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Kingaok

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Cambridge Bay
Ikaluktutiak

Gjoa Haven
Okhoktok

Taloyoak

Kugaaruk

Phyllis Beaulieu
Manager of Licencing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B1J0

June 17th, 2014

Re: Licence No. 2AM-DOH1323: Submission of Operational Plans for the Doris North Project

Dear Phyllis Beaulieu, KIA has completed its review of the revisions to the *Spill Contingency Plan, the Landfarm Management Plan,* and the revised updated *Doris North Closure and Reclamation Plan.*

The KIA primary concern is that the cost estimate for mine site closure and reclamation may be under estimated. As noted in your May 21st, 2014 letter to Catherine Farrow, CEO and Director of TMAC Resources Inc., the original cost estimate was $13.08 million and has been revised to $21.55 million dollars.

Upon inspection of the cost model in Appendix A and B, the remediation of hydrocarbon contaminated soil, indirect costs, subcontractor prices, and time estimates for some activities may be underestimated. In particular, the remediation of hydrocarbon contaminated soil has not been accounted for in the model and can significantly increase costs for mine site closure and remediation work.

Given this considerations, KIA believes that the actual cost may be double the original estimate and be about $27.6 million dollars. TMAC Resources should continue to review and revise its cost estimates for mine site closure and remediation taking into account the above considerations. Another revised cost estimate for mine site closure and remediation should be provided prior to the commencement of production.

TMAC's proposal to submit an updated reclamation security estimate six months prior to each of the two significant project milestones, installation of the mill and deposition of tailings into the lake is acceptable as long as the above noted concerns are addressed. The KIA seeks to have adequate security in place for mine site closure and reclamation and the issue of double bonding of security between it and the AANDC be resolved.

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The following are KIA's consultants' comments on the *Spill Contingency Plan*, the *Landfarm Management Plan*, and the revised updated *Doris North Closure and Reclamation Plan*.

Spill Contingency Plan

The following comments were provided by the KIA's engineering consultants:

- A methodology to ensure the contact list remains current should be presented.
- Temporary containment berms and ditches identified within the SCP for spill containment purposes should be constructed with the following considerations:
    - Impacts to archeological sites, sensitive terrain, permafrost or other land or water features should be avoided in response actions if other areas have similar ability to meet response needs without these noted impacts.
    - Spill response training should identify that construction of berms and ditches should be undertaken in a manner that ensures impacts are not exacerbated by response action.
- The SPC should highlight the importance of minimizing contact time of spilled material with the environment. Temporary containment measures should only be applied as interim measures – with appropriate containers utilized as soon as is practical in the response actions. While this is important with regard to soil material, it is particularly true of snow and ice when used as a containment measure or absorption media – as melting or effectiveness of the containment/absorption properties can quickly attenuate in contact with spilled materials.
- The importance of obtaining data to assist in quantification of the released material and accounting of the recovered quantities should be highlighted in the SCP, as the opportunity to assess these quantities can sometimes be compromised by spill response actions. Quantification of the release and recovery is crucial in assessing the effectiveness and level of completion of spill response actions. Such quantification should be presented clearly in all reporting.
- Proximity of spill kits to working equipment should be defined.
- Boston Camp is not presented on the available figures. A reference figure should be included that encompasses this site.
- The need for the spill kit items listed as "optional" should be defined more clearly. For example, it is recommended that mini-booms be included in any spill kits located near surface waters.
- The basis for the identified marine spill response equipment quantities should be presented. For example, the length of required boom should

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be assessed with reference to anticipated response time and deployment time.

- The following information should be included in Table 1 – Hope Bay Project Permanent Petroleum Storage Facilities:
    - Quantification of all secondary containment capacities (this is missing for a number of listed facilities).
    - The SCP should state explicitly whether listed secondary containment capacity meets applicable regulations.
    - Some facilities identify status information (e.g. "empty") under the column 'Maximum Expected Quantity Stored During C&M'. This column should contain actual quantities – whether it is zero due to facility status or some other quantity.
- As identified in BGC's review of a previous SCP, the table summarizing the size of reportable spills should be approved by Environment Canada (EC). In addition, KIA should confirm that these values are acceptable.
- Delineation between 'emergency spill response' and follow up remedial actions should be made. The need for and degree of consultation with stakeholders' changes between these two phases of spill response.
- The SPC does not present the decision chain for burning actions clearly. In addition, reference to the potential use of accelerants is unclear both in terms of methodology and the decision chain to be used in applying such an approach.
- It is recommended that KIA should determine if they wish to clarify their involvement in the decision to use dispersants during spill response actions.
- The opening sentence in the last paragraph of Section 6.3 appears to be partial and its intent is therefore not clear.

Landfarm Management Plan

The following comments were provided by the KIA's engineering consultants:

- The LMMP repeatedly references the oil separation (absorbent) treatment system. However, lack of information on the operation of this system implies its operation is not within the scope of the LMMP. Reference should be made to the reporting channel for operation of this system so that cross-verification of operational details is possible.
- Record keeping of soil under treatment should include location of the source of the soil and the associated quantity, in addition to the incoming, outgoing and any interim soil quality results.
- The LMMP identifies the need to assess liner cover thickness during operations, but does not provide guidance as to the assessment method. KIA should consider requesting how the liner cover thickness will be

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determined, in terms of assessing if any residual risks may occur after selection.

- Soil amendments such as organic matter (for water retention) and gypsum or sawdust (bulking agents for microbial growth) will reduce the potential post-treatment uses of the soil. This issue should be considered in approving post-treatment use.
- The LMMP does not clarify how soil treated to industrial guidelines is determined to be acceptable for post-treatment uses that are not within an industrial land use setting. Reference should be provided to such assessment protocols, channels and documents.
- Table 8 does not specify quantity under required records for soil acceptance at the facility. This information should be included.
- Table 9 identifies that soil sampling should be a sample composite made from 10 samples per 25 cubic metres. It should be clarified whether field or lab compositing is recommended. If field compositing is recommended, reference should be given to methodology that addresses the need to minimize volatile compound losses during compositing.
- Reporting section (Section 5) does not identify the reporting of soil treatment results. Explicit reference should be provided to the reporting of these operations.

The following comments were provided by the KIA's wildlife consultant:

Section 3.6.1 This section discusses the snow pond: monitoring should note the use of this pond by any water dependent birds and use deterrents to prevent birds from landing on these ponds as necessary.

Section 3.6.1 This section discusses the discharge of treated water. Documentation (or set controls) of flow rates for water release, as well as erosion and vegetation changes at the release site should be included.

Section 4.1: What is the contingency plan or contingency structures in case spring freshet and other unanticipated precipitation events cause water levels to rise too quickly (beyond the rate at which oil adsorption and separation can occur)? i.e., overflow events that could pollute surrounding habitat?

Section 4.2.2 Can the water be released at a set flow rate, determined in advance, to prevent excess erosion? Prior to release of water, the area downstream should also be checked for any dens or ground nests downstream of release site. Documentation of changes in vegetation and wildlife sign at the release site would also be helpful to determine impacts of the release.

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Doris North Closure and Reclamation Plan

The following comments were provided by the KIA's engineering consultants:

REVIEW CONTEXT

Water Licence condition Part L. 6 notes that TMAC must submit an Interim Closure and Reclamation Plan prepared in accordance with Mine Site Reclamation Guidelines for the Northwest Territories (2007)[1] and consistent with INAC Mine Site Reclamation Policy for Nunavut (2002)[2]. Table 1-2 within SRK (2014) notes that it is TMAC's intent that the currently submitted CRP satisfies the noted licence, unless otherwise advised by the NWB.

The Mine Site Reclamation Guidelines (2007) notes three stages of closure and reclamation plan (CRP) development; Preliminary CRP, Interim CRP(s) and Final CPR. The following content should be provided within a Preliminary CRP:

- Statements of reclamation objectives for the general site and major mine components.
- Realistic descriptions of activities related to temporary or indefinite closure.
- Conceptual descriptions and assessments of possible reclamation activities.
- Initiate a reclamation research plan to flesh out suitable reclamation activities and to help form a northern information data base (include quality assurance and quality control procedures, management for engineering plans and drawings, baseline studies, aboriginal involvement strategies, accounts of new or evolving reclamation technologies, reviews of similar case studies, and other appropriate research or study plans).
- Credible evidence that the stated reclamation objectives can be achieved through the described activities.
- Photographs depicting what the site looked like before operations began.
- Identify any likely post-closure monitoring requirements and responsibilities for the described activities.
- Conceptual projections of the likely post-reclamation risks to human and wildlife health and the environment (risk assessment).
- Reclamation liability costs and financial security estimates to a level of detail relevant to the information available.

[1] Indian Affairs and Northern Development, 2007. http://www.aadnc-aandc.gc.ca/eng/1100100024558/ 1100100024569.
[2] Indian Affairs and Northern Development, 2002. http://www.aadnc-aandc.gc.ca/eng/1100100036042/ 1100100036044.

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The Interim CRP should include increased detail and more specific closure criteria regarding reclamation components as these become available and as those areas of the mine are developed, with the following content:

- Renewed or updated statements of reclamation objectives.
- Reclamation and progressive reclamation schedule.
- Detailed descriptions of activities related to temporary or indefinite closure.
- Detailed descriptions of contingency plans.
- Renewed or updated descriptions of possible reclamation activities to a level of detail relevant to the information available (the level of detail should increase through the mine life due to new information).
- Updated reclamation research plan.
- Increasingly convincing evidence that the reclamation objectives can be achieved by the described activities.
- Updated photographs depicting what the site looks like during operations.
- Detailed report on progressive reclamation activities.
- Site specific closure criteria.
- Updated post-closure monitoring requirements and responsibilities.
- Renewed or updated descriptions of the likely post-reclamation risks to human and wildlife health and the environment relevant to the information available (Risk Assessments).
- Updated reclamation liability costs and financial security estimates to a level of detail relevant to the information available.

The Mine Site Reclamation Policy for Nunavut (2002) reference is a policy document meant to provide clarity concerning the government's expectations on mine site reclamation. Important excerpts from that policy are as follows;

- The required standard of reclamation should be based on the 1994 Whitehorse Mining Initiative definition: "returning mine sites and affected areas to viable and, wherever practicable, self-sustaining ecosystems that is compatible with a healthy environment and with human activities."
- Every mine should, at all times, have a mine closure and reclamation plan, which includes measures to be taken in the event of a temporary closure.
- Estimates of reclamation costs, for the purposes of financial security, should be based on the cost of having the necessary reclamation work done by a third-party contractor if the operator defaults. The estimates should also include contingency factors appropriate to the particular work to be undertaken.

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- The recognized methodology for calculating reclamation costs, for the purposes of financial security, should be the RECLAIM or some other appropriate model.
- A list of contingency measures for temporary closure of the mine, outlining specific actions and their scheduling, to be taken during the temporary closure.
- A plan for post-closure monitoring of the site including a monitoring schedule and reporting frequencies, including the establishment of thresholds or the identification of changes in circumstances.

As such, this requirement list will be used as check-list for the content in the currently reviewed TMAC closure plan.

REVIEW COMMENTS

Report Consent

Section 1 provides a background and closure plan history, along with table of concordance with the water licence conditions. In addition, the section provides a very brief and general discussion of closure objectives and final land use. No closure design criteria for the site, such as precipitation values, climate change or even discharge water quality parameters, are provided in this section (two proposed closure criteria are noted in Section 4).

Section 2 provides a general description of existing facilities, broken down into "work areas" and related Work Breakdown Structure (WBS) shown on the various plans which include aerial photos and topographic maps as background. The general description of each area is very brief; generally 3 to 4 sentences.

Section 3 provides a brief overview of facility closure and reclamation strategies, without any specific closure objectives or closure design criteria being noted. Generally, final land use objectives would be noted as driving aspect behind proposed closure strategies. Preventing permafrost degradation is mentioned as necessary but no reference is made anywhere to acceptance or use of climate change design criteria. In addition, mine waste characterization (e.g. acid generating or not) is usually provided as context for the proposed closure plan for waste rock and tailings and this aspect is not noted at all.

Section 4 of the closure plan provides a descriptive summary of the proposed closure activities in brief, regarding the following general aspects; salvage/shipment off-site, decommissioning/demolition, earthworks and water management aspects. Some specific review comments on this section are as follows:

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- Section 4.1.10 notes that Nunavut Environmental Guidelines, Industrial Land Use, Coarse Grained Soils (2009) would be criteria used to determine if soil remediation is required. No discussion regarding use of risk assessment methodology was provided to determine if these guideline criteria are appropriate for the KIA's way of life and associated wildlife and fisheries' concerns.
- Water management structures are reviewed in Section 4.6.5 but the design criteria for these structures (e.g. 1:100 year event, 1:500 year event, Probable Maximum Precipitation, climate change, etc.) were not specifically mentioned. Given that closure design criteria are not provided, KIA should request the design basis for closure water management structures.
- Section 4.6.8 notes that "Minimal to no waste rock will be left on surface at the end of mine." while Table 1-1 notes that all mineralized waste rock is to be returned underground as backfill. For the remaining residual waste rock on surface, no final closure measure is presented; only a series of conceptual options saying a design for final disposal will be provided later. Since a final waste rock closure plan has not been formulated, the cost of $1000 under WBS DC-019 does not appear conservative.
- Section 4.7.1 notes that water quality in Tails Lake will need to reach CCME Guidelines for the Protection of Aquatic Life (specific closure design criteria). This section notes that 7 years are estimated before Tails Lake water quality reaches required discharge criteria – with Amec (2005) noted as the source of the original water quality prediction. This referenced technical work is 9 years old and it would be expected that updated or revised geochemical and water balance inputs would have been considered in the interim period. Water quality predictions at closure can be subject to uncertainty. Any required water treatment beyond retention and sedimentation would have cost implications. At the current time, WBS item WM-001 for water management has an estimate of approximately $2.36 million. This section makes reference to adaptive management regarding water quality prediction and notes that contingency plans will be developed; however, no details are provided.

Section 5 provides a very brief overview of the post closure monitoring and maintenance for the site, including some suggested frequencies for visual inspections, cover monitoring, re-vegetation surveys and annual seep surveys. No detail is provided regarding risk and uncertainties that should be specifically provided, instrumentation monitoring or provision of alert thresholds where contingency measures would be required (nothing specific

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provided regarding these in the current report). Furthermore, nothing is mentioned regarding specific responsibilities in the monitoring plan.

Review comments on Section 6 are provided in the next section herein.

Section 7 provides very brief and general outline of the closure schedule. In fact, no specific mine life or year dates are mentioned at all.

Cost Estimate

Appendices A and B in SRK (2014) contains costing assumptions and related work sheets regarding the estimated closure cost for the project, which is noted to total $21.54 million in undiscounted 2013 Canadian dollars. The estimated cost is higher than the current security of $13.09 million in place for the site, based on the previously submitted 2012 Interim Doris North Closure Plan.

The cost estimate breaks down the project site into a number of WBS elements and then lists closure activity, units, unit costs and subtotal costs for both direct and indirect costs. BGC did not undertaken a comprehensive review of the cost estimate, quantities or related units rates but the following specific comments on this cost review can be made;

- Third party contractor rates were used, in agreement with Nunavut policy document.
- A 20% contingency is provided for indirect costs, which partially agrees with Nunavut policy document. No contingency amount have been provided on the direct costs. No rational is provided for the 20% value used.
- A number of indirect costs are included which accounts for approximately 31% of the total estimated cost. Costs for equipment mobilization and demobilization to site and a site camp were included. These indirect costs are important for remote, northern sites as they are a significant component of the overall cost. But should mine closure work take longer than the assumption noted within the closure plan (three quarters of a year noted in Appendix C), then indirect costs would rise, increasing the overall closure cost.
- Under indirect costs, an allowance of $150,000 has been made to sample, assess and come up with engineering design for remediation of hydrocarbon contamination. No cost allowance for soil remediation has been made under Section 4.6.3 Tank Farms. At some closed mine sites, hydrocarbon contamination and remediation can be a significant undertaking with significant costs. This potential outcome has not been reflected in the current cost estimate.

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- Post-closure monitoring aspects have been included in the cost estimate, with estimated costs totaling $1.06 million. These aspects are for the post-closure phase aspects only (as the title indicates) and do not include closure plan permitting, engineering design, as-built document preparation, project management or construction monitoring during the closure construction phase, which would have some additional costs.
- Twenty WBS items have an estimated direct cost of less than $5000 and several items are costed as $1000. Assuming a 10 hour work day for dozer/operator (or other equivalent mobile equipment) is approximately $2000/day, it appears that several work items are estimated to be less than one day in duration to perhaps 2 to 3 days in actual reclamation time. This seems optimistic for the remote north, even for small and well defined work scope and hence, it is likely that several of these small cost items will be higher cost in actual fact.
- WBS item WM-001 for water management provides for $2.36 million in costs, based on staff, site services, maintenance and consumables to undertake pumping. This cost infers retention / sedimentation are the only treatment steps required to meet discharge criteria. Should additional water treatment be required, for example the application of lime or other additives, treatment cost would be significantly higher than provided in this estimate.

As noted in Section 3.1, closure measures and quantities have been assumed and estimated without an explicit statement of site specific closure objectives, closure design criteria and/or research plan or risk assessment for the Doris North mine site. Given this context, it is likely that the cost estimate is not conservative at the current time. It should be considered that closure costs at Polaris Mine were initially estimated to be $48 million but the final actual cost totaled approximately $70 million.

Summary

As noted earlier, the requirements of an Interim CRP are laid out in Section 2 and have been used for comparison versus the content supplied in SRK (2014), as follows:

- Updated statements of reclamation objectives.
    - This information is very brief and general with no detail or specifics regarding closure objectives. Same limitations are present regarding final land use.
    - Given the mine is partially constructed, final land use and closure objectives for the overall mine site and major mine components

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should be developed and provided as context for the closure design.
    - These final land use and closure objectives are generally best developed with stakeholder input (possible future role for the KIA).
- Reclamation and progressive reclamation schedule.
    - The presented information is brief and a general closure schedule is provided, without any reference to specific mine life or actual years.
    - A more detailed schedule, perhaps broken down by WBS element, should be provided to validate the expected closure construction period of three-quarters of a year.
- Detailed descriptions of activities related to temporary or indefinite closure.
    - No detailed descriptions have been provided regarding temporary or indefinite closure activities and these should be provided.
- Detailed descriptions of contingency plans.
    - No detailed description of any contingency measures were provided and these should be provided
- Updated descriptions of possible reclamation activities.
    - Descriptions provided for reclamation activities were brief and occasionally without a final reclamation measure provided; just an acknowledgement that additional work and design is required.
    - A final reclamation measure for each area should be provided that is consistent with cost estimate assumptions.
- Updated reclamation research plan.
    - Nothing provided in the current Interim CRP addresses this specific topic (possible later role for KIA involvement) and this should be provided.
- Convincing evidence that the reclamation objectives can be achieved.
    - Neither specific closure objectives nor related evidence were provided within the current Interim CRP and these should be provided.
- Updated photographs depicting what the site looks like during operations.
    - Undated aerial photos show current conditions and preexisting conditions, relative to existing structures.
    - Detail would be enhanced with some on-the-ground photos showing native ground surfaces, topography, water courses and vegetation types for separate terrain units in the project area.
- Detailed report on progressive reclamation activities.

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  - No tailings have yet been generated and hence, progressive reclamation is yet to occur.
  - No details are provided regarding progressive reclamation, other than waste rock will be progressively backfilled underground.
  - A specific summary of progressive reclamation measures and respective timing should be provided.
- Site specific closure criteria.
  - No site specific closure criteria is provided with this document, except for those mentioned in Sections 4.1.10 and 4.7.1. and these should be provided as context for the closure plan development.
  - Climate change specifically needs to be acknowledged and accepted into closure plan development.
  - Some context on acid-generation and metals leaching potential of any mine waste left on surface needs to be provided in the closure plan, along with specific measures and contingencies to mitigate future impacts.
  - KIA should review if the Nunavut Environmental Guidelines, Industrial Land Use, Coarse Grained Soils (2009) are appropriate for their wildlife and fisheries' concerns.
  - KIA should request the design basis for all water management structures proposed for closure.
- Updated post-closure monitoring requirements and responsibilities.
  - A brief post-closure monitoring plan is provided but with no details regarding uncertainties (risk assessment), contingency action thresholds to monitor against, or responsibilities within the plan and these should be provided.
- Updated descriptions of post-reclamation risks to human and wildlife health and the environment (risk assessment).
  - No risk assessment is provided (possible future role for KIA) and an assessment should be provided.
- Updated reclamation liability costs and financial security estimates to a level of detail relevant to the information available.
  - A detailed cost estimate, based on third party rates, including indirect costs and associated 20% contingency, has been provided, but with some limitations as noted previously.

Unfortunately, important closure objectives and design criteria have not been explicitly stated, and hence, were not used within the specific development of the current closure measures and related quantity estimates. When this limitation is taken together with some significant uncertainties in the areas of mine waste plans, potential indirect costs, closure water quality and treatment and contingencies, it is likely that the quoted closure cost is not conservative. If

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the KIA needs to hold some closure security in its own right, then additional detail and assessment of the risks and associated costs should be undertaken.

The following comments were provided by the KIA's wildlife consultant:

More Details on Re-vegetation Efforts and Goals

Part L. 13 of the Licence Reference (Table 1-2) reads as follows: "In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading or scarifying the surface to conform to natural topography"

The closure plan sections that are meant to address this are listed as Sections 3, 4.7.7 and 4.1.11. Other than grading, very little emphasis in these sections is placed on other aspects of site preparation for re-vegetation (ripping and scarifying); rather, they mainly point out areas that will be left in place and that will not be re-vegetated.

The only clear reference to ripping and scarifying to promote natural re-vegetation was made in Section 4.1.11, which only refers to doing so in remaining depressions from tracks and trails in the tundra around Roberts Bay. Of course, without re-vegetation, the loss to wildlife becomes irreversible, which should be checked against original predictions for reversibility in the EIS tables for vegetation loss and wildlife habitat loss.

Finally, monitoring for re-vegetation is mentioned in Section 5, point 3, which states that: "The site should be inspected by an Arctic vegetation specialist to confirm suitability of the re-vegetation efforts. Re-vegetation efforts should be completed at the following intervals, unless otherwise recommended by the vegetation expert: Year 2, Year 4, Year 8, and Year 11 post closure". The document should ideally note general site-specific goals for re-vegetation for the purposes of monitoring progress. Based on the limited information provided on re-vegetation efforts among locations, including a paucity of details on ground preparation to specifically promote re-vegetation, it is unclear what the objectives are for re-vegetation, and what the Arctic re-vegetation specialist would be looking for in terms of progress with monitoring.

As an aside, vegetation in Arctic environments is expected to take longer than 11 years to re-establish due to the short growing season; monitoring for additional years may be needed.

Rock Fill from Jetty being Moved to Surrounding Water

In Section 4.1.5 SRK states that the rock fill jetty will be partially removed, to an elevation of 0.3 m below the low water level and that the rock fill will be

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placed in the surrounding water. This plan is expected to change the availability/cover of existing benthic habitat that may be supporting fish and benthic feeding near-shore mammals, and removal of those materials may be less harmful to the existing ecosystem. Alterations in the depth of the water in certain areas (to 0.3 m), may also affect the amount of ice and the timing of thaw around shoreline.

Subsequent comments from KIA's fish consultant on Jetty.

- TMAC should provide details on why the jetty is being lowered and in filled into the surrounding areas (stability or navigational issues? To create habitat?)
- The movement of rock material within the high water mark may be considered infilling and thus serious harm to fish. It is important to know how much material is being moved, and what type of habitat it will be placed in.
- The lowering of the jetty and depositing rock infill into nearby areas may enhance aquatic habitat, similar to creating shoals. If this is the intent, they should submit a design for review.
- It is important to adequately assess structural stability of the proposed design, particularly as the design may implicate ice thickness, thawing processes, and the potential for increased erosion and scouring. Further, the jetty toe was prone to erosional instability previously.
- Any movement of materials within the high water mark will require an outlined plan for mitigation and best management practices, as well as a DFO review

Collection and Disposal of Demolition and Non-Hazardous Waste

In Section 4.1.8 SRK states that wood waste will either be chipped or burned. Please indicate whether CCA (Chromatid Copper Arsenate) or ACQ (Ammoniacal Copper Quaternary) pressure treated wood will be included in these disposal activities, as such woods can release toxins that can affect the health of wildlife, fish, and humans. Likewise, chipping such woods and using them as backfill in excavations (as mentioned in Section 4.1.10), along with drill cuttings, could potentially cause adverse health impacts through leaching into groundwater and soils in the future. Removal of wood may be a better option, as wood chips are a foreign substance to the Arctic in any form and their use as backfill hasn't been well studied.

TIA Water Management

In Section 4.7.4, SRK states that their water quality model (AMEC 2005) suggests that the water quality in the lake will not satisfy discharge requirements for 7 years. As there will be less activity on site during this

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period to deter wildlife from the area, installed wildlife deterrents may be needed (sound or floating) to keep wildlife from drinking from, landing on, or nesting beside the TIA may be needed.

Further, as the water level of Tail Lake is returned to 28.3 m, the soil around the edge of the retracted Lake may have elevated tailings that have settled to the bottom. If this previously submerged habitat is used by ground nesting birds, foraging ungulates, or burrowing mammals, it may lead to high levels of exposure. Further, metals may leach from deposits in the newly exposed shoreline into the groundwater.

Will the soils surrounding the receded Tail Lake be tested and remediated if necessary once the Lake volume is returned to 28.3 m (prior to the blanketing in rip rap to prevent erosion; noted in section 4.7.3)?

Doris North Wastewater Treatment Management Plan

The following comments were provided by the KIA's aquatic consultants:

The comments are referenced to the sections of the 2014 Management Plan.

- Section 1.1, Table 1: Four reports preceding the 2014 Management Plan are referenced. The reviewer has assumed any outstanding comments or issues regarding these reports have been addressed and are included in the 2014 Management Plan.
- Section 1.2, Table 2: All elements described in the Table of Concordance were addressed in the 2014 Management Plan as indicated by the proponent. The Table of Concordance was well laid-out and assisted the reviewer in summarizing the issues of concern.
- Section 2, general: The membrane biological reactor wastewater treatment plant implemented at the Doris North site appears to be a technology that will provide clean, well-treated effluent if operated within its design specifications, and its application by the proponent is commendable.
- Section 2.4, Figure 3: Heat-traced and insulated pipe between the trailers (modules) of each WTP is not specified in Figure 3 or elsewhere in the document. If heat-traced and insulated pipe is not used for inter-trailer transfer of wastewater, it is reasonable to expect that pipes may freeze in cold temperatures and cause a spill or malfunction of one of both of the WTPs. If heat-traced and insulated pipe is not used, does the proponent consider freezing of the pipe a concern? Please provide rationale for the response, and a description of mitigating action in the Management Plan if it is necessary.
- Section 2.7.1, paragraphs 2 and 3: A description of the erosion protection measures at the ST-8 (tundra discharge point) and old

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tundra discharge point should be included in the plan, as well as what conditions are acceptable, and an inspection and reporting schedule.

- Section 2.7.1, paragraph 3, and Figures 5 and 6: The old tundra discharge location is not shown. Request that it is added to Figure 5.
- Section 2.7.1, Figure 5: Location ST-7 is shown southeast of the site on the northwest shore of Doris Lake. ST-7 is not discussed in the plan. Is this location the old tundra discharge site, or another location? If it is pertinent, please describe it in the Monitoring Plan or remove it from Figure 5 if it is not pertinent.
- Section 2.7.2, paragraph 1: Please describe in the plan, the polymer type that may be used for sludge thickening. Anionic polymers should not be used if any water in contact with the polymer will be discharged to the surface, because even low concentrations of anionic polymer can smother aquatic organisms.
- Section 2.7.2, paragraphs 2 and 3:
- If the sludge is disposed to the overburden pile, compost or a reclamation site, how will its free- and pore-water be captured? Please describe the capture method, monitoring and reporting in the Management Plan. Given the typical solids content of 25 to 30%, there will be some runoff with suspended solids and dissolved contaminants from its placement that could be a concern.
- Is the sludge suitable for future reclamation activities given that contaminants are likely to present in it? Please provide rationale.
- Section 2.7.3, paragraph 2:
- If grey water is disposed to the overburden piles, how will its runoff be captured? Please describe the capture method, monitoring and reporting in the Management Plan. During operation of the site, appreciable grey water may be produced and could cause adverse aquatic effects to small receivers if not properly contained.
- The option of grey water discharge to the overburden stockpile was discussed with AANDC. Is this option acceptable to the KIA? *(Yes it is acceptable to KIA)*
- Section 2.8.1, paragraph 2: Collecting and returning membrane cleaning water to the WTP for treatment and dilution before discharge to protect receivers is a commendable initiative.
- Section 3.2, Table 3: What is the Maximum Average Concentration calculated from (i.e., how many monitoring events)? Please specify in the Management Plan.
- Section 3.2, paragraph 4: A more rigorous sampling schedule may be required during start-up operations if the WTP is not functioning optimally during these periods. Based on the operation of the plant to date, does the proponent feel that monthly sampling is appropriate under these conditions, and if more rigorous sampling may be required,

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please propose a schedule and supporting rationale. The reviewer is not sufficiently familiar with the performance of the WTP to date to propose an alternative sampling schedule if one is needed.

If the NWB Board or you have any questions concerning the comments submitted for the review of Operational Plans for the Doris North Project please contact me at your convenience.

Yours truly

John Roesch

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