SNAP LAKE DIAMOND PROJECT De Beers	**TECHNICAL MEMORANDUM** **Date:** 1 May 2003
Submitted to: Yellowknives Dene First Nation	
Submitted by: De Beers Canada Mining Inc.	
Subject: Response to Questions Submitted to the MVEIRB for the Snap Lake Diamond Project Public Hearings	

De Beers Canada Mining Inc. would like to submit the following information in response to the questions raised by the Yellowknives Dene First Nation during the MVEIRB Public Hearing on 1 May 2003, as well as in their written submission to the Review Board titled, "Concerns Relating to the Proposed Snap Lake Diamond Project". Please note that De Beers has only responded to specific questions stated in this same document. However, should the Yellowknives Dene wish to submit specific questions in relation to their concerns, statements or recommendations, De Beers would be happy to provide a response. De Beers would respectfully request that this memorandum be added to the Public Registry for the Snap Lake Diamond Project.

A. AQUATICS

1. Localized Eutrophication

i) Is there a possibility that nutrient loading into Snap Lake could cause local blooms of cyanobacteria in small bays or arms of the lake?

We do not predict that nutrient additions to Snap Lake will cause local blooms of cyanobacteria (blue-green algae) that would result in cyanotoxin impacts to the lake. There are several reasons for this prediction based on the nature of lakes where these types of blooms do occur and the lake conditions necessary for these occurrences.

- Lakes that experience large blue-green algal blooms are generally highly productive, so on the scale we presented in our talk and technical memoranda, they would be upper mesotrophic to hypereutrophic (moderately high to very high production). For example the work done by the University of Alberta* on cyanobacteria was completed on lakes with chlorophyll a ranges of 11 µg/L to 32 µg/L. In Snap Lake, the chlorophyll a will be at 2.3 µg/L (oligo-mesotrophic). Consequently the chlorophyll a levels are below that for which a blue-green algal bloom would be expected.

Also, the phosphorus concentrations evaluated in the Environmental Assessment are the maximum concentrations that would occur anywhere in Snap Lake, in fact nutrient levels are predicted to be less in the north arm.

(*E.E. Prepas, B. Pinel-Alloul, D. Planas, G. Methot, S. Paquet, and S. Reedyk. 2001. Forest harvest impacts on water quality and aquatic biota on the Boreal Plain: introduction to the TROLS lake program. Canadian Journal of Fisheries and Aquatic Sciences 58:421-436).

- Lakes where large blue-green algal blooms occur in the summer have water temperatures above 20 °C and generally stratify, or develop temperature layers with warm water on top that doesn't mix with lower colder water. This stratification does not occur in Snap Lake and the summer lake water temperatures are generally <15 °C.

- Lakes where blue-green algal blooms occur are often found to have low Total Nitrogen to Total Phosphorus (TN:TP) ratios. For example the lakes in the University of Alberta studies had TN:TP rations of between 14:1 and 52:1. This means that nitrogen and phosphorus both limit the types of algae that grow (that is, either nitrogen or phosphorus can be in short supply, but not both). Blue-green algae can grow faster than other algae under these conditions because they can take nitrogen out of the air, as well as the water. Nitrogen from the air is not available to other algae so large numbers of blue-greens can grow quickly and out-compete the other types. In Snap Lake the TN:TP ratio will be 1000:1. This means that there is plenty of nitrogen so the blue-green algae will have no advantage over the other algae and phosphorus will limit the entire algal community.

- Other conditions that are strongly linked to blue-green algal blooms are the types of conditions found in the southern prairies lakes. For example, summer periods with low wind and low light conditions over several days, in lakes with high pH (greater than 7 and up to 9). These conditions do not and will not exist in Snap Lake.

ii) **If so, what effect would cyanobacterial blooms have on aquatic life, birds and mammals that could live in, swim through, or drink from the affected area?**

The conditions that produce these blooms will not exist in Snap Lake. Therefore there will be no release of cyanotoxins that would affect aquatic life, birds and mammals.

2. Total Dissolved Solids

i) **De Beers seems to believe that the lake community function will be the same post-development as pre-development. But what will the communities of Snap Lake look like?**

De Beers predicts that Snap Lake will look similar to pre-development following post-development since no loss of species will occur during operations. Effects during operations will be restricted to changes in the relative abundance of some species. As TDS levels gradually return to baseline conditions after mining is complete, the relative abundance of species is also expected to be similar to baseline conditions. The reduction will be gradual, and fish will be capable of adapting to these changes back to baseline conditions.

ii) **If they (phyto- and zoo-plankton communities) die off, will there be any remnant of the original dominant species to fill the void?**

At maximum predicted TDS levels, there will be no loss of species during operations. There will be no die-off. The TDS concentrations will not be high enough to cause death; in fact, they will not be high enough to cause changes in growth or reproduction. Only a small shift in relative abundance is expected. The community will slowly return to a state similar to baseline once TDS levels return to baseline levels.

iii) **If predictions prove inaccurate with respect to a decrease in TDS after mine closure and fish continue to live in high TDS waters, Yellowknives Dene would like to know if the taste of these fish will change?**

The higher TDS levels predicted in Snap Lake are not expected to affect the taste of fish. Other fish bearing lakes with similar TDS levels as expected in Snap Lake support fishing by people for food, without any reports of problems with the taste of the fish.

After mining is complete, the discharge of treated water from the mine will cease and TDS concentrations in Snap Lake will gradually return to baseline concentrations. It is not possible for TDS concentrations to remain high after mine closure.

3. Dissolved Oxygen

i) **As stated in our Technical Report, the total area of Snap Lake that may become anoxic (as defined by a dip below the CCME guideline level of 5.5 mg/L for oxygen concentration) due to nutrient**

enrichment has not yet been determined. The company has presented the detailed winter baseline DO data in Snap Lake. But there is no quantitative evaluation of the drop in DO during mine development and operations, and where in the lake we can expect this decrease to occur. Golder Associates does, however, refer to the benthos likely being subjected to a drop in DO of 1 to 2.2 mg/L.

If we apply the high (and thus most conservative) end of the above-noted range of potential DO decreases, to baseline conditions in the whole of Snap Lake, we find that a 2.2 mg/L decrease in DO would result in 5 additional sites in the lake experiencing oxygen levels below the CCME guideline. What this ultimately means for winter survival of lake benthos and fish should be analyzed. Five stations of 50 would suggest a 10% reduction in the area with DO below the threshold level during operations. Please explain. ***(this is paraphrased from the presentation, it was not part of the written text).***

The winter dissolved oxygen sampling completed in February 2003 included 50 sampling locations. The focus of the sampling program was on deeper water areas where the potential for effects was considered more likely to occur. Therefore, the sampling was biased to deeper areas and not all depth intervals were equally represented (i.e., majority of the sampling locations were greater than 8-m deep). We used the bathymetry (depth) information for Snap Lake along with the data from this winter's dissolved oxygen monitoring to calculate the correct proportion of Snap Lake that could be affected.

An illustration of why a simple percentage of monitoring sites overestimates effects in Snap Lake is provided in the following example. Of the 50 locations sampled, 6% (or 3 samples) were from depths of less than 4 m. However, looking at the bathymetry map of Snap Lake we see that 37% of Snap Lake is at a depth of less than 4 m. Because dissolved oxygen will remain above thresholds at these shallower depths, a simple calculation of the percentage of sampling locations affected, will overestimate the actual percentages of area or volume in Snap Lake.

The February 2003 DO sampling program demonstrated that DO is low in the deep water areas of Snap Lake under natural conditions. As the winter progresses, the DO in these deep water areas will continue to drop. As a result, we expect that most of the areas sampled, including the five sites mentioned, will have DO levels below the CCME guideline by the end of the winter under natural conditions. Although the DO loss due to the project may lower these values further, this will not affect the ability of

aquatic organisms to survive the winter since these habitats would have been unavailable to them with or without influence from the project (i.e., they are adapted to dealing with this natural cycle in deep water DO levels).

4. Acidification

i) **There are discrepancies in the EA Report's discussion of air-borne acid deposition onto Snap Lake. The EA Report states (p. 9-252) that Potential Acid Inputs (PAI) are predicted to be 0.084 keq/ha/yr. But their PAI contour map (Fig. 9.4-19) shows the entire lake to be within 0.11-0.13, which is at Snap Lake's threshold (0.125) for absorbing this acid deposition without harmful effects.**

De Beers should explain this discrepancy, since the map would indicate that the impact rating should be higher than indicated (i.e., a more likely possibility of a greater impact to the lake).

The discrepancy is that the data presented in Figure 9.4-19 mistakenly used an incorrect background value of Potential Acid Input (PAI) of 0.1 keq/ha/year. The correct background PAI of 0.04 keq/ha/year was used in the assessment of impacts to surface waters and the correct PAI values are presented in the Water Quality Section in Table 9.4-31, as well as in the Air Quality Section of the Environmental Assessment Report.

WILDLIFE

1. Upland Birds

i) **A question as to the adequacy of the determination of impacts on birds.**

The impact assessment did consider the potential disturbance from noise and/or vehicle traffic on nesting birds by assuming that no nesting was occurring within the immediate mine footprint. We assumed that impacts would occur within 1-2 kilometers, and the impact assessment on breeding bird populations was based on this assumption.

CUMULATIVE EFFECTS

1. Winter Road

i) A question that can be asked is whether a strong enough pressure wave can damage a beaver lodge or muskrat push-up that is within the impact zone of the wave? Also, are there sub-ice noises caused by trucks and/or maintenance equipment that could disturb nearby beaver colonies?

To De Beers knowledge, there is no information available on the effects of sub-ice noises on either beaver or muskrat habitat.

SOCIO-ECONOMIC

i) Will the lands and wildlife in our area be able to withstand the added pressures of increased snowmobile traffic on existing trails, or the creation of new ones? Will there be increased hunting pressures from numerous additional hunter on our lands? Whether an increase in our local human populations will put new pressures on our land's renewable resources and wildlife?

De Beers anticipates that the development of the Snap Lake Diamond Mine will have a positive economic impact on Yellowknife and the surrounding communities. Associated with this is the potential for an increase in the local human population. Changes to harvesting levels, increased use of existing trails, creation of new trails and pressures on renewable resources and wildlife that may result from this increase should be managed by the responsible government agencies.

ii) Whether Aboriginal communities have the ability and infrastructure needed to absorb an influx of new residents?

It is not possible to predict the number of people who might seek to move into one of the primary aboriginal communities. Of the 150 households that De Beers has estimated will move to the Northwest Territories:

- about 70% (105) are estimated to locate in Yellowknife,
- about 20% (30) will locate in Hay River and other medium-sized communities, and
- about 10% (15) remain who may locate in the primary Aboriginal communities.

It is likely that those locating in the primary Aboriginal communities will be returning community members or individuals with close community ties.

Each community will have different levels of infrastructure and services that may be needed to service any people who chose to move to these communities.