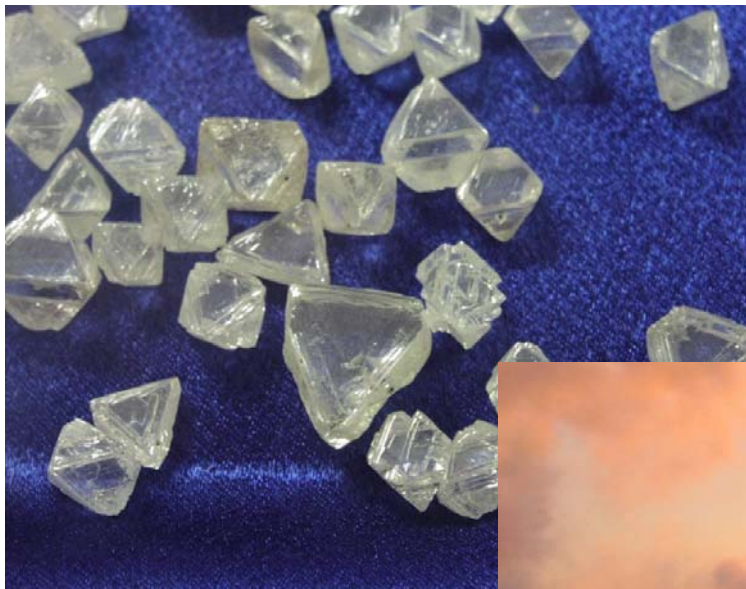




2003 Annual Environmental Agreement Report



June 2004



1. EXECUTIVE SUMMARY

As part of the Environmental Agreement, which is monitored by the Environmental Monitoring Advisory Board (EMAB), the primary purpose of this report is to provide summary information regarding Diavik Diamond Mines Inc.'s progress during 2003, plans for 2004, and how we are managing these activities in the context of the environment at the Lac de Gras site. This report is intended to meet the requirements of Article 12 of the Diavik Environmental Agreement (page vi).

Discussion with the EMAB determined information from the reporting calendar year is to be included in this report, and therefore, all reports submitted by Diavik to various regulators for the 2003 field season, are summarized and included, regardless of submission date.

The Environment

The mine site at Lac de Gras is about 100 km north of the treeline in the arctic tundra region of the Northwest Territories. The gently rolling tundra is made up of numerous lakes, bedrock outcrops and glacially deposited boulder fields, till and eskers. There is very little soil and the area is within the continuous permafrost zone.

Long, cold winters and short, cool summers are the norm. Mean monthly temperatures range from -31°C in January to 10°C in July. There is little rain or snowfall and the main annual precipitation is 266 mm. Average wind speeds are about 10 km/h, with many calm days.

Despite the harsh conditions and the rugged geography, the barren lands near the Diavik site supports many wildlife species. Eighty-four bird species and 16 mammal species have been confirmed as summer visitors or permanent residents in the area. Lac de Gras falls within the extensive range of the Bathurst caribou herd, part of which migrates through the area during spring and fall. Wolves following these caribou also den in the area during summer. The home ranges of an estimated 30 grizzly bears overlap in the Lac de Gras region. While the region sees many visitors, on the east island only a few species are permanent residents. These include red fox, arctic hare, arctic ground squirrels, red-backed voles, brown lemmings and rock ptarmigan.

At 60 km long, Lac de Gras is a large lake that drains into the Coppermine River. Typical of arctic lakes, aquatic productivity in Lac de Gras is low. This is the natural result of relatively low concentrations of nutrients, low light levels during the winter months, extended periods of ice cover and low water temperatures. Lake trout, cisco, round whitefish, Arctic grayling, burbot, longnose sucker and slimy sculpin are among the fish species found in Lac de Gras.

Inukshuk on the Northern Horizon



The Diavik Mine

The diamond deposits are found in four kimberlite pipes just off the shore of East Island in Lac de Gras. Large engineered water diversion dikes are being constructed to hold back the water of Lac de Gras, so that DDMI can safely mine the resource from the lakebed. The A154 dike was completed in 2002. DDMI is utilizing open pit mining methods initially, followed by underground mining to maximize resource extraction in two of the richest deposits. To accomplish the open pit mining, a fleet of trucks operates round the clock, hauling kimberlite to the processing plant, where a washing and sorting process separates the diamonds from the kimberlite.

To support mining, DDMI has constructed infrastructure on the island that includes permanent accommodation and administration facilities, a maintenance shop, a diesel power generation facility, fuel storage, airstrip, a water management system including water and sewage treatment plants and waste management facilities.

Adaptive Management

Diavik continues to work to ensure that environmental protection commitments made through the project development and assessment process are followed up. Work during 2003 focused on the development, review, and approval of several environmental management strategies for facilities operations as the project moves from construction. This allows the development of adaptive solutions to issues as they are encountered.

Monitoring Programs

Environmental monitoring programs have been developed and are continually being adapted to integrate the ongoing guidance and assistance of regulators, communities and the Environmental Monitoring Advisory Board. Diavik is improving our level of understanding with respect to how methodologies and techniques can be standardized between the Diavik project and other projects in the Lac de Gras area, and with any other monitoring work that may be underway by the Department of Resources, Wildlife and Economic Development (RWED).

Wildlife

The following documents the results of the 2003 Wildlife Monitoring Program for the Diavik Diamond Mine located at Lac de Gras, Northwest Territories. Wherever possible, comparisons to the information gathered during the previous monitoring years (2000 to 2002) and the pre-construction baseline (June 1995 to August 1997), have been included. This report presents data that was collected during 2003 in association with the revised 2002 Wildlife Monitoring Program.

While there are too few results to draw any firm effects conclusions, general observations and recommendations for possible improvements in the pro-



Grizzly Bear Monitoring at Site

gram are as follows:

- The direct vegetation/habitat loss in 2003 due to the mine footprint was 0.49 km², which is within the expected amount. Total lost to date from mining activities is 6.43 km².
- Direct summer habitat loss for caribou in 2003 from the mine footprint was 0.15 habitat units (HU's), which is within the expected amount.
- No mortalities to caribou due to the mine occurred during 2003.
- The levels of the caribou advisory monitoring remained at "no concern" (no caribou or fewer than 100 caribou) for 365 days during 2003.
- Direct terrestrial habitat loss for grizzly bear in 2003 from the mine footprint was within the expected amount at 0.42 km².
- Grizzly bears are still present in the Diavik Wildlife Study Area.
- No bear mortalities occurred in 2003.
- A bear was relocated from the East Island in June 2003.

Based on the findings of the 2003 wildlife monitoring program, recommendations for the 2004 Grizzly bear effects program are:

- DDMI will make a request for Resources, Wildlife and Economic Development's grizzly bear collar data to be provided in such a way that Diavik would be able to amalgamate bear observations within the wildlife study area with collar information. This data would also allow us to determine the frequency that collared bears are within 10 km of the mine site and outside 10 km of the mine site.
- Wolverines were present on the East Island in 2003.
- No mining related wolverine mortalities, injuries or relocations occurred during 2003.
- During 2003, one Peregrine Falcon nest was occupied but not productive.
- No project related Peregrine Falcon mortalities occurred during 2003.
- Waterfowl Habitat Loss in 2003 was within the expected range and equaled 0.02 km² of shallow and deep water.
- Waterfowl were present at the East Island Shallow Bays.
- Waterfowl are utilizing mine-altered wetlands.



Red Fox at Site.

Dust

In 2003 the dust gauge program was continued and dust gauges were deployed for the entire year. The dust gauges act as a repository for air born dust particles. Both the snow core and dust gauge monitoring are aimed at understanding dust deposition rates caused by project activities during the lifecycle of the mine. Results are compared with the predictions made in the Environmental Effects Report, Climate and Air Quality (DDMI, 1998). DDMI intends to conduct snow surveys on an annual basis in the spring, collect dust particles throughout the year and perform habitat assessment reviews every third summer, to monitor trends in total deposited particulates, snow water chemistry, summer dust deposition and habitat community vitality.

Similar to results from the 2002 monitoring program, the 2003 dust deposition program is consistent with the predictions in the environmental effects report, in that dust deposition rates will be higher adjacent to the project infrastructure and decrease as the distance increases from the project footprint.

Results from 2003 indicate the following:

- Dust deposition levels in snow are highest adjacent to the project and reduce to background levels at approximately one km from the project.
- Levels were greater in 2003 than 2002, particularly near the newly formed A154 pit.

Aquatic Effects

Diavik Diamond Mines Inc. conducted Aquatic Effects Monitoring in 2003 as a requirement of the Type A Water License N7L2-1645. This is the third year of post-baseline aquatic effects monitoring and the second full year of monitoring (open-water and ice-cover) since the Mackenzie Valley Land and Water Board approved the program in July 2001.

In reviewing the 2002 results, it was determined that earlier QA/QC data reviews could assist in improving the program quality. This was implemented in 2003, but will require ongoing attention.

Water Quality

- Despite the very close (60m) proximity of SNP Station 19 to the effluent diffuser, open-water and ice-cover results remain below CCME Guidelines for the protection of aquatic life.
- Ice-cover concentrations at SNP Station 19 tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water resulting in better initial dilution or mixing.
- Data analysis was conducted following the approved 4 step process. The results of the first step of the data analysis identified specific monitoring locations where there were changes in the concentrations of 7 water quality parameters. Of these only total arsenic could be identified as possibly being caused by the NIWTP effluent (data analysis Step 2). Measured changes in total arsenic are within the levels predicted in the environmental assessment (data analysis Step 3) and are below levels that would cause environmental effects.
- The results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations (LDG50) or parameters (nitrite at LDG46) where baseline data are not available and so the data analysis is not possible. It is therefore recommended that in the future the data analysis method be



Collecting Samples for the AEMP

modified so that the baseline references are from the combined mid-field and far field sites instead of each individual monitoring site. This change would reduce the number of false positives results.

Phytoplankton and Zooplankton

- At the combined mid-field and combined far-field sites, chlorophyll *a* concentrations have not increased from baseline.
- Data analysis results indicate a change (increase) in chlorophyll *a* concentrations at LDG46 as was also identified in 2002. This is a far-field site toward the west end of Lac de Gras. The 2003 results at this site are comparable to the other far-field sites and are within the baseline range for the combined far-field sites. No changes were determined at any of the mid-field sites indicating that the NIWTP effluent is not a likely cause of this increase.
- Zooplankton biomass results at both far-field and mid-field monitoring locations remain within the baseline range.

Benthic Invertebrates

- The data analysis methods do not appear to provide a meaningful interpretation of change for the benthic invertebrate results as the year-to-year natural variability in the metrics are substantially greater than as defined by the baseline statistics. Contributing to this problem is the fact that although baseline sampling for benthic invertebrates was conducted over several years, the results from only one year (1997) were used to define the baseline variance as this was the only year when sampling methods were sufficiently comparable to those defined for the AEM. Therefore the results of the data analysis will continually report false positives for most metrics which is not helpful for data interpretation.
- It is DDMI's recommendation that the data analysis methods for benthic invertebrate community structure be revised so that the results can be more meaningfully interpreted with respect to change. Specifically it is recommended that every three years the full data sets be provided to a qualified invertebrate biologist to conduct a separate statistical analysis and prepare an interpretive report.

Sediment Quality

- The step one data analysis indicated changes at specific monitoring locations of four sediment quality parameters. The step two analysis determined that Diavik activities were not likely the cause of the indicated changes primarily because the concentration gradients were the reverse of what would be expected if Diavik was the source. This conclusion was supported by a lack of similar trends in water quality results.

Sediment Samples



Fish

Winter Dissolved Oxygen Baseline Survey

- In 2003 an annual survey of dissolved oxygen (DO), percent oxygen saturation, and temperature profiles was conducted in Lac de Gras adjacent to the north and south sewage treatment plant (STP) discharge locations. The work performed during 2003 was conducted as part of the Diavik Diamond Mines Inc. (DDMI) Fisheries Authorization (File # SC98001).
- Results obtained in 2002 and 2003 are representative of over two years of discharge into Lac de Gras. Discharge from the north STP was discontinued in mid-April 2003 due to north camp closure while discharge from the south STP was redirected to the Processed Kimberlite Containment (PKC) on May 1st, 2003.
- The results indicate that the majority of stations generally exhibit near oxygen-saturated conditions close to surface, with decreasing concentrations at depth. No significant reductions in dissolved oxygen have been determined in comparing the 2003 dataset with the 2001, 2002 and baseline dataset.

Fish Palatability Study

As per subsection 35(2) 9 of the *Fisheries Act*, DDMI in cooperation with DFO and aboriginal partners, developed and conducted a fish palatability and texture study at the Diavik mine site on Lac de Gras. In conjunction with this study, scientific samples were taken and sent for analysis, to monitor fish populations and indices of fish health.

The study took place over two days and included participants from Dogrib Treaty 11, Lutselk'e, North Slave Metis Alliance and Yellowknives Dene. Due to unfavorable weather conditions, participants from Kugluktuk were unable to attend in 2002 but participated in 2003. Fish were collected from the lake and samples were taken for metallothionein and metals analysis, aging structures (fins or otoliths) were harvested, and whole fish were sent to Winnipeg for electronic sniffing and texture testing. Observations on fish weight, length, fecundity, stomach content and general health were also recorded.

Participants were given questionnaires to fill in regarding the fish sampled for tasting in comparison with fish from their own communities. Each community collaborated as a group on rating the fish that were cooked for sampling. Fish were rated on how they looked before cleaning, during cleaning and how they looked and tasted once cooked. This study is to be repeated every five years but may be done more often as requested by the aboriginal participants, and the fish in subsequent years will be compared to those caught in 2002 for the baseline study.

No concerns in fish quality or condition were noted. In general, the community participants agreed the fish from Lac de Gras tasted good in 2002 and 2003.



Youth and Elders from Lutselk'e sampling fish.

This 2003 Annual Report is intended to address the requirements of Article XII, ANNUAL REPORTS, of the Environmental Agreement.

12.1 ANNUAL REPORT

- (a) DDMI shall prepare and submit an annual report (the “Annual Report”) to the Parties, the Government of Nunavut, and the Advisory Board on March 31, (or on such other date as prescribed by the Minister from time to time), for each calendar year during the term of this Agreement, commencing March 31, 2001.
- (b) Each Annual Report shall include the results of Environmental Monitoring Programs, and a rolling summary and analysis of environmental effects data over the life of the Project to illustrate any trends. The actual performance of the Project shall be compared to the results predicted in the environmental assessment and the CSR and an evaluation provided as to how DDMI’s adaptive environmental management has performed to the date of each Annual Report.
- (c) Each Annual Report shall include, but not be limited to, the following:
 - (i) a comprehensive summary of all supporting information, data and results from the Environmental Monitoring Programs and all studies and research;
 - (ii) a comprehensive summary of all compliance reports required by the Regulatory Instruments;
 - (iii) a comprehensive summary of operational activities during the preceding year;
 - (iv) actions taken or planned to address effects or compliance problems which are set out in the Annual Report;
 - (v) a comprehensive summary of operational activities for the next year;
 - (vi) lists and abstracts of all Environmental Plans and Programs;
 - (vii) verification of accuracy of environmental assessments;
 - (viii) determination of effectiveness of mitigative measures;
 - (ix) a comprehensive summary of all adaptive management measures taken;
 - (x) a comprehensive summary of public concerns and responses to public concerns;
 - (xi) a comprehensive summary of the new technologies investigated;
 - (xii) the Minister’s comments, including any Minister’s Report, on the previous Annual Report; and
 - (xiii) a plain English executive summary and translations into Dogrib, Chipewyan, and Innuinaqtun using appropriate media.



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2. INTRODUCTION

The Environmental Monitoring Advisory Board's objectives are to provide community input and advice to DDMI and regulators, with the overall intent of minimizing project environmental impacts. With participation and contribution from Aboriginal Peoples and affected communities, the Board plans to build a strong relationship with DDMI to ensure communities are full participants in all aspects of environmental monitoring and mitigation measures associated with the project.

Diavik Diamond Mines Inc. is pleased to report a successful first year of operations at the Diavik Mine, located 300 km northeast of Yellowknife. By year end, approximately 26 million tonnes of waste rock and nearly 1.3 million tonnes of kimberlite ore had been mined. Diamond production was approximately 3.8 million carats. The project is in environmental compliance and continues with its regular monitoring programs.

Diavik continues to work with the Environmental Monitoring Advisory Board, on environmental issues affecting the impacted Aboriginal communities. With their input, Diavik's environmental monitoring programs are evolving to better protect the pristine arctic environment and wildlife spe-

cies, surrounding the mine site.

Company Profile

Diavik Diamond Mines Inc. is a Canadian mining company, with its corporate headquarters in Yellowknife, Northwest Territories in Canada. Diavik was created in 1996 to develop and manage the Diavik Diamond Mine.

The Diavik Diamond Mine is an unincorporated joint venture between Diavik Diamond Mines Inc., holding 60% and Aber Diamond Mines Ltd., holding 40%. Diavik is a wholly owned subsidiary of Rio Tinto plc of London, England. Aber Diamond Mines Ltd. is a wholly owned subsidiary of Aber Diamond Corporation of Toronto, Canada.





Regional Environment

Lac de Gras is about 100 kilometres north of the tree line in the arctic tundra region of the Northwest Territories. The gently rolling tundra is made up of numerous lakes, bedrock outcrops and glacially deposited boulder fields, till and eskers. There is very little soil and the area is within the continuous permafrost zone.

At 60 kilometres long, Lac de Gras is a large lake with a drainage area of approximately 4,000 square kilometres. The main inflow is through a narrow channel from Lac du Sauvage, a 120 square kilometre lake to the northeast. From the west end of Lac de Gras, the Coppermine River continues to flow 520 kilometres north to the Arctic Ocean.

Typical of arctic lakes, aquatic productivity in Lac de Gras is low. This is the natural result of relatively low concentrations of nu-

trients, low light levels during the winter months, extended periods of ice cover and low water temperatures. Lake trout, cisco, round whitefish, arctic grayling, burbot, longnose sucker and slimy sculpin are among the fish species found in Lac de Gras.

East Island

While the region sees many visitors, on the east island only a few species are permanent residents. These include red fox, arctic hare, arctic ground squirrels, red-backed voles, brown lemmings and rock ptarmigan.

In some years, small to large numbers of caribou may cross the ice of Lac de Gras to the east island during spring migration and may visit the islands for short periods during summer and fall movements. Grizzly bears, wolves and wolverines have large home ranges and occasionally visit the

east island, especially when following caribou herds. There are no recent grizzly bear dens or permanent wolf denning sites on the island.

Many different species of birds have been observed to stop briefly at the east island during spring and fall migrations. A variety of waterfowl, shorebirds and songbirds nest on the east island during the summer. One cliff-nesting site used by peregrine falcons is located on the east island, but is not affected by the mine footprint.

Figure 1: Diavik Diamond Mine Site Layout



3. SUBMISSION SUMMARIES

A154 Dike and Mine Discharged Lakebed Sediment, Water Quality and Benthic Invertebrate Study, Results Year One **Submitted to DFO December, 2004** **Awaiting Approval**

The objective of this study was to measure water quality, sediment quality and benthic invertebrate community structure before and after construction of the A154 dike. In summary, the final design of this program included the following:

- 25 sampling sites located on five transects radiating from the A154 dike footprint. Sampling sites were located along each transect at 25 m, 75 m, 150 m, 450 m and 900 m.
- One water sample was collected at each site from the bottom of the water column (2 m off bottom) and analyzed for trace metals (dissolved and total) and nutrients. Field measurements were made near the surface, at mid-depth and near the bottom at each sampling site.
- Three sediment core samples were collected from within a 10 m radius around each sampling site; the top 5 cm of each core was submitted for analysis of trace metals and particle size.
- Three composite benthic invertebrate samples (three Ekman grabs per composite sample) were collected from within a 10 m radius around each sampling site; all samples were submitted for taxonomic enumeration.
- In 2002 (after dike construction), water samples were collected from the underwater surface of the dike using “peepers” (Lorax Diffusion Samplers; see Section 2.4 and Appendix A) deployed at various depths at the starting point of each transect and at a control site; these samples were considered representative of dike interstitial waters.

The A154 Dike Monitoring Program was first implemented in September 2000, to document conditions prior to dike construction. Results of the first survey were reported by DDMI (2001). Construction of the A154 dike was completed by August 2002. The first year of post-construction monitoring was 2002. The monitoring program will now be implemented every three years, if necessary, with the next cycle in 2005. This report presents both the pre-construction “baseline” (2000) and post-construction “year 1” (2002) results.

Aquatic Effects Monitoring Program Technical Report **Submitted to the MVLWB March 31, 2004** **Awaiting Approval**

Diavik Diamond Mines Inc. conducted Aquatic Effects Monitoring in 2003 as a requirement of the Type A Water License N7L2-1645. This is the third year of post-baseline aquatic effects monitoring and the second full year of monitoring (open-water and ice-cover) since the Mackenzie Valley Land and Water Board approved the program in July 2001.

In reviewing the 2002 results it was determined that earlier QA/QC data reviews could assist in improving the program quality. This was implemented in 2003 but will require ongoing attention.

Water Quality

- Despite the very close (60m) proximity of SNP Station 19 to the effluent diffuser, open-water and ice-cover results remain below CCME Guidelines for the protection of aquatic life.

Summer Student Doing Groundwater Sampling



- Ice-cover concentrations at SNP Station 19 tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water resulting in better initial dilution or mixing.
- Data analysis was conducted following the approved 4 step process. The results of the first step of the data analysis identified specific monitoring locations where there were changes in the concentrations of 7 water quality parameters. Of these only total arsenic could be identified as possibly being caused by the NIWTP effluent (data analysis Step 2). Measured changes in total arsenic are within the levels predicted in the environmental assessment (data analysis Step 3) and are below levels that would cause environmental effects.
- The results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations (LDG50) or parameters (nitrite at LDG46) where baseline data are not available and so the data analysis is not possible. It is therefore recommended that in the future the data analysis method be modified so that the baseline references are from the combined mid-field and far field sites instead of each individual monitoring site. This change would reduce the number of false positives results.

Phytoplankton and Zooplankton

- At the combined mid-field and combined far-field sites, chlorophyll *a* concentrations have not increased from baseline.
- Data analysis results indicate a change (increase) in chlorophyll *a* concentrations at LDG46 as was also identified in 2002. This is a far-field site toward the west end of Lac de Gras. The 2003 results at this site are comparable to the other far-field sites and are within the baseline range for the combined far-field sites. No changes were determined at any of the mid-field sites indicating that the NIWTP effluent is not a likely cause of this increase.
- Zooplankton biomass results at both far-field and mid-field monitoring locations remain within the baseline range.

Benthic Invertebrates

- The data analysis methods do not appear to provide a meaningful interpretation of change for the benthic invertebrate results as the year-to-year natural variability in the metrics are substantially

greater than as defined by the baseline statistics. Contributing to this problem is the fact that although baseline sampling for benthic invertebrates was conducted over several years, the results from only one year (1997) were used to define the baseline variance as this was the only year when sampling methods were sufficiently comparable to those defined for the AEM. Therefore the results of the data analysis will continually report false positives for most metrics which is not helpful for data interpretation.

- It is DDMI's recommendation that the data analysis methods for benthic invertebrate community structure be revised so that the results can be more meaningfully interpreted with respect to change. Specifically it is recommended that every three years the full data sets be provided to a qualified invertebrate biologist to conduct a separate statistical analysis and prepare an interpretive report.

Sediment Quality

- The data analysis (step 1) indicated changes at specific monitoring locations of 4 sediment quality parameters. The step 2 analysis determined that Diavik activities were not likely the cause of the indicated changes primarily because the concentration gradients were the reverse of what would be expected if Diavik was the source. This conclusion was supported by a lack of similar trends in water quality results.

Annual Geotechnical Engineering Report – North Inlet Storage Facility Submitted to the MVLWB October 29/03 Waiting for Approval

The North Inlet East Dike (NIED) was constructed to create an enclosure within the North Inlet for use as temporary storage during the initial dewatering of the pit areas and during mine operations until the water is treated for release to Lac de Gras, as well as a deposition area for the sediments dredged from the foundations of the A418 and A21 dikes. The dike consists of a zoned rock fill embankment with a cut-off comprising jet grout columns anchored in the till foundation.

The dike was constructed in 2001 and 2002. An initial lowering of the inlet water level took place early in 2002 and part of the water volume from the initial dewatering of the A154 dike refilled the basin. However, the dike was not completed until September 2002. An annual inspection and performance evaluation is required and is to be carried in July. This report constitutes the findings of the first annual report. The performance of the dike is satisfactory based on observations during the drawdown period in 2002 and a visual inspection carried out in 2003. Cracking along the centerline was noticed in the spring of 2003, but these are now closed. The lake side slope is subject to greater wave attack than the inlet side but no adverse effect has been observed.



Annual Geotechnical Inspection – A154 Water Retention Dike Submitted to the MVLWB September 5, 2003 Waiting for Approval

The A154 dike was constructed to permit the dewatering of an area enclosing the kimberlite pipes

A154N and A154S and the exploitation of the same by open pit mining methods.

The dike consists of a zoned rock fill embankment with plastic concrete diaphragm wall in the fill and till foundation, and which is continued to rock by jet grout columns. A grout curtain in the rock also contributes to reducing seepage and uplift pressures.

The dike was constructed in 2001 and 2002. The initial dewatering took place from late July to mid September of 2002. An annual inspection and performance evaluation is required and is to be carried in July. This report constitutes the findings of the first annual report.

The performance of the dike is satisfactory. Piezometric levels are declining as a result of the drainage of the overburden and rock within the enclosure and the deepening of the mine pit. The spring runoff caused some short term rises in the levels but these have returned to previous values. The total recorded seepage is well within the design criterion.

Deformation of the dike as measured by the inclinometers and survey markers is equal to or less than the values predicted by finite element stress/strain analyses. Temperature measurements show satisfactory performance of the thermosyphon groups. The natural permafrost conditions on the abutments have not deteriorated but the degree of freezing is low.

Blast monitoring has revealed the generation of excess pore water pressure which often takes several hours to dissipate. Extra instruments in critical areas and continued monitoring are required to demonstrate that no accumulated deformation of the dike is occurring.

Several recommendations are given in relation to improvement of drainage, the addition as required of filter material, and the repair of upstream slope erosion.

**As-Built Geotechnical Engineering Report - North Inlet Storage Facility
Submitted to the MVLWB October 28/03
Waiting for Approval**

This facility is required to temporarily contain water pumped from the mine or transferred from the sediment containment facility prior to treatment and release into Lac de Gras. The design of the dike is presented in the document entitled "A154 Water Retention Dike, Detailed design report", dated July 1999.

The dike closes the mouth of the North Inlet as shown on drawing number 2110-41D2-1038. The choice of alignment took into account the topography of the north and south shores, the lakebed bathymetry and the presence of an island in mid channel.

The dike consists of a zoned rock fill embankment with jet grout cut-off in the embankment and in the till foundation. The cut-off is partial and no grout curtain was deemed necessary for this low head structure. The central part of the embankment was constructed of 0-56mm crushed rock (zone 1) to retain the cement grout of the cut-off. The upstream and downstream shoulders are of 0-900mm quarry run rock (zone 3). A transition zone of 0-200mm crushed rock (zone 2) was placed between the zone 1 and the zone 3. The shoulders are underlain by a filter blanket of 0-56mm material to protect the foundation against piping.

The lakebed sediments, judged to be prejudicial to the dike stability, were removed by excavation prior to embankment placing. The crest of the embankment is at elevation 418.5m, which provides a 1.5m freeboard above maximum storage level (417m), 2.5m above normal operating level (416m) and a 1.0m freeboard above the invert of the spillway. The freeboard material also provides a measure of thermal protection to reduce the freeze/thaw cycles at the level of the

cut-off, which extends to elevation 417m.

No instruments were installed in the dike and visual inspection only is used for monitoring the behaviour of the dike.

This As-Built Report provides the description of the major construction activities, field modifications, photographs showing different constructions activities, material testing results, and as-built drawings.

As-Built Geotechnical Engineering Report – A154 Water Retention Dike Submitted to the MVLWB September 5, 2003 Waiting for Approval

The design of the dike is presented in the document entitled “A154 Water Retention Dike, Detailed design report”, dated July 1999. The alignment of the dike is essentially a ‘U’ shape linking two peninsulas on East Island and encompassing two additional islands identified as ‘D’ and ‘E’ as shown on drawing number 2110-41D2-1008. The selected alignment had to respect a minimum setback distance from the pit perimeter of 100m and also stay within the claim boundary on the North side.

The dike consists of a zoned rock fill embankment with a plastic concrete diaphragm wall in the fill and till foundation, and which is continued to rock by jet grout columns. A grout curtain in the rock also contributes to reducing seepage and uplift pressures. The central part of the embankment was constructed of 0-56mm crushed rock to permit the excavation of the diaphragm wall under bentonite slurry. The downstream shoulder is of 0-200mm crushed rock and the upstream shoulder of 0-900mm quarry run rock. The maximum size of particles in the downstream shoulder was required to reduce segregation and to better ensure filter compatibility with the central zone. The upstream zone is less critical in this respect and the larger size rock provides greater wave protection. The downstream shoulder is underlain by a filter blanket of 0-56mm material to protect the foundation against piping.

The foundation was dredged prior to embankment placing to remove lakebed sediments judged to be prejudicial to the dike stability. The crest of the embankment is at elevation 421m, which provides a 5m freeboard above normal lake level and adds thermal protection to reduce the freeze/thaw cycles at the level of the cut-off, which extends to elevation 417.5m.

The dike foundation under the lake was originally unfrozen, whereas the on-land areas are affected by permafrost. The grout curtain could not treat the frozen rock and a potential weak zone could exist at the frozen/unfrozen boundary if degradation of the permafrost occurs. To mitigate against this possibility, thermosyphons were installed at the abutments to artificially freeze the ground and the rock, and envelope the end of the grout curtain and the diaphragm wall. In this way, some fluctuation of the boundary may take place without opening a window for seepage.

After the initial dewatering of the pit area, perforated drains were installed along the dike toe, and pump stations provided at the low spots in the profile to collect and dispose of seepage water. A total of five stations were required. These are hooked up to heat traced pipelines installed on the 419m level berm. An additional weighting berm was added after the toe drain installation, to a height of 5m in deeper areas or to reach elevation 416m in the shallow areas.

A comprehensive set of instruments was installed in the dike and the foundation to monitor the behaviour of the dike. Several of these are connected to an automated data acquisition system, which permits readings to be made from a central location in the mine maintenance building.

Blasting Effects Study Design
Submitted to DFO May 7, 2003
Approved May 30, 2003

Diavik Diamond Mines Inc. (DDMI) is proposing to conduct open pit and underground mining of kimberlite pipes at their Lac de Gras mine site; explosives will be used as the primary method of excavating rock. The resulting explosions will produce peak particle velocities and overpressures that radiate outward from the pit; for blasting activities associated with the A154 pit, it is expected that peak particle velocities that exceed DFO guidelines (Wright and Hopky 1998) will extend beyond the pit's dike walls and into Lac de Gras, where they could cause death or injury to fish (DFO Project Authorization). Indeed, geophysical calculations (DDMI 1998a) predicted that the "blast zone", where guidelines would likely be exceeded, will extend into the lake by ca. 450 m. Consequently, a *Fisheries Act* section 32 Authorization (SC98001) relating to this activity requires that DDMI monitor peak particle velocities and overpressures resulting from blasting activities in and around the predicted blast zone, to define the actual blast zone; effects of blasting on fish must also be determined. In particular, any incubating fish eggs within the blast zone could be susceptible to mortality or damage, especially since they would be exposed to the excessive velocities or pressures for 6-10 months. Because there is considerable uncertainty regarding the cumulative effects of repeated guideline-exceeding forces on overwintering, developing eggs in Arctic lakes, and because the use of explosives in or near arctic Canadian fisheries waters will likely increase in the future, it is important to conduct a study into effects on fish and especially fish eggs, both with respect to the A154 pit but also to assess more generally the relationship between the current guidelines and effects under arctic field conditions.

Blasting and Explosives Management Plan
Submitted to the MVLWB March 2003
Waiting for Approval

Explosives will be used as a normal part of the mining operations of Diavik Diamond Mines Inc. (DDMI). The purpose of this updated Blasting and Explosives Management Plan is to describe how DDMI intends to minimize adverse environmental impacts in carrying out the blasting activities.

DDMI will be employing conventional open pit mining methods. Most of the explosives will be bulk explosives manufactured on site. The recommended formulations are of commercial quality, industry-proven and accepted worldwide. The raw ingredients will be delivered to the site in separate bulk containers and stored in separate bulk storage facilities. The bulk explosives manufacturing plant and storage facilities are being built and operated by an experienced, reputable explosives supplier under long-term contract to DDMI, currently Densoline Western Explosives. This supplier will also be providing down-the-hole delivery of the product to the mine by means of state-of-the-art facilities and equipment licensed and approved by National Resources Canada, Explosives Division.

In addition to the raw ingredients, DDMI's explosives supplier will also be providing commercial packaged explosives and accessories that will be transported to the mine site. This will include detonators, boosters, detonating cord and packaged explosives for specialty applications. These materials will be stored securely on site in approved magazines until released for use by authorized persons.

This document describes steps that will be taken to minimize effects on the environment (water quality and wildlife). It describes actions that will be taken to manage spillages of explosives at point source (areas) that in turn will assist in reducing ammonia levels to the environment. It describes how larger wildlife (i.e. caribou and bears) will be protected during blasting activities.

This document is intended only to complement federal, territorial and local acts, regulations, codes, and bylaws. Applicable statutes include but are not limited to:

- Canada Transportation of Dangerous Goods Act
- Canada Explosives Act
- Northwest Territories Mine Health and Safety Act
- Northwest Territories Mine Health and Safety Regulations

This document is also intended to complement other plans, policies, procedures and guidelines set out by DDMI for day-to-day management of such areas as:

- Health and safety
- Waste management
- Contingency planning
- Mine operating procedures
- Blasting procedures
- Employee training – e.g. Blaster, Blaster Helper, Driller, etc.
- Explosives supplier's employee training

This document notwithstanding, all regulations and requirements will be adhered to in the manufacture, storage, transport, handling and use of explosives at the mine site.

Operational Phase Contingency Plan Submitted to the MVLWB March 2003 Waiting for Approval

The purpose of the Diavik Diamond Mine Inc. (DDMI's) Operational Phase Contingency Plan (OPCP) is to provide a course of action response measures for any unintentional releases of hazardous/toxic substances (such as petroleum products) as well as procedures for water management. The OPCS defines the responsibilities of key positions personnel (i.e. On-Scene Coordinator) and outlines their duties and required procedures for when responding to these incidents unintentional releases of products to the environment.

This plan has been designed to facilitate the efficient clean up of spills from potential hazardous materials. The hazardous materials include:

- Hydrocarbon liquids such as diesel fuel, gasoline, hydraulic oil;
- Soluble solids such as ammonium nitrate pill;
- Soluble liquids, such as glycols, acids, and paints;
- Poor water quality (i.e. sediments and sewage and water treatment plant effluent & sludge)

The principle objectives of this plan are:

- To provide readily accessible emergency information to the clean-up crews, management, and



government agencies in the event of any emergency situation.

- To comply with federal and territorial regulations and guidelines pertaining to the preparation of contingency plans and notification requirements.
- To comply with company environmental and safety policies.
- To promote the safe and effective recovery of spilled materials.
- To minimize the environmental impacts of spills to water or land.

This plan addresses outlines response measures and the organization of the emergency response team and response measures. Alerting and notification procedures and cleanup strategies are outlined along with the duties and responsibilities of key response personnel. Contained within this documents are the Emergency contacts listed for DDMI, any applicable contractors, government agencies, private organizations and neighboring sites/operations.

In support of this plan and any ensuing response actions, further information is provided in the following appendices:

- Appendix A contains an up-to date inventory of spill response material, equipment and their location.
- Appendix B contains the inspection schedules.
- Appendix C provides environmental sensitivity maps to assist in planning and conducting spill clean up operations on the transportation corridor and at the mine site.
- Appendix D describes Specific Response Strategies for cleanup in different kinds of conditions.

The OPCP is prepared in accordance with the Northwest Territories Water Board's Guidelines for Contingency Planning (January 1987). It combines the requirements for Spill Contingency and General Contingency Plan. The plan will be reviewed at least on an annual basis or when necessary as required to make modifications and improvements as the operation continues to evolve.

**Annual Dam Safety Inspection Report
Submitted to the MVLWB August, 2003
Waiting for Approval**

Nishi-Khon/SNC-Lavalin (NKSL) was retained by Diavik Diamonds Mines Inc. (DDMI) to perform the Annual Dam Safety Inspection for the dams of the On-Land Dredged Sediment Storage Facility (OLDSSF), Processed Kimberlite Containment (PKC) Facility and Runoff Collection Facility. Normally, the annual dam inspection is required by the water license to be carried out during July of each year. Because Dr. Hu was on site at the end of June, DDMI therefore decided that the dam inspection is carried out slightly earlier for year 2003.

All the dams were regularly monitored by DDMI geotechnical inspectors. Dr. X. Hu, a senior cold regions engineering specialist of NKSL also performed periodic inspections during the construction and after the completion of the dams. The annual inspection for year 2003 was carried out between June 24 and 26. Photos taken during the inspection are presented in Appendix A. Water levels for all the inspected facilities and the settlement monuments of OLDSSF were surveyed by the survey department of DDMI. Ground temperature sensors were installed for the dams of the OLDSSF and PKC. DDMI geotechnical inspectors carried out the readings for these thermistor cables.

**Dissolved Oxygen Survey Winter 2003
Submitted to DFO October 20, 2003
Waiting for Approval**

In 2003 an annual survey of dissolved oxygen (DO), percent oxygen saturation, and temperature

profiles was conducted in Lac de Gras adjacent to the north and south sewage treatment plant (STP) discharge locations. The work performed during 2003 was conducted as part of the Diavik Diamond Mines Inc (DDMI) Fisheries Authorization (File # SC98001).

DDMI initiated discharge of treated effluent at the north outfall in January 2001. Dissolved oxygen profiles were taken at the north stations in 2001, 2002 and 2003. Discharge at the south STP outfall was not commissioned until June 2001 therefore the measurements taken at the south stations during the winter of 2001 represent baseline conditions. Results obtained in 2002 and 2003 are representative of over two years of discharge into Lac de Gras. Discharge from the north STP was discontinued in mid-April 2003 due to north camp closure while discharge from the south STP was redirected to the Processed Kimberlite Containment (PKC) on May 1st, 2003.

Electrical problems with the Hydrolab surveyor in 2003 prevented data from being stored and consequently information from the April survey for stations CSD-7, CSD-8 and CSD-9 are not available. Therefore, grab samples were collected at three different depths for these stations and Winkler titrations conducted to obtain relevant information. At the request of DFO, a survey of station WQ-04, which is located between the north and south STP discharge locations, was conducted in 2003 and information gathered is available in this report.

The results indicate that the majority of stations generally exhibit near oxygen-saturated conditions close to surface, with decreasing concentrations at depth. No significant reductions in dissolved oxygen have been determined in comparing the 2003 dataset with the 2001, 2002 and baseline dataset.

This report concludes the dissolved oxygen monitoring required under the Fisheries Authorization.

Dust Deposition Monitoring Program 2003 Submitted to EMAB/RWED with the Wildlife Report

Diavik Diamond Mines Inc. (DDMI) initiated a dust deposition monitoring program during the spring of 2001. The program involved snow core sampling to determine levels of dust deposition. This program was continued in spring of 2002 with an additional trial program using dust gauges during the late spring and summer months. In 2003 the dust gauge program was continued and dust gauges were deployed for the entire year. The dust gauges act as a repository for air born dust particles. Both the snow core and dust gauge monitoring are aimed at understanding dust deposition rates caused by project activities during the lifecycle of the mine. Results are compared with the predictions made in the Environmental Effects Report, Climate and Air Quality (DDMI, 1998). DDMI intends to conduct snow surveys on an annual basis in the spring, collect dust particles throughout the year and perform habitat assessment reviews every third summer, to monitor trends in total deposited particulates, snow water chemistry, summer dust deposition and habitat community vitality.

Similar to results from the 2002 monitoring program, the 2003 dust deposition program is consistent with the predictions in the environmental effects report, that dust deposition rates will be higher adjacent to the project infrastructure and decrease as the distance increases from the project footprint.

Results from 2003 indicate the following:

- Dust deposition levels in snow are highest adjacent to the project and reduce to background levels at approximately one km from the project. Levels were greater in 2003 than 2002, particularly near the newly formed A154 pit.

Fish Habitat Design for the Pit Shelf Areas at Diavik Diamond Mine
Submitted to DFO April 3, 2003
Waiting for Approval

This report presents the detailed design for the creation of fish habitat on the interior of the water retention dikes for the Diavik Diamond Mines Inc. diamond mine located on Lac de Gras in the Northwest Territories, Canada. This design was prepared in accordance with the "No Net Loss" plan prepared by Diavik Diamond Mines Inc.

This design is applicable to the A154, A418, A21 pits; however, since only the A154 dike has been constructed, the majority of the information is based on A154. This design has been prepared by developing criteria for the end result, thus providing flexibility on the part of the Diavik Diamond Mines Inc. as to how the end result is achieved.

The fish habitat creation on the interior of the dikes consists of placing material excavated from the open pits in the area between the pit crest and the toe of the dikes, to create an area generally varying from 3m to 5m below the mean normal water level for Lac de Gras. During mining operations, the toe of the fill will be extended to the pit crest.

Detailed design drawings have been prepared for A154, and construction guidelines have been presented that can be applied to A418 and A21, once the dike location and pit geometry are determined.

Fish Palatability and Texture Study
Submitted to DFO January, 2004
Waiting for Approval

As per subsection 35(2) 9 of the *Fisheries Act*, DDMI in cooperation with DFO and aboriginal partners, developed and conducted a fish palatability and texture study at the Diavik mine site on Lac de Gras. In conjunction with this study, scientific samples were taken and sent for analysis, to monitor fish populations and indices of fish health.

No concerns in fish quality or condition were noted. In general, the community participants agreed the fish from Lac de Gras tasted good in 2002 and 2003.

Hazardous Materials Management Plan
Submitted to the MVLWB March 2003
Waiting for Approval

Diavik Diamond Mines Inc. (DDMI) requires that the transportation, storage, handling and use of hydrocarbon products, ammonium nitrate, and associated explosive materials, and all other chemicals be conducted in a safe and efficient manner. Prevention, detection, containment, response, and mitigation are the key elements in the management of hazardous materials. DDMI is committed to minimizing the potential for adverse environmental effects on terrestrial and aquatic biota and ecosystems that may result from accidental release. The first step in accomplishing this is to apply consistent practices towards the management of hazardous materials site-wide. The purpose of this document is to establish the foundation for the application of procedures to the management of hazardous materials.

Processed Kimberlite Containment Facility As-Builts
Submitted to the MVLWB Jan.7, 2003
Approved June 16, 2003

This facility is designed to store the Processed Kimberlite (PK) materials, consisting of coarse PK and Fine PK. All materials will be deposited within the area enclosed by the containment dams. The dams forming this facility are designed to be constructed in stages, initiated with two starter dams at the West and east end of the PKC valley. These two starter dams constitute the Phase 1 construction and will be raised in the future in several phases to form a continuous, approximate 6 km long, containment dam. The two starter dams, constructed in 2001 and 2002, termed as the phase 1 Construction consisted of the East and West PKC Dams.

The detailed design of the dams is presented in the document named "Processed Kimberlite Containment Facility, Updated Design report", dated April 2001.

QA/QC Plan
Submitted to MVLWB and DIAND, March, 2003 with Type A Annual Report
Approved by DIAND, June 27, 2003

Diavik Diamond Mines Inc. (DDMI) Quality Assurance (QA) and Quality Control (QC) Plan was granted approval in 2000 by the Department of Indian Affairs and Northern Development (DIAND). This revised document is being submitted to DIAND as required by the Type A Water License. The purpose of the revised QA/QC Plan is to specifically outline the steps, procedures, and equipment that will be used by Diavik personnel to maintain sample integrity and to assess the precision and accuracy of analytical results.

Storm Water Collection Ponds – As-Builts
Submitted to the MVLWB January 7, 2003
Approved June 16, 2003

A total of 8 collection ponds were designed on the Diavik site, named Ponds Nos. 1,2,3,4,5, 10, 11, and 12. Collection Ponds 10, 11 and 12 were constructed in year 2001 and the construction information was reported in the report titled "As-Built Report, Storm water Collection ponds Nos. 10,11 and 12", dated October, 2001. Pond No.3 is part of the west Dam of the Sediment Storage Facility. This dam was completed in July of 2001.

There were three ponds constructed between May and October of 2002, namely Storm water Collection Pond Nos. 1,4 and 5. Pond No. 2 will be constructed in year 2004, prior to the North Country Rock Pile construction in this area.

Among the three ponds constructed in year 2002, Pond 1 was designed to store runoff from the North Country Rock Pile/North Till Storage areas. Pond 4 was designed to store runoff from the West PKC Dam watershed area and, seepage if any, from the West PKC Dam. Pond 5 was designed to store runoff from the East PKC Dam watershed and seepage if any, from the East Dam.

Due to field conditions encountered, some modification to the original designs were made during construction. This As-Built Report provides the description of the major construction activities, field changes and modifications, photos taken during different construction stages, material testing results and as-built drawings.

**Type A Water License 2003 Annual Report
Submitted to the MVLWB March 31, 2004
Approval not required – waiting for letter of acknowledgment**

This Annual Report is prepared as per Part B, Section 4 of the Type A Water Licence issued to Diavik Diamond Mines Inc (DDMI), by the Northwest Territories Water Board and currently administered by the Mackenzie Valley Land and Water Board.

The following reports were updated as required and appended to the Type A report:

- Tabular Summaries SNP Data
- Revised Operational Phase Contingency Plan
- Revised Hazardous Materials Management Plan
- Revised Waste Management Plan
- Revised Blasting Explosive Management Plan
- 2003 Aquatic Effects Monitoring Report
- 2003 East Island Seepage Report
- 2003 Dust Deposition Monitoring Report
- Winter Dissolved Oxygen Report 2003

**Waste Management Plan Operational Phase
Submitted to MVLWB and DIAND March 2003
Waiting for Approval**

Diavik Diamond Mines (DDMI) is committed to taking all necessary steps to ensure that the collection, storage, transportation and disposal of all wastes generated by the project are being conducted in a safe, efficient and environmentally compliant manner. The fundamental basis of the plan is the practical and positive management of wastes incorporating the implementation of a sound waste minimization program.

The main objectives of the plan are:

- ✓ to create a framework for the proper disposal of wastes
- ✓ to minimize potentially adverse impacts on the physical and biological environment,
- ✓ to comply with the Federal and Northwest Territories (NWT) legislation.

Along with the ideals of the four R's namely reduction, recovery, reuse and recycling of wastes, which are embodied in the Waste Management Plan, appropriate mitigation measures to counteract adverse environmental effects are identified and discussed.

This plan will be reviewed annually and revised as required. This Waste Management Plan is an integral part of Diavik Diamonds' Environmental Management System.

**Water Retention Dikes Operation Manual – August 2003
Submitted to the MVLWB September 5, 2003
Waiting for Approval**

The purpose of the Operation Manual is to provide guidance and instructions to project personnel for proper operation and maintenance of the water retention dikes and their ancillary components, both during the initial pool dewatering and over the life span of the structures.

This document was updated to reflect the design changes introduced during the construction phase and the as-built conditions prevailing at the end of the construction period. Subsequent modifications that may be made during the useful life of the project will need to be incorporated.

The Operation Manual consists of three volumes as follows:

- Volume I : Emergency Response Plan and Operation Manual Overview
- Volume II : Detailed Operating Manual
- Volume III : Manufacturers' Literature Backup

The present Volume II contains procedures and instructions dealing with the instrumentation, monitoring and visual inspection of the water retention dikes. It is divided into 6 chapters. Chapters 2, 3 and 4 present a brief description of the dikes, their constitutive fill materials and the seepage control measures incorporated in the design. Chapter 5 deals with instrumentation monitoring and data management. Chapter 6 presents the methodology proposed for the inspection of the structures while chapter 7 deals with the maintenance of the works.

2003 Wildlife Effects Monitoring Report Submitted to EMAB March 2003 Approved

As a requirement of the Environmental Agreement, Diavik Diamond Mines Inc. (DDMI) has conducted a Wildlife Monitoring Program (WMP). The objective of the WMP is to collect information that will assist in determining if there are effects on wildlife in the study area (Figure 1-1) and if these effects were accurately predicted in the Environmental Assessment (DDMI, 1998). The WMP also permits the collection of data to determine the effectiveness of site specific mitigation measures and the need for any modifications. The following documents the results of the 2003 Wildlife Monitoring Program for the Diavik Diamond Mine located at Lac de Gras, Northwest Territories. Wherever possible, comparisons to the information gathered during the previous monitoring years (2000 to 2002) and the pre-construction baseline (June 1995 to August 1997), have been included. This report presents data that was collected during 2003 in association with the revised 2002 Wildlife Monitoring Program.

While there are too few results to draw any firm effects conclusions, general observations and recommendations for possible improvements in the program, are as follows:

Vegetation

- The direct vegetation/habitat loss in 2003 due to the mine footprint was 0.49 km², which is within the expected amount. Total lost to date from mining activities is 6.43 km².

Barren-ground Caribou

- Direct summer habitat loss in 2003 from the mine footprint was 0.15 habitat units (HU's), which is within the expected amount.
- No mortalities to caribou due to the mine occurred during 2003.
- The levels of the caribou advisory monitoring remained at "no concern" (no caribou or fewer than 100 caribou) for 365 days during 2003.

Grizzly Bear

- Direct terrestrial habitat loss in 2003 from the mine footprint was within the expected amount at 0.42 km².
 - Grizzly bears are still present in the Diavik Wildlife Study Area.
-

- No bear mortalities occurred in 2003.
- A bear was relocated from the East Island in June 2003.

Based on the findings of the 2003 wildlife monitoring program, recommendations for the 2004 Grizzly bear effects program are:

- DDMI will make a request for Resources, Wildlife and Economic Development's grizzly bear collar data to be provided in such a way that Diavik would be able to amalgamate bear observations within the wildlife study area with collar information. This data would also allow us to determine the frequency that collared bears are within 10 km of the mine site and outside 10 km of the mine site.

Wolverine

- Wolverines were present on the East Island in 2003.
- No mining related wolverine mortalities, injuries or relocations occurred during 2003.

Waste Management

- Inspections were conducted at the Waste Transfer Area (WTA) and Inert Landfill in 2003 and produced improved results compared to 2002. Food and food packaging were found during 22% and 28% of inspections, respectively, at the WTA, and food and food packaging were found during 14% and 26% of inspections, respectively at the Inert Landfill.

Raptors

- During 2003, one Peregrine Falcon nest was occupied but not productive.
- No project related mortalities occurred during 2003.

Waterfowl

- Habitat Loss in 2003 was within the expected range and equaled 0.02 km² of shallow and deep water.
- Waterfowl were present at the East Island Shallow Bays.
- Waterfowl are utilizing mine-altered wetlands.



Blastine Effects Study—Mature Lake Trout for egg harvest



4. OPERATIONS SUMMARY

JANUARY: All required sampling at the SNP stations were conducted by DDMI. Samples were collected at 1645-10 and 1645-11 (Sewage Treatment plants) on six-day intervals. Treated effluent from stations 1645-10 and 1645-11 were directed to Lac de Gras during the month of January.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month of January. Results for 1645-52 have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

During the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Under ice samples were obtained from station 1645-12 during the third week of January. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. SNP station 1645-15 was monitored during the month for percent solids and monthly total volume pumped to the PKC.

FEBRUARY: All required sampling at the SNP stations were conducted by DDMI. Samples were collected at 1645-10 and 1645-11 (Sewage Treatment plants) on six-day intervals. Treated effluent from station 1645-10 and 1645-11 was directed to Lac de Gras during the month of February.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled. Results for 1645-52 have been included in the report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

During the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Under ice samples were obtained from station 1645-12 during the third week of February. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. SNP station 1645-15 was also monitored during the month of February, with measurements of percent solids and monthly total volume pumped to the PKC.

Winter road trucking started the first week of February. To month end, a total of 637 loads had been received at site.

MARCH: All required sampling at the SNP stations were conducted by DDMI. Samples were collected at 1645-10 and 1645-11 (Sewage Treatment plants) on six-day intervals. Treated effluent from station 1645-10 and 1645-11 were directed to Lac de Gras during the month of March.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled. Results for 1645-52 have been included in the report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

During the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Under ice samples were obtained from station 1645-12 during the second week of March. Station 1645-18 was reactivated on March 25, 2003, with the first sweep of parameters being

taken on this day. Water from the treatment plant was not discharged to Lac de Gras until results were received on March 27, 2002. Water chemistry results were received on March 27, with all parameters below license limits. Results were forward to the DIAND inspector, and the water was redirected to Lac de Gras on March 27th.

Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

Winter road trucking was completed in the last week of March with a total of 1,556 loads shipped in and 760 outbound.

On March 19, the Tibbitt to Contwoyto Winter Road Joint Venture Committee drove the winter road up to the Diavik Mine Site, attended by Diavik environmental staff and community delegates. Attendees were pleased with the condition of the road as very little garbage and no spills were seen.



APRIL: All required sampling at the SNP stations were conducted by DDMI. Samples were collected at 1645-10 and 1645-11 (Sewage Treatment plants) on six-day intervals, however, by mid month SNP station 1645-10 could only be sampled when water was flowing out of the plant. This change in sample frequency was due to the plant running in batch mode due to the low volumes of wastewater being generated by the north construction camp. The DIAND inspector was notified about this change in sampling frequency. Treated effluent from station 1645-10 and 1645-11 were directed to Lac de Gras during the month.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled. Results for 1645-52 have been included in the report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Samples were collected at 1645-18 on a weekly schedule using March 25 as the starting date. Samples were collected at the NIWTP diffuser, 1645-19 during the second week of April for a full sweep of parameters. During the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Under ice samples were obtained from station 1645-12 during the second week of April. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

Wolverine tracking surveys were conducted at site. Based on the track survey it is believed that eight wolverines, which include a mating pair, live in the study area. A snow den was noted on the southern part of island. The study area is now set out in a grid, enabling consistency for future studies.

The Lac du Sauvage exploration camp was opened April 4.

MAY: All required sampling at the SNP stations were conducted by DDMI. Samples were collected at 1645-11 (Sewage Treatment Plant) on a six-day interval, with the last sample being taken on April 29th, 2003. As of May 01, 2003 all treated sewage was being directed to the Processed Kimberlite Containment Facility.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month of May.

Results for 1645-52 have been included in the report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

The North Inlet Storage Facility and Water Treatment Plant were sampled; however, station 1645-12 was suspended due to unsafe ice conditions. The DIAND Inspector was notified about the unsafe ice conditions via email. Also during the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge.

Samples were collected at 1645-18 on a weekly schedule with no notable concerns. Prior to the ice become unsafe on Lac de Gras, samples were collected at the NIWTP diffuser, 1645-19 during mid May for the normal full sweep of parameters. During this sample session, technical problems prevent DDMI from obtaining field measurements.

Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

On May 03, 2003 the new flow meters for the A154 Pit Water, North Dike Seepage Wells, and South Dike Seepage Wells were activated. Total flows for the A154 Pit Water and Dike Seepage Wells were included in the May SNP report.

Collection ponds were sampled for the first time in 2003 as the spring melt started to accumulate within them. Of the six collection ponds constructed in 2002, two of them do not have assigned SNP station numbers. These stations are: Collection Pond 5 – West End of PKC; Collection Pond 1 – East End of Country Rock Pile. A letter will be sent to MVLWB outlining these collection ponds, so as to have permanent SNP numbers assigned to them. SNP stations have been assigned the following: Collection Pond 5 – 1645-42b; Collection Pond 1 – Pond 1.

Joint weekly caribou surveys continued to be conducted with BHP. Very few animals had been spotted in the Diavik area in the spring. Canada geese and Greater White-fronted Geese and various duck species were seen migrating through the Lac de Gras region.

On two occasions, the environmental staff had to haze (push) Grizzly bears away from the site using helicopters, when it was determined that a potential safety hazard existed related to their close proximity to the mine site. The animals were pushed approximately 10 km south & east to the mainland.

DDMI has been working with both DFO and the U of A to develop an agreed upon scope for the Blasting Effects Study required by the Fisheries Authorization
Six geophysical targets were drill tested in May.





JUNE: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled. Results for 1645-52 have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

The North Inlet Storage Facility and Water Treatment Plant were sampled. Station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge.

Samples were collected at 1645-18 on a weekly schedule with no notable concerns. Station 1645-19 at the NIWTP diffuser line was sampled during June for the normal full sweep of parameters as well as the quarterly sediment samples as outlined in the water license. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. Total flows for the A154 Pit Water and Dike Seepage Wells have been included in this month's SNP report as obtained from the flow meters.

On June 5, a 10-year old grizzly bear was tranquilized and re-located by helicopter 74 km east of the Diavik site. This was recommended when the bear was not deterred from site using the helicopter. RWED personnel were brought in to undertake the relocation.

On June 24, 2003, DDMI submitted a water license amendment application along with supporting documentation to the MVLWB requesting changes to ammonia discharge limits. Earlier in the month DDMI presented the application details to both the DTC (Diavik Technical Committee) and the EMAB (Environmental Monitoring Advisory Board) members.

The site wide clean up was conducted on June 24th and was well attended by all departments. By month's end, the Site Services group had commenced the implementation of the new permanent waste transfer area.

The annual engineering inspection of the PKC, sedimentation, and collection ponds was conducted in accordance with license requirements during the third week in June. There were no significant issues raised. A final inspection to close the 1998 – 2002 exploration land use permit was completed by the Mackenzie Valley Land and Water Board in early June. No deficiencies were noted and the permit was closed. Drill holes completed in 2003 were also inspected. No deficiencies were noted.

JULY: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were. Results for 1645-52a&b have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the North Inlet Storage Facility was sampled. Also during the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Samples were collected at 1645-18 on a weekly schedule with no notable concerns, unfortunately samples taken on July 23, 2003 were QC rejected due to the holding time and storage conditions being exceeded in shipping. Station 1645-19 at the NIWTP diffuser line was sampled during July for the normal full sweep of parame-

ters as well as the quarterly sediment chemistry samples. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. Total flows for the A154 Pit Water and Dike Seepage Wells have been included in this month's SNP report.

Pond 1, 1645-42A, 1645-42B, and 1645-46 were sampled in July. SNP station 1645-45 was dry; therefore, no water samples could be taken. Unfortunately, SNP station 1645-47 was missed this month due to miscommunication between staff.

One male caribou and one female grizzly with two cubs, were reported on the island.

Field work resumed at the Lac du Sauvage exploration camp on July 18. This work included geological mapping, geochemical sampling, and ground truthing of selected airborne and ground geophysical anomalies.

AUGUST: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month of August. Results for 1645-52a&b have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the North Inlet Storage Facility was sampled during the month of August. Also during the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge.

Samples were collected at 1645-18 on a weekly schedule except for August 30th as this sampling schedule fell on the weekend and samples would not have passed the limited holding time due to the biological samples that the Inspectors had requested (Fecal Coliforms and BOD). Station 1645-19 at the NIWTP diffuser line was sampled during August for the normal full sweep of parameters.

Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

Pond 1, 1645-42A, 1645-42B, 1645-46 and 1645-47 were sampled in August. SNP station 1645-45 only had a small puddle of water; therefore, no water samples could be taken.

Aquatic Effects Monitoring Program commenced for the collection of data for annual reporting. Seasonal monitoring of rain gauge and evaporation pans continued. The Blasting Effects Study was initiated and will run until 2005.

The Community Fish Quality monitoring program was conducted from a community camp established 3 km from the Diavik site, in a small bay on the east mainland. Participants from Kugluktuk, Lutsel K'e, North Slave Metis Alliance, Yellowknives Dene, and the Dogrib Treaty 11 participated. The objective of the study is to enable community members to assess the quality of fish from Lac de Gras over the life of the mine, as required.

Golder Associates were on site to assist in establishing and monitoring annual bear plots determine the utilization of territories around the east island. Additionally, Golder is assisting with mainland caribou observations.

Allied Commercial Divers were on site to complete the placement of geophones, take video footage of the North Inlet Water Treatment Plant diffuser line and the north wall of the dike, clean the screen for the raw water intake (RWI) and conduct an inspection of the RWI pipe.

SEPTEMBER: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month of Sep-

tember. Results for 1645-52a&b have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the North Inlet Storage Facility was sampled. Station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. Samples were collected at 1645-18 on a weekly schedule. Station 1645-19 at the NIWTP diffuser line was sampled during September for the normal full sweep of parameters.

Toxicity samples were taken from station 1645-18 on September 29th along with the normal sweep of elements. As soon as results are obtained from DDMI's contracted laboratory, they will be forward on to MVLWB as an addendum.

As per the DIAND Inspectors request, DDMI initiated a QC program related to zinc at SNP station 1645-18. The program consisted of testing the: Field samplers – triplicate sampling; Laboratory – Duplicate samples from a homogenous sample collected from a source; and Blanks – Field and Travel Blanks.

The Lac du Sauvage exploration camp was winterized, inventoried, and closed on September 26. During 2003, a total of 1,740 field days (20,880 hours) of work was safely completed from this camp.

OCTOBER: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month. Results for 1645-52a&b have been included in the monthly report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the NISF was sampled. Station 1645-13 was sampled in the NISF off of the North Inlet Reclaim Barge. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns. Samples were collected at 1645-18 on a weekly schedule except for a delay in sampling Station 1645-18 on the scheduled date of October 12th due to the statutory holiday on the 13th. Station 1645-19 at the NIWTP diffuser line was sampled during October for the normal full sweep of parameters.



Pond 1, 1645-42 A, 1645-42B, and 1645-46 were not sampled in October as they were frozen. Station 1645-47 was sampled on October 2nd and 11th for pH, TSS and turbidity, during discharge into a wetland leading into Lac de Gras. The pump ran for 24 hours on October 2nd, and then shut down. The pump and water intake line was readjusted, as the water elevation was below the water intake after the 24 hours of pumping. Pumping recommenced on October 11th. The full sweep of 1645-47 prior to discharge can

be found in September's monthly report.

The 2003 Winter Dissolved Oxygen Report was completed and submitted to the Regulatory bodies. Waste Monitoring Operations Plan was completed and given to Site Services for implementation. Waste Management Plan version 7 was completed to indicate the implementation of use of the new permanent waste transfer area.

Allied Divers and a researcher from the U of A were on site to retrieve 40 incubators as part of the Blasting Effects Study.

NOVEMBER: All required sampling at the SNP stations were conducted by DDMI.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled during the month of November. Results for 1645-52a&b have been included in the report for *information purposes only*, as the water is being directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the North Inlet Storage Facility was not sampled during the month of November, as ice conditions were unsafe (thin ice). Also during the month, station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

Samples were collected at 1645-18 on a weekly schedule with no notable concerns. The inspector requested on November 11, 2003 that Fecal Coliforms, BOD, and Oil and Grease be analyzed every six days during the transfer of water from the Sedimentation Pond to the North Inlet. Sampling for these additional parameters will commence in the first week in December 2003.

Station 1645-19 at the NIWTP diffuser line was not sampled in November due to safety, as the ice was too thin to travel on. The inspector was notified at the end of the month that station 1645-19 would not be sampled due to safety reasons. Sampling will commence in December 2003.

DECEMBER: All required sampling at the SNP stations were conducted by DDMI.

Station 1645-11 (sewage treatment plant) was sampled as per the annual requirements under the water license. All parameters listed within the annual requirements were tested for, however the *E. Coli.* sample did not make it to the designated laboratory due to the bottle breaking in transport. This sample will be re-taken in January and the result provided in the January monthly SNP report.

Stations 1645-49 (Pit Water) and 1645-52 (Dike Seepage Wells) were sampled. Results for 1645-52a&b have been included in the monthly report for *information purposes only*, as the water is directed to the North Inlet Storage Facility (NISF). Once DDMI is confident in the quality of the water from the seepage wells, it will be directed to Lac de Gras. At that time, DDMI will follow the water license sampling schedule and required list of parameters.

Station 1645-12 at the North Inlet Storage Facility was sampled. Station 1645-13 was sampled in the North Inlet Storage Facility off of the North Inlet Reclaim Barge. Station 1645-16 was sampled in the Process Kimberlite Containment Facility (PKC) off of the PKC Reclaim Barge, with no notable concerns.

Samples were collected at 1645-18 on a weekly schedule with no notable concerns. The inspector requested on November 11, 2003 that Fecal Coliforms, BOD, and Oil and Grease be analyzed every six days during the transfer of water from the Sedimentation Pond to the North Inlet. Sampling for these additional parameters has commenced and are included in this report. Station 1645-19 at the NIWTP diffuser line was sampled in December, with no notable concerns.

During October 2003 sediment sample were to be taken for SNP stations 1645-19A,B, and C, however field staff inadvertently missed them. Rescheduling of the samples was to take place in November, however due to unsafe ice conditions, sampling was postponed until December to allow ice to thicken. Sam-

ples were extracted in December with no notable concerns. The collection ponds were not sampled in December as they were frozen.

The DIAND Inspector collected regulatory samples at SNP stations 1645-18 and 1645-49 on December 10, 2003. DDMI collected samples at the same time and location as the inspector. These results have been included in the monthly report.

The application for amendment to the water license regarding concentration levels of ammonia was revised and re-submitted to the MVLWB.

Operational Activities Planned for 2004

In addition to the regular environmental monitoring programs to be undertaken, Diavik plans to:

- Operate the NIWTP to treat mine inflow water and water stored in the sedimentation pond;
- Raise the east and west PKC dams an additional 5 m as per design specifications;
- Continue stripping and mining the A154 pit, mining and processing from both the north and south pipes;
- Production will continue to ramp up during the first quarter of the year, with a target for 1.7mt of ore processed for the year;
- Fisheries studies to be undertaken include:
 - Second year of the Blasting Effects Study;
 - Fish Palatability and metals study, to be run by the communities.



Kimberlite Ore for the Process Plant

5. PUBLIC CONCERNS 2003

In 2003, there were no letters directly from the communities to Diavik expressing any concerns with the operation of the mine.

The following table notes concerns from EMAB and responses from DDMI in 2003.

DATE	From EMAB to DDMI	DDMI RESPONSE
June 10	EMAB wants information on how Diavik is going to manage the fencing of the pit and PKC and how they will manage a worst case scenario involving a large number of caribou traveling toward the pit or PKC.	July 7—CSR clause refers to adaptive management by Diavik should the need arise. To date, no caribou have been found in the PKC or A154 pit area and therefore fencing is not required. Monitoring of these areas continues and should the need arise, adaptive management options will be considered. Caribou advisory procedures are in place and describe actions to be taken depending on the number of caribou on the island.
July 23	Letter regarding DDMI to fence as per the CSR, and to provide a copy of the caribou advisory policy or management plan.	September 15—DDMI wishes to meet with EMAB to discuss and review monitoring results, effectiveness of existing mitigative measures and the possible addition of fencing, if necessary, in the areas suggested.
Dec. 16	EMAB requested that DDMI go through the review by MSES of the 2002 WEMP, and respond to the questions raised.	Feb. 13/04—DDMI responded with information as requested.



Erik Madsen doing a site tour with aboriginal community partners.

6. ADVANCED TECHNOLOGY

In 2003, Diavik investigated ammonia removal technologies, including equipment to lower pH.

The equipment supplier for the NIWTP (Degremont) was on site during the week of December 8, 2003 to provide recommendations on processes for pH control. It is understood that these changes to the NIWTP constitute a “Modification” under Part I of the Water License. As soon as possible, DDMI will notify the Board of the specifics of the planned changes.

Treatment technologies for ammonia removal that have been considered are:

- Biological
- Air stripping
- Break-point Chlorination
- Ion Exchange
- Aeration Basin



Diavik Site, Fall, 2003

Biological

This is a two-step biological process that uses nitrifying bacteria under aerobic conditions to oxidize ammonia to nitrate and denitrifying bacteria under anaerobic conditions to reduce nitrate to nitrogen gas. The biological processes are temperature dependent with minimum operating water temperatures of around 10°C. The processes also require a biologically degradable soluble organic carbon energy source (methanol at 3-7 times the total nitrogen content) be added to the raw water as well as ortho-phosphorus (to around 1 mg/L). Pilot plant test work at Colomac (Appendix F) demonstrated that this process can reduce nitrogen levels to less than 2 mg/L.

Environmental limitations of this process include:

- the requirement to heat the raw water creating atmospheric emissions;
- substantial additions of methanol (soluble carbon) and phosphorus to the raw water with residual amounts discharged with the effluent;
- sludge waste that would require land disposal.

Break-Point Chlorination

This is a chemical treatment process where ammonia is oxidized to nitrogen gas. Chlorine gas or sodium hypochlorite can be used to mediate the oxidation and a follow-up chemical process (dechlorination) can be used to reduce the residual chlorine levels from the first phase with the addition of sodium metabisulphite. The process targets ammonia removal and small amounts of nitrate can be generated in the process. Pilot plant testing of this process was also completed at Colomac (Appendix F) and it also demonstrated ammonia removal to less than 2 mg/L.

Environmental limitations of this process include:

- substantial chemical additions to raw water with residuals discharges with final effluent;
- transport and handling of chemicals;
- issue of chloramines generated in effluent.

Ion Exchange

Ion exchange involves the removal of soluble ions from solution by replacing them with a different species using ion exchange resins. Selective ion exchange resins are available for ammonia and nitrate removal. The resins must be regularly regenerated. For an ammonia resin, hydrochloric acid would be used for resin regeneration. Regeneration effluent would have a pH of <6 and a total dissolved solids level of > 2000 mg/L. Ion exchange is a reliable process over a wide range of temperature conditions.

Environmental limitations of this process include:

- production of regeneration effluent (500 m³/d).
- effluent produced during regeneration requires further treatment and disposal with no viable disposal location at Diavik.

Air Stripping

Ammonia stripping is a chemical/physical process in which the pH of the wastewater is raised to 10.8 to 11.5 to convert ionized ammonia to unionized ammonia. The unionized ammonia is then stripped by air contact in a stripping tower and released to the atmosphere. The process is dependent upon air temperature, is ineffective below 0°C and most effective above 10°C. One tower (7 feet in diameter by 40 feet in height) is needed to treat 7,000 m³/d of water. Seasonally this technology should be able to achieve ammonia levels less than 2 mg/L. Nitrate levels would remain largely unaffected.

Future wastewater volumes are in the range of 15,000 to 30,000 m³/d. Seasonal treatment (perhaps

four months per year) with this process would therefore require storage of the wastewater for the remaining months. A water storage structure with capacity for some 7 to 10 million m³ would need to be developed as the current largest capacity structure (OLDSSF) is planned to be part of the wasterock storage area in the near future leaving only the North Inlet. The completed North Inlet capacity (maximum of 3.7Mm³) would be insufficient. Seasonal treatment would require treatment capacities of 40,000 to 80,000 m³/d that would require seven or more towers and a tripling of the North Inlet Water Treatment Plant.

Environmental limitations of this process include:

- ammonia air emissions;
- large water impoundment reservoir increasing the mine footprint.

Aeration Basin

This treatment alternative is similar to air stripping but instead of using towers it would utilize existing water retention in the North Inlet. Mechanical aerators would be added to enhance the volatilization of ammonia to the atmosphere. Even under ideal operating conditions, aeration basins are a substantially less reliable treatment process. While the aerators could be operated year round at Diavik, with low air temperatures and pH and water temperatures that favor ionized ammonia, only small amounts of ammonia removal are likely. The review in Appendix D includes an evaluation of potential removal efficiencies.

Environmental limitations of this process include:

- ammonia air emissions;
- high energy requirements for mechanical aerators.

Conclusion

Significant limitations were identified for all of the treatment technologies. The technologies that have a chemical process component (Biological and Break-point Chlorination) could introduce chemicals into the final effluent with potential for environmental concerns greater than is expected for ammonia. Physical process technologies that transfer ammonia from water discharge to air emission are not suited to the low air temperature, low water temperature and low pH conditions at Diavik. Engineered solutions around these constraints, employing chemical additions and high capacity seasonal treatment would also require the development of large water storage reservoirs with different environmental concerns. The least invasive technology, Aeration Basin, is unlikely to substantially remove ammonia, and would not be able to reliably achieve the current 2 mg/L limit. It is DDMI's view that none of the treatment technologies are therefore appropriate for the Diavik site.

Aboriginal Elders touring the water treatment facility at site.



7. ROLLING EFFECTS SUMMARY

Climate and Air Quality

Will the mine development affect air quality around Lac de Gras?

EA Prediction

- Ambient air quality objectives and occupational health criteria will not be exceeded.
- The mine will be a very minor contributor of greenhouse gases.

2003 Observations

- Occupational health monitoring results (total suspended particulates) were below health criteria.
- Total greenhouse gas emissions were 104,800 t CO₂ ee
- Dust deposition levels in snow are highest adjacent to the project and reduce to background levels at approximately one km from the project.
- Levels were greater in 2003 than 2002, particularly near the newly formed A154 pit.

2002 Observations

- Dust deposition levels in snow are highest adjacent to the immediate construction footprint and reduce to background at about 1 km.
- Dust deposition levels were higher than 2001 particularly near the west PKC dam construction.
- Occupational health monitoring results (total suspended particulates) were below health criteria.
- Total greenhouse gas emissions were 138,878 t CO₂ ee

Previous Years

- Dust deposition levels are within EA estimates (2001).
- Greenhouse gas emissions were 73,637 t CO₂ e (2001)

Vegetation and Terrain

How much vegetation/land cover will be directly affected by the mine development?

EA Prediction

- Approximately 8 km² of vegetation/land cover will be lost at full development.
- Slow recovery of vegetation following mine closure.

2003 Observations

- The direct vegetation/habitat loss in 2003 due to the mine footprint was 0.44 km², which is within the expected amount. Total lost to date from mining activities is 6.28 km².

2002 Observations

- 0.24 km² of vegetation/land cover was lost.

Previous Years

- Cumulative vegetation/land cover losses to end of 2001 were 2.84 km².

How will the vegetation communities outside the mine footprint be changed as a result of mine development?

EA Prediction

- Localized changes in plant community composition adjacent to mine footprint due to dust deposition

and changes in drainage conditions.

2003 Observations

- Study proposal received from the U of A for implementation in 2004.

2002 Observations

- Monitoring is every three years, starting in 2003, therefore no results to-date.

Wildlife

Will the distribution or abundance of caribou be affected by the mine development?

EA Prediction

- The regional distribution and abundance of caribou will not be affected measurably by the small (2.8 habitat units) loss of habitat.
- Caribou are expected to divert around the mine development during migrations but this would not affect the overall distribution or abundance of the Bathurst herd.

2003 Observations

- Direct summer habitat loss in 2003 from the mine footprint was 0.142 habitat units (HU's), which is within the expected amount.
- No mortalities to caribou due to the mine occurred during 2003.
- The levels of the caribou advisory monitoring remained at "no concern" (no caribou or fewer than 100 caribou) for 365 days during 2003.

2002 Observations

- Direct habitat loss was 0.083 habitat units.
- No mortalities to caribou due to mine activities.
- Caribou advisory at "no concern" for 362 or 365 days .

Previous Years

- Cumulative direct habitat loss to 2001 was 0.980 habitat units.
- There have been no mine related caribou mortalities.

Will the distribution or abundance of grizzly bears be affected by the mine development?

EA Prediction

- Approximately 8 km² of grizzly bear habitat will be lost and there will be some avoidance of the area, but the abundance and distribution of grizzly bears in the regional area will not be affected measurably.
- Bear mortalities due to mine related activities is expected to average 0.12 to 0.24 bears per year over the mine life.

2003 Observations

- Direct terrestrial habitat loss in 2003 from the mine footprint was within the expected amount at 0.423 km².
- Grizzly bears are still present in the Diavik Wildlife Study Area.
- No bear mortalities occurred in 2003.
- A bear was relocated from the East Island in June 2003.



2002 Observations

- Loss of 0.243 km² of grizzly bear habitat.
- No grizzly bear mortalities due to mine related activities.

Previous Years

- Cumulative direct habitat loss to 2001 is 2.858 km².
- There have been no mine related grizzly bear mortalities.

Will the distribution or abundance of wolverines be affected by the mine development?

EA Prediction

- Reduced ability for East Island to support wolverines will cause a localized shift in habitat use.
- No measurable change in regional population sizes or distributions.

2003 Observations

- Wolverines were present on the East Island in 2003.
- No mining related wolverine mortalities, injuries or relocations occurred during 2003.

2002 Observations

- No carnivore mortalities due to mine related activities.
- Fewer wolverines on the East Island than 2001 or pre-development.
- Food or food wastes were found at waste disposal sites during up to 50% of inspections.

Previous Years

- There has been one mine related wolverine mortality (2001).

Will the distribution or abundance of raptors be affected by the mine development?

EA Prediction

- Habitat suitability for nesting will likely be reduced.
- Mine related mortalities possible but expected to be low.
- No measurable effect on regional distribution or abundance.

2003 Observations

- During 2003, one Peregrine Falcon nest was occupied but was not productive.
- No project related mortalities occurred during 2003.

2002 Observations

- No raptor mortalities due to mine related activities.
- Productivity was higher at Peregrine Falcon nests than during pre-development or previous years.

Previous Years

- There have been no mine related raptor mortalities.

Will the distribution or abundance of waterfowl be affected by the mine development?

EA Prediction

- At full development 3.58 km² of aquatic habitat will be lost.
- Distribution and abundance of waterfowl is not expected to be measurably affected outside the local area.

2003 Observations

- Habitat Loss in 2003 was within the expected range and equaled 0.016 km² of shallow and deep water.

- Waterfowl were present at the East Island Shallow Bays.
- Waterfowl are utilizing mine-altered wetlands.

2002 Observations

- Aquatic habitat loss of 0.968 km² from A154 dike dewatering.
- Waterfowl are utilizing water storage facilities on the East Island.
- Mortality of 5 Red-throated Loons during A154 fish salvage.
- Waterfowl continue to use shallow bays of East Island.

Previous Observations

- Cumulative loss of aquatic habitat to 2001 was 0.252 km.

Fish and Water

What effect will the mine development have on water quality?

EA Prediction

- Water will remain at a high quality for use as drinking water and by aquatic life.
- Localized zones of reduced quality during dike construction.
- Nutrient enrichment likely from the mine water discharge.
- Post-closure runoff expected to influence quality of two inland lakes.

2003 Observations

- Despite the very close (60m) proximity of SNP Station 19 to the effluent diffuser, open-water and ice-cover results remain below CCME Guidelines for the protection of aquatic life.
- Ice-cover concentrations at SNP Station 19 tend to be higher and more variable than open-water concentrations. This is likely a result of increased wind driven lake circulation in the open-water resulting in better initial dilution or mixing.
- Data analysis was conducted following the approved 4 step process. The results of the first step of the data analysis identified specific monitoring locations where there were changes in the concentrations of 7 water quality parameters. Of these only total arsenic could be identified as possibly being caused by the NIWTP effluent (data analysis Step 2). Measured changes in total arsenic are within the levels predicted in the environmental assessment (data analysis Step 3) and are below levels that would cause environmental effects.
- The results for several of the parameters indicated a possible change when the actual reason for the positive results was a low baseline statistic. There are also locations (LDG50) or parameters (nitrite at LDG46) where baseline data are not available and so the data analysis is not possible. It is therefore recommended that in the future the data analysis method be modified so that the baseline references are from the combined mid-field and far field sites instead of each individual monitoring site. This change would reduce the number of false positives results.

2002 Observations

- Water quality at all Lac de Gras monitoring locations, including sites immediately adjacent to effluent diffuser remained high.
- Increases from location specific baseline levels were measured for turbidity and suspended solids at 3 mid-field monitoring stations, however all remained within typical baseline values for the area.
- Predicted nutrient enrichment effects were not realized although phytoplankton biomass was determined to have increased over baseline at one far-field location but not at any mid-field locations.
- No trends or specific concerns were noted for zooplankton, benthic invertebrates and sediment quality, based on two sampling results.
- Snow chemistry results were all below discharge limits.

Previous Years

- Localized increases in turbidity, suspended solids and aluminum were measured due to dike construction.
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- Water and sediment quality, zooplankton, phytoplankton and benthic invertebrate results were generally consistent with baseline, however some results, particularly benthic invertebrate numbers, showed larger year-to-year variability.

What effect will the mine development have on water quantity?

EA Prediction

- Water supply to the mine is not limited and use of the resource will not cause changes in water levels and discharges from Lac de Gras beyond the range of natural variability.

2003 Observations

- Consumptive water use totaled .52Mm³.
- Treated effluent discharged 6.9Mm³.
- Approximately 1.0 Mm³ water stored for treatment and discharge in 2004.

2002 Observations

- Consumptive water uses totaled 0.17 Mm³.
- Treated effluent discharges totaled 4.12 Mm³ with approximately 3.5 Mm³ water stored for treatment and discharge in 2003.

Previous Years

- Consumptive water uses totaled 0.19 Mm³ in 2001.
- Treated effluent discharges totaled 0.06 Mm³ with 2.9 Mm³ water stored.

What effect will the mine development have on fish?

EA Prediction

- On a regional scale the only effect on the fish population of Lac de Gras would be due to angling.
- Locally effects due to blasting, suspended and settled sediment from dike construction, increase in metal concentrations around dikes and post-closure runoff.

2003 Observations

- No fish were taken by recreational fishing from Lac de Gras by DDMI.
- Fish palatability is good.
- Metals levels in fish sampled for tasting were as expected.
- Sediment deposition rates measured during the construction of the A 154 dike were below levels predicted in the Environmental Assessment. See A154 Dike Program report for summary.
- Blasting Effects Study initiated.

2002 Observations

- No fish were taken by recreational fishing from Lac de Gras by DDMI.
- Measured sediment accumulation near dike construction activities was within the predicted range.
- 2526 fish were salvaged from inside the A-154 dike pool area and released in Lac de Gras.

Previous Years

- No fish were taken by recreational fishing from Lac de Gras by DDMI.
- Turbidity and suspended solids levels elevated due to dike construction activity remained below the threshold effects levels outside the silt curtain.
- 526 fish were salvaged from the North Inlet and released to Lac de Gras.

Table 1: 2003 Compliance Summary

Inspection Date	Issue	Issue Response
January 15	Provide construction schedule for the A154 truck refueling station.	Provide to inspector, plus arranged meeting within Site Engineers.
March 12	Have spill kit available at the A154 refuelling station offloading area.	Done April 16
April 16	Implement weekly dam and dike inspections.	Inspector reviewed data June 24 & 25.
	Ensure all drainage from the A154 refuelling pad is to the sump.	Completed
May 14	Place spill kit near the fuel tank for the pump generator on the pervious dam at the sedimentation/clarification ponds.	Fuel tanks removed, pumps are now tied into the permanent power supply.
	Plan needed to deal with runoff in the crusher area, where water has formed ponds.	Inspected June 24.
May 29—LUP	No major concerns were noted.	
	Provide updated coordinates and maps to the Inspector once the drilling program is complete.	
June 24—25	Put a barrel in place at the fuel station in which to store the nozzle.	Done July 30.
	Provide updated spill follow-up maps.	Completed
	Scrape up small spills as noted.	Done July, 2003 and ongoing
	AN bags stored outside to be used or moved inside the new storage facility.	Done July 8
	Develop dust control plan for the crusher.	Done July 8 – Inspected Aug.13
	Zinc exceedences may be inability of lab to measure low concentrations. DDMI to initiate triplicate sampling to test lab's detection limits. Results to be forwarded to Inspector.	Have completed, documentation to follow, March 2004.
	Inspector to receive preliminary zinc results as they become available.	Have provided.

Inspection Date	Issue	Issue Response
July 30	Operating plan required for the Landfarm.	Waste Transfer Operation Plan submitted.
	DDMI urged to complete triplicate split sampling at 1645-18 for zinc, to define the capability of the lab to precisely measure it.	Have completed, documentation to follow.
August 13	Updated PKC Operation plan required due to change in dewatering procedure.	Will be addressed in the annual report to be submitted in March 2004.
September 2	Clean up small hydrocarbon spill next to the berm at the A154 refuelling area.	Completed
September 24	Sampling frequency for fecal coliforms, BOD and oil and grease at 1645-18 can be reduced to monthly as license limits are consistently being met.	Ongoing
	Pond 10 to be pumped out on a regular basis to prevent seepage until repaired.	As required
October 22	Fuel handling precautions to be used on the A154 dike and spill kit required when generator and heater in place for exploration drilling within the pit.	Increased size of spill kit for area. Area to be scraped after decommissioning.
	Provide written results of zinc QA sampling to Inspector when available.	Will provide to the inspector once the program has completed.
	AN bags outside to be stored inside storage building.	AN bags outside different than those inside and cannot be mixed so they were placed on Geotextile liner and covered with a tarp.
	Remove inert garbage from landfarm cell. This area is for contaminated earth materials only.	Will be completed in the summer of 2004.
November 26	Sampling for oil, grease, fecal coliforms and BOD at stn 1645-18 required due to dilution of the NI with PKC water.	Have added parameters list for SNP station.



Table 2: Environmental Monitoring Programs 2003

	Purpose of the 2003 Monitoring	Key 2003 Activities	Key Results
Dust Monitoring	Determine if environmental assessment predictions are accurate. To inform management when dust levels require management response.	Ongoing notification to Operations for dust suppression. Summer and winter dust sampling to determine extent of dust dispersion related to operations activities.	Dust suppression using water is effective for reducing dispersal of dust during non-freezing periods. Dust deposition rates are higher close to operational activities.
Meteorological	Measure/detect meteorological trends. Determine influences on site water balance. Provide design and construction information to operations.	Measured: <ul style="list-style-type: none"> • Horizontal wind speed and direction and standard deviation of horizontal wind direction; • Ambient temperature; • Relative humidity; • Precipitation – rain and snow; • Incoming solar radiation; • Evaporation rates. 	On going collection of site-specific data including evaporation data. In-house analysis of data undertaken.
Water Quantity	Measure limits, sources and purpose of water consumption as established in water licence.	All water used for consumption and operations is metered. PKC Facility levels monitored. All make-up water measured.	Total water used for operations, including consumption, domestic use, dust suppression, and PKC make-up was 517,263 m ³
Water Quality Compliance	Monitor effluent limits as required by water licence.	Collected and analyzed samples in compliance with the water licence at required SNP locations. QA/QC program for sampling and analysis revised, approved and implemented.	Results of monitoring are consistent with baseline data and compliant with water licence requirements. Water licence amendment application submitted, to adjust how ammonia is measured. Awaiting approval.
Aquatic Effects	Collection of information to determine the short and long-term effects in the aquatic environment resulting from the project.	Samples collected at AEMP sites for: water quality, phytoplankton biomass, zooplankton biomass and sediment chemistry.	No observed effects.
Wildlife	Determine if predictions in environmental assessment are accurate. Assess the effectiveness of mitigation strategies.	Caribou monitoring for; <ol style="list-style-type: none"> 1. Numbers on Island; 2. Mitigation effectiveness; 3. Aerial surveys, in conjunction with BHP Billiton. <ul style="list-style-type: none"> • Raptor and waterfowl monitoring. • Wolverine Track Surveys for presence • Grizzly Bear habitat plot surveys for presence • Carnivore mitigation effectiveness monitoring. 	<ul style="list-style-type: none"> • Grizzly Bear relocated in June 2003.
Wildlife Habitat (Vegetation)	Determine if environmental assessment predictions (linked to wildlife program) are accurate. Determine extent of loss of vegetation/habitat.	Survey extent of mine footprint.	Total habitat used within expected limits except for birch seep riparian shoreline habitat where an additional 0.0028km ² was lost.
Fisheries	Fisheries authorization requirement. Establish additional baseline information. Initiate long-term monitoring programs and identify control sites. Test Monitoring methodology. Test modeling predictions.	Completed required Dissolved Oxygen sampling; Fish palatability study conducted in conjunction with EMAB. Initiated Blasting Effects study. Completed Lakebed Sediment, Water Quality and Benthic Invertebrate Study post dike construction.	Dissolved oxygen profiles consistent with baseline. Fish continue to taste good. Texture and metals results within expected limits. No noted effects. Baseline and first year post construction results of the benthic invertebrate analysis suggest that benthic invertebrate abundances are highly variable among years in Lac de Gras, likely as a result of natural factors. Based on the results of this study, another monitoring cycle is recommended in 2005, using the same study design, to confirm the general lack of effects in the vicinity of the A154 dike. It is also recommended that the 2005 program be expanded to include the A418 dike baseline survey.