AGNICO EAGLE

MEADOWBANK DIVISION

Terrestrial Ecosystem Management Plan

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
July 2017

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 and the Whale Tail Pit Final Environmental Impact Statement, which identify potential residual effects of the Project to wildlife and wildlife habitat. For each potential effect, mitigation measures are proposed. To confirm that residual effects (i.e., after mitigation) are acceptable, a comprehensive monitoring plan is presented that evaluates the response of wildlife habitat and wildlife populations to the effects of the Project and Project-related activities, and measures effects against thresholds.

Adaptive management is used to assess the effectiveness of the mitigation. Ongoing review of the TEMP through the Whale Tail Pit regulatory process and annual Wildlife Monitoring Summary Reports by regulatory agencies, technical reviewers, Terrestrial Advisory Group, 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 effective in identifying, monitoring, and managing residual effects of the Project on wildlife and wildlife habitat. This revised TEMP has incorporated detailed decision trees outlining monitoring and adaptive management 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 Nunavut Water Board and Nunavut Impact Review Board as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle – Geology Superintendent

Agnico Eagle – Engineering Superintendent

Agnico Eagle – Geotechnical Engineer

Agnico Eagle – Environment Superintendent

Agnico Eagle – Environmental Coordinator

Agnico Eagle – 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
3	February 2017	All	Update in response to Whale Tail environmental assessment information requests
3.1	May 2017	All	Further revisions following meetings with GN, KivIA, HTO in Ottawa, February 22 and 23, 2017
3.2	June 2017	2.2, 3.4 and 4.0	Following EIS Technical Session and Community Roundtable in Baker Lake, April 28 – May 2, 2017
4	July 2017	All	Further revisions following meetings with GN, KivIA, HTO in Winnipeg, June 20 and 21, 2017

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

Approved by:

Jamie Quesnel
Jamie.Quesnel@agnicoeagle.com
819.856.8021.
Environmental Superintendent – Nunavut

Ryan Vanengen
ryan.vanengen@agnicoeagle.com
819.651.2974
Amaruq Permitting Lead

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1. INTRODUCTION AND APPROACH

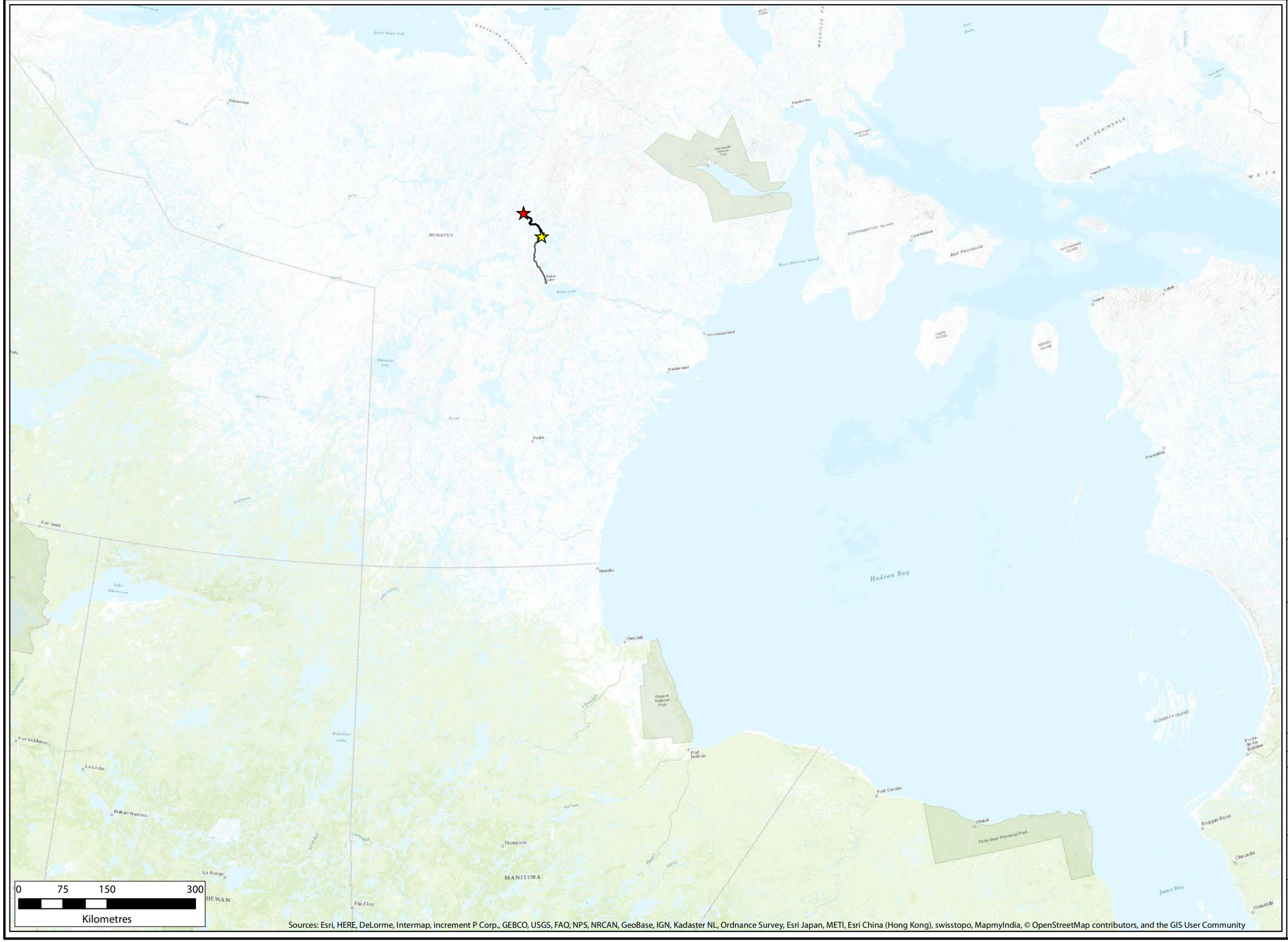
1.1 BACKGROUND

This report provides the 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 TEMP has been written to ensure consistency in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (EIA; Cumberland 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 on terrestrial Valued Ecosystem Components (VECs). In addition to being a revision of the original TEMP (Cumberland 2005a) and building on the monitoring experience at Meadowbank, this TEMP has also benefitted from collaborative input from the Government of Nunavut Department of Environment (GN), the Kivalliq Inuit Association (KivIA), and the Hunters and Trappers Organization (HTO) of Baker Lake through annual report reviews, technical reviews, workshops, and discussions.

A summary of environmental effects and a description of mitigation measures that have already been implemented during the design, construction, and operations 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 measure residual effects (i.e., after mitigation), a monitoring plan is presented that evaluates the response of vegetation communities and wildlife to the effects of the Project and Project-related activities, and measures effects against thresholds (see **Figure 3**).



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Legend

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

Project Location Map - Nunavut Overview

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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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CLIENT: Agnico Eagle Mines Limited

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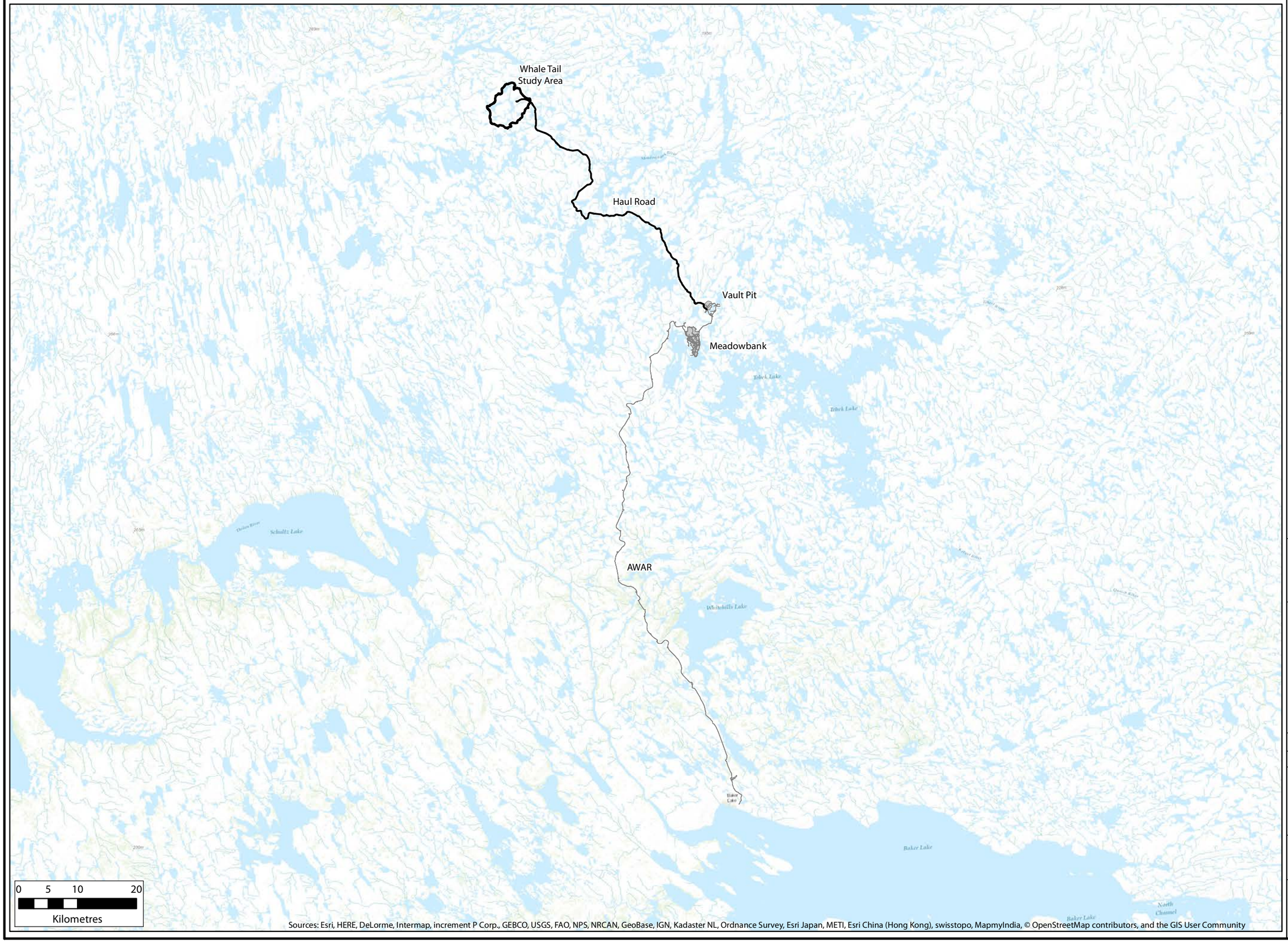
Figure: 1



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Legend

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

Project Location Map - Meadowbank & Whale Tail

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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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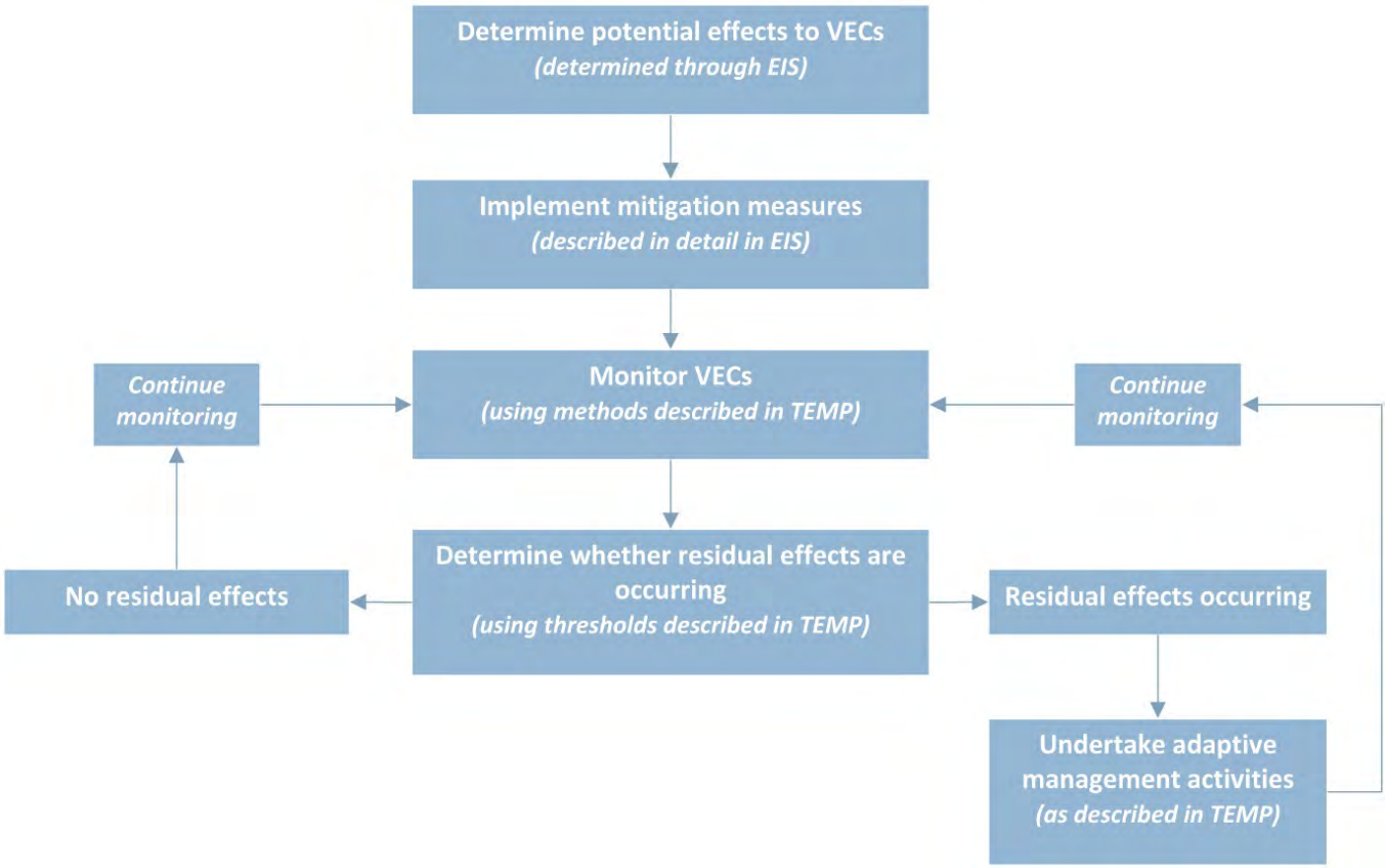
Figure 3: Relationship between Effects, Mitigation, and Monitoring



Where monitoring determines that unacceptable residual effects exist, an adaptive management approach will be taken to assess the monitoring and mitigation. Additional mitigation 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 Nunavut Impact Review Board (NIRB). For example, due to concerns raised by local stakeholders, Agnico Eagle has prepared the All-Weather Access Road and Whale Tail Haul Road Dust Monitoring Plan (**Appendix D**) to continue to measure dustfall along the Baker Lake to Meadowbank AWAR and Whale Tail Haul Road, and a Screening Level Risk Assessment Plan (**Appendix E**). In addition, response 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 also outlines 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 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

While specific monitoring objectives for each VEC are provided in later sections, the TEMP should meet the following global objectives:

- Provide information to test the predicted wildlife-related effects of the Project
- Estimate the effectiveness of environmental design and mitigation efforts
- Incorporate local and traditional ecological knowledge (Inuit Qaujimajatuqangit)
- Monitor for action levels or thresholds that could be used to initiate additional mitigation or studies
- Reduce uncertainties and provide information that increases confidence in environmental assessment predictions of future developments
- Consider regional and collaborative environmental monitoring programs, and contributions to regional or national monitoring initiatives
- Reduce Project related effects to wildlife

1.3 RELEVANT ENVIRONMENTAL MANAGEMENT PLANS

This document includes overlap with other environmental management plans for the Meadowbank Mine and Whale Tail Project. The following other plans contain elements of mitigation and monitoring that are relevant to the terrestrial environment. If there is any discrepancy between the TEMP and the Plans listed below, the TEMP takes precedence.

- Air Quality and Dustfall Monitoring Plan
- Hazardous Materials Management Plan
- Landfarm Design and Management Plan
- Landfill Design and Management Plan

- Noise Monitoring and Abatement Plan
- Spill Contingency Plan
- Transportation Management Plan All-weather Private Access Road
- Wildlife Protection and Response Plan
- Predatory Mammal Den Management and Protection Plan
- Migratory Bird Mitigation Plan

1.4 VALUED ECOSYSTEM COMPONENTS SELECTION

Valued Ecosystem Components were selected through consultation with regulatory and governmental authorities and members of the local community (e.g., Hamlet of Baker Lake, Baker Lake HTO), and a review of VECs identified in other northern mines. Selection of VECs was further refined through the consideration 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: Wildlife Habitat, Ungulates, Predatory Mammals, Raptors, Waterbirds, and Upland Breeding Birds. Key species associated with these VECs are shown in **Table 1.**

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 muskox	*Rangifer tarandus* ssp. *groenlandicus* *Ovibos moschatus*
Predatory Mammals	grizzly bear wolverine gray (Arctic) wolf Arctic fox	*Ursus arctos* *Gulo* *Canis lupus* *Vulpes lagopus*
Raptors	peregrine falcon gyrfalcon rough-legged hawk snowy owl	*Falco peregrinus* ssp. *tundrius* *Falco rusticolus* *Buteo lagopus* *Nyctea scandiaca*
Waterbirds	Canada goose long-tailed duck loons waterfowl[(a)]	*Branta canadensis* *Clangula hyemalis* *Gavia* spp.
Upland Breeding Birds	rock ptarmigan lapland longspur horned lark semipalmated sandpiper sandhill crane	*Lagopus mutus* *Calcarius lapponicus* *Eremophila alpestris* *Calidris pusilla* *Grus canadensis*

a) Waterfowl, in general, are included based on concerns related to potential for bycatch of diving birds during fish-outs, see Section 2.2.5

1.5 SPECIES OF CONCERN

Species of concern include those species identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being At Risk or Threatened, and may be impacted by the Project. Species of concern for the Project are listed in **Table 2**.

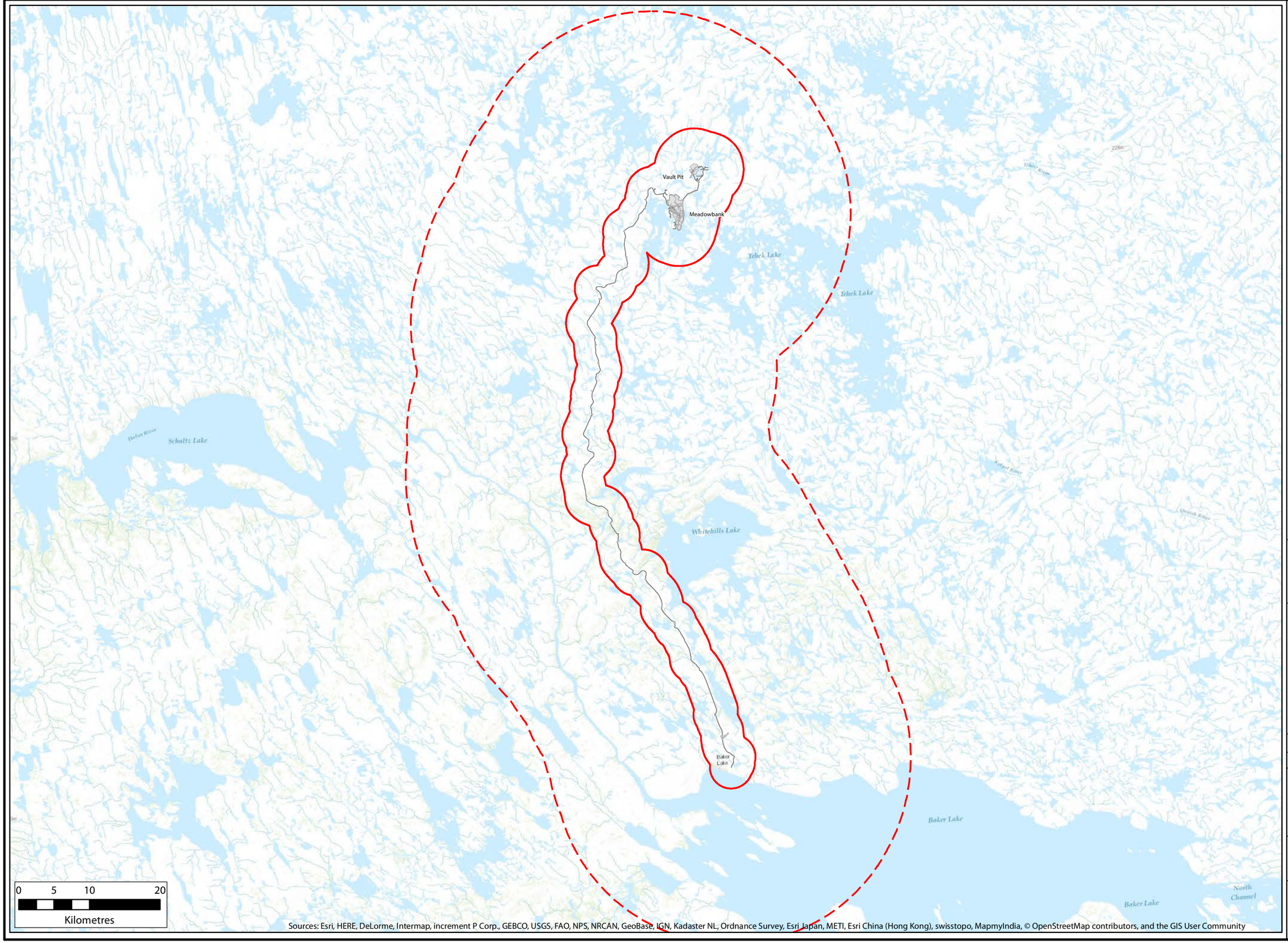
Table 2: Species of Concern Meadowbank and Whale Tail Study Areas

Species	COSEWIC Status	SARA Status	Effects Pathways
Barren-ground caribou	Threatened	No schedule	• mortality due to vehicle collisions • habitat loss • change in harvest due to improved access • barriers to movement and changes in behaviour
Grizzly bear	Special Concern	No schedule	• habitat loss • mortality due to attraction or vehicle collisions
Polar Bear	Special Concern	Schedule 1	• None anticipated
Wolverine	Special Concern	No schedule	• habitat loss • mortality due to attraction or vehicle collisions
Short-eared Owl	Special Concern	Schedule 1	• habitat loss
Peregrine Falcon	Special Concern	Schedule 1	• physical hazards to nests on mine infrastructure or in quarries
Red-Necked Phalarope	Special Concern	No schedule	• habitat loss

1.6 SPATIAL BOUNDARIES

The Meadowbank Mine local study area (LSA) includes a 5 km radius area centred on the Mine 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 4**). The regional study area (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 4**).

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 road and 1.5 km around borrow areas) and includes an approximate 1.5 km buffer around development areas at the Whale Tail Pit area, for a total area of 282 km^2. 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), with a total area of 5,017 km^2 (**Figure 5**).



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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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77 Wyndham Street South • Guelph ON N1E 5R1
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Figure:

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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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1.7 RESIDUAL EFFECTS

Residual effects are Project effects that remain after implementation of all mitigation. A comprehensive assessment of the expected residual effects on vegetation and wildlife has been provided in the Meadowbank Terrestrial Ecosystem Impact Assessment (Cumberland 2005a) and the Whale Tail Pit Environmental Impact Statement (Golder 2016). The effectiveness of mitigation (described in **Section 2.0**) and magnitude of residual effects will be determined via monitoring programs outlined in this document, and compared against thresholds described in **Section 3.0**. Where monitoring determines that residual effects are outside established thresholds of acceptability, adaptive management will lead to more intensive monitoring or additional mitigation.

2. MITIGATION

2.1 GENERAL MITIGATION

General mitigation applicable to most wildlife are provided in **Table 3** below, while **Section 2.2** summarizes the anticipated environmental effects and mitigation specific to each VEC.

Table 3: General Mitigation for the Meadowbank Mine, and Whale Tail Pit and Haul Road

Environmental Education
Employees will participate in a wildlife awareness program during their induction, including bear safety procedures, instructions on wildlife rights-of-way, and other wildlife protection measures (see Wildlife Response and Protection Plan in **Appendix A**).
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 (up to an including stopping work in the affected area). 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
Public use of the AWAR is monitored by the Safety Department. For mine safety reasons, Baker Lake residents will be prohibited from travelling beyond the 85 km mark of the AWAR (see **Figure 2**). Because the Vault and Whale Tail Haul Roads begin within existing mine facilities and are beyond km 85, public access to these roads will be limited (see **Figure 2**). Voluntary hunting use data will be collected by Agnico Eagle at the gatehouse.
The *Wildlife Act* prohibits discharging firearms along or across roads or within 1 km of dwellings (see **Figure 2** for no shooting zone). Upon notification by Agnico Eagle or this public, this is to be enforced by the Government of Nunavut (GN).
To avoid unnecessary degradation of wildlife habitats, Project vehicles will be restricted to existing roads.
Wildlife have the right-of-way on roads.
Maximum speed limits of 50 km/hr will be enforced.
All road-killed wildlife will be reported immediately to Meadowbank Mine 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. If approved by the GN officer, disposal of ungulates and predatory mammals will be through incineration at the mine or as directed by the GN. In the case of an ungulate and predatory mammal collision, drivers must fill out a vehicle/animal collision report to document the conditions and circumstances surrounding the incident. All such incidents will be reported using the Incident Report Form **(Appendix B)**.
Hunting
Hunting and harassment of any wildlife species by mine employees while on shift will be prohibited.
Access by way of All Terrain Vehicle (ATV) from Baker Lake to km 85 on the AWAR for hunting, is permissible according to NIRB Project Certificate No 4. condition 32. See **Figure 2**
Agnico Eagle will enforce the policy of a “no-hunting zone” from km 85 to Whale Tail Pit, to reduce road-related effects on wildlife and to protect employee safety. A 1 km marker at the gatehouse will be used to ensure all hunters are aware of these restrictions. Periodic markers will be used along the AWAR to delineate the 1 km no-hunting zone between the Baker Lake gatehouse and km 85. See **Figure 2**.

Table 3: General Mitigation for the Meadowbank Mine, and Whale Tail Pit and Haul Road

Except for designated persons (e.g., wildlife monitors, environmental technicians), employees will not be permitted to carry firearms.
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 the 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

2.2.1 Wildlife Habitat

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 access roads to quarry and borrow sites. 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 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.

Another potential effect on Wildlife Habitat is degradation from dust and exhaust. 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 and EIS predicted that the primary effects of dust are generally confined to the immediate area next to roadways (Cumberland 2005a; Golder 2016; Everett 1980; Walker and Everett 1987). A recent study found that dust on plant leaves from diamond mine haul roads was significantly higher in a zone of up to 1000 m from the road (Chen et al. 2017).

2.2.1.2 Mitigation for Wildlife Habitat

Proposed mitigation for Wildlife Habitat are summarized in **Table 4**.

Table 4: Mitigation to Minimize Effects to Wildlife Habitat at the Meadowbank Mine, and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Minimizing 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
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
Minimizing Wildlife Habitat Degradation				
Minimize vehicle traffic and speeds to reduce dust		X	X	X
Contain (berms) fuel storage areas	X	X	X	X
Follow hazmat and spill contingency guidelines	X	X	X	X
Implement dust control measures (including dust suppressants) on mine roads and airstrip		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
Maintain natural drainage patterns	X	X	X	X
During water diversion, pump discharge using natural drainage patterns when possible		X	X	X
Remove and dispose of contaminated soil (see 'Environmental Guidelines for Site Remediation', GN-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 sensory 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. Movements of collared caribou through the Meadowbank RSA are most common during the spring (April 1 to May 25) and fall (October 15 to November 7) migratory periods, although caribou may be present during any season (Agnico Eagle 2016; Golder 2016 Appendix 5-D). Likewise, while there are areas of the AWAR with more frequent observations of caribou, caribou may be observed along the entire length of the AWAR (Agnico Eagle 2016). Roadside observations of caribou from 2007 to 2016 show that caribou within and adjacent to the Meadowbank RSA are most

common during the winter (44% of caribou observed), rut and fall migration (34% of caribou observed) and spring (16% of caribou observed) (see **Table 5**). Data from collared caribou also closely follow the seasonal pattern of caribou observations observed from the AWAR and the Meadowbank Mine.

Table 5: Summary of AWAR Caribou Observations from 2007 to 2016 by Season and Collar Data from the Ahiak/Beverly, Lorillard, and Wager Bay Herds (2000 to 2016)

Season	Total Number of Caribou Observed from AWAR (% of Total)	Range of AWAR Count Observations (min-max)	Collar Days in Whale Tail RSA (% of Total in RSA)
Spring Migration (April 1 to May 25)	15,510 (16%)	230 to 6042	224.01 (23%)
Calving (May 26 to June 25)	4,213 (4%)	33 to 1,163	3.34 (0.3%)
Post-Calving (June 26 to July 31)	220 (0.2%)	0 to 135	18.42 (2%)
Summer Dispersal (August 1 to September 15)	1,815 (2%)	2 to 1,815	139.31 (14%)
Rut and Fall Migration (September 16 to November 7)	32,934 (34%)	44 to 9,856	155.15 (16%)
Early and Late Winter (November 8 to March 31)	43,500 (44%)	152 to 13,568	438.22 (44%)
Total	**98,192**	**0 to 13,568**	**978.45**

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), and likely results from sensory disturbance that may be related to smell, noise, taste and sight. 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 km (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). To date, although ZOI have been demonstrated to varying degrees around mine sites, they are poorly understood in terms of their mechanism, their extent, and the effects to individual caribou and populations. Agnico Eagle is currently undertaking an analysis of caribou collar data to potentially determine the ZOI around the existing Meadowbank Mine and AWAR.

Road-related mortality may be a source of residual effects if not carefully managed. Although muskox are 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.

A 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 this has not been documented. Approved deterrent methods have been implemented at Meadowbank Mine when necessary to remove caribou from areas of risk. On-site environmental staff will monitor the tailings facilities daily.

2.2.2.2 Mitigation for Ungulates

Proposed mitigation for Ungulates are summarized in **Table 6**. See also General Mitigation in **Table 3** and the Wildlife Protection and Response Plan.

Table 6: Mitigation to Minimize Effects to Ungulates at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Minimizing Wildlife Habitat Loss (see Table 4 for Wildlife Habitat)				
Minimizing Wildlife Habitat Degradation (see Table 4 for Wildlife Habitat)				
Reducing Sensory Disturbance (see also General Measures, Table 3)				
Site-wide notifications of caribou presence (see **Figure 6** and **Figure 7**)		X	X	
Caribou on or crossing the road are given right-of-way		X	X	X
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 engine noises, as per the Noise Abatement and Monitoring Plan		X	X	X
Limit blasting when caribou are near (**Figure 9**); Maintain blasting windows (see Transportation Management Plan: All Weather Private Access Road and Whale Tail Haul Road Management Plan)		X	X	
Enforce speed limits on the AWAR and haul roads (Transportation Management Plan: All Weather Private Access Road and Whale Tail Haul Road Management Plan)		X	X	X
Aircraft pilots are instructed to avoid caribou, and will receive site-wide notifications of caribou movements. Recommended minimum distance is 300 m altitude and 1 km horizontal		X	X	X
Report Ungulates in the vicinity of the road to environmental staff and road dispatcher		X	X	X
Reduce speed to 30 km/h when caribou are observed from the haul road and Level 3 caribou mitigation is triggered (**Figure 7**)		X	X	

Table 6: Mitigation to Minimize Effects to Ungulates at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Other mitigative action as determined by the Environmental Supervisor, possibly including: grouping haul trucks into convoys (e.g., 2X2 or groups of 4 or more vehicles), imposing additional speed limits, using pilot vehicles, stopping traffic near caribou attempting to cross haul roads, complete closure of haul roads, suspending blasting in accordance with **Figures 6** through **9**		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) if air traffic could not be delayed		X	X	X
Avoiding Exposure to Potentially Contaminated Water and Wildlife Habitat				
Deter Ungulates attracted to potentially contaminated water in tailings ponds or runoff, documented using the Incident Report Form (**Appendix B**)		X	X	X
Avoiding Disruption of Movement or Migration Patterns				
Road shoulders are designed with a low profile and are sloped to ground level to accommodate haul trucks. Road building materials are esker-sourced and thus are fine-grained. Consequently, roads are not perceived to be a physical barrier to caribou movement	X	X	X	
Implement special measures if Ungulates are in close proximity to Project facilities and roads (see **Section 3.4**)		X	X	
Contour snow banks to avoid creating barriers		X	X	X
Post updated maps of known migration corridors and report to GN, KivIA, and HTO 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). Wolf denning occurs between early May and late September (May et al. 2012).

Grizzly Bears are also known to use habitats such as eskers for denning (Mueller 1995), wolverines have been linked to areas 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. 2012).

Other potential effects to Predatory Mammals, such as changes in prey abundance, distribution, or health, are of lesser concern. Mitigation 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 for Predatory Mammals

Proposed mitigation for Predatory Mammals are summarized in **Table 7**. See also General Measures in **Table 3** and the Wildlife Protection and Response Plan.

Table 7: Mitigation to Minimize Effects to Predatory Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Reducing Project-related Mortality (see also General Measures, Table 3)				
Apply response plan (see **Appendix A**) when individuals are near		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 or 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 daily		X	X	X
Seal and store all aromatic products (e.g., paint) in bear-proof containers		X	X	X

Table 7: Mitigation to Minimize Effects to Predatory Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Construct skirts or sheathing along all facilities with potential to attract Predatory Mammals	X	X	X	
Use deterrents if necessary for human and wildlife safety (**Appendix A**)		X	X	X
Avoiding Disturbance of Den Sites				
Initiate a den-specific response plan when a wolverine, grizzly bear or wolf den site is detected within 1 km of activities (see **Section 3.5**)		X	X	X
Restrict human and vehicle activity in the vicinity of den sites		X	X	X

2.2.4 Raptors

2.2.4.1 Summary of Potential Environmental Effects

Available survey data indicate that few Raptors nest in the vicinity of the Project area, and possibly also in old quarries and open pits. However, direct effects to breeding Raptors are expected to be very low (Cumberland 2005b; Dougan & Associates and Nunavut Environmental 2015). Ongoing monitoring (see **Section 3.6)** will document active nests if they are near mine facilities, or along the AWAR, Whale Tail Haul Road, and access roads to quarry/borrow sites.

Other potential effects to Raptors may result from changes in abundance, distribution, and health of prey populations due to road activities. Mitigation to minimize Wildlife Habitat removal (see **Section 2.2.1)** will reduce effects to prey populations.

2.2.4.2 Mitigation for Raptors

Proposed mitigation for Raptors are summarized in **Table 8**. See also General Measures in **Table 3**.

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

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Minimizing Wildlife Habitat Loss (see Table 4 for Wildlife Habitat)				
Minimizing Wildlife Habitat Degradation (see Table 4 for Wildlife Habitat)				
Avoiding Disturbance to Nesting Raptors				
Develop a nest-specific response 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 (GN-DOE 2005) for avoiding disturbance to raptor nests		X	X	X
Consult with GN (with respect to obligations under the *Wildlife Act*, SNU 2003, c.26). If deemed appropriate, discourage raptors from establishing nests on artificial structures, pit walls, or other facilities (see **Appendix G**)			X	
Limit ferrying flight altitudes to a minimum height of 300 m above ground level where possible		X	X	X

2.2.5 Waterbird

2.2.5.1 Summary of Potential Environmental Effects

During baseline data collection and operational monitoring, only a small number of nesting Waterbirds 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 have 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).

Waterbirds 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 or invertebrates in the tailings impoundment and water management areas. There is a possibility that Waterbirds (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 Mine have indicated no excess risk to Waterbirds as a result of Project activities (Agnico Eagle 2014).

The proposed expansion at Whale Tail will require a fish-out, which may lead to mortality of diving birds that can get caught in nets. Further, possible flooding during the nesting season may lead to loss of nests.

2.2.5.2 Mitigation for Waterbirds

Proposed mitigation for Waterbirds are summarized in **Table 9**. See also General Measures in **Table 3**.

Table 9: Mitigation to Minimize Effects to Waterbirds at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Minimizing Wildlife Habitat Loss (see Table 4 for Wildlife Habitat)				
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 Waterbirds, particularly geese, over the long term in revegetated areas and flooded mine pits			X	X
Minimizing Wildlife Habitat Degradation (see Table 4 for Wildlife Habitat)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to manage risks to Waterbirds		X	X	X
Avoiding Disturbance to Nesting Waterbird				
Clear land outside the breeding season (mid-May to mid-August) unless a nest survey by a qualified wildlife biologist has determined that no Waterbird nests are present		X	X	X
Helicopter ferrying flight altitudes should remain above 300 m, where possible		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 m horizontal distance whenever possible (Hines and Wiebe 1997). Make all pilots aware of these flight restrictions		X	X	X
Reducing Waterbird Project-related Mortality (see also General Measures, Table 3)				
Monitor tailings, reclaim ponds, and storm water retention ponds daily to ensure that Waterbird have not landed on these waterbodies. Where Waterbird have landed on ponds, use aversive tactics to scare them away		X	X	X
Implement mitigation for nests in flooding zones at the Whale Tail Project (**Appendix I**)		X		
Implement mitigation for diving bird mortality during Whale Tail Lake fish-out (see the Fishout Diving Waterbird Protection Plan)		X		

2.2.6 Upland Breeding Birds

2.2.6.1 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 Waterbird. 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.

2.2.6.2 Mitigation for Upland Breeding Birds

Proposed mitigation for Upland Breeding Birds are summarized in **Table 10**. See also General Measures in **Table 3**.

Table 10: Mitigation to Minimize Effects to Upland Breeding Birds at the Meadowbank Mine and Whale Tail Pit and Haul Road

Mitigation	Design	Construction	Operations	Closure/ Post-Closure
Minimizing Wildlife Habitat Loss (see Table 4 for Wildlife Habitat)				
Minimizing Wildlife Habitat Degradation (see Table 4 for Wildlife Habitat)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to manage risks to Upland Breeding Birds		X	X	X
Avoiding Disturbance to Nesting Upland Breeding Birds				
Clear land outside the breeding season (mid-May to mid-August) unless a nest survey by a qualified wildlife biologist or technician has determined that no Upland Breeding Bird nests are present		X	X	X
If nest found within Project facilities, 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 3)				
Deter Raptors from nesting or roosting on mine facilities (see **Appendix G**). Locally breeding Raptors will increase predation rates on songbirds		X	X	X
Deter Upland Breeding Bird nesting attempts on equipment and facilities		X	X	X
Implement mitigation for nests in flooding zones at the Whale Tail Project (**Appendix I**)		X		

3. MONITORING OVERVIEW

A comprehensive suite of monitoring activities are being undertaken for the Project facilities, haul roads and AWAR. **Table 11** summarizes all of the monitoring activities, their frequency, and the VEC each activity targets.

Table 11: Monitoring Activities Being Undertaken for the Project Facilities, Haul Roads, and All-Weather Access Road

Monitoring Activity	Frequency	VECs					
		Wildlife Habitat	Ungulates	Predatory Mammals	Raptors	Waterbird	Upland Breeding Birds
Traffic Monitoring for AWAR and Haul Roads	Currently completed and will be provided in the annual summary report		X	X	X	X	X
Public Use of Roads	Tracked at security gate and incidental observations, and will be provided in the annual summary report		X	X	X	X	X
Habitat monitoring	Every three years post-construction, or if greater than 25% of the overall mine footprint changes	X					
Dustfall monitoring	Monthly around Meadowbank Mine and Whale Tail Pit; detailed study conducted annually along the AWAR and the Whale Tail Haul Road	X					
Habitat reclamation monitoring	At Year 2 post-closure and every 3 years until Year 12 post-closure	X					
Caribou satellite-collaring program	Data provided to Agnico Eagle from GN at least 1x/week		X				
Haul Roads, Pits and mine site ground surveys	At least 1x/week, includes inspections of waste streams for scavenger attractants		X	X	X	X	
Road surveys (AWAR and Haul Roads)	At least 1x/week		X	X	X	X	X
Height-of-Land surveys	At least 1x/week		X	X			
Vehicle encounter reports	Ongoing		X	X	X	X	X
Incident reports	Ongoing (when incidents with wildlife occur)						
Hunter Harvest Survey	Will be redeveloped and implemented in collaboration with the GN, KivIA and HTO (see **Section 3.4.2.7**)		X	X			
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 **Figure 12**)			X			

Table 11: Monitoring Activities Being Undertaken for the Project Facilities, Haul Roads, and All-Weather Access Road

Monitoring Activity	Frequency	VECs					
		Wildlife Habitat	Ungulates	Predatory Mammals	Raptors	Waterbird	Upland Breeding Birds
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 **Figure 13**)				X		
Waterbird nest surveys	Active nests identified within 100 m of Project facilities and all roads monitored, if deemed necessary Additional monitoring may be required during fish-out or flooding					X	
PRISM plot surveys	Once every three years in collaboration with ECCC						X
North American Breeding Bird Survey (BBS)	Once every three years during closure and post closure complete a North American Breeding Bird Survey (NABBS) route and contribute to the NABBS						X

3.2 GENERAL MONITORING

3.2.1 Road Surveys

Meadowbank AWAR and Vault/Whale Tail Haul Road

Methods: Systematic ground surveys will be conducted along the AWAR and Whale Tail Haul Road by two observers (one can be the driver) in a vehicle. Survey vehicles will travel no more than 30 km/h to maximize observations of all wildlife along the route. All wildlife observations recorded incidentally as part of regular traffic along the haul roads and AWAR will be known at the start of ground surveys so that observers are aware of the location of wildlife observations and can focus attention in these areas. For each sighting, a UTM coordinate will be taken along the route along with distance of the animal from the haul road or AWAR, 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.

Height of Land Surveys

Methods: While conducting the ground surveys, two observers will stop at the Height-of-Land (HOL) survey locations (see **Appendix H**) for 20 minutes to survey the area, focusing

on furtherfield areas (i.e., likely up to 4 to 5 km). Raw data (i.e., field forms) will be included in the annual Wildlife Monitoring Summary Report.

Frequency (haul roads and AWAR): January to April and July to August, once per week; May to June and September to December (frequency will increase when caribou are present, see **Figure 6, Figure 7,** and **Figure 9**; **Table 11**).

3.2.2 Pits and Mine Site Ground Surveys

Methods: Within the Meadowbank Mine and Vault sites (e.g., tailings pond, haul 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: Once per week (frequency will increase if caribou are present, **Figure 6, Figure 7,** and **Figure 9; Table 11).**

3.3 WILDLIFE HABITAT

3.3.1 Objectives

The objectives of monitoring Wildlife Habitat will be to ensure that measures to minimize the amount (or area) of 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 12** describes the framework that has been established for monitoring effects to Wildlife Habitat.

Table 12: Monitoring Approach for 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)	Area of altered habitat	5% above predicted EIA values of 867 ha for the Mine site	Habitat monitoring	Every three years post-construction, or if greater than 25% of the overall mine footprint changes.
Habitat Loss **Meadowbank AWAR**	Loss <EIA prediction and subsequent approvals (see Gebauer et al., 2015)	Area altered habitat	5% above predicted EIA values 281 ha for AWAR	Habitat monitoring	Every three years post-construction, or if greater than 25% of the overall mine footprint changes.

Table 12: Monitoring Approach for Wildlife Habitat for the Meadowbank and Whale Tail Project

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss **Whale Tail Pit and Haul Road**	Loss < EIS prediction (see Golder 2016)	Area of altered habitat	5% above predicted EIs values of 820 ha for the Pit and Haul Road	Habitat monitoring	Every three years post-construction, or if greater than 25% of the overall mine footprint changes.
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 D**	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	Proportion 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

3.3.2 Monitoring Approach

Monitoring activities for Wildlife Habitat will be carried out post-construction and post-closure. The following are the methods and frequency for the monitoring efforts for each measurable parameter.

3.3.2.1 Habitat Loss

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 are disturbance of 5% above predicted EIA values of 867 and 281 ha (includes approved changes), respectively. For the Whale Tail and Haul Road location, the threshold is disturbance of 5% above a predicted EIS value of 820 ha.

Frequency: Every three years post-construction or if changes are greater than 25% of the overall mine site footprint from the previous year ELC was evaluated. This frequency may be reduced during the operation phase if the amount of new disturbance and reclamation areas is relatively unchanged.

3.3.2.2 Habitat Degradation by Contamination

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**.

3.3.2.3 Habitat Reclamation Post-Closure

Methods: Reclamation efforts will focus on providing conditions conducive to natural re-colonization of the site by surrounding native vegetation. 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 reduce overall residual effects within the LSA.

Frequency: Vegetation plots and mapping will be conducted during the second 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 effort is made to re-vegetate and that re-vegetation of previously disturbed areas is progressing.

3.3.3 Thresholds

Should the thresholds outlined in **Table 12** be exceeded, the following actions will be undertaken.

3.3.3.1 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 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.

3.3.3.2 Habitat Degradation by Contamination

See **Appendix E -** Screening Level Risk Assessment Program

3.3.3.3 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).

3.4 UNGULATES

As previously mentioned, decision charts (**Figures 6** through **10**) outlining monitoring and mitigation (adaptive management) measures for ungulates have been developed for each phase as follows:

- Figure 6 – caribou and mining operations;
- Figure 7 – caribou and haul roads;
- Figure 8 – caribou and the All Weather Access Road (AWAR);
- Figure 9 – caribou and blasting; and
- Figure 10 – muskox and operations.

3.4.1 Objectives

The monitoring objectives are to detect if effect thresholds have been exceeded, to test the efficacy of mitigation, and understand Project-related effects to Ungulates. For Ungulates, it is also an objective to manage sensory disturbance to caribou approaching the Project, leading to monitoring to detect caribou approach and mitigation to reduce sources of sensory disturbance. Due to the collar data sharing agreement, extensive range, large numbers of caribou and muskox, and history of analysis, this evaluation is done in collaboration with the GN.

3.4.2 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.

Table 13 describes the framework which has been established for monitoring effects to Ungulates. As described above, an objective is to reduce sensory disturbance to caribou approaching the Project. This objective is not linked to an impact prediction, as the monitoring is to trigger mitigation rather than to test a threshold. **Figure 6** through **Figure 10** describe monitoring and mitigation for caribou/muskox approaching the Project site for all aspects of the operations. Documents reviewed to develop monitoring and mitigation strategies included:

- Caribou Road Mitigation Plan for the Jay Project (Golder 2017)
- Wildlife Mitigation and Monitoring Program Plan for the Back River Project (ERM 2017)
- Management of Caribou Post-Calving Areas in the Kivalliq Region, Nunavut (Poole and Gunn 2016)

Distance thresholds for caribou monitoring have the ultimate objective of detecting caribou group size triggers up to a distance of 4 km (or maximum distance observed); however, not all caribou will be able to be observed at this distance in all circumstances and areas associated with the Project.

Although the monitoring and mitigation is focused on caribou, muskox are also observed along the AWAR, with approximately 2500 animals from 299 observation records, of which nearly 2/3 of observations consist of 5 animals or less. A specific monitoring and mitigation decision chart for muskox has also been developed (**Figure 10**).

Table 13: Monitoring Approach for Ungulates for the 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)	area 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 or based on TAG meeting outcomes
Habitat Loss **Meadowbank AWAR**	Loss <EIA prediction and subsequent approvals (see Gebauer et al., 2015)	area 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 or based on TAG meeting outcomes
Habitat Loss **Whale Tail Pit and Haul Road**	Loss <EIS prediction (see Golder 2016)	area of altered habitat	10% above total loss of high suitability habitat (for Caribou)[(a)] predicted in EIA **Whale Tail Site** – 30 and 342 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction or based on TAG meeting outcomes
Sensory Disturbance to Caribou	N/A	Caribou presence	Monitoring is continuous, but with increasing intensity as caribou approach the Project (see **Figures 6** through **9**)	Pits and mine site ground surveys	Weekly increased up to every two days as per triggers (see **Figure 6**)
				Whale Tail Haul Road surveys	Weekly increased up to every two days as per triggers (see **Figure 7**)
				Caribou satellite-monitoring program	Data provided to Agnico Eagle from GN weekly, requested daily as per triggers(see **Figure 6** through **Figure 9**)
				Incident reports	As occurring
				Height-of-land surveys	Weekly increased up to every two days as per triggers (see **Figure 6** through **Figure 9)**

Table 13: Monitoring Approach for Ungulates for the Project

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Sensory Disturbance to Caribou from Blasting	N/A	Intensity of blast	NPC-119 criteria Monitoring is continuous, but with increasing intensity as caribou approach the blasting site (see **Figure 9**)	Monitoring of blast frequency, noise, and vibration	Blast is postponed. 2 x daily site-wide notification of ungulates to Blast supervisor; location and proximity to be confirmed by Environmental Technicians (see **Figure 9**)
Sensory Disturbance to Muskox	N/A	Muskox presence	Monitoring is continuous, but with increasing intensity as muskox approach the Project (see **Figure 10**)	Pits and mine site ground surveys	Weekly increased up to 2x/week as per triggers (see **Figure 10**)
				Whale Tail Haul Road surveys	Weekly increased up to 2x/week as per triggers (see **Figure 10**)
				Incident reports	As occurring
				Height-of-land surveys	Weekly increased up to 2x/week as per triggers (see **Figure 10**)
Vehicle Collisions	Ungulates will not be killed by vehicles	Numbers of Ungulates killed by vehicles	2 individuals	Pits and mine site ground surveys	See above
				Whale Tail Haul Road and All Weather Access Road surveys	See above
				Incident 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 Monitor trend in harvest from Hunter Harvest Study	>20% adjustment in harvest distribution Meadowbank AWAR use. This metric will further be refined as part of the revised HHS design and implementation	Baker Lake Hunter Harvest Study	Initiated in 2007 and active until 2015. Re-initiated in September 2017 with quarterly data collection; Yearly reporting

Table 13: Monitoring Approach for Ungulates for the Project

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
	No increase in harvest from Whale Tail Haul Road RSA	Monitor trend in harvest distribution or total harvest from Hunter Harvest Study	No change in harvest	Baker Lake Hunter Harvest Study Satellite-collaring program	Initiated in 2007 and active until 2015. Re-initiated in September 2017 with quarterly data collection; Yearly reporting Data provided to Agnico Eagle from GN weekly, requested up to 2x/week as per triggers (see **Figure 6** through **Figure 9**)

Note: Frequency for some activities may change, see **Figure 6** through **Figure 9**

(a) 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

Figure 6: Thresholds for Monitoring and Mitigation of Caribou in Proximity to Mine Operations

Caribou Group Size Threshold (GST)			
Sensitive Season		Sensitive Season	
Fall	Winter	Spring	Summer
Sept 16 to Nov 7	Nov 8 to March 31	April 1 to May 25	May 26 to Sept 15
GST - 140 caribou	GST - 35 caribou	GST - 14 caribou	GST - 35 caribou

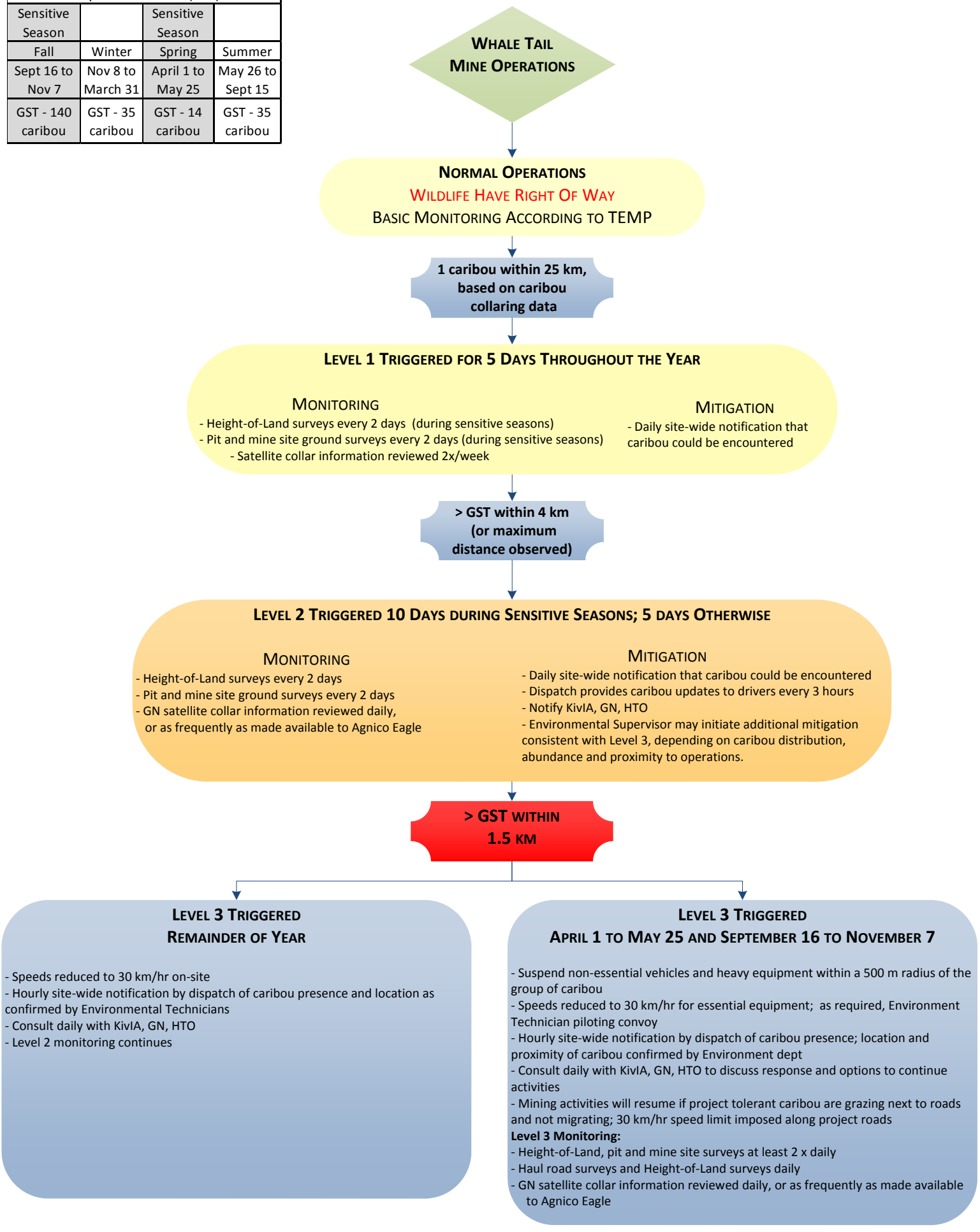


Figure 7: Thresholds for Monitoring and Mitigation of Caribou in Proximity to the Whale Tail Haul Road

Caribou Group Size Threshold (GST)			
Sensitive Season		Sensitive Season	
Fall	Winter	Spring	Summer
Sept 16 to Nov 7	Nov 8 to March 31	April 1 to May 25	May 26 to Sept 15
GST - 140 caribou	GST - 35 caribou	GST - 14 caribou	GST - 35 caribou

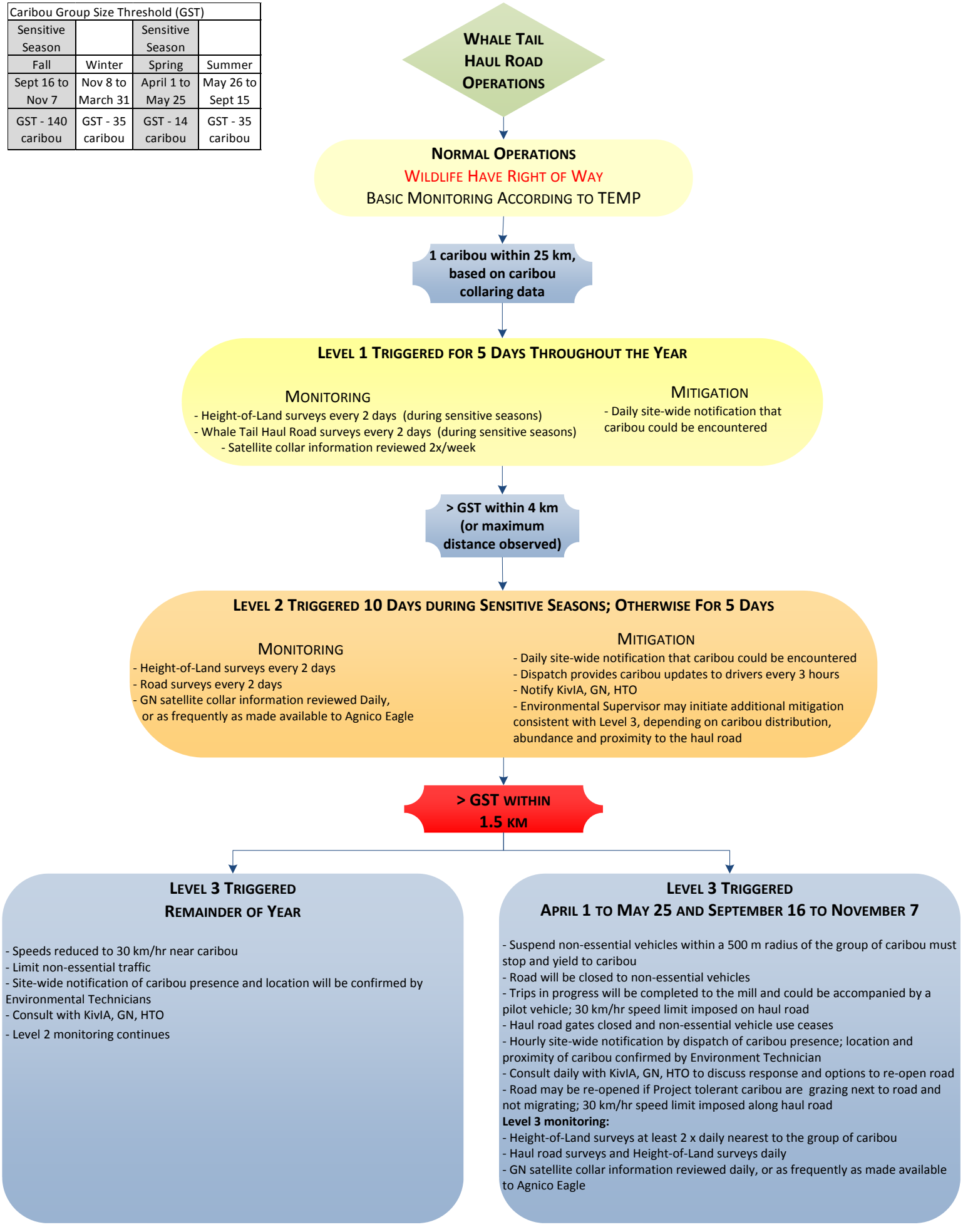


Figure 08: Thresholds for Monitoring and Mitigation of Caribou in Proximity to the All Weather Access Road (AWAR)

Caribou Group Size Threshold (GST)			
Sensitive Season		Sensitive Season	
Fall	Winter	Spring	Summer
Sept 16 to Nov 7	Nov 8 to March 31	April 1 to May 25	May 26 to Sept 15
GST - 140 caribou	GST - 35 caribou	GST - 14 caribou	GST - 35 caribou

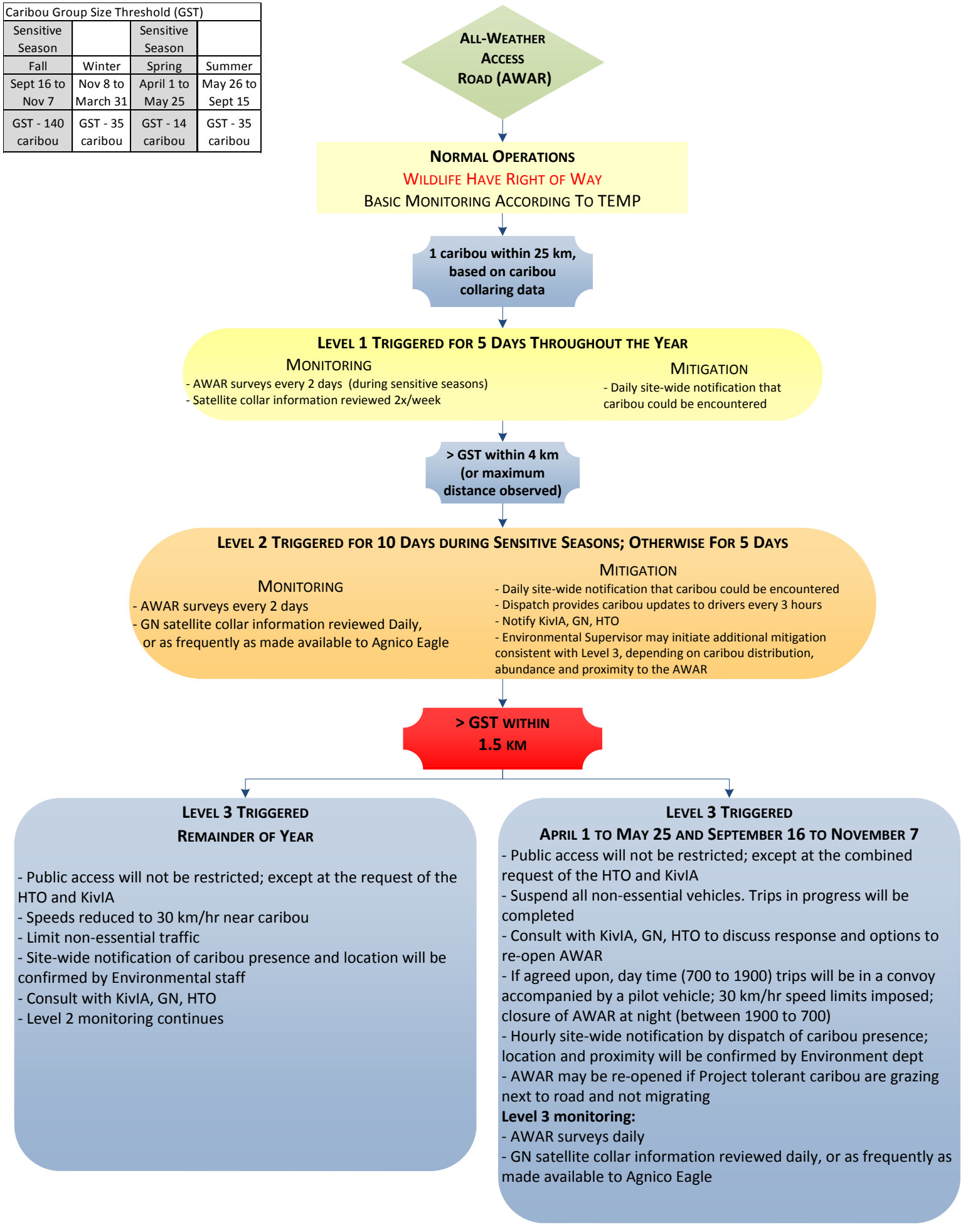


Figure 09: Thresholds for Monitoring and Mitigation of Ungulates in Proximity to Blasting Activities

Caribou Group Size Threshold (GST)			
Sensitive Season		Sensitive Season	
Fall	Winter	Spring	Summer
Sept 16 to Nov 7	Nov 8 to March 31	April 1 to May 25	May 26 to Sept 15
GST - 140 caribou	GST - 35 caribou	GST - 14 caribou	GST - 35 caribou

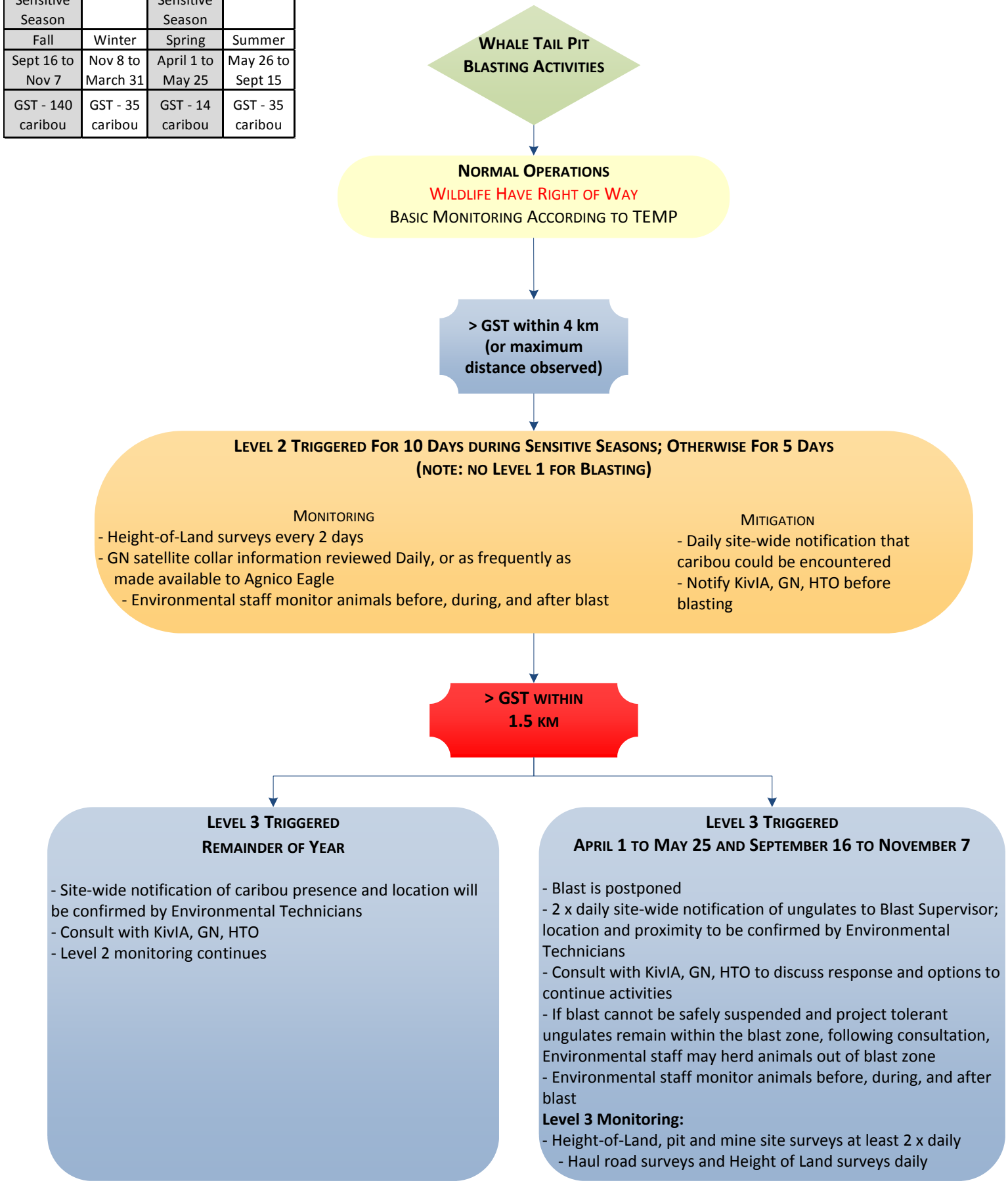


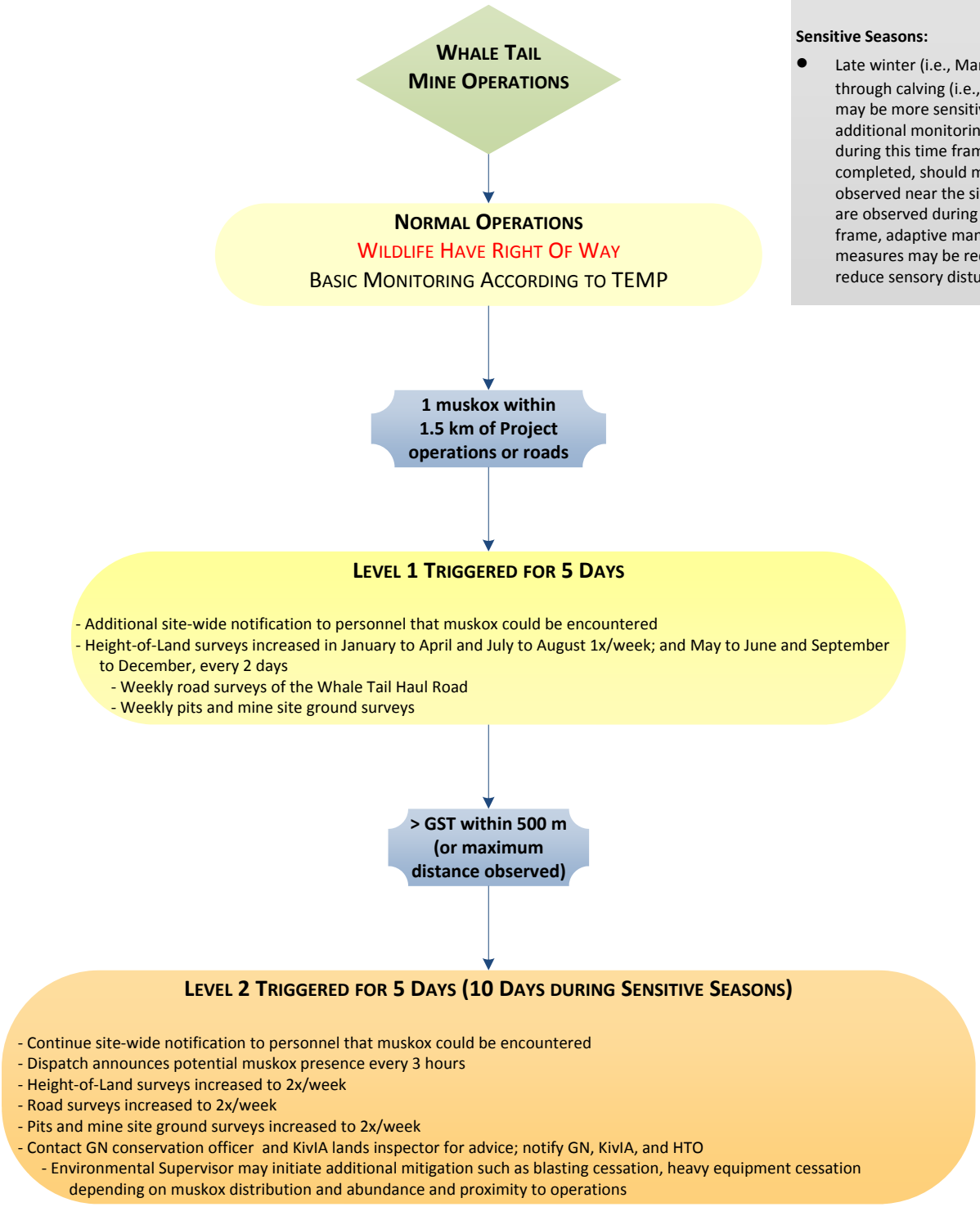
Figure 10: Thresholds for Monitoring and Mitigation of Muskox in Proximity to the Project

Muskox Group Size Threshold (GST):

- 13 muskox year round

Sensitive Seasons:

- Late winter (i.e., March 1st) through calving (i.e., mid-June) may be more sensitive and additional monitoring of muskox during this time frame will be completed, should muskox be observed near the site. If muskox are observed during this time frame, adaptive management measures may be required to reduce sensory disturbance.



3.4.2.1 Caribou Group Size

The environment department representative or observer (i.e., biologist, technician, and local hunter conducting caribou surveys) responsible for determining exceedance of triggers will monitor and document a "group of caribou" defined as:

> An aggregation of caribou that are sufficiently close together that they can see and react to another animal's behaviour, and have the potential of responding should one or more animal in the aggregation become startled.

At the discretion of the observer, if an aggregate of caribou are separated by approximately 500 m, this may be considered 2 groups of caribou depending on level of interaction and behaviour of groups. Agnico Eagle observes will work with GN, KivIA, and HTO representatives to ensure consistency in the application of this definition.

3.4.2.2 Group Size Thresholds

Group size numbers of caribou collected from observation monitoring along the AWAR are shown in **Table 14**. A group size of 50, which has been used to trigger adaptive management for caribou to date at the Meadowbank Mine, has been shown to encompass almost 2/3 (i.e., 64%) of all caribou observed from roadside surveys from 2007 to 2016 (**Table 14**). In addition, the majority of caribou groups greater than or equal to 50 are observed in the rut and fall migration and winter seasons (i.e., 91%).

Table 14: Summary of Caribou Numbers by Group Size Thresholds Along the All-Weather Access Road (AWAR) from 2007 to 2016

Group Size	Total Number of Observations	Total Number of Caribou Represented in Group Size	% Total Caribou Observed
≥500	30	24,204	24.6%
≥100	181	52,513	53.4%
≥50	346	62,503	63.7%
≥40	423	65,772	67.0%
≥30	572	70,666	72.0%
Total	**3,961**	**98,192[(a)]**	

(a) Represents the total number of caribou observed from AWAR surveys between 2007 and 2016, consequently it will not be the sum of the Total Number of Caribou.

Through discussions with the GN and the KivIA, a desired minimum protection level of 70% of all caribou observed will be used as the foundation for group size thresholds (GST). Consequently, GSTs have been develop for the three main periods when caribou are observed on-site: early and late winter, fall rut and migration, and spring migration (**Table 15**). These data are also presented in **Appendix J** as graphs for each season. To be further conservative of caribou protection, the lower Confidence Interval value was used for the GST to trigger adaptive management (**Table 15**).

Agnico Eagle has developed and will implement GSTs to protect 70% of the caribou interacting with the Project. Agnico Eagle is committed to caribou conservation through the

implementation of adaptive management based on group size and distance thresholds, but these measures have to be done in a manner that balances mining operations, and at this point it is uncertain how operations will be affected using a GST of 70%. Agnico Eagle suggests using the 70% GST and revisiting this number during the Terrestrial Advisory Group (TAG) meeting provided that this percentage balances operations and caribou conservation. As mentioned earlier, the indirect effects of sensory disturbance on wildlife populations is poorly understood in terms of affecting the distribution and abundance of wildlife in relation to a mining development, even less is known of how these effects can translate to population level effects. Resource management objectives are typically devised around direct effects to wildlife populations such as hunting and habitat conservation, among others.

Table 15 Seasonal Caribou Group Size Thresholds Representing the Protection of 70% of All Caribou Observed, with 95% Confidence Intervals

Season	Group Size Threshold	Average Group Size	Upper/Lower 95% Confidence Intervals (CI)
Spring Migration	14	14.6	14.9/14.3
Early and Late Winter	35	35.3	35.7/34.9
Fall Rut/Fall Migration	140	175.0	209.6/140.4

3.4.2.3 Blasting Thresholds

Nunavut does not have any regulations or guidelines related to potential environmental noise and vibration effects from blasting and the NIRB does not endorse or recommend any specific regulation or guideline as being appropriate for assessing potential environmental effects from blasting. As such, the approach used here is that safety procedures for the protection of caribou due to blasting should follow the standards and procedures for humans.

The Ontario Ministry of Environment Noise Pollution Control (NPC) Publication 119 (OMOE 1978) represents best practices with respect to the assessment of potential noise and vibration effects from blasting. As such, NPC-119 assessment methods and criteria were used in the Project Noise Impact Assessment. The EIS estimates that blasting noise during haul road construction will reach the NCP-119 limit of 120 dBZ at 300 m from the blast, and at 1,000 m for Whale Tail Pit operations. Noise is also reduced when receptors are not within the line-of-sight of the blast (such as when the blast is in a deep open pit or when receptors are behind a hill). For vibration, the EIS estimates that blasting vibration from haul road construction will reach the NCP-119 limit of 10 mm/s at 165 m from the blast, and at 1,150 m for Whale Tail Pit operations. Blasting vibrations from the Whale Tail Pit operations decay quickly from the source and are 504 mm/s at 100 m from the source, 38 mm/s at 500 m from the source, and down to 4 mm/s 2 km from the source.

Caribou Response to Noise and Vibration

Research into the range of caribou frequency sensitivity has found that caribou are less sensitive to low frequency noise than humans (Flydal et al. 2001). For example, the caribou hearing threshold at 63 Hz is approximately 30 decibels (dB) higher than the human hearing threshold at 63 Hz. Put another way, a human could be expected to detect a low frequency noise approximately 30 dB quieter than could be detected by a caribou.

Because human hearing is more sensitive to low frequencies than caribou hearing, using human-centric thresholds for effects to caribou can be considered conservative – i.e., tending to overestimate the magnitude of the effect.

Blasting noise and vibration are measured by two parameters:

- Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s)
- Peak Pressure Level (PPL) expressed in unweighted or linear decibels (dBZ)

Caribou hearing is less sensitive at low frequencies than human hearing (Flydal et al. 2001); therefore, it is likely that humans will be able to detect airborne PPL associated with blasting at larger distances than will caribou. In contrast, Inuit Qaujimajatuqangit (IQ) indicates that caribou feet are sensitive; therefore, it is likely that caribou will be able to detect ground-borne PPV associated with blasting at larger distances than humans. In the absence of research identifying specific vibration detection thresholds for caribou feet, it is not possible to estimate specific distances over which caribou will be able to detect ground vibration from Project blasting, although Reimers and Coleman (2001) noted that aerial bombing in military exercises did not typically elicit a visible behavioural response from reindeer at distances between 1.8 and 3.0 km. The EIS indicates that PPV from blasting at the Whale Tail Pit is predicted to drop to effectively 0 mm/s for distances of 4.0 km from the blasting site. As such, it seems reasonable to conclude that PPV associated with blasting would not be detectible by even the most sensitive caribou feet at distances beyond 4.0 km from the blasting site. Conversely, PPV is predicted to be at 13 mm/s at 1,000 m from the source and 7 mm/s at 1.5 km from the site.

The approach outlined in **Figure 9**, will be followed. In addition, following threshold to delay a blast will be used:

- If caribou or other wildlife are observed within the danger zone for humans surrounding the blast, where there may potentially be fly rock or debris, as determined by the Blast Supervisor
- If the caribou Level 3 mitigation is triggered, when the caribou seasonal GST are observed within 1.5 km of the Project facilities (**Figure 9**)

3.4.2.4 Habitat Loss & Degradation

Methods: Habitat loss and degradation will be monitored and assessed through habitat monitoring (see **Section 3.3.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 12**).

Frequency: See **Section 3.3.2**.

3.4.2.5 Sensory Disturbance and Disruption of Movements

The primary goal of monitoring for sensory disturbance and disruption of movements of Ungulates is to provide an early detection of animals approaching a project (Poole and Gunn 2015). Once animals are detected, operational activities will be adjusted, as described in **Figure 6** through **Figure 10**, to reduce sensory disturbance. When the caribou seasonal GST are observed within 1.5 km of the Whale Tail Haul Road, additional mitigation will be implemented of reducing speeds to 30 km/h and any caribou crossing the Whale Tail Haul Road will be given the right-of-way. The following monitoring will be used to detect caribou.

- Caribou Satellite-Collaring Program
- Height-of-Land Surveys (see **Section 3.2.1**)
- Road Surveys (see **Section 3.2.1**)
- Pit and Mine Ground Surveys (see **Section 3.2.2**)

Monitoring and mitigation triggers for caribou include one collared caribou within 25 km of the Project (i.e., Level 1), which initiates more intensive monitoring and heightened awareness for Project staff that caribou are in the area. See **Table 15** for seasonal specific GSTs.

Caribou Satellite-Collaring Program

Methods: As part of its ongoing monitoring program for the Project, Agnico Eagle is collaborating with the GN 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.

To determine whether caribou not observed from the Project are being disturbed (e.g., if their movement is deflected to avoid the Project), a one-time comprehensive analysis of satellite-collaring data since 2008 will be undertaken collaboratively by the GN and Agnico Eagle, but will be led by the GN. Results of the analysis will be included in the annual Wildlife Monitoring Summary Report. In addition, Agnico Eagle has initiated an initial analysis to explore the extent of a potential ZOI from the Project and will provide this information as it is available.

Frequency: Initiated in 2008 with four subsequent deployments. Data provided to Agnico Eagle from GN weekly, requested up to twice per week (see **Figure 6** through **Figure 9**).

Height-of-Land Surveys

Methods: Five, easily accessible, HOL 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 Whale Tail Pit Haul Road, and provide an unobstructed view (up to 360^0) of the surrounding terrain. **Appendix H** shows a viewshed analysis showing the amount of land available within a 4 km viewshed from each HOL survey location and a 1 km viewshed from the AWAR and Whale Tail Haul Road. The HOL locations also show where caribou observations, signs, and trails were observed, which were used to guide these survey locations. The HOL surveys provide an 'early warning' system of the presence of caribou in proximity to the Whale Tail Pit and Haul Road after the collar data has shown that caribou may be moving towards the Project area and/or collars are within 25 km of the Project area. The surveys can be easily accessed from the Haul Road and will be conducted by environmental technicians or trained wildlife monitors. A minimum of 20 minutes will be spent surveying at each of the locations using a combination of naked eye, binoculars, and scopes. The surveyors will independently view the landscape for caribou starting at opposite cardinal directions and will scan 180° for 5 minutes at a time, but move 90° every 5 minutes. Results will then be compared. If there are discrepancies in terms of the number of caribou observed between observers a consensus discussion will inform the data entry and will lean towards the more conservative number. A representative photo of the herd will be taken if GSTs (refer to decision trees) are exceeded; the environmental supervisor will be contacted immediately.

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 **Appendix H**). 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**).

A summary of field confirmation details regarding the viewscape analysis at HOL locations includes the following (M. Young, Dougan Associates, 2017, pers. comm.):

HOL Survey Point	Average Maximum Observable Distance	Comments
1	9.2 km	This site was slightly relocated to improve the visibility of the road. Small blind spots (50 to 100 m wide) facing S and NW
2	7.2 km	Small blind spots facing S, SW, and W
3	9.1 km	Small blind spots facing S, SE, NW, and E
4	8.9 km	Lars Qaqqaq identified this location as a movement corridor for Barren Ground Caribou Small blind spots facing SE, W
5	5.5 km	Road at this section is not currently built. Small blind spots facing SW, NW, NE. SW, and NE blinds spots to be opened up when eskers removed for road construction.

The viewshed analysis is an important component of the overall monitoring program as it provides direction for monitoring locations that best capture caribou movements through the Project area during the spring and fall migration periods. Consequently, the survey locations chosen based on the results of the viewshed analysis will be continually reviewed and updated with the TAG. As of July 2017, additional tasks remaining related to the viewshed and survey locations still need to be completed prior to construction of the Whale Tail Pit and Haul Road, which include the following:

- Field crews are identifying ideal HOL survey locations and maximum line of sight distances during the summer of 2017, some of this information is incorporated in the table above and some will be compiled into this document at the end of the field season.

- Additional HOL survey location to be added on the west side of the Whale Tail Pit to capture areas not currently covered by survey locations as revealed in the viewshed analysis.

- Selected points along the road may fill in monitoring gaps in the viewshed, these sites have not yet been selected.

- Determine the amount of the landscape covered by HOL survey locations and roadside surveys within an area that buffers the HOL locations by 4 km and the road by 1.5 km to determine if there is sufficient monitoring coverage from the existing surveys.

Frequency: Surveys will be conducted weekly from January to April and July to August, twice per week from May to June and September to December. Increased up to every two days as per triggers (see **Figures 6, 7, 9,** and **10**).

3.4.2.6 Project-Related Mortality – Vehicle Collisions

Methods: Monitoring will be conducted during ground surveys at pits and the mine site, and along roads. Incident report (**Appendix B**) to be submitted following every vehicle collision with an Ungulate. The thresholds level of mortality beyond which further mitigation will be required is two mortalities per year (see **Table 13**).

Frequency: Incident reports (**Appendix B**) submitted when road-related mortalities occur. Ungulate mortality will be reviewed on an annual basis.

3.4.2.7 Project-Related Mortality – Hunting by Baker Lake Residents

Methods: As stated in the TEMP (Cumberland 2006), the Hunter Harvest Study (HHS) was established to monitor the spatial distribution, seasonal patterns, and harvest rates prior to and following construction of the AWAR. A survey of hunter harvests was conducted among Baker Lake residents from 2007 through 2015; however, declining participant rates has led to revaluation of the HHS approach.

Agnico Eagle has discussed and met with stakeholders (GN, KivIA, and HTO in November 2016 [Winnipeg], January and June 2017 [Ottawa]) to broaden the scope of the HHS and facilitate greater involvement of the local community in future years of the study.

The primary objectives of the HHS are to monitor potential Project related effects on harvesting of wildlife by residents of Baker Lake. This objective is achieved by estimating the following key metrics:

1. The distribution of caribou, muskox, and wolverine harvest by residents of Baker Lake; and

2. The total level (or an index of) caribou, muskox, and wolverine harvest by residents of Baker Lake.

Other objectives of the HHS may be established in consultation with TAG or other participants and may include:

1. Supporting creel surveys by gathering information on Arctic Char (*Salvelinus alpinus*), Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeaformis*), and Arctic Grayling (*Thymallus arcticus*) catch rates and Inuit-use patterns in the Baker Lake area;

2. Understanding regional distribution of hunting and fishing activity;

3. Investigating seasonal timing of hunting and fishing activity; and

4. Determining whether increased harvest and catch rates are associated with the AWAR.

As discussed during consultation with stakeholders, HHS will further seek to:

- increase and maintain the hunter participant rate in the future of the program;

- improve resource protection,

- improve hunter awareness and education;

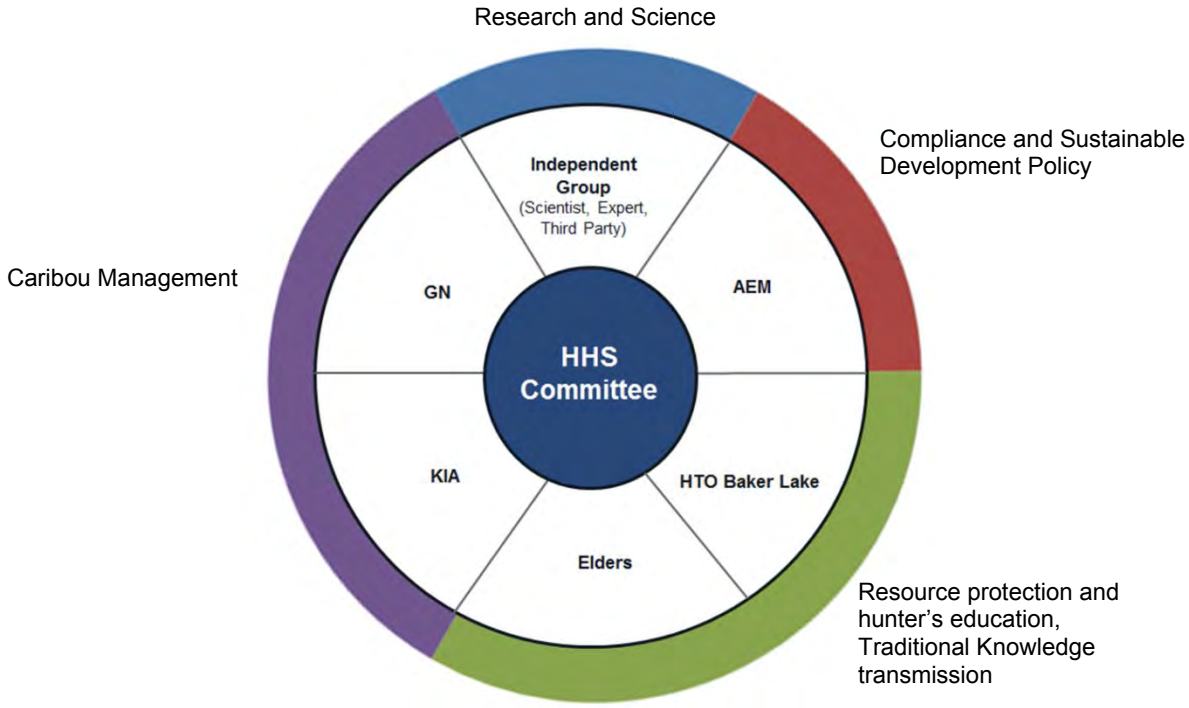
- increase the integration of Inuit Qaujimajatuqangit and Traditional Knowledge; and

- increase availability of data collected for a collective approach to understanding wildlife harvest, assist Agnico Eagle in mitigative actions and the GN in management decisions.

The HHS will promote involvement/partnership of the local stakeholders; including the HTO, Elders, GN officer, and KivIA in a collaborative format conceptually illustrated in **Figure 11.** Detailed survey methods, survey timing, and promotional strategies will tentatively include HHS Committee members visit hunter harvest study participants on a regular basis to

document harvests and discuss general hunting trends and observations. The members will also conduct communication actions and post promotional material around the Hamlet of Baker Lake. The use of social media will also be assessed and potentially used to increase awareness within the community and especially towards a younger generation of hunters.

Figure 11: Conceptual Hunter Harvest Study Partnership, Participants, and Relevant Objectives



The use of a third party group was suggested and intended to facilitate the collection, preservation, exchange, and use of local observations and knowledge of the community. The emphasis would be targeted on supporting community-based efforts to direct research and monitoring based on priorities and information needs. It would also link between stakeholders and provide expertise towards community led initiatives in the HHS.

Frequency: Data will continue to be collected at least quarterly and analyzed at the end of each calendar year and provided within the annual Wildlife Monitoring Summary Report.

3.4.3 Thresholds

Should the thresholds outlined in **Table 13** exceeded, the following actions will be undertaken.

3.4.3.1 Habitat Loss & Degradation

See **Section 3.3.3**.

3.4.3.2 Sensory Disturbance and Disruption of Movements

Agnico Eagle has developed a tiered caribou monitoring procedure to increase levels of monitoring and mitigation if caribou are found to be in the vicinity of the site. **Figure 6** through **Figure 9** describes the tiers and triggers of this procedure and the appropriate actions to be undertaken.

3.4.3.3 Project-Related Mortality – Vehicle Collisions

If an Ungulate mortality occurs (i.e., threshold of two mortalities exceeded), an investigation into the circumstances and factors leading up to the incident will be conducted by the on-site Environmental Supervisor (see also the Incident Report Form, **Appendix B**). Where an incident has resulted from operator negligence, disciplinary action may be considered.

3.4.3.4 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, will request the Baker Lake HTO and GN investigate additional access control measures.

3.5 Predatory Mammals

3.5.1 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 and detect thresholds, as opposed to reactively trying to manage them by relocation or destruction.

3.5.2 Monitoring Approach

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

Table 16: Monitoring Approach for Predatory Mammals at 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	Two individuals of the same species in a year	Pits and mine site ground surveys	Weekly, at least. Includes inspections of waste streams to ensure no attractants for Predatory Mammals
				Road surveys	Weekly, at least
				Incident and vehicle encounter reports	Ongoing (when incidents with wildlife occur)
				Baker Lake Hunter Harvest Study (for wolverines)	Initiated in 2007, stopped in 2015 and scheduled for re-implementation in 2017 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	One active 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 **Figure 12**. Frequency of den monitoring will be determined by season, species and location. See **Appendix F**

3.5.2.1 Project-Related Mortality

Methods: Methods are the same as those described for Ungulates (**Section 3.4.2**). The threshold level of mortality beyond which further mitigation will be required is two 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 16**).

3.5.2.2 Disturbance of Den Sites

Methods: For existing operations, data will be collected on Arctic wolf abundance and behaviour during ground surveys, vehicle surveys, and HOL 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 further mitigation will be required is discovery of one active den (see **Figure 12** and **Table 16**).

Frequency: See **Table 13** for frequency of ground, road, and HOL surveys, see **Figure 12, Section 3.4.3** for further mitigation strategy to be undertaken upon discovery of an active Predatory Mammal den.

3.5.3 Thresholds

Should the thresholds outlined in **Table 16** be exceeded, the following actions will be undertaken.

3.5.3.1 Project-Related Mortality

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

3.5.3.2 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 **Figure 12** and **Appendix F** for details). The plan will include consultation with the GN with respect to obligations under *The Wildlife Act*, SNU 2003, c. 26. 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 further mitigation strategies as required. See **Appendix F** for Den Management and Protection Plan components.

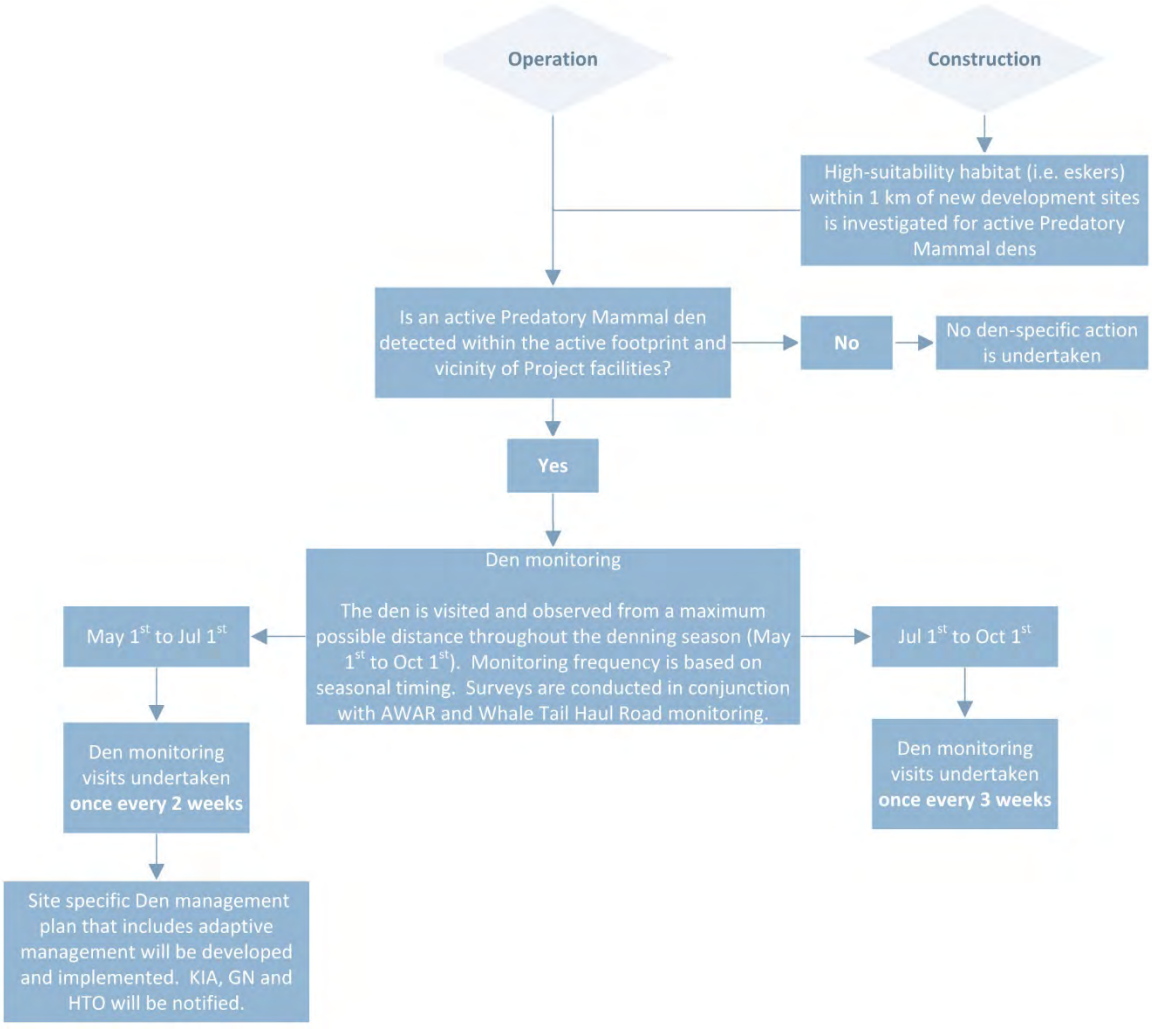
Based on the findings from den monitoring, disturbance mitigation may be required, including increased frequency of den site monitoring, vehicle access restrictions, alterations to Project operation, or work stoppage in the vicinity of the den. Dens will be observed from a distance of at least 300 m with a spotting scope, and information on location, behaviour and number of juveniles will be determined, where possible. **Figure 12** below outlines the steps to be taken if a den is found during monitoring activities.

Example of mitigation and monitoring 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 **Figure 12** 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.

Figure 12: Thresholds for Monitoring and Mitigation of Predatory Mammal Dens in Proximity to the Project



3.6 RAPTORS

3.6.1 Objectives

The primary objective of ongoing monitoring surveys for nesting Raptors evaluate the success of mitigation to prevent disturbance to raptors or raptor nests, to test for thresholds, and to determine the level of Project-related effects. Nest-specific management plans for nesting birds will reduce the potential for birds to abandon nests due to high noise or activity levels.

3.6.2 Monitoring Approach

Table 17 describes the framework that has been established for monitoring effects to Raptors.

Table 17: Monitoring Approach for Raptors at the Meadowbank and Whale Tail Project

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Disturbance of Nesting Raptors	Nest failures are not Project-related	Nest success	Failure of nest monitored through a Nest Protection Plan	Active Raptor nest monitoring	Daily during nesting season (May 1 to September 15) if active nest on Project facilities or within 500 m of activity Weekly if not within area of concern (see **Figure 13)**
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	Weekly, at least
				Road surveys	Weekly, at least
				Incident and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.6.2.1 Nest Monitoring

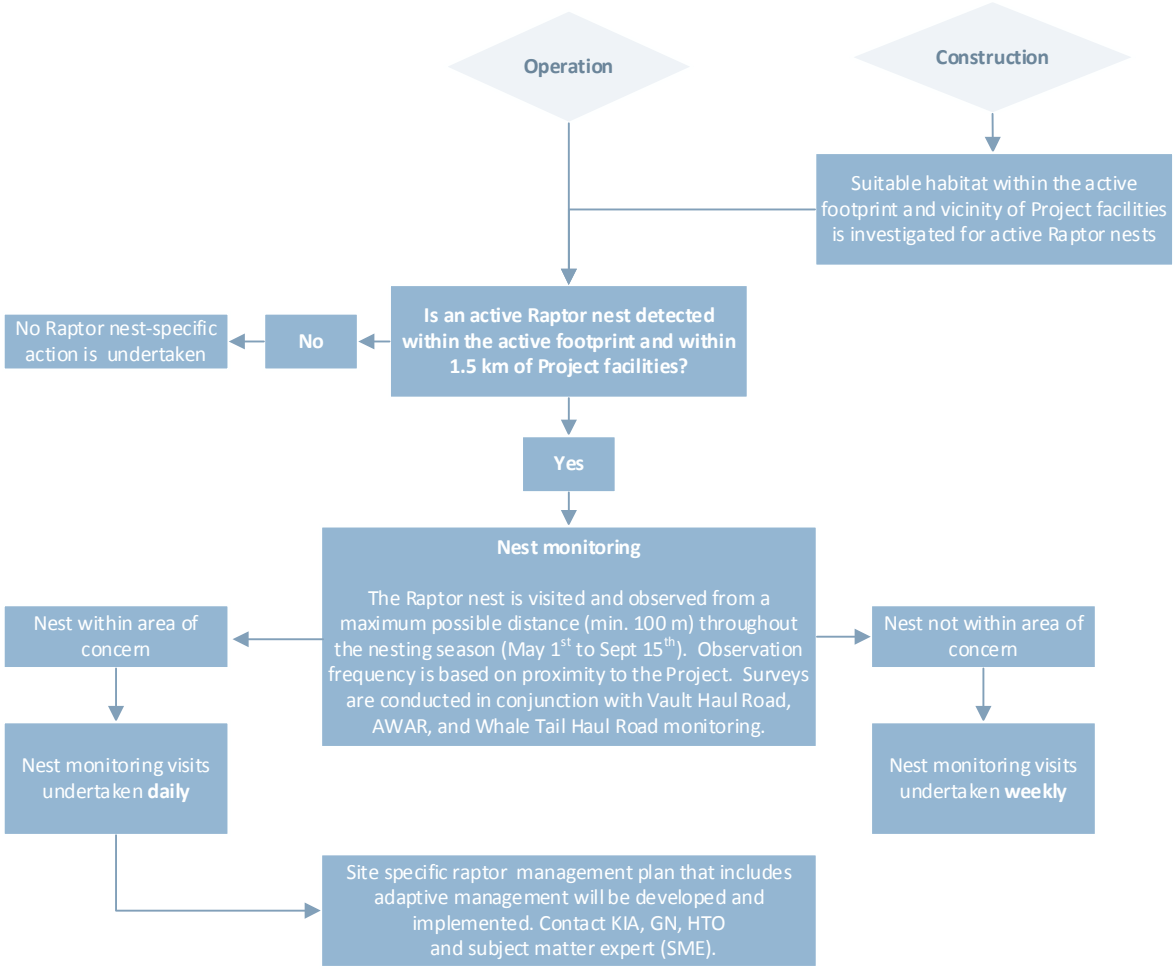
Methods: For existing operations, data will be collected on Raptor abundance and behaviour during ground, road, and height-of-land surveys. For active nests within the active footprint and within 1.5 km (AANDC 2011) of Project facilities, daily surveys will be conducted for nests within area of concern while weekly surveys will be conducted for nests outside the area of concern. For nests within the area of concern, a site-specific raptor response plan will be developed and implemented.

Prior to undertaking discouragement and in accordance with obligations under the *Wildlife Act* (SNU 2003, c. 26), the GN will be contacted to obtain a permit if required. 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. A raptor researcher or subject matter expert will be consulted as needed. The threshold beyond which further mitigation will be required is disturbance of one active Raptor nest (**Table 17**).

Frequency: During the nesting season (May 1 to September 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 **Figure 13**. If disturbance to an active raptor nest is detected, mitigation and monitoring will be initiated (see **Figure 13**).

Figure 13: Thresholds for Monitoring and Mitigation of Raptor Nests in Proximity to the Project



3.6.2.2 Project-Related Mortality

Methods: Methods are the same as for the ground surveys, road surveys, and Incident reports described for Ungulates (**Section 3.4.2**). The threshold level of mortality beyond which further mitigation will be required is one (1) Raptor per year (see **Table 17** and **Appendix G** for details).

Frequency: Incident 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 Thresholds

Should the thresholds outlined in **Table 17** be exceeded, the following actions will be undertaken.

3.6.3.1 Nesting Monitoring

In consultation with the subject matter expert, 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 **Figure 13**). Where recommended mitigation are not considered adequate for reducing disturbance to nesting raptors (determined through the nest management plan monitoring), more stringent mitigation, such work stoppage for nearby operations, may be implemented.

3.6.3.2 Project-Related Mortality

If the threshold mortality level for Raptors is exceeded, further mitigation will be implemented as described for Ungulates (**Section 3.4.3**).

3.7 Waterbirds

3.7.1 Objectives

The primary objective will be to determine the effectiveness of mitigation efforts to prevent or reduce effects from the Project, to test for thresholds, and to describe Project-related effects to Waterbirds.

3.7.2 Monitoring Approach

Table 18 describes the framework that has been established for monitoring effects to Waterbirds.

Table 18: Monitoring Approach for Waterbirds at 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)	Area 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)	Area 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 Waterbird were not considered an issue and were screened out during the EA (Golder 2016)				
Loss of nests due to flooding **Whale Tail Pit**	Nests will be lost due to flooding during nesting season	See the Migratory Bird Protection Plan (**Appendix I**)			
Project-related Mortality	Waterbird will not be killed at the Project	Number of Waterbird killed	1 individual	Pits and mine site ground surveys	Weekly, at least
				Road surveys	Weekly, at least
				Incident and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.7.2.1 Habitat Loss & Degradation

Methods: Habitat loss and degradation will be monitored and assessed through the Wildlife Habitat monitoring program (see **Section 3.3.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 18 and Appendix I**).

Frequency: See **Section 3.3.2**.

3.7.2.2 Project-Related Mortality

Methods: Methods are the same as for the ground and road surveys, and Incident reports described for Ungulates (**Section 3.4**). The threshold level of mortality beyond which further mitigation will be required is one (1) Waterbird per year (see **Table 18**).

Frequency: See **Table 18**. The number of Waterbird mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.7.3 Thresholds

Should the thresholds outlined in **Table 18** be exceeded, the following actions will be undertaken.

3.7.3.1 Habitat Loss & Degradation

See **Section 3.3.2.**

3.7.3.2 Disturbance of Nesting Waterbird

Where disturbances to nesting Waterbirds are observed beyond the acceptable threshold (see **Table 18**), further mitigation will be implemented to minimize effects.

3.7.3.3 Project-Related Mortality

If the threshold mortality level for Waterbirds is exceeded, further mitigation 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 collect information that contributes to national monitoring databases by undertaking the Protocol for Regional and International Shorebird Monitoring (PRISM) and complete a North American Breeding Bird Survey Route every three years, or as agreed upon by Environment and Climate Change Canada (ECCC), for contribution to this program. While these protocols will contribute data to national databases, they will be unsuited to detecting Project-related effects. Previous studies at other similar developments have found that effects to upland birds are either undetectable or not biologically significant (see **Section 2.2.6**).

3.8.2 Monitoring Approach

The PRISM and North American BBS surveys are intended to contribute to national databases administered by ECCC (2012), and are not linked to an impact prediction or threshold. PRISM plots and North American BBS surveys will be conducted every three years; stations locations and methods will be developed in consultation with ECCC.

3.8.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Wildlife Habitat monitoring program (see **Section 3.3.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 18**).

Frequency: See **Section 3.3.2**.

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 (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 review and 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.

Further, a comprehensive data analysis report will be prepared at three-year intervals (in addition to the annual Wildlife Monitoring Summary Report). The comprehensive report will consider questions such as the ZOI, deflection of caribou by the road, the efficacy of mitigation, or other such questions depending on the availability of data. The comprehensive reports should focus on specific areas of concern and specific VCs, as the Wildlife Monitoring Summary Report provides this overview.

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.

4.1 MITIGATION AUDIT

The mitigation described in this document stems from current practices at existing mines, or was suggested during the environmental assessment process. However, an auditing system is required to evaluate the use and effectiveness of the mitigation, following the principals of adaptive management. In other words, it should be confirmed that the mitigation proposed here is used and that it works. Further, new mitigation should be documented. Thus, an audit should be undertaken annually, specific to the mitigation listed in Section 2, to evaluate:

- if all mitigation has been implemented
- which mitigation is perceived to be or shown to be successful
- if new mitigation has been implemented in response to new issues
- if some mitigation is redundant

This audit is implemented annually, as part of the annual report.

4.2 TERRESTRIAL ADVISORY GROUP

Agnico Eagle is committed to the establishment of a TAG consisting of representatives, at a minimum, from the following organizations:

- Agnico Eagle
- the Government of Nunavut Department of Environment (GN-DoE)
- the Kivalliq Inuit Association (KivIA)
- the Hunters and Trappers Organization (HTO) of Baker Lake

Other organizations that may participate in the TAG include ECCC, Nunavut Tunngavik Inc (NTI), and others.

The terms of reference for this TAG will be discussed and drafted during the summer of 2017. Items that will be identified as part of the TAG terms of reference will include the following:

- Reporting frequency for annual and comprehensive analysis (e.g., every 3 years)
- Monitoring outcomes
- Mitigation summary (i.e., operation cessation, shutdowns, etc.)
- Mitigation improvements
- Learnings from other mines
- Opportunity for all parties to contribute for continuous improvement of the TEMP

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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 (TEMP; 2017), 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 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 Wildlife Protection and Response Plan 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 2.2.7** (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 2.2.7** (Reporting Wildlife Observations and Incidents) for more information.
- Improperly disposed of garbage, particularly food wastes will be reported as soon as possible.

See **Section 2.2.7** (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 2.2.7** (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 2.2.7** (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 2.2.7** (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 2.2.7** (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 (found in Appendix B to the TEMP) 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 2.2.7** (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 Responses to Different Levels of 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, your response will depend on the situation at hand. There are different levels of sightings and predatory wildlife alerts that will affect the immediate decisions you make in the field (i.e. General Sighting, or a Green, Yellow, and Red Wildlife Alert). This system allows for workers to quickly determine if predatory wildlife on or near the Project footprint/personnel needs to be left alone to pass through the size, or moved away from hazards or if the animal presents a risk to humans.

General Wildlife Sighting

Definition: When a bear or other predatory mammal is sighted >1000 m away from human activity and/or Project footprint.

Action:

- Immediately inform the Environment Department of situation using a radio/phone. A general notice will be broadcasted by the Environment Coordinator via radio to all other departments;
- Workers on the ground or helicopters in the vicinity will monitor the wildlife's trajectory non-invasively;
- Follow up notifications will be issued if the sighting changes to an Alert status, which will be dependent on the worker's location and exposure; and
- 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).

Green Wildlife Alert

Definition: When a bear or other predatory mammal is sighted <1000 m away from human activity and/or Project footprint.

Action:

- Immediately inform the Environment Department of situation using a radio/phone. A Green Wildlife Alert will be broadcasted by the Environment Coordinator via radio to all other departments;

- Workers on the ground or helicopters in the vicinity will monitor the wildlife's trajectory non-invasively and report the animals location regularly so that a trajectory of movement can be estimated;
- Follow up notifications will be issued if the sighting changes to a higher Alert status, which will be dependent on the worker's location and exposure;
- Workers in the affected area should be ready in case the situation escalates to a Yellow Alert Status by having a safe area (e.g., inside a building or vehicle) in the immediate vicinity that they can access quickly; and
- 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).

Yellow Wildlife Alert

Definition: When a bear or other predatory mammal is sighted <500 m away from human activity or Project footprint where an encounter, near miss, incident, or injury to a person or animal may be possible. If the wildlife's trajectory is aimed at human activity and/or Project footprint, or if the wildlife demonstrates abnormal behavior (such as interest or fixation), the following actions must be taken.

Action:

- Avoidance and distancing measures between workers and the animal should take place first by moving all workers away from the predicted trajectory of the animal, which may lead to a temporary closure of activities in that area. Preparation of personal deterrents should take place. Actively move personnel away from the work area, cease activities in the area and the predicted trajectory of the animal and go to a safe place (e.g., inside a building or vehicle);
- Immediately inform the Environment Department of the situation using a radio/phone. A Yellow Wildlife Alert will be broadcasted by the Environment Coordinator via radio to all other departments;
- Should avoidance and distancing measures not be possible for wildlife deterrence, possible mobilization of helicopters and the Environment Department Response Team may occur; and
- 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).

Red Wildlife Alert

Definition: When a bear or other predatory mammal is sighted <250 m away from human activity and/or Project footprint where an encounter, near miss, incident, or injury to a person or animal may be imminent if the animal does not change their trajectory. Wildlife deterrence must be placed into action immediately by trained wildlife responders and the following actions must be taken.

Action:

- Sound air horn with two long blasts. This will help deter the bear/predatory animal and inform all other workers of dangerous wildlife in close proximity;

- Avoidance and distancing measures between workers and the animal should take place first by moving all workers away from the predicted trajectory of the animal, which will lead to a temporary closure of activities in that area. Preparation of personal deterrents should take place. Actively move personnel away from the work area and cease activities in the immediate area of the animal and the predicted trajectory of the animal and go to a safe place (e.g., inside a building or vehicle);
- Immediately inform the Environment Department of the situation using a radio/phone. A Red Wildlife Alert will be broadcasted by the Environment Coordinator via radio to all other departments;
- ***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;
- Immediate mobilization of helicopters (if available) and the Environment Department Response Team will occur to remove personnel from the area and/or deter the animal; and
- 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).

Table A-1 Summary of Predatory Wildlife Sightings and Alerts

General Wildlife Sighting **If wildlife is more than 1 km away:** 1. Inform Environment Department of location, distance, and number of animals. 2. Continue to monitor the bear and notify is sighting changes to Alert status. 3. Stay in radio/phone contact 4. Helicopters and Environment Department Team prepared to remove personnel or deter bear if needed.
Green Wildlife Alert **If wildlife is less than 1 km away:** 1. Inform Environment Department of location, distance, and number of animals. 2. Continue to monitor the bear and notify if Alert status changes. 3. Stay in radio/phone contact. 4. Workers are ready to go to safe area if needed. 5. Helicopters and Environment Department Response Team prepared to remove personnel or deter bear if needed.
Yellow Wildlife Alert **If wildlife if less than 500 m away:** 1. Inform Environment Department of location, distance, and number of animals. 2. Temporary work area closures for areas in vicinity of the animal and along its trajectory. Workers to prepare their personal deterrents and to go to a safe area immediately. 3. Stay in radio/phone contact. 4. Helicopter and Environment Department Response Team may be deployed to remove personnel or deter bear. 5. All personnel to stay in safe area until an all clear is given.
Red Wildlife Alert **If wildlife is less than 250 m away:** 1. Sound air horn with two long blasts. 2. Temporary work area closures for areas in vicinity of the animal and along its trajectory. Workers to immediately go to a safe area and use personal deterrents if needed. 3. Inform Environment Department of location, distance, and number of animals. 4. Stay in radio/phone contact. 5. Helicopter and armed Environment Department Response Team are deployed immediately to remove personnel or deter bear. 6. All personnel to stay in safe area until an all clear is given.

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 the 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 Department of Environment (DOE) 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 Response Team 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 DOE conservation personnel. All wildlife problems are to be recorded in the wildlife database.

In case of a General Wildlife Sighting or a Green Wildlife Alert, the Environment Department will:

- Conduct on-going monitoring and radio communication will continue in case the situation escalates and Alert status increases.

In the case of a Yellow Wildlife Alert:

- Environmental Coordinator or delegate will respond to the initial radio/call to confirm they have received the Alert message and that action is being taken;
- Environmental Coordinator or delegate will commence temporary area closures and collect all deterrent equipment and give a briefing to the Environment Department Response Team on location and circumstance of the call;
- The Environmental Coordinator will contact the helicopter dispatch and request immediate deployment (if required). Helicopter will prepare for deployment of Environment Department Response Team in to the field for emergency pick-up of field crews or a bear deterrence using the helicopter; and
- The Environmental Coordinator (or designate) should proceed to the security office to provision a firearm if needed and the site Medic should be on alert and monitor Alert updates.

In the case of a Red Wildlife Alert:

- The Environmental Coordinator or delegate will respond to the initial radio/call to confirm they have received the Alert message and that action is being taken;
- Environmental Coordinator or delegate will commence temporary area closures and collect all deterrent equipment and give a briefing to the Environment Department Response Team on location and circumstance of the call;
- The Environmental Coordinator will contact the helicopter dispatch and request immediate deployment (if required). Helicopter will prepare for deployment of Environment Department Response Team in to the field for emergency pick-up of field crews, or a bear deterrence using the helicopter;
- The Environmental Coordinator (or designate) should proceed to the security office to provision a firearm if needed and the site Medic and ERT should be on standby in the

unlikely event of a wildlife attack; and

- Updates on the situation will be broadcast if the situation or affected areas change, the Alert status changes, or when the hazard no longer exists and work may resume.

Once the Environment Department Response Team is deployed in the field:

- Prior to implementing any deterrence measures ensure the bear has a clear avenue of escape, and all workers have vacated the area;
- Depending on location, slowly drive or walk towards the animal staying a safe distance from the animal (minimum of 10 m);
- No firearms or deterrents should be discharged in a work area until all personnel are removed or are safely inside structures;
- 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 DOE 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; and
- 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 DOE conservation officers will be notified by phone. Direction will then be given to properly dispose of the carcass; and
- Any wildlife showing signs of rabies will be killed (never shot in the head) and reported.

Helicopter Deterrence:

- This method of deterrence is to be considered as a last resort depending on the circumstances (i.e., location of work);
- At least one member of the Environment Department must be onboard the helicopter to monitor the deterrence. The helicopter pilot is in charge of the safety of the aircraft and the passengers. The pilot will have the final say regarding where and how the aircraft is flown with regards to safety;
- To reduce stress on the animal, the helicopter must stay at least 100 m back and 30 m up from the animal during a helicopter deterrence;
- Animals cannot be pushed for more than ten minutes or 3 km (2.2 miles);
- The Environment Department passenger will notify the helicopter pilot once they are satisfied that the animal has been pushed a sufficient distance and that it is moving away from the site. They will then instruct the pilot to go up in altitude to continue monitoring the location of the animal and ensure that it is not returning;
- In the event that a firearm will need to be transported to a site via helicopter for deterrence (e.g., remote drill site), the firearm must be placed in a secure gun case and be unloaded; and
- A detailed record of all bear/wildlife activities and deterrence actions must be presented to the Environment Coordinator in a timely manner. This forms part of the reporting requirements for Wildlife Incident Tracking for regulatory authorities.

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.

5.3.1 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 Agnico Eagle 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

MEADOWBANK WILDLIFE INCIDENT PROCEDURES

Wildlife incidents refer to a range of possible occurrences at the Mine, including:

- human-wildlife interactions that present a risk to either people or animals
- wildlife-caused damage to property or delay in operations
- wildlife deterrent actions
- wildlife injury or mortality

The objective of wildlife incident reporting is to document and mitigate impacts to wildlife, reduce risks to people, and identify new mitigation.

Natural processes should be left alone, unless intervention is required to reduce risk to either wildlife or staff from Project activities. Each incident requires unique responses, but each incident should be assessed to reduce or eliminate the chance that it will recur.

GN should be contacted in the case of problem wildlife, and prior to disturbing nests. Detailed wildlife incident reporting is critical for implementing adaptive management. As part of the TEMP, all wildlife incidents are reported and reviewed to determine patterns in incident occurrences and to develop management procedures.

All wildlife incidents should be documented by Meadowbank Environment Department staff using the attached form, and reported immediately to the Environmental Superintendent. The report should include photographs and conversations with the individuals involved. Please attached additional pages or information that may be useful to understand what occurred and what can be learnt from the incident.

Wildlife Incident Report Form

Date:		**Time:**	
Individuals involved:			
Species:			
Number, gender, age:			
Location (description):			
Location (UTM):			
Digital photo numbers:			
Describe the incident or accident that occurred. Was there a threat to wildlife or human safety? What was the situation that caused it?			
Describe any use of wildlife deterrents: Describe any wildlife mortality:			
Describe any communication with GN-DOE:			
What immediate measures were taken to reduce risk or harm?			
What measures are recommended to prevent future occurrences?			
Report prepared by:		**Reviewed by:**	

APPENDIX C

UTM Coordinates for Monitoring Programs

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 18 and 19; km 36 and 37; and km 54 and 55. 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.

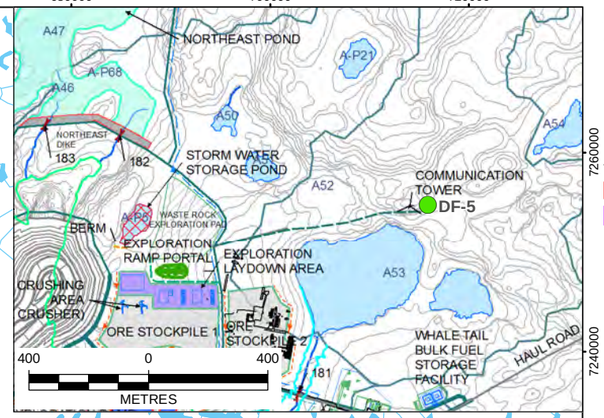
Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1658927_RegulatorySupport\02_PRODUCTION\6000\MXD\Report\1658927_6000_6010_02_WHALE_TAIL_AIR_QUALITY_MONITORING_STATIONS.mxd

560000 580000 600000 620000 640000 660000 680000 700000 720000

7260000 7240000 7220000 7200000 7180000 7160000 7140000

N

Whale Tail Pit
DF-5
Between km 54 & km 55
Meadowbank Mine to Whale Tail (71.5 km)
Between km 36 & km 37
Between km 18 & km 19
Pipedream Lake
Vault Pit
DF-1
DF-4
DF-3
DF-2
Tehek Lake
km 78
km 76
Baker Lake to Meadowbank Mine (107.5 km)
Schultz Lake
km 18
Baker Lake
Baker Lake



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 MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

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

Golder Associates

PROJECT		1658927	FILE No.	
DESIGN	CM	03 Apr. 2017	SCALE AS SHOWN	REV. 0
GIS	CDB	03 Apr. 2017		
CHECK	JR	03 Apr. 2017		
REVIEW	LY	03 Apr. 2017		

FIGURE 2

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

Alberta Environment, 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Prepared by Patricia Mitchell Environmental Consulting. July, 2006. Web Site: http://www3.gov.ab.ca/env/info/infocentre/publist.cfm

Auerbach, N.A., Walker, M.D. and D. A. Walker 1997. Effects of roadside disturbance on substrate and vegetation properties in arctic tundra. Ecological Applications: Vol. 7, No. 1, pp. 218–235.

Cumberland (Cumberland Resources Ltd.), 2005. Meadowbank Gold Project- Terrestrial Ecosystem Impact Assessment. October 2005.

Golder, 2016. Final Environmental Impact Statement for the Whale Tail Pit and Haul Road. Prepared by Golder Associates on behalf of Agnico-Eagle Mines Ltd. June, 2016.

Fisk, A. T., Hobbs, K., and D. C.G. Muir. Editors, 2003. Contaminant Levels, trends and effects in the biological environment. Canadian Arctic Contaminants Assessment Report II Indian and Northern Affairs, Canada.

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

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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

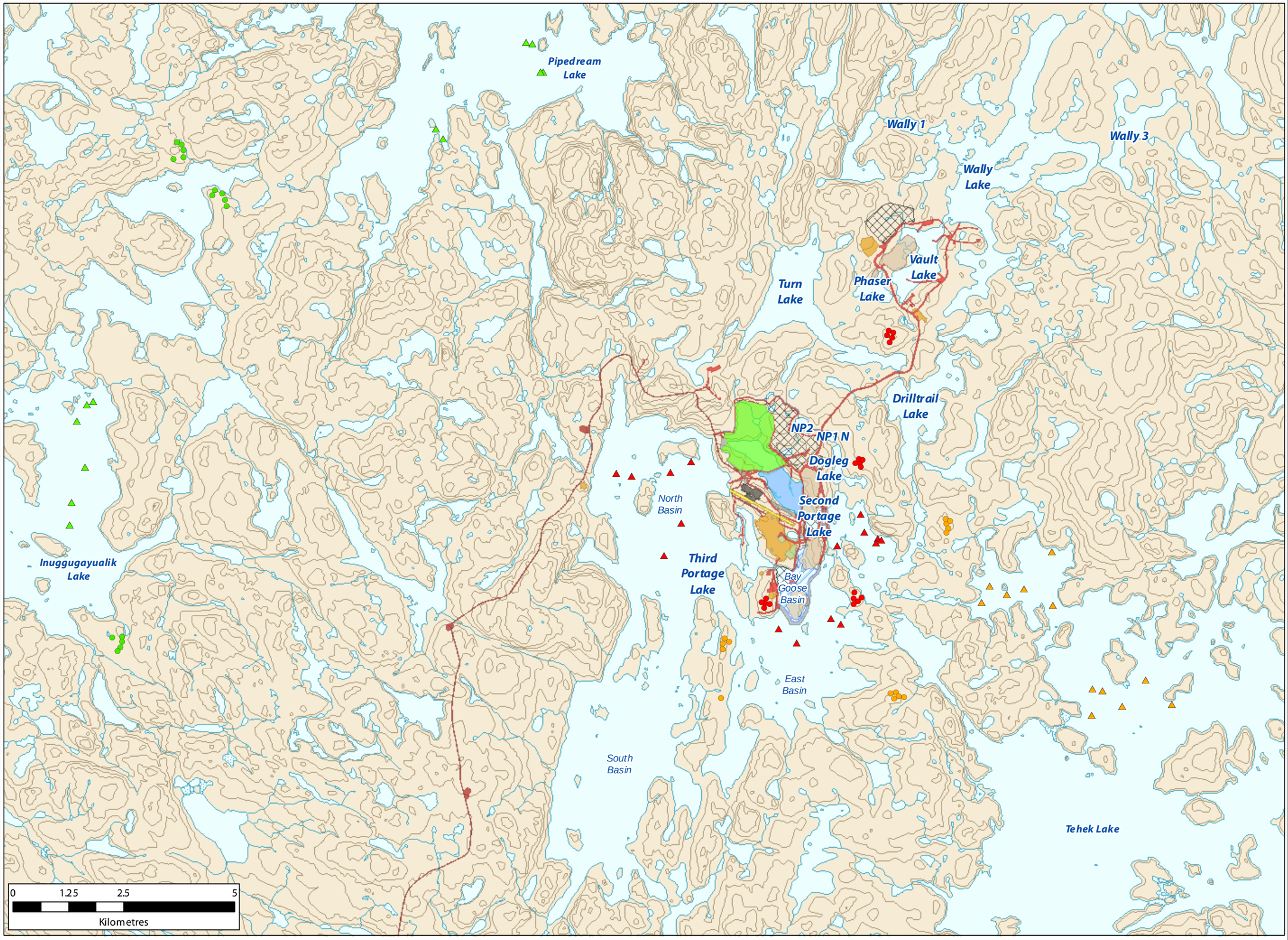
Concentrations of COPCs will be measured in and around the Meadowbank site in water, soil and plant tissue (food items: sedges, lichens, berries) in assessment years. This includes five samples of each media type from four onsite locations, three near-site locations, one AWAR location, two Whale Tail 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. The plan will include consultation with the Government of Nunavut (GN) with respect to obligations under the *Wildlife Act*, SNU 2003, c. 26.

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.

APPENDIX H

Viewshed Analysis

MEMORANDUM

TO Ryan Vanengen, Agnico Eagle Mines Ltd. **DATE** July 14, 2017

CC Dionne Filiatrault, Jen Range, Damian Panayi

FROM Corey De La Mare, P.Biol. **PROJECT No.** Doc 110-1658927.3200_Rev1

WHALE TAIL VIEWSHED ANALYSIS

Introduction

During the development and revisions of the Terrestrial Ecosystem Management Plan (TEMP) for the Whale Tail Project (the Project), which is an expansion of the existing Meadowbank Mine, several discussions revolved around caribou detection within and around the mine site, along the All Weather Access Road (AWAR) and the associated triggering mitigation actions. It became apparent that although caribou are regularly observed from roadside surveys along the existing Meadowbank AWAR, the sightability limit (i.e., maximum distance at which caribou could be observed based on topography) is largely unknown. This sightability distance is required to understand how much time Agnico Eagle Mines Limited (Agnico Eagle) may have to respond to caribou encountering the Project based on receiving GPS collar data and the lag time between receiving that data and caribou approaching the Project. The notion is that a greater distance of visible detection will allow for better caribou mitigation preparedness by Agnico Eagle.

The proposed Whale Tail Haul Road is a 65 km all weather haul road between the existing Meadowbank Operations (i.e., Vault Pit) and Whale Tail Pit. As part of the caribou monitoring component for this haul road, five height of land (HOL) survey locations are proposed in areas where caribou have been observed based on collar data, presence of caribou trails, caribou sign, and where topographic relief is greatest. The main methods for collecting caribou observation data are through roadside surveys along the existing Meadowbank AWAR and the proposed Whale Tail Haul Road, and at the five HOL survey locations.

To determine the extent of visibility from these locations, a viewshed analysis was completed within a GIS platform. The results of this memo are intended to validate the distance of visible detection using road surveys and HOLs will provide adequate caribou mitigation preparedness by Agnico Eagle.

Methods

The viewshed analysis shows the area where there is a line of sight based evaluation from elevations within the landscape, the observer height and the height of the target, in this case caribou. Visual aids, such as binoculars and spotting scopes, aid the observer to see at the extreme ends of the lines of sight so that caribou can be detected but the line of sight is not changed based on visual aids. The following assumptions were included in this viewshed analysis:

- An observer height of 2.0 m was added to each of the HOL locations, it is recognized that observers may not actually be 2.0 m but this is a standard observer measurement for viewshed analysis.
- A surface offset to simulate the height of caribou was added at 1.5 m.
- The observer height is set as: 2 m for the points and 1 m (default value) for the road; however, for the Whale Tail Haul Road the proposed road elevations based on the CAD profile was used.

The viewshed was required for the Regional Study Area; however, the availability of datasets was not consistent for the entire Regional Study Area in terms of data format and data resolution. Consequently, the datasets used and methods for harmonization are as follows:

- Road centerlines: Whale Tail Haul Road centerline and elevations (profile) provided by CAD, all weather road centerline generated semi-automatically using its footprint and linking its northern extremity to the Whale Tail Haul Road.
- 2016 HOL survey locations are only general and may have a high error range in their location precision, more specific coordinates will be acquired in 2017.
- Digital Elevation Model (DEM) for the haul road and the HOL survey points used a high resolution DEM (1 m). The DEM was down-sampled to 3 m resolution and merged with CDEM that has a 20 m resolution and then re-sampled back to 3 m resolution, but this is only to keep the 3 m precision where it exists and id does not make the CDEM more precise. Using a merging process avoiding edge effects and creates a smooth transition from one DEM source to the other.
- The high resolution DEM only covers the haul road (approximatively 500 m on each side) and a large portion of the Whale Tail Pit and development area.
- For the AWAR, no high resolution DEM coverage exists, consequently we only used the CDEM (20 m resolution) for this.

The viewshed analysis was run on an ESRI ArcGIS 10.4.1 platform using the 3D analyst tool – Viewshed. The visibility analysis does not take into account any potential vegetation or any other obstructions (natural/human) that are not part of the bare ground. A viewshed was developed for the existing Meadowbank AWAR, the proposed Whale Tail Haul Road, and the five HOL survey locations.

Results

The results of the viewshed analysis can be found in Figures 1 to 3, which each show the viewshed from the five HOL survey locations (Figure 1), the proposed Whale Tail Haul Road (Figure 2), and the existing Meadowbank AWAR (Figure 3). All three figures illustrate that with the naked eye, the sightlines from all three sources (HOL, Whale Tail Haul Road, AWAR) range from less than 1 km to greater than 8 km with a range of 3 to 5 km in several different directions from each location. When HOL locations are combined with the Whale Tail Haul Road as a point of observation, the visibility in general for all locations is around 5 km, with several vantage points of greater than 5 km.

A summary of field confirmation details regarding the viewscape analysis at HOL locations includes the following (M. Young, Dougan Associates, 2017, pers. comm.):

HOL Survey Point	Average Maximum Observable Distance	Comments
1	9.2 km	This site was slightly relocated to improve the visibility of the road. Small blind spots (50 to 100 m wide) facing S and NW
2	7.2 km	Small blind spots facing S, SW, and W
3	9.1 km	Small blind spots facing S, SE, NW, and E
4	8.9 km	Lars Qaqqaq identified this location as a movement corridor for Barren Ground Caribou Small blind spots facing SE, W
5	5.5 km	Road at this section is not currently built. Small blind spots facing SW, NW, NE. SW, and NE blinds spots to be opened up when eskers removed for road construction.

The viewshed analysis is an important component of the overall monitoring program as it provides direction for monitoring locations that best capture caribou movements through the Project area during the spring and fall migration periods. Consequently, the survey locations chosen based on the results of the viewshed analysis will be continually reviewed and updated with the Terrestrial Advisory Group. Additional tasks remaining prior to construction of the Whale Tail Pit and Haul Road include the following:

- Field crews are identifying ideal HOL survey locations and maximum line of sight distances during the summer of 2017, some of this information is incorporated in the table above and some will be compiled into this document at the end of the field season.
- Additional HOL survey location to be added on the west side of the Whale Tail Pit to capture areas not currently covered by survey locations as revealed in the viewshed analysis.
- Selected points along the road may fill in monitoring gaps in the viewshed, these sites have not yet been selected.
- Determine the amount of the landscape covered by height of land survey locations and roadside surveys within an area that buffers the height of land locations by 4 km and the road by 1.5 km to determine if there is sufficient monitoring coverage from the existing surveys.

Closure

We trust this meets your needs, if you have any questions or concerns, feel free to contact the undersigned.

Regards,

GOLDER ASSOCIATES LTD.

Corey De La Mare, P.Biol.
Principal, Senior Wildlife Ecologist

Citation

Young, M.Y. 2017. Landscape Architect, Ecologist. Dougan & Associates – Ecological Consulting & Design, Guelph, ON. E-mail with R. Vanengen (Agnico Eagle). July 2017.

https://capws.golder.com/sites/1658927RegulatoryAffairs/p3100_TEMP_and_Workshops/TEMP/02_Appendices/Appendix H_Viewshed/Appendix H_Viewshed_Analysis_June5.docx

635000

640000

645000

7225000

7220000

N

Pipedream Lake

Vault Pit

LEGEND

- 2016 HEIGHT OF LAND SURVEY POINT (D&A, JULY 2016)

BARREN-GROUND CARIBOU[2]

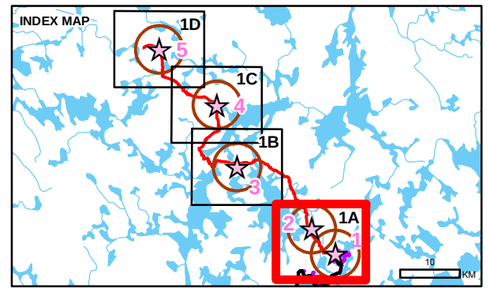
- SIGN
- OBSERVATION
- CARIBOU TRAIL

PROJECT DATA AND INFRASTRUCTURE

- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- VISIBILITY ANALYSIS AREA (4 km)
- AREA VISIBLE FROM PROPOSED HAUL ROAD

BASE DATA

- 10 m CONTOUR
- 100 m CONTOUR
- WATERCOURSE
- WATERBODY



REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. 2015/16 BARREN-GROUND CARIBOU OBSERVATIONS FROM THE GROUND RECONNAISSANCE SURVEYS, WATERBIRD NEST SURVEYS, BREEDING BIRD ROAD TRANSECT SURVEYS & HEIGHT-OF-LAND SURVEYS.
3. CONTOURS, WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. KEY MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

1.5 0 1.5

KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

VIEWSHED FROM PROPOSED HAUL ROAD

Golder Associates

PROJECT		1658927	FILE No.	
DESIGN	CDM	3 May 2017	SCALE AS SHOWN	0
GIS	SB	12 May 2017		
CHECK	JR	14 Jul. 2017		
REVIEW	CDM	14 Jul. 2017		

FIGURE 1A

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1658927_RegulatorySupport\02_PRODUCTION\3100\MXD\Report\1658927_FIG_1_Viewshed_land_survey_points.mxd

620000
625000
630000
7240000
7235000
7230000
N
1
2
3
4
5

LEGEND

2016 HEIGHT OF LAND SURVEY POINT (D&A, JULY 2016)

BARREN-GROUND CARIBOU[2]

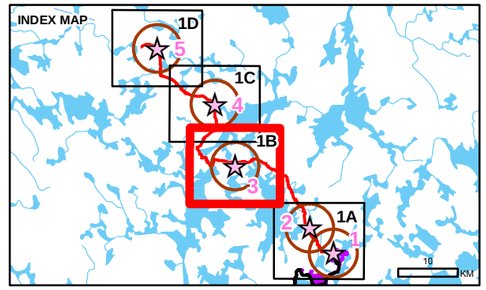
- SIGN
- CARIBOU TRAIL

PROJECT DATA AND INFRASTRUCTURE

- PROPOSED HAUL ROAD
- WHALE TAIL PIT
- VISIBILITY ANALYSIS AREA (4 km)
- AREA VISIBLE FROM PROPOSED HAUL ROAD

BASE DATA

- 10 m CONTOUR
- 100 m CONTOUR
- WATERCOURSE
- WATERBODY



REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. 2015/16 BARREN-GROUND CARIBOU OBSERVATIONS FROM THE GROUND RECONNAISSANCE SURVEYS, WATERBIRD NEST SURVEYS, BREEDING BIRD ROAD TRANSECT SURVEYS & HEIGHT-OF-LAND SURVEYS.
3. CONTOURS, WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. KEY MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

1.5 0 1.5
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

VIEWSHED FROM PROPOSED HAUL ROAD

Golder Associates

PROJECT		1658927	FILE No.	
DESIGN	CDM	3 May 2017	SCALE AS SHOWN	0
GIS	SB	12 May 2017	FIGURE 1B	
CHECK	JR	14 Jul. 2017		
REVIEW	CDM	14 Jul. 2017		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1658927_RegulatorySupport\02_PRODUCTION\3100\MXD\Report\1658927_FIG_1_Viewshed_land_survey_points.mxd