SLEMA
July 2011
Environmental Update

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July 31, 2011

Outline

1. Mine Update
2. Inspection Update
3. Regulators' 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
- AANDC – Aboriginal Affairs and Northern Development Canada (previous INAC – India and Northern Affairs Canada)
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- PM – Particulate Matter (air quality)
- SLEMA – Snap Lake Environmental Monitoring Agency
- SNP – Surveillance Network Program
- TDS – Total Dissolved Solids
- TSP – Total Suspended Particulates (air quality)
- TSS – Total Suspended Solids (water quality)
- WL – Water Licence
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond

1.1 Mine Update – June 2011

- Production rate: 72.5 % of its capacity (68,550 tonnes of kimberlite processed)
- 4,267 m^3 of water withdrawn from Snap Lake
- 725,030 m^3 of treated water discharged into Snap Lake
- 61,040 tonnes of coarse reject and 48,704 m^3 of slimes deposited in the North Pile
- 6 spills (2 reportable)
- Water sampled in 12 monitoring stations
  - The monthly average for all parameters met compliance except
    - Nitrate at SNP 02-17 (Temporary Water Treatment Plant) on June 30
    - Nitrate and ammonia at SNP 02-09.4 and SNP 02-09.5 (at the base of the AN sump)
- Construction and grubbing of the East Cell continued
- A core drilling program is ongoing and has moved from working over ice to land

1.2 Notice of Recent Changes in De Beers

- Dated June 30, 2011
- Mr. Chantal Lavoie is no longer with De Beers Canada
- Mr. Tony Guthrie is the President and Chief Executive Officer
- Ms. Alexandra Hood has been recently promoted to Superintendent Permitting/Environment for the Snap Lake Mine

1.3 Response to TDS Modeling – Whole-lake TDS concentrations are predicted to exceed the present limit of 350 mg/L in 2018

- Dated June 30, 2011
  - Modeling completed by Golder Associates Ltd. (GAL) indicates that the 350mg/L operationally defined WL limit will be exceeded within 7-8 years. However, De Beers is not requesting a change to the current limit at the present time as we need to complete appropriate scientific studies before doing so
    - De Beers will have a technically defensible, environmentally protective path forward to put before the Board, no later than 2013, 5-6 years prior to the predicted exceedance of the current TDS Water License Limit
  - a literature review conducted on the toxicological database for TDS that supports the benignness of elevated TDS concentrations on benthic invertebrates
  - Additional toxicity testing being undertaken to determine the sensitivity of phytoplankton, zooplankton and sensitive life stages of fish to elevated TDS concentrations

2. Inspection Update

- INAC Inspector – Tracy Covey
- Water Licence Inspection
  - June 8, 2011
  - July 6, 2011
- Land Use Permit Inspection
  - May 25 and June 8, 2011

2.1.1 Water Licence Inspection

- Dated June 8, 2011
- Inspected the North Pile, water management, waste management, and Closure and Reclamation Plan
- Environmental risks identified in previous inspections remains
  - Reclamation status
  - Elevated ammonia situation at the historic AN storage pad

PK slurry being deposited into the Starter Cell of the North Pile

Material from a diesel fuel spill (2011-224) added into the Landfarm

3 outflow plumes near the Diffuser

Top layer of fill and liner material removed from the Historic AN Pad and relocated to the Starter Cell as per the Inspector direction

2.1.2 Water Licence Inspection

- Dated July 6, 2011
- Inspected the Drilling Program, water management, waste management, and Closure and Reclamation Plan
- Environmental risks identified
  - Requested an assessment of the cause/source of
    - Elevated Nitrate in the Water Management Pond and any mitigative measures/practices
    - Elevated Copper at SNP 02-05 and any mitigative measures/practices

Current State of the AN Pad Area

Current State of the Sump at the AN Pad Area

Recently Established SNP Sampling Stations Down-gradient from the Sump at the AN Pad

2.2 LUP Inspection

- Dated June 8, 2011
- Inspected the North Pile, drilling sites (spill management), and waste management
  - Drilling-fluid containment issues appear to be resolved (closed-circuit drilling)
- No environmental risk noted, but concerns remain about the reporting requirements on reclamation status

Close-up of drill rod/liner interface and secondary containment to prevent from drilling spills

Stains from small fuel spill to be cleaned up during the annual “Tidy Tundra” event as per recommendation by the Inspector

3. Regulator Update

- MVLWB
  - Updated the Water Licence Renewal Work Plan on July 7, 2011
    - Technical sessions planned for the week of September 12-18
    - The Public Hearing moved to December 13-14

4. Stakeholders' Update

- Comments on Water Licence Renewal by
  - Akaitcho Interim Measures Agreement Implementation Office on June 29 and July 13, 2011
  - AANDC on July 22
  - EC on July 28
  - ENR on July 28
  - Yellowknives Dene First Nation on July 28
  - AANDC Inspector on July 29
  - DFO on July 29
  - NSMA on July 29

4.1 Comments on Water Licence Renewal by Akaitcho

- Akaitcho Interim Measures Agreement Implementation Office
  - Requested an extension to the date for comment on the work plan that has been set for July 4, 2011 to July 25, 2011, on June 29, 2011
    - To be considered by MVLWB
  - Requested the materials for review delivered via fax as per the Interim Measures Agreement on July 13, 2011

4.2 Comments on Water Licence Renewal by AANDC/Water Resources

- Dated July 22, 2011
  - All reports and plans described in the WL should be updated on a predetermined schedule
  - asked that the MVLWB Board consider the inclusion of additional parameters into the updated water license
  - A separate approval process for the ICRP is preferred
  - De Beers should describe how they will incorporate TK into the mine's monitoring program and where in the license it would be more appropriate

4.3 Comments on Water Licence Renewal by EC

- Dated July 28, 2011
  - Air Quality
    - Requested a discussion of potential causes of the elevated levels of ambient TSP concentration during the period from July 13, 2010 to August 12, 2010, internal review and action plan for TSP and the external review and action plan for PM_{10} and $PM_{2.5}$
    - Requested a copy of the full 2007 Incineration Stack Testing
    - Report; the waste stream for the 2011 incineration stack tests
    - should include sewage sludge and raw sewage; a letter from the manufacturer confirming that the incinerator is suitable for burning sewage sludge and raw sewage; and incineration Management Plan should be developed in consultation with EC and the GNWT

4.3 Comments on Water Licence Renewal by EC

- Water Quality
  - Recommended complete sampling data for SNP stations be provided for intervenor review
  - Recommended the Board revise parameter limits of TSS, nitrate, nitrite, ammonia and total metals in the new licence to reflect what is technically achievable at the mine site
  - Recommended De Beers consider the environmental risk and cleanup costs associated with failure of each disposal method as a decision criteria when making its final decision on a preferred disposal option for the secondary waste of reverse osmosis and evaporator-based treatments for managing anticipated excessive TDS concentrations in mine site water
  - Recommended De Beers provide a summary of the literature reviewed related to TDS toxicity, including a complete reference list of the sources consulted that supports the benignness of elevated TDS to benthos
  - Requested De Beers provide more details related to the study designs, including the species that will be tested and the protocols followed, for phytoplankton, zooplankton and sensitive life stages of fish to elevated TDS concentrations
  - Recommended AEMP update and summary report for every three year
- Recommended a water licence term of no longer than 10 years (i.e. from 2012 to 2022)
- Recommended that a separate process take place for the review of the Interim Mine Closure and Reclamation Plan (ICRP)

4.4 Comments on Water Licence Renewal by ENR

- Dated July 28, 2011
- Comments on proposed WL terms and conditions
  - Adaptive management can be incorporated and defined within the individual Plans required under the Water License, however if the Board feels that a stand alone Adaptive Management Plan is required, ENR supports that decision
  - Include specific requirements for the *Domestic Waste and Sewage Management Plan* (Part E Section 10), which includes" a description of the criteria for the management and placement of hydrocarbon contaminated soils and landfills
  - Recommended the water license specifically outline all Plan revisions and update requirements
  - recommended that Part E, Section 7d) include "treatment and testing and mitigative measures to prevent wildlife attraction" and the addition of e) "a listing of expected waste types and quantities to be transported off site and identify the respective final disposal locations“. The Plan should also include detailed Incineration Management Strategies
  - The Closure and Reclamation Plan should be prepared in accordance with *INAC's Mine Site Reclamation Guidlines for the Northwest Territories* and the Boards *DRAFT Guidelines for Development of Closure and Reclamation Plans for Advanced Mineral Exploration and Mine Sites in the Northwest Territories*

4.5 Comments on Water Licence Renewal by YKFN

- Dated July 28, 2011
  - Recommended a five year term to allow all parties to be involved, as the predicted concentrations of contaminants in the lake begin to approach or exceed the EA predictions, in the decision making process
  - Requested that the Board require the company to submit their documents in accessible formats that facilitate information exchange. As an example, digital files that are submitted to the Board should be done in such a way that "copy and paste" functions are enabled to aide Parties in reviewing and commenting
  - Requested that the Board require the company to monitor the amount of furans and dioxins that are present in Snap Lake and at one of the downstream lakes to establish a baseline
  - Requested that the Board attach submission dates to all Plans
  - The AEMP has a 'toolbox' of examples/mechanisms to incorporate this type of work within its structure — fish tasting should be only one example of the TK monitoring that is done
  - The license condition about closure and reclamation should reflect, with the inclusion of hard dates, the companies need to meaningfully consult with the communities to develop the plan
  - Merely including annual closure update as a section within a larger WL report downplays its significance and makes it more difficult to focus on tracking year-on-year progress

4.6 Comments on Water Licence Renewal by AANDC Inspector

- Dated July 29, 2011
- Comments on the proposed WL
  - Retain 2004 condition Part E #3b, Part B#10 and B#12+13, Part E/3 and E #4/5 as is
  - The calculation of effects of Nitrate on Snap Lake would seem to retain value
  - Recommended retaining any conditions for any action which we'd like to be able to ensure (i.e., if we remove this condition from the Water License, and there is nothing in the W.L. compelling the proponent to conduct this TK activity...in a legal sense, the fish tasting event would become a voluntary act)
  - Retain a requirement for a special study of the diffuser
  - Retain the conditions in the 2004 License on security clauses
  - It'd be nice if some Reports/Plan due dates which are currently set for March 31st be spread out over the year (to ease the burden on reviewers)
  - Complete the approval process for the ICRP & include that version in the WL Renewal
  - Raise the maximum allowable Zinc level in the License to some value over 25 mg/L

4.7 Comments on Water Licence Renewal by DFO

- Dated July 29, 2011
  - Requested to clarify if fish tasting will continue to be included as part of the WL requirements
  - Conditions about adaptive management should be further discussed
  - TDS should be discussed in detail at the technical sessions
  - Recommended that conditions within the Fisheries Act Authorization that pertain to Dissolved Oxygen be placed into the WL
  - The existing AEMP should be updated and required as a condition within the renewed licence
    - Reference lake, Fish Population Monitoring, special studies, review and update
  - The omitted components about closure and reclamation should be included in the conditions of the renewed water licence

4.8 Comments on Water Licence Renewal by NSMA

- Dated July 29, 2011
- Expressed potentially serious community concerns with regard to the WL renewal
  - The construction and operation of tailings ponds
  - The design and function of the diffuser
  - The management of topsoil on site
  - The impact of salt in minewater
  - The annual Environmental Agreement Annual Report
  - Many overdue reports and plans
  - There are rumours circulating that there is a conflict of interest relationship between an AAND inspector potentially involved in the management of the Snap Lake mine and De Beers staff
  - The fact that the Socioeconomic monitoring agency has not been set up
  - De Beers is not meeting all of its Environmental Agreement or Impact Benefit Agreement commitments. (no caribou tasting yet, not the number of contracts or opportunities expected)

5. Reviews

- Documents to be reviewed
  - 2011 DO Monitoring Report
  - 2011 TDS Monitoring Report
    - Submitted on July 28, 2011

5. Reviews

- Water Licence Renewal Application
  - Construction: Start date - 2005
  - Production: Completion date - 2029
  - Closure: Completion date - 2032
  - Requested term of water licence: 2012 - 2027, a term of 15 years

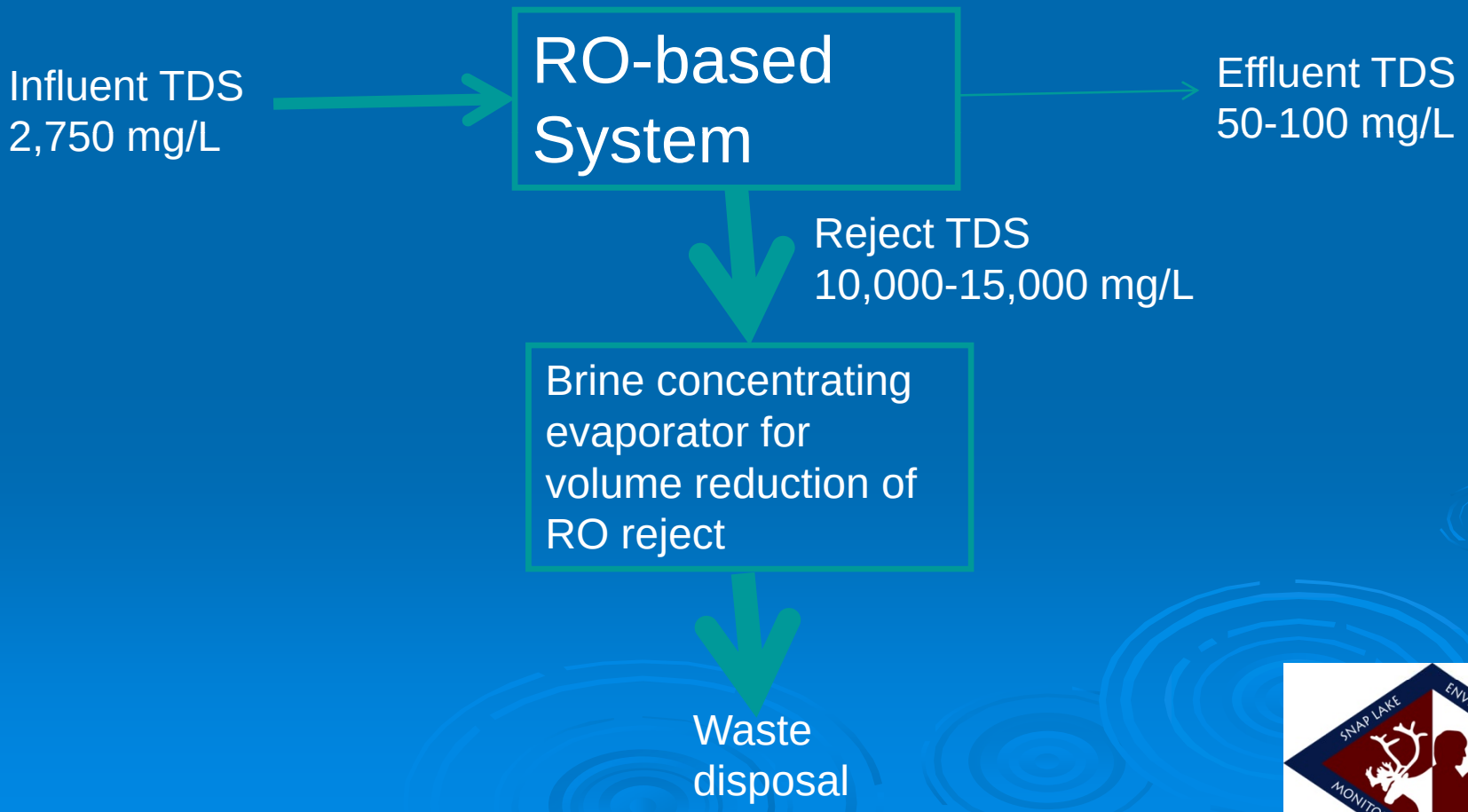
5.1 Snap Lake Water Management Treatment Alternatives Report

- Dated May 19, 2008
- Screened treatment systems for removal of total dissolved solids (TDS)
  - evaporation, reverse osmosis (RO), ion exchange, electrodialysis reversal, and chemical precipitation
- Viable treatment technologies for the Snap Lake Diamond Mine are RO and evaporation

5.1 Snap Lake Water Management Treatment Alternatives Report

- The technical factors evaluated favor the RO-based system, as do the cost-based evaluation factors
  - Estimated capital and operation costs for maximum flow of 20,000 m^3/day during the period of 20 years is $438,036,800
  - The primary operating cost factor is power consumption
  - Waste disposal is considered to be of critical importance due to the extremely remote location of the mine

TDS Removal System



Comments from the Environmental Analyst

- 2007-2008 water quality data of minewater used in the study
  - 2,750 mg/L vs. 500-600 mg/L in 2011
- With the much lower TDS concentrations in minewater, the expensive TDS removal system may not necessary in the future

5.2 Snap Lake Mine Lake Model Report

- Supporting document 7 of Water Licence Renewal Application
- Dated June 6, 2011
- Objectives of the lake water quality model
  - To better understand how conditions in the lake will change through the development of the Mine
  - To update the model predictions generated for the Environmental Assessment Report
- De Beers is developing a site-specific, aquatic health-based TDS benchmark for Snap Lake

Key Findings from the Modeling (I)

- The modelling predicted that TDS concentrations would increase above the present management-based license limit and EAR-predicted peak of 350 mg/L
  - Whole lake average concentrations are predicted to reach approximately 560 mg/L under the Upper Bound Scenario and slightly exceed 350 mg/L under the Lower Bound Scenario
  - Chloride is also predicted to be above the U.S. EPA aquatic life benchmark
  - Fluoride concentrations are predicted to exceed the CCME aquatic life guideline under present conditions, and remain above that value until approximately 2016

Key Findings from the Modeling (II)

- Concentrations of all metals are predicted to remain below applicable water quality benchmarks
- Dissolved oxygen concentrations are predicted to be similar to EAR predictions
- Both nitrate and ammonia concentrations are predicted to be slightly lower than was predicted in the EAR, but above CCME water quality guidelines
- Concentrations of TDS, and by extension, other Mine-related constituents, are predicted to return to background levels by approximately 2070
- Concentrations downstream are conservatively predicted to reach background concentrations within approximately 44 km of Snap Lake assuming maximum concentrations during operations

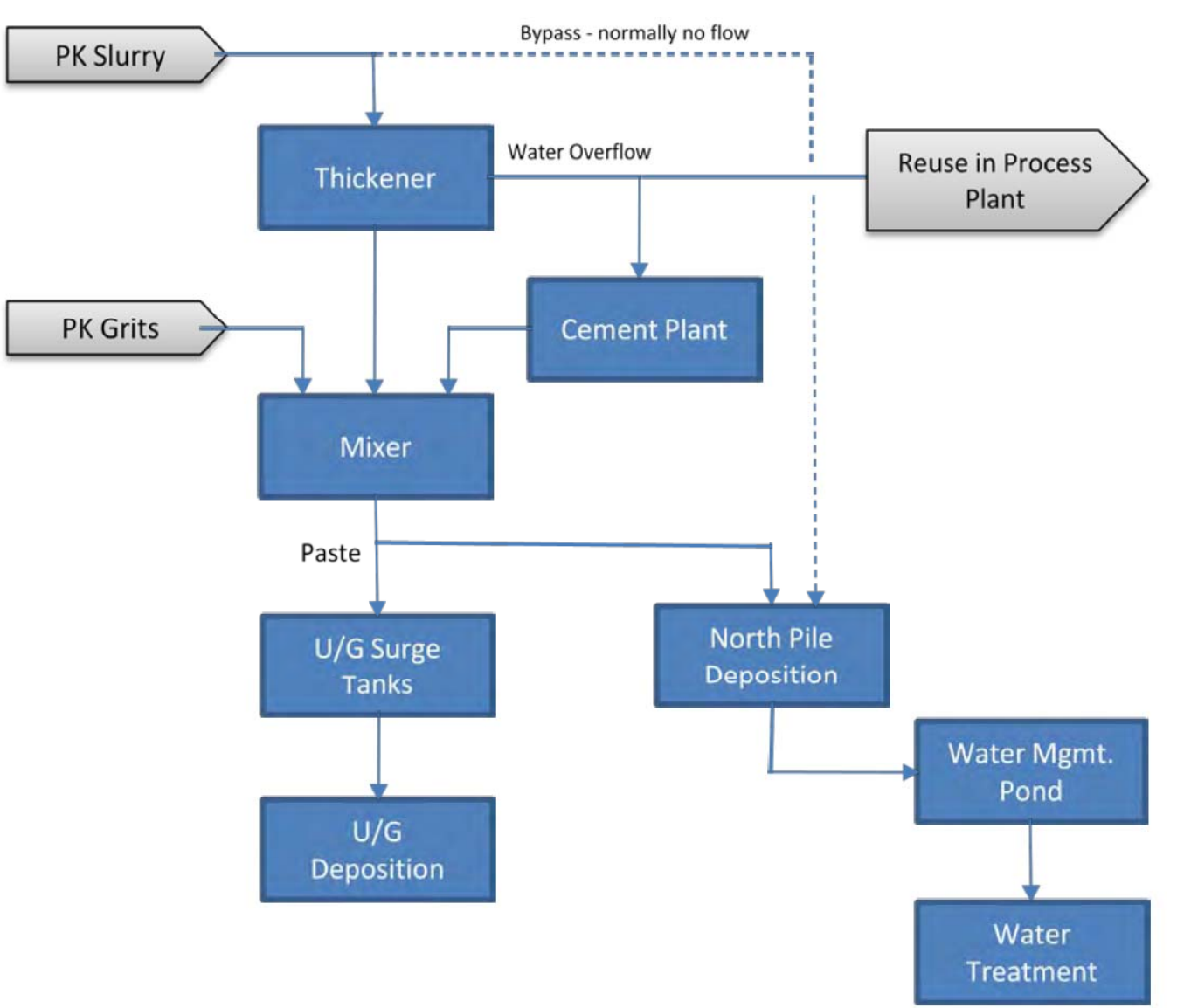
Comments from the Environmental Analyst

- The modeling is scientifically defensible
  - Results of TDS modeling confirmed SLEMA modeling efforts
- No concerns are raised

5.3 Update on Paste Production

- Supporting document 8 of Water Licence Renewal Application
- Dated June 2011
- Paste refers to a clay-like mixture of processed kimberlite (PK, i.e., thickened slurry, coarse and fine grit fractions) and a binder material (e.g., cement)
  - For use as underground backfill and/or ground support.

Paste Production System



Progress and Schedule

- The design and test work is substantially complete with additional verification testing and engineering optimization work being completed in 2011
- Surface infrastructure is in place with the exception of redesigned pipeline and pumps required for delivery of thickened PK to the North Pile
- Work has commenced to complete the design and construction of the underground distribution system

Key Schedule Milestones for Implementation of Underground Backfill at Snap Lake Mine

Item	Milestone	Target
1	Procure additional items (pumps, piping, lab equipment)	Jul 2011
2	Install surface distribution system	Aug 2011
3	Conduct surface deposition trial	Sep 2011
4	Commence surface deposition to North Pile (following completion of trials)	Dec 2011
5	Design and install underground test distribution system	Oct 2011
6	Conduct underground deposition trial	Dec 2011
7	Complete installation of underground distribution system	Sep 2012
8	Commence deposition underground	Dec 2012

Comments from the Environmental Analyst

- The update for paste production is valuable
- No concerns are raised