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BHP Billiton Diamond Inc.

June 20, 2008

To: Zabey Nevitt
Executive Director
Wek'èezhii Land and Water Board
#1-4905 48th Street
Yellowknife, NT X1A 3S3

Re: Review Comments – BHP Billiton Diamonds Limited (BHPB) 2007 AEMP

Dear Mr. Nevitt:

Indian and Northern Affairs Canada –Water Resources Division (INAC) has briefly reviewed BHPB's 2007 Aquatic Effects Monitoring Program (AEMP); specific comments on the 2007 AEMP are attached (Attachment 1). INAC would note that BHPB has prepared a quality AEMP document for 2007; our issues and concerns with the 2007 AEMP are more overarching and big picture.

First, INAC feels it is important to note that BHPB has identified that the AEMP is a key component of adaptive management because it provides the annual monitoring data and analytical assessments that are used to determine if the mine is affecting aquatic ecosystems. INAC agrees with this statement but does not believe that the AEMP is being used properly to interpret potential impacts in the receiving environment, and as such, formal adaptive management of aquatic effects is not presently being conducted (these two things need to be instruments of each other). INAC believes the main reasons for this are: the lack of effect sizes (see discussion below), and, the fact that a formalized Adaptive Management Plan (AdMP) has only recently been submitted but not yet reviewed or approved.

Each year BHPB's AEMP identifies a number of increasing parameters. Again this year concentrations of nine parameters, which include pH, sulphate, total dissolved solids, chloride, potassium, nitrate, arsenic, molybdenum and nickel have continued to increase. At some point these increases will cause impacts which BHPB may or may not be able to fully mitigate. Therefore, the adaptive management framework must be applied now to help address these issues before they become significant impacts.



INAC commends BHPB for committing to develop effects levels for the site. Unfortunately, there seems to be a misunderstanding in what INAC and others were requesting. BHPB has estimated the Minimal Detectable Difference (MDD) from the current sampling regime using CCME water quality criterion; minimal detectable differences are not effects. Effects levels are levels that stakeholders agree are unacceptable. Once effect levels are agreed upon, some lower value or early warning signals trigger action (i.e. adaptive management). This is done before unacceptable effects are observed.

INAC is very concerned that BHPB's 2007 AEMP results are being assessed relative to CCME guidelines and not particular baseline, background or reference conditions. Again, as INAC has stated before, CCME guidelines are not "pollute up to limits" and therefore should not be used to develop triggers for adaptive management. Active adaptive management should occur when low level effects or impacts are observed to prevent effect levels from being exceeded.

Lake water quality in the north usually falls below laboratory detection limits and is typically reported as <DL (Kokelj *et al*, 2008, 2009; Peinitz *et al* (1997a, b)). The CCME non-degradation policy states that:

"The degradation of the existing water quality should always be avoided. The natural background concentrations of parameters and their range should also be taken into account in the design of monitoring programs and the interpretation of the resulting data".

Therefore the allotted change inherent in using CCME guidelines is too large and should not be use as the primary trigger mechanisms for adaptive management. INAC understands that BHPB has proposed benchmarks as part of their AdMP but at this point this plan has not been fully reviewed or approved by the Wek'èezhii Land and Water Board. As such INAC is suggesting that potential low level effects or impacts should be determined in a way which is more consistent with other mines. An example of which is provided below; note, this is not an exhaustive list:

- Statistical differences in the immediate receiving environment (to be determined) relative to baseline, background or reference conditions; or,
- Statistical increasing trend predicting exceedences of thresholds or benchmarks (to be determined) within three years in the immediate receiving environment;

It is these effects levels that may signify early warnings or potential low level impacts that would trigger active adaptive management and lead to potential mitigation strategies. The absence of effects levels or triggers for adaptive management can only lead to continued monitoring and identification of effects.

INAC understands that BHPB does have internal processes that are used to determine if operational changes can help mitigate effects in the receiving environment; however, 1) this process has not yet been formalized; 2) the recent AdMP has not been approved; and, 3) acceptable/unacceptable effects must be developed through consultation with



stakeholders. INAC stresses that the results of the AEMP must be used to help make decisions regarding operations. Aquatic effects monitoring must not only be a monitoring and assessment tool. Direct linkages between the AEMP to the AdMP must be evident and concrete in order to facilitate continued improvement and to mitigate any potential future impacts.

In closing, BHPB has taken steps to distinguish between changes, effects and impacts. However, BHPB has not identified at what point an effect becomes an impact nor have they defined what constitutes a significant effect (effect levels). BHPB has stated (p. 1-3) that there are no impacts resulting from their operation; INAC notes this is a broad statement which is open to interpretation because the word significant has not yet been defined. Since concentrations of parameters of concern may be much higher than baseline, background or reference conditions “impacts” may already exist. BHP (p. 3-4) states that there is a potential for adverse biological effects in Leslie and Moose lakes even when CCME guidelines are used as the definition of “significant”.

INAC hope that the above comments are helpful to both BHPB and the Board. If there are any questions or concerns please contact Marc Casas at (867) 669-2664 casasm@inac.gc.ca or Nathen Richea at (867) 669-2657 richean@inac.gc.ca.

Sincerely,

-Original signed by-

Carole Mills
Acting Manager
Water Resources Division



References:

- Kokelj SV, Zajdlik B, Thompson MS, Jenkins REL. 2008. Thawing permafrost and temporal variation in the electrical conductivity of small tundra lakes, Mackenzie Delta region, NWT, Canada. In Ninth International Conference on Permafrost Proc., Fairbanks Alaska, June 2008. (In press).
- Kokelj SV, Zajdlik B, Thompson MS. 2009. The impacts of thawing permafrost on the chemistry of lakes across the subarctic boreal-tundra transition, Mackenzie Delta region, Canada. *Permafrost and Periglacial Processes*. In review. Steve
- Pienitz, R. J.P. Smol, and D.R.S. Lean. 1997a. Physical and chemical limnology of 59 lakes located between the southern Yukon and the Tuktoyaktuk Peninsula, Northwest Territories (Canada). *Can. J. Fish. Aquat. Sci.* 54:330–346.
- Pienitz, R. J.P. Smol, and D.R.S. Lean. 1997b. Physical and chemical limnology of 24 lakes located between Yellowknife and Contwoyto Lake, Northwest Territories (Canada). *Can. J. Fish. Aquat. Sci.* 54:347-358.



Attachment 1

General Comments:

- When calculating the MDDs, BHPB used 90% for the statistical power and 0.05 for the significance level. These two intervals should be similar, for example if BHPB wants to use 0.05 as the significance level then statistical power should be set at 95%. This way the allotted level of protection would be equal.
- Again BHPB is seeing increases in parameter as far downstream as Lac de Gras (sampling sites S2 & S3). It seems that these sites continue to represent far-field exposure areas.
- INAC acknowledges that BHPB has concentrated much effort in calculating MDDs for a number of parameters. This work is exhausting and very detailed. However, INAC feels in the context of Adaptive Management, arguing over uncertain in concentrations being above, at, or below CCME water quality guidelines is not fruitful at this point in time. It is clear concentrations are increasing signaling the need for formal adaptive management processes, particularly for nitrate, molybdenum and nickel.
- BHPB has noted that fish in Leslie Lake were exposed to trace concentrations of hydrocarbons as it was detected in fish bile. INAC understands that BHPB may look into this further and strongly encourages this process. To do so, it will likely be necessary to conduct trace analyses for trace hydrocarbons in both water and sediment in Cell E and Leslie Lake.

Specific Comments:

- Section 1.2 (p. 1-3) distinguishes between a change, an effect and an impact. Considering the list of parameters in Section 3 (p. 3-1) it is unclear how increases in these parameters could not be defined as potential low effects or impacts (particularly nitrate, nickel, chloride, and molybdenum). A more robust investigations and potential justifications are needed before statements about impacts can be made. INAC notes that consistently increasing trends in parameters of interest are typically not favourable (possible) signs.
- Section 3 (p. 3-1) claims that the chemical composition of water discharged from the LLCF in 2007 remained below discharge limits of the Water License and CCME guidelines, with the single exception of nitrate. The Surveillance Network Program's (SNP) results from November 2007 indicate that at station 1616-30 (discharge point from Cell E) molybdenum concentrations averaged 0.0878 mg/L for 10 samples. The highest reading was 0.0926 mg/L and the lowest was 0.0819 mg/L. The CCME guideline for molybdenum is 0.073 mg/L.
- Section 3 (p.3-4) states that for molybdenum we can reliably conclude that the total molybdenum concentrations in all water bodies were below the interim site specific guideline (16 mg/L). The site specific guideline referred to is part of the unapproved adaptive management plan which has not been approved by the Board. Pending approval the default guideline should be CCME which is 0.073 mg/L. The plan goes on to say that the likely source of molybdenum is the



- Misery pit; we note that it is possible that Misery will reopen at some point in the future and at present there are still elevated levels of molybdenum in the LLCF.
- Figure 3-1 lists all the parameters measured and whether they have increased, decreased or remained the same. The figure is accompanied by the graphs for all the parameters listed. However, the phytoplankton density and diversity graphs are not included for either watershed. Was this omission an error? This is particularly important for the King-Cujo watershed as the data sets show some uncertainty.
 - Section 2 (p.3-6) states that if the elevated parameters in Kodiak Lake, the Lower PDC and Kodiak-Little Stream are due to a mine effect, the effects had already occurred by the time the AEMP began and has remained stable since then. Why doesn't BHPB look into this to determine if this is or isn't a mine effect; all that is required are comparisons with baseline data?
 - Section 4 indicates that there is an increase in zooplankton density and mid depth lake benthos in Cujo Lake. Similarly, there is an increase in the zooplankton density in Kodiak Lake. These increases are concerning and leads us to believe that possibility the increased nutrients (e.g. nitrate, ammonia, etc.) maybe having an effect on the plankton and benthic community dynamics. Due to the potential importance of this finding, a great deal of effort should be made to determine the cause of the increase and to better understand the plankton community.