# MEADOWBANK MINE

## 2019 WILDLIFE MONITORING SUMMARY REPORT

## FINAL

# SECTION 4 • PITS AND MINE SITE GROUND SURVEYS

## 4.1 OVERVIEW

The mine site ground survey monitoring program (i.e., for Meadowbank, Vault, and Whale Tail) has been designed to verify that impacts to wildlife in and around the mine site LSA are not occurring. The program has a strong emphasis on monitoring mortality and disturbance of various wildlife groups utilizing habitats near the mine site. In addition, the mine site ground survey monitoring program is an integral component of the monitoring strategy for evaluating sensory disturbance indicators for Caribou.

## 4.2 OBJECTIVES

The primary objectives of the mine site ground surveys are to:

1. Use Decisions Trees when Caribou are seen near mine facilities to determine the level of adaptive management (e.g., road closures) required;
2. Confirm that Caribou will not be killed through other mine-related mortality such as falling in pits, tailings sludge, or other means. The cumulative mine threshold level of mortality is two (2) individuals per year;
3. Verify that measures are in place such that Grizzly Bears, Wolverines or Wolves will not need to be destroyed at the mine site. The threshold level of mortality for Predatory Mammals is two (2) individuals per year; and
4. Verify that high value habitats (e.g., sedge meadows) are avoided, and all activities within 100 m of a bird nest site during the latter part of the nest stage (fledgling) are avoided.

## 4.3 DURATION

The mine site ground surveys are to be conducted regularly by Agnico Eagle environmental personnel over the operation and closure phases of the mine to verify that changes to habitats around the mine site do not cause effects to wildlife and their use of habitat.

## 4.4 METHODLOGY

### 4.4.1 Mine Site Inspections

In 2019, environmental personnel conducted regular mine site inspections focusing on waste management, spills, hazardous waste management, and wildlife monitoring. Formal mine site inspections were carried out at least weekly as part of broader environmental on-site management. Surveys were also conducted prior to blasting. During these inspections, non-conformities were identified and rapidly addressed by the responsible department.

Weekly and pre-blasting inspections included:

- Regular monitoring of Caribou and Muskox near the facilities. Large mammal presence within the mine is documented during daily and weekly (formal) inspections. Any issues related to safety or proximity effects are identified and the appropriate mitigation is implemented. If risks to animal health are perceived, efforts are made to avoid the wildlife and provide them the right of way. In 2019, a minimum of weekly mine-site ground survey inspections were conducted;
- Regular monitoring of all large mammals on the site;
- Regular monitoring of breeding birds (especially in the spring). No active nests were found in 2019 at the Meadowbank and Whale Tail sites, therefore no additional monitoring occurred; and
- Inspections of waste management areas, bins, and hazardous material storage.

Environment department inspections and wildlife ground surveys focus on migratory birds, Ungulates, Arctic Fox, Wolf, Grizzly Bear, and Wolverine. Through these observations, those of other Agnico Eagle employees, and incidence reports provided to the Environment department, technicians follow up as needed to ensure the protection of wildlife near the mine site. Observations, along with monitoring and deterrence activities, are recorded in **Appendix E**. Monthly summary reports and wildlife observation data are submitted to the GN, while quarterly reports are submitted to the KIA.

No ancillary construction activity was undertaken without environmental notification and all activities were within the predicted and approved mine footprint or permit area as confirmed through environmental inspections, ground surveys, and coordination with engineering and site services on the mine site. All areas used by the mine have been accepted and approved by regulators and the KIA through submission and acceptance of annual reports and updated management plans.

### 4.4.2 Incidental Mine Site Wildlife Observations

All mine site personnel, including construction and support staff, are required to document and report wildlife observed within the boundaries of the mine as well as ancillary areas (e.g., AWAR and haul roads). The protocol involves filling out a wildlife log form located in designated areas or by notifying staff in the Environment department, which is intended to ensure that potential problem animals are identified. Completed incidental wildlife log forms are collected on a regular basis for review by environmental personnel. Pertinent data, and daily and weekly mine site inspection reports are consolidated and entered into a database (**Appendix E**). Monthly summary reports and wildlife observation data are submitted to the GN. Quarterly reports are submitted to the KIA.

## 4.5 2019 RESULTS

### 4.5.1 Incidental Wildlife Observations

Mine site incidental observations were consolidated from the daily and weekly inspection reports, and observations by mine personnel (see **Appendix E**). Observations were used by environmental personnel to monitor wildlife activity within the mine site and identify potential problem animals. A summary of observations that required action is provided in **Table 4.1** while a summary of total wildlife observations by species and month is provided in **Table 4.2**. Total wildlife observations were much higher in 2019 than in 2018, largely because of significant movements of Caribou in April and May and Snow Geese in August and September.

As expected, total bird sightings were highest in summer while Wolverine sightings were highest in winter (see **Figure 4.1**). For birds, the noticeable peak in sightings in August and September were due to large numbers of Snow Geese migrating through the study area. In 2019, peak Caribou sightings were during the spring and fall migratory period (**Figure 4.1**). The very large peak in April and May reflects the large numbers of Caribou migrating through the study area in 2019 relative to 2018.

When wildlife was observed in and around the mine site, monitoring frequency increased. In 2019, the frequency of wildlife activity and deterrence actions taken (31 actions) were similar to 2018 (32) but still higher than in 2017 (21). Deterrence actions were primarily required for Wolverine and Wolves (i.e., >80% of actions) and particularly in the winter months (i.e., January, February and December) (see **Table 4.1**). Deterrence actions implemented in and around the Meadowbank and Whale Tail mine sites ranged from minimal actions (i.e., blocking the road, approaching animals or herds on foot or by vehicle) to more aggressive use of flares and scare cartridges. In 87% of cases, deterrence proved effective (**Table 4.1** and **Appendix E**). Deterrence efforts related to nesting birds within the Whale Tail flooding areas, is described in **Section 14**.

Trends and unique wildlife observations around the mine site are discussed in the following sections. In a few cases, observations led to direct action to prevent human-wildlife conflict.

### 4.5.2 Waterbird Monitoring

To minimize accidental waterbird confinement around the Meadowbank and Whale Tail sites, entrapment in the tailings, and mortality, regular inspections were completed throughout the migratory period and during weekly or daily inspections, as deemed necessary by environmental personnel. Waterbird species recorded by mine personnel between May and September included Canada Goose, Snow Goose, Long-tailed Duck, and ducks (see **Table 4.2**).

### 4.5.3 Raptor Monitoring

Raptor monitoring was conducted as part of routine mine site inspections of the pit and other areas to ensure adequate bird protection and management. Peregrine Falcons were observed around project facilities from May to September, with most records from June to August, while Rough-legged Hawks were observed on several occasions in May and October. Other raptor species observed included Bald Eagle (July to September), Snowy Owl (August to October), and Short-eared Owl (September) (see **Table 4.2** and **Appendix E**). No deterrence activities were required for raptors in 2019 (see **Table 4.1**).

**Table 4.1:** Wildlife Presence Requiring Action at the Meadowbank and Whale Tail Sites in 2019 (from **Appendix E**).

| Date | Species | # | Location | Behavior | Action |
|---|---|---|---|---|---|
| **JANUARY** | | | | | |
| 08 January | Wolverine | 1 | Behind incinerator at Amaruq | Running | Deterred. Successful |
| 09 January | Wolverine | 1 | Behind incinerator at Amaruq | Running | Deterred. Successful |
| 11 January | Arctic Fox | 1 | Incinerator at Amaruq | Eating | Deterred. Unsuccessful |
| 13 January | Arctic Fox | 1 | Nova Camp, Meadowbank | Sick or injured | Deterred. Successful |
| 21 January | Wolverine | 1 | Amaruq Camp | Walking | Deterred. Successful |
| **FEBRUARY** | | | | | |
| 03 February | Wolverine | 1 | Lake A53, Amaruq | Running | Deterred. Successful |
| 18 February | Wolverine | 1 | Amaruq Camp | Fleeing | Deterred. Successful |
| 18 February | Wolverine | 1 | Behind the kitchen, Amaruq Camp | Walking | Deterred. Unsuccessful. Euthanized 22 February (see **Appendix D**) |
| **APRIL** | | | | | |
| 06 April | Wolf | 1 | Whale Tail Exploration Camp | Walking | Deterred. Successful |
| 07 April | Wolf | 1 | Emulsion Road, Whale Tail | Walking | Deterred. Successful |
| 26 April | Arctic Fox | 1 | Behind Clinic, Whale Tail | Sick or wounded | Deterred. Successful |
| **MAY** | | | | | |
| 29 May | Wolf | 1 | Whale Tail Camp | Walking | Deterred. Successful |
| 30 May | Wolf | 1 | Landfill, Meadowbank | Eating | Deterred. Successful |
| 31 May | Wolverine | 1 | Landfill, Meadowbank | Eating | Deterred. Successful |
| **JUNE** | | | | | |
| 22 June | Wolf | 1 | Near Incinerator, Meadowbank | Walking | Deterred. Successful |

**Table 4.1:** Continued.

| Date | Species | # | Location | Behavior | Action |
|---|---|---|---|---|---|
| **JULY** | | | | | |
| 01 July | Wolf | 1 | Landfill, Meadowbank | Observing | Deterred. Successful |
| 22 July | Wolf | 1 | Landfill, Meadowbank | Observing | Deterred. Successful |
| 29 July | Wolf | 1 | Landfill, Meadowbank | Observing | Deterred. Successful |
| **AUGUST** | | | | | |
| 01 August | Caribou | 1 | FGL Area, Whale Tail | Walking | Deterred. Unsuccessful |
| 02 August | Caribou | 1 | FGL Area, Whale Tail | Grazing | Deterred. Successful |
| **SEPTEMBER** | | | | | |
| 15 September | Wolf | 1 | Landfill, Meadowbank | Running | Deterred. Successful |
| **NOVEMBER** | | | | | |
| 23 November | Wolverine | 1 | Tailings Road, Meadowbank | Running | Deterred. Successful |
| 30 November | Arctic Fox | 1 | Energy & Infrastructure Garage, Whale Tail | Running | Deterred. Successful |
| **DECEMBER** | | | | | |
| 03 December | Wolverine | 1 | Landfill, Meadowbank | Running | Deterred. Unsuccessful |
| 14 December | Wolverine | 1 | Incinerator, Meadowbank | Running (1030 am) | Deterred. Successful |
| 14 December | Wolverine | 1 | Incinerator, Meadowbank | Running (6 pm) | Deterred. Successful |
| 28 December | Wolverine | 1 | Assay Lab, Meadowbank | Running | Deterred. Successful |
| 29 December | Wolverine | 1 | Airport, Meadowbank | | Deterred. Successful |
| 31 December | Wolverine | 1 | Meadowbank Camp, Nova, Dorm 12 | Walking (0715 am) | Deterred. Successful |
| 31 December | Wolverine | 1 | Main entrance, Meadowbank | Walking (0800 am) | Deterred. Successful |
| 31 December | Wolverine | 1 | Nova Camp, Meadowbank | Running (1400 pm) | Deterred. Successful |

**Table 4.2:** Total Wildlife Records by Species and Month at the Meadowbank and Whale Tail Sites in 2019 (from **Appendix E**).

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mammals** | | | | | | | | | | | | |
| Arctic Fox | 3 | 4 | 4 | 9 | 1 | 3 | 5 | 2 | 4 | 10 | 6 | 5 |
| Arctic Hare | 4 | 1 | | 14 | 10 | 11 | 12 | 3 | 5 | 5 | | 1 |
| Caribou | 1 | 5 | 9 | 604 | 371 | 55 | 42 | 276 | 45 | 280 | 125 | 6 |
| Grizzly Bear | | | | 1 | 2 | | | 1 | | | | |
| Muskox | 7 | 7 | 8 | 37 | 9 | 18 | 63 | 39 | 8 | 11 | 18 | 6 |
| Sik Sik | | | | | | | | 3 | 4 | | | |
| Weasel | | | | | | | | | | | 2 | |
| Wolf | 4 | | | 5 | 17 | 12 | 12 | 11 | 2 | 2 | 9 | |
| Wolverine | 20 | 22 | | 5 | 4 | 2 | 1 | 3 | 1 | 4 | 4 | 26 |
| **Birds** | | | | | | | | | | | | |
| Bald Eagle | | | | | | | 6 | 15 | 3 | | | |
| Canada Goose | | | | | 3 | 10 | 2 | 10 | | | | |
| Common Raven | 1 | 1 | 1 | 4 | | 1 | 1 | 3 | 1 | | | |
| Duck | | | | | 2 | 4 | 1 | 1 | | | | |
| Gull | | | | | | | 1 | 2 | | | | |
| Long-tailed Duck | | | | | | | | | 1 | | | |
| Peregrine Falcon | | | | | 5 | 9 | 8 | 10 | 4 | | | |
| Ptarmigan | | 1 | | | 2 | 10 | 7 | 2 | 2 | 5 | | |
| Rough-legged Hawk | | | | | 13 | 7 | 9 | 18 | 2 | 2 | | |
| Sandhill Crane | | | | | 13 | 15 | 6 | 7 | 3 | | | |
| Short-eared Owl | | | | | | | | | 1 | | | |
| Snow Goose | | | | | | 1 | | 21 | 120 | | | |
| Snowy Owl | | | | 2 | | | | 1 | 4 | 1 | | |
| **Total Birds** | **1** | **2** | **1** | **6** | **38** | **57** | **41** | **90** | **141** | **3** | **0** | **0** |

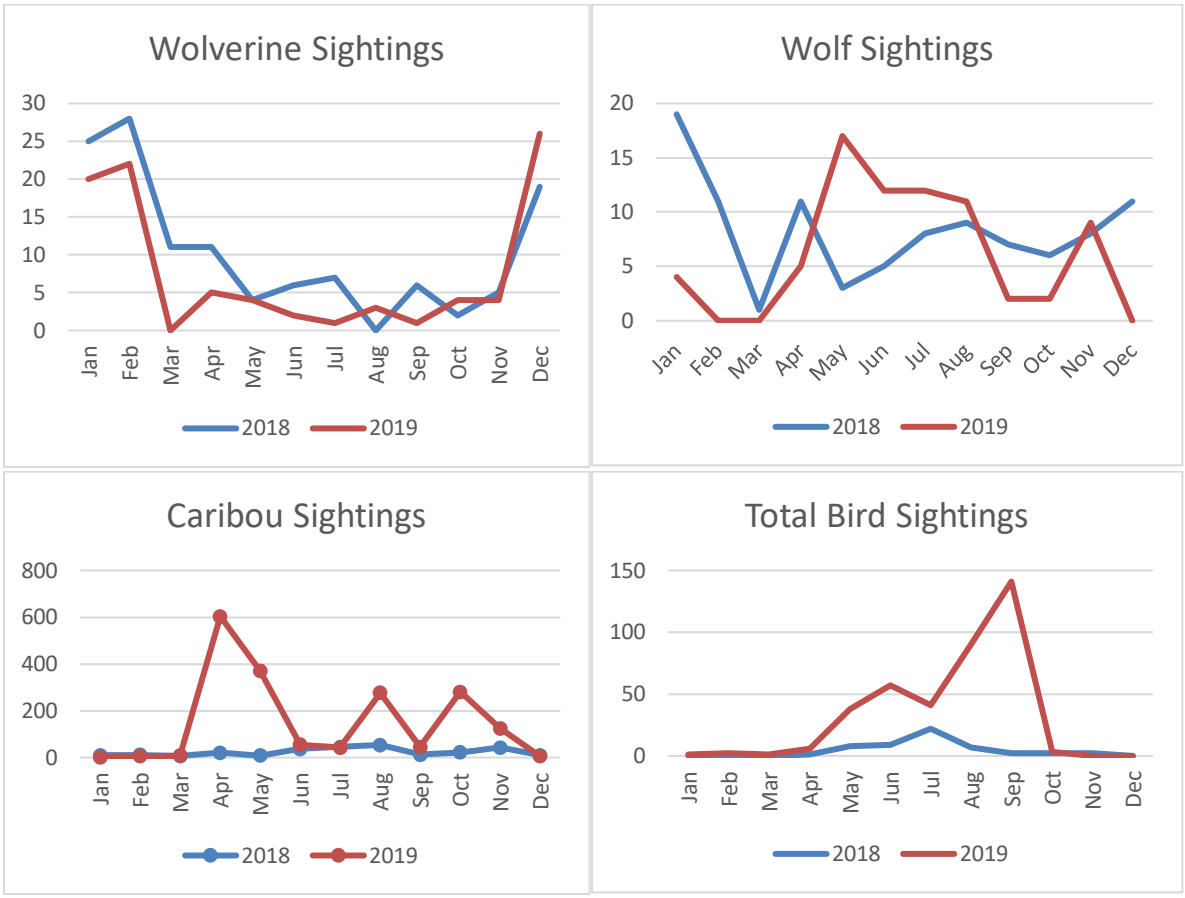



**Figure 4.1**: Total Incidental Sightings of Wolverine, Wolf, Caribou, and Birds by Month at the Meadowbank and Whale Tail Sites in 2019.

## 4.5.4 Caribou and Muskox Protection

Caribou were observed on a regular and year-round basis in and around the Meadowbank and Whale Tail sites and along the AWAR, Vault Haul Road, and Whale Tail Haul Road in 2019. The highest number of Caribou reports were from April, May, August, October, and November (see **Table 4.2**) with group sizes of 1,000 individuals on April 9th , April 30th , and May 2nd, 3,000 individuals on August 16th, 4,000 on October 27th, and 2,000 on October 29th (see **Appendix E**). Because of the high numbers of Caribou close to project facilities in 2019, numerous road closures and restrictions were required along the AWAR, Vault Haul Road, and Whale Tail Haul Road (see **Tables 3.4** to **3.6**).

Muskox individuals and herds, ranging in size from two to 38 individuals, were reported on numerous occasions in 2019 but particularly between April and August (**Table 4.2; Appendix E**). No mitigation measures or deterrence efforts were required for Muskox.

### 4.5.5 Predatory Mammal Deterrence and Protection

Improved practices for waste segregation and incineration, the use of enclosed food waste facilities, and skirting around buildings have improved Arctic Fox protection and decreased fox-human interactions (see **Table 4.3**). No deterrence efforts were required for Muskox or birds in 2019 (**Table 4.3**).

**Table 4.3**: Summary of Deterrence Activities at the Meadowbank Mine and Whale Tail Sites from 2015 to 2019.

| Species | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| **Mammals** | | | | | |
| Arctic Fox | 6 | 6 | 2 | | 4 |
| Caribou | 10 | 24 | | | 2 |
| Red Fox | 1 | | | | |
| Wolf | 1 | 4 | 9 | 14 | 9 |
| Wolverine | 5 | 3 | 10 | 17 | 16 |
| **Total** | **23** | **37** | **21** | **31** | **31** |
| **Birds** | | | | | |
| Ducks | 2 | 5 | | | |
| Ducks & Geese | 1 | | | | |
| Geese | | 3 | | | |
| Snow Goose | | | | 1 | |
| Tundra Swan | 1 | | | | |

Wolverines were regularly observed around the Meadowbank and Whale Tail sites primarily during the winter months in 2019 (see **Table 4.2**, **Figure 4.1**, and **Appendix E**). Deterrence actions, which followed the Wildlife Protection and Response Plan (Appendix C in 2019 TEMP), were required on 16 occasions primarily in January and December (**Table 4.1**). One Wolverine, which was not successfully deterred from the site, was dispatched on February 22nd (see **Section 4.5.6.2** and **Table 4.3**). Well-defined food-handling practices and employee awareness programs have minimized Wolverine fatalities or Wolverine-human interactions but the number of deterrence efforts were similar to 2018 (see **Table 4.3**).

Wolves were also regularly observed around the Meadowbank and Whale Tail sites primarily in the summer months, unlike the pattern of winter observations in 2018 (see **Table 4.2**, **Figure 1**, and **Appendix E**). Deterrence actions were required on nine (9) occasions from April through September (**Table 4.1**). Notices were sent on a periodic basis to Meadowbank employees regarding the presence of wildlife, waste management procedures, and requesting all sea cans and doorways be closed.

Grizzly Bears were reported on four (4) occasions in 2019 (**Table 4.2**; **Appendix E**). No deterrence action was required.

### 4.5.6 Wildlife Mortality – Meadowbank and Whale Tail Sites

A summary of recorded wildlife fatalities near or within the mine site in 2019 is provided in **Table 4.4**, and a summary of fatalities to date is provided in **Table 4.5**. Copies of mortality incident reports can be found in **Appendix D**. Road-related fatalities are tabulated and discussed in **Section 3.6.6**.

**Table 4.4:** 2019 Mine Site Wildlife Fatality Log.

| Date | Species | Count | Mine Related | Location | Comments |
|---|---|---|---|---|---|
| 22 Feb | Wolverine | 1 | Yes | Amaruq Camp | Dispatched after deterrence actions were unsuccessful and authorization received from DoE (see **Appendix D**) |
| 27 Aug | Stickleback | multiple | Yes | NE Pond, Amaruq | Sticklebacks were being impinged and killed on intake screen of pump for NE discharge (see letter to DFO - **Appendix D**) |
| 21 Dec | Arctic Fox | 1 | Yes | Meadowbank Site, near HAZMAT area | Found in middle of road; roadkill incident; taken to incinerator (see **Appendix D**) |

**Table 4.5:** Summary of Mine Site Related Wildlife Fatality Records for Caribou and Predatory Mammals (2007 to 2019).

| Year | Caribou | Grizzly Bear | Wolverine | Wolf |
|---|---|---|---|---|
| 2007 | 0 | 0 | 0 | 0 |
| 2008 | 0 | 0 | 0 | 2 |
| 2009 | 0 | 0 | 0 | 4 |
| 2010 | 0 | 0 | 0 | 1 |
| 2011 | 0 | 0 | 1 | 4 |
| 2012 | 0 | 0 | 0 | 1 |
| 2013 | 0 | 0 | 1 | 0 |
| 2014 | 0 | 0 | 0 | 1 |
| 2015 | 4[1] | 0 | 0 | 1[2] |
| 2016 | 1[3] | 0 | 0 | 0 |
| 2017 | 1[3] | 0 | 1 | 3[4] |
| 2018 | 0 | 0 | 1 | 2[5] |
| 2019 | 0 | 0 | 1 | 0 |

[1] One Caribou died of natural causes while three were killed by Wolves.
[2] Naturally injured Wolf that needed to be euthanized.
[3] One Caribou killed by Wolves.
[4] One Wolf likely killed by Wolverine.
[5] Wolf died at mine site of head injuries; did not need to be dispatched

### *Caribou*

No Caribou mortalities related to project activities were reported at the mine site in 2019. All incident reports, observations, deterrence activities, and environment team responses to Caribou sightings are included in **Appendix E**.

### *Predatory Mammals*

All incident reports, observations, deterrence activities, and environment team responses to predatory mammal sightings are included in **Appendices E** and **F**.

One Wolverine, which was accessing the kitchen grease trap at the Amaruq camp site by going under the sleeping quarters and water treatment plant, was euthanized on February 22nd when deterrence actions beginning 18 February were not successful (see **Appendix D**). Written wildlife destruction authorization was received from the Baker Lake Conservation Officer, Robert Arsenault (see **Appendix D**). Adaptive mitigation actions taken included, placing metal sheets onto the walls of the grease trap and kitchen area, ensuring sheeting covers extended to the ground, and being more vigilant in deterring wildlife when reported around the Amaruq site.

### *Other Wildlife*

On December 21st, an Arctic Fox carcass was found in the middle of the road near the HAZMAT area of the Meadowbank camp (see **Appendix D**). The carcass was taken to the incinerator to avoid attracting other scavengers to the area.

In late August, a number of sticklebacks were impinged and killed on the intake screen of a second pump at the NE pond at Amaruq (see **Appendix D**), and the Department of Fisheries was notified on August 29th. The pump was stopped until mitigation measures were put in place to prevent reoccurrence. Mitigation measures consisted of inspecting the intake pump and downstream lake area on a daily basis, and modifying the pumping intake location in a manner to limit access by small-bodied fish.

## 4.6 ACCURACY OF IMPACT PREDICTIONS

**Table 4.6** provides a summary of the impact predictions identified in the TEMP (Agnico Eagle 2019) that are evaluated, in part, by the mine site ground surveys. Specifically, the 2019 mine site ground survey monitoring data were compared to the impact prediction thresholds to evaluate adherence to the impact predictions and the provision of adaptive management, as either a necessary or proactive measure. None of the thresholds were exceeded in 2019 (**Table 4.6**).

**Table 4.6:** Accuracy of Impact Predictions – Mine Site Wildlife Disturbances.

| Potential Effect | Threshold | Threshold Exceeded (2019) | Adaptive Management Implemented | Status |
|---|---|---|---|---|
| Sensory Disturbance | No threshold but Decisions Trees followed when Caribou are seen near mine facilities | NA | YES. Multiple road closures and notices. Use of Decision Tree for Management and Monitoring. | Satellite-collaring data<br>Road surveys<br>Daily and weekly pit and mine-site ground surveys<br>Incidental wildlife reporting<br>Motion sensing cameras |
| Disturbance to Nesting Raptors | Raptor nest failures will not be caused by mine-related activities. Threshold is one (1) nest failure per year. | NO | NO | Daily and weekly pit and mine-site ground surveys<br>Incidental wildlife reporting<br>Dedicated raptor nest surveys<br>Road surveys |
| Disturbance of Nesting, Roosting or Moulting Waterfowl | Mine facilities and activities will not affect the breeding success of Waterbirds occurring in the area or disturb large concentrations of roosting or moulting Waterbirds. Threshold level is one (1) nest failure per year. | NO | NO | Daily and weekly pit and mine-site ground surveys<br>Waterbird nest surveys |
| Project-related Mortality | Destruction of two (2) problem Grizzly Bear, Wolverine, or Wolf per year. | NO. One (1) Wolverine dispatched in 2019 | NO | Daily and weekly pit and mine-site ground surveys |
| Project-related Mortality | Two (2) Caribou or Muskoxen mortality per year because of mine-related activities (e.g., falling into pits, tailing, sludge or other means) | NO | NO | Daily and weekly pit and mine-site ground surveys |
| Project-related Mortality | Raptors and Waterbirds will not be killed at the mine site. Threshold is one (1) individual per year. | NO | NO | Daily and weekly pit and mine-site ground surveys |

## 4.7 MANAGEMENT RECOMMENDATIONS

The following are specific management recommendations for the mine site ground survey monitoring program:

- Continue to conduct informal and formal, daily and weekly, pit and mine surveys to document wildlife activity and to verify that effects to wildlife are not occurring because of mine-related activities;
- Continue raptor nest monitoring around the Meadowbank and Whale Tail LSAs, and along the AWAR, Vault Haul Road, and Whale Tail Haul Road;
- Continue to apply the Wildlife Protection and Response Plan (Appendix C, 2019 TEMP), which includes waste provisions, training, incident reporting, and protocols for problem wildlife. Efforts should be taken to ensure all perishable garbage is directed to the incinerator;
- Continue training and re-education to ensure that incidental wildlife reporting is completed by all mine site personnel so that environmental personnel can remain informed of pertinent wildlife-related activity near the mine site;
- Monitor tailings ponds daily during the waterbird migration period, beginning in mid-May. Increase the frequency of deterrent use if required; and
- Gather detailed information (e.g., sex; age) on deceased animals and include in incident reports.

# SECTION 5 • WILDLIFE HABITAT MONITORING

## 5.1 OVERVIEW

The wildlife habitat mapping monitoring program was developed to describe the overall area of different Ecological Land Classification (ELC) units lost due to mine-related activities (i.e., during construction, operation, decommissioning, and post-closure phases) at three primary locations: Meadowbank Main and Vault sites (which together encompass the mine site), the AWAR, and the Whale Tail Pit and Haul Road. The initial strategy in the impact assessments for Meadowbank and Whale Tail was to compare predicted habitat losses due to mine development to actual losses (i.e., from the environmental assessments); however, regular infrastructure extensions and expansions, changes to the project, and subsequent regulatory approvals, made this approach difficult to implement. The current approach is to compare habitat losses from development to permitted areas, which encompass all proposed development.

## 5.2 OBJECTIVE

The primary initial objective of the habitat mapping monitoring program was to confirm that habitat losses identified in the TEMP (Agnico Eagle 2019) and the Whale Tail Pit EIS Addendum (Golder 2016) for the mine sites, haul roads, and AWAR, plus any subsequent approved extensions, have not exceeded threshold limits. As indicated above, this approach was difficult to execute due to regular mine plan changes and subsequent approvals; therefore in 2018, habitat losses were compared to permitted areas, which encompass mine development areas. A summary of each monitoring parameter, predicted losses, permitted areas, and thresholds for the Meadowbank Mine and Whale Tail components is included in **Tables 5.1** and **5.2**, respectively.

**Table 5.1:** Habitat Mapping Monitoring Parameters, Predicted Footprint Losses, Permitted Areas, and Thresholds for the Meadowbank Mine, AWAR and Vault Haul Road.

| Monitoring Parameter | Mine Site Predicted Loss | Mine Site Permitted Area | AWAR / Vault Haul Road Predicted Loss | Threshold |
|---|---|---|---|---|
| Wildlife Habitat | 867 ha | 1,532 ha | 281 ha[1] | >5% Predicted |
| Ungulate – High Suitability Habitat | 240 ha (growing)<br>191 ha (winter) | 531 ha (growing)<br>407 ha (winter) | 63 ha (growing)<br>188 ha (winter) | >10% Predicted |
| Small Mammals – High Suitability Habitat | Given the minimal effects associated with the Meadowbank project, habitat loss effects on Small Mammals were screened out during the EA (Golder 2016) | | | |
| Waterbirds – High Suitability Habitat | 518 ha | 417 ha | 22 ha | >10% Predicted |
| Breeding Birds – High Suitability Habitat | 322 ha | 736 ha | 170 ha | >10% Predicted |

[1] Permitted areas along the AWAR and Vault Haul Road is 348 ha.

**Table 5.2:** Habitat Mapping Monitoring Parameters, Predicted Footprint Losses, Permitted Areas, and Thresholds for the Whale Tail Pit and Haul Road.

| Monitoring Parameter | Whale Tail Predicted Loss | Whale Tail Permitted Area | Threshold |
|---|---|---|---|
| Wildlife Habitat | 820 ha | 1,473 ha | >5% Predicted |
| Ungulate – High Suitability Habitat | 30 ha (growing)<br>342 ha (winter) | 76 ha (growing)<br>602 ha (winter) | >10% Predicted |
| Small Mammals – High Suitability Habitat | Given the minimal effects associated with the Meadowbank project, habitat loss effects on Small Mammals were screened out during the EA (Golder 2016) | | |
| Waterbirds – High Suitability Habitat | Given the minimal effects associated with the Meadowbank project, habitat loss effects on Waterbirds were screened out during the EA (Golder 2016) | | |
| Breeding Birds – High Suitability Habitat | Given the minimal effects associated with the Meadowbank project, habitat loss effects on Breeding Birds were screened out during the EA (Golder 2016) | | |

## 5.3 DURATION

The total area of habitat disturbance associated with mine site and ancillary facility construction was mapped following significant construction completion (2010) and was to be mapped annually during the operation phase as detailed in the TEMP (Cumberland 2006). At the end of 2010, a detailed ELC habitat loss analysis found that habitat losses to date were substantially lower than predicted and that no habitat loss thresholds for VECs were exceeded. Given this outcome, another detailed ELC habitat loss analysis was not provided until the 2012 report, which had similar conclusions as those in 2010. The 2014 habitat analysis determined that habitat losses were still below predicted losses but that some of the thresholds were being reached. A partial analysis was conducted in 2017 while a full and through analysis using a revised approach (see **Section 5.1**) was completed in 2018.

The current habitat mapping monitoring program is intended to be completed every three years post-construction or if changes are greater than 25% of the overall mine site footprint from the previous year evaluation. This frequency may be reduced during the operation phase if the amount of new disturbance and reclamation areas is relatively unchanged. Following decommissioning, vegetation mapping will be conducted in the first two years post-closure and every three years thereafter until Year 11 post-closure to verify that thresholds have been met. The next complete habitat analysis is scheduled for 2021.

## 5.4 HISTORICAL RESULTS

### 5.4.1 Meadowbank Mine Site

In 2014, construction of the Main Site construction was almost complete, including most of the infrastructure for the Vault Pit area, although much of the pit and waste rock storage area had not yet been disturbed. ELC results for the mine site footprint, based on as-built drawings from 2014, were compared to predicted ELC unit losses from the 2005 EIS, plus approved extensions. Actual habitat loss for the mine site in 2014 was calculated to be 775.7 ha, which was 91.1 ha less than the predicted total habitat loss of 866.8 ha for the mine site. Differences between predicted and actual habitat losses were greatest in Heath Tundra, Birch and Riparian Shrub, and Lichen ELC units, all of which are High suitability habitat for ungulates during the winter season. Although no thresholds (>5 to 10% above predicted losses) for the loss of High suitability habitat were exceeded for any VECs, threshold levels for the mine site were almost reached in 2014. Consequently, commitments were made to remove the material stored in the NPAG extension area (which was approved by NWB) and use it for capping of the North Cell Tailings Storage Facility during the closure/reclamation phase of the mine.

In 2017, the mine development footprint had changed substantially since the 2014 analysis (see **Figure 5.1**). The Vault Pit was fully operational and had expanded into the Phaser Lake area. Although the Phaser Lake extension was completed with approval from the NIRB and the Nunavut Water Board (NWB), the size of the extension area was not available for habitat calculations in the 2017 report. Actual habitat loss for the mine site in 2017 was calculated to be 1,021 ha, which was 154 ha more than the predicted total habitat loss of 867 ha for the mine site. The difference between predicted and actual habitat losses was primarily attributable to the final extent of the Vault waste dump, the Phaser Lake extension of the Vault Pit area (i.e., not included in the 867 ha calculation), and the as-built layout of the NPAG expansion of the Portage Waste Rock Facility. Differences between predicted and actual habitat losses were greatest for the Sedge, and Birch and Riparian Shrub ELC units, both of which are High suitability habitat for ungulates during the winter season. Greater than 10% differences between predicted and actual habitat losses were also observed in Heath Tundra, Lichen, Lichen-Rock, and Rock and Boulder ELC units. Additionally, losses of High suitability habitat exceeded established thresholds for Ungulates (growing and winter season), Small Mammals, and Other Breeding Birds.

For the 2018 habitat analysis, the approach was revised to compare habitat losses to total area within Agnico Eagle's permitted areas, which also encompasses future work. For all ELC units combined, overall habitat losses (i.e., 1,129 ha) were 26% less than the habitat available within permitted areas (i.e., 1,532 ha) of the Meadowlark Mine Site; therefore, thresholds were not surpassed. Similar to the overall habitat loss assessment, high suitability habitat losses for Ungulates, Small Mammals, Waterbirds, and Other Breeding Birds were all well below high suitability habitats available within permitted areas, also not surpassing any thresholds.

### 5.4.2 AWAR

The ELC results for the AWAR had not changed since the 2010 analysis, and habitat loss analyses were not required. The 2010 ELC results for the AWAR were compared to ELC unit losses predicted in the 2005 EIS report. Construction of the AWAR required considerably less area (173 ha) than predicted in the 2005 EIS (281 ha) and for each ELC unit, actual habitat losses were less than predicted. ELC habitat loss values for the AWAR in 2010 were compared to predicted High suitability habitat losses for Ungulates (growing and winter season), Waterbirds, Other Breeding Birds, and Small Mammals. In all cases, the actual High suitability habitat losses were significantly less than predicted losses and no thresholds (i.e., >5 to 10% above predicted losses) were exceeded.

### 5.4.3 Whale Tail Pit and Haul Road

A thorough habitat loss analysis was conducted in 2018 and habitat loss outcomes were compared to permitted areas. For all ELC units, habitat losses were less than the habitat available within permitted areas; therefore, thresholds were not surpassed. As with the overall habitat loss assessment, high suitability habitat losses for Ungulates was well below high suitability habitats available within permitted areas; therefore, again no thresholds have been surpassed.

## 5.5 MANAGEMENT RECOMMENDATIONS

Calculated habitat loss for the project is well below habitats available within the permitted areas, as are high suitability habitat losses for wildlife VECs. Given this outcome, the next habitat analysis is planned for 2021.

# SECTION 6 • CARIBOU SATELLITE-COLLARING PROGRAM

## 6.1 OVERVIEW

Agnico Eagle continues to collaborate with the GN DoE in a Caribou satellite-collaring program that includes data collected within the Meadowbank and Whale Tail RSAs, as per the MOU (renewed in 2017) with government partners. The GN biologists discuss collar deployments with hunters and Elders and get approval prior to proceeding. Discussions are ongoing between Agnico Eagle, GN, and other partners on the best path forward to ensure Caribou migration maps continue to integrate Elders and local HTO input.

Information pertaining to the identification and location of various herds that use the Meadowbank and Whale Tail RSAs at different times of the year are important components of ongoing monitoring and management efforts at the mine site and along project roads.

## 6.2 OBJECTIVES

The satellite-collaring program was developed to provide information on the distribution of Caribou occurring within the Meadowbank and Whale Tail RSAs and contribute data to ongoing satellite-collaring programs for the Ahiak, Qamanirjuaq, and other herds. The satellite-collaring program, along with GN DoE regional data, is an important monitoring and management tool that provides a regional perspective on Caribou activity near mine operations. Another key objective of the program is to provide timely information for the Caribou management and monitoring strategy at the Meadowbank and Whale Tail sites (i.e., Decision Tree approach; see 2019 TEMP [Agnico Eagle 2019]).

To determine whether Caribou approaching the mine and roads are being disturbed (e.g., if their movement is deflected to avoid the project), a comprehensive analysis of satellite collaring data since 2008 was undertaken by the GN and Agnico Eagle, led by the GN.

## 6.3 DURATION

The satellite-collaring program was initially designed to continue for five consecutive years in accordance with the original TEMP (Cumberland 2006), but collar deployments have continued beyond this period as part of a long-term Caribou monitoring strategy for the region. Caribou in the Baker Lake area were first collared in May 2008, and the program has continued for more than a decade.

## 6.4 METHODOLOGY

Caribou are carefully netted by the contracted satellite-collaring crew via helicopter and fitted with either an Advanced Research and Global Observation Satellite (ARGOS) GPS Type IV or Iridium satellite-collar. Collar data are regularly[1] retrieved electronically via satellite and distributed to GN DoE and Nunavut Environmental personnel by CLS America, the data-management company.

Deployed collar data were included in a population distribution analysis completed for the GN (Nagy et al. 2011). The clustering and movements of each collared Caribou are examined and assigned to the sub-population (i.e., Ahiak, Beverly, Lorillard, Qamanirjuaq, and Wager Bay) that best fits the animal's movement characteristics.

## 6.5 HISTORICAL RESULTS

Collaring was originally scheduled to commence in 2007 but was postponed for one year due to logistical constraints. Seven deployments, with a total of 115 collars, have been completed in the area around Baker Lake since Agnico Eagle became involved in the collaring program. The following numbers of collars were successfully deployed since 2008:

- 9 collars (Agnico Eagle) in May 2008;
- 21 collars (shared by Agnico Eagle and AREVA) in November 2009;
- 13 collars (Agnico Eagle) in April 2011;
- 15 collars (shared by Agnico Eagle and AREVA) in April 2013;
- 10 collars (Agnico Eagle) in April 2015;
- 13 collars (Agnico Eagle) in May 2016; and
- 34 collars (Agnico Eagle) in April 2018

Also included in **Section 6** figures are collared Caribou from the Qamanirjuaq herd, which are part of a separate GN program, and collars from a Government of the Northwest Territories (GNWT) program on the Beverly herd. These telemetry data are included because of the proximity of animals to the Meadowbank RSA. As discussed above, historical collar data have all been assigned to one of the five major sub-populations (Nagy et al. 2011).

## 6.6 2019 RESULTS

At the beginning of the 2019 monitoring year, 35 of the Baker Lake collared Caribou were still active, including three (3) from the 2015 deployment, four (4) from the 2016 deployment, and 28 from the April 2018. By the end of 2019, 31 collars were active, comprised of three (3) from the 2015 deployment, four (4) from the 2016 deployment, and 24 from the 2018 deployment. A summary of 2019 locations and movement patterns for Caribou collared around Baker Lake by season is described below and summarized in **Figure 6.1**.

[1] Data are often retrieved on a daily basis but may vary depending on signal strength and weather conditions.


**Legend**

- All-Weather Access Road
- Whale Tail Haul Road
- Meadowbank All-Weather Access Road Local Study Area (LSA)
- Meadowbank Local Study Area (LSA)
- Meadowbank Regional Study Area (RSA)
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Whale Tail Pit and Haul Road Regional Study Area (RSA)

0 50 100 150

Kilometres

**Projection:** UTM Zone 14 NAD83

**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database,
Agnico-Eagle Mines Limited,
Department of Environment
(Gov't of Nunavut),
Gov't of Northwest Territories

[redacted]

**Figure 6.1: 2019 Government of Nunavut and Northwest Territories Telemetry Programs Collar Locations**

## Meadowbank Gold Project

Prepared for: [redacted]

By: [redacted]

Seasonal movements of collared Caribou in close proximity to the Meadowbank RSA and LSA in 2019 are shown in **Figure 6.2**. Note that the seasons indicated in the figures and discussed further align with those identified in the 2019 TEMP (i.e., Spring – 01 April to 25 May; Summer – 26 May to 21 September; Fall – 22 September to 15 December; and Winter 16 December to March 31). In 2019, most Caribou appeared to migrate through the RSA and across the AWAR and Whale Tail Haul Road without major deflections. This positive result may be due to the number of road closures, timing of initial road closures and/or a combination thereof that were initiated in 2019 in response to Caribou presence.

Movements for Qamanirjuaq herd collared animals, a program also supported by Agnico Eagle, and animals collared by the GNWT are provided for context in **Figure 6.1**. At the beginning of 2019, 40 collars were active (i.e., 11 from the 2016 deployment, 8 from 2016, and 21 from 2017). In late April 2019, an additional 35 animals from the Qamanirjuaq herd were fitted with collars. By the end of 2019, 55 of the Qamanirjuaq collars were active (i.e., 6 from the 2016 deployment, 17 from 2017, and 32 from 2019). Seasonal movements of all collared Caribou are discussed below.

**Spring (01 April to 25 May)**

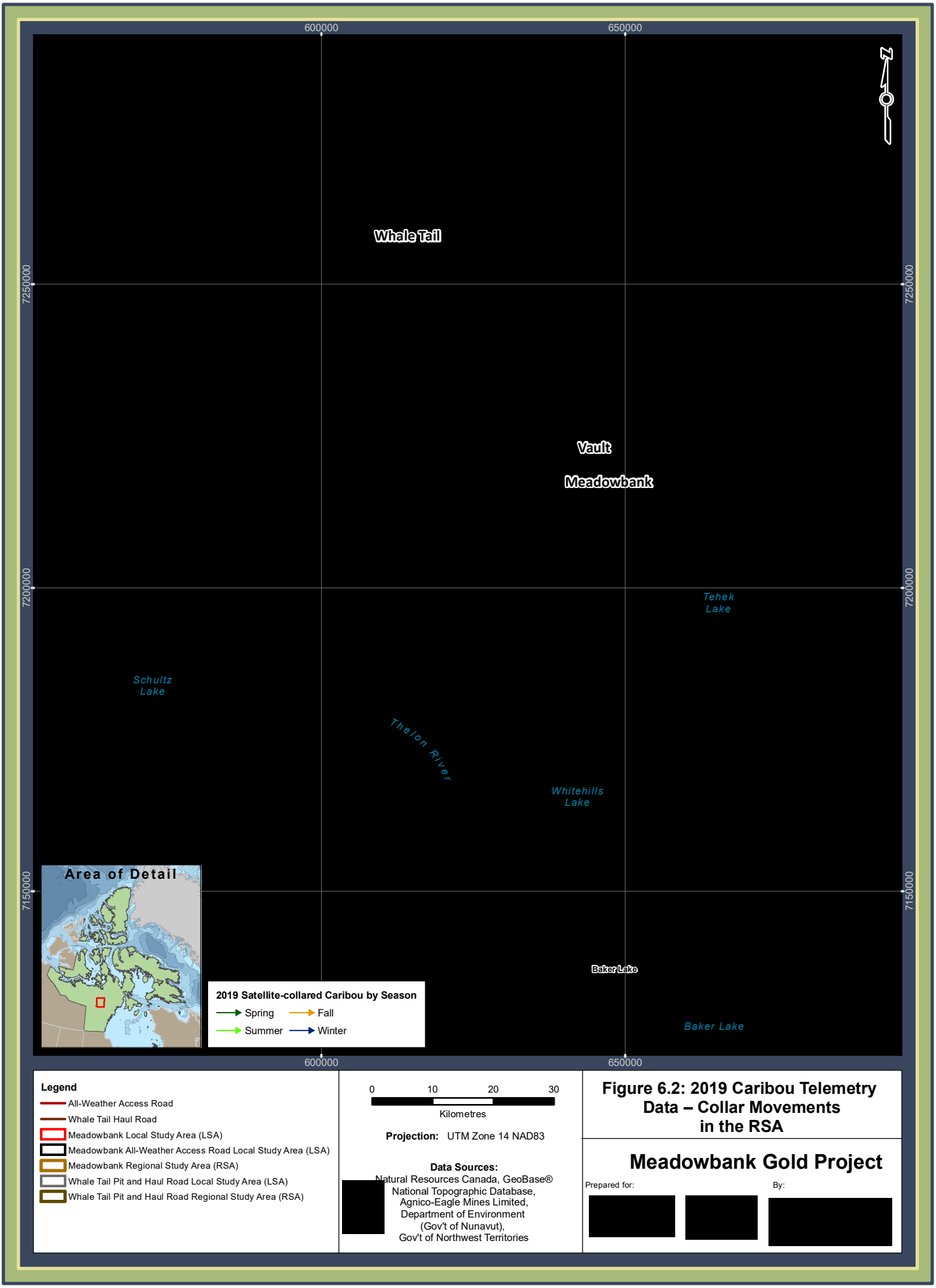
In 2019, spring collar data indicated movement of Caribou across the entire length of the AWAR and Whale Tail Haul Road (**Figure 6.3**), which was supported by road survey data (**Section 3**). Caribou moving across the AWAR appeared to be primarily from the Lorillard and Wager Bay Caribou herds while individuals moving across the Whale Tail Haul Road appeared to be from the Ahiak herd (**Figure 6.3**). The majority of collared Ahiak animals moved in a northeast direction well to the west of the Meadowbank RSA. A significant movement of the Qamanirjuaq herd to calving grounds occurred south of Chesterfield Inlet (**Figure 6.3**).

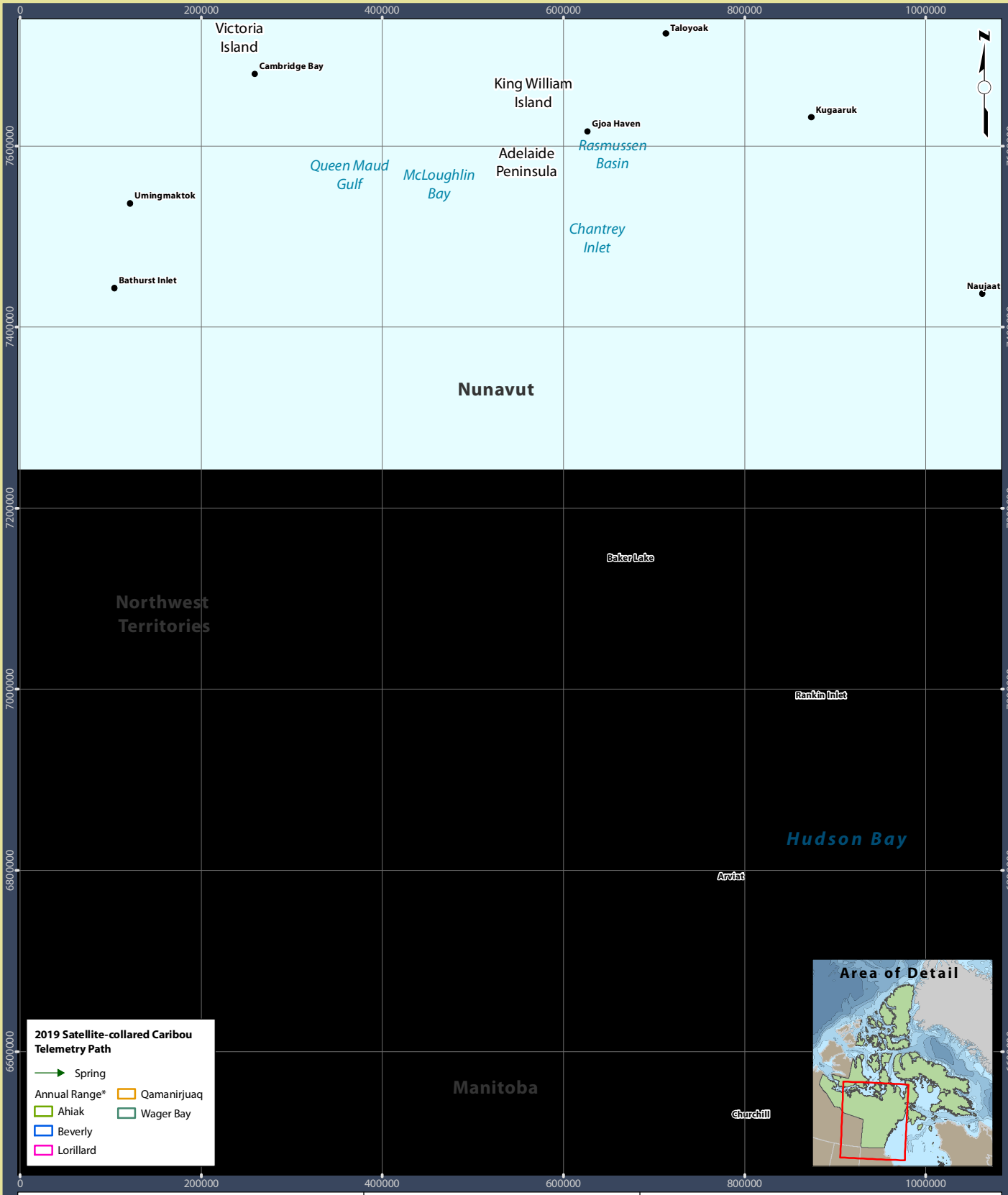
**Summer (26 May to 21 September)**

At least two individuals from the Ahiak herd spent a considerable amount of time in the vicinity of the Whale Tail Pit LSA during summer 2019 (**Figure 6.4**). Interestingly, one Caribou that had migrated with the Qamanirjuaq herd to calving grounds south of Chesterfield Inlet crossed the inlet just east of Baker Lake and wandered in a northwest direction through the Whale Tail RSA to join the Ahiak herd (**Figure 6.4**). The majority of collared Ahiak animals were well to the northwest and west of the Meadowbank RSA. South of Chesterfield Inlet, collared Qamanirjuaq animals moved in a largely clockwise direction in an area generally west of Arviat (**Figure 6.4**).

**Fall (22 September to 15 December)**

At least five collared Caribou from the Wager Bay and Lorillard herds moved across the AWAR in fall 2019 (**Figures 6.2** and **6.5**). This movement corresponded with a large number of Caribou observed on road surveys (see **Section 3**) and an increased number of animals harvested by hunters (see **Section 10**). Collared Ahiak animals were well west of the Meadowbank RSA in an area southeast of Bathurst Inlet (**Figure 6.5**). South of Baker Lake, collared Qamanirjuaq animals moved further south into northern Manitoba and then migrated in a western direction toward the Northwest Territories (**Figure 6.5**).


600000
650000
7250000
7200000
7150000
Whale Tail
Vault
Meadowbank
Tehek Lake
Schultz Lake
Thelon River
Whitehills Lake
Baker Lake
Baker Lake
Area of Detail
2019 Satellite-collared Caribou by Season
Spring
Fall
Summer
Winter
Legend
All-Weather Access Road
Whale Tail Haul Road
Meadowbank Local Study Area (LSA)
Meadowbank All-Weather Access Road Local Study Area (LSA)
Meadowbank Regional Study Area (RSA)
Whale Tail Pit and Haul Road Local Study Area (LSA)
Whale Tail Pit and Haul Road Regional Study Area (RSA)
0
10
20
30
Kilometres
Projection: UTM Zone 14 NAD83
Data Sources:
Natural Resources Canada, GeoBase® National Topographic Database, Agnico-Eagle Mines Limited, Department of Environment (Gov't of Nunavut), Gov't of Northwest Territories
Figure 6.2: 2019 Caribou Telemetry Data – Collar Movements in the RSA
Meadowbank Gold Project
Prepared for:
By:




**Legend**

- All-Weather Access Road
- Whale Tail Haul Road
- Meadowbank Local Study Area (LSA)
- Meadowbank All-Weather Access Road Local Study Area (LSA)
- Meadowbank Regional Study Area (RSA)
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Whale Tail Pit and Haul Road Regional Study Area (RSA)

* Official home ranges and calving grounds are from the following publication: Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifertarandus L.) in arctic and subarctic Canada. Ecological Applications [doi:10.1890/10-1410.1].

0 50 100 150

Kilometres

**Projection:** UTM Zone 14 NAD83

**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database,
Agnico-Eagle Mines Limited,
Department of Environment
(Gov't of Nunavut),
Gov't of Northwest Territories

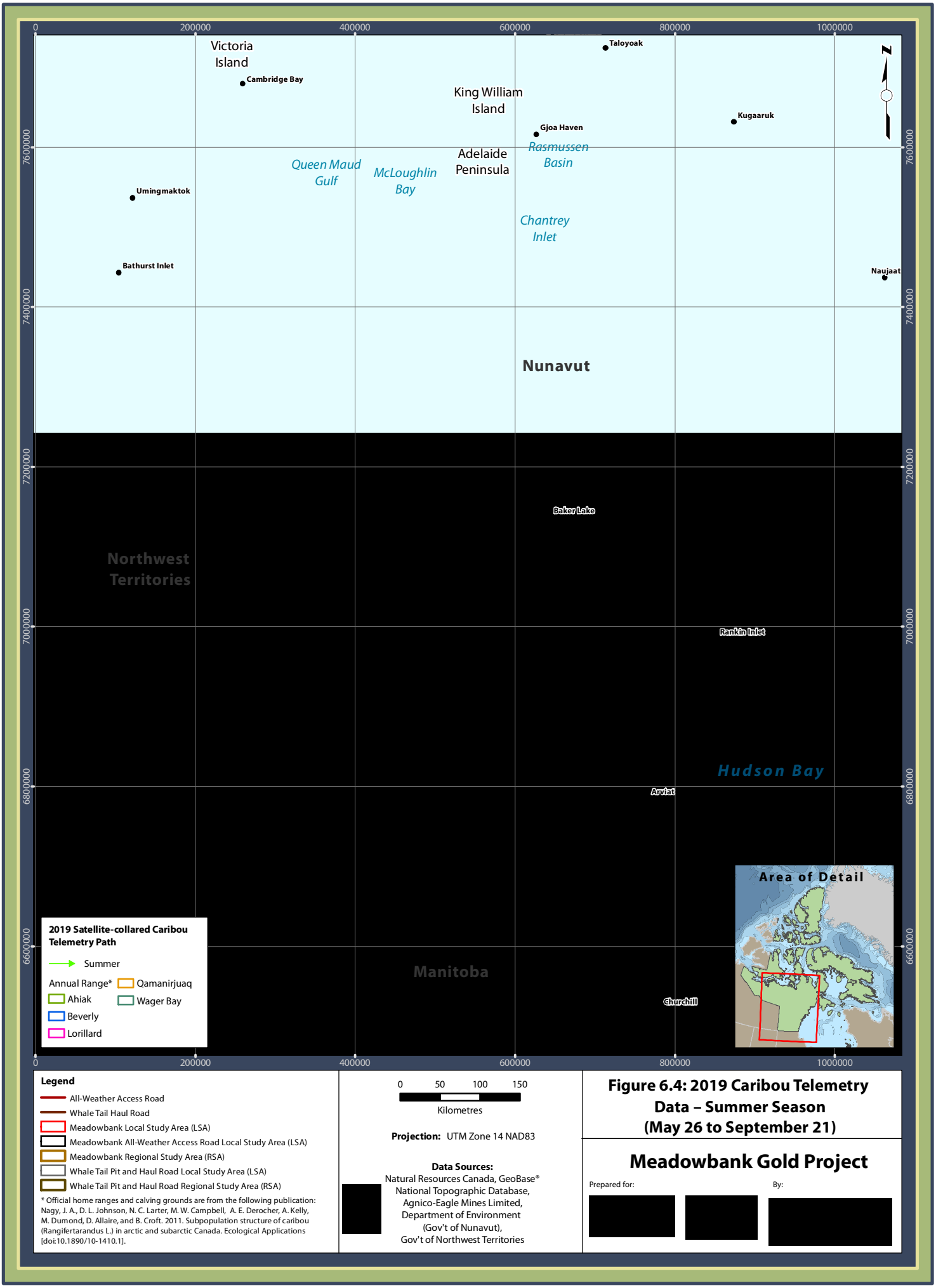
[redacted]

**Figure 6.3: 2019 Caribou Telemetry Data – Spring Season (April 1 to May 25)**

## Meadowbank Gold Project

Prepared for: [redacted]

By: [redacted]




**Legend**

- All-Weather Access Road
- Whale Tail Haul Road
- Meadowbank Local Study Area (LSA)
- Meadowbank All-Weather Access Road Local Study Area (LSA)
- Meadowbank Regional Study Area (RSA)
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Whale Tail Pit and Haul Road Regional Study Area (RSA)

* Official home ranges and calving grounds are from the following publication: Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifertarandus L.) in arctic and subarctic Canada. Ecological Applications [doi:10.1890/10-1410.1].

0 50 100 150

Kilometres

**Projection:** UTM Zone 14 NAD83

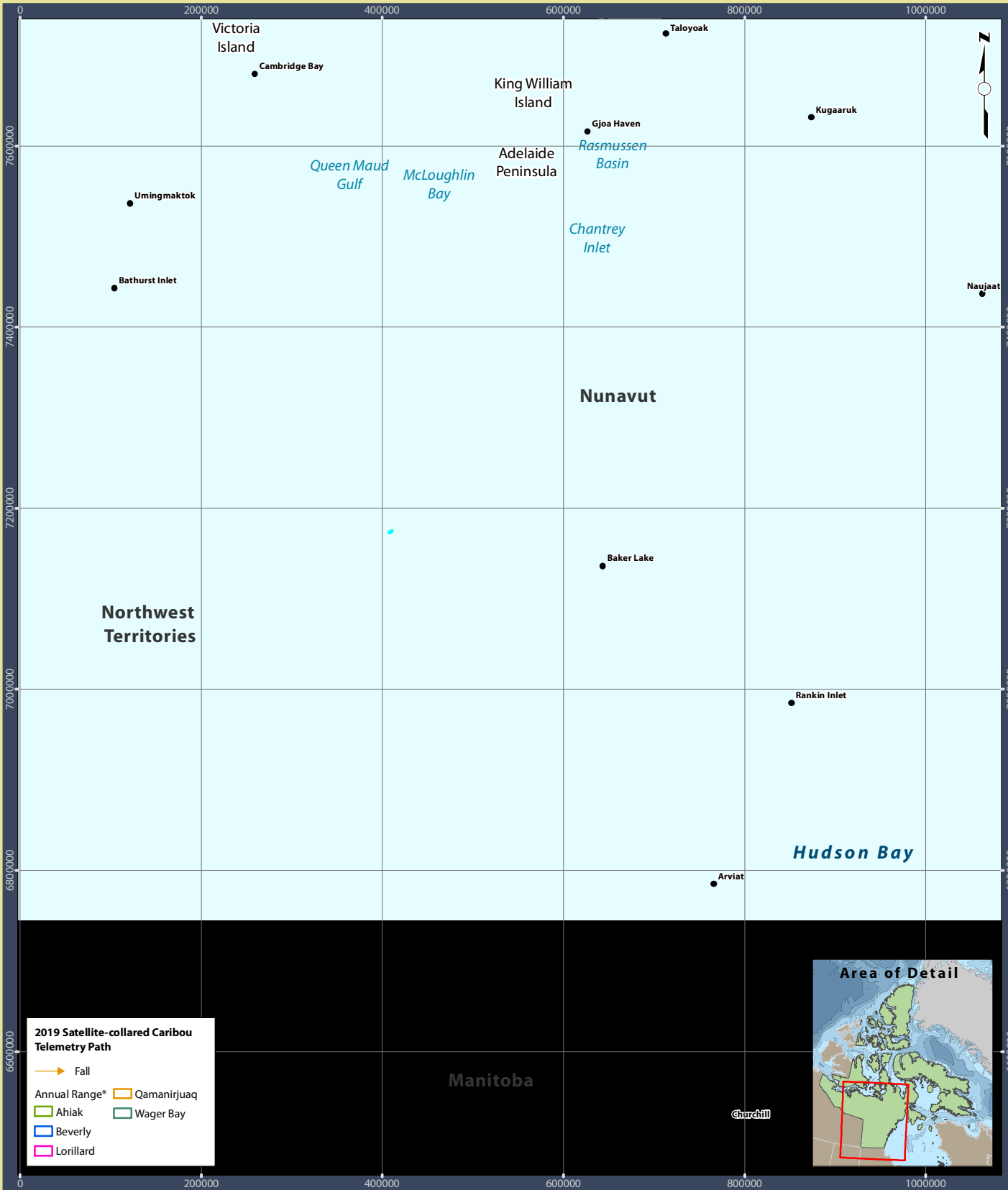
**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database,
Agnico-Eagle Mines Limited,
Department of Environment
(Gov't of Nunavut),
Gov't of Northwest Territories

**Figure 6.4: 2019 Caribou Telemetry Data – Summer Season (May 26 to September 21)**

## Meadowbank Gold Project

Prepared for:

By:




**Legend**

- All-Weather Access Road
- Whale Tail Haul Road
- Meadowbank Local Study Area (LSA)
- Meadowbank All-Weather Access Road Local Study Area (LSA)
- Meadowbank Regional Study Area (RSA)
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Whale Tail Pit and Haul Road Regional Study Area (RSA)

* Official home ranges and calving grounds are from the following publication: Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifertarandus L.) in arctic and subarctic Canada. Ecological Applications [doi:10.1890/10-1410.1].

0 50 100 150

Kilometres

**Projection:** UTM Zone 14 NAD83

**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database,
Agnico-Eagle Mines Limited,
Department of Environment
(Gov't of Nunavut),
Gov't of Northwest Territories

**Figure 6.5: 2019 Caribou Telemetry Data – Fall Season (September 22 to December 15)**

## Meadowbank Gold Project

Prepared for:

By:

**Winter (16 December to 31 March)**

Collared Caribou were not present in the Meadowbank or Whale Tail RSAs during the winter of 2019 (**Figure 6.6**). A cluster of collared Lorillard and Wager Bay animals were present in the Aberdeen Lake area, which was also frequented by some hunters in 2019 (see **Section 10**). Qamanirjuaq and Ahiak collared animals wintered in western Nunavut and northeastern Northwest Territories (**Figure 6.6**).

**All Seasons**

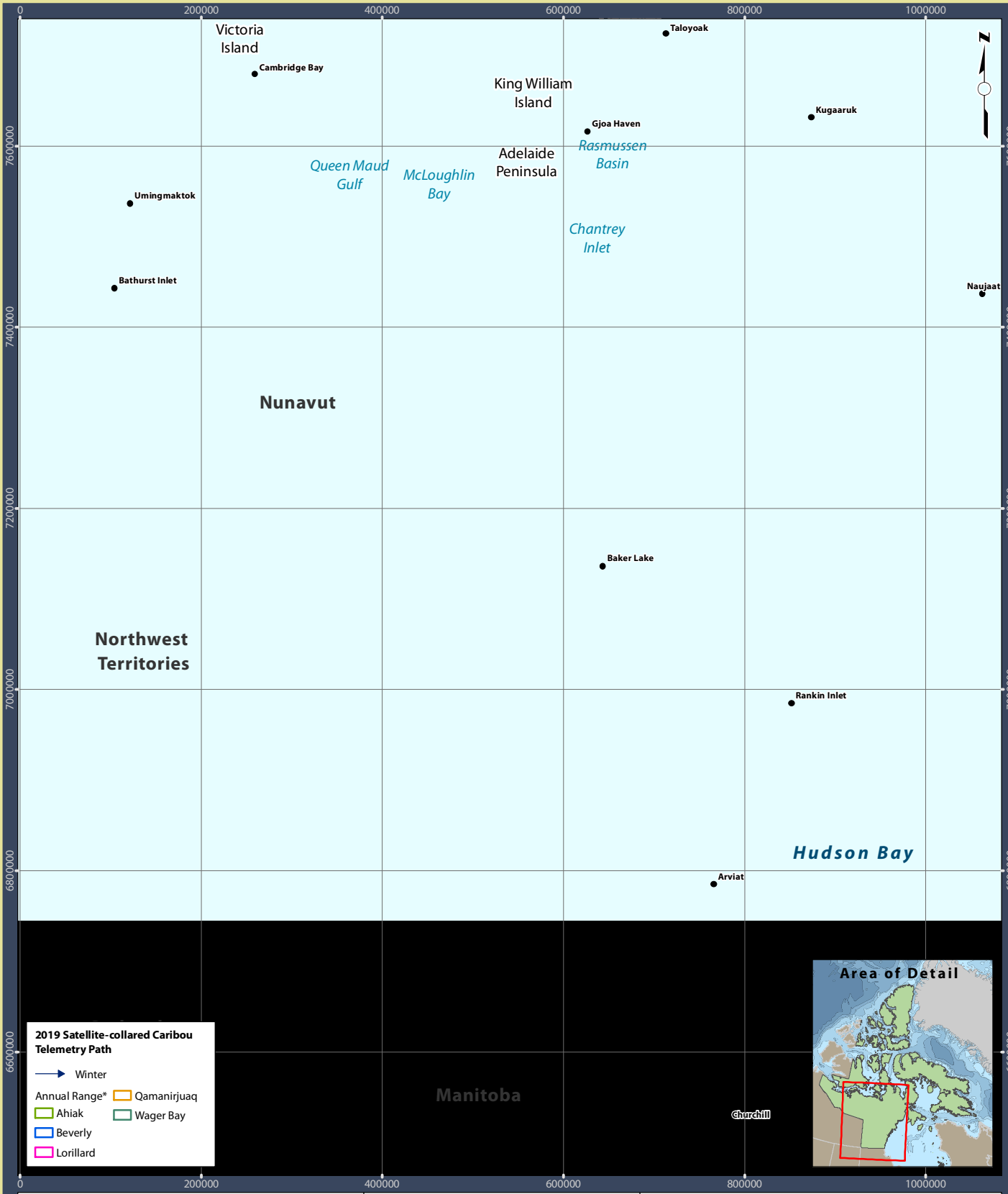
An overview of collared Caribou distribution in 2019 for all seasons is provided in **Figure 6.1.** These data include all remaining active collars from 2015, 2016, 2017, 2018 and 2019 deployments around the Baker Lake area. General trends in seasonal distribution are evident and generally comparable to findings from previous years for animals collared in this area. Collared Caribou calved (light green symbol) in five distinct areas: 1) around McLoughlin Bay and Rasmussen Basin and Kugaaruk (Ahiak herd); 2) north and west of Repulse Bay (Wager Bay herd); 3) between Chesterfield Inlet and Wager Bay, towards Hudson Bay (Lorillard herd); 4) south of Chesterfield Inlet in the traditional calving grounds of the Qamanirjuaq herd; and 5) along the Queen Maud Gulf and McLoughlin Bay (Beverly). By the end of 2019, collared animals were congregated either between Aberdeen Lake and Dubawnt Lake, on Qamanirjuaq wintering grounds in the Northwest Territories, and in northeastern Northwest Territories (**Figure 6.1**).

As in most monitoring years to date, few collared Caribou were found within the Meadowbank and Whale Tail RSAs during the calving season (i.e., summer). In addition, no collared individuals were found in the RSAs during the winter season. Within the Meadowbank and Whale Tail RSAs, collared Caribou were present predominantly during the spring and fall periods (**Figure 6.2**).

At the end of 2019, 31 satellite collars originally deployed near Baker Lake continued to be active and tracked, with results being downloaded on a regular basis. Caribou collaring maps are posted at the Meadowbank mine site for staff to observe; however, maps are slightly out of date and do not depict current locations (i.e., in order not to facilitate hunting pressure).

## 6.7 CARIBOU MIGRATION PATTERNS

A summary of Caribou migration patterns, which synthesizes migration information from satellite-collaring data to 2012 and was developed by the GN for the spring and fall migrations, was provided in the 2014 annual report. The seasonal range maps are currently being updated by the GN and will include an update on migration corridors. As these figures have not been updated, they are not discussed in this year's report.




**Legend**

- All-Weather Access Road
- Whale Tail Haul Road
- Meadowbank Local Study Area (LSA)
- Meadowbank All-Weather Access Road Local Study Area (LSA)
- Meadowbank Regional Study Area (RSA)
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Whale Tail Pit and Haul Road Regional Study Area (RSA)

* Official home ranges and calving grounds are from the following publication: Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifertarandus L.) in arctic and subarctic Canada. Ecological Applications [doi:10.1890/10-1410.1].

0 50 100 150

Kilometres

**Projection:** UTM Zone 14 NAD83

**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database,
Agnico-Eagle Mines Limited,
Department of Environment
(Gov't of Nunavut),
Gov't of Northwest Territories

**Figure 6.6: 2019 Caribou Telemetry Data – Winter Season (December 16 to March 31)**

## Meadowbank Gold Project

Prepared for:

By:

## 6.8 ACCURACY OF IMPACT PREDICTIONS

A summary of the impact predictions identified in the TEMP is provided in **Table 6.1**. The 2019 satellite-collaring data were compared to the impact prediction thresholds to evaluate adherence to the impact predictions and the provision of adaptive management, as either a necessary or proactive measure.

**Table 6.1:** Accuracy of Impact Predictions – Satellite-collaring Data

| Potential Effect | Threshold | Threshold Exceeded (2019) | Adaptive Management Implemented | Status |
|---|---|---|---|---|
| Sensory Disturbance | No threshold but Decisions Trees followed when Caribou are seen near mine facilities | No | YES. Multiple road closures and notices. Use of Decision Tree for management and monitoring. Ongoing analysis by GN (in partnership with Agnico Eagle) | Satellite-collaring data<br>Daily and weekly pit and mine-site ground surveys<br>AWAR and Haul Road surveys<br>HOL Surveys<br>Motion sensing cameras |
| Hunting by Baker Lake Residents | Caribou herds will not be significantly affected by year-round access to the RSA. | No | NA | Satellite-collaring data<br>Hunter Harvest Study |

## 6.9 MANAGEMENT RECOMMENDATIONS

The 2019 satellite-collaring data depicted Caribou movements within and through the Meadowbank and Whale Tail RSAs and LSAs during most seasons but particularly during spring and fall. Most 2019 Caribou activity was observed during the spring and fall migration requiring numerous road closures and restrictions along the Whale Tail Haul Road and Meadowbank AWAR. Agnico Eagle and regulatory agencies are committed to conducting more detailed analyses of Caribou monitoring data, satellite collar data, hunter harvest activity, and other potential influences on Caribou movement and migration to adaptively manage and minimize project-related effects on Caribou. Agnico Eagle is also exploring the link between Caribou road crossings and road closures and several technical memorandums have been presented to the TAG regarding effects to Caribou.

Agnico Eagle environment department should continue to closely monitor Caribou movement in the weeks leading up to seasonal migrations using the latest available satellite-collaring and monitoring data (e.g., road surveys) as well as incidental reports from staff. As a proactive adaptive management strategy, notification and announcements, staff re-education, specific dispatch protocols, and temporary road closures should continue to be implemented. Where applicable, Caribou management and monitoring should be conducted according to protocols outlined in the 2019 TEMP, including continued use of a decision tree. Issues and concerns that arise should be discussed with regulatory personnel and during TAG meetings to ensure that a balance is achieved between Caribou protection and conservation, and mine operation. Infographic tools developed to assist in presenting and educating site staff and road users on key information and actions should continue to be used.

# SECTION 7 • HEIGHT OF LAND MONITORING

## 7.1 OVERVIEW

The purpose of the Height of Land (HOL) surveys is to serve as another level of Ungulate monitoring along the Whale Tail Haul Road.

In 2019, Agnico Eagle advanced the idea of using Roadside Survey Points instead of HOL locations because of safety and logistical reasons. A viewshed analysis and report were prepared by Golder (2020a – see **Appendix G**). Agnico Eagle, subject to approval by the TAG, intends to begin using the Roadside Survey Points in 2020. If this is the case, the approach and methodology will be described in the 2020 annual wildlife monitoring report.

## 7.2 OBJECTIVES

The HOL surveys provide an 'early warning' system of the presence of Caribou in proximity to the Whale Tail Pit and Haul Road.

## 7.3 DURATION

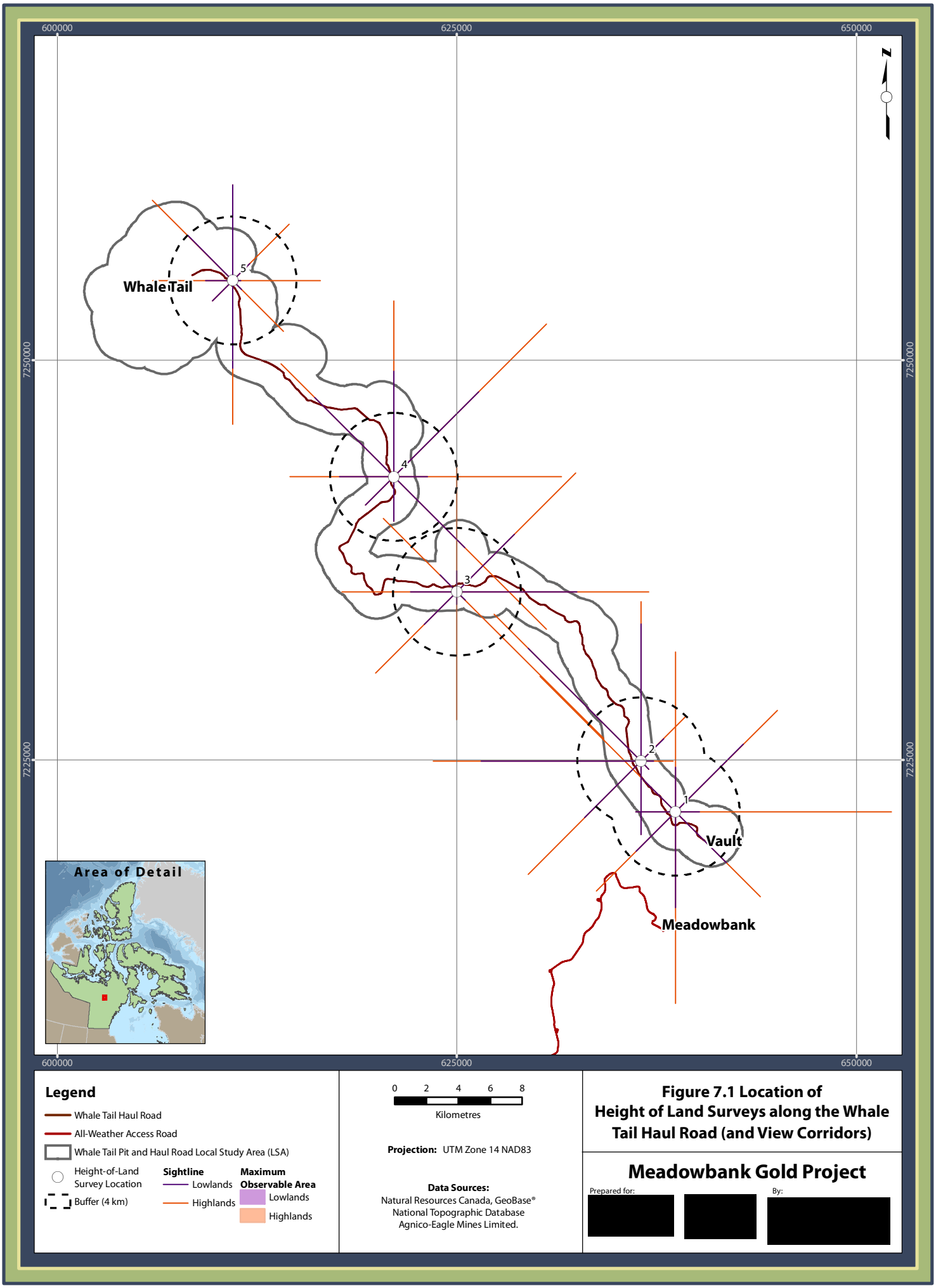
The HOL surveys are scheduled to be conducted once per week from January to April and from July to August. From May to June and September to December, the prime migratory period for Caribou, the frequency of surveys will increase to twice per week unless triggers (see **Section 9**) require surveys every two days.

## 7.4 METHODOLOGY

Five easily accessible HOL survey locations were established in 2017 along the Whale Tail Haul Road (see **Figure 7.1**). The locations are within 500 m of the Whale Tail Pit Haul Road and provide an unobstructed view (up to $360^0$) of the surrounding terrain. While conducting the ground surveys, two observers stop at the HOL locations and survey the area for 20 minutes using a combination of naked eye, binoculars, and scope. The surveyors independently view the landscape for Caribou starting at opposite cardinal directions and scan 180° for five minutes at a time, but move 90° every 5 minutes. Results are then compared to determine if Caribou Group Size Threshold (GST; see **Section 9**) is triggered, but consensus on numbers is not necessary as each survey will generate a separate result for each observer so that variability can be incorporated into detection rates.

## 7.5 2019 RESULTS

Fifty HOL surveys were conducted between 09 January and 15 December 2019. Because of weather-related issues, particularly in during the winter months, not all five HOL locations could be surveyed on each of the survey days. A summary of survey results by Caribou season is provided in **Table 7.1**. Raw data is provided in **Table 7.2** while field survey sheets can be found in **Appendix H**.




## Legend

- Whale Tail Haul Road
- All-Weather Access Road
- Whale Tail Pit and Haul Road Local Study Area (LSA)
- Height-of-Land Survey Location
- Buffer (4 km)

**Sightline**
- Lowlands
- Highlands

**Maximum Observable Area**
- Lowlands
- Highlands

0 2 4 6 8
Kilometres

**Projection:** UTM Zone 14 NAD83

**Data Sources:**
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.

**Figure 7.1 Location of Height of Land Surveys along the Whale Tail Haul Road (and View Corridors)**

## Meadowbank Gold Project

Prepared for: [redacted]

By: [redacted]

**Table 7.1:** Cumulative Number of Wildlife Observed on Height-of-Land Surveys along the Whale Tail Haul Road in 2019.

| | Caribou Seasons | | | |
|---|---|---|---|---|
| **Species** | **Spring 01 Apr to 25 May** | **Summer 26 May to 21 Sep** | **Fall 22 Sep to 15 Dec** | **Winter 16 Dec to 31 Mar** |
| **MAMMALS** | | | | |
| Arctic Hare | 2 | 3 | 3 | |
| Caribou | 842 | 177 | 529 | |
| Muskox | 17 | 16 | | 32 |
| Wolf | | | 1 | |
| Wolverine | | | 1 | 1 |
| **BIRDS** | | | | |
| Canada Goose | | 6 | | |
| Geese sp. | | 167 | | |
| Gull sp. | | 2 | | |
| Owl sp. | | 2 | | |
| Ptarmigan sp. | | 19 | 15 | |
| Snow Bunting | | 10 | | |
| Snow Goose | | 346 | | |

## 7.6 MANAGEMENT RECOMMENDATIONS

In 2019, an effort was made to identify Roadside Observation Points that could more easily and safely be surveyed (Golder 2020a – **Appendix H**). Based on discussions within the TAG, these Roadside Observation Points will be used in 2020 and replace the HOL surveys.

**Table 7.2:** Height-of-Land Survey Data along the Whale Tail Haul Road in 2019. Highlighted cells were not surveyed.

| Date (2019) | Observations (4 directions-360$^0$) | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|
| **Winter Season (01 January to 31 March)** | | | | | | | |
| 01 Jan | All directions | | | | - | - | No observations |
| 10 Jan | N – 5 minutes | | | - | | | Muskox resting 350 m from HOL |
| | E – 5 minutes | | | - | | | |
| | S – 5 minutes | | | - | | | |
| | W – 5 minutes | | | 30 Muskox | | | |
| 30 Jan | All directions | | | - | - | - | No observations |
| 06 Feb | All directions | - | - | - | - | - | No observations |
| 27 Feb | N – 5 minutes | - | - | - | 1 Wolverine | - | Wolverine walking >1km from HOL; Muskox resting >1.5km from HOL |
| | E – 5 minutes | - | - | - | 2 Muskox | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | - | - | - | |
| 13 Mar | All directions | - | - | - | - | - | No observations; visibility very poor |
| **Spring Season (01 April to 25 May)** | | | | | | | |
| 04 Apr | N – 5 minutes | | - | - | - | - | Caribou walking slowly 850 m from HOL |
| | E – 5 minutes | | - | - | - | - | |
| | S – 5 minutes | | 11 Caribou | - | - | - | |
| | W – 5 minutes | | - | - | - | - | |
| 06 Apr | All directions | | - | - | | | No observations |
| 20 Apr | N – 5 minutes | - | 45 Caribou | - | 9 Caribou | - | Almost all observations >1 km from HOL stations; some Caribou at HOL 5 were 650 m away |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | 43 Caribou | 37 Caribou | - | - | - | |
| | W – 5 minutes | - | - | - | - | 72 Caribou | |
| 21 Apr | N – 5 minutes | - | 6 Muskox | - | 40 Caribou | - | Observations ranged from 1 to 3 km away from HOL stations |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | 160 Caribou | - | - | - | 29 Caribou | |
| | W – 5 minutes | 117 Caribou | 9 Muskox | 14 Caribou | 68 Caribou | - | |

**Table 7.2:** Continued.

| Date (2019) | Observations (4 directions-360$^0$) | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|
| **Spring Season (01 April to 25 May)** | | | | | | | |
| 08 May | N – 5 minutes | 40 Caribou | - | | | | Caribou observed from 800 to 1000 m from HOL stations |
| | E – 5 minutes | - | 40 Caribou | | | | |
| | S – 5 minutes | - | 20 Caribou | | | | |
| | W – 5 minutes | - | - | | | | |
| 09 May | N – 5 minutes | - | - | - | - | - | No observations |
| 10 May | All directions | - | - | | | | No observations |
| 15 May | N – 5 minutes | 1 Arctic Hare | - | - | - | - | Muskox resting 1 km from HOL; Caribou walking slowly 2.5 km from HOL |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | 2 Muskox | - | - | - | - | |
| | W – 5 minutes | 65 Caribou | - | - | - | - | |
| 16 May | All directions | - | - | - | - | - | No observations |
| 16 May | N – 5 minutes | - | - | - | - | - | Caribou grazing 500 m from HOL station |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | - | 1 Arctic Hare | - | - | - | |
| | W – 5 minutes | - | 12 Caribou | - | - | - | |
| 19 May | All directions | - | - | - | | | No observations |
| 22 May | N – 5 minutes | - | - | - | - | - | Caribou grazing 2 km from HOL station |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | 20 Caribou | - | - | - | - | |
| **Summer Season (26 May to 21 September)** | | | | | | | |
| 28 May | All directions | - | - | - | - | - | No observations |
| 30 May | N – 5 minutes | - | - | - | - | - | No other observations |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | 1 Ptarmigan | - | - | |

**Table 7.2:** Continued.

| Date (2019) | Observations (4 directions-360$^0$) | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|
| **Summer Season (26 May to 21 September)** | | | | | | | |
| 05 Jun | N – 5 minutes | - | - | 3 Caribou | 15 Geese | - | Caribou walking from 1 to 2 km from HOL stations |
| | E – 5 minutes | - | - | - | 6 Caribou | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | - | 1 Arctic Hare | - | |
| 20 Jun | N – 5 minutes | - | - | - | - | 1 Arctic Hare | No Caribou observations |
| | E – 5 minutes | - | - | - | - | 1 Ptarmigan | |
| | S – 5 minutes | - | - | 6 Canada Goose | - | - | |
| | W – 5 minutes | - | - | 2 Ptarmigan | - | - | |
| 17 Jul | N – 5 minutes | - | - | - | 1 Muskox | - | Muskox from 500 to 1000 m from HOL stations |
| | E – 5 minutes | 1 Muskox | - | - | - | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | - | - | - | |
| 24 Jul | N – 5 minutes | - | - | - | - | - | Muskox foraging 1000 m from HOL station |
| | E – 5 minutes | 1 Arctic Hare | - | 1 Gull | - | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | 14 Muskox | - | - | - | 1 Gull | |
| 29 Jul | All directions | - | - | - | - | - | No observations |
| 14 Aug | All directions | - | - | - | - | - | No observations |
| 21 Aug | N – 5 minutes | - | - | - | - | - | Caribou 400 m to 1.5 km from HOL stations |
| | E – 5 minutes | - | - | - | - | 1 Caribou | |
| | S – 5 minutes | - | - | 1 Caribou | - | - | |
| | W – 5 minutes | - | - | - | - | 4 Caribou | |
| 26 Aug | N – 5 minutes | - | - | 57 Caribou | - | - | Caribou resting and foraging 700 to 800 m from HOL stations |
| | E – 5 minutes | - | - | - | - | - | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | 48 Caribou | - | - | |

**Table 7.2:** Continued.

| Date (2019) | Observations (4 directions-360$^0$) | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|
| **Summer Season (26 May to 21 September)** | | | | | | | |
| 27 Aug | N – 5 minutes | | | | | - | Caribou resting and foraging 900 m to 2 km from HOL stations |
| | E – 5 minutes | | | | | - | |
| | S – 5 minutes | | | | | 6 Caribou | |
| | W – 5 minutes | | | | | 1 Caribou | |
| 29 Aug | N – 5 minutes | - | - | - | - | - | Caribou walking slowly and foraging 1 to 2 km from HOL stations |
| | E – 5 minutes | - | - | - | 1 Owl | 13 Caribou | |
| | S – 5 minutes | - | - | - | - | - | |
| | W – 5 minutes | - | - | 2 Caribou | - | 14 Caribou | |
| 04 Sep | N – 5 minutes | 40 Snow Geese | - | 80 Snow Geese | - | - | Snow Geese foraging ~1 km from HOL stations; Caribou grazing 1 to 2 km away |
| | E – 5 minutes | 40 Snow Geese | 20 Snow Geese | 2 Caribou | 60 Snow Geese | 10 Snow Geese | |
| | S – 5 minutes | - | - | 20 Snow Geese | - | - | |
| | W – 5 minutes | - | - | - | 1 Owl | - | |
| 11 Sep | N – 5 minutes | | - | - | 30 Geese | - | Geese foraging and flying; Caribou foraging, walking slowly and resting 1 to 2 km from HOL stations |
| | E – 5 minutes | | 33 Geese | 33 Geese | - | 3 Caribou<br>6 Snow Geese | |
| | S – 5 minutes | | - | - | - | 16 Caribou | |
| | W – 5 minutes | | - | 10 Geese | 20 Geese | - | |
| 12 Sep | All directions | - | | | | | No observations |
| 19 Sep | N – 5 minutes | 10 Snow Bunting | - | 6 Geese | 20 Snow Geese | | Geese flying over or foraging close to the HOL stations |
| | E – 5 minutes | - | - | - | - | | |
| | S – 5 minutes | 20 Geese | - | 15 Ptarmigan | 50 Snow Geese | | |
| | W – 5 minutes | - | - | - | - | | |
| **Fall Season (22 September to 15 December )** | | | | | | | |
| 25 Sep | N – 5 minutes | | - | | | - | Hares resting 100 m from HOL station |
| | E – 5 minutes | | 3 Arctic Hare | | | - | |
| | S – 5 minutes | | - | | | - | |
| | W – 5 minutes | | - | | | - | |

**Table 7.2:** Continued.

| Date (2019) | Observations (4 directions-360$^0$) | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|
| **Fall Season (22 September to 15 December )** | | | | | | | |
| 11 Oct | N – 5 minutes | | | | - | - | Caribou foraging, walking slowly, and running (wolf) 950 m to 2.5 km from HOL stations |
| | E – 5 minutes | | | | 31 Caribou | - | |
| | S – 5 minutes | | | | - | 200+ Caribou | |
| | W – 5 minutes | | | | - | 48 Caribou<br>1 Wolf | |
| 14 Oct | N – 5 minutes | | | - | - | - | Caribou foraging and resting 1 km from HOL station |
| | E – 5 minutes | | | - | 250+ Caribou | - | |
| | S – 5 minutes | | | - | - | - | |
| | W – 5 minutes | | | - | - | - | |
| 18 Oct | N – 5 minutes | - | 15 Ptarmigan | - | | | Ptarmigan 300 m from HOL station |
| | E – 5 minutes | - | - | - | | | |
| | S – 5 minutes | - | - | - | | | |
| | W – 5 minutes | - | - | - | | | |
| 23 Oct | All directions | - | - | - | - | - | No observations |
| 24 Oct | All directions | | - | - | - | | No observations; poor visibility because of fog |
| 30 Oct | N – 5 minutes | | | | | 1 Wolverine | Wolverine right beside HOL station |
| | E – 5 minutes | | | | | - | |
| | S – 5 minutes | | | | | - | |
| | W – 5 minutes | | | | | - | |
| 30 Oct | All directions | | | - | - | | No observations |
| 13 Nov | All directions | - | - | | - | - | No observations |
| 16 Nov | All directions | | - | - | | | No observations |
| 17 Nov | All directions | | - | - | | - | No observations |
| 24 Nov | All directions | - | | - | | | No observations |

**Table 7.2:** Continued.

| Date | Observations | HOL 1 | HOL 2 | HOL 3 | HOL 4 | HOL 5 | Comments |
|---|---|---|---|---|---|---|---|

| (2019) | (4 directions-360$^0$) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Fall Season (22 September to 15 December )** | | | | | | | |
| 27 Nov | All directions | | | | - | - | No observations |
| 28 Nov | All directions | | | | | | No observations; poor visibility |
| 12 Dec | All directions | | | - | - | - | No observations |
| 15 Dec | All directions | | | | - | - | No observations |

# SECTION 8 • REMOTE CAMERAS

## 8.1 OVERVIEW

The use of remote cameras was first introduced in October 2018 as another technique to monitor Caribou interactions (e.g., behavior) with project roads equipment or other industrial features (e.g., roadside marker flags). The approach is one of several monitoring techniques to ensure that the best Caribou management practices and mitigation are implemented for the project.

## 8.2 OBJECTIVES

The primary objective of using remote cameras is to monitor Caribou behavioral interactions with project roads and equipment, and adapt management practices and mitigation as required.

## 8.3 DURATION

The use of remote cameras will continue indefinitely but camera results will be analyzed and discussed at TAG meetings to ensure that the monitoring objectives are being achieved.

## 8.4 METHODOLOGY

Remote cameras can be used and set to be triggered based on motion/heat and/or on a time series to view video footage of Caribou interaction with project infrastructure such as roads and equipment. In November 2019, a detailed remote camera protocol was developed by Golder (2019) (see **Appendix I**).

## 8.5 2019 RESULTS

Results from the 2018 remote camera program have been summarized in a Technical Memorandum by Golder (2020b) and is included in **Appendix J** (see also Photo below). Results from the 2019 remote camera program are not yet available.

## 8.6 MANAGEMENT RECOMMENDATIONS

Subject to results of the analysis under the remote camera program, the program may be revised or no longer required after collecting data for consecutive seasons over three years to establish trends. Communications with the TAG on this program will be ongoing.


2018-10-22 14:38:21 M 1/3 -7°C
AECCO1

# SECTION 9 • CARIBOU MANAGEMENT DECISION TREE

## 9.1 OVERVIEW

Introduced in 2018, the 2019 TEMP describes the use of decision trees or charts that outline monitoring and mitigation (adaptive monitoring) measures for Ungulates for each of five phases: 1) Caribou and mining operations; 2) Caribou and haul roads; 3) Caribou and the AWAR; 4) Caribou and blasting; and 5) Muskox and operations (see Agnico Eagle 2019).

## 9.2 OBJECTIVES

The monitoring objectives are to:

1) Detect if effect thresholds have been exceeded;
2) Test the efficacy of mitigation; and
3) Understand project-related effects to Ungulates. For Ungulates, the decision charts are also an objective to manage sensory disturbance to Caribou approaching the project, leading to monitoring to detect Caribou approaching the project and mitigation to reduce sources of sensory disturbance.

Monitoring activities for Ungulates will be carried out prior to, during, and following construction. The use of decision trees for managing disturbance to Ungulates is an ongoing and continuous monitoring strategy for the life of the project. Monitoring intensity is increased as Ungulates approach the project.

## 9.3 DURATION

Monitoring activities for Ungulates will be carried out prior to, during, and following construction. The use of decision trees for managing disturbance to Ungulates is an ongoing and continuous monitoring strategy for the life of the project. Monitoring intensity is increased as Ungulates approach the project.

## 9.4 METHODOLOGY

The approach involves monitoring the number of Ungulates in close proximity to mining operations through various monitoring tools including Caribou collaring data, HOL surveys, AWAR and haul road surveys, and pit and mine site grounds surveys. Depending on the number of Ungulates observed (i.e., Caribou Group Size Threshold – GST), proximity to the road, and time of year, different monitoring levels are triggered (i.e., Level 1, Level 2, Level 3). For example, triggers may result in pit and mine site ground surveys and/or haul road surveys increased up to every two days, and Caribou satellite data reviewed on a daily basis.

For the purposes of monitoring, a “group of Caribou” is defined as: “An aggregation of caribou that are sufficiently close together that they can see and react to another animal’s behaviour, and have the potential of responding should one or more animal in the aggregation become startled.” For further details on the reasoning behind Caribou GSTs and the decision chart approach, refer to the 2019 TEMP

(Agnico Eagle 2019). The GST approach and monitoring/management outcomes will be reviewed by the TAG on a regular basis to determine whether an acceptable balance has been achieved between mining operations and conserving Caribou populations. As GSTs are the main trigger for mitigation and management, understanding their efficacy for overall herd protection is of high importance.

## 9.5 2019 RESULTS

Use of the decision tree and trigger approach was used on multiple occasions in 2019. In many cases where groups of Caribou were observed close to the road, closures or restrictions were implemented (see **Tables 3.4** to **3.6**). Project-tolerant animals are defined in the TEMP as an animal or group of animals observed within a mitigation distance buffer for greater than 72 hours during the winter or 48 hours during other seasons; and not visibly disturbed by the Project. To understand visible disturbance to the animals, behavioural monitoring (i.e., group scans) will be completed when the animal(s) are encountered and at least once per day until they are deemed project-tolerant.

## 9.6 ACCURACY OF IMPACT PREDICTIONS

An objective of the decision chart approach is to reduce sensory disturbance to Caribou approaching the project. The objective is not linked to an impact prediction as the monitoring is to trigger mitigation rather than to test a threshold.

## 9.7 MANAGEMENT RECOMMENDATIONS

Decisions and outcomes resulting from the use of the decision tree approach in 2019 should be analyzed to determine whether adjustments to the approach need to be made and discussed in TAG meetings. A dedicated log of decisions and outcomes should be kept in 2020 to facilitate future analyses of the effectiveness of this monitoring approach.