixing zone in Roberts Bay?	Technical Comment	The 'mixing zone' is expected to be within meters of the diffuser outlet. Minimum dilutions at the expected trapping depth in winter (37.8 m) have been calculated at 50:1 and 87:1 in summer (trapping depth: 38.0 m).
23-KIA	General	"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean .floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all weather road to Roberts Bay.	• What impact will discharge to Roberts Bay have on the formation of ice?	Technical Comment	See Document P4-1, Section 4.5.4 of the Amendment Application. No effects to sea ice are expected given that the discharge plume is expected to be trapped below the pycnocline and not interact with the surface water. Further information is available in IR response KIA-10.
24-KIA	General	An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area, terminating at a point on shore where the pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the 40 m bathymetric contour."	• Has TMAC adequately characterized the discharge location?	Technical Comment	Yes. See EC#1, EC IR#2 response. Additional deep-water sediment quality and benthos data will be collected before construction of the pipeline.
25-KIA	General	An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area, terminating at a point on shore where the pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the 40 m bathymetric contour."	• Is the bathymetry sufficiently detailed?	Technical Comment	Yes, detailed bathymetry has been conducted (2009-10) in the near-shore region of Roberts Bay proximate to the on-land fuel tanks and westward along the remainder of the Roberts Bay coastline. Several lead-line measurements were taken to confirm the absence of a sill at the mouth of Roberts Bay. Measurements were taken within a grid in Roberts Bay and in Melville Sound. Deep-water measurements have been taken at each sampling site which confirms the data on the relevant Canadian Hydrographic Service charts.
26-KIA	General	An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area, terminating at a point on shore where the pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the 40 m bathymetric contour."	• Is the pipeline designed to withstand environmental stressors?	Technical Comment	The pipeline will be designed to withstand various environmental stressors including excessive settlement, wave action and ice scour as outlined in the application P6-7 (Roberts Bay Discharge System: Surface Infrastructure).

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27-KIA	General	An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area, terminating at a point on shore where the pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the 40 m bathymetric contour."	• What emergency response capacity exists should failure of the marine discharge infrastructure occur?	Technical Comment	The pipeline has been sited and designed to withstand various environmental stressors including excessive settlement, wave action and ice scour. A preliminary engineering assessment on the overall feasibility of the outfall serves as the basis of the information contained in the Application. Engineering planning has been completed at a level consistent with the expectations for Water Licence applications. Detailed design of the outfall will be provided to the NWB prior to construction. Should the outfall fail during winter operations when only mine water is being discharged mine water will be retained in the mine as long as possible to facilitate a resolution of the situation. Should the outfall fail during summer operations with both mine water and excess tailings effluent is being discharged, mine water would be retained in the mine and Tailings Impoundment Area (TIA) effluent in the TIA while the matter is resolved.
28-KIA	General	"TMAC is introducing additional treatment measures in the mill to destroy cyanide in the tailings slurry (which was not a measure proposed by Miramar). Cyanide will be reduced to 0.5 mg/L which will fall below management thresholds set out in the International Cyanide Management Code for the Gold Mining Industry and will meet all applicable Canadian regulatory standards."	• Is TMAC using proven technology to destroy the residual cyanide and meet the management thresholds set out in the International Cyanide Management Code?	Technical Comment	Yes. As addressed in 12-KIA, we are using the INCO Process (air/SO_2). Additionally the leach fluid post-cyanide destruct will have a concentration of 2 mg/l total CN and will be recombined with the flotation tailings (which is free of all cyanide) and as such there will be a significant dilution factor in the tailings slurry prior to disposal in the Tailings Impoundment Area.
29-KIA	General	"The revisions that TMAC is requesting to TIA water management (which include treatment, if needed) will ensure that discharge meets required criteria and as such the on-site laboratory previously proposed by Miramar Hope Bay and described in the Project Certificate is no longer necessary."	• Do the proposed changes to the project limit the need for more direct Tailings management, negating the need for an on-site laboratory?	Technical Comment	The on-site laboratory identified in the Project Certificate was required to confirm water quality met discharge criteria prior to discharge. Under the current Project Certificate and Water Licence, Tailings Impoundment Area (TIA) effluent is permitted to discharge seasonally into a low flow, sensitive freshwater creek, therefore frequent monitoring during discharge was required. With the change in tailings management to a marine discharge strategy, there will no longer be a discharge to the creek. As Roberts Bay has far greater volume and consequently lower sensitivity than the creek, monitoring with the use of an off-site laboratory services are appropriate. Further, with the change in mill process from Merrill Crowe to resin in leach, and tailings disposal wherein leach tailings are disposed of underground instead of co-disposed in the TIA, source terms have changed and metals levels in the TIA effluent will be significantly reduced. Based on the water and load balance (P6-10), metals are not predicted to be of concern; routine analysis provided by an off-site laboratory is sufficient to confirm effluent quality.
30-KIA	General	1. Between the Packages (P) of information, there are some inconsistencies in statements of the predicted effects. P1, pg.l states that 'there is a possibility that the water level in Doris Lake could change temporarily, during mining; however any changes are expected to be similar to the changes that occur naturally throughout the seasons. If changes are greater than expected, TMAC will offset impacts to fisheries.' P2, pg v states something similar that changes are mostly considered to natural, but TMAC will offset for any negative effects to fisheries. However, P4, pg i, states that the cumulative water losses from Doris Lake are predicted to result in serious harm to fisheries and an Offset Plan and DFO Authorization will be obtained. Further, P4, p 2-26 identifies data gaps in fish habitat information for the lake, and that should it be identified that important habitats will be impacted, an offsetting plan will be developed in accordance with the *Fisheries Act* (1985).	Recommendation: Review statements and confirm consistent finding and update as required. Also note that the *Fisheries Act* was amended in 2013 and the reference to the Act should be updated accordingly.	Technical Comment	As presented in document P4-1 (Effects Assessment, pg 2-26) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. The hydrologic assessment indicates a lake level decrease of up to 0.23 m during winter; this change is within the natural range of water level and ice thickness and is not expected to result in adverse effects to fish and fish habitat in Doris Lake. To confirm this assessment, TMAC completed a field study on Doris Lake in fall 2015 and included a detailed habitat survey around the entire perimeter of the lake, focusing on the 1.5 to 4 m zone, the primary area of concern immediately below natural lake ice, where eggs and larvae left by fall-spawning fish overwinter. If the lake is drawn down below the natural range, eggs and alevins close to the ice could perish. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. These field data will be summarized in Q4 2015 as part of the self-assessment process to determine effects. The field information will be assessed in conjunction with existing fisheries and hydrological baseline data to accurately quantify potential effects and if the analysis of the field program results do in fact indicate that the drawdown of Doris Lake will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed.

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31-KIA	General	2. TMAC is proposing to amend the Aquatic Effects Monitoring Program(AEMP) throughout 2015 to address changes associated with the TIA effluent discharge location to Roberts Bay. The monitoring program study design as presented in P2 and P4 seems scientifically-sound and includes water quality, phytoplankton and benthic communities. However, it is not clear whether monitoring of fish presence, health, or behaviour is part of this AEMP. There is the potential to affect fish through both water quality and changes in lower trophic levels, as well as more directly through potential changes in fish habitat or fish behaviour (including avoidance) at the location of the diffuser, pipeline and marine berm. If changes are found as a result of the discharge of the TIA water, TMAC will review possible adaptive management measures to address the situation.	Recommendation: It is recommended that the KIA review the draft of the AEMP and have input to trigger levels and management actions that would be outlined in an adaptive management plan. Please provide further information on fish monitoring as part of the AEMP.	Technical Comment	Under the current authorizations, TMAC is required to provide an AEMP for review and approval. In addition, TMAC will be developing an aquatic monitoring framework in a manner that also meets the needs of the Environmental Effects Monitoring program under the MMER. New guidelines for the preparation of such a program require the inclusion of input from community and government stakeholders. TMAC will engage with the Inuit Environmental Advisory Committee, as established in the IIBA to assist in developing an aquatic monitoring framework.
32-KIA	General	3. The Doris Connector Vent Raise will be connected to the Float Plane Dock Access Road by a spur road. In P2 it states that the spur road will cross a potentially fish-bearing creek with two 0.5 m diameter CSP culverts. A Fisheries Self-Assessment will be conducted in the open-water 2015 season to confirm the expectation that the watercourse is non-sport fish bearing and therefore would not result in serious harm.	Recommendation: Please note that even if the watercourse contains nonsport fish bearing species that the *Fisheries Act* will still apply, and should still be assessed for potential serious harm to fish, particularly for those fish that are part or, or support, Commercial, Recreational or Aboriginal fisheries. Suggest change wording to reflect this and recommend that the NIRB & NWB review the self-assessment and results of the fisheries survey once available.	Technical Comment	TMAC will avoid, mitigate, or lastly offset any instance of serious harm to commercial, recreational, or Aboriginal fisheries, as defined by the *Fisheries Act*. In this case, data were collected from this stream during summer 2015 and a self-assessment will be completed in autumn 2015 to determine whether the road crossing will cause serious harm. As with all construction activities, TMAC will use guidance documents and site-specific management plans during construction to protect fish habitat in Doris Lake. Several DFO operational statements have been developed to guide these processes and will be used as best management practices, along with DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat. Temporary stream crossings will be constructed according to the DFO Nunavut Operations Statement for Temporary Stream Crossings (DFO 2007a). Culvert maintenance will be conducted following the DFO Nunavut Operations Statement for Culvert Maintenance (DFO 2007b). In-water work will be conducted during approved timing windows presented in the DFO Nunavut Operations Statement for Timing Windows (DFO 2007c). If serious harm will occur that cannot be avoided or mitigated, an offsetting plan will be developed. References DFO. 2007a. DFO Nunavut Operational Statement: Temporary Stream Crossing, version 1.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area. DFO. 2007b. DFO Nunavut Operational Statement: Culvert Maintenance, version 3.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area. DFO. 2007c. DFO Nunavut Operational Statement: Timing Windows, version 1.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area.
33-KIA	General	4. As stated in PZ and shown on drawing P6-1, the Doris Central Access Road will not require a 'stream crossing' but it will cross a defined surface water drainage feature and a double culvert will be installed to allow surface water to drain into Doris Lake.	Recommendation: Please confirm that this water feature does not provide fish habitat (including seasonal), and as the water drains to Doris Lake, appropriate mitigation and protection measures should still be in place during construction and operation.	Technical Comment	An assessment of this area was completed in summer 2015; no fish habitat exists in this area. There is water drainage feature on the map of this area, but this feature indicates the general pathway where surface water travels towards Doris Lake. There is no defined channel in this area, only a vegetated draw that carries seepage during freshet. As with all construction activities, TMAC will use guidance documents and site-specific management plans during construction to protect fish habitat in Doris Lake. Several DFO operational statements have been developed to guide these processes and will be used as best management practices, along with DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat. Temporary stream crossings will be constructed according to the DFO Nunavut Operations Statement for Temporary Stream Crossings (DFO 2007a). Culvert maintenance will be conducted following the DFO Nunavut Operations Statement for Culvert Maintenance (DFO 2007b). In-water work will be conducted during approved timing windows presented in the DFO Nunavut Operations Statement for Timing Windows (DFO 2007c). If serious harm will occur that cannot be avoided or mitigated, an offsetting plan will be developed. References DFO. 2007a. DFO Nunavut Operational Statement: Temporary Stream Crossing, version 1.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area. DFO. 2007b. DFO Nunavut Operational Statement: Culvert Maintenance, version 3.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area. DFO. 2007c. DFO Nunavut Operational Statement: Timing Windows, version 1.0. Iqaluit, NU: Fisheries and Oceans Canada - Eastern Arctic Area.

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34-KIA	General	5. In PZ it states that limited drilling and blasting will be required to anchor the vent raise fan to the vent raise, but is not clear if there are potential effects to fish and fish habitat. This activity is not included in the effects assessment.	Recommendation: Please provide confirmation that blasting activities will occur away from fish habitat and therefore no mitigation measures are required.	Technical Comment	As noted in Documents P6-1, Drawing DC-04 and P6-2, Drawing DCVR-03 of the submission, no quarrying is planned at the surface collars of the vent raises. Rather, the exit site for the vent raises will be to outcrops and a level surficial granular pad of crushed material will be placed around the collar. Hence minimal surface blasting is anticipated. The site infrastructure will be placed on the pad of crushed material. The proposed locations for the Connector and Central vent raises are approximately 100m and 200 m respectively from the shoreline of Doris Lake and any potential fish habitat. Accordingly, no damage to fish habitat from blasting is anticipated for the Central Vent Raise. For the Connector Vent Raise, TMAC, as a matter of usual procedure employs vibration monitoring and designs blasting to minimize damage within the mine. Using industry and blasting best practices, TMAC will identify suitable maximum vibration velocities to ensure protection of fish habitat close to the Connector Vent raise and design blasting rounds to achieve compliance.
35-KIA	General	6. Table 1of Environmental Impacts in P3-1 provides a good summary of potential impacts and all impacts for Freshwater and Marine Aquatic Organisms and Fish and Fish Habitat are classified as 'M- Negative and Mitigatable'. Considering that there are some data gaps in baseline fish habitat (including for culvert crossings, Roberts Bay shoreline, and spawning shoals in Doris Lake), it may be premature to classify impacts as 'Mitigatable' until assessments are complete. In P4 it is stated that no residual effects are anticipated on fish habitat through stream crossings, but then notes that if operational statements and best management practices cannot be followed and will result in serious harm, then TMAC will develop offsetting plans. It is also noted in P4 that 'Serious Harm' to fish in Doris Lake is likely due to reductions in water levels, which suggests that impacts cannot be mitigated. Impacts to vegetation through the construction of infrastructure and project footprint is classified as 'N- Negative and non-mitigatable'. It is not clear why loss of aquatic habitat though project infrastructure (culverts, pipeline, marine berm) would not also be classified as 'N'.	Recommendation: Please provide rationale behind this identification of environmental impacts, or revisit potential effects once additional fisheries assessments are complete.	Technical Comment	The survey of spawning sites in Doris Lake, and of culvert road crossing locations, has been completed. In Doris Lake, the primary area of concern is immediately below natural lake ice, where eggs and larvae left by fall-spawning fish (Lake Trout, whitefish, and cisco) overwinter. A detailed habitat survey was completed around the entire perimeter of the lake in fall 2015, focusing on the 1.5 to 4 m zone, where eggs and alevins are most vulnerable. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. All life stages of all fish species in Doris Lake will be considered to determine 1) what effects can be avoided, 2) what effects can be mitigated, and lastly 3) what effects require offsetting. Specific protection measures will be developed once effects are quantified through the process of determining offsetting requirements. For the culvert road crossings, data were collected from these streams during summer 2015 and a self-assessment will be completed in winter 2015 to determine whether the road crossings will cause serious harm. As with all construction activities, TMAC will use guidance documents and site-specific management plans during construction to protect fish habitat in Doris Lake. Several DFO operational statements have been developed to guide these processes and will be used as best management practices, along with DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat. Temporary stream crossings will be constructed according to the DFO Nunavut Operations Statement for Temporary Stream Crossings (DFO 2007a). Culvert maintenance will be conducted following the DFO Nunavut Operations Statement for Culvert Maintenance (DFO 2007b). In-water work will be conducted during approved timing windows presented in the DFO Nunavut Operations Statement for Timing Windows (DFO 2007c). If serious harm will occur that cannot be avoided or mitigated, an offsetting plan will be developed.
36-KIA	General	7. P4 provides a good overview of aquatic baseline conditions. On pg2-16 it is stated that metal concentrations in tissue from Lake Trout, Lake Whitefish and Nine spine Stickleback remained relatively consistent from 1995 to 2010.However it is not clear at what levels or implications for fish health.	Recommendation: Please provide clarification on this baseline data.	Technical Comment	The species sampled, tissue types collected, and methods used have varied throughout baseline data collection, making direct comparisons among years impossible. However, fish tissue metal concentrations in Doris Lake have remained consistent because in four years of sampling (1995, 1996, 1997, and 2010) there is just one occurrence of one metal exceeding consumption guidelines for muscle tissues. In 1997, one lake trout muscle tissue sample (0.64 µg/g wet weight) exceeded consumption guidelines (0.5 µg/g wet weight) for mercury. In 2010, the fish component of the AEMP program was established that was designed to monitor the effects of the mine on fish, including fish tissue metal concentrations. The intent was to complete this program every third year, but it was put on hold during care and maintenance and will be reactivated in the near future. When this program is re-established, it will provide a valuable tool to monitor the impacts of the mine to Doris Lake and other local waterbodies.

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37-KIA	General	8. The hydrological assessment in P4 concludes that under the proposed scenario, the lake level will decrease by 0.23m during winter. Potential effects include exposing Lake Trout eggs to desiccation, if spawning shoals are within 0.23m of the ice bottom. The report acknowledges that additional data should be collected to verify locations and depths of Lake Trout spawning habitat so that they can be protected in the future. The baseline information also shows that Lake Whitefish and Cisco are also present in Doris Lake, both of which also spawn in the Fall, also with a preference for shoreline or shoal habitat. After egg incubation over the winter, young-of year Whitefish and Lake Trout remain in the spawning area for weeks to months before moving into deeper areas.	Recommendation: Agree with the need to collect more specific baseline on spawning shoals in Doris Lake, but would recommend that this be expanded to other species as appropriate (for example Lake Whitefish), and that the effects assessment is expanded to include young-of-year and juveniles, as well as eggs. Further information on potential protection measures should also be provided and perhaps an adaptive management plan if appropriate as well. Please also provide information on potential effects of this reduction over the life of the mine, and post-closure. It will be important to determine any potential long-term effects on fisheries, particularly if viable spawning habitat is reduced.	Technical Comment	TMAC has undertaken a field program designed to quantify potential effects to fish and fish habitat in Doris Lake; this dataset will be processed in fall 2015 to inform the self-assessment process. If the drawdown of Doris Lake will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed to ensure all activities adhere to the federal *Fisheries Act*. The primary area of concern is immediately below natural lake ice, where eggs and larvae left by fall-spawning fish overwinter. If the lake is drawn down below the natural range, eggs and alevins close to the ice could perish. Consequently, a detailed habitat survey was completed around the entire perimeter of the lake in fall 2015, focusing on the 1.5 to 4 m zone. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. This information will be assessed in conjunction with existing fisheries and hydrological baseline data to accurately quantify potential effects. If these effects are significant, then an offsetting program will be considered. TMAC commits to developing and Aquatic Monitoring Framework, which will include adaptive management strategies. The Framework scope will be inclusive of that typically addressed in an Aquatic Effects Monitoring Program (AEMP). TMAC will commence the process of Framework development following the technical review of the Application in order to adequately consider Party comments and any additional considerations that may arise through the technical review process. Document P6-3 (Groundwater Model) submitted with the application describes the timing of expect groundwater flows from Doris Lake into the mine; refer to Table 8 and Figure 14. Once mining in the talik starts in Year 3, mine inflow will increase gradually until 2020 (Year 4). Mine inflow will start decreasing after 2020 when some sections of the mines are completed, and subsequently backfilled and sealed off. Inflow will stop in 2022 (Year 6), after the last stope is mined.
38-KIA	General	9. There will be a reduction in flow (discharge) in Doris Outflow and Doris Creek throughout the open water season resulting from a decrease in Doris Lake available volume. To ensure a conservative approach, potential effects to fish habitat in an extreme year result in a total decrease of 24 flow days in the Outfall and the Creek. This represents a reduction in available rearing habitat used by Arctic char, Lake Trout, and Ninespine Stickleback by an average of 11o/o and up to a maximum of 18% during mining. Mean annual discharge will also be reduced, resulting in a reduction in wetted stream width and therefore available habitat. It is not clear what this reduction means for the local fish population nor fisheries productivity and whether this results in 'Serious Harm' (as defined by the *Fisheries Act*). It is noted that additional modeling and characterization of Doris Lake Outflow and Creek are required.	Recommendation: Agree that further work is required to help determine potential effects on fisheries. The Approach to Freshwater Fisheries Offsetting Memo in P4 Appendix B offers a reasonable approach to address this. Recommend that KIA are involved in the process as stated, and review documents as available. Further recommend that the effects assessment is re-addressed once this further information is available.	Technical Comment	As noted, Appendix B of P4-1 provides an approach to offsetting serious harm to Commercial, Recreational, or Aboriginal fisheries. Once additional work has been completed that will quantify the effects to fisheries, an offsetting plan will be developed, if required, by the *Fisheries Act*. TMAC will ensure that the KIA is fully informed of the process and if they choose, to play an active role in this process through the IEAC.
39-KIA	General	10. P4 includes analysis that there will be a reduction in total number of flow days in Little Roberts Outflow, and also that the reduction in stream wetted widths will be negligible. The maximum reduction of 10.8% reduction in mean annual lake discharge may be just over the upper limit of DFO's recommendation of 10% to mitigating water discharge reduction, but it is not clear what effect this would have on the fish population at a local level.	Recommendation: Suggest some more site-specific assessment to provide guidance on potential effects on fisheries would be useful.	Technical Comment	As presented in document P4-1 (Effects Assessment, pg 2-26) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. A reduction in discharge to Doris Creek of up to 13.7 to 27.9% (P4-1, pg 2-27) will result in a reduction in the wetted stream width and thus the amount of available habitat for the duration of water withdrawal for the six years during which water loss during mining may persist. To quantify the amount of serious harm required to be offset additional modeling and characterization of Doris Lake Outflow and Creek was initiated in 2015, however, challenging flow conditions during the field program prevented the collection of the data required to complete the effects assessment for Doris Creek. TMAC will conduct this field program in 2016 and a self-assessment process will be completed. If it is confirmed that reduced flows will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed to ensure all activities adhere to the federal *Fisheries Act*.

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50-KIA	General	11. There appears to be a generally good understanding of marine fish and fish habitat in Roberts Bay. It is noted that the installation and decommissioning of the subsea pipeline and diffuser system has the potential to affect fish habitat. From P3, Table 2, it seems as though the marine pipeline would be left in place, therefore the activities (and potential effects) from pipeline decommissioning are unclear. It is noted that concrete blocks are used for counter buoyancy weights every Sm along the pipeline, but it is unclear if there are long term effects from these as this deteriorate over time.	Recommendation: Please provide further clarification on the activities associated with pipeline decommissioning, as well as potential fish and fish habitat effects.	Technical Comment	Roberts Bay Discharge System decommissioning is discussed in document P5-2 (Interim Closure and Reclamation Plan) and in document P6-5 (Reclamation and Security) as included as part of the Application submission. Pipeline and associated buoyancy weights will not be removed during the decommissioning phase. Upon placement they will serve to increase habitat heterogeneity in the area by providing hard substrates that are relatively less abundant than the characteristic soft substrates of Roberts Bay (refer to P4, Section 4.4.2 for additional information). As discussed in P4, Section 4.5.5.2, it is expected that the structures will form a settlement substrate for algae and sessile invertebrates, which may form a source of food for small fish and invertebrates. They will also provide vertical habitat for species such as sculpins, gunnels and cod. Many studies of fish recruitment to artificial habitats indicate that concrete block structures are useful in creating fish habitat, particularly in sediment bottom areas where no other hard substrate exist, characteristic of Roberts Bay. Removing the structures following colonization by organisms would reduce the number of habitats preferring hard substrates.
51-KIA	General	12. There is no mention of potential entrapment of fish at the diffuser or at end of pipe. Although detailed engineering is not yet available, it is not clear if this is a potential effect or not (noting that it may depend on the final design).During construction and operation of the pipe and diffuser, there are also no potential effects noted on acoustics/sound pressure and fish mortality or behaviour.	Recommendation: Please provide comment on these potential effects and whether mitigation through design is possible.	Technical Comment	TMAC acknowledges the reviewer's comment. TMAC commits to undertaking a self-assessment to determine whether proposed in-water works have the potential to result in serious harm to fish. Final engineering design and associated construction plans will incorporate best management practices during construction and will also incorporate available end-of-pipe guidelines if relevant to final design. The diffuser system, in itself, is a form of 'mitigation by design' essential to the effluent outfall for mixing. TMAC will be developing a revised aquatic monitoring framework to monitor in water works and effects.
52-KIA	General	13. It is noted in P4 that a fisheries self-assessment will be completed in advance of construction once detailed engineering is available. A preliminary self assessment has however already been completed and is outlined, so this could proceed to DFO Project Review as it is clear that there is some loss of habitat from the marine berm and pipeline installation. However, it is not clear what type of fish habitat, nor potential effects on fisheries and P3 Table1states that the effects are 'Mitigatable'. It was noted in P3 Table 2, that the shoreline crossing of the pipeline has been designed to avoid disturbing sensitive shoreline fish habitat, but no information seems to have been provided on what type of habitat.	Recommendation: Please provide clarification on the avoidance and protection measures implemented for fish and fish habitat by the proposed marine pipeline and berm. Please also provide further assessment on loss of habitat, effect on fisheries, and the effects assessment.	Technical Comment	TMAC acknowledges the reviewer's comment. Baseline marine fish community and fish habitat information is provided in P4-1, Section 4.4-2. Habitat information is provided in Table 4.4-2 and figures 4.4-2 to 4.4-4. Species lists, life history strategies and habitat preferences summarized in tables 4.4-3 and 4.4-4. As detailed engineering and construction schedule becomes available, a self-assessment will be undertaken to determine what relevant mitigation and protection measures will need to be implemented in order to avoid serious harm to fish, in addition to whether there will be a need for an offsetting plan (including associated monitoring) to adhere to the *Fisheries Act* (1985) as outlined in Package 4-1, section 4.5.8.2.
KIA-1	Consideration of eskers and cliffs as special landscape features	TMAC does not include eskers and cliff habitat in their special landscape features.	Please provide rationale for not including esker and cliff habitats in this section, given their importance for mammal dens and nesting raptors. Related to this comment, "special landscape features" may not be an appropriate title for the ecosystem assemblages listed in Table 3.3-1unless all special landscape features are included.	Technical Comment	TMAC agrees that eskers and cliffs are important habitat features for wildlife. Please see Appendix 2.0 - Figure 1c - Eskers near Water Licence Amendment Infrastructure that shows the location of eskers based on CanVec imagery. The locations of cliffs have not been identified in available imagery, but can be inferred based on the maps of raptor nesting provided in the annual WMMP reports.
KIA-2	Many of the conclusions about anticipated impacts to wildlife, or a lack thereof, rely on anticipated use of sites that assume current migration patterns persist and that avoidance will prevent site attraction by wildlife.	The rationale for a lack of predicted impacts to wildlife relies on the assumption that wildlife will not use or be drawn to the area. However, some wildlife may still obtain rewards at site, despite mitigation and noxious stimuli, Attraction may be a risk to grizzly bears, which frequently travel along Roberts Bay and may find more Arctic ground squirrel and other small mammals, which use mine buildings/infrastructure for shelter, food rewards, heat and predator avoidance. Raptors may also feed on small mammals drawn to the area. Small mammals, may, in turn, be feeding on vegetation impacted by the sub-aerial tailing dust. Finally, caribou herds are known to alter their calving, post-calving areas and migration paths over time, and they may be attracted to sub-aerial tailings due to the present of salts in boils.	Please provide rationale for not including an assessment of attractants or a toxicological risk assessment (or screening) for wildlife due to the increase in dust deposition from the sub-aerial tailings. Please also provide information on new monitoring and adaptive management protocols to allow for the detection of animals attracted to new infrastructure associated with the updated mine, and ways in which those monitoring data will lead to adaptive management decisions.	Technical Comment	As outlined in the application Package 4, sections 3.4.2 and 3.4.3, with the implementation of mitigation measures to reduce dust generated from the subaerial tailings and adaptive management incorporated into monitoring plans, no significant residual effects are anticipated to the terrestrial environment. For this reason, the toxicological risk assessment is not needed. Management and Monitoring Plans, including a Wildlife Management and Monitoring Plan (WMMP), are approved and ongoing under the current Type A Water Licence and Project Certificate. The Amendment application is not requesting an amendment to these terms and conditions. The current authorizations and management plans provide a mechanism for the update, review and approval of these Plans and the WMMP will be revised accordingly.

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KIA-3	Updated Wildlife Mitigation and Monitoring Program not supplied.	Many of the proposed changes for the mine plan are potentially significant, and should require additional mitigation and monitoring locations and/or techniques. There are not supplied.	Please provide updated Wildlife Effects Mitigation and Monitoring Plan with changes to address project updates.	Request for Additional Information	The interaction between terrestrial wildlife and the amended Project have been evaluated and assessed to be negative and mitigable (document P4-1 Section 3.4.3). Revisions to the Wildlife Mitigation and Monitoring Plan (WMMP) are made based on input from the GN-DoE, KIA and EC as outlined the Doris North Gold Mine Project Certificate (NIRB No. 003) and the KIA Commercial Land Lease (No. KTCL313D001). TMAC will continue to provide updates to the WMMP in conformance with the existing requirements, and in consideration of input received during this permitting process. The current (2013) Doris North WMMP is located on the NIRB ftp site.
KIA-4	TMAC plans on increasing camp personnel, increasing milling rates, using more equipment, increasing olfactory disturbances, and continuing previously temporary measures (over-winter fuel barges and vessels in ice).	These project changes can impact wildlife by increasing both noxious/repelling and attracting stimuli, but these were not screened into the project amendments requiring re-assessment. These factors may be of importance to species that frequent or move along Roberts Bay (e.g. grizzly bears) that may experience a threshold effect at a certain level of noxious stimuli where after they alter their movement patterns. There is currently insufficient information provided to determine how the changes to the mine plan will potentially increase the zone of influence in terms of stimuli that attract and deter wildlife from the area.	Please provide scientific rationale for not considering the impacts of these project changes on wildlife. Further, please provide information on how the existing wildlife mitigation and monitoring requirements for the project will enable identification of these potential impacts and adaptive management responses.	Technical Comment	Although the mine life will be extended 4 years, attraction/deterrent stimulus sources will remain largely the same, as will frequency and magnitude of their occurrence. As a result, TMAC is of the opinion that the assessments made in the Doris North FEIS with respect to Wildlife remain valid. Additionally, the Wildlife Mitigation and Monitoring Program will continue to monitor for, and adaptively manage, any wildlife impacts. Many effective management plans are already in place to mitigate for anthropogenic stimuli e.g. Hope Bay Spill Contingency Plan, Oil Pollution Prevention Plan/Oil Pollution Emergency Plan, Interim Non-Hazardous Waste Management Plan, Hazardous Waste Management Plan, Incinerator Management Plan, Waste Water Treatment Management Plan, Interim Water Management Plan, and Noise Abatement Plan. These will be updated as per the current terms and conditions and submitted for review and approval. The Wildlife Mitigation and Monitoring Program is currently included within the terms and conditions of the NWB/NIRB authorizations and will continue to monitor for zone of influence as related to birds and interactions with Project infrastructure for mammals. There is a mechanism in place to revise this management plan and submit for approval. The proposed Project amendment will be included in the forthcoming Wildlife Mitigation and Monitoring Plan.
KIA-5	Effect of potential caribou migration over or near tailings facilities.	According to Rykaart and Hockley {2009), when discussing sub-aerial tailings in northern environments, two wildlife related concerns are noted: 1. the potential effect of caribou migration over or near tailings facilities can result in substantial erosion or local liquifaction and boils of covered tailings (i.e. migration of fines appearing through the covers), and 2 animals can be attracted to waste areas due to the increased presence of salts. These potential issues are not discussed in the re- evaluation of the mine plan, even though the tailings plan has changed from subaqueous deposition to sub-aerial. There is a potential for the Ahiak Caribou or Dolphin and Union herd to move across the TIA in large numbers in the future, and these potential impacts should be addressed.	Please provide information on how the wildlife related issues noted above (boiling related to movement of wildlife across sub-aerial tailings and attraction to salt in tailings) have been considered, and show how the tailings design a closure plan will prevent these risks into the far future (e.g. how will the 0.3 m thick cover protect against boils and local liquifaction/attraction in the context of this northern environment).	Technical Comment	The current proposed cover of 0.3 m of waste rock is described in P5-2 (Interim Closure and Reclamation Plan). The closure design will take into account any risks to wildlife the remaining Project features may have, as well as risks wildlife may pose to the integrity of those features. Appropriate mitigation e.g. prevention of wildlife access to those features, will be implemented if deemed necessary. Rykaart and Hockley (2009) mention two wildlife concerns that have been raised by local communities for sub-aerial tailings in northern climates. The first concern pertains to uncovered tailings, which sometimes contains efflorescent salts, which through evaporative action would accumulate on the surface. Wildlife can be attracted to these salts, and if that is not a desirable situation, the tailings might need to be covered with a cover that prevents mobilization of salts to the surface. The second concern pertains to the ability of caribou to move over a tailings cover constructed of coarse rock, suggesting that the final surface must be designed to ensure that caribou migration would not be prohibited by the cover. Rykaart and Hockley (2009) did not suggest that caribou migration across covers will result in substantial erosion or liquefaction with associated development of boils. At Hope Bay tailings liquefaction can only occur as a result of an earthquake, and under such conditions any cover is subject to damage. The Hope Bay area is in the lowest seismic risk region of Canada, and is considered not seismically active. The likelihood of earthquake induced damage to the tailings cover is sufficiently low that it is not reasonable to suggest the cover design be modified to account for this. Tailings boils, which is a phenomena whereby tailings moves up through the final cover is a process triggered as a result of pore pressure differentials. The chance of this happening is exacerbated when the tailings is unfrozen and has a high water level. It is conceivable that some of the Tailings Impoundment Area (TIA) cover, especially in the vicinity of the Interim Dike might be susceptible to this process and as a result as cover designs are advanced in future stages of the project, appropriate consideration needs to be given to ensure this does not occur. Likewise as the design process advances an evaluation of the requirement to design the cover to avoid wicking of salts will be conducted, and if necessary the cover design will be adapted accordingly.

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KIA-5 *(cont'd)*	Effect of potential caribou migration over or near tailings facilities. *(cont'd)*	As above	As above	Technical Comment *(cont'd)*	Finally, a relatively thin rock cover such as currently proposed for the TIA will have similar features to the surface infrastructure pads currently constructed on site. The nominal rock size will be about 150 mm and is not expected to be of concern to caribou movement across the surface.
KIA-6	No information presented to contextualize statistical result that concludes no impact.	TMAC presents statistical conclusions with no information on a) the statistical tests used, b) the P value obtained and alpha value used, and c) post-hoc power calculation.	Please provide information about the test used, P value and test statistic obtains, and include a post-hoc power value. The latter is particularly important for evaluating the potential that this result is a Type II error (false negative).	Technical Comment	Details are provided in "Doris North Gold Mine Project - Wildlife Mitigation and Monitoring Program, 2010" and are repeated here for convenience. Two 2-way ANOVAs were performed on density results from 2009 and 2010: one comparing results between July 2010 and August 2010, and another comparing results between August 2009 and August 2010. Conclusions may have been drawn from visual inspection of the data as other parameters are not reported.
KIA-7	Marine mammal data not displayed spatially	Data presented in Table 4.4-6 not presented spatially. Survey path also not shown, making it difficult to evaluate effort versus observations.	Please provide a map showing the distribution of a) area surveyed, and b) the spatial locations of seals observed.	Request for Additional Information	Please see Appendix 1.0 Figure 2 - Marine Wildlife Observations Recorded during the Barge Survey, September 2010 and Figure 3 - Marine Wildlife Observations recorded during the Spring Seal Aerial Survey, June 2010.
KIA-8	References supporting conclusions about construction-related effects not provided.	TMAC concludes that, during construction, construction of the pipeline/anchoring in water will cause temporary increases in suspended solids that would quickly return to baseline levels within days after the activity ceases. No references for similar construction activities and observed duration and spatial extent of construction- related impacts on suspended sediments and metals are provided, nor is information on the likely geographic extent of this effect.	Please provide information and references from other studies and/or monitoring programs from other relevant projects that report on impacts of similar construction- related activities in marine habitat on the duration and spatial extend of suspended sediment and associated metal disturbance, as well as any other construction-related impacts noted.	Technical Comment	It is not expected that the construction of in-water works will have anything but a transient, localized effect on TSS, and hence metals associated with the TSS and their potential effects on marine life. The pipeline and ballasts will largely be laid in the shallow region of Roberts Bay within the upper mixed layer. In this region, TSS is greater as wind-driven mixing interacts with the sediments (Rescan 2010, 2011), and thus re-suspended sediments due to in-water works would likely be within the range of baseline levels. During quiescent periods, TSS would settle more quickly and during periods of greater turbulence (waves), would mix with additional re-suspended material and settle as waters calm. The laying of the ballasts would be expected to re-suspend less material than occurs when a marine vessel anchors in Roberts Bay and is likely similar to marine mammals foraging for prey in the sediments. Past Aquatic Effects Monitoring Programs (AEMP) for the Doris North Project have monitoring sites near the Roberts Bay jetty to account for activities such as barge docking, jetty repairs, and in-water works near the jetty. Over 5 years, no Project-related increase in Total Suspended Solids (TSS) has been observed. These AEMPs are posted on the Nunavut Water Board ftp site.
KIA-9	Model assumptions for groundwater/TIA discharge into Roberts Bay.	The assumptions of the evenness of discharge assumptions are unclear.	Please discuss the likelihood of being able to achieve a relatively even discharge rate during these periods. If exceedances in rates are likely to occur, please provide information on the anticipated maximum rates of discharge during each season modelled, and the consequences of needing to use that maximum discharge rate (on both metal concentrations and water temperature/ice formation). As Figures 4.5-1 to 4.5-3 show that, particularly in years 2-6, peak level will approach CCME guidelines, it will be important to identify realistic factors that could cause exceedances.	Technical Comment	Flows to Roberts Bay will be intermittent, but effluent will be pumped at a constant rate when the discharge occurs and is not anticipated to exceed maximum projected rates. In the box model outlined in Package 4, Section 4.5.2.2, a conservative approach was taken assuming a maximum discharge rate of 80 L/s through the open-water season (July-September) when TIA and groundwater are discharged to Roberts Bay and 35 L/s during the ice-covered season (remainder of year) when only groundwater is discharged to the bay. It is far more likely that less discharge will occur month to month (given the intermittent nature of flow), and therefore the bay would have a greater ability to accept metals and nutrients before reaching CCME water quality guideline limits. However, it is important to recognize, the box model was developed to estimate the maximum WQ parameter concentrations that could be discharged to meet CCME WQ limits with in the trapping plume. In reality, the predicted WQ parameter concentrations to be discharged are far less, usually by more than an order of magnitude, the that predicted in the box model (Document p4-1, Table 4.5-3), and therefore will not approach CCME guidelines within trapping layer.

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KIA-10	Effect of increased temperature on ice thickness.	TMAC has not discussed the potential for the introduction of warmer water from the subsea diffuser in Roberts Bay to affect ice bowing. In the Arctic, ridges up to 10-20 m thick can form when thick ice deforms and forms in a way that encourages deformity; as this could affect caribou movement and migration, this topic requires further discussion. TMAC has only considered that the diffuser will warm a 20 m thick ice layer by 0.01C; however, this may not fully depict the reality of the situation, as ice of this thickness does not form immediately, and thinner, preceding ice layers may be impacted more by heating effects. We expect Roberts Bay, during calm ocean conditions to form ice from frazil ice to grease ice, to nilas, to rafts, to congleation ice, and then finally to sheet ice of growing thickness. It appears from the impact assessment done that TMAC considered only heating impacts to the final layer of sheet ice of maximum thickness. In rough sea conditions, we would expect different ice growth processes, with the potential for rafting and ridging to increase. None of these ice growth processes are considered alongside the heat that will be introduced by the TIA/groundwater diffuser into Roberts Bay. This consideration is important to ensure that Dolphin and Union caribou herd, a species of Special Concern under Schedule 1of the SARA, can still migrates across sea ice in this location (if/when needed), wolverine and other large mammals can hunt for seals, and for non-project- related human safety and travel is not impaired. TMAC has also not addressed whether in ice fuel barges and vessels, are now being proposed on more than a temporarily basis, act as visual deterrents to wildlife use the ice.	Please provide information about whether the TIA/groundwater discharge could cause an increase in ice bowing/ridging by considering how the introduced heat will affect ice as it grows and forms at different thicknesses. Please provide a discussion of the potential for heat to impact ice deformation and ridge height, including considerations of the complex nature of the sea ice formation processes, and the ways in which ice subject to rafting and ridging due to heat introduction at various thicknesses during its formation and growth. Please also comment on whether any scientific studies or monitoring programs have examined or uncovered any impacts of over-wintering fuel barges and vessels on the use of ice adjacent or nearby ice by wildlife.	Technical Comment	The discharge should not cause in increase in ice bowing or ridging. Effluent must be discharged at a temperature above its freezing point (to remain liquid). In practice it is advisable to maintain the effluent temperature one or two degrees above its freezing point. The temperature of a fresh water effluent would be approximately 2°C. Upon discharge, fresh water at 2°C will contact and mix with seawater (~28 ppt; -0.5°C) very near its freezing point. The minimum dilution of the effluent with ambient seawater is approximately 50:1 so that the mixture of effluent and seawater will be at -0.45°C with a salinity of 27.45 ppt. The freezing point of the mixture is -1.53°C so that ice will not form. In fact, the effluent will not form ice upon discharge regardless of its temperature or salinity. It should be noted that tidewater glaciers composed of fresh water ice melt when in contact with seawater at temperatures below zero (Greisman, 1979). This situation is distinct from the situation of flow within the outfall pipe where ice can form due to heat exchange through the pipe wall in the absence of salt exchange. Pressure ridges are formed (and ice rafting occurs) when winds cause ice floes to collide. Pressure ridges are absent in land fast ice which remains immobile through the winter. With respect to wildlife interactions with overwintering barges (no overwintering vessels other than barges are envisioned) current wildlife management and deterrent practices are considered to be suitable and will continue to be implemented.
KIA-11	A lot of the lack of anticipated impacts to wildlife rely on current use sites.	Rationale for lack of impact to wildlife heavily relies on the assumption that wildlife will not use or be drawn to the area. Wildlife may still obtain rewards at site despite mitigation, due to the expanded footprint, which may be a particular risk of grizzly bears, which frequently travel along Roberts Bay and which may find a greater abundance of Arctic ground squirrel and other small mammals, which use mine sites and buildings for shelter, food rewards, heat and predator avoidance. Raptors may also feed on small mammals drawn to the area. Small mammals, may, in turn, be feeding on vegetation impacted by the sub-aerial tailing dust. Finally, caribou herds are known to alter their calving, post-calving areas and migration paths over time.	Please provide rationale for not including a toxicological risk assessment for wildlife due to the increase in dust deposition from the sub-aerial tailings, and some discussion on the possibility that some species may feed in the area impacted by tailing dust, and the likely toxicological impacts.	Technical Comment	As outlined in the application package 4, sections 3.4.2 and 3.4.3, with the implementation of mitigation measures to reduce dust generated from the subaerial tailings and adaptive management incorporated into monitoring plans, no significant residual effects are anticipated to the terrestrial environment. For this reason, the toxicological risk assessment is not needed. TMAC acknowledges that additional dust will be generated and commits to tailings management and dust suppression measures to reduce the fugitive dust generated. TMAC also actively implements measures to ensure wildlife are not attracted to the area, for safety reasons for both personnel and wildlife. Response measures if wildlife are within the Project area are also implemented. However, even with mitigation measures there will be dust generated and there is the potential that wildlife species to be in the area. As outlined in application package 4, section 3.4.3, the vegetation cover and terrain in the area of the TIA are not unique and that other similar areas can be found within the Local and Regional Studies Areas. Therefore any areas affected by dustfall will not be the exclusive feeding area used by wildlife and exposure will thereby be limited.
KIA-12	TMAC plans on increasing camp personnel, increasing milling rates, using more equipment, increasing olfactory disturbances, and continuance of previously temporary measures (over-winter fuel barges and vessels in ice).	These project changes can impact wildlife by increasing noxious and attracting stimuli, but were not screened into the project amendments requiring re-assessment as potential interactions between the project and wildlife. These factors may be of particular importance for grizzly bears that frequent or move along Roberts Bay, and which may experience a threshold effect at a certain level of noxious stimuli whereby they alter their movement patterns.	Please provide scientific rationale for not considering the impacts of these changes on wildlife. Further, please provide information on how the existing wildlife mitigation and monitoring requirements for the project will enable identification of these potential impacts and adaptive management responses.	Technical Comment	Although the mine life will be extended 4 years, attraction/deterrent stimulus sources will remain largely the same, as will frequency and magnitude of their occurrence. As a result, TMAC is of the opinion that the assessments made in the Doris North FEIS with respect to Wildlife remain valid. Additionally, the Wildlife Mitigation and Monitoring Program will continue to monitor for, and adaptively manage, any wildlife impacts. Many effective management plans are already in place to mitigate for anthropogenic stimuli e.g. Hope Bay Spill Contingency Plan, Oil Pollution Prevention Plan/Oil Pollution Emergency Plan, Interim Non-Hazardous Waste Management Plan, Hazardous Waste Management Plan, Incinerator Management Plan, Waste Water Treatment Management Plan, Interim Water Management Plan, and Noise Abatement Plan. These will be updated as per the current terms and conditions and submitted for review and approval. The Wildlife Mitigation and Monitoring Program is currently included within the terms and conditions of the NWB/NIRB authorizations and will continue to monitor for zone of influence as related to birds and interactions with Project infrastructure for mammals. There is a mechanism in place to revise this management plan and submit for approval. The proposed Project amendment will be included in the forthcoming Wildlife Mitigation and Monitoring Plan.

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KIA-13	Effect of new above ground pipeline to Roberts Bay on movement of caribou and other large mammal VECs.	The new above ground pipeline to Roberts Bay may act as a potential barrier to movement of mammalian VECs that resist crossing pipelines at particular heights. An impact assessment on effects of above ground pipelines on movement of potentially affected wildlife VECs seem warranted, particularly as oil and gas projects are starting to show that above ground pipelines can affect movement patterns of woodland caribou (particularly fast movements).	Please provide information on: 1) scientific considerations of the potential for the pipeline to impact movement of large mammals, 2) proposed mitigation to prevent the pipeline from acting as a semi-permeable barrier, and 3) the ways in which the monitoring program will monitor the effectiveness of mitigation and enable adaptive management if a residual impact is detected.	Technical Comment	The above-ground Roberts Bay Discharge Pipeline will parallel the existing airstrip, the primary road, and the Roberts Bays shoreline (see document P6-7 pg. 169) and will be 25.4 cm in diameter. Although, a study found that roads paralleled by pipelines reduced crossing frequency for caribou in Alaska (Curatolo and Murphy 1986), the pipelines in question were large and elevated (152-432 cm in height). Due to the small diameter of the Doris pipeline, the assumption it will be buried by snow during winter months, and its route paralleling existing infrastructure, large mammal movement is not anticipated to be additionally impeded. Large mammal interaction with this new Project feature will be monitored using remote cameras.
KIA-14	Fish and Fish Habitat- Inconsistencies in predicted effects.	Between the Packages (P) of information, there are some inconsistencies in statements of the predicted effects. P1, pg.1states that 'there is a possibility that the water level in Doris Lake could change temporarily, during mining; however any changes are expected to be similar to the changes that occur naturally throughout the seasons. If changes are greater than expected, TMAC will offset impacts to fisheries.' P2, pg v states something similar that changes are mostly considered to natural, but TMAC will offset for any negative effects to fisheries. However, P4, pg i, states that the cumulative water losses from Doris Lake are predicted to result in serious harm to fisheries and an Offset Plan and DFO Authorization will be obtained. Further, P4, p 2-26 identifies data gaps in fish habitat information for the lake, and that should it be identified that important habitats will be impacted, an offsetting plan will be developed in accordance with the *Fisheries Act* (1985).	Review statements and confirm consistent finding and update as required. Also note that the *Fisheries Act* was amended in 2013 and the reference to the *Act* should be updated accordingly.	Technical Comment	See 30-KIA for response.
KIA-15	Fish and Fish Habitat- Amendment to AEMP.	TMAC is proposing to amend the Aquatic Effects Monitoring Program (AEMP) throughout 2015 to address changes associated with the TIA effluent discharge location to Roberts Bay. The monitoring program study design as presented in P2 and P4 seems scientifically-sound and includes water quality, phytoplankton and benthic communities. However, it is not clear whether monitoring of fish presence, health, or behaviour is part of this AEMP. There is the potential to affect fish through both water quality and changes in lower trophic levels, as well as more directly through potential changes in fish habitat or fish behaviour (including avoidance) at the location of the diffuser, pipeline and marine berm. If changes are found as a result of the discharge of the TIA water, TMAC will review possible adaptive management measures to address the situation.	Please provide further details on the components of the proposed-AEMP that will monitor fish and fisheries in Roberts Bay.	Request for Additional Information	TMAC commits to developing an Aquatic Monitoring Framework, which will be inclusive of a scope typically addressed in an Aquatic Effects Monitoring Plan (AEMP), yet will extend to the marine environment. Development of the Framework will follow the Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT (INAC 2009). This process calls for establishment of a multi-stakeholder Working Group to review working drafts of an AEMP. Accordingly, TMAC will commence the process of Framework development following the technical review of the Application in order to adequately consider Party comments and any additional considerations that may arise through the technical review process. TMAC anticipates initiating the Working Group and developing of a first draft Study Design in Q1 2016, with a final Framework in place prior to entering operations in January 2017.
KIA-16	Fish and Fish Habitat- Spur road connecting vent raise and float plane dock.	The Doris Connector Vent Raise will be connected to the Float Plane Dock Access Road by a spur road. In P2 it states that the spur road will cross a potentially fish-bearing creek with two 0.5 m diameter CSP culverts. A Fisheries Self-Assessment will be conducted in the open-water 2015 season to confirm the expectation that the watercourse is non-sport fish bearing and therefore would not result in serious harm.	Please note that even if the watercourse contains non-sport fish bearing species that the *Fisheries Act* will still apply, and should still be assessed for potential serious harm to fish, particularly for those fish that are part or, or support, Commercial, Recreational or Aboriginal fisheries. Suggest change wording to reflect this and recommend that the KIA review the self-assessment and results of the fisheries survey once available. Update effects assessment and mitigation measures once site-specific fisheries information is confirmed.	Technical Comment	See 32-KIA for response.
KIA-17	Fish and Fish Habitat- Culvert crossing on Doris central access road.	As stated in P2 and shown on drawing P6-1, the Doris Central Access Road will not require a 'stream crossing' but it will cross a defined surface water drainage feature and a double culvert will be installed to allow surface water to drain into Doris Lake.	Please confirm that this water feature does not provide fish habitat (including seasonal), and as the water drains to Doris Lake, appropriate mitigation and protection measures should still be in place during construction and operation.	Technical Comment	See 33-KIA for response.
KIA-18	Fish and Fish Habitat- Drilling and blasting to anchor vent raise fan.	Limited drilling and blasting are proposed to anchor the vent raise fan to the vent raise, but is not clear if there are potential effects to fish and fish habitat. This activity is not included in the effects assessment.	Please provide confirmation that blasting activities will occur at a suitable distance away from fish habitat and no impacts are therefore anticipated.	Technical Comment	See 34-KIA

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KIA-19	Fish and Fish Habitat- Data gaps in fish habitat.	Table 1of Environmental Impacts provides a good summary of potential impacts and all impacts for Freshwater and Marine Aquatic Organisms and Fish and Fish Habitat are classified as 'M- Negative and Mitigatable'. Considering that there are some data gaps in baseline fish habitat (including for culvert crossings, Roberts Bay shoreline, and spawning shoals in Doris Lake),it may be premature to classify impacts as 'Mitigatable' until assessments are complete. In P4 it is stated that no residual effects are anticipated on fish habitat through stream crossings, but then notes that if operational statements and best management practices cannot be followed and will result in serious harm, then TMAC will develop offsetting plans. It is also noted in P4 that 'Serious Harm' to fish in Doris Lake is likely due to reductions in water levels, which suggests that impacts cannot be mitigated. Impacts to vegetation through the construction of infrastructure and project footprint is classified as 'N- Negative and non-mitigatable'. It is not clear why loss of aquatic habitat though project infrastructure (culverts, pipeline, marine berm) would not also be classified as 'N'.	Please provide more robust supporting evidence and analysis on the fisheries effects assessment. Please also provide justification for loss of vegetation through project infrastructure being classed as 'N-Negative and non-mitigatable' while loss of fish habitat is 'M'.	Technical Comment	Effects to fisheries in Doris Lake, Doris Creek and Outflow, and at stream crossing sites have been assessed based on available information and reported in document P4-1. TMAC recognizes some additional information is necessary to support this assessment and in summer 2015 commissioned a field data gathering program to address these needs. Once these field data are processed and effects confirmed TMAC will develop strategies to avoid, mitigate, or lastly offset serious harm to commercial, recreational, or Aboriginal fisheries, as defined by the *Fisheries Act*. Vegetation loss is immitigable because tundra is buried under a rock cover that will not be removed. Fish habitat loss can be mitigated because it can be offset under the provisions of the *Fisheries Act*.
KIA-20	Fish and Fish Habitat- Aquatic baseline conditions.	P4 provides a good overview of aquatic baseline conditions. On pg2-16 it is stated that metal concentrations in tissue from Lake Trout, Lake Whitefish and Ninespine Stickleback remained relatively consistent from 1995 to 2010. However it is not clear at what levels or implications for fish health.	Please provide additional detail on this baseline data, including tissue concentration values for the data set noted.	Technical Comment	The species sampled, tissue types collected, and methods used have varied throughout baseline data collection, making direct comparisons among years impossible. However, metal concentrations in Doris Lake have remained consistent because in four years of sampling (1995, 1996, 1997, and 2010) there is just one occurrence of one metal exceeding consumption guidelines for muscle tissues. In 1997, one lake trout muscle tissue sample (0.64 µg/g wet weight) exceeded consumption guidelines (0.5 µg/g wet weight) for mercury.
KIA-21	Fish and Fish Habitat- Hydrological assessment.	The hydrological assessment concludes that under the proposed scenario, the lake level will decrease by 0.23m during winter. Potential effects include exposing Lake Trout eggs to desiccation, if spawning shoals are within 0.23m of the ice bottom. The report acknowledges that additional data should be collected to verify locations and depths of Lake Trout spawning habitat so that they can be protected in the future. The baseline information also shows that Lake Whitefish and Cisco are also present in Doris Lake, both of which also spawn in the Fall, also with a preference for shoreline or shoal habitat. After egg incubation over the winter, young-of-year Whitefish and Lake Trout remain in the spawning area for weeks to months before moving into deeper areas.	Please provide information on the proposed surveys to identify spawning shoals in Doris Lake. Please comment on why the effects assessments focuses on Lake Trout egg incubation, and recommend that the baseline and effects assessment are expanded to other relevant species and life stages. Please provide supporting evidence on the potential effects to fisheries over the life of the mine, and post- closure, based on the assessment of the viable spawning habitat that is affected. Please provide details on suitable protection and mitigation measures for this habitat and fisheries.	Technical Comment	As presented in document P4-1 (Effects Assessment) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. The hydrologic assessment indicates a lake level decrease of up to 0.23 m during winter; this change is within the natural range of water level and ice thickness and is not expected to result in adverse effects to fish and fish habitat in Doris Lake. To confirm this assessment, TMAC completed a field study on Doris Lake in fall 2015 and included a detailed habitat survey around the entire perimeter of the lake, focusing on the 1.5 to 4 m zone, the primary area of concern immediately below natural lake ice, where eggs and larvae left by fall-spawning fish overwinter. If the lake is drawn down below the natural range, eggs and alevins close to the ice could perish. In addition, hydroacoustics, gillnetting, angling, underwater video, and visual observations were used to further categorize lake habitats and to identify spawning fish locations within the lake. These field data will be summarized in Q4 2015 as part of the self-assessment process to determine effects. The field information will be assessed in conjunction with existing fisheries and hydrological baseline data to accurately quantify potential effects and if the analysis of the field program results do in fact indicate that the drawdown of Doris Lake will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed.
KIA-22	Fish and Fish Habitat- Reduction in discharge from Doris Lake.	There will be a reduction in flow (discharge) in Doris Outflow and Doris Creek throughout the open water season resulting from a decrease in Doris Lake available volume. To ensure a conservative approach, potential effects to fish habitat in an extreme year result in a total decrease of 24 flow days in the Outfall and the Creek. This represents a reduction in available rearing habitat used by Arctic char, Lake Trout, and Ninespine Stickleback by an average of 11% and up to a maximum of 18% during mining. Mean annual discharge will also be reduced, resulting in a reduction in wetted stream width and therefore available habitat. It is not clear what this reduction means for the local fish population nor fisheries productivity and whether this results in 'Serious Harm' (as defined by the *Fisheries Act*). It is noted that additional modeling and characterization of Doris Lake Outflow and Creek are required.	Please provide further details on this additional modeling and characterization, as well as review of final data and report when available. Please update effects assessment once this information is available.	Technical Comment	As presented in document P4-1 (Effects Assessment, pg 2-26) included with the Application, water balance modelling indicates that water removal from Doris Lake for industrial use, combined with seepage from the lake into the underground mine while mining in the talik, will drop the surface water level of the lake and decrease the flow in the lake outflow. A reduction in discharge to Doris Creek of up to 13.7 to 27.9% (P4-1, pg 2-27) will result in a reduction in the wetted stream width and thus the amount of available habitat for the duration of water withdrawal for the six years during which water loss during mining may persist. To quantify the amount of serious harm required to be offset additional modeling and characterization of Doris Lake Outflow and Creek was initiated in 2015, however, challenging flow conditions during the field program prevented the collection of the data required to complete the effects assessment for Doris Creek. TMAC will conduct this field program in 2016 and a self-assessment process will be completed. If it is confirmed that reduced flows will cause serious harm that cannot be avoided or mitigated, an offsetting plan will be developed to ensure all activities adhere to the federal *Fisheries Act*.

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KIA-23	Fish and Fish Habitat- Reduction in outflow from Little Roberts Lake.	P4 includes analysis that there will be a reduction in total number of flow days in Little Roberts Outflow, and also that the reduction in stream wetted widths will be negligible. The maximum reduction of 10.8% reduction in mean annual lake discharge may be just over the upper limit of DFO's recommendation of 10% to mitigating water discharge reduction, but it is not clear what effect this would have on the fish population at a local level.	Please provide justification for applying DFO's recommendation at this site. Please also provide more site-specific information on potential effects (and suitable mitigation) on fisheries.	Technical Comment	From the DFO document (DFO 2013) "For Canadian rivers and streams, the expert consensus is that cumulative flow alterations of less than +/- 10% of the magnitude of actual (instantaneous) flow in the river relative to a "natural flow regime" have a low probability of detectable negative impacts to ecosystems including those that support CRA fisheries." This science advisory document included Arctic Char in the species depending on river flow regimes. TMAC considers this Science Advisory Report to indicate that any negative effects on fish productivity would be indistinguishable from natural variation in productivity within the local system, especially when considering the short duration of activities reducing flow. TMAC will monitor the flow levels during project activity to measure the reduction in discharge within the system and provide an adaptive management plan to be put in place if flow reductions exceed those modeled for the Type A water licence application. Reference: DFO. 2013. Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada. DFO. Can. Sci. Advis. Sec. Proceed. Ser. 2013/017. Fisheries and Oceans Canada: Ottawa, ON.
KIA-24	Fish and Fish Habitat - Roberts Bay pipeline and diffuser decommissioning.	There appears to be a generally good understanding of marine fish and fish habitat in Roberts Bay. It is noted that the installation and decommissioning of the subsea pipeline and diffuser system has the potential to affect fish habitat. From P3, Table 2, it seems as though the marine pipeline would be left in place, therefore the activities (and potential effects) from pipeline decommissioning are unclear. It is noted that concrete blocks are used for counter buoyancy weights every 5m along the pipeline, but it is unclear if there are long term effects from these as this deteriorate over time.	Please provide further clarification on the activities associated with pipeline decommissioning, as well as potential fish and fish habitat effects, including from infrastructure left in place.	Technical Comment	Pipeline and associated buoyancy weights will not be removed during the decommissioning phase. Upon placement they will serve to increase habitat heterogeneity in the area by providing hard substrates that are relatively less abundant than the characteristic soft substrates of Roberts Bay (refer to document P4-1, Section 4.4.2 for additional information). As discussed in document P4-1, Section 4.5.5.2, it is expected that the structures will form a settlement substrate for algae and sessile invertebrates, which may form a source of food for small fish and invertebrates. They will also provide vertical habitat for species such as sculpins, gunnels and cod. Many studies of fish recruitment to artificial habitats indicate that concrete block structures are useful in creating fish habitat, particularly in sediment bottom areas where no other hard substrate exist, characteristic of Roberts Bay. Removing the structures following colonization by organisms would reduce the number of hard substrate habitats considered limiting within Roberts Bay.
KIA-25	Fish and Fish Habitat- Diffuser impact on marine fish.	There is no mention of potential entrapment of fish at the diffuser or at end of pipe. Although detailed engineering is not yet available, it is not clear if this is a potential effect or not (noting that it may depend on the final design). During construction and operation of the pipe and diffuser, there are also no potential effects noted on acoustics/sound pressure and fish mortality or behaviour.	Please provide comment on these potential effects and provide suitable mitigation measures (if required).	Technical Comment	TMAC acknowledges the reviewer's comment. Detailed engineering is not yet available. TMAC has committed to undertaking a self-assessment to determining whether proposed in-water works have the potential to result in serious harm to fish. TMAC commits to utilizing best management practices with regards to diffuser design.
KIA-26	Fish and Fish Habitat- Pipeline and diffuser self assessment.	It is noted in P4 that a fisheries self assessment will be completed in advance of construction once detailed engineering is available. A preliminary self assessment has however already been completed and is outlined, so this could proceed to DFO Project Review. P3 Table 1states that the effects are 'Mitigatable'. It was noted in P3 Table 2, that the shoreline crossing of the pipeline has been designed to avoid disturbing sensitive shoreline fish habitat, but no information seems to have been provided on what type of habitat.	Please provide clarification on the avoidance and protection measures implemented for fish and fish habitat by the proposed marine pipeline and berm. Please also provide further assessment on the potential effect of fisheries.	Technical Comment	TMAC acknowledges the reviewer's comment. Baseline marine fish community and fish habitat information is provided in document P4-1, Section 4.4-2. Habitat information is provided in Table 4.4-2 and figures 4.4-2 to 4.4-4. Species lists, life history strategies and habitat preferences summarized in tables 4.4-3 and 4.4-4. TMAC has committed to undertaking a self-assessment to determining whether proposed in-water works have the potential to result in serious harm to fish, as indicated in document P3-1, Table 2. This will be completed once final engineering plans are confirmed.

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KIA-27	TIA expansion capacity	TMAC states *"The Doris North Project and the Madrid/Boston (Phase 2) Hope Bay Belt Project are separate but related neighboring projects...To minimize overall project footprint and potential for impact, and to maximize the existing investment TMAC has designed the Madrid/Boston project to use facilities that already exist at Doris to the extent possible. However, it is important to note that the revisions to Doris facilities listed in this Amendment Application are in support of the Doris Mine itself Additional changes will later be required to support the Madrid/Boston project, but any such changes will be outlined and permitted separately as part of the Part 5 review of the Madrid/Boston (Phase 2} Hope Bay Belt Project."* *The current Tailings Impoundment Area (TIA) plan has been rescoped in the amendment to use sub aerial deposition designed to accommodate a greater volume of tailings than the originally permitted sub-aqueous deposition would have been able to hold within the current project footprint. It is unclear if this new shift to sub-aerial deposition would eventually require an even larger project footprint at the time of the Madrid and Boston (phase 2) project permitting. Does proceeding with this updated deposition strategy allow for the accommodation of the tailings generated from the expanded project? For example, alternative #5 presented in the Tailings Management Strategies Alternatives Assessment has the reported benefit of permitting a larger "volume of tailings within a smaller footprint, [generating] an overall more stable landform unit". A smaller footprint would provide more space for future expansion.*	Will the proposed sub-aerial TIA need further expansion if TMAC proceeds with phase 2? Can TMAC provide a discussion on the TIA's capacity to handle additional tailings from Doris North (if additional resources are discovered), and the other proposed projects in the Hope Bay Belt (Madrid and Boston)? What will this expansion, if built, eventually mean to the final build out of the tailings disposal facility? Does it enhance or jeopardize the need for any further expansion?	Technical Comment	While the Doris facilities have the capacity to support use by future development in the Hope Bay Belt, the scope of the Amendment Application is limited to the Doris Mine. Consideration of future developments in the Hope Bay Belt and their associated impacts should be considered as either a separate application or a future amendment to existing licences, as appropriate. Accordingly, TMAC respectfully requests that the consideration of the use of Doris infrastructure in the Madrid, Boston and Phase 2 projects be considered in their respective regulatory processes.
KIA-28	Cyanide destruction through SO_2-Air Process	TMAC states *"Cyanide destruction will be performed using the SO_2-Air Process, a process that has been successfully tested. Test work confirmed previous findings that the concentration of Weak Acid Dissociable (WAD) cyanide could be reduced to less than 0.5 mg/L. At a concentration of less than 0.5 mg/L the subsequent tailings filtration and handling for backfill will not be classified as Cyanide Facilities by the International Cyanide Management Institute (ICMI)."* The declassification of the cyanide facilities relies on the successful application of the SO_2-Air Process as does ensuring excess tailings reclaim water meets all Canadian cyanide discharge requirements.	Please provide test results for the site demonstrating the effectiveness of the SO_2-Air Process and include documentation of the test conditions. Please also provide examples where the SO_2-Air Process has been successfully applied. This discussion should include geographically relevant examples which have been exposed to similar climate conditions to those expected at the Project site.	Request for Additional Information	"Test work conducted can be found in report TMAC Resources - Hope Bay - DC02 T1240 Part II: Detox Testwork Report attached in Appendix 2.1. This contains all information on test conditions and results thereof. The INCO Process (air/SO_2) is used at more than 90 mines worldwide. Companies that use this process successfully include global mining leaders such as Newmont, Barrick, and Goldfields. Climatic conditions are not really applicable given the destruction process occurs inside the process plant building which will be nominally at +5oC and in solutions in the order of 10-30oC. The INCO process is generally unaffected by temperatures in the range 5oC-60oC and since we are not going below 5oC at Hope Bay no evaluation of Arctic conditions and temperatures is necessary.
KIA-29	Mixing zone delineation	TMAC states: *"The proposed discharge criteria for the water from the TIA will be MMER limits in the discharge system and CCME Guidelines within Roberts Bay. Water quality modelling results show that the TIA discharge water quality would be in compliance with these criteria under a wide range of conditions without the need for additional water treatment."* The distance designated as the "mixing zone" is not outlined. TMAC only states the *"end of pipe discharged water quality for all three scenarios was determined to be below MMER limits (MMER 2015)... [and] To meet the CCME water quality guidelines within the marine environment mixing zone, a 20:1 dilution (i.e. 20 parts seawater to 1 part discharge water) would need to be achieved."*	What is the distance from the diffuser at which CCME water quality guidelines will be met in Roberts Bay (i.e.: what is the size of the mixing zone)? Please demonstrate how the 20:1dilution will be achieved. Please provide modeling results for all three discharge scenarios (groundwater only, groundwater and TIA, TIA only) in both the open water season when full exchange with Melville Sound is expected and under ice when the water exchange is negligible. We note these seasonal differences specifically as they were highlighted by TMAC in Package 2.	Technical Comment	Dilution will be achieved rapidly given the pumping and small portals. Of the Canadian Council of Ministers of the Environment (CCME) metals in effluent, maximum predicted chromium concentrations (0.0062 mg/L; Table 4.5-3, document P4-1) will require the greatest dilution to meet CCME guideline levels (0.0015 mg/L; Table 4.5-1, document P4-1) in the receiving environment of Roberts Bay (baseline: 0.001 mg/L; Table 4.5-2, document P4-1), in this case a 9.2:1 dilution. This will be reached within 1 m of the diffuser portals, and given this parameter requires the greatest dilution, the 'CCME mixing zone' will be 1 m. Modelling results for the 3 requested scenarios during summer and winter can be provided during the technical review portion of the Amendment review process.

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KIA-30	Robustness of discharge infrastructure	TMAC states: *"A critical component of the outfall involves the crossing of the foreshore zone adjacent to Roberts Bay to a point below the expected depth of freezing (approximately the 4* m *bathymetric contour). The pipeline will thus consist of both armoured and exposed sections. Construction of the Morine Outfall Berm to the 4* m *bathymetric contour protects the pipeline from ice scouring and displacement."* We accept that armouring will extend below the level of ice cover (up to 2m), but are concerned with the capacity of the discharge infrastructure to withstand damage from environmental factors such as the storm that damaged the Roberts Bay Jetty.	Please provide an evaluation of the discharge infrastructure's capacity to withstand a range of environmental stressors. This should be accompanied with evidence such as side-scan sonar surveys demonstrating ice scouring is not an issue of concern below 4m in the vicinity of the discharge infrastructure. In the event of extended (longer than for standard maintenance) infrastructure failure, please provide the framework for an emergency response plan and contingency for storage of effluent. If this discussion requires consideration of alternate discharge locations (e.g.: those presented in Package 6-7), it should be accompanied with: • An assessment of the mixing zone, • The dilution ratio of effluent to receiving environment water needed to meet CCME guidelines at the edge of the required mixing zone, and • The sensitivity of the receiving environment within the mixing zone. The mixing zone under failure of the discharge system will vary based upon the season (ice free versus ice cover) and the location of the failure (shoreline versus subsurface) and will be dissimilar to that of the planned mixing zone due to the shallow depth and the absence of a diffusor. Explain in the emergency response plan how this type of failure will be managed and mitigated.	Request for Additional Information	The pipeline will be designed to withstand various environmental stressors including excessive settlement, wave action and ice scour. A preliminary engineering assessment on the overall feasibility of the outfall serves as the basis of the information contained in the Application. Engineering planning has been completed at a level consistent with the expectations for Water Licence applications. Detailed design of the outfall will be provided to the NWB prior to construction. Should the outfall fail during operations as a result of environmental conditions, sufficient time (measured in years) will be available to suspend discharge to Roberts Bay from the TIA in order to complete repair of the outfall. An alternate discharge location is not needed as a contingency measure.
KIA-31	Potential interaction with freshwater environment	TMAC provides the following potential interactions with the freshwater aquatic environment resulting from the proposed Project changes: • "Potential alteration of Doris Lake outflow; • Changes in surface water quality from runoff water from proposed expanded laydown area and ore storage pad; • Reduction in or alteration of habitat (changes in flow) through water losses; and • Removal or alteration of aquatic habitat for infrastructure, including culvert construction." We note several additional potential interactions the project may have with the freshwater environment: 1) Saline groundwater will be a significant water quality and quantity management issue under the proposed changes to the project; peak groundwater inflow has been modelled at 3000 m^3/day and the proposed disposal method is ocean discharge. However, little discussion of how TMAC will handle saline groundwater in the event of prolonged diffuser and/or related infrastructure failure is provided. TMAC only indicates that "intercepted groundwater inflows will be stored in the underground sumps and pumped to the Pollution Control Ponds for Temporary Management or to the TJA." 2) The impact of fugitive dust to surface water quality has not been assessed as a potential impact to water quality. "Sub-aerial tailings have the potential to generate fugitive dust emissions..." as does vehicular traffic. While we acknowledge "there are proven mitigation measures that will be incorporated in tailings management to reduce emissions from the tailings" we still stress the importance of this pathway as a potential influence to the freshwater environment. We also acknowledge that magnitude of this pathway is reduced as compared with open pit mining. 3) The freshwater environment will also continue to be directly influenced by water from the TIA "in 2015 and 2016 (Years -2 and -1)" as well as after the North Dam has been breached and the natural flow from Tail Lake has been re-established.	1a) Please provide an analysis of alternatives for disposal of saline groundwater and a contingency plan should problems arise with the diffuser, marine outfall mixing box, or water transport infrastructure (pipeline) preventing ocean disposal of saline groundwater and please provide volume estimates of short term storage availability in the event of a failure. lf TMAC has insufficient short term storage capacity or treatment capacity, if required, for saline groundwater in the pollution control ponds or TIA and needs to discharge excess water to the freshwater environment or to the near shore marine environment, an evaluation of environmental impacts to freshwater quality or the near-shore marine environment associated with the proposed saline water management should be addressed. 1b) Please provide an assessment of variance in the range of volume and concentrations of saline groundwater to be managed. 2) Please include an assessment of the impacts on water quality of fugitive dust stemming from the nearby transportation routes and sub-aerial tailings deposition. 3) Please provide an assessment of the impacts water from the TIA will have on Doris Lake and Doris Creek when an intentional connection has been established from the water body (i.e.: prior to operations and after the North Dam has been breached). Please also see KIA-36.	Request for Additional Information	1a) Groundwater will not be treated but managed as discussed in document P6-6 (Roberts Bay Discharge System Water Management Options) submitted as part of the application package. The management scheme is based on collecting the groundwater in the underground workings and reusing for drilling; excess groundwater will be pumped to the surface and discharged to Roberts Bay via a pipeline and diffuser. In the event that the saline groundwater cannot be discharged to Roberts Bay, mine water would be stored in the mine on a temporary basis. Once the matter has been resolved discharge to Roberts Bay would resume. Discharge to the surface freshwater environment will not occur. 1b) The range of effluent volumes and concentrations of saline groundwater is presented in application document P6-6 (Roberts Bay Discharge System Water Management Options) and document P4-1 Section 4.5.2. 2. Dust and effects to the environment is included in the application document 4 (Environmental Effects Assessment), Section 3.0. Dust will be generated due to project activities, however, the fugitive dust along road corridors was part of the 2006 FEIS and included in current authorizations with an associated Air Quality Monitoring and Management Plan. The change from subaqueous to subaerial tailings deposition will also result in dust generation, however, with design and mitigation measures dust generation will be minimized and no residual effects are anticipated including effects to surface freshwater. 3. Construction of the North Dam was completed in 2012. Catchment water in the Tail Lake outflow channel downstream of the dam are from the remaining natural catchment downstream of the dam. The system represents natural baseline conditions prior to operations and does not need assessment. At closure, the North Dam will not be breached until the TIA water quality is such that it will meet closure objectives. Treatment is currently not identified as being needed with discharge of excess TIA effluent directly to Roberts Bay via pipeline/diffuser. This discharge will be maintained until the TIA effluent meets discharge requirements for freshwater and the North Dam can be breached.

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ID #	Subject	Issue/Concern	Information Requested	Comment Category[1]	TMAC Response
KIA-32	Saline discharges to Roberts Bay	TMAC indicates that the winter ice cover shelters Roberts Bay from the wind, the primary mixing force for waters between the bay and Melville Sound. When under- ice, *"currents were generally very weak, with mean horizontal current velocities between 1 and 2 cm/s. Deep currents, which were driven either by density gradients formed through episodic ice formation/brine release or advection of waters from Melville Sound, had slightly stronger velocities. Tidal flows are weak and likely have little effect on exchange between Roberts Bay and Melville Sound." This may result in the pooling of discharged effluent while under ice, especially if it contains substantial amounts of saline groundwater. Salinity measured near the outfall as part of the baseline studies found salinity to naturally fluctuate between 15.4-27.6 ppt with a median value of 26.8 ppt. The CCME marine water quality guideline for salinity is provided as a narrative requiring that anthropogenic activities not vary the natural level of salinity at a given depth by more than 10%3 at the edge of the mixing zone. This would imply that salinity should not fluctuate by more than 2.68 ppt from a background of 26.8 ppt. However, Figure4.5-1(below) indicates the background salinity is 27.1ppt, which would permit an anthropogenic generated fluctuation of 2.71 ppt. As this figure further indicates that salinity will be close to the CCME guideline for at least one month each year, it is important to clarify what concentration will be used as the background and how that number was derived.*	Please provide the following clarification for salinity discharges to Roberts Bay: 1) How and where was the background concentration of 27.1 ppt arrived at? 2) What inputs were used to generate Figure 4.5-1 in Package 4) See KIA-31, above for concerns with expected salinity and volume of saline groundwater to be managed. 3) Please clarify why salinity increases during the first two years of operation to a new base of 28.5% and remains steady as the new base until discharge ceases despite reported annual "full exchange with Melville Sound"? Does full exchange not occu at the proposed discharge point? This concern also applies to other contaminants of potential concern discharge to Roberts Bay such as those indicated in KIA-33. 4) Please characterize the vertical structure column at the discharge point.	Technical Comment	1) The baseline salinity range of 15.4-27.6 was calculated from all profiles taken at sites in Figure 4.3-11 between 2009 and 2011, including the less saline surface waters (see note 'b' at bottom of Table 4.3-1). For the purpose of modelling, background salinity was calculated by averaging baseline salinity profiles (10 casts) between 20 m and 40 m (assumed trapping depth) collected between 2009 and 2011 at the site near the proposed diffuser (sites ST4, WT4, and RB1) (See note at bottom of Table 4.5-2 in document P4-1). 2) The model inputs used to produce Figs 4.5-1 through 4.5-3 are discussed in document P4-1, Section 4.5.2.2. 3) Full flushing in the box model was constructed with 33% of the Roberts Bay water being flushed during each of July, August, and September (see 'Model Assumptions', Section 4.5.2.2). However, discharge continues during this timeframe so 'residual' effluent remains in the bay during each month. At the end of the open-water season, Roberts will have accumulated effluent compared to a year previous (hence the year-to-year increase in WQ parameter concentrations). If 100% were fully exchanged instantaneously, then Roberts Bay would return to baseline concentrations. The model was designed such that the CCME concentrations would be achieved during the last year of discharge. The model also used a 33% per month open-water flushing rate to be conservative as opposed using 100% per month. 4) The vertical structure of the water column at the discharge point (Sites WT4/ST4) can be seen in Figs 4.3-10 and 4.3-11 in document P4-1. This diagram shows the water column to be stratified during winter and summer with an upper mixed layer depth of about 10 m. Additional water column profiles and raw data for the discharge site (WT4, ST4, RB1) can be found in Rescan (2010, 2011, 2012) available on request.
KIA-33	Increasing contaminants of potential concern concentrations in Roberts Bay	All parameters of potential concern in the referenced figures show increasing concentrations in Roberts Bay year over year due to effluent discharge. TMAC indicated that water in Roberts Bay was totally exchanged with Melville Sound during the open water months. We further note that all of these parameters (nitrate-N, salinity arsenic, cadmium, chromium, mercury) are very close to or above their respective CCME WQG after 6 years of production for what appears to be up to a month.	Please provide a discussion of why concentrations are increasing year over year despite annual full exchange with Melville Sound. Please clarify maximum concentrations that are expected after 6 years. Please provide a discussion of how CCME water quality criteria in Roberts Bay will be met if TMAC proceeds with Phase 2 of the project given that effluent will continue to be discharged to Roberts Bay.	Technical Comment	See response#3 to KIA-32 regarding increasing concentrations in Roberts Bay despite full annual exchange. TMAC appreciates the reviewer's comment but Phase 2 is beyond the scope of this Application and so is therefore not appropriate to be discussed herein.
KIA-34	Fugitive dust monitoring	It does not appear that dust fall originating along the road has been included in the Air Quality Management Plan. Similarly, TMAC has not included proposed dust fall monitoring locations around the tailings facility. They state that *"An update to this program will be included in the next iteration of [the Air Quality Monitoring] plan"*. Proposed locations should be included in this iteration of the plan as sub-aerial tailings deposition carries with it a greater risk to generate fugitive dust than sub- aqueous deposition as originally permitted. Similarly, vehicular travel along the road leading to the marine discharge infrastructure will be an additional source of fugitive dust at the project site. The proposed application of chemical suppressants, while likely effective, does not supersede the need for documented monitoring.	Please include proposed locations and specific approaches for the air quality monitoring around the amended project footprint in this iteration of the application for review.	Technical Comment	The proposed locations and approaches for air quality monitoring around the amended project footprint are detailed in the Air Quality Management Plan (AQMP) document P5-1. The locations of air quality monitoring stations, including PASS, Partiol, and dustfall monitoring locations, are provided in Figure 3-1, with the approach to each of the monitoring programs described in Section 3.1 to 3.3, respectively. Dustfall stations are located downwind of infrastructure, including roads. Dustfall monitoring station CDF3 will be relocated to the southeast of the Tailing Impoundment Area (TIA) to better capture potential dust generation from the TIA. Air quality monitoring stations may be repositioned in the future in response to program results or observations on site and the use of alternative methods (e.g., snow core surveys for dustfall analysis) may be considered in the future to ensure program efficiency and effectiveness.
KIA-35	NPAG tailings cover depth	TMAC indicates *"At the end of operations the tailings area in the TIA will be closed by construction of an isolation cover, consisting of a single layer of non-acid generating quarry rock. Most of the contaminated water retained in the Reclaim Pond will be pumped through the Roberts Bay Discharge System for undersea discharge. The pond will then be allowed to re-flood naturally to pre-disturbance levels (elevation 28.3 mas/). The North Dam will then be breached to re-establish the natural drainage path through an engineered spillway structure."* The *"single layer"* is later defined as"0.3 m of quarry rock." However, no rationale as to why 0.3 m of quarry rock is sufficient to cap the tailings beach is provided and 0.3 m is not sufficient depth to allow the establishment of a stable permafrost cap.	Please provide an assessment as to why 0.3 m of quarry rock is an acceptable depth of used up to 3 m of non-acid generating rock {NAG) to cover their tailings.	Technical Comment	The tailings has been classified as non-acid generating with potential for neutral metal leaching. A source load associated with the tailings has been developed and incorporated into the site wide water and load balance model [Document P6-10;.]. The model indicates that the design of the tailings cover does not need to reduce water infiltration or oxygenation as contamination of surface or subsurface waters are not predicted. Based on these results, TMAC believes that all of the information needed for the review is included in the Application. The design of the final cover will be provided to the NWB prior to its construction.

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KIA-36	Elevated parameters of potential concern in the TIA post closure	*"Water quality in the TIA Reclaim Pond is arguably the biggest uncertainty identified to date, with potentially the largest impact on the closure cost and schedule. The water quality model will be updated and refined, as site water quality data becomes available."* Modelling for different project phases have been summarized in Package 6-10 Table 6-2 providing mean and maximum concentrations of water quality parameters in the TIA until the end of the modelling period in 2035. The modeled monthly values are then graphed in Package 6-10 Appendix B which indicates chloride, arsenic aluminum, copper and iron will be elevated above the CCME WQG and above background concentrations at TL-2, the outlet from Tail Lake into Doris Lake.in the TIA until the end of the modelling period in 2035. The modeled monthly values are then graphed in Package 6-10 Appendix B which indicates chloride, arsenic aluminum, copper and iron will be elevated above the CCME WQG and above background concentrations at TL-2, the outlet from Tail Lake into Doris Lake. While we agree "The comparison [between TIA water quality and CCME guidelines] is for reference purposes only as the CCME guidelines apply to natural watercourses, whereas the TIA is a designated tailings impoundment facility", once the North Dam is breached, water from the TIA will be in direct contact with the freshwater environment. At that point, CCME criteria would be a valid comparison. TMAC provides a contingency stating, "In the case where water quality standards cannot be met by the end of the post-closure period specified in the water management plan, the monitoring time may be extended as required. Alternatively, water treatment options could be explored once the cause of the delay is known and quantified." However, TMAC has neither discussed how elevated parameters in the TIA will impact Doris Lake, or Doris Creek during post closure, nor what treatment options are proposed or feasible if water quality standards are not met.	Please include a discussion on the impacts elevated parameters in the TIA may have on freshwater quality once the North Dam has been breached, and what treatment options can be applied if water quality standards are not met and when they would be applied. The latter is particularly important, as no treatment has currently been proposed for the Project and we note that treatment of a high concentration waste stream at the time of generation is more feasible than treatment of tailings water at lower concentrations at a later date. Please model the TIA discharge water quality assuming that process waters were treated prior to discharge to the TIA and how this would influence water quality at closure.	Technical Comment	The expected closure water quality in the TIA prior to breach of the North Dam is discussed in the Site-Wide Water and Load Balance Report (document P6-10). The current closure plan incorporates breaching of the North Dam once the TIA effluent quality meets closure objectives and the information presented within the application support this approach. An alternative assessment in the FEIS 2006 (SRK 2006. Water Quality Model, Doris North Project, Hope Bay, Nunavut, Canada. October) included consideration of treatment of TIA effluent prior to discharge to Doris Creek, however, in revisiting the mine plan and proposed Project components and activities, the proposed change to subaerial deposition reduces the effluent capacity within the TIA and separating the detoxified tailings (disposed underground) and the cleaner tailings (disposed in TIA) changes the effluent quality such that treatment prior to discharge is not needed. The only water quality parameters for which exceedances to CCME guidelines have been identified post closure in the TIA are aluminium, copper and iron. These exceedances are marginal at between 1.3 and 3.4 times background values. These exceedances are however within the TIA, which is a designated tailings impoundment. At the receiving environment compliance point in Doris Creek, downstream of the waterfall, the concentrations will be below CCME and therefore protective of aquatic life.
KIA-37	Alternative explosives for use under wet conditions	TMAC states *"If the hole cannot be dewatered, or if it is seeping water, the hole will be loaded with an alternative explosive that is effective under wet conditions."* Potential alternative explosives have not been outlined in the amendment application. Alternatives should be presented to ensure the suite of monitored parameters would be able to identify water that has come into contact with residue from the alternative explosives.	What are the alternative explosives and what are the environmental risks, if any, associated with them? Are the currently proposed suite of parameters and their concentration sufficient to characterize water containing explosive residue? Will these tend to impact the receiving waters in Roberts Bay by accumulating there? Please review alternative methods for "dry" blasting, such as lining blast holes, as has been successfully implemented at the Diavik project.	Technical Comment	The explosives used and planned have been in use, world-wide for over 30 years and are essentially the only types of explosives available. Ammonium nitrate/fuel oil (ANFO) is the only commercially available explosive that is water sensitive. It is used whenever we can because it is far less expensive. If wet holes are encountered an explosive such as Geldyne by Orica (which is an emulsified ANFO base explosive packaged and designed to tolerate wet holes) or similar, will be used. Every explosives manufacturer offers both ANFO and ANFO emulsion products. The emulsion is offered in bulk and packaged form and its use will be determined by volume as the bulk material is less expensive but requires investment in delivery equipment. The primary ingredients are, as in all the primary explosives product lines, ammonium nitrate and diesel. The high explosives and detonators utilize PETN (blasting cord and caps). This is not a change from the current licence.
KIA-38	Hydraulic connection between Tail Lake and Doris Lake	Saline groundwater will be a significant water quality and quantity management issue under the proposed changes to the project; peak groundwater inflow has been modelled at 3000 m^3/day and the proposed disposal method is ocean discharge. TMAC provides ample discussion of the interaction between groundwater, the underground mining operations and Doris Lake. However, no discussion is provided regarding the potential subsurface hydraulic connection between Tail Lake (the TIA) and Doris Lake. A hydraulic connection could provide a potential pathway between tailings contact water and a freshwater or marine receiving environment. TMAC should provide evidence that no hydraulic connection exists between the TIA and Doris Lake.	Please provide evidence indicating the absence of a hydraulic connection between the TIA and Doris Lake. This evidence should include data from piezometers and thermistors strategically located between the two water bodies including relevant geochemical tracers used for the TIA water.	Technical Comment	There is no hydraulic connected between Doris Lake and Tail Lake. This has been confirmed though deep thermistor data. This issue has been addressed during the original water licence application in 2007.
KIA-39	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut	Water quality sampling has confirmed that the groundwater has high salinity and high concentrations of dissolved chloride, ammonia, boron, cadmium and manganese and therefore careful management of the ground water is required.	Given the statement above, is there a ground water collection and treatment plan associated with the project?	Technical Comment	As described in KIA-38, it has been determined that there is no hydraulic connection between Doris Lake and Tail Lake. This was considered during the application process for the existing water licence (2AM-DOH1323). Groundwater will enter the underground mine workings and will be collected. Any excess water not used for underground mining purposes will be managed as discussed in document P6-6 (Doris North Project: Roberts Bay Discharge System Water Management Options) submitted as part of the Application package.
KIA-40	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut	Average thickness of soft lake bed sediments= 17m	Given the significant thickness of soft lakebed sediments, what is the expected settlement of the intermediate dike or can dike stability be assured? What happens if Intermediate Dike fails?	Technical Comment	A stability assessment was undertaken as part of the design for the intermediate dike and is included in the design report included as part of the Application [Document P6-13; Tailings Management System, Appendix E]. While failure is unlikely, the integrity of the TIA would not be compromised should the intermediate dike fail given the presence of the North Dam downstream.

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KIA-41	Hydrogeological Modelling of the Proposed Doris North Project, Hope Bay, Nunavut	70% of the mine inflow is associated with water from Doris Lake, with the remainder coming from deep groundwater.	Given the amount of inflow water expected from Doris Lake, what is the expected impact on the water level in the lake from these losses?	Technical Comment	Doris Lake level is predicted to be drawn down by 23 cm during the winter as summarized in document P4-1, Table 2.5-1.
KIA-42	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut	The water encountered during mining, at least initially, will be saline, and dominated by chloride.	Given the above statement on water quality, will the mine inflows require treatment prior to disposal?	Technical Comment	Groundwater will not be treated but managed as discussed in document P6-6 (Roberts Bay Discharge System Water Management Options), submitted as part of the application package.
KIA-43	Water and Load Balance Report	Mercury and selenium have been excluded due to high detection limits in the mill effluent water quality dataset, which could result in artificially elevated predictions, which could result in artificially elevated predictions.	Given the exclusion of these parameters in the study, are they accommodated in water quality predictions in another way?	Technical Comment	The exclusion of mercury and selenium is due to a higher detection limit for TIA effluent monitoring that would result in an artificial elevated concentration if data is assumed to be at detection limit when the analysis reports as 'below detection limit'. TIA effluent quality has been included in the amendment application (document P6-10 Site-wide Water and Load Balance) and prediction of water quality in Roberts Bay are included in monthly time-steps for the 6 years of operations (discharge stops at closure) in the amendment application document P-4-1 (Environmental Effects Assessment, Section 4.5.2) that includes Total Arsenic, Cadmium, Chromium and Mercury. Selenium is not included in the model as there are no CCME criteria for this parameter currently for comparison.
KIA-44	Water and Load Balance Report	The majority of predicted concentrations in the TIA are expected to be below the CCME guidelines once the TIA refills with the exception of aluminum, copper and iron.	Given the water quality exceedances noted above, is there a plan for water treatment?	Technical Comment	TMAC does not intend to treat water post closure. The exceedances of aluminium, copper and iron are marginal, between 1.3 and 3.4 times background values. These exceedances are within the TIA, which is a designated tailings impoundment. At the receiving environment compliance point in Doris Creek, downstream of the waterfall, the concentrations are below CCME.
KIA-45	Expanded Laydown Area (Pad U)	Comprehensive geotechnical investigations have been carried out at the Hope Bay Site.	Have boreholes been drilled under the U Pad?	Technical Comment	Preliminary design of Pad U has been informed by site wide geotechnical information collected to date at Hope Bay and from exploration drill holes that have been advanced under the location of Pad U. Dedicated geotechnical drill holes under Pad U will be advanced prior to construction for confirmatory purposes.
KIA-46	Expanded Laydown Area (Pad U)	Typical Detail1- Drawing DN-WRE-03 Sections and Details 1of 2	BGC Comment is with respect to liner location.	Technical Comment	This request was subsequently clarified by the NIRB and KIA. TMAC understands that the reviewer is looking for the liner location to be identified in the relevant figures. In the event that Pad U is utilized for ore storage, the Sedimentation Pond will be converted to a Pollution Control Pond, include placement of a liner. The liner is illustrated in Section C of Sheet 4 of 8, of document P6-11, submitted with the application. The liner is not clearly illustrated; a revised drawing has been included as Appendix 7.0.
KIA-47	Doris North Pad U Ore Stockpile Stability Analysis	Marine Silt and Clay Foundation unfrozen friction angle = 40 degrees, frozen apparent cohesion = 112 kPa.	Confirm the basis for the parameters used.	Technical Comment	The selection of the parameters used in the design basis for ore stockpiles is considered for the existing Water Licence and is provided in SRK Consulting (Canada) Inc., 2009. Hope Bay Gold Project: Stage 2 Overburden Characterization Report. Report prepared for Hope Bay Mining Ltd. Project Number 1CH008.002. September (Appendix 3.3) as well as the original Water Licence Application North Dam Design Report. The parameters used for the designs presented in this Application are consistent with those presented previously.
KIA-48	Tailings Management Strategies Alternatives Assessment	At that time, it was acknowledged that expansion of the facility would require the tailings deposition strategy to change from subaqueous deposition to sub-aerial, unless perpetual water retaining dams were deemed acceptable.	Since the sub-aerial tailings will take a significant amount of time to freeze back post closure, the dam will retain saturated tailings for a significant period of time following closure. How is this accommodated in the design and closure of the facility? The GCL liner only at the South Dam will be potentially leaky until beach is fully developed.	Technical Comment	A seepage assessment and thermal analysis for the South Dam has been provided with the amendment application in document P6-13 (Tailings Management System). This supports the conclusion that the maximum possible amount of seepage, assuming a full head of water behind the dam and a completely thawed foundation would be 0.6 m^3/day. The thermal analysis however demonstrates that the foundation will remain frozen, and the tailings deposition plan demonstrate that this scenario is unlikely. If seepage were to occur, the discharge rates would be of a magnitude that would enable interception and pump-back to the TIA (if determined necessary) which is common practice in the mining industry.

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KIA-49	Tailings Management Strategies Alternatives Assessment	The foundation conditions at the site beneath the North and South Dams (SRK 2007) are however such that the use of conventional non-frozen dam construction methods would be technically challenging.	What is the contingency plan should the North Dam be required to stay in service longer than expected? When does the foundation start to thaw?	Technical Comment	This was provided in the original Water Licence Application. SRK Consulting (Canada) Inc., 2007. Design of the Tailings Containment Area, Doris North Project, Hope Bay, Nunavut, Canada. Report prepared for Miramar Hope Bay Ltd., Project Number: 1CM014.008.165. March 2007. Thermal analysis demonstrated that assuming a full head of water from the first day post construction, the foundation would remain frozen for at least 20 years. This analysis includes an allowance for climate warming.
KIA-50	Tailings Management Strategies Alternatives Assessment	The North and South Dams can be constructed and operated as frozen core dams since at closure they will only retain tailings solids, which in the long term is expected to be unsaturated and frozen.	What are the impacts on the thermal state of the dam if the tailings take a significant amount of time to freeze back? If the tailings covers are only terrestrial covers, then infiltratoin will occur into the tailings until they freeze. Does the freeze back rate include increasing moisture content in the taillings?	Technical Comment	The thermal analysis is described in document P6-10, Tailings Management System, Appendix F and the stability analysis is presented in dociument P6-10, Tailings Management System, Appendix E. The stability analysis was completed for different scenarios including fully thawed foundation conditions and the results confirm that the long term containment dam integrity does not rely on tailings freezeback. The freezeback analysis for the tailings did not include an evaluation of infiltration on the effect of freeze back timing. This was not deemed necessary since the impoundment integrity does not rely of freezeback, and the tailings geometry is benign and therefore also does not require freezeback to ensure environmental containment.
KIA-51	Tailings Management Strategies Alternatives Assessment	Drawbacks of this strategy includes high initial capital cost for the filter process, increased operational cost for transportation and compaction of the tailings and a requirement to manage fugitive tailings dust until such times as the closure cover is in place.	Have temporary measures such as surficial cover material been considered to control dusting? In addition, high capital costs for these measures are offset by the lack of dam construction dry stack may be overall cheaper upon full life cycle assessment. Comments?	Technical Comment	Options for dust mitigation methods and tailings selection has been provided with the amendment application document P6-13 (Tailings Management System)
KIA-52	Tailings Management Strategies Alternatives Assessment	To maximize the benefits of this alternative, the area where dry stack tailings are to be placed within the TIA footprint will have to be drained prior to deposition.	Have alternative locations for the dry stack be evaluated?	Technical Comment	A comprehensive tailings alternatives assessment which included alternate dry stack sites was completed in 2005 as part of the application for the existing Water Licence. This Application is for an amendment to the existing Water Licence and details regarding proposed changes to the TIA is presented in the design report that was included [document P6-10, Tailings Management System, Appendix B]. An alternate location for the TIA is not necessary in the context of this Application.

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