



**Mackenzie Valley Land and Water Board**  
**7th Floor - 4922 48th Street**  
**P.O. Box 2130**  
**YELLOWKNIFE NT X1A 2P6**  
**Phone (867) 669-0506**  
**FAX (867) 873-6610**

## Reasons for Decision

<b>Land Use Permit &amp; Water Licence Applications</b>	
<b>Preliminary Screener</b>	Mackenzie Valley Land and Water Board
<b>Reference/File Number</b>	MV2005C0032, MV2005L2-0015
<b>Applicant</b>	De Beers Canada Inc.
<b>Project</b>	Gahcho Kué Project, Kennady Lake, NT

### Decision from Mackenzie Valley Land and Water Board

August 11, 2014

---

Issued pursuant to paragraph 40(2)(c) of the *Mackenzie Valley Land Use Regulations*  
 (MVLUR) and section 54 of the *Waters Act*

## **Table of Contents**

1.0 Background .....	4
2.0 Decision .....	7
3.0 General Principles for Land Use Permit MV2005C0032 and Water Licence MV2005L2-0015 .....	8
4.0 Determinations Pertaining to Water Licence MV2005L2-0015 .....	8
4.1 Requirements of Section 26 of the <i>Waters Act</i> .....	8
4.1.1 Existing Licensees .....	8
4.1.2 Existing Water Users .....	8
4.1.3 Water Quality Standards .....	9
4.1.4 Effluent Quality Standards .....	9
4.1.5 Financial Responsibility of the Applicant .....	9
4.1.6 Requirements of Subsection 27(2) of the <i>Waters Act</i> .....	10
4.2 Environmental Impact Review Measures .....	10
4.3 Water Licence MV2005L2-0015 Terms and Conditions .....	10
4.3.1 Water Licence Term .....	10
4.3.2 Part A: Scope and Definitions .....	12
4.3.3 Part B: General Conditions and Schedule 1 .....	14
4.3.4 Part C: Conditions Applying to Security Deposits and Schedule 2 .....	14
4.3.5 Part D: Conditions Applying to Water Use and Schedule 3 .....	17
4.3.6 Part E: Conditions Applying to Construction and Schedule 4 .....	18
4.3.7 Part F: Conditions Applying to Modifications .....	20
4.3.8 Part G: Conditions Applying to Water and Waste Management and Schedule 5 .....	20
4.3.9 Part H: Conditions Applying to Contingency Planning .....	29
4.3.10 Part I: Conditions Applying to Aquatic Effects Monitoring and Schedule 6 .....	30
4.3.11 Part J: Conditions Applying to Closure and Reclamation .....	33
4.3.12 Annex A: Surveillance Network Program .....	35
5.0 Land Use Permit MV2005C0032 Terms and Conditions .....	39
5.1 Part A: Scope of Permit .....	39
5.2 Part B: Definitions .....	39
5.3 Part C: Conditions Applying to All Activities .....	40
5.3.1 Control or Prevention of Ponding of Water, Flooding, Erosion, Slides, and Subsidence of Land .....	40
5.3.2 Use, Storage, Handling, and Ultimate Disposal of Any Chemical or Toxic Material .....	40
5.3.3 Wildlife and Fish Habitat .....	41

5.3.4 Storage, Handling, and Disposal of Refuse or Sewage .....	42
5.3.5 Security Deposit .....	42
5.3.6 Fuel Storage .....	42
5.3.7 Restoration of the Lands .....	42
5.3.8 Biological and Physical Protection of the Land .....	43
6.0 Conclusion.....	44
Appendix 1 – Detailed Reasons for Decision for Effluent Quality Criteria (EQC) .....	46
Appendix 2 – Detailed Reasons for Decision for the Determination of the Gahcho Kué Project	
Reclamation Security .....	90

## **1.0 Background**

### ***Initial Application***

On November 24, 2005, De Beers Canada Inc. (De Beers or Applicant) submitted applications for a Land Use Permit (Permit) and a Water Licence (Licence) for various activities associated with the Gahcho Kué Project (the Project) to the Mackenzie Valley Land and Water Board (MVLWB or Board). The scope of the applications included the use of land and water and the disposal of waste associated with diamond mining and milling for the Project. The applications were circulated for review and comment, and subsequently referred to the Mackenzie Valley Environmental Impact Review Board (MVEIRB or Review Board) for Environmental Assessment by Environment Canada on December 22, 2005.

### ***Environmental Assessment***

On January 4, 2006 the Review Board commenced Environmental Assessment 0506-008. On June 12, 2006, the Review Board ordered an Environmental Impact Review 0607-001.

### ***Environmental Impact Review***

On July 19, 2013 the Review Board released their [Report of Environmental Impact Review and Reasons for Decision](#) for the Project. After considering the evidence, the Review Board concluded, pursuant to subsection 134 (2) of the *Mackenzie Valley Resource Management Act* (MVRMA), that the proposed project was likely to cause significant adverse impacts to the environment. The Review Board set out measures which, if adopted, would ensure that the impacts would no longer be significant. On October 22, 2013, the Minister of Aboriginal Affairs and Northern Development Canada approved Environmental Impact Review 0607-001; this included the acceptance of the three measures that were recommended by the Review Board.

### ***Post- Environmental Impact Review Regulatory Process***

On October 22, 2013, the regulatory process for the Project resumed, pursuant to paragraph 129 (a) of the MVRMA. The Board sent a letter to De Beers detailing the post-Environmental Impact Review submission requirements, including the requirement of an Updated Project Description. On November 14, 2013, the Board determined, pursuant to section 22(2)(b) of the MVLUR, that further studies and/or a hearing was required for the Permit in order to align the review process for the Permit and Licence applications. De Beers submitted an updated application package<sup>1</sup>, including the [Updated Project Description](#), to the Board on November 28, 2013.

On December 9, 2013, the Board circulated the updated application package for review and comment. A Work Plan was attached to the review, which established a schedule for the regulatory review of the applications. All parties were given the opportunity to participate in the regulatory process, which included review of the applications and draft Permit and Licence, and involvement in the technical session and public hearing processes.

---

<sup>1</sup> The following documents were submitted in the Application package: [Land Use Permit Application Form](#), [Water Licence Application Form](#), [Updated Project Description](#), [Engagement Plan](#), [Aquatic Effects Monitoring Program](#), [Groundwater Monitoring Program](#), [Geochemical Characterization Plan](#), [Air Quality and Emissions Monitoring and Management Plan](#), [Wildlife Effects Monitoring Program](#), [Vegetation and Soils Monitoring Program](#), [Closure and Reclamation Plan](#), [Adaptive Management Plan](#), [Explosives Management Plan](#), [Wildlife and Wildlife Habitat Protection Plan](#), [Emergency Response Plan](#), [Spill Contingency Plan](#), [Waste Management Framework](#), [Processed Kimberlite and Mine Rock Management Plan](#), [Erosion and Sediment Management Plan](#), [Water Management Plan](#), [Incinerator Management Plan](#), [Non-hazardous Solid Waste Management Plan](#), [Hazardous Materials and Waste Management Plan](#), and [Landfarm Management Plan](#).

On December 19, 2013, De Beers submitted a letter to the Board requesting the technical sessions be moved from February 10-12, 2014 to February 11-13, 2014 to accommodate participation in the De Beers Aquatic Effects Monitoring Program Workshop which was scheduled for February 10, 2014. Board staff revised the Work Plan to reflect the new dates of the technical sessions and on January 8, 2014 the revised Work Plan was circulated to reviewers.

Initial comments on the applications were submitted to the Board by January 16, 2014, and De Beers responded to reviewer's comments on January 27, 2014. Review comments were received from Aboriginal Affairs and Northern Development Canada (AANDC), Akaitcho Interim Measures Agreement Office, Environment Canada (EC), Government of the Northwest Territories – Department of Environment and Natural Resources (GNWT-ENR), and the Yellowknives Dene First Nation (YKDFN).

Technical sessions were held on February 11-13, 2014, in Yellowknife, NT, to discuss and seek clarity on issues raised by reviewers and Board staff during the review. The technical sessions were facilitated by Board staff and consultants. Attendees included; De Beers, AANDC, EC, GNWT-ENR, GNWT – Industry, Tourism and Investment, Department of Fisheries and Oceans Canada (DFO), Canadian Northern Economic Development Agency (CanNor), YKDFN, North Slave Metis Alliance (NSMA), and the Tlicho Government. Information Requests (IRs) resulting from these sessions were circulated to the participants at the end of each day. AANDC submitted a response to their IR on February 14, 2014 and De Beers submitted their responses to IRs on February 21, February 24, March 5, and March 27, 2014.

During the third day of the technical sessions, AANDC requested the Work Plan be adjusted to allow additional time for the submission of interventions.<sup>2</sup> Board staff rescheduled the intervention submission deadline and a revised Work Plan was circulated to reviewers on February 20, 2014.

On March 10, 2014, Board staff distributed a draft Licence (v.1) for review. Comments on the conditions were received from De Beers, GNWT-ENR, EC, YKDFN and Deninu Kue First Nation (DKFN).

On March 18, 2014, Board staff held a pre-hearing conference in Yellowknife, NT to discuss the conduct of the public hearing, the intervention presentations, and to briefly outline the Board's Rules of Procedure. The pre-hearing conference was attended in person by representatives from De Beers, CanNor, AANDC, and GNWT-ENR; YKDFN and NSMA participated over the phone.

Notice of the public hearing was advertised in the *News North* newspaper the week of March 17, 2014, and indicated the hearing was scheduled to occur May 6-8, 2014, in Yellowknife, NT. On March 21, 2014, Board staff sent a hearing notice to the distribution list and included the date for filing interventions. Public hearing interventions were received from GNWT-ENR, EC, NSMA, YKDFN and DKFN on April 7, 2014. De Beers submitted a response to interventions on April 14, 2014.

On April 1, 2014, just prior to the submission of the interventions, the devolution of the federal government's land and water resource management responsibilities occurred. Public hearing presentations were received from GNWT-ENR, EC, NSMA, YKDFN and DKFN on April 17, 2014. De Beers submitted a public hearing presentation on April 25, 2014.

---

<sup>2</sup> See technical transcript for February 13, 2014, pages 197-201.

On April 8, 2014 Board staff received a request from the YKDFN to extend the review period of the draft Licence (v.2) and draft Permit (v.1) from June 5, 2014 to June 10, 2014. Board staff requested comments from the various review organizations regarding this proposed extension. No comments on the proposed change were received. The extension was granted and the revised Work Plan was circulated to reviewers on April 14, 2014.

A public hearing was held, in accordance with section 42 of the *Waters Act* and section 24 of the MVRMA, in Yellowknife, NT on May 6 and 7, 2014 at the Tree of Peace Friendship Centre. Chipewyan translation services were provided and the proceeding was recorded and transcribed. The public hearing transcripts for the hearing are available on the Board's Online Registry.<sup>3</sup>

During the course of the public hearing, De Beers was required to provide eight undertakings (#1-5 and #8-10) to the Board, and the GNWT-ENR was required to provide two undertakings (#6 and #7) to the Board. The eight undertakings were as follows:

- Undertaking #1: De Beers Canada Inc. to provide to the MVLWB an updated Standard Operating Procedure (SOP) for handling potentially acid generating (PAG) and Non-PAG rock. The SOP shall include the placement procedures (including volumes of rock), and the verification process for the rock placement strategy. Due May 9, 2014.<sup>4</sup>
- Undertaking #2: De Beers Canada Inc. to provide to the MVLWB with information to support De Beers' request to have several management plans submitted within 60 days of water licence issuance. For example, please provide the sequence of construction activities and critical paths, including times, in relation to the submission of the plans and programs required for the Water Licence and Land Use Permit. Due May 15, 2014.<sup>5</sup>
- Undertaking #3: De Beers Canada Inc. to provide to the MVLWB an example of how the values in the last column of Table E.3 of the EQC Report (labeled the "Estimated Maximum Concentrations at the Edge of the Mixing Zone") were calculated. Please define the equation used and the actual numbers used in the equation. A sample calculation only has to be done for one parameter. Due May 15, 2014.<sup>6</sup>
- Undertaking #4: De Beers Canada Inc. to provide to the MVLWB the equations used as well as the rationale for the calculation of the ammonia EQC. Please clarify the apparent inconsistencies in the discussion at the top of page 36 of the EQC Report and the discussion on ammonia in section 3.2.1. Due May 15, 2014.<sup>7</sup>
- Undertaking #5: De Beers Canada Inc. to provide to the MVLWB further information related to predicted hardness concentrations in the water management pond over time. Please update Table D.2 of the EQC Report to include hardness. Due May 15, 2014.<sup>8</sup>
- Undertaking #6: Government of the Northwest Territories – Environment and Natural Resources to provide to the MVLWB any regulatory reference(s) for re-vegetation covers on waste rock piles. Due May 15, 2014.<sup>9</sup>

---

<sup>3</sup> See Public Hearing transcript for [May 6, 2014](#) and [May 7, 2014](#).

<sup>4</sup> See pages 197-201 of the Public Hearing transcript for May 6, 2014

<sup>5</sup> See pages 139-141 of the Public Hearing transcript for May 6, 2014.

<sup>6</sup> See pages 144-145 of the Public Hearing transcript for May 6, 2014.

<sup>7</sup> See pages 146-148 of the Public Hearing transcript for May 6, 2014.

<sup>8</sup> See pages 149-150 of the Public Hearing transcript for May 6, 2014.

<sup>9</sup> See pages 210-212 of the Public Hearing transcript for May 6, 2014.

- Undertaking #7: Government of the Northwest Territories – Environment and Natural Resources to provide to the MVLWB any comments or documents provided to De Beers Canada Inc. in relation to the Wildlife and Wildlife Habitat Protection Plan and the Wildlife Effects Monitoring Plan. Due May 15, 2014.<sup>10</sup>
- Undertaking #8: De Beers Canada Inc. to provide to the MVLWB any available data that is related to E. coli from existing baseline studies for Lake N11 and Area 8. Due May 15, 2014.<sup>11</sup>
- Undertaking #9: De Beers Canada Inc. to provide to the MVLWB a map, of appropriate scale, that shows where the discharge point and intake point are in Lake N11. Due May 15, 2014.<sup>12</sup>
- Undertaking #10: De Beers Canada Inc. to provide to the MVLWB an update on proposed forward looking Engagement activities, with a description of current and future plans. Due May 15, 2014.<sup>13</sup>

De Beers submitted Undertaking #1 on May 9, 2014 and the remaining undertakings were submitted on May 15, 2014.

Following the submission of the undertakings, Board staff prepared a draft Licence (v.2) and draft Permit (v.1) and distributed them for review on May 23, 2014. When these drafts were distributed, the MVLWB clearly indicated that:

- “The purpose of the draft Permit and Licence is to allow parties to comment on Board staff’s suggested conditions;
- These draft materials are not intended to limit in any way the scope of parties’ closing arguments; and
- The Board is not bound by the contents of the draft Permit and Licence and will make its decision at the close of the proceeding on the basis of all the evidence and arguments filed by all parties.”

Comments and recommendations on the draft Permit (v.1) were submitted by DKFN, DFO, GNWT-ENR and Lutsel K’e Dene First Nation (LKDFN) and on the draft Licence (v.2) by DKFN, EC, DFO, GNWT-ENR, and LKDFN.

Closing arguments were provided to the Board in writing, from Interveners by June 24, 2014 and from De Beers on July 1, 2014. Parties had an opportunity, in their closing arguments, to update their position on issues raised during the public hearing and to summarize their final recommendations to the Board.

## **2.0 Decision**

After reviewing the evidence and submissions from De Beers and the written comments and submissions from parties received by the Board, and having due regard to the facts, circumstances, and the merits of the submissions made to it, and to the purpose, scope, and intent of the MVRMA, MVLUR and the *Waters Act* made thereunder, the Board has determined that Permit MV2005C0032 and Licence MV2005L2-0015 be issued, subject to the scopes, terms, and conditions contained therein. The Board’s determinations and reasons for this decision are set out below.

---

<sup>10</sup> See pages 231-234 of the Public Hearing transcript for May 6, 2014.

<sup>11</sup> See pages 136-138 of the Public Hearing transcript for May 7, 2014.

<sup>12</sup> See pages 139-140 of the Public Hearing transcript for May 7, 2014.

<sup>13</sup> See pages 151-154 of the Public Hearing transcript for May 7, 2014.

### **3.0 General Principles for Land Use Permit MV2005C0032 and Water Licence MV2005L2-0015**

In conducting the review process for the Permit and Licence applications, the Board has ensured that all applicable legal and procedural requirements have been satisfied, including:

- Notice of the Permit and Licence applications was given in accordance with sections 63 and 64 of the *Mackenzie Valley Resource Management Act* (MVRMA) and section 23<sup>14</sup> of the *Northwest Territories Waters Act* (NWTWA). The Board is satisfied that a reasonable period of notice was given to Communities and First Nations so that they could provide comments to the Board.
- There was a public hearing held, in association with these applications, in Yellowknife, NT on May 6-7, 2014.
- The use of land proposed by the Applicant is of a nature contemplated by the MVRMA.
- It is the opinion of the Board that the terms and conditions attached to MV2005C0032 and MV2005L2-0015, pursuant to the MVRMA and the *Waters Act*, will prevent or mitigate any potential significant environmental impacts which might result from the Gahcho Kué Project. Specific conditions and how they relate to issues raised during the proceedings are discussed below.

The scopes, definitions, terms, and conditions set forth in the Permit and Licence have been developed in order to address the Board's statutory responsibilities and the concerns that arose during the regulatory process. These Reasons for Decision focus on the major issues and those that (1) were the subject of substantive argument submitted by one or more parties, or (2) resulted in the use of conditions that differ from those found on the MVLWB Standard Land Use Permit Conditions Template (Standard Template).

### **4.0 Determinations Pertaining to the Water Licence (MV2005L2-0015)**

#### **4.1 Requirements of Section 26 of the Waters Act**

##### **4.1.1 Existing Licensees**

After reviewing the submissions filed on the Public Registry and made at the public hearing, the Board is satisfied that, with respect to paragraph 26(5)(a) of the *Waters Act*, the granting of this Licence to De Beers will not adversely affect, in a significant way, any existing Licensee, provided that compliance with the conditions of the Licence are adhered to. There are no other applicants with precedence.

##### **4.1.2 Existing Water Users**

Paragraph 26(5)(b) of the *Waters Act* prohibits the issuance of a Licence unless the Board is satisfied that appropriate compensation has been or will be paid by the Applicant to people who were, at the time when the Applicant filed its application with the Board, members of the classes of water users depositors, owners, occupiers, or holders listed under paragraph 26(5)(b), who would be adversely affected by the use of waters, or deposit of waste proposed by the Applicant.

---

<sup>14</sup> The NWTWA was in force at the time when notice was given. As of April 1, 2014, section 43 of the *Waters Act* applies, which mirrors section 23 of the NWTWA.

The Board received no claims for compensation either during the prescribed period or afterwards. Provided that compliance with the Licence conditions is achieved, the Board does not believe that any users or persons listed in paragraph 26(5)(b) of the *Waters Act* will be adversely affected by the use of Waters or the deposit of Waste proposed by the Applicant.

#### **4.1.3 Water Quality Standards**

With regards to subparagraph 26(5)(c)(i) of the *Waters Act*, the Board is satisfied that compliance with the Licence conditions will ensure that waste produced by the Project will be collected and disposed of in a manner which will maintain water quality consistent with applicable standards and the Board's *Water and Effluent Quality Management Policy*. Refer to section 4.3.8 (Part G: Conditions Applying to Water and Waste Management and Schedule 5 of the Licence) for more information.

#### **4.1.4 Effluent Quality Standards**

Consistent with subparagraph 26(5)(c)(ii) of the *Waters Act*, the Board is satisfied that the effluent quality standards it has set out in the Licence as conditions are consistent with the Board's *Water and Effluent Quality Management Policy* and will protect the receiving waters and environment. These are summarized below in section 4.3.8 (Part G: Conditions Applying to Water and Waste Management and Schedule 5 of the Licence) and are discussed in detail within Appendix 1 (Detailed Reasons for Decision for Effluent Quality Criteria) attached to these Reasons.

#### **4.1.5 Financial Responsibility of the Applicant**

The Board must satisfy itself of the financial responsibility of De Beers under paragraph 26(5)(d) of the *Waters Act* before it can issue the Licence.

This matter was investigated in the public hearing through questioning of De Beers' Chief Operating Officer, Mr. Glen Koropchuk. Mr. Koropchuk was asked to confirm that the financial capacity of the applicant is sufficient to deal with the completion of the undertaking and the ultimate closure and reclamation of the project; and more specifically, whether the Joint Venture Agreement between De Beers and Mountain Province Diamonds would have any effect on De Beers' financial capacity.<sup>15</sup> Mr. Koropchuk confirmed that De Beers is the operator of the Project and will be financially liable for all of the funding related to the joint venture, including the responsibilities associated with posting any required security.<sup>16</sup>

The financial security conditions in the Licence and Permit require initial deposits shortly after approval, with additional deposits phased to match the increasing liability as the Project progresses. In this way, the liability at the site is completely matched by security deposits as the Project proceeds through each phase of construction, operation, and closure. This approach is consistent with AANDC's *Mine Site Reclamation Policy for the Northwest Territories* (2002). Consequently, the Board is satisfied that the requirements it has imposed are sufficient to protect the environment and ensure that the Gahcho Kué Project is restored. In the Board's opinion, paragraph 26(5)(d) of the *Waters Act* has been satisfied.

---

<sup>15</sup> See hearing transcript for May 6, 2014, pages 169-170.

<sup>16</sup> See hearing transcript for May 6, 2014, page 170.

As is indicated below in these reasons (Part A through J of the Licence), the Board has imposed terms and conditions sufficient to protect water resources, and the environment, and through the Permit, the land. In addition, the terms and conditions of the Licence, including financial security requirements, are in the Board's view sufficient to ensure satisfactory closure and reclamation of the Project.

#### **4.1.6 Requirements of Subsection 27(2) of the Waters Act**

It is the opinion of the Board that adherence to the Licence terms and conditions it has imposed on De Beers will ensure that any potential adverse effects on other water users, which might arise as a result of the issuance of the Licence, will be minimized.

### **4.2 Environmental Impact Review Measures**

The Gahcho Kué Project was the subject of an Environmental Impact Review conducted by the Review Board. The Report of Environmental Impact Review was approved by the federal and responsible Ministers on October 22, 2013 and included three measures and three suggestions. Section 62 of the MVRMA requires that measures within the jurisdiction of the Board must be reflected in conditions set out in any Licence or Permit issued by the Board.

The Board carefully reviewed each measure and suggestion from the Report of Environmental Impact Review to determine whether conditions reflecting the measures or suggestions could be included in the Licence or Permit. The Board noted that Environmental Impact Review measures are sometimes written in broad terms which are not appropriate for direct inclusion in a regulatory instrument or are not within the Board's jurisdiction. Furthermore, although the reflection of suggestions in a Licence or Permit is not mandatory, the Board reviewed the suggestions to ensure the closest possible conformity with the Report of Environmental Impact Review approved by the Ministers. In these reasons the Board has, where appropriate, identified those Licence and Permit conditions which in the Board's view, satisfy the intent and achieve the outcome of the Environmental Impact Review measures and suggestions relevant to its jurisdiction. In this way, the Board is of the opinion that the Licence has met the requirements of section 62.

### **4.3 Water Licence MV2005L2-0015 Terms and Conditions**

De Beers currently holds Licence MV2003L2-0005 which allows them to use water and dispose of waste for mining exploration and the extraction of bulk samples. The conditions of this Licence MV2005L2-0015 have been drafted to reflect inclusion and consolidation of the existing exploration Licence MV2003L2-0005 and clarify administrative requirements and enforcement for the Project as a whole.

#### **4.3.1 Water Licence Term**

De Beers requested a 20 year term in their November 28, 2013 Licence application; this would include the construction, operation and closure (refilling the lake) phases of the Project. De Beers reconfirmed their 20-year term request during the public hearing<sup>17</sup> and in their closing arguments<sup>18</sup>, and identified that changes or modifications to the Project could be captured in the monitoring and management plans through the adaptive management plans. De Beers also stated that there are a variety of tools within the Licence (e.g., the Aquatics Effects Monitoring Program, the Geochemical Characterization and Management Plan and Closure and Reclamation Plans) that address the level of uncertainty associated with this Project. De Beers

---

<sup>17</sup> See page 142 of the Public Hearing transcript for May 6, 2014.

<sup>18</sup> See De Beers closing arguments, submitted July 1, 2014.

has also committed to establishing working groups (e.g., wildlife and closure working groups) which will allow parties the opportunities to participate in Project oversight and to evaluate the Project on a regular and ongoing basis.

During the public hearing, EC indicated they would be amendable to a ten year<sup>19</sup> term given the length of the Project and the proposed phases, while affording for finalization of the closure and reclamation plans during the operational life of the Project. This would allow for a full review of project documentation to develop a subsequent licence which would encompass the entire closure phase. The DKFN recommended a term between seven to nine years<sup>20</sup> as that would allow for the review of the entire Licence and project closer to the end of the Project's operation period, prior to the transition into the closure and reclamation period. The YKDFN indicated that a term of five or eight years<sup>21</sup> would be appropriate as this would allow opportunities to review predictions and operations, and would be consistent with YKDFN's submission regarding the De Beers Snap Lake Project. The NSMA indicated that they were in agreement with the term put forth by the DKFN, a term of seven to nine years,<sup>22</sup> which would allow for the review of all structures related to the Project phases.

In their closing arguments, DKFN reconsidered their original recommendation and came back with a proposed term of five to eight years<sup>23</sup> which would allow for a higher level of scrutiny until De Beers could demonstrate a proven track record in environmental compliance.

In their closing arguments, GNWT-ENR suggested a thirteen year<sup>24</sup> term as it would align with the construction and operational phases as presented by De Beers. The renewal process would then provide the Board with the opportunity to develop a closure specific licence for the closure phase of the project, which would rely heavily upon information collected during the operational phase.

The Board believes it will be useful to ensure that at least two years of the Aquatic Effects Monitoring Program (AEMP) monitoring after commencement of operational discharge should occur before making any substantial changes to the Licence. The Board has established a variety of tools within the Licence (the AEMP, actions levels and associated response plans within management plans, closure and reclamation planning, Standard Operating Procedure/Rock Placement Verification Program, etc.), which will provide parties with numerous opportunities to evaluate the project on an on-going basis. Consideration was also given to having the term of this Licence run in tandem with the term of the Permit; taking potential Permit extensions and renewal opportunities into consideration (i.e. a five-year Permit, with the potential for a two-year extension, followed by a potential five-year renewal Permit with the potential for a two-year extension). The Board has decided to grant a term of 14 years for this Licence.

---

<sup>19</sup> See page 45 of the Public Hearing transcript for May 7, 2014.

<sup>20</sup> See pages 77-78 of the Public Hearing transcript for May 7, 2014.

<sup>21</sup> See page 115 of the Public Hearing transcript for May 7, 2014.

<sup>22</sup> See pages 132-133 of the Public Hearing transcript for May 7, 2014.

<sup>23</sup> See DKFN closing arguments, submitted June 25, 2014.

<sup>24</sup> See GNWT-ENR closing arguments, submitted June 24, 2014.

### **4.3.2 Part A: Scope and Definitions**

#### Scope

The scope of the Licence ensures the Licensee is entitled to conduct activities which have been applied for and assessed during the Environmental Impact Review pursuant to Part 5 of the MVRMA and the components that were subsequently screened by the Board on March 20, 2014. In setting out the scope of the Licence, the Board endeavoured to provide enough detail to identify and enable the authorized activities, but not so much detail that De Beers' activities would be unduly restricted. As a result, the Board included a list of authorized activities in the scope of the Licence.

LKDFN indicated in their comments on draft Licence (v.2) that the Board should consider stronger enforcement under the MVLUR for circumstances of non-compliance with the conditions of the Permit and Licence.<sup>25</sup> The Board has the authority to suspend or cancel a Permit in accordance with subsection 59(1) of the MVRMA and to suspend a Licence in accordance with subsection 38 of the *Waters Act*.

In their comments on the draft conditions, De Beers proposed that the scope include the landfill. The Board did not include this, as the landfill is a part of the waste rock piles.<sup>26</sup>

In their comments on the draft Licence (v.1), the DKFN recommended that '*the Ni Hadi Yati agreement made between De Beers Canada Inc. and Indigenous Parties*' be added following item c, '*...comply with the requirements of any applicable Federal, Territorial or municipal laws*'. The Board did not include this as any agreements made between De Beers and other parties are not within the Board's jurisdiction. The DKFN further requested that the scope of the Permit and the Licence be consistent. The Board notes that there are slight differences between the scopes of the Licence and the Permit. The Board has decided to place water-related activities within the scope of the Licence, and land-related activities within the scope of the Permit.

#### Definitions

The Board defined a number of terms used in the Licence in order to ensure a common understanding of conditions and to avoid future differences in interpretation. For the most part, the definitions used wording similar to that found in other Licences issued by the Board. Where appropriate, the Board created new definitions or changed standard wording, as described below:

- Area 8, Controlled Area, Collection Ponds, Coarse Processed Kimberlite Containment Facility, Fine Processed Kimberlite Containment Facility, South Mine Rock Pile, and West Mine Rock Pile: These components of the Project are site-specific and are mentioned in many conditions. The definitions are based on descriptions provided in the applications and subsequent documentation.
- Construction and Operations: These definitions are used throughout the Licence to establish deadlines for various submissions, and several Licence conditions stipulate that Construction cannot begin until the Board has approved those submissions. They also identify the transition of Kennedy Lake into a Water Management Pond; the start of milling; and the shift into closure; all of these events trigger security requirements.

---

<sup>25</sup> See LKDFN comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, June 10, 2014.

<sup>26</sup> See De Beers comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, June 17, 2014.

- Drawdown: De Beers initially defined both drawdown and dewatering,<sup>27</sup> since some areas of Kennady Lake will only be partially drawn down, and other areas will be completely drawn down. Since all areas to be drawn down are within the Controlled Area, and the discharge points are the same, the Board has not found it necessary to distinguish between partial and complete drawdown for the purposes of the Licence conditions. Accordingly, the Board has decided to define drawdown broadly as the removal of water from Kennady Lake.
- Engineered Structures: This is defined to include facilities which have been engineered, for which construction and as-built drawings and inspections are required. Specific engineered structures which meet the definition of a dam, in accordance with the *Dam Safety Guidelines*, have additional specific inspection requirements.
- Modifications: This definition is used in Part F. De Beers requested that “*substantially*” be added before ‘...*alter the purpose or function of a structure*’ in their comments on the draft Licence (v.1). Modification is defined within the Exemption List Regulations. As such, the Board did not change this definition.
- Overburden: This definition is used throughout the Licence and is supported by the definition of Waste Rock. EC recommended rewording the definition to specifically identify that it includes the lake-bottom sediments and/or till that overlies the host/country rock and kimberlite.<sup>28</sup> De Beers agreed with this recommendation. The Board is of the opinion that the definition in the Licence is comprehensive enough to include this recommendation from EC.
- Reclamation Materials: This definition supports the requirement in Part E, item 15 to stockpile Reclamation Materials. The definition is broad and is meant to include all possible reclamation materials generated at the site.
- Waste Management Plan: This definition is used within the Licence. De Beers recommended this definition be specific to only hazardous and non-hazardous waste management. The approved MVLWB *Guidelines for Developing a Waste Management Plan* does not limit this plan to hazardous and non-hazardous waste management. A list of waste types that should be included in the Plan is provided on page 13 of these Guidelines, and includes, but is not limited to hazardous and non-hazardous wastes. The Board has not included this recommendation in the definition as these waste types are referenced in the Guidelines and should therefore be included in the Waste Management Plan.
- Waste Rock: This definition is used throughout the Licence. De Beers requested this term be changed to “Mine Rock” to be consistent with the term used throughout the Environmental Impact Review and in the updated project description and management plans. The Board has chosen the term “waste rock” as it better describes the nature of the rock in terms of how this rock will be managed and to be consistent with other similar licences. A note has been added to the end of the definition to clarify that this material has been referred to as “mine rock” during the Environmental Impact Review and in the application and supporting materials documents.
- Water Management Pond: In the draft Licences (v.1 and v.2), the Water Management Pond was defined as Areas 3 and 5 of Kennady Lake, which was consistent with the Updated Project Description. In response to the draft Licence (v.2), ENR pointed out that it must be clear when these Areas form the Water Management Pond and are no longer considered Kennady Lake.<sup>29</sup> This is critical for determining when different discharge criteria apply and is

---

<sup>27</sup> Application, Draft Water Licence, November 24, 2013.

<sup>28</sup> See EC comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, June 10, 2014.

<sup>29</sup> See ENR comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, June 10, 2014.

also relevant to the timing for submission of related management plans and security. In its June 17, 2014 response, De Beers suggested that Areas 3 and 5 would become the Water Management Pond when milling commences. This is expected to occur near the end of the initial two-year construction period, which is consistent with the timeline proposed by De Beers for the completion of drawdown.<sup>30</sup> The Board notes that before the completion of drawdown of Kennady Lake, Operations will have commenced, as Operations begins when kimberlite has been mined. At this point some groundwater from the first open pit will be combined with drawdown water for discharge to Lake N11 and Area 8; however, no process water will have been discharged prior to this point because milling will not have commenced.<sup>31</sup> The Board notes that there is a time differential between the commencement of Operations (mining of kimberlite) and “turning the key” in the process plant (commencement of milling). The Board did not receive any other recommendations regarding the definition of the Water Management Pond and has incorporated the clarification provided by De Beers.

#### **4.3.3 Part B: General Conditions and Schedule 1**

Part B of the Licence applies to matters regarding compliance and conformity with the MVRMA and the *Waters Act*, and is consistent with standard conditions found in previous Licences issued by the Board. This section addresses water use fees and conformity and compliance with plans, the Surveillance Network Program (SNP), and the Schedules which are appended and annexed to and form part of the Licence. This section also addresses signage, measuring devices, public engagement requirements and annual water licence reporting. Schedule 1 details the requirements for the Annual Water Licence Report required by Part B, item 10 of the Licence.

De Beers had requested the Board consider a submission date of May 1 of the Annual Water Licence Report, as that would allow for an extended engagement period prior to submission.<sup>32</sup> The DKFN requested a submission date of March 31, as May is a busier time of year and there would be fewer people and resources available to review the report.<sup>33</sup> The DKFN also stated that as the monitoring occurs throughout the year, March 31 affords ample time to prepare the report. As engagement should be ongoing throughout the year, and to allow time to implement adaptive management before the open water season occurs, the Board has set the submission date of the Annual Water Licence Report to March 31.

#### **4.3.4 Part C: Conditions Applying to Security Deposits and Schedule 2**

This section of the Licence, by reference to Schedule 2, sets the level of security to be maintained by the Licensee and sets out requirements related to posting and updating security. As in other licences, the Board may request a security update from the proponent at any time, and may adjust the security amount at any time, based on available information. Specifically, Part C items 3 and 4 stipulate that the Board can revise the security deposit and that the Licensee will post the new deposit within 90 days. This condition pertains to both increases and reductions in security.

---

<sup>30</sup> Application, Updated Project Description and Water Management Plan, November 24, 2013.

<sup>31</sup> Pages 6, 14, 16, and 24 of the Application - Water Management Plan; Pages 3-2 and 3-3 of the Updated Project Description.

<sup>32</sup> See page 37 of the Public Hearing transcript for May 6, 2014.

<sup>33</sup> See pages 59 – 60 of the Public Hearing transcript for May 7, 2014.

The purpose of these conditions is to implement the direction provided in AANDC's Mine Site Reclamation Policy for the Northwest Territories, chiefly, that "Adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure, is born by the operator of the mine rather than the Crown".<sup>34</sup> The Board is authorized to set the security deposit amount by subsection 35(1) of *the Waters Act* and the regulations<sup>35</sup> promulgated under that Act.

With the exception of Part C, item 5, the conditions in this section are similar to those found in other Licences issued by the Board.

Part C, item 5 includes a provision for a revised Project Reclamation liability estimate after the Board approves the Rock Placement Verification Program Report in accordance with Part E, item 7 of the Licence. This condition is based on the uncertainties expressed by reviewers regarding the predications made by De Beers regarding the segregation and behaviour of PAG materials, and more specifically, the costs associated with the appropriate reclamation of these materials. A large discrepancy between the security estimates proposed by De Beers and GNWT-ENR was associated with the need to segregate and rehandle PAG materials. The outcome of the verification program will provide information to determine the actions which are appropriate for reclaiming this material, will influence how mine development proceeds, and will provide additional evidence for predictions on the costs associated with reclamation.

The remainder of this section of the reasons addresses how the Board set the security deposit amounts stipulated in the Licence and the Permit. The security deposits required by these two instruments are discussed together since the estimates deal with the same project and are intimately linked.

### Security Deposit Amounts

The Board has determined that the security deposit amount shall be \$83,835,700. Consistent with the Board's normal practice, the Board adopted the split between land and water security estimates in RECLAIM, and has placed the land liability amounts under the Permit, and the water liability under the Licence. \$67,148,612 is required under the Licence and \$16,687,088 is required under the Permit.

A detailed explanation of how the Board determined the total security deposit is provided in Appendix 2: Detailed Reasons for Decision for the Determination of the Gahcho Kué Project Reclamation Security.

---

<sup>34</sup> AANDC's duties regarding security for projects on non-federal lands have been passed to the GNWT. The AANDC Policy has been a fundamental underpinning to the Board's security-related decisions in the past, and in the absence of official direction from the GNWT on how the Policy applies under devolution; the Board has continued to rely on this Policy for decision-making related to this Licence.

<sup>35</sup> Subsection 11(1) of the *Waters Regulations*.

### Phased Security Payments

GNWT-ENR proposed a security payment schedule that coincides with specific operational milestones, acknowledging that “the total liability for the Gahcho Kué Project would not be realized within the first several years of operation at the project site”.<sup>36</sup> De Beers agreed to the construction phase liability, including the amount;<sup>37</sup> however, De Beers proposed a more detailed break-down of security payments coinciding with milestones during Operations and disagrees with the liability amount for the Operations phases.<sup>38</sup>

The Board agrees that security can be posted under a phased payment schedule, as this is consistent with AANDC’s *Mine Site Reclamation Policy for the Northwest Territories*, which states that:

*The total financial security for final reclamation required at any time during the life of the mine should be equal to the total outstanding reclamation liability for land and water combined (calculated at the beginning of the work year, to be sufficient to cover the highest liability over that time period) (page 6).*

The Board has selected the following milestones for the security payment schedule, as described in Schedule 2 of the Licence and in Appendix 2 of the reasons:

**Table 1: Total Security Deposits Required for the Gahcho Kué Project**

<b>Phased Payment Schedule</b>			
	Total (cumulative total)	Land (cumulative total)	Water (cumulative total)
<b>Construction Phase</b>			
Prior to Initiating Construction Activities	\$15,429,858	\$11,816,392	\$3,613,466
One Year following the Initiation of Construction Activities	\$19,043,323	N/A	\$7,226,931
<b>Operation Phase</b>			
Prior to Year 1 of Operations	\$37,594,133	\$13,817,863	\$23,776,270
Prior to Year 4 of Operations	\$79,690,301	\$15,200,797	\$64,489,504
Prior to Year 7 of Operations	\$82,081,001	\$16,031,943	\$66,049,058
Prior to Year 11 of Operations	\$83,835,700	\$16,687,088	\$67,148,612

<sup>36</sup> See page 36 of GNWT-ENR intervention, submitted April 7, 2014.

<sup>37</sup> See page 16 of De Beers’ closing argument, submitted July 1, 2014.

<sup>38</sup> See page 4 of De Beers’ intervention response, submitted April 14, 2014.

Following the review of security, pursuant to Part C, item 3 or 5, the Board will adjust Schedule 2 of the Licence as needed. To estimate the amount of security to be posted at each milestone, the Board adopted the underlying assumptions from the RECLAIM model provided by GNWT-ENR, which are:

- The cost estimate assumes the company goes bankrupt or abandons the property,
- The cost estimate does not provide allowance for progressive reclamation,
- All work is based on independent, third party contractor rates,
- All costs are Canadian dollars, and use present values,
- The cost estimate does not include revenue from recovery of assets,
- The cost estimate assumes the project is developed substantially as planned and as per the scope of the licence, and
- The estimate does not include costs for catastrophic events.

#### **4.3.5 Part D: Conditions Applying to Water Use and Schedule 3**

Part D of the Licence contains conditions related to water use for the Project. Several of the conditions are consistent with standard conditions found in previous Licences issued by the Board. Schedule 3, item 1 addresses the quantity of fresh water permitted for withdrawal related to Part D, item 2 of the Licence. Schedule 3, item 2 addresses the quantity of water permitted for drawdown of Kennady Lake related to Part D, item 3 of the Licence. Schedule 3, item 3 details the requirement of a fish screen related to Part D, item 5. Schedule 3, item 4 provides guidance to calculating the maximum allowable water volume allowed in any single ice-covered season related to Part D, item 6 of the Licence.

De Beers indicated in their application that freshwater was only to be obtained from Area 8.<sup>39</sup> In their review of the draft Licence (v.2), De Beers indicated they wished to add Lake N11 as a source for freshwater withdrawal.<sup>40</sup> The Board has included both sources in Part D, item 1.

Water will be required for dust suppression. De Beers indicated in their review of the draft Licence (v.2) that sources of water for dust suppression for roads and pads outside the Controlled Area should include Area 8, Lake N11, and the Water Management Pond (if the water meets the EQC).<sup>41</sup> The Board has incorporated this recommendation into Part D, item 4 of the Licence for operational flexibility.

In their comments on the draft Licence (v.2), DFO offered the following suggestions pertaining to Part D:

- Item 5. As DFO's "*Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut*" is being referenced, and as it only applies to waterbodies that support fish and fish habitat, this condition should make that distinction.

---

<sup>39</sup> See De Beers' Application, submitted November 28, 2013.

<sup>40</sup> See De Beers' comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 17, 2014.

<sup>41</sup> Ibid.

In response to comments on the draft Licence (v.2), De Beers confirmed that the lakes that will be used for water withdrawal (Lake N11 and Area 8) are fish-bearing, so the Protocol applies. For this reason, the Board has decided to retain the condition as originally written in the draft Licences (v.1 and v.2). This approach is consistent with other Licences recently issued by the Board.

#### **4.3.6 Part E: Conditions Applying to Construction Schedule 4**

Part E of the Licence contains conditions related to construction activities at the mine site, and is consistent with standard conditions found in previous Licences issued by the Board. These conditions ensure that engineered structures are built to appropriate standards, and require the submission of design reports and engineering reports. New site-specific conditions were developed where necessary, as described below. The major decisions on conditions applying to construction are detailed in this section.

The submission deadlines in Part E are based on a consideration of a number of factors, including De Beers' project schedule.<sup>42</sup> The Board also considered how many other submissions are due at the same time, and whether certain plans might require the Board or other parties to hire outside expertise for review.

Part E, item 6 of the Licence requires De Beers to submit a Standard Operating Procedure (SOP) to the Board for approval, detailing the handling of PAG and Non-PAG rock during the construction and operation phases of the Project. The SOP is required to ensure that rock handling techniques are in place to minimize the potential for acid rock drainage and metal leaching of any materials used in construction, mining, and reclamation phases of the project.

Part E, item 7 of the Licence requires De Beers to conduct a Rock Placement Verification Program and submit a Rock Placement Verification Program Report to the Board for approval. These results will inform the Board of the accuracy of predictions made and the success of rock segregation practices detailed in the SOP. During the review of the draft Licence (v.2) De Beers stated that they do not agree with the requirement for a stand-alone verification program; they believe the intent of this condition is covered under the requirement for a Geochemical Characterization and Management Plan.<sup>43</sup>

The results of this program will provide necessary information regarding any future monitoring and reclamation activities that would be appropriate for the site; this includes rock handling procedures that would be necessary during operations for a "design for closure" approach. Any implications the results of the Rock Placement Verification Program have on waste rock handling and closure and reclamation options are required to be included in the Interim Closure and Reclamation Plan (ICRP) that shall be submitted within twenty four (24) months of issuance as per Part J, item 1 of this Licence. This data will also inform the security amount that should be in place to conduct the reclamation work, and is intimately linked to the security provision for a revised project reclamation liability estimate outlined in Part C, item 5 of the Licence. If predictions are shown to be correct, and segregation practices for handling PAG materials are successful, the need for re-handling PAG rock for placement in mined out pits may not be required and De Beers can apply for a security reduction. The re-handling of PAG materials has been accounted for in the current security amount under this Licence. The verification program is required to be submitted within 18 months of issuance; this timeline allows for a full review of

---

<sup>42</sup> See De Beers' response to Public Hearing Undertaking #2, submitted May 15, 2014.

<sup>43</sup> See De Beers' comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 17, 2014.

the program results prior to required security installments relating to operations and prior to the submission requirement for the ICRP.

The Board has decided to require a stand-alone verification program as the condition accounts for reporting of results in a timely manner to inform operational details described in the SOP as they relate to security, operations, and closure planning. The Geochemical Characterization and Management Plan is meant to be an overarching management plan that describes characterization and management practices, not operational procedures; results of monitoring described under the Geochemical Characterization and Management Plan are reported annually under the Annual Report and are not specifically designed to coincide with security payment schedules or closure planning. Furthermore, the Geochemical Characterization and Management Plan does not require Board approval prior to the commencement of construction. It is important that the rock handling procedures for the placement of PAG and Non-PAG rock is reviewed and approved prior to the commencement of construction activities because it will not be possible to locate and re-handle this material once it has been placed.

Part E, items 8 and 9 contain provisions for updating the SOP to reflect changes in operations or the results of the verification program, and to allow the Board to request a revised Rock Placement Verification Program if deemed necessary. This requirement allows for a focused review of the SOP if there are changes in operations or as a result of the verification program results.

Part E, item 10 of the Licence restricts the material that De Beers can use for construction and reclamation purposes. To prevent acid rock drainage and metal leaching, the geochemical characteristics of material used in construction must be regulated. For this reason, this condition defines the geochemical characteristics of Non-PAG material as less than 0.1% total sulphur, which reflects De Beers handling and management procedures as outlined in the Geochemical Characterization Plan<sup>44</sup> and the Processed Kimberlite and Mine Rock Management Plan<sup>45</sup> submitted to the Board as part of this application. The Board has also included a provision within this condition that provides an opportunity for De Beers to propose new criteria if they demonstrate that different Non-PAG criteria would have minimal potential for acid rock drainage and metal leaching.

Part E, item 11 requires the submission of Final Detailed Construction Plans for engineered structures. De Beers suggested in their comments on the draft Licence (v.2) that these submissions be referred to as Final Detailed Design Plans.<sup>46</sup> The Board has rejected this recommendation because Final Detailed Construction Plans include design drawings for the construction of facilities, whereas the title “Final Detailed Design Plans” may be misinterpreted to refer to as-built construction drawings; these are a separate requirement (Part E, item 14). Schedule 4, item 2, sets out the required contents for the final detailed construction plan required by conditions in Part E.

Part E, item 13 references the site manager as the contact for construction because De Beers requested this site-specific reference be included in this condition in their review of draft Licence (v.2).<sup>47</sup>

---

<sup>44</sup> See page 17, Geochemical Characterization Plan, submitted November 28, 2013.

<sup>45</sup> Processed Kimberlite and Mine Rock Management Plan, page 14, submitted to the Board November 28, 2013.

<sup>46</sup> See De Beers' comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 17, 2014.

<sup>47</sup> Ibid.

#### **4.3.7 Part F: Conditions Applying to Modifications**

Part F of the Licence contains conditions outlining when and how modifications of engineered structures, water management pond, sewage treatment plant and the processing plant facilities may be authorized. The conditions also ensure the Board and the Inspector are kept informed and have had the opportunity to request more information or reject the proposed modification. This section is closely linked to the construction section (Part E), which contains conditions related to the design and construction of engineered structures. Part F relies on the definition of modification, which does not include expansions, nor alterations of the purpose or function of a structure. Part F, item 1 has been revised to reflect the addition of new definitions that are site specific. Part F, items 2 and 3 are consistent with standard conditions found in previous Licences issued by the Board.

The purpose of Part F is to streamline the process for authorizing modifications and ensure that any proposed changes to structures that might be outside the scope of the Licence are brought to the Board's attention.

Part F, item 3 references the submission of as-built drawings for structures which have been modified. Not all structures which may require modifications will have Final Detailed Construction Plans, referred to in Part E, item 11. Therefore, following the completion of a modification only as-built drawings are required.

#### **4.3.8 Part G: Conditions Applying to Water and Waste Management and Schedule 5**

Part G of the Licence contains conditions related to water and waste management activities at the mine site, and is consistent with standard conditions found in previous Licences issued by the Board. Site-specific conditions were developed where necessary. Schedule 5 sets out the required contents of specific reports and plans where required by the conditions in Part G.

##### Management Plans and Monitoring Programs

Part G, item 1 sets out the objectives for the management of water and waste for the project. This condition is consistent with the principles of objective-based regulation: it essentially defines the objectives of any required management actions, plans or reports. This has become a standard in Licences issued by the Board, and reminds the Licensee of the need to manage water and waste with the goal of minimizing impacts on the receiving environment.

Part G, item 18 requires De Beers to annually review the Plans and, if revisions are necessary to reflect upcoming changes, submit revised plans to the Board for approval. It is the Board's opinion that these water and waste management planning requirements, and the associated review and approval process, are adequate to ensure water and waste is managed responsibly and to prevent impacts to land and water. This condition also provides a trigger for the Inspector to review the operation, in the context of the management plan and any changes in activities within the last year or planned for the forthcoming year.

##### Waste Management Plan

Part G, item 2 of this Licence includes a provision to submit a Waste Management Plan. De Beers submitted a plan to the MVLWB with the application; however, the plan was not developed in accordance with the MVLWB's *Guidelines for Developing a Waste Management Plan*. The guidelines "provide a template for proponents to write a plan and a benchmark for reviewers to evaluate a proponent's plan, thus ensuring that waste management plans are submitted and reviewed in a consistent way".

LKDFN requested in their review of draft Permit (v.1) that further conditions be included regarding the construction and operation of the landfarm, specifically with respect to requiring a timeline for the establishment of the facility. The Board notes that the guidelines require information about the development of landfarms in Waste Management Plans, and as such, has determined that additional conditions, related to the construction and operation of a landfarm, are not required. This approach is consistent with other licences issued by the Board.

GNWT-ENR provided a specific recommendation for a condition related to stack testing on the Project's incinerator.<sup>48</sup> De Beers responded that they "will conduct stack testing for Canada-wide standards for dioxins, and furans, and mercury." EC recommended that sewage sludge should not be incinerated.<sup>49</sup> De Beers made a commitment to reflect this, and plans to store the sewage sludge in the onsite landfill.<sup>50</sup>

In the Board's view, De Beers' commitments adequately address the need for stack testing. In addition, the Board has carefully considered the GNWT-ENR closing argument and does not agree that s.26(1)(i) of the MVLUR provides authority for a stack testing condition in the context of a Waste Management Plan required by the land use permit. In respect of the Licence, the broad definition of waste and prohibition against the deposit of waste in the *Waters Act*<sup>51</sup> are not unlimited in scope. The Board does not have general authority over air quality, including monitoring, and has concerns about the limits of its jurisdiction in relation to air quality. Stack testing is in the Board's view more closely related to air quality management than to preventing the deposit of waste to water.

The Board notes that requests for terms and conditions in Licences and Permits to address the management of incinerators are recurring features of its recent proceedings. This could be the result of the perception that there are no other vehicles to address this particular source of airborne contaminants. In the Board's view, parties with an interest in air quality should look for collaborative opportunities to address air quality matters in a way that will generate a lasting solution.

De Beers recommended that the Waste Management Plan be implemented in its current state until the Board has approved an updated Plan.<sup>52</sup> They state that it is their view that other parties have had considerable opportunity to provide input on the Plan, and as such, it can be implemented upon receipt of the of the Licence and Permit without the need for additional regulatory review. De Beers subsequently submitted an updated Waste Management Plan, including components relating to Hazardous and Non-Hazardous Waste, Incineration, and Landfarming on June 30, 2014 and July 1, 2014.

The Board requires the Waste Management Plan be for Board approval prior to the commencement of Construction activities. It is the Board's opinion that the waste management planning requirements shall be deemed appropriate prior to the generation of waste from the Project. The updated Plan will be distributed for review prior to the Board making a decision.

---

<sup>48</sup> See pages 180 – 181 of the Public Hearing transcript for May 6, 2014; GNWT-ENR comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

<sup>49</sup> See pages 38 – 39 of the Public Hearing transcript for May 7, 2014.

<sup>50</sup> See page 49 of the Public Hearing transcript for May 6, 2014.

<sup>51</sup> S.N.W.T. 2014, c.18.

<sup>52</sup> See De Beers comments, Gahcho Kué Project – Draft Permit (v.1)– Review Comment Table, submitted June 17, 2014; De Beers closing arguments, submitted July 1, 2014.

### Water Management Plans

Part G, items 3-5 and Schedule 5, items 1-3 describe the requirements for phased water management plans. An overall water management plan addressing all phases of the Project was submitted with the application. AANDC first raised the concept of phased Water Management Plans in its January 16, 2014 review comments, suggesting that a separate plan should be provided for the initial drawdown phase of the Project, noting that this phase will require “specific management actions that are independent from the normal operation of the mine.” While no other reviewers made similar recommendations during the initial review process, this concept was discussed briefly on the first and third day of the technical session,<sup>53</sup> and the NSMA and ENR formally recommended phased water management plans in their respective interventions.<sup>54</sup> Both parties noted that there will be significant differences in water management activities associated with each phase, specifically highlighting the winter discharge activities associated only with the construction phase.<sup>55</sup>

In its April 14, 2014 response to interventions, De Beers agreed to submit phased water management plans as recommended by ENR and the NSMA. Accordingly, the Board has separated the Water Management Plan into three phases – construction, operations, and closure. In order to allow time for review and Board decision, the operational and closure phases of the Plan are due a minimum of 60 days prior to commencing key activities associated with the relevant phase, which is consistent with what was proposed by De Beers and ENR. This 60-day timeline has not been specified for the Construction Water Management Plan, so that construction is not delayed following the Board’s decision on this Plan. This phase of the Plan must be submitted and approved by the Board prior to commencing dyke construction or drawdown. This approach satisfies the NSMA’s recommendation that winter discharge of drawdown water should not be initiated until action levels have been established<sup>56</sup> – these action levels are a required component of the Construction Water Management Plan. De Beers submitted an updated version of the Construction Water Management Plan on July 1, 2014. The updated Plan will be distributed for review prior to the Board making a decision.

### Groundwater Monitoring Program

Part G, item 6 and Schedule 5, item 4 list the requirements for the Groundwater Monitoring Program. The draft Groundwater Monitoring Program submitted with the application was “designed to provide information that will allow De Beers to assess the quantity and quality of inflows to the open pits and pit seepages to effectively manage mine water during the operation of the mine.” In their review comments on the application, both AANDC and MVLWB staff note that no action levels were established to determine when response actions, such as contingency plans and modelling updates, should be implemented.<sup>57</sup> In its January 28, 2014 response, De Beers committed to including action levels and addressing other information gaps<sup>58</sup> in the final Groundwater Monitoring Plan.

---

<sup>53</sup> See page 66 of the Technical session transcripts for February 11, 2014; page 181 of the Technical session transcripts for February 13, 2014.

<sup>54</sup> See NSMA Intervention, submitted April 8, 2014; ENR Intervention, submitted April 7, 2014.

<sup>55</sup> Ibid.

<sup>56</sup> See page 2, NSMA’s closing argument, submitted June 20, 2014.

<sup>57</sup> See item 33, AANDC Comments; items 56 and 57, MVLWB Staff Comments, Application - Review Comment Table.

<sup>58</sup> See items 58, 60, and 61, MVLWB Staff Comments, Application - Review Comment Table.

Following further discussion at the technical session with regard to action levels and contingencies for groundwater quantity and quality, EC and ENR's interventions included recommendations for the development of action levels in the Groundwater Monitoring Program.<sup>59</sup> DKFN also recommended that a response framework should be required in all management and monitoring plans.<sup>60</sup> As a result, the Board determined that a revised Groundwater Monitoring Program should be submitted for approval and must include action levels for groundwater quantity and quality, as well as information about how monitoring results are interpreted and linked to response actions.

### Drawdown and Discharge

Part G, item 7 sets restrictions on the daily flow rates at the outlets of Lake N11 and Area 8 when De Beers is discharging to these areas from drawdown or from the Water Management Pond. The maximum allowable daily flow rates for the outlets were proposed by De Beers in the draft Licence submitted with the application and were set equivalent to the peak baseline daily flow rates at these outlets for a one-in-two-year return period, with the intent of reducing the potential for increased erosion at these outlets and downstream.<sup>61</sup> According to information provided by De Beers at the technical session, modelling done during the EA that shows that the outlet of Lake N11 is resistant to erosion up to a 1:100 flood event,<sup>62</sup> suggests that limiting flow rates to a 1:2 maximum flow is adequately conservative in terms of erosion protection.

During discharge to either Lake N11 or Area 8, the total flow at the affected outlet will consist of both natural outflow and pumped discharge, and De Beers will need to adjust the discharge pumping rate such that the maximum outlet flow rate is not exceeded. This will include stopping discharge if the natural flow exceeds the maximum allowable daily flow rate at the affected outlet.

Although De Beers originally proposed flow monitoring at these outlets as part of the AEMP, the Board has included flow monitoring stations at these outlets as part of the Surveillance Network Program, because monitoring at these outlets is directly linked to compliance with Part G, item 8.

While the outlet flow rate restrictions in Part G, item 7 apply year-round, Part G, item 8 further directs the Licensee to cease winter discharge when established action levels are exceeded. This condition was included by the Board to address concerns raised by reviewers regarding the potential impacts associated with winter discharge as discussed above in relation to Part G, items 3-5.

As noted by AANDC in its January 16, 2014 application review comments and as acknowledged by De Beers in its January 28, 2014 response, winter discharge was first proposed in the draft water management plan that was submitted with the application, while only seasonal discharge was discussed during the Environmental Impact Review.<sup>63</sup> In the draft Water Management Plan, De Beers proposed downstream monitoring of water level, ice depth, and development of aufeis to determine the risk of increased spring-time erosion secondary to winter discharge.<sup>64</sup>

---

<sup>59</sup> See page 26, GNWT-ENR Intervention, submitted April 8, 2014; Page 23, EC Intervention, submitted April 7, 2014.

<sup>60</sup> See Page 1, DKFN Intervention, submitted April 3, 2014.

<sup>61</sup> See page 22, Application – Draft Water Management Plan, submitted November 24, 2013.

<sup>62</sup> See page 46 of the Technical session transcripts, February 11, 2014.

<sup>63</sup> See Item 26, AANDC Comments, Gahcho Kue – Application - Review Comment Table.

<sup>64</sup> Application, Draft Water Management Plan, November 24, 2013, page 16.

Following the review comment period and technical session discussions,<sup>65</sup> De Beers submitted a technical memorandum<sup>66</sup> that provided further information on proposed winter discharge, including a summary of baseline information, potential impacts, and monitoring. The memo also included preliminary recommendations for thresholds for suspending winter pumping based on monitoring results; however, as noted by De Beers during the technical sessions, additional baseline data collection in the spring of 2014 would further inform these thresholds, and this information was not expected to be available prior to the public hearing in May.<sup>67</sup> As such, specific action levels have not been set by the Board, but are to be developed by the Licensee in the Construction Water Management Plan as per Part G, item 3, and Schedule 5, item 1. Monitoring will also be conducted through the AEMP to verify erosion predictions.<sup>68</sup>

Part G, item 9 specifies the Effluent Quality Criteria (EQC) that apply at the end-of-pipe SNP stations in Lake N11 (SNP 02) and Area 8 (SNP 04) during drawdown of Kennady Lake. During drawdown, no waste streams will be mixed with the drawdown water, so the only identified parameter of potential concern will be total suspended solids (TSS), resulting from the disturbance of sediment on the lake bottom.

In the application, De Beers proposed a maximum average concentration (MAC) of 15 mg/L and a maximum grab concentration (MGC) of 30 mg/L for TSS during drawdown. Although a detailed draft EQC Report was included in the application, it was limited to discharge from the water management pond and didn't provide rationale for the proposed drawdown TSS EQC. At the technical session, De Beers then presented a TSS limit of 25 mg/L.<sup>69</sup> This was further clarified as a MAC of 15 mg/L and an MGC of 25 mg/L in De Beers' April 14, 2014 comments on the draft Licence (v.1).

At the technical session, both EC and Board staff requested clarification on how the proposed TSS EQC would be protective of the receiving environment.<sup>70</sup> IR 4 was subsequently issued for an assessment on the implications of discharge of 25 mg/L TSS into Lake N11 during drawdown. De Beers' February 24, 2014 response to IR 4 focused on the short-term CCME guidelines for TSS, which recommended a maximum increase of 25 mg/L from background levels for any short-term discharge. De Beers stated their intention to use turbidity as an indicator of TSS and to stop discharge if the MGC of 25 mg/L is expected to be exceeded. Based on this approach, De Beers expects that discharges of 25 mg/L of TSS would last less than 24 hours. Additionally, De Beers noted that TSS will only gradually increase as Kennady Lake is lowered and more sediment is disturbed, so most of the drawdown discharge will actually contain less than 25 mg/L TSS, and due to mixing, most organisms in Lake N11 would not be exposed to TSS concentrations of 25 mg/L. There was no indication of what the predicted TSS concentration would be at the edge of the mixing zone.

Parties did not comment further on the proposed TSS EQC in their interventions, during the public hearing, or in their closing arguments; and the proposed TSS EQC are consistent with the requirements in the Snap Lake, Ekati and Diavik Mine water licences. The Board has accepted the TSS EQC for drawdown as proposed by De Beers in its April 14, 2014 comments on the draft Licence (v.1). Action levels must be set in the Construction Water Management Plan, as per Schedule 5, item 1.

---

<sup>65</sup> See pages 53 -64 of the Technical session transcripts, February 11, 2014.

<sup>66</sup> See Technical session Information Response 1, submitted February 24, 2014.

<sup>67</sup> See page 63 of the Technical session transcripts, February 11, 2014.

<sup>68</sup> See page 50 of the Technical session transcripts, February 11, 2014.

<sup>69</sup> See page 33 of the Technical session transcripts, February 11, 2014.

<sup>70</sup> See pages 222-224 of the Technical session transcripts, February 11, 2014.

Part G, item 10 requires the submission of a Drawdown Summary Report within four months of completing the drawdown of Kennady Lake. This Report was first proposed by De Beers in the draft Licence submitted with the application. No comments or recommendations regarding the Drawdown Summary Report were received by the Board during the regulatory process. As per De Beers' proposal, the Drawdown Summary Report is expected to include the volume of water discharged during drawdown; the metered pumping rates; a description of any erosion problems encountered and subsequent response actions; the details and results of water quality monitoring conducted during drawdown; and a summary of any impacts and mitigation measures.

#### *Erosion and Sediment, and Explosives Management Plans*

Part G, items 11 and 12 requires the submission of an Erosion and Sediment Management Plan and Explosives Management Plan. In their comments on the draft Licence (v.2) and in the closing arguments, De Beers stated that these Plans should be implemented in their current state until the Board has approved an updated Plan.<sup>71</sup> They state that it is their view that other parties have had considerable opportunity to provide input on the Plans, and as such, they can be implemented upon receipt of the of the Licence and Permit without the need for additional regulatory review. De Beers subsequently submitted updated versions of these Plans on July 1, 2014.

The Board requires the Erosion and Sediment Management Plan and the Explosives Management Plan be for Board approval prior to the commencement of construction activities. It is the Board's opinion that the erosion and sediment, and explosives management planning requirements shall be deemed appropriate prior to conducting activities that would lead to erosion and sedimentation or require the use of explosives. The updated Plan will be distributed for review prior to the Board making a decision. Schedule 5, items 5 and 6 detail the required content to be included as part of these Plans.

#### *Geochemical Characterization and Management Plan*

Part G, item 14 of the Licence requires that a Geochemical Characterization and Management Plan be submitted within sixty (60) days following Licence issuance, for Board approval. The Board has required the submission of this Plan to ensure that adequate standards are in place for the characterization and management of waste rock, coarse and fine processed kimberlite, ore, and other materials that may be prone to acid generation or metal leaching. The Geochemical Characterization and Management Plan will contain all of the details necessary to assess appropriate segregation criteria and management activities to minimize the potential of metal-rich leachate entering the receiving environment. The excavation, processing, and placement of these materials can pose a long-term risk to water quality due to runoff or seepage that could be high in metal concentrations. It is therefore ideal to require that cutoff criteria for the use of Non-PAG materials are in place prior to using these materials for construction activities. The cutoff criteria put forth in draft versions of this plan have undergone review by the public, Board staff, and experts hired by the Board. To enable construction activities to commence prior to the review and approval of this plan, the cutoff criteria for the use of construction materials has been defined under Part E, item 10 of this Licence. Furthermore, a condition requiring approval of the SOP – which will detail the operating procedures in place for rock identification, segregation, and handling for placement – is required

---

<sup>71</sup> See De Beers comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 17, 2014; De Beers closing arguments, submitted July 1, 2014.

under Part E, item 6 of this Licence. The Geochemical Characterization and Management Plan will detail management practices in addition to defining the cutoff criteria. The Board has required that this plan be submitted prior to construction to ensure that all of the management activities described in the plan are approved during the construction phase of the project, such that any long-term risks associated with geochemical characterization and management can be minimized or avoided prior to mine production. This plan shall be in conformity with the SOP and shall address both the Construction and Operation phases of the Project. De Beers submitted an updated version of this Plan on July 1, 2014. The updated Plan will be distributed for review prior to the Board making a decision.

#### *Dyke Construction Management Plans*

Part G, item 15 of the Licence requires that a Dyke A Construction and Management Plan be submitted to the Board for approval within sixty (60) days following issuance, for Board approval. Part G, item 16 requires a separate Dyke Construction and Management Plan as there are several other dykes that will be constructed to segregate the different areas within Kennady Lake. Concerns were raised by ENR<sup>72</sup> that the level of detail provided for dyke construction was insufficient for the comprehensive construction process, design, monitoring, action levels, mitigation activities, and reporting protocols associated with the development of these structures. The Board agrees that a greater level of detail surrounding dyke construction must be provided to the Board, for approval, prior to the commencement of construction activities to ensure that effects to the receiving environment, mostly relating to erosion and sedimentation, are minimized. Dyke A will be the first dyke to be constructed. As such, the Board believes it is acceptable to require a stand-alone construction plan for this dyke to enable construction activities to begin following review and approval of this plan. The construction plan for all other dykes must also be approved prior to their construction, however, these construction activities are not planned to commence within the first year of the project. ENR, in their April 7, 2014 intervention, recommended that the plan be submitted 90 days prior to construction, however; the Board feels as though 90 days is not necessary to run a comprehensive review process of these plans. Instead, the Board has required that approval of these plans must take place prior to the commencement of dyke construction, and has also specified that the construction plan required under Part G, item 16 be submitted to the Board 60 days prior to construction. This provides adequate time to run a comprehensive review process prior to a Board decision on the plan, and puts less timing restrictions on De Beers to begin construction activities for Dyke A. De Beers submitted a Dyke A Construction and Management Plan on July 2, 2014. The updated Plan will be distributed for review prior to the Board making a decision.

#### *Processed Kimberlite and Waste Rock Management Plan*

Part G, item 17 of the Licence requires that a Processed Kimberlite and Waste Rock Management Plan be submitted to the Board for approval 90 days prior to the commencement of construction of the south Mine rock pile, west mine rock pile, the fine kimberlite containment facility and the coarse kimberlite containment facility. The milestone for the requirement of this plan is linked to the construction of the various mine rock piles and facilities that are addressed in this management plan. This timeline allows the Board to run a comprehensive review process for waste rock and processed kimberlite management prior to the construction of the facilities designed to manage and contain these materials, and can therefore approve or provide further direction on the management plan before creating any risks to the environment.

---

<sup>72</sup> See pages 2 – 3, GNWT-ENR intervention, submitted on April 7, 2014.

The plan itself is important to quantify and qualify the waste rock and processed kimberlite that will be produced as a result of the project and to identify areas onsite that may be subject to higher environmental risk (due to seepage or runoff of poor water quality for example). These predictions will be used to develop and detail management practices that include monitoring and mitigative actions. De Beers submitted an updated version of this Plan on July 1, 2014. The updated Plan will be distributed for review prior to the Board making a decision.

### Operations of Structures and Facilities

Part G, item 19 of the Licence details the Board's expectations for constructing, operating, and maintaining the south mine rock pile, west mine rock pile, the fine kimberlite containment facility, and the coarse kimberlite containment facility, and all other waste storage facilities. These requirements are included to clearly define the design specifications/engineering standards that must be in place to reduce, manage, monitor, and mitigate environmental risk and waste generation associated with these structures. This condition also details the linkages between these structures/facilities with associated waste management plans and construction plans such that the structures/facilities must be designed to be in conformance with approved plans. De Beers subsequently submitted an updated version of this Plan on July 1, 2014. The updated Plan will be distributed for review prior to the Board making a decision.

Part G, item 20 lists the general design and operational specifications for the water management pond. Maintaining a minimum freeboard, minimizing seepage, repairing erosion, and designing for closure are typical requirements for a structure designed to retain wastewater. This condition also links the construction and operation of the water management pond to any applicable action levels that will be established in the Water Management Plan.

Part G, item 26 requires the Licensee to direct all sewage to the sewage treatment plant, and item 27 sets the EQC for effluent from the sewage treatment plant. These EQC must be met at SNP station 07, located at the outlet of the sewage treatment plant, prior to mixing with other waste streams. Effluent from the sewage treatment plant will be discharged to the water management pond either directly or indirectly via the fine processed kimberlite containment (PKC) facility. Although monitoring of biological parameters will be conducted periodically in the discharge from the water management pond, the water management pond will also collect runoff from the controlled area, which may contain biological wastes from wildlife, so it will not be practical to evaluate the performance of the sewage treatment plant at the final discharge point to the receiving environment. In the application, De Beers proposed to meet the NWT Water Board's "Guidelines for the Discharge of Treated Municipal Wastewater in the NWT".<sup>73</sup>

This approach is consistent with other Licences issued by the Board, and no other party submitted evidence or recommendations to the Board regarding EQC for the sewage treatment plant. Because the effluent from the sewage treatment plant will be mixed with other waters and wastewater prior to discharge to the receiving environment, the Board has determined that the key parameter of potential concern for the sewage treatment plant effluent is faecal coliforms. While several parameters will be monitored under the SNP in order to continuously assess the effectiveness of the sewage treatment plant, the Board has only set an EQC for faecal coliforms. The MGC (maximum grab concentration) criteria is set at 20 CFU/100mL, which is consistent with other Licences issued by the Board. A MAC (maximum average concentration) is not appropriate, since the sewage treatment plant effluent will only be monitored for biological parameters on a monthly basis.

---

<sup>73</sup> See page 69, Application - Draft Water Management Plan, submitted November 24, 2013.

Part G, item 28 requires the proponent to collect wastewater in the water management pond prior to discharge to the receiving environment. The Board notes that this condition applies only to wastewater that is intended to be discharged to the receiving environment and does not prevent the Licensee from directing wastewater to the open pits.

Prior to commencing planned discharges from the water management pond to Lake N11 or Area 8, the Licensee must provide sampling results from the applicable compliance station (SNP 02 or 04) to an Inspector for authorization as per Part G, item 29. Wastewater to be discharged from the water management pond to Lake N11 and Area 8 must meet the EQC set out in Part G, item 30 and item 31, respectively. EQC for Lake N11 were first proposed in a Draft EQC Report submitted with the application. At the technical sessions, De Beers committed to developing draft EQC for Area 8, which were provided to the Board on March 27, 2014. Detailed reasons for decision regarding the EQC are provided in Appendix 1.

In response to review comments on the application, De Beers stated that discharge from the water management pond would be limited to three years (after initial drawdown), but that discharge might continue beyond three years if the EQC could still be met.<sup>74</sup> This was not discussed further at the technical sessions, but the assumption that discharge would be limited to three years was maintained in responses to technical session IRs and commitments.<sup>75</sup> ENR's April 8, 2014 intervention included a recommendation to restrict discharge to three years, but allowed that "if any additional water is discharged later in the mine life, it must meet all EQCs and established WQOs for the immediate receiving waters"; however, during the public hearing, ENR's presentation clarified that EQCs would need to be established for discharges beyond the three-year period<sup>76</sup>. No other parties made recommendations regarding the timelines for discharge in their interventions. During the public hearing, De Beers agreed with the Board's technical consultant that water quality modelling and EQC calculations were based on the three-year discharge period, and that further discussions would be needed to evaluate whether the proposed EQC would be suitable if discharge were to be extended beyond three years.<sup>77</sup>

In the event that De Beers determines that it is necessary to continue discharge to Lake N11 beyond the planned three years, Part G, item 34 requires the submission of an EQC Evaluation Report to the Board six months prior to continuing discharge. This requirement also applies if De Beers proposes to continue discharge to Area 8 beyond the planned one year. This Report must include a recommendation on whether the existing EQC should be maintained or revised. Rationale for the recommendation must be provided and must clearly indicate how site-specific water quality objectives will be maintained.

#### Adaptive Management Plan

De Beers initially submitted a separate adaptive management plan as part of the application package. During the technical sessions, AANDC asked whether action levels would be set out in the adaptive management plan, or whether they would be set out in various management plans.<sup>78</sup> De Beers responded that the action levels would be "housed within the individual plans. The (...) Adaptive Management Framework is intended to be an umbrella document, and then in the specific plans (...) we have what those -- what we're measuring against in terms of what we

---

<sup>74</sup> See Item 6, AANDC Comments, Application - Review Comment Table.

<sup>75</sup> See De Beers' responses to IRs 3, 4, 6 and 7, submitted February 24, 2014; Response to Commitment 2, March 27, 2014; Response to Commitment 3, March 6, 2014.

<sup>76</sup> See page 192 of the Public Hearing transcripts, May 6, 2014.

<sup>77</sup> See pages 160 – 164 of Public Hearing transcripts, May 6, 2014.

<sup>78</sup> See pages 145-147 of the Technical session transcripts, February 13, 2014.

think are triggers.”<sup>79</sup> IR 13 was subsequently issued, requiring De Beers to compile all the action levels from the management plans into an appendix accompanying the adaptive management plan.

ENR’s April 8, 2014 intervention included a recommendation for a stand-alone adaptive management response plan, which should include both a framework and action levels. De Beers responded by clarifying that the adaptive management plan was only developed as a framework to describe the adaptive management process for the Project and the linkages between different management plans, but that the details of action levels and response plans would be provided in the various management plans.<sup>80</sup> Although all parties recommended the development of action levels during the course of the regulatory process, no other parties made recommendations regarding a stand-alone adaptive management plan.

Monitoring, action levels, and response actions will be specific to different management activities. The Board concludes that the management plans are the most appropriate vehicle for descriptions of how the Licence will link monitoring to corrective actions, including the development of action levels and responses. The Board has decided not to require an additional, overarching adaptive management plan, because it would not contain the enforceable components of adaptive management, which are the action levels and response plans that will be detailed in the specific management plans. This decision is consistent with the Board’s decision to remove the requirement for an adaptive management plan during the water licence renewal for the Snap Lake Mine.<sup>81</sup>

#### **4.3.9 Part H: Conditions Applying to Contingency Planning**

Part H of the Licence contains conditions related to spill contingency planning and reporting, and the reclamation of spills and unauthorized discharges. The purpose of this part is to ensure that the Licensee is fully prepared to respond to spills and unauthorized discharges. The planning and reporting requirements in this part ensure that the company has identified the lines of authority and responsibility, has an action plan(s) for responses to spills and unauthorized discharges, and has established reliable reporting and communication procedures. This will ensure that any spills or unauthorized discharges are effectively controlled and cleaned up, with the goal of preventing or limiting damage to the receiving environment. The conditions in Part H are largely consistent with standard conditions found in previous Licences issued by the Board.

Part H, item 1 of this Licence includes a provision for a Spill Contingency Plan. EC recommended that this plan include all potential spills/runoff of deleterious substances from the airstrip to the area 8 sub-watershed, as it had yet to be referenced in any of the plans.<sup>82</sup> De Beers responded that this would fall under the overall Spill Contingency Plan and they would make sure it is included.

EC also had a concern with the proposed discharge of untreated sewage to an adjacent wetland, to be used as a contingency, which would be considered if the sewage plant failed.<sup>83</sup> The concerns are with the potential for deleterious wastewater reaching fish-bearing waters. De Beers agreed to update their Spill Contingency Plan so there are other options for retention or alternative management of camp wastewater in the event of treatment plant issues.

---

<sup>79</sup> See page 148 of the Technical session transcript, February 13, 2014.

<sup>80</sup> See page 3, De Beers response to interventions, submitted April 14, 2014.

<sup>81</sup> See pages 8-10, Reasons for Decision, MV2011L2-0004, April 13, 2012.

<sup>82</sup> See pages 8-10 of the Public Hearing transcript for May 7, 2014.

<sup>83</sup> See pages 33-34 of the Public Hearing transcript for May 7, 2014.

The Board has required De Beers to submit a Spill Contingency Plan, to be approved by the Board prior to the commencement of construction, to address the concerns raised and to ensure adequate plans are in place prior to the potential of any spills. De Beers submitted an updated version of this Plan on July 22, 2014. The updated Plan will be distributed for review prior to the Board making a decision on the Plan.

#### **4.3.10 Part I: Conditions Applying to Aquatic Effects Monitoring and Schedule 6**

Part I contains conditions related to the AEMP, which are similar to other Licences issued by the Board. Schedule 6 sets out the required contents of the plans and reports required by Part I.

Part I, item 1 outlines the objectives of the AEMP that is to be developed by De Beers. The overall purpose of the AEMP is to measure the effects of the project on the receiving environment. These objectives are consistent with those listed in other Licences issued by the Board, as well as with guidance provided by AANDC's *Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories* (June 2009). In its response to comments on the draft Licence (v.1), De Beers proposed that the reference to the Environmental Impact Review should be changed to Environmental Impact Statement.<sup>84</sup> The Board disagrees as the definition provided for Environmental Impact Review includes, without limiting, all documents, records and materials submitted to the MVEIRB public registry. As such, the Environmental Impact Statement is included under the Environmental Impact Review.

Part I, item 2 requires De Beers to implement Version 3 of the AEMP Design Plan, which was submitted on June 26, 2014. Although the Board is aware that stakeholders have not had an opportunity to review Version 3 of the AEMP Design Plan, the Board has decided to require that this version be implemented upon Licence issuance for reasons discussed below.

Review processes for AEMP design documents typically take several months to complete before final approval is given which means that if construction cannot begin until the document is approved, then construction may be delayed by several months. If the Board were convinced that the AEMP Design Plan needed to be approved prior to the initiation of construction, then the Licence conditions could reflect this. In reviewing the evidence, however, the Board notes the following:

- De Beers has based its AEMP Design on input from stakeholders gathered during AEMP workshops held in March 2013, February 2014, and March 2014.<sup>85</sup>
- A key revision in Version 3 of the AEMP Design from earlier versions was the addition of continuous monitoring of water levels during construction in several small lakes extending as far as the P watershed downstream of the mine.<sup>86</sup> De Beers states that the purpose for this monitoring, which is in addition to monitoring already planned during open water in lakes closer to the mine, is to “provide indications of flow behaviour and ice effects during dewatering.”<sup>87</sup> Version 3 of the AEMP also includes low action levels for potential physical alterations in the receiving environment due to drawdown of Kennady Lake during the winter months.<sup>88</sup> This additional hydrological monitoring is intended to ensure that any effects of the drawdown of Kennady Lake can be measured. These revisions were in direct response

---

<sup>84</sup> See page 23, De Beers intervention response, submitted April 14, 2014.

<sup>85</sup> See Covering Letter and Appendix B, AEMP Design Plan, Version 3, submitted June 26, 2014.

<sup>86</sup> Ibid, See Table 7.6-1.

<sup>87</sup> Ibid, See page 7-30.

<sup>88</sup> Ibid, See Table 8.4-3.

to stakeholder concerns about winter discharge as expressed in interventions to the public hearing.

- The majority of the proposed AEMP sampling will not begin until April of 2015,<sup>89</sup> by which time the full AEMP Design Plan can be reviewed and approved.
- There are other several management plans and design reports required by the licence that need to be reviewed and approved prior to construction. Given the limited time and resources of stakeholder who wish to be involved in these plan reviews, the Board feels that the priority should be on approving plans that will dictate how the mine operates rather than on how monitoring is done.

Note that the requirement to implement Version 3 of the AEMP Design Plan upon Licence issuance is not equivalent to Board approval of the document. After Licence issuance and prior to the proposed 2015 sampling season, the Board will conduct a full review and approval process for the Version 3 AEMP Design Plan.

With regard to future review and revisions to the AEMP Design Plan, Part I, item 4 requires the review and submission of a revised AEMP Design Plan, for approval by the Board by September 30, 2019 and every three years thereafter. De Beers has provided inconsistent recommendations for the frequency of resubmission. De Beers' April 14, 2014 response to ENR's intervention stated that the AEMP has been set up to be redesigned in three years, but in response to the draft Licence (v.2), De Beers recommended that a re-design should be submitted every five years. No other Parties provided recommendations on the frequency for revising the Design Plan, and after considering the timeline for the Project, the Board has determined that AEMP Design Plan should next be submitted on September 30, 2019 and then to be revised every 3 years after that. Based on De Beers' proposed project timeline, the third year of operational discharge into Lake N11 will be in year 2019. If that is the final year of discharge, then it is expected that the AEMP plan will change and a revised plan can be in place in time for the sampling season starting in April 2020. If De Beers does apply to extend the discharge period for a fourth year, the AEMP design can be revised based on the previous two years of operational discharge. The requirement for an AEMP re-design in 2019 means that any changes will be based on at least two years of monitoring during construction and two years of operational discharge. If revisions to the AEMP design are deemed necessary prior to 2019, the condition Part I, item 3 allows the Board to request changes at any time.

Part I, item 5 lists the objectives of the Aquatic Effects Re-evaluation Report that is to be developed by De Beers. The objectives are consistent with other Licences, as well as AANDC's AEMP guidelines. This report is meant to evaluate monitoring data collected since project inception in a more comprehensive manner than is required in the AEMP Annual Reports. In the Re-evaluation Report, the Applicant is also required to update predictions of project related effects to the environment. This information can be used in several ways. For example, updated effect predictions will form the basis of changes to the design of the AEMP itself to ensure the monitoring program continues to measure the right things at the right time and in the right places. As well, if the updated predictions indicate that the Licence is not protecting the environment in the way envisioned by the Board, the Board will have the information it needs to consider amendments to the conditions of the Licence as appropriate.

---

<sup>89</sup> Ibid, See section 9.

De Beers has provided inconsistent recommendations regarding the frequency of submission for the Re-evaluation Report: De Beer's response to interventions recommends May 1, 2017 and every five years thereafter; yet its response to draft Licence (v.1) recommends October 31, 2017, and then every five years; and its response to draft Licence (v.2) recommends July 31, 2019, and then every four years. In its April 3, 2014 intervention, DKFN recommended submission of the Re-evaluation Report by March 31, 2017, and every five years thereafter. No other Parties provided recommendations regarding the frequency of submission for the Re-evaluation Report.

Based on these recommendations, and considering the construction and operations schedule provided in the application, the Board has determined that the first Re-evaluation Report should be submitted by July 31, 2019, with subsequent versions submitted every three years. In this way, the report will incorporate the results of at least two years of operational discharge into the receiving environment in addition to the measured effects, if any, of the drawdown of Kennady Lake. Since the Re-evaluation Report is meant to inform any modifications to the AEMP Design Plan, updates to the latter plan are also due every three years as per Part I, item 4.

Part I, item 6 requires the submission of an AEMP Annual Report on or before May 1 each year. The Response Framework required by Schedule 6, item 1 g) is intended to provide the information needed to link the results of the AEMP to those actions necessary to ensure that project-related effects on the receiving environment remain within an acceptable range. Part I, item 7 requires the submission of an AEMP Response Plan if any action level is exceeded. The contents of the AEMP Response Plan are consistent with what is described in the Board's draft *Guidelines for Adaptive Management – A Response Framework for Aquatic Effects Monitoring*. The Guidelines, which have been publicly reviewed, were written by the Wek'èezhii Land and Water Board based largely on experiences with the Ekati and Diavik Diamond Mines. The response framework requires the Proponent to take appropriate action upon reaching pre-defined levels of environmental change or effect (the "action levels") as measured through ongoing monitoring. If any of the tiered action levels are exceeded, the Proponent is required to submit a response plan that details actions to be taken and may include, for example, further investigations, changes to operations, or enhanced mitigations. The response framework thus describes a systematic and transparent method for responding to the results of monitoring.

DKFN recommended that the annual report be submitted by March 31 each year.<sup>90</sup> De Beers has recommended May 1 in order spread out the AEMP Annual Reports that are due from various projects on March 31.<sup>91</sup>

While the Annual Report is an important summary of the previous year's results, the Annual Report is not the mechanism for making changes to the program design. Changes to the program design must be made through revisions to the AEMP Design Plan, which must be submitted to the Board for approval. Consequently, the Board has accepted De Beers' recommendation to submit the Annual Report by May 1 each year in order to avoid overloading reviewers with AEMP Annual Reports from various projects at the same time.

---

<sup>90</sup> See page 7, DKFN intervention, submitted April 3, 2014.

<sup>91</sup> See De Beers' response to interventions, submitted April 14, 2014; De Beers' response to draft Licence (v.2).

#### **4.3.11 Part J: Conditions Applying to Closure and Reclamation**

Part J contains conditions related to the submission of Closure and Reclamation Plans (Interim and Final) for the mine site. The conditions establish a planning process over the life of the project, beginning with the Interim Closure and Reclamation Plan (ICRP) required within twenty four (24) months following issuance of the Licence, followed by revisions upon request of the Board, and ending with a Final Closure and Reclamation Plan required two (2) years prior to the end of commercial operations. The Licence conditions applying to the security deposit (Part C of the Licence) are closely tied to Part J; the security deposit is directly related to the activities described in the closure plans, and updates to closure plans often result in updates to the security deposit. There are standard conditions consistent with other Licences issued by the Board as well as new site specific conditions that were developed where necessary.

The purpose of this Part is to establish a rigorous closure planning process that begins early, provides ample opportunity for public input, continues over the life of the Project, and reduces uncertainties related to post-closure risks. The ultimate goal of this Part is to ensure that the mine will meet the closure goal for mine sites in the NWT: “returning mine sites and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities.”<sup>92</sup>

The following paragraphs explain the context of each condition in Part J, and discuss reasons for conditions that are unique to this Licence.

The first ICRP will focus on finalizing closure objectives, which inform the design of mine components, in accordance with the “design for closure” principle embodied in the Guidelines.<sup>93</sup> A recommendation was made by GNWT-ENR to the Board that an ICRP be submitted for review and approval within one year of issuance of the Licence.<sup>94</sup> The YKDFN recommended to the Board that an ICRP be submitted for approval prior to operations.<sup>95</sup> During the Technical Session, De Beers committed to updating the Closure and Reclamation Plan to reflect the suggestions (1-3) outlined in the MVEIRB Report of Environmental Impact Review.<sup>96</sup> The Board has required De Beers to submit the ICRP within twenty four months to allow sufficient time to gather the necessary information from various parties to try to address the concerns that were raised on closure priorities. The deadline for this first iteration of the ICRP is also closely linked to the timing of the Rock Placement Verification Program Report deadline identified in Part E, item 7. The verification program results will inform the options that will be viable for closure of waste rock piles and open pits, along with any water management issues that need to be considered if segregation methods prove to vary from the predictions made. For example, if the segregation techniques for PAG materials cannot be achieved (as will be evident from the verification program results), rehandling of the waste rock for placement in mined out open pits will need to be given greater consideration in terms of long-term management of acid rock drainage or metal leaching. This would result in a different discussion surrounding waste rock piles, specifically; their volume, height, angle of repose, and possibly their potential for successful re-vegetation.

---

<sup>92</sup> This is the required standard of reclamation, as outlined in AANDC’s Mine Site Reclamation Policy for the Northwest Territories (2002), and in the MVLWB’s Guidelines for the Closure and Reclamation of Advanced Exploration and Mine Sites in the Northwest Territories (or the “Closure Guidelines”).

<sup>93</sup> See section 3.1.2 of the Closure Guidelines for an example.

<sup>94</sup> See page 200 of the Public Hearing transcript for May 6, 2014.

<sup>95</sup> See page 112 of the Public Hearing transcript for May 7, 2014.

<sup>96</sup> See pages 206 – 208 of the Technical session transcript for February 12, 2014.

In addition to conforming to the *Closure Guidelines*, Part J, item 1 requires that the closure plan include:

- Proposed methods to reducing the period of time required for recovery of the water management pond. GNWT-ENR raised concerns with regards to the post-closure water quality in the water management pond, the stability of the chemocline post-closure, and the amount of time required for the water management pond/Kennady Lake to reintegrate into the local ecosystem. GNWT-ENR recommended the water quality within the water management pond be monitored during the life of mine, and that an option of pumping the entire pond volume into Tuzo pit at closure be investigated to reduce the time required for Kennady Lake to return to a viable and self-sustaining ecosystem that is compatible with the regional watershed.<sup>97</sup> EC recommended that vertical diffusion and groundwater inflows be evaluated in Tuzo pit to determine the stability/increase confidence in the meromitic or chemocline layer.<sup>98</sup> De Beers agreed to doing investigations, monitoring and research on the meromixis within the pits, and to provide periodic updates to the Board<sup>99</sup> as requested by GNWT-ENR and EC. The Board has required that De Beers propose methods to reduce the period of time required for the recovery of the water management pond to address the concerns raised by reviewers. The proposed methods would then form part of the discussion and review of the ICRP.
- A research plan for investigating cover options for the waste rock piles. De Beers indicated that the rock piles have been designed to minimize the footprint of the project, and that this has been discussed in the Environmental Impact Review.<sup>100</sup> The Board heard the YKDFN exclaim they were surprised that De Beers had, "...unilaterally ruled out vegetation of the rock piles, citing steepness of the sides..." and that the YKDFN would have preferred that this be discussed during closure engagement.<sup>101</sup> De Beers agreed that they would conduct reclamation research of re-vegetation trials.<sup>102</sup> The Board issued Undertaking 6 to GNWT-ENR which relates to re-vegetation cover options.<sup>103</sup> In their response, GNWT-ENR provided regulatory references for re-vegetation covers on waste rock piles.<sup>104</sup> This plan is a critical step towards resolving the uncertainties surrounding the closure options and costs for reclaiming waste rock piles, as described in detail in Part C of the Licence (Security) and in Appendix 2 of the reasons (Detailed Reasons for Decision for the Determination of the Gahcho Kué Project Reclamation Security). The Board has required that De Beers include a research plan for investigating cover options for the waste rock piles and processed kimberlite to assess the viability of this option as it relates to the selection of closure objectives, options, and costs.
- Implications of the Rock Placement Verification Program results on the reclamation of waste rock. The YKDFN raised a concern with the lack of clear closure objectives<sup>105</sup>, and GNWT-ENR and De Beers did not agree on options and costs associated with the reclamation of waste rock.<sup>106</sup> The Board has required that De Beers include any implications the verification program results will have on the closure and reclamation options for waste rock

---

<sup>97</sup> See pages 198 – 199 of the Public Hearing transcript for May 6, 2014.

<sup>98</sup> See page 34 of the Public Hearing transcript for May 7, 2014.

<sup>99</sup> See page 53 of the Public Hearing transcript for May 6, 2014.

<sup>100</sup> See page 110 of the Public Hearing transcript for May 6, 2014.

<sup>101</sup> See page 109 of the Public Hearing transcript for May 6, 2014.

<sup>102</sup> See page 110 of the Public Hearing transcript for May 6, 2014.

<sup>103</sup> See pages 210-212 of the Public Hearing transcript for May 6, 2014.

<sup>104</sup> See GNWT-ENR response to Public Hearing Undertaking #6, submitted May 15, 2014.

<sup>105</sup> See pages 109-110 of the Public Hearing transcript for May 7, 2014.

<sup>106</sup> See GNWT-ENR Intervention and closing argument; De Beers security estimate and closing argument.

as this will inform the viability, preference, and costs required for successful reclamation of waste rock.

Part J, item 3 requires the Licensee to submit a revised ICRP at the Board's request. There are a number of factors that can influence the timing of these submissions, such as security reviews, operational changes, and major research results. This condition therefore provides the Board with the flexibility to accommodate these or other factors.

The purpose of the Annual Closure and Reclamation Plan Progress Report required under Part J, item 4 is to keep the Board informed of the company's progress as it relates to planning, research, engagement, and other activities described in the closure plan. This is important since several years can pass between submissions of the closure plan, and the Board must have a means of ensuring that the company is on track. Within a Progress Report, the company may propose changes to the closure plan, which must be approved by the Board before they can be implemented. The Board has been requiring annual progress reports for mines within its jurisdiction for several years, and has found this to be a useful practice that keeps all parties informed, and that can streamline the process of updating and approving ICRPs.

The GNWT-ENR, the NSMA, and the YKDFN have recommended the establishment of a reclamation working group to assist De Beers in the closure and reclamation planning process to help define closure options, goals, objectives, and criteria in accordance with the guidelines within the Licence. De Beers has committed to participating in a closure working group.<sup>107</sup> It is common practice for the Board to establish closure and reclamation review processes for larger projects such as this one designed to inform development, review, and decision making for ICRPs and final CRPs.

#### ***4.3.12 Annex A: Surveillance Network Program***

The Surveillance Network Program (SNP) has been annexed to the Licence to detail sampling and monitoring requirements related to compliance with numerous conditions and plans required by the Licence. The Board has adopted many of De Beers' recommendations with respect to sampling sites and analytical requirements as provided in the draft Licence attached to the application, although the SNP stations have been renumbered for clarity, and new SNP stations have been added. While De Beers originally proposed separate SNPs for construction and operations, the Board has combined these into one SNP for ease of implementation. Where necessary, distinctions have been made between construction and operational sampling requirements at specific stations. Requirements for measuring flows, volumes and meteorological data are based on standard Licence conditions as are the reporting requirements.

#### ***Part A: Reporting Requirements***

Items 1-8 are standard reporting requirements for Type A Licences issued by the Board. Item 9 requires the Licensee to conduct a correlation study to establish the site-specific relationship between total suspended solids (TSS) and turbidity prior to commencing drawdown of Kennady Lake. The Board included this requirement because De Beers is proposing to monitor turbidity as an indicator of TSS in order to demonstrate compliance with the TSS EQC for drawdown. In its intervention, ENR recommended that De Beers conduct a correlation study prior to any discharge.<sup>108</sup> De Beers agreed to this recommendation, and stated that the frequency of

---

<sup>107</sup> See page 138 of the Technical session transcript for February 12, 2014.

<sup>108</sup> See pages 7-9, ENR intervention, submitted April 8, 2014.

verifying this relationship and calibrating the instrumentation will be described in the Erosion and Sediment Management Plan.<sup>109</sup> The Board has linked the correlation survey and the on-going verification to the Construction Water Management Plan rather than to the Erosion and Sediment Management Plan, because the TSS-turbidity relationship will be used for demonstrating compliance with the TSS EQC for drawdown at SNP stations 02 and 04.

### Part B: Site Descriptions and Monitoring Requirements

SNP stations 01 and 03, each of which is comprised of three sub-stations, are located at the edges of the mixing zones in Lake N11 and Area 8, respectively. These water and sediment sampling stations will be active during any discharges of water or wastewater in order to verify that water quality objectives are being met at the edges of the mixing zones. Specific sampling frequency and parameters are set for discharges of drawdown water and discharges of wastewater from the water management pond, and are relevant to the parameters of potential concern for each type of discharge. Based on the GNWT's June 10, 2014 recommendation in response to the draft Licence (v.2), the Board increased the frequency of sampling to weekly for some physical parameters at these stations during discharge of drawdown water.

SNP stations 02 and 04 are the compliance monitoring points for discharge into Lake N11 and Area 8, respectively. EQC set out in Part G, items 28 and 29 must be met at these stations. Although De Beers originally proposed one compliance point located in the north basin of the water management pond, effluent quality criteria are typically applied at end-of-pipe to reflect the actual water quality of discharge. Board staff proposed two in-line stations (one for the Lake N11 discharge and one for the Area 8 discharge) in the draft Licence (v.2). As noted above for SNP 01 and 03, separate sampling frequencies and parameters are set for discharge of water from drawdown and discharge of wastewater from the water management pond. No comments were received by the Board regarding these revised stations, so these stations were accepted by the Board.

Two stations in the water management pond were proposed by De Beers – one north of the west mine rock pile, and one southwest of the fine PKC facility. Although De Beers originally proposed these stations for monitoring compliance, Board staff adapted these stations to monitor the influence of seepage from the waste storage facilities on water quality in the water management pond. No comments were received by the Board regarding these revised stations, so these stations were accepted by the Board.

SNP station 07 is a compliance monitoring station for effluent from the sewage treatment plant. The effluent must meet the EQC set out in Part G, item 27 prior to mixing with other waste streams. The Board has adopted the sampling frequency and parameters for this station as originally proposed by De Beers.

SNP stations 08, 09, and 10 are located in the sumps of the three open pits for the purposes of monitoring the quantity and quality of groundwater and runoff that will collect in the open pits. Data from these stations will help inform water management decisions throughout the life of the Project. The Board has adopted the sampling frequency and parameters for these stations as originally proposed by De Beers.

SNP stations 11-14 are the sampling stations associated with seepage surveys of the waste storage facilities, which are to be conducted as per the Geochemical Characterization and Management Plan. These stations are to be sampled twice per year and after major storm

---

<sup>109</sup> See De Beers response to interventions, submitted April 14, 2014.

events to monitor the quantity and quality of seepage from the waste storage facilities. Each station may consist of multiple substations and may vary from year to year depending on where seepage is observed. The Board has adopted the sampling frequency and parameters for these stations as originally proposed by De Beers.

SNP stations 15-17 are seepage survey stations for Dykes A1, D and E, which are located along the boundaries of the Controlled Area. This survey is to be conducted annually in later summer to monitor the quality and quantity of seepage from the controlled area. Seepage from these facilities that does not meet the EQC set out in Part G must be collected and prevented from entering the receiving environment. The Board has adopted the sampling frequency and parameters for these stations as originally proposed by De Beers.

SNP stations 18 and 19 are flow monitoring stations at the outlets of Lake N11 and Area 8. These stations were added by Board staff in the draft Licence (v.2) to reflect the condition which specifies maximum flow rates at these outlets during discharge. No comments were received by the Board regarding the addition of these stations, so the Board has accepted these stations.

In its June 10, 2014 comments on the draft Licence (v.2), EC recommended adding SNP stations in the upstream lakes (D2 and D3) where the water level will likely be raised as a result of isolating the Controlled Area. EC suggested that water and sediment quality monitoring in these lakes would fit better into the SNP than the AEMP, because “operational decisions and approvals with the involvement of the Inspector” may be needed.<sup>110</sup> In response, De Beers disagreed, stating that the draft AEMP currently includes hydrology, water quality, sediment quality, and biological monitoring in these lakes.<sup>111</sup> The Board notes that there were no conditions or criteria in the draft Licence related to the raised lakes, and therefore, it is unclear what decisions and approvals EC was referring to. EC did not recommend additional conditions or criteria for the Licence, nor did it recommend specific SNP sampling locations, parameters or frequency for these lakes. Additionally, in its June 24, 2014 closing statement, EC acknowledged that this monitoring could be covered under a management plan. The Board has determined that there is inadequate evidence at this time to support transferring this monitoring to the SNP. Monitoring, action levels and response actions will all be approved by the Board through the AEMP Design Plan, which the Licensee must then adhere to.

### Toxicity Testing

In the draft Licence submitted with the application, DeBeers proposed to undertake chronic toxicity testing at the edge of the mixing zone using invertebrates, algae, and rainbow trout. At the technical sessions, EC recommended tiered toxicity testing, where chronic toxicity testing would be conducted at end-of-pipe first, and if effects were noted there, then toxicity testing should be conducted in the receiving environment at the edge of the mixing zone. De Beers agreed that this approach is reasonable.<sup>112</sup> As noted by AANDC,<sup>113</sup> this approach would be consistent with the requirements of the Metal Mining Effluent Regulations, which could be applied to diamond mines in the near future.

---

<sup>110</sup> See EC comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 10, 2014.

<sup>111</sup> See De Beers, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, June 17, 2014.

<sup>112</sup> See pages 148-153 of the Technical Session Transcripts, February 11, 2014.

<sup>113</sup> Ibid, page 150.

EC also asked De Beers whether the fathead minnow larval stage test had been considered instead of the rainbow trout early life stage test, which led to the issuance of IR 2 for a comparison of the viability of the rainbow trout and fathead minnow toxicity tests, particularly for TDS and salinity.<sup>114</sup> De Beers' February 21, 2014 response concluded that fathead minnows demonstrate either similar or greater sensitivity compared to rainbow trout (though limited data is available specific to TDS or its constituents), and that the fathead minnow test uses smaller sample volumes and more readily available organisms, and is more widely conducted in Canadian laboratories. ENR's April 7, 2014 intervention included a review of De Beers' response to IR 2 that raised some concerns,<sup>115</sup> and ENR consequently recommended that both tests be required for the first year of operational discharge in order to determine which species demonstrates more site-specific sensitivity.

At the public hearing, although De Beers reiterated the difficulties with the rainbow trout test, it concluded that "given the fish that are within Kennady Lake and the downstream, the rainbow trout is more appropriate and provided better information and appropriate information to our study."<sup>116</sup> ENR's technical expert, Mr. Don Macdonald, pointed out that both species are actually relevant, because the fathead minnow is a cyprinid and closely related to cyprinids that are found in the receiving waters. Mr. MacDonald also noted that the discussion had not addressed the use of invertebrates for toxicity testing and that, in his opinion, Daphnids are very sensitive to major ions in the effluent, so the proposed *Ceriodaphnia dubia* test will also be very relevant.<sup>117</sup>

Anne Wilson, for EC, stated that a key requirement for toxicity testing was that the test should be achievable. While she acknowledged that there are good arguments to be made in support of using either species, she did not believe there is a need to do both, and she mentioned that the fathead minnow test is "routinely done and very easy to run."<sup>118</sup> She also noted that the draft AEMP included provisions to monitor algae and *Ceriodaphnia*, the latter of which is very sensitive to salinity.<sup>119</sup> No other Parties made recommendations regarding the selection of toxicity testing species in their interventions, at the public hearing, or in their closing arguments.

The Board agrees with EC that the key is to use a test that is achievable, because the receiving environment is better protected through toxicity testing that is carried out on a regular and reliable basis. The recommendation to test both species carries the same risk to success as a recommendation to use rainbow trout. The Board therefore concludes that the evidence supports the use of the fathead minnow test, since it is a) as or more sensitive than the rainbow trout, b) can be conducted at more laboratories with a reliable supply of test organisms, c) requires less effluent volume to complete, and d) the fathead minnow is a good surrogate for species that are found at the Project site now.

Accordingly, the Board has required chronic toxicity testing using the fathead minnow, *Ceriodaphnia dubia*, and *Pseudokirchneriella subcapitata* at both end-of-pipe SNP stations. Methodologies are set out in Part B of the SNP. As suggested by EC at the public hearing,<sup>120</sup> additional toxicity testing at the edge of the mixing zone should be carried out in accordance with the action levels and response actions described in the AEMP Design Plan, once approved by the Board.

---

<sup>114</sup> Ibid, page 153-158.

<sup>115</sup> MacDonald Environmental Services, March 28, 2014 (Appendix A of ENR's Intervention, submitted April 7, 2014).

<sup>116</sup> See page 45 of the Public Hearing Transcripts for May 6, 2014.

<sup>117</sup> Ibid, page 240-241.

<sup>118</sup> See page 46 of the Public Hearing Transcripts for May 7, 2014.

<sup>119</sup> Ibid, pages 45-47.

<sup>120</sup> Ibid, pages 47-48.

The Board notes that chronic toxicity testing at end-of-pipe does not satisfy the requirement of Part G, item 33 to demonstrate that the discharge is not acutely toxic, because the methodologies for the acute tests are different. Accordingly, the Board has added standard acute toxicity testing to the SNP to meet the requirements of Part G, item 33. The Board has included a separate SNP station at the intake point specifically for acute and chronic toxicity testing (SNP 20), since the requirements of Part G, item 33 are the same for both discharges.

#### Part C: Other Monitoring Requirements

Part C includes standard meteorological monitoring and reporting requirements for Type A Licences issued by the Board.

### **5.0 Land Use Permit MV2005C0032 Terms and Conditions**

The conditions set forth in the Permit have been imposed in order to address the Board's statutory responsibilities and the concerns which arose during review.

De Beers currently holds two Permits MV2013C0019 and MV2014Q0008. Permit MV2013C0019 allows De Beers to quarry, construct and maintain the camp, roads and airstrip and to upgrade the Gahcho Kué winter spur road. Permit MV2014Q0008 allows De Beers to obtain fill to aid in closure and reclamation activities, respectively. The conditions of this Permit MV2005C0032 have been drafted to reflect the inclusion and consolidation with the existing Permits MV2013C0019 and MV2014Q0008 and to clarify administrative requirements and enforcement for the Project as a whole.

#### **5.1 Part A: Scope of Permit**

The scope of the Permit ensures the Permittee is entitled to conduct activities which have been applied for and assessed during the Environmental Impact Review pursuant to Part 5 of the MVRMA and the components that were subsequently screened by the Board on March 20, 2014. In setting out the scope of the Permit, the Board endeavored to provide enough detail to identify and enable the authorized activities, but allows for project flexibility throughout the life of the Permit. No comments were received regarding the scope of the draft Permit during review.

#### **5.2 Part B: Definitions**

The Board defined a number of terms used in the Permit in order to ensure a common understanding of conditions and to avoid future differences in interpretation. For the most part, the definitions used wording from the MVLWB's Standard Land Use Permit Conditions Template (Standard Template).<sup>121</sup> Where appropriate, the Board created new definitions or changed standard wording, as described below:

- **Construction and Operations:** These definitions are used within the Permit to establish deadlines for events which trigger security requirements and for the submission of a Final Closure and Reclamation Plan.
- **Waste Management Plan:** This definition is from the MVLWB's Standard Template. In their comments on the draft Permit (v.1), De Beers recommended this definition to be specific to only hazardous and non-hazardous waste management.<sup>122</sup> The approved MVLWB *Guidelines for Developing a Waste Management Plan* does not limit this Plan to those of hazardous and non-hazardous waste management. A list of waste types that should be included in a Waste Management Plan is provided on page 13 of these guidelines that includes, but is not limited to,

<sup>121</sup> <http://mvlwb.com/resources/policy-and-guidelines>.

<sup>122</sup> See De Beers' comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 17, 2014.

ash or incinerator residue and contaminated soils. Refer to section 5.3.4 for further information on the submission of a Waste Management Plan.

### **5.3 Part C: Conditions Applying to All Activities**

The subheadings below correspond to the headings in the conditions section of the Permit, as outlined in section 26(1) of the MVLUR. Many conditions were based on wording from the MVLWB's Standard Template.

#### **5.3.1 Control or Prevention of Ponding of Water, Flooding, Erosion, Slides, and Subsidence of Land**

The Board has included a condition regarding the submission of an Erosion and Sediment Management Plan which is not part of the Standard Template. The Erosion and Sediment Management Plan is intended to explain how erosion and sedimentation will be mitigated and controlled on the land, and to prevent eroded materials from migrating and settling in the water as a result of Project activities. This Plan is also required under Part G of the Licence and the Board's reasons for including this plan are described above in section 4.3.8. To ensure consistency between the authorizations regarding the submission of this Plan, the Board has chosen to require Board approval of this Plan prior to commencement of the land-use operation.

#### **5.3.2 Use, Storage, Handling, and Ultimate Disposal of Any Chemical or Toxic Material**

The Board has included a condition regarding the submission of MSDS sheets for any chemicals that were not identified in the application, which is a part of the Standard Template. During the review of the draft Permit (v.1), De Beers recommended that MSDS sheets must be submitted in electronic form. The Board did not adopt De Beers' recommendation as the current wording of this condition is not specific, one way or another, to how these are to be submitted. It is up to an Inspector and the Board to decide on what form is acceptable at the time of submission.

During the review of the draft Permit (v.1), LKDFN recommended that to ensure transparency and effective communication of spills, the reports should be sent to all parties to the assessment.<sup>123</sup> The Board did not adopt this recommendation as there are established procedures for the reporting of spills in accordance with the GNWT's *Spill Contingency Planning and Reporting Regulations*. In addition, the Board requires reporting in accordance with conditions #39 of the permit; the Permittee is required to report each spill and unauthorized discharge to the Board; and the Board is required by law to maintain a public registry whereby such reports will be posted.

The Board has included a condition regarding submission of an Explosives Management Plan which is not part of the Standard Template. The Explosives Management Plan is intended to describe the management practices that will be followed for the storage and use of explosives at the Project. This plan will address and mitigate potential environmental impacts, specifically with respect to the spread of explosives by-products from the land, and into the water. This Plan is also required under Part G of the Water Licence and the Board's reasons for including this plan are described above in section 4.3.8. To ensure consistency between the authorizations regarding the submission of this Plan, the Board has chosen to require Board approval of this Plan prior to commencement of the land-use operation.

---

<sup>123</sup> See LKDFN comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

### **5.3.3 Wildlife and Fish Habitat**

The Board has included a condition regarding submission of a Wildlife and Wildlife Habitat Protection Plan which is not part of the Standard Template. During the review of the draft Permit (v.1), De Beers recommended this condition be changed to reflect the implementation of the Plan as submitted, without having prior Board approval. The Board did not adopt De Beers' recommendation as the habitat protection measures as outlined in this Plan are within the Board's jurisdiction and as such, should be approved prior to implementation. It is the Board's opinion that habitat protection measures are best addressed in the Wildlife and Wildlife Habitat Protection Plan, because this will allow De Beers to update their procedures on an ongoing basis. The Board's review and approval process, solely for items within the Board's jurisdiction (i.e. Habitat protection measures), will allow other parties to provide input to ensure applicable best practices and procedures are implemented.

The DKFN recommended in their comments on the draft Permit (v.1),<sup>124</sup> that specific references to the Wildlife Effects Monitoring Program (WEMP) and wildlife awareness training be added as conditions. GNWT-ENR contended in its closing arguments that a WEMP would address potential effects of the Project on the attributes of habitat at a cumulative, regional scale, and is therefore within the Board's jurisdiction.<sup>125</sup>

The GNWT-ENR's argument suggests an expansive interpretation of the word habitat as that term is used in s. 26(1)(h) of the MVLUR, and of the language in paragraph 26(1)(q) as well. Paragraph (h) gives the Board the authority to set out conditions in a Permit for the protection of wildlife and fish habitat. There is no doubt that when required, the habitat affected by a land use operation can be protected in this way. The Board regularly includes such conditions in its permits. It is, however, something else again to suggest that monitoring of wildlife populations on a regional or cumulative scale can be required by this same Permit – in areas far removed from the land use operation.

The Board recognizes the integrated nature of the MVRMA and the interconnections between land, water and wildlife. Where appropriate the Board acts to protect wildlife habitat from the impacts of land use operations. The Board notes nonetheless that the rules of statutory interpretation say that the word "habitat" found in the MVLUR should be given its plain and ordinary meaning and that it should first be interpreted in the context of a full reading of these regulations. Other statutory authorities and the cases applying them are of relevance only if there is difficulty discerning the proper meaning of the word habitat in the MVLUR. The Board finds that there is no such difficulty.

We do not equate the word habitat with the words "critical habitat" which are used in Species at Risk legislation and are imbued with additional important meaning in that context. But these legislative frameworks have a different purpose and are very different. As a result, the Board finds that the term habitat in the MVLUR should not be given such a broad meaning. It is noted that the new NWT *Wildlife Act*<sup>126</sup> includes the following more narrow definition of habitat:

"habitat" means the area or type of site where a species or an individual of a species of wildlife naturally occurs or on which it depends, directly or indirectly, to carry out its life processes;

---

<sup>124</sup> See DKFN comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

<sup>125</sup> See pages 7 – 11, GNWT-ENR closing argument, submitted June 24, 2014.

<sup>126</sup> Bill 3 Fourth Session 17<sup>th</sup> Assembly, section 1.

What the Board has the authority to do under the MVLUR is to protect the habitat which is affected by a land use operation from the effects of that operation. In the Board's opinion, the habitat protected by the terms and conditions of a Permit should be reasonably and directly linked to the effects of that land use. The Board recognizes that caribou have broad ranges and that they are a species of critical importance in the NWT, but the farther away from the site of a land use operation gets, the more likely it is that influences not caused by the prospective permit holder are affecting a wildlife population and its habitat. These are not matters for which the developer at a site remote from these effects can be shown to be responsible. In this case the evidence does not support an argument that the WEMP requirement should be set out in the Permit.

The Board has taken care to ensure that the De Beers' Licence and Permit implement the Review Panel's Measures, to the extent of the Board's jurisdiction. It is noted that section 136(2) of the MVRMA requires all regulators and governments to do whatever is within their authority to see to the implementation of these measures. This includes the GNWT.

#### ***5.3.4 Storage, Handling, and Disposal of Refuse or Sewage***

A Waste Management Framework was submitted in the application. The Board is of the opinion that the Framework was not developed in accordance with the MVLWB *Guidelines for Developing a Waste Management Plan*. The guidelines "provide a template for proponents to write a plan and a benchmark for reviewers to evaluate a proponent's plan, thus ensuring that waste management plans are submitted and reviewed in a consistent way". Permit conditions require waste to be managed in accordance with the Waste Management Plan. The Waste Management Plan is intended to ensure that all waste management activities are carried out in a way that is consistent with best practices and applicable guidelines in order to minimize waste released from the Project. This Plan is also required under Part G of the Licence and the Board's reasons for including this plan are described above in section 4.3.8. To ensure consistency between the authorizations regarding the submission of this Plan, the Board has chosen to require Board approval of this Plan prior to commencement of the land-use operation.

#### ***5.3.5 Security Deposit***

The Board has included a requirement for a phased security consistent with the Licence as described in 4.3.4 above.

#### ***5.3.6 Fuel Storage***

The Board has included the requirement for a Spill Contingency Plan as is typical in most permits. This Plan is also required under Part H of the Licence and the Board's reasons for including this plan are described above in section 4.3.9. To ensure consistency between the authorizations regarding the submission of this Plan, the Board has chosen to require Board approval of this Plan prior to commencement of the land-use operation.

#### ***5.3.7 Restoration of the Lands***

In order to integrate the closure-planning requirements between the Licence and Permit, the Board has included the following condition in the Permit: "The Permittee shall submit an Interim Closure and Reclamation Plan to the Board for approval, in accordance with the Mackenzie Valley Land and Water Board and Aboriginal Affairs and Northern Development's November 2013, or subsequent editions, *Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories*."

DKFN recommended in their comments on the draft Permit (v.1),<sup>127</sup> that conditions relating to the Closure and Reclamation Plan should be consistent with the Licence. De Beers agreed with this recommendation<sup>128</sup> as it relates to the schedule of submission deadlines. The issuance dates of the Permit and Licence will be different because the Board approval of the Permit and the Minister of the GNWT-ENR approval of the Licence occur at different times. As such, the timelines associated with the requirements for an ICRP and Final CRP have been defined in the Licence. An identical condition regarding the submission of the revised Plan, upon request of the Board, has been included in both authorizations.

### **5.3.8 Biological and Physical Protection of the Land**

The De Beers Engagement Plan was not developed in accordance with the MVLWB *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits* which was submitted to the MVLWB as part of the application. The guidelines describe the submission requirements of an engagement plan that “clearly describes when, what and how engagement will occur with the effected parties throughout the life of the project”.

It also requires that:

“The engagement plan(s) must:

- Describe the goals and the methods of engagement;
- Outline a frequency of engagement that allows for relevant and timely information sharing;
- Establish a process that allows the affected party to raise concerns or issues;
- Allow opportunities for, when appropriate, community meetings to take place to be inclusive of perspectives from all sectors of the community, including women, youth, and Elders;
- Ensure the proponent has procedures in place to understand and respond to issues as they arise; and
- Provide the opportunity for relationships to be built proactively, not just when issues occur.”

The YKDFN recommended that the Engagement Plan be resubmitted in a way that conforms to the Board’s guidelines.<sup>129</sup> Board staff also raised a concern regarding the lack of details linking the proposed activities to each phase of the development.<sup>130</sup>

The Engagement Plan is intended to ensure that affected parties are able to develop an understanding of a proposed project or component of a project, provide feedback during the engagement process and work towards building relationships with the proponent. The Board has required that an Engagement Plan, for Board approval in accordance with the MVLWB Guidelines, be submitted. It is the Board’s opinion that this engagement requirement, and the associated review and approval process, will be adequate to ensure engagement is managed responsibly for the Project.

---

<sup>127</sup> See DKFN comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

<sup>128</sup> See De Beers responses to comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 17, 2014.

<sup>129</sup> See page 165 of the Technical session transcript for February 13, 2014.

<sup>130</sup> See pages 168 – 173 of the Technical session transcript for February 13, 2014; pages 151-153 of the Public hearing transcript for May 7, 2014.

The DKFN recommended in their comments on the draft Permit (v.1),<sup>131</sup> that this Plan should be submitted within 60 days of issuance. De Beers responded<sup>132</sup> that this deadline should be within 90 days of issuance. The issuance dates of the Permit and Licence will be different because the Board approval of the Permit and the Minister of the GNWT-ENR approval of the Licence occur at different times. As such, the timeline associated with the requirement for an Engagement Plan have been defined in the Licence. An identical condition regarding the submission of the revised Plan, upon request of the Board, has been included in both authorizations.

The Board has developed a new site-specific condition for the Vegetation and Soils Monitoring Program. This requirement only appears in the Permit, and is not a part of the Licence.

The YKDFN raised concerns regarding the Program as submitted with the application package dated November 28, 2013, mostly relating to caribou, reclamation research and vegetation planning.<sup>133</sup> De Beers has agreed to include additional information to address the YKDFN's concerns.<sup>134</sup>

The Board has decided to require this Program be for Board approval prior to the commencement of this land-use operation. De Beers submitted a Vegetation and Soils Monitoring Program on June 30, 2014. The updated Program will be distributed for review prior to the Board making a decision.

The Permit includes a requirement for the submission of an Annual Land Use Permit Report. De Beers requested the Board consider a submission date of May 1 for the Annual Land Use Permit Report<sup>135</sup> as that would allow time for compilation of the results and to reduce the number of reports that will be submitted on that date.<sup>136</sup> The Board has set the submission date of the Annual Land Use Permit Report to March 31 to be consistent with the submission date in the Licence; the Board's reasons for this submission date are described above in section 4.3.3.

## **6.0 Conclusion**

Subject to the terms and conditions set out in the Licence, and for the reasons expressed herein, the MVLWB is of the opinion that the licensed undertaking for water use and waste disposal associated with the Gahcho Kué Project can be completed by De Beers while providing for the conservation, development, and utilization of Waters in a manner that will provide the optimum benefit for all Canadians and in particular for the residents of the Mackenzie Valley.

Land Use Permit MV2005C0032 and Water Licence MV2005L2-0015 contains provisions that the Board feels necessary to ensure and monitor compliance with the MVRMA and the Regulations made thereunder and to provide appropriate safeguards in respect of the Applicant's use of the land affected by the Permit.

---

<sup>131</sup> See DKFN comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

<sup>132</sup> See De Beers' responses to comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 17, 2014.

<sup>133</sup> See pages 179 – 180 of the Technical session transcript for February 13, 2014.

<sup>134</sup> See pages 78-79, De Beers' responses to YKDFN comment #62, Gahcho Kue Project – Application – Review Comment Table.

<sup>135</sup> See De Beers' responses to comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 17, 2014.

<sup>136</sup> See DKFN comments, Gahcho Kué Project – Draft Permit (v.1) – Review Comment Table, submitted June 10, 2014.

SIGNATURE

**Mackenzie Valley Land and Water Board**



August 11, 2014

\_\_\_\_\_  
Chair

\_\_\_\_\_  
Date

Attached:      Appendix 1 – Detailed Reasons for Decision for Effluent Quality Criteria  
                    Appendix 2 – Detailed Reasons for Decision for the Determination of the  
                    Gahcho Kué Project Reclamation Security

## Appendix 1

### Detailed Reasons for Decision for Effluent Quality Criteria

#### Table of Contents

Acronyms .....	47
1.0 Introduction.....	48
2.0 General Principles for Setting EQC for Discharges from the Water Management Pond 48.....	48
3.0 EQC Determinations for Discharges from the Water Management Pond to Lake N11 During Operations	49
3.1 Parameters for Review .....	50
3.2 Determination of Water Quality Based EQC.....	50
3.2.1 Derivation of Numeric Site-Specific WQOs for Lake N11 .....	50
3.2.1.1 Proposed SSWQOs for Lead and Mercury.....	55
3.2.1.2 Proposed SSWQOs for Nitrate.....	56
3.2.2 Mixing Zone Considerations .....	63
3.2.3 Determination of Parameters of Potential Concern.....	64
3.2.4 Calculation of Water Quality-Based EQC .....	69
3.3 Technology Based EQC .....	73
3.4 Final EQC for Discharges at SNP Station # 2 from the Water Management Pond to Lake N11 .....	74
4.0 EQC Determinations for Discharges from the Water Management Pond to Area 8 During Operations .	75
4.1 Parameters for Review .....	75
4.2 Determination of Water Quality Based EQC.....	76
4.2.1 Derivation of Numeric Site-Specific WQOs for Area 8 .....	76
4.2.1.1 SSWQOs for Iron and Lead .....	76
4.2.2 Mixing Zone Considerations.....	81
4.2.3 Determination of Parameters of Potential Concern.....	82
4.2.4 Calculation of Water Quality-Based EQC .....	84
4.3 Technology Based EQC .....	86
4.4 Final EQC for Discharges at SNP Station 04 from the Water Management Pond to Area 8 .....	87

## **Acronyms**

AANDC: Aboriginal Affairs and Northern Development Canada

AEP: Alberta Environmental Protection

BCMOE: British Columbia Ministry of the Environment

CCME: Canadian Council of Ministers of the Environment

CWQGs-PAL: CCME Water Quality Guidelines for the Protection of Aquatic Life

De Beers: De Beers Canada Inc.

EC: Environment Canada

EQC: Effluent Quality Criteria

GNWT - ENR: Government of the Northwest Territories – Department of Environment and Natural Resources

MVLWB: Mackenzie Valley Land and Water Board

POPC: parameters of potential concern

TSS: Total Suspended Solids

SSWQO: site specific water quality objective

USEPA: United States Environmental Protection Agency

WLWB: Wek'eezhii Land and Water Board

WMP: Water management pond

WQO: water quality objective

## **1.0 Introduction**

The construction of dykes around Kennady Lake will create a “controlled area” in which minewater, run-off or other wastewater generated on site can collect without danger of accidental release to the receiving environment. Within the controlled area, a water management pond (WMP) will be established<sup>137</sup> as the primary reservoir for the storage of site water. The maximum storage capacity of the WMP is 18.8 million cubic metres and during operations wastewater will be pumped from the WMP to Lake N11 and/or Area 8 as required from SNP stations 02 and 04, respectively. Discharge is anticipated to take place during open water conditions between June and August. While discharges from the WMP to Lake N11 are proposed to occur for up to three years, De Beers proposes<sup>138</sup> to discharge to Area 8 only during the first year of operations.

This Appendix to the Reasons for Decision for MV2005L2-0015 provides a detailed analysis of the evidence related to setting effluent quality criteria (EQC) for discharges from the Water Management Pond to Lake N11 and to Area 8 during operations. The EQC for Water Licence MV2005L2-0015 have been determined based on the evidence before the Board at this time. The EQC or other conditions of MV2005L2-0015 may be amended in the future if other relevant evidence is presented to the Board.

## **2.0 General Principles for Setting EQC for Discharges from the Water Management Pond**

As per the Water and Effluent Quality Management Policy<sup>139</sup> (the Policy), the Board sets water licence conditions, including EQC, with the goal of ensuring that current and future water uses in the receiving environment will be protected. As stated in the Policy:

*“Protection of water quality in the receiving environment is the primary objective. The level of protection will be defined by the water quality standards that have been set site-specifically for the receiving environment in question. Effluent Quality Criteria (EQC) will be set for a project to ensure that water quality standards will be met.”*

EQC that are set to meet this Policy objective are called “water quality-based EQC”. As described below, water quality-based EQC were considered with the goal of protecting water uses in Lake N11 and waters downstream of Kennady Lake based on the narrative water quality objectives set out in Suggestion 1 of the Report of Environmental Impact Review (EIR0607-001) for the Gahcho Kué Project. Water quality-based EQC are discussed further in Section 3.2.

The second objective of the Policy is to ensure that the amount of waste to be deposited to the receiving environment is minimized. As stated in the Policy:

*“The Boards expect proponents to identify and implement waste prevention and/or minimization measures, whenever feasible. Implementation of such measures may be stipulated in the terms and conditions of a water licence. The Boards can assess how these measures are expected to impact effluent from a project in order to set EQC that proponents can reasonably and consistently achieve.”*

EQC that are set to meet this Policy objective are called “technology-based EQC”. In the case of the Gahcho Kué Project, wastewater collected in the WMP will not undergo formal treatment (e.g., through a water treatment plant) although suspended solids may settle out in the pond prior to discharge. Technology-based EQC are therefore dependent on what is achievable based on the waste minimization practices implemented on site as well as passive sedimentation in the water management

---

<sup>137</sup> Page 2, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>138</sup> Page 3, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>139</sup> MVLWB, Water and Effluent Quality Management Policy, March 31, 2011.

pond.<sup>140</sup> As discussed further below, technology-based EQC for this water licence are based on De Beers own predictions of what is reasonably and consistently achievable for each effluent stream.

As described in the reasons for decision for water licences issued<sup>141</sup> since the Policy was developed, the Board's general process for setting EQC is to first derive water quality-based EQC and then consider whether a) the EQC are reasonably achievable, and b) if the EQC could be made more stringent based on what is technologically feasible for the site. Final EQC for the site are summarized in Sections 3.4 and 4.4 below. The step-wise process for deriving EQC can be summarized as:

- 1) Determine the Parameters for Review. In this step, the Board evaluates the evidence to determine which chemical parameters may be elevated in the effluent relative to background concentrations and that, therefore, may need to be regulated through EQC in the water licence.
- 2) Derive Water Quality-Based EQC. As described in the Introduction above, EQC are first derived with the goal of ensuring that the water quality objectives (WQOs) for the receiving environment will be met during all phases of the project.
- 3) Evaluate Technology-Based EQC. These EQC are not calculated per se but are based on what effluent quality the proponent can reasonably and consistently achieve at the end-of-pipe.
- 4) Determination of final EQC values for the water licence. Generally, the Board will choose those EQC that are the lower of the values derived as per step 3) or 4) above. However, and as per the Policy, the Board will ensure that EQC are set at levels that the proponent can reasonably and consistently achieve.<sup>142</sup>

Below, each step in the EQC derivation process is described in detail for discharges to Lake N11 (section 3) and Area 8 (section 4).

Note that as requested<sup>143</sup> by the Board, De Beers submitted a "Draft Effluent Quality Criteria Report" (the EQC Report) on December 13, 2013 as part of its updated water licence application. In this report, De Beers described its review and conclusions for EQC using the same step-wise process given above. In response to questions and comments arising from the technical sessions in February 2014, De Beers updated its EQC Report and submitted the update to the Board on April 4, 2014. On May 5, 2014, De Beers submitted an erratum for Table 3.2-1 of the April 2014 EQC Report to correct an error in their calculations of an EQC for nitrate. In this Appendix to the reasons for decision, references to De Beers' EQC Report are to the April 2014 EQC Report submission accounting for the May 5, 2014 erratum.

### **3.0 EQC Determinations for Discharges from the Water Management Pond to Lake N11 During Operations**

In this section of Appendix 1, the Board discusses the determination of EQC for discharges from the WMP to Lake N11.

---

<sup>140</sup> Note that De Beers has proposed to use in line flocculation during drawdown of Kennady Lake if necessary.

<sup>141</sup> See, for example, Reasons for Decision from the MVLWB for MV2011L2-0004 (renewal of De Beers Canada water licence for the Snap Lake Diamond Mine) and MV2008L2-0002 (Canadian Zinc's Prairie Creek Mine) as well as the WLWB decisions on W2012L2-0001 (Dominion Diamond's Ekati Diamond Mine) and W2008L2-0003 (Fortune Mineral's NICO Mine).

<sup>142</sup> Ibid.

<sup>143</sup> MVLWB letter to De Beers "Submission Requirements for Mining and Milling applications for Water Licences and Land Use Permits", October 22, 2013.

### 3.1 Parameters for Review

In its EQC Report, De Beers adopted the list of parameters recommended<sup>144</sup> by the Board as a starting point for evaluating EQC with the exception of total suspended solids, pH, Faecal coliforms, and total petroleum hydrocarbons. Faecal coliforms are being regulated through EQC on effluent from the sewage treatment plant (see conditions Part G, Item 27) and, therefore, the Board agrees that it is not necessary to regulate this parameter in the WMP. However, pH, total suspended solids and total petroleum hydrocarbons have been retained as parameters for review. De Beers also added the parameters fluoride and thallium to the list of parameters for review “because concentrations of these two parameters have the potential to increase above baseline concentrations, consistent with trends observed at the Snap lake Mine.”<sup>145</sup>

Table 1 contains the list of 33 parameters that were evaluated as potential EQC as described below. The final list of parameters that will be regulated with EQC for discharges to Lake N11 (i.e., the list of parameters of potential concern) is determined in section 3.2.4 below.

### 3.2 Determination of Water Quality Based EQC

The derivation of Water Quality-Based EQC involves the following subtasks:

- a) Derivation of numeric water quality objectives (WQOs) for the receiving environment.
- b) Definition of a mixing zone or other location downstream of the mine where the WQOs must be met.
- c) Definition of Parameters of Potential Concern (POPC). POPC are those chemical parameters that, in the Board’s opinion, have “the potential to adversely affect water quality in the receiving environment.”<sup>146</sup>
- d) Calculation of numeric EQC to meet WQOs at the specified location for each POPC.

#### 3.2.1 Derivation of Numeric Site-Specific WQOs for Lake N11

The level of water quality that must be maintained in order to protect a given water use is defined by water quality objectives (WQOs) which are established for each specific receiving environment. WQOs may be described either numerically (e.g., grams of a substance per litre) or as narrative statements. For example, the Canadian Council of Ministers of the Environment has published the Canadian Water Quality Guidelines for the Protection of Aquatic Life<sup>147</sup> (CWQGs-PAL), which define numeric objectives, for substances in water, which are meant to protect all forms of aquatic life and all aspects of aquatic life cycles from adverse toxic effects over the long term. There are also published guidelines which can be adopted as water quality objectives with the goal of protecting other water uses including drinking water and recreational uses.

As discussed earlier, in order to set EQC for discharges according to the Policy the Board first had to consider what the appropriate water quality objectives for the receiving environment should be. Section 8 of the Policy outlines the kinds of information that the Board will consider when setting site-specific water quality standards or objectives (SSWQOs) including: baseline conditions, traditional knowledge, traditional water uses, published guidelines or other studies,

---

<sup>144</sup> Ibid, Schedule 5.

<sup>145</sup> See page 11 De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>146</sup> Section 7.2, MVLWB, Water and Effluent Quality Management Policy, March 2011.

<sup>147</sup> See page 1. CCME, Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, CCME, Winnipeg.

and measures or suggestions from reports of Environmental Assessment/Environmental Impact Review. In the case of the Gahcho Kué Project, parts (a) and (b) from Suggestion #1 of the Environmental Impact Review<sup>148</sup> (EIR) are relevant in the context of setting WQOs and, hence, EQC:

“Suggestion #1

- a) Traditional water uses in Lake N11 (outside of the initial dilution zone) and in all waters downstream of Kennady lake should not be affected by Gahcho Kué mining activities throughout construction, operation and reclamation of the mine. Post-closure conditions in all waters in the region, including the refilled Kennady Lake, shall support all traditional water uses. Traditional water uses include:
- drinking the water
  - harvesting and consuming fish

This means that:

- b) Throughout all project stages (construction, operations, closure and post-closure) the Gahcho Kué Project should be designed and managed by De Beers so that the following water quality objectives in Lake N11 or any waters downstream of Kennady Lake are met:
- water quality changes due to Project activities will not substantially alter the suitability of waterbodies to support viable aquatic ecosystems; and
  - water quality changes due to Project activities will not substantially alter fish health, abundance or diversity or impact the ability of traditional users to harvest or consume fish.
- c) De Beers should monitor conditions including water and sediment quality, during the refilling of Kennady Lake to ensure that conditions are suitable to support aquatic life before re-connecting the lake to the rest of the watershed.”<sup>149</sup>

Part (a) of EIR Suggestion #1 explicitly defines the two traditional water uses that must be protected from mining effects downstream of the Gahcho Kué during all project phases: the use of water for drinking and fishing. Part (b) of EIR Suggestion #1 is more specific than part (a) in that it directly describes water quality objectives for the receiving environment albeit in a narrative fashion. In order to use this information to set numeric EQC that will protect the defined water uses, the Board first needs to “translate” the water uses and narrative objectives into numeric WQOs for this site. In this regard, the Board notes that any numeric WQOs that meet the intent of the narrative objectives listed in part (b) will also protect the traditional water use of fishing. The Board concludes that the intent of EIR Suggestion #1 will be satisfied by choosing WQOs for the Gahcho Kué Mine receiving environment that will protect drinking water use and aquatic life in general.

---

<sup>148</sup> Mackenzie Valley Environmental Impact Review Board Gahcho Kué Panel, Report of Environmental Impact Review and Reasons for Decision, EIR 0607-001, Gahcho Kué Diamond Mine Project, July 19, 2013.

<sup>149</sup> Ibid, page 53.

In many previous decisions<sup>150</sup> on water quality objectives, the Board has looked to CCME or Health Canada publications for guidance on choosing appropriate WQOs for the protection of aquatic life and drinking water, respectively. For example, Health Canada has published guidelines that define numeric WQOs for the protection of drinking water uses across Canada. As well, the Board notes that the CWQGs-PAL are intended to protect the designated uses of aquatic ecosystems throughout all of Canada and that adoption of the guideline values directly as WQOs is an acceptable and nationally recognized practice. However, the CCME also notes<sup>151</sup> that:

“Nevertheless, it is possible that the guidelines are over- or under-protective at sites with unique conditions. For example, the most sensitive species that occurs at a site may be more or less sensitive than the most sensitive species represented in the toxicological data set that was used to derive the guidelines. Similarly, a substance may be more or less toxic in site water (i.e., due to factors such as pH, water hardness, complexing agents, etc.) than it is under the range of conditions that is represented in the toxicological dataset. In some cases, natural background concentrations of a substance may exceed the guideline without any apparent effect on biota (i.e., if the substance is not present in a bioavailable form). Under these circumstances, it might be necessary to modify the WQGs to account for conditions that occur at the site.”

On the basis of this guidance, the Board also considers, on a case-by-case basis, site-specific WQOs (SSWQOs) that differ from national guideline values if there is sufficient evidence to support a different approach.

In Appendix B of its EQC Report, De Beers has proposed WQOs for all the potentially harmful substances that will be discharged from the WMP to Lake N11<sup>152</sup> and Area 8.<sup>153</sup> De Beers took the following approach in selecting objectives:

- If the concentration of a parameter at the edge of the mixing zone was predicted to be lower than the mean regional baseline concentration plus two standard deviations, then the WQO was set equal to the latter value;
- If the concentration of a parameter at the edge of the mixing zone was predicted to be higher than the mean regional baseline concentration plus two standard deviations, then the WQO was set equal<sup>154</sup> to:
  - the CWQGs-PAL value or,
  - if there was no CWQG-PAL value for that parameter, De Beers proposed a guideline value from another jurisdiction;
- For hardness-dependent objectives, De Beers used<sup>155</sup> a hardness value of 50 mg/L CaCO<sub>3</sub> as this is predicted to be the hardness level in Lake N11 and Area 8 at the time of maximum operational discharge.

---

<sup>150</sup> See, for example, Reasons for Decision from the MVLWB for MV2011L2-0004 (renewal of De Beers Canada water licence for the Snap Lake Diamond Mine) and MV2008L2-0002 (Canadian Zinc's Prairie Creek Mine) as well as the WLWB decisions on W2012L2-0001 (Dominion Diamond's Ekati Diamond Mine) and W2008L2-0003 (Fortune Mineral's NICO Mine).

<sup>151</sup> CCME (2003) "Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives" CCME, Winnipeg, MB: Section 1.1.

<sup>152</sup> Table B1 and B2, Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>153</sup> Table B3 and B4, Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>154</sup> A final step in the De Beers' selection process for WQOs was to compare the guideline value (if selected) to the baseline mean plus two standard deviations. If the baseline concentration was higher, then the WQO would be equal to baseline. See Appendix B of the EQC Report.

Using this approach, De Beers has proposed SSWQO for several parameters that are lower than guideline values for the protection of aquatic life. De Beers' proposed SSWQO are listed in Table 1.

In its intervention to the public hearing, the GNWT-ENR had four recommendations related to setting SSWQOs at the Gahcho Kué Project site. The first recommendation was to use "the narrative statements established by the MVEIRB in Suggestion #1 and #2 when deriving SSWQOs for Lake N11, Area 8 and Kennady Lake post closure." As discussed above, the Board agrees that Suggestion #1 from the EIR is an appropriate basis for setting SSWQOs at the Gahcho Kué Project site. However, the Board notes that Suggestion #2 from the EIR relates only to enhancing chemocline stability post-closure and not to SSWQOs. Without further explanation of the relationship of Suggestion #2 to SSWQOs, the Board is not able to adopt that part of ENR's recommendation.

The next two WQO related recommendations from the GNWT-ENR are:

"ENR recommends that specific baseline values, as opposed to regional baseline values, should be used when deriving SSWQOs for Lake N11, Area 8 and Kennady Lake post-closure.

ENR recommends that the SSWQO for mercury should be set to concentrations that are within the range of naturally occurring background concentrations in Lake N11, Area 8 and Kennady Lake post-closure."<sup>156</sup>

Although both of these recommendations show the GNWT - ENR's disagreement with aspects of De Beers' protocol for selecting WQOs, the Board notes that ENR seems to agree with De Beers' overall approach of setting SSWQOs as low as reasonably achievable. That is, both parties have recommended setting SSWQOs to levels lower than what has been demonstrated through toxicological testing to protect the designated uses of the receiving water (e.g., CWQGs-PAL or Health Canada drinking water guidelines). As stated by the GNWT-ENR:

"ENR views WQO, or SSWQOs, as the "Standard for Water" which should be maintained in order to preserve the present and future integrity and uses of an aquatic ecosystem. Consequently, WQOs must consider a number of factors such as use of the aquatic ecosystem, existing background concentrations, or objectives that may be reasonably achieved through the use of Best Management Practices and effluent treatment technologies."<sup>157</sup>

This approach to setting WQOs is based on the GNWT-ENR's goal of "minimizing impacts to the receiving aquatic ecosystem by limiting the amount of waste discharged and therefore minimizing the degradation of receiving water quality."

As per the Board's Policy, the Board has the same goal of minimizing the amount of waste to be discharged; however, the Board prefers to consider the principle of waste minimization when deciding on a final EQC instead of altering SSWQO directly. For example, EQC are first calculated based on maintaining the concentration of a parameter of potential concern below the SSWQO in the receiving environment. The resulting water-quality-based EQC may then be lowered if there is evidence that a lower EQC is achievable or that the amount of waste can be minimized through reasonable pollution prevention efforts such as source control or other

---

<sup>155</sup> Footnote d in Tables B1 and B3, Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>156</sup> See page 14, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>157</sup> Ibid.

mitigations. As a result of this approach, the Board has, for the purposes of setting water quality-based EQC, chosen to set SSWQOs based on toxicological evidence of potential impairment to the designated water uses of the receiving environment. In determining the final EQC for water licence MV2005L2-0015, the Board has considered what “may be reasonably achieved through the use of Best Management Practices and effluent treatment technologies” as discussed further in section 3.4 below. The Board concludes that this decision is consistent with the Policy and previous Board decisions<sup>158</sup> on this issue.

GNWT-ENR’s last recommendation related to setting WQOs was:

“ENR recommends that the hardness concentration used for calculating hardness dependent SSWQOs should reflect the baseline hardness concentration and not the altered conditions predicted as a result of mining activities (anthropogenic sources).”<sup>159</sup>

In making this recommendation, the GNWT-ENR noted that De Beers had calculated hardness-dependent SSWQO based on a hardness of 50 mg/L CaCO<sub>3</sub> which is the level expected in both Lake N11 and Area 8 by the time the maximum operational discharge level is realized. In previous Board decisions,<sup>160</sup> the Board has acknowledged the scientific evidence that increasing hardness can have the effect of reducing the toxicity of certain metals and ions including sulphate, chloride, nitrate, lead, nickel, copper etc. However, and in contrast to the GNWT’s position that hardness-dependent SSWQOs should be based solely on baseline hardness concentrations, the Board has taken the position that the ameliorating effect of hardness may be considered in setting SSWQO and EQC whatever the source of the increased hardness (i.e., natural or through previous effluent discharges).

What De Beers is proposing with respect to hardness-based SSWQO differs in an important way however from previous Board decisions in that De Beers recommends using a future predicted hardness level in the receiving water to calculate the SSWQO. In previous decisions,<sup>161</sup> the Board has been careful to ensure that the SSWQO and, hence the EQC, were based on the current hardness level. There are two ways of doing this: 1) use the existing hardness level in Lake N11 (which, in this case, is equal to baseline); or 2) set<sup>162</sup> the SSWQO equal to the equation that relates hardness to the SSWQO mathematically. In the latter case, the SSWQO increases as hardness increases during operations but the objective remains protective of water uses at all times. For the purposes of evaluating which parameters are “parameters of potential concern”, the Board has chosen to use the baseline hardness<sup>163</sup> in Lake N11 in SSWQO calculations where applicable.

---

<sup>158</sup> See, for example, Reasons for Decision from the MVLWB for MV2011L2-0004 (renewal of De Beers Canada water licence for the Snap Lake Diamond Mine) as well as the WLWB decisions on W2012L2-0001 (Dominion Diamond’s Ekati Diamond Mine) and W2008L2-0003 (Fortune Mineral’s NICO Mine) and W2007L2-0003 (Diavik Diamond Mine, January 27, 2007).

<sup>159</sup> Page 15, GNWT-ENR’s Intervention to the Public Hearing for MV2005C0032 and MV2005L2-0015, submitted to the MVLWB on April 7, 2014.

<sup>160</sup> See, for example, Reasons for Decision from the MVLWB for MV2011L2-0004 (renewal of De Beers Canada water licence for the Snap Lake Diamond Mine) as well as the WLWB decisions on W2012L2-0001 (Dominion Diamond’s Ekati Diamond Mine) and W2008L2-0003 (Fortune Mineral’s NICO Mine).

<sup>161</sup> For example, the Ekati water licence W2012L2-0001 has EQC equal to the equation that relates the SSWQO to hardness – in this way, the EQC increases in the proper proportion to the hardness. Otherwise, the Board has set SSWQO based on the existing hardness, whether that hardness is a result of natural or anthropogenic sources.

<sup>162</sup> This was done by the WLWB in the renewal water licence W2012L2-0001 for the Ekati Diamond Mine.

<sup>163</sup> The baseline hardness levels in Lake N11 are: mean = 5 mg/L CaCO<sub>3</sub>; mean+2standard deviations = 9 mg/L CaCO<sub>3</sub>; maximum= 10 mg/L CaCO<sub>3</sub>. The Board has chosen to use 9 mg/L CaCO<sub>3</sub> to represent baseline hardness in Lake N11.

Table 1 compares guideline values to the SSWQOs proposed<sup>164</sup> by De Beers in its EQC Report. Table 1 also summarizes the numeric SSWQOs chosen by the Board for the Gahcho Kué receiving environment based on the evidence at this time. In its determination of numeric SSWQOs for the protection of water uses in the Gahcho Kué receiving environment, the Board applied the following principles:

- As has been the case in previous Board decisions, the Board adopted the lowest relevant Canadian water quality guideline value as a SSWQO unless there was compelling evidence that the guideline value was overly conservative or otherwise inappropriate for the Gahcho Kué receiving environment. The Board notes that this decision is consistent with a recommendation<sup>165</sup> made by the DKFN in its comments on the draft Licence (v.2). As shown in Table 1, the baseline concentrations of two parameters (i.e., lead and mercury) were higher than the CCME guideline value; SSWQO for these three parameters are discussed further in section 3.2.1.1 below. Also note that in the case of nitrate, De Beers originally proposed to adopt the CWQG-PAL guideline value but then changed its recommendation; this is discussed further in section 3.2.1.2 below.
- If a parameter did not have a national water quality guideline from the CCME or Health Canada, the Board adopted a guideline value from another jurisdiction if such a guideline value was proposed by any party including De Beers.
- Since there are no CCME guideline values for sulphate, potassium and strontium, De Beers proposed SSWQOs based on values that were developed for the Ekati and Snap Lake Diamond Mines. In the case of the sulphate and potassium SSWQOs, the WLWB adopted the SSWQOs for the Ekati site during the renewal of the water licence in 2013 based on evidence<sup>166</sup> from extensive reviews done by expert consultants working for both stakeholders and the Board. The Board notes however that the SSWQO for strontium as proposed by De Beers has not undergone review in a Board process nor has it been adopted at this time for the Snap Lake Mine. None of the parties to this proceeding have specifically objected to the proposed SSWQO for sulphate, potassium or strontium. The Board has decided to adopt the proposed SSWQOs for the purposes of defining parameters of potential concern in the Gahcho Kué Project effluent.

Based on the evidence at this time, the Board concludes that the SSWQOs listed in column 6 of Table 1 are protective of the designated water uses in Lake N11 and Area 8 as well as downstream areas during operations and that these SSWQO satisfy the intent of Suggestion 1 of EIR 0607-001.

### **Section 3.2.1.1 Proposed SSWQOs for Lead and Mercury**

As shown in Table 1, the CCME guideline values for lead, and mercury are lower than what can be considered the upper edge of natural baseline concentrations in Lake N11 (i.e., the mean baseline concentration in Lake N11 plus two standard deviations). Therefore, the CCME guideline value can be considered too conservative for this receiving water body and, consistent with past Board practice, the Board has considered adopting alternative values for SSWQOs.

---

<sup>164</sup> Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted to the MVLWB on April 4, 2014.

<sup>165</sup> See page 1, LKDFN comments, Gahcho Kué Project – Draft Licence (v.2) – Review Comment Table, submitted June 10, 2014.

<sup>166</sup> WLWB, Reasons for Decision for Water Licence W2012L2-0001, May 27, 2013.

De Beers proposed SSWQOs for lead and mercury that were equal to the mean regional baseline concentrations plus two standard deviations. The region used to estimate baseline concentrations in this case is that of the Kirk Lake Watershed which is downstream of the project area; De Beers justified the use of statistics generated with the regional baseline data “because the Kirk Lake watershed has a much larger dataset that captures potential local scale variability compared to Lake N11 or Area 8 alone.” However, the GNWT-ENR objected to the use of the regional baseline data because “using a regional value (i.e., Kirk Lake watershed) instead of a lake specific value (i.e., Lake N11, Area 8 etc.) as an estimate of baseline may not provide adequate protection to the specific receiving lakes.”<sup>167</sup> According to the Water and Effluent Quality Management Policy, EQC are set to ensure that water quality objectives are not exceeded at the edge of a defined mixing zone. Since the mixing zones are within Lake N11 and Area 8, the Board concludes<sup>168</sup> that the use of baseline concentrations for setting SSWQOs and EQC should be made with respect to the specific lake that receives the discharge.

For these reasons, the Board has set the SSWQO for lead and mercury equal to the mean baseline concentration of each parameter in Lake N11 plus two standard deviations. The Board notes that this determination is in line with the GNWT-ENR’s recommendation<sup>169</sup> on a SSWQO for mercury.

### **Section 3.2.1.2 Proposed SSWQOs for Nitrate**

In Appendix B of the EQC Report, De Beers proposed to adopt the CWQG-PAL guideline value for nitrate of 2.93 mg-N/L as a SSWQO at the Gahcho Kué Mine Site. However, the EQC calculated based on that SSWQO was deemed to be unachievable and so, in section 3.2.1 of the EQC Report, De Beers proposed instead to adopt the nitrate SSWQO<sup>170</sup> that was originally developed for the Ekati Mine Site in 2012. The latter SSWQO takes into account the evidence that increasing water hardness can decrease the toxicity of nitrate and so the objective is expressed as an equation rather than a single numeric value. De Beers calculated the nitrate SSWQO using a hardness value of 50 mg/L CaCO<sub>3</sub> in the equation to get an SSWQO of 5.4 mg/L nitrate. An EQC calculated based on that SSWQO was deemed to be achievable by De Beers. The Board notes, however, that the hardness level in Lake N11 is only predicted to reach 50 mg/L CaCO<sub>3</sub> after three years of effluent discharge – the current hardness level is between 5 and 10 mg/L CaCO<sub>3</sub>.

Based on the Board’s decision to set SSWQO on current hardness levels rather than future predicted levels, the Board concludes that an SSWQO of 5.4 mg/L nitrate is not appropriate at this time. If the current hardness of Lake N11 is used to calculate an SSWQO for nitrate using the equation, the calculated value is lower than the CWQG-PAL guideline value. Based on the evidence at this time, the Board has chosen to adopt the CWQG-PAL guideline value of 2.93 mg/L as the SSWQO for nitrate at the Gahcho Kué Mine Site.

---

<sup>167</sup> See page 13, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>168</sup> In making this determination, the Board would like to clarify that the regional baseline data set may still be useful in interpreting AEMP data and/or in the setting of applicable downstream action levels in the Response Framework.

<sup>169</sup> See page 13, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>170</sup> BHP Billiton, “EKATI Diamond Mine Site-Specific Water Quality Objective for Nitrate, April 2012”, submitted April 26, 2012.

**Table 1: Comparison of Water Quality Guideline Values to Proposed WQOs and Baseline Receiving Water Concentrations**

Parameter	Guideline Values for the Protection of Water Uses (mg/L)		De Beers' Proposed SSWQO <sup>171</sup>	Mean baseline concentration in Lake N11 plus two standard deviations	SSWQO adopted for Lake N11 by the Board at this time	Notes
	<i>Health Canada Guidelines for Drinking Water</i> <sup>172</sup>	<i>CCME Guidelines for the Protection of Aquatic Life</i>				
<b>Major Ions</b>						
Chloride	250 (aesthetic <sup>173</sup> objective)	120	120	1.2	120	The CCME value has been adopted as the SSWQO.
Fluoride		0.12	0.12	0.05	0.12	The CCME value has been adopted as the SSWQO.
Potassium			41	0.7	41	De Beers has proposed to adopt the SSWQO for potassium that was developed for the Ekati Mine. As discussed in section 3.2.1, the Board has adopted this SSWQO based on the evidence at this time.

<sup>171</sup> Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>172</sup> Health Canada (2012) Guidelines for Canadian Drinking Water Quality see summary table at: [http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum\\_guide-res\\_recom/index-eng.php#fn\\_t2b1](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum_guide-res_recom/index-eng.php#fn_t2b1).

<sup>173</sup> Ibid. Note that aesthetic objectives are based on effects to the taste or odour of water that play a role in determining whether consumers will consider water drinkable; however, these parameters are not considered to have health effects.

Sulphate	500 (aesthetic objective)		196	2	41	De Beers has proposed to adopt the hardness dependent SSWQO for sulphate that was developed for the Ekati Mine; De Beers has calculated an SSWQO of 196 mg/L sulphate based on the future predicted hardness in Lake N11 of 50 mg/L CaCO <sub>3</sub> . However, and as discussed in section 3.2.1 of these reasons, the Board has calculated <sup>174</sup> the SSWQO based on the current hardness concentration in Lake N11.
Total Dissolved Solids	500 (aesthetic objective)		500	32	500	The Health Canada guideline has been adopted.
<b>Nutrients</b>						
Ammonia as N		2.4 <sup>175</sup>	2.4	0.1	2.4	The CCME guideline varies with temperature and pH of the receiving water. The value of 2.4 mg N/L is calculated under worst case conditions <sup>176</sup> in Lake N11.
Nitrate as N	10	2.93	2.93	0.038	2.93	The CCME value has been adopted as the SSWQO. See discussion in section 3.2.1.1.
Total Phosphorus			0.0109	0.006	0.0109	De Beers' SSWQO has been adopted.

<sup>174</sup> BHP Billiton, "Ekati Diamond Mine Site-Specific Water Quality Objective for Sulphate, April 2012", submitted on April 26, 2012 to the WLWB as part of the renewal application for W2012L2-0001. The long-term SSWQO equation is  $WQO \text{ (mg/L)} = e^{(0.9116 \cdot \ln(\text{hardness}) + 1.712)}$ , which at the current hardness in Lake N11 of 9 mg/L CaCO<sub>3</sub>, gives a sulphate SSWQO of 41 mg/L.

<sup>175</sup> This is total ammonia as N, calculated using the equation that relates unionized ammonia to total ammonia as per the CCME Canadian water quality guidelines for the protection of aquatic life: Ammonia (From the Canadian environmental quality guidelines, 1999, CCME, Winnipeg). This value was calculated using the 95<sup>th</sup> percentile values for pH and temperature in Lake N11 (i.e., pH 7.1 and 16.4C) as proposed by De Beers in footnote (e) of Table B1 in Appendix B of the EQC Report.

<sup>176</sup> Footnote (e) of Table B1 in Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<b>Total Metals</b>						
Aluminum		0.1	0.045	0.02	0.1	The CCME value has been adopted as the SSWQO.
Antimony	0.006		0.02	0.00018	0.006	The Health Canada guideline has been adopted.
Arsenic		0.005	0.005	0.00016	0.005	The CCME value has been adopted as the SSWQO.
Barium	1		1	0.0044	1	The Health Canada guideline has been adopted.
Beryllium	0.004		0.0053	<0.00001	0.004	The Health Canada guideline has been adopted.
Boron		1.5	1.5	<0.005	1.5	The CCME value has been adopted as the SSWQO.
Cadmium	0.005	0.09	0.00004	0.000033	0.005	The Health Canada guideline has been adopted.
Chromium		0.001	0.001	0.0002	0.001	The CCME value has been adopted as the SSWQO.
Cobalt			0.00075	0.00021	0.004	De Beers has proposed a SSWQO for cobalt based on the mean regional baseline concentration plus two standard deviations although evidence was given that British Columbia Ministry of Environment (BCMOE) has a guideline value of 0.004 mg/L for cobalt. As per the discussion in section 3.2.1, the Board has adopted the BCMOE guideline value.

Copper		0.002	0.0027	0.0012	0.002	De Beers has proposed a SSWQO for copper that is higher than the CCME value based on the fact that the regional baseline mean plus two standard deviations value (0.0027 mg/L) is higher than CCME. However, the Board notes that the equivalent baseline concentration in Lake N11 is only 0.0012 mg/L iron. Therefore, the Board has adopted the CCME value as the SSWQO.
Iron	0.3 (aesthetic objective)	0.3	0.57	0.07	0.3	De Beers has proposed a SSWQO for iron that is higher than the CCME value based on the fact that the regional baseline mean plus two standard deviations value (0.57 mg/L) is higher than CCME. However, the Board notes that the equivalent baseline concentration in Lake N11 is only 0.07 mg/L iron. Therefore, the Board has adopted the CCME value as the SSWQO.
Lead	0.01	0.001	0.00121	0.0038	0.0038	See discussion in section 3.2.2.1.
Mercury	0.001	0.000026	0.000016	0.00004	0.00004	See discussion in section 3.2.2.1.
Molybdenum		0.073	0.073	0.00007	0.073	The CCME value has been adopted as the SSWQO.
Nickel		0.025	0.025	0.0026	0.025	The CCME value has been adopted as the SSWQO.
Selenium	0.01	0.001	0.001	0.00008	0.001	The CCME value has been adopted as the SSWQO.

Silver		0.0001	0.0003	0.000004	0.0001	The CCME value has been adopted as the SSWQO.
Strontium			14	0.013	14	De Beers has proposed to adopt the SSWQO for strontium that was developed for the Snap Lake Mine. As discussed in section 3.2.1, the Board has adopted this SSWQO for the purposes of screening POPC, based on the evidence at this time.
Thallium		0.0008	0.0008	0.000003	0.0008	The CCME value has been adopted as the SSWQO.
Uranium	0.02	0.015	0.015	0.000012	0.015	The CCME value has been adopted as the SSWQO.
Vanadium			0.006	<0.0002	0.006	De Beers has proposed to adopt the Ontario Ministry of Environment guideline value as SSWQO for vanadium. As discussed in section 3.2.1, the Board has adopted this SSWQO based on the evidence at this time.
Zinc		0.03	0.015	0.0032	0.03	The CCME value has been adopted as the SSWQO.

<b>Other Parameters</b>						
pH		6.5-9	-	7.3	6.5 -9	De Beers did not propose a WQO for pH but did propose <sup>177</sup> an EQC of 6 -9. The Board has adopted the CCME value as the SSWQO.
Total Petroleum Hydrocarbons		-	-	-	-	This parameter has no water quality guideline value as it has low solubility in water. Therefore, the Board has not adopted an SSWQO for TPH.
Total Suspended Sediments		5 <sup>178</sup>	-	2.3	6.2	The average baseline TSS concentration in Lake N11 is 1.2 mg/L. Therefore, the CCME's long-term guideline for TSS is equal to 5 plus 1.2 mg/L.

<sup>177</sup> See page 47 De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>178</sup> Note that this long-term CCME guideline value for TSS is 5 mg/L above the background value; the CCME proposes a guideline of 25 mg/L TSS above background for short-term exposures (i.e., less than 24 hour exposure).

### 3.2.2 Mixing Zone Considerations

The Board's Water and Effluent Quality Management Policy states that:

“On a case-by-case basis, the Boards may decide to define a mixing zone between the point of effluent discharge and the point at which water quality standards need to be met.”<sup>179</sup>

De Beers has proposed a mixing zone for Lake N11 equal to 200m from a diffuser. De Beers' recommendation is based on 1) the fact that the Snap Lake Mine has a 200m mixing zone; and 2) because modelling results “indicated that a submerged diffuser would result in an initial turbulent mixing area around the diffuser between 100 and 200m.”<sup>180</sup> None of the interveners objected to the proposed mixing zone size nor was any additional evidence on the subject presented during the regulatory process. Therefore, the Board has decided to adopt the 200m mixing zone around a submerged diffuser in Lake N11.

In Appendix E of the EQC Report, De Beers describes the modelling analysis of diffuser discharge in Lake N11. The mixing analysis was done for three different potential discharge scenarios: a piped outfall discharge at the edge of the south basin of Lake N11, as well as discharge through a submerged diffuser in either the north or south basins of Lake N11. The modelling was done using the CORMIX program under a range of ambient and discharge conditions<sup>181</sup> in order to generate minimum and maximum predicted dilution ratios in Lake N11 equal to 40 and 89, respectively. These dilution ratios mean that, at a minimum, there should be 40 volumes of Lake N11 water available to mix with one volume of effluent at the edge of the 200m mixing zone. However, this dilution ratio cannot be used directly to calculate EQC from the WQOs that are to be met at the edge of the mixing zone because it alone does not account for the accumulation of contaminants over time in Lake N11.

Figure 3.1-1 of the EQC Report depicts the accumulation of contaminants in Lake N11 over the three years that De Beers proposes to discharge effluent. According to the figure, at the end of open water discharge period in year 3, the maximum proportion of Lake N11 that will be effluent is 0.28. Because of the effects of cryoconcentration under ice, the maximum predicted proportion of Lake N11 that will be effluent is 0.42 in the winter after discharge ceases. In other words, at the end three years of effluent discharge to Lake N11 the maximum available dilution of effluent into the lake will be approximately 2.4X (i.e., 1/0.42). The Board notes that this value is lower than the 6X dilution estimated<sup>182</sup> by the GNWT-ENR's consultant from Stantec – a value that was also meant to estimate the steady-state concentrations that would be realized in Lake N11 after approximately three years of discharge. In response to Undertaking #5 from the public hearing, De Beers explained the reason for the discrepancy: when De Beers did the modelling for the assimilation of contaminants in Lake N11, they only modelled the assimilative capacity of the south basin the lake, and not the whole lake. As stated by De Beers:

---

<sup>179</sup> See page 11, MVLWB, Water and Effluent Quality Management Policy, March 2011.

<sup>180</sup> See page 26 De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>181</sup> For example, ambient conditions in Lake N11 under ice and in open water were modelled as per Table E1 of Appendix E of the EQC Report. Modelling was also done with varying assumptions of discharge rates, density, and temperature as well as different diffuser port configurations.

<sup>182</sup> See pages 2.1-2.3 of appendix B, GNWT-ENR Intervention, submitted April 7, 2014. This appendix was written by Stantec and dated March 27, 2014.

“As outlined at the Water Licence Hearing (see also response to Undertaking 3), the south basin possesses a volume of approximately 10 million cubic metres (Mm<sup>3</sup>) and a water yield of approximately 8.8 Mm<sup>3</sup>, compared to all of Lake N11, which has an approximate volume of 18 Mm<sup>3</sup>, and a water yield of approximately 20 Mm<sup>3</sup>. Consideration of the whole lake as a receiving environment provides a substantially greater attenuation of the WMP discharge, with a maximum estimated effluent proportion in winter of Year 3 being approximately 20% as compared to 42% in the south basin of Lake N11.”

De Beers did not give a reason why they initially modelled accumulation in the south basin of Lake N11 instead of the entire lake. For example, there is no evidence to suggest that the south basin is isolated from the rest of the lake or that there is any other hindrance to lake wide mixing. On the basis of the evidence provided by De Beers and by the GNWT-ENR, the Board has concluded that the evidence favors using the estimate that the maximum effluent proportion in the winter of Year 3 in Lake N11 will be 20% (or approximately a maximum dilution of 5X).

### **3.2.3 Determination of Parameters of Potential Concern**

The Water and Effluent Quality Management Policy states:<sup>183</sup>

“Once all reasonable measures have been taken to limit the amount of waste, concerns may still exist about the quantity, concentration, and type of waste to be deposited, and in these cases the Boards will set EQC in the water licence. EQC define the maximum allowable concentrations (e.g., mg/L), quantities (e.g., kg/year), or limits (e.g., pH range) of any contaminant or parameter of the waste which, in the Boards’ opinion, has the potential to adversely affect water quality in the receiving environment.”

Parameters of Potential Concern (POPC) are, therefore, defined as those chemical parameters in the effluent that have, in the Board’s opinion, the potential to adversely affect water quality in the receiving environment. In this step of the EQC setting process, the Board considers the evidence as to which chemical parameters qualify as POPC.

In the EQC Report, De Beers proposed POPC based on a screening process<sup>184</sup> that progressively eliminated parameters if they met the following successive criteria:

- 1) If the maximum predicted discharge concentration of a parameter was lower than the baseline concentration minus 10%,
- 2) If the maximum predicted discharge concentration of a parameter was less than the WQO minus 10%, or
- 3) If the maximum predicted concentration at the mixing zone was less than the WQO minus 10%.

---

<sup>183</sup> Section 7.2, MVLWB, Water and Effluent Quality Management Policy, March 2011.

<sup>184</sup> See figure 2.1-1, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

Based on their analysis, De Beers concluded that nitrate, ammonia, total phosphorus and aluminum qualified as POPC. The Board notes that De Beers' screening process is based on modelled parameter concentrations in the discharge and the receiving environment, however, De Beers also recommended that EQC may be necessary for parameters that "may be influenced by treatment and mitigation technologies to be used at the Mine."<sup>185</sup> For the reasons described in Section 4 of the EQC Report, De Beers also recommended that EQC be set for total suspended solids, pH and total petroleum hydrocarbons.

In its intervention to the public hearing, the GNWT-ENR expressed its concerns over the "completeness of the list of EQC proposed by De Beers." The GNWT-ENR outlined all of the sources of potential contaminants in the mine discharge and proposed that at least one of the POPC from each waste source be regulated through an EQC. Waste sources identified by the GNWT-ENR included saline groundwater seepage into the open pits, contact water from seepage through tailings and waste rock, process water from mining operations, sewage, and natural runoff water from ongoing dewatering of Kennady Lake. On this basis, the GNWT-ENR proposed the following additional POPC:<sup>186</sup>

- Total dissolved solids (TDS), on the basis that it is an indicator of saline groundwater;
- Chloride, on the basis that it is a component of saline groundwater, it is a parameter that is regulated at other NWT diamond mines, and that the predicted concentration in the WMP discharge is greater than a generic WQO minus 10%;
- Fluoride, on the basis that it is a component of saline groundwater, and that the predicted concentration in the WMP discharge is greater than a generic WQO minus 10%;
- Arsenic, on the basis that the predicted concentration in the WMP discharge is greater than a generic WQO minus 10%; and
- Chromium, on the basis that the predicted concentration in the WMP discharge is greater than a generic WQO minus 10%.

Although Environment Canada (EC) acknowledged De Beers' efforts to propose POPC based on predicted future parameter concentrations, EC also proposed that additional parameters should be regulated as EQC on the basis that "modelling has an inherent uncertainty until operational monitoring data can be collected to calibrate and validate predictions." EC recommended that the Board consider EQC for parameters that are typically regulated at other mines including sulphate, chloride, cadmium, chromium, arsenic, copper, lead, molybdenum, nickel and zinc.

The Board agrees that it is reasonable to consider regulating at least some parameters from each waste stream reporting to the Water Management Pond as proposed by the GNWT-ENR. As also suggested by the GNWT-ENR, parameters can be chosen based on predictions that concentrations in the Water Management Pond may approach or exceed the SSWQO for that parameter after Year 3 of Operations. Column 5 of Table 2 below lists those parameters that are predicted to exceed<sup>187</sup> SSWQOs in the Water Management Pond for comparison to the POPC recommended by other parties. Although De Beers recommended further screening of

---

<sup>185</sup> See page 46, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>186</sup> Note that an additional reason given by the GNWT-ENR for the addition of arsenic and chromium was that they no other metals had been proposed to be regulated. However, that conclusion was based on the December 2013 version of the EQC Report which was updated to include aluminum as a POPC in the April 2014 EQC Report.

<sup>187</sup> Note that the GNWT-ENR proposed to choose parameters that exceed, in the Water Management Pond, the respective SSWQOs minus 10% but the resulting parameter list is the same as the list in column 5 of Table 2.

POPC based on predictions of parameter concentrations at the edge of the mixing zone, the Board has decided not to do this in this case. The reason is that predictions of mixing zone concentrations are necessarily more uncertain than estimates of Water Management Pond concentrations because of the greater number of assumptions required with each level modelling after the initial source term predictions. In this specific case, there are also uncertainties in the way De Beers calculated dilution factors for Lake N11 as already discussed in Section 3.2.2 above.

During the public hearing, the Board's geochemical consultant asked<sup>188</sup> several questions of De Beers regarding the degree of uncertainty in source term predictions for geochemical loadings. For example, water quality predictions for contact water associated with waste rock, processed kimberlite and pit walls all have inherent uncertainty as deviations from predictions in field monitoring data are common. De Beers has proposed that the Ekati Mine is an appropriate analog to the Gahcho Kué deposit and associated host rocks; therefore it is considered valid to assess trends in contact water quality at Ekati to inform POPCs associated with Gahcho Kué. Indicators of rock weathering that might be considered sentinel species based on this analog<sup>189</sup> are sulphate (sulphide oxidation), calcium and magnesium (mineral buffering), molybdenum, nickel (near neutral pH metal leaching) and uranium (alkaline pH leaching from processed kimberlite). Of these parameters, calcium and magnesium are not considered to be toxic to aquatic life and therefore have not been included in the final column of Table 2 below.

On the basis of the evidence, the Board has decided to set EQC for 1) all of the parameters that are predicted to exceed SSWQOs in the Water Management Pond as listed in column 5 of Table 2; 2) those parameters for which there is uncertainty in the source term predictions as per column 6 of Table 2; and 3) for pH, total suspended sediments and total petroleum hydrocarbons. Note that using this approach, at least one parameter from each identified waste stream will be regulated through an EQC as recommended by the GNWT-ENR.

---

<sup>188</sup> See pages 129 – 139 of the Public Hearing transcripts for May 6, 2014.

<sup>189</sup> BHPB, "Ekati Diamond Mine 2012 Waste Rock and Waste Rock Storage Area Seepage Survey Report, submitted to the WLWB March 2013.

**Table 2: Comparison of Parameters of Potential Concern Proposed for Discharges to Lake N11**

Parameter	Proposed POPC			Parameters predicted to exceed <sup>190</sup> the SSWQO in the WMP after Year 3 of Operations	Additional parameters recommended on the basis of uncertainty in geochemical predictions
	Proposed by De Beers	Proposed by GNWT-ENR	Proposed by EC		
<i>Major Ions</i>					
Chloride		√	√	√	
Fluoride		√	√	√	
Potassium					
Sulphate			√		√
Total Dissolved Solids		√			
<i>Nutrients</i>					
Ammonia as N	√	√	√	√	
Nitrate as N	√	√	√	√	
Total Phosphorus	√	√	√	√	
<i>Total Metals</i>					
Aluminum	√		√	√	
Antimony					
Arsenic		√	√		
Barium					
Beryllium					
Boron					
Cadmium			√		
Chromium		√	√	√	
Cobalt					
Copper			√	√	
Iron				√	
Lead			√		
Manganese					
Mercury					

<sup>190</sup> SSWQOs from Table 1 of this Appendix were compared to the maximum concentrations in Year 3 of Table D2, Appendix D to De Beers' EQC Report. Year 3 maximum values were used as De Beers has proposed to discharge to Lake N11 for three years.

Molybdenum			√		√
Nickel			√		√
Selenium					
Silver					
Thallium					
Uranium					√
Vanadium					
Zinc			√		
<i>Other Parameters</i>					
pH	√	√	√		
Total Petroleum Hydrocarbons	√	√	√		
Total Suspended Solids	√	√	√	√	

### 3.2.4 Calculation of Water Quality-Based EQC

In its EQC Report, De Beers proposed using a method for calculating water quality-based EQC that followed guidance published by Alberta Environmental Protection<sup>191</sup> and the United States Environmental Protection Agency.<sup>192</sup> The methodology has been used previously by the Boards for calculating EQC and no other party objected to the methodology during this proceeding. For these reasons, the Board has accepted De Beers' recommendation and has also calculated water quality-based EQC based on the AEP and USEPA procedures.

The first step in calculating the water quality-based EQC is to calculate a "waste load allocation" or WLA which is defined by De Beers<sup>193</sup> as follows:

"The WLA represents the maximum concentrations of a parameter that can be discharged to the receiving environment while maintaining the proposed WQOs under reasonable "worst-case" or most limiting conditions, The WLA calculation considers the average discharge during the year of maximum discharge, the natural inflow to Lake N11 during the year of maximum discharge, baseline parameter concentrations in Lake N11 and the dilution of the WMP discharge provided by the submerged diffuser. The WLA is a deterministic or fixed value that does not consider discharge or sampling variability."

De Beers derived the following equation for the WLA for the Gahcho Kué Mine Site (note that the derivation of the equation is described both in section 3.1 of the EQC Report as well as in a memo<sup>194</sup> brought forward during the Technical Sessions):

$$\text{Equation A} \quad \text{WLA} = \frac{(DF+1)*C_{WQO}*(Q_{IN}+Q_{WMP})-(DF*C_{IN}*Q_{IN})}{(DF+1)*Q_{WMP}+Q_{IN}}$$

Where:

- DF = The dilution factor (i.e., the volume of lake water that mixes with one volume of effluent discharged from the WMP to Lake N11) which was set equal to the minimum value of 40 as modeled in Appendix E of the EQC Report.
- $C_{WQO}$  = SSWQO for each parameter of potential concern in mg/L
- $Q_{IN}$  = The volume of natural inflow water which is available for dilution of the effluent in Lake N11; this value is calculated to account for the assimilative capacity of Lake N11 as discussed further below.
- $Q_{WMP}$  = The flow of operational discharge from the WMP to Lake N11; this value is equal 37,500 m<sup>3</sup>/day which is the maximum flow predicted during operations.
- $C_{IN}$  = Average baseline concentration of a parameter in natural inflows to Lake N11; this value has been set equal to the average baseline concentrations in Lake N11.

<sup>191</sup> Alberta Environmental Protection, 1995, Water Quality Based Effluent Limits Procedures Manual, Edmonton, AB.

<sup>192</sup> United States Environmental Protection Agency, 1991, Technical Support Document for Water Quality-Based Toxics Control. EPA 505-2-90-001. Washington, DC, USA.

<sup>193</sup> See page 31, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>194</sup> See "EQC Equation Derivations" Memo, submitted during the technical sessions on Feb. 12, 2014.

The accumulation of contaminants in Lake N11 is accounted for in the WLA equation within the term “Q<sub>IN</sub>”. As described on page 35 of the EQC Report, the following equation was used to calculate Q<sub>IN</sub>:

$$\text{Equation B} \quad C_{N11} = \frac{(C_{IN} * Q_{IN}) + (C_{WMP} * Q_{WMP})}{Q_{WMP} + Q_{IN}}$$

Where:

C<sub>N11</sub> = The concentration of a parameter in Lake N11; in order to account for the accumulation of contaminants in Lake N11, C<sub>N11</sub> is set equal to 0.2 which is the maximum proportion of effluent predicted to make up Lake N11 after three years of effluent discharge (see section 3.2.3 above for further discussion on this value).

C<sub>IN</sub> = This is meant to be the average baseline concentration of a parameter in natural inflows to Lake N11; for the purposes of this particular calculation, this value has been set equal to the 0.

C<sub>WMP</sub> = This is meant to be the maximum predicted concentration of a parameter in WMP during operations; for the purposes of this particular calculation, this value has been set equal to the 1.

Q<sub>IN</sub> = The volume of natural inflow water which is available for dilution of the effluent in Lake N11; and the value being calculated in this instance.

Q<sub>WMP</sub> = The flow of operational discharge from the WMP to Lake N11; this value is equal 37,500 m<sup>3</sup>/day which is the maximum flow predicted during operations.

When Equation B is solved using the parameters described above, Q<sub>IN</sub> = 150,000 m<sup>3</sup>/day, and this is the value used to calculate the WLA values using Equation A.

WLA values have been calculated using Equation A for all the POPC except for ammonia. Ammonia is a non-conservative parameter and is therefore not expected<sup>195</sup> to accumulate over time. Therefore, as described on page 36 of De Beers’ EQC Report, the WLA for ammonia was calculated<sup>196</sup> without regard for the accumulation in Lake N11.

<sup>195</sup> For example, ammonia in aquatic systems is transformed rapidly to other nitrogen species.

<sup>196</sup> See equation 6 on page 36, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

Using the equations and values described above, the waste load allocations for the POPC are as follows:

**Table 3: Calculated Waste Load Allocations for POPC in Discharges to Lake N11**

<b>Parameter</b>	<b>Waste Load Allocation in mg/L</b>
Ammonia as N	82
Sulphate	183
Nitrate as N	13
Total Phosphorus	0.035
Chloride	543
Fluoride	0.37
Total Aluminum	0.42
Total Chromium	0.0042
Total Copper	0.0070
Total Iron	1.26
Total Molybdenum	0.33
Total Nickel	0.11
Total Uranium	0.068
Total Suspended Solids	24

As noted by De Beers in its response to Undertaking #4, the calculated WLA value for ammonia is higher than the acute water quality criterion for ammonia as published by the USEPA. Therefore, De Beers recommended setting the water quality-based EQC for ammonia to the acute criterion of 21 mg/L and this has been reflected in Table 4.

The AEP and USEPA procedures then require the calculation of long-term average (LTA) concentrations that take into account the potential for parameter concentrations to vary in the discharge and are therefore smaller than the WLA values. The maximum average<sup>197</sup> and maximum grab EQC concentrations are then calculated from the LTA values to further account for the variability in the discharge quality. De Beers has described these equations and their uses in section 3.1.2 and 3.1.3 of their EQC Report. Overall the use of these procedures and calculations should result in EQC that are conservative and that will ensure SSWQOs are met at the edge of mixing zone as long as the estimates of mixing and dilution in Lake N11 are accurate.

<sup>197</sup> Note that in the terminology of the AEP/USEPA guidance and De Beers' EQC Report the "maximum average concentration" and "maximum grab concentration" are referred to the "average monthly limit" and the "daily maximum limit" respectively. The Board has chosen to use the former terms to be consistent with other water licences.

Using the equations defined in the AEP and USEPA (which are equivalent to those recommended in section 3.1.2 and 3.1.3 of the De Beers EQC Report), the Board calculated<sup>198</sup> maximum average and maximum grab concentrations for the selected POPC and these values are listed in Table 4 below. As shown in Table 4 below, the water quality-based EQC for pH was set equal to the SSWQO range of 6.5 -9. This is because buffering capacity of Lake N11 is unknown and so in order to ensure that pH in Lake N11 remains within the SSWQO range, the effluent must also be within the SSWQO range.

**Table 4: Water Quality Based EQC for POPC in Discharges to Lake N11**

Parameter	Concentration Units	Maximum Average Concentration	Maximum Grab Concentration
Ammonia as N	mg/L	21	21
Sulphate	mg/L	150	300
Nitrate as N	mg/L	11	22
Total Phosphorus	mg/L	0.029	0.058
Chloride	mg/L	444	892
Fluoride	mg/L	0.3	0.6
Total Aluminum	mg/L	0.34	0.7
Total Chromium	mg/L	0.0034	0.007
Total Copper	mg/L	0.0057	0.011
Total Iron	mg/L	1.03	2.1
Total Molybdenum	mg/L	0.27	0.54
Total Nickel	mg/L	0.092	0.184
Total Uranium	mg/L	0.056	0.11
Total Suspended Solids	mg/L	20	40
pH	pH units	6.5 - 9	

<sup>198</sup>The Board used the equations and default values exactly as defined in sections 3.1.2 and 3.1.3 of the De Beers EQC Report.

### 3.3 Technology Based EQC

In Appendix D of the EQC Report, De Beers provided predicted effluent quality in the water management pond during the first three years of operations. These predictions are based in part on source terms, or contact water quality predictions related to waste products and were derived<sup>199</sup> during the EIR process.

Since De Beers has not proposed to actively treat the effluent, technology-based EQC are in this case based on what the proponent has predicted to be achievable<sup>200</sup> after all mitigation and waste management practices have been implemented on site. Therefore, the Board has decided that the technology-based EQC for this project will be equal to the maximum predicted concentration of POPC in the water management pond in year 3 of operations. For the parameters of pH, total suspended solids and total petroleum hydrocarbons, De Beers has not provided predictions of maximum concentrations the WMP so the technology-based EQC for these parameters were set as follows:

- pH: De Beers proposed to use the CCME Guidelines as EQC however the CCME values were misquoted in the EQC report as being between 6-9. In face the CCME Guidelines call for pH for fresh water to remain between 6.5 and 9 and this is the range chosen by the Board for this Licence.
- Total suspended solids: De Beers have proposed EQC equal to 15 and 25 mg/L for maximum average and maximum grab concentrations respectively based on requirements in the Snap Lake, Ekati and Diavik Mine water licences. Since De Beers has proposed these values, the Board considers them to be achievable at the Gahcho Kué mine site.
- Total petroleum hydrocarbons: De Beers proposed<sup>201</sup> a narrative EQC: “Operational discharge from the WMP shall be managed to prevent the appearance of any visible film of the surface of Lake N11 or Area 8.” In response to a recommendation by EC, De Beers proposed a daily maximum limit for total petroleum hydrocarbons of 5 mg/L. During the public hearing, EC stated<sup>202</sup> that that this value was “pretty typical” and the Board notes that 5 mg/L is the EQC in De Beers’ current Type B water licence. Therefore, the technology-based EQC for total petroleum hydrocarbons has been set equal to 5 mg/L as a maximum grab concentration.

---

<sup>199</sup> EIR0607-001\_2012\_EIS\_Supplement\_-\_Part\_08\_-\_App\_8-I\_and\_8-II\_to\_Attach\_8-II-1, page8.11-15:

<sup>200</sup> Note that De Beers itself recommended EQC for ammonia and nitrate that were equal to the maximum predicted concentrations of those parameters in year 3 of operations; therefore, the Board concludes that De Beers considers all of the maximum predicted concentrations in the WMP, as reported in Appendix D of the EQC Report, to be achievable during all of operations. See also section 3.2.1 of the EQC Report as well as the “Errata Note” for the EQC Report submitted May 5, 2014.

<sup>201</sup> See page 49, Table 4.1-1 of the EQC Report, submitted May 5, 2014.

<sup>202</sup> See page 24 of the day 2 of the Public Hearing transcripts for May 7, 2014.

In Table 5, below, the technology-based EQC are compared to the water quality-based EQC determined in section 3.2.

**Table 5: Comparison of Water Quality Based EQC to Technology Based EQC for Discharges to Lake N11**

Parameters of Potential Concern	Water quality based EQC (in mg/L unless otherwise indicated)	Technology based EQC (in mg/L unless otherwise indicated)
Ammonia as N	21	10
Sulphate	150	33
Nitrate as N	11	9.9
Total Phosphorus	0.029	0.033
Chloride	444	157
Fluoride	0.3	0.15
Total Aluminum	0.34	0.099
Total Chromium	0.0034	0.0021
Total Copper	0.0057	0.0027
Total Iron	1.03	0.39
Total Lead	0.0026	0.00046
Total Molybdenum	0.27	0.051
Total Nickel	0.092	0.0056
Total Uranium	0.056	0.0026
pH	6.5 -9 pH units	6 -9 pH units
Total Suspended Solids	20	15
Total Petroleum Hydrocarbons	n/a	5

### 3.4 Final EQC for Discharges at SNP Station # 2 from the Water Management Pond to Lake N11

The comparisons in Table 5 above show that for all POPC except phosphorus and pH, De Beers predicts that it can achieve EQC that are lower than what is necessary to maintain the SSWQO for those parameters in Lake N11. Therefore, and in keeping with the Board's Policy of minimizing the amount of waste deposited to the receiving environment, the Board has chosen to set most of the EQC equal to the technology-based EQC. The exceptions to this general conclusion are as follows:

- Phosphorus: De Beers also noted that the water quality-based EQC is lower than what they had predicted to be achievable; however, De Beers still recommended the lower EQC citing the fact that the predictions for phosphorus are probably overly conservative.<sup>203</sup>
- pH: De Beers proposed to use the CCME guidelines as EQC however, the CCME values were misquoted in the EQC Report as being between pH 6 -9. In fact the CCME guidelines call for pH of freshwater to remain between 6.5 and 9 and this is the range chosen by the Board for this water licence.
- Molybdenum, sulphate, uranium and nickel: The Board has decided to set the EQC equal to the Water Quality Based EQC because of the potential uncertainty in the source term predictions for these parameters as discussed above.

<sup>203</sup> See page 40, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

- Total petroleum hydrocarbons: No maximum average EQC for this parameter was recommended, therefore, only a maximum grab EQC has been set in this Licence.

The final EQC for discharges from the Water Management Pond to Lake N11 at SNP Station 02 are listed in Table 6 below and in Part G, Item 30 of MV2005L2-0015. The Board considers these EQC to be set at levels that will protect downstream water uses as well as minimize the amount of waste discharged. Furthermore, the evidence<sup>204</sup> is consistent with these EQC being reasonably and consistently achievable during operations at the Gahcho Kue Mine.

**Table 6: Final EQC for Discharges to Lake N11 at SNP Station 02**

Parameters	Maximum Average Concentration (in mg/L unless otherwise indicated)	Maximum Grab Concentration (in mg/L unless otherwise indicated)
Ammonia as N	10	20
Sulphate	150	300
Nitrate as N	10	20
Total Phosphorus	0.03	0.06
Chloride	160	320
Fluoride	0.15	0.3
Total Aluminum	0.1	0.2
Total Chromium	0.002	0.004
Total Copper	0.003	0.006
Total Iron	0.4	0.8
Total Molybdenum	0.3	0.6
Total Nickel	0.09	0.18
Total Uranium	0.06	0.12
pH	6.5 -9 pH units	
Total Suspended Sediments	15	25
Total Petroleum Hydrocarbons	n/a	5

#### **4.0 EQC Determinations for Discharges from the Water Management Pond to Area 8 During Operations**

In this section of Appendix 1, the Board discusses the determination of EQC for discharges from the WMP to Area 8. Note that the Board's decisions on Area 8 are consistent with those described above for discharges to Lake N11. Therefore, this section will not substantively repeat those reasons unless the supporting evidence with respect to Area 8 is materially different than that for Lake N11.

#### **4.1 Parameters for Review**

In its EQC Report, De Beers adopted the list of parameters recommended by the Board as a starting point for evaluating EQC with the exception of total suspended solids, pH, Faecal coliforms, and total petroleum hydrocarbons. Faecal coliforms are being regulated through EQC on effluent from the sewage treatment plant (see conditions Part G, Item 27) and, therefore, the Board agrees that it is not necessary to regulate this parameter in the WMP. EQC for pH, total suspended solids and total petroleum hydrocarbons are discussed below in section 4.3. De Beers also added the

<sup>204</sup> See section 3.3 above and footnote 197 of this document.

parameters fluoride and thallium to the list of parameters for review “because concentrations of these two parameters have the potential to increase above baseline concentrations, consistent with trends observed at the Snap lake Mine.”<sup>205</sup>

Table 7 contains the list of 33 parameters that were evaluated as potential EQC as described below. The final list of parameters that will be regulated with EQC (i.e., the list of parameters of potential concern) is determined in section 4.2.4 below.

## **4.2 Determination of Water Quality Based EQC**

As already discussed in section 3.2, the derivation of Water Quality-Based EQC involves the following subtasks:

- a) Derivation of numeric WQOs for the receiving environment.
- b) Definition of a mixing zone or other location downstream of the mine where the WQOs must be met.
- c) Definition of Parameters of Potential Concern (POPC). POPC are those chemical parameters that, in the Board’s opinion, have “the potential to adversely affect water quality in the receiving environment”.<sup>206</sup>
- d) Calculation of numeric EQC to meet WQOs at the specified location for each POPC.

### ***4.2.1 Derivation of Numeric Site-Specific WQOs for Area 8***

In Appendix B of its EQC Report, De Beers has proposed WQOs for all the potentially harmful substances that will be discharged from the WMP to Lake N11<sup>207</sup> and Area 8.<sup>208</sup> De Beers proposed SSWQO for Area 8 are listed in Table 7 below. Table 7 also summarizes the numeric WQOs chosen by the Board for the Gahcho Kué receiving environment based on the evidence at this time. With the exceptions noted in section 4.2.1.1 below, the basis for the Board’s decisions are fully described in section 3.2.1 of this document and summarized in Table 7.

Based on the evidence at this time, the Board concludes that the SSWQOs listed in column 6 of Table 7 are protective of the designated water uses in Area 8 as well as downstream areas during operations and that these SSWQO satisfy the intent of Suggestion 1 of EIR 0607-001.

#### **Section 4.2.1.1 SSWQO for Iron and Lead**

As shown in Table 7, the CCME guideline values for iron and lead are lower than what can be considered the upper edge of natural baseline concentrations in Area 8 (i.e., the mean baseline concentration in Area 8 plus two standard deviations). Therefore, the CCME guideline value can be considered too conservative for this receiving water body and, consistent with past Board practice, the Board has considered adopting alternative values for SSWQOs.

---

<sup>205</sup> See page 11, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>206</sup> See section 7.2 of the Water and Effluent Quality Management Policy March 2011.

<sup>207</sup> See Table B1 and B2, Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>208</sup> See Table B3 and B4, Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

De Beers has proposed a SSWQO for iron that is higher than the CCME value based on the fact that the regional baseline mean plus two standard deviations value (0.57 mg/L) is higher than CCME. However, the Board notes that the equivalent baseline concentration (i.e., mean plus two standard deviations) in Area 8 is 2.47 mg/L iron. The site specific mean baseline value in Area 8 is much lower, at 0.28 mg/L and below the CCME value of 0.3 mg/L, and the large difference in the baseline statistical values for iron in Area 8 indicates that there is either a lot of variation in Area 8 or there were quality control problems with the sampling and analysis in that area. In this case then, the Board has decided to adopt the regional baseline mean plus two standard deviations (0.57 mg/L) as the SSWQO.

De Beers proposed a SSWQO for lead that was equal to the mean regional baseline concentration plus two standard deviations. As per the decisions described in section 3.2.1.1 above, the Board has chosen to set the SSWQO for lead equal to the mean Area 8 baseline concentration plus two standard deviations.

**Table 7: Comparison of Water Quality Guideline Values to Proposed WQOs and Predicted Receiving Water Concentrations**

Parameter	Guideline Values for the Protection of Water Uses (mg/L)		De Beers' Proposed SSWQO <sup>209</sup>	Mean baseline concentration in Area 8 plus two standard deviations	SSWQO adopted for Area 8 by the Board at this time	Notes
	Health Canada Guidelines for Drinking Water <sup>210</sup>	CCME Guidelines for the Protection of Aquatic Life				
<i>Major Ions</i>						
Chloride	250 (aesthetic <sup>211</sup> objective)	120	120	2.3	120	The CCME value has been adopted as the SSWQO.
Fluoride		0.12	0.061	0.06	0.12	The CCME value has been adopted as the SSWQO.
Potassium			41	1.0	41	De Beers has proposed to adopt the SSWQO for potassium that was developed for the Ekati Mine. As discussed in section 3.2.1, the Board has adopted this SSWQO based on the evidence at this time.

<sup>209</sup> See Appendix B, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>210</sup> Health Canada (2012) Guidelines for Canadian Drinking Water Quality see summary table at: [http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum\\_guide-res\\_recom/index-eng.php#fn\\_t2b1](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum_guide-res_recom/index-eng.php#fn_t2b1).

<sup>211</sup> Ibid. Note that aesthetic objectives are based on effects to the taste or odour of water that play a role in determining whether consumers will consider water drinkable; however, these parameters are not considered to have health effects.

Sulphate	500 (aesthetic objective)		196	0.6	61	De Beers has proposed to adopt the hardness dependent SSWQO for sulphate that was developed for the Ekati Mine; De Beers has calculated an SSWQO of 196 mg/L sulphate based on the future predicted hardness in Area 8 of 50 mg/L CaCO <sub>3</sub> . However, and as discussed in section 3.2.1 and 4.2.1 of these reasons, the Board has calculated <sup>212</sup> the SSWQO based on the current hardness concentration in Area 8.
Total Dissolved Solids	500 (aesthetic objective)		40	71	500	The Health Canada guideline has been adopted.
<b>Nutrients</b>						
Ammonia as N		1.78 <sup>213</sup>	1.78	0.137	1.78	The CCME guideline varies with temperature and pH of the receiving water. The value of 2.4 mg N/L is calculated under worst case conditions <sup>214</sup> in Area 8.
Nitrate as N	10	2.93	2.93	0.051	2.93	The CCME value has been adopted as the SSWQO.
Total Phosphorus			0.0109	0.008	0.0109	De Beers' SSWQO has been adopted.
<b>Total Metals</b>						
Aluminum		0.1	0.045	0.03	0.1	The CCME value has been adopted as the SSWQO.

<sup>212</sup> Give the sulphate SSWQO equation here and reiterate the current hardness level in Area 8 which is 68 mg/L for a hardness of 14 mg/L which is baseline plus 2 std dev.

<sup>213</sup> This is total ammonia as N, calculated using the equation that relates unionized ammonia to total ammonia as per the CCME Canadian water quality guidelines for the protection of aquatic life: Ammonia (From the Canadian environmental quality guidelines, 1999, CCME, Winnipeg). This value was calculated using the 95<sup>th</sup> percentile values for pH and temperature in Lake N11 (i.e., pH 7.4 and 18.4C) as proposed by De Beers in footnote (e) of Table B1 in Appendix B of the EQC Report.

<sup>214</sup> De Beers in footnote (e) of Table B3 in Appendix B of the EQC Report, pH of 7.4 and temp of 18.4C.

Antimony	0.006		0.02	0.00055	0.006	The Health Canada guideline has been adopted.
Arsenic		0.005	0.005	0.00031	0.005	The CCME value has been adopted as the SSWQO.
Barium	1		1	0.0068	1	The Health Canada guideline has been adopted.
Beryllium	0.004		0.0053	<0.00001	0.004	The Health Canada guideline has been adopted.
Boron		1.5	1.5	<0.005	1.5	The CCME value has been adopted as the SSWQO.
Cadmium	0.005	0.09	0.00004	0.000023	0.005	The Health Canada guideline has been adopted.
Chromium		0.001	0.00047	0.00012	0.001	The CCME value has been adopted as the SSWQO.
Cobalt			0.00075	0.00281	0.004	De Beers has proposed a SSWQO for cobalt based on the mean regional baseline concentration plus two standard deviations although evidence was given that British Columbia Ministry of Environment (BCMOE) has a guideline value of 0.004 mg/L for cobalt. As per the discussion in section 3.2.1, the Board has adopted the BCMOE guideline value.
Copper		0.002	0.0027	0.0011	0.002	The CCME value has been adopted as the SSWQO.
Iron	0.3 (aesthetic objective)	0.3	0.57	2.47	0.57	See discussion in section 4.2.2.1.
Lead	0.01	0.001	0.00121	0.0014	0.0014	See discussion in section 4.2.2.1.
Mercury	0.001	0.000026	0.000016	0.0000041	0.000026	The CCME value has been adopted as the SSWQO.
Molybdenum		0.073	0.073	0.000027	0.073	The CCME value has been adopted as the SSWQO.

Nickel		0.025	0.0022	0.0006	0.025	The CCME value has been adopted as the SSWQO.
Selenium	0.01	0.001	0.001	0.00006	0.001	The CCME value has been adopted as the SSWQO.
Silver		0.0001	0.0003	<0.000005	0.0001	The CCME value has been adopted as the SSWQO.
Strontium			14	0.019	14	De Beers has proposed to adopt the SSWQO for strontium that was developed for the Snap Lake Mine. As discussed in section 3.2.1, the Board has adopted this SSWQO for the purposes of screening POPC, based on the evidence at this time.
Thallium		0.0008	0.0008	0.000003	0.0008	The CCME value has been adopted as the SSWQO.
Uranium	0.02	0.015	0.015	0.000022	0.015	The CCME value has been adopted as the SSWQO.
Vanadium			0.006	<0.0002	0.006	De Beers has proposed to adopt the Ontario Ministry of Environment guideline value as SSWQO for vanadium. As discussed in section 3.2.1, the Board has adopted this SSWQO based on the evidence at this time.
Zinc		0.03	0.015	0.0024	0.03	The CCME value has been adopted as the SSWQO.
<b>Other Parameters</b>						
pH		6.5-9	-	7.4	6.5 -9	De Beers did not propose a WQO for pH but did propose <sup>215</sup> an EQC of 6 -9. The Board has adopted the CCME value as

<sup>215</sup> See page 47, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

						the SSWQO.
Total Petroleum Hydrocarbons		-	-	-	-	This parameter has no water quality guideline value as it has low solubility in water. Therefore, the Board has not adopted an SSWQO for TPH.
Total Suspended Sediments		5 <sup>216</sup>	-	6.2	6.7	The average baseline TSS concentration in Area 8 is 1.7 mg/L. Therefore, the CCME's long-term guideline for TSS is equal to 5 plus 1.7 mg/L.

#### 4.2.2 Mixing Zone Considerations

De Beers has proposed<sup>217</sup> a mixing zone for Area 8 equal to 100m from a diffuser. No rationale is given for this recommendation; presumably the proposed mixing zone for Area 8 is smaller than for Lake N11 because<sup>218</sup> of the smaller relative size and volume of Area 8. None of the interveners objected to the proposed mixing zone size and the Board has decided to adopt the 100m mixing zone around a submerged diffuser in Area 8.

In Appendix F of the EQC Report, De Beers describes the modelling analysis of diffuser discharge into Area 8. The modelling was done using the CORMIX program for the range of ambient and discharge conditions expected in the months of June, July and August for operations years 1 to 3, inclusive, and for a year 1 scenario only. The minimum and maximum predicted dilution ratios in Area 8 were 36.7 and 62.8, respectively. These dilution ratios mean that, at a minimum, there should be approximately 37 volumes of Area 8 water available to mix with one volume of effluent at the edge of the 100m mixing zone. However, this dilution ratio cannot be used directly to calculate EQC from the WQOs that are to be met at the edge of the mixing zone because it alone does not account for the accumulation of contaminants over time in Area 8.

Figure 3.1-2 of the EQC Report depicts the accumulation of contaminants in Area 8 over three years effluent discharge. According to the figure, at the end of open water discharge period in year 1, the maximum proportion of Area 8 that will be effluent is 0.35. Because of the effects of cryoconcentration under ice, the maximum predicted proportion of Lake N11 that will be effluent is 0.68. If effluent was also discharged to Area 8 in year 2 of operations, then by the following winter, Area 8 would be 100% effluent. Based on these modelling results, De Beers has proposed to only discharge to Area 8 during the first year of operations.

<sup>216</sup> Note that this long-term CCME guideline value for TSS is 5 mg/L above the background value; the CCME proposes a guideline of 25 mg/L TSS above background for short-term exposures (i.e., less than 24 hour exposure).

<sup>217</sup> See Appendix F, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>218</sup> See discussion on pages F-3 and F-4 of Appendix F, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

#### **4.2.3 Determination of Parameters of Potential Concern**

In the EQC Report, De Beers proposed POPC for Area 8 based on the same screening process<sup>219</sup> that was used to determine POPC for Lake N11. Based on their analysis, De Beers concluded that ammonia and total dissolved solids qualified as POPC for Area 8 although the company also recommended EQC for pH, total suspended solids and total petroleum hydrocarbons. Only two other parties made specific recommendations with respect to POPC or EQC for Area 8:

- EC recommended the same POPC for Area 8 as for Lake N11 for reasons already discussed in section 3.2.4.
- In their closing comments the YKDFN recommended<sup>220</sup> only that “Any EQCs for Area 8 should be similar to the baseline quality”. Unfortunately, no specific evidence was presented by the YKDFN with respect to what parameters should be considered as POPC or exactly how EQC should be set in this case.

Table 8, below, lists the POPC recommended by De Beers and EC in comparison to those parameters expected to exceed the SSWQO in Year 1 of operations and the additional parameters where there is some uncertainty in source term predictions as discussed already in section 3.2.3. The Board has decided to select POPC for Area 8 on the same bases as was done for Lake N11 including those parameters listed in columns 4 and 5 of Table 8 in addition to pH, total suspended sediments and total petroleum hydrocarbons. However, and in contrast to the equivalent analysis done for discharges to Lake N11, none of the typical groundwater parameters are expected to exceed their respective SSWQO in the WMP after one year of operations. Therefore, the Board has decided to include total dissolved solids as a POPC for Area 8 as recommended by De Beers. POPC for Area 8 therefore include sulphate, ammonia, nitrate, phosphorus, chromium, molybdenum, nickel, uranium, pH, total dissolved solids, total suspended solids and total petroleum hydrocarbons.

---

<sup>219</sup> See figure 2.1-1 , De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>220</sup> See Page 4, YKDFN, “Gahcho Kué permit and License Closing Comments (MV2005L2-0015 and MV2005C0032)”, submitted June 24, 2014.

**Table 8: Comparison of Parameters of Potential Concern Proposed for Discharges to Area 8**

Parameter	Proposed POPC		Parameters predicted to exceed <sup>221</sup> the SSWQO in the WMP after Year 1 of Operations	Additional parameters recommended on the basis of uncertainty in geochemical predictions
	Proposed by De Beers	Proposed by EC		
<i>Major Ions</i>				
Chloride		√		
Fluoride		√		
Potassium				
Sulphate		√		√
Total Diss. Solids	√			
<i>Nutrients</i>				
Ammonia as N	√	√	√	
Nitrate		√	√	
Total Phosphorus		√	√	
<i>Total Metals</i>				
Aluminum		√		
Antimony				
Arsenic		√		
Barium				
Beryllium				
Boron				
Cadmium		√		
Chromium		√	√	
Cobalt				
Copper		√		
Iron				
Lead		√		
Manganese				
Mercury				
Molybdenum		√		√
Nickel		√		√
Selenium				
Silver				
Thallium				
Uranium				√
Vanadium				
Zinc		√		
<i>Other Parameters</i>				
pH	√	√		
Total Petroleum Hydrocarbons	√	√		
Total Suspended Solids	√	√	√	

<sup>221</sup> SWQOs from Table 7 of this Appendix were compared to the maximum concentrations in Year 1 of Table D2, Appendix D to De Beers' EQC Report. Year 1 maximum values were used as De Beers has proposed to discharge to Lake N11 for one year.

#### 4.2.4 Calculation of Water Quality-Based EQC

Water quality-based EQC for Area 8 were calculated using the same methodology as described in section 3.2.5 for Lake N11. The equations are described again below however to specify what values were used for Area 8.

Equation C is the same as Equation A in section 3.2.5 except for the definition of terms as shown below:

$$\text{Equation C} \quad \text{WLA} = \frac{(DF+1)*C_{WQO}*(Q_{IN}+Q_{WMP})-(DF*C_{IN}*Q_{IN})}{(DF+1)*Q_{WMP}+Q_{IN}}$$

Where:

DF = The dilution factor (i.e., the volume of lake water that mixes with one volume of effluent discharged from the WMP to Area 8) which was set equal to the minimum value of 36.7 as modelled in Appendix F of the EQC Report.

$C_{WQO}$  = SSWQO for each parameter of potential concern in mg/L as per Table 7

$Q_{IN}$  = The volume of natural inflow water which is available for dilution of the effluent in Area 8; this value is calculated to account for the assimilative capacity of Area 8 as discussed further below.

$Q_{WMP}$  = The flow of operational discharge from the WMP to Area 8; this value is equal 20, 223 m<sup>3</sup>/day which is the average flow to Area 8 predicted<sup>222</sup> during year one of operations.

$C_{IN}$  = Average baseline concentration of a parameter in natural inflows to Area 8; this value has been set equal to the average baseline concentrations in Area 8.

The accumulation of contaminants in Area 8 is accounted for in the WLA equation within the term " $Q_{IN}$ ". As described on page 35 of the EQC Report, the following equation was used to calculate  $Q_{IN}$ :

$$\text{Equation D} \quad C_{\text{Area8}} = \frac{(C_{IN}*Q_{IN})+(C_{WMP}*Q_{WMP})}{Q_{WMP}+Q_{IN}}$$

Where:

$C_{\text{Area8}}$  = The concentration of a parameter in Area 8; in order to account for the accumulation of contaminants in Area 8,  $C_{\text{Area8}}$  is set equal to 0.68 which is the maximum proportion of effluent predicted to make up Area 8 after one year of effluent discharge (see section 4.2.3 above for further discussion on this value).

$C_{IN}$  = This is meant to be the average baseline concentration of a parameter in natural inflows to Area 8; for the purposes of this particular calculation, this value has been set equal to the 0.

---

<sup>222</sup> In the EQC Report, page 35, De Beers states that the discharge rate to Area 8 was set to 34,560 m<sup>3</sup>/day for June, 17; 280 m<sup>3</sup>/day for July; and 8640 m<sup>3</sup>/day for August. These values were averaged according to the number of days in each month to give a value of 20, 223 m<sup>3</sup>/day for entire period.

- $C_{WMP}$  = This is meant to be the maximum predicted concentration of a parameter in WMP during operations; for the purposes of this particular calculation, this value has been set equal to the 1.
- $Q_{IN}$  = The volume of natural inflow water which is available for dilution of the effluent in Area 8; and the value being calculated in this instance.
- $Q_{WMP}$  = The flow of operational discharge from the WMP to Area 8; this value is equal 20, 223 m<sup>3</sup>/day which is the average flow to Area 8 predicted<sup>223</sup> during year one of operations.

When Equation D is solved using the parameters described above,  $Q_{IN} = 9,517$  m<sup>3</sup>/day, and this is the value used to calculate the WLA values using Equation C.

WLA values have been calculated using Equation C for all the Area 8 POPC except for ammonia. Ammonia is a non-conservative parameter and is therefore not expected<sup>224</sup> to accumulate over time. Therefore, as described on page 36 of De Beers' EQC Report, the WLA for ammonia was calculated<sup>225</sup> without regard for the accumulation in Area 8.

Using the equations and values described above, the waste load allocations for the POPC are as follows:

**Table 9: Calculated Waste Load Allocations for POPC in Discharges to Area 8**

Parameter	Waste Load Allocation in mg/L
Ammonia as N	51
Sulphate	89
Nitrate as N	4.25
Total Phosphorus	0.014
Total Chromium	0.0014
Total Molybdenum	0.11
Total Nickel	0.025
Total Uranium	0.022
Total Dissolved Solids	500
Total Suspended Solids	6.7

As noted by De Beers in its response to Undertaking #4, the calculated WLA value for ammonia is higher than the acute water quality criterion for ammonia as published by the USEPA. Therefore, De Beers recommended setting the water quality-based EQC for ammonia to the acute criterion of 21 mg/L and this has been reflected in Table 10.

The AEP and USEPA procedures then require the calculation of long-term average (LTA) concentrations that take into account the potential for parameter concentrations to vary in the

<sup>223</sup> In the EQC Report, page 35, De Beers states that the discharge rate to Area 8 was set to 34,560 m<sup>3</sup>/day for June, 17, 280 m<sup>3</sup>/day for July, and 8640 m<sup>3</sup>/day for August. These values were averaged according to the number of days in each month to give a value of 20, 223 m<sup>3</sup>/day for entire period.

<sup>224</sup> For example, ammonia in aquatic systems is transformed rapidly to other nitrogen species.

<sup>225</sup> See equation 6 on page 36, De Beers, Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

discharge and are therefore smaller than the WLA values. The maximum average<sup>226</sup> and maximum grab EQC concentrations are then calculated from the LTA values to further account for the variability in the discharge quality. De Beers has described these equations and their uses in section 3.1.2 and 3.1.3 of their EQC Report. Overall the use of these procedures and calculations should result in EQC that are conservative and that will ensure SSWQOs are met at the edge of mixing zone as long as the estimates of mixing and dilution in Area 8 are accurate.

Using the equations defined in the AEP and USEPA (which are equivalent to those recommended in section 3.1.2 and 3.1.3 of the De Beers EQC Report), the Board calculated<sup>227</sup> maximum average and maximum grab concentrations for the selected POPC and these values are listed in Table 10 below. The water quality-based EQC for pH was set equal to the SSWQO range of 6.5 -9. This is because buffering capacity of Area 8 is unknown and so in order to ensure that pH in Area 8 remains within the SSWQO range, the effluent must also be within the SSWQO range.

**Table 10: Water Quality Based EQC for POPC in Discharges to Area 8**

Parameter	Maximum Average Concentration in mg/L	Maximum Grab Concentration in mg/L
Ammonia as N	21	21
Sulphate	72	145
Nitrate as N	3.5	7.0
Total Phosphorus	0.0115	0.023
Total Chromium	0.0011	0.0023
Total Molybdenum	0.087	0.174
Total Nickel	0.02	0.04
Total Uranium	0.018	0.036
Total Dissolved Solids	409	821
Total Suspended Solids	5.5	11

### 4.3 Technology Based EQC

The rationale for setting technology based-EQC for the WMP has been previously described in section 3.3. The one change with respect to Area 8 discharges is that since De Beers has only proposed to discharge to Area 8 for one year, the technology based- EQC have been set equal to the maximum predicted WMP concentration after Year 1 of operations as reported by De Beers in Appendix D of its EQC Report. As discussed for discharges to Lake N11, the Board has concluded that technology based-EQC set in this way will be reasonably and consistently achievable. Note that total suspended solid concentrations in the WMP were not reported in Appendix D. When analyzing the EQC information for Lake N11 in section 3 above, the Board considered an EQC of 15 mg/L for total suspended sediments to be achievable based on the fact that De Beers recommended this value as an EQC. Therefore, the technology based-EQC for total suspended solids could be lower than 15 mg/L but there is no data to confirm this.

<sup>226</sup> Note that in the terminology of the AEP/USEPA guidance and De Beers' EQC Report the "maximum average concentration" and "maximum grab concentration" are referred to the "average monthly limit" and the "daily maximum limit" respectively. The Board has chosen to use the former terms to be consistent with other water licences.

<sup>227</sup>The Board used the equations and default values exactly as defined in sections 3.1.2 and 3.1.3 of the De Beers EQC Report.

**Table 11: Comparison of Water Quality Based EQC to Technology Based EQC for Discharges to Area 8**

Parameters of Potential Concern	Water quality based EQC (in mg/L unless otherwise indicated)	Technology based EQC (in mg/L unless otherwise indicated)
Ammonia as N	21	7.1
Sulphate	72	15
Nitrate as N	3.5	7.0
Total Phosphorus	0.0115	0.023
Total Chromium	0.0011	0.0014
Total Molybdenum	0.087	0.0031
Total Nickel	0.02	0.0036
Total Uranium	0.018	0.0013
Total Dissolved Solids	409	107
Total Suspended Sediments	5.5	15
pH	6.5 -9 pH units	6 – 9 pH units
Total Petroleum Hydrocarbons	n/a	5

#### 4.4 Final EQC for Discharges at SNP Station 04 from the Water Management Pond to Area 8

The comparisons in Table 11 above show that for all POPC except nitrate, phosphorus, chromium, total suspended solids and pH, De Beers predicts that it can achieve EQC that are lower than what is necessary to maintain the SSWQO for those parameters in Area 8. Final EQC were evaluated as follows:

- Ammonia and total dissolved solids: The technology based-EQC are lower than the calculated water quality based EQC for ammonia and total dissolved solids. In the EQC Report, De Beers also noted that the calculated water quality based-EQC were high and, on this basis, De Beers recommended<sup>228</sup> the lower EQC of 250 mg/L and 10 mg/L for total dissolved solids and ammonia respectively. The EQC for total dissolved solids was derived by De Beers by setting the maximum grab concentration at the WQO of 500 mg/L and then assuming that the maximum average concentration should be half of that. The same reasoning was used by De Beers to derive the recommended EQC for ammonia. However, and in order to be consistent with the Board's Policy and the decisions made for discharges to Lake N11, the Board has set the Area 8 EQC for total dissolved solids and ammonia equal to the technology based-EQC. The Board concludes that the final EQC for total dissolved solids and ammonia are achievable for the proposed single year of discharge from the WMP to Area 8.
- Phosphorus: As discussed in section 3.4, De Beers have noted that predictions for phosphorus concentrations in the WMP are probably overly conservative.<sup>229</sup> Therefore, there is evidence that the water quality-based EQC for phosphorus is achievable.

<sup>228</sup>See page 43-45, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, April 4, 2014. Note that De Beers did not specify the value of the water quality-based EQC that was calculated.

<sup>229</sup> See page 40, De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

- pH: De Beers proposed to use the CCME guidelines as EQC however, the CCME values were misquoted in the EQC Report as being between pH 6 -9. In fact the CCME guidelines call for pH of freshwater to remain between 6.5 and 9 and this is the range chosen by the Board for this water licence.
- Molybdenum, sulphate, uranium and nickel: The Board has decided to set the EQC equal to the water quality-based EQC because of the potential uncertainty in the source term predictions for these parameters as discussed in section 3.
- Total petroleum hydrocarbons: No maximum average EQC for this parameter was recommended, therefore, only a maximum grab EQC has been set in this water licence.
- Chromium: The Board notes that the technology based-EQC for chromium is slightly higher than the calculated water quality-based EQC. However, according to Table D2 of the EQC Report, the concentrations of chromium in the WMP will be below the water quality-based EQC of 0.0011 mg/L for most of Year 1 of operations, at least up until September of that year when discharge to Area 8 is planned to cease anyway. On this basis as well as De Beers' own confirmation that the predicted WMP concentrations are conservative, the Board concludes that the final EQC for chromium is achievable for discharges to Area 8 during Year 1 of operations.
- Total suspended solids (TSS): De Beers proposed a maximum average and maximum grab concentration of 15 and 25 mg/L respectively for TSS. The rationale given in De Beers' EQC Report for the recommended TSS EQC was centered on dewatering rather than operational discharge and De Beers has not provided any predictions for expected TSS concentrations in the WMP during operations. As discussed in the main body of these Reasons for Decision, the Board has accepted the recommended TSS EQC during drawdown with the understanding that De Beers will be continuously monitoring the turbidity of the drawdown water and action levels will be in place to ensure that drawdown will cease if TSS levels become elevated. During operations, suspended solids are expected to settle in the WMP and there is no evidence to support the need for TSS EQC that are higher than what is necessary to maintain the long term SSWQO for TSS in the receiving environment. Therefore, the Board has set the TSS EQC equal to the water quality-based EQC that has been calculated based on maintaining the TSS concentration in the receiving environment below the long term CCME guideline value of 5 mg/L TSS above background.
- Nitrate: The calculated water quality-based EQC for nitrate is half what De Beers predicts will be achievable in the WMP during Year 1 of operations (i.e., the technology based-EQC). This implies that if De Beers discharged effluent from the WMP to Area 8 during Year 1 at the predicted<sup>230</sup> nitrate concentration of 7 mg/L, then the SSWQO of 2.93 mg/L nitrate would be exceeded in Area 8. This was an unexpected result since if it were true then presumably the EQC screening process carried out by De Beers should have picked up nitrate as a POPC, however that is not what De Beers concluded. Instead, De Beers concluded that nitrate was not a POPC on the basis<sup>231</sup> that the predicted concentration at the edge of the Area 8 mixing zone would be 2.33 mg/L which is below the nitrate SSWQO. However, the predicted value of 2.33 mg/L nitrate at the edge of the Area 8 mixing zone appears to be in error: it appears that that value was calculated without consideration<sup>232</sup> of the predicted winter cryoconcentration in

<sup>230</sup> See Table D2, Appendix D of De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>231</sup> See Table 2.2-8 and Appendix D of De Beers Canada Inc., Gahcho Kué Mine Draft Effluent Quality Criteria Report, April 2014, submitted April 4, 2014.

<sup>232</sup> As per Figure 3.1-2 of the EQC Report, the percentage of effluent in Area 8 in open water after 3 months of discharge from the WMP is 35%. Based on the predicted WMP nitrate concentration of 7 mg/L during Year 1 of operations, the estimated concentration of nitrate in

Area 8. For example, the percentage of effluent in Area 8 in the winter following a year of discharge from the WMP is estimated at 68% (see section 4.2.2) which means that if nitrate was being discharged at a concentration of 7 mg/L then the maximum Area 8 nitrate concentration may be estimated as  $0.68 \times 7 \text{ mg/L} = 4.76 \text{ mg/L}$  which is higher than the SSWQO. Although potentially unachievable, there is, unfortunately, no evidence at this time to support an EQC higher than the calculated water quality-based EQC of 3.5 mg/L nitrate as N. In making this decision, the Board notes that as nitrate originates from explosives use, it is possible to control nitrate concentrations through source control measures. It is possible, therefore, that nitrate concentrations in the WMP will not be as high as predicted and the EQC of 3.5 mg/L may be achievable.

The final EQC for discharges from the Water Management Pond to Area 8 at SNP Station 04 are listed in Table 12 below and in Part G, Item 31 of MV2005L2-0015. The Board considers these EQC to be set at levels that will protect downstream water uses as well as minimize the amount of waste discharged. As discussed above, the Board has set these EQC even though there is evidence that the nitrate EQC may not be achievable and that, therefore, De Beers may not be able to discharge effluent to Area 8 during operations. The Board has concluded however that should this situation arise, De Beers will still be able to operate on schedule as all of the WMP effluent can be directed to Lake N11. In fact, discharges from the WMP to Area 8 have been proposed<sup>233</sup> by De Beers as alternative method of supplementing downstream flows, confirming that discharge from the WMP to Area 8 is optional.

**Table 12: Final EQC at SNP Station 04**

Parameters	Maximum Average Concentration (in mg/L unless otherwise indicated)	Maximum Grab Concentration (in mg/L unless otherwise indicated)
Ammonia as N	7	14
Sulphate	70	140
Nitrate as N	3.5	7
Total Phosphorus	0.012	0.024
Total Chromium	0.001	0.002
Total Molybdenum	0.09	0.18
Total Nickel	0.02	0.04
Total Uranium	0.02	0.04
Total Dissolved Solids	110	220
Total Suspended Sediments	6	12
pH	6.5 - 9	
Total Petroleum Hydrocarbons	n/a	5

Area 8 during open water would be  $0.35 \times 7 = 2.45 \text{ mg/L}$  which is similar to De Beers' estimation of a maximum of 2.33 mg/L nitrate in Area 8. Therefore, it appears that De Beers used the wrong percentage effluent value from Figure 3.1-2 in their estimation of nitrate concentrations in Area 8 and this lead to nitrate being screened out as a POPC.

<sup>233</sup> See section 3.2.3.2 of the Draft Water Management Plan submitted to the MVLWB in November 2013 where De Beers describes one of the key water management activities as: "discharge water from the WMP to Lake N11 when water quality meets discharge requirements (if water quality in the WMP is acceptable, discharge may be direct to Area 8 during this timeframe to supplement downstream flow mitigations)." Also, see page 49 of the Transcripts from Day One of the Technical Sessions for MV2005L2-0015 where De Beers describes how downstream flow mitigation will be carried out by pumping from Lake N11 to Area 8 if EQC cannot be met for discharges from the WMP to Area 8.

**Appendix 2**  
**Detailed Reasons for Decision for the Determination of the Gahcho Kué Project**  
**Reclamation Security**

**Table of Contents**

1.0 Introduction.....	91
2.0 Reclamation Security Estimates - Evidence Submitted to the Board.....	91
3.0 Summary of Security Estimates by Mine Component.....	94
3.1 Open Pit.....	95
3.2 Underground Mine.....	95
3.3 Tailings Facility.....	95
3.4 Rock Piles - South and West.....	96
3.5 Buildings and Equipment.....	98
3.6 Chemicals and Soil Management.....	98
3.7 Surface and Groundwater Management.....	99
3.8 Interim Care and Maintenance.....	99
3.9 Mobilization/Demobilization.....	99
3.10 Monitory and Maintenance.....	100
3.10.1 Air Quality Monitoring.....	100
3.10.2 Wildlife Effects Monitoring Program.....	101
3.11 Ancillary Costs.....	101
3.12 Summary of RECLAIM Cost Components.....	102
4.0 Security Phasing Schedule for Land Use Permit and Water Licence.....	103
4.1 Construction Phase.....	103
4.2 Prior to Mining and Milling (Year 1 of Operations).....	104
4.3 The End of Mining the Hearne Pit (Year 4 of Operations).....	105
4.4 The Remaining Life of the Project (Years 4-11 of Operations).....	105

## **1.0 Introduction**

This appendix provides a detailed explanation of how the Mackenzie Valley Land and Water Board (the Board) arrived at the reclamation security as discussed in the main body of the Reasons for Decision (Part 4.3.4 and 5.3.5), and required by conditions in the Licence and Permit. The Board required the posting of reclamation security deposits for the Gahcho Kué Project (the Project) as presented in Table 1. The security amounts required at each phase depicted below represents the *total* amount of security that shall be posted for the project, not the incremental amount of security required at each phase.

**Table 1. Total Security Deposits Required for Gahcho Kué Project**

<b>Estimate</b>	<b>Total</b>	<b>Land</b>	<b>Water</b>
<b>Total</b>	<b>\$83,835,700</b>	<b>\$16,687,088</b>	<b>\$67,148,612</b>
<b>Phased Payment Schedule</b>			
<b>Construction Phase</b>			
Prior to Initiating Construction Activities	\$15,429,858	\$11,816,392	\$3,613,466
One Year following the Initiation of Construction Activities	\$3,613,465	N/A	\$3,613,465
<b>Operation Phase</b>			
Prior to Year 1 of Operations	\$37,594,133	\$13,817,863	\$23,776,270
Prior to Year 4 of Operations	\$79,690,301	\$15,200,797	\$64,489,504
Prior to Year 7 of Operations	\$82,081,001	\$16,031,943	\$66,049,058
Prior to Year 11 of Operations	\$83,835,700	\$16,687,088	\$67,148,612

## **2.0 Reclamation Security Estimates - Evidence Submitted to the Board**

The Board is conforming to the direction provided in Aboriginal Affairs and Northern Development Canada's (AANDC) *Mine Site Reclamation Policy for the Northwest Territories*, chiefly, that "Adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure, is born by the operator of the mine rather than the Crown".<sup>234</sup> The Board is authorized to set the security deposit amount by subsection 35(1) of the *Waters Act*, and the regulations<sup>235</sup> promulgated under that Act.

The Government of the Northwest Territories (GNWT-ENR) and De Beers Canada Inc. (De Beers) were the only parties to submit security estimates, including security phasing proposals, to the Board. The Yellowknife Dene First Nation (YKDFN) provided recommendations on closure options for waste rock piles in that the, "Site must be reclaimed to something that reflects the surrounding environment", and provides, "Effective habitat for the wildlife that use the area presently".<sup>236</sup> The YKDFN made additional recommendations regarding the preparation of a reclamation research plan, the initiation of

<sup>234</sup> AANDC's duties regarding security for projects on non-federal lands have been passed to the GNWT. The AANDC Policy has been a fundamental underpinning to the Board's security-related decisions in the past, and in the absence of official direction from the GNWT on how the policy applies under devolution, the Board has continued to rely on this Policy for decision-making related to this Licence.

<sup>235</sup> Subsection 11(1) of the Waters Regulations.

<sup>236</sup> See pages 7 – 9, YKDFN Intervention, submitted April 7, 2014.

a Closure Working Group, the collaborative development of closure objectives, and comments to expand upon the interim closure and reclamation plan.<sup>237</sup> Their concerns were echoed in their closing argument.<sup>238</sup>

No other party submitted evidence regarding security calculations or assumptions used, or provided support for either model submitted.

De Beers calculated their security in a format that is different from the RECLAIM model that was requested by the Board.<sup>239</sup> The model used by De Beers reflects liability on-site at each specific phase of development. As such, the total security amount fluctuates from year to year in De Beers' estimate, where the estimate is the highest at the end of Year 4 of Operations. De Beers' security estimate accounts for closure activities that are planned to be reclaimed progressively. Furthermore, De Beers did not utilize updated RECLAIM unit cost units in all instances.

GNWT-ENR provided a security estimate using the most current version of the RECLAIM model. The assumptions applied in the RECLAIM model do not account for progressive reclamation, but rather account for incremental increases in amounts of security to reflect an increasing liability on-site over time. This approach is in line with the *NWT Minesite Reclamation Policy*, which states that credit is not to be applied to the total reclamation amount for activities that are planned to be completed during progressive reclamation. GNWT-ENR was clear in its closing arguments that in accordance with the *NWT Minesite Reclamation Policy*,<sup>240</sup> credits are, "Not to be applied to the total reclamation amount for activities that are planned to be completed during progressive reclamation." GNWT-ENR explained in its intervention<sup>241</sup> and closing argument that progressive reclamation is encouraged, but that the RECLAIM model credits these amounts following their completion. As such, the total security amount in GNWT-ENR's estimate is the highest at the last phase of the Project (projected to be at Year 11 of Operations).

Comparing De Beers' estimate with GNWT-ENR's estimate was difficult because of the different formats used to calculate security, and the assumptions made regarding progressive reclamation. GNWT-ENR used De Beers' final phase (the end of Year 11 of Operations) when comparing the two estimates. The Board has also used De Beers' final Project phase total in their analysis of the cost units for mine components, but has tried to capture and consider the assumptions made throughout De Beers' security estimate submissions.

Prior to the public hearing, De Beers submitted a security estimate that included a line item to represent "optional items". The optional items included: the separation and stockpiling of Potentially Acid Generating (PAG) rock during operational years 2-4 and rehandling for disposal in the Hearne Pit; and a 0.5m overburden cover placement on all pads, roads, and rock/processed kimberlite piles. The cost of the "optional items" changes with each phase of Project development, and is highest in Year 4 (\$20,496,452). The Year 11 estimate accounted for \$10,062,445 in "optional items". De Beers did not include these "optional item" costs in their post-public hearing estimate; they do not believe that these reclamation options are a reasonable and accurate reflection of the probable costs, and stated that they do not reflect waste management procedures described in their submitted management plans.<sup>242</sup> GNWT-ENR's security estimate does account for these costs associated with

---

<sup>237</sup> Ibid. page. 9.

<sup>238</sup> See page 4, YKDFN Closing Argument, submitted June 25, 2014.

<sup>239</sup> October 22, 2013 MVLWB letter to De Beers regarding: Submission Requirements for Mining and Milling Water Licence and Land Use Permit applications Gahcho Kué Project - Kennady Lake, NT.

<sup>240</sup> See page 10 – 11, AANDC Mine Site Reclamation Policy, 2007.

<sup>241</sup> See GNWT-ENR Intervention, submitted April 7, 2014; page 1 of Appendix C and page 4, Closing Argument, submitted June 24, 2014.

<sup>242</sup> See page 15 – 16, De Beers Closing Argument, submitted July 2, 2014.

PAG rehandling and overburden cover.<sup>243</sup> The Board’s analysis of these “optional items” is addressed in more detail below.

De Beers has posted \$11,278,206 for security as required under Permit MV2013C0019. De Beers’ April 2, 2014 security estimate included the costs of activities covered by Permit MV2013C0019, and a statement that this amount should be refunded or credited against the grand total shown for reclamation.<sup>244</sup> GNWT-ENR indicated in the public hearing that their security estimate did not credit the monies held under Permit MV2013C0019.<sup>245</sup> The mining applications before the Board include all of the activities covered by Permit MV2013C0019; and as such, security that covers all of the activities included in the applications should be accounted for when setting security for the Project. De Beers may request to discontinue Permit MV2013C0019 in accordance with subsection 37(1) of the Mackenzie Valley Land Use Regulations (MVLUR), and will be able to recover the security held under that instrument once Final Clearance is granted in accordance with subsection 35(5) of the MVLUR. For this reason, the Board did not credit the amount of security held under Permit MV2013C0019 in setting the security requirements.

A summary of the reclamation security estimates submitted to the Board during the proceeding is presented in Table 2. The values presented in De Beers’ estimates represent the total liability on-site at the projected end of production scheduled for Year 11 of the Project, and does not consider costs for items De Beers assumes would have been reclaimed prior to this stage.

**Table 2. Reclamation Security Estimates Submitted to the Board**

<b>Party</b>	<b>Total Amount (Land and Water)</b>	<b>Submission</b>	<b>Date Submitted</b>
<b>Before Public Hearing</b>			
De Beers (does not include “optional items”)	\$50,403,545 (Year 11 of Operations)	Report submitted prior to intervention deadlines	April 2, 2014*
De Beers (includes the “optional items”)	\$60,465,990 (Year 11 of Operations)	Report submitted prior to intervention deadlines	April 2, 2014*
GNWT-ENR	\$84,471,700	Included in GNWT- ENR Intervention	April 7, 2014
<b>Party</b>	<b>Total Amount (Land and Water)</b>	<b>Submission</b>	<b>Date Submitted</b>
<b>After Public Hearing</b>			
De Beers (does not include “optional items”)	\$46,503,615 (Year 11 of Operations)	Included in Closing Argument	July 1, 2014
GNWT-ENR	\$84,471,700	Included in GNWT-ENR Intervention	April 7, 2014

\*De Beers submitted various versions of their security estimate prior to the public hearing (March 20, 2014, March 21, 2014, and April 2, 2014). The most current pre-public hearing version (submitted on April 2, 2014 to the Board) is represented in this table.

<sup>243</sup> See page 4, Appendix C, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>244</sup> See page 2, De Beers Reclamation Cost Estimate, March 2014, submitted April 2, 2014.

<sup>245</sup> See page 10 of the Public Hearing Transcripts for May 7, 2014.

The security estimate provided to the Board in De Beers' closing argument (July 1, 2014) presented lower numbers than their last pre-public hearing estimate (April 2, 2014). However, De Beers did not provide detailed evidence to support the lower numbers in their new estimate, or a breakdown of costs by mine components. De Beers' estimate submitted on July 1, 2014 recommended that the Board not include costs associated with the Wildlife Effects Monitoring Program,<sup>246</sup> which amounts to a difference of \$30,000 from their April 2, 2014 submission. The remaining \$3,869,930 difference in the two estimates was not addressed in their closing argument. In comparing major differences in the security line items and components, the Board used De Beers' April 2, 2014 cost breakdown to compare with GNWT-ENR's estimate.

There are six (6) primary areas of difference between the GNWT-ENR and De Beers total estimates that account for approximately \$34 million. Costs associated with the "optional items" are included in these areas, and account for a significant portion of the difference (\$10,062,990 in De Beers' Year 11 estimate). These differences are related to the following mine components:

- Open Pit;
- Tailings Facilities;
- Waste Rock Piles;
- Buildings and Equipment;
- Chemical and Soil Management; and
- Mobilization/Demobilization.

### **3.0 Summary of Security Estimates by Mine Component**

A summary of the differences by mine component is presented in Table 3 and is discussed below.

**Table 3: Summary of Estimates by Mine Component**

<b>Mine Component</b>	<b>GNWT-ENR Estimate (April 7, 2014)</b>	<b>De Beers Estimate (April 2, 2014 – does not include "optional items")</b>	<b>Difference</b>
Open Pit	\$5,907,360	\$4,476,000	\$1,431,360
Underground Mine	\$0	\$0	\$0
Tailings Facilities	\$15,478,809	\$10,461,632	\$5,017,177
Rock Piles – South and West	\$18,709,152	\$1,713,920	\$16,995,232
Buildings and Equipment	\$4,280,573	\$8,123,159	(\$3,842,586)
Chemicals and Soils Management	\$1,943,432	\$0	\$1,943,432
Surface and Groundwater Management	\$2,599,754	\$2,599,754	\$0
Interim Care and Maintenance	\$1,623,040	\$1,125,600	\$497,440
Mobilization / Demobilization	\$10,142,100	\$2,876,440	\$7,265,660
Monitoring and	\$7,614,000	\$6,808,000	\$806,000

<sup>246</sup> See page 14, De Beers Closing Arguments, submitted July 1, 2014.

Maintenance			
Project Management (5%)	\$2,527,106	\$1,909,225	\$617,881
Engineering (5%)	\$2,527,106	\$1,909,225	\$617,881
Health (1%) & Safety/Bonding (1%)	\$1,010,842	\$763,690	\$247,152
Contingency (20%)	\$10,108,424	\$7,636,901	\$2,471,523
<b>Total</b>	<b>\$84,471,700</b>	<b>\$50,403,545</b>	<b>\$34,068,155</b>

### 3.1 Open Pit

The De Beers closure plan is to breach the dykes to flood the pits and allow the restoration of Kennady Lake through natural runoff accumulation, with supplemental pumping from Lake N11. The closure plan for open pits is highly dependent on the water quality in the pits and the Water Management Pond, and will rely on water quality monitoring data. The De Beers estimate identifies a single pumping component with a single unit cost.

The GNWT-ENR estimate identifies costs associated with open pits to include:

- Relocating a pumping station to the end of the pipeline for pumping from Lake N11 to the Water Management Pond.
- Operating and maintaining the pump for 12 years, three months of the year.
- Decommissioning the pump station and removing the pipeline once lake levels have been restored.

The Board agrees with GNWT-ENR's guiding principles that security estimates should include all components of the Project, including closure and post-closure phases, and that costs should be based on the plans at-hand. Given the uncertainty in future water quality and that additional development of the closure and reclamation plan is required, the Board has decided to adopt GNWT-ENR's estimate of \$5,907,360 in security for the reclamation of open pits.

### 3.2 Underground Mine

As there are no underground mine components associated with these applications, the Board has decided not to apply security to this component; this is in line with recommendations put forth by De Beers and GNWT-ENR.

### 3.3 Tailings Facilities

The De Beers' estimate includes costs to cover the Fine Processed Kimberlite (FPK) area. GNWT-ENR's estimate suggests that in addition to a cover for the FPK area, filling and covering will be required in a void area adjacent to Dyke L. GNWT-ENR's estimate accounts for a 1 metre layer of Course Processed Kimberlite (CPK) between the FPK and waste rock, a 1.5 metre cover of waste rock over the CPK, and a 0.5m overburden cover over Area 2 waste rock and over the CPK storage area.

The cover designs presented by the two parties differ in the areas requiring fill and covers, and in the use of the 0.5m overburden cover. These costs are associated with the "optional costs" that De Beers believes are unnecessary.

The YKDFN identified in their intervention that additional development of closure components and objectives is required, and specifically suggested that the closure plan for the fine PKC facility and, more generally, reclamation research plans, require significant development because the,

“Site must be reclaimed to something that reflects the surrounding [pre-development] environment”.<sup>247</sup>

The Licence includes a requirement for a Reclamation Research Plan to investigate the cover options for reclamation purposes (Part J item 1(b) of the Licence). It will become evident whether or not these costs are appropriate once the reclamation objectives and options have been established under an approved Closure and Reclamation Plan, and the findings of the related Reclamation Research Plan for investigating cover options have been obtained.

In the absence of this information, the Board has opted with a more conservative approach to include the cost of these activities until it has been proven that these activities will not be necessary to achieve the approved to closure objectives. The Board has decided to apply \$15,478,809 towards the closure costs associated with the tailings facilities.

### **3.4 Rock Piles – South and West**

De Beers’ estimate accounts for the recontouring of mine rock piles, and does not include covering or revegetating the piles. However, there have been commitments made by De Beers to assess the feasibility of recovering and stockpiling overburden for use in reclamation. The Licence includes a requirement for a Reclamation Research Plan to investigate the cover options for reclamation purposes (Part J, item 1 (b) of the Licence). GNWT-ENR’s estimate has included the costs associated with a 0.5m overburden cover over the waste rock areas. GNWT-ENR notes that while this option is not included in the conceptual closure plan, the concept is supported by Aboriginal interveners.<sup>248</sup> The YKDFN expressed a preference for the revegetation of waste rock piles, and are opposed to ruling this option out prior to discussions of closure objectives and options.<sup>249</sup> It will become evident whether or not these costs are appropriate once the reclamation objectives and options have been established under an approved Closure and Reclamation Plan, and the findings of the related cover research plan have been obtained.

In the absence of evidence to prove that the conceptual closure activities presented by De Beers are appropriate, and/or the cover research data shows that revegetating the waste rock piles is not feasible, the Board has decided to adopt GNWT-ENR’s estimate to include costs associated with stockpiling excavated overburden to use as a growth medium for vegetation on the waste rock piles.

Additionally, in their conceptual closure plan, De Beers has proposed to dispose of PAG waste rock within the West and South Mine Rock Piles, with a portion placed in areas that will be submerged by Kennady Lake once has refilled in the post-closure phase. There will be insufficient storage volume for all PAG rock to be submerged, so a contingency strategy to segregate PAG rock for disposal into a mined-out pit that will be flooded post-closure has been presented by De Beers as part of their “optional items”. This “optional item” cost has been accounted for in De Beers’ estimate for Year 4 of Operations, adding an additional \$20 million to the Year 4 estimate.<sup>250</sup> However, De Beers believes these costs are unnecessary and should not be included in the security calculation. During the public hearing, De Beers stated that their preferred contingency measure for addressing PAG issues would be to construct selective covers over portions of the waste rock pile(s) that would contain the PAG rock.<sup>251</sup> De Beers’ Year 11 estimate

---

<sup>247</sup> See page 7 – 10, YKDFN Intervention, submitted April 7, 2014.

<sup>248</sup> See page 4, GNWT-ENR Closing Argument, submitted June 24, 2014.

<sup>249</sup> See page 7 – 10, YKDFN Intervention, submitted April 7, 2014.

<sup>250</sup> See page 10, De Beers Reclamation Cost Estimate, submitted April 2, 2014.

<sup>251</sup> See page 123 of the Public Hearing Transcripts for Day 1, May 6, 2014.

of \$50,403,545 (April 2, 2014) does not include the costs associated with segregating and rehandling this PAG material. Similarly, the estimate submitted in their closing argument on July 1, 2014 of \$46,503,615 does not include these costs. In their closing argument, De Beers stated that to stockpile and rehandle PAG material would have negative environmental and economic consequences.<sup>252</sup>

GNWT-ENR's estimate includes the costs of stockpiling and rehandling PAG materials to be placed in a mined-out pit, once a pit becomes available. The PAG material would then be submerged once the pits (and Kennady Lake) are refilled with water. GNWT-ENR has expressed that this is their preferred option, stating that the disposal of PAG materials in subaqueous environments provides the most certainty for secure and long-term control of acid rock drainage and metal leaching; and they believe that this option will not be cost prohibitive.<sup>253</sup> GNWT-ENR also stated that De Beers has not provided details, or cost estimates for the alternative option of selective covers that was raised by De Beers at the public hearing, and have therefore not considered this option.

Part E, item 7 and Schedule 4, item 1 of the Licence include conditions requiring the submission of a Rock Placement Verification Program to assess the rock management procedures De Beers defined in their Standard Operating Procedures (SOP) (required under Part E, item 6 of the Licence). The findings of this verification program will inform the predictions that have been made by De Beers and will be used to assess the success of the PAG segregation procedures proposed. This will provide further information to determine what contingency measures will be appropriate for the handling of PAG materials, including whether or not selective covers would be a viable contingency option. Part C, item 5 of the Licence includes a provision for a revised Project Reclamation liability estimate after the Board approves the verification program report in accordance with Part E, item 7 of the Licence. The Board included the requirement for this review to ensure that any changes to the verification program that arise from the SOP will be reflected in the security deposit amounts. This information will help inform the discrepancies between De Beers' and GNWT-ENR's estimates as they relate to PAG management and help determine whether or not these "optional items" should be accounted for in the security estimate.

Furthermore, the costs associated with PAG stockpiling and rehandling will become more apparent once the reclamation objectives and options have been established under an approved Closure and Reclamation Plan, and the findings of the verification program have been obtained. Part J, item 1c) of the Licence requires that the implications of the results of the Rock Placement Verification Program to Waste Rock handling and closure and reclamation options be included in the Interim Closure and Reclamation Plan.

In the absence of evidence to prove that the conceptual closure activities presented by De Beers will be protective of the environment, the Board has decided to adopt GNWT-ENR's estimate to include costs associated with the more conservative PAG handling procedures.

The Board has decided to include a total security requirement of \$18,709,152 towards the reclamation of waste rock piles.

---

<sup>252</sup> See page 16, De Beers Closing Argument, submitted July 1, 2014.

<sup>253</sup> See GNWT-ENR Closing Argument, submitted June 24, 2014.

### 3.5 Buildings and Equipment

GNWT-ENR indicated in their intervention that De Beers used different methods and assumptions to estimate costs.<sup>254</sup> GNWT-ENR noted they remained consistent with the AANDC *Mine Site Reclamation Policy for the Northwest Territories* in that demolition costs are estimated with no credit towards their salvage value, that they are decontaminated, demolished, and the areas are graded and contoured. Revegetation of the roads and airstrip was also included in their estimate. GNWT-ENR further identified that this portion of the estimate should be reassessed if additional buildings or facilities are required for the Project.

The De Beers April 2, 2014 estimate for this cost component (\$8,123,159) is approximately double the GNWT-ENR estimate (\$4,280,573), despite GNWT-ENR's concerns that De Beers included salvage credits in their estimate. De Beers' July 1, 2014 closing argument submission did not include additional information specific to this cost component.

De Beers has assumed that non-salvageable equipment and materials will be disposed of in a landfill located in one of the open pits, and any hazardous materials will be transported off-site for disposal at appropriate facilities. Similarly to the GNWT-ENR, De Beers included costs for re-contouring and scarification of pads and roads.

The Board has decided to adopt GNWT-ENR's estimate for the buildings and equipment cost component because the Board agrees with the assumptions made in the GNWT-ENR submission, and GNWT-ENR has more experience estimating third party costs for building demolition reclamation costs for sites in the north.

The Board has decided to include a total security requirement of \$4,280,573 towards the reclamation of buildings and equipment.

### 3.6 Chemicals and Soils Management

De Beers has not included any costs associated with the reclamation of contaminated materials or soils, citing that fuel will be stored in tanks placed within lined, engineered facilities and that all fuel will be used at closure.<sup>255</sup> De Beers also noted that minimal quantities of explosives would remain at closure, and that the remainder could be resold.

GNWT-ENR's RECLAIM assumptions do not include recovery of revenue from assets such as residual fuel, chemicals, or reagents. GNWT-ENR further noted that their calculations for this cost component are rough because specific examinations of the site would need to be conducted and cleanup of chemicals or contaminated soils is highly dependent on their properties and state of existing containment.<sup>256</sup> GNWT-ENR also assumes that there will be some portion of contaminated soil, resulting from accidents and spills during decommissioning, that would require the handling and disposal of soil at closure.

Based on the experiences of the existing operational mines in the NWT, accidents and spills are likely to occur during all phases of the Project. The Board agrees with GNWT-ENR that contaminated materials will likely require handling and disposal through the closure and decommissioning phases. The Board also agrees with GNWT-ENR's assumptions regarding the cost recovery of assets.

---

<sup>254</sup> See page 29, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>255</sup> See page 4, De Beers Reclamation Cost Estimate, submitted April 2, 2014.

<sup>256</sup> See page 35 and page 7 of Appendix D, GNWT-ENR Intervention, submitted April 7, 2014.

The Board has decided to include a total security requirement of \$1,943,432 towards the reclamation of chemical and soil management.

### **3.7 Surface and Groundwater Management**

Refilling of the mined-out pits and restoration of Kennady Lake will be a major part of the reclamation for closure of the mine. Water management is closely linked to costs associated with reclaiming the open pits. Breaching dykes and flooding pits to restore Kennady Lake will be contingent on the water quality in the water management pond, including the concentration of suspended solids. The current closure plan includes costs associated with breaching dykes, conducting environmental sampling and reporting throughout flooding periods, and diverting water if required.

There were no differences in assumptions or cost estimates between De Beers and GNWT-ENR for this reclamation component.

The Board has decided to adopt the recommendations put forth by De Beers and GNWT-ENR as there is no evidence to suggest that this recommendation is unreasonable.

The Board has decided to include a total security requirement of \$2,599,754 towards the reclamation of surface and groundwater management.

### **3.8 Interim Care and Maintenance**

Interim care and maintenance costs were estimated for circumstances where general site maintenance would be required if production at the mine ceases. This includes third party costs to maintain the site and conduct on-going environment monitoring and management. Estimates put forth by De Beers and GNWT-ENR are similar; GNWT-ENR's estimate is \$497,440 higher than De Beers'.

The Board has decided to adopt GNWT-ENR's estimate for the interim care and maintenance cost component because the Board agrees with the assumptions made in the GNWT-ENR submission, and GNWT-ENR has more experience estimating third party costs for interim care and maintenance for sites in the north.

The Board has decided to include a total security requirement of \$1,623,040 towards interim care and maintenance costs.

### **3.9 Mobilization/Demobilization**

GNWT-ENR identified that the unit costs and scope of work used by De Beers for calculating the mobilization/demobilization cost component were different due to the particulars within the RECLAIM model.<sup>257</sup> Because the two parties utilized different methods to calculate this component, direct comparisons of the estimates are difficult. It appears as though some of the costs included in GNWT-ENR's estimate for mobilization/demobilization may have been accounted for in De Beers' estimate for buildings and equipment.

GNWT-ENR's estimate is based on De Beers' assumption that 85 truckloads would be required to and from the site over the winter road, that construction and maintenance of the winter road would cover 2 years (30 days/year), and that the costs include worker transport, fuel freight costs, and demobilization of a small camp following completion of lake level restoration. Both GNWT-ENR

---

<sup>257</sup> See page 35, GNWT-ENR Intervention, submitted June 24, 2014.

and De Beers indicated they assumed that all reclamation work would be carried out by third party contractors.

The Board has decided to adopt GNWT-ENR's estimate for the mobilization/demobilization cost component because the Board agrees with the assumptions made in the GNWT-ENR submission, and GNWT-ENR has more experience estimating third party costs for mobilization/demobilization for sites in the north. Furthermore, because the Board adopted GNWT-ENR's lower estimate for buildings and equipment, any costs that were not accounted for in that cost component would be covered here if the Board is consistent in applying the estimate assumptions made by GNWT-ENR.

The Board has decided to include a total security requirement of \$10,142,100 towards mobilization/demobilization.

### **3.10 Monitoring and Maintenance**

Monitoring and maintenance costs have been included during and after lake refilling periods. The length of the monitoring period during the pumping phase depends on the volume of water to be pumped. De Beers has assumed 5 years of additional monitoring once refilling activities have ceased. Monitoring activities during these periods include geotechnical inspections, and regulatory costs associated with reports and management plans. De Beers also accounted for travel and accommodations for work crews.

The Board has decided to adopt GNWT-ENR's estimate for the majority of the monitoring and maintenance cost component because the Board agrees with the assumptions made in the GNWT-ENR submission, and GNWT-ENR has more experience estimating third party costs for monitoring and maintenance of sites in the north. The Board has not adopted GNWT-ENR's estimates for the line items that address air and wildlife effects monitoring; this is described in more detail below.

#### **3.10.1 Air Quality Monitoring**

GNWT-ENR incorporated estimates for an Air Quality Monitoring Program (AQMP) into the monitoring and maintenance cost components for all phases of Project development. The total estimate for this program is \$460,000; paid in the following installments to match their proposed security payment schedule: \$100,000, \$120,000, \$120,000, and \$120,000.<sup>258</sup>

GNWT-ENR requested in its intervention and closing argument that the MVLWB include a condition in the Licence to require the performance of stack testing on the Project's incinerator, to be performed every other year, and to meet the *Canadian Council of Ministers of the Environment (CCME) Guidelines for Canada-Wide Standards for Dioxins, Furans, and Mercury Emissions*.<sup>259</sup>

De Beers submitted an updated Incinerator Management Plan on July 1, 2014, and reiterated in its closing arguments its commitment to conduct stack testing upon commissioning and every three years thereafter.<sup>260</sup> De Beers is of the opinion that this Plan is consistent with best management practices, and, "Submits that no further conditions regarding the incinerator

---

<sup>258</sup> See page 12( Phases 1 through 4), GNWT-ENR Intervention, submitted April 7, 2014.

<sup>259</sup> See page 11, GNWT-ENR Intervention, submitted April 7, 2014; page 6, Closing Argument, submitted June 24, 2014.

<sup>260</sup> See page 13, De Beers Closing Argument, submitted July 1, 2014.

should be required by the Board.”<sup>261</sup> There does not appear to be estimate for an AQMP included in the De Beers security estimate.

In the Board’s view, the De Beers commitments adequately address the need for stack testing. In addition, the Board has carefully considered the GNWT-ENR closing argument and does not agree that s.26(1)(i) of the MVLUR provides authority for a stack testing condition in the context of a Waste Management Plan required by the land use permit. In respect of the Water Licence, the broad definition of Waste and prohibition against the deposit of Waste in the *Waters Act*<sup>262</sup> are not unlimited in scope. The Board does not have general authority over air quality, including monitoring, and has concerns about the limits of its jurisdiction in relation to air quality. Stack testing is in the Board’s view more closely related to air quality management than to preventing the deposit of waste to water.

### **3.10.2 Wildlife Effects Monitoring Program**

GNWT-ENR incorporated estimates for a Wildlife Effects Monitoring Program (WEMP) into the monitoring and maintenance cost components for all phases of Project development. The total estimate for this program is \$176,000 paid in the following installments to match their proposed security payment schedule: \$8,000, \$40,000, \$64,000, and \$64,000.<sup>263</sup>

De Beers included costs for a WEMP in their April 2, 2014 submission, totaling \$30,000. However, in their closing argument, De Beers indicated that a WEMP should not be included in the Permit as this type of requirement would be, “More properly within the jurisdiction of ENR, which has the statutory mandate to conserve “wildlife and its habitat”.”<sup>264</sup>

The Board has decided that the requirement for provision of an AQMP and a WEMP is outside its jurisdiction. As the monitoring and management of air quality and wildlife are outside the limits of the Board’s authorities, as more deeply examined in section 4.3.8 (air) and 5.3.3 (wildlife) of the main body of the reasons, the Board has not included the estimated costs associated with these programs.

Therefore, the Board has subtracted the amounts GNWT-ENR incorporated into their monitoring and maintenance cost component for both air and wildlife effects monitoring.

The Board has decided to include a total security requirement of \$6,978,000 towards monitoring and maintenance.

### **3.11 Ancillary Costs**

The ancillary costs associated with the Project and accounted for in the RECLAIM model include: project management, engineering, health and safety / bonding, and contingency. Both De Beers and GNWT-ENR applied the same percentage values for each of these line items, however, because different subtotals for the capital costs were applied, the total values for these line items were different.

---

<sup>261</sup> Ibid.

<sup>262</sup> S.N.W.T. 2014, c.18.

<sup>263</sup> Ibid.

<sup>264</sup> See page 14, De Beers Closing Argument, submitted July 1, 2014.

The Board has decided to apply the same percentage values to these ancillary line items used by De Beers and GNWT-ENR in their estimates. The resulting values, based on the sub-total that has been calculated by the Board, is described below in Table 4.

**Table 4: Ancillary Security Cost Determination**

<b>Board Calculated Capital Costs Sub-Total = \$50,542,121</b>	
Project Management (5%)	\$2,527,106
Engineering (5%)	\$2,527,106
Health & Safety (1%) / Bonding (1%)	\$1,010,842
Contingency (20%)	\$10,108,424

### 3.12 Summary of RECLAIM Cost Components

A summary of the amount of security the Board has adopted for each mine cost component is presented in Table 5.

**Table 5. Summary of Security Estimates by Mine Component**

<b>Mine Component</b>	<b>Board Decision</b>	<b>Rationale</b>
Open Pit	\$5,907,360	Adopted GNWT-ENR recommendation
Underground Mine	\$0	Adopted De Beers and GNWT-ENR recommendation
Tailings Facilities	\$15,478,809	Adopted GNWT-ENR recommendation
Rock Pile – South and West	\$18,709,152	Adopted GNWT-ENR recommendation
Buildings and Equipment	\$4,280,573	Adopted GNWT-ENR recommendation
Chemicals and Soils Management	\$1,943,432	Adopted GNWT-ENR recommendation
Surface and Groundwater Management	\$2,599,754	Adopted De Beers and GNWT-ENR recommendation
Interim Care and Maintenance	\$1,623,040	Adopted GNWT-ENR recommendation
<b>Subtotal: Capital Costs</b>	<b>\$50,542,121</b>	<b>Calculated Capital Costs based on Board Decisions</b>
Mobilization/Demobilization	\$10,142,100	Adopted GNWT-ENR recommendation
Monitoring and Maintenance	\$6,978,000	Recalculation: Board subtracted AQMP and WEMP amounts from GNWT-ENR recommendation
Project Maintenance (5%)	\$2,527,106	Adopted De Beers and GNWT-ENR recommendation based on Board calculated Capital Costs Sub-total
Engineering (5%)	\$2,527,106	Adopted De Beers and GNWT-ENR recommendation based on Board calculated Capital Costs Sub-total
Health and Safety (1%)	\$1,010,842	Adopted De Beers and GNWT-ENR recommendation based on Board calculated Capital Costs Sub-total

Bonding (1%)	\$10,108,424	Adopted De Beers and GNWT-ENR recommendation based on Board calculated Capital Costs Sub-total
Contingency (20%)	\$2,527,106	Adopted De Beers and GNWT-ENR recommendation based on Board calculated Capital Costs Sub-total
<b>Total</b>	<b>\$83,835,700</b>	

#### **4.0 Security Phasing Schedule for Land Use Permit and Water Licence – Evidence Submitted to the Board**

Security phasing schedules for security amounts divided between land and water-related liabilities were submitted to the Board by GNWT-ENR and De Beers during the proceeding. Both parties recognized that there are operational milestones where liability at the site will increase. Both parties submitted sequenced cost estimates that coincide with operational milestones, however, assumptions applied to sequencing considerations and the land-water split varied.

De Beers submitted their proposed security estimates by time period using the RECLAIM model format for the construction phase of the Project and reformatted the estimates for the end of Operations for years 1, 4, 7, and 11.<sup>265</sup>

Alternatively, GNWT-ENR recommended that security estimates be posted prior to the initiation of each milestone and included the following phases: Construction (noting that water-related security could be scheduled over the assumed 2 year construction period), prior to mining and milling (year 1 of operations), the end of mining in Hearne Pit (year 4 of operations), and that the remaining security amount could be linearly scheduled until the full security amount is posted for the Project (through years 4-11).<sup>266</sup>

The Board agrees that security can be posted under a phased payment schedule, as this is consistent with AANDC's *Mine Site Reclamation Policy for the Northwest Territories*, which states that:

The total financial security for final reclamation required at any time during the life of the mine should be equal to the total outstanding reclamation liability for land and water combined (calculated at the beginning of the work year, to be sufficient to cover the highest liability over that time period).<sup>267</sup>

Furthermore, and in line with the *Mine Site Reclamation Policy*, the Board requires that security be posted such that monies are “sufficient to cover the highest liability over that time period”, or in other words, prior to the initiation of each milestone. In the security phases discussed below, the Board has adopted GNWT-ENR's recommendation that security be posted prior to the relevant milestone.

#### **4.1 Construction Phase**

De Beers and GNWT-ENR are in agreement on the total amount of liability associated with the Construction phase; however, GNWT-ENR believes that only the water-related security should be phased over this Construction period.<sup>268</sup>

<sup>265</sup> See page 15 -16, De Beers Closing Argument, submitted July 1, 2014.

<sup>266</sup> See page 37, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>267</sup> See page 6, AANDC Mine Site Reclamation Policy, 200.

<sup>268</sup> See page 37, GNWT-ENR Intervention, submitted April 7, 2014.

The Board has decided to breakdown the Construction phase in two parts, as proposed by De Beers and supported by GNWT-ENR. However, the Board agrees with GNWT-ENR that only the water-related liability should be scheduled in phases over the Construction period because much of the land-related costs associated with the removal of buildings and equipment and demobilization would be realized early on in the Construction phase.

The Board has decided to include a total security requirement of \$19,043,323 for the Construction phase of the Project, as follows:

**Table 6: Summary of Construction Phase Security**

Liability For:	Construction Phase		
	Prior to Construction	One Year Following Initial Security Payment	Total for Construction Phase
Water	\$3,613,466	\$3,613,465	<b>\$7,226,931</b>
Land	\$11,816,392	N/A	<b>\$11,816,392</b>
<b>Total</b>	<b>\$15,429,858</b>	<b>\$3,613,465</b>	<b>\$19,043,323</b>

#### 4.2 Prior to Mining and Milling (Year 1 of Operations)

The main difference in the security estimates submitted by De Beers and GNWT-ENR for year 1 of operations is the timing for security payment (i.e. prior to the initiation of mining and milling - before year 1 of operations) versus following the initial phase of mining and milling (after year 3 of operations), and the amount of security associated with this phase.

As described above, the Board has decided to require that security be posted prior to each operational milestone.

In determining the amount of security required for this phase for the land and water-related liabilities, the Board adopted GNWT-ENR's recommendation since this is largely consistent with the total amount of security the Board has chosen for each mine component.

The Board has decided to include a total security requirement of \$37,594,133 for the initial mining and milling phase of the Project, as follows:

**Table 7: Summary of Operation Phase Security – Year 1**

Liability For:	Initial Mining and Milling Phase Required Prior to Mining and Milling (Correlated to Year 1 of Operations)
Water	\$23,776,270
Land	\$13,817,863
<b>Total</b>	<b>\$37,594,133</b>

### 4.3 The End of Mining the Hearne Pit (Year 4 of Operations)

The main difference in the security estimates submitted by De Beers and GNWT-ENR for year 4 of operations is the timing for security payment. GNWT-ENR recommends this installment coincides with the end of mining in Hearne Pit.<sup>269</sup> De Beers recommends that security be posted following year 4 of operations which coincides to the completion of the Hearne pit and use of the Area 2 fine PKC facility,<sup>270</sup> and presents this period as years 4-6 in their closing argument.<sup>271</sup>

As described above, the Board has decided to require that security be posted prior to each operational milestone. In this instance, the Board requires that security be posted prior to year 4 of operations to coincide with the end of mining of the Hearne Pit. This assumes the mining plan is adhered to, as presented.

In determining the amount of security required for this phase for the land and water-related liabilities, the Board adopted GNWT-ENR's recommendation since this is largely consistent with the total amount of security the Board has chosen for each mine component.

The Board has decided to include a total security requirement of \$79,690,301 prior to year 4 of operations, as follows:

**Table 8: Summary of Operation Phase Security – Year 4**

Liability Due For:	Year 4 of Operations
	Required Prior to year 4 of Operations (Correlated to the end of mining the Hearne Pit)
Water	\$64,489,504
Land	\$15,200,797
<b>Total</b>	<b>\$79,690,301</b>

### 4.4 The Remaining Life of the Project (Years 4-11 of Operations)

De Beers has recommended that the remainder of the security be broken down in two additional phases; years 7-10 of operations to correlate to the mining and completion of the 5034 pit, and year 11 to correlate to the projected end of production.<sup>272</sup> GNWT-ENR recommended that the remainder of the security be linearly scheduled until the full security amount is posted for the Project (through years 4-11).<sup>273</sup> GNWT-ENR did not provide a cost breakdown or propose a schedule for the remaining security.

The Board has decided to adopt the phased schedule proposed by De Beers, with the condition that security payments are posted prior to the associated activity. De Beers' recommendation is justified by operational milestones, and the approach was not contested by any other parties.

In determining the amount of security required for the remaining phases for the land and water-related liabilities, the Board recalculated the total amount of security, using the remaining costs that were chosen for each mine component. As previously discussed, the Board's security calculation for the final security phase does not include the costs associated with the AQMP

<sup>269</sup> See page 41, GNWT-ENR Intervention, submitted April 7, 2014.

<sup>270</sup> See page 2 and 10, De Beers Reclamation Cost Estimate, submitted April 2, 2014.

<sup>271</sup> See page 16, De Beers Closing Argument, submitted July 2, 2014.

<sup>272</sup> See page 2, De Beers Reclamation Cost Estimate, submitted April 2, 2014; page 16, De Beers Closing Argument, submitted July 1, 2014.

<sup>273</sup> See page 37, GNWT-ENR Intervention, submitted April 7, 2014.

(associated with the water-related liability) and the WEMP (associated with the land-related liability).

The Board has decided to include a total security requirement of \$82,081,001 prior to year 7 of operations, and a total security requirement of \$83,835,700 prior to year 11 of operations, broken down as follows:

**Table 9: Summary of Operation Phase Security – Years 4-11**

Liability For:	Final Project Phase	
	Prior to Year 7 of Operations (correlates to the completion of 5034 pit)	Prior to Year 11 of Operations (correlates to the projected end of production)
Water	\$66,049,058	\$67,148,612
Land	\$16,031,943	\$16,687,088
<b>Total</b>	<b>\$82,081,001</b>	<b>\$83,835,700</b>