

# **A Review of the 2011 Diavik Diamond Mine Wildlife Monitoring Program Report**

Prepared for

**Environmental Monitoring Advisory Board**

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Prepared by



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## Executive Summary

### Summary and Recommendations

In this review on behalf of The Environmental Monitoring Advisory Board (EMAB or the Board), Management and Solutions in Environmental Science (MSES) assesses the procedures and results of the Wildlife Monitoring Program Report 2011 (WMPR). The annual data collection is mandated to follow a Wildlife Monitoring Program (WMP), developed in 2002, which determined the testable questions and the objectives that need to be addressed through the life of the project. In the course of the past ten years, MSES reviewed the WMPRs to evaluate how the WMP was and is adhered to. In the course of 2010, MSES participated in several communications with Diavik Diamond Mine Inc. (DDMI) and other parties where a number of recommendations were discussed in workshops and other venues to adapt the data collection in light of current information (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the 2011 WMPR.

The disturbance of vegetation types remained at or below predicted levels in 2011 as there was no new disturbance.

In accordance with recommendations from a 2009 workshop with Environment and Natural Resources (ENR) and other mines and monitoring boards, DDMI adapted its monitoring program for caribou in 2010 by coordinating with BHP-Billiton's Ekati mine and implementing ground observations of caribou behaviour for 2010. Aerial surveys were suspended for 2010 following a new schedule for these surveys which will be designed to test whether or not caribou occurrence changes with changes in mine activity.

Analyses presented in previous WMPRs have indicated that there appears to be an effect of the mine on caribou behaviour within 5 km of the mine. Surveys in 2010 and 2011 added more data which may soon be suitable for further, more detailed analyses.

As far as grizzly bear habitat loss and mortality is concerned, there were no surprises in the 2011 WMPR; both effects remain at or below predicted levels. The methods applied for this part of monitoring are adequate.

Wolverine data from past years combined, both on observations and on snow tracking, appear to show that neither attraction to nor avoidance of the mine is a consistent phenomenon. This appears to be a result of a rather well-managed waste program which does not leave many attractants for wolverine. Mortality and relocations of wolverine are at or below predicted levels. The DNA sampling program is a worthwhile effort as it is useful to know that 18 individual wolverine were identified in 2011 and that over the past years a total of 50 were identified.

The attractants on the Waste Transfer Area (WTA) were at approximately the same low levels in 2011 compared to 2010. Some oil contaminated waste increased in the landfill, but the overall effect of waste management is rather positive. As in past years, we commend DDMI for its efforts which probably led to the low attraction effect on wolverine and bears.

We concur with the new objectives adopted by DDMI for falcons which reflect the discussions of the 2009 workshop. The new focus on contributing data to the Canadian Peregrine Falcon Survey (CPFS), in particular, is a good initiative.

Effects of habitat alterations for waterfowl and shorebirds are at or below predicted levels.

Overall, the measurements taken adequately address the predictions at hand. The analysis of the data yields a great deal of credible information about the effectiveness of mitigation measures. We generally agree with DDMI's recommendations submitted in their 2011 WMPR. There are, however, some highlights for the Boards' consideration; several are re-stated here as they await future detailed data analyses. We recommend that the following issues be addressed:

1. Please consider how the information gained from various caribou datasets could be used in terms of mitigation for the Diavik mine in particular and for other future projects in the region in general.
2. Please justify the pooling of caribou behavioural data across years and any assumptions made in future analyses.
3. Please address the following in future detailed analysis of caribou occurrence and behavioural data:
  - a. Reconcile behaviours observations with the occurrence of caribou: does behavior change with distance as occurrence does, i.e. is behavior "normalized" past the zone of influence of 14-40 km?
  - b. Why do the results show such a large range (i.e. 14-40 km)?
  - c. Why does occurrence of caribou appear to be lower past that distance?
  - d. Why is there the same effect before Diavik was built (given that the years 1998/99 show the same ZOI "effect" as the years after the mine was built)?
  - e. Clarify if "probability of occurrence" indicates caribou densities, as opposed to simply the number of caribou in each distance category.
  - f. How can the information gained from the various caribou analyses be used to develop mitigation measures if there is an effect of the mine on caribou?
4. Please justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.
5. Please consider an analysis of the indirect (in addition to the currently presented direct) footprint effect on caribou habitat for understanding the true effects on caribou and for determining future mitigation measures.
6. A number of recommendations remain unaddressed in the detailed data analysis of WMPR 2010, including:

- a. Testing changes in caribou behaviour over time. This will require an increased sample size of behavioural observations to allow for an analysis of behavioural changes over time.
  - b. Discussing caribou and caribou group (composition) occurrence results. (i.e., Why such a large range for ZOI? Why do we see the same effect before Diavik was built? Why is there so much uncertainty in the ZOI calculations, i.e. 14-40 km, and what does this uncertainty mean for the interpretation of ZOIs?)
  - c. Relating caribou and wolverine track densities to the land area in each distance category.
  - d. Providing a detailed analysis of grizzly bear data.
  - e. Discussing possible causes and consequences of the increase in raven and fox observations in waste areas.
7. Provided that the predictions set out in the 2002 WMP need continued testing, we recommend that the grizzly bear hair sampling program be continued, even if other mines do not continue their programs. However, a regional collaborative effort on the analysis of the bear population would be a worthy effort and EMAB may consider the benefits of a regional study as opposed to the site specific study set out in the 2002 WMP.
  8. Please consider the potential correlation between average camp population and the number of grizzly bear sightings. Please give careful consideration to the possibility that bears may be becoming habituated and their presence on the site may be on the rise.
  9. Please consider possible mitigation measures to address the increase in raven and fox observations in both waste areas.
  10. Please discuss the results showing an effect of the mine on vegetation structure in reclamation and revegetation studies and discuss the implications for wildlife recolonization in terms of the likelihood for re-establishment of natural or pre-disturbance vegetation and wildlife communities.
  11. Please provide details of future monitoring plans for lichen, such as frequency and timing of monitoring, and integrate with the results provided here to form a comprehensive vegetation monitoring program.
  12. Please provide responses to the detailed questions and comments (presented in bold font) in the body of this review report.
  13. Except for our recommendations listed above, we are in agreement with the recommendations listed in the 2011 WMPR and do not recommend any actions additional to providing the information requested above.
  14. We recommend that the Board accept the 2011 WMPR with the understanding that the above listed questions and recommendations will be addressed in communications and workshops by DDMI in 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.

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## 1.0 Introduction

The Environmental Monitoring Advisory Board (EMAB or the Board) 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 2011 Wildlife Monitoring Program Report (WMPR). The WMPR communicates the findings of surveys conducted during 2011 as well as DDMI's recommendations for future activities.

The annual data collection is mandated to follow a Wildlife Monitoring Program (WMP), developed in 2002, which determined the testable questions and the objectives that need to be addressed through the life of the project. In the course of the past ten years, MSES reviewed the WMPRs to evaluate how the WMP was and is adhered to. In the course of 2010, MSES participated in several communications with DDMI and other parties where a number of recommendations were discussed in workshops and other venues to adapt the data collection in light of current information (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the 2011 WMPR.

Based on its annual reviews of past WMPRs and detailed data analyses, MSES submitted numerous recommendations for EMAB and DDMI to consider. The present report takes past recommendations and discussions as well as the recently altered WMP objectives into account. Here, we review how DDMI addressed the above discussions and previous recommendations in the 2011 WMPR.

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 and DDMI has anchored its' monitoring reports on these objectives. For more clarity, below we re-state the objectives set forth in the WMP v. 2 of 2002 to emphasize that these objectives are the foundation and focus of our review, and that the methods and results in the 2011 WMPR, are reviewed in light of these objectives.

*"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 1999); and*
- b. Ensure that management and mitigation measures for wildlife and wildlife habitat are effective in preventing significant adverse impacts to wildlife."*

These objectives are the foundation and focus of our past and current reviews, relating the methods and results in the 2011 WMPR to what we believe is the ultimate goal of monitoring, namely the understanding and alleviating of effects of the project. However, a number of specific questions that have been tested in the course of the years of monitoring have been found to be either largely answered or

ineffective for the testing of mitigation effectiveness, prompting discussions about adapting the objectives of data collection in light of current information (Handley 2010). DDMI adopted the recommended changes to the program in the WMPR 2011 by addressing the new objectives, where appropriate.

## 2.2 The State of Current Information

The WMPR 2011 did not present any new detailed data analyses. This is reasonable as such analyses have been provided last year and it was agreed that DDMI would now focus on the collection of additional trend data and data for the new objectives (Handley 2010) before further detailed statistical analyses would be required.

For the reader of this review, however, we re-state some of the highlights in our last year review (MSES 2011a) of the detailed analysis as this is the current best available information on trends and data quality:

- The detailed analyses are generally well presented and informative. We would like to note that some of the recommendations made in previous years have been incorporated into the latest analyses. We would like to commend the authors for including more detail in the analytical results than in previous years.
- The permanent vegetation plot analysis suggests that indeed vegetation composition, in particular lichen cover, is altered near the mine. There are fewer lichen but more grasses, forbs and vegetation litter near the mine.
- The general findings for caribou remain relatively unchanged, namely that there appears to be a ZOI for caribou occurrence where caribou are more likely to occur at about 14 km to 40 km from the mine than closer to the mine. A new and potentially important finding is that caribou groups with calves spend less time feeding and resting within 5 km of the mine than farther away. This suggests that caribou behaviour and potentially the energy balance of young caribou is affected within that distance.
- For grizzly bears and wolverine, no particular new information was found compared to previous years. Both mortality and habitat loss remain at or below the levels predicted.
- Waste management seems to be effective in minimizing attractants for both grizzly bear and wolverine.
- For falcons the new objectives seem reasonable as they potentially contribute to a better regional understanding of falcon populations.
- There are no new findings regarding the abundance and species composition of waterfowl and shorebirds.



While DDMI has incorporated some of our recommendations or questions from last year, others remain unaddressed. Table I summarizes the current status of our 2010 recommendations.

**Table I: Actions by DDMI in Response to 2010 Recommendations**

2010 Recommendation/Question	Action by DDMI
<b>Vegetation and Wildlife Habitat</b>	
<p>Discuss the revegetation program in light of the current findings [initially high plant productivity of some plots in which productivity did not seem to lead to the highest plant density and cover; the majority of shrub cuttings died]. 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?</p>	<p>The revegetation report provided some very useful information. The experimental set and data analyses are adequate and proved credible results. DDMI should take the recommendations in the revegetation report as guidance in reclamation planning.</p>
<b>Barren-Ground Caribou</b>	
<p>Discuss the implications of a larger than expected effect on caribou for future environmental management.</p>	<p>No discussion was provided.</p>
<p>What is the actual size of the larger caribou ZOI, 14 or 28 km?</p>	<p>The detailed analysis of occurrence showed similar results as in earlier years. A zone of influence is suggested to be at 15 km to 40 km. Interpretation of results is debatable. The large range of possible effect size points to a great deal of uncertainty in the data.</p>
<p>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?</p>	<p>No discussion was provided.</p>
<p>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. How can the information on behaviour be used to adapt management actions at the mine and in the region? A detailed technical side-bar discussion may be useful for us to better understand the assumptions and expectations by DDMI.</p>	<p>Analysis of caribou behavioural data was undertaken using data from all years. Caribou with young changed feed and rest less with 5 km of the mine. Analyses or discussion supporting the combination of all years of caribou behavioural data were not provided. Assumptions were not provided. A discussion on “How can the information on behaviour be used to adapt management actions at the mine” was not provided.</p>
<p>Can DDMI elaborate on why it no longer believes that behavioural data from aircraft are useful?</p>	<p>No discussion was provided.</p>
<p>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</p>	<p>No discussion was provided.</p>

discussions about these ideas could be fruitful.	
Is group composition data not collected anymore?	Data were analyzed and presented in 2011 report, but no new data exists and we do not know if group composition data will be collected in the future. Analyses on data to date suggest that there is no consistent pattern as in some years there are more nursery groups closer to the mine than farther away and in other years it is the opposite.
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 would be beneficial. A 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?	Caribou density does not appear to have been used in any of the analyses, particularly in relation to land area.
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)?	DDMI acknowledge verbally (phone conversation in Summer 2010) that this may be the case but no discussion of this potential confounding issue was presented in the 2011 WMPR.
<b>Wolverine</b>	
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.	Wolverine density does not appear to have been used in any of the analyses, particularly in relation to land area.
<b>Waste Monitoring</b>	
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?	The issue was discussed verbally, but no resolution appears to exist at present.
<b>Falcons</b>	
In the course of 2009 there were some discussions, which included Environment and Natural Resources (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?	It appears that DDMI is working with ENR on coordinating the required data collection and changing its past approach.

## 3.0 Specific Observations

### 3.1 Vegetation and Wildlife Habitat

The disturbance of vegetation types remained at or below predicted levels in 2011 as there was no new disturbance.

As last year, we concur with the recommendations proposed by DDMI. **However, we recommended last year that the results of the Permanent Vegetation Plot study showing an effect of the mine be clearly addressed in reclamation and revegetation studies and be discussed with regards to implications for wildlife recolonization and the likelihood for re-establishment of natural communities. We do not know if re-vegetation studies have been continued in 2011 or if any new results were analyzed, but whenever the opportunity arises, the above recommendation should be considered.**

In late 2011 we had the opportunity to review the study addressing Dust Deposition to Lichen (MSES 2011b). We cross-reference our review of the Dust Deposition to Lichen study here because the issues investigated in that study are relevant for vegetation health and should be integrated with the WMPR lichen study. **We recommend that details of future monitoring plans for lichen be provided, such as frequency and timing of monitoring, and integrated with the results provided here to form a comprehensive vegetation monitoring program.**

### 3.2 Barren-Ground Caribou

In accordance with recommendations from a workshop in 2009 with ENR and other mines and monitoring boards (Handley 2010), DDMI adapted its monitoring program for caribou in 2010 by coordinating with BHP-Billiton's Ekati mine and implementing ground observations of caribou behaviour for 2010. Aerial surveys were suspended for 2010 following a new schedule for these surveys which will be designed to test whether or not caribou occurrence changes with changes in mine activity.

Previous analyses have indicated that there appears to be an effect of the mine on caribou behaviour within 5 km of the mine. Surveys in 2010 and 2011 added more data which may soon be suitable for further, more detailed analyses. As last year, we believe that the methods of the behavioural study seem to be adequate, but it would be useful to understand how or if the behaviour of caribou changed over time. As it stands, it appears that data from all years were combined. **Future analyses should justify the pooling of data across years and what, if any, assumptions were made.**

Future detailed analysis of data should address the following:

- **Reconcile behaviours observations with the occurrence of caribou: does behavior change with distance as occurrence does, i.e. is behavior "normalized" past the zone of influence of 14-40 km?**
- **Why do the results show such a large range (i.e. 14-40 km)?**
- **Why does occurrence of caribou appear to be lower past that distance?**

- **Why is there the same effect before Diavik was built (given that the years 1998/99 show the same ZOI “effect” as the years after the mine was built)?**
- **Clarify if “probability of occurrence” indicates caribou densities, as opposed to simply the number of caribou in each distance category.**
- **How can the information gained from the various caribou analyses be used to develop mitigation measures if there is an effect of the mine on caribou?**

As last year, we note that future analyses will focus on changes in caribou occurrence (and possibly in behaviour) relative to the changes in mine activity. Given that such analyses are still planned for the future, we re-state, for the future record, that **DDMI should justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.**

As to caribou habitat, the recent study on Dust Deposition to Lichen (Risk Assessment Report) submitted by DDMI in late 2011 indicates that lichen are affected through the absorption of metals for a considerable distance from the mine (MSES 2011b). Although the Dust Deposition report concluded that there is no significant health risk to caribou, we raised some methodological issues which may potentially change the conclusions. Moreover, the WMPR Permanent Vegetation Plot study from previous years indicated that vegetation composition, most notably, lichen abundance, is changed beyond the footprint of the mine. Consequently, caribou habitat is changed through both abundance and quality of forage. While the 2011 WMPR focuses on the loss of habitat from the direct footprint of the mine (this focus reflects the prediction in the Environmental Effects Report of 1998), the lichen studies indicate that the effects on habitat loss go beyond just the footprint. **We suggest that an analysis of the indirect (in addition to the currently presented direct) footprint effect on caribou habitat may be useful for understanding the true effects on caribou and for determining future mitigation measures.**

We concur with the recommendations DDMI submitted in the 2011 WMPR regarding caribou. We particularly appreciate the recommendation to change survey methods for assessing caribou occurrence relative to the mine site. This recommendation is a nice example for adaptive management which should be employed when results indicate that the approach to date was not satisfactory. We would be interested to learn if DDMI could clarify whether or not a change to this program has been considered before or whether DDMI believed previously that surveys were adequate.

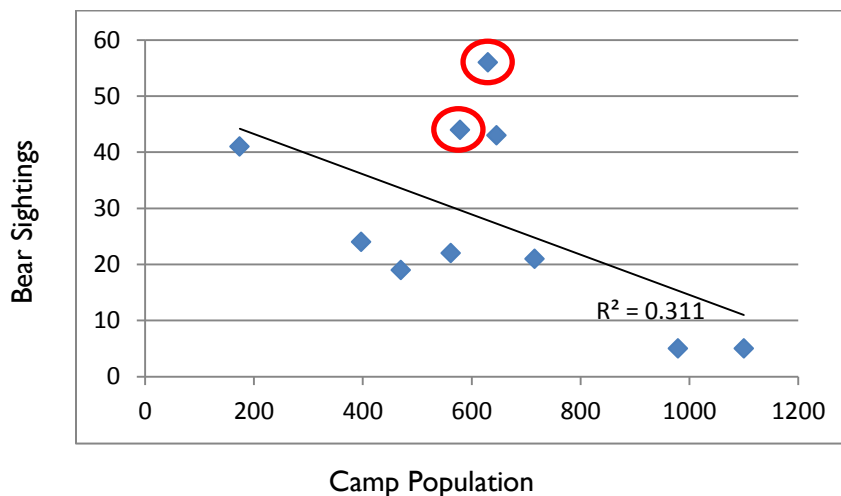
### **3.3 Grizzly Bears**

As far as grizzly bear habitat loss and mortality is concerned, there were no surprises in the 2011 WMPR; both effects remain at or below predicted levels. The methods applied for this part of monitoring are adequate.

The modified impact prediction for the presence of bears relative to mine activities is useful and should be tested in the years to come. This prediction changes the focus from testing the ZOI to testing effects of mine activity. Last year, we concurred with DDMI’s conclusion that “*this new method [hair sampling] is advantageous in that grizzly bear hair present on the tripod is indicative of fresh sign*” (p. 33). Clearly, challenges coordinating the approach with other mines need to be overcome. However, as last year, we

do not see any reason, nor was there any reason identified in our communications through the past year, that this program should be discontinued until it is successfully coordinated with other programs. **We recommend that the hair sampling program be continued, even if other mines do not commit to it. Please explain why this was not done.**

Last year, we observed that there were a large number of days with bear observations on the mine site. This year (in 2011) the number of observations was even greater. As we were intrigued by the fluctuations of the camp population and the fluctuation of the number of sightings, we hypothesized that perhaps there would be more sightings when there were more people. However, a simple correlation of the numbers presented in Table 6-4 of the WMPR 2011 indicates a nearly significant negative trend, suggesting that there may be more sightings when there are fewer people on site (Figure 1). **There may well be many explanations for this trend, but we recommend that DDMI gives some thought to this potential correlation.** If the trend is true, then it would indicate that bears may avoid the mine more often when there are many people. This may make sense. However, two outliers of the trend occurred in the last two years (circled in red on Figure 1) when there were a moderate number of people, but the greatest number of sightings. **Please give careful consideration to the possibility that bears may be becoming habituated and their presence on the site may be on the rise.**



**Figure 1: Average camp population related to the number of bear sightings (data from Table 6-4 of the WMPR 2011; data circled in red indicate the most recent two years).**

DDMI recommends introducing a structured hair snagging program in collaboration with Government of the Northwest Territories (GNWT) and BHP-Billiton. The program would address a new, regional scale question about the bear population. Implicitly, this new program would replace much of the bear occurrence monitoring that was designed in the 2002 WMP to test the zone of influence (ZOI). Given the ten years of information on the grizzly bear ZOI, we support a change in favour of a more regional and collaborative study.

### 3.4 Wolverine

Data from past years combined, both on observations and on snow tracking, appear to show that neither attraction to nor avoidance of the mine is a consistent phenomenon. This appears to be a result of a rather well managed waste program which does not leave many attractants for wolverine. Mortality and relocations of wolverine are at or below predicted levels. The 2011 WMPR seems to corroborate this supposition.

The DNA sampling program is a worthwhile effort as it is useful to know that 18 individual wolverine were identified in 2011 and that over the past years a total of 50 individuals were identified. This puts the possible effect of the mortality or relocation of a wolverine into perspective. That is, with so few numbers of wolverine in the region, any additional mortality could have a serious impact on population viability.

We concur with DDMI's recommendation to continue participation in the DNA program in 2015.

### 3.5 Waste Monitoring

The attractants on the Waste Transfer Area (WTA) were about the same low levels in 2011 compared to 2010. Some oil contaminated waste increased in the landfill, but the overall effect of waste management is rather positive. As in past years, we commend DDMI for its efforts which probably led to the low attraction effect on wolverine and bears.

We note, however, that fox and raven increased in both waste areas. In fact, raven observations were some of the highest ever and fox observations were not far behind. This finding remains unchanged from last year. **We recommend that DDMI discuss the possible causes and consequences of this increase. DDMI should discuss possible mitigation measures.**

### 3.6 Falcons

We concur with the new objectives adopted by DDMI which reflect the discussions of the 2009 workshop. The new focus on contributing data to the Canadian Peregrine Falcon Survey (CPFS), in particular, is a good initiative. There do not appear to be any new findings or changes of note regarding the presence and productivity of Falcons. We concur with DDMI's recommendations.

### 3.7 Waterfowl

As far as waterfowl habitat alterations, effects are at or below predicted levels. Regarding species composition and presence, as last year the 2011 WMPR showed that shore birds and diving ducks respond differently to mine affected waters: ducks prefer it and shorebirds seem to avoid these waters, preferring to use the shores of the Shallow Bay. Although the 2011 WMPR showed lower numbers of birds than previous years, we concur that this may have been caused by an unusual season. Without a control area this supposition may only be confirmed through long-term data collection.

## 4.0 Closure

The review of the 2011 WMPR reported herein presents the conclusions arrived at by MSES. As last year, we note with satisfaction that the communications we were involved in with DDMI, since our review of the past years, were useful in improving our understanding of the monitoring work conducted by DDMI. Given our review and comment herein, we believe that DDMI better incorporated some of our comments compared to previous years. However, we also note that several recommendations and requests from previous years were not responded to by DDMI (Table 1). We hope that future communications will lead to further clarification on several details of the 2011 WMPR. Our views are submitted to EMAB for its consideration of potential recommendations and actions.

## 5.0 References

Handley, J. 2010. Diamond Mine Wildlife Monitoring Workshop Report. Prepared by Joe Handley. Yellowknife, NT.

MSES. 2011a. A Review of The 2010 Diavik Diamond Mine Wildlife Monitoring Program Report. Prepared for Environmental Monitoring Advisory Board. May 2011.

MSES. 2011b. A Review of the 2011 Diavik Diamond Mine Risk Assessment of Caribou Exposure to Metals from Dust Deposition to Lichen. Prepared for Environmental Monitoring Advisory Board. December 2011.