IR Number: *22*
Source: *Qikiqtani Inuit Association*
To: *Baffinland*
Subject: Calving Distribution and Mine Construction
Preamble:
The historic and current distribution of caribou calving includes the proposed mine site and the road to Milne Inlet. Canada has taken an international position (with the US) against industrial development on the calving ground for the Porcupine Herd. The federal government has also imposed restrictions on mineral exploration activities for the Beverly and Qamanirjuaq herds in response to Inuit concerns. This suggests that during the assessment, attention will be focused on proposed mitigation and monitoring for a large open pit mine and associated activities. However, although calving distribution was included in the baseline, it was not specifically addressed in the EIS (Vol. 6) which is based on four measurable parameters (habitat, movement, mortality and health). The habitat approach was based on winter and summer habitat effectiveness. The particular vulnerability of calving areas was not addressed (responsiveness to disturbance and need for high quality forage to support lactation). The Proponent did not integrate the different sources of information to assess the probability of caribou calving at various distances from the mine site. The Proponent did not address monitoring or mitigation for calving.

Request:

1. *It is requested that the Proponent provide in detail the probability of caribou calving during lows and highs in the abundance cycle relative to terrain, vegetation and proximity to mine infrastructure.*
2. *It is requested that the Proponent provide more results from the June 1994-97 caribou surveys conducted by GN-DoE.*
3. *It is requested that the Proponent provide a map of calving locations (during approx. 15-21 June) based on the GN DoE collar program from June 2009 and June 2010.*
4. *It is requested that the Proponent clarify if they anticipate providing details of monitoring and mitigation for caribou calving.*

BAFFINLAND RESPONSE

QIA-22-1

It is not possible to predict with confidence the probability of caribou calving locations during lows and highs in the abundance cycle relative to terrain, vegetation and proximity to mine infrastructure. The cycle is thought to be partly driven by forage abundance. We are not able to predict the future abundance of vegetation cover with accuracy. We expect that the current distribution of collared calving caribou will be somewhat representative of the distribution during population highs.

Based on collar data recently made available to Baffinland from the GN, the Resource Selection Probability Function (RSPF) identifies that caribou select 10–20 degree slopes with south to east facing aspects and 300-600 m elevation. We expect that during future population highs caribou will continue to select habitats with these attributes.

QIA-22-2

The information available on the Government of Nunavut's 1994–'97 caribou survey is limited to an unpublished database of point locations from weekly aerial surveys in 1997, and reference to the data in a conference abstract by Ferguson (1999). There was no indication of the spatial extent of the weekly surveys or details on three satellite-collared females (or spatial extent of collaring effort), or reference to data prior to 1997. Data from the 1994-'97 surveys were retrieved and presented in the baseline report (DEIS Appendix 6F, Section 2.1.1). No further data or survey results were available. Thus there is no information on the spatial extent of calving in the RSA during 1994–1997 when caribou numbers may have been closer to a "peak" in the population. Ferguson (1999) presumed that "t*he distribution of the snowmelt margin, timing of snow melt and the juxtaposition with productive post calving areas may be the primary ecological factors influencing calving*…." There are no other published or unpublished results of the 1994-'97 survey, and the Mary River Project's baseline report (EDI 2010) is the first known published summary.

QIA-22-3

The GN provided updated caribou collar location to Baffinland on April 6, 2011. Caribou location data were provided from GPS collars programmed to acquire fixes every 11 hours. The raw dataset contained 24,721 locations from 30 caribou. To clean the data, we removed all locations that had time intervals greater than 44 hours since the last fix (44). Lastly, all data that had speeds greater than 80km/22 h were removed (9) and all data with speeds in the top 99th percentile were individually scanned for accuracy (12 removed). The remaining cleaned dataset contained 24,223 locations.

We calculated mean movement rate per week throughout the year to estimate the calving season. Based on results, weeks 22–26 (May 23rd or May 24th to June 26th or 27th) showed a distinct change in movement rate (Figure 1) and we use those data to describe the calving season. Because there were only 2 months of data for only 1 caribou in 2008 we limited the data used for the analysis to 2009–2011 locations (24,166 locations).

The updated GN caribou collar data indicates that caribou are broadly distributed throughout the entire RSA during the calving period. This suggests that there are no distinct calving "grounds" for north Baffin Island caribou. The broad distribution is consistent with the baseline report and attributed to IQ (Volume 6, Appendix 6F, Section 2.1.4). A map displaying the collar location data during the calving season is provided (Map 1). While there are no known calving areas where caribou traditionally congregate in large numbers, there is some indication that within an individual caribou's home range there is some degree of fidelity to calving locations.

Of the 16 caribou that were collared during consecutive years, 11 calved in the same general location. Calving areas are not exclusively used for calving. The collar data shows caribou also occupying calving areas during winter and growing seasons. Given the relatively limited movement of caribou within their annual range (described in the DEIS Volume 6f), it is not clear if this represents a significant movement to important seasonal habitat.

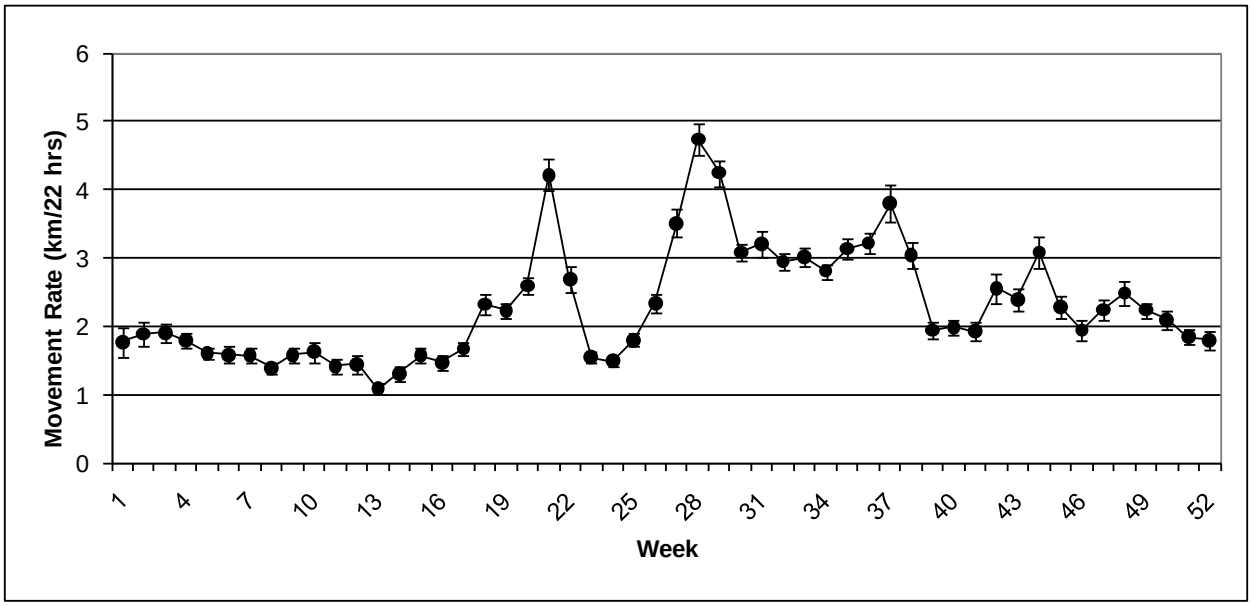


Figure 1.Combined movement rates of 30 female caribou on north Baffin Island from 2008–2010.

The decreased movement rate from ~ May 23 to June 27 (week 22 to 26) is presumed to reflect the likely calving period when female caribou stop moving to give birth and tend newborn calves.

QIA-22-4

As previously mentioned for this IR in Baffinland's April 15th, 2011 response to IRs, no effect of the project is expected to be unique during calving periods and mitigation measures will be applicable for all seasons. However, on-site environmental staff could increase observation effort during the expected calving season (mid-June to early August) with an emphasis on the most probable calving locations. Surveys would be limited to ground observations. Aerial surveys are not anticipated while caribou densities are as low as they are currently.

Literature Cited

EDI Environmental Dynamics Inc. 2010. Mary River Project Terrestrial Wildlife Baseline 2006–2010. Volume 6F of the Draft Environmental Impact Statement. Prepared for Baffinland Iron Mines Corporation. 113 pp.

Ferguson, M.A.D. 1999. Distribution, timing, and ecology of calving in a population of arctic tundra caribou (Abstract). 73–74 *In*: *10th Arctic Ungulate Conference*. August 9–13, 1999. University of Tromsø, Norway. Rangifer Report No. 4

IR Number: *23*
Source: *Qikiqtani Inuit Association*
To: *Baffinland and GN*
Subject: *Use of Full Complement of North Baffin Caribou Collar Data*
Preamble:
Data from satellite collared North Baffin caribou are a critical part of the baseline and assessment for this project. Collars were deployed in March 2008 (4 collars) and March 2009 (28 collars) in a GN-led program, apparently with financial support from Baffinland (Terrestrial baseline, p. 48). The baseline states that GN DoE provided Baffinland with 9 months of data (Apr-Dec 2009) for the baseline report (Terrestrial baseline, p. 48) (although Vol. 6, p. 130 states this was Dec-Aug). These data are a critical component of examining seasonal distribution and habitat selection (RSPF modelling) in the baseline and assessment. Seasonal habitat selection analyses were divided into summer and winter. The winter season (16 Sep to 25 May) has 3 central months missing for that period (Terrestrial baseline p. 70). Although sample size is low (4 collars), data from March 2008 would allow some examination of annual fidelity to seasonal ranges, including calving locations.

The Government of Nunavut has established and maintained biologists in Pond Inlet for a number of years. It is understood that a great deal of the work associated with the Pond Inlet office has been focused on North Baffin caribou.

Furthermore, the Action 2.3b and 2.3c of the Government of Nunavut's Draft Caribou Strategy Framework's states the GN will:

- *Make caribou data and information readily available to other organizations involved in harvest management, land-use planning and environmental impact assessment within the range of each herd.*
- *Work with industry to make caribou information available for baseline studies and impact assessments.*

Request:
1. *It is requested that the GN provide the Proponent with the most recent complete North Baffin caribou collar dataset for use in the baseline and impact assessment for this project.*
2. *It is requested that the GN clarify if they are aware of any other data in relation to North Baffin caribou that may not be listed in the proponent's baseline reports. If so, it is requested that the GN provide additional data so that it can be integrated into the DEIS.*
3. *It is requested that the Proponent clarify whether addition data will be integrated into the DEIS provide an updated analyses to examine seasonal habitat use, fidelity to seasonal habitat and movements, and calving locations.*

Baffinland Response

QIA-23-1

The Government of Nunavut provided data on April 6, 2011. Four collars were deployed in 2008 and 28 in 2009 (two collars from harvested animals were re-deployed in 2009). The raw dataset contained 24,721 locations from 30 collars, current to February, 2011.

QIA-23-2

Baffinland has not received further information from the GN in regards to available caribou location data other than the file received on April 6, 2011 as described above. Ferguson (1999)

alludes to data from three satellite collared female caribou in 1997, but those data are not available.

QIA-23-3

All analyses have been updated. RSPFs are complete. The impact predictions on caribou habitat will be updated and include calving season impacts. A description of seasonal habitat will be updated using the complete caribou collar data. We will describe caribou habitat selection during winter, calving and growing seasons. See response to the Government of Nunavut Information Request No. 44 below.

Government of Nunavut Information Request			
Reviewer's Department:	Department of Environment (DoE)	**Information Request #:**	44
Information Request From:	Government of Nunavut		
Information Request For:	Baffinland Iron Mines Corporation		
References:	Volume 6, Section 5.2.1, Pg. 131		
Issue/Concern or Information Deficiency and Request:	• The resource selection probability function analysis was based upon location data collected between April and December 2009 on 32 GPS radio-collared females. However, no information was provided regarding the movement of marked females during calving season. Movement data during calving should be provided over a short period of time (7-10 days), where daily movements were the lowest recorded. This data [sic] will this help to identify if characteristics of calving habitats differ from those during the growing season. Please provide the data and the analysis. • No information was provided regarding site fidelity for calving. Please provide this information if available, or describe the proposed monitoring plan to gather such data.		
Rationale:	Because female and calves are more sensitive to disturbances than males (Volume 6, section 5.2, page 129), a greater potential effect of the project on the selection process of habitats by females and calves may affect indirectly the demographics of this resident population. This information is necessary to adequately determine potential Project impacts, as well as the effectiveness of mitigation.		

Baffinland Response

The first part of the IR is addressed in Baffinland's response to QIA IR #22-3 above.

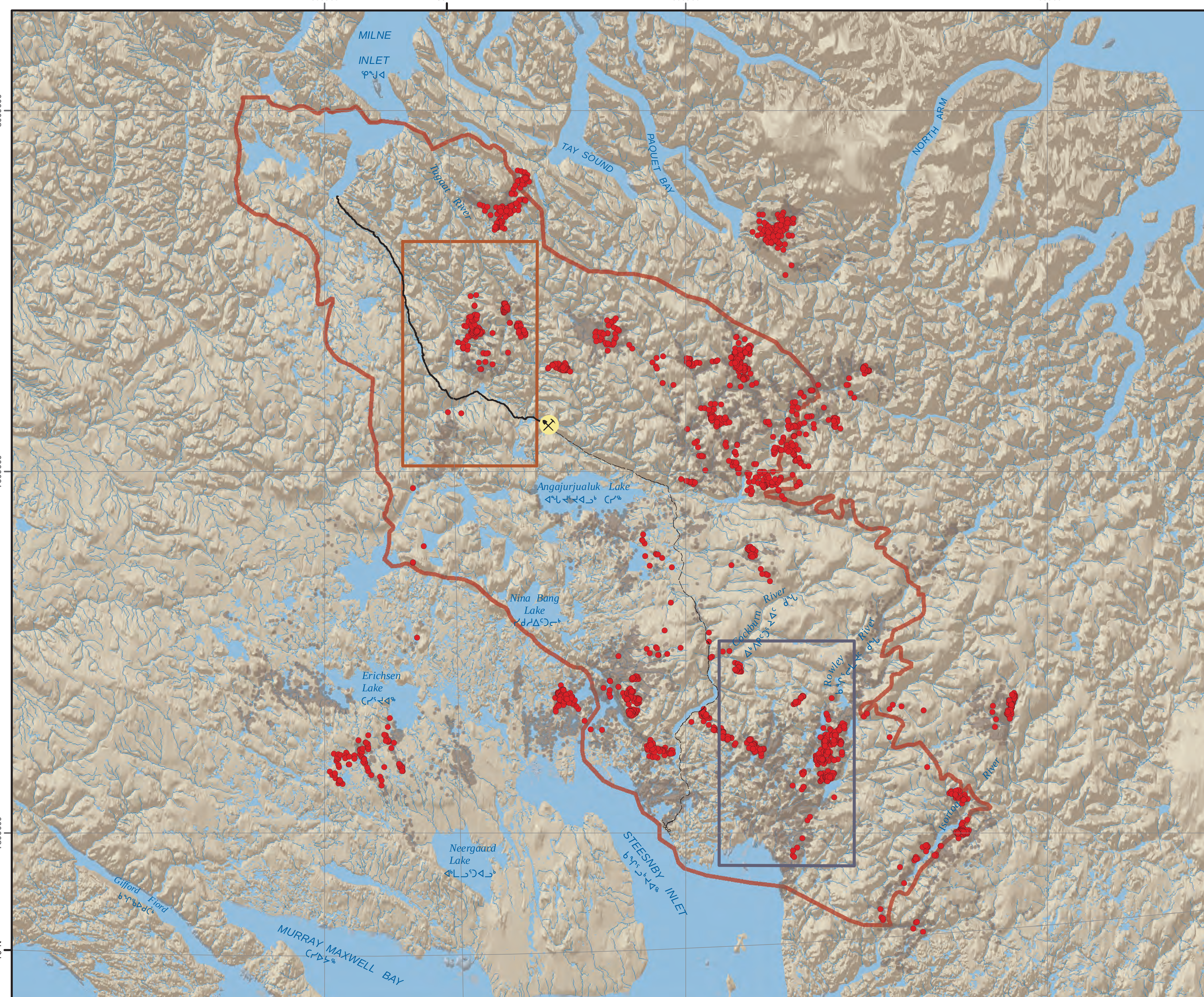
Caribou on north Baffin Island are more sedentary compared to other barren-ground caribou (DEIS Appendix 6F, Section 3.3). They spend the majority of their lives within a much smaller area (median home range size: 1,106 km^2; range: 306–5,087 km^2), do not perform long distance directional migrations between summer and winter ranges, and do not have defined calving areas where large numbers of caribou congregate.

The two years of collar location data during the calving season indicate that some female caribou show fidelity to calving locations within an individual's home range (Map 2). To estimate calving site fidelity we plotted caribou collar data during consecutive calving seasons by individual caribou. We used a kernel density tool to identify the centres of individual caribou calving locations and measured the distance between calving locations. When there was overlap between calving point concentrations, we assume the caribou are calving in the same location. Of the 16 caribou which we have multi-year calving season data, 11 calved in approximately the same location (Table 1). Caribou calved near their previous calving areas, while other caribou calved in essentially the same area in consecutive years. Two examples of caribou calving site fidelity area shown in Map 2.

Table 1. Distance between individual calving locations during the 2009 and 2010 calving seasons.

Collar ID	Distance (km)
36837	23 – 40[a]
36838	0
36840	0
36841	0
36842	8
36843	0
36846	17
36851	0
37025	0
37033	0
37048	11
37052	18
37055	0
37408	0
37490	0
37492	0

Notes: [a] Caribou 36837 showed two concentrations of calving points during 2010.



LEGEND

Mary River Project Study Specifics

.......Mary River Project

.......Proposed Rail Alignment

.......Milne Inlet Tote Road

Collared Caribou Data

Collared Caribou Areas (refer to Map 2)

.......Details of Collared Caribou #37052 in Map 2

.......Details of Collared Caribou #37492 in Map 2

.......Calving Locations (May 23 to June 27)

.......All Seasons

NOTES:

Caribou Collar Data: The Government of Nunavut provided data on April 6, 2011.

Proposed Rail Alignment provided by Canarail September 2010.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

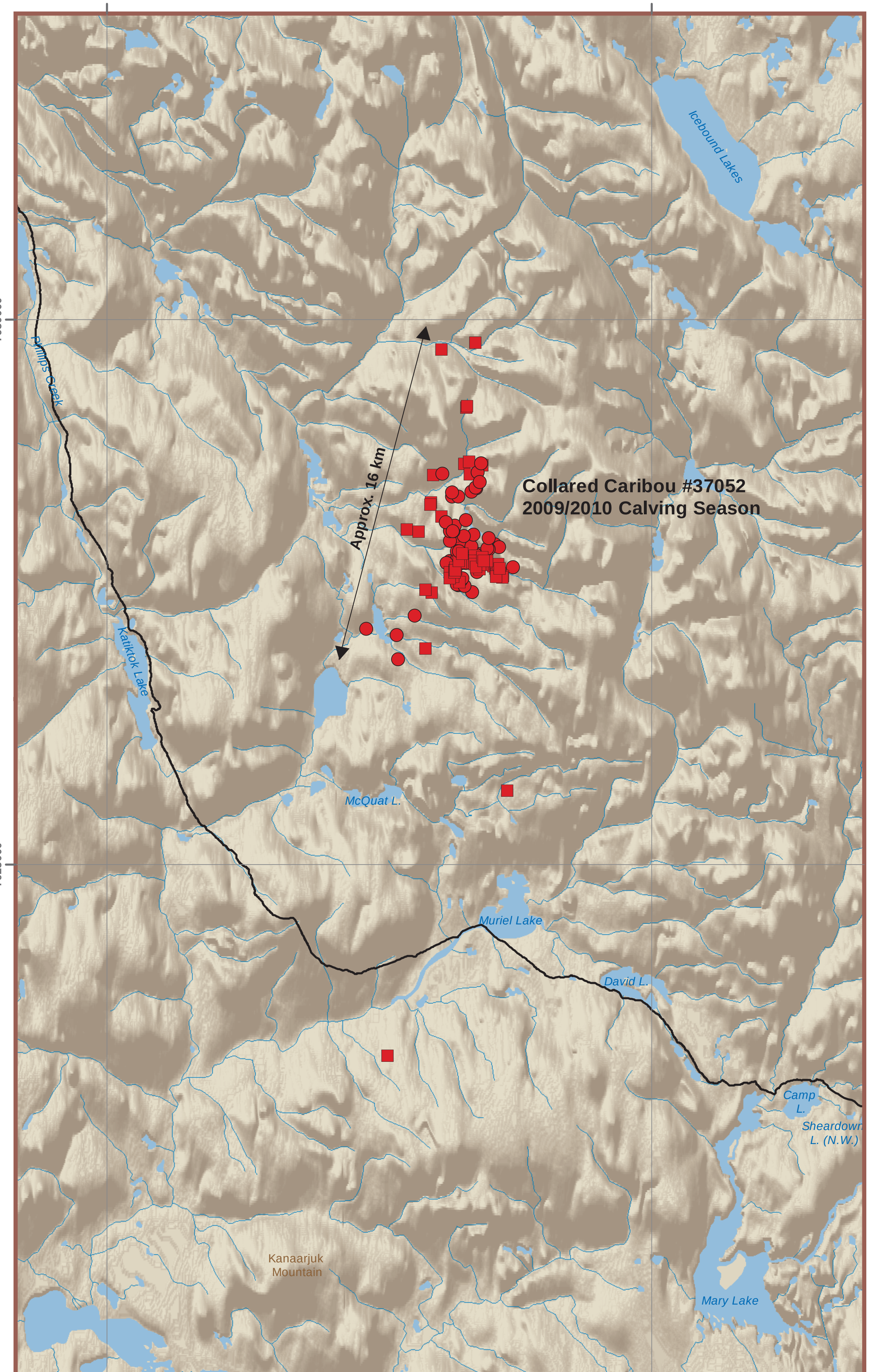
Calving Caribou Distribution in 2009 and 2010.

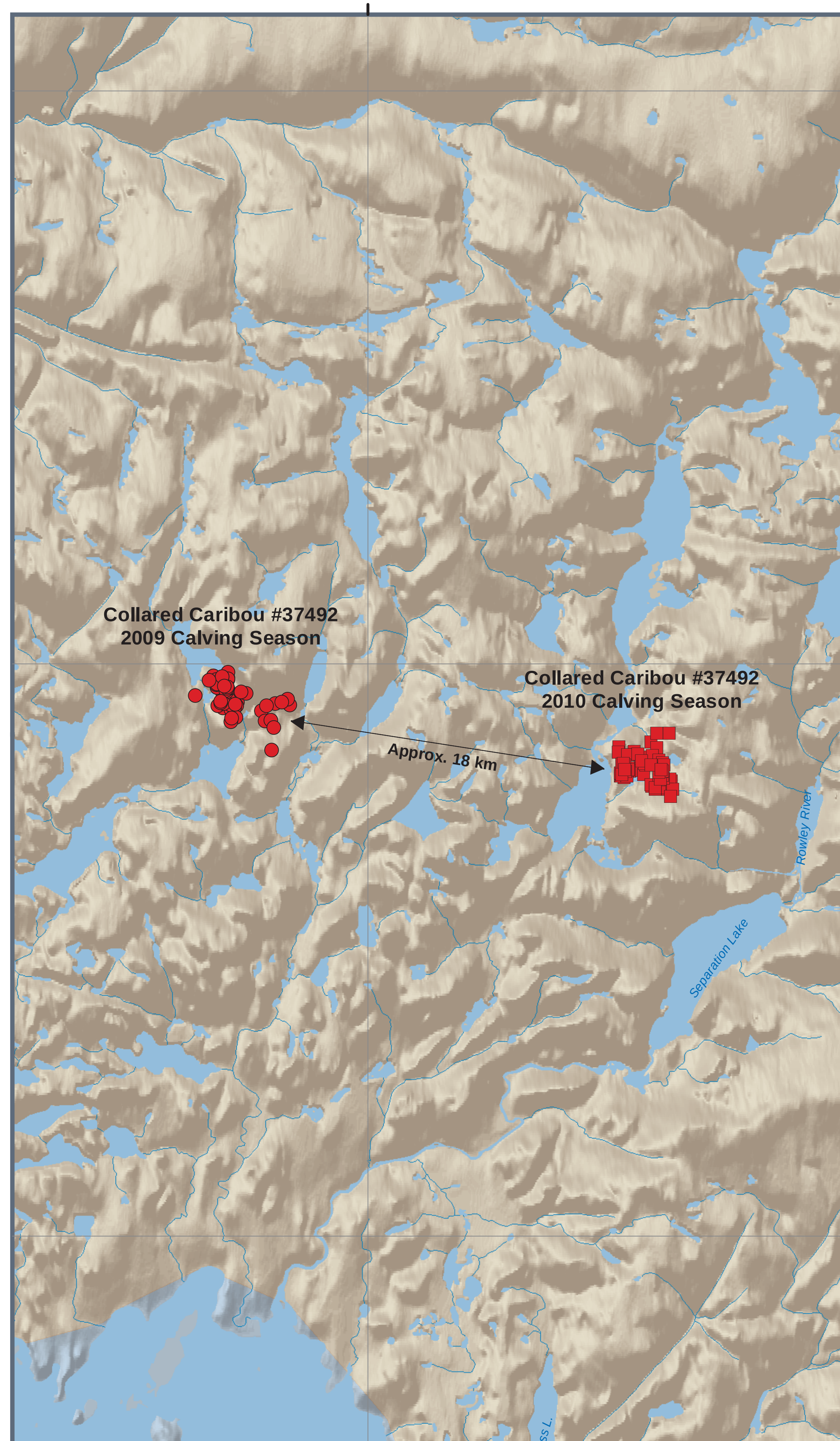
EDI Environmental Dynamics Inc.

Date: 5/30/2011

MAP 1

Path: J:\Yukon\Projects\2011\11_Y_0128_Baffinland_PostEIS\Mapping\Map1_CaribouCollarDistribution_30May2011.mxd





LEGEND

Mary River Project Study Specifics

.......Mary River Project

.......Proposed Rail Alignment

.......Milne Inlet Tote Road

Calving Caribou Locations (May 23 to June 27)

2009 Collar Locations

2010 Collar Locations

NOTES:

Caribou Collar Data: The Government of Nunavut provided data on April 6, 2011.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale: 0, 3, 6, 9, 12, 15 Km

Baffinland Iron Mines Corporation

Calving Caribou: Individual Caribou Movement in 2009 and 2010

EDI Environmental Dynamics Inc.

Date: 5/30/2011

MAP 2