

**Environment Canada's Intervention on the Tahera Diamond Corp.
Jericho Diamond Mine Water Licence Application**

Nov. 30, 2004

INTRODUCTION

Environment Canada is a science-based Department whose business is to help Canadians live and prosper in an environment that needs to be conserved and protected. Contributing to making sustainable development a reality in Canada's North is a priority for Environment Canada. The Department focuses on provision of scientific expertise for incorporation into decisions on developments, such that all parties working together can ensure that there is minimal impact on the natural environment, and that ecosystem integrity is maintained and preserved for future generations.

MANDATE, ROLE AND RESPONSIBILITIES OF ENVIRONMENT CANADA

The mandate of Environment Canada is determined by the statutes, regulations, guidelines, policies, federal, territorial, and international agreements, and related programs that it is assigned by Parliament to administer. The overall objective is to foster harmony between society and the environment for the economic, social and cultural benefit of present and future generations of Canadians. The Department shares this goal with other federal agencies, provinces, territories and First Nations.

The Department of the Environment Act provides Environment Canada with general responsibility for environmental management and protection. Its obligations extend to and include all matters over which Parliament has jurisdiction, not by law assigned to any other department, board, or agency of the Government of Canada as related to preservation and enhancement of the quality of the natural environment (e.g. water, air, soil); renewable resources including migratory birds and other non-domestic flora and fauna; water; meteorology; coordination of policies and programs respecting preservation and enhancement of the quality of the natural environment; development of standards and guidelines; promotion of sound environmental practices and providing advice to federal government agencies. In delivering on these obligations Environment Canada has responsibility for specific legislation; regulations; policies and agreements.

Of particular concern and interest for the current project are the responsibilities conferred on the Department by legislation such as the:

- *Canadian Environmental Protection Act*
- *Fisheries Act* (Sections 36-42)
- *Canada Water Act*
- *Migratory Birds Convention Act* and Regulations
- *Canada Wildlife Act*
- *Species at Risk Act*

Relevant National policies and international agreements include the Toxic Substances Management Policy, National Pollution Prevention Strategy, UN Convention on Biological Diversity, National Biodiversity Strategy, Arctic Environmental Protection Strategy, Montreal Protocol on Ozone depleting Substances and the National Action Program on Climate Change.

SUMMARY OF REVIEW

Environment Canada's (EC) review has considered the following documents: Final Environmental Impact Statement (FEIS) for the Jericho Diamond Project (including Appendices A-E) dated January 2003; Supplemental Information to the FEIS dated Oct. 2003; and the Water Permit Submission dated Aug. 2004 (including Appendices A-HH).

Concerns identified in EC's technical submission for the Environmental Assessment have been addressed to some extent by information and undertakings provided by the Tahera Diamond Corp. Ltd. (TDC). This intervention will highlight areas which warrant further attention, and provide recommendations for consideration in the development of water licence conditions.

REGULATORY COMMENTS & RECOMMENDATIONS

Monitoring of aquatic effects

TDC has submitted an Aquatic Effects Monitoring Program (Appendix N) which outlines the media to be sampled, sampling locations, and frequency. In response to concerns raised in the Environmental Assessment, TDC has collected supplemental baseline data for aquatic biota and sediments, and this should be available in early 2005. Additional sampling will be done in 2005, including winter dissolved oxygen data collection. In general, EC finds that the aquatic effects program should be comprehensive enough to detect changes in the environment, but has some concerns with how the data are to be evaluated. To ensure that the proponent has collected the appropriate data (and not violated any test assumptions) it is important to identify what statistical tests are going to be used early in the study design. Statistical tests will be used to identify whether a significant difference is occurring in a parameter, and test power should be set appropriately. Tahera must determine how effects on sediments, benthic invertebrates, zooplankton and phytoplankton should best be monitored and what statistical design will achieve good detection of potential impacts. A rigorous, statistically defensible monitoring program will ensure predictions made prior to mine development are correct, and detect any effects that were not anticipated.

Environment Canada recommends that ammonia levels within the Long Lake Containment Facility (LLCF) and the downstream receiving environment be carefully monitored, and that TDC be prepared to implement an effective contingency plan should levels show trends which could be harmful to aquatic

ecosystems. Target thresholds should be identified which would trigger appropriate action.

Monitoring of water chemistry should be done often enough to identify seasonal and long-term changes in major ion, nutrient, and metal concentrations. Although LLCF discharge will be done on a seasonal basis during summer, it will be prudent to include monitoring of under ice chemistry to track potential changes in concentrations which may be associated with cryoconcentration or internal recycling processes. In addition, in summer there may be effects of seasonal density stratification within lakes which alter the mixing regime and could affect the effluent mixing according to predictions. The AEMP submitted proposes to take single samples of surface waters within lakes; this should be validated as being a representative sample by first using a field meter to obtain a conductivity and temperature profile.

EC recommends that the water licence include a requirement for submission of an aquatic effects monitoring plan (AEMP) for review and approval. The plan should include an evaluation of baseline data, and set out exactly what tests will be used to identify and evaluate changes in the environment.

Thresholds should be established for changes in the environment which will trigger adaptive management actions.

Discharge criteria

TDC has proposed end-of-pipe discharge criteria for various parameters of concern. The approach used to derive the suggested criteria values is generally appropriate, and focuses on maintaining receiving water quality by meeting a combination of site-specific objectives and/or national water quality guidelines. Reasonably conservative mixing predictions are used, and it is predicted that there should be no chronic effects beyond 200 m of the point where Stream C3 enters Lake C3. Discharge criteria were back-calculated to achieve levels needed to maintain water quality objectives beyond the mixing zone, or were suggested based on limits set for other diamond mines in the north.

EC generally concurs with this approach, with the following specific differences and/or recommendations:

For the LLCF, parameters to be regulated should include pH, suspended solids (TSS), ammonia ($\text{NH}_3\text{-N}$), nitrate ($\text{NO}_3\text{-N}$), nitrite ($\text{NO}_2\text{-N}$), phosphorus (P), total petroleum hydrocarbons (TPH), BOD_5 , faecal coliforms (FC), and the following total metals: aluminum, arsenic, cadmium, chromium, copper, lead, molybdenum, nickel, and zinc.

Testing frequencies should be set with a lower frequency for the parameters associated with the sewage (BOD_5 and FC).

With respect to limits, EC recommends the following changes be made to the criteria suggested in Table 4.2:

Parameter (mg/L except pH)	Proposed by TDC		Recommended by EC	
	Grab	MAC	Grab	MAC
pH ¹	6-9	6-9	6-8.5	6-8.5
Total Dissolved Solids	4000	2000	*	*
Total Suspended Solids ²	25	15	25	15
Chloride	1000	500	*	*
Ammonia-N	12	6	12	6
Nitrate-N	56	28	56	28
Nitrite-N ³	5	2.5	2	1
Total Phosphorus	0.4	0.2	0.4	0.2
Total Aluminum ⁴	3.0	1.5	2.0	1.0
Total Arsenic	0.1	0.05	0.1	0.05
Total Cadmium	0.0024	0.0012	0.0024	0.0012
Total Chromium ⁵	0.17	0.087	0.1	0.05
Total Copper	0.04	0.02	0.04	0.02
Total Lead	0.02	0.01	0.02	0.01
Total Molybdenum	1.5	0.73	1.5	0.73
Total Nickel	0.5	0.25	0.5	0.25
Total Uranium	1.0	0.5	*	*
Total Zinc	0.50	0.25	0.50	0.25
Total Petroleum Hydrocarbons	-	-		3
BOD ₅	-	-		30
Faecal Coliforms (CFU/dL)	-	-		100

MAC = Maximum Average Concentration

*Monitor rather than regulate.

¹ High pH is a factor in the potential toxicity associated with kimberlites, and aluminum is also more soluble at higher pH values. Ammonia toxicity is greatest at high pH values as well. Note that Diavik is regulated to an upper pH limit of 8.4.

² TDC has requested limits of 100 mg/L (grab) and 50 mg/L (MAC) for surface runoff and LLCF discharges during construction. EC concurs with this limit for surface runoff, as it will involve limited volumes, and much of the sediments will remain on the land, and/or be mitigated by the use of silt curtains. **EC does not agree that it should apply to discharges from the LLCF as there is the potential for large volumes of silty water to be discharged to Stream C3.**

³ Receiving water quality objectives were overstated by using different measures of nitrite when comparing guidelines to literature effects values. Specifically, the receiving water quality objective for nitrite should be corrected to 0.075 from 0.25 mg N/L.

⁴ For aluminum, there is a period during freshet where aluminum levels are predicted to exceed receiving water objectives, but this is rationalized by stating that most of the aluminum will be in the insoluble form. EC disagrees with this, as the acidic pulse associated with snow melt will mobilize aluminum into solution in more soluble forms.

⁵ The chromium receiving water quality objective was based on the CCME guideline for trivalent chromium of 0.0089 mg/L. The other form of chromium which may be found in the effluent is hexavalent chromium, and the guideline for this is 0.001 mg/L. Accordingly, the objective should have been adjusted downwards to account for both forms.

EC recommends that a full suite of parameters be monitored under the SNP, including the metals listed in an ICP scan, major ions, nutrients, and physical parameters.

Use of toxicity testing

TDC has proposed the use of the Microtox bioassay test as a screening tool for monitoring effluent quality. Testing would be done monthly, and failures would trigger further testing using *Daphnia magna*. If the *Daphnia* test failed, TDC proposed to assess mixing zone volumes and evaluate effluent chemistry, doing a TIE if necessary, and assessing chronic toxicity in the mixing zone.

EC feels this is a good start to approaching toxicity testing, but that several key points have been omitted.

- Firstly, **effluent discharge must cease** if the effluent is shown to be acutely toxic by **any** of the standard bioassay tests (including the Microtox test).
- Secondly, the Microtox test is well established as a screening tool for many types of effluent, but it is known to give a false negative for effluents containing nitrogen compounds. This is known as hormesis, and occurs when the test bacteria use ammonia or other nitrogen forms as a nutrient, and show a stimulated response in effluents that would be toxic to fish or water fleas. For this reason, **the Microtox test on this effluent would need to be calibrated to *Daphnia* and/or rainbow trout test results to validate the response.**

EC recommends that acute toxicity testing be done on the end-of-pipe effluent twice a year, at startup of discharge, and just before freeze-up, using the rainbow trout and *Daphnia* tests. Chronic testing should be done at least once annually on samples taken at the edge of the mixing zone, just before freeze-up, using the *Ceriodaphnia dubia* test at a minimum, and preferably also a fish test.

Plans

Environment Canada recommends that annual reporting include updates to the site water balance, particularly as this pertains to the operation of the LLCF. The Site Water Management plan (Appendix X) sets out monitoring requirements for flows and quality, and these results should be included in an annual update of this plan.

Seep surveys are mentioned in the Waste Rock Management Plan (Appendix T0 and the site Water Management Plan (Appendix X). A more detailed plan for conducting seepage surveys should be submitted for review and approval, with annual reporting of results.

EC recommends that TDC submit a dewatering plan for Long Lake. Currently the plan is to "substantially dewater" Long Lake (p. 41 Appendix W), presumably during the summer. This may not be feasible due to lakebed disturbance causing increases in suspended solids, and an alternative approach for dewatering may be needed. In addition, TDC plans to release water June-Sept. 2006 during the internal dyke construction. Again, contingency plans should be in place in the event that suspended solids or other water quality parameters preclude discharge.

The Abandonment and Reclamation plan should be updated annually after production starts, and submitted for approval. The first submission should include identification of research needs to inform reclamation planning. One example would be an evaluation of the site's coarse kimberlite for weathering and behaviour, to determine if it is a suitable cover material and identify appropriate cover depths.

Miscellaneous licence recommendations

There will be several new definitions needed for this project; EC recommends that the licence define the following terms: ARD to include alkaline drainage; the AEMP; ground ice; ICP metal scan; land farm; major ions; nutrients; physical parameters; and seepage.

The Annual Report for the Jericho Diamond Mine should include tabular summaries of the SNP data plus graphs of the data for all monitored parameters.

Summary

Environment Canada's concerns may be substantially addressed through the use of appropriate licence conditions and monitoring programs. Environment Canada appreciates the proponent's attention to issues we have raised, and we anticipate that this ongoing interaction with stakeholders will be carried forward into adaptive management processes that will lead to ongoing implementation of site-specific best practices