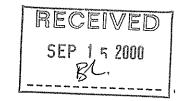


# INDEPENDENT ENVIRONMENTAL MONITORING AGENCY

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September 15th, 2000



Gordon Lennie Chairperson Mackenzie Valley Environmental Impact Review Board Box 938 Yellowknife, NT X1A 2N7 Fax-920-4761

Re: Technical Comments on BHP's Environmental Assessment Report (EAR) for the BHP Diamonds Inc. Beartooth, Pigeon and Sable Kimberlite Pit Mine Extension

Dear Mr. Lennie:

The Independent Environmental Monitoring Agency (The Agency) has completed its examination of BHP's Environmental Assessment Report for the BHP Diamonds Inc. Beartooth, Pigeon and Sable Kimberlite Pit Mine Extension, along with information received from BHP in response to information requests made by us. This letter summarizes our review of the environmental information pertaining to the proposed projects.

The document is generally well written and presented. The Agency finds that the proposed treatment for most subjects to be adequate

The Agency's comments focus mainly on information inadequacies that have not been satisfied in either the EAR<sup>1</sup> or the responses to our information requests.

All references are to the EAR; unless otherwise specified.

SPECIFIC ASSESSMENT METHODOLOGY [SEC. 4.2.2]

Of some considerable concern to the Agency is the assessment of significance of impacts throughout the report. These assessments rely on "professional judgment" with no description of who is applying this judgment; or the process used for the determination of any particular significance. Tables 4.3-4.6 do not indicate a clear means of determining significance. It appears considerations have been chosen arbitrarily with no consistency. While we acknowledge that determining significance of impacts is very difficult, the interpretation of significance is a core component of good impact evaluation. Each of these selection determinations requires transparency and detail in the factors and people making such determinations.



<sup>&</sup>lt;sup>1</sup> EAR for Sable, Pigeon and Beartooth Kimberlite Pipes; BHP; April 2000

## AIR QUALITY [SEC.4.3.1]

The EAR recognizes that dust emissions represent the largest source of air emissions at the site and, therefore, the largest potential source of airborne contaminants to the surrounding land. The report concludes generally that the effects of air emissions and fugitive dust will be negligible. While this may be the case, data and analysis to support this conclusion have not been presented. It is inappropriate to assume that all particulate matter is "dust" which will settle out quickly from each source type.

For an accurate understanding of airborne emission impacts, substantial enhancements to BHP's current monitoring programs are required. First, it is clear from BHP's 1998 snow survey and vegetation studies that elevated levels of some contaminants are found at selected sites adjacent to the mining activities. Data from the 2000 surveys have not been provided even though requested. Since airborne particulate matter can have a number of sources (both within and without the mine site), it is important to characterize the chemical nature of the particulate matter being sampled. This will assist in determining the contribution of various sources to the contamination being observed. The current monitoring programs provide no chemistry for the TSP being measured.

Second, there do not appear to be any measurements of combustion source emissions other than estimates provided by the 1995 EIS<sup>2</sup> modeling. Emission factors and modeling results have not apparently been verified by subsequent monitoring. Such data, along with chemical profiles for fugitive dust sources are required to properly interpret snow and vegetation sampling data.

#### Recommendation

While this cannot be resolved immediately, the Agency recommends that regulators involved with air discharge permits review the current air quality-monitoring program at the appropriate time with a view to improving its design and adding a source characterisation program.

### **VEGETATION [SEC.4.4.1.3]**

The report describes the total amount of each habitat type that will be lost to the development footprint. The lost areas are also shown as percentage losses for the local study area, the claim block, and the regional wildlife study area. The report states that the effect (vegetation loss) may be considered reversible because "vegetation that does eventually recolonise the area will be characteristic of the local study area." However it should be noted that BHP has stated<sup>3</sup> there is considerable growth at the existing minesite of plants not native to the local area; seeds are being brought in possibly on workers boots, or equipment.

<sup>&</sup>lt;sup>2</sup> NWT Diamonds Project, Environmental Impact Statement; BHP, DIAMET

<sup>&</sup>lt;sup>3</sup> John Witteman, BHP; IACT Meeting, 25th August 2000

The report concludes, "because the area of impact is so small, the effect is rated as negligible." To gain a proper understanding of the significance of footprint impacts, the loss of each habitat type should have been compared to the amount of that habitat type available in some larger, ecologically relevant zone, not to arbitrarily chosen units such as the claim block. Significance might also be related to the value of a particular habitat type to its resident animal species. A more realistic and conservative conclusion would be that the effect is permanent rather than reversible. The final rating of "negligible" might yet be correct, but it cannot be supported until the relative ecological significance of each habitat type loss is evaluated.

## WETLANDS [SEC. 4.4.1.3.5]

Wetland loss effects are rated as "negligible" because the amount of wetland habitat to be affected is a small percentage of the local study area. Again, this assumes that all habitat types are of equal value. The significance of the effect needs to be determined on the basis of the loss of this habitat type with the total amount of it available within some ecologically relevant boundary, and its relative value to species depending upon it. These factors appear not to have been fully considered in the assessment, so that the true ecological significance of the loss remains uncertain.

## HERITAGE SITES [SEC. 4.4.1.3]

The EAR notes that portions of the proposed development area "have not yet been adequately surveyed with regard to archaeological resources." Subsequent conclusions are made that the magnitude of any impacts is "judged to be low and the general significance to be negligible." A complete archaeological assessment of potentially disturbed sites would have been desirable to support the conclusion.

BHP's stated intentions to have the requisite monitoring and fieldwork done to locate and mitigate (remove artifacts) sites prior to disturbance appear reasonable, and should avoid impacts to any archaeological resources in the development area.

## WASTE ROCK STORAGE AND DRAINAGE [SEC. 4.5.1.5]

The Monitoring Agency conducted an independent review<sup>4</sup> of the waste rock geochemistry information and formulated our conclusions below based on our own assessment of the EAR and the independent report. Our comments here are directed, first, at the work presented to predict water quality and, second, at the mitigation measures proposed.

### Site Water Quality Predictions

The EAR presents some preliminary geochemistry data for waste rock and kimberlite samples from the three pipes. The information includes whole rock elemental composition

<sup>&</sup>lt;sup>4</sup> Environmental Geochemical Data for Sable, Pigeon and Beartooth Pipes; MDAG; July 30th, 2000 & August 12th, 2000

and static acid-base accounting (ABA) testwork for some kimberlite and waste rock samples from each of the three pipes.

A subsequent addendum from BHP<sup>5</sup> provides plan views of the sample locations for the ABA tests that were conducted. Problems exist with both the data and the analysis of the data. For the following reasons the data presented appear less than satisfactory for predicting waste rock drainage:

- no description that matches the samples taken to geologic units has been provided so that representativeness of samples cannot be determined;
- no cross-section of sample drill holes for the 3 pipes have been provided so
  it is impossible to determine whether sampling is sufficient to reflect geology
  and final pit outline;
- sample numbers in the data tables do not correspond to the sample numbers on the drill-hole location maps, so it is impossible to correlate results with location;
- on the basis of the static ABA tests the report concludes that generally "waste rock samples are net acid consuming or essentially inert with respect to acid generation". This conclusion is invalid. ABA tests only report the relative amounts of acid generating potential (AP) compared to neutralizing potential (NP)—they say nothing about reactive rates and, particularly, about whether a rock will be "inert" or not.
- the report makes no allowances for unavailable neutralizing potential in its discussions of potential acid generation, and hence the conclusions about available NP are not conservative. The net neutralizing potential could be significantly less than indicated, which would result in much more of the waste rock from the three pits having no significant NP under field conditions. The result is that even minute amounts of sulphides could generate net acidity at these sites.
- the report correctly points out that kinetic testing is required to determine metal leaching rates and water quality, but then notes that kinetic testing has not yet been conducted. A subsequent conclusion is made in the report that no significant concerns with respect to metal leaching have been identified in the testwork to date. This is not surprising since the testwork has not been done. Consequently, very little can be concluded about the potential for metal leaching on the site.
- kinetic testing is also required to predict rates of any acid or alkaline reactions in the waste rock that would characterise drainage; since these tests have not been conducted there are no reliable predictions about potential waste rock drainage quality. The report states that "the next stage of assessment" will include quantification of waste rock volumes as represented by the sampling done, as well as kinetic testing. This work was required at

<sup>&</sup>lt;sup>5</sup> Response to Information Request #2 from Bart Blais, Water Management and Planning, DIAND. May 24, 2000.

the present stage of assessment in order to make meaningful predictions about site water quality, assess potential impacts, and develop robust mitigation measures if required.

- geochemical characterization of rocks requires qualified, registered professionals to supervise sampling, lab work, and interpretation of results. The report provides no indication of who conducted this work.
- QA/QC in ABA data tables (Appendix C) has the following deficiencies:
  - plotting paste pH against NP shows no significant trend of decreasing pH as NP decreases, which it should. No explanation is offered for this inconsistency;
  - some samples show up on two different tables (4 & 10) as either waste rock or kimberlite—it is not clear which;
  - at least one sample is listed twice on Table 10 with different values:
  - reporting of low values is variably given as "0", "N/D", or "<" which suggests the possibility of different detection limits or transcription errors. Since analyses can yield only amounts less than the detection limit, descriptions of rock containing "no sulphides" are incorrect.

The Agency therefore concludes that the sampling and data analysis reported in the EAR are inadequate to render a clear and accurate understanding of water quality that might be expected from the proposed waste rock dumps. BHP's conclusions about "not expecting" net acid generation and metal leaching from waste rock may be true, but this cannot be substantiated on the basis of the work reported. Given apparent emerging water quality problems with waste rock run-off at the existing operations (which were not originally predicted), the conclusion is also not conservative. Further work is needed to make meaningful conclusions, and the report recognizes that further testing is required. However, BHP has stated that this testwork will be left to the "next phase of pit design". This work should rightly have been a part of the present environmental assessment if, as we assume, an understanding of potential impacts is to be gained prior to regulatory licensing.

#### Recommendation

The Agency recommends that the MVEIRB require BHP to complete the kinetic test program and analysis, and submit the results prior to the approval of this project by the MVEIRB or as part of its application for a water license.

### Proposed Mitigation & Management

In its plans for managing waste rock disposal, the report states that "the data obtained to date has identified no potential for acid generation that cannot be readily managed by proper waste rock pile construction practices." [p.2-37] This is not a conservative conclusion, for two reasons at least. First, the frozen perimeter berms proposed for the construction of

waste rock dumps are speculative and experimental<sup>6</sup>, as BHP has rightly acknowledged in an addendum to the EAR.<sup>7</sup> This technique remains to be tested for its efficacy at controlling undesirable waste rock drainage. Second, without meaningful predictions about run-off water quality, particularly metal leaching, we can have no assurance about the appropriateness of a proposed mitigation measure.

Finally, one of the most important ways of mitigating potentially adverse effects is through the adoption of alternative approaches to the project that would greatly reduce, if not eliminate, impacts. Such an approach is to be found in underground mining, and this is the basis of the request we made previously to BHP to supply either an analysis of the non-viability of mining for technical or economic reasons or, alternatively, an assessment of the impacts of the underground approach. Contrary to what is stated in the EAR, the possible adverse environmental impacts of storing tremendous volumes of potentially reactive waste rock on surface would be greatly reduced by leaving most of this rock in the ground.

BHP's contention that underground mining of the new pits is not viable for economic or safety reasons may be correct, but it is not supported by the limited information presented. This is particularly true since the company in any event intends to mine the deeper portions of some pipes by underground methods. Clearly, economic and safety concerns can be overcome. What remains to be demonstrated through a proper analysis is just where the line of viability for underground mining the pipes can be drawn and whether, in fact, an all-underground approach would provide a profitable venture.

This is an issue that apparently will not be resolved as part of this assessment. However, the Agency remains concerned that what may well be a solution to perhaps the most significant long-term environmental management issue on the claim block is escaping rigourous public analysis. Because of implications surface waste rock disposal has for cumulative effects upon terrestrial and aquatic ecosystems in the region, this is an issue that demands priority attention by assessors and government regulators for all new pipe developments in the diamond fields. Perhaps an independent evaluation, as suggested by BHP in its response document, is the right next step.

Further, the plan to use frozen-core berms to control any future adverse drainage from waste rock piles is worrisome also from the perspective of global warming. While BHP and others have conducted some short-term (i.e. ≤50 years) computer modeling, a longer-term view would be valuable given the recent data on arctic warming trends. If it should turn out that the waste rock piles have a significant potential to generate undesirable drainage under future (perhaps unfrozen conditions), then BHP's proposed management approach should not be accepted without very careful consideration. This is not a unique situation, and the Board will be faced with a number of such proposals from BHP and others over the years ahead.

<sup>&</sup>lt;sup>6</sup> Despite BHP's repeated statements "The new pits will be developed by methods and technology already in use at EKATITM" pg. 2-18 EAR; "No new processes or methods are proposed" pg. 2-20 EAR

<sup>&</sup>lt;sup>7</sup> "It is a new concept that has not been used to date." Response to Information Request #4 from Bart Blais, Water Management and Planning, DIAND. May 24, 2000. See also Response to Information Request #1 from Christa Domchek, Fisheries and Oceans Canada. June 29, 2000.

### Recommendation

The Agency recommends that the Board undertake an independent evaluation of the applicability of frozen-core berms to permanently control waste rock drainage at the earliest opportunity.

## SABLE PIPE AQUATIC EFFECTS [SEC.4.5.2.4]

The EAR notes that the concentration of suspended solids in water released from Two Rock Lake will depend upon effectiveness of the semi-pervious dam built in the lake. While immediate downstream aquatic values are relatively low, according to the EAR, contingency plans should be described to deal with high TSS levels in the event that the dike is not able to achieve regulated limits. The monitoring currently being done for aquatic effects in the Koala watershed should be expanded to include the downstream reaches in the Exeter watershed. Such plans should accompany the application for the water licence.

The EAR contends that the fish populations of Sable and Two Rock Lakes are isolated and do not contribute to genetic exchange with other populations lower in the Yamba and Exeter system. While the biophysical conditions admittedly are poor to permit such an exchange, the assertion has not been demonstrated. If such an important claim is to be sustained, this should be further investigated in the field. BHP's contention would imply that the fish populations in these "isolated" lakes may be genetically distinct so that their extinction would have biodiversity implications.

The EAR concludes that the effects of the Sable development will be reversible. This assertion has not been demonstrated, primarily because the plan to flood and recreate fish habitat in Sable pipe is not yet demonstrated in its effectiveness to replace original fish habitat

It is the Agency's view that the "temporary" loss of productive fish habitat both <u>during</u> the operation and <u>until</u> it is effectively reclaimed is rightly a matter for consideration under the fish habitat compensation (No Net Loss) policy. The issue has been ignored in the proposals for habitat compensation to date.

## BEARTOOTH PIT RECLAMATION [SEC.4.5.5]

BHP proposes that Beartooth pit be filled with processed kimberlite slurry as part of its reclamation, "provided that testing shows this material will not cause deterioration in water quality." [p.4-123] The EAR notes that the filling of pit lakes with processed kimberlite is experimental, and that it cannot readily be predicted when conditions in the reclaimed lake would once again be suitable for fish.

The details of the proposed testing have not been provided but, given the experimental nature of the backfilling and unresolved issues relating to kimberlite toxicity, it would be prudent to investigate the proposal as early as possible. This would allow the development

of contingency plans in the event that backfilling of kimberlite turned out not to be desirable.

### Recommendation

Accordingly, the Agency recommends that the environmental feasibility of the approach be further documented as part of the water licence application for Beartooth pipe, and that this include an updated geochemical characterization of slurry solids and pond water from the lower end of cell B in Long Lake, along with the results of toxicity testwork currently being undertaken in the impoundment facility.

## WILDLIFE AND HABITAT [SEC. 4.6]

Overall, the assessment of impacts on wildlife was discussed with sufficient detail to permit a judgment of residual effects after mitigation measures. The Agency focuses our comments on the two following issues that deserve special consideration by the MVEIRB.

Impacts of road traffic on caribou distribution and movements [Sec. 4.6.1.1.3.2]

BHP discussed the impacts of road traffic along the Sable road, either as a single source of disturbance, or as a cumulative source of disturbance (e.g., in addition to disturbance along other haul roads in BHP's claim block).

The Agency requested additional information<sup>8</sup> about traffic volume along the Sable Road. BHP estimates in its response that traffic by haul trucks will peak at 8.3 units per hour (198 one-way trips per day), and by other vehicles at about 1.3 units per hour (30 one-way trips per day). However, these figures are "averages" assuming a uniform distribution of traffic, 24 hours per day, 365 days per year. These rates average to 9.6 vehicles per hour. Obviously there will be daily and seasonal variations in traffic. BHP does not provide any estimates for such variation. Also, BHP does not provide any estimation of traffic volume during road development.

The literature cited by BHP (section 4.6.1.2) makes reference to effects of traffic volume on caribou movements and distribution when traffic exceeds 10 vehicles per hour or so. The yearly average traffic volume along the Sable road approaches such a threshold value. Considering daily or seasonal variation, traffic volume will likely exceed at times 10 vehicles per hour. Hence, traffic should be considered a significant source of disturbance for caribou movements and distribution. This note of caution is even more important considering the Sable road will traverse two esker systems used extensively by caribou during migration

#### Recommendation

The Agency recommends that the MVEIRB seek the following specific terms and conditions for vehicle operation in order to mitigate impacts on caribou movements and distribution;

- traffic volume per day should be recorded and reported to regulatory agencies.
- traffic volume per day should not exceed a specific limit e.g. 200 one-way trips during caribou migration periods.

<sup>&</sup>lt;sup>8</sup> Information Request "Impacts Road traffic on Caribou" IEMA; July 14th, 2000

- road development should not take place during caribou migration periods (due to the high -volume of traffic during construction).
- road design should be "low profile" as much as possible.

## Impacts of Infrastructure on Grizzly Bears [Sec. 4.6.1.1.3.3]

BHP made a commendable effort to assess direct and indirect impacts of the Sable road and other infrastructures on grizzly bears (section 4.6.1.2). The Agency appreciates the difficulty in assessing such impacts. Also, the Agency is aware of the excellent "track record" of BHP in avoiding attracting grizzly bears to the mine site (through excellent operation procedures to handle waste food) and in avoiding mortality due to collisions along roads (through setting stringent speed limits and giving wildlife the right-of-way).

However, the grizzly bear is a vulnerable species and is known to be highly sensitive to human disturbances. From the Agency's point of view, the greatest potential impact is the possibility of displacement of grizzly bears along the roads, which will contribute to "indirect" losses of habitat. Admittedly, displacement of grizzly bears due to human activities is a tough and a complex ecological question. Based on the precautionary principle, indirect losses of habitat for grizzly bears due to roads should be viewed as possibly significant, but undocumented at this time, for the purpose of the review process.

# CUMULATIVE EFFECTS ASSESSMENT [SEC. 4.9]

The spatial boundaries used for evaluation of cumulative effects of the proposed project on the Bathurst caribou were set to include the migration corridor of the herd, exclusive of the calving ground and the traditional wintering range [Sec.4.9.5.1.1]. While this may be a suitable choice, no ecological justification is provided for these boundaries. It also appears inconsistent with the cumulative effects assessment undertaken by Diavik, which recognised that herd level effects might be affected at the calving grounds with respect to conception rates and birthing success.<sup>9</sup>

The EAR notes that a number of caribou experts have suggested that energetics represent the most likely pathway by which disturbance effects could be manifested at the population level. [Sec.4.9.7.2.4] However, in its subsequent analysis of habitat loss effects from development footprints and zones of influence, the cumulative results are presented only as percentage losses in the herd's annual range. While area losses for each habitat type are identified, there is no correlation with the significance of individual habitat types for energetic considerations. To conclude, for example, that a 3 km zone of influence around all developments yields a potential reduction in habitat effectiveness of 117,644 hectares, or approximately 0.47% of the caribou's annual range, does not provide any evaluation of the ecological effects due to increased energetic demands there may be for the herd. Hence an ecologically meaningful conclusion about cumulative effects from reductions in caribou habitat effectiveness cannot be drawn.

Axys Environmental Consulting Ltd. Assessment of the Energetic Effects of Exposure of Caribou to the Diavik Diamond Mine Project. Diavik Diamonds Project, Lac de Gras, Northwest Territories. April, 1999.

The EAR states on page 4 – 287 that CEAA requires "the associated need to manage cumulative effects on a project-specific basis." This is simply not true: Cumulative effects by their very nature refer to the potential impacts from many human activities, and in the assessment of impacts to the calving, migration routes and wintering areas of the barren land caribou, this must include the growing number of activities in the region. Therefore the monitoring and management of cumulative effects on the caribou must extend beyond the individual project.

BHP cannot be solely responsible for the development of this mechanism (for cumulative effects monitoring). This as previously noted<sup>10</sup> by the Agency lies within the responsibility of the Government of the Northwest Territories, and the company must acknowledge its responsibility to collaborate with others to ensure any implemented cumulative effects monitoring program achieves its purpose.

## FISH and AQUATIC HABITAT [SEC. 4.9.4.4]

BHP has stated that Beartooth Lake, Big Reynolds Pond, Sable Lake and Two Rock Lake do not constitute a fishery as defined by the Fisheries Act (pg. 4-235 EAR). Similar statements were made by BHP in relation to the Misery Project. The Agency is not convinced this is the case.

#### Recommendation

The Agency suggests that the MVEIRB seek a formal clarification of this issue from the Department of Fisheries and Oceans.

BHP has determined in the EAR that there is very little opportunity for genetic exchange within the lakes mentioned above; therefore the effect of the loss of these lakes would have little effect on population genetics within the region. As mentioned above in our evaluation of the Sable Pipe aquatic effects, the Agency is concerned about these statements; BHP has not carried out field studies to determine movements of fish between populations, or looked at DNA to determine whether there is exchange or long-term isolation. Therefore there cannot be any certainty regarding predictions about what opportunities exist for exchange or on the potential impacts from losing this genetic pool. The amount of genetic exchange required to counter the effects of inbreeding is likely very small; a few fish every few years. If in fact these lakes do represent genetically isolated and therefore likely unique populations, the impacts from a biodiversity perspective may be more significant than if the populations are linked to the larger aquatic ecosystems.

### Recommendation

The Agency believes that more field research is required to investigate genetic exchange within these water bodies and the impacts of the extinction of these populations.

BHP has described how the Pigeon Stream Diversion channel will be engineered to achieve No Net Loss. BHP should describe in detail the engineering of this structure. A

<sup>&</sup>lt;sup>10</sup> See Recommendation #16; IEMA Annual Report 1999/2000; IEMA; March 31st, 2000

presumption is made that no net loss will be achieved. No one knows whether the Panda Diversion has actually achieved this, since there is no quantative baseline describing what was lost. Potential impacts need to be described in the event that the Pigeon Stream Diversion Channel cannot reach the goal of no net loss.

### Recommendation

The Agency recommends a "no net loss" plan be required as a part of the companies application for a water license.

The Agency is concerned with the EAR assertions that there will be no cumulative effects due to the permanent loss of Big Reynolds Pond. The very nature of cumulative effects is to look at the effects of losses from not only Big Reynolds but also other lakes lost throughout the region; those lost in the Koala Watershed, the Yamba and Exeter Watershed, and those lost on the East Island due to the Diavik project. This combines to a total of over twenty lakes, and assuming an average of three species per lake, possibly sixty species populations within the region. BHP should recognise this as a significant potential cumulative effect on fish populations within the region.

### MONITORING

The Agency generally commends BHP's use of monitoring results in preparing this EAR. However, BHP should focus not only on identifying absolute levels, but also examine the trends in monitoring data. Trends can be used as an early warning indicator of potential problems and hence lead to better adaptive environmental management. An example of this is the Kodiak Lake problem BHP encountered. At the time of detection of the problem, absolute levels were acceptable. However the trend to unacceptable levels was clear. Examining trends could preempt other such situations occurring.

The above concludes our comments on BHP's EAR for the three proposed pipe developments.

Please also accept this letter as notification that the Independent Environmental Monitoring Agency wishes to make a presentation at the public meeting planned for later in this month on the BHP expansion. At this meeting the Agency may have further recommendations to the board about the course of the environmental assessment and regulatory process from this point on.

If you have any questions relating to the Agency's comments, do not hesitate to contact Zabey Nevitt, Manager at (867) 669-9141, email monitor@yk.com.

Sincerely,

Red Pedersen Chairperson

CC: The Agency's Society Members: Akaitcho Treaty 8, Dogrib Treaty 11, North Slave Metis Alliance, Kitikmeot Inuit Association, DIAND, GNWT and BHP.