April 2013 Environmental Update for SLEMA Board

Zhong Liu

April 30, 2013

Outline

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

Acronyms

- AANDC – Aboriginal Affairs and Northern Development Canada (previous INAC – India and Northern Affairs Canada)
- 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
- 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 – March 2013

- Production rate: 100.8% of its capacity (98,432 tonnes of kimberlite processed)
- 3,906 m^3 of water withdrawn from Snap Lake
- 1,082,994 m^3 of treated water discharged into Snap Lake
- 85,614 tonnes of coarse reject and 50,464 m^3 of slimes deposited in the North Pile
  - No paste was deposited in the North Pile in March
- 3 spills (0 reportable)
- Water sampled in 7 monitoring stations
  - The monthly average for all parameters met compliance except the concentrations of Chloride at the edge of the mixing zone (SNP 02-20) are above the Water Quality Objective (120 mg/L)
- No environmental concerns were identified on the [illegible] Road. Last day of winter road for 2013 was March 31

1.2 Spill Reporting in April 2013

Date	Location	Waste Spilled	Amount (L)	Cause
April 28	Road along Temporary Sump 4	Hydraulic oil + engine oil	250+10	Leak from heavy equipment

1.3 Water Licence 2012 Annual Report

- Submitted with four appendices on March 31, 2013
  - Appendix A Acid Rock Drainage and Geochemical Characterization 2012 Annual Report
  - Appendix B Summary of September 2012 Geotechnical Site Inspection
  - Appendix C Monitoring Program Summary for the Period 1999 to 2012
  - Appendix D DRAFT – Updated Predictions of Total Dissolved Solids and Chloride Concentrations in Snap Lake for 2013 and 2014

1.4 2012 TDS Results - Laboratory Calculation Discrepancy

- Technical memorandum by Golder Associates on April 26, 2013
  - In March 2013 Golder noticed that ALS Canada Ltd. changed their TDS calculation formula to a version that was no longer consistent with past practice
  - The discrepancy affected samples collected as part of the AEMP and SNP in 2012
  - Follow-up action have been conducted to correct the issue

1.5 2012 Annual Closure and Reclamation Plan Progress Report

- Dated April 30, 2013
  - The report aims to satisfy Part I, Condition 3 of Water Licence MV20 the 11L2—0004.
    - This condition states that an *Annual Closure and Reclamation Plan Progress Report must be submitted to the Mackenzie Valley Land and Water Board (MVLWB) annually by April 30*

2. Inspection Update

- AANDC Inspector – Patrick Kramers
- No inspection reports received in April 2013

2.1 Immediate Concerns regarding Waste Storage at the Waste Management Area

- E-mail dated April 12, 2013
- During the 10/11 April 2013 inspection an unacceptable amount of waste was noted on site
  - 5 full sea-cans full of waste were currently being held on site
  - This waste would have originally been identified for incineration, however both of the incinerators located on site are decommissioned and awaiting replacement and operation estimated to occur in 30-40 days

Rationale

- With freshet fast approaching, the current management of incinerator waste on site presents a clear potential for wildlife attraction and therefore a danger to site personnel. It is understood that logistical issues regarding the new incinerators purchased by De Beers are forcing short term storage of waste on site but the management and removal of this material must be held to a higher standard in order to eliminate the potentially dangerous consequences to wildlife and site personnel.

Short and Long Term Actions to Be Taken

- Much of this waste was meant to be back-hauled on the winter road but through a oversight during the winter road operations the material was not removed. With freshet fast approaching bringing warmer weather and the danger of wildlife attraction, De Beers has been instructed by the Inspector to perform the following actions
  - To develop an immediate plan to remove all incinerator based waste from site by April 19 and submit it to the Inspector no later than April 15
  - To develop and submit to the Inspector, a logistical plan for weekly removal of all waste material from site until the new incinerator are installed and operational

3.1 Regulators' Update – MVLWB (I)

- The Board reviewed the Notice of Increased Discharge letters. Board staff recommended the following points to be considered on March 28, 2013
  - De Beers clarify why they will only require increased discharge rates for 2013 and 2014, when both mine flows and freshet will occur beyond those dates
  - De Beers put a 'rush' on the samples taken during the increased discharge, in order to reduce any potential time lag in receiving the water quality results

3.1 Regulators' Update – MVLWB (II)

- The Board approved the AEMP Re-evaluation Report as submitted and approved the AEMP Design Plan with the following conditions on March 28, 2013
  - Lake 13: Include additional monitoring of the effects of the winter road (water, snowpack, dust, etc.) on reference Lake 13
  - Skip-spawners: De Beers provide data to support their assertion that Lake Chub are not skip-spawners. De Beers could demonstrate this using histological and size data or with existing data in the next annual report

3.1 Regulators' Update – MVLWB (II)

- Sediment Sampling: De Beers include a feasibility study on the freeze core methodology or other methods to take thinner sediment samples. This study is to be submitted before the next iteration of the AEMP in 4 years time
- Downstream Baseline: The Downstream Lake Special Study report contain a section listing recommendations for further future monitoring as well as an assessment of the need to collect baseline data on aquatic life (i.e. benthics, plankton, fish, etc.)
- Light Measurement: De Beers submit their findings regarding the feasibility and logistics of introducing light measurements in the euphotic zone by November 30, 2013

3.1 Regulators' Update – MVLWB (III)

- The Board approved the Workplan for the 2012 AEMP Design Plan Section 6.0 Weight of Evidence and 7.0 AEMP Response Framework on March 28, 2013
  - Comments and clarification due Friday May 17
  - Technical Workshop on Wednesday May 29
  - Reviewer final comments due Tuesday June 4
  - De Beers' responses due Monday (morning) June 10

3.1 Regulators' Update - MVLWB (IV)

- Distributed 2012 Water Licence Annual Report for review on April 11, 2013
  - "This Report is not for Board approval however comments will be accepted, posted and forwarded to the Proponent"
  - Due on May 8

3.1 Regulators' Update - MVLWB (V)

- Approved the Plume Characterization Study Report as submitted, on April 25, 2013
- Approved the Acid/Alkaline Rock Drainage and Geochemical Characterization Plan as submitted, on April 25

3.1 Regulators' Update - MVLWB (VI)

- De Beers requested on January 2, 2013 that "the Board consider modifying the SNP Annex to the Water Licence to allow De Beers to conduct a shorter duration Rainbow Trout ELS test, replacing the 70-d EAF test with the 7-d trout embryo viability test
- The MVLWB Issued the following directives on April 25:
  - Annex A: Surveillance Network Program: Station SNP 02-20 of the WL annual test be changed to the 30 day egg/alevin ELS test for Rainbow Trout
  - A 7 day (egg only) Rainbow Trout ELS test be conducted for every period of increased discharge

3.1.1 EcoMetrix Comments on Action Levels Proposed by De Beers

- Golder Associates on behalf of De Beers Canada Inc. has proposed action levels for the Snap Lake Diamond Mine to meet the intent of the Response Framework for Aquatic Effects Monitoring in the AEMP Design Plan
- The MVLWB asked EcoMetrix Incorporated to review the proposed action levels as outlined by Golder
- EcoMetrix identified **20 key findings** and provided recommendations for each of the key findings on February 4, 2013
- De Beers responded to EcoMetrix comments on March 12

3.2 Regulators' Update – AANDC

- AANDC issued out two letters on 2010 and 2011 Environmental Agreement Annual Reports (EAARs) to De Beers on April 18, 2013
  - With attachments of comments from SLEMA and ENR
  - "DFO has indicated the Annual Report is satisfactory and may provide you with more details on the results at a later date"

3.2.1 AANDC Comments on EAARs

- Pursuant to Article 10.1 of the Environmental Agreement, AANDC is satisfied with the contents of the 2010 and 2011 Annual Reports and, therefore, deems the two reports to be satisfactory
- AANDC requests that De Beers staff report on the issues addressed by SLEMA and ENR as quickly as possible and looks forward to reviewing the responses

3.2.2 ENR Comments on EAARs (I)

- ENR recognizes and appreciates the effort it takes for De Beers to fulfill the multitude of reporting requirements
  - Comments from Wildlife Division (WD) and NS Region (NSR)
- ENR commits to continue working with De Beers in being proactive and adaptive at the mine site, in addition to working jointly with other operating diamond mines to collectively improve various management plans and programs
- ENR also expects to see these efforts reflected in the 2012 Environmental Agreement Annual Report

3.2.2 ENR Comments on EAARs (II)

- De Beers has blended the concepts of what is now considered by the GNWT to be Wildlife and Wildlife Habitat Protection Plan (WWHPP) and a Wildlife Effects Monitoring Program (WEMP)
- The GNWT would propose that for the upcoming year, De Beers voluntarily apply the detailed outlines that will soon be provided by the GNWT for the WWHPP and WEMP. This will ensure minimal confusion between a wildlife mitigation and employee/contractor guidance manual (i.e. WWHPP) and a follow-up effects monitoring program (i.e. WEMP). Consistency and a common language when developing industry-wide best practic and guidelines will be beneficial to governments, regulators, and other future development projects

3.2.2 ENR Comments on EAARs (III)

- De Beers has committed to a joint grizzly bear DNA hair-snagging study, a wolverine DNA hairsnagging study and a North American Peregrine Falcon Survey to be conducted every five years. The GNWT has advocated for these programs in past workshops because they provide for standardized regional monitoring data and can be used to assess, monitor and mitigate cumulative effects on these species

3.2.2 ENR Comments on EAARs (IV)

- For the purposes of supporting an open and transparent process for wildlife management and to continue ensuring safety for both mine staff and surrounding wildlife, the GNWT wants to convey the importance of reporting to the GNWT. The accurate recording of wildlife incidents and occurrences by mine environmental personnel and timely reporting back to the GNWT will assist in developing and implementing current best management practices

3.2.2 ENR Comments on EAARs (V)

- The GNWT requests an opportunity to discuss with De Beers options on developing and implementing a formal standard operating procedure or protocol between the two parties that will better streamline wildlife management actions that require the assistance of the GNWT. Such procedures or protocols might better address wildlife concerns that occur on the mine site, in particular wildlife concerns requiring the immediate attention of the GNWT

3.2.2 ENR Comments on EAARs (VI)

- ENR recognizes that the summary information provided in the EAAR on air quality monitoring and emissions management is also presented under separate cover in the *Annual Air Quality-Meteorological and Emissions Report*, and as such, has no comments at this time. ENR will continue to work with De Beers as they implement and refine their Air Quality Emissions Management and Monitoring Plan

4. Aboriginal Update

- No comments received from Aboriginal groups in April 2013

5. Stakeholders' Update

- AANDC and ENR commented Environmental Agreement 2010 and 2011 Annual Reports, as described in Section 3.2

6. Agency's Activities

- Liaison Meeting was re-established on April 2, 2013
- Executive Meeting held on April 26
- Two letters were sent out to the MVLWB on April 26
  - http://www.slema.ca/wp-content/uploads/2013/02/20130426-Letter-to-MVLWB-on-SNP-02-20.pdf
  - http://www.slema.ca/wp-content/uploads/2013/02/20130426-Letter-to-MVLWB-on-WLAR-2012-with-comment-table.pdf

6.1 Liaison Meeting

- Held on April 2, 2013
- Participants
  - Lionel Marcinkoski from AANDC
  - Patrick Kramers, AANDC Inspector
  - Marc Cacas from the MVLWB
  - Patrick Clancy from GNWT/ENR
  - Dave White and Zhong Liu from SLEMA
- No De Beers staff were able to attend the meeting

7. SLEMA Reviews

- Water Quality in SNP 02-20 (Mixing Zone)
  - SNP Monthly Report for February 2013
- Water Licence 2012 Annual Report
  - Appendix A Acid Rock Drainage and Geochemical Characterization 2012 Annual Report
  - Appendix B Summary of September 2012 Geotechnical Site Inspection
  - Appendix C Monitoring Program Summary for the Period 1999 to 2012
  - Appendix D DRAFT – Updated Predictions of Total Dissolved Solids and Chloride Concentrations in Snap Lake for 2013 and 2014

7.1 Water Quality in SNP 02-20 (Mixing Zone)

- De Beers submitted SNP 02-20 monthly data in the February 2013 SNP Monthly Report
- It is noted that the concentrations of TDS and Chloride in SNP 02-20 (d), (e) and (f) were approaching the Water Quality Objectives (350 mg/L and 120 mg/L, respectively), and concentrations of Fluoride exceeded the WQO (0.12 mg/L) in February 2013

Water Quality Data in SNP 02-20 on February 10, 2013

SNP 02-20 (d)	Surface	Mid	Bottom	WQO
TDS, mg/L	295/263WH	326/270WH	330/278WH	350
Chloride, mg/L	112	118	119	120
Fluoride, mg/L	**0.17**	**0.18**	**0.19**	0.12

SNP 02-20 (e)	Surface	Mid	Bottom	WQO
TDS, mg/L	301/264WH	317/262WH	328/275WH	350
Chloride, mg/L	114	118	**123**	120
Fluoride, mg/L	**0.18**	**0.18**	**0.19**	0.12

SNP 02-20 (f)	Surface	Mid	Bottom	WQO
TDS, mg/L	296/257WH	337/260WH	341/265WH	350
Chloride, mg/L	111	119	**120**	120
Fluoride, mg/L	**0.17**	**0.18**	**0.18**	0.12

WH = warning , hold; TDS data were recalculated because ALS had changed the way they were calculating TDS, artificially skewing the values high.

Comments from the Environmental Analyst (I)

- It is good timing that De Beers was required to submit SNP 02-20 data
- The WQOs at least for Chloride at the edge of the mixing zone may be exceeded in the next few months (late winter means poor mixing condition)
- It is recommended that De Beers take actions to mitigate the coming exceedances

Comments from the Environmental Analyst (II)

- It is recommended that the MVLWB require De Beers to conduct chronic toxicity tests (cladoceran crustacean Ceridaphnia dubia and alga Pseudokirchneriella subcapitata) for SNP 02-20 in the following month after a Chloride exceedance

Comments from the Environmental Analyst (III)

- In addition, it will be appropriate to reaffirm the comments dated March 11, 2013 on Rainbow Trout Early Life Stage (ELS) Toxicity Testing, i.e. "*SLEMA suggests that De Beers conduct the 70-day test for not less than 2 years or 4 comparable tests (same season) and compare the 7 and 30-day results (which De Beers will have) with the 70-day results*"

Communication with MVLWB, AANDC, EC and DFO

- SNP 02-20 data were sent to the above governmental departments via e-mails
- A meeting was held on April 5, 2013 to discuss this issue among SLEMA staff, MVLWB staff and AANDC inspector

DFO Responses

- Dated April 17, 2013
  - WQO exceedances would trigger an action level in an adaptive management/ response framework plan. As the EQC is based on meeting the WQO's one action level would be to lower the EQC to bring water quality into line with the WQO

Responses from AANDC / Water Resources Division

- Dated April 17, 2013
  - It is expected that during the course of an operation the Site Specific Water Quality Objectives (SSWQOs) may be exceeded at the edge of the Initial Dilution Zone (IDZ). The acceptability of this is dependent on the magnitude of the SSWQOs and the sensitivity of the receiving environment (level of protection to be afforded)
  - Exceedance of the SSWQO should trigger management response
  - The first step of the response should be an evaluations of the EQC

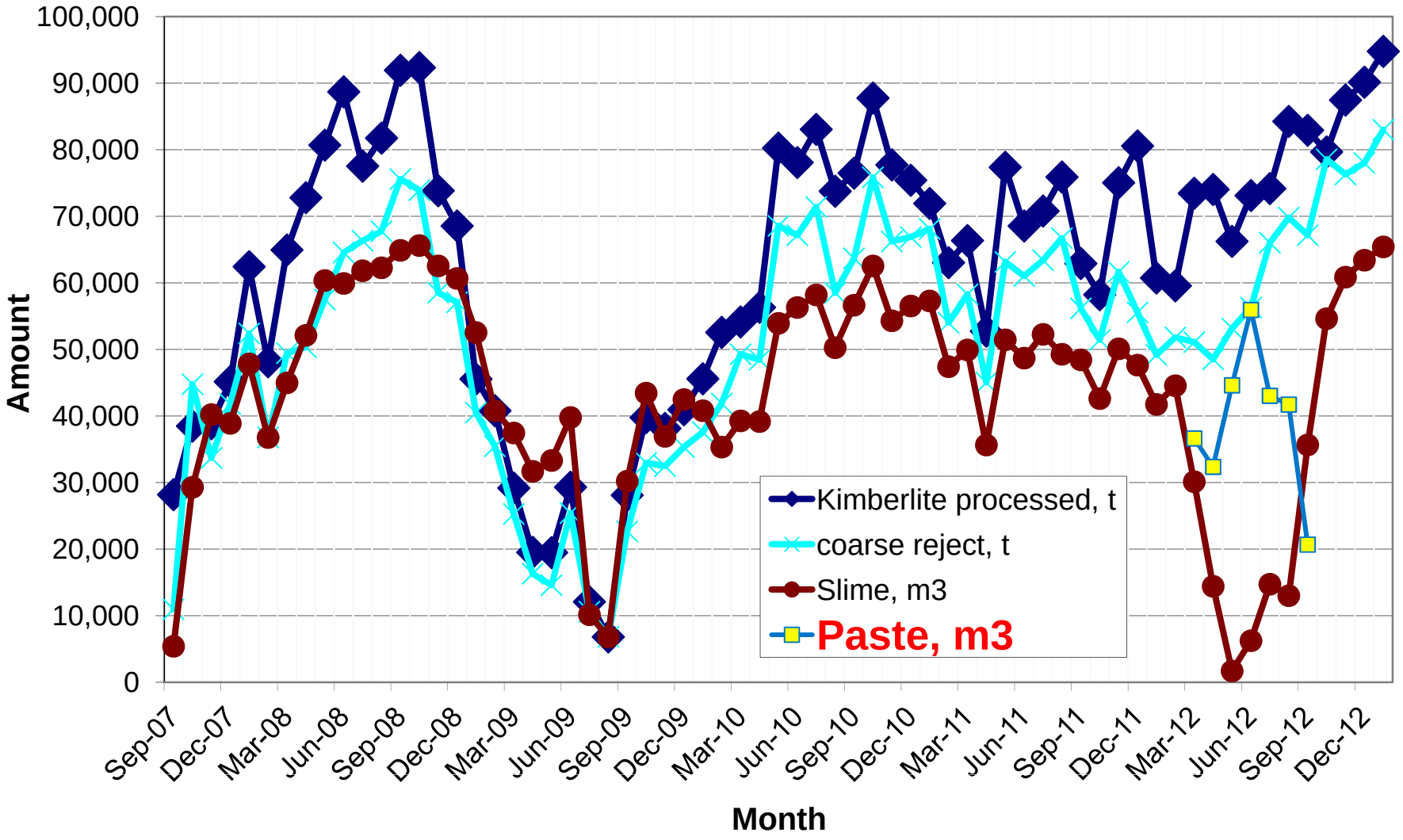
7.2 Water Licence 2012 Annual Report

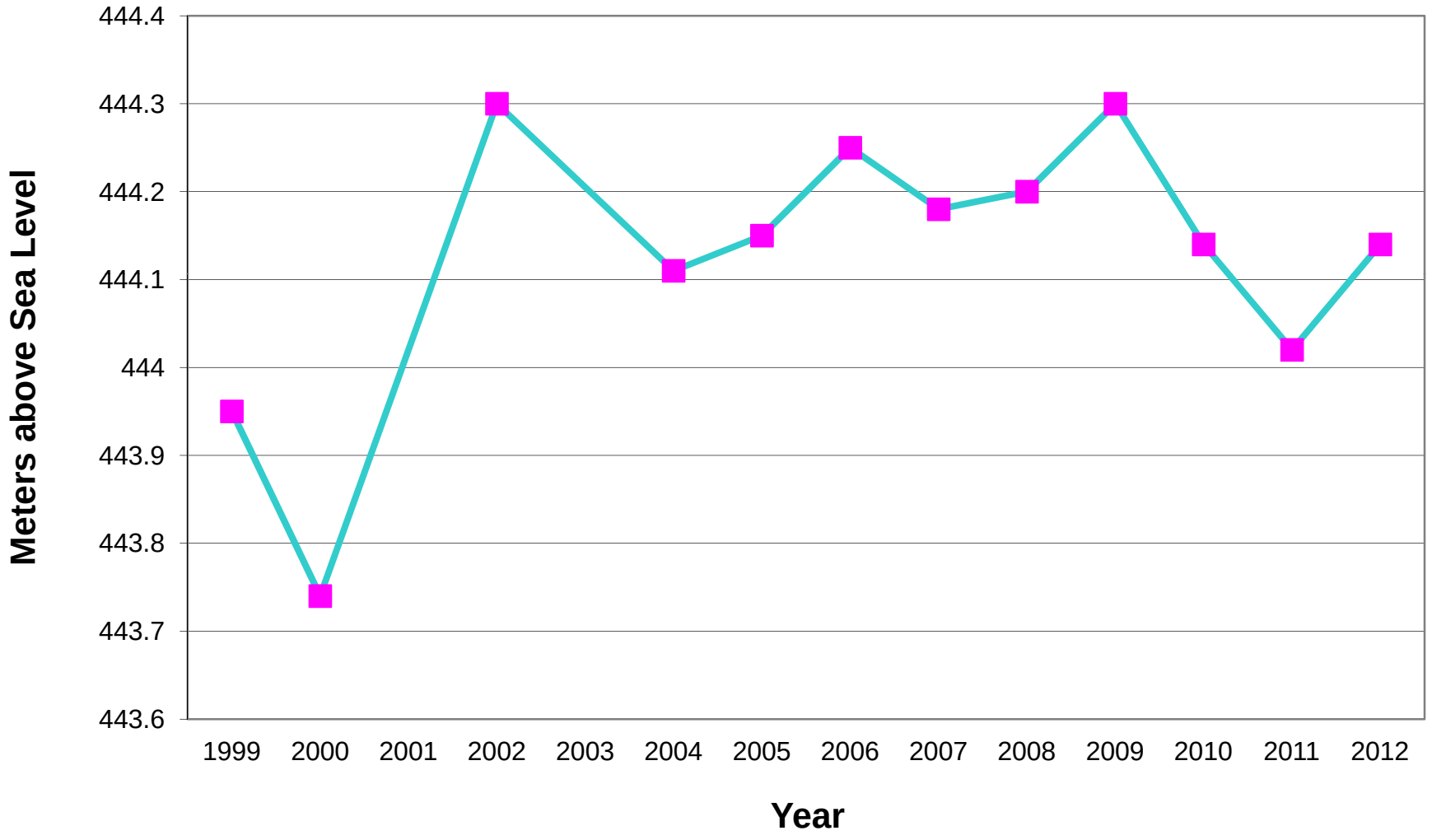
- Submitted with four appendices on March 31, 2013
  - Appendix A Acid Rock Drainage and Geochemical Characterization 2012 Annual Report
  - Appendix B Summary of September 2012 Geotechnical Site Inspection
  - Appendix C Monitoring Program Summary for the Period 1999 to 2012
  - Appendix D DRAFT – Updated Predictions of Total Dissolved Solids and Chloride Concentrations in Snap Lake for 2013 and 2014

2012 Fact Sheet

- Water intake from Snap Lake: 40,134 m^3
- Discharge to Snap Lake: 10,657,324 m^3
- Deposition to the North Pile
  - Slime Solids: 266,966 tonnes
  - Grits: 751,067 tonnes
  - Paste: 325,797 tonnes

Kimberlite Processed at the Mine




Water Elevations in Snap Lake
Meters above Sea Level
444.4
444.3
444.2
444.1
444
443.9
443.8
443.7
443.6
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year

Improvements of Water Management in 2012

- Hardware and software were improved for water management
  - Improved communication between underground sump and pump operators and WTP operators,
  - Investigated programming of dynamic interlock setpoints based on month-to-date average discharge, grab limit and average limit,
  - Installed in-line turbidity and nitrate meters on all direct inflows to pH tank with interlocked diversion valves (scheduled January 2013),
  - Prescribed mandatory checks on all sumps, ditches, and pipelines, etc.

Hydrological Modeling

- The maximum inflow rate (minewater) by the end of mining predicted by Itasca's model (2012) is approximately **56,000 m^3/day**, in comparison to 29,000 m^3/day by Fracflow's model (2011)
- In comparison, the average daily minewater in 2012 was 33,634 m^3/day

Comments from the Environmental Analyst

- It is good to see De Beers making more efforts in improving water management
- Based on recent hydrological modeling results, De Beers has to work harder in water management, especially source control, at the mine
- A few editing issues, e.g. Table 13-1 and Table 22-2, were pointed out to De Beers via e-mails, and correction was made

7.3 Acid Rock Drainage and Geochemical Characterization 2012 Annual Report

- The Report is Appendix A of WLAR 2012
  - A geochemical site inspection was performed in September 2012 to identify any visible signs of acid generation where rock has been used for construction at the Mine, and areas of seepage or runoff that may represent non-point source runoff to Snap Lake
  - Rock samples were taken and analyzed
  - Water quality data were evaluated

Geochemical Site Inspection

- Main observations
  - No visible signs of incipient acid generation were observed in the roads, rock pads or building foundations at the Mine during the 2012 geochemical inspection
  - During 2012, construction occurred in the North Pile East Cell and Starter Cell. Embankments were constructed with PK coarse and grits
  - Stockpiles of granite rock suitable for construction are maintained at the camp site east of the WMP. Samples collected from the granite stockpiles contained low sulphide-sulphur concentrations and are classified as non-AG

Geochemical Characterization of Mine Rock and Processed Kimberlite

- A total of 197 additional samples were collected from the Mine in 2012, including 17 samples of kimberlite and PK, 11 samples of metavolcanic and 169 samples of granite
- The composition of samples collected in 2012 was within the range of composition of samples in the existing geochemical dataset
- The geochemical assessment of kimberlite, PK and granite has not changed based on the results of the 2012 geochemical assessme

Water Quality (I)

- Mine water inflow rates and TDS loading rates increased throughout 2012:
  - TDS concentrations ranged from 335 to 888 mg/L.
  - Mine water discharge rates varied from 22,445 cubic metres per day (m3/day) to about 32,516 m3/day during the 2012 monitoring period

Figure 7-1 Minewater Discharge Rate Through December 31, 2012

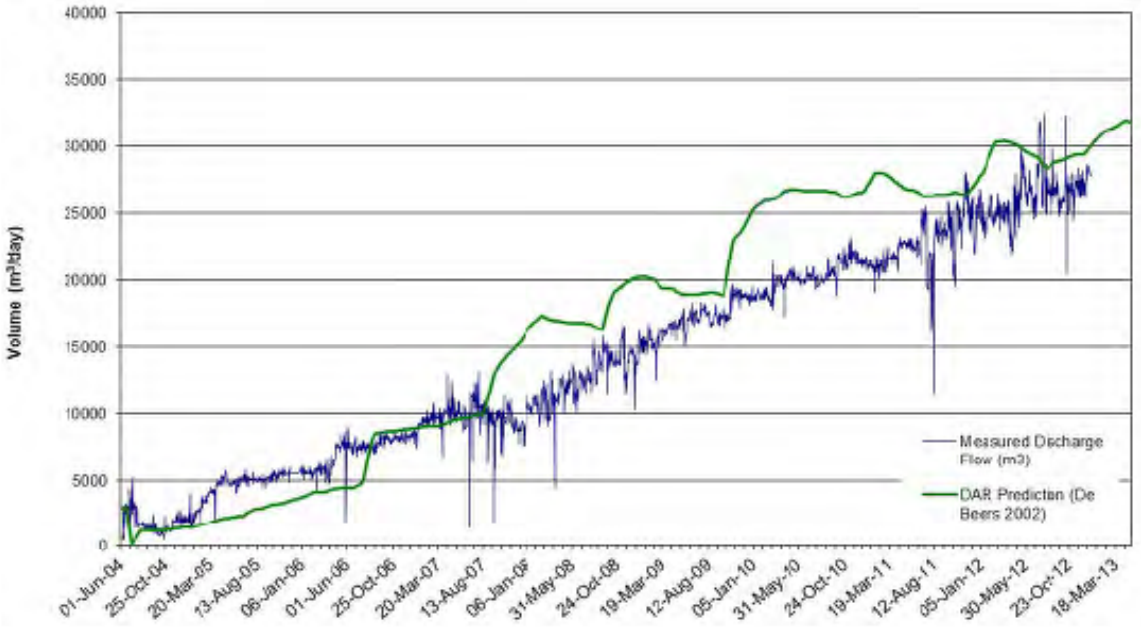
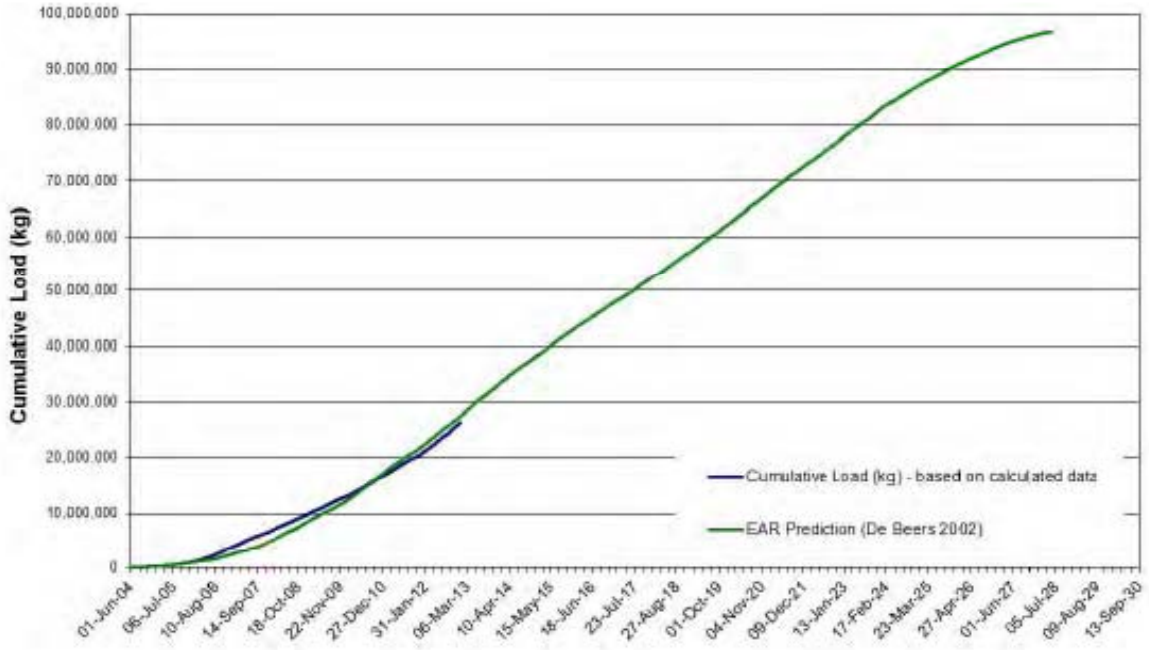
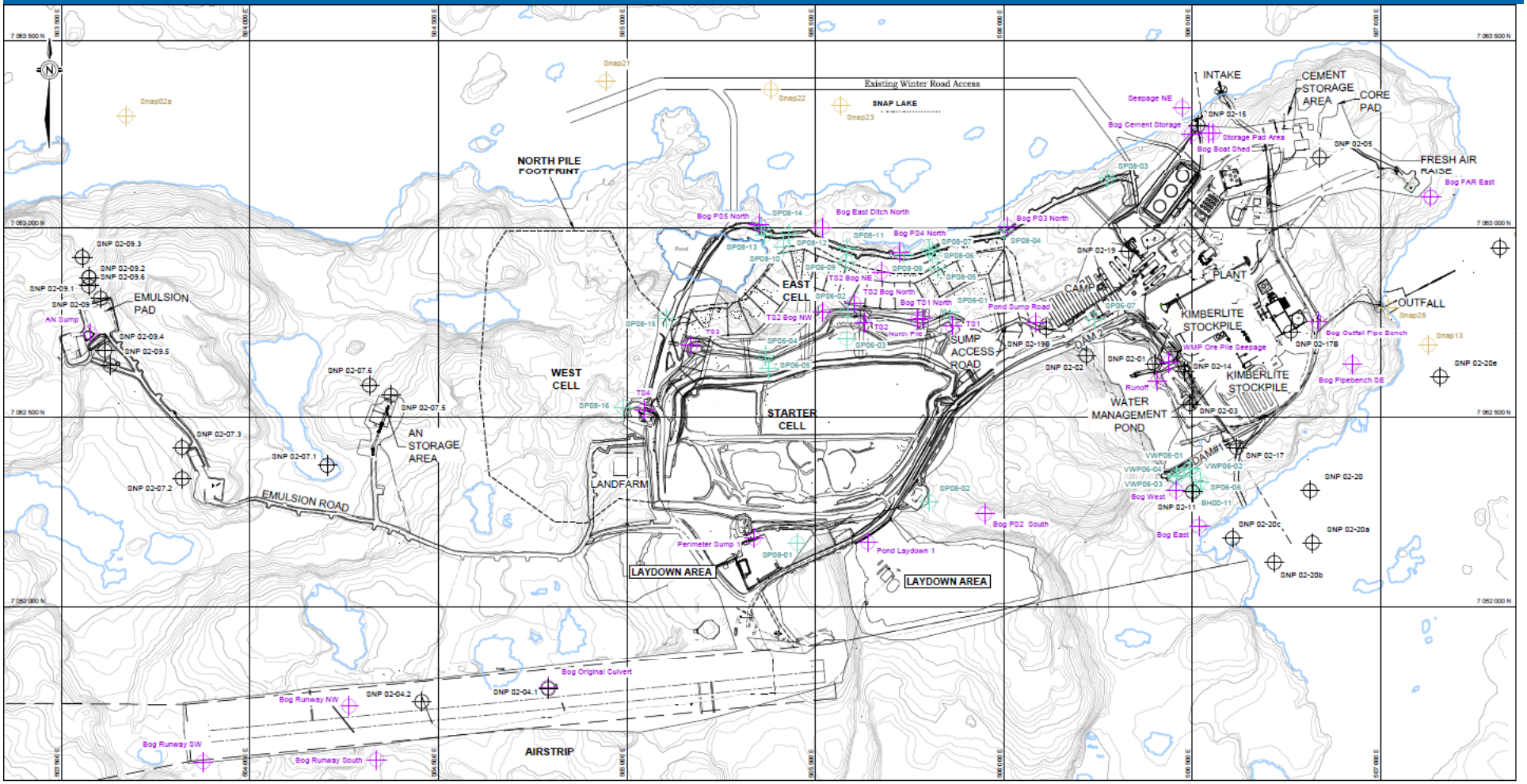


Figure 7-2 Cumulative Minewater Total Dissolved Solids to December 31, 2012



Water Quality Monitoring Locations



LEGEND

- SNP MONITORING LOCATIONS
- AEMP MONITORING LOCATIONS
- ARD MONITORING LOCATIONS
- PIEZOMETER LOCATIONS
- WATERBODY
- MINOR TOPOGRAPHIC CONTOUR (INTERVAL = 1 m)
- MAJOR TOPOGRAPHIC CONTOUR (INTERVAL = 5 m)

REFERENCE

1. ALL DIMENSIONS AN ELEVATIONS ARE IN METERS UNLESS OTHERWISE NOTED. COORDINATE SYSTEM IS NAD83 UTM ZONE 12.
2. THE GROUND SURFACE AND WATER LEVEL ELEVATIONS ARE CONSIDERED APPROXIMATE.

NOTES

1. BASE MAP INFORMATION PROVIDED BY AMEC AMERICAS LIMITED ON NOVEMBER 12, 2004.
2. GROUND SURVEY INFORMATION PROVIDED BY AMEC AMERICAS LIMITED ON JANUARY 5, 2005 AND ABORIGINAL ENGINEERING LTD. ON DECEMBER 07 & 18, 2005. IN AREAS OF COMMON COVERAGE, THE MOST RECENT DATA IS PRESENTED.
3. PROJECT SITE INFRASTRUCTURE INFORMATION PROVIDED BY DEBEERS CANADA IN FEB. 2010 (Site Map.dwg).

200 0 200
SCALE METRES

PROJECT: De Beers Canada — Snap Lake Mine

TITLE: SNAP LAKE MINE SITE CONFIGURATION, INCLUDING WATER QUALITY MONITORING LOCATIONS

Golder Associates

PROJECT		13.1349.0001	FILE No.	131349001450GA004	
DESIGN	KS	28FEB13	SCALE	AS SHOWN	REV. 0
CADD	JEF	12MAR13			
CHECK	KS	20MAR13			
REVIEW	KD	20MAR13			

FIGURE: 5-2

Water Quality (II)

- The composition of seepage and runoff from various areas at the site is evaluated at a number of SNP monitoring stations, and bog and seepage monitoring stations
- The results of water quality analysis at most SNP monitoring stations, bog and seepage monitoring stations was similar to concentration trends observed during the previous monitoring year
- Bogs north of SP3 and SP5 had elevated concentrations of nitrate (0.07 to 38 mg/L as N), which may result from North Pile seepage

Report Recommendations (I)

- In 2013, the geochemical performance monitoring program should proceed according to the requirements of the ARD and Geochemistry Plan
- Clean granite stockpiles should continue to be maintained as a source of non-AG construction material
- De Beers should continue to monitor for visible signs of incipient acid generation. If visible signs of sulphide oxidation and / or acid generation are observed, or if the result of water quality monitoring indicate changes in the chemical stability of construction rock, remedial measures may need to be investigated

Report Recommendations (II)

- Water quality monitoring should continue according to the SNP monitoring program for the Mine, and the recommendations of the ARD and Geochemistry Plan to evaluate changes in water quality resulting from runoff and/or seepage from site facilities
  - Ongoing monitoring of the bogs and piezometers in the north perimeter embankment of the East Cell is recommended to verify the performance of the North Pile, and to evaluate the composition of potential seepage from the North Pile
- The results of ongoing water quality monitoring should continue to be used as input to the ongoing site water quality prediction updates

Comments from the Environmental Analyst (I)

- All recommendations in Section 9.2 are supported
- It is stated in Section 9.1 that Bogs north of SP3 and SP5 had elevated concentrations of nitrate (0.07 to 38 mg/L as N), which may result from North Pile seepage. This raises a concern

Comments from the Environmental Analyst (II)

- SLEMA has been concerned about the seepage from the North Pile to Snap Lake. During the water licence renewal process, SLEMA recommended the MVLWB put the ARD bog stations between the North Pile and the Snap Lake shoreline into the Surveillance Network Program, especially under the umbrella of SNP 02-10. The MVLWB stated in the Reasons for Decision (Page 114) that once the licence is approved, the proposed changes to the SNP based on IL-6 and proposed east cell site (SLEMA's recommendation) can be sent out for review, ensuring everyone has proper input
- Now it may be the right time to initiate the review of SNP 02-10. It is recommended that the MVLWB do so

7.4 Summary of September 2012 Geotechnical Site Inspection

- This report summarizes the September 2012 geotechnical inspection of the North Pile facility and the Water Management Pond (WMP) dams

Comments from the Environmental Analyst

- Field Inspection Report was reviewed and commented in November 2012 Environmental Update and one SLEMA letter was issued out
  - http://www.slema.ca/wp-content/uploads/2012/01/November-2012-Environmental-Update.pdf
  - http://www.slema.ca/wp-content/uploads/2012/01/20121221-Letter-to-MVLWB-on-2012-Geotechnical-Field-Inspection.pdf

7.5 Monitoring Program Summary for the Period 1999 to 2012

- This report presents the results from the monitoring of thermistors, piezometers, and survey prisms installed on the site

Report Summary (I)

- The quality of some data provided by De Beers is suspect as the results vary from those expected. De Beers should review and confirm these data and improve Quality Control and Quality Assurance measures in future monitoring and reporting
- The aggradation of permafrost to the original ground surface of the North Pile and into the deposited materials indicates that the deposited materials are freezing. These results are expected

Report Summary (II)

- The foundation of Dams 1 and 2 and the ground beneath the WMP are expected to be thawed as the thermal mass of the water stored within the WMP has formed a talik beneath it
- The monitoring results indicate that the design and operation of the East Cell perimeter water control structures are promoting a hydraulic gradient towards the North Pile from Snap Lake as per design; this is considered to be acceptable

Report Summary (III)

- The displacement of the North Pile embankments are considered to be acceptable. The monitoring indicates that the structures are performing as per the design intent
- The installation of thermistors and piezometers into the deposited materials is planned by De Beers
- The replacement of the damaged instrument should be considered

Comments from the Environmental Analyst

- Recommendations in Section 5. Summary are supported. No other concerns are raised

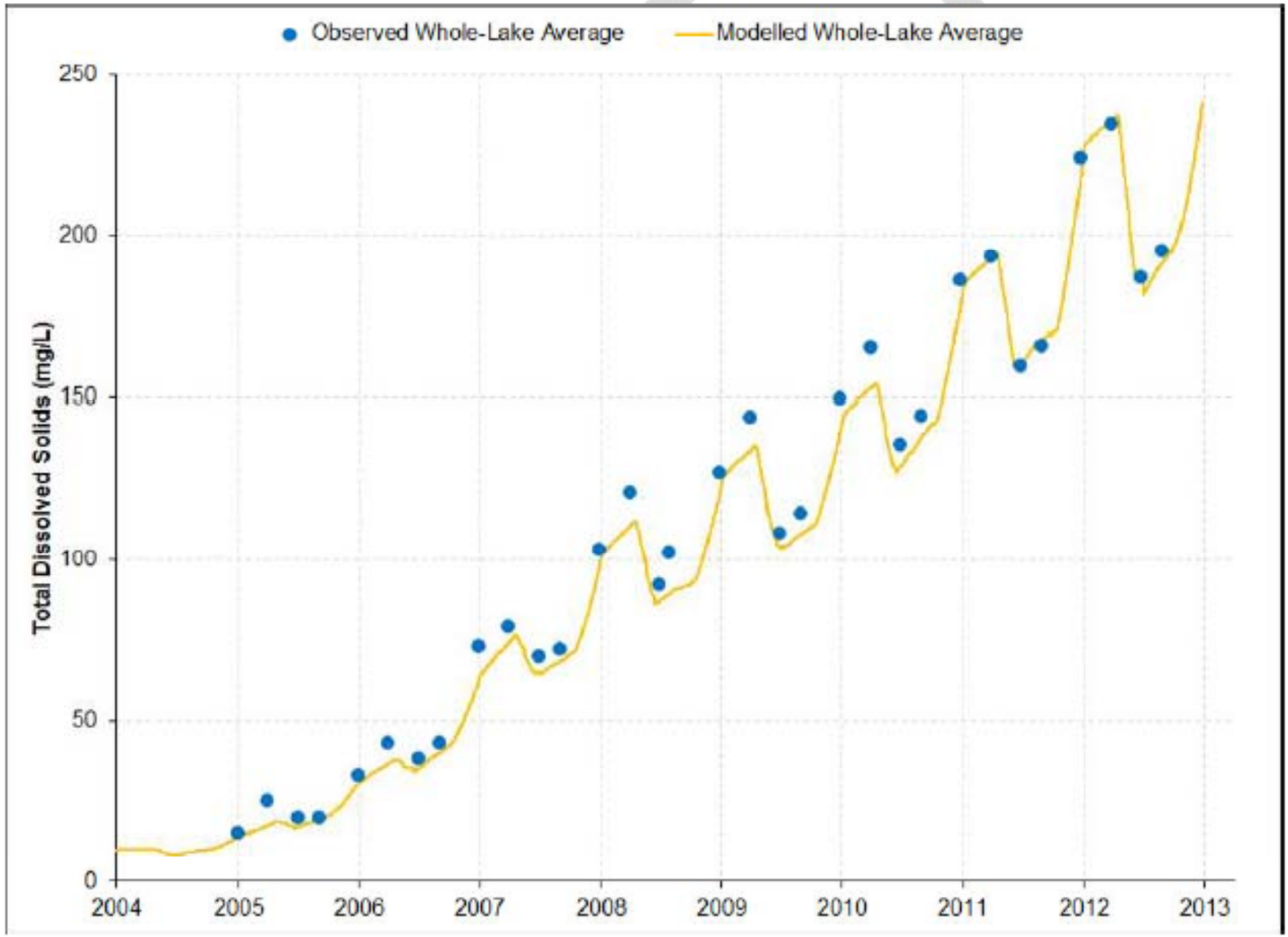
7.6 Updated Predictions of Total Dissolved Solids and Chloride Concentrations in Snap Lake for 2013 and 2014

- Models updated by Golder Associates Ltd.
  - "This report provides details of updates to the site and Snap Lake models, and updated projections of TDS and chloride concentrations in the treated effluent discharge and in Snap Lake from January 1, 2013 to January 1, 2015, as requested by De Beers, with a comparison of the results to the relevant Water Licence Limit for TDS and CCME (1999) WQG for chloride. Both models are dependent on the hydrogeological model predictions provided by Itasca (2012)"

Modeling Results

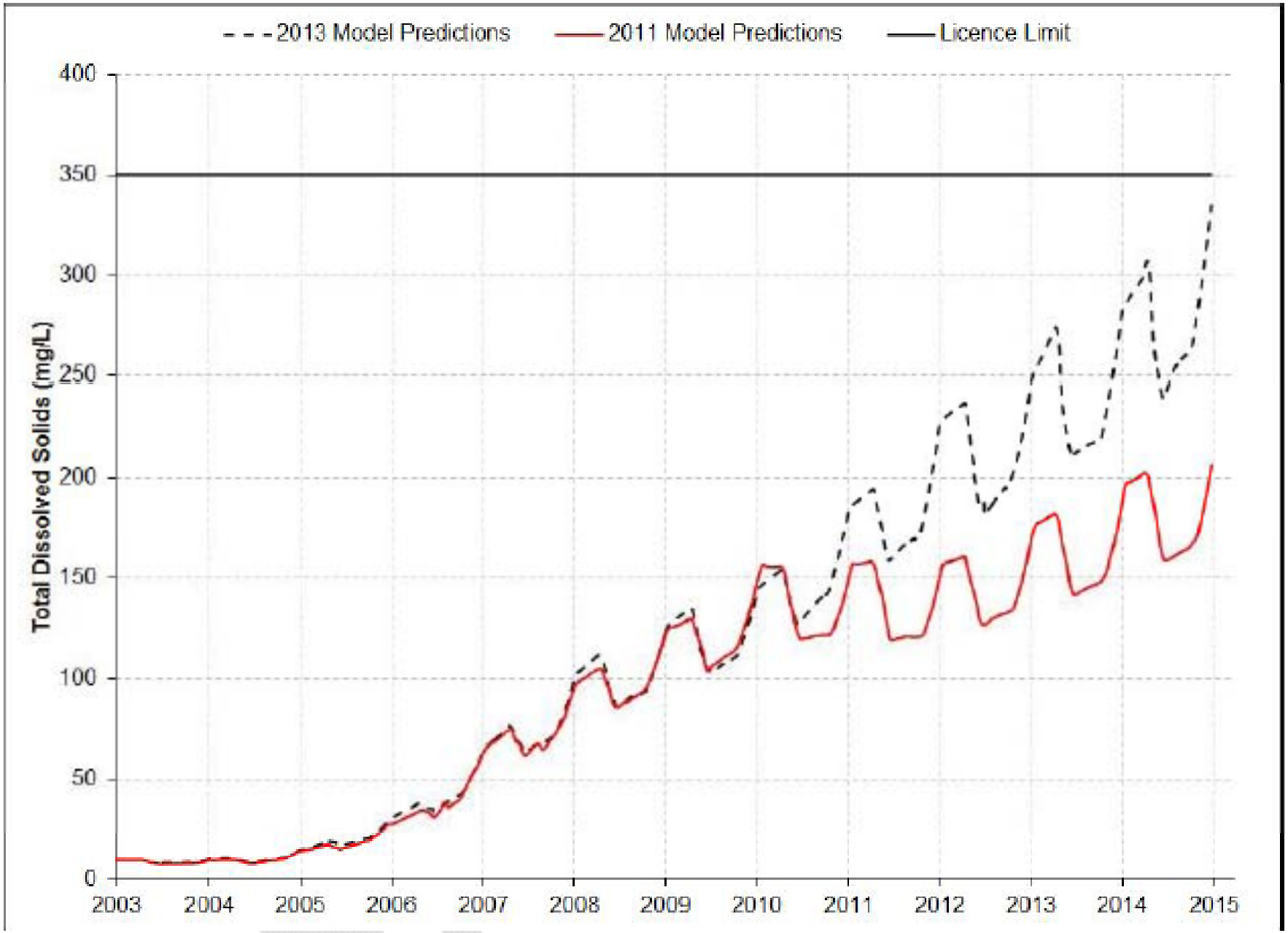
- TDS and chloride concentrations are predicted to be higher in Snap Lake compared to 2011 predictions. The updated site and Snap Lake models predicted that whole-lake average TDS concentrations would not exceed the Water Licence Limit of 350 mg/L through January 1, 2015, but that **chloride concentrations would exceed the CCME WQG for chloride of 120 mg/L in 2013**

Figure 17 Observed and Modelled Whole-Lake Average Total Dissolved Solids Concentrations



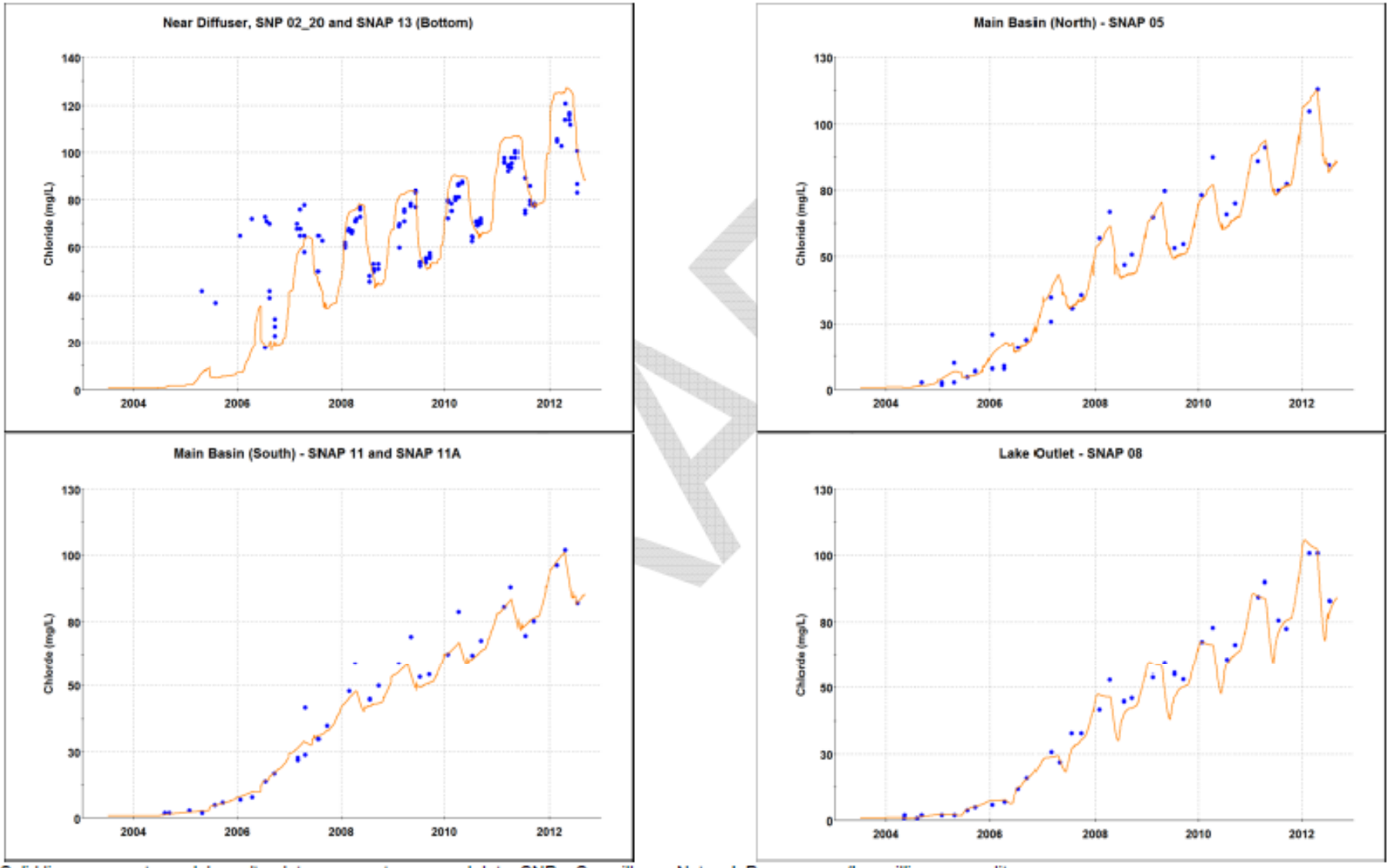
Note: Solid line represents model results; dots represent measured data.
mg/L = milligrams per litre.

Figure 20 Predicted Whole-Lake Average Total Dissolved Solids Concentrations in Snap Lake



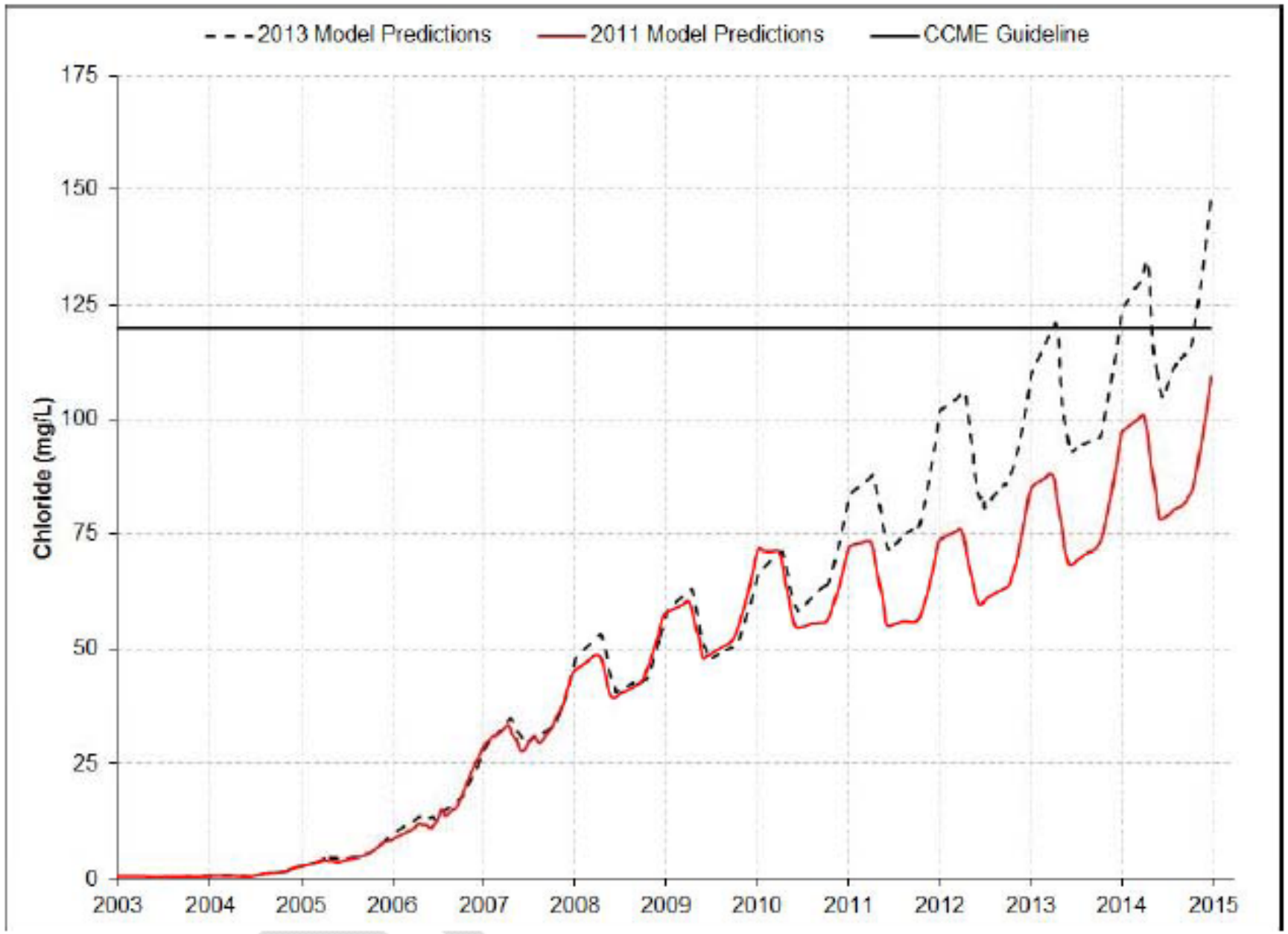
mg/L = milligrams per litre.

Figure III-1 Calibration Plots for Chloride (continued)



Note: Solid line represents model results; dots represent measured data; SNP = Surveillance Network Program, mg/L = milligrams per litre.

Figure 21 Predicted Whole-Lake Average Chloride Concentrations in Snap Lake



CCME = Canadian Council of Ministers of the Environment.

mg/L = milligrams per litre.

Comments from the Environmental Analyst

- The modeling for TDS and Chloride is satisfactory
- SNP 02-20 data on February 10, 2013 indicates that the Chloride exceedance is coming in the following months
- One concern is raised about the potential impacts of the Chloride exceedance