Inuvik – Tuktoyaktuk Highway Baseline Data Acquisition Program: Wildlife Habitat Potential Mapping

Final Report

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Abbreviations

DOT ..... Department of Transportation
EIRB ..... Environmental Impact Review Board
EIS ..... Environmental Impact Statement
ENR ..... Environment and Natural Resources GNWT
EOSD ..... Earth Observation for Sustainable Development of Forests
IOL ..... Imperial Oil Limited
GIS ..... Geographic Information System
GNWT ..... Government of the Northwest Territories
MGP ..... Mackenzie Gas Project

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Government of the Northwest Territories (GNWT), Department of Transportation (DOT), the Town of Inuvik and the Hamlet of Tuktoyaktuk are proposing to construct a 140 km all-season highway to connect the Town of Inuvik with the Hamlet of Tuktoyaktuk (the Project). The Project is wholly within the Inuvialuit Settlement Region, with portions of the highway crossing Inuvialuit 7(1)(a), 7(1)(b) and Crown lands. The Project is currently undergoing a substituted Panel review by the Environmental Impact Review Board. An Environmental Impact Statement (EIS) was submitted in May 2011. The EIS has undergone a conformity review by the EIRB and reviewers, where a number of deficiencies have been identified. The goal of the present report is to present additional information related to the identification of habitat suitability for four birds listed under Schedule 1 of the *Species at Risk Act,* as well as concentrations of breeding waterbirds, within a 1 km corridor centered on the Project's proposed Alignments #1 and #3 (Alternate and Preferred) as filed in the EIS and supplementary documents.

1.2 STUDY OBJECTIVES

The scope of the wildlife habitat suitability study includes the following tasks:

- Summarize habitat associations of bird species at risk occurring in the Project study area (Horned Grebe, Peregrine Falcon, Short-eared Owl, Rusty Blackbird)
- Categorize suitability of habitat types within the Project study area for bird species at risk and waterbirds
- Map habitat suitability in the Project study area for each bird species at risk, as well as waterbirds Characterize and categorize potential areas suitable for Grizzly bear dens
- Identify any locations within the Project study area where bird species at risk, waterbirds, or Grizzly bear dens are likely to be located, and suggest mitigation measures to limit effects of the Project

The study was completed in two parts:

1. Preliminary wildlife habitat classification and habitat and den potential mapping based on desktop review
2. Final wildlife habitat classification and den potential mapping based on desktop review and field verification

2 METHODOLOGY

The following section describes the methodology used to complete wildlife habitat/den suitability classification and habitat/den potential mapping, as well as field studies.

2.1 REVIEW OF EXISTING INFORMATION

KAVIK-STANTEC's Preliminary Vegetation Mapping Report (KAVIK-STANTEC, 2012a) describes vegetation classes in the Inuvik to Tuktoyaktuk Highway study area, based on literature review, image interpretation and field verification. The vegetation classes presented in the Vegetation Mapping Report are supplemented by water and terrain classes, also defined using desktop methods. These vegetation, water and terrain classes have been used in conjunction with knowledge about habitat preferences, to define wildlife habitat suitability across the Project study area. Background information regarding status, distribution, and habitat associations of waterbirds and species at risk was compiled from key species-specific references, including Birds of North America accounts, COSEWIC status reports, and wildlife reports from the region of the Project or elsewhere in the western Canadian arctic (e.g. IOL et al., 2004; Hines et al. 2004; Hines and Fournier 2005; Hines and Robertson 2006).

2.2 MAPPING METHODOLOGY

2.2.1 Vegetation, Water and Terrain Classes

Nine Tundra Ecozone vegetation types in the Project study area were identified in the Preliminary Vegetation Report (KAVIK-STANTEC 2012a). Two additional types were added after the vegetation field surveys were completed:

- (1) Dry Saxifrage Tundra
- (2) Dwarf Shrub Heath
- (3) Dwarf Shrub Heath/Upland Shrub
- (4) Cotton-Grass Tussock
- (5) High-Centred Polygons
- (6) Low-Centred Polygons
- (7) Riparian Shrub
- (8) Riparian Sedge - Cotton-Grass
- (13) Riparian Black Spruce/Shrub
- (Td5) Upland Alaska Birch–Spruce
- (Th3) Black Spruce/Ground Birch

In addition to these eleven vegetation type classes, two water classes and four terrain (slope) classes have been added to define wildlife habitat and den suitability potential:

- Ponds (less than 2 ha)
- Lakes (2 ha or greater)
- Flat to gentle slope (0-15%)
- Moderate to strong slope (15-45%)
- Very strong to extreme slope (45-85%)
- Steep slope (above 85%)

2.2.2 Wildlife Habitat Suitability Mapping

The distribution of wildlife is generally closely linked to the availability of habitat, and the preferences of each species. Habitat associations for most birds are quite well described, although they can vary considerably across the range of a species, and as much as possible, local data should be given priority. For each of the four bird species at risk, as well as for waterbirds in general, habitat suitability was assessed for each of the vegetation types, water and terrain classes, with reference to habitat preferences reported in literature, emphasizing sources from the Northwest Territories or elsewhere in the arctic where available. A preliminary report of wildlife habitat suitability and associated maps was presented to EIRB on June 15, and subsequently discussed with Canadian Wildlife Service.

2.2.3 Grizzly Bear Den Potential Mapping

The identification of areas suitable for dens for Grizzly bears was based on slope, aspect, terrain and vegetation parameters, as discerned through project imagery (photos and LiDAR) and terrain and vegetation mapping as completed by KAVIK-STANTEC. These parameters were based on guidance from GNWT-Environment and Natural Resources and literature review, with a priority on Northwest Territories sources.

2.2.4 Field Verification

A field verification program was completed July 2-6, 2012. The program was designed to collect observations of bird species at risk, waterbirds, and Grizzly bear dens to validate and update the habitat suitability modeling, as well as to identify concentrations of these species or other wildlife that may be important to consider with respect to project design and mitigation.

The wildlife field program was completed in two parts. On 2 July 2012, an aerial survey was conducted using a Bell 206L helicopter equipped with bubble windows on the left side. All wetlands within the Project area were overflown, and observers recorded all waterbirds associated with each wetland, as well as incidental observations of raptors and mammals. From 3-6 July 2012, surveys were completed at 57 pre-selected ground locations, approximately 2 km apart, throughout the Project study area. At each site, a 10-minute point count was completed, recording all birds seen and heard, habitat suitability was assessed

for waterbirds and bird species at risk, dominant shrubs and ground cover were noted, and at least 6 photos were taken for future reference (four cardinal directions, aerial, ground vegetation). All observations were uploaded daily to Stantec's wildlife database.

2.2.5 Final Wildlife Habitat Suitability Mapping

The final wildlife habitat suitability map atlas depicts probability of occurrence of high, medium and low quality habitat for each of the four bird species at risk and waterbirds at a scale of 1:10,000. A Grizzly bear den potential map identifies areas of higher or lower potential of occurrence of suitable denning sites across the Project study area.

3 RESULTS

3.1 Preliminary Wildlife Habitat Suitability

The results of preliminary habitat suitability mapping for Horned Grebe, Rusty Blackbird, Short-eared Owl, Peregrine Falcon and waterbirds were submitted to the EIRB in June, 2012. The results of preliminary mapping are presented again below, and are further refined in Section 3.3, based on results of field verification.

3.1.1 Horned Grebe

Horned Grebe (*Podiceps auritus*) is a small waterbird classified as Special Concern by COSEWIC and pending status assignment under SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2012). The Project area is just within the northern limits of the breeding range of Horned Grebe (Stedman 2000, GNWT 2012).

Aside from nesting, Horned Grebes are primarily aquatic, and their distribution is largely dependent on availability of suitable wetlands. Breeding sites are most commonly small wetlands with emergent vegetation (particularly cattails and sedges) along the margins and enough open water and depth to allow for diving (Stedman 2000). In a ten-year study around Yellowknife, Fournier and Hines (1999) found that ponds smaller than 0.1 ha were almost never occupied, whereas those between 0.3 ha and 2 ha were most frequently used, and occupancy dropped off noticeably again at ponds larger than 4 ha. Faaborg (1976) also noted a strong preference for ponds smaller than 1 ha in a broader review. Availability of residual emergent growth from the previous year, especially cattail and willow, appears to be preferred (Fournier and Hines 1999).

Project imagery allows for identification of ponds as small as approximately 0.1 ha, but smaller waterbodies are not mapped. Given the preferences for small ponds as described in the literature for Northwest Territories and elsewhere, habitat suitability for Horned Grebe is therefore assessed as high for ponds (waterbodies up to 2 ha), moderate for lakes (waterbodies >2 ha), and nil for all terrestrial habitat classes.

3.1.2 Waterbirds

A wide variety of waterbirds breed in the Project area, including various waterfowl (ducks, geese, swans), loons, grebes, shorebirds, gulls, terns, and jaegers). Of particular interest are species important for subsistence as identified in Kiggiak-EBA (2011) (Tundra Swan, Greater White-fronted Goose, Snow Goose, Canada Goose, Mallard, and Northern Pintail) and shorebirds as a group, given that many species have been in decline. Other waterbirds that have been assessed for nearby projects include Greater and Lesser Scaup, Whimbrel, and Arctic Tern (IOL et al., 2004). The evaluation of habitat

suitability for waterbirds therefore focuses principally on waterfowl and shorebirds, although the habitat requirements of most other waterbirds in the area are similar.

While waterbirds are generally dependent on proximity to waterbodies, waterfowl and shorebirds nest on adjacent upland habitat. Considering in particular the large number of waterbird species present in the Project area, all upland habitat types provide some degree of nesting potential. However, overall waterbird density is likely to be highest in vegetation types dominated by low ground cover, and lowest where trees and large shrubs dominate. Bare areas may also be somewhat less attractive for many species due to lack of cover.

Habitat suitability for waterbirds is therefore expected to be high for cottongrass tussock, high-centred and low-centred polygons, and riparian sedge-cottongrass; moderate for dry saxifrage tundra, dwarf shrub heath, riparian shrub; and low for upland shrub and riparian black spruce/shrub. Although waterbodies are not used for nesting, they are important for feeding, and all are ranked as having high habitat suitability potential. Slope classes are not used to rank habitat for waterbirds.

3.1.3 Peregrine Falcon

Peregrine Falcon (*Falco peregrinus*) – *anatum/tundrius* is a raptor classified as Special Concern by COSEWIC and Schedule 1 of SARA (GC 2012); it is also considered Sensitive in the Northwest Territories (WGNWTS 2012). The entire Project area is well within the breeding range of Peregrine Falcon, and the *anatum* subspecies is considered dominant in this area (White et al. 2002, GNWT 2012).

Among the most widely distributed birds in the world, Peregrine Falcons are associated with a wide variety of habitats, but nest sites are consistently on cliffs or other elevated ledges, and often near water (White et al. 2002). In the arctic, Peregrine Falcons often nest on cliffs much lower than they would use elsewhere, sometimes 10 m or less (Jenkins and Hockey 2001). Northern nest sites often include river banks and other steep slopes, as well as rock outcrops. In a five-year study around Rankin Inlet, 29 cliff nests ranged from 4 to 26 m above ground, all were within 300 m of significant water bodies, and the majority had a southerly exposure (Court et al. 1988). Peregrine Falcons in the Northwest Territories often occupy stick nests previously built by Common Ravens (*Corvus corax*) or Rough-legged Hawks (*Buteo lagopus*), as these may offer flat surfaces otherwise scarce on some slopes (Calef and Heard 1979; Court et al. 1988). Notwithstanding these requirements for nesting, Peregrine Falcon often hunt over large territories and can therefore be seen far from breeding habitat (White et al. 2002).

The abundance of water bodies within the Project area is attractive to Peregrine Falcons and provides an abundance of potential prey, but their distribution is limited by availability of potential nesting sites, namely steep river and lake banks. As a result, terrestrial and aquatic habitat classes do not contribute to the identification and ranking of habitat. Instead, habitat potential is estimated by slope class as discerned from terrain mapping and LiDAR imagery. Steep slopes (above 85%) are considered to provide high suitability habitat; very strong to extreme slopes (45-85%) are moderate; moderate to strong slopes (15-45%) are low, and flat to gentle slopes (0-15%) are not considered to provide any potential nesting habitat for Peregrine Falcons.

3.1.4 Short-Eared Owl

Short-eared Owl (*Asio flammeus*) is a medium-sized owl classified as Special Concern by COSEWIC and Schedule 1 of SARA (GC 2012); it is also considered Sensitive in the Northwest Territories (WGNWTS 2012). The Project study area is entirely within the breeding range of Short-eared Owl (Wiggins et al. 2006, GNWT 2012), and aerial waterfowl surveys between 1989 and 2008 recorded several incidental sightings of Short-eared Owls in the region south and west of Tuktoyaktuk (CWS, unpub. data).

Short-eared Owls occupy a wide variety of open habitats, ranging from grassland to tundra and also including a variety of wetlands such as bogs and marshes (Wiggins et al. 2006). They nest on the ground, often favoring locations that are somewhat concealed by taller grasses and slightly higher than surrounding areas (e.g. hummocks), and may feature dead and matted-down vegetation from the previous year (Holt 1992, Wiggins et al. 2006, Keyes 2011). In parts of its range, Short-eared Owl is quite nomadic in response to variability in prey populations, especially voles or lemmings, posing challenges for estimation of local and regional populations (Wiggins et al. 2006, COSEWIC 2008). There is some evidence that Short-eared Owls may desert their nests if disturbed during laying and incubation (Leasure and Holt 1991, GNWT 2012).

Most terrestrial habitat within the Project study area is open and therefore has some potential as breeding habitat for Short-eared Owl. The least suitable habitat type in the Project study area is riparian black spruce-shrub, but even within patches of that habitat there may be open areas with some potential for nesting. Habitat suitability mapping takes into consideration the preference for open grassy habitat and slightly elevated patches. Therefore cottongrass-tussock and low-centred polygon vegetation classes are considered to have high potential for Short-eared Owl; dwarf shrub heath, high-centred polygons and riparian sedge-cottongrass to have moderate potential; and dry saxifrage tundra, upland shrub, riparian shrub, and riparian black spruce-shrub to have low potential. Lakes, ponds and slopes are not applicable for assessing habitat suitability for Short-eared Owls.

3.1.5 Rusty Blackbird

Rusty Blackbird (*Euphagus carolinus*) is a medium-sized songbird classified as Special Concern by COSEWIC and listed as Special Concern under Schedule 1 of SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2012). The Project area is just within the northern limits of the breeding range of Rusty Blackbird (Avery 1995, GNWT 2012). Previous monitoring along the Mackenzie Valley (Machtans et al. 2007) and one incidental observation of Rusty Blackbird from aerial waterfowl surveys in the region, approximately 45 km southwest of Tuktoyaktuk have been reported (CWS, unpub. data).

Rusty Blackbird is predominantly found in boreal forest wetlands; while its breeding range extends a bit to both the north and south, it is rare beyond the tree line (Avery 1995, COSEWIC 2006). Bogs, fens, swamps, riparian corridors, and shrubby meadows all provide suitable habitat, as the key requirements are easy access to aquatic invertebrates as prey, and dense shrubs or small trees for nesting and shelter (Avery 1995, COSEWIC 2006). Upland habitat may be used during migration, but does not offer breeding potential (COSEWIC 2006).

Given the abundance of water bodies in the Project study area, proximity of water is assumed to not be a limiting factor for Rusty Blackbirds. Habitat suitability is instead determined by availability of shrubs for nesting. Therefore riparian shrub and riparian black spruce-shrub vegetation classes are considered high potential habitat for Rusty Blackbird because they combine nesting habitat with proximity to water, while dwarf shrub heath/upland shrub, low-centred polygons, and riparian sedge-cottongrass have low potential because nesting options are likely to be present, but limited. Other terrestrial habitats that lack shrubs are rated nil for habitat suitability. Slopes are not used to assess habitat suitability.

3.2 Preliminary Wildlife Habitat Suitability Mapping

Based on habitat preferences as summarized in Section 3.1, relative habitat suitability ratings are compiled in Table 3-1 for the four bird species at risk, in each of the terrestrial and aquatic habitat classes and slope categories.

Table 3-1 Preliminary Habitat Suitability Ratings for Horned Grebe, Peregrine Falcon, Short-eared Owl, Rusty Blackbird, and waterbirds

Vegetation, Water or Terrain Class	Habitat Rating				
	Horned Grebe	Waterbirds	Peregrine Falcon	Short-eared Owl	Rusty Blackbird
01 Dry Saxifrage Tundra	4	2	n/a	3	4
02 Dwarf Shrub Heath	4	2	n/a	2	4
03 Dwarf Shrub Heath/Upland Shrub	4	3	n/a	3	3
04 Cotton-Grass Tussock	4	1	n/a	1	4
05 High-Centred Polygons	4	1	n/a	2	4
06 Low-Centred Polygons	4	1	n/a	1	3
07 Riparian Shrub	4	2	n/a	3	1
08 Riparian Sedge - Cotton-Grass	4	1	n/a	2	3
13 Riparian Black Spruce/Shrub	4	3	n/a	3	1
Td5 Upland Alaska Birch-Spruce	4	4	n/a	4	4
Th3 Black Spruce/Ground Birch	4	4	n/a	4	4
Pond (<2 ha)	1	1	n/a	n/a	4
Lake (2+ ha)	2	1	n/a	n/a	4
Flat to gentle slope (0-15%)	n/a	n/a	4	n/a	n/a
Moderate to strong slope (15-45%)	n/a	n/a	3	n/a	n/a
Very strong to extreme slope (45-85%)	n/a	n/a	2	n/a	n/a
Steep slope (>85%)	n/a	n/a	1	n/a	n/a
	NOTES: Habitat suitability is rated as follows: 1 = high, 2 = moderate, 3 = low and 4 = very low to nil. n/a = not applicable as a rating criteria for this species.				

The preliminary potential habitat suitability maps for each of the species at risk and waterbirds within the Project study area that were provided June 2012 are based on the above ratings.

3.3 Field Results and Final Wildlife Habitat Suitability Mapping

Preliminary habitat suitability mapping was revised following the field program. The updated mapping takes into account concurrent revisions in vegetation classification and mapping, as well as adjustments to wildlife rankings based on field observations. Habitat suitability mapping for Grizzly bear was added following the field surveys.

3.3.1 Horned Grebe

Preliminary habitat mapping identified wetland size as the only factor determining suitability for Horned Grebe, with waterbodies up to 2 ha considered to have high suitability, larger waterbodies moderate suitability, and all terrestrial habitat nil suitability.

Three Horned Grebes were observed during the aerial surveys (Table 3-2; Appendix A). All were in the southernmost portion of the Project study area.

Table 3-2 Horned Grebe Field Observations

Date	Zone	Easting	Northing	Habitat
2 Jul 2012	8	550901	7605180	Lake > 2 ha; Vegetation class dominantly dwarf shrub heath, no emergent vegetation
2 Jul 2012	8	550268	7594093	Lake > 2 ha; vegetation classes dominantly dwarf shrub heath/upland shrub and riparian shrub
2 Jul 2012	8	560052	7626137	Lake > 2 ha; mixed vegetation types; no emergent vegetation

Field observations revealed that many wetlands within the study area originally identified to be of optimal size for Horned Grebes, have little or no emergent vegetation suitable for nesting by Horned Grebes. Conversely, some larger wetlands in the Project study area have extensive beds of emergent vegetation, which in some cases partially to completely delineate smaller pools that are of optimal size for Horned Grebes. Consequently, habitat suitability for Horned Grebes as identified during preliminary mapping was adjusted by taking into account whether wetlands are associated with vegetation class 8: riparian sedge – cottongrass (Table 3-3).

Table 3-3 Adjusted Habitat Suitability for Horned Grebes

	Vegetation class 8	All other vegetation classes
Wetlands < 2 ha	high	moderate
Wetlands > 2 ha	moderate	low

Results of revised habitat mapping (Appendix A) show patches of moderate habitat suitability along the length of the Project, and 24 scattered wetlands considered to be high suitability for Horned Grebe. This revised potential habitat distribution should take into consideration however, that the Project is near the northern limits of the breeding range of Horned Grebe, so while moderate quality habitat occurs along the length of the Project study area, Horned Grebes should be more likely to occur near the southern portion. This is corroborated by the low frequency and geographic location of observations within the study area.

The edge of Horned Grebe range within the Project study area has not been defined in literature, and as such, there is no basis for which to define a latitude at which suitability drops off.

3.3.2 Waterbirds

Preliminary habitat mapping identified high potential for waterbirds at all waterbodies, as well as cottongrass tussock, high-centred and low-centred polygons, and riparian sedge-cottongrass vegetation classes, all of which were expected to provide nesting habitat for a variety of waterbird species.

Field observations were collected primarily through an aerial survey of 264 wetlands along the Project on 2 July 2012. A total of 2628 individuals of 30 waterbird species were counted, with Tundra Swan, Scaup, and Pacific Loon the most widely distributed species, and Tundra Swan, Northern Pintail, and Scaup the most abundant species overall (Table 3-4, Appendix B); note that while the only scaup identified to species were Greater Scaup, Lesser Scaup may also occur in the Project study area. Counts of more than 100 individuals were recorded at four wetlands (wetland ID 9, 18, 22, 207), and 10% of wetlands (n=26) accounted for 57% of all individuals observed. Conversely, there were 50 wetlands with only one individual observed, and 56 wetlands with two individuals. scoters, long-tailed duck, loons, grebes, glaucous gull, and arctic tern.

Nesting potential for waterbirds was also evaluated during ground-based surveys, 3-6 July 2012. These surveys confirm that all terrestrial habitat has some potential for waterbird nesting, given the range of preferences among species observed. Taking into account observations of nesting waterbirds and nesting potential (extent and variety of cover, and typical proximity to water), the preliminary habitat suitability rankings were adjusted. The suitability of cottongrass tussock, high-centred and low-centred polygons vegetation classes was reduced to moderate, leaving riparian sedge-cottongrass as the only terrestrial vegetation class considered to have high habitat suitability (Table 3-7). It is important to note that habitat suitability for any individual waterbird species may deviate from this general model substantially. Additionally, while the field surveys suggested there are few concentrations of waterbirds during the breeding season, greater numbers are expected to occur at some locations during spring and fall migration. Latour et al. (2006) did not identify any key migratory bird areas within the Project study area, but included the Mackenzie Delta as one of 23 such sites with the Northwest Territories.

Table 3-4 Summary of Waterbird Observations during the Aerial Survey, 2 July 2012

English name	Scientific name	Nesting habitat preference	# Wetlands	# Individuals
Greater White-fronted Goose	*Anser albifrons*	Terrestrial	2	5
Cackling Goose	*Branta hutchinsii*	Terrestrial	2	4
Canada Goose	*Branta canadensis*	Terrestrial	1	1
Tundra Swan	*Cygnus columbianus*	Terrestrial	74	248
Mallard	*Anas platyrhynchos*	Terrestrial	11	35
Green-winged Teal	*Anas crecca*	Terrestrial	17	60
American Wigeon	*Anas americana*	Terrestrial	21	126
Northern Pintail	*Anas acuta*	Terrestrial	30	166
Northern Shoveler	*Anas clypeata*	Terrestrial	8	101
Greater Scaup	*Aythya marila*	Terrestrial	34	309
Scaup sp.	*Aythya sp.*	Terrestrial	84	682
White-winged Scoter	*Melanitta fusca*	Aquatic	15	36
Surf Scoter	*Melanitta perspicillata*	Aquatic	25	132
Scoter sp.	*Melanitta sp.*	Aquatic	3	12
Long-tailed Duck	*Clangula hyemalis*	Aquatic	19	54
Unidentified diving duck		Terrestrial	16	31
Red-breasted Merganser	*Mergus serrator*	Terrestrial	7	11
Red-throated Loon	*Gavia stellata*	Aquatic	46	72
Pacific Loon	*Gavia pacifica*	Aquatic	82	129
Common Loon	*Gavia immer*	Aquatic	2	3
Horned Grebe	*Podiceps auritus*	Aquatic	3	3
Red-necked Grebe	*Podiceps grisigena*	Aquatic	3	5
Sandhill Crane	*Grus canadensis*	Terrestrial	9	13
American Golden-Plover	*Pluvialis dominica*	Terrestrial	1	1
Lesser Yellowlegs	*Tringa flavipes*	Terrestrial	11	27
Whimbrel	*Numenius phaeopus*	Terrestrial	2	2
Long-billed Dowitcher	*Limnodromus*	Terrestrial	1	12
Red-necked Phalarope	*Phalaropus lobatus*	Terrestrial	14	59
Unidentified shorebird		Terrestrial	17	114
Mew Gull	*Larus canus*	Terrestrial	1	3
Glaucous Gull	*Larus hyperboreus*	Aquatic	12	15
Arctic Tern	*Sterna paradisaea*	Aquatic	15	150
Parasitic Jaeger	*Stercorarius parasiticus*	Terrestrial	1	1
Long-tailed Jaeger	*Stercorarius longicaudus*	Terrestrial	3	3
Unidentified jaeger	*Stercorarius sp.*	Terrestrial	3	3

3.3.3 Peregrine Falcon

Habitat potential for nesting Peregrine Falcons identified during preliminary habitat mapping was limited to a few low, but relatively steep slopes. Each of these specific locations were visited during the aerial survey on 2 July 2012. No Peregrine Falcons were observed at any of these locations, nor was any evidence of their presence noted (i.e. whitewash below frequently used perches). In all cases, the slopes also appeared to lacking suitable ledges for nesting, and were somewhat unstable as evidenced through recent or active erosion.

Peregrine Falcons may occasionally nest on the ground in arctic regions, but this is poorly documented in Canada, so, while possible ground-nesting habitat could occur within the Project study area, it would be speculative to identify any areas other than steep slopes as suitable habitat given the rarity of ground nests and the low density of Peregrine Falcon observations in the area generally. Therefore, while Peregrine Falcons could occasionally nest within the Project study area, there appears to be no particularly suitable habitat for them, and as such no habitat suitability is mapped for this species.

Three individual Peregrine Falcons were observed during field surveys (Table 3-5). All were second-year (immature) birds, unlikely to be occupying breeding territories this year. The location of these observations is shown in Appendix C.

Table 3-5 Peregrine Falcon Field Observations

Date	Zone	Easting	Northing	Proximal Vegetation Class
2 Jul 2012	8	550860	7600531	Riparian shrub
4 Jul 2012	8	572507	7660841	Cottongrass-tussock
5 Jul 2012	8	563413	7648622	Riparian shrub

3.3.4 Short-eared Owl

Preliminary habitat mapping identified high potential for Short-eared Owls in cottongrass-tussock and low-centred polygon vegetation classes, and moderate potential in dwarf shrub heath, high-centred polygons, and riparian sedge – cottongrass.

Field observations were collected during both the aerial waterfowl survey on 2 July 2012, and ground-based habitat assessment surveys on 3-6 July 2012. Thirteen Short-eared Owls were observed, all initially from the air, either already in flight or flushed by the approach of the helicopter (Table 3-6, Appendix D). Nine of the owls were observed over dwarf shrub heath or upland shrub. However, since all owls were observed in flight, the habitat association cannot necessarily be linked to nesting suitability. The dominance of dwarf shrub heath and upland shrub (approx. 60% of the Project area) could account for the frequency with which these vegetation types were associated with sightings.

Ground-based habitat assessment confirmed initial expectations that dwarf shrub heath and upland shrub vegetation classes typically provide low suitability for Short-eared Owl nesting due to the density of shrubs in such vegetation types. Suitability of cottongrass-tussock habitat varied somewhat due to size of habitat patches and encroachment of shrubs, but overall appeared to provide the best potential for Short-eared Owl nesting habitat. As a result, this was the only vegetation class to retain a high suitability

ranking. The majority of low-centred and high-centred polygons visited provide moderate nesting suitability for Short-eared Owl, compromised to some extent by shrubs and excessive moisture. Riparian sedge – cottongrass was also initially expected to be of moderate suitability, but was observed to be generally too wet, although dry edges might offer nesting opportunities in some cases. The habitat suitability of sedge – cottongrass was therefore adjusted to low potential. Riparian shrub habitat is also considered to have low potential, as some patches of this vegetation class could include grassy patches potentially large enough for use by nesting Short-eared Owls. Riparian black spruce/shrub was confirmed as being unsuitable for this species. Revised habitat suitability rankings for Short-eared Owl are summarized in Table 3-7.

Table 3-6 Short-eared Owl Field Observations

Date	Zone	Easting	Northing	Proximal Vegetation Class (potential habitat)
2 Jul 2012	8	561561	7647471	Dwarf Shrub Heath
2 Jul 2012	8	565717	7655628	Dwarf Shrub Heath
2 Jul 2012	8	582514	7687343	Dwarf Shrub Heath/Upland Shrub
2 Jul 2012	8	582962	7680902	Dwarf Shrub Heath
2 Jul 2012	8	576346	7671861	Dry Saxifrage Tundra
2 Jul 2012	8	581444	7669451	Dwarf Shrub Heath/Upland Shrub
2 Jul 2012 (2 owls)	8	580748	7668367	Dwarf Shrub Heath
2 Jul 2012	8	575901	7666156	Dwarf Shrub Heath/Upland Shrub
2 Jul 2012	8	567551	7656765	Dwarf Shrub Heath/Upland Shrub
3 Jul 2012	8	583601	7679488	Low-Centred Polygons
4 Jul 2012	8	577508	7670867	Dwarf Shrub Heath/Upland Shrub
4 Jul 2012	8	572507	7660841	Cotton-Grass Tussock

3.3.5 Rusty Blackbird

In preliminary habitat suitability modeling, Rusty Blackbird was expected to potentially occur in five of the nine vegetation types within the Project study area (Appendix E). However, no Rusty Blackbirds were observed during either the aerial survey on 2 July 2012 or the ground-based habitat assessments 3-6 July 2012. Furthermore, shrub height and density in most vegetation types were found to be too low to be suitable as nesting habitat. The only vegetation classes that appear to actually be suitable habitat for Rusty Blackbird are riparian shrub and black spruce riparian/shrub. Given that the Project study area is near the limits of the Rusty Blackbird's range, and no blackbirds were observed during the field surveys, the relative suitability of these habitat types is not assessed; rather they are considered suitable, while all others are unsuitable.

Table 3-7 Adjusted Habitat Suitability Ratings for Waterbirds, Short-eared Owl, and Rusty Blackbird

Vegetation, Water or Terrain Class	Habitat Rating		
	Waterbirds	Short-eared Owl	Rusty Blackbird
01 Dry Saxifrage Tundra	moderate	low	unsuitable
02 Dwarf Shrub Heath	moderate	low	unsuitable
03 Dwarf Shrub Heath/Upland Shrub	low	low	unsuitable
04 Cotton-Grass Tussock	moderate	high	unsuitable
05 High-Centred Polygons	moderate	moderate	unsuitable
06 Low-Centred Polygons	moderate	moderate	unsuitable
07 Riparian Shrub	moderate	low	suitable
08 Riparian Sedge - Cotton-Grass	high	low	unsuitable
13 Riparian Black Spruce/Shrub	low	nil	suitable
Pond (<2 ha)	high	n/a	n/a
Lake (2+ ha)	high	n/a	n/a

3.3.6 Grizzly Bear

No bear dens were observed during wildlife field surveys, although an attempted den site, and one fox den were recorded. Historical documented den locations, as provided to ENR by Imperial Oil Resource Ventures Limited as a response to GNWT IR 1.102 during the review of the Mackenzie Gas Project, and approximate den locations as recorded during 2011 den surveys (ENR, unpublished data) are shown in Appendix F. Traditional knowledge indicates bear denning in the area of West Hans and East Hans Lakes, but no specific locations within the Project study area, although some gravel source sites are believed to have potential (Kavik-Stantec 2012b).

Suitable den sites for Grizzly bears are largely determined by aspect, soil type, moisture content, terrain features and vegetation type (Harding 1975). Sand-dominated materials with low moisture content, found on glaciofluvial landforms such as eskers, kames and drumlins are preferred denning habitat; rock and gravel-dominated surficial materials, and poorly-drained areas generally have no den potential (Harding 1975). Neither of these surficial material types or associated landforms are found in the Project study area, as determined through surficial mapping (KAVIK-STANTEC 2012c). Silt-dominated materials, with low moisture content can provide suitable den habitat, if they are associated with other suitable conditions. Silt-dominated surficial materials are found throughout the Project study area and are therefore not considered to be limiting factors.

Den suitability as identified by surficial material, moisture content and landform, is ultimately limited by slope and aspect (McLaughlin et al. 2002). Grizzly bears show a strong preference for denning on slopes that accumulate snow as insulation during winter, with a preference for 20-50%, and lesser use of slopes 10-20% (Nagy et al. 1983). Flatter ground, as well as steep slopes, tend to not be used for dens.

Aspect, particularly at northern latitudes, provides potential for solar warming. Generally south-facing aspects are preferred, and data from the Northwest Territories suggest that the optimal range extends

from 120 to 310 degrees (Nagy et al. 1983, McLoughlin et al. 2002). Dens may face in any direction, but are much less likely when the aspect has a north-facing component.

Vegetation type is less critical in defining Grizzly bear potential than for some other species, but shrub cover of at least 10% is generally preferred, typically dwarf birch or alder, as this provides some soil stability (Nagy et al. 1983).

Vegetation mapping has been completed for a 1 km wide corridor centered on the proposed route. To better understand the regional potential for Grizzly bear dens, limited analysis was extended to a 3 km wide corridor, with consideration for only slope and aspect beyond the 1 km corridor (Table 3-8).

Table 3-8 Factors Determining Grizzly Bear Den Potential in Project Study Area

	1 km corridor	outside 1 km corridor
Higher suitability	slopes 20-50% and with an aspect of 120-310 degrees, in vegetation types 2, 3, 7, or 13; all terrain units	slopes 20-50% and with an aspect of 120-310 degrees
Lower suitability	all slopes 10-20% slopes 20-50% and with an aspect of 310-360 or 0-120 degrees slopes 20-50% and with an aspect of 120-310 degrees, in vegetation types 1, 4, 5, or 6 all terrain units	all slopes 10-20% slopes 20-50% and with an aspect of 310-360 or 0-120 degrees
No suitability	all slopes <10% or >50% all waterbodies vegetation type 8 all terrain units	all slopes <10% or >50% all waterbodies vegetation type 8

It is important to note in this relative den potential suitability ranking, that “higher suitability” does not equate to “high suitability”, since as discussed, no preferred denning habitat as determined by aspect, soil type, moisture content and landforms occurs in the study area. This is supported by a scarcity of historical den observations in the Project area, in both scientific studies and traditional knowledge.

3.4 Summary of Wildlife Habitat Suitability and Distribution

Habitat suitability within the Project area was evaluated for four bird species at risk, as well as for waterbirds in general, using GIS modeling and ground surveys. Suitable den habitat for Grizzly bear was identified using GIS modeling.

Of the four bird species at risk, Short-eared Owl was encountered most frequently during field surveys, and also has the greatest extent of suitable habitat within the study area, with three vegetation classes (cottongrass tussock, high-centred polygons, and low centred polygons) providing high or moderate potential. Suitable habitat is scattered along the length of the Project, with concentrations of moderate and high habitat most notable south of borrow source 170 and around borrow source 314/325.

Horned Grebe was observed at three wetlands in the southernmost portion of the Project study area. Although wetlands with moderate to high potential for Horned Grebes occur along the full length of the

Project study area, the species is near the limit of its range, and as a result, Horned Grebes are most likely to be found in this habitat in the southern portions of the Project study area.

Three Peregrine Falcons were observed during field surveys. All were immature birds not likely to be breeding this year. Observation of steep slopes in the Project study as identified during preliminary mapping, revealed that they appear unsuitable for nesting and do not show any signs of use by Peregrine Falcons or other raptors. While Peregrine Falcons may occasionally nest on the ground, this is rare in the Canadian arctic, and cannot be reasonably expected to occur, nor predicted through modeling. Therefore the probability of Peregrine Falcons nesting within the Project area is considered to be uniformly very low or nil, and nesting potential has not been mapped.

No Rusty Blackbirds were observed during field surveys, and ground-based habitat assessment showed that shrubs in most vegetation classes are too short or scattered to provide suitable nesting habitat for this species. Suitable habitat is limited to riparian shrub and black spruce/shrub habitat, both of which are primarily associated with watercourses. Given that no blackbirds were seen and the Project is near the limit of the species range, potential is limited throughout the Project area, but somewhat more likely near the southern end.

Lakes and wetlands are numerous throughout the Project study area, and consequently there is some degree of habitat potential for waterbirds throughout. Aerial surveys confirmed that waterbird density is low at most wetlands in the Project study area, with the majority of individuals found in larger groups at several larger waterbodies.

Grizzly bear den habitat potential modeling shows that throughout the Project study area there are locations with slope and aspect that may provide suitable conditions for Grizzly bear denning, however due to the absence of well-drained, sand-dominated glaciofluvial landforms in the study area, this potential den habitat is not characterized as “highly suitable”, but rather relatively more or less suitable. Neither bears nor dens were observed within the Project area during field surveys.

Overall, the density of species at risk within the Project area appears to be low, with the potential exception of Short-eared Owl, which has potential high quality habitat at several locations, and were observed throughout the study area.

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APPENDIX A

Horned Grebe Habitat Suitability Map Atlas

APPENDIX B

Waterbird Habitat Suitability Map Atlas

APPENDIX C

Peregrine Falcon Habitat Suitability Map Atlas

APPENDIX D

Short-eared Owl Habitat Suitability Map Atlas

APPENDIX E

Rusty Blackbird Habitat Suitability Map Atlas

APPENDIX F

Grizzly Bear Den Habitat Suitability Map Atlas