



The Government of the Northwest Territories

Public Hearing Presentation

De Beers Canada Mining Inc. Snap Lake Project Environmental Assessment EA1314-02

Yellowknife, NT
June 5th – 6th, 2014



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Presentation Overview

- Introduction
- Water Management in the NWT - Principles
- Snap Lake - Historical and Existing Conditions
- Snap Lake - Future Conditions
- SSWQO Derivation for Snap Lake and Lockhart System
- Protecting Traditional Use
- Closing



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Introduction

- MVEIRB has scoped the development narrowly, to water related issues.
- ENR is presenting water-related evidence and recommendations on behalf of the Government of the Northwest Territories.



NWT Water Management Principles

- NWT Water Stewardship Strategy:

“Waters that flow into, within or through the NWT are substantially unaltered in quality, quantity and rates of flow.”

- Minimize degradation of receiving waters.
- Consistent with CCME:

“For waters of superior quality or that support valuable biological resources, the CCME non-degradation policy states that the degradation of the existing water quality should always be avoided.”



NWT Water Management Principles

- Consistent with industry statements, e.g. De Beers:

“... Through careful planning and consultation with all of our stakeholders, we aim to minimize any environmental disturbance by our exploration and mining activities. ...”

- Must evaluate all reasonable efforts to eliminate or minimize the discharge of waste.



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EA Focus

- Requested amendments are associated with managing greater than expected groundwater inflows at the Snap Lake mine.

Recommendation

1. The GNWT recommends that the Review Board include a specific statement in the Report of Environmental Assessment that the conclusions and measures that result from this environmental assessment are specific to the Snap Lake Mine and Snap Lake.



Snap Lake – Historical Conditions

- Pre Development:
 - Relatively clear (low turbidity)
 - Soft water (i.e. low hardness)
 - Neutral to slightly acidic pH
 - Upper oligotrophic to lower mesotrophic
- Water Quality:
 - TDS: ~15mg/L
 - Chloride: <1 mg/L
 - Nitrate: ~0.04mg/L
 - Ionic composition: carbonate and sulphate dominated



Snap Lake – Previous EA

- Previous EA accepted that some level of change would occur.
- Disagreement over modeling interpretation and saline groundwater inflow:
 - Five interveners stated concern that contributions were underestimated.
 - De Beers maintained that their predictions regarding maximum TDS concentrations were accurate.
- Review Board accepted De Beers position, but acknowledged uncertainty by including a measure to limit TDS to a maximum of 350 mg/L whole lake average in the water licence.



Snap Lake – Previous EA Predictions vs. Existing Conditions

- Predicted:
 - whole lake average TDS of 330 mg/L.
 - peak TDS concentrations (450 mg/L) were predicted to occur within 250 m of the diffuser (1% of Snap Lake).
 - maximum whole lake average chloride concentration of 137 mg/L.
- Current conditions (2012):
 - TDS: 212 mg/L whole lake average.
 - ionic composition: calcium and chloride dominated.
 - effluent detected 11 km downstream of Snap Lake, 5 km into Lac Capot Blanc. Increasing TDS trend identified in King Lake, 25 km downstream (2013).



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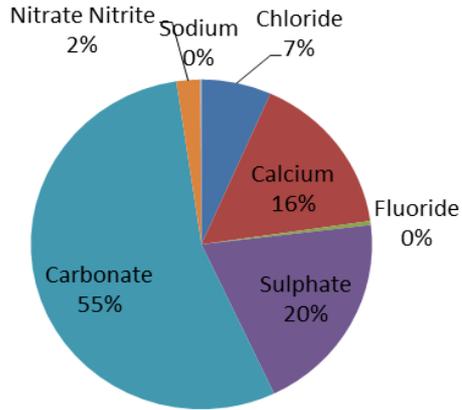


Snap Lake Future Conditions

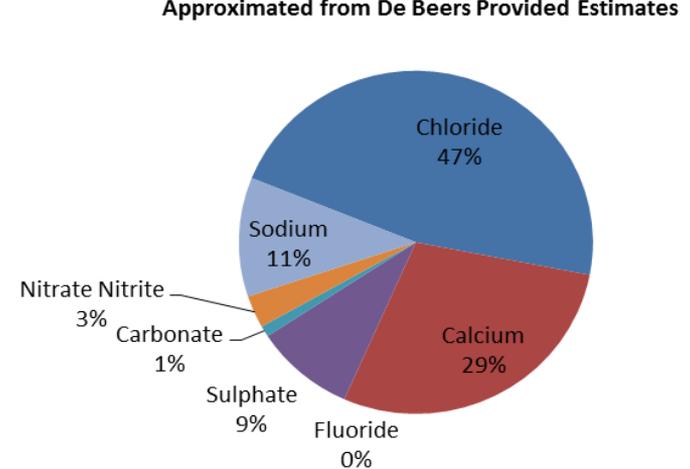
- Modeling uncertainty remains.
- Worst case predictions:
 - Effluent TDS: 1700 mg/L.
 - Snap Lake assimilative capacity: 9 parts effluent to 1 part natural water.
 - Ionic composition: 47% chloride, 28% calcium, 11% sodium, 9% sulphate, 5% remaining (carbonate, nitrate, fluoride, potassium, magnesium).



Snap Lake Baseline Condition as a percentage of TDS (15mg/L TDS)



Snap Lake Mine End of Life Ionic Composition as a percentage of TDS (350 and 1800 mg/L (TDS) Approximated from De Beers Provided Estimates



■ Chloride
 ■ Calcium
 ■ Fluoride
 ■ Sulphate
 ■ Carbonate
 ■ Nitrate Nitrite
 ■ Sodium

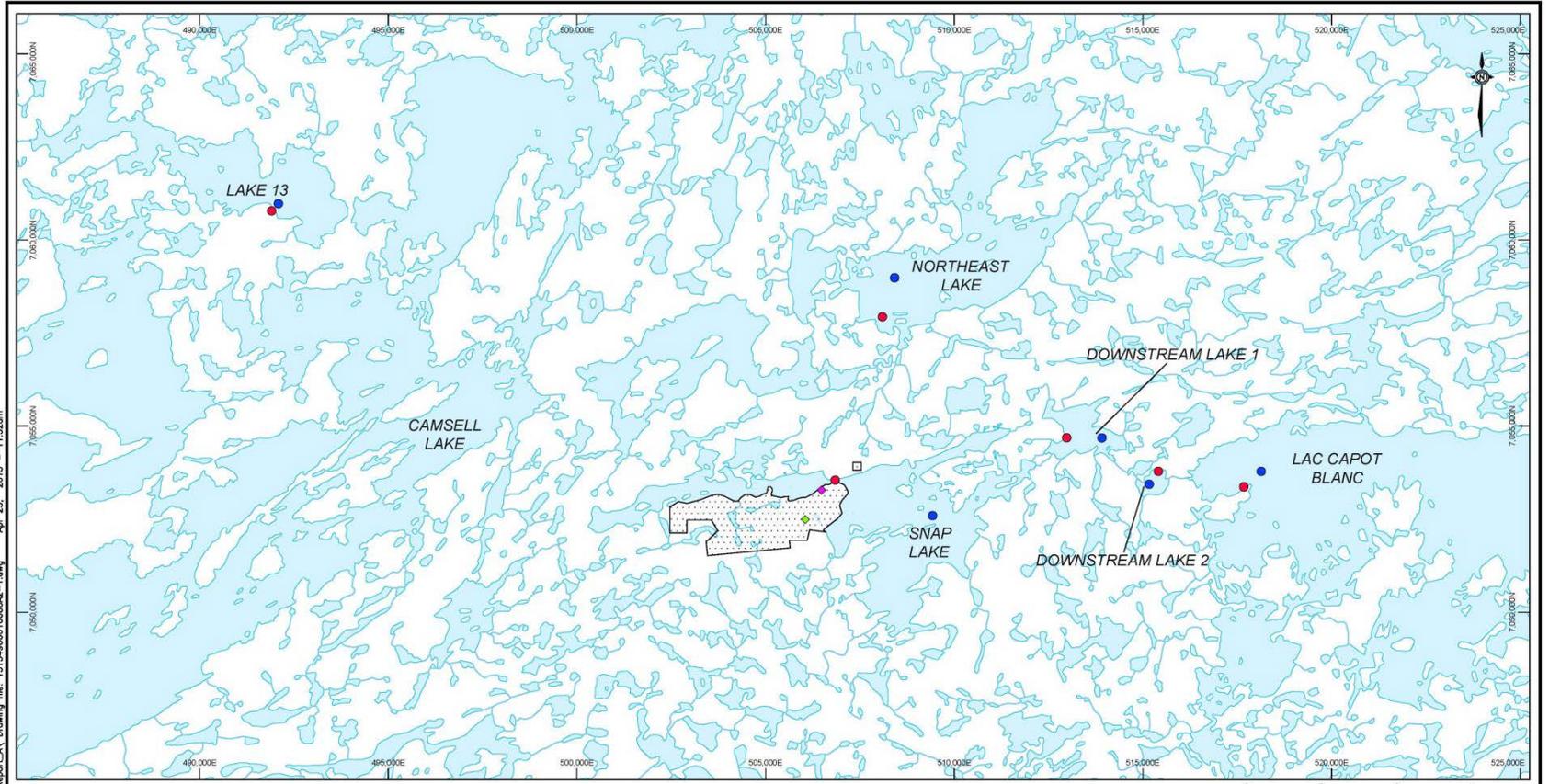


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Snap Lake Future Conditions

- Duration
 - GNWT estimates time to return to baseline conditions from worst case maximum (1700 mg/L TDS) would be 90 years.
 - Water replacement time of ~13 years.
- Spatial Extent
 - TDS changes measurable > 65 km downstream (potentially up to 155 km downstream).
 - Water in Lac Capot Blanc could exceed drinking water aesthetic objectives for TDS and chloride – 11 km downstream.



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- LEGEND**
- TEMPERATURE LOGGER LOCATION (SHALLOW)
 - TEMPERATURE LOGGER LOCATION (DEEP)
 - METEOROLOGICAL LAKE SAMPLING STATION
 - METEOROLOGICAL HILL SAMPLING STATION
 - SNAP LAKE MINE FOOTPRINT
 - WATERBODY

REFERENCE

DIGITAL MAP FROM MACKAY LAKE, NORTHWEST TERRITORIES, PRODUCED BY DEPARTMENT OF ENERGY, MINES AND RESOURCES. MAP 73M, ORIGINAL SCALE 1:250,000, NAD 83 UTM ZONE 12.

SNAP LAKE OUTLINE AND ISLANDS WERE CORRECTED TO LANDSAT 7 SATELLITE IMAGE 45/15, DATED SEPTEMBER 2, 2000. PROVIDED BY GEOBASE.

NOTES

1. MAP MOVED TO NAD83 COORDINATE SYSTEM.



PROJECT	DE BEERS <small>BAKOP DE GEMMENS</small>		
TITLE	TEMPERATURE LOGGER LOCATIONS, 2012		
PROJECT	13.1349.0001.0100	FILE No.	13134900016000A02
DESIGN	DC	SCALE	AS SHOWN
CADD	JEF	SCALE	AS SHOWN
CHECK	LMB	SCALE	AS SHOWN
REVIEW	PMC	SCALE	AS SHOWN
		FIGURE 2-1	



Snap Lake Future Conditions

- De Beers has indicated that they will apply some form of mitigation to limit effluent TDS to 684 mg/L.
- The type of mitigation or when it will be implemented has not been provided.
- De Beers has declined to accept mitigation as an EA measure.
- Unmitigated effluent from the Snap Lake mine would represent a worst case scenario.



Snap Lake Future Conditions

Recommendations

- 2. The GNWT recommends that the Review Board consider an unmitigated, worst case scenario for the Snap Lake Mine as a significant deviation from the original impacts authorized in the Report of Environmental Assessment in 2003.*
- 3. The GNWT recommends that the Review Board include a measure requiring that De Beers conduct a robust study on the anticipated reduction time of hardness during the recovery of Snap Lake (post operation) and how this reduction will compare to metals and nutrients over time. Specific attention should be given to impacts that would result from the utilization of any hardness-adjusted SSWQOs.*
- 4. The GNWT recommends that the Review Board consider uncertainties related to varied concentration reductions over time for various hardness-adjusted parameters and that these uncertainties be taken into account when assessing significance of proposed increases in TDS and its constituents.*



Snap Lake Future Conditions

Recommendations

5. The GNWT recommends that the Review Board consider that an unmitigated, worst case scenario for the Snap Lake Mine has the potential to lead to a significant adverse impact on traditional uses of Snap Lake (i.e. fishing, drinking, etc.) and its downstream aquatic environment.

6. The GNWT recommends that the Review Board include a measure requiring De Beers to minimize the degree or extent of project related impacts to Snap Lake and the downstream aquatic environment.

7. The GNWT recommends that the Review Board include a measure requiring De Beers to take necessary steps during operation and closure to return Snap Lake to pre-mining conditions as soon as possible post-closure.



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Snap Lake SSWQO

- De Beers is proposing to increase TDS and chloride concentrations.
- Important to consider the constituents of TDS.
- Most natural saline lakes (not marine systems) are typically dominated by sulphate and carbonate, rarely by chloride.



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Snap Lake SSWQO

- Water with TDS less than 1000 mg/L generally considered freshwater, but there is a continuum:

“Salinity is a measure of the total salt composition of water, with freshwater lakes being dominated by the cations Ca^{2+} , Mg^{2+} , K^{+} and Na^{+} and the anions HCO_3^{-} , CO_3^{2-} , SO_4^{2-} and Cl^{-} (Wetzel 1983). Water is classified according to salinity. Freshwater lakes are those with less than 500 mg/L salinity” (CCME 2011).



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Snap Lake SSWQO

- The CCME provides guidance on deriving SSWQO.
- Type A – uses a Species Sensitivity Distribution when there are adequate primary and secondary toxicity data to satisfactorily fit a SSD curve.
- Type B – inadequate or insufficient toxicity data for the SSD approach, but for which enough toxicity data from a minimum number of primary and/or secondary studies are available.



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Snap Lake SSWQO

- GNWT has concerns with the protocols used by DeBeers:
 - Use of requisite test species;
 - Use of appropriate safety factors;
 - Use of anthropogenically altered toxicity modifying factors.
- Strictly following CCME protocols would likely lead to lower SSWQO.



Snap Lake Traditional Use

- Traditional use of the area must be considered and preserved.
- The Lockhart system, particularly the Lady of the Falls, has high cultural significance.
- Impacts to the Lady of the Falls would be considered a significantly adverse cultural impact.
- Traditional use of Snap Lake and the immediate downstream waters should also be preserved.



Snap Lake Traditional Use

Recommendations

8. The GNWT recommends that the Review Board include a measure to require De Beers to prevent measurable changes to water quality at the Lady of the Falls.

9. The GNWT recommends that the Review Board include a measure to require De Beers to ensure protection of the traditional use of water in Snap Lake and downstream.



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Closing

- The magnitude of adverse impact under an unmitigated scenario would likely be significant based on the anticipated concentrations of TDS and its constituents within Snap Lake and in the downstream aquatic environment.
- The loss of traditional use in the area (fishing, use as drinking water, etc.) under worst case conditions should be considered as a potential significant adverse cultural impact.



Closing

- The increasing levels of TDS in Snap Lake have been an acknowledged problem for some time:
 - The current Water Licence (2011) included interim EQC, which were set to be reduced in 2015.

Recommendation:

10. The GNWT recommends that the Review Board include a measure requiring De Beers to implement, no later than 18 months following the issuance of the water licence, mitigation sufficient to protect the aquatic environment and maintain traditional use of Snap Lake.



Closing

The GNWT would like to thank the MVEIRB for providing the opportunity to present its Technical Report and associated recommendations.