APPENDIX 8-E

Addendums for Environmental Protection and Monitoring Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-E.7: Terrestrial Ecosystem Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Terrestrial Ecosystem Management	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 54, 61
NWB Requirement:	2AM-MEA-1525	**Condition:** not applicable
Addendum:		
Section Change	**Specify: Update or New**	**Details**
	New	WT Addendum

AGNICO EAGLE

MEADOWBANK DIVISION

Terrestrial Ecosystem Management Plan

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 2
June 2016

EXECUTIVE SUMMARY

This report provides an updated Terrestrial Ecosystem Management Plan (TEMP) for Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Gold Mine, which includes the All-Weather Access Road (AWAR) from Baker Lake to the Mine, the Vault Pit Haul Road, and the extension of the Meadowbank Mine through the Whale Tail Pit and Haul Road (inclusively the Project). The Project is located from approximately 90 to 150 km north of Baker Lake and 300 km inland from the northwest coast of Hudson Bay.

This revised TEMP has been written in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (EIA; Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Amendment (EIS; Golder 2016), which identify potential residual effects of the Project to vegetation and wildlife. For each potential effect, mitigation measures are proposed. To ensure that residual effects (i.e., after mitigation) are acceptable, a comprehensive monitoring plan is presented that evaluates the response of vegetation communities and wildlife populations to the effects of the Project and Project-related activities, and measures effects against thresholds.

Where monitoring determines that unacceptable residual effects exist, an adaptive management approach will be used to ensure that further effects are acceptable. Ongoing review of the TEMP through the Whale Tail Pit regulatory process and annual Wildlife Monitoring Summary Reports by regulatory agencies, technical reviewers, and stakeholders will further ensure that local and regional concerns have been adequately addressed.

This revised comprehensive TEMP builds on the successes of the original TEMP (October 2005) and incorporates the extension of the Meadowbank Mine through the Whale Tail Pit operations. To date, the TEMP has been very effective in identifying, monitoring and managing residual effects of the Project on vegetation and wildlife. This revised TEMP has incorporated detailed decision trees outlining monitoring and adaptive management strategies for varying scenarios of wildlife occurrence, and should enhance the ability of operations managers to respond to changes in wildlife distribution, abundance, and movement. This method provides transparency based on agreed upon approaches, thereby minimizing and mitigating potential Project/wildlife interactions.

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Geology Superintendent

AEM – Engineering Superintendent

AEM – Geotechnical Engineer

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	October 2005		Comprehensive plan for Meadowbank Project
2	May 2016	All	Update to include Whale Tail Pit and Haul Road

Prepared By: Nunavut Environmental Consulting, Dougan & Associates, and Meadowbank Environment Department

Approved by: 

Environmental Superintendent – Permitting and Regulatory Affairs

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION AND APPROACH

1.1 BACKGROUND

This report provides an updated Terrestrial Ecosystem Management Plan (TEMP) for Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Gold Mine, which includes the All-Weather Access Road (AWAR) from Baker Lake to the Mine, the Vault Pit Haul Road, and the Whale Tail Pit and Haul Road extension (inclusively the Project; see **Figures 1** and **2**). The Project is located from approximately 90 to 150 km north of Baker Lake and 300 km inland from the northwest coast of Hudson Bay. The Project area is above the tree line near the Arctic Circle. The local physiography is characterized by numerous lakes and low, rolling hills covered mainly by lichen/rock complexes, and heath tundra.

This revised TEMP has been written in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (EIA; Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Addendum (EIS; Golder 2016), which identify potential residual effects of the Project to vegetation and wildlife. The EIAs are based on an analysis of Project components and their effects, with and without mitigation, on terrestrial Valued Ecosystem Components (VECs). The purpose of mitigation in the context of the TEMP is to minimize or eliminate Project effects on wildlife and wildlife habitat in the Project area through all phases (i.e., exploration, construction, operation, closure/post-closure, temporary closure, and long-term shutdown). A summary of environmental effects and a description of mitigation measures that have already been implemented during the design, construction, and operation phases of the Project, and those that will be implemented, are provided in this document. A detailed description of potential environmental effects is provided in the Project's EIA documents.

For each potential effect (described in detail in the EIAs), mitigation measures are proposed. To ensure that residual effects (i.e., after mitigation) are acceptable, a monitoring plan is presented that evaluates the response of vegetation communities and wildlife populations to the effects of the Project and Project-related activities, and measures effects against thresholds (see **Chart 1**).

Where monitoring determines that unacceptable residual effects exist, an adaptive management approach will be taken to ensure that further effects are acceptable. Additional mitigation measures will be the most likely means by which this will be accomplished. Adaptive management is an ongoing process that evolves throughout the life of the Project as better and more effective ideas are introduced in a process that is designed to be continually improving. Ongoing review of the TEMP and annual Wildlife Monitoring Summary Reports (which provide results of TEMP monitoring programs) by regulatory agencies, technical reviewers, and stakeholders will further ensure that local and regional concerns

have been adequately addressed. All of these approaches or plans have been previously reviewed by NIRB. For example, due to concerns raised by local stakeholders, AEM has formalized a dustfall plan (Appendix D) to continue to measure dustfall along the Baker Lake to Meadowbank AWAR and Whale Tail Pit Haul Road, and a Screening Level Risk Assessment Plan (Appendix E). In addition, adaptive management procedures have been developed for when Ungulates, Predatory Mammal dens, and Raptor nests are in close proximity to Project facilities.

The mitigation and monitoring procedures identified in this TEMP will be integrated into all stages of the Project to ensure that mine operation and future mine development can proceed as scheduled while accommodating wildlife management needs. The TEMP will also outline strategies for identifying how natural changes in the environment can be distinguished from Project-related effects. Reporting of natural versus Project-related effects will be in the annual Wildlife Monitoring Summary Report.

This revised TEMP builds on the success of the original TEMP (October 2005) and includes monitoring of the extension of the Meadowbank Mine through the operation of Whale Tail Pit, and additions (e.g., decision trees for wildlife monitoring and management) will increase the transparency or the monitoring and mitigation, and enhance the ability of operation managers to protect wildlife occurring in the area.

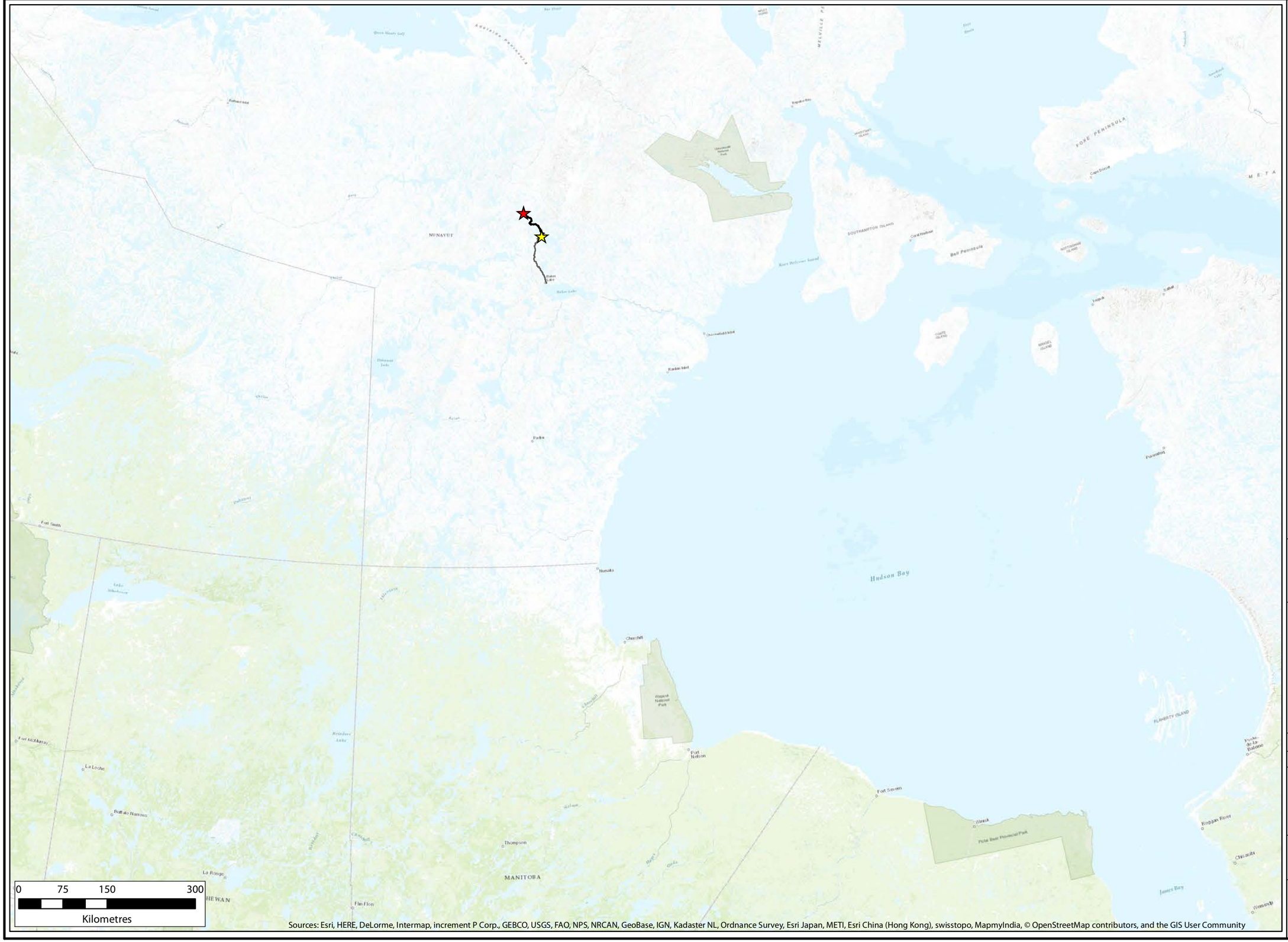
1.2 PURPOSE AND OBJECTIVES

The purpose of the TEMP is to manage the interaction between the Project and the terrestrial ecosystem so that residual effects (i.e., effects that remain after mitigation has been implemented) to vegetation, wildlife, and wildlife habitats are acceptable. The primary objectives of the TEMP will be to: 1) summarize mitigation strategies developed in the EIAs for this Project (**Section 2**); and 2) present monitoring approaches (**Section 3**).

1.3 VALUED ECOSYSTEM COMPONENTS SELECTION

Key VECs were selected through consultation with regulatory and governmental authorities and members of the local community (e.g., Hamlet of Baker Lake, Baker Lake Hunters and Trappers Association [HTO]), and a review of VECs identified in other northern mine projects. Selection of VECs was further refined through the application of one or more of the following criteria: conservation status, relative abundance within the Project study area, importance in subsistence lifestyle and economy, importance in predator-prey systems, habitat requirement size and sensitivity, and contribution to local area concerns.

Based on this selection process, the key terrestrial VECs were determined to be: Vegetation (Wildlife Habitat), Ungulates, Predatory Mammals, Small Mammals, Raptors, Waterfowl, and Upland Breeding Birds. Key species associated with these VECs are shown in **Table 1.**



Legend

- Whale Tail Project Location
- Meadowbank Mine Site
- Haul Road (AEM, Nov. 2015)
- All Weather Access Road (AWAR)

Project Location Map - Nunavut Overview

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R1
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

Nunavut ENVIRONMENTAL CONSULTING LTD

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CLIENT: Agnico Eagle Mines Limited

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Figure: 1

Whale Tail Study Area

Haul Road

Vault Pit

Meadowbank

AWAR

Schultz Lake

Whitehills Lake

Baker Lake

Tehek Lake

Thelon River

Quoich River

North Channel

0 5 10 20

Kilometres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Project Location Map - Meadowbank & Whale Tail

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R1
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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Figure: 2

Chart 1: Relationship between effects, mitigation, and monitoring

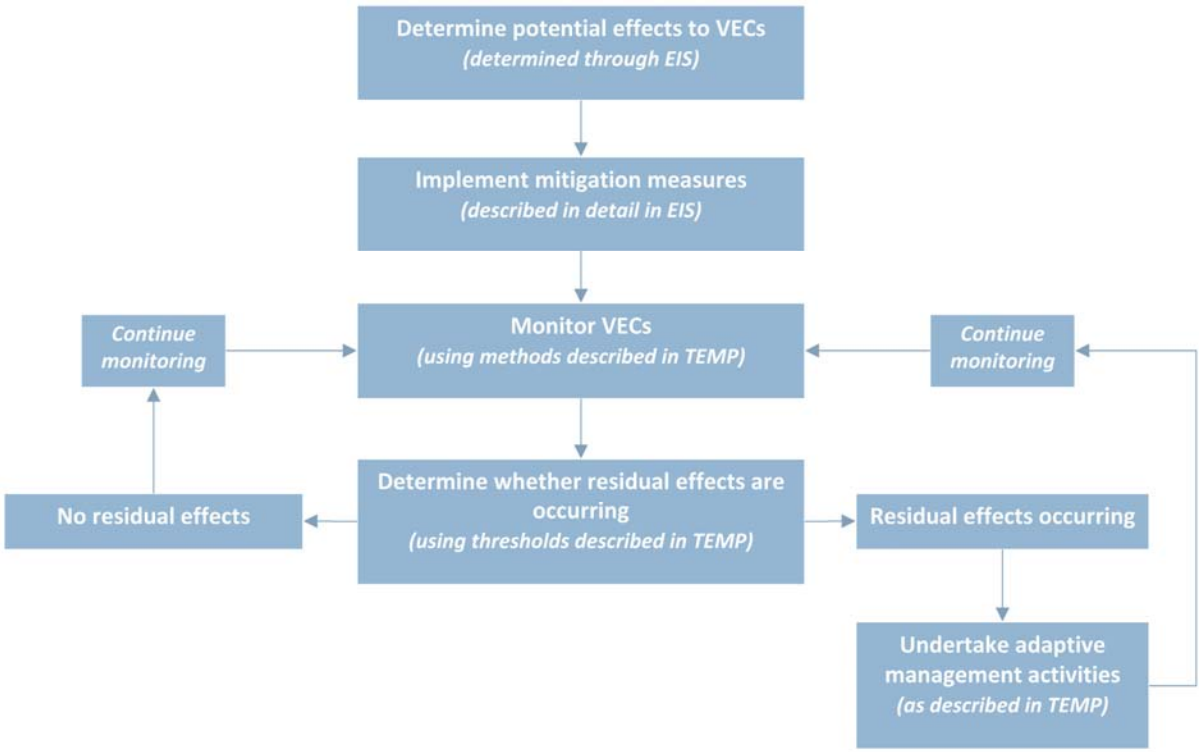


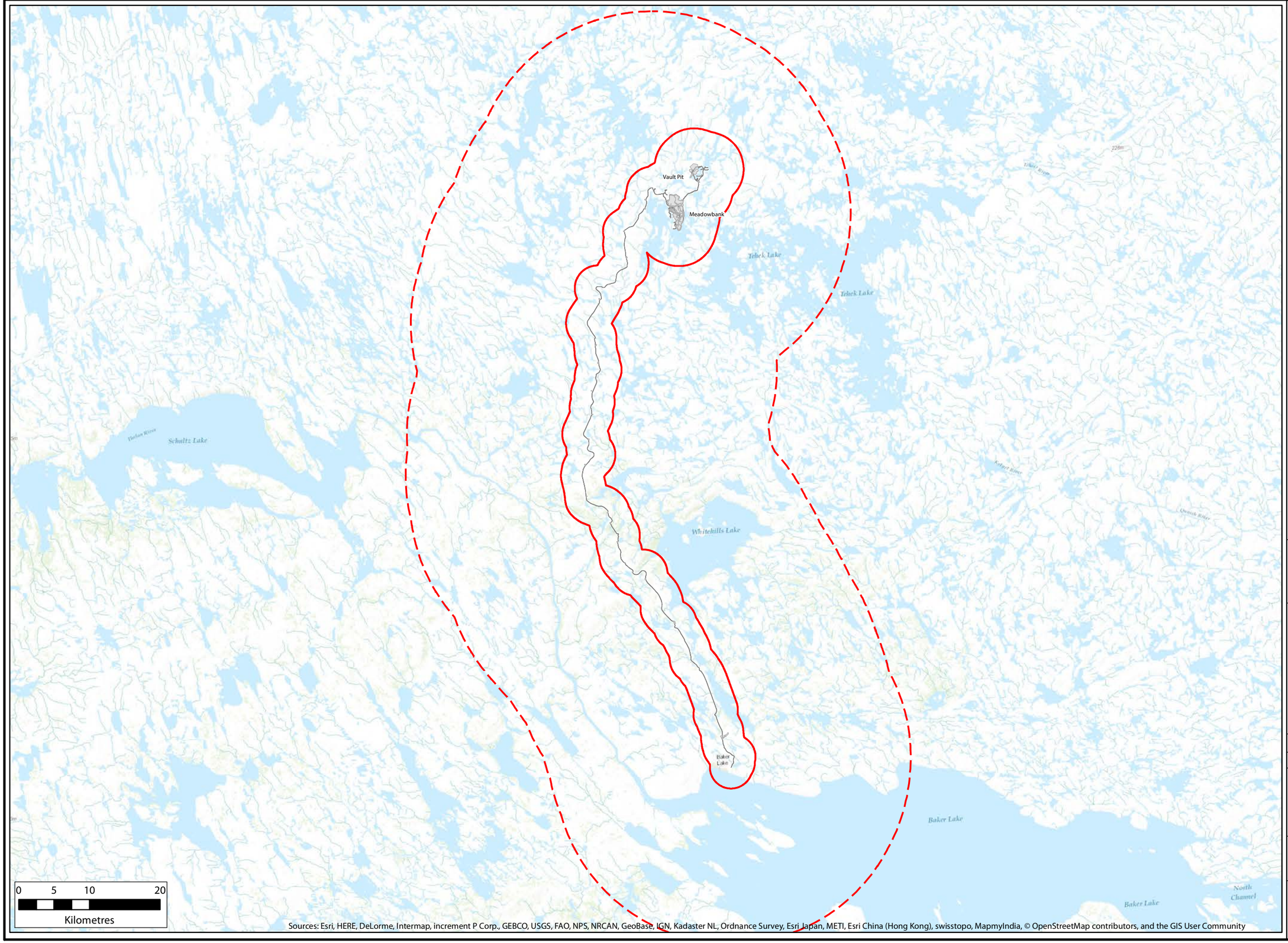
Table 1: Valued Ecosystem Components in the Meadowbank and Whale Tail Study Areas.

VEC	Common Name	Scientific Name
Vegetation	N/A	N/A
Ungulates	Barren-ground Caribou	*Rangifer tarandus* ssp. *groenlandicus*
	Muskox	*Ovibos moschatus*
Predatory Mammals	Grizzly Bear	*Ursus arctos*
	Wolverine	*Gulo gulo*
	Gray (Arctic) Wolf	*Canis lupus*
	Arctic Fox	*Vulpes lagopus*
Small Mammals	Arctic Hare	*Lepus arcticus*
	Arctic Ground Squirrel (Sik Sik)	*Spermophilus parryi*
	Collared Lemming	*Dicrostonyx groenlandicus*
	Northern Red-backed Vole	*Clethrionomys rutilis*
Raptors	Peregrine Falcon	*Falco peregrinus* ssp. *tundrius*
	Gyrfalcon	*Falco rusticolus*
	Rough-legged Hawk	*Buteo lagopus*
	Snowy Owl	*Nyctea scandiaca*
Waterfowl	Canada Goose	*Branta canadensis*
	Long-tailed Duck	*Clangula hyemalis*
	Loons	*Gavia* spp.
Upland Breeding Birds	Rock Ptarmigan	*Lagopus mutus*
	Lapland Longspur	*Calcarius lapponicus*
	Horned Lark	*Eremophila alpestris*
	Semipalmated Sandpiper	*Calidris pusilla*
	Sandhill Crane	*Grus canadensis*

1.4 SPATIAL BOUNDARIES

1.4.1 Meadowbank Mine Site, Vault Pit and Haul Road, and AWAR

The Meadowbank 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 154 km^2. The AWAR LSA consists of a 3 km wide corridor centred on the AWAR between Baker Lake and the Meadowbank Mine (**Figure 3**). The RSA encompasses an area that includes a 25 km radius area around the Main and Vault sites and a 50 km wide corridor along the AWAR for a total area of 5,077 km^2 (**Figure 3**).



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank (5 km) & AWAR (3 km) LSA Boundary
- AWAR RSA Boundary (25 km)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank RSA & LSA Boundaries for Monitoring Studies

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ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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Figure: 3

1.4.2 Whale Tail Pit and Haul Road

The Whale Tail LSA is a 3 km corridor centered on the Whale Tail Haul Road and borrow site access roads (i.e., 1.5 km on either side of the roads and 1.5 km around borrow areas), and includes an approximate 1.5 km buffer around development areas at the Whale Tail Pit area). The Whale Tail RSA is a 50 km corridor centred on the Haul Road alignment (i.e., 25 km on either side of the Haul Road and borrow site access roads, and 25 km around borrow areas). Total area of the RSA is 5,017 km^2, while the total area of the LSA is 282 km^2 (**Figure 4**).

1.5 RESIDUAL EFFECTS

Residual effects are Project effects that remain after implementation of all mitigation measures. A comprehensive assessment of the expected residual effects on vegetation and wildlife has been provided in the Meadowbank Terrestrial Ecosystem Impact Assessment (Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Addendum (Golder 2016). The effectiveness of mitigation and magnitude of residual effects will be determined via monitoring programs outlined in this document. Where monitoring determines that residual effects are outside established thresholds of acceptability, an adaptive management approach will be taken.

Whale Tail Study Area

Vault Pit

Meadowbank

0 5 10 20
Kilometres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Esker Access Road
- Meadowbank Mine Site
- All Weather Access Road (AWAR)
- LSA Boundary (1.5 km)
- RSA Boundary (25 km)

Whale Tail RSA & LSA Boundaries for Monitoring Studies

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ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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Figure: 4

2. MITIGATION MEASURES

2.1 GENERAL MITIGATION MEASURES

Detailed mitigation measures have been provided in the Meadowbank EIA (Cumberland Resources 2005a) and Whale Tail Pit Final EIS (Golder 2016). A summary of general measures is provided in **Table 2** below, while **Sections 2.2** to **2.8** summarize the anticipated environmental effects and mitigation measures specific to each VEC.

Table 2: General Mitigation Measures for the Meadowbank Mine, and Whale Tail Pit and Haul Road.

Environmental Education
Employees will participate in an environmental awareness program during their induction (see Wildlife Response and Protection Plan in **Appendix A**), including bear safety procedures, instructions on wildlife rights-of-way, and other wildlife protection measures will be presented.
Feeding of wildlife is prohibited
Wildlife on Site
A wildlife reporting system (e.g., wildlife log) will be maintained by environmental staff. Where human safety or wildlife well-being is an issue, employees will be notified regarding procedures (e.g., 'stop work' policy). The bear response contingency plan includes a staff organizational chart indicating who has responsibility for bear-human interactions, and procedures to be followed (see **Appendix A**).
Road Access and Restrictions
Access will be restricted to the AWAR, Haul Roads, and quarry/borrow access roads to avoid unnecessary degradation of wildlife habitats
Wildlife have the right-of-way on roads
Vehicle traffic will be minimized and traffic will travel in convoys if deemed necessary when possible
Maximum speed limits of 50 km/hr will be enforced
All road-killed wildlife will be reported immediately to Project environmental staff and removed to avoid attracting scavengers. If necessary, animals will be examined by the Environment Department to determine cause of death; Ungulate and Predatory Mammal mortalities will be reported to the GN wildlife conservation officer. Disposal will be through incineration at the mine or as directed by the GN. Drivers must fill out a vehicle/animal collision report to document the conditions and circumstances surrounding the incident
For mine safety reasons, Baker Lake residents will be prohibited from travelling beyond the 85 km mark of the AWAR. Because the Vault and Whale Tail Haul Roads begin within existing mine facilities, public access to these roads will be limited.

Table 2: Continued.

Hunting
Hunting and harassment of any wildlife species by mine employees will be prohibited.
A no-hunting zone of 1 km from roads will be enforced to reduce road-related effects on wildlife and to protect employee safety.
Except for designated persons (e.g., wildlife monitors, environmental technicians), employees will not be permitted to carry firearms while they are on the mine roads.
Spills and Contamination
All spills will be immediately cleaned up or isolated to minimize the potential for exposure to wildlife or degradation of the surrounding environment (see Spill Contingency Plan).
Water that has the potential to come into contact with the mining activities will be intercepted, contained, and will meet license limits prior to discharge.

2.2 VEC-SPECIFIC MITIGATION MEASURES

2.2.1 Vegetation

2.2.1.1 Summary of Potential Environmental Effects

Permanent habitat loss will occur due to the construction footprint of mine facilities, including mine buildings, haul roads, and ancillary roads (e.g., to quarry and borrow sites). As well, dewatering of Whale Tail Lake at the end of the construction phase, will result in the flooding of a number of tributary lakes upstream of the Whale Tail Dike to the Mammoth Lake Watershed, thereby altering flows to Mammoth Lake and downstream lakes. This change in water regime can strongly influence plant species composition, community structure, and biological diversity (Vale et al. 2015). These temporary changes in water levels will affect soil moisture, and may result in localized effects to vegetation habitat quality through decreased species abundance and flooding. All terrestrial habitats provide some value to wildlife VECs. Consequently, loss or degradation of any of these habitats may result in localized negative effects on wildlife (see the EIAs). Any given wildlife species is likely to be associated with more than one type of habitat, and some species, such as Caribou, follow seasonal migration patterns that cross entire ecozones, while Predatory Mammal VECs such as Arctic Wolf and Wolverine are more closely associated with the movements of Caribou than with any specific habitat, except when they are denning.

Another potential effect on Vegetation is degradation by contamination resulting from dust dispersal and exhaust (i.e., from vehicles). Bryophytes and lichens may experience the largest effects close to roads where the greatest amount of deposition frequently occurs. Consistent with current dustfall monitoring and terrestrial monitoring along the AWAR, the EIA has found that the primary effects of dust are generally confined to the immediate area next to roadways (Everett 1980; Walker and Everett 1987).

2.2.1.2 Mitigation Measures for Vegetation

Proposed mitigation measures for Vegetation (Wildlife Habitat) are summarized in **Table 3**.

Table 3: Mitigation Measures to Minimize Effects to Vegetation at the Meadowbank Mine and Vault Site, and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post -Closure
Minimizing Vegetation (Wildlife Habitat) Loss				
Avoid high value habitats (e.g., eskers)	X	X		
Cluster facilities and minimize footprints	X			
Minimize haul and access road width and length	X	X		
Minimize borrow area size	X	X	X	
Construct boardwalks and helicopter pads		X	X	X
Construct buildings above ground	X	X		
Stay on roads		X	X	X
Clearly mark road edges		X	X	X
Restore and revegetate disturbed habitats			X	X
Scarify roads, remove facilities, restore drainage patterns, and stabilize slopes			X	X
Replant indigenous shrub species			X	X
Minimizing Vegetation Degradation				
Minimize vehicle traffic and speeds		X	X	X
Maintain vehicles in good working order		X	X	X
Contain (berms) fuel storage areas	X	X	X	X
Follow hazmat and spill contingency guidelines	X	X	X	X
Control facility and vehicle emissions		X	X	X
Implement dust control measures (e.g., if needed, spraying and chemical suppressants) on mine roads and airstrip		X	X	X
Use appropriate waste disposal containers		X	X	X
Use landfill area to dispose of inorganic waste (e.g., concrete, plastic). All other materials shipped and disposed off-site		X	X	X
Incinerate organic waste		X	X	X
Maintain natural drainage patterns	X	X	X	X
During water diversion, pump discharge directly to the lake environment using natural drainage patterns when possible		X	X	X

Table 3: Continued.

Minimizing Vegetation Degradation				
Remove and dispose of contaminated soil (see 'Environmental Guidelines for Site Remediation', DOE 2009		X	X	X

2.2.2 Ungulates

2.2.2.1 Summary of Potential Environmental Effects

Caribou and Muskox are susceptible to habitat loss and disturbance associated with Project facilities and activities. The potential for direct effects such as vehicle/animal collisions and increased hunting pressure are concerns, as are indirect effects related to contaminated water and vegetation.

Monitoring at other mines suggests that caribou herds change their distribution around diamond mine developments, where probability of occurrence increases with distance from the mine (Boulanger et al. 2012; Johnson et al. 2005; Rescan 2007; Golder 2011a). This area is termed the zone of influence (ZOI). A study using aerial survey and satellite-collar data collected around the Diavik, Ekati, and Snap Lake mines estimated that caribou relative abundance was reduced near the mine, and reached expected levels at up to 14 (Boulanger et al. 2012). Golder (2011a) detected ZOI ranging from 12 to 40 km around the Diavik mine and Lac de Gras, although the estimates may be confounded by the presence of Lac de Gras, which affects caribou distribution. Ground-based monitoring at Ekati suggested that caribou groups with calves spend less time feeding within 5 km of the footprint (BHPB 2004). At the smaller Snap Lake Mine, a ZOI of 6.5 to 28 km was detected (Golder 2008; Boulanger et al. 2009), which increased with the level of mining activity (Golder 2008). Adding to the uncertainty, interviews with hunters in Kulguktuk familiar with mining reported that caribou are often observed at active mines; appearing undisturbed and staying for days at a time. Caribou are even attracted to mine infrastructure for mosquito relief (Golder 2011b).

Road-related mortality may be a source of residual effects if not carefully managed. Although Muskox is not considered a species-at-risk, their low reproductive rate, sedentary nature, and tendency to stand their ground when threatened make them vulnerable to disturbance and over-hunting. Muskoxen, therefore, require careful management and monitoring of any adverse effects from road development and operation within their range (JWEL 2001). No Muskox mortalities have been associated with the Project to date.

A more minor concern is the potential for Caribou or Muskox to drink potentially contaminated water from the tailings impoundments or possibly runoff from the waste rock piles; however, in eight years of on-site monitoring, this has not been documented.

Approved deterrent methods have been implemented at Meadowbank when necessary. On-site environmental staff will be monitoring the tailings facilities on a daily basis.

2.2.2.1 Mitigation Measures for Ungulates

Proposed mitigation measures for Ungulates are summarized in **Table 4**. See also General Measures in **Table 2**.

Table 4: Mitigation Measures to Minimize Effects to Ungulates at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation Degradation (see Table 3 for Vegetation)				
Reducing Sensory Disturbance (see also General Measures, Table 2)				
Construct the Whale Tail Haul Road during the winter to avoid effects to Caribou during potentially sensitive periods (e.g., spring and fall migration)	X	X		
Minimize blasting and engine noises		X	X	X
Maintain blasting windows (see Transportation Management Plan: All Weather Private Access Road and Amaruq Haul Road Management Plan)		X	X	
Enforce speed limits (50 km) on mine roads (see Transportation Management Plan: All Weather Private Access Road and Amaruq Haul Road Management Plan)		X	X	X
Maintain ferrying flight altitudes of 610 m when feasible. Report Ungulate aggregations.		X	X	X
Report Ungulates in the vicinity of the road to environmental staff and road dispatcher		X	X	X
Reducing Ungulate Project-related Mortality (see also General Measures, Section 2.2)				
Along pits, graduate slope angles to diminish likelihood of slippage	X	X	X	
Herd Ungulates off airstrip only prior to arrivals and departures (see Access and Air Traffic Management Plan)		X	X	X
Avoiding Exposure to Potentially Contaminated Water and Vegetation				
Use aversive techniques to chase off Ungulates attracted to potentially contaminated water in tailings ponds or runoff,		X	X	X

Table 4: Continued.

Avoiding Disruption of Movement or Migration Patterns				
Design roads with low profile to avoid barriers	X	X		
Implement special measures if Ungulates are in close proximity to Project facilities and roads (see **Section 3.3**).		X	X	
Contour snow banks to avoid creating barriers		X	X	X
Post updated maps of know migration corridors and report to GN, KivIA, and NIRB personnel		X	X	
During road decommissioning, flatten and scarify road edges			X	X

2.2.3 Predatory Mammals

2.2.3.1 Summary of Potential Environmental Effects

Predatory Mammals are susceptible to animal/vehicle collisions, loss of denning habitat, and sensory disturbance associated with Project construction and operation. Grizzly Bears and Wolverines may be particularly vulnerable to road development. Due to their wide-ranging and scavenging natures, they are drawn to road edges where road kills may be readily available. Once they have been attracted, habituated or food-conditioned to a site, they may be difficult to avert and may eventually become a human safety concern. One Wolverine and three Wolves have been killed along the Meadowbank AWAR between 2007 and 2015 (Gebauer et al. 2016).

The potential for direct loss of denning habitat for some Predatory Mammals, especially Wolves, is also a concern during road construction and borrow pit development. Wolves use unconsolidated materials (e.g., eskers), to excavate den sites, and the same den sites may be used from year to year (Cluff et al. 2002). Occasionally, adults with pups have been sighted along the AWAR area in summer denning months, and most recently, an active den and nursery site was identified within the borrow area at Esker #3 in the Whale Tail Haul Road study area (Dougan & Associates and Nunavut Environmental 2015). Two ground reconnaissance surveys in this area indicated that a small Wolf pack (three adults) was protective of an unknown number of juveniles. One recently used (previous year) Wolf den site was located and the suspected location of a second active den (year of survey) and later a pup nursery area were deduced based on territorial adult Wolf behaviour. Wolf denning occurs between early May and late September (May et al. 2002).

Grizzly Bears are also known to use habitats such as eskers for denning (Mueller 1995), while Wolverines have been linked to zones of persistent snow cover and boulders because of their reliance on cached food as they litter during late winter (Inman et al. 2012). Sensory

disturbance from road construction and operation could result in an indirect loss of nearby functional denning habitat (May et al. 2002).

Other potential effects to Predatory Mammals, such as changes in prey abundance, distribution, or health, are of lesser concern. Mitigation measures to ensure that the viability and integrity of prey populations are maintained (e.g., Ungulates) will also mitigate the potential effects to Predatory Mammals.

2.2.3.2 Mitigation Measures for Predatory Mammals

Proposed mitigation measures for Predatory Mammals are summarized in **Table 5**. See also General Measures in **Table 2**.

Table 5: Mitigation Measures to Minimize Effects to Predatory Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Reducing Project-related Mortality (see also General Measures, Table 2)				
Apply response plan (see **Appendix A**) when individuals are in close proximity		X	X	X
Manage mine food wastes and odors (**Appendix A**)		X	X	X
Instruct mine workers to keep lunches inside vehicle cabs or buildings		X	X	X
Remove and incinerate all wildlife carcasses to avoid attracting predators to facilities		X	X	X
Continue to improve waste segregation techniques and procedures	X	X	X	X
Incinerate all kitchen waste, wood/paper products on a daily basis		X	X	X
Seal and store all aromatic products (e.g., paint) in bear-proof containers		X	X	X
Construct skirts or sheathing along all facilities with potential to attract Predatory Mammals	X	X	X	
Use deterrents if necessary (**Appendix A**)		X	X	X
Avoiding Disturbance of Den Sites				
Initiate a den-specific management plan when a Wolverine, Grizzly Bear or Wolf den site is detected within 1 km of activities (see **Section 3.4.3**)		X	X	X
Restrict human and vehicle activity in the vicinity of den sites		X	X	X

2.2.4 Small Mammals

2.2.4.1 Summary of Potential Environmental Effects

Because the home ranges of Small Mammals are relatively small, local populations could be affected by loss of important habitat within existing home ranges. Habitat loss (i.e., Project footprint) is unavoidable; however, degradation of existing habitats can be minimized.

The most substantial effect to Small Mammals in the Project area will occur during the construction phase. The major effects include loss, disturbance, and fragmentation of breeding and foraging habitat, reduced habitat effectiveness due to noise and activity, displacement, mortality due to collisions with traffic, and degradation of health and habitat due to toxic spills and contaminant loading from dust and exhaust.

The major areas of effect will be the plant site and ancillary facilities, open pits, all weather roads, waste rock disposal facilities, and the airstrip. Voles, lemmings, and Arctic Ground Squirrels will likely be more directly affected by the development of the mine and its facilities than Arctic Hare, due to the ground squirrel's reduced ability to avoid mobile machinery, earth-moving machinery, and blasting. As well, rodents instinctively burrow when a threat is perceived, whereas Arctic Hares either freeze momentarily or flee.

Minor declines in local populations of Small Mammals, particularly voles and lemmings, may occur; however, increased denning opportunities for Arctic Ground Squirrels in road banks may result in an increase in local populations.

2.2.4.1 Mitigation Measures for Small Mammals

Proposed mitigation measures for Small Mammals are summarized in **Table 6**. See also General Measures in **Table 2**.

Table 6: Mitigation Measures to Minimize Effects to Small Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Contour habitat on slopes of waste rock storage facilities			X	X
Minimizing Vegetation Degradation (see Table 3 for Vegetation)				
Reducing Small Mammal Project-related Mortality (see also General Measures, Table 2)				
Small mammals may be attracted to burrowing opportunities on road banks and fill areas. Make drivers aware of this behaviour so that interactions can be minimized		X	X	X

2.2.5 Raptors

2.2.5.1 Summary of Potential Environmental Effects

Available survey data indicate that few Raptors nest in the vicinity of the Project area; therefore, direct effects to breeding Raptors are expected to be very low (Cumberland Resources 2005b; Dougan & Associates and Nunavut Environmental 2015). Ongoing monitoring (see **Section 3.6)** will ensure that active nests will be documented if they are present in close proximity to mine facilities, or along the AWAR, Haul Road, and access roads to quarry/borrow sites.

Other potential effects include changes in abundance, distribution, and health of prey populations (e.g., Small Mammals and Upland Breeding Birds) due to road activities. Mitigation measures to minimize Vegetation (i.e., Wildlife Habitat) removal (see **Section 2.2.1)** will ensure that habitat is available to support local Small Mammal and bird populations.

2.2.5.2 Mitigation Measures for Raptors

Proposed mitigation measures for Raptors are summarized in **Table 7**. See also General Measures in **Table 2**.

Table 7: Mitigation Measures to Minimize Effects to Raptors at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Avoiding Disturbance to Nesting Raptors				
Develop a nest-specific management plan for identified raptor nests within areas of concern to ensure that nesting success is not affected by development activities (see **Section 3.6**)		X	X	X
Follow GN DoE guidelines (DOE 2005) for avoiding disturbance to raptor nests[1]		X	X	X
Discourage raptors from establishing nests on artificial structures, pit walls, or other facilities (see **Appendix G**)			X	
Limit ferrying flight altitudes to 610 m above ground level (Hines and Wiebe 1997, Access and Air Traffic Management Plan, except during approaches and take-offs, unfavourable weather conditions (e.g., low ceiling), and some exploration activities (e.g., moving drilling equipment)		X	X	X

2.2.6 Waterfowl

2.2.6.1 Summary of Potential Environmental Effects

Waterfowl species are most often associated with wetlands with emergent vegetation, which are a relatively rare type of habitat in the Arctic, and particularly in the Meadowbank and Whale Tail areas. During many years of baseline data collection and operational monitoring, only a small number of nesting Waterfowl were documented within the Meadowbank Mine and along the AWAR (see annual Wildlife Monitoring Summary Reports). Given these low densities of nests identified within the Project area since 2005 (i.e., too low to determine whether changes in nest abundance or success occurred), and the absence of data suggesting that road-related effects were occurring, the Waterfowl nest survey program at Meadowbank was discontinued in 2012 (Gebauer et al. 2013). Initial Waterfowl surveys for the Whale Tail study area have also documented low numbers of nesting Waterfowl (Dougan & Associates and Nunavut Environmental 2015).

Waterfowl that use flooded portions of the tailings impoundment areas for resting or roosting purposes during the summer and migratory periods may be exposed to contaminants; however, residence times are not expected to be long due to the lack of wetland vegetation, and the absence of fish in the tailings impoundment areas. There is also a possibility that Waterfowl (e.g., geese) may forage on potentially contaminated graminoid vegetation (e.g., vegetation that may have been contaminated by fugitive dust fall from vehicles); however, results of recent risk assessments for the Meadowbank site (Wildlife Screening Level Risk Assessment; Agnico Eagle 2014) have indicated no excess risk to Waterfowl as a result of Project activities.

2.2.6.2 Mitigation Measures for Waterfowl

Proposed mitigation measures for Waterfowl are summarized in **Table 8**. See also General Measures in **Table 2**.

Table 8: Mitigation Measures to Minimize Effects to Waterfowl at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Stay 30 m away from shoreline areas during design except where necessary for constructing road crossings and pit development	X	X	X	
Provide foraging opportunities for Waterfowl, particularly geese, over the long term in revegetated areas and flooded mine pits			X	X

Table 8: Continued.

Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to ensure that levels are acceptable to Waterfowl in the long		X	X	X
Avoiding Disturbance to Nesting Waterfowl				
Clear land outside the breeding season (June 1 to August 1) unless a nest survey by a qualified wildlife biologist has determined that no Waterfowl nests are present		X	X	X
Limit ferrying flight altitudes to 610 m above ground level (Hines and Wiebe 1997)		X	X	X
Where important bird areas (e.g., moulting areas, goose breeding colonies etc.) are identified, observe a 1,000 m vertical and 1,500 km horizontal distance whenever possible (Hines and Wiebe 1997). Make all pilots aware of these flight restrictions.		X	X	X
Establish blasting windows and distances for Waterfowl nests within 100 m, where applicable		X	X	
Reducing Waterfowl Project-related Mortality (see also General Measures, Table 2)				
Monitor tailings, reclaim ponds, and storm water retention ponds daily to ensure that Waterfowl have not landed on these waterbodies. Where Waterfowl have landed on ponds, use aversive tactics to scare them away		X	X	X

2.2.7 Upland Breeding Birds

2.2.7.1 Summary of Potential Environmental Effects

The greatest effect to Upland Breeding Birds (e.g., songbirds) is the removal, flooding, or degradation of nesting habitat. Virtually all terrestrial habitat within the study area provides foraging or nesting habitats for one or more species. Some species prefer shrubby terrain (e.g., Savannah Sparrow), others are found primarily in open tundra (e.g., Lapland Longspur), whereas some are restricted to wet meadows (e.g., Semipalmated Sandpiper).

Another potential environmental effect is the reduced habitat effectiveness due to human activity, although passerines appear to readily habituate to these activities compared to larger species such as Raptors and Waterfowl. Studies have documented avoidance effects and reduced bird densities within 1 km of human infrastructure (Reijnen et al. 1997; Benitez-Lopez et al. 2010). Conversely, a study of Lapland Longspurs by Male and Nol (2005) showed no difference in nest success between sites with high and low levels of human noise at the Ekati Diamond Mine. In addition, no decrease in upland bird species richness or

abundance from mine activity has been observed at the Meadowbank Mine (Gebauer et al. 2012, 2013) or at the Ekati Diamond Mine (Smith et al. 2005; Rescan 2010).

Buildings, pits, and other facilities will provide new perching opportunities and possibly nesting opportunities for Raptors. The potentially higher densities of Raptors in the area, and potentially increased depredation rates on passerines, are possible negative effects of the Project on songbirds

2.2.7.2 Mitigation Measures for Upland Breeding Birds

Proposed mitigation measures for Upland Breeding Birds are summarized in **Table 9**. See also General Measures in **Table 2**.

Table 9: Mitigation Measures to Minimize Effects to Upland Breeding Birds at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to ensure that levels are acceptable to Upland Breeding Birds in the long term		X	X	X
Avoiding Disturbance to Nesting Upland Breeding Birds				
Clear land outside the breeding season (May 1 to August 1) unless a nest survey by a qualified wildlife biologist has determined that no Upland Breeding Bird nests are present		X	X	X
If nest found within Project facilities, mark nest location and set up buffer zone if possible		X	X	X
Avoid human activity around nest sites to avoid attracting predators to site		X	X	X
Reducing Upland Breeding Bird Project-related Mortality (see also General Measures, Table 2)				
Discourage Raptors from nesting or roosting on mine facilities (see **Appendix G**). Locally breeding Raptors will increase depredation rates on songbirds		X	X	X
Discourage Upland Breeding Bird nesting attempts on equipment and facilities		X	X	X

3. MONITORING

3.1 OVERVIEW

A comprehensive suite of monitoring activities are being undertaken for the Project facilities and roads. **Table 10** summarizes all of the monitoring activities, their frequency, and the VEC each activity targets.

Table 10: Summary of Terrestrial Ecosystem Monitoring Activities for the Meadowbank and Whale Tail Project.

Monitoring Activity	Frequency	VEC						
		Vegetation	Ungulates	Predatory Mammals	Small Mammals	Raptors	Waterfowl	Upland Breeding Birds
Habitat monitoring	Every three years post-construction	X						
Dustfall monitoring	Monthly around Meadowbank Mine and Whale Tail Pit; detailed study conducted annually along Haul Roads and AWAR.	X						
Habitat reclamation monitoring	At Year 2 post-closure and every 3 years until Year 12 post-closure	X						
Caribou satellite-collaring program	Initiated in 2008 with four (4) subsequent deployments. Data provided to AEM from GN weekly throughout the year, requested up to 2x/week as needed (see Chart 2)		X					
Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see Chart 2). Includes inspections of waste streams to ensure no attractants for Predatory Mammals		X	X		X	X	
Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – up to 2x/week as needed during observed migration (see Chart 2)		X	X	X	X	X	X
Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)		X	X	X	X	X	X
Height-of-Land surveys	Jan to Apr and Jul to Aug – 1x/week; May to June and Sep to Dec – 2x/week. Up to daily as needed according to adaptive management programs (see Chart 2)		X	X				
Hunter Harvest Survey	Initiated in 2007 and ongoing. Data collected at least twice annually, reported annually.		X	X				

Table 10: Continued.

Monitoring Activity	Frequency	VEC						
		Vegetation	Ungulates	Predatory Mammals	Small Mammals	Raptors	Waterfowl	Upland Breeding Birds
Active den site surveys*	Initiated by the detection of an active den (Grizzly Bear, Wolf or Wolverine) within the active footprint or vicinity of Project facilities. (see Chart 3)			X				
Active Raptor nest monitoring*	During nesting season (May 1 to Sept 15) if active nest is within the active footprint and vicinity of Project facilities: within area of concern – 1x/day; not within area of concern – 1x/week (see Chart 4)					X		
Waterfowl nest surveys	Active nests identified within 100 m of Project facilities and roads monitored if deemed necessary						X	
PRISM plot surveys	Once every three years							X
Breeding bird transects	Once every three years during closure and post closure							X

*only to be initiated if an active Raptor or Predatory Mammal den is detected within active footprint or in vicinity of Project facilities or roads. See **Charts 3 & 4.**

Full descriptions of how the monitoring efforts will apply to each VEC are provided in Sections **3.2** to **3.8**.

3.2 VEGETATION (WILDLIFE HABITAT)

3.2.1 Objectives

The objectives of monitoring Vegetation will be to ensure that measures to minimize the amount (or area) of Vegetation and Wildlife Habitat lost to Project construction and operation are effective, and that concentrations of contaminants in vegetation do not exceed acceptable levels for wildlife health. Residual effects will be assessed, and opportunities for reclamation or habitat creation will be identified (e.g., recontouring, stabilization, and restoration of drainage patterns). Monitoring will also ensure that potentially contaminated vegetation is removed (or isolated from wildlife), and that the site is restored to its natural state.

Table 11 describes the framework that has been established for monitoring effects to vegetation.

Table 11: Monitoring Approach for Vegetation and Wildlife Habitat for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss **Meadowbank Mine and Vault Pit and Haul Road (Mine Site)**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	5% above predicted EIA values of 867 ha for the Mine site. As of 2014, habitat loss has been 776 ha, which is 91 ha less than predicted (or 89% of predicted)	Habitat monitoring	Every three years post-construction
Habitat Loss **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	5% above predicted EIA values 281 ha for AWAR. As of 2014, habitat loss has been 173 ha, which is 108 ha less than predicted (or 62% of predicted)	Habitat monitoring	Every three years post-construction
Habitat Loss **Whale Tail Pit and Haul Road**	Loss < EIA prediction (see Golder 2016)	# of ha of altered habitat	5% above predicted EIA values of 820 ha for the Pit and Haul Road	Habitat monitoring	Every three years post-construction
Habitat Degradation by Contamination **Meadowbank Mine site and Haul Roads**	Dust and emissions will not result in unacceptable levels of contaminants in vegetation	Concentrations of contaminants	See Screening Level Risk Assessment Plan, Appendix E and AWAR Dust Monitoring Plan, Appendix F	Screening Level Risk Assessment Dust fall monitoring	SLRA: Every three years Dust fall monitoring : annually
Habitat Reclamation following Project Closure	Vegetation will be naturally established on reclaimed sites	% of disturbed areas revegetated	Up to 80% of the reclamation will be completed by year 12. Refer to the reclamation and closure plan for more details.	Habitat reclamation monitoring	At Year 2 post-closure and every 3 years until Year 12 post-closure

3.2.2 Monitoring Approach

Monitoring activities for Vegetation will be carried out post-construction and post-closure. Following are the methods and frequency for the monitoring efforts for each measurable parameter.

3.2.2.1 Habitat Loss (monitored via habitat monitoring)

Methods: Total area of habitat disturbance will be determined following Project construction using a combination of ground and aerial surveys, photography, ground-truthing (with the aid of GPS), as-built reports, and possibly satellite imagery. Monitoring of habitat loss will occur at three primary locations: Meadowbank Mine (includes Vault Pit and Haul Road), AWAR (including quarry sites), and Whale Tail Pit and Haul Road (includes borrow sites and access roads). Reporting will describe the overall area of different ELC units lost due to Project development. For the Meadowbank Mine and AWAR locations, thresholds for adaptive management are disturbance of 5% above predicted EIA values of 867 and 281 ha

(includes approved changes), respectively. To date, actual disturbance has been 776 and 173 ha, respectively, which are well below predicted values. For the Whale Tail and Haul Road location, the threshold for adaptive management is disturbance of 5% above a predicted EIA value of 820 ha.

Frequency: Every three (3) years post-construction. This frequency may be reduced during the operation phase if the amount of new disturbance and reclamation areas is relatively unchanged.

3.2.2.2 Habitat Degradation by Contamination (monitored via Screening Level Risk Assessment and dustfall monitoring)

Methods: A comprehensive environmental health monitoring program has been initiated that compares contaminant levels in soil and vegetation (i.e., lichen, berries, and sedges) before and after Project activities. Samples taken from the Project area are also compared to reference sites that are not influenced by Project activities. This Screening Level Risk Assessment program is described in **Appendix E** of this document. Additional information is provided through dustfall monitoring along the AWAR and Whale Tail Haul Road, as described in **Appendix D**.

3.2.2.3 Habitat Reclamation Post-Closure (monitored via habitat reclamation monitoring)

Methods: Reclamation efforts will focus on providing conditions conducive to natural re-colonization of the site by surrounding native vegetation. In addition, there is a lack of available soils in the Project area that, in conjunction with the harsh climatic conditions (short cold and dry growing season), makes it difficult to establish vegetation over large areas. Reclamation activities and natural re-vegetation of disturbed areas during the closure and post-closure phases will improve the loss of vegetation communities and reduce overall residual effects within the LSA.

Frequency: Vegetation plots and mapping will be conducted during the 2nd growing season following closure and every three years thereafter up to Year 12 post-closure (considered to be a reasonable period of time within which to expect revegetation of most disturbed areas) to ensure that re-vegetation of previously disturbed areas is progressing.

3.2.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.2.3.1 Habitat Loss

Where mapping indicates a loss of habitat area beyond that predicted, discussions will be held with construction contractors and Project personnel to resolve the concern. Additional mitigation measures may include clearer delineation of work space, road areas, and

designated no-disturbance areas. Where unauthorized off-road vehicle activity is noted, more stringent off-road access control measures will be implemented. Habitat reclamation and restoration of natural drainage patterns and contours may be ordered depending on the scale of the disturbance.

3.2.3.2 Habitat Degradation by Contamination

See **Appendix E**.

3.2.3.3 Habitat Reclamation Post-Closure

If progress of revegetation is not occurring, further reclamation activity will be undertaken and may involve reseeding (e.g., native-grass cultivars and forbs such as nitrogen-fixing legumes).

3.3 UNGULATES

3.3.1 Objectives

The objectives of monitoring programs for the Project is to ensure that the abundance, health, and movement patterns of Caribou and Muskox populations are not negatively affected by the Project, particularly the AWAR and Haul Roads; due to the extensive range and large numbers of Caribou and Muskox, this evaluation is done in collaboration with the GN.

Table 12 describes the framework which has been established for monitoring effects to Ungulates. Also refer to **Chart 2**.

Table 12: Monitoring Approach for Ungulates for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss **Meadowbank Mine, and Vault Pit and Haul Road**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above total loss of high suitability habitat (for ungulates) predicted in EIA. **Meadowbank Mine and Vault Site** - 240 and 191 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction
Habitat Loss **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above total loss of high suitability habitat (for Ungulates) predicted in EIA. **Meadowbank AWAR** - 63 and 188 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction
Habitat Loss **Whale Tail Pit and Haul Road**	Loss < EIA prediction (see Golder 2016)	# of ha of altered habitat	10% above total loss of high suitability habitat (for Caribou) [1] predicted in EIA. **Whale Tail Site** – 30 and 342 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction

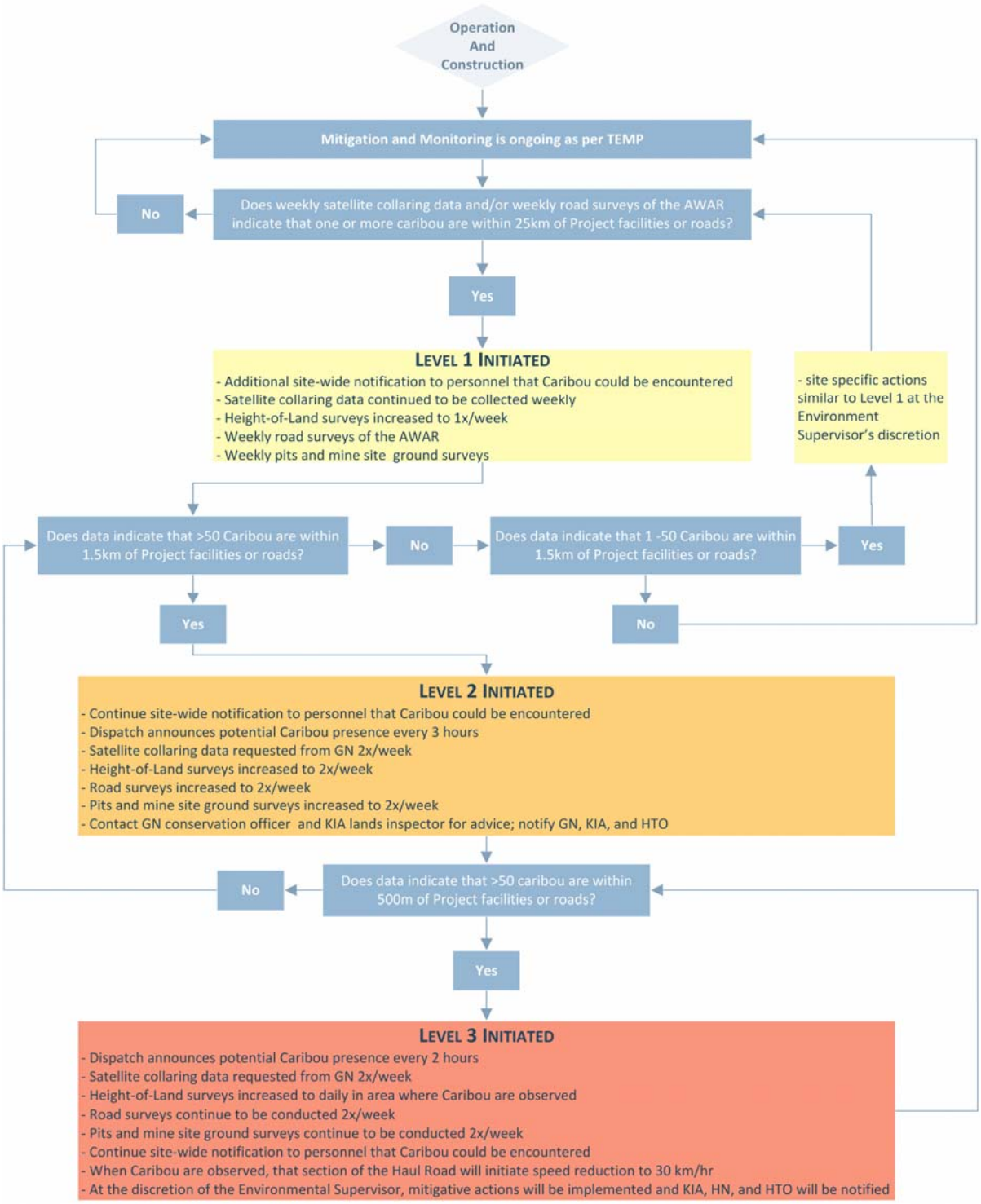
*Frequency for some activities changes due to adaptive management. See **Chart 2**.

[1] For Whale Tail extension, effects on Muskox were screened out during the EA process; therefore, they are not included in habitat loss calculations for the Whale Tail Site

Table 12: Continued.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Sensory Disturbance	Project activities will not affect Ungulate activities >1,000 m away	Ungulate distribution as a function of distance from Project facilities and roads	Adjacent to Project facilities and roads, unnatural caribou use patterns at >1,000 m.	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to 2x/week as needed (see **Chart 2**)
				Caribou satellite-monitoring program	Data provided to AEM from GN weekly, requested up to 2x/week as needed (see **Chart 2**)
				Incidence reports	As occurring
				Height-of-land surveys	Jan to Apr and Jul to Aug – 1x/week; May to June and Sep to Dec – 2x/week. Increased up to daily as needed (see **Chart 2**)
Vehicle Collisions	Ungulates will not be killed by vehicles	Numbers of Ungulates killed by vehicles	2 individuals	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec - Increased up to 2x/week as needed (see **Chart 2**)
				Incidence reports	As occurring
Hunting by Baker Lake Residents	Harvest intensity in the Meadowbank RSA will increase <20%	Correlation between spatial distribution of Ungulate harvest and road development	>20% adjustment in harvest activities correlated to road use	Baker Lake hunter harvest study	Initiated in 2007 and active until 2015. Quarterly data collection; Yearly reporting
	Caribou herds not significantly affected by year-round access to the RSA	Ungulate herd composition and distribution	NA	Satellite-collaring program	Data provided to Agnico Eagle from GN weekly, requested up to 2x/week as needed (see **Chart 2**)

Chart 2: Adaptive Management for Caribou in Proximity to Project Facilities and Roads



3.3.2 Monitoring Approach

Monitoring activities for Ungulates will be carried out prior to, during, and following construction. Following are the methods and frequency for the monitoring efforts for each measurable parameter.

3.3.2.1 Habitat Loss & Degradation (monitored via Habitat Monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through habitat monitoring (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 12**).

Frequency: See **Section 3.2.2**.

3.3.2.2 Sensory Disturbance and Disruption of Movements (monitored via ground, road, and height-of-land surveys, and satellite-collaring program)

The primary goal of monitoring for sensory disturbance and disruption of movements of Ungulates is to provide an early detection of animals approaching the roads and Project facilities using mobile monitoring methods (Poole and Gunn 2015). Once animals are detected, operational activities will be adjusted, if necessary, to minimize sensory disturbance and disruption of movement for these animals.

Monitoring consists of the four types of survey protocols described below. When Caribou are documented as being in close proximity to the road, a mitigation and avoidance plan will be implemented that considers the number and proximity of animals observed (see **Section 3.3.3 Adaptive Management**).

1. Pits and Mine Site Ground Surveys

Methods: Within the Meadowbank Mine and Vault sites (e.g., tailings pond, access road to Vault Site) and the Whale Tail Pit site, systematic ground observations of Ungulates will be conducted by on-site environmental technicians/monitors who record details on species, numbers, sex, habitat type, and location. Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**).

Frequency: 1x/week; increased to 2/week as needed (see **Chart 2**, **Table 12**, and field data form in **Appendix B**):

2. Road Surveys

Meadowbank AWAR and Vault Haul Road

Methods: Systematic ground surveys will be conducted along the AWAR by two observers (one can be the driver) in a vehicle. Survey vehicles will travel no more than 30 km per hour to maximize observations of all wildlife along the route. For each sighting, a UTM coordinate will be taken along the route along with distance of the animal from the road, nearest road marker, and a variety of other information (see field data form in **Appendix B**). Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**). Raw data (i.e., field forms) will be included in the annual Wildlife Monitoring Summary Report.

Whale Tail Haul Road

Methods: Systematic ground surveys will be conducted along the Whale Tail Haul Road by vehicle. Survey methodology will be the same as along the Meadowbank AWAR (see above). Raw data (i.e., field forms) will be included in the annual Wildlife Monitoring Summary Report.

Frequency (both roads): Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to 2x/week as needed (see **Chart 2** and **Table 12**).

3. Caribou Satellite-Collaring Program

Methods: As part of its ongoing monitoring program for the Project, Agnico Eagle is collaborating with the Government of Nunavut DOE in a Caribou satellite-collaring program in the Meadowbank RSA. The joint satellite-collaring program will provide seasonal and regional information on Caribou distribution within the Meadowbank and Whale Tail RSAs, and data collected during spring and fall migration periods will inform mitigation and management activities. In collaboration with the GN, data are formally analyzed for Caribou migration trends and analyzed annually (see **Table 12**).

To determine whether Caribou not observed along the road or on the mine site are being disturbed (e.g., avoiding crossing the road), a comprehensive analysis of satellite-collaring data since 2008 will be undertaken collaboratively by the Government of Nunavut and Agnico Eagle, but will be led by the GN. Results of the analysis will be included in the annual Wildlife Monitoring Summary Report.

Frequency: Initiated in 2008 with four subsequent deployments. Data provided to Agnico Eagle from GN 1/week, requested up to 2x/week needed (see **Chart 2**).

4. Height-of-Land Surveys

Methods: Five, easily accessible, height-of-land survey locations are established along the Whale Tail Haul Road, one of which is near the Whale Tail Pit and another near the Vault Pit. The locations are within 500 m of the Haul Road, and provide an unobstructed view (up to 360^0) of the surrounding terrain. The height-of-land surveys provide an 'early warning' system of the presence of Caribou in proximity to the Whale Tail Pit and Haul Road. The surveys can be easily accessed from the Haul Road and will be conducted by environmental technicians or trained wildlife monitors. A minimum of 30 minutes will be spent surveying at each of the locations. Information collected will be similar to that collected during systematic pits and mine site ground surveys (see **Table 12**, field data form in **Appendix B,** and **Figure 5**). Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**).

Frequency: Surveys will be conducted Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to daily as needed (see **Chart 2**).

3.3.2.3 Project-Related Mortality – Vehicle Collisions (monitored via incidence reports)

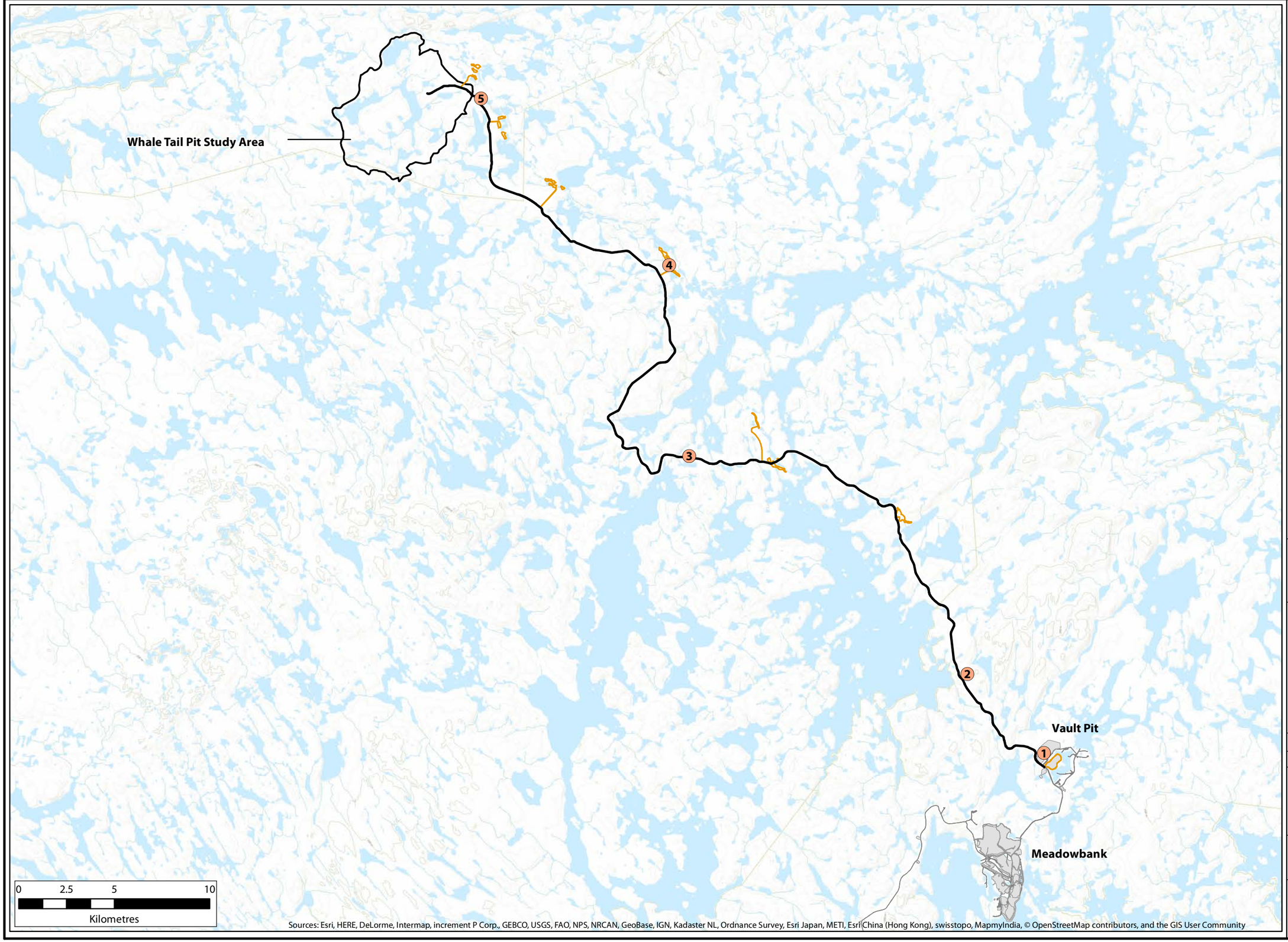
Methods: Monitoring will be conducted during ground surveys at pits and the mine site, and along roads. Incidence report to be submitted following every vehicle encounter with an Ungulate. The thresholds level of mortality beyond which adaptive management will be required is two (2) individuals per year (see **Table 12**).

Frequency: Incidence reports submitted when road-related mortalities occur. Ungulate mortality will be reviewed on an annual basis.

3.3.2.4 Project-Related Mortality – Hunting by Baker Lake Residents (monitored via hunter harvest study)

Methods: A survey of hunter harvests was conducted among Baker Lake residents from 2007 and is ongoing. For a detailed description of the hunter harvest study approach from 2007 to 2015, refer to the 2015 Wildlife Monitoring Summary Report (Gebauer et al. 2016).

Frequency: Data is analyzed at the end of each calendar year and provided within the annual Wildlife Monitoring Summary Report.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- Esker borrow site or Esker Access Road
- Height-of-Land Survey Location

Height-of-Land Survey Locations

	NAD 83 Zone 14N	
ID	X Coordinate	Y Coordinate
1	640481.6898	7220659.4891
2	636472.8938	7224808.4891
3	621885.7947	7236225.4065
4	620828.5176	7246252.2529
5	610959.2793	7254989.6058

Height-of-Land Survey Locations

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R1
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

Nunavut ENVIRONMENTAL CONSULTING LTD

PROJECT: Terrestrial Ecosystem Management Plan

CLIENT: Agnico Eagle Mines Limited

N W E S
UTM Zone 14 NAD83

DATE: FEBRUARY 2016

SCALE: 1:185,000

DRAWN BY: LC

CHECKED BY: MAY

Figure:

5

3.3.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.3.3.1 Habitat Loss & Degradation

See **Section 3.2.3**.

3.3.3.2 Sensory Disturbance and Disruption of Movements

Agnico Eagle has developed a tiered Caribou monitoring procedure to increase levels of monitoring and, if necessary, adjust operations at Project facilities and along roads if Caribou are found to be in the vicinity of the site. **Chart 2** describes the tiers of this procedure and the appropriate actions to be undertaken.

Examples of the adaptive management procedure in action: if a herd of four Caribou is observed within 100 m of the Haul Road, the Environmental Supervisor will provide site-wide notification. If a herd of 75 caribou is observed within 100 m of the Haul Road, dispatch announces potential Caribou presence every two hours, site-wide notification is provided, and as deemed necessary, a 30 km/hr speed restriction will be initiated along the affected section of the Haul Road.

3.3.3.3 Project-Related Mortality – Vehicle Collisions

If an Ungulate mortality occurs (i.e., threshold of two [2] mortalities exceeded), an investigation into the circumstances and factors leading up to the incident will be conducted by the on-site Environmental Supervisor. Additional mitigation measures that may be implemented to reduce future incidences may include:

- Further reduction of vehicle speeds in critical areas;
- Additional signs; and
- More intensive awareness and training programs for vehicle operators.

Where an incident has resulted from operator negligence, disciplinary action may be considered.

3.3.3.4 Project-Related Mortality – Hunting by Baker Lake Residents

If harvest rates are determined to be increasing significantly (as determined by the GN) as a result of Project infrastructure, Agnico Eagle, in collaboration with the Baker Lake HTO and GN DOE, may investigate additional access control measures.

3.4 PREDATORY MAMMALS

3.4.1 Objectives

The primary objective of the Predatory Mammal monitoring program in the Project area will be to evaluate the success of preventative programs designed to proactively avoid the occurrence of problem animals, as opposed to reactively trying to manage them by relocation or destruction.

Table 13 describes the framework that has been established for monitoring effects to Predatory Mammals.

Table 13: Monitoring Approach for Predatory Mammals for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related mortality	Predatory Mammals will not be killed as a result of Project activities	Number of Grizzly Bears, Wolves and Wolverines killed	2 individuals	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**). Includes inspections of waste streams to ensure no attractants for Predatory Mammals
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)
				Baker Lake Hunter Harvest Study (for Wolverines)	Initiated in 2007 and ongoing Quarterly data collection; Yearly reporting
Disturbance of Den Sites	Active Predatory Mammal dens will not be destroyed or disturbed to the point of den abandonment	Number of active Grizzly Bear, Wolf or Wolverine dens destroyed or abandoned due to sensory disturbances	1 den	Den-specific management plan, active den site surveys	Initiated by the detection of an active Predatory Mammal den (Grizzly Bear, Wolf or Wolverine) within the active footprint or vicinity of Project facilities. See **Chart 3**. Frequency of den monitoring will be determined by season, species and location. See **Appendix F**

3.4.2 Monitoring Approach

Project-Related Mortality (monitored via ground and road surveys, incidence reports, hunter harvest study)

Methods: Methods are the same as those described for Ungulates (**Section 3.3.2**). The threshold level of mortality beyond which adaptive management will be required is two (2) individuals per year (see **Table 13**). The pits and mine site ground surveys will include inspections of waste streams to ensure no attractants for Predatory Mammals. In addition, the hunter harvest study (see **Section 3.3.2**) will investigate potential increases in Wolverine mortality related to the road.

Frequency: The number of Grizzly Bear, Wolf, and Wolverine mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report (see **Table 13**).

3.4.2.1 Disturbance of Den Sites (monitored via ground, road, and height-of-land surveys, which can initiate active den site surveys)

Methods: For existing operations, data will be collected on Arctic Wolf abundance and behaviour during ground surveys, vehicle surveys, and height-of-land surveys. Should the wildlife technician suspect or confirm that a den is present within the active footprint and vicinity of Project facilities or roads, a den management plan will be prepared (see **Appendix F** for required components of den management plans). For new development sites, suitable habitat within 1 km of new development site will be investigated on foot for active Wolf dens. In the event that Wolverine or Grizzly Bear dens are discovered, den management strategies with appropriate timing windows will be developed for these species. The thresholds beyond which adaptive management will be required is discovery of one (1) active den (see **Table 13**).

Frequency: See **Table 13** for frequency of ground, road, and height-of-land surveys, see **Chart 3, Section 3.4.3** for adaptive management strategy to be undertaken upon discovery of an active Predatory Mammal den.

3.4.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.4.3.1 Project-Related Mortality (vehicle collisions and problem animals)

The basic course of action is to contact the appropriate conservation officer with the Hamlet of Baker Lake and the Government of Nunavut, and to discuss additional mitigation options. At the discretion of the Agnico Eagle Environment Supervisor, GN conservation officer and

the KIA land inspector, if Grizzly Bears, Wolverines, or Wolves become problems and need to be dispatched or get killed in vehicle collisions (i.e., thus exceeding the threshold mortality of two [2] despite efforts to avoid habituation and/or food conditioning), alternative mitigation action may be required. Regular inspections of waste streams will identify possible attractants and respond immediately with improved waste management approaches. Detailed reports for dealing with problem wildlife will be issued and are provided as an example in **Appendix A**.

3.4.3.2 Disturbance of Den Sites

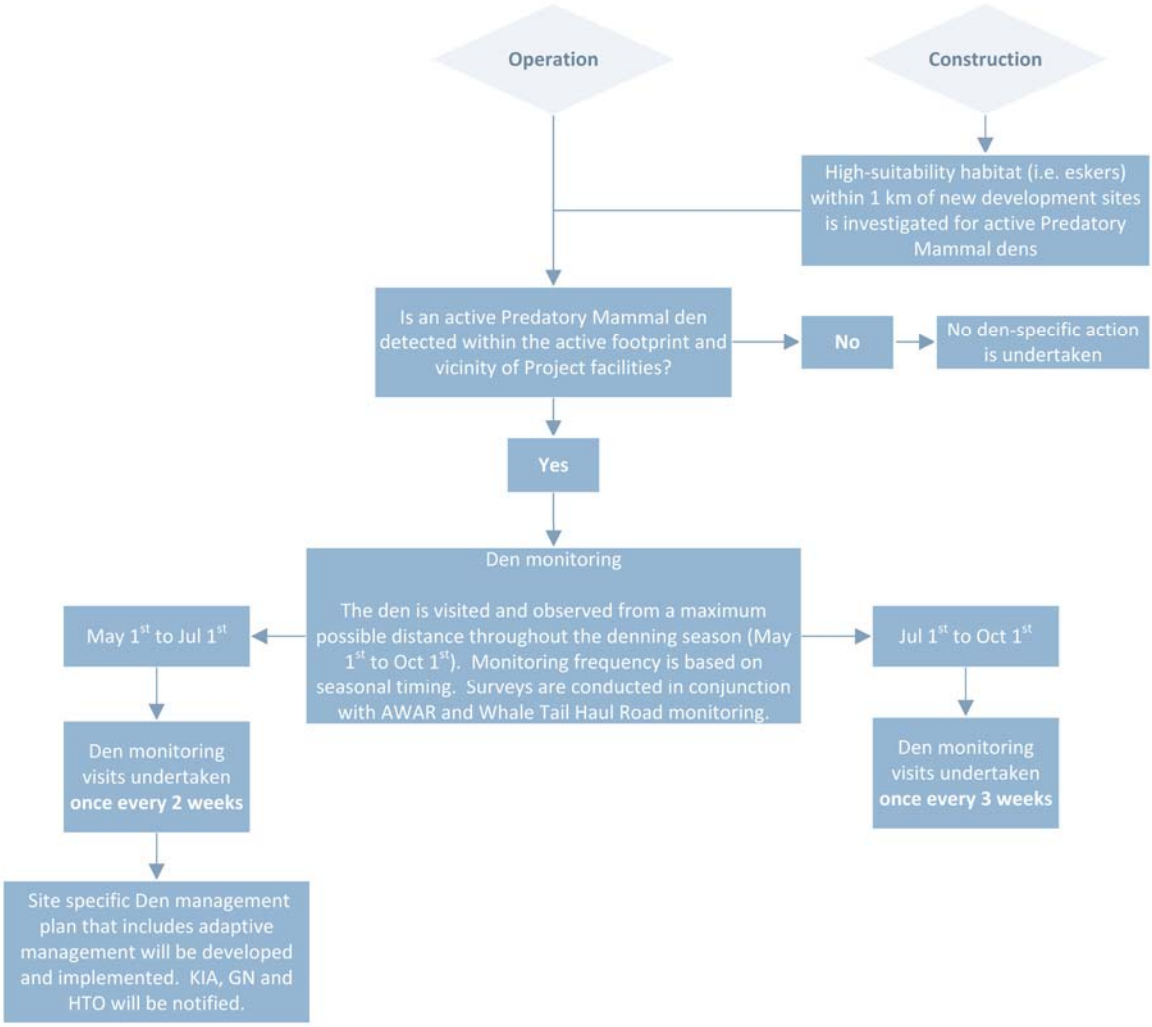
If an active Predatory Mammal den is detected within the active footprint or in the vicinity of Project facilities, a den management plan will be developed (see **Chart 3** and **Appendix F** for details). Ground personnel and vehicle access will be restricted in the vicinity of the den as needed to minimize disturbances at the den. The den management plan outlines a monitoring schedule (dependent on seasonal timing) and will inform adaptive management strategies as required. See **Appendix F** for Den Management and Protection Plan components.

Based on the findings from den monitoring, disturbance mitigation may be required. These adaptive management strategies may include increased frequency of den site monitoring, vehicle access restrictions, alterations to Project operation, or work stoppage in the vicinity of the den. Dens will be observed from a distance of at least 300 m with a spotting scope, and information on location, behaviour and number of juveniles will be determined, where possible. **Chart 3** below outlines the steps to be taken if a den is found during monitoring activities.

Example of the adaptive management procedure in action: if construction is proposed within 1 km of high-suitability denning habitat (i.e., eskers), these areas will be investigated for signs of denning (Wolf pack, defensive behaviour, pups). If a den is confirmed within the active footprint or in the vicinity of Project facilities, monitoring will be undertaken from the maximum possible distance to determine if Project activities are inducing stress responses. See **Chart 3** for monitoring frequencies. If Wolves are showing signs of stress, further restrictions on vehicle access or other adaptive mitigation options may need to be considered.

See **Appendix F** for recommended Den Management and Protection Plan components.

Chart 3: Adaptive Management for Predatory Mammal Dens in Proximity to Project Facilities and Roads



3.5 SMALL MAMMALS

3.5.1 Objectives

The primary objective of the monitoring program for Small Mammals is to determine if mitigation measures to minimize the loss and fragmentation of Small Mammal habitat are effective (see **Vegetation, Section 3.2),** to evaluate the success of mitigation measures to provide high-quality habitat for Small Mammals wherever possible, and to document Project-related mortality.

Table 14 describes the framework that has been established for monitoring effects to Small Mammals.

Table 14: Monitoring Approach for Small Mammals for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine, and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 178 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 156 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Small Mammals were not considered an issue and were screened out during the EA (Golder 2016)				

Table 14: Continued

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Some vehicle-related mortality unavoidable	# of Small Mammals killed by vehicles	100 individuals per year	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.5.2 Monitoring Approach

3.5.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 14**).

Frequency: See **Section 3.2.2**.

3.5.2.2 Project-Related Mortality (monitored via ground and road surveys)

Methods: Methods are the same as for the pits and mine site ground surveys, and road surveys described for Ungulates above. The threshold level of mortality beyond which adaptive management will be required is 100 Small Mammals per year (see **Table 14**).

Frequency: Surveys will be conducted up to 2x/week and all road-related mortalities will be reported. The number of Small Mammal mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.5.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.5.3.1 Habitat Loss & Degradation

See **Section 3.2.3.**

3.5.3.2 Project-Related Mortality

If Project-related mortality of Small Mammals is occurring in a specific area (e.g., Arctic Ground Squirrel colony in the road bank), additional mitigation measures may include posting signs indicating reduced vehicle speeds (e.g., 30 km/hr) and educational sessions with vehicle operators describing the susceptibility of certain Small Mammals populations to road-related mortality and techniques for anticipating Small Mammals behaviour

3.6 RAPTORS

3.6.1 Objectives

The primary objective of ongoing monitoring surveys for nesting Raptors will be to identify potential inadvertent Project-related effects on nesting birds. Nest-specific management plans for nesting birds will reduce the potential for birds to abandon nests due to high noise or activity levels.

Table 15 describes the framework that has been established for monitoring effects to Raptors.

Table 15: Monitoring Approach for Raptors for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Healthy Prey Populations	Negative effects on prey populations will be negligible	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds
Disturbance of Nesting Raptors	Nest failures are not Project-related	Nest success	1 nest failure	Active Raptor nest monitoring	During nesting season (May 1 to Sept 15) if active nest is within the active footprint and vicinity of Project facilities: within area of concern – 1x/day; not within area of concern – 1x/week (see **Chart 4**)

Table 15**:** **Monitoring**

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Raptors will not be killed at the Project site or along roads	Number of raptors killed	1 individual	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec –. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.6.2 Monitoring Approach

3.6.2.1 Healthy Prey Populations (monitored via habitat monitoring)

Methods: Surveys to monitor Small Mammal population abundance, diversity, and distribution will not be conducted because of the high cost, difficulty in assigning Project-related population changes, and potential for trapping-related mortality. See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds) for methods to monitor habitat availability and suitability of these VECs.

Frequency: See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds).

3.6.2.2 Nest Monitoring (monitored via ground, road, and height-of-land surveys, which initiate active raptor nest monitoring)

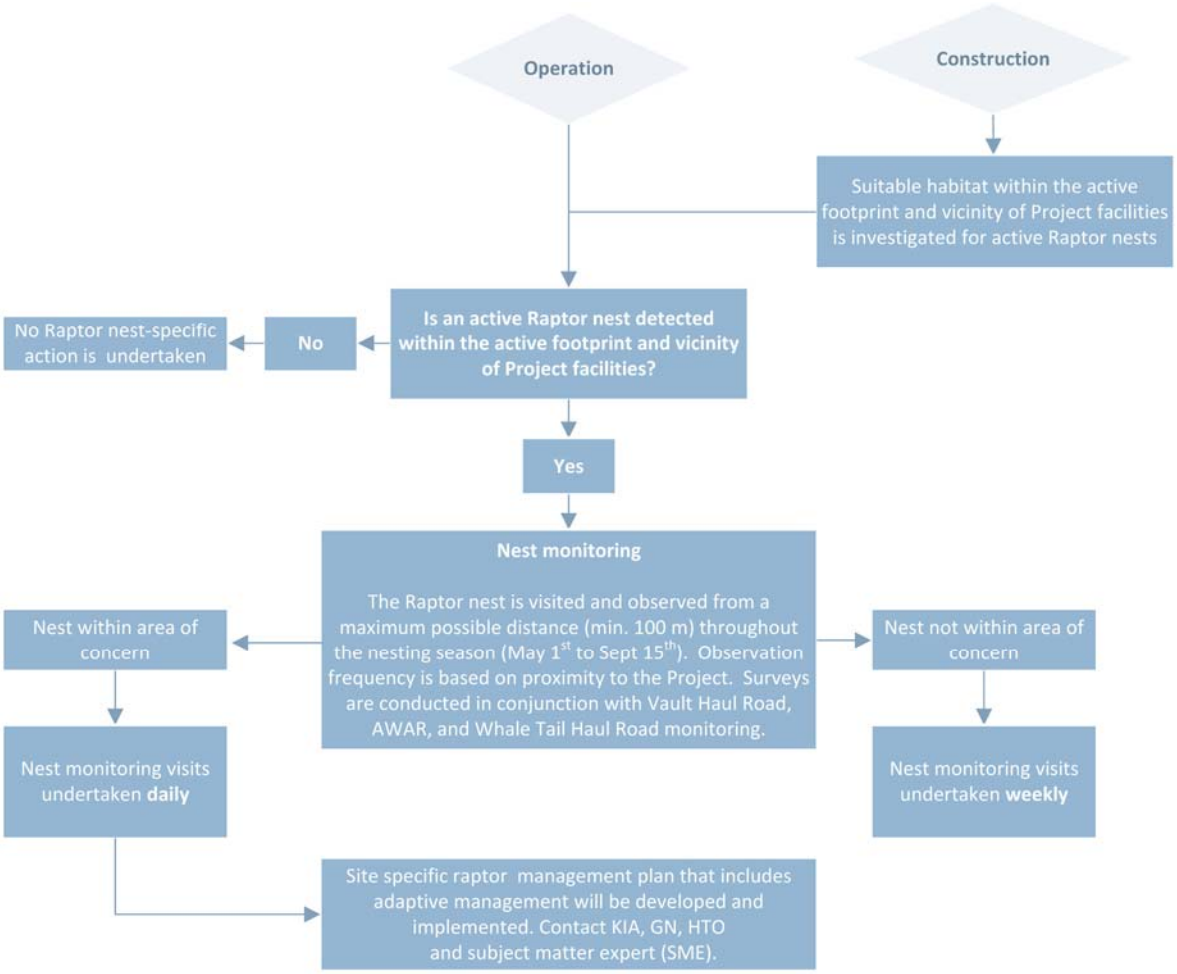
Methods: For existing operations, data will be collected on Raptor abundance and behaviour during ground, road, and height-of-land surveys. For active nests within the active footprint and in the vicinity of Project facilities, daily surveys will be conducted for nests within area of concern while weekly surveys will be conducted for nests outside the area of concern. For nests within the area of concern, a site-specific raptor management plan that includes adaptive management will be developed and implemented.

To discourage raptors from nesting on pit walls and Project facilities, protocols outlined in the 'Peregrine Falcon Management and Protection Plan on the Meadowbank Gold Project Site' will be followed (see **Appendix G).** The plan also outlines management and mitigation around nests that have become established on Project facilities.

For new development sites, suitable habitat within 1 km of the sites will surveyed on foot for active Raptor nests. Active nests will be monitored from a distance of at least 100 m with a spotting scope, and information on location, behaviour, number of eggs, number of chicks, and number of fledged young will be determined, if possible. Alastair Franke or a representative of the Arctic Raptor Research group will be consulted as needed. The threshold beyond which adaptive management will be required is disturbance of one (1) active Raptor nest **Table 15**).

Frequency: During the nesting season (May 1 to Sept 15), if an active nest is within the active footprint and vicinity of Project facilities and within an area of concern, surveys will be conducted as per Chart 4. If disturbance to an active raptor nest is detected, adaptive management will be initiated (see **Chart 4**).

Chart 4: Adaptive Management for Raptor Nests in Proximity to Project Facilities and Roads



3.6.2.3 Project-Related Mortality (monitored via ground and road surveys, and incidence and vehicle encounter reports)

Methods: Methods are the same as for the ground surveys, road surveys, and incidence reports described for Ungulates (**Section 3.3.2**). The threshold level of mortality beyond which adaptive management will be required is one (1) Raptor per year (see **Table 15** and **Appendix G** for details).

Frequency: Incidence reports are filed when a Raptor mortality occurs. The number of Raptor mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.6.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.6.3.1 Healthy Prey Populations

By managing the integrity and health of Vegetation communities, Small Mammal and Upland Breeding Bird populations should thrive in the area, thus providing an ongoing prey source for Raptors utilizing the area. See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds) for adaptive management approaches.

Example of the adaptive management procedure in action: surveys find that a raptor nest has been established 500 m from the Whale Tail Haul Road. Because the nest is not within an area of concern, the nest is monitored weekly from a distance of at least 100 m. The raptors are not displaying stress behaviours, so adaptive management is not required and monitoring is continued weekly until Sept 15th.

3.6.3.2 Nesting Monitoring

In consultation with Alastair Franke or a representative of the Arctic Raptor Research, a nest management plan will be developed for active nests established within an area of concern (e.g., within active footprint or in close vicinity of Project facilities) and will include a monitoring schedule based on the proximity of the nest to the Project. The management plan will also review disturbance levels at the nest to inform active management requirements (see **Chart 4**). Where recommended mitigation measures are not considered adequate for reducing disturbance to nesting raptors (determined through the nest management plan monitoring), more stringent mitigation measures, such work stoppage for nearby operations, may be implemented.

3.6.3.3 Project-Related Mortality

If the threshold mortality level for Raptors is exceeded, adaptive management measures will be implemented as described for Ungulates (Section 3.3.3).

3.7 WATERFOWL

3.7.1 Objectives

The primary objective will be to monitor the effectiveness of mitigation efforts to prevent or reduce effects from the Project, including loss of habitat suitability and effectiveness, and reduction of abundance and distribution, nesting success, and survival.

Table 16 describes the framework that has been established for monitoring effects to Waterfowl.

Table 16: Monitoring Approach for Waterfowl for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 518 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 22 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Waterfowl were not considered an issue and were screened out during the EA (Golder 2016)				
Disturbance of Nesting Waterfowl **For All Project Facilities**	Nest failures are not Project-related	Nest success	1 nest failure	Waterfowl nest surveys	Active nests identified within 100 m of Project facilities and roads monitored weekly

Table 16: Continued

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Waterfowl will not be killed at the Project	Number of Waterfowl killed	1 individual	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.7.2 Monitoring Approach

3.7.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 16**).

Frequency: See **Section 3.2.2**.

3.7.2.2 Disturbance of Nesting Waterfowl (monitored via Waterfowl Nest Surveys)

Methods: Waterfowl nest surveys will determine the number and distribution of nesting Waterfowl within the vicinity of Project facilities and roads. The threshold beyond which adaptive management will be required is one (1) nest failure per year. The general survey protocol consists of two observers walking around the edges of islands, wetlands, or shorelines, with one observer 5 m from the water's edge and the second observer 15 m from the water's edge (10 m between observers). Areas are assessed for indications of nesting Waterfowl (i.e., ducks, swans, geese, jaegers) in potentially suitable sites. Observers use maps and UTM coordinates for orientation. UTM locations of all observed Waterfowl, nests, and/or broods are recorded. Surveys are conducted within the first two weeks of July, when most Waterfowl species are expected to be nesting.

Meadowbank Mine, Vault, and AWAR – At the Meadowbank and Vault site, surveys were conducted within 200 m of mine facilities and AWAR (i.e., 200 m considered to be the approximate 'zone of influence' for Waterfowl). The total shoreline survey length within the mine site and along the AWAR is 51,500 m (51.5 km) and 37,839 m (37.8 km), respectively.

Whale Tail Pit and Haul Road – Active nests identified within 100 m of Project facilities and roads will be monitored weekly. As well, ground surveys and road surveys will document Waterfowl occurrence, particularly areas of nesting birds. The total shoreline survey length within the Whale Tail mine site and along the Haul Road is 48,730 m (48.7 km) and 14,730 m (14.7 km), respectively.

Frequency:

Meadowbank Mine, Vault, and AWAR – Surveys were conducted for eight (8) years between 2005 and 2012, but were suspended after 2012 given the low densities of nesting Waterfowl recorded during the surveys. Ground and road surveys will continue to document waterfowl nests in close proximity (i.e., within 100 m) to Project facilities.

Whale Tail Pit and Haul Road – Baseline surveys were conducted in 2015 for all shorelines within 100m of Project facilities. Ground and road surveys will continue to document waterfowl nests in close proximity (i.e., within 100 m) to Project facilities.

3.7.2.3 Project-Related Mortality

Methods: Methods are the same as for the ground and road surveys, and incidence reports described for Ungulates (**Section 3.2.3**). The threshold level of mortality beyond which adaptive management will be required is one (1) Waterfowl per year (see **Table 16**).

Frequency: See **Table 16**. The number of Waterfowl mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.7.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.7.3.1 Habitat Loss & Degradation

See **Section 3.2.3.**

3.7.3.2 Disturbance of Nesting Waterfowl

Where disturbances to nesting Waterfowl are observed beyond the acceptable threshold (see **Table 16**), further mitigation will be implemented to minimize effects.

3.7.3.3 Project-Related Mortality

If the threshold mortality level for Waterfowl is exceeded, adaptive management measure will be implemented (e.g., slower vehicle speeds, driver education).

3.8 UPLAND BREEDING BIRDS

3.8.1 Objectives

The primary objective of the monitoring program for ptarmigan, shorebirds, passerines, and other upland breeding birds, is to evaluate the success of measures to minimize the amount of vegetation that is removed or degraded by the Project, and to determine whether Project activities have resulted in reduced abundance, diversity, and species composition. Breeding bird surveys conducted according to standard methodologies will allow this objective to be met.

Table 17 describes the framework that has been established for monitoring effects to Upland Breeding Birds.

Table 17: Monitoring Approach for Upland Breeding Birds for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 322 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 170 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Upland Breeding Birds were not considered an issue and were screened out during the EA (Golder 2016)				

Table 17: Continued.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Some vehicle-related mortality unavoidable	# of Upland Breeding Birds killed by vehicles	50 individuals per year	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec –. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)
Changes in Breeding Bird Abundance and Diversity **Meadowbank Mine, Vault, and AWAR**	Changes in Upland Breeding Bird composition will not be Project-related	Relative abundance, diversity, and richness demographics	**PRISM Plots** – significant difference in relative abundance, diversity, or richness between mine and reference plots **Transects** – unnatural use patterns greater than 100 m from AWAR centreline	PRISM plot surveys	Once every three years
				Breeding bird transects	Once every three years during closure and post closure
Changes in Breeding Bird Abundance and Diversity **Whale Tail Pit and Haul Road**	Changes in Upland Breeding Bird composition will not be Project-related	Relative abundance, diversity, and richness demographics	**PRISM Plots** and **Transects** (as above)	Same as per Meadowbank	Same as per Meadowbank

3.8.2 Monitoring Approach

3.8.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 17**).

Frequency: See **Section 3.2.2**.

3.8.2.2 Project-related Mortality

Methods: Methods are the same as for the ground surveys, road surveys, and incidence reports described for Ungulates (**Section 3.2.3**). The threshold level of mortality beyond which adaptive management will be required is 50 Upland Breeding Birds per year (see **Table 16**).

Frequency: See **Table 16**. The number of Upland Breeding Bird mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.8.2.3 Changes in Breeding Bird Abundance and Diversity (monitored via PRISM plot surveys and breeding bird transects)

Methods: The monitoring plan consists of two components: 1) breeding bird plot surveys (i.e., PRISM plots) at the Meadowbank and Whale Tail Pit sites, and at a reference or control area; and 2) breeding bird transect surveys along the AWAR and the Whale Tail Haul Road. The thresholds beyond which adaptive management will be required is a statistically significant difference in relative abundance, diversity, or richness between mine and reference plots for PRISM plots and unnatural use patterns greater than 100 m from AWAR centreline for transects.

1. Breeding Bird Survey PRISM Plots

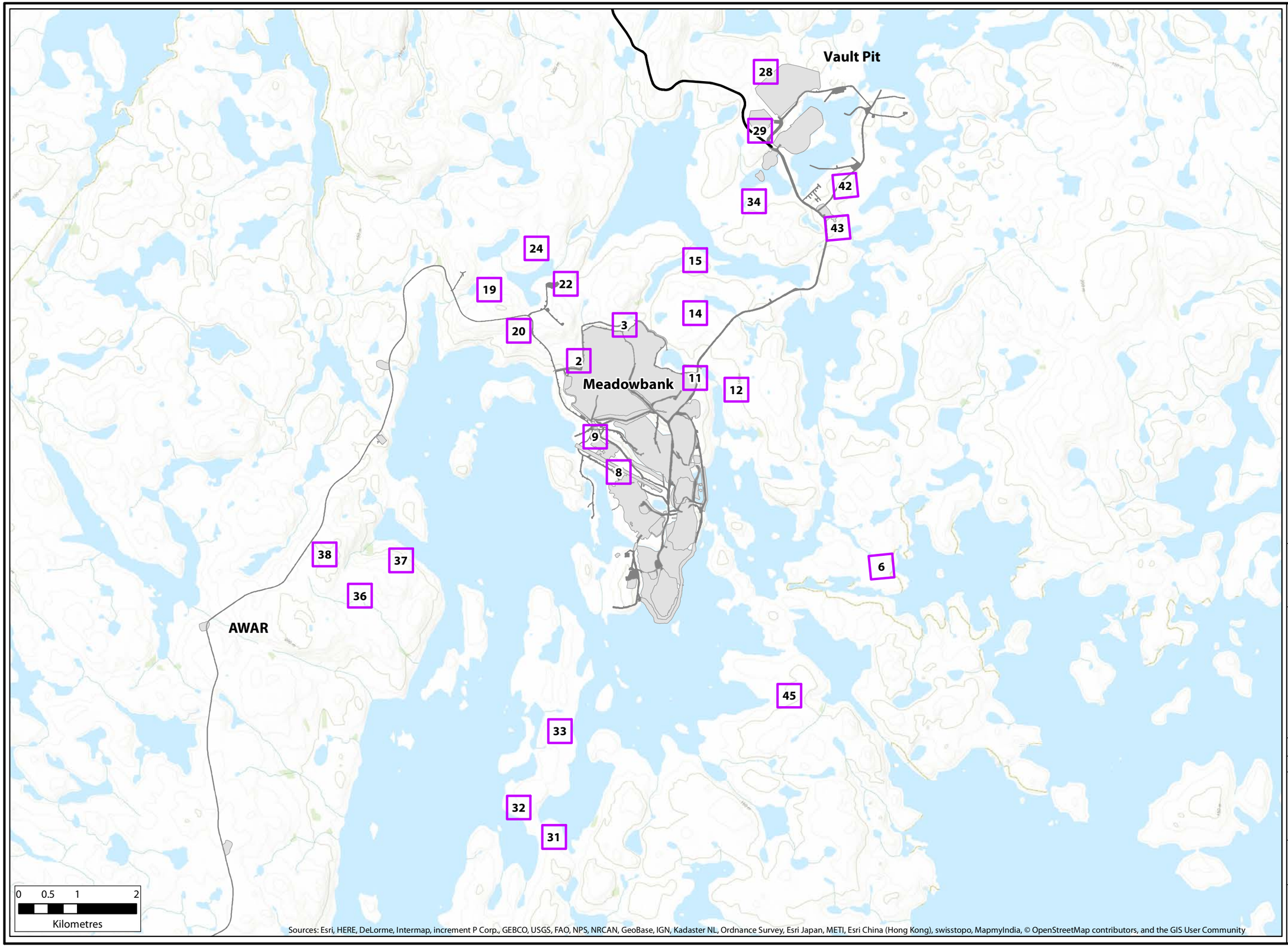
The survey methodology involves a survey of plots measuring 400 x 400 m (16 ha) following the Environment Canada PRISM protocols (EC 2012). Specifically, two observers, spaced at 25 m intervals, walk slowly back and forth (north-south direction) across each plot (1.5 to 2.0 hours per plot) and record all birds and nests observed. Plots are surveyed by two teams, each consisting of two observers, and surveys alternate daily between control and mine plots. To reduce observer bias, teams also alternate between mine and control locations.

Based on the 25 m intervals, 17 transects need to be traversed to complete each survey plot. Orientation on the plot is accomplished with handheld GPS units. Sightings are recorded on plot maps using pre-determined codes for nests, probable nests, pairs, males, females, birds of unknown sex, and groups. Plot maps are oriented with the north direction at the top of the page. Direction of flight, interactions, and other behaviours are also recorded. Following each daily field survey, the total number of each bird species using each plot is determined and recorded on a separate datasheet (see field forms in **Appendix B**).

Meadowbank Mine and Vault - Twenty-five (25) breeding bird survey plots have been established at the mine site and twenty (20) plots have been established at a reference area

(see **Figures 6** and **7** for plot locations and **Appendix C** for UTM coordinates). The 25 plots at the mine site were a randomly selected subset of 49 plots sampled during the baseline collection period. The reference site was chosen because of its proximity to the aquatic and fisheries reference area, the considerable distance from the Meadowbank Mine site (i.e., outside 'zone of influence'), and the similar terrain and ELC communities as the mine site area.

Whale Tail Pit and Haul Road - Twenty (20) breeding bird survey plots have been established at the Whale Tail Pit site (see **Figure 8** for plot locations and **Appendix C** for UTM coordinates). The Meadowbank reference site is also the reference site for the Whale Tail plots.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank PRISM Plot
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank
PRISM Plot Locations

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

Nunavut Environmental Consulting Ltd

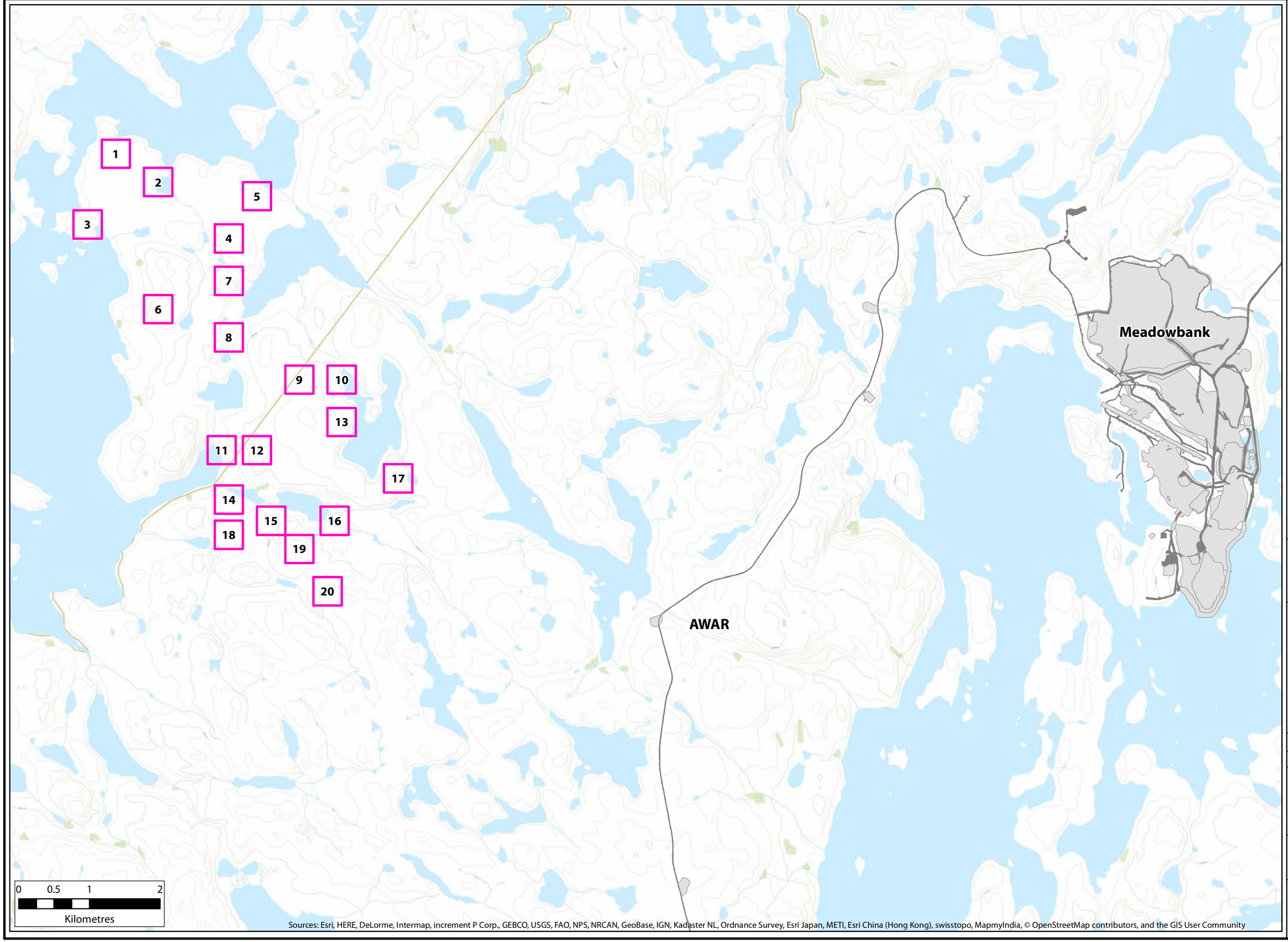
PROJECT: Terrestrial Ecosystem Management Plan

CLIENT: Agnico Eagle Mines Limited

N W E S
UTM Zone 14 NAD83

DATE: FEBRUARY 2016
SCALE: 1:60,000
DRAWN BY: LC
CHECKED BY: MAY

Figure:
6



Legend

- Control (Reference) PRISM Plot
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Reference PRISM Plot Locations

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ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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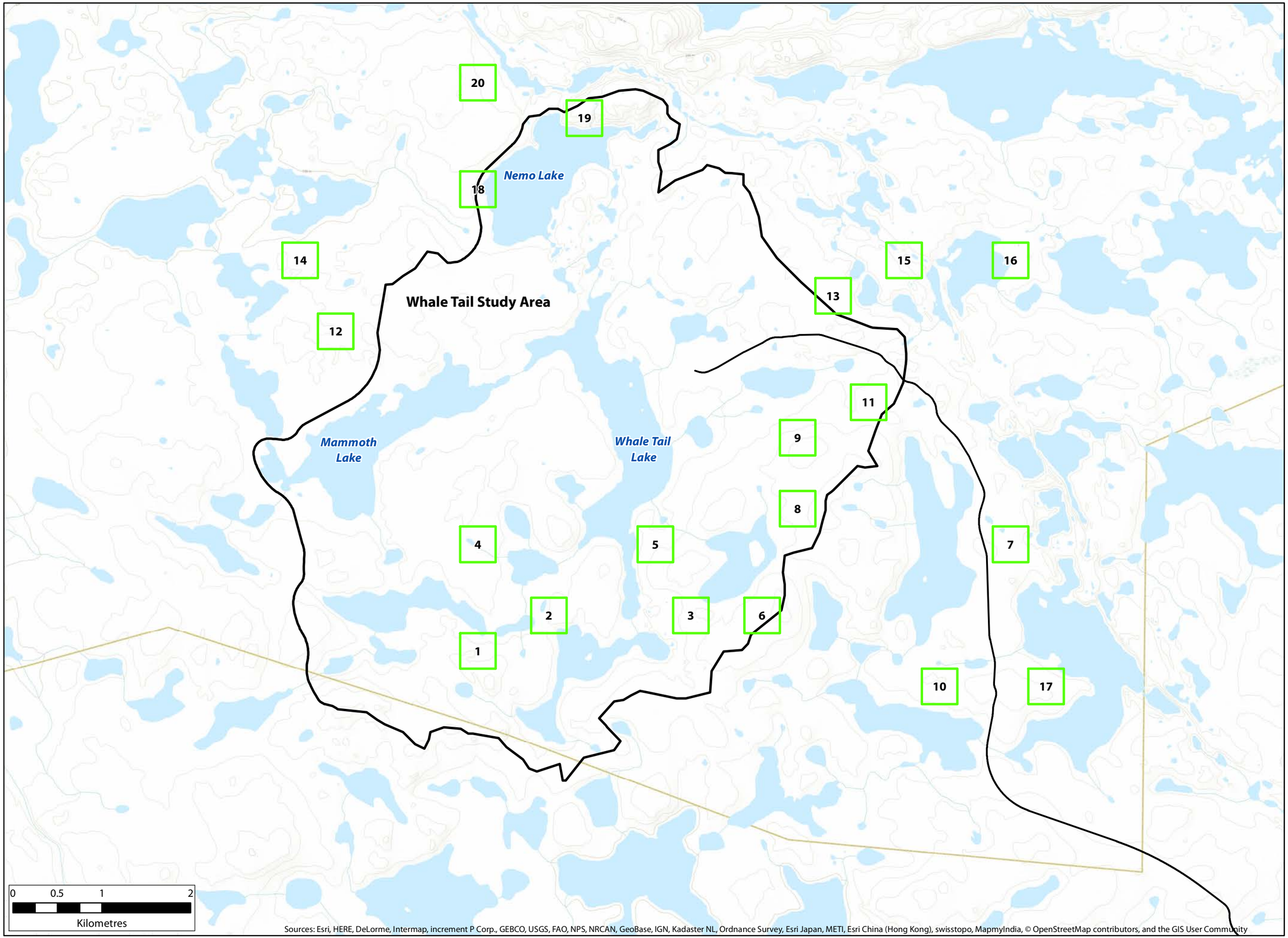

Legend

- Whale Tail PRISM Plot
- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)

Whale Tail
PRISM Plot Locations

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ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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Figure:
8

Frequency: ***Meadowbank Mine and Vault*** - The 25 plots at the Meadowbank mine site were surveyed annually for 10 years from 2003 to 2012, while the 20 plots at the reference site were surveyed for eight years from 2005 to 2012. Mine and reference sites were sampled again in 2015. PRISM plots will be conducted every three years for the life of the mine

Whale Tail Pit and Haul Road - The 20 plots at Whale Tail Pit were surveyed in 2015 for baseline purposes. Consistent with Meadowbank monitoring, surveys will be continued every three years for the life of the Whale Tail Pit.

2. Breeding Bird Transects

Transect surveys provide data prior to road development to which data collected after construction can be compared. Transect locations were selected using orthographic imagery and each transect was oriented with an approximately perpendicular intersection to the Meadowbank AWAR and Whale Tail Haul Road alignments. Transect locations were spaced somewhat evenly along the length of the alignments, although major obstacles such as large lakes necessitated alterations to this spacing to conduct field work. Transects were 3,000 m in length with approximately 1,500 m on either side of the road. Surveys involved a minimum of two field staff, walking each transect from west to east (or south to north) and recording all wildlife observations within 100 m of the transect line (i.e., 200 x 3,000 m; 60 ha each). Additionally, the 3,000 m length of each transect was divided into 30 intervals (0 to 100 m, 100 to 200 m, etc.) and bird sightings were associated with these intervals (see data form in **Appendix B**). Orientation within intervals and along transects was achieved with handheld GPS units. Data collected during surveys included species, number of individuals, sex, age, direction of travel, distance from observer, and any additional behaviours or comments noted.

Surveys are repeated three times during the breeding season (i.e., between mid- to late June). Data will be suitable for a statistical analysis of between year and distance from road differences.

Meadowbank AWAR – Twelve (12), 3 km long breeding bird transects running perpendicular to the AWAR were established for long-term monitoring purposes (see **Figure 9** and **Appendix C).**

Whale Tail Pit and Haul Road – Six (6), 3 km long breeding bird transects running perpendicular to the Whale Tail Haul Road were established (see **Figure 10** and **Appendix C).**

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank AWAR Breeding Bird Transect
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank AWAR Bird Transect Locations

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ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R1
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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PROJECT: Terrestrial Ecosystem Management Plan

CLIENT: Agnico Eagle Mines Limited

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UTM Zone 14 NAD83

DATE: FEBRUARY 2016

SCALE: 1:350,000

DRAWN BY: LC

CHECKED BY: MAY

Figure:

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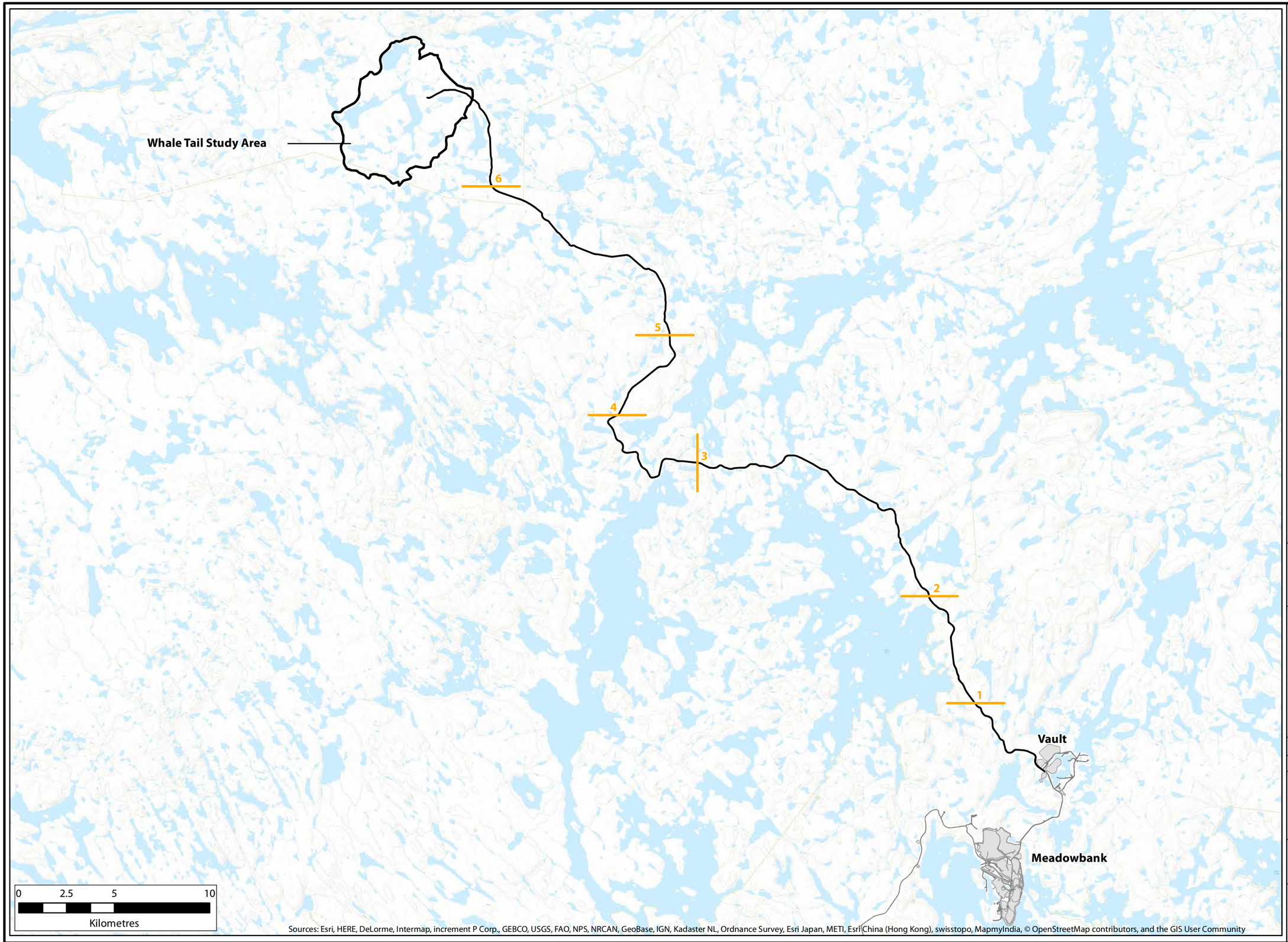

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Breeding Bird Transect
- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

DRAFT

Whale Tail Bird Transect Locations

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

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DATE: FEBRUARY 2016

SCALE: 1:185,000

DRAWN BY: LC

CHECKED BY: MAY

Figure: 10

Frequency:

Meadowbank AWAR – Surveys were initiated in 2005, prior to AWAR construction, and continued until 2010. A comprehensive analysis of the data to 2010 did not determine any noticeable effects; therefore, the survey was suspended until 2015 when a small subset was resurveyed.

Whale Tail Pit and Haul Road – Surveys were initiated in 2015, prior to Haul Road construction, and will be surveyed for baseline purposes.

3.8.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.8.3.1 Habitat Loss & Degradation

See **Section 3.2.3**.

3.8.3.2 Project-Related Mortality

If the threshold mortality level for Upland Breeding Birds is exceeded, adaptive management measures will be implemented (e.g., slower vehicle speeds, driver education). If Project-related mortality of birds is occurring in a confined area (e.g., Snow Buntings at gravel bank), additional mitigation measures may include posting signs indicating reduced vehicle speeds (e.g., 30 km/hr) and holding educational sessions with vehicle operators describing the susceptibility of certain bird populations to road-related mortality and techniques for anticipating bird behaviour.

3.8.3.3 Changes in Breeding Bird Abundance and Diversity

If reductions in breeding bird populations are documented, adaptive management options could include revegetation of disturbed areas, alternative traffic management options, or remediation of disturbed areas in close proximity to roads.

4. REPORTING

A Wildlife Monitoring Summary Report will be provided annually summarizing the terrestrial ecosystem monitoring activities and results of the previous calendar year. The summary report will discuss the accuracy of predictions of the effect of the Project on the various wildlife VECs, the success of mitigation measures (i.e. whether any thresholds are exceeded), briefly describe new measures taken through the adaptive management approach, visually present results of all monitoring activities, and recommendations for mitigation and monitoring activities in the current year. An attempt will be made to distinguish between Project-related changes and natural variations in wildlife populations.

The annual Wildlife Monitoring Summary Report will allow regulators and other stakeholders to contribute insight, expertise, and suggestions for improving wildlife management activities within the Project area. To ensure the reported information is accessible for all stakeholders, the summary report will be concise, visual and simple in format.

Agnico Eagle will have the full responsibility for all aspects of the monitoring program (implementation, monitoring, reporting) and the plan will be reviewed and updated as deemed necessary.

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APPENDIX A

Wildlife Protection and Response Plan: Meadowbank Division

1. SECTION 1 – INTRODUCTION

As part of this Terrestrial Ecosystem Management Plan (2015), mitigation measures and monitoring initiatives have been proposed to lessen the likelihood that wildlife will become habituated to the Meadowbank Mine, which includes Vault Pit, the All-Weather Access Road, Whale Tail Pit, and the Whale Tail Haul Road, and all associated infrastructure. The TEMP identified measures to deter wildlife from obtaining food rewards, finding shelter around the Project site, gaining access to harmful substances present on the site, being injured as a result of vehicle collisions, and damaging mine property.

Despite these mitigation measures, personnel may occasionally come into contact with wildlife that inhabits the Project area. To manage these incidents, a specific Wildlife Protection and Response Plan (WPRP) has been developed. Incidents must be managed to keep both humans and wildlife safe, using only humane control methods.

Furthermore, all staff must be familiar with the standard operating procedures and best practices aimed at ensuring human-wildlife conflicts are minimized during the life of the Project. All personnel, including contractors, on site have a role to play in ensuring human safety, conservation of wildlife and documenting wildlife activities in the Project area.

The following WPRP provides information on general human-wildlife conflicts policies and regulations, species-specific response plans for Ungulates and Predatory Mammals, and wildlife awareness.

2. SECTION 2 – HUMAN-WILDLIFE CONFLICTS

2.1 OVERVIEW

Wildlife encounters can take many forms. A conflict occurs when either human or wildlife health, and/or safety are put at risk. Human health and safety can be affected by contact or conflict with wildlife in several ways, including direct or indirect physical injury, and exposure to animal diseases that can infect humans (i.e., known as zoonotic diseases).

The most common conflict faced by wildlife is the increased risk of mortality from human encounters, which most often occurs when wildlife become habituated to human activity and lose their natural fear of people. The most serious form of habituation is directly correlated to the animal obtaining food, which is known as food conditioning. Food-conditioned animals become dependent on humans as sources of food. Because these human-induced habits become engrained in the animal, attempts to deter the habituated behavior generally fail with the end result usually the death of the animal. Loss of habitat effectiveness (how the animal uses its available habitat), and effects to wildlife movement (how the animal travels through its available habitat) can also result from wildlife in conflict with human development. Ultimately, this will affect both the health and safety of the wildlife species involved. While it is impossible to remove all risk to human and wildlife health and safety, approaches to minimize the risk do exist. Reactive measures do have their place in stopping the conflicts when they occur, but proactive strategies are the most effective means of preventing potential conflicts.

2.2 MINE POLICIES AND REGULATIONS

The following summarizes the general rules regarding wildlife on the site and will form the basis of the Wildlife Awareness Orientation and Courses (see below).

Employees and contractors are advised to report all incidents of unauthorized activities on or in the vicinity of the mine site to the Environment Department.

2.2.1 General Restrictions for Wildlife Protection

The following are general restrictions for Project workers and contractors, intended to minimize the potential for negative Project-related effects (e.g., increased mortality risk) on wildlife in and around the site.

- Wildlife shall have the right-of-way except where it is judged to be unsafe to do so. All species of wildlife (i.e., from small mammals to large carnivores, songbirds to raptors) when encountered by personnel on foot or in vehicles will be given the right-of way.

- Non-mine-registered firearms are not permitted on site (i.e., carrying of firearms in private vehicles to and from the project site on workdays).

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- Harassment (defined as to kill, injure, seize, capture or trap, pursue and includes to stalk, track, search for, lie in wait for, or shoot at - for any of those purposes not authorized by the Environment Department) of wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- The deliberate destruction or disruption of wildlife nests, eggs, dens, burrows, and the like, is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- Hunting and fishing is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Pets are prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Maximum speed limit on all access roads is 50 km/h (30 mph).

- Traffic (including ATVs and snowmobiles) is restricted to designated access roads and trails.

The mine site refers to any mine facility present during the operations phase of the Project, including but not limited to, outbuildings (e.g., machine shop, offices), pits, parking areas, tailings storage facilities and waste piles.

2.2.2 Wildlife Attractants

A list of potential wildlife attractants is provided below. The list is intended as a general summary of attractants but may not be comprehensive of all potential attractants.

- Food wastes and garbage.

- Chemicals (e.g., road salt) and their refuse (e.g., empty fuel containers).

- Wildlife carcasses (e.g., road kills, hunter kills).

- Movement and human activity (e.g., movement of people and equipment outdoors).

- Roads, which may create preferential travel corridors for wildlife, can lead to vehicle collisions and increased exposure to wildlife encounters at the Project site.

General recommendations directed at minimizing wildlife concerns related to food wastes and garbage is presented under **Section 2.2.3** (Garbage Management).

Protocols for dealing with chemical storage, disposal, and spills are presented in Meadowbank's Hazardous Materials Management Plan and Spill Contingency Plan. These protocols will minimize the potential for adverse wildlife effects, and are referenced under **Section 2.2.3** (Garbage Management) and **Section 2.2.4** (Wildlife Health).

Requirements related to the reporting and removal of wildlife carcasses are presented under **Section 2.2.6** (Reporting Wildlife Observations and Incidents).

2.2.3 Garbage Management

General recommendations directed at minimizing wildlife concerns related to food wastes and garbage are provided below.

- Littering is prohibited on and in the vicinity of the Project site, which includes all access roads. All garbage (e.g., lunch bags) must be returned to temporary storage containers. Note: organic wastes (e.g., orange peels, apple cores) are included.

- Food-related waste (including packaging) will be incinerated on a daily basis and general waste will be sent to the landfill and then buried.

- Wastes associated with mechanical maintenance and repairs (e.g., motor oil and antifreeze) will be disposed of as per the Hazardous Materials Management Plan.

- All temporary (small) storage containers for food waste garbage (yellow bin) will be wildlife protective (i.e., have bear proof lids).

- No open top buckets or anything similar will be tolerated outside buildings.

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Wildlife incidents related to garbage or human food attractants will be reported as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

- Improperly disposed of garbage, particularly food wastes will be reported as soon as possible.

See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

While Arctic Fox tend to be the greatest concern with respect to access to garbage, other animals (e.g., Wolverines, Wolves and Grizzly Bears) may be attracted to uncontained garbage sources. Problem wildlife data at the Meadowbank Mine to date indicate that Arctic Fox and Wolves are the most likely species to be attracted to the site.

2.2.4 Wildlife Health

The following recommendations are intended to reduce potential Project-related effects on wildlife health (including non-vehicle related accidents and consumption of toxic substances).

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site. If caught feeding wildlife, an employee can be suspended and/or dismissed.

- Company procedures on the safe and prompt clean-up of any chemical spills will be followed. See Spill Contingency Plan for a more detailed protocol.

- Any observations of wildlife in and around potential sources of contaminants (e.g., fuelling sites) will be reported. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

2.2.5 Wildlife and Vehicles

The following recommendations are intended to reduce the incidence of wildlife-vehicle collisions and near misses.

- Wildlife has the right-of-way except where it is judged to be unsafe to do so.

- Obey all traffics signs.

- Maximum speed limit on all access roads is 50 km/h (30 mph).

- Verbally report wildlife carcasses observed on and in the vicinity of the Project, including along all access roads, as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

- Restrict traffic (including ATVs and snowmobiles) to designated access roads and trails.

- Push and spread out the snow with a dozer when clearing the road to avoid build-up snow banks on the side of the road.

- Report all wildlife-vehicle collisions that results in the death or injury of wildlife as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

- A near miss between a vehicle and an animal should be reported as a wildlife ‘incident’. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

2.2.6 Wildlife and Buildings

The following recommendations are intended to reduce the risk of close encountering situations between wildlife and people.

- Skirting will be added around the building to avoid having wildlife under the buildings.
- Under building access ways must be closed at all time.
- Keep c-can doors close at all time to avoid wildlife using them as shelter.
- Open top bins and containers for food waste will not be permitted outside buildings. If needs be, a bear-resistant container shall be used.

2.2.7 Reporting Wildlife Observations and Incidents

2.2.7.1 Reporting Requirements of Project Workers and Contractors

Project workers and contractors are required to verbally notify the Environment Department of the following wildlife observations or incidents as soon as possible.

- Signs of animal presence (e.g., tracks, scat, nests, burrows) in close proximity (visible to the eye from within the mine site footprint) to site facilities, vehicles, equipment, or areas frequented by workers.
- Sightings of animals in close proximity (visible to the eye from within the mine site footprint) to site facilities, vehicles, equipment, or areas frequented by workers.)
- Aggressive or unusual wildlife behavior in and around Project facilities.
- Instances of workers feeding wildlife.
- Instances of improper disposal of garbage or other waste materials.
- Observed maintenance issues (e.g., improper placement or maintenance of garbage containers).
- Instances of workers not following vehicle use guidelines (e.g. speed limits).
- Vehicle collisions with wildlife or near misses.
- Observations and locations of dead (e.g., road kill) or injured animals.

Following the verbal report of a wildlife incident or observation, completion of a Wildlife Incident Report Form may be requested at the discretion of the Environmental Coordinator or designate (s).

2.2.7.2 Reporting Requirements of Wildlife Occurrences

Wildlife Incident Reports provide essential information that may identify: 1) potentially dangerous situations requiring intervention (e.g., problem wildlife); 2) situations that require notification of the Department of Environment; 3) weaknesses in garbage-handling and problem wildlife prevention measures; and 4) areas that may require warning signs (e.g., poor visibility road corners). The Environmental Coordinator or designate(s) should ensure that records of wildlife observations and incidents are thoroughly documented. Reports should attempt to include the following information wherever possible.

- Identification and number of wildlife observed.
- Specific timing and location of the observation(s).
- Details regarding the animal behavior, including direction of approach and departure, what it was doing, any aggressive behavior, etc.
- Assessment of local attractants, such as garbage, odors, movement of people, other wildlife, etc.
- If local attractants are identified as a factor, determination of what steps were or will be taken to address/remove potential attractants.
- Identification of any potential mitigation measures available to deter wildlife or limit access and how they will be implemented (refer to **Section 2.2.7** for additional information on dealing with problem wildlife).
- If an animal is destroyed, a description of the lethal measures deployed (e.g., rifle), statement of the rationale for use of lethal measures (e.g., proximity to workers, repeated incidents, observed condition of the animal, etc.), and indication of what previous non-lethal measures were employed (e.g., deterrents, hazing, trapping, and relocating (with permission from GN) etc.).

2.2.8 Protocols for Dealing with Problem Wildlife

A problem wildlife situation may arise where animal acts in an aggressive manner and/or is a repetitive nuisance or threat to worker safety. The following protocols should be used to deal with problem wildlife.

- Immediately notify the Environmental Coordinator or designate(s) of any problem wildlife issue. Reporting wildlife incidents as they occur will ensure that proactive rather than reactive measures can be taken to prevent a serious outcome (e.g., human injury, destruction of the problem animal). See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.
- If deemed necessary by the Environmental Coordinator, notify the Conservation Officer in the Hamlet of Baker Lake or other designated Government of Nunavut representative,

inform them of the problem wildlife encountered on site, discuss appropriate aversive and mitigation actions, and determine timing when lethal methods should be implemented, if necessary.

- The Environmental Coordinator or designate(s) will initiate the appropriate actions in response to a problem wildlife issue, Recommended actions include:

    - Assess potential local attractants and address or remove all those identified, where practical;

    - Utilize non-lethal deterrents (e.g., aversive conditioning, hazing, trapping and relocating), projectiles (e.g., rubber bullets) or consider trapping and relocation of animals (e.g., Arctic Fox), where it is considered appropriate and safe to do so (refer to **Sections 3 and 4** for species-specific deterrents); and

    - Use lethal measures. Lethal measures should only be considered as a last resort in the event of aggressive animal behavior and/or repeated nuisance animals that pose a threat to worker safety and/or site facilities.

- Only authorized personnel (Environment Department) are permitted to use lethal and non-lethal projectiles (e.g., rubber bullets) or deploy traps for problem wildlife interventions.

- Do not attempt to deal with a problem wildlife issue on your own. Problem wildlife can be dangerous.

- Conform to recommendations regarding predator safety. All staff should have received a predatory mammal (i.e., Grizzly Bear, Wolverine, Wolf, and Arctic Fox) awareness training orientation. See **Section 5**.

3. SECTION 3 – SPECIES-SPECIFIC RESPONSE PLANS

3.1 PURPOSE

Response plans specific to species groups (i.e., ungulates and predatory mammals) are required to ensure that all personnel working for the Project are provided guidance on how to respond in a manner that is safe to both humans and wildlife should they encounter wildlife on or around the Project site.

3.2 SPECIES GROUPS ADDRESSED

Ungulates (Caribou and Muskoxen) and predatory mammals (Grizzly Bear, Wolverine, Wolf, and Arctic Fox) have the highest potential for interactions with humans during the life of the Project, and thus require specific response plans. If other wildlife are encountered, adaptive management strategies will be implemented if mitigation techniques and the policies and regulations mentioned in this document are not effective for these species. The proposed wildlife monitoring program will be the preferred measure of identifying potential areas in need of new mitigation strategies, or changes in policies or regulations.

For each of the species groups described below, the seasonal activity in the Project area is discussed, as well as the protocol in the event of an encounter.

3.2.1 Ungulates (Caribou and Muskoxen)

3.2.1.1 Seasonal Activity in the Project Area

Results from baseline surveys indicate that Caribou and Muskoxen are present in the Project area in all four seasons, but are observed in greatest abundance in the fall (e.g., October) when thousands of animals may be present in the vicinity of the Project, and in lowest abundance in the summer (see the baseline reports for Meadowbank [Cumberland Resources 2005a] and Whale Tail [Dougan and Nunavut Environmental 2015], and annual Wildlife Monitoring Reports for more details). Calving or post-calving aggregations or movements of Caribou have not been observed within the Project study areas since baseline studies were initiated in 1999.

3.2.1.2 Response to Encounters

Humans rarely have physical altercations with Caribou. Caribou do rut in the fall when they are at relatively high numbers on the Project site and the levels of aggression displayed, particularly by males, increases substantially. There is some anecdotal information suggesting that a bull Caribou may attack a person or vehicle during the rut; therefore, a close encounter with Caribou (during the fall) could be dangerous. Although considered rare, Muskoxen will charge humans if they are threatened (especially lone bulls). Being a sedentary species, Muskoxen will have the tendency to stand their ground when threatened, defending their territory or their young.

If you encounter a single or herds of Caribou or Muskoxen, the following actions should be taken.

- Back away slowly.
- Ensure animal(s) have an escape route.
- Do not make sudden movements.
- Do not make loud noises or attempt to scare the animal(s).
- Use radio/satellite phone to report presence of the animal(s) to the Environment Department.
- Stay in radio/phone contact until the animal(s) moves away or you have returned to a safe area (e.g. inside vehicle or building).
- Wait for the animal(s) to pass before continuing work in the area.

3.2.2 Predatory Mammals

3.2.2.1 Seasonal Activity in the Project Area

Grizzly Bear

Baseline surveys indicated limited use of the Project area by Grizzly Bears, which is consistent with what would be expected for Grizzly Bears in the north, given their wide-ranging habits and low densities. In the fall, when Caribou (a prey item) are more abundant, the Project area may have higher value for Grizzly Bears (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Furthermore, increasing hunting and food caches along the Meadowbank access road in all seasons may also attract Grizzly Bears to the area.

Wolverine

Wolverines occur in the Project area on a year-round basis. Records of Wolverine sightings or their sign were infrequent in the Project area during baseline and monitoring studies beginning in 1999. Similar to Grizzly Bears, the limited evidence for Wolverine in the area is not surprising given their wide-ranging movements and characteristically low population densities (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Only two occurrences (i.e., in 2011 and 2014) of a habituated Wolverine has reported at the Project site since baseline studies began in 1999.

Wolf

Although they do occur year-round in the Project area, Wolves were observed infrequently during all survey sessions, but were most common in the fall, perhaps in response to the increased Caribou abundance at that time of the year (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Wolves have been one of the

most frequent problem wildlife species encountered since the Meadowbank mine became operational in 2009. Most problem Wolves were single and emaciated.

Arctic Fox

Camp personnel have regularly observed Arctic Foxes close to camp and in and around camp buildings during most months of operation, including winter (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Arctic Foxes are the most common predatory mammal species to be encountered at the Project site.

3.2.2.2 Response to Encounters

Predatory mammals (such as Wolves, Wolverine, Arctic Fox and Grizzly Bears) rarely attack people; however, they are extremely strong and vicious, and should be given respect. Members of the dog family (such as wolves and foxes) are more at risk of carrying rabies, and other zoonotic diseases, and therefore should be avoided. Arctic Fox in particular is easily tamed, quickly losing their fear of humans, and often approaching very close. Sick or injured animals may no longer be able to feed themselves and could be in a state of starvation. Often they show few physical signs that something may be wrong, but typically act more aggressively or even 'friendly' towards humans; therefore, a close encounter with a predatory mammal could be dangerous. All bites and scratches from wildlife should be reported immediately to Health & Safety department since animals can be vectors for rabies.

If you encounter a predatory mammal, the following actions should be taken.

- Immediately inform the Environment Department of situation using a radio/phone.
- Back away slowly and do not turn your back on the animal.
- Do not make sudden movements.
- Do not make loud noises or attempt to scare the animal if it is simply traveling through the area.
- Use radio/satellite phone to report the presence of the animal to the Environment Department.
- Stay in radio/phone contact until the animal moves away or you have returned to a safe area. (e.g. inside vehicle or building).
- Wait for the animal to pass before continuing work in the area.

If the predatory mammal does not back away, or shows interest in you.

- Continue to back away slowly and ensure a 10 m distance between yourself and the animal.

- Make sure the animal has a safe route of escape.
- Make noise to alert the animal of your presence or to scare it off.
- Avoid provoking it.
- Return to a safe area as soon as possible (e.g. inside a building or vehicle).
- Keep the Environment Department informed of situation using the radio/phone.

If the predatory mammal still does not back away, call for deterrent action by the Environment Department

The Environment Department is to treat all predatory mammals that are threatening or aggressive as they would treat a Grizzly Bear, which is perceived to be most dangerous. All predatory mammals that are showing interest in a person or Project facilities must be aggressively deterred to prevent habituation to the Project site. Detailed response recommendations are provided in **Section 3.2.2.**3 below. If an animal is not of an immediate safety concern, the Wildlife Response team should discuss options to deter or remove the animal with Government of Nunavut conservation personnel.

3.2.2.3 Environment Department Protocols for Managing Problem Predatory Mammals

As part of the detailed response plan, the Environment Department will follow the procedures included here when responding to predatory mammal sightings and encounters. It is assumed that the reporting person(s) has followed procedures for predatory mammal incidents, and has requested the Environment Department to be dispatched due to the failure of human presence to deter the predatory mammal. If an animal is not of an immediate safety concern, the Environment Department should discuss options to deter or remove the animal with Government of Nunavut conservation personnel. All wildlife problems are to be recorded in the wildlife database.

The Environment Department will:

- Collect all deterrent equipment and receive briefing from the Environmental Coordinator or delegate (s) on location and circumstances of the call;
- When firearms are to be used there will always be two individuals, one person with a firearm (12 gauge) for deterrent use, the other as back up with lethal force. No lethal force will be taken without consent from the Environmental Superintendent / Coordinator in conjunction with the consultation of the Government of Nunavut Wildlife Officer unless the situation is deemed to be life threatening;
- The appropriate less than lethal deterrent will be chosen and used in an effort to scare the predatory mammal away; and
- If the deterrent is successful, the incident will be recorded in the wildlife database and will

detail the type and level of deterrent used, information on the predatory mammal involved, and all information on the circumstances leading up to the incident.

If the deterrent is not effective and the predatory mammal continues to approach or doesn't move away from the area of human activity or project footprint.

- Increase deterrent efforts to less than lethal projectile (rubber bullet) if not already being employed.
- Ensure the animal has an open escape route.
- Continue aggressive use of less than lethal projectile deterrents to try and chase the animal away.

All but the most aggressive animals should have been deterred at this point. The situation is now extremely dangerous and the Environment Department must be ready to use lethal force.

The risk to human life or property is imminent since the predatory mammal has not responded to non-lethal deterrent options and the safety of the team or mine property is now compromised.

- Shoot with the intention of stopping the threat, using the buckshot or 1-ounce lead slugs, as appropriate, to kill the animal.
- Shots should be aimed at the chest area, not the head or hind quarters.
- If lethal force has been used, the Environment Department must complete a full report detailing the event immediately.
- The Government of Nunavut conservation officers will be notified by phone. Direction will then be given to properly dispose of the carcass.
- Any wildlife showing signs of rabies will be killed (never shot in the head) and reported.

4. SECTION 4 – WILDLIFE AWARENESS INFORMATION AND ENCOUNTER STRATEGIES

This section deals with general predatory mammal (i.e., Wolves, Wolverines, and Grizzly Bears) awareness information and encounter strategies. It does not replace the need for all personnel to take a recognized wildlife awareness course.

4.1 FACTORS THAT INFLUENCE A PREDATORY MAMMAL'S REACTION

Wolverines, Wolves, and Grizzly Bears will react differently to chance encounters with humans, depending upon many factors, including each animal's past experience with humans. Their reaction is difficult to predict because of the variability of factors with each encounter.

- Female mammals may aggressively defend her young ones (for example: Female bears with cubs are more likely to attack than to flee).

- Wolverines or bears may defend a food cache (for example: a bear's main objective is to eat from the time it leaves its den to the time it returns to a winter den. Hunting bears will cache food after eating part of it by covering the food with dirt, branches or leaves. They will often establish a daybed nearby and return later for another meal). Animals will aggressively defend their food cache.

- Individual Space: All predatory mammals have a minimum distance surrounding them within which any intrusion is considered a threat. A cornered or surprised predatory mammal may be dangerous. If there is no cover to retreat to, their usual response to danger is to attack or to stand its ground.

- Old, wounded or predatory mammals with teeth malformations can be dangerous because they are very hungry or starving (e.g. Wolves observed on-site in 2009).

- Wolverines, Wolves, Arctic Fox, and Grizzly Bears are easily attracted to human food sources and may become aggressive to obtain it. Predatory mammals that have obtained food from humans become "human food habituated`. These mammals are accustomed to humans and link people as sources for obtaining food.

- Young animals which are inexperienced hunters and/or recently weaned are also at a greater risk to take advantage of human food source opportunities.

4.2 ANIMAL ENCOUNTERS

Most of animal safety is prevention – avoiding an encounter is the best way to stay safe while working in the home ranges of Wolverines, Wolves, Arctic Fox, and Grizzly Bears.

4.3. HOW TO REACT TO ANIMAL ENCOUNTERS

Your reaction should depend on circumstances and the behavior of the mammal.

- Stop and assess the situation before you act.
- Does the predatory mammal know you are there?
- How is the animal reacting to the nearby activity?
- Remain calm.
- Do not turn your back on the animal.

DO NOT RUN – You will trigger the animal's natural response to chase you. Wolverines, Wolves and Grizzly Bears are extremely fast and you cannot outrun them.

Some Simple Rules

- Respect them – they can kill you.
- Be alert at all times.
- Watch for sign.
- Make noise – don't surprise animals.
- Travel in groups when possible.
- Be cautious in noisy areas (streams).
- Know the types of areas animals use during the year.
- Do not approach them.
- Never feed them.
- Get trained and carry deterrents.
- Remember carcass equals danger – look for ravens, strong odours.
- Mentally rehearse encounters.

4.3.1 Specific situations: Animal Encounters

Wolverine, wolf, or bear is not aware of you.

- Leave the area quietly in the same direction that you came from.

- Move while the predatory mammal is not aware of you and stop moving when the mammal lifts its head to check its surroundings.
- Stay downwind so the predatory mammal will not pick up your scent.
- When you have moved a safe distance away and preferably to your truck or shop where you can watch and wait until the predatory mammal leaves.
- Report event to Environment Department immediately.

If the wolverine, wolf or bear is unaware of you and approaching.

- Allow the mammal the right-of-way. Make sure there is a safe escape route and that you are not in the way.
- Return to vehicle or building when available or allow animal a wide birth.
- Report event to Environment Department immediately.

If you cannot leave undetected

- Move upwind so animal can pick up your scent; this will help them identify you as human.
- If it is possible, try to keep the predatory mammal in your sight.
- Watch to see if the predatory mammal leaves when it smells that a person is nearby.
- Report event to Environment Department immediately.

If the wolverine, wolf or bear is aware of you but in the distance.

- Continue walking at the same general pace and towards a safe area (vehicle or building).
- DO NOT RUN.

The wolverine, wolf or bear is aware of you and close.

- A predatory mammal will feel threatened in a close confrontation. Generally their natural tendency will be to reduce or to remove the threat. Assist the animal by acting as non-threatening as possible.
- Do not make direct eye contact.
- Do not make any sudden moves.

- DO NOT RUN.

- In the case of a bear, they need to identify you as a person, so talk in low tones and slowly wave your arms over your head.

- Attempt to give the predatory mammal an opportunity to leave. Be sure they have an open escape route.

- Try to back away slowly.

    - If the predatory mammal begins to follow you, drop your jacket, or pack or some other article (not food) to distract it. This may distract the animal long enough for you to escape.

    - Report to Environment Department immediately.

The wolverine, wolf or bear is close and threatening.

- If you have a deterrent such as a bear banger or bear spray, be prepared to use it depending on how close the predatory mammal is.

- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.

- Talk to the predatory mammal in a calm authoritative tone of voice.

- Do not startle or provoke the predatory mammal by making sudden moves.

- Back slowly away from the animal and drop a pack, jacket, or some other article in order to distract it momentarily.

- Remember that the predatory mammals may be defending their cubs that you have not yet seen or they may have a food cache nearby. Attempt to look as non-threatening as possible.

- Report to Environment Department immediately.

The wolverine, wolf or bear is very close and approaching.

A distance of less than 50 m in an open area is considered very close.

- If the predatory mammal continues to approach, use your deterrent when in range.

- If the predatory mammal does not respond to the deterrent you must now STAND YOUR GROUND!

- Report to Environment Department immediately.

The wolverine, wolf or bear charges.

In this case you have done something that has provoked the Wolverine, Wolf or Grizzly Bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the mammal until after the attack. It is important that you act passively, humble your posture, and do not look directly at the animal. Always keep the animal in sight. Never yell or throw things as these are obvious signs of aggression

When faced with a charging wolverine, wolf or bear.

- First use your deterrent, either a banger or pepper spray. If authorized (only Environment Department representatives or local security personnel) to carry a firearm, shoot the predatory mammal.

- **DO NOT PLAY DEAD IF THE PREDATORY MAMMAL CONSIDERS YOU FOOD**.

- You must defend yourself with whatever means are available, act aggressively towards the bear.

- Stand up on something high and try to make yourself look bigger. Try to appear dominant. Try to frighten it. Yell, scream, shout, and wave your arms. Jump up and down and fight back.

- Hold your jacket or backpack over your head to make yourself look bigger.

- If being aggressively attacked in a predatory attack, fight back. Concentrate your efforts on the face, eyes, and nose of the bear. Use whatever means you have, rocks, sticks, tools, hardhat, or simply kick and punch with all the strength you can muster.

- Report to Environment Department immediately.

4.3.2 Types of Bear Attacks.

Provoked Attacks

- You have done something that has provoked the bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the bear until after the attack.

- It is important that you act passively, humble your posture and do not look directly at the bear. Always keep the bear in sight.

- Lie down on the ground in the prone position (i.e., play dead as this is a sign of submission to the bear and shows the bear that you are no longer a threat to them).

- Never yell at the bear or throw things at the bear, these are obvious signs of aggression

towards the bear.

- Report to Environment Department immediately.

Predatory Attacks

- The bear is hunting or stalking you! You are being treated as potential food. DO NOT PLAY DEAD IF THE BEAR CONSIDERS YOU FOOD.

- You must defend yourself with whatever means are available, act aggressively towards the bear. Stand up on something high and try to make yourself look bigger.

- Try to appear dominant. Try to frighten the bear. Yell, scream, shout and wave your arms. Jump up and down and fight back. Hold your jacket or backpack over your head to make yourself look bigger.

- Use your deterrent; either a banger or pepper spray. If authorized to carry a firearm, shoot the bear.

- Report to Environment Department immediately.

4.4 WILDLIFE DETERRENTS

4.4.1 Noise

- Pencil Flare Guns are highly portable but many people have received injuries from this type of deterrent as the pen explodes while they are holding it. This deterrent is still sold and is not recommended. Canadian Conservation Officers no longer using pencil flares.

- Pyrotechnics, including bangers, screamers, whistlers, and flares. Requires a magazine launcher. These launchers look like a small handgun. There are different types available, some carry only a single shot, and some will carry multiple cartridges. The bangers, screamers and whistlers are charges that will explode and emit a variety of different noises. The name of the device indicates the noise it will make.

4.4.2 Wildlife chemical Deterrents

Bear Sprays are highly effective but they must be used correctly to be effective. As with all deterrents they have their good points and their bad points.

- The main ingredient in bear spray is Capsicum an extract from hot peppers.

- Capsicum needs to strike the eyes, nose or mouth of the mammal, (open membranes) to be effective.

- These sprays can only be used at very close range, 3 to 8 m or 10 to 25 ft.

- You cannot discharge the bear spray too early – or it will be completely ineffective.

- If the predatory mammal comes within the range of the bear spray – aim directly into their face and spray.

- You must be aware of the wind direction. If you the wind is blowing towards you, the spray will be carried by the wind into your face.

- Bear spray may not be effective in sub-zero weather (Spray cans do not fire well in very cold temperatures.) In colder weather, you need to keep the can of bear spray warm in order for it to fire effectively.

- Bear spray will not be effective in the rain. When you fire a can of bear spray, the spray will create a billowing cloud of capsicum and propellant. Rain can/will wash the spray right out of the air before it strikes the bear in the face.

- If you have used your can of bear spray to deter a mammal, wash the nozzle off with soap and water to remove the scent. Replace your can of spray as soon as possible. You do not want to have another bear encounter with a half a can of spray left.

- Bear sprays have a shelf life. Always replace your bear spray when you are nearing the end of the shelf life. The Capsicum does not deteriorate over time; it is the canister seals that deteriorate over time.

- Do not test your can of spray before going out into the field. You need to take a full can of spray into the field, not a partially used one.

- Wildlife chemical deterrents are only to be used for the purpose they are intended for. Misuse of wildlife deterrents such as chemical sprays, bangers, and pyrotechnics is considered a criminal offence.

5. SECTION 5 – TRAINING PROTOCOL

5.1 SCOPE

The Wildlife Training Protocol outlines recommended levels of training that specific groups of people at the Project site should receive. It is important that human activity at the site does not result in wildlife encounters that put people or wildlife at risk. All personnel on site have a role to play in ensuring human safety, conservation of wildlife, and documenting wildlife activities in the project area.

5.2 ASSUMPTIONS AND KEY CONSIDERATIONS

Agnico Eagle, Meadowbank Division must assign overall accountability, recording and reporting responsibility to the Environmental Coordinator or designate(s) if the various wildlife response plans and training initiatives are to be effective.

The Environmental Coordinator or designates(s) will be responsible for ensuring that all employees, contractors, and visitors at the Project site receive wildlife training appropriate to their roles and responsibilities.

The Environment Department will be responsible for all deterrent action whenever it is necessary to deter wildlife from mine infrastructure or personnel. All members of the Environment Department will receive specialized training in various levels of deterrent use. Security personnel and the Environment Department will be the only onsite personnel to have access to a firearm.

5.3 TRAINING

Mandatory wildlife awareness orientation for all staff will include the following components.

1.1.1 Wildlife-Human Conflict

- General restrictions for wildlife protection.
- Wildlife Attractants.
- Garbage Management.
- Wildlife Health.
- Wildlife and Vehicles.
- Preventing Problem Wildlife.

- Dealing with Problem Wildlife.
- Reporting Wildlife Observations and Incidents.

5.3.2 Wildlife Awareness

The Wildlife Awareness and Working in the Wild brochure has been developed to provide AEM staff and contractors with awareness of potential wildlife encounters that may occur at the Project site. This brochure discusses the following:

- Wildlife that commonly occur near the Project site;
- Behavior of wildlife that may be encountered near the Project site;
- Wildlife encounters; and
- Wildlife Deterrents.

5.3.3 Environment Department

In addition to the required Project site orientation, the Environment Department may require additional training. The following training is recommended, especially for those without experience in situations where wildlife occurrences are common.

Bear Safety Training

Provided by qualified contractor or territorial, provincial or federal Wildlife Officer, this course will provide:

- Instruction on the use of lethal and non-lethal deterrents for emergency response to bear incidents;
- Techniques for euthanizing bears during an emergency response;
- Other types of deterrent options available in non-emergency situations;
- In depth aversive conditioning techniques;
- Live trapping techniques and protocols;
- Necropsy techniques, and biological sampling; and
- Practicum.

Carnivore Safety Training

Provided by qualified contractor or territorial, provincial or federal Wildlife Officer to include:

- Biology, ecology, and behavior of Wolverine, Wolf, Arctic Fox, and Grizzly Bear;
- Rabies and other zoonotic diseases;
- Detailed deterrent and aversive conditioning techniques;
- Live trapping techniques;
- Instruction on the use of lethal and non-lethal deterrents for emergency response to incidents involving large carnivores;
- Necropsy techniques and biological sampling; and
- Practicum

APPENDIX B

Field Data Forms

AGNICO EAGLE MINES LTD. – MINE SITE AND ROAD SURVEYS

Date (day/month/year) _____ **Time Started** _____ **Time Ended** _____ **Page** ____ **of** _____

Start Location (UTM) _____ **End Location** _____ **Observer Names**: _____+_____

Temperature: ____ **Wind Speed (km/hr):** _____ **Wind Direction:** ____ **Visibility (circle):** 100m 500m 1km >1km **Precip:** _____

Time	Species Name	Number, Sex and Age[1]	Habitat Type (ELC)[2]	Behaviour[3]	Direction of Travel[4]	Distance from Road (m)	Direction from Road (N or S)	Location on Access Road (GPS Coordinates)			Comments
								Zone	Easting	Northing	

[1] **Sex** = M (male) or F (female); Age = C (calf, chick, cub or pup), Y (yearling), and A (adult)
[2] **Habitat** = WA (water), SE (sedge), BR (birch and riparian shrub), HT (heath tundra), LI (lichen), LR (lichen-rock), RC (ridge crest/esker/avens), RO (rock and boulder), and DI (disturbed)
[3] **Behaviour** = RE (resting), FO (foraging), WK (walking), RU (running), ST (standing), MI (milling), CO (courting), FL (flying), and NE (nesting)
[4] **Direction of Travel** = N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest)

AGNICO EAGLE MINES LTD. – HAUL ROAD HEIGHT-OF-LAND SURVEYS

Date (day/month/year) _____ **Time Started** _____ **Time Ended** _____ **Page** ____ **of** _____

Observer Names: _____

Temperature: ____ **Wind Speed (km/hr):** _____ **Wind Direction:** ____ **Visibility (circle):** 100m 500m 1km >1km **Precip:** _____

Stn #	Time	Species Name	Number, Sex and Age[1]	Habitat (ELC)[2]	Distance from Observer	Direction from Station	Observation Type[3]	Direction of Travel[4]	Behavior[5]	Comments

[1] **Sex** = M (male) or F (female); Age = C (calf, chick, cub or pup), Y (yearling), and A (adult)
[2] **Habitat** = WA (water), SE (sedge), BR (birch and riparian shrub), HT (heath tundra), LI (lichen), LR (lichen-rock), RC (ridge crest/esker/avens), RO (rock and boulder), and DI (disturbed)
[3] **Observation Type** = visual (animals seen), tracks, pellets, scat, feather, burrow, den, antler, bones, carcass, call, fur etc.
[4] **Direction of Travel** = NA (Not Applicable), N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest)
[5] **Behaviour** = RE (resting), FO (foraging), WK (walking), RU (running), ST (standing), MI (milling), CO (courting), FL (flying), and NE (nesting)

RAPID SURVEY PLOT SUMMARY FORM

Date:______________________

MEADOWBANK MONITORING PROGRAM

Surveyors:____________________

Site:________________ Plot:____________ Time: IN ________h OUT _______h

Incidentals[1]:____

Weather: Estimated Temp: ________°C

Cloud Cover:
- ☐ Clear (0 tenths)
- ☐ Mainly clear (1 to 4 tenths)
- ☐ Mostly cloudy (5 to 9 tenths)
- ☐ Cloudy (10 tenths)

Precipitation:
- ☐ None ☐ Freezing rain
- ☐ Drizzle ☐ Freezing drizzle
- ☐ Rain ☐ Snow

Wind:
- ☐ Calm (<1kph; smoke rises vertically)
- ☐ Light air (1-5kph; smoke would drift)
- ☐ Light Breeze (6-11kph; felt on face, leaves rustle)
- ☐ Gentle Breeze (12-19kph; leaves, small twigs constant motion)
- ☐ Moderate breeze (20-28kph; raises dust and loose paper)
- ☐ Fresh Breeze (29-38kph; crested wavelets)
- ☐ Strong Breeze (39-49kph; umbrella used with difficulty)
- ☐ Near Gale (50-61kph; inconvenience felt walking into wind) **[If this or greater, should not be doing surveys!]**

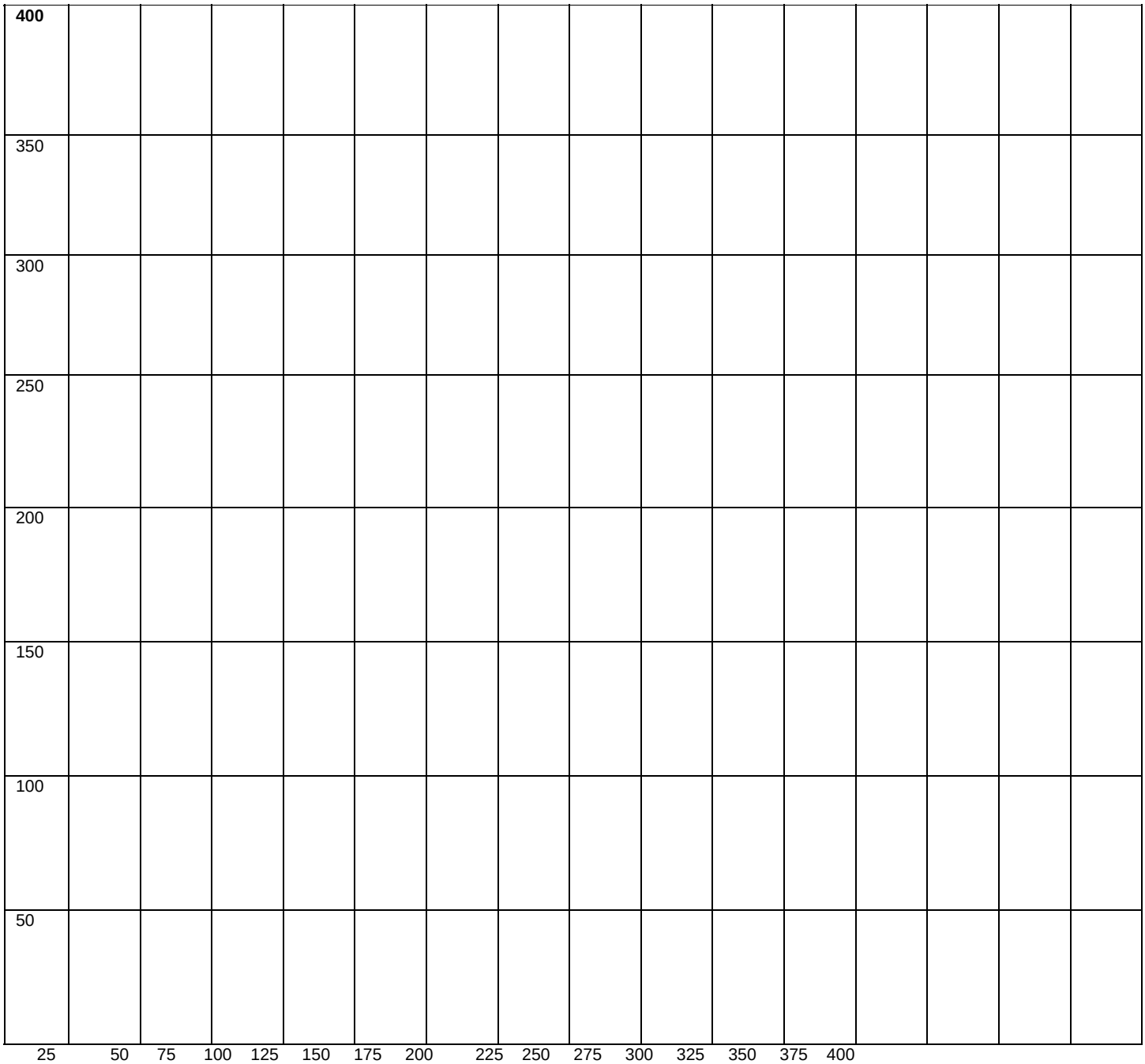
Species	Nests[2,3]	Probable Nest[2,4]	Pairs[2]	Males[2]	Females[2]	Unknown Sex[3]
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						

[1] Notable species seen off the plot - flybys and off transect birds should also be added.
[2] If you see both a nest and the pair or a single bird associated with the nest, record just as the nest (i.e. highest breeding code) and note which parent(s) you saw in the comments.
[3] Fill out the Nest Information Datasheet (***Nest Information – All Species***) for all nests found, on and off the plot.
[4] Only used when a nest distraction display is seen or 99% sure has nest and don't have time to look for it.

MEADOWBANK PLOT MAP- RAPID SURVEYS

Site:_____ Plot:____ Date:_____ Time In:_____ Out:_____ Surveyors:_____

NW Corner **NE Corner**



SW Corner **SE Corner**

Coordinates: SW: NW: NE: SE:

AGNICO EAGLE MINES LTD. – BREEDING BIRD TRANSECTS

Date (dd/mm/yy) _____ Time Started: _____ Time Ended: _____
Observer Names:_____ **Page _____ of _____**
Transect # ____W or S Start Coordinate _____ E or N End Coordinate _____
Location: Meadowbank or Whale Tail Coordinate on access Road _____
Temperature:_____ Wind Speed_____ Wind Direction _____ Precipitation _____

Interval (at 100 m from W or S)	Species Name	Number, Sex and Age	Distance	In/Out	Comments Describe: **Nest, age, behaviour etc.**

APPENDIX C

UTM Coordinates for Monitoring Program

APPENDIX C-1: UTM Coordinates (NAD 83) of PRISM plots Used for Long-term Monitoring at Meadowbank and Whale Tail Study Areas.

MEADOWBANK STUDY SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
2	14W 0637020 7216090	14W 0637020 7216490	14W 0637420 7216490	14W 0637420 7216090
3	14W 0637800 7216700	14W 0637800 7217100	14W 0638200 7217100	14W 0638200 7216700
6	15W 0359400 7212500	15W 0359400 7212900	15W 0359800 7212900	15W 0359800 7212500
8	14W 0637700 7214200	14W 0637700 7214600	14W 0638100 7214600	14W 0638100 7214200
9	14W 0637300 7214800	14W 0637300 7215200	14W 0637700 7215200	14W 0637700 7214800
11	14W 0639000 7215800	14W 0639000 7216200	14W 0639400 7216200	14W 0639400 7215800
12	14W 0639700 7215600	14W 0639700 7216000	14W 0640100 7216000	14W 0640100 7215600
14	14W 0639000 7216900	14W 0639000 7217300	14W 0639400 7217300	14W 0639400 7216900
15	14W 0639000 7217800	14W 0639000 7218200	14W 0639400 7218200	14W 0639400 7217800
19	14W 0635500 7217300	14W 0635500 7217700	14W 0635900 7217700	14W 0635900 7217300
20	14W 0636000 7216600	14W 0636000 7217000	14W 0636400 7217000	14W 0636400 7216600
22	14W 0636800 7217400	14W 0636800 7217800	14W 0637200 7217800	14W 0637200 7217400
24	14W 0636300 7218000	14W 0636300 7218400	14W 0636700 7218400	14W 0636700 7218000
28	14W 0640200 7221000	14W 0640200 7221400	14W 0640600 7221400	14W 0640600 7221000
29	14W 0641100 7220000	14W 0640100 7220400	14W 0640500 7220400	14W 0640500 7220000
31	14W 0636600 7208000	14W 0636600 7208400	14W 0637000 7208400	14W 0637000 7208000
32	14W 0636000 7208500	14W 0636000 7208900	14W 0636400 7208900	14W 0636400 7208500
33	14W 0636700 7209800	14W 0636700 7210200	14W 0637100 7210200	14W 0637100 7209800
34	14W 0640000 7218800	14W 0640000 7219200	14W 0640400 7219200	14W 0640400 7218800
36	14W 0633300 7212100	14W 0633300 7212500	14W 0633700 7212500	14W 0633700 7212100
37	14W 0634000 7212700	14W 0634000 7213100	14W 0634400 7213100	14W 0634400 7212700
38	14W 0632700 7212800	14W 0632700 7213200	14W 0633100 7213200	14W 0633100 7212800
42	15W 0359400 7219000	15W 0359400 7219400	15W 0359800 7219400	15W 0359800 7219000
43	15W 0359200 7218300	15W 0359200 7218700	15W 0359600 7218700	15W 0359600 7218300
45	14W 0640600 7210400	14W 0640600 7210800	14W 0641000 7210800	14W 0641000 7210400

WHALE TAIL STUDY SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
1	14N 0605500 7251900	14N 0605500 7272300	14N 0605900 7252300	14N 0605900 7241900
2	14N 0606300 7252300	14N 0606300 7252700	14N 0606700 7252700	14N 0606700 7252300
3	14N 0607900 7252300	14N 0607900 7252700	14N 0608300 7252700	14N 0608300 7252300
4	14N 0605500 7253100	14N 0605500 7253500	14N 0605900 7253500	14N 0605900 7253100
5	14N 0607500 7253100	14N 0607500 7253500	14N 0607900 7253500	14N 0607900 7253100
6	14N 0608700 7252300	14N 0608700 7252700	14N 0609100 7252700	14N 0609100 7252300
7	14N 0611500 7253100	14N 0611500 7253500	14N 0611900 7253500	14N 0611900 7253100
8	14N 0609100 7253500	14N 0609100 7253900	14N 0609500 7253900	14N 0609500 7253500
9	14N 0609100 7254300	14N 0609100 7254700	14N 0609500 7254700	14N 0609500 7254300
10	14N 0610700 7251500	14N 0610700 7251900	14N 0611100 7251900	14N 0611100 7251500
11	14N 0609900 7254700	14N 0609900 7255100	14N 0610300 7255100	14N 0610300 7254700
12	14N 0603900 7255500	14N 0603900 7255900	14N 0604300 7255900	14N 0604300 7255500
13	14N 0609500 7255900	14N 0609500 7256300	14N 0609900 7256300	14N 0609900 7255900
14	14N 0603500 7256300	14N 0603500 7256700	14N 0603900 7256700	14N 0603900 7256300
15	14N 0610300 7256300	14N 0610300 7256700	14N 0610700 7256700	14N 0610700 7256300
16	14N 0611500 7256300	14N 0611500 7256700	14N 0611900 7256700	14N 0611900 7256300
17	14N 0611900 7251500	14N 0611900 7251900	14N 0612300 7251900	14N 0612300 7251500
18	14N 0605500 7257100	14N 0605500 7257500	14N 0605900 7257500	14N 0605900 7257100
19	14N 0606700 7257900	14N 0606700 7258300	14N 0607100 7258300	14N 0607100 7257900
20	14N 0605500 7258300	14N 0605500 7258700	14n 0605900 7258700	14N 0605900 7258300

APPENDIX C-1: UTM Coordinates (NAD 83) of PRISM plots Used for Long-term Monitoring at Meadowbank and Whale Tail Study Areas.

CONTROL OR REFERENCE SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
1	14W 0623000 7218000	14W 0623000 7218400	14W 0623400 7218400	14W 0623400 7218000
2	14W 0623600 7217600	14W 0623600 7218000	14W 0624000 7218000	14W 0624000 7217600
3	14W 0622600 7217000	14W 0622600 7217400	14W 0623000 7217400	14W 0623000 7217000
4	14W 0624600 7217000	14W 0624600 7217400	14W 0625000 7217400	14W 0625000 7217000
5	14W 0625000 7217600	14W 0625000 7218000	14W 0625400 7218000	14W 0625400 7217600
6	14W 0623600 7216000	14W 0623600 7216400	14W 0624000 7216400	14W 0624000 7216000
7	14W 0624600 7216400	14W 0624600 7216800	14W 0625000 7216800	14W 0625000 7216400
8	14W 0624600 7215600	14W 0624600 7216000	14W 0625000 7216000	14W 0625000 7215600
9	14W 0625600 7215000	14W 0625600 7215400	14W 0626000 7215400	14W 0626000 7215000
10	14W 0626200 7215000	14W 0626200 7215400	14W 0626600 7215400	14W 0626600 7215000
11	14W 0624500 7214000	14W 0624500 7214400	14W 0624900 7214400	14W 0624900 7214000
12	14W 0625000 7214000	14W 0625000 7214400	14W 0625400 7214400	14W 0625400 7214000
13	14W 0626200 7214400	14W 0626200 7214800	14W 0626600 7214800	14W 0626600 7214400
14	14W 0624600 7213300	14W 0624600 7213700	14W 0625000 7213700	14W 0625000 7213300
15	14W 0625200 7213000	14W 0625200 7213400	14W 0625600 7213400	14W 0625600 7213000
16	14W 0626100 7213000	14W 0626100 7213400	14W 0626500 7213400	14W 0626500 7213000
17	14W 0627000 7213600	14W 0627000 7214000	14W 0627400 7214000	14W 0627400 7213600
18	14W 0624600 7212800	14W 0624600 7213200	14W 0625000 7213200	14W 0625000 7212800
19	14W 0625600 7212600	14W 0625600 7213000	14W 0626000 7213000	14W 0626000 7212600
20	14W 0626000 7212000	14W 0626000 7212400	14W 0626400 7212400	14W 0626400 7212000

APPENDIX C-2: UTM Coordinates of Breeding Bird Transects along the Meadowbank AWAR and Whale Tail Haul Road

Meadowbank AWAR				
Transect	**NAD**	**Start Coordinate**	**End Coordinate**	**Coordinate on AWAR**
1	27	14W 0644200 7138000	14W 0647200 7138000	14W 0645524 7138000
2	27	14W 0639450 7152000	14W 0642450 7152000	14W 0640226 7152000
3	27	14W 0634800 7158000	14W 0637800 7158000	14W 0636319 7158000
4	27	14W 0631900 7163000	14W 0634900 7163000	14W 0633968 7163000
5	27	14W 0629000 7167000	14W 0632000 7167000	14W 0630098 7167000
6	27	14W 0624500 7178000	14W 0627500 7178000	14W 0625081 7178000
7	27	14W 0624000 7182000	14W 0627000 7182000	14W 0625872 7182000
8	27	14W 0625500 7189000	14W 0628500 7189000	14W 0626421 7189000
9	27	14W 0626500 7193000	14W 0629500 7193000	14W 0627284 7193000
10	27	14W 0626200 7203000	14W 0629200 7203000	14W 0627472 7203000
11	27	14W 0630000 7209000	14W 0633000 7209000	14W 0631031 7209000
12	27	14W 0633000 7217000	14W 0636000 7217000	14W 0634284 7217000

Whale Tail Haul Road				
Transect	**NAD**	**Start Coordinate**	**End Coordinate**	**Coordinate on Proposed Haul Road Alignment**
1	83	14N 0635400 7223500	14N 0638400 7223500	14N 0636853 7223500
2	83	14N 0633000 7229100	14N 0636000 7229100	14N 0634445 7229100
3	83	14N 0622300 7234600	14N 0622300 7237600	14N 0622300 7236106
4	83	14N 0616600 7238600	14N 0619600 7238600	14N 0618155 7238600
5	83	14N 0619100 7242800	14N 0622100 7242800	14N 0620588 7242800
6	83	14N 0610000 7250600	14N 0613000 7250600	14N 0611531 7250600

APPENDIX D

AWAR and Haul Road Dustfall Monitoring Plan

AGNICO EAGLE

All-Weather Access Road and Whale Tail Haul Road Dust Monitoring Plan

MEADOWBANK DIVISION

Version 1

March, 2016

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	2016-03-31	All	Comprehensive plan for Meadowbank Mine including Whale Tail Pit

Prepared By: Meadowbank Environment Department

Approved by: 

Ryan Vanengen MSc. - Environmental Superintendent – Permitting and Regulatory Affairs

TABLE OF CONTENTS

LIST OF FIGURES

SECTION 1 • INTRODUCTION

1.1 BACKGROUND

In accordance with NIRB Project Certificate No.004, AEM has conducted annual dustfall and air quality monitoring around the Meadowbank site since 2011. Evaluation and monitoring of fugitive dust along the AWAR to Baker Lake was not required as a component of this program, because air quality modelling in support of the FEIS predicted that the worst case levels of dust would occur onsite where monitoring was planned, and would be in the range of air quality objectives.

In 2012, the hamlet of Baker Lake raised concerns about high dust levels along the AWAR near the community. In response, AEM provided calcium chloride to the hamlet as a dust suppressant, and began to evaluate dustfall along the AWAR annually.

Further, in 2015 the development of an access road between Meadowbank and the Amaruq exploration site, located 50 km northwest of Meadowbank was approved by NIRB and the NWB under a Type B exploration license. In consideration of community concerns regarding potential generation and impacts of dust, as well as the low availability of background dusfall rates in the North, AEM included an assessment of dustfall in the area of the proposed Whale Tail Haul Road in the 2015 study in support of the Whale Tail Pit FEIS submission. These results serve as baseline concentrations for continued future assessments under operational conditions.

Analysis of dustfall along the AWAR to Baker Lake and Whale Tail Pit Haul Road are planned to continue on an annual basis.

1.2 GOAL AND OBJECTIVE

The primary goal of these studies is to confirm the accuracy of impacts predicted in the FEIS with regards to AWAR and Whale Tail Haul Road dust.

The Whale Tail Pit and Haul Road Atmospheric Environment FEIS (Golder, 2016) predicted:

> "$PM_{2.5}$ adjacent to the haul road were below Nunavut ambient air quality guidelines within 50 to 75 metres (m) from the haul road. Maximum annual TSP concentrations are predicted to exceed the ambient air quality standard (60 micrograms per cubic metre [$\mu g/m^3$}) within the first 100 to 300 m from the haul road. Predicted dust deposition rates are predicted to be below the BC dustfall standard within 300 m of the haul road. Annual dust deposition is predicted to be below the Ontario dustfall standard within 25 m from the haul road. These standards are considered to be the strictest dust deposition standards in Canada.
>
> The effects of fugitive dust emissions on air quality adjacent to the haul road are limited in spatial extent and occur primarily on dry windy days in the summer. These effects are reversible in that fugitive dust will no longer affect air quality once the Whale Tail Pit is decommissioned and the haul road becomes inactive."

Furthermore, the Whale Tail Pit and Haul Road Terrestrial Environment Impact assessment (Golder, 2016) found:

> "Dust deposition is anticipated to be primarily in downwind areas from the haul road and mine site. Dustfall effects on vegetation will be reversible following Project closure. Dustfall studies for the Meadowbank All Weather Access Road (AWAR) support dustfall modelling predictions for the Project; specifically that the majority of dustfall occurs within 100 m of the road, and that impacts to vegetation (wildlife habitat) because of dust will be restricted to this area.

> Consequently, effects of dust on vegetation are expected to be restricted to the LSA, continuous through operations of the Project and reversible following closure."

Meadowbank's Terrestrial Ecosystem Impact Assessment (Cumberland, 2005) indicated:

> "Potential effects from roads (e.g., all-weather access road)…will include … reduced habitat effectiveness and habitat degradation due to dust and exhaust, and potential for increased contaminant loading in food sources (Auerbach et al, 1997; Fisk et al, 2003). With or without mitigation, these overall impacts in the LSA (local study area) are not expected to be significant."

Nevertheless, AEM will continue to evaluate the potential impacts of the roads on contaminant loading in food sources are addressed through the Wildlife Screening Level Risk Assessment program (refer to TEMP – AEM, 2016). Potential impacts on animal VECs and indirectly, degradation of their habitat, are or have been assessed through various components of the Terrestrial Ecosystem Management Plan (TEMP) such as breeding bird, waterfowl, raptor and caribou surveys. However, since several components of the AWAR terrestrial wildlife monitoring programs were discontinued in 2011 or 2012 due to lack of observed effects (per the TEMP), dustfall studies can be used to ensure rates of dustfall are not increasing.

Therefore, the objectives of the annual AWAR and Whale Tail Haul Road dustfall monitoring studies are to:

1. Characterize the dustfall gradient in relation to distance from the roads.
2. Compare rates of dustfall with background concentrations and regulatory guidelines, for context.
3. Identify inter-annual trends in rates of dustfall.
4. Relate results to impact predictions as described in the Terrestrial Ecosystem Impact Assessments (Cumberland, 2005; Golder, 2016) and results of TEMP monitoring programs to determine whether dust could be a potential cause of any observed changes in VECs beyond impact predictions.

1.3 GENERAL APPROACH

While predicted dustfall rates were not specified, the 2005 FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the AWAR. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC was also 100 m, with the prediction that impacts to VECs outside this zone would not be significant (< 1% change within the LSA from baseline). Therefore, dustfall studies focus around the 100 m distance, but extend to 1000m and particularly focus on the downwind (most impacted) side of the roads. The largest ZOI was identified as 1000 m for ungulates, so sample transects are extended to this distance to further and more specifically confirm any potential impacts to this VEC, since impacts on caribou are of particular concern to the local community.

SECTION 2 • METHODS

2.1 SAMPLE COLLECTION AND ANALYSIS

Dustfall samples will be collected in open vessels containing a purified liquid matrix provided by an accredited laboratory (typically Maxxam Analytics). Particles are deposited and retained in the liquid, which is then filtered to remove large particles (e.g. leaves, twigs) and analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall.

Dustfall canisters will be deployed for approximately one month (typically August, the driest month with high traffic rates), and calculated dustfall rates will be normalized to 30 days (mg/cm^2/30 days, per ASTM 1739-98).

ASTM and Ontario MOE methods suggest collection of the dustfall sample at 2-3 m height on a utility pole to prevent re-entrainment of particulates from the ground, and to reduce vandalism. Due to the difficulty of constructing and deploying stands to hold the sample containers in this remote location, the initial 2012 study compared dustfall at ground level and at 2 m height to inform future sampling method decisions. Based on these results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all sampling canisters will continue to be deployed at ground level.

Difficulty with maintaining canisters upright in 2013 during strong winds resulted in the use of heavy plastic pipe pieces to surround and support canisters starting in 2014. These support casings will continue to be used and will be maintained at a height lower than the canister opening so that dust deposition is not impeded.

2.2 SAMPLE LOCATIONS

Meadowbank and Whale Tail Haul Road sampling locations are shown in Figure 2.0 which has been adapted from the Meadowbank Air Quality Monitoring Plan.

2.2.1 Meadowbank AWAR Locations

Consistent with historical, sampling canisters will be secured on the ground with a support casing at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the road (east and west) in duplicated transects at AWAR km 18, 76 and 78. Duplicate transects at each location are approximately 20 m apart. These distances were chosen to bracket the smallest predicted zone of influence (ZOI) of 100 m and extend to the furthest assumed zone of influence (1000 m - ungulates). The zone of maximum dustfall has previously been reported to be within 300 m of roads under heavier use than the Meadowbank AWAR (Auerbach et al. 1997). Sampling transects are located perpendicular to road segments that are relatively straight with few notable topographical features, in order to limit confounding factors that alter prevailing winds and create different micro-climates. UTM coordinates for the mid-point (road) of the transects are 14W 0640224 7152042 (km 18) and 14W 0626148 7199739 (km 78).

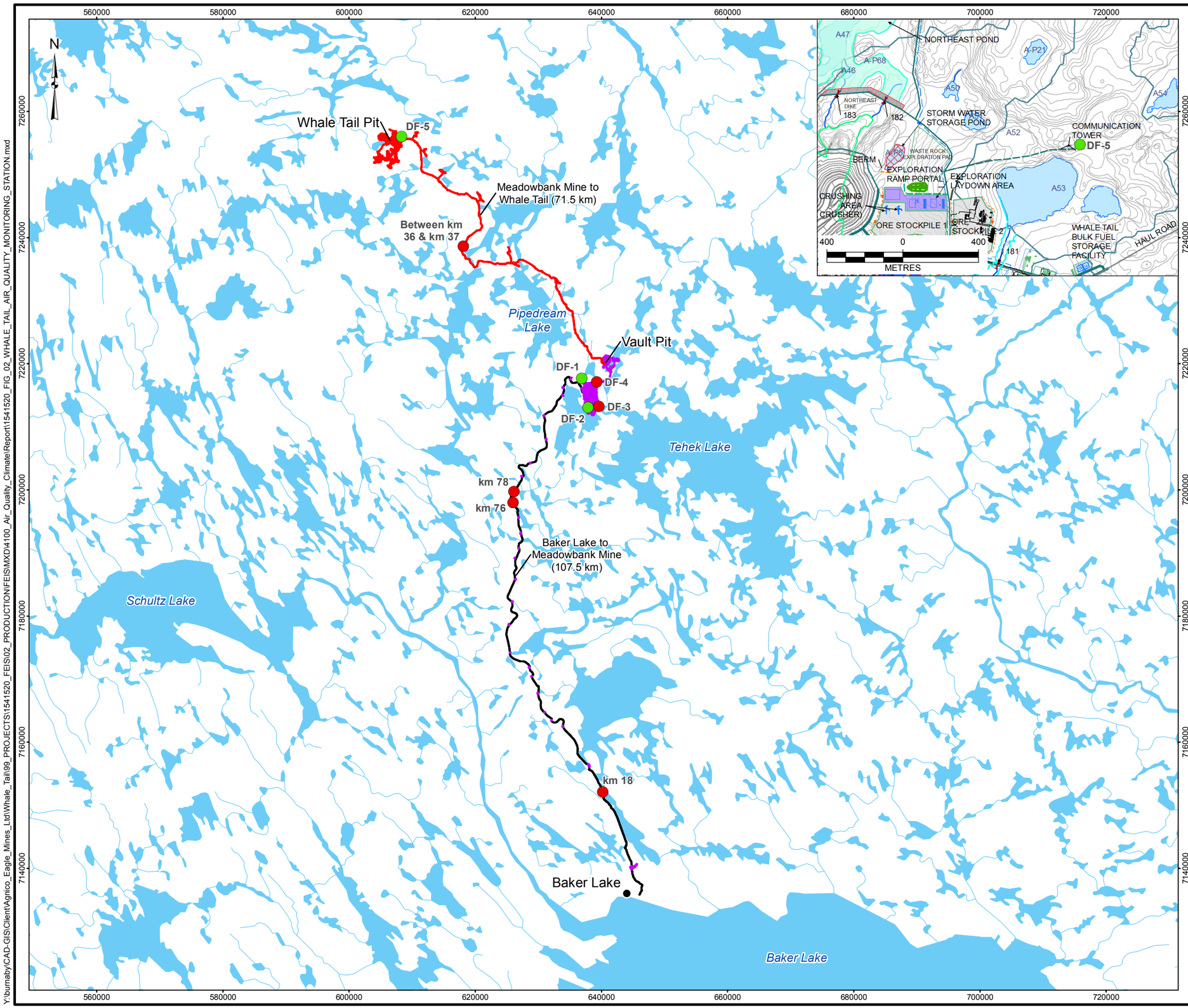
2.2.2 Whale Tail Haul Road Locations

Sampling canisters will be secured on the ground with a support casing at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the road alignment (east and west) in a duplicated transect between km 36 and 37. Duplicate transects locations will be determined in the field. This location corresponds with breeding bird study transect #4 (see 2015 Whale Tail Pit Terrestrial Characterization Report), is located near the traditional land use crossings and is approximately mid-

way along the road route. Topography in this location is gently rolling, with a more prominent north-south slope at each end of the transect. The UTM coordinates for the transect centre point are approximately 14N 0618155 7238600, but will be adjusted as necessary based on road-as built designs.

2.2.3 Background Sample Locations

Samples of background dustfall rates will continue to be collected periodically at locations that are a minimum of 1000 m upwind of road activity. Results of the 2015 study indicated that all samples at 1000 m of the Meadowbank AWAR were within the range of “true” background levels (as determined through an extensive suite of samples collected in association with the proposed Amaruq AWAR). Therefore, results at this distance, upwind, will be considered representative of background dustfall, unless significant changes are observed. Additional background samples will be collected occasionally, as necessary and as opportunities arise, to supplement the dataset.



LEGEND

AIR QUALITY MONITORING STATION

- MEASURED PARAMETER = DUSTFALL
- MEASURED PARAMETER = TSP, PM_{10}, $PM_{2.5}$, NO_2, DUSTFALL
- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

MEADOWBANK MINE, AWAR, AND WHALE TAIL AIR QUALITY AND DUSTFALL MONITORING LOCATIONS

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	20 May 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	20 May 2016		
CHECK	JR	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE 2

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\4100_Air_Quality_Climate\Report\1541520_FIG_02_WHALE_TAIL_AIR_QUALITY_MONITORING_STATION.mxd

2.3 QA/QC

2.3.1 Sample Handling

Sampling canisters and analytical services will be provided by an accredited laboratory (typically Maxxam Analytics Inc.). Canisters will be received and deployed by appropriately trained personnel. Sample collection containers should remain sealed until they are installed at the specified sampling points. Once containers are installed, container lids will be removed and placed in a clean Ziploc bag (or similar). All sample collection containers will be labeled with time, date and sampling location. To avoid contamination or sample loss, no material will be removed from the containers. Only canisters that are upright at the time of collection will be used in data analyses.

2.3.2 Field Duplicates

Precision of the study results will be assessed by calculating the relative percent difference (RPD) between duplicate measurements. For samples that are > 5x the method detection limit, RPD can be calculated as:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where: A = analytical result

B = duplicate result

Samples for the purpose of determining precision will be collected at a rate of 10%, including one canister at each distance from the road. These duplicates will consist of two canisters within approximately 30 cm proximity. Past studies have indicated consistently high RPD values (sometimes > 40%), so while results of this analysis will be reported and the implications discussed, results will not be discounted on the basis of RPD values.

2.3.3 Trip Blanks

Trip blanks (unopened sample canisters) will be deployed in the field at a rate of two canisters per study. Trip blanks will be used to confirm samples are not contaminated by sample containers, transportation, and storage conditions.

2.4 DATA ANALYSIS

All samples will be compared to available regulatory guidelines from Alberta Environment (Section 3), as well as to the range of background dustfall rates (samples collected at the Inuggugayualik Lake reference site in 2014, the proposed Amaruq road location in 2015, samples collected at 1000 m upwind from the road, and any supplementary background samples collected annually).

Results of the dustfall analysis will be discussed in the context of any available results for associated wildlife studies, as described in the Terrestrial Ecosystem Management Plan.

Specifically, reported results will include:

- QA/QC results and data summary for the current year
- Summary of results to date, including:
    - Comparison to regulatory guidelines and background values

    - Inter-annual trends
    - Effects of distance from the road
- Conclusions and adaptive management actions

SECTION 3 • REGULATORY GUIDELINES

No regulatory standards for dustfall are available for the territory of Nunavut, and those available elsewhere are based on aesthetic or nuisance concerns. On this basis, Alberta Environment has published a guideline for recreational/residential areas of 0.53 mg/cm^2/30d (respectively), and a guideline for commercial/industrial areas of 1.58 mg/cm^2/30d. Total dustfall results will be compared to these guidelines or other appropriate guidelines to provide context.

SECTION 4 • REPORTING AND ADAPTIVE MANAGEMENT

Dustfall studies for the Meadowbank AWAR and Whale Tail Haul Road will be conducted annually as described here. Results of the dustfall study will be reported annually to NIRB as a component of AEM's Annual Report for the Meadowbank Project.

In the case that results of dustfall monitoring indicate a potential for adverse effects to wildlife beyond those predicted in the Project FEIS, supplemental monitoring studies will be conducted, and may include additional dustfall sampling in the subsequent year (or as soon as possible) to confirm results, and implementation of wildlife studies to determine whether roadways are causing significant impacts to VECs. Adaptive management to mitigate any adverse impacts established following supplementary monitoring may include road watering, application of other chemical dust suppressants, adjustments to speed limits or increased enforcement of speed limits.

SECTION 5 • REFERENCES

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APPENDIX E

Screening Level Risk Assessment Plan

AGNICO EAGLE

MEADOWBANK DIVISION

Wildlife Screening Level Risk Assessment Plan

In Accordance with NIRB Project Certificate No.004

Version 1

June, 2016

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	2016-06-01	All	Comprehensive plan for Meadowbank Mine

Prepared By: Meadowbank Environment Department

Approved by: 

Ryan Vanengen

Environmental Superintendent – Permitting and Regulatory Affairs

TABLE OF CONTENTS

APPENDICES

Appendix A: Example Calculation

Appendix B: Toxicity Reference Values

Appendix C: Standard Operating Procedure for Soil and Vegetation Sample Collection

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 BACKGROUND

In 2006, Azimuth Consulting Group Inc. conducted a pre-construction wildlife screening level risk assessment (WSLRA) for the Meadowbank site to assess potential risks to wildlife via dietary uptake of mine-related contaminants (Azimuth, 2006). Specifically, the pre-construction SLRA focused on determining the contaminants of potential concern (COPCs) from predicted minesite activities, evaluating potential risks to wildlife from exposure to contaminants under baseline conditions, and determining the magnitude of increase in contaminant exposure required to cause concern for wildlife populations. Preliminary estimates of post-development contaminant concentrations were then obtained from models, and based on those potential future changes, expected potential risks to local wildlife were evaluated.

Under baseline conditions, negligible risks were found for all COPCs except chromium, which was determined to pose an improbable but potential risk for songbirds at baseline concentrations. COPC exposure concentrations were not expected to increase during operation, so potential risks were not expected to change from baseline conditions.

As required under the Nunavut Impact Review Board Project Certificate - Condition 67, the WSLRA is completed every 3 years during mine operation. Results to date indicate that the Meadowbank mine does not appear to be contributing significant incremental risk to wildlife from consumption of chemical contaminants.

In 2016, AEM submitted an Environmental Impact Statement (EIS) to NIRB for the Whale Tail Pit satellite deposit, located approximately 50 km north of the main Meadowbank mine site. The EIS includes an assessment of risk for wildlife in the Whale Tail Pit area under baseline conditions and the post-development scenario. Results indicated that:

> "All concentrations in soil met their respective screening values and/or baseline plus 10%; as a result, no COPCs were retained in soil and no residual impacts due to changes to soil quality were identified. Furthermore, given that no COPCs were identified for soil, no residual impacts to vegetation quality were identified. This result is consistent with the results of the conclusions of the previous risk assessments conducted at the Meadowbank Mine."
>
> "Given that no COPCs were identified in soil (Section 4.3), concentrations of chemicals in prey items (i.e., plants and animals consumed as prey) were not anticipated to change. As a result, prey items were not assessed further with respect to potential wildlife health effects and no residual health impacts due to changes to prey item quality were identified."

Nevertheless, due to stakeholder concerns with contaminant loadings due to dust, this plan presents the assessment approach and methodology that will continue to be used to assess potential risk to wildlife from chemical contaminants as a result of operations at the Meadowbank site as well as the Whale Tail Pit satellite deposit.

1.2 GENERAL APPROACH

The goal of the WSLRA is to determine whether there are potential risks to wildlife from the identified contaminants of potential concern (COPCs) under operational conditions. The general approach includes the common risk assessment components of problem formulation, exposure assessment, hazard assessment and risk characterization. In particular, assessments will aim to distinguish risk

due to operation of the mine from risk due to background conditions by taking soil and vegetation samples at on-site, near-site, AWAR, Whale Tail site, Whale Tail haul road, and reference locations.

Risk assessments will follow a hazard quotient approach, and are based on food-chain modeling developed by Azimuth Consulting Group Inc. for the baseline wildlife screening level risk assessment at the Meadowbank site (Azimuth, 2006). The risk assessment framework used by Azimuth was taken from various Canadian and American sources (Environment Canada, 1994; CCME, 1996; BCE, 1998; US EPA, 1992, 1998). The exposure assessment stage will be updated with field data collected in each assessment year. Toxicity reference values (TRVs) will be continually compared to those used in similar risk assessments in the Kiggavik region and published databases.

2 PROBLEM FORMULATION

2.1 LOCATION DESCRIPTION

The main Meadowbank site is located 70 km north of the hamlet of Baker Lake, Nunavut, near the border of the Northern and Southern Arctic ecozones. Terrain in the Meadowbank area is typical barren-ground subarctic, with low-growing vegetation in poorly developed soil with continuous permafrost. The landscape is dominated by many interconnected lakes and isolated ponds with indistinct drainage patterns. Topography consists of rolling hills, boulder fields and bedrock outcrops. The main mine site is located at the headwaters of the Quioch River system, which flows southeast through Chesterfield Inlet into Hudson Bay. Lakes in this region are ultra-oligotrophic, with low productivity levels. This region supports few terrestrial mammals (15 species) and birds (62 species) (Azimuth, 2006). Migratory species (primarily caribou and Canada geese) are present.

2.2 SITE FACILITIES

The Meadowbank project consists of several gold-bearing open-pit deposits (Portage, Goose, Vault, and Whale Tail). Much of the infrastructure is located in close proximity to the mill and mine facilities, with the exception for the Vault Pit which is approximately 10 km northeast of the site, and the Whale Tail Pit which is approximately 50 km northwest of the site.

Waste rock from the pits are stored in the Portage Waste Rock Storage Facility, Vault Waste Rock Storage Facility, and Whale Tail Waste Rock Storage Facility (RSFs). Rock Storage Facilities are constructed to minimize the disturbed area and will be capped with a layer of non-potentially acid-generating rock (NPAG). During the construction period, NPAG is also used for construction of dikes and roads. Mined ore is either processed in the mill or stockpiled for eventual processing.

Tailings are stored in the Tailings Storage Facility (TFS) adjacent to the main minesite. The TSF is defined by the series of dikes built around and across the basin of the dewatered northwest arm of Second Portage Lake. Tailings water is reclaimed for use in ore processing.

An onsite airstrip supports transportation of goods and personnel to and from the Meadowbank site by jet. A 110-km All Weather Access Road (AWAR) runs between the main minesite and the hamlet of Baker Lake, where AEM maintains a bulk fuel storage and barge facility. The Vault Pit is connected to the main minesite by a 10-km haul road, and the Whale Tail Pit satellite deposit will be connected by a 62-km haul road.

2.3 SOURCES OF CONTAMINANTS

Major mine site operations and their potential to contribute to COPCs (based on Azimuth, 2006) are summarized here.

Open pits – Along with ore, pits produce waste rock, which may contribute to COPCs through dust emissions.

Rock storage facilities – Waste rock (not containing ore) is moved to these areas. Dust may be blown from the rock piles during dumping and vehicle traffic during transport of material. Seepage from rock storage facilities is controlled in sumps and pumped back to attenuation ponds or the TSF.

Borrow pits and quarries – Borrow pits and quarries are used as necessary for the construction of mine site roads and the airstrip. The COPCs for borrow pits and quarries are similar to open pits.

Tailings Storage Facilities (TSF) – The northwest arm of Second Portage Lake was partitioned off by the East Dike and de-watered from 2009 to 2012. The northwestern portion of this area was further partitioned by the Stormwater Dike to create the North and South Cell TSF. Although permafrost is expected to freeze the tailings, the material is fine-grained and could be a source of dust emissions during dry periods.

Roads and airstrip – Frequently used gravel haul roads run throughout the mine site to connect pits, waste rock storage and processing facilities. An airstrip, receiving approximately 4 planes per week, was built at the mine site to receive deliveries and personnel. Dust from these sources could be a potential source of contaminants. A 110 km long all weather access road (AWAR) was constructed between the mine and the Hamlet of Baker Lake, using gravel from quarries along the road.

Effluent discharge – De-watering of lakes for pit development or TSF construction is considered effluent discharge and is regulated under the current NWB Water License. Lake water is treated for suspended solids removal before discharge, and since it is an existing surface water source, it is not likely to be a source of contaminants in the receiving water. Effluent is also periodically discharged from attenuation ponds into adjacent lakes, under NWB Water License and MMER requirements. As a result, metals regulated under MMER are considered as COPCs.

Diesel generating plant, mine mill plant and associated facilities – Three diesel generating plants provide power for the mine. The Air Quality Impact Assessment (2005) determined emission of PAHs was “very low” and did not require modeling. The milling of rock in the processing plant takes place under wet conditions, and is not a source of particulate emissions. All health and safety-related requirements to reduce particulate emissions during handling of the ore at the mine plant before processing are met, so these are not expected to be a significant source of contaminants.

Overall, roads, waste rock and tailings were determined to be the main sources potentially contributing to COPCs through dust emissions. Dewatering effluent discharge may potentially contribute to COPCs in water sources.

2.4 CONTAMINANTS OF POTENTIAL CONCERN (COPCS)

In the baseline WSLRA, Azimuth (2006) identified COPCs for the main minesite area based on the chemical composition of the identified dust sources, the predicted effects of effluent on water quality in Third Portage Lake (from Golder, 2005), and a review of metals regulated under MMER (see Azimuth, 2006, Section 2.5 for details). No terrestrial wildlife COPCs were identified in the Whale Tail Pit FEIS (Golder, 2016).

Projected concentrations of metals in four dust sources (roads, waste rock and tailings) that exceeded the 90th centile of baseline soil concentrations or the CCME guidelines (CCME 1999, 2001) were included as COPCs for the main minesite. Five metals regulated under MMER (arsenic, copper, lead, nickel and zinc) were also included in the assessment. Although mercury was not predicted to exceed baseline soil concentrations or CCME criteria, it was included because it was found to be of concern to the general public in the Arctic.

Methods for Whale Tail COPC determination

The COPCs for this assessment are therefore comprised of:

Antimony	Lead	Tin
Arsenic	Manganese	Uranium
Barium	Mercury	Vanadium
Beryllium	Molybdenum	Zinc
Cadmium	Nickel	
Chromium	Selenium	
Cobalt	Strontium*	
Copper	Thallium	

Certain chemicals which are controlled through best management practices and which were not addressed in the baseline SLRA include petroleum hydrocarbons, process chemicals, dioxins, nitrates, ammonia and PAHs. For each source of these chemicals, best management practices are in place and environmental exposures are not expected to occur.

2.5 RECEPTORS OF CONCERN

The WSLRA considers four Receptors of Concern (ROCs): ungulates, small mammals, waterfowl and songbirds. These choices were determined from the project's initial EIA, which included discussions with stakeholders, public meetings, traditional knowledge and experience from other mines. Specifically, the WSLRA focuses on caribou, Canada goose, Lapland longspur and northern red-backed vole as representative species. An ecological description of the area and detailed descriptions of the biology of each of these receptors can be found in Azimuth (2006). Receptor-specific values such as dietary preferences that are used in this assessment are further discussed in Section 3.1 (Table 3-1).

Separate characterizations are conducted for the main minesite, near-site, AWAR, Whale Tail pit, Whale Tail haul road, and external reference locations for northern red-backed vole, Lapland longspur and Canada goose because these species have small territories when not migrating and would not be expected to move between the sampling areas. Main minesite and near-site samples are combined for the caribou risk characterization, because it is assumed that when caribou are present they can readily move between these sampling locations. See Section 3.4 for a discussion of how residence time in each area is handled as a dose-adjustment factor.

2.6 PROTECTION GOALS AND ENDPOINTS

Since the ROCs identified are not rare or endangered species, protection at the population level was determined to be appropriate (Azimuth, 2006). The assessment endpoint is no adverse effect of COPCs on populations of caribou, Canada goose, Lapland longspur and northern red-backed vole.

The measurement endpoints will be calculated as exposure to the COPCs through ingestion of soil, water and food items. Ingested concentrations will be compared to literature-based ecotoxicological benchmarks equivalent to maximum acceptable exposure levels for each ROC. Specifically, the ecotoxicological benchmarks will be lowest observable adverse effect levels (LOAELs), which are generally considered to be appropriate for determining risk at the population level (Azimuth, 2006). Sample et al. (1996) provided TRVs for most of the COPCs, but values for antimony, cobalt, and thallium were obtained from other sources (see Appendix B).

2.7 EXPOSURE PATHWAYS

The following exposure pathways will be investigated:

Small mammals – ingestion of plants, insects, water, soil

Ungulates – ingestion of plants, water, soil

Songbirds – ingestion of plants, insects, water, soil

Waterfowl - ingestion of plants, insects, water, soil

Inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005), so they are not considered here.

3 EXPOSURE ASSESSMENT

Exposure assessment is used to calculate the dose of each COPC received by each ROC. The exposure assessment uses the food chain model developed by Azimuth (2006), and provided in Excel format. The model was developed to include the influence of COPC concentrations in exposure pathways, dietary preferences, ingestion rates and dose-adjustment factors. Estimated daily intake of each COPCs is calculated for each study area (main minesite, near-site, AWAR, Whale Tail site, Whale Tail haul road, external reference) as:

$$EDI = [\sum (I_{w,s,f} \times C_{w,s,f}) \times BF \times T]_{study} + [\sum (I_{w,s,f} \times C_{w,s,f}) \times BF \times T]_{ext\ ref}$$

Where:

EDI = estimated daily intake (mg/kg body weight/day)

$I_{w,s,f}$ = intake of water, soil and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

$C_{w,s,f}$ = concentration of COPC in water, soil and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

BF = biotransfer factor (absorption factor)

T = proportion of time in area

Each component is described below, and an example calculation is provided in Appendix A.

3.1 INTAKE OF WATER, SOIL AND FOOD

Water, food and soil ingestion rates used in the assessments are shown in Table 3-1. All intake parameters are considered to be conservative. Water and food ingestion rates were derived from USEPA (1993). Soil ingestion rates for Canada goose and Northern red-backed vole are also from USEPA (1993). Although Beyer et al. (1994) was referenced as the source of most soil ingestion rates in the Meadowbank baseline assessment, the species chosen to represent caribou and Lapland longspur were not indicated. The soil consumption rate for caribou was increased in subsequent Meadowbank assessments and here from 2% of dry food consumption to 5%, which is the general rate for mammals in Beyer et al. (1994), as used in (Senes, 2008). The soil ingestion rate for Lapland longspur was increased from 2% to 7%, based on Hansen et al. (2011). This study identified a rate of 0.7% for Swainson's thrush, a ground-dwelling songbird that primarily feeds on flying insects and berries. A 10x safety factor was applied because Swainson's thrush is a foliage-gleaner, while Lapland longspur is considered a ground-forager (Cornell University, 2011). This factor is considered to be conservative however, because Lapland longspur does not scratch the ground to uncover food items as other ground foragers do (Harrison 1967, Greenslaw 1977).

Table 3-1. Body weight (BW), water intake (I_{water}), soil intake (I_{soil}), and wet and dry (I_{food}; FI) food intake for the identified ROCs.

Parameter	Units	Value	Reference	Notes
Northern Red-backed Vole				
BW	kg wet	0.02	Nagorsen (2005)	Smallest body weight used
I_{water}	L/kg wet/day	0.253	USEPA (1993)	Species profile data for the Prairie Vole
I_{soil}	kg dry/kg wet/day	0.0008	USEPA (1993)	Assumed 2.4% of dry food ingestion rate (similar to Meadow Vole)
I_{food}	kg wet/kg wet/day	0.135	USEPA (1993)	Species profile data for the Prairie Vole
FI	kg dry/kg wet/day	0.049	Not available	Moisture in food assumed to be 64% as per diet moisture calculation
Caribou				
BW	kg wet	75	Dauphine (1976)	Smallest body weight used
I_{water}	L/kg wet/day	0.064	USEPA (1993)	Based on allometric equation for all mammals (L/day) $(0.099*(BW)^{0.90})$
I_{soil}	kg dry/kg wet/day	0.0013	Beyer et al. (1994)	Assumed 5% of dry food ingestion rate (general rate for mammals)
I_{food}	kg wet/kg wet/day	0.047	Not available	Moisture in food assumed to be 43% as per diet moisture calculation
FI	kg dry/kg wet/day	0.027	USEPA (1993)	Based on total dry food intake for herbivorous mammals (g/day) $(0.577*(BW)^{0.727})$
Lapland Longspur				
BW	kg wet	0.023	Cornell University (2011)	Smallest body weight used
I_{water}	L/kg wet/day	0.205	USEPA (1993)	Based on allometric equation for all birds (L/day) $(0.059*(BW)^{0.67})$
I_{soil}	kg dry/kg wet/day	0.0174	Hansen et al. (2011)	Assumed 7% of dry food ingestion rate (rate of Swainson's thrush +10x safety factor)
I_{food}	kg wet/kg wet/day	0.656	USEPA (1993)	Moisture in food of insectivorous birds; assumed 62% as per diet moisture calculation
FI	kg dry/kg wet/day	0.249	USEPA (1993)	Based on total dry food intake for passerine birds (g/day) $(0.398*(BW)^{0.850})$
Canada Goose				
BW	kg wet	2.000	Mowbray et al. (2002)	Smallest body weight used
I_{water}	L/kg wet/day	0.044	USEPA (1993)	Species profile data for Canada Goose
I_{soil}	kg dry/kg wet/day	0.0006	USEPA (1993)	Assumed 8.2% of dry food ingestion rate
I_{food}	kg wet/kg wet/day	0.032	USEPA (1993)	Species profile data for Canada Goose
FI	kg dry/kg wet/day	0.011	Not available	Moisture in food assumed to be 66% as per diet moisture calculation

3.2 DIETARY CONCENTRATIONS OF COPCS

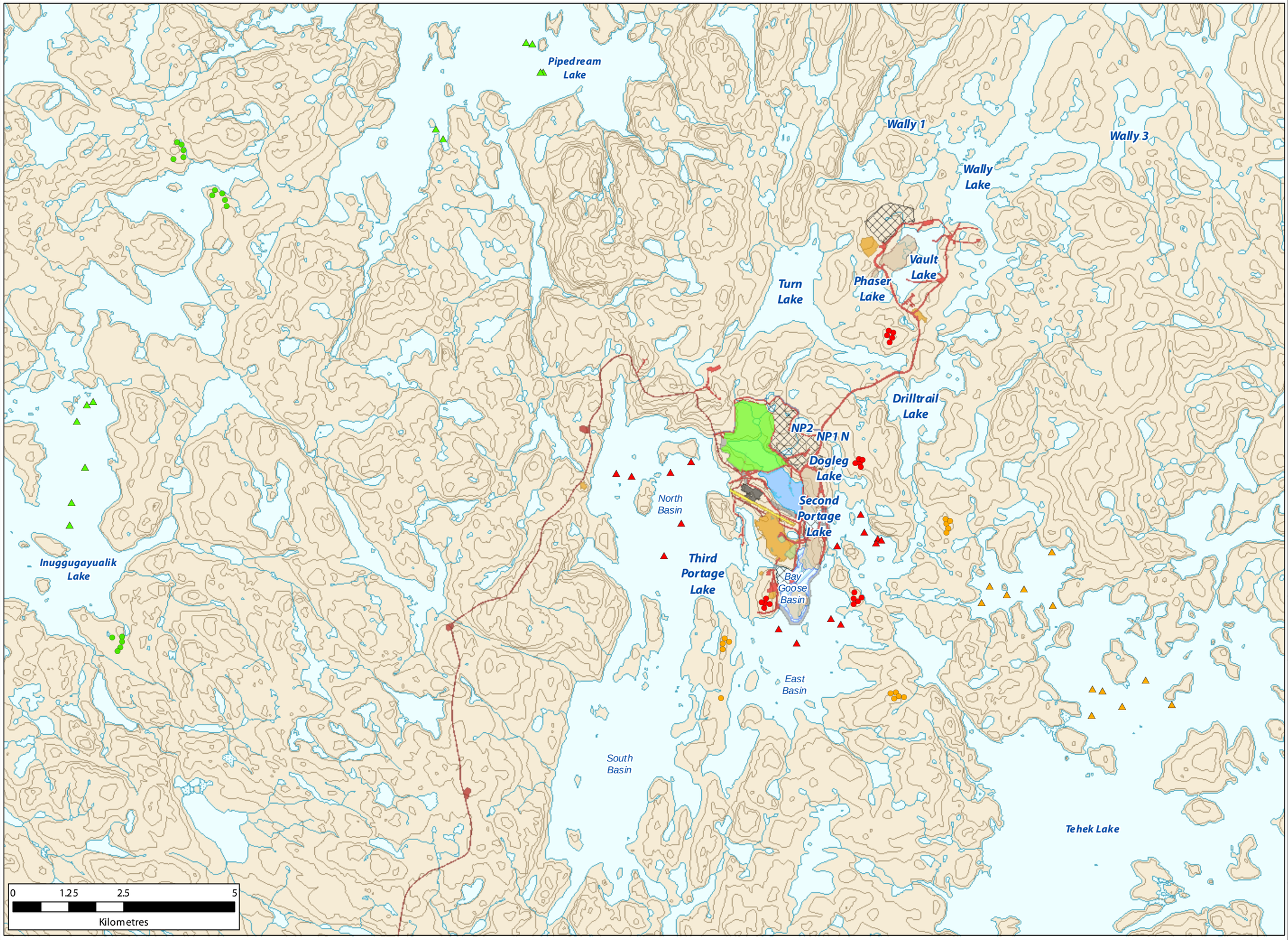
Concentrations of COPCs will be measured in and around the Meadowbank site in water, soil and plant tissue (food items: sedges, lichens, berries) in assessment years. This includes five samples of each media type from four onsite locations, three near-site locations, one AWAR location, two Whale Tail Pit locations, one Whale Tail Haul Road location, and three external reference locations. An SOP for methods of collection along with UTM coordinates is provided in Appendix C.

Water samples from the Core Receiving Environment Monitoring Program (CREMP) data collection will be used in the WSLRA analyses. Main minesite concentrations will be from samples collected in Second Portage Lake (SPL) and the east and north basins of Third Portage Lake (TPE, TPN). Near-site concentrations will be from samples collected in Tehek Lake (TE). Whale Tail concentrations will be from samples collected in Whale Tail Lake (South basin) and Mammoth Lake. External reference samples are from Inuggugayualik Lake (INUG) and Pipedream Lake (PDL). Exact coordinates are subject to slight changes each year – see CREMP Plan (Azimuth, 2015) for details.

All locations for the main Meadowbank site are shown on Figure 3-1 and coordinates for soil and vegetation samples are provided in Appendix C. Specific locations for the Whale Tail site and along the haul road will be determined following ground-truthing, but will target locations up to 5 km downwind (to the south/southeast) of site activity, and will include one location on the downwind side of the haul road. The general approach for selecting these sites will be consistent with a near-field/ far-field approach used for the main Meadowbank Mine site since 2008 and illustrated in Figure 3-1.

Concentrations in soil and plant tissue used for food chain modeling will be the upper 95% confidence limit of the mean (UCLM). If values are below the detection limit, a value of ½ the detection limit will be used. Based on published literature, methyl mercury is assumed to comprise 1% of total mercury in water and soil, and 34% of total mercury in plant tissue, and inorganic mercury = total – methyl mercury (Azimuth, 2006).

Concentrations of COPCs in insects are not planned to be measured, but will be modeled from soil concentrations using published bioaccumulation models (see Azimuth, 2006). This method is particularly conservative, because the modeled factors are for ground insects whereas the songbird population in this assessment consumes primarily flying insects.



Legend

Soil/Veg Sampling Location

- Onsite
- Near Site
- External Reference

Water Sampling Locations

- Onsite
- Near Site
- External Reference

2014 Mine Plan

- Quarry
- AWPAR Quarry
- Dewatered Lake
- Portage Attenuation Facility
- Tailings Storage Facility
- Roads
- AWPAR
- Dikes
- Diversion Ditch
- Stockpiles
- Pits
- Facility
- Airstrip
- Waste Dump

Wildlife Screening Level Risk Assessment

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3
T 519.822.1609 • F 519.822.5389 • www.dougan.ca

PROJECT: DA11-062-03

CLIENT: Agnico-Eagle Mines Ltd., Meadowbank Div.

N W E S
UTM Zone 14 NAD83

DATE: MARCH 2015

SCALE: 1:80,000

DRAWN BY: LW

CHECKED BY:MAY

FIGURE:

3-1

3.2.1 Dietary Preferences

The proportions of food items (sedge, lichen, berries, insects) that comprise each diet were determined by Azimuth (2006) using the literature reviews referred to in Section 2.6. Similar values have been used in another recent risk assessment (Senes, 2008) and all dietary preferences presented in Azimuth (2006) will be used in subsequent assessments (Table 3-2). Consistent with Azimuth (2006), sedges, lichens and berries will be considered surrogates for all plant matter ingested by the ROCs.

Table 3-2. Estimated dietary preferences for the receptors of concern at the Meadowbank site. From Azimuth, 2006.

Dietary Item	Northern red-backed vole	Caribou	Lapland longspur	Canada goose
Sedges	55%	30%	25%	50%
Lichens	0%	65%	0%	0%
Berries	40%	5%	5%	45%
Insects	5%	0%	70%	5%
Total	100%	100%	100%	100%

3.3 BIOTRANSFER FACTOR

The uptake efficiency factor (biotransfer or absorption factor) describes the proportion of the COPC that is absorbed into the animal from any ingested sources. Uptake efficiency was conservatively assumed to be 100% for all COPC/receptor combinations. This is likely an extremely conservative assumption; for example, chromium compounds were found to have a maximum absorption efficiency of 10% in the GI tract (Outridge and Scheuhammer, 1993).

3.4 TIME IN AREA

Territory size (foraging range) affects the proportion of an animal's diet that could be affected by mine-related contaminants. In the baseline assessment for Meadowbank (Azimuth, 2006), an adjustment factor for foraging range was not applied (animals were assumed to spend 100% of time in the study area). For subsequent assessments, the only ROC assumed to spend 100% of its time in any study area will be the northern red-backed vole, because of its small territory size. Caribou, Canada geese and Lapland longspur are migratory species, and the fraction of time spent in each study area (main minesite, near-site, AWAR, Whale Tail site, Whale Tail Haul Road) is estimated at 33%, based on a recent risk assessment completed in the Kivalliq region (Senes, 2008). The remaining fraction of exposure dose (67%) will be calculated based on external reference samples. An examination of collared caribou from the Meadowbank region found that any one animal spent no more than a maximum of 12% of the year within 25 km of the minesite (Martin Gebauer and Jason Shaw, personal communication, March 2012), so the assumption of 33% is expected to be conservative. Risk will be characterized for small-territory ROCs Northern red-backed vole, Canada

geese and Lapland longspur for main minesite, near-site, AWAR, Whale Tail Pit, Whale Tail Haul Road, and external reference locations separately, in order to determine whether those animals choosing territories on the mine-site are at increased risk compared to those choosing territories at nearby locations. Exposure data for main minesite and near-site locations will be combined for caribou because caribou can readily roam between the onsite and near-site locations in the course of a day.

4 TOXICITY ASSESSMENT

The toxicity reference values (TRVs) used in the Meadowbank assessments were collated from a review of the literature; mainly from Sample et al. (1996). This represents one of the most comprehensive and commonly used sources available for wildlife toxicity reference values and has been used in other recent similar assessments (e.g. Senes, 2008). In order to ensure the selected TRVs were relevant to the Meadowbank site and the conditions of that risk assessment, several criteria were used in the baseline assessment in screening toxicity studies. These included selecting values from studies conducted on species of similar phylogeny (i.e. bird or mammal), and selecting studies that examined individual or population-level effects over chronic time periods. The following describes TRV selection, as performed by Azimuth (2006):

> The TRVs chosen for use in the risk characterization include both no observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) when available. If effects concentrations were reported in terms of food concentrations, these were converted to dose. If a LOAEL was reported but no NOAEL could be determined, it was estimated as 1% of the LOAEL (as in Sample et al. 1996, Chapman et al. 1998). LOAELs cannot be estimated if only a NOAEL is available. Since the protection goal of this risk assessment no adverse effect of COPCs on populations of the ROCs, LOAELs are the most relevant TRV, and are used in the final risk estimate.
>
> Instead of species-to-species uncertainty factors, the baseline assessment used allometric scaling factors (Sample et al. 1996) to adjust mammalian TRVs from the test species (typically mouse or rat) to the ROC. A scaling factor of 1 was used for birds (Mineau et al. 1996).
>
> Where toxicity information was found for multiple forms of a contaminant, the one with the greatest toxic potency was chosen. TRVs for chromium-VI were available for mammals, but only chromium-III was available for birds. No NOAELs or LOAELs were available for total mercury. Mammalian LOAELs were not available for inorganic mercury or beryllium. Avian LOAELs were not available for uranium or vanadium. Avian NOAELs were not available for antimony and beryllium and were extrapolated from the mammalian values. The avian LOAEL for antimony was extrapolated from the mammalian value.

5 RISK CHARACTERIZATION

5.1 HAZARD QUOTIENTS

Risk characterization compares predicted exposure concentrations with the toxicity reference values from the literature, using the hazard quotient approach. Hazard quotients for all locations (main minesite, near-site, AWAR, Whale Tail Pit, Whale Tail Haul Road, and external reference) will be calculated as:

$$HQ = EDI / TRV$$

Where:

EDI = estimated daily intake (ug/kg body weight/day)

TRV = toxicity reference value (ug/kg body weight/day)

See Appendix A for an example calculation and Appendix B for all TRVs to be used in assessments for Meadowbank. As discussed above, the TRV to be used is represented by the LOAEL, unless only a NOAEL was available (indicated).

Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk. A hazard quotient > 1 indicates the possible need for more in-depth assessment, including analysis of assumptions used. However, when HQ values exceed 1 for both the baseline (or external reference) and the study areas, and are of similar magnitude, it may be assumed that the receptor is adapted to the measured exposure level, or that the assumptions used in calculating the HQ have resulted in an over-estimation of risk (Dominion Diamond, 2015).

HQ values and a characterization of risk for each ROC will be provided in the assessment report.

5.2 UNCERTAINTY ASSESSMENT

The assumptions included in each section of the assessment are discussed here, along with implications for over- or under-estimating risk.

5.2.1 Uncertainty in Exposure Assessment

ROCs used in the assessment are assumed to represent categories of species (e.g. ungulates, small mammals, waterfowl, song birds) that are found around the Meadowbank site. Exposure is assumed to be similar for other species in these categories. Compared to other Arctic animals, the exposure for the species chosen is expected to be realistic to conservative, because they all are assumed to forage in or on the soil.

Exposure concentrations in environmental media are assumed to be represented by the 95$^{\%}$ UCLM of the measured concentrations. Since animals would be more likely to ingest food sources with a range of COPC concentrations, this is a conservative assumption.

Ingestion rates are applied using published values for similar but not identical species. Based on biological factors, these rates were chosen to be conservative.

Dietary preferences are from studies on the same or similar species, but are not from populations specifically inhabiting the study region.

It is assumed that flying insects accumulate the same proportion of metals from soil as ground-dwelling insects, because no flying insect BAFs were available. This assumption likely results in an over-estimation of risk for ROCs who primarily consume flying insects (Lapland longspur).

Absorption of COPCs in the gastrointestinal tract was assumed to be 100%. This assumption likely results in an over-estimation of risk for all COPCs/ROC combinations.

Methyl mercury proportions of total mercury concentrations are estimated from the available literature using the UCLM from two studies (Azimuth, 2006). While there is an unknown degree of uncertainty in the extrapolation of this data for use at the Meadowbank site, the fractions chosen were at the highest end of the published range, and are therefore designed to be conservative. Furthermore, mercury was included as a COPC because it was found to be of concern to the general public in the Arctic, and no source of elevated mercury was identified at the mine.

Ingestion of COPCs was the only route of exposure considered in this assessment. While this assumption may slightly under-estimate actual exposure, inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005).

5.2.2 Uncertainty in Toxicity Assessment

TRVs are not available for the ROCs considered in this assessment and species-to-species extrapolations are necessary. This includes allometric scaling for mammals, 1:1 scaling for birds, and the application of uncertainty factors in mammal-to-avian extrapolation. Food intake-to-body weight ratios are well studied and uncertainty factors are designed to be protective, so these extrapolations are likely to be realistic or conservative.

As is common in screening level risk assessments, the estimation of risk is for each COPC in isolation, and does not consider potential additive, synergistic or antagonistic reactions. Models for determining mixture toxicity of a large suite of metals are not yet widely available, and guideline values are for single compounds only. This factor may lead to under-estimation of actual risk from metals overall, but the otherwise conservative nature of an SLRA is assumed to compensate for this issue.

6 REPORTING AND ADAPTIVE MANAGEMENT

The SLRA for the Meadowbank Mine (including the Whale Tail Pit) will evaluate risks to wildlife from contaminant exposure in and around the mine site every three years during operation, and results will be reported to NIRB in the context of AEM's Annual Report for the Meadowbank site.

Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk (HQ <1). In the case that hazard quotients exceed 1 and differ substantially (generally, by more than an order of magnitude) between mine-related and reference and/or baseline sites for a certain COPC, incremental risk due to mine operation will be classified as potentially unacceptable and more detailed investigations will be initiated. This may include a desk-top review and refining of the assessment parameters, and/or additional sampling in the subsequent year to confirm results. In the case that results of refined assessments continue to indicate unacceptable risk, adaptive management may include such interventions as capping of dust sources, increased road watering, delineation of contaminated areas, and deterrence methods pending reclamation.

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Appendix A

Example Calculation

Exposure of Lapland longspur to Pb (main minesite area)

Exposure Assessment

$$EDI = T_{onsite}(DS_{onsite} + DW_{onsite} + DF_{onsite}) + T_{ref}(DS_{ref} + DW_{ref} + DF_{ref})$$

Where:

EDI = estimated daily intake of COPC

T_{onsite} = fraction of time in study area (i.e. onsite) = 33%

T_{ref} = remaining fraction of time = 67% (remainder of exposure based on external reference concentrations)

DS = dose from incidental soil ingestion

I_{soil} = intake of soil

DW = dose from drinking water

I_{water} = intake of water

DF = dose from food

I_{food} = intake of food

$Pb_{(media)}$ = measured concentration of lead in media (95% UCLM of onsite or external reference values, accordingly)

Example:

DS_{onsite} (mg/kg ww/d) = Pb_{soil}* (mg/kg dw) * I_{soil} (mg dw/kg ww/d)

= 11.23 * 0.0174

= 0.195

DW_{onsite} (mg/kg ww/d) = Pb_{water} (mg/L) * I_{water} (L/kg ww/d)

= 0.00 * 0.205

= 0.00

DF_{onsite} (mg/kg ww/d) = Pb_{sedge} (mg/kg ww)*25% + Pb_{lichen} (mg/kg ww)*0% + $Pb_{berries}$ (mg/kg ww)*5% + $Pb_{insects}$ (mg/kg ww)*70% * I_{food} (kg ww/kg ww/d)

= 0.35*25% + 1.68*0% + 0.03*5% + 0.37*70% * 0.656

= 0.228

DS_{ref} (mg/kg ww/d) = Pb_{soil} (mg/kg dw) * I_{soil} (mg dw/kg ww/d)

= 8.757 * 0.0174

= 0.152

DW_{ref} (mg/kg ww/d) = Pb_{water} (mg/L) * I_{water} (L/kg ww/d)

= 0.00 * 0.205

= 0.00

DF_{ref} (mg/kg ww/d) = Pb_{sedge} (mg/kg ww)*25% + Pb_{lichen} (mg/kg ww)*0% + $Pb_{berries}$ (mg/kg ww)*5% + $Pb_{insects}$ (mg/kg ww)*70% * I_{food} (kg ww/kg ww/d)

= 1.01*25% + 2.85*0% + 0.02*5% + 0.31*70% * 0.656

= 0.309

EDI_{Pb} (mg/kg ww/d) = 33%(0.195 + 0.00 + 0.228) + 67%(0.152 + 0.00 + 0.309)

= 0.45

Risk Characterization

HQ = EDI (mg/kg ww/d) / LOAEL-based TRV (mg/kg ww/d)**

= 0.45 / 11.30

= 0.04

**see values in Appendix B

Appendix B

Toxicity Reference Values
From Azimuth (2006)

Parameter				Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]
TRVs for Mammals (see allometric scaling equation in footnotes)													
	NOAEL-based TRV:	Test Species		Mouse	Mouse	Rat	Rat	Rat	Rat	Rat	Mink	Rat	Rat
		BW_{NOAEL}(kg wet)		0.03	0.03	0.435	0.35	0.303	0.35	0.15	1	0.35	0.35
		NOAEL (mg/kg wet/day)		98.0	0.126	5.1	0.66	1	3.28	0.2	11.7	8	88
	LOAEL-based TRV:	Test Species		Rat	Mouse	Rat	na	Rat	Rat	Rabbit	Mink	Rat	Rat
		BW_{LOAEL}(kg wet)		0.27	0.03	0.35	na	0.303	0.35	3	1	0.35	0.35
		LOAEL (mg/kg wet/day)		112.9	1.26	19.8	na	10	13.14	2	15.14	80	284
TRVs for Birds (allometric scaling factor of 1 was assumed; see footnotes)													
	NOAEL-based TRV:	Test Species		Rat (see above)	Brown-headed cowbird	Chicken	Rat (see above)	Mallard	Black duck	Pek. Duckling	Chicken	Japanese quail	Japanese quail
		NOAEL (mg/kg wet/day)		9.8	2.5	21	0.066	1.5	1	2.37	47	1.13	977
	LOAEL-based TRV:	Test Species		Rat (see above)	Brown-headed cowbird	Chicken	na	Mallard	Black duck	Pek. Duckling	Chicken	Japanese quail	na
		LOAEL (mg/kg wet/day)		11.29	7.4	42	na	20	5	4.74	62	11.3	na
	Wildlife Species	**Body Weight (kg wet)**											
Mammals	Northern Red-backed Vole	0.02	NOAEL	108.5	0.1	11.0	1.3	2.0	6.7	0.3	31.1	16.4	180.0
	Northern Red-backed Vole	0.02	LOAEL	216.4	1.4	40.5	na	19.7	26.9	7.0	40.3	163.6	580.9
	Caribou	75	NOAEL	13.9	0.0	1.4	0.2	0.3	0.9	0.0	4.0	2.1	23.0
	Caribou	75	LOAEL	27.7	0.2	5.2	na	2.5	3.4	0.9	5.1	20.9	74.2
Birds	Lapland Longspur	0.023	NOAEL	9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0
	Lapland Longspur	0.023	LOAEL	11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na
	Canada Goose	2	NOAEL	9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0
	Canada Goose	2	LOAEL	11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na

Notes:

Based on Sample et al. (1996), the following allometric equation was used for interspecies extrapolations among mammals: $NOAEL_w = NOAEL_{ts} * (BW_{ts}/BW_w)^{0.25}$; the equation also applies to the LOAEL

Based on Sample et al. (1996), an allometric scaling factor of 1 was considered appropriate for interspecies extrapolations among birds

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] Sample et al. (1996)
[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see text for discussion)
[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)
[4] LOAEL from Rossi et al. (1987)
[5] Mammals TRV based on chromium VI; bird TRV based on chromium III
[6] Ueberschar et al. (1986)
[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

Parameter				Total Hg	Inorg-Hg[1]	MeHg[1]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]
TRVs for Mammals (see allometric scaling equation in footnotes)															
	NOAEL-based TRV:	Test Species		na	Mink	Mink	Mouse	Rat	Rat	Rat	Rat	Mouse	Mouse	Rat	Rat
		BW_{NOAEL}(kg wet)		na	1	1	0.03	0.35	0.35	0.35	0.365	0.03	0.028	0.26	0.35
		NOAEL (mg/kg wet/day)		na	1	0.015	0.26	40	0.2	263	0.0074	23.4	3.07	0.21	160
	LOAEL-based TRV:	Test Species		na	Mink	Mink	Mouse	Rat	Rat	na	Rat	Mouse	Mouse	Rat	Rat
		BW_{LOAEL}(kg wet)		na	1	1	0.03	0.35	0.35	na	0.365	0.03	0.028	0.26	0.35
		LOAEL (mg/kg wet/day)		na	na	0.025	2.6	80	0.33	na	0.074	35	6.13	2.1	320
TRVs for Birds (allometric scaling factor of 1 was assumed; see footnotes)															
	NOAEL-based TRV:	Test Species		na	Japanese quail	Mallard	Chicken	Mallard	Mallard	Rat (see above)	Chicken	Japanese quail	Black duck	Mallard	White leghorn hen
		NOAEL (mg/kg wet/day)		na	0.45	0.0064	3.53	77.4	0.4	26.3	0.202	6.8	16	11.4	14.5
	LOAEL-based TRV:	Test Species		na	Japanese quail	Mallard	Chicken	Mallard	Mallard	na	Chicken	Japanese quail	Black duck	Mallard	White leghorn hen
		LOAEL (mg/kg wet/day)		na	0.9	0.064	35.3	107	0.8	na	0.757	16.9	na	na	131
	Wildlife Species	**Body Weight (kg wet)**													
Mammals	Northern Red-backed Vole	0.02	NOAEL	na	2.7	0.0	0.3	81.8	0.4	537.9	0.0	25.9	3.3	0.4	327.2
	Northern Red-backed Vole	0.02	LOAEL	na	na	0.1	2.9	163.6	0.7	na	0.2	38.7	6.7	4.0	654.5
	Caribou	75	NOAEL	na	0.3	0.0	0.0	10.5	0.1	68.7	0.0	3.3	0.4	0.1	41.8
	Caribou	75	LOAEL	na	na	0.0	0.4	20.9	0.1	na	0.0	4.9	0.9	0.5	83.6
Birds	Lapland Longspur	0.023	NOAEL	na	0.5	0.0	3.5	77.4	0.4	26.3	0.2	6.8	16.0	11.4	14.5
	Lapland Longspur	0.023	LOAEL	na	0.9	0.1	35.3	107.0	0.8	na	0.8	16.9	na	na	130.9
	Canada Goose	2	NOAEL	na	0.5	0.0	3.5	77.4	0.4	26.3	0.2	6.8	16.0	11.4	14.5
	Canada Goose	2	LOAEL	na	0.9	0.1	35.3	107.0	0.8	na	0.8	16.9	na	na	130.9

Notes:

Based on Sample et al. (1996), the following allometric equation was used for interspecies extrapolations among mammals: $NOAEL_w = NOAEL_{ts} * (BW_{ts}/BW_w)^{0.25}$; the equation also applies to the LOAEL

Based on Sample et al. (1996), an allometric scaling factor of 1 was considered appropriate for interspecies extrapolations among birds

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see text for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III

[6] Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

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Appendix C

Standard Operation Procedure for Soil and Vegetation Sampling Based on Azimuth (2006)

Meadowbank Project - Standard Operating Procedure

Collection of soil and vegetation samples for the Screening Level Risk Assessment program (from Azimuth, 2006)

March, 2016

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1. Sample Locations

Three external reference (control) areas and eleven treatment areas are to be sampled. Control areas were selected northwest and west of the project area, upwind from mine related activities (C-1 to C-3). Treatment areas (main minesite, near-field, AWAR, Whale Tail Pit, Whale Tail Haul Road) were selected to represent wind distribution of contaminants from mining related activities (T-1 to T-11). Within each control and treatment area, five sample sites (S1 to S5) were selected within a 200 to 300 m radius, at least 150 m apart from one another. Within each sample site, composite tissue and soil samples are collected within a 10 to 30 m radius, depending on tissue (particularly berry) availability. UTM coordinates for each sample site are presented in Table 1.

Table 1. UTM coordinates for soil and vegetation sampling locations (NAD 83).

Sampling Area	Site #1	Site #2	Site #3	Site #4	Site #5
T1 – Main minesite	14W 0639238 7215692	14W 0639137 7215734	14W 0639061 7215668	14W 0639109 7215569	14W 0639010 7215459
T2 – Near-site	15W 0359410 7214020	15W 0359403 7214128	15W 0359507 7214072	15W 0359459 7213912	15W 0359391 7213816
T3 – Main minesite	14W 0640069 7212342	14W 0640146 7212421	14W 0639967 7212281	14W 0639976 7212409	14W 0639991 7212541
T4 – Near-site	14W 0640916 7210294	14W 0640994 7210201	14W 0641112 7210194	14W 0640890 7210137	14W 0640802 7210271
T5 – Near-site	14W 0637020 7211270	14W 0636978 7211160	14W 0637013 7211394	14W 0637162 7211419	14W 0637057 7211513
T6 – Main minesite	14W 0638559 7213995	14W 0638651 7213953	14W 0638780 7214028	14W 0638515 7214226	14W 0638400 7214038
T7 – Near-site	14W 0640847 7218280	14W 0640872 7218395	14W 0640755 7218444	14W 0640719 7218338	14W 0640788 7218177
T8 - AWAR	14W 0626884 7200614	14W 0626837 7200520	14W 0626806 7200427	14W 0626746 7200306	14W 0626675 7200224
T9 – Whale Tail Pit	TBD	TBD	TBD	TBD	TBD
T10 – Whale Tail Pit	TBD	TBD	TBD	TBD	TBD
T11 – Whale Tail Haul Road	TBD	TBD	TBD	TBD	TBD
C1 – External Reference	14W 0623453 7211586	14W 0623450 7211467	14W 0623416 7211345	14W 0623339 7211252	14W 0623217 7211558
C2 – External Reference	14W 06255518 7221488	14W 0625569 7221607	14W 0625743 7221542	14W 0625790 7221388	14W 0625825 7221244
C3 – External Reference	14W 0624717 7222685	14W 0624818 7222623	14W 0624850 7222504	14W 0624861 7222349	14W 0624636 7222313

2. Soil Sample Collection

Soil samples will be collected using a composite sampling method at each sample site. Representative grab samples will be collected from five separate test pits per sample site (generally no greater than a 5.0 m^2 area) using a stainless steel ladle. First, the organic layer (which ranges from 0 to 5 cm below the surface) will be removed and discarded. Second, two small scoops of soil, approximately 5-10 cm below surface, will be placed in a pre-labeled Ziploc bag and homogenized. Decontamination (i.e., cleaning to prevent cross-contamination) of soil sampling equipment (i.e. stainless steel spoons) will be conducted at the beginning of each day, between treatment and control areas and between sample site locations. The cleaning procedures will include:

- Rinsing with site water to remove any remaining sediment or organic matter
- Scrubbing with brushes using Liquinox detergent
- A final rinse with site water

3. Tissue Sample Collection

Sedges and lichen samples will be collected in close proximity to the composite soil samples. Sedges will be collected from an approximate 5.0 m^2 area, near the center of the sample site, by randomly selecting and simply grabbing/ pulling representative sedge, periodically including the roots. Samples will be placed in a pre-labeled Ziploc bag. Similarly, lichen tissue samples will be collected by hand and placed in a pre-labeled Ziploc bag. Collection of lichen and sedge should continue until the Ziploc bag is full. Berry collection sites were selected along moderately dry, rolling hills where berries are the most abundant. Approximately 2 cups of berries should be collected per site. No species of berries, sedges and lichen should be sampled preferentially, as each treatment and control area has a different variety and abundance of vegetation.

4. Sample Handling, Documentation and Analyses

4.1 Field Book

During the field-sampling program a field book will be used to maintain a record of sample collection and observations, including:

- field staff
- descriptions of photos taken
- date and time
- weather conditions
- sample identifications
- tissue and soil sample characteristics
- # of samples taken
- sample locations, including GPS coordinates
- sample time
- notes and general observations

The field logbook is intended to provide sufficient information such that personnel may reconstruct events that occurred during the sampling period, without having to rely on field personnel or memory of the individuals.

4.2 Containers and Labeling

Samples will be collected in Ziploc bags for ease of sample collection and prevention of sample destruction and mixing during shipping:

- Soil samples – one (1) 950 mL (18cm x 20cm) Ziploc® bag per soil composite
- Tissue samples – one (1) 950 mL (18cm x 20cm) Ziploc® bag, per berries, sedge, and lichen sample
- Samples will be labeled with the following:
    - Site ID
    - Sample Date and Time
    - Sample ID
    - GPS Coordinates
    - Sample Type
    - Initials of Field Staff

Sample Identification (ID) will be coordinated to accommodate ease of organization and interpretation of analytical results. As an example, the ID for a Treatment Area 1, Site No. 2, Lichen tissue sample could be: T1 S2 Li.

4.3 Tracking, Preservation, Storage and Transportation

Tissue and soil samples will be recorded in the field book following sample collection at each sample site within each area. Chain-of-custody forms will be filled out for transport. Care will be taken to ensure that the sample identification is clearly marked on each bag. A small piece of paper with the sample ID, date and sample type may be placed in the sample bag. Samples will be placed on ice in coolers and shipped, along with the chain of custody records, to an accredited laboratory (typically ALS Laboratories in Vancouver, BC).

4.4 Laboratory Analysis

All soil and tissue analyses will be conducted by a CALA-accredited laboratory (typically ALS Environmental Laboratories in Vancouver, BC). The following laboratory analyses will be requested:

Soil – soil pH and total metals; and

Plant Tissue – Moisture content and total metals.

5. Quality Assurance/Quality Control (QA/QC)

The following recommended sample collection and handling techniques will be employed during collection of vegetation tissue and soil samples:

- Sampling by qualified personnel
- Prevention of foreign material in samples or loss of sample material
- Minimization of sample handling and use of new nitrile or latex gloves during sample collection
- Use of appropriate clean containers and proper storage of samples
- Collection of sufficient sample volumes as specified by the data quality objectives
- Adequate decontamination
- Use of appropriate packaging, ice and shipping methods to ensure that holding times and storage conditions are met.

APPENDIX F

Predatory Mammal Den Management and Protection Plan

BACKGROUND AND PURPOSE

Predatory mammals represent a valued ecosystem component (VEC), which occur and are known to den in the vicinity of the Meadowbank and Whale Tail Project facilities. Sensory disturbances near to active dens such as blasting, vehicles and, most significantly, ground personnel, may negatively impact denning success by inducing stress responses in the adult mammals, which can result in den abandonment.

This plan is applicable to four species:

- Arctic wolf (*Canis lupus*) natal dens
- Grizzly bear (*Ursus arctos*) natal/overwintering dens
- Arctic fox (*Vulpes lagopus*) natal dens
- Wolverine (*Gulo gulo*) natal dens

The purpose of this plan is to provide a framework for identification, characterization, and monitoring of predatory mammal dens in order to protect any detected dens from disturbance throughout exploration and operation activities in the vicinity of all Meadowbank and Whale Tail Project facilities.

MANAGEMENT AND PROTECTION PLAN PROTOCOL

Overview

All observation visits to any active predatory den site must be undertaken with utmost care to avoid disturbing the den. Observations will take place from the greatest possible distance that allows for accurate observation and will employ binoculars and spotting scopes.

Stage 1 – Detection

Detection of predatory mammal dens will be completed using a combination of targeted surveys prior to new construction and ongoing wildlife monitoring during operation.

OPTION A – DURING OPERATION	OPTION B – PRIOR TO CONSTRUCTION
During project facilities operation; Predatory mammal observations, including any indication of denning, will be recorded at any point during operation of project facilities. This detection will be supported by ongoing monitoring activities: road surveys and height-of-land surveys in conjunction with incidental observations by AEM personnel.	**Prior to construction of any new project facilities;** High-suitability denning habitat (i.e. eskers) within 1 km of the project footprint will be investigated for active predatory mammal dens.

If active predatory mammal dens are detected during Option A or Option B of Stage 1 (listed above) then proceed to Stage 2 of the protocol. If no active dens are detected then continue with Stage 1: Option A is ongoing and Option B is to be utilized as needed.

Stage 2 – Identification and Characterization

If an active predatory mammal den has been detected, Stage 2 of the protocol will be undertaken. In the table below, a list of the identification questions and examples of characterization answers are provided. This process will involve the completion of the following questions as well as dates, timing, identification information about the observer(s), and any additional comments. A blank version of this table, which can be used as a field data collection sheet, is provided at the end of this Appendix.

	Identification Questions to be Answered	Characterization Answer Examples
1	Unique ID?	e.g Wolf Den 01
2	What predatory mammal species is occupying the active den?	e.g. Arctic wolf; Grizzly bear; Arctic fox; Wolverine
3	Coordinates of the active den?	UTM Coordinates of den
4	Site description?	e.g. Arctic fox denning under trailer near Whale Tail helipad e.g. Arctic wolf den located approximately 800 meters from Whale Tail haul road on the south facing side of an ~8m tall esker.
5	Juveniles Observed?	e.g. Yes; 3 fox pups observed in the entering the den. e.g. No; wolf pups have not been observed directly. However, the behaviour of the adult wolves, the repeated observations of wolves at the site, the sandy ridge location of the site and the observations of wolf burrows at the site indicate that an active den with juveniles is highly probable.
6	Disturbance and impact considerations?	e.g. The wolf den occurs within 800 m of the Whale Tail haul road. As such vehicle noise, including helicopters, is frequently present within 1 km of the den site.
7	Adaptive management considerations?	e.g. Ground personnel access will be restricted within 1km of the den and, as much as possible, vehicles will not stop on the roadway at km 35. Helicopter routing will be advised and flybys of the esker at this location will be minimized.
8	Recommended monitoring program?	e.g. Weekly checks by the den monitoring survey team will be undertaken to monitor the progress of den development (i.e. age of pups), investigate for signs of adult stress responses and inform any additional adaptive management requirements. Checks will be undertaken from a height-of-land at (coordinates), approximately 300 m NW of the suspected den location.

Stage 3 – Monitoring

Monitoring visits will be undertaken at the frequency, distance and location recommended by the identification and characterization stage (Stage 2). In addition to the information in the table below, dates, timing, identification information about the observer(s), and any additional comments will be recorded. A blank version of this table is provided at the end of this appendix.

	Monitoring Questions to be Answered	Monitoring Characterization Answer Examples
1	Unique ID?	Wolf Den 01
2	Changes to disturbance and impact considerations?	e.g. frequency of helicopter flybys within 1 km have increased in conjunction with construction activities at the Whale Tail site.
3	Development stage of den?	e.g. Pups are now more active outside of the den.
4	Changes to site location?	e.g. Adult wolves still display territorial behaviours, but the specific den has likely been relocated ~200m to the NE.
5	Recommended changes to monitoring program?	e.g. Weekly monitoring is considered sufficient. e.g. Recommendation to reduce monitoring to bi-weekly visits: wolf den establishment appears stable, so reduction of personnel presence in the area is advisable
6	Recommended adaptive management considerations?	e.g. Continue restricting access to ground personnel within 1 km of the den. e.g. Develop new flight path instructions with helicopter teams. Avoid flybys over the den by at least 1 km.

Monitoring (Stage 3) continues at the rate recommended by Stage 2 assessment and all subsequent monitoring visits. Monitoring of an active den will be discontinued once the pups have left the den, the den has been relocated to a distance greater than 1 km from operating facilities, or the potential impacts to the den are considered negligible.

ADAPTIVE MANAGEMENT

Based on findings from Stage 3 monitoring, new adaptive management solutions may be required to prevent negative impacts to the active predatory mammal den. This may include the restriction of movements or activities by certain vehicles or work teams to minimize disturbances. It may also include alterations to monitoring activities to reduce disturbances or increase the amount of information available to inform management decisions. See Chart 3 in 2016 TEMP for adaptive management timing and work flow.

Data Sheet for Stage 2 – Identification and Characterization

Date: **Observer:**

	Identification Questions to be Answered	**Characterization Data**
1	Unique ID?	
2	What is the predatory mammal species is occupying the active den?	
3	Coordinates of the active den?	
4	Site description?	
5	Juveniles Observed?	
6	Disturbance and impact considerations?	
7	Adaptive management considerations?	
8	Recommended monitoring program?	

Data Sheet for Stage 3 – Monitoring

Date: **Observer:**

	Monitoring Questions to be Answered	**Monitoring Data**
1	Unique ID?	
2	Changes to disturbance and impact considerations?	
3	Development stage of den?	
4	Changes to site location?	
5	Recommended changes to monitoring program?	
6	Recommended adaptive management considerations?	

APPENDIX G

Peregrine Falcon Management and Protection Plan

Peregrine Falcon Management

and Protection Plan on the Meadowbank Gold Project Site

Version 2 - Updated June 18, 2012

Background and Purpose:

Since 2009, peregrine falcons have been observed along the All Weather Access Road occurring in three to five quarries. In June 2012, for the first time, falcon activity was observed in the Portage Pit. Subsequently a falcon nest site was observed in the South Portage Pit. In response a general mine site peregrine falcon management and protection plan was developed in accordance with the Terrestrial Ecosystem Management Plan (TEMP).

The purpose of this plan is to protect peregrine falcons from mine activities by firstly preventing them from nesting within the perimeter of active mining Pits (Portage, Goose, or Vault pits) during operation. If falcons nest in the mine pits, operations will be adapted according to the management plan and monitoring will increase to ensure protection of the falcons and their nest(s). The peregrine falcon is listed as "may be at risk" by the Canadian Endangered Species Conservation Council (2001) and the Nunavut Government (Government of Nunavut, 2001). *Falco peregrinus tundrius*, the subspecies that breeds north of the treeline, is listed as being of special concern in Canada (COSEWIC, 2002). Therefore we must ensure all activities protect these species.

Throughout the year Meadowbank environment department staffs routinely monitor the pit and other areas on site for birds to ensure their protection and that the management plan is being implemented. The following document outlines specific management and mitigative measures to protect peregrine falcons in accordance with the Meadowbank TEMP.

Deterrence and Protection Plan Prior to Nesting in Portage, Goose and Vault Pit:

Level 1) Prior to and during nesting season (May 25 – July 1) an inspection of the pit walls will be conducted daily. These inspections will include a visual assessment from the bottom of the pit looking up at the wall faces, and also from the top looking down the wall faces. Records shall be kept of the dates, times, and which individual(s) carried out the inspection.

Level 2) If falcons are reported to have been seen in the vicinity of the pit or are observed by environment department staff, inspections will increase to 3 times daily; once in early morning, once at mid-day, and once again in the later evening. All sightings shall be documented as to the date, time, location, and individual(s) spotting the falcons. Owl decoys will be erected in the

area where the falcons have been seen to attempt to deter the falcons from nesting in the pit areas. Noise cannons may also be utilized.

Level 3) If sightings become regular, inspections will increase to every 3 hours including incorporating a night shift to perform inspections.

Level 4) If perching is observed or if nests are being created within the pit, the following management measures will be under taken.

A. Shoot off a pistol banger (non-pyro technique) to ease them away from their location of perching. At no time will a banger be shot in the direction of the falcon, all bangers will be shot from a safe distance away to avoid any physical harm to the bird, i.e. hearing impairment.
B. When the bird flies away it will be observed. The reason for this is that Agnico-Eagle does not want any falcon to leave one active pit, ie., South Portage and move to North Portage or from either Portage pit to Bay Goose Pit. We must ensure the falcon is deterred from the active pit areas. If the falcon re-lands within one of the pit perimeters repeat step A.
C. If a nest is being constructed, each nest will be treated on a case by case basis depending on its location. One option at this level would be to roll or place wire mesh fencing over the nesting area to prevent the return of the falcon to the nesting area.

With protective measures in place, our goal is to never have to get beyond *Level 4:A*.

Portage, Goose and Vault Pit Nest Monitoring and Protection Plan

If a nest is established and/or eggs are observed blasts will be minimized within a protective zone of the nest. It is likely that the nest will occur near the top of the pit wall. Blast vibration and noise has not appeared to have deterred the falcons from nesting near pits at this time; therefore the greatest risk to the eggs and young would be from blast fly rock. To prevent falcon disruption, the frequency of blasts will be reduced, vehicle traffic and most importantly human traffic will be reduced within a radius of ~150m from the nest. Fly rock will be monitored by video to ensure no impacts. Through controlled blasts and video monitoring of fly rock in June and July AEM will ensure that fly rock is kept to a minimum height that does not exceed the height of the nests.

In accordance with the TEMP, daily monitoring by environmental staff will be conducted with binoculars or a scope from the west side of the pit and recorded. After all blasts, environmental staff will check on the nests and record observations. Portable motion sensor automatic cameras may also be installed to record movements in the nest on regular intervals.

Based on past monitoring results of the nests along the All Weather Road (2009-2011), there is no pattern that has indicated that some young have survived while others have not due to road or quarry operations. The activities in the pit need to continue to be protective of the nests and the environmental staff will continue to monitor the activity and nests daily between June and September if a nest is observed.

Portage, Goose and Vault Pit Mine Operation Mitigation

Blasting

As a protective measure, blasting in the south pit east wall will become less frequent with smaller controlled blasts. Over the past 6 months, blasting has been optimized to reduce dilution and control fly rock by modifying blast material density, timing and patterns.

Blasts should occur less frequently and should be minimized within 150m of the nest in June and July, operations will prevent blast fly rock from disturbing the nests and video record all blasts within a 150m radius. The blast vibration and noise does not appear to have deterred the falcons from nesting nearby. Through controlled blasts and video monitoring, fly rock will be monitored to ensure it has not flown towards the nests. If blasts occur within the radius, fly rock will not exceed 60m or the height of the nest in June and July.

Mine Operations and Reduced Vehicle Traffic

Traffic should be reduced within 150m radius of the nest to protect it from dust; if traffic cannot be reduced, dust suppressant should be used.

If all above mentioned measures have failed and AEM environment are not able to conform to the TEMP, the Government of Nunavut Department of Environment will be contacted by the Environment Superintendent, Environment Biologist, or Environment Coordinator.