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Department of Environment

Ministère de l'Environnement

Stephanie Briscoe
Executive Director
Nunavut Impact Review Board
PO Box 2379
Cambridge Bay
Nunavut
XOB OCO

June 16, 2005

Dear Ms. Brisco


RE: Review of the Jericho Diamond Project Terrestrial Wildlife Mitigation and Monitoring Plan (Axys Environmental Consulting, April 2005)

The Department of Environment, (DoE) reviewed the document noted above (the Plan) submitted as a project certificate requirement prior to construction of the Jericho Diamond Mine (Project Certificate NIRB No. 002, primarily addressing conditions 2–7, 10, 12–16). This Plan is a significant improvement from the one submitted on 4 March 2005, and it begins to address many of the issues noted in our March 18 response. We appreciate the efforts of Tahera in addressing these outstanding certificate requirements by their submitting this additional material in a timely manner. We look forward to working with them in addressing all certificate requirements to all stakeholder's satisfaction and to ensure appropriate protection and monitoring of the land and wildlife resources that may be disturbed as a result of the development activity.

Based upon the document submitted and the review presented below, this Plan does not in its current form adequately cover how the project certificate conditions will be addressed. Generally, many technical details are inadequate, quantifiable criteria that will trigger management actions are not identified, and inappropriate survey techniques are used and these will not detect the effects of the mining activities on terrestrial wildlife, should they occur.

We have, therefore, provided sufficient detailed information below that would allow Tahera to readily address outstanding technical issues. We think that another draft prior to field operations and a finalized document following field trials this season could readily accommodate our concerns and the NIRB certificate conditions.

Sincerely,


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Michael Settingington, R.P.Bio.
Ecosystems Biologist
Department of Environment, Government of Nunavut

The following review is divided into two parts according to the mitigation and monitoring sections of the Wildlife Mitigation and Monitoring Plan (the Plan). Our review deals only with perceived deficiencies in the Plan and does not address areas that are considered adequate. Comments provided in this review under the headings "Mitigation Plan" and "Monitoring Plan" are not necessarily mutually exclusive and should be considered as a whole. For explanatory purposes or emphasis, some overlap in comments between sections occurs.

REVIEW PART 1: MITIGATION PLAN

General Comments

At a general level, two main concerns are noted with respect to the mitigation plan:

1. **Application of mitigation measures:** In a number of instances, the Plan lacks clear criteria for when/how certain measures will be applied. It is, therefore, not possible to properly evaluate the adequacy of these measures.
2. **Evaluation of mitigation measures:** As noted in the Plan, Section 4.26 of the EA Guidelines for the Project called for a monitoring plan that addressed a number of needs including the need to evaluate the effectiveness of mitigation measures. However, in many cases insufficient information (or no information) is provided on the methodology or criteria to be used for assessing the effectiveness of mitigation measures. Further, there is no discussion of acceptable levels/thresholds of impact from the Project beyond which improvements to mitigation measures would be implemented. The reader is therefore left to guess how the mitigation measures and the monitoring of these measures will serve to minimize project impacts. For example: What is the maximum acceptable problem bear annual mortality level beyond which new/improved mitigation measures will be implemented? How much do caribou have to be 'disturbed', and according to what measurable parameters (and analytical methods), before mitigation measures are considered inadequate?

Elements of these two concerns are highlighted in the specific comments below.

Site Design

The Plan (s2.3.1) refers to the fact that the mine plan was developed with special consideration given to important wildlife areas. For ease of review, a series of maps illustrating the design of the site, overlain with a biological inventory of sensitive/key wildlife areas (dens, nests, caribou crossings etc.), would be a useful addition to the document.

Hunting and Fishing

In numerous sections (s2.2.1, s2.3.2, s2.3.3), the Plan indicates that hunting and fishing by employees will not be allowed while "on site", "on the job" or "on the property". Some clarification of these sections would be useful to determine whether or not there is still potential for employees to engage in hunting and fishing while off the job (i.e. during leisure time at the mine) and off the property. If hunting and fishing by employees can take place in the area around the property, what measures are in place; for example, to ensure that attractants such as fish and wildlife carcasses are properly handled/disposed of to avoid creating problems with wildlife around the site? Will fish and game meat be stored on the mine site?

Project Activities and Disruption of Wildlife

Information in the Plan regarding mitigation of the Project's impacts on the movements and other activities of wildlife is largely based on a series of general statements. These aspects of the Plan are not amenable to evaluation. Additional details (quantitative where possible) are required. For example:

1. **Work Stoppages:** Sections 2.2.2 and 2.3.2 state that: "All activity including construction, drilling, blasting, and traffic movements will be stopped in the immediate vicinity in the presence of raptors, ungulates and carnivores". The terms "presence" and "immediate vicinity" require further definition. Both are not specific enough to assess the suitability of these mitigation measures and are not elaborated on in any detail in other parts of the Plan. Could a single caribou bring all these activities to a halt? What happens if a bear digs a den next to the mine site? How close would the den have to

be to stop activities? How close does a wandering bear have to be to trigger this mitigation measure? Could a single raptor flying over the site stop activities? Clearly, it would be difficult to develop and present detailed procedures for all of these eventualities. However, the Plan should provide more details (quantitative if possible) on the number of individuals, their distance from the site and their behaviour required to trigger changes in site activities such as stoppages. These measures should be species specific. The traffic management procedures outlined in appendix A (p11-16) do provide some details but these are focused largely on the control (not stoppage) of road traffic (not other activities) in response to caribou and muskoxen. Furthermore, the caribou/muskox watch program for traffic management, outlined in appendix A, is not explicit in stating how many individuals or the size of herd required to initiate a traffic management action. Could a single caribou within 100m of the project infrastructure result in traffic speeds being reduced to 20km/hr?

Section 2.4.1.1 states: “*Limit activities in caribou summer range between April and August to limit interaction with caribou, to the extent practical*”. Define “*extent practical*”. Again, this term is too vague to assess the suitability of mitigation measures and is not specifically elaborated on in other parts of the plan.

2. **Traffic:** Section 2.2.1 of the Plan states that: “*Vehicle traffic will be planned to limit disturbance of sensitive wildlife areas, or where wildlife is concentrated*”. What constitutes a concentration of wildlife? Some definition is required. Presumably, the definition would depend upon the species involved.

In various sections (e.g. s2.2.3, s2.3.1, s2.4.1.1, s2.4.3.1), the Plan indicates that air traffic will be restricted to prescribed flight corridors, specific times and minimum altitudes near sensitive areas and known concentrations of wildlife or birds. What are these prescribed corridors? How are they determined? What information are the minimum altitudes (600m for wildlife, 1000m for birds) based on? Will there be monitoring to assess the effectiveness of these altitudes in minimizing impacts? How will compliance with flight corridors and altitudes be assessed? Again, what constitutes a “*concentration*” for a given species (caribou, bears, raptors, etc)? What constitutes a “*sensitive area*”? 1000 caribou, a single bear? A single raptor nest, a single den? Who makes this determination and the decision to implement the mitigation measures?

3. **Blasting:** The NIRB certificate for this project includes the following relevant requirements: No. 9 “*Environmental effects of blasting shall be kept to a minimum. Blasting cannot occur if it affects in anyway migrating caribou, birds or local carnivores.*” No. 13 “*Tahera shall submit plans to regulatory authorities to include measures that will ensure caribou are not harmed, entrapped or frightened by any project activity.*”

In response to these requirements, the Plan proposes that the Project will “*Avoid blasting in sensitive areas and during ecologically sensitive times*” (e.g. s2.3.1, s2.3.2, s2.3.3). Further clarification is required as to what constitutes a “*sensitive area*” or “*sensitive time*” with respect to blasting. Presumably, these terms require definition according to the type of sensitive area/habitat and the wildlife species involved since some areas and species are presumably more sensitive to blasting than others. Also, see comments above regarding work stoppages.

The description of blasting procedures in appendix A (pages 62-63) indicates that mitigation measures for wildlife will be taken with reference to a “*Danger Zone*” of 600m which is based upon the maximum distance from the blast site where injury from flying rock might occur. While this zone considers the potential for direct wildlife mortality as a result of blasting, it does not take into account other impacts such as disturbance of migration, foraging, nesting and denning, as is required under the NIRB certificate. The Plan does briefly mention that wildlife responses to blasting will be monitored and recorded. However, no details are provided with respect to things such as, what data will be used to assess wildlife responses, how these data will be collected and analyzed, and how the resulting information will be used to modify mitigation measures for blasting. How will wildlife responses to blasting be quantified? What thresholds or criteria are there for determining when blasting is having an unacceptable effect on wildlife? What further measures might be employed? Should the extent of blasting mitigation measures be determined, monitored, assessed and modified

according to the particular wildlife species present, the number of animals present, their distance from the blast site and the nature of their activities? Is the same blasting procedure applicable when a single caribou is present versus a herd of 50,000? Without addressing these questions in the Plan, it is not possible to assess whether the NIRB certificate requirements have been met.

On a related note, sections 2.3.2 and 2.3.3 state that “*Visual and noise disturbances near migrating animals, such as caribou and waterfowl, will be limited.*” What does “*limited*” mean in this case? How will it be assessed/measured?

Habitat Alteration and Restoration

A number of sections of the Plan are notable with respect to this topic:

1. Section 2.3.1 states that the Project will “*Encourage recovery of habitat where practical*” and “*Investigate the return of native vegetation to disturbed areas*”. How will recovery be encouraged? Define “*where practical*” in this case. How will the return of native vegetation be investigated?

Section 2.3.4 states that during closure the “*site will be restored to as natural a setting as possible to conserve wildlife habitat...*”. Section 2.3.4 also states that “*Tahera will undertake a 5 year period of re-vegetation studies at the site that will determine if future larger scale re-vegetation efforts are possible*”. Define “*possible*” in this case.

Have there not already been sufficient studies of re-vegetation/remediation of disturbed sites to determine the potential or practicality for restoration of the Project site? What information is available on this subject in the published scientific literature or in unpublished technical reports from governments and industry? How might experiences at other sites be applied to this Project? Have other projects in the north, including other diamond projects, already conducted these sorts of studies or assessments? Is it not possible at this stage to provide, at the very least, a preliminary assessment regarding whether or not the site will be re-vegetated? Assuming that the native vegetation is physically capable of re-growth on the disturbed sites, what other criteria are there for determining if restoration is “*possible*” or “*practical*”?

2. Section 2.3.4 states that “*the open pit will have a permanent berm with Inukshuks surrounding it in order to deflect wildlife.*” Besides a berm and the use of Inukshuks, will there be any restoration efforts within the pit itself?

Wildlife Mortality

At various points, the Plan indicates that a wildlife kill report will be completed for any animal killed directly as a result of project activities. For example, section 2.3.3 states that “*A wildlife kill report will be completed by the driver for every animal (from ungulates to small mammals) that is killed along haul roads related to the project.*” The Plan also states that the information from these reports will be analyzed annually to determine whether changes to mitigation measures are warranted. The Plan does not mention how these data will be analyzed or what criteria will be used to determine the need for change. What is the anticipated mortality rate for a given species? What are the mortality thresholds for the project beyond which changes to mitigation measures must be made? Is an annual mortality of one (1) bear, one (1) wolverine, one (1) caribou or one (1) lemming acceptable? What information is available from other northern mines for predicted and observed kill rates and acceptable standards?

Daily Wildlife Logs

The Plan refers to the use of daily wildlife logs as a tool in monitoring and mitigation efforts. Given the acknowledged biases in the data derived from these logs, how are they to be analyzed and used as part of the mitigation plan?

Den Surveys

Sections 2.4.2.1 to 2.4.2.3 of the Plan discuss conducting den surveys for bears, wolves and wolverines before the construction phase of the project. However, there is no mention of how these surveys will be done, how data will be analyzed or what decisions will be made based upon the results? Presumably, for mitigation purposes, the objective is to locate all den sites within a prescribed study area rather than estimating the number of den sites. If so, a transect survey with partial coverage of the study area is not sufficient. (Also see comments in the monitoring section). Is the plan referring to den surveys done by Hubert and associates in 1999/2000? If so, are these still relevant as mitigative tools?

Adaptive Management

In section 2.5 (*"Adaptive Management"*), the species-specific criteria for assessing the success of mitigation measures are vague and qualitative. It is not clear at what level of impact/point mitigation measures will be considered ineffective. Further definition is required. For example:

1. For ungulates, statements such as *"Observed difficulties in movements across designed crossing structures"*, *"Substantial change in movement patterns through the project area"*, and *"Ungulate deaths within the project area"* require clarification. Define *"difficulties"*. Define *"substantial"*. How many ungulate deaths?
2. For carnivores, statements such as *"Increase in reports of nuisance wildlife....."*, *"Carnivore deaths within the project area"* require clarification. How many deaths are necessary before measures are considered unacceptable and change is required?
3. For birds, statements such as *"Increase in bird mortality due to project-related traffic"*, *"Nest abandonment incidents increase due to project disturbances"* and *"Bird deaths"* require clarification. How many deaths would trigger changes in mitigation measures?

Monitoring of Mitigation Measures

Section 2.6.2 of the Plan, indicates that additional plans will be developed to monitor the effectiveness of certain mitigation measures. These 'mitigation monitoring plans' are central to the integrity of the overall Plan. However, it is not clear how they will be designed, conducted and analyzed.

The purpose of the Wildlife Mitigation and Monitoring Plan (the Plan) should be to identify and describe all of the necessary monitoring for the Project, rather than indicating the intent to do. Without details of the specific mitigation monitoring plans, it is not possible to properly assess the Plan as a whole. For example, the Plan states that *"For raptors, a monitoring plan will be developed to assess the effectiveness of avoidance of raptors nests."* The monitoring section of the Plan (section 3) goes on to indicate that data will be collected on the use and productivity of raptor nests in the regional study area (RSA) for comparison to a control site at Daring Lake. However, it is not clear how these data will be used as part of a study to look specifically at success in avoiding raptor nests. The reader is left to speculate on this topic.

Inconsistencies Within the Document

A number of possible inconsistencies between the material prepared by Bearwise (Appendix A) and that prepared by Axys were noted. For example:

1. **Flight Altitudes:** Sections of the Axys material refer to 600m and 1000m as minimum altitudes for aircraft approaching wildlife (i.e. caribou) and migratory birds, respectively. In contrast, appendix A (e.g. pages 12, 16) states that *"Aircraft are to maintain a minimum flying altitude of 300m"* and that *"Aircraft are not to approach closer than 500m from a raptor nest, waterfowl nesting area or caribou crossing when any of these areas are active."*
2. **Migratory Birds:** In response to specific concerns raised by Environment Canada, the Plan presents a number of mitigation measures for impacts on migratory birds. However, there appear to be some

inconsistencies in the material presented. For example, pages 19-20 & 23 state that “*Project facilities will be built during the winter when migratory birds are absent*”, “*Mine site clearance will be completed before migratory birds return.*”, “*Construction of all buildings and stockpile pads and roadways will be completed during the winter months when the ground is completely frozen to preserve the integrity of the permafrost*” and “*Project scheduling of construction shows initial construction of roads, building pads, tailings dams etc completed prior to the arrival of nesting birds in the area*”. These statements are in direct conflict with the development scheduled presented in section 1.2.4 of the Axys document.

If construction is indeed proceeding during the nesting season, does the statement on page 23 (appendix A), that “*If active, nests will be marked and operators will be instructed to avoid these areas until nesting season is over*”, still apply?

Bear Response Procedures (Appendix A- part 9)

The Plan should perhaps note that when a bear responds to a deterrent by retreating, immediate cessation of deterrent activity is not always appropriate. Continued application of deterrents is sometimes important to adequately reinforce the negative experience and ensure that the retreat is full and lasting. Even a retreating bear may need additional deterrents to avoid a partial retreat and return. It is perhaps also worth emphasizing that prolonged periods of observation of a bear, before making a decision to apply deterrents, is not advisable since this provides opportunity for habituation. A bear's first experiences with people are likely the most significant in terms of shaping future behaviour. The speed and intensity with which deterrents are first applied is therefore important.

Relocation of Wildlife (Appendix A- part 10)

The Plan makes reference (pg. 41) to the relocation of problem wildlife, stating that this measure should be viewed as a last resort and is to be carried out by the Government of Nunavut's Department of Environment. It is strongly recommended that the option of capturing and relocating wildlife, in particular grizzly bears, be given more consideration/emphasis in the Plan. Given the low acceptable human-caused mortality rate for this species, even a single mortality each year at the mine may be significant. Trapping, snaring and drugging followed by relocation can be an effective deterrent.

If Tahera considers a relocation program, it should include the collaring of the bear (satellite collar) to monitor its movements and take action if that bear approaches any community or human activity area. Relocation of problem wildlife is not necessarily a success with bears and may create a liability if that bear creates problems elsewhere.

It is recommended that Tahera and the Government of Nunavut examine the possibility of establishing a formal agreement for the relocation of problem wildlife. This might involve a commitment on the part of Tahera to provide logistical support such as transportation and larger items of capture equipment (i.e. snares, drum traps etc), balanced by a commitment from the Government of Nunavut to ensure the availability of trained, certified and equipped staff.

A strong commitment to the use of relocation, rather than destruction, as a management tool will; (a) set an important tone for this and future development projects in Nunavut, (b) minimize cumulative impacts and (c) help preserve Tahera's record on problem wildlife. This action however will require further consideration and consultations between Tahera and Nunavut's wildlife co-management partners.

Carnivore Deterrent Procedures (Appendix A- part 12)

Appendix A, part 12 notes that “*When approaching any fox keep a look out for signs of rabies.*” Although rabies is most prevalent amongst foxes, it should be noted that any of the mammal species encountered around the project site are potential carriers of rabies and should be dealt with accordingly. It should also be noted that there are different presentations of rabies besides the classic symptoms such as salivation, aggression, hydrophobia and ataxia. For example, some animals may simply appear depressed (so-called ‘dumb rabies’).

REVIEW PART 2: MONITORING PLAN

Detecting Change: Experimental Design

The Environmental Assessment Guidelines for the Project called for a monitoring plan that addressed a number of needs. Some of the key needs were for a monitoring plan that:

1. Distinguishes between natural environmental changes and those caused by the Project, and
2. Assesses the validity of impact predictions.

How are these needs addressed in the Plan as presented? Any monitoring plan designed to detect changes in biological parameters that result from project impacts must satisfy a number of conditions:

1. The magnitude and pattern of natural variation (spatial and temporal) in the measured parameters must be quantified on an inter/intra seasonal and annual basis.
2. The direction and magnitude of changes in these parameters, in response to the project's impacts, must be predicted or estimated.
3. Based upon (1) and (2), a sampling program must be designed which collects data of sufficient sensitivity, specificity, accuracy and precision to detect the predicted impacts.

While the Plan appears to acknowledge these needs, in places, there is little evidence that they have been taken into account in a quantitative way in the design of the monitoring plan. For example:

1. **Testing Predictions:** In various places, the Plan refers to the idea of testing predictions concerning impacts yet there is no discussion of predicted impacts, to any degree. Little qualitative information on predicted impacts and no quantitative estimates are provided.
2. **Measuring/Estimating Natural Variation in Biological Parameters:** Has natural variation been measured or estimated for the parameters to be used by the monitoring program? If not, how will this be done? Will this rely on the baseline data collected in 1999 and 2000? If so, are these data adequate to fully characterize variation (temporally and spatially)? Were sufficient years of data collected (2 years) to document potential annual variation? Were there sufficient intra/inter seasonal replicates to document variation? Were sampling designs adequate for the level of specificity, sensitivity, accuracy or precision required to detect impact related changes? These questions are not addressed in the Plan.
3. **Use of Control Sites:** Sections of the monitoring plan describe the use of a before/after-control/impact (BACI) design in which changes in biological parameters at the impact site are to be compared to control sites. However, amongst other things, for this experimental design to be useful in detecting impacts, a number of conditions must be satisfied, including:
 - a. Sample design/data collection methods must be such that data are specific, sensitive, accurate or precise enough to detect change within the order predicted for project impacts.
 - b. Although the absolute values for measured parameters (e.g. animal density) need not be the same between the control and impact sites, the timing and direction of natural changes in these parameters must be the same between the two treatments to distinguish impact from natural change using a two-factor analysis of variance (where an interaction between year and treatment is used as evidence of an impact).

What is the magnitude of natural variation in the parameters to be measured? How has this been considered in sampling design and data collection methods? Is the pattern of natural variation in the measured biological parameters positively correlated between control and impact sites? The

Plan does not provide details on how control sites were selected and whether the conditions mentioned above have been/will be satisfied. Consequently, those elements of the Plan which use this BACI approach may possess significant potential for making type I and II errors; in other words, detecting no impacts where impacts exist, or detecting impacts where no impacts exist. The key question is whether these methods could detect change/impact if it occurred? What level of change are they capable of detecting? Could these methods detect when an unacceptable change has occurred? These issues are not addressed in plan.

On a minor note, the plan assumes that data to be analyzed by the BACI approach will be amenable to an ANOVA. It is possible that, even with manipulation, the data will not satisfy the assumptions of a parametric test with respect to things such as underlying distribution, variance etc.... If so, what alternative tests will be used? Furthermore, it is useful to clarify whether or not data will be analyzed on a year by year basis versus pooling multiple years into a single category called "After". This is important since some potential impacts may not become apparent until the later years of the project. Pooling data under a single heading "after" may 'wash out' the significance of these data.

Survey Methods

The core of the monitoring plan is a series of periodic systematic surveys. However, it is not possible to fully assess the validity of these surveys since the document is lacking in details. For example, details are not provided with respect to how often surveys will be repeated within seasons? Given the fact that there may be considerable intra-seasonal variation in the abundance of some species (such as caribou, where 50,000 could appear and be gone within the space of a few days), how many surveys are needed to get a sufficiently accurate estimate that reflects seasonal relative abundance rather than abundance at a single point in time? Presumably the frequency of surveys will be dependent upon the pattern of natural temporal-spatial variation that is specific to each species. Perhaps the Plan should include provision to conduct monitoring surveys with greater intensity in the early years of the Project with the potential to reduce sampling effort later on, once a greater understanding of the level of variation and required intensity of sampling is acquired.

The Plan notes (section 3.2.4) that additional details of survey design will be provided when specific sampling protocols are developed. Never-the-less, based upon the information provided, a number of deficiencies seem to be apparent.

1. **Aerial Transect Surveys:** The Plan proposes to use a single aerial survey design as a key tool for data collection for monitoring caribou, grizzly bear, muskoxen, wolf, fox and wolverine. Given the vast differences amongst these species in terms of population size, density, abundance, movement patterns, temporal/spatial distribution, social organization and behaviour, a single survey design is completely inadequate to collect data of appropriate accuracy and precision to meet the needs for monitoring all of these species. Although the proposed method (20% coverage of a 30 x 30km area), may be a somewhat adequate tool for estimating the abundance or relative abundance of caribou, it is very unlikely to be sufficient for other species such as grizzly bears and wolverines, or even muskoxen, that will be present within the study area at far lower densities and/or differing patterns of distribution. Transect aerial surveys for these species are likely to yield data with high sample-related variability, poor accuracy and precision such that they are not sensitive indicators of change. In summary, the concern is that using a single design will create a situation in which the data for some species are not robust enough to detect change in the order of that predicted and considered unacceptable.

There is no evidence in the Plan that analyses have been conducted to establish a suitable level of coverage or spatial scale for the transect-based aerial surveys. For species, such as bears and wolverines, obtaining a sufficiently accurate/precise estimate of numbers, relative abundance or density within the study area is likely to require a much higher level of coverage than that proposed (potentially complete coverage) and may also require a larger search area. Alternatively, rather than the transect approach, a more suitable method of survey for these species might involve a habitat selection-based search effort (such as that used at Diavik) which surveys wildlife activity in specific

habitat types defined according to their known suitability for the species and season in question.

Besides obtaining estimates of relative abundance and density, it seems that one of the key goals in monitoring species such as bears, wolves and wolverine should be to locate all individuals, den sites and other sensitive habitats within a specified area around the Project site. Knowing the location of all individuals (rather than some) is an important tool for managing the risks of human-wildlife encounters that are associated with these species. Knowing the location of all dens and other sensitive habitats will help to ensure mine activities do not disturb key life-history processes such as reproduction. This type of information is not obtained through transect style surveys which are designed for sampling a population rather than counting and locating all individuals. Indeed, collecting this type of information and using it for mitigating impacts on denning and minimizing human-wildlife encounters may be the only realistic goals of survey based monitoring for these species.

Finally, it is not clear from the Plan whether separate aerial surveys will be flown for each species or if a single survey flight is planned to count all species. If the later is the case, how is it proposed that problems such as the development of search images etc.... will be dealt with to maintain the accuracy of the surveys?

2. **Ground Transect Surveys:** Many of the concerns described above for aerial surveys also apply to the Plan's proposed use of ground-based transects.
3. **Caribou Behaviour:** The plan proposes (in table 6) to study caribou behaviour in part by noting the behaviour (feeding, moving etc) of animals observed during aerial surveys. Besides the obvious bias introduced by disturbance from the aircraft, is it really feasible to accurately note, to any useful degree, the behaviour of animals (even in small groups) while flying at a 120-140km per hour, 120-150m above the ground? As an alternative, the Plan should consider making detailed ground-based observations, such as movement rates, foraging time and vigilance time at variable distances from sites of disturbance for possible comparison with control sites?

Caribou movement patterns

1. **Track Density:** The Plan proposes to use track density as a measure of caribou activity around the Project. Is it possible to distinguish whether a track has been used by several caribou versus several thousand? The general appearance of a track will be a function of the time since it was last used and the number of animals that have used it. How sensitive is this method to the number and level of activity of caribou? Has its validity been tested? Is this a useful monitoring tool for anything other than the grossest of impacts?
2. **Telemetry Surveys:** The Plan proposes to use caribou satellite collar data provided by RWED to study changes in seasonal caribou movements which might be associated with the presence of the mine. While satellite collars are a useful tool to study the large scale movements of herds, it is unlikely they will be useful in studying the smaller scale movements potentially associated with avoidance of the mine. How many collars will be used? Is it reasonable to assume that data from a dozen or so satellite collars will be sufficiently sensitive to reflect changes in the movements of hundreds of thousands of caribou relative to a 222 hectare site? Based on pure probability, how many of the satellite collared animals are likely to come close enough to the Project to be influenced in their movements? Are the collars on a duty cycle suitable for looking at small scale movements? In other words, how often are the collars' locations fixed within a 24 hour period?

Wildlife Observation Logs

Considering the acknowledged biases, how will the data from these logs be analyzed and used?

Thresholds (Section 3.2.2.3)

Table 4 provides information on thresholds for wildlife indicators. With respect to this information, the following points are noted:

1. No information is presented for muskoxen.
2. For grizzly bears, given the naturally low density of this species in the region, and the likelihood that proposed survey methods will be insensitive to all but the most extreme changes in density, direct human-caused mortality will probably be the most significant indicator of the Project's impacts. It would be useful, therefore, to define a threshold for human-caused mortalities that is specific to the Project rather than one based on a population-level. In other words, what level of human-caused grizzly bear mortality will be considered acceptable for the Project (keeping in mind cumulative impacts from other sources; current and future)?

Wildlife Health

Has consideration been given to the idea of periodically monitoring the health of wildlife around the Project, with reference to control samples? For example, looking at body condition, stomach contents, contaminant levels etc....

Species Specific Comments

The following comments are intended to supplement or reinforce some of those already made.

1. **Grizzly Bears:** As recognized in the Plan, impacts upon grizzly bears are likely to be one of the key issues during the construction, operation and closure of the mine. Impacts will result either through direct mortality (human-bear encounters) or indirectly through mechanisms such as the displacement of bears from foraging or denning habitat, displacement of prey species, and disturbance causing reductions in body condition and reproductive success. Given the susceptibility of this species to impacts, the Plan must address the following issues:
 - a. The Plan uses density as a measurable parameter for grizzly bears. Given the low density and spatial/temporal distribution of bears in the study area, the proposed methods of survey (based on the information provided) seem unlikely to yield data amenable to detecting effects.
 - b. The Plan should provide more information on what the acceptable rates of human-bear interaction and bear mortalities will be. Threshold levels for these parameters must be established beyond which major changes to mitigation efforts are made.
 - c. The option of catching and relocating problem bears should be given further consideration. This option could be implemented from the start of the project or once a defined threshold of bear mortality has been exceeded.
 - d. Previous surveys suggest areas around the Project have been used as den sites. What happens if a bear decides to dig a den near the Project while it is under construction or in operation? The Plan is not clear on how this situation would be handled.
2. **Muskoxen:** Habitat loss and disturbance may have a greater impact on muskoxen compared to caribou owing to the more limited movements of the former. This species is one of the few that has been observed in the vicinity of the Project during the winter. Disturbance at this time is potentially more detrimental to these animals than disturbance in summer or spring. Over the winter, muskoxen may exist in a marginal nutritional state making them more susceptible to impacts if forced to expend additional energy. Winter disturbance or planned herding of muskoxen may constitute an unacceptable impact and should therefore only be permitted under special circumstances.

What information is available on the winter distribution of muskoxen in the region? How has this been

considered in the monitoring and mitigation plans? The monitoring program contains no provisions to monitor/survey muskoxen during the winter.

Other Comments

- The DoE review of the FEIS (NIRB 197b - DSD submission) noted that there was little detailed information on the effects on habitat fragmentation or deleterious behaviour changes resulting from increased traffic along the Yellowknife-Jericho winter road, especially with the increased use of the route from Lupin to Jericho. It is unclear if there is a specific component of the monitoring plan that addresses this concern;
- Include in Scope of the Monitoring Plan (pg. 31), "Does the project result in increased mortality of wildlife.";
- Include considerations of Muskox distribution (esp. in winter) in the Scope of the Monitoring Plan (pg. 31);
- The Kugluktuk HTO also conducts a Grizzly Bear and Wolverine hair snagging project for collection of DNA samples (include in table on pg. 34);
- The GN does not conduct small mammal surveys (pg. 35).

Terms and Conditions of the NIRB Certificate

Based upon the document submitted and the review presented above, it is concluded that the Wildlife Mitigation and Monitoring Plan does not, in its current form, fully satisfy the conditions of the Project's NIRB certificate. In particular, the Plan does not adequately address how the following conditions will be met:

No. 9 "*Environmental effects of blasting shall be kept to a minimum. Blasting cannot occur if it affects in anyway migrating caribou, birds or local carnivores.*"

No. 13 "*Tahera shall submit plans to regulatory authorities to include measures that will ensure caribou are not harmed, entrapped or frightened by any project activity.*"

No. 16 "*The highest protection shall be given to nesting and flightless birds or vulnerable wildlife including all dens*".