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Revised
April 30, 2003

Department of Fisheries and Ocean (DFO)

Public Hearing Presentation
on the Proposed
Snap Lake Diamond Project

Overview of DFO's Technical Review

- Participated in the Technical Review of the proposed project since March 2002
- Presentation at Technical Hearings – November-December 2002
- Technical Report February 14, 2003
- Addendum Technical Report March 14, 2003

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DFO's Approach to its Technical Review

- Understanding the story:
 - what are the components of the project;
 - what are the predicted impacts related to the various components;
 - what are the mitigation measures proposed or available to deal with these impacts; and
 - what is the magnitude and extent of the residual or unmitigated impacts

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DFO's Approach to its Technical Review

- Providing Recommendations to De Beers and MVEIRB to lessen the residual impacts
- Make a final determination on the acceptability of those predicted residual impacts from the perspective of DFO's mandate.

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Resolved Issues

The following issues are considered resolved provided that monitoring, mitigation and/or commitments form part of the EA decision.

- ✓ Identification of Fish Habitat Areas in effluent zone of influence
 - ✓ All species considered in assessment, neg. impacts to habitat
- ✓ Bioaccumulation of Metals
 - ✓ DFO calculated values in liver of round whitefish and lake trout are at or below no-effect levels and the US EPA risk-based concentration
 - ✓ Potential for bioaccumulation by fish needs to be monitored
- ✓ Nutrient Additions and Effects (including DO)
 - ✓ Predicted DO decline may be within natural DO range observed for Snap Lake
 - ✓ DeBeers has committed to monitor DO and benthic invertebrates and apply adaptive management approaches
- ✓ Increased Metals from Waste Rock Seepage
 - ✓ Seepage collection system improved

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Remaining Unresolved Issues

- Fish Habitat Assessment
- Adequacy of Baseline Aquatic Data
- Total Dissolved Solids (TDS) Plume & Impacts to Fish and Fish Habitat
- Metals Discharge From Mine Effluent and Effects on the Aquatic Community

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Fish Habitat Assessment

- DFO id'd a lack of data on inland water bodies used to support habitat assessments
- De Beers provided Feb. 2003 report that clarified issues related to fish habitat data and No Net Loss Accounting
- The Report clarified almost all issues
- De Beers concludes 0.00002 habitat units (HU) will be impacted and need to be compensated for
- DFO concludes 6HU at a 2:1, gains to losses will need to be compensated for
 - $HU = \text{quantity (m}^2) \times \text{quality (HSI)}$
- Difference due to De Beers applying a time factor to impacted habitat – unacceptable approach

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Adequacy of Baseline Aquatic Data

- De Beers does not have baseline data for benthic inverts beyond 8m depth in Snap Lake
- Predicting negligible impacts to benthic species
- Confidence in prediction is low as real data not available & professional judgment used to make predictions
- To verify predictions, pre-project data are required to measure against project conditions
- Recommend that baseline data be collected before project begins to impact Snap Lake
- De Beers acknowledges lack of specific data, commit to collecting samples before operations begin

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Total Dissolved Solids (TDS) Plume & Impacts to Fish & Fish Habitat

- Baseline TDS concentration of 15 mg/L in Snap Lake
- Discharge concentration predicted at 929 mg/L
- Proposed multi-port diffuser to induce rapid mixing to reduce local impacts
- Predicted TDS increase at year 19 to maximum of 350 mg/L in Snap Lake under ice, and maximum of 444 mg/L in 1% of Snap Lake during summer
- Predicted that effluent will accumulate in deep areas of lake due to increased density and lack of mixing under ice
 - Concern that meromictic conditions will persist in summer
- Primary toxicological concern of elevated TDS is an increase in osmotic stress on aquatic biota
- Concern with TDS loading estimates
 - discrepancy with predicted concentrations need to be resolved

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Total Dissolved Solids (TDS) Plume & Impacts to Fish & Fish Habitat

Zooplankton

- No water quality criteria for TDS therefore effects were evaluated by the exceedance of toxicity thresholds for individual ions
- The ions of concern in the mine effluent initially stated as chloride and calcium
 - EAR (p. 9-322) states that potential Ca concentrations may exceed chronic effects levels for cladocerans in up to 10% of Snap Lake in winter
 - Tech Memo (TDS) calcium dismissed as being toxicological constituent
- Chloride predicted to increase to 177 mg/L (1% of lake) and 137 mg/L (whole lake) vs. EPA and Quebec criterion of 372 mg/L and 230 mg/L therefore no effects predicted by De Beers
 - if concentrations underestimated, could be above criterion

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Total Dissolved Solids (TDS) Plume & Impacts to Fish & Fish Habitat

Benthic Inverts

- Benthic invertebrates will be exposed to higher concentrations of TDS in winter, unable to "migrate" away from area to avoid higher salinity
- Comparisons with literature cited in Technical Memorandum "Potential Effects of Increased Total Dissolved Solids" reported species decline in North Saskatchewan lake
 - referenced no decline in California river – not comparable to arctic lake systems
- De Beers expects shift in relative species abundance only, as noted in April 23, 2003 letter
- No data on benthic community at greater than 8m depth in Snap Lake – community composition is assumed
- Reference effective concentrations of >1000mg/L in EAR
 - If concentrations underestimated, could be above this effect level
- Reference in TDS Tech Memo to various chironomid TDS optima for riverine species – may not be comparable to arctic lake systems

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Total Dissolved Solids (TDS) Plume & Impacts to Fish & Fish Habitat

Fish

- Aquatic biota and especially lake trout have adapted to low salinity conditions of Snap Lake for thousands of years.
- Lake trout exhibit the most sensitivity to ion concentrations in water compared to whitefish species that can tolerate brackish water
 - Ontario Ministry of Natural Resources report cites a preference for <50 mg/L TDS for lake trout
- Lake trout typically not found in high saline waters (few exceptions)
- TDS levels in Snap Lake approaching 350 mg/L may not have a direct lethal impact on adult fish due to acclimation over 20 year period
- However, unknown impacts on reproductive success and larval fish
- Possible community shift due to competitive advantage of less sensitive fish species i.e. whitefish
- Must also consider level of impact if TDS concentrations are underestimated

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Water Quality Effects of Effluent Discharge

- Ammonia, Cl, Cd, Cu, Hg, Mo, Ni, Pb, Se exceed CCME guidelines at end of pipe (Table 9.4-18).
- Cd, Cu, ammonia, Cr⁶⁺ exceed CCME guidelines in 1% of Snap Lake.
- Site specific benchmarks derived for Cd, Cu, Cr⁶⁺ (Appendix 9.4-20).
- Cd and Cu not carried forward for impact assessment < HC5 benchmark
- Cr carried forward for assessment as Cr⁶⁺
- Cd, Cu, Ammonia not assessed further for impacts on aquatic biota
 - Benchmarks less conservative than CCME, lower safety factor
 - Conservative approach may be more appropriate for sensitive northern lakes
 - Benchmark approach should be reviewed more closely before being accepted as alternative to CCME
- The Whole Effluent was predicted in EAR to be chronically toxic in up to 10% of Snap Lake
 - Impact classified as low but not carried forward in assessment because no "acute" toxicity anticipated
 - Underestimates importance of chronic effects

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Water Quality Effects of Effluent Discharge

- DFO identified inconsistencies in forms and concentrations of chromium reported in Sections 9.4 and 9.5 of the EAR
 - difficulties in interpreting the effects from chromium.
- Still unclear as to forms, fate and thresholds for treatment
- Total chromium in effluent is 7.5 ug/L.
- Following mixing and dispersion the concentrations are reduced to 2.5 ug/L within 230 m of the diffuser.
- HC5 value not achieved until beyond 1% and up to 3% of Snap Lake
- 2.5 ug/L value reported < than the chronic effect value for 3 most sensitive invert species, effects therefore rated as negligible.
- Concerns with derivation of benchmarks and their use rather than CCME for impact assessment
- De Beers concludes impacts in 1-3% of Snap Lake + impacts to 5% of aquatic community deemed acceptable
 - Questionable approach in sensitive arctic environment

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