**Snap Lake Environmental Monitoring Agency**
**Main Floor, Lahm Ridge Tower**
**4501 Franklin Avenue**
**P.O. Box 95, Yellowknife, NT X1A 2N1**
**Phone: 867-765-0961 FAX: 867-765-0963**
**Website: www.slema.ca**

Marc Casas
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor – 4910 50th Avenue
P.O.Box 2130
Yellowknife, NT X1A 2P6

File: Water Licence MV2011L2-0004

October 31, 2013

**Re: SLEMA Modeling Update**

Dear Mr. Casas,

Snap Lake Environmental Monitoring Agency (SLEMA) developed a water quality model to predict whole lake average of TDS, Chloride and Calcium concentrations in Snap Lake in 2010, and updated the predictions in 2012.

Again SLEMA updated the modeling in 2013, and would like to provide the MVLWB with the modeling results as below.

Back tests for modeling TDS and Chloride were carried out with discharge data up to August 2013, and reasonable assumptions are applied in the prediction of water quality change in Snap Lake.

## Chloride Modeling

Back test demonstrated the Chloride modeling works well.

- Correlation coefficient of the two data sets (observed values and modeling results) is 0.990.
- Modeling results show that whole lake average of Chloride concentrations in April 2013 (120.1 mg/L) is above the CCME Guideline.
    - Observed Chloride value in May 2013 is 128 mg/L.
- **Prediction in 2012 proved to be right.**
    - **"the exceedance of WQO for Chloride is imminent".**

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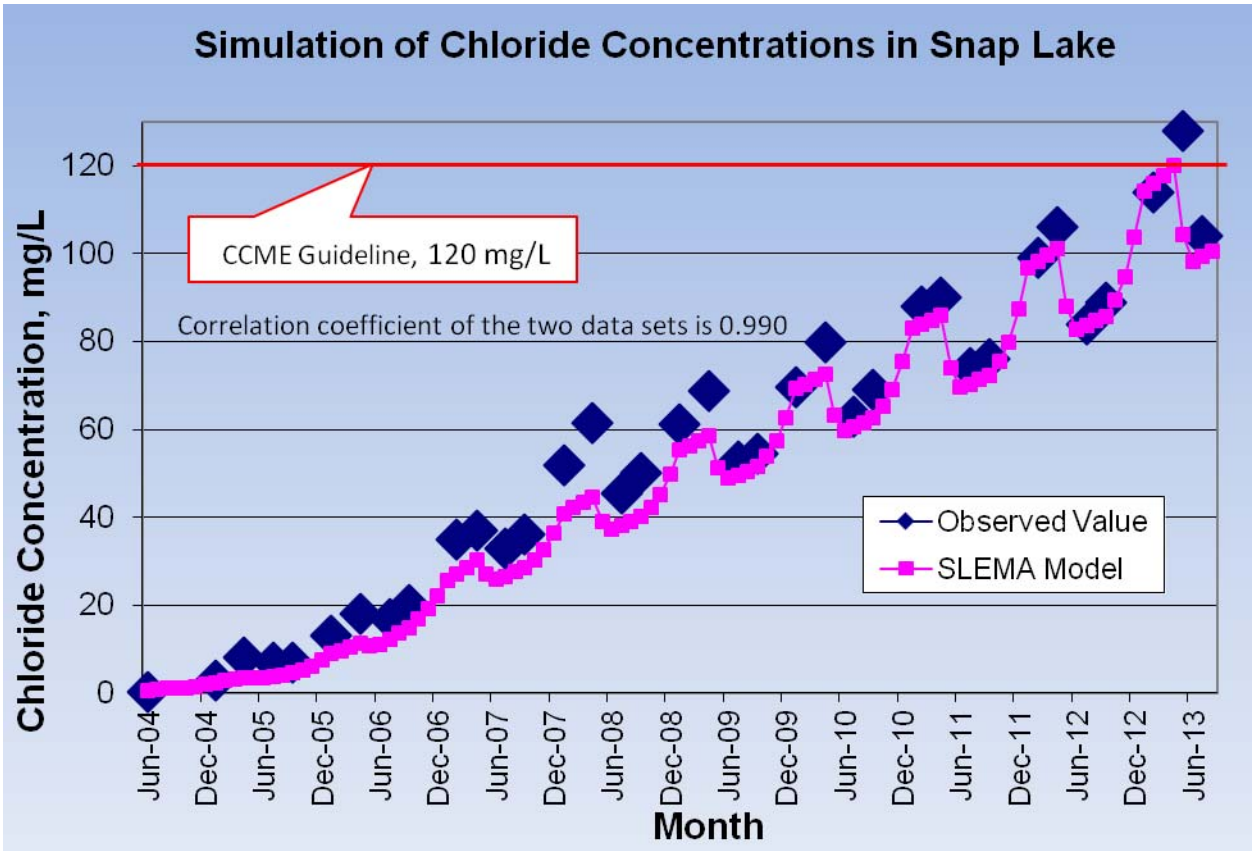


**Figure 1. Chloride Modeling Back Test**

Predictions made in 2010 and 2012 were relatively conservative, especially the assumption of the discharge quantity. Three scenarios were predicted. Under Scenario 2 and 3, USEPA Guideline for Aquatic Life and Canadian Aesthetic Objective for Drinking Water will be exceeded within the Mine life.

**Table 1. Results of Chloride Modeling**

| Scenario | Assumed Discharge Quantity, $m^3$/month | Assumed Quality, mg/L Chloride | Guideline value to be exceeded? If yes, when? | | |
|---|---|---|---|---|---|
| | | | 120 mg/L (CCME) | 230 mg/L (USEPA) | 250 mg/L (Aesthetic) |
| 1 | 1,000,000 | 240 | Apr. 2013 | N/A | N/A |
| 2 | 1,200,000 | 280 | Apr. 2013 | Jan. 2021 | Feb. 2024 |
| 3 | 1.400,000 | 310 | Apr. 2013 | Jan. 2018 | Apr. 2019 |

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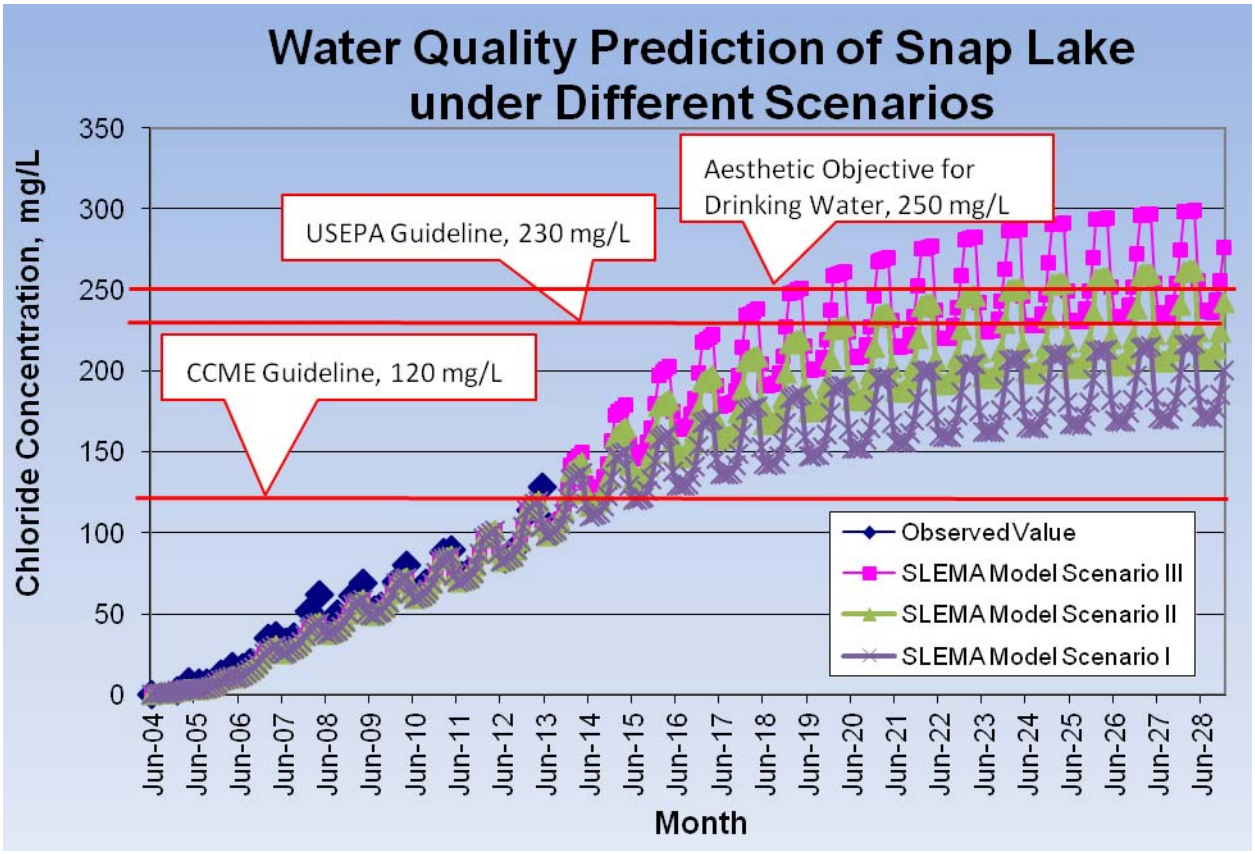


**Figure 2. Chloride Predications**

## TDS Modeling

TDS modeling back test indicated that the correlation coefficient of the two data sets (observed values and modeling results) is 0.992, and confirmed the model capable of predicting future whole lake average of TDS concentrations in Snap Lake.

One prediction was made for TDS. If the discharge amount and TDS concentration are 1,400,000 $m^3$/month and 650 mg/L, whole lake average TDS level will be 378 mg/L in **January 2015**, exceeding the Water Licence limit (350 mg/L).

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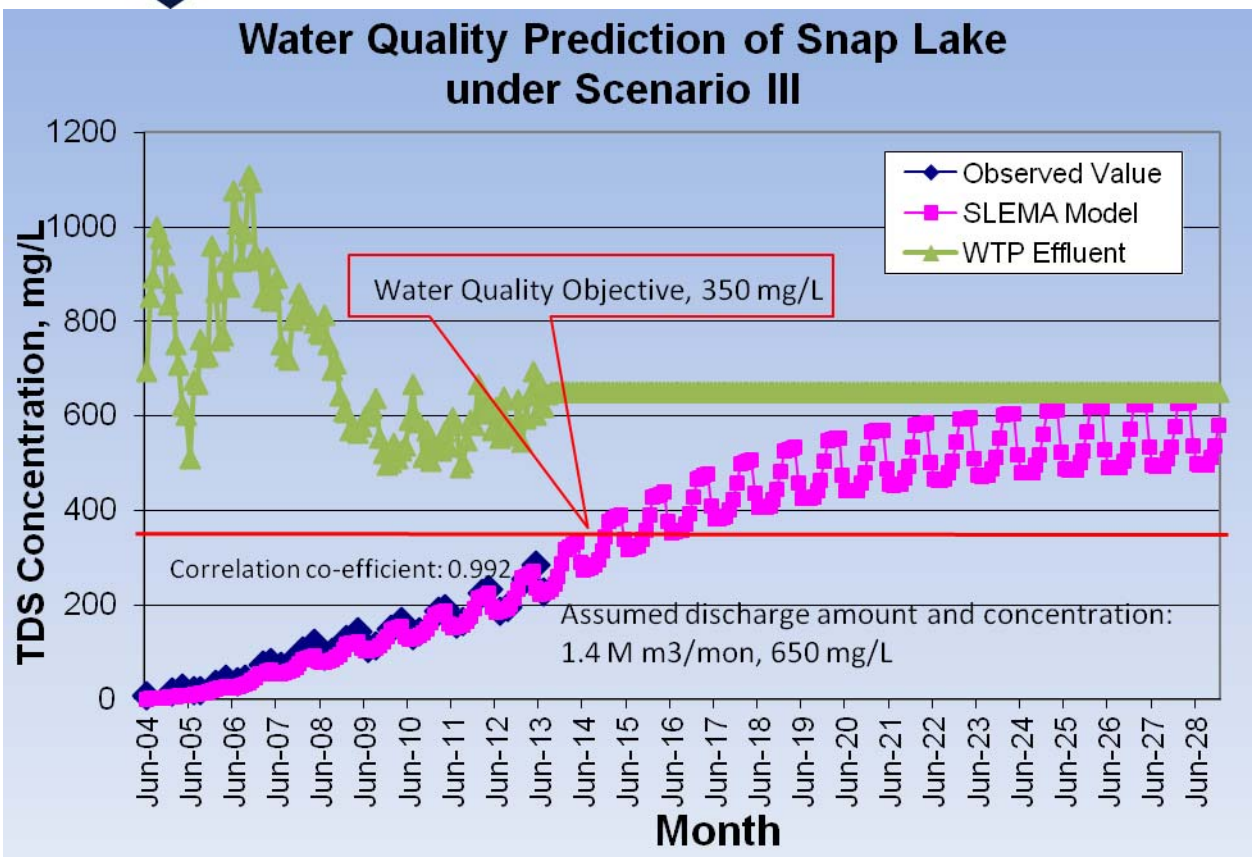


**Figure 3. TDS Predication**

SLEMA believes the modeling results may help the MVLWB in the file of Snap Lake Diamond Mine, especially the review of TDS Response Plan to be submitted by December 31, 2013. If you have any questions whatsoever please feel free to contact Philippe di Pizzo at 867-765-0961 / exec@slema.ca.

Sincerely,

Johnny Weyallon

Chairperson