SLEMA December 2011 Environmental Update

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Outline

1. Mine Update
2. Inspection Update
3. Regulators' Update
4. Stakeholders' Update
5. Reviews
6. Agency Activities

Acronyms

- AANDC – Aboriginal Affairs and Northern Development Canada (previous INAC – India and Northern Affairs Canada)
- AEMP – Aquatic Effects Monitoring Program
- AIMAIO – Akaitcho Interim Measures Agreement Implementation Office
- ARD – Acid Rock Drainage
- DFO – Fisheries and Oceans Canada
- EC – Environment Canada
- ENR – Department of Environment and Natural Resources, GNWT
- GNWT – Government of the Northwest Territories
- IEMA – Independent Environmental Monitoring Agency (for Ekati Mine)
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- SLEMA – Snap Lake Environmental Monitoring Agency
- SNP – Surveillance Network Program
- TDS – Total Dissolved Solids
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond

1.1 Mine Update – November 2011

- Production rate: 79.4 % of the Mine capacity (75,050 tonnes of kimberlite processed)
- 2,678 m^3 of water withdrawn from Snap Lake
- 779,288 m^3 of treated water discharged into Snap Lake
- 61,658 tonnes of coarse reject and 50,102 m^3 of slimes deposited in the North Pile
- 5 spills (1 reportable)
  - 141 spills in the underground mine: 2 transmission oil (30L), 1 coolant (10L), and 138 hydraulic oil (5,485 L)
  - The underground spills are recorded for information purposes and are not reported as they are contained and routed through the sumps
- Water sampled in 7 monitoring stations
  - The monthly average for all parameters met compliance

1.2 2011 Geotechnical Inspection of North Pile and WMP Dams

- Letter dated December 1, 2011
- Attached Field Report by Golder Associates Ltd.
- Responded to the recommendations made by the Engineer in the field report
  - To review the feasibility of having dedicated geotechnical staff at Snap Lake Mine
  - Planed workshop of the North Pile for 2012
  - To dewater sumps prior to the 2012 freshet
  - To provide monitoring data to Golder on an ongoing basis
  - To maintain the water level of the Water Management Pond below freeboard

1.3 Provision of Temporary Accommodation at Snap Lake

- Letter address to the Inspector on December 6, 2011
- The Mine is anticipating the requirement for increased accommodation capacity on-site
  - "As a temporary solution to an immediate need for more beds, and after discussion with the Inspector, the 'C' dorm of the old camp is being re-commissioned (along with attached boot room)"

1.4 Landfarm Operating Procedures

- Submitted on December 8, 2011 for the MVLWB review
  - Modified from the Landfarm Operations Guidance document submitted to De Beers by Golder and Associates in 2008
- Described responsibilities, procedure for treatment of contaminated soil by light hydrocarbons

1.5 Responses to SLEMA Letter on Two Spills in the East Cell

- Dated December 14, 2011
  - Signed by A/Mine General Manager and Maintenance Manager
- "De Beers Canada Inc. wishes to thank the Board, staff, and stakeholders of SLEMA for their letter to the MVLWB dated December 6, 2011. The objective analysis and constructive recommendations that it contains underscore the value of SLEMA as an independent monitoring agency for Snap Lake."
- Accepted all four SLEMA recommendations

1.6 Notice of Completion of Diffuser Replacement

- Dated December 16, 2011
- Addressed to DFO and MVLWB
  - Construction began August 10, 2011 and was completed September 14, 2011
  - submitted an “as-built” drawing of the new treated effluent pipe and diffuser, and photographs of construction activities
  - Monitoring results during construction showed compliance

1.7 Spill 11-460 in the Starter Cell

- Occurred on December 19, 2011
- Water leaked from the North Pile towards Temporary Sump #4 (TS4), and cross the road towards TS4 access road, beyond the collection sump. 1 cubic meter of water was contained on the access road before the tundra. Temporary mitigative measures were taken – snow berm was built
  - Due to operator misunderstanding directions, the snow berm that was supposed to direct flow towards Temporary Sump 4 was placed on the north side of the access road instead of the south edge. Process water flowed over the surface impacting an area of 225 square meters – Spill 11-461 on December 20
- The spill shares similarities with Spill 10-458

Comments from the Environmental Analyst

- The follow-up report for Spill 10-458 identifies one possible longer term solution, i.e. rerouting the access road to increase the continuity of the ditch collection system. The solution appears not to have been implemented. As a result, similar spill reoccurred
- De Beers demonstrated a lack of due diligence in regards to Spill 11-460
- It is recommended that De Beers re-examine the design of water collection system of the North Pile, correct any defects, and prevent similar spills from occurring

1.8 Spill 11-469 in the Starter Cell

- Occurred on December 29, 2011
- Temporary Sump #4 (TS4) was found to be overflowing to the tundra
  - A sudden inflow of water from the North Pile caused the sump water level to rise quickly overnight
  - A berm has been placed to prevent the water from moving across the tundra and a ditch is being dug to divert the water back into containment

Comments from the Environmental Analyst

- Another example of overflowing spill in the Starter Cell
  - Similar to Spill 09-005 at Temporary Sump #3 (TS3) on January 6, 2009
- The spill demonstrates the necessity and importance of real-time water level control

2. Inspection Update

- INAC Inspector – Tracy Covey
- No inspection reports received in December 2011

2.1 Concerns Associated with the October 2011 Monthly Report

- Letter dated December 2, 2011
- The October 2011 Monthly Report details some non-compliant result of treated sewage (i.e., Faecal Coliform counts ofmore tan 24,000 CFU/100 ml vs. the maximum allowable grab concentration of the Water Licence (20 CFU/100 ml)
  - De Beers should have reported it as a spill
  - The non-complaint effluent should be discharged to Water Management Pond (WMP)
  - This incident seems to identify a shortcoming in the current WL terms and conditions
- Recommended that “until compliance is re-established, non-compliant sampling results will trigger daily sampling and some sort of corrective action”, and “results of this sampling must be forwarded to the Inspector immediately”

Responses to the Inspector's Concern on Non-compliant Treated Sewage

- De Beers reported the spill on December 2, 2011
- De Beers further responded on December 9, 2011
  - Lack of communication between departments lead to a lag in non-conformance discharge and non-conformance reporting

2.2 Inspector Letter of Warning: Concerns about Spill Reporting

- Dated December 23, 2011
  - Recent events of non-compliant discharges in July (8 days of Nitrate exceedance) and October (6 days of Faecal Coliform exceedance) raised two serious issues
    - Contraventions of the Water Licence/NWT Waters Act
    - Not immediately reported to the NWT Spill Line
  - "The above review clearly indicates a chronic inability to meet this compliance condition", and a solution is long overdue
- "From this point forward, De Beers will be strictly held to this standard. Failure to do so will leave the inspector with no choice but to consider further legal action to solve this matter."

2.3 Concerns about Spill Management Associated with Sumps

- Dated December 23, 2011
  - Spill 11-460 and 11-461: breach of containment from the sumps
  - “A review of spill incidents shows that at least 3 other sump exceedances/non-compliant releases of water occurred in the last 12 months (i.e., 10-458, 11-391, 11-398). These exceedances appear to be due to a combination of ineffective operational practices and/or facility design.”

3.1 Regulator Update – MVLWB (I)

- Distributed the webpage link of CCME Guideline for the Protection of Aquatic Life for Chloride on December 5, 2011
  - "It is possible that this document will be referred to during the upcoming public hearing for De Beers – Snap Lake. As such, the Mackenzie Valley Land and Water Board would prefer that this document be placed on the public record for this file. At this time, the MVLWB would like to hear from parties which have any objections or concerns with placing this information on the record."

3.1 Regulator Update – MVLWB (II)

- Public Hearing for Water Licence Renewal
  - December 13-15, 2011
  - Board members, staff and consultants
    - De Beers staff and consultants
    - Interveners: AANDC and consultants, EC, DFO, DKFN
    - Registered Public: YKDFN
    - Public: Akaitcho Interim Measures Agreement Implementation Office (AIMAIO), SLEMA, IEMA, Ekati Mine
  - Presentations and Questions
    - De Beers and Interveners
    - Licence term, WQOs and EQCs, adaptive management, North Pile, security

3.1 Regulator Update – MVLWB (III)

- Distributed Public Hearing Undertakings on December 19, 2011
  - Undertaking #1:De Beers to provide the Mackenzie Valley Land and Water Board (MVLWB) a technical memorandum summarizing information on the relationship between chloride toxicity and water hardness.
    - Provided to the MVLWB on December 14
  - Undertaking #2: AANDC to provide to the MVLWB with information regarding the amounts of security they hold against the Snap Lake Diamond Project, including the various regulatory instruments, the Environmental Agreement, and land leases

    Due on December 22

3.2 Regulator Update – DFO

- Issued a letter to De Beers on December 5, 2011
  - De Beers has met the physical and ecological success criteria for the artificial reef to compensate for the authorized impacts to Inland Lake #1 and associated stream, S30, in the development of the processed kimberlite containment facility, at the Snap Lake Mine
  - DFO has determined that all the conditions of Authorization SC-99-123 have been satisfied

4. Stakeholders' Update

- AANDC, EC, DFO, DKFN, YKDFN, AIMAIO participated in the Water Licence Renewal Public Hearing on December 13-15
  - ENR, NSMA were not present

5. Reviews

- Toxicity Analysis Reports in October 2011
  - Submitted on December 1, 2011
- Field Report for September 2011 Geotechnical Inspection of North Pile and Water Management Pond Dams, Snap Lake Mine
  - Submitted on December 1, 2011
- CCME Guideline for the Protection of Aquatic Life for Chloride
  - Released on November 30, 2011

5.1 Toxicity Analysis Reports in October 2011

- Received on December 1, 2011
- Water Treatment Plant (WTP) effluent samples taken on October 24 were tested
  - By HydroQual Laboratories Ltd. (Calgary) from October 25 to November 2, 2011
- Standard biological test methods used
- 4 analysis reports for each samples submitted
  - Algae, Ceriodaphnia, Trout, and Daphania
  - No negative effects occurred except Ceriodaphnia testing
    - The test showed adverse effect for Ceriodaphnia mortality and reproduction

Ceriodaphnia Tests

- De Beers responded to the Information Request #6 about chronic toxicity of both the treated effluent (SNP 02-17) and the diffuser stations (SNP 02-20) that
  - No consistent concentration-response relationship
  - No consistent trend in toxicity over time and location
  - Sporadic chronic toxicity events are not uncommon
  - Most of the observed toxicity was not related to the chemistry composition of the samples
  - Data are being interpreted in a conservative manner
- However, of the 30 Ceriodaphnia tests conducted between November 2005 and October 2011, 4 tests showed adverse effects for mortality and 19 tests showed adverse effects on reproduction

Comments from the Environmental Analyst

- The Environmental Analyst feels uncomfortable with the chronic toxicity testing results for Ceriodaphnia and De Beers responses to Information Request #6
- It is recommended that De Beers conduct further study on toxicity of treated mine effluent on Ceriodaphnia, and one appropriate regulator, MVLWB or AANDC or EC or DFO thoroughly examine the toxicity testing results from 2005 to 2011

5.2 Field Report for September 2011 Geotechnical Inspection of North Pile and Water Management Pond Dams, Snap Lake Mine

- Dated November 21, 2011
- Prepared by Golder Associated Ltd. For De Beers

Key Observations and Issues Identified by Golder (I)

- A significant quantity of water was observed in the North Pile sumps and WMP during the geotechnical inspection
  - The design intent of the sumps are to be maintained at the minimum practicable levels at all times
  - The practice of pumping water into the North Pile sumps for storage violates the design objective of these structures; the sumps are not water storage facilities

Key Observations and Issues Identified by Golder (II)

- The mine plan is not communicated to the various mine departments within De Beers; this is a key risk to the operations at the Snap Lake Mine
  - The quantity and schedule of waste rock. Ore, PK streams, and waste streams must be communicated to key personnel at the mine
  - In the absence of an up-to-date and communicated mine plan, the performance of the North Pile operation and development will be challenged to continue and will likely result in unwarranted future operational and environmental risks

Key Observations and Issues Identified by Golder (III)

- A monitoring program for the North Pile facility and the WMP dams is in place. Data are being collected by De Beers; however, there are major deficiencies in interpretation and use of those data
  - De Beers has not interpreted and summarized those data in a reasonably usable format for operational purposes
  - Golder recommends that De Beers form their own suitably staffed geotechnical department for the North Pile at the Snap Lake Mine
    - This department would liaise with De Beers' key personnel involved in the operation of the North Pile to ensure timely and effective communication and coordiantion

Comments from the Environmental Analyst

- The Field Report provides evidence for the Environmental Analyst to question the effectiveness of mine site Environmental Management System (EMS/ISO 14001: 2004), which is said to have been certified since the mine construction
  - Evident deficiencies in the Plan-Do-Check-Act cycle of an effective EMS
  - Consequence – Incidents/spills in the North Pile resulted from poor management
- It is recommended that SLEMA reaffirm the recommendation made in the letter dated December 6, 2011
  - De Beers to overhaul their EMS
  - De Beers to submit their EMS audit report as part of Water Licence reporting requirements

5.3 CCME Guideline for the Protection of Aquatic Life for Chloride

- The Canadian Council of Ministers of the Environment (CCME) released a document regarding Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life for Chloride November 30, 2011
  - Generally speaking, the approximate order of chloride salt toxicity to freshwater organisms is KCl > $MgCl_2$ > $CaCl_2$ > NaCl
  - Based on these observations, chloride toxicity to freshwater organisms was only evaluated using tests with $CaCl_2$ and NaCl
  - Some studies have indicated that increased hardness may have an ameliorating effect on the toxicity of chloride. Jurisdictions may choose to derive site-specific hardness-adjusted water quality criteria (or objectives) where appropriate

CCME Guideline for Chloride

CCME Guideline for Chloride	Long-Term Exposure (mg/L)	Short-Term Exposure (mg/L)	*EcoMetrix Proposed WQO (mg/L)*	*AANDC Proposed WQO (mg/L)*
Freshwater	**120**	**640**	*213*	*150*
Marine	**No recommended guideline**	**No recommended guideline**		
Note	Short-term exposure guidelines are derived with severe effects data (such as lethality) of defined short-term exposure periods (24 to 96-hour)	Long-term exposure guidelines are derived using long-term data (7-day exposures for fish and invertebrates, 24-hour for aquatic plants and algae)		

Comments from the Environmental Analyst

- The CCME Guideline will be a great reference for the discussion of Water Quality Objective and Effluent Quality Criterion for Chloride during the Public Hearing (December 13-15, 2011)
- The Environmental Analyst has no objections or concerns with placing this information on the record by the MVLWB

6. Agency Activities

- Core Group Meeting on December 19, 2011
- Wildlife Workshop on December 20
  - Spills within the North Pile
  - Anne Gunn's comments on
    - Wildlife Effects Monitoring Program 2010 Annual Report
    - Vegetation Monitoring Program 2010 Annual Report
    - Air Quality Monitoring Program 2010 Annual Report
  - Discussion with De Beers staff
- SLEMA Annual General Meeting on December 21
  - SLEMA 2010-2011 Annual Report distributed
  - Presentation
    - Financial Statement 2010-2011
    - Workplan 2011-2013
  - Discussion with De Beers and AANDC staff