

DISCUSSION PAPER: IMPACTS ON CARIBOU  
AND HUNTING IN AREVA'S DRAFT  
ENVIRONMENTAL IMPACT STATEMENT FOR  
THE PROPOSED "KIGGAVIK" URANIUM MINE.

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BAKER LAKE HUNTERS AND TRAPPERS  
ORGANIZATION

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## INTRODUCTION

This discussion paper looks at the way AREVA's Environmental Impact Statement analyzes impacts on caribou and hunting. It is intended to help summarize the main arguments AREVA makes about potential impacts on caribou. This discussion paper was written to help hunters, Elders and others understand the way of thinking behind the conclusions AREVA reaches about caribou and hunting. It was also written to raise questions that Inuit may want to consider, and to help the HTO get feedback from hunters and Elders to develop their response to AREVA's impact statement. The questions this report raises are mostly based on concerns raised during the Baker Lake Hunters and Trappers Organizations' Inuit Qaujimajatuqangit workshop on AREVA's road options in February 2011.<sup>1</sup>

This discussion paper begins with a brief summary of the questions and concerns the paper raises. This is followed by an outline of the methodology of AREVA's impact statement. Next, it outlines the way AREVA studies impacts on caribou and hunting.

## SUMMARY OF QUESTIONS/CONCERNS

**1) Inuit Qaujimajatuqangit (IQ) Report.** The IQ report (Volume 3, part 2) is missing a lot of information about land use (especially travel routes). This makes it look like Inuit don't use the area for hunting. Also, IQ is mostly limited to information about wildlife and hunting. It does not contain very much information about Inuit values. It also does not contain very much information about what sort of future Inuit want for themselves.

**2) Use of Inuit Qaujimajatuqangit (IQ).** IQ is not used very much in the study of impacts on caribou. AREVA relies almost entirely on collar data to study caribou migrations. AREVA relies almost entirely on scientific studies to predict how the mine will affect caribou.

**3) Concerns That Are Not Studied.** In the EIS, AREVA does not study many of the concerns that Inuit have raised. AREVA does not seem to study how increased numbers of airplanes at the Baker Lake airport will impact caribou. AREVA does not study how exploration is impacting caribou. AREVA does not study how the other mines Kiggavik might make possible will impact caribou. AREVA does not study how Kiggavik will make it more difficult for Inuit to hunt caribou by disturbing caribou and making them avoid the Baker Lake area.

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<sup>1</sup> See: JT Consulting (2011). *Preliminary Report on the Inuit Qaujimajatuqangit Regarding AREVA's "Road Options"*. Report to the Baker Lake Hunters and Trappers Organization. NIRB File No. 09MN003

4) **Who Decides What Impacts Are Acceptable?** When defining what impacts are acceptable (“significance thresholds”), AREVA relies on “professional judgement”. AREVA does not explain what this means, but it seems like AREVA and their consultants are deciding by themselves what impacts are acceptable. Should AREVA decide what impacts are acceptable, or should the community decide?

5) **Caribou Quotas.** In the EIS, AREVA suggests that caribou quotas and the banning of hunting of the Beverly herd might be necessary. This is not discussed in the main summary of the EIS. Since caribou quotas is an issue that is very sensitive for many Inuit, should this be discussed more openly and directly?

## MAIN CONCLUSIONS

In the executive summary of the main document (Volume 1), AREVA states that the Kiggavik mine will have effects, but there will be no “significant” negative effects on the environment. It also states that effects on Inuit society are “positive overall” and that “many benefits” will be experienced by Inuit.

*“The EIS concludes that the Project will have effects but there will be no significant adverse Project, cumulative or transboundary effects on the biophysical environment. Ecosystem integrity is not compromised. Worker and public health are also not compromised. Socioeconomic effects are positive overall and many benefits will last beyond Project life.”<sup>2</sup>*

## AREA STUDIED

In the DEIS, AREVA identifies three different “assessment areas” which they use when assessing the impact of the mine on different parts of the environment. The first assessment area is the project footprint, which is the project itself (the roads, pits, airstrips, buildings, et cetera). The second assessment area is the local assessment area which is the area in which AREVA feels it can accurately predict impacts. The third assessment area is the regional assessment area which is a broader area in which impacts may potentially occur. Presumably, outside of the regional assessment area, AREVA does not believe there will be any impacts.

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<sup>2</sup> DEIS, Volume 1, Executive Summary: ii

*“The Project Footprint is the most immediate area of the Project. The Project Footprint includes the area of direct physical disturbance associated with the construction or operation of the Project.*

*The Local Assessment Area (LAA) is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence.*

*The Regional Assessment Area (RAA) is a broader area within which cumulative environmental effects on the VC may potentially occur. (...) For the socio-economic environment, the RAA may be much broader (planning areas, regions, territories etc.) based on the potential geographic extent over which socio-economic effects are likely to occur. It is also the area where, depending on conditions (e.g., seasonal conditions, habitat use, more intermittent and dispersed Project activities), Project environmental effects may be more wide reaching.”<sup>3</sup>*

In the analysis of impacts on caribou, the local assessment area is a 5 kilometer area around all project facilities. The regional assessment area is larger and oddly shaped so it can include different areas that are important for caribou and for Inuit.

*“The LAA at the mine site is centered on the Kiggavik and Sissons deposits with an approximate 5-km buffer around all proposed Project facilities...”*

*The RAA is a broader area within which cumulative effects may potentially occur, or a VEC is broader ranging. The terrestrial wildlife RAA incorporates all Project features and associated LAA buffers, known caribou water crossing locations along the Thelon River basin (DIAND 1992), and critical areas identified by IQ studies. The resulting RAA is 150 km long and 70 km wide, for a total area of 9,828 km<sup>2</sup> (see Figure 11.7-1). The RAA includes all of Judge Sissons Lake and southern portions of Aberdeen and Schultz lakes, whereas Princess Mary Lake is located just to the south.”<sup>4</sup>*

Maps of the local assessment area and regional assessment area for caribou can be found in the impact assessment, Volume 6, figure 11.7-1.

Inuit hunters and Elders may want to look at this map critically. Could impacts take place outside of the regional assessment area? Are there any important areas for caribou, for hunting, or for Inuit culture located near (but outside) the line for the

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<sup>3</sup> DEIS, Volume 6, Main Document: 3-6

<sup>4</sup> DEIS, Volume 6, Main Document: 11-15

regional assessment area? Can AREVA understand Inuit Qaujimajatuqangit and Inuit hunting by studying such a small fragment of the land Inuit use for hunting?

## INFLUENCE OF INUIT QAUJIMAJATUQAINGIT

The DEIS claims to use Inuit Qaujimajatuqangit in a number of ways. There is an “Inuit Qaujimajatuqangit report” (Volume 3, Part 2) which outlines the results of AREVA’s interviews. This report is missing a lot of information, especially snowmobile trails and boat routes. This makes it look like Inuit don’t use the area for hunting. [See AREVA’s land use map on page 4-6 of Volume 3, part 2 of the impact statement]

Also, IQ is mostly limited to information about wildlife and hunting. It does not contain very much information about Inuit values. It also does not contain very much information about what sort of future Inuit want for themselves.

This report was made available to the scientists who analyzed the potential impacts of the project on caribou. However, the report was only “reviewed for consideration” by these scientists. It is not entirely clear how scientists used Inuit Qaujimajatuqangit in the analysis of impacts on caribou. All that is clear is that Inuit Qaujimajatuqangit was used to determine that caribou are very important to Inuit in Baker Lake and that AREVA should study the impact of roads on caribou migrations. Also, Inuit Qaujimajatuqangit studies were used to help predict whether or not mine roads would cause Inuit hunters to hunt unsustainably.

*“Engagement undertaken to date with regulators, Inuit and public stakeholders in relation to the Project is described in Volume 3. Issues raised during these engagement activities and Inuit Qaujimajatuqangit (IQ) sessions were documented, and were reviewed for consideration in each discipline-specific assessment, including scoping of baseline data collection, selection of VC and KIs, use of TEK and IQ in the environmental effects assessment, mitigation and monitoring.”<sup>5</sup>*

*Inuit Qaujimajatuqangit has been fundamental in selection of VECs for the terrestrial wildlife assessment, and identification of potential Project effects. Specifically, it has highlighted concern regarding the sensitivity of terrestrial wildlife to road traffic in the region, and the importance of year-round harvesting of caribou in providing food and clothing for local communities (CHE*

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<sup>5</sup> DEIS, Volume 6, Main Document: 3-9

2009). *These issues and concerns have been considered in scoping of the terrestrial wildlife assessment.*<sup>6</sup>

Aside from the analysis of whether or not a mine road would cause Inuit to hunt too many caribou, in its analysis of impacts on caribou AREVA seems to rely almost completely on collar data and knowledge of caribou from scientific sources. Hunters and Elders may want to consider whether or not this is a meaningful way to use Inuit knowledge.

## **COLLAR DATA**

As noted, AREVA seems to rely almost completely on collar data for its analysis of impacts on caribou. When using collar data, AREVA makes a number of “assumptions”. These include: 1) collar data represent the entire herd; 2) movement between different collar sites is always a straight line; 3) the way caribou migrated during the collaring experiment is the way caribou will migrate in the future.

*Three assumptions were made [in] the assessment using collar data: 1) the collar data are representative of the entire herd; 2) caribou movement between collar relocation is a straight line; and 3) caribou movement during the collaring period reflects movement in the future.*<sup>7</sup>

Hunters and Elders may want to think about these assumptions. Do hunters and Elders agree with these assumptions? When you see a group of caribou out on the land, does one of them always have a collar on? How often do you see groups of caribou that have collars? How often do you see groups of caribou with no collars? Do caribou migrations change?

## **KEY ISSUES**

In the DEIS, AREVA groups the different ways that the project might impact caribou into four categories:

- An increase in the number of caribou killed (increased mortality)
- A loss of caribou habitat

<sup>6</sup> DEIS, Volume 6, Main Document: 11-3

<sup>7</sup> DEIS, Volume 6, Executive Summary: xix

- A change in caribou migration
- A change in caribou health.

The analysis of impacts on caribou is divided into these four sections. These are discussed more below.

## **SIGNIFICANCE THRESHOLDS**

In the analyses of these four issues, AREVA uses something called “significance thresholds” to assess the impacts the Kiggavik mine will have on caribou. If an impact is considered “significant” then it can affect the conclusions AREVA reaches about whether or not the mine should be approved. In other words, if an impact is considered not significant, it is considered an acceptable impact. This means that “significance thresholds” are very important to understand how AREVA comes to their conclusions.

A threshold is a type of limit. Beyond the threshold limit, impacts are considered significant. If impacts are below the threshold limit, they are not considered significant. Different significance thresholds were created for each of the four issues discussed above.

*“Standards and thresholds for determining significance are specific to each indicator and are described in the assessment sections.”<sup>8</sup>*

Significance thresholds are often determined by government regulations or scientific standards. However, since no government regulations or scientific standards exist for many of the impacts on caribou, most of the significance thresholds for caribou in the DEIS are based on “professional judgement”. The DEIS is not entirely clear about what “professional judgement” means.

*“No standards or thresholds exist for determining the significance of Project effects on caribou and muskox. The Project is not located within any known caribou calving grounds and there are no protected water crossing areas located within 10 km of the Project. In the absence of legislated or otherwise identified thresholds, the significance of effects are determined based on professional judgment.”<sup>9</sup>*

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<sup>8</sup> DEIS, Volume 6, Main Document: 11-19

<sup>9</sup> DEIS, Volume 6, Main Document: 13-4

Inuit hunters and Elders may want to think about whether or not this is a good way to decide whether or not an impact is acceptable. Should the decision on whether or not an impact is acceptable be left up to AREVA and their consultants? Should the decision of whether or not an impact is acceptable be made by Inuit? Should NIRB and AREVA consult with Inuit hunters and Elders about what impacts they think are acceptable?

Based on “professional judgement”, AREVA has decided that an impact is significant only if the impact affects the long term survival of a caribou herd or delays its recovery. Effects that do not change the integrity of a herd in a measurable way are considered not significant.

*“Determination of whether the Project’s residual effects on caribou and muskox are considered significant is based on whether the effect influences the long-term viability of a population or delays its recovery. A residual effect is considered not significant if the effect causes a change in the condition of an individual or population (or their habitat) that is within the range of natural variability or does not affect the integrity of a population in a measurable way.”<sup>10</sup>*

Inuit hunters and Elders may want to think about the way these “professionals” have decided which impacts are acceptable. Any impacts that do not impact the long-term survival of the herd are considered not significant. This means, even if caribou avoid the Baker Lake area entirely for long periods of time, the impact is considered acceptable as long as the herd as a whole is okay.

Since Inuit have repeatedly raised concerns about caribou avoiding the area because of mines<sup>11</sup>, it seems very odd that AREVA defines significance in this way. Do hunters and Elders feel that it would be acceptable if caribou avoided the Baker Lake area? Or do hunters and Elders feel that AREVA should study impacts on caribou more closely?

## **CUMULATIVE IMPACTS**

In the DEIS, AREVA has to do a *cumulative* assessment. “Cumulative impacts” are impacts from different sources that add together. In its analysis, AREVA studies how impacts from other activities (other mines, exploration, etc.) might work together to have negative impacts on caribou.

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<sup>10</sup> DEIS, Volume 6, Main Document: 13-4

<sup>11</sup> See: JT Consulting (2011); DEIS, Volume 3, Part 2: 3-4



AREVA organizes its cumulative assessment according to four “cases”: the “base case” the “project case” the “future case” and the “far future case”. The “base case” is a study of impacts from activities that currently exist in the Kivalliq region. The “project case” is a study of the impacts from the Kiggavik project and activities that already exist in the region. The “future case” is a study of the impacts from Kiggavik, activities that already exist, and eight other mines that are currently under review (most of which are not in the Kivalliq region). The “far future case” adds 3 more uranium mines and 1 more gold mine to the assessment.

*• Base Case: the current status of the measurable parameters for the environmental effects at baseline (i.e., prior to the Project). Baseline includes all past and present projects and activities in the RAA that may result in similar environmental effects to the Project environmental effect, including ongoing mineral exploration. Existing projects include projects that have received environmental approval and are in some form of planning, construction or commissioning.*

*• Project Case: the status of the measurable parameters for the environmental effect with the Project in place, over and above the Base Case. This is usually assessed using the peak environmental effect of the Project or maximum active footprint for the Project.*

*• Future Case: the status of the measurable parameters for the environmental effect because of the Project Case, in combination with all reasonable foreseeable projects, activities and actions. Reasonably foreseeable projects are defined as future projects, activities and actions that will occur with certainty, including projects that are in some form of regulatory approval or have made a public announcement to seek regulatory approval. For this assessment, future projects include proposed mines that are currently under NIRB review:*

- Meadowbank*
- Doris North 1*
- Doris North 2*
- Meliadine*
- Mary River*
- Hackett River*
- Back River*

- *Hackett River*
- *High Lake*<sup>12</sup>

*“• Far Future Case: the status of the measurable parameters for the environmental effect because of the Future Case, in combination with possible far future developments in the Kiggavik region.”<sup>13</sup>*

In the DEIS, AREVA “screens” for potential cumulative effects. This means, AREVA only studies cumulative impacts if an effect meets certain criteria. To be studied as a cumulative impact, an effect on caribou from Kiggavik has to have a “measurable, demonstrable or reasonably expected” impact. The effect from Kiggavik must also overlap with the impacts of other activities. Finally, and importantly, the effect from Kiggavik must threaten the caribou herd as a whole.

*“Cumulative environmental effects are only assessed if the following criteria are met for the residual Project effect under consideration:*

- *The Project will result in a measurable, demonstrable or reasonably expected residual environmental effect on a component of the biophysical or socio-economic environment.*
- *The Project-specific residual environmental effect on the component will likely act in a cumulative fashion with the environmental effects of other past or future projects or activities that are likely to occur (i.e., Is there overlap of environmental effects?).*
- *There is a reasonable expectation that the Project’s contribution to cumulative environmental effects will be substantive, measurable or discernible such as that it will affect the viability or sustainability of the resource.”<sup>14</sup>*

Again, Inuit hunters and Elders may want to think critically about these criteria. Since AREVA only studies cumulative impacts on caribou that threaten the herd as a whole, the cumulative impact assessment does not study localized impacts on caribou. This means there is no study of whether or not the Kiggavik mine, combined with the Meadowbank mine and other future mines, will make it more difficult for Inuit to hunt caribou.

It is also important to note that AREVA assumes that the other uranium mines Kiggavik will likely create will not be built until Kiggavik is decommissioned.<sup>15</sup> For this reason, AREVA does not study the impacts of the other uranium mines Kiggavik will create.

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<sup>12</sup> DEIS, Volume 6, Main Document: 3-13 to 3-14

<sup>13</sup> DEIS, Volume 6, Main Document: 3-14

<sup>14</sup> DEIS, Volume 6, Main Document: 3-12

## **POTENTIAL INCREASE IN NUMBERS OF CARIBOU KILLED (Mortality)**

### **FOCUS OF ASSESSMENT (PATHWAYS FOR IMPACTS)**

The DEIS claims to study three main ways in which the mine might cause an increase in the number of caribou killed each year. The first is caribou might be killed by collision with vehicles on the access road. The second is that more caribou might die due to changes in the amount of energy they use because the mine might make them use up more energy running away from disturbances. The third is that more caribou might be hunted by Inuit if AREVA builds an all season road. The first way (collision with vehicles) is covered in this section. The third way (increased hunting) is covered in the cumulative impacts section. The second way (changes in energy use) is apparently covered in the section on habitat. However, there does not seem to be any reference to energy use in the habitat section.

*“Caribou and muskox mortality can be affected by human developments through direct mortality from collision with vehicles, and indirect mortality from changes to activity budgets potentially increasing individual energetic demands leading to reduced survival... Direct mortality from collisions with vehicles are quantifiable. Changes to activity budgets and resulting effects on energy balance are currently addressed using a measure of reduced habitat effectiveness described below. The effect of potential increased harvest is addressed as a cumulative effect in section 13.3.2”<sup>16</sup>*

### **SIGNIFICANCE THRESHOLD**

The DEIS sets a significance threshold for caribou death based on scientific estimates of how many caribou can be sustainably harvested from a herd each year. The number used is 5%. In other words, as long as the total number of caribou being hunted and killed by vehicles each year is under 5% of the herd, the impact will be insignificant.

*“Increased mortality risk is considered to be a significant effect if caribou or muskox herd-specific mortality is increased beyond a level of sustainable harvest (e.g., TAH, or greater than 5% mortality for overall harvest of the “standing stock” of a given caribou herd (a sustainable harvest level for caribou identified by the Kivalliq Regional Biologist; Campbell et al. 2010). Standing*

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<sup>15</sup> DEIS, Volume 6, Main Document: 13-113

<sup>16</sup> DEIS, Volume 6, Main Document: 13-5

*stock is 75% of a total herd estimate. We assume the same TAH calculation for muskox herds.”<sup>17</sup>*

### PREDICTION OF IMPACTS

AREVA claims that some vehicle collisions will occur, but that mitigation measures will make collisions unlikely and infrequent.

*Caribou-vehicle collisions may occur, but the identified mitigation will make these events unlikely. The magnitude of the effects regarding the interaction of the Project with the caribou herds is expected to be low.<sup>18</sup>*

Mitigation measures include:

- *Temporary road shut downs to accommodate seasonal wildlife movements near the road*
- *Reduced speed limits to avoid collisions with wildlife<sup>19</sup>*

### SIGNIFICANCE DETERMINATION

The DEIS concludes that the Kiggavik mine’s impact on caribou death will be insignificant.

*“There is a very low potential for direct mortality risk from collisions with caribou along the access roads. The winter roads have much reduced speed limits, so collisions will be very unlikely as vehicles should be able to stop quickly if caribou are on the road. The North All-Season Road has faster speed limits, but vehicles should still be able to avoid collisions with caribou, particularly with communication among vehicles travelling the road. Despite mitigation measures, the likelihood is high that caribou will occasionally collide with mine vehicles, but the overall number of affected individuals will be small.”<sup>20</sup>*

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<sup>17</sup> DEIS, Volume 6, Main Document:13-4

<sup>18</sup> DEIS, Volume 6, Main Document: 13-8

<sup>19</sup> DEIS, Volume 6, Main Document:13-7

<sup>20</sup> DEIS, Volume 6, Main Document:13-8

## CUMULATIVE IMPACTS

In this section, AREVA studies how the all-weather road to the Kiggavik mine might make Inuit hunt more caribou. AREVA claims that an all-weather road can allow Inuit to hunt more caribou, or to hunt more caribou from certain herds.

*“Residual effects of increased mortality risk...are expected because an all-season road can provide additional hunter access over several generations of caribou...”<sup>21</sup>*

*“The Project will increase mortality risk primarily to the Qamanirjuaq caribou when they are present in the RAA during summer movement.”*

*“The Project could either increase the total harvest among all herds, or increase the proportion of animals taken from particular herds (Most likely the Qamanirjuaq)”<sup>22</sup>*

After an analysis, AREVA concludes that the increase in the number of caribou hunted will not be significant.

*“The magnitude of cumulative effects on caribou mortality risk is predicted to be negligible.”<sup>23</sup>*

However, this is based upon the assumption that access to the road will be controlled. Also, AREVA assumes that, if need be, hunting will be managed in other ways. The other measures AREVA discusses include harvest quotas for caribou. Another management measure AREVA suggests is that Inuit could be banned from hunting the Beverly caribou herd.

*“Other agencies may be interested in monitoring harvest and populations, and establishing TAH limits. Ultimately, the potential cumulative additional harvest of caribou could require mitigation and management intervention by management authorities.”<sup>24</sup>*

*“...application of mitigation measures (eg improved monitoring, and promotion of hunting allocations and techniques by the HTO among other potential*

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<sup>21</sup> DEIS, Volume 6, Main Document:13-87

<sup>22</sup> DEIS, Volume 6, Main Document:13-88

<sup>23</sup> DEIS, Volume 6, Main Document:13-110

<sup>24</sup> DEIS, Volume 6, Main Document: xvi

*measures) will help manage the potential for increased mortality risk from harvest”<sup>25</sup>*

*“Wildlife managers are concerned about the viability of the Beverly caribou herd, with its breeding grounds in northwestern Kivalliq. Any increased pressure on this herd could have a negative effect on the sustainability of hunting of the herd. It is noted in this regard that both the wildlife boards and HTOs share responsibility for ensuring the sustainability of harvesting levels and although problematical in some respects, a prohibition on hunting of the Beverly herd would be an effective means of addressing concerns about over hunting of these caribou.”<sup>26</sup>*

## **POTENTIAL DAMAGE TO CARIBOU HABITAT**

### **FOCUS OF ASSESSMENT (PATHWAYS FOR IMPACTS)**

The DEIS studies two ways in which caribou habitat may be destroyed by the Kiggavik mine. The first is direct habitat loss because of land that the mine is built on. The second is indirect habitat loss because dust, noise and other disturbances from the mine and roads will make caribou avoid some areas.

*“The Kiggavik Project will result in a loss of caribou and muskox habitat. Habitat availability can be affected by human developments through two pathways:*

- 1. direct habitat loss due to Project construction (i.e., the Project footprint) will reduce the amount of habitat available*
- 2. indirect habitat loss from human activity associated with the Project that causes a functional loss of habitat (avoidance due to sensory disturbances such as that associated with noise and dust)”<sup>27</sup>*

The assessment of damage to caribou habitats focuses on the Qamanirjuaq and Baker Lake (resident) herds, because the other caribou herds (Beverly, Wager Bay, etc.) use the area less frequently.

*“The assessment of changes in habitat availability for caribou focussed on the resident (non-migratory) Baker Lake and the Qamanirjuaq herds because these*

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<sup>25</sup> DEIS, Volume 6, Main Document:13-110

<sup>26</sup> DEIS, Volume 9, Part 1: 9-5

<sup>27</sup> DEIS, Volume 6, Main Document: 13-11

*herds were identified to use the RAA the most during the winter and growing seasons, respectively. The remaining herds use the RAA less frequently; therefore, Project-related effects will likely be less for these herds.”<sup>28</sup>*

### SIGNIFICANCE THRESHOLD

The DEIS uses a significance threshold for damage to caribou habitat based on “professional judgement”. Based on this professional judgement, AREVA has decided that impacts on caribou habitat are only significant if 5% of the winter range or 5% of the summer range of a caribou herd is destroyed.

*“Based on professional opinion from experience on other northern projects, and knowledge of caribou and muskox ecology, Project effects on habitat availability are considered significant if more than 5% of caribou growing or winter range becomes unsuitable for use by caribou; or, if the muskox wildlife management unit MX/21 becomes unsuitable for use by muskox.”<sup>29</sup>*

Inuit may want to seriously consider whether or not they agree that this is a meaningful way to determine whether or not impacts on caribou habitat are acceptable. Setting destruction of 5% of available habitat as a threshold does not seem to consider how hunters may be impacted by destruction of caribou habitat. Should the analysis also focus on how much useful habitat near Baker Lake is being destroyed? Should this take into consideration which areas Inuit value for hunting and camping? Should this study incorporate Inuit Qaujimagatuqangit, including Inuit experience with the Meadowbank gold mine? Should this be considered in a cumulative analysis, which studies how much habitat near Baker Lake will be destroyed as a result of the combined impacts of Meadowbank, Kiggavik and the other mines Kiggavik is likely to create? Should “significance” be attached to this in some way?

### PREDICTION OF IMPACTS

The analysis of impacts on caribou habitat used a combination of caribou collar data and satellite images. Collar data is used to determine how often herds use the area. Satellite images are used to determine what areas near the project are important grazing habitats, and what areas are not. Habitat within 4 kilometers of roads, and 14 kilometers of the mine itself, is considered to be “reduced in quality”.<sup>30</sup>

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<sup>28</sup> DEIS, Volume 6, Main Document:13-11

<sup>29</sup> DEIS, Volume 6, Main Document: 13-4

<sup>30</sup> DEIS, Volume 6, Main Document: 13-12

*“While the size of the Project footprint is very small at the scale of the affected caribou and muskox herd/population’s ranges, mine associated activities will reduce the availability of habitat up to 14 km from the Project footprint resulting in a moderate loss of habitat. After final closure, the Project footprint will remain unusable as foraging habitat, consequently the magnitude of the predicted effect remains low beyond the life of the Project. There is general consensus that human disturbance causes large wildlife to avoid areas at the scale of kilometres.”<sup>31</sup>*

This does not seem to take into consideration the impact of the increased numbers of airplanes that the Kiggavik project will bring to the Baker Lake airport.

### SIGNIFICANCE DETERMINATION

The DEIS concludes that the impact on caribou habitat will be insignificant, because less than 5% of the seasonal range of the Qamanirjuaq and Baker Lake herds will be impacted.

*“The Kiggavik Project will have a not significant effect on the availability of caribou and muskox growing and winter season habitat. Loss in habitat availability across the seasonal ranges does not exceed the 5% significance threshold. For caribou, the mine and all road options will cause a habitat loss of less than or equal to 0.3% within the seasonal ranges of the focal herds”<sup>32</sup>*

### CUMULATIVE IMPACTS

In this section, AREVA considers how other activities are affecting caribou habitat. AREVA only considers the impact of the Meadowbank mine and Inuit communities on caribou habitat. AREVA claims that exploration activities do not cause a loss of habitat for caribou. Therefore, they do not study exploration. AREVA claims that it is unlikely that other mines will open up near Baker Lake while the Kiggavik mine is operating. Therefore, other “future” mines are not considered here.

*“...exploration activities are expected to be a not significant cause of habitat loss.”<sup>33</sup>*

*“While there are a number of mineral exploration operations in the region, few exploration projects turn into active mines. Therefore, it is unlikely that the*

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<sup>31</sup> DEIS, Volume 6, Main Document: 13-41

<sup>32</sup> DEIS, Volume 6, Main Document: 13-41

<sup>33</sup> DEIS, Volume 6, Main Document: 13-114



*Project will overlap temporally with operating mines or other industrial developments in the region.”<sup>34</sup>*

AREVA concludes that cumulative impacts on caribou habitat will be insignificant. The overall habitat loss due to the Meadowbank mine, the Kiggavik mine and the communities in the Kivalliq will disturb less than 5% of the habitat of each herd in each season.

*“Currently, there are few human activities in the region that affect wildlife. The Meadowbank mine and regional communities are currently the greatest sources of habitat loss for wildlife. The addition of the Kiggavik Project to these disturbances is not expected to measurably reduce the amount of caribou and muskox habitat. Mineral exploration is currently not causing substantive loss of habitat. Although there is the potential for future mine development in the region, given the history of such development the likelihood of multiple future mines existing at the same time as the Kiggavik Project is low. The cumulative change to habitat availability for caribou and muskox as a result of the Project is therefore assessed as not significant.”<sup>35</sup>*

## **POTENTIAL CHANGES TO CARIBOU MIGRATION ROUTES**

### **FOCUS OF ASSESSMENT (PATHWAYS FOR IMPACTS)**

The analysis of changes in caribou migrations focuses on whether or not the mine and mine roads will impact the ability of caribou to get to and from their calving areas during fall and winter migrations.

*“The focus of this assessment is on caribou migration between calving grounds and winter range during the spring and fall migration periods.”<sup>36</sup>*

The analysis of changes in caribou migrations focuses on all the major caribou herds in the region: the Beverly, Ahiak, Qamanirjuaq, Wager Bay, Lorillard and Baker Lake caribou herds are all studied.<sup>37</sup>

### **SIGNIFICANCE THRESHOLD**

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<sup>34</sup> DEIS, Volume 6, Main Document: 13-113

<sup>35</sup> DEIS, Volume 6, Main Document: 13-114

<sup>36</sup> DEIS, Volume 6, Main Document: 13-68

<sup>37</sup> DEIS, Volume 6, Main Document: 13-70

The DEIS uses a significance threshold for changes to caribou migration based on “professional judgement”. Based on this professional judgement, AREVA has decided that impacts on caribou migration are only significant if 10% of the animals in a herd do not reach their calving grounds or winter ranges because of the project.

*“Based on professional opinion, Project effects on movement are considered significant if more than 10% of the animals in a herd are diverted by Project activities such that the animals do not arrive at calving grounds or wintering areas.”<sup>38</sup>*

Inuit may want to seriously consider whether or not they agree that this is a meaningful way to determine whether or not impacts on caribou migration are acceptable. This definition of significance does not seem to address how hunters might be impacted by changes in caribou migration. Should the analysis also study what percentage of caribou may be diverted away from the Baker Lake area? Should this take into consideration which areas Inuit value for hunting and camping? Should this study incorporate Inuit Qaujimaqatuqangit, including Inuit experience with the Meadowbank gold mine? Should this be considered in a cumulative analysis, that studies whether or not caribou will avoid important hunting areas near Baker Lake as a result of the combined impacts of Meadowbank, Kiggavik and the other mines Kiggavik likely to create? Should “significance” be attached to this in some way?

### PREDICTION OF IMPACTS

To predict impacts on caribou migrations, AREVA used collar data to see how many caribou migrate through the area where the Kiggavik mine and roads would be built. AREVA also identified water crossings within 10 km of the mine and roads.

*“To assess the likelihood of the Project interacting with caribou herds, the available collar information (Table 13.2-16) was analyzed in a Geographic Information System. Analyses completed include: a count of the number of caribou that crossed the study areas to get an indication of potential caribou interaction with the Kiggavik Project during migration; as well as identifying all water crossings within 10 km of each of the Project options.”<sup>39</sup>*

This does not seem to take into consideration the impact of the increased numbers of airplanes that the Kiggavik project will bring to the Baker Lake airport.

Based on this analysis, AREVA determined that caribou rarely use the Kiggavik area during migration season.

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<sup>38</sup> DEIS, Volume 6, Main Document: 13-4

<sup>39</sup> DEIS, Volume 6, Main Document: 13-69

*“The distribution of collared caribou during the migratory seasons is generally outside of the RAA.”<sup>40</sup>*

AREVA then determines that the impact of the mine on caribou migrations is likely to be low. AREVA says that few caribou will come close to the mine and roads. Also, AREVA says roads and other infrastructure will not be a barrier to caribou. Caribou may spend little time near the roads, but they will cross them without problems.

*“Collar data from the migratory caribou herds during the migratory period and the known locations of the current calving grounds suggests that few caribou will interact with the Project during the migration seasons. Therefore, the likelihood of the Project restricting caribou movement is relatively low. All migratory caribou cross many natural barriers during migrations (e.g., large river valleys, mountain ranges) and many herds cross human infrastructure. While caribou may spend less time near the infrastructure, the infrastructure is not a barrier to migrations.”<sup>41</sup>*

### SIGNIFICANCE DETERMINATION

AREVA says that the effects of the project on caribou migrations are not significant.

*“The effect of the Project on caribou migration because of Project infrastructure and activities is assessed as not significant. Seasonal shutdowns of various Project activities are possible when large numbers of caribou are observed approaching the site, and that mitigation should be appropriate to allow free movement through the RAA. Confidence in the prediction is moderate over the short-term because variability in caribou movement is not entirely understood. The dynamic nature of caribou herd range use means that caribou migration over the life of the Project cannot be predicted.”<sup>42</sup>*

### CUMULATIVE IMPACTS

AREVA does not study cumulative impacts on caribou migration. This is because AREVA does not expect impacts on caribou migrations to be noticeable.<sup>43</sup>

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<sup>40</sup> DEIS, Volume 6, Main Document: 13-69

<sup>41</sup> DEIS, Volume 6, Main Document: 13-91

<sup>42</sup> DEIS, Volume 6, Main Document: 13-105

<sup>43</sup> DEIS, Volume 6, Main Document: 13-87

## POTENTIAL IMPACT ON CARIBOU HEALTH

### FOCUS OF ASSESSMENT (PATHWAYS FOR IMPACTS)

In this section, AREVA studies the ways the mine might affect caribou health by contaminating caribou with toxins.

*“As a result of emissions from the Project to the atmosphere and water there is the potential for caribou and muskox to be exposed to COPC. The potential for these emissions to cause adverse effects in the populations of caribou and muskox was evaluated.”<sup>44</sup>*

AREVA states that different toxins can contaminate caribou, because emissions from the mine can contaminate water, soil and plants, which caribou may later eat. AREVA studies whether or not uranium (and its by-products), arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, and zinc will contaminate caribou.

*“Emissions from the Project can affect the concentrations of COPC in the environment (e.g., water, soil, vegetation) which in turn will affect the exposure of caribou and muskox as they consume these items. The COPC included in the assessment include uranium and the uranium- 238 decay series (thorium-230, lead-210, radium-226, and polonium-210), arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, and zinc.”<sup>45</sup>*

AREVA says the mine’s water and air emissions can contaminate the water, the soil and the plants near the mine. In turn, caribou can consume water and plants, and become contaminated.

*“The assessment of changes in health of caribou and muskox depends on the estimated changes in concentrations of environmental components such as vegetation and soil which are derived from the atmospheric and aquatic environment assessments.”<sup>46</sup>*

AREVA says that air can be contaminated by mining, milling, vehicle traffic and other activities, while water can be contaminated by water emissions from mining and milling.

*“The Project air quality effects relate to emissions of air COPC from open pit and underground mining and supporting activities, milling and vehicle traffic on*

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<sup>44</sup> DEIS, Volume 6, Main Document: 13-82

<sup>45</sup> DEIS, Volume 6, Main Document: 13-82

<sup>46</sup> DEIS, Volume 6, Main Document: 13-84

*unpaved roads. The Project water quality effects relate to emissions of COPC from WTPs at the Kiggavik and Sissons mine sites. Complete details about the COPC sources and all assumptions used in the assessments were provided in the atmospheric and aquatic environment assessments.”<sup>47</sup>*

### SIGNIFICANCE THRESHOLD

For caribou health, AREVA sets a maximum dose of each substance to determine whether or not the amounts of toxins caribou consume are significant.

*“For this assessment, the estimated exposure to COPC by wildlife and birds is compared to values that are set to be protective of health and if the exposure is lower than this value then no adverse effects are expected. The estimated dose received by the biota from exposure to radioactivity, considering both baseline and Project emissions, is compared to a level that is protective of mammals.”<sup>48</sup>*

*“The total dose, which is based on the baseline plus Project emissions for the sum of the uranium-series radionuclides, is compared to a benchmark that is protective of mammals (1 mGy/d).”<sup>49</sup>*

For safe dose levels for most toxins, AREVA uses dose levels for toxins derived from guidelines from the United States Environmental Protection Agency. The dose levels chosen as thresholds are apparently the smallest levels where an observable effect on the animal would take place. However, the guidelines AREVA uses do not have values for caribou, so AREVA uses dose rates for cow (beef) calves instead.

*“For the wildlife species, the US EPA risk-based ecological soil screening levels (Eco-SSLs) (US EPA 2010) were used as the primary data source for the derivation of toxicity reference values used to determine the potential for an effect. For this assessment, the lowest observable adverse effect levels (LOAELs) based on growth and reproduction were selected, as these endpoints are considered to be the most relevant for the maintenance and persistence of wildlife populations. For COPC without Eco-SSL data (in this case uranium), literature studies were reviewed and values from long-term (chronic) exposure studies were selected. The Eco-SSL database provides information for a number of different species that could be used as a surrogate for other species with similar diets. For example, for molybdenum the benchmark value for a calf was used as the surrogate for caribou. If none of the test species were similar to the*

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<sup>47</sup> DEIS, Volume 6, Main Document: 13-84

<sup>48</sup> DEIS, Volume 6, Main Document: 13-4

<sup>49</sup> DEIS, Volume 6, Main Document:: 13-82

*ecological receptors selected in this assessment, then the lowest value was selected as the conservative default benchmark for the ecological receptor. The Ecological and Human Health Risk Assessment report (i.e., Tier III, Appendix 8A) provides the final selected values along with additional detail on the derivation and rationale for the value.”<sup>50</sup>*

*“Transfer factors are generally derived for domestic agricultural animals (cattle and poultry). Beef cattle were assumed to be the agricultural animal of interest and thus the body weight can be taken to be approximately 400 kg (NRC 2000; CCA 1999, internet site).”<sup>51</sup>*

*“Due to the lack of available transfer factors for different non-human biota for all elements, it is recommended that allometric scaling of the transfer factors based on beef is used. This approach provides a reasonable estimate of the transfer factor that can be used to calculate the concentration of non-human biota.”<sup>52</sup>*

However, the guidelines AREVA used for toxicity do not have values for uranium. Instead, AREVA based safe uranium values on a review of other scientific literature.

*“For COPC without Eco-SSL data (in this case uranium), literature studies were reviewed and chronic LOAEL and NOAEL values were selected. Only growth and reproduction endpoints were considered, as described above for the Eco-SSL data. In general, TRVs from Sample et al. (1996) were used.”<sup>53</sup>*

For a list of toxicity thresholds AREVA uses for wildlife, see Volume 8, Appendix A: 6-8.

### PREDICTION OF IMPACTS

AREVA says that it is important to study how much time caribou will spend near the mine, to predict how much toxins caribou might consume. AREVA assumed that some caribou will spend 2% of their time in the local assessment area and 4% of their time in the regional assessment area (See map, DEIS, Volume 6, 11-17).

*“The intake of COPC can then be estimated using the predicted concentrations and assumptions about how much the caribou and muskox consume. The amount*

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<sup>50</sup> DEIS, Volume 6, Main Document: 13-85 to 13-86

<sup>51</sup> DEIS, Volume 8, Appendix A: 5-14

<sup>52</sup> DEIS, Volume 8, Appendix A: 5-15

<sup>53</sup> DEIS, Volume 8, Appendix A: 6-6

*of time that the wildlife spend in the area is also an important factor. For caribou, a conservative scenario was used in the assessment. It is assumed some caribou may spend 2% of their time in the LAA while other caribou may spend 4% of their time in the RAA.”<sup>54</sup>*

AREVA uses the results of its analyses of impacts on air and impacts on water (part of another volume) to determine what dose of toxins caribou will be exposed to.

*“The Project-environment interactions and effects described in the Atmospheric Environment (Tier II, Volume 4) and Aquatic Environment (Tier II, Volume 5) form the basis for the effects mechanisms and linkages.”<sup>55</sup>*

Based on this study, AREVA concludes that, with the exception of uranium and cadmium, the doses of toxins caribou are exposed to will not change from current levels. With regards to uranium and cadmium, they are not expected to go above levels associated with negative effects.

*“With the potential exception of cadmium and uranium exposure to caribou, it is not expected that the emissions from the Project will result in a discernible change in exposure to COPC. The results show that it is not expected that the exposure to caribou or muskox will exceed exposure levels associated with adverse effects.”<sup>56</sup>*

#### SIGNIFICANCE DETERMINATION

AREVA concludes that impacts on caribou health will be not significant.

*“As the level of exposure for caribou and muskox to most COPC are not expected to change from baseline and the exposure will remain below exposure levels associated with adverse effects. No residual effects are expected on the health of caribou and muskox as a result of exposure to COPC.”<sup>57</sup>*

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<sup>54</sup> DEIS, Volume 6, Main Document: 13-82

<sup>55</sup> DEIS, Volume 6, Main Document: 13-84

<sup>56</sup> DEIS, Volume 6, Main Document: 13-86

<sup>57</sup> DEIS, Volume 6, Main Document: 13-86

## CUMULATIVE IMPACTS

AREVA does not study cumulative impacts on caribou health. This is because AREVA does not expect impacts on caribou health to be noticeable.<sup>58</sup>

## IMPLICATIONS FOR INUIT HARVESTING

The DEIS briefly discusses what their conclusions mean for Inuit harvesting. This discussion takes place in the socio-economic impact analysis. AREVA says that the Kiggavik project will not affect the numbers or the availability of caribou. AREVA bases this argument on the results they generated in their study of caribou.

AREVA then says that there is some concern that caribou distribution might change, making it more difficult for hunters to access caribou. However, they then claim that caribou move all the time anyways, and that Inuit can just go somewhere else to hunt. This seems odd, since AREVA assumes that caribou migrations stay the same in the chapter on caribou. They also say that hunters don't use the area very much anyways.

The section that deals with potential impacts on Inuit hunting is brief, not thorough and seems one sided. No scientific tests were carried out, and the Inuit Qaujimaqatuqangit that AREVA uses seems to ignore the concerns that many Inuit, including the Baker Lake Hunters and Trappers Organization, have shared with both AREVA and NIRB.<sup>59</sup> This section does not have a significance threshold, which means that it cannot directly affect the conclusions AREVA reaches. This section also does not consider the way the Kiggavik mine might interact with other mines (cumulative impacts).

The sections that deal with the way impacts on caribou might impact Inuit hunting are quoted in their entirety below.

*“The Project is not expected to negatively affect harvesting through limiting the numbers or availability of resources. The Project footprint does not intersect with known carving stone resources. The environmental assessments on terrestrial, marine and aquatic animals indicate no significant environmental effects on harvested resources, although there is necessarily some level of uncertainty. Loss of habitat is minimal. Traffic related accidents are expected to be infrequent and even should an accident result in animal mortality, it*

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<sup>58</sup> DEIS, Volume 6, Main Document: 13-87

<sup>59</sup> See: JT Consulting (2011); DEIS, Volume 3, Part 2: 3-4



*could only affect one or very few individuals. A major spill could affect more animals, but such spills should be rapidly contained in a comparably small area. Significant effects on changes in abundance are therefore not expected from environmental effects.*

*There is more uncertainty about animal distribution patterns and migration routes in response to some environmental effects, such as noise and other disturbances at the mine site and docking facilities, and from both truck and marine traffic. These are related primarily to land and marine mammals, rather than fish.*

*Although elders identified Judge Sissons Lake, south of the mine site, as a migration route for caribou in the past, they noted that the area was not frequently used for hunting, and was only irregularly used for fishing. Technical Appendix 3B, IQ Documentation notes that there has been little past use of the area based on interviews with Inuit and on historical references, and NWMB (2004) concluded that the area west of the Thelon River had been subject to little harvest pressure, due to low animal densities as well as it being difficult to access to the area. However caribou crossings were also identified to the north west of Baker Lake, crossings potentially affected by the all-weather road.”<sup>60</sup>*

*“Results from consultations and socio-economic and IQ data collection suggest that with regard to land mammals, migratory patterns are in any case changeable and unpredictable (see Box 9.1-1). As the animals move, so do hunters as they share information on successful hunts. There is some feeling that caribou avoid hamlets because of noise and traffic, although in Baker Lake people feel that caribou may be attracted to the hamlet as they are often seen drinking at the landfill. Nor does unpredictability appear to affect levels of harvesting activity, insofar as it is understood to be normal. As the baseline notes, harvest levels continue to remain high although unpredictability may explain part of the high year to year variability in catches as reported in NWMB’s harvest study (2004).”<sup>61</sup>*

Do hunters and Elders feel that this is a meaningful way to study impacts on Inuit hunting? Instead of a short discussion about hunting, should impacts on Inuit hunting be incorporated into significance thresholds and study designs in the chapters about caribou?

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<sup>60</sup> DEIS, Volume 9, Part 2: 9-2

<sup>61</sup> DEIS, Volume 9, Part 2: 9-3