SLEMA
June 2011
Environmental Update

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June 30, 2011

Outline

1. Mine Update
2. Inspection Update
3. Regulator Update
4. Stakeholders' Update
5. Reviews

Acronyms

- AEMP – Aquatic Effects Monitoring Program
- 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
- INAC – India and Northern Affairs Canada
- 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 – May 2011

- Production rate: 79.2 % of its capacity (77,381 tonnes of kimberlite processed)
- 4,679 m^3 of water withdrawn from Snap Lake
- 716,738 m^3 of treated water discharged into Snap Lake
- 63,162 tonnes of coarse reject and 51,455 m^3 of slimes (or 32,445 tonnes of fine fragment solids) deposited in the North Pile
- 17 spills (6 reportable)
- Water sampled in 9 monitoring stations
  - The monthly average for all parameters met compliance except
    - Faecal Coliform in one grad sample in SNP 02-16i
    - TSS in SNP 02-05, 02-07, and 02-09 (Elevations in TSS are suspected to be due to disturbance of the bog during sampling)

1.2 Responses to Series of Drilling Spills on the Ice of Snap Lake

- 11 reportable drilling spills from March to May 2011
  - 18 reportable spills by the end of June 2011
- De Beers issued a letter on June 2, 2011 and reported
  - Mitigations currently in place, and
  - Planned mitigation measures

Spills Location (on the Ice)

1.3 Notice of Construction Activity

- Dated June 7, 2011
- Planned to replace the treated effluent pipeline and diffuser at the Mine in August 2011
  - Minor modification designed to reduce air entrainment
- Intended to re-activated SNP station 02-22 for monitoring during the period of construction

1.4 Reissuance of SNP 02-17

- Notice to the Inspector on June 23, 2011
- Notice for the commencement of water treatment and discharge at SNP 02-17 (Temporary Water Treatment Plant) starting at 7:00 am on Wednesday June 29, 2011

1.5 2011 Water Licence Renewal Application - MV2011L2-0004

- Submitted on June 8, 2011
  - Cover Letter
  - Water Licence Application
  - Mining Industry Renewal Questionnaire
  - Community Engagement
  - 8 Supporting Documents
  - 31 Appendices

1.5 2011 Water Licence Renewal Application - MV2011L2-0004

- Supporting Documents
  1. DBCI Draft Water Licence
  2. DBCI Draft Water Licence Concordance Table
  3. Snap Lake Water Management Treatment Alternatives Report
  4. Snap Lake Interim Mine Closure and Reclamation Plan
  5. Mine Inflow Simulation Technical Memo
  6. Snap Lake Site Model Report
  7. Snap Lake Mine Lake Model Report
  8. Update on Paste Production

2. Inspection Update

- INAC Inspector – Tracy Covey
- Water Licence Inspection
  - May 25 and 26, 2011

2.1 Water Licence Inspection

- Dated May 25, 26, 2011
- Inspected Drill Sites, waste management facilities, diffuser, Contingency Plan, and Closure and Reclamation Plan
- Environmental risks identified in previous inspections remains
  - Reclamation status
  - Diffuser line
  - Elevated ammonia situation at the historic AN storage pad

Reclamation of the Historic AN Pad

3.1 Regulators Update - MVLWB

- Notification of technical support for the upcoming renewal application, on June 6, 2011
  - Dr. Neil Hutchinson was hired to aid in technical aspects
- On June 17, 2011, requested De Beers' responses to stakeholders comments on the ICRP by Monday July 25, 2011
- On June 24, 2011, requested stakeholders comments on
  - Water Licence (MV2011L2-0004) Renewal Work Plan, due on July 4, 2011
  - Renewal Application, due on July 28, 2011

3.1 Regulators Update - MVLWB

- Information request on June 28, 2011
  - **De Beers predicted** that the whole-lake TDS (total dissolved solid) concentrations would exceed the current Water Licence limit of 350 mg/L in 2018, but not requested this increase in its June 8, 2011 application
  - The MVLWB requests that De Beers submit information on how it plans to address this situation by July 12, 2011
    - Water quality model information, the results of available updates to toxicity studies, mitigation measures

3.2 Regulators Update - DFO

- DFO reviewed the proposal of the flumes (De Beers letter dated May 24, 2011)
  - No authorization required
  - Additional mitigation measures recommended
- Comments on Minewater Embankment Post-construction Habitat Compensation Monitoring Report, 2010 on June 28, 2011
  - Compensation requirements for the minewater outlet and intake embankments compensation have been fulfilled
  - De Beers is requested to provide the outstanding compensatory habitat (8678 Habitat Units)

4. Stakeholders' Update

- Comments on 2010 Water Licence Annual Report and AEMP by Environment and Natural Resources (ENR), GNWT May 27, 2011 and INAC Inspector On May 27 and 30
- Comments on Interim Mine Closure and Reclamation Plan (ICRP) by INAC (Water Resources Division and Inspector) and DFO On June 1, and Deninu Kue Fist Nation on June 10
- Comments on Interim Adaptive Management Plan (AdMP) by DFO on June13 and INAC Inspector on June 15, 2011

4.1 ENR Comments on 2010 Water Licence Annual Report

- Dated May 27, 2011
- No comments or recommendations at this time

4.2 INAC Inspector Comments on 2010 Water Licence Annual Report

- Dated May 27, 2011
- The submission met most of the Water Licence compliance conditions but
  - failed to provide an update to the Groundwater Quantity and Quality Monitoring Plan
- Recommendation – MVLWB to reinstate conditions associated with SNP station 02-03
- Any discussion of TSS in the Water Licence, ARD, or AEMP reports should be based on comparisons made to TSS conditions for uncontrolled surface runoff as defined under Part F (8) (a) because the mine entered the "operational phase"
  - 14 mg/L for maximum grab sample
  - 7 mg/L for monthly average

4.3 INAC Inspector Comments on 2010 AEMP Annual Report

- Dated May 30, 2011
- The submission met most of the Water Licence compliance conditions but
  - A discussion of the estimated loadings of Ammonia and Nitrate to Snap Lake seemed to be missing
- Any discussion of TSS in the Water Licence, ARD, or AEMP reports should be based on comparisons made to TSS conditions for uncontrolled surface runoff as defined under Part F (8) (a) because the mine entered the "operational phase"
  - 14 mg/L for maximum grab sample
  - 7 mg/L for monthly average

4.4 INAC (Water Resources Division) Comments on 2010 AEMP Annual Report

- Dated June 6, 2011
- INAC-WRD is concerned with the increase of some parameters and the rate at which these parameters are changing
  - The rate of increase of chloride is a concern
- To date EAR benchmarks and CCME guidelines have not been exceeded often. That does not necessarily preclude the possibility that effects are occurring in Snap Lake

4.4 INAC (Water Resources Division) Comments on 2010 AEMP Annual Report

- Comparisons of current concentrations to background concentrations should also be provided, to identify the magnitude of change which has occurred since the commencement of mining operations
- There are parameters such as Strontium that have greatly increased above background, but that do not have guidelines. In subsequent AEMP reports, consideration and discussion should be given to the potential effects of these parameters on Snap Lake

4.4 INAC (Water Resources Division) Comments on 2010 AEMP Annual Report

- INAC is concerned that the proponent is dismissing the potential effects of Fluoride because its toxicity is expected to ecrease with increases in other parameters such as calcium, chloride, and hardness
- De Beers should explain why they have not addressed or discussed INAC's previous comments in the new report
  - Sediment sampling from 5 cm to 1or 2 cm
  - DO guideline value (9.5 mg/L) was not mentioned or used

4.5 INAC Inspector Comments on ICRP

- Dated June 1, 2011
- The Water Licence should establish/set a date for completion of the goals listed
- Figure 2, 12-19 should be updated

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- The aesthetic concerns were not addressed
- No discussion was given for a significant modification/addition which was made to the water management structures, i.e. the grout curtain

4.5 INAC Inspector Comments on ICRP

- No mention was made of the contaminated site (i.e. the historic AN storage pad) or potentially contaminated site (the environment around that site, the "Procon" site
- Water Licence requirements about Reclamation Research Plan were not fully addressed

4.6 INAC (Water Resources Division) Comments on ICRP

- Dated June 1, 2011
- Objectives should be clearly measurable via their associated criteria
- Several sections include monitoring as part of the criteria. Monitoring is not a criteria
- The starter cell will be full or nearly full of wet PK slurry while the rest of the NP presumably will have relatively dry PK paste. These two different scenarios will require significantly different closure options and research. As such the starter cell should be addressed separately from the remainder of the NP
- To date there are no thermistors within the PK itself. As a result there is no way to confirm whether or not the PK is actually freezing. Research on this topic will be required

4.7 DFO Comments on ICRP

- Dated June 1, 2011
- The report contains many subjective terms that need proper definition
- Many criteria for evaluation for objectives are actually closure options. Closure criteria should be measurable performance indicators that determine when an objective has been achieved
- Research plans should be developed for each mine component. BHP's approach is referenced
- Throughout the ICRP active re-vegetation does not appear to be considered. Re-vegetation efforts would aid in site-specific erosion and sediment control. Consideration should be given to incorporating active re-vegeting riparian areas into the ICRP, or provide rationale as to why it is not being incorporated

4.8 DKFN Comments on ICRP

- Deninu Kue Fist Nation commented the ICRP on June 10, 2011
  - The goals/objectives/criteria should be solicited from and agreed to by stakeholders
  - Many objectives and criteria should be clarified

4.9 DFO Comments on AdMP

- DFO retained ESSA in 2009 to review the previous AdMP (August 2004 version)
- DFO reviewed the new version on June 13, 2011

4.9.1 Comments from DFO

- In general terms, the proposed AdMP responses reflect a knee-jerk reaction to changing conditions and do not address issues of uncertainty. A proper AdMP should demonstrate a proactive attempt to adapt and improve to changing conditions by reducing uncertainties

4.9.1 Comments from DFO

- The MVLWB should:
  - (1) review what its intent is when it asks for an Adaptive Management Plan,
  - (2) provide proponents and regulators with the appropriate definition for Adaptive Management, and
  - (3) then evaluate submitted plans accordingly

4.9.2 Comments on 2004 AdMP from ESSA

- Dated January 31, 2009
- There are no explicitly-stated goals in the AdMP
- The purpose of Adaptive Management is not for *managing uncertainty, but for reducing management uncertainty*
- The AdMP outlines a passive rather than an active approach of Adaptive Management
  - "Passive AM" involves implementing a single management treatment believed to be best, and
  - "Active AM" involves implementing and comparing several treatments as management experiments

4.9.2 Comments on 2004 AdMP from ESSA

- Recommendations
  - Explicitly state the purpose (goals) of the AdMP
  - Clarify how the AdMP addresses uncertainty
  - Clarify/quantify the action levels
  - Include a commitment to prepare a more situation-specific AdMP

4.10 INAC Inspector Comments on AdMP

- Dated June 15, 2011
- The Plan didn't seem to specify quantifiable thresholds & specific action/mitigative measures which will be implemented once those thresholds are reached for geotechnical performance of the North Pile
- Annual loading limits for Ammonia, Phosphorous, and Nitrogen are part of the Water License, but a discussion of Ammonia is missing

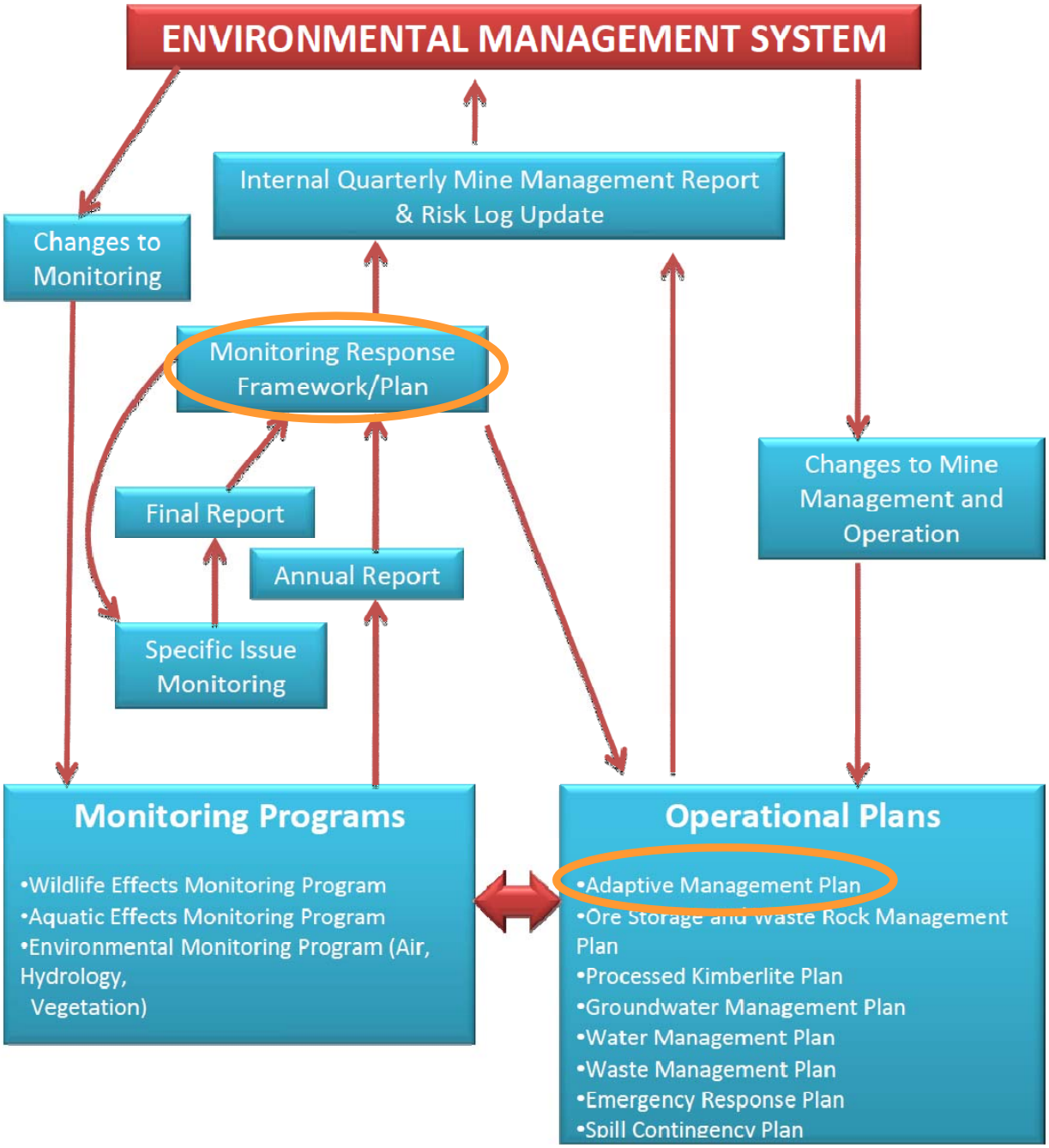
5. Reviews

- Adaptive Management Plan
  - Updated on April 29, 2011
- Mine Outfall Pipeline and Diffuser Replacement
  - Submitted on June 7, 2011
- Water Licence (MV2011L2-0004) Renewal Work Plan
  - MVLWB request on June 24, due on July 4, 2011
- Toxicity Analysis Reports in April 2011
  - Submitted on June 30, 2011
- Reports to be reviewed
  - Hydrology Monitoring Program 2010 Annual Report
  - Air Quality, Meteorological Monitoring and Emission Reporting 2010 Annual Report
  - Vegetation Monitoring Program 2010 Annual Report
  - Wildlife Effects Monitoring Program 2010 Annual Report

    Submitted on June 23, 2011

5.1 Adaptive Management Plan

- Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. It is a logical way of dealing with uncertainty
- Adaptive management involves learning from the successes and failures of the solutions that have been tried and applying this learning to develop better solutions



Adaptive Management within De Beers Environmental Management System (EMS)

Four Water Licence Conditions Addressed

- Uncertainty in lake mixing and density stratification,
- Geotechnical performance of the North Pile,
- Nutrient Enrichment of Snap Lake, and
- Increase in Total Suspended Solids (TSS)

Monitoring Response Plan

- Secondary, used in conjunction with the AdMP
- Focused on responses to the results of on-site monitoring programs
- Provide the linkage between the terrestrial and aquatic monitoring programs and the operational management of the mine

Comments from the Environmental Analyst (I)

- The following issues should be address
  - Action level for chloride (from the British Columbia water quality guideline), in the 2004 AdMP, was removed
  - Action levels for the issues of Uncertainty in Lake Mixing and Density Stratification, and Nutrient Enrichment of Snap Lake partly depend on the update modeling efforts made during the period of 2010 to 2011. However, the modeling results are not presented in the AdMP

Comments from the Environmental Analyst (II)

- The following issues should be address
  - Water licence limits are used as action levels for the issues of Uncertainty in Lake Mixing and Density Stratification, and Increase in Total Suspended Solids. That is questionable, because it involves compliance issue
  - The effects threshold for calcium appears not to be provided, and the diffuser mixing zone not defined either
  - No specific action levels are provided for the issue of Nutrient Enrichment of Snap Lake

Comments from the Environmental Analyst (III)

- The AdMP provide a framework for De Beers to manage the uncertainties associated with the mining operation at the Snap Lake Mine site, but more details are needed to support the AdMP

5.2 Mine Outfall Pipeline and Diffuser Replacement

- In 2007, air entrained in the minewater outfall pipeline caused the pipe to float up from its original location on the lake bottom of Snap Lake. Corrections to date to remove the entrained air have been ineffective
- As a result, De Beers will install a new pipeline with minor modifications designed to reduce air entrainment. A new diffuser will also be installed at the same time

Diffuser (note the larger dispersion hole in the near-shore ice than at the ice above the diffuser end)

Schedule

- Preparation for construction in late July 2011
- In-water construction in August 2011
  - The pipeline does not lie on the substrate of the lake but is weighted to sit slightly above the substrate and as such there is no alteration of the substrate as fish habitat

Contingency Plan

- During the in-water installation process (2 days), water treatment and release to Snap Lake will temporarily cease, and minewater and runoff water will be temporarily held in the Water Management Pond (WMP)
- If delays occur due to weather or logistics, treated water can be released via a bypass pipeline connected to the existing diffuser

Potential Effects to Fish and Fish Habitat

- Disruption of lake bottom sediments during pipeline removal and placement which may cause a short term increase in suspended sediments
- Land based erosion caused by equipment during construction activities
- Fish displacement or exclusion from location during construction period
- Exposure to contaminants from oil, grease, and fuel from spills or leaking equipment

Proposed Mitigation

- Environmental Protection Plan was developed
  - Erosion and sediment control measures
  - Procedures for equipment fueling, operation and maintenance
  - Emergency spill containment and reponse
  - Site inspection and water quality monitoring
  - Roles and responsibilities of the Contractor and Environmental Monitor
  - Key contact information

Environmental Analyst Comments

- No concerns or comments

5.3 Water Licence Renewal Work Plan (MV2011L2-0004)

- Water Licence MV2001L2-0002 expires on April 14, 2012. De Beers submitted their renewal application on June 8, 2011.
  - 10 months to complete the renewal process prior to license expiry
    - Reviewers comments due on July 28, 2011
    - Technical session on September 7 to 8, 2011
    - Pre-hearing conference on November 25, 2011
    - Public Hearing on December 7 to 8, 2011
    - Draft Water Licence sent out for review in mid-January 2012

Comments from the Environmental Analyst

- No issues with the Work Plan

5.4 Toxicity Analysis Reports in April 2011

- Received on June 30, 2011
- Toxicity samples (Water Treatment Plant effluent) taken by De Beers environmental technician on April 10, 2011
- Tested by HydroQual Laboratories Ltd. (Calgary) during April 12 to 20, 2011
  - Standard biological test methods used
- 4 analysis reports submitted
  - Algae, Ceriodaphnia, Trout, and Daphania
  - No negative effects occurred

5.4 Toxicity Analysis Reports in April 2011

- The reports provide adequate information about the toxicity assessment of water samples
  - No evidence of Western Science about negative effects of mine operation on tested species
- No concerns from the Environmental Analyst, SLEMA