



INDEPENDENT ENVIRONMENTAL MONITORING AGENCY

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January 31, 2007

Ms. Violet Camsell-Blondin
Chairperson
Wek'eezhi Land and Water Board
c/o Box 2130
Yellowknife NT X1A 2P6

Wek'eezhi Land
& Water Board

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FEB 01 2007

Dear Ms. Camsell-Blondin

Application # MN 200342-0013
Copied To SB

Re: BHP Billiton Geochemical Characterization and Metal Leaching Plan

The Agency is pleased to submit our comments on the Geochemical Characterization and Metal Leaching Plan submitted by the BHP Billiton (BHPB) on November 20, 2006 to your Board.

We have conducted a preliminary review of this report, and have no comment on the results reported other than the work is thorough and aids in interpreting the annual seepage reports. We should also state that the recommended changes to the rock geochemistry sampling program are reasonable and that we support them, now that we have good and consistent data on rock types.

We note from the new water licence requirements (see Part F 2(viii)) that BHPB is now required to carefully consider the linkages and management implications among the Geochemical Characterization and Metal Leaching Plan, Seepage Reports, Aquatic Effects Monitoring Program, and the Waste Rock and Ore Storage Management Plan. We look forward to a discussion of these linkages and management implications in relevant future submissions from BHPB.

The Agency offers a general summary of the draft Plan with some observations in the attached Appendix.

Sincerely,

Bill Ross
Chairperson

cc. Brent Murphy, BHP Billiton Diamonds Inc.
Society Members



**Appendix to IEMA Comments on
Geochemical Characterization and Metal Leaching Plan**

1. The report was submitted to the WLWB on November 20, 2006 as a requirement under Water Licence clause F.2a. The report is a thorough update on the sampling that has been done to characterize the geochemistry of the dominant four rock types and to explain what water quality problems associated with waste rock piles are likely to exist and how they will be managed in the long-term. There are no surprises from what we knew before:
 - a) granite is the most abundant waste rock and is the most geochemically inert;
 - b) schist (or metasediment) is common at Misery and Beartooth pipes and, while it has generated acidic water in the laboratory, it has to date shown no capacity in the field to do so;
 - c) diabase is the least abundant rock type, has some elevated sulphide levels, but is not expected to have ARD generating potential;
 - d) kimberlite, particularly mudstone inclusions, does have elevated sulphides, but also has substantial carbonates to neutralize any acidic water that might result from sulphide oxidation and is defined as “not potentially acid generating”.
2. Seepage from the coarse kimberlite rejects (CKR) pile reveals that pH can reach 3.9 and that elevated levels of several metals (aluminum, copper, iron, silica, arsenic, chromium, lead) can result. The report notes that this seepage presently reports to the Long Lake Containment Facility (LLCF) and so ‘has no direct impact on the receiving environment’. Post-closure implications of this are not discussed.
3. The report notes that the major factor controlling water chemistry in the LLCF is the underground connate water being discharged there, not the loadings from the tailings discharge.
4. New data on tailings pore water quality are provided. Notably, copper, molybdenum and cadmium appear to be concentrating in the pore water (which benefits LLCF discharge quality to Leslie Lake in the long-term).
5. The report references a 2006 study by Rollo and Jamieson which concluded that the high sulphate levels in the tailings water were not coming from sulphide oxidation, but from calcium sulphate minerals contained in mudstone inclusions in the kimberlite. There was little evidence of sulphide oxidation of the pyrite in the mudstones (source of both sulphate and sulphide), which supports SRK’s theory that observed acidic drainage downstream from the CRK piles is not the result of sulphide oxidation.

6. The report notes that [1] there is on-going work to confirm SRK's hypothesis that the interaction of kimberlite wastes with tundra water is producing acidic drainage; and [2] that BHPB has constructed granite shells around the outer edge of the coarse rejects rock pile to ensure that the kimberlite remains in permanently frozen parts of the waste rock piles. If the kimberlite eventually freezes as BHPB assumes (thermistor data indicate that this is not yet happening) then this approach should render any acidic drainage issues inconsequential.
7. On the basis of the report's findings SRK recommends a few 'down-sizing' changes to existing sampling and survey work to characterize rock geochemistry:
 - a) eliminate waste rock testing for developments that occur in host rocks to access kimberlite (e.g., underground access ramps);
 - b) for open pits, scale frequency of sampling to 3 samples of each rock type per bench every 3 years; and,
 - c) for waste kimberlite piles scale sampling frequency down to quarterly from monthly.
8. Finally, BHPB's cover letter to the report notes that several other relevant studies are being undertaken:
 - a) a mineralogical study to identify the carbonate mineral in the kimberlite which is providing the neutralization potential (we have been asking for this since the beginning of the project);
 - b) controlled field tests using barrels of waste rock to examine long-term physical and chemical weathering effects;
 - c) a study to investigate the ion exchange mechanism for the pH depression observed in the iron-rich waters at Seep-019; and,
 - d) further investigations of cell B pore water quality.

**Wek'èezhii Land
& Water Board**

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**Indian and Northern
Affairs Canada**

**Affaires indiennes
et du Nord Canada**

JAN 31 2007

Water Resources Division
3rd Floor Bellanca Building
PO Box 1500
Yellowknife, NT
X1A 2R3

Application # MV2003L2-0013
Copied To SB/IR/9
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File: MV2003L2-0013
BIIP Billiton Diamond Inc.

January 31, 2007

To: Sarah Baines
Regulatory Officer
Wek'èezhii Valley Land and Water Board

Re: Ekati Geochemical Characterization and Metal Leaching - Comments

The Water Resources Division, INAC, retained an independent expert to review BHP Billiton's Geotechnical Characterization and Metal Leaching Management Plan. Water Resources has reviewed the attached comments and wishes to submit them so that they may be placed on the public record.

The Division agrees with the assessment, this plan generally meets the requirements of Part F, Item 2 of the Water Licence. However, comments have been provided to help improve the plan and ensure that the environment is not degraded.

INAC hopes that the above comments are useful both to the WLWB and to BHP. Any questions may be directed to Nathan Richea at richean@inac-aine.gc.ca.

Sincerely,

For **Kathleen Racher, Ph. D.**
Manager, INAC Water Resources

Mehling
Environmental
Management Inc.

3826 Balclutha St.
Vancouver, BC
Canada V6L 2S8
Telephone: (604) 731 4150 Facsimile: (604) 733 4255

MEMORANDUM

To: Nathen Richea, INAC, Yellowknife
From: Peri Mehling (MEMi)
Date: January 29th, 2007
Re: Preliminary Review – Ekati Diamond Mine - Geochemical Characterization and Metal Leaching (ML) Management Plan

Introduction

Mehling Environmental Management Inc. (MEMi) was retained by the Department of Indian Affairs and Northern Development (DIAND) to review the report entitled: "Ekati Diamond Mine – Geochemical Characterization and Metal Leaching (ML) Management Plan" dated November 2006, prepared by SRK Consulting (Canada) Inc. for BHP Billiton Diamonds Inc.

This is generally an excellent report. Questions/comments and suggestions are provided below, and may arise from not having reviewed previously submitted and related reports.

- The report proposes to eliminate monitoring of blast rock, as previous monitoring has shown that the materials are relatively consistent in nature, and can be visually segregated, and that the data is not used by the mine for management purposes. While the data appears to support the consistency of the various rock types at source, monitoring does not appear to be undertaken to demonstrate the appropriate segregation and nature of the materials in the final disposal locations. Monitoring and demonstration of the material characteristics in the final disposal location may not be critical in portions of the waste rock piles that will freeze, but is more important in the 'cover' materials that will be left in the active zone. Some continued sampling of cover materials may be appropriate, particularly in areas where metasediments are present or being handled (Misery/Beartooth)
- The report does not explain the nature of waste rock taken from the underground. There appears to have been no monitoring to demonstrate its characteristics, and there does not appear to be a management plan for this specific material. This material may be more likely to be of poorer quality, with greater relative quantities potentially containing kimberlite xenoliths at the contact with the Kimberlite pipe. Although identified as a relatively insignificant volume (page 25), this material may not be appropriate for use as cover material, or for direct placement on tundra. Although a minor component, specific management plans for this waste rock should be described.

- Waste Kimberlite at the Misery Pit is apparently being handled by moving this material to the waste rock dumps (page 8). It is not clear whether this material will be covered with relatively inert granite, as proposed at other locations, or whether cover material will be available. The management details should be described and logistics for cover material identified, if necessary.
- Seepage surveys are to be continued throughout the site. The seepage surveys should include older storage areas such as the Kimberlite Ore Pad and Waste Kimberlite Pad at Misery (page 20), until drainage from these areas are demonstrated to have recovered.
- There appears to be an inconsistency in the reported objective of waste rock management. The Executive Summary (page iii) indicated that weakly ARD generating metasediments are segregated visually and encapsulated by non acid generating material to provide neutralization. Only Kimberlite is identified as having neutralizing potential. The body of the report appears to state the objective more accurately by stating “Encapsulation of potentially reactive materials (eg. Metasediments) by rock with low reactivity (granite) so that the reactive materials remain at freezing conditions...” (page 4).
- Details on proposed studies (eg. ion exchange reaction between drainage water and the soil in the vicinity of seeps – page 14) should be provided, indicating how the studies may influence the management plan.
- Lake sediments (co-mixed with glacial till) are being considered for reclamation (page iii). The plan does not include geochemical characterization of lake sediments, but this may be provided in other documents.
- Although apparently predominantly controlled by underground connate water (page 22), trend analyses (section 4.2) would benefit by being expanded to include TDS and chloride for the Long Lake Containment Facility (L.L.C.F), and Process Plant Discharge (PPD) water (section 4.2.4.2).
- Table 2.1 does not include projected pit wall area exposure beyond 2006. While not explicitly part of a waste management plan, the projected areas should be reviewed with respect to closure considerations, such as pit water quality, as part of an updated C&R Plan.

The proposed modifications to the monitoring plans are shown on Table 5.1. The key modifications are the elimination of waste rock analyses, with the exception of the Beartooth and Fox Pits which occurs once every 3 years. As noted above, sampling of placed cover material may be appropriate to demonstrate the actual quality of cover materials. Other monitoring amendments appear appropriate with the following minor comments:

- Past and current sampling/monitoring of the Beartooth Pit show bi-annual WRSA seepage monitoring, but this is removed from future monitoring – is this because that monitoring is covered under the Beartooth licence, or is covered in another part of this license (i.e. Panda and other WRSA seepage surveys)?

- Material moved out of the underground developments is to be documented for rock types and volumes. The disposal location of these materials should also be provided.
- Details of 'additional studies' should be provided.

We trust that these comments meet your current needs. Please call if you wish further discussion or clarifications.

Best Regards,
MESH Environmental Inc.

Per:

A handwritten signature in black ink, appearing to read "P. Mehling". The signature is written in a cursive style with a long, sweeping underline that extends to the right.

Peri Mehling, P.Eng. (NWT)
Senior Consultant



Environment Canada
Environnement Canada

Environment Canada
Prairie and Northern Region
#301 - 5204 - 50th Ave
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Feb. 1, 2007

Wek'eezhii Land and Water Board
P.O. Box 32
Wekweeti, NT X0E 1W0

Our File: 4780 005 004

Attention: Sarah Baines

By email

**Re: Ekati Mine - Geochemical Characterization and Metal Leaching
Management Plan (November 2006) - MV2003L2-0013**

The above document has been reviewed on behalf of Environment Canada (EC) by Savanna Levenson and myself. The purpose of the plan is to provide the framework for managing non-neutral drainage and metal leaching from the waste rock and coarse kimberlite rejects piles, including the evaluation and prediction of seepage chemistry. The November 2006 plan outlines past characterization and sampling, and provides recommendations for changes to the program. The following comments regarding the Geochemical Characterization and Metal Leaching Management Plan (GCMLMP) are provided for your consideration.

Clause F (2.a)(iii) Assessment of Potential for ARD/ML in Rock

The plan states that metasediments contain higher sulphide concentrations and generate acid under laboratory conditions; however, acid rock drainage (ARD) has not been observed under field conditions. Has this been addressed over the long-term and considering there is a potential for warmer conditions (climate change) in the region?

Clause F (2.a) (v) Assessment of Potential for ARD in Processed Kimberlite

It is suggested that the release of iron under reducing conditions at the contact between coarse kimberlite rejects (CKR) and naturally acidic tundra soils is the cause of waters resembling ARD containing elevated total dissolved solids found adjacent to the Coarse Kimberlite Reject Storage Area. As a result CKR is no longer placed directly on the tundra but placed on a pre-laid granite pad. Long-term monitoring and sampling of adjacent waters should continue to ensure that the mitigation measure developed is appropriate and to ensure no other factors were involved in the release of ARD into the surrounding water system.

Clause F (2.a) (vi) Description of Predicted Loadings

As stated on pg 20 of the report, Misery Waste Rock Storage Area is expected to have slightly low pH, typical of tundra drainage as well as containing elevated concentrations of nutrients and metals. Although elevated, they do not exceed the water limits except

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for ammonia. The report states that the chemistry of this water has been affected by temporary disposal of mixed kimberlite and metasediment waste upstream of SEEP-52 and is therefore not typical of the bulk of the waste rock pile. Although "atypical", ongoing monitoring is needed to detect any further changes, and mitigation measures need to be in place to address possible future negative impacts to water chemistry.

General

Table 4.2 provides a summary of the fine PK water chemistry. It would be helpful to have chloride included in the list of parameters reported, as this is increasing with deeper connate water contributions and process additions.

We note that the GCMLMP references trend review for seepage chemistry in Section 5 (page 25) and would find this information helpful. Figures contained in the January 2007 Waste Rock and Waste Rock Storage Area Seepage Survey Report show historical concentrations of various parameters in line graph form. It would be useful to have trend lines plotted, and periodic statistical analysis of the slope of the line to assess significance of a trend, at least for parameters of obvious concern.

Several changes to the testing and monitoring regimes are proposed. Based on Table 2.1 and the tonnes of rock mined over the past ten years, it appears that there would have been approximately 2800 samples of granite tested (or about 280 per year). The proposal is to reduce geochemical testing to triennial sampling of three samples per rock type per bench in the open pits (roughly 10% of past sampling?). Given that the rock types are visually different enough to permit segregation, this should be acceptable, with the caveat that if significant changes to the geology (anomalies) are encountered, additional testing should be done.

Table 5.1 also outlines that in conjunction with the lower frequency of geochemical sampling, data review would take place every three years. If there are unexplained or unexpected findings in the bi-annual seepage surveys, we would expect that adaptive management actions would include increasing the frequency and review of geochemical investigations.

Please do not hesitate to contact me with any questions or comments with regards to the foregoing at (867) 669-4735 or by email at anne.wilson@ec.gc.ca.

Yours truly,

Anne Wilson
Water Pollution Specialist
Environmental Protection Operations

cc: Carey Ogilvie (Head, Assessment and Monitoring, EPOD)
Mike Fournier (EA Coordinator, EPOD)
Savanna Levenson (EA Specialist, EPOD)

Canada

January 24, 2007

Sarah Baines
Regulatory Officer
Wek'eezhii Land and Water Board
PO BOX 32
Wekweeti, NT X0E 1W0

VIA FACSIMILE

Dear Ms. Baines

BHP BILLITON DIAMONDS INC., MV2006L2-0013
Geochemical Characterization and Metal Leaching Management Plan.

The Department of Environment and Natural Resources (ENR) with the assistance from Dillon Consulting has reviewed the above plan and would like to provide the following comments based on the mandated responsibilities under the *Environmental Protection Act (EPA)*.

In general the document is very well organized and the geochemical data, findings, and interpretations are well presented.

In particular, this document demonstrates BHPB's attention to the implementation of on-going management as observed in two particular circumstances where acidic conditions were detected in the monitoring network. Assessments were made as to the cause of these conditions, and actions were taken to address and eliminate the unfavourable conditions. The actions carried out to manage low pH waters resembling Acid Rock Drainage (ARD) with high solute concentrations associated from the interaction of kimberlite materials with the acid tundra soils, and the abnormal water chemistry from SEEP-019 indicates an effective monitoring network.

The geology and the mineralogy of the rock types subject to mining are well presented. It is apparent that there is a comprehensive understanding of the rock geochemistry and that there is a significant quantity of baseline chemical information. As a result of this, along with material having the potential to be visually separated, we support the request for reduced sampling.

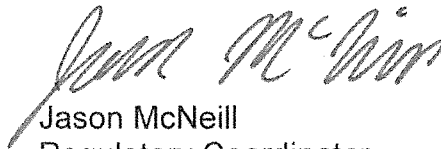
We agree with the observation that primary source material for ARD is limited in this mining complex and the shift from ARD focus to Metal Leaching is warranted.

As noted, our review of this report is generally favorable. However, we suggest that the report could be improved through the following recommendations:

- 1) The inclusion of geologic maps/block diagrams to provide a visual understanding of the basic rock distribution and quantity within the mine complex;
- 2) The inclusion of visual documentation that would support the claim that the rock types are visually distinctive and to provide a basis for the visual separation process;
- 3) In the request for reduced sampling, it is recommended that the identification of threshold levels which would trigger the need for increased sampling be included in the report; and
- 4) We recommend that the report include a section specifically addressing the information available regarding the ARD/ML characteristics of the material designated for post-mine reclamation.

Should you have any questions regarding the above, please contact Jason McNeill, Environmental Assessment Officer at 920-8071.

Sincerely



Jason McNeill
Regulatory Coordinator
Environmental Assessment and Monitoring
Environment and Natural Resources

- C. Erika Nyssonen
Industrial Technologist - Mining
Environmental Protection