Appendix 26 : 2020 Terrestrial Environment Management and Monitoring Plan Report

REPORT

Agnico Eagle Mines Limited - Meliadine Division

2020 Terrestrial Effects Monitoring and Mitigation Program Annual Report

Submitted to:

Agnico Eagle Mines Limited
Attention: Sara Savoie / Robin Allard

Submitted by:

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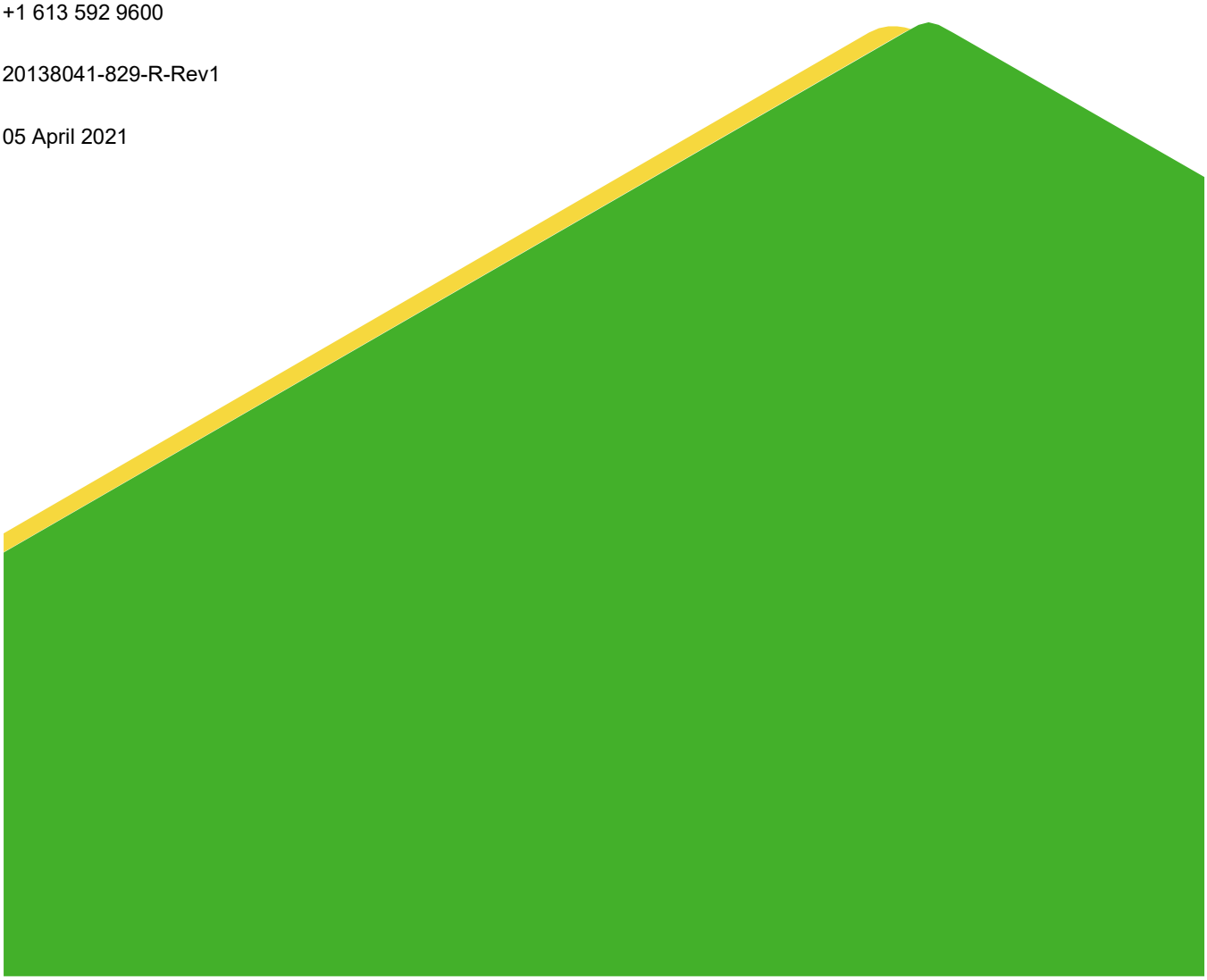
05 April 2021



Distribution List

Electronic Copy - Agnico Eagle Mines Limited

Electronic Copy - Nuqsana Golder

Study Limitations

On behalf of Agnico Eagle Mines Limited (Agnico Eagle), Nuqsana Golder Engineering and Environmental Inc. (Nuqsana Golder) has prepared this Terrestrial Effects Monitoring and Mitigation Program (TEMMP) Annual Report for the 2020 Monitoring Period at the Meliadine Gold Mine near Rankin Inlet, Nunavut.

This report was prepared, based in part, on information obtained from Agnico Eagle and other external information sources. In preparing the report, Golder has relied in good faith on the information provided. We accept no responsibility for any deficiency or inaccuracy contained in this report because of our reliance on the aforementioned information.

The findings and conclusions documented in this report have been prepared for the specific application to this Project and have been developed in a manner consistent with that level of care normally exercised by environmental professionals currently practicing under similar conditions in the jurisdiction.

With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time and should be reviewed regularly.

If new information is discovered during future work, the conclusions of this report should be re-evaluated, and the report amended, as required, prior to any reliance upon the information presented herein.

Executive Summary

The Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Mine (the Project or the Mine), received a Project Certificate (No. 006) from the Nunavut Impact Review Board (NIRB) in February 2015, and amended (Amendment No. 001) in February 2019. A Terrestrial Environment Management and Monitoring Plan (TEMMP) for the Project was prepared for submission with the Project Final Environmental Impact Statement (FEIS; Golder 2014a) and forms a component of the documentation series produced in accordance with the Project, updated and submitted to the NIRB in June 2020 (TEMMP Version 3; Agnico Eagle 2020a). This report addresses requirements of the Terms and Conditions of the NIRB Project Certificate (No. 006), as relevant to the TEMMP.

The objectives of the TEMMP Annual Report are to summarize annual data collected from wildlife and vegetation monitoring programs, and to describe natural variation and potential Project-related effects to wildlife populations within and adjacent to the Project. The data was collected according to procedures and sampling or monitoring intervals outlined in the Project's Standard Operating Procedures (SOPs) and the TEMMP. The 2020 TEMMP Annual Report describes monitoring objectives and methods, 2020 survey results, mitigation activities, and management recommendations (i.e., adaptive management). The following summary documents monitoring information collected for the 2020 TEMMP for the Meliadine Project located in the Kivalliq Region of Nunavut.

Incorporation of Inuit Qaujimajatuqangit

- When possible, field programs in 2020 were guided by Inuit Qaujimajatuqangit (IQ), including the assistance of local field assistants. Participation of local field assistants was limited during 2020 in consideration of COVID-19 health and safety protection measures for the local community. Annual contributions from Inuit to the monitoring programs are presented in Section 3.0.

Direct Habitat Loss

- Direct habitat loss is assessed every three years and was not assessed in 2020 (next assessment in 2021).

Indirect Habitat Loss

- Indirect habitat loss for caribou and wildlife habitat (soils and vegetation) is assessed every three years and was not assessed in 2020 (next assessment in 2022, tied to the Vegetation Health Program).

Wildlife Observations

- In 2020, there were 416 recorded incidental observations of wildlife around the Mine (including the camp area) and the All-weather Access Road (AWAR), representing 2,645 individuals of 22 species. Incidental wildlife observations do not include mortalities or observations of large herds of migrating caribou.

Wildlife Track Surveys

- Wildlife sighting/track surveys were completed by Agnico Eagle personnel along the AWAR and infrastructure.
- Excluding caribou, a total of 1,761 individuals from 17 identified wildlife species and 10 unidentified wildlife species groups (e.g., duck species) were recorded during surveys along the AWAR in 2020. Large groups (>1,000 individuals) of barren-ground caribou were recorded within 0 to 3 km of the AWAR on 6, 10, and 16 July 2020. Snow goose was the most commonly recorded bird species with a total of 966 individuals (i.e., 55% of all non-caribou sightings) observed along the AWAR.

- A total of 572 individuals from 15 identified species and 7 unidentified species groups were observed during surveys at Mine infrastructure other than the AWAR in 2020. Snow goose and Canada goose were the most frequently observed species with 144 and 146 individuals recorded, respectively (each 25% of all sightings). One caribou was observed along the road to D7 on 28 July 2020.

Bird Nests

- One sandhill crane and one common raven nest were observed in 2020.

Incidents and Mortalities

- A total of 11 wildlife mortalities from 8 species were reported at the Project from 1 January 1 to 31 December 2020; 6 of these mortalities were suspected or confirmed to be caused as a direct result of Project activities.

Wildlife Deterrents

- Wildlife deterrents (i.e., propane cannons and fake owls) were utilized at eight locations at management ponds SP4, CP6, and H8 to deter birds from nesting.
- Deterrent measures were implemented on 22 July 2020 to deter a polar bear from a drill rig using bear bangers and a helicopter.

Barren-ground Caribou

Caribou Behaviour

- Behavioural observations were conducted in 56 surveys in 2020.
- Caribou showed more running and alert behaviour closer to the AWAR, but this is confounded by group size.

Caribou Advisory

- Caribou advisory and shutdowns occurred from 7 to 19 July 2020 as the Qamanirjuaq Caribou herd moved through the Project area.
- At the Mine there were 143 hours of work stoppage mitigation over the course of 8 days, and the AWAR was closed over a 10 day period for a total of 165 hours.

Hunter Harvest

- Four hunters from the KHTO contributed to hunter harvest surveys in 2020.
- A total of 24 survey records were submitted. A total of 62 harvested caribou were reported, including 40 cows, 18 bulls, and 4 non-adults.

Birds

Shoreline Surveys

- A total of 15 nests were detected in 2020, from 7 unique species.
- The number of observed nests per year is declining but it is unknown if the decline is due to a loss of suitable habitat, Project-related disturbance, survey timing, or observer nest finding ability.

Point Counts

- Species richness and diversity were similar among habitats and among years.
- Species density was lower closer to the AWAR and was lower in 2020 than 2018 or 2019.

PRISM

- Agnico Eagle contributed to the Environment and Climate Change Canada (ECCC) PRISM surveys in 2018 and 2019 and will continue to do so every five years (next survey in 2023/2024).

Raptors

- The 2020 Arctic Raptors Research Program was cancelled as a Wildlife Research Permit was not able to be obtained and limitations associated with COVID-19 health and safety protection measures.

Soil and Vegetation Monitoring

- Soil and vegetation health monitoring (dust and metals survey) is assessed every three years and was not assessed in 2020 (next assessment in 2022, tied to the Indirect Habitat Loss assessment).

Non-native Plants

- One instance of dandelion was found along AWAR.

Environmental Variables

- The maximum annual temperature was 30.0°C and was recorded on 4 August 2020. The minimum annual temperature was -41.8°C and was recorded on 8 March 2020 with an annual mean temperature of -9.7°C. Total recorded annual precipitation was 179.8 mm and snowmelt began 7 June 2020 when the average daily air temperature exceeded 0°C; precipitation data was collected over 316 days of 2020. Environmental variables will continue to be monitored on an on-going basis.

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Acronyms

Acronym	Full Term
AIC	Akaike's Information Criterion
ATV	All Terrain Vehicle
AWAR	All-weather Access Road
CESCC	Canadian Endangered Species Conservation Council
COVID-19	Coronavirus Disease
EC	Esker Complex
ECCC	Environment and Climate Change Canada
FEIS	Final Environmental Impact Statement
G/Q	Gravel/Quarry
GIS	Geographic Information System
GLM	Generalized Linear Model
GN	Government of Nunavut
GN DoE	Government of Nunavut Department of Environment
GPS	Global Positioning System
HBed	Heath Bedrock
HBou	Heath Boulder
HHS	Hunter Harvest Survey
HT	Heath Tundra
IOL	Inuit Owned Lands
IQ	Inuit Qaujimajatuqangit
KHTO	Kivalliq Hunters and Trappers Organization
KivIA	Kivalliq Inuit Association
LS	Low Shrub
LSA	Local Study Area
MOU	Memorandum of Understanding
NIRB	Nunavut Impact Review Board
NRV	Natural Range of Variation
PRISM	Program for Regional and International Shorebird Monitoring
RSA	Regional Study Area
SARA	Species At Risk Act
SLRA	Screening Level Risk Assessment
SW	Sedge Wetland
TBD	To Be Determined
TEMMP	Terrestrial Environment Management and Monitoring Plan
TH	Tundra Heath
VEC	Valued Ecosystem Component
ZOI	Zone of Influence

1.0 INTRODUCTION

1.1 Background

The Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Mine (the Project), located in the Kivalliq Region of Nunavut (Figure 1), received a Project Certificate (No. 006) from the Nunavut Impact Review Board (NIRB) in February 2015 (with Amendment 001 in February 2019). The subsequent Water Licence and leases allowed for the construction of a gold mine and ancillary facilities including an All-weather Access Road (AWAR), barge unloading facilities, lay-down area, and a fuel tank farm in Rankin Inlet. A conceptual Terrestrial Environment Management and Monitoring Plan (TEMMP) for the Mine was prepared for submission with the Project Final Environmental Impact Statement (FEIS; Golder 2014a). The TEMMP will be reviewed and updated on an as-needed basis as the Mine proceeds from detailed design and construction through operations, closure, and post-closure. The TEMMP was updated in June 2020 and issued to the NIRB (TEMMP Version 3; Agnico Eagle 2020a).

This report addresses requirements of Project Certificate No. 006, which were first included in the 2017 Annual TEMMP Report (Golder 2018) and are listed in Table 1-1 of this report. The 2020 TEMMP Annual Report (this document) is the fourth of a series of annual TEMMP summary reports for the Mine and captures the second year of operations for the Mine. The purpose of this report is to summarize the 2020 data collected from wildlife and vegetation monitoring programs, and to describe natural variation and potential Project-related changes in wildlife populations within and adjacent to the Mine. The 2020 Annual Report describes monitoring objectives and methods, annual results, mitigation activities, and management recommendations (i.e., adaptive management). The Mine is anticipated to be operational through to 2027, with closure and post-closure activities continuing until 2037.

1.2 Project Description

The Project is located approximately 25 kilometers (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1’23.8’’ N, 92°13’6.42"W), on Inuit Owned Lands (IOL).

The scope of the TEMMP Annual Report is to report on terrestrial monitoring activities for the Project throughout its various phases of development. This report includes data collected in 2020, reflecting the second year of operations. Project site facilities include a plant site and accommodation buildings, a water management system that includes collection ponds, water diversion channels, retention dikes/berms, and water treatment plants. Project components include two ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a landfarm, incinerator, and landfill.

Environmental baseline studies were completed in the Project area prior to Project approval and integrated into the current project design according to the TEMMP (Agnico Eagle 2020a). Vegetation and wildlife Valued Ecosystem Components (VECs) were identified in consultation with regulatory agencies, the Kivalliq Inuit Association (KivIA) and the Kangiqtiniq Hunters and Trappers Organization (KHTO). Vegetation VECs include plant populations and communities, listed (rare) plant species, and traditional use plant species. Wildlife VECs include ungulates (caribou [*Rangifer tarandus groenlandicus*] and muskox [*Ovibos moschatus*]), carnivores (grey wolf [*Canis lupus*] and polar bear [*Ursus maritimus*]), raptors, waterbirds, and upland birds (including migratory birds). Further details on VEC selection can be found in the FEIS (Golder 2014a) and the TEMMP (Agnico Eagle 2020a).

1.2.1 Concordance with Terms of Reference

The NIRB Project Certificate (No. 006) for the Meliadine Gold Mine was issued on 26 February 2015, and Amendment 001 was issued 26 February 2019. This fourth iteration of the TEMMP Annual Report addresses the Terms and Conditions of Project Certificate No.006 as they relate to the TEMMP. Concordance as reflected in Table 1-1.

NIRB recommends the following related to standardization of data for monitoring programs:

> *"all monitoring plans should be designed so that results from these programs can be coordinated with ongoing regional initiatives or programs with relevant government organizations, or regional authorities." NIRB guidelines, Section 9.3, page 78-79.*
>
> *"When designing data collection or baseline studies, it is recommended that the Proponent coordinate with ongoing programs with relevant developments, government organizations, regional authorities, and researchers. This recommendation applies to data collected for the Nunavut General Monitoring Program (NGMP), as per Article 12 of the NLCA, the Proponent's project-specific monitoring programs, as well as any regional monitoring initiatives in which the Proponent will participate. The Proponent is expected to coordinate on any initiatives undertaken by government organizations in respect to the NGMP and to liaise with the NGMP Secretariat whenever possible." NIRB guidelines, Section 7.7.1, page 40-41.*

Agnico Eagle will comply with these principles and has already established several programs that involve collaborations with regional initiatives and contribute to monitoring cumulative effects. These include:

- **Caribou Collar Program:** Support the Government of Nunavut's (GN) caribou satellite-collaring program for the Qamanirjuaq herd (and other herds in the Kivalliq Region), facilitating monitoring of cumulative effects at the herd level (Agnico Eagle 2020a; Sections 2.2 and 4.7).
- **Hunter Harvest Program:** Agnico Eagle has signed a memorandum of Understanding (MOU) with the KHTO in March 2019 and renewed in June 2020, which includes methods to document caribou harvesting around the Meliadine Mine, and to participate in Mine site studies and monitoring (Agnico Eagle 2020a; Section 4.8). This will contribute to an understanding of cumulative effects by increasing understanding of the regional distribution and seasonality of hunting.
- **Raptor Monitoring Program:** Agnico Eagle, in collaboration with the Arctic Raptor Project, has developed and implemented the raptor monitoring program (Agnico Eagle 2020a; Section 4.9). This will directly align monitoring efforts at Meliadine with this long-term regional research program which involves government, non-government, Indigenous communities, and academic partnerships.
- **Waterfowl and Shorebird Monitoring:** Agnico Eagle, in collaboration with Environment and Climate Change Canada (ECCC), have agreed to implement the Program for Regional and International Shorebird Monitoring (PRISM) (Agnico Eagle 2020a; Section 4.11). This will directly align monitoring efforts at Meliadine with other Agnico Eagle properties for waterfowl and shorebirds.
- **Wildlife Surveys:** Agnico Eagle, in collaboration with the KHTO, will conduct wildlife surveys along the AWAR and with environmental technicians around the Mine site. This will contribute to an understanding of cumulative effects in the region by collecting routine wildlife survey data (including caribou) and assist in anticipating large herd migrations, communicating with the KHTO and managing mine activities during migration events.

Table 1-1: Concordance Table with NIRB Project Certificate No. 006 Terms and Conditions

Term	Condition	Section
37	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g., surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.	7.0
38	The Proponent shall conduct sampling to determine baseline levels for metals in soils found in areas with berry-producing plants near the Project area and shall update relevant vegetation sections within the Terrestrial Management and Monitoring Plan to incorporate ongoing monitoring of these parameters prior to commencing operations.	6.0
39	The Proponent shall develop and establish an on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage (such as lichens) near Project areas, prior to commencing operations.	5.1, 6.0
40	The Proponent shall review, on an annual basis, all monitoring information and the vegetation mitigation and management plans developed under its Environmental Management Plan and Terrestrial Environment and Monitoring Plan (TEMMP) and adjust such plans as may be required to effectively prevent or reduce the potential for significant adverse project effects on vegetation abundance, diversity and health, taking into account lessons learned at other northern mining developments where appropriate.	5.1, 6.0
45	The Proponent shall demonstrate consideration for cooperating with existing and planned regional and/or community-based monitoring initiatives associated with terrestrial wildlife and wildlife habitat that produce information pertinent to mitigating project-induced impacts. The Proponent shall give special consideration for supporting regional studies of population health and harvest programs for Qamanirjuaq caribou which help address areas of uncertainty for Project impact predictions.	1.2.1, 8.3, 12.0
46	The Proponent shall update its Terrestrial Environment Management and Monitoring Plan (TEMMP) for the Project to include a detailed harvest study prepared in consultation with the Government of Nunavut (GN) and other affected parties. The design of the harvest study should demonstrate consideration for the following: a. Hiring of a dedicated local survey coordinator through local Hunters and Trappers Organizations (HTOs) and provision of adequate resources for the HTOs to run the program; b. The potential effects on caribou populations and on caribou behaviour resulting from increased human access caused by the all-weather access road and associated roads and trails; and, c. Increasing local knowledge of the project development areas, including establishing baseline harvesting levels prior to unrestricted public access on the all-weather access road.	13.0
47	The Proponent shall share information with the Government of Nunavut (GN) relating to the migration of caribou and include the GN as a party respecting caribou monitoring and movement through Project development areas, including the all-weather access road and associated roads and trails.	12.1, 12.2
52	The Proponent shall undertake periodic surveys and a habitat assessment for muskoxen in the regional study area by partnering with, or complementing, the existing regional muskox monitoring programs.	11.0
55	In consultation with the Government of Nunavut (GN) and other affected parties, the Proponent shall set thresholds for direct mortality of wolf, grizzly bear, polar bear, wolverine, and fox to ensure monitoring and mitigation for the Project is responsive to undesirable rates of mortality. The Proponent shall reach an agreement with the appropriate Designated Inuit Organization regarding compensation or any direct mortality of wildlife resulting from the Project.	9.4
56	The Proponent shall report annually to the NIRB regarding its terrestrial environment monitoring efforts, with inclusion of the following information: a. Description of all updates to terrestrial ecosystem baseline data; b. A description of the involvement of Inuit in its monitoring programs; c. A detailed presentation and analysis of the distribution relative to Project infrastructure and activities for caribou and other terrestrial mammals observed during surveys and incidental sightings; d. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn; and, e. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries.	1.2.1, 3.0, and 4.0, 9.1, and 12.1

Table 1-1: Concordance Table with NIRB Project Certificate No. 006 Terms and Conditions

Term	Condition	Section
57	Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes: a. An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting; b. A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), and responses to operations of the all-weather access road and associated access roads/trails; c. A demonstration and description of how the monitoring results, including the all-weather access road and associated access roads/trails contribute to cumulative effects of the project; and, d. Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.	8.2.3.2, 9.1, and 12.1
59	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.	9.3
61	Prior to bird breeding season, the Proponent shall either conduct clearing activities or identify and install nesting deterrents (e.g., flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities. If clearing is to take place during the nesting season, a nest survey should take place to identify nests and any identified nests must remain undisturbed until the young have fledged or left the nest. Any nests identified shall be included as part of the annual reporting for the Terrestrial Environmental Mitigation and Monitoring Plan (TEMMP).	9.3, 10.0
62	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.	9.3 and 10.0
71	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Kivalliq Inuit Association and communities.	8.0
72	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Protection Plan and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) prior to construction. The key indicators for follow up monitoring under this plan will include upland birds (including migratory birds), waterbirds, raptors, and seabirds including migration and wintering.	8.0
73	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total Project footprint.	5.1
105	The Proponent is strongly encouraged to consider incorporating information obtained from local outfitting and guiding businesses into its Hunter Harvest Survey where possible, and to include these organizations as potential respondents to surveys undertaken.	13.0
118	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan (TEMMP), plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month. These results shall be reported to the NIRB with the Proponent's annual reporting requirements.	12.5
119	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establishing deterrents along the AWAR at any areas where it is observed that caribou are attracted to the AWAR and their presence may present a risk of collisions with traffic along the AWAR (such as areas where caribou are utilizing the AWAR to facilitate movement, areas where caribou may be licking minerals/road salt from the road, areas where caribou are gathering to avoid insects, etc.).	TEMMP (Agnico Eagle 2020a) Appendix IV – Wildlife Protection and Response Plan

1.3 Study Area Boundaries

The Local Study Area (LSA) includes a 500 meter (m) radius buffer around the Project footprint and includes a 1,000 m buffer on the AWAR, Discovery Access Road and the Rankin Inlet Bypass Road. The total area of the LSA is 10,598 hectares (ha) (Figure 1).

The Regional Study Area (RSA) encompasses an area that includes a 28 km radius area centered around the Project, including Rankin Inlet for a total area of 246,300 ha (Figure 2).

Further details on the justification for study area sizes can be found in the FEIS (Golder 2014a) and the TEMMP (Agnico Eagle 2020a).

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540000
550000
560000
6990000
6980000
6970000

Lake

Tiriganiaq Deposit

Meliadine Lake

Parallel Lake

All-weather Access Road

Little Meliadine Lake (LML)

Iqalugaarjuup Nunanga Park

Meliadine River

Meliadine River Bridge

Manned Gate

Char River Bridge

Municipal Road

Prairie Bay

Rankin Inlet Bypass Road

Rankin Inlet

Hudson Bay

LEGEND

- MINE FOOTPRINT
- MINE INFRASTRUCTURE
- APPROVED PROPOSED TERRESTRIAL LOCAL STUDY AREA (LSA)
- ALL-WEATHER ACCESS ROAD (AWAR)
- RANKIN INLET
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

0 2,500 5,000

1:125,000 METRES

NOTE(S)

1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP.

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE LIMITED.
2. DATUM: NAD83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

MELIADINE GOLD PROJECT
NUNAVUT

TITLE

PROJECT LOCAL STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2021-02-16
DESIGNED	CC
PREPARED	CDB
REVIEWED	
APPROVED	

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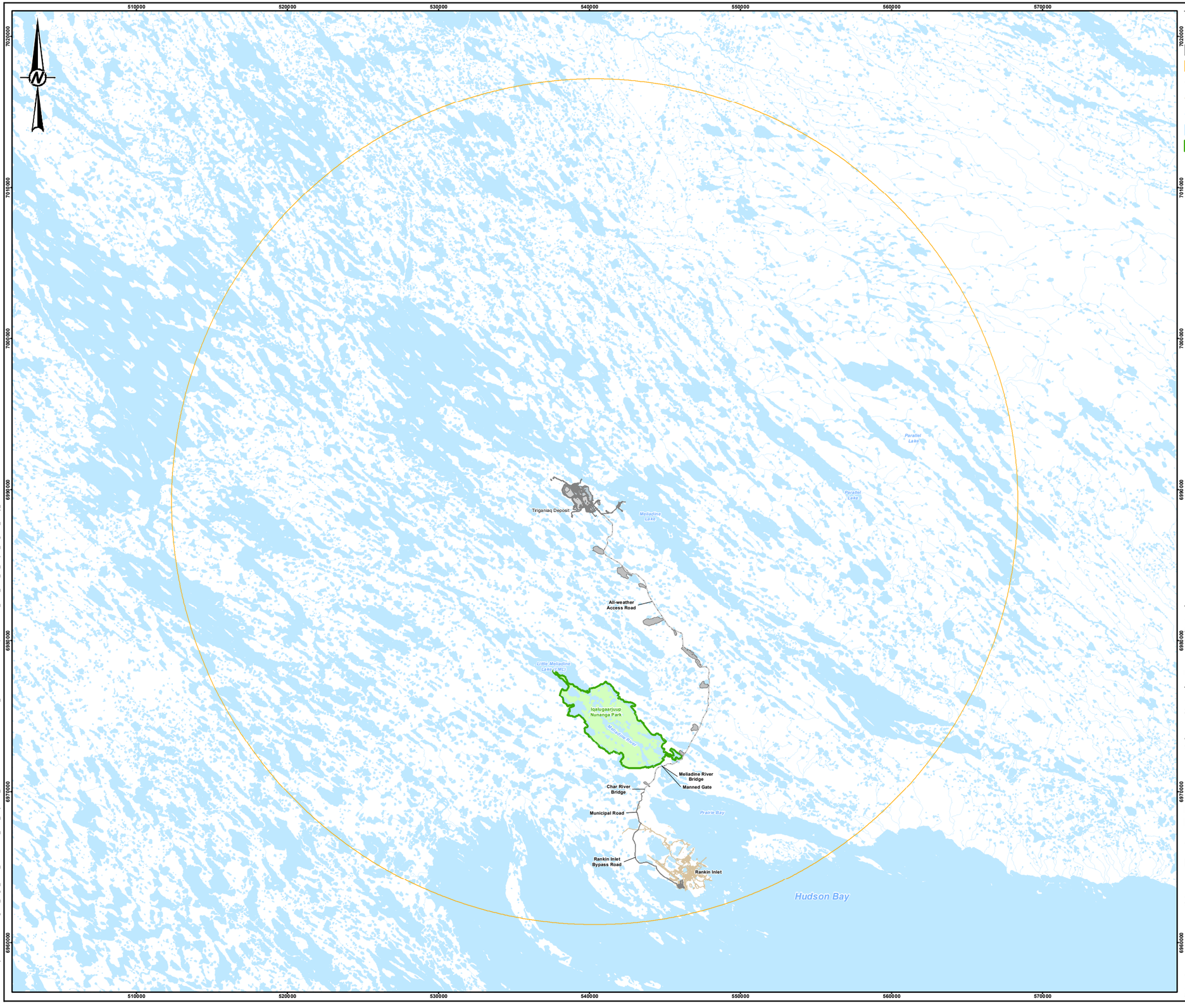

LEGEND

- MINE FOOTPRINT
- MINE INFRASTRUCTURE
- REGIONAL STUDY AREA (RSA)
- ALL-WEATHER ACCESS ROAD (AWAR)
- RANKIN INLET
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

0 5 10

1:250,000 KILOMETRES

NOTE(S)

1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP.

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE LIMITED.
2. DATUM: NAD83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

MELIADINE GOLD PROJECT
NUNAVUT

TITLE

PROJECT REGIONAL STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2021-02-16
DESIGNED	CC
PREPARED	CDB
REVIEWED	
APPROVED	

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1.4 Monitoring Approach

Wildlife monitoring is an essential tool in protecting and maintaining wildlife in the vicinity of the Project. A comprehensive monitoring strategy has been implemented and, as required, is adapted to meet the objectives of the management strategy and methods set out in the TEMMP (Agnico Eagle 2020a). Monitoring programs evaluate the effectiveness of mitigation measures and assess Project-related effects predictions. For all wildlife monitoring programs there is a certain level of uncertainty or unpredictability; therefore, residual effects identified during monitoring may require implementation of adaptive management strategies. Outcomes of adaptive management may include increasing, decreasing, or no change to mitigation and/or monitoring or implementing special studies to further understand Mine-related effects.

To evaluate the accuracy of effects predictions, a series of quantitative monitoring indicators have been developed within the broad categories of habitat distribution, wildlife distribution, wildlife richness, wildlife diversity, wildlife abundance, and environmental health. 2020 was the fourth year of overall monitoring per the TEMMP, and the second year under operations for the Mine. Previous monitoring was conducted during the construction phase. Consequently, some of the objectives below may not be answered at this time or will be addressed qualitatively as more data under operations is obtained.

1.5 Objectives

The primary objectives of this 2020 TEMMP Annual Report include:

- Collect information that will assist Agnico Eagle to determine if there are effects on the terrestrial environment and if these effects were accurately predicted in the FEIS.
- Reporting the results of the 2020 monitoring programs.
- Summarizing the monitoring strategy implemented over the course of the year.
- Evaluating the function and validity of implemented monitoring strategies.
- Summarizing adaptive management strategies.
- Providing management recommendations for 2020.
- Allowing regulators to contribute advice for improving monitoring and management.

1.6 Report Organization

Within each section of this report, data is presented that will be tracked over the life of the Project. Recommendations for enhancement to the TEMMP are presented at the end of each section for consideration and may be incorporated into the TEMMP for subsequent years. The TEMMP is an evolving program that will reflect recommendations during previous years, as well as advances in Project development. Changes will be captured in future revisions of the TEMMP as needed.

2.0 REVIEW OF IMPACT PREDICTIONS

A summary of the impact predictions proposed in the updated TEMMP (Agnico Eagle 2020a) is provided in Table 2-1. If Project impacts exceed the thresholds, an internal review of mitigation is triggered and adaptive management is implemented where applicable. The corresponding sections of this TEMMP Annual Report where monitoring indicators are discussed are also listed.

Table 2-1: Summary of Predicted Effects, and Accuracy of Impact Predictions

Monitoring Indicator	Proposed Thresholds	Surveyed in 2020?	Exceeded in 2020?	Monitoring Methods	Frequency of Data Collection	Section Reference
Vegetation (Wildlife Habitat)						
Habitat Loss	No greater than: Terrestrial – 2,950 ha Aquatic – 515 ha	No	NA	Aerial photographs, satellite imagery, ground surveys, GIS analysis	Every 3 Years	5.0
Habitat Degradation by Contamination	No effects to plant health from dust deposition SLRA – TBD	No	NA	Vegetation and Soil Samples	Every 3 Years	NA
Habitat Reclamation following Mine Closure	NA	No	NA	Ground Surveys, Vegetation Plots, Mapping	Once pre-construction baseline (2017) and 3 times Post-Closure	NA
Habitat Degradation by Contamination	No non-native plant species established	Yes	No	Invasive Plant Survey of AWAR and Project site	Annually	7.0
Ungulates						
Habitat Loss and Degradation	No greater than 2,950 ha of terrestrial habitat loss	No	NA	Aerial photographs, satellite imagery, ground surveys, GIS analysis	Every 3 Years	5.0
Sensory Disturbance	<10% caribou deflections from AWAR	No	NA	Caribou Behaviour Monitoring	Annually	12.5
Vehicle Collisions	No more than 1 ungulate/year	Yes	No	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	Daily	9.4
Hunting by Rankin Inlet Residents	TBD after 3 years of data collection, in collaboration with GN	No	NA	Hunter Harvest Study	Collected throughout the year and reported annually	13.0
Other Project-related Mortality	No more than 1 ungulate/year	Yes	Yes	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	Daily	9.4
Exposure to Contaminated Water or Vegetation	SLRA – TBD	No	NA	Vegetation and Soil Samples	Every 3 Years	NA
Predatory Mammals						
Project-related Mortality	No more than 1 Arctic fox/year	Yes	No	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance. No trapping in 2020	Daily	9.4
Raptors						
Disturbance of Nesting Raptors	To be determined in consultation with GN and Alastair Franke, related to occupancy and productivity.	No	NA	Active Nest Monitoring	Nests within 200 m – Daily Nests from 200 to 1,000 m – Weekly	NA
Project-related Mortality	No more than 1 raptor/year	Yes	No	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	Mine Site-Daily AWAR – 2x/Week	9.4
Waterbirds						
Habitat Loss and Degradation	No more than 515 ha of aquatic habitat	No	NA	Aerial photographs, satellite imagery, ground surveys, GIS analysis	Every 3 Years	5.0
Disturbance of Nesting Waterfowl	TBD once NRV is established through consultation with ECCC and GN	Yes	No	Shoreline Surveys	Annually	9.3
Exposure to Contaminated Water or Vegetation	SLRA – TBD	No	NA	Vegetation and Soil Samples	Every 3 Years	NA
Project-related Mortality	No more than 1 waterbird/year	Yes	No	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	Mine Site-Daily AWAR – 2x/Week	9.4
Other Breeding Birds						
Habitat Loss and Degradation	No greater than 2,950 ha of terrestrial habitat loss	No	NA	Aerial photographs, satellite imagery, ground surveys, GIS analysis	Every 3 Years	NA
Exposure to Contaminated Water or Vegetation	SLRA – TBD	No	NA	Vegetation and Soil Samples	Every 3 Years	NA
Changes in Breeding Bird Populations	TBD once NRV is established through consultation with ECCC	Yes	NA	Breeding Bird Plots and Transects, PRISM	Breeding Bird – Every 3 Years PRISM – Plots surveyed over 2 years every 5 Years	8.0

Notes: AWAR = All-Weather Access Road; ECCC = Environment and Climate Change Canada; GN = Government of Nunavut Department of Environment; NRV = Natural Range of Variability; PRISM – Program for Regional and International Shorebird Monitoring; SLRA = Screening Level Risk Assessment; TEMMP = Terrestrial Environment Management and Monitoring Plan (Agnico Eagle 2020a); ha = hectares; m = metres; NA = not applicable; TBD = to be determined.

3.0 INCORPORATION OF INUIT QUAJIMAJATUQANGIT

Field programs were guided by Inuit Qaujimajatuqangit (IQ), including the assistance of local field assistants whenever possible. Local participation in monitoring programs was limited in 2020 in consideration of COVID-19 health and safety measures for the protection of local communities. Local participation to the 2020 TEMMP work was entirely contact free and conducted in strict accordance with applicable protocols and health and safety measures (e.g., Detached Operation Protocol). Annual contributions from Inuit to the monitoring programs are presented below (Table 3-1).

Table 3-1: IQ Field Contributions from Inuit to Monitoring Programs

Name	Date(s) Worked on Site in 2020	Total Days	Programs Contributed To
Jeremiah Issaluk	■ July 06, 07, 10,16 ■ August 06, 07, 12,13, 16, 25, 27 ■ September 28 ■ October 13, 15, 23, 29, 30	17	■ AWAR Wildlife Survey
Jeremiah Issaluk	■ July 06-18	13	■ Caribou Monitoring and Migration Program

AWAR – All Weather Access Road

4.0 ENVIRONMENTAL VARIABLES

A summary of climate conditions collected on site in 2020 are presented in Table 4-1. Data was collected from 1 January to 31 December 2020 through the on-site meteorological station and rain gauges.

Table 4-1: Climate Conditions Recorded in the Project Area – 2020

Environmental Variable	Value[(A)]
TEMPERATURE (°C)	
Mean Annual Temperature	-9.7
Max. Annual Temperature	30.0
Min. Annual Temperature	-41.8
PRECIPITATION	
Total Annual Precipitation (mm)	179.8

(a) Values reported from January to October were collected by AE staff and data from November and December were collected using the Geonor Precipitation Gauge on site
Notes: °C = Celsius; mm = millimetres

The maximum annual temperature of 30.0°C was recorded on 4 August 2020 and the minimum annual temperature -41.8°C was recorded on 8 March 2020; the mean annual temperature was -9.7°C (Table 4-1). Total recorded annual precipitation was 179.8 mm and snowmelt began 7 June 2020 when the average daily air temperature exceeded 0°C. Precipitation was sampled 316 days out of the year in 2020, days not sampled were due to weather constraints or access difficulties. Total precipitation includes both rain and snowfall as these were not measured respectively due to a malfunction of the instrument. In November 2020 a new weather station was installed to the northeast of the camp, featuring a new precipitation gauge, evaporation pan, and sensors for temperature, barometric pressure, and solar radiation. The precipitation data will be available in real-time in 2021 and will be used for year-round precipitation data. Environmental variables will continue to be monitored on an on-going basis.

5.0 HABITAT LOSS

5.1 Direct Habitat Loss

The vegetation component of the 2020 TEMMP (Golder 2021) outlines how Agnico Eagle plans to reduce Project-related effects to vegetation populations and communities and, consequently, wildlife habitat. The monitoring plan includes both environmental and follow-up monitoring. The objective of this component of the TEMMP Annual Report is to determine if direct vegetation/habitat loss due to the Project footprint stays within impact predictions of 2,950 ha (Golder 2014a).

The Project footprint was analyzed using satellite imagery, aerial photographs, and ground surveys, and was reported in the 2018 TEMMP Annual Report (Agnico Eagle 2019). The footprint that was analyzed included all developments being completed as part of the construction phase. Although the Project footprint is currently 29% of the total predicted Project footprint (Agnico Eagle 2019), follow-up monitoring will continue at 3-year intervals (i.e., next assessment against the predicted Project footprint in 2021), as monitoring studies are used to provide feedback to Mine operations to determine if the goals and objectives are being met.

5.2 Indirect Habitat Loss

Indirect effects to wildlife are associated with changes in habitat that can alter the movement and behaviour of individuals in the vicinity of the Project as a result of sensory disturbance. Indirect effects are addressed through several of the monitoring programs per the TEMMP.

Caribou behaviour monitoring and analysis of collared caribou data (presence/absence) are presented in Section 12.0 of this report. For nesting birds, site-specific nest management plans may be required if birds are within the Project footprint. For the 2020 monitoring period, indirect Project effects on nesting birds are addressed in Sections 8.1 and 9.3.

Indirect Project effects are assessed through soils and vegetation monitoring every three years. Monitoring of indirect habitat loss assessment was last completed in 2019 (Golder 2020), , therefore, the next assessment will be completed in 2022.

6.0 SOIL AND VEGETATION MONITORING

The scope of the landscape component of the TEMMP Annual Report is to report on baseline levels of metals in berry producing plants, sedges, lichen, and soil chemistry potentially affected by the Mine. To evaluate the potential for adverse health effects to terrestrial life associated with changes in environmental quality due to chemical releases from the Mine, baseline conditions of the environment must first be understood. Vegetation and soil annual monitoring was conducted in 2017 to inform the baseline conditions. Monitoring programs are completed at three-year intervals, with monitoring completed in 2019 (Agnico Eagle 2020b) and the next assessment will be completed in 2022.

Local vegetation cover is predominantly characterized by heath tundra, and lichen-heath communities. Low-lying areas between the drumlins and eskers are dominated by sedge wetlands, shallow ponds, and various shallow and deep-water lakes. The main change from the Mine on the landscape is direct disturbance, which will be a long-term effect as the recovery of vegetation is slow in arctic environments (Burt 1997).

7.0 NON-NATIVE PLANT SURVEYS

The spread of non-native species across the landscape is a concern for the Inuit. Construction equipment and operation activities can result in the introduction of, or spread of, non-native vegetation species. Thus, Project Certificate No. 006 includes Term and Condition 36 and 37 to prevent and minimize the introduction of non-native plants during pre-construction, construction, operations, temporary closure and maintenance, closure and post closure. Pre-construction surveys were completed during the baseline studies completed during 1998, 2008 and 2009 surveys (Volume 6, SD 6-2; Golder 2014a).

This section includes the methods, results, and mitigation measures to minimize the spread of non-native invasive plant species resulting from Project construction. The Government of Nunavut (GN) and Environment and Climate Change Canada (ECCC) define a non-native species as ‘an organism that is not normally found in a region’ (CESCC 2010). Any introductions of non-native plant species must be promptly reported to the GN Department of Environment. Non-native plant monitoring surveys occurred in 2018 prior to Mine operations initiation and in 2019, when Mine operations commenced. Subsequent surveys will be completed annually as per the TEMMP (Agnico Eagle 2020a).

7.1 Methods

Non-native plant surveys were completed on 16-17 July 2020 by two Golder Biologists. The survey was focused on the 14 non-native vascular plants identified by the Canadian Endangered Species Conservation Council List (CESCC 2010; Appendix A).

Non-native plant surveys consisted of targeted surveys focused within high-priority or potential areas. The high potential areas were identified as the Project footprint, the accommodations area, the AWAR, the Agnico Eagle ship loading area in Rankin Inlet, and the bypass road. However, due to COVID-19 restrictions, the Bypass road and the Agnico Eagle ship loading area in Rankin Inlet were unable to be surveyed in 2020. However, there were no observations of non-native species along the Bypass road and the ship loading area during 2019 surveys. Mitigation to control the spread of non-native plants have been applied as described in Section 7.3, consequently, it is unlikely that new occurrences of non-native plants nave stablished in these areas in 2020. If COVID-19 restrictions are released, the 2021 monitoring surveys will continue to document the presence (if any) and extent of any new non-native species occurrences.

Species were documented as they were encountered within the Project footprint, accommodation area and along the AWAR Where invasive plant species were observed, a Global Positioning System (GPS) point and photograph were taken and the size of occurrence was recorded.

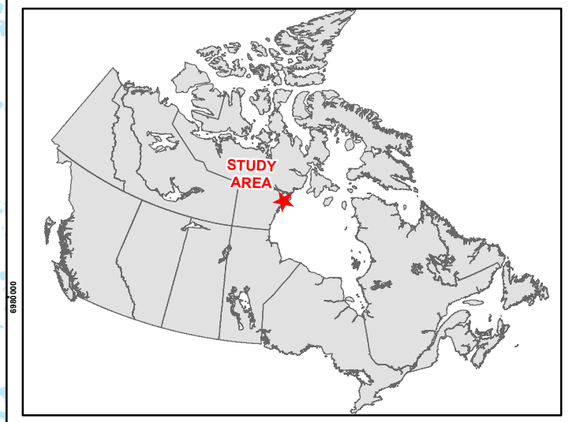
7.2 Results

One non-native plant species was identified during the surveys; common dandelion (*Taraxacum officinale*), listed under the Non-Native and Invasive Species in Nunavut (CESCC 2010; Appendix A). One occurrence of common dandelion was recorded at the Project footprint (Figure 4). Common dandelion was not observed along the exploration roads or the AWAR.

Negligible changes in abundance and distribution of non-native plant species relative to baseline conditions is expected due to the advancement of the Project but controlled through the implementation of mitigation and environmental design features (Volume 6, Section 6.5; Golder 2014a). The 2020 results show that non-native and invasive plant species are currently limited to disturbed areas, but prevention and control measures as outlined in the TEMMP (Golder 2020) need to continue to be implemented.

LEGEND

- DANDELION (TARAOFF)
- SURVEY POINT
- SURVEY POLYGON
- MINE FOOTPRINT
- MINE FEATURE
- ALL-WEATHER ACCESS ROAD (AWAR)
- RANKIN INLET
- WATERCOURSE
- WATERBODY



0 3 6

1:120,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

MELIADINE GOLD PROJECT
NUNAVUT

TITLE

2020 INVASIVE PLANT SURVEY LOCATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2020-12-18
DESIGNED	DM
PREPARED	MH
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
20138041	3000/3300	0	3

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0 25mm

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7.3 Mitigation

The early detection of non-native invasive plant species is important, as preventing these species from becoming established is the most effective mitigation that can be employed. Invasive plants identified as a concern by the Government of Nunavut Department of Environment (GN DoE) will be reported to the GN, including location of the species (i.e., GPS coordinates and map), species identification and photographs of the species in question.

In addition, due to the early detection of non-native invasive species, the following mitigation measures have been implemented by Agnico Eagle during Project operation, per the TEMMP (Agnico Eagle 2020a):

- Where possible, utilize existing access trails and roads.
- Limit the width of access roads and the size of workspaces.
- Inspect and clean new equipment arriving to site from the ship loading area prior to entering the Project Area.
- Complete non-native invasive plant monitoring surveys every year during operations to identify problem areas. Surveys should be targeted for areas with a high potential of occurrence such as along the AWAR, Project footprint, and ship loading areas.

7.4 Accuracy of Impact Predictions

One non-native invasive plant occurrence was observed in disturbed areas (i.e., Project footprint). A summary of the effects predictions proposed in the TEMMP (Golder 2020) is provided in Table 2-1. Specific thresholds for vegetation and wildlife habitat monitoring are outlined in Table 7-1.

Table 7-1: Accuracy of Effects Predictions – Vegetation

Monitoring Indicators	Threshold	Exceeded in 2020?	Adaptive Management	Monitoring Method	TEMMP* Section
Habitat Degradation by Contamination	No non-native invasive plant species established	No	See Section 7.5	Non-native invasive Plant Survey of AWAR, and Project site	13.0
Habitat Reclamation following Project Closure	NA	No	Not Currently Identified	Ground Surveys, Vegetation Plots, Mapping	4.0

Notes: *TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2020), AWAR = All-weather Access Road

7.5 Recommendations

For common dandelion occurrences mechanical control such as mowing or hand pulling is recommended, as practicable for the terrain on site.

- If hand pulling with a shovel, the plant material should be collected in bags and disposed of at an offsite location.
- Mowing is a viable option if the following conditions are met: there is access for a mowing unit or hand held trimmer, the terrain is not too steep or hazardous, or if the phenology of the plant stage is not at risk for greater seed dispersal (consult with a vegetation ecologist prior to mowing or trimming).

The CESCC (2010; Appendix A) has developed posters that show non-native species and invasive species in Nunavut. These can easily be displayed at the Project site and incorporated into on-boarding materials. Chemical herbicide treatments are not recommended to be used at this point as the native vegetation/habits in the tundra are very sensitive to impacts.

8.0 BIRDS

Two survey methods were employed in 2020 for monitoring waterfowl, waterbirds, and upland birds: shoreline surveys and point count surveys. Shoreline surveys are designed to determine nesting distribution along shorelines within 200 m of the Project footprint, which is considered to be the approximate zone of influence from sensory disturbance in the FEIS, of mining and Project-related infrastructure (e.g., AWAR). The program will attempt to determine mated pair distribution and nesting success in ponds, wetlands, and lake shorelines within 200 m of Project infrastructure.

Point counts are a method for detecting birds in habitat space (i.e., defined area of 100 m radius plot) during the breeding season. Point count data is used worldwide to estimate spatial distributions, habitat relationships, and population trends of birds.

8.1 Shoreline Surveys

8.1.1 Methods

8.1.1.1 Field Surveys

The shorelines of all waterbodies within this search area were surveyed on foot by trained biologists to locate and identify nesting waterbirds. If a waterbody partially intersected the 200 m buffer, only the extent of shoreline that occurred within the buffer was surveyed.

Shorelines of waterbodies within 200 m of the Mine and the AWAR were surveyed from 29 June to 21 July 2020 (Figure 4). Approximately 29.6 km of shorelines were surveyed by two observers walking the edge of each waterbody with the intent of flushing any breeding waterfowl or waterbirds nesting on the shore. While completing walking surveys, one observer walked 5 m from the water's edge, while the second observer walked approximately 15 m from the water's edge. Survey methods are described in more detail in the TEMMP (Agnico Eagle 2020a). A deviation from the prescribed survey protocol under the TEMMP was required for the 2017 survey period and no nests were recorded that year (Golder 2018). As such, data obtained since 2018 were analyzed for this report.

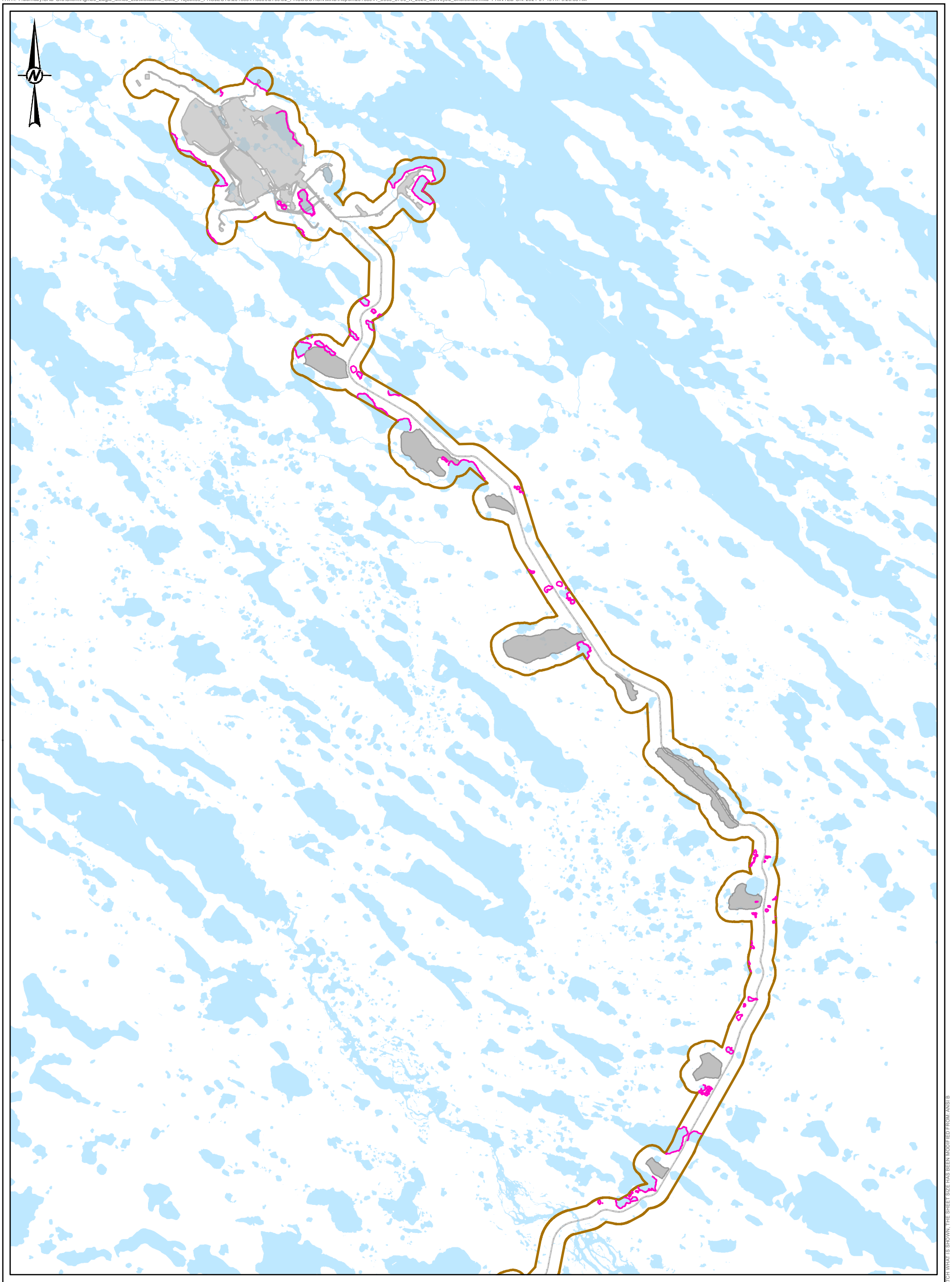
8.1.1.2 Data Analysis

Data were analyzed to determine nesting activity in ponds, wetlands, and lake shorelines within 200 m of Project infrastructure among survey years.

8.1.2 Results

Seven species were observed while conducting shoreline surveys in 2020 (Table 8-1). Due to the timing of surveys, eggs, nestlings and fledglings were observed; no nest building activity was noted. A total of 15 nests were discovered, of which the number of young was determined for 13 (87%), and 35 young in total were counted (2.3 young per nest on average). Young counts could not be confirmed for two nests due to access limitations (e.g., floating island) or apparent risk to nesting birds. Canada goose (*Branta canadensis*) was the most commonly observed species with 6 nests recorded and a total of 14 young.

Compared with 2018 and 2019 surveys, fewer nests overall were discovered in 2020. Differences among years could be due to differences in observer nest-finding ability, seasonal variation, or time of year effects. However, the number of Canada and cackling goose nests detected, which are relatively conspicuous and easy to locate, also showed a decrease (2018 – 19, 2019 – 18, 2020 – 8). The decline in conspicuous Canada and cackling goose nests suggests declines are not due to observer nest-finding ability, but rather an actual decline in nesting activity around the Project, which could be due to a natural range of variation (NRV). Statistical analyses in the future could be used to isolate observer effects to quantify annual changes in nest abundance. Furthermore, a spatial analysis can be used to identify areas showing the greatest decline in nest abundance.



LEGEND

- 2020 SHORELINE SURVEYED
- 200 m BUFFER OF MINE FOOTPRINT
- MINE FOOTPRINT
- ALL-WEATHER ACCESS ROAD (AWAR)
- RANKIN INLET
- WATERCOURSE
- WATERBODY

NOTE(S)

1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP.

0 1.2 2.4

1:60,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

CONSULTANT

GOLDER

YYYY-MM-DD	2021-01-19
DESIGNED	CC
PREPARED	CDB
REVIEWED	
APPROVED	

PROJECT

MELIADINE GOLD PROJECT
NUNAVUT

TITLE

2020 SURVEYED SHORELINES

PROJECT NO.	CONTROL	REV.	FIGURE
20138041	3000/3700	0	4

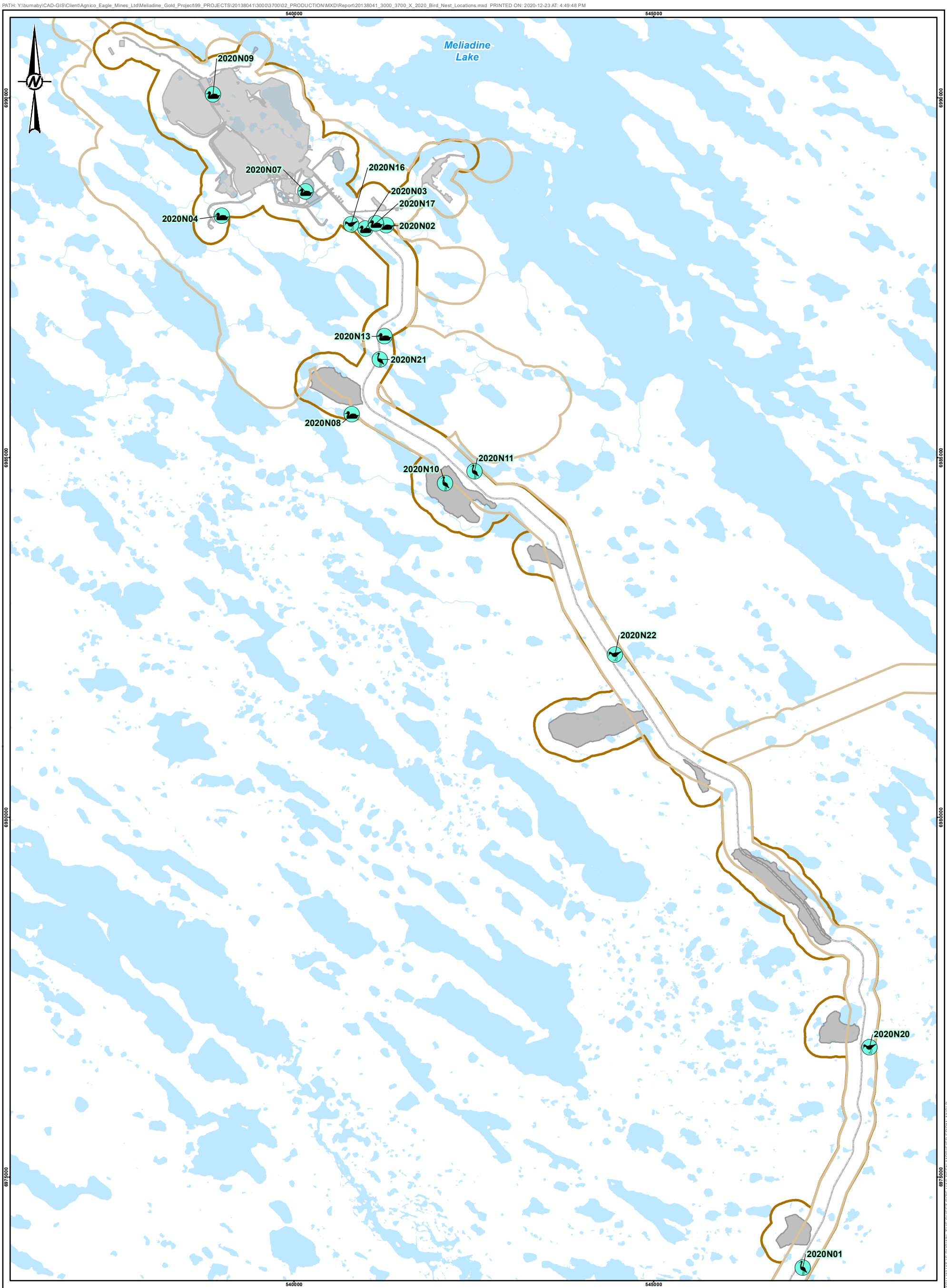
Table 8-1: Summary of Nests and Eggs Observed during Shoreline Surveys, 2018-2020

Common Name	Scientific Name	2018		2019		2020	
		Number of Young[(a)]	Number of Nests	Number of Young[(a)]	Number of Nests	Number of Young[(a)]	Number of Nests
Cackling Goose	*Branta hutchinsii*	4	3	18	4	6	2
Canada Goose	*Branta canadensis*	18	16	39	14	14	6
Greater White-fronted Goose	*Anser albifrons*	0	0	3	1	0	0
Herring Gull	*Larus argentatus*	0	0	0	1	0	0
Horned Lark	*Eremophilia alpestris*	4	1	0	0	3	1
Lapland Longspur	*Calcarius lapponicus*	2	4	5	1	4	1
Least Sandpiper	*Calidris minutilla*	0	2	0	0	4	2
Peregrine Falcon	*Falco peregrinus*	0	2	0	1	0	0
Sandhill Crane	*Grus canadensis*	0	0	2	2	0	0
Savannah Sparrow	*Passerculus sandwichensis*	0	0	0	0	11	2
Semipalmated Plover	*Charadrius semipalmatus*	0	0	4	1	0	1
Tundra Swan	*Cygnus columbianus*	2	1	0	0	0	0
Willow Ptarmigan	*Lagopus lagopus*	0	5	1	1	0	0
Total		**30**	**34 (20)[(b)]**	**72**	**26 (20) [(b)]**	**35**	**15 (13) [(b)]**

Notes:

[(a)] Eggs, nestlings, or fledglings were counted to observers' best ability while minimizing disturbance to nests

[(b)] Number in parentheses refers to the number of nests for which an egg count could be determined



LEGEND

BIRD GROUP
- GAMEBIRD
- GULL
- PASSERINE
- RAPTOR
- SHOREBIRD
- WATERBIRD
- WATERFOWL

YEAR
- 2020
- EXPANSION AREA (2020)
- 200 m BUFFER OF MINE FOOTPRINT
- MINE FOOTPRINT
- ALL-WEATHER ACCESS ROAD (AWAR)
- WATERBODY
- WATERCOURSE

NOTE(S)
1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP.

0 1 2
1:50,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-23
DESIGNED	CC
PREPARED	CDB
REVIEWED	
APPROVED	

TITLE
LOCATIONS OF BIRD NESTS DISCOVERED DURING 2020 SHORELINE SURVEY

PROJECT NO.	CONTROL	REV.	FIGURE
20138041	3000/3700	0	5

8.2 Point Counts

Upland bird plots, or point counts, were distributed along transects on either side of the AWAR. The objective of the point count surveys was to estimate the effects of increased traffic along the AWAR on the density, species richness, and distribution of upland breeding birds along the AWAR and how these effects might diminish with increasing distance from the road (Agnico Eagle 2020a). In future years, trend analysis can be conducted to measure how these responses change with increasing activity at the Mine.

8.2.1 Methods

8.2.1.1 Field Surveys

A total of 72 point count plots were surveyed in 2020 (between 29 June and 21 July 2020). Point count plots were located within 1 kilometre (km) on either side of the AWAR (2 km in total) with the first point count occurring at 50 m from the road edge and each subsequent plot spaced 100 m from the center of the preceding plot (Figure 6). Surveys did not target specific habitats and occurred in eight habitat types, as determined in the field and in the office using site photos.

Point counts were 5 minutes in duration and all species detected by sight or sound within 50 m and between 50 to 100 m of the observer were recorded; observations beyond 100 m were recorded as incidentals. The survey method is described in more detail in the TEMMP (Agnico Eagle 2020a).

8.2.2 Data Analysis

8.2.2.1.1 Individual Species Analysis

A species-level analysis calculated the mean density of individual passerine species detected during point count surveys among each habitat type in 2020. Density was calculated as the number of individuals of each species per hectare detected at each point count, averaged across point counts within each habitat type. For example, a point count circle is a 100 m radius circle, or 3.14 ha, so a single individual detected at a point count would have a density of 0.32 birds/ha (1 bird/3.14 ha). Changes in the average density of each species within habitat types from 2018 to 2020 were calculated to illustrate measured differences between the survey years (Table 8-2).

8.2.2.1.2 Community Analysis

A community-level analysis examined the total density, species richness, and an index of species diversity of all passerine species measured in each habitat type for each year. Density was calculated as the number of individuals per hectare (summed across species) detected at each point count, averaged across point counts within each habitat type. Species richness was calculated as alpha richness, or a count of the number of species detected at a point count. Diversity was calculated as the Shannon's H-index using the 'vegan' package in R (Oksanen et al. 2019).

For each metric (density, richness, and diversity), a two-way analysis of variance (ANOVA) was calculated in R version 3.5.2 (R Core Team 2020) to determine if habitat type or year were significant predictors of variation.

8.2.2.1.3 Generalized Linear Models

Generalized linear models (GLMs) assuming a normal distribution were estimated to test for the effects of categorical year ('Year'), habitat type ('Habitat'), and the distance of the point count from the AWAR ('Distance') on the density of passerines detected at each point count. Akaike's Information Criterion (AIC) was used to assess the best fit among all candidate models, and all models within ΔAIC of 2.0 of the top model were considered equally viable models. A scaled variable for distance fit between 0 and 1 was used to generate coefficient estimates rather than using raw meters.

LEGEND

- BREEDING BIRD SURVEY
- EXPANSION AREA (2020)
- 200 m BUFFER OF MINE FOOTPRINT
- MINE FOOTPRINT
- ALL-WEATHER ACCESS ROAD (AWAR)
- WATERBODY
- WATERCOURSE

NOTE(S)

1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP.

0 0.8 1.6

1:40,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-23
DESIGNED	CC
PREPARED	CDB
REVIEWED	
APPROVED	

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
BREEDING BIRD POINT COUNT LOCATIONS

PROJECT NO.	CONTROL	REV.	FIGURE
20138041	3000/3700	0	6

8.2.3 Results

8.2.3.1 Individual Species Results

Six passerine species were detected during point count surveys in 2020 (Table 8-2). An additional 23 bird species were incidentally recorded in all years during the breeding bird point count surveys, including shorebirds, waterbirds, raptors, and upland breeding birds outside of 100 m from observers (Appendix B). No upland breeding bird species at risk (Government of Alberta 2015; Government of Canada 2020) have been recorded during upland breeding bird surveys in any survey year.

Horned larks (*Eremophilia alpestris*) were recorded in all habitats, with the highest density recorded in esker and gravel/quarry habitats. Lapland longspur (*Calcarius lapponicus*) densities were highest in esker and Low Shrub habitat, however, sample size was only one in these habitats. Savannah sparrow (*Passerculus sandwichensis*) and American robin (*Turdus migratorius*) densities were highest in heath boulder. White-crowned sparrow (*Zonotrichia leucophrys*) and American pipit (*Anthus rubescens*) densities were highest in heath bedrock habitat.

Overall, density of each species only varied slightly among years in all habitat types. Compared to 2019, recorded densities in 2020 were lower for horned lark, Lapland longspur, and savannah sparrow, and white-crowned sparrow. Conversely, densities were higher for American pipit, and no different for American robin.

Table 8-2: Mean (± 1SE) Density (Individuals per Hectare) of Passerine Bird Species among Habitats along the AWAR in 2020, with Annual Rate of Change in Density from 2018 to 2020.

Common Name	Scientific Name	Habitat Type								Average Change in Density 2018 to 2019	Average Change in Density 2019 to 2020
		Esker Complex (N = 1)	Gravel Quarry (N = 3)	Heath Bedrock (N = 3)	Heath Boulder (N = 18)	Heath Tundra (N = 35)	Low Shrub (N = 1)	Sedge Wetland (N = 4)	Tussock-Hummock (N = 7)		
American Pipit	*Anthus rubescens*	0	0.11 ± 0.11	0.42 ± 0.11	0.12 ± 0.04	0.02 ± 0.01	0.32 ± 0	0.08 ± 0.08	0.09 ± 0.06	0	0.05
American Robin	*Turdus migratorius*	0	0	0	0.02 ± 0.02	0	0	0	0	0	0
Horned Lark	*Eremophilia alpestris*	0.32[(a)]	0.32 ± 0.18	0.11 ± 0.11	0.14 ± 0.05	0.18 ± 0.04	0.32[(a)]	0.16 ± 0.09	0.09 ± 0.06	0.1	-0.13
Lapland Longspur	*Calcarius lapponicus*	0.64[(a)]	0	0.32 ± 0.18	0.27 ± 0.05	0.12 ± 0.03	0.64[(a)]	0.08 ± 0.08	0.14 ± 0.06	-0.01	-0.01
Savannah Sparrow	*Passerculus sandwichensis*	0	0	0	0.09 ± 0.03	0.1 ± 0.03	0	0.08 ± 0.08	0	-0.06	-0.08
White-crowned Sparrow	*Zonotrichia leucophrys*	0	0	0.11 ± 0.11	0.07 ± 0.03	0.01 ± 0.01	0	0.08 ± 0.08	0	-0.01	0.03

[(a)] Only the mean is reported as the species was only recorded at one site within the habitat type

8.2.3.2 Community Results

Total passerine density at the point count level ranged from 0 to 1.59 birds per hectare (ha) in 2020 (Table 8-3). Low shrub had the highest mean density with 1.27 birds/ha, while tussock-hummock had the lowest density at 0.32 birds/ha. The total mean density of birds in 2020 was 0.55 ± 0.05 birds/ha. The mean density of passerine birds at the point count level was not significantly different among habitat types ($F_{7,206}$ = 1.15, P = 0.33), but varied among year ($F_{2,206}$ = 8.18, P <0.01, Figure 7). A Tukey's test for pairwise comparisons showed that 2018 and 2019 were not significantly different (P = 0.86), but 2020 had significantly lower density than 2018 (P = 0.01) and 2019 (P <0.01).

Table 8-3: Passerine Bird Densities by Habitat Type from 2018-2020.

Habitat	2018 Density			2019 Density			2020 Density		
	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max
Esker Complex	1	1.27[(a)]	1.27 – 1.27	2	0.48 ± 0.16	0.32 – 0.64	1	0.96[(a)]	0.96 – 0.96
Gravel Quarry	2	0.32 ± 0	0.32 – 0.32	2	0.96 ± 0	0.96 – 0.96	3	0.42 ± 0.21	0 – 0.64
Heath Bedrock	4	0.64 ± 0.23	0 – 0.96	5	0.45 ± 0.16	0 – 0.96	3	0.96 ± 0.18	0.64 – 1.27
Heath Boulder	18	0.92 ± 0.12	0 – 1.91	12	0.90 ± 0.15	0 – 1.59	18	0.76 ± 0.1	0 – 1.59
Heath Tundra	21	0.73 ± 0.10	0.32 – 1.91	34	0.94 ± 0.11	0 – 2.55	35	0.44 ± 0.05	0 – 1.27
Low Shrub	2	0.80 ± 0.48	0.32 – 1.27	1	0.64[(a)]	0.64 – 0.64	1	1.27[(a)]	1.27 – 1.27
Sedge Wetland	7	0.82 ± 0.12	0.32 – 1.27	6	0.58 ± 0.10	0.32 – 0.96	4	0.48 ± 0.21	0 – 0.96
Tussock-Hummock	17	0.75 ± 0.09	0.32 – 1.27	10	0.67 ± 0.14	0 – 1.59	7	0.32 ± 0.1	0 – 0.64
Totals	**72**	**0.78 ± 0.05**	**0 – 1.91**	**72**	**0.81 ± 0.06**	**0 – 2.55**	**72**	**0.55 ± 0.05**	**0 – 1.59**

Notes:

SE = standard error; Min = minimum; Max = maximum.

(a) Only the mean is reported as only a single point count was done in this habitat type in this year.

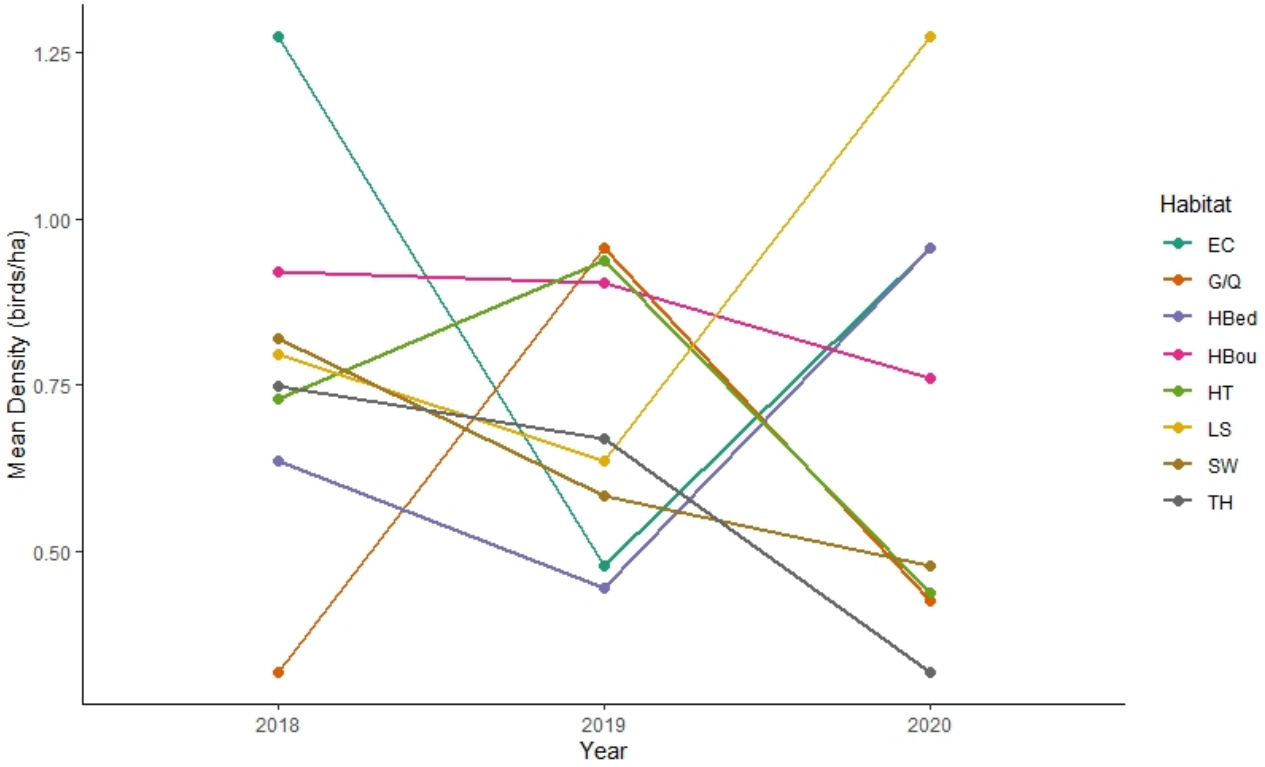


Figure 7: Plot of Avian Density Across Years and Habitat Types. EC = Esker Complex, G/Q = Gravel/Quarry, Hbed = Heath Bedrock, Hbou = Heath Boulder, HT = Heath Tundra, LS = Low Shrub, SW = Sedge Wetland, TH = Tundra Heath. Error bars not shown for clarity.

Species richness at the point count level varied from zero to four species detected in 2020, compared to zero to three species in both 2018 and 2019 (Table 8-4). Mean species richness was highest in 2020 with 1.77 ± 0.12 species per plot, compared to 1.33 ± 0.09 in 2019 and 1.71 ± 0.10 in 2018. A two-way ANOVA showed that species richness was not different among habitat types ($F_{7,206}$ = 1.25, P = 0.28) or among years ($F_{2,206}$ = 1.26, P = 0.29, Figure 8).

Table 8-4: Mean Species Richness of Passerine Birds across Habitat Types along the AWAR, 2018 to 2020.

Habitat	2018 Richness			2019 Richness			2020 Richness		
	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max
Esker Complex	1	2.00[(a)]	2 – 2	2	1.50 ± 0.50	1 – 2	1	2.00[(a)]	2 – 2
Gravel Quarry	2	1.00 ± 0	1 – 1	2	1.00 ± 0	1 – 1	3	1.00 ± 0.58	0 – 2
Heath Bedrock	4	1.75 ± 0.63	0 – 3	5	1.00 ± 0.32	0 – 2	3	2.33 ± 0.33	2 – 3
Heath Boulder	18	1.89 ± 0.24	0 – 3	12	1.50 ± 0.19	0 – 2	18	2.06 ± 0.29	0 – 4
Heath Tundra	21	1.76 ± 0.15	1 – 3	34	1.74 ± 0.14	0 – 3	35	1.29 ± 0.15	0 – 3
Low Shrub	2	2.00 ± 1.00	1 – 3	1	1.00[(a)]	1 – 1	1	3.00[(a)]	3 – 3
Sedge Wetland	7	1.57 ± 0.30	1 – 3	6	1.33 ± 0.33	0 – 2	4	1.50 ± 0.65	0 – 3
Tussock-Hummock	17	1.71 ± 0.19	1 – 3	10	1.60 ± 0.27	0 – 3	7	1.00 ± 0.31	0 – 2
Totals	**72**	**1.71 ± 0.10**	**0 – 3**	**72**	**1.33 ± 0.09**	**0 – 3**	**72**	**1.77 ± 0.12**	**0 – 4**

Notes:

SE = standard error; Min = minimum; Max = maximum.

(a) Only the mean is reported as only a single point count was done in this habitat type in this year.

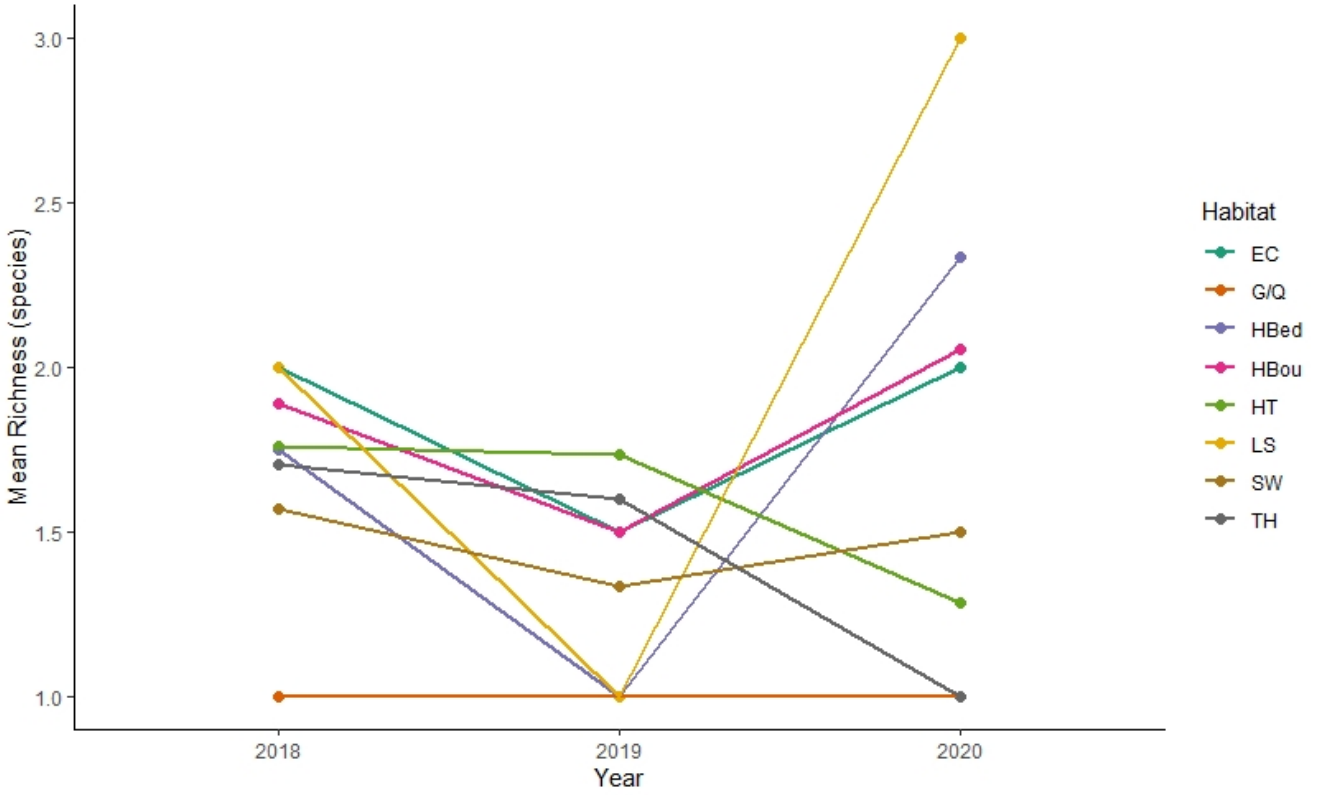


Figure 8: Plot of Avian Richness Across Years and Habitat Types. EC = Esker Complex, G/Q = Gravel/Quarry, Hbed = Heath Bedrock, HBou = Heath Boulder, HT = Heath Tundra, LS = Low Shrub, SW = Sedge Wetland, TH = Tundra Heath. Error bars not shown for clarity.

Species diversity at the point count level varied from 0 to 1.39 in 2020, 0 to 1.05 in 2019, and 0 to 1.10 in 2018. Mean diversity was highest for low shrub habitat in 2020, but this was from a single point count, followed by heath bedrock (Table 8-5). Lowest species diversity was recorded in tussock-hummock and gravel/quarry habitats. A two-way ANOVA showed that differences in species diversity were not significant among habitat types ($F_{7,206} = 1.24$, $P = 0.28$) nor between years ($F_{2,206} = 0.73$, $P = 0.48$, Figure 9).

Table 8-5: Species Diversity of Passerine Birds among Habitats along the AWAR, 2018 to 2020

Habitat	2018 Diversity[(b)]			2019 Diversity[(b)]			2020 Diversity[(b)]		
	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max	N	Mean ± SE	Min – Max
Esker Complex	1	0.69[(a)]	0.69 – 0.69	2	0.35 ± 0.35	0 – 0.69	1	0.64[(a)]	0.64 – 0.64
Gravel Quarry	2	0 ± 0	0 – 0	2	0 ± 0	0 – 0	3	0.23 ± 0.23	0 – 0.69
Heath Bedrock	4	0.61 ± 0.23	0 – 1.1	5	0.13 ± 0.13	0 – 0.64	3	0.83 ± 0.14	0.69 – 1.1
Heath Boulder	18	0.56 ± 0.10	0 – 1.04	12	0.36 ± 0.09	0 – 0.67	18	0.60 ± 0.13	0 – 1.39
Heath Tundra	21	0.46 ± 0.09	0 – 1.1	34	0.45 ± 0.07	0 – 1.05	35	0.29 ± 0.07	0 – 1.1
Low Shrub	2	0.52 ± 0.52	0 – 1.04	1	0[(a)]	0 – 0	1	1.04[(a)]	1.04 – 1.04
Sedge Wetland	7	0.33 ± 0.17	0 – 1.1	6	0.34 ± 0.15	0 – 0.69	4	0.45 ± 0.27	0 – 1.1
Tussock-Hummock	17	0.41 ± 0.11	0 – 1.1	10	0.44 ± 0.13	0 – 1.05	7	0.20 ± 0.13	0 – 0.69
Total	**72**	**0.46 ± 0.05**	**0 – 1.1**	**72**	**0.38 ± 0.04**	**0 – 1.05**	**72**	**0.40 ± 0.05**	**0 – 1.39**

Notes:
SE = standard error; Min = minimum; Max = maximum.
(a) Only the mean is reported as only a single point count was done in this habitat type in this year.
(b) Species diversity is measured using the Shannon diversity index.

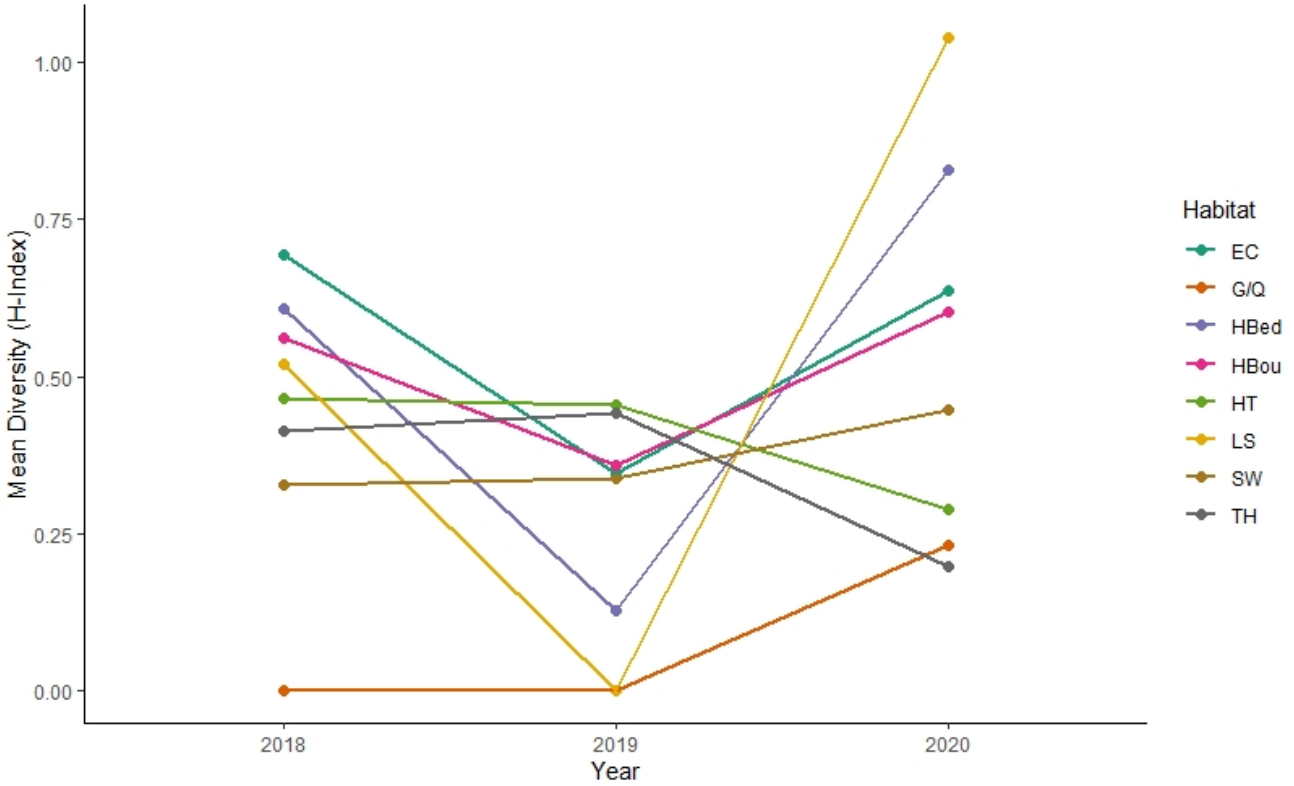


Figure 9: Plot of Avian Diversity Across Years and Habitat Types. EC = Esker Complex, G/Q = Gravel/Quarry, Hbed = Heath Bedrock, Hbou = Heath Boulder, HT = Heath Tundra, LS = Low Shrub, SW = Sedge Wetland, TH = Tundra Heath. Error bars not shown for clarity.

Overall, these results indicate that while species densities were lower in 2020 than either 2018 or 2019, species richness and diversity have not changed from 2018-2020 along the AWAR. Changes in the density of species may instead be due to observer effects, as different biologists conducted the surveys each year. Variation in distance estimation by an observer during a point count may influence the number of birds included within the 100 m survey radius and thus may drive variation in density (Yip et al. 2019). Reduction in the quality of habitat due to direct or indirect effects of the Mine would be expected to influence diversity and richness metrics, but these values were similar or slightly higher in 2020, indicating the Project has not directly nor indirectly reduced habitat quality for nesting songbirds. Improved distance estimation during fixed radius point counts can be facilitated through the use of training, calibrating estimation between observers at the same point count location, and/or the use of a laser range finder in the field during surveys.

8.2.3.3 Generalized Linear Model Results

The top model for explaining variation in species density was the Year + Distance model (Table 8-6). The intercept in the models estimated the null expected density of a point count to be approximately 0.45 to 0.84 birds per hectare. Distance had a positive effect on density, indicating that bird density was highest at farther distances from the AWAR and lowest close to the AWAR (Figure 10). This result is consistent with previous research, which indicates there is an adverse relationship between proximity to roads and the density of breeding birds (Summers et al. 2011), and may be related to traffic noise (McClure et al. 2013). Alternatively, this relationship could also be due to a trend of increasing amounts of suitable habitat with distance from roads, which warrants further investigation.

Bird densities were significantly lower in 2020 as compared to 2018 and 2019. As previously discussed, density may be affected by different observers collecting the data. In order to estimate density, point count observers are required to estimate a fixed distance in the field within which birds will be counted, and outside of which birds will only be recorded as incidentals. It is well documented in the literature that point counts often suffer from the discrepancy of distance estimation (Yip et al. 2019), and therefore some observers may include more birds within a point count circle than other observers. However, if future analyses continue to show a decreasing trend in passerine density over time, it may indicate Mine related effects on breeding bird densities rather than observer error. In the future, a subset of point count surveys can be repeated by multiple observers to tease apart observer effects from Project effects on bird density.

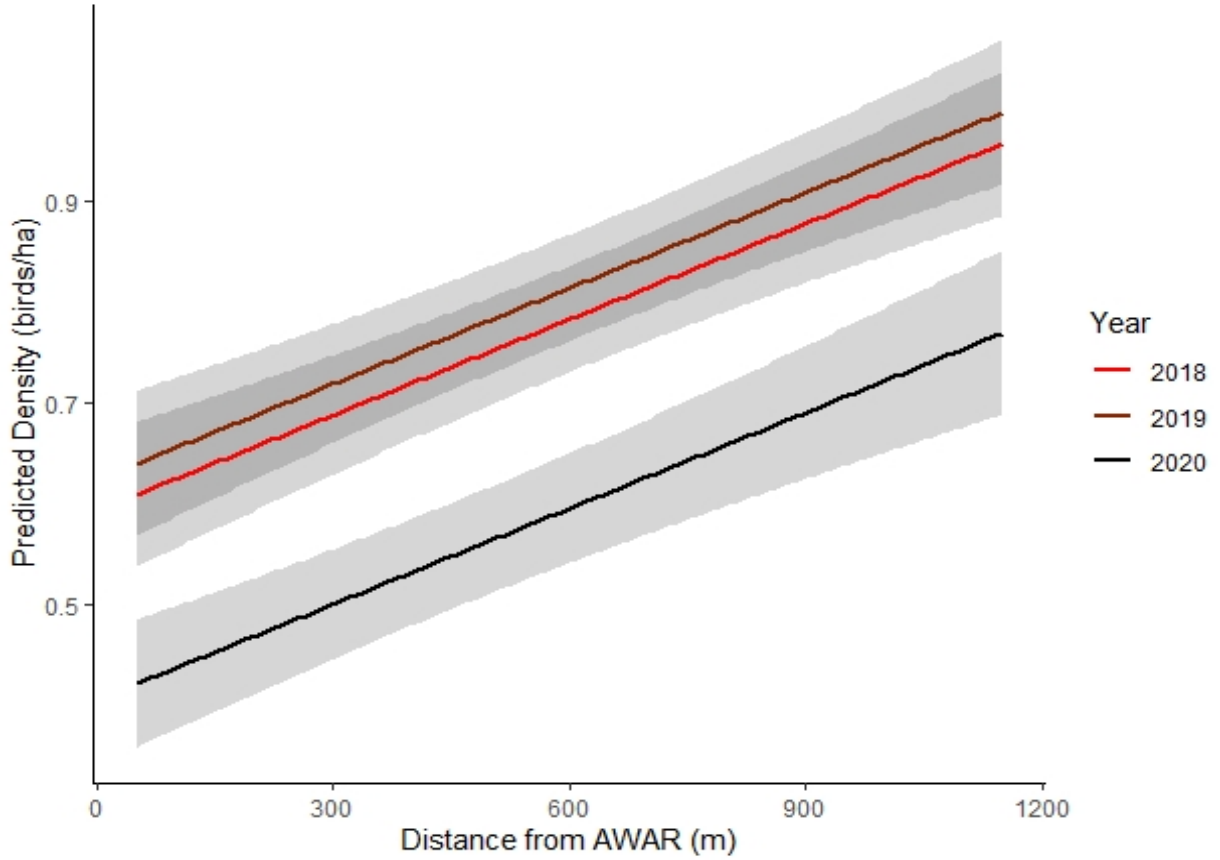


Figure 10: Predictions from Top GLM Model of Passerine Densities at Point Counts in Response to Year and Distance. Ribbons denote ± 1 standard error around the mean predicted density.

Table 8-6: Coefficients and Akaike's Information Criterion Ranking for Candidate Generalized Linear Models for Passerine Density, 2018 to 2020

Model	Coefficients											Model Selection	
	Intercept	*Distance from Road*[(a)]	*Year 2019*[(b)]	*Year 2020*[(b)]	*Gravel Quarry*[(c)]	*Heath Bedrock*[(c)]	*Heath Boulder*[(c)]	*Heath Tundra*[(c)]	*Low Shrub*[(c)]	*Sedge Wetland*[(c)]	*Tussock-Hummock*[(c)]	*AIC*[(d)]	*ΔAIC*[(e)]
Year + Distance	0.61	0.35	0.03	-0.19	-	-	-	-	-	-	-	269.82	0
Distance	0.53	0.41	-	-	-	-	-	-	-	-	-	275.47	5.65
Habitat + Year + Distance	0.55	0.32	0.04	-0.20	0.003	0.03	0.21	0.06	0.19	-0.03	0.01	276.56	6.74
Year	0.78	-	0.03	-0.23	-	-	-	-	-	-	-	280.41	10.59
Habitat + Distance	0.45	0.40	-	-	0.01	0.07	0.21	0.06	0.20	-0.01	0.05	283.96	14.15
Year + Habitat	0.84	-	0.04	-0.25	-0.20	-0.16	0.10	-0.06	0.09	-0.14	-0.16	284.41	14.60
Null	0.72	-	-	-	-	-	-	-	-	-	-	290.61	20.79
Habitat	0.80	-	-	-	-0.25	-0.16	0.06	-0.10	0.08	-0.14	-0.16	296.93	27.11

Notes:

(a) Distance between the point count and the AWAR, with positive values representing a larger distance. Variable is scaled between 0 and 1.

(b) Year is a categorical variable that includes three levels. The coefficient compares 2019 and 2020 density to the reference year 2018.

(c) Habitat is a categorical variable that includes eight levels. The coefficient is comparing habitat to the reference condition 'esker complex' habitat.

(d) Akaike's Information Criterion.

(e) Change in AIC between the given model and the top model. Top model sets are determined using a threshold of ΔAIC less than 2. Models included in the top model set are denoted in green.

8.3 PRISM

The Program for Regional and International Shorebird Monitoring (PRISM) is a standardized method for monitoring shorebirds. PRISM surveys are designed to document population numbers of Arctic breeding shorebirds, describe the distribution and habitat associations of shorebirds, and monitor trends in population size (Bart et al. 2005). The PRISM surveys conducted as part of monitoring for the Project will contribute to regional knowledge in an effort to set population targets and assist with management and conservation of these species (EC 2012). All PRISM data will be submitted to ECCC for inclusion in their regional database.

PRISM surveys were not conducted in 2020 because this monitoring was completed in 2018 and 2019. As per recommendations from ECCC, Agnico Eagle has committed to completing PRISM surveys over 2 years, every 5 years (Agnico Eagle 2020a). The next two monitoring years are scheduled to occur in 2023 and 2024.

8.4 Recommendations

The only metric of breeding bird populations that has changed over time is the density. Density is subject to observer error in estimating distance during a point count survey. To tease these effects apart, observer should be included in future analyses to determine if it is a stronger driver of density than the year effect. Section 8.2.3.3 recommends the following additional components to the breeding bird analysis:

1) Test annual AWAR traffic as a covariate on breeding bird metrics.

2) Study the influence of observers on bird density variation.

3) Investigate survey method to standardize how 100 m is measured.

Direct Habitat Loss will be assessed in the 2021 annual report. The decline of nests detected during shoreline surveys should be quantified against the loss of suitable habitat. The nesting locations from 2018 and 2019 that are no longer occupied should be spatially displayed to identify potential areas of high loss in productivity. A subset of shores in 2021 should be surveyed multiple times by separate observers to quantify observer effects in nest detectability. This will allow potential observer effects in detecting nests relative to realized declines in nest abundance over time to be determined.

9.0 WILDLIFE OBSERVATIONS

Agnico Eagle's environmental technicians conduct site surveillance monitoring and road surveillance monitoring regularly of the AWAR and the Project. In addition to planned surveys, all supervisors ask their employees to report wildlife sightings; Wildlife logs are posted throughout the Mine site and easily accessible to employees to facilitate wildlife reporting before, during, and after work shifts.

In 2020, there were 416 recorded incidental observations, representing 2,645 individuals of 22 species, around the Mine site (including the camp area) and the AWAR (Table 9-1**Error! Reference source not found.**). Incidental wildlife observations were recorded between 1 January and 31 December 2020 and do not include mortalities or observations of large herds of migrating caribou. Information on caribou migration through the Mine site and AWAR is presented in Section 11.0.

A total of 106 Caribou were observed incidentally in 2020, compared to 86 individuals in 2019 and 6,839 individuals in 2018. Arctic fox and Arctic hare incidentals have remained steady in the past three years, whereas the number of birds recorded incidentally has been increasing (Figure 11). Muskox were recorded incidentally for the first time in 2020 with 22 individuals recorded; and pine marten were also recorded for the first time in 2020 with 20 individuals observed (Figure 11). The number of birds recorded incidentally has steadily increased and was highest in 2020, likely due to an increase in the number of reports.

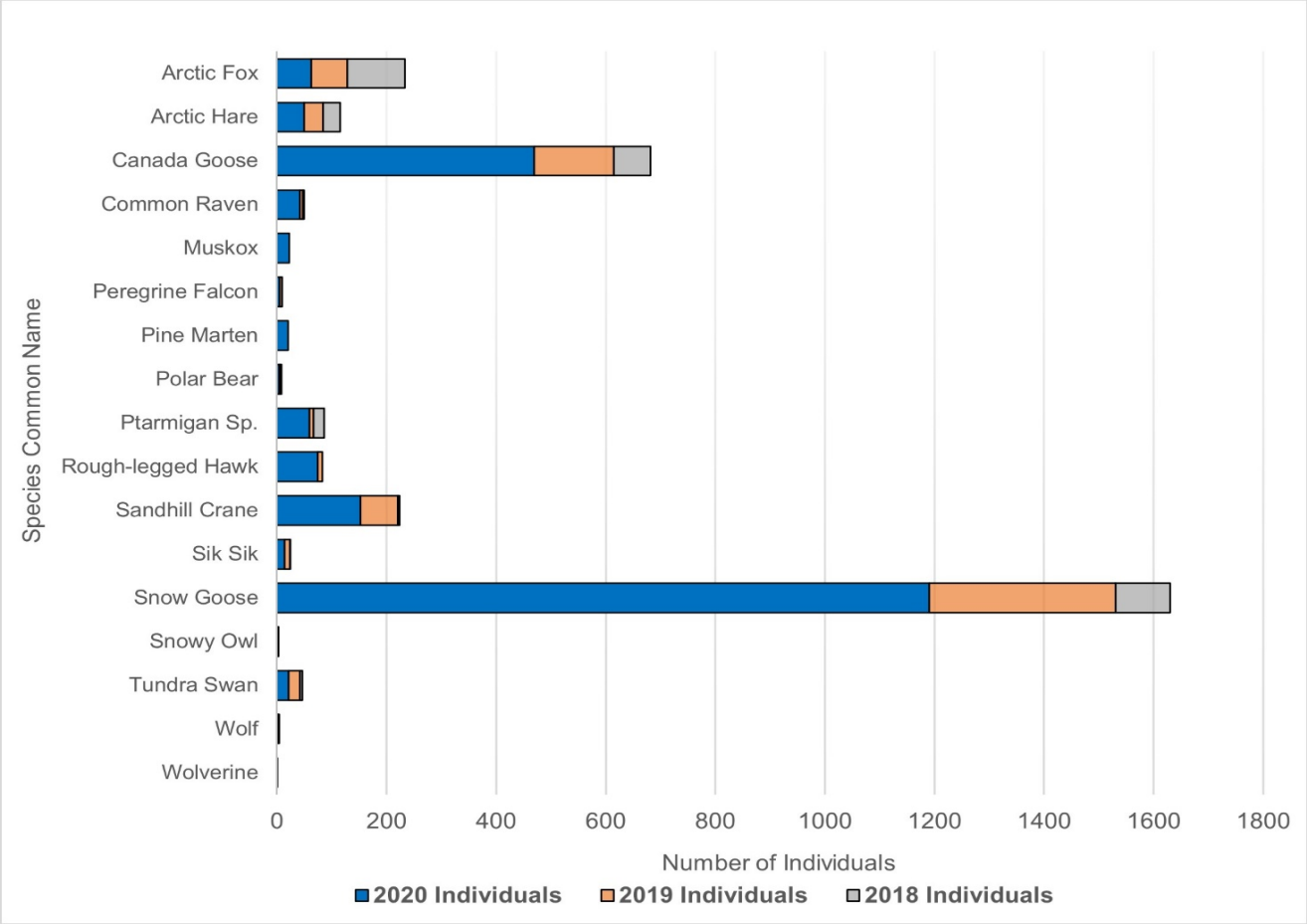


Figure 11: Number of Individuals Observed Incidentally from 2018-2020.

Table 9-1: Incidental Wildlife Observations 2018 - 2020

Common Name	Scientific Name	2018		2019		2020	
		Number of Observations	Number of Individuals	Number of Observations	Number of Individuals	Number of Observations	Number of Individuals
Mammals							
American pine marten	*Martes americana*	0	0	0	0	16	20
Arctic fox	*Vulpes lagopus*	97	105	60	67	59	62
Arctic ground squirrel	*Urocitellus parryii*	1	1	8	10	12	14
Arctic hare	*Lepus arcticus*	28	31	23	34	34	50
Caribou	*Rangifer tarandus*	76	6839	37	86	20	106
Gray wolf	*Canis lupus*	0	0	2	2	2	2
Muskox	*Ovibos moschatus*	0	0	0	0	2	22
Polar bear	*Ursus maritimus*	1	2	2	2	2	4
Wolverine	*Gulo gulo*	1	1	0	0	0	0
Birds							
American crow	*Corvus brachyrhynchos*	0	0	0	0	1	1
Bald eagle	*Haliaeetus leucocephalus*	1	1	0	0	0	0
Brant	*Branta bernicla*	0	0	0	0	17	181
Canada goose	*Branta canadensis*	6	67	21	145	55	470
Common raven	*Corvus corax*	2	2	3	5	15	42
Duck species	NA	2	20	5	17	17	95
Greater white-fronted goose	*Anser albifrons*	0	0	9	44	0	0
Gull species	NA	0	0	8	18	28	76
Long-tailed duck	*Clangula hyemalis*	0	0	0	0	2	3
Peregrine falcon	*Falco peregrinus*	0	0	3	4	4	5
Ptarmigan species	*Lagopus* spp.	4	19	3	8	6	59
Rough-legged hawk	*Buteo lagopus*	0	0	9	9	7	74
Sandhill crane	*Grus canadensis*	1	4	22	68	67	152
Snow goose	*Anser caerulescens*	1	100	20	340	44	1,190
Snowy owl	*Bubo scandiacus*	2	2	0	0	1	1
Tundra swan	*Cygnus columbianus*	2	4	9	21	10	21
	TOTAL	225	7198	244	880	421	2650

Notes:
Specific global positioning system (GPS) locations were not recorded for incidental wildlife observations in 2020.
Wildlife mortalities and counts of large herds of migrating caribou are not included.
NA = not applicable

9.1 Wildlife Track Surveys

Wildlife sighting/track surveys were completed by Agnico Eagle personnel along the AWAR an average of every 7.8 days from 2 January 2020 to 31 December 2020. In addition, wildlife sighting/track surveys were completed at Mine infrastructure (e.g., land farms, tank farms, camps, construction areas, exploration areas, the incinerator, water management ponds) an average of every 9.8 days from 5 January 2020 to 31 December 2020. When excluding caribou, a total of 1,761 individuals from 17 identified wildlife species and 10 unidentified wildlife species groups (e.g., duck species) were recorded during surveys along the AWAR in 2020. Large groups (>1,000 individuals) of barren-ground caribou (*Rangifer tarandus groenlandicus*) were recorded within 0 to 3 km of the AWAR on 6, 10, and 16 July 2020. A total of 14,637 caribou were observed during 2020 wildlife track surveys along the AWAR, across 17 unique observations. The largest groups of caribou were 3,000 individuals observed on 16 July 2020. The first caribou observation of the year occurred on 6 July 2020 when a group of 2,000 caribou were observed 600 m from the AWAR at kilometer 25, and the last caribou observation occurred on 16 December 2020 with a single caribou observed at kilometer 29. Although not currently listed under the federal *Species at Risk Act* (SARA), barren-ground caribou is under consideration for listed as Threatened under SARA (Government of Canada 2020).

One peregrine falcon (*Falco peregrinus*) was observed during surveys along the AWAR on 30 May 2020. Peregrine falcon, *anatum/tundrius* subspecies, is currently listed as a species of Special Concern under SARA; this species is under consideration for a status change under SARA to Not At Risk (Government of Canada 2020). No other species at risk were observed during the AWAR surveys.

Snow goose (*Chen caerulescens*) was the most commonly recorded bird species with a total of 966 individuals (55% of all sightings, excluding caribou) observed along the AWAR. Canada goose (*Branta canadensis*), greater white-fronted goose (*Anser albifrons*) and sandhill crane (*Grus canadensis*) were also frequently observed along the AWAR with a total of 294, 168, and 101 individuals recorded, or 17%, 10%, and 6% of all sightings (excluding caribou), for each species, respectively.

A total of 572 individuals from 15 identified species and 7 unidentified species groups were observed during surveys at Mine infrastructure other than the AWAR in 2020. Snow goose and Canada goose were the most frequently observed species with 144 and 146 individuals recorded, respectively (each 25% of all sightings). One barren-ground caribou was observed along the road to D7 on 28 July 2020. No other species at risk were observed during surveys of Mine infrastructure in 2020. A total of 38 sightings/tracks (7% of all sightings) of Arctic fox (*Vulpes lagopus*) were recorded at Mine infrastructure. The highest number of sightings were recorded at the main camp kitchen (5 individuals), in exploration areas (5 individuals), at the landfill (4 individuals), and at the land farms (3 individuals).

9.2 Den Sites

Prior to construction of Project infrastructure, surveys are required to locate dens of denning carnivores in accordance with NIRB Project Certificate 006. Den surveys were completed on 4 and 8 June 2020 to locate dens of Arctic fox, grey wolf, polar bear, grizzly bear (*Ursus arctos*), American marten (*Martes americana*), and wolverine (*Gulo gulo*) (Appendix C). Areas were searched on foot by qualified Environmental Technicians.

No carnivore dens were observed in 2020.

9.3 Bird Nests

Two incidental bird nests were observed in the Project footprint during the nesting season in 2020 (Table 9-2).

Table 9-2: Incidental Bird Nests and Approximate Location, 2020.

Date Nest First Observed	Bird Species	Location	Approximate GPS Coordinates (NAD 83; Zone 15V)		Notes
			Northing	Easting	
8 May 2020	Common raven	SP4	539923	6988387	Nest is on the cliff of SP4
16 June 2020	Sandhill crane	Front of TSF	538899	6989876	

GPS = global positioning system

9.4 Incidents and Mortalities

Mortalities can occur as wildlife interact with the Project site or become habituated to mining activities resulting from efforts to locate food or shelter (DDMI 1998). Diligent waste management, employee and environmental awareness, and immediate reporting of wildlife sightings in and around Project infrastructure can limit the mortality of wildlife.

9.4.1 Methods

Project-related incidents and mortalities are reported to the Environment Department for documentation in a detailed incident investigation for immediate follow-up. All incidental wildlife mortalities are reported immediately to the GN DoE, and the GN DoE is consulted for follow-up mitigation and disposal procedures. In addition, the KivIA will also immediately be notified of wildlife mortalities and the events and circumstances around that mortality. If wildlife had to be deterred to reduce the risk of a wildlife-human incident, then all efforts are made by the environmental technicians to start with the least intrusive method available, and all deterrent actions are recorded.

9.4.2 Results

A total of 11 wildlife mortalities from 8 species were reported at the Project from 1 January 1 to 31 December 2020; 6 of these mortalities were suspected or confirmed to be caused as a direct result of Project activities.

Table 9-3: Wildlife Mortalities Reported in 2020

Date	Species	Number	Location	Comments
7 February 2020	Arctic hare	1	road near RO plant	Project-related; likely struck by vehicle
3 June 2020	Snow goose	1	beside CP3 road	suspected predation by American marten or Arctic fox
9 June 2020	Canada goose	1	beside CP3 road	suspected predation by American marten or Arctic fox
10 June 2020	Snow goose	1	beside CP3 road	suspected predation by American marten or Arctic fox
10 June 2020	Arctic ground squirrel	1	mine site	Project-related; struck by vehicle
11 July 2020	Caribou	2	km 25 quarry	cause of death unknown; possible hunting mortalities
25 August 2020	American robin	1	maintenance shop	Project-related; hit ceiling fan in maintenance shop
20 September 2020	Ptarmigan species	1	road to A8	Project-related; likely struck by vehicle
28 September 2020	northern pintail	1	exploration camp	Project-related; believed to be hit by a piece of equipment.
23 December 2020	Arctic hare	1	haul road near paste plant	Project-related; likely struck by haul truck

One Project-related waterbird mortality was recorded in 2020. A northern pintail (*Anas acuta*) carcass was discovered on the road near Exploration camp and was believed to be hit by a piece of equipment. Following approval from the GN DoE the duck was disposed of in the incinerator.

Following initial guidance from the GN DoE in response to incidents and observations of Arctic foxes in and around the Mine in 2017, the GN DoE has occasionally directed Agnico Eagle to deploy traps to remove animals. No trapping of Arctic fox was completed in 2020.

9.5 Accuracy of Impact Predictions

A summary of the impact predictions proposed in the TEMMP (Agnico Eagle 2020a) is provided in Table 2-1. Through systematically recording the presence of all wildlife within and around the Project footprint, Environmental staff will remain appraised of current and emerging issues and will be able to manage issues as they arise. To use a common example, surveillance monitoring may detect that wildlife has gained access and is taking shelter beneath a building.

The thresholds presented in Table 9-4 have been employed for the Mine to date for consideration of any adaptive management for the TEMMP (Agnico Eagle 2020a). Refinement of these thresholds may be considered, in collaboration with the GN, as appropriate, as more data is collected and analysed over time.

Table 9-4: Accuracy of Impact Predictions – Wildlife Incidents 2020

Monitoring Indicator	Preliminary Threshold	Exceeded in 2020?	Adaptive Management	Monitoring Method	TEMMP Section
Vehicle Collisions	No more than 1 ungulate/year	No	No action required	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	9.4.2
Project Related Mortality[(b)]	No more than 1 ungulate/year	No	No action required	Wildlife Sightings Log, Site Surveillance Monitoring	9.4.2
Project Related Mortality[(a)]	No more than 1 Arctic fox/year	No	On-going waste management and, regular toolbox meetings reiterating that any disrespect of wildlife or of Meliadine's wildlife policy is unacceptable and against company rules	Wildlife Sightings Log, Site Surveillance Monitoring, with particular emphasis around waste management areas	9.4.2
Project Related Mortality[(a)]	No more than 1 raptor/year	No	Not currently identified	Wildlife Sightings Log, Site Surveillance Monitoring	9.4.2
Project Related Mortality[(a)]	No more than 1 waterbird/year	No	On-going and regular toolbox meetings on awareness of blind-spots, particularly for large vehicles and equipment	Wildlife Sightings Log, Site Surveillance Monitoring	9.4.2

Notes:
TEMMP = Terrestrial Environment Management and Monitoring Plan
(a) Project related Mortality = A death that can be directly linked to the mine or mining activity.

9.6 Recommendations

Wildlife continues to interact with the Project but Project-related wildlife mortalities in 2020 were low. Mitigations to limit wildlife mortalities appear to be effective. Wildlife observation monitoring should continue and no changes to monitoring are recommended.

10.0 WILDLIFE DETERRENTS

Wildlife deterrents were implemented at eight locations at management ponds SP4, CP6, and H8 to deter birds from nesting at these ponds; propane cannons were placed at six locations and fake owls were placed at two locations. Additional deterrent measures were implemented on 22 July 2020 to deter a polar bear from a drill rig (B7) and on 11 November 2020 to deter an Arctic fox from Dome 2. Bear bangers and a helicopter were used to deter the bear, while a truck horn was used to deter the fox.

11.0 MUSKOXEN

Agnico Eagle has provided the GN DoE with in-kind contributions and support for previous muskoxen surveys and will continue to do so when requested. No surveys were completed by the GN DoE in 2020, consequently no in-kind contributions were requested.

12.0 BARREN-GROUND CARIBOU

Barren-ground caribou (including the Lorillard and Qamanirjuaq herds) currently have a federal status of 'Threatened' (COSEWIC 2020) but are not currently listed under the *Species at Risk Act* (Government of Canada 2020). Barren-ground caribou are considered 'Apparently Secure' in Nunavut (CESCC 2016). Annual home ranges mapped by GN DoE show that the Project is within the annual home range of the Qamanirjuaq (pronounced "Kaminuriak") caribou herd (Campbell et al. 2012, 2014). The Lorillard caribou are migratory (Campbell et al. 2014) and generally distributed north of Chesterfield Inlet, based on telemetry data collected by the GN DoE and the location of their historical calving grounds (Campbell et al. 2012). The likelihood of animals from the Lorillard herd occurring in the RSA for the Mine, as defined in the FEIS (Golder 2014a), is very low. Baseline survey data documenting the distribution of barren-ground caribou during early winter, spring migration and calving, and post-calving through fall migration and rut periods suggest that the RSA is within the seasonal range of the Qamanirjuaq barren-ground caribou herd (Jalkotzy 1999, 2000a, 2000b). The annual range of the Qamanirjuaq herd occupies an area from northern Manitoba and Saskatchewan in the south, to southwestern NU and southeastern NT (BQCMB 1999; Campbell et al. 2012). Barren-ground caribou are migratory, and movements and range use varies annually (Wakelyn 1999). The annual distribution and life history of this population has been previously documented (Banfield 1954; Kelsall 1968; Thomas 1969; Parker 1972; Heard 1986). The Qamanirjuaq herd calves approximately 57 km to the west-northwest of the Mine and after calving the herd aggregates into a post-calving movement, generally moving east towards the coast and then back to the west and southwest of the Mine where their summer movement and distribution patterns commence. During the post-calving movements to the coast, thousands of caribou can come through the Meliadine Mine site and reside within and around the Project area for approximately 5 to 10 days during late June to mid-July (Nuqsana Golder 2020). For additional discussion on the Qamanirjuaq herd please refer to the FEIS (Golder 2014a). A request for access to caribou collar data for this report was submitted to the GN DoE on October 27, 2020. Collar data were not provided to Agnico Eagle at the time this report was completed.

12.1 Caribou Behaviour Monitoring

The TEMMP indicates that once 50 caribou are observed within 5 km of the Project footprint boundary (visual detection or based on collar data provided by the GN), a stop work procedure commences on site. Monitoring caribou behaviour in proximity to the mine is integral to understanding how caribou interact with the Project infrastructure including roads (i.e., crossing, deflection, walking parallel) and other Project infrastructure. Documenting behaviour through activity budgets may better inform appropriate adaptive management and distance triggers and thresholds in the future. Over time, a long-term dataset will be used to evaluate obvious response or lack of obvious response of caribou to mining based on behaviour.

Activity budgets (i.e., time spent feeding, resting, walking, running) of caribou exposed to disturbances from the Mine and AWAR will be used to provide inputs for assessing the impact to the energy balance of caribou (see Section 4.5.2 of the TEMMP, Agnico Eagle 2020a, for additional discussion). The immediate effect of specific stressors (e.g., aircraft, vehicles, other wildlife) on caribou behaviour will also provide general insight into the relative effect of natural, Project-related, and community-related (i.e., ATV traffic and harvesting) road stressors on caribou behaviour. Consequently, opportunistic surveys should be completed when appropriate to do so during the caribou post-calving migration, without causing additional stress to caribou (based on surveyor opinion).

The objectives of the caribou behaviour monitoring program are to:

- determine the effect of the Project AWAR on caribou activity budgets
- determine the effect of other mining activities (e.g., blasting) or community-related activities (e.g., human presence, harvest pressure) that may elicit a response in caribou
- determine which stressors associated with the Project have the greatest influence on caribou behaviour, and the variation in caribou behaviour from these stressors

12.1.1 Methods

Ground-based behavioural observations, or scan sampling, are conducted to provide data on changes in caribou behaviour as a function of distance from the Project. Two different, but complementary approaches have been used to record the activity budget of caribou around the Project and AWAR. See the TEMMP (Agnico Eagle 2020a) for additional details on the behaviour scan method. In 2020, an external caribou behaviour expert (ERM) was brought on site from 25 June – 28 July 2020 to provide training for the Meliadine Mine Environmental Technicians. Training included:

- Providing a Standard Operation Procedures for behaviour monitoring.
- A training slide show with examples of each behaviour type.
- A recorded version of the slide show for those technicians who could not attend.
- Example filled-in datasheets.
- A practical test of identifying caribou behaviours in a PowerPoint presentation.
- Practical in-field training.

A particular focus was applied to conducting behaviour surveys along the AWAR and at the Mine site. In total, 56 behaviour monitoring sessions were completed, approximately half led by the consultant technician and half by the Agnico Eagle environmental technicians. Because of the update to the caribou behaviour monitoring protocols, 2020 represents a baseline survey to establish behavioural responses by caribou to the Mine site and AWAR.

Generalized linear models (GLMs) were developed to statistically test for differences in the behavioural responses of surveyed animals to various sources of disturbance. One analysis focused on the average proportion of response behaviours in each thirty-minute survey period using a binomial distribution. A second analysis focused on tracking the number of minutes it took caribou to return to background behaviour levels following a disturbance, and was modelled using a normal distribution.

12.1.2 Results

The following provides a summary of caribou behaviour monitoring completed during 2020. Further details are provided in Appendix D. Field surveys were conducted as the Qamanirjuaq herd was observed approaching the Project to trigger the decision to begin behaviour surveys. Behavioural surveys were conducted as caribou were observed passing near the Project from 1 to 17 July 2020, and numbers peaked from 4 to 9 July.

Fifty-six behaviour surveys were conducted between 1 to 17 July, short of the 2020 objective of 100 surveys. There were several days when all caribou in the Project area were congregated into a single large group, and were only within visible range of the Project for two weeks, imposing a logistical constraint on achieving the desired sample size.

Of the 56 surveys completed, sample size was evenly distributed across group sizes (Table 12-1). Over half of all surveys incidentally involved at least one disturbance (e.g., ATV traffic).

Table 12-1: Meliadine Caribou Behaviour Surveys Data Summary, 2020.

Caribou Group Size	Total Number of Surveys	Surveys with Disturbances	Surveys with Observed Road Crossings
1-2	5	4	2
3-25	11	2	2
26-50	9	3	0
51-500	14	11	1
501-1000	6	3	1
>1000	11	6	0
Total	**56**	**29**	**6**

Small groups were observed equally across all distances from the AWAR; larger groups tended to be observed further from the AWAR and no groups over 50 individuals were recorded within 100 m of the AWAR. These results may be indicative of road avoidance by large caribou groups or an unmeasured natural factor (e.g., habitat) that is associated with further distances. However, because the road is closed during caribou migration and there is minimal mine-related sensory disturbance associated with the road, there may be other explanations for the observed distribution of caribou around the AWAR. One possible alternate explanation is the distribution of forage around the AWAR, which may also be influencing caribou distribution. Also, it has been discussed in past meetings that if caribou view the AWAR as a threat, they may herd up once they encounter the road. The fact that there are individuals, and not large groups, near the road would suggest that the road is not seen as a threat as herding is a predator swamping behaviour. Additionally, there are two major caribou crossings of the AWAR (Figure 12) and behavioural surveys were not completed at the southern road crossing (Appendix D) due to logistics associated with closure of the AWAR; surveys at the northern crossing were only completed on four days (Appendix D). As such, caribou observed during the surveys may be further from the road because they are not planning on crossing the road at the survey location.

Observed behaviours were feeding, laying, standing, walking, alert, and trotting. The average proportion of alert and trotting behaviours increased as group size decreased, indicating caribou are more wary in smaller groups. Groups closer to the road also showed a higher proportion of alert and trotting behaviours; however, this is confounded by the lack of observations of large groups near the AWAR.

The average number of alert and trotting behaviours in a survey was slightly higher in surveys in which at least one disturbance occurred. The proportion of responses behaviours in each three-minute interval was plotted to qualitatively assess temporal responses to disturbances. Following a disturbance event, the proportion of alert and running behaviours spiked, but typically returned to pre-disturbance levels within six minutes. Caribou at greater distance from infrastructure (>300 m) showed a lower proportion of disturbed behaviours and returned to pre-disturbance behaviour more quickly than caribou groups closer to infrastructure. Statistical analyses supported these results as the duration of response (i.e., alert or running) behaviour was higher when caribou were closer to the AWAR ($P<0.01$) and the proportion of response behaviour was nearly significantly higher when caribou were closer to the AWAR ($P=0.07$). Improved sample size, as well as the inclusion of hunter harvest pressure, will be required to tease apart zone of influence (ZOI) effects of the AWAR on caribou in the LSA. Further explanation of statistical analyses and results are contained in Appendix D.

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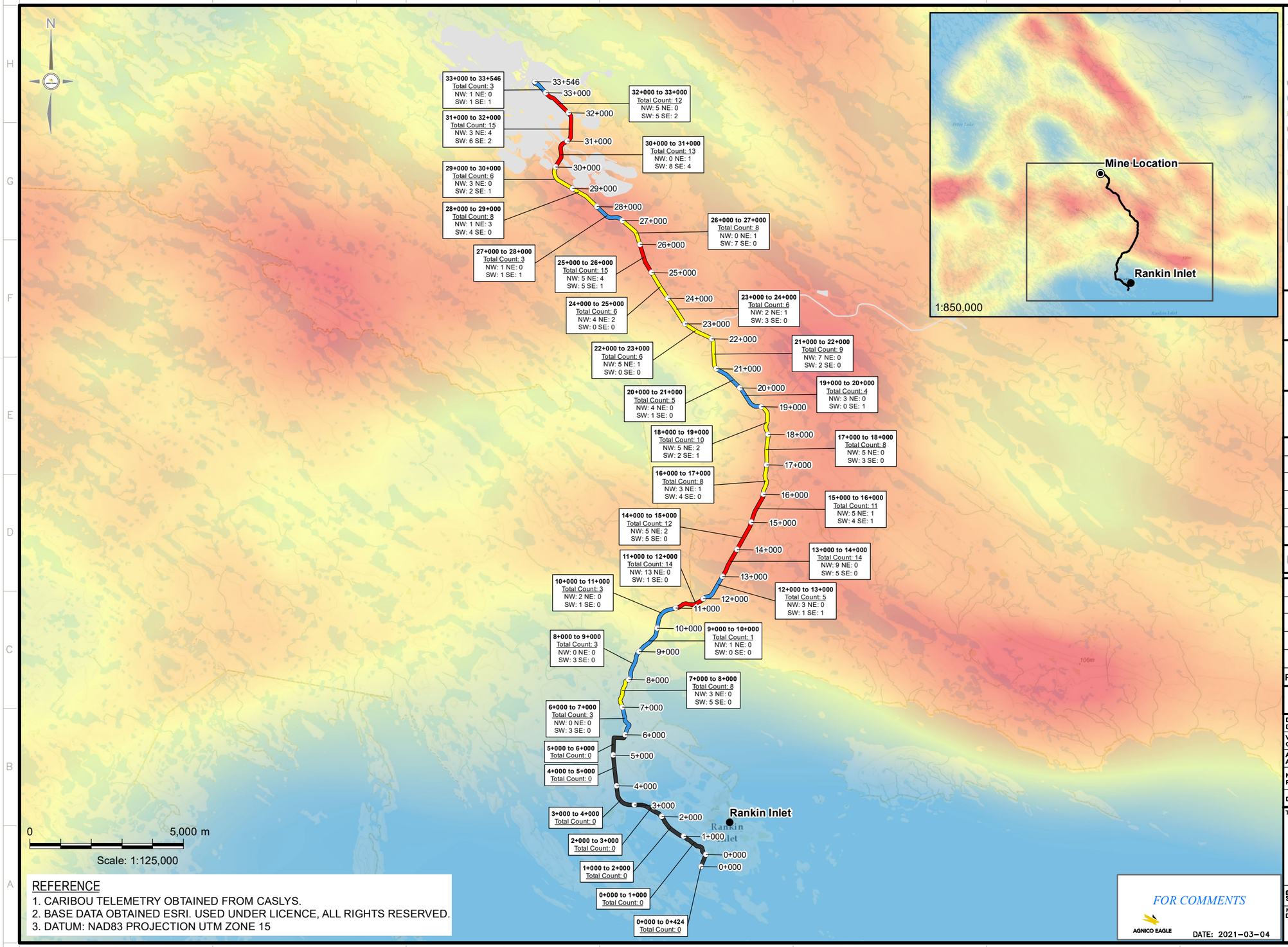

LEGEND

- POPULATED PLACE
- KILOMETRE MARKER

CARIBOU CROSSING COUNT PER ROUTE SEGMENT

- 0
- 1 - 5
- 6 - 10
- 11 - 15
- MINE FOOTPRINT

CARIBOU WALKLINE DENSITY (m / km²)

High: 25.8

Low: 0.0

PATH TRAVEL DIRECTION PER ROUTE SEGMENT

0+000 to 1+000 — ROUTE SEGMENT
Total Count: # — TOTAL CARIBOU CROSSING COUNT
NW: ## NE: ## / SW: ## SE: ## — PATH TRAVEL DIRECTION COUNT

REFERENCE

1. CARIBOU TELEMETRY OBTAINED FROM CASLYS.
2. BASE DATA OBTAINED ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. DATUM: NAD83 PROJECTION UTM ZONE 15

AGNICO EAGLE

GOLDER

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REVISIONS

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VÉRIFIÉ PAR / CHECKED BY	–	–
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No. PROJET / PROJECT NO.	20351262	
DATE	2021–03–04	

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION

FIGURE 12
CARIBOU–AWAR INTERACTIONS

FOR COMMENTS

AGNICO EAGLE DATE: 2021–03–04

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12.2 Collared Caribou Inventory

Analysis of Qamanirjuaq collared caribou from 1993 to 2019 indicate presence in the RSA (including baseline) in 13 of 27 years and alternate between periods of presence and absence through time (Nuqsana Golder 2020a). Alternating periods of presence and absence of caribou in the RSA has been noted by IQ (Golder 2014a). Collared caribou have typically entered the RSA in mid- to late- April. Annual exits from the RSA have been more variable ranging from late April to October. Evidence from collared caribou support that a portion of the Qamanirjuaq herd may pass through the RSA in summer but on occasion may in some years linger from late October through March (Hubert and Associates 2007; Nuqsana Golder 2020). When present, collared caribou spend about one to three weeks in the RSA and over all years are present for an average of 6 days.

For the LSA (Golder 2014a), Qamanirjuaq collared caribou have been present in 10 of 27 years (Nuqsana Golder 2020). Collared caribou from this herd typically enter the LSA in early to mid-July and leave within a couple of days. Over all years, collared caribou spend less than half a day inside the LSA. A data sharing agreement for access to 2020 Qamanirjuaq collared caribou was submitted to the GN on October 27, 2020. Access to 2020 Qamanirjuaq collared caribou data was not provided by the GN in time for inclusion in this report.

In consideration of these results, impacts to the Qamanirjuaq herd due to the Project have the potential for limited transboundary effects. The collar data also support that caribou are spending very little time in the areas immediately adjacent to the Project.

In response to a request by Sayisi Dene First Nation as part of the waterline addendum, a simple analysis of 2014 to 2019 Qamanirjuaq collared caribou movement paths was completed to determine the frequency of AWAR crossings (Appendix E). The results indicate the 93% of movements within the LSA crossed the AWAR, other roads and Mine infrastructure. Three animals that were deemed to have deflected from the AWAR but crossed other roads or the AWAR the following year. The results indicate no strong local scale deflection effects although more regional effects have not been assessed.

12.3 Caribou Advisory

The objective of the Caribou Advisory Monitoring program is ensuring workers are aware of the approximate numbers of caribou on and in close proximity to the Project, which is related to the potential for interactions between caribou and mining activities. The Caribou Advisory raises general awareness so that employees are alert to the likelihood that mitigation could be triggered, and what mitigation entails. The number of animals near the Project and in specific areas dictates the type of mitigation practices that will be undertaken (e.g., haul road closure, closing specific areas at the Mine site, speed reduction).

12.3.1 Methods

Agnico Eagle, in collaboration with the GN and KivIA and including participation of the KHTO, undertake the implementation of a caribou monitoring and work suspension protocol during caribou migration to minimize sensory disturbance at the Project site and along the AWAR. KHTO and KivIA members typically assist Agnico Eagle staff conducting surveys during caribou migration. In 2020, due to concerns around the COVID-19 pandemic, adaptative measures were taken to ensure contacts between the community members and Agnico Eagle employees were avoided. In accordance with the Detached Operation Protocol, KHTO led the convoys when travel was required on the AWAR (equipment transportation or employee buses) during the caribou migration. Communication protocols built into the work suspensions are designed to be broadcast swiftly and broadly among all departments in real time. The environmental department monitored caribou presence as per the caribou migration protocol (TEMMP Appendix III; Agnico Eagle 2020a) including the use of collar data and regular surveys, and issued caribou advisories. Regular surveys for caribou, were completed by on site

environmental technicians, and consisted of ground surveys at multiple locations, at regular intervals throughout the day (i.e., 06:00, 12:00, 18:00) during caribou migration. The results of the surveys were communicated to all Project Departments, including the KivIA and KHTO, indicating if any work stoppages or restrictions are required and the affected work areas.

A decision tree is used to guide adaptive monitoring and mitigation based on results of surveys. Three action levels are outlined in the decision tree:

- Level 1: triggered when 50 or more caribou are observed within 10km of Meliadine. Ground surveys are completed every two days, and satellite collar data is reviewed twice per week. Site-wide warnings are issued daily. Level 1 is ongoing for 5 days, or until Level 2 is triggered.
- Level 2: triggered when less than 50 caribou are observed within 5km of Meliadine. Ground surveys are completed every two days, and satellite collar data is reviewed twice per week. Additional mitigation (e.g., work suspension), may be implemented by the Environmental supervisor. Site-wide warnings are issued daily. Level 2 is ongoing for 10 days; or until caribou exit the 5 km mark or Level 3 is triggered.
- Level 3: triggered when 50 or more caribou are observed within 5km of Meliadine. Ground surveys are completed three times per day, and satellite collar data is reviewed at least twice per week. A work suspension protocol is implemented. Site-wide warnings are issued three times per day. Level 3 is ongoing until caribou exit the 5km mark.

12.3.2 Results

Large numbers of the Qamanirjuaq caribou herd migrated through the Mine and AWAR between 5 and 22 July 2020. At the Mine there was a total of 143 hours of work stoppage mitigation over the course of eight days during migration (Table 12-2) and the AWAR was closed for a total of 165 hours over ten days during this period (Table 12-3).

Table 12-2: Caribou Advisories Meliadine – Mine Site 2020

Date	Hours	Mitigation	Mitigation Trigger
3 July	8	Level 3 Shutdown	Large group of caribou was observed moving south along the western shore of Meliadine Lake. Another group was observed east of Meliadine Lake. Entered Level 3 Shutdown at 1800h update.
4 July	24	Full closure	Several groups of caribou observed within 5 km of Mine.
5 July	24	Full closure	Several dozen caribou observed near Exploration camp. Large group was observed south of Meliadine which had begun crossing the road.
6 July	24	Full closure	Several large groups of caribou observed in the vicinity of the west exhaust and west of the TSF.
7 July	15	Partial closure	Day began in Level 3 shutdown. The afternoon caribou survey showed caribou had moved outside the 5 km protection zone, entered Level 2 Alert at 1417h.
8 July	0	Open	No caribou were seen within 5 km of Project during all surveys.
9 July	10	Partial closure	10 caribou seen near Exploration camp during morning survey, entered Level 2 Alert. Evening survey showed two groups of caribou within 5 km of site, Level 3 Shutdown was implemented.
10 July	16	Partial closure	Level 3 Shutdown in effect due to 220 caribou west of CP1 observed during morning survey. Evening survey found no caribou within 5 km, entered Level 2 Alert.
11 July	0	Open	Caribou remain outside 5 km protection zone, Level 2 Alert all day.

Table 12-2: Caribou Advisories Meliadine – Mine Site 2020

Date	Hours	Mitigation	Mitigation Trigger
12 July	0	Open	Caribou herds outside 5 km zone, Level 2 Alert all day.
13 July	8	Partial closure	Small herd was observed north of site in morning. Large herd observed approaching Exploration camp from the south in the afternoon, entered Level 3 Alert.
14 July	14	Partial closure	Several small herds observed passing to the south of Exploration camp. The herd moved outside 5 km radius in afternoon updated, entered Level 2 Alert.
15 July	0	Open	Small herds (less than 50 individuals) observed within 5 km radius, remained in Level 2 Alert.
16 July	0	Open	No caribou observed within 5 km radius.

Table 12-3: Caribou Advisories Meliadine – AWAR 2020

Date	Hours	Mitigation	Monitoring Trigger
3 July	0	None	N/A
4 July	18	Partial closure	Several groups of caribou observed within 5 km of Mine.
5 July	24	Full closure	Large group of caribou observed crossing the road.
6 July	24	Full closure	Large group observed crossing the AWAR near KM 25.
7 July	15	Partial closure	Day began in level 3 shutdown. Afternoon caribou survey showed caribou had moved outside the 5 km protection zone. Moved into Level 2 Alert at 1417h, AWAR opened to regular traffic.
8 July	0	Open	No caribou seen within 5 km of AWAR during all surveys.
9 July	10	Partial closure	AWAR open in morning. During midday surveys, a group of 500-1000 caribou on AWAR at KM 25 triggered closure.
10 July	16	Partial closure	AWAR reopened to regular traffic at 1721h. Caribou moved outside 5 km protection zone.
11 July	0	Open	No caribou sighted along AWAR, open to regular traffic.
12 July	7	Partial closure	Open to regular traffic. Road users to proceed with caution as a large herd was seen crossing at KM 24. Evening update that a large herd was 4 km east of KM 14 to KM 19, with thousands anticipated to cross the road overnight. Level 3 Alert entered.
13 July	24	Full closure	Large herd observed moving west toward territorial park. Road closed in the morning and remained closed all day.
14 July	24	Full closure	Road remained closed due to herd within 5 km.
15 July	19	Partial closure	Road remained closed due to herd within 5 km. Level 2 Alert entered at 1900h, due to observations of 1,000 caribou 500m from AWAR at KM 19, and 2,000 caribou 1 km from AWAR at KM 13.
16 July	0	Open	Open with speed reduction to 20 km/h when caribou were within 100 m of the road.

12.3.3 Traffic Data

A total of 17,422 one-way trips along the AWAR were recorded in 2020 (Table 12-4).

Table 12-4: Total AWAR Traffic, 2020.

Vehicle Type	Total One-way Trips
Ambulance	8
ATV	6
Backhoe	10
Boom Truck	43
B-Train	102
Bus	1,787
Crane	2
Flat bed	4
Fuel Tanker	2,087
Fuel Truck	161
GN - Pickup	11
Grader	404
Haul Truck	252
Hino	918
Hyster	1
KHTO - ATV	1
KHTO - Pickup	56
KIA - Pickup	21
Loader	105
Pick up	4,183
Rock Truck	72
Roll Off	80
Sand truck	10
Service Truck	59
Sewage Truck	125
Snowblower	126
Tractor-trailer	4,897
Van	52
Water Tanker	1,682
Water Truck	152
Wide load Tractor	1
Zoom Boom	4
TOTAL	**17,422**

12.4 Accuracy of Impact Predictions

A summary of the impact predictions proposed in the TEMMP (Agnico Eagle 2020a) is provided in Table 12-5. Though not fully developed, the following thresholds are suggested as a starting point for adaptive management and TEMMP (Agnico Eagle 2020a) refinement and is tested against the results of the 2020 observational data (Table 12-5).

Table 12-5: Accuracy of Impact Predictions - Caribou

Monitoring Indicator	Preliminary Threshold	Exceeded in 2020?	Adaptive Management	Monitoring Method	TEMMP Section
Habitat Loss and Degradation	No greater than 2,950 ha of terrestrial habitat loss	Not assessed in 2020	Not Currently Identified	Aerial photographs, satellite imagery, ground surveys, GIS analysis	NA
Sensory Disturbance	<10% caribou deflections from AWAR	Not assessed in 2020	Not Currently Identified	Caribou Behaviour Monitoring	12.5
Vehicle Collisions	No more than 1 ungulate/year	No	No action required	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	9.4
Hunting by Rankin Inlet Residents	After 3 years of data collection in collaboration with GN, establish a threshold level	Not assessed in 2020	Not Currently Identified	Hunter Harvest Survey, data collected throughout the year and reported annually	13.0
Other Project Related Mortality	No more than 1 ungulate/year	No	No action required	Wildlife Sightings Log, Site Surveillance Monitoring	9.4
Exposure to Contaminated Water or Vegetation	SLRA – TBD	NA	Not Currently Identified	Vegetation and soil samples	NA

Notes: AWAR = All-Weather Access Road; GN = Government of Nunavut Department of Environment; TEMMP = Terrestrial Environment Management and Monitoring Plan; NA = not applicable; <= less than; TBD = to be determined

12.5 Recommendations

To quantify the threshold impact prediction of <10% caribou deflections from AWAR, the number of times a caribou group was deflected from the AWAR should be explicitly quantified as part of the caribou behaviour surveys. For each 30-minute survey period, the observer should specify whether the group was deflected from the AWAR or not. If a caribou group is deflected from the AWAR, the distance from the AWAR should also be recorded in addition to details associated with AWAR disturbance that may have led to the deflection. These data will help support both assessing the effectiveness of mitigation in meeting this threshold as well as any contributing factors that could be mitigated in the future should it be exceeded.

13.0 HUNTER HARVEST SURVEY

Agnico Eagle signed a Memorandum of Understanding (MOU), in principle, with the KHTO in March 2019 for the development and execution of a Hunter Harvest Survey (HHS). This MOU was renewed in June 2020. The HHS supports Project Certificate No.006 Term and Condition 46 and 48.

Agnico Eagle developed a calendar for the HHS with a focus on data collection by the KHTO from hunters and outfitters in the local community. The hunter harvest calendar was distributed to the KHTO to provide harvesters in the study area. Agnico Eagle engaged with the KHTO throughout 2020 to encourage regular participation in the HHS program.

13.1 Methods

Participants in the HHS are provided a calendar to record the location, species and numbers of animals harvested throughout the year.

13.2 Results

Four community members contributed to the HHS in 2020 for the KHTO. Harvest records were submitted from 4 January to 21 December 2020, with one datasheet omitting a date. A total of 24 reports were submitted. In total, 62 individual caribou were reported harvested in 2020. The majority of harvested caribou were cows with 40 individuals reported harvested (65%), 18 were bulls (29%), and 4 were non-adults (7%). A list of all harvest records is provided in Table 13-1

Table 13-1: Hunter Harvest Survey Records from 2020

Date	Map Grid	Number Harvested				Comments
		Total	Bulls	Cows	Non-Adults	
04-Jan	-	10		10		Supply + meat for family in Iqaluit
15-Feb	Barbour Bay Area	5	2	3		5 healthy caribou
23-Mar	-	1	1			Healthy
28-Mar	M. Lake	2		1	1	Healthy caribou
11-Apr	Twin Lake	2		2		Healthy female with no calves
22-Apr	N/A		-			All were healthy bulls.
25-Apr	Peter Lake B2	2		2		Healthy female with no calves
09-May	B2	4	1	3		Healthy caribou
16-May	C2	4		4		4 females no calves
10-Jun	A1/B1	5	5			Caribou meat was distributed within the family
13-Jul	D4	2	2			2 healthy bulls
19-Jul		1	1			Healthy
20-Jul	D4	1	1			Large healthy
23-Jul	A3	1			1	Young bull healthy
15-Aug	E6	1			1	Young and healthy
17-Aug		3	3			Harvested for family who lives in Iqaluit
22-Aug	E6	1		1		Large and healthy
31-Aug	G5	1		1		Healthy adult female with no calf
14-Sep	D2	1	1			Healthy young bull

Table 13-1: Hunter Harvest Survey Records from 2020

Date	Map Grid	Number Harvested				Comments
		Total	Bulls	Cows	Non-Adults	
02-Oct	F2	2		2		Healthy females, no calves
23-Oct	G4	3	1	2		3 healthy caribou, 1 young bull and 2 female with no calves
26-Oct	D8	1		1		Healthy, no calf
21-Dec		8		8		Meat supply end stock for drying in spring (healthy)
Unknown	-	1			1	Healthy young bull
Totals		**62**	**18**	**40**	**4**	

13.3 Recommendations

Agnico Eagle is committed to supporting participation by the community members and KHTO in the HHS. Following repeated discussions with KHTO throughout 2020 it was decided that additional assistance could be made available to improve community participation in the program, and an external consultant was hired to dedicate resources to assist with the KHTO and to facilitate positive outcomes of the HHS for the 2021.

14.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Your Truly,

Golder Associates Ltd.

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APPENDIX A

Non-Native & Invasive Species in Nunavut

Non-Native & Invasive species
In Nunavut

In 2010 the Canadian Endangered Species Conservation Council (CESCC) identified 17 species not normally found in Nunavut.

These are called "non-native species". Some of these plants and animals can become an "invasive species", which represents a potential major concern for the future health of the Arctic.

What is a non-native species?

A non-native species is defined as an organism that is not normally found in a region. They are introduced by human activities, which can be intentional (e.g. species introduced to control a pest species), accidental (e.g. shipping and ballast water exchange), or environmental (e.g. changes in climate leading to wildlife movements). An example of a non-native species in Nunavut is the European Starling *(Sturnus vulgaris)*, which was introduced to North America from Europe intentionally by humans.

What is an invasive species?

Not all non-native species are considered invasive. This term is reserved for species that do so well in their new habitat that they end up causing harm to the environment, other species, human health, or economic activity (ISAC, 2006). An example of an invasive species in southern Canada is the Zebra Mussel *(Dreissena polymorpha)*, which was introduced to North America by ships releasing their ballast water. The Zebra mussel reproduces quickly and establishes large colonies on any hard surface. In this way they take over habitat occupied by native species, reducing the availability of food for other species, and also attaching themselves in great numbers to boats and other infrastructure in the water. (Benson and Raikow, 2010).

Why should you be concerned about invasive species?

When invasive species are introduced and survive, their populations can increase rapidly because there are no natural predators. Invasive species may feed on native species, compete for food and space, as well as expose native species to new parasites and disease. Invasive species are now widely recognized as a leading cause of endangerment and/or extinction of native species (Lassuy and Lewis, 2010).

* *There are currently no known species in Nunavut that can be classified as aquatic or terrestrial invasive species.*


Scott 2011

Species: Field Sow Thistle *(Sonchus arvensis)*

Impact: The Field Sow Thistle grows quickly, easily and when there are many of them they can reduce the water resources available to other plants. They have the potential to decrease native plant diversity by competing for space and water.

Introduction pathway: Accidently introduced from Europe into North America in a containment of agricultural crop seed. This plant has been able to spread long distances across Canada because the seeds can travel far in the wind.


Sohl 2005

Species: The European Starling *(Sturnus vulgaris)*

Impact: The European Starling can displace native bird species by taking over nesting sites and competing for food.

Introduction pathway: Introduced intentionally to North America from Europe. These birds then dispersed naturally into Canada through migration.

How might invasive species get into Nunavut?

Species are transported throughout the world by human activities, like shipping, which allows species to move further distances and over barriers that they could not do on their own. Nunavut remains very remote compared to the rest of Canada and so the lack of major road systems, infrequent shipping and cold climate has limited their introduction and survival.

However, as climate change alters Arctic ecosystems, it creates conditions that are more favorable to the survival and reproduction of non-native species. It also enables greater human activity and development, which gives potential invasive species more opportunities to establish themselves. (Lassuy and Lewis, 2010).

Pathways of introduction for invasive species into Nunavut


MacGregor, 2009

Hull fouling occurs when organisms attach themselves to the outside of a ship's hull where they can then be transported around the world.

* Ballast water exchange and hull fouling have the greatest potential for introducing invasive species into the aquatic ecosystems of Nunavut. Ballast water is used to stabilize ships. It is pumped aboard ships from different ports around the world and often exchanged far from the region it was obtained. This water can contain species that are not native, and may establish themselves locally.

* Seeds, insects and even small mammals can be transported around the world through the shipping of grocery produce, lumber, construction supplies, and packing materials, even dirt from someone's footwear can contain plant seeds (IASC, 2010).

* As climate continues to change in the Arctic, many terrestrial and aquatic plants and animals will move further north looking for the food and habitat they desire. These wildlife movements are not a threat when it comes to invasive species, but it is important to note that some species, (especially rare or threatened ones) may not survive the transition. Others may do well, like flying insects, which are already increasing in number in some areas of Nunavut. (IASC, 2010).

Wildlife movements are often referred to as "range extensions" where a species expands the area they can live in when the habitat and climate is favorable for them.


DeeDee 2011

The Migratory Grasshopper *(Melanoplus sanguinipes)* is a winged insect that is widely distributed across Canada and is one example of a species that may expand its range into Nunavut.

Non-Native Species in Nunavut

As of 2011, there are 17 species known to be non-native in Nunavut, these are listed below and are all terrestrial species. Please note that it is not currently known what the potential is for any of these species to become invasive and to what extent. Two species, the starling and the sow thistle are described in more detail below.

SCIENTIFIC NAME	COMMON NAME	Photo credit	ORGANISM TYPE
Carum carvi	Wild Caraway	Sloth, 2003	Flowering Plant
Taraxacum officinale	Common Dandelion	Herbs for Life, 2010	Flowering Plant
Sonchus arvensis	Field Sow Thistle	Scott, 2011	Flowering Plant
Leucanthemum vulgare	Oxeye Daisy	Steyermark, 2007	Flowering Plant
Thlaspi arvense	Field Pennycress	Steyermark, 2007	Flowering Plant
Capsella bursa-pastoris	Shepherd's Purse	Living Afield, 2011	Flowering Plant
Barbarea vulgaris	Yellow Rocket	Michels, 2009	Flowering Plant
Amaranthus retroflexus	Green Amaranth	Shou, 2003	Flowering Plant
Hordeum vulgare	Common Barley	Michels, 2009	Flowering Plant
Puccinellia distans	Spreading Alkali Grass	Shou, 2003	Flowering Plant
Vicia cracca	Tufted Vetch	Sloth, 2003	Flowering Plant
Papaver somniferum	Opium Poppy	Andersent, 2003	Flowering Plant
Plantago major	Common Plantain	Shou, 2003	Flowering Plant
Polygonum aviculare	Prostrate Knotweed	Shou, 2003	Flowering Plant
Pieris rapae	Cabbage White	W.A.B., 2010	Butterfly
Sturnus vulgaris	European Starling	Sohl, 2005	Passerine Bird
Passer domesticus	House Sparrow	Manske, 2009	Passerine Bird

*Species photo references available upon request. Images are not to scale.

Potential Invasive Species in Nunavut

As trade and shipping continues to increase, some aquatic invasive species known to commonly foul ship hulls and ballast waters, like the Chinese Mitten Crab, are more likely to arrive at ports around Nunavut.

A recent report commissioned by Fisheries and Oceans Canada identified a number of potential aquatic invasive species, mainly for the Hudson Bay region. The table below lists only those species considered as "High Risk" to Nunavut and they are found in freshwater & marine environments.

SCIENTIFIC NAME	COMMON NAME	Photo credit	ORGANISM TYPE
Osmerus mordax	Rainbow Smelt	NOAA.GOV	Fish
Gymnocephalus cernuus	Ruffe	Shou, 2003	Fish
Caprella mutica	Skeleton Shrimp	Christensen et. al. 1995	Crustacean
Chelicorophium curvispinum	Data unavailable	home.kpn.nl	Crustacean
Dikerogammarus villosus	Killer Shrimp	Hillewaert, 2011	Crustacean
Gmelinoides fasciatus	Data unavailable	photosight.ru	Crustacean
Pontogammarus robustoides	Data unavailable	boldsystems.org	Crustacean
Eriocheir sinensis	Chinese Mitten Crab	Sloth, 2003	Crustacean
Hemimysis anomala	Data unavailable	Pothoven, 2007	Crustacean
Balanus improvisus	Acorn Barnacle	Shou, 2003	Crustacean
Corbicula fluminea	Asian Clam	Van Arkel, 2005	Mollusc
Dreissena bugensi	Quagga Mussel	CWSD.org	Mollusc
Bythotrephes longimanus	Spiny Water Flea	Meihls, 2007	Zooplankton
Cercopagis pengo	Fishhook Water Flea	Windsor U, N.D	Zooplankton
Eubosmina maritima	Data unavailable	io-warnemuende.de	Zooplankton
Marenzelleria cf. viridis	Data unavailable	Koli, 2006	Worm
Marenzelleria cf. wireni	Data unavailable	seaonscreen.org	Worm
Cordylophora caspia	Freshwater Hydroid	Galea, 2011	Hydrozoa
Coscinodiscus wailesii	Data unavailable	A.W.I., 2006	Phytoplankton
Odontella sinensi	Data unavailable	Uniport, 2002	Phytoplankton
Prorocentrum minimum	Data unavailable	Halffors, 2002	Phytoplankton
Codium fragile ssp. tomentosoides	Oyster Thief	Erickson, N.D.	Algae
Glugea hertwigi	Data unavailable	Kirjastot.fi	Protozoa
Amphilina foliacea	Data unavailable	Michigan U, 1995	Parasite

*Species photo references available upon request. Images are not to scale.

How can you help?

Report

Have you seen a different plant, animal or insect in Nunavut?

You help identifying these species is important. Report the **location** where you observed the species (GPS Coordinates are very helpful) and provide a **detailed description** of the plant, animal, or insect. If possible **take a photo**.

Remember that not all non-native species are considered invasive. If you see an unknown plant or animal, it is very important to report it.

Do not take any extreme actions; the first step is reporting the species so that territorial and federal agencies can respond appropriately. We will report our findings back to you and information about the species you have observed.

Share

Keep yourself informed and educate others about non-native and invasive species. Let them know what to do if they see an unknown or uncommon species.

Report a species to your local Conservation Officer.

For More Information or if your CO is not available please contact:

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Nunavut

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APPENDIX B

Bird Species Detected Incidentally During Point Count Surveys

Table B1: Species Incidentally Reported During Point Count Surveys Along AWAR, 2018-2020

Common Name	Scientific Name	Total Number of Individuals Observed[(a)]		
		2018	2019	2020
cackling goose	*Branta hutchinsii*	2	5	15
Canada goose	*Branta canadensis*	34	53	2
common loon	*Gavia immer*	1		0
common raven	*Corvus corax*			0
greater white-fronted goose	*Anser albifrons*	6	8	
green-winged teal	*Anas carolinensis*		1	
herring gull	*Larus argentatus*	5	3	
least sandpiper	*Calidris minutilla*	1		2
long-tailed duck	*Clangula hyemalis*	3	5	2
northern pintail	*Anas acuta*	2	2	
northern shoveler	*Spatula clypeata*		2	
pacific loon	*Gavia pacifica*	3	4	0
peregrine falcon	*Falco peregrinus*	1		
red-breasted merganser	*Mergus serrator*	2	3	
red-throated loon	*Gavia stellata*	1	2	
Ross's goose	*Chen rossii*	2		
rough-legged hawk	*Buteo lagopus*		1	
sandhill crane	*Grus canadensis*	13	25	8
semipalmated plover	*Charadrius semipalmatus*	1	5	2
snow goose	*Chen caerulescens*	81		
tundra swan	*Cygnus columbianus*			1
willow ptarmigan	*Lagopus lagopus*	4	2	1

[(a)] Includes flyovers, non-songbirds, and incidental observations >100m from observer

APPENDIX C

All Weather Access Road and Rankin Inlet Road Bypass Den Survey Memo

AGNICO EAGLE
MELIADINE

MELIADINE DIVISION

All Weather Access Road and Rankin Inlet Road Bypass Den Survey

June 2020

NIRB Project Certificate 006

Table of Contents

Appendices

1 Background

In accordance with NIRB Project Certificate 006, Condition 53:

> *Prior to construction of Project infrastructure and Phase 2 of the all-weather access road, the Proponent shall conduct a survey that is sufficient to locate any dens of foxes, bears or wolverines that could be damaged or destroyed during construction or operation of the Project.*

In addition, the Terrestrial Environment Management and Monitoring Plan Section 2.3 has monitoring conditions related to den surveys. In 2020, den survey monitoring was completed in areas around Meliadine where disturbance was likely to occur due to construction and operations. Den survey monitoring regarding Phase 2 of the all-weather access road will be provided prior to its construction, which is currently planned for 2024.

This report summarizes den survey methodology, results and discussion of the 2020 den survey at Meliadine.

2 Den Survey Methodology

The 2020 den survey was completed on throughout the month of June at Meliadine. The purpose of the den survey was to locate carnivore dens. Carnivore abundance in these areas is relatively low and includes the following species:

- Arctic Fox
- Arctic Wolves
- Polar Bears
- Grizzly Bears
- American Marten
- Wolverine

The most abundant carnivore species occurring around the mine site is the Arctic Fox followed by the American Marten. Polar Bears are occasionally observed while Grizzly Bears, Arctic Wolves and Wolverines are rarely observed in the area. Therefore, the focus of the survey was on Arctic Fox and American Marten dens.

The priority for den surveying includes areas of suitable habitat around the perimeter of the constructed site. These areas mainly consist of esker material used for industrial pads, and locations of fox observations reported by on-site staff. The survey area is illustrated in yellow on the aerial image of the site (Figure 1) in Appendix A. Photos taken during the survey are provided in Appendix B.

Surveys are conducted by qualified Environmental Technicians with field experience and training provided by Agnico Eagle Environmental Coordinators.

Areas are searched on foot along the base of industrial pad slopes and natural slope ridges to ensure that all potential dens are located and inspected. When a den site is located it is inspected on foot to determine the status (i.e. inactive, active, pups present, etc.). Attention is paid to ensure all confirmed dens are from Arctic Foxes or Martens and not ground squirrels (i.e. sik sik).

The survey was completed as soon as feasible following the snow melt.

3 Results and Discussion

The den survey was completed on the 4th June and the 8th of June 2020. No carnivore dens were observed around the mine site during the den survey. Photos taken during the survey are provided in Appendix B.

4 Conclusion

In conclusion, a den survey was completed by Environmental Technicians to determine the presence of active carnivore dens, with focus on Arctic fox and American Marten dens. Areas where disturbance was likely to occur, due to construction and operations, were targeted. No Arctic Fox or American Marten dens were observed during the survey.

Appendix A

Aerial Photo

Figure 1: Meliadine Carnivore Den Survey Area

Appendix B

Meliadine Den Survey Photos

Photo 1: Meliadine Den Survey - Landfarm B

Photo 2: Meliadine Den Survey - Crusher Pad

Photo 3: Meliadine Den Survey – P-Area

Photo 4: Meliadine Den Survey – Exploration Camp

Photo 5: Meliadine Den Survey – Emulsion Plant Access Road and CP-3 Berm

Photo 6: Meliadine Den Survey – Emulsion Plant Access Road and CP-3 Berm

APPENDIX D

Meliadine Project
Caribou Behaviour Study, 2020

AGNICO EAGLE

Meliadine Project

Caribou Behaviour Study, 2020

March 2021

Project No.: 0544016-WP4

The business of sustainability

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Signature Page

March 2021

Meliadine Project

Caribou Behaviour Study, 2020

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EXECUTIVE SUMMARY

The Meliadine Mine (the Project), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km north of Rankin Inlet, Nunavut. A 34 km All Season Access Road (AWAR) connects the Project to Rankin Inlet. During July each year, groups of Qamanirjuaq caribou occur in the Project area, some crossing through the Project site and the AWAR.

As part of the Nunavut Impact Review Board (NIRB) Project Certificate #006, Agnico Eagle is required to study and report on effects of the Project on caribou behaviour (T&C 57, b.). The Agnico Eagle Terrestrial Environment Management and Monitoring Plan (TEMMP 2020) includes a behaviour monitoring program to i) determine if there are changes to behaviour with distance to the Project and ii) in response to disturbances such as passing vehicles.

During 2020, Agnico Eagle retained ERM to update the field protocols used for behaviour monitoring. ERM adapted standard methods for caribou behaviour monitoring developed by the Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR). Studies of caribou behaviour were conducted in July 2020 at the Meliadine Mine and AWAR. As the first year of this study, 2020 represents a preliminary program meant to test and refine the methods and provide a first year of data.

Field surveys were conducted during July 2020 by an ERM wildlife biologist and an Agnico Eagle environmental technician dedicated to behaviour monitoring. In addition, Project environmental technicians were trained in the updated method and conducted behaviour surveys on an opportunistic basis while conducting other duties. Each survey lasted 30 minutes, with scan samples conducted every three minutes.

The behaviour monitoring program in 2020 had several results:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Fifty six surveys were conducted with the majority of observations between July 1 and 17. This is less than the 2020 objective of 100 surveys, largely due to safety requirements in areas of active harvest and due to COVID-19 safety measures.
- Observations were well distributed across a range of caribou group sizes from 1 to 2 individuals to >1,000.
- Small groups of <50 caribou were observed both near (<300 m) and far (>300 m) from infrastructure while large groups (>50) occurred beyond 300 m from infrastructure. Small groups consistently had a higher proportion of response behaviours (running, alert) than larger groups.
- An analysis of the first year's data indicated that there is a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. After disturbances from passing vehicles, caribou at greater distance returned to pre-disturbance/baseline behaviours more quickly. This analysis accounted for the difference in group size with distance, but should be interpreted with caution with only one year of data.
- The proportion of caribou with response behaviours in a group was unrelated to environmental variables including temperature and wind speed.
- Approximately half of the surveys included a disturbance event, typically from essential Project vehicles, mostly pickups, and all-terrain vehicles (ATVs) used by community members on the AWAR for travel and harvesting. The AWAR was closed to most Project vehicles when caribou were near the road and all Project vehicles stopped when caribou were on the road.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (six minutes).
- Following the 2020 program, Agnico Eagle plans to review the methods and results of this monitoring program with interested parties. Based on this review, Agnico Eagle may update the program as needed for the 2021 field season.

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Acronyms and Abbreviations

Agnico Eagle	Agnico Eagle Mines Ltd.
AIC	Akaike information criterion
ATV	All-Terrain Vehicle
AWAR	Meliadine Mine All Weather Access Road
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
BQCMB	Beverly Qamanirjuaq Caribou Management Board
GLMs	Generalized linear models
GN	Government of Nunavut
GNWT ENR	Government of Northwest Territories Department of Environment and Natural Resources
IOL	Inuit Owned Land
KivIA	Kivalliq Inuit Association
km	Kilometer
Km/hr	Speed expressed as kilometer per hour
M	Meter
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
NWT	Northwest Territories
T&C	Terms and Conditions
TEMMP	Terrestrial Environment Management and Monitoring Plan
The Project	The Meliadine Mine

1. PROJECT OVERVIEW

The Meliadine Mine (the Project), 100% owned by Agnico Eagle Mines Limited (Agnico Eagle), is located approximately 25 kilometres (km) north of Rankin Inlet, Nunavut. A 34 km All Season Access Road (AWAR) connects the Project to Rankin Inlet. A bypass road was constructed to the west and south of Rankin Inlet to allow mine traffic to circumvent the hamlet when traveling from the AWAR to the Project marine laydown (Figure 1-1).

The Meliadine Mine was approved with a life of mine plan that includes production from six ore bodies Tiriganiaq, Wesmeg, Normeg, F-Zone, Pump and Discovery. A conceptual plan for mining these deposits was approved by the Nunavut Impact Review Board (NIRB) in 2016 (Project Certificate #006). Mining and ore processing of the Tiriganiaq deposit, including two open pits, underground mining and associated ore processing, waste management and ancillary infrastructure operation was subsequently licenced by the Nunavut Water Board (NWB) (Meliadine Mine Type A Water Licence No. 2AM-MEL1631).

Production from the Tiriganiaq deposit began in Q2 2019. The remainder of the orebodies are planned throughout the life of the Meliadine complex.

Studies of caribou behaviour were conducted in July 2020 at the Meliadine Mine and AWAR in support of existing NIRB conditions.

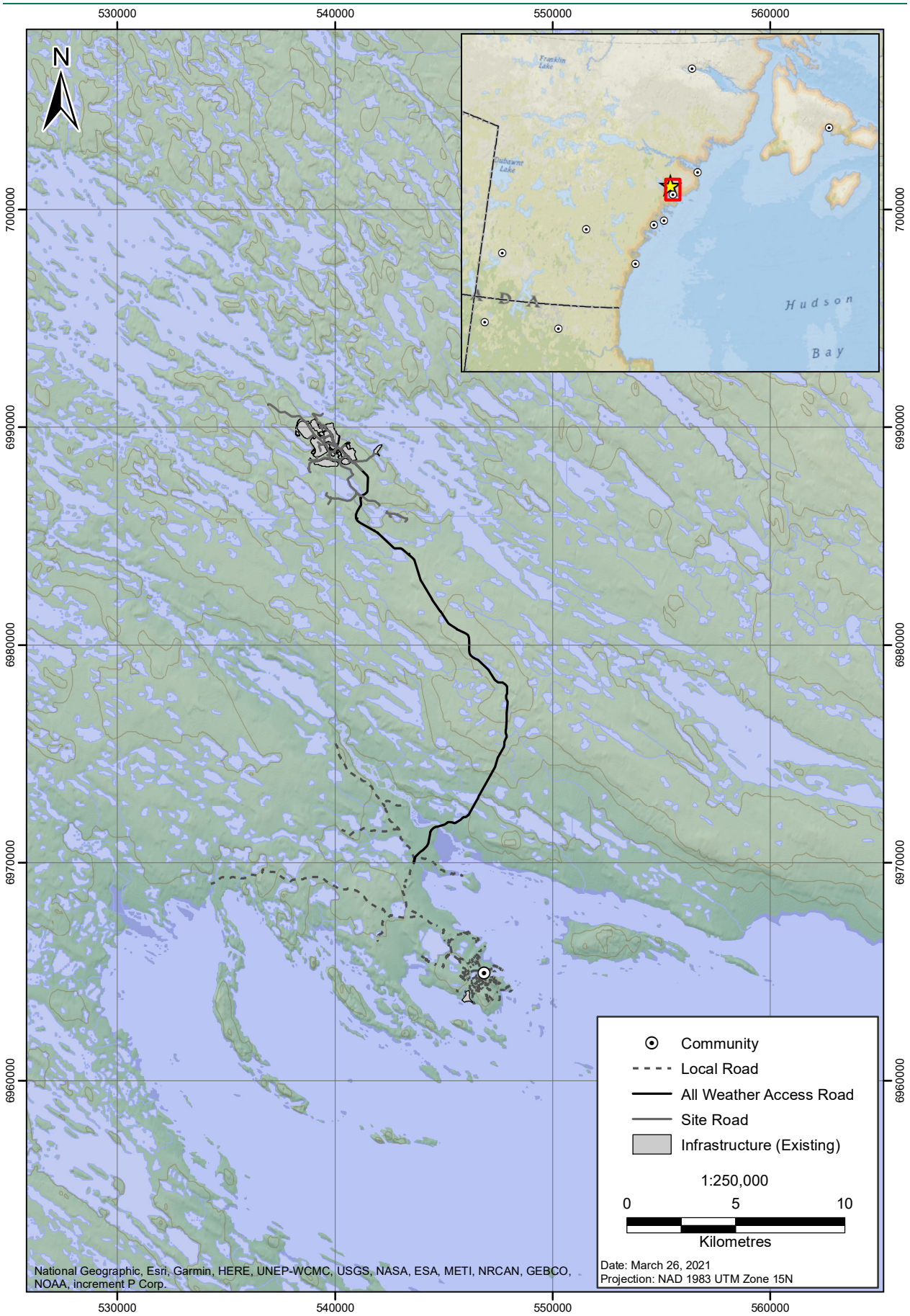


Figure 1-1: Meliadine Gold Project Location

2. STUDY OBJECTIVES

The objectives of the 2020 study were two-fold:

- To conduct a trial of the GNWT ENR behaviour survey methodology at the Project site to determine whether it is appropriate in this area, with these caribou, and at this time of year.
- For the first year of the program, to collect a set of 100 samples of caribou behaviour through conducting surveys comparing caribou behaviour: a) near vs. far, and b) with and without disturbances.

3. BACKGROUND

3.1 Qamanirjuaq Herd

The Qamanirjuaq caribou herd is a large caribou herd numbering approximately over 200,000 animals in 2017, down from over 300,000 animals reported in 2008 (COSEWIC 2016). The herd range is centered in south-eastern Nunavut. The herd range stretches approximately 1,000 km from Chesterfield Inlet in the north to northern Manitoba in the south, and from Hudson Bay on the east to eastern Northwest Territories and north-eastern Saskatchewan in the west (BQCMB 2020a).

The BQCMB has rated the Qamanirjuaq herd as having Medium vulnerability in 2014 due to continued population declines since 2008 (BQCMB 2014) and upgraded this rating to Medium-High in 2016 (BQCMB 2016).

The herd generally winters below the treeline in northern Manitoba, Saskatchewan and the adjoining areas of NWT and Nunavut. Spring migration is north along the coast of Hudson Bay, past the communities of Arviat, Whale Cove and Rankin Inlet to a broad calving ground generally centered on Qamanirjuaq Lake (BQCMB 2020a).

Following calving, the caribou form into large groups of hundreds to thousands of caribou and radiate out from the calving grounds, including east towards the coast. During July, groups of animals from this herd interact with the hamlet of Rankin Inlet, the Meliadine Mine and the AWAR connecting the two.

During summer and fall, the caribou generally move south and inland, gradually returning south towards their wintering areas by early December. Maps of the caribou range and movement are available on the BQCMB website (https://arctic-caribou.com/resources/#maps).

3.2 Terrestrial Environment Management and Monitoring Plan

The Meliadine Mine 2014 Project Certificate and 2019 Project Certificate Amendment from the Nunavut Impact Review Board (NIRB), Term and Condition 57 requires the Project to report in its annual NIRB report:

> (T&C 57, b.) A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), and responses to operations of the all-weather access road and associated access roads/trails;

The Meliadine Mine Terrestrial Environment Management and Monitoring Plan (TEMMP; Agnico Eagle 2020) is designed to meet this condition, with a behaviour monitoring program (Section 4.5) that has two objectives:

- "To determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressors.
- To determine if caribou distribution changes with proximity to the mine (i.e. do caribou avoid the mine)."

The behaviour monitoring program described in this report is designed to address the first of these objectives.

4. STUDY AREA

The dominant terrain in the Project area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and lakes. A series of low relief ridges are composed of glacial deposits, oriented in a northwest-southeast direction, which control the regional surface drainage patterns. The property is about 60 meters above sea level in low-lying topography with numerous lakes (TEMMP; Agnico Eagle 2020).

The study area for behaviour monitoring included the existing Project footprint or the Meliadine Mine site and the AWAR, plus a 1 km buffer surrounding these areas. Surveys were conducted on any caribou that could be visually surveyed from Project infrastructure up to a distance of 3 km with the aid of binoculars and a spotting scope.

5. METHODS

5.1 Field Surveys

Survey methods followed protocols for monitoring caribou behaviour developed by the Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR 2017). During 2020, ERM refined these methods for Agnico Eagle's Nunavut mine operations. The updated methods focus on scan samples, *in lieu* of both scan and focal samples. Given time and personnel constraints, this was determined to be a more efficient use of time and produce better quality data that is suitable for statistical analysis. The updated methods also include an initial survey step to randomize which group of caribou to monitor when multiple groups are available. Detailed protocols are attached in Appendix A.

Prior to July 1, a wildlife biologist from ERM conducted a classroom and practical training program for Agnico Eagle environmental technicians from the Meliadine Mine. The ERM wildlife biologist with an assistant was tasked with conducting behaviour observations as a primary role during July, while Meliadine technicians conducted behaviour observations opportunistically during other fieldwork in alignment with the TEMMP.

The overall method for the field surveys was to identify caribou groups visible from the mine site and AWAR, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their responses without any disturbance and in response to mine-related activities and natural factors. Surveys were conducted in July 2020 during the post-calving and early summer periods, when caribou pass through the Project area in large numbers.

The first step involved a reconnaissance survey to identify where caribou groups were located. Where multiple groups were observed, surveyors chose which group to sample using a random number table. Field methods included the recording of site information at the location of each survey, including GPS coordinates, weather conditions, road structure, and location of the caribou group in relation to the surveyors and the road. Individuals in the group being observed were categorized when the survey started and at three minute intervals for 30 minutes.

Behaviour categories and their definitions were standardized following GNWT ENR (2017) classifications. The behaviour categories were: feeding, lying down, standing, alert, walking, and trotting or running. Alert behaviour and trotting or running were considered disturbance "response" behaviours and were grouped together in the subsequent data analysis.

At each three-minute interval, surveyors recorded the numbers of individuals in the group exhibiting each behaviour at that time. If the group was too large to be counted in each interval, an identifiable subset of the group was surveyed during each interval and the total group size was recorded on the datasheet. In the case that a disturbance event occurred during the survey, such as a vehicle driving on the road, the time and type of disturbance was recorded.

5.2 Data Analysis

The objective of the data analysis was to quantify trends in the survey data, and determine whether factors such as distance to infrastructure, group size, or the disturbances could be used to explain caribou behavior. An initial exploratory analysis was conducted to visualize the data and determine the appropriate method for analyzing the data. A preliminary regression analysis was conducted to test whether the data from these surveys could be analyzed statistically.

To increase the statistical power to detect changes in caribou behaviour, the behaviour categories were grouped for analysis into "response" behaviours (alert and running) and non-response behaviours (feeding, lying down, standing, and walking).

Generalized linear models (GLMs) were used to assess the differences in the proportion of response behaviours in surveyed animals as a function of various controlling variables, including the occurrence of disturbances. This regression framework provides a means to control for habitat, environmental variables, repeated measurements, and spatial correlation.

Statistical analysis were conducted using variables averaged over the entire thirty-minute survey period, rather than breaking the data down by three-minute intervals. Two dependent variables were tested:

1. The first dependent variable tested was the average proportion of response behaviours in each survey, and this variable was modelled using a binomial distribution.
2. A second dependent variable was developed to track the number of minutes it took caribou to return to background behavior levels every time there was a disturbance. This variable, called “duration of response”, was assessed manually for each survey and modelled with a normal distribution.

The two dependent variables were each modelled against a suite of potentially important variables to determine if there was any statistical relationship with response behaviour. The variables included in this preliminary analysis were group size, distance to road, temperature, wind speed, and a binary variable identifying whether or not a disturbance occurred in the survey.

For each dependent variable, GLMs were constructed and tested for model fit, as evidenced by the Akaike Information Criterion (AIC). AIC is a number that is helpful for comparing models as it includes measures of both how well the model fits the data and how complex the model is (simpler is usually better). The top models were identified as having a low AIC and were within a 2 unit difference in AIC ($\Delta AIC \leq 2$) of the top-ranked model (i.e. the model with the lowest AIC; Burnham & Anderson 2004). This is the industry standard for identifying models that are essentially ‘equally good’ at explaining the data. Models with a difference in AIC (ΔAIC) of 2 to 4 from the top model are generally considered to have ‘limited support’.

6. RESULTS AND DISCUSSION

6.1 Caribou Distribution relative to the Project

During late June and early July caribou GPS collar locations were provided to the Project though a data sharing agreement by the GN. These data indicated that caribou were approaching the Project site. Field surveys were conducted three times per day in order to trigger management actions. These data informed the decision to begin behaviour surveys for caribou as they approached the site.

Survey locations by date are presented in Figure 6.1-1. From July 1 to 17, 2020, groups of caribou from the Qamanirjuaq herd were observed passing through or near the study area, with numbers peaking from July 4 to July 9. The majority of surveys were conducted on the northern portion of the AWAR.

As the post-calving period progressed, caribou were observed more frequently in the southern portion of the road near Rankin Inlet. Fewer behaviour observations were conducted on the southern portion of the AWAR due to safety concerns near active harvesting activities and COVID-19 safety rules prohibiting contact between mine site personnel and community members.

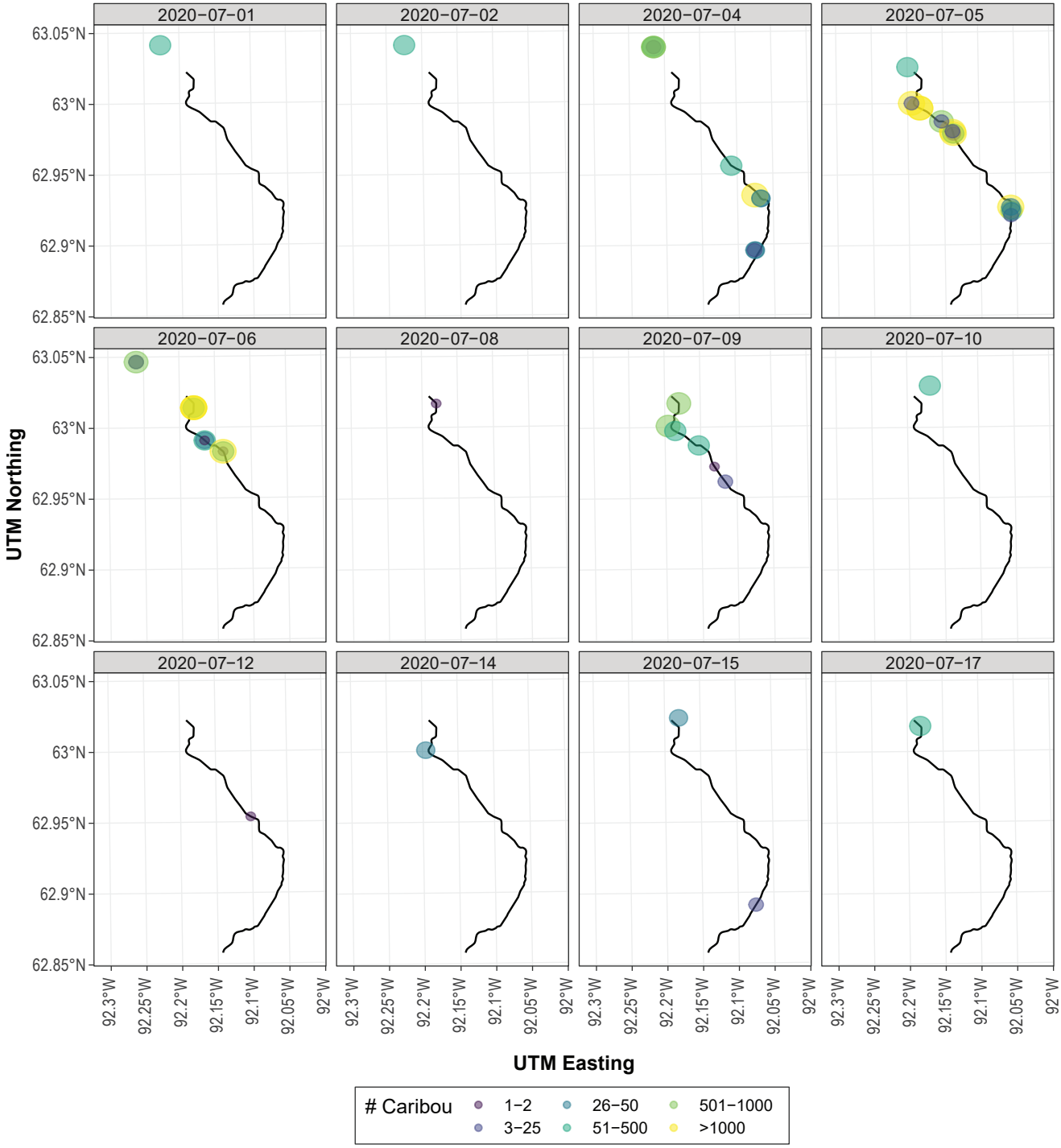
6.2 Field Surveys Completed

In total, 56 behaviour surveys were conducted during the two week period (July 1 to 17) when groups of caribou were near the Project (Table 6.2-1). Surveys were conducted opportunistically whenever caribou were encountered during daily reconnaissance drives, primarily along the AWAR but also around the mine site when the opportunity arose.

Table 6.2-1: Meliadine Caribou Behaviour Surveys Data Summary

Caribou Group Size	Total Number of Surveys	Surveys with Disturbances	Surveys with Observed Road Crossings
1-2	5	4	2
3-25	11	2	2
26-50	9	3	0
51-500	14	11	1
501-1000	6	3	1
>1000	11	6	0
Total	**56**	**29**	**6**

In July, during the post-calving and early summer periods, barren-ground caribou aggregate into large groups (COSEWIC, 2016; Russell and Gunn, 2019). There were several days where only a single group of more than 1,000 individuals and up to 50,000 individuals was encountered. In order to diminish the risk of pseudo-replication, surveyors waited at least one hour before surveying the same group. This should be considered when assessing the robustness of subsequent statistical analyses. A logistical constraint on sample size will likely also have to be a consideration for future behaviour surveys at Meliadine, which will always occur during the high density post-calving season.



Note: Colour and size indicate group size, and the location of the All-Weather Access Road is indicated by the black line.

Figure 6.1-1: Locations of Behaviour Surveys by Date

General observations on survey methodology and results included:

- Surveys were well distributed across a range of group sizes (Table 6.2-1). Surveyors reported that the addition of a reconnaissance survey and random selection of which group to survey assisted with a relatively even distribution of survey intensity across group sizes.
- Of the 56 surveys, more than half recorded at least one disturbance during the survey (Table 6.2-1). During much of the period when caribou were present in the study area and surveys were being conducted, there were sufficient caribou near the road that the AWAR was closed to mine traffic. An exception was made for convoys of mine vehicles that occurred approximately three times per week for crew change and exchange of essential goods. In total, 48% of disturbances were from ATV traffic, 30% were from light trucks, and 23% were from convoys. Light trucks (pickups) included trucks from community groups conducting monitoring, the Hunters and Trappers Association and Kivalliq Inuit Association, the pickup used for caribou surveys, or other Project environment pickups. It should be noted that surveyors specifically sought to survey caribou during convoys and would be stationed to monitor any nearby caribou during convoys. This was due to the relative shortage of data on mine-related traffic disturbances. The AWAR was closed to mine traffic during many of the surveys, leaving a small number of essential vehicles on the road, generally pickup trucks. It is expected that the ratio of ATVs to total traffic would therefore be higher during road closures because total traffic is much reduced.
- The methodology allowed for the estimation of baseline behaviour, response to disturbance, and return to baseline behaviour. Few, if any, surveys ended before caribou returned to baseline behaviour. Thus, 30 minutes appears to be an appropriate survey length. Caribou surveys were considered an essential activity by the Project, allowing the survey pickup truck to be used on the AWAR even when the road was closed to normal mine traffic. However, all vehicles must stop when caribou are on the road, leading to long periods where the survey truck was stopped on the road.
- Approximately half of the 56 surveys were conducted by the ERM biologist and the other half were conducted by the Meliadine environmental technicians. Given the logistical challenges of 1) the caribou being on-site for a short period, 2) the southern part of the road being unusable during harvesting activities, and 3) the vehicles being stopped by caribou on the road, a goal of conducting 50 surveys per year is more achievable than 100 surveys (the goal for 2020).
- Most caribou behaviours were calm, generally foraging, and not moving quickly (non-response). The one exception was smaller groups who moved more than larger groups – more walking and trotting. As a consequence, caribou were observed crossing the road in only 10% of surveys, primarily in small groups of less than 25 individuals.
- One source of uncertainty was consistently estimating distance. Hence, distance was categorized into blocks of 0 to 50 m, 50 to 100 m, etc. The use of a rangefinder would increase accuracy and allow distance to be considered as a continuous variable during analysis, rather than a categorical value.
- Overall, the 2020 survey methodology worked well for the Project location and circumstances and no major changes are planned for 2021.

6.3 Survey Results

6.3.1 Exploratory Analysis

The exploratory analysis was conducted to determine if there were any trends or interactions in the following variables: group size, distance to the AWAR, distance to the mine site, proportion of caribou showing “disturbed” behaviours and road crossing.

Road Crossing

Results of the exploratory analysis indicated, unsurprisingly, that groups closer to the road at the start of the survey were more likely to cross the road during the survey (Figure 6.3-1).

Group Size and Distance to Infrastructure

Plotting the caribou group size against the distance of caribou groups to the road (distance to observer) at the start of the survey revealed that small groups (less than 50 individuals) were observed in equal proportions across all distances (Figure 6.3-1).

Large groups tended to be observed further from the road at the start of the survey. No groups larger than 50 individuals were recorded within 100 m of the road at the start of the survey, and no group larger than 500 individuals was recorded within 300 m of the road at the start of the survey.

This may have occurred as a result of small sample size, or may be indicative of a trend that caribou tend to avoid areas within 100-300 m of the road unless they intend to cross it. Regardless of the mechanism, these trends need to be considered so that statistical analyses are not confounded.

Behaviour Type, Group Size and Distance to Infrastructure

Average proportions of each behaviour type by group size and by distance to road are presented in Figure 6.3-2. When analyzed by group size, the results suggest that the average proportion of the response behaviours of “Alert” and “Trotting” decrease as group size increases, with the highest proportion observed in groups smaller than 25.

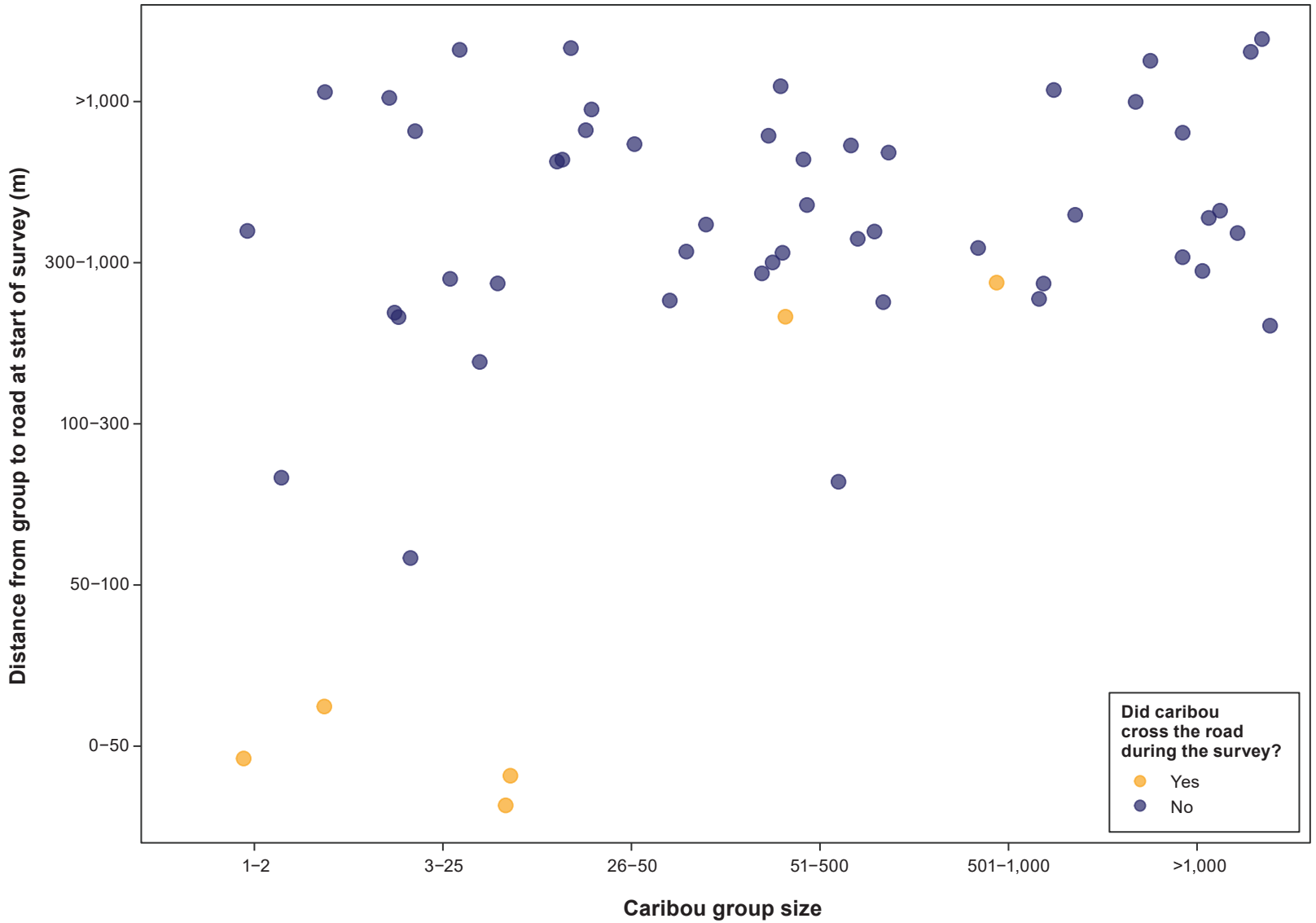
When analyzed by distance to road, the results suggest that the proportion of response behaviours is higher closer to the road than further away, with the proportion dropping off in groups further than 300 m from the road. However, due to the previously mentioned correlation between group size and distance to road, these data cannot discern between two possibilities – that caribou are more likely to be disturbed near the road, or that small groups of caribou are more likely to be disturbed. In future years of surveys, additional data with large groups observed close to the road will be required to resolve between these two possibilities.

The result that smaller groups displayed alert behaviours more frequently than large groups is interesting. The activity level of smaller groups was higher, with 50% or more of time spent in alert behaviour and running in the absence of any disturbance.

Wolfe, Griffith and Wolfe (2000) reviewed behaviour research on reindeer and caribou in relation to development, and reported that larger groups are more likely to be disturbed by human activities. At first glance, this may seem at odds with the current study, which finds that *small* groups are more likely to be disturbed. However, it is important to note that Wolfe et al (2000) review examined response to disturbances, while this study only compares group size with the response to infrastructure, with or without disturbances. Unfortunately, there was not enough data in the current study to determine if the response to disturbances changed with group sizes, but additional years of data will help address this question.

Behaviour Type and Environmental Variables

Figure 6.3-3 shows the relationship between 1) the proportion of response behaviours and 2) various environmental variables, including temperature, wind speed, date, and whether or not a disturbance such as a vehicle passing occurred during the survey. The results suggest a slightly higher proportion of alert or running caribou in surveys where a disturbance occurred. It should be noted that this figure is an average proportion of response behaviours across the entire thirty minute survey, so in some instances the proportion of response behaviours may have been obscured by the large number of intervals with no response behaviour.



Note: Colour indicates whether the group of caribou were observed crossing the road during the survey.

Figure 6.3-1: Caribou Group Size versus Distance From the Road or Infrastructure to the Caribou at the Start of the Survey

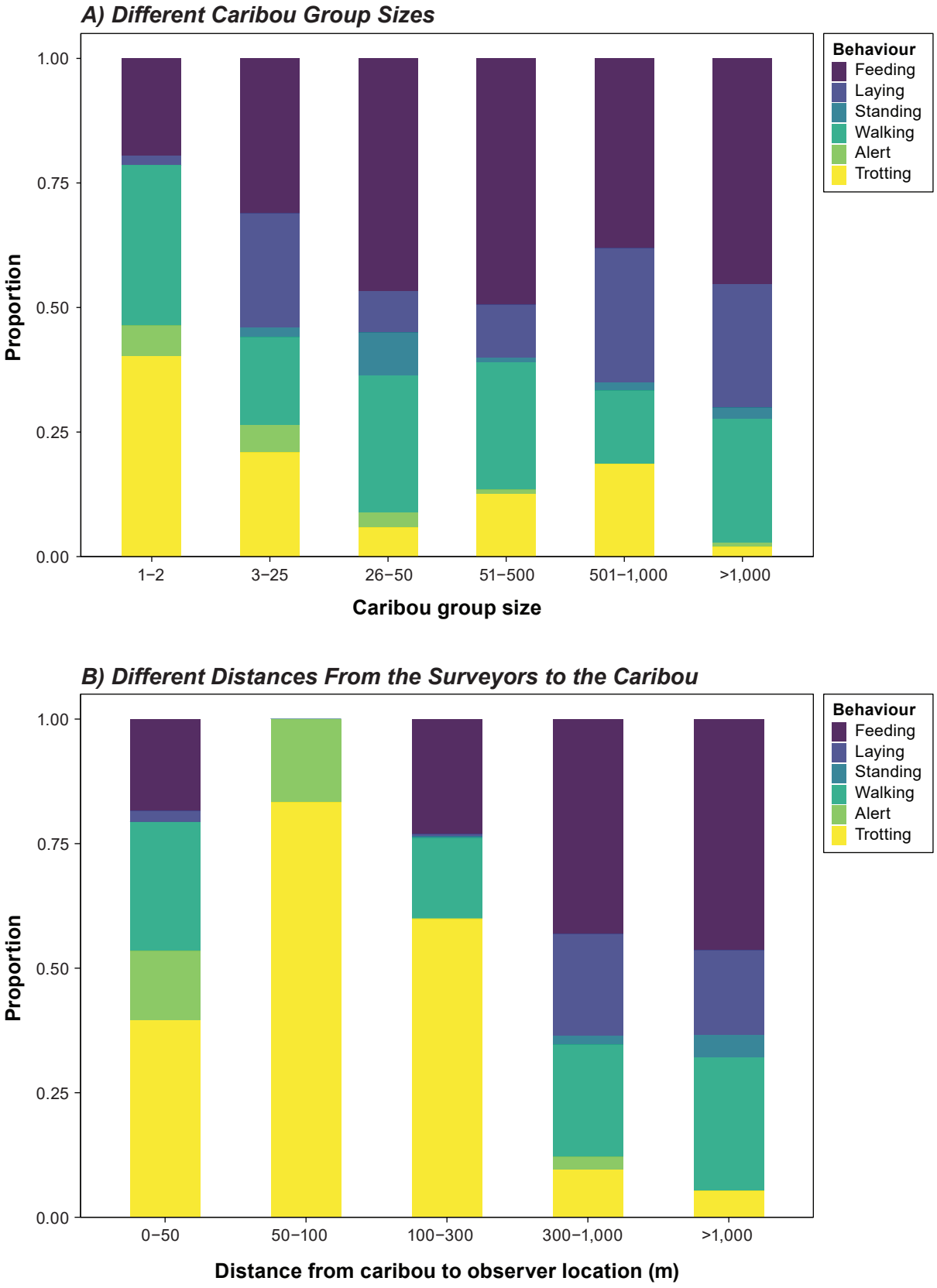
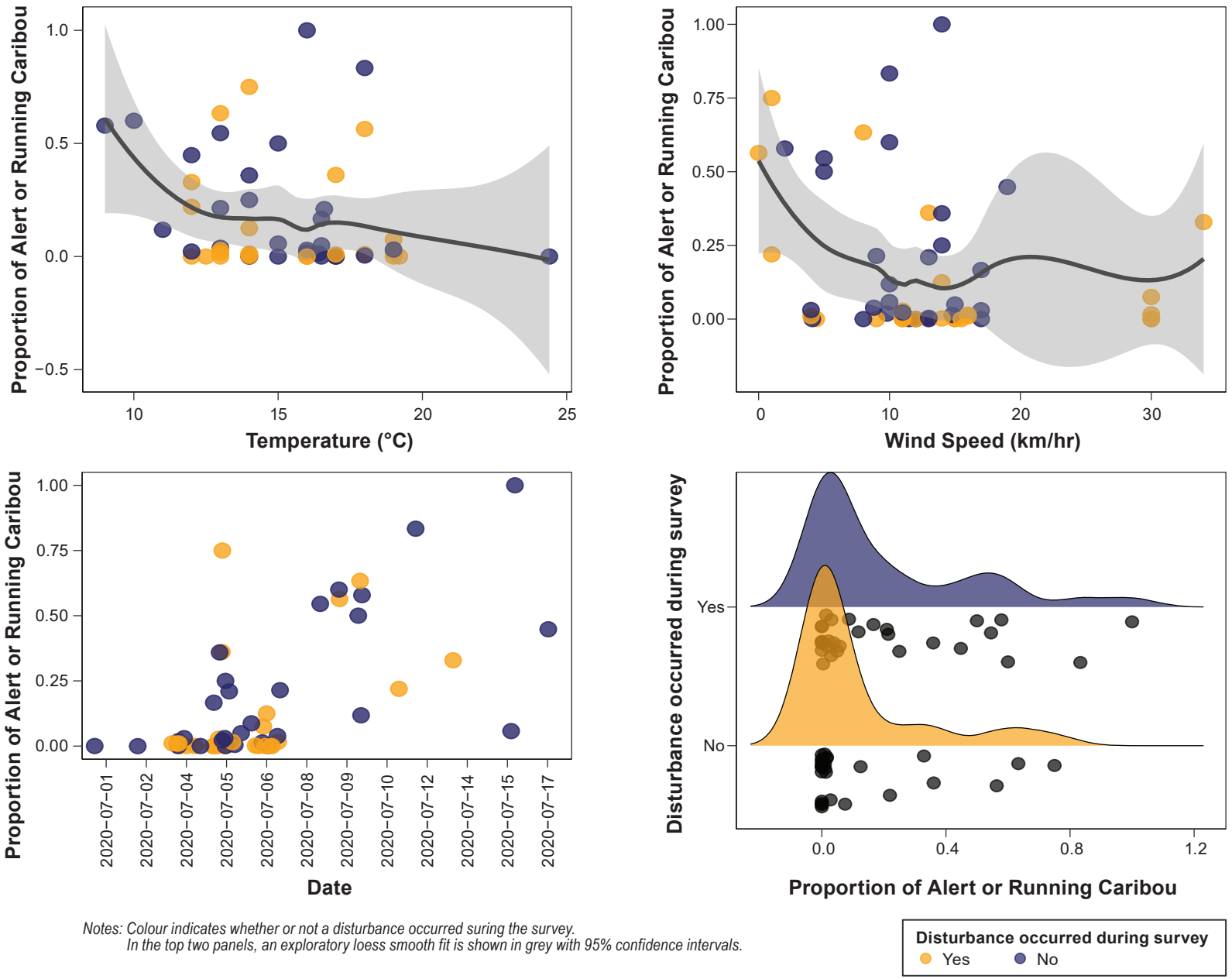


Figure 6.3-2: Average Proportion of Each Behaviour Type Observed at the Start of the Survey



Notes: Colour indicates whether or not a disturbance occurred suring the survey.
In the top two panels, an exploratory loess smooth fit is shown in grey with 95% confidence intervals.

Figure 6.3-3: Proportion of Alert or Running Caribou by Temperature, Wind Speed, Date, and Whether or Not a Disturbance Occurred During the Survey

Response to Disturbances

To examine response to disturbances, the proportion of response behaviours was plotted by three-minute interval for each survey in Figure 6.3-4. The baseline behaviours (in the absence of recent disturbances) were typically 5-10% caribou with response behaviours in a group. Figure 6.3-4 suggests that following a disturbance event, there was commonly a spike in the proportion of caribou with response behaviours to 60-90% of caribou in the group. The proportion of caribou with response behaviours returned to a pre-disturbance levels quickly, often within two intervals (6 minutes).

There was some variability in the proportion of response behaviours. During some surveys, there was a spike in response behaviours when no vehicle or other obvious disturbance was observed. In some surveys a vehicle passed by (a disturbance), but there was no increase in response behaviours observed in the caribou group on the subsequent time period.

6.3.2 Statistical Analysis

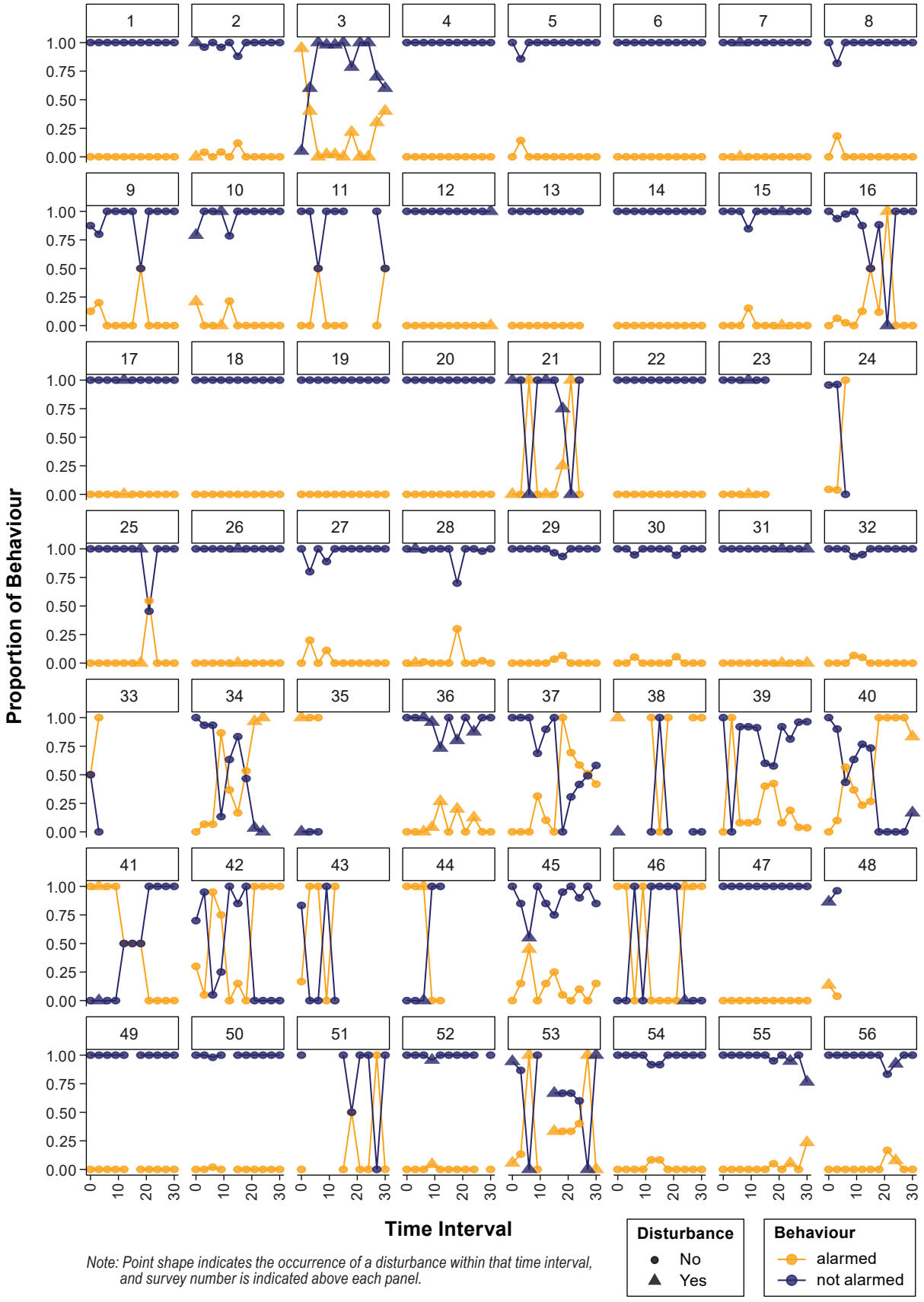
As group size and distance to road were identified as being potentially correlated during the exploratory analysis, a Chi-square test was conducted between the two variables to determine if they were too closely related to be included in a model together. A Chi-square ($\chi 2$) statistic is a test that measures how a model compares to actual observed data, and can be used to test for the correlation between two categorical variables. The resulting Chi-square statistic was not significant ($p=0.107$), indicating that group size is not associated with distance to road. However, the small number of samples in each category and the fact that the data were not normally distributed mean that some of the key assumptions of the Chi-squared test were violated, and the output statistic should be treated with extreme caution. In light of this, and in order to prevent overfitting the models, two separate models were run that included group size as an independent variable and distance to road as an independent variable, respectively.

The results indicated that distance to road out-performed group size in all variable combinations, based on the equivalent model cutoff of $\Delta AIC<2$ suggested by Burnham and Anderson (2004). As a result, distance to road was used instead of group size in final models. The estimates and significance levels for the model that used proportion of response behaviours as a dependent variable are presented in Table 6.3-1, and for the model that used duration of response as a dependent variable in Table 6.3-2.

Table 6.3-1: Summary of Model Coefficients and Significance Levels for Model Using Average Proportion of Response Behaviours as the Dependent Variable

Variable	Estimate	Standard Error	P-value
(Intercept)	1.43	2.51	0.569
Distance to road 50-100 m	17.43	3956.18	0.997
Distance to road 100-300 m	0.46	1.68	0.784
Distance to road 300-1000 m	-2.01	1.28	0.117
Distance to road >1000 m	-2.72	1.49	0.067
Temperature (°C)	-0.11	0.17	0.508
Wind speed (km/hr)	-0.02	0.08	0.827
Disturbance during survey (Yes)	0.78	0.94	0.408

Note: statistically significant p-values <0.05 are indicated with an asterisk.



Note: Point shape indicates the occurrence of a disturbance within that time interval, and survey number is indicated above each panel.

Figure 6.3-4: Proportion of Response Behaviour during Each Survey

Table 6.3-2: Summary of Model Coefficients and Significance Levels for Model Using Duration of Response as the Dependent Variable

Variable	Estimate	Standard Error	P-value
(Intercept)	6.90	2.63	0.017
Distance to road 50-100 m	-1.78	2.89	0.545
Distance to road 100-300 m	7.18	2.92	0.024*
Distance to road 300-1000 m	-3.82	1.79	0.046*
Distance to road >1000 m	-7.41	2.01	0.002*
Temperature (°C)	0.05	0.17	0.790
Wind speed (km/hr)	0.01	0.10	0.913

Note: statistically significant p-values <0.05 are indicated with an asterisk.

The statistics presented include the variable estimate, which can be interpreted as the expected effect on the dependent variable as the independent variable increases. For example, in Table 6.3-1 the negative estimate for temperature indicates that as the temperature increases, the proportion of caribou with response behaviours decreases. However, estimates should always be considered in tandem with the standard error; if the standard error is larger than the estimate, the estimate is meaningless. The p-value statistic indicates whether the model is a “statistically significant” predictor of the dependent variable, regardless of how large the estimate is. A p-value of less than 0.05 suggests that the variable is an important determinant of the response, as it indicates there was less than 5% probability that the results occurred by chance.

The results of this analysis suggest that there is a weak differential effect of distance to the road on response behaviour, and that caribou were less likely to be exhibiting response behaviours further from the road. This effect was most apparent in the surveys on caribou greater than 1,000 m from the road, as the effect was significant in models that used duration of response as the dependent variable (p=0.002), with an estimate of -7.41±2.01. This effect was near-significant in models that used proportion of response behaviour as the dependent variable (p=0.067), with an estimate of -2.72±1.49.

There is some evidence that caribou were less likely to exhibit response behaviour in distances of 300 to 1,000 m from the road, with an estimate of -3.82±1.79 in duration of response models (p=0.046) and -2.01±1.28 in proportion responding models (p=0.117). Temperature and wind speed were not found to have an effect on response behaviours in either model set.

These results should be treated with caution due to the relatively small sample size and because response behaviours were averaged over each 30 minute survey period. Nevertheless, these results are consistent with other surveys recorded on barren-ground caribou during the post-calving and early summer periods, which suggest that caribou behavioural responses to all-season haul roads tend to taper off beyond a zone of influence of approximately 500 m (Murphy and Curlato, 1987; Johnson and Lawhead 1989; Dyer et al. 2001). However, zone of influence estimates are highly variable in the literature and further analysis will be required to adequately address this question for Meliadine. Responses to roads and infrastructure have previously been linked to increased harvest from roadways (Plante et al., 2018; Russell and Gunn, 2019), a factor which was not included in this analysis.

One consideration with analyzing these data, is that the response of caribou to disturbances is relatively brief, lasting on-average 2 sampling periods (6 minutes). Using average behaviour type across the 30 minute (10 sampling periods) effectively dilutes the caribou response. With the addition of future sampling, it may be possible to examine average behaviours within a 30 minute sampling period; before a disturbance, immediately following the disturbance, and following return to pre-disturbance behaviour.

This analysis of the 2020 study represents a first year of analyzing data from behavior surveys. As noted, these analyses could be improved in future years by:

- Including information on harvesting activities and traffic;
- Increasing sample size; and
- Using a rangefinder to measure distance to caribou groups would improve data quality and ease of analysis, especially given the apparent importance of the distance variable as a predictor of caribou response.

7. SUMMARY

The behaviour monitoring program in 2020 had several results:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Fifty six surveys were conducted with the majority of observations between July 1 and 17. This is less than the 2020 objective of 100 surveys, largely due to safety requirements in areas of active harvest and due to COVID-19 safety measures.
- Observations were well distributed across a range of caribou group sizes from 1 to 2 individuals to >1,000.
- Small groups of <50 caribou were observed both near (<300 m) and far (>300 m) from infrastructure while large groups (>50) occurred beyond 300 m from infrastructure. Small groups consistently had a higher proportion of response behaviours (running, alert) than larger groups.
- An analysis of the first year's data indicated that there is a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. After disturbances from passing vehicles, caribou at greater distance returned to pre-disturbance/baseline behaviours more quickly. This analysis accounted for the difference in group size with distance, but should be interpreted with caution with only one year of data.
- The proportion of caribou with response behaviours in a group was unrelated to environmental variables including temperature and wind speed.
- Approximately half of the surveys included a disturbance event, typically from essential Project vehicles, mostly pickups, and all-terrain vehicles (ATVs) used by community members on the AWAR for travel and harvesting. The AWAR was closed to most Project vehicles when caribou were near the road and all Project vehicles stop when caribou are on the road.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (six minutes).
- Following the 2020 program, Agnico Eagle plans to review the methods and results of this monitoring program with interested parties. Based on this review, Agnico Eagle may update the program as needed for the 2021 field season.

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APPENDIX A DETAILED METHODS FOR CARIBOU BEHAVIOUR SURVEYS

AGNICO EAGLE

Meliadine Project

Caribou Behaviour Monitoring

April 2020

Project No.: 0530275-0011

The business of sustainability

ERM

CONTENTS

1. INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) would like to determine whether caribou behaviour changes in response to Project activities such as: 1) having roads largely closed in 2020 due to the COVID-19 outbreak vs. open in 2021, 2) passing vehicles and 3) other activities such as predators or mine operations. This monitoring program is designed to collect baseline data on caribou behaviour using standardized, scientifically-defensible methods. The data will be used to monitor project effects and as part of predicting the effects of future expansions during permitting.

Monitoring is to be carried out by on-site technicians as part of normal monitoring operations. The objective for the 2020 season is to collect observations on at least 100 groups of caribou; ideally 25 groups in each of the four group size categories (1-2; 3-25; 26-50; >50).

2. STUDY AREA

The study area for behaviour monitoring is anywhere that caribou may interact with the Project, including the All Weather Access Road (AWAR), and the Meliadine Mine site.

3. STANDARD OPERATING PROCEDURES

The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR). The overall method for the surveys is to identify caribou groups visible from the road, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their responses without any disturbance and to both mine-related activities and natural factors.

Notes to guide the work include:

- Systematic surveys will be conducted along all Project roads during spring and fall migration periods.
- The survey team will consist of a driver/observer and a second observer when available.

Surveys should be performed:

- Every day that caribou may be in the Project area, and
- At least an hour before convoy deployment so that the potential effect of the passing convoy can be recorded on caribou.

3.1 General Field Data

For each survey day, the appropriate general field data will be recorded onto field data sheets supplied in Appendix A and B. A new data sheet will be used for each survey, including additional sheets as necessary to record all observations. General information includes:

- Survey date and start and end times.
- Field personnel (full names on the data sheet header and initials thereafter).
- Weather conditions during and prior to sampling (e.g., snow in the last 24 hours, current wind conditions).
- Site description: provide location and description (GPS coordinates, road name and distance marker).
- Photographs (if a high resolution camera is available):
    - Take a photo of the caribou every time an observation is recorded so that the observations can be verified by another biologist.
    - For any photographs taken, record the picture IDs in the comments field on the field data sheet.
    - Write descriptions of any photos taken for specific reasons.
- General observations/notes of the environment/sampling procedures.
- Any deviation from the SOPs outlined below.

Note: When in doubt take pictures and make field notes explaining the situation, your response or consequent changes in methods. It is better to have more data/notes than not enough when interpreting the results later on.

3.2 General Equipment List

- A GPS unit with waypoints of road km markings.
- Field data sheets (Appendix A and B), clipboard, pencils, or iPad with data form.
- A timer capable of alarm setting for repeat time intervals (i.e., can be set to go off every three minutes, e.g., a phone).
- Binoculars or spotting scope.
- Compass (or use compass function on GPS unit).
- Portable weather station (temperature and wind speed).
- Camera.

3.3 Field Methods

3.3.1 Group Selection

The survey day will begin with a reconnaissance survey to determine how many caribou groups are present near the road, how large they are, and where they are. This will be accomplished by driving from the mine site to the end of the road and noting relevant information about the groups and their sizes along the way (Appendix A). At the end of the road, the observers will have a list of the total number of groups present and the group sizes.

Allow approximately one hour to survey each group. If the length of the survey day permits all groups to be surveyed then they should all be surveyed. If there are more groups to survey than the time in the day, then do the following:

1. Look at how many of each group size (bullet list below) have been surveyed to date. If one of them is under-represented and there is a group of that size on the road, then go survey that group. If there is more than one group of that size, choose it randomly using the procedure in step 2.
    a. 1 or 2 caribou
    b. 3 to 25 caribou
    c. 26 to 50 caribou
    d. >50 caribou
2. For the remainder of groups, use the random number table in Appendix C to select which groups to survey.
    a. Start with the number of groups of caribou on the road. For example, if there are 9 groups of caribou on the road, but the team can only survey 6 of them in a day.
    b. Close your eyes and point at the random number table.
    c. From where your finger lands, read the numbers sequentially to the right until you land on a number that is less than 9 (the number of groups on the road). If that number is #3, then write that down. Repeat that method until you have 6 groups identified (the number you can survey in a day). If there are 10 or more groups then use two digits at a time on the table (for group numbers less than 10 they need a zero in front of them, e.g., group 3 would be chosen when the two digits are “03”).
    d. If you get a repeat number or a number bigger than the number of groups you have, ignore it and move to the next number.

Drive back along the road, surveying the groups that you identified in the procedure above.

3.3.2 Selection of an Observation Site

Find a safe parking location and follow site safety protocols. The observation location may be the vehicle itself or a safe location off the road. If observers exit the vehicle, the observation location should be chosen where observer activity is not likely to influence caribou behaviour and where the observer can remain comfortable for a period of approximately 45 minutes without needing to move. Ideally, the vehicle should be stopped a minimum of ~250-300 m from the caribou – adapt this distance as needed. If the animals are staring at the truck or moving away, then the truck is too close.

3.3.3 Data Recording

Allow 15 minutes between arrival and the time at which behavioural observations begin. This is to allow animals to return to behaviour that may have been interrupted by the arrival of observers. In the time before recording behaviour, fill in the top portion of the form with location, weather, and group size information.

After 15 minutes, begin recording data in the form in Appendix B. The start time to record is the time that observations begin.

3.3.3.1 Location

Collect a waypoint of the location from which the observations will be made. Note the waypoint number and the UTM coordinates on the data sheet. Estimate the distance to the group (see data sheet for distance categories) and, using a compass or the GPS unit compass feature, record the bearing (0° to 360°) to the group being observed.

At each time interval during the survey, observers should record the number of individuals in the group exhibiting behaviour in each category. For clarity, observers should record zero values for behaviours not observed.

Note if the group is on the east or west side of the road. At the end of the 30 minute observation period return to the top of the form and record (Y or N) if the group crossed the road during the survey period.

3.3.3.2 Weather Conditions

Use the portable weather station to record:

- Air temperature;
- Wind speed;
- Wind direction; and
- Humidity (if the weather station has this function).

3.3.3.3 Road Structure

At the location of the caribou group, record the road characteristics:

- Height of the road above the tundra (m);
- Slope of the road side (with of the slope in m);
- Approximate height of snow bank (m); and
- Any structures, such as bridges, present.

3.3.3.4 Caribou Behaviour

Individuals in the group being observed will be categorized when the survey starts and at three minute intervals. Standardized behaviour categories will be used (Section 3.3.3). The standardization of behaviour is necessary for clarity and data analysis. If the observed behaviour does not fit within any of the categories then observers have the option of noting other behaviour in the comments field. However, this should be used only rarely as most behaviour should fit in the primary categories listed below.

The data to record at each three-minute interval are the numbers of individuals in the group exhibiting each behaviour at that time. Do not attempt to characterize the behaviour that occurred during the interval. If the group is too large to be counted in each interval, choose an identifiable subset of the group, count the individuals exhibiting each behaviour at each time interval, and add a comment that a subset of the group was sampled. Indicate the total group size at the top of the data form, not the size of the subset whose behaviour was recorded.

Practically, the easiest way to do this is to have the observer scan across the group of caribou from Left to Right, calling out the behaviour of each animal, while the recorder adds tick marks to the data sheet. When complete, count up the tick marks.

3.3.3.5 Disturbance Events

Caribou behaviour is expected to vary in response to some disturbance events. 2020 is being used as a control year with few disturbance events, to be compared to 2021, when road use returns to normal. The bottom of the data form should be used to record any potential disturbance events evident to the observer regardless of whether caribou respond to them. The main categories of events are included in the data sheet:

- Light truck;
- Haul truck;
- Road maintenance vehicle (e.g., grader);
- ATV or skidoo;
- Aircraft; and
- Predator (note species).

Record the number and approximate speed of the vehicle.

Record the time of the disturbance event (0:00 to 30:00 of the survey), indicate which type of disturbance was observed in the appropriate column. Record any additional comments and records of photographs taken in the final column.

3.3.4 Behaviour Classification

With the exception of Alert behaviour, the primary behaviour categories and their definitions follow GNWT (2017) classifications. The categories appear as columns on the data form, with descriptions on the reverse of the form. The behaviour categories are:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

In the comments, record if any animals are moving towards the road, parallel or away from the road.

4. REFERENCES

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Appendix A Data Sheet for Recording All Groups of Caribou along the Road

Pre-survey caribou reconnaissance.

Date:

Group Number	Road km marker	Group size	East or West of Road?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
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34			
35			

Appendix B Meliadine Gold Mine: Caribou Behaviour Monitoring Data Sheet

Date:		Time (24 hr [00:00 to 24:00]) Start:	End:
Observers:			
Location Waypoint number:	UTM Easting:	UTM Northing:	Road name and distance marker:
Distance from caribou to observer location. Circle one: **0-50 m** **51-100 m** **100- 300 m** **300-1000 m** **>1000 m** Bearing: _____°			
Is group location East or West of the Road at start of survey? Circle one: **E** **W**		Did the group cross the road during the survey? Circle one: **Y** **N**	
Caribou group size: Exact count when possible: _____ Estimated size (for larger groups). Circle one: **50-100** **101-200** **201-500** **501-1000** **>1000**			
Temperature: ___°C Wind speed: _____km/h Wind direction:_____° Humidity:_____% Days since last snow or wind event: _____ Weather observations:			
Road Height:	Road Side Width:	Structures Present:	

Observation time from start of survey	Number of animals exhibiting each behaviour type						Comments and photo numbers (Note if any caribou crossed road or travelled along road since previous observation)
	Feeding	Lying Down	Standing	Walking	Alert	Trotting or running	
0 minutes							
3 minutes							
6 minutes							
9 minutes							
12 minutes							
15 minutes							
18 minutes							
21 minutes							
24 minutes							
27 minutes							
30 minutes							

Observed disturbance events (record time from start of survey and check type of disturbance)

Time from start of survey	Light truck	Haul Truck	Road maintenance vehicle (e.g., grader)	ATV	Aircraft	Predator (note species)	Comments and photo numbers. Note other disturbances here

Categories and definitions of behaviour[1]:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

[1] Primary source: GNWT-ENR 2017 caribou behaviour monitoring field protocols, courtesy of GNWT Yellowknife, NT.

Appendix C Random Number Table to Select Groups to Survey

13962	70992	65172	28053	02190	83634	66012	70305	66761	88344
43905	46941	72300	11641	43548	30455	07686	31840	03261	89139
00504	48658	38051	59408	16508	82979	92002	63606	41078	86326
61274	57238	47267	35303	29066	02140	60867	39847	50968	96719
43753	21159	16239	50595	62509	61207	86816	29902	23395	72640
83503	51662	21636	68192	84294	38754	84755	34053	94582	29215
36807	71420	35804	44862	23577	79551	42003	58684	09271	68396
19110	55680	18792	41487	16614	83053	00812	16749	45347	88199
82615	86984	93290	87971	60022	35415	20852	02909	99476	45568
05621	26584	36493	63013	68181	57702	49510	75304	38724	15712
06936	37293	55875	71213	83025	46063	74665	12178	10741	58362
84981	60458	16194	92403	80951	80068	47076	23310	74899	87929
66354	88441	96191	04794	14714	64749	43097	83976	83281	72038
49602	94109	36460	62353	00721	66980	82554	90270	12312	56299
78430	72391	96973	70437	97803	78683	04670	70667	58912	21883
33331	51803	15934	75807	46561	80188	78984	29317	27971	16440
62843	84445	56652	91797	45284	25842	96246	73504	21631	81223
19528	15445	77764	33446	41204	70067	33354	70680	66664	75486
16737	01887	50934	43306	75190	86997	56561	79018	34273	25196
99389	06685	45945	62000	76228	60645	87750	46329	46544	95665
36160	38196	77705	28891	12106	56281	86222	66116	39626	06080
05505	45420	44016	79662	92069	27628	50002	32540	19848	27319
85962	19758	92795	00458	71289	05884	37963	23322	73243	98185
28763	04900	54460	22083	89279	43492	00066	40857	86568	49336
42222	40446	82240	79159	44168	38213	46839	26598	29983	67645
43626	40039	51492	36488	70280	24218	14596	04744	89336	35630
97761	43444	95895	24102	07006	71923	04800	32062	41425	66862
49275	44270	52512	03951	21651	53867	73531	70073	45542	22831
15797	75134	39856	73527	78417	36208	59510	76913	22499	68467
04497	24853	43879	07613	26400	17180	18880	66083	02196	10638
95468	87411	30647	88711	01765	57688	60665	57636	36070	37285
01420	74218	71047	14401	74537	14820	45248	78007	65911	38583
74633	40171	97092	79137	30698	97915	36305	42613	87251	75608
46662	99688	59576	04887	02310	35508	69481	30300	94047	57096
10853	10393	03013	90372	89639	65800	88532	71789	59964	50681
68583	01032	67938	29733	71176	35699	10551	15091	52947	20134
75818	78982	24258	93051	02081	83890	66944	99856	87950	13952
16395	16837	00538	57133	89398	78205	72122	99655	25294	20941
53892	15105	40963	69267	85534	00533	27130	90420	72584	84576
66009	26869	91829	65078	89616	49016	14200	97469	88307	92282
45292	93427	92326	70206	15847	14302	60043	30530	57149	08642
34033	45008	41621	79437	98745	84455	66769	94729	17975	50963
13364	09937	00535	88122	47278	90758	23542	35273	67912	97670
03343	62593	93332	09921	25306	57483	98115	33460	55304	43572
46145	24476	62507	19530	41257	97919	02290	40357	38408	50031
37703	51658	17420	30593	39637	64220	45486	03698	80220	12139
12622	98083	17689	59677	56603	93316	79858	52548	67367	72416
56043	00251	70085	28067	78135	53000	18138	40564	77086	49557
43401	35924	28308	55140	07515	53854	23023	70268	80435	24269
18053	53460	32125	81357	26935	67234	78460	47833	20496	35645

APPENDIX B DATA FROM CARIBOU BEHAVIOUR SURVEYS

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Observers	Waypoint	UTM Easting	UTM Northing	Distance Marker	Distance from Caribou to Observer Location (m)
1	7/4/2020	10:43	11:13	Emilie Fouilloux, Matthew Frey	39	546967	6974303	AWAR KM 12	>1000
2	7/4/2020	12:00	12:30	Daphne Morin, Bethany H	NA	539676	6990311	Mine Site	300-1000
3	7/5/2020	16:45	17:15	Nina Morrell, Daphne Morin	390	540503	6988701	Explo	300-1000
4	7/4/2020	9:13	9:43	Emilie Fouilloux, Matthew Frey	38	547348	6978368	AWAR KM 16	>1000
5	7/4/2020	11:56	12:26	Emilie Fouilloux, Matthew Frey	40	546924	6974314	AWAR KM 12	>1000
6	7/4/2020	16:35	17:05	Emilie Fouilloux, Matthew Frey	7	539704	6990280	Mine Site	>1000
7	7/4/2020	17:35	18:04	Emilie Fouilloux, Matthew Frey	40	546924	6978638	Mine Site	>1000
8	7/6/2020	14:38	13:08	Emilie Fouilloux, Matthew Frey	395	537407	6990986	Dyno	300-1000
9	7/6/2020	14:38	13:08	Nina Morrell	395	537407	6990986	Dyno	300-1000
10	7/6/2020	8:48	9:18	Bryce and Katarina	391	542291	6984827	AWAR KM 26	300-1000
11	7/6/2020	10:34	11:05	Bryce Pippy, Katarina	393	543606	6983974	AWAR KM 23	300-1000
12	7/6/2020	11:44	11:47	Bryce Pippy, Katarina F	394	541510	6987399	AWAR KM 29	>1000
13	7/6/2020	9:04	9:34	Emilie Fouilloux, Matthew Frey	9	542291	6984835	AWAR KM 25	>1000
14	7/6/2020	10:40	11:10	Emilie Fouilloux, Matthew Frey	11	543613	6983967	AWAR KM 23	>1000
15	7/6/2020	11:51	12:28	Emilie Fouilloux, Matthew Frey	12	541506	6987391	AWAR KM 29	>1000
16	7/5/2020	15:30	16:00	Nina Morrell, Emilie Fouilloux	389	541390	6985477	AWAR KM 27	300-1000
17	7/2/2020	14:15	17:35	Nina Morrell	BLAST 2	539222	6990437	Mine Site	>1000
18	7/5/2020	8:47	9:15	Daphne Morin, Katarina F	382	540801	6985856	AWAR KM 27	>1000
19	7/5/2020	9:52	10:24	Daphne Morin, Katarina F	383	542934	6984431	AWAR KM 24	300-1000
20	7/5/2020	10:45	11:15	Daphne Morin, Katarina F	384	543721	6983660	AWAR KM 24	300-1000
21	7/5/2020	12:00	12:30	Daphne Morin, Katarina F	385	547921	6977400	AWAR KM 27	300-1000
22	7/5/2020	13:10	13:40	Daphne Morin, Katarina F	387	547873	6977706	AWAR KM 16	300-1000
23	7/5/2020	14:25	14:55	Daphne Morin, Katarina F	388	543774	6983481	AWAR KM 23	300-1000
24	7/5/2020	14:55	15:25	Daphne Morin, Katarina F	388	543774	6983481	AWAR KM 23	0-50
25	7/5/2020	15:30	16:00	Daphne Morin, Katarina F	389	541390	6985477	AWAR KM 27	300-1000
26	7/1/2020	18:45	17:15	Nina Morrell, Daphne Morin	BLAST 1	539121	6990423	Mine Site	>1000
27	7/5/2020	8:47	9:15	Nm, ef	382	540801	6985856	AWAR KM 27	>1000m
28	7/4/2020	17:34	18:05	Nina Bryce	BLAST 3	539701	6990283	Mine site	300-1000m
29	7/4/2020	16:35	17:06	Nina Bryce	381	539700	6990283	Site	300-1000m
30	7/4/2020	12:00	12:31	Nina Bryce	380	546906	6974317	AWAR KM 12	>1000m
31	7/4/2020	10:30	11:03	Nina and Bryce	379	545243	6980951	AWAR KM 20	>1000m
32	7/4/2020	8:56	9:27	Nina Morrell	378	547358	6978390	AWAR KM 16	>1000m
33	7/5/2020	12:42	12:43	Nm	386	547896	6977062	AWAR KM 15	100-300m
34	7/17/2020	7:32	7:59	Nina Morrell	409	541422	6987852	AWAR KM 29	300-1000m
35	7/15/2020	12:58	13:08	Nina Morrell	408	547015	6973804	AWAR KM 11	50-100m
36	7/15/2020	10:33	11:00	Nina Morrell	407	541487	6988488	Explo	300-1000m
37	7/14/2020	14:12	14:46	Nina Morrell	406	540760	6985949	AWAR KM 27	>1000m
38	7/12/2020	9:06	9:32	Nina	405	545577	6980743	AWAR KM 20	100-300m
39	7/10/2020	7:39	8:09	Nina Morrell, Bryce Pippy	403	542107	6989141	Explo	100-300m
40	7/9/2020	13:48	14:20	Nina	402	541505	6987736	AWAR KM 27	300-1000m
41	7/9/2020	12:14	12:42	Nina	401	540742	6985958	AWAR KM 27	>1000m
42	7/9/2020	11:30	12:09	Nina Morrell, Katarina Fleury	400	542929	6984433	AWAR KM 25	300-1000m
43	7/9/2020	10:51	11:20	Nina	399	544821	6981586	AWAR KM 21	0-50m
44	7/9/2020	9:43	10:10	Nina	398	544048	6982766	AWAR KM 23	0-50m
45	7/9/2020	8:39	9:12	Nina	397	541253	6985565	AWAR KM 25	300-1000m
46	7/8/2020	8:52	NA	Nina Morrell	396	541504	6987728	AWAR KM 29	0-50m
47	7/6/2020	14:35	15:08	Katerina	395	537407	6990986	AWAR KM Dyno	300-1000m
48	7/6/2020	12:20	12:23	Nina and Chris	394	541510	6987399	AWAR KM 29	300-1000m
49	7/6/2020	11:41	12:13	Nina and Chris	394	541510	6987399	AWAR KM 29	300-1000m
50	7/6/2020	10:37	11:07	Nina and Chris	393	543606	6983974	AWAR KM 23	>1000m
51	7/6/2020	8:44	9:21	Nina and Chris	391	542291	6984827	AWAR KM 26	>1000m
52	7/5/2020	14:30	15:07	EF, NM	388	543774	6983481	AWAR KM 23	>1000m
53	7/5/2020	12:01	12:28	Nm, ef	385	547921	6977400	AWAR KM 15	300-1000m
54	7/5/2020	10:44	11:16	Nm, ef	384	543721	6983660	AWAR KM 24	300-1000m
55	7/5/2020	13:10	13:43	Nm, ef	387	547873	6977710	AWAR KM 16	300-1000m
56	7/5/2020	9:52	10:24	Nm, EF	383	542934	6984431	AWAR KM 24	300-1000m

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Bearing to Caribou Group	Is Group East or West of Survey	Did the Group Cross the Road during the Survey	Caribou Group Size	Temp	Wind Speed (km/h)	Wind Direction	Humidity
1	7/4/2020	10:43	11:13	300	West	No	35	14	13	207	65
2	7/4/2020	12:00	12:30	NA	East	No	500	16	9.8	5	57.6
3	7/5/2020	16:45	17:15	160	East	No	390	16.6	13	180	65
4	7/4/2020	9:13	9:43	285	West	No	45	14	9	225	65
5	7/4/2020	11:56	12:26	300	West	No	40	14	11	190	64
6	7/4/2020	16:35	17:05	75	East	No	11	16	30	200	58
7	7/4/2020	17:35	18:04	30	East	No	>1000	14	17	200	60
8	7/6/2020	14:38	13:08	370	NA	No	25	19	30	200	55
9	7/6/2020	14:38	13:08	240	NA	No	8	19	30	200	55
10	7/6/2020	8:48	9:18	NA	West	No	71	13	8.8	180	NA
11	7/6/2020	10:34	11:05	280	West	No	2	14	14	180	NA
12	7/6/2020	11:44	11:47	45	West	No	>1000	16.5	12	180	NA
13	7/6/2020	9:04	9:34	80	East	No	30	16	15	190	65
14	7/6/2020	10:40	11:10	NA	East	No	200	17	15	200	41
15	7/6/2020	11:51	12:28	NA	East	No	101-200	16.4	14.8	257	51
16	7/5/2020	15:30	16:00	200	East	No	>1000	16.5	17	200	62
17	7/2/2020	14:15	17:35	210	East	No	51-100	17	11.5	135	NA
18	7/5/2020	8:47	9:15	NA	West	No	>1000	13	11	180	65.2
19	7/5/2020	9:52	10:24	NA	West	No	501-1000	12	11	180	65.2
20	7/5/2020	10:45	11:15	NA	East	No	>1000	12.5	15.5	200	65
21	7/5/2020	12:00	12:30	NA	West	No	51-100	14	14	180	65
22	7/5/2020	13:10	13:40	270	West	No	>1000	19.2	4.4	180	65
23	7/5/2020	14:25	14:55	240	West	No	201-500	17	13	180	65
24	7/5/2020	14:55	15:25	NA	East	Yes	23	17	13	180	65
25	7/5/2020	15:30	16:00	200	West	No	>1000	16.5	15	180	65
26	7/1/2020	18:45	17:15	0	East	No	250	24.4	4.1	315	NA
27	7/5/2020	8:47	9:15	180	West	No	15	13	11	180	65
28	7/4/2020	17:34	18:05	30	East	No	501-1000	16	17	200	60
29	7/4/2020	16:35	17:06	70	East	No	501-1000	17	16	210	NA
30	7/4/2020	12:00	12:31	250	West	No	24	14	11	180	NA
31	7/4/2020	10:30	11:03	230	West	No	65	15	8	200	NA
32	7/4/2020	8:56	9:27	200	West	No	50-100	18	4	320	NA
33	7/5/2020	12:42	12:43	180	West	No	6	14	1	220	65
34	7/17/2020	7:32	7:59	140	East	No	201-500	12	19	360	NA
35	7/15/2020	12:58	13:08	90	East	No	4	16	14	100	NA
36	7/15/2020	10:33	11:00	360	West	No	26	15	10	180	NA
37	7/14/2020	14:12	14:46	140	West	No	50-100	12	34	80	NA
38	7/12/2020	9:06	9:32	40	East	No	1	18	10	270	NA
39	7/10/2020	7:39	8:09	220	East	No	201-500	12	1	260	NA
40	7/9/2020	13:48	14:20	350	East	Yes	501-1000	9	2	180	NA
41	7/9/2020	12:14	12:42	180	West	No	501-1000	15	5	200	NA
42	7/9/2020	11:30	12:09	270	West	Yes	201-500	18	0	200	NA
43	7/9/2020	10:51	11:20	320	East	Yes	12	13	8	200	NA
44	7/9/2020	9:43	10:10	180	West	Yes	1	10	10	200	NA
45	7/9/2020	8:39	9:12	200	West	No	201-500	11	10	200	NA
46	7/8/2020	8:52	NA	270	East	Yes	1	13	5	180	16
47	7/6/2020	14:35	15:08	10	East	No	501-1000	19	30	180	55
48	7/6/2020	12:20	12:23	45	East	No	>1000	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	45	East	No	>1000	16	12	180	NA
50	7/6/2020	10:37	11:07	10	East	No	>1000	14	14	180	NA
51	7/6/2020	8:44	9:21	290	West	No	1	13	9	180	NA
52	7/5/2020	14:30	15:07	60	East	No	>1000	18	13	200	65
53	7/5/2020	12:01	12:28	180	West	No	50-100	14	14	180	65
54	7/5/2020	10:44	11:16	180	East	No	12	13	16	200	65
55	7/5/2020	13:10	13:43	270	West	No	50-100	19	4	180	65
56	7/5/2020	9:52	10:24	120	West	No	20	12	11	180	65

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Days since Last Snow or Wind Event	Weather Observations	Road Height (cm)	Road Side Width (cm)	Structures Present
1	7/4/2020	10:43	11:13	>14	sun, wind, not many clouds	NA	NA	quarry
2	7/4/2020	12:00	12:30	>14	sunny	NA	NA	mine site
3	7/5/2020	16:45	17:15	>14	NA	100	100	16" pipeline
4	7/4/2020	9:13	9:43	>14	low wind, some sun	NA	NA	blind hill sign on road
5	7/4/2020	11:56	12:26	>14	partly cloudy, minor heat haze	NA	NA	quarry
6	7/4/2020	16:35	17:05	>14	NA	NA	NA	none
7	7/4/2020	17:35	18:04	>14	NA	NA	NA	none
8	7/6/2020	14:38	13:08	>14	NA	NA	NA	none
9	7/6/2020	14:38	13:08	>14	NA	NA	NA	none
10	7/6/2020	8:48	9:18	>14	mostly cloudy	50	50	none
11	7/6/2020	10:34	11:05	>14	NA	NA	NA	none
12	7/6/2020	11:44	11:47	>14	NA	NA	NA	none
13	7/6/2020	9:04	9:34	>14	cloudy, moderate wind	NA	NA	none
14	7/6/2020	10:40	11:10	>14	a bit of sun, clouds	NA	NA	none
15	7/6/2020	11:51	12:28	>14	sun and clouds, wind	300	NA	none
16	7/5/2020	15:30	16:00	>14	NA	50	100	lake between road and caribou
17	7/2/2020	14:15	17:35	>14	heatwaves reduce observation ability	NA	NA	Meliadine lake between mine and caribou
18	7/5/2020	8:47	9:15	>14	sunny	NA	NA	none
19	7/5/2020	9:52	10:24	>14	sunny	200	100	lake between road and caribou
20	7/5/2020	10:45	11:15	>14	sunny	NA	NA	lakes, tundra
21	7/5/2020	12:00	12:30	>14	sunny w/ some clouds	150	200	quarry and outcrops and lakes
22	7/5/2020	13:10	13:40	>14	sunny	150	NA	lakes, tundra
23	7/5/2020	14:25	14:55	>14	NA	150	100	lake
24	7/5/2020	14:55	15:25	>14	NA	NA	NA	road
25	7/5/2020	15:30	16:00	>14	NA	50	100	lake in between road and caribou
26	7/1/2020	18:45	17:15	>14	NA	NA	NA	mine site
27	7/5/2020	8:47	9:15	NA	NA	0	0	Quarry
28	7/4/2020	17:34	18:05	14	NA	0	0	Mine site
29	7/4/2020	16:35	17:06	14	Nothing to stay	0	0	Mine site
30	7/4/2020	12:00	12:31	14	NA	0	0	Quarry
31	7/4/2020	10:30	11:03	14	Nice day	100	200	Boulders
32	7/4/2020	8:56	9:27	14	NA	200	300	Natural esker
33	7/5/2020	12:42	12:43	NA	NA	100	200	Quarry
34	7/17/2020	7:32	7:59	3	Cloudy and windy	200	300	None
35	7/15/2020	12:58	13:08	1	Cloudy and windy	100	150	NA
36	7/15/2020	10:33	11:00	1	Partly cloudy, quite windy	100	100	Explo camp and mine
37	7/14/2020	14:12	14:46	0	Very windy	100	150	NA
38	7/12/2020	9:06	9:32	14	NA	200	400	Lakes
39	7/10/2020	7:39	8:09	14	NA	0	0	Explo camp
40	7/9/2020	13:48	14:20	14	NA	125	175	NA
41	7/9/2020	12:14	12:42	14	NA	100	100	NA
42	7/9/2020	11:30	12:09	14	Thick fog	200	200	Quarry
43	7/9/2020	10:51	11:20	14	NA	150	250	NA
44	7/9/2020	9:43	10:10	14	NA	100	150	Road
45	7/9/2020	8:39	9:12	14	Overcast	200	300	Lake, quarry
46	7/8/2020	8:52	NA	NA	Muggy overcast day	100	100	Close to mine, tractor trailers stopped on road (6)
47	7/6/2020	14:35	15:08	14	Sunny some cloud, gusting winds to 30	100	100	No road north of dyno
48	7/6/2020	12:20	12:23	NA	NA	100	200	NA
49	7/6/2020	11:41	12:13	14	Sunny partly cloudy	100	200	NA
50	7/6/2020	10:37	11:07	14	Sunny with cloud	100	100	NA
51	7/6/2020	8:44	9:21	14	Cloudy some sun	100	100	Quarry
52	7/5/2020	14:30	15:07	NA	Sun, few clouds, some wind	2	3	NA
53	7/5/2020	12:01	12:28	15	NA	150	200	Quarry and rocky outcrops
54	7/5/2020	10:44	11:16	NA	NA	100	100	Lakes,
55	7/5/2020	13:10	13:43	NA	NA	200	150	Rocky outcrop
56	7/5/2020	9:52	10:24	NA	NA	200	100	Lake between road and caribou

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 0	Laying 0	Standing 0	Walking 0	Alert 0	Trotting 0	Comments 0
1	7/4/2020	10:43	11:13	10	3	20	2	0	0	Observing from quarry at km 12
2	7/4/2020	12:00	12:30	11	24	0	0	0	0	NA
3	7/5/2020	16:45	17:15	4	0	1	0	0	95	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	4	10	5	24	0	0	herd size is approximate count, not enough for 50-100 category
5	7/4/2020	11:56	12:26	10	0	8	3	0	0	NA
6	7/4/2020	16:35	17:05	0	10	0	1	0	0	NA
7	7/4/2020	17:35	18:04	20	9	10	21	0	0	no discernable behaviour
8	7/6/2020	14:38	13:08	20	0	0	5	0	0	NA
9	7/6/2020	14:38	13:08	7	0	0	0	1	0	NA
10	7/6/2020	8:48	9:18	27	0	0	7	1	8	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	27	23	0	0	0	0	NA
13	7/6/2020	9:04	9:34	28	0	0	2	0	0	NA
14	7/6/2020	10:40	11:10	11	0	0	1	0	0	sub group of 12
15	7/6/2020	11:51	12:28	85	5	0	10	0	0	percentage of group
16	7/5/2020	15:30	16:00	20	5	0	3	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south, feeding
18	7/5/2020	8:47	9:15	15	2	1	1	0	0	NA
19	7/5/2020	9:52	10:24	11	0	1	3	0	0	NA
20	7/5/2020	10:45	11:15	12	1	1	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	15	0	0	ATV disturbance
22	7/5/2020	13:10	13:40	21	8	0	0	0	0	NA
23	7/5/2020	14:25	14:55	0	13	0	2	0	0	NA
24	7/5/2020	14:55	15:25	12	0	0	10	1	0	NA
25	7/5/2020	15:30	16:00	20	0	0	3	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	0	0	0	5	0	0	NA
28	7/4/2020	17:34	18:05	1	0	1	8	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	5	18	1	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	29	0	0	9	0	0	NA
32	7/4/2020	8:56	9:27	2	0	0	15	0	0	NA
33	7/5/2020	12:42	12:43	3	0	0	0	0	3	NA
34	7/17/2020	7:32	7:59	22	0	0	8	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	4	NA
36	7/15/2020	10:33	11:00	10	14	1	1	0	0	NA
37	7/14/2020	14:12	14:46	30	0	0	5	0	0	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	8	0	1	13	0	0	Explo camp
40	7/9/2020	13:48	14:20	26	2	0	2	0	0	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	14	0	0	0	0	6	Foggy, group seems a little anxious
43	7/9/2020	10:51	11:20	4	0	0	6	1	1	Crossed the road
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	6	0	0	14	0	0	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Female
47	7/6/2020	14:35	15:08	8	5	0	0	0	0	Swanpy area
48	7/6/2020	12:20	12:23	0	2	1	16	2	1	NA
49	7/6/2020	11:41	12:13	5	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	43	0	2	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	NA
52	7/5/2020	14:30	15:07	13	7	1	2	0	0	1 nursing
53	7/5/2020	12:01	12:28	13	0	0	4	1	0	NA
54	7/5/2020	10:44	11:16	2	4	0	6	0	0	NA
55	7/5/2020	13:10	13:43	17	0	2	7	0	0	NA
56	7/5/2020	9:52	10:24	0	0	2	2	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 3	Laying 3	Standing 3	Walking 3	Alert 3	Trotting 3	Comments 3
1	7/4/2020	10:43	11:13	11	4	16	4	0	0	NA
2	7/4/2020	12:00	12:30	13	11	0	0	0	1	NA
3	7/5/2020	16:45	17:15	10	0	10	40	0	40	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	4	10	6	23	0	0	NA
5	7/4/2020	11:56	12:26	0	0	0	18	0	3	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	3 moved into other group
7	7/4/2020	17:35	18:04	6	18	10	26	0	0	blast occurred
8	7/6/2020	14:38	13:08	12	3	0	3	0	4	group down to 22
9	7/6/2020	14:38	13:08	2	2	0	0	1	0	some out of sight
10	7/6/2020	8:48	9:18	21	0	0	7	0	0	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	21	25	0	0	0	0	NA
13	7/6/2020	9:04	9:34	34	0	0	1	0	0	5 came over ridge and joined group
14	7/6/2020	10:40	11:10	12	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	90	5	0	5	0	0	NA
16	7/5/2020	15:30	16:00	40	0	0	4	3	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south, feeding
18	7/5/2020	8:47	9:15	11	8	0	1	0	0	NA
19	7/5/2020	9:52	10:24	15	0	0	0	0	0	NA
20	7/5/2020	10:45	11:15	13	0	0	2	0	0	NA
21	7/5/2020	12:00	12:30	13	0	0	2	0	0	NA
22	7/5/2020	13:10	13:40	19	2	0	3	0	0	NA
23	7/5/2020	14:25	14:55	1	13	1	0	0	0	NA
24	7/5/2020	14:55	15:25	16	0	0	9	1	0	NA
25	7/5/2020	15:30	16:00	19	2	0	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	3	0	0	1	0	1	NA
28	7/4/2020	17:34	18:05	4	0	2	4	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	18	0	3	0	0	Rock babies.
30	7/4/2020	12:00	12:31	14	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	39	0	1	4	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	19	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	6	Ran out of sight
34	7/17/2020	7:32	7:59	23	0	0	5	0	2	NA
35	7/15/2020	12:58	13:08	0	0	0	0	2	2	NA
36	7/15/2020	10:33	11:00	13	8	0	2	0	0	Rest over the hill
37	7/14/2020	14:12	14:46	30	0	0	4	0	0	Heat waves on horizon
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	0	0	0	0	0	1	NA
40	7/9/2020	13:48	14:20	24	0	0	3	0	3	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	16	0	0	3	1	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	They are trotting into the fog, losing sight of them quickly
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	8	0	0	9	0	3	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	NA
47	7/6/2020	14:35	15:08	6	7	0	3	0	0	NA
48	7/6/2020	12:20	12:23	5	0	2	18	1	0	Post disturbance
49	7/6/2020	11:41	12:13	9	28	2	0	0	0	NA
50	7/6/2020	10:37	11:07	9	38	0	3	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of site
52	7/5/2020	14:30	15:07	18	4	1	0	0	0	NA
53	7/5/2020	12:01	12:28	11	0	0	2	2	0	NA
54	7/5/2020	10:44	11:16	5	5	0	0	0	0	NA
55	7/5/2020	13:10	13:43	21	0	0	2	0	0	Some drifted away
56	7/5/2020	9:52	10:24	3	0	0	2	0	0	Walking out of site

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 6	Laying 6	Standing 6	Walking 6	Alert 6	Trotting 6	Comments 6
1	7/4/2020	10:43	11:13	12	5	15	3	0	0	NA
2	7/4/2020	12:00	12:30	13	11	0	0	0	0	NA
3	7/5/2020	16:45	17:15	40	0	20	40	0	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	5	9	7	24	0	0	NA
5	7/4/2020	11:56	12:26	11	0	0	10	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	NA
7	7/4/2020	17:35	18:04	12	17	7	22	0	0	NA
8	7/6/2020	14:38	13:08	8	6	0	2	0	0	group down to 16
9	7/6/2020	14:38	13:08	3	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	41	0	0	2	0	0	NA
11	7/6/2020	10:34	11:05	1	0	0	0	1	0	mother limping
12	7/6/2020	11:44	11:47	24	21	0	0	0	0	NA
13	7/6/2020	9:04	9:34	35	0	0	0	0	0	NA
14	7/6/2020	10:40	11:10	12	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	99	0	0	1	0	0	NA
16	7/5/2020	15:30	16:00	30	0	0	10	1	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking out of sight
18	7/5/2020	8:47	9:15	17	5	0	2	0	0	NA
19	7/5/2020	9:52	10:24	13	0	0	2	0	0	NA
20	7/5/2020	10:45	11:15	4	2	0	9	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	15	ATV dust/whole group running
22	7/5/2020	13:10	13:40	19	1	0	4	0	0	NA
23	7/5/2020	14:25	14:55	0	16	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	3	0	crossed the road, the rest out of sight
25	7/5/2020	15:30	16:00	16	2	2	2	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	6	1	0	2	0	0	NA
28	7/4/2020	17:34	18:05	80	0	4	15	0	1	Percent of large herd
29	7/4/2020	16:35	17:06	4	19	0	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	1	4	0	1	NA
31	7/4/2020	10:30	11:03	42	0	1	1	0	0	NA
32	7/4/2020	8:56	9:27	0	0	0	23	0	0	Some are out of site
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	18	0	0	10	1	1	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	4	Out of sight
36	7/15/2020	10:33	11:00	13	4	0	6	0	0	Rest over the hill
37	7/14/2020	14:12	14:46	34	0	0	5	0	0	Some showing up on horizon
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	10	4	2	7	1	1	1 nursing,cute. 1 scratching self, both as standing
40	7/9/2020	13:48	14:20	10	0	0	3	0	17	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	1	0	0	0	1	18	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	11	0	0	0	0	9	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	Out of sight after crossing road, came back into sight
47	7/6/2020	14:35	15:08	6	8	1	1	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	8	27	1	1	0	0	NA
50	7/6/2020	10:37	11:07	12	36	0	3	0	1	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	16	5	0	2	0	0	NA
53	7/5/2020	12:01	12:28	0	0	0	0	5	13	NA
54	7/5/2020	10:44	11:16	2	2	0	6	0	0	NA
55	7/5/2020	13:10	13:43	18	0	0	3	0	0	NA
56	7/5/2020	9:52	10:24	4	0	0	3	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 9	Laying 9	Standing 9	Walking 9	Alert 9	Trotting 9	Comments 9
1	7/4/2020	10:43	11:13	18	7	6	4	0	0	NA
2	7/4/2020	12:00	12:30	11	12	0	0	0	1	2 nursing
3	7/5/2020	16:45	17:15	0	0	0	98	0	2	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	3	3	26	13	0	0	NA
5	7/4/2020	11:56	12:26	35	0	0	5	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	NA
7	7/4/2020	17:35	18:04	5	23	0	32	0	0	NA
8	7/6/2020	14:38	13:08	10	6	0	0	0	0	NA
9	7/6/2020	14:38	13:08	3	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	65	0	3	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	2	0	0	NA
12	7/6/2020	11:44	11:47	22	24	0	0	0	0	NA
13	7/6/2020	9:04	9:34	34	0	0	1	0	0	NA
14	7/6/2020	10:40	11:10	10	0	0	0	0	0	2 of group out of sight
15	7/6/2020	11:51	12:28	99	0	0	1	9	9	NA
16	7/5/2020	15:30	16:00	15	0	0	25	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	10	3	0	7	0	0	NA
19	7/5/2020	9:52	10:24	12	2	1	0	0	0	NA
20	7/5/2020	10:45	11:15	9	1	1	4	0	0	NA
21	7/5/2020	12:00	12:30	1	0	0	1	0	0	all but 2 have gone
22	7/5/2020	13:10	13:40	21	3	0	0	0	0	NA
23	7/5/2020	14:25	14:55	0	14	0	1	0	0	ATV dust
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	all out of sight
25	7/5/2020	15:30	16:00	18	0	0	4	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	5	2	0	1	0	1	NA
28	7/4/2020	17:34	18:05	19	0	0	1	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	20	0	1	0	0	NA
30	7/4/2020	12:00	12:31	12	0	0	7	0	0	NA
31	7/4/2020	10:30	11:03	40	0	0	3	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	13	0	1	Trailing group starting to merge with larger group
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	3	0	0	1	0	26	Heading SW, caribou trotting are catching up the ones walking
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	Out of sight
36	7/15/2020	10:33	11:00	16	2	0	6	0	1	Located on the edge of the hill
37	7/14/2020	14:12	14:46	14	0	0	8	0	10	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	20	0	0	3	0	2	Appear to be bothered by bugs
40	7/9/2020	13:48	14:20	6	0	1	12	0	11	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	5	0	0	0	0	15	NA
43	7/9/2020	10:51	11:20	1	0	0	11	0	0	They have gone about 700m from our position on the road
44	7/9/2020	9:43	10:10	0	0	0	1	0	0	Way too far for pictures
45	7/9/2020	8:39	9:12	14	0	0	6	0	0	NA
46	7/8/2020	8:52	NA	0	0	0	0	1	0	50m from road
47	7/6/2020	14:35	15:08	9	11	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	6	30	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	39	0	3	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	10	6	2	4	1	0	NA
53	7/5/2020	12:01	12:28	0	0	0	18	0	0	Walking out of sight away from road
54	7/5/2020	10:44	11:16	2	5	1	3	0	0	Some merged with larger
55	7/5/2020	13:10	13:43	12	0	0	7	0	0	On road
56	7/5/2020	9:52	10:24	2	0	3	4	0	0	Walking out of site

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 12	Laying 12	Standing 12	Walking 12	Alert 12	Trotting 12	Comments 12
1	7/4/2020	10:43	11:13	3	14	5	13	0	0	NA
2	7/4/2020	12:00	12:30	9	9	4	1	0	0	11 nursing
3	7/5/2020	16:45	17:15	0	0	0	98	2	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	8	4	27	10	0	0	NA
5	7/4/2020	11:56	12:26	30	0	0	10	0	0	NA
6	7/4/2020	16:35	17:05	1	7	0	0	0	0	NA
7	7/4/2020	17:35	18:04	5	16	4	2	0	0	group down to 27, 33 walked to join larger group
8	7/6/2020	14:38	13:08	10	6	2	0	0	0	2 calves came into group
9	7/6/2020	14:38	13:08	2	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	31	0	0	13	0	12	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	19	26	0	1	0	0	NA
13	7/6/2020	9:04	9:34	18	0	0	4	0	0	group down to 22, some went over ridge
14	7/6/2020	10:40	11:10	10	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	98	1	0	1	0	0	NA
16	7/5/2020	15:30	16:00	25	0	0	10	0	5	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	11	4	0	5	0	0	NA
19	7/5/2020	9:52	10:24	14	1	0	0	0	0	NA
20	7/5/2020	10:45	11:15	11	0	0	4	0	0	NA
21	7/5/2020	12:00	12:30	3	0	0	1	0	0	some have returned and ATV return
22	7/5/2020	13:10	13:40	22	3	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	10	2	1	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	17	0	0	5	0	0	NA
26	7/1/2020	18:45	17:15	30	0	0	20	0	0	NA
27	7/5/2020	8:47	9:15	7	3	0	1	0	0	1 cow nursing
28	7/4/2020	17:34	18:05	0	0	1	19	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	21	0	0	0	0	NA
30	7/4/2020	12:00	12:31	19	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	35	0	0	11	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	18	0	1	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	5	0	0	14	0	11	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	7	2	0	2	2	2	Rest over the hill
37	7/14/2020	14:12	14:46	3	0	1	40	0	5	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	24	0	0	7	0	3	NA
40	7/9/2020	13:48	14:20	17	0	0	6	1	6	NA
41	7/9/2020	12:14	12:42	0	0	0	10	0	10	NA
42	7/9/2020	11:30	12:09	14	0	0	6	0	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	NA
44	7/9/2020	9:43	10:10	0	0	0	1	0	0	Fog rolled in, visibilty getting worse at a distance
45	7/9/2020	8:39	9:12	6	0	0	11	1	2	NA
46	7/8/2020	8:52	NA	0	0	0	1	0	0	NA
47	7/6/2020	14:35	15:08	7	11	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	8	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	0	0	0	0	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	10	5	4	4	0	0	1 nursing
53	7/5/2020	12:01	12:28	0	0	0	0	0	0	All out of sight
54	7/5/2020	10:44	11:16	2	4	1	4	1	0	NA
55	7/5/2020	13:10	13:43	18	0	0	3	0	0	NA
56	7/5/2020	9:52	10:24	1	0	0	8	0	0	On ridge

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 15	Laying 15	Standing 15	Walking 15	Alert 15	Trotting 15	Comments 15
1	7/4/2020	10:43	11:13	4	12	18	1	0	0	NA
2	7/4/2020	12:00	12:30	11	8	0	3	0	3	NA
3	7/5/2020	16:45	17:15	70	0	0	30	0	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	6	3	32	6	0	0	NA
5	7/4/2020	11:56	12:26	40	0	0	0	0	0	NA
6	7/4/2020	16:35	17:05	0	7	1	0	0	0	NA
7	7/4/2020	17:35	18:04	6	19	0	2	0	0	NA
8	7/6/2020	14:38	13:08	11	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	2	1	1	2	0	0	NA
10	7/6/2020	8:48	9:18	20	0	0	1	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	1	0	0	NA
12	7/6/2020	11:44	11:47	19	30	0	0	0	0	NA
13	7/6/2020	9:04	9:34	21	0	0	1	0	0	NA
14	7/6/2020	10:40	11:10	19	0	0	4	0	0	number of caribou increased to 22
15	7/6/2020	11:51	12:28	99	1	0	0	0	0	NA
16	7/5/2020	15:30	16:00	20	0	0	0	0	20	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking S, some out of sight
18	7/5/2020	8:47	9:15	15	1	0	4	0	0	NA
19	7/5/2020	9:52	10:24	11	2	0	1	0	0	NA
20	7/5/2020	10:45	11:15	11	1	0	3	0	0	NA
21	7/5/2020	12:00	12:30	4	0	0	0	0	0	hunting disturbance
22	7/5/2020	13:10	13:40	22	1	0	1	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	1	0	0	the rest out of sight
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	19	0	0	3	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	2	2	1	6	0	0	NA
28	7/4/2020	17:34	18:05	0	0	0	1	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	4	22	1	1	0	1	NA
30	7/4/2020	12:00	12:31	17	0	0	2	0	0	Caribou very fluid
31	7/4/2020	10:30	11:03	38	0	0	12	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	19	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	5	0	0	20	1	4	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	5	0	0	0	0	0	NA
37	7/14/2020	14:12	14:46	1	0	0	3	0	0	Rest are out of sight
38	7/12/2020	9:06	9:32	0	0	0	1	0	0	NA
39	7/10/2020	7:39	8:09	5	0	0	10	0	10	NA
40	7/9/2020	13:48	14:20	10	0	0	12	1	7	NA
41	7/9/2020	12:14	12:42	10	0	0	0	0	10	Getting further away, cant see well from such a distance
42	7/9/2020	11:30	12:09	0	0	0	17	0	3	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	No visual
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual, foggy
45	7/9/2020	8:39	9:12	0	0	1	14	0	5	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	NA
47	7/6/2020	14:35	15:08	4	13	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	0	0	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	39	0	2	0	0	NA
51	7/6/2020	8:44	9:21	2	0	0	0	0	0	Found caribou with a new partner
52	7/5/2020	14:30	15:07	0	0	3	20	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	1	0	Out of site
54	7/5/2020	10:44	11:16	3	8	0	0	1	0	NA
55	7/5/2020	13:10	13:43	14	0	0	2	0	0	One crossed road
56	7/5/2020	9:52	10:24	1	0	0	7	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 18	Laying 18	Standing 18	Walking 18	Alert 18	Trotting 18	Comments 18
1	7/4/2020	10:43	11:13	17	17	0	1	0	0	Group starting to diverge
2	7/4/2020	12:00	12:30	8	15	1	1	0	0	NA
3	7/5/2020	16:45	17:15	20	5	0	15	0	11	11 crossed ramp over pipeline
4	7/4/2020	9:13	9:43	8	0	17	20	0	0	NA
5	7/4/2020	11:56	12:26	35	0	0	5	0	0	NA
6	7/4/2020	16:35	17:05	0	7	0	1	0	0	NA
7	7/4/2020	17:35	18:04	0	8	0	12	0	0	group dispersed more
8	7/6/2020	14:38	13:08	8	6	0	0	0	0	group down to 18
9	7/6/2020	14:38	13:08	1	1	0	0	0	2	NA
10	7/6/2020	8:48	9:18	12	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	Disappeared over ridge
12	7/6/2020	11:44	11:47	19	27	0	0	0	0	NA
13	7/6/2020	9:04	9:34	19	0	0	3	0	0	NA
14	7/6/2020	10:40	11:10	20	0	0	2	0	0	NA
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	5	0	0	10	2	0	NA
17	7/2/2020	14:15	17:35	0	0	0	20	0	0	walking south
18	7/5/2020	8:47	9:15	13	2	0	5	0	0	NA
19	7/5/2020	9:52	10:24	9	4	0	2	0	0	NA
20	7/5/2020	10:45	11:15	9	2	2	2	0	0	NA
21	7/5/2020	12:00	12:30	3	0	0	0	1	0	hunting shots
22	7/5/2020	13:10	13:40	21	0	0	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	22	0	0	0	0	0	NA
26	7/1/2020	18:45	17:15	20	0	0	0	0	0	out of sight
27	7/5/2020	8:47	9:15	5	5	0	0	0	0	NA
28	7/4/2020	17:34	18:05	1	0	0	6	0	3	Percent of large herd. Bab very smol
29	7/4/2020	16:35	17:06	6	21	0	1	0	2	The babies are sooo cute. Also, they pranced onto the scene.
30	7/4/2020	12:00	12:31	17	0	0	7	0	0	NA
31	7/4/2020	10:30	11:03	46	6	2	0	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	22	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	3	0	0	11	0	16	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	3	0	0	1	1	0	NA
37	7/14/2020	14:12	14:46	0	0	0	0	0	1	Rest are out of sight
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	10	0	0	5	0	11	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	Out of sight
41	7/9/2020	12:14	12:42	10	0	0	0	0	10	0
42	7/9/2020	11:30	12:09	7	0	0	13	0	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	Still no visual
45	7/9/2020	8:39	9:12	3	0	0	16	0	1	NA
46	7/8/2020	8:52	NA	0	1	0	0	0	0	Flopped down in marsh
47	7/6/2020	14:35	15:08	5	9	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	4	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	18	28	0	1	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	1	NA
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	Group blended in with rest of the herd.
53	7/5/2020	12:01	12:28	1	0	0	1	1	0	NA
54	7/5/2020	10:44	11:16	4	5	0	1	0	0	Hard to see calves
55	7/5/2020	13:10	13:43	15	0	0	4	1	0	NA
56	7/5/2020	9:52	10:24	4	0	0	2	0	0	In and out of site on ridge

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 21	Laying 21	Standing 21	Walking 21	Alert 21	Trotting 21	Comments 21
1	7/4/2020	10:43	11:13	2	18	0	0	0	0	Group starting to diverge
2	7/4/2020	12:00	12:30	7	15	2	1	0	0	NA
3	7/5/2020	16:45	17:15	80	10	0	10	0	0	10 crossed ramp over pipeline
4	7/4/2020	9:13	9:43	2	0	38	20	0	0	up to approximately 30
5	7/4/2020	11:56	12:26	25	0	0	15	0	0	NA
6	7/4/2020	16:35	17:05	4	8	0	0	0	0	4 joined group from other group
7	7/4/2020	17:35	18:04	0	1	0	17	0	0	group joining larger group
8	7/6/2020	14:38	13:08	8	6	0	0	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	only calf visible
10	7/6/2020	8:48	9:18	13	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	disappeared over ridge
12	7/6/2020	11:44	11:47	19	22	0	0	0	0	NA
13	7/6/2020	9:04	9:34	6	0	0	0	0	0	grroup down to 6, others went over ridge
14	7/6/2020	10:40	11:10	21	0	0	1	0	0	NA
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	0	0	0	0	0	40	NA
17	7/2/2020	14:15	17:35	0	0	0	20	0	0	walking south
18	7/5/2020	8:47	9:15	12	1	1	7	0	0	NA
19	7/5/2020	9:52	10:24	7	5	0	3	0	0	NA
20	7/5/2020	10:45	11:15	10	4	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	3	3	hunting shots
22	7/5/2020	13:10	13:40	20	2	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	7	0	0	3	2	10	NA
26	7/1/2020	18:45	17:15	20	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	6	0	0	0	0	1 nursing, some merged with larger group
28	7/4/2020	17:34	18:05	7	0	0	3	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	7	22	0	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	0	4	0	1	NA
31	7/4/2020	10:30	11:03	44	6	0	2	0	0	NA
32	7/4/2020	8:56	9:27	5	0	0	15	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	1	0	29	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	4	0	0	1	0	0	NA
37	7/14/2020	14:12	14:46	0	0	0	15	0	34	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	0	0	0	23	0	2	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	Out of sight
41	7/9/2020	12:14	12:42	13	0	0	7	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Group veered north to join much larger herd crossing road to east
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	4	0	0	16	0	0	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	NA
47	7/6/2020	14:35	15:08	5	8	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	2	19	0	6	0	0	NA
50	7/6/2020	10:37	11:07	19	18	0	0	0	0	Many have moved out of sight
51	7/6/2020	8:44	9:21	0	0	0	2	0	0	NA
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	1	0	NA
54	7/5/2020	10:44	11:16	3	7	0	2	0	0	NA
55	7/5/2020	13:10	13:43	14	0	0	5	0	0	NA
56	7/5/2020	9:52	10:24	1	0	0	4	1	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 24	Laying 24	Standing 24	Walking 24	Alert 24	Trotting 24	Comments 24
1	7/4/2020	10:43	11:13	0	19	0	0	0	0	Group down to 19 visible, some went over ridge
2	7/4/2020	12:00	12:30	9	15	1	0	0	0	NA
3	7/5/2020	16:45	17:15	80	10	0	10	0	0	40 crossed ramp
4	7/4/2020	9:13	9:43	4	10	43	3	0	0	NA
5	7/4/2020	11:56	12:26	33	0	0	7	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	4 left, straggling feeders
7	7/4/2020	17:35	18:04	0	0	0	18	0	0	still working towards larger group
8	7/6/2020	14:38	13:08	7	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	NA
10	7/6/2020	8:48	9:18	13	5	0	0	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	disappeared over ridge
12	7/6/2020	11:44	11:47	16	31	0	0	0	0	NA
13	7/6/2020	9:04	9:34	2	0	0	2	0	0	group down to 4, others went over ridge
14	7/6/2020	10:40	11:10	22	0	0	4	0	0	4 more joined
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	0	0	0	40	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	13	1	1	5	0	0	NA
19	7/5/2020	9:52	10:24	6	7	1	1	0	0	NA
20	7/5/2020	10:45	11:15	7	3	0	5	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	8	0	0	NA
22	7/5/2020	13:10	13:40	18	0	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	19	2	0	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	7	6	2	0	0	0	1 nursing
28	7/4/2020	17:34	18:05	4	0	1	5	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	8	21	1	0	0	0	NA
30	7/4/2020	12:00	12:31	12	0	0	9	0	0	NA
31	7/4/2020	10:30	11:03	53	6	0	3	0	0	NA
32	7/4/2020	8:56	9:27	2	2	1	15	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	5	Rest are out of sight over the hill
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	3	0	0	4	0	1	NA
37	7/14/2020	14:12	14:46	6	0	0	16	0	31	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	17	0	0	9	1	5	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	NA
41	7/9/2020	12:14	12:42	0	0	0	20	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Have joined large group
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	3	0	0	15	0	2	NA
46	7/8/2020	8:52	NA	0	0	0	0	1	0	50 m from road
47	7/6/2020	14:35	15:08	6	12	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	2	19	0	7	0	0	NA
50	7/6/2020	10:37	11:07	14	19	0	2	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	Partner is now out of sight
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	1	2	0	NA
54	7/5/2020	10:44	11:16	2	8	0	0	0	0	NA
55	7/5/2020	13:10	13:43	14	0	0	4	1	0	NA
56	7/5/2020	9:52	10:24	3	0	0	21	2	0	Some appeared on ridge

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 27	Laying 27	Standing 27	Walking 27	Alert 27	Trotting 27	Comments 27
1	7/4/2020	10:43	11:13	0	18	1	0	0	0	NA
2	7/4/2020	12:00	12:30	10	15	1	0	0	0	NA
3	7/5/2020	16:45	17:15	30	10	0	30	0	30	46 crossed ramp
4	7/4/2020	9:13	9:43	5	0	35	20	0	0	NA
5	7/4/2020	11:56	12:26	33	0	0	7	0	0	NA
6	7/4/2020	16:35	17:05	0	6	2	0	0	0	NA
7	7/4/2020	17:35	18:04	11	0	0	7	0	0	NA
8	7/6/2020	14:38	13:08	7	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	NA
10	7/6/2020	8:48	9:18	14	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	19	31	0	1	0	0	NA
13	7/6/2020	9:04	9:34	0	0	0	0	0	0	out of sight
14	7/6/2020	10:40	11:10	26	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	90	10	0	0	0	0	NA
16	7/5/2020	15:30	16:00	9	0	0	10	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	6	3	1	10	0	0	NA
19	7/5/2020	9:52	10:24	2	8	1	4	0	0	NA
20	7/5/2020	10:45	11:15	12	2	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	0	all out of sight
22	7/5/2020	13:10	13:40	18	1	1	3	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	20	2	0	2	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	4	2	4	0	0	NA
28	7/4/2020	17:34	18:05	44	0	0	5	0	1	Percent of large herd
29	7/4/2020	16:35	17:06	7	23	0	1	0	0	NA
30	7/4/2020	12:00	12:31	15	0	0	5	0	0	NA
31	7/4/2020	10:30	11:03	50	6	0	2	0	0	NA
32	7/4/2020	8:56	9:27	9	2	0	11	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	5	0	0	0	0	0	NA
37	7/14/2020	14:12	14:46	18	0	0	9	0	28	The ones running are trying to catch up with the group
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	17	0	0	7	0	1	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	NA
41	7/9/2020	12:14	12:42	20	0	0	0	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	12	0	0	7	0	0	Some out of sight
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Running out of sight
47	7/6/2020	14:35	15:08	1	10	1	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	10	14	0	2	0	0	NA
50	7/6/2020	10:37	11:07	13	27	0	0	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	1	NA
52	7/5/2020	14:30	15:07	0	0	0	0	0	0	50% walking and 50% eating
53	7/5/2020	12:01	12:28	0	0	0	0	3	4	NA
54	7/5/2020	10:44	11:16	2	8	0	0	0	0	NA
55	7/5/2020	13:10	13:43	10	0	1	0	0	0	NA
56	7/5/2020	9:52	10:24	2	0	0	1	0	0	Out of site

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 30	Laying 30	Standing 30	Walking 30	Alert 30	Trotting 30	Comments 30
1	7/4/2020	10:43	11:13	0	18	1	0	0	0	NA
2	7/4/2020	12:00	12:30	10	14	1	1	0	0	NA
3	7/5/2020	16:45	17:15	30	10	0	20	0	40	64 crossed ramp
4	7/4/2020	9:13	9:43	5	0	40	15	0	0	NA
5	7/4/2020	11:56	12:26	20	0	0	20	0	0	NA
6	7/4/2020	16:35	17:05	4	5	0	6	0	0	NA
7	7/4/2020	17:35	18:04	18	0	0	0	0	0	NA
8	7/6/2020	14:38	13:08	6	8	0	0	0	0	NA
9	7/6/2020	14:38	13:08	1	1	0	0	0	0	mother of calf back in sight
10	7/6/2020	8:48	9:18	11	4	0	2	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	1	1	0	NA
12	7/6/2020	11:44	11:47	11	31	1	0	0	0	NA
13	7/6/2020	9:04	9:34	0	0	0	0	0	0	out of sight
14	7/6/2020	10:40	11:10	22	0	0	4	0	0	NA
15	7/6/2020	11:51	12:28	80	20	0	0	0	0	NA
16	7/5/2020	15:30	16:00	20	0	0	20	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	14	0	0	6	0	0	NA
19	7/5/2020	9:52	10:24	1	5	0	0	0	0	rest out of sight
20	7/5/2020	10:45	11:15	11	3	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	0	ATV disturbance
22	7/5/2020	13:10	13:40	19	6	0	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	20	0	1	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	6	0	2	0	0	NA
28	7/4/2020	17:34	18:05	1	0	0	0	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	7	23	0	2	0	0	NA
30	7/4/2020	12:00	12:31	11	0	1	1	0	0	NA
31	7/4/2020	10:30	11:03	54	6	0	5	0	0	NA
32	7/4/2020	8:56	9:27	9	2	0	11	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	1	0	1	1	0	0	NA
37	7/14/2020	14:12	14:46	27	0	0	5	0	23	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	22	0	0	5	0	1	They have approched the truck
40	7/9/2020	13:48	14:20	5	0	0	0	0	25	NA
41	7/9/2020	12:14	12:42	20	0	0	0	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Out of sight
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	3	0	0	14	0	3	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Trotted back across road to east
47	7/6/2020	14:35	15:08	6	10	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	1	8	0	12	0	0	NA
50	7/6/2020	10:37	11:07	20	21	0	4	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	NA
52	7/5/2020	14:30	15:07	20	0	0	3	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	0	0	NA
54	7/5/2020	10:44	11:16	1	7	1	0	0	0	NA
55	7/5/2020	13:10	13:43	7	0	0	6	1	3	Walked away from road
56	7/5/2020	9:52	10:24	0	0	0	12	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Disturbance 0	Dist comments 0	Disturbance 3
1	7/4/2020	10:43	11:13	NA	NA	NA
2	7/4/2020	12:00	12:30	Haul Truck	noise in background	NA
3	7/5/2020	16:45	17:15	Waterline	Entire group passed over pipeline at the Atv ramp, except for 2 individuals that jumped the pipeline - the last of the group crossed at 17:58	Waterline
4	7/4/2020	9:13	9:43	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA
10	7/6/2020	8:48	9:18	Light Truck	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA
21	7/5/2020	12:00	12:30	ATV	NA	NA
22	7/5/2020	13:10	13:40	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	Blast
29	7/4/2020	16:35	17:06	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA
32	7/4/2020	8:56	9:27	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA
35	7/15/2020	12:58	13:08	Light Truck	Us, tye caribou saw us before we saw them	NA
36	7/15/2020	10:33	11:00	NA	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA
38	7/12/2020	9:06	9:32	Convoy	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	laintenance Vehicl
42	7/9/2020	11:30	12:09	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA
46	7/8/2020	8:52	NA	NA	Sound of haul trucks in distance for duration of survey	NA
47	7/6/2020	14:35	15:08	NA	NA	NA
48	7/6/2020	12:20	12:23	Convoy	Haul trucks were tractor trailers and maintenance vehiclea were school buses	NA
49	7/6/2020	11:41	12:13	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	ATV
52	7/5/2020	14:30	15:07	NA	NA	NA
53	7/5/2020	12:01	12:28	ATV	Atvs pulled up and stopped 200m from road	NA
54	7/5/2020	10:44	11:16	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA

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Survey ID	Date	Start Time	End Time	Dist Comments 3	Disturbance 6	Dist Comments 6	Disturbance 9	Dist Comments 9	Disturbance 12	Dist Comments 12
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	NA	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	Blast	underground blast	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	ATV	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	Blast	underground blast
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	ATV	NA	NA	NA	ATV	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	ATV	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	NA	NA	NA
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA	NA	NA	NA	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	NA	Light Truck	re on, going more tha	Convoy	NA	Light Truck	Beacons are on, going more than 15 km/h
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	Haul Truck	Tractor trailer	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	Haul Truck	ed, it was driving at	NA	NA	NA	NA
46	7/8/2020	8:52	NA	NA	NA	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	ATV	NA	NA	NA
53	7/5/2020	12:01	12:28	NA	ATV	Atvs resumed running	NA	NA	NA	NA
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA	NA	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA	NA

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Survey ID	Date	Start Time	End Time	Disturbance 15	Dist Comments 15	Disturbance 18	Dist Comments 18	Disturbance 21	Dist Comments 21
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	Convoy	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	Hunter	3 gunshots from south
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	NA	Hunter	NA	Hunter	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	Hunter	shooting	NA	NA
26	7/1/2020	18:45	17:15	Blast	surface blast	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	ATV	2 ATVs on AWAR
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA	NA	Light Truck	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	NA	NA	Light Truck	Beacons are on, going more than 15 km/h	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA	NA	NA	NA
46	7/8/2020	8:52	NA	NA	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	NA	NA	NA
53	7/5/2020	12:01	12:28	ATV	Southbound atv	NA	NA	NA	NA
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA

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Survey ID	Date	Start Time	End Time	Disturbance 24	Dist Comments 24	Disturbance 27	Dist Comments 27	Disturbance 30	Dist Comments 30
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	Convoy	2 light trucks, 3 tractor trailers, 2 school busses - slightly after end of survey
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	ATV	Two atvs on AWAR
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	Light Truck	NA	NA	NA	NA	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	Light Truck	NA	NA	NA	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	Convoy	4 buses, 2 flatbeds & hino
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA	NA	NA	NA
46	7/8/2020	8:52	NA	ATV	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	NA	NA	NA
53	7/5/2020	12:01	12:28	NA	NA	Hunter	NA	Hunter	Hunters
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	Light Truck	NA	NA	NA	Light Truck	Atv drove by but pickup still stopped
56	7/5/2020	9:52	10:24	Light Truck	NA	NA	NA	NA	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	General Comments
1	7/4/2020	10:43	11:13	NA
2	7/4/2020	12:00	12:30	Haul truck noise in background
3	7/5/2020	16:45	17:15	Entire group passed over pipeline at the Atv ramp, except for 2 individuals that jumped the pipeline - the last of the group crossed at 17:58
4	7/4/2020	9:13	9:43	larger herd approximately 5km from road
5	7/4/2020	11:56	12:26	NA
6	7/4/2020	16:35	17:05	not road survey, surveying herd on E side
7	7/4/2020	17:35	18:04	group on opposite side of water
8	7/6/2020	14:38	13:08	NA
9	7/6/2020	14:38	13:08	NA
10	7/6/2020	8:48	9:18	NA
11	7/6/2020	10:34	11:05	NA
12	7/6/2020	11:44	11:47	Convoy = 2 light trucks, 3 tractor trailers, 2 school busses - noted that most caribou got up from laying down and began walking, definitely some disturbance - photos 9211, 9212
13	7/6/2020	9:04	9:34	NA
14	7/6/2020	10:40	11:10	NA
15	7/6/2020	11:51	12:28	time recorded for convay was 12:20 so I calculated the interval based on the end time of the survey
16	7/5/2020	15:30	16:00	3 gunshots from south
17	7/2/2020	14:15	17:35	NA
18	7/5/2020	8:47	9:15	NA
19	7/5/2020	9:52	10:24	NA
20	7/5/2020	10:45	11:15	NA
21	7/5/2020	12:00	12:30	NA
22	7/5/2020	13:10	13:40	NA
23	7/5/2020	14:25	14:55	NA
24	7/5/2020	14:55	15:25	NA
25	7/5/2020	15:30	16:00	shooting
26	7/1/2020	18:45	17:15	surface blast occurred at 19:00 at pit 2km south of survey location. Video DSC_0011.MOV
27	7/5/2020	8:47	9:15	NA
28	7/4/2020	17:34	18:05	Blast reaction survey
29	7/4/2020	16:35	17:06	Members changing fluidly, part of larger group
30	7/4/2020	12:00	12:31	Heat haze, distance
31	7/4/2020	10:30	11:03	Heat haze, caribou sometimes obscured by slopes, extreme distance.
32	7/4/2020	8:56	9:27	Group approximately 2 km from AWAR, heatwaves making observations difficult.
33	7/5/2020	12:42	12:43	Group ran out of sight almost immediately. Was about to cross the road but turned around and ran. No distyrbance identified but recent gunshots may have the group on edge
34	7/17/2020	7:32	7:59	Heading SW
35	7/15/2020	12:58	13:08	Two cows and two calves
36	7/15/2020	10:33	11:00	NA
37	7/14/2020	14:12	14:46	NA
38	7/12/2020	9:06	9:32	Lots of mosquitoes
39	7/10/2020	7:39	8:09	Lots of bugs, appeared to bother them caribou
40	7/9/2020	13:48	14:20	A lot of mosquitoes and almost no wind, there a loads of mosquitoes after us They ran along the road and crossed several times
41	7/9/2020	12:14	12:42	NA
42	7/9/2020	11:30	12:09	NA
43	7/9/2020	10:51	11:20	NA
44	7/9/2020	9:43	10:10	Fog rolled in half way
45	7/9/2020	8:39	9:12	Group spread out in a line heading south, suspect mostly males, a few calves
46	7/8/2020	8:52	NA	Stopped on side of road behind tractor trailer convoy, female running around and calf sleeping under tractor trailer. As it turns out it was the mother looking for tye calf
47	7/6/2020	14:35	15:08	NA
48	7/6/2020	12:20	12:23	Disturbance convoy observation
49	7/6/2020	11:41	12:13	NA
50	7/6/2020	10:37	11:07	Watching subset and now have merged
51	7/6/2020	8:44	9:21	NA
52	7/5/2020	14:30	15:07	NA
53	7/5/2020	12:01	12:28	Crossing the quarry, running out of sight
54	7/5/2020	10:44	11:16	Generally part of large herd
55	7/5/2020	13:10	13:43	NA
56	7/5/2020	9:52	10:24	Group in and out of site on ridge

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APPENDIX E

Collared Caribou Meliadine AWAR Interactions Memo

TECHNICAL MEMORANDUM

DATE January 08, 2021 **Project No.** 20351262-822-TM-Rev0

TO Jamie Quesnel and Michel Groleau
Agnico Eagle Mines Limited

CC Jen Range (Golder)

FROM Dan Coulton, Corey De La Mare **EMAIL corey_delamare@golder.com**

COLLARED CARIBOU MELIADINE AWAR INTERACTIONS

1.0 INTRODUCTION

During a meeting on December 17, 2020 with the Sayisi Dene First Nation (SDFN) regarding the proposed waterline addendum for the Meliadine Mine, the response by Agnico Eagle Mines Limited (Agnico Eagle) to SDFN-TRC-01 (Agnico Eagle 2020) was discussed. The response to SDFN-TRC-01 included an analysis of 2019 collared caribou from the Qamanirjuaq (QAM) caribou herd present in the Local Study Area (LSA) and whether their movement paths crossed the All-Weather Access Road (AWAR). Review of collared caribou movements in 2019 indicated that of the 13 collared caribou that entered the LSA, 12 (92%) had paths showing movement across the AWAR. The one other collared caribou that also entered the LSA had a movement path with no potential to interact with the AWAR and move across it. Agnico Eagle committed to provide a historical annual summary of collared caribou interactions with the AWAR for all caribou collar data available and provided to Agnico Eagle from the Government of Nunavut.

2.0 METHODS

Construction of Phase 1 of the AWAR began in April 2012 and was completed in fall of 2013, with construction suspended during non-frozen conditions in 2012 and 2013 (i.e., typically mid-May to mid-October). Consequently, individual caribou from the QAM herd had the potential to encounter the AWAR beginning in the summer of 2014. The LSA is delineated by a 1.5 km buffer around the Meliadine Mine, AWAR, and the proposed Discovery Road. The AWAR exhibits a general north-south alignment. While the intended interest is the frequency of collared caribou crossing the AWAR, to maximize the number of caribou with the potential to interact with the AWAR and associated mining infrastructure, all caribou interacting with the LSA buffer (i.e.,1.5 km) around the AWAR, Meliadine Mine and the proposed Discovery Road to evaluate AWAR crossings were included as a precautionary approach. Analysis of QAM collared caribou data indicates that animals typically move through the LSA during late June to mid-July annually, which is the post-calving period (Nuqsana Golder 2020).

To generate movement paths, consecutive telemetry locations occurring within the LSA were connected with a straight line for each individual collared caribou. Each movement path was then reviewed to determine whether it showed movement across the AWAR or not. Paths that did not exhibit movement across the AWAR were qualified as either having no potential to move across, based on previous movement direction, or deflected. Individuals with no potential to cross the AWAR would be present in the LSA but not have a path moving toward the AWAR. For example, an individual path could enter and exit the LSA and not traverse opposite LSA boundaries (e.g., enter and

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exit the east and west LSA boundaries or animals could have a parallel movement trajectory to the AWAR). Individuals were qualified as deflected if their path moved toward the AWAR but exhibited an approximately 90 degree turn or larger and did not move closer to the AWAR again. The cause of deflected movements is unknown and could be due to a number of factors including habitat selection/avoidance (i.e., lakes/ponds), predation risk, harvest pressure or disturbance (i.e., vehicles/ATVs on the AWAR). Observations of the number of caribou that crossed the AWAR, did not cross the AWAR or were determined to have deflected were tabulated by year. Patterns related to movement paths that did not cross the AWAR were evaluated further. Movement path maps were also generated for each year.

3.0 RESULTS

The total number of collared QAM caribou present in the LSA varied from 4 in 2014 to 48 in 2017 (Table 1). Relative to the number of collared caribou present in the LSA, the percent that exhibited movements across the AWAR ranged from 71% (in 2016 and 2017) to 93% (in 2018) (Table 1, Figures 1 to 6). Over all years, 81% (132 of 163) of movement paths within the LSA crossed the AWAR.

Table 1: Movements Summary of Collared Qamanirjuaq Caribou in the Local Study Area, 2014 to 2019

Year	Total Collared Caribou in LSA	Crossed AWAR (%)	Did not Cross AWAR (%)
2014	4	3 (75%)	1 (25%)
2015	30	26 (87%)	4 (13%)
2016	28	20 (71%)	8 (29%)
2017	48	34 (71%)	14 (29%)
2018	40	37 (93%)	3 (7%)
2019	13	12 (92%)	1 (8%)
Total	**163**	**132 (81%)**	**31 (19%)**

AWAR = All-Weather Access Road; LSA = Local Study Area.
Note: the LSA is a 1.5 km buffer area around the Meliadine Mine, AWAR, and proposed Discovery Road.

Review of the 31 collared caribou movements that did not cross the AWAR indicated that across years, 22 (71%) had no potential to cross the AWAR (Table 2, Figures 1 to 6). These included caribou that did not travel east-west across the LSA (Figures 1 to 6) and 13 caribou in 2017 that crossed the hamlet road north of Rankin Inlet and below the southern end of the AWAR (Figure 4). Six (19%) other caribou crossed other infrastructure such as the Mine site or other roads (Table 2, Figures 1, 3, 4, 5). Three collared caribou in 2015 and 2016 (animal ids: QM1600415, QM1580415, QM1720416), were qualified as deflected (Table 2, Figures 1 to 6), because their movement trajectories changed from toward the AWAR to away from the AWAR upon approach. Assuming these are deflections as a result of the AWAR or another stressor (e.g., vehicle or ATV) on the AWAR, this indicates that 1.8% (i.e., 3 of 163 collared caribou years) of all caribou movements within the LSA may have been deflected as a result of the AWAR or AWAR activity. Of note is that one of these animals (i.e., QM1600415) crossed the hamlet road between the AWAR and Rankin Inlet in 2016 (Figure 4), and the AWAR in 2017 (Figure 5). Animals QM1580415 and QM1720416 both crossed the AWAR in 2017 (Figure 5).

Table 2: Summary of Collared Qamanirjuaq Caribou that Did Not Cross the AWAR, 2014 to 2019

Year	Did not Cross AWAR	Deflected	No Potential to Cross AWAR	Crossed Other Mine Infrastructure
2014	1	0	0	1
2015	4	1	3	0
2016	8	2	4	2
2017	14	0	13	1
2018	3	0	1	2
2019	1	0	1	0
Total	**31**	**2**	**22**	**6**

AWAR = All-Weather Access Road.

Removing the number of caribou with no potential to cross the AWAR including those that crossed other roads and mine infrastructure results in 135 collared caribou years available to interact with the AWAR (Table 3). When the focus is on the number of collared caribou available to cross the AWAR, 98% (132 of 135) have from 2014 to 2019 and was 100% in 4 of 6 years. The rate of deflected caribou increases from 1.8% to 2.2% (3 of 135 collared caribou years).

Table 3: Summary of Collared Qamanirjuaq Caribou Available to Cross the AWAR, 2014 to 2019

Year	Total Collared Caribou in LSA	No Potential to Cross AWAR	Crossed Other Infrastructure	Collared Caribou Available to Interact with AWAR[1]	Crossed AWAR (%)
2014	4	0	1	3	3 (100%)
2015	30	3	0	27	26 (96%)
2016	28	4	2	22	20 (91%)
2017	48	13	1	34	34 (100%)
2018	40	1	2	37	37 (100%)
2019	13	1	0	12	12 (100%)
Total	**163**	**22**	**6**	**135**	**132 (98%)**

AWAR = All-Weather Access Road; LSA = Local Study Area.

[1] Annual values of available collared caribou reflect the subtraction of individuals with no potential to cross the AWAR and that crossed other infrastructure from the total collared caribou in the LSA.

4.0 CONCLUSIONS

A simple and precautionary analysis of collared Qamanirjuaq caribou indicates that at least 81% of caribou move across the AWAR. This rate is likely underestimated because it considers movements that had no potential to interface with the AWAR as non-crossers. Non-AWAR crossing caribou also included movement paths that crossed other roads (n=13) and Mine infrastructure (n=6). Had the assessment of crossing considered all disturbed areas (i.e., AWAR and all infrastructure), then the frequency of crossing would increase from 81% to 93% (151 of 163). When the analysis is focussed on only on the AWAR, the frequency of crossing increases to 98% (132 of 135). Three deflections were qualified in two of six years examined since the AWAR was constructed which supports that deflection events are rare but these patterns could also be associated with non-AWAR factors such as predation risk or harvest. The annual pattern of deflections demonstrates that deflections do not occur every year and that caribou that typically encounter the AWAR cross it. As well, these three caribou crossed other roads or the AWAR the following year so any assumed aversion to cross the AWAR appears to be temporary. Key Terrestrial Ecosystem Management and Monitoring Plan (TEMMP) mitigation applied to the AWAR (and proposed waterlines) to minimize barrier effects to caribou movements includes operational closure of the AWAR when caribou are migrating through the area (Golder 2015), which appears to be effective. It is also important to note that only a fraction of collared Qamanirjuaq caribou move through the LSA annually (Nuqsana Golder 2020), consequently the entire herd does not interact with the AWAR.

The proposed waterlines will be located next to the AWAR and approximately 80 - 90% of the proposed waterlines will be covered. The cover design includes low slope shoulders constructed with finer grain material to facilitate movements across the AWAR. The height of the cover will be consistent with the AWAR road surface. Construction of the waterlines will eliminate traffic associated with hauling saline water to Rankin Inlet for discharge. A reduction in traffic volume predicts a decrease in the magnitude and frequency of sources of mine-related sensory disturbance to caribou from the AWAR. However, incremental changes (positive or negative) to barrier effects to caribou movements resulting from the construction of the waterlines relative to the AWAR is also predicted to not be measurable because the apparent influence of the AWAR on caribou movements is already very small.

5.0 CLOSURE

Please contact the undersigned with any questions or concerns.

ORIGINAL SIGNED
Dan Coulton, Ph.D., RPBio.
Senior Wildlife Biologist

ORIGINAL SIGNED
Corey De La Mare, P. Biol.
Principal, Senior Ecologist

DWC/CDLM/jr

https://golderassociates.sharepoint.com/sites/132380/project files/5 technical work/03_technical_meeting/05_caribou prep/20351262-822-tm_meliadineawarcaribou deflections-rev0.docx

6.0 REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2020. Waterline FEIS Addendum – Meliadine Mine, Technical Comment Responses. Submitted to Nunavut Impact Review Board. November 20, 2020.

Golder (Golder Associates Ltd.). 2015. SD 6-4 Terrestrial Environment Management and Monitoring Plan (TEMMP) – Meliadine Golder Project, Nunavut. Prepared for Agnico Eagle Mining Limited. Rankin Inlet, NU.

Nuqsana Golder (Nuqsana Golder Engineering and Environmental Inc.). 2020. Agnico Eagle Mines Limited – Meliadine Division: 2019 Terrestrial Effects Monitoring and Mitigation Program Annual Report. Prepared for Agnico Eagle Mines Limited. Ottawa, ON.

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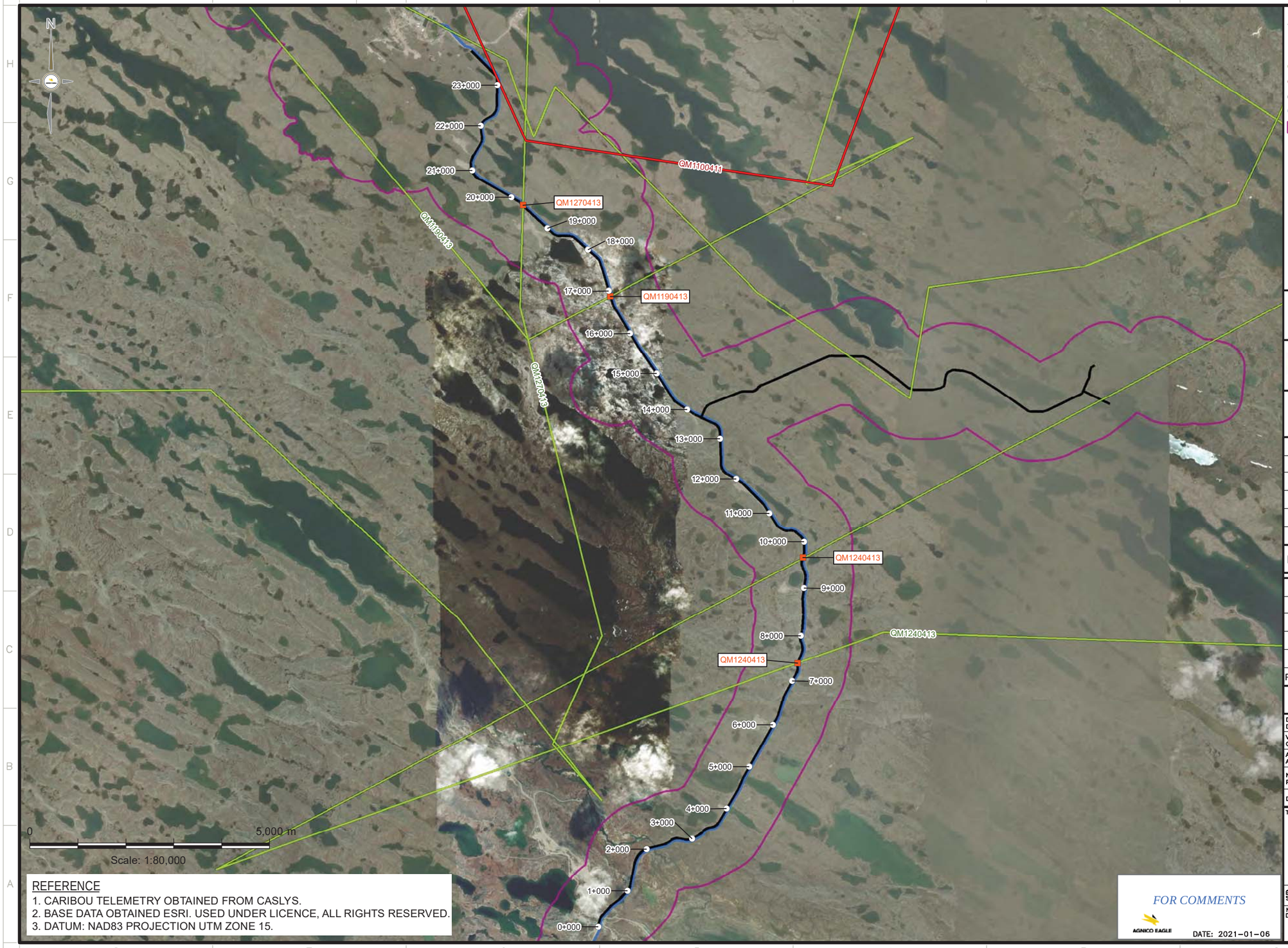

REFERENCE
1. CARIBOU TELEMETRY OBTAINED FROM CASLYS.
2. BASE DATA OBTAINED ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. DATUM: NAD83 PROJECTION UTM ZONE 15.

FOR COMMENTS
AGNICO EAGLE
DATE: 2021-01-06

LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY AREA

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FIGURE 1

COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2014

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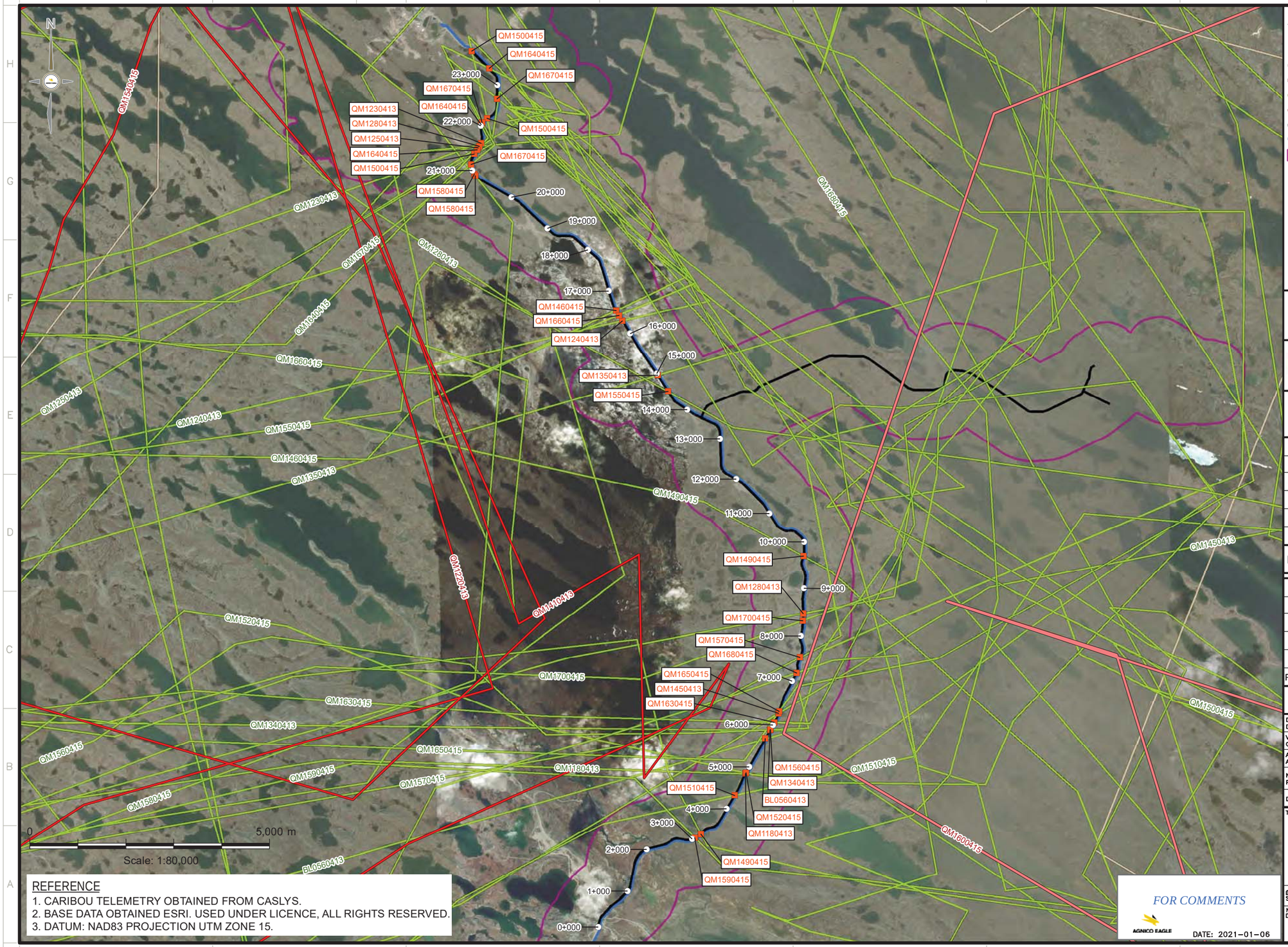

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DATE: 2021-01-06

LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2015 CARIBOU TELEMETRY PATH - OUTSIDE LSA
- CARIBOU TELEMETRY PATH - DEFLECTED
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY

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No. PROJET PROJECT NO.	20351262		
DATE	2021-01-06		

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FIGURE 2

COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2015

ÉCHELLE/ SCALE	1:80,000	FICHIER FILE	.MXD
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		FEUILLE/SHT	2 / 6

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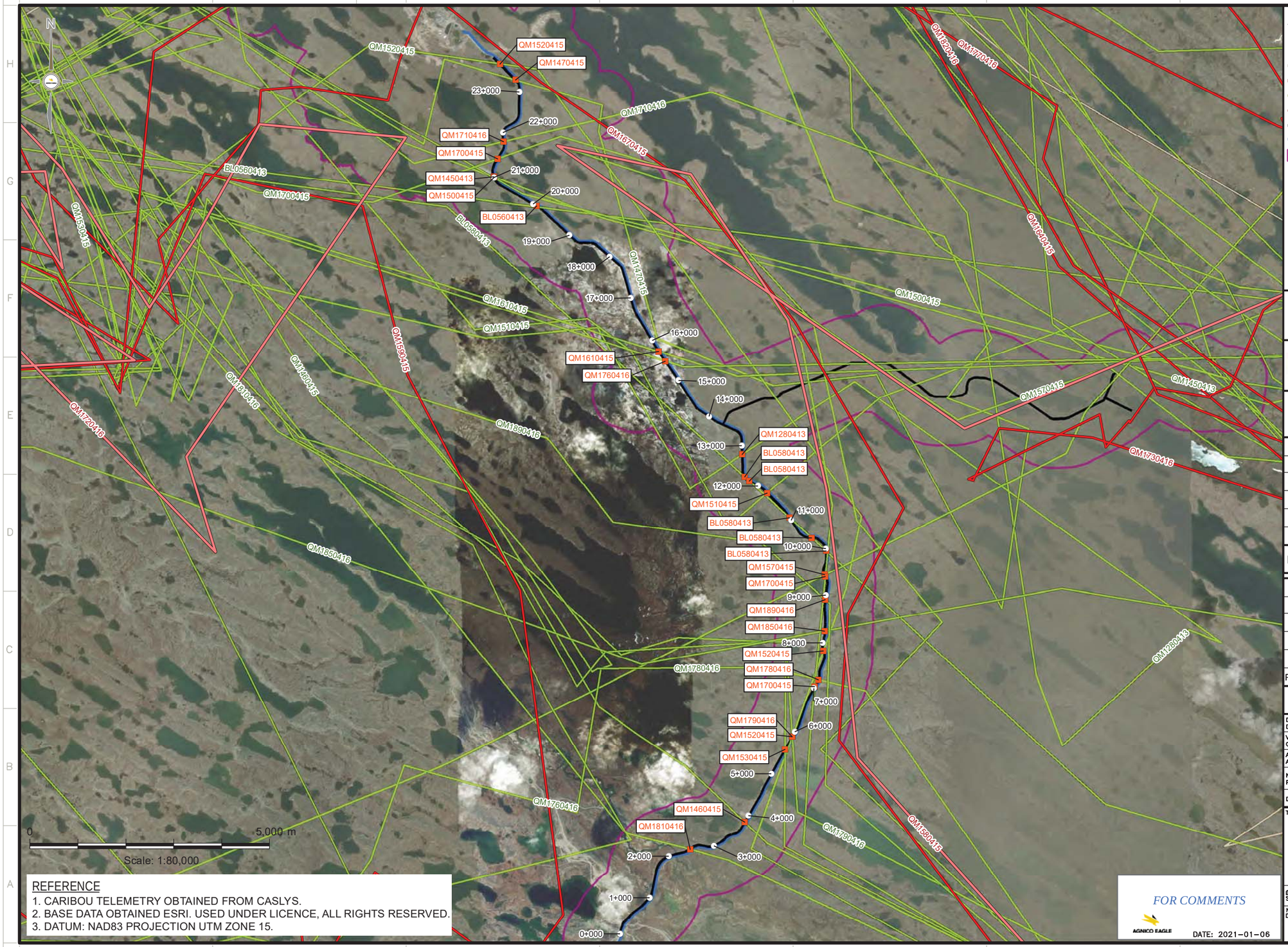

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LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2016 CARIBOU TELEMETRY PATH - OUTSIDE LSA
- CARIBOU TELEMETRY PATH - DEFLECTED
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY AREA

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DATE	2021-01-06		

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AGNICO EAGLE – MELIADINE DIVISION
FIGURE 3
COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2016

ÉCHELLE/ SCALE	1:80,000	FICHIER FILE	.MXD
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		FEUILLE/SHT	3 / 6

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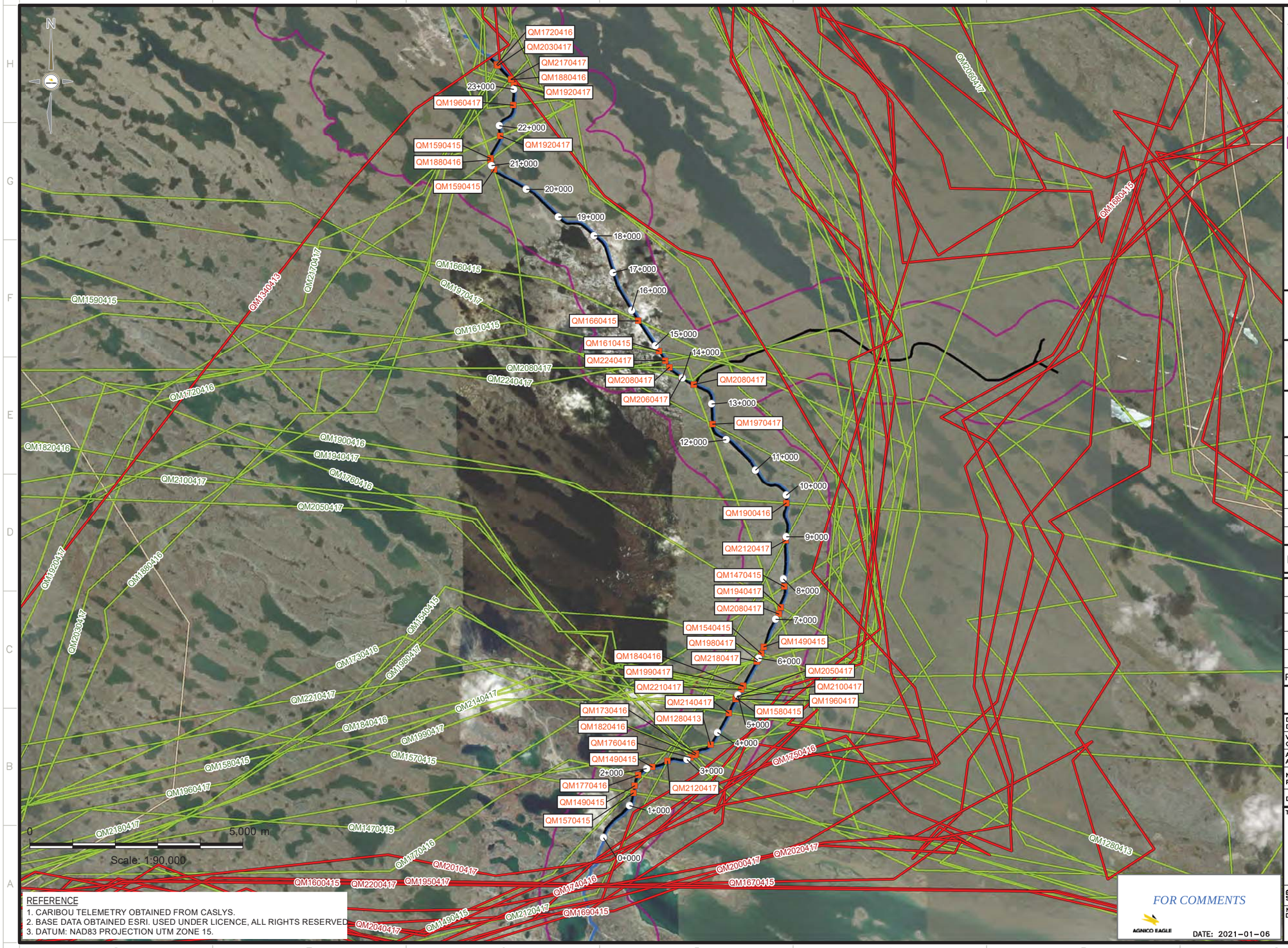

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3. DATUM: NAD83 PROJECTION UTM ZONE 15.

LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2017 CARIBOU TELEMETRY PATH - OUTSIDE LSA
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD (AWAR)
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY AREA

AGNICO EAGLE

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FIGURE 4
COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2017

ÉCHELLE/ SCALE	1:90,000	FICHIER FILE	.MXD
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DATE: 2021-01-06

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DRAWING NO.

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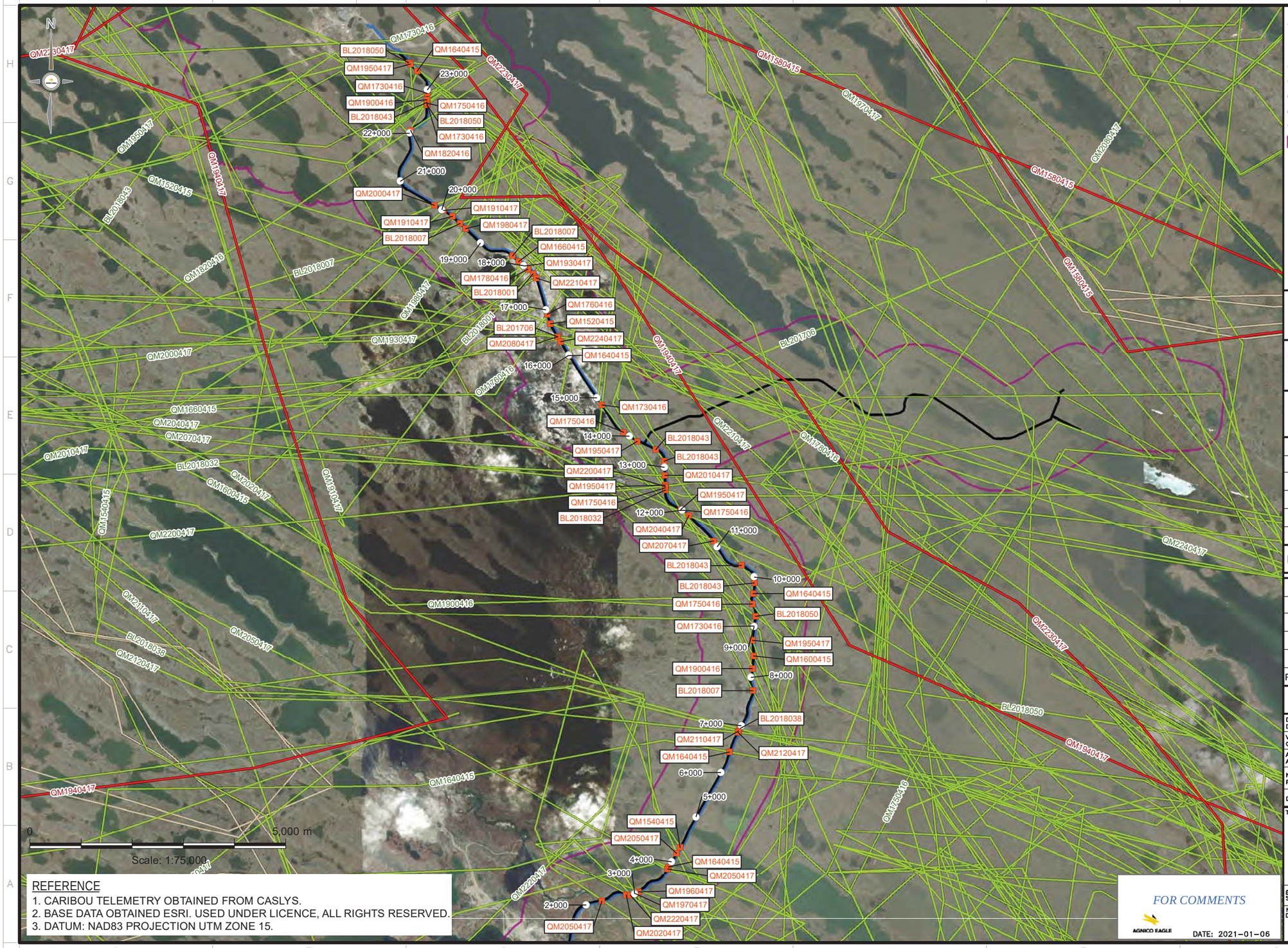

LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2018 CARIBOU TELEMETRY PATH - OUTSIDE LSA
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY AREA

AGNICO EAGLE

GOLDER

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TITRE / TITLE	# DWG

DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

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REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR DRAWN BY	LH	DATE 2021–01–06
VÉRIFIÉ PAR CHECKED BY	–	–
APPROUVÉ PAR APPROVED BY	–	–
No. PROJET PROJECT NO.	20351262	
DATE	2021–01–06	

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION

FIGURE 5

COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2018

ÉCHELLE/ SCALE 1:75,000	FICHIER FILE .MXD		
No. DESSIN/ DRAWING NO. –		REVISION A	FEUILLE/SHT 5 / 6

REFERENCE

1. CARIBOU TELEMETRY OBTAINED FROM CASLYS.
2. BASE DATA OBTAINED ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. DATUM: NAD83 PROJECTION UTM ZONE 15.

FOR COMMENTS

AGNICO EAGLE

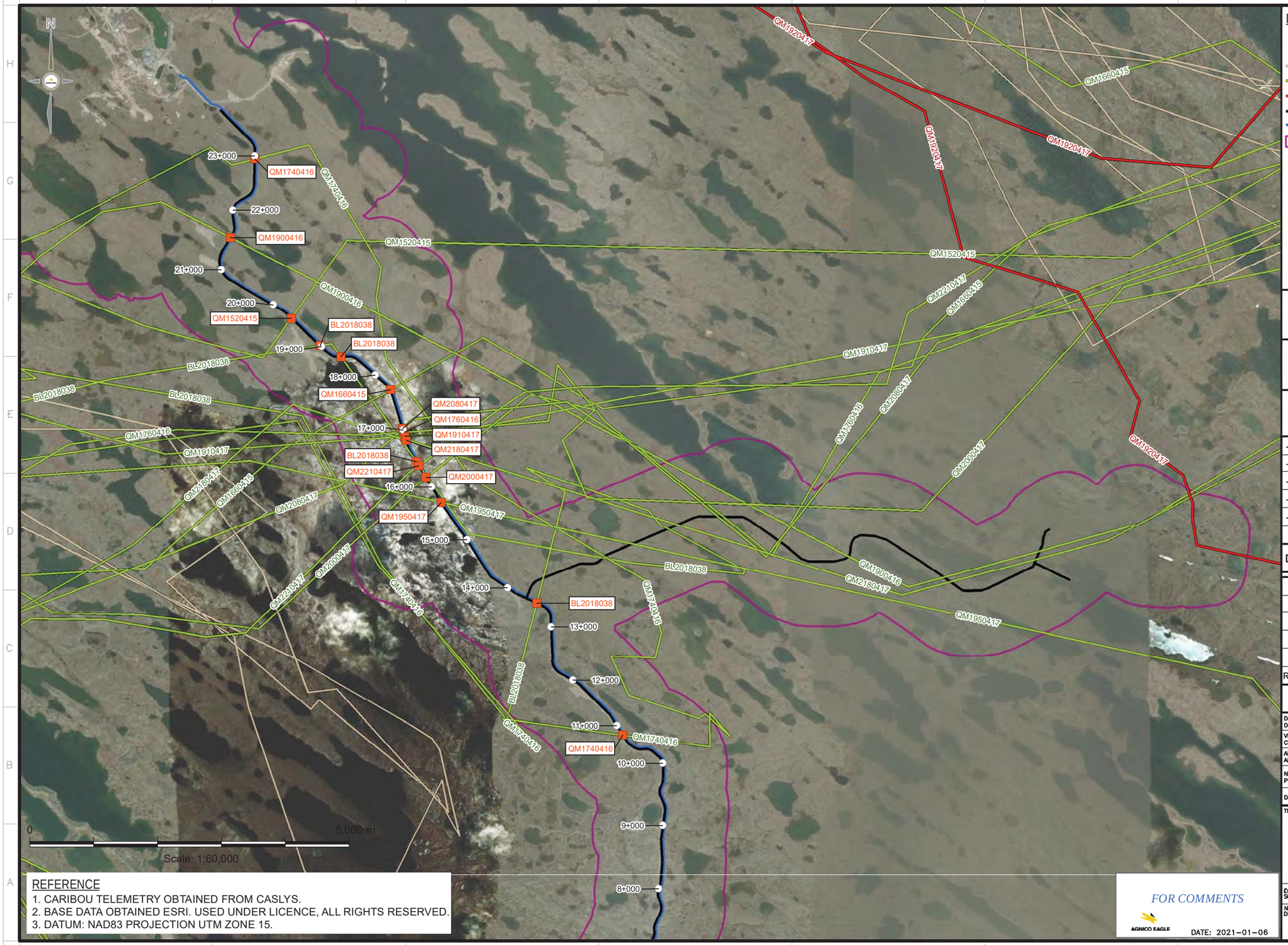
DATE: 2021–01–06

AE–CART–ANSI B

Y:\burnaby\CAD–GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\20351262\2400\2420\02_PRODUCTION\MXD\Report\20351262_2400_2420_Caribou_2018_Telemetry_RevA.mxd

NO. DESSIN
DRAWING NO.

FORMAT ANSI B – 11x17



REFERENCE
1. CARIBOU TELEMETRY OBTAINED FROM CASLYS.
2. BASE DATA OBTAINED ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. DATUM: NAD83 PROJECTION UTM ZONE 15.

FOR COMMENTS
AGNICO EAGLE
DATE: 2021-01-06

LEGEND

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2019 CARIBOU TELEMETRY PATH - OUTSIDE
- CARIBOU TELEMETRY PATH - AWAR CROSSING
- CARIBOU TELEMETRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY

AGNICO EAGLE

GOLDER

–	–
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TITRE / TITLE	# DWG

DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

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REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR DRAWN BY	LH	DATE	2021-01-06
VÉRIFIÉ PAR CHECKED BY	–		–
APPROUVÉ PAR APPROVED BY	–		–
No. PROJET PROJECT NO.	20351262		
DATE	2021-01-06		

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE 6
COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS IN THE LOCAL STUDY AREA, 2019

ÉCHELLE/ SCALE	1:60,000	FICHIER FILE	.MXD
No. DESSIN/ DRAWING NO.	–	REVISION	A
		FEUILLE/SHT	6 / 6

AE-CART-ANSI B

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