APPENDIX 6E-2

MARINE BIRD BASELINE REPORT

BAFFINLAND IRON MINES CORPORATION

2006 – 2008 MARINE BIRDS ENVIRONMENTAL BASELINE STUDY SUMMARY REPORT MARY RIVER PROJECT

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EXECUTIVE SUMMARY

This report presents the results of a baseline study conducted on marine birds for Baffinland Iron Mines Corporation's Mary River Project in 2006, 2007 and 2008. It summarizes the findings from reviews of published literature and existing databases, discussions with federal and territorial wildlife agencies, Inuit Qaujimajatuqangit studies, and field surveys. The purpose of this study was to determine marine bird species occurrence, abundance, distribution, diversity, and seasonal habitat use patterns within the Project's Regional Study Area (RSA), Local Study Area (LSA), and footprint.

Survey results determined that 34 marine bird species used the RSA at least seasonally. Although only 19 of these species were confirmed as breeding in the area by our surveys (seen on nests or with young during aerial surveys), previous ground-based studies have recorded 29 of these species breeding in the area. The lower number of breeders recorded in our study is due to the fact that the majority of our surveys were aerial surveys which tend to miss inconspicuous/camouflaged solitary nesting species. As well, some of these 34 species tend to nest further inland, outside of our marine survey transects.

Ten of the species were seen in all six survey areas and three species were seen in only one area. The six most abundant species (highest average densities across all surveys) were, in descending order: snow geese, common eiders, king eiders, Brant, arctic terns and long-tailed ducks. Combined bird densities were highest in Foxe Basin and Steensby Inlet, and in the months of June and August each year due to flocks of several thousand snow geese migrating to and from Sirmilik National Park and the Bylot Island Bird Sanctuary, located just north of the RSA. Hundreds of migrating common and king eiders and long-tailed ducks were also seen throughout the area in August of each year.

Three species (harlequin ducks, ivory gulls, Ross's gull) are listed as Species at Risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010) and are given special legislative protection under Canada's *Species at Risk Act* (Environment Canada, SARA 2010). All three species were seen in very low numbers (total count from 2006-2008 surveys was 3, 11, and 48, respectively) and none were seen breeding within the LSA, nor have they been reported to breed in the area by other studies.

All 34 species recorded are migratory and are protected under Canada's *Migratory Birds Convention Act* (1917, 1994) which regulates the protection and conservation of migratory birds, their nests, eggs, and habitats. All of these species will warrant special consideration and protection during all Project activities conducted between mid-May and October. These considerations will be discussed further in the *Environmental Impact Assessment* and in the *Mary River Project Wildlife Mitigation and Monitoring Plan*.

No large breeding colonies, *Key Habitat Sites* (as designated by Environment Canada's Canadian Wildlife Service) or *Important Bird Areas* (as designated by Bird Studies Canada and Nature Canada) exist within the RSA but several are found scattered around the edges of the Project's proposed shipping lanes, particularly in Foxe Basin and Hudson Strait.

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1.0 INTRODUCTION

The Mary River Project ("the Project") is a proposed iron ore mine and associated facilities located on North Baffin Island, in the Qikiqtani Region of Nunavut. The Project involves the construction, operation, closure, and reclamation of a 21 million tonne-per-annum (Mt/a) open pit mine that will operate for 21 years. The high-grade iron ore to be mined is suitable for international direct shipment after crushing and screening with no secondary processing or concentrating required. Three Mt/a of iron ore will be transported via an upgraded existing road to Milne Inlet where it will be stockpiled for shipment during the open water season. A railway system will transport an additional 18 Mt/a of the ore from the mine area to an all-season deep-water port and ship loading facility at Steensby Port where the ore will be loaded into ore carriers for overseas shipment through Foxe Basin. A dedicated fleet of cape-sized ice-breaking ore carriers and some non-icebreaking ore carriers and conventional ships will be used during the open water season to ship the iron ore to markets.

This environmental baseline study report has been prepared in support of an Environmental Impact Statement (EIS) for the Project, to be submitted by Baffinland to the Nunavut Impact Review Board (NIRB). This report summarizes the methodologies and results from baseline studies conducted on marine birds for Baffinland Iron Mines Corporation in 2006, 2007, and 2008. It presents the findings from reviews of regional literature and existing databases, discussions with federal (Environment Canada's Canadian Wildlife Service, CWS) and territorial (Government of Nunavut, GN) wildlife agencies, Inuit Qaujimajatuqangit (IQ) studies, and three years of field surveys. These studies and consultations were conducted in order to characterize pre-existing conditions within the Project's Regional Study Area (RSA) enabling us to identify any important marine bird issues to be examined during the environmental impact assessment process.

1.1 Objectives

The specific objectives of these baseline studies were to:

- Determine marine bird species occurrence, abundance, distribution, and diversity within the RSA, Local Study Area (LSA), and Project footprint;
- Determine the seasonal habitat requirements of these species;
- Determine the presence of any Species at Risk within the Project areas;
- Determine the presence of any ecologically unique or sensitive habitats relied upon by marine bird species.

Information gathered in this report will be used to conduct an environmental impact assessment which will identify any potential impacts the Project's marine components may have on marine bird species abundance, distribution, diversity, and habitat use patterns. Subsequent to that, mitigation plans will be created in an attempt to eliminate or minimize any potential Project impacts. A detailed monitoring program will then be prescribed to measure the effectiveness of the mitigation plans and procedures, and/or to detect any unanticipated impacts.

For the purposes of this report, *marine bird species* will be defined as any species seen occupying salt water environments within the Project's RSA at anytime during that species' annual cycle (i.e. migration, breeding, over-wintering), such that the proposed Project's marine activities may impact this species' behaviour and/or population dynamics. This report also addresses the coastal nesting habitats of marine bird species, arbitrarily defined as nesting habitats found within 500 m of the marine shoreline. Inland nesting habitat (habitat that is >500 m from the shoreline) for any of these species and those of terrestrial and freshwater bird species are described in the *Terrestrial Birds Environmental Baseline Summary Report* and in Section 3 of the *Environmental Impact Statement for the Terrestrial Environment* (Volume 6).

2.0 METHODS

The purpose of this study was to conduct a biophysical inventory of the Project area with respect to marine birds and their habitat utilization patterns in order to characterize and evaluate the existing pre-project environmental conditions. The biophysical inventory was conducted in 2006, 2007, and 2008 and consisted of a review of regional literature and existing data sources, discussions with regional biologists, Inuit Qaujimajatuqangit studies, and field surveys.

2.1 Study Areas - RSA, LSA, and Project Footprint

The RSA defined for marine bird studies includes the coastal and open water areas of Milne Inlet and Eclipse Sound in the north and Steensby Inlet, Foxe Basin, and Hudson Strait in the south (Figure 5.2). The RSA was selected to describe the regional context that may be subject to indirect effects as well as areas that could function as control areas beyond the range of Project impacts.

The LSA for marine birds is represented by a 1 km corridor to either side of the Project footprint which includes all port facilities and shipping lanes (Figure 5.2). The LSA was selected to describe the habitat within and directly adjacent to the Project footprint, that may be subject to direct and indirect effects. Both the LSA and RSA for marine birds are consistent with study areas chosen for marine mammals in the *Marine Mammal Environmental Baseline Summary Report*.

The Project footprint is the area that is directly impacted by Project development (Figure 5.2). The footprint for Milne Port includes: i) port facilities on land within 500 m of the shoreline (buildings and infrastructure), ii) docking facilities for supply ships and barges, and iii) shipping lanes to and from Eclipse Sound. The footprint for Eclipse Sound consists of the shipping lane between Milne Inlet and Baffin Bay.

The footprint for Steensby Port includes: i) port facilities on land within 500 m of the shoreline (buildings, infrastructure, ore stock piles, etc.), ii) docking facilities, and iii) shipping lanes to and

from Foxe Basin. The footprint for Foxe Basin and Hudson Strait consists of the shipping lane between Steensby Inlet and Davis Strait.

2.2 Literature Review and Existing Data Sources

A review of all identified published material from the region was conducted in order to gather historical and existing background baseline information on marine bird species diversity and abundance, as well as information on key bird habitat sites within the proposed Project area.

2.3 Consultation with Regional Biologists

Correspondence with biologists from the Government of Nunavut (Debbie Jenkins, Mike Setterington) and the Canadian Wildlife Service (Mark Dahl, Vicky Johnston, Mark Mallory, and Myra Robertson) who are familiar with the region, and Nunavut as a whole, also took place during the study period. Discussions took place by phone, email, and when possible, in person. Site visits were made by Mike Setterington in 2006 and Debbie Jenkins in 2007. Information and advice from these experts assisted in the compilation of baseline information for this report and will be used in the environmental impact assessment.

2.4 Inuit Qaujimajatuqangit (IQ) Studies (conducted by Knight Piésold Ltd.)

Inuit Qaujimajatuqangit (IQ) studies were initiated in Pond Inlet in 2006, expanded to Igloolik and Arctic Bay in early 2007, and to Hall Beach and Clyde River in 2008. Studies were initiated in those communities with the closest ecological and socioeconomical ties to the Project first, and then expanded to the other potentially affected communities, modifying the study methodology based on the experiences in the initial communities. The overall objective of the Mary River Project IQ studies was to obtain local knowledge of wildlife, land use, and areas of cultural value to support Project planning and decision making and to assist the social and environmental impact assessment processes.

A total of 45 individual surveys were conducted with elders and several workshops were held within the five communities. In March, 2008 a five-day meeting was held in Arctic Bay involving BIMC executives and the IQ working groups from all five communities.

During the surveys elders were asked the following questions with respect to marine birds, and were asked to identify important bird areas on maps:

1. Which birds arrive first in the spring?
2. Which birds are commonly seen in the summer? Please indicate on the map where these birds are commonly seen.
3. Which birds nest along the ocean? Please indicate on the map where these birds nest.
4. In the fall which birds are first to migrate south?
5. Are there any birds that winter in your area? Why do birds use these areas in the winter?
6. Do you know of any places inland that are important for birds? Please indicate on the map where these areas are. Why do birds use these areas?

7. Where do you go to hunt birds or to collect their eggs? Please indicate on the map.

2.5 Field Surveys

Field surveys were conducted to supplement information gathered from the literature review, consultation with regional biologists, and IQ studies. Information gathered from these sources helped guide the development and/or modification of the field program as surveys were designed to detect species that are important in that area or to survey habitat that may also have previously been determined to be important to the area. Field studies were designed to document current marine avian biodiversity, densities, distributions, and habitat use patterns (i.e. for migration, breeding, over-wintering) in order to provide site specific data relevant to the Project.

Systematic aerial transect surveys were carried out by both helicopter (n = 13 surveys) and fixed-wing aircraft (n = 63 surveys). All surveys were designed and conducted in a fashion that would allow both the collection of baseline data and the establishment of subsequent monitoring programs that can be analyzed following a Pairwise Before-After-Control-Impact design ('BACI Design', Underwood 1994, Treweek 1996). The aim of the baseline surveys was to confirm the presence/absence and habitat utilization of marine birds within the RSA during their fall migration, breeding season, and spring migration. Particular attention was paid during the field work to any federally or territorially listed Species at Risk.

Only two species of shorebirds were surveyed in this study (red-necked phalarope and red phalarope) as all other shorebird species were covered in the terrestrial bird studies (see the *Terrestrial Birds Environmental Baseline Study Summary Report* and Section 3 of the *Environmental Impact Statement for the Terrestrial Environment*). The reason for this is primarily due to the fact that aerial surveys conducted in this study are not an effective nor accurate way of surveying shorebirds. Red-necked phalaropes and red phalaropes were exceptions because large groups of these two species were seen in the open water areas during the marine bird surveys discussed in this report.

2.5.1 Helicopter Surveys

Helicopter surveys were conducted in either a Bell 206 Long Ranger or a Bell A-Star. All but four of these surveys (August 20, 21, 22, 23, 2006) were conducted without floatation devices and therefore were confined to a maximum distance of 50 m from shore. Therefore, surveys conducted in helicopters are referred to as 'coastal surveys' that followed the contours of the shorelines flying 50 m from shore at a height of 100 m above sea level at 100 km/hour. An observer was located on both sides of the aircraft and birds seen both in the water and on land were recorded to a distance of 200 m perpendicular to the flight path (marked on the glass of the observation window using an inclinometer). Birds passing directly below the aircraft were recorded by an observer sitting in the front seat. Groups of birds large enough to be observed more than 200 m from the helicopter (typically groups consisting of >10 individuals) were

identified as best as possible (i.e. 'unidentified eiders' or 'unidentified gulls', etc.) and were recorded as 'off transect'.

In the proposed port footprints for both Milne Inlet (approximately 80 ha) and Steensby Inlet (approximately 3000 ha), aerial line transects were flown 400 m apart to obtain 100% coverage of the areas that will be directly impacted by the construction of port facilities and infrastructure. Additional aerial surveys were conducted outside of the proposed footprints to establish and survey control sites within the RSA. These same control sites were surveyed in each of the three survey years to establish baseline data for control sites that could be incorporated into a future monitoring program.

Both port sites (Milne Port to the north, Steensby Port to the south) were more than 100 km from the Mary River exploration camp where aircraft and fuel were stored in 2006 and 2007. Therefore, the 2006-2007 surveys were limited by i) aircraft availability as they were generally needed to support exploration activities at Mary River, and ii) the distances they could fly from fuel sources. In 2008, Project activities increased at Milne and Steensby Ports and fuel was stored at both locations. However, the distance the aircraft could travel from fuel was still limited and therefore, Foxe Basin and Hudson Strait were never surveyed by helicopter. Gaps in coverage by the helicopter surveys, including over open water, were covered by fixed-wing surveys in 2007-2008 (discussed below). A total of 13 helicopter surveys were conducted (4 in 2006, 4 in 2007, and 5 in 2008) on the following dates and in the following areas:

2006

- August 20, 21 - Milne Inlet and Eclipse Sound
- August 22, 23 - Steensby Inlet

2007

- August 3, 5, 13 - Steensby Inlet
- August 16 - Milne Inlet

2008

- June 28 - Steensby Inlet
- June 29 - Milne Inlet
- July 23 - Milne Inlet
- July 24 - Steensby Inlet
- August 23 - Steensby Inlet

Track logs from hand held GPS devices (Garmin 76) were kept for all surveys and provide a detailed record of aircraft height, speed and flight path.

In each survey, approximately 60 km of coastline was surveyed in Milne Inlet, 180 km in Eclipse Sound, and 130 km in Steensby Inlet, for a total coverage area of 24 km^2, 72 km^2, and 52 km^2, respectively (based on a transect width of 400 m).

2.5.2 Fixed-wing Aircraft Surveys

Marine bird data was collected opportunistically by LGL Ltd. and North/South Consultants Inc. while conducting marine mammal surveys within the RSA. For a detailed description of the methodologies used for these surveys see the *Marine Mammal Environmental Baseline Study Summary Report*. These surveys used line transects over open water in all five of the main Projects areas (Milne Inlet, Eclipse Sound, Steensby Inlet, Foxe Basin, and Hudson Strait).

In 2006 and 2007, surveys were conducted in a Shorts Skyvan flying at 1000 feet above sea level and at 220 km/hour. In 2008, surveys were conducted in a Dehavilland Twin Otter at 500 feet and 220 km/hour. Additional shoreline surveys were conducted in 2008 around Steensby Inlet, Koch Island, Rowley Island, and part of Bray Island in a Twin Otter at 300 feet and 220 km/hour.

Fixed-wing surveys were also influenced by aircraft availability and were conducted on the following dates and in the following areas:

2006

- September 23 - Steensby Inlet

2007

- August 4, 7, 8, 10, 12, 30, 31 - Milne Inlet and Eclipse Sound
- September 1, 3, 8, 9, 10, 13, 14, 15, 17, 18 - Milne Inlet and Eclipse Sound
- September 12, 20 - Steensby Inlet and Foxe Basin

2008

- April 26, 27 - Foxe Basin
- April 28, 29 - Hudson Strait
- June 11, 12, 13, 15 - Foxe Basin and Hudson Strait
- July 29, 30, 31 - Foxe Basin and Hudson Strait
- August 1, 2, 3, - Foxe Basin and Hudson Strait
- August 4, 5, 7, 10, 21, 22, 23, 24, 25, 26, 29, 31 - Milne Inlet and Eclipse Sound
- August 23 - Steensby Inlet
- September 1, 2, 3 - Milne Inlet and Eclipse Sound
- September 7, 8, 10, 11, 12 - Foxe Basin and Hudson Strait
- October 3, 9, 11, 12 - Steensby Inlet
- October 16, 18, 19, 20 - Foxe Basin and Hudson Strait

A total of 63 fixed-wing surveys were conducted (1 in 2006, 19 in 2007, and 43 in 2008). Track logs from hand held GPS devices (Garmin 76) were kept for all surveys and provide a detailed record of aircraft height, speed and flight path.

2.5.3 Ground Surveys

Each year, ground-based surveys were conducted in and out of the proposed port footprints, primarily for the purpose of studying songbirds and shorebirds (discussed in the *Terrestrial Birds Environmental Baseline Study Summary Report* and in Section 3 of the *Environmental Impact Statement for the Terrestrial Environment*). Since all species seen or heard were recorded during these surveys, we were able to opportunistically survey all birds in these areas. Being on the ground for these surveys also allowed us to assess the general quality of these coastal areas (<500 m from shore) in terms of potential and/or realized nesting habitat for ground nesting marine bird species like eiders, loons, ducks, and geese. Both the Milne and Steensby Port sites were surveyed in mid to late June and July using standard point-count surveys and transect plots that followed the Program for Regional and International Shorebird Monitoring (PRISM) protocol (Bart et al. 2005, Environment Canada's Canadian Wildlife Service 2006). Survey locations were designed as stratified blocks based on habitat types in order to maximize coverage of all habitat types found within these proposed port areas.

3.0 RESULTS

3.1 Literature Review

No comprehensive marine bird studies have previously been conducted within Milne and Steensby Inlet, but the rest of the marine RSA (Eclipse Sound, Pond Inlet, Foxe Basin, and Hudson Strait) has been very well studied, particularly prior to 2000.

Bylot Island to the north of the RSA, and the adjacent regions of northern Baffin Island including Brodeur Peninsula, Eclipse Sound, Pond Inlet, Navy Board Inlet and Lancaster Sound have perhaps the most well studied avifaunas in the Canadian High Arctic and have been studied by many of Canada's foremost ornithologists (i.e. Tuck 1961, Nettleship and Gaston 1978, Renaud et al. 1979, 1981, Bradstreet 1982, McLaren 1982, Zoltai et al. 1983, Alexander et al. 1991, Nettleship 1994, 1996, Lepage et al. 1998, Gauthier et al. 2004, Mallory and Fontaine 2004). Long-term studies continue on Bylot Island, including areas along the shores of Eclipse Sound (i.e. Gauthier et al. 2004, Gilles Gauthier, Personal Communication). From these studies it has been concluded that Bylot Island and the surrounding marine environment, including Eclipse Sound, have among the greatest abundance and diversity of birds in the Canadian High Arctic (see Alexander et al. 1991, Lepage et al. 1998). Even 19th century explorers in search of the Northwest Passage commented on the abundance and diversity of birds in the region (Ross 1819, Parry 1821, M'Clintock 1859). The area is home to more than 74 species of birds (both marine and terrestrial species) including the world's largest greater snow goose colony (over 669,000 individuals in 1996), and large colonies of thick-billed murres, black-legged kittiwakes,

and northern fulmars (Batt et al. 1998, Lepage et al. 1998). The endangered ivory gull also breeds in this region on Brodeur Peninsula (Alexander et al. 1991, Mallory et al. 2008).

The northerly position of Bylot Island relative to the Mary River Project's RSA suggests that many of these species may pass through any or all portions of the Project's RSA during spring and fall migrations, and many or all of these species may also breed within it.

Foxe Basin and Hudson Strait's nutrient-rich cold waters, numerous islands, and vast diversity in habitat types that range from wide low-lying coastal flats to steep coastal cliffs, make them important regions for many species of seabirds, shorebirds, geese, ducks, eiders and loons as well (Ellis and Evans 1960, Reed et al. 1980, Gaston et al. 1986, Alexander et al. 1991, Forbes et al. 1992, Bechet et al. 2000, Johnston and Pepper 2009). The Great Plain of the Koukdjuak on the southwestern shores of Baffin Island has the world's largest goose colony, with over two million birds, 75% of which are lesser snow geese and the remainder Canada geese and Brant (Important Bird Areas Canada 2010). Foxe Basin is thought to be the main North American stronghold of the Sabine's gull, with some 10,000 pairs nesting here (Important Bird Areas Canada 2010). Several hundred thousand thick-billed murres breed on the cliffs of Digges Sound and Coats Island in the south, and large numbers of black guillemots, Arctic terns, glaucous and herring gulls also breed here. Several hundred thousand shorebirds and ducks also breed in Foxe Basin or migrate through, and Johnston and Pepper (2009) recently recommended that Prince Charles Island and Air Force Island be protected under the *Canada Wildlife Act* (1973) regulations for National Wildlife Areas.

The position of Foxe Basin and Hudson Strait within the Mary River Project's RSA suggests that many of these species may be encountered and possibly impacted by the Project's proposed shipping activities.

Overall, 34 species of seabirds and other marine birds have been recorded in or around the RSA by previous studies. Three of these species (harlequin duck, ivory gull, Ross's gull) are listed by COSEWIC (2010) and SARA (2010) as Species at Risk and are discussed in Section 5.3.1.1.

3.1.1 Species at Risk

Species at Risk (SAR) are plant or animal species whose populations are considered *Extirpated, Endangered, Threatened*, or of *Special Concern* in Canada, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010). Species at Risk and activities within their critical habitat are regulated by Canada's federal *Species at Risk Act* (Environment Canada, SARA 2010). A review of species listed by COSEWIC (COSEWIC 2010) and SARA (Environment Canada, SARA 2010), and by the Government of Nunavut's Department of the Environment (via the Canadian Endangered Species Conservation Council, CESCC 2005) was conducted in order to determine the likelihood of listed or sensitive marine bird species being present in the RSA. It was determined that the following three species were likely to occur in low numbers in or around Foxe Basin, Hudson Strait, and Eclipse Sound:

- **Harlequin duck** (COSEWIC Status: Schedule 1 *Special Concern*; SARA: Schedule 1 *Special Concern*; CESCC: *Sensitive*).
- **Ivory gull** (COSEWIC Status: Schedule 1 *Endangered*; SARA: Schedule 1 *Endangered*; CESCC: *May Be At Risk*).
- **Ross's gull** (COSEWIC Status: Schedule 1 *Threatened*; SARA: Schedule 1 *Threatened*; CESCC: *At Risk*).

3.1.1.1 Harlequin Duck

Harlequin ducks are not common to Canada's Arctic regions and are not found north or east of Foxe Basin (aside from a western population that breeds in Yukon and Alaska). However, they are known to breed on the southern third of Baffin Island and have been seen in small flocks in southern Foxe Basin and Hudson Strait (Mark Mallory, CWS, Personal Communication). They nest along fast moving coastal and mountain streams and are often found foraging along rocky coastlines during other times of the year. Canada's eastern population of harlequin, which is mostly concentrated in Labrador and Quebec, was listed as *Endangered* by COSEWIC in 1990 but has been upgraded to a species of *Special Concern* (COSEWIC 2010, Environment Canada, SARA 2010). Threats to this population include habitat loss, anthropogenic disturbances such as hydroelectric dams at their nesting grounds, and overhunting (Robertson and Goudie 1999). It is still illegal to hunt harlequin ducks in the Atlantic Provinces, Ontario, Quebec, and in the eastern United States, where most birds winter.

3.1.1.2 Ivory Gull

Very little is known about the *Endangered* ivory gull and its general biology (COSEWIC 2010, Mallory et al. 2008) and they have only been observed occasionally in the RSA in the past ten years (in Foxe Basin and Eclipse Sound, Mark Mallory, CWS, Personal Communication). Ivory gulls are known to nest on Brodeur Peninsula on northern Baffin Island as well as in the eastern Lancaster-Jones Sounds regions close to Bylot Island (Mallory et al. 2008). Some ivory gulls are thought to migrate through Foxe Basin and Hudson Strait each year as a few individuals have been seen migrating through Igloolik and Cape Dorset, outside of the RSA to the west (Mark Mallory, CWS, Personal Communication). However, the majority of ivory gulls that nest on Brodeur Peninsula are believed to winter either north of Bylot Island or in southwestern Baffin Bay and Davis Strait (Renaud and McLaren 1982, Mallory et al. 2008) and migrate there through Lancaster Sound or Eclipse Sound (Renaud and McLaren 1982). Three hundred and seventy-five individuals were seen in the floe edges near Pond Inlet during spring migration in 1979 (Renaud and McLaren 1982) and 75 were seen in this same location in the spring of 1994 (Lepage et al. 1998). It therefore appears that portions of the RSA may be used as a migratory pathway by this species but very little else is known about the life history of this species.

3.1.1.3 Ross's Gull

Ross's gull is one of the rarest breeding gulls in North America and is considered a *Threatened* species in Canada (COSEWIC 2007, Environment Canada, SARA 2010). Although very little is known about this species and no long-term studies exist for it in Arctic Canada, they have been recorded nesting in four locations in Canada, one of which is on Prince Charles Island in Foxe Basin (the other three locations are: Cheyne Islands, Nunavut; an unnamed island in Penny Strait, Nunavut; and Churchill, Manitoba; Environment Canada 2007). A single adult Ross's gull in breeding plumage was recorded on Bylot Island in 1979 by both Renaud et al. (1981) and Lepage et. al (1998), independently. In Foxe Basin, a pair of breeding Ross's gulls was discovered on Prince Charles Island in 1984 by Tony Gaston (CWS) and in 1997 by both Vicky Johnson (CWS) and Bechet et al. (2000). Despite intensive surveys on Prince Charles and neighbouring Air Force Island in 1996 and 1997, no additional birds were found (Johnston and Pepper 2009, Vicky Johnston, CWS, Personal Communication, Mark Mallory, CWS, Personal Communication). Most of the world's population of Ross's gulls are thought to breed in eastern Siberia and Canada's Ross's gulls are thought to spend the winter in the Chukchi Sea, between Alaska and Russia (Environment Canada's Canadian Wildlife Service Fact Sheet).

Since these three Species at Risk were expected to be found in such low numbers within the RSA, and because of the immense size of the study area, it was determined that these three species would be best surveyed while conducting general systematic aerial transect surveys throughout the RSA (non-species specific aerial surveys designed to census all marine bird species). Therefore, specific surveys for these species were not conducted.

All other marine species previously recorded in or near the RSA did not have a listing in COSEWIC or SARA, but have been ranked by the Government of Nunavut (see Table 2, below).

3.1.2 Protected Areas and Key Habitat Sites

3.1.2.1 National Parks

Sirmilik National Park (and the Bylot Island Bird Sanctuary)

At the northern end of the Project study area, outside of the Project boundaries but directly adjacent to the marine environment study area is Sirmilik National Park and within this park is the Bylot Island Bird Sanctuary. Sirmilik National Park and Bylot Island have one of the most diverse and well-studied avifaunas in the Canadian Arctic (i.e. Tuck 1961, Nettleship and Gaston 1978, Renaud et al. 1979, 1981, Bradstreet 1982, McLaren 1982, Zoltai et al. 1983, Alexander et al. 1991, Nettleship 1994, 1996, Lepage et al. 1998, Menu et al. 2002, Gauthier et al. 2004, Mallory and Fontaine 2004).

The area is home to more than 74 species of birds (both marine and terrestrial species) including the world's largest greater snow goose colony (over 669,000 individuals in 1996), and large colonies of thick-billed murres, black-legged kittiwakes, and northern fulmars (Batt et al.

1998, Lepage et al. 1998). The endangered ivory gull also breeds in this region on Brodeur Peninsula (Alexander et al. 1991, Mallory et al. 2008). Both areas are considered to be sensitive to disturbance (i.e. from shipping and tourism), and to marine pollution (Alexander et al. 1991), and have special federal and international protection under the *Migratory Birds Sanctuary Regulations* (1997), the *Migratory Birds Convention Act* (1994), and *Canada's National Parks Act* (2000). Long-term studies continue on Bylot Island, including areas along the shores of Eclipse Sound (i.e. Gauthier et al. 2004, and Gilles Gauthier, Personal Communication).

3.1.2.2 Key Migratory Bird Habitat Sites and Important Bird Areas

Environment Canada's Canadian Wildlife Service (CWS), Bird Studies Canada (BSC), and Nature Canada (NC) identify, monitor and conserve areas that provide key habitat for bird populations across Canada. In Nunavut, CWS has identified 32 *Key Marine Habitat Sites* (*KMHS*; Mallory and Fontaine 2004) and 60 *Key Terrestrial Habitat Sites* (*KTHS*; Alexander et al. 1991, Latour et al. 2008) for migratory birds in Nunavut, and BSC and NC have designated 56 areas in Nunavut as *Important Bird Areas (IBAs*; *CEC 1999,* Bird Studies Canada 2010). These designations are used by CWS, BSC, and NC to identify areas that may require special conservation measures but they do not provide any legislated protection status.

No areas within the RSA were listed as *Key Habitat Sites* or *Important Bird Areas*. However, this may be at least in part due to the lack of research that has taken place within the RSA (specifically, within Milne and Steensby Inlet and the terrestrial areas between these two sites), as other regions on or around Baffin Island that have experienced more research have had many *Key Habitat Sites* or *IBAs* identified. Several of these identified sites exist just outside of the RSA boundaries and are discussed below.

3.1.2.3 Key Habitat Sites and Important Bird Areas Near Milne Inlet

There are no CWS *Key Habitat Sites* or BSC *Important Bird Areas* in or around Milne Inlet.

3.1.2.4 Key Habitat Sites and Important Bird Areas Near Eclipse Sound

Cape Hay (*KMHS* #12*, KTHS* #NU21, *IBA* #NU004) is located on the northwestern tip of Bylot Island, protruding into Lancaster Sound. The area is characterized by tall, steep coastal cliffs, rocky shores, and areas of low-lying coastal tundra. There are large colonies of thick-billed murres (approximately 140,000 pairs presently, but this is down from 400,000 pairs in 1957; Gaston and Hipfner 2000) and black-legged kittiwakes (20,000 pairs, down from 50,000 pairs in 1957) nesting here and the area is used by thousands of northern fulmars and dovekies, and hundreds of black guillemots (Mallory and Fontaine 2004, Important Bird Areas Canada 2010).

Southwest Bylot Plain (*KTHS* #NU22, *IBA* #NU013) is a lush glacial fluvial plain located in the southwestern corner of Bylot Island along the north shores of Eclipse Sound. It is home to the world's largest known breeding colony of greater snow geese and large colonies of thick-billed

murres, black-legged kittiwakes, and northern fulmars nest on nearby cliffs (Batt et al. 1998, Lepage et al. 1998, Important Bird Areas Canada 2010).

Cape Graham Moore (*KMHS* #15*, KTHS* #NU23, *IBA* #NU068) is located on the southeastern tip of Bylot Island near the community of Pond Inlet (70 km to the southwest). It is characterized by steep coastal cliffs and rocky shores and has large colonies of thick-billed murres (30,000 pairs) and black-legged kittiwakes (3000 pairs; Gaston and Hipfner 2000, Important Bird Areas Canada 2010). Northern fulmars, black guillemots and dovekies are also numerous in this area. The *Endangered* ivory gull has been known to use the floe edge here during migration and in October 1979, 375 ivory gulls were seen near here (Renaud and McLaren 1982).

Lancaster Sound Polynya (*KMHS* #10*, IBA* #NU058). Polynyas (discussed further in Section 3.1.2.8) are recurrent sources of open water within the frozen sea ice and are essential resting and feeding areas for migrating and breeding marine birds. The Lancaster Sound Polynya at the entrance of Lancaster Sound, between Bylot Island and Devon Island (see Figure 2 in Mallory and Fontaine 2004) is thought to support between 1.5 - 3.0 million dovekies each year in May on their spring migration to Greenland (Johnson et al. 1976, Brown and Nettleship 1981, Renaud et al. 1982).

3.1.2.5 Key Habitat Sites and Important Bird Areas Near Steensby Inlet

There are no *CWS Key Habitat Sites* or BSC *Important Bird Areas* in or around Steensby Inlet.

3.1.2.6 Key Habitat Sites and Important Bird Areas Near Foxe Basin

Foxe Basin Islands (*KMHS* #22*, KTHS* #NU031, *IBA* #NU011) are located in east-central Foxe Basin and consist of Prince Charles Island, Air Force Island, and Foley Island. Over 40 bird species have been observed on these islands, and 26 of these species are known to breed here (Important Bird Areas Canada 2010). This site supports globally and nationally significant populations of at least 11 bird species including Brant, lesser snow geese, cackling geese, Sabine's gulls (50% of the Canadian population), and possibly the *Endangered* Ross's gull. The Sabine's gull population is estimated to be over 40,000 birds and is considered the largest concentration of this species in the world (Important Bird Areas Canada 2010).

Prince Charles Island and Air Force Island are also considered to be major breeding sites for many species of shorebirds and together contain an estimated 272,500 breeding pairs and 626,000 individuals, including the largest known concentration of red phalaropes (approximately 120,000 pairs; Johnston and Pepper 2009). Other species common to these islands include common eiders, king eiders, long-tailed ducks, and herring gulls. The islands are also important stop-over sites for many species migrating further north. Johnston and Pepper (2009) recommended that Prince Charles Island and Air Force Island be protected under the *Canada Wildlife Act* (1973) regulations for National Wildlife Areas.

North Spencer Island (*KTHS* #NU32) is located in northern Foxe Basin approximately halfway between Prince Charles Island and Melville Peninsula. A large Brant goose colony is located on the island and many other birds have been observed on the island including large numbers of Sabine's gulls, Arctic terns, long-tailed ducks, and Pacific loons.

The Great Plain of the Koukdjuak (*KTHS* #NU30, *IBA* #NU078) is a 15 km long tidal zone located on the south-eastern shore of Foxe Basin on Baffin Island. The lush low-lying coastal tundra at this site supports the largest goose colony in the world, numbering over two million geese, 75% of which are lesser snow geese. This is approximately 33% of all snow geese in the world (Important Bird Areas Canada 2010). Over 100,000 cackling geese are also found here, representing about 35% of the world's population. Large numbers of Brant, long-tailed ducks, common eiders and king eiders also inhabit this site, and more than 1,500 Sabine's gulls nest here. Many species and abundant numbers of shorebirds are also found here. Protected areas at this site include the Dewey Soper Migratory Bird Sanctuary and the Bowman Bay Wildlife Sanctuary (Important Bird Areas Canada 2010).

Turton Island (*KTHS* #NU33, *IBA* #NU021) is a small, flat island located on the southwestern shores of Foxe Basin, just off the southeast coast of Melville Peninsula. The island's lush tundra is home to one the eastern Arctic's largest common eider colonies (~4000 individuals). Other bird species that nest here include tundra swans, Canada geese, Brant, black guillemots, herring gulls, and Arctic terns.

East Bay/Native Bay (*KMHS* #24*, KTHS* #NU44, *IBA* #NU023) is a 50 km long inlet in southern Foxe Basin on the southeast coast of Southampton Island. Forty-one species of birds have been recorded in this area and Mitvik Island is home to the largest common eider colony in Arctic Canada, varying between 7,000 - 12,000 individuals (Abraham and Ankney 1986, Mallory and Fontaine 2004). In 1997, 157,000 lesser snow geese and 40,000 Brant were recorded nesting in the lowland tundra areas here. The area also has some of the highest breeding densities of shorebirds in the High Arctic, including red phalaropes that have been recorded at densities of 30 birds/km^2. Protected areas in this location include the East Bay Migratory Bird Sanctuary, and the community of Coal Harbour lies a few kilometres to the west.

3.1.2.7 Key Habitat Sites and Important Bird Areas Near Hudson Strait

Digges Sound (*KMHS* #27*, KTHS* #NU47, *IBA* #NU001) is located in the southwestern portion of Hudson Strait, at the northern opening to Hudson Bay, 17 km north of the community of Ivujivik. The Sound is lined with over 12 km of granite cliffs and has one of the largest concentrations of thick-billed murres in Canada (~300,000 pairs or 20% of the Canadian population; Gaston et al. 1985, Gaston and Hipfner 2000). There are also small-moderate sized breeding populations of black guillemots, glaucous gulls, Iceland gulls, herring gulls, Arctic terns, and Atlantic puffins here. The Government of Quebec has proposed turning the mainland portion of this site into a provincial park (Mallory and Fontaine 2004).

Fraser Island (*KTHS* #NU46, *IBA* #NU024) is a small island located at the west end of Hudson Strait at the juncture with Foxe Basin. Up to 3,000 pairs of common eiders nest on the islands.

Markham Bay (*KMHS* #25*, KTHS* #NU48, *IBA* #NU101) is a complex of islands and coastline located on the southern-most coast of Baffin Island, in northern Hudson Strait. Surveys in 1997 and 1998 recorded 44,500 common eiders and 8,000 nests (Gilchrist et al. 1998, 1999). The site also supports large numbers of Iceland gulls and black guillemots.

Hantzsch Island (*KTHS* #NU49, *IBA* #NU025) is a small island located off the southern-most tip of Baffin Island, in the mouth of Frobisher Bay. Although it is only 1 km in diameter it is important habitat for more than 15 species of birds. In 1982, a colony of 50,000 pairs of thick-billed murres was observed here. Also breeding on the Island are 5,000 pairs of black-legged kittiwakes, glaucous gulls, and possibly northern fulmars and black guillemots.

Button Islands (*KMHS* #29) are a series of small islands in the eastern entrance of Hudson Strait, 10 km north of Torngat Peninsula, northern Labrador. Thousands of seabirds forage in the vicinity of these islands including northern fulmars, black-legged kittiwakes, thick-billed murres, and the *Endangered* ivory gull (Mallory and Fontaine 2004).

Akpatok Island (*KMHS* #30*, KTHS* #NU50, *IBA* #NU007) is located in northwestern Ungava Bay, 70 km north of Quebec. The largest colony of thick-billed murres in Canada is found here (600,000 pairs or 40% of the Canadian population; Gaston and Hipfner 2000). These murres are found in two colonies that cover nearly 30 km of coastline. Other species that nest on these steep cliffs include black guillemots, glaucous gulls, peregrine falcons, and gyrfalcons.

The Ungava Bay Archipelagos (*KMHS* #31*, KTHS* #NU51, *IBA* #NU027, NU028, and NU029) is a group of more than 850 Nunavut islands in Ungava Bay and includes coastal areas along Ungava Bay, Quebec. This complex of *Important Bird Area*s collectively provides nesting habitat to approximately 6% (~17,900 pairs) of Canada's common eider population (Mallory and Fontaine 2004).

3.1.2.8 Polynyas and Shore Leads

Polynyas and shore leads are recurrent areas of open water in the frozen sea ice that are biologically productive, supporting a rich and abundant marine life of plankton, algae, and fish, even in the winter (Stirling 1997). They are caused by a variety of factors including tides, local currents and upwellings. Large numbers of overwintering birds rely on these predictable pockets of open water as foraging grounds and they are even known to influence migration pathways by providing valuable migratory stop-over sites where birds can rest and replenish energy supplies (Stirling 1997). These rich accessible feeding grounds are also essential to Arctic breeding colonies in the spring when most of the ocean is still frozen, and extensive reproductive failures have occurred at colonies when polynyas and shore leads have failed to form or have appeared late in the season (Robertson and Gilchrist 1998, Brown and Nettleship, 1981). In fact, there is

no major seabird colony in the eastern Canadian Arctic that is not adjacent to a reliable polynya (Brown and Nettleship, 1981).

According to the literature, there are no known polynyas or recurring shore leads in Milne or Steensby Inlet, nor in Eclipse Sound. The Lancaster Sound Polynya (Canadian *Important Bird Area* #NU058, discussed above) is a large recurring polynya at the entrance of Lancaster Sound, north of Bylot Island (outside of the RSA; see Figure 2 in Mallory and Fontaine 2004), and is thought to support up to 3 million dovekies each year in May on their spring migration to Greenland (Johnson et al. 1976, Brown and Nettleship 1981, Renaud et al. 1982). There is another polynya at the entrance to Pond Inlet and in the spring and early summer there are also recurrent shore leads at the entrances to Pond Inlet and Navy Board Inlet.

Four reliable polynyas exist in Foxe Basin (two along Melville Peninsula, one north of Prince Charles Island, and one north of Foxe Peninsula) along with lengthy floe edges along both the east and west coasts of the Basin. Hudson Strait is known to have recurring floe edges along its northern shoreline and a large polynya occurs regularly in nearby Frobisher Bay (Mallory and Fontaine 2004).

3.2 Inuit Qaujimajatuqangit (IQ) Studies

The inclusion of IQ studies within the baseline report allows us to present and incorporate local knowledge of the area from those who live there, and it also allows us to assess the importance of various wildlife species to Inuit in the region. IQ studies from five communities near the Mary River Project's RSA generally agreed with information gathered from the literature.

3.2.1 IQ Information on Marine Bird Species Occurrence, Abundance and Migration Behaviour

Results from the IQ surveys in Pond Inlet, Igloolik, Arctic Bay, Hall Beach and Clyde River indicated that the RSA and LSA contain several areas that are used seasonally by large densities of various marine bird species (seabirds, geese, eiders, ducks, terns and gulls; Figure 3), and that some of these species are harvested on a regular basis. Community Elders indicated that most marine bird species in the area are migratory and typically arrive in late-April, May, and June, and start leaving in August. The IQ studies indicated that murres, northern fulmars, gulls and eiders are the first species to arrive (in April), and that long-tailed ducks, snow geese and other species typically arrive in June. Fall migration occurs between early August to late October depending on the species and the sex as the male birds and non-breeders for some species leave the area much earlier than adult females with young. Some birds, such as the black guillemot, remain in the area year-round using the shore leads in the winter.

IQ surveys provided little information on migration corridors but it was noted that "lots" of geese and eiders fly over Foxe Basin and Steensby Inlet during their spring and fall migrations and can be found nesting near all five communities.

Residents of all five communities indicated that harvesting of birds and their eggs is still important to them but much less so than in the past. The species that were most commonly harvested were snow geese, common and king eiders, Arctic terns (eggs only) and long-tailed ducks.

3.2.2 IQ Information on Nesting Locations

Most Elders indicated that seabirds nest on many of the islands in the area (Bylot Island and the various islands in Foxe Basin) and that some nest in very large colonies on cliffs (i.e. murres and kittiwakes) while some nest on the ground along the coastlines. Geese, eiders, loons and ducks also nest on the ground along coastlines or inland along freshwater lakes.

Bylot Island was known by most interviewees to be a very good area for nesting murres, snow geese, eiders, and other species but one Pond Inlet resident said that the number of birds on Bylot Island has dropped dramatically since scientists started studying them, particularly the snow geese.

Most of the many islands in Foxe Basin (i.e. Nirlirnartuuq, Siuraq, Naluqqajarvik, Manirtulik, Qaiqsu and Qikiqtani) were identified by residents of Igloolik and Hall Beach as good nesting areas and are frequented by them for egg harvesting. Common and king eiders and Arctic terns were still popular species for egg harvesting in these areas, primarily because of the abundance of nests on islands close to these communities. Elders also indicated that there were more birds nesting on islands closer to the originally proposed western shipping route (that would have come along the west side of Rowley Island, close to Igloolik and Hall Beach) compared to the eastern route, and many voiced a personal preference to have ships travel along the eastern route, further from these islands and their communities. Elders also pointed out that many of the species such as geese, eiders, loons, ducks, terns and gulls nested in the same areas each year so residents always knew where to go for egg harvesting.

The following is a summary of other comments made by community Elders on the natural history of various local species:

Murres and Black Guillemots
Murres nest along the shoreline and on cliffs and start egg-laying in June. Murres are known to nest near Ingruraaluk and on the eastern side of Bylot Island. Black guillemots often lay eggs in rocks crevices, but in some areas, such as Arctic Bay, they nest only on cliffs.

Gulls, Terns, Jaegers, and Fulmars
Gulls nest near the shoreline, on cliffs or near lakes and ponds. They are the first to arrive to Pond Inlet in the summer and remain until the ice begins to form in the fall. IQ studies identified large gull nesting areas at Appat, Annirut, Aulattivik, Sullukuluk and Pinguq. Arctic terns also near the shoreline or on lowlands around lakes and ponds. Tern nesting areas identified by Elders include the Arctic Bay area, Qikirtaarjuk, Ikirasak, Qaiqsu, Amittuarju and Qurvingnaarjuk, and most of the islands in Foxe Basin.

IQ studies indicated that long-tailed jaegers nest near Arctic Bay at Ikirasaarjuk, and fulmars nest on the cliffs in Arctic Bay Inlet and at Ikpikittuarjuk and Nuajaakuluk. Fulmars have also been seen nesting in Pond Inlet but no fulmars have been seen nesting near Igloolik.

Geese, Eiders, and Ducks

IQ surveys indicated that geese, eiders, ducks nest in very large numbers throughout the RSA on most of the islands, along the coastlines, and inland near wetlands and lakes on the tundra.

All the residents of Pond Inlet and Arctic Bay were very familiar with the large snow goose colony on Bylot Island and indicated that although they still harvest these birds and their eggs, they do so less and less every year. One Elder mentioned that all the snow geese "…were tagged by the scientists" and she didn't like harvesting them anymore. Areas near Arctic Bay that have a lot of snow geese and eiders are Nunasaarut, Niaquartalik, Ikpikittuarjuk, and Angugaattiartalik.

Eiders nest on most of the islands near Igloolik and Arctic Bay but most of the Pond Inlet Elders thought that there were no nesting areas near Pond Inlet aside from Bylot Island. Nesting areas identified by Arctic Bay Elders included Qikiqtaukkat, Kangiq, Tasiujaq, Mitilik ("Place of Eider Ducks") and Nirlirngnaqtuuq. Nesting areas identified near Igloolik included Siuraq, Manirtulik, Nirluriaq, Tasiujaq, Uglit and Kiguit. Several residents reported seeing eiders feeding at floe edges in the spring.

Long-tailed ducks were reported to nest along shorelines and inland near lakes and ponds, including many at Tugaq Lake.

Loons

Loons were reported to prefer to nest in lowlands, near wetlands and along lakeshores. Elders from Pond Inlet commented that Pacific loons and common loons often occupy the same nesting and feeding areas and that loons are found wherever there are small lakes, especially around Aulattivik. One interviewee from Arctic Bay said that Pacific loons can be found nesting around the edges of rivers where they like to fish.

3.2.3 IQ Information on Natural Changes to Birds and Birds' Reaction to Disturbance

One Elder has recently observed ivory gulls in Igloolik and stated that they were not normally seen there. Murres are also commonly seen in Igloolik in the spring and summer now, but used to only be seen in the winter. In Pond Inlet, fewer gulls are present than in the past and in Arctic Bay one Elder believes that the "white gull" (ivory gull) is becoming extinct in the area.

During the Arctic Bay Working Group Meeting, Elders generally felt that the proposed shipping activity in Foxe Basin would disturb the birds although one resident indicated that he used to see birds resting on the deck of the MV Arctic, a ship that was regularly used at the Nanisivik Mine, and that he didn't think the birds would be negatively affected. One resident of Pond Inlet

said that aircraft traffic there has caused birds to nest further from town. During the Hall Beach Working Group Meeting, most Elders said they didn't think birds would be affected by the shipping but some felt that "…the birds would go somewhere else" and hoped that the Project would use the eastern shipping route since the western route would disturb birds nesting on islands closer to their communities. Interestingly, Elders in Hall Beach felt that the Nanisivik Mine near Arctic Bay caused a decrease in snow goose colonies close to the mine but residents of Arctic Bay did not mention this. Elders in Hall Beach did not feel that the Nanisivik Mine disturbed ducks, just geese.

As mentioned above, one resident of Pond Inlet felt that snow goose population numbers on Bylot Island have declined since scientists started studying these birds.

3.3 Field Data

3.3.1 Marine Bird Species Diversity and Distribution

Thirty-three marine bird species were expected to be observed within the RSA based on the literature review. All 33 of these species were recorded during the 2006-2008 surveys, as well as one unexpected species, the black scoter (Table 2 and Figures 4 - 27). Table 2 presents the most recent conservation status for each of these 34 recorded species according to the Government of Nunavut (Canadian Endangered Species Conservation Council, CESCC, 2005), the Committee on the Status of Wildlife in Canada (COSEWIC 2010) and Environment Canada's *Species at Risk Act* (Environment Canada, SARA 2010). A general description of the natural histories (diets, habitat preferences, phenologies) and distribution ranges of these 34 species is provided in Appendix A.

Table 1: The 34 Marine Bird Species Observed Within the RSA During the 2006-2008 Field Surveys, Along With Their Respective Conservation Status

Common Name	Scientific Name	Confirmed Breeding (Yes/No)	GN Status (CESCC 2005)	COSEWIC Status (2010)	SARA Status (2010)
Arctic Tern	*Sterna paradisaea*	Y	Secure	Not Listed	Not Listed
Black Guillemot	*Cepphus grylle*	N	Secure	Not Listed	Not Listed
Black-legged Kittiwake	*Rissa tridactyla*	N	Secure	Not Listed	Not Listed
Black Scoter	*Melanitta nigra*	N	Accidental	Not Listed	Not Listed
Brant	*Branta bernicla*	Y	Secure	Not Listed	Not Listed
Canada Goose	*Branta canadensis*	Y	Secure	Not Listed	Not Listed
Common Eider	*Somateria mollissima*	Y	Sensitive	Not Listed	Not Listed
Common Loon	*Gavia immer*	Y	Secure	Not Listed	Not Listed
Dovekie	*Alle alle*	N	Sensitive	Not Listed	Not Listed

Common Name	Scientific Name	Confirmed Breeding (Yes/No)	GN Status (CESCC 2005)	COSEWIC Status (2010)	SARA Status (2010)
Glaucous Gull	*Larus hyperboreus*	Y	Secure	Not Listed	Not Listed
Great Black-backed Gull	*Larus marinus*	N	Undetermined	Not Listed	Not Listed
Great Skua	*Stercorarius skua*	N	Accidental	Not Listed	Not Listed
Harlequin Duck	*Histrionicus histrionicus*	N	Sensitive	Special Concern	Special Concern
Herring Gull	*Larus argentatus*	N	Accidental	Not Listed	Not Listed
Iceland Gull	*Larus glaucoides*	N	Secure	Not Listed	Not Listed
Ivory Gull	*Pagophila eburnea*	N	May Be At Risk	Endangered	Special Concern
King Eider	*Somateria spectabilis*	Y	Sensitive	Not Listed	Not Listed
Long-tailed Duck	*Clangula hyemalis*	Y	Secure	Not Listed	Not Listed
Long-tailed Jaeger	*Stercorarius longicaudus*	Y	Secure	Not Listed	Not Listed
Northern Fulmar	*Fulmarus glacialis*	N	Secure	Not Listed	Not Listed
Pacific Loon	*Gavia pacifica*	Y	Secure	Not Listed	Not Listed
Parasitic Jaeger	*Stercorarius parasiticus*	Y	Secure	Not Listed	Not Listed
Pomarine Jaeger	*Stercorarius pomarinus*	Y	Secure	Not Listed	Not Listed
Red-breasted Merganser	*Mergus serrator*	Y	Secure	Not Listed	Not Listed
Red-necked Phalarope	*Phalaropus lobatus*	Y	Sensitive	Not Listed	Not Listed
Red-throated Loon	*Gavia stellata*	Y	Secure	Not Listed	Not Listed
Red Phalarope	*Phalaropus fulicarius*	Y	Sensitive	Not Listed	Not Listed
Ross's Goose	*Chen rossii*	N	Secure	Not Listed	Not Listed
Ross's Gull	*Rhodostethia rosea*	N	At Risk	Threatened	Threatened
Sabine's Gull	*Xema sabini*	N	Secure	Not Listed	Not Listed
Snow Goose (Lesser + Greater)	*Chen caerulescens*	Y	Secure	Not Listed	Not Listed
Thayer's Gull	*Larus thayeri*	N	Secure	Not Listed	Not Listed
Thick-billed Murre	*Uria lomvia*	N	Secure	Not Listed	Not Listed
Tundra Swan	*Cygnus columbianus*	Y	Secure	Not Listed	Not Listed
Yellow-billed Loon	*Gavia adamsii*	Y	Secure	Not Listed	Not Listed

The species seen in each of the six main survey areas (Milne Inlet, Eclipse Sound, Steensby Inlet, West Foxe Basin, East Foxe Basin, and Hudson Strait), and the survey year(s) in which they were recorded in those areas, is presented in Table 3.

Table 2: Marine Bird Species Distribution Across the Six Main Survey Areas and the Survey Years in Which They Were Observed (1 = 2006, 2 = 2007, 3 = 2008)

Species Common Name	Milne Inlet	Eclipse Sound	Steensby Inlet	West Foxe Basin[a]	East Foxe Basin[a]	Hudson Strait[b]
Arctic Tern	2, 3	2, 3	1, 2, 3	3	3	3
Black Guillemot	2, 3	3	3	3	3	3
Black-legged Kittiwake	2, 3	2, 3	2	3	--	3
Black Scoter	--	--	--	--	--	3
Brant	1, 2, 3	2, 3	1, 2, 3	2, 3	2, 3	--
Canada Goose	3	3	1, 2, 3	3	3	3
Common Eider	1, 2, 3	1, 2, 3	1, 2, 3	2, 3	2, 3	3
Common Loon	3	--	3	--	--	3
Dovekie	--	2, 3	--	3	--	3
Glaucous Gull	1, 2, 3	1, 2, 3	1, 2, 3	3	3	3
Great Black-backed Gull	--	2, 3	3	--	--	--
Harlequin Duck	--	--	--	--	--	3
Herring Gull	--	1	2, 3	3	3	3
Iceland Gull	2, 3	2, 3	2, 3	3	3	3
Ivory Gull	2, 3	3	--	3	3	3
King Eider	1, 2, 3	1, 2, 3	1, 2, 3	2, 3	2, 3	3
Long-tailed Duck	1, 2, 3	1, 2, 3	1, 2, 3	3	3	3
Long-tailed Jaeger	--	--	3	3	3	--
Northern Fulmar	2	1, 2, 3	--	3	--	3
Pacific Loon	1, 2, 3	3	1, 2, 3	3	3	--
Parasitic Jaeger	--	3	2, 3	3	3	--
Pomarine Jaeger	--	--	2, 3	--	3	--
Red-breasted Merganser	3	--	1, 2, 3	3	--	3
Red-necked Phalarope	--	--	2, 3	--	--	--
Red-throated Loon	1, 3	1	1, 2, 3	3	3	--
Red Phalarope	--	--	2	3	--	3
Ross's Goose	--	--	--	3	3	--
Ross's Gull	--	--	3	3	3	--
Sabine's Gull	--	3	3	3	3	3

Species Common Name	Milne Inlet	Eclipse Sound	Steensby Inlet	West Foxe Basin[a]	East Foxe Basin[a]	Hudson Strait[b]
Snow Goose (Lesser + Greater)	1, 2, 3	1, 2, 3	1, 2, 3	2, 3	2, 3	3
Thayer's Gull	2, 3	2, 3	2, 3	3	3	3
Thick-billed Murre	2, 3	2, 3	--	3	3	3
Tundra Swan	3	--	2, 3	3	--	--
Yellow-billed Loon	2, 3	--	2, 3	3	3	--
Total # of Species	**20**	**20**	**26**	**27**	**22**	**21**

Notes:
a: West and East Foxe Basin were not surveyed in 2006, and only surveyed twice in 2007 (September 12th and 20th).
b: Hudson Strait was not surveyed in 2006 and 2007.

Species diversity within each survey area was as follows:

- Milne Inlet: 20 species were recorded; 7 species were seen in all three of the survey years and 4 were seen in only one year.
- Eclipse Sound: 20 species were recorded; 6 species were seen in all three of the survey years and 8 were seen in only one year.
- Steensby Inlet: 26 species were recorded; 11 species were seen in all three of the survey years and 7 were seen in only one year.
- Foxe Basin had a total of 28 different species (West Foxe Basin and East Foxe Basin combined); 19 species were seen in both of the survey years and 8 were seen in only one year.
    - West Foxe Basin alone, had 27 species; 16 species were seen in both of the survey years and 11 were seen in only one year.
    - East Foxe Basin alone, had 22 species; 14 species were seen in both of the survey years and 8 were seen in only one year.
- Hudson Strait was only surveyed in 2008 and 21 species were recorded.

Foxe Basin (West and East Foxe Basin combined) had the highest species diversity although this is not surprising considering that it is the largest of the six survey areas. Steensby Inlet had the second highest species diversity despite being the second smallest of the six areas. Milne Inlet (the smallest survey area) and Eclipse Sound had the lowest species diversity.

Ten of the 34 species recorded were seen in all six areas (arctic tern, black guillemot, Canada goose, common and king eiders, glaucous gull, Iceland gull, long-tailed duck, snow goose, and Thayer's gull), eight species were seen in five of the six areas (black-legged kittiwake, Brant, herring gull, ivory gull, Pacific loon, red-throated loon, Sabine's gull, and thick-billed murre), and three species were seen in only one area (black scoter, harlequin duck, and red-necked phalarope).

3.3.1.1 Species at Risk

For Species at Risk, the harlequin duck (*Special Concern*) was only seen in Hudson Strait, the ivory gull (*Endangered)* was seen in five of the six areas (not seen in Steensby Inlet), and

Ross's gull (*Threatened*) was seen in the three contiguous survey areas (Steensby Inlet, West Foxe Basin, and East Foxe Basin). These three species were recorded in the following areas, on the following dates:

- *Harlequin duck*:
  - Three individuals were seen in Hudson Strait in April, 2008.
- *Ivory gull*:
  - One individual was seen in Milne Inlet in September, 2007;
  - One individual was seen in Hudson Strait in April, 2008;
  - Five individuals were seen in Milne Inlet in August, 2008;
  - One individual was seen in Eclipse Sound in August, 2008;
  - One individual was seen in West Foxe Basin in October, 2008; and
  - One individual was seen in East Foxe Basin in October, 2008.
- *Ross's gull*:
  - One individual was seen in Steensby Inlet in August, 2008;
  - Seventeen individuals were seen in West Foxe Basin in September, 2008;
  - Twenty-two individuals were seen in East Foxe Basis in October, 2008; and
  - Eight individuals were seen in West Foxe Basin in October, 2008.

3.3.1.2 Breeding

Although only 19 of the 34 recorded species were confirmed as breeding (seen on nests or with young during aerial surveys) in the RSA by our surveys, previous ground-based studies have recorded 29 of these species breeding in the area. The lower number of breeders recorded by our surveys is due to the fact that the majority of our surveys were aerial surveys which tend to miss inconspicuous/camouflaged solitary nesting species. As well, some of these 34 species tend to nest further inland, outside of our marine survey transects.

No large, conspicuous seabird nesting colonies were recorded in this study although several are known to exist along the edges of the RSA, particularly on Bylot Island, in Foxe Basin, and along Hudson Strait. However, the fixed-wing surveys conducted in this study did not cover the shoreline areas where these colonies are known to exist as these surveys were designed to survey marine mammals, and marine birds were only surveyed opportunistically. Helicopter surveys covered 100% of the shorelines in both Milne Inlet and Steensby Inlet and found:

- two moderately sized glaucous gull colonies (<100 individuals) on the cliffs in Milne Inlet;
- one large snow goose colony (>5000 individuals) on the southwestern shores of Steensby Inlet.

Also, in each of the three survey years, a few dozen female common and king eiders (<48 individuals combined) and a few red-throated loons (<10 individuals) were seen raising young in the coastal marine waters of Steensby Inlet.

3.3.2 Marine Bird Densities

The overall average density of marine birds (# of individuals per 100 km^2, for all species combined) for the RSA was 43.7 individuals per 100 km^2 (0.43/km^2). The average densities in each of the six survey areas were:

- Milne Inlet: 30.5 birds/100 km^2
- Eclipse Sound: 17.2 birds/100 km^2
- Steensby Inlet: 47.3 birds/100 km^2
- Foxe Basin (West Foxe Basin and East Foxe Basin combined): 73.9 birds/100 km^2
    - West Foxe Basin alone: 26.7 birds/100 km^2
    - East Foxe Basin alone: 121.1 birds/100 km^2
- Hudson Strait: 19.5 birds/100 km^2

Marine bird densities were highest in Foxe Basin (largest survey area) and Steensby Inlet (second smallest survey area), and were lowest in Hudson Strait. Seasonal densities were highest in the months of June and August due to large groups of snow geese migrating from Bylot Island just north of the RSA. Large groups of migrating common and king eiders and long-tailed ducks were also seen throughout the area in August.

The five most abundant species (highest average densities across all surveys and all three years) were, in descending order: snow geese, eiders (common and king eiders combined as they were often difficult to distinguish during fixed-wing surveys), Brant, arctic terns and long-tailed ducks. The terrestrial portion of the RSA has an abundant supply of tundra wetlands, streams, rivers, and waterbodies of various sizes, offering a large supply of seemingly suitable nesting habitat for all five of these species (Evans 2006, 2007). Most of these species used the marine coastal waters of Steensby Inlet as staging grounds during their spring and fall migrations and dozens of eiders used these coastal waters to raise their young.

3.3.2.1 Snow Geese

Each year tens of thousands of snow geese were seen using the RSA for spring and fall migratory stop-overs (spring: June; fall: late July - late September) and it is believed that most of these birds were travelling to and from nesting grounds on Bylot Island. These stop-over locations were most heavily concentrated in the Steensby Inlet region, especially within the marine waters and low-lying tundra areas adjacent to the Steensby coastline (inland to approximately 10 km). Dozens of snow goose nests were also observed scattered throughout the RSA in all three years of the terrestrial baseline studies (14 in 2006, 79 in 2007, and 171 in 2008) and a colony of more than 5000 individuals was recorded along the southwestern shore of Steensby Inlet, just to the southwest of the RSA.

IQ studies indicated that snow geese are an important harvest species for North Baffin communities as the birds, eggs and down feathers are all harvested. Since snow geese are both culturally and ecologically important within the RSA and Sirmilik National Park, and because of their sheer numbers and sensitivity to disturbance, this species would be a suitable

candidate for a Valued Ecosystem Component (VEC) for the Project's environmental impact assessment and wildlife monitoring program.

3.3.2.2 Common and King Eiders

Common and king eiders were also seen in large migratory flocks in the coastal waters of the RSA during their spring and fall migrations, and dozens of females were seen raising broods in Steensby Inlet around the proposed port facilities although no nests were found during ground surveys for songbirds and shorebirds. Both species of eiders have been rated as *Sensitive* by the Government of Nunavut (CESCC 2005) and although they are not listed by COSEWIC and SARA they have recently been identified as a *Species of Interest* by the Canadian Wildlife Service because of an unexplained nationwide decline observed over the past decade (Goudie et al. 2000, Suydam 2000).

IQ studies indicate that eiders are of similar community importance as snow geese in terms of harvesting and consuming and some Inuit still use eider feathers in clothes, pillows, and quilts. These two species would also make suitable candidates for VECs for the environmental impact assessment and for the Project's wildlife monitoring program.

3.3.2.3 Brant

Brant were often seen migrating in large flocks through Steensby and Milne Inlets, and like the snow geese discussed above, were believed to be headed to and from nesting grounds on Bylot Island. However, the largest densities of Brant were seen in East Foxe Basin where numerous large colonies have been reported by other studies.

3.3.2.4 Arctic Terns

Arctic terns were consistently seen foraging right across the RSA in both the marine and terrestrial environments but were most common in East Foxe Basin and Eclipse Sound.

3.3.2.5 Long-tailed Ducks

Long-tailed ducks also migrated through the Project area in large numbers in all three years of the study and most inland freshwater lakes had at least one nesting pair. Their highest concentrations were found in West Foxe Basin and Steensby Inlet during their fall migration in August.

4.0 CONCLUSIONS

4.1 General Conclusions

Tidal mudflats, low-lying coastal tundra, estuaries, salt marshes, sedge meadows, and marine waters provide important feeding, nesting and brood-rearing habitat for numerous species of birds such as seabirds, geese, ducks, eiders, loons, and shorebirds. The vast and diverse

marine environments of Milne Inlet, Eclipse Sound, Steensby Inlet, Foxe Basin and Hudson Strait offer an abundant supply of seemingly suitable habitat to these birds and our three years of surveys indicated that at least 34 species use the area in relatively high densities. At least 19 species were confirmed to be nesting in the Project's RSA but previous studies indicate this number is likely closer to 29. Baseline studies also indicate that the RSA is a major migration corridor for several species of birds (both marine and terrestrial) including snow geese, common and king eiders, Brant, and long-tailed ducks. In fact, the five most abundant species were snow geese, common and king eiders, Brant, arctic terns and long-tailed ducks.

No large, conspicuous seabird nesting colonies were recorded in the Project's LSA although several are known to exist along the outside edges of the RSA, particularly on Bylot Island, in Foxe Basin, and along Hudson Strait. Helicopter surveys found two moderately sized glaucous gull colonies (<100 individuals) on the cliffs in Milne Inlet, a large snow goose colony (>5000 individuals) on the southwestern shores of Steensby Inlet, and a few dozen female common eiders, king eiders, and red-throated loons raising young in the coastal marine waters of Steensby Inlet.

4.2 Brief Comments on Potential Project Effects and a Brief Assessment of Marine Species' Vulnerability

Although disturbance and habitat loss due to port construction and operational activities would most likely be restricted to small areas in and around the port sites' footprints (i.e. local scale effects), and along the shipping lanes (periodic, short-term effects), there are still several pathways through which Project activities could potentially affect birds that rely on marine and coastal environments for part or all of their annual cycle. These include:

- Both short-term (i.e. construction-related) and long-term (i.e. operation-related) disturbances and the loss of habitat at the proposed port sites in Steensby and Milne Inlets;
- The accidental introduction of contaminants into the marine waters from the ports or ships, and the subsequent potential for direct (poisoning) and indirect (food chain effects) mortality to birds;
- The alteration of local marine water quality or food supply due to contamination from bilge water, grey water, or ballast water discharges from ships;
- Periodic short-term disturbances caused by ships travelling along the proposed shipping routes from Steensby and Milne Inlets to the North Atlantic Ocean.

Since there are no major colonies of marine birds in the immediate vicinities of the proposed port sites in Steensby and Milne Inlet, disturbance associated with these ports will be restricted to species that nest in less dense groups (i.e. eiders) or solitary nesters (i.e. loons, shorebirds), and to birds that feed in the nearshore environment (eiders, loons, waterfowl, gulls), coastal tundra flats (geese), or along the shorelines and mudflats (shorebirds). In general, when adult birds leave the nest due to a disturbance, it exposes the eggs or nestlings to an increased probability of being predated and an increased potential for death due to exposure in cold environments. For cliff-nesting species, eggs or young being knocked off the nesting ledge is an

additional danger. Reduced nesting success has been linked to disturbance for many bird species including black guillemots, thick-billed murres, northern fulmars, long-tailed ducks, and common eiders (Cairns 1980, Curry and Murphy 1995). In contrast, nest disturbance appears to have little effect on the reproductive success of black-legged kittiwakes or glaucous gulls (Baird and Hatch 1979, Gilchrist 1995).

There appears to be a lack of information describing the level of disturbance required to cause birds to flush from or abandon their nest completely. Most information regarding nest disturbance relates to human approaches to within close proximity (meters) of the nest, the capture of adults or young for banding purposes, or the handling of eggs by researchers. There does not appear to be any literature discussing bird responses to ship movements within close proximity to the nest site, and only limited information regarding aircraft-related disturbances. Information about bird flushing distances in response to ship passage is required to properly assess this and should be gathered during the Project's environmental monitoring program.

Discharges from ships (i.e. bilge water, grey water, ballast water) can alter water quality and food supplies (lower trophic level biota) in the immediate vicinity of the ship. The potential for impacts due to ships' discharges such as these can be minimized with environmentally appropriate operating procedures. Numerous federal and territorial regulations and guidelines are in place to minimize the risk of these types of impacts on Canada's marine environments and are enforced under Canada's *Shipping Act* (2001) and Canada's *Arctic Waters Pollution Prevention Act* (1985). BIMC discusses these issues and their proposed discharge management plans in Section 3.6.6.2 of the *Updated Project Description for the Mary River Project* (2009).

The accidental introduction of deleterious contaminants such as hydrocarbons (oil spills) or metals (i.e. from ore dust released during loading operations) into marine waters can have serious consequences for birds. Effects can be manifested through direct contact with the substance or indirectly through uptake of the substance via the food chain (i.e. increase in cadmium in murres between years; Donaldson et al. 1997). Generally, populations of solitary nesting birds are at less risk to this type of impact because smaller numbers of individuals are likely to be exposed. In contrast, colonial nesting species are at greater risk because a larger proportion of the population is concentrated into a small area and, if that area is contaminated, a large number of birds would be vulnerable to exposure (Mallory and Fontaine 2004). Furthermore, colonial seabirds generally forage in large groups and within close proximity to the colony, and an accidental fuel spill or introduction of some other deleterious substance could contaminate food resources for a large number of birds (Mallory and Fontaine 2004).

Contamination of the marine environment through large catastrophic oil spills from ships carrying large resupply loads to the ports, or from small chronic fuel leaks does have the potential to cause large negative impacts on local marine bird populations. Actually quantifying the risks and impacts of either catastrophic spills or chronic oil pollution is difficult to do, at best, and requires detailed analyses and spill modelling (these will be conducted for the *Environmental Impact Statement for the Marine Environment*, Volume 8). However, the risks of

these types of impacts are generally mitigated by routing ships away from large seabird colonies, by following appropriate operating guidelines and regulations developed to maximize environmental protection, and by developing swift and effective emergency spill contingency plans.

In general, it is thought that ship movement through offshore areas will have inconsequential effects on marine birds along the shipping lanes. Bird collisions with ships is unlikely and the periodic requirement to move out of a ship's path will not be a major energetic stress to birds. Alterations to sea ice configuration caused by the passage of ice-breaking ore carriers in winter will also likely have little effect on birds as these alterations are not expected to affect available polynyas and shore leads.

In summary, although there will be some localized habitat loss and chronic disturbance, overall, the Project's proposed activities are not likely to have serious implications for any species' regional or national populations. Species abundance and habitat use will almost certainly be altered within the port footprints, and to some extent within a certain zone of influence around them (the LSA), as some individuals are forced out to neighbouring areas. An effective mitigation and monitoring plan is needed in order to ensure these potential impacts are minimized, and to properly monitor and assess local effects of the Mary River Project to marine birds.

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Igoolik

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Pond Inlet

Matthew Akoomalik, Timothy Aksarjuk, Ishmael Katsak, Gamailie Kilukishak, Daniel Komangapik, Letia Kyak, Joannasie Mucpa, Joannasie Mucpa, Qamaniq Sanguya.

7.0 GLOSSARY AND ABBREVIATIONS

7.1 Glossary

Abundance	The total number of individuals, or the total amount of a resource (i.e. food, water, habitat) present in an area, population, or community. '*Absolute abundance*' refers to the exact number present and '*relative abundance*' refers to the relative number in one area compared to another area and is a less specific estimate (i.e. an index of high, medium, low).
Baseline	Pre-existing environmental settings in the Project area as they exist naturally or pre development, against which changes in the environment from a project can be assessed.
Chronic Oil Pollution	The persistent presence of oil in the aquatic environment (i.e. leakage from passing ships or leaks on land that make it into the aquatic environment, oil in bilge water) that is much less detectable than large catastrophic spills but may actually cause more harm to aquatic systems over time. Compare to *Catastrophic Oil Spill*.
Catastrophic Oil Spill	Spills that usually result from a one- time accidental release of large quantities of oil. Compare to *Chronic Oil Pollution*.
Community (ecological)	An assemblage of species occurring in the same space or time, often linked by biotic interactions such as competition or predation.
Distribution	The boundaries or ranges within which individuals of a particular species are found.
Ecosystem	A dynamic complex of plant, animal, and microorganism communities and their abiotic environment interacting as a functional unit, usually within the certain set of boundaries (i.e. a coastal ecosystem, or a wetland ecosystem).
Endangered Species	A wildlife species that is facing imminent extirpation or extinction.
Important Bird Area	Habitat areas designated by Bird Studies Canada and Nature Canada as being ecologically important to bird populations. These areas are identified using specified criteria that are internationally agreed upon, standardized, quantitative, and

	scientifically defensible.
Inuit Qaujimajatuqangit (IQ)	Inuit traditional knowledge gained by individuals who have extensive experience in a geographic location and from personal observations rather than through scientific methods.
Key Marine Habitat Site	A marine or coastal area that is designated by Environment Canada's Canadian Wildlife Service as being considered essential to at least 1% of the Canadian population of at least one bird species, and where special conservation measures may be required. These areas are determined using internationally standardized protocols to identify important bird habitats.
Key Terrestrial Habitat Site	A terrestrial area that is designated by Environment Canada's Canadian Wildlife Service as being considered essential to at least 1% of the Canadian population of at least one bird species, and where special conservation measures may be required. These areas are determined using internationally standardized protocols to identify important bird habitats.
Listed Species	Species listed by the federal or territorial government as being at some level of risk, such as extirpated or extinct, endangered, threatened, or of special concern.
Local Study Area	The study area that describes areas within and directly adjacent to the Project footprint, and that may be subject to direct and indirect effects. See *Regional Study Area*.
Mitigation	An action taken against an impact in order to eliminate or minimize its effect.
Monitoring	The systematic observation of tracking of an activity to determine whether it is proceeding or functioning as expected. Through monitoring, the accuracy of environmental impact predictions is assessed.
Marine Bird	Any bird that occupies a marine (salt water) environment at anytime during its annual cycle (i.e. migration, breeding, over-wintering) such as seabirds, geese, eiders, ducks, terns and gulls.
Natural Variation	Measureable change in an environmental indicator or variable (i.e. number of individuals in a population, or number of species in a community) that occurs from natural processes

	such as population cycles, and are not a result of human-induced disturbance(s).
Project Footprint	Areas of direct disturbance and habitat loss due to Project facilities, roads and other infrastructure.
Regional Study Area	The study area that describes the Project's regional context that may be subject to indirect effects as well as areas that could function as control areas beyond the range of Project impacts.
Seabird	A bird that spends more than 50% of its annual cycle in the marine environment (i.e. coastal salt waters and the open ocean) and whose evolutionary history has been primarily marine (i.e. murres, dovekies, guillemots, razorbills, puffins, petrels, fulmars, shearwaters, cormorants, albatrosses, and gulls).
Schedule 1	Under Canada's *Species at Risk Act* (*SARA*), is the official list of species that have been designated by COSEWIC as being extirpated (extinct in Canada), endangered, threatened, or of special concern and are officially protected by *SARA* regulations.
Schedule 2	Under Canada's *Species at Risk Act* (*SARA*), species that have been previously designated as being extirpated (extinct in Canada), endangered, threatened, or of special concern, but have yet to be reevaluated by COSEWIC under new *SARA* criteria and are not currently protected by *SARA* regulations. Once these species have been reassessed, they may be considered for inclusion in Schedule 1.
Schedule 3	Under Canada's *Species at Risk Act* (*SARA*), species that have been previously designated as being of special concern, but have yet to be reevaluated by COSEWIC under new *SARA* criteria and are not officially protected by *SARA* regulations. Once these species have been re- assessed, they may be considered for inclusion in Schedule 1.
Species at Risk	Under Canada's *Species at Risk Act* (*SARA*), a species that has been designated by COSEWIC as being extirpated, endangered, threatened, or a species of special concern.
Species Diversity	A relative index describing the number of species found in an

	area and their relative abundance. *Compare to Species Richness*.
Species Richness	The number of different species within a given area. *Compare to Species Diversity.*
Species of Special Concern	A species that may become threatened or endangered because of a combination of biological characteristics and identified threats, and/or a species for which very little information is available.
Threatened species	A species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Valued Ecosystem Component	Environmental attributes or components perceived to be locally important based on local ecological, social, cultural, and/or economic reasons.
Zone of Influence	The geographic area where species behaviour and/or abundance may be influenced by Project activities.

7.1.1 Abbreviations

BIMC - Baffinland Iron Mines Incorporated

COSEWIC - Committee on the Status of Endangered Wildlife in Canada

CWS - Canadian Wildlife Service (Environment Canada, Government of Canada)

GN - Government of Nunavut

IBA - Important Bird Area

IQ - Inuit Qaujimajatuqangit

KMHS - Key Marine Habitat Site

KTHS - Key Terrestrial Habitat Site

LSA - Local Study Area

MBCA - Migratory Birds Convention Act

RSA - Regional Study Area

SARA - Species at Risk Act

VEC - Valued Ecosystem Component

WMMP - Wildlife Mitigation and Monitoring Plan

8.0 CLOSING

This report has been prepared by Matthew Evans, Ph.D. and reviewed by Mark E. Taylor, Ph.D., R.P.Bio, Senior Environmental Scientist.

Matthew Evans, Ph.D.
Senior Biologist

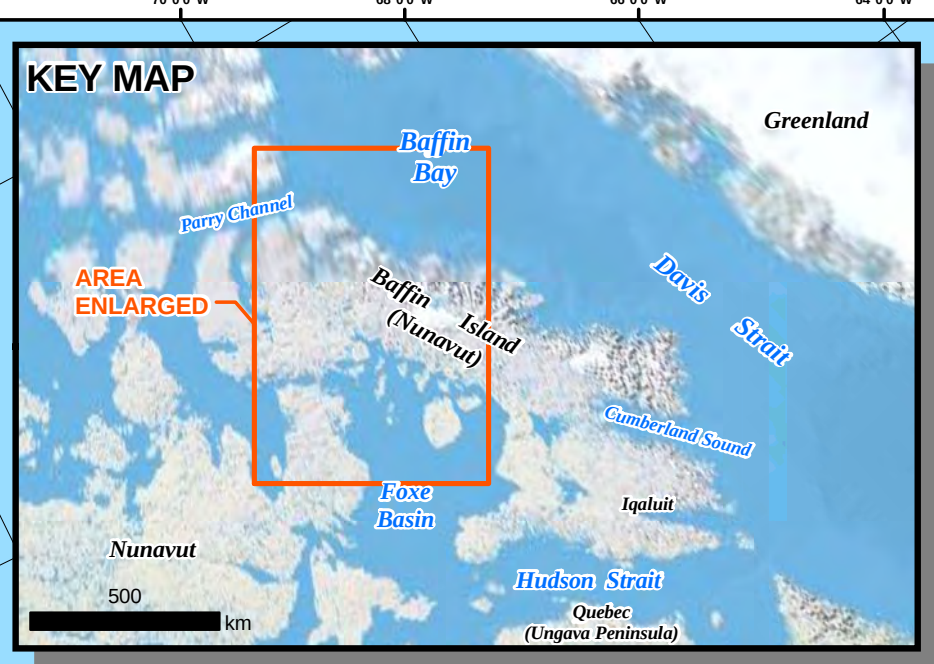
December 1, 2010
Date

Mark E. Taylor, Ph.D., R.P.Bio
Senior Environmental Scientist

December 1, 2010
Date

80°0'0"W 78°0'0"W 76°0'0"W 74°0'0"W 72°0'0"W 70°0'0"W 68°0'0"W 66°0'0"W 64°0'0"W

72°0'0"N 71°0'0"N 70°0'0"N 69°0'0"N 68°0'0"N 67°0'0"N 66°0'0"N



Devon Island

Parry Channel (Lancaster Sound)

Baffin Bay

Bylot Island

Navy Board Inlet

Borden Peninsula

Pond Inlet

Eclipse Sound

Milne Inlet

Milne Inlet Camp and Port

Mary River Site

Baffin Island

Angajurjualuk Lake

Barnes Ice Cap

Steensby Inlet Camp and Proposed Port

Steensby Inlet

Jens Munk Island

Koch Island

Bray Island

Baird Peninsula

Fury and Hecla Strait

Igloolik Island

Rowley Island

Air Force Island

Prince Charles Island

South Spicer Island

Gulf of Boothia

Melville Peninsula

Foxe Basin

P:\EM\Projects\2010\TC101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\Project_and_SiteLocation_Map.mxd

LEGEND

- Mary River Project Site Location
- Major Camp Location

NOTES:
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite
- Key map data provided by ESRI

Datum: WGS84
Projection: LAEA-Canada

0 30 60 120 180 240 300 Kilometres

Baffinland Iron Mines Corporation

amec

MARY RIVER PROJECT

Project Site Location

PROJECT N°: TC101507	**FIGURE: 1**
SCALE: 1:2,450,000	DATE: August 2010

ARCTIC BAY
ᐊᕐᑕᑎᒃ

NANISIVIK MINE
ᓇᓂᓯᕕᒃ ᓴᖅᓱᓐᓂᒃ

POND INLET
ᐱᓕᒪᓪᓗᒃ

BAFFIN BAY
ᐊᒻᐹᓪᓚᑦ ᖃᐅᓪᓚᓪᓗᒃ ᐊᒻᓴᓐᖑᓂᑲᓐᓂᖅ ᐃᑭᖓ

MILNE PORT
ᑐᓵᒡᓘᒃ ᑭᖓᐊᓐᓂ

MINE SITE
ᐅᐅᕐᓯᐅᓘᒃ

MILNE INLET TOTE ROAD
ᑭᖓᐊᓂ ᐊᓘᔪᑎ ᐅᓯᑲᒡᓘᒃ

NUNAVUT SETTLEMENT AREA BOUNDARY
ᓄᓇᕗᑦ ᐃᓕᓴᐅᓂ

CLYDE RIVER
ᑲᖏᒡᔪᒪᒃ

PROPOSED RAILWAY
ᓄᓇᓯᑎᑎᓄᑦ ᐊᓱᑎᒋᓂᐊᑦᑕᖏᑦ

STEENSBY PORT
ᐃᒃᐱᑭᑦᓯᐊᓘᑉ ᑐᓵᒡᓘᒃ

STEENSBY INLET

AGU BAY

TALOYOAK
ᒡᓗᔪᐊᓘᖅ

SIORARSUK PENINSULA

IGLOOLIK
ᐃᒃᓚᓪᒃ

GJOA HAVEN
ᑉᔪᐊᕈᑎᖅ

GARRY BAY

KUGAARUK
ᐊᒡᕐᓱᒃ

HALL BEACH
ᓴᓂᖅᐳᒃ

PILING BAY

BAFFIN ISLAND
ᖁᕕᖏᓪᓚᓪᒃ

QIKIQTARJUAQ
ᖁᕕᖏᑦᔪᐊᓘᖅ

MELVILLE PENINSULA

CAPE JERMAIN

REPULSE BAY
ᓇᐅᐳᑦ

FOXE BASIN
ᐃᒃᓚᓪᓕᐅᑦ ᐃᒪᖏᓐ

LOCAL STUDY AREA
ᖃᐅᔨᓴᖏᐊᕐᓂᐊᓕᖅᖓᑦ

PANGNIRTUNG
ᐸᖏᓂᕐᑎᖅ

BAKER L
ᐱᑲᕐ

SOUTH HAMPTON ISLAND

CORAL HARBOUR
ᓴᖑᓪᓕ

CAPE DORSET
ᑭᐅᔭᓄᑦ

IQALUIT
ᐃᖃᓗᐃᑦ

KIMMIRUT
ᑭᒥᒋᑦ

LABRADOR SEA
ᓚᕐᔪᐊᓗ ᒪᓂᐅᖏᓐᓄᑦ

HUDSON STRAIT
ᒪᓂᐅᓴ ᐊᔪᓐᓚᖅ

QUAQTAQ
ᖁᐊᖅᑕᐊᖅ

AKULIVIK
ᐊᑯᓕᕕᒃ

KANGIRSUK
ᑲᓐᖑᓕᓴᒃ

50km

50km

0 250,000 500,000 750,000 1,000,000 1,250,000 1,500,000

8,000,000 7,750,000 7,500,000 7,250,000 7,000,000 6,750,000

ᐃᓕᓴᕐᓂᐊᕐᓂᒃ ᑲᑎᒪᔨᖅᑐᑦ (ᓄᓕᖅᓱᓪᓗᒍ)
NANISIVIK MINE (DECOMMISSIONED)

ᒪᓂᓗᒋᑦ ᑐᓵᒡᓘᒃ ᐅᓴᐅᑦᑕᕐᓂ
MILNE INLET TOTE ROAD

ᓄᓇᕗᑦᑎᓂᒃ ᐊᓱᑎᒋᓂᐊᑦᑕᖏᑦ
PROPOSED RAILWAY ALIGNMENT

ᓄᓇᕗᑦ ᐃᓕᓴᕐᓂ
NUNAVUT SETTLEMENT AREA BOUNDARY

ᐅᒥᐊᑦᑕ ᐊᓱᑎᒋᓂᐊᑦᑕᖏᑦ - ᐊᖏᔪᓕᒃᓴ ᐃᒃᑲᖅᑐᓂᐊᑎᓗᔪ
NOMINAL SHIPPING ROUTE - YEAR-ROUND

ᐅᒥᐊᑦᑕ ᐊᓱᑎᒋᓂᐊᑦᑕᖏᑦ - ᐊᐅᔨᐃᓄᓂ ᐅᒥᐊᑦᑕᐅᖅᑕᕐᓂᓐᓄᑦ ᓯᕗᓪᓕᖅᐹᒪᓂᖅ
NOMINAL SHIPPING ROUTE - OPEN WATER SHIPPING ONLY

ᓄᓇᕗᑦᓂ ᐊᑐᐅᓂᖅ ᓄᓇᕗᒻᒥᐅᓂᑦ ᓴᓗ ᓄᓇᕗᒻᒥᐅᓂᑦ
AREA OF EQUAL USE AND OCCUPANCY NUNAVUT AND NUNAVIK

ᓯᓚᖓᑦ
ICE EDGE

ᐃᓚᓂᐅᑎᑦᑎᐊᓕᓚᐅᖏᓐᓄᑦ ᐊᖏᔪᓕᒪᓗᑎᒃ ᐅᒥᐊᑦᑕᐃᓕᖅᓯᒪᓂᐊᓂᒃᓯᒪᓂᖅ
PROBABLE EXTENT OF YEAR-ROUND SHIPPING

ᐃᒥᖅ
WATER

ᖁᕕᐊᓗᒃ ᐊᐅᓚᓂᒃ ᖃᐅᔨᓴᖏᐊᕐᓂᐊᓕᖅᖓᑦ
MARINE REGIONAL STUDY AREA

ᖃᐅᔨᓴᖏᐊᕐᓂᐊᓕᖅᖓᑦ
LOCAL STUDY AREA

ᖃᐅᔨᓴᖏᓐᓄᑦ
NOTES:

1. ᓄᓇᕗᒻᒥᔭᐊᑦᑕᐃᑦ ᐃᐃᓐ ᑲᓇᑕᒧᑦ
BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.

2. ᓄᓇᕗᑦ ᑎᑎᕋᓂᖓ ᒪᓕᒐᓐᓄᖓ UTM (NAD83) ZONE 17 AND IS IN METRES.
COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

SCALE 50 25 0 50 100 150 200 250 km

BAFFINLAND IRON MINES CORPORATION

ᓄᓚᒋᑐᓂ ᐅᑦᑭᕐᓂᐅᑎᒋᑦ MARY RIVER PROJECT

ᐳᐃᓐᒥᓂᖅ ᖃᐅᔨᓴᖏᐊᕐᓂᐊᓕᖅᖓᑦ
MARINE STUDY AREA

Knight Piésold CONSULTING

P/A NO. NB102-181/25

REF NO. NB10-00694

FIGURE 2

REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	16DEC'10	ISSUED WITH AMEC REPORT	RAC	ASM	RE	RE

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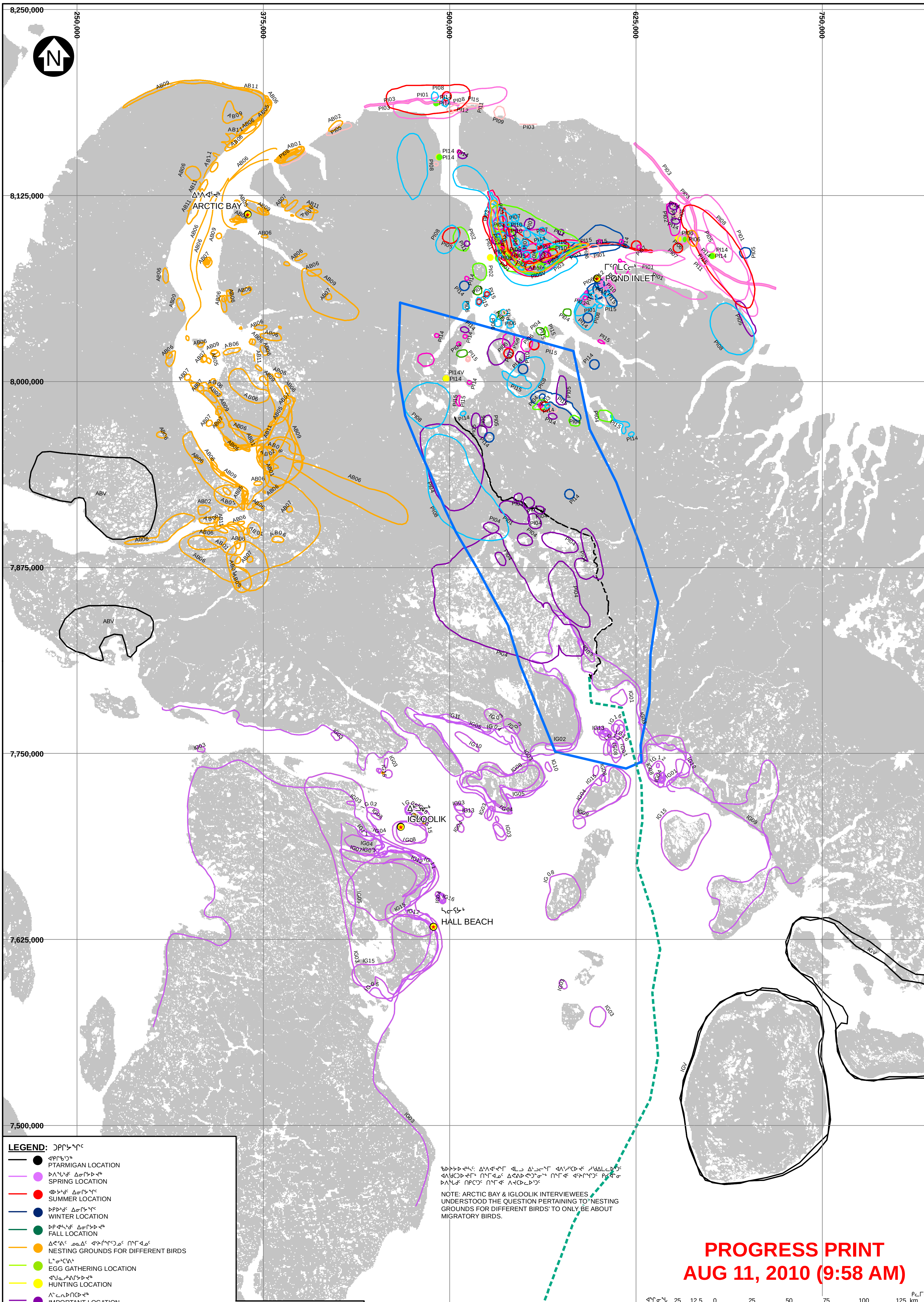

LEGEND: ᑐᑭᓯᔾᔪᑏᑦ

- ᐊᕿᒡᒋᖅ — PTARMIGAN LOCATION
- ᐅᐱᕐᖓᒃᑯᑦ ᐃᓂᖏᓐᓂᖅ — SPRING LOCATION
- ᐊᐅᔭᒃᑯᑦ ᐃᓂᖏᓐᓂᖏᑦ — SUMMER LOCATION
- ᐅᑭᐅᒃᑯᑦ ᐃᓂᖏᓐᓂᖏᑦ — WINTER LOCATION
- ᐅᑭᐊᒃᓵᒃᑯᑦ ᐃᓂᖏᓐᓂᖅ — FALL LOCATION
- ᐃᐸᕐᕕᐃᑦ ᓄᓇᐃᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ ᑎᖕᒥᐊᓄᑦ — NESTING GROUNDS FOR DIFFERENT BIRDS
- ᒪᓐᓂᒃᑕᕐᕕᒃ — EGG GATHERING LOCATION
- ᐊᖑᓇᓱᒃᕕᖏᓐᓂᖅ — HUNTING LOCATION
- ᐱᓗᐊᕐᑐᒥᒃ ᐃᓂᖏᓐᓂᖅ — IMPORTANT LOCATION
- ᒥᑎᑦ ᐊᒻᒪ ᑲᖑᐃᑦ ᐃᐸᕐᕕᖏᑦ — DUCKS AND GEESE NESTING LOCATION
- ᑎᒥᐊᑦ ᐊᖑᓇᓱᒃᑎᐅᔪᑦ ᐃᓂᖏᓐᓂᖅ — RAPTOR NESTING LOCATION
- ᑎᖕᒥᐊᑦ ᑕᕆᐅᕐᒥᐅᑕᓄᑦ ᐃᐸᕐᕕᖏᑦ — SEA BIRD NESTING LOCATION
- ᕿᒧᒃᓯᖅ ᐊᖁᑎ ᐅᓯᒃᑕᕐᕕᒃ — MILNE INLET TOTE ROAD
- ᓄᓇᓯᐅᑎᑦ ᐊᖁᑎᖓ ᐸᕐᓇᐅᑎᖃᕐᓂᖅ — PROPOSED RAILWAY ALIGNMENT
- ᐃᖏᕐᕋᕐᕕᖏᑦ ᐅᒥᐊᕐᔪᐊᓄᑦ ᐊᖁᑎᖓ ᑕᑯᔭᒃᓴᖅ — NOMINAL SHIPPING ROUTE
- TERRESTRIAL RSA

ᖃᐅᔨᔭᐅᔪᓐᓇᖅᑐᑦ: ᐃᒃᐱᐊᕐᔪᖕᒥ ᐊᒻᒪ ᐃᒡᓗᓕᖕᒥ ᐊᐱᕐᓱᖅᑕᐅᔪᑦ ᓱᖁᐃᓯᓇᖅᑐᑦ ᐊᐱᕐᑯᑕᐅᔪᒥᒃ ᑎᖕᒥᐊᓄᑦ ᐃᐸᕐᕕᐅᔪᓂᒃ ᑎᖕᒥᐊᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᑭᓯᐊᓂ ᐅᐱᕐᖓᒃᑯᑦ ᑎᑭᑦᑐᑦ ᑎᖕᒥᐊᑦ ᐱᔪᑦᑕᐅᓚᐅᖅᑐᑦ

NOTE: ARCTIC BAY & IGLOOLIK INTERVIEWEES UNDERSTOOD THE QUESTION PERTAINING TO 'NESTING GROUNDS FOR DIFFERENT BIRDS' TO ONLY BE ABOUT MIGRATORY BIRDS.

PROGRESS PRINT
AUG 11, 2010 (9:58 AM)

ᐊᖏᓂᖓ SCALE: 25 12.5 0 25 50 75 100 125 km ᑭᓛᒥᑕ

ᖃᐅᔨᒪᔭᐅᖁᔭᐃᑦ **NOTES**:

1. ᓄᓇᖑᐊᖅ ᑐᙵᕕᖓ: ᑯᐃᓐ ᑲᓇᑕᒧᑦ
BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
2. ᓄᓇᖑᐊᑉ ᑎᑎᕋᖅᓯᒪᓂᖓ ᒪᓕᒃᖢᒍ UTM (NAD83) ZONE 17 AND IS IN METRES.
COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. ᐅᓇ ᓄᓇᖑᐊᖅ ᓴᖅᑭᑕᐅᓯᒪᔪᖅ ᑐᑭᓯᔪᓐᓂᖃᐃᑦ ᐅᖃᐅᓯᐅᔪᑦ ᐃᓄᓐᓄᑦ ᐊᕿᖅᑳᖅᑯᖃᑦᑕᖅᑐᓂ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ ᓄᓇᓕᒥᐅᑦ ᐊᐱᖅᓱᖅᑕᐅᓪᓗᑎᒃ ᓄᓇᖏᑦ ᒥᒃᓵᓄᑦ. ᑖᒃᑯᐊ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐃᓄᓐᓄᑦ ᓴᖅᑭᑎᓪᓗᒋᑦ ᓄᓇᐅᑉ ᐊᑐᖅᑕᐅᓂᖓᓂᒃ ᐊᒻᒪ ᓄᓇᖏᑦ ᖃᐅᔨᒪᓂᖏᓐᓂᒃ ᐃᓄᖏᑦ. ᐅᓇ ᓄᓇᖑᐊᖅ ᐃᓗᐃᑦᑐᖑᖏᑦᑐᖅ ᑭᒡᒐᖅᑐᐃᓇᓂᓗ ᐃᓗᐃᑦᑑᒥᒃ ᑕᒪᐃᑕ ᐊᑐᖅᓯᒪᔭᖏᓐᓂᒃ ᓄᓇᐅᑉ.
THIS MAP WAS PRODUCED FROM INFORMATION COLLECTED DURING INUIT QAUJIMAJATUQANGIT INTERVIEWS WITH LOCAL RESIDENTS. THIS INFORMATION SHOWS PATTERNS OF LAND USE AND LOCAL KNOWLEDGE OF THE LAND. THE MAP IS NOT INTENDED TO BE A COMPLETE REPRESENTATION OF WHAT IS KNOWN.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	DDMMM'10	ISSUED WITH REPORT	MLT	ASM	-	-

BAFFINLAND IRON MINES CORPORATION

ᓄᓘᔾᔭᓂ ᐅᔭᕋᓯᐅᕐᑐᑦ — MARY RIVER PROJECT

ᓇᒧᓈᖅᑕᐅᓂᖏᑦ ᑎᖕᒥᐊᕐᑲᕙᓐᓂᖏᑦ ᖃᐅᔨᔭᐅᓂᖏᑦ ᐊᐱᕐᓱᖅᑕᐅᓂᖏᑦ

BIRD LOCATIONS - NORTH BAFFIN REGION (INTERVIEW RESULTS)

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/25	1

ᑎᑎᖅᑲᓯᒪᔪᖅ FIGURE **3** — REV 0

SAVED: I:\102\00181\25\A\GIS\ArcView\figures\B66.mxd; Aug 10, 2010 8:12:19 AM amoore

81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W

73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N

Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Navy Board Inlet
Bylot Island
Eclipse Sound
Pond Inlet
Milne Inlet
White Bay
Oliver Sound
Tay Sound
Paquet Bay
Milne Inlet Camp and Port

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 12
- 13 - 45
- 46 - 100
- 101 - 200

0 4.5 9 18 27 36 45 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in August 2006.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

Baffinland Iron Mines Corporation

amec

MARY RIVER PROJECT

Helicopter Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, August 20 and 21, 2006

PROJECT N^{o}: TC101507	**FIGURE: 4**
SCALE: 1:450,000	DATE: August 2010

P:\EM\Projects\2010\TC101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\MilneEclipseS_Aug2006_ME Helicopter.mxd

81°0'0"W 80°50'0"W 80°40'0"W 80°30'0"W

72°3'0"N 72°0'0"N 71°57'0"N 71°54'0"N 71°51'0"N

Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Tununek Mountain

Gull

GLGU

Milne Inlet

GLGU

GLGU

GLGU

GLGU

Milne Inlet Camp and Port

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

1

2

3 - 30

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in August 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Helicopter Survey for Marine Birds in Milne Inlet, August 16, 2007

PROJECT N^{o}: TC101507	**FIGURE: 5**
SCALE: 1:75,000	DATE: August 2010

81°0'0"W 80°50'0"W 80°40'0"W

Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Koluktoo Bay

Tununek Mountain

Milne Inlet

Milne Inlet Camp and Port

N.0.23'72°

N.0.00'72°

N.0.57'71°

N.0.54'71°

N.0.51'71°

GLGU LTDU SNGO RBME KIEI COEI

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point
- 1 - 2
- 3 - 10
- 11 - 20
- 20 - 40

Flight Track for June 2008 Survey (No Track Data Available for July 23)

Flight Tracks for June29th

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in June and July 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

0 0.5 1 2 3 4 5 Kilometres

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MARY RIVER PROJECT

Helicopter Surveys for Marine Birds in Milne Inlet, June 29 and July 23, 2008

PROJECT N°: TC101507	**FIGURE: 6**
SCALE: 1:75,000	DATE: August 2010

81°0'0"W
80°0'0"W
79°0'0"W
78°0'0"W
72°45'0"N
72°30'0"N
72°15'0"N
72°0'0"N
71°45'0"N
71°30'0"N
71°15'0"N

Navy Board Inlet
Bylot Island
Eclipse Sound
Pond Inlet
Oliver Sound
Milne Inlet
Tay Sound
Milne Inlet Camp and Port
Mary River Site
Angajurjualuk Lake

THGU
NOFU
BRAN
COEI
KIEI
SNGO
BLKI
SACR
GLGU
IVGU
EIDE
GYRF
LTDU
ARTE

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 75
- 76 - 200
- 201 - 350
- 351 - 6000

Flight Track Information is not Available for the 2007 Data

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

0 5 10 20 30 40 50 Kilometres

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, August 4, 7, 8, 10, 12, 30, 31, 2007

PROJECT N°: TC101507 | **FIGURE: 7**

SCALE: 1:600,000 | DATE: August 2010

P:\EM\Projects\2010\TC\101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\MilneEclipseS_Aug2007_LGL.mxd

81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W 77°0'0"W 76°0'0"W

73°15'0"N 73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N 71°30'0"N 71°15'0"N

Baffin Bay

Bylot Island

Navy Board Inlet

Eclipse Sound

Pond Inlet

Oliver Sound

Tay Sound

Milne Inlet

Milne Inlet Camp and Port

Mary River Site

BLKI TBMU DOVE DOVE LTDU ARTE BLKI BRAN LTDU BRAN NOFU SNGO SNGO BLKI DOVE DOVE SNGO BRAN BRAN SNGO NOFU GLGU NOFU SNGO SNGO LTDU THGU SNGO GLGU SNGO SNGO SNGO BRAN SACR LTDU SNGO SACR SNGO BRAN SNGO SNGO SNGO BRAN SNGO SNGO SNGO BRAN SNGO SNGO SNGO BRAN SACR SNGO SNGO SNGO GLGU BRAN GLGU SACR SNGO PALO YBLO SNGO SNGO THGU GLGU GBBG SNGO SACR SNGO SNGO SNGO SNGO SNGO BRAN CORA BRAN SNGO

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 125
- 126 - 350
- 351 - 800
- 801 - 1500

Flight Track Information is not Available for the 2007 Data

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

0 5 10 20 30 40 50 Kilometres

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, September 1, 3, 8, 2007

PROJECT N°: TC101507 | **FIGURE: 8**

SCALE: 1:690,000 | DATE: August 2010

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81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W 77°0'0"W

73°15'0"N 73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N 71°30'0"N 71°15'0"N

Bylot Island

Navy Board Inlet

Eclipse Sound

Pond Inlet

Oliver Sound

Tay Sound

Milne Inlet

Milne Inlet Camp and Port

Mary River Site

PEFA DOVE BRAN DOVE ARTE BLKI TBMU BRAN ARTE ARTE BRAN GLGU ARTE SACR BLKI SNGO BLKI BRAN GBBG NOFU NOFU ARTE ARTE BLKI BRAN BLKI ARTE LTDU ARTE BLKI LTDU SNGO ARTE LTDU SNGO BRAN SNGO BRAN SNGO ARTE SNGO ARTE BRAN BRAN SNGO BRAN BRAN SNGO BRAN BRAN SNGO SNGO CORA SNGO BRAN SNGO BRAN GLGU SNGO SNGO SNGO SNGO SNGO SNGO SNGO BRAN SNGO SNGO SNGO PALO SNGO SNGO SACR SACR SNGO BLGU IVGU GLGU BRAN YBLO YBLO YBLO YBLO CAGO YBLO SNGO SNGO SNGO SNGO TUSW

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 100
- 101 - 250
- 251 - 550
- 551 - 1000

0 5 10 20 30 40 50 Kilometres

Flight Track Information is not Available for the 2007 Data

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, September 9, 10, 13, 14, 15, 17, 18, 2007

PROJECT N°: TC101507 | **FIGURE: 9**

SCALE: 1:640,000 | DATE: August 2010

P:\EM\Projects\2010\TC\101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\MilneEclipseS_Sept2007_LGL_9101314151718.mxd

81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W

73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N

Bylot Island

Navy Board Inlet

Eclipse Sound

Pond Inlet

Oliver Sound

Milne Inlet

Tay Sound

Milne Inlet Camp and Port

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point
- 1 - 7
- 8 - 25
- 26 - 60
- 61 - 150

Flight Track for August 2008 Survey (No Data Available for August 7th Flight Tracks)
- Flight Tracks for August 4th
- Flight Tracks for August 5th
- Flight Tracks for August 10th

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, August 4, 5, 7, 10, 2008

PROJECT N°: TC101507 | **FIGURE: 10**

SCALE: 1:500,000 | DATE: August 2010

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Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

82°0'0"W 81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W

73°45'0"N 73°30'0"N 73°15'0"N 73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N

Bylot Island

Navy Board Inlet

Eclipse Sound

Pond Inlet

Oliver Sound

Tay Sound

Milne Inlet

Milne Inlet Camp and Port

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 9
- 10 - 25
- 26 - 60
- 61 - 100

Flight Track for August 2008 Survey

- Flight Tracks for August 21st
- Flight Tracks for August 22nd
- Flight Tracks for August 23rd
- Flight Tracks for August 24th

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet, Navy Board Inlet and Eclipse Sound Regions, August 21, 22, 23, 24, 2008

PROJECT N°: TC101507 | **FIGURE: 11**

SCALE: 1:605,000 | DATE: August 2010

81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W

73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

Navy Board Inlet
Bylot Island
Eclipse Sound
Pond Inlet
Oliver Sound
Milne Inlet
Tay Sound
Paquet Bay
Milne Inlet Camp and Port

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point
- 1 - 60
- 61 - 350
- 351 - 1500
- 1501 - 3500

Flight Track for August 2008 Survey
- Flight Tracks for August 25th
- Flight Tracks for August 26th
- Flight Tracks for August 29th
- Flight Tracks for August 31st

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, August 25, 26, 29, 31, 2008

PROJECT N°: TC101507	**FIGURE: 12**
SCALE: 1:500,000	DATE: August 2010

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81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W

73°0'0"N 72°45'0"N 72°30'0"N 72°15'0"N 72°0'0"N 71°45'0"N

Bylot Island

Navy Board Inlet

Eclipse Sound

Pond Inlet

Tremblay Sound

Milne Inlet

Oliver Sound

Tay Sound

Milne Inlet Camp and Port

NOFU BLGU BRAN CAGO SNGO GLGU THGU PAJA TBMU GLGU BLKI

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point
- 1 - 18
- 19 - 60
- 61 - 200
- 201 - 350

Flight Track for September 2008 Survey
- Flight Tracks for September 1st
- Flight Tracks for September 2nd
- Flight Tracks for September 3rd

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in the Milne Inlet and Eclipse Sound Regions, September 1, 2, 3, 2008

PROJECT N°: TC101507 | **FIGURE: 13**

SCALE: 1:500,000 | DATE: August 2010

P:\EM\Projects\2010\TC101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\MilneEclipseS_Sept2008_LGL.mxd

79°30'0"W 79°0'0"W 78°30'0"W 78°0'0"W 77°30'0"W 77°0'0"W 76°30'0"W

70°10'0"N 70°0'0"N 69°50'0"N 69°40'0"N

Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Aulasivik Peninsula

Steensby Inlet Camp and Proposed Port

Steensby Inlet

Neergaard Lake

Grant-Suttie Bay

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 40
- 41 - 120
- 121 - 300
- 301 - 600

0 10 20 40 60 80 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in August 2006.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

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MARY RIVER PROJECT

Helicopter Surveys for Marine Birds in Steensby Inlet, August 22 and 23, 2006

PROJECT N°: TC101507	**FIGURE: 14**
SCALE: 1:365,000	DATE: August 2010

79°30'0"W 79°0'0"W 78°30'0"W 78°0'0"W 77°30'0"W 77°0'0"W 76°30'0"W

70°10'0"N 70°0'0"N 69°50'0"N

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Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Aulasivik Peninsula

Steensby Inlet Camp and Proposed Port

Steensby Inlet

Neergaard Lake

Grant-Suttie Bay

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 18
- 19 - 60
- 61 - 150
- 151 - 300

0 10 20 40 60 80 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in August 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Helicopter Surveys for Marine Birds in Steensby Inlet, August 3, 5, 13, 2007

PROJECT N°: TC101507 | **FIGURE: 15**

SCALE: 1:365,000 | DATE: August 2010

80°0'0"W 79°30'0"W 79°0'0"W 78°30'0"W 78°0'0"W 77°30'0"W 77°0'0"W 76°30'0"W

70°10'0"N 70°0'0"N 69°50'0"N

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Species Code (Label)	Common Name
ARLO =	Arctic Loon
ARTE =	Arctic Tern
CAGO or CG =	Canada Goose
COEI =	Common Eider
COLO =	Common Loon
CORA =	Common Raven
Eiders or XEID =	Unidentified Eider
GLGU =	Glaucous Gull
Gull or XGUL =	Unidentified Gull
KIEI =	King Eider
LTDU =	Long-tailed Duck
NOFU =	Northern Fulmar
PALO =	Pacific Loon
RBME =	Red-breasted Merganser
RTLO =	Red-throated Loon
SACR =	Sandhill Crane
SNGO or SG =	Snow Goose
SNOW =	Snowy Owl
XDUCK =	Unidentified Duck
XLOON =	Unidentified Loon
YBLO =	Yellow-billed Loon

Steensby Inlet Camp and Proposed Port

Steensby Inlet

Neergaard Lake

Grant-Suttie Bay

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 42
- 43 - 150
- 150 - 400
- 400 - 2,000

Flight Track for June 2008 Survey (No Track Data Available for Other Dates)

Flight Tracks for June 28th

0 10 20 40 60 80 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by Matt Evans in June, July and August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

Baffinland Iron Mines Corporation

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MARY RIVER PROJECT

Helicopter Surveys for Marine Birds in Steensby Inlet, June 28, July 24, August 23, 2008

PROJECT N°: TC101507 | **FIGURE: 16**

SCALE: 1:375,000 | DATE: August 2010

81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W 77°0'0"W

70°30'0"N 70°15'0"N 70°0'0"N 69°45'0"N 69°30'0"N 69°15'0"N 69°0'0"N 68°45'0"N 68°30'0"N

Steensby Inlet Camp and Proposed Port
Neergaard Lake
Steensby Inlet
Murray Maxwell Bay
Jens Munk Island
Koch Island
Bray Island
Foxe Basin
Rowley Island
Foxe Basin
South Spicer Island

THGU THGU SNGO THGU SNGO THGU THGU THGU THGU SNGO ARTE THGU GLGU GLGU THGU LTDU SNGO CAGO BRAN CAGO YELO YBLO LTDU GLGU BRAN BRAN SNGO SNGO GLGU GLGU ARTE BRAN

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 10
- 11 - 25
- 26 - 75
- 76 - 140

0 5 10 20 30 40 50 Kilometres

Flight Track Information is not Available for the 2007 Data

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2007.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Steensby Inlet and Foxe Basin, September 12, 20, 2007

PROJECT N°: TC101507	**FIGURE: 17**
SCALE: 1:800,000	DATE: August 2010

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84°0'0"W 80°0'0"W 76°0'0"W 72°0'0"W 68°0'0"W 64°0'0"W 60°0'0"W

N.0.0.59 N.0.0.49 N.0.0.39 N.0.0.29 N.0.0.19

P:\EM\Projects\2010\TC101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Mars\FoxeBasinHuds_June2008_LGL_111213.mxd

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

Steensby Inlet
Bray Island
Fury and Hecla Strait
Air Force Island
Prince Charles Island
Nettilling Lake
Gulf of Boothia
Melville Peninsula
Foxe Basin
Amadjuak Lake
Hall Peninsula
Iqaluit
Frobisher Bay
Foxe Peninsula
Southampton Island
Salisbury Island
Hudson Strait

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 16
- 17 - 50
- 51 - 100
- 101 - 200

Flight Track for June 2008 Survey

- Flight Tracks for June 11th
- Flight Tracks for June 12th
- Flight Tracks for June 13th

0 100 200 400 600 800 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in June 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Foxe Basin and Hudson Strait, June 11, 12, 13, 2008

PROJECT N°: TC101507 | **FIGURE: 18**

SCALE: 1:3,100,000 | DATE: August 2010

84°0'0"W 82°30'0"W 81°0'0"W 79°30'0"W 78°0'0"W 76°30'0"W 75°0'0"W

72°30'0"N 72°0'0"N 71°30'0"N 71°0'0"N 70°30'0"N 70°0'0"N 69°30'0"N 69°0'0"N

Eclipse Sound
Pond Inlet
Milne Inlet
Tay Sound
Oliver Glacier
Milne Inlet Camp and Port
Mary River Site
Inuktorfik Lake
Angajurjualuk Lake
Neergaard Lake
Steensby Inlet Camp and Proposed Port
Steensby Inlet
Murray Maxwell Bay
Jens Munk Island
Koch Island
Melville Peninsula
Igloolik Island
Foxe Basin

CORA RTLO CORA RTLO RTLO SNGO GLGU COEI HEGU GLGU LTDU RTLO SNGO SNGO COEI TBMU COEI GLGU SNBU THGU LTDU CORA GLGU RBME SNGO ROGO SNGO HEGU SNGO ARTE HEGU GLGU PAJA ROGO SNGO CAGO RTLO JAEG CORA LTDU HEGU BRAN GLGU SNGO SNGO THGU NOFU GLGU RBME BRAN LTDU SNGO GWFG HEGU JAEG LTJA RTLO SNGO LTDU BLGU CAGO

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Gull
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point
- 1 - 12
- 13 - 40
- 41 - 280
- 281 - 600

Flight Tracks for June 2008 Survey
- Flight Tracks for June 14th
- Flight Tracks for June 17th

0 10 20 40 60 80 100 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in June 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

Baffinland Iron Mines Corporation

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Milne Inlet, Steensby Inlet, and NW Foxe Basin, June 14, 17, 2008

PROJECT N°: TC101507 | **FIGURE: 19**

SCALE: 1:1,250,000 | DATE: August 2010

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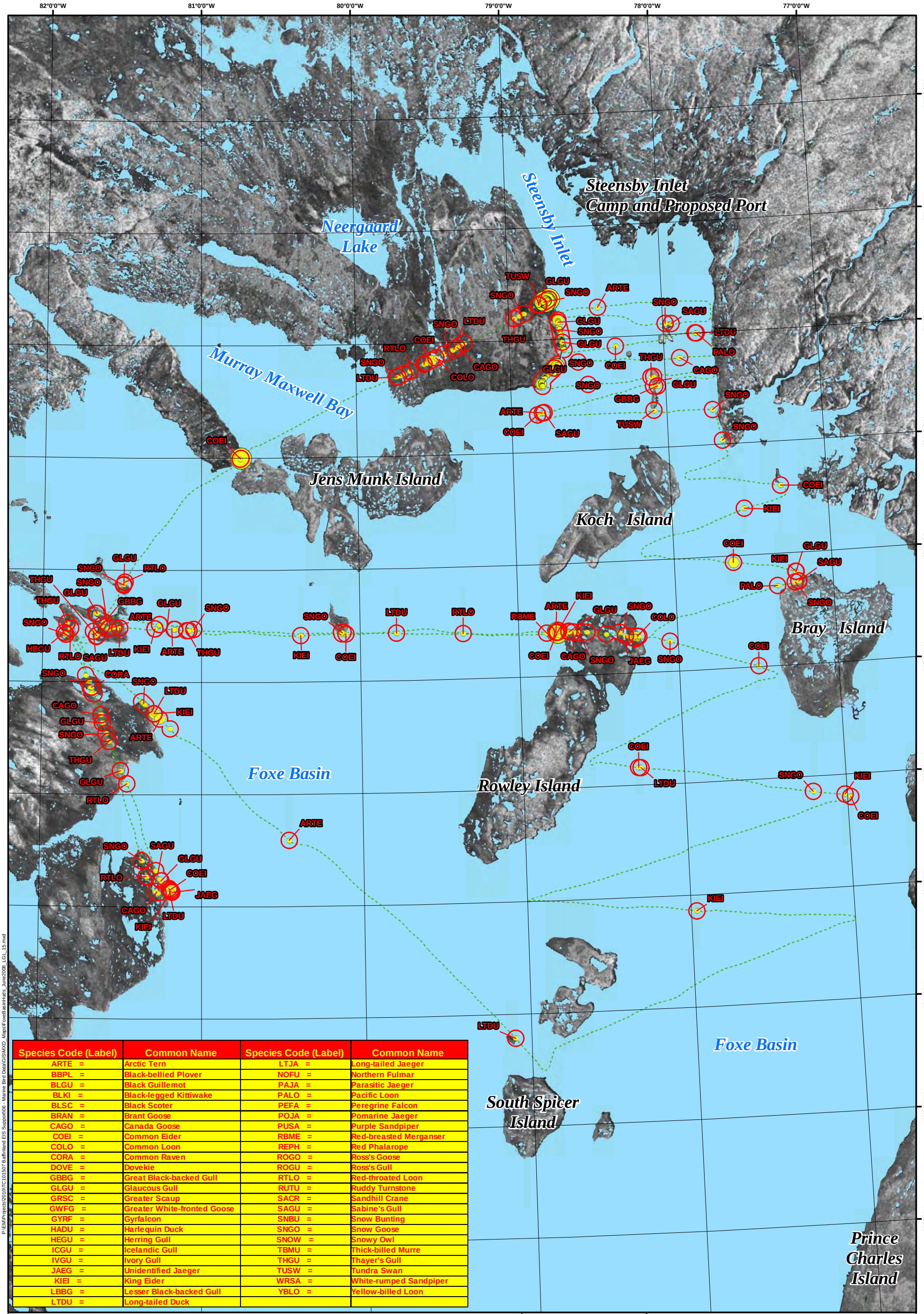

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 20
- 21 - 60
- 61 - 140
- 141 - 400

Flight Tracks for June 2008 Survey

Flight Tracks for June 15th

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in June 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

Baffinland Iron Mines Corporation

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Southern Steensby Inlet and Foxe Basin, June 15, 2008

PROJECT N°: TC101507	**FIGURE: 20**
SCALE: 1:880,000	DATE: August 2010

P:\EM\Projects\2010\TC101507 Baffinland EIS Support\06 - Marine Bird Data\GIS\MXD_Maps\FoxeBasinHuds_June2008_LGL_15.mxd

84°0'0"W 80°0'0"W 76°0'0"W 72°0'0"W 68°0'0"W 64°0'0"W 60°0'0"W

N.0.0.69 N.0.0.64 N.0.0.63 N.0.0.29 N.0.0.19

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

Steensby Inlet
Bray Island
Fury and Hecla Strait
Air Force Island
Prince Charles Island
Nettilling Lake
Gulf of Boothia
Melville Peninsula
Foxe Basin
Amadjuak Lake
Hall Peninsula
Iqaluit
Foxe Peninsula
Frobisher Bay
Southampton Island
Salisbury Island
Hudson Strait

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 8
- 9 - 25
- 26 - 60
- 61 - 150

Flight Track for July 2008 Survey

- Flight Tracks for July 29th
- Flight Tracks for July 30th
- Flight Tracks for July 31st

0 100 200 400 600 800 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in July 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

N W E S

Baffinland Iron Mines Corporation

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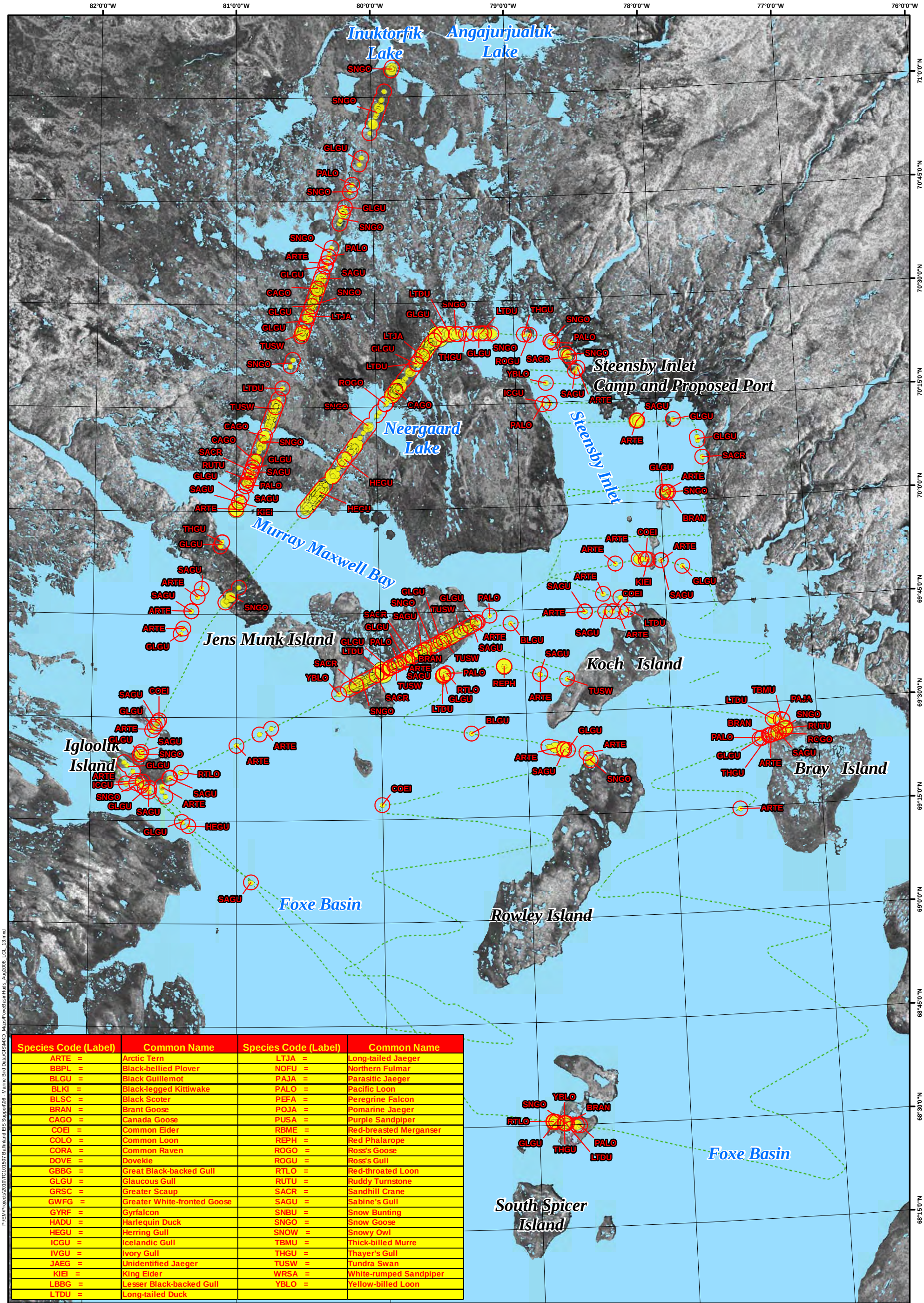
MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Foxe Basin and Hudson Strait, July 29, 30, 31, 2008

PROJECT N°: TC101507 | **FIGURE: 21**

SCALE: 1:3,100,000 | DATE: August 2010



Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
DOVE =	Dovekie	ROGU =	Ross's Gull
GBBG =	Great Black-backed Gull	RTLO =	Red-throated Loon
GLGU =	Glaucous Gull	RUTU =	Ruddy Turnstone
GRSC =	Greater Scaup	SACR =	Sandhill Crane
GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
GYRF =	Gyrfalcon	SNBU =	Snow Bunting
HADU =	Harlequin Duck	SNGO =	Snow Goose
HEGU =	Herring Gull	SNOW =	Snowy Owl
ICGU =	Icelandic Gull	TBMU =	Thick-billed Murre
IVGU =	Ivory Gull	THGU =	Thayer's Gull
JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 13
- 14 - 37
- 38 - 110
- 111 - 400

Flight Tracks for August 2008 Survey (No Data Available for August 3rd Flight Tack)

Flight Tracks for August 1st

0 10 20 40 60 80 100 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

Baffinland Iron Mines Corporation

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Steensby Inlet and Foxe Basin, August 1, 3 2008

PROJECT N°: TC101507 | **FIGURE: 22**

SCALE: 1:950,000 | DATE: August 2010

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82°0'0"W 81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W 77°0'0"W

70°30'0"N 70°15'0"N 70°0'0"N 69°45'0"N 69°30'0"N 69°15'0"N 69°0'0"N 68°45'0"N 68°30'0"N

Steensby Inlet
Camp and Proposed Port

Steensby Inlet

Neergaard Lake

Murray Maxwell Bay

Jens Munk Island

Koch Island

Igloolik Island

Bray Island

Foxe Basin

Rowley Island

Foxe Basin

South Spicer Island

Prince Charles Island

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
BLKI =	Black-legged Kittiwake	PALO =	Pacific Loon
BLSC =	Black Scoter	PEFA =	Peregrine Falcon
BRAN =	Brant Goose	POJA =	Pomarine Jaeger
CAGO =	Canada Goose	PUSA =	Purple Sandpiper
COEI =	Common Eider	RBME =	Red-breasted Merganser
COLO =	Common Loon	REPH =	Red Phalarope
CORA =	Common Raven	ROGO =	Ross's Goose
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GWFG =	Greater White-fronted Goose	SAGU =	Sabine's Gull
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JAEG =	Unidentified Jaeger	TUSW =	Tundra Swan
KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 120
- 121 - 500
- 501 - 1,770
- 1,771 - 4,770

Flight Tracks for August 2008 Survey

Flight Tracks for August 2nd

0 5 10 20 30 40 50 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in August 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Shoreline Surveys for Marine Birds in Steensby Inlet and Foxe Basin, August 2, 2008

PROJECT N°: TC101507 | **FIGURE: 23**

SCALE: 1:880,000 | DATE: August 2010

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82°0'0"W 81°0'0"W 80°0'0"W 79°0'0"W 78°0'0"W 77°0'0"W

70°30'0"N 70°15'0"N 70°0'0"N 69°45'0"N 69°30'0"N 69°15'0"N 69°0'0"N 68°45'0"N 68°30'0"N 68°15'0"N 68°0'0"N 67°45'0"N

Steensby Inlet
Camp and Proposed Port

Neergaard Lake

Steensby Inlet

Murray Maxwell Bay

Jens Munk Island

Koch Island

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Bray Island

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Foxe Basin

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LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 65
- 66 - 250
- 251 - 750
- 751 - 3,500

Flight Tracks for September 2008 Survey

- Flight Tracks for September 7th
- Flight Tracks for September 8th

0 10 20 40 60 80 100 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Shoreline Surveys for Marine Birds in Steensby Inlet and Foxe Basin, September 7, 8, 2008

PROJECT N°: TC101507	**FIGURE: 24**
SCALE: 1:900,000	DATE: August 2010

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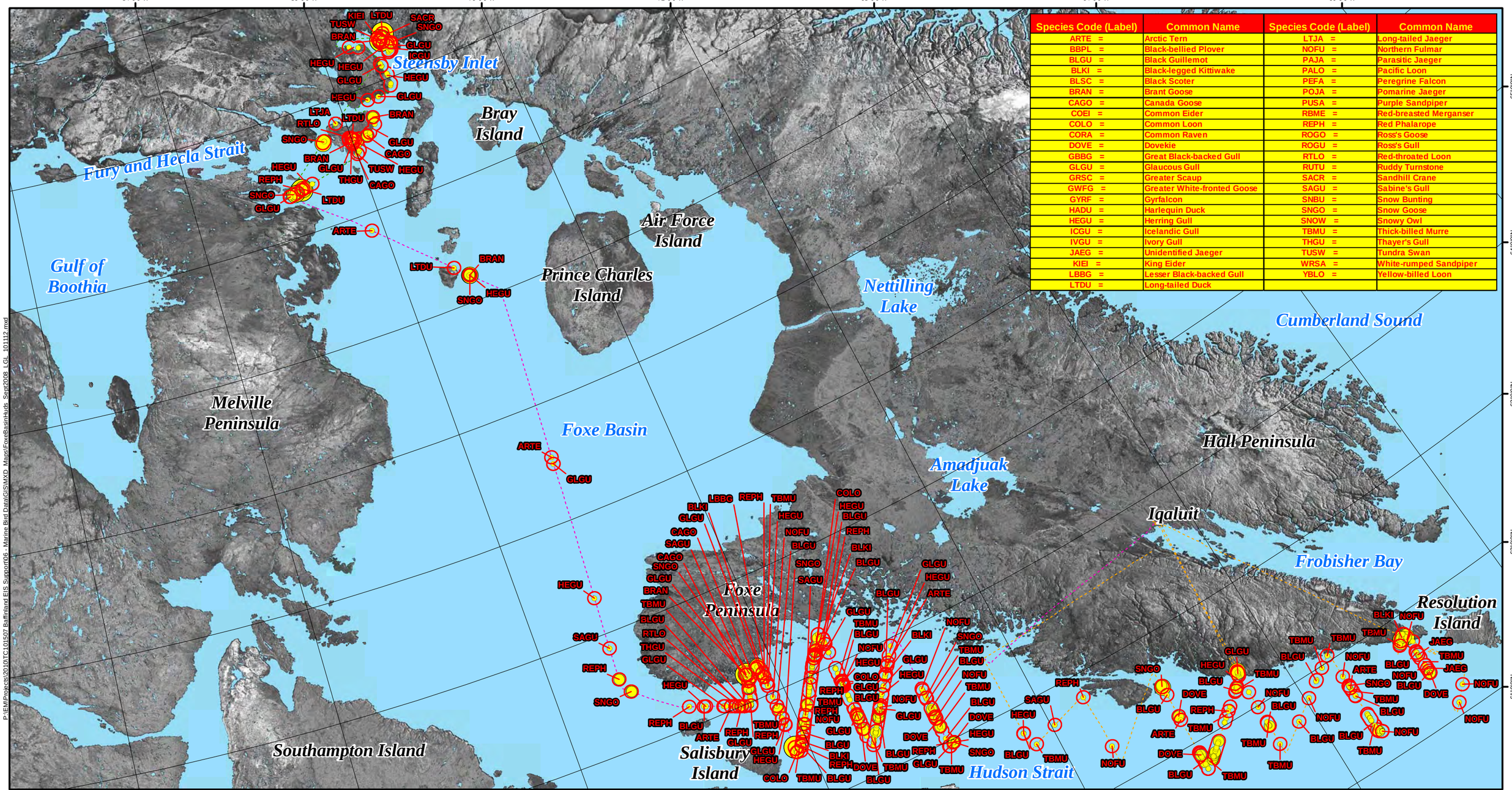

Species Code (Label)	Common Name	Species Code (Label)	Common Name
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KIEI =	King Eider	WRSA =	White-rumped Sandpiper
LBBG =	Lesser Black-backed Gull	YBLO =	Yellow-billed Loon
LTDU =	Long-tailed Duck		

LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 8
- 9 - 30
- 31 - 85
- 86 - 350

Flight Track for September 2008 Survey

- Flight Tracks for September 10th
- Flight Tracks for September 11th
- Flight Tracks for September 12th

0 100 200 400 600 800 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in September 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Steensby Inlet, Foxe Basin and Hudson Strait, September 10, 11, 12, 2008

PROJECT N°: TC101507 | **FIGURE: 25**

SCALE: 1:3,350,000 | DATE: August 2010

84°0'0"W 80°0'0"W 76°0'0"W 72°0'0"W 68°0'0"W

N.0.0.69 N.0.0.69 N.0.0.69

Species Code (Label)	Common Name	Species Code (Label)	Common Name
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LTDU =	Long-tailed Duck		

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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 18
- 19 - 70
- 71 - 110
- 111 - 450

Flight Track for October 2008 Survey

- Flight Tracks for October 3rd
- Flight Tracks for October 9th
- Flight Tracks for October 11th
- Flight Tracks for October 12th

0 50 100 200 300 400 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in October 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Steensby Inlet and Foxe Basin, October 3, 9, 11, 12, 2008

PROJECT N°: TC101507 | **FIGURE: 26**

SCALE: 1:1,750,000 | DATE: August 2010

Species Code (Label)	Common Name	Species Code (Label)	Common Name
ARTE =	Arctic Tern	LTJA =	Long-tailed Jaeger
BBPL =	Black-bellied Plover	NOFU =	Northern Fulmar
BLGU =	Black Guillemot	PAJA =	Parasitic Jaeger
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LEGEND

General Outline of Species Observation Cluster (Labelled with Species Code)

Amount of Observations per Survey Point

- 1 - 2
- 3 - 8
- 9 - 17
- 18 - 60

Flight Track for October 2008 Survey

- Flight Tracks for October 16th
- Flight Tracks for October 18th
- Flight Tracks for October 19th
- Flight Tracks for October 20th

0 100 200 400 600 800 Kilometres

NOTES:
- Aerial Marine Bird Surveys were conducted by LGL Limited in October 2008.
- Watercouse information extracted from NRCan National Topographic Database
- Background imagery provided by NRCan and CSA RADARSAT Canada Composite

Datum: WGS84
Projection: LAEA-Canada

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MARY RIVER PROJECT

Fixed-wing Surveys for Marine Birds in Steensby Inlet, Foxe Basin and Hudson Strait, October 16, 18, 19, 20, 2008

PROJECT N°: TC101507	**FIGURE: 27**
SCALE: 1:3,200,000	DATE: August 2010

APPENDIX A
NATURAL HISTORY DESCRIPTIONS FOR 34 MARINE BIRD SPECIES RECORDED IN THE MARY RIVER PROJECT REGIONAL STUDY AREA DURING THE 2006-2008 BASELINE STUDIES

Text selected[1,2] and edited[1,2] from:
Environmental Screening for the Mary River Project:
Biological Considerations Related to Seabirds and Marine Mammals
A Report Prepared for Knight Piésold Ltd.
by Warren Bernhardt and Michael Johnson (North/South Consultants Inc.), 2006.

1) Text selected and edited by Peter Quinby and Matthew Evans (Knight Piésold Ltd.), 2008.
2) Text further edited by Matthew Evans and Rebecca Harris (AMEC Earth & Environmental), 2010.

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1.0 INTRODUCTION

The Canadian Arctic contains the vast majority of Canada's coastal and marine habitats, and these areas support tremendous numbers of marine birds (Mallory and Fontaine, 2004). Each year between June and October, Canada's Arctic is home to nearly 100 species of seabirds, gulls, waterfowl, waterbirds, and shorebirds (Godfrey 1986, Gaston 1996) that rely on marine and coastal environments for part or all of their annual cycle (migration stop-overs, foraging, breeding, moulting, and for some species, over-wintering). Estimates of up to ten million pairs of breeding marine birds and hundreds of thousands of non-breeding individuals utilize a variety of habitats associated with the Arctic's nearshore or offshore marine environment (Mallory and Fontaine, 2004). These marine habitats include coastal wetlands and tundra, inter-tidal mudflats, seagrass beds, estuaries and salt marshes, open sea, continental shelf breaks and areas of rich marine upwelling, polynyas and shore leads (Gaston 1996).

This report presents brief natural history descriptions for the 34 marine bird species recorded in and around the marine components of Baffinland Iron Mines Corporation's (BIMC) Mary River Project (Table A-1). These areas include Milne Inlet, Eclipse Sound, and Pond Inlet in the northern portion of the Regional Study Area (RSA), and Steensby Inlet, Foxe Basin, and Hudson Strait in the southern portion. A list of these birds is presented in Table A-1 and includes the following groups: Alcidae (Murres and other Alcids), Anatidae (Ducks, Geese and Swans), Gaviidea (Loons), Laridae and Stercoraridae (Gulls, Terns, Jaegers), Procellaridae (Fulmars), Charadiidae and Scolopacidae (Shorebirds).

Table A-1: Feeding Habits, Habitat Preferences, and Patterns of Habitat Use by 34 Marine Bird Species Recorded in the Mary River Project RSA, 2006-2008.

Common Name	Scientific Name	Seasonal Habitat Use[a,b]	Feeding Habits[a]	Feeding Habitat[a]	Nesting Habitat	Nest in Colonies?
Alcidae						
Thick-billed Murre	*Uria lomvia*	B, M, W	Piscivore	Offshore	Cliffs	Yes
Black Guillemot	*Cepphus grylle*	B, M, W	Piscivore	Nearshore	Cliffs	Small Groups
Dovekie	*Alle alle*	B, M, W	Crustaceavore	Offshore	Cliffs	Yes
Anatidae						
Common Eider	*Somateria mollissima*	B, M, W	Molluscivore	Nearshore	Ground	Scattered
King Eider	*Somateria spectabilis*	M, W	Molluscivore	Nearshore	Ground	Scattered
Harlequin Duck	*Histrionicus histrionicus*	B, M, W	Insectivore	Nearshore	Ground	No
Long-tailed Duck	*Clangula hyemalis*	B, M, W	Ominvore	Nearshore	Ground	No
Red-breasted Merganser	*Mergus serrator*	B, M	Piscivore	Diver	Ground	No
Black Scoter	*Melanitta nigra*		Molluscivore	Nearshore	Ground	No
Canada Goose	*Branta canadensis*	B, M	Herbivore	Grassy Flats	Ground	Loose
Brant	*Branta bernicla*	B, M	Herbivore	Coastal Flats	Ground	Yes
Ross's Goose	*Chen rossii*	B, M	Herbivore	Coastal Flats	Ground	Yes
Snow Goose	*Chen caerulescens*	B, M	Herbivore	Coastal Flats	Ground	Yes
Tundra Swan	*Cygnus columbianus*	M	Herbivore	Coastal Flats	Ground	No
Gaviidae						
Common Loon	*Gavia immer*	M	Piscivore	Coastal	Ground	No
Pacific Loon	*Gavia pacifica*	B, M	Piscivore	Coastal	Ground	No
Red-throated Loon	*Gavia stellata*	B, M	Piscivore	Coastal	Ground	No
Yellow-billed Loon	*Gavia adamsii*	B, M	Piscivore	Coastal	Ground	No
Laridae/Stercoraridae						
Glaucous Gull	*Larus hyperboreus*	B, M	Ominvore	Nearshore	General	Yes
Great Black-backed Gull	*Larus marinus*	B, M	Ominvore	Nearshore	Ground	Yes
Herring Gull	*Larus argentatus*	B	Ominvore	Nearshore	Ground	Yes
Iceland Gull	*Larus glaucoides*	B, M	Ominvore	Nearshore	Cliffs	Yes
Ivory Gull	*Pagophila eburnea*	M	Scavenger	Offshore	Ground	Yes
Ross's Gull	*Rhodostethia rosea*	B	Scavenger	Nearshore	Ground	Yes
Sabine's Gull	*Xema sabini*	B, M	Scavenger	Nearshore	Ground	Yes
Thayer's Gull	*Larus thayeri*	M	Scavenger	Nearshore	Ground	No
Arctic Tern	*Sterna paradisaea*	B, M	Piscivore	Nearshore	Ground	Yes
Black-legged Kittiwake	*Rissa tridactyla*	B, M	Ominvore	Nearshore	Cliffs	Yes
Long-tailed Jaeger	*Stercorarius longicaudus*	M, W	Ominvore	Offshore	Ground	No
Parasitic Jaeger	*Stercorarius parasiticus*	M, W	Ominvore	Offshore	Ground	No
Pomarine Jaeger	*Stercorarius pomarinus*	M, W	Ominvore	Offshore	Ground	NO
Procellaridae						
Northern Fulmar	*Fulmarus glacialis*	B, M, W	Piscivore	Offshore	Cliffs	Yes
Scolopacidae						
Red Phalarope	*Phalaropus fulicarius*	B	Insectivore	Tidal Flats	Ground	No
Red-necked Phalarope	*Phalaropus lobatus*	B	Insectivore	Tidal Flats	Ground	No

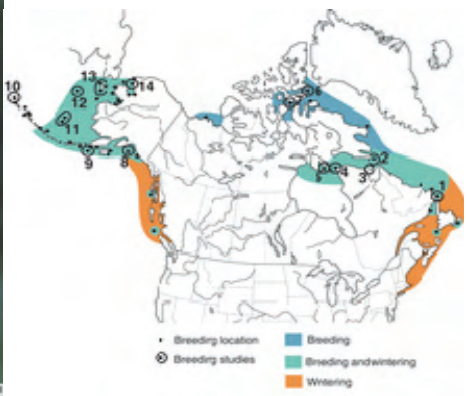
Notes: a: Taken from Table 2 in Mallory and Fontaine 2004.
b: B = some individuals breed in the area, M = some individuals migrate through the area on their way to and from breeding ground found elsewhere, W = some individuals winter in the area.

2.0 MARINE BIRD SPECIES RECORDED IN THE MARY RIVER PROJECT RSA

2.1 FAMILY ALCIDAE: MURRES and OTHERS

Alcids are a family of pelagic seabirds that use their wings to propel themselves through the water. Alcids typically only come to land to nest and they breed in large colonies located on steep cliffs and many nest in crevices or burrows safe from most predators. The colonies can contain hundreds of thousands of birds and are often comprised of several alcid species. Outside of the breeding colonies alcids will form feeding aggregations where food is abundant but otherwise will rarely flock. Although alcids are generally long-lived, they have relatively low reproductive potential as they are slow to mature and clutch sizes are typically only one or two eggs per year. Therefore, even seemingly small declines in breeding adults can have large and long-lasting effects on a population.

2.1.1 Thick-billed Murres (*Uria lomvia*)



Thick-billed murres are one of the most abundant species of marine bird in the northern hemisphere; the population in the Canadian Arctic alone is estimated to exceed four million individuals. They have been observed throughout the Bylot Island and Pond Inlet area as well as southern Foxe Basin and Hudson Strait. Thick-billed murres nest in large colonies on coastal cliffs (Tuck 1961). Most often, they build their nests on a cliff ledge, out in the open, but they have occasionally been recorded laying eggs in caves or crevices (Gaston and Nettleship 1981, Gaston et al. 1993). During the spring and summer months, they are usually associated with the edge of land-fast ice (Bradstreet 1979, 1982). Key marine foraging habitats for thick-billed murres are typically located within 30 km of the breeding colony (Mallory and Fontaine 2004). Their primary diet is fish and marine macroinvertebrates (Tuck 1961, Croll et al. 1992).

Thick-billed murres begin nesting in late June and early July. Clutch size is one egg, but replacement clutches may be laid if the first is destroyed early in the breeding season (Tuck 1961). During incubation, murres typically remain near the colony, but some may forage up to 175 km away from it (LGL Ltd. 1982). Incubation requires 30-35 days, and the young hatch in

early August. One of the adults accompanies the flightless chick when it leaves the nest 18-25 days after hatch. Murres from colonies along Hudson Strait may also migrate to southwest Greenland, but are more likely to move directly down the Labrador coast to Newfoundland (Gaston 1980). These migrations can extend over distances of as much as 1000 km before the chick matures enough to fly, and leaves pairs vulnerable to oil spills and to drowning by entanglement in fishing gear (Gaston 1982).
Phenology: First Appear in the Area: early May. Lay Eggs: mid June. Clutch Size: 1. Eggs Hatch: mid July. Leave the Area: September.

2.1.2 Black Guillemots (*Cepphus grille*)

Black guillemots have a nearly circumpolar distribution, but are absent from the islands of the western Arctic and occur along the west coast of Foxe Basin (Godfrey et al. 1986), in the southern portion of Foxe Basin, and throughout Hudson Strait. Black guillemots nest in small colonies or as single pairs along land-packed ice edges and polynyas, in crevices amongst rock rubble, in talus slopes, and cliff faces (Godfrey 1986). Their primary diet consists of benthic and pelagic fish obtained by shallow dives in the littoral zone of open water near shore, or along the edges of fast and pack ice (Bradstreet 1976).

Guillemots begin migrating to breeding areas as soon as open water is available, around mid-April, and eggs are laid in late June and early July, although timing can vary by up to three weeks. Clutch size is typically two eggs; single-egg clutches are common, but three-egg clutches are rare (Cairns 1980). The incubation period is 27-33 days. During this period, guillemots remain and feed within a few kilometres of the nesting areas, often along nearby fast ice edges (McLaren and Renaud 1979). Guillemots winter in areas adjacent to their nesting sites as long as open water persists, allowing them to feed. They have been observed wintering in unconsolidated pack ice in Hudson Strait (Nettleship and Evans 1985, Gaston and McLaren 1990). Southward movements are likely driven by the formation of consolidated or landfast ice and the consequent reduction in the availability of open water.
Phenology: First Appear in the Area: mid-April. Lay Eggs: late May to early June. Clutch Size: 1-2. Eggs Hatch: late June to early July. Leave the Area: September.

2.1.3 Dovekie (*Alle alle*)

The dovekie is the smallest and most abundant alcid in the North Atlantic. However, there are only a few small colonies in North America including the only known Canadian colony on Baffin Island with <1000 pairs. The world population is estimated at between 30-100 million individuals concentrated mostly in Greenland, Svalbard and Russia.

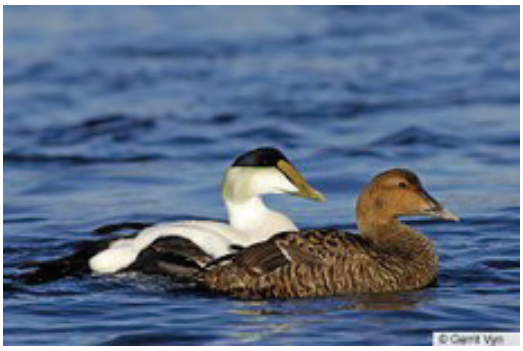
Dovekies prey mainly on copepods (only Atlantic seabird to do this), though their diet varies throughout the year and can also include various crustaceans, molluscs and small fish. Food is obtained by diving to 20-30 m in open water and capturing prey on the ascent to the surface. Foraging is often done along ice edges especially during breeding season.

Dovekies are found in open ocean except when nesting. This species starts moving north to breeding grounds in April and arrives early to late May (BNA 2010). Dovekies nest in huge monospecific colonies, their nests are often lined with pebbles or located in crevices, and often around 400 m above sea level on south slopes of rock scree (Sibley 2003, BNA 2010). The same pair will sometimes reuse the same cavity in subsequent years. Both adults incubate and provide food for offspring. Nests contain one egg; and only one clutch is raised each season. Eggs are laid in late June and hatch one month later. The young are semi-precocial; they can thermoregulate within one week, they leave the burrow after four weeks but are cared for by the adult male for an additional one month at sea. This species leaves Baffin Island for the wintering grounds between August and September. When they leave they have molted their flight feathers and are temporarily flightless; ocean currents carry them south. Dovekies winter in huge flocks (tens of millions) along the coast of northeastern North America. Wintering locations depend on ocean currents and front which influence prey distribution.
Phenology: First Appear in the Area: early May. Lay Eggs: late June. Clutch Size: 1. Eggs Hatch: late July. Leave the Area: August to September.

2.2 FAMILY ANATIDAE: WATERFOWL (DUCKS, GEESE, and SWANS)

Eleven species of waterfowl were observed in the marine environment of the proposed Mary River Project area. Some of these species may only frequent the area during migration to inland freshwater nesting sites, while others may nest in coastal areas and make use of the marine environment more frequently for foraging and even for brood rearing.

2.2.1 Common Eiders (*Somateria mollissima*)



Common Eiders occur throughout the Mary River study area. They are circumpolar in distribution, and nest in most coastal Arctic and subarctic regions. Numerous races and subspecies of common eider have been identified, and at least two may occur within the Mary River study area. They are common visitors to the flow edges and coastal areas, and breed widely throughout Foxe Basin (Godfrey 1986). Wintering areas are along the Labrador coast as far south as Newfoundland (Cooch 1965), as well as a few in open water in Hudson Strait and off southwest Greenland (Palmer 1976). Birds breeding in Hudson and James Bays overwinter in those areas, concentrating in areas of open water along flow edges and polynyas (Abraham and Finney 1986). Common eiders breed widely throughout Foxe Basin (Godfrey 1986), but little information was found regarding timing of movement patterns.

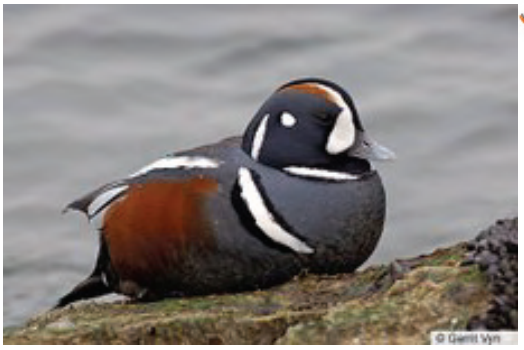
Nesting occurs close to marine water, typically on small islands, and in either dense colonies, small groups, or solitarily at widely scattered locations along coasts. Hatching generally occurs in early August, but can be protracted to late August (Geale 1971). Broods may be taken to freshwater ponds for two or three days prior to moving to the sea, but spend the majority of the brood-rearing period in nearshore marine waters (Cooch 1965). Fledging occurs in approximately 60 days (Palmer 1976). Consequently, late-hatching chicks may not survive to fledging in the Arctic. Although most common eiders have left the breeding grounds by September, flightless young have been observed in mid-October, using the few remaining patches of open water in the newly formed ice in north western Baffin Bay (McLaren and Renaud 1979).

Nesting eiders typically forage in nearshore marine areas during brood-rearing, moulting, and staging periods. They typically consume intertidal and subtidal molluscs, but also consume crustaceans and echinoderms. During winter, eiders that winter in the Arctic often occur within 10 km of the coast in melt pools, shore leads, and shallow-water polynyas, allowing access to benthic food sources (Mallory and Fontaine 2004).
Phenology: First Appear in the Area: late May. Lay Eggs: early June. Clutch Size: 1-14 (average = 4). Eggs Hatch: early July. Leave the Area: October.

2.2.2 King Eiders (*Somateria spectabilis*)

King eiders are nearly circumpolar in distribution, and occur throughout the Mary River study area. It is generally considered that two populations occur in North America; a western Arctic population and an eastern Arctic population. Birds within the Mary River study area are part of the eastern Arctic population. The eastern Arctic population winters in at the southern ice edge in coastal marine waters southwest Greenland, the coasts of Newfoundland and southern Labrador, and the Gulf of St. Lawrence. Migration to their eastern Arctic breeding grounds begins in March and continues until mid-April to mid-June (MacPherson and McLaren 1959). Hudson Strait is a common migration passageway for King Eiders. Godfrey (1986) indicates that breeding occurs throughout most coastal areas within Foxe Basin. King eiders are solitary nesters and, unlike the common eider and the long-tailed duck, nest away from the coast on the tundra, preferably at sites adjacent to an inland lake (Palmer 1976, Kellett and Alisauskas 1997). They will forage at the surface or dive for their food depending on the depth of the water body, and their diet while nesting consists mostly of vegetation and the larvae of insects and crustaceans (Lamothe 1973, Bergman et al. 1977). Peak egg-laying occurs in early July; males abandon their mates shortly after incubation begins and migrate to moulting areas.
Phenology: First Appear in the Area: early May. Lay Eggs: mid June. Clutch Size: 1-7 (average = 5). Eggs Hatch: early July. Leave the Area: October.

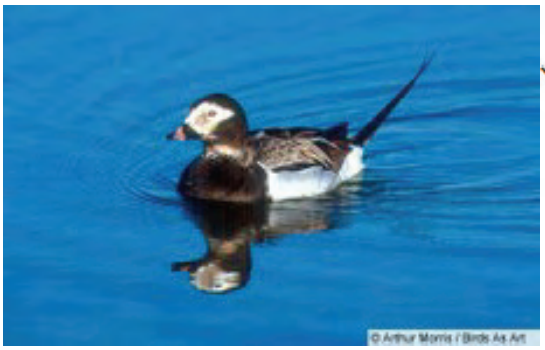
2.2.3 Harlequin Ducks (*Histrionicus histrionicus*)



Harlequin Ducks are not a common species in the Canadian Arctic; they have two distinct breeding populations in North America: an eastern population in Labrador, northern Quebec, Hudson Strait and Baffin Island, and New Brunswick, and a western population in Alaska south to the northern United States (BNA 2010). Canada's eastern population was listed as *Endangered* by COSEWIC in 1990 but was upgraded to a species of *Special Concern* in 2010 (COSEWIC 2010, Environment Canada, SARA 2010).

Harlequin ducks feed in the turbulent streams diving for various aquatic insects, crustaceans and fish eggs. This species will sometimes dabble or feed close to surface of water as well. They prefer fast-flowing turbulent waters for the breeding season (Sibley 2003, BNA 2010). This species will breed with the same partner for multiple years. Nests are placed in various locales usually close to water; on the ground, on cliffs, tree cavities and on dead stumps. Nests are lined with down from the female. Nests contain an average of 6 eggs but can range from 3-9; only one clutch is raised each season. Eggs are laid in mid May to mid June and hatch one month later; exact timing depends on annual weather and timing of spring thaw. The young are precocial and leave the nest within 1-2 days of hatching. Males and some females migrate to molting grounds in late June and then the migration to the wintering grounds occurs in mid September through October. These ducks winter along both coasts of northern North America where they prefer rocky coastal habitats (BNA 2010).
Phenology: First Appear in the Area: early May. Lay Eggs: mid May. Clutch Size: 3-9 (average = 6). Eggs Hatch: mid June. Leave the Area: September.

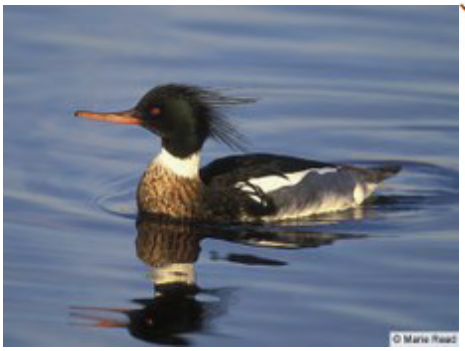
2.2.4 Long-tailed Ducks (*Clangula hyemalis*)

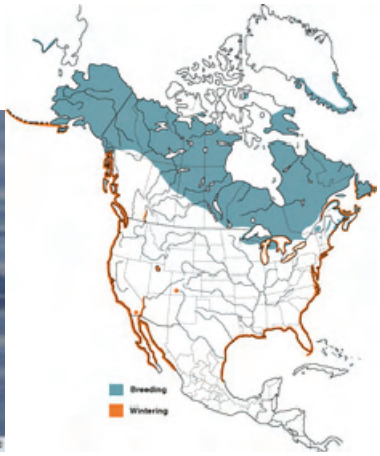


Long-tailed ducks breed in tundra habitats across the globe. In North America this includes Alaska across the tundra of Canada including the Canadian Archipelago. This species is considered a common breeder with several nests each year in the Bylot and Baffin Island area (Lepage et al. 1998). This species eats a variety of foods, predominantly animal including aquatic insects, crustaceans, fish, fish eggs and some vegetable material. Food is obtained by diving in open water (BNA 2010).

Long-tailed ducks leave the wintering grounds in late March arrive at the breeding grounds mid May to mid June (Lepage et al. 1998, BNA 2010). This species prefers to nest on islands or peninsulas in freshwater lakes and ponds. Nests are depressions made from, and lined with vegetation and down. Nests contain an average of 7 eggs; only one clutch is raised each season (BNA 2010). Eggs are laid in early to mid June and hatch just under one month later, the young are precocial and leave the nest within 1-2 days of hatching. This species often forms brood amalgamation on lakes with a single female caring for numerous young. Males and some females migrate to molting grounds in late June and then the migration to the wintering grounds occurs October through November. These ducks winter in cold coastal waters along both coasts of North America and in the Great Lakes (BNA 2010).
Phenology: First Appear in the Area: mid May. Lay Eggs: early June. Clutch Size: average 7. Eggs Hatch: early July. Leave the Area: late June through October.

2.2.5 Red-breasted Merganser (*Mergus serrator*)



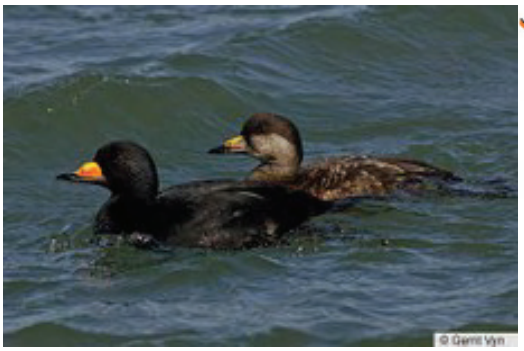


This diving duck's "saw-like bill" makes it adept at catching underwater prey (Sibley 2003, BNA 2010). This prey consists mainly of small fish but this species will also eat crustaceans, crayfish, shrimp, insects, amphibians and some aquatic vegetation. These ducks often search for fish before diving but will also search the bottom by probing cavities with its bill (BNA 2010).

There are an estimated 250,000 red-breasted mergansers in Canada and Alaska (BNA 2010). While this species has an extensive holarctic distribution and breeds across the taiga and tundra of North America it is a rare breeder in the Baffin Island area. This species is often a late migrant and breeder, leaving the wintering grounds in March and arriving at the breeding grounds late May to mid June (Lepage et al. 1998, BNA 2010).

While on the breeding ground red-breasted mergansers nest close to the shore along lakes, riverbanks and marshes, they often occur in salt water and estuaries (Sibley 2003, BNA 2010). Nests are frequently placed on islands and can be in association with colonies of other ducks, gull and terns. Nest scrapes on the ground are sparsely lined with plant materials and down from the female. There is often cover over the nest such as shrubbery, lower branches of a conifer tree, or fallen logs (BNA 2010). Nests contain an average of 10 eggs but can range from 5-24; only one clutch is raised each season. Eggs are laid in early June and hatch one month later, the young are precocial and leave the nest within a day of hatching. This species often forms creches (brood amalgamation) with a single female caring for numerous young (up to 100). Young begin the trip south once they have fledged around mid September to early October. These ducks winter in huge flocks in temperate waters on both coasts, often in bays or estuaries where seas are calm (Lepage et al. 1998, BNA 2010).
Phenology: First Appear in the Area: late May. Lay Eggs: early June. Clutch Size: 5-24. Eggs Hatch: early July. Leave the Area: September.

Black Scoter (*Melanitta nigra*)



Black Scoters feed mainly on molluscs during the winter and crustaceans, insects and some aquatic vegetation during the breeding season. Food is obtained by diving in open water, this species rarely feeds in water more than 10 m deep (BNA 2010). This species has a subarctic distribution and breeds in the taiga and tundra of North America. Two distinct populations occur, one in Alaska and the other centered in Quebec. This species leaves the wintering grounds in February and arrives at the breeding grounds late April to mid May (BNA 2010).

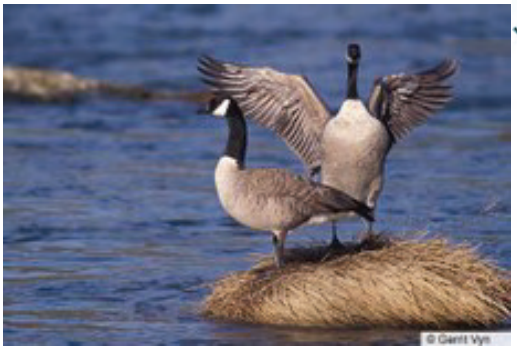
Black scoters usually nest along shrub or conifer treed shorelines along small lakes (BNA 2010); 10-30 ha with less than 5 m depth. Large lake and rivers are avoided. Nests are on the ground, in grasses or on a hummock less than 30 m from the water's edge (BNA 2010). Nests are lined with grasses and down from the female. Nests usually contain 8-9 eggs but can range from 5-10; only one clutch is raised each season. Eggs are laid in early to mid June and hatch one month later, the young are precocial and leave the nest within a day of hatching. This species often forms brood amalgamation on lakes with a single female caring for numerous young. Males and some females migrate to molting grounds in late June and then the migration to the wintering grounds occurs in mid September through November. These ducks winter along both coasts of North America (BNA 2010).
Phenology: First Appear in the Area: late April. Lay Eggs: early June. Clutch Size: 5-10. Eggs Hatch: early July. Leave the Area: August.

2.2.6 Tundra Swans (*Cygnus columbianus*)

Tundra Swans are the most widespread native swan in North America. This species feeds on all parts of aquatic plant materials and a small amount of animal material such as molluscs. Adults often dislodge vegetation with their feet while young cygnets follow behind eating the disturbed vegetation. The long neck also allows this species to feed by dabbling and reaching food on shallow bottoms of water bodies. During migration and on the wintering grounds this species frequently feeds in agricultural fields (Sibley 2003, BNA 2010).

This species breeds in arctic tundra wetlands and ponds (Sibley 2003, BNA 2010) in northern tundra regions across North America; it is a rare breeder in the Baffin Island area (Lepage et al. 1998). This species leaves the wintering grounds in March and arrives at the breeding grounds mid April to mid May. Pairs of tundra swans will maintain and defend a territory (0.5-1 km^2). The territory often encompasses a large water body or several small ponds near which the nest is built (BNA 2010). Nests are large mounds composed of grasses, sedges, lichens and other plant material pulled from within 3 m of the nest. The same pair will often reuse the same territory (breeding and wintering) and nest site in subsequent years. Both adults incubate and provide food for offspring. Nests usually contain 3-7 eggs with an average of 3.5-4.5; only one clutch is raised each season. Eggs are laid in early June and hatch one month later, the young are precocial and leave the nest soon after hatching. Family groups migrate together, leaving the breeding grounds in late September. Young stay with their parents until the following years spring migration. These swans winter in freshwater lakes and ponds and on estuaries along both coasts of North America and follow interior migration routes with traditional staging areas (BNA 2010).
Phenology: First Appear in the Area: mid April. Lay Eggs: early June. Clutch Size: 3-7. Eggs Hatch: early July. Leave the Area: September.

2.2.7 Canada Goose (*Branta canadensis*)

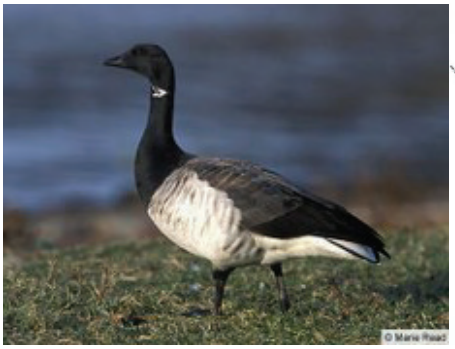


Canada Geese have the largest distribution across North America of any native goose. It has been split into numerous subspecies which can range from the tundra into the southern states. Population size has been estimated at up to 8 million individuals. Some populations have lost their migratory urge and winter on the breeding grounds but most populations follow traditional flyways and use traditional staging areas during migration (BNA 2010). Canada Goose is considered a rare breeder in the Baffin Island area (Lepage et al. 1998).

This species feeds on vegetation both aquatic and terrestrial. Various species of grass, sedge and aquatic plants are consumed as well as berries, seeds and agricultural grains especially in the winter. Food is gathered predominantly by grazing as well as reaching underwater to pluck aquatic vegetation (BNA 2010).

Brant leave the wintering grounds late January to mid February and arrive at the breeding grounds mid April to mid May (Lepage et al. 1998, BNA 2010). Pairs nest individually but will form loose colonies where suitable habitat is limited. Canada Geese, like most geese, mate for life and pairs will often return to the same breeding and wintering territories each year. In the northern part of their range Canada Geese nests near ponds, lakes or marshes; nests of this species are often placed on small islands. Nests are often placed on sites where the adults can see in all directions; muskrat houses, hummocks and floating vegetation mats are often used. Nests are lined with vegetation and down from the female (BNA 2010). Clutches can contain 2-8 eggs but especially in northern section or range average 4-6 eggs and only one clutch is raised each season. Eggs are laid in mid May to mid June and hatch around one month later, the young are precocial and leave the nest within 24 hours of hatching. Family groups migrate together, leaving the breeding grounds in late August to September, they arrive on wintering grounds late October to mid November. Many young stay with their parents until the following year spring migration. Wintering grounds are in various habitat types across the continent from southern Canada to northern Mexico (BNA 2010).
Phenology: First Appear in the Area: mid April. Lay Eggs: mid May. Clutch Size: 4-6. Eggs Hatch: mid June. Leave the Area: August.

2.2.8 Brant (*Branta bernicla*)



Brant breed from the low to high arctic; the subspecies found on Baffin Island is “Atlantic Brant” (*Branta bernicla hrota*) which is considered a rare visitor and accidental breeder in the Baffin Island area (Lepage et al. 1998) Large numbers of this variant will spend several weeks in James Bay during fall migration to feed and winters along the eastern coast of North America traveling up to 3,000 km each migration (BNA 2010).

This species feeds predominantly on vegetation both aquatic and terrestrial, especially various species of grass and algae. Food is gathered by grazing along beds of sea grasses and reaching with head underwater to pluck aquatic vegetation. This species will sometimes graze in upland grasslands during winter (BNA 2010).

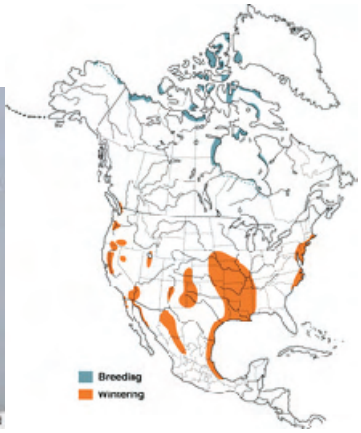
Brant leave the wintering grounds mid April to mid May and arrive at the breeding grounds early May to early June (Lepage et al. 1998, BNA 2010). Pairs in the high arctic will defend a territory and nest further inland then their southern counterparts. In low arctic, such as Baffin Island, Brant often nest in colonies adjacent to salt marshes and estuaries. Nests are often placed near other species such as glaucous gull and Sabine’s gull and occasionally near snowy owl nests. Brant, like most geese, mate for life and pairs will often return to the same breeding and wintering territories each year. Nests are lined with vegetation and down from the female. Clutches usually contain 3-5 eggs and only one clutch is raised each season. Eggs are laid in mid May to mid June and hatch just under one month later, the young are precocial and leave the nest within 24 hours of hatching (BNA 2010). Family groups migrate together, leaving the breeding grounds in early September, they arrive on wintering grounds late October to mid November (Lepage et al. 1998, BNA 2010). Many young stay with their parents until the following year spring migration. Wintering grounds are coastal areas, this species often flocks on shallow bays, marshes and intertidal mudflats, with abundant eelgrass and algae (Sibley 2003, BNA 2010).
Phenology: First Appear in the Area: early May. Lay Eggs: mid May. Clutch Size: 3-5. Eggs Hatch: mid June. Leave the Area: September.

2.2.9 Ross's Goose (*Chen rossii*)

Ross's geese winter in the south western United States and breed in the Arctic (Bellrose 1976). Although breeding populations were historically concentrated in the Queen Maud Gulf area, exponential growth in their continental population has resulted in the population expanding along the western coast of Hudson Bay, the southern coast of Southampton Island, and the southern coast of Baffin Island (Moser 2001). Helicopter surveys and banding studies conducted on Baffin Island indicated that the breeding population of Ross' geese along the coast has continued to increase from an estimated 2000 in 1998 to in excess of 4000 by 2001. The main wintering area currently includes the Central Valley of California, though increasing numbers winter in Arkansas, Louisiana, New Mexico, Texas, and the north-central highlands of Mexico (Turner et al. 1994).

Ross's geese are colonial nesters that are frequently associated with lesser snow geese during the breeding season. Preferred nesting sites are on sparsely vegetated islands and surrounding mainland areas of shallow freshwater lakes (Kerbes 1994). On average, three eggs are laid (Slattery 1994), and nest success ranges near 85% (Moser 2001). The incubation period is between 21 and 23 days (Slattery 1994). Ross's geese tend to disperse relatively far from nesting areas during brood rearing (Moser 2001). This is a grazing species that feeds on grasses, sedges, and small grains.
Phenology: First Appear in the Area: late May. Lay Eggs: early June. Clutch Size: 2-6. Eggs Hatch: early July. Leave the Area: October.

2.2.10 Snow Goose (Lesser and Greater; *Chen caerulescens*)



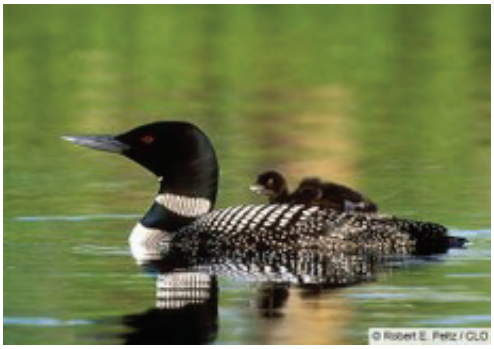
Large numbers of lesser and greater snow geese breed throughout the Mary River Project study area. Breeding colonies occur along the southern coast of Baffin Island, on Southampton Island, and along the western coast of Hudson Bay. Snow Geese nest in colonies, which can include tens of thousands of birds. Colonies are typically located in low grassy tundra on coastal plains, along broad shallow rivers near the coast, and inland on islands in shallow lakes (Bellrose 1976). Snow Geese begin to nest immediately upon arrival and begin incubation by late June. Clutch size can be as few as one or as many as nine, but averages four eggs. Eggs are laid by late May, and median hatch date is early to mid-July. Adult snow geese and their broods are very mobile and can travel 30 km in a matter of days to reach good brood-rearing habitat (Lepage et al. 1998). The young fledge by mid- to late August. Immature geese moult during mid-July, but mature birds moult slightly later after their eggs hatch. Fall migration commences in August and is generally a reversal of the spring route, although snow geese have periodically been observed flying south along the east coast of Baffin Island in September (McLaren and Renaud 1979).

Reproductive success in snow geese is quite variable between years, and is dependent upon the date of snowmelt, predator numbers (i.e., arctic fox, jaegers, and common ravens), and food availability for goslings. However, breeding conditions and nesting success over the past several decades have been such that the continental population of light-colored geese, including lesser and greater snow geese, was at record high numbers by the late 1990's and continue to grow (Batt 1998).
Phenology: First Appear in the Area: late May. Lay Eggs: late May. Clutch Size: average 4. Eggs Hatch: late June. Leave the Area: September.

2.3 FAMILY GAVIIDAE: LOONS

There are four loon species that occur in the Canadian Arctic. All are summer visitors to the region, arriving in May and June to breed. None are colonial nesters; breeding pairs disperse throughout the breeding area. Nesting by all species occurs on freshwater lakes. Some foraging may occur in coastal marine waters during the breeding season, but most species feed on fish and aquatic invertebrates in the vicinity of the lakes where they nest. Increased use of coastal marine waters in the arctic occurs during spring when birds may concentrate along coastal leads in the sea ice while waiting for ice in freshwater breeding areas to melt. Migration from summer breeding grounds to wintering areas in nearshore marine areas along the Atlantic and Pacific coasts of North America generally occurs during September through early November.

2.3.1 Common Loons (*Gavia immer*)



Common loons are widely distributed throughout central and northern North America and are most frequently associated with Canadian Shield lakes during the summer breeding period. The northern portions of their summer range include coastal western Hudson Bay, and the coasts of Hudson Strait and southern Baffin Island (Godfrey 1986). Wintering occurs in nearshore marine waters along the Atlantic and Pacific coasts of North America (Godfrey 1986, Daub 1989).
Phenology: First Appear in the Area: late April. Lay Eggs: late April to mid May. Clutch Size: 2. Eggs Hatch: late May to mid June. Leave the Area: September.

2.3.2 Pacific Loons (*Gavia pacifica*)

Pacific Loons are commonly distributed throughout coastal areas of southern Baffin Island, coastal and island areas of Foxe Basin and Hudson Bay, and inland areas to the west of Foxe Basin (Godfrey 1986). Wintering occurs along the Pacific coast from Alaska to Baja California, where birds are typically associated with marine coastal environments. Arrival at the breeding areas appears to be variable in the eastern Canadian Arctic, but generally birds first arrive between mid-May and mid-June (Soper 1946, MacPherson and McLaren 1959, Jehl and Smith 1970, Renaud et al. 1981). Breeding adults remain in coastal marine waters until inland waters break up and nesting sites become available, generally in late June. Nesting occurs on small freshwater lakes in arctic and subarctic tundra or taiga. Breeding adults feed near their nest site while breeding, although they may also return to coastal marine areas to feed (Bergman et al. 1977, Andres 1993). Non-breeding sub-adults remain in coastal waters to forage throughout the summer. Pacific Loons begin to move towards wintering areas during September in the eastern most portions of their breeding range.
Phenology: First Appear in the Area: early June. Lay Eggs: mid June. Clutch Size:1-2. Eggs Hatch: mid July. Leave the Area: September.

2.3.3 Red-throated Loons (*Gavia stellata*)

The Red-throated Loon is the most abundant loon within the Mary River study area. It breeds throughout the Foxe Basin-Hudson Strait region (Godfrey 1986), and in particular throughout the Melville Peninsula area (Montgomerie et al. 1983). Wintering areas are in nearshore marine waters along the Atlantic and Pacific coasts of North America (Godfrey 1986). The majority of spring migrants arrive at northern breeding areas during mid-late June, but remain in coastal waters until inland nesting areas become available (Alliston et al. 1976). Migration routes can be either across land or along coasts. Red-throated loons prefer to nest in low wetlands near marine environments but, on Baffin Island, may also nest in mountainous terrain at altitudes up to 1070 m (Renaud et al. 1981, Montgomerie et al. 1983). Adults forage in coastal marine waters throughout the nesting period. Coastal waters also support non-breeding adults throughout the summer, and fledged young and adults prior to fall migration. Fall migration from the nesting areas begins in early to mid-September, and is completed by late September (McLaren and Renaud 1979).

Phenology: First Appear in the Area: late May. Lay Eggs: late June. Clutch Size: 1-2. Eggs Hatch: late July. Leave the Area: September.

2.3.4 Yellow-billed Loons (*Gavia adamsii*)

Yellow-billed Loons breed in the southwestern Canadian Arctic archipelago and throughout coastal and mainland portions of the Northwest Territory mainland. The eastern-most extent of their breeding range includes Melville Peninsula, and areas along the north-western Hudson Bay coast (Godfrey 1986). They are also known to occur on Southampton Island, in southern Foxe Basin (Parker and Ross 1973). Wintering occurs along the west coast of North America, ranging from Alaska to southern British Columbia (Godfrey 1986). Throughout their range, adults arrive at breeding areas in mid-May to mid-June, depending upon location (Godfrey 1986). Yellow-billed Loons prefer to nest on islands and shorelines of freshwater lakes with stable water levels and low topography along the shores. Feeding occurs near the nest location during the breeding season.
Phenology: First Appear in the Area: late May. Lay Eggs: June. Clutch Size: 2. Eggs Hatch: July. Leave the Area: late August.

2.4 FAMILY LARIDAE and STERCORARIDAE: GULLS, TERNS and JAEGERS

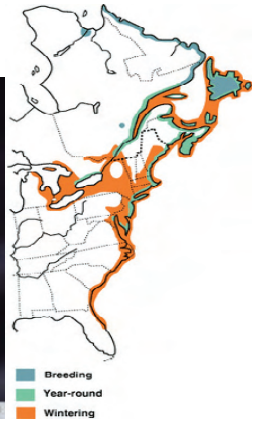
Nine species of gulls, one species of tern, and three species of jaegers occur within the Project's RSA. Gulls and terns tend to be coastal in distribution and nest in colonies that, depending on the species, range in size from a few individuals to thousands. In coastal marine environments, colonies may be located in a wide range of habitats including coastal cliffs, islands, spits, barrier beaches along the coast, or on islands in lakes adjacent to the coast (LGL Ltd. 1982). One species, the ivory gull, is listed as *Endangered* in Canada and is protected under the Species at Risk Act (Environment Canada, SARA 2010). Jaegers are widely distributed and are primarily pelagic during the non-breeding period, typically returning to land only to breed.

Gulls are generally gregarious, prefer open areas (beaches/lakes). Most nest colonially on the ground, sand scrape or mound of seaweed/grass. Terns forage by plunge diving into water from flight often from hovering position. They roost in large groups on the shoreline and nest colonially on the ground in shallow sand scrales. Jaegers come to land only when nesting. They are predatory, feeding on lemmings, small birds, and eggs or acquire much food by piracy, forcing other seabirds to relinquish fish they have captured (kleptoparasitism).

2.4.1 Glaucous Gulls (*Larus hyperboreus*)

Glaucous gulls are widely distributed across Arctic and sub-Arctic regions and are considered common breeders from Bylot Island south to Hudson Strait (Godfrey 1986, Lepage et al. 1998). They nest colonially on cliffs or islands, but individual nets may also be found on small islands. Nesting begins in late May, and clutch size is typically three, but sometimes two eggs. Incubation requires approximately 38 days (Godfrey 1986), and the young fledge in late August or early September, approximately 50 days after hatch. Glaucous gulls remain in the marine environment throughout the summer, especially along glacier fronts (McLaren and Renaud 1979) and feed primarily on fish and invertebrates, but will consume a wide array of scavenged food items.
Phenology: First Appear in the Area: early May. Lay Eggs: late May. Clutch Size: 3. Eggs Hatch: late June. Leave the Area: September.

2.4.2 Great-Black-backed Gulls (*Larus marinus*)

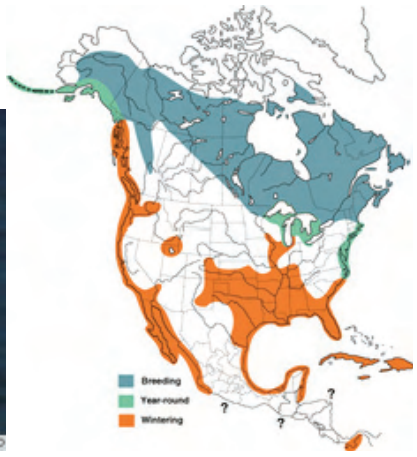


Great Black-backed gulls breed across northeastern Canada and the United States as far west as the Great Lakes occasionally. Breeding grounds are coastal areas of temperate and boreal habitats and extend into low arctic regions (BNA 2010). This species is considered an accidental visitor and possible breeders in the Baffin Island Area (Lepage et al. 1998). Great

Black-backed Gulls are generalists and eat a variety of foods including fish, invertebrates, mammals, chick and eggs of other birds. Carrion, dead fish and garbage are scavenged when available and individuals will steal prey from other gulls, eagles and even sharks. Prey caught by foraging at the tide line and shallow dives into the water (BNA 2010).

Great Black-backed gulls migrate towards breeding grounds in March and April. Pair bonds are kept for several years and sometimes for life; pairs will return to the same breeding territory as long as they are together. This species nests in loose colonies with as much space between pairs as habitat availability will allow. Great Black-backed gulls often nest in colonies with other gull species, terns, skimmer, alcids and eiders. Nest sites are varied and include rocky or grassy areas, sand dunes, marsh edges and shorelines; often placed on islands or offshore rocks to protect against terrestrial predators. Nest sites are often placed near objects such as boulders or vegetation which protects the nest form wind and is a visual barrier between neighbors. Nests are lined with vegetation, feathers and various man-made materials. Clutches contain an average of 3 eggs; one clutch is raised each season however up to two more will be attempted if the first clutches are unsuccessful. Eggs are laid in late April to May and hatch one month later. Both adults incubate eggs and care for the young after they hatch. The young are semiprecocial and leave the nest within 24 hours of hatching however do not leave the nest site for over a month. Young will sometimes stay with adults for a few months after fledging. Individuals start leaving the breeding grounds in August and migration out to deeper waters continues into October. Southern populations do not always migrate and will spend the winter in breeding areas. Migrating individuals spend the winter offshore and will roost near coastal communities such as ports and docks (BNA 2010).
Phenology: First Appear in the Area: March. Lay Eggs: late April. Clutch Size: 3. Eggs Hatch: late May. Leave the Area: August.

2.4.3 Herring Gulls (*Larus argentatus*)

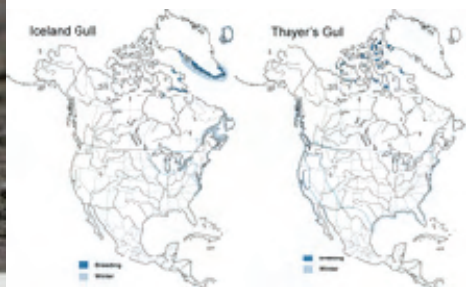


Herring Gulls are the most common gulls across the north-eastern United States. They have a circumboreal breeding range which extends across the continent into the subarctic. This species breeds across northeastern Canada and the United States as far west as the Great Lakes

occasionally (BNA 2010). Herring Gulls are generalists and eat a variety of foods including fish, invertebrates, mammals, chick and eggs of other birds. Carrion, dead fish and garbage are scavenged when available and individuals will steal prey other gulls, terns, alcids and ducks. Prey caught by foraging at the tide line and shallow dives into the water (BNA 2010).

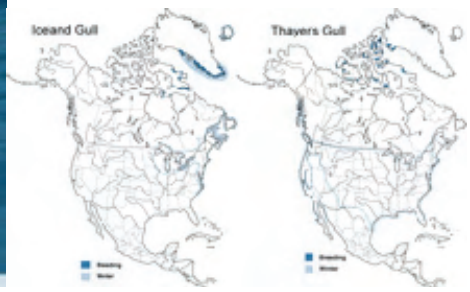
Herring Gulls return to breeding grounds in April. Pair bonds are kept for several years and sometimes for life; pairs will return to the same breeding territory as long as they are together (BNA 2010). This species nests in large loose colonies with as much space between pairs as habitat availability will allow; both conspecific and other species can be present. Nest sites are varied and include rocky or grassy areas, beaches, marsh edges and shorelines; often placed on islands or offshore rocks to protect against terrestrial predators (BNA 2010). Nest sites are often placed near objects such as boulders or vegetation which protects the nest form wind and is a visual barrier between neighbors. Nests are lined with vegetation, feathers and various man-made materials. Clutches contain an average of 3 eggs; one clutch is raised each season however another may be attempted if the first clutch is unsuccessful. Eggs are laid in early to mid May and hatch one month later. Both adults incubate eggs and care for the young after they hatch. The young are semiprecocial and leave the nest within 24 hours of hatching however do not leave the nest site for over a month. Young will sometimes stay with adults for a few months after fledging. Individuals start leaving the breeding grounds in July however only non-breeding individuals migrate; most adults disperse away from colonies but remain in the surrounding area. There is a even distribution of this species along Atlantic, Pacific and Gulf coasts from October through March.
Phenology: First Appear in the Area: April. Lay Eggs: early May. Clutch Size: 3. Eggs Hatch: early June. Leave the Area: July.

2.4.4 Iceland Gulls (*Larus glaucoides*)



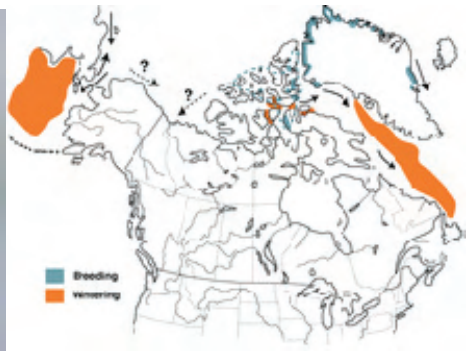
Iceland gulls nest along the northern shore of Hudson Strait (Godfrey 1986) and wintering occurs along the pack ice edge (Brown et al. 1975). Nesting colonies are generally located on cliffs and rocky islands in marine coastal areas (Godfrey 1986). Egg-laying extends through early to mid-June; hatching occurs during early to mid-July, and the young fledge in late August.
Phenology: First Appear in the Area: late May. Lay Eggs: mid June. Clutch Size: 1-3. Hatch: mid July. Leave the Area: August.

2.4.5 Thayer's Gull (*Larus thayeri*)



Thayer's gulls breed along the western coast of Foxe Basin (Godfrey 1986, Lepage et al. 1998) and begin arriving at most breeding areas in mid-May, but the major influx occurs in June (McLaren and Renaud 1979). The migration route is widespread, occurring along coastlines, ice edges, and offshore. Upon reaching the breeding areas, most of the birds remain at the coast throughout the summer (McLaren and Renaud 1979). Nesting begins in late June; hatching occurs in late July (Alliston et al. 1976), and it is suspected that the young fledge after early September. Thayer's Gulls begin to migrate away from the breeding grounds in mid-September (McLaren and Renaud 1979).
Phenology: First Appear in the Area: late May. Lay Eggs: mid June. Clutch Size: 1-3. Eggs Hatch: mid July. Leave the Area: September.

2.4.6 Ivory Gulls (*Pagophila eburnea*)



Very little is known about the *Endangered* ivory gulls and their general biology (COSEWIC 2010, Mallory et al. 2008) and they have only been observed occasionally in the RSA (in Foxe Basin and Eclipse Sound) in the past ten years (Mark Mallory, CWS, Personal Communication). Three hundred and seventy-five individuals were seen in the floe edges near Pond Inlet during spring migration in 1979 (Renaud and McLaren 1982) and 75 were seen in this same location in the spring of 1994 (Lepage et al. 1998). Ivory gulls are known to nest on Brodeur Peninsula on northern Baffin Island as well as in the eastern Lancaster-Jones Sounds regions close to Bylot Island (Mallory et al. 2008). Some ivory gulls are thought to migrate through Foxe Basin and Hudson Strait each year as a few individuals have been seen migrating through Igloolik and

Cape Dorset, outside of the RSA to the west (Mark Mallory, CWS, Personal Communication). However, the majority of ivory gulls that nest on Brodeur Peninsula are believed to winter in southwestern Baffin Bay and Davis Strait (Renaud and McLaren 1982, Mallory et al. 2008) and migrate there through Lancaster Sound (Renaud and McLaren 1982) but some of these individuals may migrate through Eclipse Sound. It therefore appears that portions of the RSA may be used as a migratory pathway by this species but very little else is known about the life history of this species.

Ivory Gulls are widely distributed throughout the polar region, and remain in the Arctic and sub-Arctic throughout the year. They occur in small numbers in the eastern Canadian Arctic (Thomas and MacDonald 1987) and are listed as a Species at Risk in Canada. Ivory gulls are rare visitors to southern Foxe Basin (MacPherson and McLaren 1959), and it is not known whether breeding occurs there. Nest sites are varied and include sea cliffs, nunataks, terrestrial islands, gravel-covered floating ice islands, and high gravel plains and ice caps (Renaud et al. 1979). Egg-laying occurs in late June or early July; average clutch size is two eggs, incubation requires approximately 25 days, and the birds fledge after five weeks. Movement towards offshore foraging and wintering areas begins in early October (Renaud and MacLaren 1982), and continues eastward and south with the formation of consolidated pack ice throughout November and December (Brown et al. 1975, Orr and Parsons 1982).
Phenology: First Appear in the Area: late May. Lay Eggs: late June. Clutch Size: 1-3. Eggs Hatch: late July. Leave the Area: September to October.

2.4.7 Ross's Gulls (*Rhodostethis rosea*)

Ross's gull is one of the rarest breeding gulls in North America and is considered a *Threatened* species in Canada (COSEWIC 2010, SARA 2010). Very little is known about this species and no long-term studies exist for it in the Canadian Arctic. This species has been recorded nesting in few locations in Canada; including Prince Charles Island in Foxe Basin, Bathurst Island, Cheyne Islands (Nunavut) an island within Penny Strait (Nunavut) and Churchill, Manitoba (Lepage et al. 1998). Single adult Ross's gull in breeding plumage were recorded on Bylot Island in 1979 by both Renaud et al. (1981) and Lepage et al. (1998) and are considered a rare visitor in this area. In Foxe Basin, a pair of breeding Ross's gulls was discovered on Prince Charles Island in 1984 by Tony Gaston (CWS) and in 1997 by both Vicky Johnson (CWS) and Bechet et al. (2000). Despite intensive surveys on Prince Charles and neighboring Air Force

Island in 1996 and 1997, no additional birds were found (Johnston and Pepper 2009, Vicky Johnston, CWS, Personal Communication, Mark Mallory, CWS, Personal Communication). The majority of the world's Ross's gulls are thought to breed in eastern Siberia. Canada's Ross's gulls are thought to spend the winter in the Chukchi Sea, between Alaska and Russia and in the pack ice of the Arctic Ocean (Lepage et al. 1998).
Phenology: First Appear in the Area: mid June. Lay Eggs: mid June. Clutch Size: 1-4. Eggs Hatch: mid July. Leave the Area: July-August.

2.4.8 Sabine's Gulls (*Xema sabini*)

Sabine's gulls breed across arctic regions; in North America their breeding ground includes coastal Alaska across the arctic to Baffin Island and Hudson Bay (BNA 2010). This specie is considered a rare breeder on Bylot Island and in the Baffin Island area (Lepage et al. 1998). When not on breeding grounds this species is found largely out at sea (Sibley 2003). Sabine's gulls primarily eat aquatic insects during the breeding season, during migration and winter months they also feed on zooplankton, crustaceans and fish. This species prefers prey from freshwater and only rarely hunts in salt water habitats. Prey is seized from at or just below the surface by walking on shore or mudflats or from swimming (BNA 2010).

Sabine's gulls begin return to breeding grounds in March and April following the edge of ice melt often arriving in Canada's arctic in mid June (Lepage et al. 1998, BNA 2010). Exact timing of breeding varies based on annual weather patterns. In northern Canada eggs are often laid in mid to late June and hatch around three weeks later. Both adults incubate eggs and care for the young after they hatch. Clutches could contain 1-4 eggs but average 2.5; young are semiprecocial and leave the nest within 24 hours of hatching (BNA 2010). This species nests solitarily or in small colonies (10-20 pairs); sometimes in association with other species such as black-legged kittiwakes, herring or mew gulls. Nests are usually placed near the coast along shorelines of marshes, ponds and lakes in the tundra. Nests are depressions in vegetation or on bare gravel, rarely line with spares plant material (BNA 2010). Fall migration peaks August to mid September but birds have been seen leaving Baffin Island until mid October. Winters are spent along the coast in the tropics and subtropics; birds from Alaska and western Canada are

believed to winter along Pacific coast of South America; while birds from eastern Canada and Greenland are believed to winter mainly along the west coast of Africa. Many first year, non breeding individuals stay in the south over the first breeding season (BNA 2010).
Phenology: First Appear in the Area: mid June. Lay Eggs: mid June. Clutch Size: 1-4. Eggs Hatch: mid July. Leave the Area: July-August.

2.4.9 Arctic Terns (*Sterna paradisaea*)

Arctic tern's breeding range is circumpolar and within North America they breed around the Arctic Ocean east to Greenland and south to the northern United States. Breeding on some northern islands in the Canadian arctic may not occur annually due to weather and ice conditions. This species has the longest migration route of all bird species with a total distance of around 40,000 km each year between breeding grounds and the Antarctic pack ice where it spends its winter. Arctic terns stay out at sea and are rarely observed from shore except during breeding season (BNA 2010). While there is an estimated 1-2 million pairs of Arctic terns worldwide (BNA 2010) they are considered a rare breeder in the Bylot and Baffin Island areas (Lepage et al. 1998). Arctic terns feed primarily on small fish but also consume crustaceans and other insects and invertebrates. Prey caught by diving from flight or grabbing food from the water's surface while swimming (BNA 2010).

Arctic terns begin migration towards breeding grounds in March; timing of breeding varies annually with temperature and weather variations (BNA 2010). This species usually nests solitarily but will form small colonies on the tundra and large colonies are sometimes formed on coastal islands (Lepage et al. 1998, BNA 2010). Nest sites are varied but usually include open treeless habitats close to water; such as marshes, lake or pond shorelines, islets in rivers, islands off the coast or in lakes. Nests are scrapes often on sand or gravel are sometimes lined with vegetation, stones, and bits of shell or plastic. Some nests are in sparse vegetation and these are often unlined (BNA 2010). Arctic terns are seen around Baffin Island from mid June to mid September with eggs laid late June and eggs hatch one month later (Lepage et al. 1998). Clutches usually contain 1-3 eggs, average of 2; one clutch is raised each season however up to two more will be attempted if the first clutches are unsuccessful (BNA 2010). Both adults incubate eggs and care for the young after they hatch. The young are semiprecocial and often leave the nest 2-3 days after hatching. Birds leave the breeding grounds shortly after young

birds have fledged; migration begins in late July and lasts until October. Congregate in Antarctica along edge of pack ice and nearshore icebergs (BNA 2010).
Phenology: First Appear in the Area: mid June. Lay Eggs: late June. Clutch Size: 1-3. Eggs Hatch: late July. Leave the Area: July-August.

2.4.10 Black-legged Kittiwakes (*Rissa tridactyla*)

Black-legged kittiwakes are one of the most widely distributed northern gull, breeding throughout the Arctic and sub-Arctic from Alaska to Greenland (Godfrey 1986) and have been observed in southern Foxe Basin and throughout Hudson Strait. Kittiwakes that breed in the eastern Canadian Arctic winter primarily off Newfoundland and Labrador. Black-legged kittiwakes breed in colonies and build their nests in isolated marine environments, such as cliffs on offshore islands, sea stacks, and inaccessible regions of shoreline. They have also been found nesting on steeply sloped ground, boulders, buildings and glaciers (Coulson and Thomas 1985, Irons 1987).

Kittiwakes consume mainly surface-schooling fish that spawn near shore and fish that are scavenged. Consequently, they do not need to travel far from their breeding colonies to feed (Schneider et al. 1990). Due to their feeding habits, these birds are often found concentrated near the edge of sea ice, or along the coast once the ice has begun to melt. In times when such food supplies run short, they will travel farther distances out into the ocean in search of prey, and will also consume aquatic invertebrates (Baird 1990). Egg-laying begins in late June to early July and the young fledge in approximately five weeks, beginning in late August or early September. Most Kittiwakes remain at or near their nests into early August. Shortly thereafter, the number of birds begins to increase along the coast in locations remote from the colonies (McLaren and Renaud 1979).
Phenology: First Appear in the Area: mid May. Lay Eggs: late June. Clutch Size: 1-3. Eggs Hatch: late July. Leave the Area: October.

2.4.11 Long-tailed Jaegers (*Stercorarius longicaudus*)

Long-tailed Jaegers are the most abundant and widespread jaeger in the Arctic; breeding across a large portion of northern North America (BNA 2010). This species is considered a common breeder in the Bylot and Baffin Islands area with several nests located each year (Lepage et al. 1998). This species can spend up to 9 months per year at sea; migratory routes and winter areas are pelagic (BNA 2010).

Long-tailed Jaegers feed mainly lemmings and voles though will also prey on varied food types such as young birds or berries. While at sea this species feeds on fish and aquatic invertebrates. Lemmings are captured by locating a burrow and attacking a lemming when it exits. They are chased down on foot and pecked until dead. Where no small mammals are available this species will resort to stealing or scavenging food. Annual breeding success of this species is directly related to lemming populations (BNA 2010).

Long-tailed Jaegers arrive on the breeding grounds late May to early June (Lepage et al. 1998, BNA 2010). This species defends territories against all jaeger species and are known to frequently use the same nesting territory as the year before with the same partner. Long-tailed Jaegers nest on the arctic tundra; often in areas with ponds and marshes away from the coast. Nests are often placed on a slight slope within or on a mound of vegetation and are unlined. Nests contain 1-2 eggs; both adults incubate and provide food for offspring once they hatch (BNA 2010). Eggs are laid in mid to late June and hatch around three weeks later, the young leave the nest within 1-2 days of hatching. Birds leave the breeding grounds at varying times; from late July through mid August depending on breeding status (Lepage et al. 1998, BNA 2010). Individuals arrive on wintering grounds off eastern South America and off south-western South Africa between late September and mid November.
Phenology: First Appear in the Area: late May. Lay Eggs: mid June. Clutch Size: 1-2. Eggs Hatch: mid July. Leave the Area: July-August.

2.4.12 Parasitic Jaeger (*Stercorarius parasitus*)

Parasitic jaegers are usually the rarest of the jaegers in the arctic; however this species is considered an uncommon breeder in the Bylot and Baffin Islands area and was seen fairly regularly (Lepage et al. 1998). This species breeds across a large portion of northern North America; migratory routes and winter areas are pelagic and this species spends a large portion of each year at sea (BNA 2010). This species is more coastal than the other jaegers and can be frequently spotted from shore.

Parasitic jaegers are the only jaeger which does not feed primarily on lemmings. Some populations hunt a variety of prey including birds, eggs and rodents. Other populations nest near seabird colonies and use kleptoparasitism as their main food source (BNA 2010).

Parasitic jaegers arrive on the breeding grounds mid May to early June (Lepage et al. 1998, BNA 2010). This species defends territories against all jaeger species. Nests are often placed on ridges in wet tundra habitats or in grassy meadows often sedge dominated; they consist of a shallow depression sometimes in moss or lichen and can be lined with grass or lichens. Nests contain 1-2 eggs; only one brood is raised per year. Both adults incubate and provide food for offspring once they hatch. Eggs are laid in late May to mid June and hatch just under one month later. The young leave the nest within 1-2 days of hatching. Birds leave for tropical waters off both coasts of South America from late July to early September (Lepage et al. 1998, BNA 2010).
Phenology: First Appear in the Area: mid May. Lay Eggs: mid June, Clutch Size: 1-2, Eggs Hatch: mid July. Leave the Area: July-September.

2.4.13 Pomarine Jaeger (*Stercorarius pomarinus*)

Pomarine Jaegers have a circumpolar breeding range; across North America it is limited to the coasts of Alaska and western Canada; individuals are seen in east but nesting is rare (BNA 2010). This species is considered an uncommon visitor and probable breeder in the Bylot and Baffin Islands area with no confirmed nesting (Lepage et al. 1998). This species spends a large portion of each year at sea; migratory routes and winter areas are pelagic (BNA 2010).

Pomarine jaegers feed mainly lemmings and other rodents and annual breeding success of this species is directly related to lemming populations. Lemmings are captured by locating a burrow and either attacking a lemming when it exits or digging it out. They are chased down on foot and pecked until dead. While out at sea this species feeds on fish, stealing food and following ships for scraps (BNA 2010).

Pomarine jaegers arrive on the breeding grounds late May to early June. This species defends territories against all jaeger species. Pomarine jaegers nest in wet coastal tundra habitats; often in areas with small lakes and marshes. Nests are slight depressions which can be lined vegetation pulled from right by the nest and are often placed on slightly higher and drier ground. Nests contain 1-2 eggs; both adults incubate and provide food for offspring once they hatch (BNA 2010). Eggs are laid in mid to late June and hatch around three weeks later, the young leave the nest within 1-4 days of hatching. Birds leave the breeding grounds at varying times; from late July through early September depending on breeding status (Lepage et al. 1998, BNA 2010). Individuals arrive on wintering grounds off eastern South America between late September and mid November.
Phenology: First Appear in the Area: late May. Lay Eggs: mid June. Clutch Size: 1-2. Eggs Hatch: mid July. Leave the Area: July-September.

2.5 FAMILY PROCELLARIDAE: FULMARS

2.5.1 Northern Fulmars (*Fulmarus glacialis*)

The northern fulmar is a pelagic seabird that has a disjunct circumpolar distribution. They are one of the most abundant seabirds in the eastern Arctic with population estimates of over 600,000 nesting birds (Brown et al. 1975). Surprisingly, there is little data available on northern fulmars in the Project's RSA, indicating that they may not be common to the region. Eggs typically hatch in late July, and young fledge by mid-September. In August and September, large concentrations of fulmars gather along the southeast portions of Ellesmere, Devon, and Baffin Islands (McLaren and Renaud 1979). Fall migration begins in mid-September and October after newly hatched birds have grown to adult size and become capable of flying (McLaren and Renaud 1979, McLaren 1982). Fulmars remain strictly pelagic throughout the non-breeding period and commonly winter in Davis Strait, the Labrador Sea and the North Atlantic Ocean. Their diet consists primary of pelagic macroinvertebrates, and breeding adults may make extended trips away from colonies to offshore areas to feed.
Phenology: First Appear in the Area: early April. Lay Eggs: late May to early June. Clutch Size: 1. Eggs Hatch: mid to late July. Leave the Area: October.

2.6 FAMILIES CHARADIIDAE and SCOLOPACIDAE: SHOREBIRDS

Fifteen species of shorebirds are likely to occur within the Project's RSA and the highest diversity and abundances are likely to be seen in the Foxe Basin and Hudson Strait regions. Species expected to be seen include two species of phalarope (red phalarope and red-necked phalarope) which are known to nest in coastal Arctic tundra. Both species are listed as *Sensitive* by the Government of Nunavut (CESSC 2010) but are not listed by COSEWIC (2010) or SARA (2010).

There are also likely to be three species of plover, five species of sandpiper, killdeer, ruddy turnstone, red knot, sanderling, and dunlin in or around the RSA. The red knot subspecies (*Calidris canutus rufa*) that is known to occur in Foxe Basin (Prince Charles and Rowley Islands)

is listed as *Endangered* by COSEWIC (2010) and *Undetermined* by CESCC (2010). It has not yet been re-assessed by SARA (2010) and remains listed as *No Status*.

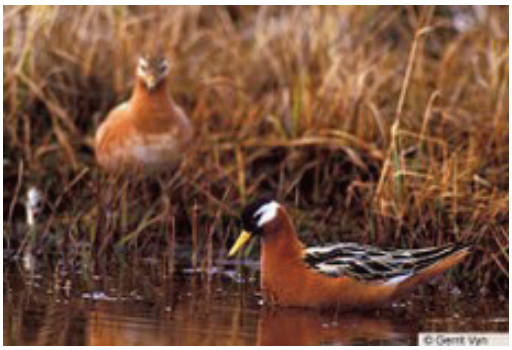
Shorebirds arrive at inland areas in the Arctic starting in late May until mid-June, although access to coastal beaches and marine habitats may not occur until later, depending upon snow and ice cover. Dispersal to breeding habitats, which range from wetland areas (red phalarope and pectoral sandpiper) to very dry terrestrial areas (semipalmated plover and ruddy turnstone) occurs once the snow has melted.

With the exception of the purple sandpiper whose winter range includes southwest Greenland, shorebirds typically migrate to wintering areas in southern North America shortly after the brood rearing period is complete (Godfrey 1986). Timing of the southward migration depends on age and reproductive status: non-breeders usually leave by late June, breeding adults by mid-August, and yearlings by September or early October.

While in the Arctic, shorebird diet includes insects, crustaceans, molluscs, and worms from the marine environment. Although they depend upon freshwater wetland areas during the breeding and brood-rearing seasons for food and nesting sites, shorebirds rely heavily upon marine littoral habitats during migration. Due to the short annual reproductive cycle, a late spring thaw can reduce breeding effort or eliminate it completely by limiting food availability and the time available to successfully raise young before fall migration (Alliston et al. 1976).

2.7 FAMILY SCOLOPACIDAE: PHALAROPES

2.7.1 Red Phalaropes (*Phalaropus fulicarius*)



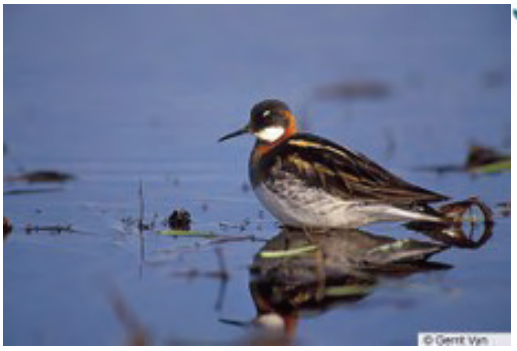
Red phalaropes, like other phalaropes have revered breeding roles; the male is smaller, more camouflaged and cares for the young alone. This species spends more time at sea than the others; migratory routes and winter areas are pelagic and this species spends around 11 months per year at sea (Sibley 2003, BNA 2010). Red phalaropes breeding range is circumpolar arctic and subarctic; and breeds across northern coast of North America. There is

an estimated 5 million individual red phalaropes worldwide, 500,000 in Canada (BNA 2010); however they are considered an uncommon breeder in the Bylot and Baffin Island areas (Lepage et al. 1998).

Red phalaropes feed primarily on insects and crustaceans during the breeding season and switches to zooplankton at sea. This species forages while walking or swimming; will also upend and pick prey from underwater while swimming. Phalaropes also feed by spinning in tight circles; this creates a vortex which lifts prey to the surface (BNA 2010).

Red phalaropes begin migration towards breeding grounds in late March to early April; timing of breeding varies annually with temperature and weather variations (BNA 2010). Nest are near water; along the tundra coastline, on edges of tundra ponds, marshes or grasslands (BNA 2010). Red phalaropes are seen around Baffin Island from early June to mid September; eggs are laid mid June to early July and eggs hatch three weeks later (Lepage et al. 1998, BNA 2010). Clutches usually contain 4 eggs; only one clutch is raised each season by the male however females may have a second clutch with another male (BNA 2010). Only the male parent incubates eggs and cares for the young after they hatch. The young are precocial and leave the nest within 24 hours of hatching. Birds leave the breeding grounds at varying times; from late June through early August depending on breeding status. They begin to arrive at the subtropical and tropical water wintering grounds off South America in September.
Phenology: First Appear in the Area: mid May. Lay Eggs: mid June. Clutch Size: 4. Eggs Hatch: late June. Leave the Area: June-August.

2.7.2 Red-necked Phalaropes (*Phalaropus lobatus*)



Red-necked phalaropes, like other phalaropes have revered breeding roles; the male is smaller, more camouflaged and cares for the young alone. This species' migratory routes and winter areas are pelagic and this species spends around 9 months per year at sea. Red-necked phalarope's breeding range is the most widely distributed of any phalarope; the range is circumpolar arctic and subarctic and this species breeds across northern North America. There are an estimated 2 million individual red-necked phalaropes within Canada (BNA 2010);

however they are considered an accidental breeder in the Bylot and Baffin Island areas and is normally found further south on Baffin Island (Lepage et al. 1998).

Red-necked phalaropes feed primarily on aquatic insects during the breeding season and switches to zooplankton at sea. This species forages while walking or swimming; will also upend and pick prey from underwater while swimming. Phalaropes also feed by spinning in tight circles; this creates a vortex which lifts prey to the surface (BNA 2010).

Red-necked phalaropes begin migration towards breeding grounds in late March to early April; timing of breeding varies annually with temperature and weather variations but arrive mid May to early June over most of their range (BNA 2010). Nest are near water; on edges of tundra ponds, marshes or bogs. Nests are often placed on hummocks or hidden in vegetation; this species breeds further from the coast than red phalarope and prefers more vegetated habitats to nest in. Eggs are laid early June to early July and eggs hatch three weeks later. Clutches usually contain 4 eggs; only one clutch is raised each season (BNA 2010). Only the male parent incubates eggs and cares for the young after they hatch. The young are precocial and leave the nest within 24 hours of hatching. Birds leave the breeding grounds at varying times from late June depending on breeding status. They begin to arrive at the subtropical and tropical water wintering grounds off South America in September (BNA 2010).
Phenology: First Appear in the Area: mid May. Lay Eggs: early June. Clutch Size: 4. Eggs Hatch: late June. Leave the Area: June-August.

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