

DE BEERS
A DIAMOND IS FOREVER



11 February 2003

Mackenzie Valley Environmental Impact Review Board (MVEIRB)
Box 938, 5102 – 50th Avenue
Yellowknife, NT X1A 2N7

Attention: Glenda Fratton, Environmental Assessment Coordinator

Dear: Glenda

SUBJECT: Meeting Notes: Snap Lake Hydrogeology Outstanding Technical Issues

Please accept the attached meeting notes from a discussion of Snap Lake Hydrogeology Outstanding Technical Issues for submission to the Public Registry. This meeting was held on 29 January 2003 in response to issues raised during the MVEIRB Technical Sessions.

Should you have any questions, please feel free to contact the undersigned.

Sincerely,

SNAP LAKE DIAMOND PROJECT

Robin Johnstone
Senior Environmental Manager



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File:

MINUTES OF MEETING

TIME: 1:00 MST

DATE: 29 January 2003

LOCATION: Yellowknife Conference Call

SUBJECT: Snap Lake Hydrogeology Outstanding Technical Issues

ATTENDEES: Kenn Raven (INTERA for INAC), Gary Grove (EC), Sevn Bohnet (INAC), Robin Johnstone (DBCMI), Colleen English (DBCMI), Ken DeVos (Golder), Don Chorley (Golder), Mark Digel (Golder)


DISTRIBUTION: Attendees

ITEM	DESCRIPTION	ACTION
1.0	Why the shallow (maximum depth 168 m) water samples collected during the AEP should be considered representative of average connate water quality (e.g., 330 mg/L chloride) for the entire Mine, when they are only from the upper half of the proposed mine, are likely influenced by surface water inflow and drill water contamination, and when selected (and I would argue more representative) samples from 125 to 165 m depth show chloride of 500 to 600 mg/L.	<p>Explained that the values are sporadic around 330 mg/L, and that a depth dependant relationship is not evident from the data available.</p> <p>Variability will be assessed by re-running the re-running GoldSim model using a depth average concentration for chloride and TDS values for the mine, adding 60% (or some other number as Golder sees appropriate) for upwelling.</p> <p>Table showing how expected and adjusted average mine concentration is to be derived and provided to participants.</p>
2.0	How the North Lakes groundwater quality data supports the selection of connate water chemistry used in the EA when it shows much higher chloride and TDS concentrations than assumed in the EA. The North Lakes groundwater data from wells MW02-05 (380 mg/L from 110 to 130 m depth) and MW02-03 (610 mg/L from 190 to 215 m depth) support the conclusion that the connate groundwater will have much higher chloride and TDS levels than 330 mg/L.	See Item 1.0 above.
3.0	Why the North Lakes groundwater quality data (see De Beers Response to INAC Concern in Day 2 Morning Session) is OK if it falls within one standard deviation of data observed in the granite AEP boreholes. Also (same Response), how the North Lakes data can be inferred to show TDS increases due to groundwater flow path evolution when depth of sample is a more obvious explanation.	Explained that this data was only used in the context of flow to the North Lakes. RESOLVED

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ITEM	DESCRIPTION	ACTION
4.0	Please explain what the actual TDS concentration increases due to up-welling of Diavik profile groundwater was from the FEFLOW modeling. A relative increase of 60% over the life of the Mine is stated in the IR Response, but actual TDS values are not given. How applicable and useful are these calculations to estimating connate water inflow quality to the Mine due to upwelling, when they do not assess inflow quantity? How were the results of the FEFLOW and MINEDW modeling linked?	The TDS profile was entered into a 2-D cross-section and the estimated increase in TDS due to upwelling was modelled. Due to permeability and upwelling, an increase of 60% is the maximum over a 21 year period, for connate water only. RESOLVED
5.0	Please explain the De Beers Response to Dogrib Concern over mine inflow chemistry variations (Day 2 Morning Session). What does "for chloride we varied pumping time" mean with respect to lake water values?	Clarified. RESOLVED
6.0	Do De Beers models used to simulate the discharge of Mine water through the diffuser allow for density driven flow or separation? If TDS values approach 2000 mg/L, will this increased salinity create incomplete mixing and thus settling of water to the bottom of the Lake, particularly under ice conditions? Has De Beers considered the potential recycling of such higher TDS water and its effects on long-term mine water discharge (i.e., average mine water discharge would evolve toward average connate water quality and not an average mixture of connate and lake water).	The Cormix model does account for density driven flow, while the RMA (hydrodynamic model) does not. Did not assume any more mixing than that provided by the diffuser. RESOLVED (Kenn Raven). Compare concentrations in Table 9.2-14 with those (not published) in the effective lake volume (Gary Grove). Ken DeVos and/or Mark Digel to follow-up on this.
7.0	Is there a near linear relationship between average connate water chloride levels, the Effective Mixing Lake Volume and concentrations in the Effective Lake Volume of Snap Lake calculated by GoldSim? Will doubling connate water concentration or halving the mixing volume, approximately double the Lake concentration?	Not a doubling effect. Using a simple mass balance, a doubling of connate concentration would result in an increase of approximately 45% in long-term, steady state concentrations - not a 1:1 ratio. However, note that there is some non-linearity associated with the recirculation loop between the mine and the lake, and in the lake mixing zone in the short-term. RESOLVED
8.0	Is reverse osmosis or other treatment methods for removal of chloride and other major ions feasible or practical for the Snap Lake project?	To be addressed in a memo submitted to the Public Registry on Friday, February 7, 2003. RESOLVED


 APPROVED BY:
 Robin Johnstone
 Senior Environmental Manager