

## INTEGRATING ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN HOPES ADVANCE BAY PROJECT - A FIRST OVERVIEW

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## **1.0 INTRODUCTION**

As part of its Ungava Bay iron properties, Oceanic Iron Ore Corp. (Oceanic) has initiated the development of the Hopes Advance Bay project. Along the northern extension of the Labrador through in the Nunavik region, the project is located within 20 km of the tidewater. Inuit people have occupied this area for centuries and are still closely tied to the land and its resources. Because of the sensitive nature of the surroundings and the close proximity with Inuit, environmental and social considerations are at the heart of Oceanic's corporate philosophy.

Indeed, Oceanic's board and management team has made the establishment of positive social and community relations a corporate philosophy and priority, focussing on the promotion of clear communication, the respect of local culture and tradition, consultation of stakeholders, economic development for the communities, safety for all, the care for the environment, and the development of projects through high standards and long term sustainability (Oceanic Iron Ore Corp. 2011a).

As part of this approach, Oceanic has continuous and open communication with the Inuit, namely the Makivik Corporation and the Nunavik Landholding Corporation of Aupaluk. These three parties embodied their desire to collaborate with the ratification of a Letter of Intent (LOI), in August 2011. The LOI stipulates that the project will continue to be developed, in the true respect of the environment, the Inuit rights, interests and traditional land-use practices. A committee will be created to foster exchange of information, mutual involvement and collaboration (Oceanic Iron Ore Corp. 2011b).

Oceanic has also undertaken scientific studies in order to describe the study area that will be receiving the project. Through environmental and social impact assessment (ESIA), Oceanic wishes to make use of the best practices in environmental assessment in order to optimize the project insertion into its surrounding environment while maximizing the social and economic spinoffs.

To do so, Golder Associés Ltée (Golder) was mandated by Oceanic to proceed with the first steps of the ESIA. A review of available information, a field survey and a consultation with the Inuit were initiated in 2011. The review of information is intended to provide a first view of the local environment and to identify social and environmental issues. As part of best practices, the review will be completed with field surveys in order to provide with a more precise description of the environment. A first survey is underway in the fall of 2011 and is focussing on the aquatic habitats. This survey will be followed by other surveys in 2012. Besides the surveys of environmental components, consultation with Inuit has also been initiated; Aupaluk and Makivik representatives were met in September 2011, as a first step to exchange information about the environmental and social studies undertaken by Oceanic as well as increase the understanding of traditional land-use within the project study area. All these information, along with information that will be gathered in 2012 will allow for the completion of the ESIA.

## **2.0 PROJECT OVERVIEW**

Oceanic has 3055 claims in the Ungava Bay region of northern Québec. However, the focus of this report is on the Hopes Advance Bay property (the Project), which is located some 10 km west of the Inuit village of Aupaluk, north of the 59<sup>th</sup> parallel. This smallest community in Nunavik (population 174; Statistics Canada, 2007) is located on the southern shore of Hopes Advance Bay, approximately 150 km north of Kuujuaq.



The Project is in the early stages of development and as such the attached conceptual layout (Figure 1) has been used as a reference for the current report. It is anticipated that the Project could include the following components:

- Open mine pits;
- Tailings management facilities;
- Waste rock and overburden deposits;
- Concentrator;
- Concentrate pipeline;
- Pelletizer plant;
- Deepwater port;
- Power plant;
- Access roads and electric lines; and
- Accommodations for the workers.

### **3.0 DESCRIPTION OF THE ENVIRONMENT**

The area used to describe the existing environment within the Project region is illustrated in Figure 1. In order to ensure the inclusion of all relevant components potentially affected by the Project, a 30-km radius around the Castle Mountain deposit was included in the Project region, totalling an estimated 2,830 km<sup>2</sup> (Figure 1).

Information requests were addressed to the regulatory agencies and organizations in July and August 2011, and other sources of information were consulted in order to obtain a general overview of the social and biophysical environment within the Project region and to highlight the major components of concern (see Section 3.1).

As previously mentioned, consultation with Inuit has also been initiated as part of this mandate. Two meetings were held in September 2011: one in Aupaluk and one in Kuujuaq, as a first step to exchange information about the environmental and social studies undertaken by Oceanic as well as increase the understanding of traditional land-use within the project study area. A summary of the meetings is presented in Section 3.2 and the key elements are also included in other relevant sections of this report.

#### **3.1 Literature Review**

The following literature review includes the information gathered in response to requests for information from regulatory agencies and organizations, scientific articles, books and atlases for the identification and classification of the different environmental components. The main sources of information consulted were the following:



### **Organizations and Government Ministries:**

- Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2011);
- Ministère des Ressources naturelles et de la Faune (MRNFa,b, 2011; Sonia Boudreault, 11 August 2011, pers. comm.);
- Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP; Benoit Larouche, 19 July 2011, pers. comm.; Jacques Perron, 3 August 2011, pers. comm.);
- Ministère de la Culture, des Communications et de la Conditions Féminine du Québec (MCCCF; Jean-Jacques Adjizian, 19 July 2011, pers. comm.);
- Ministère des Affaires Municipales, Régions et Occupation du Territoire du Québec (MAMROT; Patricia Hébert, 19 July 2011, pers. comm.);
- The Birds of North America 2011);
- Canadian Wildlife Service (CWS; Mark Dionne, 19 July 2011, pers.comm.);
- Makivik Corporation (Bill Doidge, 2 August 2011, pers. comm.); and,
- Commission de la qualité de l'environnement Kativik (Mélissa Gagnon, 21 August 2011, pers. comm.).

### **Databases**

- SOS-POP (Suivi de l'occupation des stations de nidifications des populations d'oiseaux en péril; Marie-France Julien, 19 July 2011, pers. comm.);
- ÉPOQ (Étude des populations d'oiseaux du Québec; Jacques Larivée, 19 July 2011, pers. comm.);
- Atlas des oiseaux nicheurs du Québec méridional (Daniel Jauvin, 19 July 2011, pers. comm.);
- Atlas des amphibiens et reptiles du Québec (Sébastien Rouleau, 19 July 2011, pers. comm.);
- Centre de données sur le patrimoine naturel du Québec (CDPNQ; Benoit Larouche (MDDEP), 19 July 2011, pers. comm.; Sonia Boudreault (MRNF), 29 July 2011, pers. comm.);
- List of Québec threatened or vulnerable species (MRNFa, 2011);
- Registre des aires protégées (MDDEP, 2011a);
- Species at Risk Public Registry (Government of Canada, 2011a);
- Inventaire des sites archéologiques du Québec (ISAQ; Jean-Jacques Adjizian, 19 July 2011, pers. comm.)
- Nunavik Bibliography (ASTIS, 2011);
- Fish Habitat Management Information System (FHAMIS, 2011);

### **Publications**

- Several guides, technical documents and scientific publications were also consulted (see the Reference Section for a full list)



Note that only pertinent results from the literature review are presented in the following sections.

## **3.2 Consultation with the Inuit**

A meeting was held in Aupaluk on September 2<sup>nd</sup>, 2011 with the mayor and a land holding representative. A Oceanic and a Golder representative were present. This meeting allowed for a first overview of land use and the identification of key species of interest for the Inuit. Salmonids are very much appreciated by the Inuit, namely brook trout and lake trout but mostly arctic char. The Ford river, Ford lake and Saint-Fond river are places identified as fishing spots for the Inuit. Seafood such as mussel, clam are also appreciated.

Besides fish, mammals and birds are also of importance: fox is trapped, polar bear, seal, geese, ptarmigan and caribous are hunted. Geese and caribous are abundant and very much appreciated. Plants are also used as food and medicine. Species such as whale (bowhead), beluga, seals and muskox are also seen in the region.

Considering the link Inuit have with the land, interaction between the project and land resources is of interest to them, as opportunities may arise but also to make sure the land is protected where needed, for example where there are archaeological sites.

Another meeting was held in Kuujuaq on September 8, 2011. Representatives of Nunavik Mining Exploration Fund (NMEF), Makivik Corporation and Makivik Research Centre were met by the same Oceanic and Golder representatives.

This meetings also pointed out key species for the Inuit: salmonids and waterfowl but also species of interest such as beluga and muskox that can be seen in the region.

People already see effects from the project since exploration activities have trigger a demand for food and other services by the workers. Inuit also have access to facilities and local expertise that could benefit to the project, while creating spinoffs to the region. They believe this will likely have a lasting effect on the community once the project is implemented. It will trigger opportunities for jobs; training and partnership, but to them, this also means that the development of the project should maximize opportunities.

These first meetings will be followed by others, as the project evolves. The objective is reciprocal, to gain knowledge from the Inuit, so that the project may be best adapted to their needs, and to keep the Inuit involved so that their participation into the project is maximized.

## **3.3 Social Environment**

### **3.3.1 Location and Land Tenure**

The Project is located in the Québec region of Nunavik (i.e., northern one-third of the province, above the 55<sup>th</sup> parallel), on the western side of Ungava Bay, and as previously mentioned, it is in close proximity to the northern village of Aupaluk. The Project comprises approximately 3,000 claims on 126,000 hectares (Figure 1).

The Project falls within Inuit territory governed by the James Bay and Northern Québec Agreement (JBNQA). The JBNQA is an agreement that was signed in 1975 between several parties including the Government of Québec, the Government of Canada, the Grand Council of the Crees and the Northern Québec Inuit Association (Québec Government, 1998). The JBNQA defines the land regime applicable in the territory as well as rights related to issues, such as resource management, economic development, policing and administration of justice, health and social services and environmental protection. The JBNQA has also defined a management system



for wildlife resources including hunting, fishing and trapping activities carried out by the Cree and Inuit (Québec Government, 1998).

Under the JBNQA, a land regime was instituted whereby the territory covered by the agreement is divided into three categories of land (i.e., Category I, II and III; Québec Government, 1998).

- 1) Category I lands, which are located in and around the native community villages, have been allocated to the native people for their exclusive use (e.g., for hunting, fishing and trapping) and are self-administered. Note that owners of mining rights adjacent to Category I lands will be able to exercise them within the limits they retain, but they will be obliged to obtain consent from the native community and to compensate the Band whose territory is affected by their operations.
- 2) Category II lands, which are public lands owned by the Crown-in-right-of-Québec, native people have exclusive hunting, fishing and trapping rights, but no special right of occupancy. Mining exploration and technical surveys may be carried out freely on Category II lands but these undertakings must not unfairly interfere with the hunting, fishing and trapping activities of the native people.
- 3) The vast bulk of the territory of Northern Québec is made up of public lands referred to as Category III lands. These are lands where, although exclusive rights or privileges are not granted to the native people they are able to pursue their harvesting activities year round without a permit or limit (subject to conservation principles), and certain species are reserved for their use. As such, the entire population has access to, and the use of, Category III lands in accordance with the ordinary laws and regulations of Québec concerning public lands (Québec Government, 1998).

The majority of the claims is located on Category III lands. However, there is a section of the claims located south of Red Dog River that is on Category II lands, but at this time, no mining activity is planned on these lands.

### **3.3.1.1 Regional and Local Administrations**

#### ***Kativik Regional Government***

The Kativik Regional Government (KRG), created in 1978 in accordance with the JBNQA, delivers public services to the people of Nunavik (north of the 55<sup>th</sup> parallel), provides technical assistance to the northern villages, and exercises municipal powers over lands where there are no legally-constituted Northern village corporations (KRG, 2011).

The KRG council is composed of 17 elected municipal representatives appointed by each of the 14 Northern villages and the Naskapi First Nation of Kawawachikamach for a two-year period (KRG and Makivik Corporation, 1999; KRG, 2011). The KRG has an office in each of the 14 villages and the KRG head office is located in Kuujuaq (KRG, 2011).

The main roles of the KRG, distributed amongst its 10 departments, include:

- Research and Economic Development (e.g., socio-economic planning);
- Finance (e.g., preparation and management of the KRG's overall budget);
- Legal and Municipal Management (e.g., negotiation and drafting of agreements with federal- and provincial-government departments and agencies);





- Municipal Public Works (e.g., municipal infrastructure maintenance, improvements and development);
- Public security (e.g., Kativik Regional Police Force and the Civil Security Section);
- Recreation (e.g., technical assistance to organizers and coaches, region-wide programs);
- Renewable Resources, Environmental and Land Use Planning (e.g., Inuit hunting, fishing and trapping, environment and parks, wildlife conservation, environment, land use planning and development);
- Employment, training and income support and childcare; and
- Transportation (e.g., airport management, operations and maintenance; KRG, 2011).

### ***Makivik Corporation***

Also created in 1978, the Makivik Corporation represents the Inuit with respect to all matters relating to their social, cultural and political rights, including:

- Treaty amendments and negotiations;
- Environmental impact assessments;
- Negotiation of impact and benefits agreements;
- Social and environmental research;
- Renewable resources development; and
- Several local and regional economic development activities (e.g., adventure tourism).

Source: KRG and Makivik Corporation, 1999

### **3.3.2 Land and Resource Use**

There are no roads in Nunavik outside the villages. As such, air transportation keeps the communities connected year-round, and the summer sealift ensures the delivery of necessary non-perishable food and supplies (KRG, 2009). Note that a local airport is located in the village of Aupaluk. Locally, the Inuit depend on snowmobiles, all terrain vehicles and motor boats for subsistence hunting, fishing and trapping activities (KRG, 2009). In essence, these remote northern lands are still primarily used for traditional activities practiced by the local resident Inuit population.

Inuit subsistence and game harvesting (hunting, fishing and trapping) occurs along the coast as well as inland. The following diagram gives an overview of the typical annual cycle for traditional Inuit activities. This cycle can vary according to different factors, for example, climatic conditions.



ANNUAL CYCLE OF TRADITIONAL INUIT ACTIVITIES -- OUTLINE

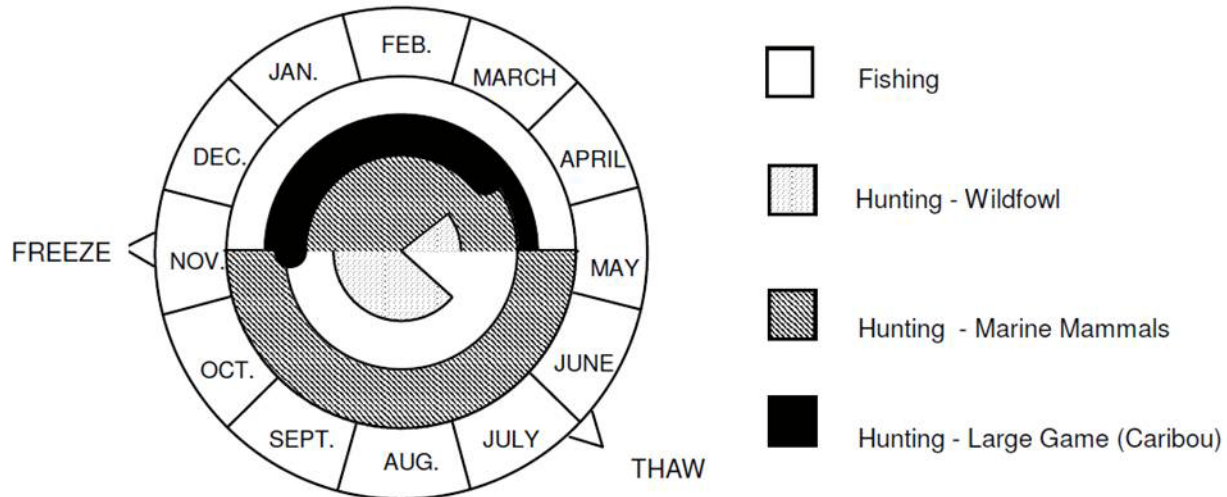


Illustration 1: Annual Cycle of traditional Inuit Activities (KRG, 1998)

Large game hunting starts around mid-November and continues into mid-May (Illustration 1). During the summer period, the Inuit spend more time fishing and hunting marine mammals. Of particular interest is that since 1998, licensed community hunts of the Bowhead whale (*Balaena mysticetus*) were permitted in Nunavik by the Federal Department of Fisheries and Oceans, when it was proven that the Bowhead, once almost at the point of extinction due to the activities of international whalers in the past two centuries, is now rebounding (Makivik Corporation, 2011).

During the September 2<sup>nd</sup> 2011 meeting with Inuit representatives, the species of importance to the Inuit of Aupaluk that were mentioned are arctic charr, brook trout, lake trout, fox, polar bear, seal, geese, ptarmigan, and caribous.

### 3.3.3 Socioeconomics

This section provides information on the existing socioeconomic conditions, including demography, employment and business.

The Inuit community of Aupaluk is one of the fourteen Inuit communities in the Nunavik territory. Data from the 2006 census published by Statistics Canada (2007) shows that in 2006, the total population in Aupaluk was 174, having increased by 9.4% since 2001. In contrast with other Québec regions, census data from 2006 shows that the Inuit population in Canada is significantly younger than the non-Aboriginal population and other indigenous groups. In 2006, the median age within the village of Aupaluk was 19.5 years, which is slightly younger than that of the Inuit population (22 years), and other indigenous groups (25 years), but is more than twice as young compared to the province of Québec (41 years; Statistics Canada, 2007).

Within the village of Aupaluk, 94.1% of the population can express themselves in Inuktitut (i.e., non-official language according to Statistics Canada), 60% of the population can converse in English, while 14.3% of the population can communicate in English and French (Statistics Canada, 2007).



In 2006, a total of 59% of the population in Aupaluk did not have a certificate, diploma or degree, while the remaining population had an apprenticeship or trades certificate diploma (14.1%), or a formal education (26.9% e.g., high school, CEGEP, University). By comparison, in 2006, half of the Inuit in Nunavik aged 25 to 64 had no certificate, diploma or degree (51%), but over one third (36%) had a formal education. The major fields chosen by the individuals in Aupaluk that pursued their formal education, included humanities (9%), education (9%), and architecture, engineering and related technologies (9%); Statistics Canada, 2007). Note that both a primary and secondary school are available in Aupaluk, and students are offered classes in Inuktitut, English or French (Kativik School Board), 29 August 2011, pers. comm.; Kativik Regional School Board, 2011a). Furthermore, technical training and vocational education are offered at the Nunavimmi Pigiursavik Centre in Inukjuaq (e.g., accounting, carpentry, electricity, heavy equipment mechanics, northern building maintenance, plumbing and heating) and the Kajusivik Centre in Kuujuaq (e.g., automobile mechanics and assistance in health care facilities; Kativik Regional School Board, 2011b).

In 2006, a total of 95 people in Aupaluk made up the labour force, the employment rate was 76.2%, and 31.6% of those employed were in sales and services, and overall, the service sector represented 89.4% of the workforce. In comparison, the 2006 labour force in the administrative region of Nord-du-Québec was 19,235 people, the employment rate was 59.0%, and the major sector was also the tertiary sector (i.e., services). Once again, within the administrative region of Nord-du-Québec, the service sector in 2006 was the most important with respect to employment (73.9%), while the construction and manufacturing sector (14.7%) and the agricultural and resource-based industry sector (11.3%) occupied a smaller share of the workforce (Statistics Canada, 2007).

The region is developing slowly and its economic situation is still difficult due to its dependence on government assistance (KRG, 1998). This limited development is attributed to the climatic constraints, the scattered resources, the distance from major cities and the lack of a skilled work force (KRG, 1998). An estimated 43% of Nunavik households live below the poverty line, compared to 17% for Québec (Nunavik Regional Board of Health and Social Services, 2010). Also worth noting is that there is a major housing shortage in Nunavik, with more than 500 families or individuals registered on a waiting list, making it commonplace to see 10 to 12 persons living under the same roof (Nunavik Regional Board of Health and Social Services, 2010). Moreover, although some dwellings have up to five or six rooms, a large number of them have less, which contributes to a higher number of persons per room in Nunavik (0.93) than in all of Québec (0.5; Nunavik Regional Board of Health and Social Services, 2010).

Looking to the future, note that in the coming years, overall, employment in the agricultural and resource-based industry sector (e.g., mining) is expected to rise by an annual average of 10.3% during the 2010-2012 period (Service Canada, 2011). The significant investments in mineral exploration in Northern Québec are changing the sectoral outlook (Service Canada, 2011). In the past, the mining industry contributed to some extent to the development of the region. However this activity has left various petroleum hydrocarbon contaminated abandoned mining exploration sites located close to the village of Aupaluk (e.g., PJ-17 (approximately 8 km northwest of Aupaluk) and PJ-10 (30 km southwest of Aupaluk); Makivik Corporation, 2003). Even though Oceanic has no obligation regarding these sites, Oceanic has nevertheless participated in the cleaning of those sites. Today, mining activities in Nunavik are increasing, notably with the operation of the Raglan nickel mine near Salluit owned by Xstrata Nickel and the Nunavik Nickel Mining Project funded by Jilin Jien Nickel Industry Co. Ltd (previously owned by Canadian Royalties) which includes several deposits throughout Nunavik. Furthermore, with the Plan Nord (Québec Government, 2011) and consequent increase in mineral exploration



within the Labrador Trough, there are a minimum of 11 new mining projects that could be launched in the coming years (not including the Oceanic Iron Ore Corp. Project), leading to a possible \$8.24 billion investment, creation of 11,000 jobs during the construction phase, and finally a possible 4,000 jobs (yearly basis) once in operation (Québec Government, 2011).

### **3.3.4 Archaeology**

According to the ISAQ database, 50 archaeological sites have been discovered near Aupaluk (Figure 2: Jean-Jacques Adjizian, MCCCCF, 19 July 2011, pers. comm.). The vast majority of those sites are located outside of the project area. Only two archaeological sites are located close to some of the project activities (near the pelletizer; see figure 2).

Several dwelling structures, vestigial remains of related lithic work, as well as artefacts that were gathered at the site surface that share traits of Palaeoeskimo tool making, were amongst the discoveries at these sites (Avataq Cultural Institute, 2011) Note that the ISAQ database only represents known archaeological sites resulting from field investigations carried out to date, and that the sites illustrated in Figure 3 were the only results from the entire Project region.

## **3.4 Biophysical Environment**

### **3.4.1 Climate**

The Project region is characterized by an Arctic climate that is greatly influenced by Ungava Bay (KRG and Makivik Corporation, 1999). The closest meteorological station is located 150 km southeast of Aupaluk in Kuujuaq but nevertheless, can provide an indication of the regional climate.

The average temperature in Kuujuaq based on data collected from the weather station from 1971 to 2000, is  $-5.7^{\circ}\text{C}$ , with January being the coldest month (average temperature  $-24.3^{\circ}\text{C}$ ) and July being the warmest month (average temperature  $11.5^{\circ}\text{C}$ ; Environment Canada, 2011). Mean monthly temperatures are below  $0^{\circ}\text{C}$  from October to April, inclusively (Environment Canada, 2011). As such, the ice typically covers Ungava Bay from November to July, greatly influencing the transportation of supplies by sea (KRG and Makivik Corporation, 1999).

The average total annual precipitation in Kuujuaq is 527 mm, with a maximum being reached during the month of August (70.4 mm) and a minimum during the month of April (27.3 mm; Environment Canada, 2011). The average annual rainfall is 277.2 mm with the maximum monthly precipitation falling during the summer months (Environment Canada, 2011). Snowfalls occur mainly from the months of October to April, with maximum recorded average snowfall being 43.5 cm occurring during the month of November. The maximum reported average snow depth accumulation was in March, at 45 cm (Environment Canada, 2011).

### **3.4.2 Hydrology**

Nunavik has a well developed river system and boasts a high density of lakes, mostly represented by small waterbodies (MRNF, 2011b). The main watersheds of the Ungava Bay Region include the Koksoak, George, Leaf, Whale, Arnaud (Payne) and Le Pellé Rivers, which all flow into Ungava Bay (KRG and Makivik Corporation, 1999). These rivers play an important role in the natural cycle of the ecological zones that transect them. The valleys of these major watersheds also contain a dense concentration of unique ecosystems and essential habitats for the survival of the resident wildlife (KRG and Makivik Corporation, 1999).



The watercourses within the Project region belong to the Hudson Bay Seaboard drainage basin, and more specifically, the Leaf River watershed (Natural Resources Canada, 2006). Based on the 1:50,000 topographic maps available for the Project region (Natural Resources Canada, National Topographic Database, National Topographic System codes 24N05, 24N06, 24M08), it can be deduced that the main lakes within the region (i.e., Ford, Red Dog, Ippialuup and Ungallijuap Qamaninga lakes) all drain into the Red Dog River, which in turn flows into Hopes Advance Bay, a part of Ungava Bay. With a mean tidal range of 8.2 metres, Hopes Advance Bay is amongst the top 30 locations around the world where the largest range of tides has been observed, together with Leaf Lake (9.8 m) and Leaf Bay (8.5 m) located some 50 km south of Aupaluk (National Oceanic and Atmospheric Administration, 2011).

### **3.4.3 Soil and Terrain**

#### **3.4.3.1 Surficial Deposits and Type of Soils**

Surficial deposits within the Project region consist mainly of sediments deposited from meltwater and floating ice in marine waters, during deglaciation and subsequent regression that have been classified as lag glaciomarine deposits (Fulton, 1995). Lag glaciomarine deposits can be described as having sand, gravel, and pockets of fine sediment; thin to discontinued sediment veneer and residual lag including areas of washed till and rock deposits (Fulton, 1995). Note also that it is not uncommon within these marine deposits to discover palsas as a result of the harsh climatic conditions (MDDEP, 2011b). Also found in the Project region are till blanket (thick and continuous) and till veneer (thin and discontinuous, areas of rock outcrop) glacial deposits which consist of silty, sandy, and clayey diamictons formed by direct action of glacier ice (Fulton, 1995).

The Soil Landscapes of Canada (Centre for Land and Biological Resources Research, 1996) describe the soils in the Project region as Orthic Turbic Cryosolic, containing between 10% and 30% rounded, subrounded, flat, angular or irregular rock fragments from 0.2 to 60 cm or more in size. This same source describes the soil in the Project region as being moderately well to well drained, and the surface material as being dominated by hard acidic rock (i.e., granite; consolidated bedrock layer that is too hard to break with the hands (>3 on Mohs' scale) or to dig with a spade when moist) interspersed with a few zones of mineral soils (mineral particles containing <30% organic matter as measured by weight) with rooting depths ranging from 20–75 cm (Centre for Land and Biological Resources Research, 1996).

#### **3.4.3.2 Landscape**

The rounded and dissymmetrical hills, glacial valleys, elongated lakes, striated rocky surfaces and unconsolidated deposits are evidence of how the glaciers of the Quaternary Period contributed to shaping the relief of the Nunavik terrain (KRG, 1998). Nunavik is also made up of several landscapes including steep mountains, cuestas, sea plains and interior plains (KRG, 1998). Within the Labrador Trough, there are a series of low hills and narrow, elongated, sub-parallel ridges, sometimes separated by deep valleys (MRNF, 2011b).

According to the 1:50,000 topographic maps available (Natural Resources Canada, National Topographic Database, National Topographic System codes 24N05, 24N06, 24M08), the land within the Project region is inclined towards Ungava Bay, which is surrounded by land that is at sea level. Furthermore, aside from a series of low hills reaching a maximum height of around 110 metres north of Ford Lake, the rest of the Project region is relatively flat (mean elevation of around 40 m), and has been grouped within a slope gradient class of 10-15 % (Centre for Land and Biological Resources Research, 1996).



### 3.4.3.3 Permafrost

The Project region is located within the zone of continuous permafrost, within which the layer of permafrost can reach thicknesses of about 25 m (Allard and Séguin, 1987).

### 3.4.4 Vegetation and Wetlands

The Project region is located within the low sub-arctic, shrub arctic tundra bioclimatic domain which extends from the 58<sup>th</sup> to the 61<sup>st</sup> parallel (MRNF, 2011c). In this domain, willows (*Salix* spp.) and dwarf birch (*Betula nana*) grow alongside herbaceous species (mostly graminoids), mosses and lichens. The vegetation canopy rarely grows beyond two metres, and it is only Arctic willows (*Salix arctica*) that can reach this height (MRNF, 2011c).

The Project region is found within the natural province of the Ungava Bay basin (called province K), an area of 103,000 km<sup>2</sup> of which 3,136 km<sup>2</sup> consist of wetlands (3.0% of province K, and 8.2% of the wetlands found within the administrative region of Nord-du-Québec; Canards Illimités Canada, 2009). These wetlands, which are for the most part unclassified, likely include:

- Peatlands as well as swamps and marshes bordering lakes and streams;
- Important wetlands in some estuaries and sheltered bays along the Ungava Bay; and
- Fens and palsa bogs (influenced by the permafrost) along the Ungava Bay coast.

### 3.4.5 Wildlife

The habitat of an animal provides its shelter, its food supply and its breeding site, while the space that the animal occupies during its daily commute to its activities is its home range (Potvin et al. 2006). Since a habitat is an area that has the resources necessary to sustain a species (Samson et al., 2002), it is important to understand it in order to maintain wildlife populations living in the Project region.

No specific studies on populations of terrestrial and avian wildlife species that frequent the area surrounding Aupaluk appears to have been published to date. However, the information collected from agencies, databases and general scientific documents consulted have enabled us to draw a general picture of the wildlife and birds likely to frequent the Project region. The following sections summarize the results of the literature review.

Note that the MRNF sets catch limits depending on the population status of key species of furbearers and their prey, and compiles statistics for trapping furbearers in the *unité de gestion des animaux à fourrure* (UGAF). The region surrounding Aupaluk is entirely within UGAF 96 and hunting area 23. Harvest statistics indicate that the highest number of pelts taken in 2011 were from red foxes (*Vulpes vulpes*; 190), marten (*Martes americana*; 110), wolves (*Canis lupus*; 104), polar bears (*Ursus maritimus*; 94), and arctic foxes (*Alopex lagopus*; 86) (MRNF, 2011d). Also worth noting was that in 2009-2010, over 10,000 caribou (*Rangifer tarandus*) were hunted in zone 23 whereas in 2010-2011 this number dropped to 1,406 (MRNF, 2011d).

#### 3.4.5.1 Birds

The ÉPOQ database revealed that 37 bird species were observed in the Red Dog Lake area (Larivée, 2011; Appendix A). Based on this same database it was confirmed that one species uses the area for reproduction (Peregrine falcon (*Falco peregrines*)) and 5 more may potentially use the area for this same purpose (Snow goose (*Chen caerulescens*), Canada goose (*Branta canadensis*), Greater scaup (*Aythya marila*), Herring gull



(*Larus argentatus*) and King eider (*Somateria spectabilis*); Larivée, 2011; Appendix A). Otherwise, the rest of the species observed were likely migrating through the region.

The CWS noted that no specific results for the Project region were available, but instead provided a list of bird species observed during aerial surveys in the general region, stating that if the ideal habitat conditions exist in the Project region, these species could potentially be present. Among the species observed were Peregrine falcons (*F. peregrines*), Golden eagles (*Aquila chrysaetos*), Common eiders (*Somateria mollissima*), Black guillemots (*Cephus grylle*), Surf scoter (*Melanitta perspicillata*), and several species of seagulls (e.g., European herring gull (*Larus argentatus*; Mark Dionne (CWS), July 2011, pers. comm.).

### 3.4.5.2 Terrestrial and Marine Mammals

The MRNF indicated that the Project region is frequented by the Leaf River caribou herd (*Rangifer tarandus*) and the muskox (*Ovibos moschatus*; Sonia Boudreault, 22 August 2011, pers. comm.). According to their general distribution, the following terrestrial mammals, amongst others, could also potentially be seen within the Project region: polar bear (*Ursus maritimus*), grey wolf (*Canis lupus*), red fox (*Vulpes vulpes*), arctic fox (*Vulpes lagopus*), Canada lynx (*Lynx canadensis*) and wolverine (*Gulo gulo*; Desrosiers et al., 2002; Prescott and Richard, 2004; Reid, 2006; Appendix A to see a full list).

The following marine mammals (amongst others), based on their general distribution, may frequent Hopes Advance Bay: harbour seal (*Phoca vitulina*), bearded seal (*Erignathus barbatus*), ringed seal (*Pusa hispida*) walrus (*Odobenus rosmarus*), beluga whale (*Delphinapterus leucas*, Ungava Bay population) Sei whale, (*Balaenoptera borealis*) and Blue whale (*Balaenoptera musculus*; Prescott and Richard, 2004; refer to Appendix A for a full list).

### 3.4.5.3 Amphibians and Reptiles

No reptile species distributions in Québec go as far north as the Project region (Desroches and Rodrigues, 2004). In response to an information request sent out on July 19, 2011, the St-Lawrence Valley Natural History Society did not find any recordings of amphibians or reptiles within the AARQ database for Project region specifically, but provided a list of species likely to be encountered north of the 54<sup>th</sup> parallel: American toad (*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer*), mink frog (*Lithobates septentrionalis*), and wood frog (*Lithobates sylvaticus*; AARQ, 2011). Based on general species distribution maps however, although the wood frog comes close, none of these species traditionally go as far north as the 59<sup>th</sup> parallel, where the Project is located (Desroches and Rodrigues, 2004).

### 3.4.5.4 Fish and Benthos

According to their general distribution, the following fish species, amongst others, are likely to frequent the Project region: brook trout (*Salvelinus fontinalis*), Arctic char (*Salvelinus alpinus*), Atlantic salmon (*Salmo salar*), northern pike (*Esox lucius*), suckers (*Catostomus* spp.), and some Cyprinid species (Bernatchez and Giroux, 2000; Appendix A). The Fish Habitat Management Information System (FHAMIS, 2011) also mentions the presence of northern pike (*E. lucius*), lake whitefish (*Coregonus clupeaformis*) and brook trout (*S. fontinalis*) around the Hopes Advance Bay area, and Greenland halibut (*Reinhardtius hippoglossoides*), Atlantic cod (*Gadus morhua*) and Atlantic salmon (*Salmo salar*) inhabiting Ungava Bay.

The marine benthic community of the region includes such species as, Iceland scallop (*Chlamys islandica*) and blue mussels (*Mytilus edulis*) which can be found off the shores of Hopes Advance Bay (FHAMIS, 2011).



### 3.4.6 Species at Risk and/or of Special Importance to the Inuit

Several populations of species in the Project region are protected at the federal level by the *Species at Risk Act* (SARA; SC. 2002, ch. 29) and/or at the provincial level by the *Act respecting threatened or vulnerable species* (LEMV; RSQ, chapter E-12.01) which includes the *Regulation respecting threatened or vulnerable species and their habitats* (R.Q. c. E-12.01, r.0.2.3). In addition, migratory bird species are protected by the *Migratory Birds Convention Act* (MBCA; S.C. 1994, ch. 22), administered by the CWS of Environment Canada in collaboration with the Canadian provincial and territorial governments. A list of special status species that could potentially frequent the Project regions can be found in Table 1. Also mentioned in this section are those species with the potential of frequenting the Project region that have been identified at this stage of the Project as being important to the Inuit population.





**Table 1: Special Status Species Potentially Present Within the Project Region**

Common Name	Latin Name	Status		
		LEMV	COSEWIC	SARA
<b>PLANTS</b>				
Orange agoseris	<i>Agoseris aurantiaca var. aurantiaca</i>	Susceptible	-	-
Clustered Lady's Mantle	<i>Alchemilla glomerulans</i>	Susceptible	-	-
Roundleaf orchid	<i>Amerorchis rotundifolia</i>	Susceptible	-	-
Rosy pussytoes	<i>Antennaria rosea ssp. confinis</i>	Susceptible	-	-
Dragon's mouth	<i>Arethusa bulbosa</i>	Susceptible	-	-
Chamisso arnica	<i>Arnica chamissonis</i>	Susceptible	-	-
Tilesius' wormwood, mountain sagewort	<i>Artemisia tilesii</i>	Susceptible	-	-
Triangle-lobe moonwort	<i>Botrychium ascendens</i>	Susceptible	-	Candidate
Stalked moonwort	<i>Botrychium pedunculosum</i>	Susceptible	-	Candidate
Northwestern moonwort	<i>Botrychium pinnatum</i>	Susceptible	-	No status
Spatulate moonwort	<i>Botrychium spathulatum</i>	Susceptible	-	-
Smooth northern-rockcress	<i>Braya glabella var. glabella</i>	Susceptible	-	-
Purple reedgrass	<i>Calamagrostis purpurascens</i>	Susceptible	-	-
Eastern fairy-slipper	<i>Calypso bulbosa var. americana</i>	Susceptible	-	-
Giant mountain aster	<i>Canadanthus modestus</i>	Susceptible	-	-
Lapland sedge	<i>Carex lapponica</i>	Susceptible	-	-
Rock-dwelling sedge	<i>Carex petricosa var. misandroides</i>	Susceptible	-	-
Prairie sedge	<i>Carex prairea</i>	Susceptible	-	-
Richardson's sedge	<i>Carex richardsonii</i>	Susceptible	-	-
Sartwell's sedge	<i>Carex sartwellii</i>	Susceptible	-	-
Raup's Indian paintbrush	<i>Castilleja raupii</i>	Susceptible	-	-
Alpine Hair Grass	<i>Deschampsia alpina</i>	Susceptible	-	-
Tufted hairgrass	<i>Deschampsia paramushirensis</i>	Susceptible	-	-
Flat-top draba	<i>Draba corymbosa</i>	Susceptible	-	-
Snowbed draba	<i>Draba crassifolia</i>	Susceptible	-	-
Ellesmereland whitlowgrass	<i>Draba subcapitata</i>	Susceptible	-	-



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Common Name	Latin Name	Status		
		LEMV	COSEWIC	SARA
Slenderleaf sundew	<i>Drosera linearis</i>	Susceptible	-	-
Male fern	<i>Dryopteris filix-mas ssp. brittonii</i>	Susceptible	-	-
Silverberry	<i>Elaeagnus commutata</i>	Susceptible	-	-
Lake Ojibway Waterwort	<i>Elatine ojibwayensis</i>	Susceptible	-	-
Arctic willowherb	<i>Epilobium arcticum</i>	Susceptible	-	-
Cutleaf daisy	<i>Erigeron compositus</i>	Susceptible	-	-
Shorthead fleabane	<i>Erigeron lonchophyllus</i>	Susceptible	-	-
White cottongrass	<i>Eriophorum scheuchzeri ssp. arcticum</i>	Susceptible	-	-
Boreal fescue	<i>Festuca hyperborea</i>	Susceptible	-	-
Snow gentian	<i>Gentiana nivalis</i>	Susceptible	-	-
Macoun's fringed gentian	<i>Gentianopsis procera subsp. macounii var. Macounii</i>	Threatened	-	-
Largeleaf avens	<i>Geum macrophyllum var. perincisum</i>	Susceptible	-	-
Golden hedgehyssop	<i>Gratiola aurea</i>	Susceptible	-	-
Northern sweetvetch	<i>Hedysarum boreale ssp. mackenziei</i>	Susceptible	-	-
Robinson's hawkweed	<i>Hieracium robinsonii</i>	Susceptible	-	-
Woolly beachheather	<i>Hudsonia tomentosa</i>	Susceptible	-	-
Entireleaf daisy	<i>Hulteniella integrifolia</i>	Susceptible	-	-
Swordleaf rush	<i>Juncus ensifolius</i>	Susceptible	-	-
Longstyle rush	<i>Juncus longistylis</i>	Susceptible	-	-
Northern twayblade	<i>Listera borealis</i>	Susceptible	-	-
Starry saxifrage	<i>Micranthes stellaris</i>	Susceptible	-	-
Mimule glabre	<i>Mimulus glabratus var. jamesii</i>	Susceptible	-	-
Blue lettuce	<i>Mulgedium pulchellum</i>	Susceptible	-	-
Norwegian arctic cudweed	<i>Omalotheca norvegica -p01, -p09, -p11</i>	Susceptible	-	-
Boreal locoweed	<i>Oxytropis borealis var. hudsonica</i>	Susceptible	-	-
Sudetan Lousewort	<i>Pedicularis sudetica ssp. interioidea</i>	Susceptible	-	-
Hartz Bluegrass	<i>Poa hartzii</i>	Susceptible	-	-



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Common Name	Latin Name	Status		
		LEMV	COSEWIC	SARA
Seneca Snakeroot	<i>Polygala senega</i>	Susceptible	-	-
Siberian polypody	<i>Polypodium sibiricum</i>	Susceptible	-	-
Northern Holly Fern	<i>Polystichum lonchitis</i>	Susceptible	-	-
Hooker's Cinquefoil	<i>Potentilla hookeriana ssp. chamissonis</i>	Susceptible	-	-
Vahl's Cinquefoil	<i>Potentilla vahliana</i>	Susceptible	-	-
Vanilla-scent Bog Orchid	<i>Pseudorchis albida ssp. straminea</i>	Susceptible	-	-
Northern Alkali Grass	<i>Puccinellia angustata</i>	Susceptible	-	-
Polar Alkali Grass	<i>Puccinellia nuttalliana</i>	Susceptible	-	-
Sulphur Buttercup	<i>Ranunculus sulphureus</i>	Susceptible	-	-
Canada Gooseberry	<i>Ribes oxyacanthoides ssp. oxyacanthoides</i>	Susceptible	-	-
Little-tree Willow	<i>Salix arbusculoides</i>	Susceptible	-	-
McCall's Willow	<i>Salix maccalliana</i>	Susceptible	-	-
False Mountain Willow	<i>Salix pseudomonticola</i>	Susceptible	-	-
Prairie Goldenrod	<i>Solidago ptarmicoides</i>	Susceptible	-	-
Purple Meadowrue	<i>Thalictrum dasycarpum</i>	Susceptible	-	-
Northern Falseasphodel	<i>Tofieldia coccinea</i>	Susceptible	-	-
Clinton Bulrush	<i>Trichophorum clintonii</i>	Susceptible	-	-
Northeastern Bladderwort	<i>Utricularia resupinata</i>	Susceptible	-	-
American Purple Vetch	<i>Vicia americana</i>	Susceptible	-	-
Pulvinate pussytoes	<i>Antennaria rosea ssp. pulvinata</i>	Susceptible	-	-
Arctic bladderpod	<i>Physaria arctica ssp. arctica</i>	Susceptible	-	-
Alaska Rein orchid	<i>Piperia unalascensis</i>	Susceptible	-	-
<b>TERRESTRIAL MAMMALS</b>				
Polar bear	<i>Ursus maritimus</i>	Vulnerable	Special concern	-
Least weasel	<i>Mustela nivalis</i>	Susceptible	-	-
Wolverine	<i>Gulo gulo</i>	Threatened	Endangered	Endangered



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Common Name	Latin Name	Status		
		LEMV	COSEWIC	SARA
<b>MARINE MAMMALS</b>				
Beluga whale	<i>Delphinapterus leucas</i>	(Ungava Bay population) Susceptible	Endangered	No status
Killer whale	<i>Orcinus orca</i>	-	Special concern	No schedule, no status
Bowhead whale	<i>Balaena mysticetus</i>	-	-	(Eastern Arctic population) Schedule 2 : Endangered
Blue whale	<i>Balaenoptera musculus</i>	(Atlantic population) Susceptible	(Atlantic population) Endangered	(Atlantic population) Endangered
Fin whale	<i>Balaenoptera physalus</i>	(Atlantic population) Susceptible	(Atlantic population) Special concern	(Atlantic population) SARA : Special concern
Humpback whale	<i>Megaptera novaengliae</i>	-	(Western North Atlantic population) Not at risk	(Western North Atlantic population) SARA Schedule 3: Special concern
Walrus	<i>Odobenus rosmarus</i>	-	Special concern	No status
<b>BIRDS</b>				
Golden Eagle	<i>Aquila chrysaetos</i>	Vulnerable	Not at risk	-
Harlequin Duck	<i>Histrionicus histrionicus</i>	Vulnerable	Special concern	Special concern
Peregrine falcon (anatum)	<i>Falco peregrinus anatum</i>	Susceptible	Non-active	Threatened
Peregrine falcon (tundra)	<i>Falco peregrinus tundrius</i>	Susceptible	Non-active	Special concern
Red Knot	<i>Calidris canutus</i>	Susceptible	Endangered ( <i>rufa</i> subspecies)	No schedule, No status
Rusty Blackbird	<i>Euphagus carolinus</i>	Susceptible	Special concern	Special concern
Short-eared Owl	<i>Asio flammeus</i>	Susceptible	Special concern	Special concern
<b>FISH</b>				
Atlantic Cod	<i>Gadus morhua</i>	-	Non-active	Special concern
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i>	Susceptible	-	-



### 3.4.6.1 Vegetation

According to the CDPNQ, no floristic species at risk nor any important terrestrial habitats have been recorded within the Project region (Benoît Larouche, August 2011, pers. comm.). It should be noted however that the lack of special status species in the Project region may simply be a result of a lack of field investigations in this remote area of Québec.

As such, a list of special-status species potentially present within the Project region was established based on the following references:

- *Liste des plantes menacées ou vulnérables selon la présence et potentiel de présence dans les régions administratives (CDPNQ, 2008a); and*
- *Liste des plantes vasculaires menacées ou vulnérables selon la phénologie et l'habitat (CDPNQ, 2008b).*

Based on this general list for the Nord-du-Québec administrative region, there are approximately 75 species of vascular plants that are susceptible of being designated threatened or vulnerable under the provincial LEMV. Of these, there may be several that have the potential of being found in the Project region.

### 3.4.6.2 Birds

According to the SOS-POP database, two special status bird species could nest in the area (SOS-POP data, Marie-France Julien (RQO), July 2011, pers. comm.):

- 1) Peregrine falcon *tundrius* (*Falco peregrinus tundrius*): susceptible of being designated threatened or vulnerable according to the provincial LEMV and listed as a special concern species according to the federal SARA.
- 2) Golden eagle (*Aquila chrysaetos*): listed as vulnerable according to the provincial LEMV and not at risk according to COSEWIC.

Verification of the CDPNQ database by the MRNF also revealed that Golden eagles (*Aquila chrysaetos*) and Peregrine falcons (both *F. peregrines tundrius* and *anatum*) have been recorded in the Project region (Sonia Boudreault (MRNF), 24 August 2011, pers. comm.).

Based on their general distribution, four other special status bird species may frequent the Project region, including the Harlequin duck (*Histrionicus histrionicus*), Red Knot (*Calidris canutus*), Rusty Blackbird (*Euphagus carolinus*), and Short-eared Owl (*Asio flammeus*; Table 1).

### 3.4.6.3 Terrestrial and Marine Mammals

A total of two terrestrial mammal species that may frequent the Project region have a special status (Table 1). Of these, the polar bear (*Ursus maritimus*), and wolverine (*Gulo gulo*) are of particular ecological or traditional importance. Furthermore, although not listed as a special status species, the importance of woodland caribou (*Rangifer tarandus*) and muskoxen (*Ovibos moschatus*) to the Inuit population is also highlighted below.

The polar bear has been listed as vulnerable under the LEMV and of special concern by COSEWIC. Linked to the presence of their favourite food (i.e., the ringed seal), polar bears prefer areas of annual ice, which they use for a hunting platform and protective cover, but can also be found frequenting snow-drifted pressure ridges, refrozen cracks, polynyas, or areas of open water surrounded by ice (Canadian Wildlife Service, 2011). In areas



such as Ungava Bay, where most or all of the pack ice melts by mid to late summer, the bear population is forced to come ashore for two to four months until fall to wait for the ice to freeze again (Canadian Wildlife Service, 2011). The polar bears of the Ungava Bay region belong to the Davis Strait population, which was estimated to be at approximately 800 in the 1970's, 1,400 in 1996, 1,650 in 2004, and 2,000 in 2007 (Peacock, 2007). Managed within the jurisdictions of Greenland (Denmark), Newfoundland and Labrador, Québec and Nunavut, the Canadian federal and provincial/territorial Polar Bear Technical Committee considers the Davis Strait population to be stable, but the threat of summer ice loss in the Arctic, which now equals an area the size of Alaska, Texas, and the state of Washington combined, remains a serious threat to their populations (Peacock, 2007; Polar Bears International, 2011). Note that the combined annual quota for Nunavut (Pangnirtung, Iqaluit, and Kimmirut) in 2007 was 46 bears (including bears taken by sport hunters outfitted from these communities and any defense kills), and in Labrador was 6 bears, while Québec does not restrict the number of polar bears that are hunted by a quota system (Peacock, 2007). Also interesting to note is that in September 2005, a polar bear and two cubs were spotted in Aupaluk as they cleaned up the remains of a dead seal (Not Obscure, 2005).

The wolverine (*Gulo gulo*) is designated threatened in Québec according to the LEMV and endangered according to SARA. In order to maintain viable populations, the wolverine, which has a low reproductive rate, low population density, and large home range, must inhabit large undisturbed areas, and thrive in locations with high densities of large ungulates, such as the arctic tundra surrounding the Project region (Government of Canada, 2011b). There have been no verified reports of wolverines in Québec since 1978, but there are unconfirmed reports almost every year (Government of Canada, 2011b).

Note that although the woodland caribou and muskox are not officially listed as a special status species at the provincial or federal levels, they warrant a special mention as they are important to the local Inuit population.

The Project area is frequented by the Leaf River Woodland Caribou and possibly the George River Woodland Caribou herds, estimated at 628,000 (2001) and 74,131 (2010) caribou, respectively (MRNF, 2011e,f). In 2001, a long-term, large-scale caribou migration project to monitor these two significant herds was initiated by the MRNF, and is supported by multiple private and public sector organizations (e.g., Makivik Corporation, Hydro-Québec Production, the Québec Outfitters Federation and Xstrata Nickel; MRNF, 2011e; Shoemaker, 2010). In response to an information request to the MRNF sent out on July 29, 2011, it was revealed that 150 radio-collar point locations of the woodland caribou in the area were recorded since 1992 within the Project region (Sonia Boudreault (MRNF), 24 August 2011, pers. comm.). The Project region is utilized by the caribou during the spring and fall migration period, when the caribou move in close to the communities located along the coast. In 2008, small groups and individual caribou were observed along two of the outcrops of the Morgan Lake area (Shoemaker, 2010). In 2011, a group of caribou stayed throughout the winter in this area, providing additional opportunities for Inuit harvesting (Sonia Boudreault (MRNF), 24 August 2011, pers. comm.). The size of the caribou population is currently declining and the subject is of growing concern to all users of this resource (Sonia Boudreault (MRNF), 24 August 2011, pers. comm.).

There are naturally occurring populations of muskoxen in Greenland and northern Canada (Canadian Wildlife Service, 2011). In 1967, 15 muskox were captured in Eureka, Nunavut and brought to a farm close to Kuujuaq, Québec but the failure of this farm led to the release of 55 muskox into the wild between 1973 and 1978 (Jean et al., 2006). From 1983 to 1991, the now free-ranging population of muskox in Nunavik numbered 533, and in 2003 they numbered approximately 1,400 in northern Québec (Jean et al., 2006). The size of the specific population of muskox using the Project region is currently unknown, as monitoring of this species following its



expansion into the peninsula has not been done in detail, but it is estimated that it is currently low (Sonia Boudreault (MRNF), 24 August 2011, pers.comm.). It should be noted that multiple groups of muskox were observed near Kangirsuk and at various locations near Morgan Lake, Hopes Advance and the North Finger Lake iron deposits in 2008 (Shoemaker, 2010). Exploitation by Inuit communities as a source of meat for subsistence officially started in 2011 and its value in economic terms is promising. Hence, although this herd is open to controlled hunting, the priority is placed on Inuit subsistence harvesting (Shoemaker, 2011).

A total of five special status marine mammals may frequent the nearby Hopes Advance Bay and/or Ungava Bay (Table 1). Of these, three are known to be of particular importance to the Inuit of Nunavik. They include the following:

The Ungava Bay beluga whale (*Delphinapterus leucas*) population is susceptible of being designated endangered or vulnerable under the LEMV, has been designated endangered by COSEWIC and is under consideration for listing under the Canadian SARA. Beluga whales, widely distributed throughout Arctic waters, summer along the coasts of sand, gravel or mud bottomed shallow bays and estuaries that support the molluscs, crustacea and bottom fish eaten by belugas (DFO, 2011). During the winter when these bays and estuaries are covered in ice, although some belugas may overwinter in small ice-free areas or regions of shifting ice in the Bays, most of them migrate to overwinter in the Hudson Strait (Hammill et al., 2004). The population of belugas in Ungava Bay is thought to be less than 100 individuals (DFO, 2011). Commercial whaling throughout the eighteenth, nineteenth, and early twentieth centuries increased hunting pressure on northern Québec beluga stocks, likely initiating their decline, and high subsistence harvests from the Inuit along the northern Québec coasts likely limited the potential for stocks to recover (Lesage et al., 2009). The introduction of quotas in 1986 to help the Hudson, James Bay and Ungava Bay stocks recover, reduced the annual Inuit harvest from 450 beluga/year, to 258 beluga/year during 1986–2000, 175 beluga/year during 2001–2004, and 161 beluga/year during 2005–2008 (Lesage et al., 2009). Other factors that have contributed to the Ungava Bay beluga population decline include habitat alterations (e.g., damming of rivers), noise pollution (e.g., shipping, dredging, industrial activities, etc.) that interferes with the belugas' ability to echo-locate their prey, and environmental pollution that has led to a decline in habitat quality and food supply due to contamination (Lesage et al., 2009). During the literature search, no record of belugas frequenting Hopes Advance Bay was found, however harvest records indicate that on average, the Inuit of Aupaluk harvested close to 6 belugas a year from 1976 to 2008 during the months of June until December (peak in July), with a high of 31 beluga/year in 1977 and several years where no belugas were hunted (Lesage et al., 2001 and 2009). However, the presence of beluga whales in Hopes Advance Bay, particularly in June/July, has been confirmed by Inuit during the meetings in Aupaluk and in Kuujuaq.

The Eastern Arctic population of Bowhead whale (*Balaena mysticetus*) is listed in Schedule 2 of SARA as endangered. Bowhead whales inhabit the ice-flows of Arctic and subarctic waters in the winter, and frequents the bays, straits and estuaries in the summer, following the expansion and retreat of the ice and remaining close to the ice-edge (Government of Canada, 2011c). Excessive whaling led to a severe depletion in Bowhead stocks, but DFO claimed in 2008 that populations in Arctic waters had rebounded to 14,000, sufficient to allow small regulated community hunts by Inuit (Makivik, 2011). Although this indicates that the population is slowly recovering, climatic factors which influence ice conditions, ship traffic and noise pollution may also affect both the survival and the distribution of Bowhead whales (Government of Canada, 2011c). The literature review returned no records of Bowhead whales in Hopes Advance Bay.



The Atlantic walrus (*Odobenus rosmarus*) is a species of Special concern according to COSEWIC. The Davis strait Atlantic walrus population inhabits large areas of shallow, open water (80 m or less) in proximity to ice or land to 'haul out', which support an abundant clam community (Government of Canada, 2011d). They rely heavily on the moving ice pack but during periods when ice is scarce, large herds congregate on low, rocky shores with steep subtidal zones (Government of Canada, 2011d). The primary threat to the walrus population remains hunting pressure, and to a lesser extent contaminant uptake, industrial development, noise disturbance, and climate change which may affect the walruses by exposing them to increased hunting pressure (COSEWIC, 2006). Harvest records indicate that on average, the Inuit of Aupaluk harvested between 1 and 5 walrus a year from 1974 to 1992 most often during the month of July (Olpinski, 1993).

#### 3.4.6.4 Fish and Benthos

A total of two special status fish species may be found within the Project region (Table 1). Atlantic cod (*Gadus morhua*) are designated as special concern species by SARA. The Fourhorn sculpin (*Triglopsis (Myoxocephalus) quadricornis*) are susceptible of being designated threatened or vulnerable under the provincial LEMV.

Although only the southern population of Arctic char (*Salvelinus alpinus oquassa*) is susceptible of being designated threatened or vulnerable under the provincial LEMV, and it is also the more southern Atlantic salmon (*Salmo salar*) populations that may be at risk, both species are of special importance to the Inuit and non-Inuit fisherman in Nunavik. For example, the importance of arctic char to the locals is reflected in the fact that an Arctic Char Stream Enhancement Program was established by the Makivik Corporation in 1986 to help alleviate some of the difficulties these fish populations were experiencing during their upstream migration in 37 river systems due to obstacles including shallow passages, diffused channels, steep climbs, short falls, and beaver dams (Dumas, 1990). A total of four rivers used by the residents of Aupaluk were selected for enhancement including Tasiujaaluk, Nikuttivik, Qingaujaq and Nuluarniavik (Dumas, 1990).

#### 3.4.7 Protected Areas

The closest protected area, located 15 km south of the mining site is called the *Réserve de parc national du Québec de la Baie-aux-Feuilles*. This area is entirely located outside of the project works and activities. This 3,850 km<sup>2</sup> area, managed by the MDDEP, received special recognition from the Québec Government in 2008, and is awaiting a legally protected status (MDDEP, 2011c). All industrial exploitation of natural resources (forestry, mining or energy) within national park reserves are prohibited; however, no official laws or regulations are in place to enforce this ban (Sonia Boudreault (MRNF), 24 August 2011, pers. comm.). These territories have nevertheless been withdrawn from mineral staking, under decree 91-192 and 92-170, and they are recognized as protected areas according to the criteria of the International Union for Conservation of Nature (IUCN; MDDEP, 2011c). The territory covered by this proposed national park contains the largest estuary in Ungava Bay, where some of the highest tides in the world are observed, reaching 17 m in amplitude. The creation of the park will ensure the protection of much of the watershed, which is known for its rich plant and animal species at risk in Québec (e.g., Peregrine falcons which nests on cliffs and islands of the bay; MDDEP, 2011c).

In terms of wildlife habitats in the region, in addition to fish habitat, which although not mapped remains protected under the *Regulation respecting wildlife habitats*, (RRQ, c C-61.1, r 18), and *Act respecting the conservation and development of wildlife* (R.S.Q., chapter C-61.1), the habitats used by threatened and





vulnerable species are also protected under the *Regulation respecting threatened or vulnerable wildlife species and their habitats* (RRQ, c E-12.01, r 2).

## 4.0 OVERVIEW OF POTENTIAL ISSUES

### 4.1 General Potential Issues

Typically, mining projects have the potential of affecting the surrounding social and biophysical environments through the waste (including rock waste and mine tailings) generated and its management, as well as how water and wastewater are managed and disposed of. Careful planning of the design and localisation of infrastructures such as waste storage facilities and the effluent treatment system will be important considerations as they have the potential to affect water quality and environmental health, most notably, federally protected fish habitat. Mine water management from the open pit(s) can also be an issue depending on intensity of precipitation, extent of permafrost, rock and soil permeability and proximity of water body to the open pit(s). With careful planning, typically these potential effects can usually be mitigated to render the Project acceptable to the regulatory agencies.

Being in a permafrost area, the vulnerability of infrastructures and facilities to permafrost degradation and isostatic rebound should be considered in the Project design (e.g., see Fortier and Savard, 2010).

### 4.2 Distinctive Project-related Potential Issues

There are four distinctive potential issues that will need to be considered throughout the life of the Project with respect to the social and biophysical environment, based on the limited information available at this stage. The first is the effect on the Inuit population which happens to be in very close proximity to the Project. The second, involves the presence of species at risk and valued indigenous species in the region. Finally, the third and fourth involve the need for new infrastructures (port and power plant).

#### *Inuit Community*

The Inuit are the main inhabitants of the territory and are most likely to be directly concerned by the mining activities of the Project. As such, they will be keeping a close eye on the progress and development of the Project. More specifically, it is anticipated that the Inuit living in the northern village of Aupaluk, just a few kilometers east of the Project, will demonstrate a desire to actively collaborate in the Project. As such, it will be very important to keep the inhabitants well informed, to consult them, and to keep them engaged throughout every phase of the Project. Furthermore, an agreement dictating, amongst other things, the training and education, employment, business opportunities, and environmental management provisions, will be negotiated with the Inuit village of Aupaluk (Oceanic Iron Ore Corp., 2011b).

The Project will be introducing a new source of income within the village, providing an economic opportunity that will likely enhance the quality of life within the benefiting community. However, this potential change in economic status could generate some side effects to the social fabric of the community because of a decrease in the practice of traditional activities, and appearance of noticeable economic disparities. Furthermore, it can also cause intercultural and/or linguistic tensions between the Inuit and non-Inuit workers.

Another unique situation that should be considered during the design stages of the Project is the fact that the Aupaluk residents will still need access to the land and its resources throughout the life of the Project. As such,



selecting the location for the proposed mining facilities and infrastructures should be done in consultation with the residents to avoid or minimize any potential affects on traditional Inuit activities.

Once again because of the close proximity of the village of Aupaluk, proper waste management and sustainable development techniques will be essential to ensure that the water and air quality in the immediate area are not compromised.

Noise and vibrations resulting from the construction and operation phases of the Project should be closely monitored in order to minimize the disturbance to the neighbouring residents.

Finally, there could also be a potential issue related to archaeological sites. Because of the large number of known archaeological sites registered in the ISAQ database in the vicinity of Aupaluk (see Section 3.3.4), it is recommended that an assessment be carried out to determine the archaeological potential and locate any features of heritage interest in the area destined for the Project infrastructures and facilities.

### ***Species at Risk and of Interest to Inuit***

The requirements of all species at risk and valued indigenous species potentially present in the Project region should be considered, and Project-related impacts avoided or mitigated throughout the life of the Project. In particular, special attention should be paid to woodland caribou, muskox, polar bear, beluga whale and arctic char population needs.

### ***Coastal Processes***

The remote nature of the project will require the installation of a new port to meet the transport demands of the new proposed iron ore mine. The construction and operation of a port, which will entail frequent visits by large sea vessels throughout the year, could change the hydrodynamic conditions (currents, waves and ice conditions) in Ungava Bay, and more precisely within Hopes Advance Bay. The possible modifications of the hydrodynamic conditions in the bay could in turn potentially affect certain species at risk (e.g., beluga whales due to potential interference with echo-location abilities and polar bears due to the regular activities of Ice Class ships during the winter), increase shoreline erosion and sediment transport, and modify Inuit hunting and fishing activities.

### ***Greenhouse Gases***

Mining and metallurgy requires significant amounts of energy and fuel. The Project region including the northern village of Aupaluk are not currently serviced by Hydro-Québec's electricity and thus the Project may require to build a fossil fuel power plant and incidently could become a significant contributor to greenhouse gas emissions (GHGs) within the Québec province. Alternate sources of energy such as hydroelectricity instead of fossil fuels should therefore be considered.

Besides these issues, other aspects typically associated with such project will also be given attention: infrastructures location and footprint, water management as it relates to ore processing, open pit dewatering, mine tailings and waste rock storage , in particular during operation and under mine closure conditions.

## **5.0 FALL 2011 FIELD SURVEY**

In order to describe the natural environment in the project area, a first aquatic survey have been initiated during fall 2011 (August 31<sup>st</sup> to September 11<sup>th</sup>, 2011). The aquatic field work performed included:



- Fish and fish habitat;
- Surface water and sediment quality;
- Hydrology.

The field work for fish and fish habitat included fish communities and health surveys in 11 watercourses and 6 lakes. In addition, a total of 20 fishes of 2 species has been examined for tissue chemistry analysis for the following parameters:

- Percent moisture; and
- Low level total metals (Hg, Mn, Sr, As, Cd, Sn, Ni, Pb, Se, Zn, Al, Cu and Cr).

The study area includes Ford River, Ford Lake and his tributaries and Red Dog Lake and his tributaries. Moreover water and sediment have been sampled for quality analysis in those lakes and watercourses. Surface water sampling also included field observations and limnology measurements.

It included water sampling at 17 stations within 17 lakes and streams and sediment sampling at 21 stations within 7 lakes and streams.

Samples were collected, handled and preserved following provincial and Golder internal procedures. Water and sediment samples were sent to an accredited laboratory and analyzed for the following parameters:

#### Surface Water:

- Routine parameters (total organic carbon, total dissolved solids, total hardness, alkalinity, biochemical oxygen demand – 5 days, total suspended matter, pH);
- Cyanide;
- Anions/nutrients (calcium, chloride, fluoride, sodium, sulphates, ammonia, nitrate, nitrite, total and dissolved phosphorus, total Kjeldahl nitrogen, bicarbonate/carbonate); and,
- Low level total and dissolved metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, vanadium, zinc).

#### Sediment:

- Particle size;
- Total organic content;
- Percent moisture; and,
- Low level total metals (aluminum, arsenic, barium, beryllium, boron, calcium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, vanadium, zinc).

#### Hydrology:

For the hydrology component, a team of two people, including a hydrologist and a surface water technician, visited the site between September 12 and September 16. Five river cross-sections suitable for stream discharge monitoring were identified and mapped; point discharge measurements were also taken at these locations. One of the selected cross-sections is located on the Red Dog River, downstream of the Red Dog Lake. The other four cross-sections are located on smaller rivers north of the Red Dog Lake and the Red Dog



River. The data and the observations collected during this visit will form the basis of the 2012 discharge surveying campaign and will support its planning, including the choice of equipment and the required measurements protocols.

## 6.0 CONCLUSION

The Hopes Advance Bay Project is located in the northern Québec region of Nunavik, governed by the Kativik Regional Government administration. The closest community is the Inuit village of Aupaluk, which is located some 10 km east of the Project and where subsistence hunting, fishing and trapping is actively practiced by its residents.

The Project region is located in the arctic tundra domain which is associated with cold temperatures and sparse vegetation. Several lakes and watercourses are found throughout the region. Migratory birds, terrestrial mammals (e.g., caribou and polar bear), marine mammals (e.g., beluga whales) and fish (e.g., arctic char) inhabit the Project region and hold both an ecological significance and importance to the Inuit population. Some of these species have also been designated as special status species by provincial (*Loi sur les espèces menacées et vulnérables*) and/or federal law (*Species at Risk Act*).

There are four distinctive potential issues that will need to be considered throughout the life of the Project with respect to the social and biophysical environment, based on the limited information available at this stage. The first issue is linked to the close proximity of the Inuit population of Aupaluk to the Project. Inuit have been involved in the project and Oceanic's intent is to continue to keep the Inuit community completely informed and engaged in the process. The second issue involves the presence of species at risk and valued indigenous species in the region, which should demand special consideration in order to avoid or minimize the effects of the Project on their populations. The third issue involves the need for new infrastructures, including the construction and operation of a new port, which may alter the hydrodynamic conditions (currents, waves and ice conditions), particularly in the Hopes Advance Bay, potentially affecting high-profile species, increasing shoreline erosion and sediment transport, and modifying Inuit hunting and fishing activities. Finally, considering the interaction of climate change with the project location in the Arctic, and considering the amount of energy that will be required by the project, the source of energy should also be regarded as an issue because of its potential impacts on the project carbon emissions, as well as the Québec government effort towards reducing greenhouse gases (GHG) emissions.

The Project design will take into account the potential social and environmental issues described above and wherever possible, efforts should be made to avoid or reduce potential Project-related impacts. Where potential impacts cannot be avoided, measures should be proposed to mitigate the residual effects of the Project. Furthermore, monitoring programs should also be implemented, as well as compensation plans elaborated, as needed.

All along the course of the Project, communication and consultation with the Inuit will be a key to its success. During the ESIA, in order to increase our understanding of the study area, as well as to keep Inuit involved at each step of the environmental assessment process, meetings should be held with the Inuit community and representatives.



A thorough baseline study including a complete desktop review, interviews with the local community and organizations, as well as field surveys will provide a more comprehensive view of the current environmental and social conditions in the Project region and will allow a better understanding of the actual issues and how to avoid and manage them.

This report is part of the Environmental and Social Impact Assessment (ESIA) that has been initiated by Oceanic Iron Ore Corp. It constitutes the first steps of what will result in a complete description of the surrounding environment as well as the social and cultural components, in order to properly identify and assess the nature and extent of interactions with the project. Since the studies have just started, our understanding of the interactions between the environment and the project will evolve; the information and data gathered here will thus be used as a reference for the next steps. Oceanic anticipates the completion of the ESIA for the last quarter of 2012.

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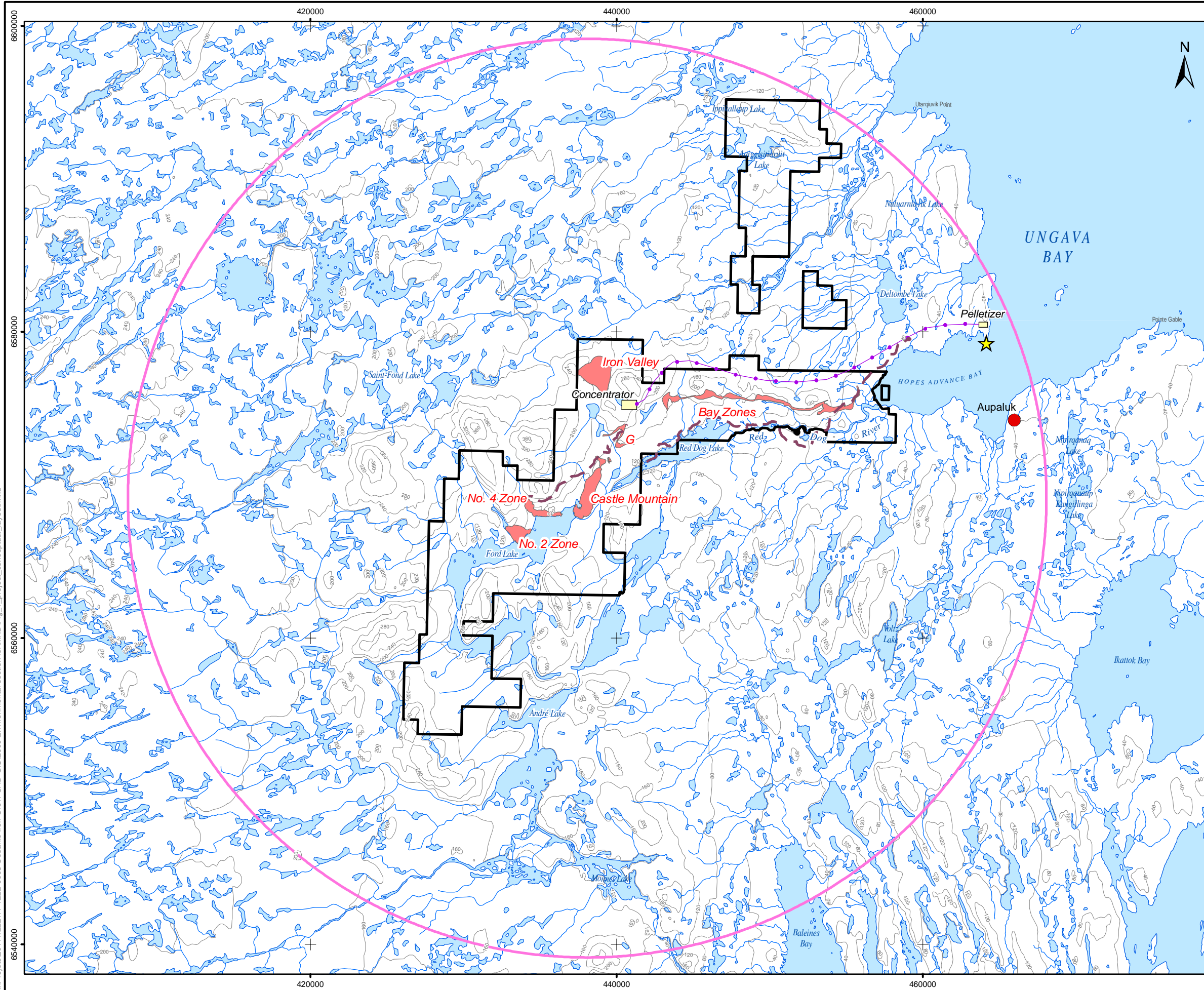


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**LEGEND**

*Proposed Infrastructures*

- ★ Port
- Pipeline
- - Access Road
- Mine Infrastructures

*Project Information*

- Project Region (30km radius)
- Oceanic Iron Ore Land Claims
- Historic Outcrop of the Iron Formation

*Topography*

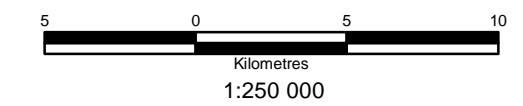
- Contour line (ft)
- Watercourse
- Waterbody




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 August 2011

Projection: NAD 83, UTM zone 18N.



<b>PROJECT</b>			
<b>OCEANIC IRON ORE CORP.'s - UNGAVA BAY PROPERTY</b>			
<b>Preliminary Economic Assessment - Social and Environmental Issues</b>			
<b>TITLE</b>		Hopes Advance Bay Property Project Conceptual Layout	
	# Project: 11-1222-0008-2000		
	Planned by: S. Jarema	2011-08-24	Revision 0
	GIS: R. Sutcliffe	2011-08-24	
	Checked by: C. Guay	2011-08-30	
Approved by: N. D'Anjou	2011-08-30		
			Figure 1

H:\Projets\2011\1222\11-1222-0008 Oceanic Iron Ore\4 CAD-GIS\2000 Environmental section for MXD\Fig\_2\_Archaeological\_Sites.mxd



**LEGEND**

**Archaeological Features**

● Known Archaeological Site

**Proposed Infrastructures**

★ Port

— Pipeline

■ Mine Infrastructures

**Topography**

— Contour Line (ft)

— Watercourse

— Waterbody

**REFERENCES**

Data: Natural Resources Canada - Canvec 1:250 000 ; Oceanic Iron Ore Corp. 2011-Hopes Advance Bay Property, Project Conceptual Layout, Slide 31 of a Powerpoint Presentation presented in August 2011 ; Jean-Jacques Adjizian, MCCCFC, 19 July 2011, pers. comm

Projection: NAD 83, UTM zone 19N.



Scale: 1:70 000

PROJECT OCEANIC IRON ORE CORP.'s - UNGAVA BAY PROPERTY  
Preliminary Economic Assessment - Social and Environmental Issues

TITLE  
Known Archaeological Sites

<p>Montréal, Québec</p>	# Project:	11-1222-0008-2000		
	Planned by	R. Méthot	2011-08-11	Rev. 0
	GIS	E. Duong	2011-08-11	
	Checked by	C. Guay	2011-08-30	
Approved by	N. D'Anjou	2011-08-30		

Figure 2



# **APPENDIX A**

## **Plant, Wildlife and Fish Species Potentially Present within the Project Region**



Table A-1: Plant species potentially present within the Project region

Common name	Latin name	Status	
		LEMV	SARA
Orange agoseris	<i>Agoseris aurantiaca</i> var. <i>aurantiaca</i>	Susceptible	-
Clustered Lady's Mantle	<i>Alchemilla glomerulans</i>	Susceptible	-
Roundleaf orchid	<i>Amerorchis rotundifolia</i>	Susceptible	-
Rosy pussytoes	<i>Antennaria rosea</i> ssp. <i>confinis</i>	Susceptible	-
Dragon's mouth	<i>Arethusa bulbosa</i>	Susceptible	-
Chamisso arnica	<i>Arnica chamissonis</i>	Susceptible	-
Tilesius' wormwood, mountain sagewort	<i>Artemisia tilesii</i>	Susceptible	-
Triangle-lobe moonwort	<i>Botrychium ascendens</i>	Susceptible	Candidate
Stalked moonwort	<i>Botrychium pedunculosum</i>	Susceptible	Candidate
Northwestern moonwort	<i>Botrychium pinnatum</i>	Susceptible	No status
Spatulate moonwort	<i>Botrychium spathulatum</i>	Susceptible	-
Smooth northern-rockcress	<i>Braya glabella</i> var. <i>glabella</i>	Susceptible	-
Purple reedgrass	<i>Calamagrostis purpurascens</i>	Susceptible	-
Eastern fairy-slipper	<i>Calypso bulbosa</i> var. <i>americana</i>	Susceptible	-
Giant mountain aster	<i>Canadanthus modestus</i>	Susceptible	-
Lapland sedge	<i>Carex lapponica</i>	Susceptible	-
Rock-dwelling sedge	<i>Carex petricosa</i> var. <i>misandroides</i>	Susceptible	-
Prairie sedge	<i>Carex prairea</i>	Susceptible	-
Richardson's sedge	<i>Carex richardsonii</i>	Susceptible	-
Sartwell's sedge	<i>Carex sartwellii</i>	Susceptible	-
Raup's Indian paintbrush	<i>Castilleja raupii</i>	Susceptible	-
Alpine Hair Grass	<i>Deschampsia alpina</i>	Susceptible	-
Tufted hairgrass	<i>Deschampsia paramushirensis</i>	Susceptible	-
Flat-top draba	<i>Draba corymbosa</i>	Susceptible	-
Snowbed draba	<i>Draba crassifolia</i>	Susceptible	-
Ellesmereland whitlowgrass	<i>Draba subcapitata</i>	Susceptible	-
Slenderleaf sundew	<i>Drosera linearis</i>	Susceptible	-
Male fern	<i>Dryopteris filix-mas</i> ssp. <i>brittonii</i>	Susceptible	-
Silverberry	<i>Elaeagnus commutata</i>	Susceptible	-
Lake Ojibway Waterwort	<i>Elatine ojibwayensis</i>	Susceptible	-
Arctic willowherb	<i>Epilobium arcticum</i>	Susceptible	-
Cutleaf daisy	<i>Erigeron compositus</i>	Susceptible	-
Shortray fleabane	<i>Erigeron lonchophyllus</i>	Susceptible	-
White cottongrass	<i>Eriophorum scheuchzeri</i> ssp. <i>arcticum</i>	Susceptible	-
Boreal fescue	<i>Festuca hyperborea</i>	Susceptible	-
Snow gentian	<i>Gentiana nivalis</i>	Susceptible	-



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Common name	Latin name	Status	
		LEMV	SARA
Macoun's fringed gentian	<i>Gentianopsis procera</i> subsp. <i>macounii</i> var. <i>macounii</i>	Threatened	-
Largeleaf avens	<i>Geum macrophyllum</i> var. <i>perincisum</i>	Susceptible	-
Golden hedgehyssop	<i>Gratiola aurea</i>	Susceptible	-
Northern sweetvetch	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>	Susceptible	-
Robinson's hawkweed	<i>Hieracium robinsonii</i>	Susceptible	-
Woolly beachheather	<i>Hudsonia tomentosa</i>	Susceptible	-
Entireleaf daisy	<i>Hulteniella integrifolia</i>	Susceptible	-
Swordleaf rush	<i>Juncus ensifolius</i>	Susceptible	-
Longstyle rush	<i>Juncus longistylis</i>	Susceptible	-
Northern twayblade	<i>Listera borealis</i>	Susceptible	-
Starry saxifrage	<i>Micranthes stellaris</i>	Susceptible	-
Mimule glabre	<i>Mimulus glabratus</i> var. <i>jamesii</i>	Susceptible	-
Blue lettuce	<i>Mulgedium pulchellum</i>	Susceptible	-
Norwegian arctic cudweed	<i>Omalotheca norvegica</i> -p01, -p09, -p11	Susceptible	-
Boreal locoweed	<i>Oxytropis borealis</i> var. <i>hudsonica</i>	Susceptible	-
Sudetan Lousewort	<i>Pedicularis sudetica</i> ssp. <i>interioides</i>	Susceptible	-
Hartz Bluegrass	<i>Poa hartzii</i>	Susceptible	-
Seneca Snakeroot	<i>Polygala senega</i>	Susceptible	-
Siberian polypody	<i>Polypodium sibiricum</i>	Susceptible	-
Northern Holly Fern	<i>Polystichum lonchitis</i>	Susceptible	-
Hooker's Cinquefoil	<i>Potentilla hookeriana</i> ssp. <i>chamissonis</i>	Susceptible	-
Vahl's Cinquefoil	<i>Potentilla vahliana</i>	Susceptible	-
Vanilla-scent Bog Orchid	<i>Pseudorchis albida</i> ssp. <i>straminea</i>	Susceptible	-
Northern Alkali Grass	<i>Puccinellia angustata</i>	Susceptible	-
Polar Alkali Grass	<i>Puccinellia nuttalliana</i>	Susceptible	-
Sulphur Buttercup	<i>Ranunculus sulphureus</i>	Susceptible	-
Canada Gooseberry	<i>Ribes oxycanthoides</i> ssp. <i>oxycanthoides</i>	Susceptible	-
Little-tree Willow	<i>Salix arbusculoides</i>	Susceptible	-
McCall's Willow	<i>Salix maccalliana</i>	Susceptible	-
False Mountain Willow	<i>Salix pseudomonticola</i>	Susceptible	-
Prairie Goldenrod	<i>Solidago ptarmicoides</i>	Susceptible	-
Purple Meadowrue	<i>Thalictrum dasycarpum</i>	Susceptible	-
Northern Falseasphodel	<i>Tofieldia coccinea</i>	Susceptible	-
Clinton Bulrush	<i>Trichophorum clintonii</i>	Susceptible	-
Northeastern Bladderwort	<i>Utricularia resupinata</i>	Susceptible	-
American Purple Vetch	<i>Vicia americana</i>	Susceptible	-
Pulvinate pussytoes	<i>Antennaria rosea</i> ssp. <i>pulvinata</i>	Susceptible	-





APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Common name	Latin name	Status	
		LEMV	SARA
Arctic bladderpod	<i>Physaria arctica ssp. arctica</i>	Susceptible	-
Alaska Rein orchid	<i>Piperia unalascensis</i>	Susceptible	-



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Table A-2: Terrestrial and Marine Wildlife Potentially Present Within the Project Region

Family	Common name	Latin name	Status			Habitat requirements
			LEMV	COSEWIC	SARA	
<b>TERRESTRIAL MAMMALS</b>						
Cervidae	Woodland caribou	<i>Rangifer tarandus caribou</i>	(Forest ecotype) – Vulnerable	(Boreal population) Threatened	(Boreal population) Threatened	Mixed forests (eg, balsam fir-white birch and yellow birch), thinning, burning, cutting area intensive, swamps and ponds.
Bovidae	Muskox	<i>Ovibos moschatus</i>	-	-	-	Arctic tundra
Ursidae	Black bear (northern limit)	<i>Ursus americanus</i>	-	Not at risk	-	Dense forests (deciduous and coniferous), burning, brush on the edge of streams, rivers, lakes and wetlands.
	Polar bear	<i>Ursus maritimus</i>	Vulnerable	Special concern	-	Pack ice, rocky shores and islands.
Felidae	Canada lynx	<i>Felis lynx</i>	-	-	-	Coniferous forests, wetlands, where snowshoe hares abound.
Canidae	Northern grey wolf	<i>Canis lupus occidentalis</i>	Not at risk	Not at risk	-	Wide variety of habitats, forest types.
	Red fox	<i>Vulpes vulpes</i>	-	-	-	Variety of habitats including fields bordered by hedges shrubs, bushes, thickets, woodlands and edges of large forest.
	Arctic fox	<i>Alopex lagopus</i>	-	-	-	Tundra, coastal areas and shifting sea ice.
Mustelidae	Least weasel	<i>Mustela nivalis</i>	Susceptible of being designated threatened or vulnerable	-	-	Swamps, wet meadows, scrub.
	Wolverine	<i>Gulo gulo</i>	Threatened	Endangered	Endangered	Large coniferous forests, tundra.
	Hermine	<i>Mustela erminea</i>	-	-	-	Area of regrowth, scrub, bogs.
	River otter	<i>Lutra canadensis</i>	-	-	-	Lakes, rivers, marshes.
	American marten	<i>Martes americana</i>	-	-	-	Large coniferous forest and mixed forest.
	American mink	<i>Mustela vison</i>	-	-	-	Forest and scrub along rivers and lakes, marshes.
Leporidae	Snowshoe hare	<i>Lepus americanus</i>	-	-	-	Where young conifers grow (thickets, scrub, meadows, wetlands).
Castoridae	Beaver	<i>Castor canadensis</i>	-	-	-	Rivers and lakes woodlands – Project region may be just above its northern limit.
Erethizontidae	Porcupine	<i>Erethizon dorsatum</i>	-	-	-	Mature forests, groves and groves of conifers and hardwoods, rocky slopes. Project region may be just above its northern limit.
Sciuridae	Red squirrel	<i>Tamiasciurus hudsonicus</i>	-	-	-	Mixed conifer forests including white pine and hemlock- Project region may be just above its northern limit.
Cricetidae	Southern red-backed vole	<i>Clethrionomys gapperi</i>	-	-	-	Mixed and coniferous forests, shady areas near wetlands and streams.
	Heather vole	<i>Phenacomys intermedius</i>	-	-	-	Grassy glades of coniferous forests near the top of the mountains and meadows dotted with bushes and heather.
	Meadow vole	<i>Microtus pennsylvanicus</i>	-	-	-	Dry areas near rivers.
	Muskrat	<i>Ondatra zibethicus</i>	-	-	-	Prefers wet meadows, clearings, thickets, swamps and grassy places.
	Northern bog lemming	<i>Synaptomys borealis</i>	-	-	-	Swamps, ponds, rivers, streams, and lakes.
	Deer mouse (northern limit)	<i>Peromyscus maniculatus</i>	-	-	-	Coniferous forests and deciduous. Prefers well-drained dry soils with a dense vegetation cover.
	Ungava lemming	<i>Dicrostonyx hudsonius</i>	-	-	-	Arid land covered with lichens in tundra.
Dipodidae	Meadow jumping mouse	<i>Zapus hudsonius</i>	-	-	-	Wet meadows dotted with bushes, stream bank, edge of swamps, thickets, and on the edge of the woods.
Soricidae	Masked shrew	<i>Sorex cinereus</i>	-	-	-	A wide variety of habitats (e.g., mature forests of conifers and deciduous trees, scrubland, borders of swamps, wet places).
	Pygmy shrew (northern limit)	<i>Sorex (Miscrosorex) hoyi</i>	-	-	-	Between tree roots in forests, wetlands and dry lands near rivers.
	Northern water shrew (northern limit)	<i>Sorex palustris</i>	-	-	-	Mixed conifer forests, wetlands, scrub along the water bodies.



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Family	Common name	Latin name	Status			Habitat requirements
			LEMV	COSEWIC	SARA	
<b>MARINE MAMMALS</b>						
Monodontidae	Beluga whale	<i>Delphinapterus leucas</i>	(Ungava Bay population) Susceptible	Endangered	No status	Coastal, estuarine and offshore waters.
Delphinidae	Killer whale	<i>Orcinus orca</i>	-	Special concern	No schedule, no status	Widely distributed in coastal and offshore waters.
Physeteridae	Sperm whale	<i>Physeter macrocephalus</i>	-	Not at risk		Deep waters, especially along the continental shelf
Balaenidae	Bowhead whale	<i>Balaena mysticetus</i>	-	-	(Eastern Arctic population) Schedule 2 : Endangered	Close to the polar pack ice.
	Blue whale	<i>Balaenoptera musculus</i>	(Atlantic population) Susceptible	(Atlantic population) Endangered	(Atlantic population) Endangered	All oceans, often on the edge of continental shelves but also in deep water and in shallow inshore water.
	Fin whale	<i>Balaenoptera physalus</i>	(Atlantic population) Susceptible	(Atlantic population) Special concern	(Atlantic population) SARA : Special concern	
	Sei whale	<i>Balaenoptera borealis</i>	-	-	-	Temperate coastal and offshore waters
	Minke whale	<i>Balaenoptera acutorostrata</i>	-	-	-	Coastal and offshore waters
	Humpback whale	<i>Megaptera novaengliae</i>	-	(Western North Atlantic population) Not at risk	(Western North Atlantic population) SARA Schedule 3: Special concern	In winter and summer found in coastal areas or near islands – migrates through open oceans.
Odobenidae	Walrus	<i>Odobenus rosmarus</i>	-	Special concern	No status	Moving pack ice over shallow continental shelf waters – also coastal beaches and rocky islets.
Phocidae	Harbour seal	<i>Phoca vitulina</i>	-	-	-	Rocky shores and coastal waters, also rivers. Estuaries and some northern freshwater lakes.
	Ringed seal	<i>Pusa hispida</i>	-	-	-	Stable landfast ice near shore in spring, open water or shifting polar ice in summer.
Phocidae	Harp seal	<i>Pagophilus groenlandica</i>	-	-	-	Shifting pack ice, open sea in summer.
	Bearded seal	<i>Erignathus barbatus</i>	-	-	-	Sea ice and relatively shallow water.

Sources : Desrosier et al. 2002; Prescott et Richard 2004; Reid 2006.



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Table A-3: Bird species potentially found within the Project region.

Common name	Latin name	Status			Habitat requirements
		LEMV	COSEWIC	SARA	
<b>WATERFOWL</b>					
*American Black Duck	<i>Anas rubripes</i>	-	No status	No status	Marshes, ponds, rivers, lakes
*Canada Goose	<i>Branta canadensis</i>	-	No status	No status	Marshes, ponds, lakes. *Probable that the Project region is used for reproduction
*Common eider	<i>Somateria millissima</i>	-	-	-	Arctic and subarctic coastal marine areas, where it frequents coastal headlands, offshore islands, skerries, and shoals.
*Greater Scaup	<i>Aythya marila</i>	-	-	-	Marshes, ponds, lakes * Probable that the Project region is used for reproduction
*King eider	<i>Somateria spectabilis</i>	-	-	-	Rocky coasts and open ocean; nests on inland freshwater lakes and ponds. *Probable that the Project region is used for reproduction
*Long-tailed duck	<i>Clangula hyemalis</i>	-	-	-	Shallow tundra ponds and lakes; ocean over sandy substrates.
*Mallard	<i>Anas platyrhynchos</i>	-	No status	No status	Marshes, ponds, rivers, lakes
*Snow Goose	<i>Chen caerulescens</i>	-	-	-	Arctic tundra within five miles of the coast inhabit coastal and freshwater marshes, estuaries, saltwater habitats. * Probable that the Project region is used for reproduction
*Tundra swan	<i>Cygnus columbianus</i>	-	-	-	Wet Arctic tundra, shallow lakes, slow-moving rivers, flooded fields, and coastal estuaries.
Black Scoter	<i>Melanitta americana</i>	-	No status	No status	Lakes
**Surf Scoter	<i>Melanitta perspicillata</i>	-	-	-	Shallow lakes mainly <10 ha in size.
Green-winged Teal	<i>Anas crecca</i>	-	-	-	Swamps, rivers
Harlequin Duck	<i>Histrionicus histrionicus</i>	Vulnerable	Special concern	Special concern	Fast rivers
Pintail	<i>Anas acuta</i>	-	No status	No status	Marshes, ponds, lakes
Red-breasted Merganser	<i>Mergus serrator</i>	-	-	-	Ponds, lakes, rivers
<b>PARTRIDGE, GROUSE and PTARMIGAN</b>					
Spruce Grouse	<i>Falcapennis canadensis</i>	-	-	-	Coniferous forests, bogs
Rock Ptarmigan	<i>Lagopus muta</i>	-	-	-	Tundra
Willow Ptarmigan	<i>Lagopus lagopus</i>	-	-	-	Tundra
<b>DIVING DUCKS</b>					
*Common Loon	<i>Gavia immer</i>	-	Not at risk	-	Marshes, ponds, lakes



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Common name	Latin name	Status			Habitat requirements
		LEMV	COSEWIC	SARA	
*Pacific Loon	<i>Gavia pacifica</i>	-	-	-	Open water, deep tundra lakes in the far north.
*Red-throated Loon	<i>Gavia stellata</i>	-	No status	No status	Marshes, ponds, lakes
<b>DIURNAL BIRDS OF PREY</b>					
**Golden Eagle	<i>Aquila chrysaetos</i>	Vulnerable	Not at risk	-	Open areas, nests usually on cliffs. Forests and wetlands, mountains and moors where there is little cover for its prey.
**Peregrine falcon (anatum)	<i>Falco peregrinus anatum</i>	Susceptible	Non active	Threatened	Open areas and forest nests on cliffs, trees and ground. *Confirmed that this species uses the Project region for reproduction.
**Peregrine falcon (tundra)	<i>Falco peregrinus tundrius</i>	Susceptible	Non-active	Special concern	Open areas and forest nests on cliffs, trees and ground
*Rough-legged Hawk	<i>Buteo lagopus</i>	-	Not at risk	-	Open areas, nests on cliffs, trees and ground
Northern Goshawk	<i>Accipiter gentilis (atricapillus)</i>	-	Not at risk	-	Boreal forest and mixed forest edges, nests usually in a tree
Gyr Falcon	<i>Falco rusticolus</i>	-	Not at risk	-	Open areas and forest nests on cliffs, trees or ground
<b>SHOREBIRDS</b>					
*Least Sandpiper	<i>Calidris minutilla</i>	-	-	-	Wet tundra, bogs
*Semipalmated Plover	<i>Charadrius semipalmatus</i>	-	-	-	Sandy or gravelly shores of lakes and rivers
*Semipalmated Sandpiper	<i>Calidris pusilla</i>	-	-	-	Shores of water bodies
*Spotted Sandpiper	<i>Actitis macularia</i>	-	-	-	Shores of lakes and rivers, marshes, shores.
*Wilson's Snipe	<i>Gallinago delicata</i>	-	-	-	Marshes, bogs, wet meadows.
Black-bellied Plover	<i>Pluvialis squatarola</i>	-	-	-	Marshes, lakes, ponds
Dunlin	<i>Calidris alpina</i>	-	-	-	Shores of water bodies
American Golden Plover	<i>Pluvialis dominica</i>	-	-	-	Marshes, lakes, ponds
Red Knot	<i>Calidris canutus</i>	Susceptible	Endangered ( <i>rufa</i> subspecies)	No schedule, No status-	Shores of water bodies
Red-necked Phalarope	<i>Phalaropus lobatus</i>	-	-	-	Ponds, rivers, marshes
Ruddy Turnstone	<i>Arenaria interpres</i>	-	-	-	Shores of water bodies
Sanderling	<i>Calidris alba</i>	-	-	-	Shores of water bodies



APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL

Common name	Latin name	Status			Habitat requirements
		LEMV	COSEWIC	SARA	
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	-	-	-	Shores of water bodies
<b>GULLS and TERNS</b>					
*Black-backed Gull	<i>Larus marinus</i>	-	-	-	Shores of water bodies
*Glaucous gull	<i>Larus hyperboreus</i>	-	-	-	Shores of water bodies
*Herring Gull	<i>Larus argentatus</i>	-	-	-	Shores, lakes, rivers *Probable that the Project region is used for reproduction
*Parasitic Jaeger	<i>Stercorarius parasiticus</i>	-	-	-	Estuaries ocean, Arctic tundra, often near a body of water.
Iceland/Thayer's Gull	<i>Larus glaucooides</i>	-	-	-	Shores of water bodies
Arctic Tern	<i>Sterna paradisaea</i>	-	-	-	Bogs, sandy or gravelly shores of water bodies
Black-legged Kittiwake	<i>Rissa tridactyla</i>	-	-	-	Shores of water bodies
**Black guillemot	<i>Cephus grylle</i>	-	-	-	Rocky marine coasts of offshore islands in shallow waters.
Sabine's Gull	<i>Xema sabini</i>	-	-	-	Shores of water bodies
<b>NOCTURNAL BIRDS OF PREY</b>					
*Short-eared Owl	<i>Asio flammeus</i>	Susceptible	Special concern	Special concern	Marsh, bog, nest on the ground
Great Horned Owl	<i>Bubo virginianus</i>	-	-	-	Forests, thickets, shores of rivers, open areas. Project region just north of known distribution.
Hawk Owl	<i>Surnia ulula</i>	-	Not at risk	-	Coniferous forests, thickets of birch, larch bogs. Project region just north of known distribution.
Snowy Owl	<i>Bubo scandiacus</i>	-	Not at risk	-	Open areas
<b>SONGBIRDS</b>					
*American Pipit	<i>Anthus rubescens</i>	-	-	-	Tundra
*American Robin	<i>Turdus migratorius</i>	-	-	-	Wooded areas
*American Tree Sparrow	<i>Spizella arborea</i>	-	-	-	Bushes, thickets of willow
*Common Raven	<i>Corvus corax</i>	-	-	-	Boreal forests, mountain forests, coastal cliffs
*Common Redpoll	<i>Carduelis flammea</i>	-	-	-	Birch trees, shrubs, grasses, shrubs, open areas
*Fox Sparrow	<i>Passerella iliaca</i>	-	-	-	Lower strata of forests, brush



**APPENDIX A - PLANT, WILDLIFE AND FISH SPECIES POTENTIALLY PRESENT WITHIN THE PROJECT REGION - CONFIDENTIAL**

Common name	Latin name	Status			Habitat requirements
		LEMV	COSEWIC	SARA	
*Horned Lark	<i>Eremophila alpestris</i>	-	-	-	Tundra shore with sparse vegetation
*Lapland longspur	<i>Calcarius lapponicus</i>	-	-	-	Open areas
*Savannah Sparrow	<i>Passerculus sandwichensis</i>	-	-	-	Open areas such as tundra, bogs
*Snow Bunting	<i>Plectrophenax nivalis</i>	-	-	-	Open areas
*White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	-	-	-	Thickets, lower strata of coniferous forests and mixed
Blackpoll Warbler	<i>Dendroica striata</i>	-	-	-	Coniferous forests
Boreal Chickadee	<i>Poecile hudsonica</i>	-	-	-	Coniferous forests
Dark-eyed Junco	<i>Junco hyemalis</i>	-	-	-	Coniferous forests and mixed.
Gray Jay	<i>Perisoreus canadensis</i>	-	-	-	Forest of fir and spruce.
Hoary Redpoll	<i>Carduelis hornemanni</i>	-	-	-	Birch trees, shrubs, grasses, shrubs, open areas.
Lincoln's Sparrow	<i>Melospiza lincolni</i>	-	-	-	Thickets of willow and alder, bog. Project region just north of known distribution
Northern Shrike	<i>Lanius excubitor</i>	-	-	-	Tundra, alders, willows, poplars
Northern Waterthrush	<i>Seiurus noveboracensis</i>	-	-	-	Swamp woods or wetlands, edges of streams and lakes. Project region just north of known distribution
Northern Wheatear	<i>Oenanthe oenanthe</i>	-	-	-	Wetlands, desert, rocky areas and coastal areas including sea cliffs and sand dunes
Pine Grosbeak	<i>Pinicola enucleator</i>	-	-	-	Coniferous forests, mixed forests and fruit trees as well (in winter)
Ruby-crowned Kinglet	<i>Regulus calendula</i>	-	-	-	Wooded areas
Rusty Blackbird	<i>Euphagus carolinus</i>	Susceptible	Special concern	Special concern	Riparian thickets, swamp forests, peat bogs. Project region just north of known distribution.
Three-Toed Woodpecker	<i>Picoides dorsalis</i>	-	-	-	Coniferous forests. Project region just north of known distribution.
White-winged Crossbill	<i>Loxia leucoptera</i>	-	-	-	Conifers
Wilson's Warbler	<i>Wilsonia pusilla</i>	-	-	-	Shrub (alder, willow), bogs
Yellow-rumped Warbler	<i>Dendroica coronata</i>	-	-	-	Coniferous forests and mixed

\*Larivé, 2011; \*\* Mark Dionne (CWS), July 2011, pers. comm.)

Sources : Aubry and Cotter (2007); COSEWIC (2011); FAPAQ (2003); Gauthier and Aubry (1995); MRNF (2011a and c); RQO (2009); Sybley (2006); The Birds of North America (on line, site consulted 20 July 2011)



Table A-4: Amphibian species potentially present within the Project region.

Family	Common name	Latin name	Status	Habitat requirements
<b>ANURA</b>				
Ranidae	Wood frog	<i>Lithobates sylvaticus</i>	-	Deciduous forest, mixed or coniferous, wet fields and bogs.

Sources: AARQ 2011, Desroches et Rodrigues 2004





Tableau A-5: Fish species potentially present within the Project region

Common name	Latin name	Status		
		LEMV	COSEWIC	SARA
Arctic char	<i>Salvelinus alpinus oquassa</i>	Susceptible	-	-
Atlantic cod	<i>Gadus morhua</i>	-	Non active	Special concern
Atlantic calmon	<i>Salmo salar</i>	-	Not at risk	
Atlantic wolffish	<i>Anarhichas lupus</i>	Susceptible	Special concern	Special -concern
Brook trout	<i>Salvelinus fontinalis</i>	-	-	-
Burbot	<i>Lota lota</i>	-	-	-
Cisco or Lake Herring	<i>Coregonus artedi</i>	-	-	-
Cusk	<i>Brosme brosme</i>	Susceptible	Threatened	-
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i>	Susceptible	-	-
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	-	-	-
Lake chub	<i>Couesius plumbeus</i>	-	-	-
Lake trout	<i>Salvelinus namaycush</i>	-	-	-
Lake whitefish	<i>Coregonus clupeaformis</i>	-	-	-
Longnose dace	<i>Rhinichthys cataractae</i>	-	-	-
Longnose sucker	<i>Catostomus catostomus</i>	-	-	-
Mottled sculpin	<i>Cottus bairdi</i>	-	-	-
Ninespine stickleback	<i>Pungitius pungitius</i>	-	-	-
Northern pike	<i>Esox lucius</i>	-	-	-
Northern wolffish	<i>Anarhichas denticulatus</i>	Susceptible	Threatened	Threatened
Round whitefish	<i>Prosopium cylindraceum</i>	-	-	-
Slimy sculpin	<i>Cottus cognatus</i>	-	-	-
Spotted wolffish	<i>Anarhichas minor</i>	Susceptible	Threatened	Threatened
Threespine stickleback	<i>Gasterosteus aculeatus</i>	-	-	-
White sucker	<i>Catostomus commersoni</i>	-	-	-

Sources : Bernatchez and Giroux, 2000

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