

Appendix G13

2016 Wildlife Monitoring Summary Report



MEADOWBANK MINE

2016 WILDLIFE MONITORING SUMMARY REPORT

FINAL

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SECTION 1 • EXECUTIVE SUMMARY

As a requirement of the NIRB Project Certificate, the 2016 Wildlife Monitoring Summary Report represents the 11th of a series of annual Wildlife Monitoring Summary Reports for the Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Mine (the project). Baseline and monitoring programs were first initiated in 1999 and will continue throughout the life of the mine. Details of the wildlife monitoring program for the project are provided in the Terrestrial Ecosystem Management Plan (Cumberland 2006). The 2016 report provides the objectives, methodology, historical and current year results, and management recommendations for each monitoring program. Each subsequent Wildlife Monitoring Summary Report builds on data presented in the previous year's report, and monitoring incorporates recommendations from the previous reports.

Six active Peregrine Falcon (*Falco peregrinus*) nests were observed and monitored at quarry sites along the AWAR in 2016, with successful nesting confirmed at four nests. No nesting activity was observed at Portage Pit in 2016 but a Rough-legged Hawk (*Buteo lagopus*) nest was observed in Goose Pit, although nesting success could not be determined. Raptor nest management plans were not warranted at any of the active nest sites as no project-related effects on raptor nesting success were observed.

The Government of Nunavut (GN) Caribou (*Rangifer tarandus*) collaring program, ongoing for the past eight years in the Baker Lake area, continued in 2016 with monitoring of existing collared animals and 13 additional collars deployed in 2016. Seasonal Caribou movements within and adjacent to the Meadowbank Regional Study Area (RSA) were tracked and mapped throughout the year. In 2016, collared Caribou were present in the RSA during the spring, late summer, fall, and early winter seasons. Movement of collared Caribou in proximity to the AWAR appeared to be more restricted in 2016, especially during spring and fall migration. Only one collared animal briefly crossed the AWAR in early October before turning back and heading east. Agnico Eagle continues to work with the GN to evaluate the collaring and monitoring data to ensure the protection of regional caribou movements.

A Hunter Harvest Study (HHS) was conducted from 2009 to 2015, but declining participation was making interpretation of hunting data increasingly difficult. Agnico Eagle suspended the program for 2016, but has begun discussions with the Baker Lake HTO and GN representatives regarding potential options for collecting hunting and fishing data in the Baker Lake area, and facilitating greater involvement of the local community, including the HTO. The program is planned to resume in 2017.

Typically during Caribou fall migration, road closure is required to ensure safe passage to migrating herds, but this was not required during the fall of 2016 (although one closure of the Vault Haul Road was required during the spring of 2016 because of Caribou presence). Sections of road were closed on four occasions during the spring, in all but one case for a herd of Muskox (*Ovibos moschatus*). More actions to deter Caribou presence around the mine site were required in January and February than in recent winter seasons. No Caribou or large predatory mammal fatalities occurred as a result of activities at the mine or along the AWAR in 2016. Improved food-handling practices and employee awareness programs at the mine site helped ensure that there were no mine-related Wolf (*Canis lupus*) or Wolverine (*Gulo gulo*) fatalities. With the Authorization of the GN officer, one Arctic Fox (*Vulpes lagopus*) needed to be euthanized after attempts to deter the animal were unsuccessful.

SECTION 2 • OVERVIEW

2.1 BACKGROUND

The Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Mine (the project), located in the Kivalliq Region of Nunavut (**Figure 2.1**), received a Project Certificate from the Nunavut Impact Review Board (NIRB) in 2006. The subsequent Water License, GN and AANDC Land Lease, and KIA Land Use Production Lease, 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 the vicinity of the Hamlet of Baker Lake.

The 2016 annual report is the 11th of a series of annual Wildlife Monitoring Summary Reports for the project. The purpose of this report is to summarize the 2016 data collected from the wildlife monitoring programs, and to describe natural variation and potential mine-related changes in wildlife populations within and adjacent to the Meadowbank Gold Mine (the mine). The 2016 report describes monitoring objectives and methodology, historical and current year results, mitigation activities, and management recommendations based on 2016 monitoring results.

2.2 PROJECT DESCRIPTION

The Meadowbank Gold Mine (the mine or project), with an expected operating life of about nine years (or until Q3 2018), is located approximately 70 km north of the Hamlet of Baker Lake and 300 km inland from the northwest coast of Hudson Bay.

The scope of the Terrestrial Ecosystem Management Plan (TEMP) is to report on monitoring of the mine during construction, operation, maintenance, reclamation, and closure. This report includes data collected in 2016, the seventh year of operation. Construction of a 106.8 km AWAR between the Hamlet of Baker Lake, the nearest community, and the mine was completed in March 2008 and provides mine site access and re-supply, while on-site mine access roads connect open pit areas to ancillary facilities. Mine site facilities include a mill, power plant, maintenance facilities, tank farm for fuel storage, water treatment plant, sewage treatment plant, airstrip, and accommodations. Mine components include open pits, waste rock storage facilities, and a tailings storage facility.

Environmental baseline studies were conducted in the project area prior to mine approval and integrated into the current project design according to the 2006 TEMP. Wildlife Valued Ecosystem Components (VECs), which were identified in consultation with regulatory agencies and residents of Baker Lake, include vegetation cover (wildlife habitat), ungulates, predatory mammals, small mammals, raptors, waterbirds, and other breeding birds. Further details on the proposed project can be found in the Final Environmental Impact Statement (FEIS 2005).

**Figure 2.1:
Project Location Map**

Legend

- Capital City
- Towns/Villages
- Rivers
- Water
- National Parks

Data Sources:

Natural Resources Canada
Geological Survey of Canada
Caslys Consulting Ltd.



Prepared for:



AGNICO EAGLE

By:



**CASLYS
CONSULTING**

2016 WILDLIFE MONITORING SUMMARY

In 2008, construction of the AWAR and numerous camp infrastructure facilities were completed, while in 2009, principal mine site construction commenced. Mine operation commenced in early 2010. Goose Pit was completely depleted in 2014 and the re-flooding trial was not completed in 2016. Agnico Eagle continued ongoing mining operations at Portage and Vault pits. Dewatering activities were completed on Phaser Lake in 2016. In anticipation of dewatering, a fish-out program was completed on Phaser Lake from 14 August to 26 September, with DFO approval. Over 1,300 fish were caught and 72% were successfully transferred to Wally Lake. Lake dewatering occurred from 26 August to 4 October. During dewatering and operations, Agnico Eagle continued to meet approved effluent discharge limits, and completed required monitoring of the receiving environment in Wally Lake. Phaser Pit pre-stripping is scheduled to begin in the second quarter of 2017.

2.3 STUDY AREA BOUNDARIES

The mine site Local Study Area (LSA) includes a 5 km radius area centred on the Main Site and a 5 km radius around the Vault Site creating an elliptical shape with a total area of 194 km² (**Figure 2.2**). The Regional Study Area (RSA) encompasses an area that includes a 25 km radius area around the Main Site and a 50 km wide corridor centred on the AWAR for a total area of 5,106 km² (**Figure 2.2**). The AWAR LSA consists of a 3 km wide corridor centred on the AWAR between Baker Lake and Meadowbank mine site (**Figure 2.2**). Justification for study area size can be found in previous wildlife monitoring summary reports.

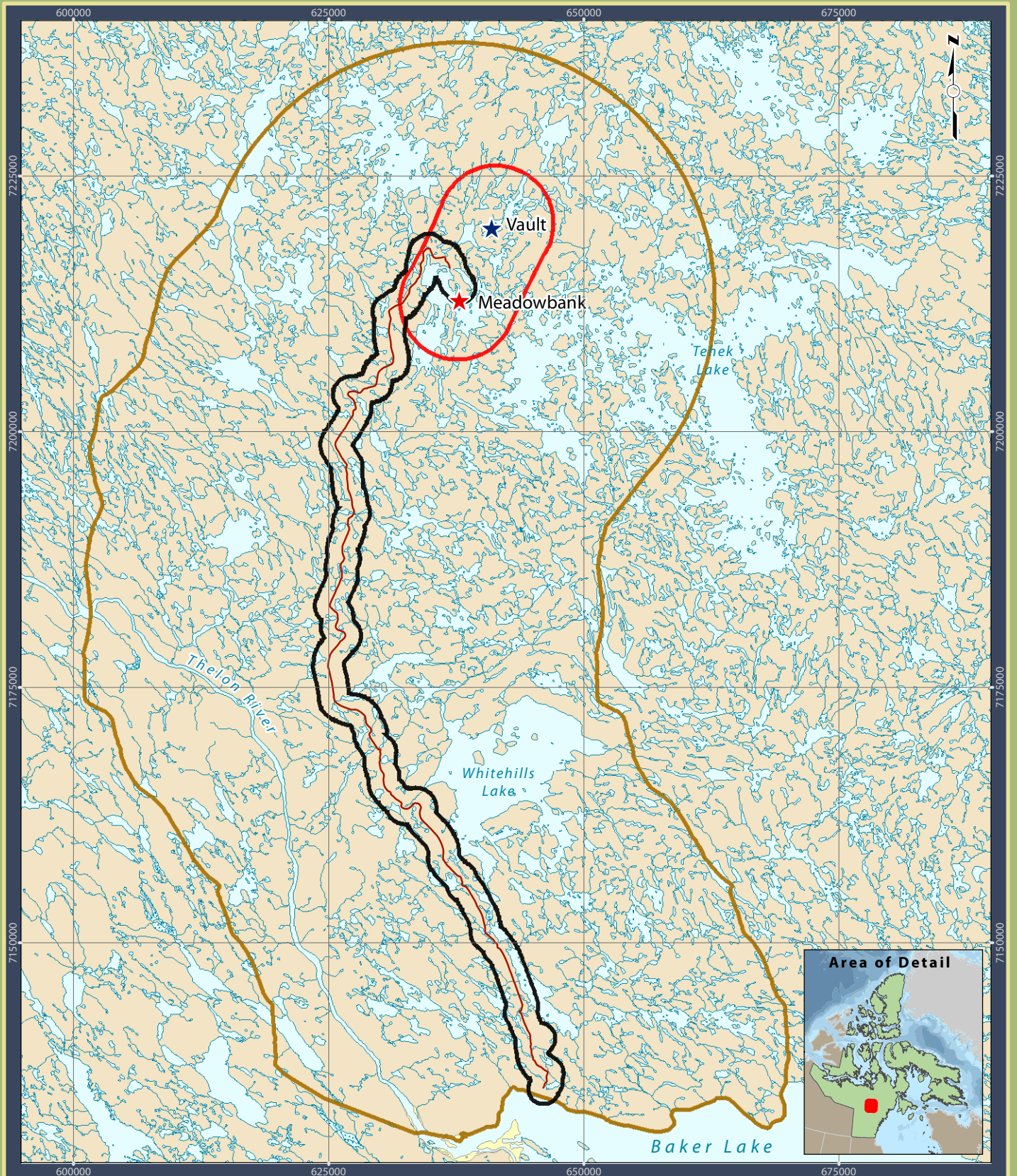
2.4 MONITORING APPROACH – LSA AND RSA

Wildlife monitoring is an essential tool in protecting and maintaining wildlife occurring 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 set out in the TEMP (Cumberland 2006). Monitoring programs evaluate the effectiveness of mitigation measures and assess mine-related impact 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.

To effectively evaluate the accuracy of impact predictions, a series of quantitative monitoring indicators, which are within the broad categories of habitat distribution, wildlife distribution, wildlife richness, wildlife diversity, wildlife abundance, and environmental health, have been developed. These indicators have been described in detail in earlier annual reports.

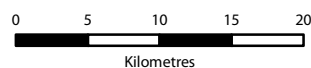
2.5 MONITORING APPROACH – MINE SITE

Environmental staff monitor wildlife in close proximity to mine facilities and along the AWAR and Vault Pit Haul Road on a regular basis (discussed in detail in **Sections 6 and 7**). Where unacceptable risks to wildlife are observed, mitigation measures are implemented to avert animals from site activities in accordance with the TEMP (Cumberland 2006). Detailed reporting protocols (e.g., a dangerous animal occurrence, monthly wildlife reports submitted to the GN, road closure notification to GN, KIA, HTO, etc.) are established and implemented by on-site environmental staff. During these events, Agnico Eagle representatives communicate any issues directly with the GN Department of Environment (DoE) Conservation Officer, KIA, and the local HTO.



Legend

- All-Weather Access Road
- Local Study Area - All-Weather Road
- Local Study Area
- Regional Study Area



Projection: UTM Zone 14 NAD83

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

**Figure 2.2: RSA and LSA
 Boundaries for Monitoring Studies**

Meadowbank Gold Project

Prepared
for:



AGNICO EAGLE

By:



**CASLYS
 CONSULTING**

2.6 REPORT OBJECTIVES

The primary objectives of the 2016 Wildlife Monitoring Summary Report include:

- Reporting the results of the 2016 wildlife 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 2017; and
- Allowing regulators to contribute advice for improving wildlife management.

2.7 INUIT INVOLVEMENT

Since 1999, local Inuit from the Hamlet of Baker Lake have been involved in all wildlife-related baseline and monitoring surveys. A summary of the various programs and the average number of Inuit involved since 1999 is provided in **Table 2.1**. As required by the IIBA, “Anything done by Agnico in order to implement the TEMP [...] shall incorporate Inuit Qaujimanituqauit”; therefore, traditional knowledge or IQ has been incorporated in this annual report.

Table 2.1: Inuit Involvement in Baseline and Monitoring Programs for the Meadowbank Mine.

Survey Description	Years Conducted (# of Years)	Average # of Inuit Involved
RSA Aerial Survey	1999, 2002 to 2008 (8) – discontinued	2
LSA Aerial Survey	1999, 2002 to 2008 (8) – discontinued	2
Breeding Bird Plots	2003 to 2012; 2015 (11)	2 to 3
Breeding Bird Transects	2005 to 2011; 2015 (8)	2
Waterfowl Nest Surveys	2004 to 2012 (9) - discontinued	3
Raptor Nest Surveys	2004 to 2007, 2010 to 2016 (11)	3 to 4
AWAR Ground Surveys	2004 to 2016 (13)	3 to 4
Habitat Mapping	2004 to 2005, 2010, 2012, 2014 (5)	1 to 2
Phenology Plots	2003 to 2005 (3) - discontinued	2

SECTION 3 • HABITAT MAPPING

The habitat mapping monitoring program was developed to describe the overall area of different Ecological Land Classification (ELC) units lost due to mine-related activities at three primary locations: Main and Vault sites (which together encompass the mine site), and the AWAR. The primary objective of the habitat mapping monitoring program is to confirm that estimated habitat losses associated with mine site and AWAR construction have not exceeded the threshold limits identified in the TEMP (Cumberland 2006) plus approved extensions. A detailed analysis was provided in the 2014 Wildlife Monitoring Summary Report and the next analysis is scheduled for the 2017 report. For monitoring program details, refer to the 2014 annual report.

Where unnecessary and unplanned habitat degradation has occurred, measures may be taken to reclaim or rejuvenate these areas. Measures may involve removal of contaminated soil, reseedling (e.g., native-grass cultivars and forbs such as nitrogen-fixing legumes), regrading and/or removal of material in affected areas leading to natural revegetation, and transplanting of vegetation.

SECTION 4 • BREEDING BIRD MONITORING

4.1 OVERVIEW

The breeding bird PRISM (Program for Regional and International Shorebird Monitoring) plot and bird transect monitoring programs were designed to evaluate potential project-related changes in breeding bird species abundance, richness, and diversity over time. The program is one component of the larger monitoring strategy to evaluate the success of mitigation measures implemented to minimize the amount of vegetation (i.e., bird habitat) removed or degraded (e.g., dustfall) by the project, and whether certain mine activities such as the mine site or AWAR have resulted in reduced or compromised habitat function or effectiveness (i.e., zone of influence) for breeding birds.

For the breeding bird transects, data analysis in 2011 and 2015 indicated that no road-related effects had been documented to date, and thresholds had not been exceeded; therefore, annual transect surveys do not need to be included in future years of the Meadowbank monitoring program.

4.2 OBJECTIVE

The objective of the breeding bird plot monitoring program is to confirm that a mine-related change of 20% function, determined by an increase or decrease in local breeding bird abundance, richness, and diversity, has not occurred. The program uses the widely accepted Canadian Wildlife Service's (CWS) PRISM protocols (CWS 2005). A secondary objective of the monitoring program is to determine more effective ways to prevent disturbance to nesting birds based on feedback from mitigation measures and observations.

4.3 DURATION

The breeding bird plot monitoring program is to continue every year during the construction period and for at least the first three full years of mine operation (2010 to 2012) in accordance with the TEMP (Cumberland 2006). The last PRISM plot survey was conducted in 2015.

4.4 RECOMMENDATIONS

For the breeding bird PRISM plots, data analysis in 2015 showed that most bird community indices were variable with little difference in overall trends between mine and control plots. Thresholds had not been exceeded and no additional management or mitigation considerations were necessary. The next set of PRISM plot surveys is planned for 2018.

SECTION 5 • RAPTOR NEST MONITORING

5.1 OVERVIEW

The raptor nest survey monitoring program has been designed to confirm that mine-related activities do not result in inadvertent negative effects on nesting raptors. Raptor surveys along the proposed AWAR alignment in 2005 (i.e., prior to construction) indicated that only low suitability habitat for nesting raptors was available. To construct the AWAR in 2007/2008, excavated and blasted rock materials were used from numerous quarries along the alignment, resulting in the creation of some moderate and high suitability raptor nesting habitat areas characterized by steep rock walls. Established nests within some of these quarries are monitored on an annual basis to evaluate occupancy.

5.2 OBJECTIVE

The primary objectives of the raptor nest survey monitoring program are to:

1. Confirm that raptor nest failures are not caused by mine-related activities. The threshold level is one nest failure per year; and
2. Confirm that no project-related mortality of raptors occurs. The threshold level of mortality is one individual per year.

5.3 DURATION

Raptor nest monitoring is to continue annually throughout the operation and decommissioning phases of the mine in accordance with the TEMP (Cumberland 2006).

5.4 METHODOLOGY

Between 2000 and 2009, raptors were periodically recorded during AWAR road surveys, waterbird nest surveys, and aerial surveys and investigated further, as required; however, given the overall low probability of raptor occurrence within the LSA and RSA, a specific raptor survey was not scheduled. In 2009, the observed active Peregrine Falcon (*Falco peregrinus*) nest at Quarry 19 prompted the initiation of a dedicated raptor nest survey in 2010. Surveys from 2011 through 2016 continued this work, focusing particularly on quarries along the AWAR. Sporadic survey in particular areas around the mine site (i.e., Portage, Goose, and Vault pits) was also conducted when raptor are seen in the pits during internal environmental inspection of the area or when employees had reported any sighting. Visual checks of active falcon nest sites were conducted during regular ground reconnaissance surveys along the AWAR. Non-disruptive monitoring techniques, which included monitoring nests from a vehicle within the quarry or from the AWAR, ensured that active nests were not approached by Agnico Eagle personnel. Using these techniques, environmental personnel were able to monitor nest success throughout the summer season. Nest monitoring was not completed along the Vault Road since neither quarries nor potential raptor habitat are present. Any observed raptor activity in this area is documented through regular mine site inspection and road surveys.

5.5 HISTORICAL RESULTS

Single nesting pairs of Peregrine Falcon were recorded in 1996 and 2005 in the Mine RSA, but nests in close proximity to mine facilities have only been routinely recorded since 2009, at which time, dedicated nesting surveys were included in the monitoring program. Six unique Peregrine Falcon nesting sites have been recorded during this period; five of these were located in quarries along the AWAR and one nest was located on the Portage Pit wall (observed in 2012 and 2013) (**Figure 5.1**). Not all of these unique nesting sites are active every year.

5.6 2016 RESULTS

In 2016, six active Peregrine Falcon nests were documented in Quarries 3, 7, 16, 18, 19, and 21 along the AWAR. One previous nest site at Quarry 2 (i.e., in 2014) was not active in 2016, while nesting was observed for the first time at Quarry 7 (see **Table 5.1**). Cumulative information on Peregrine Falcon nests from 2009 to 2016 is summarized in **Table 5.1** and **Figure 5.1**. In addition to the six active nest sites in 2016, Peregrine Falcon activity was also observed at four additional quarry sites (i.e., Quarries 13, 15, 17, 22) during the monitoring program.

A Rough-legged Hawk (*Buteo lagopus*) nest was observed this year in Goose Pit, although eggs and/or chick presence could not be confirmed due to its location.

Observations made throughout the nesting season on raptor activity and nest success are detailed in **Table 5.2**. Nesting success was confirmed through identification of maturing chicks at four out of six active nesting sites along the AWAR in 2016, all of which were previous nesting sites. Nesting success was not confirmed at Quarry 16, where a successful nest was observed for the first time in 2015. Nesting success was also not confirmed at the new site at Quarry 7, or the Rough-legged Hawk nest at Goose Pit. Specific raptor nest management plans were not warranted at any of the active nest sites. No nesting activity in more active areas of the mine (e.g., pits, waste rock piles) was observed; therefore, no steps were required to avert nesting activities.

Some additional observations on raptor activity around the mine site are included in **Appendix A**. Peregrine Falcon was observed flying over the mine site in May and June, as were Rough-legged Hawk. A Gyrfalcon (*Falco rusticolus*) was recorded in May, and a Bald Eagle (*Haliaeetus leucocephalus*) was observed feeding on a carcass in May at the old Portage WTP plant. Bald Eagle, Peregrine Falcon, Rough-legged Hawk, and Snowy Owl (*Bubo scandiacus*) were observed during AWAR surveys (**Section 7.6**).

Table 5.1: Record of Peregrine Falcon and other Raptor Nesting along the AWAR and in the LSA.

Quarry	2009	2010	2011	2012	2013	2014	2015	2016	Comments
1	No	No	No	No	No	No	No	No	Shallow quarry.
2	No	Yes	Yes	Yes	Yes	Yes	No	No	Good cliff faces for nesting. After five years of nesting, no activity since 2014.
3	No	Yes	Yes	Yes	Yes	No	Yes	Yes	2 adults, 3 maturing chicks that presumably fledged. No activity observed until late September when 1 adult spotted nearby.
4 to 6	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting.
7	No	No	No	No	No	No	No	Yes	Old raven nest. Fractured rock forming cliff faces but limited ledges. 1 adult around nest misdirecting observers. No eggs or chicks observed during season.
8	No	No	No	No	No	No	No	No	No cliff faces, so not well suited for nesting.
9	No	Yes ¹	Yes ¹	No	No	No	No	No	Lots of fractured rock forming cliff faces but limited ledges.
10 /11	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting.
12	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting.
13	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting. 2 adults flying overhead in late September; no nest.
14	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting.
15	No	No	No	No	No	No	No	No	Shallow quarry and/or flooded, so not well suited for nesting. 1 adult observed in vicinity on one occasion; no nest.
16	No	No	No	No	No	No	Yes	Yes	Moderate depth with good cliff faces, no ledges. 2 adults observed flying and intimidating observers, no eggs or chicks observed during season.
17	No	No	No	No	No	No	No	No	Very shallow quarry. 2 adults flying and intimidating observers; no nest.
18	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Good, high cliff face but no ledges. 2 adults observed intimidating, 1 chick confirmed and presumably fledged. One adult observed in September.
19	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Good, vertical cliff face, some suitable ledges. 2 active adults, 3 maturing chicks observed over summer and presumably fledged. 1 adult still remaining in late Sept.
20	No	No	No	No	No	No	No	No	Very shallow quarry, so not well suited for nesting.
21	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good, high cliff face, no ledges. 2 active adults, 4 maturing chicks over summer and presumably fledged. 1 chick in nest in mid-August. 1 adult observed in late August.
22	No	No	No	No	No	No	No	No	Good, high cliff face, but nesting has not been confirmed. 2 adults observed in vicinity; no nest.
Portage	No	No	No	Yes	Yes	No	No	No	No falcons observed.
Vault	NA	NA	NA	NA	No	No	No	No	No falcons observed.
Goose	NA	NA	No	No	No	No	No	Yes	Rough-legged Hawk nest observed in 2016; not possible to confirm egg or chick presence.

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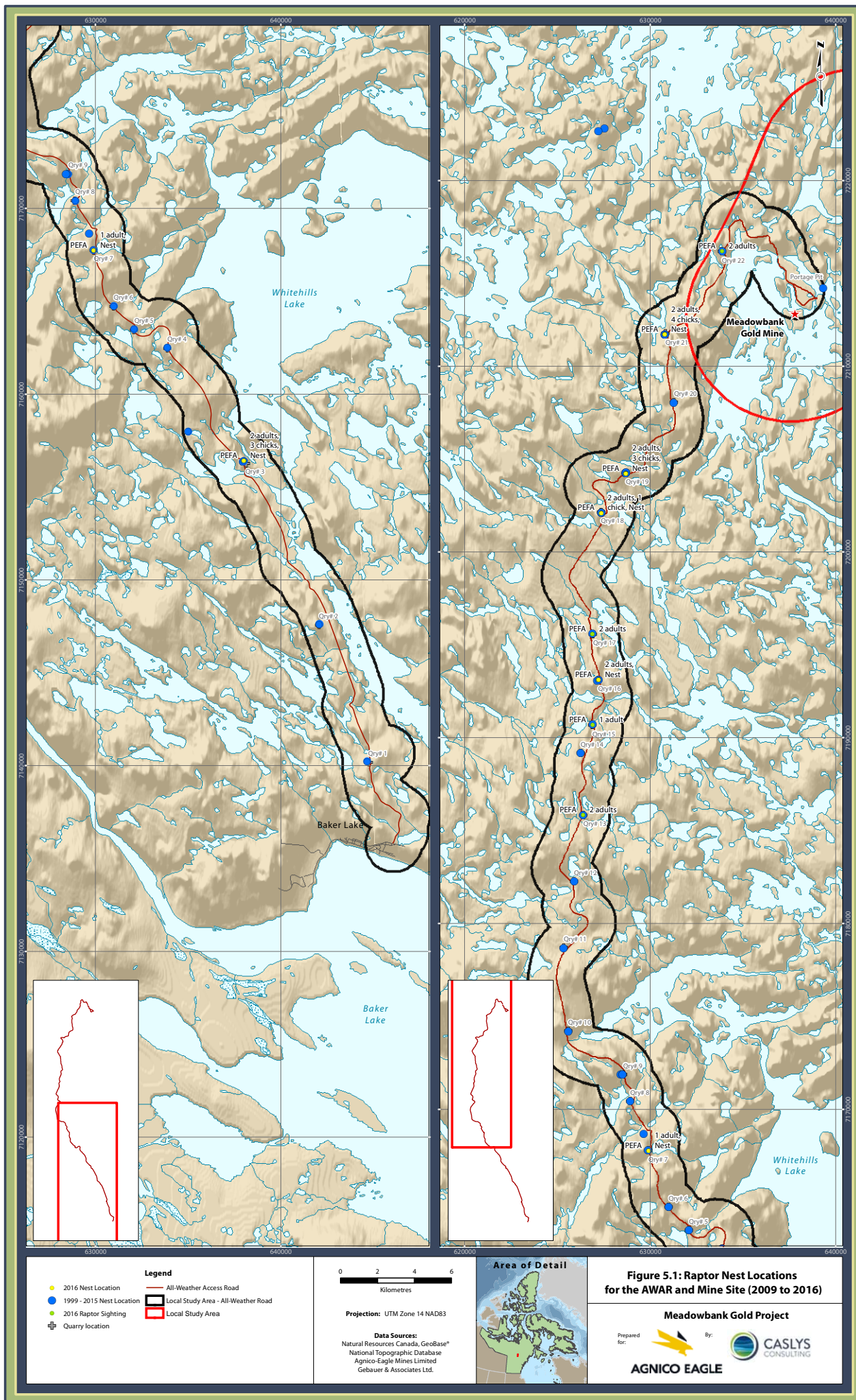
Table 5.2: Raptor Nests Identified and Monitored at the Mine Site and along the AWAR between Baker Lake and the Meadowbank Mine Site in 2016.

Quarry or Pit Location	GN Site # ¹	Species	Location (UTM)	2016 Observation Date	Observations
3	4004	Peregrine Falcon	14W 0638009 7156419	24 June	1 adult
				26 July	2 adults, 3 chicks
				9 Aug	2 adults, 3 maturing chicks
				17 Aug	No activity
				30 Sept	1 adult perched on quarry wall
7	n/a	Peregrine Falcon	14W 0629905 7167764	17 July	1 adult
				22 July	1 adult, misdirecting observers
				17 Aug	1 adult
				20 Sept	No activity
13	n/a	Peregrine Falcon	n/a	30 Sept	2 adults flying over
15	n/a	Peregrine Falcon	n/a	30 Aug	1 adult
16	4007	Peregrine Falcon	14W 0627212 7193129	10 June	1 adult
				17 July	1 adult
				22 July	2 adults, flying to intimidate
				5 Aug	1 adult
				9 Sept	1 adult
17	n/a	Peregrine Falcon	n/a	22 July	2 adults, flying to intimidate
				9 Sept	1 adult
18	4008	Peregrine Falcon	14W 0627351 7202109	3 June	1 adult
				24 June	1 adult
				17 July	1 adult
				22 July	1 adult, flying to intimidate
				23 July	2 adults, 1 chick in nest
				26 July	2 adults, 1 chick in nest
				5 Aug	1 adult
				9 Aug	2 adults, no chick confirmed
				17 Aug	2 adults, no chick observed
				2 Sept	1 adult
				20 Sept	2 adults flying over
				23 Sept	1 adult perched

Table 5.3: Continued.

Quarry or Pit Location	GN Site # ¹	Species	Location (UTM)	2016 Observation Date	Observations
19	3901	Peregrine Falcon	14W 0628686 7204285	10 June	1 adult
				14 June	1 adult
				24 June	2 adults
				17 July	2 active adults
				23 July	2 adults, 3 chicks in nest
				26 July	2 adults, 3 chicks in nest
				5 Aug	1 adult
				9 Aug	2 adults, 3 maturing chicks
				17 Aug	1 adult
				30 Aug	1 adult
				2 Sept	2 adults
				9 Sept	1 adult
				20 Sept	No activity
				23 Sept	1 adult flying
21	4009	Peregrine Falcon	14W 0630781 7211705	10 June	1 adult
				24 June	1 adult
				17 July	2 active adults
				23 July	2 adults, 3 to 5 chicks in nest
				26 July	2 adults, 4 chicks confirmed in nest
				5 Aug	1 adult
				9 Aug	2 adults, 4 large maturing chicks
				17 Aug	2 adults, 1 chick observed
				30 Aug	1 adult
				20 Sept	No activity
22	n/a	Peregrine Falcon	n/a	12 Aug	2 adults flying and diving
Goose Pit	n/a	Rough-legged Hawk	14W 0638699 7212031	24 July	1 hawk and nest, but not possible to monitor

¹ Government of Nunavut (GN) Raptor Database site number



5.7 ACCURACY OF IMPACT PREDICTIONS

A summary of the impact predictions identified in the TEMP (Cumberland 2006) is provided in **Table 5.3**. The 2016 raptor monitoring data were compared to the impact prediction thresholds to evaluate adherence to impact predictions and provision of adaptive management, as either a necessary or proactive measure.

Table 5.4: Accuracy of Impact Predictions – Disturbance to Nesting Raptors for the AWAR and Mine Site, and Raptor Mortality.

Potential Effect	Threshold	Threshold Exceeded (2016)	Adaptive Management Implemented	Status
Disturbance to Nesting Raptors	Raptor nest failures will not be caused by mine-related activities. Threshold is one nest failure per year.	NO	NO	AWAR Surveys Dedicated Raptor Nest Surveys Daily / Weekly Systematic Mine Site Ground Surveys
Raptor Mortality	One (1) individual	NO	NO	AWAR Surveys Daily / Weekly Systematic Mine Site Ground Surveys

5.8 MANAGEMENT RECOMMENDATIONS

Quarrying activities along the AWAR corridor have created moderate to high suitability Peregrine Falcon nesting habitat. Falcons are expected to continue to use select quarries for the foreseeable future, which may necessitate the implementation of a raptor nest management plan for nests if deemed necessary. Agnico Eagle will continue to:

- Conduct raptor nest surveys annually at each of the quarries along the AWAR early in the nesting season (mid- to late June) to confirm the status of previously confirmed raptor nests, assess the presence of new raptor nests, and determine the need, if any, for a raptor nest management plan;
- Monitor active raptor nests weekly in the breeding season to confirm nest success or failure;
- Ensure that environmental personnel maintain accurate records of nesting activity and success for all active nests for the duration of these surveys in order to determine if thresholds are exceeded;
- Monitor pits and waste rock piles at the mine site to avert nesting attempts by raptors. If a nest is established, the general mine site Peregrine Falcon Management and Protection Plan will be followed; and
- If the Management Plan is not successful in averting falcon nesting in active mining pits, consult with Dr. Franke to discuss site-specific protective measures and, if needed, deterrence recommendations to ensure falcon protection. Dr. Alastair Franke, from the University of Alberta, has been conducting research on raptors in Nunavut since 2003.

SECTION 6 • MINE SITE GROUND SURVEYS

6.1 OVERVIEW

The mine site ground survey monitoring program 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 of various wildlife groups utilizing habitats in the vicinity of 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 (*Rangifer tarandus*).

6.2 OBJECTIVES

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

1. Evaluate whether mine-related construction and operation activities preclude Caribou from using suitable habitats beyond 500 m (considered to be an average across various disturbance types) of mine buildings, facilities, and roads. Threshold level within mine facilities is unnatural Caribou use patterns beyond 500 m. The threshold level along the AWAR is unnatural Caribou use patterns beyond 1,000 m (also see **Section 7**);
2. Confirm that Caribou will not be killed through other mine-related mortality such as falling in pits, tailings sludge, or other means. The threshold level of mortality is one individual per year;
3. Verify that measures are in place such that no Grizzly Bears (*Ursus arctos*) or Wolverines (*Gulo gulo*) will need to be destroyed at the mine site. The threshold level of mortality for predatory mammals is one individual 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.

6.3 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.

6.4 METHODOLOGY

6.4.1 Mine Site Inspections

In 2016, 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 the broader environmental on-site management. During these inspections, non-conformities were identified and rapidly address by the responsible department.

Weekly inspections included:

- Regular monitoring of Caribou and Muskox (*Ovibos moschatus*) in the vicinity of 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 2016, 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 nests were found in 2016 therefore no additional monitoring occurred; and
- Inspections of waste management areas, bins, and hazardous material storage.

During environment department inspections and wildlife ground surveys, which focus on migratory birds, ungulates, Arctic Fox (*Vulpes lagopus*), Wolf (*Canis lupus*), Grizzly Bear, and Wolverine, or through general employee observations or incidence reports provided to the environment department, technicians record and follow up as needed to ensure the protection of wildlife near the mine site. These observations, along with monitoring and deterring activities are recorded in **Appendices A** and **B**. Monthly summary reports and wildlife observation data are submitted to the GN. 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 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.

6.4.2 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 (particularly the AWAR). 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 in accordance with Appendix A - Section 2.2.8 (Reporting Wildlife Observations and Incidents) of the TEMP (Cumberland 2006). 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 A**). Monthly summary reports and wildlife observation data are submitted to the GN. Quarterly reports are submitted to the KIA.

6.4.3 Waste Management and Landfill

Operation and management of on-site waste is an important component of wildlife management at Meadowbank. The monitoring program in 2016 built on the successes and approaches of monitoring in previous years (see 2014 Wildlife Monitoring Summary Report for details).

6.5 2016 RESULTS

6.5.1 Incidental Wildlife Observations

Mine site incidental observations were consolidated from the daily and weekly inspection reports, and observations by mine personnel (see **Appendix A**). 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 6.1** below.

In 2016, records indicate that more deterrence action was taken around the mine site, especially for Caribou in January and February. Deterrence 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 the majority of cases, deterrence proved effective (**Table 6.1** and **Appendix A**).

Trends and unique wildlife observations around the mine site are discussed in the following sections. In some cases, observations led to direct action to prevent human-wildlife conflict. For example, in December 2016, a memo was distributed to all employees and contractors regarding wildlife encounter protocols as a result of more frequent observations around the mine site of Arctic Fox, Red Fox (*Vulpes vulpes*), Caribou, and Wolverine (see **Appendix B**).

6.5.2 Breeding Bird Nest Monitoring

No breeding bird nests were found or monitored at the mine site or along the AWAR in 2016.

2016 WILDLIFE MONITORING SUMMARY

Table 6.1: Wildlife Presence Requiring Action (from Appendix A).

Date	Species	#	Location	Action
07 Jan	Caribou	2	Vault Ring Road	Deterred (blocked road)
09 Jan	Caribou	2	Vault Ring Road	Deterred (blocked road)
11 Jan	Caribou	2	Vault Ring Road	Deterred
14 Jan	Caribou	2	Vault Ring Road	Deterred
15 Jan	Caribou	2	Vault Ring Road/Parking	Deterred (truck)
17 Jan	Caribou	2	Vault Parking area	Deterred
20 Jan	Caribou	2	Vault Parking area	Deterred (flares and screamers)
21 Jan	Caribou	8	Vault Parking area	Deterred (truck)
25 Jan	Caribou	2	Vault Parking area	Deterred (truck)
27 Jan	Caribou	2	Vault Camp area	Deterred (scare cartridges)
31 Jan	Caribou	2	Vault Camp area	Deterred (scare cartridges)
2 Feb	Caribou	2	Vault Camp area	Deterred (scare cartridges)
7 Feb	Caribou	2	Vault Camp kitchen	Deterred (walking)
9 Feb	Caribou	2	Vault Camp kitchen	Deterred (walking)
16 Feb	Caribou	2	Vault explosive area	Deterred (truck)
21 Feb	Caribou	2	Vault Road/Camp	Deterred (walking)
22 Feb	Caribou	2	Vault Road/Camp	Deterred (walking)
10 Mar	Wolverine	1	Sludge dump	Deterred
18 Mar	Caribou	3	Vault Camp	Deterred (to prevent road access)
29 Mar	Caribou	2	Airport	Deterred (off airstrip)
30 Mar	Caribou	8	WTP	Deterred
5 Apr	Caribou	8	Airport	Deterred (off airstrip)
7 Apr	Wolf	1	Fuel farm/Core shack/ Nova Camp/Quarry 23	Deterred
10 Apr	Wolf	1	Incinerator	Deterred
22 Apr	Wolf	1	Sana Crusher	Deterred
27 Apr	Caribou	7	Airport	Deterred (off airstrip)
1 May	Wolf	1	Fresh water barge / Sludge dump	Deterred
2 May	Arctic Fox	1	Vault Pit	Deterred
5 May	Caribou	15	Airport	Deterred (off airstrip – ineffective)
10 May	Arctic Fox	2	Vault Pit	Deterred (ineffective)
17 May	Geese	38	Tailings Pond	Deterred (ineffective)
19 May	Geese	30+	Tailings Pond	Deterred
21 May	Geese	100+	South Cell Tailings Pond	Deterred
21 May	Caribou	30	North Cell Tailings Pond	Deterred
2 June	Long-tailed Ducks	10	Tailings Storage Facility	Deterred

2016 WILDLIFE MONITORING SUMMARY

Date	Species	#	Location	Action
4 June	Long-tailed Ducks	20	Tailings Storage Facility	Deterred
6 June	Long-tailed Ducks	20	Tailings Storage Facility	Deterred
9, 11 June	Ducks	30	Tailings Storage Facility	Deterred (ineffective)
12 July	Arctic Fox	1	Unknown (hiding)	Deterred
23 Oct	Wolverine	2	Mine site	Deterred
30 Oct	Arctic Fox	5	Mine site, site services	Deterred (ineffective)
31 Oct	Arctic Fox	2	Mine site, site services	Deterred
14 Nov	Wolverine	1	Mine site	Deterred
5 Dec	Arctic Fox	1	Mine site	Deterred

6.5.3 Waterbird Monitoring

To minimize accidental waterbird confinement around the mine site, 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. A large flock of geese frequenting the Tailings Pond in May were deterred, as well as a flock (perhaps the same flock) observed in the South Cell Tailings Pond. Bird deterrents (i.e., cannons) were installed around the Tailings Pond to deter migratory birds. Long-tailed Ducks (*Clangula hyemalis*) in the Tailings Storage Facility in early June were repeatedly but successfully deterred (**Table 6.1** and **Appendix A**). Technicians inspected the Tailings Storage Facility daily for waterbird presence in June.

A juvenile Merganser was killed when it became entangled in gill nets during the Phaser Lake fish-out operation. The Conservation Office was notified, and the specimen was brought to the Officer (**Table 6.2** and **Appendix C**).

6.5.4 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 (see **Appendix A**). Peregrine Falcons were observed around the mine site from May to August; one Peregrine Falcon was observed flying on a number of days in May around the West Diversion Ditch and Vault Road, and one falcon was observed at Portage Pit A (note that no Peregrine Falcon nests were observed at the mine site in 2016). Rough-legged Hawks were observed in May and June, flying in the vicinity of Portage Pit, Goose Pit, the Tailings Storage Facility, and the Vault area (note that a nest was observed at Goose Pit in 2016; see **Section 5.6**). Snowy Owls were sighted in June and October. One Bald Eagle was observed eating a carcass in May near the mine site, and another was seen flying overhead in August.

6.5.5 Caribou and Muskox Protection

Caribou were frequently observed in close proximity to the mine site in January and February, in particular around the Vault area (**Table 6.1** and **Appendix A**). The Conservation Officer was notified and agreed with the need for more active deterrence actions, which were implemented on a number of occasions in late January and early February. On one occasion, two Caribou narrowly escaped being hit by a pick-up truck on Vault Road at Vault Camp after running across the berm. Throughout this period, Agnico Eagle continued to advise the Conservation Officer of deterrence efforts. By March, Caribou presence had returned to seasonal norms. None of these animals were collared Caribou, as collar data did not indicate any animals present in the RSA in late winter (**Section 9.6**).

By August, an increasing number of Caribou were recorded in and around the mine site, with a steady number observed into September. During the first 10 days of October, a herd of 500 to 1,000 Caribou were observed walking and grazing near the mine site. These large numbers of Caribou were regularly monitored, but no deterrence actions were necessary. By 19 October, the larger herd appeared to have moved on, as only 100 Caribou were recorded walking nearby. Observations were used to advise specific areas of operation (e.g., airstrip) as well as general reminders on road safety (see **Appendix A** and **Section 7.6**).

Muskox herds were observed around the mine site in 2016. A herd of 15 to 30 individuals was present in the Vault area beginning in May until mid-June (**Appendix A**). This same herd appeared to have moved to the area around the AWAR in June (**Section 7.6**). In May, Muskox observed close to Vault Road resulted in road closure and notification of the Conservation Officer (**Appendix B**). A steady number of Muskox (15 to 30 individuals) was also observed throughout August and into September. In mid-November, 30 Muskox were again recorded grazing near the mine site, which were likely the same herd as reported earlier. No deterrence was needed for any of these observed animals.

6.5.6 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. Weekly inspections by environmental personnel provided monitoring data that indicated re-occurrences of Arctic Fox on-site, but no trapping was required in 2016 (**Appendix A**). A visually impaired fox was observed at East Dike in January, and the Conservation Officer was notified by phone, but this fox was not observed afterwards (**Appendix B**). In October and November, increased sightings of Arctic Fox around the front desk area prompted a memo to all employees and contractors concerning wildlife safety, and notification of the Conservation Officer (**Appendix B**). One nuisance Arctic Fox was euthanized in November following authorization by the Conservation Officer after deterrence methods were not effective (see **Appendix C** for Incident Report). Two other Arctic Fox were found dead of unknown causes (see **Table 6.2**). Relevant internal communications and notifications to the Conservation Officer are provided in **Appendix B**.

2016 WILDLIFE MONITORING SUMMARY

Less Wolverine deterrence was required throughout most of the year. Only one deterrence incident in the sewage sludge disposal area (historically an attractant for Wolverine during the winter) was required in March (see **Table 6.1** and **Appendix A**). Increased sightings of Wolverines around the mine site in November prompted a communication to all employees and contractors concerning wildlife safety, as well as active deterrence (**Appendix B**). Environmental personnel actively deterred Wolverines following the Bear Wise deterrence training. Well defined food-handling practices and employee awareness programs at the mine site appear to be minimizing Wolverine fatalities or Wolverine-human interactions.

Two Wolf packs were observed chasing Caribou in January; five Wolves on the east side of Vault Road, and seven Wolves near Bay Goose (**Appendix A**). Wolves were also recorded on a number of occasions in April, required deterrence actions in more than one instance, and prompted notification of the Conservation Officer (**Table 6.1** and **Appendix B**). Recorded observations continued throughout May and infrequently into the summer, but no further action was required. A Caribou carcass from a Wolf kill near South Cell Tailings Pond required removal and incineration in May; a report was sent to the Conservation Officer (**Table 6.2** and **Appendix C**).

Grizzly Bears were observed in the vicinity of the emulsion plant at the mine site in May 2016 (**Appendix B**), but no deterrence actions were required. Some Grizzly Bears were also observed along the AWAR (**Section 7.6** and **Appendix B**).

6.5.7 Wildlife Mortality – Mine Site

A summary of recorded wildlife fatalities near or within the mine site in 2016 is provided in **Table 6.2**, and a summary of fatalities to date from historical data is provided in **Table 6.3**. Copies of mortality incident reports can be found in **Appendix C**. All AWAR-related fatalities are tabulated and discussed in **Section 7.6.3**.

6.5.7.1 Caribou

No Caribou mortalities related to project activities were reported at the mine site in 2016. All incident reports, observations, deterrence activities, and environment team responses to Caribou sightings are included in **Appendix A**. Caribou mortalities along the AWAR are discussed in **Section 7.6.3**.

6.5.7.2 Predatory Mammals

No Wolf, Grizzly Bear, or Wolverine mortalities were reported related to activities at the mine site in 2016. All incident reports, observations, deterrence activities, and environment team responses to predatory mammal sightings are included in **Appendices A, B, and C**.

2016 WILDLIFE MONITORING SUMMARY

Table 6.2: 2016 Mine Site Wildlife Fatality Log.

Date	Species	Count	Location	Comments
13 Mar	Ptarmigan	1	Main camp	Flew into building window
27 May	Caribou	1	South Cell Tailings Pond	Wolf kill; carcass removed and incinerated
26 Sept	Duck	1	Phaser Lake	Caught in fishing nets during Phaser Lake fish-out program.
1 Nov	Arctic Fox	1	Mine site	Fox euthanized following unsuccessful deterrence
16 Nov	Arctic Fox	1	Mine site	Died of unknown causes
20 Nov	Arctic Fox	1	Mine site	Died of unknown causes; Red Fox eating carcass
5 Dec	Arctic Hare	1	Mine site	Died of unknown causes

Table 6.3: Summary of Mine Site Wildlife Fatality Records for Caribou and Predatory Mammals (2007 to 2016).

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

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.

6.5.7.3 Other Wildlife

One waterbird mortality occurred on the Meadowbank site in 2016. A dead juvenile Merganser duck was caught in gill nets during the Phaser Lake fish-out program in September (see **Appendix C** for Incident Report). The carcass was given to the Conservation Officer. On 13 March, a Ptarmigan was killed when it flew into a window at the main camp site; the carcass was also provided to the Conservation Officer (**Appendix C**). One Arctic Fox had to be euthanized in 2016 (see **Table 6.2** and **Appendix C**).

6.6 ACCURACY OF IMPACT PREDICTIONS

Table 6.4 provides a summary of the impact predictions identified in the TEMP (Cumberland 2006) that are evaluated, in part, by the mine site ground surveys. Specifically, the 2016 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.

6.7 MANAGEMENT RECOMMENDATIONS

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

- Continue to conduct informal daily and weekly mine surveys to verify that effects to wildlife are not occurring as a result of mine-related activities;
- Continue raptor nest monitoring around the mine site LSA and along the AWAR;
- Continue to apply the Wildlife Protection and Response Plan (Agnico 2014, and reviewed by GN DoE), which includes waste provisions, training, incident reporting, and protocols for problem wildlife;
- Continue training and re-education to ensure that incidental wildlife reporting is completed by all mine site personnel such that environmental personnel can remain informed of pertinent wildlife-related activity in the vicinity of 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,
- Implement methods to avoid waterbird mortality during fish-out or other programs using fish nets (e.g., implement bird deterrence prior to net deployment, adjust timing of net deployment based on waterbird presence).

2016 WILDLIFE MONITORING SUMMARY

Table 6.4: Accuracy of Impact Predictions – Mine Site Wildlife Disturbances.

Potential Effect	Threshold	Threshold Exceeded (2016)	Adaptive Management Implemented	Status
Sensory Disturbance	Mine-related construction and operation activities will not preclude Caribou and Muskoxen from using suitable habitats beyond 500 m of mine buildings, facilities and roads.	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys; Incidental Wildlife Reporting; Satellite-collaring Data
Disturbance to Nesting Raptors	Raptor nest failures will not be caused by mine-related activities. Threshold is one nest failure per year.	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys; Incidental Wildlife Reporting; Dedicated Raptor Nest Surveys; AWAR Surveys
Healthy Prey Populations	Maintenance of healthy prey populations to ensure integrity and health of raptor habitats. Thresholds are qualitative, and can be achieved through management and maintenance of vegetation and healthy prey communities.	Not completed in 2016	NA	Annual PRISM Plot surveys; ELC Habitat Mapping
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 nest failure per year.	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys; Waterbird Nest Surveys
Project-related Mortality	Destruction of one problem Grizzly Bear or Wolverine at Meadowbank Site per year.	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys
Project-related Mortality	One Caribou or Muskoxen mortality per year as a result of mine-related activities (e.g., falling into pits, tailing, sludge or other means)	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys
Project-related Mortality	Waterbirds will not be killed at the mine site. Threshold is one individual per year.	YES	YES More intensive monitoring during migratory period Special care should be taken during any future aquatic programs	Daily / Weekly Systematic Mine Site Ground Surveys
Project-related Mortality	Breeding birds will not be killed at the mine site. Threshold is 50 individuals per year.	NO	NO	Daily / Weekly Systematic Mine Site Ground Surveys

SECTION 7 • ALL-WEATHER ACCESS ROAD AND VAULT ROAD GROUND SURVEYS

7.1 OVERVIEW

The AWAR and Vault Road systematic ground survey monitoring program has been designed to evaluate sensory disturbance for wildlife, particularly Caribou and Muskoxen, utilizing habitats adjacent to the road. The program also monitors mortality of species with a potential to utilize habitats in the vicinity of the AWAR.

7.2 OBJECTIVES

The primary objectives of the AWAR and Vault Road ground survey monitoring program are to:

1. Document wildlife utilization along the AWAR and Vault Road corridors;
2. Evaluate wildlife trends along the AWAR and Vault Road corridors, including identifying areas where higher densities of wildlife are observed. Evaluate whether road-related operations preclude Caribou from using suitable habitats beyond 1,000 m. The threshold level along the AWAR is unnatural Caribou use patterns beyond 1,000 m;
3. Assess the need for adaptive mitigation, such as temporary road closures during peak Caribou migration periods; and
4. Confirm that Caribou are not killed through road-related mortality. The threshold level of mortality for ungulates and predatory mammals is one individual per year.

7.3 DURATION

The AWAR and Vault Road systematic ground surveys are ongoing and are to be conducted a minimum of once per week throughout the year, and twice per week during Caribou migration (contingent on weather, road access and personnel availability) over the operation phase of the mine. Monitoring of vehicle collisions and mortality is continual. Agnico Eagle is committed to conducting approximately 75 AWAR road surveys per year.

7.4 METHODOLOGY

Beginning in early 2016, road surveys were expanded beyond the AWAR to include the recently completed Vault Haul Road.

2016 WILDLIFE MONITORING SUMMARY

The terrain on both sides of the road (to a maximum horizontal distance of approximately 1 km perpendicular from the road edge) is surveyed as the vehicle progresses at a maximum speed of 30 km per hour. The survey team typically includes two observers, one being the driver. For each sighting, the vehicle is safely parked in a road pullout and UTM coordinates are recorded along with the estimated distance of the animal(s) from the road. Where animals are sighted close to roads and a risk of collision with vehicles is possible, the environmental monitor reports the number of animals, location, and direction of travel to the mine radio dispatcher who informs all vehicle operators. In addition, all vehicle operators report ungulates seen along the road to the dispatcher.

Regular data provided to mine site personnel from the Caribou satellite-collaring program (**Section 9**) are also used to track Caribou movement and potential migration towards the road and mine site.

7.5 HISTORICAL RESULTS

Ground surveys commenced shortly following the onset of AWAR construction (2007). Sampling intensity has been uniform along the entire length of the AWAR since 2009; whereas, surveys along the Vault Road have been irregular since its completion, but were included as part of regular surveys in 2016. Over the past nine years (to 2015), surveys have been completed along the AWAR every 3.9 to 6.1 days. Survey details are provided in **Table 7.1**.

7.6 2016 RESULTS

7.6.1 AWAR and Vault Road Surveys

The number of AWAR and Vault Road surveys completed each season in 2016 is provided in **Table 7.1**. The number of systematic road surveys completed in 2016 (n=78) is comparable to previous years with a survey conducted on average every 4½ days over the course of the year. Survey frequency was highest during months where Caribou movements are known to increase (e.g., eight surveys in June and October, nine surveys in September, and 12 surveys in November). Raw road survey data are provided in **Appendix D**.

Mammal species identified and observed during AWAR and Vault Road surveys in 2016 included Arctic Fox, Arctic Hare (*Lepus arcticus*), Caribou, Muskox, Wolf, and Wolverine. Bird species observed included Arctic Tern (*Sterna paradisaea*), Bald Eagle, Canada Goose (*Branta canadensis*), Common Loon (*Gavia immer*), Common Raven (*Corvus corax*), Greater White-fronted Goose (*Anser albifrons*), Herring Gull (*Larus argentatus*), King Eider (*Somateria spectabilis*), Long-tailed Duck, Northern Pintail (*Anas acuta*), Peregrine Falcon, Red-breasted Merganser (*Mergus serrator*), Rock Ptarmigan (*Lagopus muta*), Rough-legged Hawk, Sandhill Crane (*Grus canadensis*), Snow Goose (*Anser caerulescens*), and Snowy Owl.

Table 7.1: Details of AWAR Surveys from 2007 to 2016.

Season	Number of AWAR Surveys									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016*
Spring (April to May)	13	15	15	9	10	14	9	11	17	10
Summer (June to July)	24	7	10	9	9	13	13	7	16	14
Fall (August to September)	8	15	8	12	11	12	10	11	11	16
Winter (Jan to Mar, Oct to Dec)	33	57	25	36	33	38	31	38	32	38
Year End Total	78	94	58	66	63	77	63	67	76	78
Duration	1-Mar to 31-Dec	2-Jan to 29-Dec	9-Jan to 16-Dec	21-Jan to 17-Dec	10-Jan to 30-Dec	4-Jan to 29-Dec	2-Feb to 27-Dec	12-Jan to 30-Dec	03-Jan to 18-Dec	02-Jan to 27-Dec
Average Frequency of Surveys (over duration)**	4.1 days	3.9 days	6.1 days	5.6 days	6.0 days	4.7 days	6.0 days	5.5 days	4.7 days	4.7 days

* Vault Haul Road included in all road surveys from 2016 forward

** Frequency refers to the number of days between surveys, on average over the year

2016 WILDLIFE MONITORING SUMMARY

Cumulative Caribou density along the AWAR for 2016 (all seasons) is provided in **Figure 7.1**. The highest Caribou densities in 2016 were around the Whitehills Lake area (Km 25 to Km 50), with sporadic higher densities observed at Km 60 and Km 75. Higher densities were also recorded at the very north end of the AWAR.

The 2016 Caribou occurrence data were added to the 2008 to 2015 datasets with the resulting cumulative Caribou numbers presented in **Figure 7.2**, which illustrates that over the last 10 years of surveys the highest cumulative Caribou abundances along the AWAR continue to be in areas closest to the Hamlet of Baker Lake between Km 0 to 5 and Km 5 to 10 (cumulative density of 1,707 and 1,529 Caribou/km, respectively), and south of Whitehills Lake between Km 25 to 30 (1,941 Caribou/km). High Caribou abundances were also observed from Km 50 to 55 (1,387 Caribou/km), and 70 to 75 (1,244 Caribou/km).

Lower Caribou numbers were recorded from AWAR surveys in 2016 compared to previous years. The average number of Caribou observed per survey trip was much lower in November 2016 than in previous years, however similar results were recorded in 2011 and observation data from AWAR surveys do fluctuate across the dataset (**Table 7.2**).

7.6.2 Road-related Mitigation

As in previous years, the security department assisted the environment department in preventing wildlife incidences along the AWAR and Vault Road by dispatching regular wildlife warnings. The road supervisors and operators also ensured protection of wildlife by assisting in surveillance and shutting down roads as needed (see **Appendix B**). Notices reminding operators of the appropriate speed limit were made frequently. During Caribou peak migration, notices were sent to all road occupants (**Appendix B**), wildlife consultants were notified, and AWAR and Vault Road wildlife survey efforts were increased to at least two times per week.

On a number of occasions, drivers were advised to slow down around the airstrip, AWAR, and Vault Road due to the presence of Caribou (and Muskox in one instance) as noted in the observation log (**Appendix A**). Caribou were observed around the mine site, including road areas, at higher frequency in January and February, resulting in a number of deterrence actions during this period (**Section 6.5**). The number of Caribou observed around the mine site and road areas also increased during April (100 to 500 animals).

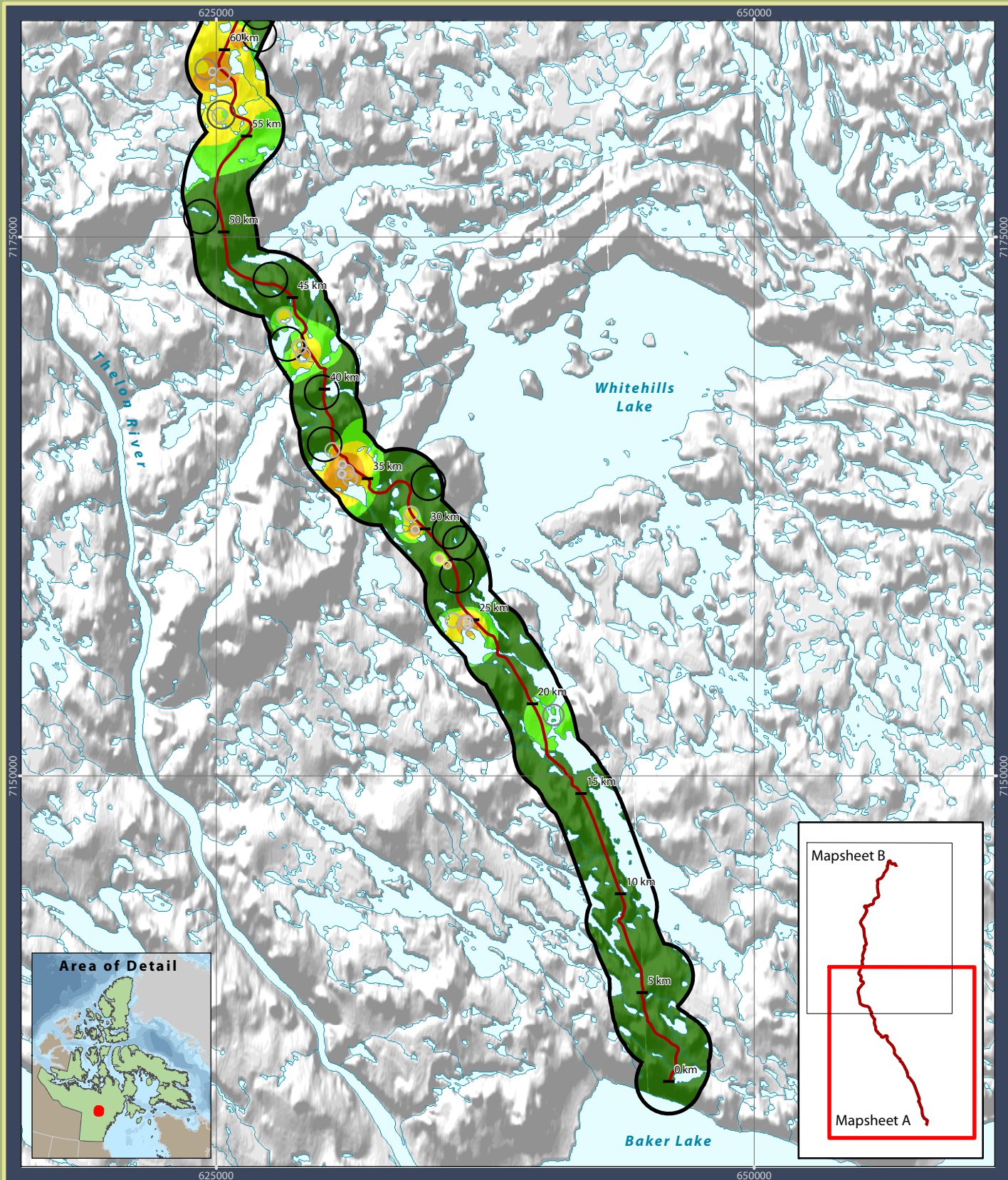
The following road closures were put in effect, with notification provided to the Conservation Officer (**Appendix B**):

- 18 April: Vault Road closed due to presence of Caribou (~25 individuals);
- 8 May: Vault Road closed due to presence of Muskox herd (~ 20 individuals);
- 13 May: Vault Road closed due to presence of Muskox (~20 individuals); and
- 23 June: AWAR closed due to presence of Muskox (29 individuals).

Table 7.2: Average Number of Caribou Observed Per Survey Trip from 2007 to 2016.

Month	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
January	0	14.3	12.0	5.3	3.0	5.1	0	3.2	5.8	3.7
February	0	11.5	10.7	4.1	1.0	5.3	68.1	10.5	7.0	2.3
March	11.4	11.4	16.7	6.7	6.0	6.0	39.8	10.5	14.4	6.0
April	14.0	12.7	11.4	10.8	34.0	15.2	0	27.2	22.4	23.8
May	15.4	12.1	13.0	18.0	25.3	14.2	11.0	8.4	14.1	13.2
June	7.1	3.5	8.2	9.0	12.5	3.1	5.3	1.5	6.3	6.9
July	1.5	13.3	0	1.1	1.0	0	0	0	2.0	0
August	1.1	5.4	3.6	5.6	63.0	1.0	1.0	1.0	3.0	2.7
September	10.8	12.5	8.5	4.8	10.3	1.0	6.5	33.1	12.3	3.3
October	18.4	44.3	25.4	197.2	71.6	60.0	6.0	101.8	41.5	73.0
November	72.4	90.7	13.0	106.0	2.3	116.5	455.2	48.4	148.9	2.0
December	18.4	10.3	11.0	7.9	7.8	169.7	16.8	17.6	275.0	15.7

Data show the average number of caribou observed for a particular month of the year, including data from all surveys done that month. Note that data are based on the observed number, which might be more inaccurate for larger groups or groups that are further away.



Legend

	All-Weather Access Road		Caribou / Ha		Observation Counts
	Local Study Area - All-Weather Road		0		0 - 5
	Hydrology		1 - 5		6 - 10
			5 - 10		11 - 15
			10 - 15		16 - 20
			15 - 20		> 20
			> 20		> 20

0 5 10
Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited
Gebauer & Associates Ltd.

Figure 7.1: 2016 Ground Survey Observed Caribou Distribution within the LSA for the AWAR - All Seasons (Mapsheet A)

Meadowbank Gold Project

Prepared for:



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By:



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