SNC·LAVALIN

FINAL REPORT

Caribou Baseline Survey – Winter 2012

IOC Mine Expansion – Labrador City

RioTinto

IOC

ENVIRONMENT

April 2012
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SNC·LAVALIN
Environment

Caribou Baseline Survey – Winter 2012

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Final Study Report

April 30, 2012

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COSEWIC	Committee on the Status of Endangered Wildlife in Canada
GPS	Global Positioning System
GRH	George River Herd
IOC	Iron Ore Company of Canada
LJH	Lake Joseph Herd
MRNF	Ministère des Ressources naturelles et de la Faune
QNS&L	Québec North Shore and Labrador
VEC	Valued Environmental Component

1. INTRODUCTION

1.1 CONTEXT

Iron Ore Company of Canada (IOC) is the largest manufacturer of iron ore pellets in Canada. Its customer base covers North American, European and Asian steel producers. IOC shareholders include Rio Tinto (58.72%), Mitsubishi Corporation (26.18%) and Labrador Iron Ore Royalty Income Fund (15.10%). IOC's major shareholder and operator is Rio Tinto, the world's third largest mining company. IOC employs approximately 2,200 people in the provinces of Newfoundland and Labrador as well as Québec. It celebrated its 50th anniversary in 2006. IOC's core values and commitments pertain to: Health Safety and Environment, Communities, Involved Employees, Sustainable Development, Quality and Innovation (technology and process).

IOC has a mining operation in Labrador City, Newfoundland and Labrador, as well as port facilities located in Sept-Îles, Québec. The company also runs a 418 kilometer railroad that links the mine to the port known as the Québec North Shore and Labrador (QNS&L) Railway. Its current mining operation consists of open pit mines, mineral processing (concentrator and pellet plant), tailings management facilities, transportation infrastructure and other associated components and activities.

As part of the on-going operation and planned future expansion of its mining and mineral processing activities in western Labrador, IOC has and will be proposing a number of development projects in the coming years. In some cases, these are required modifications, updates and improvements to its existing western Labrador facilities and operations, while others will represent planned future expansion of IOC's mining activities in the region.

In order to prepare future environmental impact assessment studies for these potential expansion projects at the mine site, IOC has decided to collect physical, biological and social baseline information in the coming years. In line with this objective, the caribou and moose survey has been defined as a priority study to be carried out in 2012.

1.2 OBJECTIVES

Following a preliminary assessment, the woodland caribou was identified as a potential Valued Environmental Component (VEC) for the IOC Mine Expansion, both environmentally and socially. The woodland caribou plays a central role in the ecology of predators and the structure of plant communities (Crête, 1999; Bergerud *et al.*, 2008) and it is also part of the traditional lifestyle of native communities which exhibit a strong cultural and economic reliance on caribou for food (NunatuKavut Community Council, 2011; Miller, 2003). Moreover, most populations of woodland caribou are declining in eastern Canada and some are now threatened.

The IOC Mine Expansion study area is located within the historical range of two caribou ecotypes: migratory and sedentary. Although the presence of the species has been confirmed in the past (MRNF, unpublished data; Schmelzer *et al.*, 2004), most sightings can likely be

attributed to the migratory ecotype (which used to visit the study area during the winter, but does not currently). Hence, considering the small amount of data specific to the sedentary ecotype (and it's the protected status both at the federal and provincial levels), a baseline study was undertaken by SNC-Lavalin Environment for IOC/Rio Tinto. The main goal of this study was to collect data on the presence (or absence) and habitat of the woodland caribou (sedentary ecotype) as part of the IOC Mine Expansion.

1.3 STUDY AREA

The study area considered for the caribou was designed to encompass the footprint of the proposed expansion works, as well as the actual mine pits and infrastructures. It is a 40 km x 40 km square (1,600 km^2) centered on Labrador City. The study area also includes the towns of Wabush and Fermont. The eastern and western limits of the study area are 66° 37' 37" W and 67° 14' 20" W between 52° 44' 12" N and 53° 6' 32" N.

2. SUMMARY OF EXISTING BASELINE INFORMATION

Currently, four subspecies of caribou (*Rangifer tarandus*) may be found in Canada: the Grant caribou (*Rangifer tarandus granti*), the Perry caribou (*Rangifer tarandus pearyi*), the tundra caribou (*Rangifer tarandus groenlandicus*) and the woodland caribou (*Rangifer tarandus caribou*).

The woodland caribou is the only subspecies found in Québec and Labrador and thus within the IOC Mine Expansion study area. This subspecies can be divided into different ecotypes[1]. Both the sedentary and migratory ecotypes are suspected to occur within the IOC Mine Expansion study area (Map 1 - Appendix A).

The sedentary ecotype has been designated at the federal level (threatened) and both at the provincial level in Labrador (threatened) and in Québec (vulnerable); Table 2.1. Although the migratory ecotype has not been given a status yet, the drastic declines in some populations could lead to its designation in the near future.

Table 2.1 Status of Woodland Caribou Ecotypes Occurring within the Study Area of the IOC Mine Expansion (as of April 30th 2012)

#	Ecotype	Latin Name	Federal Status[a]	COSEWIC[b]	Prov. Status in Labrador[c]	Prov. Status in Québec[d]
1	Sedentary	*Rangifer tarandus caribou*	Threatened	Threatened	Threatened	Vulnerable
2	Migratory	*Rangifer tarandus caribou*	-	-	-	-

[a] Species at Risk Public Registry (http://www.sararegistry.gc.ca/sar/index/default_e.cfm)
[b] COSEWIC (http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm)
[c] Department of Environment and Conservation, Newfoundland and Labrador (http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/index.html)
[d] Ministère des Ressources Naturelles et Faune, Québec (http://www3.mrnf.gouv.qc.ca/faune/especes/menacees/liste.asp)

2.1 SEDENTARY CARIBOU

Schmelzer (2011) summarizes that "the sedentary caribou ecotype is distinguished from its taxonomically identical migratory counterpart on the basis of several behavioural and morphological features: sedentary caribou do not migrate above the tree line to calve, exhibit limited movement in general, highly disperse during calving, rut in discrete ranges, and exhibit a different antler and body morphology (Couturier *et al.*, 2010; Bergerud *et al.*, 2008). In addition, several studies have confirmed genetic differences between migratory and sedentary ecotypes using DNA microsatellites (Courtois *et al.*, 2003a; Boulet *et al.*, 2007)." The split between the two ecotypes would be a result of different predator-avoidance strategies sedentary caribou tend to be widely dispersed in high ground cover habitats during calving, while migratory caribou

[1] Ecotypes are classes of populations that have adapted to different landscapes or environments, and are distinguished on the basis of migratory habits and feeding behaviour (Bergerud *et al.*, 2008).

would gather in groups far away from the tree line where predators' densities are lower (Seip 1991, 1992; Courtois et Ouellet, 2002; Briand *et al.*, 2009).

As mentioned before (Table 2.1), caribou of the sedentary ecotype are designated as threatened in Labrador (under the Endangered Species Act of Newfoundland and Labrador) and in Canada (listed in Schedule 1 of the Species at Risk Act and designated by the Committee on the Status of Endangered Wildlife in Canada).

There have not been many studies on the sedentary caribou at the latitude of the study area (Environment Canada, 2011; MRNF, 2008) and the Lake Joseph herd (LJH) has certainly been one of the most documented in the region (Crowley, pers. comm., 2011; Schmelzer, 2011; Schmelzer *et al.*, 2004).

2.1.1 Lake Joseph Herd

According to the aerial surveys which were carried out in Labrador between 1975 and 2009 (Table 2.2), there has been a significant decline in the LJH population since 1975 and the latest estimate is 1,047 individuals (Schmelzer, 2011).

Table 2.2 Population Estimates for the Lac Joseph Herd between 1975 and 2011

Year	Population estimate	Reference
1975	3,050	Folinsbee, 1975
1977	1,317	Folinsbee, 1978
1978	562	Pilgrim, 1979
1986	445	St-Martin and Théberge, 1986
2000	1,101	Chubbs *et al.* 2011
2009	1,047	Schmelzer, 2011

Adapted from Schmelzer *et al.*, 2004 and Schmelzer, 2011.

As the population was declining, there seems to have been a range contraction of the LJH since 1980 (Schmelzer *et al.*, 2004). Hence, although the historical range of this population extended north and west of Labrador City, it now seems to be limited east of the longitude 66° 30' W (Schmelzer *et al.*, 2011; Map 1 - Appendix A). Saint-Martin (1987) speculated that the northern calving range was abandoned after 1970 due to flooding and/or increased traffic on the Trans-Labrador highway and that summer ranges were simply extensions of the calving ranges (*in* Schmelzer *et al.*, 2004). Hence, increased human disturbance could be a factor explaining range contraction of the sedentary caribou. However, according to current knowledge, the IOC Mine Expansion Study area is located outside LJH actual range.

2.2 MIGRATORY CARIBOU

Migratory caribou are gregarious animals (that can gather in herds of thousands of individuals at some times of the year) and are, as their name suggests, migratory. In early summer, they reach their calving grounds which are located in the tundra above the tree line. During

postcalving, they expand their distribution in tundra seeking habitats with high-quality forage to increase growth and survival of their fawns and to avoid flies (Miller, 2003; Couturier *et al.*, 2004). In the fall, caribou migrate southward to reach their wintering grounds, which are typically at the southern extent of their range (Schmelzer and Otto, 2001). During winter, the range of migratory caribou partially overlaps with that of the sedentary caribou (Bergerud *et al.*, 2008).

The migratory caribou occurring in Québec and Labrador can be divided into two populations (or herds): the Leaf River herd and the George River herd (GRH). The latter occur in eastern Québec and Labrador and has been reported in the study area when the population levels were at its highest (Map 1 - Appendix A). However, migratory herds of caribou are known for their significant demographic fluctuations (Messier *et al.*, 1988; Festa-Bianchet *et al.*, 2011) and short periods of overabundance are followed by prolonged periods of scarcity (Couturier *et al.*, 2004; Bergerud *et al.*, 2008). In the 1950s, there were only about 5,000 individuals in the GRH (Banfield and Tener, 1958). By 1993, the population had increased to 776,000 individuals (Couturier *et al.*, 1996) before declining in the subsequent decade to about 385,000 individuals by 2001 (Couturier *et al.*, 2004). The latest population estimate, based on aerial surveys conducted in 2010, is 74,131 individuals, which confirms the drastic decline of the GRH (MRNF, 2010; Table 2.3). Actually, the population estimate circulating (based on modeling) in the scientific community for that herd is less than 50,000 individuals (Couturier, pers. comm.., 2011).

Table 2.3 Population Estimates for the George River Herd between 1975 and 2011

Year	Population estimate	Reference
1950	5,000	Banfield and Tener, 1958
1993	775,000	Couturier *et al.*, 1996
2001	385,000	Couturier *et al.*, 2004
2010	74,131	MRNF, 2010
Current	50,000	Couturier , 2012

Although the population of the GRH is in decline, the migratory ecotype is not yet designated as a Species at Risk under federal or provincial legislation (contrary to the sedentary ecotype; Table 2.1).

The GRH decline was also associated with a range contraction and the current wintering range of this herd is located outside the study area (Map 1 - Appendix A) (Schmelzer and Otto, 2001). Observations of caribou individuals in or near the study area are thus expected to be of the sedentary ecotype.

3. METHODS

The survey methodology, which consisted of helicopter transects, was adapted from Courtois *et al.* (2003b). The surveys were conducted with respect to the *Scientific Research Permit* and a *Permit to perform research on specimens of a threatened species under the Endangered Species Act of Newfoundland and Labrador* obtained from the Department of Environment and Conservation, Government of Newfoundland and Labrador (Appendix B). The survey design was composed of 21 transects (located 2 km apart and 40 km in length each). Depending on vegetation cover and light conditions, altitude varied between 150-250 m above the ground and speed varied from 120-200 km/h.

3.1 AERIAL SURVEYS

3.1.1 Period, Effort and Team

The aerial surveys took place on 27-28 February 2012 aboard an A-Star B2 helicopter. A total of 9.4 hours (excluding transit time) was required to cover the study area and details of effort on each day are presented in Table 3.1. A total of 718 linear km of transects (out of a total of 840 initially planned) were surveyed[2] (Figure 3.1).

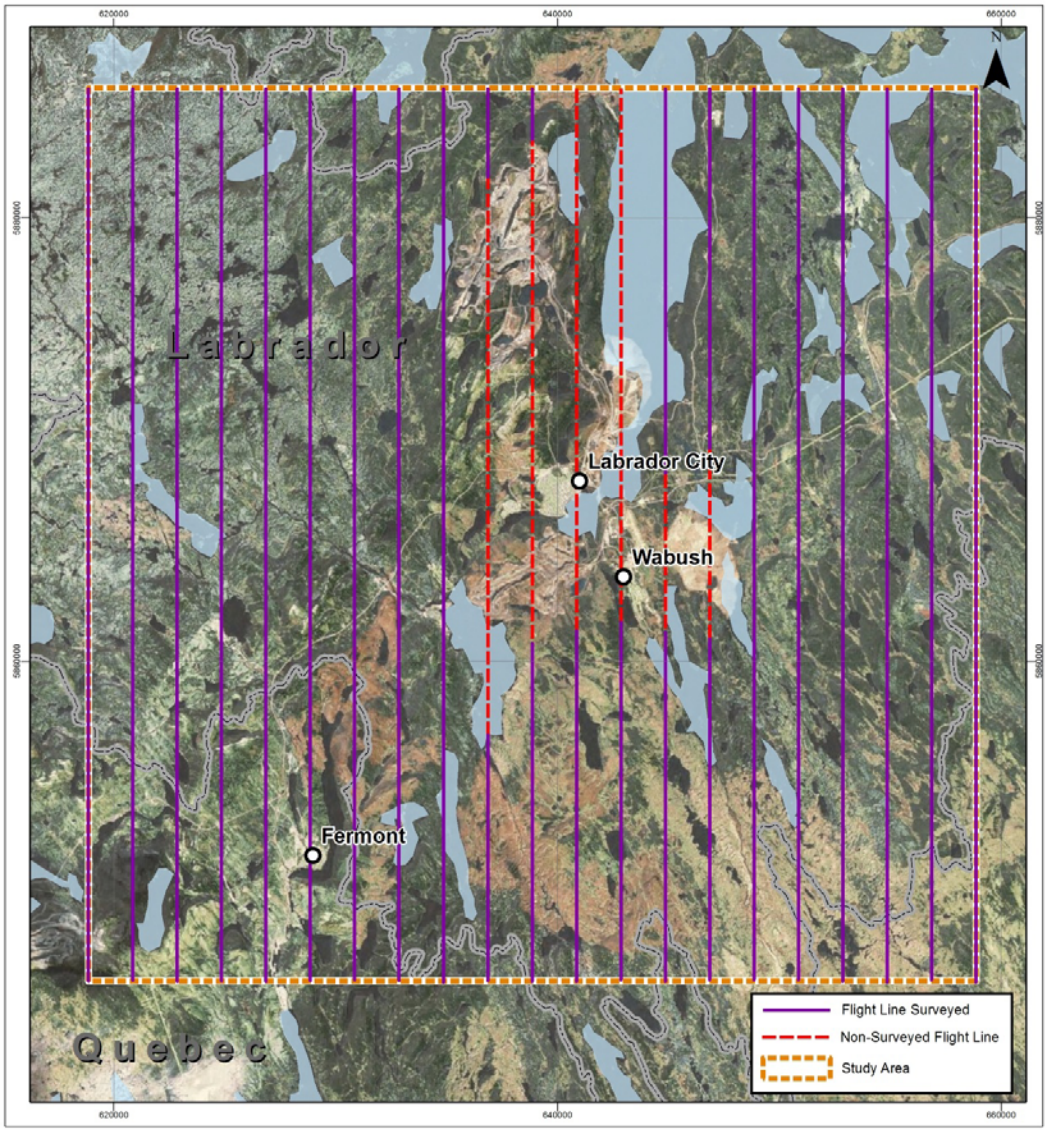
Table 3.1 Period and Survey Effort

Date	Start time	End time	Total flight time (h)*	Total survey time (h)*	Distance covered (km)
2012-02-27	9:00 a.m.	4:30 p.m.	6.5	6.1	486
2012-02-28	8:05 a.m.	12:00 p.m.	3.5	3.3	232
Total			**10.0**	**9.4**	**718**

* Total flight time includes transit time (e.g. time to get from base camp to beginning of transects, refuelling, etc.) while Total survey time excludes transit time.

[2] A total of 122 linear kilometers were not surveyed since they were located in unsuitable habitat (e.g. Labrador City, Wabush and mining infrastructures).

Figure 3.1 Flight Lines and Survey Design of the Study Area



The survey crew was composed of four members: two observers (seated at the rear of the aircraft), one observer/navigator (seated at the front of the aircraft) and a pilot (Table 3.2). A Health and Safety plan was submitted and approved by IOC/Rio Tinto prior to the mission.

Table 3.2 Team Members and Main Role in the Aircraft

Name	Role	Seat
David Mimin	Pilot	Front/right
Natalie D'Astous	Observer/navigator	Front/left
Hélène Sénéchal	Observer	Rear/right
Olivier Trépanier	Observer (and data entry)	Rear/left

3.1.2 Data Collection and Management

All observations (wildlife or human signs) were recorded using an observation form (Appendix C) and entered on a portable computer equipped with an internal GPS (Algiz 7) and the ArcPad software (ESRI, Redlands, California, USA).

When an animal track was encountered, it was identified and - if it looked fresh - was followed for about a kilometer in the hope of finding the animals or their track networks (i.e. sets of non linear tracks where animals spent some time, presumably as part of their winter yards). When animals were encountered, individuals were counted. Photos of the animals and their habitat were taken using a Nikon camera equipped with a 70-300 mm objective. When possible, photos were used to age and sex animals *a posteriori*.

Each track network (or winter yard) was described using the following parameters: area, altitude, general topography, slope, orientation and vegetation composition in relative % of cover. After the network was described, transects were resumed.

Survey conditions were recorded daily (Appendix D) and included: weather conditions (temperature, % of clear sky during the day, last snow precipitation and wind) and track visibility. Snow depth was measured at three different ground stations (three measurements were taken at each station) using a graduated metal rule.

4. RESULTS

4.1 AERIAL SURVEYS

4.1.1 Survey Conditions

Weather conditions were optimal on both survey days (Table 4.1) and there was no recent snow fall (which could have covered the tracks). Track visibility was considered as "good".

Table 4.1 Weather Conditions and Track Visibility

Date	Temp. (°C)	Wind	Date of last snow accumulation	% of clear sky during the day	Track visibility
2012-02-27	-24	Weak	24-25 Feb. (5-8 cm)	100%	Good
2012-02-28	-30	Weak	24-25 Feb. (5-8 cm)	100%	Good

Note: Temperature, wind and last snow accumulation were noted in the morning prior to departure, while cloud cover and track visibility were estimated at the end of the day.

Snow depth was measured under forest cover and was, on average, 98.6 cm deep (Table 4.2).

Table 4.2 Data on Snow Station

Station number	Date	Latitude	Longitude	Mean snow depth (cm)
1	2012-02-27	52.816953	-66.645915	117.3
2	2012-02-27	52.945212	-67.173412	99.5
3	2012-02-28	53.072874	-66.834680	79.0
			Average	**98.6**

4.2 CARIBOU

No sign of the presence of caribou (i.e. no tracks or individuals) was observed during the helicopter flyovers.

4.3 MOOSE

In total, 26 moose track networks and 12 linear tracks were observed. The track networks had a total area of 1,048.54 ha (Map 2 - Appendix A and Appendix E).

Photo #1 Moose, by Natalie D'Astous (2012-02-28)

Photo #2 Moose, by Natalie D'Astous (2012-02-27)

During the surveys, 22 animals were observed in the study area (Map 2 - Appendix A and Appendix E). Amongst the individuals that were observed, there were at least two calves. Based on this, the proportion of calves was at least 9.1%. The moose density in the study area was estimated to a minimum of 0.014 individuals/km^2 (in order to get a more accurate density, flight lines should have been conducted at every 500 m, as suggested by Courtois (1991)).

Mature conifers were the dominant vegetation type in the track networks and occupied on average 49.2% of their area, followed by open/bare land with 30.8% (Table 4.3; Appendix E).

Table 4.3 Vegetation Types and Mean % of Cover in Moose Yards

Vegetation type	Mean % of total yard area
Mature conifer	49.2
Mature mixed forest	3.2
Mature decidous	0.0
Young conifer	4.4
Young mixed forest	5.2
Young decidous	0.0
Wetland (peat moss, bog, fen)	0.80
Burnt	3.2
Open/bare	30.8
Water	2.4

4.4 OTHER SPECIES

A single *Canidae* linear track (not fresh), which could have been from a gray wolf (although the presence of domestic dog is also possible in that area; Map 2 - Appendix A) was observed.

Tracks of the following other species were observed in the study area (Table 4.4), including: Canada Lynx (*Lynx canadensis*), River Otter (*Lutra canadensis*), American Porcupine (*Erethizon dorsatum*) and numerous (not recorded) Snowshoe Hare (*Lepus americanus*).

Table 4.4 Other Wildlife Observations

English name	Scientific name	Date	Latitude	Longitude	Altitude (m)
Canada Lynx	*Lynx canadensis*	2012-02-27	52.853618	-67.179615	725.10
Canada Lynx	*Lynx canadensis*	2012-02-27	52.845065	-67.179211	757.20
Canada Lynx	*Lynx canadensis*	2012-02-27	52.833965	-67.199506	760.30
American Porcupine	*Erethizon dorsatum*	2012-02-27	52.784484	-67.124353	655.60
American Porcupine	*Erethizon dorsatum*	2012-02-28	52.924073	-66.696675	743.80
River Otter	*Lutra canadensis*	2012-02-27	52.953018	-67.140814	740.70
River Otter	*Lutra canadensis*	2012-02-27	53.017458	-67.139354	733.70
River Otter	*Lutra canadensis*	2012-02-27	53.089170	-67.134352	816.00
River Otter	*Lutra canadensis*	2012-02-27	53.078175	-67.165610	787.30
River Otter	*Lutra canadensis*	2012-02-27	52.854118	-66.848681	620.00
River Otter	*Lutra canadensis*	2012-02-28	52.733076	-66.684852	770.70
River Otter	*Lutra canadensis*	2012-02-28	53.017453	-66.687441	582.80
River Otter	*Lutra canadensis*	2012-02-28	52.827641	-66.758995	746.20
Unknown canid	-	2012-02-27	52.898227	-67.144544	658.40

4.5 HUMAN FOOTPRINT

A total of 54 sites with camps (sometimes more than one in a single location) and 77 snowmobile trails were encountered during the surveys (Map 3 – Appendix A). Considering that 718 km of transect were covered, it means that there is, on average, one of these human footprint every 5.5 km within the study area.

5. DISCUSSION

Conditions to detect and identify tracks during the surveys were considered good. Light conditions were optimal (no cloud cover), visibility was good and snow was abundant and still not compacted.

5.1 SEDENTARY CARIBOU

No caribou was observed during the aerial surveys of the IOC Mine Expansion study area, although it is located within the general range of the sedentary caribou (which extends up to the latitude of 55° N). It was not expected that individuals from the LJH would be observed, simply because data obtained from radio-collared individuals in Labrador (Crowley, comm. pers., 2011; Schmelzer, 2011) suggests that this population does not occur west of the longitude of 66°30' W, which is located outside the IOC Mine Expansion study area[3]. Sedentary caribou are generally not limited by available food and habitat throughout their range (Courtois 2003).

The disturbance of human activities, such as forest harvesting, mining and roads, on the caribou has been well documented in the boreal forest (Dyer *et al.*, 2001; Dyer *et al.*, 2002; Schaefer and Mahoney, 2007; Weir *et al.*, 2007; St-Laurent *et al.*, 2012). The impact of these activities on caribou can range from changes in physiology or behavior, such as avoidance (Briand *et al.*, 2009; Faille *et al.*, 2010), to changes in population dynamics, including reduced survival and increased risks of predation (Weir *et al.*, 2007; Faille *et al.*, 2010; Basille *et al.*, 2011; St-Laurent *et al.*, 2012).

Considering the human footprint, such as the mining activities (and infrastructures) and the large number of camps and snowmobile trails within the study area, the results of the survey for caribou are not surprising.

5.2 MIGRATORY CARIBOU

In the past, migratory caribou was present in the study area in winter (Map 1 - Appendix A). Observations recorded in winter near and around Labrador City before 2004 could be attributed to the GRH, which used to be more abundant. However, no animals were observed during this survey (2012) or during a 2009 aerial surveys of the region (Schmelzer, 2011), and it is likely that the GRH has not wintered in the study area since 2004 (due to population decline and range contraction).

[3] Althought not directly relevant for the IOC Mine Expansion, individuals of the LJH have been reported along the QNS&L Railway and this will be discussed in a separate report.

Data from the collision reports along the QNS&L Rail also suggest that the migratory caribou was the ecotype which was present in the study area before 2004 (i.e. number of incidents and number of kills drop drastically after 2004, Gauthier, unpublished data). As illustrated in section 2.2, the GRH has undergone significant decline since 1993. Historical records suggest that the migratory tundra caribou herds of Northern Québec and Labrador have undergone at least three cycles of scarcity and overabundance in the last 150 to 200 years (Weir, 2000 *in* D'Astous *et al.*, 2004). Prolonged periods of scarcity were followed by shorter periods of overabundance (Couturier *et al.*, 2004).

The "return" of the migratory caribou in the study area is nonetheless possible. However, migratory caribou in Nunavut have been documented to avoid area disturbed by mining activities (Boulanger *et al.*, 2011). Moreover, the decline and range contraction of the GRH could be further exacerbated by the impact of climate change in the future (Sharma *et al.*, 2009).

5.3 MOOSE

The predominance of moose (22 sightings) during the winter 2012 aerial surveys is consistent with the results from Schmelzer (2011), who also observed no caribou but a predominance of moose around Labrador City. The estimated minimum moose density for the study area (0.014 individuals/km^2) is comparable to low moose density areas observed elsewhere in south-central Labrador (0.013 individuals/km^2; Chubbs and Schaeffer, 1997).

6. CONCLUSION

The study area is located within the range of the woodland caribou (migratory and sedentary), although none was observed during the February 2012 aerial surveys. The most recent data suggests that the range of the George River herd have contracted so much that their current winter range is now located outside the study area and the presence of the sedentary caribou has not been confirmed in recent aerial surveys of the study area.

Sedentary caribou is most influenced by anthropogenic disturbances and requires large range areas comprised of continuous tracts of undisturbed habitat. The current level of human development within the study area (habitat modification, disturbance by roads and snowmobile trails, mining activities and infrastructures, etc.) are probably responsible for the avoidance of the area by the species.

Moose was the most abundant large mammal species observed during the aerial surveys with 28 track networks detected and a total of 22 individuals. These results are consistent with aerial surveys conducted in 2009 by the Department of Environment and Conservation in Labrador (Schmelzer, 2011), which also observed no caribou and relatively high moose densities around Labrador City.

Hence, even if no caribou was observed during the 2012 aerial surveys, it is recommended to maintain the monitoring of the species in the area and more precisely:

- Maintain collaborative effort with the federal and provincial authorities to monitor the Woodland caribou (both the migratory and sedentary ecotypes);
- Integrate traditional ecological knowledge to the studies.

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APPENDIX A

Maps

520 000 560 000 600 000 640 000 680 000 720 000 760 000 800 000 840 000 880 000 920 000

6 160 000 6 120 000 6 080 000 6 040 000 6 000 000 5 960 000 5 920 000 5 880 000 5 840 000 5 800 000 5 760 000 5 720 000 5 680 000 5 640 000 5 600 000 5 560 000 5 520 000

N

Project Components

- Railway
- Study Area
- Road

Migratory Ecotype (George River Herd)

- Historical Range
- Current Range

Sedentary Ecotype

- Lac Joseph Herd Historical Range
- Lac Joseph Herd Current Range

Schefferville

Labrador

Québec

500

mile 225

mile 250

Labrador City

Wabush

Fermont

389

mile 200

Oreway Camp

mile 175

mile 150

Mai Camp

mile 125

mile 100

mile 75

Tika Camp

mile 50

mile 25

Rivière-au-Tonnerre

Longue-Pointe

Moisie

Sept-Îles

mile 0

Port-Cartier

Rivière-Pentecôte

138

Source: BDGA, 1 : 1 000 000, MRNF Québec, 2011
BGAQ, 1 : 8 000 000, MRN Québec, 2001

Client: RioTinto IOC

Consultant: SNC·LAVALIN Environment

Échelle / Scale: 1:1 750 000

0 20 40 60 km

No. pr. / P. Number: 508409

Fichier / File: sle508409_caribou_120424.mxd

Titre / Title: **Caribou Baseline**

Map 1
Historical and current ranges of the Woodland caribou in Québec and Labrador

Projet / Project: **IOC EXPANSION PROJECTS**

No.	Date	Description	Dessiné / Drawn	Vérifié / Verified
01	2012-03-27	Preliminary	H. Dubois	C. Le Page

Directeur de projet (client) / Project Manager (Client): Lee Preziosi

Directeur de projet / Project Manager: Caroline Le Page

Path: L:\proj\508409_Project_Genesis_Pre-PFS\4E_Environment\4.0 Réalisation\4.5 SIG\ArcGIS\1ProjetMXD\Cartes_de_travail\201203_Caribou\Mine\sle508409_caribou_120424.mxd

640 000

N

Project Components

- QNS&L Railway
- Study Area
- Road
- Flight Line
- Non-Surveyed Flight Line
- Iron Ore / Rio Tinto Mining Concession
- IOC Operating Zone

Wildlife Observations

- Moose Yard (and Number of Individuals Observed)
- Moose Linear Track
- Unidentified Canid

Québec

Labrador

Labrador City

Wabush

Fermont

mile 245

mile 250

mile 255

mile 260

mile 265

mile 270

500

389

5 880 000

5 840 000

Source: BDGA, 1 : 1 000 000, MRNF Québec, 2011
BGAQ, 1 : 8 000 000, MRN Québec, 2001
Mining Concession: IOC, 2012

Client: RioTinto IOC	Consultant: SNC·LAVALIN Environment	Titre / Title: **Caribou Baseline** Map 2 Large Mammals Observations		
Échelle / Scale: 1:200 173 (0 2 4 6 km)	No. pr. / P. Number: **508409**			
	Fichier / File: sle508409_caribouReseau_120425.mxd	Projet / Project: **IOC EXPANSION PROJECTS**		
01	2012-03-27	Preliminary	H. Dubois	C. Le Page
No.	Date	Description	Dessiné / Drawn	Vérifié / Verified

Directeur de projet (client) / Project Manager (Client): Lee Preziosi

Directeur de projet / Project Manager: Caroline Le Page

Path: L:\proj\508409_Project_Genesis_Pre-PFS\4E_Environment\4.0 Réalisation\4.5 SIG\ArcGIS\1ProjetMXD\Cartes_de_travail\201203_Caribou\Mine\sle508409_caribouReseau_120425.mxd

620 000 640 000 660 000

5 900 000 5 880 000 5 860 000 5 840 000

N

Project Components

- QNS&L Railway
- Study Area
- Road
- Flight Line
- Non-Surveyed Flight Line
- Iron Ore / Rio Tinto Mining Concession
- IOC Operating Zone

Human Footprint Observations

- Camp
- Snowmobile Trail
- Landing Strip

Québec

Labrador

Labrador City

Wabush

Fermont

Québec

mile 245
mile 250
mile 255
mile 260
mile 265
mile 270

500

389

Source: BDGA, 1 : 1 000 000, MRNF Québec, 2011
BGAQ, 1 : 8 000 000, MRN Québec, 2001
Mining Concession: IOC, 2012

Client: RioTinto IOC

Consultant: SNC·LAVALIN Environment

Échelle / Scale: 1:200 000
0 2 4 6 km

No. pr. / P. Number: 508409

Fichier / File: sle508409_ObsHumain_120426.mxd

No.	Date	Description	Dessiné / Drawn	Vérifié / Verified
01	2012-03-28	Preliminary	H. Dubois	C. Le Page

Titre / Title

Caribou Baseline

Map 3
Human footprint (camps, snowbile trails and landing strips) Observations

Projet / Project

IOC EXPANSION PROJECT

Directeur de projet (client) Project Manager (Client)	Directeur de projet Project Manager
Lee Preziosi	Caroline Le Page

620 000 640 000 660 000

Path: L:\proj\508409_Project_Genesis_Pre-PFS\4E_Environment\4.0 Réalisation\4.5 SIG\ArcGIS\1ProjetMXD\Cartes_de_travail\201203_Caribou\Mine\sle508409_ObsHumain_120426.mxd

APPENDIX B

Permits

Newfoundland
Labrador

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of
Environment and Conservation
Wildlife Division

A PERMIT TO PERFORM RESEARCH ON SPECIMENS OF A THREATENED SPECIES UNDER THE *ENDANGERED SPECIES ACT* OF NEWFOUNDLAND AND LABRADOR

Date: February 23, 2012

Endangered Species Permit Number: **2011/12 -31**

Issued To: Lee Preziosi, Iron Ore Company of Canada, 150 Beaver Hall Hill, Montreal, QC H2Z 0A5
Brian Power, AMEC Environment and Infrastructure, PO Box 13216, St.John's, NL A1B 4A5

Permit To: Perform caribou and moose surveys in areas of Labrador within the range of the threatened Lac Joseph herd of Woodland Caribou (*Rangifer tarandus*).

Expiry Date: March 31, 2012

CONDITIONS:

1. The permit holder must provide a report of activities carried out under this permit to the Wildlife Division, Department of Environment and Conservation by April 30, 2012. This report must include specific methodology used and a copy of the data collected as a result of this research. Data provided must include GPS locations of any caribou sighted during the surveys.

2. The permit holder must provide the Wildlife Division with copies of all reports generated as a result of this research.

3. The permit holder has identified Olivier Trépanier, Hélène Sénéchal, and Natalie D'Astous as individuals who will be involved in the surveys. The permit holder is responsible for the training of these and any additional designated individuals and must ensure that all involved individuals follow all regulations related to this permit.

4. Names and contact information for any individuals participating in the research activities that were not identified on the permit request must be provided to the Wildlife Division once activities are completed.

5. Any amendments to the methodology for this research must be provided to the Wildlife Division prior to research being conducted. Substantial changes to the methodology may result in the permit being revoked or conditions amended.

6. Any amendments to the methodology for this research must be provided to the Wildlife Division prior to research being conducted. Substantial changes to the methodology may result in the permit being revoked or conditions amended.

7. Caribou must not be harassed, injured or killed as the result activities performed under this permit. Any disturbance to caribou must be minimized.

8. If an animal is injured or killed as a result of an activity performed under this research permit, the Director of Wildlife must be immediately notified. The Director of Wildlife may require further activities related to the disturbance of animals to cease until such time as the Director has had an opportunity to review the circumstances.

9. Under the discretion of the Director of Wildlife, this permit can be cancelled without notice.

JOHN BLAKE
Director

Newfoundland Labrador

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Dept of Environment & Conservation

Scientific Research Permit

(as under Section 86 of the Wildlife Regulations, Consolidated Newfoundland and Labrador Regulation 1156/96)

Project Title: *IOC/Rio Tinto Mine Expansion Projects, Socio-environmental Baseline Studies – Caribou and Moose survey*

Issued to: Lee Preziosi, Manager – Environment & Sustainable Development
Iron Ore Company of Canada
1050 Beaver Hall Hill, Montreal, QC H2Z 0A5
Tel: (514) 787-8828

Brian Power, Associate Environmental Engineer
AMEC Environmental & Infrastructure
P.O. Box 13216, St. John's, NL A1B 4A5
Tel: (709) 722-7023

Permit to: Undertake aerial surveys between February 20, 2012 and March 8, 2012 (weather permitting) to determine whether sedentary and possibly migratory caribou are present within the general area of the proposed mine expansion sites. This information is to be included in the associated Environmental Assessment documents.

Dates: Aerial surveys in February and March, 2012. Permit expires April 1, 2012.

Location: Within the IOC/Rio Tinto Expansion Projects footprint in Labrador West. The area to be surveyed will include approximately a 1600 km^2 area with a 40 X 40 km grid.

Conditions:

1) Prior to initiation of surveys, a digital copy of the shape files of all survey routes must be provided to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten Miller at: kirstenmiller@gov.nl.ca

2) No wildlife species, including the study species, will be harassed. The Wildlife Division advises applicants to operate under established regulations and guidelines with respect to wildlife and wildlife habitat to minimize adverse impacts (Section 106 of the *Wild Life Regulations* under the *Wild Life Act* (O.C. 96-809)).

3) The Project will be conducted using accepted wildlife research techniques and target species will be disturbed as little as possible.

4) Caribou must not be harassed, injured or killed as the result of activities performed under this permit. Any disturbance to caribou must be minimized.

5) Upon completion of the report writing, a copy of the final reports will be remitted to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten Miller at: kirstenmiller@gov.nl.ca by April 30, 2012. In addition, a list of all wildlife sightings and sign with their coordinates will be forwarded to the Wildlife Division after each aerial seasonal survey.

6) Any unusual wildlife observations or any adverse effects observed during this survey are to be reported immediately to the Wildlife Division – Corner Brook.

7) The methods and survey dates described in the application will be followed as closely as possible. Any changes to the survey design or methodology outlined in the initial permit request will require prior approval before implementation.

8) All conditions of this permit must be adhered to and data and results from previous projects submitted to the Wildlife Division prior to another permit being issued.

23 Feb 2012
Date:

Senior Manager – Habitat, Game and Fur

Wildlife Division
PO Box 2007
Corner Brook, NL A2H 7S1
Ph (709) 637-2383
Fax (709) 637-2004

APPENDIX C

Observation Form

Inventaire du caribou projet IOC - Feuille de terrain - Observations

N° Fiche _____

Date _____ 2012

N° Feuillet _____ **Pilote** _____ **Navigateur** _____ **Observateurs** _____ _____ Secteur _____

No ligne de vol	No obs.	Latitude	Longitude	Heure (hh:mm:ss)	Type d'obs.	Espèce et nombre	Statut (sexe et âge)	Composition végétale (%), densité du couvert (D= Dense; O=Ouvert)										Expo.	Pente	Topo. Gén.	Espèces végétales dominantes et remarques
					L, R, I/V, R	CM, CF, OR ou autres	AM- AF-J- NI	RE	ME	FE	RR	RM	RF	TO	BR	OU	EA	N-S-E-O	D-M-F	P-O-E	

Espèce
CM = caribou migrateur, CF = caribou forestier, OR = orignal
Autres = indiquer le nom de l'espèce

Statut (si possible)
MA = Mâle adulte, FA = Femelle adulte,
J = Jeune, NI = Non-identifiable

Type d'observation
L = Piste linéaire, R = Réseau de pistes, I = Individu (s)
V= Vieilles pistes, R= Pistes récentes

Pente
D = Douce,
M = Modéré, F = Forte

Topographie générale
P = Plat, O = Ondulé, E = Escarpé

Végétation: RE= Résineux, ME= Mélangé, FE= Feuillu, RR= Régénération résineuse, RM= Régénération mélangée, RF= Régénération feuillue (incluant arbustaie riveraine), TO= Tourbières, BR= Brûlis, OU= Ouvert (dénudé sec, lande, herbaçaie, lichénaie), EA= Eau

APPENDIX D

Survey Conditions Form

Inventaire du caribou projet IOC
Feuille de terrain – Conditions d'inventaires

Localisation

Date _____2012
Secteurs _____
Feuillets _____
Lignes de vol : de_____ à _____

Équipage

Type d'appareil _____
Pilote _____
Navigateur _____
Observateur côté droit _____
Observateur côté gauche _____

Conditions

% du temps ensoleillé : _____
% du temps nuageux : _____

Texture de la neige :	Poudreuse _____	Mouillée _____	Croûtée _____
Visibilité des pistes :	Mauvaise _____	Moyenne _____	Bonne _____
Vent : Nul _____	Faible _____	Moyen _____	Fort _____
Précipitation :	Neige _____	Pluie _____	Grésil _____
	Légère _____	Averse _____	Forte _____
Température de l'air :	Matin _____ °C	Midi _____ °C	Fin pm _____ °C
Dernière chute de neige :	Date _____	Quantité _____ (cm)	
Épaisseur de neige au sol :	Mesures_____(cm)		moyenne _____

Survol

Heure :	Début _____	Fin _____	Durée _____
Temps :	Inventaire _____	Transit _____	
Altitude :	Mesures_____ (m)		Moyenne _____
Vitesse :	Mesures _____ (km/h)		Moyenne _____

Remarques

_____
_____
_____
_____
_____

APPENDIX E

Details of Moose Observations

Appendix E - Details of moose observations – track network

Network ID	Date	Area (ha)	Total number of individuals	Latitude	Longitude	Altitude (m)	Topo	Slope[a]	Orient.[b]	Vegetation cover (% of total area – S: Sparse or D: Dense)[c]									
										CON	MIX	DEC	YCON	YMIX	YDEC	BOG	BUR	BARE	WATER
1	2012-02-27	68.72	0	52,732119	-66,643196	598.3	Flat	-	-	90-S	0	0	0	0	0	0	0	0	10
2	2012-02-28	76.34	2	52,746524	-66,745389	619.7	Hilly	M	E	10-S	0	0	0	70-O	0	0	10	0	0
3	2012-02-27	11.52	2	52,747039	-66,644847	630.3	Flat	-	E	0	80-S	0	0	0	0	0	0	20	0
4	2012-02-28	17.60	1	52,789535	-66,702497	613.4	Hilly	D	O	60-S	0	0	0	0	0	0	0	40	0
5	2012-02-28	50.90	1	52,797959	-66,784833	620.8	Hilly	D	E	20-S	0	0	50-O	0	0	0	0	30	0
6	2012-02-27	74.32	1	52,806182	-66,970062	593.8	Flat	-	-	0	0	0	0	60-O	0	0	0	30	0
7	2012-02-27	17.15	1	52,806838	-66,637357	645.1	Hilly	D	E	30-S	0	0	0	0	0	0	70	0	0
8	2012-02-27	5.94	0	52,816943	-66,872227	619.0	Flat	-	-	80-S	0	0	0	0	0	0	0	20	0
9	2012-02-28	64.99	1	52,821647	-66,800952	599.2	Flat	-	-	30-S	0	0	60-O	0	0	0	0	0	10
10	2012-02-28	48.90	0	52,825252	-66,668301	664.5	Hilly	-	O	80-S	0	0	0	0	0	0	0	20	0
11	2012-02-27	35.91	1	52,825850	-67,144693	711.9	Flat	D	S	30-S	0	0	0	0	0	0	0	70	0
12	2012-02-27	35.45	2	52,840502	-67,115139	676.8	Hilly	D	S	50-S	0	0	0	0	0	0	0	40	0
13	2012-02-28	22.66	1	52,869588	-66,788147	557.7	Hilly	D	E	20-S	0	0	0	0	0	0	0	70	10
14	2012-02-27	28.59	1	52,881939	-67,207329	657.6	Flat	-	-	60-S	0	0	0	0	0	0	0	40	0
15	2012-02-27	11.46	0	52,891282	-67,232537	661.8	Flat	-	-	40-S	0	0	0	0	0	0	0	60	0
16	2012-02-27	81.52	0	52,906862	-67,085151	692.8	Flat	D	E	80-S	0	0	0	0	0	0	0	20	0
17	2012-02-27	29.64	0	52,921126	-67,085736	622.4	Hilly	D	E	70-S	0	0	0	0	0	0	0	30	0
18	2012-02-27	47.32	0	52,945451	-67,043509	600.9	Hilly	D	O	60-S	0	0	0	0	0	0	0	20	20
19	2012-02-27	5.01	2	52,951584	-67,022419	706.4	Flat	-	E	60-S	0	0	0	0	0	0	0	40	0
20	2012-02-27	100.23	0	52,958615	-67,229245	650.2	Flat	D	S	30-S	0	0	0	0	0	0	0	70	0
21	2012-02-27	5.89	1	52,958927	-67,087430	680.2	Hilly	D	E	70-S	0	0	0	0	0	0	0	30	0
22	2012-02-27	15.77	1	52,961815	-67,086707	615.8	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2012-02-27	58.09	1	52,986571	-67,175004	624.0	Flat	-	-	40-S	0	0	0	0	0	0	0	70	0
24	2012-02-27	13.98	1	52,988763	-67,052909	630.7	Flat	-	-	80-O	0	0	0	0	0	10	0	0	10
25	2012-02-27	79.48	0	52,994191	-67,138015	632.5	Flat	D	O	50-S	0	0	0	0	0	0	0	50	0
26	2012-02-27	41.16	2	53,005255	-67,051201	659.2	Flat	-	-	90-O	0	0	0	0	0	10	0	0	0
Total	**-**	**1048.54**	**22**			**-**	**-**	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**40.33**	-			**637.9**	**-**	-	-	**49,2**	**3,2**	**0,0**	**4,4**	**5,2**	**0,0**	**0,8**	**3,2**	**30,8**	**2,4**

Notes:

[a]Slope: D=Weak; M=Medium

[b]Orientation: N=North, E=East, S=South, W=West

[v]Vegetation cover: CON = Mature conifers; MIX = Mature mixed forest; DEC = Mature deciduous; YCON = Young conifers; YMIX = Young mixed forest; YDEC = Young deciduous; BOG = peat moss, bog or fen; BUR = Burnt; BARE = Open/bare land (rocky outcrop or lichen); WATER = Lake or river

SNC·LAVALIN

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Montreal, Qc Canada H3A 1B9
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