

A Review of the 2005 Diavik Diamond Mine Wildlife Monitoring Report

Prepared for

Environmental Monitoring Advisory Board

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Summary and Recommendations

- 1.) **General:** To date, most information collected appears to support the predictions provided in the Environmental Effects Report of 1998. In general, most effects to date were at or below predicted levels. More importantly, DDMI responded to various findings of performance measures that required actions and changes in approach.
- 2.) **Vegetation:** The intended changes in vegetation monitoring that include control sites are promising. We are awaiting detailed analyses of the vegetation data. We agree with the recommendations put forth in the 2005 WMR Section 2.1.3.
- 3.) **Caribou:** Clearly, the behavioural observations will need a strong boost in sample size. The collection of behavioural data in control areas is a good development. Several factors such as habitat, season, and group composition are reflected in the data collection. We suggest that DDMI monitor the behaviour of males versus females with young.

As to the regional monitoring, and other recommendations on caribou monitoring submitted by MSES earlier, no new developments seem to have occurred. Our discussion on this topic is not repeated here, but we encourage the future deliberations within a multi-party environment in an effort to modernize the sampling effort at the regional scale.

Other than the lack of change in regional monitoring of caribou distribution and movement, we agree with the recommendations listed in the 2005 WMR Section 3.5.

- 4.) **Grizzly bear:** We anticipate that the grizzly bear monitoring, in all its aspects, will continue. Monitoring results indicate that mine effects on bears are at or below those predicted.
- 5.) **Wolverine:** As last year, we concur with the conclusions for monitoring recommendations in the 2005 WMR Section 7.4. In particular, local knowledge should be used and a better understanding of regional population dynamics could be gained by means of DNA analysis. We also agree with the new, apparently more rigorous, tracking program. However, DDMI may benefit from analyzing the required sample size and transect length. We also agree that the methods of the tracking survey should be comparable to other monitoring in the region.
- 6.) **Waste Management:** Management actions that include, but are not limited to, education of an increasing number of staff at the mine are imperative to further the cause of minimizing attractants. Although DDMI conceded in a response to our recommendations of last year that there are likely more scavengers on the sites than elsewhere, we encourage that the goal of scavenger density on waste sites be set at or close to zero. We understand that this is a difficult goal to achieve and we are encouraged by the fact that DDMI is aware of the importance of waste management

- programs. We concur with the recommendations set forth in the 2005 WMR Section 8.3.
- 7.) **Falcons:** As last year, we recommend that consideration be given to the collection and analysis of data that may relate to nesting success of Peregrines, including breeding pair density, physical attributes of nest sites (exposure to weather and predation), and prey abundance. This recommendation has not yet been responded to by DDMI. We think that knowledge of these factors would resolve some of the outstanding questions on why nest productivity seems to be lower in the study area than at Daring Lake. We concur with the recommendation in Section 9.3 that occupancy surveys need to continue.
- 8.) **Waterfowl:** We repeat our conclusion of last year that in order to draw conclusions about mine effects on bird diversity, if any, it is imperative to apply to control sites the same data collection techniques as are currently employed near the mine. However, if one accepts that the past analyses showed a potential worst case scenario of effects that were relatively low, future waterfowl monitoring may not be required.

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I Introduction

The Environmental Monitoring Advisory Board (EMAB) for the Diavik Diamond Mine Project requested that MSES Inc. review and assess the procedures and results of the 2005 Wildlife Monitoring Report (WMR). The WMR communicates the findings of surveys as established in the Wildlife Monitoring Program v.2 (WMP) developed by Diavik Diamond Mines Inc. (DDMI) in August 2002 in response to comments and issues raised by EMAB and the Department of Environment and Natural Resources (ENR, formerly Resources, Wildlife, and Economic Development (RWED)).

MSES' review of the 2004 WMR last year covered a comprehensive analysis of the data collected thus far in addition of the yearly wildlife g report. Numerous recommendations have been submitted for EMAB and DDMI to consider. In our review herein, we focus on the responses of the recommendations and how they were considered by DDMI in the 2005 WMR.

As in previous years, we comment on the contribution of current data collection to the findings of past monitoring and how the data collection will contribute to wildlife management in the future. We also provide specific recommendations to adapting the data collection in light of current information and in light of those recommendations listed in the WMR. Given that the analysis submitted last year by DDMI in conjunction with the 2004 WMR, and the subsequent review were rather comprehensive, the review of the 2005 WMR herein is focused and succinct, partly awaiting future data compilation and analysis.

2 General Observations

2.1 Current State of Knowledge

The 2005 monitoring report and analysis were a very useful tool that improved our understanding of both the potential effects of the mine on wildlife and the strength of the data that are required to measure such effects. Based on the information obtained last year, we concur with DDMI's position that some period of time is required in adding to the existing data set, before a rigorous statistical analysis would be undertaken again. However, that period of time is not yet determined and we recommend that the yearly data gathering process reported on in the WMRs should be evaluated in light of the potential for new findings or the success of adding strength to the information base.

To date, most information collected appears to support the predictions provided in the Environmental Effects Report of 1998. More importantly, DDMI responded to findings of performance measures that required actions. This included

- the increase in awareness of waste protocols;
- the need for vegetation control plots;
- the need for more rigor in caribou behavioural observations; and
- the need for the measure of productivity of falcon nests by adding spring surveys to those in July.

2.2 DDMI Responses to Recommendations in 2005

The general recommendation on the use of control sites that would make possible a comparison of the affected area with a respective, comparable undisturbed area, has been followed. However, it remains unclear as to how details of sampling design and sample size would be used to achieve this goal. As DDMI asserts that the work will be done as required, EMAB is advised to examine the development of this work.

A major point of discussion of last year's analysis and the resulting recommendations provided by MSES related to an upgrading of the regional caribou monitoring program. It is evident to us that such regional efforts must be based on multiparty input and decisions. While DDMI is willing to participate in such discussions, it continues with the current protocol that was based on a workshop in 2001. We agree that the current effort should continue in absence of a new design. However, we continue to be cautious about the efficiency of the current design in addressing the rather demanding need for a better resolution of data at the scale of the Zone Of Influence (ZOI) and concurrently at the scale of the region within which the caribou range.

As to carnivores, DDMI and MSES agree and it appears that the continuation of some protocols, as well as the development of some new ones, will improve future information of the mine effects.

As to waste management, we are satisfied that DDMI acknowledges that waste sites attract some scavengers. Therefore, the establishment of control sites for this purpose is unnecessary. However, the important recognition here is that the waste sites do have a negative effect, that the attraction of scavengers needs to be avoided, and ideally reduced to zero. We observe that DDMI continues to improve on its waste management protocols and awareness, while we are disappointed that new construction personnel have not been as compliant as they should have been.

As to raptors and other birds, DDMI and MSES agree on the changes recommended. If the fact that the “waterfowl study does not explicitly test for mine-related effects” (DDMI Letter 10 December 2005) is acceptable to EMAB or other parties, then MSES is neutral to the decision of dropping that program. We come to that conclusion because the changes experienced over time (as determined in the analysis attached to the 2004 WMR) are indeed very minor and most detectable during construction. We regret however, that this program was not designed more rigorously at the onset in such a way that would enable a meaningful comparison between impact and control sites. Given that bird diversity is one of the most readily-accessible data that might indicate changes at the community level of wildlife, it is disappointing that this opportunity was lost because by poor sampling design.

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3 Specific Reviews

3.1 Vegetation and Wildlife Habitat

3.1.1 Information About Effects To Date

The amount of vegetation cover (“habitat”) disturbed is within predicted levels. No particular concerns other than the ones implicit in the predictions are apparent.

3.1.2 Current Data Collection

The intended sampling of vegetation plots on control sites is expected to add good information to a comparison between disturbed (impacted) and undisturbed areas. Statistical analyses similar to those that have been performed in the analysis attached to the 2004 WMR will greatly add to the understanding of potential impacts on vegetation.

Some points of clarification may be raised with DDMI. The prediction that is tested in the WMR is very explicit and based on the vegetation cover maps developed for the Environmental Effects Report of 1998. Could DDMI explain how the prediction would have changed once a new classification (by Matthews et al 2001), and the use of Ikonos imagery, has been adopted?

The term “habitat” in this prediction is somewhat confusing as the habitat referred to here is clearly neither for caribou nor for grizzly bear. Is there a particular animal species for which the “habitat” term is used, or is it simply to mean that vegetation cover is synonymous with general wildlife habitat?

3.1.3 Potential for Adapting the Monitoring Program

The intended changes are promising. We are awaiting detailed analyses of the vegetation data. We agree with the recommendations put forth in WMR Section 2.1.3 (editorial note: there is no Section 2.2 so the numbering of subsection 2.1 is unnecessary).

3.2 Barren-ground caribou

3.2.1 Information About Effects To Date

The information to date indicates that some weak effects on caribou using the study area might exist. This conclusion is mostly based on the analysis attached to the 2004 WMR, but data collected in 2005 do not seem to contradict this conclusion. One should keep in mind the apparently contradictory observation that behaviour indicates more feeding and resting closer to

the mine, while the general distribution of caribou appears to indicate a slight avoidance of the mine.

3.2.2 Current Data Collection

Habitat loss for caribou is presented in Habitat Units (HUs). This is different from habitat loss presented for grizzly bear. While we prefer the use of strict habitat categories as done for bears (this is because HUs suffer from an underlying assumption that a certain habitat is of a quantifiably different value than another habitat), we can accept the use of HUs for an easy numerical comparison of the changes in the areas. We would like to know however, why the quantification of habitat loss appears to follow different procedures for different species.

The behavioural observation within the ZOI will continue to be challenging in terms of obtaining sufficient sample sizes to perform meaningful statistical analyses. This is also indicated by the lack of observation of groups within the 3 km ZOI. Could the lack of groups within the ZOI in itself be a result, corroborating the apparent tendency of caribou avoiding the proximity of the mine? Also, could not the continued low numbers of caribou observed in the study area, as compared to numbers at baseline, reflect the avoidance of the mine?

If there is an avoidance of the mine, does DDMI suggest remedial action in terms of scheduling of some activities in certain areas or attenuation of noise?

3.2.3 Potential for Adapting the Monitoring Program

Clearly, the behavioural observations will need a strong boost in sample size. The collection of behavioural data in control areas is a good development. Several factors, such as habitat, season, and group composition are reflected in the data collection. We suggest that DDMI scrutinize the behaviour of males versus females with young. Males (and often barren females) are less risk averse and may not show behavioural responses to human disturbance as overtly as females with young. It may therefore be useful to look at the behaviour of males versus females separately.

As to regional monitoring, and other recommendations on caribou monitoring submitted by MSES previously, no new developments seem to have occurred. Our earlier discussion on this topic will not be repeated here, but we encourage the future deliberations within a multi-party environment in an effort to modernize the sampling effort at the regional scale.

Other than the lack of change in regional monitoring of caribou distribution and movement, we agree with the recommendations listed in the WMR Section 3.5. We anticipate that caribou advisory monitoring will continue. This should be noted in Section 4.3. We also agree with the recommendation in Section 5.3 to continue the dust deposition research program. However, an effort should be made to collect more observations of caribou, perhaps by increasing the number of surveys or by using trained mine workers that could provide incidental observation information.

3.3 Grizzly Bears

3.3.1 Information About Effects To Date

The amount of habitat disturbed for grizzly bears is within the predicted range. Similarly, mortality and mine avoidance are at or below predicted levels. The trends in these data are stronger every year and appear to suggest a credible effect.

3.3.2 Current Data Collection

Section 6.1 presents the amounts of habitat lost, particularly heath tundra. The percentages of the area affected within a bear's home range are very small, but could DDMI provide information on how much heath tundra is, on average, available in a bear's home range, to evaluate the meaning of losing 2.61 km² of this habitat type?

3.3.3 Potential for Adapting the Monitoring Program

We anticipate that the grizzly bear monitoring in all its aspects will continue. This should be noted in Section 6.5.

3.4 Wolverine

3.4.1 Information About Effects To Date

As noted in earlier reviews, the distribution of wolverine is very difficult to measure. There is currently no evidence based on the monitoring conducted by DDMI that the mine affects the distribution and habitat use of wolverine. This finding, however, needs to be interpreted cautiously because there is a large amount of variability surrounding the tracking and sighting data and some changes may not be detectable with these methods.

There is a total mortality of two (2) wolverines over at least six years. We concur that this is a low impact, as predicted in the Environmental Effects Report of 1998. Thus far the mitigation measures applied by DDMI to minimize wolverine mortality appear to be successful, but we caution that this effort be continued. If waste management goes astray and wolverines are suddenly attracted to the site, then the current success of minimizing mortality levels could suddenly change into failure because the loss of even a small number of wolverine in one year could result in a population level effect.

3.4.2 Current Data Collection

We had no previous knowledge of a lack of skirting that may have resulted in wolverine using crawl spaces. We strongly agree that skirting be replaced and the use of any crawl space by wolverines be monitored.

As to the snow tracking data, this should be reported as a density of tracks per km and per day since last snowfall. This was requested previously, verbally. This is required because tracks accumulate over time, so that a comparison among transects (or between Inside and Outside of the 10 km zone) may not be valid if they were done on different days. Please note that wind can have a similar effect as new snowfall in that it can erase tracks on a windy day and essentially re-set the tracking surface to zero. Such conditions should be reported.

It appears that currently the best information available on wolverine distribution is that provided by Bobby Algona. We encourage the continuance of using local traditional knowledge.

3.4.3 Potential for Adapting the Monitoring Program

As last year, we concur with the conclusions for monitoring recommendations in the 2005 WMR Section 7.4, namely that local knowledge should be used and that a better understanding of regional population parameters should be gained by means of DNA analysis.

We also agree with the new, apparently more rigorous, tracking program. However, it would be useful to know the intended sample size of required transects and the rationale behind choosing such a sample size. Moreover, DDMI may want to investigate why the length of 4 km is the most efficient one for monitoring transects. We suggest that autocorrelation analyses be done to provide an estimate of the length of transects, which may in fact be shorter than 4 km. If so, then the number of transects can be increased to improve on sample size and rigor of data. Of course, we also agree that the methods should be comparable to other monitoring in the region.

3.5 Waste Management

3.5.1 Information About Effects To Date

The current information suggests that waste management techniques are successful in reducing the amount of attractants in the waste transfer area. However, the increase in food attractants in the landfill is disappointing. It appears that DDMI has recognized the shortfall in enforcing waste management with its contractors. Needless to say, the successful reductions of human food wastes is an important mitigation technique that affects several scavenger species and their potential prey.

3.5.2 Current Data Collection

Current information should be enhanced by the continuation of data from future years. It is important that awareness and training programs be implemented, and enforced, for all workers on site, including contractors.

3.5.3 Potential for Adapting the Monitoring Program

Management actions that include, but are not limited to, education of an increasing number of staff at the mine are imperative to further the cause of minimizing attractants. Although DDMI conceded in a response to our recommendations of last year that there are likely more scavengers on the sites than elsewhere, we encourage that the goal of scavenger density on waste sites be set at, or close to, zero. We understand that this is a difficult goal to achieve and we are encouraged by the fact that DDMI is aware of the importance of waste management programs.

We concur with the recommendations set forth in WMR Section 8.3.

3.6 Falcons

3.6.1 Information About Effects To Date

The number of nest sites discovered increased almost yearly since 1995. The analysis attached to the 2004 WMR indicated that total productivity has declined during the operations phase as compared to baseline. The cause of this decline is unclear and more monitoring will be required. Moreover, there appears to be higher productivity of young per occupied nest in the control area of Daring Lake than near the mine. Whether the difference is caused by differing habitat quality or any other potential effects such as the mine is unclear and remains to be investigated.

3.6.2 Current Data Collection

The current monitoring program includes a spring and a July survey which should assist in better evaluation of nest productivity. The input from ENR and coordination with other nest monitoring efforts is an improvement over past monitoring.

The incidental observations of peregrines on the mine site, both juvenile and adult, is some indication of peregrines habituating to mine activities.

3.6.3 Potential for Adapting the Monitoring Program

We concur with the recommendation in Section 9.3 that occupancy surveys need to continue.

As last year, we recommend that consideration be given to the collection or analysis of data that may relate to nesting success of Peregrines including breeding pair density, physical attributes of nest sites (exposure to weather and predation), and prey abundance. This recommendation has not been yet been responded to by DDMI. We think that knowledge of these factors would resolve some of the questions noted under 2.8.1.

3.7 Waterfowl

3.7.1 Information About Effects To Date

Last year's analysis indicated that there appear to be some changes in species composition and diversity in mine affected waters. Although there appears to be good information on the abundance and diversity of waterfowl and shorebirds, as we stated in our previous review of the 2004 WMR, the prediction about mine effects on water birds cannot be tested without information on control areas that are not affected by disturbance.

3.7.2 Current Data Collection

The data on water birds are potentially good tools for evaluating changes in a wildlife community. However, based on our understanding from DDMI communications and the 2005 workshop, the waterfowl study does not seem to be expected to explicitly test for mine-related effects. This missed opportunity is disappointing.

The data provided in the 2005 WMR are difficult to interpret as there are no indications of what the numbers of species mean in relation to potential changes over time. It is currently unclear how or if at all these data will be used in future monitoring analyses.

3.7.3 Potential for Adapting the Monitoring Program

We repeat our take-home message of 2005 that in order to draw conclusions about mine effects on bird diversity, if any, it is imperative to apply to control sites the same data collection techniques as are currently employed near the mine. However, if one accepts that the past analyses showed a potential worst case scenario of impacts, future waterfowl monitoring may not be required as the measured effects were relatively low.

4 Closure

The review of the 2005 WMR reported herein presents the conclusions arrived at by MSES. We understand that statistical analyses similar to those conducted in association with to the 2004 WMR are not currently warranted and will await the addition of a few more monitoring years. These views are submitted to EMAB for its consideration of potential recommendations and actions.

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