

A Review of the 2009 Diavik Diamond Mine Wildlife Monitoring Program Report

Prepared for

Environmental Monitoring Advisory Board

June 2010

Prepared by



207 Edgebrook Close NW
Calgary, Alberta
T3A 4W5 Canada

Phone 403-24-8668
Fax 403-241-8679
Email: petr.komers@mses.ca

List of Contributors

Monitoring & Data Analysis Review,
Project Management

Dr. Petr Komers, P. Biol.

Review and Research Support

Ms. Abbie Stewart, M.Sc., P. Biol.

Executive Summary

Summary and Recommendations

In this review, MSES comments on how the WMPR communicates the findings of surveys conducted during 2009. In the course of 2009, MSES participated in several meetings, workshops and correspondence where a number of the recommendations were discussed. The present report takes these discussions into account. Here, we review the responses to the recommendations and how they were considered by DDMI in the 2009 WMPR.

The interactions between MSES and DDMI in the course of 2009 were constructive and furthered the understanding of both parties. The past year brought about some new ideas and resulted in DDMI adapting its monitoring programs, most notably for caribou and grizzly bear.

To better understand the larger than predicted zone of influence (ZOI), DDMI now revised the aerial surveys in coordination with the BHP's-Billiton's Ekati mine. However, to better understand the mechanisms of how caribou interact with the mines, DDMI implemented in cooperation with Ekati behavioural observations of caribou from the ground. Both changes of the monitoring component for caribou appear to be a useful adaptation to what has been learned in the past.

DDMI's response is commendable. However, we encourage the Board and DDMI to discuss the implications of the failure of a prediction which could mean that either the mitigation measures are not as effective as once was thought or that the caribou are more sensitive than once was thought.

For grizzly bear, DDMI's adaptation of the monitoring program from surveying field plots for bear sign to collecting hair samples in a stratified manner has evolved in the course of the discussions of 2009. We concur with DDMI that the adapted program looks promising in delivering better data in a safer environment.

Most other monitoring results appear to confirm that the actual effects are at or below the predicted levels. We note that DDMI seems to have responded well to challenges in the area of waste management, namely food attractants. There are fewer and fewer food attractants in the waste areas, apparently contributing to the low rate of interactions with wolverines and bears. We commend DDMI for their efforts in this respect.

We recommend that the following issues be addressed:

1. Please discuss the implications of a larger than expected effect on caribou for future environmental management.
2. Please discuss the schedule and objectives for the next detailed monitoring data analysis. A number of areas in WMPR 2009 will benefit from a new detailed analysis, including:
 - a. Testing the new hypotheses for caribou which were developed in the course of 2009.
 - i. What is the actual size of the larger caribou ZOI, 14 or 28 km?
 - ii. What is the effect of mine closure on caribou range re-establishment? Are data collected to date sufficient to show a change of caribou distribution in light of the uncertainty of the size of the large ZOI? Also current baseline (pre-disturbance) information is poor, rendering conclusions on changes from pre- to post-disturbance inconclusive. Does DDMI believe that the current data quality is sufficient to show a potential reversal of the effects after closure?
 - iii. What is the behavioural response of caribou? How can the information on behaviour be used to adapt management actions at the mine and in the region?
 - b. Testing the distribution and abundance of caribou with careful consideration of the confounding factors of land area and land pattern in each of the zones (i.e. a larger number of caribou could be expected in zones with a larger land area than water area).
 - c. Testing the changes in caribou behaviour will be critical for the new approach to testing the effects within the small (3-7 km) ZOI. Please provide an analysis of the behavioural data and comment on whether or not behavioural data collected previously can be used.
 - d. Testing wolverine track density near and far to draw conclusions on whether or not track density is lower near the mine than farther away. Densities need to be related to the land area in each distance category.
3. During the meeting of May 18, 2010, several ideas about using the experience of traditional knowledge holders were discussed. We recommend that the ideas to evaluate caribou health and to ask traditional knowledge holders about the behaviours that should be included in the observation protocol should be carefully considered, particularly from the point of view that the health of wide ranging animals are a result of many factors that occur in the region through which they range. Future discussions about these ideas could be fruitful.

4. Please discuss the revegetation program in light of the current findings. Will it be possible to reclaim disturbed areas as expected (or desired), or does the information of lower than expected vegetation performance imply that vegetation may not return as expected?
5. DDMI's efforts on managing food attractants are consistently successful in improving the results over time. This is commendable. However, there is a trend of increasing raven abundance. This could be a cause of concern as ravens could seriously affect nesting success of many birds. Please discuss the causes for this trend, recognizing that the causes may be complex and may include effects such as increased nesting opportunities for ravens or increases in regional raven populations.
6. Please provide responses to the detailed questions and comments (presented in bold font) in the body of this review report.
7. We are in agreement with the recommendations listed in the WMPR 2009 and do not recommend any actions additional to providing the information requested above.
8. We recommend that EMAB accept the WMPR 2009 with the understanding that the above listed questions and recommendations will be addressed in communications and workshops proposed by DDMI for the coming year. Furthermore, we understand that detailed data analyses are required, as identified in our review, and that these analyses will be conducted in the near future.

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION.....	1
2.0 GENERAL OBSERVATIONS	1
2.1 Objectives of the Wildlife Monitoring Program	1
2.2 The State of Current Information.....	2
3.0 SPECIFIC OBSERVATIONS	3
3.1 Vegetation and Wildlife Habitat.....	3
3.2 Barren-Ground Caribou	4
3.3 Grizzly Bears.....	5
3.4 Wolverine.....	5
3.5 Waste Monitoring	6
3.6 Falcons.....	7
3.7 Waterfowl	7
4.0 CLOSURE	7

1.0 Introduction

The Environmental Monitoring Advisory Board (EMAB) for the Diavik Diamond Mine Inc. (DDMI) Project requested that Management and Solutions in Environmental Science Inc (MSES) review and assess the procedures and results of the 2009 Wildlife Monitoring Program Report (WMPR). The WMPR communicates the findings of surveys conducted during 2009. It does not contain detailed analyses of the data and the interpretation of the results because these have been presented recently, and we understand that a new report containing detailed analyses will be forthcoming in the near future.

Based on the reviews of past WMPRs and detailed data analyses, MSES submitted numerous recommendations for EMAB and DDMI to consider. In the course of 2009, MSES participated in several meetings, workshops and correspondence where a number of the recommendations were discussed. The present report takes these discussions into account. Here, we review the responses to the recommendations and how they were considered by DDMI in the 2009 WMPR.

We also comment on the contribution of current data collection, the analysis of data, and the measurement of mitigation effectiveness. We have assumed that numerous mitigation measures were implemented to alleviate potential impacts of the mine. The predictions that have been put forth in the 1998 Environmental Effects Report are based on the assumption that mitigation measures are successful; hence, a lack of support for the predictions by the results of the monitoring program may be indicative of a lack of effectiveness of the mitigation measures.

Where applicable, we also provide specific recommendations to adapt the data collection in light of current information and the objectives of the Wildlife Monitoring Program (WMP) developed in 2002. In our review below, for the ease of identifying our recommendations and requests, we highlight the **text in bold** where we specifically request actions from DDMI.

2.0 General Observations

2.1 Objectives of the Wildlife Monitoring Program

The objectives of the WMP v.2 were developed in 2002. DDMI has anchored its' monitoring reports on these objectives, recently quoting these objectives in the NWT Wildlife Monitoring Permit Application for the 2008 Wildlife Monitoring Program:

“The objectives of the wildlife monitoring program are to:

- a. Verify the accuracy of the predicted effects determined in the Environmental Effects Report (Wildlife 1998) and the Comprehensive Study Report (June 1998); and
- b. Ensure that management and mitigation measures for wildlife and wildlife habitat are effective in preventing significant adverse impacts to wildlife.”

The objectives guide our review of the monitoring report. These objectives are the foundation and focus of our review, relating the methods and results in the 2009 WMPR, as in past reviews, to what we believe is the ultimate goal of monitoring, namely the understanding and alleviating of effects of the project.

2.2 The State of Current Information

The interactions between MSES and DDMI in the course of 2009 were constructive and furthered the understanding of both parties. The past year brought about some new ideas and resulted in DDMI adapting its monitoring programs, most notably for caribou and grizzly bear. For caribou, there appears to be a consensus that a large zone of influence exists because caribou appear to be more abundant at 14 to 28 km distance from the mine. The prediction in the environmental assessment report of 1998 was that caribou would only be disturbed for up to a distance of 3 to 7 km. To better understand the larger than predicted zone of influence, DDMI now revised the aerial surveys in coordination with the BHP's-Billiton's Ekati mine. However, to better understand the mechanisms of how caribou interact with the mines, DDMI implemented in cooperation with Ekati behavioural observations of caribou from the ground.

Both changes of the monitoring component for caribou appear to be a useful adaptation to what has been learned in the past. DDMI's response is commendable. However, we point to a conceptual issue that the Board might consider. Keeping the *objectives of the wildlife monitoring program* cited above in mind, we note that an effect larger than predicted occurred. We encourage the Board and DDMI to discuss the implications of the failure of a prediction. It seems that either the mitigation measures are not as effective as once was thought or that the caribou are more sensitive than once was thought. In either case, stakeholders and regulators should be allowed to comment on what the larger than predicted effect means to them and how this new information may affect future environmental management.

For grizzly bear, the impetus of adapting the monitoring program appears to be a combination of safety concerns during field surveys and a lack of or low quality of data on bear distribution. DDMI's adaptation of the monitoring program from surveying field plots for bear sign to collecting hair samples

in a stratified manner has evolved in the course of the discussions of 2009. We concur with DDMI that the adapted program looks promising in delivering better data in a safer environment.

Most other monitoring results appear to confirm that the actual effects are at or below the predicted levels. We note that DDMI seems to have responded well to challenges in the area of waste management, namely food attractants. Not only did the results improve compared to last year, but, more importantly the waste monitoring program indicates a consistent improvement over the years. There are fewer and fewer food attractants in the waste areas, apparently contributing to the low rate of interactions with wolverines and bears. We commend DDMI for their efforts in this respect.

During the meeting of May 18, 2010, the possible changes in the health of caribou were discussed in light of the impacts of mines and other human caused disturbances. It was suggested that caribou health be evaluated using, amongst other information sources, the experience of traditional knowledge holders. We believe that this idea is worthwhile pursuing and that the details of design and interpretation of any such study be carefully considered, particularly from the point of view that the health of wide ranging animals are a result of many factors that occur in the region through which they range. Moreover, specific to behavioural observations, the idea of asking traditional knowledge holders about the behaviours that should be included in the observation protocol has merit and should be considered.

3.0 Specific Observations

3.1 Vegetation and Wildlife Habitat

The methods applied in the vegetation program are appropriately applied, as they were in previous years. The disturbance of the different vegetation types is at or below the predicted levels. It is perhaps noteworthy that the disturbance of several vegetation types reached a maximum two three years ago, but no further disturbance appeared to have occurred. This is good news as we were concerned at the time that the disturbance of those vegetation types might continue and that it would eventually surpass the predicted levels of disturbance. This has not occurred.

The permanent vegetation plots (PVP) and the lichen study, once fully developed and monitored will be a strong tool in assessing the actual effects on vegetation. No information was collected in 2009 as the next surveys are scheduled for 2010.

The revegetation study is very useful and we are encouraged that DDMI considers continuing with it, contingent on the data analysis and results that are forthcoming in 2010. We are keen on seeing these

results. However, DDMI already commented on some observations such as the initially high plant productivity of some plots in which productivity did not seem to lead to the highest plant density and cover (WMPR p. 10). Also, in Phase II, the majority of shrub cuttings died. **It would be very useful if DDMI could provide a preliminary discussion of these observations, presenting its views on what a lower than expected vegetation productivity would mean for the revegetation program.**

3.2 Barren-Ground Caribou

DDMI starts its report by restating the original prediction. This is initially confusing because it led us to believe that the old prediction is still being tested. Later it becomes clear that this is not so. In the past year or so, there was not only a great deal of discussion surrounding the old prediction, but also, DDMI redesigned its surveys to adapt to the findings of previous monitoring results.

The new design includes components that are coordinated with Ekati and addresses, on one hand, the need to capture information relating to a 14 to 28 km zone of influence, on the other hand, the need to understand behavioural responses of caribou within the smaller 3 to 7 km zone of influence. The new design appears to reflect the discussions of 2009 (and earlier) appropriately. Perhaps this is simply a matter of style or preference, but we suggest that the new predictions can be stated in the WMPR instead of re-stating the old one.

We believe that the new approach to ground observations and aerial surveys, in coordination with Ekati is beneficial. However, as it stands, it appears that behavioural data collected previously will not or cannot be used in future analyses of behavioural responses. This may also be true for the aerial surveys. **It would be useful for DDMI to discuss its views on how the new data collection will fit with previous data and whether or not the analysis of trends through the years can continue. A detailed technical side-bar discussion may be useful for us to better understand the assumptions and expectations by DDMI.**

DDMI did not collect behavioural data during the aerial transects from the helicopter this year. In the past, DDMI argued that the disturbance from the aircraft was likely but that the disturbance was the same on any of the transects, hence, a systemic error observational was introduced which would still provide some useful information. We agreed. **Can DDMI elaborate on why it no longer believes that behavioural data from aircraft are useful?**

We did not find any information on group composition of caribou observed. There appeared to be an interesting but counterintuitive finding (or trend) for females with young to be more often closer to the mine than males. **Is group composition data not collected any more?**

On p. 27 DDMI concludes that in 2009 of the caribou groups observed, 52% occurred within 28 km of the Diavik mine footprint, 4% within 14 km and 2% within 11 km. These numbers appear to indicate that there are more caribou farther away from the mine and DDMI concludes that these numbers “appear to support the 14 km ZOI proposed by Boulanger et al. (2009)” (p.28). Although DDMI notes that these results may be confounded by the presence of water, we would like to add additional caution in the interpretation of these results. Not only does water (both total amount and distributional patterns (fragmentation effect of water)) affect the presence of caribou but so does the total land mass in each of the zones. Alone the size of the area increases to the power of two with distance from the center. Moreover, the proportion of water appears to be highest near the center. **A more useful number to interpret the caribou abundance results may be a density of caribou on the land area. Is DDMI willing to present such numbers during the next presentation of results?**

On p. 30 and in Figure 3-5 DDMI concludes that 2,549 caribou were observed in the Diavik wildlife study area. **Please clarify if this number is based on the 15 % coverage. If so, then wouldn't this mean that there was a higher density of caribou observed in 2009 compared to previous years because in previous years a larger area was surveyed (having used a 4 km interval between transects before 2009)?** On p. 33 in the summary, DDMI appears to acknowledge this possibility.

3.3 Grizzly Bears

It is encouraging to see that there are no unexpected effects found on bears. The vegetation (i.e. habitat) disturbance is at or below predicted levels, the bears do not seem to be particularly attracted to the site (i.e. food wastes), and human-bear conflicts seem to be well managed with no bear mortalities resulting in 2009. The bear mortality rate over the life of the mine is currently below the rate predicted.

We are in agreement with a new approach to monitoring bear habitat use which would be based on hair samples (as described on p.52-53). As discussed during the course of 2009, this approach appears to be promising. We will await the results of the 2010 surveys.

3.4 Wolverine

The snow tracking surveys are useful in showing that wolverine use of the DDMI study area is neither diminishing nor increasing in any appreciable degree. The track density per km and per day appears to have been somewhat higher in the most recent four years than it was in the previous four years. 2009

showed the highest density of tracks. A statistical analysis could conceivably demonstrate the strength of the conclusions that can be drawn about the trend of wolverine presence, but it appears that there are no grounds for concern and that the prediction regarding no effect on wolverine presence appears to hold.

DDMI presents a quick summary on p. 61, comparing tracks near and far. However, we do not believe that the data have been analyzed rigorously enough to draw any conclusions on whether or not track density is lower near the mine than farther away. As we noted above for caribou, densities need to be related to the land area in each distance category. **We recommend that such an analysis be done in the next report on the comprehensive data analysis.**

The cooperation between DDMI and community assistants in the snow tracking is encouraging.

As far as mortalities and relocations are concerned, DDMI's effect on the population in the study area appears to be at or below the predicted level, namely that DDMI will not affect wolverine population parameters. We draw this conclusion, being keenly aware that the effect of a single mine when added several times across several mines and other human disturbance in the region, may well add up to a regional cumulative effect. However, the assessment of cumulative effects does not appear to be the objective of WMPR 2009.

3.5 Waste Monitoring

There is an encouraging declining trend of attractants in both the waste transfer area and the landfill. WE briefly summarized the numbers presented in figures 8-1 and 8-2 for food packaging and found that the trend is likely significantly declining with a $R^2=0.8$ on the WTA and $R^2=0.45$ in the landfill. This simply means that DDMI is successful in managing waste attractants and that this success appears to be consistently improving over the years. We commend DDMI for its efforts in this area.

The successful management of food attractants appears to be indeed, as DDMI noted on p.53, contributing to the lack of bear presence in the waste areas. The only puzzling finding of the food attractant monitoring is the apparent increase of ravens on site. **Can DDMI discuss the possible causes for this trend, recognizing that the causes may be complex and may include effects from increased nesting opportunities or increases in regional raven populations?** We ask this question because increased raven density can affect nest predation in the area for many different bird species, potentially even nests of raptors.

3.6 Falcons

It appears that the monitoring results confirm the trends of the past years which are that raptor nest productivity is similar to the Daring study area, and that the productivity remains relatively constant (notwithstanding the expected variation from year to year). In the course of 2009 there were some discussions, which included ENR staff, regarding a change of the effort in raptor monitoring so as to decrease the effort in nest productivity monitoring and to contribute instead to a periodically occurring falcon data base update. **Could DDMI discuss whether or not it intends to consider the suggestions by ENR?**

3.7 Waterfowl

It is encouraging to learn that the amount of waterfowl habitat disturbed is below the predicted amount and that the diversity and abundance of waterfowl species did not seem to change in any manner that would be a cause for concern. We note, as we did in past years, that the data collected on waterfowl diversity, abundance, and pond use is very detailed and could potentially be used for adequate effects monitoring, if control sites existed. We agree with DDMI that future detailed analyses of the waterfowl data are not likely to provide any greater insight into the effects of the mine on waterfowl. The recommendation to discontinue the detailed analyses on waterfowl is therefore acceptable to us.

4.0 Closure

The review of the 2009 WMPR reported herein presents the conclusions arrived at by MSES. We note with satisfaction that the communications we were involved in with DDMI, since our review of last year, were useful in improving our understanding of the monitoring work conducted by DDMI. Given our review and comment herein, we believe that DDMI, in turn, better incorporated some of our comments, compared to previous years. We hope that future communications will lead to further clarification on several details of the 2009 WMPR. Our views are submitted to EMAB for its consideration of potential recommendations and actions.