May 20, 2019

Dear Ms. Love:

Re: Snap Lake Environmental Agreement Management Plans for Closure and Post-Closure

De Beers is pleased to provide to the Mackenzie Valley Land and Water Board, for the purposes of posting to the public registry, copies of the environmental monitoring and management programs required under the Environmental Agreement for the Snap Lake Mine. The Environmental Agreement programs include:

- Wildlife Effects Monitoring Program
- Hydrology Program
- Air Quality and Emissions Monitoring and Management Plan
- Vegetation Monitoring Program

Each of these plans has been updated to align with the Closure and Post-Closure phases of Snap Lake Mine. These plans are not regulated by the MVLWB and are therefore not subject to a public review process as normally administered by the MVLWB. They are however subject to the GNWT-managed review process as stipulated by the Environmental Agreement. The GNWT review process is currently underway, led by the Environmental Assessment and Monitoring group within Environment and Natural Resources. It is understood that the GNWT-administered review process will run concurrently with the land use permit amendment and water licence renewal process administered by the MVLWB.

Should you have any questions, comments, or require further clarification about these Programs, please contact me by email Sarah.McLean@debeersgroup.com or by phone at 867-688-9227 or contact Colleen Prather, the Regulatory Specialist for Snap Lake Mine, via email at colleen.prather@debeersgroup.com or by phone at 1 (403) 930-0991 ext. 2770.

Sincerely,

Sarah McLean
Environment and Permitting Manager
De Beers Canada Inc.

CC:  SLEMA, Philippe di Pizzo  
NSMA, Bill Enge, Jessica Hurtubise  
TG, Grace MacKenzie  
DKFN, Chief Balsillie, Minnie Whimp  
LKDFN, Chief Boucher-Marlowe, Shonto Catholique  
YKDFN, Melissa Mackenzie, Delores Lacorne  
NWTMN, Garry Bailey, Ursula Vogt  
DBCI, Colleen Prather, Michelle Peters
March 25, 2019

Loretta Ransom
Manager, Environmental Assessment and Monitoring
Environment and Natural Resources, GNWT
Email transmittal: Loretta_ransom@gov.nt.ca

Dear Ms. Ransom:

Re: Snap Lake Mine Hydrology Monitoring Program for Closure and Post-Closure

As per the notification provided to all Parties on December 14, 2017, the Snap Lake mine is preparing to enter into the final closure phase of the life of mine. De Beers has prepared a Final Closure and Reclamation Plan and has updated all of the Environmental Monitoring and Management Plans for the mine to align with planned closure and post-closure activities. These plans will be submitted together with a water licence renewal application on March 29, 2019.

As you know, De Beers has already provided the draft Wildlife Effects Monitoring Plan (February 12, 2019) and the draft Air Quality and Emissions Monitoring and Management Plan (February 1, 2019) that are both aligned to closure and post-closure activities, to the Parties of the Environmental Agreement for review ahead of final submission. We thank you for your administration of the review of those plans and look forward to receiving approval of the plans following final submission.

The Hydrology Monitoring plan is also required by the Snap Lake Environmental Agreement (items 7.1.b and 7.2.g). De Beers has reviewed the Hydrology Monitoring Program in light of the future activities planned at the Mine (closure and post-closure). Because the only remaining requirements of the Hydrology Monitoring Plan are primarily managed under the Aquatic Effects Monitoring Program and/or the Surveillance Network Program (both requirements of the water licence administered by the Mackenzie Valley Land and Water Board (MVLWB)), and the Air Quality and Emissions Monitoring and Management Program administered through the Environmental Agreement by the GNWT, De Beers respectfully requests to cease monitoring and reporting under cover of the Hydrology Program through the Environmental Agreement. The Hydrology Monitoring Program is entirely redundant with other requirements.

As we move into the next phase of the life of Snap Lake Mine, we wish to simplify and streamline regulatory requirements so that the same work, in this case hydrology monitoring, is no longer being managed by two or more agencies. As always, all parties, including the Parties to the Environmental Agreement, will have a chance to review and comment on all environmental
monitoring and management plans submitted to the MVLWB or the GNWT, including any future updates to the AEMP and SNP or the AQEMMP.

The specific details to support this request are included in the attached memo (Arktis, 2019). Should you have any questions or comments, please feel free to contact me by phone at (867) 688-9227 or by email at Sarah.McLean@debeersgroup.com.

Sincerely,

Sarah McLean
Environmental & Permitting Manager
De Beers Canada Inc.

Cc: L.King LKDFN
    S.Shiga NSMA
    G.Mckenzie Tiicho
    J.Black YKDFN
    P. Di Pizzo SLEMA
    L. Malley GNWT
    M.Roesch ECCC
    M.Swallow GNWT
    L.McGregor GNWT
    K.Leach MVLWB
    M. Peters De Beers
1.0 INTRODUCTION

De Beers Canada Inc. (De Beers) contracted ARKTIS Solutions Inc. (ARKTIS) to review the Hydrology Monitoring Program for the Closure and Post-Closure phases for the Snap Lake Mine (Mine). The Hydrology Monitoring Program is a requirement of the Environmental Agreement for the Mine. It provides lake elevation, streamflow and water balance measurements and calculations to address the requirements outlined in Schedule 1 Part B and Surveillance Network Program (SNP) of the Mine’s Water Licence (MV2011L2-0004; MVLWB, 2015). With the Mine entering permanent closure, the objectives and scope of the hydrology program warrant modification and/or reductions during the Closure and Post-Closure phases to reflect the change in activity at the Mine compared to operations. The purpose of this Memorandum is to summarize the proposed monitoring for the Closure and Post-Closure phases of the Mine.

The layout of this Memorandum is as follows:

- Section 1 presents the purpose and scope;
- Section 2 summarizes the hydrology program implemented during the operations phase; and,
- Section 3 states the proposed changes to the hydrology monitoring for the Closure and Post-Closure phase of the Mine.

2.0 CURRENT HYDROLOGY MONITORING PROGRAM

Water elevation and streamflow are monitored in the area surrounding the Mine to meet three principal objectives:

- To evaluate Environmental Assessment Report (EAR) predictions (De Beers, 2002a) related to changes in lake water levels and stream flows;
- To provide flow and water level information for fish habitat compensation monitoring, and to provide an annual water balance and lake level data for water quality monitoring; and,
- To fulfill requirements of the Water License MV2011L2-0004 (MVLWB, 2015) and the Environmental Agreement (De Beers et al., 2004).

Article VII Section 7.2 (g) of the Environmental Agreement for the Mine includes a requirement for a Hydrology Monitoring Program. Part of this monitoring program includes the water elevation and streamflow monitoring program, which address the requirements in the Water License as follows:

- Part G and Schedule 6 Part G item 1 – Supports the Aquatic Effects Monitoring Program (AEMP) in evaluating Mine impacts to Snap Lake by monitoring outflow from Snap Lake.
- Schedule 1, Part B, Section 1h) – Provides data for monthly and annual estimates and measurements of precipitation and runoff.
• Schedule 1, Part B, Section 1i) – Monitors monthly elevations of water in Snap Lake during the open water season.
• SNP Section Part B item 1e) – Provides spot measurements of flow at the small tributary to Snap Lake referenced by the Licensee in Table I-8 of the September 2003 Proposed Hydrology Monitoring Program during periods of observable flow.
• SNP Section Part B item 2a) – Monitors continuous water level in Snap Lake.
• SNP Section Part C items 1a) to 1h) – Collects meteorological data (precipitation, evaporation, wind speed and direction, humidity, water temperature, net solar radiation, and water level).

The Hydrology Monitoring Program is primarily a monitoring program applied during mine operations, which is designed to confirm, or provide a basis for adjustments to, the site water balance and assess the accuracy of original EAR predictions on impacts to aquatic habitat. It also provides information required for the interpretation of related monitoring data from other environmental monitoring programs, such as the AEMP (De Beers, 2002b).

The Hydrology Monitoring Program, which was devised for an operating Mine, are currently being applied during the extended care and maintenance phase. Details of the monitoring program implemented during Mine operations are provided in Figure 1 (monitoring locations) and Table 1. Results of the hydrology monitoring are reported annually within the Annual Hydrology Report, Annual Water Licence Report, and Annual AEMP Report, as required by the Environmental Agreement (De Beers et al., 2004) and Water Licence (MV2011L2-0004).
Figure 1. Location of streamflow and water elevation monitoring stations (De Beers, 2018a).
Table 1. Hydrology Monitoring Program for the operations, Closure and Post-Closure phases.

<table>
<thead>
<tr>
<th>Program</th>
<th>Reason for Monitoring</th>
<th>Stations</th>
<th>Operations</th>
<th>Closure</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Elevation and Streamflow Monitoring</td>
<td>Identify changes in lake level, outflow patterns and runoff in response to mine dewatering and land use changes within the mine footprint.</td>
<td>Snap Lake Outflow (H1 and H2)</td>
<td>3x annual surveys and continuous over open water period</td>
<td>Water level (masl) and Flow (m³/s)</td>
<td>Program discontinued. Gains/losses to Snap Lake from Mine sources are significantly reduced after operations, with historical monitoring data indicating Mine-related impacts are negligible relative to annual natural variation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snap Lake Inflow (H4)</td>
<td>3x annual surveys and continuous over open water period</td>
<td>Water level (masl) and Flow (m³/s)</td>
<td>Program discontinued. Gains/losses to Snap Lake from Mine sources are significantly reduced after operations, with historical monitoring data indicating Mine-related impacts are negligible relative to annual natural variation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snap Lake (H3)</td>
<td>3x annual surveys and continuous over open water period</td>
<td>Water level (masl)</td>
<td>Program integrated into the AEMP and continued for the duration of AEMP monitoring to provide support for aquatic effects assessment only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North Lake</td>
<td>3x annual surveys over open water period</td>
<td>Water level (masl) and Flow (m³/s)</td>
<td>Program discontinued. Gains/losses to Snap Lake from Mine sources are significantly reduced after operations, with historical monitoring data indicating Mine-related impacts are negligible relative to annual natural variation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northeast Lake</td>
<td>3x annual surveys over open water period</td>
<td>Water level (masl) and Flow (m³/s)</td>
<td>Program discontinued. Gains/losses to Snap Lake from Mine sources are significantly reduced after operations, with historical monitoring data indicating Mine-related impacts are negligible relative to annual natural variation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1999 Reference Lake</td>
<td>3x annual surveys over open water period</td>
<td>Water level (masl) and Flow (m³/s)</td>
<td>Program discontinued. Gains/losses to Snap Lake from Mine sources are significantly reduced after operations, with historical monitoring data indicating Mine-related impacts are negligible relative to annual natural variation.</td>
</tr>
<tr>
<td>Meteorology</td>
<td>Monitoring of environmental conditions at the Mine. Support an estimated water balance for the Mine and Snap Lake.</td>
<td>Hill Station Lake Station</td>
<td>Continuous</td>
<td>Various</td>
<td>Addressed within the Final Closure Air Quality and Emissions Monitoring and Management Program.</td>
</tr>
</tbody>
</table>

masl – meters above sea level
3.0 CLOSURE AND POST-CLOSURE MONITORING PROGRAM

The Closure and Post-Closure hydrology monitoring is discussed in the following sub-sections. The monitoring program was developed with consideration to the anticipated type and magnitude of Mine influences on lake hydrology, as well as, established action levels set out in De Beers (2003) developed for Mine operations.

3.1 Gains and Losses to Snap Lake from All Mine Sources

Following the operations phase, Mine influences on surface water hydrology have decreased significantly. Based on the monitoring data collected under the Surveillance Network Program (SNP), Mine discharges to Snap Lake between 2015, the final year of operations, and 2017, the most recent reported monitoring period during extended care and maintenance (ECM), decreased by approximately 94%. Thus, Mine-related water quantity changes to the surrounding lakes during the Closure and Post-Closure phases are expected to be minimal compared to operations and likely indiscernible for natural variation, which has been the case throughout the life of mine (De Beers, 2018a). Therefore, measurement of inflows and outflows to/from Snap Lake during the closure and post-closure phases provide limited utility in the monitoring of the environment.

A summary of the Mine influences on gains/losses to Snap Lake during the Closure and Post-Closure phases are compared to the operating Mine phase in Table 2 (De Beers, 2019). As noted from Table 2, the influences on water quantity have reduced in type and magnitude since the Mine entered ECM. Only site runoff is anticipated to increase in magnitude Post-Closure, due to the expected cessation of water treatment activities and change to a freely draining site. However, relative to the operating Mine, volumes of Mine-related gains and losses to Snap Lake are anticipated to remain significantly reduced in the Closure and Post-Closure phases.

Table 2. Summary of Mine influences on surface water hydrology during mine operation, ECM, closure and post closure.

<table>
<thead>
<tr>
<th>Gains/Losses to Snap Lake</th>
<th>Mine Operation</th>
<th>ECM</th>
<th>Closure</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping (extraction) from Snap Lake</td>
<td>Active</td>
<td>Active, reduced rate compared to operations</td>
<td>Active, reduced rate compared to operations</td>
<td>Not active</td>
</tr>
<tr>
<td>Loss from Snap Lake due to groundwater recharge</td>
<td>Active</td>
<td>Underground mine flooded and closed which reduced groundwater recharge occurrence to minimal</td>
<td>Groundwater recharge to flooded underground mine is minimal, thus losses from Snap Lake restored to pre-mining conditions.</td>
<td>Groundwater recharge to flooded underground mine is minimal, thus losses from Snap Lake restored to pre-mining conditions.</td>
</tr>
<tr>
<td>Inflow from WMP seepage</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Not active</td>
</tr>
<tr>
<td>Inflow from WTP discharge to Snap Lake and/or groundwater displacement from pumping to underground</td>
<td>Active</td>
<td>Active, reduced rate compared to operations</td>
<td>Active, reduced rate compared to operations</td>
<td>Not active</td>
</tr>
<tr>
<td>Uncontained site runoff</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Active, increased rate compared to operations</td>
</tr>
</tbody>
</table>

WMP – water management pond, WTP – water treatment plant.
3.2 Closure Phase Monitoring

The Closure phase is scheduled for 8 years in duration. Primary activities include the demolition and removal of buildings from the Mine, scarifying the roads and airstrip, and covering the North Pile. During the Closure phase the main sources of Mine-related gains/losses to Snap Lake are the same as during ECM, and include: pumping (extraction), inflow from WMP seepage, WTP discharges, and site runoff (Table 2).

The Closure phase monitoring program is summarized in Table 1 and entails the following adjustments to each program from that applied during the operations phase:

- Snap Lake Elevation – continue within the scope of the AEMP.
- Snap Lake Inflow / Outflow – discontinue. The magnitude of the on-site activities is not anticipated to significantly increase Mine-related influences on local hydrology relative to ECM or operations, and thus does not warrant continued monitoring.
- North Lake, Northeast Lake and 1999 Reference Lake – discontinue. The magnitude of the on-site activities is not anticipated to significantly increase Mine-related influences on local hydrology relative to ECM or operations, and thus does not warrant continued monitoring.
- Meteorological – continue within the scope of the Air Quality and Emissions Monitoring and Management Program.

3.3 Post-Closure Phase Monitoring

The Post-Closure activities consist of site monitoring and any minor maintenance involving a small crew for a short duration over the year. Thus, site seepage and runoff are the anticipated primary sources of potential impacts to lake levels during the post-closure phase (Table 2). However, these influences are minimal compared to the operations phase influences of groundwater recharge and WTP inflows.

The Post-Closure monitoring program is summarized in Table 1 and entails the following:

- Snap Lake Elevation – continue within the scope of the AEMP.
- Snap Lake Inflow / Outflow – discontinue. Residual Mine-related influences on local hydrology relative to operations, ECM and closure phases are minimal, and thus do not warrant continued monitoring.
- North Lake, Northeast Lake and 1999 Reference Lake – discontinue. Residual Mine-related influences on local hydrology relative to operations, ECM and closure phases are minimal, and thus do not warrant continued monitoring.
- Meteorological – continue within the scope of the Air Quality and Emissions Monitoring and Management Program and addressed within the Final Closure Air Quality and Emissions Monitoring and Management Program.

4.0 CLOSING

ARKTIS Solutions Inc. assumes no responsibility for inappropriate use of the contents of this report, and disclaims all liability arising from negligence or otherwise in respect of such information and recommendations presented in this report. General terms and conditions are available in Appendix A.

ARKTIS SOLUTIONS INC.

Jamie Van Gulck, Ph.D., P.Eng.
Principal

Drew Stavinga, M.Sc., P.Geo
Environmental Geoscientist
5.0 REFERENCES


APPENDIX A – GENERAL TERMS AND CONDITIONS

This report has been prepared for the specific site, design objective, development and purpose described to ARKTIS Solutions Inc. (ARKTIS) by the Client. The factual data, interpretations and recommendations pertain to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation of site conditions, purpose, and development plans may alter the validity of the report. ARKTIS cannot be responsible for use of this report, or portions thereof, unless ARKTIS is requested to review, and if necessary, revise the report.

This report and the assessments and recommendations contained in it are intended for the sole benefit of ARKTIS’ Client. No other party may use or rely on this report or any portion thereof without ARKTIS’ expressed written consent.

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LIMITATIONS OF REPORT

The report is of a summary nature and is not intended to stand alone without the reference to the instructions given to ARKTIS by the Client, communications between ARKTIS and the Client, and to any other reports prepared by ARKTIS for the Client relative to the specific site described in the report. In order to properly understand suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. ARKTIS cannot be responsible for use of portions of the report without reference to the entire report.

LIMITATIONS OF LIABILITY

The client, and any other parties using this report with the express written consent of the clients and ARKTIS, acknowledge that conditions affecting the financial liability of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive. During the performance of the work and the preparation of this report, ARKTIS may have relied on the information provided by persons other than the client. While ARKTIS endeavors to verify the accuracy of such information when instructed to do so by the client, ARKTIS accepts no responsibility for the accuracy or the reliability of such information which may affect the report. The client acknowledges that ARKTIS is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

STANDARD OF CARE

Services performed by ARKTIS for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and financial and physical constraints applicable to the services. Engineering judgment has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

ALTERNATE REPORT FORMAT

Where ARKTIS submits both electronic file and hard copy versions of reports, drawings and other project related documents and deliverables (collectively termed instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding.