Snap Lake Diamond Mine
Water Licence Renewal MV2019L2-0004

Yellowknife, NT

November 26-27, 2019

Government of
Northwest Territories

Overview

- Water Licence Renewal Application
- Final Closure and Reclamation Plan
- Effluent Discharge Locations
- Effluent Quality Criteria and Water Quality Models
- Surface Water and Biological Monitoring
- North Pile
- Security

Water Licence Renewal Application

- De Beers submitted an FCRP and supporting documents with the WL application.
- The GNWT notes that a WL must be issued before a plan can be approved.
- The GNWT is concerned that the review timeline and significant changes proposed by De Beers have created difficulties in this process.

Water Licence Renewal Application

- **The GNWT recommends the MVLWB require the FCRP and supporting documents be resubmitted for approval post-issuance of the water licence. The MVLWB should ensure sufficient review time is available for each of these documents.**

Final Closure and Reclamation Plan

- A WL should identify required components of an FCRP and supporting documents.
- Outstanding items were identified during the review process.
  - In particular, the results of closure cover field trials, proposed to be submitted 90 days prior to construction, will inform the final North Pile design, and dictate closure criteria and response frameworks.
- The GNWT is concerned that this may result in a lower closure standard.

Final Closure and Reclamation Plan

- **The GNWT recommends the MVLWB require all closure criteria and response frameworks be submitted as part of the FCRP with sufficient time for public review and approval by the MVLWB.**
- **The GNWT recommends that in addition to components that have been submitted with the FCRP, the MVLWB require submission of all outstanding items including, but not limited to, the:**
  - **Final Landform Execution Plan;**
  - **Toxicity Testing Design Plan for the WMP; and,**
  - **Reclamation Plan for the WMP if wetlands are not constructed.**

Closure Criteria

- The GNWT expressed concern regarding the ability of the proposed closure criteria to adequately and clearly measure the success of closure activities in meeting the closure objective and their link to design and monitoring plans.
- The consistent link to closure objectives and criteria within documents will ensure that successful closure occurs.

Closure Criteria

- **The GNWT recommends that the conditions of the water licence and schedules ensure that the link to closure objectives and closure criteria is incorporated into the various phases of closure documents such as design and construction plans, monitoring and management plans, reclamation completion reports and performance assessment reports.**

Physical Stability Criteria

- De Beers has proposed physical stability closure criteria to include “acceptable results of visual monitoring…”
- De Beers has suggested visual monitoring will correspond with measurable criteria in the response frameworks.
- Closure criteria must be included in the FCRP and the monitoring programs to assess conditions against these criteria.

Physical Stability Criteria

- **The GNWT recommends a post-closure site-wide physical stability monitoring plan with a response framework for each mine component be required as a condition of the water licence.**
- **The GNWT recommends that the water licence require the FCRP include closure criteria that will be used to assess whether the closure objectives have been met.**

Effluent Discharge Locations

- De Beers initially proposed one mixing zone during Closure and two during Post-Closure.
- At the Technical Workshop, De Beers requested the ability to discharge from three different locations concurrently before the gravity fed collection system is in place (both ISPs and the WMP).
- The deposit of waste is to be regulated such that the amount of waste deposited to the receiving environment is minimized.

Effluent Discharge Locations

- **The GNWT recommends the MVLWB minimize the amount of waste that is to be deposited to the receiving environment, consistent with the Water and Effluent Quality Management Policy (MVLWB, 2011).**
- **The GNWT recommends the MVLWB consider the cumulative effects of multiple effluent discharge points to Snap Lake prior to approving multiple point source discharges, including the pumping of site water to the underground.**

EQC and Water Quality Model(s)

- Mixing Zone Configuration
- North Pile Model Input
- Toxicity Modifying Factors
- Selecting Parameters of Potential Concern
- Effluent Quality Criteria

Mixing Zone Configuration

- De Beers proposes to maintain the existing 200 m mixing zone for Closure and Post-Closure.
- A 200 m mixing zone was based on operational discharge volumes.
- The GNWT notes that mixing zone size should be reduced based on lower discharge volumes during Closure and Post-Closure relative to Operations.

Mixing Zone Configuration

- The GNWT is concerned with the method to determine the size of the mixing zones, causing challenges with the development of the SNP, AEMP benchmarks and EQC.
- De Beers' proposal does not align with the goal of Closure or the Guidelines for Mixing Zones.
- The GNWT strongly believes that mixing zones should be as small as possible and does not support larger mixing zones to eliminate the need to treat discharge.

Mixing Zone Configuration

- The GNWT lacks confidence that a 200 m mixing zone Post-Closure is necessary given the finite amount of nitrate in the North Pile, attenuation with time, and that the model likely over-predicted concentrations.
- Finally, the GNWT is concerned that De Beers has removed the Plume Delineation Study from the proposed draft water licence.

Mixing Zone Configuration

- **The GNWT recommends the MVLWB not approve the proposed mixing zone at this time due to the over conservative assumptions that were included in the linked models. The exact mixing zone dimensions for each effluent discharge location should be determined and included in the SNP after plume delineation studies have been completed.**
- **The GNWT recommends that in the interim, the mixing zones could be set at 200 m for the main site diffuser, and 100 m for the East and West Influent Storage Ponds.**

North Pile Runoff Model Input

- The North Pile runoff input has important implications on the water quality predictions, and subsequent screening for POPCs and EQC.
- The GNWT has two primary concerns for the predicted quality of North Pile inflows:
  - Model assumptions include diluted concentrations from the North Pile runoff and seepage; and,
  - The assignment of typical site runoff chemistry (SNP 02-05) during May and June which has lower concentrations in comparison to North Pile seepage and runoff (SNP 02-02).

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North Pile Runoff Model Input

- **The GNWT recommends that the Site Water Quality Model be updated to include the following to inform predicted water quality conditions in Snap Lake Post-Closure:**
  - **Thermal monitoring assessments, including the depth of thaw and the time needed for the North Pile to freeze and thaw, to better support the assumption that there will be a substantially reduced contribution from processed kimberlite to loading during May and June with placement of the cover.**

North Pile Runoff Model Input

- **The GNWT recommends that the Site Water Quality Model be updated to include the following to inform predicted water quality conditions in Snap Lake Post-Closure:**
  - **A sensitivity analysis with a scenario that assigns SNP 02-02 water chemistry to May and June seepage and runoff from the North Pile Perimeter Water Collection System (i.e. combined inflows of all sources to the PWCS) for some time after the cover is placed.**

North Pile Runoff Model Input

- **The GNWT recommends that the Site Water Quality Model be updated to include the following to inform predicted water quality conditions in Snap Lake Post-Closure:**
  - **A North Pile runoff model input based on the most representative data available, with the least amount of dilution (i.e. perimeter sumps), with rationale and sensitivity analyses to support the selection.**

Toxicity Modifying Factors

- De Beers proposes to use hardness-dependent AEMP benchmarks, and thus EQC based on anthropogenically increased hardness.
- The GNWT believes toxicity modifying factors should reflect the conditions at the beginning of Closure.
- Increasing concentrations of POPCs in the effluent would increase the zone of influence of an applicant over time.
- At Closure, the zone of influence is expected to decrease with time.

Toxicity Modifying Factors

- **The GNWT recommends that AEMP benchmarks should be re-calculated using ambient hardness concentrations from the beginning of Closure prior to effluent discharge, for parameters where toxicity is affected by hardness.**
- **The GNWT recommends that the screening process for parameters of potential concern and development of updated EQC be revised based on the updated AEMP benchmarks.**

Selecting POPCs

- De Beers eliminated parameters that did not have a toxicity-based guideline or an AEMP benchmark, and TPH from screening.
- The EQC report version 2 screened against 100% AEMP benchmarks, instead of 75% AEMP benchmarks used in version 1.
- The rationale included aligning the methods with EQC development for Operations, no wetlands and reducing the level of conservatism.
- The GNWT does not support De Beers' rationale.

Selecting POPCs

- **The GNWT recommends that the analyte list for screening parameters of potential concern include parameters that do not have a toxicity-based guideline.**
- **The GNWT recommends that De Beers use the 75% AEMP benchmark for screening potential parameters of concern, and development of EQCs.**
- **The GNWT recommends that the MVLWB retain TPH as a regulated parameter until remediation is completed at site.**

Effluent Quality Criteria

- De Beers proposes to reduce the number of parameters with EQC during Closure from 18 to four (nitrate, TSS, pH and fecal coliforms).
- The proposed Post-Closure nitrate MAC increased from 25 mg/L to 60 mg/L and MGC increased from 50 mg/L to 80 mg/L.
- The GNWT does not support EQC for Closure and Post-Closure that are higher than during Operations.
- The GNWT is concerned that EQC proposed may be unnecessarily high, and that the proposed EQC and AEMP benchmarks do not meet Measure 1 of the Report of EA.

Effluent Quality Criteria

- The proposed reduction in regulated parameters and increased MAC and MGC EQC introduces risk to Snap Lake.
- Without additional EQC, elevated concentrations of unregulated parameters may not be detected until action levels are triggered in the AEMP.
- This creates the potential for adverse impacts on Snap Lake water quality.

Effluent Quality Criteria

- **The GNWT recommends that the existing EQC remain in the Closure and Post-Closure licence on an interim basis until such a time as De Beers has updated models, and AEMP benchmarks, and submitted these updates with a revised EQC Report.**
- **The GNWT recommends that the MVLWB set numerical SSWQOs for TDS and constituent ions of concern for Closure and Post-Closure to ensure compliance with Measure 1 of the Report of EA.**

Effluent Quality Criteria

- **The GNWT recommends that the EQCs adopted in the water licence align with the Pollution Prevention Principle and Objective 2 of the MVLWB Water and Effluent Quality Management Policy (MVLWB, 2011).**
- **The GNWT recommends that there be a condition in the water licence requiring monthly representative water quality samples from sumps 3 and 5, and the WMP (as part of the SNP) to assess changes in water quality over the Closure period. The condition should include updated modelling based on this data to inform selection of POPCs and derivation of EQCs for Post-Closure.**

Surface Water and Biological Monitoring

- De Beers proposes to remove a number of SNP stations during Closure and Post-Closure.
- In 2018, several SNP stations exceeded existing EQC.
- The GNWT concludes that De Beers has not provided sufficient rationale for eliminating sites from the monitoring program.

Surface Water and Biological Monitoring

- **The GNWT recommends that all existing SNP stations be retained in the new water licence until sufficient evidence is provided to demonstrate whether or not high concentrations measured at the current SNP locations are indicative of a continuing trend during active closure, and if so, provide a description of actions that will be taken to address them.**
- **The GNWT recommends that the water licence include a condition that should De Beers wish to remove a station from the SNP, a report be submitted to the MVLWB for approval that includes potential trends in metal leaching for each of the SNP sites that are proposed to be eliminated, and any previous exceedances at each station.**

Uncontrolled Runoff Monitoring Stations

- De Beers discusses sediment release from uncontrolled runoff during Closure and Post-Closure but did not include runoff stations in the proposed SNP.
- The GNWT is concerned that sediment release events could occur from uncontrolled runoff if stations are not established prior to site regrading.

Uncontrolled Runoff Monitoring Stations

- **The GNWT recommends that Sediment and Erosion Control Plans be required for remediation activities that will occur within 150 m from Snap Lake.**
- **The GNWT recommends that the MVLWB require that SNP stations be determined prior to commencement of regrading at site within 100 m of Snap Lake during the Closure period.**

Monitoring Frequencies

- The GNWT is concerned that with the proposed monitoring frequencies, a parameter could exceed MAC EQC for an entire open water season prior to there being sufficient monitoring data to assess compliance.
  - Example: Proposed sampling frequency for SNP 02-02b (EISP) and SNP 02-02c (WISP) is once annually.
  - Four years of monitoring would be required to obtain the minimum four samples to determine the average concentration.

Monitoring Frequencies

- **The GNWT recommends that the monitoring frequencies for all SNP stations that may discharge to the receiving environment be sampled every two weeks during the Closure period in order to be able to adequately assess compliance with the maximum average concentration EQCs.**
- **The GNWT recommends that the frequency and locations be evaluated following completion of active closure of the Mine Site.**

Aquatic Effects Monitoring Program

- The GNWT is concerned that with the decreasing trend in TDS expected to continue, AEMP annual reporting may not adequately account for potential effects of this high TDS water input to Snap Lake.
- The FCRP states that flushing of mine-impacted water from the North Pile will take up to 30 years.
- The GNWT is concerned that 5 years may be insufficient to monitor potential impacts from site Post-Closure.

Aquatic Effects Monitoring Program

- **The GNWT recommends that De Beers ensure that AEMP annual reporting specifically and adequately accounts for potential aquatic effects of high-TDS water entering Snap Lake via the underground, as has been recommended by the MVLWB (response to GNWT-ENR Comment ID2, Review Comment Table). This monitoring data should then be used to update the hydrodynamic model.**
- **The GNWT recommends that De Beers continue the SNP and AEMP water quality monitoring until such time that De Beers has demonstrated that closure conditions are stable and closure criteria have been consistently met.**

North Pile - Thermal Regime

- De Beers has not developed predictions of how the active layer within the pile may change over time due to climate change.
- The GNWT is concerned that delayed release of elevated nitrate concentrations beyond 30 years could occur.
- The AEMP benchmark for nitrate is hardness dependent which is predicted to decrease with time, increasing the potential for water quality exceedances.

North Pile - Thermal Regime

- **The GNWT recommends the water licence require that the Performance Assessment Report for the North Pile include a comprehensive description on the thermal regime in the North Pile that includes predicted changes to the active layer. This includes ensuring that the associated monitoring program is developed with the Performance Assessment Report requirements in mind.**

North Pile Cover Material Sources

- De Beers proposes to use North Pile embankments and rib berms as borrow sources for North Pile cover construction.
- Various rib berms and embankments contain up to 40% PAG rock.
- The GNWT is concerned that if De Beers uses material from the North Pile without proper geochemical characterization, there is risk of long-term ARD/ML issues, which will influence seepage and runoff water quality.

North Pile Cover Material Sources

- **The GNWT recommends there be a condition in the water licence requiring that all construction material, including material to be used for the North Pile cover, be non-PAG (≤ 0.17% by weight total sulphur) and free of contaminants.**
- **The GNWT recommends that geochemical testing results be provided to the MVLWB for approval prior to using the material for remediation.**

Overall Blended Rock Units

- By characterizing blended materials, each rock type was classified as non-PAG with excess NP, including metavolcanics.
- This method creates uncertainty regarding long-term ARD/ML potential.
- De Beers has not provided sufficient rationale for classifying metavolcanics as non-PAG, or contingency and adaptive management measures that will be used in the event of changes in water quality due to ARD.

Overall Blended Rock Units

- **The GNWT recommends that the ARD and Geochemical Characterization Plan remain as a condition in the water licence during Closure to ensure that the appropriate geochemical characterization of material continues including during all blasting and earthworks activities. As an item under this plan, GNWT recommends that De Beers submit a geochemical characterization/sampling plan for review and approval for the geochemical assessment that will be conducted in areas where the acid generation potential of cover construction material needs to be confirmed and/or further defined.**

Overall Blended Rock Units

- **The GNWT recommends that all PAG material, including PAG material encountered during cover construction, and west perimeter embankment re-grade be relocated as required in order to meet the setback requirements in the North Pile Cover Design. This PAG material should be placed appropriately and covered by at least 3 m of non-PAG material.**

Seepage Surveys

- De Beers has proposed to remove the ARD and Geochem Plan, including seepage surveys.
- The GNWT remains concerned about eliminating these programs prior to completing earthworks and cover construction on the North Pile.
- It is not clear how De Beers will monitor non-point source discharges, and confirm modelled trends for surface runoff and seepage water quality.

Seepage Surveys

- **The GNWT recommends that seepage surveys be retained as part of a Seepage Monitoring Program throughout the Closure period, as a condition in the Water Licence.**
- **The GNWT recommends that if seepage assessments are to be covered by the SNP, the SNP station locations be reviewed as part of a public review process to ensure they are appropriate to effectively characterize seepage at the site and that SNP sampling occurs.**
- **The GNWT recommends that the Seepage Monitoring Program conducted during the closure period will determine how long, if at all, the monitoring should continue into the Post-Closure period.**

Security Estimate Revisions

- The GNWT has a few remaining items that require attention by De Beers and the MVLWB.
- Of significance is De Beers' omission of recommendations regarding monitoring program efforts and associated costs.

Security Estimate Revisions

- **The GNWT recommends that De Beers and the MVLWB refer to the attached memorandum and associated RECLAIM estimate for additional background and context supporting the GNWT's comments and recommendations regarding the Financial Security Estimate and the Snap Lake Mine Final Closure and Reclamation Plan.**

SNP and AEMP Monitoring

- The GNWT does not believe the monitoring program proposed by De Beers is sufficient.
- Without a final approved plan by the MVLWB, the GNWT has not reviewed and revised De Beers' estimate in terms of differences in frequency, duration, numbers of stations, etc.

SNP and AEMP Monitoring

- **GNWT recommends that the Financial Security Estimate be updated by De Beers based on the final SNP and AEMP, following the MVLWB's final approval of the FCRP.**

Phasing of Security

- De Beers has proposed a phasing of security reductions aligned with major physical works milestones.
- The GNWT notes that the reductions do not reflect:
  - The expectation that there will be some amount of holdback until monitoring performance assessments have been completed, and
  - De Beers' reiteration that schedules are subject to change.

Phasing of Security

- **The GNWT recommends that the security amounts to be returned to De Beers be evaluated at the time of the request for a security adjustment. Pre-determined phasing of security returns should not be approved.**

Environmental Agreement Security

- The GNWT is supportive of ensuring that De Beers is neither under or over secured as per requirements between the Environmental Agreement security and land and water authorizations.
- The GNWT cannot support the return of Environmental Agreement associated funds requested by De Beers until the Environmental Agreement determination process is finalized.

Environmental Agreement Security

- **The GNWT recommends that costs associated with Environmental Agreement Security remain until the Environmental Agreement is officially amended. Once finalized, the GNWT is committed to reviewing these items to ensure their accuracy.**

Interim Care and Maintenance

- Given the current status of the Mine and with the Final Closure Plan currently under review, the GNWT's position is that a time period of 2 years is justified.

Interim Care and Maintenance

- **The GNWT recommends that the period of ICM be maintained at two years, and not reduced to one as proposed by De Beers.**

Revised Security Estimate

- The GNWT has completed a revised estimate of security for De Beers 2019 Financial Security Estimate.
- The GNWT's estimate is $2,047,811 higher than that proposed by De Beers as detailed in our intervention and summarized in our following recommendation.

Revised Security Estimate

- **The GNWT recommends that the amount of security required for the Snap Lake mine totals $87,520,940.00 which is split between land related liability of $39,712,564.00 and water related liability of $47,808,376.00.**

Thank You