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
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<tr>
<th>CC</th>
<th>SLEMA, Philippe di Pizzo</th>
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<td>NSMA, Bill Enge, Jessica Hurtubise</td>
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<td>DBCI, Colleen Prather, Michelle Peters</td>
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VEGETATION MONITORING PROGRAM

Snap Lake Mine
2019

De Beers
Group of Companies
# REVISION HISTORY

<table>
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<tr>
<th>Version</th>
<th>Date</th>
<th>Notes/Revisions</th>
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<tr>
<td>Version 2</td>
<td>December, 2008</td>
<td>Vegetation Monitoring Program (De Beers, 2008).</td>
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<tr>
<td></td>
<td></td>
<td>Report finalizes the 2005 VMP and provides more details on the Dustfall Monitoring Program.</td>
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<tr>
<td>Version 3</td>
<td>March, 2019</td>
<td>Revised monitoring to align with the closure and post-closure phases.</td>
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<td></td>
<td>Vegetation Dustfall Monitoring Program included in the program.</td>
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<td>Action levels for the closure and post-closure phases included in the program.</td>
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<td>Various minor improvements to text completed throughout the document.</td>
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<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>AAAQG</td>
<td>Alberta Ambient Air Quality Guideline</td>
</tr>
<tr>
<td>AEP</td>
<td>Alberta Environment and Parks</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
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<tr>
<td>AQEMMP</td>
<td>Air Quality and Emissions Monitoring and Management Plan</td>
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<tr>
<td>ARKTIS</td>
<td>ARKTIS Solutions Inc.</td>
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<tr>
<td>CCME</td>
<td>Canadian Council of Ministers of the Environment</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer-aided design</td>
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<td>De Beers</td>
<td>De Beers Canada Inc.</td>
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<tr>
<td>e.g.,</td>
<td>for example</td>
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<tr>
<td>EAR</td>
<td>Environmental Assessment Report</td>
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<tr>
<td>ECM</td>
<td>Extended Care and Maintenance</td>
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<tr>
<td>ELC</td>
<td>Ecological Landscape Classification</td>
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<td>EMS</td>
<td>Environmental Management System</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<td>GNWT</td>
<td>Government of the Northwest Territories</td>
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<td>Golder</td>
<td>Golder Associates Ltd.</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>i.e.</td>
<td>That is</td>
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<tr>
<td>LSA</td>
<td>local study area</td>
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<tr>
<td>Mine</td>
<td>Snap Lake Mine</td>
</tr>
<tr>
<td>MVEIRB</td>
<td>Mackenzie Valley Environmental Impact Review Board</td>
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<tr>
<td>MVLWB</td>
<td>Mackenzie Valley Land and Water Board</td>
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<tr>
<td>NWT</td>
<td>Northwest Territories</td>
</tr>
<tr>
<td>PAH</td>
<td>polycyclic aromatic hydrocarbon</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Particulate matter nominally less than or equal to 2.5 microns (µm) aerodynamic diameter</td>
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<tr>
<td>PSP</td>
<td>Permanent sample plot</td>
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<tr>
<td>RSA</td>
<td>regional study area</td>
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<tr>
<td>UTM</td>
<td>Universal Transverse Mercator</td>
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<td>VMP</td>
<td>Vegetation Monitoring Program</td>
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<td>ZOI</td>
<td>Zone of Influence</td>
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## UNITS OF MEASURE

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<td>%</td>
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<tr>
<td>cm</td>
<td>centimeter</td>
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<tr>
<td>mg</td>
<td>milligram</td>
</tr>
<tr>
<td>mg/dm$^2$/30d</td>
<td>milligrams per square decimeter per 30 days</td>
</tr>
<tr>
<td>m</td>
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</tr>
<tr>
<td>µm</td>
<td>micrometre</td>
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<tr>
<td>ºC</td>
<td>degrees Celsius</td>
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INTRODUCTION

1.1 BACKGROUND

De Beers Canada Inc. (De Beers) owns and operates the Snap Lake Mine (Mine) in the Northwest Territories (NWT). The Mine is located approximately 220 kilometers (km) northeast of Yellowknife, and 30 km south of MacKay Lake (Figure 1-1). Final regulatory approvals for construction and operation of the Mine were granted in May 2004, and construction began in April 2005. Operation of the Mine commenced in 2007 and was expected to continue operations for approximately 20 years. However, on December 4, 2015, De Beers announced that it would be suspending operations at Snap Lake Mine, and that the Mine would be placed under temporary closure termed “care and maintenance”. In December 2017, De Beers announced the Mine will begin preparations for final Closure. The activities undertaken during De Beers’ care and maintenance phase are completed to maintain compliance with the Water License MV2011L2-0004 and Land Use Permits MV2017D0032 and MV2014D0010. Proposed adjustments are being contemplated with the Mine closure Water License proposal, any changes to the program will adhere to the Environmental Agreement.

The Mine includes the development of underground workings, a processed kimberlite storage facility (the North Pile), mine facilities and accommodations, an airstrip, water treatment facilities, fuel and ammonium nitrate storage facilities, and a winter access road spur off the Tibbitt to Contwoyto winter road.

The Vegetation Monitoring Program (VMP) is a requirement of the Environmental Agreement for the Mine (INAC et al., 2004). It provides support for the closure and reclamation monitoring requirements previously outlined in Part I of the Mine’s Water Licence (MV2001L2-0002; MVLWB, 2004, updated to MV2011L2-0004; MVLWB, 2015). A draft VMP was prepared for the Mine in 2005 (De Beers, 2005) and finalized in 2008 (De Beers, 2008). The VMP was subsequently updated in 2013 (Golder, 2014) with the addition of a Vegetation Dustfall Monitoring Program. This VMP, version 3.0, was updated to address monitoring at the Mine during the Closure and Post Closure phases.

Appendix A provides a concordance table to demonstrate the Program’s compliance with the Mine’s Environmental Agreement requirements.
Figure 1-1  Location of the Snap Lake Mine, Northwest Territories
1.2 OBJECTIVES AND SCOPE

The principal objective of the VMP is to comply with the requirements of the Environmental Agreement (Article VII), Water Licence, and relevant corporate commitments. To comply with these requirements, De Beers has designed the VMP to include the following objectives:

- verify the accuracy of impact predictions made in the EAR (De Beers, 2002a) through data collection;
- establish action levels or triggers which, if exceeded, would necessitate adaptive management and mitigation measures where appropriate;
- implement operational practices to mitigate disturbances to native vegetation communities and enhance reclamation measures;
- determine the effectiveness of mitigation and reclamation measures;
- consider and incorporate Traditional Knowledge where possible; and,
- provide opportunities for the involvement and active participation of Aboriginal parties in the implementation of the VMP.

To meet these objectives, De Beers has designed four vegetation monitoring studies:

- Area of Impact Monitoring Program;
- Ecological Land Classification (ELC) Area Monitoring Program;
- Passive Regeneration Monitoring Program; and,
- Vegetation Dustfall Monitoring Program.

Data collection techniques and analyses selected for these studies are precise and repeatable. This approach is intended to allow De Beers to understand and manage the effects of Mine activities on native vegetation communities, and monitor the effectiveness of closure and reclamation activities.

The following two additional Triggered Monitoring Programs (Section 2.2) may be implemented, when necessary, if specific Action Levels set out in the VMP are exceeded.

- Detailed ELC Monitoring Program. The trigger for this program is:
  - if the EAR prediction of a total disturbance of 218.3 hectare (ha), or 15 percent (%) of the local study area (LSA) is exceeded.

- Dustfall Effects Monitoring Program. The triggers for this program are:
  - if dustfall monitoring data from the Mine’s Air Quality Monitoring Program (De Beers, 2019) exceed the Alberta Ambient Air Quality Guidelines (AAAQG; AEP, 2017) for dustfall over a three-month period; or,
visual dust observations reported during daily operations when personnel are present show a high-dust condition extending over a long enough period that visible dusting of vegetation occurs.

During operations, these vegetation studies were linked to the Environmental Management System (EMS) for the Mine (De Beers, 2002b). The EMS provided a structured process for adaptive and/or active management (Figure 1-2). For example, if the data indicate that impacts are greater than predicted, unanticipated impacts are occurring, or revegetation is not successful, environmental management will be modified or adjusted to reflect and address these or other unforeseen issues. These changes in environmental management could, in turn, necessitate changes to the VMP. During Closure and Post Closure phases, a similar process for adaptive and/or active management will be followed at a level consistent with the level of activity at site.

1.2.1 Monitoring Programs

The monitoring programs are designed to test EAR impact predictions (De Beers, 2002a) and the success of reclamation activities. The specific objectives of each of these programs are described in the subsections below.

1.2.1.2 Annual / Interval Monitoring

Area of Impact and ELC Area Monitoring

Area of Impact and ELC Area monitoring are conducted to meet the following objectives:

- **Area of Impact** – Confirm predictions made in the EAR (De Beers, 2002a) related to the loss and/or alterations to native vegetation communities as a result of Mine activities.
- **ELC Area** – Gather baseline data to be used in the future to confirm predictions made in the EAR (De Beers, 2002a) related to the loss and/or alterations of individual ELC types as a result of Mine activities.

Area of Impact and ELC Monitoring were conducted in 2013 and 2018.

Vegetation Monitoring

In February 2013, the VMP was redesigned to assess the following key questions:

- Is the Mine having direct or indirect effects on vegetation community composition, abundance, and vigour?
- If effects are occurring, what is the cause of those effects?
- Which tools are effective for the reclamation of Mine disturbances?

Analysis of historical data indicated that the previous program could provide information on the composition, abundance, and vigour of the vegetation around the Mine, but that there was no effective way to determine the cause of recorded effects.
As a result, the program was adjusted to provide a means of comparing dustfall volume and chemistry with vegetation community effects. Vegetation monitoring was divided into two programs with the following objectives:

- **Passive Regeneration Monitoring** – Determine the effectiveness of passive regeneration as a means of revegetating Mine disturbances.
- **Vegetation Dustfall Monitoring** – Determine if dustfall is affecting vegetation community composition, abundance, and vigour in the area surrounding the Mine.

Passive regeneration monitoring and vegetation dustfall monitoring was completed in 2013 and 2018.

**1.2.1.3 Triggered Monitoring Programs**

The objective of the Triggered Monitoring Programs is to assess results from the on-site dustfall monitoring program and to re-evaluate the triggers and dustfall station locations used for the dustfall effects monitoring in the VMP. Triggered Monitoring Programs are additional field programs that are initiated if established Action Levels are exceeded. Adaptive management and mitigation measures are implemented, where appropriate, only when the defined trigger is surpassed.
1.3 STUDY AREAS

The VMP covers two study areas, a regional study area (RSA) and a local study area (LSA). This approach allows for both a local and regional assessment of any effects of the Mine on native vegetation communities.

1.3.1 Regional Study Area

The RSA is 301,889 ha in size, defined by a circle with a radius of 31 km centered on the Mine site (Figure 1-3). This is the same RSA used in the EAR (De Beers, 2002a). The scale of the RSA provides a biologically relevant means for determining the distribution of vegetation types in a regional context.

The RSA is located within the Coppermine River Upland Ecoregion of the Taiga Shield Ecozone in the High Subarctic Ecoclimatic Region (Ecological Framework of Canada, n.d.). This area is characterized by short, cool summers and long cold winters, where the mean annual temperature is -7.5 degrees Celsius (°C).

This ecoregion is a transitional zone between the northern boreal forest to the south and arctic tundra to the north. Vegetation communities consist of open, stunted tree canopies of black spruce (*Picea mariana*) and tamarack (*Larix laricina*), with occasional white spruce (*Picea glauca*). Ground cover is composed of dwarf birch (*Betula pumila* var. glandulifera), willow (*Salix* spp.), ericaceous shrubs, cotton-grass (*Eriophorum* spp.), lichen, and moss species. The dominant soils of this ecoregion are Dystric Brunisols with some Turbic, Static, and Organic Cryosols. Bare rock outcrops are also common. The RSA is within the continuous to discontinuous zones of permafrost.
Figure 1-3  Regional Study Area for the Snap Lake Mine
1.3.2 Local Study Area

The LSA is 1,435 ha and includes the land altered by the Mine plus a 500 metre (m) buffer (Figure 1-4). Specifically, the LSA encompasses the site infrastructure, including the airstrip and area surrounding the North Pile. Note that the additional disturbance from the partial construction of the West Cell in 2015 is not depicted in Figure 1-4. The LSA for vegetation monitoring is the same LSA as used in the EAR (De Beers, 2002a).

As outlined in the EAR (De Beers, 2002a), seven ELC types were mapped within the LSA: heath boulder, heath tundra, open spruce forest, birch seep, tussock-hummock, sedge wetlands, and deep water. The dominant ELC type was the heath boulder complex, followed by tussock-tundra. In addition, smaller units of spruce forest and several shrub units were identified.
Figure 1-4  Local Study Area for the Snap Lake Mine
2 STUDY DESIGN

The VMP is divided into two main categories of programs: monitoring programs (Area of Impact, Ecological Land Classification (ELC) Area, Passive Regeneration Monitoring and Vegetation Dustfall Monitoring) and triggered studies (Detailed ELC and Dustfall Monitoring). This section outlines the detailed study design (including the rationale, study area, and monitoring methods) for each of these programs.

2.1 ANNUAL / INTERVAL MONITORING PROGRAMS

The monitoring programs described herein represent the program to be utilized during the Closure and Post Closure phases. Four vegetation monitoring programs were previously conducted at regular intervals:

- Monitoring the total area of direct impact due to the Mine;
- Monitoring the change in ELC unit area;
- Monitoring the success of passive regeneration on disturbed areas; and,
- Monitoring dustfall effects on vegetation.

Changes to the monitoring programs for the Closure and Post Closure phases are presented herein.

2.1.1 Area of Impact Monitoring Program

2.1.1.1 Area of Impact Monitoring Rationale

The Area of Impact component of the VMP is designed to confirm predictions made in the EAR (De Beers, 2002a) related to loss and/or alterations to native vegetation communities as a result of Mine activities. The Mine will result in a change to the area of native vegetation due to the direct loss of vegetation, the disturbance or removal of soil, and re-arrangement of the terrain over time as a result of:

- construction of site infrastructure;
- additional surface modification or disturbance such as earthworks, levelling, and clearing for infrastructure and laydowns areas; and,
- dust generation.

The indicators used for this program is the land altered by the Mine area, including the site infrastructure, North Pile, the North Pile Perimeter Water Control Structures, influent storage ponds and passive wetlands in the LSA, and formerly, the esker quarry area in the RSA.

Monitoring the area of impact will provide a tool to assist in managing the direct effects of the Mine associated with the physical extent of the mine footprint. This program will also provide a mechanism...
by which impacts greater than EAR predictions would be identified, and the appropriate mitigation applied. This program will also provide a method for tracking the rate of area disturbance through the life of the Mine and linking impacts to Mine activities and EAR predictions (De Beers, 2002a).

2.1.1.2 Area of Impact Monitoring Study Area

The study areas include both the LSA and RSA. However, the focus of this program will be on the LSA since the majority of mining activities have been concentrated within this area, which includes the main Mine components plus a 500 m buffer. The esker quarry, located approximately 10 km south of the Mine site and in the RSA (Figure 1-3), was previously a focus area for monitoring. However, the esker quarry was reclaimed by re-contouring the excavation to a stable profile and closed after the most recent removal of borrow material was completed in 2000/2001 (Bartlett, 2007). The esker is no longer considered part of the Mine lease area, and thus not subject to further disturbance. As a result, this location is no longer monitored for area of impact. The LSA will form the focus area for monitoring the area of impact.

2.1.1.3 Area of Impact Monitoring Methods

The predicted area of disturbance, or area of loss, due to the Mine is calculated by overlaying the computer-aided drawings (CAD) of the Mine plan from the EAR (De Beers, 2002a) on the updated ELC map presented in the VMP annual reports. The actual total area of impact will be calculated from information captured from a high-resolution satellite image of the Mine using Geographical Information System (GIS) spatial analysis. During years that a satellite image is not required or acquired, De Beers will provide information detailing any known new disturbance in the LSA or RSA.

Once the area impacted is calculated, the following connected steps will be taken to determine the path forward from the result:

- If the area impacted is consistent with or less than the revised EAR predictions stated in the VMP annual reports, then no further assessment will be required that year (Figure 1-2).
- If the impacted area exceeds revised EAR predictions (218.3 ha) by greater than 10%, that is, a disturbance area greater than 240.1 ha in the LSA, then the nature, extent and source of impacts that exceed EAR predictions will be assessed;
- If the additional impacts are easily explained, then no further investigation will be necessary. For example, if the increase in area of impact is due to an increased area required for the North Pile, then this will be documented, and any required changes would be made in the VMP;
- If the additional impacts are significant and the cause is uncertain, the Detailed ELC Monitoring Program may be triggered (Section 2.2.1) and appropriate mitigation where possible would be identified (Figure 1-2) and may also lead to modifications to the VMP; and,
- Incremental change in the area of impact will be tracked to assess the rate of change due to the Mine, and to identify and report changes and their cause. For example, some development within the footprint of the future West Cell has occurred, resulting in a change in the ELC area in the LSA.
During periods between or after acquisition of satellite imagery, site survey data collected as part of reclamation activities will be used to delineate any new land disturbance. In the event site survey data indicate an increase in impacted area greater than 10% of that measured in the final ECM phase assessment, this program will be reassessed. If large disturbances are identified, an updated satellite image may be required to confirm the extent of the new disturbance.

### 2.1.1.4 Area of Impact Monitoring Frequency

The area of impact was measured annually throughout construction using QuickBird imagery whenever conditions allowed for imagery capture. QuickBird imagery acquisition was reduced to a frequency of every five years during operations due to the minimal increase in expected disturbances during this time. De Beers also provided a written statement describing additional disturbances from the Mine annually. If large disturbances are identified during the interim, an updated satellite image may be required to confirm the extent of the new disturbance.

The 2018 program will serve as the final measure of total disturbance prior to the commencement of closure activities. Satellite imagery will be captured every 5 years during Closure to document changes to the area of impact. Site survey data will be collected during Closure and/or Post Closure as part of reclamation activities per their own specified frequency and will be used as a trigger to reassess this program as necessary. Following Closure, no further changes to the area of impact are expected. Therefore, this program will be terminated at the end of the Closure phase.

### 2.1.1.5 Area of Impact Monitoring Parameters

The program will measure the area of impact in hectares (ha). This will include areas disturbed within the LSA. The esker quarry site in the RSA, no longer being within the Mine lease area and thus not subject to further disturbance, will no longer be monitored. Therefore, the area of impact at this location will be based on past assessments.

### 2.1.1.6 Area of Impact Monitoring Data Analysis

A geographical information system (GIS) spatial analysis of the satellite imagery will measure the total area of impact, for comparison with the revised EAR predictions (Golder, 2007).

Site survey data or imagery analysis will provide a measure of any new land disturbance during the Closure and Post Closure phases, for comparison with EAR predictions as well as the 2018 assessment.

### 2.1.2 ELC Area Monitoring Program

#### 2.1.2.1 ELC Area Monitoring Rationale

Vegetation communities may be indirectly affected by Mine activities through changes in topography, local drainage patterns and micro-climates. The ELC Area Monitoring Program is designed to assess changes in the total area of the ELC units within the LSA and formerly the esker quarry area, and to...
compare these values to EAR predictions. This program is designed to help identify, at an early stage, the need for appropriate mitigation if Mine disturbances exceed EAR predictions.

2.1.2.2 ELC Area Monitoring Study Area

The study areas include both the LSA and RSA. However, the focus of this program will be on the LSA since this area will experience most of the Mine impacts to vegetation, including indirect effects. The esker quarry area is no longer part of the Mine lease area, and thus no longer monitored for impacts to ELC unit areas.

2.1.2.3 ELC Area Monitoring Methods

For the EAR, vegetation communities in the LSA and RSA were determined from a supervised classification of a Landsat Thematic Mapper image with a resolution of 30 m obtained in 1994 (De Beers, 2002a) complemented by the use of a Landsat image obtained in July 2002 and a Quickbird satellite image in August 2006. For all three classifications, vegetation communities were determined using the ELC system developed by Matthews et al. (2001). The ELC units were developed based on integrated units that describe terrain, soils, and vegetation. The ELC patterns were classified by applying an automatic classification system process to both the Landsat and QuickBird satellite imagery. This process involved using training areas that matched spectral signatures with plots from field investigations. Each ELC unit has a unique spectral signature that was used to map the ELC units in both the LSA and RSA. Manual edits were required to correct misclassified pixels. Aerial reconnaissance and ground surveys were used to increase the accuracy of the vegetation classification in the LSA.

The predicted area of disturbance due to the Mine to each of the ELC units in the LSA and esker quarry (in the RSA) was calculated by overlaying the computer-aided drawings (CAD) of the Mine plan from the EAR on the 2002 ELC map. The actual amount of direct vegetation loss to each of the ELC units in the LSA is calculated by overlaying the current land altered by the Mine, as captured from a high-resolution satellite image of the Mine, on the 2006 ELC map. The ELC map and the existing Mine footprint are compared within a GIS platform to determine the amount that each ELC type has been directly disturbed by the Mine. The total area of ELC units disturbed at the esker quarry in the RSA was calculated from a ground survey conducted in June 2007 following the site’s closure and reclamation (Bartlett, 2007). Since the esker quarry is no longer within the Mine lease area with no further disturbance expected, no further assessment of ELC area disturbance at this location will be required. During years that a satellite image is not to be acquired, De Beers will provide information detailing any new known disturbances in the LSA or RSA.

Once the area impacted is calculated, the following connected steps will be taken to determine the path forward from the result:

- If the area impacted is consistent with or less than the revised EAR predictions stated in the VMP annual reports, then no further assessment will be required that year (Figure 1-2).
- If ELC unit area changes exceed revised EAR predictions by less than 10%, this will be documented and the change evaluated, if necessary;
• If ELC unit area changes exceed revised EAR predictions by greater than 10%, then a field program may be conducted to assess the nature, extent and source of impacts that exceed EAR predictions;

• If the ELC unit area changes are widespread and the cause is unknown, then the Detailed ELC Monitoring Program may be triggered (Section 2.2.1) and appropriate mitigation where possible would be identified (Figure 1-2) and may also lead to modifications to the VMP; and,

• Incremental change in ELC area will be tracked to assess the rate of change due to the Mine, and to identify and report significant changes and their cause. For example, some development within the footprint of the future West Cell has occurred, resulting in a change in the ELC area in the LSA.

During periods between or after acquisition of satellite imagery, site survey data collected as part of reclamation activities will be used to delineate any new disturbance to ELC units. In the event site survey data indicate an increase in ELC unit area loss greater than 10% of that measured in the final ECM phase assessment, this program will be reassessed. If large disturbances are identified, an updated satellite image may be required to confirm the extent of the new disturbance.

2.1.2.4 ELC Area Monitoring Frequency

The ELC unit area loss was measured annually throughout construction using QuickBird imagery whenever conditions allowed for imagery capture. QuickBird imagery acquisition was reduced to a frequency of every five years during operations due to the minimal increase in expected disturbances during this time. If large disturbances are found to occur, an updated satellite image may be required to confirm the extent of the new disturbance.

The 2018 program will serve as the final measure of disturbance to ELC units within the LSA prior to the commencement of closure activities. Satellite imagery will be captured every 5 years during Closure to document changes to the ELC units. Site survey data will be collected during Closure and/or Post Closure as part of reclamation activities per their own specified frequency and will be used as a trigger to reassess this program as necessary. Following Closure, no further loss to the ELC units are expected. Therefore, this program will be terminated at the end of the Closure phase.

2.1.2.5 ELC Area Monitoring Parameters

ELC unit areas will be measured in hectares (ha), within the LSA. Values will be compared to the ELC unit area of disturbance in the revised EAR predictions and the percent change. The esker quarry site in the RSA, no longer being within the Mine lease area and thus not subject to further disturbance, will no longer be monitored. Therefore, the total ELC unit area disturbance at this location will be based on past assessments.

2.1.2.6 ELC Area Monitoring Data Analysis

Data analyses will use a GIS and spreadsheet analysis to measure the ELC unit’s area for comparison with the revised EAR predictions (Golder, 2007). The area of each ELC unit will be measured and percent change from preconstruction values will be calculated and compared to revised EAR predictions. Spreadsheet applications will include tracking and graphing ELC unit area change.
Site survey data will provide a measure of any new disturbance to ELC units during the Closure and Post Closure phases for comparison with the EAR predictions as well as the 2018 assessment.

2.1.3 Passive Regeneration Monitoring Program

2.1.3.1 Passive Regeneration Monitoring Rationale

The focus of the passive regeneration monitoring component of the VMP was to measure the success of passive regeneration in meeting reclamation goals and final land-use objectives. Passive regeneration goals are:

- erosion control and slope stability;
- establishing self-sustaining vegetation communities in disturbed areas;
- developing and applying site-specific reclamation measures;
- optimizing species performance;
- controlling nuisance and noxious weeds; and
- placing land onto a trajectory towards usable wildlife habitat, as appropriate.

The results of the passive regeneration monitoring component of the VMP were used to inform the final revegetation reclamation program for the Mine. An adaptive management approach allowed implementation and application of the most suitable methods to enhance the recovery process and continue progression towards reclamation objectives.

2.1.3.2 Passive Regeneration Monitoring Locations

During the 2004 and 2005 field surveys, 11 permanent sample plots (PSPs) were established at existing disturbed sites (Figure 1-3 and Figure 1-4) to assess the rate and effectiveness of passive regeneration as a revegetation method (i.e. natural revegetation relying on recruitment and colonization by endemic species). These disturbed areas were the esker, airstrip, and old base camp. Plots were established in the esker complex, heath tundra, heath boulder, and tussock-hummock, where Mine activities (e.g., esker, temporary camp) have occurred. The number of passive regeneration PSPs, grouped according to the adjacent ELC unit, is shown in Table 2-1.
Table 2-1 Number of Passive Regeneration Permanent Sample Plots Grouped by Adjacent Ecological Land Classification Type

<table>
<thead>
<tr>
<th>Adjacent ELC Type</th>
<th>Number of Passive Regeneration PSPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esker complex</td>
<td>4</td>
</tr>
<tr>
<td>Heath tundra</td>
<td>1a</td>
</tr>
<tr>
<td>Heath boulder</td>
<td>4</td>
</tr>
<tr>
<td>Tussock-hummock</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

* PSP is located in heath tundra ELC based on 2002 Landsat classification. Reclassification in 2006 based on Quickbird imagery places this PSP within tussock-hummock ELC units.  
ELC = ecological land classification; PSPs = permanent sample plots.

2.1.3.3 Passive Regeneration Monitoring Methods

A site reconnaissance of the passive regeneration PSPs was conducted with vegetation and soil sampling data collected.

Vegetation Monitoring

Vegetation data is collected from standardized 5 m by 5 m PSPs. This is considered an adequate size to capture trees, shrubs, low growing ground cover, boulders, and other terrain features. The location of each PSP was marked on a map and the Universal Transverse Mercator (UTM) coordinates were recorded using a hand-held global positioning system (GPS) device. Plots were marked by a stake in the southwest corner of the plot, and the plot was photographed looking northeast from this corner. Photographs were to be used for visual inspection of change if additional monitoring activities were triggered.

Soil Sampling

Soil sampling adjacent to a subset of five passive regeneration PSPs was conducted in 2005 to complement existing baseline data. However, considering that change in soil character and composition is generally a slow process, detectable variation is often not readily identified in back to back annual assessments. Soil sampling is conducted to allow for comparison of the soil character at that time to baseline conditions (i.e. if there is an accumulation of metals or change in nutrient composition). Likewise, if there are indications of vegetation stress, poor vigour, or plant die-back, soil sampling at these locations was to be implemented as required to determine if changes in the growth media is influencing plant health and/or establishment.

2.1.3.4 Passive Regeneration Monitoring Frequency

Monitoring the rate of natural vegetation encroachment on passive regeneration plots was done in 2004 with partial follow up surveys in 2005 and 2006. Annual surveys were conducted again in 2008 and every five years thereafter. The last survey was completed in 2018.

The 2018 program will serve as the final assessment of vegetation and soil prior to the commencement of closure activities. No further surveys of passive regeneration plots will be
conducted since the final revegetation reclamation program is anticipated to be sufficiently advanced in 2018 and will no longer require data from the passive plots to inform its development.

2.1.3.5 Passive Regeneration Monitoring Parameters

Within the sampling plots, the following information had been collected:

- plant species composition and percent cover, by strata;
- species vigour;
- rooting depth;
- documented and standardized photograph;
- general soil profile description (soil texture, colour, grain size, moisture regime, etc.);

Specific vegetation parameters that were measured or recorded in the passive regeneration PSPs included:

- species composition and percent cover by vegetation layer (i.e., low shrub layer, graminoid, forb, bryophyte, and terrestrial and epiphyte lichen);
- presence of weed species (i.e., non-endemic); and,
- wildlife signs (e.g., tracks, fecal pellets or droppings, burrows and nests) or species observation.

Additional site and landform data collected includes:

- landscape features, aspect, and slope angle or profile;
- moisture and nutrient regime;
- signs of erosion and slope or surface stability; and,
- type of disturbance.

Supporting data describing location and physical site parameters were as follows:

- mapped location; and,
- UTM coordinates.

Soil samples were analyzed for the following parameters:

- heavy metals (in the lower horizon) (CCME, 1999);
- polycyclic aromatic hydrocarbons (PAHs) (in the upper horizon) (CCME, 1999);
- particle size (in the lower horizon); and,
- nutrients (in the composite horizon).
2.1.3.6 Passive Regeneration Monitoring Data Analysis

Analysis included a comparison of individual parameters, such as species diversity and cover, between plots to evaluate successful and cost-effective reclamation methods. Specific objectives and key questions that were to be addressed are presented in Table 2-2.

Table 2-2 Objectives and Key Questions for Future Monitoring of Passive Regeneration Permanent Sample Plots

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Objective</th>
<th>Key Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation data</td>
<td>Measure plant species colonization and establishment on disturbed areas under natural conditions.</td>
<td>Q1: Do plant species composition and cover change over time in vegetation communities that naturally colonize disturbed sites? Q2: Do plant species composition and cover differ significantly between passive regeneration plots and reference plots? Q3: Are some plant species more successful than others at colonizing disturbed sites?</td>
</tr>
<tr>
<td>Soils data</td>
<td>Monitor soil chemistry and development over time.</td>
<td>Q4: Are passive regeneration plots and reference plots in the natural ELC units becoming increasingly similar over time in terms of plant community composition? Q5: Are soil physical and/or chemical properties changing over time?</td>
</tr>
</tbody>
</table>

The action level (critical effect size) for determining a difference between treatments is based on those treatments that best meet the primary objectives of erosion control, landform stability, sustainable vegetation cover and weed control. It is likely that success between treatments and areas will vary. The selection and application of revegetation methods is based on professional judgement, supported by the data.

2.1.4 Vegetation Dustfall Monitoring Program

2.1.4.1 Vegetation Dustfall Monitoring Rationale

Dust accumulation on vegetation is considered to be the main potential effect on vegetation around the Mine site; thus, it was determined in 2013 that the VMP should be adjusted to provide a means of comparing dustfall volume and chemistry with vegetation community effects. As a result, the Vegetation Dustfall Monitoring Program was developed. In an effort to consolidate the various dustfall monitoring programs at site into a single document for ease of understanding, the dustfall component of the Vegetation Dustfall Monitoring Program has been moved from the VMP into the Air Quality and Emissions Monitoring and Management Plan (AQEMMP; De Beers, 2019). The vegetation and soil monitoring components of the Vegetation Dustfall Monitoring Program remain within the VMP.

2.1.4.2 Vegetation Dustfall Monitoring Locations

A transect consisting of nine dustfall stations and associated vegetation sampling areas was established and sampled in 2013. The locations of the vegetation dustfall monitoring stations are shown in Figure 2-1. Based on prevailing winds, PSPs were established starting from the edge of the
Mine site and oriented in a west-west-northwest direction extending to a distance of 20 km from the Mine. The station nearest the Mine (DVD105) is considered an on-site station, all others are considered off-site locations. The PSP located at 20 km from the Mine is considered to be the reference plot because this location is expected to be outside of the predicted extent of dust deposition from the Mine. Additional on-site dustfall stations monitored as part of the AQEMMP are also depicted in Figure 2-1.

### 2.1.4.3 Vegetation Dustfall Monitoring Methods

#### Dustfall Monitoring

See AQEMMP (De Beers, 2019).

#### Vegetation Monitoring

Vegetation data are collected within standardized 5 m by 5 m PSPs. The location of each PSP was marked on a map and the UTM coordinates were recorded using a hand-held GPS device. Plots were marked by a stake in the southwest corner of the plot, and the plot was photographed looking northeast from this corner (as per the VMP).

#### Soil Sampling

Soil sampling adjacent to each vegetation dustfall PSP was first conducted in 2013 to assess the soil character and composition at the time of collection. Topsoil and subsoil sampling adjacent to each PSP will be conducted to compare the soil character at the time of collection to previous conditions (i.e. to determine whether there is an accumulation of metals or change in nutrient composition). If there are indications of vegetation stress, poor vigour, or plant die-back, soil sampling at affected locations will be implemented as required to determine whether changes in the growth media are influencing plant vigour and/or establishment.

The topsoil layer includes: the organic layer; Litter, Fibric, Humus (LFH); and mineral horizon and is typically found at 0 to 10 cm from the surface. The subsoil layer is typically found at 15 to 20 cm from the surface. There is usually a change in the colour, texture (often finer texture in subsoil), and structure between the two layers. However, this depends on the type of soil. For topsoil samples the organic matter and mineral soils are collected from 0 to 10 cm. Subsoil is collected from the bottom of the topsoil (approximately 15 cm).
2.1.4.4 Vegetation Dustfall Monitoring Frequency

Vegetation dustfall sampling areas were first assessed in 2013 and then again in 2018.

During Closure, dustfall will be monitored at on-site stations (Figure 2-1) during periods of occupancy per the AQEMMP (De Beers, 2019). The vegetation dustfall plots along the 20 km transect, which is primarily off-site, will be assessed once more 5 years after the end of Closure to evaluate the potential impacts of dust on vegetation that was generated from reclamation activities. If confirmed that no Mine-related impacts remain or are of negligible risk, and the applicable closure criteria have been achieved, the program will be terminated.

2.1.4.5 Vegetation Dustfall Monitoring Parameters

Specific vegetation parameters that are measured or recorded in the vegetation dustfall PSPs are as follows:

- species composition and percent cover by vegetation layer (i.e., low shrub layer, graminoid, forb, bryophyte, and terrestrial and epiphyte lichen);
- presence of weed species (i.e., non-endemic); and,
- wildlife signs (e.g., tracks, fecal pellets or droppings, burrows and nests) or species observation.

Additional site and landform data collected include:

- landscape features, aspect, and slope angle/profile;
- moisture and nutrient regime;
- signs of erosion and slope/surface stability; and,
- type of disturbance.

Soil samples will be analyzed for the following parameters:

- heavy metals (in the lower horizon) (CCME, 1999);
- polyaromatic hydrocarbons (PAHs) (in the upper horizon) (CCME, 1999);
- particle size (in the lower horizon);
- electrical conductivity;
- pH; and,
- nutrients (in the composite horizon).

Table 2-3 provides details on the types of analyses, approximate depth of soil layers, and methods of collection for soil samples.
Table 2-3  Soil Analysis and Sample Collection

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Type of Soil</th>
<th>Approximate Depth (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCME Metals</td>
<td>Subsoil</td>
<td>15 to 20</td>
</tr>
<tr>
<td>Particle Size</td>
<td>Subsoil</td>
<td>15 to 20</td>
</tr>
<tr>
<td>PAH Analysis</td>
<td>Topsoil</td>
<td>0 to 10</td>
</tr>
<tr>
<td>Electrical Conductivity</td>
<td>Composite</td>
<td>0 to 20</td>
</tr>
<tr>
<td>pH</td>
<td>Composite</td>
<td>0 to 20</td>
</tr>
<tr>
<td>Nutrients</td>
<td>Composite</td>
<td>0 to 20</td>
</tr>
</tbody>
</table>

cm = centimetre; g = gram; mL = millilitre; CCME = Canadian Council of Ministers of the Environment; PAH = polycyclic aromatic hydrocarbon.

Additional dustfall monitoring parameters are also collected from stations adjacent to each vegetation PSP to help assess if dustfall is affecting vegetation, and are described in further detail within the Mine’s AQEMMP (De Beers, 2019).

2.1.4.6  Vegetation Dustfall Monitoring Data Analysis

Analysis of dustfall rates and spatial trends is completed within the AQEMMP (De Beers, 2019).

Dustfall volume and chemistry will be compared with vegetation and soil data, including a comparison of individual parameters, such as species diversity and cover, and metal and PAH concentrations in soil, between plots to determine if dustfall is affecting vegetation community composition, abundance, and vigour in the area surrounding the Mine. Unusual differences may trigger investigation and examination of mitigation measures. The conclusions of this analysis when it is completed 5 years after Closure will be presented in a final VMP report.

The action level (critical effect size) for determining a difference between plots would be two standard deviations from the mean. If this action level is exceeded, follow-up studies would be conducted to gather a weight of evidence for examination of cause/effect relationships between the vegetation response and alternative causes (natural factors versus dustfall).

A dustfall “trigger” may produce a response that would include enhanced dust suppression. If studies show evidence that dustfall is the cause of significant changes in vegetation community or active layer characteristics, then the appropriate changes during Closure and/or Post-Closure would be applied.
2.2 TRIGGERED MONITORING PROGRAMS

The monitoring programs described herein represent the proposed program to be utilized during the, closure and post-post-closure phases.

2.2.1 Detailed Ecological Land Classification Monitoring Program

2.2.1.2 Detailed Ecological Land Classification Monitoring Rationale

The Detailed Ecological Land Classification (ELC) Monitoring Program will only be conducted if triggered by the following condition:

1. The EAR prediction of a total disturbance of 218.3 hectare (ha), or 15 percent (%) of the local study area (LSA) is exceeded.

If triggered, the Detailed ELC Monitoring Program is designed to identify the extent, nature and cause of the impacts which exceed EAR predictions. Appropriate mitigation would then be recommended.

2.2.1.3 Detailed Ecological Land Classification Monitoring Study Area

The study area required for this monitoring program will depend on the nature of the trigger. The study area may be the LSA (e.g. if the North Pile is under investigation), the area around the esker (if the size of the esker quarry exceeded predictions), the RSA (if results indicate widespread effects), or all three areas.

2.2.1.4 Detailed Ecological Land Classification Monitoring Stations

In 2004, 2005, and 2006, PSPs were established to describe baseline conditions and to provide a basis for comparison should Triggered Monitoring Programs be required (Figure 1-2). Two types of PSPs, reference and exposure plots, were established using identical methods. The PSPs are located in the three dominant ELC types: heath boulder, open spruce forest, and tussock-hummock (Figure 1-3). These ELC types are often large polygons with little edge effect, widespread, and support a relatively consistent vegetation cover. Additional plots were established in a sedge wetland and esker complex to assess baseline conditions.

Exposure plots are located in or near the LSA, outside of the land altered by the Mine. These plots are intended to be inside the ZOI of Mine activities (Figure 1-3 and Figure 1-4). The existing exposure PSPs were replaced with the vegetation dustfall PSPs in 2013 (see Section 2.1.4). Vegetation dustfall PSPs will be compared to baseline and reference data, to assess whether there were significant differences among data.

Reference plots are further away from the LSA, outside the ZOI, but near enough to be comparable to the exposure plots (Figure 1-3 and Figure 1-4). Changes in vegetation may occur for natural or global reasons including succession, disease, and climate change, which have no link to the Mine. Therefore, baseline reference plots were established to separate natural effects from Mine related effects.
Without reference plots, the tendency would be to attribute all changes to the Mine, therefore the reference plots allow for a comparison of regional impacts.

Plots were established in the primary three ELC vegetation types, which compose 97% of the vegetated area in the LSA and 1 reference plot in the esker complex. Ten to twenty plots for each of the selected ELC units were permanently marked, in both the LSA and RSA, initially resulting in a total of 82 PSPs (Table 2-4). Starting in 2013, exposure PSPs were replaced by the vegetation dustfall PSPs, resulting in a new total of 51 PSPs. At least 10 reference plots for each of the dominant vegetation types were established, to allow for an assessment of the range of variability within each community type (Table 2-4). Plots were also designed to be transferable between both Trigger Monitoring Programs (Dustfall Effects Monitoring Program and the Detailed ELC Monitoring Program).

### Table 2-4 Baseline Vegetation Permanent Sample Plots Established for the Snap Lake Mine

<table>
<thead>
<tr>
<th>Plot Type</th>
<th>Heath Boulder</th>
<th>Tussock-Hummock</th>
<th>Open Spruce Forest</th>
<th>Sedge Wetland</th>
<th>Esker Complex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-2013 Exposure</td>
<td>21</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Reference</td>
<td>20</td>
<td>11</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>19</td>
<td>20</td>
<td>1</td>
<td>1</td>
<td>82</td>
</tr>
<tr>
<td>Post-2013 Vegetation Dustfall</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Reference</td>
<td>22</td>
<td>11</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>11</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>51</td>
</tr>
</tbody>
</table>

Note:

* Exposure PSPs were replaced with the vegetation dustfall sampling PSPs (Section 2.1.4) in 2018.
* The reference esker plot ELC type was reclassified to heath boulder in 2013.
* The vegetation dustfall PSP located at 20 km from the Mine is considered a reference plot.

Subsequent monitoring will occur if this program is triggered, and both vegetation dustfall and reference plots would be established, using plot locations from the baseline PSPs. Additional vegetation dustfall and reference plots may be established in the study area defined by the disturbance. The location and number of plots will depend on the program needs. Vegetation dustfall plots will then be compared to baseline and reference data, to determine if there is significant difference between vegetation dustfall, reference and baseline data.

### 2.2.1.5 Detailed Ecological Land Classification Monitoring Methods

Vegetation data will be collected from standardized plots to record information on species composition, structure, cover and vigour, for each vegetation type selected. Baseline soils data were also collected from the top 10 cm. Plots will be 5 m by 5 m, allowing for an adequate size to include trees, shrubs, boulders, and other terrain features. Each plot will be marked on a map and UTM location recorded using a hand-held GPS, ensuring a high level of accuracy. Plots will be marked by a stake in the southwest corner of the plot, and photographed looking northeast from this corner. This will allow for visual inspection of change if monitoring activities are triggered. Future monitoring programs, if triggered, will follow these methods.
2.2.1.6 Detailed Ecological Land Classification Monitoring Frequency

Data on vegetation and soil conditions were collected at each of the PSPs in 2004, 2005, 2008, 2013 and 2018 to provide a basis for comparisons, should Triggered Monitoring Programs be implemented in the future. The timing of future surveys is dependent upon if, and when, a Land Classification Monitoring Program is triggered. The program as applied to the operations phase will continue through the reclamation and post-reclamation phase with no change.

2.2.1.7 Detailed Ecological Land Classification Monitoring Parameters.

Data collected would be used to compare baseline indices with future indices from both reference and vegetation dustfall plots, within each ELC unit. Vegetation, site and soil parameters measured are consistent between baseline, vegetation dustfall and reference plots, so that data is comparable, within ELC units. The list of parameters chosen would depend on the change that triggered the monitoring.

Specific vegetation parameters include the following:

- species composition and cover (by strata);
- species vigour (following standard vigour classes (AEP, 1994); and,
- percent ground cover (bare ground, water, litter, live vegetation cover by layer).

Soil parameters include:

- moisture regime;
- soil nutrients including nitrogen, phosphorous and potassium;
- salinity;
- pH;
- organic matter characterization (in a subset of reference plots in the LSA);
- major ions including Calcium, Iron, Potassium, Magnesium, Manganese, Titanium and Sodium (in a subset of reference plots located in the LSA);
- soil erosion; and,
- depth of active layer.

Specific site parameters include:

- landform;
- slope angle;
- slope aspect;
- elevation;
• plot position on slope; and
• GPS coordinates.

Incidental wildlife observations will also be recorded when surveying the reference, vegetation dustfall PSPs and ELC verification plots.

2.2.1.8 Detailed Ecological Land Classification Monitoring Data Analysis

A complete list of species found at the vegetation dustfall and reference plots will be provided in the annual monitoring reports. Species diversity and cover will be calculated.

Data analysis will be required to identify if the Mine has had a significant effect on soils and vegetation. The action level (or critical effect size) for determining a difference from reference or baseline plots and between vegetation dustfall and reference plots, would be two standard deviations from the mean. It will be important to separate out Mine-related effects from other natural factors or effects, such as climate. Therefore, comparisons between vegetation dustfall plots and baseline plots will be analyzed, and compared to differences between both vegetation dustfall and reference plots, and baseline data. For example, a climactic effect should be reflected in both vegetation dustfall and reference data, but not in the 2004 baseline data. Conversely, a Mine effect should be reflected in vegetation dustfall, but not in baseline or reference plots.

Analysis will include a statistical comparison of individual parameters between reference, vegetation dustfall and baseline plots using Analysis of Variance (ANOVA), within each ELC unit. Multi-variate analysis and similarity index may be conducted to establish if there is a significant difference and to identify the nature of differences.

If this program indicates that the Mine activities are the cause of significant changes in vegetation community or soil characteristics, then the appropriate changes would be applied. Mitigation will depend on the specific cause of Mine-related changes. For example, it may include reducing the area of impacts caused by mining activities, or increasing the rate and/or quality of reclamation activities.

2.2.2 Dustfall Effects Monitoring Program

2.2.2.2 Dustfall Effects Monitoring Rationale

Dust will be generated from the Mine by wind erosion, vehicle traffic and operation of large construction equipment. Impacts to vegetation associated with dustfall from the esker quarry, airstrip and mine site construction and operation can include reduced photosynthetic capability of buried or blanketed plants (Spatt and Miller, 1981), altered soil pH, lower soil nutrient availability (Everett, 1980; Auerbach et al., 1997), earlier snowmelt on areas affected by dust fallout, and increased seasonal permafrost thawing (Walker and Everett, 1987). Changes in vegetation community species, lower biomass and decreased species diversity are also possible (Auerbach et al., 1997; Walker and Everett, 1987).
The Dustfall Effects Monitoring Program is meant to identify if dust from the Mine has caused a significant difference in the plant species cover or composition of ELC types, in the vigour of plant species, or in the depth of the active layer.

The triggers for this program are:

1. dustfall monitoring data from the Mine’s Air Quality and Emissions Monitoring and Management Plan (AQEMMP; De Beers, 2019) exceed the Alberta Ambient Air Quality Guidelines (AAAQG; AEP, 2017) for dustfall over a three month period; or

2. visual dust observations reported during daily operations when personnel are present show high dust conditions extending over a long enough period that visible dusting of vegetation occurs.

2.2.2.3 Dustfall Effects Monitoring Locations

As discussed in the AQEMMP (De Beers, 2019), during Closure dustfall monitoring will be limited to two on-site stations (see Figure 2-1) located within the active mining area at the following sites:

- north of the tankfarm (DF008), and
- west of the tankfarm (DF009)

In the Post Closure phase, dustfall monitoring will occur once more 5 years after Closure at the vegetation dustfall monitoring plots located along a 20 km transect, which is primarily off-site (Section 2.1.4; Figure 2-1). Justification for this monitoring approach is discussed in the AQEMMP (De Beers, 2019).

In addition to providing the trigger, data collection from these stations will support additional evaluation to determine whether the Dustfall Effects Monitoring Program should be triggered. In the event the triggered monitoring program is initiated, they may also be used to gather a weight of evidence for examination of cause/effect relationships between the vegetation response and alternative causes (natural factors versus dustfall).

To help assess the potential impacts of dust on surrounding vegetation in the event the Dustfall Effects Monitoring Program was triggered, exposure PSPs were established in 2004 near future dust generating activities associated with the Mine, including the Mine site footprint, airstrip and esker quarry. Reference PSPs were also established, as discussed above in Section 2.2.1. In 2013, the exposure PSPs were replaced by the vegetation dustfall PSPs described in Section 2.1.4 and shown in Figure 2-1. Each vegetation dustfall PSP is paired with a dustfall collection station to better assess dust related effects on vegetation and soil.

2.2.2.4 Dustfall Effects Monitoring Methods

Dustfall collection is a passive monitoring program that provides a measure of particulates that would be directly deposited onto vegetation, soil, and water in the vicinity of the Mine. Dustfall data are collected by using open vessels containing a purified liquid matrix. Particles are deposited and retained in the vessel, which is then sent to a laboratory where total and fixed dustfall are quantified.
Dustfall canisters are exposed in the field for a period of 30 days to allow for a sufficient sample size for analysis. During the Closure phase, samples will be collected and analyzed monthly for the period of April to September. During winter months when personnel are not present on-site, the primary sources of dustfall will not be present. The site will be snow covered which further limits dust generation. Dustfall monitoring will only occur in the snow-free season. Given dustfall monitoring throughout the life of Mine had concentrations below adopted action levels, measured values during winter vacancy are not expected to experience exceedances. Following the end of Closure, the on-site dustfall monitoring will be terminated since the primary sources of dustfall will no longer be occurring at the Mine or will be reduced in magnitude compared to operations and Closure phases. A final evaluation of Mine-related dustfall during the Post Closure phase, and any potential effects on surrounding vegetation from dust generated from reclamation activities, will be completed a minimum of 5 years Post Closure through the Vegetation Dustfall Monitoring Program (Section 2.1.4).

As there is no NWT dustfall guideline, the on-site dustfall readings will be compared to the Alberta industrial guideline of 158 milligrams per square decimetre per 30 days (mg/dm²/30d; AEP, 2017). During the Post Closure phase, on-site dustfall monitoring will be discontinued. Off-site dustfall data collected through the Vegetation Dustfall Monitoring Program 5 years after Closure will be compared to the more restrictive Alberta recreational guideline of 53 mg/dm²/30d (AEP, 2017).

Selected reference, exposure and/or vegetation dustfall PSPs that provide a baseline for the Triggered Monitoring Programs were surveyed during the 2013 and 2018 site visits for signs of dusting and vegetation health. In addition, the airstrip perimeter was inspected for signs of dusting and to visually assess vegetation health.

### 2.2.2.5 Dustfall Effects Monitoring Frequency

This program will commence only if dustfall levels exceed the Alberta’s Ambient Air Quality Objective (AEP, 2017) for dustfall over a three month period, and/or if visual observations indicate that dusting of vegetation has become a persistent and significant problem.

In the event the dustfall monitoring frequency is insufficient to assess dustfall over a three-month period, the trigger for this program will be based on visual dust observations. During Post Closure, no dustfall monitoring will be collected except once five years after Closure at the vegetation dustfall stations. During periods with no dustfall collection, the trigger for this program will be based on visual dust observations during other monitoring and maintenance visits.

In the course of regular daily operations when personnel are present at site, visual site monitoring for dust will also continue and any locations with notable dust accumulation will be identified and flagged for potential mitigation action such as watering of roads during periods of occupancy.

### 2.2.2.6 Dustfall Effects Monitoring Parameters

The following parameters that would be monitored for plants include:

- plant species composition and cover (by strata);
plant vigour;
invasive non-endemic species identification and cover;
percent ground cover (bare ground, water, litter, live vegetation cover by layer); and,
dusting of vegetation.

Soil parameters that would be monitored include:
soil profile description;
soil texture;
moisture regime;
nutrient regime;
macro-nutrient availability (e.g. nitrogen, phosphorous and potassium);
salinity;
pH; and
depth of active layer.

Specific site parameters are as follows:
landform including slope angle, aspect and elevation
plot/transect position on slope; and,
GPS coordinates.

2.2.2.7 Dustfall Effects Monitoring Data Analysis

Monthly dustfall results will be presented in the AQEMMP annual report and exceedances will be documented. In the event this program is triggered, reference and vegetation dustfall PSPs will be assessed for various plant and soil parameters. The action level (or critical effect size) for determining a difference from reference PSPs would be two standard deviations from the mean. If this action level is exceeded, follow-up studies such as the Detailed ELC Monitoring Program and/or establishment of additional PSPs and dustfall monitoring stations would be conducted to gather a weight of evidence for examination of cause/effect relationships between the vegetation response and alternative causes (natural factors versus dustfall).

A dustfall “trigger” may produce a response that would include enhanced dust suppression. Given the nature of the Mine (i.e. in preparing for final closure), it is unlikely that follow-up studies of the effects of dustfall would be required. However, if follow-up studies show evidence that dustfall is the cause of significant changes in vegetation community or active layer characteristics, then the appropriate changes during Closure and/or Post Closure would be applied.
In the event of a dustfall “trigger”, consideration will be given to the Vegetation Dustfall Monitoring Program (Section 2.1.4) in determining the timing of initiation and scope of triggered monitoring to avoid overlap.

2.3 SUMMARY OF MONITORING PROGRAMS

The techniques, variables, endpoints and action levels for each of the annual, interval and triggered VMPs are summarized in Table 2-5.
<table>
<thead>
<tr>
<th>Program</th>
<th>Techniques</th>
<th>Variables</th>
<th>Measurement Endpoint</th>
<th>Frequency</th>
<th>Action Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual / Interval Monitoring</td>
<td>Measure the land altered by the Mine using satellite imagery</td>
<td>Hectares disturbed</td>
<td>Hectares disturbed relative to predictions made in the EAR</td>
<td>Every 5 years.</td>
<td>If an increase in land disturbance of more than 10%, based on site survey data from the 2018 assessment, this program will be reassessed. 10% change in total disturbance area above EAR predictions.</td>
</tr>
<tr>
<td>ELC Area</td>
<td>Measure loss of ELC types as a result of Mine activities</td>
<td>Hectares of each ELC type disturbed</td>
<td>Hectares of each ELC type lost relative to predictions made in the EAR</td>
<td>Every 5 years.</td>
<td>If an increase in land disturbance of more than 10%, based on site survey data from the 2018 assessment, this program will be reassessed. 10% change in area of ELC units above disturbance predicted in the EAR.</td>
</tr>
<tr>
<td>Passive Regeneration Monitoring</td>
<td>Vegetation surveys of passive regeneration PSPs</td>
<td>Species composition, cover, and vigour</td>
<td>Identify effective reclamation methods</td>
<td>Program terminated since final revegetation plan anticipated to be sufficiently advanced in 2018.</td>
<td>Program terminated since final revegetation plan anticipated to be sufficiently advanced in 2018. Selection of treatments with the greatest success.</td>
</tr>
<tr>
<td></td>
<td>Soil sampling</td>
<td>Soil chemical and physical properties</td>
<td>Identify effective reclamation methods</td>
<td></td>
<td>Variance of passive regeneration plots from reference plots.</td>
</tr>
<tr>
<td></td>
<td>Vegetation surveys adjacent to dustfall monitoring station</td>
<td>Species composition, cover, and vigour</td>
<td>Identify correlations between amount and chemistry of dustfall and plant community vigour</td>
<td></td>
<td>Selection of treatments with the greatest success.</td>
</tr>
<tr>
<td></td>
<td>Dustfall monitoring</td>
<td>Fixed and total dustfall; metals content of dust</td>
<td>Compared to the AAAQG</td>
<td>Program to be conducted once more 5 years after completion of Closure phase.</td>
<td>Program to be conducted once more 5 years after completion of Closure phase. Variance of study plots from reference plots by two standard deviations from the mean.</td>
</tr>
<tr>
<td></td>
<td>Soil sampling</td>
<td>Soil chemical and physical properties</td>
<td>Identify changes in soil chemistry and correlation with dustfall chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetation Dustfall Monitoring</td>
<td>Vegetation surveys adjacent to dustfall monitoring station</td>
<td>Species composition, cover, and vigour</td>
<td>Identify correlations between amount and chemistry of dustfall and plant community vigour</td>
<td></td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
<tr>
<td></td>
<td>Dustfall monitoring</td>
<td>Fixed and total dustfall; metals content of dust</td>
<td>Compared to the AAAQG</td>
<td>Program to be conducted once more 5 years after completion of Closure phase.</td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
<tr>
<td>Triggered Monitoring</td>
<td>Vegetation surveys of additional vegetation dustfall and reference PSPs</td>
<td>Species composition, cover and vigour</td>
<td>Identify Mine-related effects to vegetation.</td>
<td>Study conducted only if triggered by action levels for ELC area unit change.</td>
<td>Study conducted only if triggered by action levels for ELC area unit change. Variance of study plots from reference plots by two standard deviations from the mean.</td>
</tr>
<tr>
<td></td>
<td>Soil sampling</td>
<td>Soil chemical and physical properties</td>
<td>Identify Mine-related effects to soil chemistry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed ELC Monitoring Program</td>
<td>Vegetation surveys of additional vegetation dustfall and reference PSPs</td>
<td>Species composition, cover and vigour</td>
<td>Identify correlations between amount and chemistry of dustfall and plant community vigour</td>
<td></td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
<tr>
<td></td>
<td>Soil sampling</td>
<td>Soil chemical and physical properties</td>
<td>Identify Mine-related effects to soil chemistry.</td>
<td></td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
<tr>
<td>Dustfall Effects Monitoring</td>
<td>Vegetation and soil surveys of existing and/or additional vegetation dustfall and reference PSPs. Study will give consideration to the Vegetation Dustfall Monitoring Program for necessary scope.</td>
<td>Species composition, cover and vigour</td>
<td>Identify correlations between amount and chemistry of dustfall and plant community vigour</td>
<td></td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
<tr>
<td></td>
<td>Soil chemical and physical properties</td>
<td>Identify Mine-related effects to soil chemistry.</td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
<td></td>
<td>Study conducted only if triggered by dustfall in excess of Alberta guideline for three months and/or visible dusting of vegetation occurs over extended period.</td>
</tr>
</tbody>
</table>

AAAQG = Alberta Ambient Air Quality Guideline (AEP, 2017); ELC= ecological land classification, EAR = Environmental Assessment Report (De Beers, 2002a); PSP = permanent sample plot.
3 ANNUAL REPORT

De Beers will provide an annual monitoring report that summarizes the vegetation data collected during each program year. Consistent with the other environmental monitoring requirements under the Water Licence, the annual vegetation requirements as part of the Water Licence Annual Report will be submitted by March 31 of each calendar year. The Annual Vegetation Monitoring Report will be submitted to the signatories of the Environmental Agreement by June 30 of each calendar year.

The report will provide a mechanism for determining the accuracy of impact predictions and unanticipated ecological effects. The report will also be used to help assess the effectiveness and utility of various components of the VMP and reclamation policies and procedures. Using the principles of adaptive management, the assessment will be used to make recommendations regarding the frequency, duration of sampling, and possible changes to components of the monitoring program.
REFERENCES

AEP, 2017. Alberta Ambient Air Quality Objectives and Guideline Summary.
Resource Information Branch, Finance, Land Information and Program Support Services.
Edmonton, AB.


Bartlett, J., 2007. Senior Permitting Coordinator, Snap Lake Project, De Beers Canada Inc. Personal communication with Chad Williams (Golder Associates Ltd.).


5  GLOSSARY

Active layer  The surface layer in permafrost soils that thaws in the summer months. This layer supports plant roots and burrowing insects.

Adaptive management  Management method that incorporates change resulting from new research approaches (e.g. for reclamation) that have been developed; an iterative and ongoing process.

Baseline  Describes the pre-development environmental setting, against which changes in the environment from the Snap Lake Mine will be assessed.

Boreal Forest  The northern hemisphere, circumpolar, tundra forest type consisting primarily of black spruce and white spruce with balsam fir, birch, and aspen.

Boulder unit  Pertaining to the class of boulder sized materials; boulders are larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctively shaped by abrasion in the course of transport, the largest rock fragment recognized by sedimentologists.

Colonization  The spreading of a species to a new habitat.

Disturbance  A natural or human-induced process that influences the patterns of species, populations, and/or individuals.

Ecological Land Classification (ELC)  An ecological mapping process that involves the integration of site, soil, and vegetation information.

Ecoregion  Relatively homogeneous subregion within an ecozone.

Ecozone  A broad geographic area in which there are distinctive climate patterns, ocean conditions, types of landscapes, and species of plants and animals.

Ericaceous  Plant species belonging to the heath family (Ericaceae) that typically prefer acidic soil.

Erosion  The process by which material, such as rock or soil, is worn away or removed by wind or water.

Eskers  Linear structures of loose sand and gravel, formed by glacial rivers. They provide critical habitat for carnivores and ungulates in the Arctic.

Footprint  The proposed development area that directly affects the soil and vegetation components of the landscape.

Forb  A herb other than grass; e.g. flase asphodel, saxifrage and Arctic harebell.

Fugitive dust  Unintended dust emissions released to the atmosphere without passing through a stack, vent or functionally equivalent opening.

Geographic Information System (GIS)  Computer software designed to develop, manage, analyze, and display spatially referenced data.

Ground survey  The collection of data on land.

Habitat  The physical location or type of environment in which an organism or biological population lives or occurs.

Heath  Any of a family (Ericaceae, the heath family) of shrubby dicotyledonous and often evergreen plants that thrive on open barren usually acid and ill-drained soil.
Hummock
A rounded knoll or hillock.

Invasive species
Non-native or native species that spread aggressively from their original site of planting or invade disturbed areas.

Kimberlite
Igneous rocks that originate deep in the mantle and intrude the Earth’s crust. These rocks typically form narrow, pipelike deposits that sometimes contain diamonds.

Land altered by the Mine
The area covered by the Snap Lake Mine site.

Lichen
Any of numerous complex thallophytic plants made up of an alga and a fungus growing in symbiotic association on a solid surface (as a rock).

Landscape
A heterogeneous land area with interacting ecosystems that are repeated in similar form throughout.

Local Study Area (LSA)
Area defined for the description of vegetation types in the vicinity of the land altered by the Mine. The area where direct effects of the Project might be expected to occur. Located within the regional study area.

Permafrost
A permanently frozen layer at variable depth below the surface in frigid regions; permafrost reduces soil water infiltration.

Polygon
The spatial area delineated on a map to define one feature unit (e.g., one type of vegetation community).

Regional Study Area (RSA)
A broad area defined for the description of vegetation conditions generally centered on the Mine and surroundings, and including areas where indirect effects of the Mine might be expected to occur. Includes the local study area.

Sample Plot
A sampling unit used to estimate variables within an area.

Sedge
Any of a family (Cyperaceae, the sedge family) of usually tufted marsh plants differing from the related grasses in having achenes and solid stems; any of a cosmopolitan genus (Carex).

Species
A group of organisms that actually or potentially interbreed and are reproductively isolated from all other such groups; a taxonomic grouping of genetically and morphologically similar individuals; the category below genus.

Species Diversity
The variety of organisms and ecosystems that comprise both the communities of organisms within particular habitats and the physical conditions under which they live; a function of species richness and density.

Taiga
A moist subarctic forest dominated by small conifers (spruce and fir); represents the transition zone between the boreal forest and the arctic tundra.

Topography
The configuration of a surface including its relief and the position of its natural and man-made features.

Traditional Knowledge
Information obtained more often through observations during extensive time spent in one geographic location than through information obtained formally by the scientific method, e.g., Aboriginal traditional knowledge.

Tundra
A level or rolling treeless plain that is characteristic of arctic and subarctic regions, consists of black mucky soil with permanently frozen subsoil, and has a dominant vegetation of mosses, lichens, herbs, and dwarf shrubs.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tussock</td>
<td>A compact tuft especially of grass or sedge; also an area of raised solid ground in a marsh or bog that is bound together by roots of low vegetation.</td>
</tr>
<tr>
<td>Upland</td>
<td>Ground elevated above the lowlands along rivers or between hills; highland or elevated land; high and hilly country.</td>
</tr>
<tr>
<td>Weeds</td>
<td>Plants that are defined as controlled weeds, nuisance weeds, or noxious weeds.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Term for a broad group of wet habitats; wetlands are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water; wetlands include features that are permanently wet, or intermittently water-covered such as swamps, bogs, muskegs, potholes, swales, glades, slashes, and overflow land of river valleys.</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Under the Species at Risk Act (<a href="http://www.sararegistry.gc.ca/approach/act/default_e.cfm">http://www.sararegistry.gc.ca/approach/act/default_e.cfm</a>), wildlife is defined as a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus that is wild by nature and is native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.</td>
</tr>
<tr>
<td>Zone of Influence (ZOI)</td>
<td>The geographic area where vegetation may be impacted by Mine activities.</td>
</tr>
</tbody>
</table>
APPENDIX A

CONCORDANCE TABLE DEMONSTRATING COMPLIANCE WITH MINE’S ENVIRONMENTAL AGREEMENT
### Table A-1  Concordance Table Showing Vegetation Monitoring Requirements Outlined in the Environmental Agreement

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirement/Commitment</th>
<th>VMP Section</th>
<th>VMP Heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3</td>
<td>Environmental Management Plans, with a link to vegetation</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>(i) Closure and Reclamation Plan(s)</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td></td>
<td>(vii) North Pile</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td></td>
<td>(viii) Air Quality and Emissions</td>
<td>2.1.4 2.2.1 2.3.2</td>
<td>Vegetation Dustfall Monitoring Program Annual Dustfall Monitoring Program Dustfall Effects Monitoring Program</td>
</tr>
<tr>
<td>(h)</td>
<td>The Closure and Reclamation Plan(s) shall be based on current information and technology as well as regulatory requirements and developed in consultation with the Monitoring Agency so that the Mine will be reclaimed incrementally in a manner consistent with sustainable development.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>7.1</td>
<td>Provisions of Environmental Monitoring Programs</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>De Beers shall undertake compliance and environmental effects monitoring of the Mine through the Environmental Monitoring Programs.</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>De Beers shall provide the Parties and the Monitoring Agency (when established) with copies of its Environmental Monitoring Programs. The Environmental Monitoring Programs contemplated by this Article shall be reviewed in accordance with Article 7.5 of this agreement. The Environmental Monitoring Programs shall be revised on an ongoing basis as necessary and where appropriate in response to changing circumstances and additional information.</td>
<td>3</td>
<td>Annual Report</td>
</tr>
<tr>
<td>(c)</td>
<td>The Environmental Monitoring Programs shall include activities designed to:</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. meet the monitoring requirements of all Regulatory Instruments;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. verify the accuracy of the impact predictions from the Environmental Assessment Report of the Mine;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii. determine the effectiveness of measures taken to mitigate any adverse environmental effects of the Mine;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv. consider, and incorporate where possible, traditional knowledge;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>v. establish thresholds or early warning signs;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vi. trigger action by adaptive mitigation measures where appropriate;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vii. provide opportunities for the involvement or active participation of members of each of the Aboriginal Parties in the implementation of the monitoring programs;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>viii. provide training opportunities for members of each of the Aboriginal Parties;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ix. include hypothesis testing during the analysis of data to facilitate Adaptive Management where appropriate; and,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>x. provide for appropriate monitoring during any suspension of operations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Requirement/Commitment</td>
<td>VMP Section</td>
<td>VMP Heading</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------</td>
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<td>-------------</td>
</tr>
<tr>
<td>7.2</td>
<td>For each Environmental Management Plan there should be a complementary Environmental Monitoring Program to support the process of Adaptive Management.</td>
<td>Document links to the Closure and Reclamation Plan</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>The Air Quality Monitoring Program shall include but not be limited to:</td>
<td>2.1.4</td>
<td>Vegetation Dustfall Monitoring Program</td>
</tr>
<tr>
<td></td>
<td>(ii) Monitoring of fugitive dust to determine the effects of dust deposition on the surrounding environment.</td>
<td>2.2.1</td>
<td>Annual Dustfall Monitoring Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3.2</td>
<td>Dustfall Effects Monitoring Program</td>
</tr>
<tr>
<td>(b)</td>
<td>Vegetation</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>North Pile</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>7.3</td>
<td>The Environmental Monitoring Programs will include the identification of monitoring objectives and the monitoring programs outlined in the commitments and in the recommendations listed in the MVEIRB Report and adopted by the Responsible Ministers. De Beers shall adapt or revise the Environmental Monitoring Programs in accordance with the principles of Adaptive Management.</td>
<td>Entire document</td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>Monitoring Data and Results</td>
<td>3</td>
<td>Annual Report</td>
</tr>
<tr>
<td></td>
<td>a) De Beers shall deliver monitoring data and information to the Parties and the Monitoring Agency in time-frames and in formats developed in consultation with the Monitoring Agency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) The formats for submission of monitoring program results and analysis shall not be inconsistent with reporting requirements established under legislation, regulations, and Regulatory Instruments shall apply to the extent of any inconsistency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Reporting dates will be established to conform with the requirements of the appropriate Regulatory Instruments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) De Beers shall carry out the monitoring in a manner which will provide data consistent with any cumulative effects monitoring programs undertaken or authorized by GNWT and Canada.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule “A” Commitments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75.</td>
<td>Throughout the construction and operation phases, De Beers will monitor whether the actual impacts to ELC units exceed or differ from those predicted in the EAR. The loss or alteration of ELC units due to the development of the Snap Lake Mine will be mapped annually and the aerial extent of change compared to predicted impacts.</td>
<td>2.1.1</td>
<td>Area of Impact Monitoring Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1.2</td>
<td>ELC Area Monitoring Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appendix B</td>
<td>Rationale for Change in the VMP from the EA</td>
</tr>
<tr>
<td>96.</td>
<td>The Snap Lake Mine will implement decommissioning and reclamation monitoring program that will extend and evolve through construction, operation, and decommissioning phases of the Mine.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>97.</td>
<td>Emerging technology and techniques will be implemented as they become available and the program will continue to evolve in consultation with government organizations and communities.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>Section</td>
<td>Requirement/Commitment</td>
<td>VMP Section</td>
<td>VMP Heading</td>
</tr>
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<td>---------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<td>--------------------------------------------------</td>
</tr>
<tr>
<td>98.</td>
<td>De Beers will develop an adaptive management approach to reclamation that will incorporate the results of the revegetation and experimental test plot program. Research and reclamation approaches that have been developed as part of other mine operations in the region (e.g. Dominion Diamond Ekati Diamond Mine) will also be employed as appropriate.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>99.</td>
<td>De Beers is committed to a program of progressive reclamation at Snap Lake. Progressive reclamation has been built in as an integral part of the mine plan.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
<tr>
<td>102.</td>
<td>With respect to contaminant uptake by roots of plants that grow on the North Pile, De Beers committed to monitor to see if there is root penetration to the processed kimberlite (North Pile). If so, and if the leachate is showing to be acidic, then De Beers indicated it will monitor plant tissue for any kind of metal uptake.</td>
<td>2.1.3</td>
<td>Passive Regeneration Monitoring Program</td>
</tr>
</tbody>
</table>

Note – The revegetation final design includes monitoring of revegetation and metals uptake within the LSA post-reclamation.

VMP = Vegetation Monitoring Program; ELC = ecological land classification; EAR = environmental assessment report; GNWT = Government of the Northwest Territories; MVEIRB = Mackenzie Valley Environmental Impact Review Board.